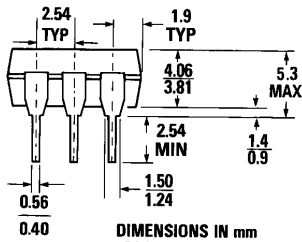
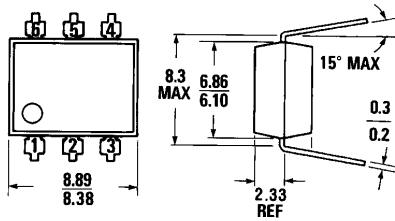
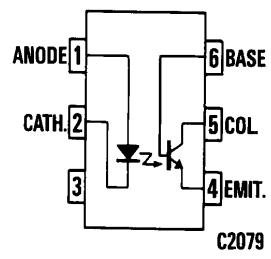


**PACKAGE DIMENSIONS**



DIMENSIONS IN mm  
PACKAGE CODE K  
ST1603A



**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<sub>a</sub>=25°C Unless Otherwise Specified)

<b>TOTAL PACKAGE</b>	<b>INPUT DIODE</b>
Storage temperature . . . . . -55°C to 150°C	Forward DC current . . . . . 100 mA
Operating temperature . . . . . -55°C to 100°C	Reverse voltage . . . . . 3 V
Lead temperature	Peak forward current
(soldering, 10 sec) . . . . . 260°C	(1 μs pulse, 300 pps) . . . . . 3.0 A
Total package power dissipation at 25°C	Power dissipation 25°C ambient . . . . . 150 mW
(LED plus detector) . . . . . 260 mW	Derate linearly from 25°C . . . . . 2 mW/°C
Derate linearly from 25°C . . . . . 3.3 mW/°C	<b>OUTPUT TRANSISTOR</b>
	Power dissipation at 25°C . . . . . 150 mW
	Derate linearly from 25°C . . . . . 2 mW/°C
	V <sub>CEO</sub> . . . . . 30 V
	V <sub>CBO</sub> . . . . . 70 V
	V <sub>ECO</sub> . . . . . 7 V
	Collector current (continuous) . . . . . 100 mA

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

**INDIVIDUAL COMPONENT CHARACTERISTICS**

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

**TRANSFER CHARACTERISTICS**

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

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

PARAMETER	SYMBOL	TIL111			UNIT	TEST CONDITIONS	
		MIN.	TYP.	MAX.			
Rise time	Phototransistor operation	$t_r$		5	10	$\mu\text{s}$	$V_{CC}=10\text{ V}, I_{C(on)}=2\text{ mA}, R_L=100\ \Omega$
Fall time							
Rise time	Photodiode operation	$t_r$		1		$\mu\text{s}$	$V_{CC}=10\text{ V}, I_{C(on)}=20\ \mu\text{A}, R_L=1\text{ k}\Omega$
Fall time							

**ISOLATION CHARACTERISTICS**

PARAMETER	SYMBOL	TIL111			UNIT	TEST CONDITIONS
		MIN.	TYP.	MAX.		
Input-to-output internal resistance	$r_{io}$	$10^{11}$			$\Omega$	$V_{ISO}=\pm 1.5\text{ kV}$
Input-to-output capacitance	$C_{io}$		1	1.3	pF	$V_{in,out}=0, f=1\text{ MHz}$ , See Note 6
Isolation voltage	$V_{iso}$		7500		VAC-PEAK	$I_{i-o} \leq 1\ \mu\text{A}, 1\text{ minute}$
			5300		VAC-RMS	$I_{i-o} \leq 1\ \mu\text{A}, 1\text{ minute}$

