

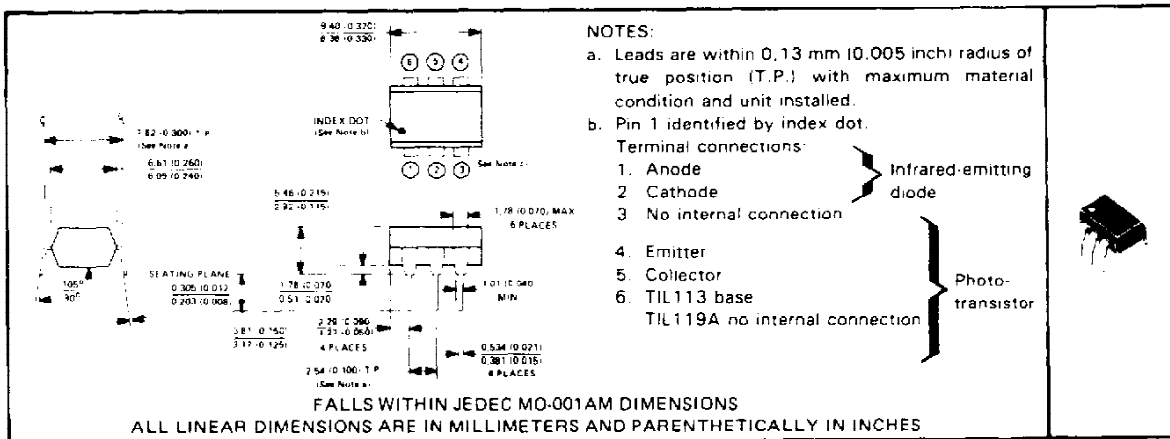
TIL113, TIL119A OPTOCOUPLED

SOOS042A D1499, AUGUST 1981 - REVISED JUNE 1989

- Gallium Arsenide Diode Infrared Source Optically Coupled to a Silicon N-P-N Darlington-Connected Phototransistor
- High Direct-Current Transfer Ratio . . . 300% Minimum at 10 mA
- High-Voltage Electrical Isolation . . . 1500-Volt Rating
- Plastic Dual-In-Line Package
- Base Lead Provided on TIL113 for Conventional Transistor Biasing
- No Base Lead Connection on TIL119A for High-EMI Environments
- Typical Applications Include Remote Terminal Isolation, SCR and Triac Triggers, Mechanical Relays, and Pulse Transformers

mechanical data

The package consists of a gallium arsenide infrared-emitting diode and an n-p-n silicon darlington-connected 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.



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

Input-to-Output Voltage	±1.5 kV
Collector-Base Voltage (TIL113)	30 V
Collector-Emitter Voltage (See Note 1)	30 V
Emitter-Collector Voltage	7 V
Emitter-Base Voltage (TIL113)	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 4)	150 mW
Total (Infrared-Emitting Diode plus Phototransistor, See Note 5)	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:**
- This value applies when the base-emitter diode is open circuited.
 - Derate linearly to 100°C free-air temperature at the rate of 1.33 mW/°C.
 - Derate linearly to 100°C free-air temperature at the rate of 2 mW/°C.
 - Derate linearly to 100°C free-air temperature at the rate of 2 mW/°C.
 - Derate linearly to 100°C free-air temperature at the rate of 3.33 mW/°C.

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TIL113, TIL119A OPTOCOUPLERS

