IS1623

OPIC Light Detector for Playback/Recording MD player

■ Features

1. OPIC light detector for RF signal detection
   (Integrates 6-division PIN photodiode and amplifier IC onto a single chip)
2. Low operating voltage design (Operating voltage : 2.7 to 5.5V)
3. Sensitivity switching between playback mode and recording mode
4. Compact and thin transparent package
   (Package dimensions : 3.06 x 4.5 x 1.06 mm)

■ Applications

1. Optical pickup for playback/recording MD players

■ Absolute Maximum Ratings

(Ta=25°C)

Parameter	Symbol	Rating	Unit
Supply voltage	V_{CC}	−0.5 to +6.0	V
Mode switching terminal voltage	V_M	−0.5 to V_{CC}	V
*1 Output voltage	V_O	−0.5 to V_{CC}	V
*2 Power dissipation	P	150	mW
Operating temperature	T_{opr}	−20 to +70	°C
Storage temperature	T_{stg}	−40 to +85	°C
*3 Soldering temperature	T_{sol}	+260	°C

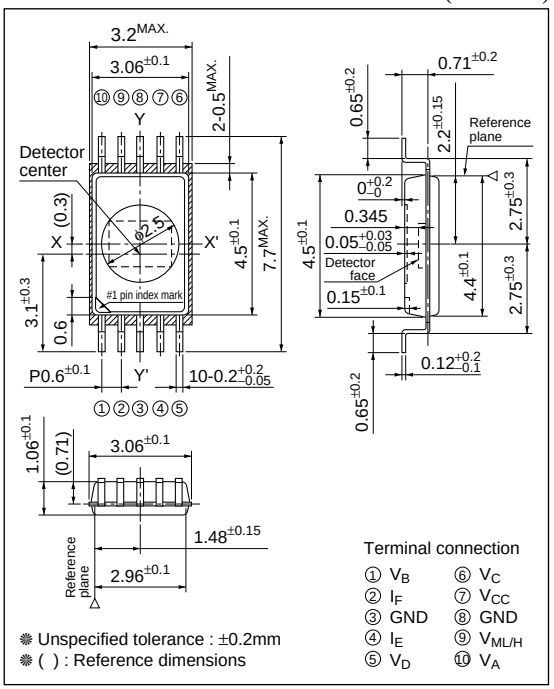
*1 Applies to individual terminals of V_A, V_B, V_C, V_D, I_E and I_F.

*2 To decrease at the rate of 2mW/°C at Ta >= 25°C

*3 For MAX. 3 seconds in the soldering area

■ 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 signal chip.

■ Recommended Operating Conditions (Vcc=3.0V, Ta=−10°C+65˚C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{cc1}	2.7	3.0	5.5	V
*4 "H" gain mode incident light quantity range 1	ϕH1	1.58	6.84	22.9	μW
*5 "H" gain mode incident light quantity range 2	ϕH2	1.1	2.77	5.93	μW
*4 "L" gain mode incident light quantity range 1	ϕL1	6.99	28.8	78.3	μW
*5 "L" gain mode incident light quantity range 2	ϕL2	5.07	12.3	21.3	μW
*4 "L" gain mode incident light quantity range 3	ϕL3	11.1	54.9	196	μW
*5 "L" gain mode incident light quantity range 4	ϕL4	7.19	18.3	47.8	μW

*4 The incident light quantity range applies to individual photodiodes of A, B, C and D and is specified in the incident light quantity per single photodiode.
*5 The incident light quantity range applies to individual photodiodes of E and F and is specified in the incident light quantity per single photodiode.

■ Electro-optical Characteristics (Current flowing into the device : +, Current flowing out of the device : −) (Ta=25°C, Vcc=3.0V)

