

S11141

S11142

**High sensitivity, direct detection of low energy (2 keV or more) electron beams**

**Features**

- Direct detection of low energy (2 keV or more) electron beams with high sensitivity
- High gain: 1100 times (incident electron energy: 5 keV)
- Large active area size  
S11141: 10 × 10 mm  
S11142: 14 × 14 mm
- $\phi$ 2.0 mm hole in center of active area  
Design is suitable for use with backscattered electron detector of SEM.
- S11142: 4-element photodiode  
Detects reflection electron beam position (angle)
- Thin ceramic package  
Allows short-distance arrangement between the electron gun and a sample in a SEM
- Uses a wiring board made of less magnetic materials that are unlikely to affect electron beam trajectories.

**Applications**

- Backscattered electron detector for scanning electron microscope (SEM)

**Absolute maximum ratings**

Parameter	Symbol	Condition	Value	Unit
Reverse voltage	$V_R$ max.	$T_a=25\text{ }^\circ\text{C}$	20	V
Operating temperature*1	$T_{opr}$		-20 to +60	$^\circ\text{C}$
Storage temperature*1	$T_{stg}$		-20 to +80	$^\circ\text{C}$

\*1: No condensation

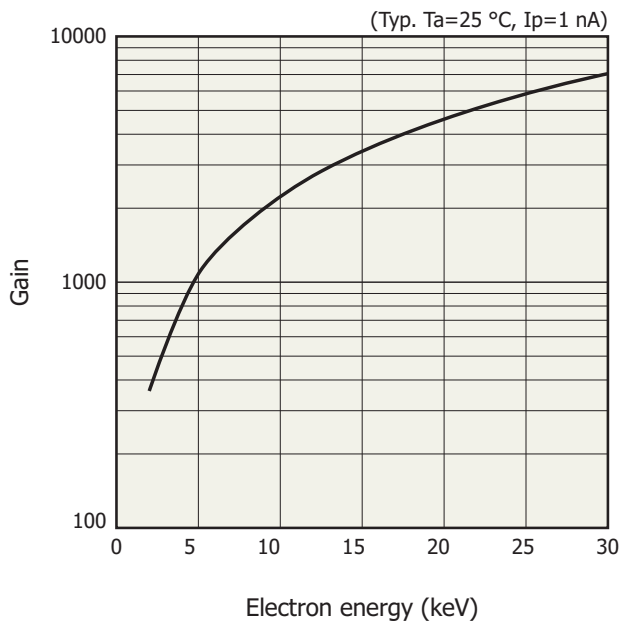
**Electrical and optical characteristics ( $T_a=25\text{ }^\circ\text{C}$ )**

Parameter	Symbol	Condition	S11141			S11142*2			Unit
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Incident electron energy range	-		2	-	30	2	-	30	keV
Output current	$I_{sc}$	Electron energy 5 keV $I_p=1\text{ nA}^{*3}$	-	1.1	-	-	1.1	-	$\mu\text{A}$
Dark current	$I_D$	$V_R=10\text{ mV}$	-	0.1	1	-	0.05	0.5	nA
		$V_R=5\text{ V}$	-	5	50	-	1	25	
Terminal capacitance	$C_t$	$V_R=0\text{ V}$ , $f=10\text{ kHz}$	-	2000	3300	-	900	1500	pF
		$V_R=5\text{ V}$ , $f=1\text{ MHz}$	-	500	850	-	250	420	
Cut-off frequency	$f_c$	$V_R=0\text{ V}$ , $R_L=50\text{ }\Omega$ $\lambda=400\text{ nm}$ , -3 dB	-	0.5	-	-	1	-	MHz
		$V_R=5\text{ V}$ , $R_L=50\text{ }\Omega$ $\lambda=400\text{ nm}$ , -3 dB	-	4	-	-	7	-	
Electron multiplying gain	-	Electron energy 5 keV	-	1100	-	-	1100	-	-

\*2: Per 1 element

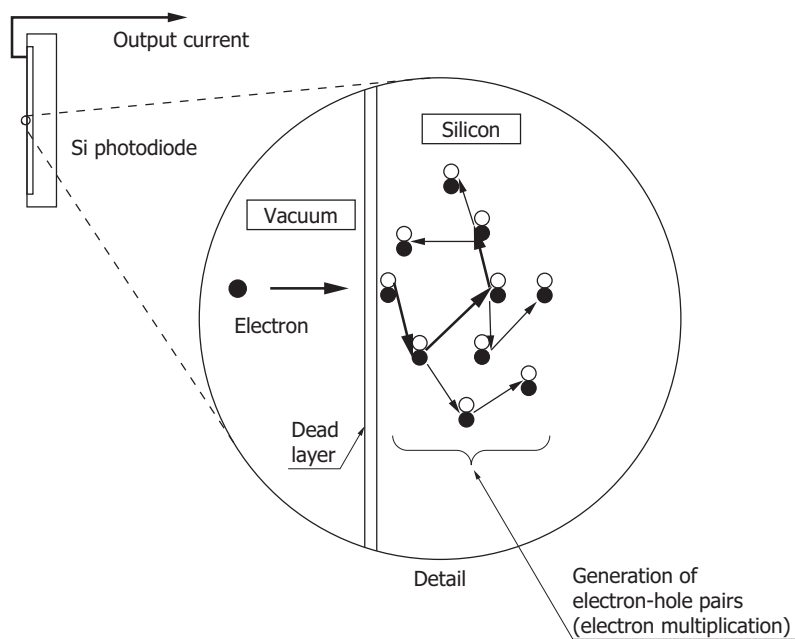
\*3: Injection current (probe current)

