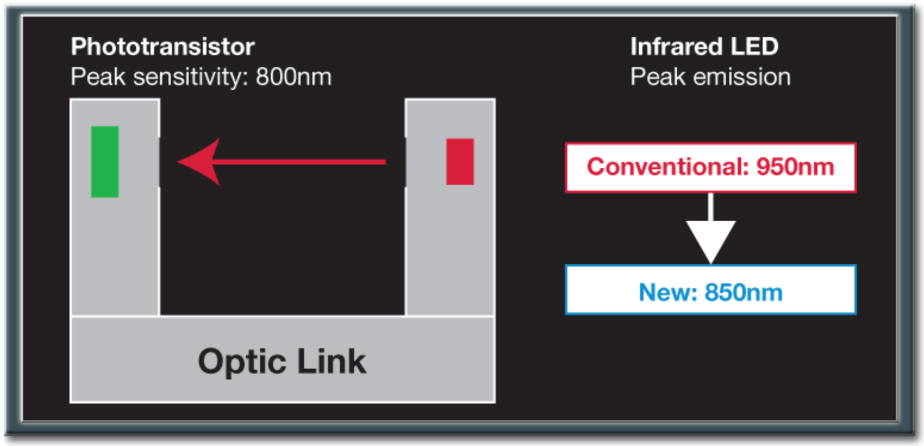
Optical Sensors

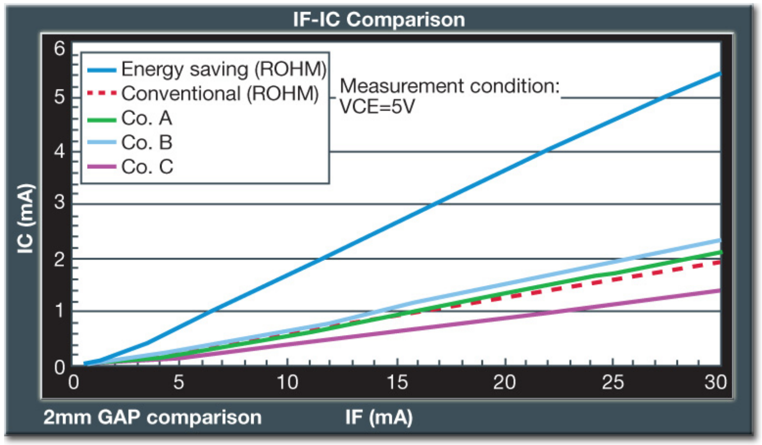
Sensor Markets

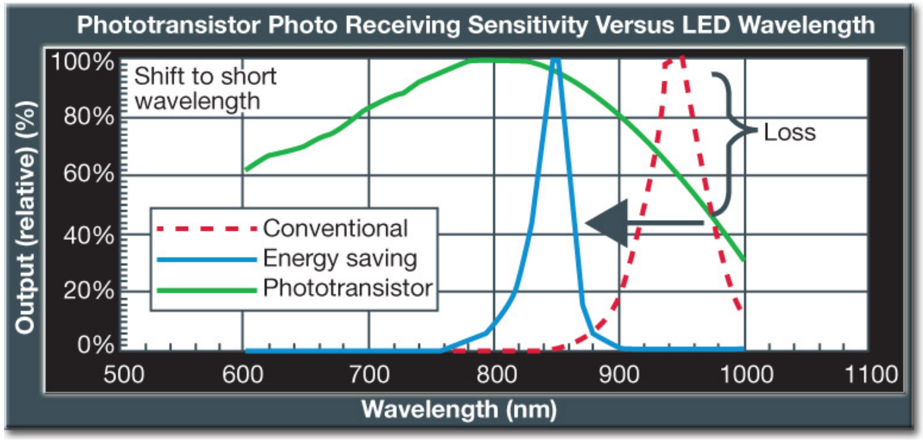
Applications	Examples
Digital Cameras, Smart Phones/Pads	Proximity Sensor; Image Rotation Sensor; Ambient Light Detection; Gesture Recognition
Automotive	Multi-switch; Air Conditioner; Power Seat; Steering Sensor; Infrared
Factory Automation	Motor Rotation Detection: Servo Motor; Power Mate
Medical	Motor Rotation Detection: Blood Pump; Syringe Pump
Household Appliances	Smoke Detection: Fire Detectors; Air Cleaners
Security	Infrared Lighting: Vein Authentication; Security Cameras
Health	Rotation & Position Detection: Massage Chair; Horse Riding Machine (Exercise Equipment)
OA / Others	Detection & Ejection: Shredder Paper Detection/Ejection; Sewing Machine Thread Detection
ATM, Kiosk, Ticket Machine, Printer	Positioning & Detection: Paper Positioning; Drawer & Cartridge Detection

Breakthrough Technology Achieves High Photo Conversion & Energy Savings in IR Optic Applications

This newly developed IR LED features light wavelength similar to the peak sensitivity wavelength of a phototransistor







3X More Efficient

66% Less Energy

Actual savings will vary depending on the customer's application and settings.

Current consumption is decreased to 1/3 when used under the same characteristics versus current products

Low Profile IR LED for Sensors: SIM-030ST

Ideal for Proximity Sensors

LCD ON during standby

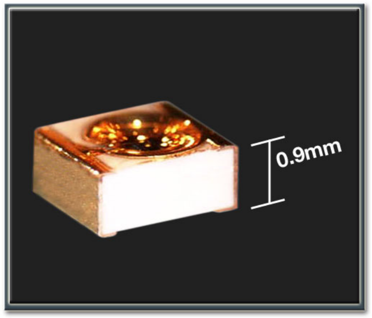
LCD OFF while talking

- Prevents malfunctions
- Saves battery power

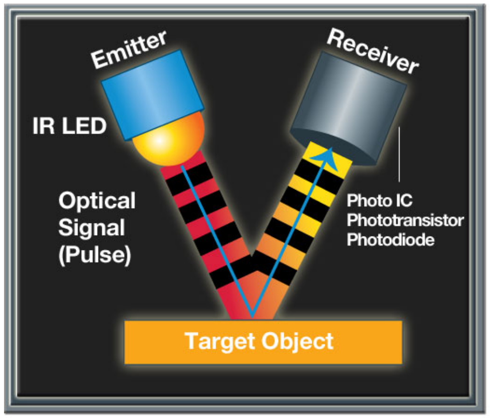
For Touch-Free Sensors

- Prevents smudges
- User interface

Thinnest IR LED: SIM-030ST



Proximity Sensor: Operating Principle



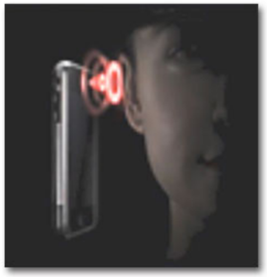
- Optical signals output from the emitter element (IR LED) are reflected off a target object and detected by the receiver element.
- Separates noise from other light sources (i.e. sunlight, fluorescent lamps).

