

InGaAs area image sensors

G16561 to G16564-0808T

Near-infrared two-dimensional image sensor with 320 \times 256 pixels

The G16561 to G16564-0808T have a hybrid structure consisting of a CMOS readout circuit (ROIC: readout integrated circuit) and back-illuminated InGaAs photodiodes. Each pixel is made up of an InGaAs photodiode and a ROIC electrically connected by indium bump. The timing generator in the ROIC provides an analog video output which is obtained by just supplying digital inputs. The G16561 to G16564-0808T have 320×256 pixels arrayed at a 20 µm pitch. Light incident on the InGaAs photodiodes is converted into electrical signals which are then input to the ROIC through indium bumps. Electrical signals in the ROIC are converted into voltage signals and then sequentially output from the video line by the shift register. The G16561 to G16564-0808T are hermetically sealed in a metal package together with a three-stage thermoelectric cooler to deliver stable operation. The dynamic range has been more than doubled compared to conventional products, and integrate while readout (IWR) and multi-line readout functions have been added.

Features

- Dynamic range: 3500
- 4-port analog output
- Frame rate: 503 frames/s max. (All-line readout mode, integration time=1.98 ms, in IWR operation)
- Low dark current
- Operation of integrate while readout function and integrate then readout function can be done.
- Multi-line readout function
- Simple operation (built-in timing generator)
- Three-stage TE-cooled type

Applications

- Near infrared non-destructive inspection (farm produce inspection, semiconductor inspection, etc.)
- Hyperspectral imaging (plastic sorting, food screening, etc.)
- Traffic monitoring

Selection guide

Type no.	Spectral response range (µm)
G16561-0808T	0.95 to 1.69 (15 °C)
G16562-0808T	1.12 to 1.85 (-20 °C)
G16563-0808T	1.3 to 2.15 (-20 °C)
G16564-0808T	1.7 to 2.55 (-20 °C)

Structure

Parameter	Specification	Unit
Image size	6.40 × 5.12	mm
Cooling	Three-stage TE-cooled	-
Total number of pixels	320 × 256 (81920)	pixels
Number of effective pixels	320 × 256 (81920)	pixels
Pixel size	20 × 20	μm
Pixel pitch	20	μm
Fill factor	100	%
Package	28-pin metal	-
Window material	Sapphire glass with AR coating	-

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Block diagram

The series of operations of the readout circuit are described below.

G16561 to G16564-0808T can support both integrate while readout mode (IWR) and integrate then readout mode(ITR) by switching the input timing.

- 1) Turn on the reset switch to reset.
- After turning off the reset switch, turn on the sample hold switch to start integration. Pixel optical signal information is integrated in the capacitance Cf as a signal voltage.
- Turn off the sample hold switch to end the integration. The pixel signal voltage is held in the capacitance Ch.
- Turn on the reset switch to reset the pixel signal voltage integrated in the capacitance Cf.
- 5) The vertical shift register turns on the row direction shift register switch in the first row, and the signal voltage is transferred to the capacitance Cs.
- The horizontal shift register turns on the column direction shift register switch in the first row and first column of each port.
- 7) The next column is selected by the horizontal shift register of each port, and the output signals (Video1 to 4) are read out sequentially.
- Repeat steps 5 to 7 for each row. (When doing the IWR operation, turn off the reset switch and start integration.)
- 9) To perform the next integration, return to step 2.



Absolute maximum ratings

Parameter	Symbol	Condition	Value	Unit
Supply voltage (5 V)	Vdd1, Vb1, Vinp, Vpdn	Ta=25 °C	-0.3 to +6.0	V
Supply voltage (3.3 V)	Vdd2, Vrst	Ta=25 °C	-0.3 to +4.2	V
Input signal voltage	Vi	Ta=25 °C	-0.3 to +4.2	V
Operating temperature*1, 2	Topr		-30 to +60	°C
Storage temperature* ²	Tstg		-40 to +70	°C
Allowable current of TE-cooler*3, 4	ITE max		3.5	А
Allowable voltage of TE-cooler*3, 5	VTE max		7.8	V
Thermistor power dissipation	Pd_th		400	mW
Maximum temperature of heat radiation side ^{*6}	-		70	°C

*1: Chip temperature

*2: No dew condensation

When there is a temperature difference between a product and the ambient in high humidity environment, dew condensation may occur on the product surface. Dew condensation on the product may cause a deterioration of characteristics and reliability.

