InAsSb photovoltaic detectors

P13243 series

High sensitivity, high-speed response infrared detector up to 5 µm band.

The P13424 series are photovoltaic type detectors that have high sensitivity in the spectral band up to 5 µm. This high sensitivity has been achieved due to Hamamatsu's unique crystal growth technology and process technology. These products are environmentally friendly as they do not use lead, mercury, or cadmium which are substances restricted by the RoHS Directive. Therefore, they are replacements for previous products that contain these substances. The non-cooled types offer easy handing and include the surface mount ceramic type which compatible with lead-free solder reflow. The surface mount ceramic type is compact and suitable for automated mounting. The series also includes the TE-cooled type with a large photosensitive area which delivers stable, high S/N measurement.

Features

- **High sensitivity**
- **High-speed response**
- **High shunt resistance**
- **Compact, surface mount type ceramic package (P13243-013CA)**
- **Compatible with lead-free solder reflow (P13243-013CA)**
- **TE-cooled type (P13243-122MS/-222MS)**
- **RoHS compliant (lead, mercury, cadmium free)**

Applications

- **Gas detection (CH_4, CO_2, CO, etc.)**
- **Radiation thermometers**
- **Flame detection (CO_2 resonance radiation)**

Options (sold separately)

Heatsink for one-stage TE-cooled type	**A3179**
Heatsink for two-stage TE-cooled type	**A3179-01**
Temperature controller for TE-cooled type	**C1103-04**
Amplifier for infrared detector	**C4159-01**

Structure

Type no.	Photosensitive area (mm)	Package	Window material	Cooling	Field of view FOV (degrees)
P13243-011MA	0.7 × 0.7	TO-46	Si with AR coating*1	Non-cooled	90
P13243-013CA		Ceramic			102
P13243-022MS	2 × 2	TO-5	Sapphire	Non-cooled	97
P13243-122MS		TO-8		One-stage TE-cooled	134
P13243-222MS				Two-stage TE-cooled	113

*1: Refer to the spectral transmittance of window materials (P.3).

Absolute maximum ratings

Type no.	TE-cooler allowable current (A)	Thermistor power dissipation (mW)	Reverse voltage VR (V)	Operating temperature Topr*2 (°C)	Storage temperature Tstg*2 (°C)	Maximum incident light level (W/cm²)	Soldering temperature Tsol (°C)
P13243-011MA	-	-	1	-40 to +85	-40 to +85	1	-
P13243-013CA	-	-					240 (once)*3
P13243-022MS	-	-					-
P13243-122MS	1.5	0.2		-40 to +60	-40 to +60		-
P13243-222MS	1.0						

*2: No dew condensation
When there is a temperature difference between a product and the surrounding area in high humidity environments, dew condensation may occur on the product surface. Dew condensation on the product may cause deterioration in characteristics and reliability.
*3: Reflow soldering, JEDEC J-STD-020 MSL2, see P.9
Note: Exceeding the absolute maximum ratings even momentarily may cause a drop in product quality. Always be sure to use the product within the absolute maximum ratings.

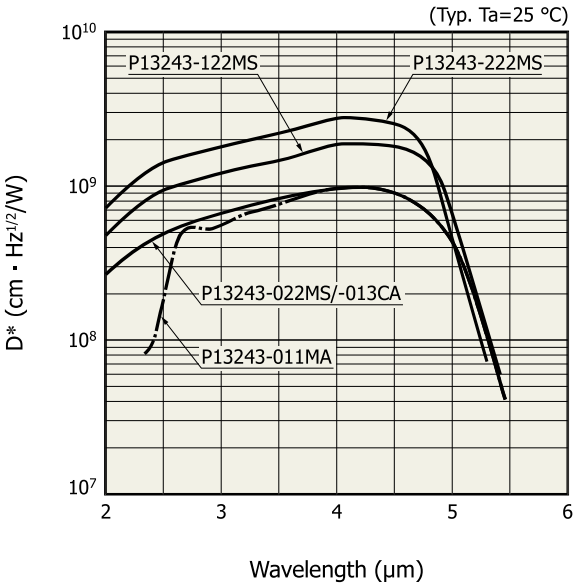
Electrical and optical characteristics (Typ. Ta=25 °C, unless otherwise noted)