Low Profile IR LED for Sensors: SIM-030ST

Applications

- Outdoor/high power devices

Mobile Phone



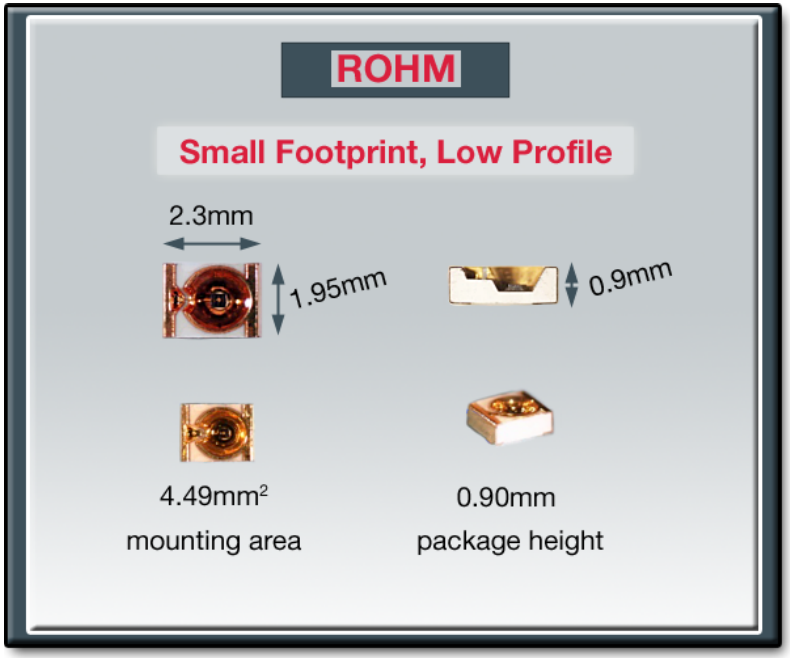
Proximity Sensor

Power saving with
viewfinder display OFF

Single Lens Reflex Camera

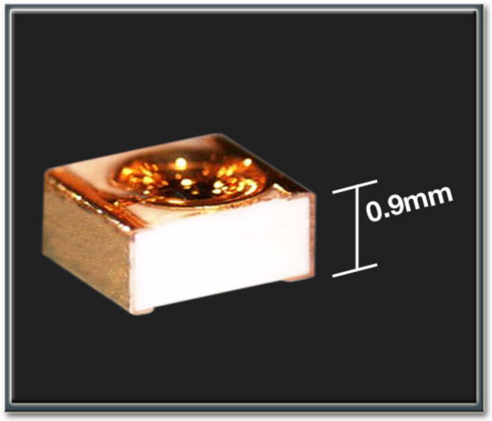
Package Comparison

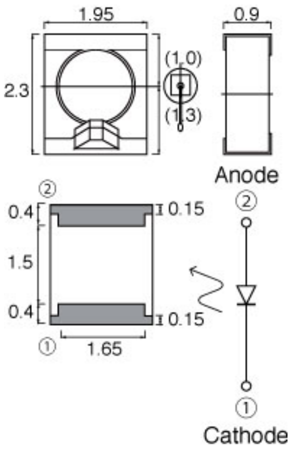
- 33% smaller mounting area than conventional models
- 42% thinner, narrow beam than conventional models
- MID structure (Improved beam phase matching & output power)



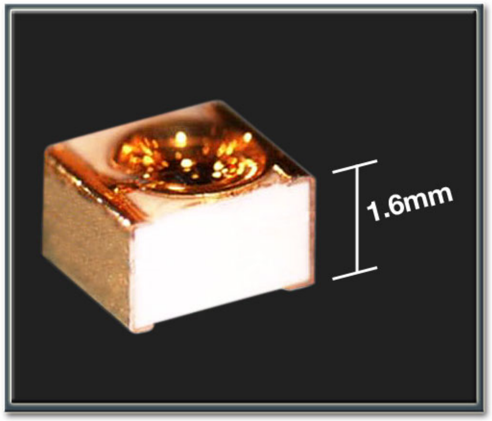
Low Profile High Power IR LEDs: SIM-030ST/031ST, SIM-040ST/041ST

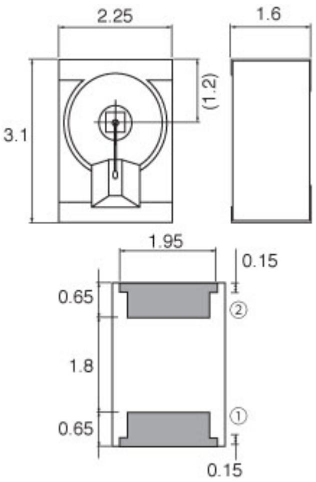
SIM-030ST/031ST





SIM-040ST/ 041ST





Specifications

Part #	Forward Current (I_F)	Power Dissipation (V_R)	Operating Temperature (T_{OPR})	Min. Emitting Strength (I_E)	Forward Voltage (V_F)	Peak Emitting Wavelength (λP)	Half Viewing Angle (Φ½)	Response Time (tr. tf)
	mA	mW	ºC	mW/sr	V	nm	deg	µs
SIM-030ST	100	180	-25 to 85	30	1.7	870	±20	0.1
SIM-031ST	100	180	-25 to 85	30	1.7	850	±20	0.1
SIM-040ST	100	180	-25 to 85	40	1.7	870	±20	0.1
SIM-041ST	100	180	-25 to 85	40	1.7	850	±20	0.1

Ultra-Compact Surface Mount Tilt Sensor (4-way Detection): RPI-1040

Broad Compatibility: Optically detects device orientation – ideal for image orientation and fall detection applications

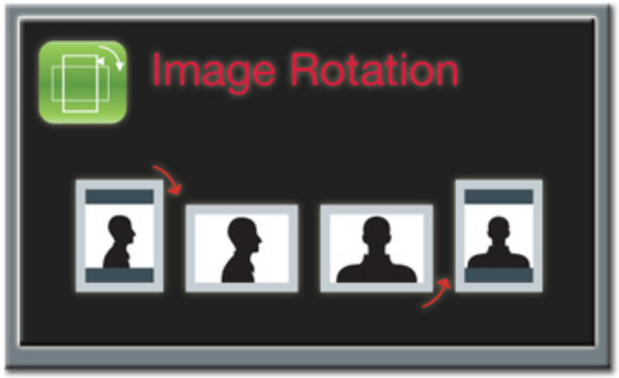


Image rotation
based on device position

Apps: Photo Display Devices (Projectors, Photo Frames)