- *3: Th=25 °C, Th is the temperature on the heat dissipation side of the built-in Peltier element.
- *4: The current value that provides the maximum temperature difference between the heat absorption side and heat dissipation side of the Peltier element in a completely insulated state. We recommend using it at 80% of the maximum current value due to the load on the Peltier element and stability of temperature.
- *5: The voltage required between the Peltier element terminals to allow maximum current to flow.
- *6: If the temperature on the heat dissipation side exceeds this temperature, the Peltier element may degrade.
- 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.



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Electrical and optical characteristics (Ta=25 °C, Vdd1=5.0 V, Vdd2=3.3 V, Vpdn=3.18 V, Vinp=3.1 V, Vrst=1.7 V, fop=50 MHz)

Deremeter	Cumbal	G	16561-0808T	*7	G	16562 to G1	.6564-0808T	*8	Linit
Parameter	Symbol	Min.	Тур.	Max.	Type no.	Min.	Тур.	Max	Unit
					G16562	-	1.12 to 1.85	-	
Spectral response range	λ	-	0.95 to 1.69	-	G16563	-	1.3 to 2.15	-	μm
					G16564	-	1.7 to 2.55	-]
					G16562	-	1.75	-	
Peak sensitivity wavelength	λр	-	1.55	-	G16563	-	1.95	-	μm
					G16564	-	2.2	-	
					G16562	0.9	1.1	-	
Photosensitivity ($\lambda = \lambda p$)	S	0.7	0.8		G16563	0.85	1.0	-	A/W
					G16564	0.8	1.0	-	
Conversion efficiency	CE	-	2.0	-		-	2.0	-	µV/e⁻
Saturation charge	Csat	0.8	1.05	-		0.8	1.05	-	Me⁻
Saturation output voltage	Vsat	1.6	2.1	-		1.6	2.1	-	V
Photoresponse nonuniformity*9	PRNU	-	±10	±20		-	±10	±30	%
					G16562	-	0.3	3	
Dark current	ID	-	0.03	0.3	G16563	-	3	30	pА
					G16564	-	30	300	
Dark output nonuniformity*10	DSNU	-	±0.02	±0.12		-	±0.1	±0.6	V
Readout poise*11	Nroad	-	600	1400		-	600	1400	µV rms
Reduct Hoise	Niedu	-	300	700		-	300	700	e⁻
Dynamic range	Drange	1500	3500	-		1500	3500	-	-
Defective pixels ^{*12}	-	-	-	0.37		-	-	1	%

*7: Tchip=15 °C

*8: Tchip=-20 °C

 *9: Measured at 50% saturation after subtracting the dark output, excluding the first and last pixels of each row G16561/G16562-0808T: Integration time=2 ms, G16563-0808T: Integration time=0.5 ms, G16564-0808T: Integration time=0.05 ms *10: G16561-0808T, G16562-0808T: Integration time=2 ms, G16563-0808T: Integration time=0.5 ms, G16564-0808T: Integration time=0.05 ms

*11: Integration time=8.76 µs

*12: Pixels whose saturation output voltage, photoresponse nonuniformity, dark current, dark output nonuniformity, or readout noise is outside the specifications (Zone 1 + 2 + 3)

[Zone	definitions]
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Zone 3 Zone 2 250 pixels 128 pixels 256 pixels Zone 1 160 pixels 314 pixels 320 pixels

[Consecutive defective pixels] The number of consecutive adjacent defect pixels is less than 16.

[Defective pixels in each zone]

G16561-0808T

Maximum number of defective pixels	Percentage of defective pixels
41	0.2%
116	0.2%
171	5%
	Maximum number of defective pixels 41 116 171

G16562 to G16564-0808T

Zone	Maximum number of defective pixels	Percentage of defective pixels
1	123	0.6%
2	348	0.6%
3	513	15%

KMIRC0142EA



Equivalent circuit



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Connection example



KMIRC0144EA



Timing chart

G16561 to G16564-0808T can support both integrate while readout mode (IWR) and integrate then readout mode (ITR) by switching the input timing. For details, see the timing chart.

