

**GENERAL
INSTRUMENT**

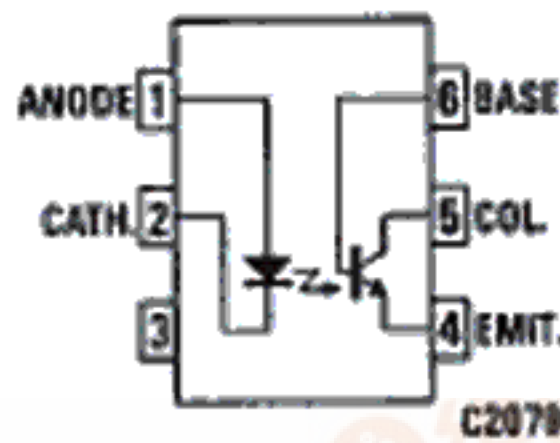
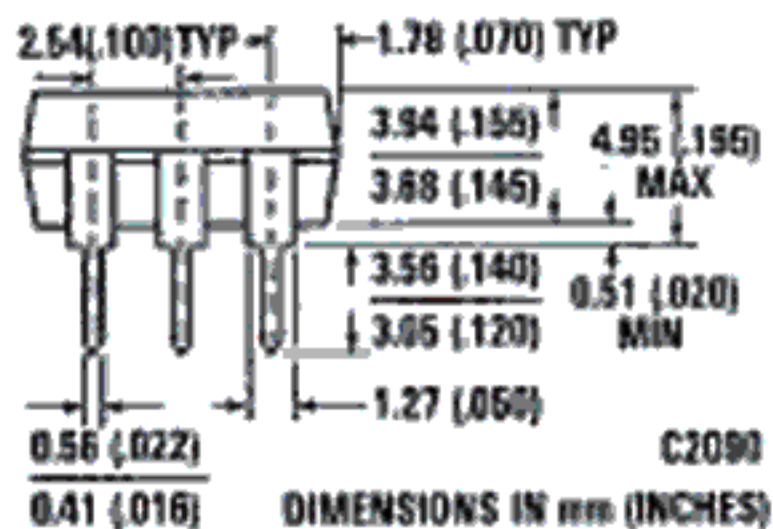
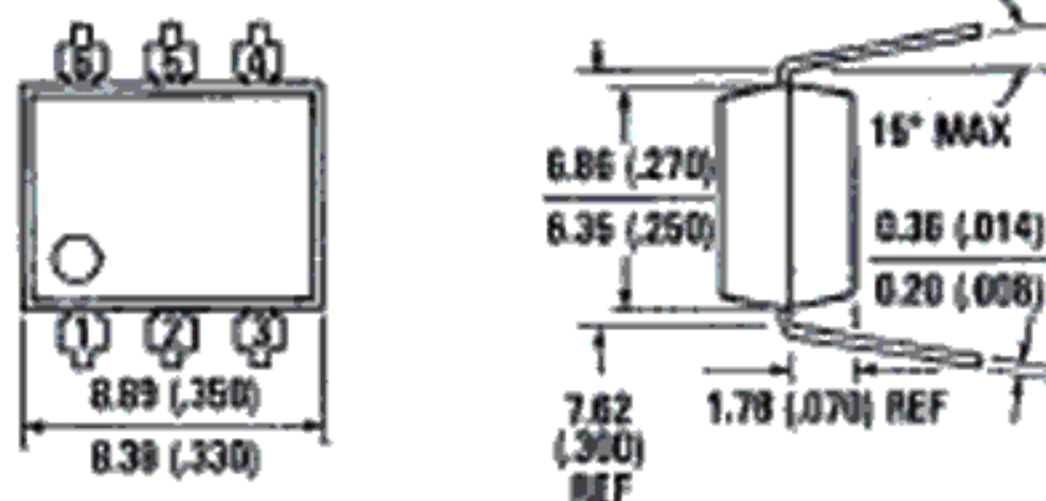
**VDE APPROVED
TRANSISTOR OUTPUT OPTOCOUPLER**

Cptocouplers



**H11A1
H11A1Z**

PACKAGE DIMENSIONS



Equivalent Circuit

DESCRIPTION

The H11A1 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 in a standard plastic six-pin dual-in-line package.

