

TIL186-1, TIL186-2, TIL186-3, TIL186-4 AC-INPUT OPTOCOUPERS

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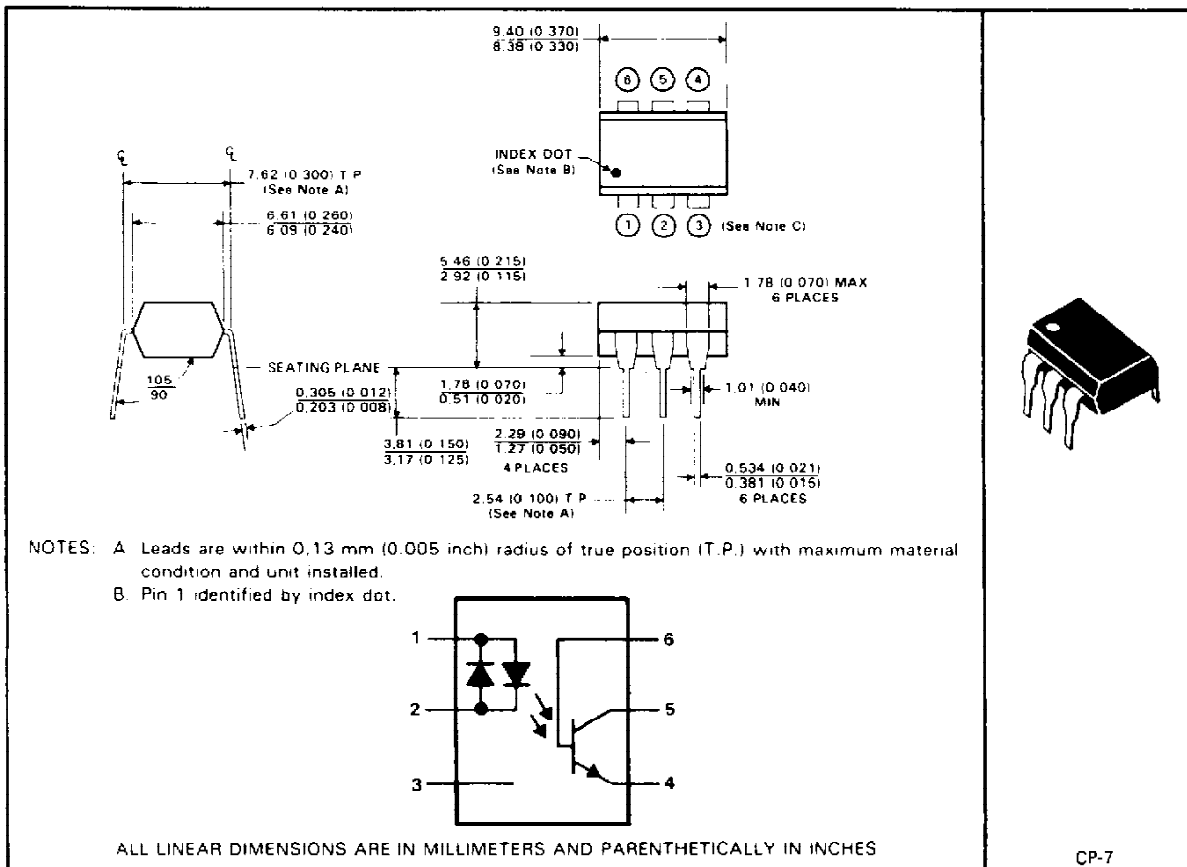
- A-C Signal Input
- Gallium Arsenide Dual-Diode Infrared Sources Coupled to a Silicon NPN Photo-Transistor
- Plastic Dual-In-Line Package
- UL-Recognized — File # E65085
- Choice of Four Current Transfer Ratios
- High-Voltage Electrical Isolation
3.535 kV Peak (2.5 kV rms)
- High-Speed Switching . . . $t_f = 4 \mu s$ Typ

description

The TIL186 optocoupler is designed for use in ac input signal applications that require high-voltage isolation between input and output. Users can select from four different current gains (TIL186-1 through TIL186-4). These optocouplers consist of two GaAs light-emitting input diodes connected in a reverse-parallel configuration for ac input applications and a silicon npn output phototransistor.

mechanical data

The package is mounted on a 6-pin lead frame encapsulated within an electrically nonconductive plastic compound. The case will withstand soldering temperature with no deformation. Device performance characteristics will remain stable when operated in high-humidity conditions. Unit weight is approximately 0.52 grams.



