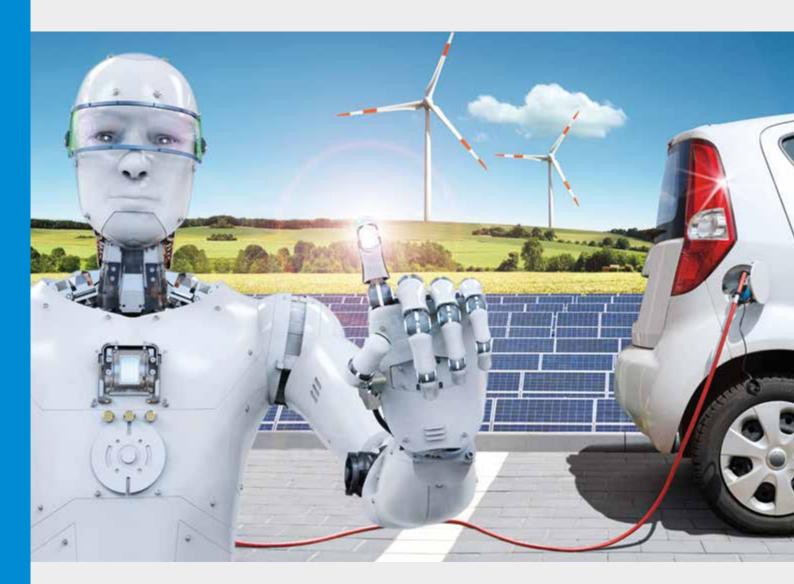


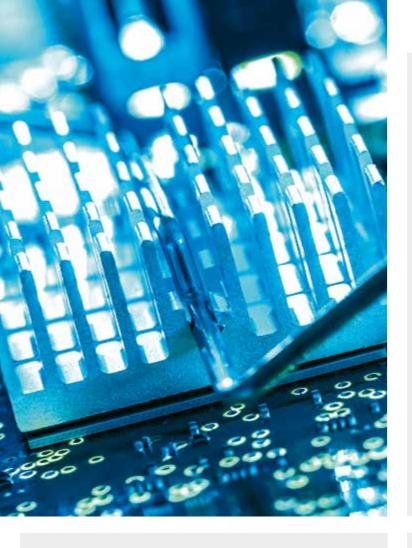
Power & Discrete Semiconductor Highlights



V4.1

Discretes, Drivers, Switch Mode Power Supply ICs, Voltage Regulators, AC/DC & DC/DC Converters, Power Supplies & Modules





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Power Supplies
RUTRONIK24
Voltage Regulators
RUTRONIK SMART
Switching Regulators ICs
RUTRONIK Electronics Worldwide
Protected MOSFETs
RUTRONIK AUTOMOTIVE
Motor Driver ICs
Gate Driver ICs
IGBTs
Power MOSFETs
RUTRONIK EMBEDDED
Triacs
Schottky Diodes & Rectifiers
RUTRONIK POWER
Bridge Rectifiers 80 – 81
Protection Diodes
Digital Transistors
Bipolar Transistors
RF / HF Transistors
Modules

Our Product Portfolio





& Boards

Technologies



Passive

Components



Wireless Technologies

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Committed to excellence

Consult – Know-how, Built-in.

The technical competence from Rutronik

Worldwide and individual consulting on the spot: by competent sales staff, application engineers and product specialists.

Components – Variety. Built-in.

The product portfolio from Rutronik

Wide product range of semiconductors, passive and electromechanical components, storage, displays & boards and wireless technologies for optimum coverage of your needs.

Logistics – Reliability. Built-in.

The delivery service from Rutronik

Innovative and flexible solutions: from supply chain management to individual logistics systems.

Quality – Security. Built-in.

Quality management without compromise

The integrated management system (IMS) encompasses quality control, environmental protection and occupational health and safety.

Rutronik -Power Expertise meets Innovation

Many customers already know and appreciate Rutronik as a reliable partner with great expertise in power semiconductors and both an innovative and well-balanced portfolio. This brochure gives you an overview of our broad product portfolio as well as the latest, most advanced products in terms of power management and small signal devices.

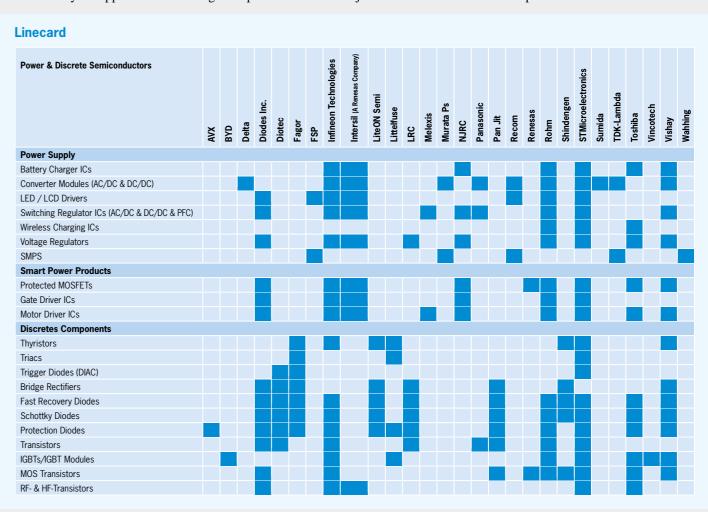
The semiconductor market is still very dynamic with a high innovation rate due to the ever higher requirements of new applications with respect to regulation on the components. Regarding the manufacturers there is a lot of M&A actions, which is affecting as well the product innovation, the availability and the supply chain for the products.



Senior Marketing Manage

Power goes Efficient. Robust. Scalable.

Today the markets requiring the most sophisticated solutions in terms of efficiency – growth drivers are e-mobility, power supplies as well as the renewable energy. Robustness is even mandatory in all safety functions and harsh environments, where you need the maximum of reliability for your system. To support fast time-to-market designs as well as modular systems, scalable solutions are hardly needed. Rutronik will offer you not only the state of the art components, Rutronik will offer you also innovative solutions and ideas for your application and design. So please be invited to join us and benefit from our expertise in Power Electronics.



For more detailed information on the products, including datasheets, availability and prices, please visit our e-commerce platform: www.rutronik24.com





RUTRONIK

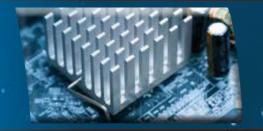
POWER SEMICONDUCTORS



Product Cycle

CONCEPT

- Product Specification
- Target Costing
- Technical Support
- Samples & Evaluation Boards



- Product Qualifications/Documentation
- Reference Designs
- Pre-Series
- **Direct Supplier Support**



PRODUCTION

- Cost Optimization
- Availability
- Automatic Processing
- Logistic Solutions & Traceability Information



SERVICE

- PCN / PTN Support
- Last-Time-Buy (LTB) Handling
- Workshops & Seminars
- Webg@te

Segments



















































































Power Supply Units

A power supply is a hardware component that supplies power to an electrical device. It converts main AC- to low regulated DC power for the internal components of an electrical system. The power supply is an integral part of electrical system and supports all the power that is needed for the electrical function of any system. The supplier portfolio has a wide range of different packages and power classes as well.

Rutronik offers a large variation from leading suppliers like FSP, Murata Power Solutions, Recom and TDK-Lambda for applications in the field of Tele/Data communication, computer systems, industrial, office equipment, transportation, medical and power distribution applications. There are also options for redundancy and customized designed power supplies.

Wah Hing is a specialist for customized solutions.

Power Supply Units

Suppliers	Suppliers Housing Power Range		Vout							
			3,3 V	5 V	12 V	15 V	24 V	36 V	48 V	50-60 V
FSP	Din-Rail									
	Panel Mount enclosed	25-400		Х	Х	Х	Х	Х	Х	
	Open Frame	30-400 W	Х		Х	Х	Х	Х	Х	Х
	Rack	100-1400 W	Х		х					Х
Murata PS	Din-Rail	-								
	Panel Mount enclosed									
	Open Frame	250-400 W			х	х	х	Х	Х	х
	Rack	650-7000 W	Х	Х	Х					Х
Recom	Din-Rail	45-240 W			Х		х		Х	
	Panel Mount enclosed	40-150 W		Х	Х	Х	Х		Х	
	Open Frame	40-150 W				х	х		х	
	Rack									
TDK-	Din-Rail	10-960 W	Х	Х	х	х	х		Х	
Lambda	Panel Mount enclosed	10-1500 W	х			х	х	Х	х	х
	Open Frame	10-420 W	Х		х	х	х	х	Х	х
	Rack	1000-10000 W			Х		Х		Х	

























DC/DC & AC/DC Converter Modules

A DC/DC converter module is an electronic circuit which converts a source of direct current called DC from one voltage level to another one. The isolation of the DC/DC converter module allows the electronics design engineers to comply with the safety regulations and solve issues such as interferences and failure protection and helps to speed up any development and certification process. An AC/DC converter module converts main AC- to low regulated DC power for the internal components of an electrical system. It is an integral part of electrical system and supports all the power that is needed for the electrical function of any system. AC/DC and DC/DC converter modules offer a flexible and clean solution to Distributed Power Architecture systems in the lower range of power. Rutronik offers a strong portfolio of leading suppliers like RECOM, Murata Power Solutions and Delta for applications in the field of industrial, transportation, medical, energy, aerospace and communication segment.

AC/DC Converter Modules

	Recor	n	
Туре	Power	Vout	Outputs
RACxx-GA	1, 2	5, 12	1
RACxx-GB	1, 2	5, 12	1
RACxx-SC*	1, 2, 3, 4	3.3, 5, 9, 12, 15, 24	1
RACxx-SE/277*	2, 3	3.3, 5, 12, 24	1
RAC03-SER/277**	3	3.3, 5, 12, 24	1
RACxx-SA	4, 5, 15, 20, 30	3.3, 5, 12, 15, 24	1 & 2
RACxx-DA	5, 10, 15, 20, 30	5, 12, 15	2
RACxx-SB	5, 10, 20, 40, 50, 60	3.3, 5, 12, 15, 24, 48	1
RACxx-S_DC	5, 6	3.3, 5, 9, 12, 15, 24	1 & 2
RAC04-S_DC/230	4	3.3, 5, 12, 15, 24	1 & 2
RACxx-S_DC/277	4, 10	3.3, 5, 12, 15, 24	1 & 2
RACxx-TA	15, 20, 30	5, 12, 15	3
RACxx-N	12, 18, 20	3.3, 5, 12, 15, 24	1
RAC40-xB	40	5, 12, 15	D=2, T=3

1 & 2	PF
1 & 2	PF
3	PF
1	PF

TDV I I I						
TDK-Lambda						
Power	Vout	Outputs				
5, 10, 15, 25	5, 12, 15, 24	1				
15, 25, 30, 50, 60	5, 9, 12, 15, 24	1				
5, 10, 15	3.3, 5, 12, 15, 24	1				
5, 10, 15	5, 12, 15	1				
5, 10, 15	5, 12, 15	2				
10, 15, 40	3.3, 5, 9, 12, 15, 24	1				
15, 40	5, 12, 15, 24	2				
15, 40	5, 12, 15	3				
2, 4	3.3, 5, 9, 12, 15, 24	1				
300, 500, 700	12, 28, 48	1				
1000	12, 28, 48	1				
500	12, 28, 48	1				
500, 1000	360	1				
	Power 5, 10, 15, 25 15, 25, 30, 50, 60 5, 10, 15 5, 10, 15 5, 10, 15 10, 15, 40 15, 40 2, 4 300, 500, 700 1000 500	5, 10, 15, 25 5, 12, 15, 24 15, 25, 30, 50, 60 5, 9, 12, 15, 24 5, 10, 15 3.3, 5, 12, 15, 24 5, 10, 15 5, 12, 15 5, 10, 15 5, 12, 15 10, 15, 40 3.3, 5, 9, 12, 15, 24 15, 40 5, 12, 15 2, 4 3.3, 5, 9, 12, 15, 24 300, 500, 700 12, 28, 48 1000 12, 28, 48 500 12, 28, 48				

DC/DC Converter Modules

Suppliers		Delta		Murata PS		Recom		Sumida	TDK-Lambda		
Power [W]	Isolated	Non-Isolated	Standalone	Isolated	Non-Isolated	Micro DC-DC	Regulated	Unregulated	Non-Isolated	Isolated	Non-Isolated
< 0-1		Х		Х		Х	Х	Х			
< 1-5	X	Х		Х	Х	х	х	Х		X	x
< 5-10	X	Х		Х	Х	х	х			X	x
< 10-50	Х	Х	Х	Х	Х	Х	Х		Х	Х	Х
< 50-100	х	Х	Х	Х	Х		Х			X	Х
< 100-250	X	Х		Х	Х		Х			X	x
< 250-500	Х	Х	Х	Х						Х	
< 500-1000	X			Х						X	
> 1000											



*/W = wired | **wired

























Modules for Distributed Power Architecture

The concept of distributed power architecture - the combination of a centralized switching power supply with many local "on board" converter modules enables developers to come up with much more flexible and efficient designs. Today, "off-the-shelf" modules are available for virtually any application in the industrial controls, power generation, medical, aerospace, and transport markets.

1W and 2W Mini Power Supplies for Smart Home / Smart Office Applications

RECOM's low cost RAC01-G and RAC02-G AC/DC power supplies are specially designed to power smart building infrastructure 24/7 by offering small PCB footprints, very low standby power consumption and full certifications: CE, UL60950 + IEC/UL/EN62368-1 CB, EN60335-1 + EN55014

Fully-automated manufactured 1W DC/DC **Converters with Very Low Profile**

The R1SX series is suited for bus isolation and a wide range of industrial automation control equipment. These converters have nearly 20% lower profile than the industry standard due to their unique inverted transformer design. Featuring a stable performance and consistent high-quality at a very competitive price.

AC/DC: We Power your Products

Mains powered equipment requires universal input AC/DC converters if it is to be used globally, with full international certifications. RECOM specializes in on-board and off-board power supplies from 1W up to 480W with fully protected outputs and high efficiencies. The modules can be powered from as low as 80VAC up to 305VAC and come with 3kVAC/1min or 4kVAC/1 min isolation.

Low Power AC/DC Modules

RAC01, RAC02, RAC03, RAC04, RAC05, RAC06, RAC10

- Ultra-compact, low profile AC/DC module (class II) with 3kVAC isolation
- 1-10W converters with either pins or wires for versatile installation options
- Low standby consumption <30mW
- Wide input voltage range (80 305VAC)
- UL & CE certified and fully protected outputs (short circuit, overload and overheating)
- 3 year warranty



AC/DC Power Supplies Off-board

RAC35-G/OF, RAC45-G/OF, RAC60-G/OF, RACG100, RACG150, RAC150-G

- Open frame and enclosed power supplies for cost sensitive applications
- Universal input voltage
- Wide operating temperature range
- Built-in class B EMC filters
- Screw terminal or header pin connection
- Designed to be built-in, with pre-threaded mounting holes
- 3 year warranty



AC/DC Power Supplies for Medical Applications

RACM40, RACM65, RACM100, RACM150

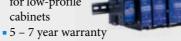
- Fanless 40W, 65W, 100W or 135W (150W with fan)
- Space-saving 3"x2" or 4"x2" open-frame or enclosed cases
- Universal input (85-264VAC / 120-370VDC) with active PFC
- 2MOPP with 250VAC working voltage
- 4kVAC/1min reinforced isolation with 8mm creepage and clearance
- Less than 100μA leakage current (BF rated output)
- Wide operating temperature range (-40°C up to +85°C) and 5000m altitude
- UL/IEC/EN 60601 3rd Ed certified
- ErP compliant standby (<0.3W)
- 5 year warranty



Din Rail Power Supplies for Industrial Automation

REDIN45, REDIN60, REDIN120, REDIN240, REDIN480

- Boost power capability up to 150%
- Rugged mechanical design
- Smart overload protection
- Temperature range -25°C to +70°C Parallel operation without OR-ing diodes
- Operating altitude up to 5000m
- Universal input range (85-264VAC)
- Conformally coated and tested for high humidity environments
- Slim shape takes up less room on the rail
 UL/IEC/EN 60950 certified / UL 508 listed
 - Side mount option for low-profile
 - cabinets



Super Small and Flat LED Drivers

RACD03 (-PSE), RACD04, RACV04, RACD06-LP, RACV06-LP, RACD12-LP, RACV12-LP, RACD20-LP, RACV20-LP

- voltage versions
- 3, 4, 6, 12 & 20 Watt
- Super small footprint, super flat design
- Constant current & constant Open circuit, short-circuit, overload,
 - over-temperature protected • Simple installation wired or
 - screw terminal UL8750, ENEC & CE certified
 - 3 year warranty





DC/DC Converters for Every Application

When RECOM started to develop their first DC/DC-converters more than 40 years ago, nobody could imagine their wide-spread use in electronics today. As one of the pioneers in this market, RECOM covers the entire power range from 0.25 - 240 Watts with a wide range of general purpose and application specific products. Whether regulated or unregulated, non-isolated or with very high isolation of up to 10kVDC, through-hole or SMD, industrial and medical grade, or designed for extremely low or high ambient temperature operation, RECOM offers a solution for every application.

Switching Regulator Module

R-78xx, R-78AA, R-78C, R-78B, R-78HB, R-78/W, ROF-78E, R-78E, R-78T-1.0, R-5xxx, R-6xxx, R-7xxx, R420

- 8:1 input voltage range up to 72V
- High efficiency up to 96%
- Replacement for linear regulators
- TO-220 compatible SIP case or SMD
- Tight regulation (+/-0.5%) and low noise
- Operating temperature -40°C and +85°C
- Remote ON/OFF control
- EN certified / 3 year warranty



Low Power SMD DC/DC **Converters**

R0.25S/D, R0.5S/D, R1S/D, R1SX, R2S/D, R1DA, R0.5Z, R1Z, RTC2

- 0.25 to 2 watt SMD converters
- Regulated and unregulated
- Very compact size
- Up to 3kV isolation • Operating temperature -40°C to
- +100°C
- EN/UL certified, CB report
- 3 year warranty



Premium DC/DC for Industry Applications

REC3, REC3A, REC5, REC5A, REC6A, REC8, REC10, REC10/M, REC15/M, REC20, REC30, RPA20-AW, RPA30-AW, RPA60-FW, RPA120H-RW

- 3 to 120 watt in compact packages
- Industry standard pinouts
- 2:1 & 4:1 inputs
- Isolation up to 6kVDC
- Short circuit protection
- EN/UL certified, CB report
- 3 year warranty

High Isolated DC/DC for IGBT/SiC

RH, RP, RxxPxx, RxxP2xx, RKZ, RGZ, RV

- Asymmetric dual output
- +15/-9V // +20/-5V //+15/-3V Compact design
- High isolation up to 6.4kVDC
- Extreme low isolation capacity
- Efficiency up to 86%
- Operating temperature -40°C to +85°C
- EN / UL certified, CB report
- 3 year warranty



High Isolated Reinforced DC/DC RxxPxx/R, RxxP2xx/R, RV/R, REC3.5/R, REC6/R

- Ultra-compact design
- 1 & 2 watt in SIP7 package
- 2, 3.5 & 6 watt in DIP24 package
- Reinforced isolation up to 10kVDC
- Efficiency up to 86%
- Operating temp. -40°C to +85°C
- EN/UL certified, CB report
- IEC/EN/UL 60601-1 3rd Ed. certified
- 3 year warranty



DC/DC Converters for Cost-effective Applications

R-78E, ROF78E, ROE, R1SE, R1SE/H2, RBE, REE, RKE/H, RSE, RSOE

- Ideal for the interface isolation in large numbers
- Pin-compatible with industry standard converters
- Operating temperature: -40°C to +85°C
- R1SE suitable for vapor phase soldering
- RKE/H available with $3.75kV_{DC}$ isolation



DC/DC Conv. with Railway Certification

RP08, RP20-FR, RPA20-AW, RPA30-AW, RP40-FR, RPA60-FW, RP75H-RW, RP90Q-RW, RP100H-RW, RP120Q-RW, RP180H-RW, RP240H-RW

- Wide 4:1 input voltage range
- 1.6kVDC isolation
- Efficiency up to 89%
- Six-side shielding ■ EN50155,
- UL60950 certified



Medical Grade DC/DC Converters REM1, REM3, REM6, REM10

250VAC working voltage – 2MOPP

- 2µA patient leakage current
- 5kVDC/min isolation
- 8mm creepage and clearance • Fully protected single / dual outputs
- IEC/EN/UL 60601-1
- 3 year warranty



DC/DC LED Drivers

R-78E, ROF78E, ROE, R1SE, R1SE/H2, RBE, REE, RKE/H, RSE, RSOE

- High Efficiency up to 96%
- PWM / digital and analogue dimming Wide input voltage range
- Buck & Buck-boost topology Ready to use (no external
- components necessary) ■ EN/UL 8750 certified
- 5 year warranty



TDK·Lambda



AC-DC Power Supplies 5W to 10.000W

DC-DC Converters

1.5W to 700W



Programmable Power Supplies 200W to 15.000W



EMC/EMI Filters 0.5A to 300 A Line Current

Power Supply Solutions. Worldwide.

CC-G

15 - 30W DC-DC Converters

The units are enclosed in a metal case with 6-sided shielding for lower noise and encapsulated for rugged shock and vibration performance.

Power	15, 30W
Output Voltages	3.3, 5, 12 or 15V _{dc}

- Industry Standard 1" x 1" Footprint
- Wide Range DC Input 9 36 or 18 76V
- High Efficiency Up to 91%
- Adjustable output
- Remote on/off
- Six Sided Shielding





Power Supplies & DC-DC Converters

Highly Reliable Power Supplies for Industrial & Medical Equipment

TDK-Lambda, a subsidiary of the TDK Corporation, is a leading global power supply company providing highly reliable power supplies for industrial equipment worldwide. TDK-Lambda offers a broad product line of AC-DC power supplies, DC-DC converters and programmable power supplies from 1.5W to 15kW and meets the various needs of customers with entire range of activities, from research and development through to manufacturing, sales, and service with bases in five key areas, covering Japan, Europe, America, China, and Asia.

KMS-A - Series

Single Output, Medically Certified 15 - 60W Encapsulated Power Supplies

Designed for medical and industrial applications that require robust, encapsulated, lightweight and compact power supplies, these sealed AC-DC pcb mount KMS-A supplies resist dust and humidity.

Power	15, 30, 60W
Output Voltages	5, 9, 12, 15, 24Vdc

Features:

- EC 60601-1 & IEC 60950-1 approvals
- Input Output isolation 4kV_{AC}, 2 x MoPP
- Suitable for B & BF applications
- Enclosure leakage current less than 100μA
- Low off load power draw <0.3W
- Class II (no ground needed)
- Operating altitude 5.000m



KWS-A – Series

Class II Encapsulated Power Supplies Operate in High Ambient Temperatures

Featuring a wide operating temperature range of up to 85°C and start-up temperatures of -40°C, the single output encapsulated power module series KWS-A is ideal for harsh industrial applications.

Power	5, 10, 15, 25W
Output Voltages	5, 12, 15, 24V _{dc}

- Compact AC-DC supply with no need for external components
- 66% Footprint saving over previous generation KWS
- Improved efficiency values up to 88%
- No load power consumption less than 0.5 W
- Class II (no ground needed)

LS-Serie

25 -200W Single Output General **Purpose Power Supplies**

The LS series of 25W to 200W power supplies offers users both affordability and reliability with MTBF figures of up to 900,000 hours. Backed by a five year warranty, the LS has a superior operating performance in ambient temperatures up to +70°C

Power	25, 50, 75, 150, 200W
Output Voltages	3.3, 5, 7.5, 12, 15, 24, 36, 48V _{dc}

Features:

- High MTBF up to 700 000 hours
- Superior operating temperature
- Performance up to 70 °C
- High efficiency up to 87%
- Low cost
- Compact
- Withstands 300V_{AC} surges (5s)
- Five year warranty

HWS-A

15-150W Industrial Power Supplies

Significantly upgraded in 2013, the HWS-A series now has a higher efficiency (up to 91%), a lighter weight and reduced no-load power consumption.

Power	15, 30, 50, 100, 150W
Output Voltages	3.3, 5, 12, 15, 24 and 48V _{dc}

Features:

DRB

- Limited lifetime warranty
- High efficiency (up to 91%)
- Wide range AC input
- Optional with or without cover
- Options: medical or heavy duty versions

DRL

10-100W Low Profile, Ultra Slim DIN Rail Power Supplies

The low profile and ultra slim DRL series provide a reliable solution for many industrial applications and building automation.

Power	10, 30, 60, 100W
Outnut Voltages	12 or 24V ₄

Features:

- High Eff. up to 90% @ 230V_{AC}
- UL1310 class 2 compliant
- "Fuse" shape design
- Long E-Cap-Life (>8 years @ 40°C, 75% load, 230VAC)
- Low no load consumption • Class II, wide range input
 - $(85-264V_{AC})$

15-480W Ultra Slim DIN Rail Power Supplies

The DRB series of single output DIN rail power supplies offers basic functionality with IEC/EN/UL 60950-1 and UL 508 certifications for power applications up to 480 W.

The series combines low cost and extremely compact dimensions with efficiencies of up to 92%.

Power	15W, 30W, 50W, 100W, 480W
Output Voltages	5, 12-15, 24, 48V _{do}

Features:

- Excellent efficiency up to 92%
- ErP compliant up to 100W
- Single phase input
- 3 year warranty



CUS-M - Series

Single Output, Chassis Mount Medical & Industry Power Supplies

Convection cooled AC-DC series with full medical approvals and low profile - ideal for applications where audible noise cannot be tolerated.

Power	150, 200, 350W
Output Voltages	12, 18, 24, 36 or 48V _{dc}

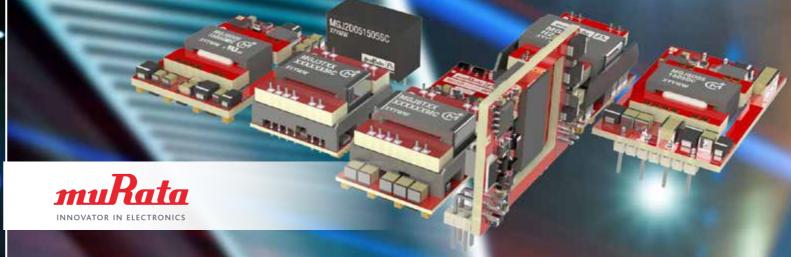
Features:

- IEC 60601-1 (2x MOPP) & IEC 60950-1 Approvals
- Suitable for B & BF applications
- 200W convection cooled rating
- 350W convection (up to 420W rating with forced air)
- 5V Standby power (CUS200m, 5V & 12V Aux Power on board)
- Low profile (<1U)
- Operating altitude up to 5000m
- High efficiency up to 94 %
- Low no-load power consumption (<0.5W)









AC/DC Power Supplies

With design centers and ISO 9001:2000 registered manufacturing facilities on three continents, Murata is able to produce power supplies to the highest standards in terms of power, performance, efficiency, protection, approvals compliance and cooling for a multitude of application requirements. In addition to an expanding offering of standard models, Murata has a long and proud history of designing custom solutions to meet even the most stringent and challenging requirements.

PQC250 Series - 250W 3" x 5" Convection Cooled AC-DC Power

Feature

- IEC60601 Ed.3 medical (2 x MOPP Pri-Sec; 1 x MOPP Pri-Chassis Ground); POM250-xx Series
- 60950-1 compliant, IEC62368 3 planned submission
- 250W compact high density; operation to 250W at +50°C
- Very low no load standby power; designed to meet
 ENERGY STAR* Program Requirements for Single Voltage
- External AC-DC Power Supplies
- True zero load operation of the Main (V1) output; no minimum load requirements

Specifications

- 3" x 5" industry standard footprint
- High efficiency 94% typical; excellent overall no load efficiency of circa 74%
- Remote sense, main output
- Universal AC input with active PFC
- Less than 1U high



Model Number	Natural Convection Cooling	Load Current	Main Out- put (V1)	Aux Output (V2)	Efficiency
PQC250-12xxx			12V		
PQC250-15xxx1	250W		15V		
PQC250-18xxx1			18V		
PQC250-24xxx		0 to 0.5A	24V	5V	High efficiency
PQC250-28xxx1		0 to 0.5A	28V	34	up to 95%
PQC250-36xxx			36V		
PQC250-48xxx			48V		
PQC250-54xxx			54V		

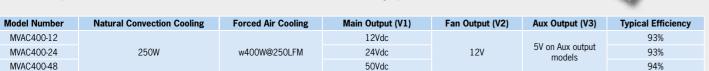
MVAC400 Series - Medically approved Highly Efficient Open Frame

Features

- 3rd ed. Medical and ITE safety approved
- Remote sense
- Remote on-off and PS_OK (Aux output models)
- Isolated 12W fan available and 10W standby (on Aux output models)

Specifications

- 3" x 5" x 1.4" standard footprint
- High efficiency up to 94%
- Convection-cooled operation up to 250W
- Active inrush protection
- Current sharing option available



DC/DC Converter Highlights

Murata Power Solutions is one of the world's largest suppliers of DC/DC converters. The main benefits of Murata Power Solutions are reliability, efficiency and cost-effectiveness. Their unique ability to blend proven circuit topologies, high-performance components, contemporary SMT construction and highly automated assembly brings you exceptional quality products, from standard off-the-shelf models to modified products and complete custom designs in a high grade of performance.

MGJ6Q24P24MC

MGJ6HB, MGJ6FB, and MGJ63P- Gate Drive Power for Half, Full, and Three-phase Bridge Circuits

ANSI/AAMI ES60601-1

typically 15pF

gate drives

recognition pending 2 MOPP's

Ultra-low coupling capacitance

• 5V, 12V, & 24V input voltages

Two, three, or four isolated output

voltages for IGBT/SiC & Mosfet

- Characterized dv/dt immunity 80kV/µs at 1.6kV
- Characterized partial discharge performance
- DC link voltage 3kVDC
- Reinforced insulation to UL60950 with 8mm creepage & clearance recognition pending

Applications

- Solar Inverters
- Traction, EV/HEV
- Welding
- Motor Drives/Motion Control Medical
- Alternative Energy (wind power generators)

EMH-54 Series – Efficient Power-over-Ethernet for 24/48/60V Battery Systems

Isolated, 54V_{out}, 3A, Ethernet Power Half-Brick DC-DC Converters

- PoE compliant
- 18V 72Vin Range
- 54Vout @ 3A (162W)
- 2250V_{dc} input to output isolation
- Applications
- Tele-communication
- Power-over-Ethernet
- Datacom
- Networking applications

Half Brick footprint

Optional baseplate

91% efficiencyIndustry-standard

Model	Input Voltage	Output Voltage	Output Current	Output Power	Efficiency
	V _{In} (V _{dc})	V _{out} (V _{dc})	I _{out} (A)	Pout (W)	%
EMH-54/3-Q48	18-72V (48V tvp.)	54V	3A	162W	91.50%

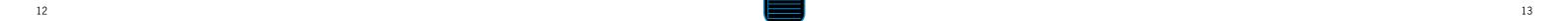
Model	Input Voltage	Output Voltages
MGJ6D05H24MC	4.5-9V	24V
MGJ6D12H24MC	9-18V	24V
MGJ6D24H24MC	18-36V	24V
MGJ6T05F24MC	4.5-9V	24V
MGJ6T12F24MC	9-18V	24V
MGJ6T24F24MC	18-36V	24V
MGJ6Q05P24MC	4.5-9V	24V
MGJ6Q12P24MC	9-18V	24V

18-36V

ICx Series		ICF Serie	s ICH Serie	es ICQ Serie
Model	Input \	/oltage	Output Voltage	Output Current
	Min	Max	V _{out} (V _{dc})	I _{out} (A)
ICF Series: Wide	Input 100) Watt Isola	ted Full Brick	
ICF0442V1xC	9	36	24	42
ICF0536V1xC	9	36	28	36
ICH 360-Watt Se	ries: Wide	Input Isolat	ed Half Brick DC-DC	
ICH0130V1xC	9	36	12	30
ICH0415V1xC	9	36	24	15
ICH0513V1xC	9	36	28	13
ICH 500-Watt Se	eries: Wide	Input Isolate	ed Half Brick DC-DC	
ICH0141V1xC	9	36	12	41
ICH0421V1xC	9	36	24	21
ICH0518V1xC	9	36	28	18
ICQ Series: Wide	Input 250	Watt Isolat	ed Quarter Brick DC-	DC
ICQ0120V1PC	9	36	12	20.5

Model	Output Voltage	Output Current	Input Voltage (V)
	V _{out} (V _{dc})	I _{out} (A)	V _{in} (V _{dc})
IRH Series: Encap	sulated Half-Brick	150-Watt Isolated DO	C-DC Converter
IRH-5/30-T110	5	30	110
IRH-12/12.5-T110	12	12.5	110
IRH-24/6.3-T110	24	6.25	110
IRQ Series: Encapsulated Quarter-Brick 100-Watt Isolated DC-DC Converter			
IRQ-5/20-T110	5	20	110
IRQ-12/8.3-T110	12	8.3	110
IRQ-24/4.2-T110	24	4.2	110

Industrial/Railway





Standard Power Modules Isolated DC/DC Module

Open Frame DC/DC Brick

The power modules range all DOSA-compatible brick converter from 1/32 brick to $\frac{1}{2}$ brick with industrial standard footprint and pinout. With 18 \sim 75V input voltage range, products output power up to 600W. Delta provides these high-density and higherficiency converters with advance performance, flexibility and reliability, which are widely applied to the telecom, networking and datacenter marketplace.

