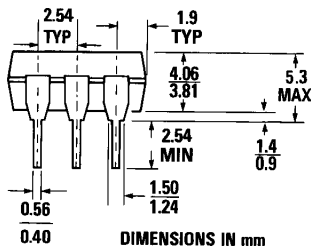
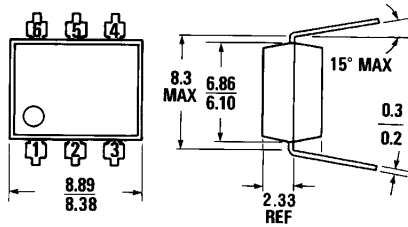
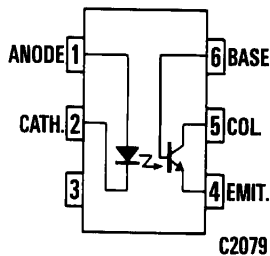


PACKAGE DIMENSIONS



DIMENSIONS IN mm
PACKAGE CODE K

ST1603A



C2079

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 ($T_A=25^\circ\text{C}$ 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/ $^\circ\text{C}$ |

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/ $^\circ\text{C}$ |

OUTPUT TRANSISTOR

| | |
|---|------------------------|
| Power dissipation at 25°C | 150 mW |
| Derate linearly from 25°C | 2 mW/ $^\circ\text{C}$ |
| V_{CEO} | 30 V |
| V_{CBO} | 70 V |
| V_{ECO} | 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. | | |
| INPUT DIODE Input diode static reverse current | I_R | | | 10 | μA | $V_R = 3\text{ V}$ |
| Input diode static forward voltage | V_F | | 1.2 | 1.4 | V | $I_F = 16\text{ mA}$ |
| OUTPUT TRANSISTOR 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 | mA | $V_{CE} = 0.4\text{ V}$, $I_F = 16\text{ mA}$, $I_B = 0$ | |
| | Photodiode operation | $I_{C(on)}$ | 7 | 20 | μA | $V_{CB} = 0.4\text{ V}$, $I_C = 16\text{ mA}$, $I_E = 0$ | |
| Off-state collector current | Phototransistor operation | $I_{C(off)}$ | | 1 | 50 | nA | $V_{CE} = 10\text{ V}$, $I_C = 0$, $I_B = 0$ |
| | Photodiode operation | $I_{C(off)}$ | | 0.1 | 20 | | $V_{CB} = 10\text{ V}$, $I_C = 0$, $I_E = 0$ |
| 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 | μs | $V_{CC} = 10\text{ V}$, $I_{C(on)} = 2\text{ mA}$, $R_L = 100\ \Omega$ |
| Fall time | | | | | | | |
| Rise time | Photodiode operation | t_r | | 1 | | μs | $V_{CC} = 10\text{ V}$, $I_{C(on)} = 20\ \mu\text{A}$, $R_L = 1\text{ k}\Omega$ |
| Fall time | | | | | | | |

ISOLATION CHARACTERISTICS

| PARAMETER | SYMBOL | TIL111 | | | UNIT | TEST CONDITIONS |
|-------------------------------------|-----------|-----------|------|------|----------|--|
| | | MIN. | TYP. | MAX. | | |
| Input-to-output internal resistance | r_{io} | 10^{11} | | | Ω | $V_{ISO} = \pm 1.5\text{ kV}$ |
| 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 minute |
| | | 5300 | | | VAC-RMS | $I_{i.o} \leq 1\ \mu\text{A}$, 1 minute |

