

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

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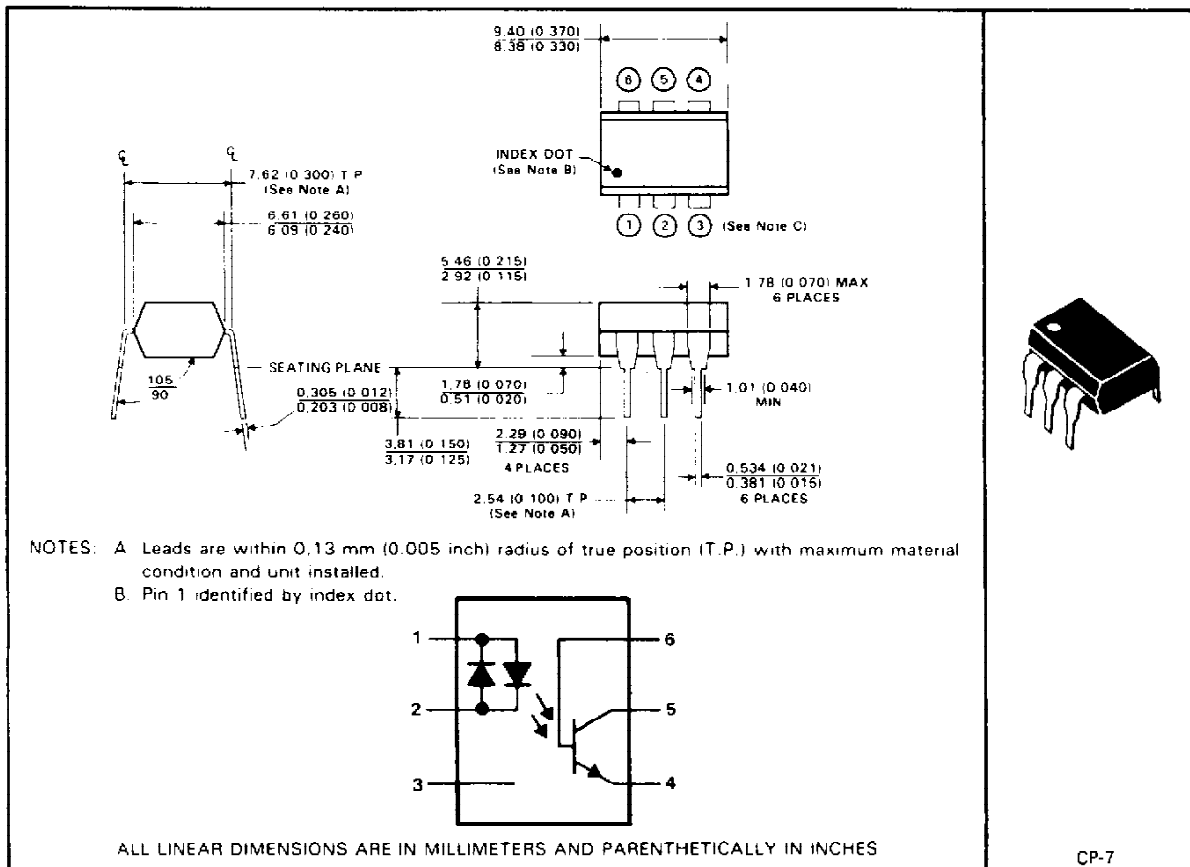
- A-C Signal Input
- Gallium Arsenide Dual-Diode Infrared Sources Coupled to a Silicon NPN Photo-Transistor
- Plastic Dual-In-Line Package
- UL-Recognized — File # E65085
- Choice of Four Current Transfer Ratios
- High-Voltage Electrical Isolation
3.535 kV Peak (2.5 kV rms)
- High-Speed Switching . .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



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
INSTRUMENTS

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TIL186-1, TIL186-2, TIL186-3, TIL186-4 **AC-INPUT OPTOCOUPLERS**

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.

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

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	$I_C = 1 \text{ mA}$, $I_B = 0$, $I_F = 0$	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 $V_{CE} = 10 \text{ V}$, $I_F = 2 \text{ mA}$, $I_B = 0$	TIL186-1	0.1		mA
			TIL186-2	0.2		
			TIL186-3	0.5		
			TIL186-4	1		
		Phototransistor operation $V_{CE} = 10 \text{ V}$, $I_F = 10 \text{ mA}$, $I_B = 0$	TIL186-1	1		
			TIL186-2	2		
			TIL186-3	5		
			TIL186-4	10		
	Photodiode operation	$V_{CB} = 10 \text{ V}$, $I_F = 10 \text{ mA}$, $I_E = 0$	5	12		μA
$I_{C(off)}$	Off-state collector current	$V_{CE} = 50 \text{ V}$, $I_F = 20 \text{ mA}$, $I_B = 0$		2	200	nA
h_{FE}	Transistor static forward current transfer ratio	$V_{CE} = 5 \text{ V}$, $I_C = 10 \text{ mA}$, $I_F = 0$	100	550		
$V_F^{\dagger}$	Input diode static forward voltage	$I_F = 10 \text{ mA}$	1	1.16	1.5	V
$V_{CE(sat)}^{\dagger}$	Collector-emitter saturation voltage	$I_C = 1 \text{ mA}$, $I_F = 10 \text{ mA}$, $I_B = 0$		0.14	0.4	V
r_{iO}	Input-to-output internal resistance	$V_{in-out} = \pm 500 \text{ V}$. See Note 5	10^{11}			Ω
C_{iO}	Input-to-output capacitance	$V_{in-out} = 0$, $f = 1 \text{ MHz}$. See Note 5		1	2	pF
$I_{C(on)1}$	On-state collector current	$V_{CE} = 10 \text{ V}$, $I_F = 10 \text{ mA}$, $I_E = 0$	1		3	
$I_{C(on)2}$	symmetry ratio (see Note 6)					

