



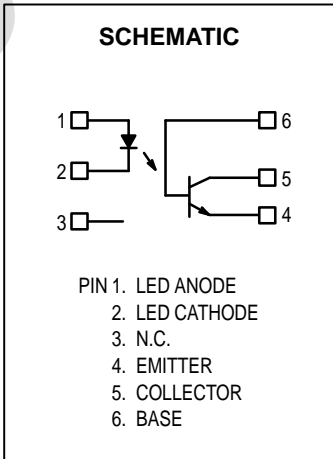
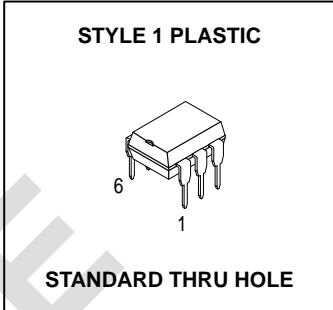
MTIL117

**6-Pin DIP Optoisolator
Transistor Output**

The MTIL117 device consists of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

Applications

- Appliances, Measuring Instruments
- General Purpose Switching Circuits
- Programmable Controllers
- Portable Electronics
- Interfacing and coupling systems of different potentials and impedances
- Telecommunications Equipment



MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Rating | Symbol | Value | Unit |
|--------|--------|-------|------|
|--------|--------|-------|------|

INPUT LED

| | | | |
|---|-------|------|----------------------|
| Reverse Voltage | V_R | 6 | Volts |
| Forward Current — Continuous | I_F | 60 | mA |
| LED Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Output Detector Derate above 25°C | P_D | 100 | mW |
| | | 1.41 | mW/ $^\circ\text{C}$ |

OUTPUT TRANSISTOR

| | | | |
|--|-----------|------|----------------------|
| Collector–Emitter Voltage | V_{CEO} | 30 | Volts |
| Emitter–Base Voltage | V_{EBO} | 7 | Volts |
| Collector–Base Voltage | V_{CBO} | 70 | Volts |
| Collector Current — Continuous | I_C | 50 | mA |
| Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above 25°C | P_D | 50 | mW |
| | | 1.76 | mW/ $^\circ\text{C}$ |

TOTAL DEVICE

| | | | |
|--|-----------|-------------|----------------------------|
| Isolation Surge Voltage ⁽¹⁾ (Peak ac Voltage, 60 Hz, 1 sec Duration) | V_{ISO} | 7500 | Vac(pk) |
| Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 250 2.94 | mW mW/ $^\circ\text{C}$ |
| Ambient Operating Temperature Range ⁽²⁾ | T_A | -55 to +100 | $^\circ\text{C}$ |
| Storage Temperature Range ⁽²⁾ | T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Soldering Temperature (10 sec, 1/16" from case) | T_L | 260 | $^\circ\text{C}$ |

1. Isolation surge voltage is an internal device dielectric breakdown rating.
For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

MTIL117

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)⁽¹⁾

| Characteristic | Symbol | Min | Typ ⁽¹⁾ | Max | Unit |
|--|--------|-------------|---------------------|---------------|---------------|
| INPUT LED | | | | | |
| Forward Voltage ($I_F = 16\text{ mA}$) $T_A = 0\text{--}70^\circ\text{C}$ $T_A = -55^\circ\text{C}$ $T_A = 100^\circ\text{C}$ | V_F | — — — | 1.15 1.3 1.05 | 1.4 — — | Volts |
| Reverse Leakage Current ($V_R = 3\text{ V}$) | I_R | — | 0.05 | 10 | μA |
| Capacitance ($V = 0\text{ V}$, $f = 1\text{ MHz}$) | C_J | — | 18 | — | pF |

