GP2TC1

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

■ Features

1. Adopted diffusive reflection method
   (Wide detecting range : 0 to 1.0mg/cm^2)
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/cm^2)
   (K : 0 to 0.6mg/cm^2)
5. High resolution (0.1mg/cm^2)
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)

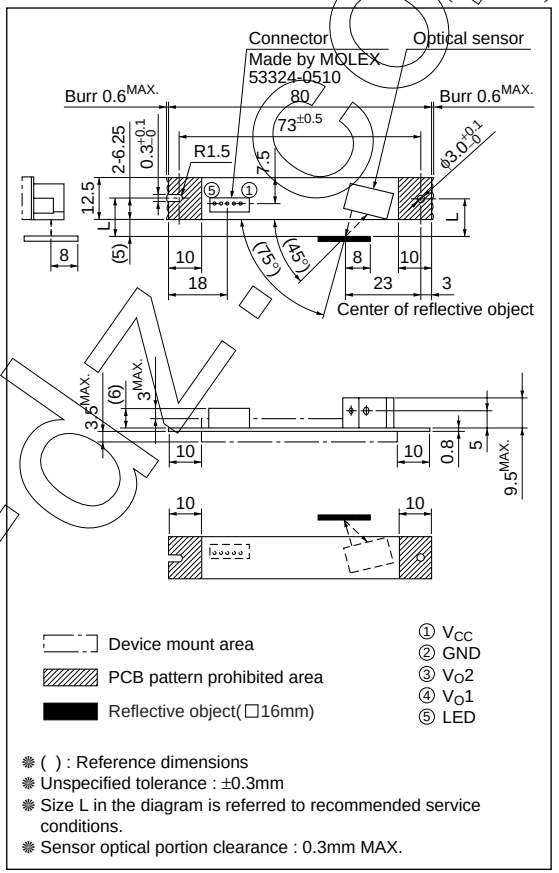
Parameter	Symbol	Rating	Unit
Operating voltage	V_{CC}	−0.3 to 7	V
LED current	I_F	50	mA
Output terminal voltage	V_O	−0.3 to Vcc +0.3	V
Operating temperature	T_{opr}	0 to +60	°C
Storage temperature	T_{stg}	−20 to +70	°C

■ 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

■ Outline Dimensions

(Unit : mm)



※ ( ) : Reference dimensions
※ Unspecified tolerance : ±0.3mm
※ Size L in the diagram is referred to recommended service conditions.
※ Sensor optical portion clearance : 0.3mm MAX.

■ Electro-optical Characteristics

(Ta=25°C, V_{CC}=5V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output voltage	V_{O1A}	Reflective object A (I_{FM}=20mA)	0.70	1.06	1.42	V
	V_{O2A}		1.68	2.63	3.58	V
	V_{O10}	LED current I_{FM}=0mA	0.3	0.6	0.9	V
	V_{O20}		0.3	1.1	1.9	V
Displacement of output voltage	ΔV_{O1BA}	Displacement of output voltage V_{O1} when reflective object is changed from A to B (I_{FM}=20mA)	1.30	1.45	1.60	V
	ΔV_{O2AC}	Displacement of output voltage V_{O2} when reflective object is changed from C to A (I_{FM}=20mA)	1.06	1.21	1.36	V
	ΔV_{O1A0}	V_{O1A}–V_{O10}	0.40	0.46	0.52	V
	ΔV_{O2A0}	V_{O2A}–V_{O20}	1.38	1.53	1.68	V
Rise time	tr	Reflective object C (Munsell N2 no gloss (Reflectivity 3.1%)) (I_{FM}=20mA)	–	70	300	µs
Fall time	tf		–	70	300	µs
Consumption current	I_{CC}	Consumption current at LED current I_{FM}=0mA	–	4	12	mA

