GP2TD03/GP2TD04

Tilt Sensor for Optical Disk

■ Features

1. With built-in lens
2. Compact
3. Linear output current can be obtained in conformance with tilt angle.

■ Applications

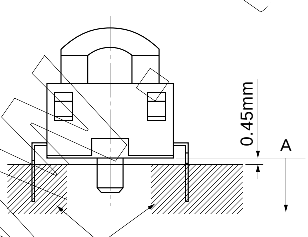
1. LD players
2. DVD players

■ Absolute Maximum Ratings

(Ta=25˚C)

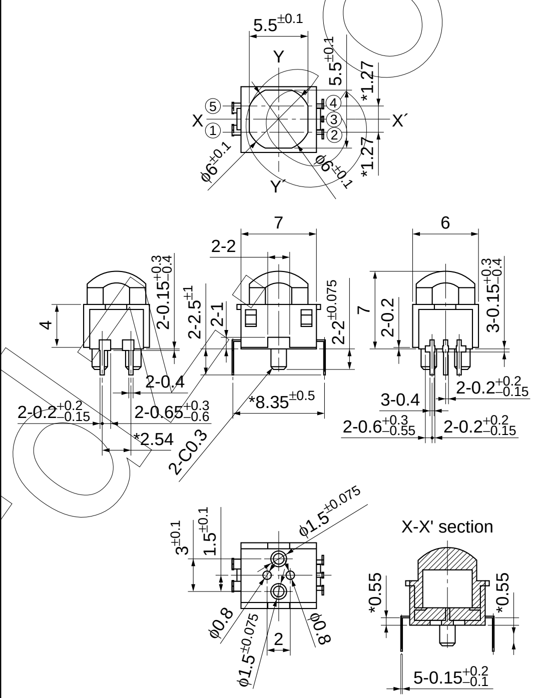
Parameter		Symbol	Rating	Unit
Input	Forward current	I_F	50	mA
	Reverse voltage	V_R	6	V
	Power dissipation	$P_{D (IN)}$	75	mW
Output	Reverse voltage	V_R	20	V
	Power dissipation	$P_{D(OUT)}$	75	mW
Operating temperature		T_{opr}	–10 to +70	˚C
Storage temperature		T_{stg}	–40 to +85	˚C
*1 Soldering temperature		T_{sol}	260	˚C

*1 For 5s below the tie bar cut part (0.45mm from the face A).



■ Outline Dimensions

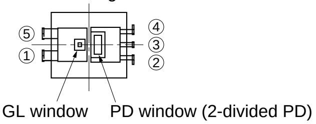
(Unit : mm)



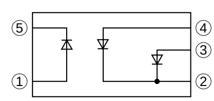
* Dimension shall be lead root portion

❅ Unspecified tolerance : ±0.2mm

Internal configuration

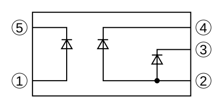


Internal connection diagram(**GP2TD03**)



① Anode (Light emitting diode)
② Cathode (Photodiode 1, 2)
③ Anode (Photodiode 1)
④ Anode (Photodiode 2)
⑤ Cathode (Light emitting diode)

Internal connection diagram (**GP2TD04**)



① Anode (Light emitting diode)
② Anode (Common)
③ Cathode (Photodiode 1)
④ Cathode (Photodiode 2)
⑤ Cathode (Light emitting diode)

■ Electro-optical Characteristics

(Ta=25˚C)

