TIL118-1, TIL118-2, TIL118-3
OPTOCOUPLERS

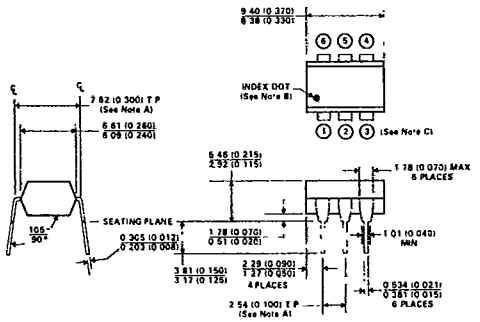
D1607, NOVEMBER 1973—REVISED JULY 1989

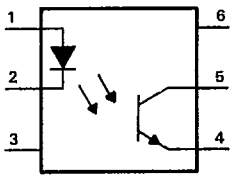
T-41-83

- **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 μs, t_f = 2 μs Typical**
- **Choice of Three Current Transfer Ratios**
- **No Base Lead Connection for High EMI Environment**

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.





NOTES: A. Leads are within 0,13 mm (0.005 inch) radius of true position (T.P.) with maximum material condition and unit installed.

B. Pin 1 identified by index dot.

Terminal connections:

1. Anode	Infrared-emitting diode
2. Cathode	
3. No internal connection	
4. Emitter	Phototransistor
5. Collector	
6. Base	

FALLS WITHIN JEDEC MO-001AM DIMENSIONS
ALL LINEAR DIMENSIONS ARE IN MILLIMETERS AND PARENTHETICALLY IN INCHES



3 Optocouplers (Isolators)

PRODUCTION DATA documents contain information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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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

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
$V_{(BR)ECO}$	Emitter-collector breakdown voltage			I_E = 10 μA, I_F = 0	7			V
$I_{C(on)}$	On-state collector current	Photo-transistor operation	TIL118-1	V_{CE} = 5 V, I_F = 10 mA, I_B = 0	2			mA
			TIL118-2		5			
			TIL118-3		10			
$I_{C(off)}$	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.

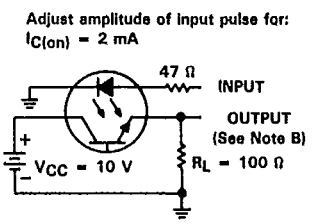
switching characteristics at 25°C free-air temperature

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	

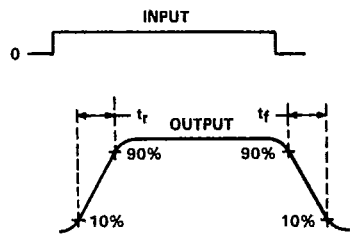
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PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

