



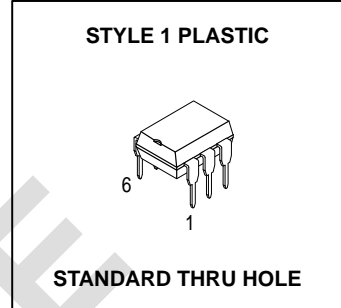
6-Pin DIP Optoisolators Transistor Output

The M4N25 device consists of a gallium arsenide infrared emitting diode optically coupled to a silicon NPN phototransistor detector.

- Most Economical Optoisolator Choice for Medium Speed, Switching Applications
- Meets or Exceeds All JEDEC Registered Specifications

Applications

- General Purpose Switching Circuits
- Interfacing and coupling systems of different potentials and impedances
- I/O Interfacing
- Solid State Relays



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

Rating	Symbol	Value	Unit
INPUT LED			
Reverse Voltage	V _R	3	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

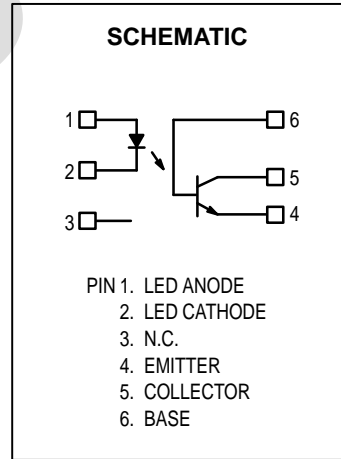
OUTPUT TRANSISTOR

Collector–Emitter Voltage	V _{CEO}	30	Volts
Emitter–Collector Voltage	V _{ECO}	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	150	mW
		1.76	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.



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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	—	1.15	1.5	Volts
T _A = 25°C		—	1.3	—	
T _A = -55°C		—	1.05	—	
Reverse Leakage Current (V _R = 3 V)	I _R	—	—	100	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}	—	1	50	nA
	I _{CEO}	—	1	—	μA
(V _{CE} = 10 V, T _A = 100°C)					
Collector–Base Dark Current (V _{CB} = 10 V)	I _{CBO}	—	0.2	—	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–Collector Breakdown Voltage (I _E = 100 μA)	V _{(BR)ECO}	7	7.8	—	Volts
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⁾	2 (20)	7 (70)	—	mA (%)
Collector–Emitter Saturation Voltage (I _C = 2 mA, I _F = 50 mA)	V _{CE(sat)}	—	0.15	0.5	Volts
Turn–On Time (I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω) ⁽³⁾	t _{on}	—	2.8	—	μs
Turn–Off Time (I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω) ⁽³⁾	t _{off}	—	4.5	—	μs
Rise Time (I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω) ⁽³⁾	t _r	—	2	—	μs
Fall Time (I _F = 10 mA, V _{CC} = 10 V, R _L = 100 Ω) ⁽³⁾	t _f	—	2	—	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	—	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.

