

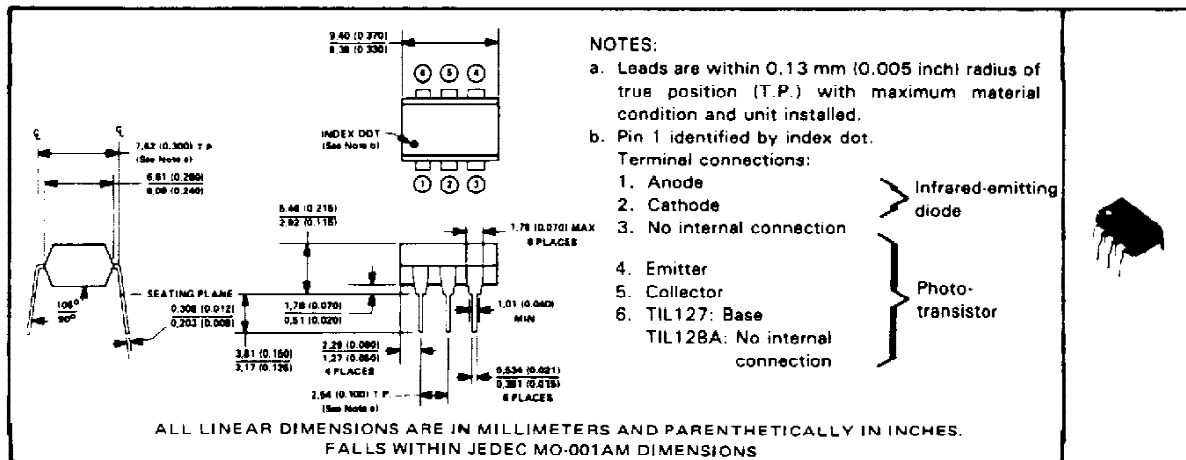
TIL127, TIL128A OPTOCOUPERS

SOOS045A D232B, MAY 1977—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 . . . 5000-Volt Rating
- Plastic Dual-In-Line Package
- Typical Applications Include Remote Terminal Isolation, SCR and Triac Triggers, Mechanical Relays, and Pulse Transformers
- No Base Connection on TIL128A for Environments with High Electromagnetic Interference

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.



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

Input-to-Output Voltage	±5 kV
Collector-Base Voltage (TIL127)	30 V
Collector-Emitter Voltage (See Note 1)	30 V
Emitter-Collector Voltage	7 V
Emitter-Base Voltage (TIL127)	7 V
Input-Diode Reverse Voltage	3 V
Input-Diode Continuous Forward Current	100 mA
Continuous Power Dissipation at (or below) 25°C Free-Air Temperature:	
Infrared-Emitting Diode (See Note 2)	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:
- This value applies when the base-emitter diode is open-circuited.
 - 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.

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.

TEXAS
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TIL127, TIL128A OPTOCOUPERS

electrical characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS†	TIL127			TIL128A			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	$I_C = 1 \text{ mA}$, $I_B = 0$, $I_F = 0$	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_R Input Diode Static Reverse Current	$V_R = 3 \text{ V}$			10			10	μA
$I_{C(on)}$ On-State Collector Current	$V_{CE} = 1 \text{ V}$, $I_B = 0$, $I_F = 10 \text{ mA}$ $V_{CE} = 1 \text{ V}$, $I_F = 10 \text{ mA}$	30	100		30	160		mA
$I_{C(off)}$ Off-State Collector Current	$V_{CE} = 10 \text{ V}$, $I_B = 0$, $I_F = 0$			100			100	nA
h_{FE} Transistor Static Forward Current Transfer Ratio	$V_{CE} = 1 \text{ V}$, $I_C = 10 \text{ mA}$, $I_F = 0$		15 000					
V_F Input Diode Static Forward Voltage	$I_F = 10 \text{ mA}$			1.5			1.5	V
$V_{CE(sat)}$ Collector-Emitter Saturation Voltage	$I_C = 125 \text{ mA}$, $I_B = 0$, $I_F = 50 \text{ mA}$ $I_C = 30 \text{ mA}$, $I_F = 10 \text{ mA}$			1.2			1	V
r_{IO} Input-to-Output Internal Resistance	$V_{in-out} = 500 \text{ V}$, See Note 5		10^{11}			10^{11}		Ω
C_{io} Input-to-Output Capacitance	$V_{in-out} = 0$, $f = 1 \text{ MHz}$, See Note 5		1	1.3		1	1.3	pF

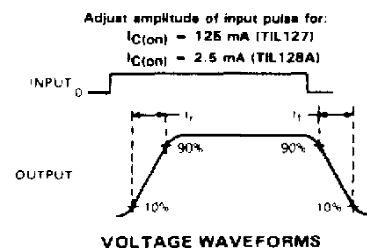
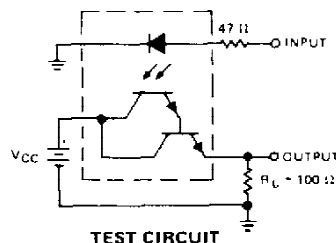
NOTE 5: These parameters are measured between both input-diode leads shorted together and all the phototransistor leads shorted together.

