



M4N37

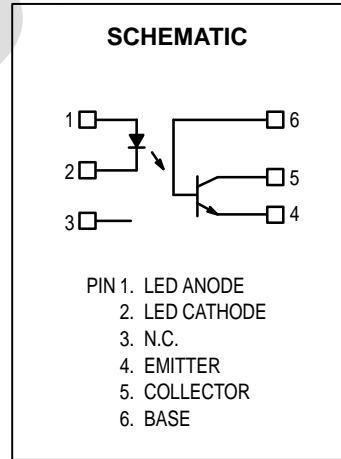
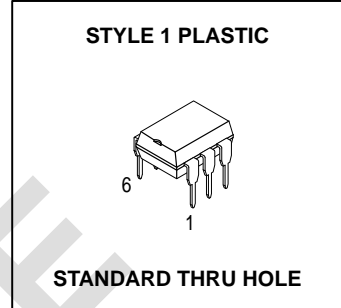
6-Pin DIP Optoisolators Transistor Output

The M4N37 device consists of a gallium arsenide infrared emitting diode optically coupled to a monolithic silicon phototransistor detector.

- Current Transfer Ratio — 100% Minimum @ Specified Conditions
- Guaranteed Switching Speeds
- Meets or Exceeds All JEDEC Registered Specifications

Applications

- General Purpose Switching Circuits
- Interfacing and coupling systems of different potentials and impedances
- Regulation Feedback Circuits
- Monitor & Detection Circuits
- Solid State Relays



MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
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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	mW
		1.41	mW/°C

OUTPUT TRANSISTOR

Collector–Emitter Voltage	V _{CEO}	30	Volts
Emitter–Base Voltage	V _{EBO}	7	Volts
Collector–Base Voltage	V _{CB0}	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	150	mW
		1.76	mW/°C

TOTAL DEVICE

Isolation Source 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	mW
		2.94	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.

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

Characteristic	Symbol	Min	Typ ⁽¹⁾	Max	Unit	
INPUT LED						
Forward Voltage (I _F = 10 mA)	V _F	T _A = 25°C	0.8	1.15	1.5	Volts
		T _A = -55°C	0.9	1.3	1.7	
		T _A = 100°C	0.7	1.05	1.4	
Reverse Leakage Current (V _R = 6 V)	I _R	—	—	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) (V _{CE} = 30 V, T _A = 100°C)	I _{CEO}	— —	1 —	50 500	nA μA
Collector–Base Dark Current (V _{CB} = 10 V)	I _{CBO}	—	0.2 100	20 —	nA
Collector–Emitter Breakdown Voltage (I _C = 1 mA)	V _{(BR)CEO}	30	45	—	Volts
Collector–Base Breakdown Voltage (I _C = 100 μA)	V _{(BR)CBO}	70	100	—	Volts
Emitter–Base Breakdown Voltage (I _E = 100 μA)	V _{(BR)EBO}	7	7.8	—	Volts
DC Current Gain (I _C = 2 mA, V _{CE} = 5 V)	h _{FE}	—	400	—	—
Collector–Emitter Capacitance (f = 1 MHz, V _{CE} = 0)	C _{CCE}	—	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)	T _A = 25°C T _A = -55°C T _A = 100°C	I _C (CTR) ⁽²⁾	10 (100) 4 (40) 4 (40)	30 (300) — —	— — —	mA (%)
Collector–Emitter Saturation Voltage (I _C = 0.5 mA, I _F = 10 mA)		V _{CE(sat)}	—	0.14	0.3	Volts
Turn-On Time	(I _C = 2 mA, V _{CC} = 10 V, R _L = 100 Ω) ⁽³⁾	t _{on}	—	7.5	10	μs
Turn-Off Time		t _{off}	—	5.7	10	
Rise Time		t _r	—	3.2	—	
Fall Time		t _f	—	4.7	—	
Isolation Voltage (f = 60 Hz, t = 1 sec)		V _{ISO}	7500	—	—	Vac(pk)
Isolation Current ⁽⁴⁾ (V _{I-O} = 1500 Vpk)		I _{ISO}	—	8	100	μA
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 × 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.