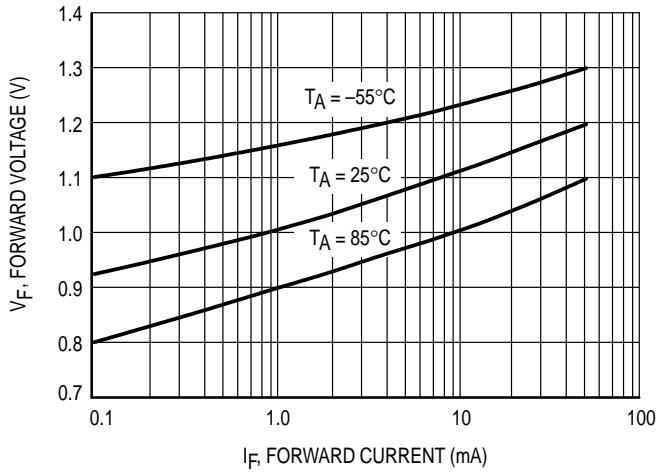


Figure 1. Forward Voltage vs. Forward Current

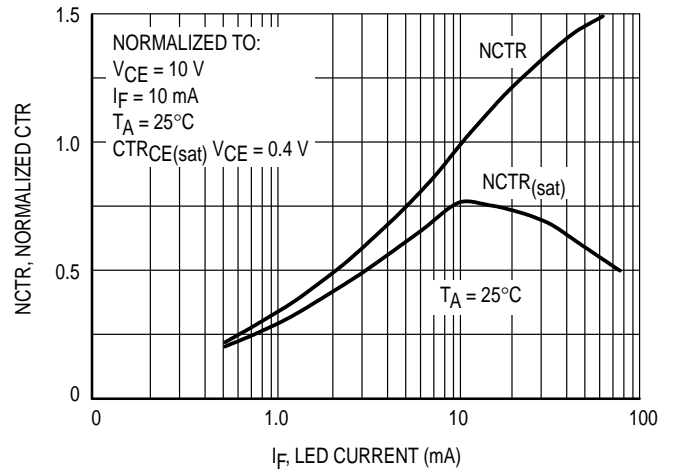


Figure 2. Normalized Non-Saturated and Saturated CTR, $T_A = 25^\circ\text{C}$ vs. LED Current

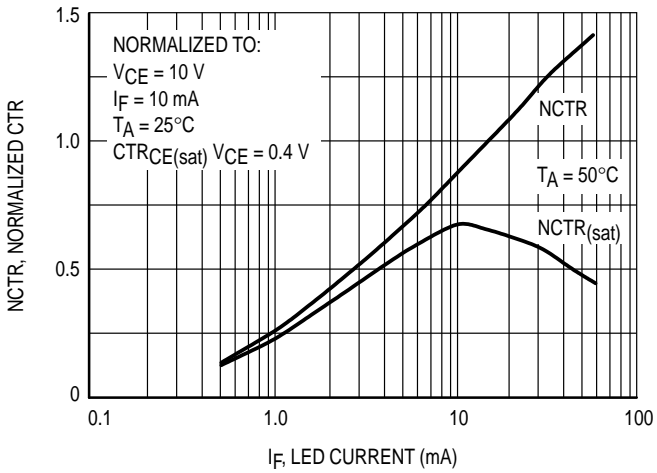


Figure 3. Normalized Non-Saturated and Saturated CTR, $T_A = 50^\circ\text{C}$ vs. LED Current

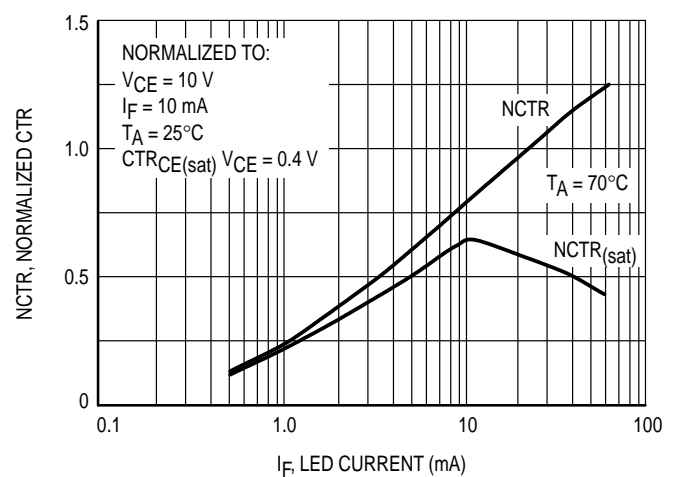


Figure 4. Normalized Non-Saturated and Saturated CTR, $T_A = 70^\circ\text{C}$ vs. LED Current