Type no.	Chip temperature Tchip (°C)	Peak sensitivity wavelength λp (μm)	Cutoff wavelength λc (μm)	Photosensitivity S*4 λ=λp (mA/W)	Shunt resistance Rsh VR=10mV (kΩ)	Detectivity D* (λp, 1200, 1) Min. (cm·Hz^1/2/W)	Detectivity D* (λp, 1200, 1) Typ. (cm·Hz^1/2/W)	Noise equivalent power NEP λ=λp Typ. (W/Hz^1/2)	Noise equivalent power NEP λ=λp Max. (W/Hz^1/2)	Rise time tr*5 (ns)	Terminal capacitance Ct*6 (pF)
P13243-011MA	25	4.1	5.3	4.5	300	8.0×10^{8}	1.0×10^{9}	7.0×10^{-11}	8.8×10^{-11}	15	0.7
P13243-013CA											
P13243-022MS	25		5.3	8.0	7	8.0×10^{8}	1.0×10^{9}	2.0×10^{-10}	2.5×10^{-10}	100	20
P13243-122MS	-10		5.2	8.6	19	1.0×10^{9}	1.9×10^{9}	1.0×10^{-10}	2.0×10^{-10}	100	
P13243-222MS	-30		5.1	8.8	33	1.6×10^{9}	2.8×10^{9}	0.7×10^{-10}	1.3×10^{-10}		

*4: Uniform irradiation on the entire photosensitive area
*5: VR=0 V, RL=50 Ω, 10 to 90%, λ=1.55 μm
*6: VR=0 V, f=1 MHz

Note: Uniform irradiation must be applied to the entire photosensitive area during use.

Spectral response (D*)



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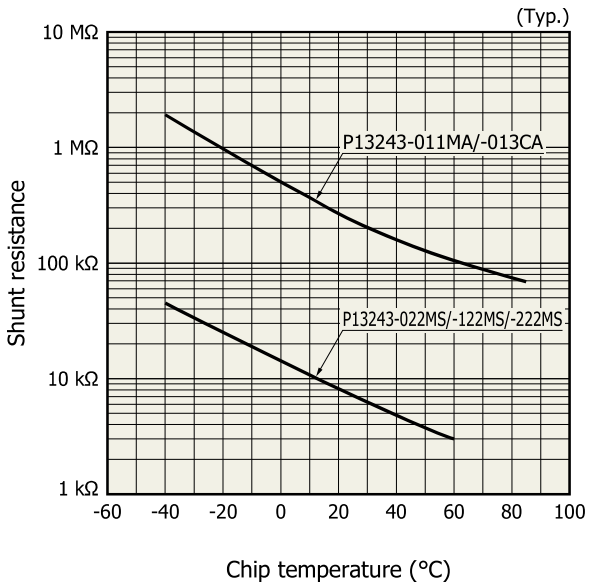
Shunt resistance vs. chip temperature



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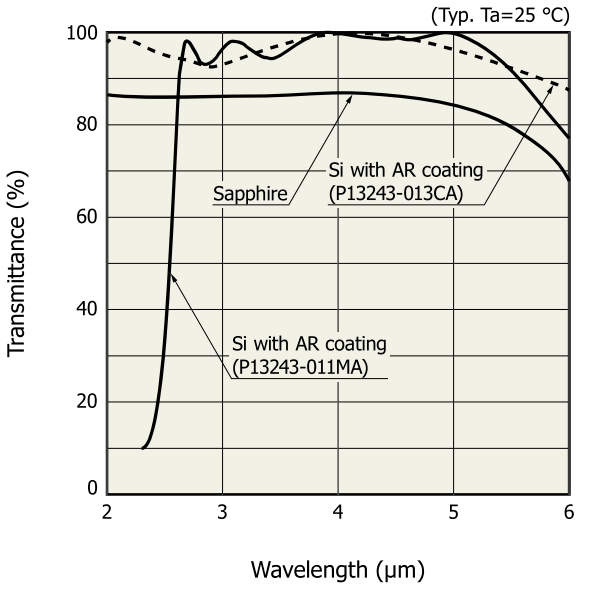
Spectral transmittance of window materials