Simplifies preview
for image correction

Apps: Video Devices (Mobile Phones, Digital Cameras)

Movement sensing – detects falls
and turns the power OFF

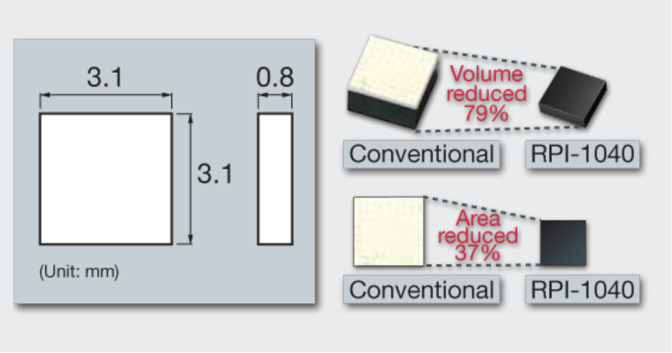
Apps: LCD TVs

Ultra-Compact Surface Mount Tilt Sensor (4-way Detection): RPI-1040

Low profile package (0.8mm)

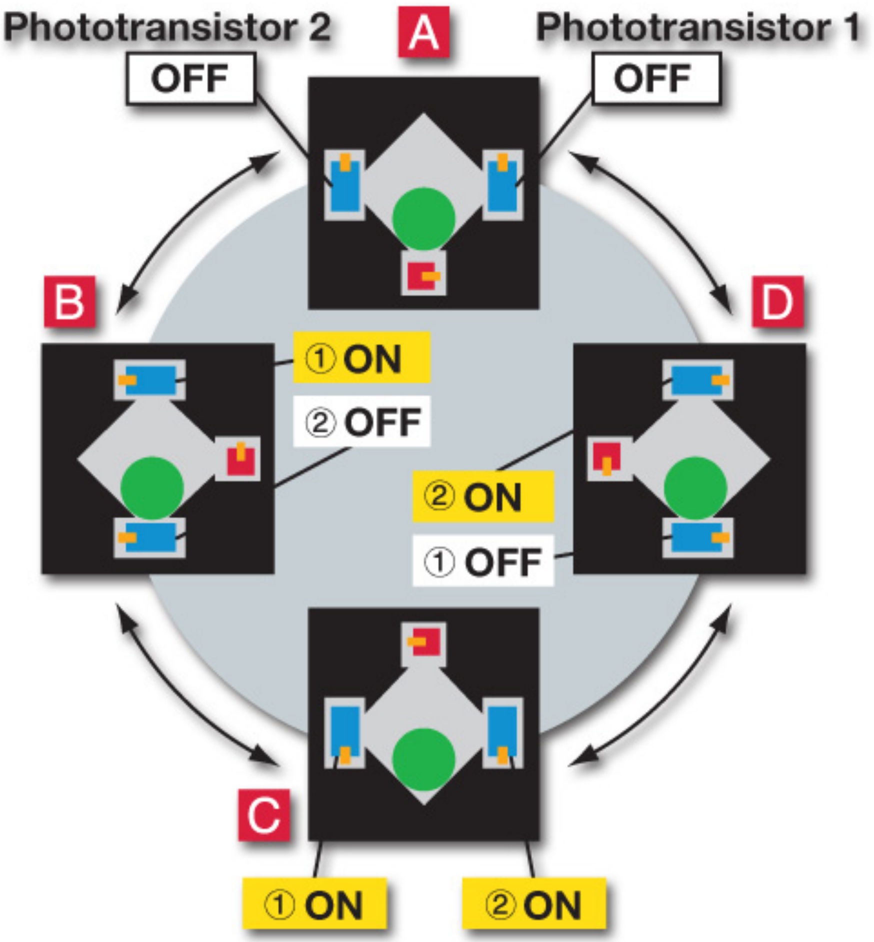
Features

- 4-way detection at 90º intervals using a shield IR diode and phototransister
- Easy integration for instantaneous detection
- Simple design and optical method minimizes malfunctions and ensures high precision
- Utilization of a novel light shield results in no EMI noise emission



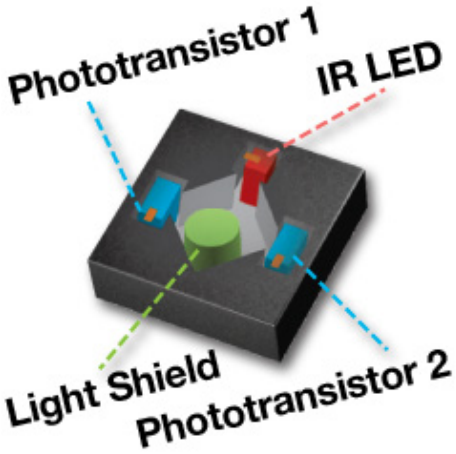
Tilt Sensor Operating Principle: RPI-1040

Silent Construction: During operation, the movement of the ball shield is suppressed.



Position	Phototransistor	
	①	②
A	OFF	OFF
B	ON	OFF
C	ON	ON
D	OFF	ON

Structural Diagram

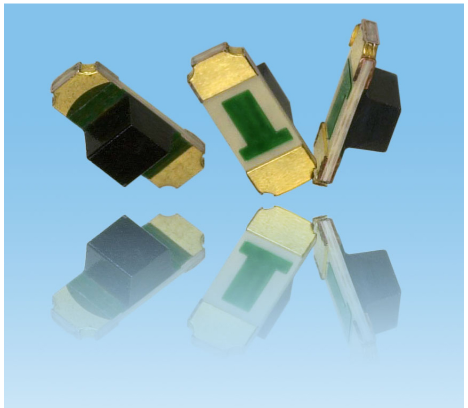


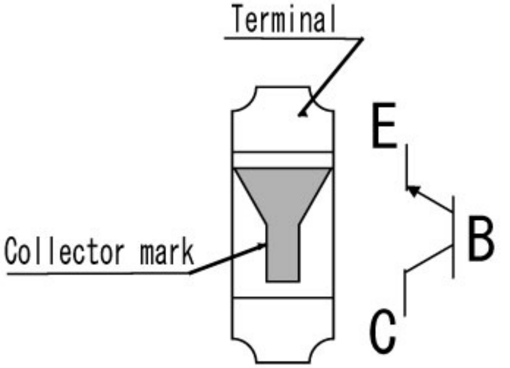
IR Phototransistor: SML-810TB

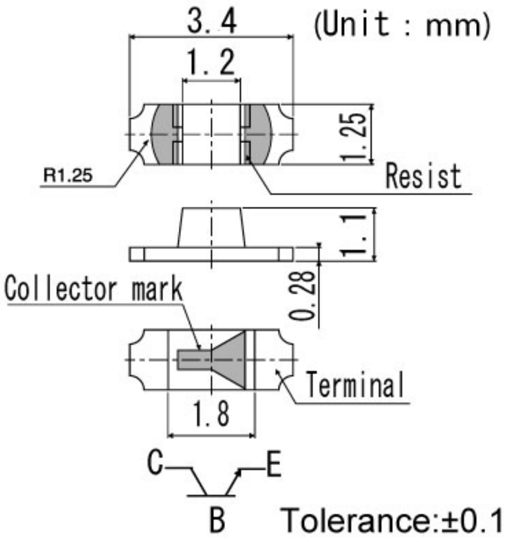
Molded lens, high accuracy, gain and collector current

