

T-41-83

**GENERAL  
INSTRUMENT**

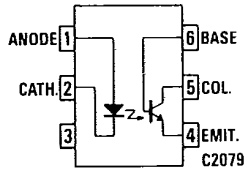
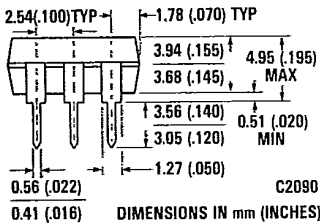
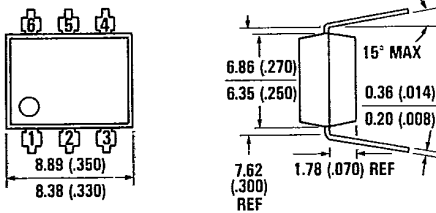
**VDE APPROVED  
PHOTOTRANSISTOR OPTOCOUPERS**

Optocouplers



**MCT2200/0Z  
MCT2201/1Z  
MCT2202/2Z**

**PACKAGE DIMENSIONS**



Equivalent Circuit

**DESCRIPTION**

The MCT2200, MCT2201 and MCT2202 are opto-isolators with phototransistor output. A gallium arsenide infrared emitting diode is selectively coupled with an NPN silicon phototransistor.

**FEATURES**

- High isolation voltage:  
5300 VAC RMS—5 seconds  
7500 VAC PEAK—5 seconds
- Minimum current transfer ratio of 100%
- Maximum turn-on, turn-off time:  
MCT2200—20  $\mu$ s  
MCT2201—10  $\mu$ s  
MCT2202—10  $\mu$ s
- Underwriters Laboratory (UL) recognized  
File #350151

**APPLICATIONS**

- Power supply regulators
- Digital logic inputs
- Appliance sensor systems
- Industrial controls

**ABSOLUTE MAXIMUM RATINGS**

**TOTAL PACKAGE**

Storage temperature ..... -55°C to 150°C  
 Operating temperature ..... -55°C to 100°C  
 Lead soldering temperature (10 sec.) ..... 260°C  
 Total package power dissipation at 25°C ambient  
 (LED) plus detector ..... 260 mW  
 Derate linearly from 25° ..... 3.5 mW/°C

**INPUT DIODE**

Forward current ..... 60 mA  
 Reverse voltage ..... 3.0 V  
 Peak forward current (1  $\mu$ s pulse, 300 pps) .... 3.0 A  
 Power dissipation at 25°C ambient ..... 135 mW  
 Derate linearly from 25°C ..... 1.8 mW/°C

**OUTPUT TRANSISTOR**

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

**MCT2200/OZ MCT2201/1Z MCT2202/2Z**

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

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TRANSFER CHARACTERISTICS							
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
DC	Current Transfer Ratio, collector to emitter	CTR					
	MCT2200		20	60		%	
	MCT2201		100	200		%	I <sub>F</sub> = 10 mA; V <sub>CE</sub> = 5 V
	MCT2202		63	95	125	%	
	Saturation voltage	V <sub>CE(SAT)</sub>		.21	.40	V	I <sub>F</sub> = 10 mA; I <sub>C</sub> = 2.5 mA
SWITCHING TIMES	Non-saturated						R <sub>L</sub> = 100 Ω; I <sub>C</sub> = 2 mA; V <sub>CC</sub> = 10 V See Figure 10.
	Turn-on time	t <sub>on</sub>		6.0	10	μs	
	Turn-off time	t <sub>off</sub>		5.5	10	μs	
ISOLATION	Isolation voltage	V <sub>iso</sub>	5300			V <sub>AC</sub> RMS	Relative humidity ≤ 50%, I <sub>L-O</sub> ≤ 10 μA, 5 seconds
		V <sub>iso</sub>	7500			V <sub>AC</sub> PEAK	
	Isolation resistance	R <sub>iso</sub>	10 <sup>11</sup>			ohms	V <sub>L-O</sub> = 500 VDC
	Isolation capacitance	C <sub>iso</sub>		0.5		pF	f = 1 MHz