OUTPUT TRANSISTOR

| | | | | | |
|--|---------------|----|------|----|---------------|
| Collector–Emitter Dark Current ($V_{CE} = 10\text{ V}$, $T_A = 25^\circ\text{C}$) ($V_{CB} = 30\text{ V}$, $T_A = 70^\circ\text{C}$) | I_{CEO} | — | 3 | 50 | nA |
| | I_{CEO} | — | 0.05 | 50 | μA |
| Collector–Base Dark Current ($V_{CB} = 10\text{ V}$) | I_{CBO} | — | 0.2 | 20 | nA |
| Collector–Emitter Breakdown Voltage ($I_C = 1\text{ mA}$) | $V_{(BR)CEO}$ | 30 | 45 | — | Volts |
| Collector–Base Breakdown Voltage ($I_C = 10\text{ }\mu\text{A}$) | $V_{(BR)CBO}$ | 70 | 100 | — | Volts |
| Emitter–Base Breakdown Voltage ($I_E = 10\text{ }\mu\text{A}$) | $V_{(BR)EBO}$ | 7 | 7.8 | — | Volts |
| DC Current Gain ($I_C = 1\text{ mA}$, $V_{CE} = 5\text{ V}$) (Typical Value) | h_{FE} | — | 600 | — | — |
| Collector–Emitter Capacitance ($f = 1\text{ MHz}$, $V_{CE} = 0$) | C_{CE} | — | 7 | — | pF |
| Collector–Base Capacitance ($f = 1\text{ MHz}$, $V_{CB} = 0$) | C_{CB} | — | 19 | — | pF |
| Emitter–Base Capacitance ($f = 1\text{ MHz}$, $V_{EB} = 0$) | C_{EB} | — | 9 | — | pF |

COUPLED

| | | | | | |
|---|----------------------------|-----------|---------|-----|---------------|
| Output Collector Current ($I_F = 10\text{ mA}$, $V_{CE} = 10\text{ V}$) | I_C (CTR) ⁽²⁾ | 0.5 (50) | 1 (100) | — | mA (%) |
| Collector–Emitter Saturation Voltage ($I_C = 100\text{ }\mu\text{A}$, $I_F = 1\text{ mA}$) | $V_{CE(sat)}$ | — | 0.22 | 0.5 | Volts |
| Turn–On Time ($I_C = 2\text{ mA}$, $V_{CC} = 10\text{ V}$, $R_L = 100\text{ }\Omega$) ⁽³⁾ | t_{on} | — | — | 10 | μs |
| Turn–Off Time ($I_C = 2\text{ mA}$, $V_{CC} = 10\text{ V}$, $R_L = 100\text{ }\Omega$) ⁽³⁾ | t_{off} | — | — | 10 | μs |
| Rise Time ($I_C = 2\text{ mA}$, $V_{CC} = 10\text{ V}$, $R_L = 100\text{ }\Omega$) ⁽³⁾ | t_r | — | 3.8 | — | μs |
| Fall Time ($I_C = 2\text{ mA}$, $V_{CC} = 10\text{ V}$, $R_L = 100\text{ }\Omega$) ⁽³⁾ | t_f | — | 5.6 | — | μs |
| Isolation Voltage ($f = 60\text{ Hz}$, $t = 1\text{ sec}$) ⁽⁴⁾ | V_{ISO} | 7500 | — | — | Vac(pk) |
| Isolation Resistance ($V = 500\text{ V}$) ⁽⁴⁾ | R_{ISO} | 10^{11} | — | — | Ω |
| Isolation Capacitance ($V = 0\text{ V}$, $f = 1\text{ MHz}$) ⁽⁴⁾ | C_{ISO} | — | 0.2 | 2 | pF |

1. Always design to the specified minimum/maximum electrical limits (where applicable).
2. Current Transfer Ratio (CTR) = $I_C/I_F \times 100\%$.
3. For test circuit setup and waveforms, refer to Figure 14.
4. For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.

