

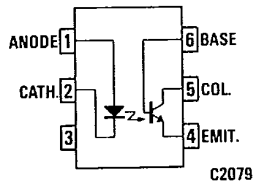
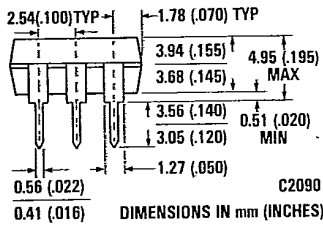
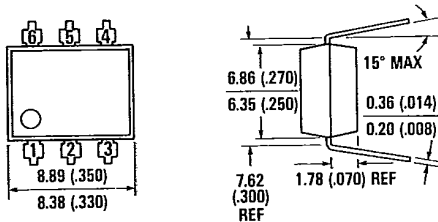
GENERAL INSTRUMENT

PHOTOTRANSISTOR OPTOCOUPLER

Optocouplers

MCT277

PACKAGE DIMENSIONS



Equivalent Circuit

DESCRIPTION

The MCT277 is a phototransistor-type optically coupled isolator. A gallium arsenide infrared emitting diode is selectively coupled with an NPN silicon phototransistor.

FEATURES

- 40% Transfer ratio at $V_{CE(SAT)}$ of 0.4 volts for multiple gate interface
- Temperature – stable from 0°C to 25°C
- 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

- Digital to digital system interface
- Sensor to many gates
- Ground loop isolation
- Power supply regulation

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 DC current	60 mA
Reverse voltage	3 V
Peak forward current (1 μ s pulse, 300 pps)	3.0 A
Power dissipation @ 25°C	90 mW
Derate linearly from 25°C	0.8 mW/°C

OUTPUT TRANSISTOR

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

MCT277

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88D 03000

DT-41-83

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

TRANSFER CHARACTERISTICS						
	CHARACTERISTICS	SYMBOL	MIN.	TYP.	MAX.	UNITS TEST CONDITIONS
DC	Current Transfer Ratio, collector to emitter (a)	CTR _{CE}	100			% I _F = 10 mA; V _{CE} = 10 V
			40			% I _F = 16 mA; V _{CE} = 0.4 V
	Current Transfer Ratio, collector to base	CTR _{CB}		0.4		% I _F = 10 mA; V _{CB} = 10 V
SWITCHING TIMES	Non-saturated Turn-on time	t _{on}			15	μs R _L = 100 Ω; I _C = 2 mA; V _{CC} = 5 V
	Turn-off time	t _{off}			15	μs See figures 15, 17
	Saturated Turn-on time	t _{on}		3.8		μs I _F = 16 mA; R _L = 1.9 KΩ
	Turn-off time (Approximates a typical TTL interface)	t _{off}		90		μs See figures 16, 18
	Turn-on time	t _{on}		3.7		μs I _F = 16 mA; R _L = 4.7 KΩ
	Turn-off time (Approximates a typical low power TTL interface)	t _{off}		190		μs See figures 16, 18
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
		V _{iso}	3500			VDC Relative humidity < 50%, I _{I-O} < 10 μA
	Isolation resistance	R _{iso}	2500			VAC-rms t = 1 minute
		R _{iso}	10 ¹¹			ohms V _{I-O} = 500 VDC
	Isolation capacitance	C _{iso}		1.0		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}		420		V _{CE} = 5 V, I _C = 100 μA
	Breakdown voltage					V
	Collector to emitter	BV _{CEO}	30	45		V I _C = 1.0 mA, I _F = 0
	Collector to base	BV _{CBO}	70	130		V I _C = 10 μA
	Emitter to base	BV _{EBO}	5	7		V I _E = 100 μA, I _F = 0
	Leakage current					nA
	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)