Package	1/32, 1/16, 1/8, ¼, ½ brick
Power	17~600W
Annlications	Telecom Networking Datacenter

Panel Mount DC/DC Module

Panel-mounted DC/DC converter, a wide input range of $18\sim106$ V, can be provide 360W, regulated DC output voltage with high efficiency. It has an option for integrated fuse holder and enable on/off function. It also has parallel function; and allows a wide operation temperature range of -40° to +75°C with high reliability under extremely harsh operating conditions.

Package	SIP, SMD
Power	3~30A
Applications	Telecom, Networking, Datacenter

Panel Mount DC/DC Module

Delta offers a wide range of AC/DC power supplies in miniature, fully encapsulated plastic modules. All models provide universal input voltage 85-264VAC.

Package	PCB Mount, Panel Mount
Power	2~60W
Applications	Industrial, Medical

Encapsulated DC/DC Module

Delta's expansive product portfolio provides solution capability to meet the specific requirements of industrial application. Products achieve extremely high efficiency, low power dissipation and greater reliability. These Modules housed in industrial standard footprint and pinout are easy to use abd available in a fully encapsulated package for harsh environment applications.

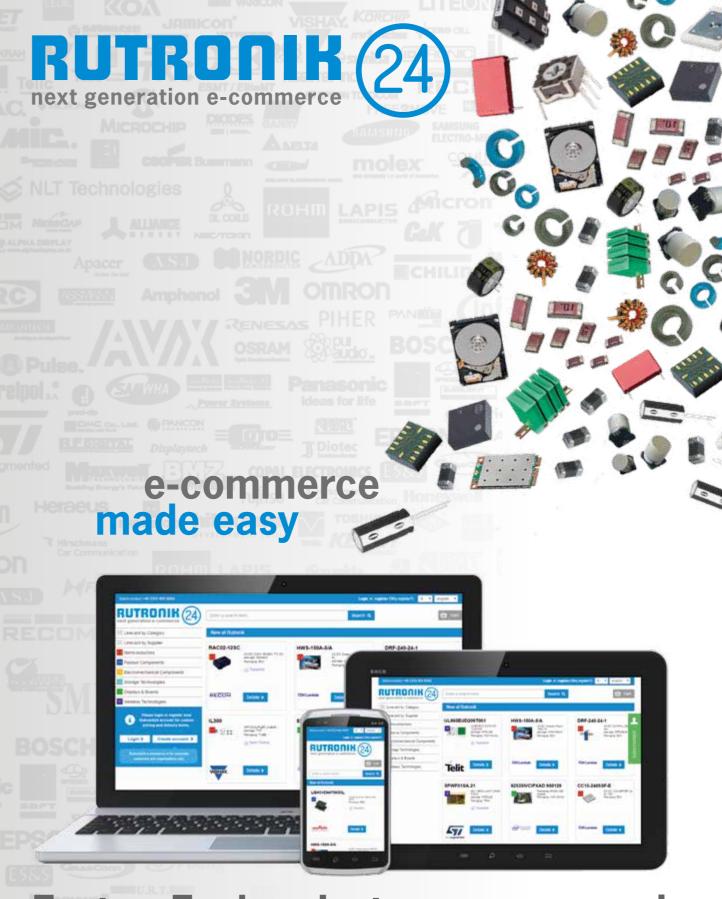
Package	SIP, DIP, SMD
Power	1~60W
Applications	Industrial, Railway, Healthcare

Non-isolated POL

DOSA POL power modules are designed in an industry standard footprint and pinout. Each provides programmable output voltage by using an external resistor. Some series have flexible and programmable tracking and sequencing feastures to enable a variety of startup voltage as well as sequencing and tracking between power modules. Both DIP and SMD package are available.

Package	SIP, SMD
Power	3~30A
Applications	Telecom, Networking, Datacenter





Faster. Easier. Just more personal. rutronik24.com



Voltage Regulators





Voltage Regulators

Rutronik offers a comprehensive portfolio of linear voltage regulators fitting a broad range of automotive, industrial and consumer applications from the world's biggest and leading suppliers. We are an experienced long-term Distributor in power parts for all kinds of applications.

We are continuously expanding our portfolio to meet our customer's present and future application requirements.

	Diodes Inc.	Infineon	Intersil	NJRC	ROHM	ST	Toshiba
Linear Regulators							
Positive							
Negative							
LDOs							
Industrial							
Automotive							















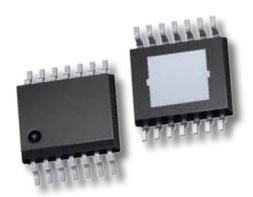


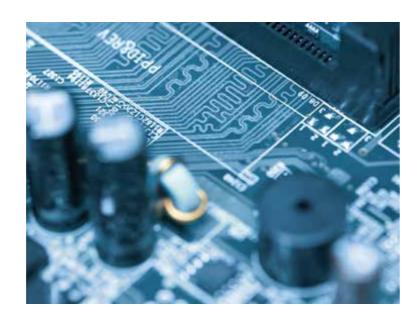


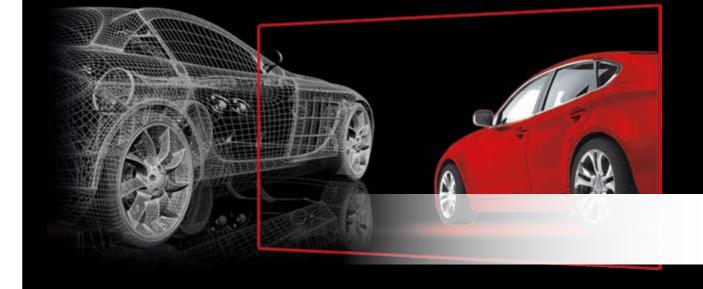














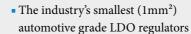
Small Package Automotive LDO Smaller | Stronger | Faster

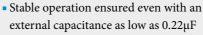
The world's Smallest*Automotive-grade LDOs

The continued integration of cameras, sensor modules, and other devices that collect data in Advanced Driver Assist Systems (ADAS), which are experiencing rapid growth, has demanded increased miniaturization. To meet this need, the BUxxJA2MNVX-C series of 200mA output full CMOS regulators provide automotive-grade reliability in the industry's smallest package (1.0mm x 1.0mm x 0.6mm). In addition, low power consumption with fast response is achieved, making them ideal for ADAS devices, power supplies for car radar/indicators, and similar applications.

World's Smallest*Automotive-grade LDO Regulators

BUxxJA2MNVX-C Series





Ultra-Low Quiescent Current LDO Regulators

BD4xxMx / BD7xxLx Series

- State-Of-The-Art in current consumption for high voltage regulators
- No-load current reduced down to only 6μA
- Multiple package types offered for broad compatibility

For MCU Applications in Body and Powertrain Systems

BD4xxM2 Series (45V Breakdown/200mA)

Output Vol	tage (typ.)	Package	Output Shutdown		
3.3V	5.0V		Switch Function		
BD433M2WFP3-C	BD450M2WFP3-C	S0T223-4			
BD433M2WEFJ-C	BD450M2WEFJ-C	HTSOP-J8			
BD433M2FP3-C	BD450M2FP3-C	S0T223-4			
BD433M2EFJ-C	BD450M2EFJ-C	HTSOP-J8			

BD4xxM5 Series (45V Breakdown/500mA)

- Output Voltage (tvp) 3.3V BD433M5WFPJ-C BD450M5WFPJ-C T0252-J5 BD433M5WFP2-C BD450M5WFP2-C T0252-3 BD450M5FP-C BD433M5FP2-C BD450M5FP2-C T0263-5
- FI
- HEV/EV Inverters
- TPMS
- BCM Smart Keys
- HUDs
- LCD Monitors
- Cluster Systems

For Power Supplies in Information Systems (Various Output Levels/Package Types)

		Output Voltage (typ.)			Daakawa	Output Shutdown	
3.3V	5.0V	8.0V	9.0V	Variable	Package	Switch Function	
BD33C0AWFP-C	BD50C0AWFP-C	BD80C0AWFP-C	BD90C0AWFP-C	BD00C0AWFP-C	T0252-5		
BD33C0AFP-C	BD50C0AFP-C	BD80C0AFP-C	BD90C0AFP-C	-	T0252-3		
BD33C0AWHFP-C	BD50C0AWHFP-C	BD80C0AWHFP-C	BD90C0AWHFP-C	BD00C0AWHFP-C	LIDDE		
BD33C0AHFP-C	BD50C0AHFP-C	BD80C0AHFP-C	BD90C0AHFP-C		HRP5		
BD33C0AWFP2-C	BD50C0AWFP2-C	BD80C0AWFP2-C	BD90C0AWFP2-C	BD00C0AWFP2-C	T0263-5		
BD33C0AFP2-C	BD50C0AFP2-C	BD80C0AFP2-C	BD90C0AFP2-C		T0263-3		

systems ■ ETCs and the like

Audio/navigation

- Other applications such as heated seat controls

17

*April 2016 ROHM study



Infineon's Power Supplies Address a broad Range of Automotive Applications

Infineon offers a comprehensive portfolio of linear regulators and voltage trackers, fitting a broad range of automotive applications and is the global market leader with over 15 years of experience in the automotive regulator segment. Infineon continuously expands their portfolio to meet the customers present and future application requierements. Infineon automotive voltage regualtors are especially designed for use in harsh environments and are offered in the highest quality level. The robust design approach ensures delamination-free ICs and long-term reliability.

Automotive Linear Voltage Regulators Portfolio

TLE42xx4. TLE72xx-2 TLE46xx

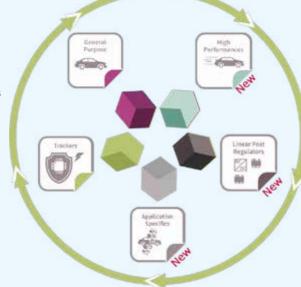
- Vin: 3.3V-45V (some products up-to 65V)
- Iout: 20-550mA
- Various features and protections

TLE425x

TLS810x1EJ Vxx

TLS850F0TA V50 T0263-7

- Vin: 3.5V-45V
- Iout: 50-400mA
- Reverse protection
- Accurate current limit



TLF4277-xx • Regulator with monitoring features **TLE4247xx** • Constant current driver

3.3V, 5.0V

TLF80511xx

TLS820xx/50xx

TLS805xx

TLS810xx

■ Vin: 3V-45V

TLF1963xx

TLS202xx

TLS203xx

TLS205xx

TLS208xx

Low noise

■ Vin: 2.3V-20V ■ Iout: 150-1500mA

■ Fast reaction time

■ Iout: 50-500mA

Ultra low quiescent current

Ultra-fast regulation loop

■ Only 1µF output cap

EN Enable | RES Reset | ADJ Adjustable Output Voltage | WD Standard Watchdog driver | WWD Window Watchdog driver

Max Output

200mA

www.infineon.com/voltage-regulators

Linear Voltage Regulators for Industrial Applications

Infineon offers a comprehensive portfolio of linear voltage regulators fitting a broad range of consumer, computing, communications and industrial applications. By leveraging Infineon's long standing and market leading experience in automotive power supplies application, they are expanding their portfolio to provide power supply solutions to customer's current and future applications.

Applications

- Industrial & consumer
- Manufacturing & automation
- HDTV & Flat panel monitors
- Appliances / white goods
- Battery chargers
- Battery powered
- instrumentation USB HUBs, routers, modems
- Post regulator for DC/DC
- Active SCSI terminators
- Cordless phones

converts

- Metering systems
- Motor drives

Features

- Low current consumption • Pin-to-pin compatible to
- industry standard parts Overvoltage / short-circuit
- protection
- Reverse polarity protection
- High input voltage rating: Up to 45V
- Overtemperature protection
- Very low dropout voltage
- Load protection
- -40°C up to +125°C

■ Temp. range:



LV20001	TSON-10	Lillear	auj., 3.3v	0.02	JUIIA	1001110	300μΑ
FX21401MB	PG-SCT595-5	Linear -> Tracker	adj.	0.5 %	50mA	300mV	140μΑ
FX4949SJ	PG-DSO-8	Linear	5V	2.0 %	100mA	500mV	180μΑ
FX2931G	PG-DSO-8	Linear	5.0V	5.0 %	100mA	300mV	400μΑ
FX21004TN /51	PG-T0220-5	Linear ->Multiple output	5V/15V	5.0 %	100mA	5000/	700μΑ
FX54211MB /33	PG-SCT595-5	Linear	3.3V	3.0 %	150mA	290mV	50μΑ
FX54441EJ	PG-DSO-8, TSON-10	Linear	adj., 3.3, 5.0V	2.5 %	300mA	270mV	0.03mA
FX24401TE /50	PG-T0252-5	Linear	5V	2.0 %	300mA	250mV	20μΑ
FX24401EL /50	PG-SSOP-14	Linear	5V	2.0 %	300mA	250mV	20μΑ
FX25401TE	PG-T0252-5	Linear	adj., 5.0V	4.0 %	400mA	250mV	100μΑ
FX25401TB	PG-T0263-5	Linear	adj., 5.0V	4.0 %	400mA	250mV	100μΑ
FX25001TS	PG-T0220-3	Linear	5.0V	4.0 %	400mA	250mV	100μΑ
FX25001TF	PG-T0252-3	Linear	3.3, 5.0V	4.0 %	400mA	700mV	100μΑ
FX25001TC	PG-T0263-3	Linear	5.0V	4.0 %	400mA	250mV	100μΑ
FX25001ME	PG-S0T223-4	Linear	2.5, 3.3V	4.0 %	400mA	1000mV	100μΑ
FX78M05ABTF	PG-T0252-3	Linear	5V	3.8 %	500mA	2000mV	3500μΑ
FX1763XEJ	PG-DSO-8, TSON-10	Linear	adj., 3.3, 5.0V	2.5 %	500mA	320mV	0.030mA
FX7805ABTS	PG-T0220-3	Linear	5V	3.8 %	1000mA	2000mV	3500μΑ
FX7805ABTF	PG-T0252-3	Linear	5V	3.8 %	1000mA	2000mV	3500μΑ
FX7805ABTC	PG-T0263-3	Linear	5V	3.8 %	1000mA	2000mV	3500μΑ
FX27001TF	PG-T0252-3	Linear	adj., 3.3, 5.0V	3.0 %	1000mA	1300mV	Αμ008

2.0 % 1000mA 1200mV 5000uA

3.0 % 1500mA 340mV 1100µA

1500mA 340mV 1100µA

Recommended Infineon Industrial Voltage Regulators for Infineon Microcontroller Families

MCU Family	MCU Input Voltage [V]	MCU Input Current (max) [mA]	Voltage Regulator
XMC1x00 family	1.8V5.5V	<100	IFX54211/IFX2931/IFX4949/IFX20002/IFX20001/IFX544xx/IFX30081
XMC4x00 family	3.3	<500/300	IFX1763/IFX544xx/IFX1117/IFX25001/IFX25401
XC8xx	3.35.0	200	IFX24401/IFX544xx
XE166 / XC2000	1.5 and 3.3 or 5	100	IFX2931/IFX4949/IFX54211/IFX54441/IFX30081
TriCore™	1.53.3	>400	IFX27001/IFX8117/IFX25001/IFX1117

IFX1963TEV



Low Dropout Linear Regulators Portfolio

ST's low dropout (LDO) regulators offer an optimal combination of low dropout voltage, low quiescent current, fast transient response, low noise and good ripple rejection. In particular, the ultra-low dropout (ULDO) regulators are ideal for battery-powered consumer applications as well as portable healthcare devices as a result of:

- Ultra-low quiescent current (down to 0.3 μA) which extends battery run time
- Tiny package options, including the 0.65 x 0.65 mm CSPs and 0.47 x 0.47 mm STSTAMPTM to achieve the smallest footprint

Signal fidelity is maintained over a wide range of input voltages and output currents all along the signal path, thanks to the high PSSR (power supply rejection rate) and low noise.

Ultra Low dropout

LD39200: **2A Ultra Low Dropout**

- 110mV of dropout @ 2A
- Low startup voltage:1.25V
- Reverse current protection
- High PSRR and low noise

Low guiescent current

STLQ020: 200mA Very Low Dropout

- 0.3 uA of quiescent current
- 0.8x0.8 mm Flip Chip and DFN6 2x2mm package

Low noise/High PSRR

LDLN025: 250mA Very Low Dropout

- $6.5 \mu V V_{rms}$ of output noise
- 75dB of PSRR
- 0.65x0.65mm Flip Chip and DFN4 1x1mm package

Miniature

LDBL20: 200mA Very Low Dropout

- 0.47x0.47mm STSTAMPTM Micropackage
- 80dB of PSRR

Part Number	Maximum current (mA)	Quiscent Current (uA)	Typ Vdrop at max load (mV)	Input Voltage Range (V)	PSRR typ @ 1kHz	Noise (uVrms)	Package	Feature
STLQ50	50	3.5	400	2.3-12	30	560	S0T323-5L	Ultra Low Iq
LDK715	85	5	500	4.3-24	45	95	SOT23-5L, DFN8 3x3	Ultra Low Iq, High Vin
ST715	85	3.8	500	2.5-24	45	95	SOT23-5L, DFN8 3x3	Ultra Low Iq, High Vin
LD39015	150	18	80	1.5-5.5	65	29	SOT23-5L , Flip Chip 4	High PSRR, Tiny Package
LD39115	150	20	80	1.5-5.5	74	30	Flip Chip 4	High PSRR, Tiny Package
LD59015	150	31	150	2.3-5.5	76	20	S0T323-5L	High PSRR, Low Noise
LDCL015	150	120	50	1.8-5.5	52	40	SOT23-5L	Capless
LDLN015	150	35	86	2.1-5.5	92	6.3	DFN6 2x2	High PSRR, Ultra Low Noise
STLQ015	150	1	115	1.5-5.5	40	75	SOT23-5L	Ultra Low Iq
LD39020	200	20	200	1.5-5.5	80	45	SOT23-5L, DFN4 1x1	High PSRR, Tiny Package
LDK120	200	30	150	1.9-5.5	60	51	SOT23-5L, SOT323-5L, DFN6 1.2x1.3	Cost Effective, Tiny Package
LDBL20	200	20	200	1.5-5.5	80	45	STSTAMPTM	High PSRR, Tiny Package
LDK220	200	55	200	2.5-13.2	55	20	SOT23-5L, SOT323-5L, SOT-89, DFN6 1.2x1.3	Cost Effective, Tiny Package
LDK320	200	60	200	2.5-18	65	60	SOT23-5L, SOT-89	Cost Effective, High PSRR
STLQ020	200	0,3	160	2-5.5	40	135	DFN6 2x2 , Flip Chip 4	Ultra Low Iq, Tiny Package
LDLN025	250	12	120	1.5-5.5	65	6.5	DFN4 1x1 , Flip Chip 4	High PSRR, Ultra Low Noise
LD39030	300	20	300	1.5-5.5	80	45	DFN4 1x1	High PSRR, Tiny Package
LD39030SJ	300	20	200	1.5-5.5	62	30	Flip Chip 4	High PSRR, Tiny Package
LD39130	300	1	300	1.4-5.5	70	38	DFN4 1,2x1,3 , Flip Chip 4	Ultra Low Iq, Tiny Package
LDK130	300	30	200	1.9-5.5	60	51	SOT23-5L, SOT323-5L, DFN6 1.2x1.3	Cost Effective, Tiny Package
LDFM	500	150	125	2.5-16	62	45	DFN6 2x2, DFN6 3x3, DPAK, PPAK	High Vin
ST1L08	800	35	70	1-5.5	80	45	DFN8 2x3	Ultra LDO, High PSRR
LDF	1000	150	200	2.6-16	62	45	DFN6 2x2, DFN6 3x3, DPAK, PPAK	High Vin
LD39100	1000	20	200	1.5-5.5	65	30	DFN6 3x3	Low Noise, Low Iq
LDL112	1200	35	350	1.6-5.5	57	135	DFN6 2x2, DFN6 3x3, SO-8, PPAK	Low Iq, Rev. Current Protection
LDL212	1200	250	350	2.5-18	70	75	DFN6 2x2, DFN6 3x3, SO-8	Cost Effective, High PSRR
LD39200	2000	100	110	1.25-6	70	45	DFN6 3x3, DFN8 4x4	Ultra LDO, High PSRR, Reverse Current Protection





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OSRAM

Panasonic

















Switching Regulators ICs

Rutronik's unique switching regulator portfolio offers input-voltage capability up to 55 V, deliver output currents up to 4 A, with high switching frequency. This broad portfolio of ICs is composed of highly-specialized products to meet every market requirement: HV technology, together with high reliability and robustness for industrial applications, compactness, high efficiency at any load and a high level of performance for consumer and computer products. These devices embed a full set of protection functions (overcurrent, overvoltage, over-temperature) to increase the MTBF and reduce the number of external components. There are multiple package options, all offering compactness and high thermal performances to fit different applications.























	Diodes	Infineon	Intersil	NJRC	Rohm	ST	Toshiba	Vishay
Battery-Charger ICs								
DC-DC Converter ICs								
Step-Down Switching Regulators								
Step-Up Switching Regulators								
Switch-Mode Power Supply ICs								
Power Factor Correction ICs								
Wireless Power ICs								

















LED Drivers Topologies & Applications









Topologies	Diodes	FSP	Infineon	Intersil	NJRC	Recom	Rohm	ST	Toshiba
Boost									
Buck									
Buck-Boost									
Charge Pump									
Digital Control									
Flyback									
Hysteric									
Isolated									
Linear									
Modules									
Offline LED Drivers									
PFC									
SEPIC									
Dimmable									
Others									
Applications									
Architectural									
Automotive Exterior									
Automotive Interior									
Backlighting									
High Bay Storage									
Lighting Power Supply									
Portable									
Refrigiation									
Retrofit LV									
Retrofit Offline									
Signage									
Smart Lighting									
Street Lamps									



LITIX™: Infineon® Auto LED Driver

The LITIX™ - Infineon® Auto LED Driver is an enabler of protected and high-performing lighting applications in the automotive industry. In particular, the constant current regulation secures the stable brightness of the LED over the whole automotive temperature and voltage range. Both the driver and LED are protected against overstress e.g. caused by voltage spikes or overtemperature. All kinds of load conditions are detected by its diagnostic features, such as open-load or shorted LED. All features are required to drive LEDs in harsh automotive environment conditions.

Key Features

- Constant output current, therefore constant brightness and extended LED lifetime
- Wide input voltage range
- Low drop voltage
- Open-load detection
- Overtemperature protection
- Short-circuit proof
- Reverse polarity proof
- Wide temperature range
- Automotive qualified





Applications

The Infineon automotive-optimized LED drivers address interior and exterior, low to high-power automotive LED applications such as: high and low beam, fog, DRL, position, tail, stop, CHMSL, RCL, reverse, turn indicator, dome, ambient lighting, status lamps etc.



LITIX[™] – Infineon[®] Auto LED Driver consists of 4 sub-families:

LITIX™ Basic :	Flexible linear current source family with scalable feature set
LITIX™ Linear:	BCR400 series is the most cost effective solution to drive low-power LED Linear current sources for low, medium and low-cost high-power applications
LITIX™ Power	DC-DC converter and controller for medium to high-power applications
LITIX™ Power Flex	Multitopology DC-DC controller for highest flexibility/power applications

VIPerPlus HV Converters

Easy SMPS Design with Best Efficiency & Lowest Power Consumption: Where Every mW Counts

Today power supply units require more sophisticated methods for improving performance while energy saving regulations push for greater efficiency. VIPerPlus high voltage converters from STMicroelectronics address the challenge. They combine an 800 V avalanche rugged power switch with state of the art PWM circuitry for control, and offering a comprehensive set of features and built-in protection. The result is a switched-mode power supply (SMPS) design that meets the most demanding energy-saving regulations and more: high reliability, flexibility and minimal component count.

Typical Topologies

- Isolated flyback
- Secondary-side reg. (SSR)
- Primary-side reg. (PSR)
- Non-isolated
- Flyback with direct feedback
- Buck / Buck-boost

Typical Applications

- Home automation
- Metering
- Lighting
- Home appliances
- IoT
- Consumer electronics

Common Features

- PWM current mode
- Cycle-by-cycle OCP
- · Light load management
- Soft start up
- Thermal shutdown
- Short-circuit protection
- · Automatic restart after fault

Simulation Tool

 Design is also made easy thanks to the online simulation tool: www.st.com/eDesignSuite

Packages

SO16N, SDIP10, SSO10, DIP7

New Families Highlights

■ VIPerx6, VIPerx1 & VIPer0P:

Optimized also for non-isolated topologies thanks to embedded E/A & self-supply (to remove auxiliary winding)

- VIPerx1 & VIPer0P: Extended VCC (4.5 to 30 V)
- VIPerx1: Low input voltage (18 VDC)
- VIPer0P: Zero power mode (ZPM)







V_{BVDSS}: 800 **V** VIPer01 VIPer35 VIPer25 VIPer26 VIPer37 VIPer38 Different MOSFET sizes for different output power capabilities Flyback converter: 85-265 V 200 mA 600 mA 32 Ω 24 Ω 20 Ω 7Ω 4.5 Ω **Family Portrait** Max R 400 A 400 mA/*600 mA 700 mA



Battery Pack Monitor Protects and Extends Life of Multi-Cell Li-ion Batteries





Charge/Discharge Path 3 to 8 Cell Battery Pack Monitor ISL94202 – Series

The ISL94202 is a Li-ion battery monitor IC that supports from three to eight series connected cells. It provides complete battery monitoring and pack control. The ISL94202 provides automatic shutdown and recovery from out-of-bounds conditions and automatically controls pack cell balancing. The ISL94202 is highly configurable as a stand-alone unit, but can be used with an external microcontroller, which communicates to the IC through an I2C interface.

Features

- Eight cell voltage monitors support Li-ion CoO2, Li-ion Mn2O4, and Li-ion FePO4 chemistries
- Stand-alone pack control no microcontroller needed
- Multiple voltage protection options (each programmable to 4.8V; 12-bit digital value) and selectable overcurrent protection levels
- Programmable detection/recovery times for overvoltage, undervoltage, overcurrent, and short-circuit conditions
- Configuration/calibration registers maintained in EEPROM
- Open battery connect detection
- Integrated charge/discharge FET drive circuitry with built-in charge pump supports high-side N-channel FETs
- Cell balancing uses external FETs with internal state machine or external microcontroller
- Enters low power states after periods of inactivity
 Charge or discharge current detection resumes normal scan rates

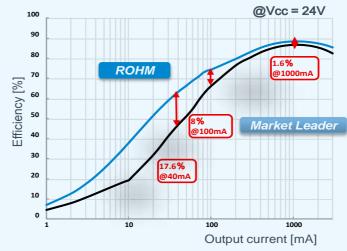
Tools

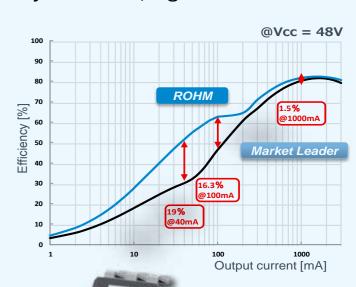
Evaluation Board ISL94202EVKIT1Z

Applications

- Power tools
- Battery back-up systems
- Light electric vehicles
- Portable equipment
- Energy storage systems
- Solar farms
- Medical equipment
- Hospital beds
- Monitoring equipment
- Ventilators

BD9G341 Archives High Efficiency Especially under Low/Light Load Conditions





High Voltage DC/DC Converter ICs High Voltage | High Reliability | Ultra-High Efficiency

ROHM provides a complete line-up of High Voltage DC/DC-Converter ICs. In addition to the just released BD9G341, ROHM offers other solutions like BD9G101, with internal high-side 42V Power MOSFET, providing 0,5A DC output with small SOT23 package. ROHM's DC/DC-Converter-ICs are built for power supplies, industrial distributed applications, automotive, battery powered equipment

BD9G341

Features

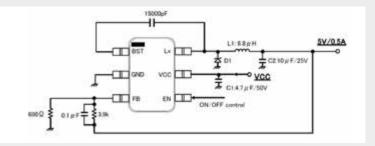
- Wide input voltage range: 12V to 76V (80V max.)
- Output current: up to 3A
- · High efficiency under light and heavy load conditions

BD9G341 - Tiny 6-pin SOT23 / SSOP6 package

Features

- $V_{IN} = 6V \text{ to } 42V$
- $V_{OUT} = 1V \text{ to } 0.7^* \text{ VCC}$
- I_{OUT} = 500mA
- Switching Frequency = 1.5MHz
- Under Voltage Lockout (UVLO),
 Thermal Shutdown (TSP),
 Over Current (OCP) Protection
- ENABLE pin
- Operating Temperature of -40°C to +105°C

Typical Application Circuit







BCR4xxU Linear LED Drivers

The BCR4xxU family offer a simple means of driving multiple low power LEDs in single strings focussed on 12V, 24V and 48V systems. Supporting adjustable currents from 10 to 350mA, which allows an optimized LED current to be set giving a uniform brightness and extend the LED longevity. Available in SOT26 (SC-74) package for pin-compatibility with other sources and also DFN2020 for low profile edge lighting strips.

Features

■ 1.4 to 40V Supply Voltage

Low voltage overhead to increase efficiency with sufficient headroom for over-voltage conditions such as LEDs failing short

■ 10mA to 350mA

Adjustable CCR enables platform designs based on a single device to used across multiple LED strips – easing manufacturer's qualification

Negative Temperature Coefficient

Self-protects and allows current sharing between parallel CCRs

BCR421U with PWM

PWM directly from MCU with up to 25kHz to adjust light output

Application

Diodes Incorporated's LED driving solutions are not only recognised for their high efficiency and simplicity; they are also renowned for their incredible versatility and are well suited to tackle a wide range of applications, such as:

- LED strip lights
- General and retail lighting
- Automotive
- Architectural
- Signage and display

Packages

SOT26 (SC-74)

pinout and footprint





Specifications

Part Number	Configuration	PWM from MCU	Max. Input Voltage	Fixed Current	Adjustable Current	Package
BCR420UW6/Q	NPN Low-side	No	40V	10mA	10 to 200mA	S0T26 (SC74)
BCR421UW6/Q	NPN Low-side	Yes	40V	10mA	10 to 350mA	S0T26 (SC74)
BCR401UW6/Q	PNP High-side	No	40V	10mA	10 to 65mA	S0T26 (SC74)
BCR402UW6/Q	PNP High-side	No	40V	20mA	20 to 65mA	S0T26 (SC74)
BCR405UW6/Q	PNP High-side	No	40V	50mA	50 to 65mA	S0T26 (SC74)
BCR420UFD/Q	NPN Low-side	No	40V	10mA	10 to 200mA	DFN2020
BCR421UFD/Q	NPN Low-side	Yes	40V	10mA	10 to 350mA	DFN2020

Automotive Compliant products with a Q suffix are AECQ qualified and supported with a PPAP.