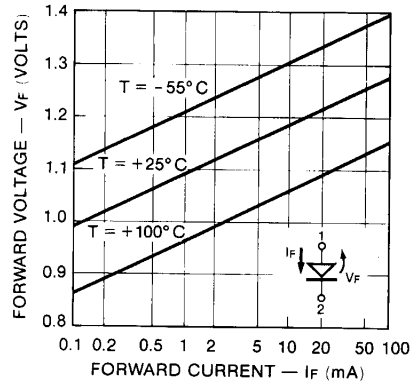


Fig. 1. Forward Voltage vs. Current

C1686

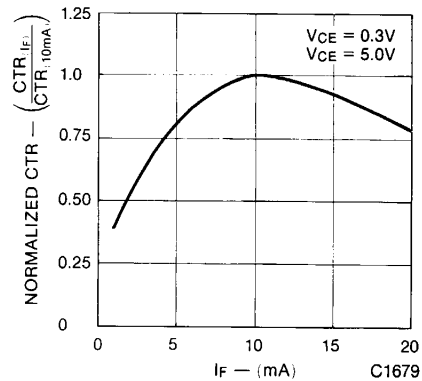


Fig. 2. Normalized CTR vs. Forward Current

C1679

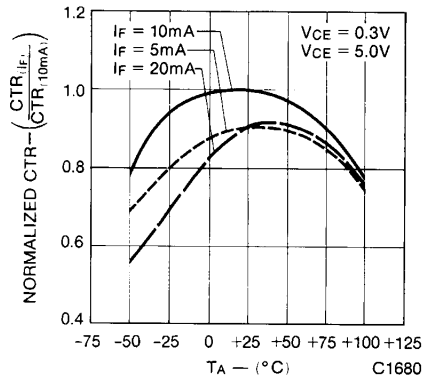


Fig. 3. Normalized CTR vs. Temperature

C1680

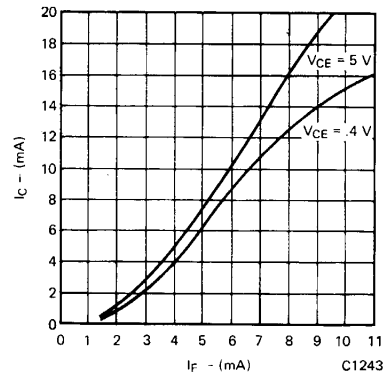


Fig. 4. Collector Current vs. Forward Current

C1243

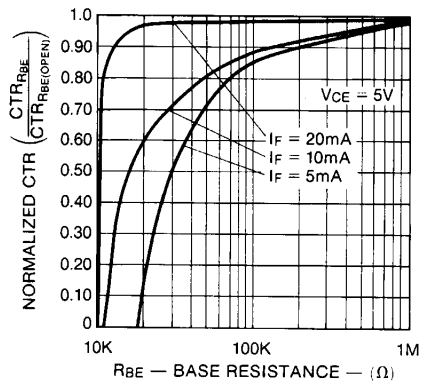


Fig. 5. CTR vs. RBE (Unsaturated)

C1681

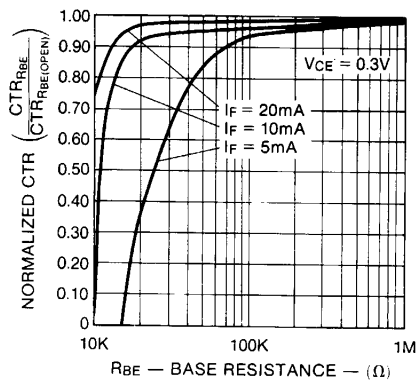


Fig. 6. CTR vs. RBE (Saturated)

C1682

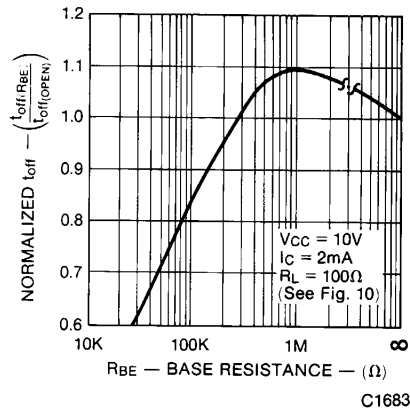


Fig. 7. Normalized T_{OFF} vs. R_{BE}

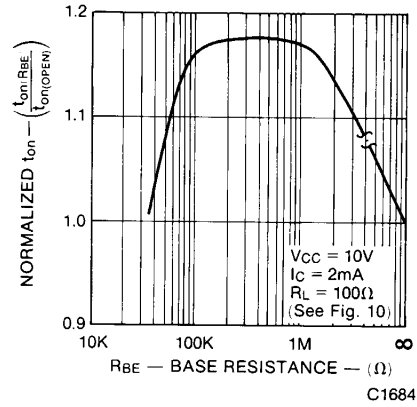


Fig. 8. Normalized T_{ON} vs. R_{BE}

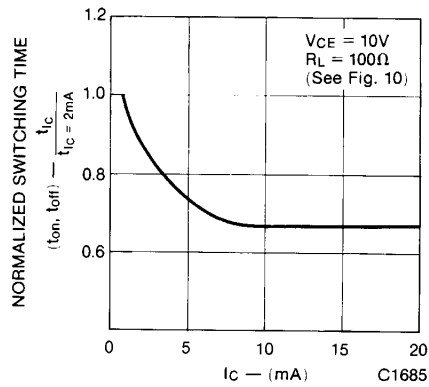


Fig. 9. Switching Time vs. I_C

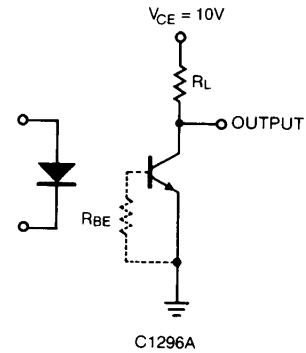


Fig. 10. Switching Time Test Circuit

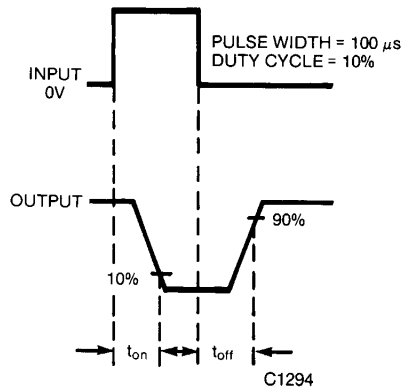


Fig. 11. Switching Time Waveforms



PHOTOTRANSISTOR OPTOISOLATOR

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