Parameter			Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Input (Emitter)	Forward voltage		V_F	I_F=17mA	–	1.25	1.5	V
	Reverse current		I_R	V_R=6V	–	–	10	μA
	Peak sensitivity wavelength		λp_1	–	–	950	–	nm
	Spectrum radiation bandwidth		$\Delta\lambda$	–	–	45	–	nm
Output (Detector)	*2 Dark current (Each PD)		Id	V_R=10V	–	–	100	nA
	Peak sensitivity wavelength	GP2TD03	λp_2	–	–	960	–	nm
		GP2TD04	λp_2	–	–	900	–	nm
	Response time	GP2TD03	t_r, t_f	*2 V_R=1V, R_L=1kΩ	–	50	–	ns
		GP2TD04	t_r, t_f	*2 V_R=1V, R_L=1kΩ	–	300	–	ns
	Short circuit current	GP2TD03	I_{SC}	*3 E_V=1 000 1x	–	4.2	–	μA
		GP2TD04	I_{SC}	*3 E_V=1 000 1x	–	3.5	–	μA
Coupling charac-teristics	*4 Difference output increment rate	GP2TD03	A/deg.	*4 V_{CC}=5V, H=10.0mm, θy=–0.5 to 0 to +0.5deg.	3.3	6.6	12.87	μA/deg.
		GP2TD04	A/deg.	*4 V_{CC}=5V, H=10.0mm, θy=–0.5 to 0 to +0.5deg.	3	6	11.7	μA/deg.
	*5 Angle range of tilt angle output 0		θo	*5 V_{CC}=5V, H=10mm	–2	–	+2	deg.
	*6 Monotonous increase range of tilt angle output		| θr |	*6 V_{CC}=5V, H=10mm	1.5	–	–	deg.
	*7 Non-invert range of tilt angle output		| θt |	*7 V_{CC}=5V, H=10mm	5.0	–	–	deg.
	*8 Leak		| A_{LEAK} |	*8 V_{CC}=5V	–	–	57	nA

*2 Measuring method of response time, refer to Fig.1
*3 E_V : Illuminance by CIE standard light source A (tungsten lamp).
*4 Difference output A stands for A=I_{SC} (PD1)–I_{SC} (PD2).
Difference output increment rate (A/deg.) shall be the current increase rate of A for 1deg.

$$\frac{[\{I_{SC}(PD1)-I_{SC}(PD2)\}\text{ at }(+0.5deg.)]+[\{I_{SC}(PD2)-I_{SC}(PD1)\}\text{ at }(-0.5deg.)]}{1}$$

*5 The subtraction output zero angle region shall be the range of the angle at which A is zero.
*6 The angle, θr, which monotonously increases when the angle at which A is zero is assumed to be zero.
*7 The subtraction output non-reversing region shall be the angle, θt, when the angle which A is zero is assumed to be zero.
*8 A_{LEAK} applies to the value of A measured without reflective object.
*9 The measurement of *4 to *8 shall be or test circuit in accordance with Fig.8 and Fig.9.
*10 Reflective objected used in test for coupling characteristics shall be multi-layer coating mirror (NIPPON SHINKU KOGAKU made mirror of reflectance of 95% min. at 950nm). The test circuit and the coordinate system shall be as shown in Fig.8 and Fig.9. It shall be assumed that there is no deviation in the directions X and Y.