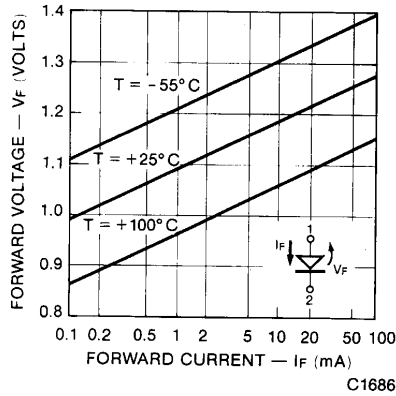


Fig. 1. Forward Voltage vs. Current

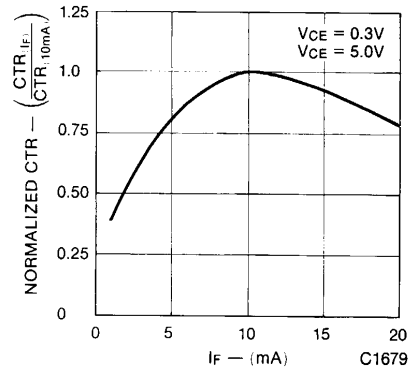


Fig. 2. Normalized CTR vs. Forward Current

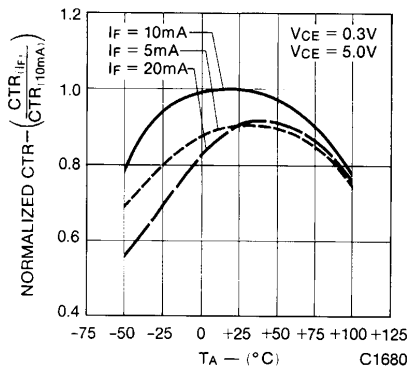


Fig. 3. Normalized CTR vs. Temperature

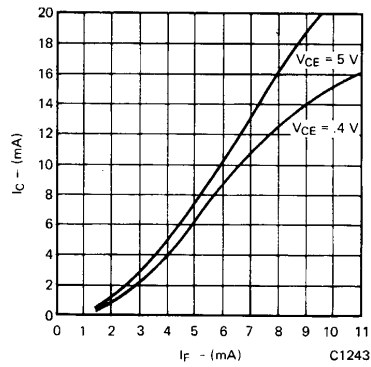


Fig. 4. Collector Current vs. Forward Current

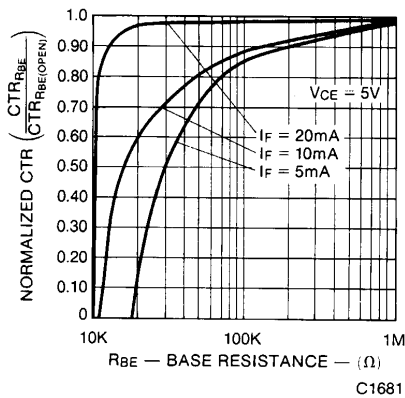


Fig. 5. CTR vs. RBE (Unsaturated)

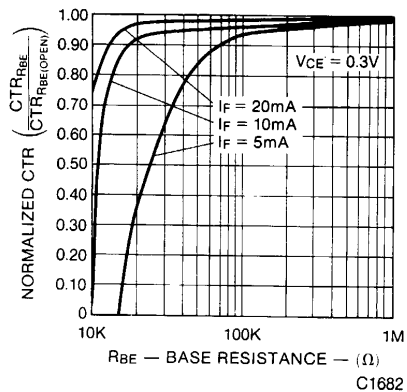
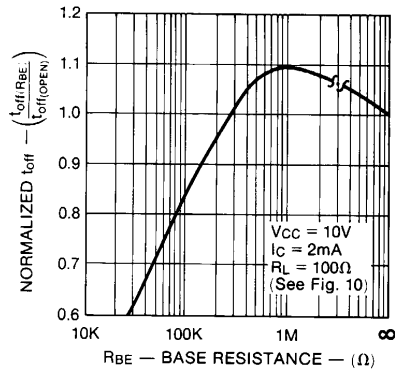
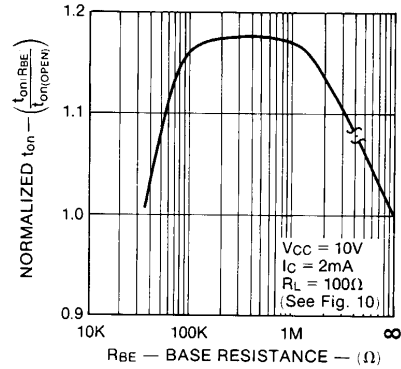


Fig. 6. CTR vs. RBE (Saturated)



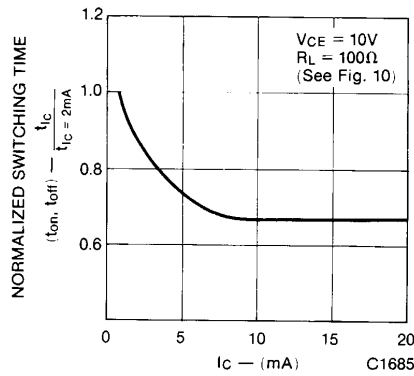
C1683

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



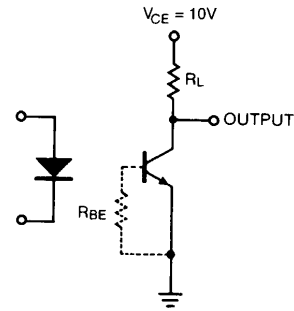
C1684

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



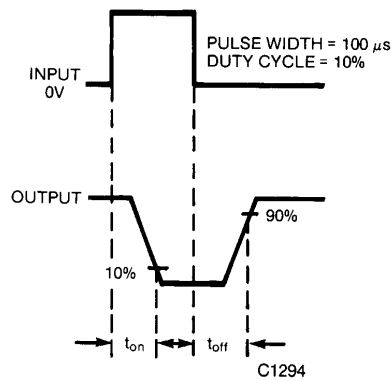
C1685

Fig. 9. Switching Time vs.  $I_C$



C1296A

Fig. 10. Switching Time Test Circuit



C1294

Fig. 11. Switching Time Waveforms



## PHOTOTRANSISTOR OPTOISOLATOR

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.