Flexible Wireless Battery Charger Design for Standard & Custom Applications

STWBC/STWLC Families - Optimized for Wearable & Portable Devices

Wireless battery chargers (WBC) are becoming more and more popular, especially for wearable devices, where the miniaturization makes the difference, and for portable devices, where a more frequent charging is required in order to avoid running on low battery. WBC transmitters are expected to become ubiquitous in hotels, airports, cafes and public places, allowing consumers to leave their cables at home and top up batteries in their devices wherever they are.

The STWBC transmitter family allows full compatibility with the Qi® standard. The STWBC performs all the essential functions for transmitter control: the detection of a valid receiver, the control of the amount of transmitted power matching with RX request, and the detection of metal objects close to the receiver (foreign objects detection, FOD). Uniquely, the STWBC family offers different firmware options, which allow customers to personalize their end products through an API libraries-based firmware and GUI or just take advantage of a turn-key design. The STWLC receiver family is compatible with Qi® & PMA standard protocol, allowing automatic detection of operating standard.

Typical Applications

- Wearable devices
- Charging accessories
- Cell Phones and Smartphones chargers

Support and Development Tools

 A set of evaluation boards is available including Qi* A11 and A34 certified reference designs, and a custom kit for wearable applications

Transmitters Family

- STWBC: 5W Qi^o1.1 A11 certified; API; turnkey SW
- STWBC-WA: optimized for low-BOM wearables
- STWBC-MC: 5W Qi*1.2 A34 multi-coil
- STWBC-EP*: 15W Qi®1.2 EPP applications

Features & Package

- Active object detection
- Transmitted power control
- Foreign object detection
- Low standby power
- QFN 5x5mm 32L

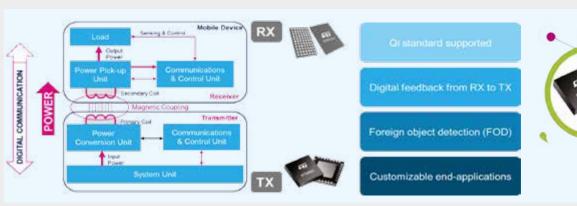
STWOOD STREET ST

Receivers Family

- STWLC03: 1-12W Qi® 1.1 & PMA compatible
- STWLC04: Qi-based, optimized for 1W wearables

Package

• Flip Chip 77 bumps (3.12x4.73 mm)













SiC462 microBUCK®

First in a Family of 4.5 V to 60 V Input Buck Regulators

SiC462's architecture delivers ultra-fast transient response with minimum output capacitance and tight ripple regulation at very light load. The device is stable with any capacitor and no external ESR network is required for loop stability. The device also incorporates a power saving scheme that significantly increases light load efficiency. The regulators integrates a full protection feature set, including over current protection (OCP), output overvoltage protection (OVP), short circuit protection (SCP), output undervoltage protection (UVP) and thermal shutdown (OTP). It also has UVLO for input rail and a user programmable soft start.

Features

- Scalable solution: 3 A, 6 A, and 10 A
- Stable with any output capacitor
- ullet Low quiescent current 250 μA
- Adjustable current limit, soft start, switching frequency
- Ability to start up into a pre-biased load
- Protection and monitoring:
- OVP, OCP, UVP, OTP, UVLO, power good
- -40°C to +105°C operating ambient temperature

Applications

- Base station power supplies
- Distributed supply regulation
- General purpose POL
- High-voltage single-board systems
- Industrial power supplies
- Wall transformer regulation

Minimum Solution Size

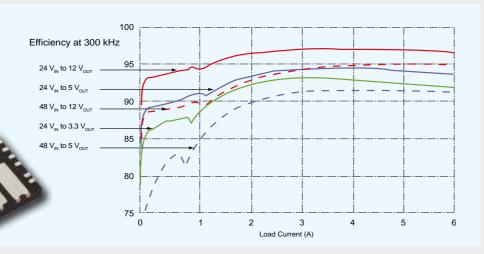
< 20 mm x 30 mm



63mm x 50 mm _

Technical Features

- Wide operating voltage up to 60V
- Up to 10A load (100W output power)
- Low operation current (<250uA)
- Full protections (OC, OV, OT and UV)
- Power Good / Enable
- Fast Transient Response







High-Tech Components for Your Innovations

- Semiconductors
- Passive Components
- Displays & Boards
- Electromechanical Components

- Storage Technologies
- Wireless Technologies
- Lighting Solutions
- Photovoltaic Solutions

Committed to excellence

















Protected MOSFETs

Protected MOSFETs are known as low-side and high-side switches.

High-side switches, with additional integrated features that can switch high currents into grounded loads safely and in compliance with the harsh automotive environment. High-side switches only require a simple TTL logic input, and incorporate a diagnostic output status to the microcontroller. They can easily drive all types of inductive, resistive and capacitive loads. The Rutronik portfolio fits a broad range of automotive, industrial and consumer applications.



Technical Facts			Infined	n		(Intern. Rectifier)		ST	Microelectroni	CS	Diodes	Rei	nesas	Rohm	Toshiba	NJRC	Intersil
	TEMPFET™	HITFET™	SPIDER+	FLEX Multi Channel	PROFET™/ PROFET™+		OMNIFET III	Smart High Side Switch with SPI and asymmetrical Output	Smart High Side Switch 24V	High Side Switch	IntelliFET®	IPDs	Thermal FET	IPDs	HSS/LSS MosFET	HSS/LSS MosFET	FETs
Product Identification	BTS28xx, BTS24xx	BTS31xx, BTS32xx, BTS3xxxSDx	TLE75xxx	TLE62xxxx, TLE81xxx	BTT60xx, BTT61xx, BTT62xx, BTS42k5D-xx, BTS50xxx, BTS51xx, BTS552xx, BTS555xx, BTS621xx, BTS621xx, BTS64xx, BTS64xx, BTS4xxx, BTS84xx, BTS52xx, BSP762x, BSP75xx, BSP4xx, BTS7xxx, BTS700xx, ITS40xxx, ITS41xxx, ITS42xxx, ITS43xx	AUIPS10xx, AUIPS20xx, AUIPS60xx, AUIPS70xx, AUIR33xx, AUIPS71xx	VNL53xx, VNLD53xx, VNL51xx, VNLD51xx, VNLD50xx, VNLD50xx, VNL5Dxxx	VNQ600xx, VNQ604xx, L99CL01XP	VN5Txxxx, VND5Txxxx	VN7xxxAx, VND7xxxAx, VNQ7xx- xAx, VN7004Cx, VND7xxxAJ12 L6370Q, VN751, TDE170x, IPS160H, L637x, VNI2140J, VNI4140x, VNQ860, VN808-xx, VN808CM-xx, VNI8200XP, IS08200x	ZXMS6006xx, ZXMS6005xx, ZXMS6004xx, ZXMS6003xx, ZXMS6002xx, ZXMN6001x, BSP75x	NHS01xx, NHD01xx, NHD05xx, NHQ05xx, NHD09xx, NHQ05xx, NHQ05xx, NHQ09xx, µPD16600xx	RJF060xx, RJE060xxx, RJE061xxx, HAF10xxx, HAF20xxx	BD266xx, BD20xx, BD22xx, BD82xx, BD65xx BM2LBxx, BV1LBxx, BD1Hxx, BD1LBxx, BD8Lxx	TPD1052F, TPD1053F, TPD1044F, TPD1054F, TPD1030F, TPD1036F, TPD1032F, TPD1046F, TPD7101F, TPD7104F, TPD7210F, TPD7211F	NJW48xxx, NJM354xxx	HIP4020x, ISL891xx, ISL551xx, EL71xx, EL72xx, EL74xx, ICL766x
AECQ Qualified																	
Industrial																	
Truck																	
1CH																	
2CH																	
4CH																	
8CH CH up to				18													
Low Side				10													
High Side																	
Temperature Protection																	
Current Protection																	
Overvoltage Protection																	
ESD																JEITA standard	
R _{DSON} (mΩ)	6.5 - 18	10 - 800	1000	depending on Channels	1.5 - 1000	7 - 300	30 - 300	2x10 - 4x40, 500 - 1000	6 - 100	4 - 270	125 - 675	6 - 59000	10 - 260	50 - 700	120 - 800	250 - 1100	2000 - 8000
Special Features	switching up to 100kHz	ESD, Over-cur- rent and over- temperature protection with latch / restart	All devices with Limp Home and Cranking function down to 3V bat- tery. Enhaced diagnosis function, small 150 mil packages only. 2 direct inputs with mapping func- tion. Optional features for LED and bulb drive		Thermal shutdown with restart/ latch, over-current and over- temperature protection, protection against loss of battery and GND, reverse battery protection, short- circuit protection, proportional load current sense, fast switching	Logic Level input, active clamp, switching time optimized for low EMI, Diagnostic on the input current, reverse battery pro- tection, short circuit protection	MO5 Technology	MO6 Technology / BCD Technology	MO5 Technology	MO-7 Technology / BCD Technology / VIPower Technology	smallest packa- ge: SOT23F package	reverse battery protection by self turn on of N-Ch MOSFET	over temperature shut-down, by sensing junction temperature of N-Ch MOSFET	Optimized for USB and SD cards, Soft Start	Detecting a load short to power supply. Low voltage operation. Output current monitoring. Reverse supply protection. Current-sense output. Diagnostic output.	be suited for sen- sor output block	fast rise and fall time
Preferred Load	R, L, C, bulb, motor	R, L, C, bulb, motor	R, L, LED, unipolar step- per motors	L, R	L, R, C	L, R, C	L, R, C, bulb, LED	L, R, C, bulb, LED	L, R, C, bulb, LED	L,R,C, bulb, LED, motor	L, motor, relay, bulb	R, L, C, LED, bulb	R, L, C, LED, bulb	L,R,C, bulb, LED, motor	R, L, C, bulb, motor	L, R, C	L, R, motor



RENESAS













JRG

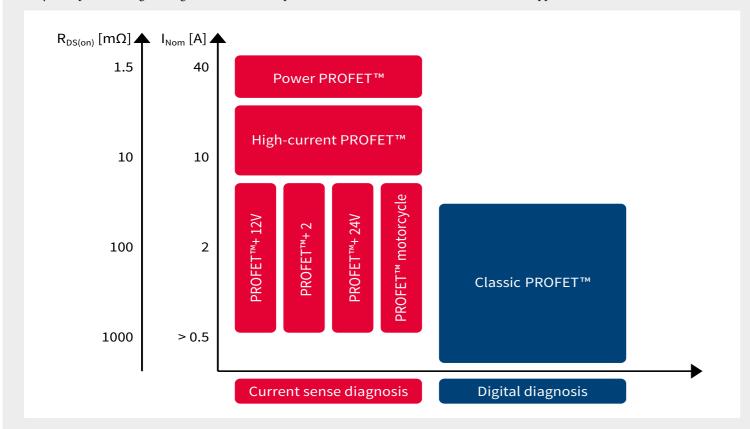






PROFET™ Smart High-Side Switches

The highly integrated PROFET[™] family (Protected FET) incorporates a broad range of smart features like diagnose and protection. PROFET[™] intelligent power high side switches consist of a DMOS power transistor and CMOS logic circuitry for complete built-in protection. They offer protection against e.g. overload, overtemperature, short circuit for all kinds of automotive applications.



Automotive Applications

- Lighting: Exterior and interior lighting (bulb/LED)
- Power Distribution: Relay & fuse replacement, solid state, relay, Smart Power Distribution Center (PDC)
- Heating: Seat, PTC, auxiliary, glow plug
- Motor Control: DC brush motor, pumps, fans
- Infotainment

Industrial Applications

- Automation/robotics
- General load management
- Electric drives
- Control systems/energy saving



Family name	Basic features	Benefits
Classic PROFET™	 > High-side switches for load currents between 0.25 and 12 A > Suitable for resistive, capacitive and inductive loads > Wide operating voltage range > On-state resistance between 2.5 and 20 m > Improved electromagnetic compatibility (EMC) > Protection: overtemperature, overvoltage, load dump, reverse polarity > Diagnosis: open load in OFF detection, current sense (partially) 	 Established and proven technology/products since more than 10 years Benchmark energy robustness High-voltage capability Fast switching capability Fast demagnetization of inductive loads
PROFET™+ 12V and 24V	 > High-side switches for load currents between 0.5 and 10 A > Especially suitable for capacitive loads > Operating voltage range: PROFET ™+12V: 5 - 28 V PROFET ™+24V: 5 - 36 V > 3.3 and 5V compatible logic input PWM capability up to 200 Hz (PROFET™+ 12V) or 400 Hz (PROFET™+ 24V) > Protection: overtemperature, overvoltage, load dump, reverse polarity, short-circuit > Diagnosis: load current sense output 	 Maximum design flexibility thanks to identical footprint Pin-compatibility between 12 and 24 V and within each of the individual family members Very low stand-by current (< 0.5 μA max.) High short-circuit robustness Outstanding current sense accuracy Improved heat dissipation of DSO package
PROFET™+2	 High-side switches for nominal load currents between 0.5 and 10 A Especially suitable for capacitive loads e.g. halogen bulbs and LED modules Operating voltage range 3.1 – 28 V 3.3 and 5 V compatible logic input PWM capability up to 1 kHz Protection: current tripping ,over temperature, overvoltage, load dump, reverse polarity, short-circuit Diagnosis: load current sense output 	 > 50% reduced current consumption > Simplified and cost efficient ground network only requiring small resistor while offering functional system safety > Outstanding current sense accuracy (K_{ILIS}) ≤ 5% @ nominal current > Benchmark cranking voltage capability able to work down to 3.1 V > 40% smaller package than previous generation offering PCB area savings > Optimized for design flexibility across the family due to pin to pin compatibility > Very Low output leakage current 'quiescent current' (≤ 0.5 μA up to 85°C)
High-Current PROFET™	 > High-side switches for load currents up to 45 A > Suitable for resistive, capacitive and inductive loads > Optimized for 12 and 24 V supply voltages > Current-driven and voltage-driven input logic > On-state resistance from typically 20 to 2.5 m > PWM capability > Very high energy capability up to 3 joules > Protection: overtemperature, overvoltage, load dump, reverse polarity, short-circuit > Diagnosis: load current sense output 	 Efficient and robust drivers for high-current loads Monitoring of load current Protection of device, wiring harness and load Available in standard power packages, such as DPAK and D²PAK
Power PROFET™	High-side switches for load currents up to 40 A Suitable for resistive, capacitive and inductive loads Optimized for 12 V supply voltage Voltage-driven input logic (3.3 and 5 V) Stable behavior during cranking down to 3.2 V supply voltage Lowest on-state resistance down to 1.0 m Protection: overtemperature, overvoltage, load dump, reverse polarity, short-circuit Diagnosis: load current sense output	 Efficient and robust drivers for high-current loads Monitoring of load current Protection of device, wiring harness and load High short-circuit robustness Available in standard power package (D²PAK)





The New Low-side Switch Family HITFET™+







With Outstanding Design Flexibility

HITFET[™] stands for highly integrated temperature protected MOSFET. These low-side switches offer a compelling feature set with protections against over temperature, short circuit and overload conditions as well as ESD robustness.

HITFET**+ is a highly scalable portfolio based on new technology. In order to meet specific application requirements Infineon provides two different packages (TO252-x, TDSO-8) and two types of feature sets - standard versions (BTS3xxx) and fully featured devices (BTF3xxx). Now available are 8 new BTS3xxx HITFET**+ products with a standard feature set and different RDSon: BTS3035, BTS3050, BTS3080, BTS3125 are available in a DPAK and TDSO-8 package. With the new benchmark TDSO-8 package Infineon enables 50% footprint shrink compared to DPAK and 35% shrink compared to SOT223. package. At the same time the devices achieve an outstanding thermal capability. The devices are optimized to drive capacitive, inductive and resistive loads for 12V automotive and industrial applications.

Features

- Very low power DMOS leakage current in OFF state
- 3.3V and 5V compatible logic inputs
- Electrostatic discharge protection (ESD)
- Adjustable switching speed
- Handshaking digital feedback with autorestart in power stage
- Green product (RoHS compliant)
- AEC qualified
- Packages: 3-pin and 5-pin DPAK

Benefits

- Increased robustness
- Selectable slew-rate
- 3.3V microcontroller compatible
- Low DMOS leakage current

Applications

- Suitable for resistive, inductive and capacitive loads
- Fuse replacement
- Relay replacement
- Small motors
- Solenoids



Product type	$R_{DS(on)}$ $[m\Omega]$	R _{DS(on)} (max) @ 150°C [mΩ]	Nominal load current [A]	Current limitation [A]	Channels	Protection	Package
BTF3050TE	50	100	3	8	1	Auto-restart	TO252-5 (DPAK 5-leg)
BTS3035TF	35	70	5	20	1	Auto-restart	TO252-3 (DPAK)
BTS3035EJ	35	70	5	20	1	Auto-restart	TDSO-8-31
BTS3050TF	50	100	4	15	1	Auto-restart	TO252-3 (DPAK)
BTS3050EJ	50	100	4	15	1	Auto-restart	TDSO-8-31
BTS3060TF	60	135	3	10.5	1	Latch	TO252-3 (DPAK)
BTS3080TF	80	160	3	10	1	Auto-restart	TO252-3 (DPAK)
BTS3080EJ	80	160	3	10	1	Auto-restart	TDSO-8-31
BTS3125TF	125	250	2	7	1	Auto-restart	TO252-3 (DPAK)
BTS3125EJ	125	250	2	7	1	Auto-restart	TDSO-8-31

IR Protected MOSFETs

Automotive Intelligent High Side Power Switch (IPS)

Infineon offers with IR protected Mosfets qualified protected high-side switches to drive any kind of load connected to the ground. IR's high-side Intelligent Power Switch (IPS) family integrates into a single package a low RDS(on) output HEXFET® power MOSFET with protection and control circuits, making these ICs the most rugged, efficient and compact devices available for automotive loads in harsh environments. The embedded charge pump makes the interface to the microcontroller very simple with full logic-level compatibility. Providing the ideal replacement for electro-mechanical relays, these devices suit applications including transmission and electronic stability controls, lighting, ABS, fuel injection systems, pump motors and radiator fans.

Features

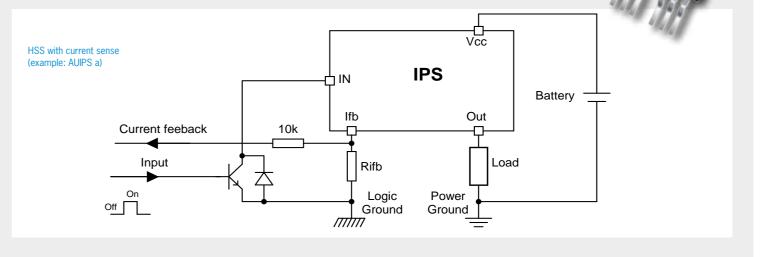
- Protected high side switch
- AEC qualified
- Rdson from $3m\Omega$ up to $120m\Omega$
- Packages:
- D^2 pak 5 leads, 7 leads,
- DPAK/SO8
- Voltage and current controlled
- High speed or high energy
- 12V and 24V applications

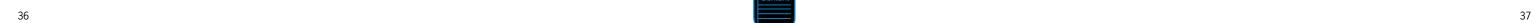
Benefits

- Over-current protection
- Over-temperature protection restart / latch
- Reverse battery protection
- Active clamp
- Digital diagnostic output
- Open load detection
- Proportional load current sensing
- ESD protected

Applications

- Suitable for resistive, inductive and capacitive loads
- Fuse replacement
- Relay replacement
- Small motors
- Solenoids







ISO8200B(Q):

The Market Smallest Octal Intelligent High-Side Driver

The ISO8200B is an isolated 8 channel monolithic power switch capable to drive any kind of load. It is designed to realize $0.5A_{TYP}$ rated digital outputs in industrial automation applications compliant with IEC61131-2 standard. Galvanic isolation between the logic & the power sides guarantees transient overvoltage immunity of $3.5kV_{PEAK}$ in accordance with the IEC 60747-5-2 norm.

The two sections communicate with each other in both directions with certain level of redundancy in order to achieve reliable operation with feedback from the power side. Its power stage features very low R_{DSON} fully protected MOSFETs (110m Ω). Together with its low supply consumption it makes the driver very efficient. The chip has a parallel interface which supports the two possible options: a) direct mode and b) synchronous mode.

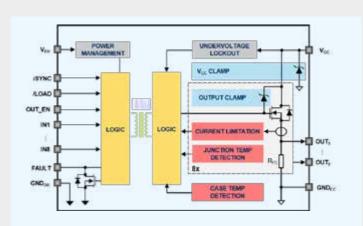
Thanks to its tiny QFN housing and embedded isolation minimizing the amount of external components, the application becomes extremely compact.

SI

IS08200BQ

Key Features

- Embedded galvanic isolation
- Low R_{DSON} 110mΩ TYP
- Output current 0.7Amin per channel
- Output synchronization capability
- Full set of protections
- Diagnostic feedback
- High robustness against EMC
- Tiny QFN 9x11 and PowerSO-36 packages



IPS160H / 161H: Extreme Supply Voltage Range for Excellent Safety

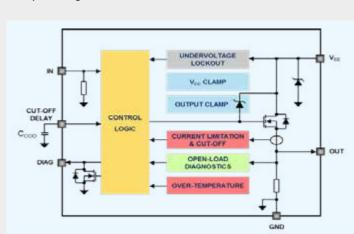
The IPS160H and IPS161H are single channel high-side switches embedding a rich set of protections and diagnostics. Supply voltage range up to $65~\rm V$ makes the devices ideally fitting in the applications with high safety requirements, such as safe outputs in Factory Automation. The chips are characterized and all parameters are guaranteed up to $60~\rm V$.

Both products are capable to drive any kind of loads (resistive, capacitive and inductive) with one side connected to ground. They are capable to handle very high switch-off energy. The drivers featuring power stages with low $R_{\rm DSON}$ (60m Ω), which minimizes power dissipation. For enhanced system diagnostics, over-load, over-temperature as well as open-load detection features are implemented.

Embedded configurable cut-off function can disable the output in case of a long-term overload and eliminates excessive power dissipation.

Kev Features

- Operating Supply up to 60V / 65Vmax
- Low R_{DSON} 60mΩTYP
- Output current
- IPS160H: 2.5Amin
- IPS161H: 0.7Amin
- Full set of protections
- Cut-off function to eliminate dissipation
- Rich diagnostics incl. load wire break
- High robustness against EMC
- Tiny housing PowerSSO-12





Next-Generation VIPower MO-7® intelligent High-Side Switches

ST's new family of VIPower M0-7 intelligent power switches provide enhanced intelligent features, improve protection and reliability, and are up to 40% smaller than competing alternatives. Pioneered by ST, intelligent high-side switches provide a more reliable and efficient replacement for conventional relays, and can drive also all kind of inductive, capacitive and resistive loads. In the VIPower M0-7 series, 75% of family members are available in a 5 x 4 mm package, which is 40% smaller than the smallest competing devices. This allows car electronics designers to save PCB space and aim for smaller module sizes. Moreover, various internal design changes increase precision, enhance diagnostic feedback and improve reliability. Specifically, performance improvements include very low standby current (0.5 μ A max @85°C), greater protection against short-circuits, increased current-sense precision with new options (chip temperature, Vcc feedback) and best-in-class electromagnetic emission (EMI) performance. The VIPower M0-7 family operates at very low battery voltage, even down to 2.85V.

Diagnostic Functions

- Multiplexed analog feedback
- load current with high precision proportional current mirror
- -VCC supply voltage
- -TCHIP device temperature
- Overload and short to ground (power limitation) indication
- Thermal shutdown indication
- Full ON- and OFF-state diagnostics capability
- Output short to VCC detection
- Multisense enable/disable

Protections

- Undervoltage shutdown
- Overvoltage clamp
- Two levels of load current limitation
- Self limiting of fast thermal transients
- Real-time configurable latch-off or auto-restart mode on overtemperature or power limitation
- Loss of GND and Vcc
- Reverse battery with and without external components
- Electrostatic discharge protection (ESD)

Part Number	Package	Operating Range V _{cc} [V]	Max Supply Voltage V _{cc} [V]	On-State Resistance R _{dson} [mW]	Current Limitation I _{lim} [A]	Configurable Auto-restart or Latch-off	Multisense	Reverse Battery
Single-Channel D	evices							
VN7000AY*	PowerSSO-36	3-28	38	1.5	190	yes	yes	yes
VN7003AH	Octapak	3.2-28	38	3.5	100		yes	yes
VN7003ALH	Octapak	3.2-28	38	3.5	100	yes	yes	yes
VN7004CH	Octapak	4-28	38	4	100		Current sense	yes
VN7004CLH	Octapak	4-28	38	4	100	yes	Current sense	yes
VN7007AH	Octapak	4-28	38	7	100		Current sense	yes
VN7007ALH	Octapak	4-28	38	7	100	yes	Current sense	yes
VN7008AJ	PowerSS0-16	4-28	38	8.5	96	yes	Current sense	External components
VN7010AJ	PowerSSO-16	4-28	38	10	91	yes	yes	External components
VN7016AJ	PowerSSO-16	4-28	38	16	77	yes	yes	External components
VN7020AJ	PowerSSO-16	4-28	38	20	63	yes	yes	External components
VN7040AS	SO-8	4-28	38	40	34		Current sense	External components
VN7040AJ	PowerSSO-16	4-28	38	40	34	yes	yes	External components
VN7050AS	SO-8	4-28	38	50	30		Current sense	External components
VN7050AJ	PowerSSO-16	4-28	38	50	30	yes	yes	External components
VN7140AS	SO-8	4-28	38	140	12		Current sense	External components
VN7140AJ	PowerSSO-16	4-28	38	140	12	yes	yes	External components
Dual-Channel Dev	vices							
VND7004AY	PowerSSO-36	4-28	38	4	100	yes	yes	yes
VND7012AY	PowerSSO-36	4-28	38	12	75	yes	yes	yes
VND7020AJ	PowerSSO-16	4-28	38	20	63	yes	yes	External components
VND7030AJ	PowerSSO-16	4-28	38	30	56	yes	yes	External components
VND7040AJ	PowerSSO-16	4-28	38	40	34	yes	yes	External components
VND7050AJ	PowerSSO-16	4-28	38	50	30	yes	yes	External components
VND7050AJ12	PowerSS0-12	2.85-28	38	50	30		Current sense	External components
VND7140AJ	PowerSSO-16	4-28	38	140	12	yes	yes	External components
VND7140AJ12	PowerSSO-12	2.85-28	38	140	12		Current sense	External components
Quad-Channel De	evices							
VNQ7040AY	PowerSSO-36	4-28	38	40	34	yes	yes	yes
VNQ7050AJ	PowerSSO-16	4-28	38	50	27	yes	Current sense	External components
VNQ7140AJ	PowerSSO-16	4-28	38	140	12	yes	yes	External components

* In development | AJ12): extended operating range down to 2.85V for deep cold cranking applications, compliant with LV124 revision 2013





New IPDs

The IPD (intelligent power device) series of the ROHM offers universal switches with automotive grade which integrated low on resistance MOSFET and various protection circuit into one chip. The devices provide high level protection against overheat, overcurrent, overvoltage and short circuit. The devices are suitable for different loads including resistant, capacitive and inducible making them suitable for various applications in the Automotive and Industrial area.

Part Number	Channel Number [ch]	Voltage (Max.) [V]	Output Current [A]	ON Resistance [mΩ]	Over Current Detect [A]	Supply Voltage (Min.)[V]	Supply Voltage (Max.)[V]	Current Consumption (Typ.) [µA]	Current Consumption (Typ.) [µA]	Package
BM2LB150FJ-C	2	42	6.5	150	6.5	3	5.5	150	Self-restart	SOP-J8
BM2LB300FJ-C	2	42	1.7	300	1.7	3	5.5	150	Self-restart	SOP-J8
BV1LB085FJ-C	1	42	13	85	13	3	5.5	150	Self-restart	SOP-J8
BV1LB150FJ-C	1	42	6.5	150	6.5	3	5.5	150	Self-restart	SOP-J8
BV1LB300FJ-C	1	42	1.7	300	1.7	3	5.5	150	Self-restart	SOP-J8
BV1LB300HFS-C	1	42	1.7	300	1.7	3	5.5	150	Self-restart	HSON-A8
BD1HC500EFJ-C	1	44.5	0.8	500	0.8	4	18	1500	Off-Latch	HTSOP-J8
BD1HC500FVM-C	1	44.5	0.8	500	0.8	4	18	1500	Off-Latch	MSOP8
BD1HC500HFN-C	1	44.5	0.8	500	0.8	4	18	1500	Off-Latch	HSON8
BD1HD500EFJ-C	1	44.5	0.8	500	0.8	4	18	1500	Self-restart	HTSOP-J8
BD1HD500FVM-C	1	44.5	0.8	500	0.8	4	18	1500	Self-restart	MSOP8
BD1HD500HFN-C	1	44.5	0.8	500	0.8	4	18	1500	Self-restart	HSON8
BD1LB500EFJ-C	1	42	0.8	350	0.8	3.5	5.5	500	Self-restart	HTSOP-J8
BD1LB500FVM-C	1	42	0.8	350	0.8	3.5	5.5	500	Self-restart	MSOP8
BD8LA700EFV-C	8	45	0.5	700	0.5	3.0/4.0 (Digital/Analog)	5.5	500/3000 (Digital/Analog)	Off-Latch	HTSSOP-B24
BD8LB600FS-C	8	45	1	600	1	3.0/4.0 (Digital/Analog)	5.5	500/2000 (Digital/Analog)	Self-restart	SSOP-A24

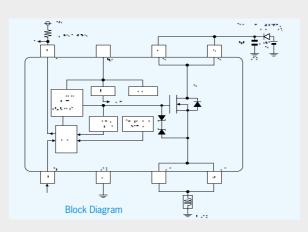
BM2LB150FJ-C

Specification

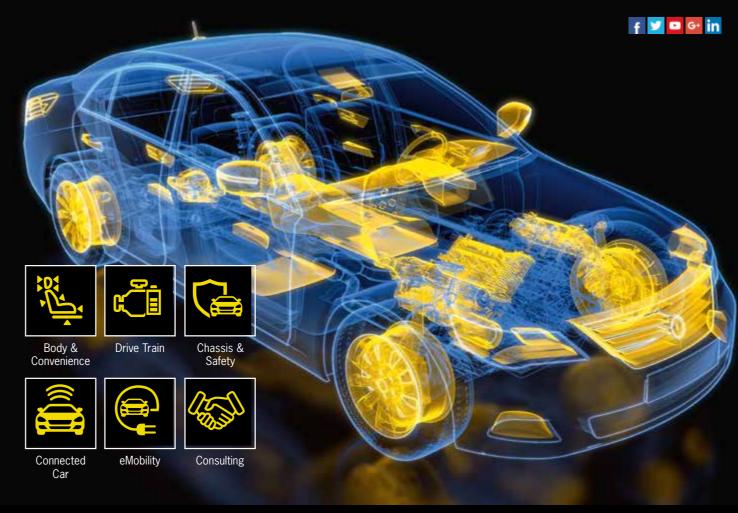
- Grade: Automotive
- Channel Number: 2ch
- Drain-Source Voltage (Max.): 42.0V
- Output Current: 6.5A
- ON Resistance: 150mΩ
- Over Current Detect [A]: 6.5A
- Active Clamp Energy: 165.0mJ

Features

- Built-in overcurrent limiting circuit (OCP)
- Built-in thermal shutdown circuit (TSD)
- Direct control enabled from CMOS logic IC,
- Low On resistance RDS(ON) up to 150 m Ω
- Monolithic power management IC with the control block (CMOS) and power MOSFET mounted on a single chip
- Surface mount package SOP-J8
- AEC-Q100 qualified







Discover Innovation in Motion

RUTRONIK AUTOMOTIVE offers you a new range of bundled hardware, software and services. RUTRONIK AUTOMOTIVE brings together entire solutions to build applications for:

- Chassis & Safety
- Drive Train
- Body Electronics

- Comfort & Convenience
- Connected Car
- eMobility

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Motor Driver ICs





Motor Driver ICs

The trend towards greater efficiency in automotive and industrial applications also concerns electric motors. Applications such as power steering, HVAC compressors and engine cooling fans and robotics will be controlled by electronic motors in the future. In general, there are three different types of Motor Drivers for Stepper, DC brush/brushless and 3Phase. Our portfolio includes Monolithic Driver IC's, Half-Bridges, Full-Bridges, Multi-Half-Bridges, Integrated Motor Driver ICs, H-Bridge Drivers + MOSFETs and 3Phase-Bridge Driver + MOSFETs.

