

Signal processing circuit for 1-D PSD



C3683-02

Circuit board for easier 1-D PSD operation

The C3683-02 is a DC signal processing circuit for one-dimensional PSD. It is suitable for displacement measurements using DC light.

Features

- **No complicated adjustments required**
Position measurement of a light spot can be made simply by mounting 1-D PSD.
- **Output voltage directly representing the position data**
The position (mm) of a light spot from the PSD (S3931, S3932) center is obtained as an output voltage (V).
- **Accurate position sensing**
Position data of a light spot is independent of incident light intensity.
- **Three sensitivity ranges**
- **Compact design**
Head amp, signal addition/subtraction circuits, and analog divider circuit are mounted on a compact PC board.

Applications

- **Displacement measurements using DC light**
- **Various studies using 1-D PSD**
- **Performance evaluation of 1-D PSD**

Absolute maximum ratings (Ta=25 °C unless otherwise noted)

Parameter	Symbol	Value	Unit
Supply voltage	Vs max	±18	V
Operating temperature*1	Topr	0 to +50	°C
Storage temperature*1	Tstg	-10 to +60	°C
Input current	Iin max	1 × 10 ⁻²	A

*1: No dew condensation

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

Specifications (Ta=25 °C, Vs=±15 V)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	
Conversion impedance		Zt	*2	H range	-	1 × 10 ⁶	-	
				M range	-	1 × 10 ⁵	-	
				L range	-	1 × 10 ⁴	-	
Input photocurrent		Ip	*3	H range	1 × 10 ⁻⁶	-	1 × 10 ⁻⁵	
				M range	1 × 10 ⁻⁵	-	1 × 10 ⁻⁴	
				L range	1 × 10 ⁻⁴	-	1 × 10 ⁻³	
Head amp output (V1, V2)	Cutoff frequency	fc	-3 dB	Lower	-	DC	-	
				Upper	12	16	-	
	Output voltage	High	VOH		-	0	-	V
		Low	VOL		-	-13.8	-13.5	
Output noise voltage	Vn	*5		-	2	-	mVp-p	
Output offset voltage	Vos	*5		-1	-	+1	mV	
Sum signal output (VA)	Cutoff frequency	fc	-3 dB	Lower	-	DC	-	
				Upper	12	16	-	
	Output voltage	High	VOH		+13.5	+13.8	-	V
		Low	VOL		-	0	-	
Output noise voltage	Vn	*5		-	2	-	mVp-p	
Output offset voltage	Vos	*5		-5	-	+5	mV	
Subtracted signal output (VB)	Cutoff frequency	fc	-3 dB	Lower	-	DC	-	
				Upper	12	16	-	
	Output voltage	High	VOH		+13.5	+13.8	-	V
		Low	VOL		-	-13.8	-13.5	
Output noise voltage	Vn	*5		-	2	-	mVp-p	
Output offset voltage	Vos	*5		-5	-	+5	mV	
Position conversion signal output (Vo)	Cutoff frequency	fc	-3 dB	Lower	-	DC	-	
				Upper	12	16	-	
	Maximum output amplitude voltage	Vfs	Factory setup prior to shipping*6		±5.8	±6	±6.2	V
	Output noise voltage	Vn	*5		-	5	-	mVp-p
Output offset voltage	Vos	*5		-60	-	+60	mV	
Reference voltage	Vref	*6		+2	-	+10	V	
Reverse voltage for PSD	Vr	Factory setup prior to shipping*7		+4.9	+5	+5.1	V	
Operating supply voltage	Vs	*8		±14.5	±15	±15.5	V	
Current consumption	Is	*5		-	±8	-	mA	

*2: Factory setup prior to shipping is M range. The range can be switched with the jumper on the board.

*3: Photocurrent with PSD installed. PSD does not operate correctly if the input signal current is outside the specified range.

*4: Output response time 10 to 90%

*5: With no PSD installed. Current signal that substitutes for PSD photocurrent (L range: X1=X2=400 μA, M range: X1=X2=40 μA, H range: X1=X2=4 μA) is input. When maximum output amplitude voltage Vfs=±6 V is set.

*6: Factory setup prior to shipping is 6 V. Adjustable with a volume resistor on the board according to the PSD type to be used.

*7: Factory setup prior to shipping is +5 V. The voltage can be adjusted in the range of 0 to +14 V with a variable resistor on the board.

*8: Switching power supplies are not supported. Use a series power supply (with 3 mVp-p or less ripple voltage).

Combination with a PSD

A PSD is installed (soldered) on the signal processing circuit.

Note: PSDs are sold separately.