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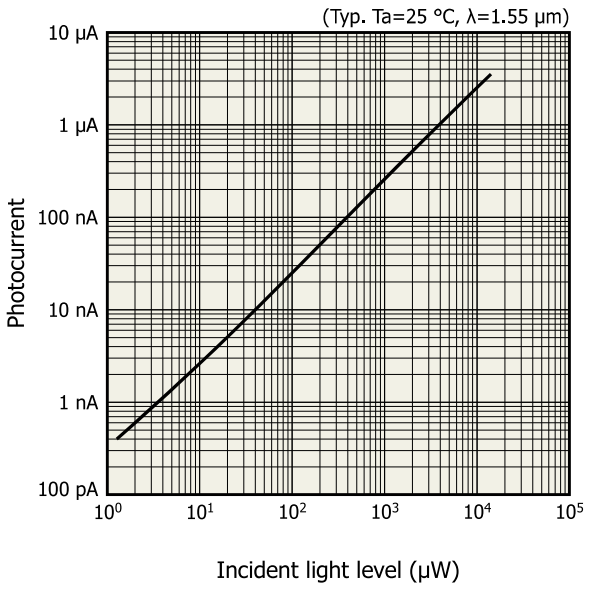
Linearity



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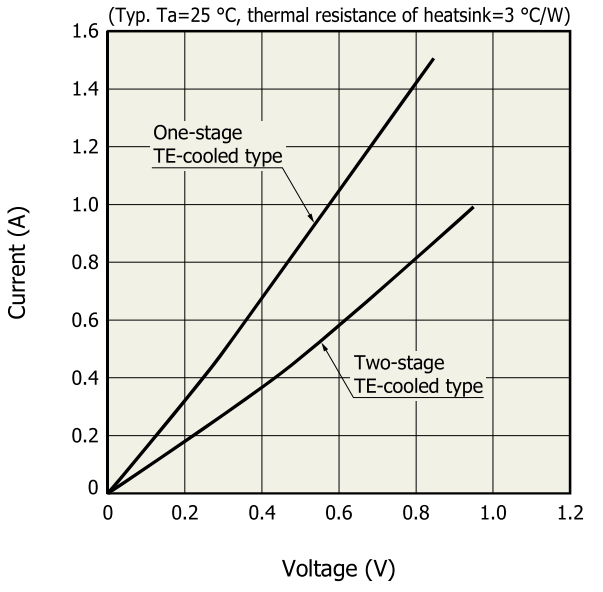
TE-cooler specifications (Ta=25 °C, unless otherwise noted)

Parameter	Condition	Symbol	Min.	Typ.	Max.	Unit
TE-cooler allowable current	One-stage TE-cooled	Ic max	-	-	1.5	A
	Two-stage TE-cooled		-	-	1.0	
TE-cooler allowable voltage	One-stage TE-cooled	Vc max	-	-	1.0	V
	Two-stage TE-cooled		-	-	1.2	
Thermistor resistance		Rth	-	9	-	kΩ
Thermistor B constant	T_1=25 °C, T_2=-20 °C	B	-	3300	-	K
Thermistor power dissipation		Pth	-	-	0.2	mW