Motor	Infineon	NJR	С	ROHM		STMicroelectronic	s	Toshiba	Melexis
DC-Brush	TLE520xx, TLE720xx, TLE82xxx, TLE9201/ IFX9201, TLE6208xx, TLE844xx, TLE820xx, BTN89X2, BTN77XX, TLE618x, TLE7181, TLE7182, TLE7182, TLE420x,	Single Phase DC Motor driver	NJU7367/A	H-Bridge Drivers - Standard BA62xx, BA69xx, BD169xx, BD62xx, BD654xx, BD673xx, BD694xx H-Bridge Drivers -	STSPIN power	Dual Full Bridge L6205 L6206 L6207 L6225 L6226 L6227 L6206Q L6207Q L6226Q L6227Q	Full bridge L6201 L6202 L6203 Dual Full Bridge L6219		MLX81150 MLX83100
	TLE6208, TLE84106, TLE84110 TLE986x			Automotive BD169xx	L9958 L9959 L9960	VNH2xx VNH3xx VNH5xx VNH7xx	L99H01		
	TLE941xx				STSPINbattery	Dual Full Bridge STSPIN Single Full Bridge STSP			
Stepping Motor	TLE472xx, TLE844xx	Bipolar Driver	NJM371x, NJM377xx, NJM13775, NJM2673, NJM6219, NJW4382	BD6290. BD635xx, BD636xx, BD637xx, BD638xx, BD639xx, BD64xx, BD68xx	STSPINdigital	μStepper DRIVER with motion engine L6470 L6472 μStepper DRIVER L6474 L6258	μStepper Controller with motion engine L6480 L6482 μStepper SiP Controller+MOSFETS with motion engine powerSTEP01		
S		w/Translator	NJM4372, NJM4375		STSPINbattery	μStepper DRIVER STSPIN220			
		H(Full) Bridge Driver	NJW267x, NJW437x, NJW438x		Dual Full bridge with co L6208 L6228 L9942, L99SM81*	ontroller L6208Q L6228Q			
	6ED003xx BTN89x2	Bipolar Process	NJM262xx	Low Power	STSPIN power	3-phase Bridge L6229	L62290	TPD41xxA /AK	MLX8320x
3Phase Brushless Motor	TLE718x TLE9180 TLE987x	BCD Process	NJW430x	BD63441, D6326/46 BD6201x, BD630xx, BD168xx		L6230 L6234 L6235	L6230Q L6235Q L99ASC03 L9907x	(Fig.	28
3Phase				High Power - IPM	STSPINbattery	3-phase Bridge STSPIN230	1		-
				BM62xx, BM633xx, BM637xx	System In Package	STSPIN32F0			
developn	nent								























ROHM offers a broad lineup Motor drivers supporting a wide range of supply voltages and output currents. Features like V_{REF}-PWM conversion for H-bridge drivers, integrated protection functions and their high reliability operation, making them ideal for many applications.

BM2LB150FJ-C NEW

The BD16952EFV is an AEC-Q100 automotive qualified 2-channel Half-Bridge Gate Driver, controlled by an external MCU through a 16-bit Serial Peripheral Interface (SPI). Independent control of low-side and high-side N-MOSFETS allows for several MCU controlled modes. A programmable drive current is available to adjust slew-rates, in order to meet EMI and power dissipation requirements. Diagnostics can be read and reset by an external MCU.

Specification

- Common Standard AEC-Q100
- V_{cc} (Max.): 40.0V
- Power Supply Voltage (Max.) 5.5V
- Power Supply Voltage (Min.) 3.0V
- Output On Resistance (Typ.)[Ω] 10.0Ω

Features

- AEC-Q100 Qualified
- 2ch Half-Bridge Gate Drivers
- 4 external MOSFETs are
- Controlled Independently Half-Bridge Control Modes are
- Selected by SPI Slew Rates are Controlled with
- Constant Source/Sink Current.
- 500 kHz Oscillation for Charge Pump.
- 16bit SPI

Block Diagram

BM63767S-V NEW

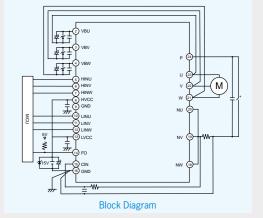
BM63767S-VC is an new 30A type Intelligent Power Module that integrated gate drivers, bootstrap diodes, fly wheel diodes and IGBTs into one package.

Specification

- Power Device IGBT
- V_{CES}: 600V
- Current: 30A
- V_{ce(sat)}: 1.7V
- Switching Frequency: ~20kHz
- Isolation Voltage: 1500V_{rms}

Features

- 3phase DC/AC Inverter
- Low Side IGBT Open Emitter
- Built -in Bootstrap Diode
- High Side IGBT Gate Driver(HVIC)
- Low Side IGBT Gate Driver(LVIC):
- Fault Signal(LVIC) Corresponding to SCP (Low Side IGBT), TSD, UVLO Fault
- Input Interface 3.3V, 5V Line























Motor Driver ICs

Power bridges for all kind of motors in automotive and industrial applications from 100mA up to 70A with different feature sets "scaled to your needs"

- High Power DC and BLDC motor bridges
- Scalable and flexible solutions with different functional options for all kind of motor drivers from 2A DC up to 70A peak currents. Usable in all kind of application areas.
- Smart power motor bridges
- Infineon low-current DC motor bridge family consists of a broad variety of bridges designed for use in automotive and industrial applications
- Our portfolio comprises complete end-to-end solutions for low voltage as well as high voltage applications. Infineon's family of configurable, Full-Bridge, Half-Bridge and 3-Phase Gate Driver IC's can be combined with MOSFETs to provide the power and efficiency these systems demand.

Available Certificates

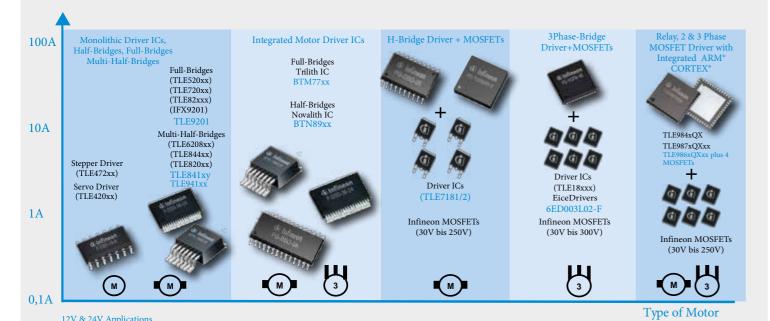
- TS16949 and ISO 9001 Certificates
- ISO 14001 and OHSAS 18001 Certificates
- IRIS Certificates
- TL9000 Certificates

Applications

- Automotive
- Industrial
- Truck
- Renewable energy



(infineon



NovalithIC™ Family

NovalithIC[™] – Integrated High Current Half-Bridge Motor Drivers in D²PAK Package

Infineon's series of NovalithIC[™] devices extends the performance capabilities of integrated and protected motor drives. This series brings the advantages of particularly compact designs to applications beyond 250 W without requiring increased cooling effort. Integrated features – such as overcurrent protection, undervoltage lockout and overtemperature protection – considerably reduce design work and, at the same time, keep system costs (BOM) at a low level. By extending the voltage range up to 40 V, NovalithIC[™] is now the ideal fit for many industrial electronics applications in addition to the usual automotive electronics spectrum.

The internal 3-chip structure of the NovalithIC $^{\infty}$ family comprises a half-bridge driver, an n channel MOSFET and a p-channel MOSFET in chip-by-chip and chip-on-chip construction, which delivers maximum performance in the smallest space. The new family differs from the familiar BTN79xx series mainly in its use of the latest MOSFET technology for n- and p-channels. The integrated driver IC works in the same way as before with a logic level input, and can therefore be controlled directly by the μ C. The use of p-channel technology on the high side switch of the motor eliminates the need to design a charge pump.

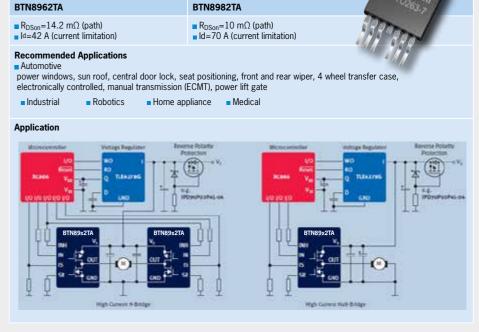
NovalithlC™with open package, showing chip-on-chip and chip-by-chip construction

In this way, five chips (half-bridge driver and four MOSFETs) can be replaced by two Novalith IC[™] devices in a conventional H-bridge application for controlling a bidirectional brushed DC motor (BDC), which reduces the component mounting effort. What is of greater importance in many applications, however, is the space saving of about 30 %.

Key Features & Benefits

- Path resistance:
- typ. 14.2m Ω @ 25°C for BTN8962TA
- typ. $10.0 m\Omega$ @ 25°C for BTN8982TA • Low quiescent current (typ. $7\mu A$ @ 25°C)
- for an extended battery life

 Capable of high PWM frequency (with active
- freewheeling in BTN8962TA, BTN-8982TA)
- Switched mode current limitation for reduced power dissipation in overcurrent condition
- Integrated over/undervoltage, overtemp., overcurrent protection and analog current sense to minimize the external components required
- Status flag diagnosis w. current sense capability
- Driver circuit with logic level inputs
- Option for on-board kilis offset calibration
- Operating voltage range up to 40V
- Enhanced switching speed with adjustable slew rate for optimized EMI and reduced switching losses
- Package D2PAK (TO263-7)



44



TLE986x & TLE987x Infineon® Embedded Power IC 2/3-Phase Motor Driver with integrated ARM® Cortex® M3 MCU

The TLE986x/TLE987x is a single chip 2/3-Phase motor driver that integrates the industry standard ARM*. Cortex* M3 core, enabling the implementation of advanced motor control algorithms such as field-oriented control (3 Phase). It includes four/six fully integrated NFET drivers optimized to drive a 2/3-Phase motor via four/six external power NFETs, a charge pump enabling low voltage operation and programmable current along with current slope control for optimized EMC behavior. Its peripheral set includes a current sensor, a successive approximation ADC synchronized with the capture and compare unit for PWM control and 16-bit timers. A LIN transceiver is also integrated to enable communication to the device along with a number of general purpose I/Os. It includes an on-chip linear voltage regulator to supply external loads. It is a highly integrated automotive qualified device enabling cost and space efficient solutions for mechatronic DC/BLDC motor drive applications such as pumps and fans.

Features

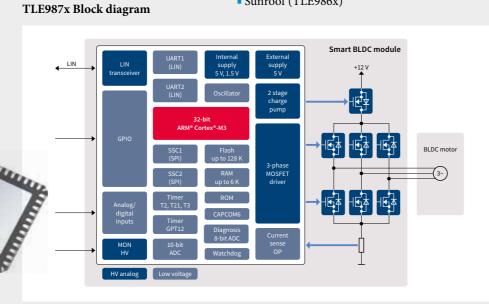
- ARM® Cortex® M3 MCU
- System clock up to 40MHz
- Up to 128KB Flash memory
- 4K EEPROM emulation
- NFET drivers with charge pump
- Current programmable NFET driver with patented slope control for optimized EMC behavior
- Integrated LIN transceiver compatible with LIN standard 2.2 and
- SAE J2602
- Support fast programming via LIN
- Direct Memory Access (DMA)
- 10-bit SAR ADC for sensing
- Timers for PWM signal generation for 3-Phase motor control
- On chip oscillator & PLL
- AECQ-qualified

Benefits

- Complete system-on-chip for DC/ BLDC motor control
- Minimum number of external components reduce BOM cost
- PG-VQFN package with 7 x 7mm footprint enable PCB space saving

Applications

- Fuel pump
- HVAC blower
- Engine cooling fan
- Water pumps
- High efficiency BLDC pumps and fans (TLE987x)
- Sensor-less and sensor-based BLDC motor applications controlled by the Local Interconnect Network (LIN) or PWM (TLE987x)
- Window Lift (TLE986x)
- Sunroof (TLE986x)





TLE986x - Motor Drivers

Product name	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM emulation [KB]	OP-AMP	Low-side MOSFET drivers	High-side MOSFET drivers
TLE986x 32-bit μC	with 2-phase NFE1	gate driver for DC	motors (grade-1, T	= 150°C)				
TLE9861QXA20	24	PWM	3	36	4	у	2	2
TLE9867QXA20	24	PWM + LIN	6	64	4	у	2	2
TLE9867QXA40	40	PWM + LIN	6	64	4	у	2	2
TLE9869QXA20	24	PWM + LIN	6	128	4	у	2	2
TLE986x 32-bit μC	with 2-phase NFET	gate driver for DC	motors (grade-0, T	= 175°C)				
TLE9867QXW20	24	PWM + LIN	6	64	4	у	2	2

TLE987x - Motor Drivers

Product name	Frequency [MHz]	Interface	RAM [KB]	Flash [KB]	EEPROM in flash included [KB]	OP-AMP	Low-side MOSFET drivers	High-side MOSFET drivers
TLE987x 32-bit μ	C with 3-phase NFE	Γ gate driver for DC	motors (grade-1, T	_j = 150°C)				
TLE9871QXA20	24	PWM	3	36	4	у	3	3
TLE9877QXA20	24	PWM + LIN	6	64	4	у	3	3
TLE9877QXA40	40	PWM + LIN	6	64	4	у	3	3
TLE9879QXA20	24	PWM + LIN	6	128	4	у	3	3
TLE9879QXA40	40	PWM + LIN	6	128	4	у	3	3
TLE987x 32-bit μ	C with 3-phase NFE	T gate driver for DC	motors (grade-0, T	_j = 175°C)				
TLE9873QXW40	40	PWM + LIN	3	48	4	у	3	3
TLE9877QXW40	40	PWM + LIN	6	64	4	у	3	3
TLE9879QXW40	40	PWM + LIN	6	128	4	у	3	3







A unique Motor Driver Product Portfolio

PowerSTEP01

Micro-stepping motor driver with advanced control logic and very low R_{dson} F7 series MOSFETs

PowerSTEP01 is a micro-stepping driver capable to drive both phases of a bipolar stepper motor. Thanks to the embedded low R_{DSON} MOSFETs (16m Ω) it can deliver high power while keeping power dissipation at a very low level.

Features

- Intended for 2 phase bipolar stepper motor
- Voltage & current control modes supported
- Resolution up to 128µsteps
- Motion control engine for autonomous movement
- Speed and positioning commands
- Capable to drive 10A r.m.s. @ 85V (max.)
- Achievable power up to approx. 850W



L62xx Series Robust, Reliable, Scalable

A Family of STSPIN Motor Drivers

Fully intergated motor driver ICs provide complete solutions for driving stepper, brush, and brushless DC motors, controllers and drivers combined in one chip.

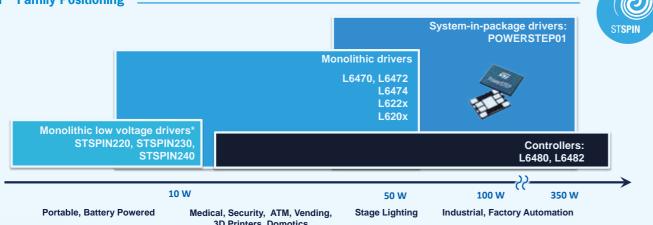
Features

- Mixed signal DMOS power technology
- 8VDC to 52VDC operating voltage
- Output current 2.8A DC (5.6A Pk) L620x Series, 1.4A DC (2.8A Pk)
- PowerSO, SO, DIP and tiny QFN packages
- Extensive diagnostics
- Non-dissipative high side OC sensing and OC protection

Applications

- Automation
- Factory automation
- Office automation
- Medical equipment
- Vending machines
 Industrial

STSPIN™ Family Positioning











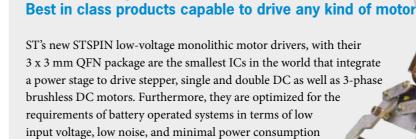






* In development

Motor Drivers with the Market Lowest Supply Voltage Maximizing Battery Endurance



at full load as well as in standby conditions. Finally they provide accurate positioning and unprecedented smoothness of motion with up to 256 microsteps per full step.

Features

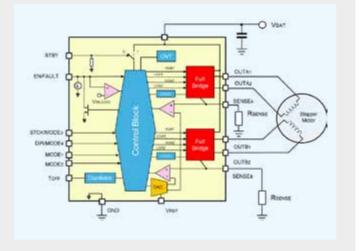
STSPINbatterv

- Extremely low operating voltage 1.8 10 V, ideal for low-voltage, battery-operated motors
- High output current up to 1.3 ARMS for each full-bridge
- Energy saving and long battery life with best-in-class standby consumption down to 80 nA
- Extreme position accuracy and motion smoothness with up to 256 microsteps per full step (STSPIN220)
- Maximum reliability UVLO, over-current and thermal protection
- Ultra-miniaturized 3 x 3 mm QFN package

Device	Motor type to drive
Device	Motor type to urive
STSPIN220	Stepper motors with resolution up to 256 µsteps
STSPIN230	3 phase permanent magnet (brushless) synchronous motors
STSPIN240	2x Brush DC motors
STSPIN250	1x Brush DC motor

Applications

- Toys
- Portable printers
- Portable medical equipment
- Robotics
- Point of sale (POS) devices
- Healthcare and wellness devices
- (shavers and toothbrushes)







3-Phase Motor Drive was Never Smaller

STSPIN32F0: 3-Phase Motor Pre-Driver with Embedded 32-bit Microcontroller

Combination of a well market proven STM32 microcontroller together with a specialized gate driver chip makes it possible to realize a very precise field-oriented control of the electric motor, 6-step sensor-less or other advanced driving algorithms, including the speed control loop. The integrated operational amplifiers allow maximum flexibility to design cost-effective sensor-less or Hall-effect sensor feedback systems. An internal 3.3 V DC-DC buck converter and 12 V LDO linear regulator provide the voltage rails to supply the MCU, the external circuitry and the gate drivers, further reducing the bill of materials and enhancing efficiency. The IC can be put into standby mode to disable all the internal circuitry apart from the DC-DC converter that supplies the MCU, thus reducing power consumption to a minimum. A complete set of protection features is present including over-current, over-temperature and short-circuit, thus making it a bullet-proof solution for demanding applications, especially industrial ones, and further helping to reduce the number of external components, cost and complexity. All this comes in a miniaturized 7x7 mm QFN package that perfectly fits into compact devices and ensures a minimal footprint.

Features & Benefits

Three-phase Gate Driver for High Performance

- 600mA current capability to drive a wide range of power MOSFETs
- Real-time programmable over-current
- Integrated bootstrap diodes
- Cross-conduction, under-voltage and temp. protections

Integrated 32-bit STM32F0 MCU with ARM® Cortex®-M0 Core

- 48MHz, 4-Kbyte SRAM and 32-Kbyte Flash memories
- 12-bit ADC
- 1 to 3 shunt FOC supported
- Communication interfaces: I²C, UART, and SPI
- Complete development ecosystem available

Operational Amplifiers and Comparator

 Sensor-less or Hall-effect sensors supported for accurate control of 3-phase motors, with high efficiency

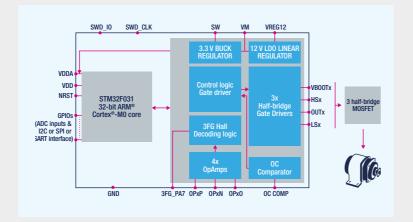
On-chip Generated Supplies for MCU, Driver and Eexternal Circuitry

• For maximum efficiency and flexibility

Typical Applications

- Portable vacuum cleaners
- Fans
- Drones and aeromodelling
- Power tools
- Air purifiers
- Industrial and educational robots







Gate Driver ICs

The Gate Driver overview goes from a Single-, Half Bridge- up to a 3-Phase driver solution. The portfolio can be used in many applications from drones, home appliance until to electrical drive systems. Gate Drivers providing the required power and efficiency from the end application. They are an easy solution between the controller and the manageable power switches. Furthermore it is possible a fast switching and accurate timing with a maximize system efficiency. In summary in our portfolio we are able to offer, isolated Gate Driver for the industrial and the automotive sector as well as non-isolated solutions.

Gate Driver ICs



Туре	Infineon	ST	Diodes	Intersil	ROHM	JRC
Single	Х	х	х	х	X	х
High-Side / Low-Side	Х	Х	х	х	Х	х
Dual	Х	х	х	х	Х	х
Half Bridge	х	х	х	х	х	x
H-Bridge					Х	
3-Phase	Х	х	х	х	Х	
Non-Isolated	x	х	х	х	x	Х
Isolated	Х	х			Х	
Automotive (AECQ)	x	х	х	х	х	
Industrial	Х	Х	х	х	Х	х

Applications

- AC and Brushless DC Motor Drives
- High Voltage DC/DC-Converter
- UPS-SystemsWelding
- Home appliances
- Drones
- Fans, pumps
- General purpose drives















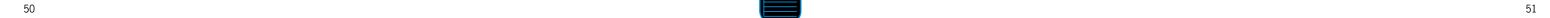


























Reliable and Efficient Control of MOSFET, IGBT and GaN Switching Devices

Infineon's 1EDN and 2EDN MOSFET EiceDRIVER™ gate driver ICs are the crucial links between control ICs and powerful MOSFET, IGBT and GaN switching devices. Gate driver ICs enable high system level efficiencies, excellent power density and consistent system robustness. Manufactured after industry standards and offered in different standard packages and pinout configurations, they offer full compatibility with existing designs, which eases drop-in replacements and upgrades. These flexible gate driver ICs are complementary to Infineon's IGBTs, MOSFETs, SiC JFET and other power switches in discrete gate drive applications or as part of integrated power modules.

1EDN MOSFET EiceDRIVER™ Family

The new one-channel 1EDN MOSFET EiceDRIVER™ family is an industrial leader in low internal power consumption, with up to 200% higher efficiency of the output stages, compared to other 1-channel low-side gate driver ICs. The gate driver IC is capable to drive output reverse currents up to 5 A for both source and sink. The family serves PFC, synchronous rectification, DC-DC converters, telecom bricks, power tools, industrial SMPS, motor control and wireless charging applications, and is compatible to industrial standard pinout for 1:1 replacement.

Key Features

- Single channel
- 4 A source/8 A sink
- Optional separate source/ sink outputs
- 19 ns propagation delay
- -10 V input robustness

SOT-23, WSON

Figure	Package	Source / Sink Peak Current	Separate Source / Sink Output	Typ. UVLO	Part Number	OPN
	5-pin SOT23	4 A / 8 A	no	4 V	1EDN7512B	1EDN7512BXTSA1
	6-pin WSON	4 A / 8 A	no	4 V	1EDN7512G	1EDN7512GXTMA1

2EDN MOSFET EiceDRIVER™ Family

The new two-channel 2EDN MOSFET EiceDRIVER™ family features two independent, non-isolated low-side channels, each capable of providing a 5 A source and sink peak current, without the need of external Schottky clamping diodes, for higher power density and lower BoM costs. The family serves server, telecom, DC-DC converters, bricks, power tools, industrial SMPS, motor control, and solar applications.

Key Features

- Dual-channel
- 5 A source/5 A sink
- Low ohmic output stages
- 19 ns propagation delay
- -10 V input robustness
- DSO, TSSOP, WSON

Figure	Package	Typ. UVLO	Control Inputs	Product Name	Orderable Part Number
rigure	Fackage	Typ. UVLU	direct	2EDN7524F	2EDN7524FXTMA1
		4 V	inverted	2EDN7523F	2EDN7523FXTMA1
	DSO	0.14	direct	2EDN8524F	2EDN8524FXTMA1
		8 V	inverted	2EDN8523F	2EDN8523FXTMA1
190 Mar.		4 V	direct	2EDN7524R	2EDN7524RXUMA1
	TSSOP	4 V	inverted	2EDN7523R	2EDN7523RXUMA1
	1330F	8 V	direct	2EDN8524R	2EDN8524RXUMA1
and the same		O V	inverted	2EDN8523R	2EDN8523RXUMA1
July 1			direct	2EDN7524G	2EDN7524GXTMA1
	WSON	4 V	inverted	2EDN7523G	2EDN7523GXTMA1

DGDxxxx Gate Drivers - Covering 50 V to 600 V

Provides a Simple Means of Switching Power MOSFETs and IGBTs in Half-bridge and Full-Bridge Configurations

Featuring both high-side and low-side output drive capability, with simple logic level input, enables an easy interface between the controller and the power MOSFET / IGBT switches. Supporting up to 600 V via a floating high-side driver allows operation on high-voltage rails commonly used in power supplies, motor drive and DC-AC inverters.

Encompassing self-protection features: such as fixed dead-time delay to evade shoot- through issues; Schmitt triggered inputs to avoid false triggering; gate drive tolerance to negative transients caused during high dV/dt switching; and, undervoltage lockout (UVLO) protection on the V_{CC} supply to avoid malfunction under low supply voltage.

DGDxxxx Gate Drivers

Orderable Part Number	Integrated Bootstrap	Offset Voltage Max	Inputs	Output Current lo+ Typ	Output Current Io- Typ (mA)	Internal Deadtime Typ	ton / toff Typ	tr / tf Typ	Package	Status
	Diode	(V)		(mA)	(mA)	(ns)	(ns)	(ns)		
DGD0507FN-7	Υ	50	HIN, LIN, EN	1400	2200	-	20 / 23	17/13	DFN3030-10	Production
DGD2110S16-13	N	500	HIN, LIN, SD	2500	2500	-	105/94	25/17	S016	Production
DGD2101MS8-13	N	600	HIN, LIN	290	600	-	160 / 150	70 / 35	S08	Production
DGD2106MS8-13	N	600	HIN, LIN	290	600	-	220 / 200	100/35	S08	Production
DGD21064MS14-13	N	600	HIN, LIN	290	600	-	220 / 200	100/35	S014	Production
DGD2181S8-13	N	600	HIN, LIN	1900	2300	-	180 / 220	40 / 20	S08	Production
DGD21814S14-13	N	600	HIN, LIN	1900	2300	-	180 / 220	40 / 20	S014	Production
DGD2113S16-13	N	600	HIN, LIN, SD	2500	2500	-	105/94	25 / 17	S016	Production
DGD2190MS8-13	N	600	HIN, LIN	4500	4500	-	140 / 140	25 / 20	S08	Production
DGD21904MS14-13	N	600	HIN, LIN	4500	4500	-	140 / 140	25 / 20	S014	Production
Half-Bridge Gate Driv	ers									
DGD0506FN-7	Υ	50	IN, DT, EN	1500	2500	70 – 420 #	96 / 463	14/12	DFN3030-10	Production
DGD0503FN-7	N	100	HIN, LIN*	290	600	430	680 / 150	70 / 35	DFN3030-10	Production
DGD0504FN-7	N	100	IN, SD^	290	600	430	680 / 150	70 / 35	DFN3030-10	Production
DGD1503S8-13	N	250	HIN, LIN*	290	600	430	680 / 150	70 / 35	S08	Production
DGD1504S8-13	N	250	IN, SD^	290	600	430	680 / 150	70 / 35	S08	Production
DGD2103MS8-13	N	600	HIN, LIN*	290	600	420	680 / 150	70 / 35	S08	Production
DGD2104MS8-13	N	600	IN, SD^	290	600	420	680 / 150	70 / 35	S08	Production
DGD2304S8-13	N	600	HIN, LIN	290	600	100	150 / 150	70 / 35	S08	Production
DGD2108S8-13	N	600	HIN, LIN*	290	600	540	220 / 200	100/35	S08	Production
DGD21084S14-13	N	600	HIN, LIN*	290	600	540 - 5000 #	220 / 200	100/35	S014	Production
DGD2184S8-13	N	600	IN, SD^	1900	2300	400	680 / 270	40 / 20	S08	Production
DGD21844S14-13	N	600	IN, SD^	1900	2300	400 - 5000 #	680 / 270	40 / 20	S014	Production
Single Channel Gate	Drivers									
DGD2117S8-13	N	600	IN	290	600	-	125 / 105	75 / 35	S08	Production
DGD2118S8-13	N	600	IN*	290	600	-	125 / 105	75 / 35	S08	Production
3-phase Gate Drivers										
DGD2136S28-13	N	600	HIN*1,2,3, LIN*1,2,3, EN, ITRIP	200	350	290	330 / 330	90 / 35	S028	Production

^{* =} out of phase with output # = Adjustable by external resistor

IGBTs





IGBTs

Providing IGBTs (insulated-gate bipolar transistors) for all switching frequencies and common voltage classes, Rutronik fulfills all demands of the industry. Due to the latest hard and soft switching technologies of leading suppliers we are able to offer a high efficiency portfolio for your application. The devices offer very low switching losses, optimized thermal performance and minimal conduction losses.

Switching Frequency	Infineon			Rohm	STMicroelectronics	Toshiba	Applications
Low < 20 kHz	lxxxN60x lxxxT60x lxxxN120xx lxxxT120xx lxxxT60x	IRG4xxxxxx IRG6xxxxxx IRG7xxxxxx IRG8xxxxxx	IRGBxxxxxx IRGIxxxxxx IRGPxxxxxx IRGRxxxxxx IRGSxxxxxx	RGTxxxx RGTHxxx	STGxxxM60xx STGWxxH120DF STGWxxH130D STGxxxN60xx STGxxxN3xLZ STGxxxN4LZ	GTxxx	Induction Heating Multifunction Printers Solar Inverter Motor Controll UPS Bridge Major Home Appliances
Medium > 20 kHz < 50 kHz	SxxxN60xx SxxxN120xx lxxxN60xx lxxxN120xx	IRG4xxxxx IRG6xxxxxx IRG7xxxxxx IRG8xxxxxx	IRGBxxxxxx IRGIxxxxxx IRGPxxxxxx IRGRxxxxxx IRGSxxxxxx	RGTxxxx RGTHxxx	STGxx0H65xxFB STGxxNC60Hx STGxxNC60Kx STGxxNC60Vx	GTxxx	Induction Heating Microwave Inverter Motor Controll Major Home Appliances
High > 100kHz	lxxxN60xx lxxxN120xx	IRG4xxxxx IRGBxxxxxx IRGPxxxxxx		RGTxxxx RGTHxxx	STGxx0V60xF	GTxxx	Welding Inverter Inverter Airconditioning Washing Machine Power Supply
With antiparallel diode	2nd position is a "K"	"D" at the end name	of the product	"D"at the end of the product name	"D" at the end of the product name	6th position is "3" or "R"	

























IGBT – Trench Gate Field Stop High Efficiency Technology

M-Series 650 V IGBTs

The 650 V IGBT M series combines the best trade-off between conduction and switch-off energy with outstanding robustness and EMI behavior. They enable more efficient and reliable motor control, air conditioning compressors, HVAC motor drives, UPS, solar power converters and all power conversion applications working up to 20~kHz in hard-switching topologies. A 6 μs (min) short-circuit withstand time at

150 °C starting junction temperature, an extended operating junction temperature of 175 °C and a wide safe operating area extend service lifetime and boost reliability of applications requiring high power dissipation.

