FAIRCHILD SEMICONDUCTOR®

January 2008

QRD1113, QRD1114
Reflective Object Sensor

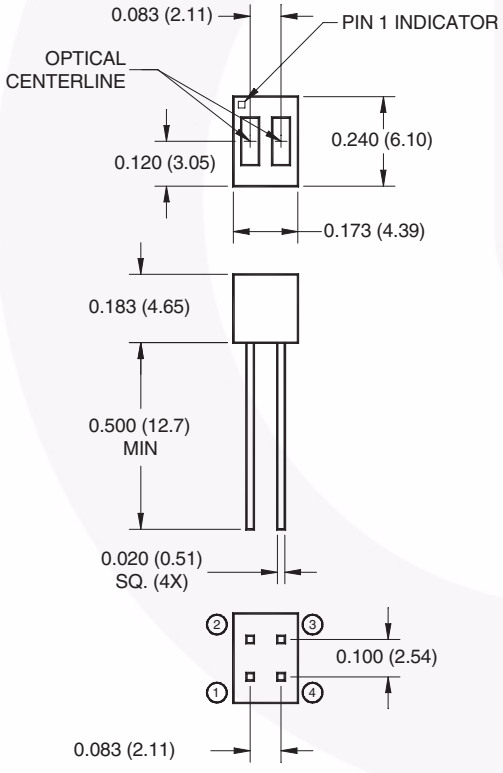
Features

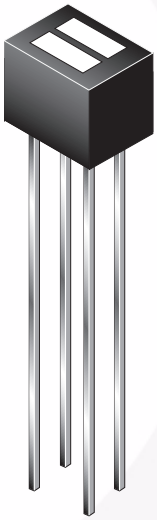
- Phototransistor Output
- No contact surface sensing
- Unfocused for sensing diffused surfaces
- Compact Package
- Daylight filter on sensor

Description

The QRD1113/14 reflective sensor consists of an infrared emitting diode and an NPN silicon phototransistor mounted side by side in a black plastic housing. The on-axis radiation of the emitter and the on-axis response of the detector are both perpendicular to the face of the QRD1113/14. The phototransistor responds to radiation emitted from the diode only when a reflective object or surface is in the field of view of the detector.

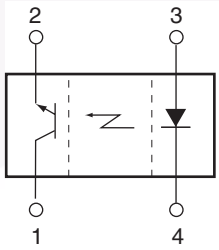
Package Dimensions





PIN 1 COLLECTOR
PIN 2 EMITTER
PIN 3 ANODE
PIN 4 CATHODE

Schematic



Notes:

1. Dimensions for all drawings are in inches (millimeters).
2. Tolerance of ± .010 (.25) on all non-nominal dimensions unless otherwise specified.
3. Pins 2 and 4 typically .050" shorter than pins 1 and 3.
4. Dimensions controlled at housing surface.

Absolute Maximum Ratings (T_A = 25°C unless otherwise specified)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating	Units
T_{OPR}	Operating Temperature	-40 to +85	°C
T_{STG}	Storage Temperature	-40 to +100	°C
T_{SOL-I}	Lead Temperature (Solder Iron)[2,3]	240 for 5 sec	°C
T_{SOL-F}	Lead Temperature (Solder Flow)[2,3]	260 for 10 sec	°C
EMITTER			
I_F	Continuous Forward Current	50	mA
V_R	Reverse Voltage	5	V
P_D	Power Dissipation[1]	100	mW
SENSOR			
V_{CEO}	Collector-Emitter Voltage	30	V
V_{ECO}	Emitter-Collector Voltage		V
P_D	Power Dissipation[1]	100	mW

Electrical/Optical Characteristics (T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
INPUT (Emitter)						
V_F	Forward Voltage	I_F = 20mA			1.7	V
I_R	Reverse Leakage Current	V_R = 5V			100	µA
λ_{PE}	Peak Emission Wavelength	I_F = 20mA		940		nm
OUTPUT (Sensor)						
BV_{CEO}	Collector-Emitter Breakdown	I_C = 1mA	30			V
BV_{ECO}	Emitter-Collector Breakdown	I_E = 0.1mA	5			V
I_D	Dark Current	V_{CE} = 10 V, I_F = 0mA			100	nA
COUPLED						
$I_{C(ON)}$	QRD1113 Collector Current	I_F = 20mA, V_{CE} = 5V, D = .050"[6,8]	0.300			mA
$I_{C(ON)}$	QRD1114 Collector Current	I_F = 20mA, V_{CE} = 5V, D = .050"[6,8]	1			mA
$V_{CE(SAT)}$	Collector Emitter Saturation Voltage	I_F = 40mA, I_C = 100µA, D = .050"[6,8]			0.4	V
I_{CX}	Cross Talk	I_F = 20mA, V_{CE} = 5V, E_E = 0[7]		.200	10	µA
t_r	Rise Time	V_{CE} = 5V, R_L = 100Ω, $I_{C(ON)}$ = 5mA		10		µs
t_f	Fall Time			50		µs