Absolute Maximum Ratings (Ta=25ºC)

Rated Parameters	Standard Value
Collector-Emitter voltage V_{CEO}(V)	32
Emitter-Collector voltage V_{ECO}(V)	5
Collector current I_C(mA)	30
Power dissipation P_C(mW)	80
Operating temperature Topr(ºC)	-30 to 85
Storage temperature Tstg(ºC)	-30 to 100







Electrical & Optical Characteristics (Ta=25ºC)

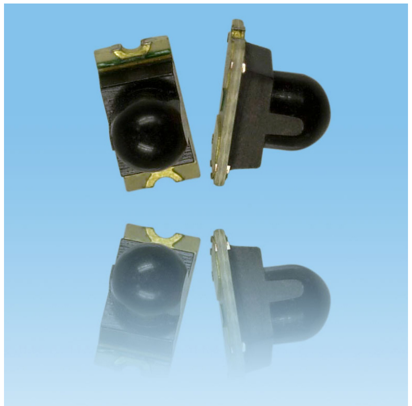
Parameters		
Parameters	Value	Conditions
Photoelectric current-Min. Ic(mA)	2.3	V_{CE}=5V,E=500Lx
Dark current-Max. ICEO(µA)	0.5	V_{CE}=10V(Dark Box)
Peak sensitivity wavelength λP(nm)	800	
Collector-Emitter saturation voltage-Max. VCE(sat)(V)	10	µs
Response time tr·tf	-	

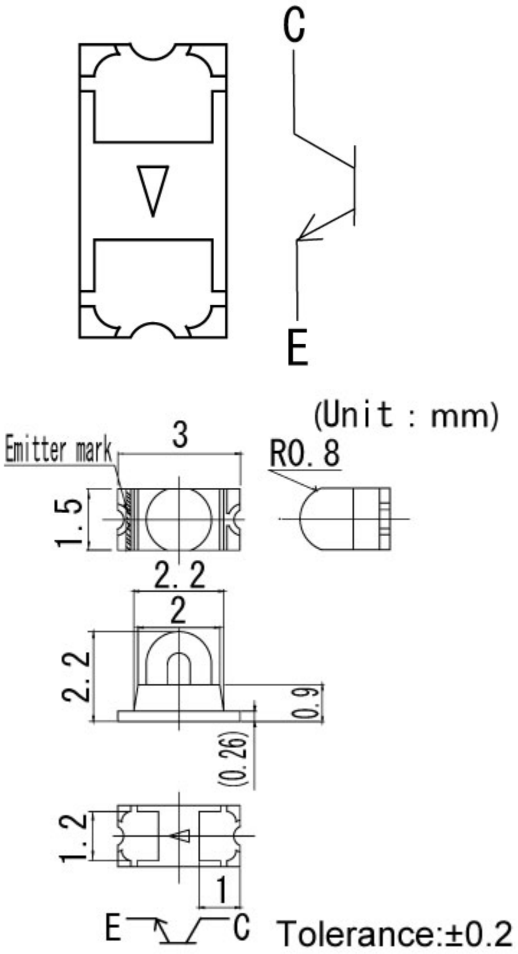
Top-view IR Phototransistor: SCM-014TB

Molded lens, high accuracy, gain and collector current

Absolute Maximum Ratings (Ta=25ºC)

Rated Parameters	Standard Value
Collector-Emitter voltage V_{CEO}(V)	32
Emitter-Collector voltage V_{ECO}(V)	5
Collector current I_C(mA)	30
Power dissipation P_C(mW)	100
Operating temperature Topr(ºC)	-30 to 85
Storage temperature Tstg(ºC)	-30 to 100





Electrical & Optical Characteristics (Ta=25ºC)

Parameters		
Parameters	Value	Conditions
Photoelectric current-Min. Ic(mA)	0.5	V_{CE}=5V,E=500Lx
Dark current-Max. ICEO(μA)	0.5	V_{CE}=10V(Dark Box)
Peak sensitivity wavelength λP(nm)	800	
Collector-Emitter saturation voltage-Max. VCE(sat)(V)	0.4	I_C=1mA ,E=500Lx
Response time tr·tf	10	μs

Side-view IR Phototransistor/Sensor and Emitter: RPM-012PB, SIM-012SB

RPM-012PB - Ultra-compact, High Sensitivity Sensor

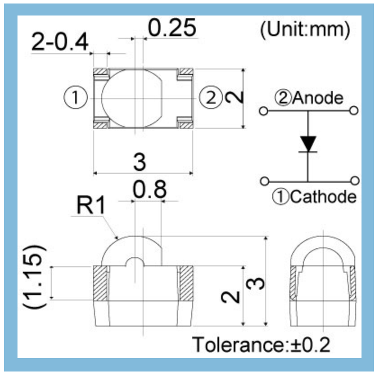
Features

- High sensitivity
- ϕ2mm lens
- Ultra-compact surface mount package: 3mm x 3mm x 2mm
- Reflow-compatible

Applications

- Optical control equipment
- Receiver for sensors

SIM-012SB - Ultra-compact, High Power Emitter



Features

- ϕ2mm lens
- High power
- Ultra-compact surface mount package: 3mm x 3mm x 2mm
- Reflow-compatible

Applications

- Optical control equipment
- Light source for remote control devices

Side-view IR Phototransistor Sensor and Emitter: RPM-012PB, SIM-012SB

RPM-012PB Sensor

Absolute Maximum Ratings (Ta=25ºC)

Rated Parameters	Standard Value
Collector-Emitter voltage V_{CEO}(V)	32
Emitter-Collector voltage V_{ECO}(V)	5
Collector current I_C(mA)	20
Power dissipation P_C(mW)	75
Operating temperature Topr(ºC)	-30 to 85
Storage temperature Tstg(ºC)	-40 to 100

SIM-012SB Emitter

Absolute Maximum Ratings (Ta=25ºC)