electrical characteristics at 25°C free-air temperature

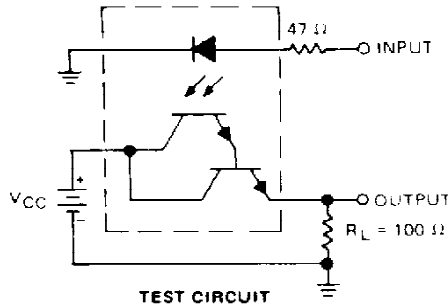
PARAMETER	TEST CONDITIONS†	TIL113			TIL119A			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage $I_C = 10 \mu A, I_E = 0, I_F = 0$	30						V
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage $I_C = 1 mA, I_B = 0, I_F = 0$	30			30			V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage $I_E = 10 \mu A, I_C = 0, I_F = 0$	7						V
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage $I_E = 10 \mu A, I_F = 0$				7			V
$I_{C(on)}$	On State Collector Current $V_{CE} = 1 V, I_B = 0, I_F = 10 mA$	30	100					mA
	$V_{CE} = 1 V, I_F = 10 mA$				30	160		
$I_{C(off)}$	Off-State Collector Current $V_{CE} = 10 V, I_B = 0, I_F = 0$			100			100	nA
β_{FE}	Transistor Static Forward Current Transfer Ratio $V_{CE} = 1 V, I_C = 10 mA, I_F = 0$		15,000					
V_F	Input Diode Static Forward Voltage $I_F = 10 mA$			1.5			1.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage $I_C = 125 mA, I_B = 0, I_F = 50 mA$			1.2				V
	$I_C = 30 mA, I_F = 10 mA$						1	
r_{IO}	Input-to-Output Internal Resistance $V_{in-out} = \pm 1.5 kV$. See Note 6		10^{11}			10^{11}		Ω
C_{io}	Input-to-Output Capacitance $V_{in-out} = 0, f = 1 MHz$. See Note 6		1	1.3		1	1.3	pF

NOTE 6: These parameters are measured between both input-diode leads shorted together and all the phototransistor leads shorted together. †Reference to the base are not applicable to TIL119A.

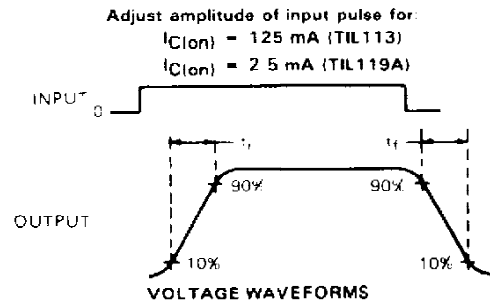
switching characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS	TIL113			TIL119A			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_r	Rise Time $V_{CC} = 15 V, I_{C(on)} = 125 mA, R_L = 100 \Omega$		300					μs
t_f	Fall Time $R_L = 100 \Omega$. See Figure 1		300					μs
t_r	Rise Time $V_{CC} = 10 V, I_{C(on)} = 2.5 mA, R_L = 100 \Omega$					300		μs
t_f	Fall Time $R_L = 100 \Omega$. See Figure 1					300		

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



- NOTES: a. The input waveform is supplied by a generator with the following characteristics: $Z_{out} = 50 \Omega, t_r = 15 ns, duty\ cycle = 1\%, t_w = 500 \mu s$.
 b. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r = 12 ns, R_{in} = 1 M\Omega, C_{in} = 20 pF$.

