- 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 photo-transistor 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
2. Cathode ⎭ diode
3. No internal connection
4. Emitter ⎫
5. Collector ⎬ Photo-transistor
6. TIL113 base
   TIL119A no internal connection ⎭

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

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: 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 mA/°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 2 mW/°C.
5. Derate linearly to 100°C free-air temperature at the rate of 3.33 mW/°C.

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electrical characteristics at 25°C free-air temperature

PARAMETER		TEST CONDITIONS†			TIL113 MIN	TIL113 TYP	TIL113 MAX	TIL119A MIN	TIL119A TYP	TIL119A MAX	UNIT
$V_{(BR)CBO}$	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
h_{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	$I_F = 10\,mA$					1.6			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	$V_{in-out} = 1.5\,kV$, 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 MIN	TIL113 TYP	TIL113 MAX	TIL119A MIN	TIL119A TYP	TIL119A MAX	UNIT
t_r	Rise Time	$V_{CC} = 15\,V$,	$I_{C(on)} = 125\,mA$,		300					μs
t_f	Fall Time	$R_L = 100\,\Omega$,	See Figure 1		300					
t_r	Rise Time	$V_{CC} = 10\,V$,	$I_{C(on)} = 2.5\,mA$,					300		μs
t_f	Fall Time	$R_L = 100\,\Omega$,	See Figure 1					300		

PARAMETER MEASUREMENT INFORMATION

Adjust amplitude of input pulse for:
$I_{C(on)} = 125\,mA$ (TIL113)
$I_{C(on)} = 2.5\,mA$ (TIL119A)

TEST CIRCUIT

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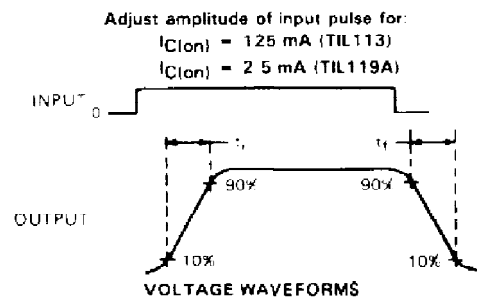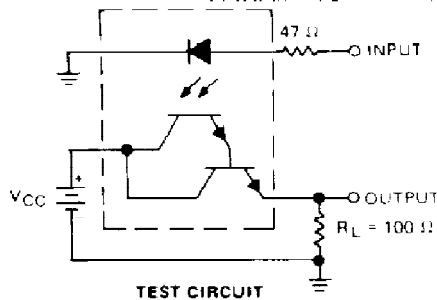
NOTES: a. The input waveform is supplied by a generator with the following characteristics: $Z_{out} = 50\,\Omega$, $t_r \leq 15\,ns$, duty cycle ≤ 1%, $t_w = 500\,\mu s$.
b. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r \leq 12\,ns$, $R_{in} \geq 1\,M\Omega$,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

