IS1660

OPIC Light Detector for X8 to X10 Speed DVD-ROM

■ Features

1. OPIC light detector with built-in RF amplifier
   (Integrates 12-division PIN photodiode and Amp. IC onto a single chip)
2. High speed response
   (Response frequency : MIN. 60MHz)
3. Can read various discs such as DVD, DVD-ROM, DVD-RAM, DVD-R, CD-ROM, CD-R, CD-RW
4. High sensitivity
5. Compact and thin package
   (Package dimensions : 5.0×4.0×1.5mm)
6. Possible to supply custom-made detecting patterns
7. Pair use with SHARP's laser diode is recommended.
   Laser diode : 650nm band **GH06510B2A/B**

■ Applications

1. DVD-ROM drives
2. DVD players

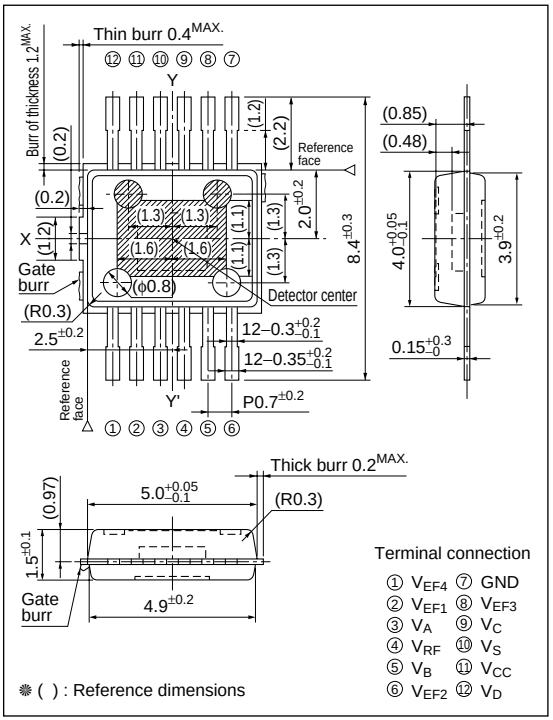
■ Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	6.0	V
*1 Output voltage	V_O	V_{CC}	V
Operating temperature	T_{opr}	–30 to +80	°C
Storage temperature	T_{stg}	–40 to +100	°C
*2 Soldering temperature	T_{sol}	260	°C

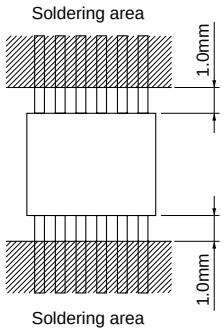
*1 Applies to individual terminals of V_A, V_B, V_C, V_D, V_{EF1}, V_{EF2}, V_{EF3}, V_{EF4}, and V_{RF}

*2 For MAX. 3s at the position of 1.0mm from the resin edge

■ Outline Dimensions (Unit : mm)



* "OPIC"(Optical IC) is a trademark of the SHARP Corporation. An OPIC consists of a light-detecting element and signal-processing circuit integrated onto a single chip.



■ Recommended Operating Conditions

(Ta=25°C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Operating supply voltage 1	V_{CC}	4.75	5	5.25	V
Operating supply voltage 2	V_S	2.2	2.3	2.4	V

■ Electro-optical Characteristics 1

(Ta=25°C, V_{CC}=5V, V_S=2.3V, R_L=10kΩ [V_{RF} : Open], C_L=5pF)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Application
Supply current	I_{CC}	–	8.8	17.8	25	mA	Vcc
Output off-set voltage 1	V_{od1}	Specified by voltage difference from Vs	–25	0	+25	mV	V_A to V_D
Output off-set voltage 2	V_{od2}	Specified by voltage difference from Vs	–15	0	+15	mV	V_{EF1} to V_{EF4}
Output off-set voltage 3	V_{od3}	GND reference	1.25	1.4	1.55	V	V_{RF}
Extremes of off-set voltage	ΔV_{od}	A–B	–20	0	+20	mV	V_A, V_B
		C–D	–20	0	+20		V_C, V_D
		(A+C)–(B+D)	–20	0	+20		V_A to V_D
		(A+D)–(B+C)	–20	0	+20		V_A to V_D
		(A+B)–(C+D)	–20	0	+20		V_A to V_D
		(EF1+EF3)–(EF2+EF4)	–15	0	+15		V_{EF1} to V_{EF4}
		(EF1+EF4)–(EF2+EF3)	–15	0	+15		V_{EF1} to V_{EF4}
		(EF1+EF2)–(EF3+EF4)	–15	0	+15		V_{EF1} to V_{EF4}
		A+B+C+D	–100	0	+100		V_A to V_D
High level output voltage 1	V_{OH1}	–	3.8	–	–	V	V_A to V_D
High level output voltage 2	V_{OH2}	–	3.8	–	–	V	V_{RF}
Output noise level 1	V_{n1}	f=54MHz, BW=30kHz	–	–80	–72	dBm	V_A to V_D
Output noise level 2	V_{n2}	f=54MHz, BW=30kHz	–	–70	–62	dBm	V_{RF}