FIGURE 1—SWITCHING TIMES

TYPICAL CHARACTERISTICS

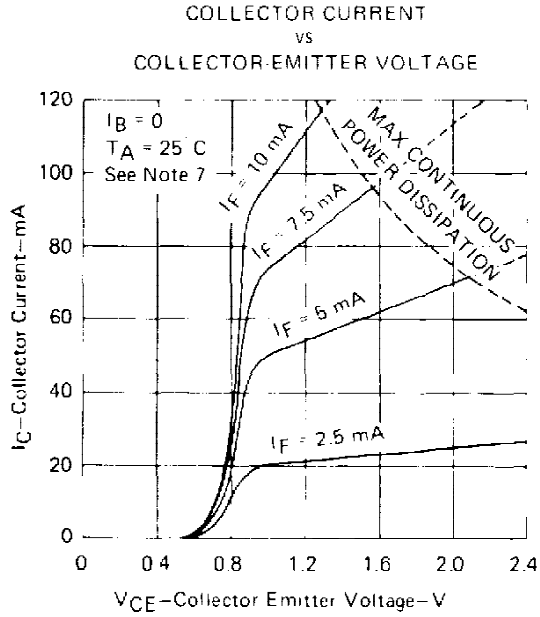


FIGURE 2

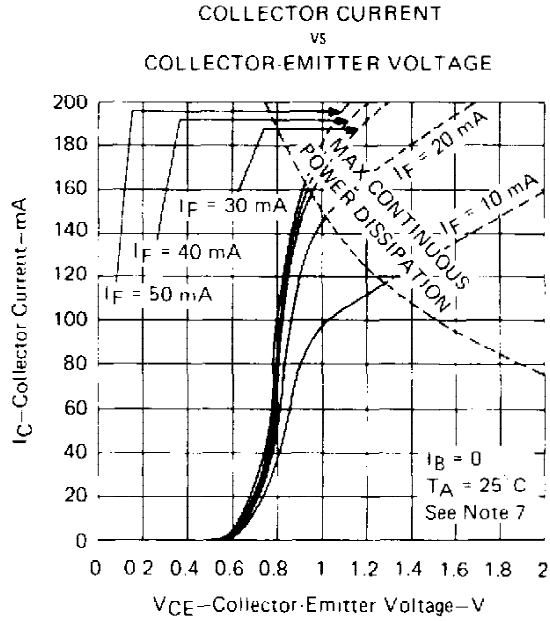


FIGURE 3

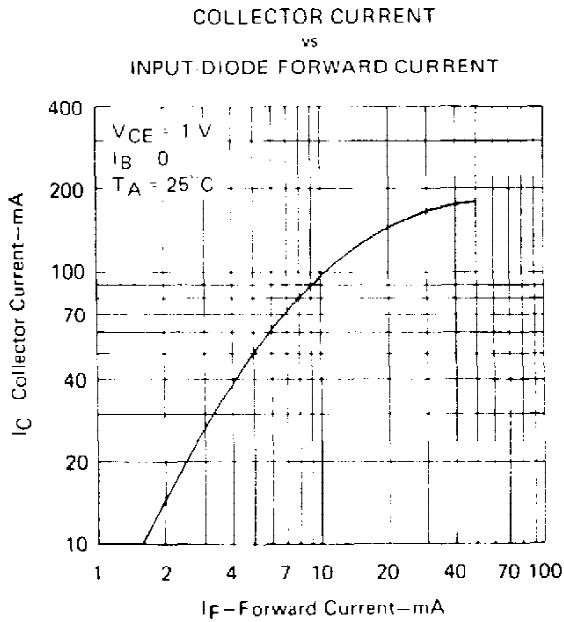


FIGURE 4

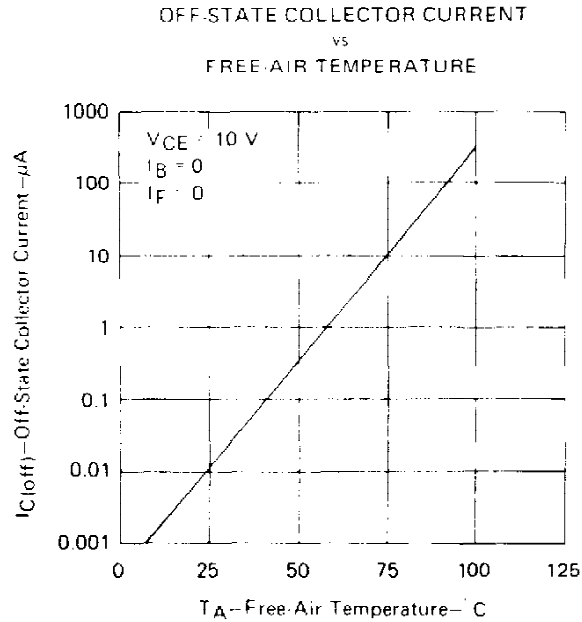


FIGURE 5

NOTE 7. Pulse operation of input diode is required for operation beyond limits shown by dotted line.

