

**TIL118-1, TIL118-2, TIL118-3
OPTOCOUPLED**

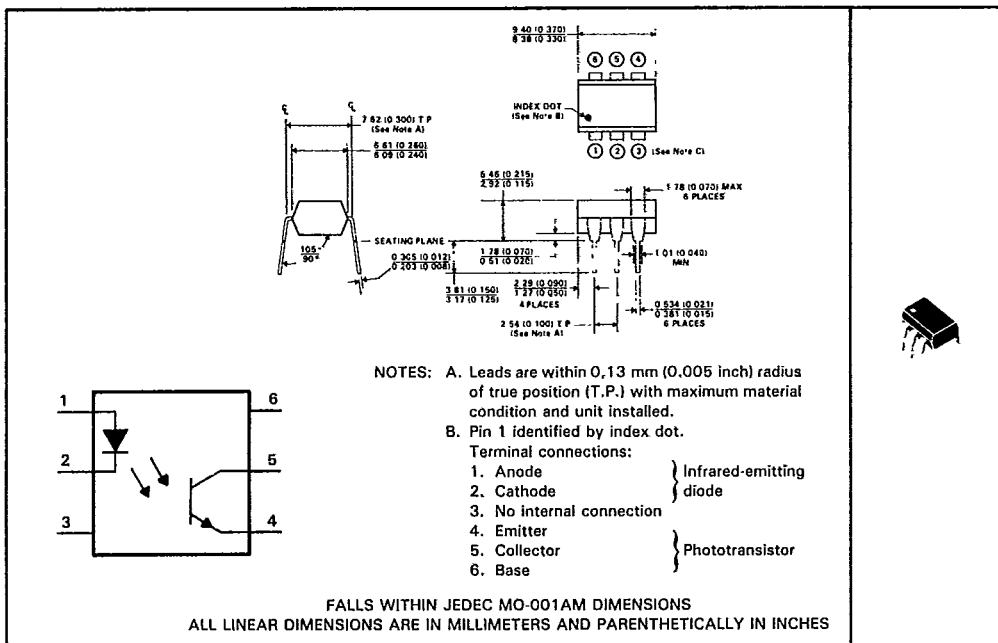
D1607, NOVEMBER 1973—REVISED JULY 1989

- Gallium Arsenide Diode Infrared Source Optically Coupled to a Silicon N-P-N Phototransistor
- High Direct-Current Transfer Ratio
- High-Voltage Electrical Isolation . . . 3.53 kV
- Plastic Dual-In-Line Package
- High-Speed Switching: $t_r = 2 \mu s$, $t_f = 2 \mu s$ Typical
- Choice of Three Current Transfer Ratios
- No Base Lead Connection for High EMI Environment

T-41-83

mechanical data

The package consists of a gallium arsenide infrared-emitting diode and an n-p-n silicon phototransistor mounted on a 6-lead frame encapsulated within an electrically nonconductive plastic compound. The case will withstand soldering temperature with no deformation and device performance characteristics remain stable when operated in high-humidity conditions. Unit weight is approximately 0.52 grams.



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Optocouplers (Isolators)

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**TIL118-1, TIL118-2, TIL118-3
OPTOCOUPERS**

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absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Input-to-output voltage	±3.535 kV peak or dc (±2.5 kV rms)
Collector-emitter voltage (see Note 1)	30 V
Emitter-collector voltage	7 V
Input diode reverse voltage	3 V
Input diode continuous forward current at (or below) 25°C free-air temperature (see Note 2)	100 mA
Continuous power dissipation at (or below) 25°C free-air temperature:	
Infrared-emitting diode (see Note 3)	150 mW
Phototransistor (see Note 3)	150 mW
Total, infrared-emitting diode plus phototransistor, (see Note 4)	250 mW
Storage temperature range	-55°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C

- NOTES: 1. This value applies when the base-emitter diode is open circuited.
 2. Derate linearly to 100°C free-air temperature at the rate of 1.33 mW/°C.
 3. Derate linearly to 100°C free-air temperature at the rate of 2 mW/°C.
 4. Derate linearly to 100°C free-air temperature at the rate of 3.33 mW/°C.