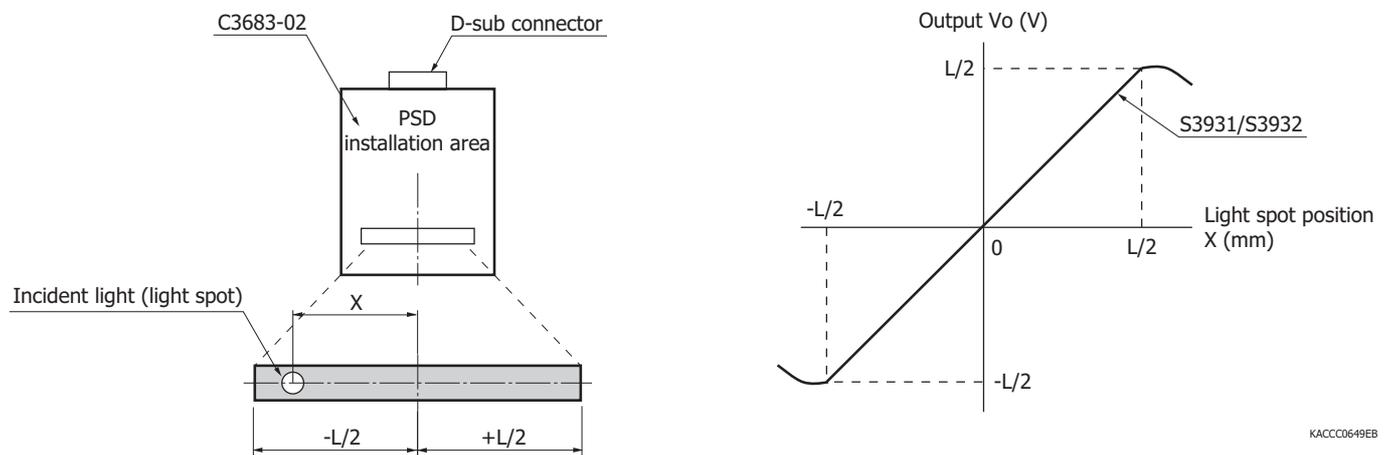
Type no.	Photosensitive area size (mm)	Position resolution* ⁹ (μm)	Package (mm)	Installation on board	External attachment* ¹⁰
S3931	6 × 1	2.5	Ceramic (9.2 × 4.8)	Yes	Yes
S3932	12 × 1	5	Ceramic (15.2 × 4.8)	Yes	Yes
S8543	24 × 0.7	10	Ceramic (36.7 × 4)		Yes
S4583-04	3 × 1	1.3	Plastic		Yes
S4584 series	3.5 × 1	1.5	Plastic		Yes
S3274-05	3.5 × 1	1.5	Plastic		Yes
S7105 series	4.2 × 1	1.8	Plastic		Yes

*9: Reference value. When maximum output amplitude voltage $V_o = \pm 6$ V is set.

*10: Wiring using shielded wires or AWG#26 or equivalent twisted pair wires (no longer than 30 cm) is recommended.

PSD and output voltage

With the D-sub connector on top, the output corresponding to the horizontal position (converted output voltage of the X position) is output from D-sub connector terminal No. 2 (V_o).



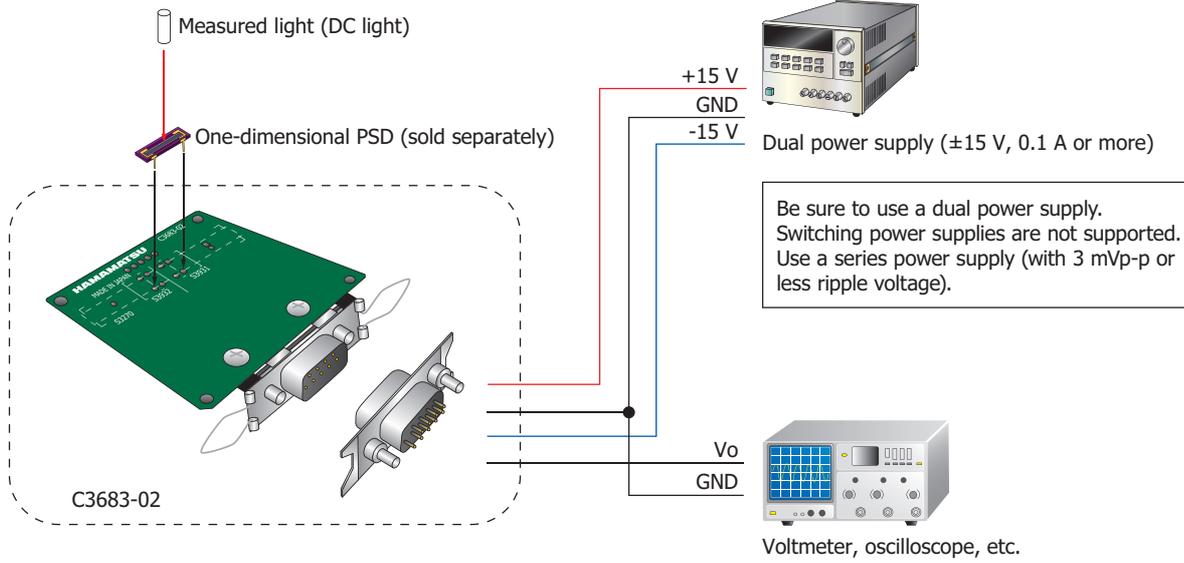
L: PSD photosensitive area length (mm)

