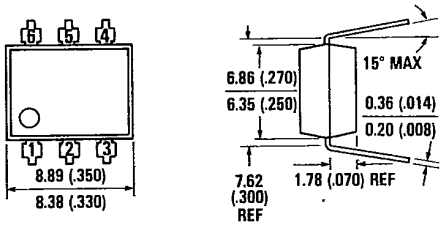
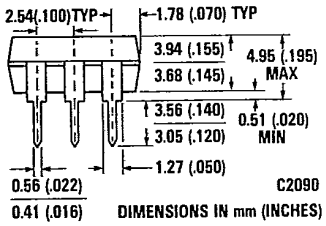
GENERAL INSTRUMENT

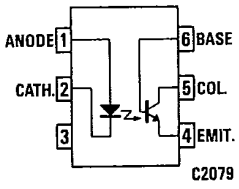
PHOTOTRANSISTOR OPTOCOUPLER

MCT275

PACKAGE DIMENSIONS







Equivalent Circuit

DESCRIPTION

The MCT275 is a phototransistor-type optically coupled isolator. A gallium arsenide infrared emitting diode is selectively coupled with a high voltage NPN silicon phototransistor.

FEATURES

- High voltage output – 80 volts, BV_{CEO}
- Controlled Current Transfer Ratio – 70% to 210% (specified conditions)
- Maximum Turn-on time – 15 μseconds (specified condition)
- Maximum Turn-off time – 15 μseconds (specified condition)
- Surge Isolation Rating – 4000 volts DC 3000 volts AC, rms
- Steady-state Isolation Rating – 3500 volts DC 2500 volts AC, rms
- Underwriters Laboratory (U.L.) recognized – File E50151

APPLICATIONS

- Telephone circuits
- Digital input to telecommunications
- Industrial control of high DC voltage
- Telephone relay driver

ABSOLUTE MAXIMUM RATINGS

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 @ 25°C (LED plus detector) . . . . . 260 mW
Derate linearly from 25°C . . . . . 3.5 mW/°C

INPUT DIODE

Forward current . . . . . 60 mA
Reverse voltage . . . . . 3 V
Peak forward current (1 μs pulse, 300 pps) . . . . . 3.0 A
Power dissipation 25°C ambient . . . . . 90 mW
Derate linearly from 25°C . . . . . 1.2 mW/°C

OUTPUT TRANSISTOR

Power dissipation @ 25°C . . . . . 200 mW
Derate linearly from 25°C . . . . . 2.67 mW/°C

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

	TRANSFER CHARACTERISTICS						
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
DC	Current Transfer Ratio, collector to emitter (a)	CTR_{CE}	70	125	210	%	I_F = 10 mA; V_{CE} = 10 V
			12.5			%	I_F = 16 mA; V_{CE} = 0.4 V
	Current Transfer Ratio, collector to base	CTR_{CB}		0.15		%	I_F = 10 mA; V_{CB} = 10 V
	Saturation voltage	$V_{CE(SAT)}$		0.25	.40	V	I_F = 16 mA; I_C = 2 mA
SWITCHING TIMES	Non-saturated						
	Turn-on time	t_{on}		4.5	15	μs	R_L = 100 Ω; I_C = 2 mA; V_{CC} = 5 V
	Turn-off time	t_{off}		3.5	15	μs	See figures 11, 13
	Saturated						
	Turn-on time	t_{on}		3.2		μs	I_F = 16 mA; R_L = 1.9 KΩ
	Turn-off time	t_{off}		50		μs	See figures 12, 14
	(Approximates a typical TTL interface)						
	Turn-on time	t_{on}		3.1		μs	I_F = 16 mA; R_L = 4.7 KΩ
	Turn-off time	t_{off}		90		μs	See figures 12, 14
	(Approximates a typical low power TTL interface)						
ISOLATION	Surge isolation	V_{iso}	4000			VDC	Relative humidity ≤ 50%, I_{I-O} ≤ 10 μA
			3000			VAC-rms	t = 1 second
	Steady state isolation	V_{iso}	3500			VDC	Relative humidity ≤ 50%, I_{I-O} ≤ 10 μA
			2500			VAC-rms	t = 1 minute
	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		1.20	1.50	V	I_F = 20 mA
	Forward voltage temp. 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	DC forward current gain	h_{FE}		170			V_{CE} = 5 V, I_C = 100 μA
	Breakdown voltage						
	Collector to emitter	BV_{CEO}	80	85		V	I_C = 1.0 mA, I_F = 0
	Collector to base	BV_{CBO}	100	150		V	I_C = 10 μA
	Emitter to base	BV_{EBO}	5	7		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
	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

TYPICAL ELECTRICAL CHARACTERISTIC CURVES (25°C Free Air Temperature Unless Otherwise Specified)

