

# Photonic Highlights



A World of Optical Disinfection, 3D Vision, Identification & Isolation

UV LEDs, Visible & Infrared Laserdiodes and Lasermodules, VCSEL,  
Sensors (UV, TOF, ALS, Color, Infrared, Bio, VOC, PIR) , Infrared LEDs, Optocouplers

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## Our Product Portfolio

 Semiconductors	 Boards & Systems
 Passive Components	 Storage Technologies
 Electromechanical Components	 Wireless Technologies
 Displays & Monitors	

## Our Initiatives

			
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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 electro-mechanical components, displays & monitors, boards & systems, storage 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.

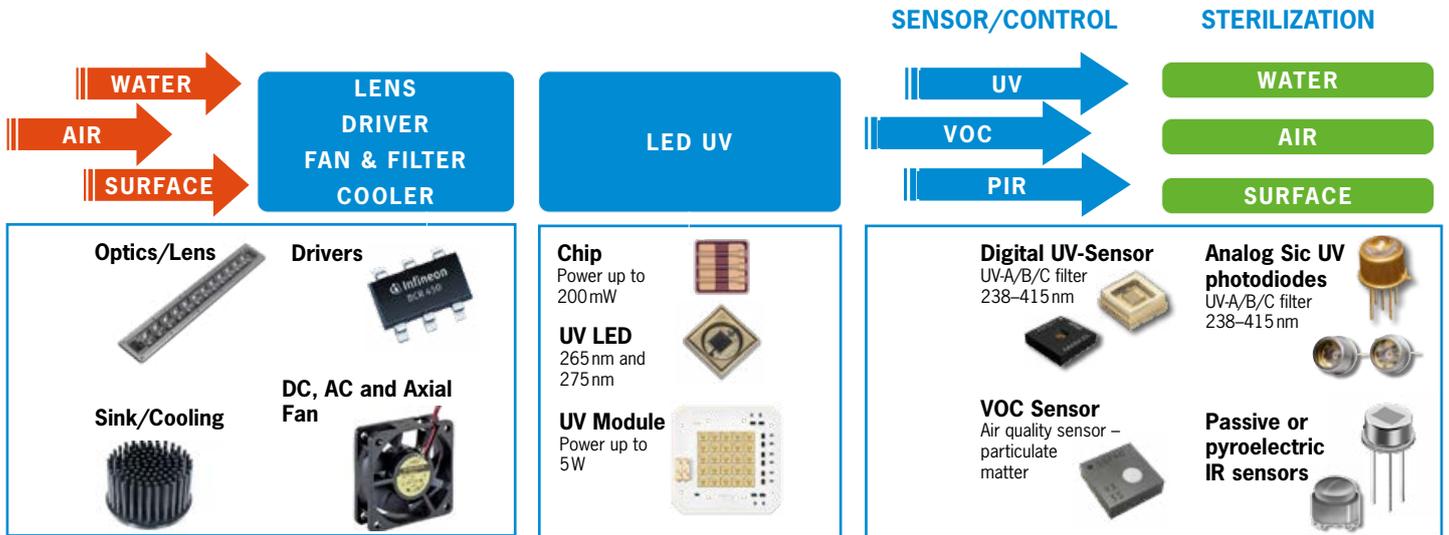
**Quality without Compromise from RUTRONIK**

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

# Photonic Focus Products

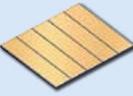
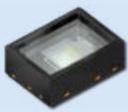
## Sterilization, Degermination, Plant Production and Curing Process by UV LED

The Rutronik portfolio of mercury-free UV products will enhance, and in some cases revolutionize, the way applications are built in UV market segments such as medical cell imaging, drug detection, fire protection, preservation and photosynthesis. In addition to UV-controlled components and modules, UV lenses, LED drivers, fans and control sensors (UV, VOC, PIR, etc.), Rutronik offers an evaluation board that uses a VOC sensor to detect odors. The odors are neutralized either with UV-A LEDs in combination with a photocatalytic filter or a board that enables the disinfection of air, water and surfaces using UV-C LEDs.



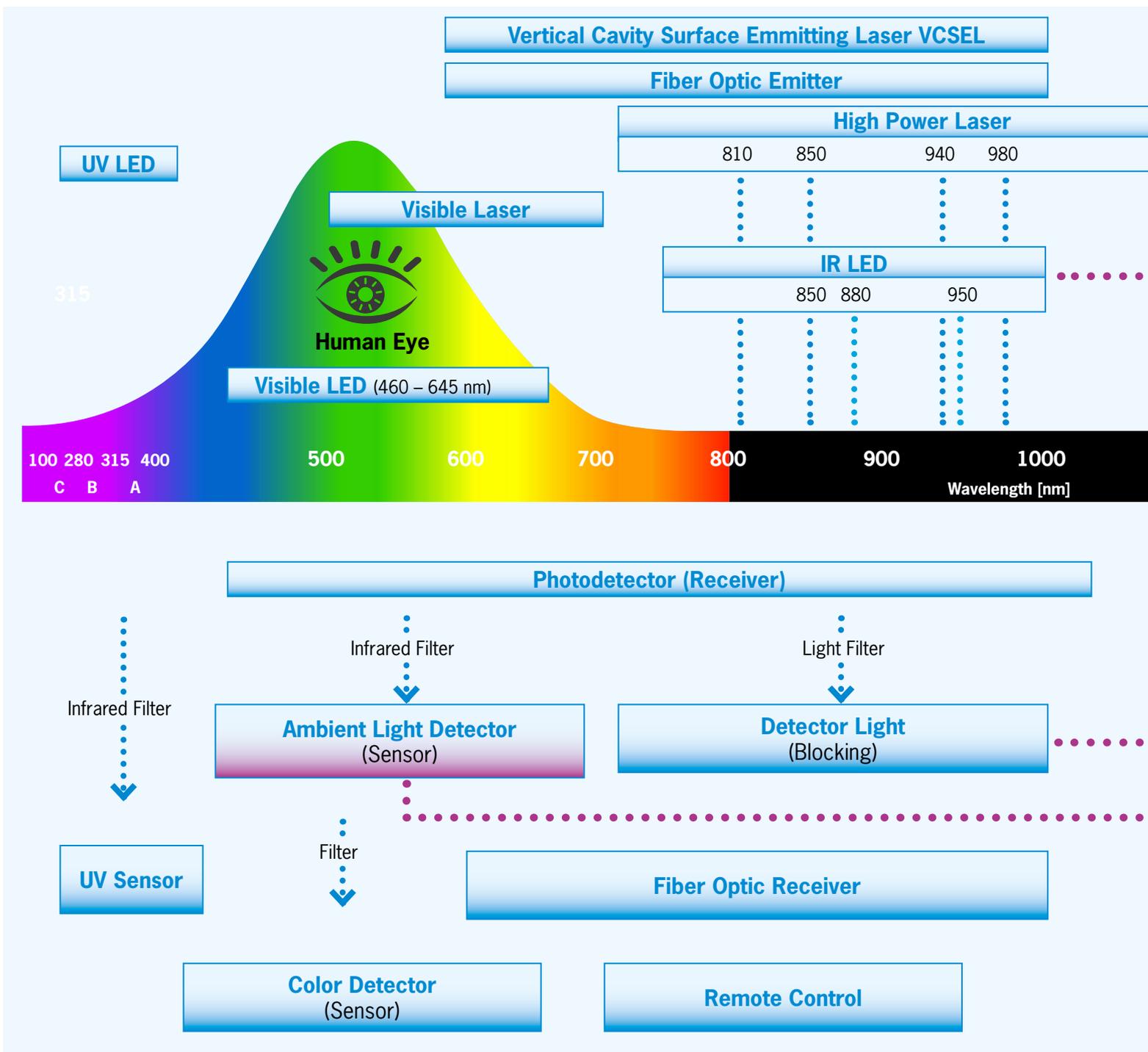
# Design of Lasers or Industry and Automotive Applications

## VCSEL & EEL Technologies

Type	Description	Parameter	Application
 <b>Laserdiode LASDIO</b>	<ul style="list-style-type: none"> <li><b>Colour:</b> Cyan, blue, green, red, Low power infrared, high power Infrared</li> <li><b>Package:</b> Radial, metal can, SMT, laser dies</li> </ul>	<ul style="list-style-type: none"> <li>Wavelength (nm)</li> <li>Package (TO38, SMT, Chip...)</li> <li>Output power (typ in watts)</li> <li>Forward current (typ in mA)</li> </ul>	<ul style="list-style-type: none"> <li>Levelling and aiming</li> <li>Laser illumination and projection</li> <li>Medical DNA analyse &amp; light therapy</li> <li>Gas and particle detection Flame and smoke detection</li> </ul>
 <b>Laser Bars BARS</b>	<ul style="list-style-type: none"> <li>Single emitter</li> <li>Bar for fiber coupling</li> <li>High power bar (CW up 250W)</li> <li>QCW Bar (up to 500W)</li> </ul>	<ul style="list-style-type: none"> <li>Wavelength (nm)</li> <li>For single emitter use Y/N</li> <li>Output power (typ in watts)</li> <li>Forward current (typ in mA)</li> </ul>	<ul style="list-style-type: none"> <li>Fiber coupled laser diodes</li> <li>Laser stacks</li> <li>Pumping light source for solid state</li> <li>Hair removal</li> </ul>
 <b>VCSEL VCSEL</b>	<ul style="list-style-type: none"> <li>Vertical cavity surface Emitting laser</li> <li>VCSEL die, package, array, module</li> <li>Red, low power infrared, High power infrared</li> </ul>	<ul style="list-style-type: none"> <li>Wavelength (nm)</li> <li>Output power (typ in watts)</li> <li>FOV/FOI (field of view/interest)</li> <li>Forward current (typ in A)</li> <li>Photodiode yes or no</li> </ul>	<ul style="list-style-type: none"> <li>Gesture recognition proximity</li> <li>Machine vision autofocus smart</li> <li>ADAS (Advanced Driver Assistance Systems)</li> <li>TOF (Time of Flight) LIDAR 3D</li> </ul>
 <b>Laser Module LASMOD</b>	Point, dot, line and cross-hair laser green, red, blue, violet, white focusable, small housing, gaussian line housing, connector violet, white focusable, small housing, gaussian line housing, connector	<ul style="list-style-type: none"> <li>Wavelength (nm)</li> <li>Laser class</li> <li>Output power (in watt)</li> <li>Fan angles (in degree°)</li> <li>Supply voltage (in V)</li> </ul>	<ul style="list-style-type: none"> <li>Gesture recognition proximity</li> <li>Machine vision autofocus smart</li> <li>ADAS (Advanced Driver Assistance Systems)</li> <li>TOF (Time of Flight) LIDAR 3D</li> </ul>
 <b>Accessoires for Laser ACCESL</b>	<ul style="list-style-type: none"> <li>Mount for laser modules</li> <li>Pattern generator for modules</li> <li>Laser second optic drivers</li> <li>Laser demo boards</li> </ul>	<ul style="list-style-type: none"> <li>Target modules</li> <li>Specifications</li> <li>Dimensions</li> </ul>	<ul style="list-style-type: none"> <li>Mount for laser modules</li> <li>Pattern generator for modules</li> <li>Laser second optic drivers</li> <li>Laser demo boards</li> </ul>



# Overview Optoelectronic Components





**Standard Coupler**

- $BV_{ceo} < 80\text{ V}$   $CTR < 600\%$
- Available in DC and AC

**Photodarlington Coupler**

- $BV_{ceo} > 80\text{ V}$   $CTR > 600\%$

**High Speed Coupler**

- High speed signals
- Data rate 20 kbps to 50 Mbps

**IGBT/MOSFET Coupler**

- Driven IGBT and MOSFET with an output from 0.6 A to 6.0 A

**Phototriac Coupler**

- Output triac photodetector

**Solid State Relay Coupler**

- Alternative to mechanical

**Photovoltaic Coupler**

- MOSFET gate driver without external secondary-side power supply

**High Voltage Isolation CAT IV**

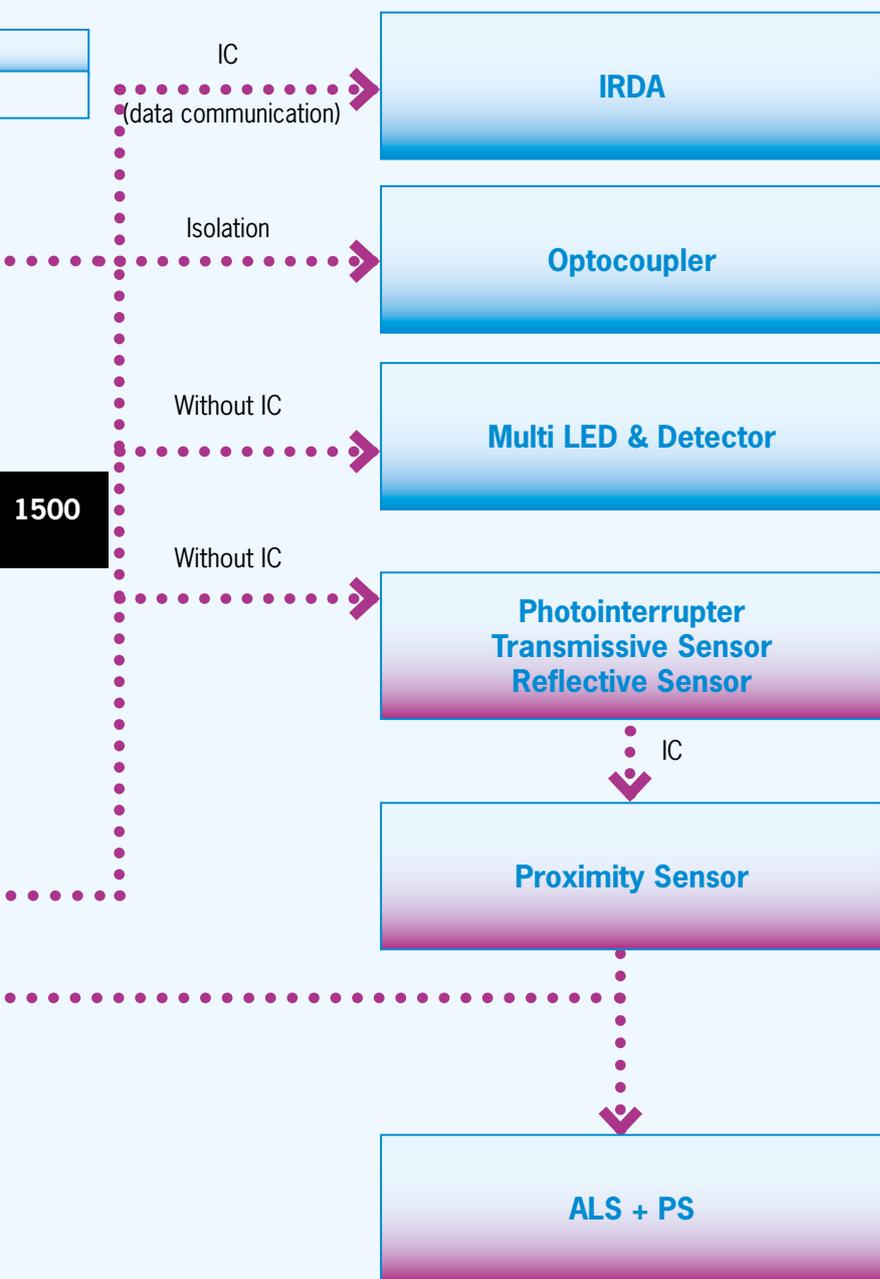
- High voltage up to 12kV

**Schmitt Trigger Coupler**

**Thyristor Trigger Coupler**

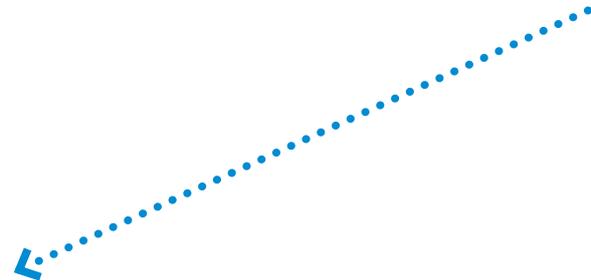
- Control AC loads direct
- Connected to a 100 or 200 V-AC power supply

**Linear Coupler**





# Infrared Automotive Components



**Occupancy detection**



1

PA35RT1-145D



VSMA109445DS 4715AS A01

**Drowsy Driver Detection**



2

PA35RT1-80D



VSMY3890X01 SFH4727AS

**IR Touch Panel**



3



VSMB10941X01 SFH4451  
VEMD10940FX01 SFH3600

**Rain Sensor**



4



VSMY5850X01 SFH 4253  
VEMD4110X01 SFH 2400 FA

**Rearview Mirror**



5



VEMD5510FX01 SFH2430

**Center Stack Gesture Recognition**



6



VCNL4020X01 VSMY2890GX01

**Steering Angle Sensor, Control Knobs, Gear Shift**



7



SFH4240+SFH320  
TCUT1350X01 TCPT1600X01  
VEMT3700FX01 VSMY3940X01

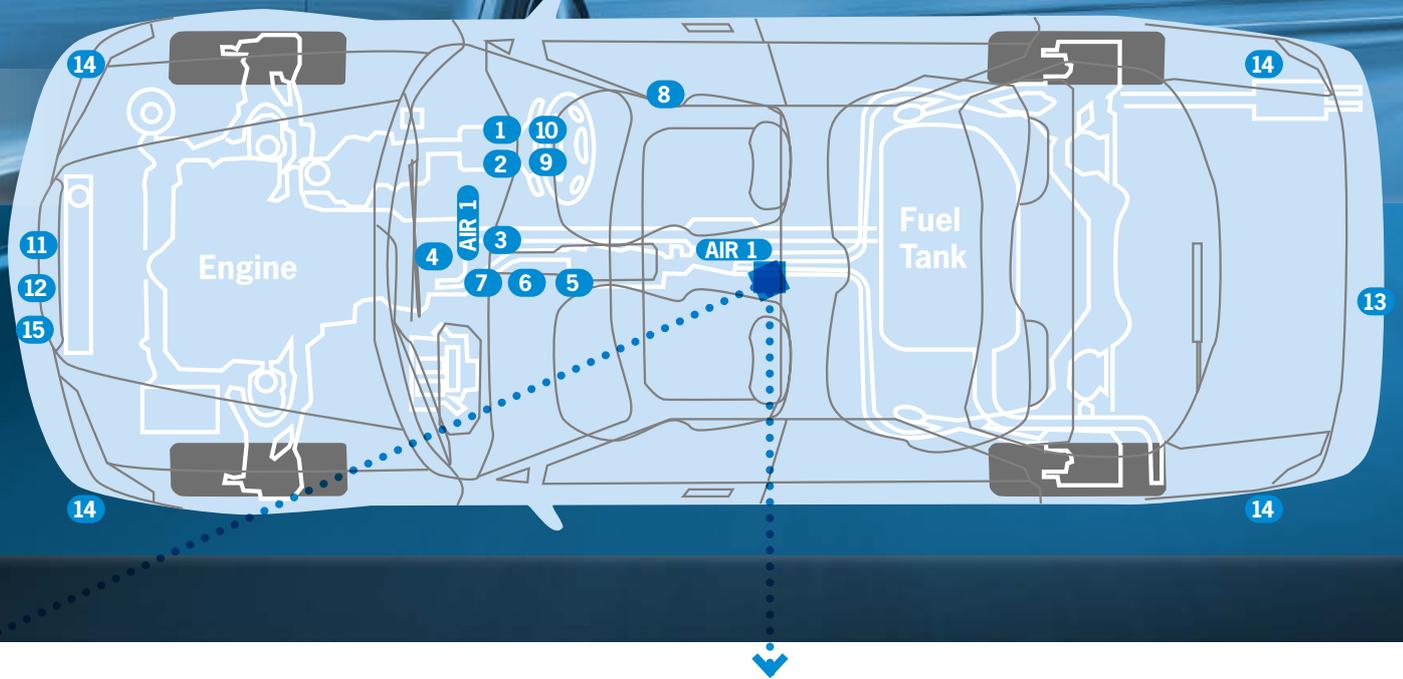
**MAP Lights Control: Gesture Recognition**



8



PR27T11-80D  
VCNL4035X01 PLPVCQ\_940



Virus Killer	Odor Killer	Air Quality Sensor
<b>AR 1</b>		

**LCD Backlighting Light Dimming**

**9**

**Head-Up Display**

**10**

Pre-crash Sensing	Night Vision

**Trunk Foot Sensor Back up Camera**

**13**

**Blind Spot Detection & Parking Distance Control**

**14**

**Adaptive Cruise Control (ACC) Lane Departure Warning**

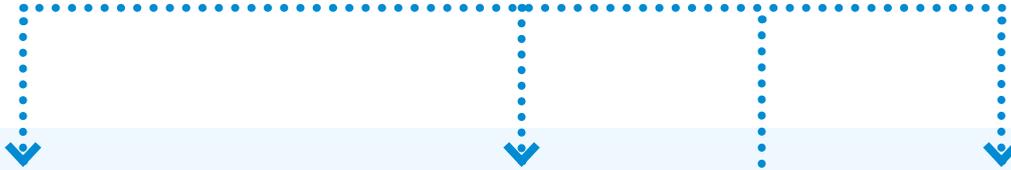
**15**

**Lidar 3D Sensor Time of Flight (TOF)**

**16**



# Home Automation / Smart Home



## Family Room

- LCD plasma TV **DCFISHG**
- DVR/DVD/CD player **LCFISH**
- Game console **LCFISH**
- Musical instruments **DCFISH**
- Phone charger **S**
- Thermostat **EDPIST**
- Alarm system **EDPSTR**
- Remote control systems **EADPFISR**
- Visualization control unit **EADPFISR**
- Computer monitor **DCFISHG**
- D-Link **DCFISH**
- Projector **LDCFISH**
- Smoke detector **EDR**
- Light control **CPST**
- Power supply **S**



## Dining Room

- Lighting controls **CPST**
- Wine cooler **EDIST**
- Smoke detector **EDR**
- Heater **EDCIST**
- Air conditioner **EDCISTHG**
- Aquarium **UEDIST**
- Landline phone **SR**
- Alarm system **EDPSTR**
- Power supply **S**



## Bedroom

- Mobile phones **EADPISHG**
- Tablet **EADPISHG**
- Smart watch **EADPIS**
- Thermometer
- Camera **EADPIST**
- Safe **EDR**
- Power supply **S**



## Mudroom

- Washer **UEDIST**
- Dryer **UEDIST**
- Smart meter **EDISHG**
- Vacuum cleaner **UEDISTHG**
- Motion detector (sensor) **EP**
- Energy Meter **UEDIST**
- Building management: relay, switch... **EADPFISR**
- Power supply **S**



S Standard coupler H High speed coupler G IGBT T Triac coupler R Solid state relay E IR LED U UV LED /sensor D IR detector



Lextar

LITEON

amun OSRAM

TOSHIBA



The DNA of tech™



### Bathroom

- Hand UV dryer **U E D I S T**
- Acne treatment **U S T**
- Nail gel curing **U S T**
- Urinal **U P I S T**
- Faucet **U P I S T**
- Paper towel dispenser **P I S T**
- Refresher **U P I S T**
- Touch air spray **P I S T**
- Flush **U P I S T**
- Rubbish bin **U P I S T**
- Power supply **S**



### Garage

- IR camera **E A P**
- Garage door opener **E D C P I S T**
- Biometric door access **E D C P I S T**
- Motion detector (sensor) **P R**
- Solar panel system **U A F I S T H G R**
- Metering **E D L C F I S R**
- Fitness equipment **E D C F I S T G**
- Pool **U P S T R**
- Power supply **S**



### Kitchen

- Refrigerator **U E D I S T H G**
- Stove/furnace **E D I S T**
- Coffee machine **U E D I P S T**
- Dishwasher **U E D I P S T**
- Microwave **E D I P S T**
- Trash compactor **U E D I S T**
- Cooktop/induction heating **E D I P S T H G**
- Hood **S T**
- Air cleaner **U E D I S T**
- Motion detector (sensor) **E P R**
- Power supply **S**



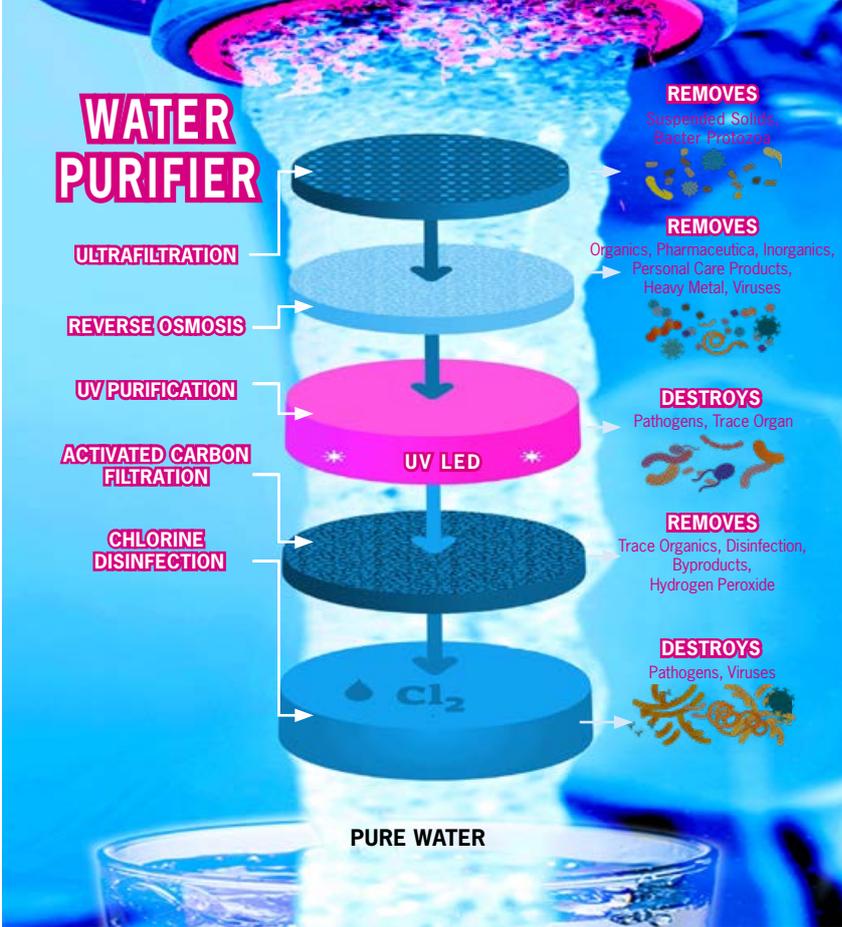
R Remote control I IRDA F Fiber optic A Ambient light sensor P Proximity sensor M Multi LED detector I Photointerrupter L Laser diode



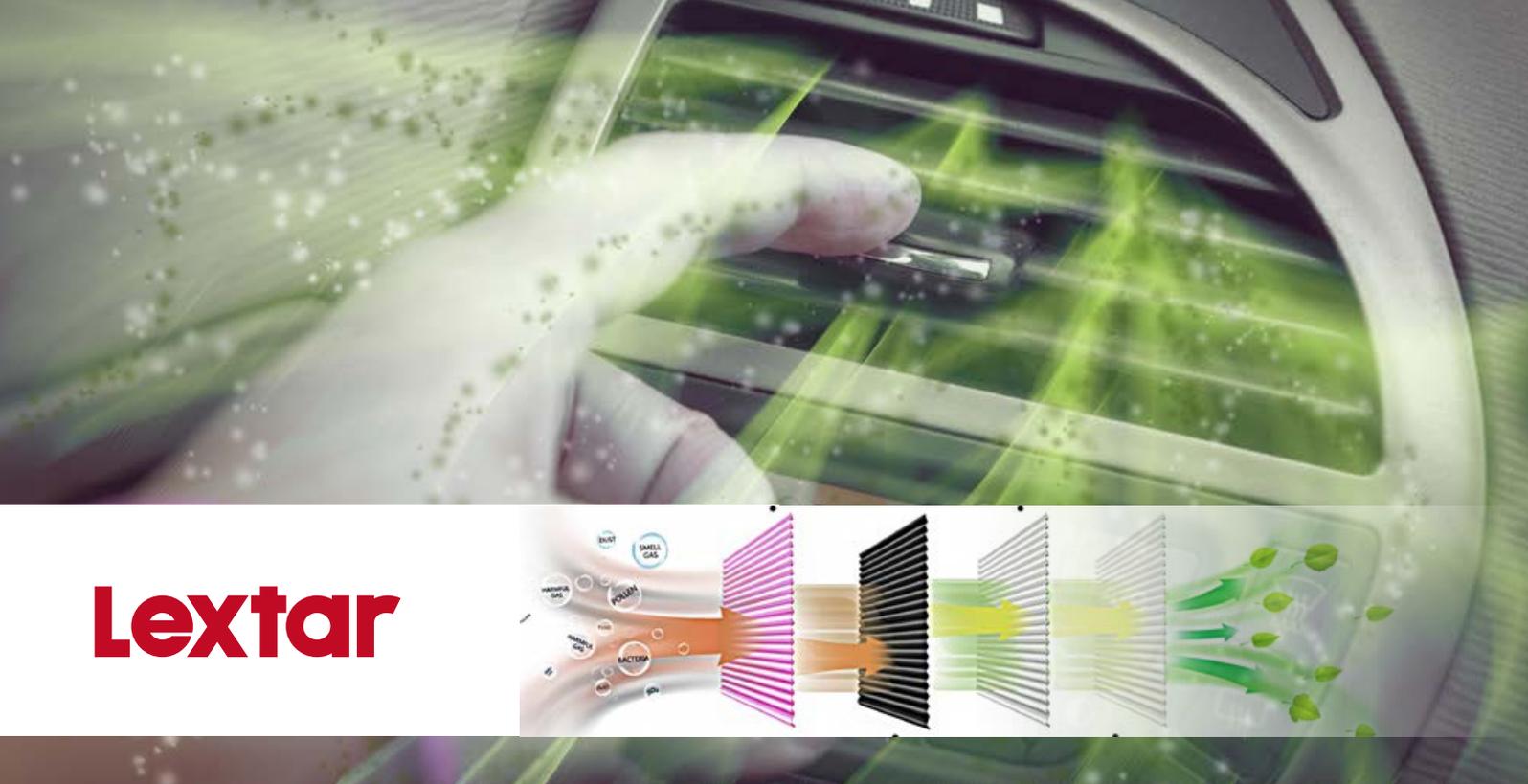
# Suppliers & Focus Invisible Components