### Gain vs. electron energy



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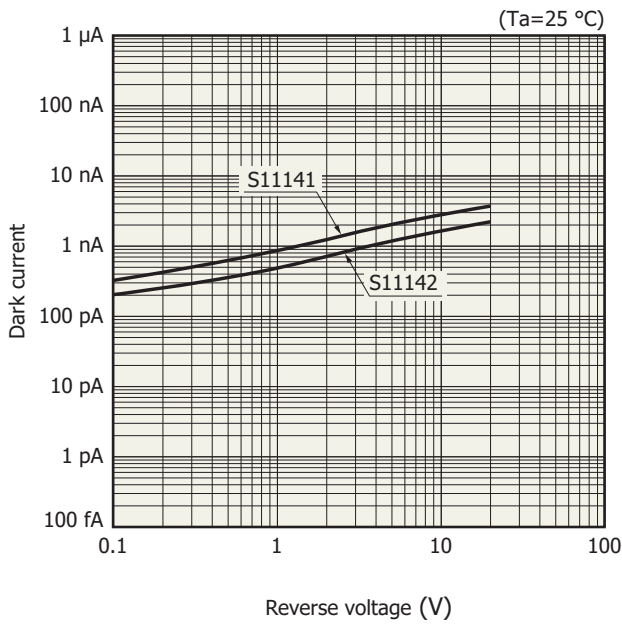
### Electron multiplication principle



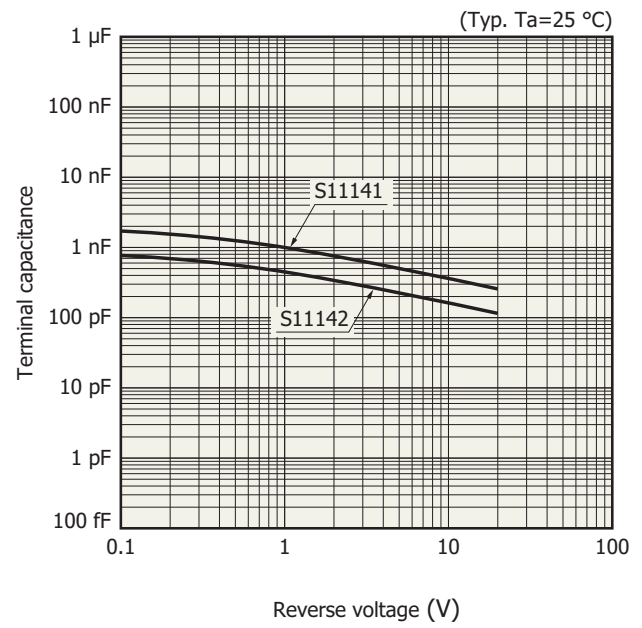
Electrons generate ions as they pass through silicon. This ionization process generates a large number of electron-hole pairs that then multiply the number of electrons. The electron multiplication can boost the output current by approximately 1100 times at an input electron energy of 5 keV (refer to "Gain vs. electron energy").

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Dark current vs. reverse voltage (typical example)

