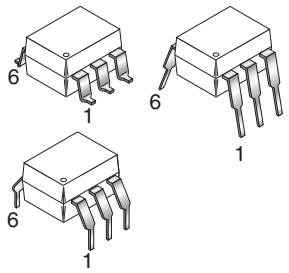
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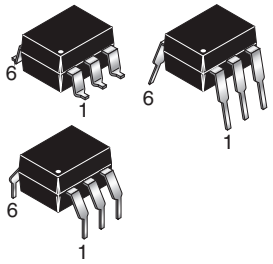
PHOTOTRANSISTOR OPTOCOUPLERS

MCT2 **MCT2E** **MCT210** **MCT271**
MCT2200 **MCT2201** **MCT2202**

WHITE PACKAGE (-M SUFFIX)



BLACK PACKAGE (NO -M SUFFIX)



DESCRIPTION

The MCT2XXX series optoisolators consist of a gallium arsenide infrared emitting diode driving a silicon phototransistor in a 6-pin dual in-line package.

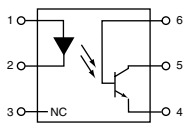
FEATURES

- UL recognized (File # E90700)
- VDE recognized (File # 94766)
  – Add option V for white package (e.g., MCT2V-M)
  – Add option 300 for black package (e.g., MCT2.300)
- MCT2 and MCT2E are also available in white package by specifying -M suffix, eg. MCT2-M

APPLICATIONS

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs

SCHEMATIC



PIN 1. ANODE
2. CATHODE
3. NO CONNECTION
4. EMITTER
5. COLLECTOR
6. BASE

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ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Device	Value	Units
TOTAL DEVICE Storage Temperature	T_{STG}	ALL	-55 to +150	°C
Operating Temperature	T_{OPR}	ALL	-55 to +100	°C
Lead Solder Temperature	T_{SOL}	ALL	260 for 10 sec	°C
Total Device Power Dissipation @ T_A = 25°C	P_D	-M	250	mW
		Non-M	260	
Derate above 25°C		-M	2.94	mW/°C
		Non-M	3.3	
EMITTER DC/Average Forward Input Current	I_F	-M	60	mA
		Non-M	100	
Reverse Input Voltage	V_R	ALL	3	V
Forward Current - Peak (300µs, 2% Duty Cycle)	I_F(pk)	ALL	3	A
LED Power Dissipation @ T_A = 25°C	P_D	-M	120	mW
		Non-M	150	
Derate above 25°C		-M	1.41	mW/°C
		Non-M	2.0	
DETECTOR Collector Current	I_C	ALL	50	mA
Collector-Emitter Voltage	V_{CEO}	ALL	30	V
Detector Power Dissipation @ T_A = 25°C	P_D	ALL	150	mW
Derate above 25°C		-M	1.76	mW/°C
		Non-M	2.0	

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ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

Individual Component Characteristics

Parameter	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
EMITTER							
Input Forward Voltage	(I_F = 20 mA)	V_F	MCT2/-M MCT2E/-M MCT271 MCT2200 MCT2201 MCT2202		1.25	1.50	V
	(T_A = 0-70°C, I_F = 40 mA)		MCT210		1.33		
Reverse Leakage Current	(V_R = 3.0 V)	I_R	MCT2/-M MCT2E/-M MCT271 MCT2200 MCT2201 MCT2202		0.001	10	µA
	(T_A = 0-70°C, V_R = 6.0 V)		MCT210				
DETECTOR Collector-Emitter Breakdown Voltage	(I_C = 1.0 mA, I_F = 0)	BV_{CEO}	ALL	30	100		V
	(T_A = 0-70°C)		MCT210				
Collector-Base Breakdown Voltage	(I_C = 10 µA, I_F = 0)	BV_{CBO}	MCT2/-M MCT2E/-M MCT271 MCT2200 MCT2201 MCT2202	70	120		V
	(T_A = 0-70°C)		MCT210	30			
Emitter-Collector Breakdown Voltage	(I_E = 100 µA, I_F = 0)	BV_{ECO}	MCT2/-M MCT2E/-M MCT271 MCT2200 MCT2201 MCT2202	7	10		V
	(T_A = 0-70°C)		MCT210	6	10		
Collector-Emitter Dark Current	(V_{CE} = 10 V, I_F = 0)	I_{CEO}	ALL		1	50	nA
	(V_{CE} = 5 V, T_A = 0-70°C)					30	µA
Collector-Base Dark Current	(V_{CB} = 10 V, I_F = 0)	I_{CBO}	ALL			20	nA
Capacitance	(V_{CE} = 0 V, f = 1 MHz)	C_{CE}	ALL		8		pF

** Typical values at T_A = 25°C

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TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