Features

- Wide Product Range up to 120 A in discrete package
- 175 °C max junction temperature
- Very low VCE(sat)
- Self-ruggedness against short circuits events
- Low switching-off losses
- Safe paralleling
- Optimized very fast and soft recovery co-packed freewheeling diode option
- AEC-Q101 Qualified

Benefits

- M series is tailored to improve efficiency of targeted applications
- Longer lifetime
- Safe paralleling
- Soft and fast recovery antiparallel diode
- High robustness

Part Number	Icn ¹ (A)	VCE(sat) ² (V)	E _{tot} ³ 'mJ)	t _{sc} ⁴ (µs)	Switching Freq. Range	FRD Option	DPAK	D2PAK	T0-220	TO-220FP	T0-247	TO-247 long leads	Max247 long leads
STGx4M65DF2	4	1.6	0.18				D	В	Р	F			
STGx6M65DF2	6	1.55	0.24			114	D	В	Р	F			
STGx10M65DF2	10	1.55	0.39			HA, Invert.,		В	Р	F	W		
STGx15M65DF2	15	1.55	0.54		- N	Fan,		В	Р	F			
STGx20M65DF2	20	1.55	0.70	6	Up to 20KHz	Pumps		В	Р	F		WA	
STGx30M65DF2	30	1.55	1.26		7 %			В	Р	F	W	WA	
STGx50M65DF2	50	1.65	2.45			PV, Invert.,						WA	
STGx75M65DF2	75	1.65	3.22			UPS, PFC, HEV					W	WA	
STGx120M65DF2	120	1.65	6.20			1 1 L V							YA

HB-Series 650 V IGBTs

Leveraging latest ST's advanced Trench Gate Field-Stop High-Speed technology the HB series IGBTs combine this picture turnoff efficiency with a very low saturation voltage (V_{CE(SAT)}) down to 1.6 V (typical). In addition to the above features the extended voltage rating (BV_{CES}) at 650 V, the maximum operating junction temperature (T_I) of 175 °C and a wide Safe Operating Area (SOA) results in an increased robustness and so reliability and lifetime. The HB series enhance the energy efficiency of solar inverters, induction heaters, welders, uninterruptible power supplies, powerfactor correction, and other high-frequency power converters.

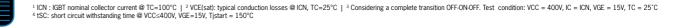
Features

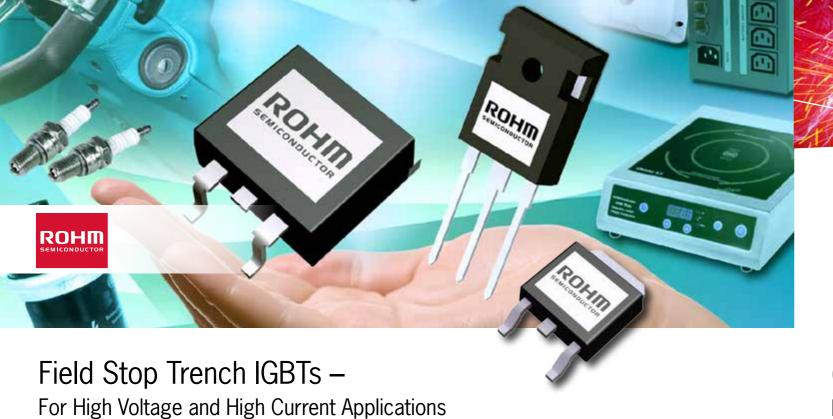
- Maximum junction temperature: $T_I = 175$ °C
- Very low & minimized tail in switching-off
- V_{CE(SAT)} = 1.6 V (typ.) @ I_{CN} (100 °C)
- ullet Positive derating of $V_{CE(SAT)}$ with temperature
- Tight parameters distribution
- Co-packed different feature diode

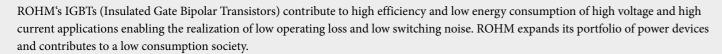
Benefits

- Higher robustness and reliability
- Increase system efficiency for energy saving
- Safer paralleling operations
- Specific diode option for different applications

Part Number	BV _{CES} (V)	I _{CN} ¹ (A)	V _{CE(sat)} ² (V)	Switching Freq. Range	FRD Option	D2PAK	T0-247	T0-3P	T0-3PF	MAX-247
STGx20H65FB	650	20	1.6	8 - 50kHz	-		W	WT	FW	
STGx30H65FB	650	30	1.6	8 - 50kHz	-		W	WT	FW	
STGx30H60DFB	600	30	1.6	8 - 50kHz	Very Fast		W	WT	FW	
STGx30H60DLFB	600	30	1.6	8 - 50kHz ³	Low Drop	В	W			
STGx40H65FB	650	40	1.6	8 - 50kHz	-		W	WT	FW	
STGx40H65DFB	650	40	1.6	8 - 50kHz	Very Fast		W	WT		
STGx40H60DLFB	600	40	1.6	8 - 50kHz ³	Low Drop		W	WT		
STGx60H65FB	650	60	1.6	8 - 50kHz	-		W	WT		
STGx60H65DFB	650	60	1.6	8 - 50kHz	Very Fast		W	WT		
STGx60H60DLFB	600	60	1.6	8 - 50kHz ³	Low Drop		W	WT		
STGx80H65DFB	650	80	1.6	8 - 50kHz	Very Fast		W	WT		Υ







Series

- RGT series designed optimize to use converter
- RGT series are suitable for inverters
- RGPx series is designed to igniter and it follows AEC-Q101

Features & Benefits

- Low collector Emitter Saturation Voltage
- Low switching loss
- Short circuit withstand time 5µs
- Built-in very fast & soft recovery FRD (RFN-series)

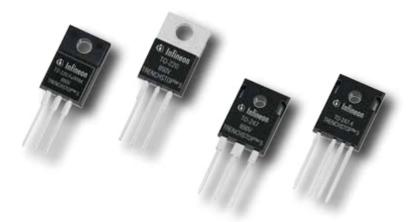
Applications

- General inverter
- UPS
- Power conditioner
- Welder
- Igniter

Show/Hide	V _{CES} [V]	I _C (100°C) [A]	V _{CE(sat)} (Typ.) [V]	t _{sc} (Min.) [μs]	Built-in Diode	V _{GE(th)} (Min.) [V]	Package
RGT16NS65D	650	8	1.65	5	FRD	5	LPDS
RGT30NS65D	650	15	1.65	5	FRD	5	LPDS
RGT40NS65D	650	20	1.65	5	FRD	5	LPDS
RGT40TS65D	650	20	1.65	5	FRD	5	TO-247N
RGT50TS65D	650	25	1.65	5	FRD	5	T0-247N
RGT60TS65D	650	30	1.65	5	FRD	5	TO-247N
RGT80TS65D	650	40	1.65	5	FRD	5	T0-247N
RGT8BM65D	650	4	1.65	5	FRD	5	T0-252
RGT8NS65D	650	4	1.65	5	FRD	5	LPDS
RGT00TS65D	650	50	1.65	5	FRD	5	T0-247N
RGTH00TS65	650	50	1.6	-	·	4.5	T0-247N
RGTH00TS65D	650	50	1.6	-	FRD	4.5	TO-247N
RGTH40TS65	650	20	1.6	-	·	4.5	T0-247N
RGTH40TS65D	650	20	1.6	-	FRD	4.5	TO-247N
RGTH50TS65	650	25	1.6	-	-	4.5	TO-247N
RGTH50TS65D	650	25	1.6	-	FRD	4.5	TO-247N
RGTH60TS65	650	30	1.6	-	-	4.5	T0-247N
RGTH60TS65D	650	30	1.6	-	FRD	4.5	TO-247N
RGTH80TS65	650	40	1.6	-		4.5	TO-247N
RGTH80TS65D	650	40	1.6	_	FRD	4.5	T0-247N







650 V TRENCHSTOP™ 5

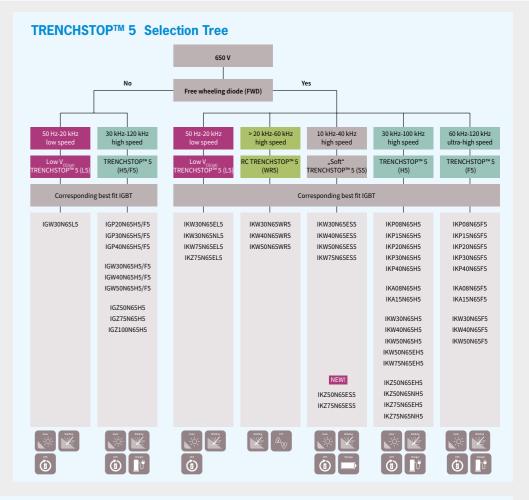
Introducing a Technology to Match Tomorrow's High Efficiency Demands

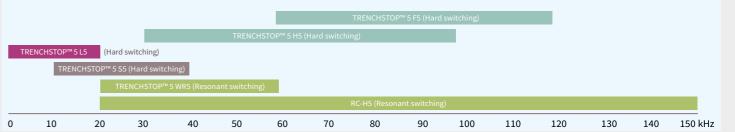
Infineon's TRENCHSTOP™ 5 IGBT technology redefines best-in-class IGBT by providing unmatched performance in terms of efficiency for hard switching applications. The family is a major breakthrough in IGBT innovation to match the market's high efficiency demands of tomorrow.

When high efficiency, lower system costs and increased reliability are demanded, TRENCHSTOP $^{\infty}$ 5 is the only option.

The TRENCHSTOP[™] 5 IGBTs deliver a dramatic reduction in switching and conduction losses.

The TRENCHSTOP[™] 5 IGBT technology will be used as a basic for 5 IGBT series - H5/F5/L5/WR5 and new S5 IGBT.











Power MOSFETs















Rutronik is a leading global provider for MOSFETs of the world's well-known suppliers. MOSFETs (metal-oxide-semiconductor field-effect transistor) are usable for applications in the automotive segment as well as in the field of industrial and consumer. We provide you with a large product range including P-Channel, N-Channel and Dual MOSFETs for applications with voltage classes starting from -400V up to 1700V.

Our Power MOSFETs support high efficiency requirements in all necessary terms:

- Minimum conduction losses
 Low switching losses
- Extremely low R_{DSon} Optimized gate charge





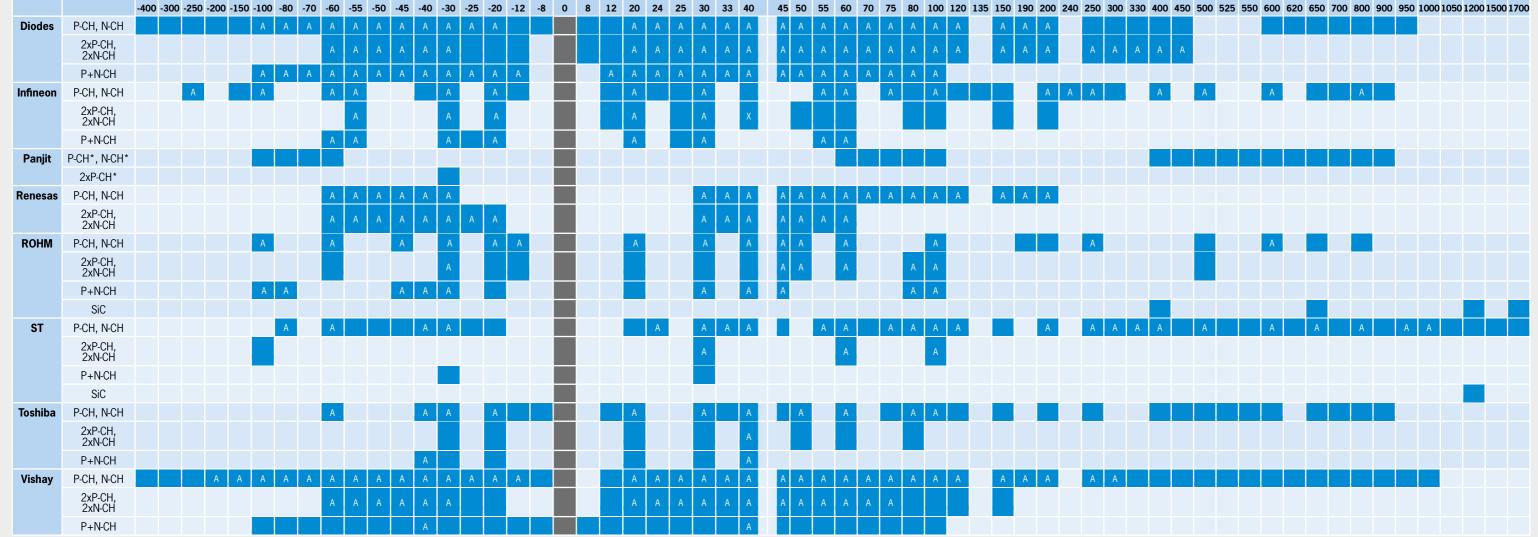






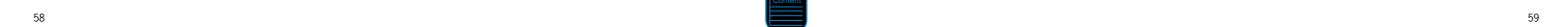


Supplier Range / Series



A = also available as AECQ

* Qualification for automotive: upon request





40 V and 60 V StronglRFET™



Logic level technology for battery powered applications

StrongIRFET $^{\text{\tiny M}}$, Infineon's MOSFET technology, offers higher max current ratings compared to the market and provides greater reliability in designs with high surge currents. The logic level gate drive allows designers to drive MOSFETs with only 5 V V_{GS} . This is ideal in applications where standard gate drive is not available such as a battery powered circuits.

The family features low $R_{DS(on)}$ for reduced conduction losses, high current carrying capability for increased power capability and rugged silicon for robustness. The implemented enhanced wire-bond construction makes Infineon the unique supplier to offer a possibility of an upgrade of StrongIRFET $^{\infty}$ to TO220, TO247, D2PAK, and D2PAK-7 packages. Such a wide and scalable offering enables the family to address a wider range of customer needs.

The newest upgrade to the family is 40 V StrongIRFET™ MOSFET in D2PAK 7pin+ package. Compared to the D2PAK 7pin, it offers up to a 20 percent larger die leading to 15 percent lower R_{DS(on)}, and up to 39 percent lower thermal resistance from junction to PCB. These benefits, along with increased robustness, reliability, and power density, give designers better reliability when designing an application that could potentially see high current spikes.

Applications

- Power tools
- Light electric vehicles (LEV)
- Uninterruptible power supply
- Solar
- Industrial drives
- Electric toys
- Battery powered applications

DC/DC applications

Features & Benefits

- Designed for industrial applications
- Ideal for low switching frequency (<100 kHz)
- High current carrying capability (>120 A)
- 4.5 V logic level optimized
- Rugged silicon
- Low R_{DS(on)}

StrongIRFET™ in D2PAK 7pin+ package portfolio

Product name	V _{DSS} (V)	$R_{DS(on)}$ max. @ $V_{GS}=10$ V (m Ω)	$R_{DS(on)}$ max. @ V_{GS} = 4.5 V (m Ω)	lo max. (A)	Logic level
IRL40SC228	40	0.65	0.90	360	Yes
IRL40SC209	40	0.65	1.10	300	Yes

Product portfolio 40 V and 60 V StrongIRFET™

Part number	Breakdown voltage (V)	Package (outline)	Current rating (A)	R _{DS(on)} typ/max. @ 4.5V (mO)
IRL7472L1	40	Large Can DirectFET ™ package (L8)	375	0.52 / 0.97
IRL40SC228	40	D2PAK 7pin	360	0.60 / 0.90
IRL40SC209	40	D2PAK 7pin	360	0.80 / 1.10
IRL7486M	40	Medium Can DirectFET ™ package (ME)	209	1.5 / 2.0
IRL40B209	40	T0-220	195	1.2 / 1.6
IRL40B212	40	T0-220	195	1.9 / 2.4
IRL40S212	40	D2PAK	195	1.9 / 2.4
IRL40B215	40	TO-220	120	2.8 / 3.5
IRL60S216	60	D2PAK	195	1.8 / 2.2
IRL60SL216	60	T0-262	195	1.8 / 2.2
IRL60B216	60	T0-220	195	1.7 / 2.2

600 V CoolMOS™ P7 and 600 V CoolMOS™ C7 Gold (G7)



High voltage MOSFETs enabling highly efficient solutions for low and high power market

Infineon's 600 V CoolMOS[™] C7 Gold (G7) and 600 V CoolMOS[™] P7 series are designed to operate at 600 V breakdown voltage and deliver improved superjunction MOSFET performance needed for target applications to achieve high power density.

600 V CoolMOS™ P7

offers a perfect balance between performance, ease of use, price and portfolio granularity. It brings efficiency gains of up to 1,5% in various topologies, and up to 4.2°C thermal benefits compared to the competition.

Features

- Outstanding commutation ruggedness
- Optimized balance between efficiency and ease-of-use
- Significant reduction of switching and conduction losses
- Excellent ESD robustness > 2 kV (HBM) for all products
- Better $R_{DS(on)}$ /package products compared to competition enabled by a low $R_{DS(on)}$ x A (below 1 Ω x mm²)

Benefits

- Suitable for hard and soft switching (PFC and LLC)
- Ease-of-use and fast design-in through low ringing tendency and usage across PFC and PWM stages
- Simplified thermal management due to low switching and conduction losses
- Higher manufacturing quality due to > 2 kV ESD protection

600 V CoolMOS™ C7 Gold (G7)

for PFC & LLC circuits combines the benefits of the C7 Gold technology and superior thermal properties of the TOLL package resulting in new best in class products. The 4 pin Kelvin source configuration minimizes switching losses, offering efficiency gains of 0.6% at full load in PFC circuits.

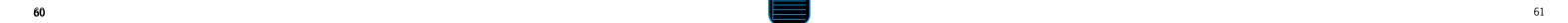
Features

- Best-in-class FOM R_{DS(on)} x E_{oss} and R_{DS(on)} x Q_g
- Enables best-in-class R_{DS(on)} in smallest footprint
- TOLL package
- Inbuilt 4th pin Kelvin source configuration and low parasitic source inductance (~1 nH)

Benefits

- FOM R_{DS(on)} x Q_g is 16% better than previous 600 V C7 enabling higher efficiency
- Power density through best-in-class 28 m Ω in TOLL 115 mm² footprint
- Reducing parasitic source inductance by Kelvin source improves efficiency and ease-of-use

		600 V CoolMOS™ C7 Gold (G7)							
R _{DS(on)} max [mΩ]	TO -220	TO-220 FullPAK	T0-247	TO-247 4pin	TO-252 DPAK	TO-220 FullPAK Wide Creepage	ThinPAK 5x6 / 8x8	$R_{DS(on)}$ max $[m\Omega]$	TO-Leadless
37			IPW60R037P7	IPW60R037P7				28	(TOLL)
180	IPP60R180P7	IPA60R180P7	IPW60R180P7		IPA60R180P7	IPAW60R180P7S		50	IPT60R050G7
185							IPL60R185P7	80	IPT60R080G7
360	IPP60R360P7	IPP60R360P7			IPP60R360P7	IPAW60R360P7S		102	IPT60R102G7
365							IPL60R365P7	125	IPT60R125G7
600	IPP60R600P7				IPD60R600P7			150	IPT60R150G7
40/45		IPB65R045C7 IPB60R040C7		IPP65R045C7 IPP60R040C7	IPA65R045C7	IPW65R045C7 IPW60R040C7	IPZ65R045C7 IPZ60R040C7		
17/19						IPW65R019C7 IPW60R017C7	IPZ65R019C7 IPZ60R017C7		





State-of-the-art MOSFETs Technologies

SiC MOSFET – The real breakthrough in high-voltage switching

Based on the advanced and innovative properties of wide bandgap materials, ST's silicon carbide (SiC) MOSFET feature very low R_{DS(on)} per area for the 1200 V rating combined with excellent switching performance, translating into more efficient and compact designs. ST is among the first companies to produce high-voltage SiC MOSFET. Compared to silicon MOSFET, SiC MOSFET also feature significantly reduced switching losses with minimal variation versus the temperature.

Features

- Very low switching losses
- Low power losses at high temperature
- Higher operating temperature (200°C)
- Body diode with no recovery losses
- Easy to drive

Benefit

- Smaller form factor and lighter systems
- Reduced size/cost of passive components
- Higher system efficiency
- Reduced cooling requirements and heatsink size

Applications

- Solar inverters
- High-frequency power supplies
- Motor drives



Part	number	V _{DSS} (V)	I _D max (A) (@ 25 °C)	$R_{DS(on)}$ max (Ω) (@ $V_{GS} = 20$ V)	Total gate charge Q _g typ (nC)	T _j max (°C)	Package
SCT1	.0N120	1200	12	0.69	22	200	HiP247™
SCT2	20N120	1200	25	0.239	45	200	HiP247™
SCT3	30N120	1200	45	0.1	105	200	HiP247™
SCTS	60N120	1200	65	0.069	122	200	HiP247™
SCTWA	A50N120	1200	65	0.069	122	200	HiP247™ long leads

$800-1050 \text{ V MDmesh}^{\text{TM}} \text{ K5} -$ ST's first super-junction VHV MOSFET series to boost efficiency in high-voltage power supplies

ST's latest-generation MDmeshTM K5 series enables flat-panel televisions, PC power supplies, LED lighting drivers and electronic ballasts for highintensity discharge (HID) lamps to establish the best efficiency and safety margin in the marketplace. These MOSFETs enable designers to meet increasingly strict limits on maximum power and minimum energy efficiency specified by eco-design standards such as Energy Star and the EU's energy-related products (ErP) directive.

Features

- Extremely good R_{DS(on)} at very high BV_{dss}
- High switching speed
- 800-1050 V BV_{dss} rated
- Available in slim I2PAKFP package
- 100% avalanche-tested
- Zener-protected

Benefits

- High efficiency with lower design complexity
- Especially targeted for flyback-based topologies applications
- Industry's best figure of merit (FoM)

Applications• SMPS

- LED Driver
- Standby SMPS
- Metering
- Lighting
- μ-Inverter

5.5 STx5N80K5 12 STx7LN80K5 STx9N80K5 I²PAKFP/TO-220FP I2PAKFP/TO-220/TO-220FP STx14N80K5 30 STx15N80K5 D2PAK/T0-220FP/T0-220/T0-247 11.6 STx4N90K5 DPAK/IPAK/TO-220/IPAK/TO-220FP/ 15.6 STx6N90K5 DPAK/TO-220/TO-220FP/TO-247 19.8 STx8N90K5 D2PAK/TO-220/TO-220FP/TO-247 STx2N95K5 12.5 STx5N95K5 13 STx6N95K5 20 STx10N95K5 TO-220FP/D2PAK/TO-247/TO-220 27 STx15N95K5 TO-220FP/TO-220/TO-247 0.5 12

STripFET™ F7

STripFETTM F7 low-voltage MOSFETs set new class standard for on-state resistance, enhancing energy efficiency and reliability of telecom, server, industrial and automotive applications. ST's series of 80 and 100 V STripFETTM F7 MOSFETs feature an enhanced trench-gate structure that lowers device on-state resistance while also reducing internal capacitances and gate charge for faster and more efficient switching. The devices also have high avalanche ruggedness making them ideal for rugged designs.

Thanks to the new gate structure, high power design can be simplified by reducing the number of paralleled devices.

Also, with the improved figure of merit and recovery diode, this technology is also ideal for high frequency switching applications.

Features

- High avalanche capability
- Optimized body diode
- High junction temperature (175 °C)

Benefits

- Low conduction losses
- Small form factor of final system
- Excellent behavior to EMI
- Robust design

Applications

- Automotive
- Industial
- Motor controlSMPS

STx110N10F7 6.7 STL100N10F7 7.3 STx100N10F7 STL90N10F7 STx80N10F7 9.5 STL60N10F7 18 STx45N10F7 STL8N10F7 STL40N10F7 STx30N10F7 STI 30N10F7 STx25N10F7

67

70

8

1.1

2.5

2.5

2.5

2.1

3.6

3.6

4.4

2.3

2.5

3.9

29

120

400/650 V MDmesh™ DM2

ST's new MOSFET series with integrated fast-recovery body diode

The MDmesh^{∞} DM2 is a new MOSFET silicon-based technology with a fast-recovery intrinsic diode. This new 400/650 V series achieves up to 40% better $R_{DS(on)}$ than earlier versions thanks to ST's super-junction technology, combined with an excellent performance in terms of trr/Qrr and the industry's best soft switching performance.

STx410N4F7 -2/-6AG 40

STL285N4F7AG

STL210N4F7AG

STL190N4F7AG STL140N4F7AG

STx260N4F7

STL160N4F7

STx270N8F7

STx170N8F7

STx140N8F7

STL130N8F7

STL120N8F7

STx130N8F7-2 STL100N8F7

STx110N8F7

STx310N10F7

STx240N10F7

STx150N10F7

STL110N10F7

STL7N10F7

STL4N10F7

STL20DN10F7

Benefits

- Higher BVDSS: from 400 up to 650 V
- Fast-recovery body diode
- Ultra-low gate charge (Q_g)
- Very low R_{DS(on)}
- Automotive AEC-Q101 qualified

Applications

- Telecom/Server
- Automotive
- Solar
- Motor Control

Benefits

- Increased safety range & flexibility
- Excellent dynamic behavior
- Improved high load efficiency
- Lower conduction losses



BV _{DSS} [V]	Туре	AECQ -101	$\begin{array}{c} \text{Max R}_{\text{DS(on)}} \\ [\Omega] \end{array}$	Max I _D [A]	T _{rr} [ns]	Packages
400	STx45N40DM2AG	YES	0.072	38		D2PAK/T0-220
500	STx12N50DM2		0.35	11	110	TO-220FP / DPAK
	STx34N50DM2AG	YES	0.12	26	110	D2PAK / T0-247
600	STD5N60DM2		1.55	3,5	70	DPAK
	STx8N60DM2		0.6	8	80	TO-220FP / DPAK
	STx11N60DM2		0.42	11	90	TO-220 / TO-220FP / DPAK
	STx13N60DM2		0.365 / 0.380	11	97	DPAK / PowerFLATTM 5x6 HV / TO-220FP
	STx18N60DM2 STL19N60DM2		0.295/0.32	11	120	TO-220 / D2PAK / TO-247 / PowerFLATTM8x8 HV
	STx24N60DM2		0.200/ 0.22	18	155	TO-220 / D2PAK / TO-247 / TO-220FP / PowerFLATTM8x8 HV
	STx33N60DM2		0.130/0.14	25	150	TO-220 / TO-247 / D2PAK / TO-220FP / PowerFLATTM8x8 HV
	STx37N60DM2AG	YES	0.11	28	120	D2PAK / T0-247
	STx45N60DM2AG	YES	0.093	34	120	TO-247 / TO-220 / D2PAK
	STW48N60DM2		0.079	40	140	TO-247
	STx72N60DM2AG	YES	0.042	66	150	TO-247 / TO-247 long leads
650	STx26N65DM2		0.19/0.205	21	105	TO-220 / TO-220FP / TO-247 / PowerFLATTM8x8 HV
	STx35N65DM2		0.11	32	115	D2PAK / TO-220FP / TO-220 / TO-247 / TO-247 LL
	STW50N60DM2AG	YES	0.087	38	150	TO-247
	STW56N65DM2		0.065	48	145	TO-247
	STx65N65DM2AG	YES	0.05	60	154	TO-247 / TO-247 long leads

 \blacksquare



New SiHP065N60E Fourth-Generation 600 V E-Series Power MOSFET

Vishay Intertechnology introduces the first device in its fourth generation of 600 V E-Series power MOSFETs. Providing high efficency for telecom, industrial, and enterprise power supply applications, the Vishay Siliconix N-channel SiHP065N60E offers the industry's lowest gate charge times on-resistance, a key FOM for 600 V MOSFETs used in power conversion applications.

Benefits

- Ultra-low on-resistance and gate
 Server and telecom power charge reduce conduction and switching losses to save energy
- Gate charge times on-resistance figure of merit (FOM) of 2.8 Ω*nC
- Low effective output capacitances Co(er) and Co(tr) improve switching performance
- Offered in the TO-220AB package
- RoHS-compliant, halogen-free
- Designed to withstand overvoltage transients in the avalanche mode with guaranteed limits through 100 % UIS testing

Applications

- supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- High-intensity discharge
- (HID) Fluorescent ballast lighting
- Welding
- Motor drives
- Battery chargers
- PV inverters



Single N-Channel | $V_{DS} = 600 \text{ V}$ | $V_{GS} = 30 \text{ V}$

Series	Package	R _{DS(on)} @ 10 V (Ohms)	Q _g @ 10 V (nC)	Q _{gs} (nC)	Q _{gd} (nC)	I _D Max. (A)	P _D Max. (W)	V _{GS(th}) min (V)	R _{gTyp.} (Ohms
SiHA12N60E		0.38	29	6	13	12	33	2	1.1
SiHA14N60E	Thin-Lead TO-220 FULLPAK	0.309	32	8	13	13	147	2	0.75
SiHA15N60E	Ç≹	0.28	38	11	17	15	34	2	0.86
SiHA18N60E	Lead TO- FULLPAK	0.202	46	10	18	18	34	2	0.74
SiHA22N60AE	취근	0.18	48	12	25	20	33	2	0.6
SiHA22N60E	Ė	0.18	57	11	24	21	35	2	0.77
SiHA22N60EL		0.197	37	15	15	21	35	3	0.65
SiHB12N60E		0.38	29	6	13	12	147	2	1.1
SiHB15N60E		0.28	39	11	17	15	180	2	0.86
SiHB18N60E	3	0.202	46	10	18	18	179	2	0.74
SiHB22N60AE	D2PAK (T0-263)	0.18	48	12	25	20	179	2	0.6
SiHB22N60E	<u> </u>	0.18	57	11	24	21	227	2	0.77
SiHB22N60EL	¥	0.197	37	15	15	21	227	3	0.65
SiHB23N60E)2P	0.158	63	16	25	23	227	2	0.73
SiHB30N60E		0.125	85	15	39	29	250	2	0.63
SiHB33N60E		0.099	100	24	42	33	278	2	0.7
SiHB35N60E	_	0.094	88	22	46	32	250	2	0.5
SiHD14N60E	52 52	0.309	32	8	13	13	147	2	0.75
SiHD7N60E	DPAK (TO-252)	0.6	20	5	9	7	78	2	1.1
SiHD9N60E	E	0.368	26	6	13	9	78	2,5	1.2
SiHF12N60E	×	0.38	29	6	13	12	33	2	1.1
SiHF15N60E	10-220 FULLPAK	0.28	39	11	17	15	34	2	0.86
SiHF22N60E	\exists	0.18	57	11	24	21	35	2	0.77
SiHF23N60E	- O	0.158	63	16	25	23	35	2	0.73
SiHF30N60E	-22	0.125	85	15	39	29	37	2	0.63
SiHF35N60E	2	0.094	88	22	46	32	39	2	0.5
SiHF7N60E		0.6	20	5	9	7	31	2	1.1
SiHG15N60E		0.28	39	11	17	15	180	2	0.86
SiHG22N60AE		0.18	48	12	25	20	179	2	0.6
SiHG22N60E		0.18	57	11	24	21	227	2	0.77
SiHG22N60EL		0.197	37	15	15	21	227	3	0.65
SiHG23N60E	O	0.158	63	16	25	23	227	2	0.73
SiHG30N60E	10-247AC	0.125	85	15	39	29	250	2	0.63
SiHG33N60E	-24	0.099	100	24	42	33	278	2	0.7
SiHG35N60E	은	0.094	88	22	46	32	250	2	0.5
SiHG40N60E		0.075	131	33	54	40	329	2	0.6
SiHG47N60AE		0.065	121	29	62	43	313	2	0.6
SiHG47N60E		0.064	148	29	57	47	357	2	0.65
SiHG73N60E		0.039	241	48	98	73	520	2	1.52
SiHG80N60E		0.03	295	85	139	80	520	2	1.2
SiHH11N60E	m	0.339	31	7	13	11	114	2	0.7
SiHH14N60E	×	0.255	41	8	16	16	147	2	0.75
SiHH21N60E	~	0.176	55	11	20	20	104	2	0.6
SiHH26N60E	rPA	0.135	77	18	33	25	202	2	0.5
SiHH28N60E	PowerPAK 8 x 8	0.098	86	20	44	29	202	3	0.5
SiHJ10N60E	Р.	0.36	25	6	13	10	89	2,5	0.8
SiHJ8N60E		0.52	22	5	10	8	89	2	0.93
SiHP065N60E		0.065	49	19	15	40	250	3	2
SiHP12N60E		0.38	29	6	13	12	147	2	1.1
SiHP14N60E		0.309	32	8	13	13	147	2	0.75
SiHP15N60E		0.28	39	11	17	15	180	2	0.86
SiHP18N60E		0.202	46	10	18	18	179	2	0.74
SiHP22N60AE	AB	0.18	48	12	25	20	179	2	0.6
SiHP22N60E	-0-220AB	0.18	57	11	24	21	227	2	0.77
SiHP22N60EL	0-5	0.197	37	15	15	21	227	3	0.65
SiHP23N60E	_	0.158	63	16	25	23	227	2	0.73
SiHP30N60E		0.125	85	15	39	29	250	2	0.63
SiHP33N60E		0.099	100	24	42	33	278	2	0.7
SiHP35N60E		0.094	88	22	46	32	250	2	0.5
SiHP38N60E		0.065	122	27	62	43	313	2	0.6
SiHP7N60E		0.6	20	5	9	7	78	2	1.1
SiHU7N60E	TO-247AD (TO-251)	0.6	20	5	9	7	78	2	1.1
SiHW33N60E	0	0.099	100	24	42	33	278	2	0.7
	7AI	0.064	148	29	57	47	357	2	0.65
SiHW47N60E					.11	7/	.1.1/	_	





PowerPAK® 8 x 8L AEC-Q101-Qualified SQ Rugged Series MOSFETs

Vishay Intertechnology introduces a new 8 mm by 1.8 mm PowerPAK® 8x8L package designed to provide a high-current, space- and power-saving alternative to D²PAK and DPAK devices commonly used in automotive applications. Dedicated automotive processes ensure quality and robustness from design to manufacturing.