Fig.1 Test Circuit for Response Time

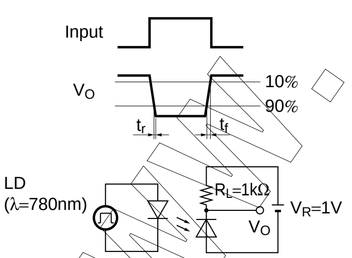


Fig.2 Subtraction Output

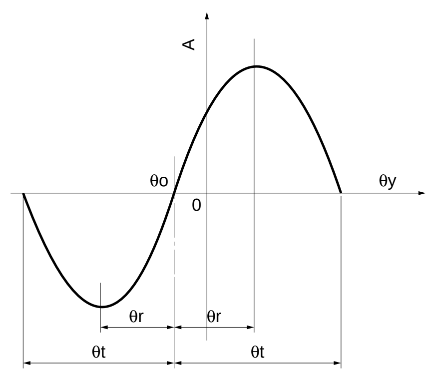


Fig.3 Forward Current vs. Ambient Temperature

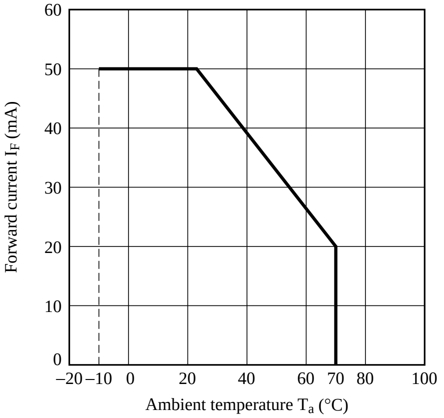


Fig.4 Output Power Dissipation vs. Ambient Temperature

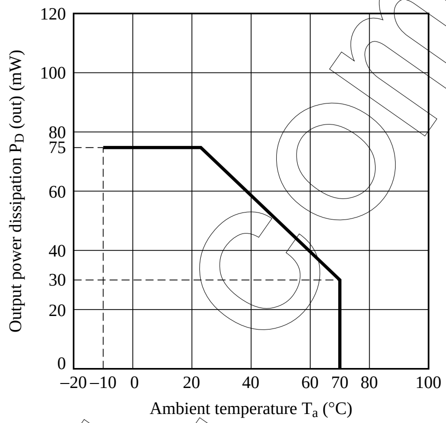


Fig.5 Difference Output vs. Angle (Y-Y' direction)

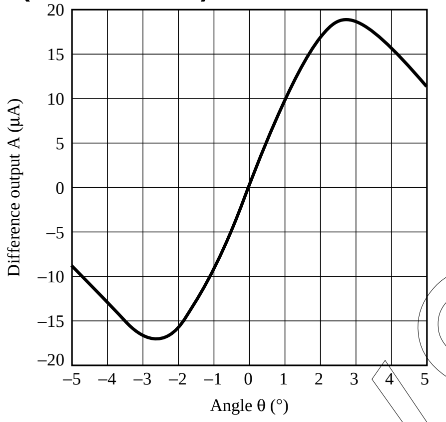


Fig.6 Additional Output vs. Angle (X-X' direction)

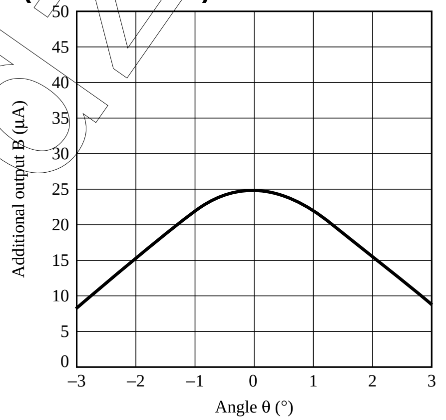


Fig.7 Short-circuit Current vs. Ambient Temperature

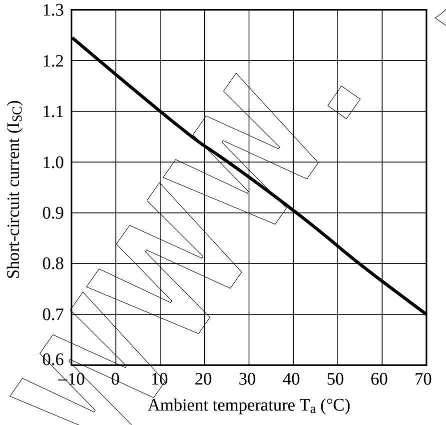
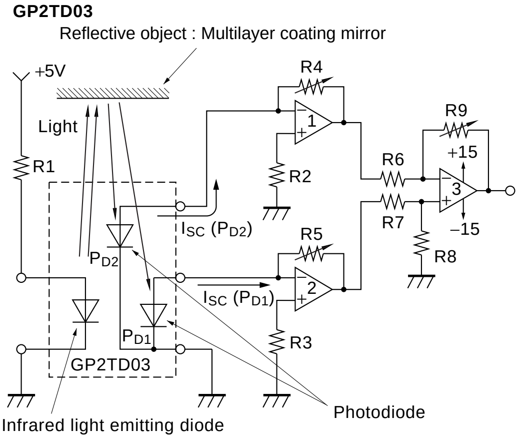
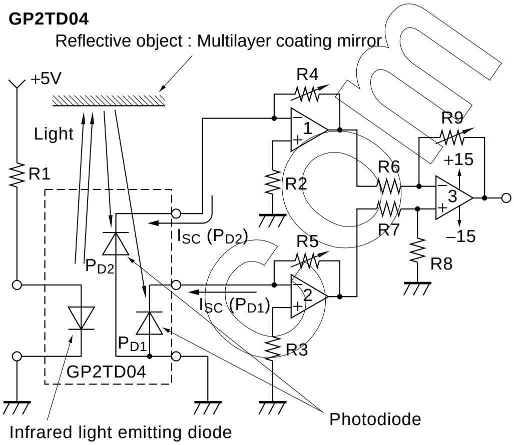


