



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 ($T_A = 25^\circ\text{C}$ 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 @ $T_A = 25^\circ\text{C}$ with Negligible Power in Output Detector Derate above 25°C	P_D	100 1.41	mW mW/ $^\circ\text{C}$

OUTPUT TRANSISTOR

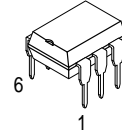
Collector–Emitter Voltage	V_{CEO}	30	Volts
Emitter–Base Voltage	V_{EBO}	7	Volts
Collector–Base Voltage	V_{CB0}	70	Volts
Collector Current — Continuous	I_C	50	mA
Detector Power Dissipation @ $T_A = 25^\circ\text{C}$ with Negligible Power in Input LED Derate above 25°C	P_D	150 1.76	mW mW/ $^\circ\text{C}$

TOTAL DEVICE

Isolation Source Voltage ⁽¹⁾ (Peak ac Voltage, 60 Hz, 1 sec Duration)	V_{ISO}	7500	Vac(pk)
Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$ 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	$^\circ\text{C}$

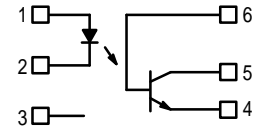
1. Isolation surge voltage is an internal device dielectric breakdown rating.
For this test, Pins 1 and 2 are common, and Pins 4, 5 and 6 are common.
2. Refer to Quality and Reliability Section in Opto Data Book for information on test conditions.

STYLE 1 PLASTIC



STANDARD THRU HOLE

SCHEMATIC



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

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

Characteristic	Symbol	Min	Typ ⁽¹⁾	Max	Unit	
INPUT LED						
Forward Voltage ($I_F = 10\text{ mA}$)	V_F	$T_A = 25^\circ\text{C}$	0.8	1.15	1.5	Volts
		$T_A = -55^\circ\text{C}$	0.9	1.3	1.7	
		$T_A = 100^\circ\text{C}$	0.7	1.05	1.4	
Reverse Leakage Current ($V_R = 6\text{ V}$)	I_R	—	—	10	μA	
Capacitance ($V = 0\text{ V}$, $f = 1\text{ MHz}$)	C_J	—	18	—	pF	

OUTPUT TRANSISTOR

Collector–Emitter Dark Current ($V_{CE} = 10\text{ V}$, $T_A = 25^\circ\text{C}$)	I_{CEO}	—	1	50	nA
($V_{CE} = 30\text{ V}$, $T_A = 100^\circ\text{C}$)		—	—	500	μA
Collector–Base Dark Current ($V_{CB} = 10\text{ V}$)	I_{CBO}	—	0.2 100	20 —	nA
$T_A = 25^\circ\text{C}$					
$T_A = 100^\circ\text{C}$					
Collector–Emitter Breakdown Voltage ($I_C = 1\text{ mA}$)	$V_{(BR)CEO}$	30	45	—	Volts
Collector–Base Breakdown Voltage ($I_C = 100\text{ }\mu\text{A}$)	$V_{(BR)CBO}$	70	100	—	Volts
Emitter–Base Breakdown Voltage ($I_E = 100\text{ }\mu\text{A}$)	$V_{(BR)EBO}$	7	7.8	—	Volts
DC Current Gain ($I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$)	h_{FE}	—	400	—	—
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 ($I_F = 10\text{ mA}$, $V_{CE} = 10\text{ V}$)	$T_A = 25^\circ\text{C}$ $T_A = -55^\circ\text{C}$ $T_A = 100^\circ\text{C}$	I_C (CTR) ⁽²⁾	10 (100) 4 (40) 4 (40)	30 (300) — —	— — —	mA (%)
Collector–Emitter Saturation Voltage ($I_C = 0.5\text{ mA}$, $I_F = 10\text{ mA}$)		$V_{CE(sat)}$	—	0.14	0.3	Volts
Turn–On Time	$(I_C = 2\text{ mA}$, $V_{CC} = 10\text{ V}$, $R_L = 100\text{ }\Omega$) ⁽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 ($f = 60\text{ Hz}$, $t = 1\text{ sec}$)		V_{ISO}	7500	—	—	Vac(pk)
Isolation Current ⁽⁴⁾ ($V_{I-O} = 1500\text{ Vpk}$)		I_{ISO}	—	8	100	μA
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.

