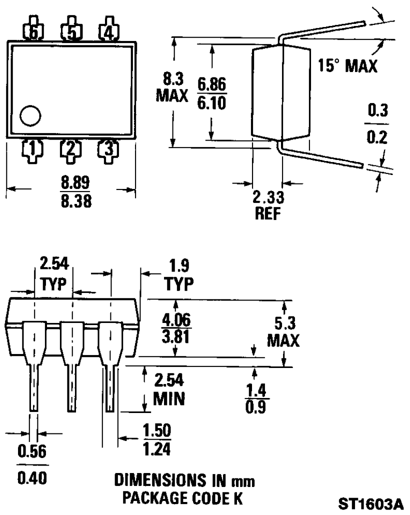
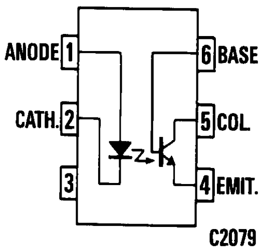
FAIRCHILD SEMICONDUCTOR™

PHOTOTRANSISTOR OPTOISOLATOR

TIL111

PACKAGE DIMENSIONS





DESCRIPTION

The TIL111 is a phototransistor-type optically coupled isolator. An infrared emitting diode manufactured from specially grown gallium arsenide is selectively coupled with an NPN silicon phototransistor. The device is supplied in a standard plastic six-pin dual-in-line package.

FEATURES

- Underwriters Laboratory (UL) recognized File #E90700

APPLICATIONS

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls

ABSOLUTE MAXIMUM RATINGS (T_A=25°C Unless Otherwise Specified)

TOTAL PACKAGE

Storage temperature .... −55°C to 150°C
Operating temperature .... −55°C to 100°C
Lead temperature
(soldering, 10 sec) .... 260°C
Total package power dissipation at 25°C
(LED plus detector) .... 260 mW
Derate linearly from 25°C .... 3.3 mW/°C

INPUT DIODE

Forward DC current .... 100 mA
Reverse voltage .... 3 V
Peak forward current
(1 μs pulse, 300 pps) .... 3.0 A
Power dissipation 25°C ambient .... 150 mW
Derate linearly from 25°C .... 2 mW/°C

OUTPUT TRANSISTOR

Power dissipation at 25°C .... 150 mW
Derate linearly from 25°C .... 2 mW/°C
V_{CEO} .... 30 V
V_{CBO} .... 70 V
V_{ECO} .... 7 V
Collector current (continuous) .... 100 mA

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ELECTRICAL CHARACTERISTICS (At 25°C Free-Air Temperature)

INDIVIDUAL COMPONENT CHARACTERISTICS

PARAMETER	SYMBOL	TIL111 MIN.	TIL111 TYP.	TIL111 MAX.	UNIT	TEST CONDITIONS
INPUT DIODE						
Input diode static reverse current	I_R			10	µA	$V_R=3$ V
Input diode static forward voltage	V_F		1.2	1.4	V	$I_F=16$ mA
OUTPUT TRANSISTOR						
Collector-base breakdown voltage	$V_{(BR)CBO}$	70			V	$I_C=10$ µA, $I_E=0$, $I_F=0$
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	30			V	$I_C=1$ mA, $I_B=0$, $I_F=0$
Emitter-base breakdown voltage	$V_{(BR)EBO}$	7			V	$I_E=10$ µA, $I_C=0$, $I_F=0$
Transistor static forward current transfer ratio	h_{FE}	100	300			$V_{CE}=5$ V, $I_C=10$ mA, $I_F=0$

TRANSFER CHARACTERISTICS

PARAMETER		SYMBOL	TIL111 MIN.	TIL111 TYP.	TIL111 MAX.	UNIT	TEST CONDITIONS
On-state collector current	Phototransistor operation	$I_{C(on)}$	2	7		mA	$V_{CE}=0.4$ V, $I_F=16$ mA, $I_B=0$
	Photodiode operation	$I_{C(on)}$	7	20		µA	$V_{CB}=0.4$ V, $I_F=16$ mA, $I_E=0$
Off-state collector current	Phototransistor operation	$I_{C(off)}$		1	50	nA	$V_{CE}=10$ V, $I_F=0$, $I_B=0$
	Photodiode operation	$I_{C(off)}$		0.1	20	nA	$V_{CB}=10$ V, $I_F=0$, $I_E=0$
Collector-emitter saturation voltage		$V_{CE(sat)}$		0.25	0.4	V	$I_C=2$ mA, $I_F=16$ mA, $I_B=0$