All-line readout mode_IWR mode

IWR all-line readout mode [MCLK frequency: 50 MHz, falling period, "Mode2" setting: 3.3 V (High)] Case (1) Integration time <readout period (when integration time is 8.76 μ s to 1979.8 μ s)

MCLK (input)



Case (2) Integration time>readout period (when integration time is 1979.8 $\ensuremath{\mu s}$ or more)



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All-line readout mode_ITR mode

ITR all-line readout mode [MCLK frequency: 50 MHz, falling periodcycle, "Mode2" setting: 3.3 V (High)] MST (input) "MST" High period=1986.6 µs SHP (input) Integration time: From the falling edge of "Reset" to the falling edge of "SHP" Reset (input) Video (output) .24 µs 0.08 µs 0.08 µs 0.08 µs <u>1.36 µs</u> 0.08 µs 0.08 µs 0.1 <u>µs</u> 0.98 µs or more 0.04 µs 0.06 µs 0.1 µs 0.06 µs 256-80 ch Blank Blank 1-80 ch Blank 0.0<u>2 μs</u> 1-1 ch 1-2 ch 2-1 ch or more or more or more period period period



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Multi-line readout mode_IWR mode

IWR multi-line readout mode [MCLK frequency: 50 MHz, falling period, "Mode2" setting: 0 V (Low)]

Case (1) Integration time < readout period (when integration time is 8.72 μ s to 8.72 μ s + 8.16 μ s × [number of readout rows - 1])

MCLK (input)	งงางงางการ		ί νίννιν	www.	ww/	μννννίν	N/W/μ	νίλ	Ŵ	ww	www.	ŃWW	///////	ν'n	www	Ŵ	ί, Μ	www	ww	ww
MST (input)		"MST	' Hiah	neriod=(06 115	+ 8 16		numt	ner o	f read	out row	s ¹ - 0 22	2115 +	0 1	IS	1	ЧЦ	<u> </u>		
SHP (input)						- 0.10						5] 0.22	<u>н</u> о т			-	╧┟┤╢	,∖	/	
Reset (input)		<u>+</u>	Integ	ration time	e: 8./2	us or moi	e from	the fa	alling	edge o	f "Reset"	to the fa	lling ed	ge of	f "SHP"	(8.16 µs	steps)		
VSP (output)		\vdash	╞╌╱╢╴			<u> </u>	$ \downarrow \downarrow $	-	1	\dashv	$\left \right $		$\left \begin{array}{c} \cdot \\ \cdot \\ \cdot \end{array} \right $	+\			++			
ENadr (input)				1 1		1 1		++	<u>_</u>		<u>}</u>	1 1		-		1		<u> </u>		
ADR (input)		*13		i i		li i		<u> </u>	-13	<u> </u>		i i	<u>li</u>	<u> </u>		Ì		<u> </u>	i	
Video (output)				++		++					\vdash		\vdash	$\dot{+}$	+					
	0.06 0.04 <u>us</u> 0.16 0.02 us 0	0.12 6 µs µs).02 µs	1.18	us 0.08 µs 0. n-1 ch in	.08 µ <u>s</u> I-2 ch	0.08 µs n-80 ch	.22 0.(µs µ ()4 5 0.16 0.02 µ	µs 0.14 Js	μ <u>ς</u> 1.18	8 µ <u>s 0</u> .08 µ m-1 cl	<u>s 0.08 μs</u> h m-2 ch	0.08 µ m-80 ¢	is ch	0.08 µ: q-80 cl	0.1 μs	1 µ 0	<u>ις 0.1 μ</u> .02 μs	us 1 l	เร

Case (2) Integration time > readout period (when integration time is 8.72 μ s + 8.16 μ s × [number of readout rows - 1])

 $\mathsf{MCLK} (\mathsf{input}) \\ \mathsf{MCLK} (\mathsf{input}) \\ \mathsf{MCLK}$

