

# QRD1113, QRD1114 Reflective Object Sensor

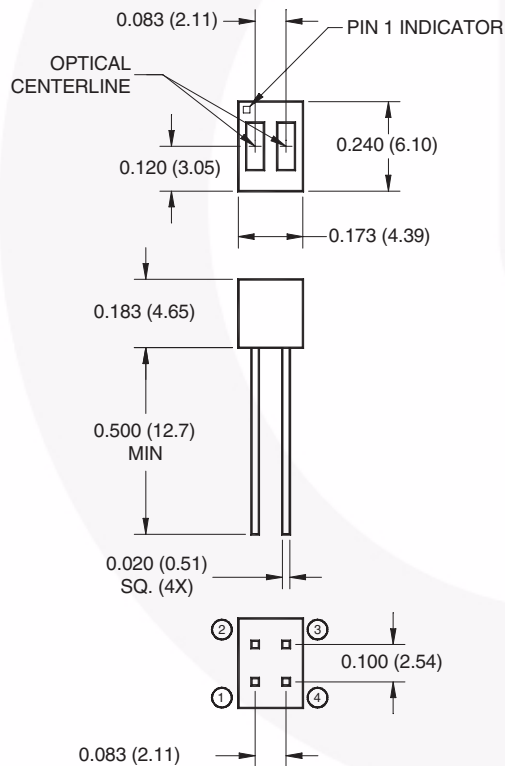
## Features

- 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

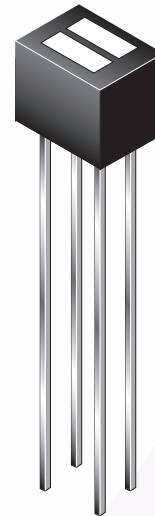


PIN 1 COLLECTOR

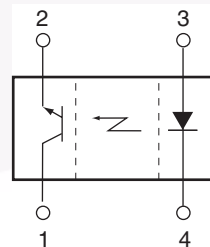
PIN 2 EMITTER

PIN 3 ANODE

PIN 4 CATHODE



## Schematic



### Notes:

1. Dimensions for all drawings are in inches (millimeters).
2. Tolerance of  $\pm .010$  (.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** ( $T_A = 25^\circ\text{C}$  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
$T_{\text{OPR}}$	Operating Temperature	-40 to +85	$^\circ\text{C}$
$T_{\text{STG}}$	Storage Temperature	-40 to +100	$^\circ\text{C}$
$T_{\text{SOL-I}}$	Lead Temperature (Solder Iron) <sup>(2,3)</sup>	240 for 5 sec	$^\circ\text{C}$
$T_{\text{SOL-F}}$	Lead Temperature (Solder Flow) <sup>(2,3)</sup>	260 for 10 sec	$^\circ\text{C}$
<b>EMITTER</b>			
$I_F$	Continuous Forward Current	50	mA
$V_R$	Reverse Voltage	5	V
$P_D$	Power Dissipation <sup>(1)</sup>	100	mW
<b>SENSOR</b>			
$V_{\text{CEO}}$	Collector-Emitter Voltage	30	V
$V_{\text{ECO}}$	Emitter-Collector Voltage		V
$P_D$	Power Dissipation <sup>(1)</sup>	100	mW

**Electrical/Optical Characteristics** ( $T_A = 25^\circ\text{C}$ )

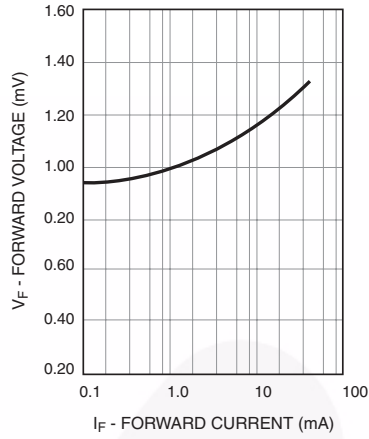
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>INPUT (Emitter)</b>						
$V_F$	Forward Voltage	$I_F = 20\text{mA}$			1.7	V
$I_R$	Reverse Leakage Current	$V_R = 5\text{V}$			100	$\mu\text{A}$
$\lambda_{\text{PE}}$	Peak Emission Wavelength	$I_F = 20\text{mA}$		940		nm
<b>OUTPUT (Sensor)</b>	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

**Notes:**

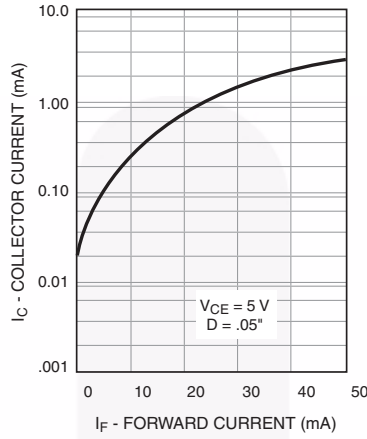
- Derate power dissipation linearly 1.33mW/ $^\circ\text{C}$  above 25 $^\circ\text{C}$ .
- RMA flux is recommended.
- Methanol or isopropyl alcohols are recommended as cleaning agents.
- Soldering iron tip 1/16" (1.6 mm) minimum from housing.
- As long as leads are not under any stress or spring tension.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

## Typical Performance Curves

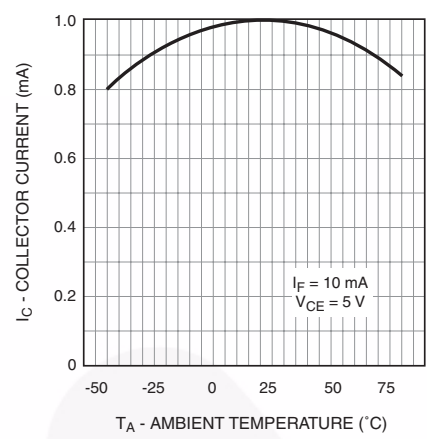
**Fig. 1 Forward Voltage vs. Forward Current**



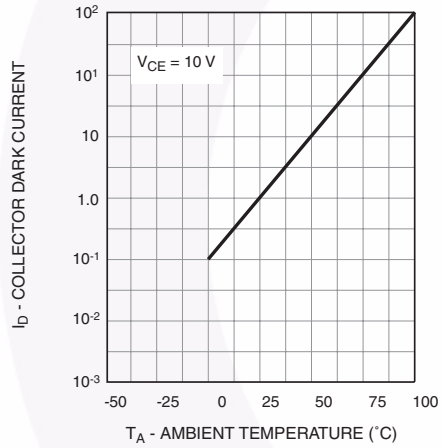
**Fig. 2 Normalized Collector Current vs. Forward Current**



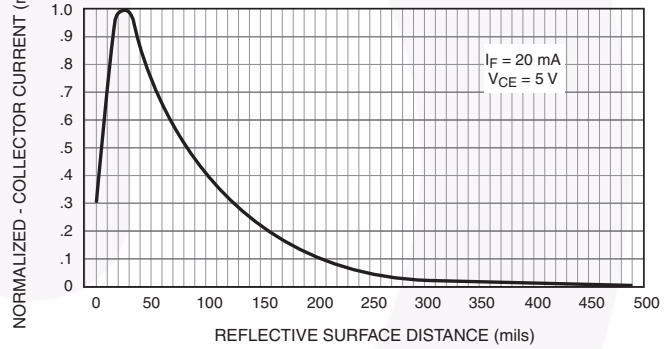
**Fig. 3 Normalized Collector Current vs. Temperature**



**Fig. 4 Normalized Collector Dark Current vs. Temperature**





**Fig. 5 Normalized Collector Current vs. Distance**





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