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

FIGURE 1. SWITCHING TIMES

TYPICAL CHARACTERISTICS

COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

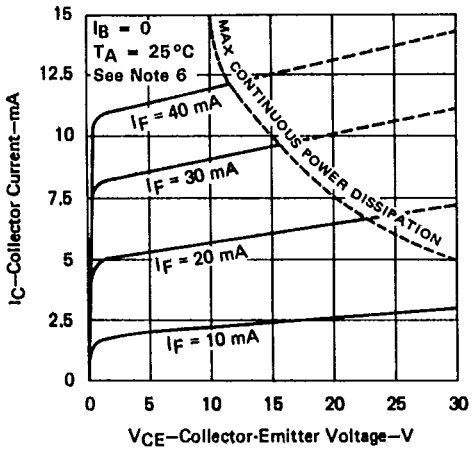


FIGURE 2

COLLECTOR CURRENT
vs
INPUT-DIODE FORWARD CURRENT

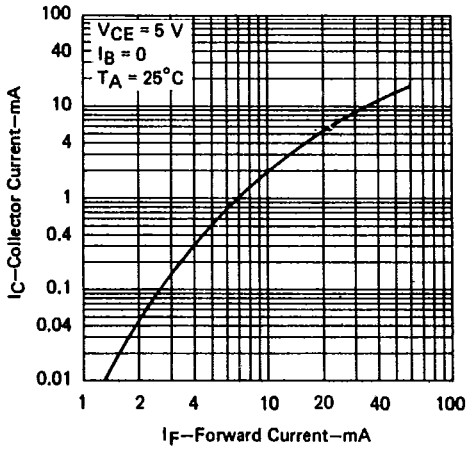


FIGURE 3

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

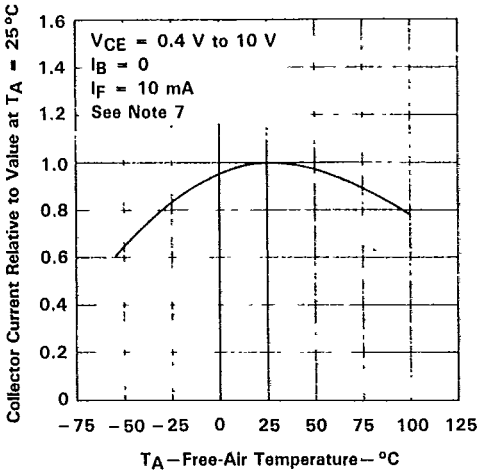


FIGURE 4

OFF-STATE COLLECTOR CURRENT
vs
FREE-AIR TEMPERATURE

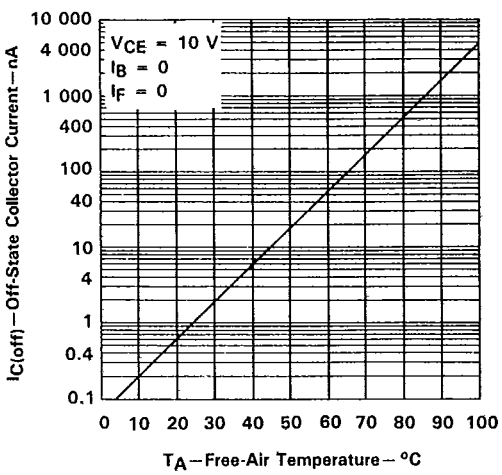


FIGURE 5

INPUT DIODE FORWARD
CONDUCTION CHARACTERISTICS

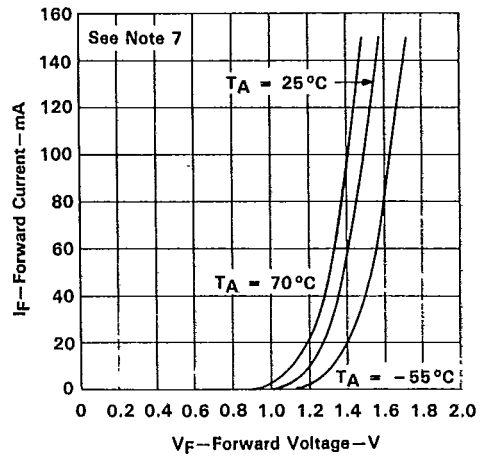


FIGURE 6

COLLECTOR CURRENT
vs
MODULATION FREQUENCY

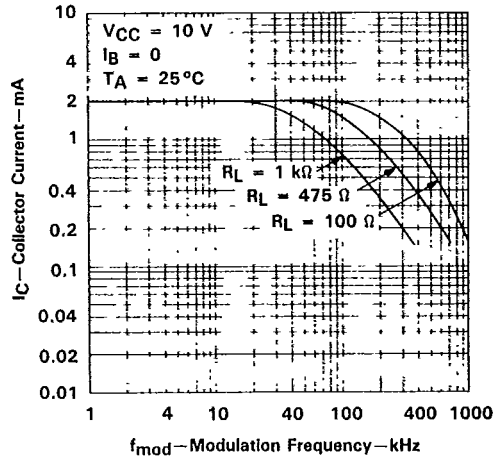


FIGURE 7

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

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