■ Electro-optical Characteristics 2

Input light source wavelength λp=650nm

(Ta=25°C, V_{CC}=5V, V_S=2.3V, R_L=10kΩ [V_{RF} : Open], C_L=5pF)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Application
*3*4 Sensitivity 1	R_{p1}	–	14	20	27.5	mV/μW	V_A to V_D
*3*4 Sensitivity 2	R_{p2}	–	23.8	34	46	mV/μW	V_{EF1} to V_{EF4}
*3*4 Sensitivity 3	R_{p3}	–	17.4	24.8	34	mV/μW	V_{RF}
*5 Extreme of sensitivity 1	ΔR_1	–	–	–	10	%	–
Sensitivity ratio 1	R_{p2}/R_{p1}	–	1.52	1.7	1.88	–	–
Sensitivity ratio 2	R_{p3}/R_{p1}	–	0.95	1.24	1.55	–	–
*4*6*7 Response frequency 1	f_{c1}	–3dB	60	85	–	MHz	V_A to V_D
*4*6*8 Response frequency 2	f_{c2}	–3dB	60	85	–	MHz	V_{RF}
*4*6*7 Response frequency 3	f_{c3}	–3dB	2	4	–	MHz	V_{EF1} to V_{EF4}
*4*7 Sensitivity response 1	ΔR_{p1}	f=1 to 54MHz	–3	+2	+5	dB	V_A to V_D
*4*7 Sensitivity response 2	ΔR_{p2}	f=1 to 54MHz	–3	+2	+5	dB	V_{RF}
*4*7 Peaking rate 1	ΔR_{p3}	1MHz standard	–	–	+4.5	dB	V_A to V_D
*4*7 Peaking rate 2	ΔR_{p4}	1MHz standard	–	–	+4.5	dB	V_{RF}
*4*7 Group delay deviation 1	t_{gd1}	f=1 to 54.1MHz, Average of V_A to V_D	–	2	5	ns	V_A to V_D
*4*7 Group delay deviation 2	t_{gd2}	f=1 to 54MHz	–	2	5	ns	V_{RF}

■ Electro-optical Characteristics 3

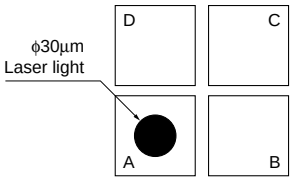
Input light source wavelength λp=780nm (Ta=25°C, V_{CC}=5V, V_S=2.3V, R_L=10kΩ [V_{RF} : Open], C_L=5pF)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Application
*3*4 Sensitivity 4	R_{p4}	–	18	24.6	31.2	mV/μW	V_A to V_D
*3*4 Sensitivity 5	R_{p5}	–	28	41.8	54.3	mV/μW	V_{EF1} to V_{EF4}
*3*4 Sensitivity 6	R_{p6}	–	21.3	30.5	39.7	mV/μW	V_{RF}
*5 Extreme of sensitivity 2	ΔR_2	–	–	–	10	%	–
Sensitivity ratio 3	R_{p5}/R_{p4}	–	1.52	1.7	1.88	–	–
Sensitivity ratio 4	R_{p6}/R_{p4}	–	0.95	1.24	1.55	–	–
*4*6*7Response frequency 4	f_{c4}	–3dB	50	70	–	MHz	V_A to V_D
*4*6*8Response frequency 5	f_{c5}	–3dB	50	70	–	MHz	V_{RF}
*4*6*7Response frequency 6	f_{c6}	–3dB	2	4	–	MHz	V_{EF1} to V_{EF4}
*4*7 Sensitivity response 3	ΔR_{p5}	f=1 to 54MHz	–3	+1	+3	dB	V_A to V_D
*4*7 Sensitivity response 4	ΔR_{p6}	f=1 to 54MHz	–3	+1	+3	dB	V_{RF}
*4*7 Peaking rate 3	ΔR_{p7}	1MHz standard	–	–	+3.5	dB	V_A to V_D
*4*7 Peaking rate 4	ΔR_{p8}	1MHz standard	–	–	+3.5	dB	V_{RF}
*4*7 Group delay deviation 3	t_{gd3}	f=1 to 54MHz, Average of V_A to V_D	–	0.5	4	ns	V_A to V_D
*4*7 Group delay deviation 4	t_{gd4}	f=1 to 54MHz	–	0.5	4	ns	V_{RF}

