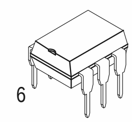
UL | CSA | SETI | BABT

MTIL117

6-Pin DIP Optoisolator Transistor Output

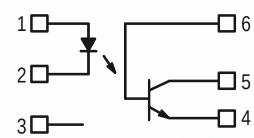
The MTIL117 device consists of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

STYLE 1 PLASTIC



STANDARD THRU HOLE

SCHEMATIC



PIN 1. LED ANODE
2. LED CATHODE
3. N.C.
4. EMITTER
5. COLLECTOR
6. BASE

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°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°C with Negligible Power in Output Detector Derate above 25°C	P_D	100 1.41	mW mW/°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°C with Negligible Power in Input LED Derate above 25°C	P_D	50 1.76	mW mW/°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°C Derate above 25°C	P_D	250 2.94	mW mW/°C
Ambient Operating Temperature Range(2)	T_A	–55 to +100	°C
Storage Temperature Range(2)	T_{stg}	–55 to +150	°C
Soldering Temperature (10 sec, 1/16″ from case)	T_L	260	°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.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)(1)

Characteristic	Symbol	Min	Typ(1)	Max	Unit
INPUT LED					
Forward Voltage (I_F = 16 mA) T_A = 0–70°C	V_F	—	1.15	1.4	Volts
T_A = –55°C		—	1.3	—	
T_A = 100°C		—	1.05	—	
Reverse Leakage Current (V_R = 3 V)	I_R	—	0.05	10	µA
Capacitance (V = 0 V, f = 1 MHz)	C_J	—	18	—	pF
OUTPUT TRANSISTOR					
Collector–Emitter Dark Current (V_{CE} = 10 V, T_A = 25°C)	I_{CEO}	—	3	50	nA
(V_{CB} = 30 V, T_A = 70°C)	I_{CEO}	—	0.05	50	µA
Collector–Base Dark Current (V_{CB} = 10 V)	I_{CBO}	—	0.2	20	nA
Collector–Emitter Breakdown Voltage (I_C = 1 mA)	$V_{(BR)CEO}$	30	45	—	Volts
Collector–Base Breakdown Voltage (I_C = 10 µA)	$V_{(BR)CBO}$	70	100	—	Volts
Emitter–Base Breakdown Voltage (I_E = 10 µA)	$V_{(BR)EBO}$	7	7.8	—	Volts
DC Current Gain (I_C = 1 mA, V_{CE} = 5 V) (Typical Value)	h_{FE}	—	600	—	—
Collector–Emitter Capacitance (f = 1 MHz, V_{CE} = 0)	C_{CE}	—	7	—	pF
Collector–Base Capacitance (f = 1 MHz, V_{CB} = 0)	C_{CB}	—	19	—	pF
Emitter–Base Capacitance (f = 1 MHz, V_{EB} = 0)	C_{EB}	—	9	—	pF
COUPLED					
Output Collector Current (I_F = 10 mA, V_{CE} = 10 V)	I_C (CTR)(2)	0.5 (50)	1 (100)	—	mA (%)
Collector–Emitter Saturation Voltage (I_C = 100 µA, I_F = 1 mA)	$V_{CE(sat)}$	—	0.22	0.5	Volts
Turn–On Time (I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω)(3)	t_{on}	—	—	10	µs
Turn–Off Time (I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω)(3)	t_{off}	—	—	10	µs
Rise Time (I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω)(3)	t_r	—	3.8	—	µs
Fall Time (I_C = 2 mA, V_{CC} = 10 V, R_L = 100 Ω)(3)	t_f	—	5.6	—	µs
Isolation Voltage (f = 60 Hz, t = 1 sec)(4)	V_{ISO}	7500	—	—	Vac(pk)
Isolation Resistance (V = 500 V)(4)	R_{ISO}	10^{11}	—	—	Ω
Isolation Capacitance (V = 0 V, f = 1 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 x 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.

