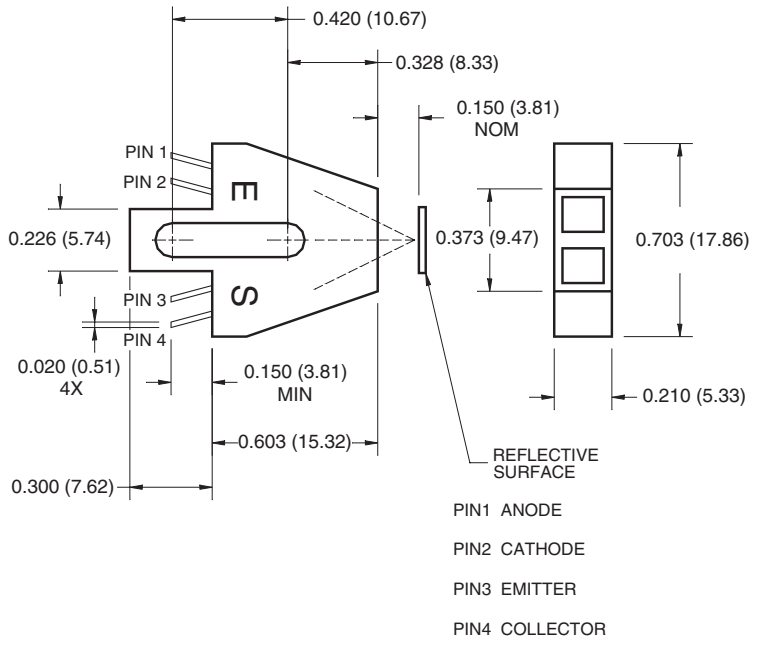
FAIRCHILD
SEMICONDUCTOR®

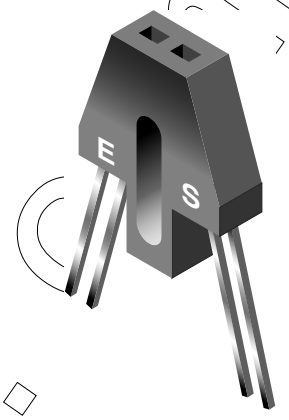
# PHOTOTRANSISTOR REFLECTIVE OBJECT SENSOR

## QRB1113 QRB1114

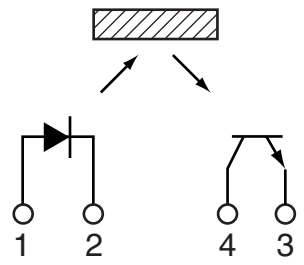
### PACKAGE DIMENSIONS




NOTES:
1. Dimensions for all drawings are in inches (mm).
2. Tolerance of ± .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

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## QRB1113 QRB1114

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

**NOTES**
1. Derate power dissipation linearly 1.67 mW/°C above 25°C.
2. RMA flux is recommended.
3. Methanol or isopropyl alcohols are recommended as cleaning agents.
4. Soldering iron 1/16" (1.6mm) minimum from housing.
5. D is the distance from the assembly face to the reflective surface.
6. Measured using an Eastman Kodak neutral test card with 90% diffused reflecting surface.
7. Cross talk is the photo current measured with current to the input diode and no reflecting surface.

| **ELECTRICAL/OPTICAL CHARACTERISTICS** ($T_A$ = 25°C) | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Test Conditions** | **Symbol** | **Min.** | **Typ.** | **Max.** | **Units** |
| **EMITTER** | | | | | | |
| Forward Voltage | $I_F$ = 40 mA | $V_F$ | — | — | 1.7 | V |
| Reverse Current | $V_R$ = 5.0 V | $I_R$ | — | — | 100 | µA |
| Peak Emission Wavelength | $I_F$ = 20 mA | $\lambda_{PE}$ | — | 940 | — | nm |
| **SENSOR** | | | | | | |
| Collector-Emitter Breakdown Voltage | $I_C$ = 1 mA | $BV_{CEO}$ | 30 | — | — | V |
| Emitter-Collector Breakdown Voltage | $I_E$ = 0.1 mA | $BV_{ECO}$ | 5 | — | — | V |
| Collector-Emitter Dark Current | $V_{CE}$ = 10 V, $I_F$ = 0 mA | $I_{CEO}$ | — | — | 100 | nA |
| **COUPLED** | | | | | | |
| On-state Collector Current | | | | | | |
| QRB1113 | $I_F$ = 40 mA, $V_{CE}$ = 5 V D = .150"(5,6) | $I_{C(ON)}$ | 0.20 | — | — | mA |
| QRB1114 | | | 0.60 | — | | |
| Collector-Emitter Saturation Voltage | $I_F$ = 20 mA, $I_C$ = 0.5 mA | $V_{CE\ (SAT)}$ | — | — | 0.4 | V |
| Rise Time | $V_{CE}$ = 5 V, $R_L$ = 100 V $I_{C(ON)}$ = 5 mA | $t_r$ | — | 8 | — | µs |
| Fall Time | | $t_f$ | — | 8 | — | |
| Cross Talk | $I_F$ = 40 mA, $V_{CE}$ = 5 V(7) | $I_{CX}$ | — | — | 1.00 | µA |