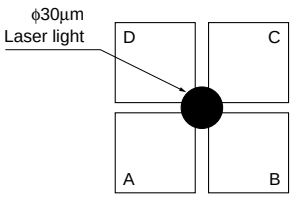
*3 5μW, ϕ30μm of DC light is applied to the center of each photodiode.
Under that condition, sensitivity R_p is shown by following formula.
$R_p=(V_p-V_{od})$ / 5μW
*4 Light source : laser diode of λ=650nm or 780nm.
*5 Extreme of sensitivity is shown by following formula.
$2\times(R_{p1}max.-R_{p1}min.)/(R_{p1}max.+R_{p1}min.)\times100$
$2\times(R_{p2}max.-R_{p2}min.)/(R_{p2}max.+R_{p2}min.)\times100$
$2\times(R_{p4}max.-R_{p4}min.)/(R_{p4}max.+R_{p4}min.)\times100$
$2\times(R_{p5}max.-R_{p5}min.)/(R_{p5}max.+R_{p5}min.)\times100$
*6 Frequency sensitivity is –3dB. (reference sensitivity : value at f=1MHz)
*7 Refer to Fig.1
*8 Refer to Fig.1

Fig.1 Response Frequency

*7 In addition to 10μW, ϕ30μm DC light, 4μW peak-to-peak AC light is applied to the center of each photodiode. BW=10kHz



*8 In addition to 10μW, ϕ30μm DC light, 4μW peak-to-peak of AC light is applied to the center of the divided portion of photodiode A, B, C and D. BW=10kHz



Application : fc2 and fc5 (V_{RF})

Fig.2 Block Diagram

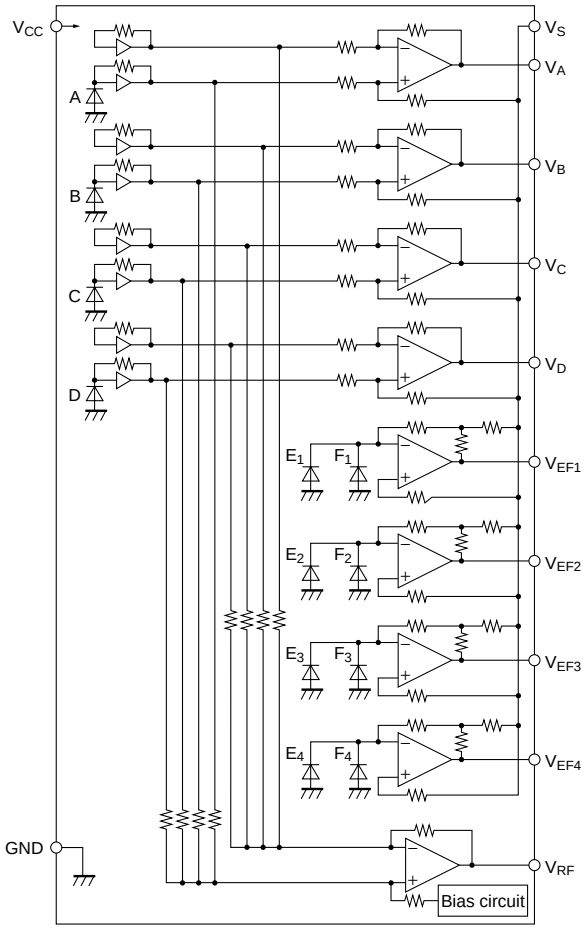


Fig.3 Detecting Pattern of Photodiode

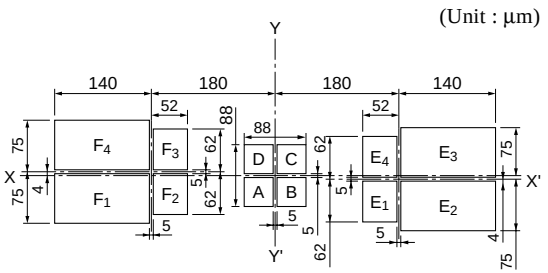


Fig.4 Supply Current vs. Ambient Temperature

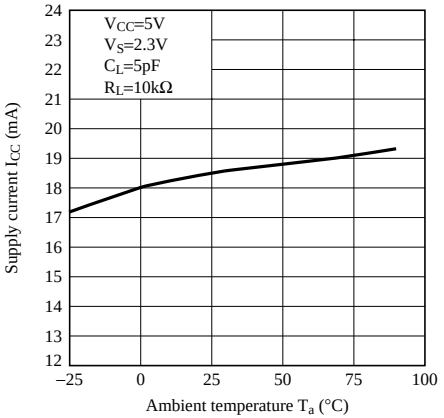


Fig.5 Output Offset Voltage vs. Ambient Temperature (A to D)