FEATURES

- High isolation voltage
5300 VAC RMS — 5 seconds
7500 VAC PEAK — 5 seconds
- Minimum current transfer ratio of 50%
- Underwriters Laboratory (UL) recognized
File #E50151
- VDE approval Certificate 39 419 for H11A1Z

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 | 3.5 mW/°C |

INPUT DIODE

| | |
|---|-----------|
| Forward DC current | .60 mA |
| Reverse voltage | .6 V |
| Peak forward current (1 μs pulse, 300 pps) | 3.0 A |
| Power dissipation 25°C ambient | 100 mW |
| Derate linearly from 25°C | 1.8 mW/°C |

OUTPUT TRANSISTOR

| | |
|--------------------------------------|------------|
| Power dissipation at 25°C | 150 mW |
| Derate linearly from 25°C | 2.67 mW/°C |
| V _{CEO} | 30 V |
| V _{CBO} | 70 V |
| V _{ECO} | .7 V |
| Collector current (continuous) | 100 mA |

H11A1 H11A1Z

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ELECTRO-OPTICAL CHARACTERISTICS (T_A = 25°C Unless Otherwise Specified)

| TRANSFER CHARACTERISTICS | | | | | | | |
|--------------------------|---|----------------------|------------------|------|------|----------------------|---|
| | CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
| DC | Current Transfer Ratio collector to emitter | CTR | 50 | | | | I _F = 10 mA, V _{CE} = 10 V |
| | Saturation voltage | V _{CE(SAT)} | | 0.1 | 0.4 | V | I _F = 10 mA, I _C = 0.5 mA |
| SWITCHING TIMES | Non-saturated Turn-on time | t _{on} | | 2 | | μs | V _{CE} = V, I _{CE} = 2 mA, R _L = 100 Ω, See Figure 9 |
| | Turn-off time | t _{off} | | 2 | | μs | |
| | Non-saturated Turn-on time | t _{on} | | 300 | | ns | V _{CE} = 10 V, I _{CB} = 50 μA, R _L = 100 Ω, See Figure 9 |
| | Turn-off time | t _{off} | | 300 | | ns | |
| ISOLATION | Isolation voltage | V _{iso} | 5300 | | | V _{AC} RMS | Relative humidity ≤ 50%, I _{CO} ≤ 10 μA, 5 seconds |
| | | | 7500 | | | V _{AC} PEAK | Relative humidity ≤ 50%, I _{CO} ≤ 10 μA, 5 seconds |
| | Isolation resistance | R _{iso} | 10 ¹¹ | | | ohms | V _{I-O} = 500 VDC |
| | Isolation capacitance | C _{iso} | | 0.5 | | pF | f = 1 MHz |

| INDIVIDUAL COMPONENT CHARACTERISTICS | | | | | | | |
|--------------------------------------|---|-------------------|------|------|------|-------|---|
| | CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNITS | TEST CONDITIONS |
| INPUT DIODE | Forward voltage | V _F | | 1.1 | 1.50 | V | I _F = 10 mA |
| | Forward voltage temperature coefficient | | | -1.8 | | mV/°C | |
| | Reverse voltage | V _R | 3.0 | 25 | | V | I _R = 10 μA |
| | Junction capacitance | C _J | | 50 | | pF | V _F = 0 V, f = 1 MHz |
| | | | | 65 | | pF | V _F = 1 V, f = 1 MHz |
| | Reverse leakage current | I _R | | 0.35 | 10 | μA | V _R = 3.0 V |
| OUTPUT TRANSISTOR | Breakdown voltage Collector to emitter | BV _{CEO} | 30 | 45 | | V | I _C = 10 mA, I _F = 0 |
| | Collector to base | BV _{CBO} | 70 | 130 | | V | I _C = 100 μA, I _F = 0 |
| | Emitter to collector | BV _{ECO} | 7 | 10 | | V | I _E = 100 μA, I _F = 0 |
| | Leakage current Collector to emitter | I _{CEO} | | 5 | 50 | nA | V _{CE} = 10 V, I _F = 0 |
| | Collector to base | I _{CBO} | | | 20 | nA | V _{CB} = 10 V, I _F = 0 |
| | Capacitance Collector to emitter | | | 8 | | pF | V _{CE} = 0, f = 1 MHz |
| | Collector to base | | | 20 | | pF | V _{CB} = 5, f = 1 MHz |
| | Emitter to base | | | 10 | | pF | V _{EB} = 0, f = 1 MHz |

ELECTRICAL CHARACTERISTIC CURVES (T_A = 25°C Unless Otherwise Specified)