INDIVIDUAL COMPONENT CHARACTERISTICS							
	CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE	Forward voltage	V <sub>F</sub>		1.3	1.50	V	I <sub>F</sub> = 20 mA
	Forward voltage temperature coefficient			-1.8		mV/°C	
	Reverse voltage	V <sub>R</sub>	3.0	25		V	I <sub>R</sub> = 10 μA
	Junction capacitance	C <sub>J</sub>		50		pF	V <sub>F</sub> = 0 V, f = 1 MHz
				65		pF	V <sub>F</sub> = 0 V, f = 1 MHz
	Reverse leakage current	I <sub>R</sub>		.35	10	μA	V <sub>R</sub> = 3.0 V
OUTPUT TRANSISTOR	Breakdown voltage						
	Collector to emitter	BV <sub>CEO</sub>	30	45		V	I <sub>C</sub> = 1.0 mA, I <sub>F</sub> = 0
	Collector to base	BV <sub>CBO</sub>	70	130		V	I <sub>C</sub> = 10 μA
	Emitter to base	BV <sub>EB0</sub>	5	7		V	I <sub>E</sub> = 100 μA, I <sub>F</sub> = 0
	Leakage current						
	Collector to emitter	I <sub>CEO</sub>		5	50	nA	V <sub>CE</sub> = 10 V, I <sub>F</sub> = 0
	Collector to base	I <sub>CBO</sub>			20	nA	V <sub>CB</sub> = 10 V, I <sub>F</sub> = 0
	Capacitance						
Collector to emitter			8		pF	V <sub>CE</sub> = 0, f = 1 MHz	
Collector to base			20		pF	V <sub>CB</sub> = 5, f = 1 MHz	
Emitter to base			10		pF	V <sub>EB</sub> = 0, f = 1 MHz	