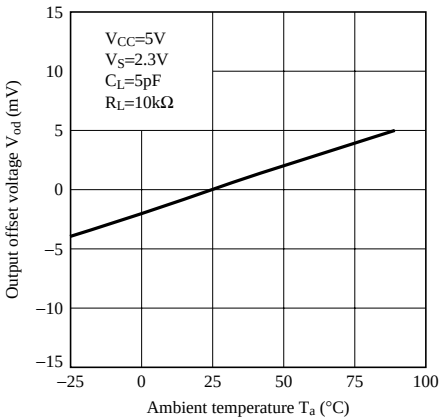


Fig.6 Output Offset Voltage vs. Ambient Temperature (EF1 to EF4)

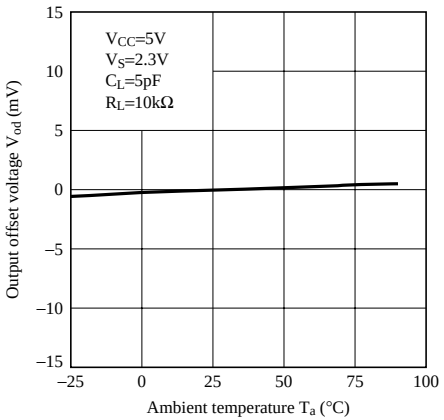


Fig.7 Output Offset Voltage vs. Ambient Temperature (RF)

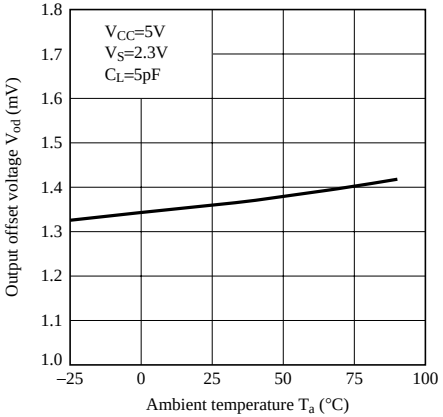


Fig.8 Response Frequency vs. Ambient Temperature (A to D)

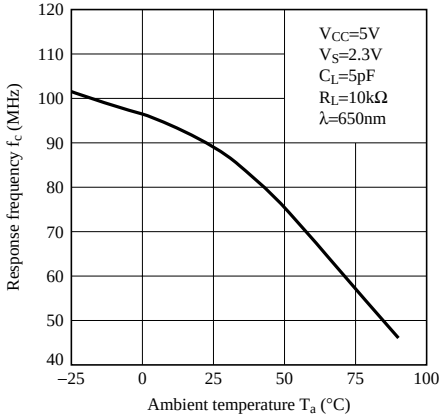


Fig.9 Response Frequency vs. Ambient Temperature (A to D)

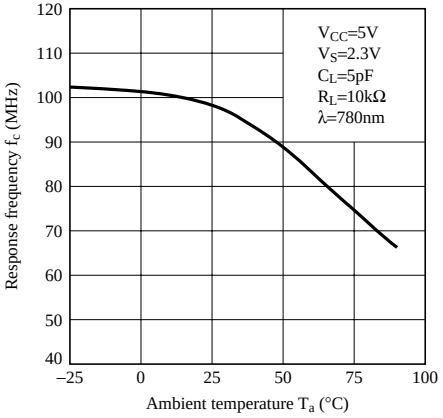


Fig.10 Response Frequency vs. Ambient Temperature (RF)

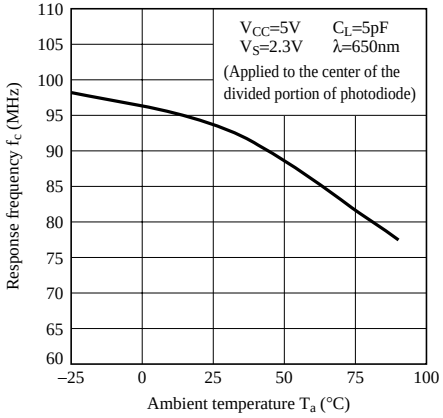


Fig.11 Response Frequency vs. Ambient Temperature (RF)