DC Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
Output Collector Current	(T_A = 0-70°C)	CTR	MCT210	150			%
	(I_F = 10 mA, V_{CE} = 5 V)		MCT2200	20			
			MCT2201	100			
			MCT2202	63		125	
	(I_F = 10 mA, V_{CE} = 10 V)		MCT2 MCT2-M MCT2E MCT2E-M	20			
			MCT271	45		90	
	(I_F = 3.2 mA to 32 mA, V_{CE} = 0.4 V) (T_A = 0-70°C)		MCT210	50			
Collector-Emitter Saturation Voltage	(I_C = 2 mA, I_F = 16 mA)	$V_{CE\ (SAT)}$	MCT2 MCT2-M MCT2E MCT2E-M MCT271			0.4	V
	(I_C = 16 mA, I_F = 32 mA, T_A = 0-70°C)		MCT210				
	(I_C = 2.5 mA, I_F = 10 mA)		MCT2200 MCT2201 MCT2202				
AC Characteristic Saturated Turn-on Time from 5 V to 0.8 V	(I_F = 15 mA, V_{CC} = 5 V, R_L = 2 kΩ) (R_B = Open) (Fig. 20)	t_{on}	MCT2		1.1		µs
			MCT2E		1.1		
	(I_F = 20 mA, V_{CC} = 5 V, R_L = 2 kΩ) (R_B = 100 kΩ) (Fig. 20)		MCT2		1.3		
			MCT2E		1.3		
Saturated Turn-off Time from SAT to 2.0 V	(I_F = 15 mA, V_{CC} = 5 V, R_L = 2 kΩ) (R_B = Open) (Fig. 20)	t_{off}	MCT2		50		
			MCT2E		50		
	(I_F = 20 mA, V_{CC} = 5 V, R_L = 2 kΩ) (R_B = 100 kΩ) (Fig. 20)		MCT2		20		
			MCT2E		20		
Turn-on Time	(I_F = 10 mA, V_{CC} = 10 V, R_L = 100 Ω)	t_{on}	MCT2-M MCT2E-M		2		
Turn-off Time	(I_F = 10 mA, V_{CC} = 10 V, R_L = 100 Ω)	t_{off}	MCT2-M MCT2E-M		2		
Rise Time	(I_F = 10 mA, V_{CC} = 10 V, R_L = 100 Ω)	t_r	MCT2-M MCT2E-M		2		
Fall Time	(I_F = 10 mA, V_{CC} = 10 V, R_L = 100 Ω)	t_f	MCT2-M MCT2E-M		1.5		

** Typical values at T_A = 25°C

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TRANSFER CHARACTERISTICS (Cont.)

AC Characteristic	Test Conditions	Symbol	Device	Min	Typ**	Max	Unit
Saturated turn-on time	(I_F = 16 mA, R_L = 1.9kΩ, V_{CC} = 5 V) (Fig. 20)	t_{on}	MCT271		1.0		μs
Saturated turn-off time (Approximates a typical TTL interface)		t_{off}			48		
Saturated turn-on time	(I_F = 16 mA, R_L = 4.7kΩ, V_{CC} = 5 V) (Fig. 20)	t_{on}			1.0		
Saturated turn-off time (Approximates a typical low power TTL interface)		t_{off}			98		
Saturated rise time	(I_F = 16 mA, R_L = 560Ω, V_{CC} = 5 V) (Fig. 20, 21)	t_r	MCT210		1.0		
Saturated fall time		t_f			11		
Saturated propagation delay - high to low	(I_F = 16 mA, R_L = 2.7kΩ) (Fig. 20, 21)	$T_{PD\ (HL)}$			1.0		
Saturated propagation delay - low to high		$T_{PD\ (LH)}$			50		
Non-saturated turn on time	(I_C = 2 mA, V_{CC} = 10 V, R_L = 100Ω (Fig. 20)	T_{ON}	MCT2200 MCT2201 MCT2202		2	10	
Non-saturated turn off time		T_{OFF}			2	10	
Non-saturated rise time	(I_C = 2 mA, V_{CC} = 5 V, R_L = 100Ω) (Fig. 20)	t_r	MCT210		2		
Non-saturated fall time		t_f			2		
Non-saturated turn-on time	(I_C = 2 mA, V_{CC} = 5 V, R_L = 100Ω) (Fig. 20)	t_{on}	MCT271		2	7	
Non-saturated turn-off time		t_{off}			2	7	

** Typical values at T_A = 25°C

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units
Input-Output Isolation Voltage	(Non '-M', Black Package) (f = 60 Hz, t = 1 min)	V_{ISO}	5300			Vac(rms)
	('-M', White Package) (f = 60 Hz, t = 1 sec)		7500			Vac(pk)
Isolation Resistance	(V_{I-O} = 500 VDC)	R_{ISO}	10^{11}			Ω
Isolation Capacitance	(V_{I-O} = &, f = 1 MHz)	C_{ISO}		0.5		pF
	('-M' White Package)			0.2	2	pF

Note

* Typical values at T_A = 25°C

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TYPICAL PERFORMANCE CURVES

Fig. 1 LED Forward Voltage vs. Forward Current (Black Package)