electrical characteristics at 25°C free-air temperature

3 Optocouplers (isolators)

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
V _{(BR)CEO}	Collector-emitter breakdown voltage	I _C = 1 mA, I _B = 0, I _F = 0			30			V
	Emitter-collector breakdown voltage	I _E = 10 μA, I _F = 0			7			V
I _{C(on)}	On-state collector current	Phototransistor operation	TIL118-1 TIL118-2 TIL118-3	V _{CE} = 5 V, I _F = 10 mA, I _B = 0				
						2		
						5		
						10		mA
I _{C(off)}	Off-state collector current	Phototransistor operation		V _{CE} = 5 V, I _F = 0, I _B = 0		1	100	nA
V _F	Input diode static forward voltage			I _F = 10 mA		1.2	1.5	V
V _{CE(sat)}	Collector-emitter saturation voltage			I _C = 2 mA, I _F = 10 mA, I _B = 0			0.4	V
r _{IO}	Input-to-output internal resistance			V _{in-out} = ±500 V, See Note 5	10 ¹¹			Ω
C _{io}	Input-to-output capacitance			V _{in-out} = 0, f = 1 MHz, See Note 5		1	2	pF

NOTE 5: These parameters are measured between both input-diode leads shorted together and all the phototransistor leads shorted together.

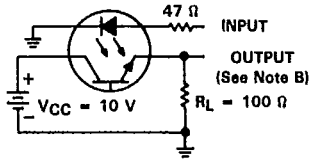
switching characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
t _r	Rise time	Phototransistor operation	V _{CC} = 10 V, I _{C(on)} = 2 mA, R _L = 100 Ω, See Figure 1		2	15		μs
t _f	Fall time				2	15		

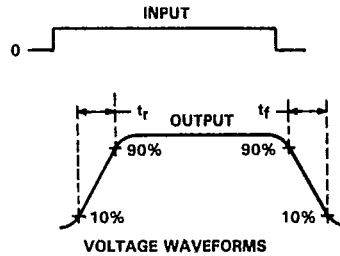
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PARAMETER MEASUREMENT INFORMATION

Adjust amplitude of input pulse for:
 $I_{C(on)} = 2 \text{ mA}$



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The input waveform is supplied by a generator with the following characteristics: $Z_{out} = 50 \Omega$, $t_r \leq 15 \text{ ns}$, duty cycle = 1%, $t_w = 100 \mu\text{s}$.
B. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r \leq 12 \text{ ns}$, $R_{in} \geq 1 \text{ M}\Omega$, $C_{in} \leq 20 \text{ pF}$.

FIGURE 1. SWITCHING TIMES

TYPICAL CHARACTERISTICS

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Optocouplers (Isolators)

COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

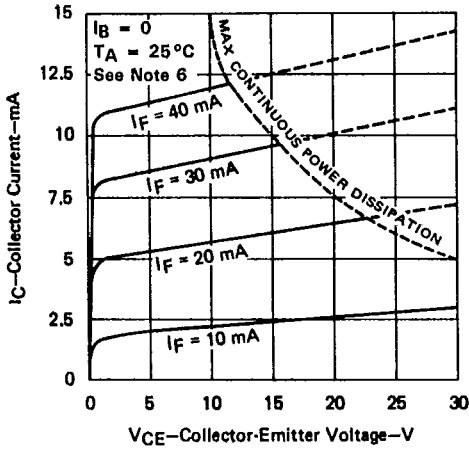


FIGURE 2

COLLECTOR CURRENT
vs
INPUT-DIODE FORWARD CURRENT

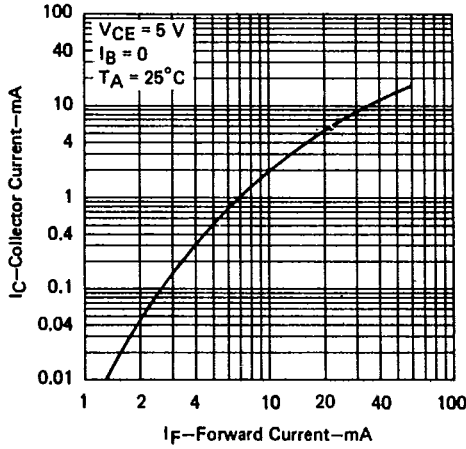


FIGURE 3

NOTE 6: Pulse operation of input diode is required for operation beyond limits shown by dotted lines.