$\dagger$ 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	$V_{CC} = 10 \text{ V}$, $I_{C(on)} = 2 \text{ mA}$, $R_L = 100 \Omega$, See Figure 1		4	10	μs
t_f Fall time			4	10	μs

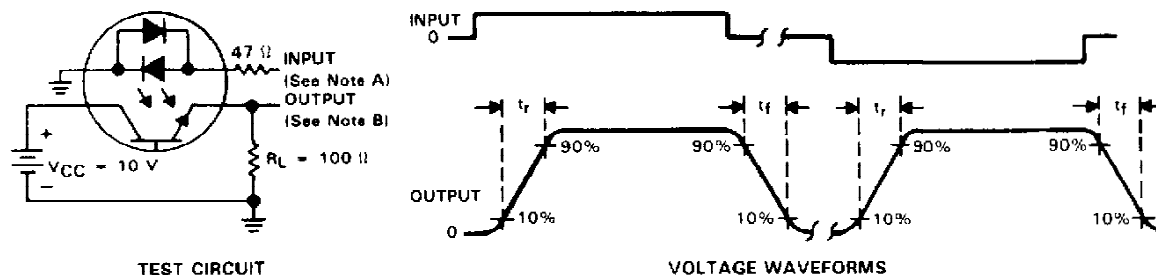


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TIL186-1, TIL186-2, TIL186-3, TIL186-4 AC-INPUT OPTOCOUPLEDERS