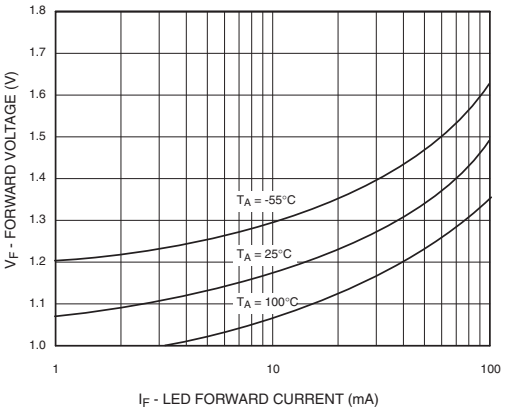


Fig. 2 LED Forward Voltage vs. Forward Current (White Package)

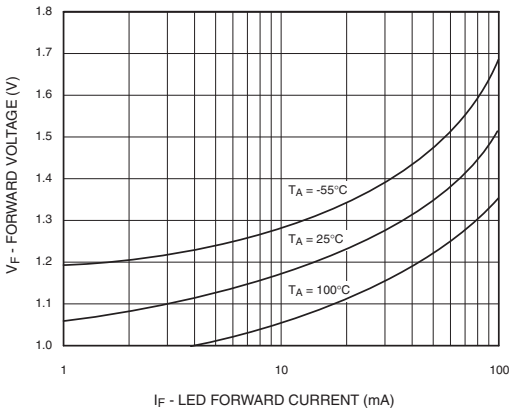


Fig.3 Normalized CTR vs. Forward Current (Black Package)

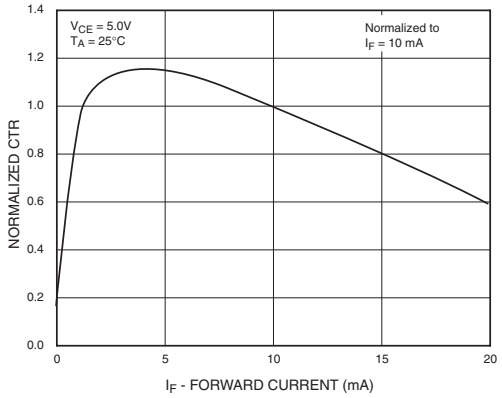


Fig.4 Normalized CTR vs. Forward Current (White Package)

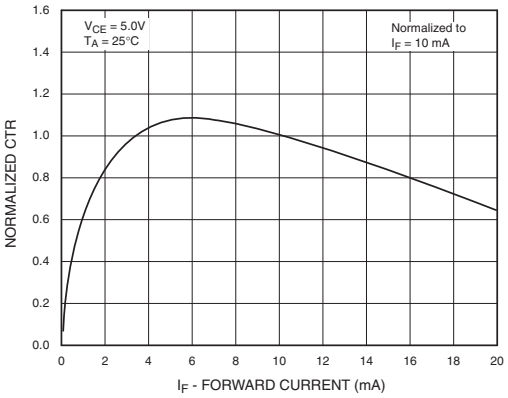


Fig. 5 Normalized CTR vs. Ambient Temperature (Black Package)

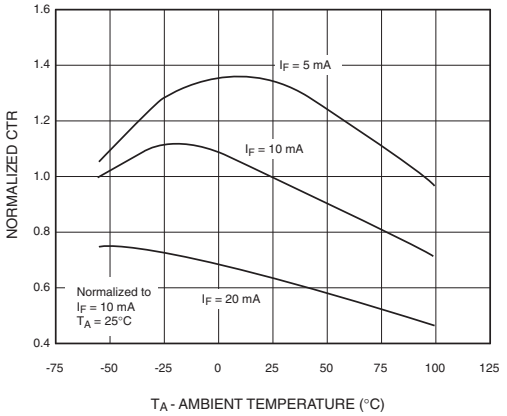
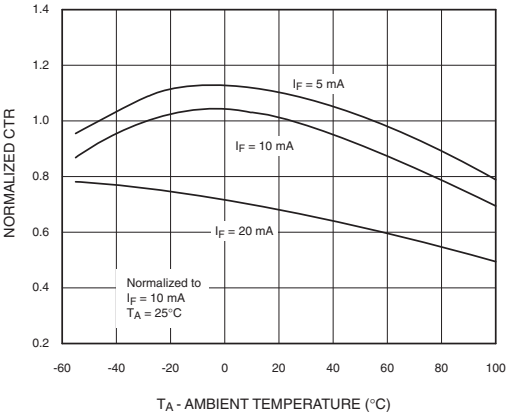


Fig. 6 Normalized CTR vs. Ambient Temperature (White Package)



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Fig. 7 CTR vs. RBE (Unsaturated) (Black Package)