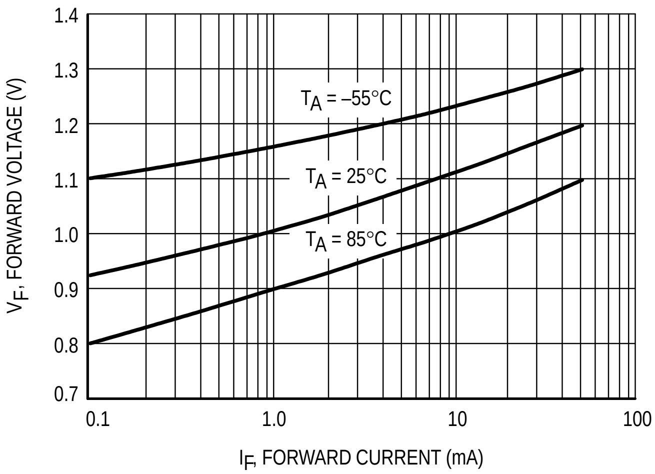


Figure 1. Forward Voltage vs. Forward Current

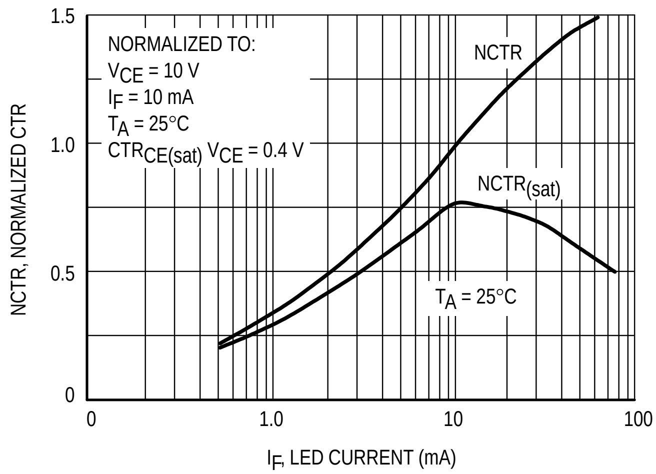


Figure 2. Normalized Non–Saturated and Saturated CTR, T_A = 25°C vs. LED Current

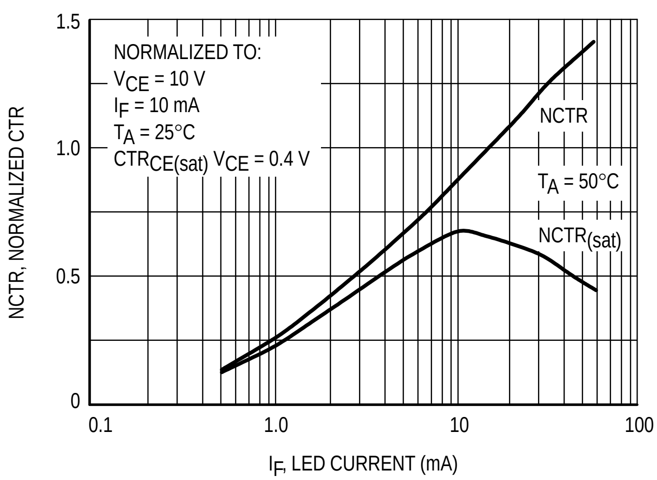


Figure 3. Normalized Non–Saturated and Saturated CTR, T_A = 50°C vs. LED Current

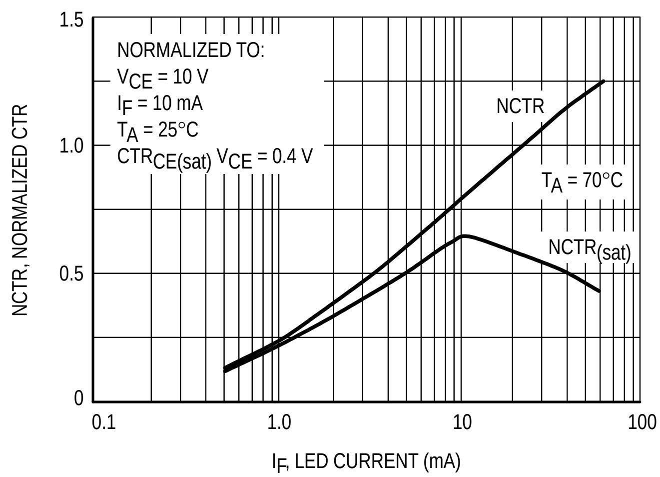


Figure 4. Normalized Non–Saturated and Saturated CTR, T_A = 70°C vs. LED Current

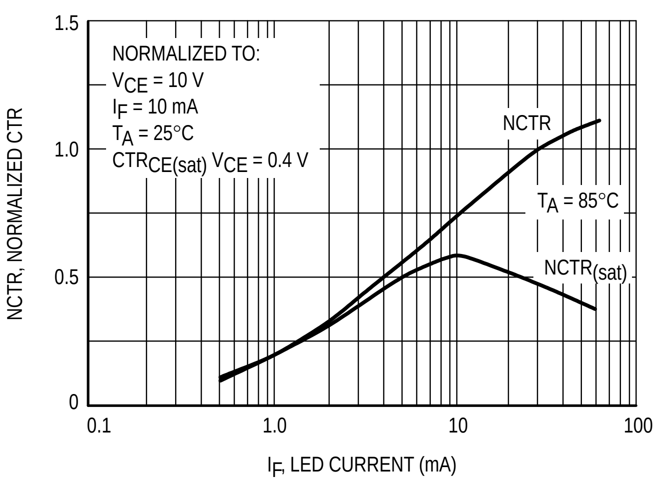