SWITCHING CHARACTERISTICS (At 25°C Free-Air Temperature)

PARAMETER		SYMBOL	TIL111 MIN.	TIL111 TYP.	TIL111 MAX.	UNIT	TEST CONDITIONS
Rise time	Phototransistor operation	t_r		5	10	µs	$V_{CC}=10$ V, $I_{C(on)}=2$ mA, R_L - 100 Ω
Fall time		t_f					
Rise time	Photodiode operation	t_r		1		µs	$V_{CC}=10$ V, $I_{C(on)}=20$ µA, R_L - 1 kΩ
Fall time		t_f					

ISOLATION CHARACTERISTICS

PARAMETER	SYMBOL	TIL111 MIN.	TIL111 TYP.	TIL111 MAX.	UNIT	TEST CONDITIONS
Input-to-output internal resistance	r_{IO}	10^{11}			Ω	$V_{ISO}=\pm1.5$ kV
Input-to-output capacitance	C_{IO}		1	1.3	pF	$V_{in-out}=0$, f=1 MHz, See Note 6
Isolation voltage	V_{iso}	7500 5300			VAC-PEAK VAC-RMS	$I_{I-O}\leq1$ µA, 1 minute $I_{I-O}\leq1$ µA, 1 minute

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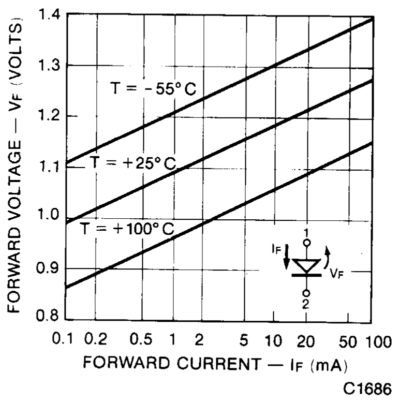