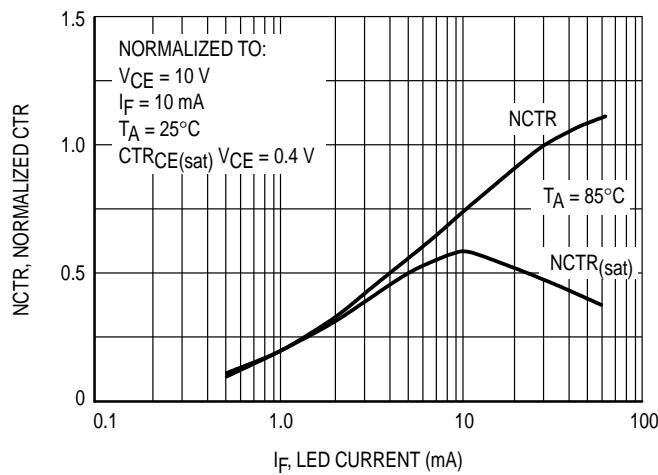


Figure 5. Normalized Non-Saturated and Saturated CTR, $T_A = 85^\circ\text{C}$ vs. LED Current

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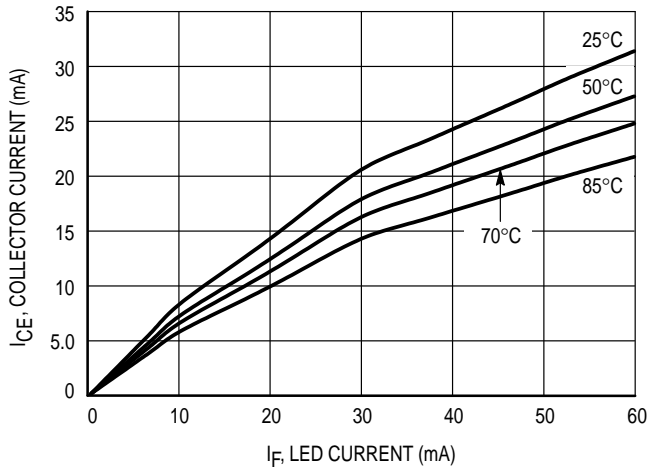