The internal construction of the PowerPAK* 8x8L package minimizes inductance and enables low maximum on-resistance. Gull-wing leads specifically designed to reduce PCB solder joint stress caused by the wide range of operating temperatures commonly experienced in automotive applications. While the D2PAK and DPAK contain lead (Pb), the PowerPAK* 8x8L exceeds current RoHS standards and is completely lead (Pb)-free.

Benefits

- AEC-Q101-qualified
- Junction temperature up to 175 °C
- 75 % thinner and 60 % smaller than D²PAK
- Low on-resistance n- and p-channel TrenchFET® technologies
- Gull-wing leads for mechanical stress relief

Applications

 All automotive applications requiring ruggedness and high reliability such as such as motor control, electric power steering, transmission control, injector drives, and coil drivers



Series	Configura- tion	Package	Chan- nel	V _{DS} (V)	V _{GS} (V)	I _D Max. (A)	P _D Max. (W)	R _{DS(on)} @ 10 V (Ohms)	R _{DS(on)} @ 4.5 V (Ohms)	Q _g @ 10 V (nC)	Q _{gs} (nC)	Q _{gd} (nC)
SQJQ100E	Single	PowerPAK 8 x 8L	N	40	20	200	150	0.002		125	35	13
SQJQ100EL	Single	PowerPAK 8 x 8L	N	40	20	200	150	0.001	0.002	140	30	20
SQJQ402E	Single	PowerPAK 8 x 8L	N	40	20	200	150	0.002	0.002	169	32	29
SQJQ410EL	Single	PowerPAK 8 x 8L	N	100	20	135	136	0.003	0.004	97	15	20
SQJQ466E	Single	PowerPAK 8 x 8L	N	60	20	200	150	0.002		135	47	14
SQJQ480E	Single	PowerPAK 8 x 8L	N	80	20	150	136	0.003		82	11	21
SQJQ900E	Dual	PowerPAK 8 x 8L	N	40	20	100	75	0.004	0.005	85	10	12
SQJQ904E	Dual	PowerPAK 8 x 8L	N	40	20	100	75	0.003		60	16	5
SQJQ906E	Dual	PowerPAK 8 x 8L	N	40	20	95	50	0.003		34	11	4
SQJQ910EL	Dual	PowerPAK 8 x 8L	N	100	20	70	187	0.009	0.011	46	7	10
SQJQ960EL	Dual	PowerPAK 8 x 8L	N	60	20	63	71	0.009	0.013	19	4	2
SQJQ980EL	Dual	PowerPAK 8 x 8L	N	80	20	36	187	0.014	0.017	26	5	4



SiC – MOSFET & Full SiC Power Modules

SiC - MOSFET

ROHM Semiconductor's line-up of 650 V, 1200 V an 1700 V SiC MOSFETs are designed to deliver cost-effective and breakthrough performance in inverters and converters. The devices offer dramatically lower switching losses - up to 90% less compared to traditional Si-IGBT.

Key Features:

- High-speed switching
- Qualified body-diode (T_i max=175°C)
- with low reverse recoveryHigh reliabilityLow switching losses (e.g. Gate oxide)
- Low switching losses
 Low V_{th} shift

Applications:

- PFC/ SMPS/ Aux Power Supply
- Renewable Energy Inverter/Converter
- EV/HEV Inverter and ChargersInduction Heating/ Welding
- HVDC
- Motor Drivers

		Part No.	Automotive Grade Available*	Polarity (ch)	V _{DSS}	I _D	P _D (W)	R _{DS (on)} Typ. (mΩ)	Q	g Typ. (nC)	Package
e-up of 650 V, 1200 V a esigned to deliver cost-	and		Auton Grade Availa	Polari	(V)	(A)	(TC=25°C)	V _{GS} =18V	V _{GS} =18V	Drive Voltage (V)	
performance in inverter	re	2nd-Generation	SIC MOS	FET							
		SCT2120AF	-	N	650	29	165	120	61	18	TO-220AE
offer dramatically lowe	er	SCH2080KE	-	N	1200	40	262	80	106	18	
less compared to		SCT2080KE	-	N	1200	40	262	80	106	18	
		SCT2080KEAHR	Yes	N	1200	40	262	80	106	18	
		SCT2160KE	-	N	1200	22	165	160	62	18	
		SCT2160KEAHR	Yes	N	1200	22	165	160	62	18	T0-247
		SCT2280KE	-	N	1200	14	108	280	35	18	
 High temp. operation 	on	SCT2280KEAHR	Yes	N	1200	14	108	280	35	18	
$(T_i max=175^{\circ}C)$		SCT2450KE	-	N	1200	10	85	450	27	18	
,		SCT2450KEAHR	Yes	N	1200	10	85	450	27	18	
High reliability	NEW	SCT2H12NY	-	N	1700	4	44	1150	14	18	T0-268-2
(e.g. Gate oxide)	NEW	SCT2750NY	-	N	1700	6	57	750	17	18	10-200-2
	NEW	SCT2H12NZ	-	N	1700	3.7	35	1150	14	18	TO-3PFM
		3rd-Generation S	SIC MOS	FET							
	NEW	SCT3017AL	-	N	650	118	427	17	172	18	
	NEW	SCT3022AL	-	N	650	93	339	22	133	18	
upply	NEW	SCT3030AL	-	N	650	70	262	30	104	18	
er/Converter	NEW	SCT3060AL	-	N	650	39	165	60	58	18	
	NEW	SCT3080AL	-	N	650	30	134	80	48	18	
argers	NEW	SCT3120AL	-	N	650	21	103	120	38	18	TO-247N
ng	NEW	SCT3022KL	-	N	1200	95	427	22	178	18	
	NEW	SCT3030KL	-	N	1200	72	339	30	131	18	
	NEW	SCT3040KL	-	N	1200	55	262	40	107	18	
	NEW	SCT3080KL	-	N	1200	31	165	80	60	18	
	NEW	SCT3160KL	-	N	1200	17	103	160	42	18	
											*AEC-Q1

Full SiC Power Module

Switching loss reduced by 85% (max.)

ROHM has developed low-surge-noise power modules integrating SiC devices produced in-house, maximizing high-speed performance. The result is significantly reduced switching loss compared with conventional Si IGBTs.

Applications:

- High Voltage Motor Drives
- Inverters, Converters for industrial equipment,
 e-mobilities (EV, HEV, train, e-bike etc.)
- Solar/wind power generation, power supply unit, induction heating equipment

	Part No.	Equivalent Circuit	rcuit Max. Drain*1 ource*1		T _j (°C)	R _{DS(on)} Typ.	Pack- age			
		Diagram	atings (T _a =25°C) V _{DSS} (V)	I _D (A) [T _C = 60°C]	I _{DRM} (A)	I _S (A)	I _{SRM} (A)		(mΩ)	
	2nd-Generation SiC	MOSFET								
NEW	BSM080D12P2C008	Half Bridge	1200	80	160*2	80	160	-40 to +175	34	
	BSM120D12P2C005	Half Bridge	1200	120	240*2	120	240	-40 to +175	20	С
NEW	BSM120C12P2C201	Chopper	1200	134	240*2	134	240	-40 to +175	20	type
	BSM180D12P2C101	Half Bridge	1200	204	360*2	204	360	-40 to +175	12.2	
NEW	BSM180D12P2E002	Half Bridge	1200	204	360*2	204	360	-40 to +175	12.2	□ h m o
	BSM300D12P2E001	Half Bridge	1200	300	600*2	300	600	-40 to +175	7.3	E type
	3rd-Generation SiC	MOSFET								
	BSM180D12P3C007	Half Bridge	1200	180	360*2	180*3	360*4	-40 to +175	10	С
NEW	BSM180C12P3C202	Chopper	1200	180	360*2	180	360	-40 to +175	10	type
NEW	BSM300C12P3E201	Chopper	1200	300	600*2	300	600	-40 to +175	6.3	E type

DTMOS – High Voltage Mosfets

Toshiba has developed new generations of super-junction 600 V, 650 V and 800 V DTMOS MOSFET series. Fabricated using the state-of-the-art single epitaxial process, DTMOS IV provides a 30% reduction in Ron*A, a figure of merit (FOM) for MOSFETs, compared to its predecessor, DTMOS III. A reduction in Ron*A leads to smaller $R_{DS(on)}$ chips in the same packages. This helps users to improve efficiency and reduce the size of power systems. Fast switching X-type and fast body-diode W5-type versions are also available. The new DTMOS V is designed to provide even better EMI performance.

Attractive Cost Effects

- Reduced heat system costs
- Less costs of field failure
- Less passive component costs
- Reduced BOM costs due to most effective solutions

Smart Performance Increases

- Easy design-in for faster time to market and product launch
- Ready to support high volume markets with competitive prices

DTMOS IV 800 V Standard "W"-Series NEW

Outline	T0-220	TO-220SIS
0.95Ω	TK7E80W	TK7A80W
0.55Ω	TK10E80W	TK10A80W
0.45Ω	TK12E80W	TK12A80W
0.29Ω	TK17E80W	TK17A80W

Features	Advantages
 30% reduction in R_{DS(on)}*A compared to previous generation 	▶ Reduction of chip size at same performance or improved performance at same chip size
 Improved figure of merit (FOM) compared to DTMOS III generation 	Improved electrical efficiency by reduced switching and static losses
Reduction in Coss	▶ 12% reduction in switching loss, E _{OSS} , compared to the predecessor
 Application of latest process technology: single epitaxial process 	▶ Lower increase in on-resistance at temperature rise
• Wide range of on-resistances and packaging options, see tables	► Freedom of choice and flexibility on package and on R _{DSon} line-up
• 45% reduction of Qgd (gate drain Charge) at X-Series	► High efficiency switching at PFC

DTMOS IV & V - Series	Applications
W-Series: Standard type	For general switching
W5-Series: With high speed body diode	For bridge circuitry, like UPS or server SMPS
X-Series: High speed type (H-Type)	For PFC circuit
X5-Series: High speed type with high speed body diode	For bridge circuitry, like UPS or server SMPS
Y-Series: Low EMI	For lighting, battery charger and AC/DC adapter

DTMOS IV & V 650 V Standard "W" & "Y" Series

Outline	D-PAK	I-PAK	D2-PAK	I2-PAK	DFN 8x8mm	T0-220	TO-220SIS	TO-247
(1.2/1.22) Ω	TK5P65W	TK5Q65W					TK5A65W	
$(1.0/1.05) \Omega$	TK6P65W	TK6Q65W					TK6A65W	
(0.78/0.8) Ω	TK7P65W	TK7Q65W					TK7A65W	
(0.65/0.67) Ω	TK8P65W	TK8Q65W					TK8A65W	
$(0.5/0.56) \Omega$	TK560P65Y* TK9P65W	TK9Q65W					TK560A65Y* TK9A65W	
$(0.39/0.44) \Omega$	TK380P65Y* TK11P65W	TK11Q65W					TK380A65Y* TK11A65W	
$(0.25/0.29) \Omega$	TK290P65Y*		TK14G65W	TK14C65W	TK14V65W	TK14E65W	TK290A65Y* TK14A65W	TK14N65W
$(0.20/0.21) \Omega$				TK17C65W	TK17V65W	TK17E65W	TK17A65W	TK17N65W
$(0.11/0.12) \Omega$					TK28V65W	TK28E65W	TK28A65W	TK28N65W
80mΩ							TK35A65W	TK35N65W
$55 m\Omega$								TK49N65W

^{*} DTMOS V

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Triacs

Triacs are applied to control AC mains applications. They can be used as simple on/off switches, to replace electromechanical relays while providing a higher degree of flexibility (through electronic control) and superior reliability. Using a simple phase-control circuit, they can also control power level through AC loads.











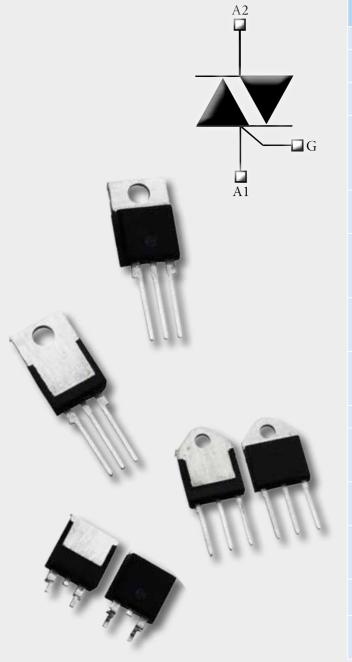












Suppliers	Fag	gor	Littelfuse		STMicroelectronics	
I _{T (RMS)} [A]	SMD	Axial	SMD	Axial	SMD	Thru-Hole
0.8			LxXx QxXx	LxX8Wx QxX8Ex	Z006xxxN	Z006xxxA
1	FT01xxN	FT01xxA	LxNx QxNx		Z01xxxN	Z01xxxA
4	FT04xxD	FT04xxH FT04xxI FT04xxW	Lxx04xx Qxx04xx	Lxx04xx Qxx04xx	T4xx-xxxB T4xx-xxxH	Z04xxxF BTA04-xxx BTB04-xxx T4xx-xH T4xx-xT T4xx-xFP
6		FT06xxH FT06xxJ FT06xxW	Lxx06xx Qxx06xx	Lxx06xx Qxx06xx		T610-8T
8	FT08xxD FT08xxG	FT08xxH FT08xxl FT08xxJ FT08xxW	Lxx08xx Qxx08xx	Lxx08xx Qxx08xx	T8xx-xxxB T8xx-xxxG T8xxx-xG	BTA08-xxx BTB08-xxx T8xx-xT T8xx-xI T8xx-xFP
10		FT10xxH FT10xxJ FT10xxW	Qxx10xx	Qxx10xx	T10xxx-xG	BTA10-xxx BTB10-xxx T10xx-xT T10xx-xI
12	FT12xxG	FT12xxH FT12xxJ FT12xxW	Qxx12xx	Qxx12xx	T12xxx-xG T12xx-xxxG	BTA12-xxx BTB12-xxx T12xx-xT T12xx-xl
15			Qxx15xx	Qxx15xx		
16	FT16xxG	FT16xxH FT16xxJ FT16xxW	Qxx16xx	Qxx16xx	T16xxx-xG T16xx-xxxG	BTA16-xxx BTB16-xxx T16xx-xW T16xx-xT
20					T2035H-xx T2050H-xx T20xx-xG	BTA20-xxx T20xx-xT
25	FT25xxG	FT25xxH FT25xxJ FT25xxW	Qxx25xxW	Qxx25xx	BTA25-xxx T2550-12G T25xx-xxxG	BTA24-xxx BTA26-xxx BTB24-xxx BTB26-xxx
30			Qxx35xx	Qxx35xx	T3035H-6G T3050H-6G	T3035H-6x T3050H-6x
40		FT40xxP FT40xxV		Qxx40xx	BTA40-xxx	BTA41-xxx BTB41-xxx

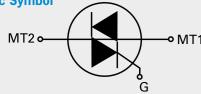


Teccor® Brand Thyristors

High Current Capability, High Reliability for Heating Control

Thyristors (TRIACs and SCR) give best balance in efficiency, simplicity, reliability and system costs in AC power applications such as heater and AC motor controls.

Schematic Symbol



06025PH5 / 06035PH5 /06040PH5

25 / 35 / 40 A RMS High Commutation Triac for Heating Control in TO-218, TO-220 and the new FASTPAK.











MS0690J-DL1TE (90A, 600V)

All new 90 A RMS Back-to-Back



SCR for Robust Heating Control in SOT227B

S			

Application	V _{DRM}	I _{T(RMS)}	Littelfuse Type	Package	Feature
Coffee brewer, etc.	600V	16A	Q6016LH4	T0-220 Iso.	Robust TO-220 package; high surge capability;
	600V	25A	Q6025LH5	T0-220 Iso.	ceramic isolation
Tankless water heater, etc.	600V	25A / 35A	Q6035PH5	New FASTPAK	FAST-ON terminal screw-on installation
	600V	40A	Q6040J7	T0-218X Iso.	Robust TO-218 package; unique eyelet leads
			Q6040PH5	New FASTPAK	FAST-ON terminal; screw-on installation
	600V (SCR)	65A	S6065J	T0-218X Iso.	Wide lead for high IT conduction
	600V	90A	MS0690D-J	New SOT227B	Screw-on terminal; highest IT in 600V S0T227B

800 V T-Series Triac Family

30-40 A Hi-Temp SCR

T-Series Triacs offer on the same device 800 V capability with 125°C max T_j 600V capability with 150°C max T_j

With the 800 V T-Series Triacs family, ST is offering a series which exhibits superior dynamic performances (noise immunity and turn-off capability) and an extended temperature range up to 150°C.

Moreover, the off-state voltage capability has been raised up to 800 V. This enables a downsizing

of the Triac for a given load or higher load rating utilization.

Features

- 800 V, 6 A 16 A snubberless Triacs
- 150°C max T_i
- High static and dynamic commutation
- 2 times better vs. std. BTA/BTB family
- 4 times better noise immunity vs. std. BTA/BTB family

Benefits

- Superior dynamic performance due to ST high temperature process
- 10mA version can be directly driven by microcontroller

Key-Applications

- Inrush current limiting circuits
- Home appliances & small appliances
- Fan & motor control
- Heater
- Lighting

Logic-level Gate ACS Series

STMicroelectronics has developed a series of overvoltage resistant AC switches. Their switching characteristics is immune to higher level surges than Triacs. The new logic level gate drive (such as the new ACS108-8TN with 5mA gate current) makes auxiliary loads and motor appliances drive an easy circuit design.

Features

- Enables equipment to meet IEC 61000-4-5 surge with overvoltage crowbar technology
- High noise immunity against static dV/dt and IEC 61000-4-4 burst
- Needs no external protection snubber or varistor
- -5 and 10 mA products interface directly with the microcontroller
- ECOPACK® 2 and RoHS compliant component

ACS type, current rating, and type of load

ACS Type	Current Rating	Type of Loads
ACS102-x	1A	Auxiliary boards
ACS108-x	1A	in Appliances
ACST2x-8	2A	Main loads
ACST4x-8	4A	in Appliances
ACST6x-8	6A	
ACST8x-8	8A	
ACST10x-8	10A	
ACST12x-8	12A	
ACST16x-8	16A	
ACST6x-8 ACST8x-8 ACST10x-8 ACST12x-8	6A 8A 10A 12A	in Appliances

High Temperature 30 and 40 A SCRs: TN30/TN4050H-12 Thyristors

This series make AC/DC converters safe by limiting the inrush current and providing insulation against AC line overvoltages.

TN30/TN4050H-12 thyristors add current limiting and mains switching to AC/DC converters and other industrial loads. TN30H and TN40H also feature high surge current handling and high surge voltage capability. $(V_{DSM}/V_{RSM} = 1300V)$

Features

- High commutation: 200 A/µs
- High off-state immunity: 1000 V/μs
- Gate trigger current: 50 mA
- Thermal cooling capability: Rth(j-c) = 0.3 °C/W)
- AEC-Q101 compliant

Benefits

- Reduce BOM: extra power device no longer needed in the rectifier bridge
- Same efficiency and cooling size as diode bridge
- High PCB creepage distance above 4mm
- Control peak current at charger power up

Key Applications

- Industrial battery chargers
- Renewable energy inverters
- Motor drive
- Industrial welding system



Schottky Diodes & Rectifiers





















Any technology in the fields of high-voltage or small-signal needed for your application, Rutronik is able to provide it. No matter if it is Schottky, Standard-, Fast-, Superfast-, Ultrafast-Recovery or even Silicon Carbide Diodes we offer

the solution for your need. Parts are available starting from 15V up to 4500V and give best performance caused by the technical characteristics.

- Optimized thermal behavior
- Minimalized reverse leakage current
- Low forward-drop voltage V_F Very fast reverse recovery times

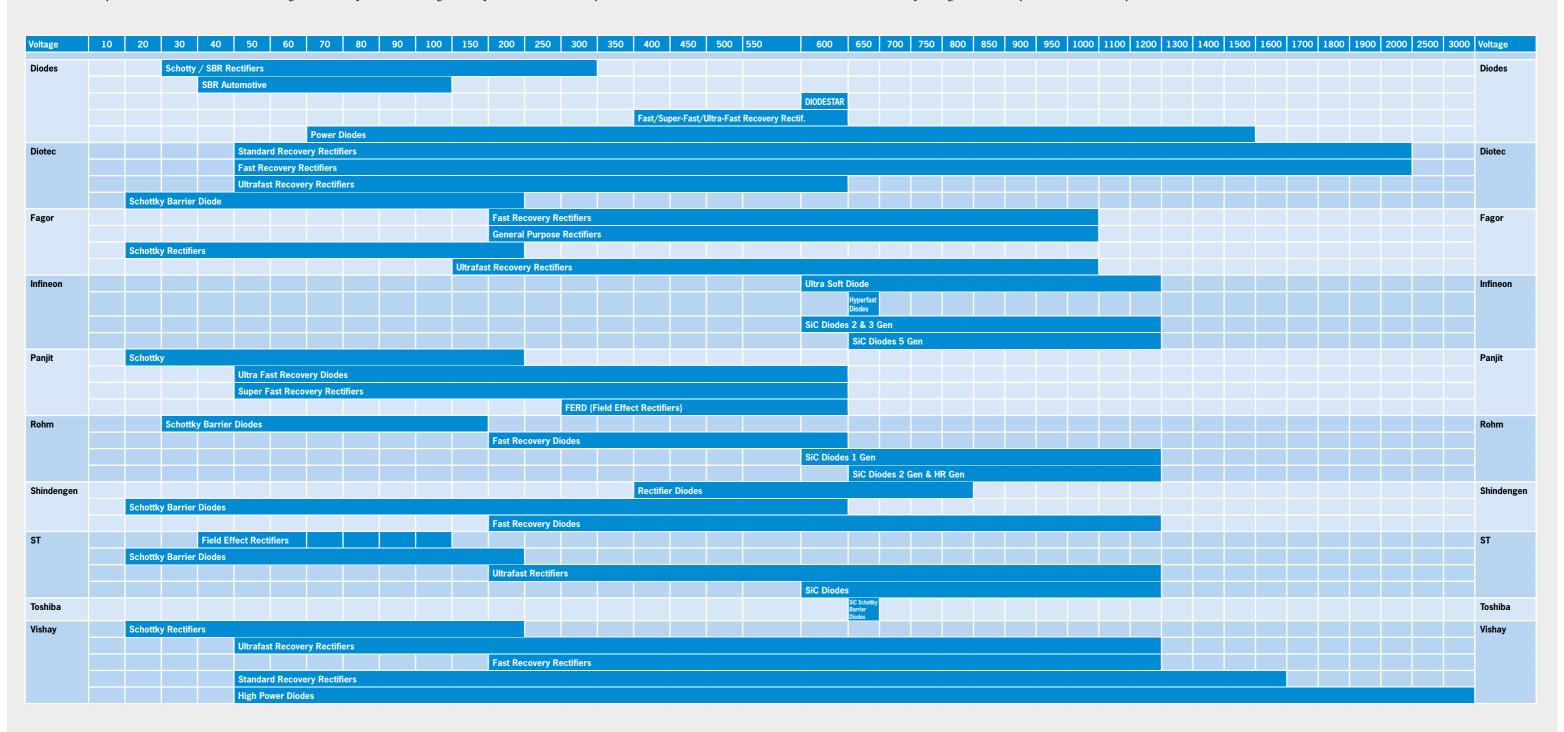




















SiC FERD Diodes

Silicon Carbide Diodes - Drastic Reduction of Generated Losses

Thanks to exceptional reverse recovery performances, the new Silicon Carbide (SiC) diodes of ST represent a key contributor to energy savings in SMPS applications and in emerging domains, such as solar energy conversion. The new SiC Diodes ST show an increased breakdown capability (650 V and 1200 V) and state-of-the-art surge current capability. These features, together with the exceptionally low forward-drop voltage VF, make this family the new reference in the market. Design, diffusion and packaging are made by ST.

Features

- No or negligible reverse recovery
- Reverse recovery unaffected by dI/dt and forward current
- Switching behavior independent of temperature

- Efficiency increased by up to 2% vs conventional ultrafast silicon diodes
- Less EMI in application
- Permits reduction in associated filter size and cost

Applications

- Photovoltaic inverter
- High performance SMPS
- High-frequency motor control drives
- Indispensable when power density increase
- Allows the use of smaller passive components
- losses**
- **approx. 70% compared to

- is crucial
- Reduction of generated

		of Diodes	[V]	
STPSCxx06*	TO-220AC; DPAK; D2PAK	1	600	4/6/8/10/12
STPSC2006C	TO-247	2	600	2 x 10
STPSCxxH065*	D2PAK; T0-220AC; DPAK; T0-220AC Ins	1	650	4/6/8/10
STPSCxxH065C*	TO-220AC	2	650	8/10/12/16
STPSCxx065*	TO-247; TO-220AC; TO-220AC Ins	1	650	12/20
STPSC40065C	TO-247	2	650	2x20
STPSCxxTH13TI*	TO-220AB Ins	2	650	6/8/10
STPSCxxH12B-TR1*	DPAK HV; TO-220AC	1	1200	2/5/6
STPSCxx12*	TO-220AC; DPAK HV; D2PAK	1	1200	10/15
STPSC20H12	TO-220AC; D2PAK	1	1200	20
STPSCxxH12C*	TO-247	2	1200	10/20/30
STPSC40H12	TO-247	2	1200	2x20
* xx = lo max [A]				

FERD (Field-Effect Rectifier Diodes)

After the Silicon Schottky barrier diodes rectification method, the only way to achieve a breakthrough in efficiency and power density was to use expensive, complex synchronous rectification solutions, with MOSFETs and dedicated controllers. ST introduces a new generation of diodes, the FERD with a rectification performance in applications close to that of synchronous solutions yet with the lower complexity of traditional rectification techniques.

1	οw	l eakage	Current

- Increase the thermal runaway risk safety margin
- Easier to put several diodes in parallel

Part Number	Packages	No	V _{RRM}	I ₀	V _F	V_F (@ I_F)	Tj
			Max (V)	Max (A)	Max (V)	(A)	Max (°C)
FERD30M45	TO-220AC	1	45	30	0.42	15	175
FERD30M45C	D2PAK; TO-220AB, I2PAK	2	45	2x15	0.47	15	175
FERD30S50	PowerFLAT 5x6	1	50	30	0.44	15	150
FERD40M45C	D2PAK; T0-220AB	2	45	2x20	0.5	20	175
FERD40U50CFP	TO-220FPAB	2	50	2x20	0.43	15	175
FERD40U45C	D2PAK; T0-220AB	2	45	2x20	0.385	20	175
FERD40H100S	TO-220AB; D2PAK	1	100	40	0.51	10	175
FERD60M45C	TO-220AB	2	45	2x30	0.55	30	175
FERD60U45C	TO-220AB	2	45	2x30	0.5	20	175

Low V_f

- Improved efficiency
- Possibility to reduce the heatsink size and reduce the cost to work at same Tj



I_o max [A]

Trench Super Barrier Rectifiers Exceeds Charger Requirements

Trench SBRs meet the requirements of the charger output rectifier diode, easily coping with the shorter current pulses of 36 KHz discontinuous mode charger designs. Trench SBR devices span a reverse voltage range from 10 V to 100 V and a current handling capability from 0.2 A to 40 A. They come in a variety of different package options, including Diodes' space-saving PowerDI123, PowerDI5 and PowerDI5060.

For example:

SBRT15U50SP5's forward voltage of 0.47 V at 15 A and SBRT20U50SLP's forward voltage of 0.5 V at 20 A, coupled with an operating temperature of +90°C, means conduction losses are minimized and charger efficiencies are increased.

PartNumber	Package	Configu- ration	I ₀ [A]	V _{RRM} [V]	V _F @ I _{max} [V]	I _R @ V _{max} μA]	I _{FSM} [A]
SBRT05U10LP	X1-DFN1006-2	Single	0.5	10	0.39	1000	5
SBRT2M10LP*	X1-DFN1411-3	Single	2	10	0.40	250	25
SBRT4U10LP*	U-DFN2020-2 (Type B)	Single	4	10	0.50	200	35
SBRT6U10LP*	U-DFN3030-8	Single	6	10	0.48	300	55
SBRT2U15LP*	X1-DFN1411-3	Single	2	15	0.45	100	25
SBRT4U175LP*	U-DFN2020-2 (Type B)	Single	4	15	0.48	100	35
SBRT05U20LP	X1-DFN1006-2	Single	0.5	20	0.39	50	10
SBRT05U20S3*	S0D323	Single	0.5	20	0.40	70	10
SBRT6U20LP*	U-DFN3030-8	Single	6	20	0.45	250	55
SBRT3M30LP	U-DFN3030-8	Single	3	30	0.49	20	30
SBRT4M30LP	U-DFN3030-8	Single	4	30	0.51	60	30
SBRT4U30LP*	U-DFN2020-2 (Type B)	Single	4	30	0.50	100	45
SBRT3M40P1	POWERDI123	Single	3	40	0.53	30	70
SBRT3M40SA	SMA	Single	3	40	0.53	40	70
SBRT3U40P1*	POWERDI123	Single	3	40	0.49	180	75
SBRT2U45LP*	X1-DFN1411-3	Single	2	45	0.55	100	25
SBRT3U45SA*	SMA	Single	3	45	0.48	150	50
SBRT3U45SAF*	SMAF	Single	3	45	0.48	150	50
SBRT4U45LP*	U-DFN2020-2 (Type B)	Single	4	45	0.52	100	45
SBRT6U475LP*	U-DFN3030-8	Single	6	45	0.52	150	55
SBRT20V45CT	TO220AB	Dual	20	45	0.62	300	180
SBRT30A45CT	TO220AB	Dual	15	45	0.51	400	240
SBRT30A45CTFP	ITO220AB	Dual	15	45	0.51	400	240
SBRT30U45CT	TO220AB	Dual	15	45	0.50	400	250
SBRT30U45CTFP	ITO220AB	Dual	15	45	0.50	400	250
SBRT5A50SA*	SMA	Single	5	50	0.53	0.15	100
SBRT5A50SAF*	SMAF	Single	5	50	0.53	150	100
SBRT10U570SP5*	PowerDI5	Single	10	50	0.45	300	320
SBRT10M50SP5*	PowerDI5	Single	10	50	0.47	150	300
SBRT15M50AP5*	PowerDI5	Dual	15	50	0.54	150	290
SBRT15U50SP5	PowerDI5	Single	15	50	0.47	500	290

		ration	[Ă]	[V]	I _{max} [V]	μΑ]	[A]
SBRT25M50SLP*	PowerDI5060-8	Single	25	50	0.55	120	220
SBRT25U50SLP*	PowerDI5060-8	Single	25	50	0.60	150	220
SBRT60U50CT	T0220AB	Dual	30	50	0.52	50	350
SBRT3M60P1*	POWERDI123	Single	3	60	0.59	100	70
SBRT3M60SA*	SMA	Single	3	60	0.59	100	50
SBRT3U60P1*	POWERDI123	Single	3	60	0.56	150	70
SBRT3U60SA*	SMA	Single	3	60	0.56	500	60
SBRT3U60SAF*	SMAF	Single	3	60	0.53	0.50	40
SBRT4U60LP*	U-DFN3030-8	Single	4	60	0.52	150	20
SBRT10U60D1	T0252 (DPAK)	Single	10	60	0.52	400	140
SBRT20M60CT*	T0220AB	Dual	10	60	0.60	150	210
SBRT20M60SP5*	PowerDI5	Single	20	60	0.57	180	320
SBRT20U60SP5*	PowerDI5	Single	25	60	0.53	400	320
SBRT20V60CT	T0220AB	Dual	20	60	0.69	300	190
SBRT25M60SLP*	PowerDI5060-8	Single	25	60	0.60	150	220
SBRT25U60SLP*	PowerDI5060-8	Single	25	60	0.55	400	220
SBRT30A60CT	T0220AB	Dual	15	60	0.56	400	220
SBRT30A60CTFP	ITO220AB	Dual	15	60	0.56	400	220
SBRT60U60CT	T0220AB	Dual	30	60	0.62	60	320
SBRT20M80SLP*	PowerDI5060-8	Single	20	80	0.61	160	210
SBRT20M80SP5*	PowerDI5	Single	80	80	0.66	200	350
SBRT25U80SLP*	PowerDI5060-8	Single	25	80	0.61	500	200
SBRT40M80CTB	TO263AB (D2PAK)	Dual	40	80	0.72	1	230
SBRT10A100CTL*	T0252 (DPAK)	Dual	5	100	0.78	180	85
SBRT15U100SP5*	PowerDI5	Single	15	100	0.70	250	250
SBRT20U100SLP*	PowerDI5060-8	Single	20	100	0.70	300	180
SBRT30A100CT*	T0220AB	Dual	15	100	0.80	150	200
SBRT30A100CTFP*	ITO220AB	Dual	15	100	0.80	150	200
SBRTF40U100CT	T0220AB	Dual	40	100	0.61	0.50	200
SBRTF40U100CTFP	ITO220AB	Dual	40	100	0.61	0.50	200
SBRT40V100CT*	T0220AB	Dual	40	100	0.73	300	180
SBRT40V100CTE	T0262	Dual	40	100	0.73	300	180
SBRT40V100CTFP	ITO220AB	Dual	40	100	0.73	300	180
SBRT60U100CT*	T0220AB	Dual	60	100	0.78	300	320

^{*} Also available with automotive compliant PPAP capable



SiC Schottky Barrier Diodes

Significantly Lower Switching Loss

SBDs were developed utilizing SiC, making them ideal for PFC circuits and inverters. Ultra-small reverse recovery time (impossible to achieve with silicon FRDs) enables high-speed switching. This minimizes reverse recovery charge (Q_{rr}) , reducing switching loss considerably and contributes to end-product miniaturization. Rohm offers automotive-grade (AEC-Q101 qualified) products which have been adopted in a variety of charging circuits in electric/hybrid vehicle.