FIGURE 1—SWITCHING TIMES

TYPICAL CHARACTERISTICS

COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

FIGURE 2

COLLECTOR CURRENT
vs
COLLECTOR-EMITTER VOLTAGE

FIGURE 3

COLLECTOR CURRENT
vs
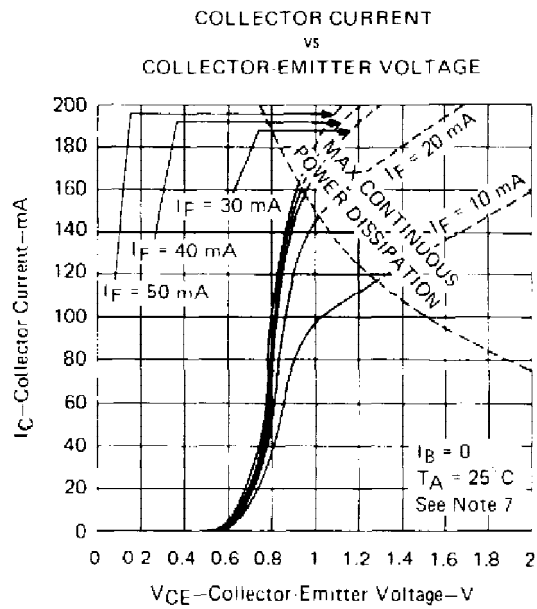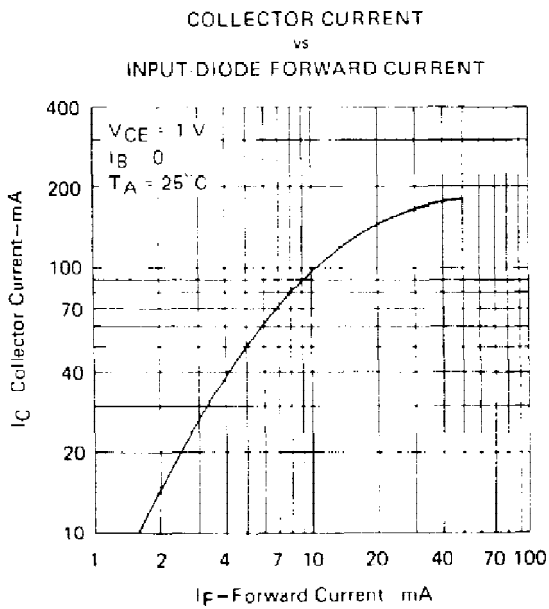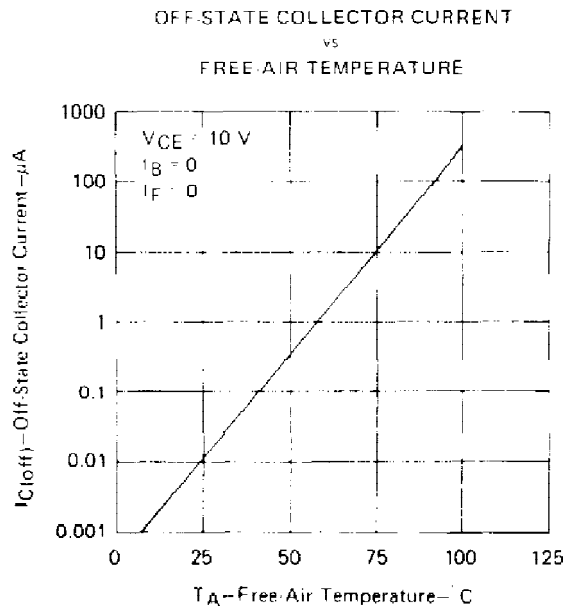INPUT DIODE FORWARD CURRENT