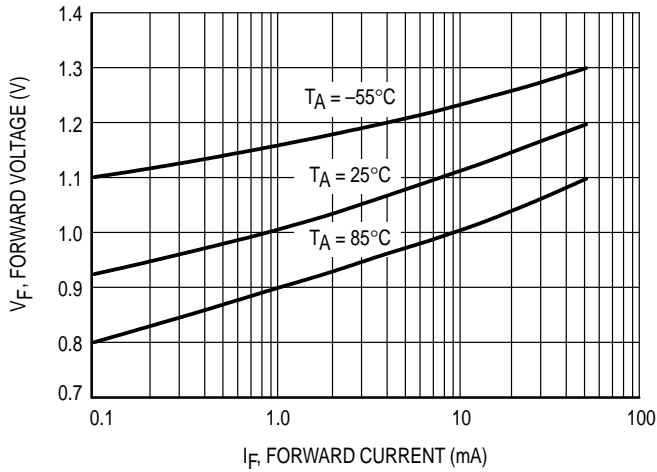


Figure 1. Forward Voltage vs. Forward Current

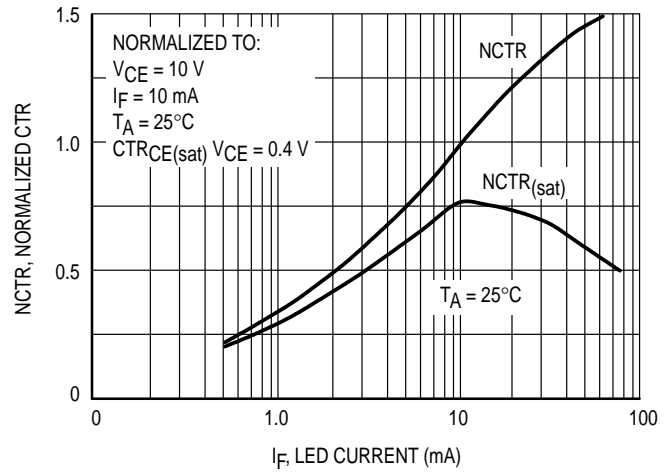


Figure 2. Normalized Non-Saturated and Saturated CTR, $T_A = 25^\circ\text{C}$ vs. LED Current

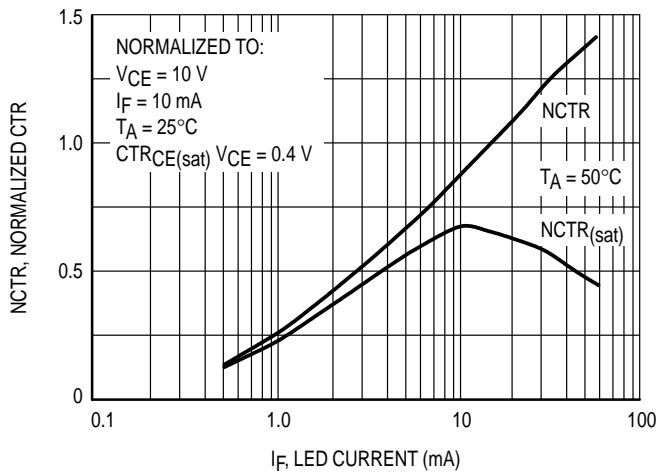


Figure 3. Normalized Non-Saturated and Saturated CTR, $T_A = 50^\circ\text{C}$ vs. LED Current

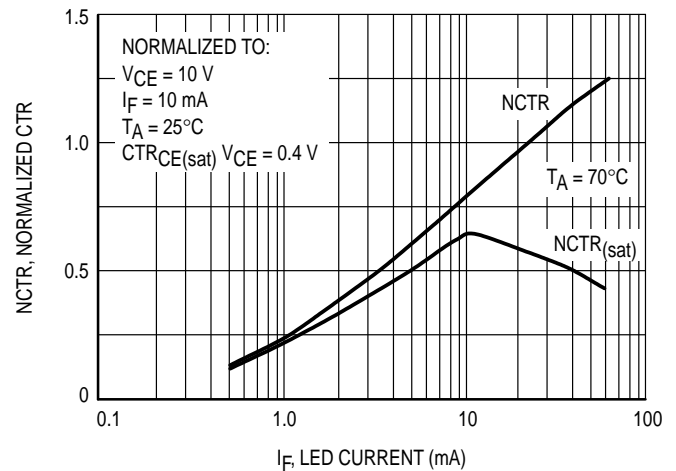


Figure 4. Normalized Non-Saturated and Saturated CTR, $T_A = 70^\circ\text{C}$ vs. LED Current

