

GP2TC2

■ Features

1. Adopted diffusive reflection and mirror reflection method
Color toner detection : diffusive reflection method
Black toner detection : mirror reflection method
2. Analog output according to amount of reflective light
(adhesive volume of toner)
3. 2 system output : adhesive volume of black toner
adhesive volume of color toner
4. Detection range of toner density
(Y, M, C : 0 to 1.0mg/cm²)
(K : 0 to 0.6mg/cm²)
5. High resolution (0.1mg/cm²)
6. Output can be adjusted by control of LED current

■ Applications

1. Full-color copiers
2. Color LBPs

■ Absolute Maximum Ratings

(Ta=25°C, Vcc=5V)

Parameter	Symbol	Rating	Unit
Operating voltage	V _{CC}	-0.3 to 7	V
LED current	I _F	50	mA
Output terminal voltage	V _O	-0.3 to V _{CC} +0.3	V
Operating temperature	T _{opr}	0 to +60	°C
Storage temperature	T _{stg}	-20 to +70	°C

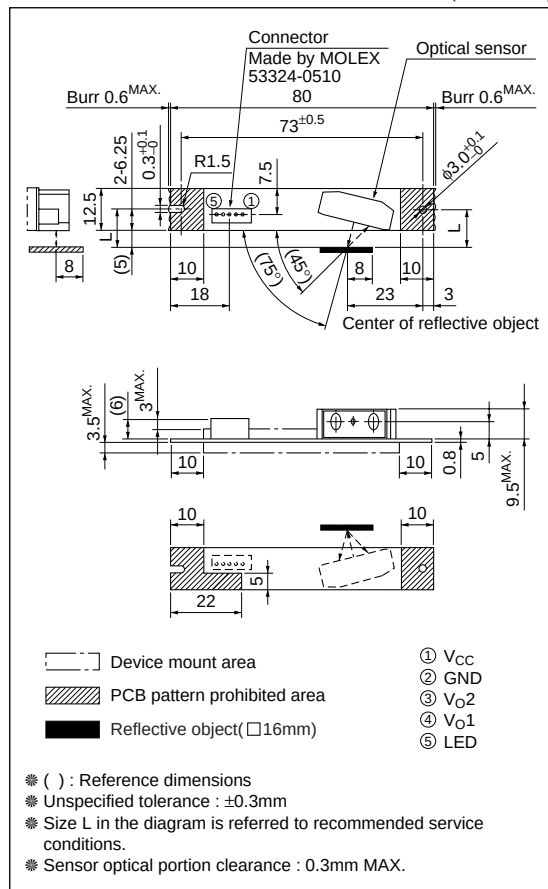
■ Recommend Operating Conditions

Parameter	Symbol	Rating	Unit
Supply voltage	V _{CC}	4.5 to 5.5	V
Detection distance range	L	11.0 to 11.5	mm

Color Toner Density (Adhesive Volume) Sensor by Diffusive/ Mirror Reflection Method

■ Outline Dimensions

(Unit : mm)



Electro-optical Characteristics

(Ta=25°C, V_{CC}=5V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	V _{O1A}	Reflective object A (V _{O1A} :I _{FM} =15mA, V _{O2A} :I _{FM} =20mA)	0.73	1.17	1.61	V
	V _{O2A}		2.12	2.81	3.50	V
	V _{O10}	LED current I _{FM} =0mA	0.2	0.6	1.0	V
	V _{O20}		0.1	0.7	1.3	V
Displacement of output voltage	ΔV _{O1BA}	Displacement of output voltage V _{O1} when reflective object is changed from A to B (I _{FM} =15mA)	1.56	1.74	1.92	V
	ΔV _{O2C0}	ΔV _{O2C0} =V _{O2C} -V _{O20} (V _{O2C} :Reflective object C, I _{FM} =20mA)	0.39	0.45	0.51	V
	ΔV _{O1A0}	V _{O1A} -V _{O10}	0.53	0.57	0.61	V
	ΔV _{O2A0}	V _{O2A} -V _{O20}	2.02	2.11	2.20	V
Displacement of output voltage	ΔV _{O12}	ΔV _{O12} =(ΔV _{O1BA} +ΔV _{O1A0}) / ΔV _{O1A0} ,	3.75	4.05	4.35	—
	ΔV _{O22}	ΔV _{O22} =ΔV _{O2C0} / ΔV _{O2A0}	0.19	0.21	0.23	—
Rise time	t _r	Reflective object C (Munsell N2 no gloss(Reflectivity 3.1%)) (V _{O1A} : I _{FM} =15mA, V _{O2A} : I _{FM} =20mA)	—	70	300	μs
Fall time	t _f		—	70	300	μs
Consumption current	I _{CC}	Consumption current at LED current I _{FM} =0mA	—	4	12	mA

