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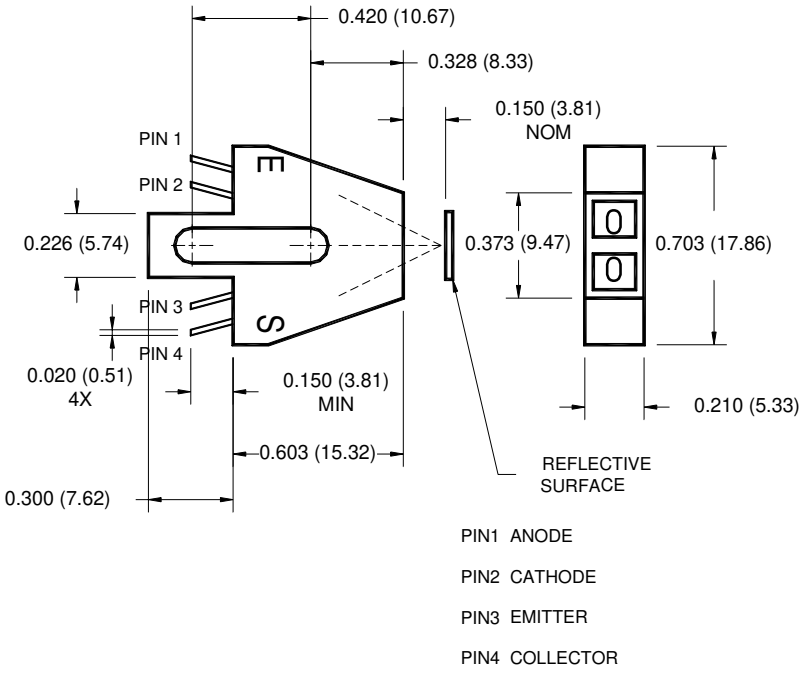
FAIRCHILD
SEMICONDUCTOR®

# PHOTOTRANSISTOR OPTICAL INTERRUPTER SWITCH

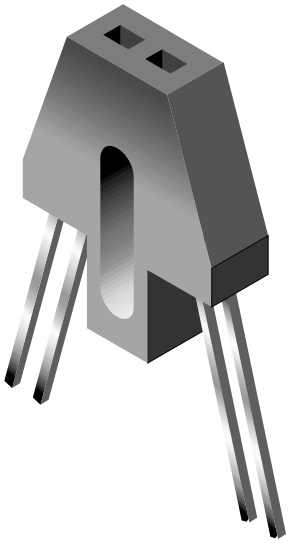
## QRC1113

### PACKAGE DIMENSIONS

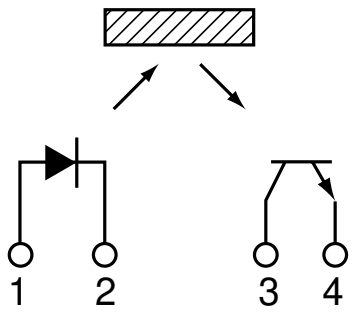



NOTES:

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 QRC1113 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

- Phototransistor output
- High sensitivity
- Low cost plastic housing

# PHOTOTRANSISTOR OPTICAL INTERRUPTER SWITCH

## QRC1113

### 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 | $V_{ECO}$ | 5 | V |
| Collector Current | $I_C$ | 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. Cross talk is the photo current measured with current to the input diode and no reflecting surface.
7. Measured using an Eastman Kodak neutral test card with 90% diffused 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 | $V_R$ = 2.0 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 | $I_F$=40mA,$V_{CE}$=5V,D =.150"(5,7) | $I_{C(ON)}$ | 0.20 | — | — | mA |
| Collector-Emitter Saturation Voltage | $I_F$ = 40 mA, $I_C$ = 0.1 mA D = .150"(5,7) | $V_{CE\ (SAT)}$ | — | — | 0.4 | V |
| Rise Time | $V_{CE}$ = 5 V, $R_L$ = 100 Ω | $t_r$ | — | 8 | — | µs |
| Fall Time | $I_{C(ON)}$ = 5 mA | $t_f$ | — | 8 | — | µs |
| Crosstalk | $I_F$ = 40 mA, $V_{CE}$ = 5 V(6) | $I_{CX}$ | — | — | 1.00 | µA |