MST (input)		<u>``М</u> С	T" Hia	h period-l	0.06	+ 8 16 1	c 🗸 [num	hor o	froad	out ro	vc1 - 0 2	2116	± 0 1	ue.	<u> </u>		ļĻ		ļŕ
SHP (input)					ο.οο μs	τ 0.10 μ	3 ^ [Teau		//3] - 0.2	2 µ3	+ 0.1	μs			h∟	 	Ľ
Reset (input)				gration time: 8.	72 µs + 8.16	i µs × [numb	per of re	eadout	rows -] or mor	e from the	e falling edge	e of "Re	set" to t	he falling e	dge of "SHP"	(free ste	p)	/	H
VSP (output)		1 1	\square	\vdash			-_	-					+		+		+	+	<u>+</u>	$\left(+ \right)$
ENadr (input)		<u></u>					/	+	_\			1	I	1) <u> </u>	1 1		1÷		1
ADR (input)		*13			<u> </u>	i /	ii		*13	Ļ	<u> </u>	1	<u> </u>	i	<u> </u>	i i		<u>li</u>		Ľ
Video (output)													-fi-		<u> </u>	/				H
	0.06 0.04 µs 0. 0.02 µs	0. 16 μ <u>s</u> μ 0.02 μ	12 IS 1.10 S	<u>8 µs 0.08 µs 0</u> n-1 ch _r	.08 µ <u>s</u> 1-2 ch i	0.2 0.08 µs µs 1-80 ch	2 0.(5 µ)4 s 0.16 0.02	µ <u>s</u> 0.14 Js	1 µs 1.1	3 μ <u>s</u> 0.08 m-1	<u>µs 0.08 µs</u> ch m-2 ch	<u>0</u> .(m-	08 µ <u>s</u> 80 ch	<u>0.08 µ</u> q-80 c	s 0.1 µs h	1	µs C).1 µs 1	μş

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Multi-line readout mode_ITR mode

ITR multi-line readout mode [MCLK frequency: 50 MHz, falling period, "Mode2" setting: 0 V (Low)]

MST (input) "MST" High period=0.06 μ s + 8.16 μ s × [number of readout rows] - 0.22 μ s + 0.1 μ s SHP (input) Integration time: From the falling edge of "Reset" to the falling edge of "SHP" Reset (input) VSP (output) ENadr (input) *13 *13 ADR (input) Video (output) 0.06 µs 0.1 µs 0.04 µs 0.16 µs 0.14 µs 1.18 µs 0.08 µs 0.08 µs 0.04 µs 0.06 µs 0.04 µs 0.16 µs 0.14 µs 1.18 µs 0.08 µs 0.08 µs or more or more 0.98 µs or more 0.08 µs 0.22 µs 0.08 µs 0.08 µs 0.1 µs or more 0.02 µs n-1 ch n-2 ch n-80 ch m-1 ch m-2 ch m-80 ch q-80 ch Blank 0.02 µs 0.02 µs period KMIRC0148EB



*13: ADR signal setting of multi-line readout mode



*14: ADR signal setting example

Select Line Row-ch	SL Address Decimal	SL Address Binary	SL0	SL1	SL2	SL3	SL4	SL5	SL6	SL7
1	0	00000000	0	0	0	0	0	0	0	0
11	10	00001010	0	1	0	1	0	0	0	0
129	128	1000000	0	0	0	0	0	0	0	1
200	199	11000111	1	1	1	0	0	0	1	1
234	233	11101001	1	0	0	1	0	1	1	1
256	255	11111111	1	1	1	1	1	1	1	1



Timing specifications (MCLK, MST, SHP, Reset)

Timing specifications of external input signals (MCLK, MST, SHP, Reset)are shown below.



Specifications of external input signal (MCLK, MST, SHP, Reset)

Parameter	Symbol	Min.	Тур.	Max.	Unit
Clock frequency	fop	-	-	50	MHz
Clock pulse width	tpw(MCLK)	10	-	-	ns
Clock pulse rise/fall times	tr(MCLK), tf(MCLK)	-	3	4	ns
MST pulse width	tpw(MST)	40	-	-	ns
SHP pulse width	tpw(SHP)	1000	-	-	ns
Reset pulse width	tpw(Reset)	1000	-	-	ns
MST rise/fall times SHP rise/fall times Reset rise/fall times	tr(MST), tf(MST), tr(SHP), tf(SHP), tr(Reset), tf(Reset)	-	3	4	ns
Setup time	tSET(MST), tSET(SHP), tSET(Reset)	5	-	-	ns
Hold time	tHOLD(MST), tHOLD(SHP), tHOLD(Reset)	5	-	-	ns



Multi-line readout mode

G16561 to G16564-0808T can be set to multi-line readout mode in addition to normal readout mode (all-line readout mode). By setting to the multi-line readout mode, it is possible to freely read any row (multi-line readout mode). To set the readout row, it is necessary to input an external signal to the specified terminal (ADR, ENadr). For details, see "Timing chart of multi-line readout mode".