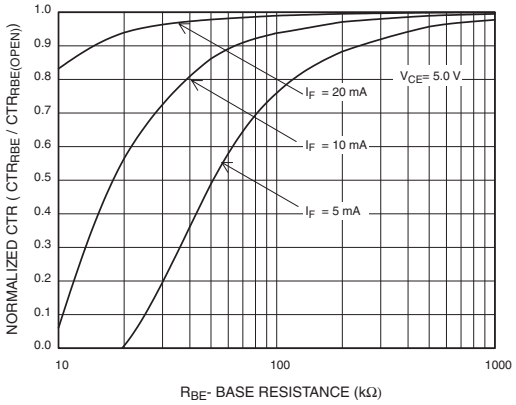


Fig. 8 CTR vs. RBE (Unsaturated) (White Package)

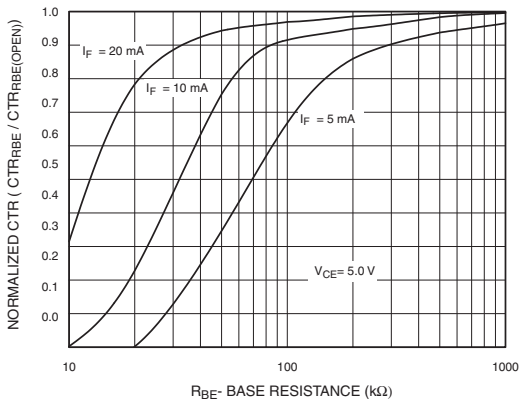


Fig. 9 CTR vs. RBE (Saturated) (Black Package)

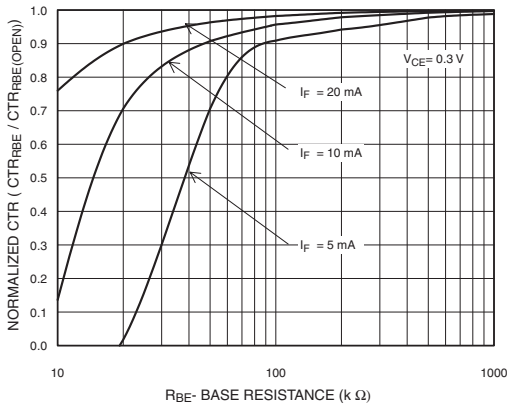


Fig. 10 CTR vs. RBE (Saturated) (White Package)

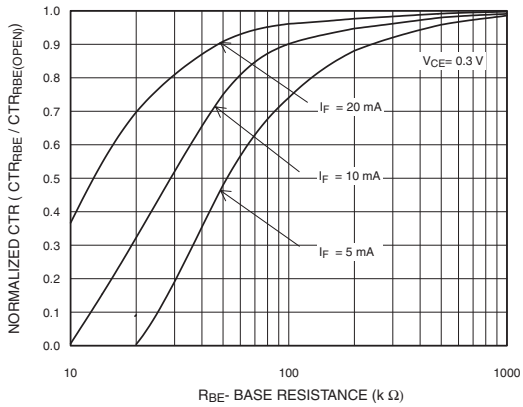


Fig. 11 Collector-Emitter Saturation Voltage vs Collector Current (Black Package)

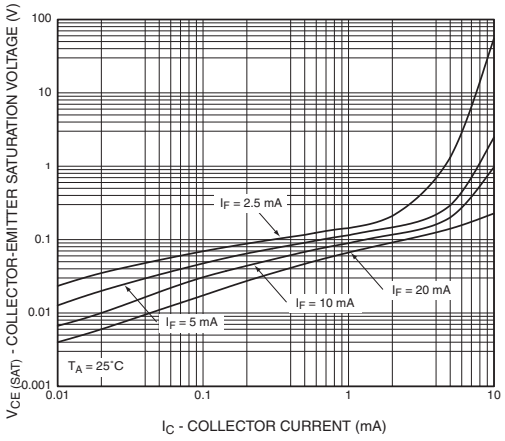
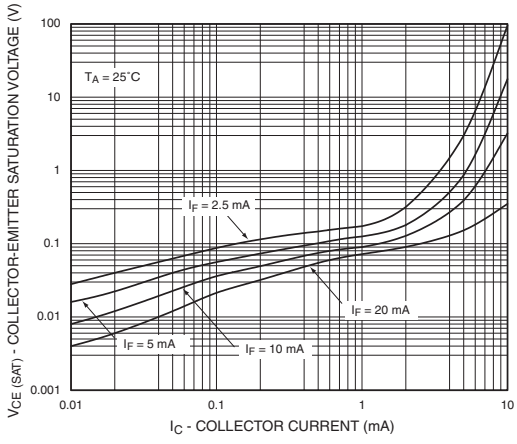


Fig. 12 Collector-Emitter Saturation Voltage vs Collector Current (White Package)



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Fig. 13 Switching Speed vs. Load Resistor (Black Package)

