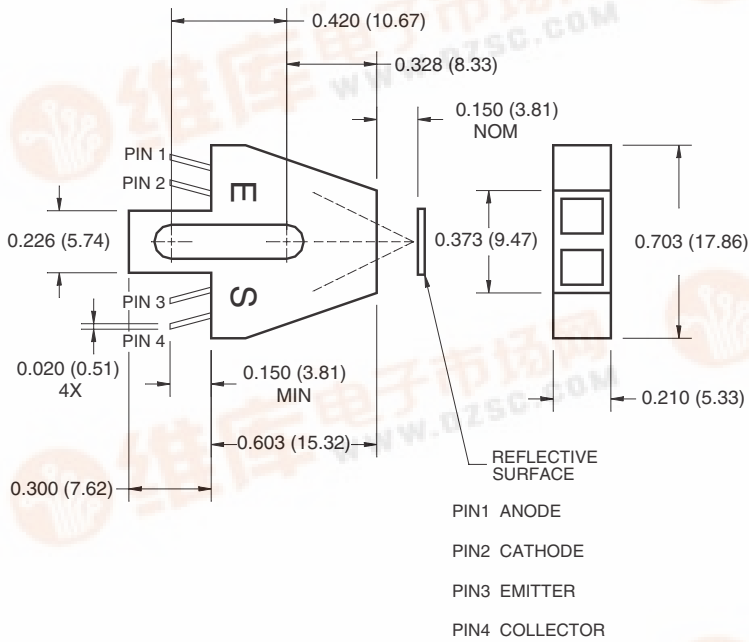


**FAIRCHILD**  
SEMICONDUCTOR®

# PHOTOTRANSISTOR REFLECTIVE OBJECT SENSOR

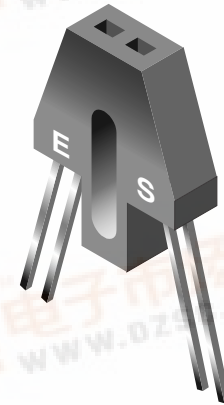
QRB1113 QRB1114

## PACKAGE DIMENSIONS

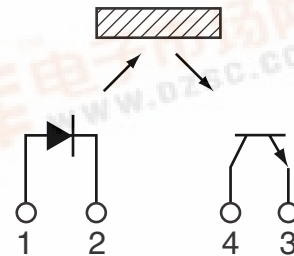


### NOTES:

1. Dimensions for all drawings are in inches (mm).
2. Tolerance of  $\pm .010$  (.25) on all non-nominal dimensions unless otherwise specified.



## SCHEMATIC



## DESCRIPTION

The QRB1113/1114 consists of an infrared emitting diode and an NPN silicon phototransistor mounted side by side on a converging optical axis in a black plastic housing. The phototransistor responds to radiation from the emitting diode only when a reflective object passes within its field of view. The area of the optimum response approximates a circle .200" in diameter.

## FEATURES

- No contact surface sensing
- Phototransistor output
- Focused for sensing specular reflection
- Daylight filter on photosensor
- Dust cover

**QRB1113 QRB1114**

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise specified)			
Parameter	Symbol	Rating	Units
Operating Temperature	$T_{OPR}$	-40 to +85	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-40 to +85	$^\circ\text{C}$
Soldering Temperature (Iron) <sup>(2,3,4)</sup>	$T_{SOL-I}$	240 for 5 sec	$^\circ\text{C}$
Soldering Temperature (Flow) <sup>(2,3)</sup>	$T_{SOL-F}$	260 for 10 sec	$^\circ\text{C}$
<b>EMITTER</b>			
Continuous Forward Current	$I_F$	50	mA
Reverse Voltage	$V_R$	5	V
Power Dissipation <sup>(1)</sup>	$P_D$	100	mW
<b>SENSOR</b>			
Collector-Emitter Voltage	$V_{CEO}$	30	V
Emitter-Collector Voltage	$V_{ECO}$	4.5	V
Collector Current		20	mA
Power Dissipation <sup>(1)</sup>	$P_D$	100	mW

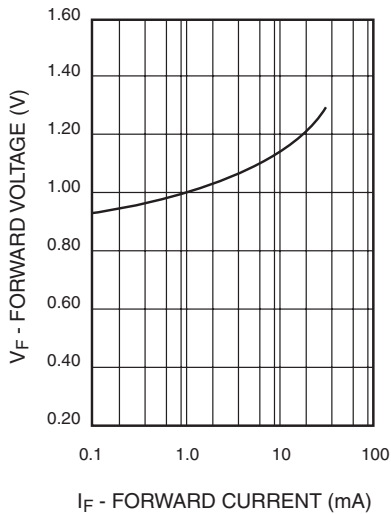
**NOTES**

- Derate power dissipation linearly 1.67 mW/ $^\circ\text{C}$  above 25 $^\circ\text{C}$ .
- RMA flux is recommended.
- Methanol or isopropyl alcohols are recommended as cleaning agents.
- Soldering iron 1/16" (1.6mm) minimum from housing.
- D is the distance from the assembly face to the reflective surface.
- Measured using an Eastman Kodak neutral test card with 90% diffused reflecting surface.
- Cross talk is the photo current measured with current to the input diode and no reflecting surface.