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TIL186-1, TIL186-2, TIL186-3, TIL186-4
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absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Input-to-output voltage	± 3.535 kV peak (± 2.5 kV rms)
Collector-base voltage	100 V
Collector-emitter voltage (see Note 1)	55 V
Emitter-collector voltage	7 V
Emitter-base voltage	7 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
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 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 3.33 mW/°C.

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electrical characteristics at 25°C free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS			MIN	TYP	MAX	UNIT
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C = 10 \mu A,$	$I_E = 0,$	$I_F = 0$	100			V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage	$I_C = 1 mA,$	$I_B = 0,$	$I_F = 0$	55			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	$I_E = 100 \mu A,$	$I_B = 0,$	$I_F = 0$	7			V
$I_{C(on)}^\dagger$	On-state collector current	Phototransistor operation	$V_{CE} = 10 V,$ $I_B = 0$	$I_F = 2 mA,$	TIL186-1	0.1		mA
					TIL186-2	0.2		
					TIL186-3	0.5		
					TIL186-4	1		
			$V_{CE} = 10 V,$ $I_B = 0$	$I_F = 10 mA,$	TIL186-1	1		
					TIL186-2	2		
	Photodiode operation	$V_{CB} = 10 V,$	$I_F = 10 mA,$	$I_E = 0$	5	12		μA
$I_{C(off)}$	Off-state collector current	$V_{CE} = 50 V,$	$I_F = 20 mA,$	$I_B = 0$		2	200	nA
h_{FE}	Transistor static forward current transfer ratio	$V_{CE} = 5 V,$	$I_C = 10 mA,$	$I_F = 0$	100	550		
V_F^\dagger	Input diode static forward voltage	$I_F = 10 mA$			1	1.16	1.5	V
$V_{CE(sat)}^\dagger$	Collector-emitter saturation voltage	$I_C = 1 mA,$	$I_F = 10 mA,$	$I_B = 0$		0.14	0.4	V
r_{iO}	Input-to-output internal resistance	$V_{in-out} = \pm 500 V.$ 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
$I_{C(on)1}$	On-state collector current	$V_{CE} = 10 V,$ $I_F = 10 mA,$ $I_E = 0$			1	3		
$I_{C(on)2}$	symmetry ratio (see Note 6)							

[†]These parameters apply for either direction of the input current.

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

6. The higher of the two $I_{C(on)}$ values generated by the two diodes is taken as $I_{C(on)1}$

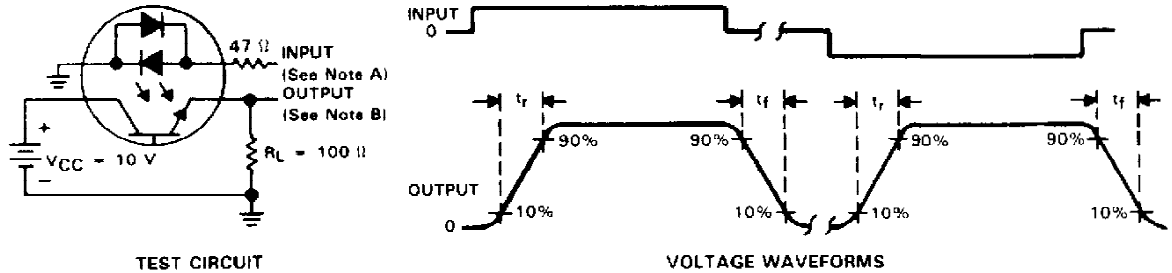
switching characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_r Rise time	$V_{CC} = 10 V,$ $I_{C(on)} = 2 mA,$ $R_L = 100 \Omega,$ See Figure 1		4	10	μs
t_f Fall time			4	10	μs

