

Signal processing circuit for 2-D PSD C4674, C4757, C4758, C7563

Signal processing circuit designed to facilitate operation of 2-D Position Sensitive Detector



Features

- No complicated adjustment required
Position measurement can be made simply by mounting 2-D PSD.
- Output voltage directly representing the position data
The position (mm) of a light spot from the PSD center is obtained as an output voltage (V).
- Accurate position detection
Accurate position data can be obtained, independent of light intensity.
- Compact on-board configuration
A head amplifiers, signal addition/subtraction circuits, and analog divider are mounted on a compact PC board.

Applications

- Displacement measurements using 2-D PSD
- Various studies using 2-D PSD
- Evaluation of 2-D PSD

■ Four models are available to meet various 2-D PSD types

PSD type	DC signal processing circuit	AC signal processing circuit
Pin-cushion type PSD	C4674	C7563
Duo-lateral type PSD	C4757	-
Tetra-lateral type PSD	C4758	-

- DC signal processing circuit
Suitable for DC light displacement measurement.
- AC signal processing circuit
Designed specifically for pulse (AC) signal detection.
Has a synchronous circuit, S/H (sample & hold) circuit and LED driver circuit.
Use of a pulse-driven LED ensures reliable operation even under background light.

■ Combination with Hamamatsu 2-D PSD

Each signal processing circuit can be used with the following Hamamatsu 2-D PSD.

PSD Signal processing circuit	Pin-cushion type					Duo-lateral type	Tetra-lateral type
	S1880	S1881	S2044	S5990-01	S5991-01	S1300	S1200
C4674	○	○ *1	○	○ *2	○ *2		
C4757						○	
C4758							○
C7563	○	○ *1	○	○ *2	○ *2		

*1: Connected externally

*2: Using attachment board

■ Accessories

The mating connectors to a power supply/signal readout device and the boards for mounting surface-mounting ceramic package PSD are supplied with each signal processing circuit.

Type No.	Accessory	
	Supplied connector	Attachment board
C4674	HDEB-9S (made by Hirose Electric)	for mounting S5990-01, S5991-01
C4757	HDAB-15S (made by Hirose Electric)	-
C4758		-
C7563		for mounting S5990-01, S5991-01

■ Absolute maximum ratings

Parameter		Symbol	DC circuit			AC circuit	Unit
			C4674	C4757	C4758	C7563	
Signal processor	Supply voltage	Vcc Max.	±18				V
	Input current	I _{IN} Max.	Vcc Max. × 10 ⁻⁵				A
	Output short-circuit time	-	Continuous				s
	Operating temperature	T _{opr}	0 to +50				°C
LED driver	Transistor collector-emitter voltage	V _{CE}	-	-	-	+50	V
	Transistor collector current *3	I _c	-	-	-	2	A
	Transistor collector dissipation *3	P _c	-	-	-	900	mW

■ Specifications (T_a=25 °C, V_{cc}=±15 V)

Parameter		Symbol	Condition	Typical value				Unit
				DC circuit			AC circuit	
				C4674	C4757	C4758	C7563	
Signal processor	Head-amp conversion impedance *4	R _f	Factory setup prior to shipping	1 × 10 ⁵				V/A
	Feedback capacitance	C _f	Factory setup prior to shipping	100			22	pF
	Input signal current *5	I _{IN}	Photocurrent with PSD installed	1 × 10 ⁻⁵ to 1 × 10 ⁻⁴				A
	Rise time	t _r	Output response time versus movement of light spot position, measured with PSD installed.	30				μs
	PSD reverse bias voltage	V _R	-	+5				V
	Output offset voltage	V _{os}	*7	-10 to +10				mV
	Output voltage amplitude *6	V _o	With PSD installed and light spot falling on edge of active area.	-10 to +10				V
	Output noise (analog divider)	V _n	All range *7	5			10	mVp-p
	Current consumption	I _{cc}	*7	±15			±60	mA
LED driver	Transistor collector current	I _c	*3	-	-	-	680	mA _{p-p}
	Repetition frequency	f _r	*8	-	-	-	333	Hz
	Output type	-	-	-	-	-	Open collector	-

*3: Duty ratio: 3/100, pulse width: 90 μs, LED: Hamamatsu L1915-01 (sold separately)

*4: These resistors are lead types and inserted into sockets, so it can be easily to exchange by the user if necessary in a range between 1 × 10⁴ to 1 × 10⁶ Ω. For more details, see the instruction manual that comes with the product.

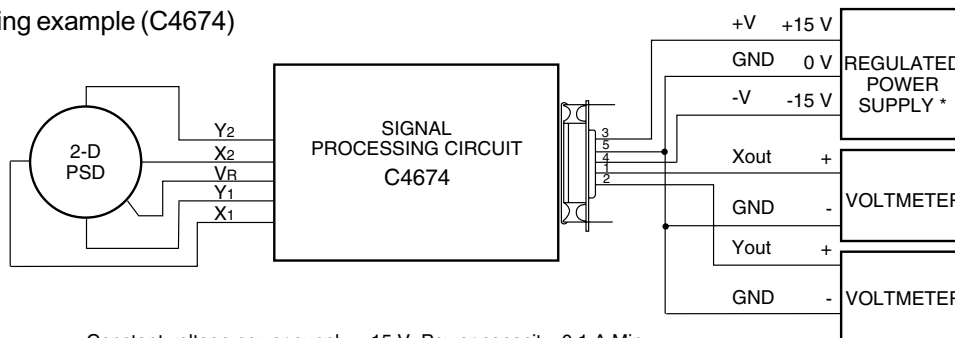
*5: The circuit does not operate correctly when input signal level is not appropriate.