Current vs. voltage characteristics of TE-cooler



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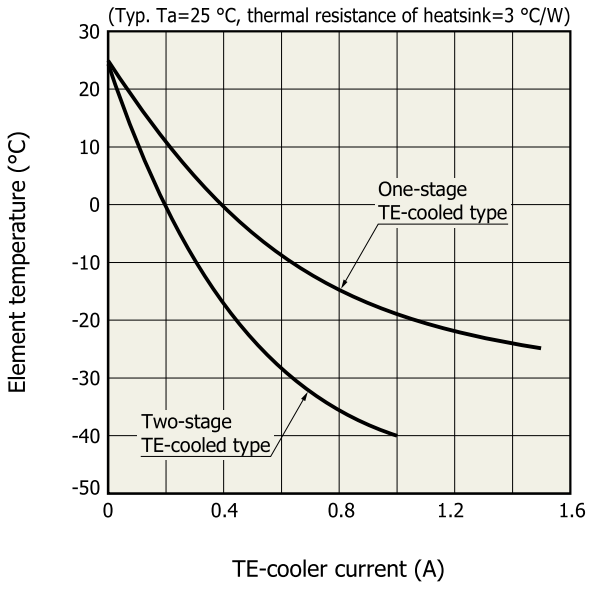
Cooling characteristics of TE-cooler



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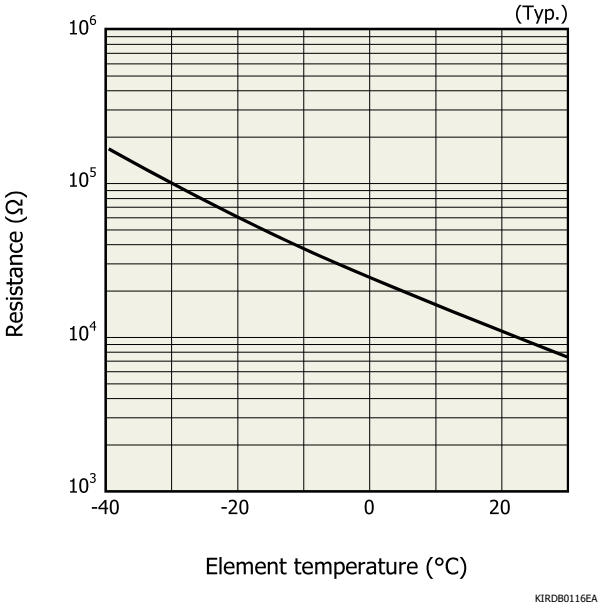
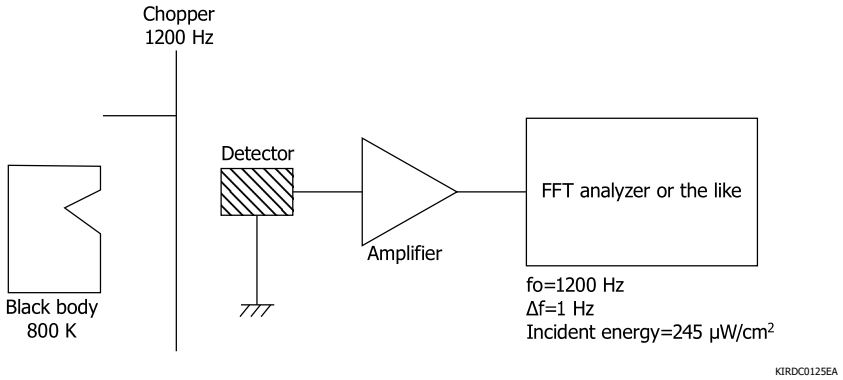
Thermistor temperature characteristics

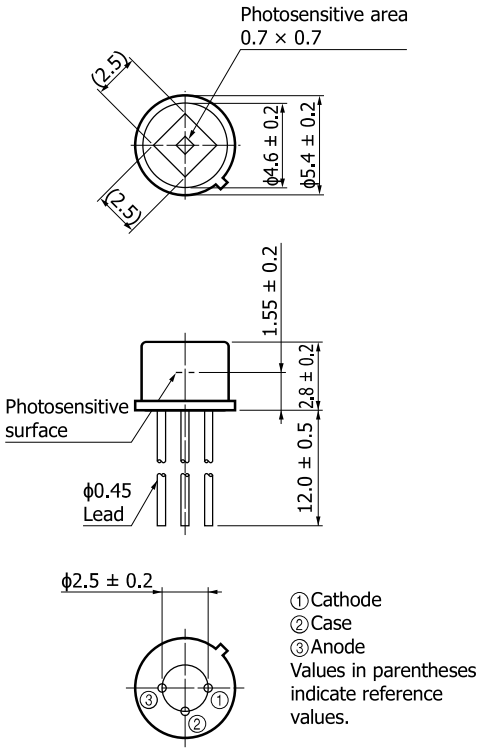


Block diagram for characteristic measurement



Dimensional outlines (unit: mm)