Multi-line readout mode_frame rate in IWR operation

(Typ. Ta=25 °C, fop=50 MHz) 10000 Frame rate (frames/s) 1000 100 Number of readout rows: 16 rows Number of readout rows: 32 rows Number of readout rows: 64 rows Number of readout rows: 128 rows Number of readout rows: 256 rows 10 1000 10 100 10000 Integration time (µs)

Multi-line readout mode_frame rate in ITR operation



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KMIRB0140EA

Recommended drive conditions (Ta=25 °C)

Parameter		Symbol	Min.	Тур.	Max.	Unit	
Supply voltage		Vdd1	4.9	5.0	5.1	V	
Supply voltage		Vdd2	3.2	3.3	3.4	V	
Supply surront		Ivdd1	-	63	120	mA	
Supply current		Ivdd2	-	30	60	mA	
First-stage amplifier reference	Supply voltage	Vinp	3.0	3.1	3.2	V	
voltage*15	Supply current	Ivinp	-	-	10	mA	
Video line reset veltage	Supply voltage	Vrst	1.6	1.7	1.8	V	
video inte reser voltage	Supply current	Ivrst	-	-	10	mA	
Element hiss voltage*15	Supply voltage	Vpdn	3.08	Vinp + 0.08	3.28	V	
Element bias voltage"	Supply current	Ivpdn	-	-	20	mA	
Divel hiss veltage*16	Supply voltage	Vb1	2.5	3.5	4.5	V	
Pixel bids vollage 10	Supply current	Ivb1	-	-	10	mA	
MCI K welte e e	High		Vdd2 - 0.25	Vdd2	Vdd2 + 0.25		
MCLK Voltage	Low	VI(MCLK)	-	-	0.25	l v	
MCT voltage	High		Vdd2 - 0.25	Vdd2	Vdd2 + 0.25	V	
MST voltage	Low	VI(MST)	-	-	0.25	V	
	High	ласар)	Vdd2 - 0.25	Vdd2	Vdd2 + 0.25	V	
SHP voltage	Low	VI(SHP)	-	-	0.25	l v	
Posst veltage	High	Vi(Decet)	Vdd2 - 0.25	Vdd2	Vdd2 + 0.25	V	
Reset voltage	Low	VI(Resel)	-	-	0.25		
ENade valtage	High	Vi(ENady)	Vdd2 - 0.25	Vdd2	Vdd2 + 0.25	V	
ENdur Voltage	Low	VI(ENdur)	-	-	0.25	V	
	High		Vdd2 - 0.25	Vdd2	Vdd2 + 0.25	V	
ADR Vollage	Low	VI(ADR)	-	-	0.25		
Madal valtaga* ¹⁷	High	Vi(Medel)	Vdd2 - 0.25	Vdd2	Vdd2 + 0.25	V	
Model Voltage "	Low	VI(MODET)	-	-	0.25	V	
Mada2 valtaga*18	High	Vi(Mede2)	Vdd2 - 0.25	Vdd2	Vdd2 + 0.25	V	
Modez voltage 10	Low	VI(MODEZ)	-	-	0.25		
	Dark output	Vs(dark)	2.2	2.4	2.6		
Video output voltage	Saturation	Vs(sat)	0.1	0.3	0.5	V	
		70	-	1	-	kQ	
Clock frequency		fon	-	-	50	MH7	
Data rate		DR	-	fon/4	-	Hz	
Frame rate (fon=50 MHz)*19		FR	-	-	503	fns	
		11	1			1 193	

*15: Set Vpdn to a higher voltage than Vinp.

*16: Setting values vary depending on the sample. For the setting value, refer to the Vb1 value written on the final inspection sheet enclosed at the time of shipment.

*17: Set to 3.3 V.

