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FAIRCHILD SEMICONDUCTOR®

June 2013

QRD1113 / QRD1114
Reflective Object Sensor

Features

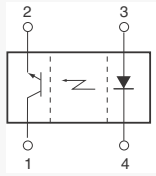
- Phototransistor Output
- No-Contact Surface Sensing
- Unfocused for Sensing Diffused Surfaces
- Compact Package
- Daylight Filter on sensor

Description

The QRD1113 and QRD1114 reflective sensors consist 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 and QRD1114. 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.



Schematic



PIN 1. Collector PIN 3. Anode
PIN 2. Emitter PIN 4. Cathode

Ordering Information

Part Number	Operating Temperature	Package	Top Mark	Packing Method
QRD1113	-40 to +85°C	Custom 4L	QRD1113	Bulk
QRD1114		Custom 4L	QRD1114	Bulk

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Absolute Maximum Ratings

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. Values are at T_A = 25°C unless otherwise specified.

Symbol	Parameter	Min.	Unit
T_{OPR}	Operating Temperature	-40 to +85	°C
T_{STG}	Storage Temperature	-40 to + 100	
T_{SOL-I}	Lead Temperature (Solder Iron)(1,2,3)	240 for 5 s	
T_{SOL-F}	Lead Temperature (Solder Flow)(1,2)	260 for 10 s	
EMMITER			
I_F	Continuous Forward Current	50	mA
V_R	Reverse Voltage	5	V
P_D	Power Dissipation	100	mW
SEMSOR			
V_{CEO}	Collector-Emitter Voltage	30	V
V_{ECO}	Emitter-Collector Voltage		V
P_D	Power Dissipation(4)	100	mW

Notes:

1. RMA flux is recommended.
2. Methanol or isopropyl alcohols are recommended as cleaning agents.
3. Soldering iron tip 1/16 inch (1.6 mm) minimum from housing.
4. Derate power dissipation linearly 1.33 mW/°C.

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Electrical / Optical Characteristics

Values are at T_A = 25°C unless specified otherwise.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
INPUT (Emitter)						
V_F	Forward Voltage	I_F = 20 mA			1.7	V
I_R	Reverse Leakage Current	V_R = 5 V			100	µA
λ_{PE}	Peak Emission Wavelength	I_F = 20 mA		940		nm
OUTPUT (Sensor)						
BV_{CEO}	Collector-Emitter Breakdown	I_C = 1 mA	30			V
BV_{ECO}	Emitter-Collector Breakdown	I_E = 0.1 mA	5			V
I_D	Dark Current	V_{CE} = 10 V, I_F = 0 mA			100	nA
COUPLED						
$I_{C(ON)}$	QRD1113 Collector Current	I_F = 20 mA, V_{CE} = 5 V, D = 0.050 inch[5, 7]	0.300			mA
$I_{C(ON)}$	QRD1114 Collector Current		1			mA
$V_{CE(SAT)}$	Collector Emitter Saturation Voltage	I_F = 40 mA, I_C = 100 µA, D = 0.050 inch[5, 7]			0.4	V
I_{CX}	Cross Talk	I_F = 20 mA, V_{CE} =5 V, E_E = 0[6]		0.2	10.0	µA
t_r	Rise Time	V_{CE} = 5 V, R_L = 100 Ω, $I_{C(ON)}$ = 5 mA		10		µs
t_f	Fall time			50		µs

Notes:

5. D is the distance from the sensor face to the reflective surface.
6. Crosstalk (I_{CK}) is the collector current measured with the indicated current on the input diode and with no reflective surface.
7. Measured using Eastman Kodak natural white test card with 90% diffused reflecting as a reflecting surface.