	Parameter	Symbol	*8 Conditions	MIN.	TYP.	MAX.	Unit	Application
"H" gain mode	Supply current	I_{CCH}	−	1.9	4.2	7.6	mA	Vcc
	Dark output voltage	V_{odH}	−	0.5	0.68	0.9	V	V_A, V_B, V_C, V_D
	Dark output differential voltage	V_{odHS}	−	−25	0	25	mV	V_A, V_B, V_C, V_D
	*6 *7 Sensitivity	R_{pH}	−	13.0	22.5	34.0	mV/μW	V_A, V_B, V_C, V_D
	Sensitivity temperature coefficient	R_{pHt}	Ta=−20 to +70°C	−	+4000	−	ppm/°C	V_A, V_B, V_C, V_D
	*6 Response frequency	f_{CH}	−3dB	3.0	5.3	−	MHz	V_A, V_B, V_C, V_D
	*6 Output noise level 1	V_{nH1}	f=22kHz, BW=1kHz	−	−100	−90	dBm	V_A, V_B, V_C, V_D
	*6 Output noise level 2	V_{nH2}	f=720kHz, BW=10kHz	−	−90	−80	dBm	V_A, V_B, V_C, V_D
"L" gain mode	Supply current	I_{CCL}	−	2.1	4.6	8.3	mA	Vcc
	Dark output voltage	V_{odL}	−	0.5	0.68	0.9	V	V_A, V_B, V_C, V_D
	Dark output differential voltage	V_{odLS}	−	−25	0	25	mV	V_A, V_B, V_C, V_D
	*6 *7 Sensitivity	R_{pL}	−	1.3	2.8	4.9	mV/μW	V_A, V_B, V_C, V_D
	Sensitivity temperature coefficient	R_{pLt}	Ta=−20 to +70°C	−	+4000	−	ppm/°C	V_A, V_B, V_C, V_D
	*6 Response frequency	f_{CL}	−3dB	1.8	3.8	−	MHz	V_A, V_B, V_C, V_D
	*6 Output noise level 1	V_{nL1}	f=22kHz, BW=1kHz	−	−100	−90	dBm	V_A, V_B, V_C, V_D
	*6 Output noise level 2	V_{nL2}	f=720kHz, BW=10kHz	−	−90	−80	dBm	V_A, V_B, V_C, V_D
Common to both modes	Sensitivity	R_{pE}, R_{pF}	−	0.32	0.45	0.57	μA/μW	I_E, I_F
	Output current	I_O	−	100	250	380	μA	V_A, V_B, V_C, V_D
	*6 Dark current	I_{dE}, I_{dF}	−	−	−	10	nA	I_E, I_F
	*6 Terminal capacitance	C_{AK}	−	−	(20)	−	pF	I_E, I_F
	*6 Mode switching terminal voltage 1	V_{ML}	−	Vcc−0.5	−	Vcc	V	V_M
	Mode switching terminal voltage 2	V_{MH}	−	0	−	0.4	V	V_M
	Mode switching terminal current 1	I_{ML}	−	−	−	230	μA	V_M
	Mode switching terminal current 2	I_{MH}	−	−	−	−5	μA	V_M
Mode switching characteristics	*6 Sensitivity response	R_{pLH}	∗9	11.7	22.5	35.7	mV/μW	V_A, V_B, V_C, V_D
	*6 Sensitivity response	R_{pHL}	∗9	1.2	2.2	3.8	mV/μW	V_A, V_B, V_C, V_D

*6 Specified by sampling test.
*7 6μW, ϕ50μm of DC light is applied to the center of each photodiode.
Under that condition, sensitivity R_P is shown by following formula.
$R_P=(V_P-V_{od})/6\mu W$
V_P : Output voltage when DC light is applied.
V_{od} : Output voltage when DC light is not applied.
*8 "H"gain mode : V_M=0V.
"L"gain mode : $V_M=V_{CC}$.
*9 Sensitivity response characteristics after switcing mode is specified in the sensitivity in 200μs after change of the mode switcing voltage.
$R_P=(V_P-V_{od})/20\mu W$

Fig.1 Response Time

"H" gain mode → "L" gain mode switching time

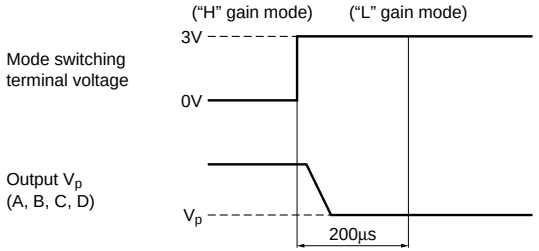


Fig.2 Response Time

"L" gain mode → "H" gain mode switching time

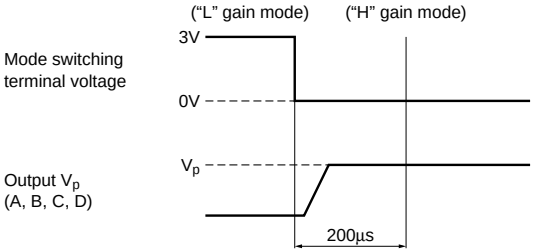


Fig.3 Detecting Pattern of Photodiode

(Unit : µm)