## Couplers, IR & UV LEDs, Detectors, Optical Sensors & Lasers

Suppliers	ams OSRAM	VISHAY <small>The DNA of tech</small>	TOSHIBA	LITEON
	ams OSRAM	Vishay	Toshiba	Liteon
Franchise Situation	Worldwide	Worldwide	Worldwide	Europe without I, E & F
<b>Couplers</b>				
Standard				
Highspeed		★	★	
TRIAC				
Solid State Relays		★	★	★
IGBT Drivers		★	★	
<b>Infrared &amp; UV</b>				
IR & UV Emitters, Detectors	★	★		★
UV LEDs	★	★		★
Remote Control & IRDA				
Fiber Optic				
<b>IC Switch (Optical Sensors)</b>				
Color Detector (UV, RGB, ALS)	★	★		★
Photointerrupter (Optical Switch)	★	★		
ALS+PS (AL + Proximity Sensor)	★	★		
<b>Laser &amp; VCSEL</b>				
Visible, Infrared & High Power	★			
VCSEL	★			
<b>Applications</b>	<ul style="list-style-type: none"> <li>Automotive (interior &amp; exterior)</li> <li>Biometrics</li> <li>Machine vision</li> <li>IR illumination (night vision &amp; CCTV)</li> </ul>	<ul style="list-style-type: none"> <li>Automotive</li> <li>Industrial</li> <li>Metering</li> <li>Remote control</li> <li>IR illumination (night vision &amp; CCTV)</li> </ul>	<ul style="list-style-type: none"> <li>Automotive</li> <li>Industrial</li> <li>Heating</li> <li>Metering</li> <li>Telecommunication</li> <li>Motor control</li> <li>Renewable energy</li> </ul>	<ul style="list-style-type: none"> <li>Intrusion detection</li> <li>Smoke detection</li> <li>Industrial</li> <li>Metering</li> </ul>
<b>Focus Products Rutronik</b>	<ul style="list-style-type: none"> <li>High power emitter</li> <li>Photodetectors</li> <li>High power laser</li> <li>Blue &amp; green laser</li> </ul>	<ul style="list-style-type: none"> <li>Standard coupler</li> <li>Solid state relays</li> <li>Emitters</li> <li>Photodetectors</li> <li>Receiver</li> <li>UV (ultra-violet)</li> </ul>	<ul style="list-style-type: none"> <li>High speed optocoupler</li> <li>Solid state relays</li> <li>IGBT driver</li> <li>Automotive couplers</li> </ul>	<ul style="list-style-type: none"> <li>Standard coupler</li> <li>Phototriacs</li> <li>Emitter</li> <li>UV (ultra-violet)</li> <li>Solid state relays</li> </ul>
<b>Benefits</b>	<ul style="list-style-type: none"> <li>Automotive certified (AECQ 101)</li> <li>Single selection products</li> <li>Application assistance</li> <li>Own chip production</li> </ul>	<ul style="list-style-type: none"> <li>Wide range of IR products</li> <li>Automotive certif. available</li> <li>Comprehensive selection guide &amp; application notes</li> </ul>	<ul style="list-style-type: none"> <li>Wide optocoupler portfolio</li> <li>High market acceptance</li> <li>Wide range of Avago Crosses available</li> </ul>	<ul style="list-style-type: none"> <li>Wide standard optocoupler portfolio</li> <li>High market acceptance</li> <li>Wide range of IR and UV products</li> </ul>



EVERLIGHT	ROHM SEMICONDUCTOR	STANLEY	LASER COMPONENTS	Lextar		
Everlight	Rohm	Stanley	Lasercomponents	Lextar		
Europe	Worldwide	Europe	Worldwide	Worldwide		
	★	★	★	★		
		★	★	★		
			★			
	★					
		★				
	★		★			
				★		
<ul style="list-style-type: none"> <li>Power supply</li> <li>White goods</li> <li>Dimmers</li> <li>Thermostates</li> <li>Industrial</li> <li>Automation</li> </ul>	<ul style="list-style-type: none"> <li>Consumer</li> <li>Office</li> <li>Mobile</li> <li>Industry</li> <li>Communication</li> </ul>	<ul style="list-style-type: none"> <li>Automotive</li> <li>Desinfection</li> <li>Photocatalyst</li> <li>Horticulture</li> <li>CCTV</li> <li>Biometrics</li> </ul>	<ul style="list-style-type: none"> <li>Position markers</li> <li>Gas Snsor</li> <li>Particles detection</li> <li>Industry</li> <li>Metering</li> </ul>	<ul style="list-style-type: none"> <li>Leveling</li> <li>Spectroscopy</li> <li>Flame detection</li> <li>Temperature measurement</li> </ul>	<ul style="list-style-type: none"> <li>Automotive</li> <li>Lidar</li> <li>TOF (time of fight)</li> <li>People counting</li> </ul>	<ul style="list-style-type: none"> <li>3D sensor</li> <li>Desinfection</li> <li>Photocatalyst</li> <li>Bio sensor</li> <li>CCTV</li> </ul>
<ul style="list-style-type: none"> <li>Standard coupler</li> <li>Photo triacs</li> <li>Photolink</li> <li>Remote control</li> <li>UV (ultra-violet)</li> </ul>	<ul style="list-style-type: none"> <li>Remote control</li> <li>Receiver</li> <li>IRDA</li> <li>Laser diodes</li> </ul>	<ul style="list-style-type: none"> <li>UV LED</li> <li>High Power IR</li> <li>Optical sensors</li> </ul>	<ul style="list-style-type: none"> <li>Laser diodes and modules</li> <li>IR Components</li> <li>Laser accessories</li> <li>Laser driver</li> </ul>	<ul style="list-style-type: none"> <li>VCSEL</li> <li>UV LED chips, components</li> <li>And modules</li> <li>High Power IR</li> </ul>		
<ul style="list-style-type: none"> <li>Good standard product portfolio</li> <li>Optocouplers are certified to VDE IEC60747-5-5</li> </ul>	<ul style="list-style-type: none"> <li>High quality products</li> <li>Expertise in consumer applications</li> </ul>	<ul style="list-style-type: none"> <li>Expertise in consumer applications</li> <li>High value special products</li> </ul>	<ul style="list-style-type: none"> <li>High value special products</li> <li>Unique product portfolio</li> <li>Customizing</li> </ul>	<ul style="list-style-type: none"> <li>Software support</li> <li>Expertise in consumer applications</li> </ul>		



# Automotive UV-C LED Concept Disinfection Module

There exists Three main ways of transmission Covid 19: Droplet transmission, Aerosol transmission and Contact transmission. In the space of a car, Covid 19 survives longer and is more infectious. Generally Covid 19 survives up to 3 hours in the air, therefore it is very important, to have in car a air purifier system. The new Automotive UV-C LED Disinfection module with the car air conditioning system, destroy the vital structure of various bacteria & viruses and Improve indoor air quality. The module does not affect the speed of the air through the filter element and consists of High UV-C Energy matrix with UV-C LED & reflectors (each UV-C LED with 3 reflectors) and PM 2.5 particles filter.

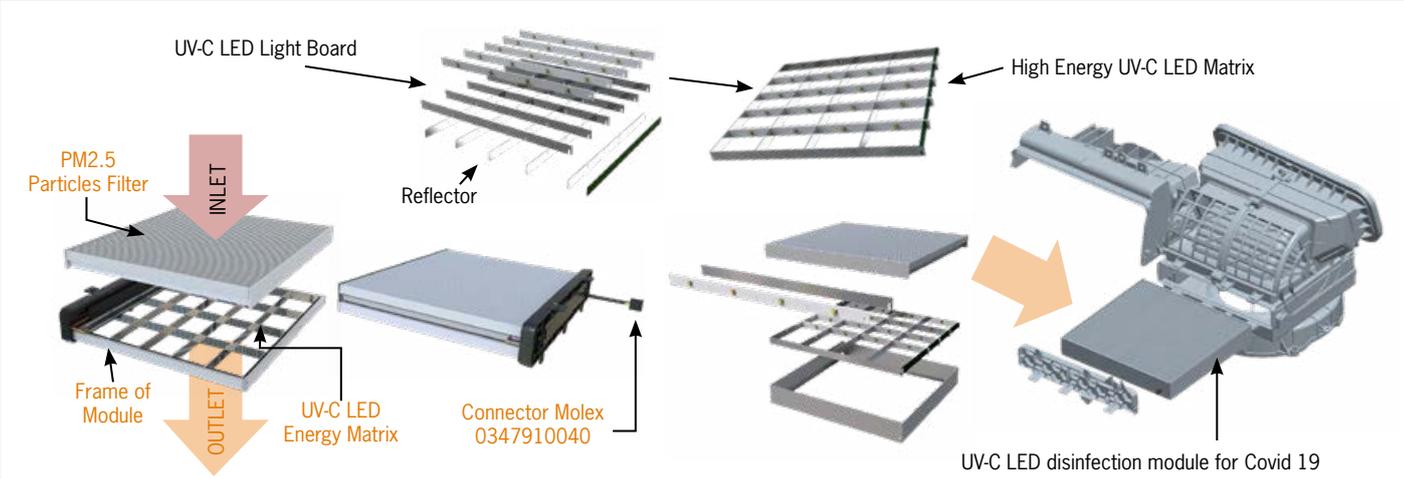
The module disposes of dual function: Nano scale filter for PM2.5 particles 99.53% ±10% removed. UV-C LED disinfection module for Covid 19 sterilization rate 99%. This module is compatible with current filter design, plug & replace without modification and can be customized accordingly the costumer`s enquiries.

### Features

- Each UV-C LED with 3 reflectors
- High UV-C Energy matrix with UV-C LED and reflectors
- The module does not affect the speed of the air through the filter element

### Benefits

- Combine with car air conditioning system
- Destroy the vital structure of various bacteria and viruses
- Improve indoor air quality





## Fully Integrated Proximity Automotive Grade Sensor

### VCNL3030X01 & VCNL3036X01 Deliver High Resolution up to 20µm for Force Sensing

VCNL3030X01 integrates a proximity sensor (PS) and a high power IRED into one small package while the VCNL3036X01 hold a PS, a mux and a driver for up to 3 external IREDs. It incorporates photodiodes, amplifiers, and analog to digital converting circuits into a single chip by CMOS process. The PS offers a programmable interrupt with individual high and low thresholds which offers the power savings on the microcontroller. The AEC-Q101 qualified devices provide higher resolution compared to previous-generation sensors at a lower cost. The sensors offer the flexibility to fine-tune the current for short displacements while the devices support the I<sup>2</sup>C bus communication interface.

#### Benefits

- Integrated amplifier and ADC circuitry
- Intelligent cancellation eliminates cross-talk
- Accurate sensing and faster response time
- Prevent false triggers
- Operate normally even if the user is wearing gloves
- Selectable 12-bit and 16-bit outputs
- 4 mm x 2.36 mm x 0.75 mm surface-mount package
- IRED wavelength (VCNL3030X01) peaks at 940 nm and has no visible “red-tail”

#### Interrupt

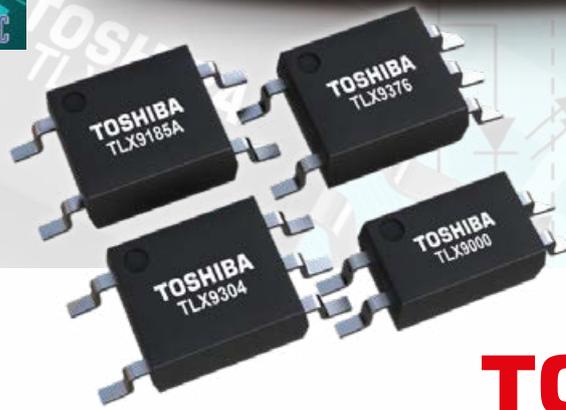
- Programmable interrupt function for PS with upper and lower thresholds
- Adjustable persistence to prevent false triggers for PS

#### Applications

- Force feedback applications (e.g. steering wheel controls, laptop smart power buttons and multi-force trackpads, and touchpads for IoT devices and kitchen appliances)
- Proximity / optical switch for consumer, computing, automotive and industrial devices



Operating Range	Operating Voltage Range	I <sup>2</sup> C Bus Voltage Range	IRED Pulse Current	Output Code	ADC Resolution Proximity / Ambient Light
0 mm to 300 mm	2.5 V to 3.6 V	1.8 V to 5.5 V	200 mA	16 bit, I <sup>2</sup> C	16 bit / -



## Automotive Couplers

# TOSHIBA

Toshiba offers a new generation of AEC-Q101 qualified photocouplers compliant to the requirements of most automotive applications. With more than 18 years of experience in the automotive photocouplers market, Toshiba provides suitable products for the increasing isolation requirements in today's automotive applications.

### Features

- Wide range of AEC-Q qualified couplers with extended temp. range: -40 to +125°C
- Extensive range of data rate: up to 20 Mbps
- Optical isolation with guaranteed internal galvanic isolation distance of min. 0.4 mm
- Leading edge technology for highest reliability and lowest power consumption
- Packages with clearance and creepage distances of 5 mm

### Benefits

- Products are perfectly applicable for harsh automotive environments
- Free choice of speed options for various communication standards
- Provides best in class isolation performance
- Enables highest system performance and efficiency
- Packages meet the required safety standards
- High reliability of end products reduces cost of operation failures
- Ability to reduce bill of material cost due most effective solution
- Reduction of product size, lead to a unique selling proposition

### Applications

- EV/HEV
- DC-DC Converter
- BMS
- Inverter

### IC Output

Clearance/Creepage Distance		5 mm	
Data Rate (Standard)	Output Configuration		SO6
1 Mbps	Open collector (Analog output)		TLX9309
1 Mbps	Open collector		TLX9304
5 Mbps	Totem-pole		TLX9310
10 Mbps	Open collector		TLX9378
20 Mbps	Totem-pole		TLX9376

### Transistor Output

Clearance/Creepage Distance		5 mm	
Isolation voltage BVs [Vrms]	Output Configuration	SO4	SO6
3750		TLX9000	TLX9300
		TLX9291A	TLX9185A

### Photovoltaic Output

Clearance/Creepage Distance		5 mm	
Isolation voltage BVs [Vrms]	Output Configuration	SO6	
3750		TLX9905	
		TLX9906	

### Photorelay

Clearance/Creepage Distance				5 mm	
Off-State Voltage (MAX)[V]	On-Resistance (MAX)[Ω]	On-State Current (MAX)[A]	Output Configuration	SO6	
600	335	0.08		TLX9175J	

# Workflow of Sterilization and Technologies



## UV Led Design

### Advantages of UV LED vs. Traditional Mercury Vapor Lamps

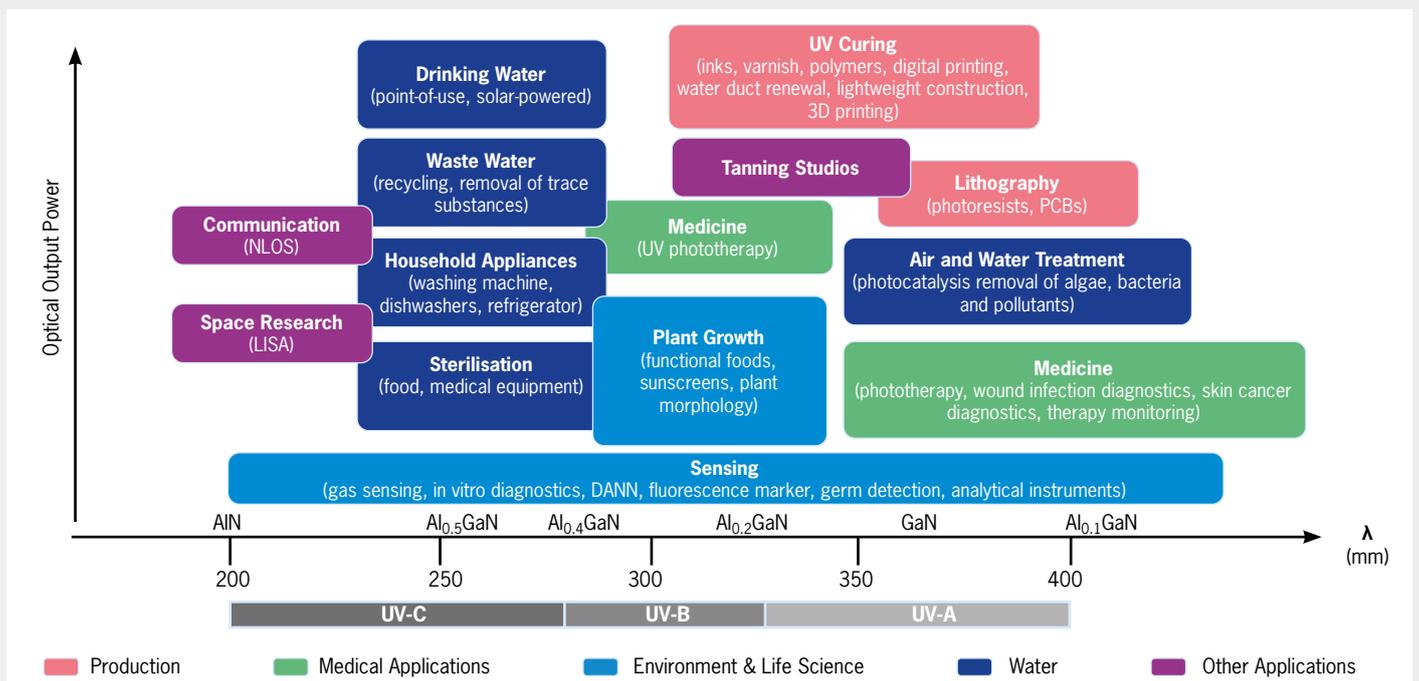
- Consistent UV spectral output for a given temperature
- Flexibility: broad range of wavelengths
- Package form: smaller and more robust, SMD available
- No degradation of intensity with toggling
- Contain no mercury, obviating need for disposal/recycling
- Energy efficient and infinite On/Off Switching battered, portable solutions with instant full light output
- Efficiency UV-A LED 30%

### Key Applications

- Consumers (air conditioner, fridge, Toilet, air cleaner, Insect attracting lamps)
- Medicine (disinfection box, skin therapy, water quality sensor, cleaning robots)
- Industry (filling machine, water quality sensor, cloth, cartons, bottles, cans)
- Breeding, horticulture, fishery (conservation, photosynthesis, artificial light)
- Curing/drying (plastic coatings, 3D/ink printers, photoresist, nail, resin)

Passive Solutions	Active Solutions
<b>Filters</b> (Hepa, Activated Carbon, Ceramic ...) <ul style="list-style-type: none"> <li>Based on the storage effect (the pollutants are only retained, but not destroyed)</li> <li>Maintenance needed</li> </ul>	<b>Ozone Generator</b> (Ionisator and Plasma Systems) <ul style="list-style-type: none"> <li>Ozone is harmful for Human Health</li> <li>Hazardous Air Pollutants</li> </ul>
<b>Chemical Products</b> (Chlorine...) <ul style="list-style-type: none"> <li>Pathogen resistant</li> <li>Only for static situation (no flow)</li> <li>Produces Volatile Hydrocarbons (Chlorine Dioxide...)</li> </ul>	<b>UV-Light</b> (UV LEDs and Traditional Mercury Vapor Lamps) <ul style="list-style-type: none"> <li>No Volatile Hydrocarbons</li> <li>No Hazardous Air Pollutants</li> <li>Dangerous in open system (Human Body Radiation)</li> </ul>

### Ultraviolet Applications Depending of Wavelength



Technology	400-420nm Blue Lighting	UV-C LEDs
Features	400-420nm Blue Lighting	250-290nm
Disinfection Characteristic	Continuous Disinfection	Terminal Disinfection
Safety	Can be used safely	Safety Hazards
Disinfection Time	Slower Inactivation	Rapid Inactivation
Compatibility	More Materials Compatible	Polymer damage
Penetrability	Does not Penetrate	Can Penetrate
Escherichia Coli	24 Hours (99,9%)	Smaller than 1 Hour (99,9%)
Foods	Does not Change the Properties	Loss of Nutritional Characteristics
Environment	Eliminate Toxic Gas	Produce Ozone (Toxic Gas)



Swimming Pool

Hospital

Kitchen

Elevator

Bathroom

# 405 nm Light for Continuous Disinfection

## Disinfection for Human Body

400 - 420 nm Blue Lighting is also able to be used for disinfection and infection control, this wavelength is causing oxidation damage and his successful inactivation is demonstrated for a wide range of organisms.

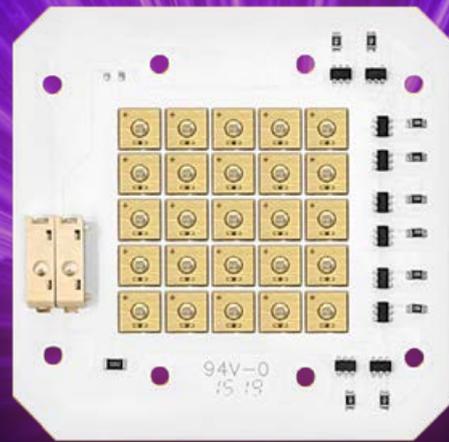
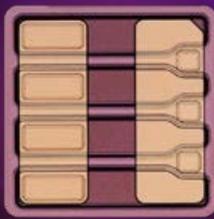
Healthcare related infections (HAI) are the most frequent and serious complication in healthcare assistance, become very dangerous especially due to poor physical conditions of the patients. Pathogens (Virus, Bacteria, Fungi, Mould ...) can be found in rooms (patients, operating and waiting), on diagnostic instruments etc. 400 - 420 nm Blue Lighting contributes to the safe healthcare practices, and prevents the transmission of infectious diseases in hospitals and in healthcare facilities.

At home, in offices, schools and in common spaces (gyms, wellness centers and spas) the critical points where bacteria can be found are all the surfaces that come in contact with people's hands, pets, food, cleaning tools and vending machines.

400 - 420 nm Blue Lighting reduces the bacteria count, prevents the formation of biofilm, creates a safe environment, thus supporting the natural evolution of the immune system in adults and children. It creates further a safe environment by reducing the chances of acquiring infections, by sanitizing the ideal habitats for the proliferation of bacteria and fungi, sanitizes effectively the environments of animals and plants. In this way it contributes to reduce the use of antibiotics among animals and in animal products and it ensures a more rational use of chemical disinfectants. In combination with a PHOTOCATALYSIS Filter (Titanium Dioxide TiO<sub>2</sub> surface coating), it eliminates significantly the VOC (Volatile Organic Compounds) of the main external polluting sources (fossil fuel heating systems, vehicular traffic, industrial settlements, agriculture and livestock).



Part Number	Wavelength (nm)			Dimensions (mm)			Radiant Power (mW)			I <sub>FforΦe</sub> (mA)	Forward Voltage, V <sub>F</sub>		Angle of Half Intensity (± °)	Supplier
	Min.	Typ.	Max.	L	W	H	Min.	Typ.	Max.		Typ.	Max.		
VLMU3100	400	405	410	3.2	2.8	1.9	5	6.8	8	20	3.2	3.8	60	Vishay
VLMU3520-385-060	380	385	390	3.5	3.5	2.9	740	900	-	500	3.6	4.0	60	Vishay
VLMU3520-395-060	390	395	400	3.5	3.5	2.9	740	900	-	500	3.6	4.0	60	Vishay
VLMU3520-405-060	400	405	410	3.5	3.5	2.9	740	900	-	500	3.6	4.0	60	Vishay
VLMU3520-385-120	380	385	390	3.5	3.5	2.2	780	930	-	500	3.6	4.0	120	Vishay
VLMU3520-395-120	390	395	400	3.5	3.5	2.2	780	930	-	500	3.6	4.0	120	Vishay
VLMU3520-405-120	400	405	410	3.5	3.5	2.2	780	930	-	500	3.6	4.0	120	Vishay
PU88S01 V0 (U0405)	400	405	410	3.45	3.45	2.1	550	900	1050	500	3.6	4.4	60	Lextar
PU35AH1 V0 405NM	400	405	410	3.3	3.3	2.48	910	1150	1460	700	3.55	4	60	Lextar
PU88S04 V0 (U0405)	400	405	410	3.45	3.45	2.1	510	600		350	3.4	3.5	60	Lextar
PU28AM2_405nm	400	405	410	3.5	2.8	1.65	200	200	240	150	3.4	3.6	60	Lextar
LZ1-00UBOR-00U8	400	405	410	4.4	4.4	2.7	18.5	21.5		700	6.3	7	36	Osram/Ledingin
LZ1-10UBOR-00U8	400	405	410	19.9	19.9	4.45	1100	1260	1760	700	3.5	4.2	36	Osram/Ledingin
NDU1104ESE-405-TR	400	405	410	3.5	3.5	2.9	620	780	940	500	3.4	4	60	Stanley
LTPL-C034UVG405	400	405	410	3.45	3.45	2.1	1225	1415	1805	700	3.6	4.4	60	Liteon
LTPL-C034UVG415	410	415	430	3.45	3.45	2.1	1225	1415	1805	700	3.6	4.4	60	Liteon
LTPL-C034UVE405	400	405	410	3.45	3.45	2.1	560	690	900	350	3.6	4.4	60	Liteon
ELUA20160GB-P0010Q53038020-VA1M	400	405	410	2.04	1.64	0.75	25	35	45	20	3.6	4.4	60	Everlight
ELUA45450G3-P9000U23241500-VD1M	400	405	410	4.5	4.5	4.5	900	1000	1600	1000	3.2	4.1	30	Everlight
ELUA35350GB-P0010U23240500-VD1M	400	405	410	3.5	3.5	2.5	1000	1250	1500	500	3.2	4.1	60	Everlight



# UV-B and Germicidal UV-C LEDs

## High Efficiency Against Microbes, Bacteria, and Viruses



Laser Components specializes in the UV-B/UV-C LEDs wavelength range 255-308 nm. The LEDs at 265/272/275/295 and 308 nm offer an output power of 100 mW and more from a single die, the 255 nm LED offers 38 mW and soon even 65 mW, which is significantly higher performance than similar products by other manufacturers. The Germicidal LEDs (GLEDs) are available as single chip SMD LEDs, bare die and as preassembled arrays up to 2.2 Watt. Their main application area is sterilization and disinfection of air, water, and surface. Studies have also shown notable effect against the SARS-COV-2 virus. UV-B wavelengths can be effectively used in UV curing, analytics, and dermatology.