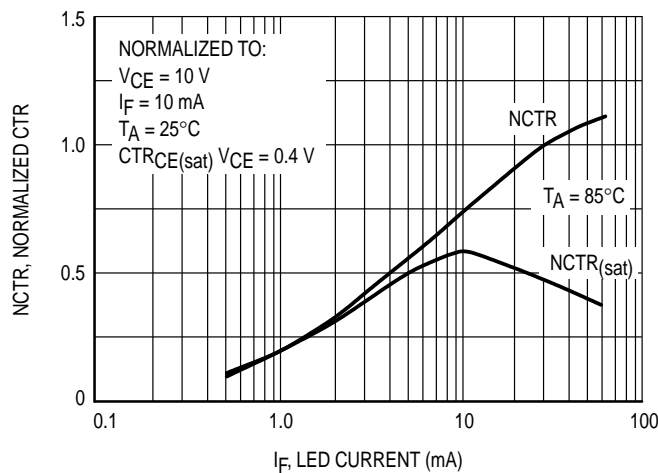


Figure 5. Normalized Non-Saturated and Saturated CTR, $T_A = 85^\circ\text{C}$ vs. LED Current

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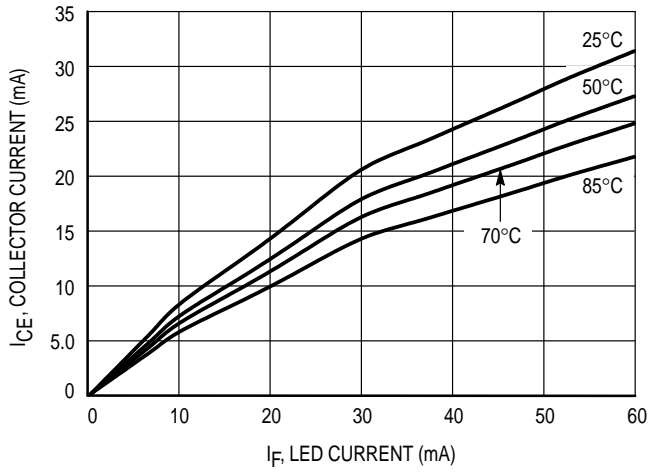