2nd Generation SiC Schottky Barrier Diodes – Industry-Leading Low VF SCS2 Series

Features

- Industry-leading low forward voltage $(V_F=1.35 \text{ V}, 650 \text{ V}/10 \text{ A})$
- High-speed recovery characteristics
- Dramatically lower switching loss

Applications

- Power conditioners used in photovoltaic power generation
- Switching mode power supplies
- EV/HEV inverters and chargers

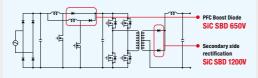


Part No.	a ge	mum	ute Maxi- Ratings =25°C)	Elect Charact (Ta=2	eristics
	Package	V _R [V]	I _F [A]	V _F [V] Typ.	I _R [μΑ] Max.
SCS206AJ**		650	6	1.35	120
SCS208AJ**	m	650	8	1.35	160
SCS210AJ**	ro-263AB	650	10	1.35	200
SCS212AJ**	0-2	650	12	1.35	240
SCS215AJ**	Ĕ	650	15	1.35	300
SCS220AJ**		650	20	1.35	400
SCS206AG**		650	6	1.35	120
SCS208AG**	O.	650	8	1.35	160
SCS210AG**	TO-220AC	650	10	1.35	200
SCS212AG**	0-2	650	12	1.35	240
SCS215AG**	Ĕ	650	15	1.35	300
SCS220AG**		650	20	1.35	400
SCS206AM		650	6	1.35	120
SCS208AM	Σ	650	8	1.35	160
SCS210AM	TO-220FM	650	10	1.35	200
SCS212AM	0-25	650	12	1.35	240
SCS215AM	Ĕ	650	15	1.35	300
SCS220AM		650	20	1.35	400
SCS215AE		650	15	1.35	300
SCS220AE	7	650	20	1.35	400
SCS220AE2**	TO-247	650	10 / 20*	1.35	200
SCS230AE2**	\succeq	650	15/30*	1.35	300
SCS240AE2**		650	20 / 40*	1.35	400

Part No.	age	Absolute Maxi- mum Ratings Characteris (Ta=25°C) (Ta=25°C)			eristics
	Package	V _R [V]	I _F [A]	V _F [V] Typ.	I _R [μΑ] Max.
SCS205KG**	O	1200	5	1.40	100
SCS210KG**	TO-220AC	1200	10	1.35	200
SCS215KG**	5.5	1200	15	1.35	300
SCS220KG**	Ĕ	1200	20	1.35	400
SCS210KE2**		1200	5/10*	1.35	100
SCS220KE2**	247	1200	10 / 20*	1.35	200
SCS230KE2	TO-247	1200	15/30*	1.35	300
SCS240KE2		1200	20 / 40*	1.35	400

- **Also available with Automotive Grade (AEC-Q101). Adding HR at the end of the partnumber

Example: Automotive Charging Circuit



3rd Generation SiC Schottky Barrier Diodes – SCS3 Series with High I_{FSM} with Industry-Leading Low V_F

- High IFSM with low forward voltage (VF = 1.35V, 650V 10A)
- Low leakage current characteristics
- High speed recovery characteristics

Applications

- Solar system
- PFC circuit in switching power supplies
- Forward Current Is Reverse Voltage Package 650V TO-220ACP SCS306AF SCS308AP SCS310AF SCS320AP TO-220FM SCS306A1 SCS310AJ SCS312AJ* SCS315AJ* SCS320AJ* T0-263AB

* Under developmen

in Low-Profile SMPD (TO-263AC) & SlimDPAK Package

10 A to 30 A FRED Pt® Ultrafast Rectifiers in SMPD Package

density and efficiency to enable slimmer end products.

Offer increased power density and system efficiency for automotive and telecom applications. The rectifiers reduce switching losses and over-dissipationin automotive and telecom applications. With a footprint compatible with the D2PAK package, the FRED Pt Hyperfast and Ultrafast recovery rectifiers in the SMPD package offer a lower package height of < 1.7 mm for increased power

- High operating temperature up to 175 °C
- Low forward voltage drop down to 0.75 V typical with fast recovery time down to 25 ns
- Soft recovery behavior over a temperature range of -40 °C up to 175 °C
- Low profile (< 1.7 mm height) SMPD (TO-263AC) package is footprint-compatible to TO-263 (D2PAK) package

- Provide a high-density alternative to the TO-263 (D2PAK) package
- Feature a planar structure and platinum-doped lifetime control to guarantee high overall performance, ruggedness, and reliability
- Offer an operating T_i from -65 °C to +175 °C for a more robust design

Applications

- DC/DC converters, power factor correction (PFC), low-voltage inverters, and chopper motor drives
- in automotive engine control units (ECUs), anti-lock braking systems (ABS), LED lighting, and HID lighting

Part Number	Package	Туре	Diode Varia- tion	I _F (AV) [A]	V _R [V]	V _F TYP @ RATED I [V]	T _{RR} TYP. [ns]
VS-10CDH06HM3/1*		Hyperfast	Dual	2 x 5	600	1	35
VS-10CDH06-M3/I		Hyperfast	Dual	2 x 5	600	1	35
VS-12CDU06HM3/I*		Ultrafast	Dual	2 x 6	600	0.89	45
VS-12CDU06-M3/I		Ultrafast	Dual	2 x 6	600	0.89	45
VS-16CDH02HM3/1*		Hyperfast	Dual	2 x 8	200	0.77	27
VS-16CDH02-M3/I		Hyperfast	Dual	2 x 8	200	0.77	27
VS-16CDU06HM3/1*		Ultrafast	Dual	2 x 8	600	0.94	45
VS-16CDU06-M3/I	T0-263AC	Ultrafast	Dual	2 x 8	600	0.94	45
VS-16EDH02HM3/I*	(SMPD)	Hyperfast	Single	16	200	0.75	32
VS-16EDH02-M3/I		Hyperfast	Single	16	200	0.75	32
VS-16EDU06HM3/I*		Ultrafast	Single	16	600	0.91	55
VS-16EDU06-M3/I		Ultrafast	Single	16	600	0.91	55
VS-20CDH02HM3/1*		Hyperfast	Dual	2 x 10	200	0.77	25
VS-20CDH02-M3/I		Hyperfast	Dual	2 x 10	200	0.77	25
VS-30CDU06HM3/1*		Ultrafast	Dual	2 x 15	600	0.9	55
VS-30CDU06-M3/I		Ultrafast	Dual	2 x 15	600	0.9	55

High Current Density TMBS® Rectifiers -Industry-First TMBS® in SlimDPAK Package

Height, weight saving to replace conventional DPAK and PCB space saving to replace conventional D2PAK. Power Density improvement with TMBS die technology to replace conventional planar sky

Features & Benefits

- Very low-profile, surface-mount SlimDPAK package with typical height of 1.3 mm (57 % of DPAK package height)
- Better thermal performance (R θ JM = 1.5 °C/W) than DPAK (TO-252) due to 14 % larger heatsink area
- High current density up to 35 A (single chip) and 40 A (dual chip center-tap common cathode)
- PCB footprint compatible with DPAK (TO-252)

Applications

- SMPS
- DC/DC converters
- Battery-charger units Frequency inverters

Part Number	Package	IF(AV)	tage [V]	(V@A)	ı _j max. [°C]	Diode Variations
V20PW101,2		20	100	0.69	150	Single die
V20PW121,2		20	120	0.72	150	Single die
V20PW151,2		20	150	0.74	150	Single die
V20PW451,2		20	45	0.46	150	Single die
V20PW601,2		20	60	0.54	150	Single die
V20PWM101,2		20	100	0.7	175	Single die
V20PWM121,2		20	120	0.72	175	Single die
V20PWM15 ^{1,2}		20	150	0.74	175	Single die
V20PWM45 ^{1,2}		20	45	0.51	175	Single die
V20PWM601,2		20	60	0.58	175	Single die
V35PW101		35	100	0.68	150	Single die
V35PW121		35	120	0.7	150	Single die
V35PW151		35	150	0.71	150	Single die
V35PW45 ¹	¥	35	45	0.46	150	Single die
V35PW601	SlimDPAK	35	60	0.55	150	Single die
V35PWM101	<u>=</u>	35	100	0.68	175	Single die
V35PWM121	S	35	120	0.68	175	Single die
V35PWM15 ¹		35	150	0.71	175	Single die
V35PWM45 ¹		35	45	0.52	175	Single die
V35PWM601		35	60	0.58	175	Single die
V40PW10C1		40	100	0.7	150	Dual common cathode
V40PW12C1		40	120	0.73	150	Dual common cathode
V40PW15C1		40	150	0.76	150	Dual common cathode
V40PW45C1		40	45	0.49	150	Dual common cathode
V40PW60C1		40	60	0.57	150	Dual common cathode
V40PWM10C1		40	100	0.68	175	Dual common cathode
V40PWM12C1		40	120	0.7	175	Dual common cathode
V40PWM15C ¹		40	150	0.76	175	Dual common cathode
V40PWM45C1		40	45	0.52	175	Dual common cathode
V40PWM60C ¹		40	60	0.59	175	Dual common cathode











New Generation of Schottky SiC Schottky

Compared with silicon schottky, PANJIT's new silicon carbide (SiC) schottky delivers lower switching loss, higher breakdown voltage, and outstanding performance under high temperature condition (175 °C) due to its material characteristics. It is the optimal choice for customers who need high system efficiency, especially in the solar system, power management applications, and industrial fields.

Features

- Low Trr
- High frequency operation
- Low EMI

Part Numbe

SiC02A065T*

SiC04A065T*

SiC06A065T*

SiC04A065ND

SiCO6A065ND

SiC08A065ND

SiC10A065ND

 Good performance at high temperature operation



TO-220AC

TO-220AC

TO-220AC

TO-263/D2PAK

TO-263/D2PAK

TO-263/D2PAK

TO-263/D2PAK

Applications

LED

- Industrial equipment
- IT power supplies
- Solar inverter high temperature

small footprint package for high current devices.

Forward current loss reduction

PanJit's Super Schottky is a new Schottky technology that utilizes

a MOS manufacturing process to create a superior two terminal

device that has a lower forward voltage and leakage current than

Standard Schottky. With the implantation of an upgraded techno-

logy, this new family has an extremely low forward voltage drop,

lower reverse current, lower power dissipation at high current and

Low leakage current at

Super Schottky

- Ultra low voltage drop
- High frequency switching
- Smart phone charger
- Adapter for

Applications

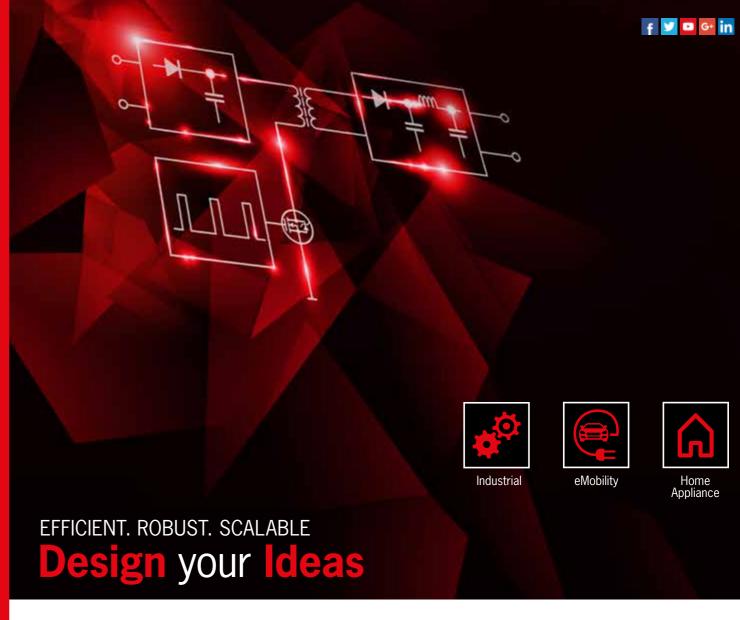
- Set-up box, TV box
- Power Supply for TV, LED, PC



V_{RRM}								IF							
Max.	0.5A	14	2A	3A	4A	5A	8A	10A	12A	15A	16A	20A	25A	30A	40A
20V	Х	х	х	х		х									
30V	Х	Х	х	Х		Х									
40V	Х	Х	Х	Х		Х									
45V			х	х		х	х	х		х	х	х	х	х	х
50V			Х			Х		Х		Х	Х	Х			
60V			Х	х		х	х	Х	х	Х	х	х		Х	х
80V							Х	Х		Х		Х			
100V				Х		х	х	Х	Х	Х		Х		Х	х
120V								Х	Х	Х		х		х	
150V								Х	Х	Х		Х		Х	х
200V					х										

SiC08A065T* TO-220AC SiC10A065T* TO-220AC SiC05A120T TO-220AC SiC10A120T TO-220AC TO-252AA SiC02A065NS SiC04A065NS TO-252AA SiCO6A065NS TO-252AA TO-252AA SiC08A065NS SiC02A120S TO-252AA SiC05A120S TO-252AA

*also avaiable AEC-Q101 qualified



RUTRONIK **POWER** brings the latest knowledge, scalable solutions and efficient support for innovative power electronic components together - not only in the focus markets:

Industrial

eMobility

Home Appliance

More information:

www.rutronik.com/power | power@rutronik.com



















































Bridge Rectifiers

A bridge rectifier consists of 4 individual diodes. The benefit of a bridge rectifier is the lower assembly cost. Rutronik offers a strong product portfolio of leading suppliers like Vishay, Fagor, Diotec, Panjit. These parts are dedicated to applications from low rated current until high power rated current (0.5 A until 50 A). General purpose use in AC/DC bridge full wave rectification for switching power supplies or home appliances.







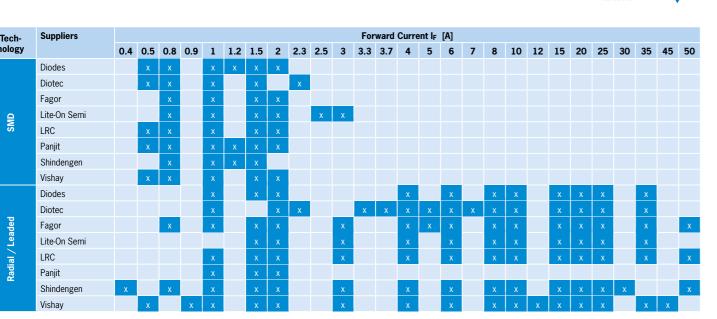


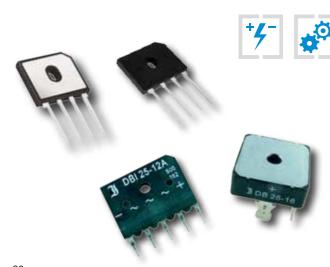
















Slim Profile SMD Bridge Rectifier

Space and Energy Saving AC to DC Conversion

Diotec offers a broad range of SMD bridge rectifier with slim profile and small footprints. They come with current ratings from 0.5 to 2.3 A, and maximum AC input voltages from 40 to $500V_{RMS}$. These devices feature high power density, high surge current ratings and low forward voltage drop, thus ensuring low power losses. The family comprises Standard Recovery, Fast Switching, Schottky and Low Capacitance bridges. A smart new device family are the so-called Protectifiers*, combining extra low forward voltage with high reverse robustness.

Features

Low profile package

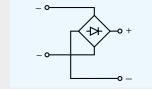
- Low forward voltage
- Low capacitance
- High surge current
- High robustness

Benefits

- Power savings
- Ideal solution for space constraint
- Light and slim electronic circuits

Applications

- 50/60 Hz mains rectification
- Input power stages
- Offline power supplies
- Audio power supplies
- Steering and clamping circuits



PROTECTI-FIERS®

Block Diagramm

Part Number	Family	Package	Height [mm]	V _{RRM} [V]	I _{FAV} [A]	VF [V] at I _{FAV}	I _{FSM} [A] 50/60 Hz	C」 [pF]	E _{RSM} [mJ]	ESD [kV]
MYS40MYS380	Standard	MicroDIL	1.9	80800	0.5	1.2	20/22	3.5	-	-
MB2SMB10S	Standard	TO-269AA	1.6	2001000	0.5	1.0	32/35	15	-	-
S40S500	Standard	TO-269AA	1.6	801000	0.8	1.1	40/44	10	-	-
S40FS380F	Fast Recovery	TO-269AA	1.6	80800	0.8	1.3	40/44	10	-	-
S125K, S250K	Protectifiers®	TO-269AA	1.6	190, 380	1.0	0.95	50/55	10	20	8
ABS2ABS10	Standard	ABS	1.5	2001000	0.8	1.1	27/30	10	-	-
B40SB500S	Standard	SO-DIL	2.7	801000	1.0	1.1	45/50	25	-	-
B40FSB380FS	Fast Recovery	SO-DIL	2.7	80800	1.0	1.3	40/44	25	-	-
CS10SCS50S	Schottky	SO-DIL	2.7	20100	1.0	0.50.8	40/44	30	-	-
B40S15AB500S15A	Standard	SO-DIL	2.7	801000	1.5	1.1	45/50	30	-	-
B40S2AB380S2A	Standard	SO-DIL	2.7	80800	2.3	0.95	65/72	35	-	-

Bridge-Protectifiers* are based on innovative chip technology by Diotec. They offer what designers of power supplies nowadays are looking for: Energy savings and high robustness in reverse and forward. Its best-in-class forward voltage drop reduces power losses and allows for higher surge currents. Protective elements like inrush current limiting resistors can be kept small and thus save further energy. New requirements on stand-by power can be fulfilled by using these bridges.

In reverse direction, these parts feature an avalanche rating and are able to withstand ESD pulses. Rather than going higher and higher in reverse voltage, these parts offer a certain clamping capability for short transients.

Features

- Extra low forward voltage
- ESD rating (JESD22-A114 Method) Class 3B
- Reverse avalanche energy rating ERSM 20 mJ
- Forward surge current rating IFSM up to 75 A (1ms)

Benefits

- Help to reduce stand-by power consumption
- Lower heat generation
- Allows for smaller inrush current limiting resistor
- More robust against ESD pulses and short transients







Protection Diodes

Circuit protection devices interrupt overcurrent events (e.g. overload, short circuit) and divert overvoltage surges (e.g. inductive load switching, automotive load dump, ESD). They increase safety and enable end products to survive harsh conditions. Most electrical and electronic equipment require circuit protection devices. In many cases they must be installed to comply with safety standards before the end products can be sold or used.

Туре	Peak Pulse Power (PPP)	AVX	Diodes	Diotec	Fagor	Infineon	Lite-On Semi	Littelfuse	LRC	Panjit	STM	Toshiba	Vishay
	100 W										х		
	150 W			Х					х				х
	200 W		Х	Х			х	х		Х	Х		х
	250 W												х
	300 W		Х	Х									х
	350 W		Х										
	400 W	x	х	х	х		x	х	х	х	х		х
	500 W							x		х			х
	600 W	х	Х	х	Х		х	х	х	х	X		х
	800 W												х
TVS	1000 W							X					х
	1500 W	х	Х	Х	X		х	х	х	Х	X		х
	3000 W		Х	Х			х	х		х	X		х
	3500 W												х
	4000 W						х						
	4500 W												х
	5000 W			X	X		х	х		Х	X		
	6500 W												х
	15000 W						х	х					
	20000 W							х					
	30000 W							x					
ESD			Х		Х	х		x	х	х	х	X	х



























PAN<mark>JIT</mark>













High Power TVS Diode Protection

AK / LTKAK Series

Littelfuse AK/ LTKAK Series high energy TVS Diodes offer superior clamping performance over standard Silicon Avalanche Diode Technologies. LTKAK series also offer the highest power rating (8x20 µs waveform) among surface mount TVS available in the current market.

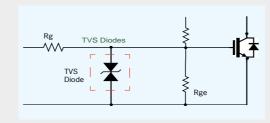
Key Advantages

- Innovative package (patent pending) design offers the highest power rating (8x20 μs waveform) among surface mount TVS available in current market
- SMT package is ideal for automatic pick and place assembly and reflow processes, allowing for a lower manufacturing cost and greater soldering quality than axial leads packages
- Because AK/LTKAK TVS Diodes can withstand multiple surge events, they will help equipment manufacturers extend their product warranties because, unlike passive MOVs, these semiconductor TVS Diodes do not wear out, which makes them ideal for protecting valuable loads

Applications

- Cell phone base stations
- Industrial transient voltage surge suppressors
- Defense and avionics
- Power grid and distribution systems
- AC/DC power line circuit protection

IGBT Gate Protection



Series	AK1	AK3	AK6	AK10	AK15	LTKAK6	LTKAK10
	××	4	× ×	8	*	0	0
	×	4	1	No. of the last of	*	A.	4
Reverse Standoff Voltage (VR)	76	15 30 58 66 76 150 170 208 380 430	30 58 66 76 170 190 240 380 430	15 30 58 66 76 170 190 240 380 430	58 66 76	58 66 76	58 66 76
Package Type	Axial Lead					Surface	e Mount
Peak Pulse Current (IPP 8/20µs)	1kA	3kA	6kA	10kA	15kA	6kA	1kA

IGBT Protection

At times, providing voltage protection for an overall system can be very difficult to accomplish, especially for high power line voltage applications of 600V or higher. For these cases, Littelfuse suggests an additional (or secondary) high power TVS Diode that offers accurate low voltage clamping capability to provide differential protection to the rectifier diodes, capacitor, and IGBT.

The IGBT provides both power transistor and power MOSFET benefits. It works at high frequencies and is easy to drive and to shut off; however, it also has a weakness. Normally, two portions need be protected to achieve a robust design:

- Because the gate is a MOS structure, it can be easily damaged by electrostatic discharge (ESD), an electrical fast transient (EFT), or an overvoltage induced by the Miller effect.
- In high power/high current applications, high voltage inrush may occur at IGBT terminal C and terminal E when the device is turning off.









Repetitive Voltage Suppressor

STRVS Family

In applications, overvoltage constraints may not always come from lightning, electrical overstress or electrostatic discharge, but from the circuit itself. In such cases, standards do not apply. Repetitive surges may raise protection device temperature. The ST's STRVS family is the first TVS series to be specified against repetitive overvoltages in high temperature conditions. Protection devices must be selected according to their power capability at high junction temperatures and their clamping voltage specified at high temperature.

Features

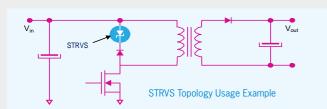
- Clamping voltage characteristics defined at 25 °C, 85 °C and 125 °C
- Stand-off voltage range: 85 to 188V
- Low leakage current:
 0.2 μA at 25 °C

Applications:

- Adapters
- Smart metering
- Solar inverters
- Residential, commercial, architectural and street lighting

Benefits

- Better Transil[™] selection for cost -optimization (oversizing avoided)
- Fixed and reliable clamping voltage
- Reduced power consumption vs discrete protection (RC snubber)
- Customer design effort reduced



Part Numbers	T _j Max	V _{cl}	Wave	Package
STRVS118X02C	150°C	118V (typ) at 2A at 125°C		SMC
STRVS142X02F	175°C	142V (typ) at 2A at 125°C		DO-201
STRVS182X02F	175°C	182V (typ) at 2A at 125°C		DO-201
STRVS185X02B	150°C	185V (typ) at 2A at 125°C		SMB
STRVS185X02E	175°C	185V (typ) at 2A at 125°C		DO-15
STRVS222X02F	175°C	222V (typ) at 2A at 125°C		DO-201
STRVS225X02E	175°C	225V (typ) at 2A at 125°C		DO-15
STRVS241X02E	175°C	241V (typ) at 2A at 125°C		DO-15
STRVS248X02C	150°C	248V (typ) at 2A at 125°C		SMC
STRVS252X02F	175°C	252V (typ) at 2A at 125°C		DO-201
STRVS280X02F	175°C	280V (typ) at 2A at 125°C		DO-201
SM6T220A	150°C	328V (max) at 2A at 25°C	10/1000 μs	SMB
SMA6J	150°C	134V (max) at 4.6A at 25°C	10/1000 μs	SMA

Ultimate TVS Protection for USB Fast-charging Port

ESDAxxP Family

The ESDAxxP family is the right way to protect the USB charging circuits to improve your devices robustness and lifetime.

Strong and thin protection, the ESDAxxP-1U1M series helps to stop damages due to the surge events. Wearable equipment are all supplied by a battery where the charging circuit that can be damaged by surges.

3 Reasons to Adopt the ESDAxxp

The ESDAxxP series saves space on PCBs so that you can integrate more functionalities or miniaturize even more your device. With a maximum thickness of 0.55 mm they are ideal for flat devices.

Discretion

The ESDAxxP series saves space on PCBs so that you can integrate more functionalities or miniaturize even more your device. With a maximum thickness of 0.55 mm they are ideal for flat devices.

Robustness:

the ESDAxxP series can absorb up to 120 A peak pulse current while always keeping the clamping voltage versus operational voltage ration below 2.

Simple

ST offers protection devices for 5 V, 9 V, 12 V and 20 V charging voltage in the same micro-QFN package

Part Number	Stand-off voltage (V _{RM})	Peak pulse current (I _{PP} 8/20µs)
ESDA7P60-1U1M	5V	60A
ESDA7P120-1U1M	5V	120A
ESDA13P70-1U1M	12V	70A
ESDA15P60-1U1M	13.2V	60A
ESDA17P50-1U1M	15V	50A
ESDA25P35-1U1M	22V	35A

Applications Smartphone

- Tablet
- IOTs
- Wearable
- Drones

Bidirectional ESD Protection Diodes

Offer Low Capacitance and Low Leakage Current

Vishay Intertechnology develops bidirectional symmetrical (BiSy) ESD protection diodes in the compact SOT-32, SOD-323 and SOT-323 packages. The single-line VLIN26A1-03G and the dual-line VCAN26A2-03G offer low capacitance and leakage current for the protection of automotive data lines against transient voltage signals. The VLIN26A1-03G is optimized for LIN-Bus applications, while the VCAN26A2-03G is ideal for CAN-Bus and FLEX-Bus applications.

These ESD protection devices which clamp positive and negative overvoltage transients to ground. Connected between the signal or data line and the ground the ESD Diodes offer a high isolation (low leakage current, small capacitance) within the specified working range of -16 V to +16 V or -26 V to +26 V. Due to the short leads and small package sizes the line inductance is very low, so that fast transients like an ESD-strike can be clamped with minimal over - or + undershoots.

As SOT-23 is leaded it is preferred for all production processes where an optical inspection is requested.

Applications

 LIN-, CAN-, and FLEX-Bus protection in automotive applications



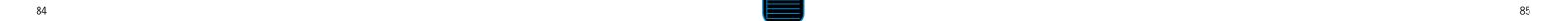
Features

- Space-saving solutions
- Low package height = 1.0 mm
- Low leakage current < 0.05 μA
- Low load capacitance typical CD from < 13pF at 0 V
- ESD-protection acc. IEC 61000-4-2
 (± 30 kV contact discharge / ± 30 kV air discharge)
- Soldering can be checked by standard vision inspection.
 (AOI = Automated Outgoing Inspection)

Benefit

- Compact SOT-323 package measures only 2.3 mm by 2.1 mm with a low 0.95 mm profile
- Low load capacitance of 10 pF typical and 15 pF maximum
- Low maximum leakage current of < 0.05 μA
- Provide transient protection for one (VLIN26A1-03G) and two data lines (VCAN26A2-03G) per IEC 61000 4 2 at ± 30 kV (air and contact discharge)

Vishay P/N	Package	V _{RWM}	I _R @ V _{RWM}	I _{PPM} acc. IEC 61000-4-5	PPP acc. IEC 61000-4-5	CD	ESD- Immunity acc. IEC 61000-4-2	AEC-Q101
				@8/E1620μs * =@10/1000	@8/20μs * =@10/1000	@V _R = 0V	contact discharge	
		[V]	[μΑ]	[A]	[W]	[pF]	[kV]	
VCAN26A2-03G	SOT-323	26.5	0.05	3	150	15	30	Yes
VCAN26A2-03S	S0T-23	26.5	0.05	3	150	13	30	Yes
VLIN26A1-03G	SOT-323	26.5	0.05	3	150	15	30	Yes
VLIN2626-02G	SOD-323	26.5	0.05	4	200	16	30	Yes
VLIN1616-02G	SOD-323	16	0.05	6	200	24	30	Yes
VLIN1626-02G (Pin 1-2)	SOD-323	16	0.05	6	200	18	30	Yes
VLIN1626-02G (Pin 2-1)	SOD-323	26.5	0.05	4	200	18	30	Yes





















Digital Transistors

Digital transistors were first invented and introduced to the market by Rohm. Today, Rohm is Rutronik's main supplier for digital transistors, alongside Diodes Inc. Transistors of the conventional type are available with 100mA and 500mA, as both PNP and NPN type. This product is a combination of a bipolar transistor (SMD package) and base resistor(s) integrated into the package – called a "Resistor-equipped Transistor". Also commonly known as Pre-Biased Transistor.