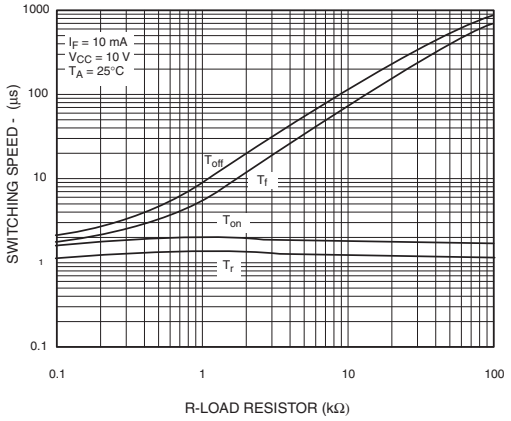


Fig. 14 Switching Speed vs. Load Resistor (White Package)

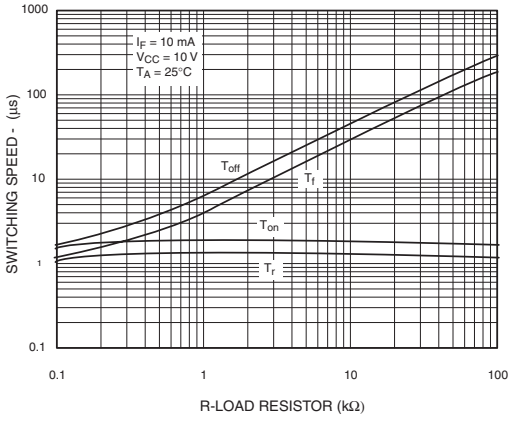


Fig. 15 Normalized t_{on} vs. R_{BE} (Black Package)

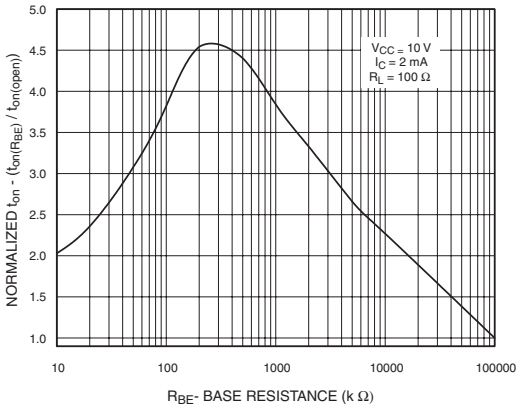


Fig. 16 Normalized t_{on} vs. R_{BE} (White Package)

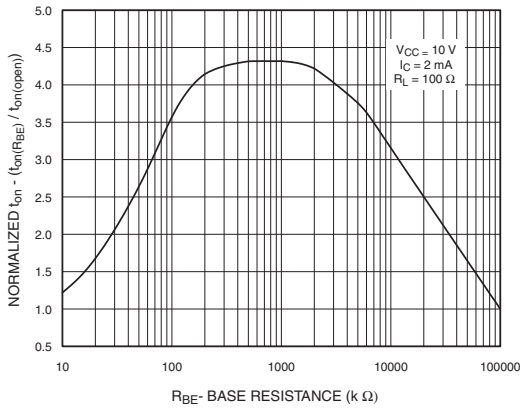


Fig. 17 Normalized t_{off} vs. R_{BE} (Black Package)

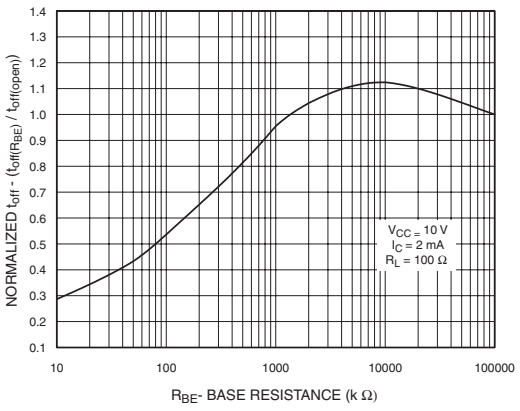
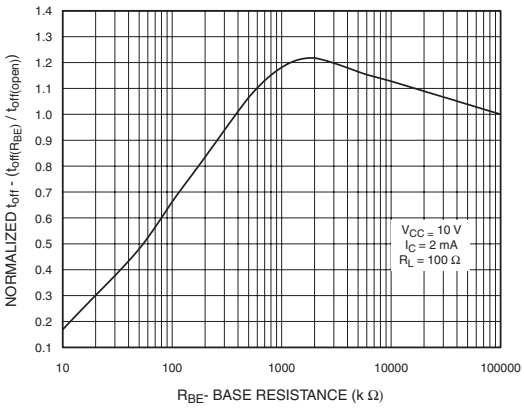
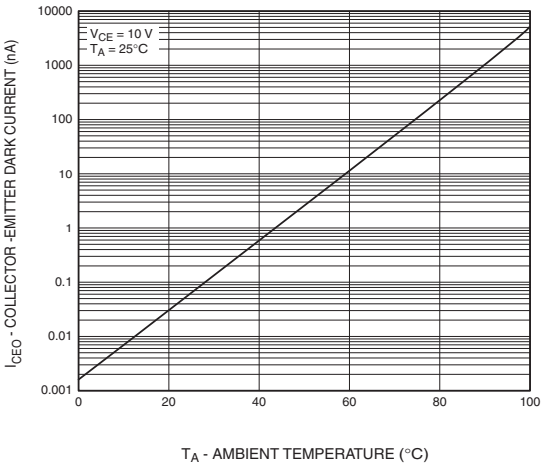