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Typical Performance Characteristics

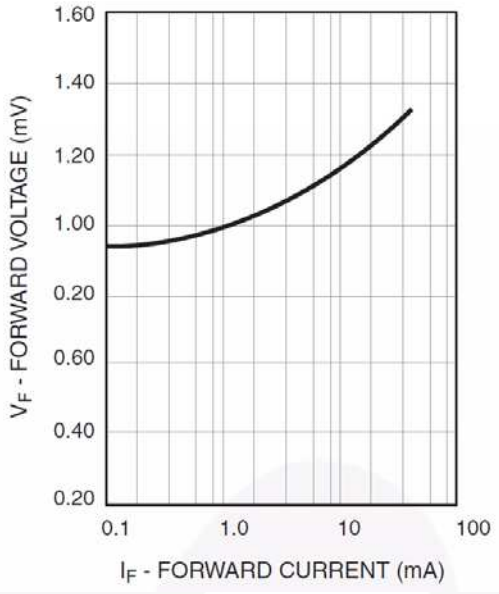


Figure 1. Forward Voltage vs. Forward Current

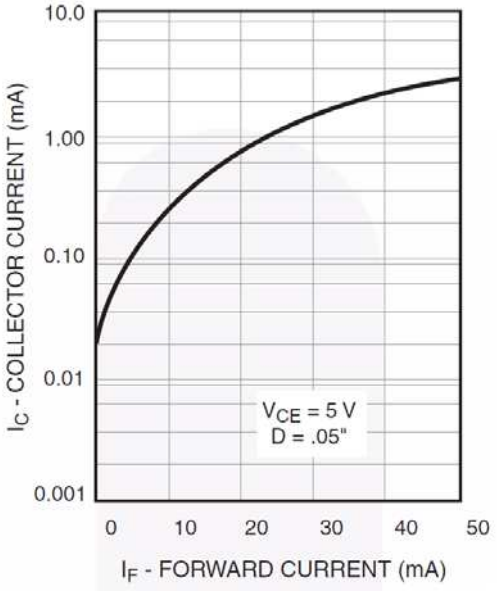


Figure 2. Normalized Collector Current vs. Forward Current

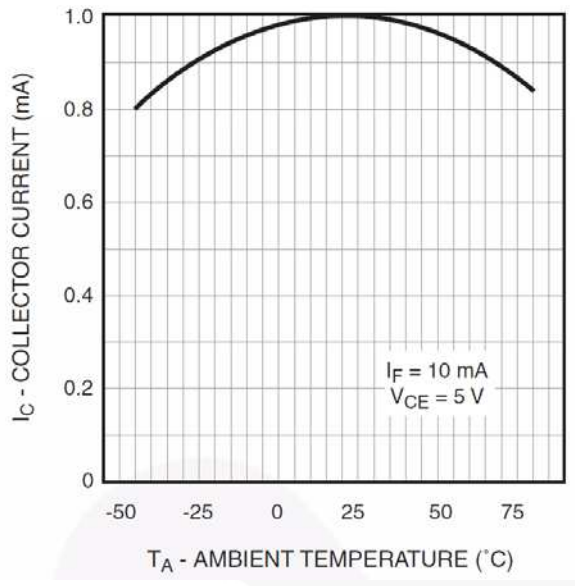


Figure 3. Normalized Collector Current vs. Temperature

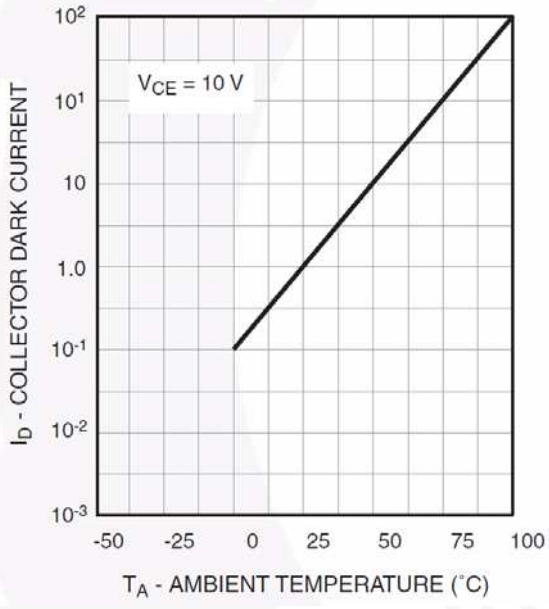


Figure 4. Normalized Collector Dark Current vs. Temperature

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Typical Performance Characteristics (continued)

