IS1682E

OPIC Light Detector for X40 Speed CD-ROM Drive / CD-RW Drive

■ Features

1. High speed response (Response frequency : MIN. 55MHz)
   (Best suited for optical pick-up in X40 speed CD-ROM drive)
2. With built-in RF amplifier
   (Integrates 6-division PIN photodiode and amplifier circuit onto a single chip)
3. Compact and thin package
   (Dimensions : 5.0x4.0x1.5mm)
4. Possible to supply custom-made detecting patterns

■ Applications

1. CD-ROM drives (to X40 speed)
2. CD-ROM drives for CD-RW

■ Absolute Maximum Ratings

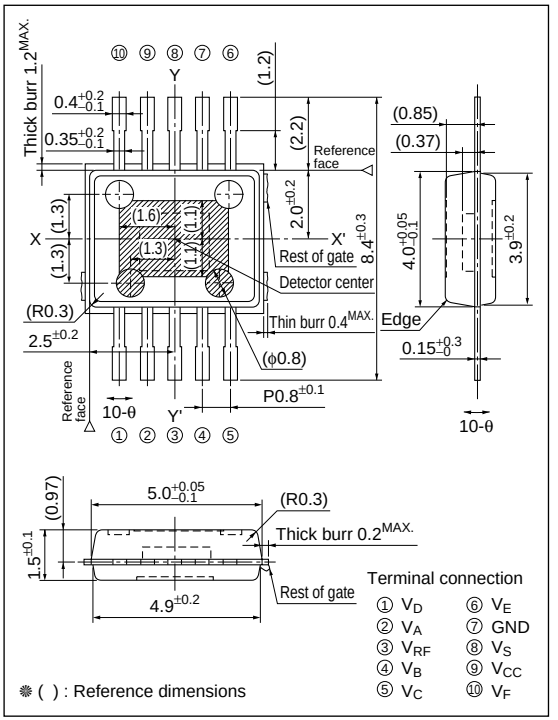
(Ta=25˚C)

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

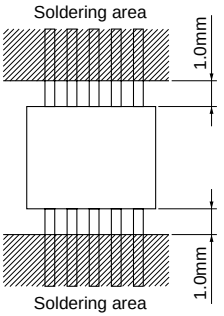
*1 Applies to individual terminals of V_A, V_B, V_C, V_D, V_E, V_F, V_{RF} .
*2 For MAX. 3s at the position of 1.0mm from the resin edge.

■ 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 signal chip.



■ Recommended Operating Conditions (Ta=25˚C)

Parameter	Symbol	MIN	TYP	MAX	Unit
Supply voltage	Vcc	4.5	5.0	5.25	V
Recommended supply voltage	Vcc	4.75	5.0	5.25	V
Operating supply voltage 1	Vs	2.0	2.1	2.2	V
Operating supply voltage 2	Vs	2.4	2.5	2.6	V

■ Electro-optical Characteristics 1-1

(Ta=25°C, Vcc=5V, V_S=2.1V, R_L=10kΩ (V_{RF} : Open), C_L=10pF)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Application
Supply current	I_{CC}		8.8	14.8	20	mA	Vcc
Output off-set voltage 1	$V_{od}1$	Specified by voltage difference from Vs	−25	0	+25	mV	V_A to V_D
Output off-set voltage 2	$V_{od}2$	Specified by voltage difference from Vs	−15	0	+15	mV	V_E, V_F
Output off-set voltage 3	$V_{od}3$	GND Standard	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
		E−F	−15	0	+15		V_E, V_F
		A+B+C+D	−40	+5	+50		V_A to V_D

■ Electro-optical Characteristics 1-2

(Ta=25°C, Vcc=5V, V_S=2.5V, R_L=10kΩ (V_{RF} : Open), C_L=10pF)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Application
Output off-set voltage 4	V_{od4}	Specified by voltage difference from Vs	−25	+2	+28	mV	V_A to V_D
Output off-set voltage 5	V_{od5}	Specified by voltage difference from Vs	−16	0	+16	mV	V_E, V_F
Output off-set voltage 6	V_{od6}	GND Standard	1.25	1.4	1.55	V	V_{RF}
Extremes of off-set voltage	ΔV_{od}	(A+C)−(B+D)	−22	0	+22	mV	V_A to V_D
		E−F	−15	0	+15		V_E, V_F
		A+B+C+D	−40	+13	+62		V_A to V_D