Fig. 18 Normalized t_{off} vs. R_{BE} (White Package)



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Fig. 19 Dark Current vs. Ambient Temperature



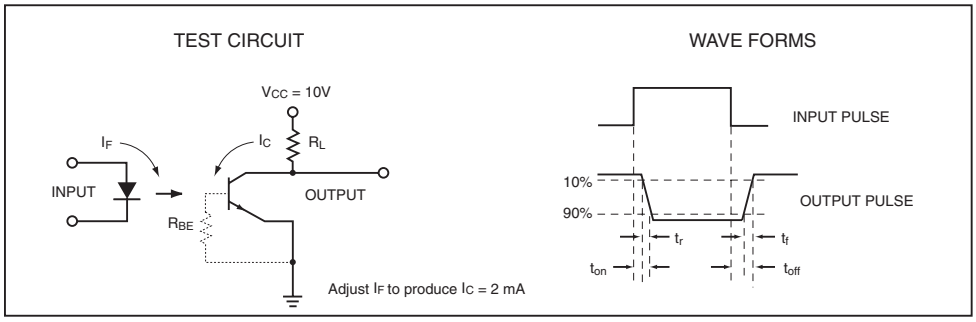


Figure 20. Switching Time Test Circuit and Waveforms

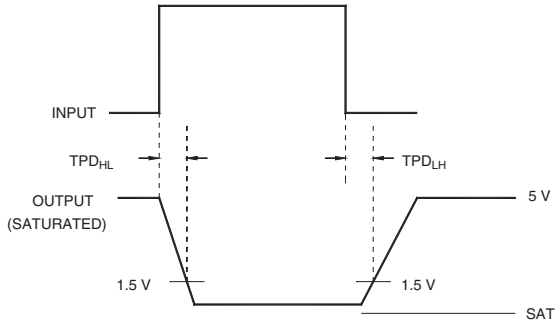
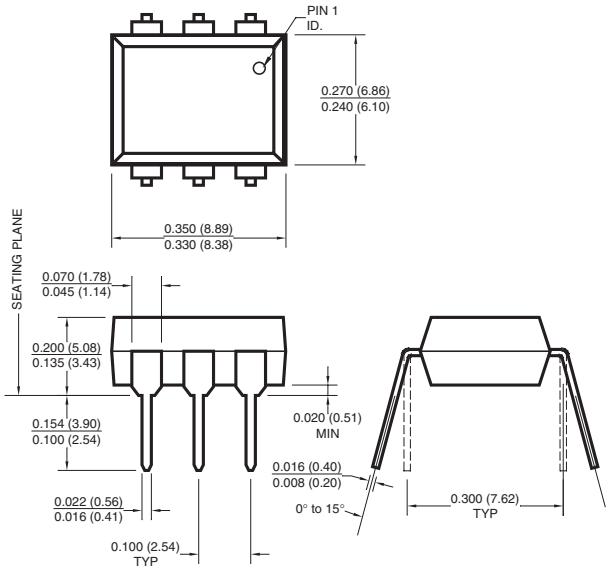


Figure 21. Switching Time Waveforms (MCT210)

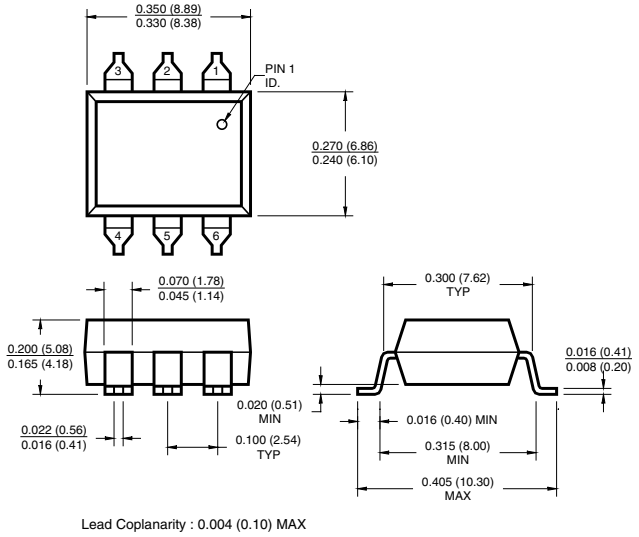
MCT2 **MCT2E** **MCT210** **MCT271**
MCT2200 **MCT2201** **MCT2202**

Black Package (No -M Suffix)

Package Dimensions (Through Hole)