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

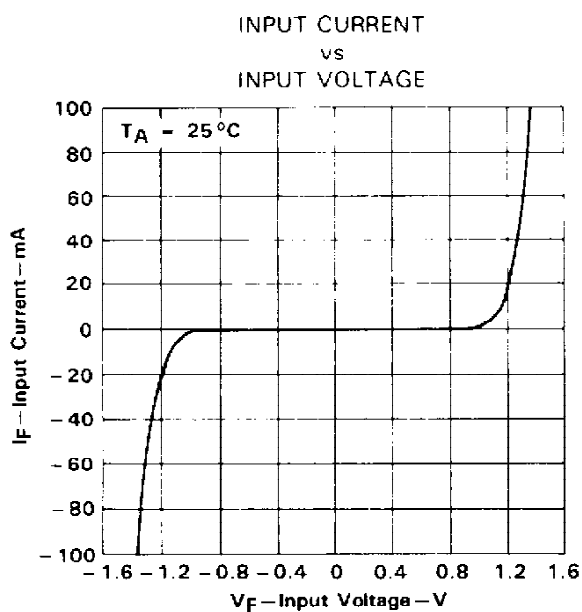


FIGURE 2

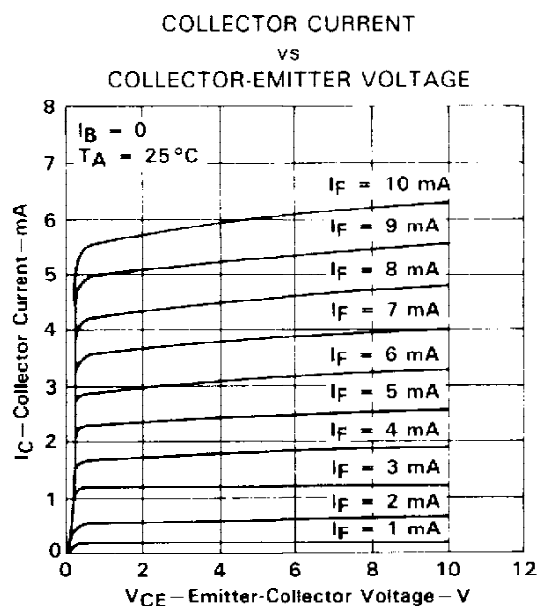


FIGURE 3

TYPICAL CHARACTERISTICS

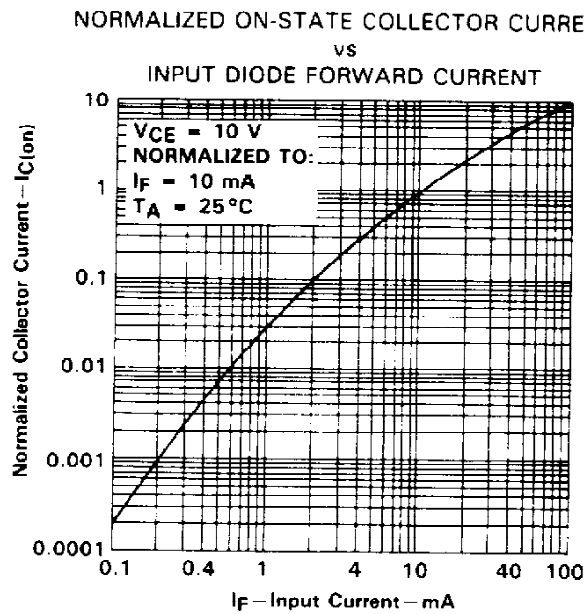


FIGURE 4

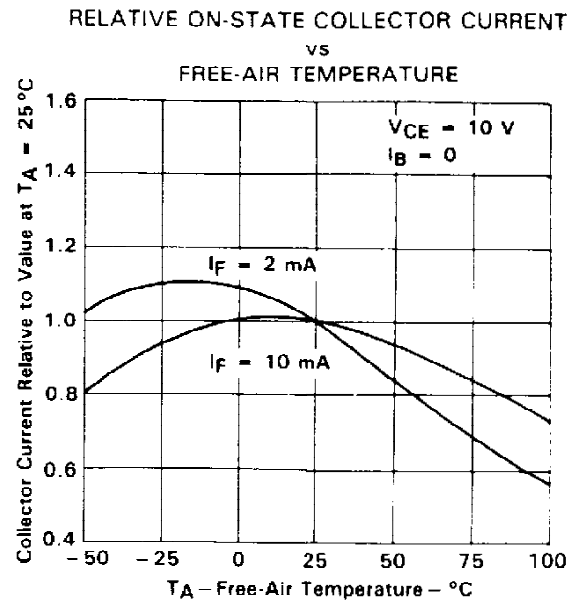


FIGURE 5

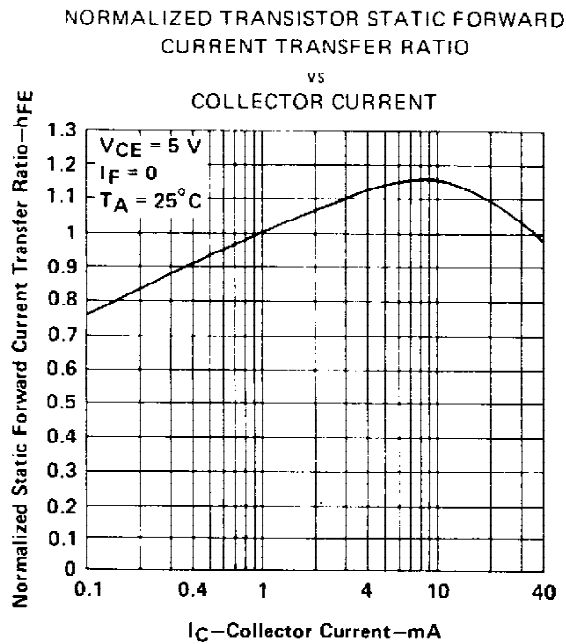


FIGURE 6

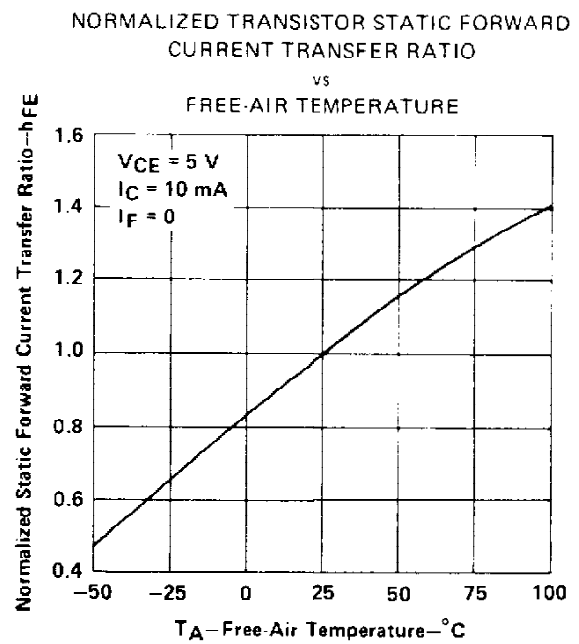


FIGURE 7

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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TIL186-1	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL186-2	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL186-3	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI
TIL186-4	OBSOLETE	PDIP	N	6		TBD	Call TI	Call TI

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

ACTIVE: Product device recommended for new designs.

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⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

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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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