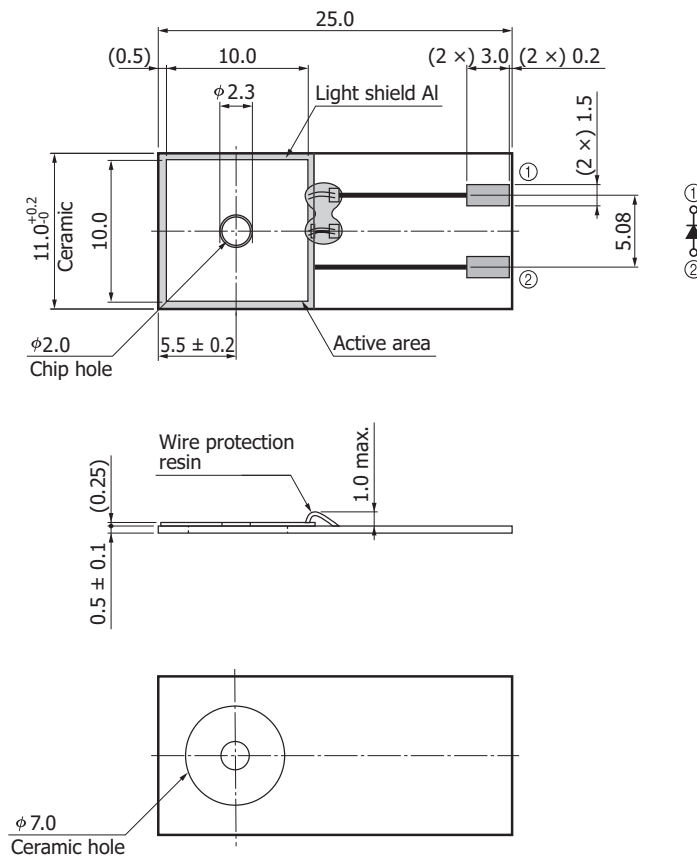


Terminal capacitance vs. reverse voltage



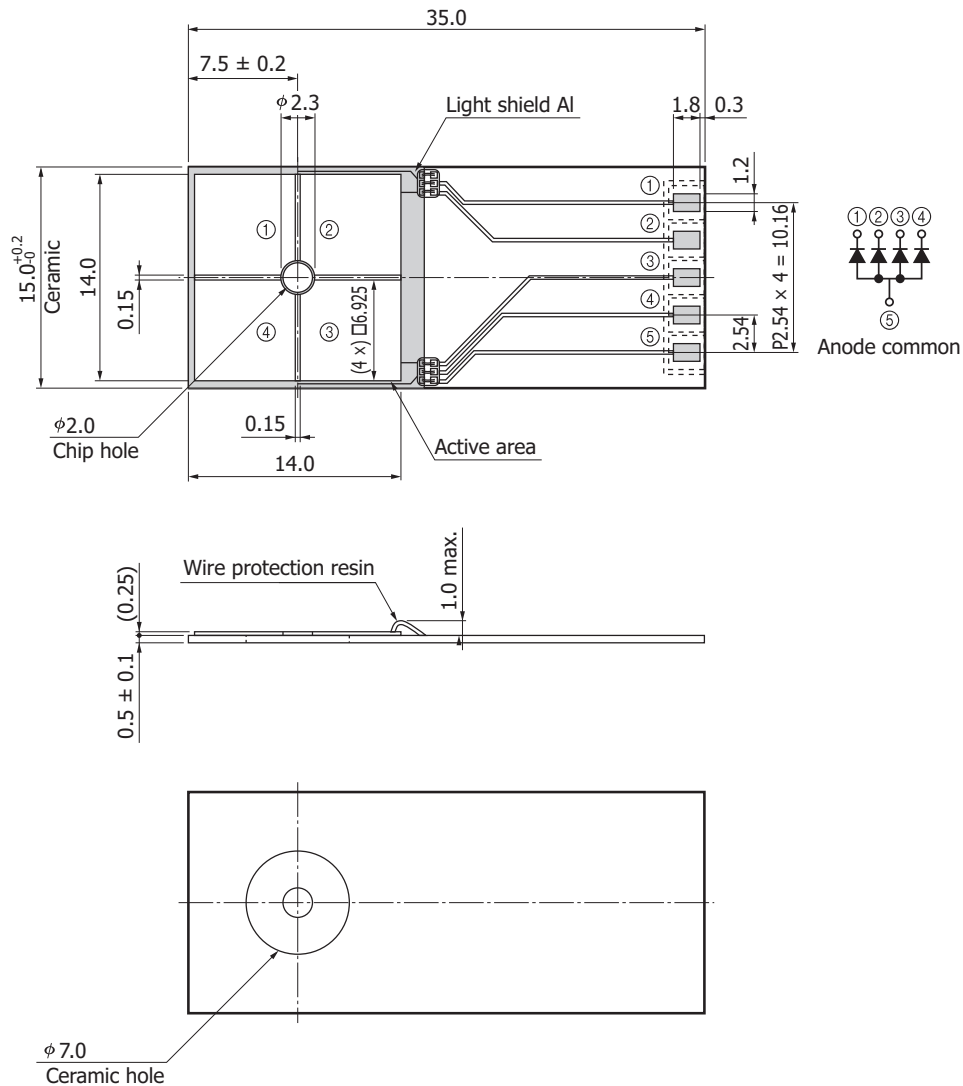
Dimensional outlines (unit: mm, tolerance unless otherwise noted: ±0.2)

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### Recommend soldering conditions

- Soldering temperature: below 260 °C
- Soldering time: within 5 seconds

Information described in this material is current as of July, 2011. Product specifications are subject to change without prior notice due to improvements or other reasons. Before assembly into final products, please contact us for the delivery specification sheet to check the latest information.

Type numbers of products listed in the delivery specification sheets or supplied as samples may have a suffix "(X)" which means preliminary specifications or a suffix "(Z)" which means developmental specifications.

The product warranty is valid for one year after delivery and is limited to product repair or replacement for defects discovered and reported to us within that one year period. However, even if within the warranty period we accept absolutely no liability for any loss caused by natural disasters or improper product use.

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