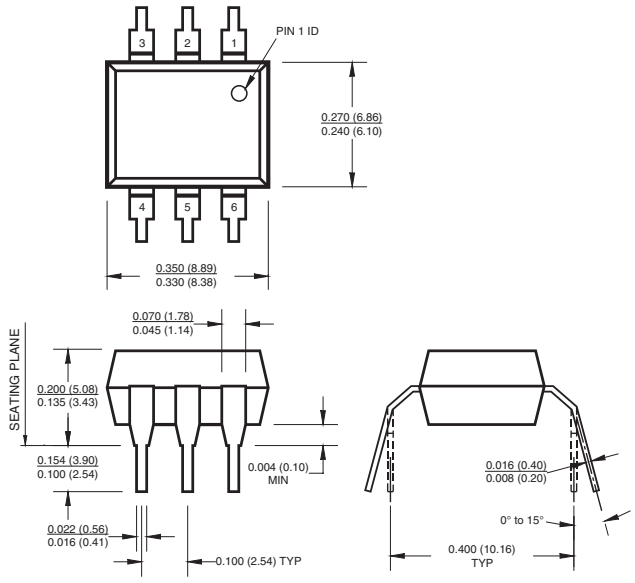


Package Dimensions (Surface Mount)

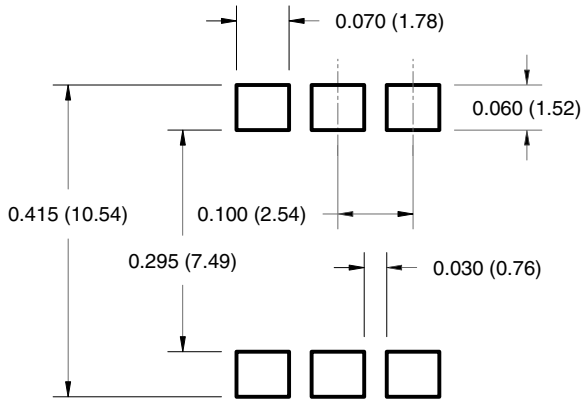


Lead Coplanarity : 0.004 (0.10) MAX

Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform

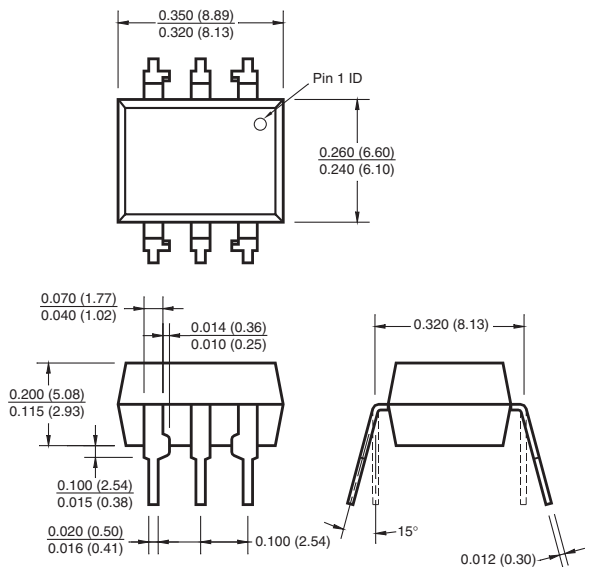


NOTE
All dimensions are in inches (millimeters)

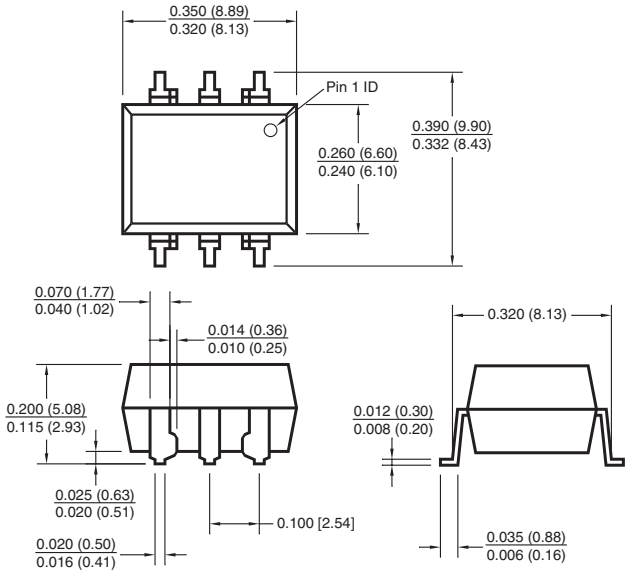
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White Package (-M Suffix)

