

GENERAL INSTRUMENT

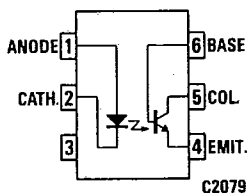
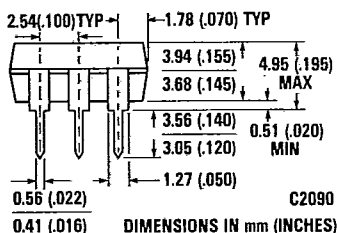
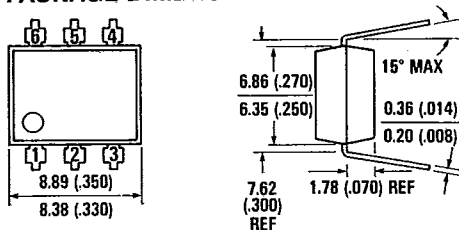
VDE APPROVED TRANSISTOR OUTPUT OPTOCOUPLER

Optocouplers



**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 current60 mA
Reverse voltage6 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

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DT-41-83

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 _{CB} = 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 _{I-O} ≤ 10 μA, 5 seconds
			7500			V _{AC} PEAK	
	Isolation resistance	R _{iso}	10 ¹¹			ohms	Relative humidity ≤ 50%, I _{I-O} ≤ 10 μA, 5 seconds
	Isolation capacitance	C _{iso}		0.5		pF	V _{I-O} = 500 VDC 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 _{ECCO}	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

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

Optocouplers

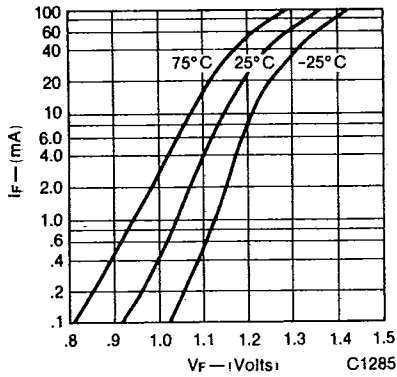


Fig. 1. Forward Voltage vs. Forward Current

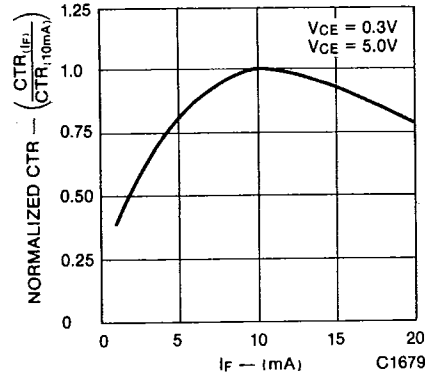


Fig. 2. Normalized Current Transfer Ratio vs. Forward Current

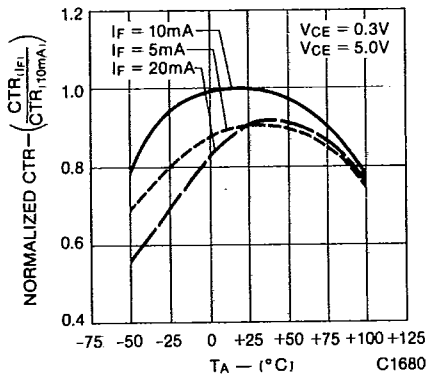


Fig. 3. Normalized Current Transfer Ratio vs. Ambient Temperature

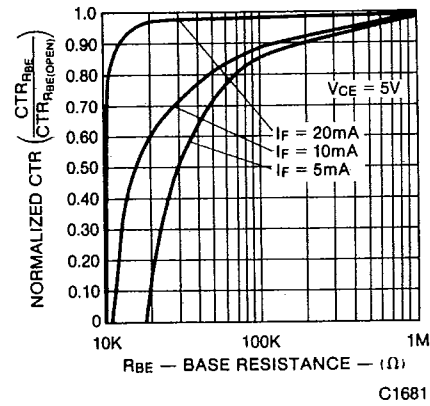


Fig. 4. C_{TR} vs. R_{BE}

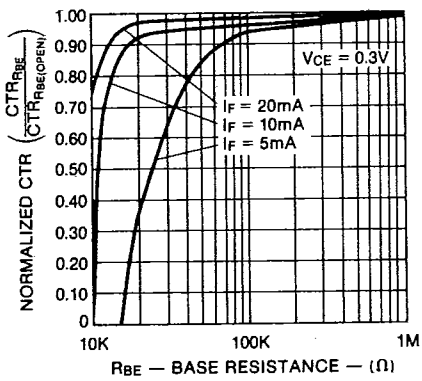


Fig. 5. C_{TR} vs. R_{BE}

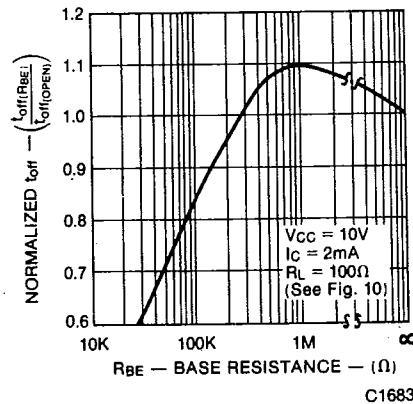


Fig. 6. Normalized toff vs. R_{BE}

H11A1 H11A1Z

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

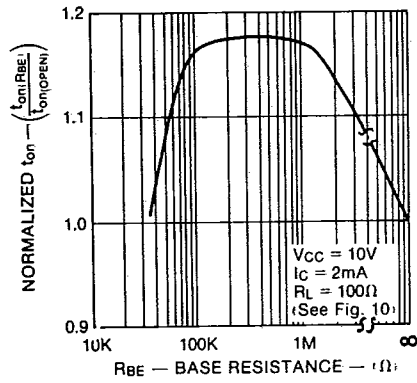


Fig. 7. Normalized t_{on} vs. R_{BE}

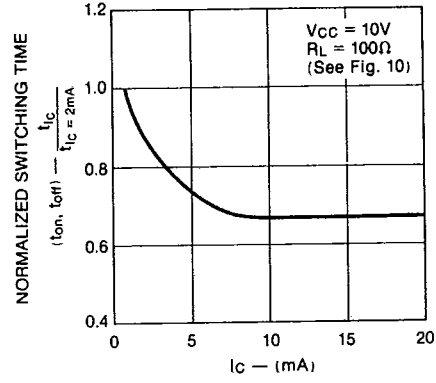


Fig. 8. Normalized Switching Time vs. Collector Current

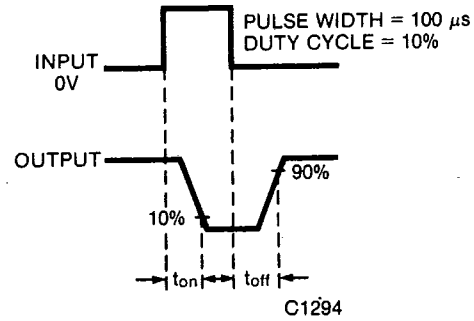
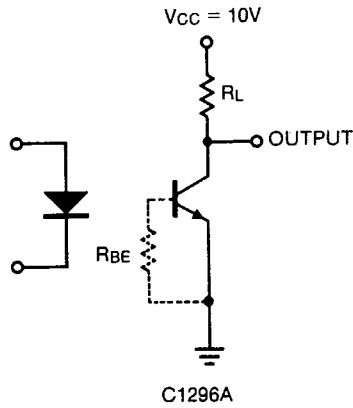


Fig. 9. Switching Time Test Circuit and Waveform