Туре	R1 (KΩ)	R2 (KΩ)	Diodes DFN 1006	Rohm SOT723	Rohm SOT416FL	Rohm SOT523	Diodes SOT523	Rohm SOT- 323FL	Rohm SOT323	Diodes SOT323	Rohm SOT346	Rohm SOT23	Diodes SOT23	Rohm SOT89
			100005	VMT3	EMT3F	EMT3	161607	UMT3F	UMT3	20.21.10	SMT3	SST3	20.24.12	MPT3
			1.0x0.6x0.5 only	1.2x1.2x0.5 only only	1.6x1.6x0.7 only	1.6x1.6x0.7 only only	1.6x1.6x0.7 only	2.0x2.1x0.9 only	2.0x2.1x1.0 only only	2.0x2.1x1.0 only	2.9x2.8x1.1 only	2.9x2.4x1.2 only	2.9x2.4x1.2 only	4.5x4.0x1.5 only
100 mA Sir	ıgle		Offiny	Orny Orny	Offiny	Offiny Offiny	Offig	Offily	Offig Offig	Offig	Office	Offig	Only	Offiny
NPN , PNP	2,2	2,2		A N	A NPN N	A N	Α	A NPN N	A N	Α	N	A N	Α	
R1 = R2	4,7	4,7		A N	A NPN N	A N	Α	A NPN N	A N	Α	N	A N	Α	
	10	10	A NPN	A N	N	A NPN	A	A N	A N	A	N	A N	A	
	22	22		A N	N	A N	A	N	A N	A	N	AN	A	
	47		A	A N	N	A N	A	N	A N	А	N	A N	Α	
	100	100		A PNP N	A NPN N	A PNP N	A	A NPN N	N	A NPN		A N	Α	
NPN, PNP R1 ≠ R2	0,22	10					A			A				
π1 ≠ π ∠	0,47	10 10		N	N	A N PNP	A	N	A N	A	N	Λ Ν	Δ	
	1 2,2	10		N N	A N	A N PNP	A	N N	A N N	A	N	A N	A	
	2,2	47	A NPN		N	A N	A	N	A N	A	N	AN	A	
	4,7	10		A N	N	A N	A	N	A N	A	N	AN	A	
	4,7	22					A			Α			A	
	4,7	47	A NPN	A N	N	A N	Α	N	A N	Α	N	AN	A	
	10	4,7					A		N	Α			A	
	10	47	A NPN	A N	A NPN N	A N	A NPN			A NPN		A N	A NPN	
	22	47		A N	N	A N	A	N	A N	Α	N	A N	Α	
	47	10					A		A NPN	А			A	
	47	22					A		N	Α			A	
NPN , PNP R1 only	0,22						A			A				
KI OHIY	0,47		A NDN				A			A			Α	
	1 2,2		A NPN				Δ			A	A PNP	N	A	
	4,7			A N	N	A NPN N	A		A N	A	A I IVI	A N	Α	
	10			A N	N	A N	A	N	A N	A	N	AN	A	
	22			N			Α			Α			Α	
	47			A N	N		Α	N	A N	Α		Α	A	
	100			N	N		A	N	N	A			A	
	200						A			A			Α	
NPN , PNP		10					A		N	Α			Α	
R2 only		22					A		A NPN	A			A	
		47					A		N N	A			A	
500 mA Sir	aglo	100					А		IN	А			А	
NPN , PNP	0,22	0.22											A NPN	
R1 = R2	1	1								Α	N	N	Α	
	2,2	2,2								Α	N	N	A	
	4,7	4,7		N 12V	/	N 12V				A	N	N	A	
	10	10								A	N	N	A	
NPN , PNP	0,22	4,7								A			A PNP	
R1 ≠ R2	0,22	10								A			A	
	0,47	10		N 101	4	N 19V			N NON	A	N	N	A DND	
	1	10		N 12V N 12V		N 12V N 12V			N NPN N PNP	A	N	N	A PNP	N COV
	2,2 3,3	10 10		N 12V		N 12V			N PNP	A	N	IN	A PNP	N 60V
	3,3 4,7	10		N 12\		N 12V				A			A	
	4,7	47		N 12V N 12V	/	N 12V N 12V								
NPN , PNP	0,22	.,		112		11 121				A PNP			Α	
R1 only	0,47									A			A	
	2,2									Α	N 40V	N 40V	A	
	4,7									А			Α	
	10									Α			A	
NPN , PNP		10								A	N	N	A	N60V NPN
R2 only														

The resistor values are set to provide saturation of the transistor with a 5 Volt input. They are available with different configuration settings that can be selected according to the existing application's conditions.

The idea is to further reduce the number of components needed in a product that needs to be small, and on the other hand to get more circuitry into a smaller PCB.

A major priority of Rutronik is to offer a wide range of products with AECQ qualification.

For more information, please visit our $e\text{-}commerce\ platform:\ www.rutronik 24.com$



Туре	R1	R2	Rohm		Rol			Diod		Rohm			hm			Dioc		Rohi		Rohr		Diodes	
	(ΚΩ)	(K Ω)	SOT5			T563		SOT	563	SOT3			T363			SOT	363	SOT		SOT		SOT26	
			EMT5		EM		_			UMT5		UN						SMT		SMT		SC74F	
			1,6x1,6	-	-	1,6x0,5		1,6x1,	,6x0,5	2,0x2,1		2,0>	2,1x1,1			2,0x2	-	2,9x2		2,9x2		3,0x2,8x	
				only		only			only		only		only		only		only		only		only		only
100 mA - Dual																	,						
NPN + NPN	4.7	4.7						Α								Α	2xNPN						
PNP + PNP R1 = R2	10	10			Α		N	Α		N		Α		N		Α	2xNPN	N		N		Α	2xPNP
K1 = K2	22	22	N	2xNPN	Α	2xNPN	N	Α		N		Α	2xNPN	N	2xNPN	Α		N		N	2xNPN	Α	2xPNP
	47	47			Α		N	Α		N		Α		N		Α		N		N		Α	2xPNP
	100	100														Α	2xNPN						
NPN + NPN	0.22	10																					
PNP + PNP	0.47	10						Α								Α							
R1 ≠ R2	2.2	47	N		Α		N	Α		N		Α		N		Α		N	2xPNP	N	2xPNP	Α	2xPNP
	4.7	47	N	2xNPN	Α	2xNPN	N			N	2xNPN					Α	2xNPN						
	10	47			Α	2xNPN	N	Α		N	2xNPN	Α	2xNPN	N	2xNPN	Α				N	2xNPN	Α	2xPNP
NPN + NPN	0.22							Α								Α							
PNP + PNP	0.47							Α								Α							
R1 only	1															Α							
	4.7				Α		N	Α				Α				Α	2xPNP					Α	2xPNP
	10				Α			Α				Α				Α						Α	2xPNP
	47							Α	2xNPN							Α	2xNPN						
100 mA - Compl	ementary																·						
NPN + PNP	4.7	4.7						Α								Α							
R1 = R2	10	10			Α		Ν	Α				Α		N		Α				N		Α	
	22	22			Α		N					Α		N		Α				N		Α	
	47	47			Α		N	Α				Α		N		Α						Α	
	100	100														Α							
NPN + PNP	0.22	10						Α								Α							
R1 ≠ R2	0.47	10						Α								Α							
	2.2	47						Α								Α						Α	
	4.7	47			Α		N					Α		N		Α							
	10	47			Α		N	Α				Α		N		Α				N		Α	
NPN + PNP	0.22							Α								Α							
R1 only	0.47							Α								Α							
	4.7				Α		Ν	Α				Α		N		Α				N		Α	
	10																			N			
	100																			N			
PNP + NPN	2	2			Α																		

















Our wide range of Bipolar Transistors are useable for applications in automotive supported products as well as in the field of industrial and consumer products. With our suppliers, we are able to offer a variety of packages and a broad portfolio of small-signal to high-power bipolar transistors in order to cover the market extensively.

The packages range from micro-miniature surface-mount options of 0806 mm size up to high-voltage power package.

The broad portfolio of bipolar transistors that Rutronik offers include NPN,PNP, dual and complementary transistors for general purposes, as well as low saturation, fast switching and darlington transistors for various applications.

The majority of products available in Rutronik's bipolar transistors portfolio meet the stringent requirements of the Automotive Electronic Council specification AEC-Q101.











Bipolar Transistors









Supplier	Series																																														
		-500	400	300	-200	-160	-150	140	-100	8	-70	9	-50	4 4 5	-32	-30	-25	-12	-12	0 4	, <u>e</u>	==	15	15	18	20	30	32	45	20	22	09 1	8 2	75	80	120	125	140	150	180	200	220	300	400	450	200	800
Diodes Inc.	PNP,NPN	А	Α /	A A	А		Α	A A	A	А	A A	A A	Α	A A	A	Α	Α /	A A	А		Α		Α	A A	А	Α /	A A	Α	Α	Α	Α	Α	A A		Α	A A	Α	А	Α	Α /	A A		Α	A A	Α	N	N
	2 x NPN																							A A		Α /	A		A A	А		Α	А	Α	Α	А				А			Α				
	2 x PNP						Α	А			F	A N	Α	A A	A		A A	Ą	Α																												
	PNP + NPN						Α		Α	Α	F	A A	Α	A A	A	Α	A A	A A	Α				А			Α /	A A		A A	A		Α	А		Α	А			Α								
	Darlington							A	A A			Α				Α											Α		Α			Α			Α	A A		Α									
Panjit	PNP,NPN			А			N			Α	F	A A	N	A A	A	Α	1	И						N			Α	А	A A	N		Α	А		Α					А		N	А	N			
	2 x NPN																												A A	1			А														
	2 x PNP										F	A N		A N	1																																
	PNP + NPN										F	A N	N	A 1	١														N A	N		N	А														
Rohm	PNP,NPN		N			N		A	A N	Α		Α	Α	A A	A A		1	N N	N		N	N	N	N		N 1	N A	А	A A	A		N			Α	N A				N			N	N			
	2 x NPN																																														
	2 x PNP																		N																												



 Market leading technologies from 10V to 800V • NPN & PNP in single, duals, complementary, matched pairs, Darlington transistors, Pre-Bias (Digital) Very low VCE(SAT) for improved efficiency in

Excellent gain hold up at high peak currents for





Bipolar Transistors

saturated switching applications

improved driving of MOSFETs

Diodes is the market leader when it comes to Bipolar transistors. By utilizing its wide line up of in-house packaging and superior silicon technology, Diodes is ideally positioned to meet your application needs for Bipolar transistors.

Continued Innovation

Bipolar Transistors

The Bipolar transistor portfolio is built on successive generations of our innovative matrix emitter process. Years of know-how, leading edge designs and process innovation have extended our leadership in building ultra-low saturation, fast switching transistors.

Application-Specific Products

Market demands for improved electronic systems solutions, whether in terms of improved efficiency, increased power density, or just cost reduction, drive all our application specific products. Avalanche transistors, Gate drivers and H-bridge devices have all been developed to create dedicated solutions driven by customer needs and combine the benefits of the exceptional transistor die performance with Diodes packaging expertise.

Best-in-Class Performance

With focus on optimizing processes for the lowest saturation voltage, reduced die area and subsequently improved switching performance, the consequent reduction in power dissipation allows ever smaller surface mount packages, which still meet the demands of the target applications. The inherent ruggedness to ESD of the Bipolars along with their very low specific on-resistance also make them very cost effective alternatives to MOSFET technology in a wide range of circuit topologies.

The majority of the products in the Diodes' Bipolar transistor portfolio are designed to meet the stringent requirements of the Automotive Electronic Council specification AECQ101.

Part Number		V _{CEO}	Ic	I _{CM}	P _D		h _{FE}				V _{CE (}	sat)		Package
						Min	@lc	Min	@lc	Max	@ I _C /I _B	Max	@ I _C /I _B	
NPN	PNP*	(V)	(A)	(A)	(W)		(A)		(A)	(mV)	(A/mA)	(mV)	(A/mA)	
	FMMT717Q	12	2.5	10	0.625	300	0.1	180	2.5	17	0.1/10	170	1.5/50	SOT23
FMMT618Q	FMMT718Q	20	2.5	6	0.625	300	0.2	200	2	15	0.1/10	200	2.5/50	SOT23
	FZT789AQ	25	3	6	2	250	1	200	2	250	1/10	450	2/20	S0T223
FMMT491AQ	FMMT591AQ	40	1	2	0.5	300	0.5	200	1	300	0.5/50	500	1/100	SOT23
DXT690BP5Q		45	3	6	3.2	400	1	150	2	360	1/5	320	2/40	PowerDI5
ZXT690BKQ		45	3	6	3.9	400	1	60	3	360	1/5	320	2/40	T0252-3L
FMMT619Q		50	2	6	0.625	300	0.2	100	2	200	1/10	220	2/50	SOT23
FMMT491Q	FMMT591Q	60	1	2	0.5	100	0.5	80	1	150	0.5/50	250	1/100	SOT23
DXT651Q	DXT751Q	60	3	6	2	100	0.5	40	2	300	1/100	600	3/300	S0T89
FZT651Q	FZT751Q	60	3	6	2	100	0.5	40	2	300	1/100	600	3/300	S0T223
ZXTN2010ZQ	ZXTP2012ZQ	60	4.3	15	2.1	100	2	45	5	65	1/100	110	2/200	S0T89
ZXTN2010GQ	ZXTP2012GQ	60	5.5	15	3	100	2	10	10	70	1/100	250	5/500	S0T223
	ZXT951KQ	60	5	15	3	100	2	10	10	50	0.1/10	460	5/500	T0252-3L
BCX5616Q	BCX5316Q	80	1	1.5	1	100	0.15	25	0.5	500	0.5/50	-	-	S0T89
BCP5616Q	BCP5316Q	80	1	2	2	100	0.15	25	0.5	500	0.5/50	-	-	S0T223
FMMT634Q		100	0.9	5	0.625	15K	1	-	-	960	1/5	-	-	SOT23
FZT653Q	FZT753Q	100	2	6	2	100	0.5	25	2	300	1/100	500	2/200	S0T223
MJD31CUQ	MJD32CUQ	100	3	5	15	25	1	10	3	1200	3/375	-	-	T0252-3L
	FZT953Q	100	5	10	3	100	1	30	4	50	0.1/10	420	4/400	S0T223
ZXTN4004KQ		150	1	3	3.8	60	0.085	100	0.15	250	0.1/5	-	-	T0252-3L
FMMT459Q		450	0.15	0.5	0.625	50	0.03	-	-	75	0.02/2	90	0.05/6	SOT23
	FMMT560Q	500	0.15	0.5	0.625	100	0.001	80	0.05	200	0.02/2	500	0.05/10	SOT23

^{*} Refer to data sheet for any differences to the NPN specs given

The above table represents a selection from over 250 automotive Q grade bipolar transistors.

RF / HF Transistors







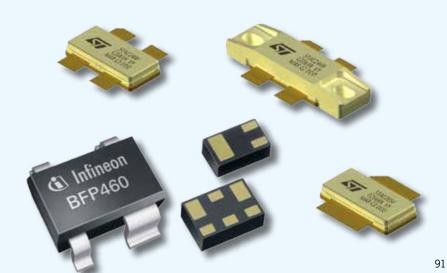


In the fast growing market for wireless applications Rutronik offers a wide range of cost-effective, and high-end RF / HF transistors. Our comprehensive portfolio includes Low Noise Amplifiers (LNAs), Biased Low Noise Amplifiers, High Linearity Transistors, MMICs, RF MOSFET as well as LD MOS.

Find the most suitable device in our product catalogue and ask for samples respective design support via our e-commerce platform: www.

Туре	Diodes	Infineon	Intersil	STM	Applications
RF-Transistors	BFSxxx	BFPxxx			General Purpose
	ZUMTSxxx	BFRxxx			
		BFQxxx			
MMICs		BGAxxx			Broadband and Driver Amplifier
Low Noice Amplifier		BGBxxx			GPS, Glonass, Compass, Mobile TV, WLAN, UMTS, UWB, WiFi, Bluetooth,
		BGSxxx			WEAR, OWITS, OWD, WIT, Bidetootif, WiMax, ISM
LDMOS		PTxxx		SDxxx	Car Mobile Radios, Safety Mobile Radios,
		PXxxx		PDxxx	HF/VHF Marine Mobile Radios, VHF/UHF Alarm Systems, Wireless Data Modems, Satellit Mobile Communication,
				STAxxx	Avionics, L-Band Radar, RFID and Meter Readers,
				LETxxx	Power Amplifier Applications
Ultra High Frequency			HFA3xxx		VHF/UHF Amplifier, VHF/UHF Mixers,
Transistor Arrays					IF Converters, Satellite Communications





Modules





Modules

Rutronik offers a wide range of power module topologies, standard solder-pin connectors, press-fit technology, spring connections, innovative thermal interface material (TIM), and a broad power spectrum range. The offering encompasses Intelligent Power Modules (IPM), Power Integrated Modules (PIM, a combination of input rectifiers, inverter and brake chopper), sixpack inverters, and rectifier, PFC-, H-bridge, half-bridge, booster, as well as NPC, MNPC and AMNPC converter modules. Our experts work closely with yours to deliver solutions that fit your needs.

















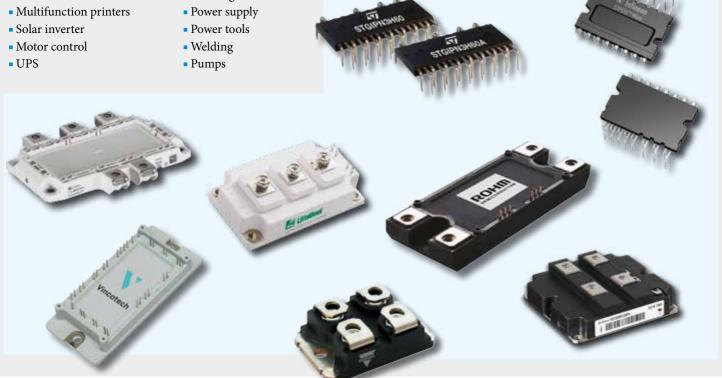




	BYD	Infineon	Littelfuse	ROHM	STMicroelectronics	Vincotech	Vishay
Full Bridge							
Half Bridge							
IGBT							
MOSFET							
Rectifier							
6-PAK							
IPM							
PFC							
SiC							

Applications

- Induction heating
- Microwave
- AirconditioningWashing machine





IGBT Intelligent Power Module: Compact and high-perform. AC motor drive for simple and rugged designs up to 3kW

The SLLIMM 2nd series is ST's new family of compact, high efficiency, dual-in-line intelligent power modules, with optional extra features. This family is designed using a new internal configuration with two gate drivers, one high-side driver and one low-side driver as well as an improved trench gate fieldstop IGBT. The best compromise between conduction and switching energy with an outstanding robustness and EMI behavior makes the new series ideal to enhance the efficiency of compressor, pumps, fans and motor drives working up to 20kHz in hard-switching circuitries and for applications with a power range from 300W to 3kW.

Key Features

- ${\color{red}\bullet}\,600V_{DC}$ rating from 8A to 35A at 25°C
- Low V_{CE (sat)}
- Optimized driver and silicon for low EMI
- Lowest R_{th} value on the market for the DBC package versions
- Internal bootstrap diode
- 175°C max. operating junction temperature
- Separate open emitter outputs
- NTC on board
- Integrated temp. sensor on low-side driver
- Comparator for fault protection
- Shutdown input/fault output
- Isolation rating of 1500V_{RMS/min}

Key Benefits

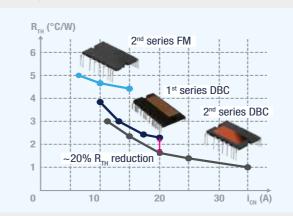
- Easy to drive through microcontroller
- 175°C maximum junction temperature for higher robustness and reliability

Key Applications

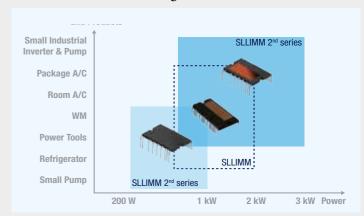
- Industrial motor drives
- 3-phase inverter for motor drives up to 3kW
- Home appliances

Package	Part Number	I _{cn} (A) @ 25 °C (@ 80 °C)	Voltage (V)	V _{ce(sat)} (V) at I _{CN} 25 °C (80 °C)	R _{thj-c} (max) (°C/W)	Min Viso (V)	Max T _J (°C)
	STGIF5CH60TS-L(E)	8 (5)			5.0		
SDIP2F-26L	STGIF7CH60TS-L(E)	10 (7)			4.8		
	STGIF10CH60TS-L(E)	15 (10)			4.6		
	STGIB8CH60TS-L(E)	12 (8)	600	1.7 (1.5)	3.0	1500	175
	STGIB10CH60TS-L(E)	15 (10)	000	1.7 (1.3)	2.26	1300	175
SDIP2B-26L	STGIB15CH60TS-L(E)	20 (15)			1.85		
	STGIB20M60TS-L(E)	25 (20)			1.4		
	STGIB30M60TS-L(E)	35 (30)			1.2		
Temp. sensing/protection: T= NTC on board S= Temperature sensing	Package and leads F= Full molded B= DBC (direct bo	·	E= S	hort leads and ong leads	emitter for	ward	

SLLIMM R_{th}



SLLIMM Series: Positioning



 \blacksquare



EconoDUAL™ 3

IGBT Modules

With the EconoDUAL $^{\infty}$ 3 family, Infineon supports the complete current ranges from 100 A up to 600 A at 600 V / 650 V / 1200 V / 1700 V. Excellent mechanical robustness, power cycling capability, the option of PressFIT pins as well as the availability of TIM makes it a reliable, cost effective solution for applications in drives, CAV, wind turbines, solar, and hybrid vehicles. EconoDUAL $^{\infty}$ 3 modules are available in 3-level, half-bridge, H-bridge and chopper topologies for efficient inverter designs.

EconoDUAL^{∞} 3 modules are equipped with the state-of-the-art IGBT4 technology supporting junction temperatures of $T_{vjop} = 150$ °C for highest power density and leading-edge power cycling capability. The symmetrical design of the module enables optimized currency sharing between the IGBT half bridges in parallel operation.

The FF600R17ME4_B11 is the flagship product of Infineon's well established EconoDUAL™ 3 series. It is developed with a clear focus on maximum possible power density within a given footprint.

Features

- Highest power density for compact inverter designs
- Trench/Fieldstop IGBT4
- Compact modules with only 17 mm height
- PressFIT contact technology
- Emitter controlled diode
- Integrated NTC temperature sensor
- $T_{vjop} = 150 \, ^{\circ}\text{C}$
- ullet V_{CEsat} with positive temperature coefficient
- Isolated base plate
- Parallel operation enabled by symmetrical design
- Standard housing
- Optional pre-applied thermal interface material (TIM)

Benefits:

- New advanced assembly technologies
- Superb thermal performance to enable full power utilization
- Plug and play upgrade of existing inverter designs
- PressFIT and solder pin versions
- Best in class current rating: 650 V/1200 V/1700 V from 100 A to 600 A with Infineon's IGBT4

I _C [A]	650 V	1200 V	1700 V
H Brid	ge		
100			F4-100R17ME4_B11*
150			F4-150R17ME4_B11*
250			F4-250R17ME4_B11*
3-Leve	el		
300		F3L300R12ME4_B22 F3L300R12ME4_B23	
		F3L300R12MT4_B22 F3L300R12MT4_B23	
400	F3L400R07ME4_B22 F3L400R07ME4_B23		
Dual			
225		FF225R12ME4_B11	FF225R17ME4_B11
300	FF300R07ME4_B11	FF300R12ME4_B11	FF300R17ME4_B11
450	FF450R07ME4_B11	FF450R12ME4_B11	FF450R17ME4_B11
600	FF600R07ME4_B11	FF600R12ME4_B11 FF600R12ME4C_B11 FF600R12ME4A_B11	FF600R17ME4_B11
ourpac	k		

New: EconoDUAL™ 3 for Medium Voltage Drives (MVD)

Infineon's new EconoDUAL™ 3 H Bridge modules address the specific requirements of the Cascade H Bridge (CHB) topology, typically used in Medium Voltage Drives applications.

One EconoDUAL 1 3 H Bridge module can replace two 62 mm modules, enabling for more compact inverter designs at reduced system costs for CHB drives.

EconoPACKTM4 IGBT Modules

The EconoPACK[™] 4 package perfectly fits into the well-known Econo portfolio. EconoPACK[™] 4 features screw power terminal, providing excelent electric connection. DC and AC link are separated and distinguishable at one glance for ease of use. Control pins feature Infineon's PressFIT technology for solderless assembly. A new and highly reliable ultrasonic welding process is used for all connections between the terminals and the DCBs within the module.

Optimized gate driver connection is possible by placing the driver on top of the module. Low parasitic stray inductance and optimized thermal resistance to heat sink contribute to excellent inverter solutions.

The EconoPACK $^{\sim}$ 4 portfolio is available in current ratings from 100 A up to 400 A. Sixpack and half-controlled input rectifier configurations (available in 1600 V with current ratings of 240 A and 360 A) are tailor-made for industrial applications. Furthermore, three level one phase solutions are available with the 650 V, 1200 V and 1700 V IGBT Technology and current ratings of 200 A to 400 A, offering higher efficiencies, lower switching losses as well as savings in system costs, e.g. due to lower filter requirements.

1EDI EiceDRIVER™



EiceDRIVER[™] solutions from Infineon are the expert's choice. With its HV Gate Driver Boards and HV Gate Driver ICs Infineon provides a broad spectrum of solutions for reliable and efficient controls for IGBT and MOSFET products.

Main Features:

- Single channel isolated driver
- Input to output isolation voltage up to 1200 V
- For high voltage power MOSFETs and IGBTs
- Up to 6 A minimum peak rail-to-rail output
- Separate source and sink outputs or active Miller Clamp

Main Features

- Robustness: rugged mechanical design with ultrasonic welded and injection moulded terminals
- Easy and most reliable assembly: PressFit control pins and screw power terminals for completely solderless connections
- Efficiency: leading IGBT technologies with increased
 T_{viop} = 150 °C, optimized module layout for high power densities
- Integration: compact rectifier, sixpack and three level one phase configurations with NTC

3-Level

I _C [A]	650 V	1200 V
	NPC-1	NPC-2
200	F3L200R07PE4	
300	F3L300R07PE4(P)	F3L300R12PT4(P)_B26
400		F3L400R12PT4(P)_B26

2-Level

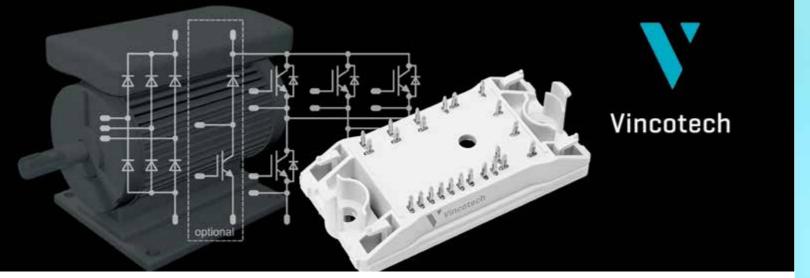
2-Level	650 V	1200 V	1700 V
Ic [A]	sixpack	sixpack	sixpack
100	FS100R07PE4	FS100R12PT4	FS100R17PE4
150	FS150R07PE4	FS150R12PT4	FS150R17PE4
200	FS200R07PE4	FS200R12PT4(P)	

Others

others							
I _C [A]	650 V	1200 V	1600 V				
	3x chopper	3x chopper	half-controlled input rectifier				
200		FD200R12PT4_B6 DF200R12PT4_B6					
240			TDB6HK240N16P				
300	FD300R07PE4_B6 DF300R07PE4_B6						
360			TDB6HK240N16P				
400	FD400R07PE4R_B6 DF400R07PE4R_B6						

(P): pre-applied Thermal Interface material (TIM) optionally available; _B26 NPC 2 topology;

94 95

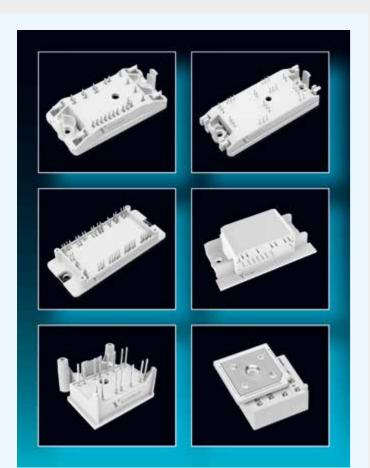


Flexible Module Solutions for Motion Control Power Modules

Vincotech is an established, reliable partner in designing and building semiconductor power modules for motion control, renewable energy and power supply applications, setting performance standards for both off-the-shelf and application-specific solutions. An independently operating affiliate of Mitsubishi Electric Corporation staffed with around 500 people worldwide, Vincotech delivers fast, flexible and customer-

focused solutions, service and support to empower customer's ideas. A major part of the power module portfolio is designed for standard motor drive applications featuring state-of-the-art chip technologies.

The *flow* module family is suited for a power range of below 1 kW and up to 50 kW. The name Vincotech stands for highest product reliability and excellent customer service resulting in outstanding customer satisfaction.



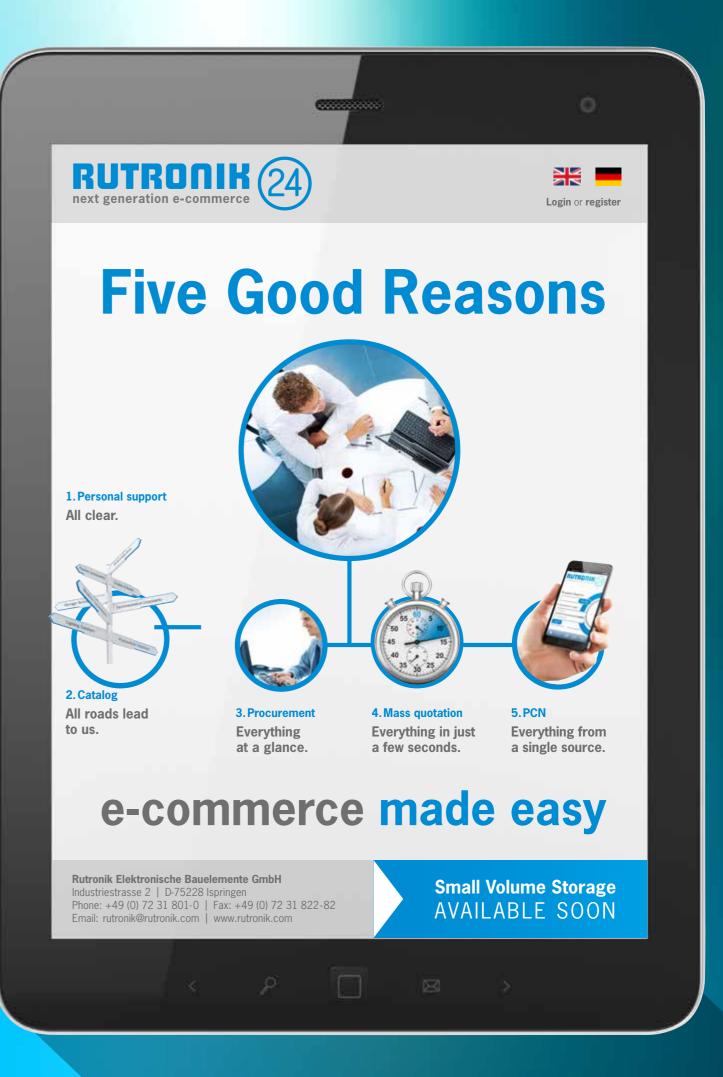
Vincotech offers

- Power semiconductor modules based on components from leading manufacturers (IGBT, MOSFET, thyristors and diodes, SiC MOSFET) as well as passive components (shunts, capacitors, NTC, PTC)
- Various topologies (e.g. Rectifier, Sixpack, PIM (CIB), PIM with PFC, IPM) all with low stray inductance
- 22 different housings in various contact options (solder, Press-fit, screw and spring terminals), flexible heat sink orientation (horizontal and vertical), with pre-applied thermal interface material, e. g. highly conductive phase change material.
- Standard Al₂O₃ and advanced AlN substrate for improved thermal connectivity
- Convex, pre-bent DCB to minimize thermal grease thickness
- Simulation tools that interactively calculate modules' electrical and thermal behavior based on fully measured parameters

Available Topologies	Package	Voltage [V]	Current [A]
Rectifier, sixpack, PIM with PFC	flow 0B	6001600	435
Rectifier, sixpack, 7pack, PIM (CIB), PIM with PFC, half-bridge, H-bridge	flow 0	6001600	4200
Sixpack	flow90 0	1200	835
Sixpack, 7pack, PIM (CIB), H-bridge	flow 1	6001200	15100
PM	flow 1B	6001200	410
Rectifier, sixpack, 7pack, PIM (CIB)	flow 2	6001600	35150
Rectifier, sixpack, PIM (CIB), PIM with PFC	flow90 1	6001600	675
Sixpack, PIM (CIB)	MiniSKiiP®	6001200	6150

"MiniSKiiP®" is a trade mark of SEMIKRON Elektronik GmbH & Co KG







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