†References to the base are not applicable to the TIL128A.

switching characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS†	TIL127			TIL128A			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_r Rise Time	$V_{CC} = 15 \text{ V}$, $I_{C(on)} = 125 \text{ mA}$, $R_L = 100 \Omega$, See Figure 1		300					μs
t_f Fall Time	$V_{CC} = 15 \text{ V}$, $I_{C(on)} = 125 \text{ mA}$, $R_L = 100 \Omega$, See Figure 1		300					μs
t_r Rise Time	$V_{CC} = 10 \text{ V}$, $I_{C(on)} = 2.5 \text{ mA}$, $R_L = 100 \Omega$, See Figure 1					300		μs
t_f Fall Time	$V_{CC} = 10 \text{ V}$, $I_{C(on)} = 2.5 \text{ mA}$, $R_L = 100 \Omega$, See Figure 1					300		μs

PARAMETER MEASUREMENT INFORMATION



- 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 $\approx 1\%$, $t_w = 500 \mu s$.
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

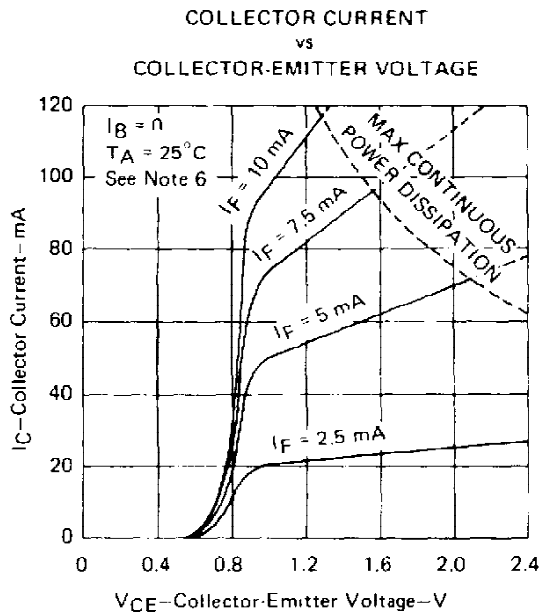


FIGURE 2

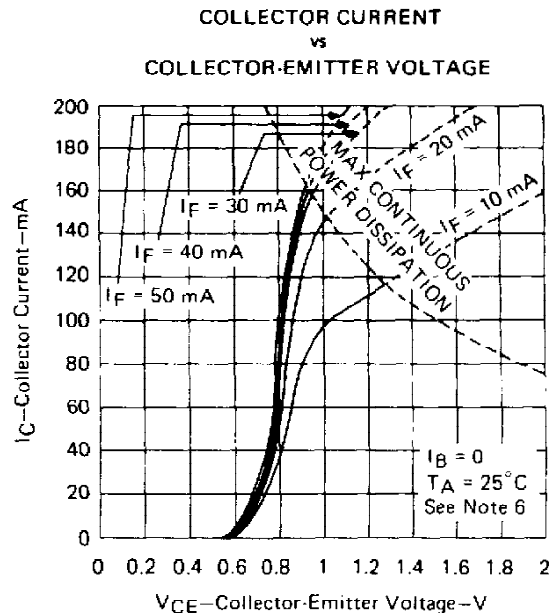


FIGURE 3

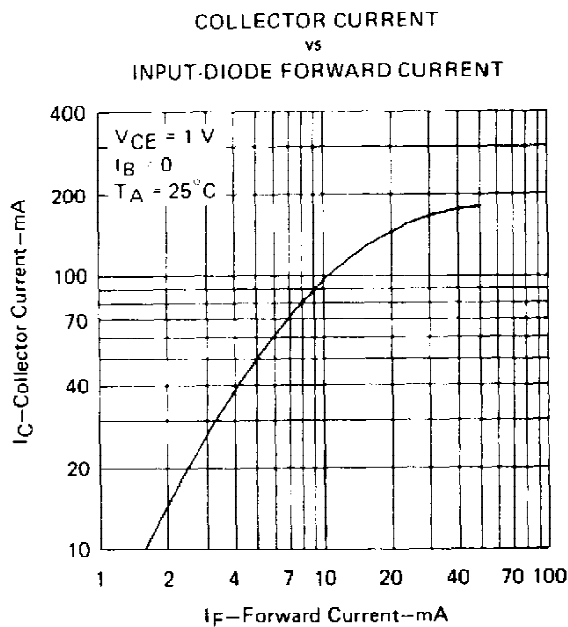


FIGURE 4

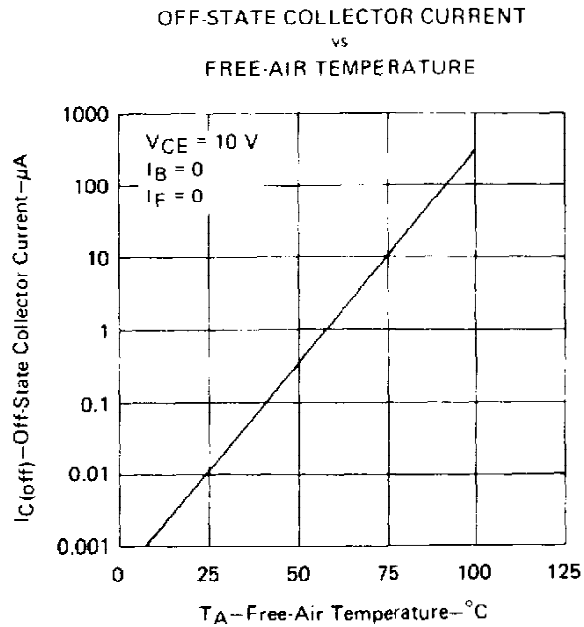


FIGURE 5

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

TYPICAL CHARACTERISTICS

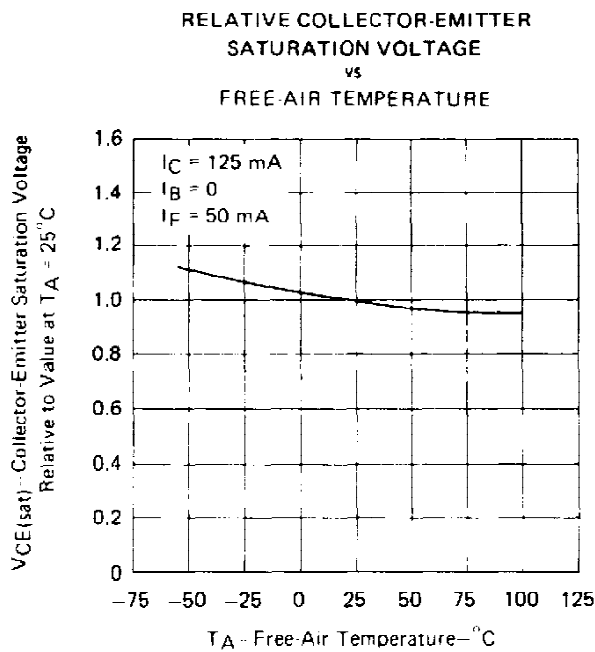


FIGURE 6

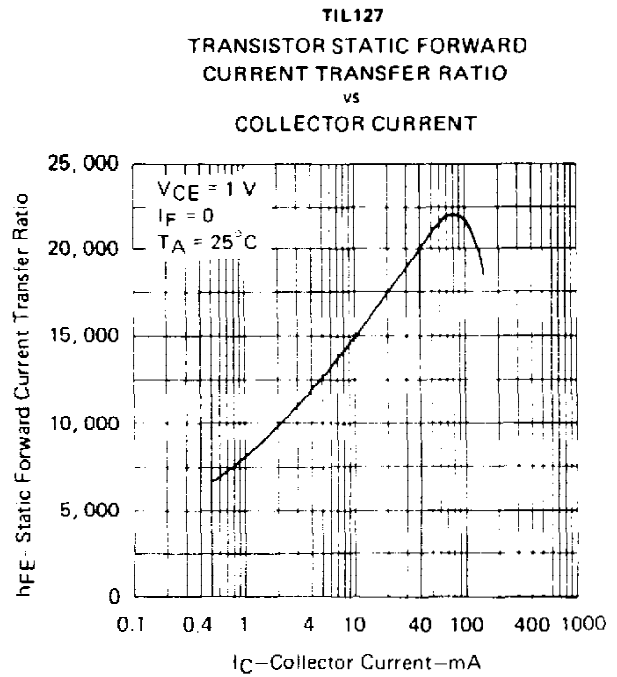


FIGURE 7

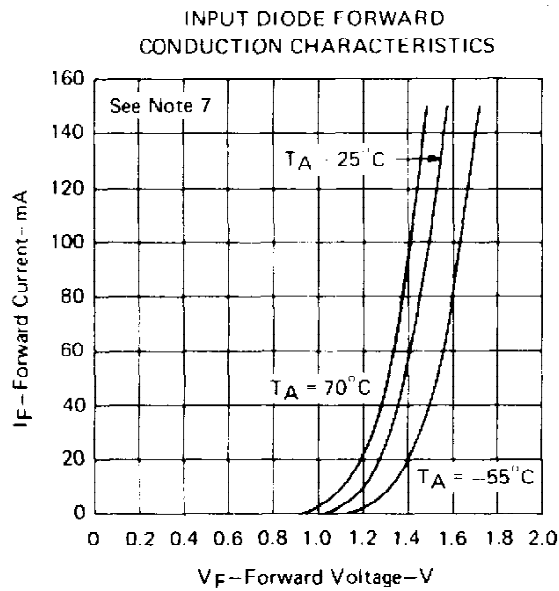


FIGURE 8

NOTE 7: This parameter was measured using pulse techniques. $t_w = 1\text{ ms}$, duty cycle $\leq 2\%$.

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