Figure 5. Normalized Non–Saturated and Saturated CTR, T_A = 85°C vs. LED Current

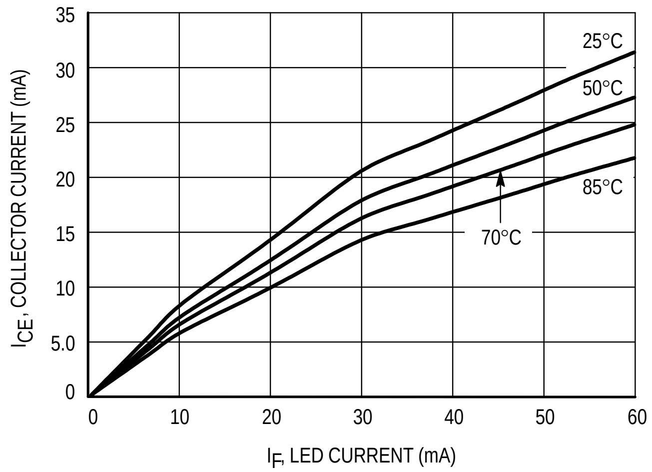


Figure 6. Collector–Emitter Current vs. Temperature and LED Current

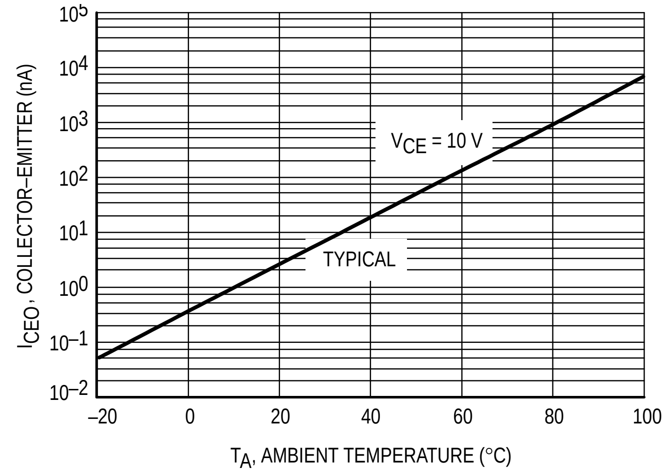


Figure 7. Collector–Emitter Leakage Current vs. Temperature

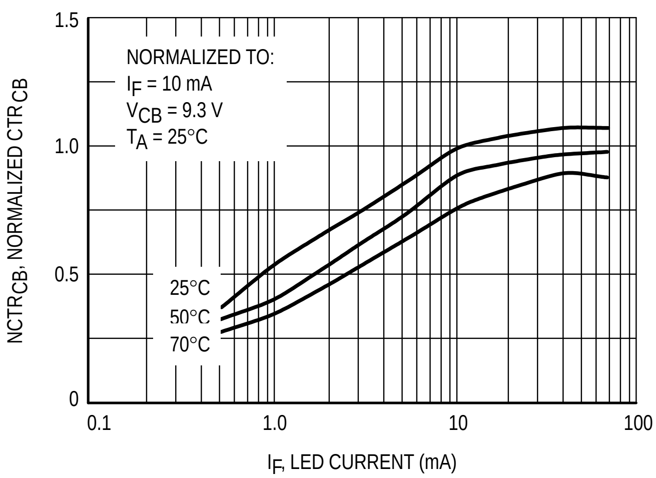


Figure 8. Normalized CTRcb vs. LED Current and Temperature

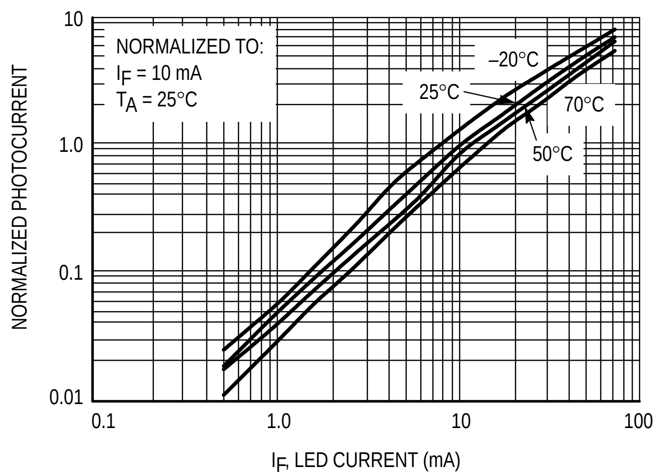


Figure 9. Normalized Photocurrent vs. I_F and Temperature