■ Electro-optical Characteristics 2

(Ta=25°C, Vcc=5V, Vs=2.1V, RL=10kΩ (VRF : Open), CL=10pF)

	Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit	Application
*3*4	Sensitivity 1	R_{p1}	–	18.0	24.6	31.2	mV/μW	V_A to V_D
*3*4	Sensitivity 2	R_{p2}	–	31.2	44.7	58.1	mV/μW	V_E, V_F
*3*4	Sensitivity 3	R_{p3}	–	30.2	43.2	56.1	mV/μW	V_{RF}
*5	Extreme of sensitivity	ΔR_p	–	–	–	10	%	–
	Sensitivity ratio 1	R_{p2}/R_{p1}	–	–	1.81	–	–	–
	Sensitivity ratio 2	R_{p3}/R_{p1}	–	1.67	1.76	1.84	–	–
*4*6*7	Response frequency 1	f_{c1}	–3dB	50	70	–	MHz	V_A to V_D
*4*6*7	Response frequency 2	f_{c2}	–3dB	55	72	–	MHz	V_{RF}
*4*6*7	Response frequency 3	f_{c3}	–3dB	1	5	–	MHz	V_E, V_F
*4*6*7	Response frequency 4	f_{c4}	Average of V_A to V_D	50	70	–	MHz	V_A to V_D
*4	High level output voltage 1	V_{OH1}	–	3.8	–	–	V	V_A to V_D
*4	High level output voltage 2	V_{OH2}	–	3.8	–	–	V	V_{RF}
*4*7*9	Sensitivity response 1	ΔRp1	1MHz to 23.1MHz	–1.0	+1.0	+2.0	dB	V_A to V_D
*4*7*9	Sensitivity response 2	ΔRp2	1MHz to 23.1MHz	–1.0	+1.0	+2.0	dB	V_{RF}
*4*7*10	Peaking rate 1	ΔRp3	1MHz Standard	–	–	+3.0	dB	V_A to V_D
*4*7*10	Peaking rate 2	ΔRp4	1MHz Standard	–	–	+3.0	dB	V_{RF}
*4*7	Group delay deviation 1	tgd1	f=1 to 23.1MHz, Average of V_A to V_D	–	2.5	5.5	ns	V_A to V_D
*4*7	Group delay deviation 2	tgd2	f=1 to 23.1MHz	–	2.5	5.5	ns	V_{RF}
	Output noise level 1	V_{n1}	f=23.1MHz, BW=30kHz	–	–81	–76	dBm	V_A to V_D
	Output noise level 2	V_{n2}	f=23.1MHz, BW=30kHz	–	–70	–65	dBm	V_{RF}
	Extremes of off-set voltage	ΔV_{od}	A+B+C+D Ta=70°C	–60	+10	+100	mV	V_A to V_D
*8	Difference of output off-set voltage fluctuation temperature characteristics	$TC\Delta V_{od}$	(A+B)–(C+D) Ta=25°C to 70°C	–240	–30	+240	μV/°C	V_A to V_D
			E–F, Ta=25°C to 70°C	–150	+50	+150	μV/°C	V_E, V_F
*8	Output off-set voltage fluctuation temperature characteristics	TCV_{od}	GND reference, Ta=25°C to 70°C	–	+5	–	mV/°C	V_{RF}

*3 5μW, ϕ30μm of DC light is applied to the center of each photodiode.
Under that condition, sensitivity R is shown by following formula.
$R_p=(V_p-V_{od})/5\mu W$
V_p : Output voltage when DC light is applid.
V_{od} : Output voltage when DC light is not applied.