Fig. 1. Forward Voltage vs. Current

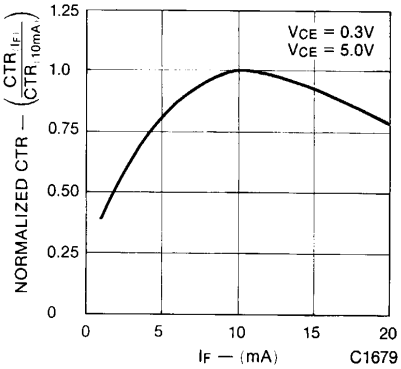

Fig. 2. Normalized CTR vs. Forward Current

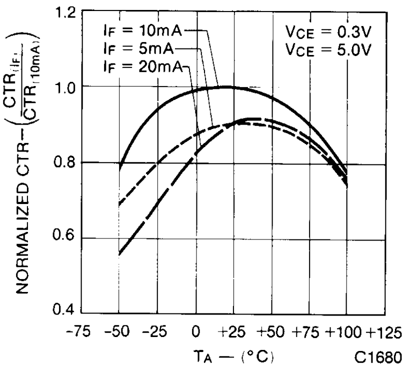

Fig. 3. Normalized CTR vs. Temperature

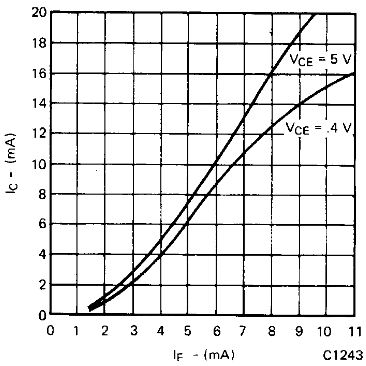

Fig. 4. Collector Current vs. Forward Current

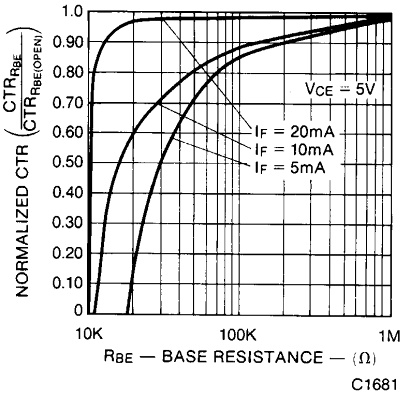

Fig. 5. CTR vs. RBE (Unsaturated)

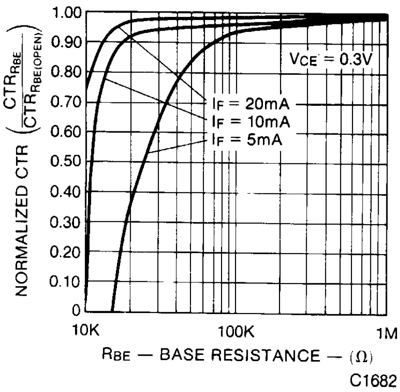

Fig. 6. CTR vs. RBE (Saturated)

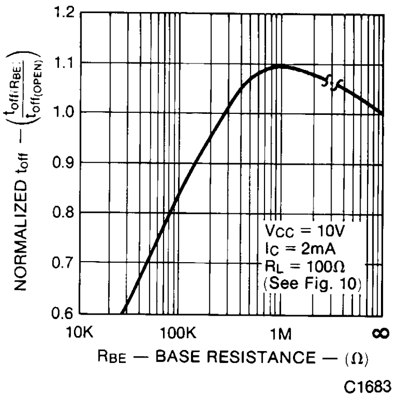

Fig. 7. Normalized T_{OFF} vs. RBE

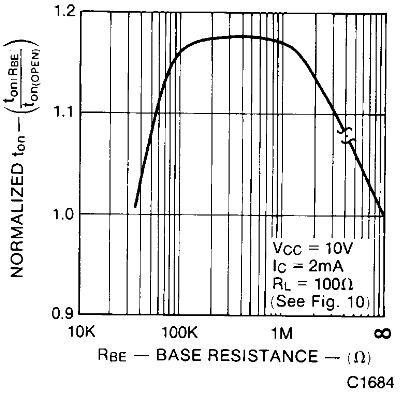

Fig. 8. Normalized T_{ON} vs. RBE

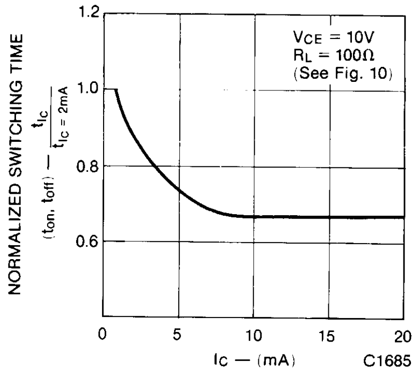

Fig. 9. Switching Time vs. IC

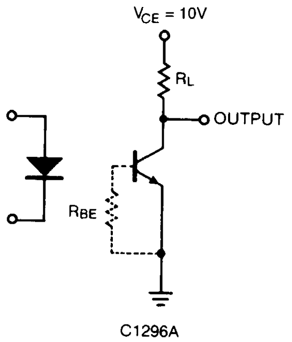

Fig. 10. Switching Time Test Circuit

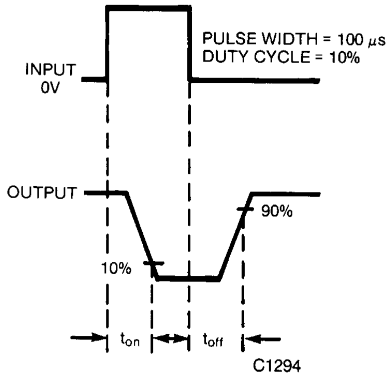

Fig. 11. Switching Time Waveforms