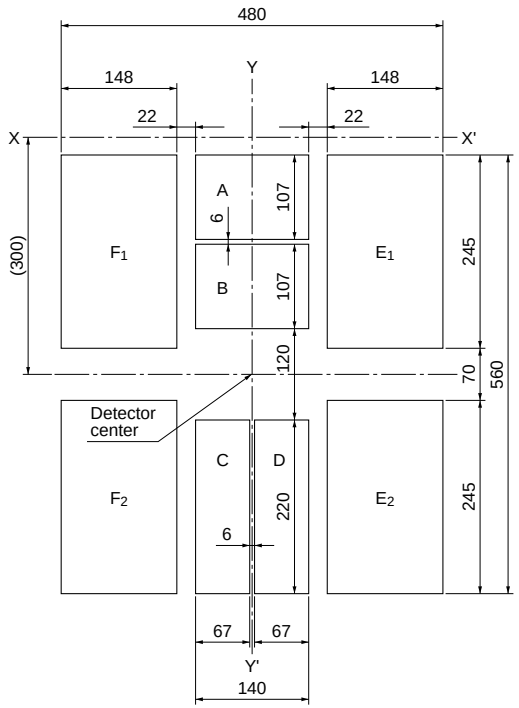
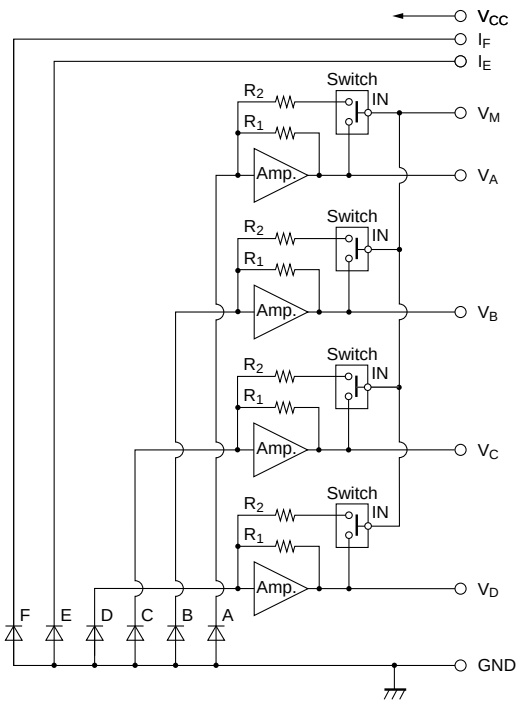


Fig.4 Block Diagram



The switching circuit operates according to H and L voltage of the V_M terminals.

Mode	V_M terminal voltage	SW state	Gain resistance
"H"gain mode	L	OFF	R1
"L"gain mode	H	ON	R1/R2

Fig.5 Supply Current vs. Ambient Temperature (H Gain Mode)

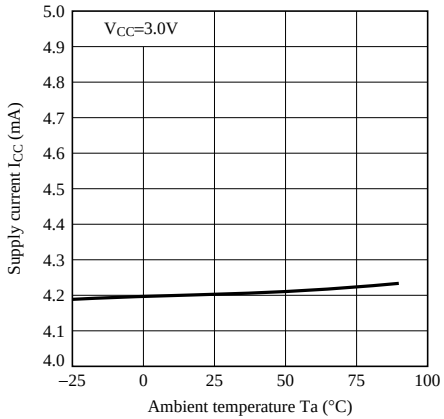


Fig.6 Supply Current vs. Ambient Temperature (L Gain Mode)

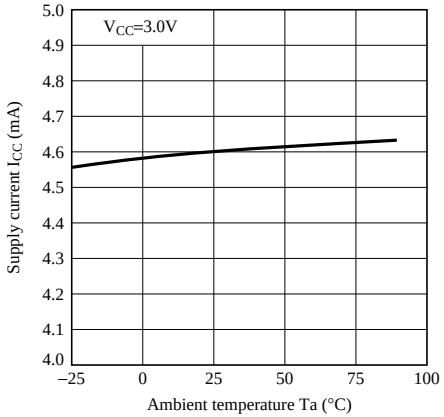


Fig.7 Dark Output Voltage vs. Ambient Temperature (H/L Gain Mode)

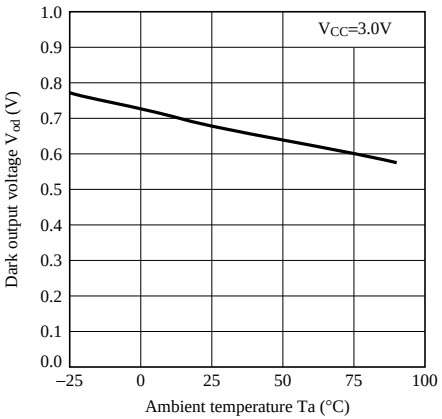


Fig.8 Response Frequency vs. Ambient Temperature (H Gain Mode)