P13243-011MA



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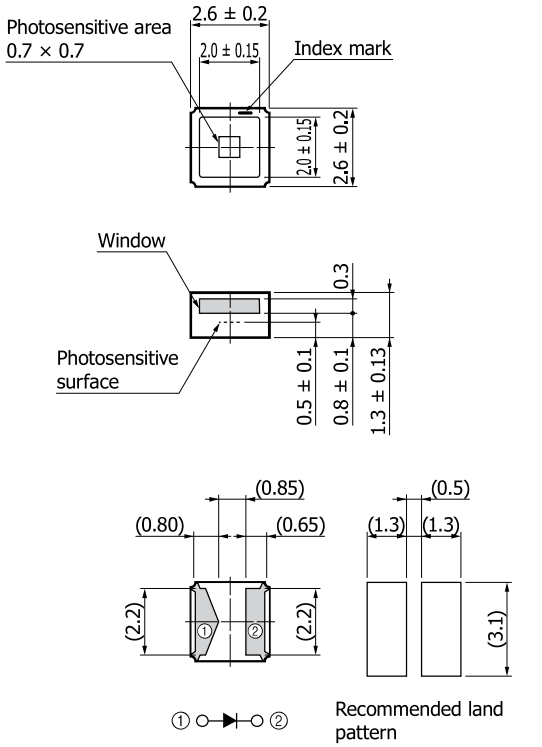
P13243-013CA