*18: High (3.3 V): All-line readout mode, Low (0 V): Multi-line readout mode

*19: All-line readout mode, integration time=1.98 ms, in IWR operation

Operation mode selection

Terminal name	Pin no.	Input	Description
Mode1	17	High=3.3 V [Vdd2(3.3 V)]	Apply the fixed voltage indicated on the left.
Mode2	25	High=3.3 V [Vdd2(3.3 V)]	All-line readout mode
		Low=0 V (GND)	Multi-line readout mode



Spectral response



KMIRB0142EA

Specifications of built-in TE-cooler/thermistor (Ta=25 °C)

Parameter	Symbol	Condition	Min.	Тур.	Max.	Unit
Recommended TE-cooler operating current	ITE		-	-	2.8	Α
RecommendedTE-cooler operating voltage	VTE		-	-	6.2	V
Temperature difference*20	ΔΤ	ITE=2.8 A, Ta=25 °C	50	-	-	°C
Thermistor resistance	Rth	Tchip=25 °C	9	10	11	kΩ
Thermistor B constant	В	*21	-	3660	-	K

*20: Temperature difference between the photosensitive area and package heat dissipation area

*21: T1=25 °C, T2=-20 °C





Thermistor temperature characteristics





- Current vs. voltage characteristics of TE-cooler



Dimensional outline (unit: mm)

Pin No.	Symbol	Pin No.	Symbol
1	TE+	15	Vdd1
2	GND	16	Vdd2
3	Vpdn	17	Mode1
4	Vb1	18	VSP
5	Vinp	19	ADR
6	Vrst	20	SHP
7	Video1	21	MST
8	NC	22	MCLK
9	Video2	23	Reset
10	NC	24	ENadr
11	Video3	25	Mode2
12	NC	26	THERM1
13	Video4	27	THERM2
14	NC	28	TE-

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Pin connections

Pin no.	Symbol	Input/output	Description	Note
1	TE+	Input	TE-cooler (+)	-
2	GND	Input	0 V ground	0 V
3	Vpdn	Input	Photodiode bias voltage	3.18 V Typ.
4	Vb1	Input	Pixel bias voltage	2.5 V to 4.5 V
5	Vinp	Input	Charge amplifier reset voltage	3.1 V Typ.
6	Vrst	Input	Video line reset voltage	1.7 V Typ.
7	Video1	Output	Video output after integration (port 1)	0.1 V to 2.6 V
8	NC	-	-	-
9	Video2	Output	Video output after integration (port 2)	0.1 V to 2.6 V
10	NC	-	-	-
11	Video3	Output	Video output after integration (port 3)	0.1 V to 2.6 V
12	NC	-	-	-
13	Video4	Output	Video output after integration (port 4)	0.1 V to 2.6 V
14	NC	-	-	-
15	Vdd1	Input	+5 V power supply	+5 V
16	Vdd2	Input	+3.3 V power supply	+3.3 V
17	Mode1	Input	Mode switching signal	Set to High (3.3 V)
18	VSP	Output	Synchronization signal for multi-line readout mode	-
19	ADR	Input	Control pulse for multi-line readout mode	-
20	SHP	Input	Sample hold pulse	-
21	MST	Input	Frame scan start pule	-
22	MCLK	Input	Clock pulse for timing generator	-
23	Reset	Input	Charge amplifier reset pulse	-
24	ENadr	Input	Control pulse for multi-line readout mode	-
25	Mode2	Input	Mode switching signal	High (3.3 V): all-line readout mode Low (0 V): multi-line readout mode
26	THERM1	Output	Thermistor	-
27	THERM2	Output	Thermistor	-
28	TE-	Input	TE-cooler (-)	-

Precautions

(1) Electrostatic countermeasures

This device has a built-in protection circuit against static electrical charges. However, to prevent destroying the device with electrostatic charges, take countermeasures such as grounding yourself, the workbench and tools to prevent static discharges. Also protect this device from surge voltages which might be caused by peripheral equipment.

(2) Incident window

If there is dust or stain on the light incident window, it will show up as black blemishes on the image. When cleaning, avoid rubbing the window surface with dry cloth, dry cotton swab or the like, since doing so may generate static electricity. Use soft cloth, paper or a cotton swab, or the like moistened with alcohol to wipe off dust and stain. Then blow compressed air onto the window surface so that no stain remains.

(3) Soldering

To prevent damaging the device during soldering, take precautions to prevent excessive soldering temperatures and times. Soldering should be performed within 10 seconds at a soldering temperature below 260 °C.

(4) Operating and storage environments

Handle the device within the temperature range specified in the absolute maximum ratings. Operating or storing the device at an excessively high temperature and humidity may cause variations in performance characteristics and must be avoided.

Related information

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

- Precautions
- Disclaimer
- Safety consideration
- · Image sensors

Catalogs

- · Selection guide / InGaAs image sensors
- · Technical note / InGaAs area image sensors

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