Rated Parameters	Standard Value
Forward current IF(mA)	40
Reverse voltage VR(V)	5
Power dissipation PD(mW)	60
Pulse forward current IFP*(A)	0.5
Operating temperature Topr(ºC)	-30 ~ +85
Storage temperature Tstg(ºC)	-40 ~ +100

*Pulse width = 0.1msec, duty ratio 1%

Electrical & Optical Characteristics (Ta=25ºC)

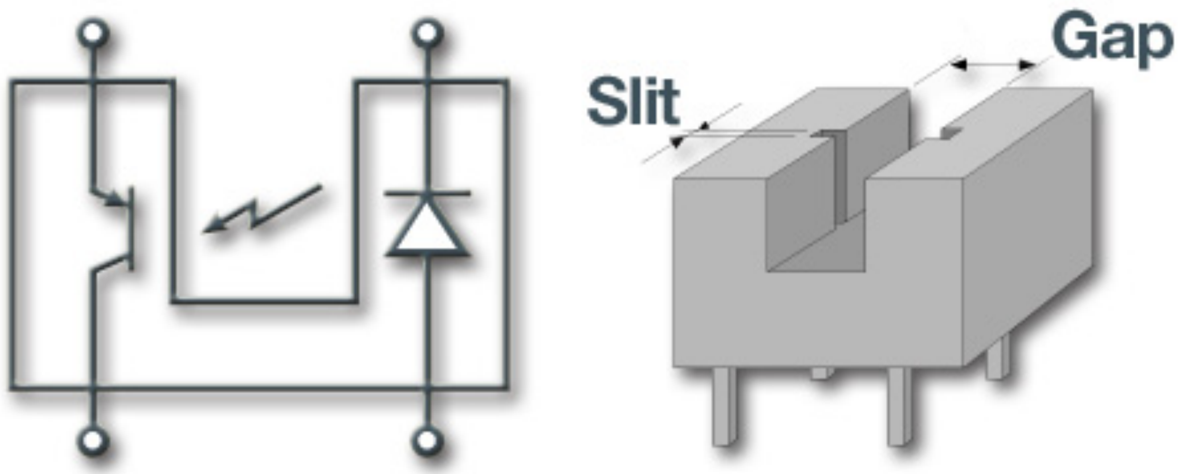
Parameters		
Parameters	Value	Conditions
Photoelectric current-Min. Ic(mA)	0.56	V_{CE}=5V,E=500Lx
Dark current-Max. ICEO(μA)	0.5	V_{CE}=10V(Dark Box)
Peak sensitivity wavelength λP(nm)	800	
Collector-Emitter saturation voltage-Max. VCE(sat)(V)	0.4	I_C=1mA ,E=500Lx
Response time tr·tf	10	V_{CE}=5V,I_C=1mA,R_L=100Ω
Viewing angle θ1/2(deg)	±12	

Electrical & Optical Characteristics (Ta=25ºC)

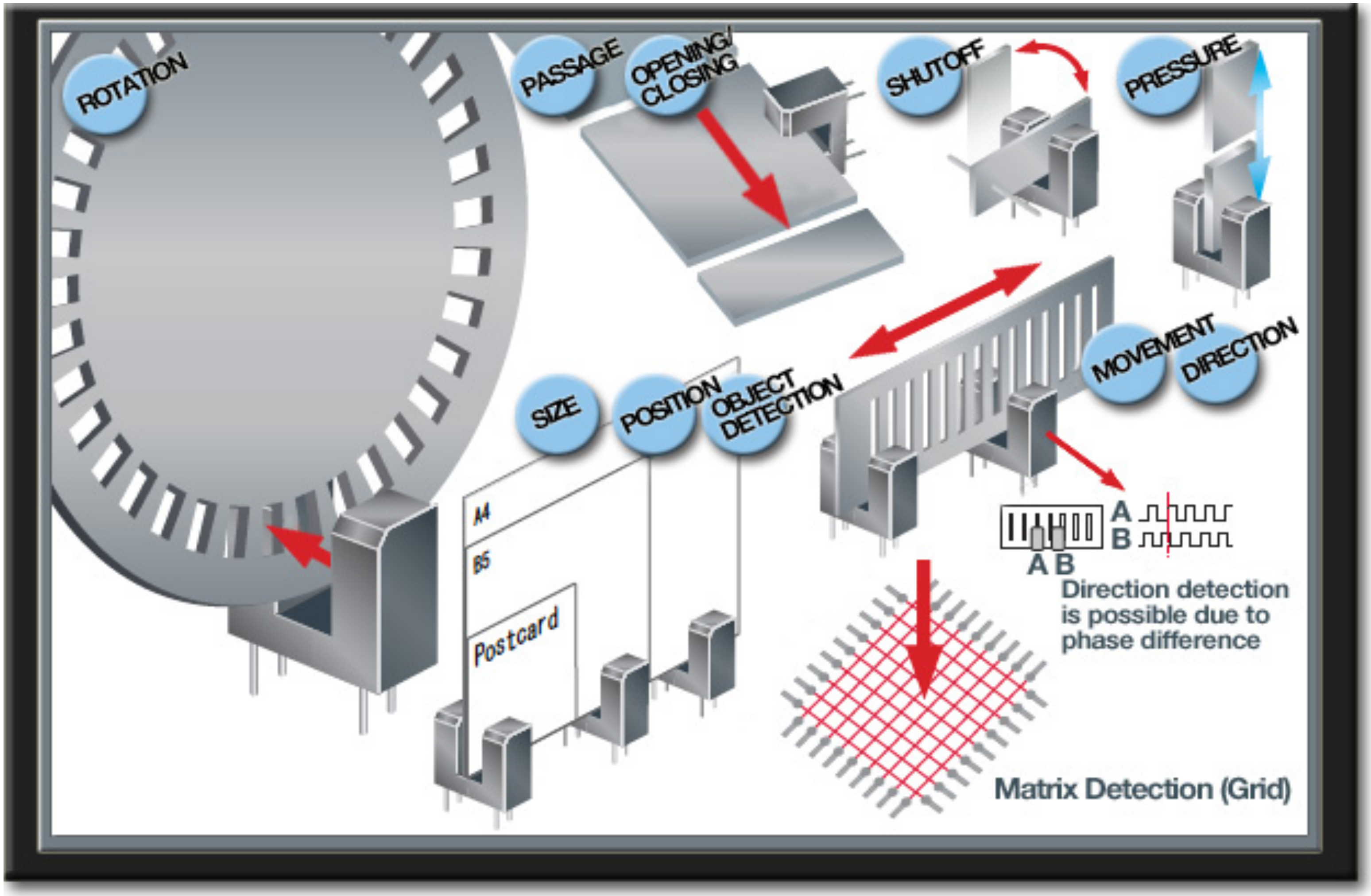
Parameters	Min.	Typ.	Max.	Conditions
Optical output PO(mW)	-	3.5	-	IF=20mA
Emitting strength IE(mW/sr)	0.9	-	7.1	IF=20mA
Forward voltage VF(V)	-	1.2	1.5	IF=20mA
Reverse current IR(μA)	-	-	10	VR=3V
Peak light emitting wavelength λP (nm)	-	950	-	IF=20mA
Spectral line half width Δλ(nm)	-	40	-	IF=20mA
Half-viewing angle θ1/2(deg)	-	±12	-	IF=20mA
Response time tr-tf(μs)	-	1.0	-	IF=20mA
Cut-off frequency fc(MHz)	-	1.0	-	IF=20mA