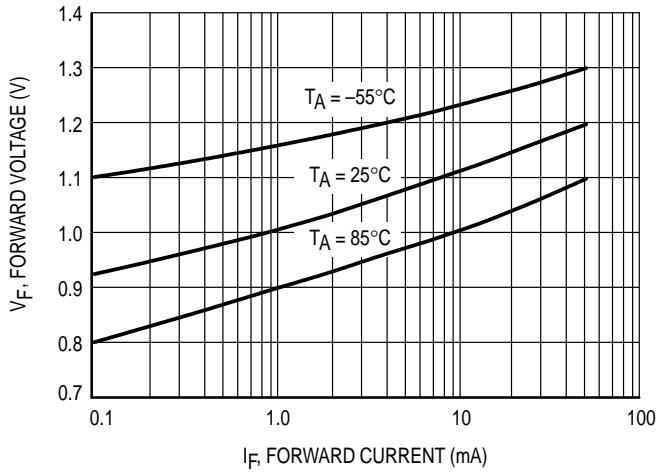


Figure 1. Forward Voltage vs. Forward Current

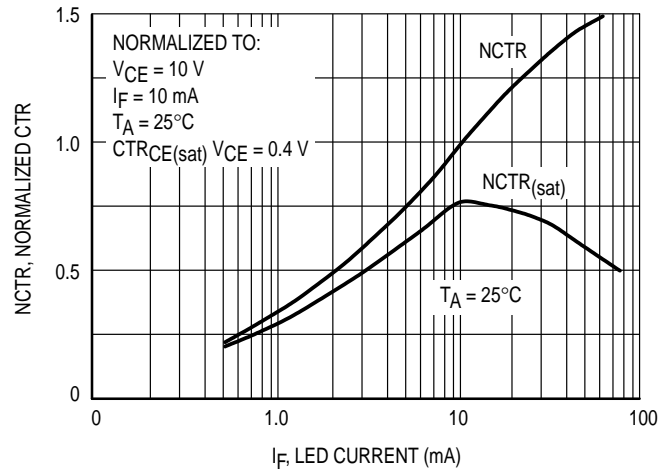


Figure 2. Normalized Non-Saturated and Saturated CTR, $T_A = 25^\circ\text{C}$ vs. LED Current

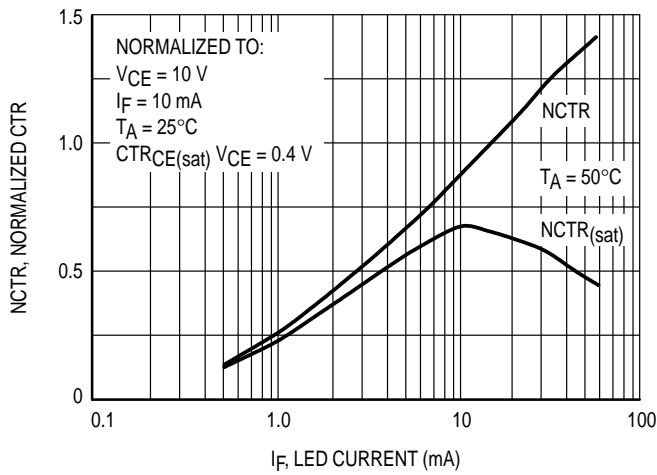


Figure 3. Normalized Non-Saturated and Saturated CTR, $T_A = 50^\circ\text{C}$ vs. LED Current

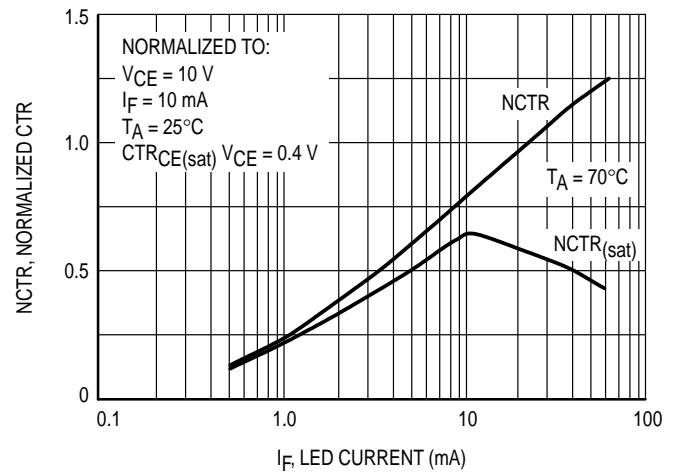


Figure 4. Normalized Non-Saturated and Saturated CTR, $T_A = 70^\circ\text{C}$ vs. LED Current

