

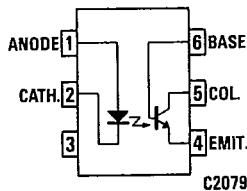
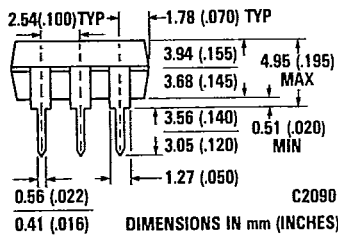
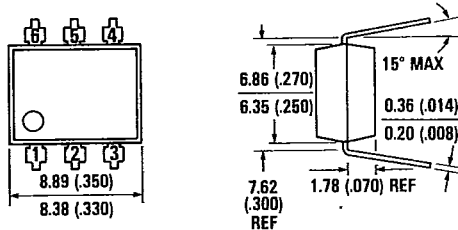
GENERAL INSTRUMENT

PHOTOTRANSISTOR OPTOCOUPLER

Optocouplers

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 μ seconds (specified condition)
- Maximum Turn-off time – 15 μ seconds (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 μ s 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

MCT275

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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
SWITCHING TIMES	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
	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						
ISOLATION	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
	Steady state isolation	V _{iso}	3000			VAC-rms	t = 1 second
			3500			VDC	Relative humidity < 50%, I _{I-O} < 10 μA
	Isolation resistance	R _{iso}	2500			VAC-rms	t = 1 minute
		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	

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

Optocouplers

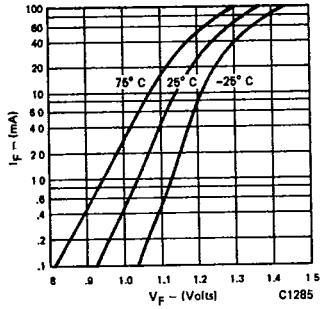


Fig. 1. Forward Voltage vs. Forward Current

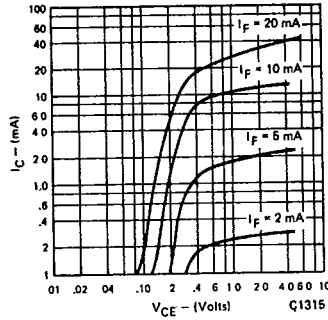


Fig. 2. Collector Current vs. Collector to Emitter Voltage

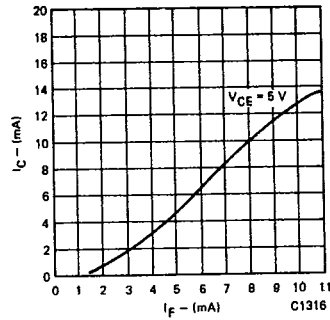


Fig. 3. Collector Current vs. Forward Current

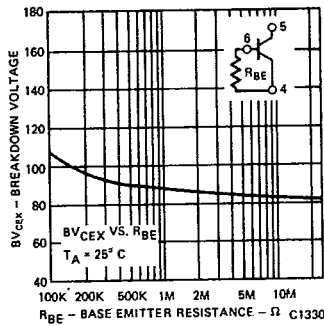


Fig. 4. Collector-Emitter Breakdown Voltage vs. Base Resistance

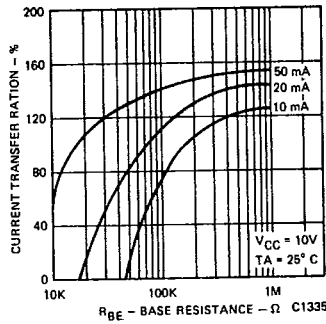


Fig. 5. Sensitivity vs. Base Resistance

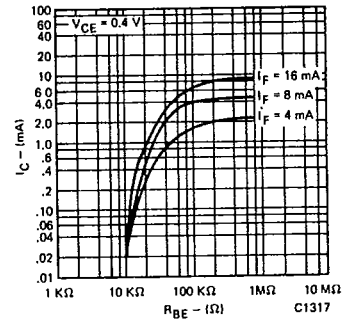


Fig. 6. Saturated CTR vs. Base to Emitter Resistance

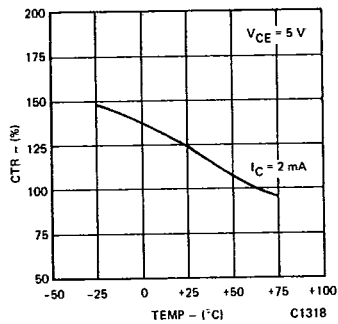


Fig. 7. Current Transfer Ratio (unsaturated) vs. Temperature

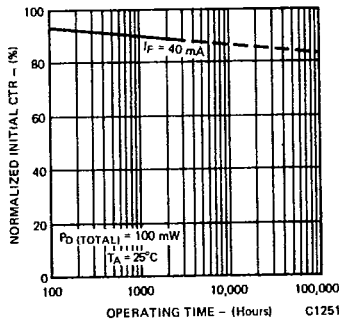


Fig. 8. Current Transfer Ratio vs. Operating Time

TYPICAL SWITCHING CHARACTERISTICS

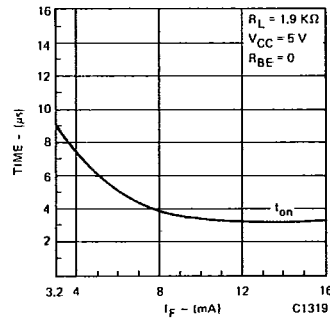


Fig. 9. Switch-on Time vs. I_F Drive (saturated)

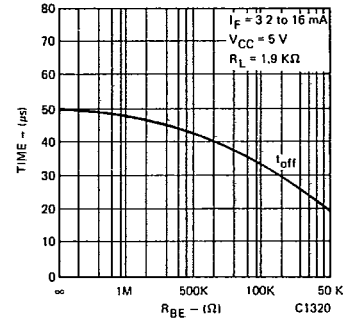


Fig. 10. Switch-off Time vs. Base to Emitter Resistance (saturated)

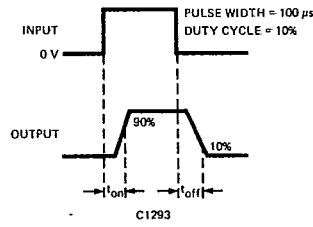


Fig. 11.

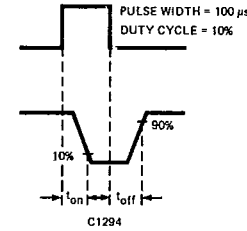


Fig. 12.

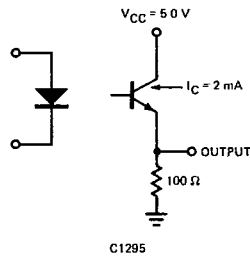


Fig. 13.

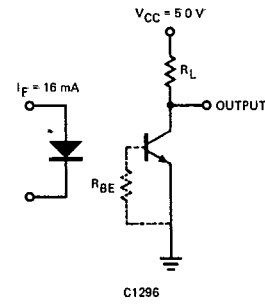


Fig. 14.