## TYPICAL PERFORMANCE CURVES

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

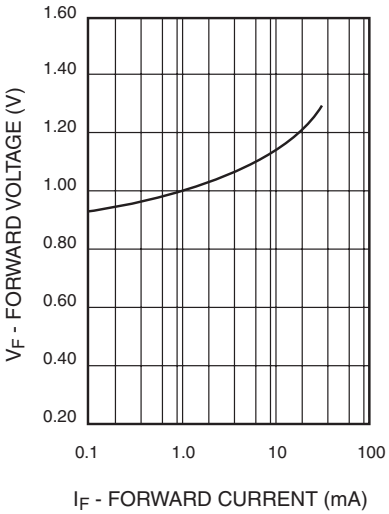



**Fig. 2 Normalized Collector Current vs. Forward Current**

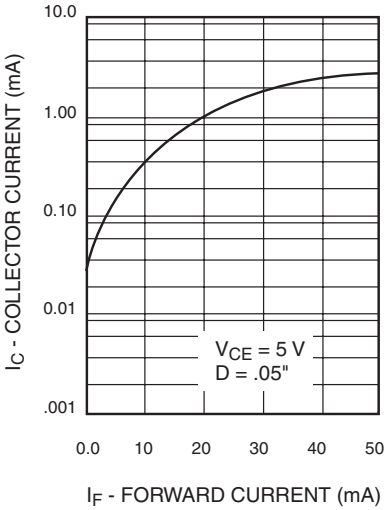



**Fig. 3 Normalized Collector Current vs. Temperature**

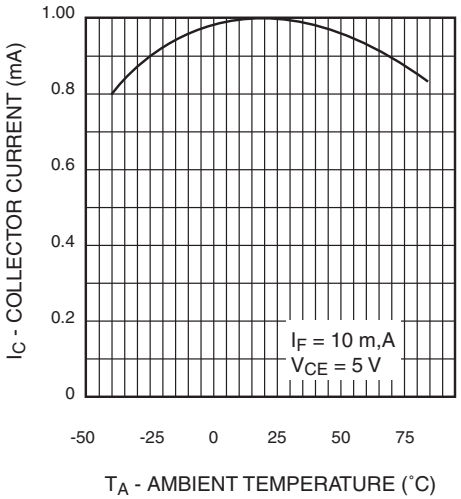



**Fig. 4 Normalized Collector Dark Current vs. Temperature**

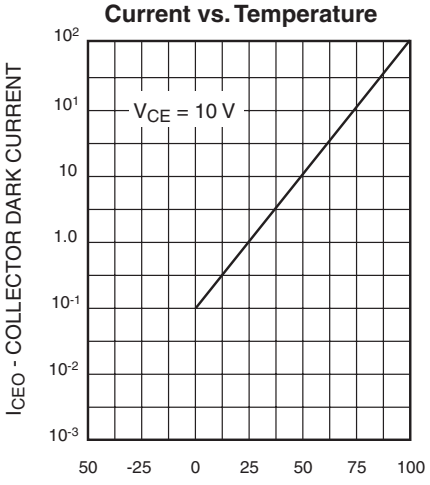
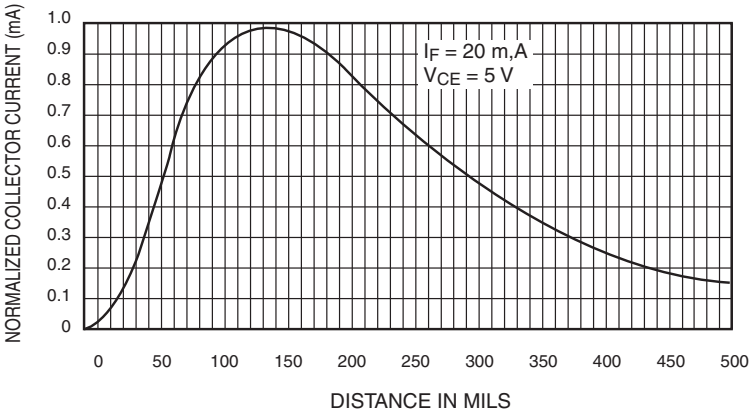



**Fig. 5 Normalized Collector Current vs. Distance**



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## QRB1113 QRB1114

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