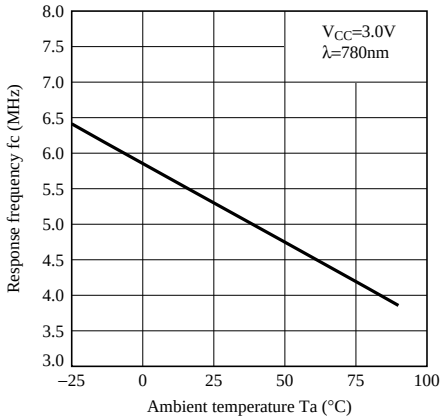


Fig.9 Response Frequency vs. Ambient Temperature (L Gain Mode)

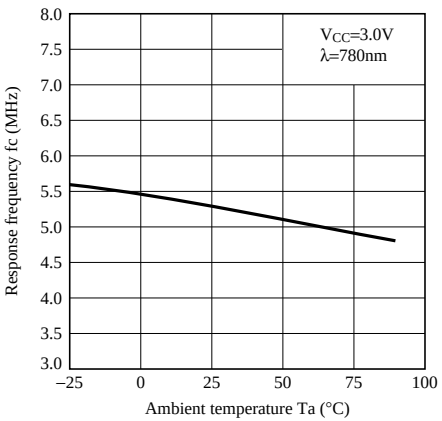


Fig.10 Sensitivity vs. Ambient Temperature (H Gain Mode)

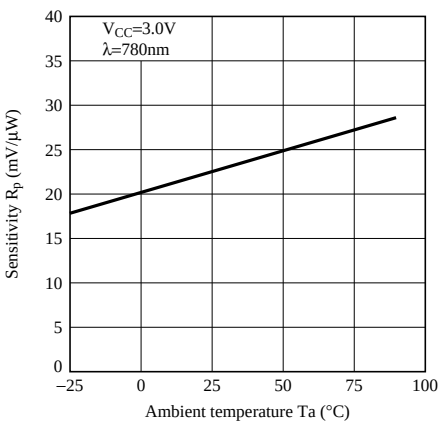
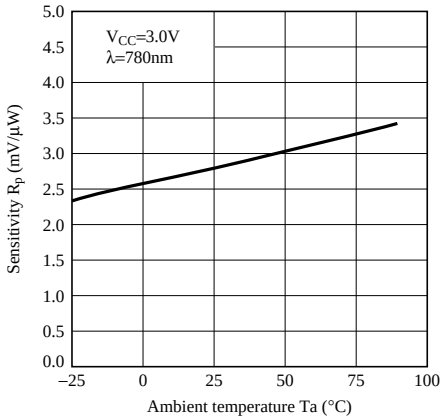


Fig.11 Sensitivity vs. Ambient Temperature (L Gain Mode)



NOTICE

- The circuit application examples in this publication are provided to explain representative applications of SHARP devices and are not intended to guarantee any circuit design or license any intellectual property rights. SHARP takes no responsibility for any problems related to any intellectual property right of a third party resulting from the use of SHARP's devices.
- Contact SHARP in order to obtain the latest device specification sheets before using any SHARP device. SHARP reserves the right to make changes in the specifications, characteristics, data, materials, structure, and other contents described herein at any time without notice in order to improve design or reliability. Manufacturing locations are also subject to change without notice.
- Observe the following points when using any devices in this publication. SHARP takes no responsibility for damage caused by improper use of the devices which does not meet the conditions and absolute maximum ratings to be used specified in the relevant specification sheet nor meet the following conditions:

(i) The devices in this publication are designed for use in general electronic equipment designs such as:
— Personal computers
— Office automation equipment
— Telecommunication equipment [terminal]
— Test and measurement equipment
— Industrial control
— Audio visual equipment
— Consumer electronics

(ii) Measures such as fail-safe function and redundant design should be taken to ensure reliability and safety when SHARP devices are used for or in connection with equipment that requires higher reliability such as:
— Transportation control and safety equipment (i.e., aircraft, trains, automobiles, etc.)
— Traffic signals
— Gas leakage sensor breakers
— Alarm equipment
— Various safety devices, etc.

(iii) SHARP devices shall not be used for or in connection with equipment that requires an extremely high level of reliability and safety such as:
— Space applications
— Telecommunication equipment [trunk lines]
— Nuclear power control equipment
— Medical and other life support equipment (e.g., scuba).

- Contact a SHARP representative in advance when intending to use SHARP devices for any "specific" applications other than those recommended by SHARP or when it is unclear which category mentioned above controls the intended use.
- If the SHARP devices listed in this publication fall within the scope of strategic products described in the Foreign Exchange and Foreign Trade Control Law of Japan, it is necessary to obtain approval to export such SHARP devices.
-
- Contact and consult with a SHARP representative if there are any questions about the contents of this publication.