Photointerrupter (Transmission Type)

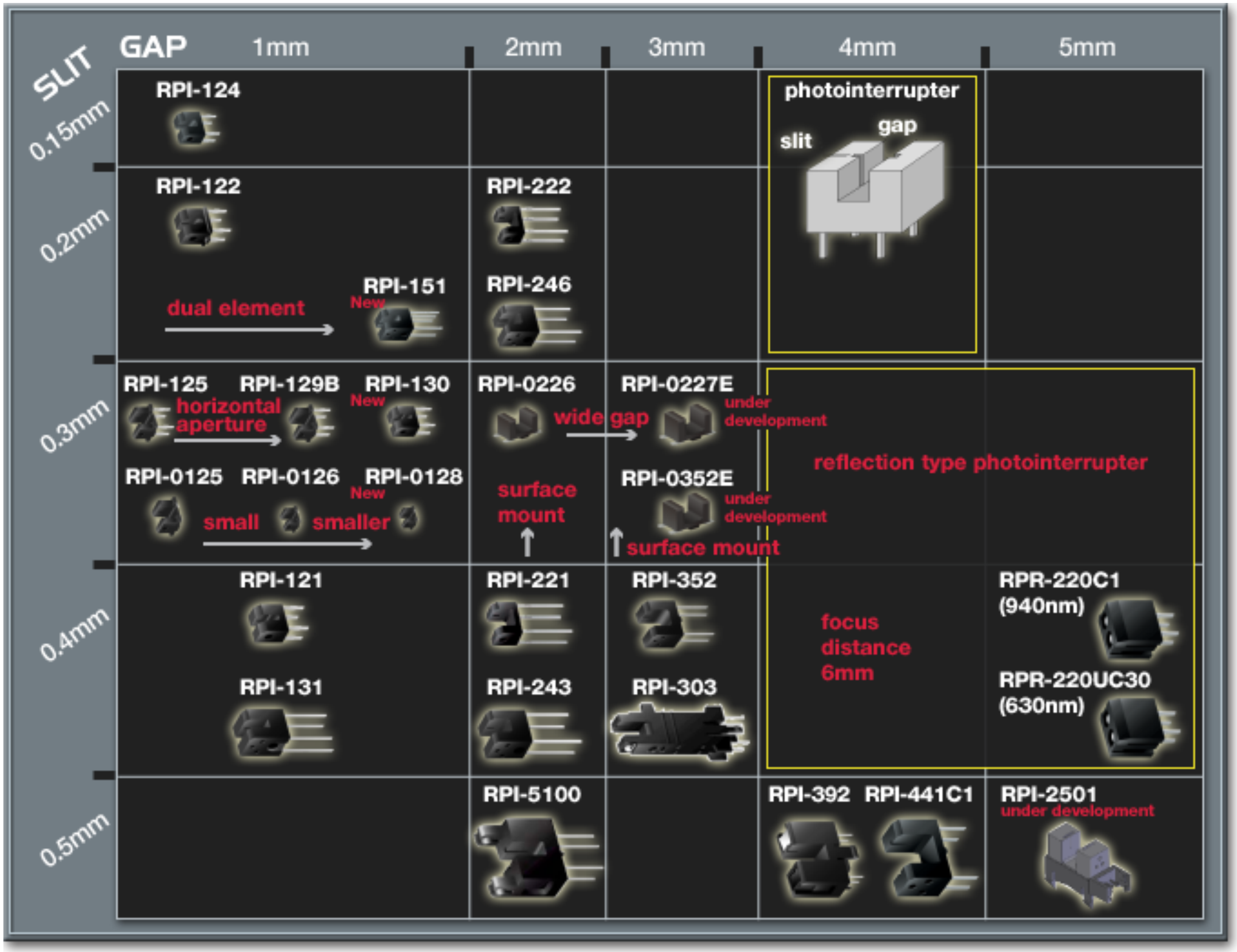
- A photointerrupter detects movement/positioning
- Photo sensor module comprised of an infrared diode and infrared sensor
- Detects the movement of objects passing through the gap between the emitter and receiver
- The photointerrupter slit influences the accuracy and timing position of detection points



Photointerrupter (Transmission Type)



Photointerrupter Lineup



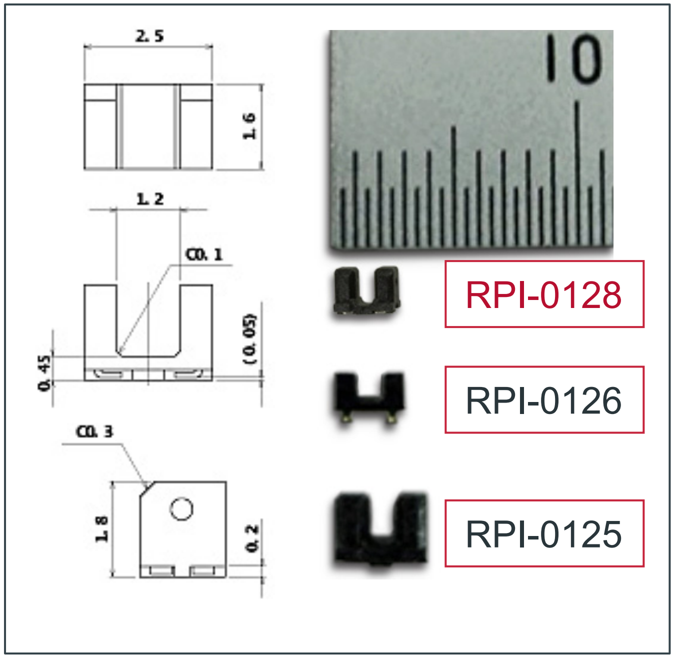
SLIT \ GAP	1mm	2mm	3mm	4mm	5mm
0.15mm	RPI-124			photointerrupter slit gap	
0.2mm	RPI-122 dual element → RPI-151 New	RPI-222 RPI-246			
0.3mm	RPI-125 horizontal aperture → RPI-129B RPI-130 New RPI-0125 small → RPI-0126 smaller → RPI-0128 New	RPI-0226 wide gap → surface mount ↑	RPI-0227E under development RPI-0352E under development ↑ surface mount	reflection type photointerrupter	
0.4mm	RPI-121 RPI-131	RPI-221 RPI-243	RPI-352 RPI-303	focus distance 6mm	RPR-220C1 (940nm) RPR-220UC30 (630nm)
0.5mm		RPI-5100		RPI-392 RPI-441C1	RPI-2501 under development