### Features SMD LED

- High performance components for customer flexibility
- UV-C LEDs at typ. 255, 265, 272 and 275 nm
- UV-B LEDs at typ. 295nm and 308nm
- Single chip
- High power output 100mW/chip
- 5.7 – 7 V operating voltage
- Diversity on chip sizes and output power
- Most output power per mm<sup>2</sup>
- Robust structure with more than 10 kh L70 lifetime

### Features Arrays

- Task-specific modules for maximum differentiation
- All advantages of 272 nm SMD GLEDs on a board
- Small footprint
- High output with 360 mW, 1.1 W or 2.2 W per array
- Array sizes: 1 x 4, 1 x 12, 5 x 5 with
- Fastest to market release design
- Low profile for ease of integration

### Applications

- Water treatment
- Air disinfection
- Surface sterilization
- UV-curing
- Dermatology
- Deodorization
- Mold growth reduction

Part Number	Description	Output Power
PKB-35	UV-C LED, typ. 255 nm ±5nm, 38mW @ 350mA & 5.9V, SMD3535, 120° Viewing Angle	38mW
PKC-50	UV-C LED, typ. 265 nm ±5nm, 90mW @ 500mA & 6.5V, SMD3535, 120° Viewing Angle	90mW
S6060	UV-C LED, typ. 272 nm +6/-7 nm, 100mW @ 250mA & 6-7V, SMD6060, 150° Viewing Angle	100mW
PKD-50	UV-C LED, typ. 275 nm ±5nm, 100mW @ 500mA & 6.4V, SMD3535, 120° Viewing Angle	100mW
PKE-50	UV-C LED, typ. 295 nm ±5nm, 100mW @ 500mA & 6.4V, SMD3535, 120° Viewing Angle	100mW
PKF-50	UV-C LED, typ. 308 nm ±5nm, 100mW @ 500mA & 6.4V, SMD3535, 120° Viewing Angle	100mW
2S2P-S6060 UVC SMD LED array	2S2P SMD UV-C LED Array, typ. 272 nm +6/-7 nm, 360mW @ 250mA/Chip, Lensed LEDs 150°	360mW
3S4P-S6060 UVC SMD LED array	3S4P SMD UV-C LED Array, typ. 272 nm +6/-7 nm, 1.2W @ 250mA/Chip, Lensed LEDs 150°	1.2W
5S5P-S6060 UVC SMD LED array	5S5P SMD UV-C LED Array, typ. 272 nm +6/-7 nm, 2W @ 250mA/Chip, Lensed LEDs 150°	2W



# Ceramic Based UV-C LED Series

## Higher Power and Narrower Binning with VLMU3520... Series and VLMU35C\*2\*... Series



The DNA of tech.™

Vishay introduces a family of ceramic-based, high power UV-C LEDs with silicone and fused silica lenses. In combinations with suitable sensors, they show their full potential in hygienic applications. When designing sterilization applications with UV-C LEDs, two limiting factors are the minimum radiant power and the maximum wavelength. Both specifications have been improved on an updated VLMU35C\*20 version. In addition to this, a higher radiant power binning the VLMU35C\*21 is now also available.

### Benefits

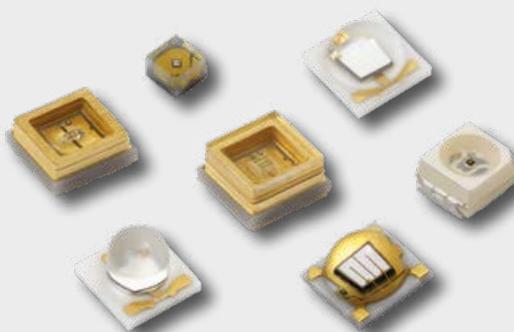
- Exceptionally long lifetime
- Compact surface-mount packages
- RoHS-compliant, halogen-free, and Vishay Green
- Compatible with reflow soldering processes
- Moisture sensitivity level of 3 in accordance with J-STD-020
- Emitters available from UV-A to UV-C
- UV-A: optical power up to 2 W
- UV-C: optical power up to 24 mW

### Applications

- UV curing Nail salon, Dental, Printing
- Blood detection
- Photocatalytic purification
- Counterfeit currency detection
- Medical application
- Sterilization

### Technology Comparison

Feature	UV LED	Mercury Lamp
Life cycle	25 k Hours	10 k Hours
Environmental	No heavy metals	Unfriendly
Security	Low-voltage, simple drive circuit	Shock sensitive
Energy	Low power consumption	Higher power consumption



### VLMU35C\*2\* - Series

Part Number	Status	Color	Radiant Power (mW)			Wavelength (nm)			Forward Voltage (V)			AT IF <sub>spec</sub> (mA)	Technology
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
VLMU35CB20-275-120	OLD	UV-C	7	10	-	270	277	285	5.00	6.50	7.00	100	AlGaIn
VLMU35CB20-275-120	UPDATE		10	13.5	-	270	273	280	5.00	6.20	7.50	120	AlGaIn
VLMU35CB21-275-120	NEW		12	13.5	-	270	273	280	5.00	6.20	7.00	120	AlGaIn
VLMU35CT20-275-120	OLD		12.5	19	-	270	277	285	5.00	6.50	7.00	150	AlGaIn
VLMU35CT20-275-120	UPDATE		16.5	21.5	-	270	274	280	5.00	6.30	7.00	180	AlGaIn
VLMU35CT21-275-120	NEW		18.5	21.5	-	270	274	280	5.00	6.30	7.00	180	AlGaIn

### Ceramic-based high power UV-A LED series with silicone lens for long life time

Part Number	Package	Color	Radiant Power (mW)			Wavelength (nm)			Forward Voltage (V)			AT IF <sub>spec</sub> (mA)	Technology
			Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
VLMU3520-385-060	SMD ceramic high power	Ultra-violet	740	900	-	380	385	390	3.2	3.6	4.0	500	InGaIn
VLMU3520-395-060			740	900	-	390	395	400	3.2	3.6	4.0	500	InGaIn
VLMU3520-405-060			740	900	-	400	405	410	3.2	3.6	4.0	500	InGaIn
VLMU3520-385-120			780	930	-	380	385	390	3.2	3.6	4.0	500	InGaIn
VLMU3520-395-120			780	930	-	390	395	400	3.2	3.6	4.0	500	InGaIn
VLMU3520-405-120			780	930	-	400	405	410	3.2	3.6	4.0	500	InGaIn

# Deep-UV LED

The world's highest power output of 50 mW, emitting at 265 nm: ideal for water purifiers



## Deep UV 265 nm – ZEUBE265 Devices Ideal for Water Purification



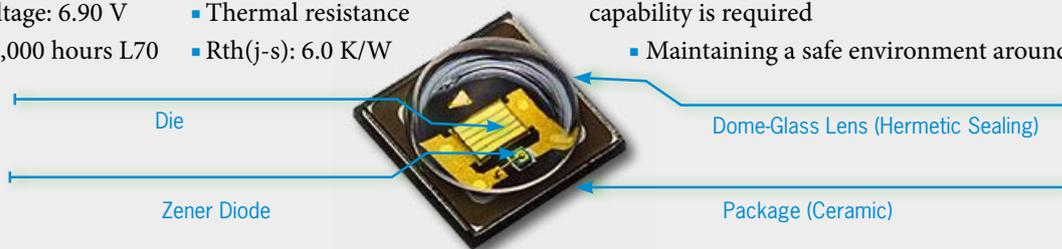
Stanley's 265 nm LED achieves a higher bactericidal effect than other wavelength LEDs. The AlN substrate makes it possible to reduce the density of dislocations up to 10,000 times in comparison to common UV-C LEDs. In addition the substrate drastically improves the permeability below 300 nm. This leads to a high output power of 50 mW. There is no noticeable decrease of efficiency as forward current and temperature rise..

### Typical Specifications (Ta=25°C, If = 400 mA)

- Wavelength: 265 nm
- Output power: 50 mW
- Forward voltage: 6.90 V
- Lifetime: 10,000 hours L70 (Tj=70°C)
- Light distribution: 120°
- Thermal resistance
- Rth(j-s): 6.0 K/W

### UV germicidal irradiation:

- No chemicals, no odor residue
- Sterilizing objects that people may touch or put in their mouth
- Sterilizing food, medicines, etc., for which a high sterilizing capability is required
- Maintaining a safe environment around children and pets



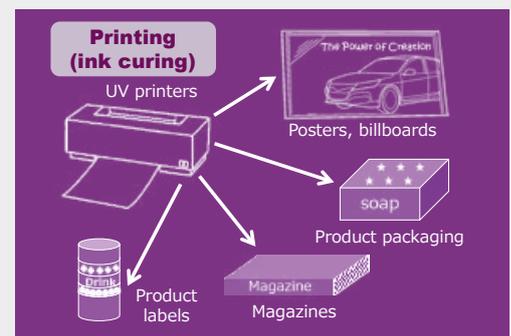
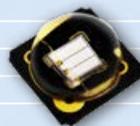
## UV-A – NDU1104ESE

High reliability and low thermal resistance LED adopting an AlN substrate and anti-UV silicone resin. Thanks to its low thermal resistance characteristics, it achieved an even higher quality than other companies' products.

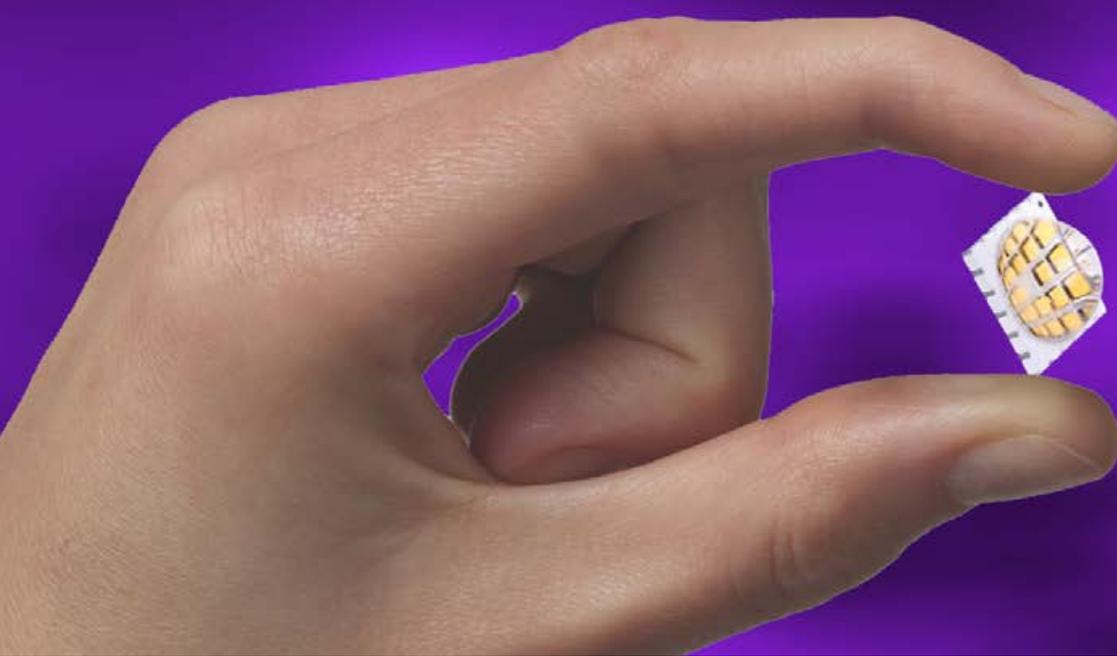
### Features

- High output and high heat dissipation
- Product variations
- Distribution angle: 115/130
- Narrow spectral width: 10 nm
- Single peak wavelength: 365/385/395/405 nm

Type		Mid-Power type				Units
Part No.		NDU1104ESE series				
Wavelength	λp	365	385	395	405	nm
Light Output	Po	950	1,100	1,100	1,100	mW
Forward Voltage	VF	3.6	3.4	3.4	3.4	V
Spatial Distribution	2θ1/2	130				deg.
Thermal Resistance	Rth (j-s)	3.0				°C/W
Max Forward Current	IF	700				mA
Junction Temperature	Tj	90				°C
Operating Temperature	Topr	-10 to 85				°C
Storage Temperature	Tstg	-40 to 100				°C
Size	LxWxH	3.5x3.5x2.05				mm







# LED Engin UV-A 365-410 nm LED Emitters

## Bright Light. Tiny Package.

LED Engin UV-A emitter offering ranges from 365nm to 405nm, with electrical input power ranging from 5W to 80W. LED Engin emitters are based on LuxiGen™ platform – ceramic substrate with glass dome or flat lens.

LuxiGen emitters deliver a combination of high-power density, low thermal resistance and robust, reliable performance. High consistency of power density ensure stable performance over lifetime. High W/cm<sup>2</sup> power density helps to reduce the number of curing cycles. The products are available as emitter only (L1) and emitter on star MCPCB (L2) to ease customer evaluation.

### Benefits

- Extremely high flux density based on maximum drive current
- Lowest thermal resistance keeps LED running cooler
- Robust ceramic package with glass lens for harsh operating conditions
- 5nm-wide bins in 365 nm, 385 nm, 395 nm and 405 nm allows for precise wavelength tuning to match application
- Beam pattern optimized for maximum flux density and uniformity

### Typical Applications

- Ink and adhesive curing
- Dental Curing and Teeth Whitening
- Counterfeit Identification
- Leakage Detection
- Sterilization and Medical
- DNA Gel

Part Number	Wavelength (nm)		Dimensions			Radiant Power (mW)	IF for $\phi_e$ (mA)	Forward Voltage, VF		Angle of Half Intensity ( $\pm$ °)
	Min.	Typ.	Length	Width	Height			Typ.	Max.	
LZ1-00UV0R-0000	365	370	4.4	4.4	2.7	1360	700	3.8	4.5	32
LZ4-04UV00-0000	365	370	7	7	1,3	4100	700	15.2	18	55
LZ1-00UB0R-00U4	385	390	4.4	4.4	2.7	1380	700	3.4	4.2	36
LZ4-00UB0R-00U4	385	390	7	7	3,9	5400	700	14	16.8	55
LZC-04UB0R-00U4	385	390	9	9	1.4	11000	700	42	50.4	57.5
LZP-04UB0R-00U4	385	390	12	12	2.9	22500	700	21.0/Ch	25.2/Ch	58.5



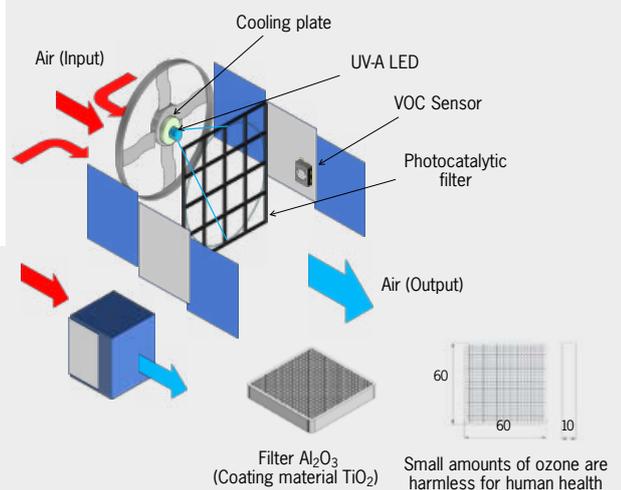
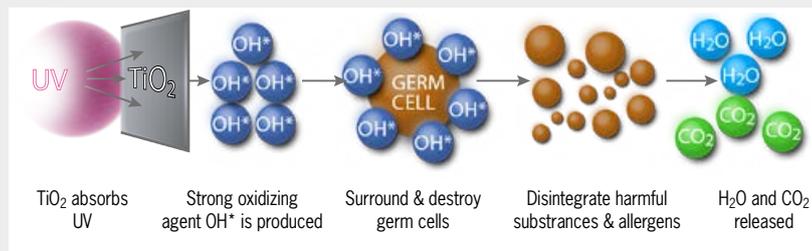
New generation LZ1 and LZ4 in 395nm and 405nm coming in March 2022



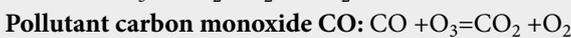
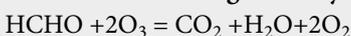
## UV-C Module for Water, Air and Surface Purification by UV LED Best Fit for Smart, Integrated and Intelligent Disinfection Systems (VOC, UV and PIR sensors)

UV-C LED sterilization and disinfection modules can be used in application in the fields of water purification, surface sterilization, and air sterilization. Due to the current epidemic situation, a variety of UV LED sterilization modules for air sterilization are popular, which can be adapted to sterilize air in different applications. The compact size of UV-C LED sterilization function module for air purification equipment and air-conditioning equipment and other compact products, makes it easy to integrate with the customer terminal equipment. And its special concentrating design can gather the ultraviolet rays radiated by the LED inside the equipment. It improves the efficacy of UV-C, and at same time it resolves leakage of ultraviolet rays to safety problem.

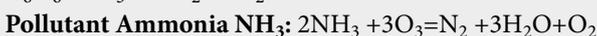
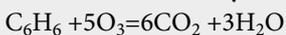
### Definition and Principle of Operation of Odor Eliminator via Photocatalysis Filter and UV-A LED (365 nm)



#### Pollutant in building industry formaldehyde HCHO:



#### Pollutant benzene/hydrocarbon C<sub>6</sub>H<sub>6</sub>:



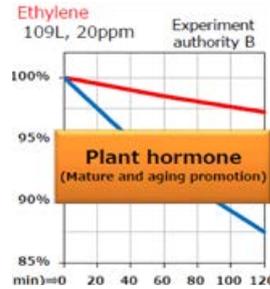
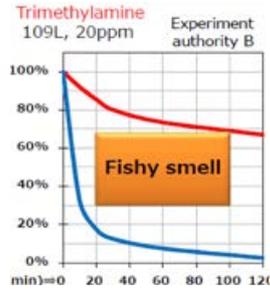
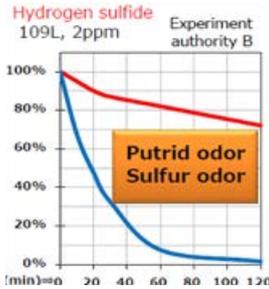
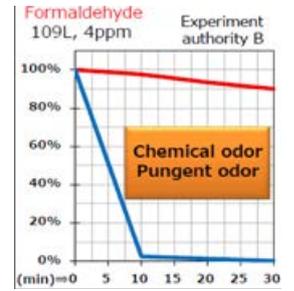
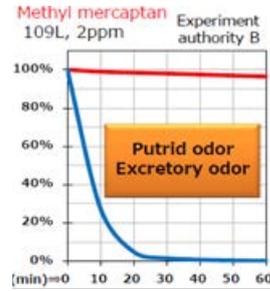
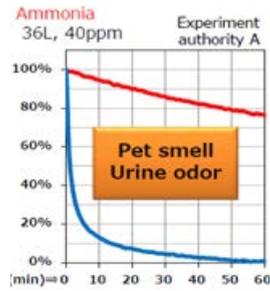
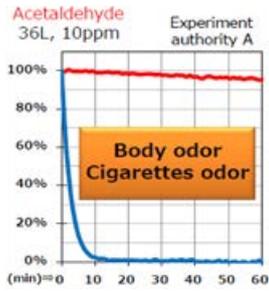
### UV-C LED Module Products List for Water Purification

Model	LBM1101	LBM3502	LBM1801	LBM1802	LBM3501	LBM4201	LBM6301	LBM3601
Appearance								
Type	Static				Dynamic			
Static Tank Size/Dynamic Flow Rate	1-2L	1-5L	1-10L	1-10L	0.2-1L/min	1-2.5L/min	6-8L/min	2-10L/min
Dimension (mm)	Φ11.3 x 8	Φ35 x 27	Φ18 x 162	Φ25 x 12	Φ35 x 100	Φ42 x 128	Φ63 x 145	Φ36 x 110
Applications	<ul style="list-style-type: none"> <li>Water dispenser tank</li> <li>Dehumidifier water tank</li> </ul>		<ul style="list-style-type: none"> <li>Fish tank</li> <li>Tumbler</li> </ul>		<ul style="list-style-type: none"> <li>Water purifier waterway</li> <li>Water dispenser waterway</li> </ul>		<ul style="list-style-type: none"> <li>Smart toilet</li> <li>Coffee machine</li> </ul>	
Disinfection Efficiency (E. coli)	>Log3 (99.9%)				>Log3 (99.9%)			

# List of Test Results by Target Components

— UV-A + Photocatalysts

— Natural attenuation



**Deodorization effect has been confirmed for various components**

Experiment authority A:  
Kanagawa Institute of Industrial Science and Technology (KISTEC)

Experiment authority B:  
Japan Food Research Laboratories

## UV-A LED Package

### Printing Curing

- >400mW/cm<sup>2</sup>
- Ultra high radiant intensity
- Focus light

### PCB Curing/Exposure

- 250-400mW/cm<sup>2</sup>
- Ultra high radiant intensity
- Focus light/ Collimated Light

### Lower Power Curing

- Wide angle
- High performance/ low Cost

Lifetime: L70 > 20000 hrs | L50 > 50000 hrs



### Photo Catalyst

**LBS0601** (60x60x12.5 mm)

**LBS1001** (100x100x12.5 mm)

**LBS1002** (100x40x8 mm)

**LBS1401** (148x145x12.5 mm)

**LBS1801** 80x110x12.5 mm)

**UV-A solutions for static & flow type air purifier**

**Customized UV-A light and photo catalyst**

## UV-C LED Package

### High Power/Air Disinfection

- Ultra high radiant intensity
- High flow rate (> 2L/min)

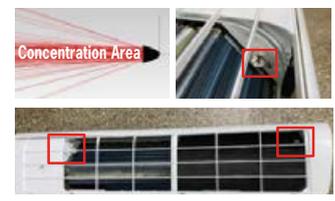
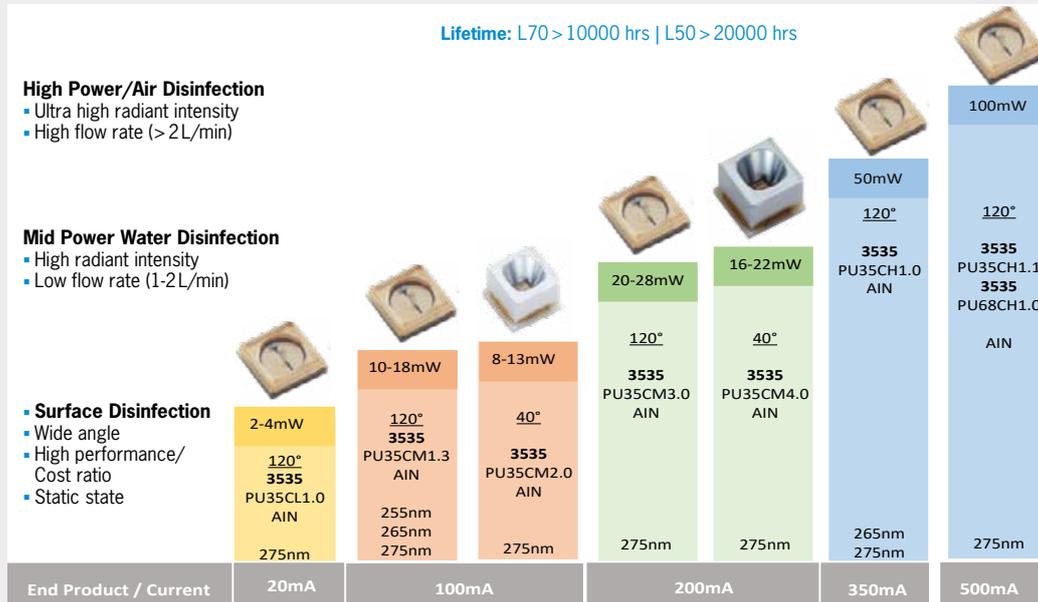
### Mid Power Water Disinfection

- High radiant intensity
- Low flow rate (1-2L/min)

### Surface Disinfection

- Wide angle
- High performance/ Cost ratio
- Static state

Lifetime: L70 > 10000 hrs | L50 > 20000 hrs



Kettle



**STELLA**  
Large, ultra slim  
UV cluster solution



UV-A UV-B UV-C

**ZORYA**  
~340° omni-  
directional lens



UV-A UV-B UV-C

**ALISE**  
Cost efficient and versatile  
reflector system for UV



UV-A UV-B UV-C

**VIOLETTA**

Single silicone lens specifically  
for UV-C applications

UV-A UV-B UV-C



**VIOLET**

The first standard silicone optic  
in the world designed speci-  
fically for UV-C applications

UV-A UV-B UV-C



**LEDiL**<sup>®</sup>

## Optics for UV Applications

### Optics for UV-A, UV-B and UV-C LEDs

LEDiL was the first company to offer injection moulding optics designed and tested for UV-C, making the lenses vastly superior when compared to other silicone solutions on the market. Lenses such as VIOLET, use a special silicone grade that has a very high transmission of UV-C wavelengths and can be used for complex lens designs with easy to achieve ingress protection. LEDiL aluminium reflectors are also highly reflective at all UV wavelengths making them especially suitable for UV-C LED clusters.

#### Benefits

The tiny amount of light UV-C LEDs produce can be focused more effectively with the help of the right optics. This can lead to increased radiation output on the desired area and reduce the time needed for exposure while maintaining the same dosage. Using different LED clusters with compatible lenses makes luminaire power output easily scalable for different purposes.

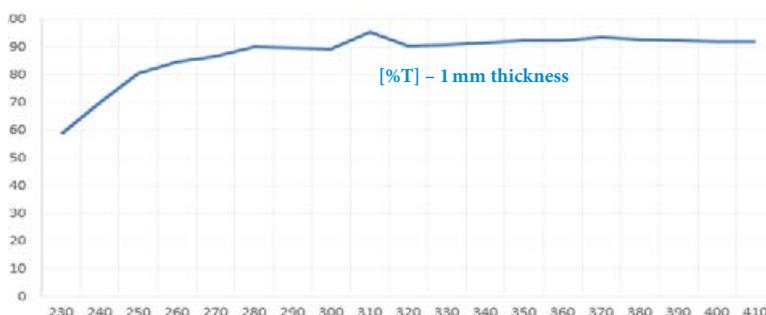
#### Applications

Printing, curing, lithography, sensing medical, breeding, horticulture, fishery, insect attracting lamps, sterilisation, degermination.

#### LEDiL Materials for UV Optics

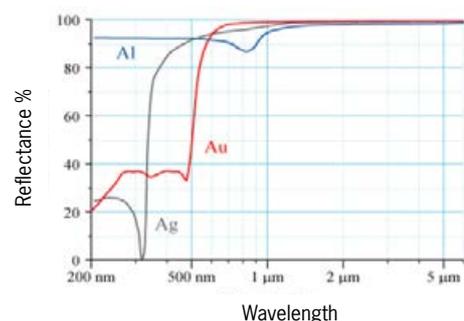
##### LEDiL Silicone

- High transmission in UV wavelengths, including UV-C
- Suitable for complex optical lens designs
- Easy to achieve ingress protection



##### Aluminium

- Cost effective option
- For UV LED clusters
- Highly reflective in all UV wavelengths





Constant Voltage – Indoor



Constant Voltage – Outdoor



Programming Tools & Accessories



Constant Current – Outdoor



Constant Current Linear – Indoor



Constant Current Compact – Indoor



# OPTOTRONIC LED Drivers

## Light is Universal



ams OSRAM offers a comprehensive portfolio of OPTOTRONIC LED drivers suitable for practically any application in the area of LED lighting: SELV and „non-isolated“, compact and linear, constant current and constant voltage, indoor and outdoor.

### Compact OPTOTRONIC LED Drivers

- 1...100 % amplitude dimming of LED DALI drivers with 10-50 W
- Compact LED drivers, 4 current settings selectable via DIP switch

### Linear OPTOTRONIC LED Drivers

- 1...100 % amplitude dimmed, non-isolated DALI driver
- 11 mm ultraflat, non-isolated DALI driver, also with 1...100 % amplitude dimming
- Linear LED drivers with current settings selectable via DIP switch

### OPTOTRONIC LED Drivers for Outdoor Applications

- ON/OFF driver: 100/150/200 W OT...P5 for independent mounting, street and urban lighting, industry
- High surge protection up to 6 kV
- Adjustable and wide output current range
- High IP rating (IP65)
- Long lifetime of up to 100,000 h

### LED Driver Types

- Compact constant current LED drivers
- Linear constant current LED drivers
- Constant current LED drivers for outdoor applications
- Constant voltage LED drivers (24 V/12 V)

### OSRAM Tuner4TRONIC

The comprehensive tool chain for the entire life cycle of your luminaires. Tuner4TRONIC is a powerful, digital end-to-end solution for development, production and maintenance.

- Software suite for OEM use to configure all programmable OPTOTRONIC®, QUICKTRONIC® and POWERTRONIC® drivers in the luminaire manufacturing process
- Best suited for programming in luminaire manufacturing
- For quick manual as well as automatic programming
- Works with DALI magic and OT Programmer hardware or NFC
- Easily enables pre-parameterization, also when using the pre-parameterization service from ams OSRAM



# RECOM

## LED Drivers for Integrated Lighting



RECOM's constant current (CC) and constant voltage (CV) low profile LED drivers have been designed for cost-sensitive applications. Screw terminal or wired versions make them ideal for built-in or independent power supplies for LED lighting. Advances in LED chip technology mean that low power supplies are sufficient for many LED illumination applications such as spotlights, reading lights and display lighting. These low cost series meet the growing demand for compact driver, while the low profile solutions meet the needs of the high brightness LED lighting market. RECOM LED drivers are ENEC, UL8750 and CE certified, with special versions also EAC (Russia), PSE (Japan) or RCM (Australia) certified.