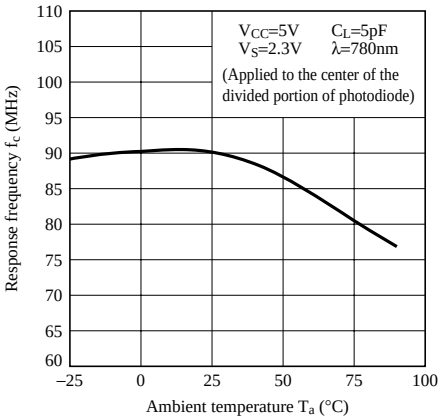


Fig.12 Sensitivity vs. Ambient Temperature (A to D)

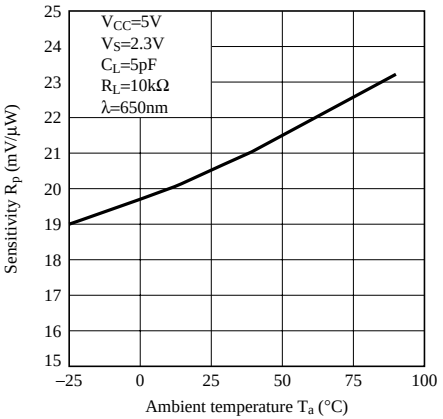


Fig.13 Sensitivity vs. Ambient Temperature (A to D)

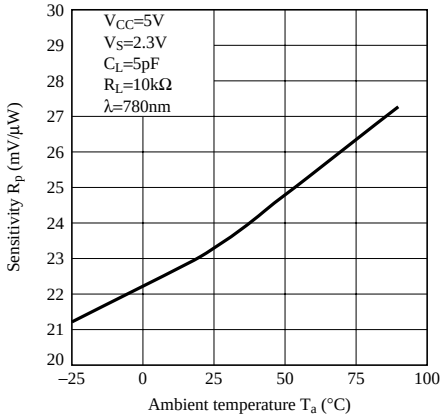


Fig.14 Sensitivity vs. Ambient Temperature (RF)

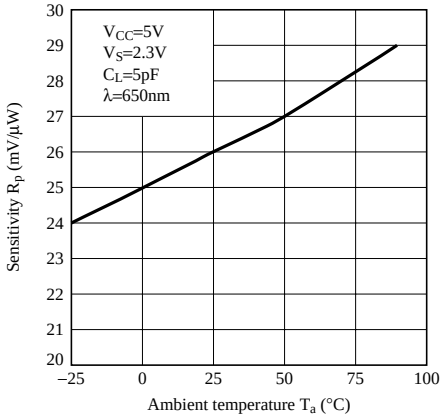


Fig.15 Sensitivity vs. Ambient Temperature (RF)

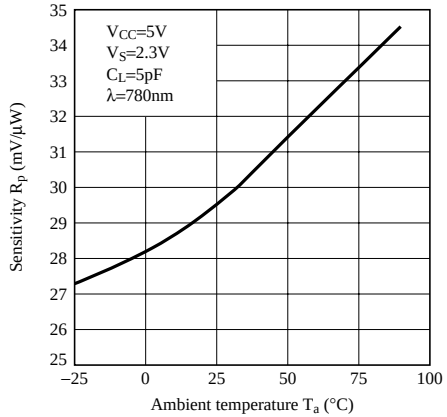


Fig.16 Sensitivity vs. Ambient Temperature (EF1 to EF4)

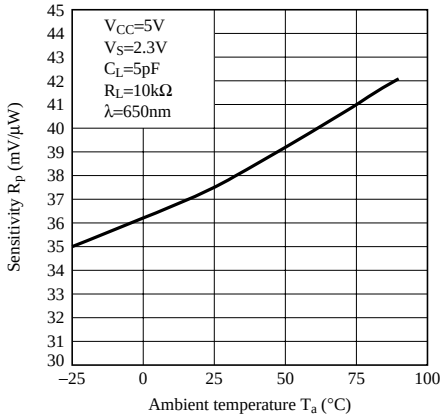
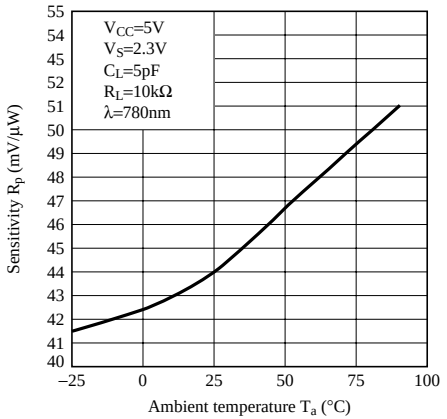


Fig.17 Sensitivity vs. Ambient Temperature (EF1 to EF4)



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— Industrial control
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— Consumer electronics

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— Various safety devices, etc.

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