**TIL113, TIL119A
OPTOCOUPERS**

TYPICAL CHARACTERISTICS

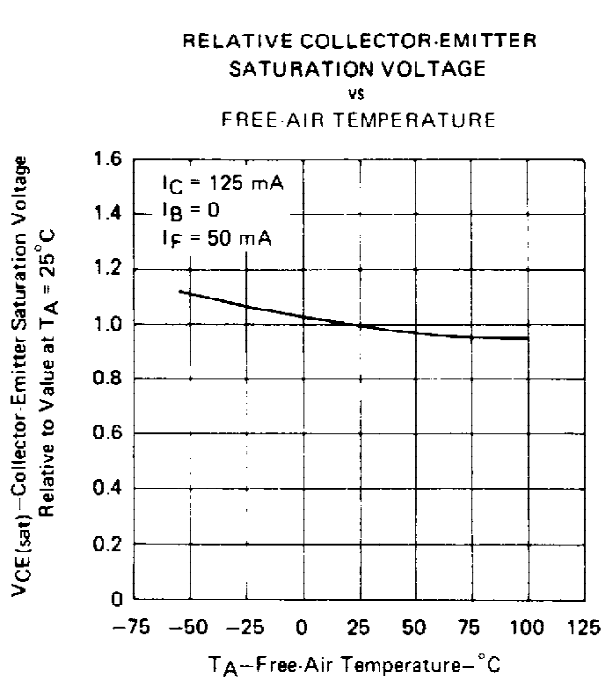


FIGURE 6

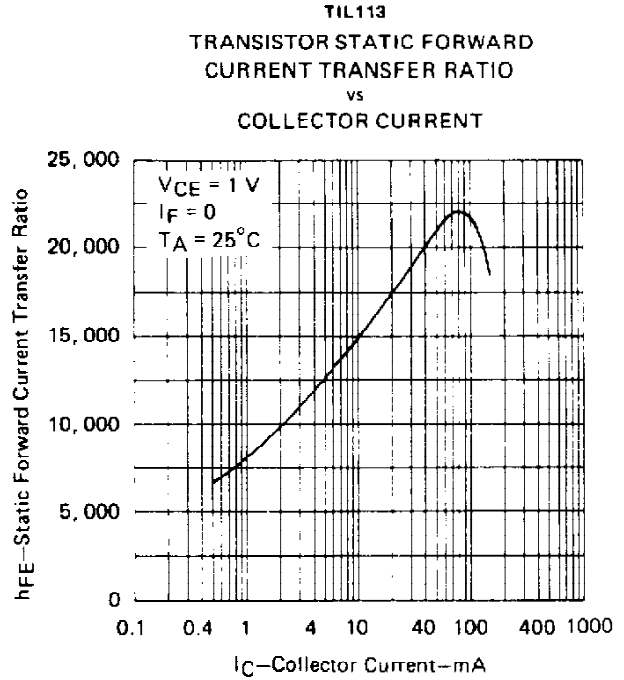


FIGURE 7

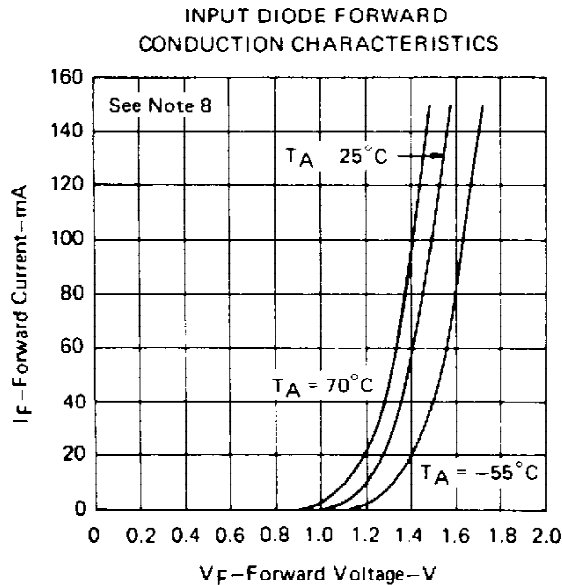


FIGURE 8

NOTE 8: This parameter was measured using pulse techniques. $t_w = 1\text{ ms}$, duty cycle $\leq 2\%$.

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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TIL113	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL119	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL119A	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI

⁽¹⁾ The marketing status values are defined as follows:

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⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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