### RACD03 (-PSE) and RACD04 Series

The RACD03 (-PSE)/04 can drive one to four high brightness LEDs with 350 mA, 500 mA or 700 mA constant current for accent lighting. The RACV04 has 12 V or 24 V CV outputs for strip lighting. These series contain a built-in EMC input filter for universal input voltages and meet EN61347, EN55015 and FCC18A without any additional external components. The LED drivers are designed to provide a long, trouble-free life and are rated at >20,000 hours, equivalent to eight hours daily operation up to seven years.



#### Features

- Universal AC input voltage (90 to 264 V<sub>AC</sub>)
- Low standby consumption (ErP conform)
- 3kVAC double insulated isolation
- Wired or screw terminal connections
- IP64 rated (RACD03)
- Both compact and low profile packages available

### RACD-LP Series

A low profile design ( $\leq 13$  mm) allows them to be invisibly built into furniture, discreetly mounted under shelves or integrated in space-restricted applications. Their SELV outputs are suitable for both independent and built-in power-supply LED luminaires. They are available with 6W, 12 W or 20 W output power.



#### Features

- Constant current outputs of 350 or 700 mA
- Constant voltage outputs of 12 V or 24 V
- 230 VAC input
- Low standby consumption (ErP conform)
- Isolation: 3 kVAC double insulated
- Screw terminal connections with cable clamps

#### Typ. Applications

- Integrated LED lighting
- Accent lighting
- Strip lighting
- Recessed lighting systems
- Furniture, cove & cabinet lighting



# DC/DC LED Driver ICs

## For Keeping the Current at UV LEDs Reliably under Control



Infineon's BCR linear LED driver ICs are the best choice for driving LED strings supplied by a DC voltage source. The BCR regulators are suitable for driving currents from 10mA to 250mA. That is why they are the best solution for low- and mid-power LEDs. For high-power LEDs, the linear constant current LED controller ICs in combination with an external power stage allow for the greatest design flexibility.

### Features

- Supply voltage 8V to 80 V
- Integrated HS MOSFET switch, up to 1.5 A average output current
- Efficiency up to 97 %
- LED current precision  $\pm 3\%$
- Up to 2 MHz switching frequency
- Low typical  $R_{DS(on)}$  of 275 m $\Omega$
- Soft-start to protect primary side
- External shunt resistor connected to GND to set LED target current
- Low power shutdown pin
- Overtemperature protection, UVLO

Supplier	Description	Adjustable current range	Voltage drop	Breakdown voltage	Protections	Package total power dissipation	Dimming	Qualification	Size
BCR401W BCR402W	Linear LED driver IC	10 – 60 mA	1.2V	18V	Negative thermal coefficient	500mW	Ext. Digital transistor required, bus voltage	AEC Qualified	SOT-343
BCR401U BCR402U BCR405U		10 – 65 mA	1.4V	40V		750mW			
BCR420U BCR320U		10 – 250 mA	1.4V	25V / 40V		1000mW	PWM dimming via enable pin, bus voltage		SC-74
BCR450	Linear LED controller IC	50 mA – 1 A	0.5V	27V	Thermal shut down at 120 °C	Depends on transistor	PWM dimming via EN pin	Industrial	SC-74
BCR430U BCR431U	Linear LED driver IC	20 – 100 mA 8 – 37 mA	0.135V at 50 mA 0.345V at pin $V_{drop}$	42V	Smart temperature controlling circuit	600mW	PWM dimming via $R_{set}$ pin, bus voltage		SOT-23-6
BCR601	Linear LED controller IC	Bipolar or NMOS transistor up to xA	0.345V at pin $V_{drop}$						60V
BCR602			Depending on $V_{in}$ , system configurable	OTP	Analog down to 3% and PWM dimming down to 1 %	SOT-23-6			





# Fan Portfolio

Best Fit for Project Odor Killer and Germ Contamination Applications



## DC Fan



### Key Features

- Bearing: Dual Ball, Sleeve, Ball
- Rated Voltage: 5 – 48V
- Air Flow: 0.2 – 290 CFM
- Speed: 900 – 26500 R.P.M
- Lifetime: 50K - 100K hours
- Size: 25 x 25 – 172 x 51 mm

### Key Applications

- Interior Vehicle
- Small portable devices

### Key Benefits

- Compact design
- Longevity (Dual Ball Bearing)
- Wide range of sizes

### Why should I buy this product?

- IP protection according to the requirement
- PWM, speedometer according to the requirement
- Specification according to customer requirements (connector, cable length)
- Good price-performance ratio

## AC Fan



### Key Features

- Bearing: Longlife Ball
- Rated Voltage: 110 – 240 VAC
- Lifetime: 50K – 70K hours
- Size: 60 – 250 mm

### Key Applications

- Indoor

### Key Benefits

- Compact design
- Longevity (Dual Ball Bearing)
- Wide range of sizes

### Why should I buy this product?

- IP protection according to the requirement
- PWM, speedometer according to the requirement
- Specification according to customer requirements (connector, cable length)
- Good price-performance ratio

## Axial EC



### Key Features

- Bearing: Ball
- Rated Voltage
  - Single phase 200 – 277 VAC
  - Three phase 380 – 480 VAC
- Lifetime: 50K – 70 K hours
- Size: 170 – 910 mm

### Key Applications

- Indoor

### Key Benefits

- Brushless DC motor fan driven by applying AC source
- PWM or voltage speed control
- High reliability/ Long Life motor with multi-protection function

### Why should I buy this product?

- Efficiency of BLCD motor is higher than AC motor: by 30-50%, depending on type of AC motor
- Efficiency by BLCD motor with PWM speed control is higher than AC motor with transformer or inverter speed control: by approximately 40%
- Delta EC Fan offers approxi-mate double the efficiency comparing to the traditional AC Fan

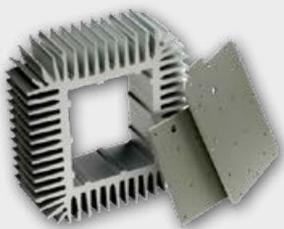


# Thermal Management UV LEDs

## Disinfection and Purification with UV-C LEDs



### Profile Heat Sinks UV-A / B / C



#### Key Features & Benefits

- High power dissipation
- Convection possibility must be available
- Complex applications

### Stamped Heat Sinks UV-A / (B)



#### Key Features & Benefits

- Low power dissipation
- Less reradiation
- Limited space for heat sinks

### Pin Heat Sinks UV-A / B



#### Key Features & Benefits

- Medium power dissipation
- Convection possibility
- Simple application

### Air Cooling UV-A / B / C



#### Key Features & Benefits

- High power dissipation
- For poor free natural convection
- Limited space for heat sinks

### Cold Plates UV-A / B / C



#### Key Features & Benefits

- Very high-power dissipation
- Specific applications (e.g. industrial requirements or disinfection)

Cooling solutions can only be selected on the base of the final application. Successful cooling solutions for UV LEDs always will be customized according to the specific application. The choice of the cooling solution depends on the heat to be dissipated, the size and number of LEDs used.

### Most Important Factors

LED Features	Applications	Cooling Solution	Advantages	Disadvantages
<ul style="list-style-type: none"> <li>▪ Size</li> <li>▪ Quantity</li> <li>▪ Single / Array</li> <li>▪ Power Type</li> <li>▪ Thermal conditions</li> <li>▪ Operating temperature</li> </ul>	<ul style="list-style-type: none"> <li>▪ Case / housing</li> <li>▪ Temperature requirements</li> <li>▪ Air flow within application</li> <li>▪ Space requirements</li> <li>▪ Special requirements</li> </ul>	<b>Passive</b> <ul style="list-style-type: none"> <li>▪ Profile heat sinks</li> <li>▪ Pin heat sinks</li> <li>▪ Stamped heat sinks</li> </ul>	<ul style="list-style-type: none"> <li>▪ High cooling capacity</li> <li>▪ Noiseless</li> <li>▪ No vibrations / shocks</li> <li>▪ No additional maintenance</li> <li>▪ Good for customization</li> </ul>	<ul style="list-style-type: none"> <li>▪ More space needed within application</li> </ul>
		<b>Active</b> <ul style="list-style-type: none"> <li>▪ Fans</li> <li>▪ Liquid cold plates</li> </ul>	<ul style="list-style-type: none"> <li>▪ Very high cooling capacity</li> <li>▪ High efficiency</li> <li>▪ Small space requirements</li> <li>▪ Integration into existing cooling solutions</li> </ul>	<ul style="list-style-type: none"> <li>▪ Additional maintenance</li> <li>▪ Noise &amp; dust possible</li> <li>▪ Vibrations or shocks possible</li> </ul>

# UV Sensors

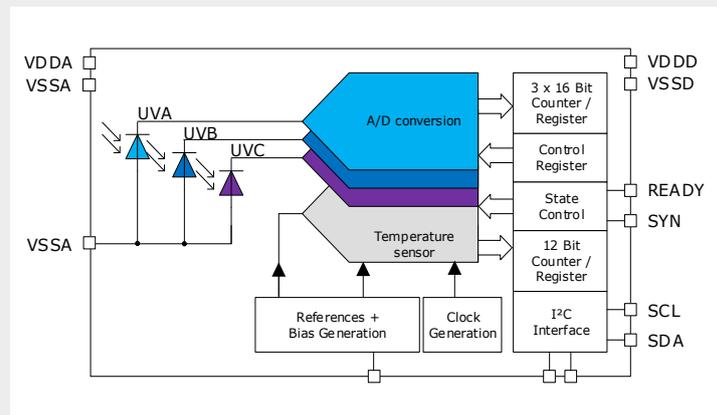
## UV Sensor Chip

This Chip enables the detection of microorganism concentration and the optimization of disinfection due to dose adjustment according to water purity. Regarding the water quality in washing machines, the optimization of washing cycle and detergent dose adjustment is made possible.

### Features & Benefits

- Interference filter technology
- UV-A/B/C filter characteristic (238 nm - 415 nm)
- 250M:1 dynamic range (16...24 Bit ADC) with a sensitivity up to 2.1m counts/( $\mu\text{W}/\text{cm}^2$ )
- Temperature range from -40 up to 125°C
- Temperature compensation on chip
- Radiation measurements (reflection, transmission) from low radiation to bright radiation conditions
- Fast/high accurate radiation and fluorescence detection
- Usability in harsh environments
- EVK platform for use case evaluations and developments
- USB interface, housing
- EEPROM on sensor board
- Optical adapter (0/45°) for light metering & reflective measurement
- Easy prototyping of optical stacks
- Evaluation software GUI for sensor configuration, visualization, spectral data acquisition, export and post processing

### Functional Blockdiagram



### Applications

- Water purifiers
- Water purification systems
- Washing machines
- Dishwashers

## Detectors for UV Radiation Monitoring

Given the potential health hazard UV radiation poses, these SiC UV photodiodes are indispensable for monitoring your application.



### Benefits

- Solar blind: No reaction to visible light
- Large wavelength range: UV-A, UV-B, and UV-C
- Robust: Radiation doses of up to 1,000 W/m<sup>2</sup>; temperatures from cold space to hot oven (250 °C)
- Ultra-sensitive: Hybrid versions with large dynamic range of up to 0.26  $\mu\text{W}/\text{cm}^2$



# LTR-390UV-01: Optical UV Sensor



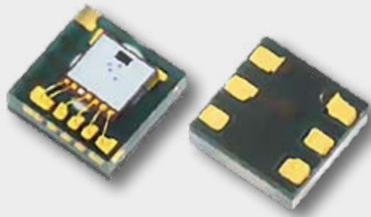
The LTR-390UV-01 is an ambient light sensor (ALS) and an ultraviolet light sensor (UVS) in a single miniature 2x2 mm chipled SMD package. It provides a linear ALS response over a wide dynamic range of 1:18,000,000. The sensor has a programmable interrupt with hysteresis to response to events, removing the need to poll the sensor for a reading and improving system efficiency. This CMOS design and factory-set one time trimming capability ensure minimal sensor-to-sensor variations for ease of manufacturability to the end customer.

### Features & Benefits

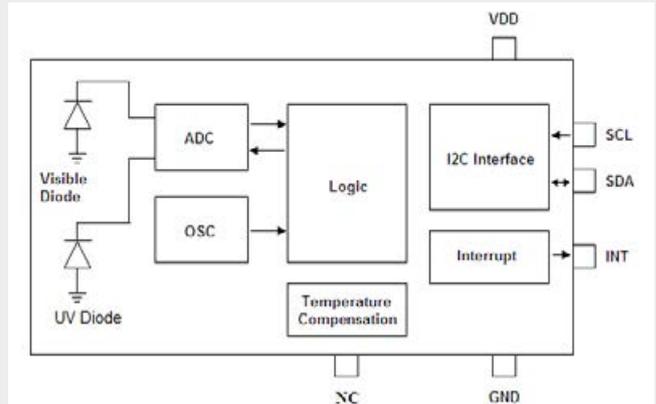
- I<sup>2</sup>C interface capable of Standard mode @100 kHz or fast mode @400 kHz communication; 1.8 V logic compatible.
- Low power consumption with sleep mode capability.
- UVS/ALS Features: 13 to 20 bits effective resolution; Close to human eye spectral response; automatic rejection for 50 Hz/60 Hz lighting flicker.

### Applications

- Effectively protecting people from sunburns, cancer or eye damage.
- Brightness and color control of display panels in mobile, computing and consumer device.



### Functional Block Diagram



LTR-390UV-01 contains 2 integrated photodiodes (ALS/UVS) for respective photocurrent measurements.

The photodiode currents are converted to digital values by ADCs. The sensor also includes some peripheral circuits such as an internal oscillator and voltage reference.

# ML8511A: UV Sensor with Voltage Output

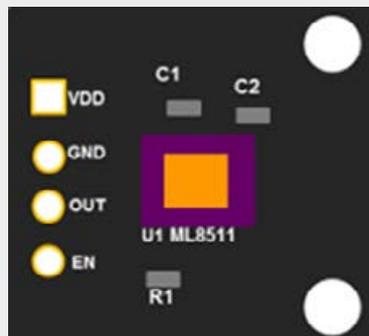


The ML8511A is an UV sensor, which is suitable for acquiring UV intensity indoors or outdoors. The ML8511A is equipped with an internal amplifier, which converts photo-current to voltage depending on the UV intensity. This unique feature offers an easy interface to external circuits such as ADC. In the power down mode, typical standby current is 0.1  $\mu$ A, thus enabling a longer battery life.

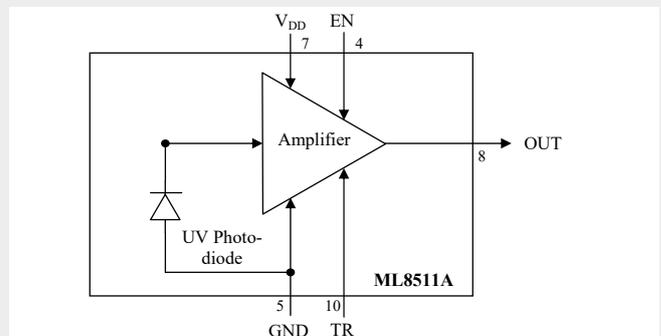
### Features

- Photodiode sensitive to UV-A and UV-B
- Embedded operational AMP
- Analog voltage output
- Low supply current (300  $\mu$ A typ.) and low standby current (0.1  $\mu$ A typ.)
- Small and thin surface mount package (4.0 mm x 3.7 mm x 0.73 mm, 12-pin ceramic QFN)

### Board Layout



### Block Diagram



Pin	Symbol	I/O	Function
7	VDD	PW	Supply voltage. Decouple this pin to ground with 0.1 $\mu$ F cap.
5	GND	PW	Ground
4	EN	I	Active high enable pin. (High: Active mode, Low: Standby mode)
8	OUT	O	Output (Low in power down or standby mode)
10	TR	I/O	Internal ref. voltage. Decouple this pin to ground with 1 nF cap.

### Applications

- Smartphone
- Wearable healthcare device
- Bicycle navigation
- Smart watch
- Weather station
- Accessory



# VOC Sensor SGP40

## Air Quality Sensor (Particulate Matter)

**SENSIRION**

The SGP40 is an integrated CMOSens® sensor system on a single chip based on a metal-oxide sensor. By relying on Sensirion’s proven MOXSens® Technology, the sensor’s unmatched robustness against contamination by siloxanes results in outstanding long-term stability in terms of sensitivity and response time. Pushing the sensing material and microhotplate technology to the next level, the SGP40 offers a drastic reduction in power consumption, making it suitable for battery-driven applications as well. Sensirion’s industry-leading production processes guarantee high reproducibility and reliability and helps enabling accurate measurements of Volatile Organic Compounds (VOC) to improve IAQ and your quality of life. The VOC Index indicates to what extent the indoor air quality has deteriorated or improved compared to the sensor’s average VOC environment. This information can be used, e.g., for gradually controlling the fan of an air treatment device or to provide users with feedback on their daily activity profile.

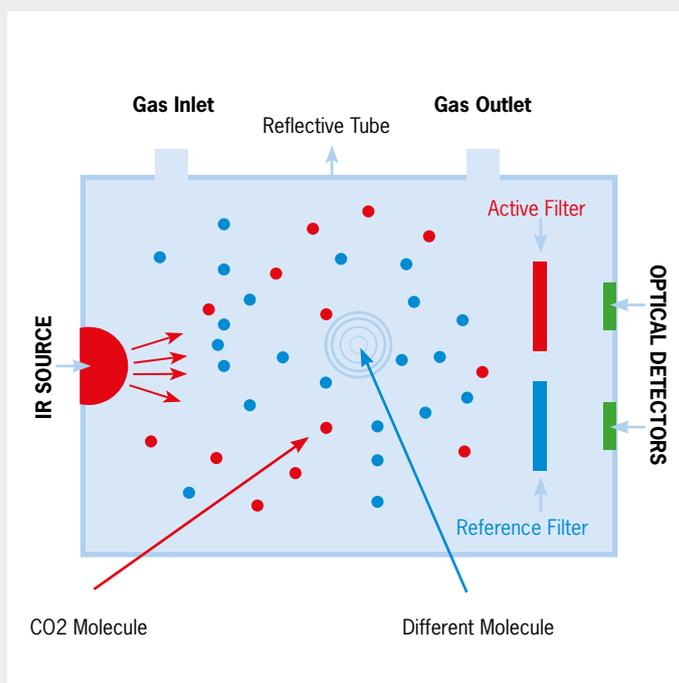
### Features

- Complete sensor solution for detecting VOC events with a simple interface, powerful VOC Algorithm, easy integration of driver package and on-chip humidity compensation
- Proven performance improved shown by low device-to-device variation under field or lab conditions in the 2nd generation and fast start-up behavior
- Reliable and accurate long-term user experience with robust and reliable hardware, stable and repeatable signal output over lifetime, smart adaptation to any indoor environment and an excellent longevity of > 10 years

### Electrical Specifications

<b>Supply Voltage Range</b>		1.7 - 3.6 V
<b>Idle Current</b>		34 µA
<b>Current consumption during operation</b>	at 1.8 V	3.5 mA
	at 3.3 V	2.6 mA
<b>Interface</b>		I <sup>2</sup> C

### CO<sub>2</sub> VOC Sensor NDIR Measuring Principle





# Pyroelectric Infrared Sensor and Lens of IRA-S Series

## IRA-S210ST01 IML-0685, IML-0688

IRA series offers pyroelectric infrared sensor that deliver high sensitivity and reliable performance made possible by Murata's ceramic technology. Used mainly in security equipment. Combining performance with low costs, the IRA-S series makes it easier to use pyroelectric infrared sensor in security application and general consumer equipment.

### Key Features

- **Functionality:** Conversion of a signal generated by temperature change into a corresponding electric current
- **Low power**
- IRA-S series covers different target detection areas

### Key Benefits

- **Compact design**
- **Energy efficiency**
- **Module comprising ambient light sensor, proximity sensor and signal processing IC**
- **Desing-in capable**

### Lens IML Series

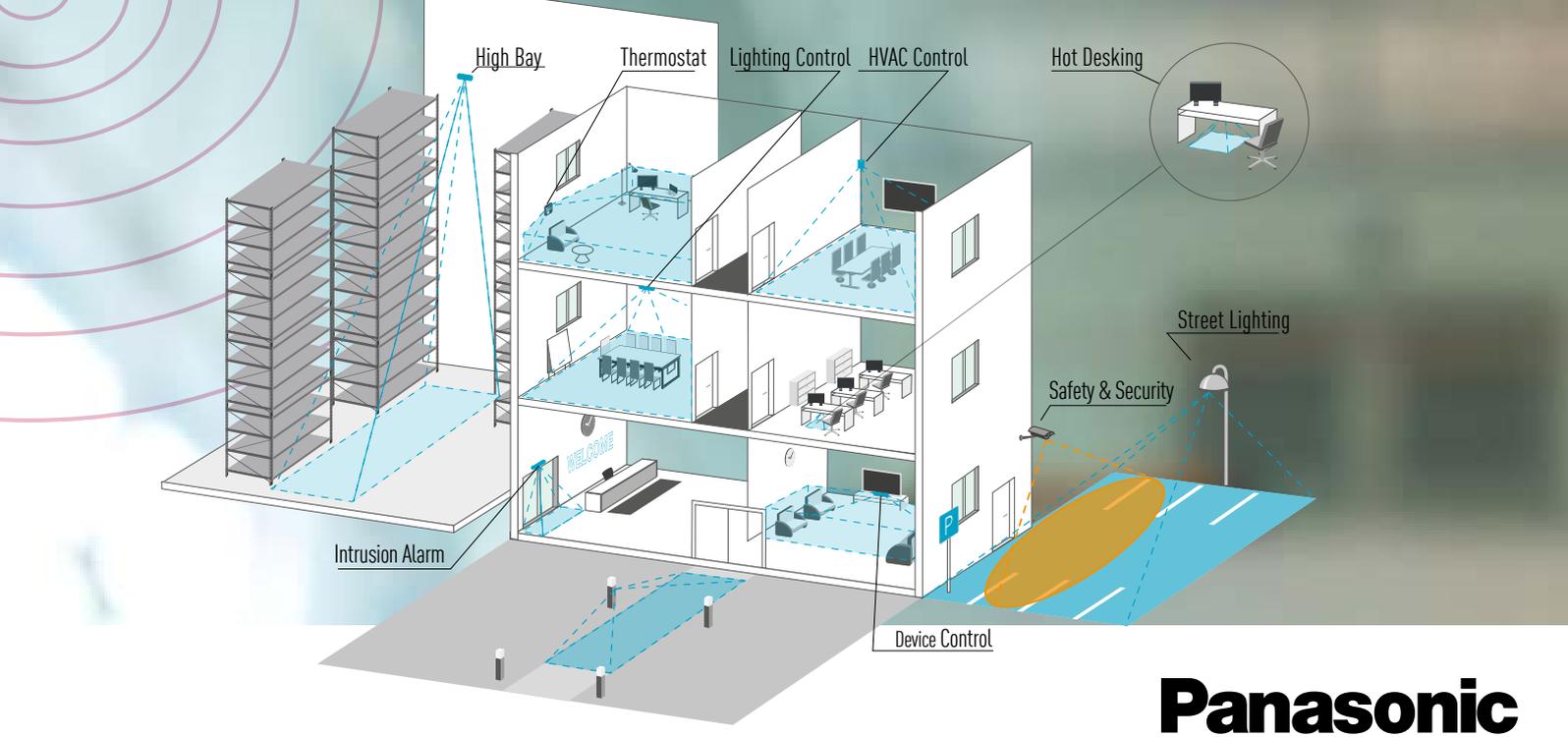
IML series offer Fresnel lens for Murata pyro-electric infrared sensors. These are classified as a product for lead type sensors. Please choose the suitable lens for target detective area.



### Key Applications

- Security systems
- Motion Sensor
- Lighting automation

Part Number	Status	Field of View	Electrode	Shape	Responsivity (typ.)	Optical Filter	Operating Temp. Range	Storage Temp. Range
IRA-S200ST01A01	In Production (Recommended)	theta1=theta2=45deg.	(2.0x1.0mm)x2	Lead	4.6mV	5micro meter Long Pass	-40 to 70 °C	-40 to 85 °C
IRA-S210ST01		theta1=theta2=45deg.	(2.0x1.0mm)x2	Lead	4.6mV			
IRA-S220ST01A01		theta1=theta2=45deg.	(2.0x1.0mm)x2	Lead	4.6mV			
IRA-S230ST01		theta1=theta2=45deg.	(2.0x1.0mm)x2	Lead	4.6mV			
IRA-S400ST01A01		theta1=38deg.,theta2=45deg.	(2.3(gap0.3)x1.0mm)x2	Lead	7.0mV			
IRA-S410ST01		theta1=38deg.,theta2=45deg.	(2.3(gap0.3)x1.0mm)x2	Lead	7.0mV			
IRA-S500ST01A01		theta1=theta2=44deg.	(1.0x1.0mm)x4	Lead	3.3mV			
IRA-S510ST01		theta1=theta2=44deg.	(1.0x1.0mm)x4	Lead	3.3mV			
IRS-B210ST01-R1	Discontinued	theta1=50deg.,theta2=70deg.	(1.2x0.85mm)x2	SMD	3.6mV	3micro meter Long Pass		
IRS-B345ST03-R1		theta1=70deg.,theta2=50deg.	(0.8x0.7mm)x4	SMD	3.6mV			



**Panasonic**

# Passive Infrared Motion Sensors – PaPIRs

## Extremely Small and Powerful

Passive or pyroelectric infrared (PIR) sensors are thermal detectors and suitable as motion sensors. They react to a change in infrared heat radiation in the environment, e.g. by a moving person (or object). The latest Panasonic PIR generation, the EKM family, comprises two mechanically identical series: the EKMB (1  $\mu$ A, 2  $\mu$ A and 6  $\mu$ A; digital output) and the EKMC series (170  $\mu$ A; digital and analog output). The best PIR motion sensors convince with their simple plug-and-play concept, and are extremely small and powerful. The product portfolio offers solutions for almost all applications.

### Explore the EKM family with the EKMB (1,2,6 $\mu$ A) and EKMC (170 $\mu$ A) Series

<b>Aesthetic integration – Flat Square Type</b>	<b>Wide Area &amp; Ultra Slight Motion Detection</b>	<b>Low Profile Type, small and powerful</b>	<b>High Density Long Distance Type, the smallest long range sensor</b>	<b>Standard Detection Type, the bestseller</b>
With its flat and square lens, the pyroelectric passive infrared motion sensor allows an aesthetically pleasing product design.	Passive Pyroelectric Infrared motion sensors EKMB/ EKMC with small 14mm lens for detection in large areas or small objects and movements	The Low Profile Type, small and powerful! For maximum detection distances up to 5m and typical ceiling installation heights up to 3m.	The smallest long range sensor offers 128 detection zones. The digital standard sensitivity type is specified up to 12m, while the high sensitivity type, with lower thresholds is specified up to 17m.	The Standard Detection Type, the bestseller! The unobtrusive, flat lens serves detection distances up to 5m and typical ceiling installation heights up to 3m.
				
<b>Wall Installation (corner) Type, the powerful room monitoring sensor</b>	<b>Long Distance Detection Type, the powerful mid-bay sensor!</b>	<b>Slight Motion Detection Type, the powerful indoor sensor</b>	<b>Standard and Slight Motion Detection Type</b>	<b>Horizontally Wide Detection Type</b>
The Wall Installation (corner) Type, can monitor a whole room up to 12m when installed in the corner at a typical installation height of 2.5m - 3m.	The Long Distance Detection Type, the powerful mid-bay sensor! For maximum detection distances up to 12m and typical ceiling installation heights up to 7m.	The Slight Motion Detection Type, the powerful indoor sensor. For typical ceiling installation height of up to 3m.	The Standard and Slight Motion Detection Type, has two zones optimized for different movement patterns. For typical ceiling installation height of up to 3m.	The Horizontally Wide Detection Type with a patented special lens for improved radial sensitivity, a maximum horizontally field of view of 150° and a detection distance up to 5m.
				



**Lextar**

# Vertical Cavity Surface Emitting Lasers

## Driver Monitoring, Gesture Control, People Recognition, Machine Vision

Lextar continuously extends its VCSEL portfolio, which can be used for 3D depth sensing including gesture recognition, people detection, facial recognition and driver fatigue detection. Parts with automotive grade and eye safety feature are available. As one of the first suppliers worldwide, Lextar offers automotive grade VCSEL with an integrated photo diode for eye safety function. This safety feature makes the PV85Q series the first choice for driver and cabin monitoring systems but it also suites other in-cabin applications such as gesture control.