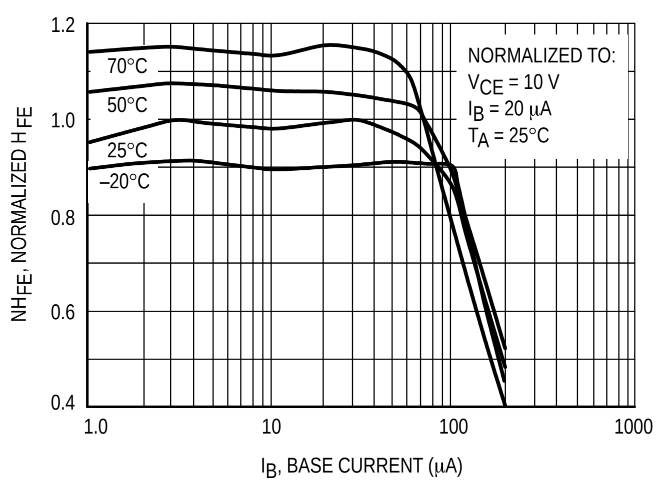


Figure 10. Normalized Non–Saturated H_{FE} vs. Base Current and Temperature

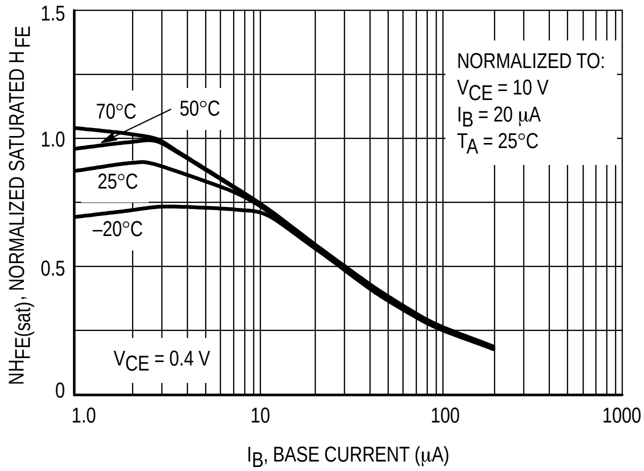


Figure 11. Normalized H_{FE} vs. Base Current and Temperature

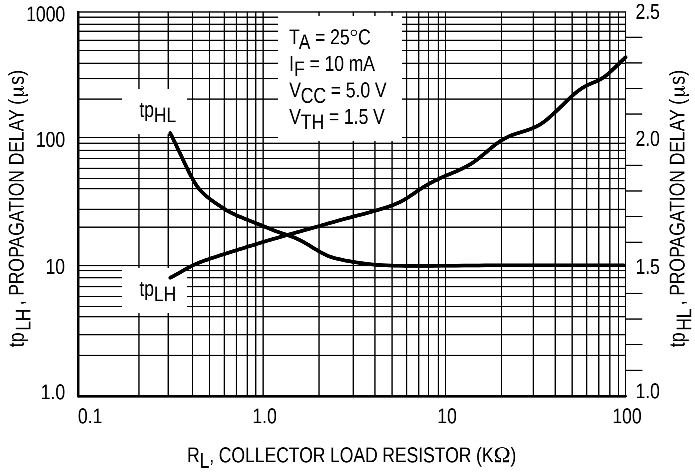


Figure 12. Propagation Delay vs. Collector Load Resistor

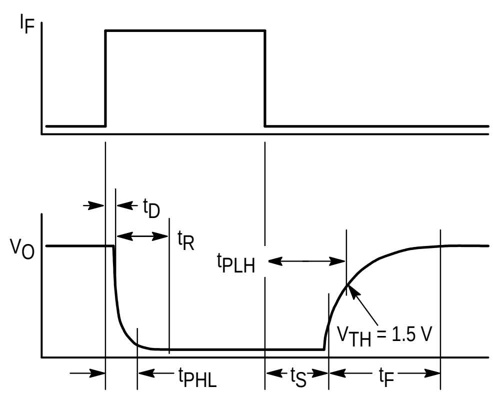
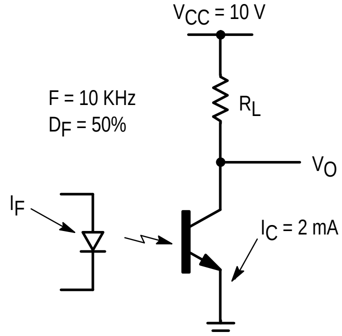
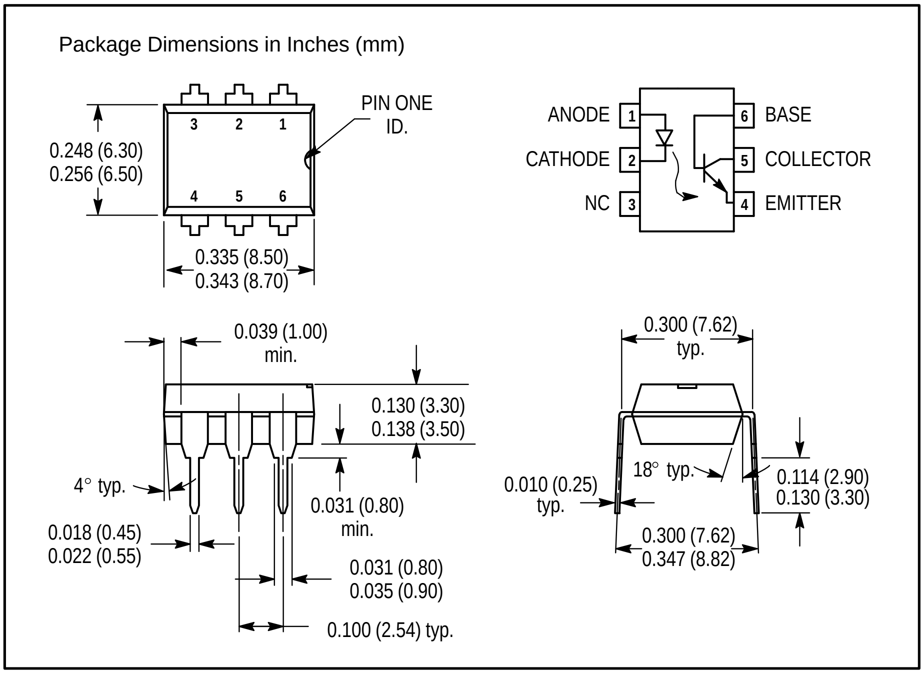


Figure 13. Switching Timing



I_F = As necessary to get I_C = 2 mA

Figure 14. Switching Schematic


Package Dimensions in Inches (mm)
PIN ONE ID.
0.248 (6.30)
0.256 (6.50)
0.335 (8.50)
0.343 (8.70)
ANODE
CATHODE
NC
BASE
COLLECTOR
EMITTER
0.039 (1.00) min.
0.130 (3.30)
0.138 (3.50)
4° typ.
0.031 (0.80) min.
0.018 (0.45)
0.022 (0.55)
0.031 (0.80)
0.035 (0.90)
0.100 (2.54) typ.
0.300 (7.62) typ.
18° typ.
0.010 (0.25) typ.
0.114 (2.90)
0.130 (3.30)
0.300 (7.62)
0.347 (8.82)

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