Notes:

1. Derate power dissipation linearly 1.33mW/°C above 25°C.
2. RMA flux is recommended.
3. Methanol or isopropyl alcohols are recommended as cleaning agents.
4. Soldering iron tip 1/16” (1.6 mm) minimum from housing.
5. As long as leads are not under any stress or spring tension.
6. D is the distance from the sensor face to the reflective surface.
7. Crosstalk (I_{CK}) is the collector current measured with the indicated current on the input diode and with no reflective surface.
8. Measured using Eastman Kodak neutral white test card with 90% diffused reflecting as a reflecting surface.

Typical Performance Curves

Fig. 1 Forward Voltage vs. Forward Current

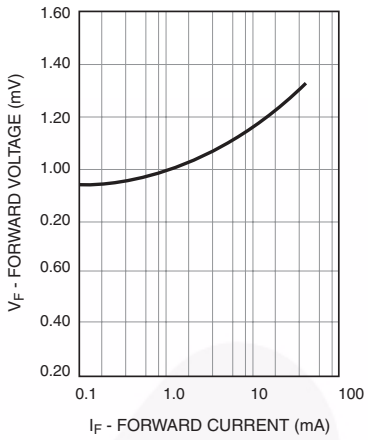


Fig. 2 Normalized Collector Current vs. Forward Current

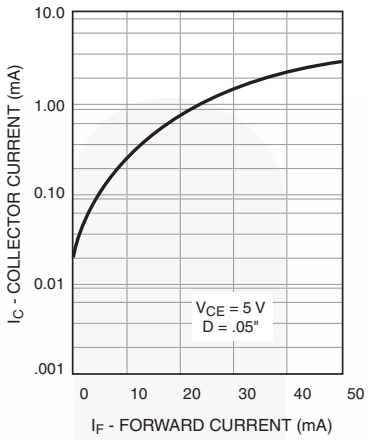


Fig. 3 Normalized Collector Current vs. Temperature

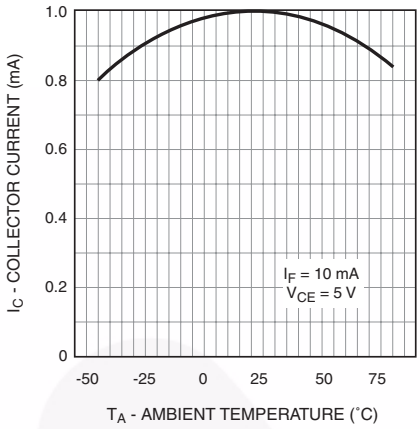


Fig. 4 Normalized Collector Dark Current vs. Temperature

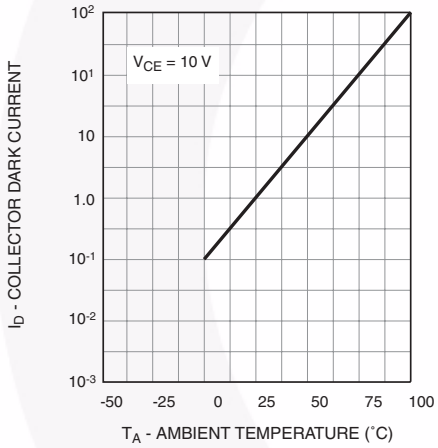
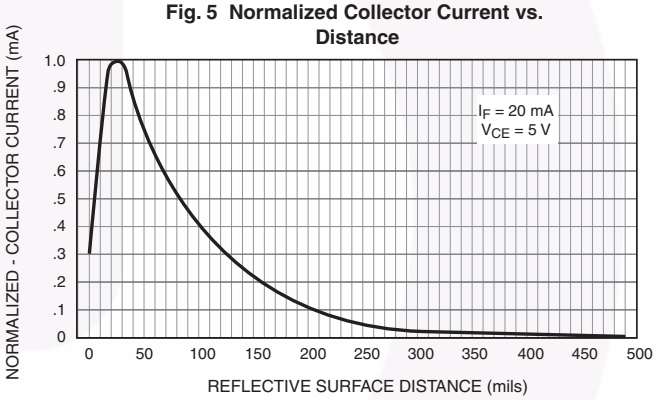


Fig. 5 Normalized Collector Current vs. Distance



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