As ToF systems are operating at high modulation frequencies, the rise and fall time of VCSELS are crucial. Lextar uses special low inductance design to ensure fast switching times. Viewing angles from 50x45 degrees up to 120x90 are available to suit various applications such as driving monitoring, gesture control, machine vision and human or object detection.

### Benefits

- 3532 and 3532 ceramic package
- 850nm and 940nm
- High quality diffuser for high uniformity
- Integrated photo diode for eye safety
- Up to 4W CW optical power

### Applications

- Driver monitoring
- Gesture control
- Machine vision
- People/object detection
- Night vision systems



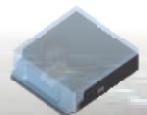
Form	Series	Package	Power	Wavelength	FoV	Eye safety	Automotive Grade
	PV85D	3532	1 – 4W	850/940nm	60x45 72x55	Yes	No
	PV85Q	3532	1 – 4W	850/940nm	50x45 60x45 100x85 120x90	yes	Yes
	PV88M	3535	1 – 4W	850/940nm	60x45 72x55 90x60 110x85	no	No
	PV88Q	3535	1 – 4W	850/940nm	60x45 110x85	no	yes



**VCSEL**  
Fast and Stable



**EEL**  
Powerful Solutions



# LiDAR

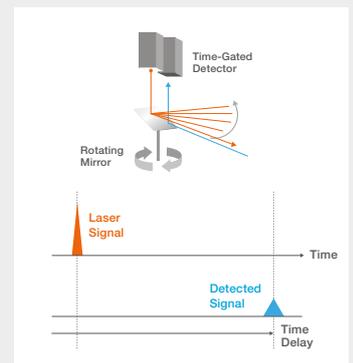
## Measurement Techniques for LiDAR



### Direct Time of Flight (dToF)

- Infrared source generates an extremely narrow pulse with high power limited by eye safety standards
- A time-gated detector determines when the signal returns from the source to calculate object distance
- Varying detectors are used (PIN, APD, SPAD) for many different technologies to scan an illuminated field
- Resolution is dependent on pulse width

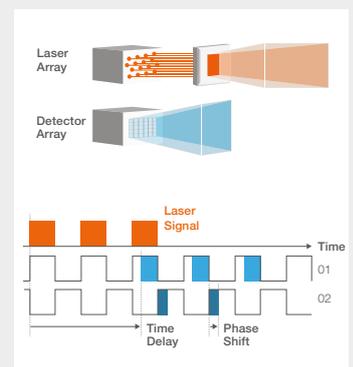
Application Requirement	Laser Feature	VCSEL	EEL
Ability to project a high power density for long range	High power density		X
	High speed	X	X
High resolution in wide variety of environments	Narrow spectrum	X	X
	Stable spectrum	X	
Optimized package design	Low Inductance	X	X
	High thermal conductivity		X



### Indirect Time of Flight (iToF)

- Illumination source is pulsed continuously with a 50 % duty cycle (pulse train)
- Diffuser converts beam shape into uniform illumination over target
- Specialized detector array finds the temporal phase shift between two phase-locked detectors
- Detector measures both delay and shift in pulse train with resolutions smaller than the pulse width

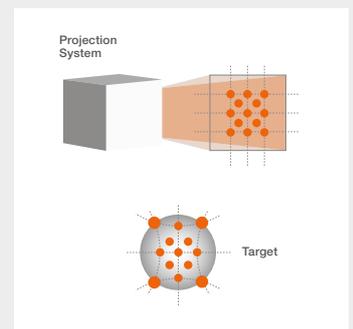
Application Requirement	Laser Feature	VCSEL	EEL
Ability to project a clean pulse train for scanning	High speed	X	X
	Pulse consistency	X	
High resolution in wide variety of environments	Narrow spectrum	X	X
	Temperature stable	X	
Compact, efficient solution for low power monitoring	High efficiency	X	X
	Monitoring diode	X	



### Structured Light

- IR source projects a known illumination structure into the environment (dots, stripes, pattern)
- High resolution camera is coated with a high-resolution IR bandpass filter to only image dot structure
- Captured image triangulates object depth with high res. with conventional imaging sensors (kHz)

Application Requirement	Laser Feature	VCSEL	EEL
Ability to build on a light pattern with the use of diffractive optical elements (DOE)	Narrow spectrum	X	X
	Narrow beam	X	X
Multiple point sources to improve resolution in a structured light pattern	Die layout customizable	X	
	2D source layout	X	
Optics can be integrated or closely placed to compact	Top emission	X	
	Integrated optics	X	



# LiDAR

## Vertical Cavity Surface Emitting Lasers (VCSELs)



### Features & Benefits

- Compact footprint with superior mechanical robustness and leading-edge VCSEL technology inside
- Stable light with a short cavity height
- Multiple lasers (apertures) are built on a VCSEL chip to increase power
- Large quantity of apertures reduce speckle in IR illumination

### Characteristics

- Optimal power density in compact package
- Integrated optics for delivering desired field of view (FoV), eliminating the need for secondary optics
- Versions with integrated photo diode to detect loss of diffusor and imperfect diffraction grading

### Applications

- 3D Sensing for Mobile Devices and Industry
- Robotics and Automated Guided Vehicles
- Smart Access and Payment Authentication



Power [ns Pulsed]	~120W
Emitting Area	Large Area
Power Density	Mid
Beam quality	Symmetric /Low divergence
Temperature shift	0.07 nm/K
Spectral width	1-2nm
Switching time	Few ns
Direction of emission	Top looker

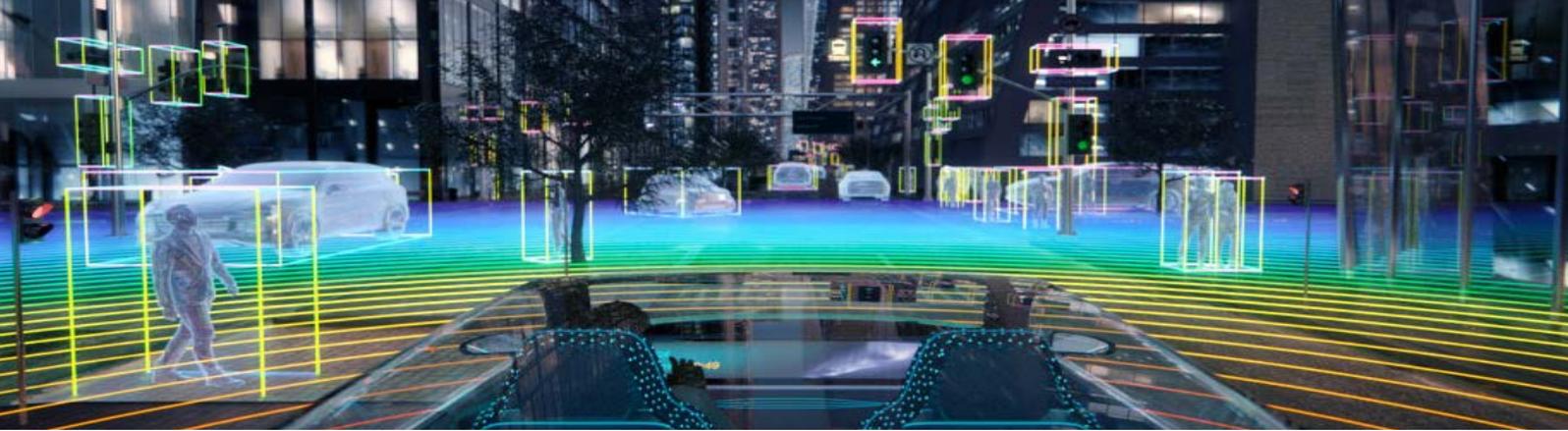
## VCSEL Portfolio for Time-of-Flight / 3D Sensing – BIDOS® P 2835 C

### High-Power VCSEL with 2835 Ceramic Packaging

Part No.	Wave-length (nm)	Emitter Quantity	Optics (°)	Eye Safety	Recommended max. Peak Power CW, 100% DC (W)	Recommended max. Peak Power 100µs, 1% DC (W)	Recommended max. Peak Power 5ns, 0.1% DC (W)	
V102C021A-850	850	281	60 x 45	-	1.5	5.5	32	
V102C121A-850			60 x 45	MPD				
V00100			72 x 58	-				
V107C021A-850		770	770	60 x 45	-	3.5	10	52
V00129				72 x 58	-			
V107C000A-850				None	-			
V102C021A-940	940	281	60 x 45	-	1.5	5.5	32	
V102C121A-940			60 x 45	MPD				
V00065		550	550	60 x 45	-	2.5	7	44
V105C121A-940				72 x 58	MPD			
V105C131A-940				110 x 80	MPD			
V105C141A-940				60 x 45	-			
V00075		770	770	60 x 45	-	3.5	10	52
V00130				72 x 58	-			

### Low-Power VCSEL with 3020 PLCC packaging by VIXARR

Part No.	Wave-length (nm)	Emitter Quantity	Optics (°)	Eye Safety	Recommended max. Peak Power CW, 100% DC (W)	Recommended max. Peak Power 100µs, 1% DC (W)	Recommended max. Peak Power 5ns, 0.1% DC (W)
V00002	680	1	None	-	0.007	0.015	-
V00013					0.0015	0.003	
V00147	850	3			0.070	0.150	0.330



# LiDAR

## Edge Emitting Lasers (EELs)



### Features

- Different package designs available (TO, Plastic, SMT)
- Serving a great variety of different power classes
- Well-established wavelength of 905 nm
- Leading-edge in EEL chip (Nanostack Technology) offers the highest optical output power
- Optimized for short pulsed ToF applications

### Characteristics

- Highest peak power and highest average power in the market
- High power within a small area
- High efficiency
- Low Cost in high volumes (plastic)
- Outstanding  $R_{th}$  and inductance optimized package (SMT)

### Applications

- Home automation
- Industrial sensing
- Last mile delivery
- Laser rangefinder
- Pulsed laser LiDAR application

### Benefits:

- Produce high power from a single spot due to the long cavity length
- Narrow rectangular design results in asymmetric beam profile requiring collimation
- Robust Package (TO)
- Very good cost & performance ratio and long history in serving the market with outstanding quality (plastic)
- Industry Grade qualification
- Easy to use within pick & place and reflow soldering processes (SMT)
- AM Grade qualification for SMT and Smart Lasers

Power [ns Pulsed]	~120W
Emitting Area	Point Source
Power Density	High
Beam quality	Asymmetric / Medium divergence
Temperature shift	0.25 nm/K
Spectral width	3-8 nm
Switching time	Few ns
Direction of emission	Side looker

## EEL Portfolio for industrial applications Nanostack pulsed laser diodes

Laser diodes in a variety of package designs (TO56, Plastic, SMT)

Part No.	Stack Quantity	Wave-length (nm)	Emitter Quantity	Aperture (µm)	Output power (W)	Forward current (A)	Operating voltage (V)	Threshold current (A)	Beam divergence (FWHM)	Operating range (°C)
SPL PL90	1	905	1	200	25	30	4.3	0.75	9° x 25°	-40 ... + 85
SPL PL90_3E	3				50	20	9			
SPL PL90_3					75	30	9			
SPL LL90_3	3		70	-	20	-	15° x 30°			
SPL TL 90AT08	1		220	1 or 4	125	40	10.8	0.6	10° x 25°	
SPL UL 90AT08	1									
SPL S1L90A_3	1 or 4									
SPL S4L90A_3	1 or 4									-40 ... +105

### LiDAR dToF Driver – Evaluation Driver Kits

Type	1 Channel Reference Design	4 Channel Reference Design
Description	Designed in cooperation with Efficient Power Conversion (EPC)	
Key Components Utilized	<ul style="list-style-type: none"> <li>▪ SPL S1L90A_3 A01 IR Pulse Laser</li> <li>▪ EPC: EPC2212</li> </ul>	<ul style="list-style-type: none"> <li>▪ SPL S4L90A-3 A01 IR Pulse Laser</li> <li>▪ GaN Systems: GS66516T</li> </ul>
Key Performance Metrics	<ul style="list-style-type: none"> <li>▪ Peak laser current of 40A</li> <li>▪ Optical output of 120W</li> <li>▪ Pulse width ~2ns (FWHM)</li> <li>▪ Option to measure the laser current</li> <li>▪ V max = 80V</li> </ul>	<ul style="list-style-type: none"> <li>▪ Fire all 4 channel simultaneous</li> <li>▪ Peak laser current: 40A/chn -&gt; total current 160A</li> <li>▪ Total optical output = 480 W</li> <li>▪ Pulse width ~2.7ns - 3.5ns (FWHM)</li> <li>▪ V max = 150V</li> </ul>



The DNA of tech.™

# VCNL36825T

## Proximity Sensor with Interrupt, VCSEL, and I<sup>2</sup>C Interface

VCNL36825T integrates a new fully integrated proximity sensor (PS) designed to increase efficiency and performance. Featuring a vertical-cavity surface emitting laser (VCSEL), the Vishay Semiconductors VCNL36825T combines a photodiode, signal processing IC, and 12-bit ADC in a compact surface-mount package (2.0mm x 1.25mm x 0.5mm). PS programmable interrupt features of individual high and low thresholds offers the best utilization of resource and power saving on the microcontroller.

### Benefits

- Intelligent cancellation eliminates cross-talk
- A smart persistence scheme ensures accurate sensing and faster response time
- Small 1.6 mm light hole offers power consumption down to 6.63  $\mu$ A
- VCSEL wavelength peaks at 940 nm and has no visible “red-tail”
- RoHS-compliant, halogen-free, and Vishay Green
- 76 % smaller package compared to previous-generation devices
- Programmable interrupt function and IVCSEL sink current
- Sunlight cancellation up to 100 klx Interrupt
- Low power consumption I<sup>2</sup>C (SMBus compatible interface)

### Applications

The device’s small size makes it ideal for space-constrained battery-powered applications:

- Handheld device
- Consumer device
- Industrial application
- Detect if users are wearing true wireless stereo earphones or virtual reality / augmented reality headsets
- Collision detection in toys and consumer and industrial robots

Operating Range	Operating Voltage Range	I <sup>2</sup> C Bus Voltage Range	VCSEL Driving Current	Output Code	ADC Resolution Proximity / Ambient Light	Temperature Compensation
200 mm	2.64 V to 3.6 V	1.7 V to 3.6 V	20 mA	12 bit, I <sup>2</sup> C	12 bit / -	-40 °C to +85 °C

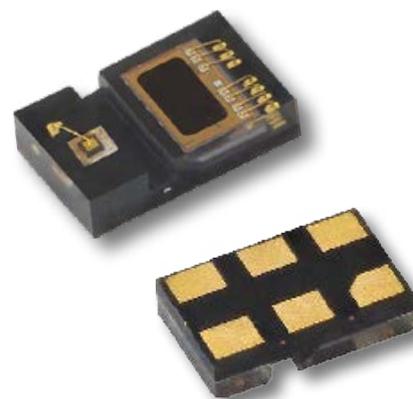
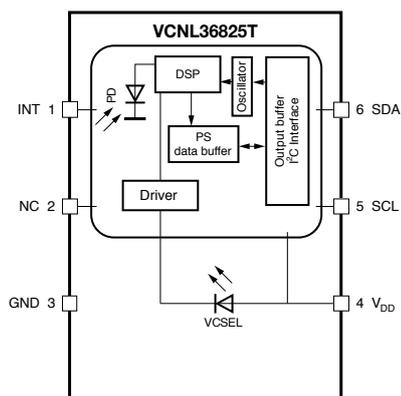
### Block Diagram – Components

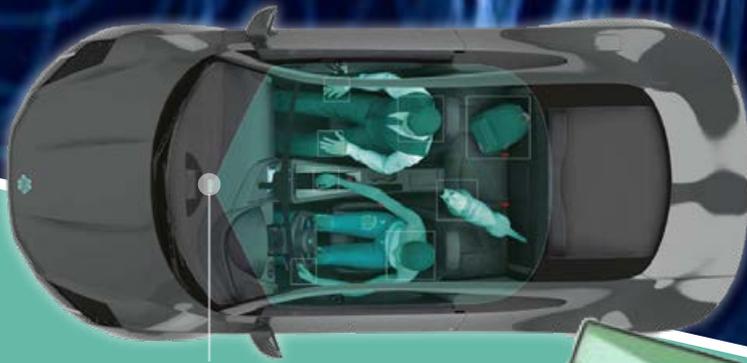
The major components of the VCNL36825T are shown in the block diagram.

In addition to the ASIC with the proximity photodiode, the VCSEL emitter is also implemented.

Its cathode is connected to the driver internally and does not need to be connected externally.

The anode of the VCSEL is connected to the V<sub>DD</sub> through internal wiring.





Driver Monitoring and In-Cabin Monitoring with single 3D Time-Of-Flight Camera



# Automotive ToF Sensor

## Single Chip – High Resolution



Indirect Time of flight technology works by illuminating a scene using modulated light and measuring the phase delay of the returning light after it has been reflected by the objects in the scene. The phase delay is then measured and converted to distance using a quadrature sampling technique. The advantages of this technology are high frame rate due to low computation required, a small footprint and a relatively low cost.

### MLX75027

The MLX75027 Automotive Time-Of-Flight sensor supports up to VGA resolution. The sensor, alongside the BSI VGA pixel array, provides the control signals for the illumination unit and has a MIPI CSI-2 high speed serial interface to stream data to the host processor. Thanks to a simple supply system, with only 3 positive voltage domains, the sensor simplifies the design of the supply unit and together with a low power dissipation allows a very compact 3D camera.

The MLX75027 supports up to 100 MHz illumination modulation frequency, which makes it well suited for VCSELs illumination and has a built-in temperature sensor. The EVK75027 evaluation kit is available to evaluate the MLX75027 Automotive VGA ToF sensor.

- Support both 850 and 940 nm wavelength
- 1/2" optical VGA (640 x 480) Time-of-Flight image sensor
- High distance accuracy because of programmable modulating frequencies up to 100 MHz
- Full resolution readout up to 135 distance frames per second (in 4 phase configuration)
- 1.5 ms phase readout time and Build-in temperature sensor
- Up to 8 raw phases (or quads) per frame, perphase statistics & diagnostics
- Continuous or triggered operation mode(s) and Configurable over I<sup>2</sup>C (up to 400 kHz)
- CSI-2 serial data output, MIPI D-PHY, 1 clock lane, 2 or 4 data lanes
- Region of interest (ROI) selection, Integrated support for binning (2x2, 4x4, 8x8), Horizontal mirror & vertical flip image modes

### Time-Of-Flight Sensor Applications

Comfort & UX	Safety L3/L4	Legal, NCAP	Security	Autonomous Vehicles
<ul style="list-style-type: none"> <li>▪ Hand position detect &amp; Hand gestures</li> <li>▪ Intuitive HMI, pointing finger</li> <li>▪ Object detection, parcel classification</li> <li>▪ Face and body recognition</li> </ul>	<ul style="list-style-type: none"> <li>▪ NCAP driver drowsiness &amp; distraction, eye state, eye gaze, head pose</li> <li>▪ Occupant classification &amp; body pose</li> </ul>	<ul style="list-style-type: none"> <li>▪ Driver activity detection</li> <li>▪ Advanced seatbelt detection</li> <li>▪ Child left behind</li> </ul>	<ul style="list-style-type: none"> <li>▪ Anti-spoof (2D+3D based) face and body recognition</li> <li>▪ Access control</li> <li>▪ Secure authentication</li> </ul>	<ul style="list-style-type: none"> <li>▪ Blindspot detection</li> <li>▪ Collision avoidance</li> <li>▪ Autonomous parking</li> <li>▪ Vehicle exterior cocoon</li> <li>▪ Smart access</li> </ul>

intel.  
**REALSENSE™**



D415



D435 / D435i



D455

# Intel® RealSense™ Stereo Depth Technology

Bringing 3D vision to devices and machines that only see 2D today

Stereo Depth Cameras enable devices to see, understand, interact with, and learn from their environment. The onboard Intel® RealSense™ Vision Processor D4 performs all the depth calculations on the camera, allowing for low power, platform agnostic devices. Stereo image sensing technologies work both indoors and outdoors in a wide variety of lighting conditions and can also be used in multiple camera configurations without the need for custom calibration.

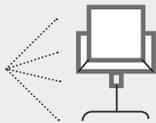
**Experience the world in 3D with the Intel® RealSense™ products, available from stock at Rutronik.**

Based on Stereo image sensing technology, the Intel® RealSense™ Cameras provide a solution for a wide range of different applications. Supported by Intel's open-source SDKs, it's fast and easy to build your future vision solution.

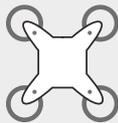
## Application Examples



Robotics



3D Scanning



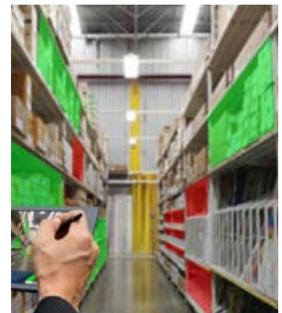
Drones



People Tracking



Object Measurement





## Depth Cameras

### Intel® RealSense™ D400 Series

Designed for easy setup and portability, Intel® RealSense™ D400 series cameras feature high depth resolution and include active infrared (IR) stereo with standard or wide field of view. For high-precision applications, choose the D415 with rolling shutter. If your application is fast-moving or outdoors, select either the D435 or D435i camera which feature a global shutter. For longer range applications, the D455 features wide field of view and global shutter on the depth and RGB sensors.

#### Specifications

Type	D415	D435 / D435i	D455
			
<b>Depth Technology</b>	Active IR Stereo	Active IR Stereo	Active IR Stereo
<b>Technology</b>	Rolling Shutter	Global Shutter	Global Shutter
<b>Depth FOV<sup>1</sup> (H x V)</b>	65° × 40°	87° × 58°	87° × 58°
<b>Depth Resolution</b>	up to 1280x720	up to 1280x720	up to 1280x720
<b>Depth Accuracy<sup>2</sup></b>	<2% at 2 m	<2% at 2 m	<2% at 4 m
<b>Depth Frame Rate</b>	Up to 90 fps	Up to 90 fps	Up to 90 fps
<b>RGB Sensor Technology</b>	Rolling Shutter	Rolling Shutter	Global Shutter
<b>RGB Sensor Resolution</b>	2 MP	2 MP	1 MP
<b>RGB Frame Rate &amp; Resol.</b>	1920 × 1080 at 30 fps	1920 × 1080 at 30 fps	1280 × 800 at 30 fps
<b>RGB Sensor FOV<sup>1</sup> (H x V)</b>	69° × 42°	69° × 42°	90° × 65°
<b>IMU</b>	—	— / Yes	Yes
<b>Min-Z at Max Resolution</b>	~45 cm	~28 cm	~52 cm
<b>Ideal Range</b>	.5 m to 3 m	.3 m to 3 m	.6 m to 6 m
<b>Main components</b>	D415 Depth Module D4 Vision Processor	D430 Depth Module D4 Vision Processor	D450 Depth Module D4 Vision Processor
<b>Dimensions (L x D x H)</b>	99 mm × 20 mm × 23 mm	90 mm × 25 mm × 25 mm	124 mm × 26 mm × 29 mm
<b>Connectors</b>	USB-C* 3.1 Gen 1*	USB-C* 3.1 Gen 1*	USB-C* 3.1 Gen 1*
<b>Mounting Mechanism</b>	1/4"-20 UNC thread mounting point, 2x M3 thread mounting points, Tripod		1/4"-20 UNC thread mounting point 2x M4 thread mount. points   Tripod
<b>Use Environment</b>	Indoor/Outdoor	Indoor/Outdoor	Indoor/Outdoor

<sup>1</sup> measured +/-3° of stated value <sup>2</sup> measured as out of the factory

#### Ordering Information

Intel® RealSense™  
Depth Cameras

**D415** (Retail)  
82635ASRCDVKHV

**D435** (Retail)  
82635AWGDVKPRQ

**D435i** (Retail)  
82635D435IDK5P

**D455** (Retail)  
82635DSD455

**D415** (Bulk)  
82635ASRCDVKMP

**D435** (Bulk)  
82635AWGDVKPMP

**D435i** (Bulk)  
82635D435IDKMP

**D455** (Bulk)  
82635DSD455MP

**Retail:** Package contains camera, USB cable and Tripod | **Bulk:** Package contains only the camera



# Depth Modules & Processors

## Intel® RealSense™ D400 Series



For the integration of Intel® RealSense™ technology into higher volume products, depth modules can offer the best compromise between price and flexibility. Multiple different configurations are offered to better suit your needs and product requirements. Designed for easy system integration, all modules feature an imaging sub-system with stereo sensors. When paired with an Intel® RealSense™ Vision Processor, depth data can be output via USB to any platform.

### Specifications

Type	D415	D430	D450
			
<b>Depth Technology</b>	Active IR Stereo	Active IR Stereo	Active IR Stereo
<b>Technology</b>	Rolling Shutter	Global Shutter	Global Shutter
<b>Depth FOV (H x V)</b>	65° x 40°	87° x 58°	87° x 58°
<b>Depth Resolution</b>	1280x720	1280x720	1280x720
<b>Depth Frame Rate</b>	Up to 90 fps	Up to 90 fps	Up to 90 fps
<b>RGB Frame Rate &amp; Resol.</b>	1920 x 1080 at 30 fps	-	1280 x 800 at 30 fps
<b>Interface</b>	50-pin Board to Board Connector	50-pin Board to Board Connector	50-pin Board to Board Connector
<b>Dimensions (L x D x H)</b>	83.7 mm x 10 mm x 4.7 mm	70.7 mm x 14 mm x 10.53 mm	119.5 mm x 17.4 mm x 10.53 mm

Also available: Phased-out Depth Modules **D410** and **D420**

### Ordering Information

Intel® RealSense™  
Depth Modules

**D415** (Bulk)  
82635DSASRCPRQ

**D430** (Bulk)  
82635DSAWGPRQ

**D450** (Bulk)  
82635DSD450

### Recommended Accessories

**D415 & D430 - Intel® RealSense™  
Vision Processor D4 Card**

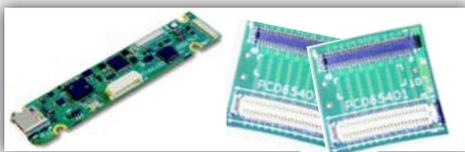
82635DSASMDLPRQ

**D450 - Intel® RealSense™  
Vision Proc. D4 Board V3**

82635DSASICBDIF

**D400 - Intel® RealSense™  
Interposer Rigid**

82635DSITR50P



### Intel RealSense SDK 2.0

- Intel® OpenVINO™ integration
- Fast and easy data integration tool
- Open Source cross platform library

### More information

<https://www.intelrealsense.com/sdk-2/>

### Operating Systems

- Windows
- Linux
- mac OS
- Android

### Programming Languages

- Python
- C/C++
- C#/.NET
- Node.js



### Frameworks and Wrappers

- ROS
- OpenCV
- OpenNI
- ATLAB
- PCL
- UnrealEngine4
- LabVIEW
- Unity



# Laser Bars for Material Processings

ams OSRAM has a Dedicated Bare-Die Laser Portfolio to Address Customer Needs

Laser bars are widely used in various laser systems either as direct laser source, or as pumping light source for solid state laser, fiber laser, direct diode laser for end applications like laser marking, welding, cutting.

**Even though the established infrared lasers offer many advantages, blue lasers are gaining more importance:**

The copper absorption in blue is 12x higher than in infrared lasers while the gold absorption in blue is up to 50x higher than in infrared lasers. Other advantages are better control in Cu-materials processing, spatter-free and defect-free welding at higher processing speed as well as the fact that battery welding for electrical vehicles a driver for future demand is.