Ultra-Compact Surface Mount Photointerrupters (Double Mold type): RPI-0128/128, RPI-0125

RPI-0128/128 Features

- Industry's smallest and lowest profile photointerrupter
- Miniaturized while maintaining a 1.2mm gap
- 28.6% smaller than the RPI-0126

Dimensions



Applications

- Mobile phones
- Digital cameras
- Handheld devices

Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Forward Voltage	VF	1.2	1.35	1.5	V	IF=5mA
Collector Current	IC	1.0	-	5.0	mA	VCE=5V IF=5mA

RPI-0125 Features

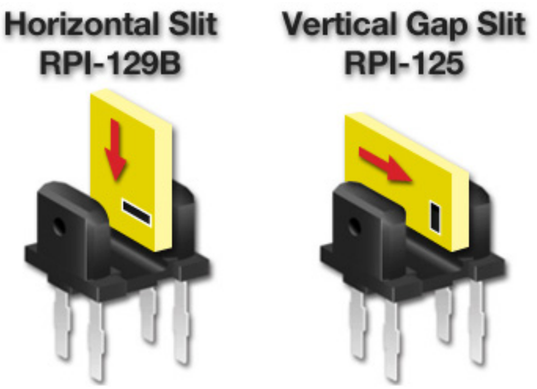
- ROHM's smallest, low profile photointerrupter developed using original Double-Mold technology
- Contributes to thinner, smaller sets

Compatible with flex cables

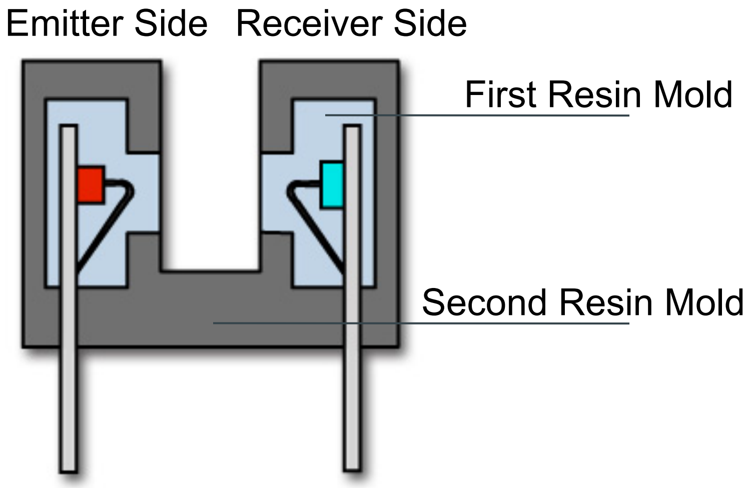
Ultra-Compact Surface Mount Wide Gap, Horizontal & Vertical Slits Photointerrupters (Double Mold Type): RPI-129B/125

Features

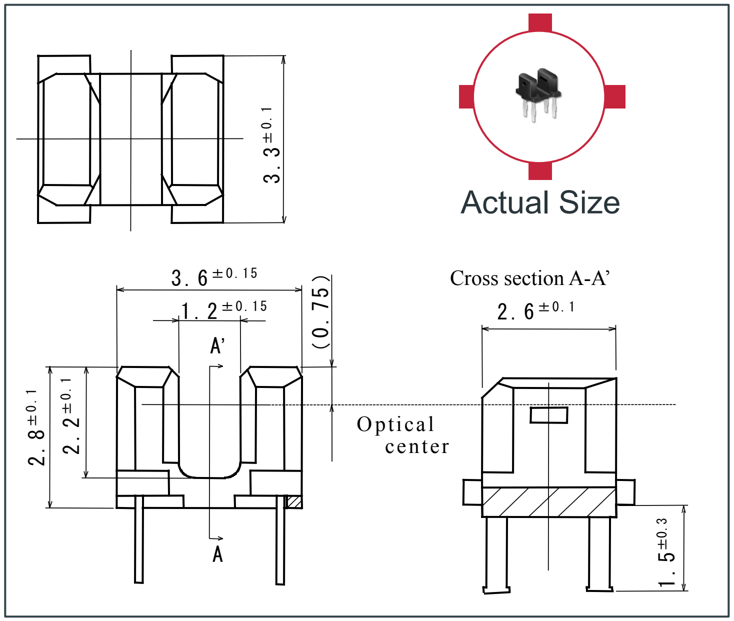
- Wider gap (1.2mm)
- Narrow slit (0.3mm) high accuracy position detection
- Double-mold structure (a ROHM original)
- High reliability



Double-mold structure offers greater reliability & high accuracy.



Dimensions



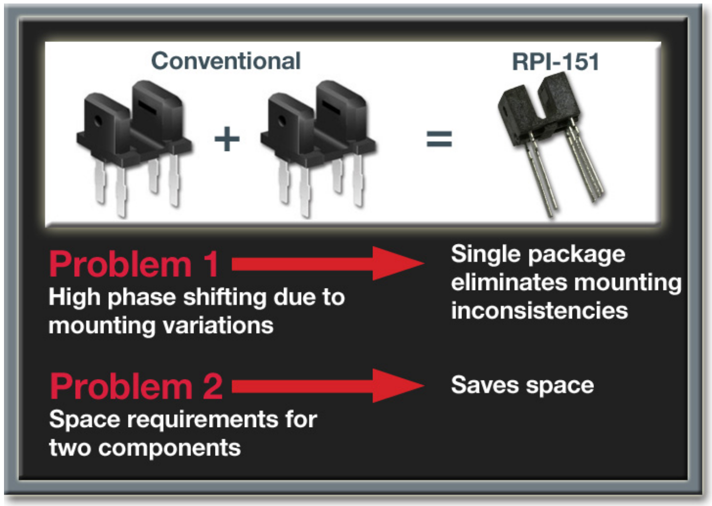
2-Phase Output Photointerrupter: RPI-151

Key Feature

- Dual role - detects the spin speed and motor direction with greater accuracy than conventional two-device configurations