Figure 6. Collector-Emitter Current vs. Temperature and LED Current

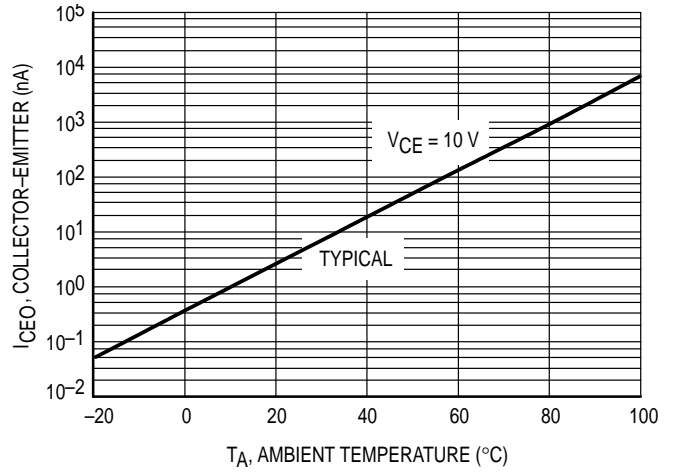


Figure 7. Collector-Emitter Leakage Current vs. Temperature

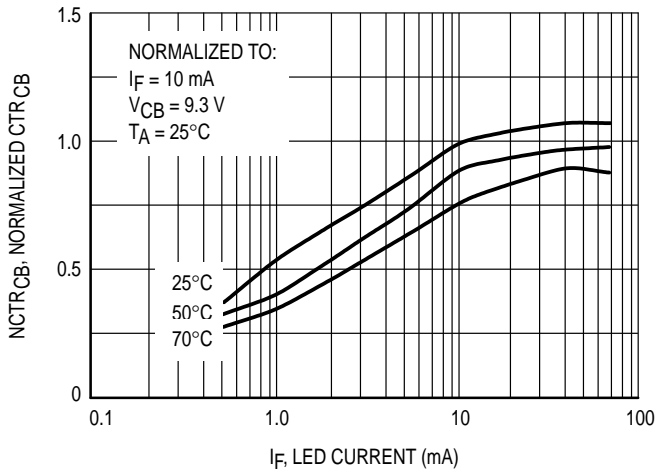


Figure 8. Normalized CTR_{cb} vs. LED Current and Temperature

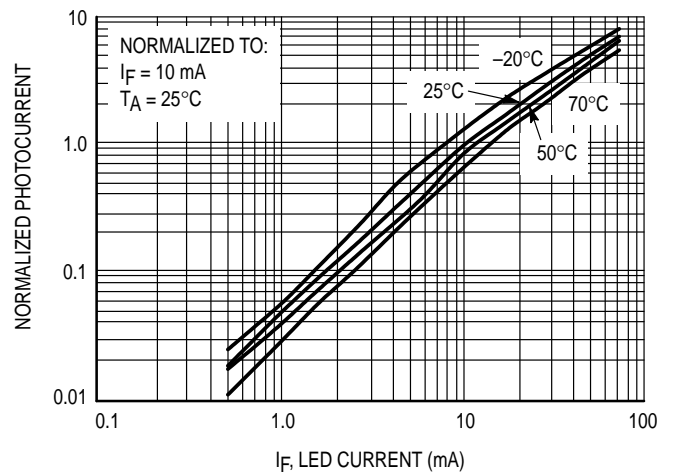


Figure 9. Normalized Photocurrent vs. I_F and Temperature

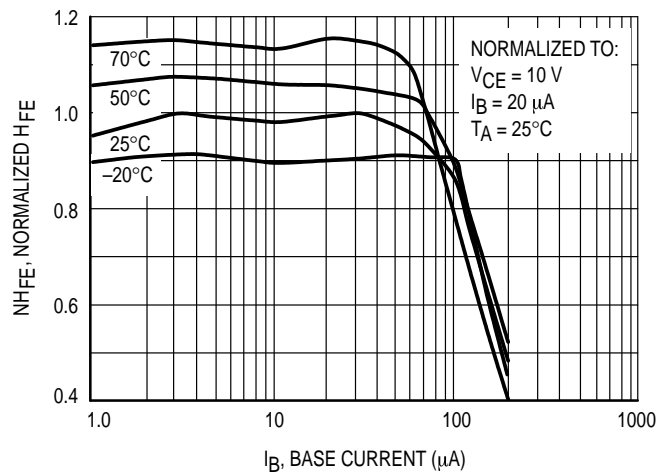


Figure 10. Normalized Non-Saturated H_{FE} vs. Base Current and Temperature