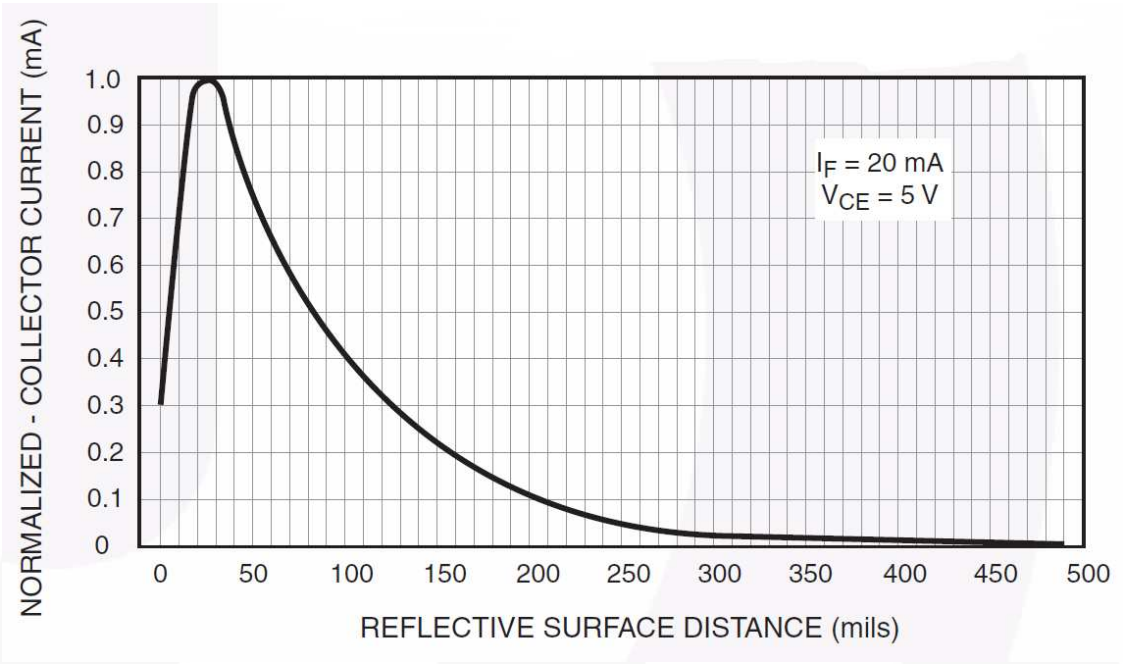
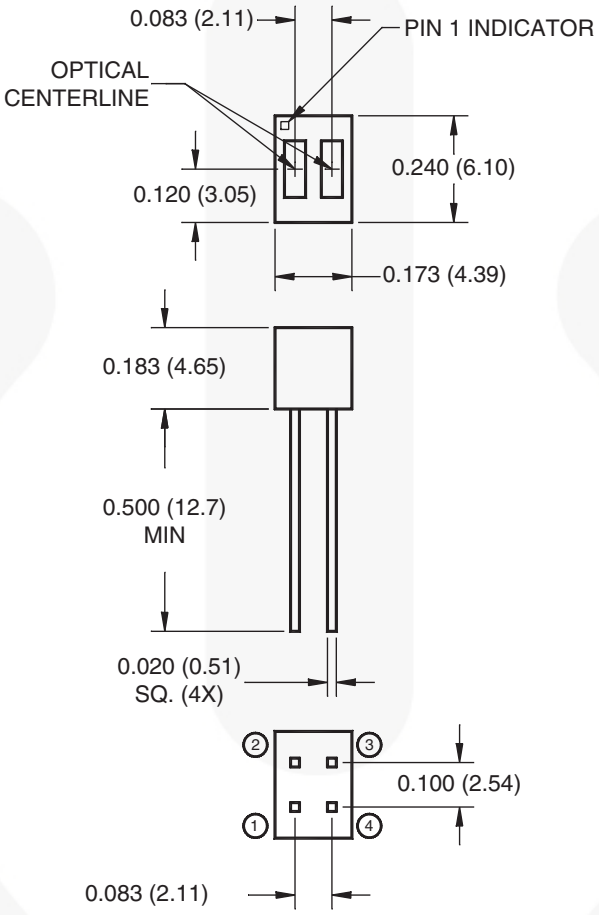


Figure 5. Normalized Collector Current vs. Distance

Physical Dimensions

Custom 4L



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.

Figure 6. REFLECTIVE RECTANGULAR SENSOR PCB MOUNT (ACTIVE)

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