Optocouplers

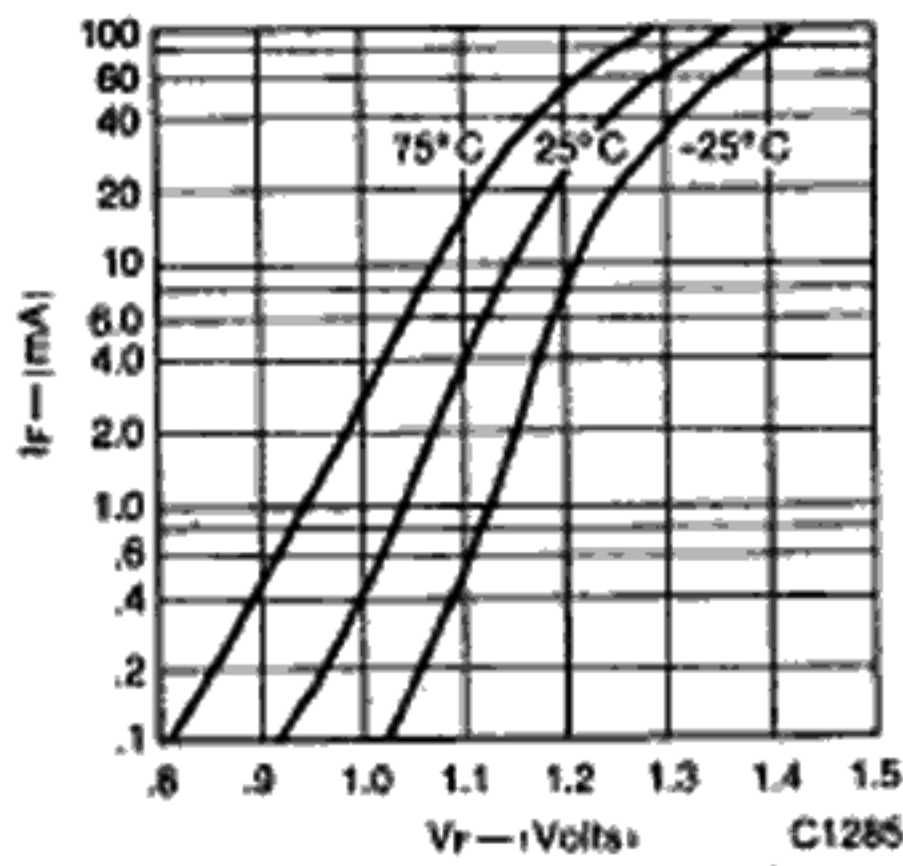


Fig. 1. Forward Voltage vs. Forward Current

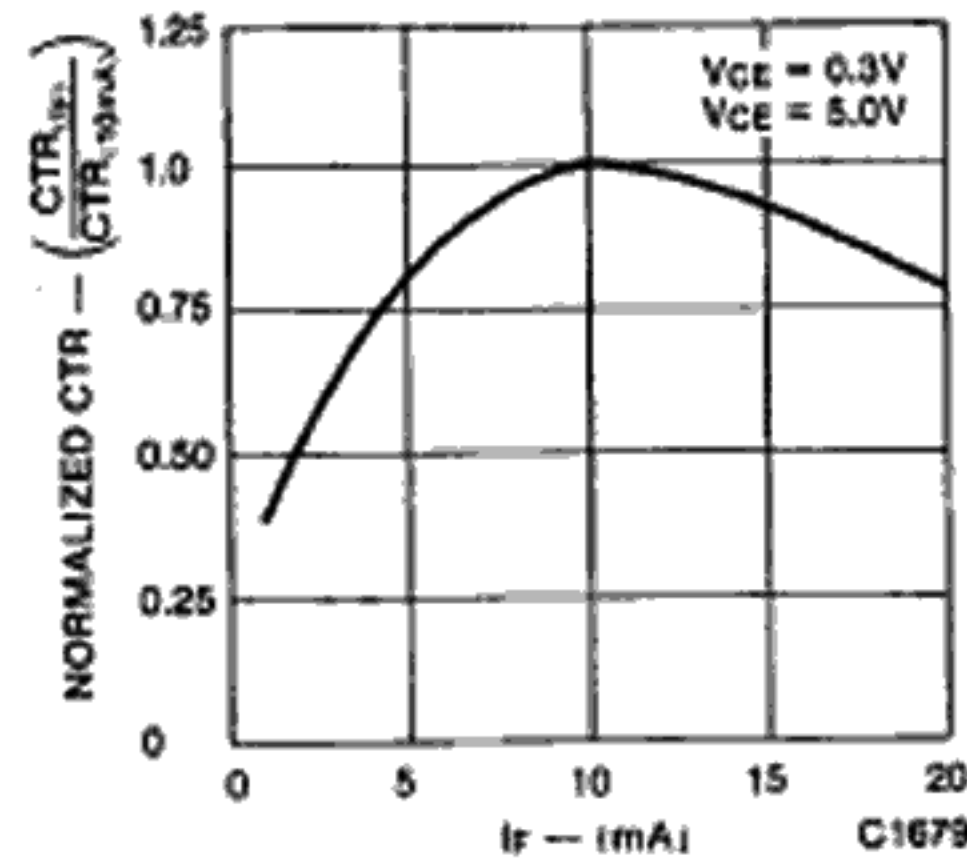