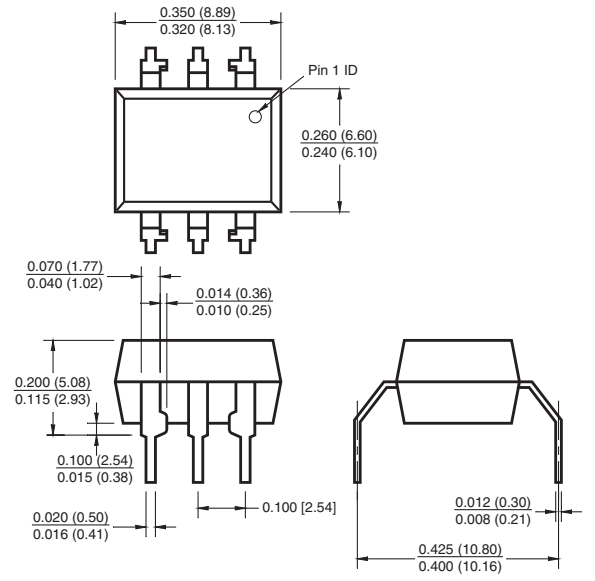
Package Dimensions (Through Hole)



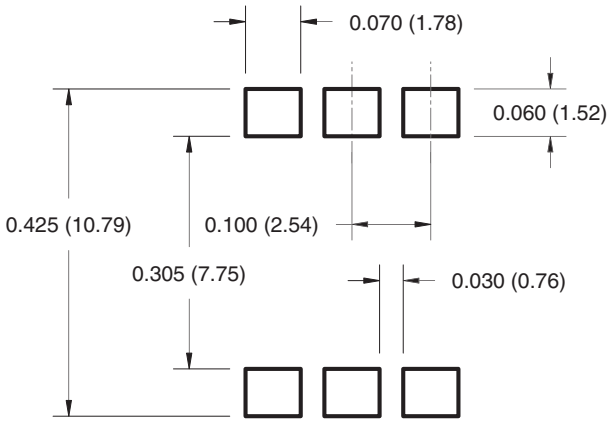
Package Dimensions (Surface Mount)



Package Dimensions (0.4” Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE
All dimensions are in inches (millimeters)

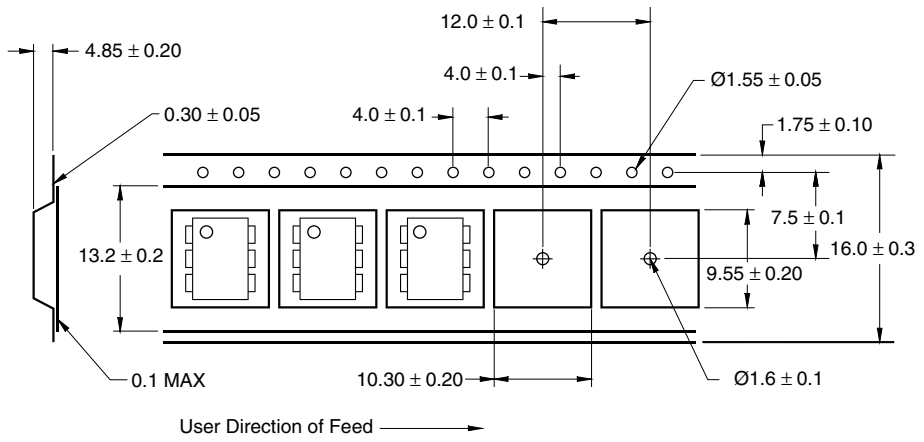
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ORDERING INFORMATION

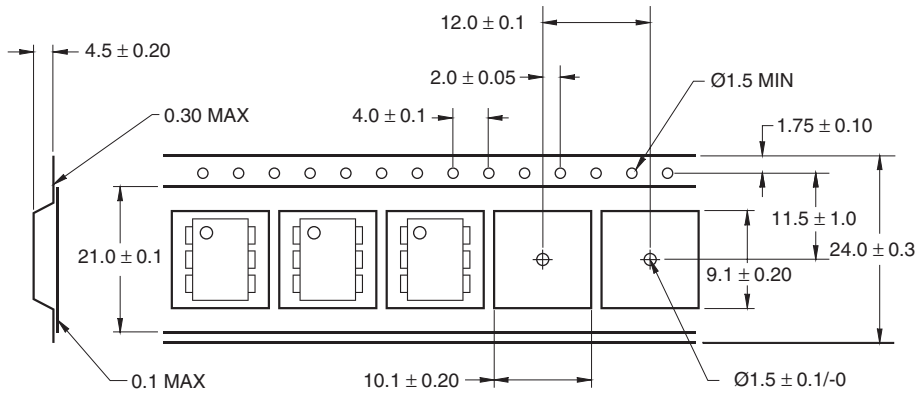
Order Entry Identifier		
Black Package (No Suffix)	**White Package (-M Suffix)**	**Description**
.S	S	Surface Mount Lead Bend
.SD	SR2	Surface Mount; Tape and reel
.W	T	0.4" Lead Spacing
.300	V	VDE 0884
.300W	TV	VDE 0884, 0.4" Lead Spacing
.3S	SV	VDE 0884, Surface Mount
.3SD	SR2V	VDE 0884, Surface Mount, Tape & Reel

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QT Carrier Tape Specifications ("D" Taping Orientation) (Black Package, No Suffix)



QT Carrier Tape Specifications ("D" Taping Orientation) (White Package, -M Suffix)



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