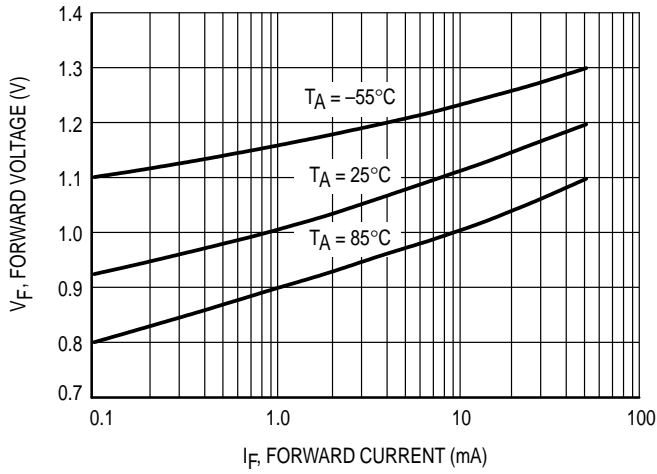


Figure 1. Forward Voltage vs. Forward Current

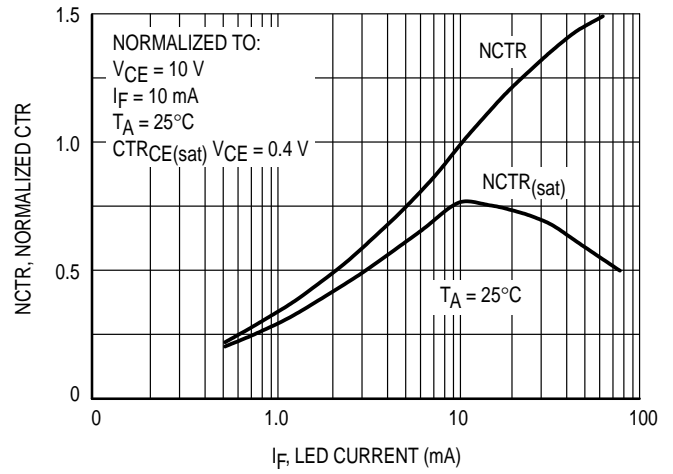


Figure 2. Normalized Non-Saturated and Saturated CTR, $T_A = 25^\circ\text{C}$ vs. LED Current

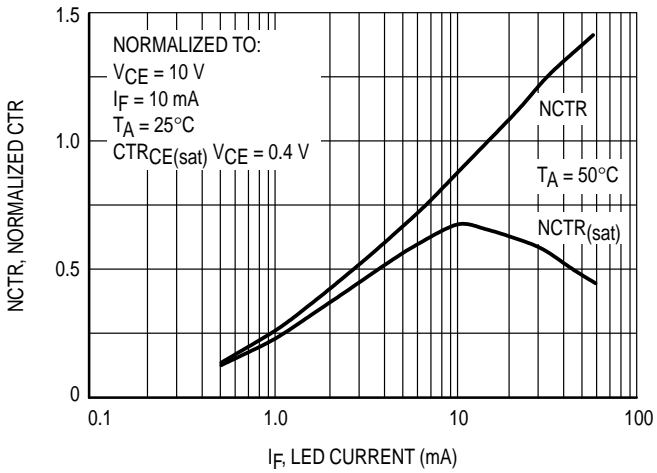


Figure 3. Normalized Non-Saturated and Saturated CTR, $T_A = 50^\circ\text{C}$ vs. LED Current

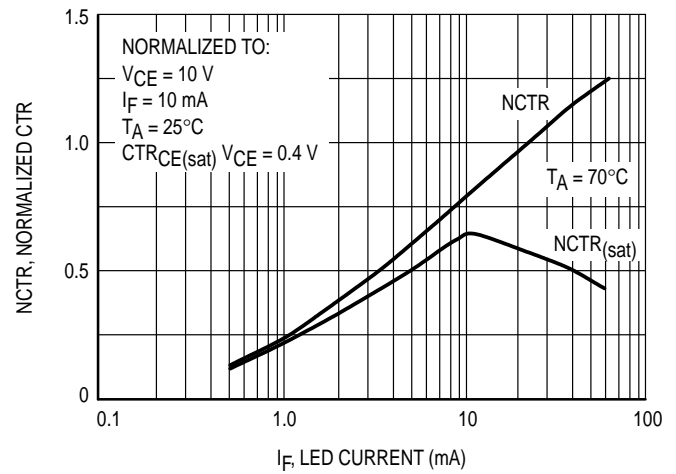


Figure 4. Normalized Non-Saturated and Saturated CTR, $T_A = 70^\circ\text{C}$ vs. LED Current