KACCC0651EA

KACCC0649EB

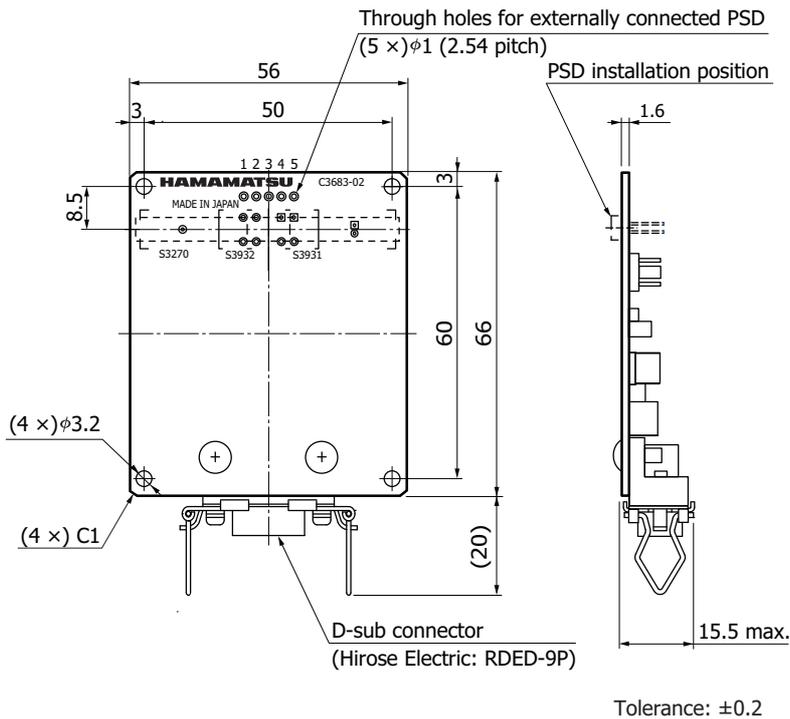
Parameter	Symbol	One-dimensional PSD		Unit
		S3931	S3932	
Photosensitive area length	L	6	12	mm
Output amplitude voltage	$V_o(X)$	± 3	± 6	V

Connection example



KACCC0653EC

Dimensional outline (unit: mm)



KACCA0307EA

Pin connections

D-sub connector

Pin no.	Name	Content
1	V _R	PSD reverse bias voltage output
2	V ₀	Analog divider output (position signal output)
3	-V	-15 V
4	+V	+15 V
5	G	GND
6	V _B	Differential signal output
7	V ₂	Head amp output X2
8	V ₁	Head amp output X1
9	V _A	Sum signal output (incident light level monitor output)

Through holes for externally connected PSD

Pin no.	Name	Content
1	X2	Connection to PSD anode terminal "X2"
2	G	GND (for signal cable shield)
3	V _R	PSD reverse bias voltage output: Connection to PSD cathode terminal
4	G	GND (for signal cable shield)
5	X1	Connection to PSD anode terminal "X1"

Accessories

- Instruction manual
- Connector HDEB-9S (Hirose Electric: for connections to power supply and output readout device)

Related information

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

Precautions

- Disclaimer

Information described in this material is current as of August 2020.

Product specifications are subject to change without prior notice due to improvements or other reasons. This document has been carefully prepared and the information contained is believed to be accurate. In rare cases, however, there may be inaccuracies such as text errors. Before using these products, always contact us for the delivery specification sheet to check the latest 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. Copying or reprinting the contents described in this material in whole or in part is prohibited without our prior permission.

HAMAMATSU

www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Solid State Division

1126-1 Ichino-cho, Higashi-ku, Hamamatsu City, 435-8558 Japan, Telephone: (81)53-434-3311, Fax: (81)53-434-5184

U.S.A.: Hamamatsu Corporation: 360 Foothill Road, Bridgewater, N.J. 08807, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218, E-mail: usa@hamamatsu.com

Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-265-8, E-mail: info@hamamatsu.de

France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10, E-mail: infos@hamamatsu.fr

United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire AL7 1BW, UK, Telephone: (44)1707-294888, Fax: (44)1707-325777, E-mail: info@hamamatsu.co.uk

North Europe: Hamamatsu Photonics Norden AB: Torshamnsgatan 35 16440 Kista, Sweden, Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01, E-mail: info@hamamatsu.se

Italy: Hamamatsu Photonics Italia S.r.l.: Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy, Telephone: (39)02-93 58 17 33, Fax: (39)02-93 58 17 41, E-mail: info@hamamatsu.it

China: Hamamatsu Photonics (China) Co., Ltd.: 1201 Tower B, Jiaming Center, 27 Dongsanhuan Beilu, Chaoyang District, 100020 Beijing, P.R.China, Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866, E-mail: hpc@hamamatsu.com.cn

Taiwan: Hamamatsu Photonics Taiwan Co., Ltd.: 8F-3, No. 158, Section2, Gongdao 5th Road, East District, Hsinchu, 300, Taiwan R.O.C. Telephone: (886)3-659-0080, Fax: (886)3-659-0081, E-mail: info@hamamatsu.com.tw