Fig.1 Internal Block Diagram

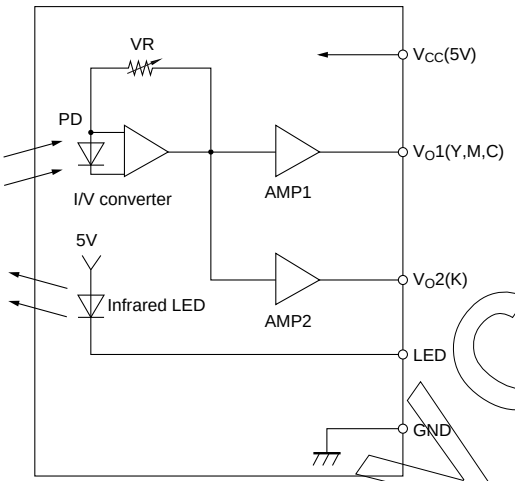


Fig.2 Schematic measurement block diagram

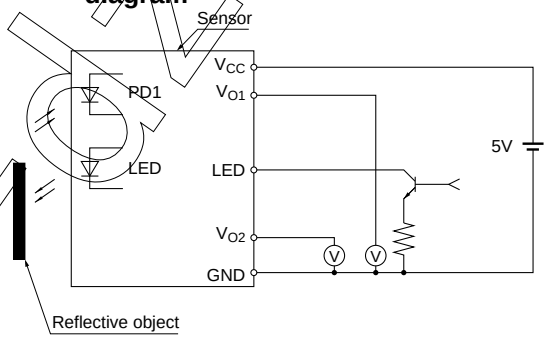


Fig.3 LED lighting condition

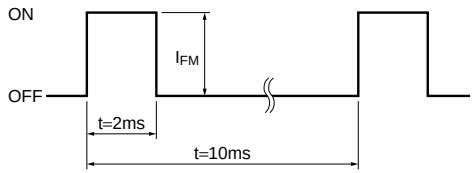


Fig.4 Response Time

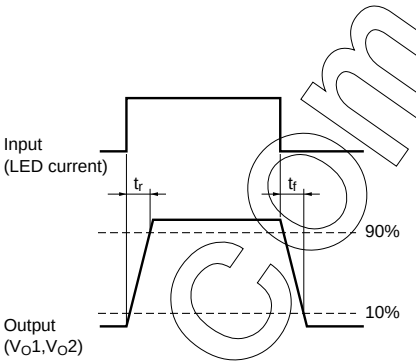
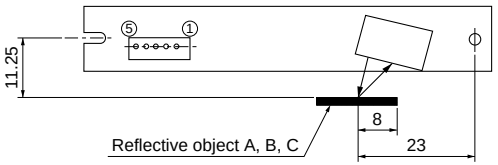


Fig.5 Measurement Condition



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}=5V and measure V_{O1_0} at V_{O1}, V_{O2_0} 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_{O2} and adjust I_{FM} in order to fix ΔV_{O2_1} (determine value by your actual application). After the adjustment, memorize the values, V_{O1}, V_{O2} and I_{FM}, (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 ouput 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 ouput 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}=0mA and turn off the LED.
7. To measure them again, start from 1.

Note V_{O1_0} : Output voltage at I_{FM}=0mA
V_{O2_0} : Output voltage at I_{FM}=0mA
V_{O1} : V_{O1} terminal ouput voltage at no toner
V_{O2} : V_{O2} terminal ouput voltage at no toner
ΔV_{O1} : Output voltage when black toner is attached–V_{O1}
ΔV_{O2} : Output voltage when black toner is attached–V_{O2}
ΔV_{O2_1} : V_{O2}–V_{O2_0}
I_{FM} : LED current

Fig.6 Output Voltage vs. Reflectivity of Reflective Objects

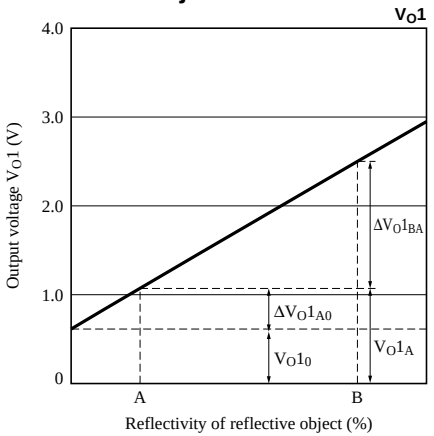
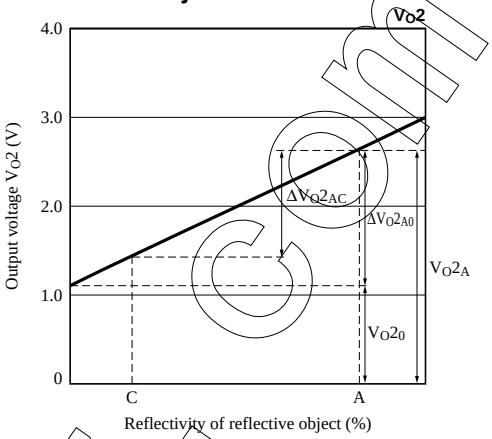


Fig.7 Output Voltage vs. Reflectivity of Reflective Objects



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