Fig. 2. Normalized Current Transfer Ratio vs. Forward Current

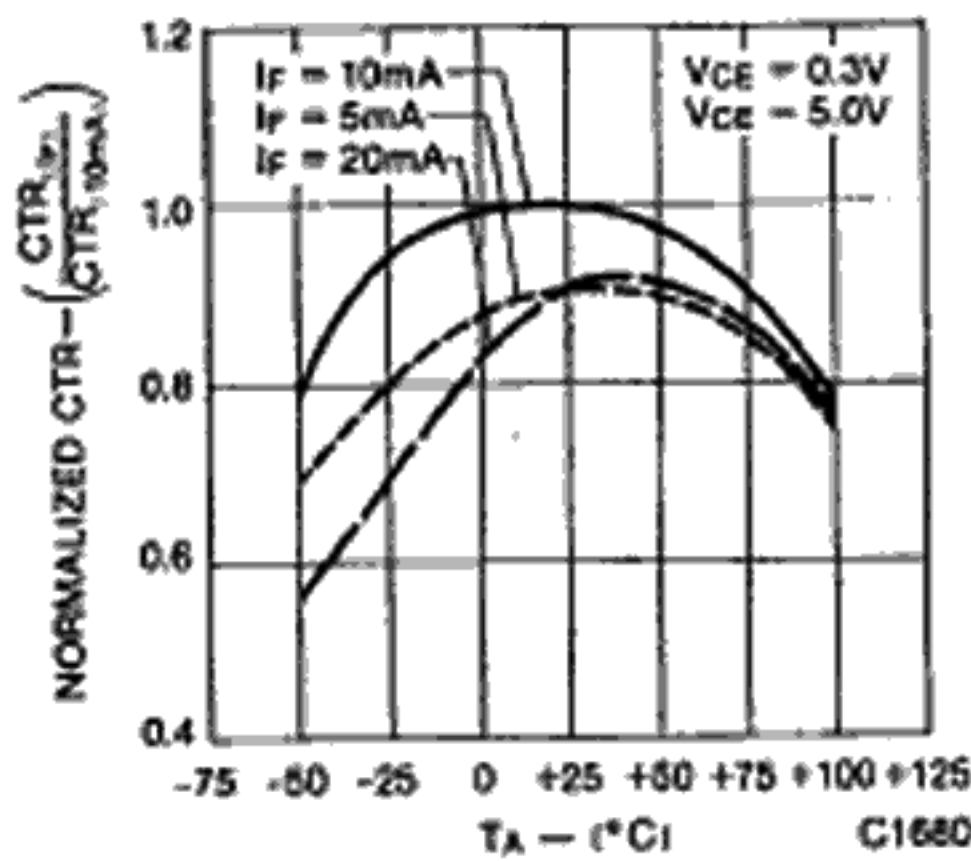


Fig. 3. Normalized Current Transfer Ratio vs. Ambient Temperature