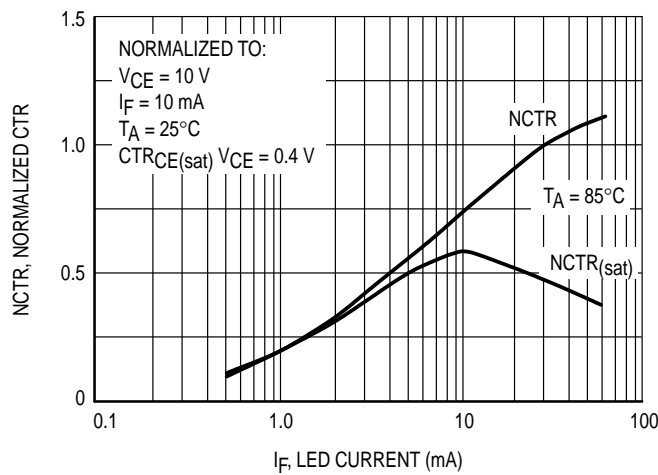


Figure 5. Normalized Non-Saturated and Saturated CTR, $T_A = 85^\circ\text{C}$ vs. LED Current

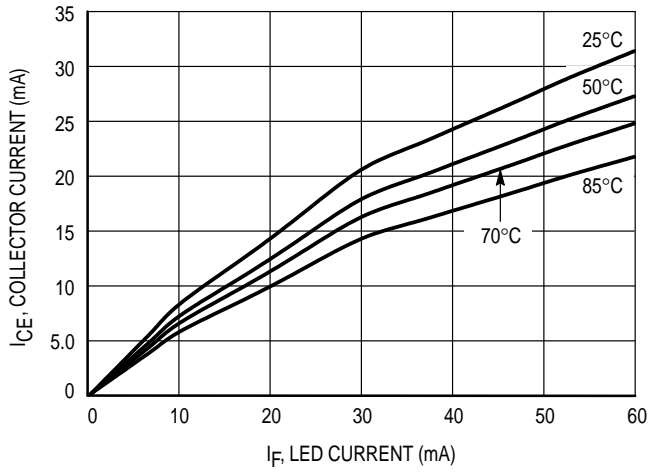


Figure 6. Collector–Emitter Current vs. Temperature and LED Current

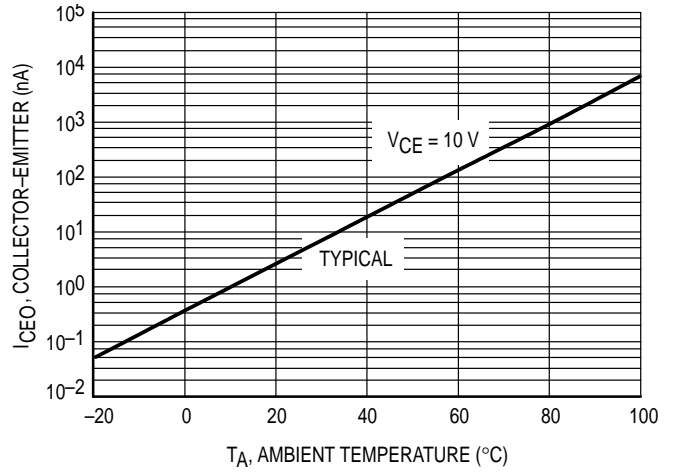


Figure 7. Collector–Emitter Leakage Current vs. Temperature

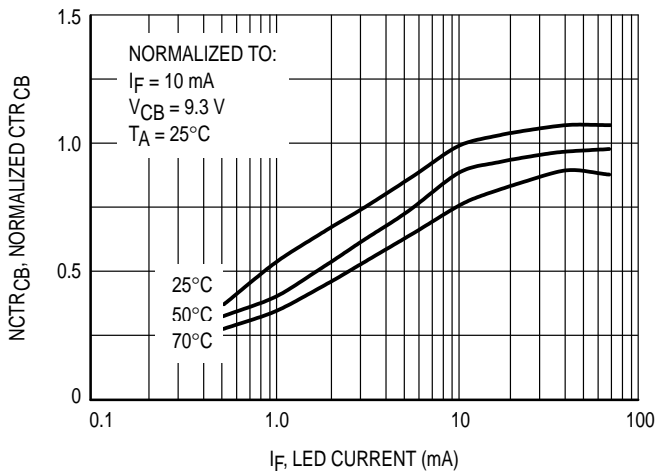