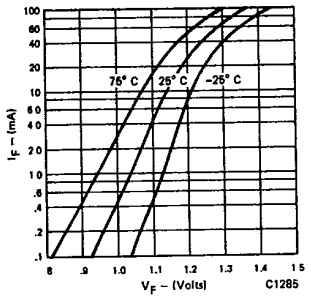


Fig. 1. Forward Voltage vs. Forward Current

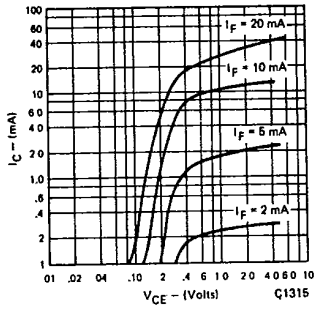


Fig. 2. Collector Current vs. Collector to Emitter Voltage

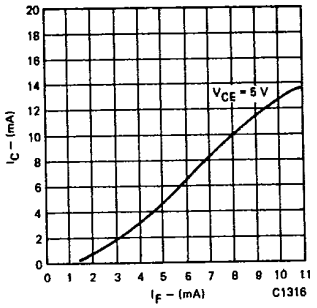


Fig. 3. Collector Current vs. Forward Current

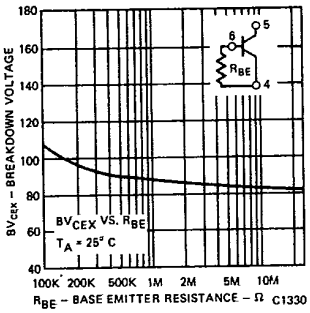


Fig. 4. Collector-Emitter Breakdown Voltage vs. Base Resistance

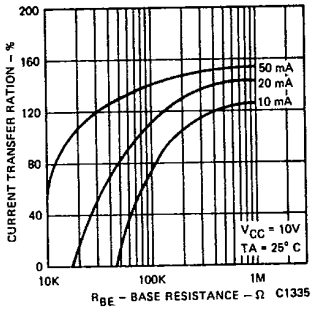


Fig. 5. Sensitivity vs. Base Resistance

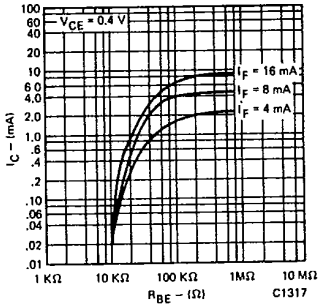


Fig. 6. Saturated CTR vs. Base to Emitter Resistance

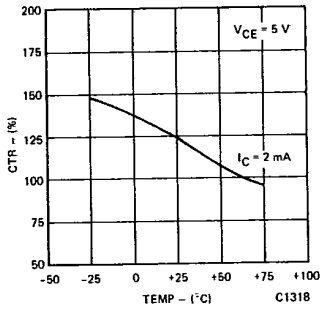


Fig. 7. Current Transfer Ratio (unsaturated) vs. Temperature

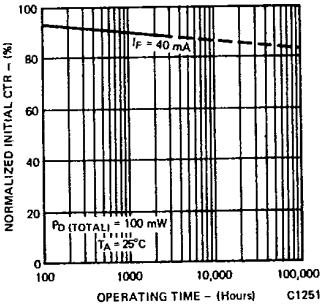


Fig. 8. Current Transfer Ratio vs. Operating Time

TYPICAL SWITCHING CHARACTERISTICS

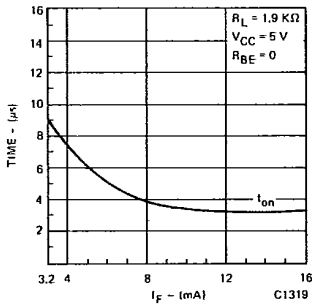


Fig. 9. Switch-on Time vs. I_F Drive (saturated)

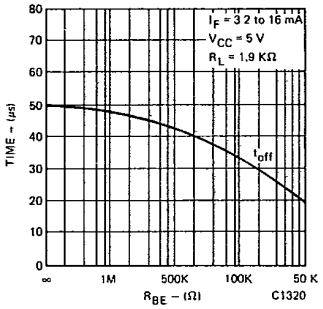


Fig. 10. Switch-off Time vs. Base to Emitter Resistance (saturated)

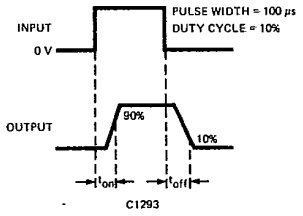


Fig. 11.

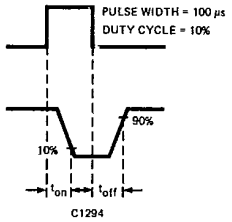


Fig. 12.

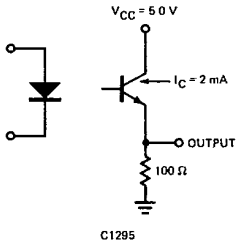


Fig. 13.

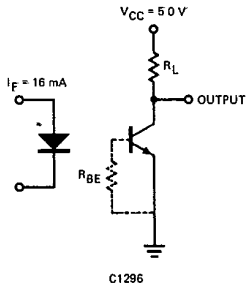


Fig. 14.