*6: Maximum output amplitude can be adjusted in a range of ±2 to ±10 V according to PSD type to be used.

*7: Measured without PSD and with LED turned off, while using a current source of 20 μA (X1=X2=Y1=Y2) substituting for PSD photocurrent. In the case of C7563, however, pulse current with a duty ratio of 3/100 and a pulse width of 90 μs is supplied.

*8: Repetition frequency 333 Hz (duty ratio: 3/100, pulse width: 90 μs) cannot be modulated.

■ Operating example (C4674)



Constant voltage power supply: ±15 V, Power capacity: 0.1 A Min.
Ripple voltage: 3 mVp-p Max.

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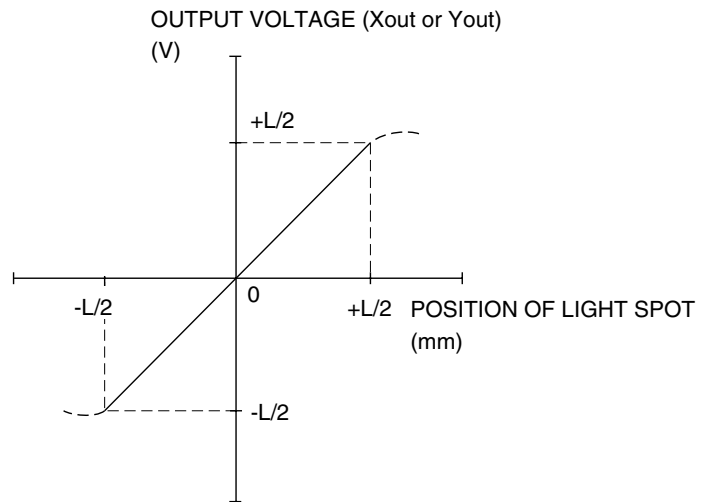
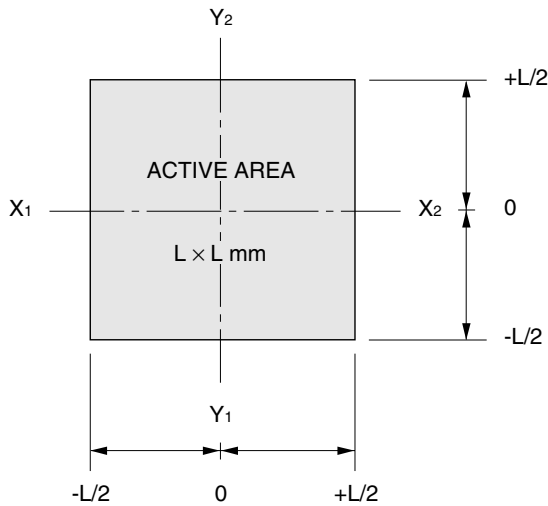
Condition

- | | |
|------------------------------|----------------------|
| 1. Light source | LED (λ=900 nm) |
| 2. Light spot diameter | φ200 μm |
| 3. PSD used | S1880 (12 × 12 mm) |
| 4. PSD photocurrent | 10 μA |
| 5. Signal processing circuit | C4674 |
| 6. Frequency bandwidth | 10 Hz |
| 7. Voltmeter | KEITHLEY model 195 A |

The followings are obtained with the conditions listed on the left.

Output voltage amplitude	V _{FS} (X)=±6 V
	V _{FS} (Y)=±6 V
Position resolution (calculated values)	Δx=0.1 μm approx.
	Δy=0.1 μm approx.

■ 2-D PSD and output voltage



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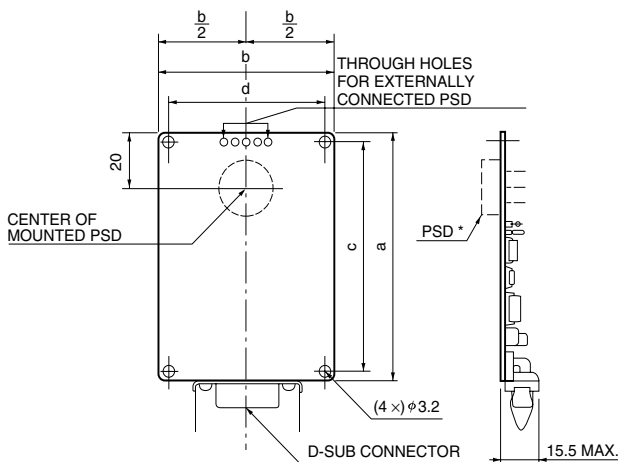
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Parameter	Pin-cushion type					Duo-lateral type	Tetra-lateral type	Unit
	S1880	S1881 *9	S2044	S5990-01	S5991-01	S1300	S1200	
Active area length L	12	22	4.7	4	9	13	13	mm
Output voltage amplitude V_o (X)	± 6	± 5.5	± 2.35	± 2	± 4.5	± 6.5	± 6.5	V
Output voltage amplitude V_o (Y)	± 6	± 5.5	± 2.35	± 2	± 4.5	± 6.5	± 6.5	V

*9: The position (mm) of light spot from the center is twice the output voltage (V) for the S1881.

If the incident light spot is not sufficiently focused on the PSD, i.e., the light spot diameter is large, and falls upon near the edge of the active area, part of the light spot may go outside the active area, thus degrading position accuracy. The output voltage amplitude values listed above are measured when the light spot diameter is made as small as possible within the range in which adequate intensity is maintained.

■ Dimensional outline (unit: mm, tolerance: ± 0.2 mm)



Symbol	C4674	C4757	C4758	C7563
a	90	92	90	110
b	65	70	65	75
c	84	84	83	102
d	59	62	57	67

* PSD is not mounted on this board.

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