Figure 8. Normalized CTR_{cb} vs. LED Current and Temperature

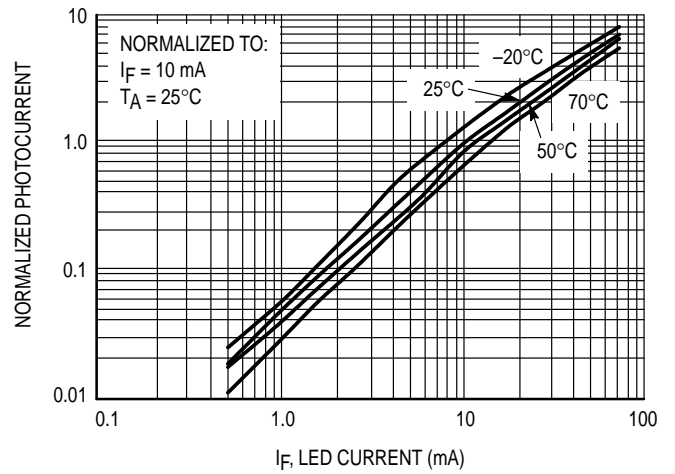


Figure 9. Normalized Photocurrent vs. I_F and Temperature

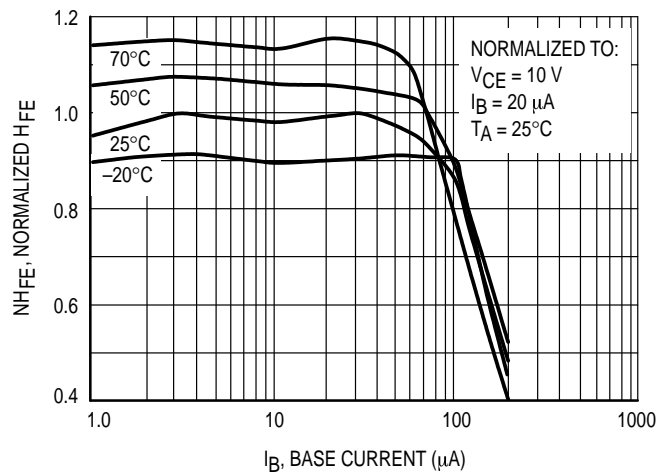


Figure 10. Normalized Non–Saturated H_{FE} vs. Base Current and Temperature

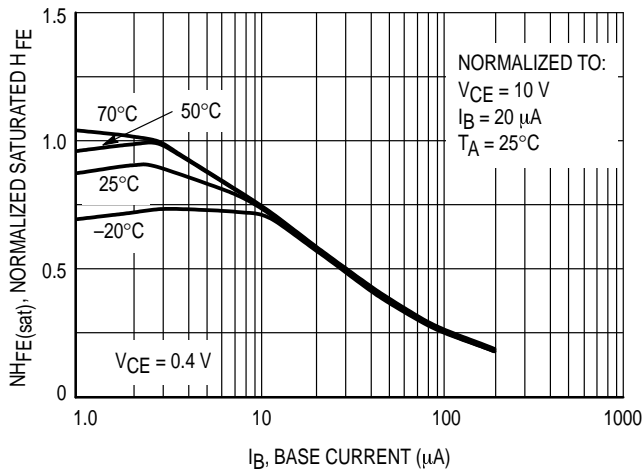


Figure 11. Normalized H_{FE} vs. Base Current and Temperature