## Laser Bars

- With high homogeneity and high efficiency
- Fully meet industry life time standard
- Performance widely acknowledged by users worldwide

## ams OSRAM is one of the most famous laser bar providers

- With rich experience and long history in laser bar production
- With established high-volume production capability, synergy with LED production
- Focus on chips/bars, never compete with our customers

 <p>Single Emitter Bar</p>	 <p>Single Emitter Bar</p>	 <p>Single Emitter Bar</p>	 <p>Single Emitter Bar</p>	 <p>Single Emitter Bar</p>
 <p><b>Fiber Laser Pumps</b></p> <p>Markets</p> <ul style="list-style-type: none"> <li>▪ Industrial Material Processing</li> </ul>		 <p><b>Fiber Laser Pumps</b></p> <p>Markets</p> <ul style="list-style-type: none"> <li>▪ Industrial Material Processing</li> <li>▪ Military</li> <li>▪ Hair Removal/Cosmetics</li> </ul>		

### High-Power Single Emitters

- SPL Ex with up to 25 emitter bar design for singulation into single emitters
- Various emitter widths of 100  $\mu$ m -230  $\mu$ m for easy fiber coupling available
- Recommended optical output power up to 30 W, CW
- Typ. electro-optical efficiency of > 60 %
- Available wavelengths: 915 nm, 976nm

### High-Power CW Laser Bars

- SPL BKxx-40-25-10B with 50% fill-factor
- Designed for high-power direct diode lasers
- Recommended optical output power up to 350 W, CW
- Typ. electro-optical efficiency of > 60 %
- Available wavelengths: 940, 980, 1020 nm

### Standard QCW/CW Laser Bars

- SPL Bx
- QCW bars with 808 nm up to 500 W
- 50 % fill-factor bar with 808 nm for hair removal up to 100 W, CW
- 30 % fill-factor bar 880 nm for pumping of DPSSL up to 90 W, CW

### Blue Laser Bars / Single Emitters\*

- SPL BD45x laser bar up to 50 W, CW
  - PLPCOS 450x single emitter up to 5 W, CW
  - Typical wavelength 445 nm
  - Typical electro-optical efficiency of > 38 %
- \* chip on submount



# Visible Laser Diodes in TO Cans

## High Performance in a Compact Package



### Single Mode Low Power

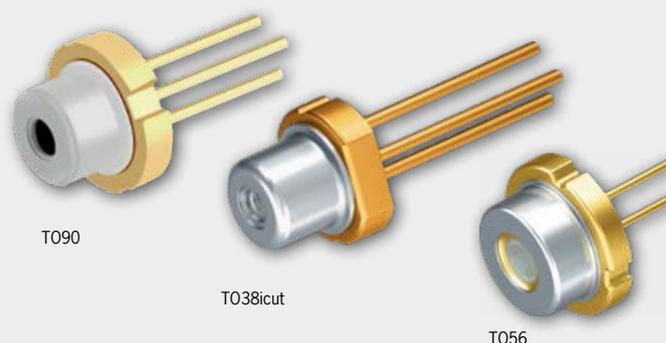
Due to their excellent efficiency, the temperature increase experienced by blue and green InGaN lasers during operation is kept to an absolute minimum, allowing them to deliver a long life – up to 10,000 hours at 40 °C. Thanks to their excellent beam quality, our lasers are ideally suited for the optical imaging of light.

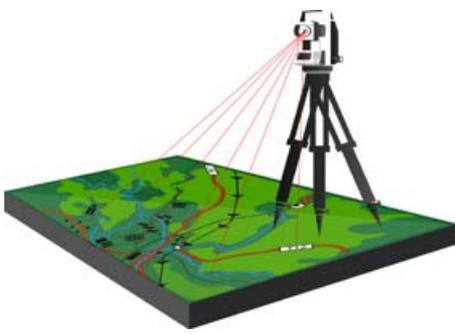
Type	PLT5 450B	PL 450B	PLT5 488	PLT5 510	PLT5 522 EA_P	PLT5 520 B1-B6	PLT5 520 B1-B3	PLT5 520B	PLT3 510	PL 520_B1_2	PL 520_B1	PLT3 520D
Wavelength (Typ.)	450 nm	450 nm	488 nm	520 nm	520 nm	520 nm	520 nm	520 nm	520 nm	515 nm	520 nm	520 nm
Output power (Typ.)	100 mW	100 mW	60 mW	10 mW	20 mW	30 mW	50 mW	110 mW	10 mW	30 mW	50 mW	110 mW
Forward current (Typ.)	90 mA	90 mA	85 mA	45 mA	68 mA	95 mA	115 mA	225 mA	45 mA	100 mA	125 mA	225 mA
Operating voltage (Typ.)	5.5 V	5.5 V	6.0 V	5.0 V	5.5 V	5.8 V	6.0 V	6.1 V	5.0 V	6.5 V	6.9 V	6.1 V
Threshold current (Typ.)	17 mA	17 mA	25 mA	25 mA	30 mA	40 mA	30 mA	40 mA	25 mA	50 mA	45 mA	40 mA
Thermal Resistance	34 K/W	38 K/W	34 K/W	34 K/W	34 K/W	34 K/W	34 K/W	34 K/W	38 K/W	38 K/W	38 K/W	38 K/W
PD include	No	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
ESD Diode include	No	No	Yes	No	No	No	No	No	No	No	No	No
Package	T056	T038	T056	T056	T056	T056	T056	T056	T038 ICut	T038 ICut	T038 ICut	T038 ICut

### Multi Mode Power

ams Osram offers various versions from 1.6 to 5.0 Watt for industry and automotive applications with a typical wavelength of 447 nm. With the help of appropriate optics, the laser light is focused at a point only a few micrometers in diameter. The laser can be directly used as a blue light source or in combination with a special phosphor for white conversion.

Type	PLPT9 447 KA	PLPT9 450LB_E
Wavelength	447 nm	447 nm
Output power	1.6 W	5 W
Forward current (Typ)	1.2 A	3.0 A
Operating voltage (Typ)	4.9 V	4.3 V
Threshold current	0.19 A	0.25 A
Thermal Resistance	13 K/W	8 K/W
Operating temperature	-20°C – 80°C	-20°C – 90°C
Storage temperature	-20°C – 100°C	-40°C – 120°C
ESD Diode include	Yes	Yes
Package	T056	T090





# Low-Cost Red Lasers and CW Laser Diodes

## LC-LMD, LC-LMP and ADL Series



The world's smallest modules contain the laser diode, drive electronics, and optics all in a metal housing.

### LC-LMD

- With the LC LMD series LASER COMPONENTS introduces new low cost laser modules into the OEM market.
- The absolutely smallest modules in the world contain the laser diode, drive electronics, and optics all in a metal housing. They can be operated directly with 3 V<sub>DC</sub> without additional electronics. The integrated APC (automatic power control) electronics allow the laser diode to be operated automatically in the working point with the desired output power, increasing the life expectancy of the module.
- The smallest modules have a diameter of only 3.3 mm at a length of just 7 mm.
- In total, dot lasers with a collimated or focusable beam at 635/650/785/850 nm are available for selection in twelve different kinds of housings.
- LC LMD modules are the right choice if you are looking for an easy and inexpensive solution in large quantities. Typical applications for these laser diode modules are consumer products.

### LC-LMP

- The LC-LMP series lasers produce either a bright red cross hair or a bright red line. The adjustable focus makes it possible to set the focus of the laser to any distance. The laser power is <3 mW; the modules are operated with 3 V<sub>DC</sub>.
- The LC-LML-635-01 line lasers feature a large fan angle of >120°. There are versions available at <1 mW and <3 mW.

### ADL

- The classic laser diode emits in the red spectral range from 635 nm to 680 nm. Depending on the field of application and required specifications, we can provide you with a suitable laser diode with a power range from 3 mW to 4 W.
- We offer both the smallest and top-selling CD housings available on the market – 3.3 mm and 5.6 mm housings, respectively. We also have C/CT mount diodes available. Upon request, we can fiber couple your diode.



Type	Part Number	Description	Output Power	Laser Class
Low Cost Laser	LC-LMD-525-120-01-A	Low Cost Point Laser green	< 1 mW	2
	LC-LMD-650-01-01-A-C	Low Cost Point Laser red	< 1 mW	2
	LC-LMD-650-03-01-A-C	Low Cost Point Laser red	< 1 mW	2
	LC-LMD-650-05-01-A-C	Low Cost Point Laser red, focusable	< 1 mW	2
	LC-LMD-650-07-01-A-C	Low Cost Point Laser red, smallest housing	< 1 mW	2
	LC-LMD-650-12-01-A-C	Low Cost Point Laser red, coaxial aligned	< 1 mW	2
	LC-LMP-635-245-03-A	Low Cost Cross Hair Laser red, 10°, focusable	< 3mW	1
	LC-LMP-635-249-03-A	Low Cost Cross Hair Laser red, 45°, focusable	< 3mW	1
	LC-LMP-635-283-03-A	Low Cost Laser Line red, 20°, focusable	< 3mW	1
	LC-LMP-635-287-03-A	Low Cost Laser Line red, 45°, focusable	< 3mW	1
LC-LML-635-01-03-A-C	Low Cost Laser Line red, 120°, Gaussian Line	< 3mW	1	
CW Laser Diodes	ADL-63054TL	Laser Diode 635 nm, 5 mW, 5.6 mm Housing, 50°C, LDA=PDC	5mW	*)
	ADL-65055TL	Laser Diode 650 nm, 5 mW, 5.6 mm Housing, 50°C, LDA=PDC	5mW	*)
	ADL-65075TA4	Laser Diode 650 nm, 7 mW, 5.6 mm Housing, 70°C, APC	7mW	*)
	ADL-65075TL	Laser Diode 650 nm, 7 mW, 5.6 mm Housing, 70°C, LDA=PDC	7mW	*)
	ADL-66505TL	Laser Diode 660 nm, 50 mW, 5.6 mm Housing, 60°C, LDA=PDC	50mW	*)
	LCU670561A	Laser Diode 670 nm, 5 mW, 5.6 mm Housing, 60°C, LDA=PDC	5mW	*)
	ADL-78051TL	Laser Diode 780 nm, 5 mW, 5.6 mm Housing, 60°C, LDA=PDC	5mW	*)
	ADL-80Y05TL	Laser Diode 808 nm, 200 mW, 5.6 mm Housing, 50°C, LDA=PDC	200mW	*)
	ADL-83Y51TL	Laser Diode 830 nm, 250 mW, 5.6 mm Housing, 60°C, LDA=PDC	250mW	*)
ADL-85051TL	Laser Diode 850 nm, 5 mW, 5.6 mm Housing, 50°C, LDA=PDC	5mW	*)	
Lenses for CW Laser Diodes	CAX100	Aspherical Plastic Collimator Lens, f=10mm, NA=0.2, d=6.3 mm		
	CAY046/55	Aspherical Plastic Collimator Lens, f=4.6mm, d=5.5 mm		

\*) Laser Diode without driver have no laser class. Always results from the operating conditions of the user.



**Position Markers**

Detailed, high precision

**Meters**

High accuracy visible spots

**Optical Sensors**

Minute detection (i.e. foreign particles) over long distances

**Optical Mice**

High precision, high-speed response

**Bar Code Readers**

Verify position

**Laser Microscopes**

Adjustable height, ultra-precise

# High Output Laser Diodes



Infrared high-power lasers deliver high peak output with pulse lighting, making them ideal for use as light sources for distance measurement. It is expected to be applied to the in-vehicle field such as LiDAR (Light Detection and Ranging) by making the best use of the straightness and light collection characteristics of laser light. It is also ideal as a SLAM (Simultaneous Localization and Mapping) light source for robot vacuum cleaners and service robots.

## Features & Benefits

- Industry standard 5.6 CAN package
- High efficiency operation / excellent temp. characteristics
- Wide range of package options

- Reduction of the setting times
- Optimal material exploitation
- Optimal perform. adjusted to your request
- Reduction of cutting waste

## Applications

- Illumination
- Measurement
- Sensing

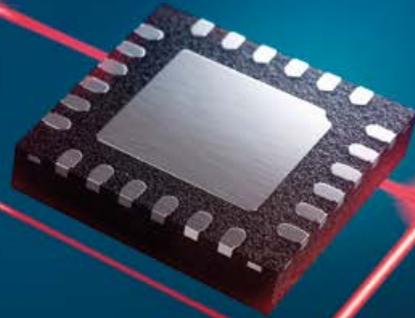
## Focus & Highlight Laser Diodes Rohm

Part No	Wave Length	Absolute Maximum Ratings (Tc=25°C)			Electrical and Optical Characteristics (Tc=25°C)							
	$\lambda_p$ (nm)	Po (mW)	Po (V)	ToPr Max. (°C)	Po (mW)	Ith (mA)	Iop (mA)	$\eta$ (W/A)	Vop	Im (mA)	$\Theta_{\perp}$ (deg)	O// (deg)
RLD63NPCA	635	7	2	50	5	25	32	0.70	2.20	0.06	32	8.0
RLD63NPC9	638	9	2	50	7	28	38	0.70	2.20	0.18	32	8.0
RLD63NPC8	638	24	2	50	20	32	65	0.60	2.25	0.20	30	8.0
RLD65PZX3	657	12	2	70	10	25	42	0.60	2.30	0.20	28	8.5
RLD65NZX1	660	10	2	80	7	15	21	0.85	2.30	0.30	27	9.0
RLD65NZX2	655	7	2	70	5	25	33	0.60	2.30	0.20	28	8.5
RLD65NZX3	657	12	2	70	10	25	42	0.60	2.30	0.20	28	8.5
RLD78NZM5	793	10	2	60	6	10	20	0.55	1.80	1.15	28	9.0
RLD78PZMA	792	10	2	60	6	10	20	0.65	1.80	0.25	26	9.0
RLD78MZA6	790	4.5	2	70	3	25	35	0.35	1.90	0.15	37	11.0
RLD78MZM7	792	20	2	60	15	11	33	0.65	1.80	0.50	24	8.5
RLD78NZM7	792	20	2	60	15	11	33	0.65	1.80	0.90	24	8.5
RLD82PZJ1	822	220	2	60	200	50	255	0.95	2.40	0.30	17	9.5
RLD82NZJ1	822	220	2	60	200	50	255	0.95	2.40	0.30	17	9.5
RLD84PZJ2	842	220	2	60	200	40	250	0.95	2.40	0.40	18	9.5
RLD84NZJ2	842	220	2	60	200	40	250	0.95	2.40	0.40	18	9.5
RLD90QZW3	905	90000	16	85	75000	900	27000				25	10
RLD90QZW5	905	25000	14	85	25000	400	9000				25	12
RLD90QZW6	905	30000	16	85	25000	400	9000				25	14
RLD90QZW8	905	145000	16	85	120000	100	42000				25	10

## Vertical Cavity Surface Emitting Laser (VCSEL)

ROHM offers the very small VCSEL package on the market and includes 200mW to 2W types optimized for light sources in 1D and 3D TOF (Time Of Flight) sensor applications.

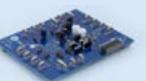
Part No	Package Size (mm)	Wavelength $\lambda_p$ (nm)	Optical Output Po (V)	Forward Current IF (mA)	Forward Voltage VF (V)	Threshold Current Ith (mA)	PCE (%)	$\Theta$ (deg x deg)	$\eta$ (W/A)	Emission area (mm x mm)	Measurement pulse condition
RLD94SAQ8	3x2 (t=0.97)	940	2400	3000	2	750	40	-00x: 20 x 20, -10x: 60 x 45, -20x: 72 x 55, -30x: 90 x 69, -40x: 110 x 85	1	1.10 x 0.82	Pulse width 400µs 1shot
RLD94SAQ6	3x2 (t=0.77)	940	200	300	2	70	33	13 x 13	0.85	0.41 x 0.23	Pulse width 800µs 1shot



# iC-Haus' Laser Driver ICs and Evaluation Boards

iC-Haus' laser drivers portfolio is dedicated to operate all types of CW and pulsed semiconductor laser diodes. The iCs provide fast switching, avoid overshooting by patented circuitries, and feature various monitoring safety functions. Evaluation boards allow easy testing and evaluation of the driver performance and provide easy access to configuration parameters.

## Laser Driver Solutions for OSRAM Diodes

LD / OSRAM	CW Driver		Evaluation Board		Puls Driver		Evaluation Board	
	IC	IC	IC	IC	IC	IC	IC	IC
PL 450B	iC-NZN		iC-NZN EVAL NZN1D		iC-NZN		iC-NZN EVAL NZN1D	
PL 520_B1	iC-NZN		iC-NZN EVAL NZN1D		iC-NZN		iC-NZN EVAL NZN1D	
PL 520B	iC-NZN		iC-NZN EVAL NZN1D		iC-NZN		iC-NZN EVAL NZN1D	
PLT3 450C	iC-NZN		iC-NZN EVAL NZN1D		iC-NZN		iC-NZN EVAL NZN1D	
PLT3 510	iC-NZN		iC-NZN EVAL NZN1D		iC-NZN		iC-NZN EVAL NZN1D	
PLT3 520D	iC-HT		iC-HT EVAL HT1D		iC-HKB		-	-
PLPT5 447KA	iC-HT		iC-HT EVAL HT1D		iC-HN3		iC-HN3 iCSY HN1M	
PLPT5 450KA	iC-HTG		iC-HTG EVAL HTG1D		iC-HN3		iC-HN3 iCSY HN1M	
PLT5 450B	iC-NZN		iC-NZN EVAL NZN1D		iC-NZN		iC-NZN EVAL NZN1D	
PLT5 488	iC-WKM		iC-WKM EVAL WKM1D		iC-NZN		iC-NZN EVAL NZN1D	
PLT5 510	iC-WKN		iC-WKN EVAL WK4D		iC-NZN		iC-NZN EVAL NZN1D	
PLT5 520_B1-3	iC-WKN		iC-WKN EVAL WK4D		iC-NZN		iC-NZN EVAL NZN1D	
PLT5 520B	iC-WKN		iC-WKN EVAL WK4D		iC-NZN		iC-NZN EVAL NZN1D	
PLT5 520EA_P	iC-WKN		iC-WKN EVAL WK4D		iC-NZN		iC-NZN EVAL NZN1D	
PLPT9 450LA_E	iC-HTG		iC-HTG EVAL HTG1D		iC-HG		iC-HG iCSY HG8M	
PLPT9450D_EA01	iC-HTG				iC-HG		iC-HG iCSY HG8M	
V102C021A-850	iC-HTG		iC-HTG EVAL HTG1D		iC-HG30		-	-
V105C121A-940	iC-HTG				iC-HG30			
V107C021A-850	iC-HTG				iC-HG30			

### Wide Portfolio for Laser Bars

Industrial sensors, laser distance measurement, laser pointers, short range LIDAR, gesture recognition, augmented/virtual reality, bar code scanners, laser levelling.



## Street Lighting and Automotive



Smart street lighting recognizes ambient condition and adapts automatically with sensor technology

Providing drivers with perfectly illuminated roads: a compact brightness sensor for headlamp control

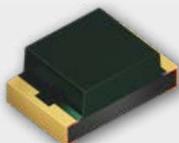
One sensor many applications: From toys and home automation to automotive cabin infotainment

### SFH 5701

Ambient light sensors enable light-based solutions to automatically adapt to the ambient conditions and thereby not only ensuring ideal visibility but also high energy efficiency. After introducing the latest ambient light sensors product line for automotive interior applications ams OSRAM has now added a new solution ideally suited for smart street lighting and consumer applications.

#### Features

- Analog output current is proportional to Ambient Light Intensity
- Spectral response close to human eye sensitivity
- Integrated dark current suppression
- Built in thermal compensation
- Linear response over 6 decades of illumination range
- The product qualification test plan is referenced to the guidelines of AEC-Q102 (Failure mechanism based stress test qualification for discrete optoelectronic semiconductors in automotive applications)

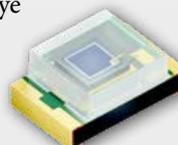


### SFH2716A01

ams OSRAM expands its ambient light sensor portfolio to address automotive applications challenged by strict limitations with respect to cost or size. The photodiode SFH2716A01 combines a good technical performance and a small package in the most economic way. Typical applications include headlamp control or automatic dimming of dashboard backlighting.

#### Features

- Package: clear epoxy
- Qualifications: The product qualification test plan is based on the guidelines of AEC-Q101-REV-C
- Stress Test Qualification for Automotive Grade Discrete Semiconductors
- ESD: 2 kV acc. to ANSI/ESDA/JEDEC JS-001 (HBM, Class 2)
- Spectral range of sensitivity: (typ) 350 ... 1000 nm
- Very small SMT package
- SMT package 0805, colorless clear resin, 2 mm x 1.25 mm x 0.8 mm
- Adapted to human eye sensitivity ( $V\lambda$ )

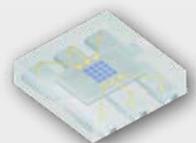


### SFH5721

Digital Ambient Light Sensor combines an array of photodiodes and wide dynamic range readout channels to enable ambient light and infrared sensing. The Hardware consists of 3 main parts, which are Sensor Board, Main Board and micro USB cable. The SFH 5721 A01 is certified for automotive applications.

#### Features

- Wide Operating Voltage  
Min/Max: 1.7 V, Max: 3.3 V
- ODFN 2 x 2 x 0.5 mm
- ALS sensitivity in Lux  
Min/Max: 0.001 Lux, Max: 64000 Lux
- Accurate ALS reading without influence from IR
- Separate IR read out channel
- Flexible integration time Min: 0.2 ms, Max: 1600 ms
- I<sup>2</sup>C interface
- Supports multiple I<sup>2</sup>C address
- Cycling redundancy check (CRC) functionality for I<sup>2</sup>C communication for Auto grade parts





The DNA of tech.™



# Digital I<sup>2</sup>C Ambient Light Sensors

## High Accuracy Digital Light Sensors to Sense Brightness Conditions

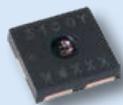
Vishay Ambient light sensors allow settings to be adjusted automatically in response to changing ambient light conditions. By turning on, turning off, or adjusting features, ambient light sensors can conserve battery power or provide extra safety while eliminating the need for manual adjustments.

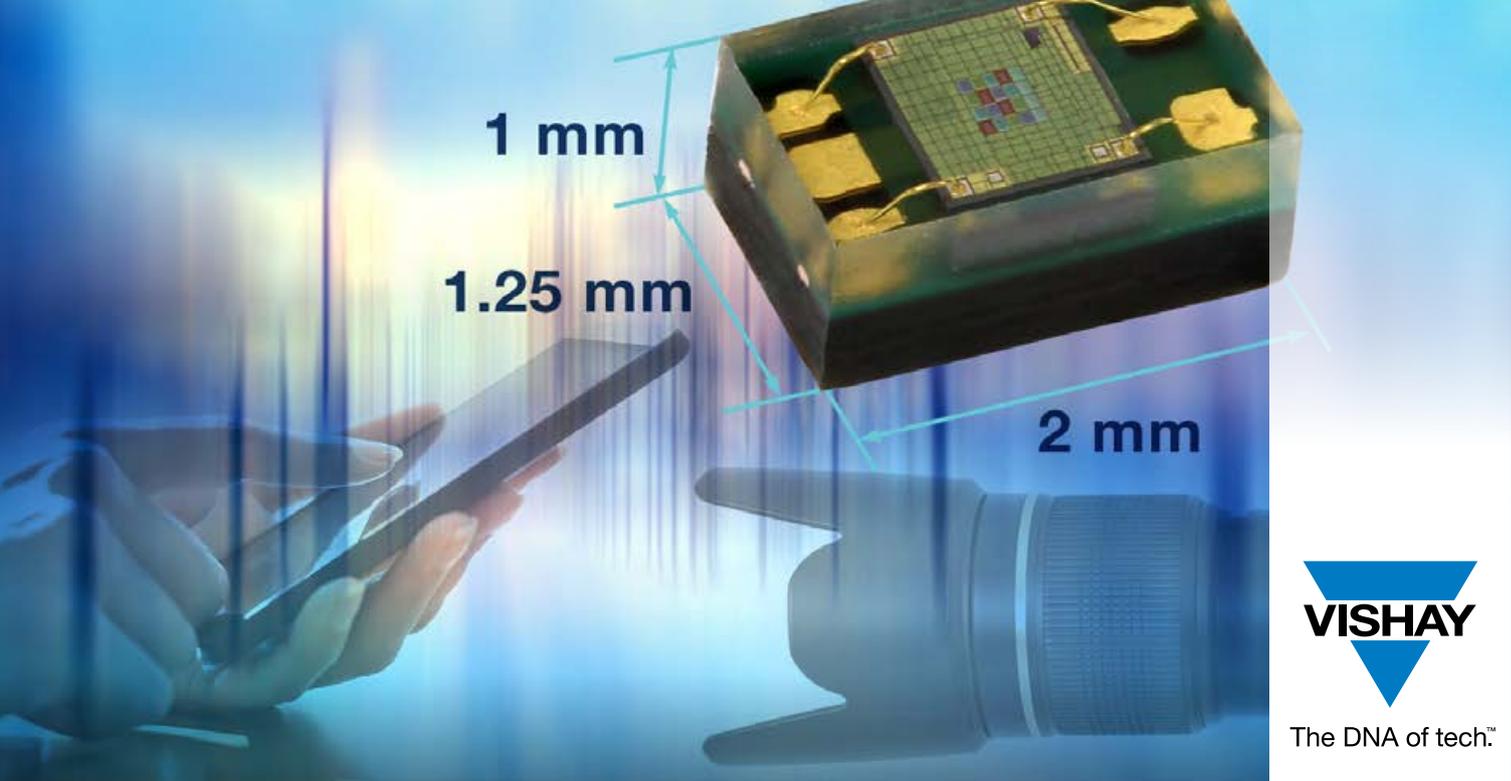
### VEML6031X00

VEML6031X00 is a high accuracy ambient light digital 16-bit resolution sensor in a miniature opaque package. It includes a highly sensitive photodiode, a low noise amplifier, a 16-bit A/D converter and supports an easy to use I<sup>2</sup>C bus communication interface and additional interrupt feature. The ambient light result is as digital value available.

### VEML3235 and VEML3235SL

VEML3235 and VEML3235SL incorporate a photodiode, amplifiers, and analog circuits in a single chip. The best spectral sensitivity is used to closely capture real human eye responses. Their robust refresh rate setting does not need an external RC low pass filter. Software shutdown mode is provided, which reduces power consumption to be less than 1  $\mu$ A.

Type	VEML6031X00	VEML3235 / VEML3235SL
Shape		
Features	Package type: surface-mount	
	Dimensions (in mm): 2.67 x 2.45 x 0.6	Dimensions (in mm): 2 x 2 x 0.87 (VEML3235) / Dimensions (in mm): 2.95 x 1.5 x 1.5 (VEML3235SL) – side-view
	Supply voltage range VDD: 2.5 V to 3.6 V	
	Communication via I <sup>2</sup> C interface	
	I <sup>2</sup> C bus H-level range: 1.7 V to 3.6 V I <sup>2</sup> C	
Ambient Light Function	Low shut down current consumption: typ. 0.5 $\mu$ A AEC-Q100 qualified	Low stand by current consumption: typ. 1 $\mu$ A
	16-bit dynamic range for ambient light detection from 0 lx to about 228 klx with resolution down to 0.0034 lx/ct, supports low transmittance (dark) lens design	High ALS sensitivity with minimum detectable intensity of 0.0021 lux/ct supports low transmittance lens design
	Excellent temperature compensation	
	High dynamic detection resolution	
Applications	Filtron™ technology adaption: close to real human eye response	Software shutdown mode control
	Typical ALS output tolerance of $\leq 10\%$ under different light sources	
	<ul style="list-style-type: none"> <li>▪ Display backlight controls</li> <li>▪ Infotainment systems</li> <li>▪ Rear view mirror dimming</li> <li>▪ Interior lighting control systems</li> <li>▪ Head-up displays</li> </ul>	<ul style="list-style-type: none"> <li>▪ Handheld device</li> <li>▪ Notebook</li> <li>▪ Consumer device</li> <li>▪ Industrial and medical application</li> <li>▪ Computing, and industrial devices and displays</li> </ul>



# RGBCIR Color Sensors with I<sup>2</sup>C Interface

## VEML3328 and VEML3328SL

VEML3328 and VEML3328SL sensors sense a variety of light by incorporating photodiodes, amplifiers, and analog / digital circuits into a single CMOS chip. With these sensors, the brightness and color temperature of a display backlight can be adjusted based on the ambient light source, and it can differentiate indoor from outdoor lighting environments. A very good CCT performance is given as well.