## TYPICAL PERFORMANCE CURVES

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

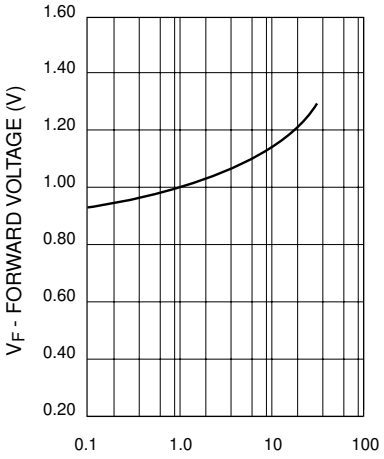



**Fig. 2 Normalized Collector Current vs. Forward Current**

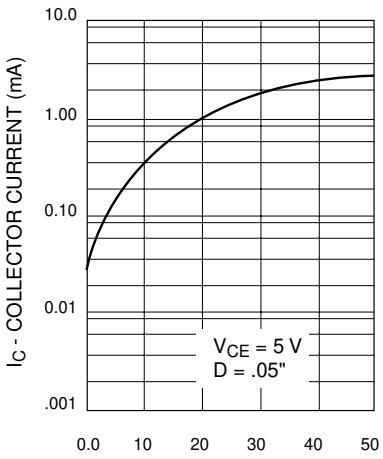



**Fig. 3 Normalized Collector Current vs. Temperature**

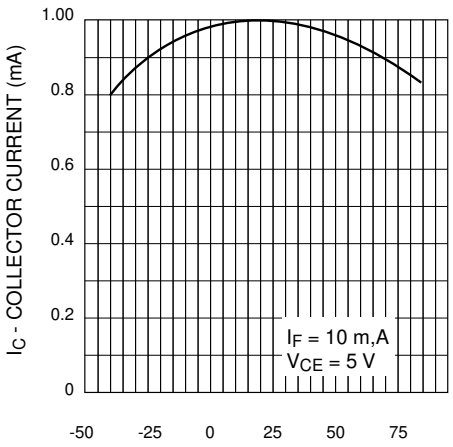



**Fig. 4 Normalized Collector Dark Current vs. Temperature**

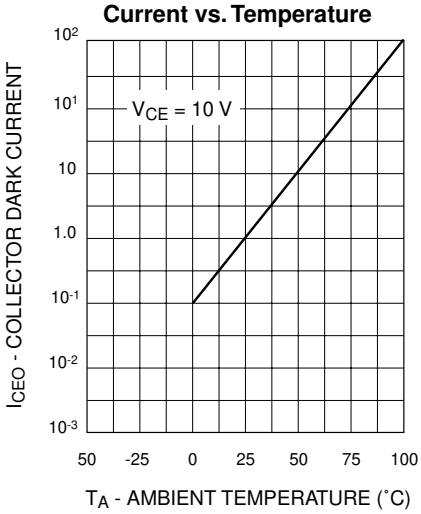
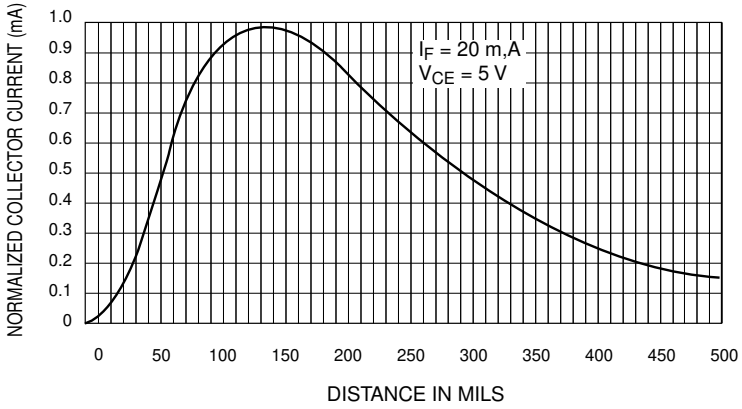



**Fig. 5 Normalized Collector Current vs. Distance**



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