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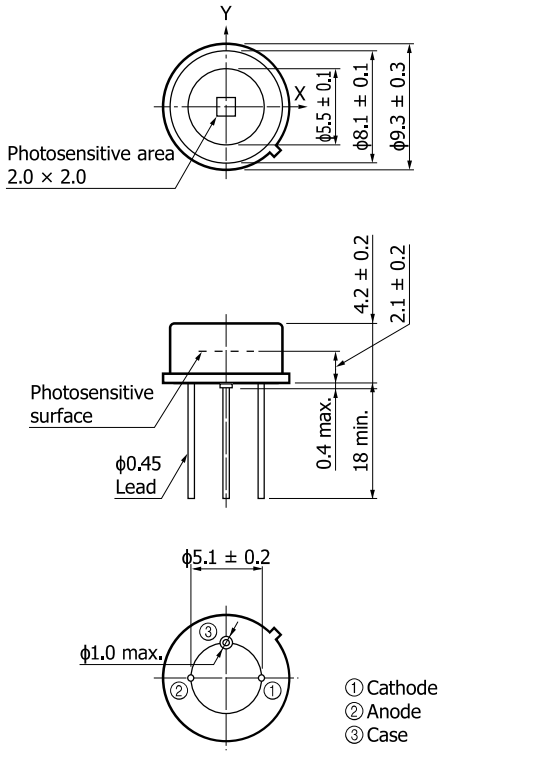
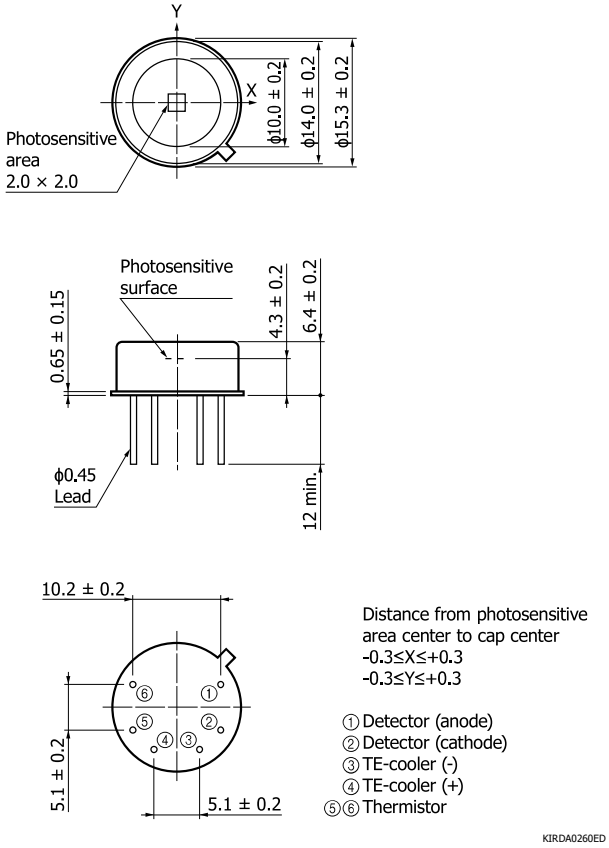
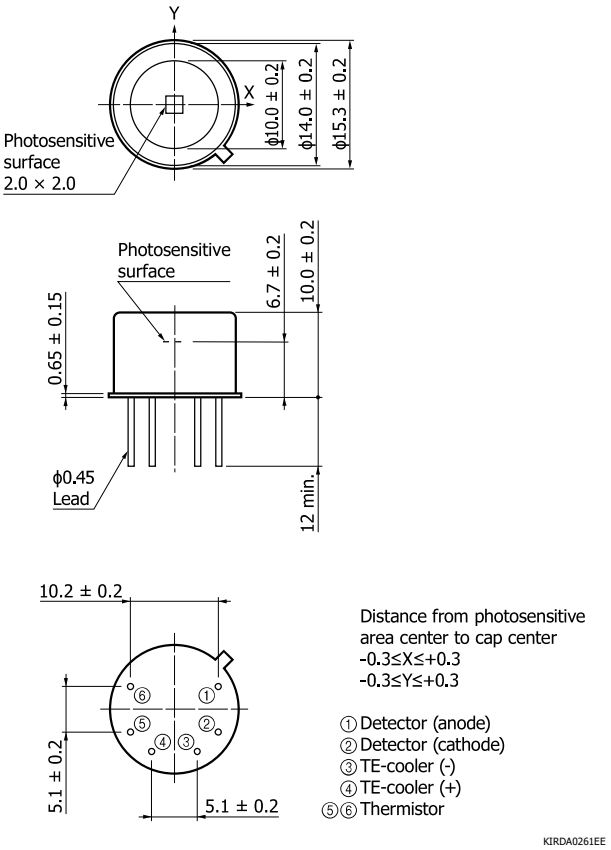
P13243-022MS