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PARAMETER MEASUREMENT INFORMATION

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



NOTES: A. The input waveform is supplied by a generator with the following characteristics: $Z_o = 50 \Omega$, $t_r \leq 15 \text{ ns}$, duty cycle = 1%.
 B. The output waveform is monitored on an oscilloscope with the following characteristics: $t_r \leq 12 \text{ ns}$, $R_i \geq 1 \text{ M}\Omega$, $C_i \leq 20 \text{ pF}$.

FIGURE 1. SWITCHING TIMES

TYPICAL CHARACTERISTICS

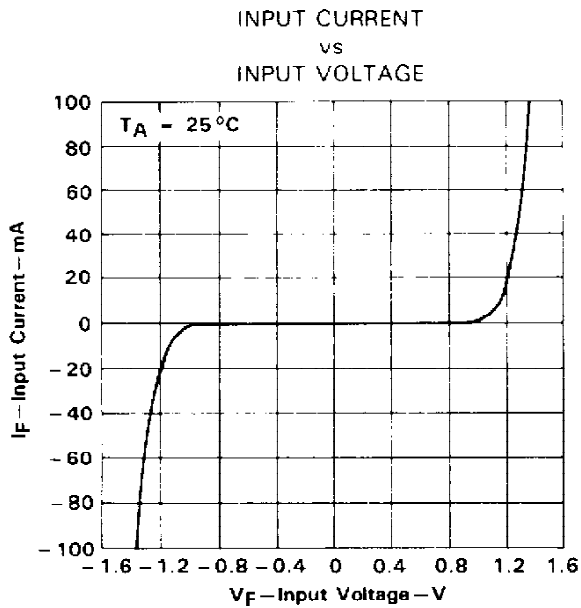


FIGURE 2

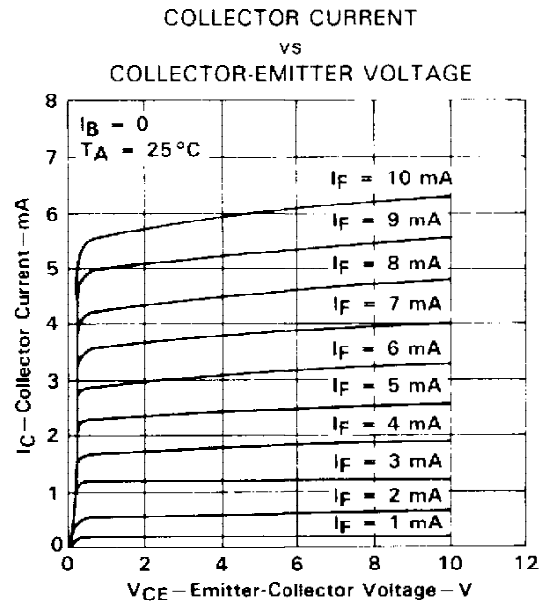


FIGURE 3

TYPICAL CHARACTERISTICS

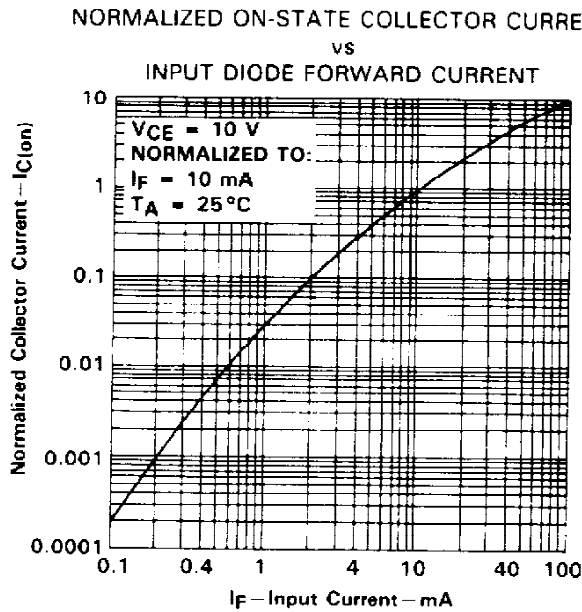


FIGURE 4

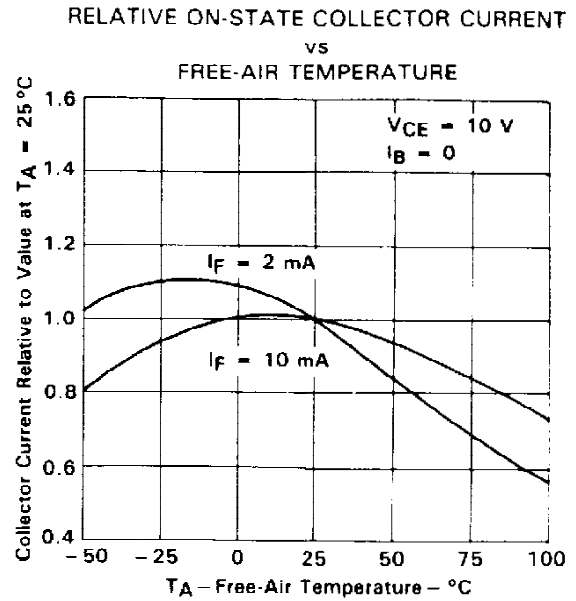


FIGURE 5

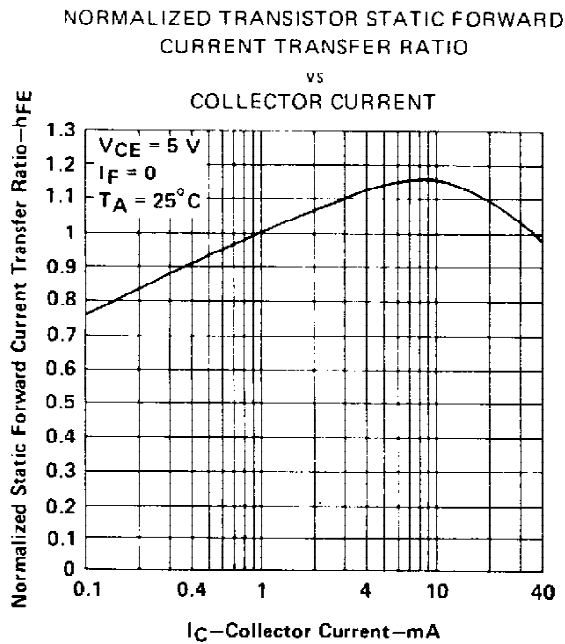


FIGURE 6

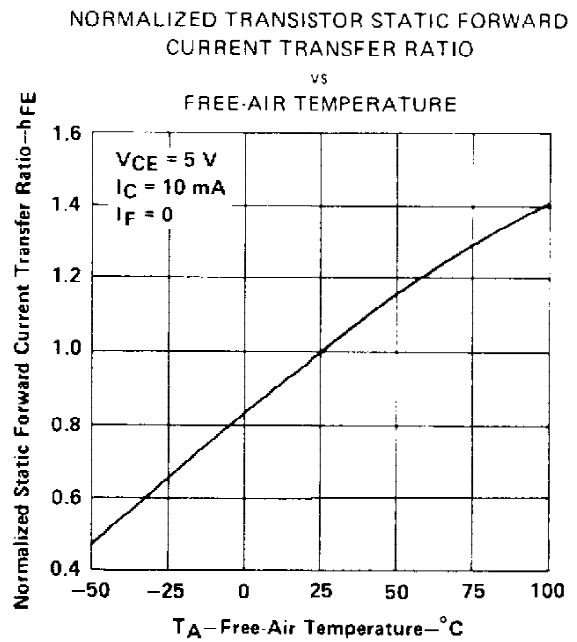


FIGURE 7

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