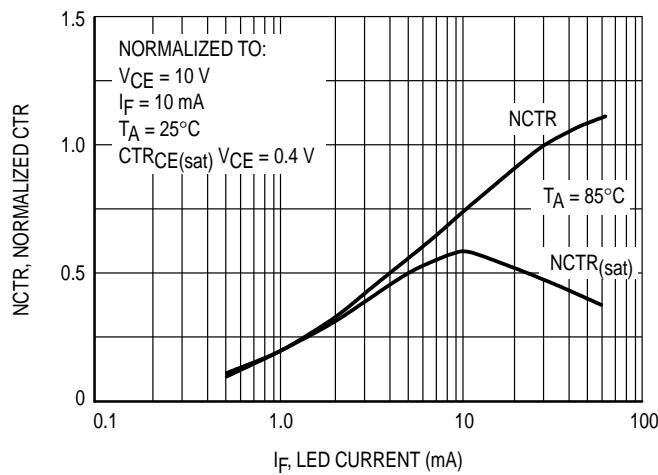


Figure 5. Normalized Non-Saturated and Saturated CTR, $T_A = 85^\circ\text{C}$ vs. LED Current

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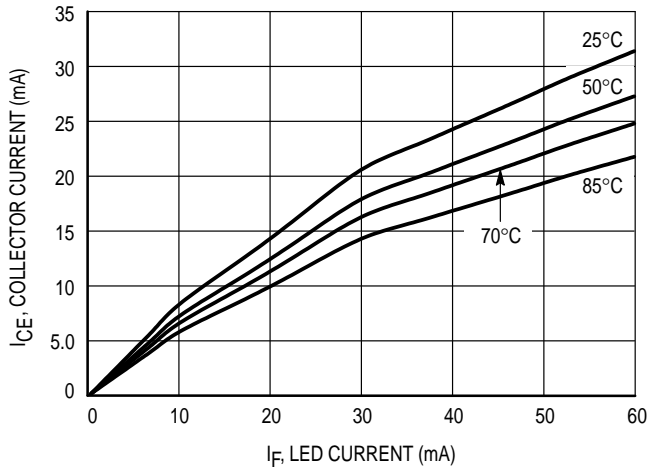