MCT2200/OZ MCT2201/1Z MCT2202/2Z

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

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Optocouplers

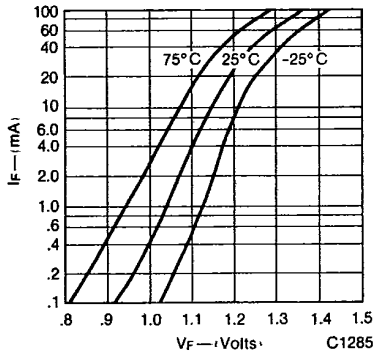


Fig. 1 Forward Voltage vs. Forward Current

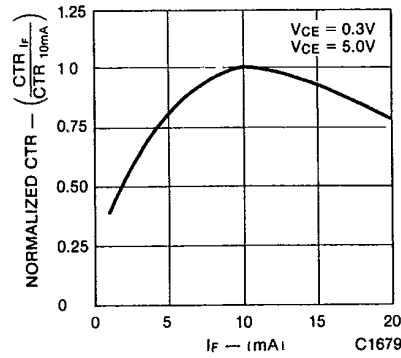


Fig. 2 Normalized Current Transfer Ratio vs. Forward Current

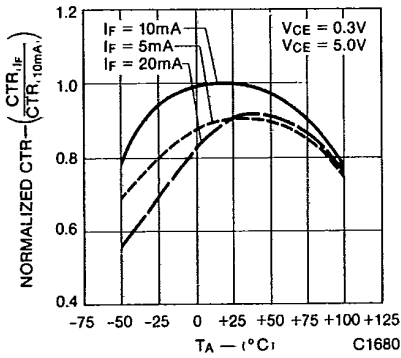


Fig. 3 Normalized Current Transfer Ratio vs. Ambient Temperature

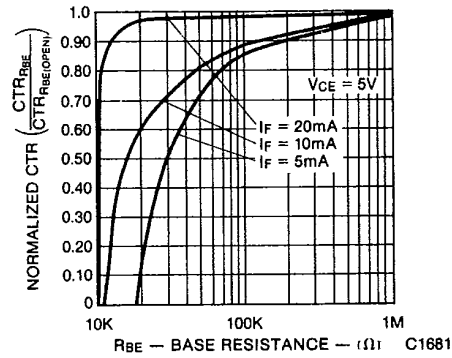


Fig. 4 CTR vs. RBE

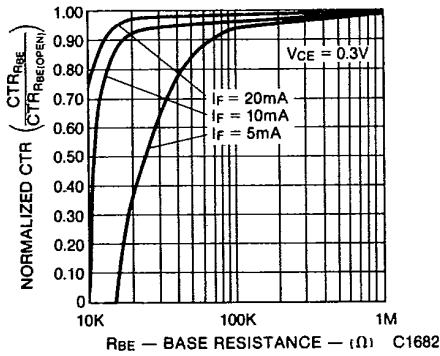


Fig. 5 CTR vs. RBE

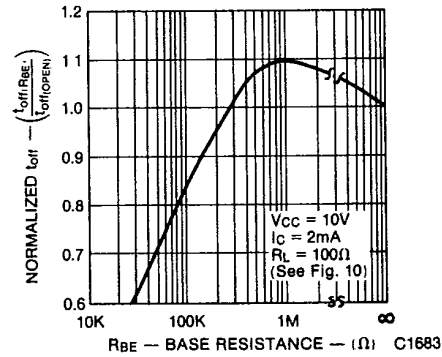


Fig. 6 Normalized toff vs. RBE

**MCT2200/0Z MCT2201/1Z MCT2202/2Z**

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

T-41-63

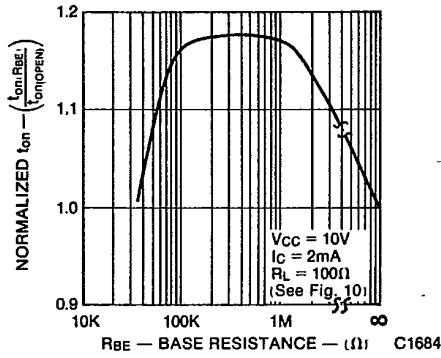


Fig. 7 Normalized  $t_{on}$  vs.  $R_{BE}$

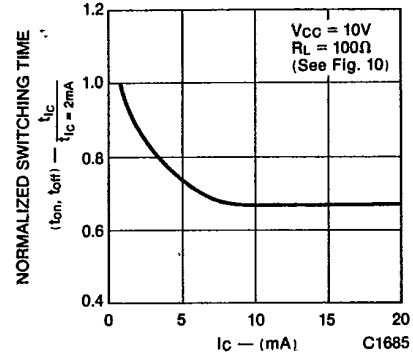


Fig. 8 Normalized Switching Time vs. Collector Current

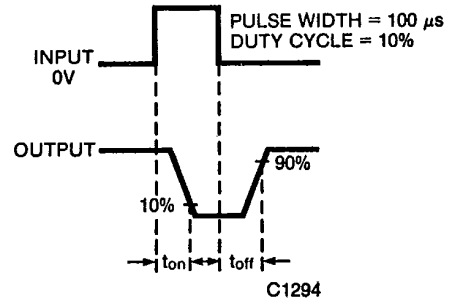
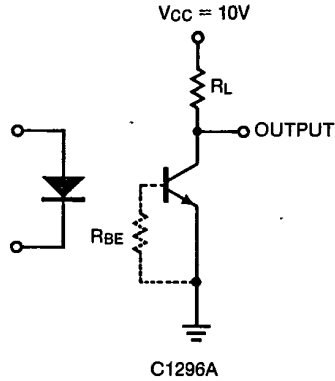


Fig. 9 Switching Time Test Circuit and Waveform