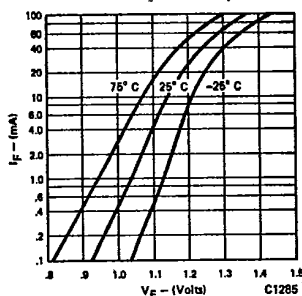


Fig. 1. Forward Voltage vs. Forward Current

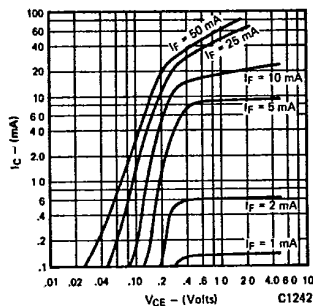


Fig. 2. Collector Current vs. Collector to Emitter Voltage

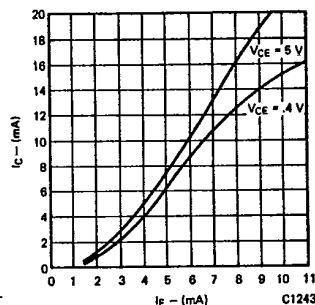


Fig. 3. Collector Current vs. Forward Current

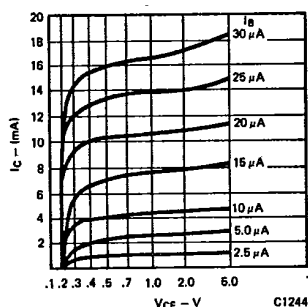


Fig. 4. Collector Current vs. Collector to Emitter Voltage

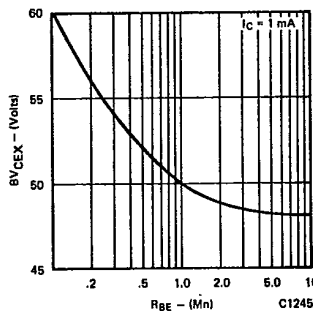


Fig. 5. Collector to Emitter Breakdown Voltage vs. Base to Emitter Resistance

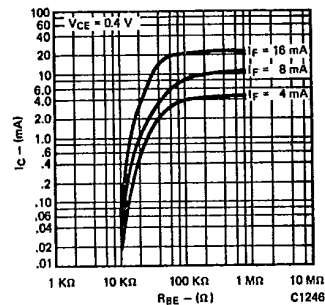


Fig. 6. Saturated CTR vs. Base to Emitter Resistance

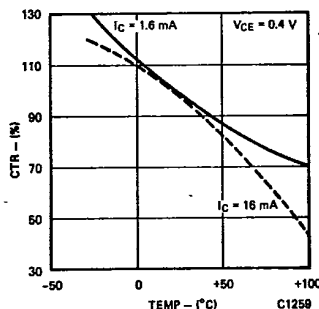


Fig. 7. Current Transfer Ratio (saturated) vs. Temperature

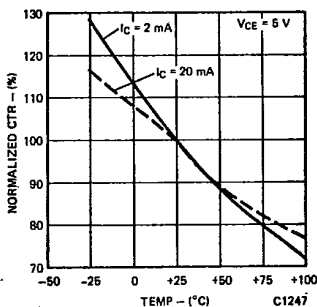


Fig. 8. Current Transfer Ratio (unsaturated) vs. Temperature

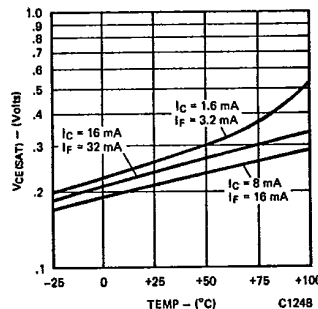


Fig. 9. Collector to Emitter Saturation Voltage vs. Temperature

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

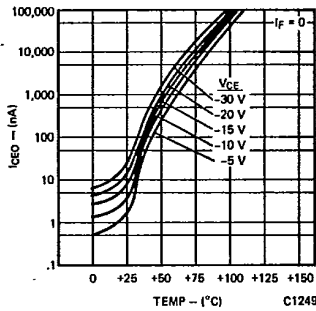


Fig. 10. Collector to Emitter Leakage Current vs. Temperature

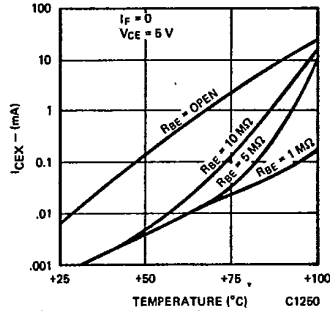


Fig. 11. Collector to Emitter Leakage Current vs. Temperature

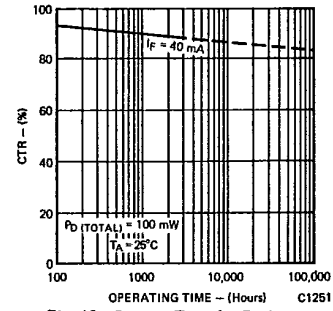


Fig. 12. Current Transfer Ratio vs. Operating Time

TYPICAL SWITCHING CHARACTERISTICS

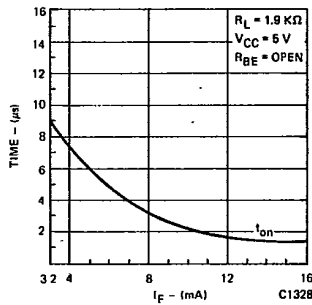


Fig. 13. Switch-on Time vs. I_F Drive (saturated)

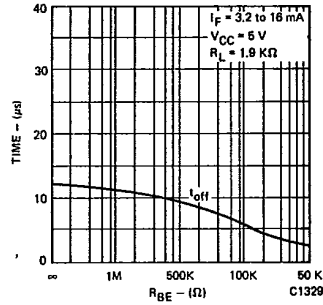


Fig. 14. Switch-off Time vs. Base to Emitter Resistance (saturated)

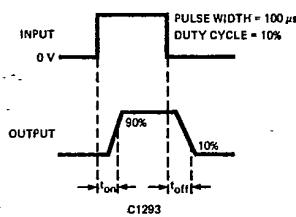


Fig. 15.

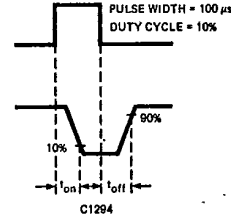


Fig. 16.

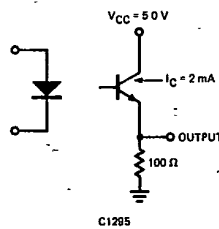


Fig. 17.

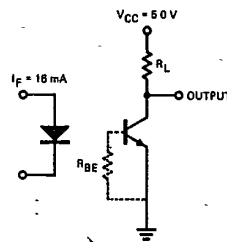


Fig. 18.

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