### VEML3328 and VEML3328SL

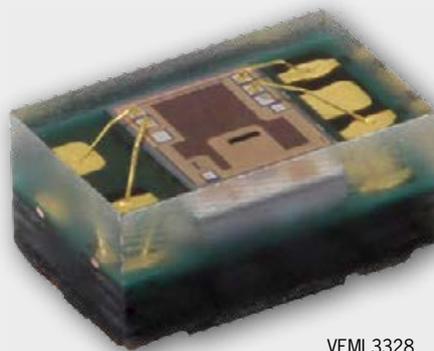
#### Features

- Package type: OPLGA4 surface-mount
- Dimensions:
 

<b>VEML3328</b>	2.0 x 1.25 x 1.0 (in mm)	Top-view
<b>VEML3328SL</b>	2.95 x 1.50 x 1.50 (in mm)	Side-view
- Integrated modules: color sensor and signal conditioning IC
- Supports low transmittance (dark) lens design
- Excellent Temperature compensation: -40 °C to +110 °C
- Low power consumption I<sup>2</sup>C (SMBus compatible) interface
- Parallel measurement
- No scattered light by FAM package

#### Applications

- Automatic white balancing and color cast correction in digital cameras
- Eliminate unsightly blue or orange color casts
- Automatic LCD backlight adjustment
- Maintaining consistent true color and ideal brightness levels on handheld displays as users move between indoor and outdoor environments
- On / off light switching in industrial and consumer applications
- Active monitoring of LED color output for IoT and smart lighting





Tx (Transmitter)	Rx (Receiver)
<b>PN: PI22G01</b> • 2.2 x 1.8 x 0.6mm • 535nm	<b>PN: PP32ZN1</b> • 2.6 x 2.3 x 0.6mm • Light current @535nm: 1µA
<b>PN: PI22N01</b> • 2.0 x 0.8 x 0.6mm • 660nm + 940nm	<b>PN: PP73XA1</b> • 5.1 x 4.0 x 0.85mm • Light current @535nm: 3.1µA
<b>PN: PI11H01</b> • 1.85 x 1.65 x 0.6mm • 535nm + 660nm + 940nm	<b>PN: PP21ZN1</b> • 2.0 x 1.8 x 0.6mm • Light current @535nm: 0.5µA
	<b>PN: PP52ZN4</b> • 3.5 x 2.5 x 0.6mm • Light current @535nm: 1.5µA

# Wearable Devices

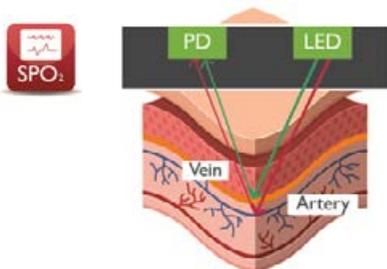


## Best-in-Class Optical Monitoring for Smart Watch and Band

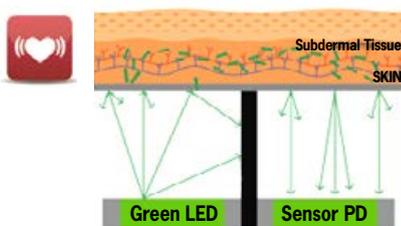
A photoplethysmogram (PPG) is an optically obtained plethysmogram that can be used to detect blood volume changes in the microvascular bed of tissue. A PPG is often obtained by using a pulse oximeter which illuminates the skin and measures changes in light absorption. A conventional pulse oximeter monitors the perfusion of blood to the dermis and subcutaneous tissue of the skin.

### Function

#### Peripheral Capillary Oxygen Saturation



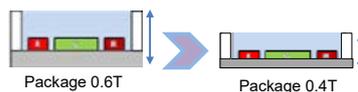
#### Heart Rate Measurement



When your heart beats, the blood flow in your wrist – and the green light absorption – is greater. Between beats, it's less.

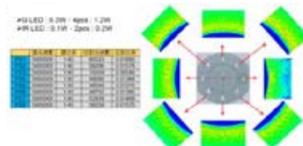
### Features & Benefits

#### Thinner Tx



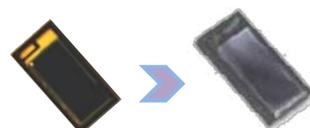
Decrease the package thickness to make wearable device thinner.

#### Optical Simulation



Optical simulation to optimized the Tx/Rx Package Design

#### Consistency Design



Concealed the copper trace to make the appearance consistency.

### Applications

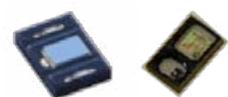
- Wearable devices
- Heart rate monitoring
- Pulse oximetry
- PPG (PhotoPlethymoGraphy)
- Sleep apnea
- Disposable medical

#### Thinner Rx



Flip-chip PD increase the sensitive area but decrease the package size.

#### Customized package



Tx:  
460/530/630/660/680/880/940/1050/1350 nm  
Rx: Ir-cut/long-Wp/optical Filter



# New High-Speed PIN Photodiode: VEMD8081

## Improved Bio Sensor Performance with Slim Design for Wearable Devices and Medical Applications

The VEMD8081 is the succession to the VEMD8080 and offers 15% greater reverse light current than its predecessor, while maintaining the same package dimensions. It utilizes Vishay's proven wafer technology to detect visible and near infrared radiation. The device provides designers with a drop-in replacement that can improve performance by increasing signal output, or extend battery life by reducing LED current. The VEMD8081's rectangular shape maximizes the area of the photodiode receiving reflected light, eliminating the wasted area typically found in square photodiodes.

### Benefits

- Enhanced sensitivity to visible and infrared light
- Rectangular 4.8 mm by 2.5 mm top-view, surface-mount package with a low 0.48 mm profile
- Typical reverse light current of 33  $\mu$ A
- Radiant-sensitive area measuring 5.4 mm<sup>2</sup>
- Wide spectral range from 350 nm to 1100 nm
- Fast switching times and low capacitance of 50 pF enable high sampling rates
- $\pm 65^\circ$  angle of half-sensitivity
- 840 nm wavelength of peak sensitivity
- RoHS-compliant, halogen-free, and Vishay Green

### Applications

- Optical heart rate detection in wearable devices such as fitness trackers and smartwatches when placed between two pulsing green LEDs
- For heart rate measurement in wearable devices, the light reflected off the skin is received by the photodiode and converted to an output current, with the device's increased sensitivity enabling more accurate measurements
- SpO2 measurement in medical monitors when combined with red and infrared emitters





# Near-Infrared Spectroscopy

## Mega Trend – Wellbeing? Consumers want to know what is in their food

The basis of the SFH4737 is a blue 1 mm<sup>2</sup> chip in UX:3 technology. Its light is converted into infrared radiation with the aid of a phosphor converter developed specifically for this application. A residual blue component in the light helps users target the area they want to investigate.

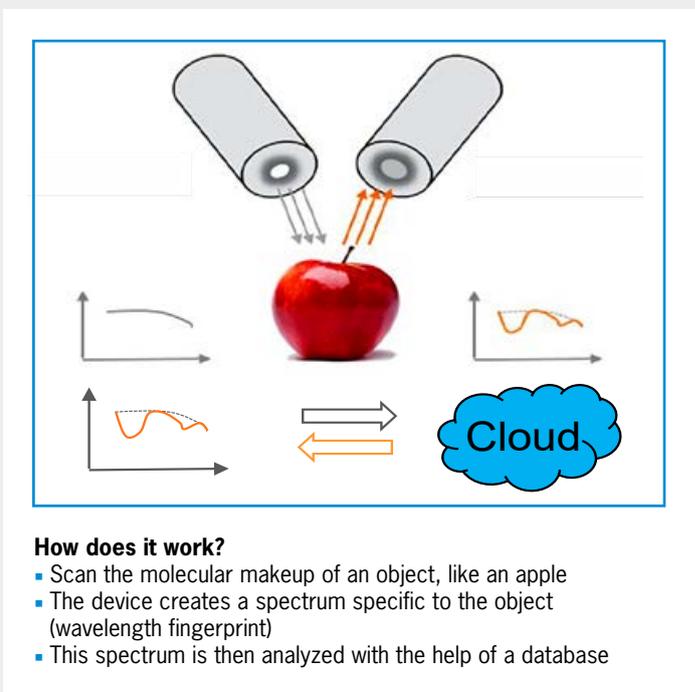
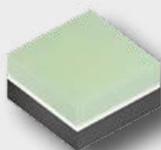
### How does it work?

Near-infrared spectroscopy enables such things as the water, fat, sugar and protein content of food to be measured.

This technology uses the characteristic absorption behavior of certain molecular compounds. If a defined light spectrum is directed at a sample it is possible to determine the presence and quantity of certain ingredients from the wavelength distribution of the reflected light. An IRED, such as the SFH 4737 acts as a compact light source for the spectrometer.

### Benefits

- Smallest dimensions
- Tripled efficiency values
- Improved energy consumption



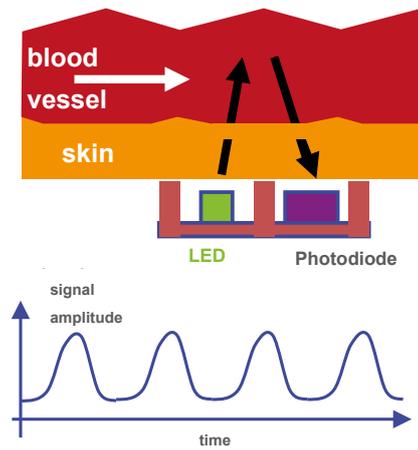
Part No	OSLON P1616 - SFH 4737
	Designed for Mobile
Dimensions / Package	1.6 x 1.6 x 0.9 mm
Halfangle	± 65°
Total radiant flux in NIR (650 nm – 1050 nm, at 350 mA)	74 mW
Radiant intensity in NIR (650 nm – 1050 nm, at 350 mA)	18 mW/s

### Applications

- Measurement of the nutritive substances of food
- Identification of counterfeit medicine
- Measurement of wellness
- Analyze and control the growing process status of the plant
- Control process in industrial foods

## Heart Rate Monitoring

Blood vessels expand and contract with each heartbeat  
 → light absorption varies



The frequency of the signal allows to derive the pulse rate → Green LED



## Near-Infrared Spectroscopy

Optical Solutions for Bio-Sensing in Wearables and Medical Devices

### Optical Sensor Frontend (BIOFY)

Discrete Solution	
	<b>Heart Rate Monitoring</b> Green LED + large area photo diode with IR cut filter e.g. LT PW5G + SFH 2240
	<b>Heart Rate Monitoring</b> Red LED and IRED + broad-band photodiode e.g. CH DELSS1.22 + SFH 4441 + SFH 2200

Integrated solution BIOFY®	
	<b>Heart Rate Monitoring</b> BIOFY® Sensor (green LED + photodiode) e.g. SFH 7070
	<b>Pulse Oximetry + HRM</b> Green/red/IR LED + broad-band photodiode e.g. SFH 7072

### Integrated Optical Sensor Frontend (BIOFY)

Shape	Device	Part Number	Centroid wave length (nm)	Forward Voltage (V @ mA)	Total Optical Flux (mW @ 20 mA)	Radiant sensitive Area (mm)	Capacitance (pF)	Spectral Range (nm)	Dimensions (mm)
	BIOFY®	SFH7050 A	530 / 655 / 940			1.51 x 1.51			4.7 x 2.5 x 0.9
	BIOFY®	SFH7060	530 / 655 / 940	3.4 / 2.1 / 1.3	3 * 3.4 / 6.4 / 5.3	1.4 x 1.4	5	400 – 1100	7.2 x 2.5 x 0.9
	BIOFY®	SFH7070	530	3.0	2 * 11.7	1.29 x 2.69	55	402 – 694 (IR Filter)	7.5 x 3.9 x 0.9
	BIOFY®	SFH7072	530	3.0	2 * 11.7	1.29 x 2.69 1.29 x 2.69	55 55	410 – 1100 (IR Filter) 402 – 694 (IR Filter)	7.5 x 3.9 x 0.9
	BIOFY®	SFH7074	530 / 655 / 940						12.0 x 4.1 x 0.8

### Photodiodes

Shape	Device	Part Number	Radiant sensitive Area (mm)	Capacitance (pF)	Spectral Range	Dimensions (mm)
	TOPLED® D5140	SFH 2201	2.85 x 2.85	65	300 – 1100	5.1 x 4.0 x 0.85
	SMT DIL	SFH 2440	2.65 x 2.65	135	400 – 690 (IR Filter)	6.5 x 3.9 x 1.15
	TOPLED® D5140	SFH 2200	2.65 x 2.65	60	300 – 1100	5.1 x 4.0 x 0.85
	TOPLED® D5140	SFH 2240	2.65 x 2.65	135	400 – 690 (IR Filter)	5.1 x 4.0 x 0.85



# Vital Advancements for Vital Signs Monitoring



Fitness bracelets, smart watches and other wearables provide more and more information to monitor our vital signs. What began with simple features such as step counting has expanded to monitoring calorie consumption, body temperature, sleep quality, blood sugar level, blood pressure, blood oxygen content and the heart rate. Optoelectronic components provide the basis to achieve the exact measurements necessary to derive these values.

ams OSRAM has contributed significantly to the progress in the development of these components, e.g. with the first generation of integrated optical front end solutions with emitters (SFH 7050, SFH 7051 and SFH 7060), the second generation OFE (SFH 7070 and SFH 7072), several generations of discrete multi-wavelength emitters (SFH 7012, SFH 7013) and photodetectors (SFH 2440, SFH 2200, SFH 2201).

## Optical Heart Rate Monitoring (HRM)

**Photo Plethysmography (PPG): Varying light absorption by expanding and contracting blood vessels with each heart beat.**

Light strikes the body tissue and then is transmitted, absorbed and reflected – the larger the irradiated blood volume, the lower the amount of light reflected. As the blood volume in the arteries changes with the cardiac cycle, the heart rate results from the periodicity of the detector signal.

This optical measurement of the change of blood volume in the blood vessels is referred to as photoplethysmography (PPG). In practice, the sensor consisting of juxtaposed light source and detector is located directly on the skin, usually on the wrist or fingers.

Due to the location the measurement is made at different wavelengths – green light has established itself as the best option for the wrist, red and infrared light for the finger.

## Pulse Oximetry (SpO<sub>2</sub>)

**Comparing the transmitted or reflected signal at 660 nm (red) and 940 nm (IR) allows the measurement of oxygen content in blood.**

The oxygen saturation of the blood can be measured when infrared and red light are used at the same time. This so-called pulse oximetry is based on the fact that hemoglobin (Hb) is changing its absorption behavior when it binds oxygen (oxyhemoglobin HbO<sub>2</sub>). The concentrations of these two variants of hemoglobin can be determined by measuring the absorption at two different wavelengths. This yields the oxygen saturation of the blood. Red (660 nm) and infrared (940 nm) light are the ideal choice, because here the absorption behavior of the two hemoglobin molecules deviates most from each other. In contrast to the pulse measurement, which is only considering the relative changes in light absorption, the light absorption of arterial blood must be measured in absolute terms here. In practice, the blood oxygen saturation can be expressed as a function of the ratio of the minimum and maximum detector signals ( $I_{\min}/I_{\max}$ ) at the respective wavelength.



The DNA of tech.™

# K857PE: 4-Quadrant Silicon PIN Photodiode

## New Qualified Device in Opaque Package Delivers Excellent Signal to Noise Ratio and Virtually no Tolerance Between Segments

Vishay Intertechnology introduces the industry's first 4-quadrant silicon PIN photodiode in a standard surface-mount package that is AEC-Q101 qualified. Combining high photo sensitivity with low 0.1 % electrical segment to segment crosstalk and virtually no tolerance between its segments, the Vishay Semiconductors K857PE enables a variety of sensor and control applications for the automotive, consumer, and industrial markets.

### Benefits

- Four monolithic diodes integrated into a single 4.72 mm by 4.72 mm by 0.8 mm top-view, surface-mount package
- Active area of 1.6 mm<sup>2</sup> per quadrant
- Wide sensitivity range from 690 nm to 1050 nm
- 8.5  $\mu$ A reverse light current
- Daylight blocking filter
- $\pm 60^\circ$  angle of half sensitivity
- Epitaxial Technology
- RoHS-compliant, halogen-free

### The News

- Opaque package sides eliminate stray light irradiating the photodiodes
- Linear photo response enables small signal detection
- The defined gap between the K857PE's four radiant sensitive areas allows for reliable measurement during laser positioning
- The current from each of the device's PIN diodes can be processed individually, resulting in low electrical crosstalk

### Market Applications

Small signal detection for automotive rain / light sensors, industrial automation systems, laser beam alignment, and virtual reality applications



### Application Schematics



#### Laser Beam Alignment

Docking Applications

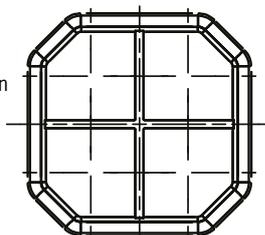
- Laser position feedback to guidance system
- Subtle adjustments in position possible with K857PE



#### Tracking the Sun

Automotive Applications

- Automatically adjust air conditioning depending on orientation of the sun
- Determine ingress and egress of tunnel



#### Spatial Position

Virtual Reality Applications

- Practicing surgery, defusing a bomb
- Fine positioning of head and hand implements



#### Gesture Recognition

Reflective Applications

- Up, down, left, right
- Up/down at an angle





# IR LEDs for Even “More Real” Virtual and Augmented Reality

## Firefly SFH 4030 and SFH 4060 for Eye-tracking Systems

Virtual (VR) and Augmented Reality (AR) applications have long played a central role in areas far beyond classic gaming. Various global players have used these technologies for training purposes or integrated them firmly into their daily work processes.

Eye-tracking systems register the user’s viewing angle and the movements of his or her eyes. The systems illuminate the eyes with infrared light and register the reflections with a camera sensor.

Software then determines the exact position of the eyes and the viewing direction of the user to derive relevant information for the imaging elements of the system.

Eye-tracking offers a very intuitive way of human-machine interaction for AR and VR applications, including displaying important information about the focused object, this making system integration easier.

As these applications become part of our everyday lives, some users are developing feelings of discomfort and dizziness when the virtual and real perceptions do not match.

ams OSRAM’s new Firefly SFH 4030 and SFH 4060 help to prevent these side effects by enabling state-of-the-art eye-tracking solutions that provide a targeted point of reference, allowing users to safely immerse in other worlds.



Type	Firefly SFH 4030	Firefly SFH 4060
Dimensions	1.0 x 0.325 x 0.55 mm	
Wavelength	940 nm	850 nm
Features	Side emitting components for easy installing	
	Black cap makes the IREDS „invisible“	
	Avoids „red glow“ effect	High sensitivity of sensors



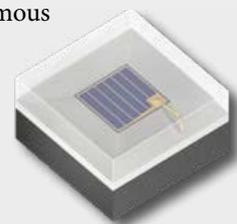
## Ultra-compact IR LED Enables Gesture Control in Car Interiors OSLON® Piccolo Combines Compact Dimensions with Outstanding Brightness Values

Advanced Driver Assistance Systems (ADAS) and technologies previously designed for mobile devices – such as facial recognition, eye tracking or gesture control – are increasingly making their way into the automotive sector.

These technologies are based on infrared light. Autonomous driving will lead the way causing cars to be equipped with more and more functions to make the interaction between occupants and vehicles more intuitive. An autonomous vehicle will have a fundamentally different interior design than current models.

The classic dashboard will be replaced by other user interfaces and options for communication. Today, drivers can use voice assistants for navigation and control simple functions via gesture control. Thanks to gesture recognition, completely new ways of using displays were also created. For example, when navigating to a destination, the vehicle displays a map with the corresponding route. At the edges of the image, different menu items for operating the display are often shown in a standardized way – which in turn takes away space from displaying the map. With the help of gesture recognition, menu items are only shown when the driver moves his hand towards the display, allowing the route to appear full screen.

The smaller and more powerful the required components, the easier they are to integrate into complex designs. ams OSRAM's Osolon Piccolo now offers an extremely compact infrared LED (IRED) that packs enormous power in a small package, making it ideal for customers.



Type	Osolon Piccolo SFH 4170S A01	Osolon Piccolo SFH 4180S A01
Dimensions	1.6 x 1.6 x 0.81 mm	
Wavelength	850 nm	940 nm
DC power at 1 A	1.15 W	
Switching time	10 ns	
Features	AEC-Q102 certified	
	Suitable as a constant light source for a camera-based application	
	Suitable for 3D image acquisition with modulated or fast pulsed light	



Half angle  $\pm 35^\circ$   
 SFH 4171S (850nm)  
 SFH 4181S (940nm)



## Infrared OSLON® P1616 with Lens:



Superior package size to performance ratio with 450 mW/mm<sup>2</sup>

The OSLON P1616 Infrared series is designed to provide efficient high power Infrared illumination for compact designs as it comes in an ultra-small package. The SFH 4171S and SFH 4181S – the newest additions to the P1616 portfolio – already have an integrated lens with a viewing angle of  $\pm 35^\circ$  and are available as stack version, therefore being the perfect fit for applications requiring a high radiant power and a homogenous bright illumination area, such as 2D Face Recognition for user authentication in laptops and smart door bells for example.

### Smallest Size, Higher Power – Typ. 1150 mW out of 1.6 x 1.6 mm<sup>2</sup>

#### Characteristics

Wavelength	850 nm / 940 nm
Pop	1150 mW (@1A)
Radiant intensity	680 mW/sr
Junction Temp.	T <sub>j</sub> max. 145 °C
Spectral bandwidth	30 / 37 nm

#### Optics and Package

Footprint	1.60 x 1.60 mm <sup>2</sup>
Height	1.71 mm
T <sub>op</sub>	- 40 °C to 105 °C
R <sub>thjS</sub> elec. (max.)	8.1 K/W
R <sub>thjS</sub> real (max.)	13 K/W
Half angle	$\pm 35^\circ$

#### Electrical specification

V <sub>f</sub> (typ.)	2.95 V @1A (940 nm)
	3.25 V @1A (850 nm)
If (max.) DC	1.0 A
If (max) pulse	2.0 A
ESD stability	max. 2 kV

#### Target Applications



■ Computing ■ Mobile Devices



■ CCTV, Security ■ Smart Home



■ Machine Vision ■ Spectral Sensing

Material Description	Ordering Codes	MSL	Pack. Unit	COO	Delivery Packaging	MOQ	MQQ	Design-In Type	Ship & Debit	HTS	ECCN
SFH 4171S	Q65113A1098	2	2000	China	Tape & Reel	4000	12000	YES	YES	85414010	N
SFH 4181S	Q65113A1097	2	2000	China	Tape & Reel	4000	12000	YES	YES	85414010	N



MACHINE VISION



SURVEILLANCE



ACCESS CONTROL

# Lextar

NIGHT VISION



## High Power IR LEDs

### Vision Systems, Access Control, Night Vision, Gesture Control

Lextar offers a broad product portfolio of high power IR LEDs with different dimensions and electro-optical specifications. Power ratings from 1W up to 5.8 W with 850 nm and 940 nm are available. New chips are offering increased efficiency at high driving currents. Additionally a wide range of viewing angles from 35 degrees up to 130 x 80 degrees are available. The asymmetric lens design of the 130 x 80 degrees version is specially designed for vision systems and offers better illumination at the corners of the cameras field of view.

High Power IR LEDs often produce a small amount of visible red light, which makes them visible for human eyes.

Lextar also offers a special non red gloss version to overcome this issue. Main applications of these IR LEDs are surveillance cameras, night vision systems or machine vision systems. However they are also suitable for time-of-flight cameras with lower modulation frequencies.

#### Features

- Package with low thermal resistance
- 850nm and 940nm
- Non red gloss version available
- Asymmetric viewing angle available
- Up to 2W optical power

#### Applications

- Surveillance cameras
- Night vision systems
- Machine vision
- Gesture control
- People/object detection

Style	Type	Series	Package Size	Power	Wave-length	Viewing Angle
	Peak wavelength	PR37xxx	3.7x3.7	1-5.8W	850 940	150
	Radiant intensity	PR35xxx	3.55x3.55	1-5.8W	850 940	35/60/90/120 130x80
	Total radiant flux	PR27xxx	2.75x2.0	1-5.8W	850 940	60/80/120

Comparison

Asymmetric LED

Simulation

Real Camera Image

# Transistor Optocouplers

## Selection Guide



### Application

- Power supplies
  - Isolated DC converters; SMPS; AC adapters; DC/DC bricks
- Industrial I/O
  - Isolated 4 mA to 20 mA control loops & communications
- Smart grids
  - Grid voltage detection
  - ZC detection
  - Communication isolation
- Industrial automation
  - Switching supply
  - I/O isolation
  - Feedback control loops

Type	Creepage Distance		5 mm	5 mm	5 mm	5 mm	5 mm	8 mm	8 mm	7 or 8 mm	8 mm	7 or 8 mm	7 or 8 mm	8 mm	Suppliers		
	Internal	Isolation															
Connections	Features	Voltage (V <sub>rms</sub> )	SSOP-4	SSOP-8	SOP-16	SOP-4	SOP-5/ 6L5	Single Channel	DUAL Channel	DIP4	DIP6-SMD6	DIP-8	DIP-16	LSOP-4			
																base connect.	base connect.
	Standard	3750/ 4000	TLP291(SE)		TLP291-4	TLP185 (SE)									Toshiba		
			VOS617A			VOM617A		VO2xx	VOD2xx							Vishay	
			EL3H7-G	ELD3H7	ELQ3H7	EL357N-G		EL2xx	ELD2xx								Everlight
			LTV-217	LTV-227	LTV-247	LTV-356T			LTV-20x								Liteon
	5000										TLP785				TLP385	Toshiba	
							TCLT111x				VO617A	H11Ax	TCET2200		VOL617A	Vishay	
							EL111x-G				EL816	H11Ax	EL827	EL847	EL101x-G	Everlight	
							LTV-110X				LTV-816	CNY17-x	LTV-826	LTV-846	LTV-100x	Liteon	
	Low input current	3750	TLP293		TLP293-4	TLP183									TLP383	Toshiba	
			VOS618A		SFH6916	VOM618A					VO618A				VOL618A	Vishay	
	350V V <sub>CEO</sub>	3750				TLP188									TLP388	Toshiba	
											TLP628					Toshiba	
-300V V <sub>CEO</sub>	5000											SFH640 (300V)			Vishay		
										EL851					Everlight		
										LTV-851 *				Liteon			
	Purpose	3750	TLP290 (SE)		TLP290-4	TLP184 (SE)									Toshiba		
			VOS627A		TCMT4600	SFH691AT										Vishay	
			EL3H4-G	ELD3H4	ELQ3H4	EL354N-G										Everlight	
			LTV-214	LTV-224	LTV-244	LTV-354T										Liteon	
	5000										TLP620				Toshiba		
											SFH620x				Vishay		
											EL814				Everlight		
											LTV-814T	LTV-733	LTV-824	LTV-844		Liteon	
	Low input current	3750	TLP292		TLP292-4	TLP182										Toshiba	
			VOS628A													Vishay	
	5000										TLP626				VOL628A	Toshiba	
											SFH628x					Vishay	
											H11AAx				Everlight		
	V <sub>CEO</sub>	2500				TLP127									Toshiba		
						TLP187										Toshiba	
		3750	TCMD1000		TCMD4000			VO223AT	VOD223T							Vishay	
			EL452-G													Everlight	
		5000					LTV-352T									Liteon	
												TLP627				TLP387	Toshiba
									SFH619A	4N32	TCED2100	TCED4100	TCLD1000	Vishay			
									EL852	H11Bx	EL825			Everlight			
									LTV-852	LTV-725V				Liteon			

# High Speed Couplers

## Selection Guide



### Applications

- Industrial communication buses
- High-speed A/D and D/A converters
- Digital control and high performance switch mode power supplies
- Industrial controller I/O interfaces
- Signal isolation transformer replacement AC motor drives
- IPM drivers
- Harsh environment
- Smart metering

Draft	Clearance/Creepage Distance		4 or 5 mm	5 mm		7 or 8 mm	7 or 8 mm	7 or 8 mm		8 mm	8 mm			
	Data Rate (Typ.)	Output Configuration	S05 (MFP)	S08 1ch	S08 2ch	SDIP6	SDIP6 Wide	DIP8 1ch	DIP8 wide	DIP8 2ch	S06L			
	~20 kbps	Open collector	TLP2301									Toshiba		
			LTV-2301										Liteon	
	~100 kbps	Open collector	TLP2303	TLP2403							TLP2703	Toshiba		
				SFH6318/9				6N138/9	SFH6139-X006				Vishay	
			LTV-M701	LTV-0701	LTV-073L		6N138/9						Liteon	
	~1 Mbps	Open collector		EL070X			6N138/9					Everlight		
			TLP2309	TLP2409		TLP719	TLP719F	TLP759	TLP759F			TLP2719	Toshiba	
			VOM452/3	SFH6315/6				6N135/6	VOW135/6	SFH6325/6				Vishay
			LTV-M501	LTV-0501	LTV-053L		6N135/6	LTV-W136	LTV-2530	LTV-50LP/W			Liteon	
	~5 Mbps	Open collector	ELM45X	EL050X	EL053X		6N135/6	ELW135/6	EL253X			Everlight		
			TLP2395										Toshiba	
	~5 Mbps	Totem pole			TLP2105							Toshiba		
			TLP2310, TLP2395, TLP2398											
								SFH6705	SFH6705-X006				Vishay	
	~10 Mbps	Open collector						SFH6702/12	SFH6702-X006			Vishay		
			TLP2362, TLP2363								TLP2662		Toshiba	
				V006xxT	V006x1T			V02601/11	VOW137	V04661				Vishay
			LTV-M601	LTV-0601	LTV-063L		6N137	LTV-W137	LTV-2630	LTV-60LP/W			Liteon	
			ELM6XX	EL060X	EL063X		6N137	ELW26XX	EL263X				Everlight	
	~10 Mbps	Totem pole	TLP2391								TLP2735	Toshiba		
			LTV-M61L	LTV-0601	LTV-064L							LTV-61L	Liteon	
	~15 to 20 Mbps	Open collector	TLP 2368	TLP 2468	TLP 2168	TLP 2768	TLP 2768F	TLP 2962	TLP 2962F			TLP2768A	Toshiba	
														Liteon
				LTV-071L/N	LTV-074L/N	LTV-70LP/W								Liteon
			TLP2066, TLP2366	TLP2466	TLP2166A, TLP2261, TLP2270	TLP2766	TLP2766F						TLP2761, TLP2767, TLP2770, TLP2766A	Toshiba
	~15 to 20 Mbps	Ultra low power	TLP2361, TLP2370		TLP 2161								Toshiba	
	~50 Mbps	Totem pole	TLP2367										Toshiba	

# INDUSTRIE 4.0

## Internet of Things IoT

### IPM Drive Photocouplers Compact Motor Drive



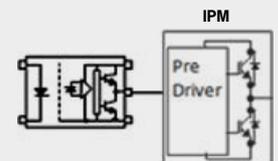
Power electronics for application embedded motor drives need to be compact and to have good thermal characteristics. Different IPM (intelligent power module) concepts are competing with different sets of features to be the best solution. They are a combination of power semiconductors like IGBTs, MOSFETs and Optocouplers (in peripheral components like driver circuits). IPM-drive photocouplers offer photocouplers ideal for isolated interfacing to an intelligent power module (IPM). IPM-drive photocouplers are available with an output in open-collector and inverting and non-inverting totem-pole configurations. Therefore, you can find optimal photocouplers that best fit your needs, regardless of the input configuration (active level) of the driven IPM.