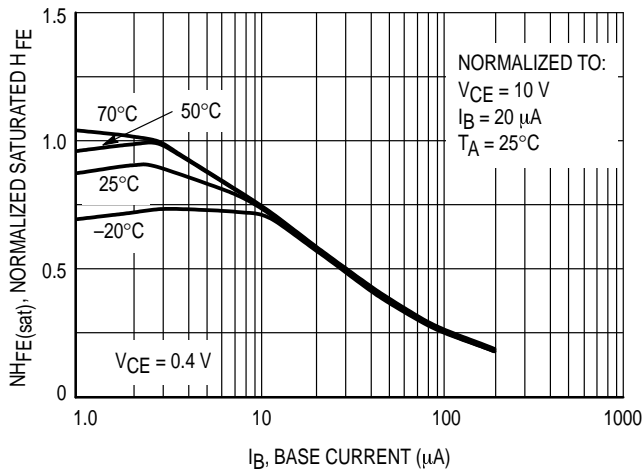


Figure 11. Normalized H_{FE} vs. Base Current and Temperature

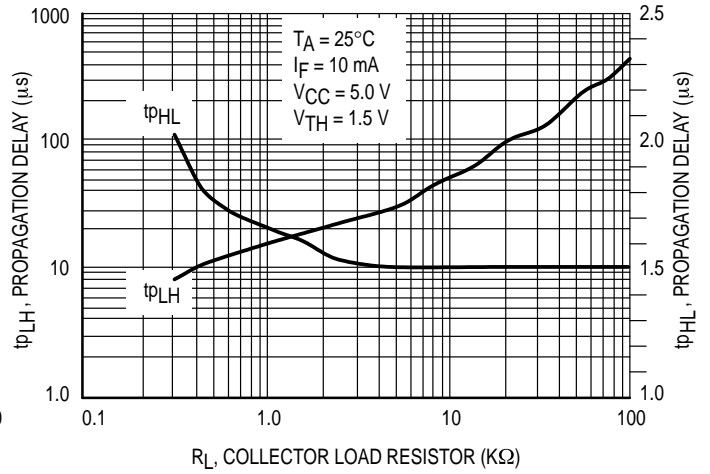


Figure 12. Propagation Delay vs. Collector Load Resistor

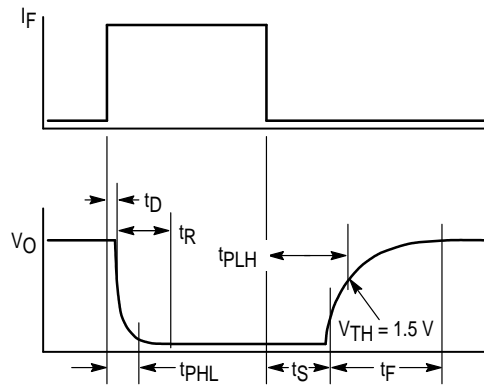


Figure 13. Switching Timing

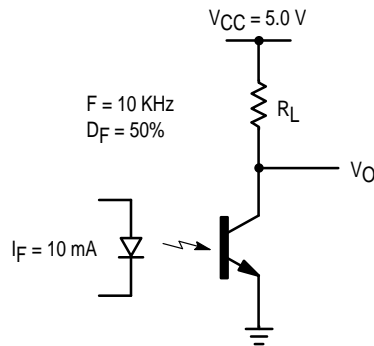
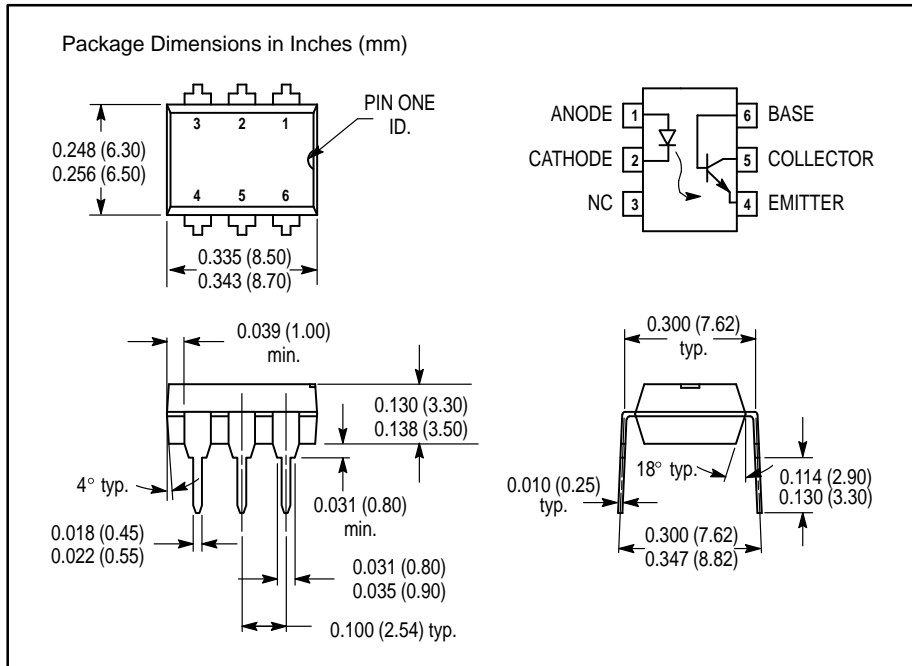



Figure 14. Switching Schematic

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