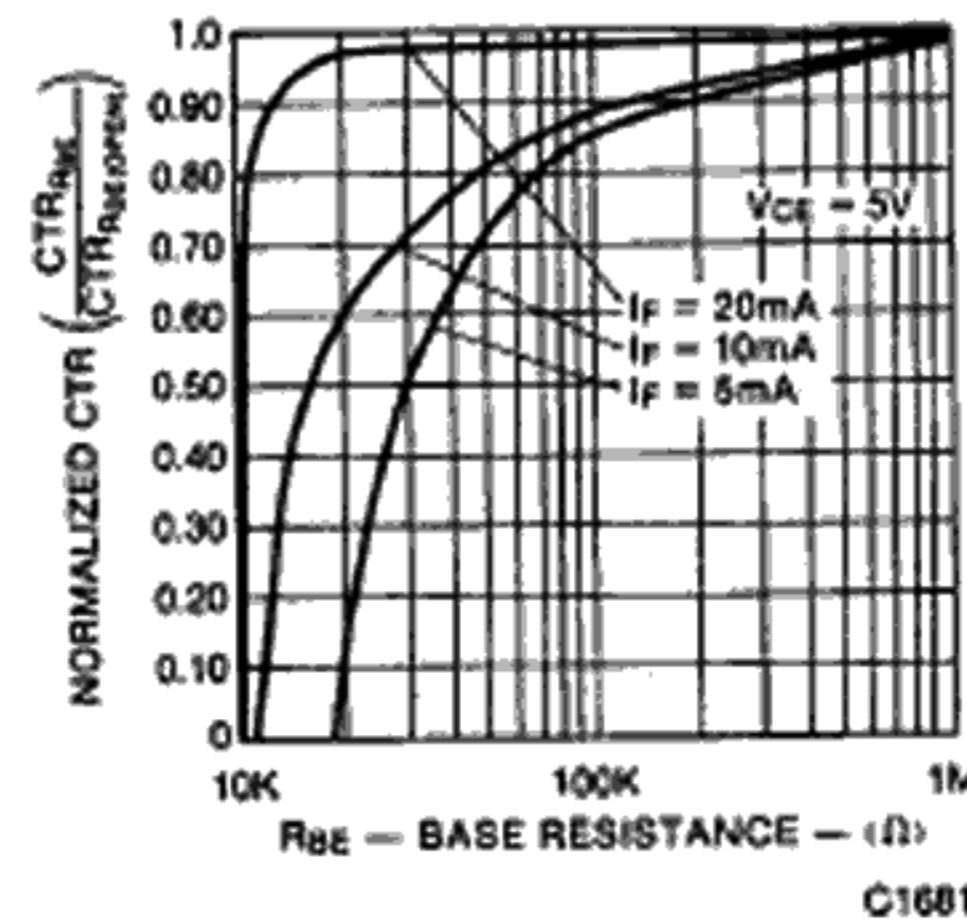


Fig. 4. CTR vs. R_{BE}

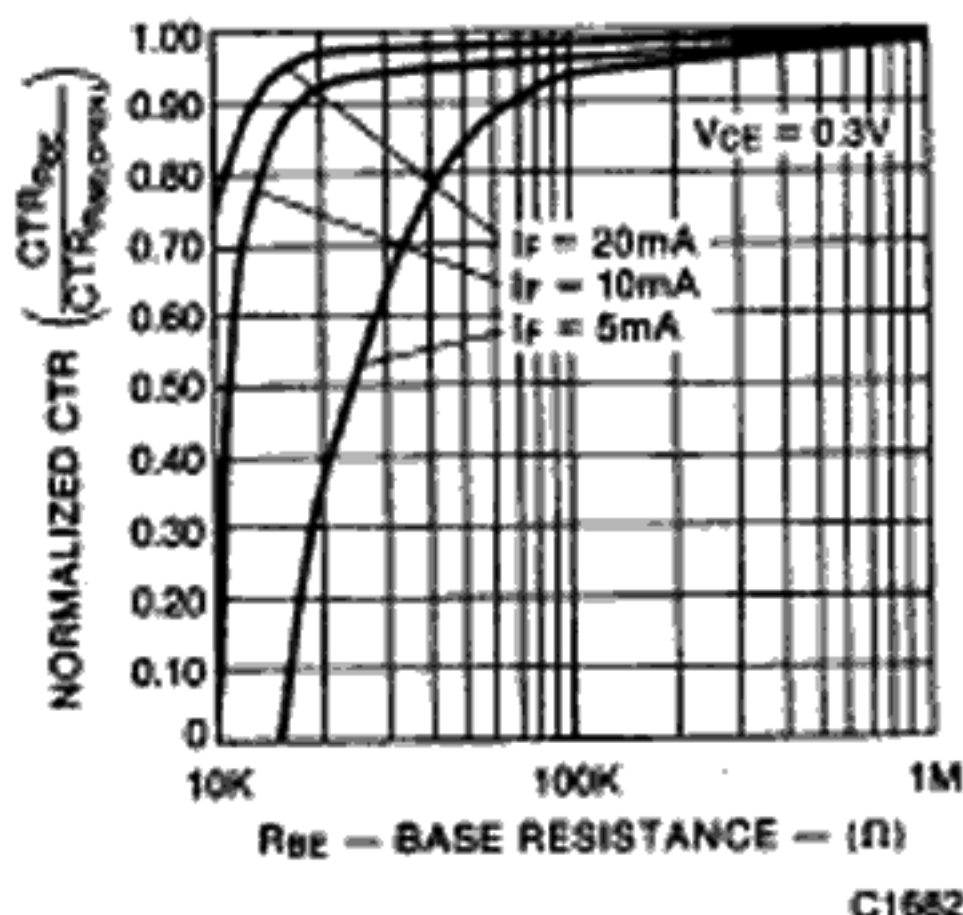


Fig. 5. CTR vs. R_{BE}

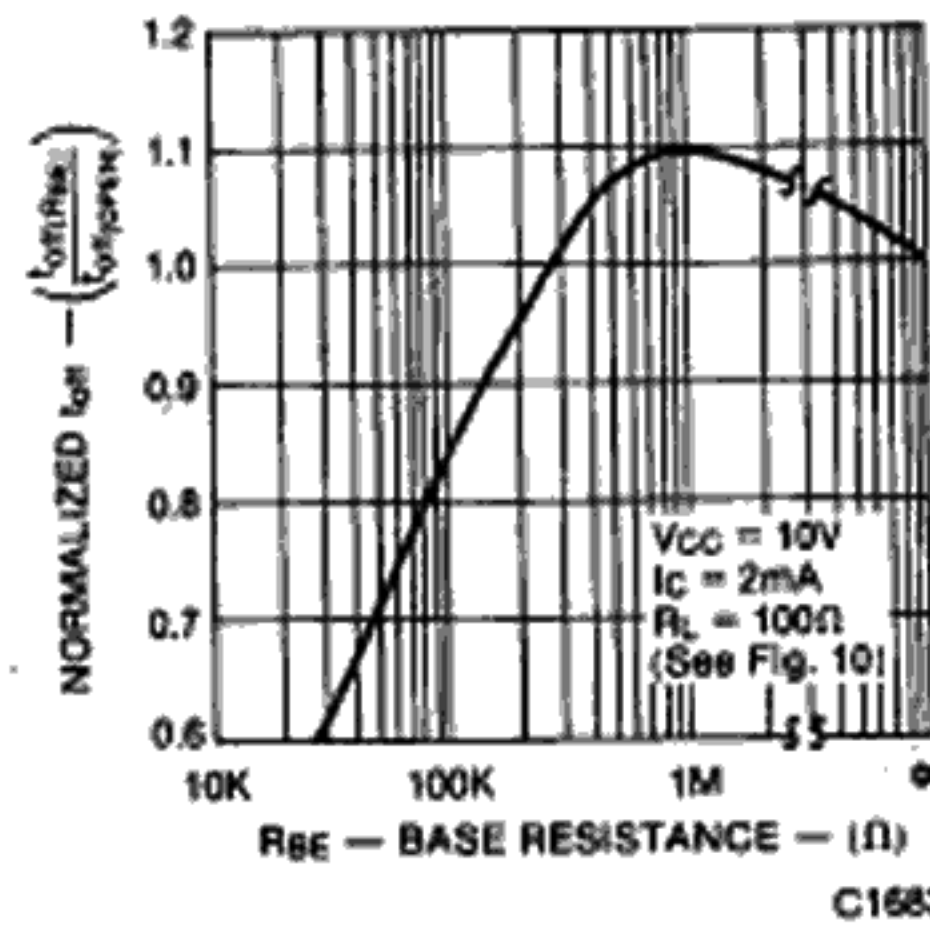


Fig. 6. Normalized I_{OL} vs. R_{BE}

H11A1 H11A1Z

ELECTRICAL CHARACTERISTIC CURVES ($T_A = 25^\circ\text{C}$ Unless Otherwise Specified)