Figure 6. Collector-Emitter Current vs. Temperature and LED Current

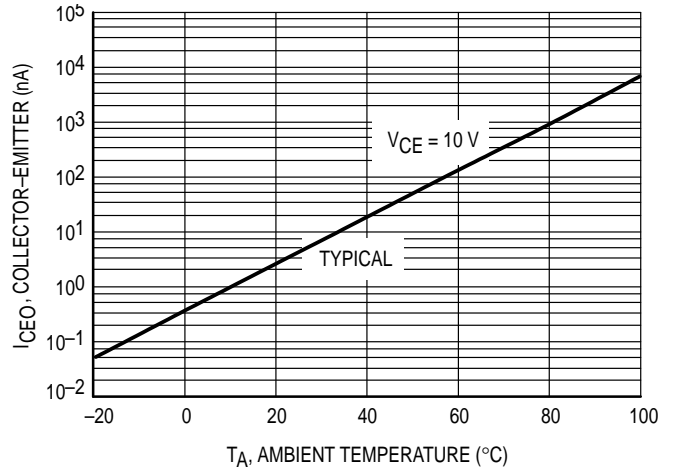


Figure 7. Collector-Emitter Leakage Current vs. Temperature

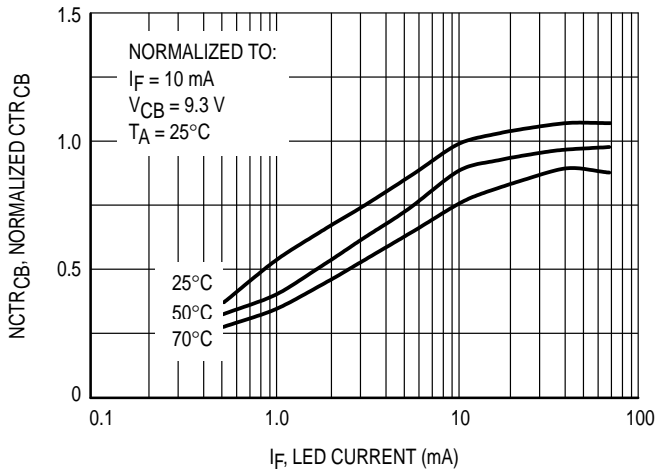


Figure 8. Normalized CTR_{cb} vs. LED Current and Temperature

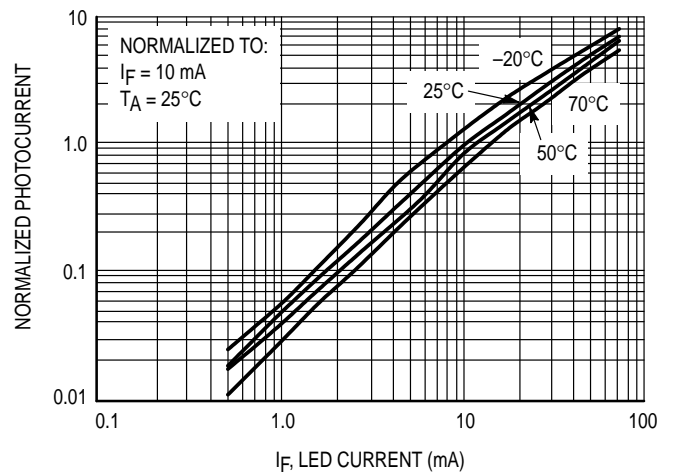


Figure 9. Normalized Photocurrent vs. I_F and Temperature

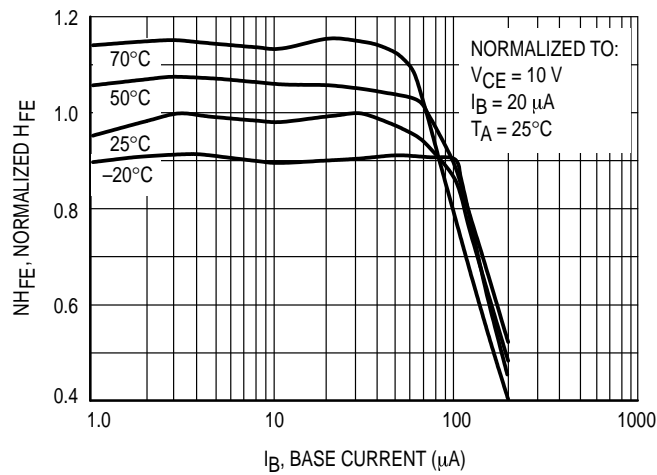


Figure 10. Normalized Non-Saturated H_{FE} vs. Base Current and Temperature