Figure 6. Collector–Emitter Current vs. Temperature and LED Current

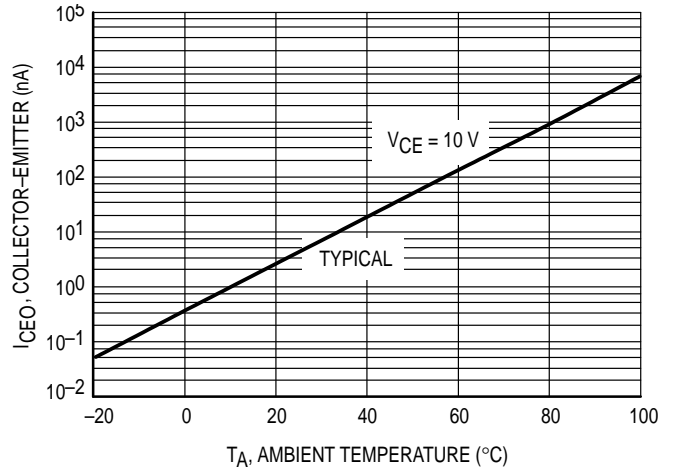


Figure 7. Collector–Emitter Leakage Current vs. Temperature

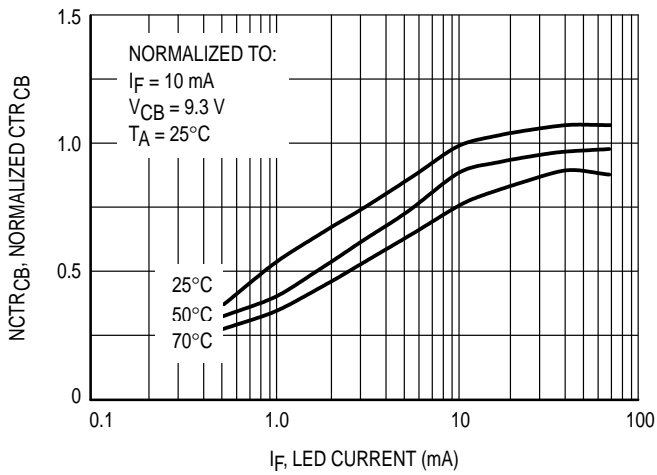


Figure 8. Normalized CTR_{cb} vs. LED Current and Temperature

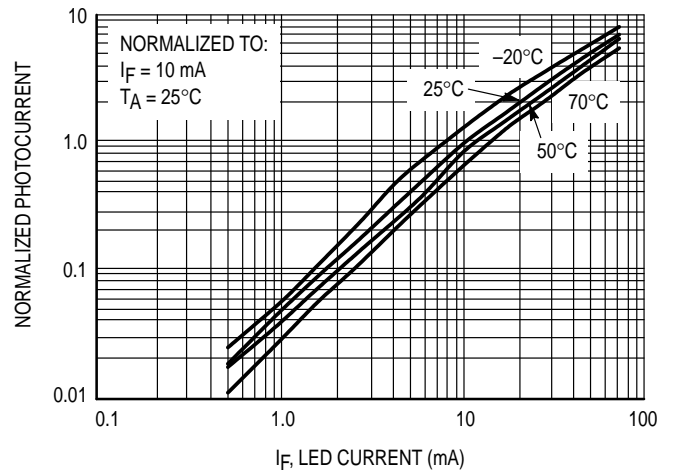


Figure 9. Normalized Photocurrent vs. I_F and Temperature

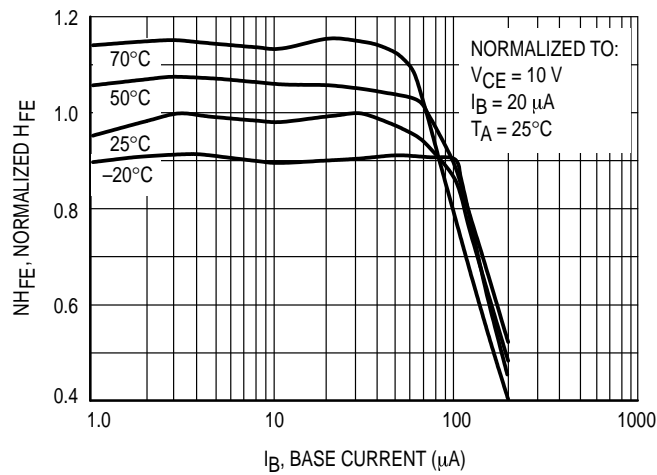


Figure 10. Normalized Non–Saturated H_{FE} vs. Base Current and Temperature