#### Features

- Interfaces with active-low and active-high IPMs
- Common-mode rejection (CMR) up to 20 kV/μs
- Fast switching with a propagation delay of 200 ns
- High noise isolation
- High voltage isolation
- Flexible output configuration

#### Applications

- IPM (Intelligent Power Module) Driver
- General purpose inverter
- Solar and industrial inverters
- Welding machine



#### Selection Guide

	Clearance/Creepage Distance		4 or 5 mm	4 mm	7 or 8 mm	7 or 8 mm	8 mm	Supplier	
	Data Rate (Typ.)	Output configuration	MFP/SO5	SO8	SDIP6	DIP8	SO6L		
	~1 Mbps	Open collector	TLP109(IGM)		TLP719	TLP759(IGM)		Toshiba	
			LTV-M456		LTV-456P			Liteon	
		Open collector	VOM453			SFH6345		Vishay	
			TLP104, TLP2304	TLP2404	TLP714	TLP754	TLP2704	Toshiba	
	~5 Mbps	Totem pole (buffer logic type)			LTV-456W	LTV-4506		Liteon	
			TLP2355	TLP2405	TLP715	TLP2955		Toshiba	
			LTV-M480	LTV-0480	LTV-480	LTV-4800		Liteon	
		Totem pole (inverter logic type)	TLP2358	TLP2408	TLP718	TLP2958		Toshiba	
			LTV-M481	LTV-0481	LTV-481	LTV-4801		Liteon	
	~10 Mbps	Totem pole (buffer logic type)	TLP2345				TLP2745	Toshiba	
		Totem pole (inverter logic type)	TLP2348					TLP2748	Toshiba

# Phototriacs for Motor Control

The photo detector in a phototriac is a photo sensitive TRIAC, sometimes called an optotriac. Phototriacs are used to switch on and off AC loads. Turning on the infrared emitting diode allows current to flow to the AC load. Phototriacs are primarily used as a silicon-controlled rectifier (SCR) or as a pre-driver to a TRIAC. They are commonly found in industrial applications such as in motor control. As optocouplers, they isolate the low voltage control circuitry and people from the high-voltage mains. Phototriacs can be zero-crossing and non-zero-crossing. You can choose from non-zero-cross (NZC) triac-output photocouplers that allow hardware phase control of the triac and zero-cross (ZC) triac-output photocouplers that help reduce switching noise.



## Application

- Controlling the speed of low-power motors
- Lighting controls: dimming lamps
- Controlling AC heating resistors
- Temperature controls
- Electromechanical contactors
- Solid-State Relays (SSR)
- AC motor starters and drives
- Utilities metering over AC lines
- Interfacing microprocessors 115 to 240 V<sub>AC</sub> peripherals
- Solenoid/valve controls
- Static power switches

EVERLIGHT LITEON



TOSHIBA

The DNA of tech.™

## Features

- Wide range of LED trigger current: 1.5 to 30 mA
- High peak repetitive off-state voltage up to 800 V
- Available in the cost-effective small package SOP-4
- DIP, SMD, SOP with leadbend options available
- Worldwide safety agency certifications: UL, cUL, CSA, CQC, VDE, DIN EN (60747-5-5), FIMKO

Clearance/ Creepage Distance		Static dV/dt < 5000V/μs				Static dV/dt=10000V/μs					
		4 or 5 mm		7 or 8 mm		7 or 8 mm		7 or 8 mm			
Off-State Output VDRM (V)	Isolation Voltage, BVs (Vrms)	SO-4/MFSOP-6		DIP-4/SMD-4		DIP-6/SMD-6		DIP-6/SMD-6			
		NZC	ZC	NZC	ZC	NZC	ZC	NZC	ZC		
400	2500	TLP160G	TLP161G	TLP525G		TLP560G	TLP561G	TLP560G	TLP561G	Toshiba	
		ELM302X	ELM304X							Everlight	
		LTV-302X								Liteon	
	5000					VO302X		BRT11x	BRT21x	Vishay	
				ELT302X	ELT304X	EL302X	EL304X			Everlight	
				LTV-802X		MOC-302X				Liteon	
600	2500	TLP165J	TLP168J							Toshiba	
		ELM305X	ELM306X							Everlight	
		VOM305X	VOM160X							Vishay	
		LTV-305X	LTV-306X							Liteon	
		TLP267J	TLP268J							Toshiba	
	4000						TLP762J	TLP763J			Toshiba
		5000			ELM305X	ELM306X	EL305X	EL306X			Everlight
					LTV-805X	LTV-806X	MOC-305X	MOC-306X			Liteon
							VO305X	VO306X	BRT12x/IL4216	BRT22x/IL4116	Vishay
				TLP360J	TLP363J	TLP3052	TLP306X			Toshiba	
800	3500		ELM308X							Everlight	
		VOT8121AM	VOT8024AM							Vishay	
			LTV-308X							Liteon	
					ELT308X		EL308X			Everlight	
	5000						LTV-808X	MOC-308X			Liteon
							VO4257/8	VO4157/8	BRT13x/IL4218	BRT23x/IL4118	Vishay
							TLP665L	TLP3082			Toshiba



# Gate drive IGBT/MOSFET Optocouplers Selection Guide



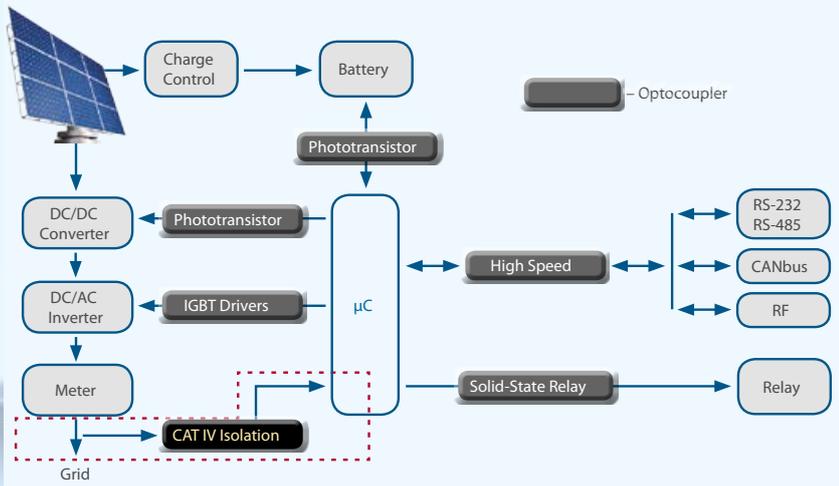
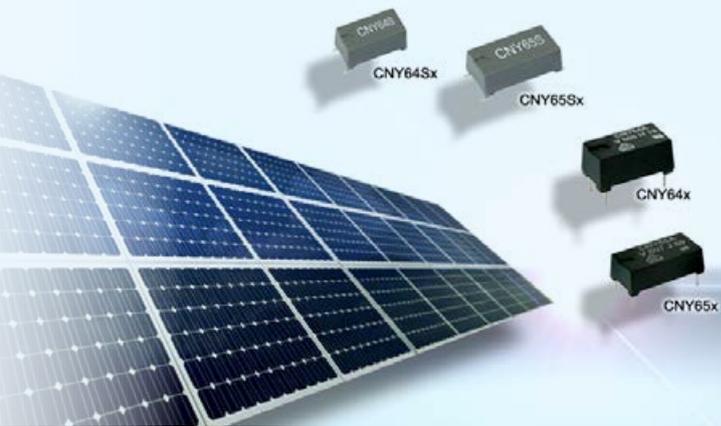
## Applications

- Industrial Automation
- AC Servo
- Air Conditioner Inverter
- Home Appliances
- FA Inverter
- Power Supply (UPS)
- Photovoltaic Inverter
- Induction Cooking

Clearance/ Creepage Distance	Supply Voltage $V_{CC}$	Propagation Delay $t_{pHL}/t_{pLH}$	4 or 5 mm	7 or 8 mm		7 or 8 mm		8 mm	8 mm	Supplier	
			S05/MFP	SDIP6	SDIP6 Wide	DIP8	DIP8 wide	S06L	S016L		
-6 A	15V-30V	500ns				TLP358H	TLP358HF			Toshiba	
-4.A	15V-30V	150ns						TLP5754 Rail to Rail	TLP5214A Rail toRail	Toshiba	
	15V-30V	150ns						TLP5774 Rail to Rail		Toshiba	
~2.5 A	15V-30V	150ns						TLP5752 Rail to Rail		Toshiba	
		200ns	TLP152	TLP700A	TLP700AF	TLP352	TLP352F	TLP5702		Toshiba	
			LTV-152T	LTV-341P	LTV-341W	LTV-3180	LTV-3180M			Liteon	
		500ns		TLP700H	TLP700HF	TLP350H	TLP350HF			Toshiba	
					LTV-3120	LTV-3120M			Liteon		
						VO3120(R2R)	VOW3120			Vishay	
10V-30V	500ns				TLP250H	TLP250HF				Toshiba	
					LTV-3150L	LTV-3150M				Liteon	
	150ns							TLP5751 Rail to Rail	TLP5731 Dual output	Toshiba	
								TLP5771 Rail to Rail			Toshiba
200ns			LTV-340P	LTV-340W			LTV-3150M-L Rail to Rail			Liteon	
	500ns					LTV-3150L Rail to Rail	LTV-3150M-L			Liteon	
~0.6 A	10V-30V	200ns	TLP155E	TLP705A	TLP705AF					Toshiba	
				LTV-155E	LTV-314P	LTV-314W					Liteon
		500ns	TLP151A	TLP701A	TLP701AF	TLP351A			TLP5701		Toshiba
						VO3150A					Vishay
700ns		TLP701H	TLP701HF	TLP351H	TLP351HF				Toshiba		

# 12 kV<sub>PEAK</sub>

Overvoltage protection and CatIV isolation



## High-Voltage & Linear Couplers CAT IV Isolation High-Voltage Optocouplers



Isolation requirements vary depending on the device's installation category. As shown in the diagram, Category IV devices are connected to utility power. To protect low-voltage electronics from high-voltage power, ordinary optocouplers may not be sufficient. For CAT IV, AC isolation should be at least 8000 V.

### CNY6XX Ultra High Isolation High Creepage Couplers

#### Features

- AC isolation of 8200 VRMS minimum
- Distance through insulation > 3 mm
- VDE 0160 and VDE 0884 for electrical power installation
- IEC 60065 for mains-operated electronics

Types	CNY64x	CNY65x	CNY66x
	CNY64xST	CNY65xST	
Creepage	9.5 mm	14.0 mm	17.0 mm

Through-Hole				
Package	Current Transfer Ratio % (CTR)			
		50 to 300	63 to 125	100 to 200
DIP	CNY64	CNY64A	CNY64B	
	CNY65	CNY65A	CNY65B	
	CNY66		CNY66B	CNY651AGR

Surface-Mount (SMD)				
Package	Current Transfer Ratio % (CTR)			
		50 to 300	50 to 150	80 to 240
HVSM	CNY64ST	CNY64AYST	CNY64ABST	CNY64AGRST
	CNY65ST	CNY65AYST	CNY65ABST	CNY65AGRST
		CNY651AYST		CNY651AGRST

## IL300 Linear Optocoupler, High Gain Stability, Wide Bandwidth

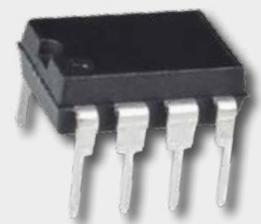
Isolation amplifier circuit is useful in industrial, instrumentation, medical, and communication systems. Galvanic isolation is desirable and often essential in many measurement systems. Applications requiring galvanic isolation include industrial sensors, medical transducers, and mains powered switchmode power supplies. Operator safety and signal quality are insured with isolated interconnections. These isolated interconnections commonly use isolation amplifiers.

#### Features

- Couples AC and DC signals
- 0.01 % servo linearity
- Wide bandwidth: > 200 kHz
- High gain stability:  $\pm 0.005$  %/°C typically
- Low input-output capacitance

#### Applications

- Power supply feedback voltage/current
- Medical sensor isolation
- Audio signal interfacing
- Isolated process control transducers
- Digital telephone isolation



## Photovoltaic, Linear and High-Voltage Couplers

### TLP3905 / TLP3906

- 4pin SO6 package
- Extended temperature range - 40 to +125 °C
- Isolation Voltage: 3750 Vrms (min.)
- Embedded discharge circuit for fast switching included in TLP3906



### TLP3910 NEW

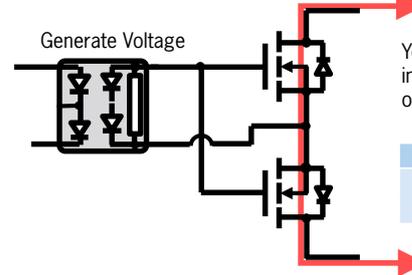
- High VOC for High Voltage MOSFET drive:  $V_{OC} = 17V$  (typ.)
- ISC = 30  $\mu A$  (typ.)
- 4pin SO6L package
- Isolation voltage: 5000 Vrms (min.)
- Embedded discharge circuit
- Extended temperature range - 40 to +125 °C



Product	TLP3905	TLP3906	TLP3910
Package	SO6 (4pin)		SO6L
VOC (min.)	7 V	7 V	14 V
ISC (min.)	-	12 $\mu A$	-
IFT (max.)	-	3 mA	3 mA
BVs (min.)	3750 Vrms		5000 Vrms
ton (typ.)	0,3 ms	0,2 ms	0,3 ms
toff (typ.)	1 ms	0,3 ms	0,1 ms
Top	-40 to +125 °C		

### Reference Circuit

#### AC Line Switch



You can control high current insulation relay circuit with only 10mA LED current!

PV Coupler	MOSFET
TLP3910	TK62J60W
	TK39J60W

## Isolation Amplifiers/Delta-Sigma Modulators

Our isolation amplifier is an optically coupled isolation amplifier with a high-precision  $\Delta\Sigma AD$  converter on the input side. It is particularly suitable for realizing current sensor and voltage sensor. It achieves the industry's highest level of linearity and has high common-mode transient immunity (CMTI), so it can be operated stably even in motor control applications where high noises are generated

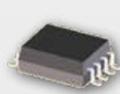
Analog Output	TLP7820	TLP7920	TLP7920F
Digital Output	TLP7830	TLP7930	TLP7930F
Package	SO8L (LF4)		DIP8
Creepage / Clearance (mm)	8.0	7.0	8.0
Isolation Voltage ( $V_{rms}$ )	5000	5000	5000



TLP7820



TLP7920

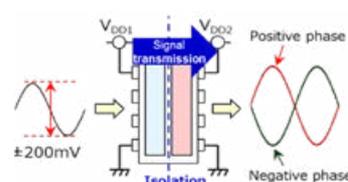


TLP7830

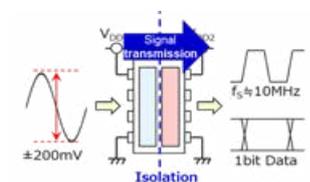


TLP7930

### Analog Output



### Digital Output



## Digital Isolators – High-Speed data rate up to 150 Mbps

Digital isolators offer significant, compelling advantages over optocouplers in terms of size, speed, power consumption, ease of use, and reliability. Digital isolators use transformers or capacitors to magnetically or capacitively couple data across an isolation barrier, compared to optocouplers that use light from LEDs

### Features and Benefits

<b>High-Speed</b>	Max. data rate 150 Mbps	
	4ch / 2ch high-speed logic	
<b>High CMTI</b>	CMTI 200 kV/μs typ. (100 kV/μs min)	
	Good noise isolation due to Magnetic coupling	
<b>High Reliability &amp; robust safety</b>	Long life (>70 years) Insulation	
	Double insulation structure	
	Reinforced insulation 5kVrms	

### Applications

- Isolated PWM Control
- Industrial Fieldbus Communications
- Microprocessor System Interface (SPI, I<sup>2</sup>C, etc.)
- Programmable Logic Control
- Isolated Data Acquisition System
- Voltage Level Translator

### Standard Digital Isolators

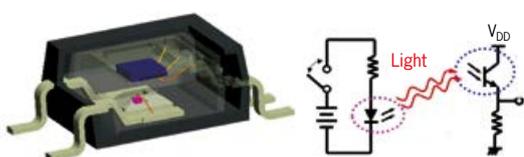
Channel	P/N	Number of Inputs (Forward:Reverse)	Max Data Rate (Mbps)	Default Output State	Control Signal Package	Package	Pin Layout
4ch	DCL540C01	4 : 0	150	Low	Enable	SOIC16-W	
	DCL540D01			High			
	DCL540L01			Low			
	DCL540H01			High			
	DCL541A01	3 : 1	150	Low	Disable	SOIC16-W	
	DCL541B01			High			
2ch	DCL541C01	1 : 1	150	Low		SOIC8	
	DCL541D01			High			

### Standard Digital Isolators

Channel	P/N	Number of Outputs (VDD2 sides)	I <sub>p</sub> (sink) (A)	UVLO Level (V)	Function	Package	Pin Layout
2ch	DCD241B01	2 (Dual-Channel)	4	5	Programmable dead time (DT)	SOIC16-W (14pin)	
	DCD241C01			8			
	DCD241F01			12.5			

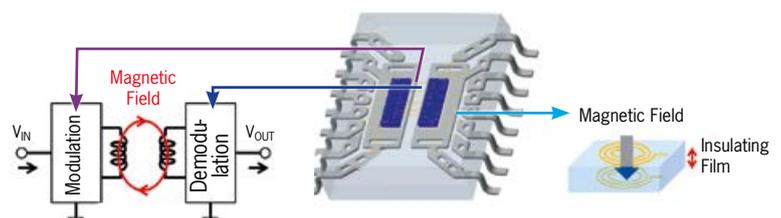
#### PHOTOCOUPLER

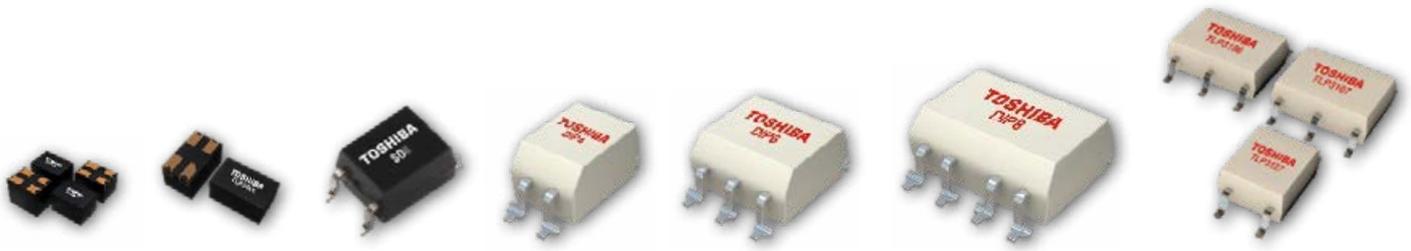
USING LIGHT SIGNAL



#### DIGITAL ISOLATOR

USING MAGNETIC OR ELECTRICAL FIELD SIGNAL





# Photorelays



## Ideal For Industrial Applications

Photorelays are a type of photocoupler consisting of an LED optically coupled with a MOSFET. They offer many advantages over mechanical relays such as long operational life, low-current drive and fast response. Widely used for contact switching in various industrial applications, Toshiba photorelays provide low RON, low COFF, devices in various packages featuring high current and high off-state voltage.

### Features

- No mechanical contacts, no wear and tear
- Leading edge technology for best technical performance
- Drive directly from MCU
- Large package variety including smallest S-VSON package
- Wide range of photorelays with extended temp range from -40°C up to +110°C
- Optical isolation with guaranteed internal galvanic isolation

### Benefits

- No wear and tear induced degradation
- Devices offer highest currents and fastest switching
- Improved system efficiency, lowest power consumption
- Suitable photorelay for each application and available space
- Products are flexible applicable in harsh industrial environments
- Provides best in class Isolation / Less power consumption
- Fewer field failures due to higher product reliability and lifetime
- Smaller footprint compared with mechanical relays
- High speed switching / No operational noise

Off-Off-State Voltage $V_{OFF}$	On-State Current $I_{ON}$	On-state resistance $R_{ON}$ max.	Terminal Cap. $C_{OFF}$ typ.	$BV_S$ min.	4 Pin S06	2.54SOP4	2.54SOP6	DIP4	DIP6	DIP8
600 V	0.6 A	2 $\Omega$	4300 pF	2500 V						TLP3549 UL
	0.09 A	60 $\Omega$	75 pF	5000 V				TLP240J UL		
400 V	0.4 A	5 $\Omega$	410 pF	2500 V						TLP3548
	0.12 A	35 $\Omega$	80 pF	5000 V				TLP240GA UL		
350 V	0.11 A	65 $\Omega$	30 pF	3750 V	TLP172GAM					
	0.10 A	50 $\Omega$	30 pF	3750 V	TLP172GM H, UL				TLP240G UL	TLP3825
200 V	1.5 A	0.5 $\Omega$	400 pF	2500 V						TLP3825 H
	0.7 A	0.15 $\Omega$	110 pF	2500 V				TLP3558A H, UL		
	0.4 A	2 $\Omega$	100 pF	1500 V		TLP3145 H				
	0.25 A	8 $\Omega$	90 pF	5000 V				TLP240D UL		
100 V	3.5 A	0.08 $\Omega$	450 pF	2500 V					TLP3546A H, UL	
	3 A	0.15 $\Omega$	720 pF	2500 V						TLP3823 H
	3 A	0.065 $\Omega$	460 pF	1500 V			TLP3109A* H			
	2 A	0.2 $\Omega$	110 pF	2500 V				TLP3556A H, UL		
	2 A	0.07 $\Omega$	500 pF	1500 V			TLP3109			
60 V	1.5 A	0.2 $\Omega$	160 pF	1500 V		TLP3149* H				
	5 A	0.05 $\Omega$	850 pF	2500 V						TLP3547 UL
	4 A	0.04 $\Omega$	1000 pF	1500 V			TLP3107A*			
	4 A	0.06 $\Omega$	640 pF	2500 V					TLP3545A H, UL	
	3.3 A	0.06 $\Omega$	700 pF	1500 V			TLP3107			
	3 A	0.1 $\Omega$	250 pF	2500 V				TLP3555A H, UL		
	2.5 A	0.065 $\Omega$	400 pF	2500 V					TLP3542	
	2.5 A	0.1 $\Omega$	240 pF	1500 V		TLP3147* H				
40 V	2.3 A	0.07 $\Omega$	1000 pF	1500 V			TLP3103			
	1.4 A	0.25 $\Omega$	100 pF	3750 V	TLP3122A H, UL					
	0.7 A	2 $\Omega$	100 pF	3750 V	TLP176AM H, UL					
	0.5 A	2 $\Omega$	130 pF	5000 V				TLP240A UL		
	3.5 A	0.06 $\Omega$	1000 pF	2500 V					TLP3544	
	2.5 A	0.06 $\Omega$	1000 pF	1500 V			TLP3102			
	2.5 A	0.15 $\Omega$	300 pF	2500 V				TLP3554		
	2 A	0.15 $\Omega$	300 pF	5000 V				TLP241A UL		
30 V	5 A	0.04 $\Omega$	1100 pF	2500 V					TLP3543A H, UL	
	5 A	0.03 $\Omega$	1000 pF	1500 V			TLP3106A* H			
	4 A	0.05 $\Omega$	450 pF	2500 V				TLP3553A* H, UL		
	4 A	0.04 $\Omega$	1100 pF	1500 V			TLP3106			
20 V	3.3 A	0.05 $\Omega$	450 pF	1500 V		TLP3146* H				
	4 A	0.05 W $\Omega$	1000 pF	2500 V					TLP3543	
	2.5 A	0.05 W $\Omega$	1000 pF	1500 V			TLP3100			

H: Photocouplers with a maximum operating temperature of 110°C | UL: UL 508 recognized | H, UL: Ta max = 110°C, for UL 508 application, Ta max = 85°C



Security Systems



Battery Management



Automatic Measurement Equipment



Meetering



Telecommunication



Instrumentation



Industrial

# Solid-State Relays and MOSFET Drivers

## VOR Series – High Reliable and Compact Packages



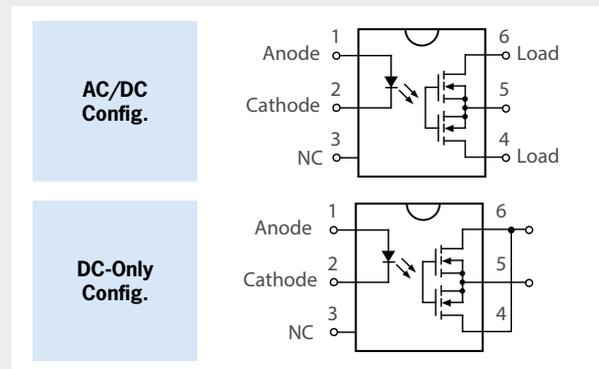
The DNA of tech.™

It is common to include relay contact outputs for actuation of external devices, such as audible alarms in case of power outages and fans for auxiliary cooling. While mechanical relays can be used in these applications, it is more reliable to use optically isolated solid-state relays. In addition to Vishay's broad selection of SSRs, customers also have the option of using MOSFET drivers to build a custom relay using discrete standard MOSFETs

### Benefits

- High reliability
- Tiny package foot print options
  - > Saves board space compared to bulky electro-mechanical relays
- Wide package options
- Fast switching Times – noiseless switching (no click)
- Low on-resistance down to 12 Ohm (typ.)
- Single and dual channel options
- High open circuit voltage / High short circuit current
- Isolation test voltage up to 5300 V<sub>RMS</sub>

### AC and DC Configuration with SSRs

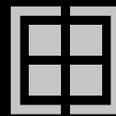


### Solid State Relays

Part Number	Package	R <sub>ON</sub> Typical (Ω)	Load Voltage (V)	I/O Isolation (V <sub>RMS</sub> )	Load Current (mA)	t <sub>on</sub> / t <sub>off</sub> <sup>1</sup> (μs)
VOR1121A6	DIP-6	12	250	5300	200 / 370	200 / 30
VOR1121B6	SMD-6					
VOR2121A8	DIP-8				200 / 140	
VOR2121B8	SMD-8					
VOR1142M4	SOP-4	22	400	3750	140	200 / 50
VOR1142B4	SMD-4					
VOR1142A6	DIP-6			5300	140 / 270	130 / 50
VOR1142B6	SMD-6				140	
VOR2142A8	DIP-8					2000
VOR2142B8	SMD-8					
VO14642AT	SMD-6 / DIP-6	0.18	60	3750	100	52 / 36
VO1400AEFTR	SOP-4	2.3				

### MOSFET Driver

Part Number	Function	Package	Open Circuit Voltage Typ. (V)	Short Circuit Current Typ. (μA)	I/O Isolation (V <sub>RMS</sub> )	t <sub>on</sub> / t <sub>off</sub> <sup>1</sup> (μs)
LH1262	MOSFET Driver	SMD-8 / DIP-8	13.5	3.4	5300	35 / 90
VO1263			14.3	9.8		26 / 73
VOM1271T		SOP-4	8.4	15	3750	53 / 24


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