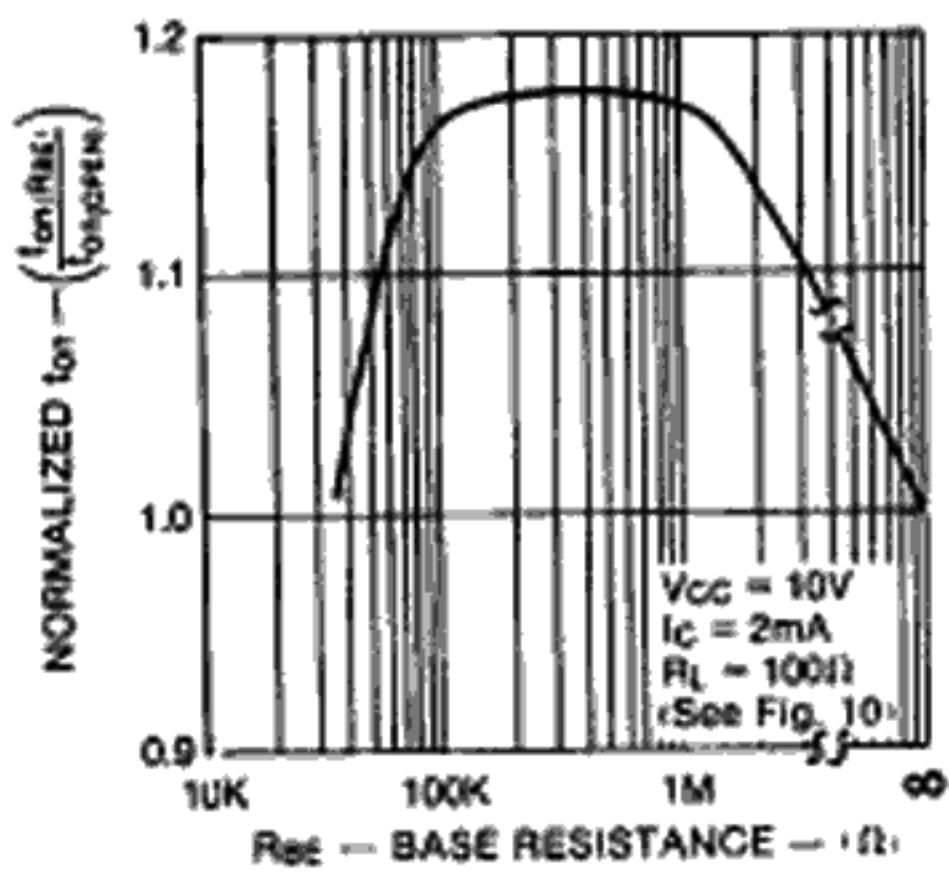


Fig. 7. Normalized t_{on} vs. R_{BE}

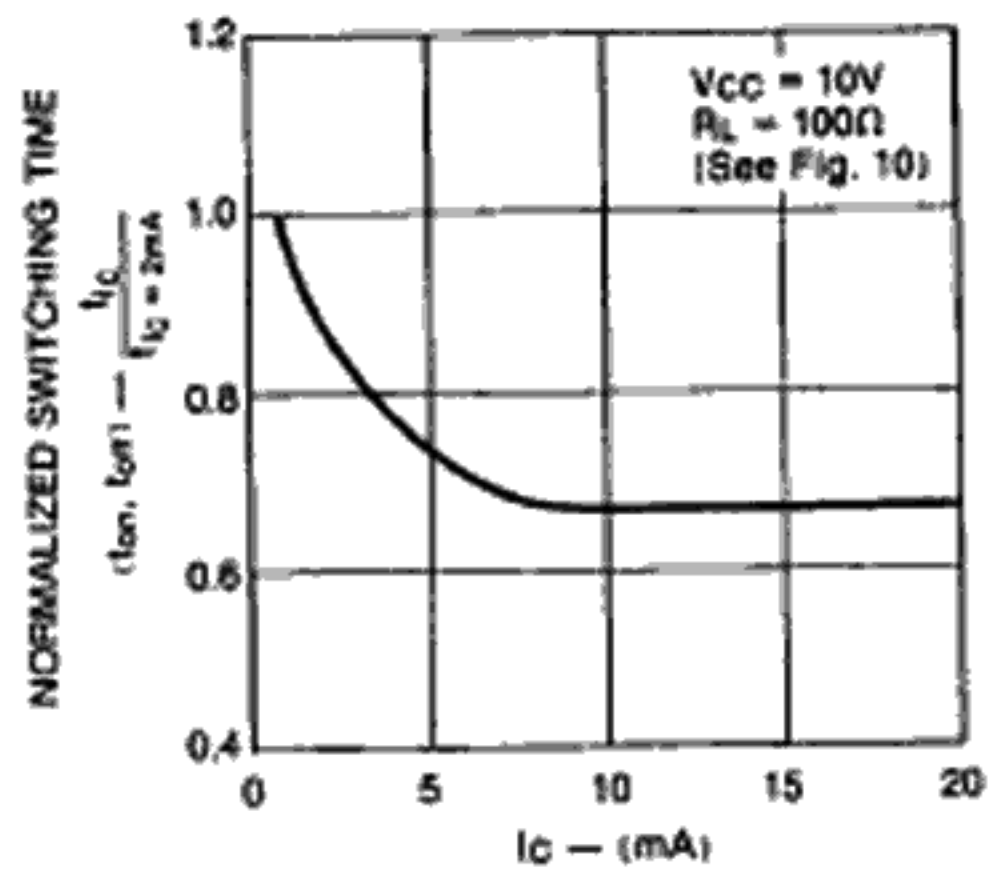


Fig. 8. Normalized Switching Time