*4 Light source : laser diode of λ=780nm

*5 Extreme of sensitivity is shown by following formula.
2 x (R_{p1}max–R_{p1}min) / (R_{p1}max+R_{p1}min) x 100
2 x (R_{p2}max–R_{p2}min) / (R_{p2}max+R_{p2}min) x 100

*6 Frequency sensitivity is –3dB. (reference sensitivity : value at f=1MHz) and f_{C4} is shown by following formula.
$f_{C4}=(f_{CVA}+f_{CVB}+f_{CVC}+f_{CVD})$ /4

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

*8 Output off-set voltage deference temperature characteristics and
Output off-set voltage temperature characteristics shall be specified by following formula.
(ΔV_{od} (70˚C)–ΔV_{od} (25˚C)) / (70–25)
(V_{od} (70˚C)–V_{od} (25˚C)) / (70–25)

*9 When V_{CC} is changed from 5V to 4.5V, the increase of sensitivity response is MAX, 0.5Bb.

*10 When V_{CC} is changed from 5V to 4.5V, the increase of peaking rate is MAX, 1Bb.

Fig.1 Detecting Pattern of Photodiode

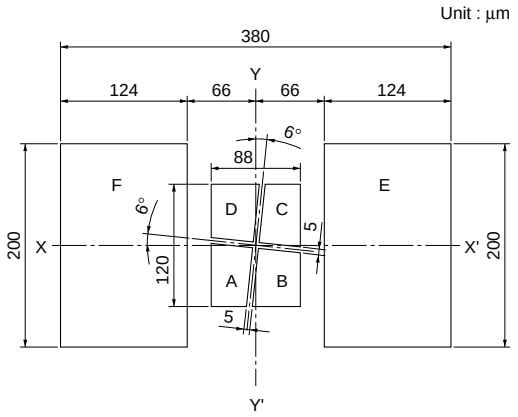


Fig.2 Block Diagram

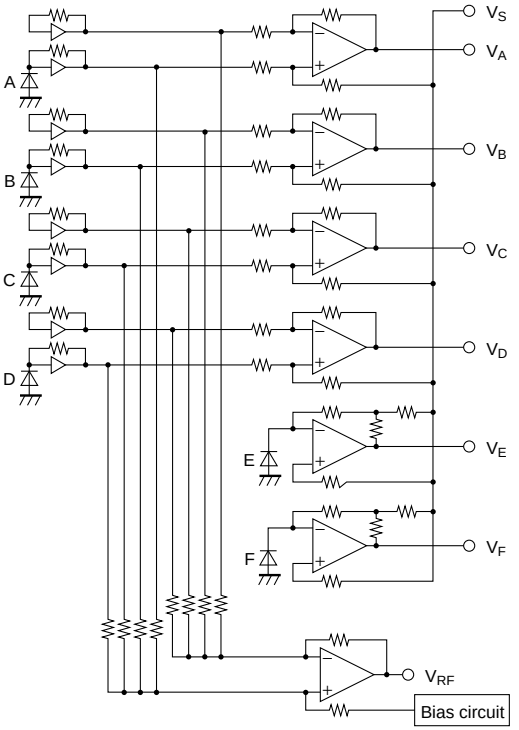


Fig.3 Supply Current vs. Ambient Temperature

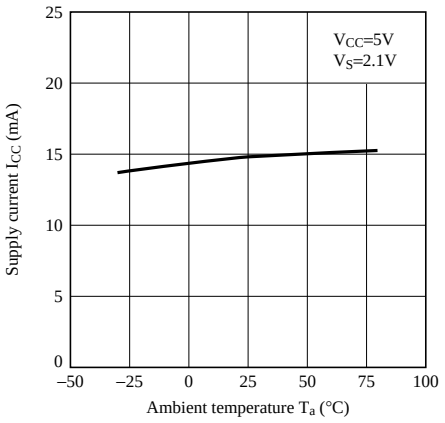


Fig.4 Output Offset Voltage vs. Ambient Temperature (V_A to V_D)