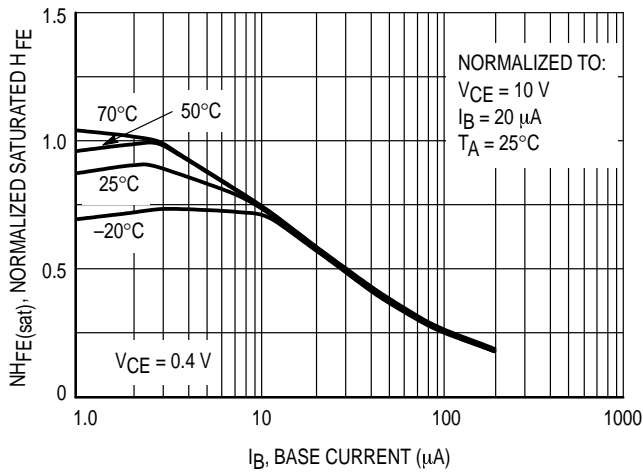


Figure 11. Normalized H_{FE} vs. Base Current and Temperature

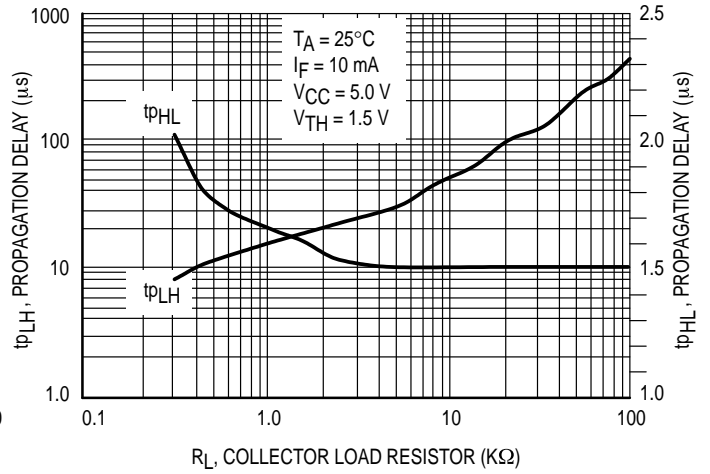


Figure 12. Propagation Delay vs. Collector Load Resistor

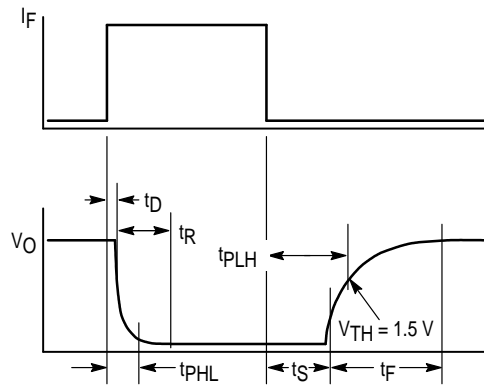


Figure 13. Switching Timing

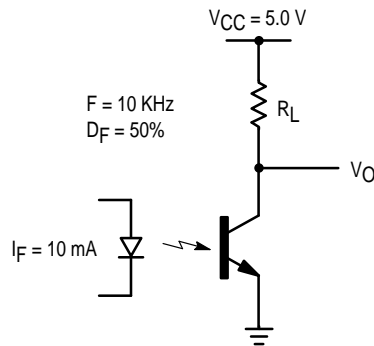
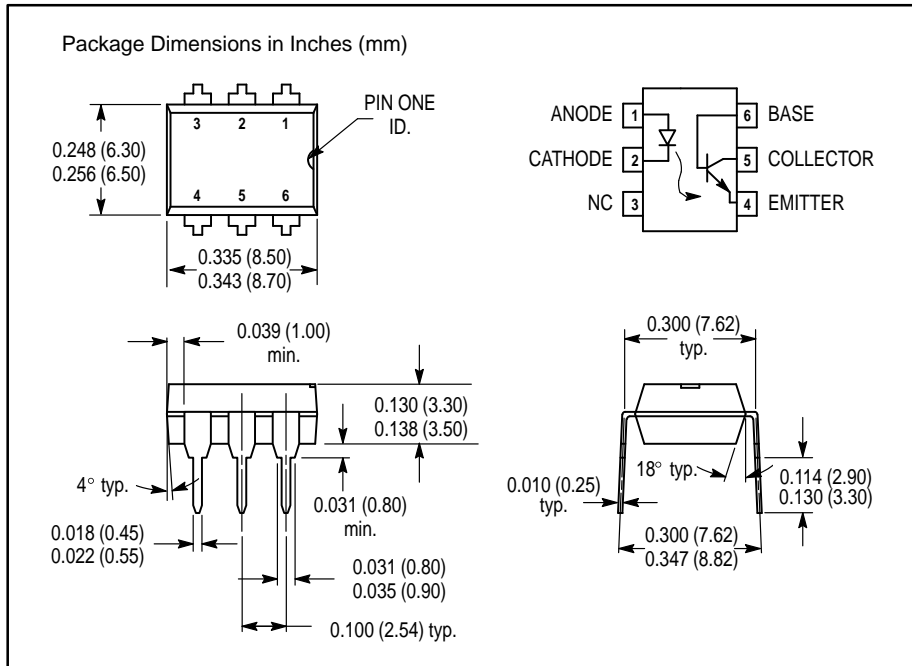



Figure 14. Switching Schematic

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