vs. Collector Current

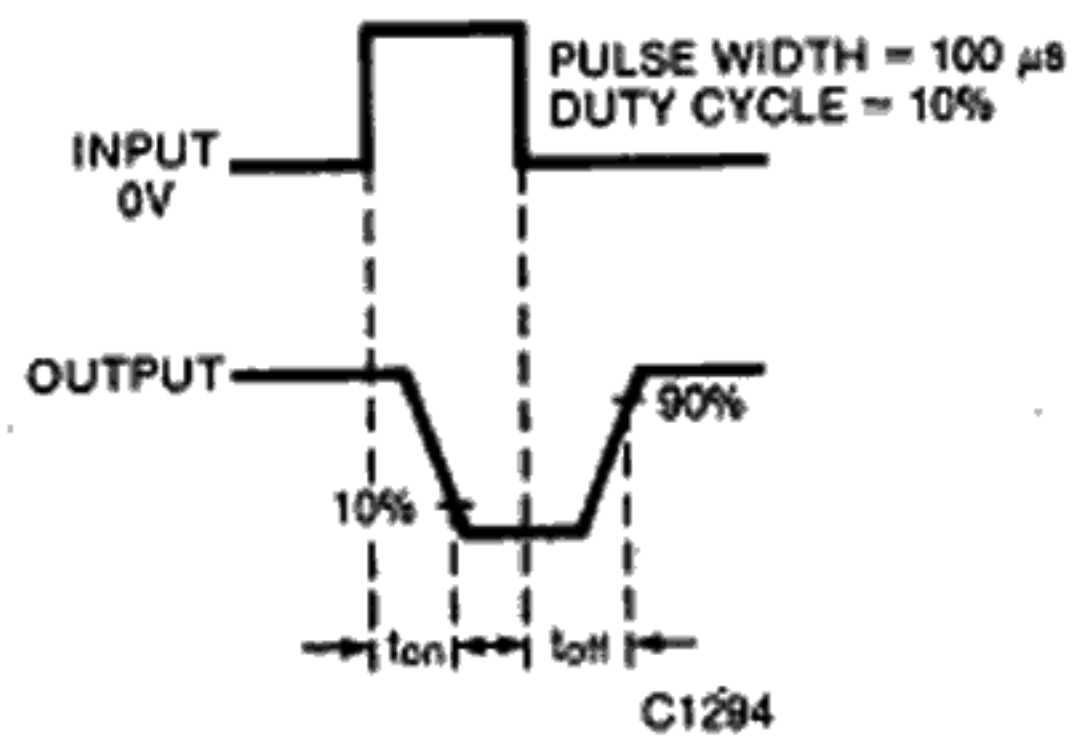
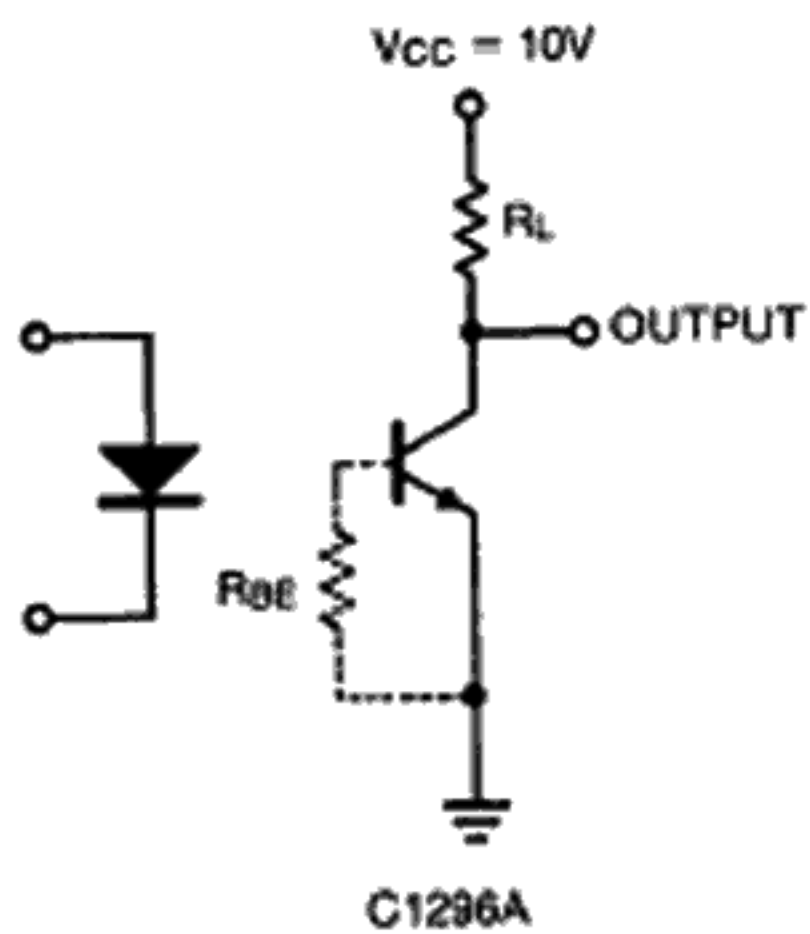


Fig. 9. Switching Time Test Circuit and Waveform