Fig.8 Example of Test Circuit

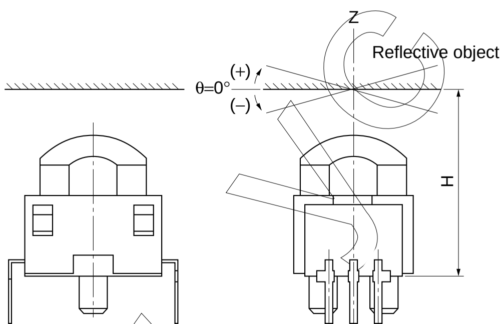


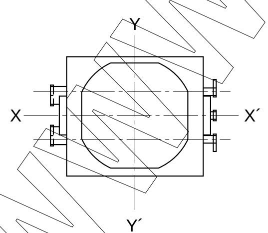


R1 : 220Ω
R2, R3, R6, R7, R8 : 10kΩ
R4, R5 : 220kΩ to 10MΩ (optional)
R9 : 10kΩ to 100kΩ (optional)
OPAMP : 1, 2, 3

Arrows indicate current directions
Above sample circuits are the model circuit, which amplitude and calculate the signals.
Output is determined by the constant of resistance.
Specifications above are calculated using output current.

Fig.9 Coordinate System





Definition of θ=0˚ : Surface parallel to the reference plane A of this reflection type photointerrupter defined by the equation Z=H (H=10mm) shall be taken as a θ=0˚ surface. The clockwise direction of rotation of a reflective object located at θ=0˚ around the X-axis shall be the θ(+) rotational direction. The counterclockwise direction of its rotation shall be the θ(–) rotational direction.

■ Precautions for Use

1. Cleaning
   Polycarbonate resin is used as the material of the lens surface. As to cleaning, this reflective type photointerrupter shall not be cleaned by cleaning materials absolutely. Dust and stain shall be cleaned by air blow, or shall be cleaned by soft cloth soaked in washing materials.
2. Reduction of light emitting diode output
   In circuit designing, make allowance for the degradation of the light emitting diode output that results from long continuous operation. (50% degradation / 5years)
3. Soldering
   To solder onto lead pins, solder at the position of 0.45mm or more from the package's bottom at 260˚C for 5s or less. Please don't bend lead pins from the root of package when soldering. And please take care not to let any external force exert on lead pins. Please don't do soldering with preheating, and please don't do soldering by reflow.
4. Positioning pin
   This reflection type photointerrupter is positioned in the directions X and Y of the coordinate system shown in Fig.9 by means of two ϕ1.5mm pins of 2-mm height.
   Do not heat stake the positioning pin because it affects the reliability of the internal element adversely. To fix the pin, use adhesives unlikely to erode this reflection type photointerrupter such as epoxy and silicone type adhesives.

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— Office automation equipment
— Telecommunication equipment [terminal]
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— Consumer electronics

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— Alarm equipment
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