Fig.1 Internal Block Diagram

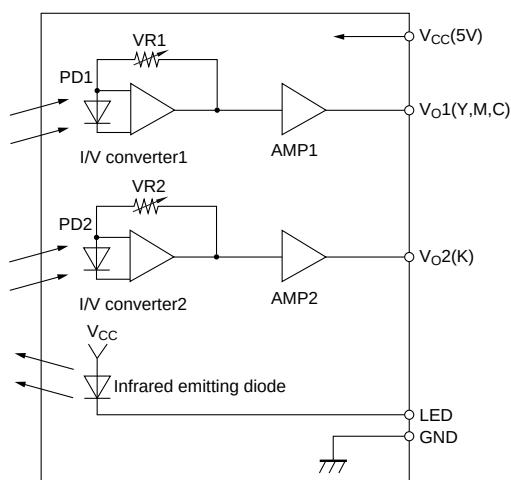


Fig.2 Schematic measurement block diagram

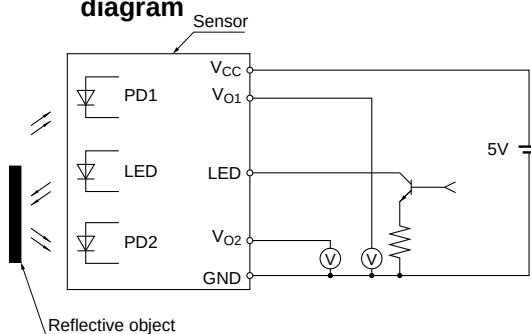


Fig.3 LED lighting condition

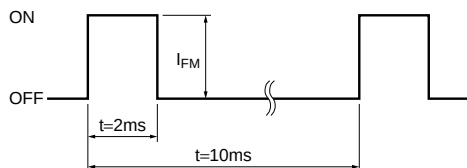


Fig.4 Response Time

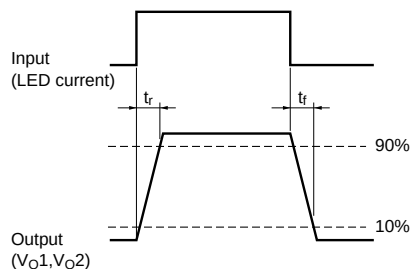
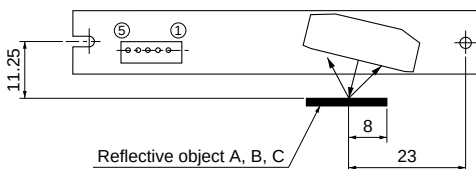


Fig.5 Measurement Condition



Reflective object A : Munsell N4.5 no gloss (reflectivity 15.6%)
 Reflective object B : Munsell N7.75 no gloss (reflectivity 54.8%)
 Reflective object C : Munsell N2 no gloss (reflectivity 3.1%)

■ Example of application

1. Apply $V_{CC}=5\text{V}$ and measure V_{O10} at V_{O1} , V_{O20} at V_{O2} .
2. In order to stabilize output voltage measure 3. to 5. on the LED lighting condition shown in Fig.3 for example.
3. Measure the output voltage V_{O1} and V_{O2} and adjust I_{FM} in order to fix ΔV_{O1} and ΔV_{O21} (determine value by your actual application). After the adjustment, memorize the values, V_{O1} , V_{O2} and I_{FM} , (Adjust I_{FM} for V_{O1} and V_{O2} each, and memorize them.) (If there are the initial memorized values, V_{O1} , V_{O2} and I_{FM} , measure V_{O1} and V_{O2} at memorized I_{FM} . If there are difference between the measured values and memorized values adjust I_{FM} to let V_{O1} and V_{O2} be initial values.)
4. Attach the color toner and measure the output voltage at V_{O1} (I_{FM} at the value memorized at 3.). Determine the output voltage difference ΔV_{O1} between the measured value and memorized value V_{O1} at 3, and adjust the attached color toner amount.
5. Attach the black toner and measure the output voltage at V_{O2} (I_{FM} at the value memorized at 3.). Determine the output voltage difference ΔV_{O2} between the measured value and memorized value V_{O2} at 3, and adjust the attached black toner amount.
6. After the measurement, set $I_{FM}=0\text{mA}$ and turn off the LED.
7. To measure them again, start from 1.

Note V_{O10} : Output voltage at $I_{FM}=0\text{mA}$
 V_{O20} : Output voltage at $I_{FM}=0\text{mA}$
 V_{O1} : V_{O1} terminal output voltage at no toner
 V_{O2} : V_{O2} terminal output voltage at no toner
 ΔV_{O11} : $V_{O1}-V_{O10}$
 ΔV_{O21} : $V_{O2}-V_{O20}$
 ΔV_{O1} : Output voltage when black toner is attached- V_{O1}
 ΔV_{O2} : Output voltage when black toner is attached- V_{O2}
 I_{FM} : LED current

Fig.6 Output Voltage vs. Reflectivity of Reflective Objects

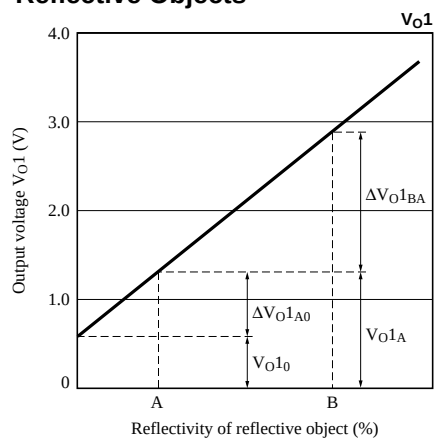
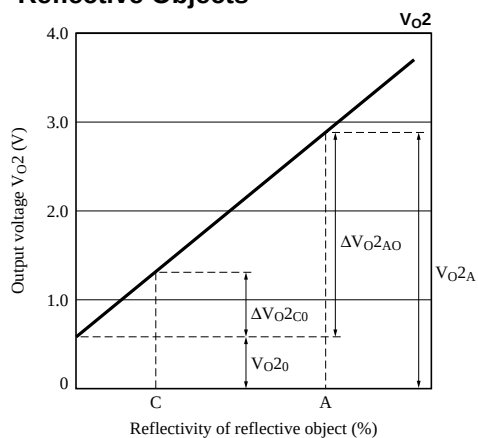


Fig.7 Output Voltage vs. Reflectivity of Reflective Objects



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