Applications

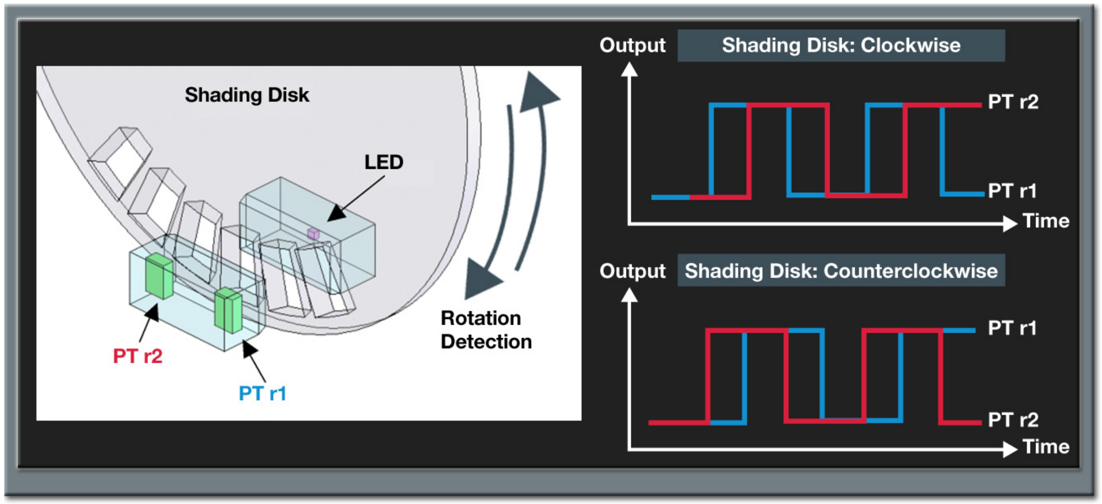
- Digital camera lens position sensing



Problem 1 High phase shifting due to mounting variations → Single package eliminates mounting inconsistencies

Problem 2 Space requirements for two components → Saves space

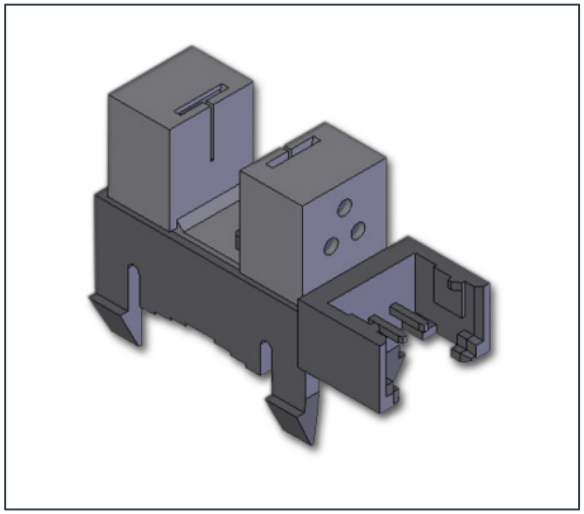
Operating Principle



Photointerrupter with Connector: RPI-2501

Features

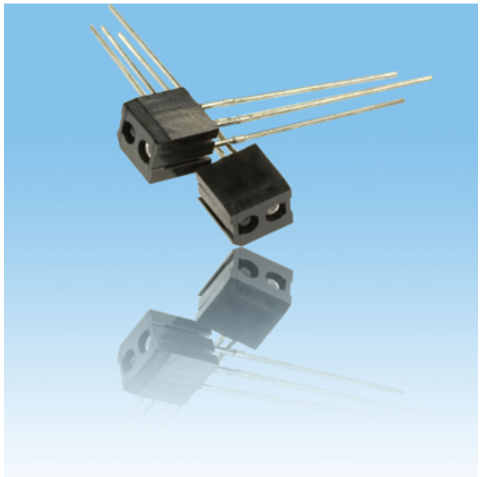
- Dual mold structure with lens integrated into the primary mold
- Peak light wavelength: 850nm, high efficiency
- Panel clip mounting eliminates use of PCB
- CT mini connector
- Improved detection accuracy (0.4mm slit)



Reflective Type Photointerrupters: RPR-220C1

Features

- 940nm wavelength
- Plastic lens yields high sensitivity
- Built-in visible light filter minimizes stray light influences
- Light & compact
- Excellent reflection sensitivity (3-6mm)



Applications

- Printers, CD players, gaming machines

Emitter Part #	Forward Current (IF)	Power Dissipation (PD)	Operating Temperature (TOPR)	Forward Voltage (VF)	Peak Emitting Wavelength (λP)	Switching Time
	mA	mW	ºC	V	nm	µs
RPR-220C1	50	80	-25 to 85	1.34	940	1

Sensor Part #	Collector Current (Ic)	Power Dissipation (Pc)	Operating Temperature (TOPR)	Min. Photoelectric Current (Ic)	Collector-Emitter Voltage	Peak Sensitivity Wavelength (λP)	Max. Dark Current	Response Time (tr. tf)
	mA	mW	ºC	mA	V	nm	µA	µs
RPR-220C1	30	80	-25 to 85	0.08	30	800	0.5	10

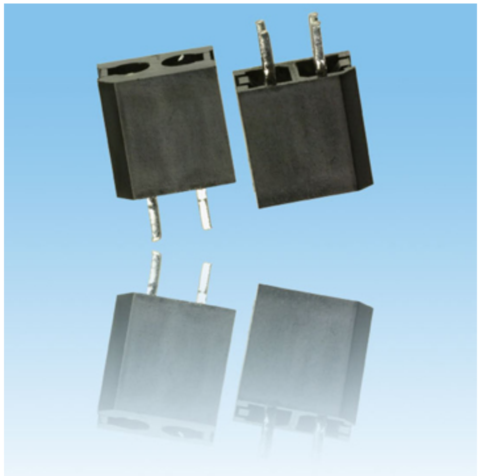
Reflective Type Photointerrupters: RPR-220UC30, RPR-220PC30N

Features

- Plastic lens yields high sensitivity
- Built-in visible light filter minimizes stray light influence
- Light & compact
- RED and BLUE wavelength emitter

Applications

- Printers, medical, games



Emitter Part #	Forward Current (I_F)	Power Dissipation (P_D)	Operating Temperature (T_{OPR})	Forward Voltage (V_F)	Peak Emitting Wavelength (λP)	Switching Time
	mA	mW	ºC	V	nm	µs
RPR-220UC30	30	80	-25 to 85	2	630	1
RPR-220PC30N	30	80	-25 to 85	2	470	1

Sensor Part #	Collector Current (Ic)	Power Dissipation (Pc)	Operating Temperature (TOPR)	Min. Photoelectric Current (Ic)	Collector-Emitter Voltage	Peak Sensitivity Wavelength (λP)	Max. Dark Current	Response Time (tr. tf)
	mA	mW	ºC	mA	V	nm	µA	µs
RPR-220UC30N	30	80	-25 to 85	0.08	30	800	10	10
RPR-220PC30N	30	80	-25 to 85	0.08	30	800	10	10

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