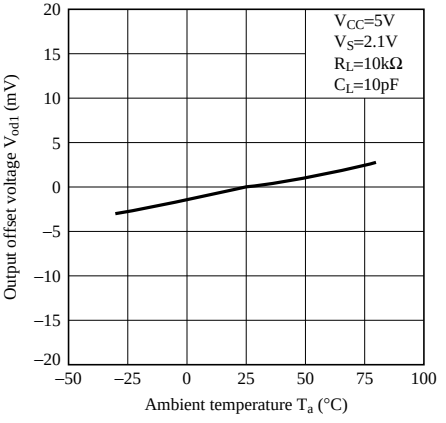


Fig.5 Output Offset Voltage vs. Ambient Temperature (V_E, V_F)

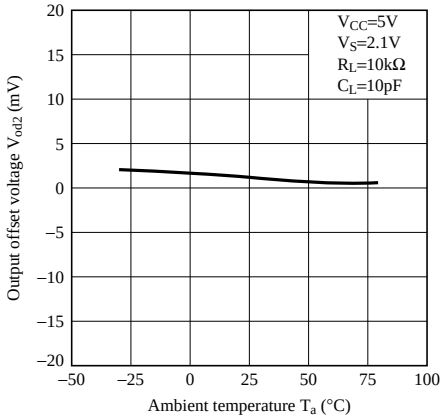


Fig.6 Output Offset Voltage vs. Ambient Temperature (V_{RF})

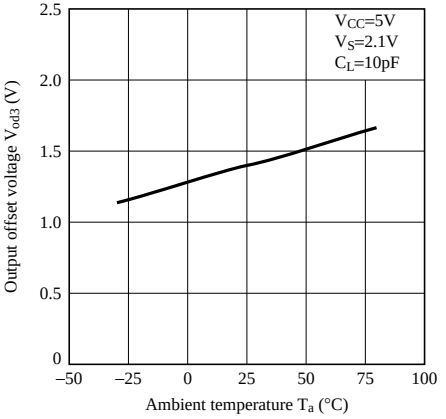


Fig.7 Response Frequency vs. Ambient Temperature (V_A to V_D)

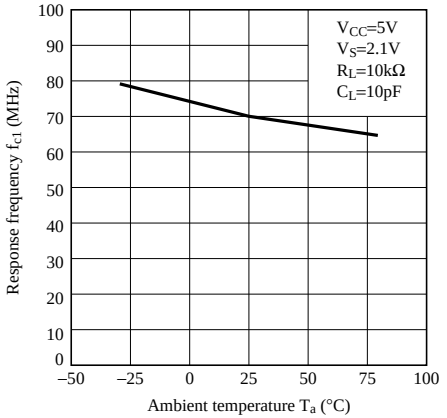


Fig.8 Response Frequency vs. Ambient Temperature (V_{RF})

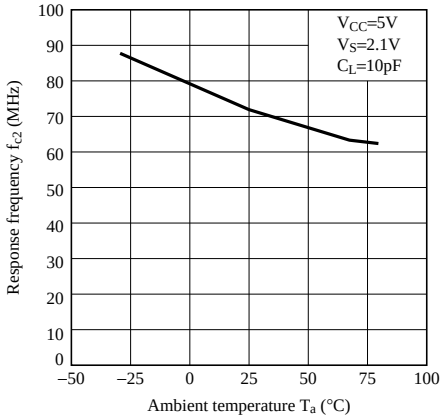


Fig.9 Sensitivity vs. Ambient Temperature (V_A to V_D)

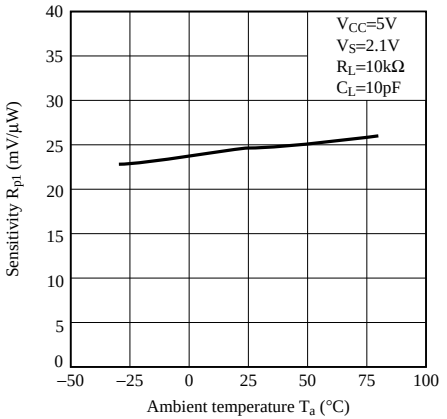


Fig.10 Sensitivity vs. Ambient Temperature (V_{RF})