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TYPICAL CHARACTERISTICS

RELATIVE ON-STATE COLLECTOR CURRENT
vs
FREE-AIR TEMPERATURE

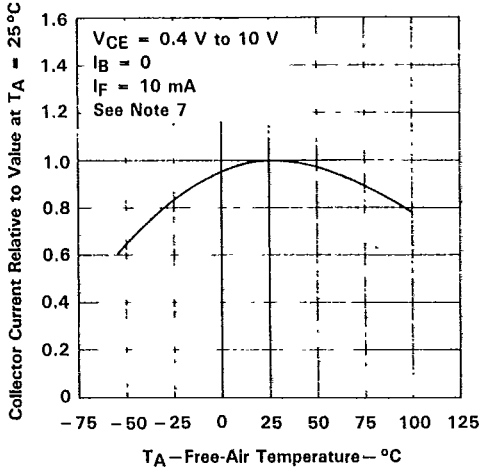


FIGURE 4

OFF-STATE COLLECTOR CURRENT
vs
FREE-AIR TEMPERATURE

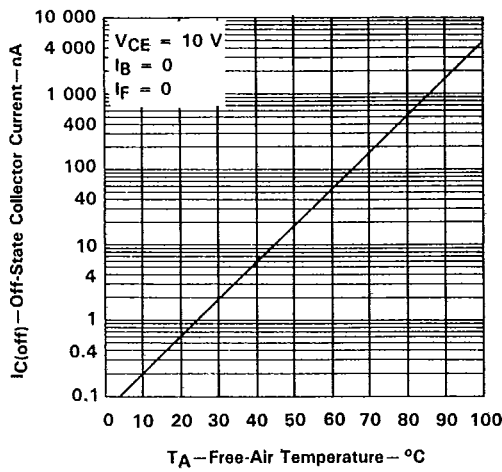


FIGURE 5

INPUT DIODE FORWARD
CONDUCTION CHARACTERISTICS

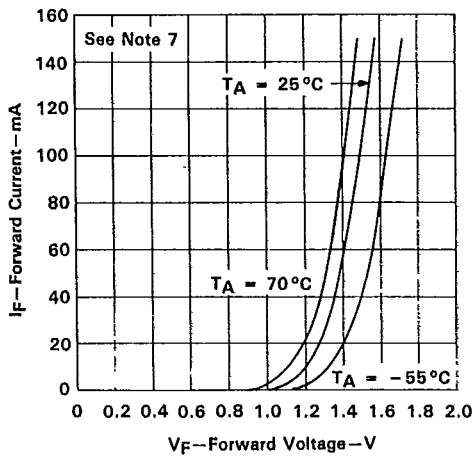


FIGURE 6

COLLECTOR CURRENT
vs
MODULATION FREQUENCY

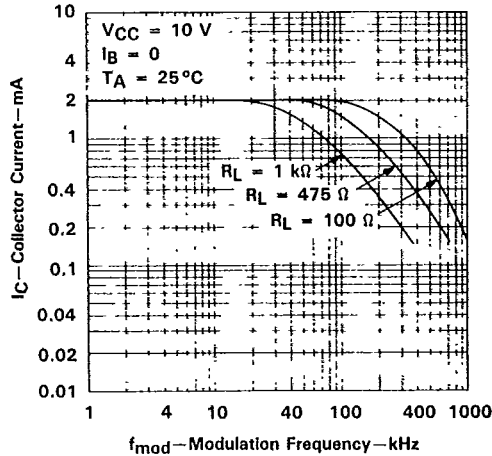


FIGURE 7

NOTE 7: These parameters were measured using techniques. $t_w = 1$ ms, duty cycle $\leq 2\%$.

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