FIGURE 4

OFF-STATE COLLECTOR CURRENT
vs
FREE-AIR TEMPERATURE
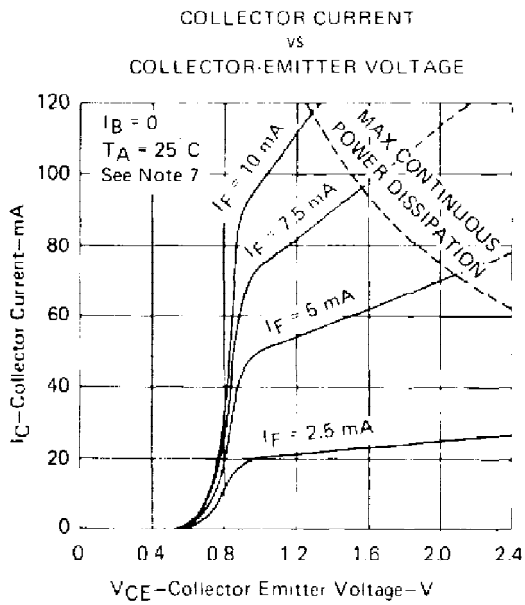
FIGURE 5

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

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TYPICAL CHARACTERISTICS

RELATIVE COLLECTOR-EMITTER
SATURATION VOLTAGE
vs
FREE-AIR TEMPERATURE

TIL113
TRANSISTOR STATIC FORWARD
CURRENT TRANSFER RATIO
vs
COLLECTOR CURRENT

FIGURE 6

FIGURE 7

INPUT DIODE FORWARD
CONDUCTION CHARACTERISTICS
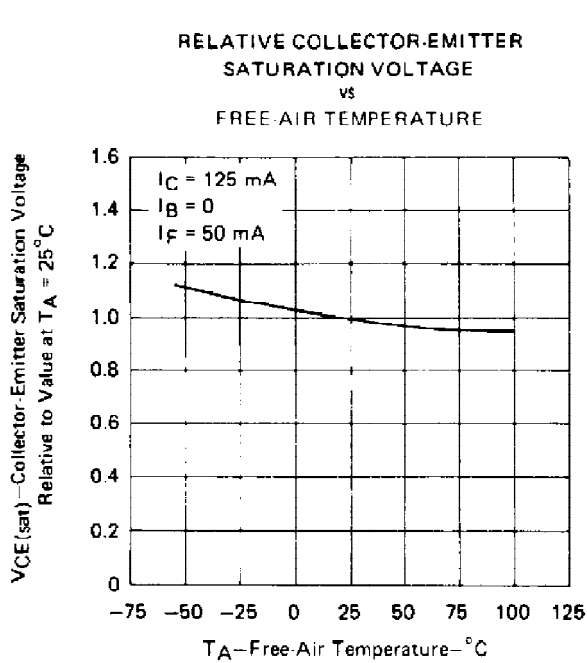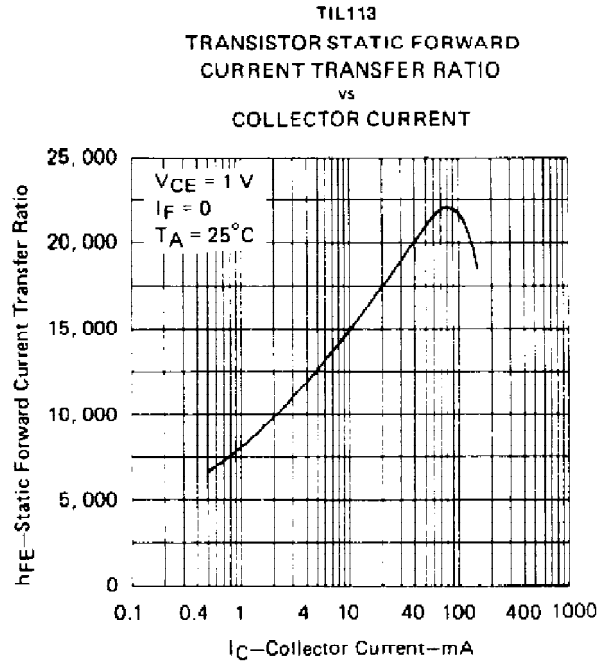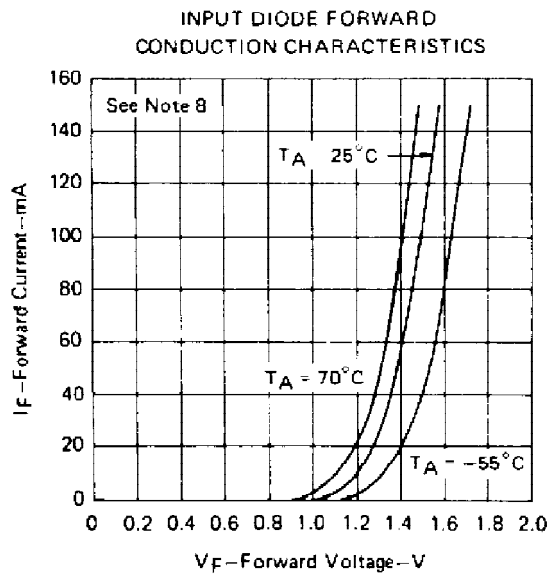

FIGURE 8

NOTE 8: This parameter was measured using pulse techniques. t_w = 1 ms, duty cycle < 2%.

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