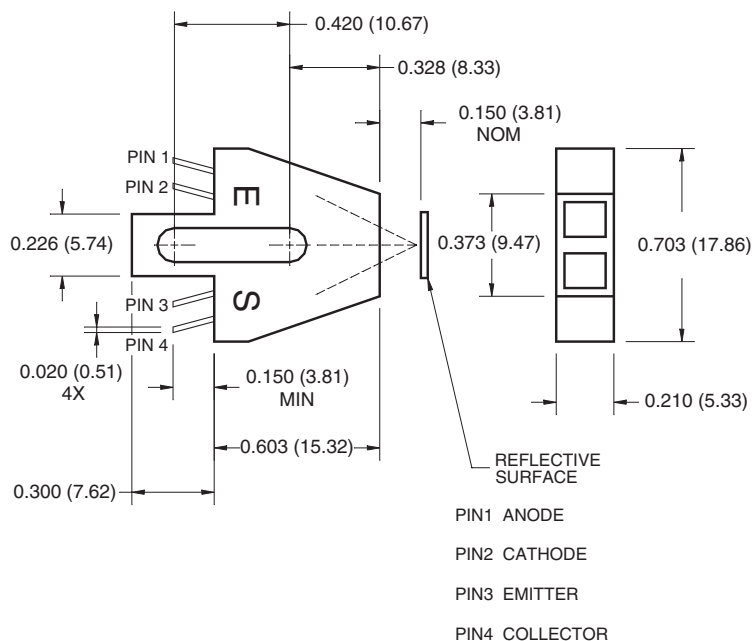


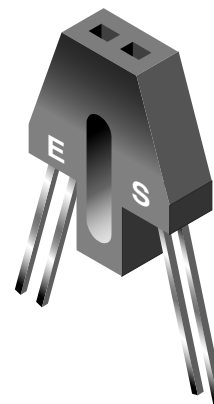
**QRB1113 QRB1114**

**PACKAGE DIMENSIONS**

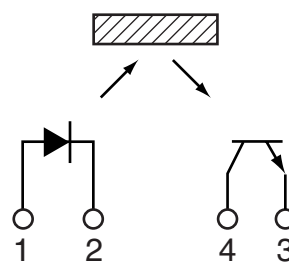


**NOTES:**

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               |

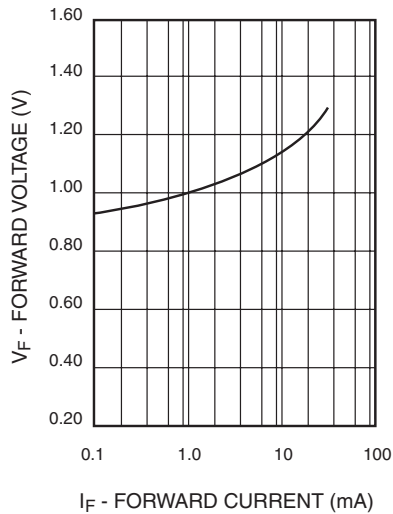
**NOTES**

1. Derate power dissipation linearly 1.67 mW/ $^\circ\text{C}$  above  $25^\circ\text{C}$ .
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.

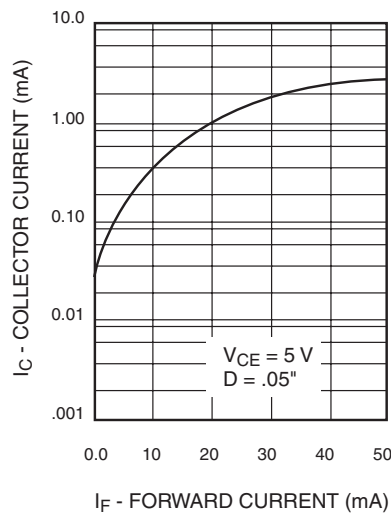
| <b>ELECTRICAL/OPTICAL CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ ) |                                                                        |                |      |      |      |               |
|------------------------------------------------------------------------|------------------------------------------------------------------------|----------------|------|------|------|---------------|
| 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                                             | $I_F = 40\text{ mA}, V_{CE} = 5\text{ V}$<br>$D = .150''^{(5,6)}$      | $I_{C(ON)}$    |      |      |      | mA            |
| QRB1113                                                                |                                                                        |                | 0.20 | —    | —    |               |
| QRB1114                                                                |                                                                        |                | 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                                                              | $V_{CE} = 5\text{ V}, R_L = 100\text{ V}$<br>$I_{C(ON)} = 5\text{ mA}$ | $t_r$          | —    | 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**

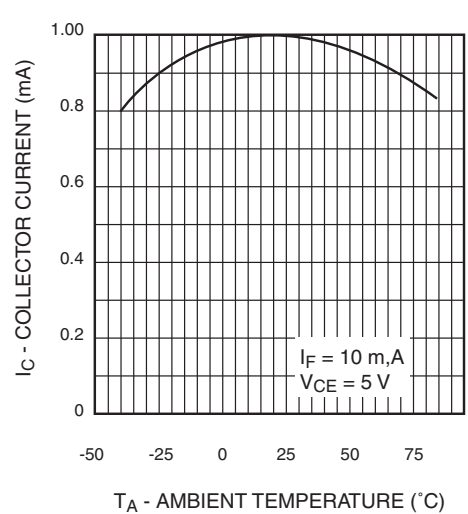
**Fig. 1 Forward Voltage  
vs. Forward Current**



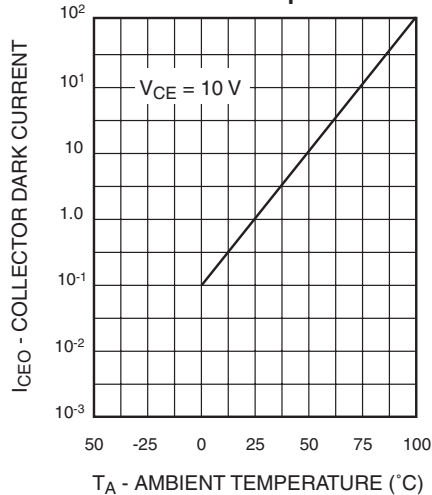
**Fig. 2 Normalized Collector Current  
vs. Forward Current**



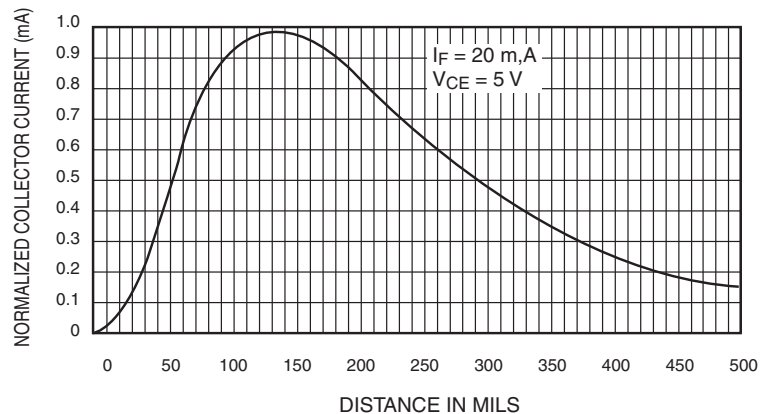
**Fig. 3 Normalized Collector Current  
vs. Temperature**



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



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



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