P13243-122MS



P13243-222MS



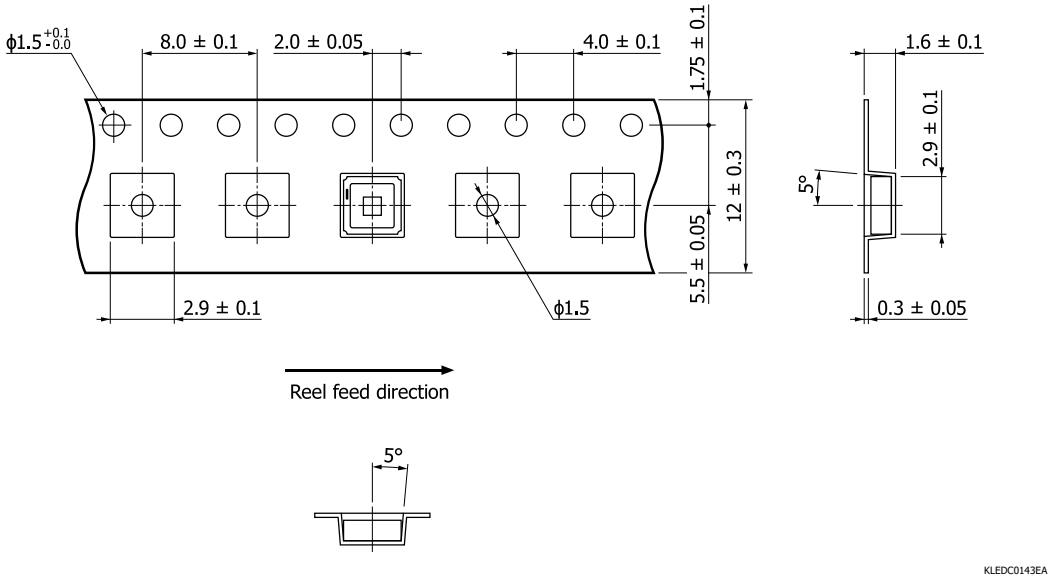
Standard packing specifications

P13243-013CA

■ Reel (conforms to JEITA ET-7200)

Outer diameter	Hub diameter	Tape width	Material	Electrostatic characteristics
ϕ180 mm	ϕ60 mm	12 mm	PS	Conductive

■ Embossed tape (unit: mm, material: PS, conductive)



■ Packing quantity
500 pcs/reel

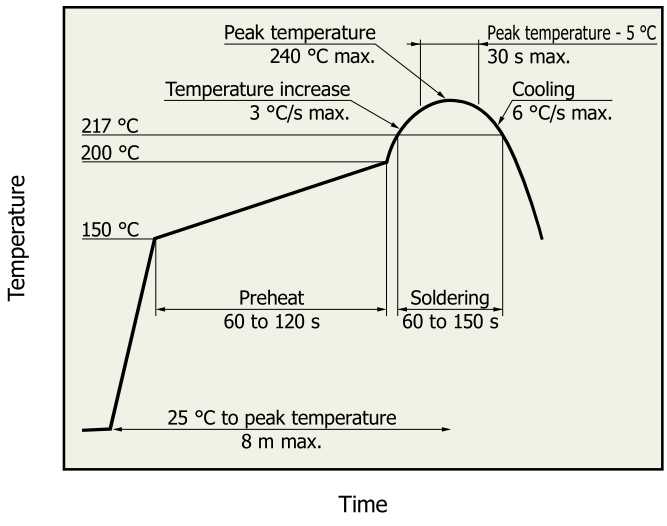
■ Packing state
Reel and desiccant in moisture-proof packaging (vacuum-sealed)

Recommended soldering conditions

P13243-011MA/-022MS/-122MS/-222MS

· Solder temperature: 260 °C (10 s or less, once)
Solder the leads at a point at least 1 mm away from the package body.
Note: When you set soldering conditions, check that problems do not occur in the product by testing out the condition in advance.

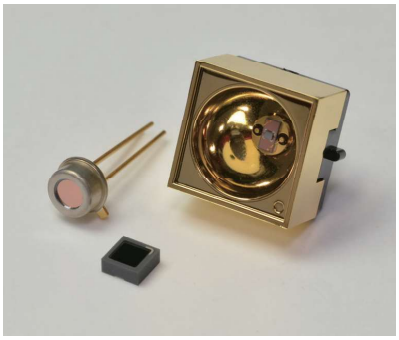
P13243-013CA



- After unpacking, store the device in an environment at a temperature range of 5 to 30 °C and a humidity of 60% or less, and perform reflow soldering within 1 year.
- The effect that the product receives during reflow soldering varies depending on the circuit board and reflow oven that are used. When you set reflow soldering conditions, check that problems do not occur in the product by testing out the conditions in advance.

Related products

Mid infrared LED L15893/L15894/L15895 series



Hamamatsu's unique crystal growth and process technologies enable mid infrared LEDs with peak emission wavelengths of 3.3 µm, 3.9 µm, and 4.3 µm.

Type no.	Package
L15893-0330C, L15894-0390C, L15895-0430C	Ceramic
L15893-0330M, L15894-0390M, L15895-0430M	TO-46
L15893-0330ML, L15894-0390ML, L15895-0430ML	TO-46 with reflector

Related information

www.hamamatsu.com/sp/ssd/doc_en.html

■ Precautions
· Disclaimer
· Compound opto-semiconductors (photosensors, light emitters)

■ Technical information
· Compound semiconductor photosensors / Technical note

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