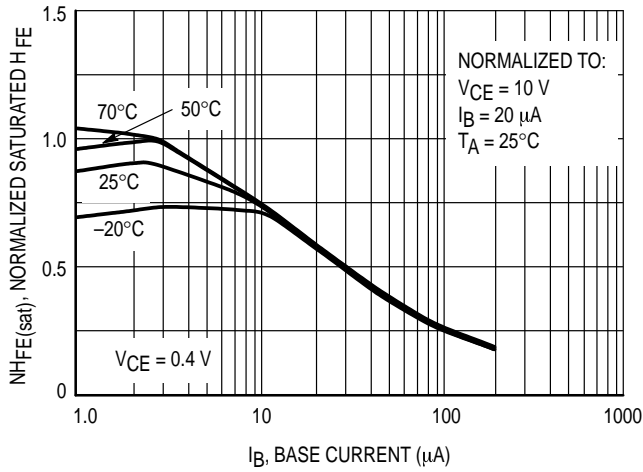


Figure 11. Normalized H_{FE} vs. Base Current and Temperature

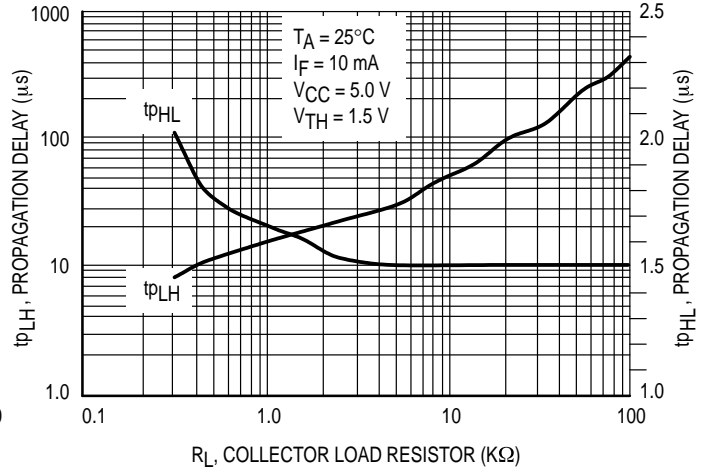


Figure 12. Propagation Delay vs. Collector Load Resistor

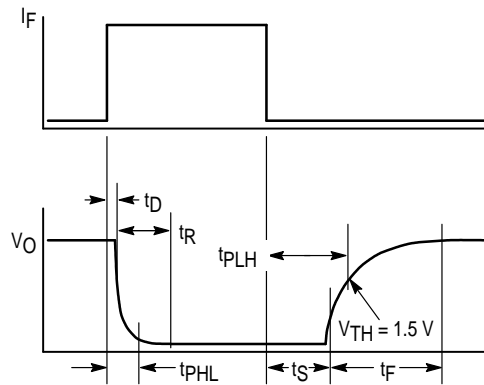


Figure 13. Switching Timing

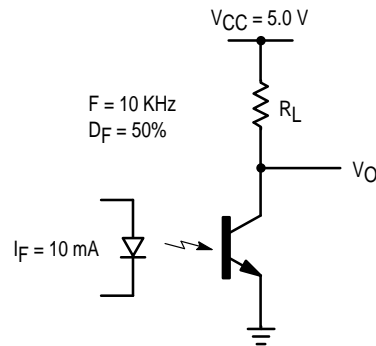
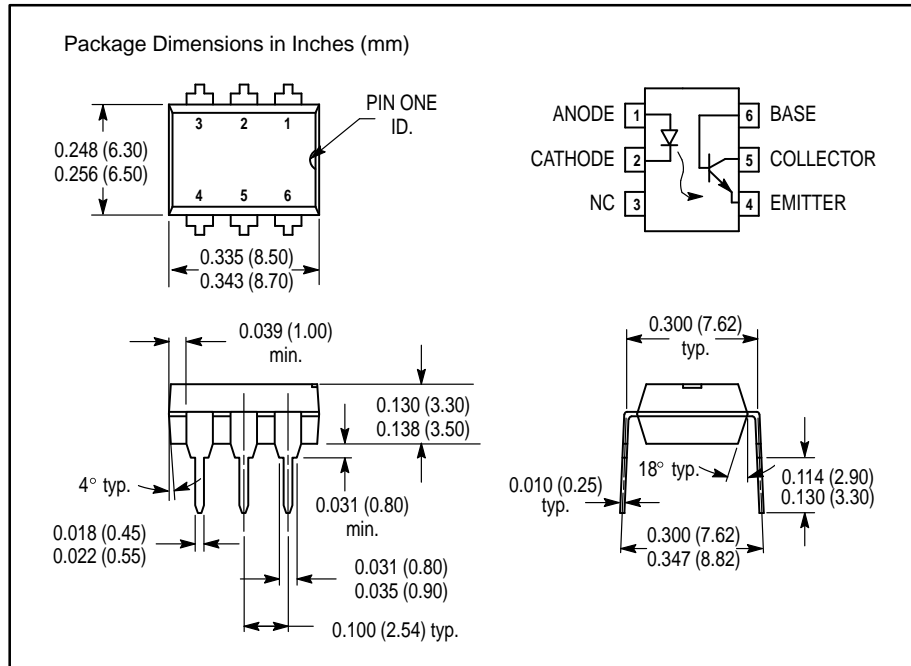



Figure 14. Switching Schematic

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