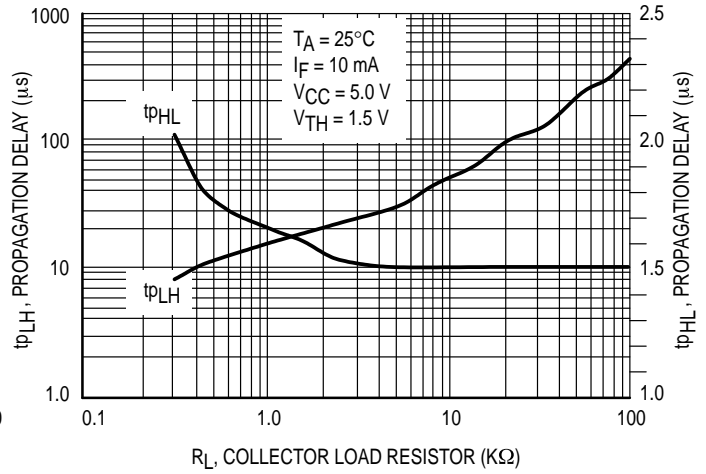


Figure 12. Propagation Delay vs. Collector Load Resistor

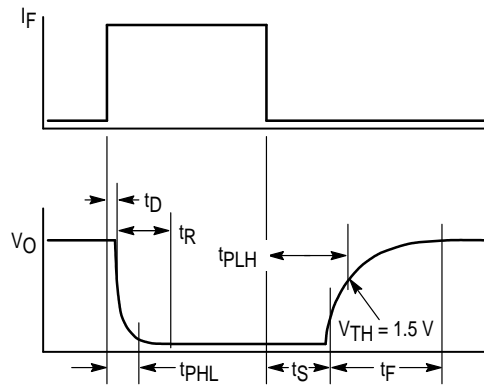
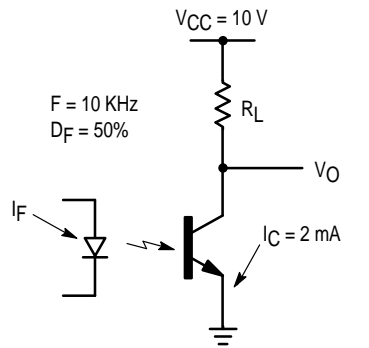
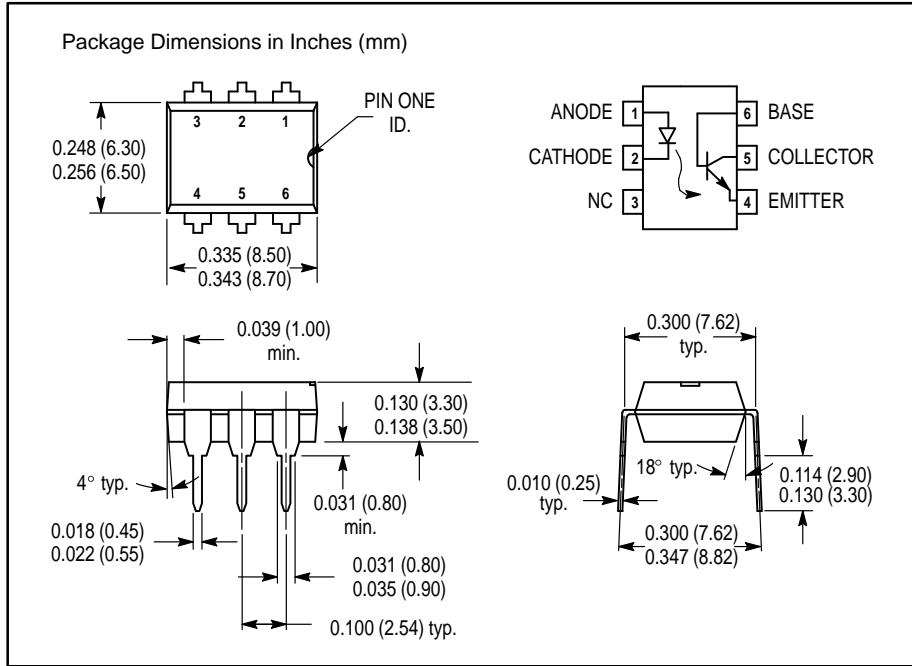



Figure 13. Switching Timing



$I_F = \text{As necessary to get } I_C = 2 \text{ mA}$

Figure 14. Switching Schematic



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