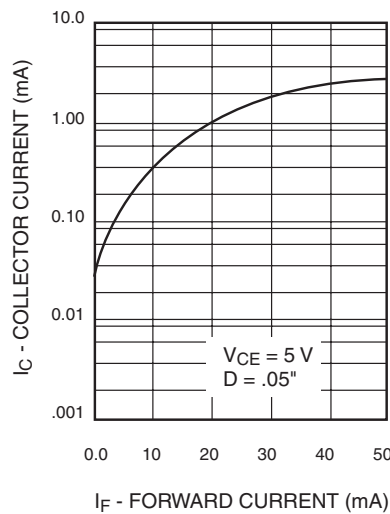
<b>ELECTRICAL/OPTICAL CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ )						
Parameter	Test Conditions	Symbol	Min.	Typ.	Max.	Units
<b>EMITTER</b>						
Forward Voltage	$I_F = 40\text{ mA}$	$V_F$	—	—	1.7	V
Reverse Current	$V_R = 5.0\text{ V}$	$I_R$	—	—	100	$\mu\text{A}$
Peak Emission Wavelength	$I_F = 20\text{ mA}$	$\lambda_{PE}$	—	940	—	nm
<b>SENSOR</b>						
Collector-Emitter Breakdown Voltage	$I_C = 1\text{ mA}$	$BV_{CEO}$	30	—	—	V
Emitter-Collector Breakdown Voltage	$I_E = 0.1\text{ mA}$	$BV_{ECO}$	5	—	—	V
Collector-Emitter Dark Current	$V_{CE} = 10\text{ V}, I_F = 0\text{ mA}$	$I_{CEO}$	—	—	100	nA
<b>COUPLED</b>						
On-state Collector Current	$I_F = 40\text{ mA}, V_{CE} = 5\text{ V}$ $D = .150^{(5,6)}$	$I_{C(ON)}$	0.20	—	—	mA
QRB1113			0.60	—	—	
Collector-Emitter Saturation Voltage	$I_F = 20\text{ mA}, I_C = 0.5\text{ mA}$	$V_{CE(SAT)}$	—	—	0.4	V
Rise Time	$V_{CE} = 5\text{ V}, R_L = 100\text{ V}$ $I_{C(ON)} = 5\text{ mA}$	$t_r$	—	8	—	$\mu\text{s}$
Fall Time		$t_f$	—	8	—	
Cross Talk	$I_F = 40\text{ mA}, V_{CE} = 5\text{ V}^{(7)}$	$I_{CX}$	—	—	1.00	$\mu\text{A}$

**TYPICAL PERFORMANCE CURVES**

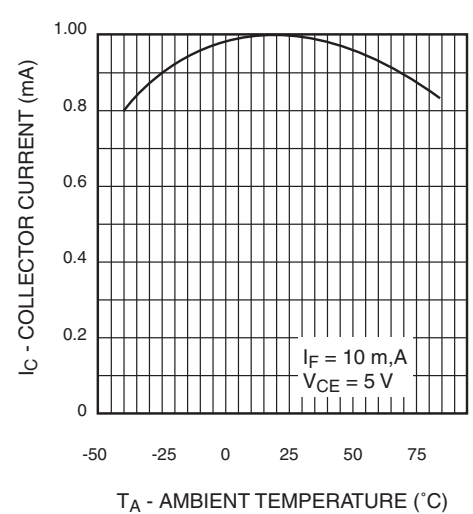
**Fig. 1 Forward Voltage vs. Forward Current**



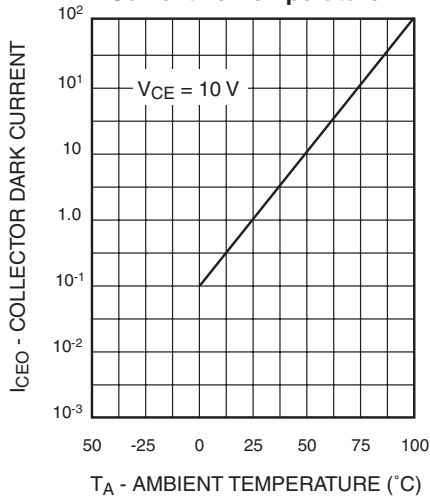
**Fig. 2 Normalized Collector Current vs. Forward Current**



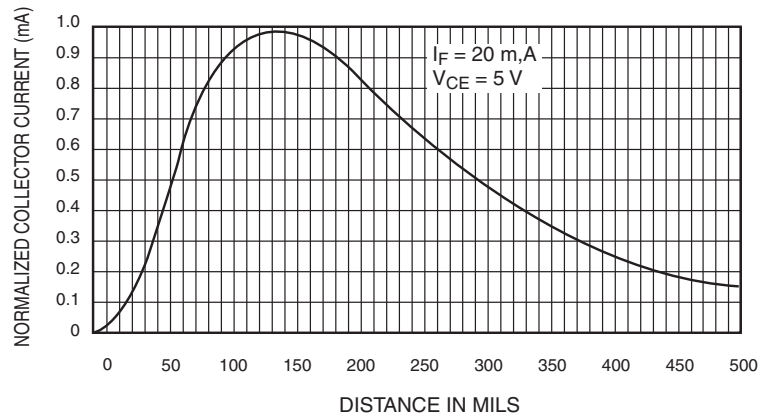
**Fig. 3 Normalized Collector Current vs. Temperature**



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



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



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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.