



# MMT05B230T3, MMT05B260T3, MMT05B310T3

Preferred Devices

## Thyristor Surge Protectors High Voltage Bidirectional TSPD

These Thyristor Surge Protective devices (TSPD) prevent overvoltage damage to sensitive circuits by lightning, induction and power line crossings. They are breakover-triggered crowbar protectors. Turn-off occurs when the surge current falls below the holding current value.

Secondary protection applications for electronic telecom equipment at customer premises.

### Features

- High Surge Current Capability: 50 A 10 x 1000  $\mu$ sec, for Controlled Temperature Environments
- The MMT05B230T3 Series is used to help equipment meet various regulatory requirements including: Bellcore 1089, ITU K.20 & K.21, IEC 950, UL 1459 & 1950 and FCC Part 68
- Bidirectional Protection in a Single Device
- Little Change of Voltage Limit with Transient Amplitude or Rate
- Freedom from Wearout Mechanisms Present in Non-Semiconductor Devices
- Fail-Safe, Shorts When Overstressed, Preventing Continued Unprotected Operation
- Surface Mount Technology (SMT)
- $\mathcal{R}$  Indicates UL Registered – File #E210057
- Pb-Free Packages are Available

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Off-State Voltage – Maximum MMT05B230T3 MMT05B260T3 MMT05B310T3	$V_{DM}$	$\pm 170$ $\pm 200$ $\pm 270$	V
Maximum Pulse Surge Short Circuit Current Non-Repetitive Double Exponential Decay Waveform (Notes 1 and 2) ( $-25^\circ\text{C}$ Initial Temperature)			A(pk)
8 x 20 $\mu$ sec	$I_{PPS1}$	$\pm 150$	
10 x 160 $\mu$ sec	$I_{PPS2}$	$\pm 100$	
10 x 560 $\mu$ sec	$I_{PPS3}$	$\pm 70$	
10 x 1000 $\mu$ sec	$I_{PPS4}$	$\pm 50$	
Maximum Non-Repetitive Rate of Change of On-State Current Double Exponential Waveform, $R = 1.0$ , $L = 1.5 \mu\text{H}$ , $C = 1.67 \mu\text{F}$ , $I_{pk} = 110\text{A}$	$di/dt$	$\pm 150$	A/ $\mu$ s

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Allow cooling before testing second polarity.
2. Measured under pulse conditions to reduce heating.



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**BIDIRECTIONAL TSPD ( $\mathcal{R}$ )**  
**50 AMPERE SURGE**  
**265 thru 365 VOLTS**



**SMB**  
**(No Polarity)**  
**(Essentially JEDEC DO-214AA)**  
**CASE 403C**

### MARKING DIAGRAMS



RPBx = Device Code  
x = G or J  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

**Preferred** devices are recommended choices for future use and best overall value.

# MMT05B230T3, MMT05B260T3, MMT05B310T3

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Operating Temperature Range Blocking or Conducting State	$T_{J1}$	-40 to +125	°C
Overload Junction Temperature – Maximum Conducting State Only	$T_{J2}$	+175	°C
Instantaneous Peak Power Dissipation ( $I_{pk} = 50$ A, $10 \times 1000$ $\mu$ sec @ 25°C)	$P_{PK}$	2000	W
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	$T_L$	260	°C

**ELECTRICAL CHARACTERISTICS** ( $T_J = 25^\circ\text{C}$  unless otherwise noted) Devices are bidirectional. All electrical parameters apply to forward and reverse polarities.

Characteristics	Symbol	Min	Typ	Max	Unit
Breakover Voltage (Both polarities) ( $dv/dt = 100$ V/ $\mu$ s, $I_{SC} = 1.0$ A, $V_{dc} = 1000$ V)  (+65°C)	$V_{(BO)}$	-	-	265 320 365  280 340 400	V
Breakover Voltage (Both polarities) ( $f = 60$ Hz, $I_{SC} = 1.0$ A(rms), $V_{OC} = 1000$ V(rms), $R_f = 1.0$ k $\Omega$ , $t = 0.5$ cycle) (Note 3)  (+65°C)	$V_{(BO)}$	-	-	265 320 365  280 340 400	V
Breakover Voltage Temperature Coefficient	$dV_{(BO)}/dT_J$	-	0.08	-	%/°C
Breakdown Voltage ( $I_{(BR)} = 1.0$ mA) Both polarities	$V_{(BR)}$	-	190 240 280	-	V
Off State Current ( $V_{D1} = 50$ V) Both polarities ( $V_{D2} = V_{DM}$ ) Both polarities	$I_{D1}$ $I_{D2}$	-	-	2.0 5.0	$\mu$ A
On-State Voltage ( $I_T = 1.0$ A) ( $PW \leq 300$ $\mu$ s, Duty Cycle $\leq 2\%$ ) (Note 3)	$V_T$	-	1.53	3.0	V
Breakover Current ( $f = 60$ Hz, $V_{DM} = 1000$ V(rms), $R_S = 1.0$ k $\Omega$ ) – Both polarities	$I_{BO}$	-	230	-	mA
Holding Current (Both polarities) (Note 3) $V_S = 500$ V; $I_T$ (Initiating Current) = $\pm 1.0$ A	$I_H$	150	340	-	mA
Critical Rate of Rise of Off-State Voltage (Linear waveform, $V_D = \text{Rated } V_{BR}$ , $T_J = 25^\circ\text{C}$ )	$dv/dt$	2000	-	-	V/ $\mu$ s
Capacitance ( $f = 1.0$ MHz, 50 Vdc, 1.0 V rms Signal) ( $f = 1.0$ MHz, 2.0 Vdc, 15 mV rms Signal)	$C_O$	-	22 53	- 75	pF

3. Measured under pulse conditions to reduce heating.

# MMT05B230T3, MMT05B260T3, MMT05B310T3

## Voltage Current Characteristic of TSPD (Bidirectional Device)

Symbol	Parameter
$I_{D1}, I_{D2}$	Off State Leakage Current
$V_{D1}, V_{D2}$	Off State Blocking Voltage
$V_{BR}$	Breakdown Voltage
$V_{BO}$	Breakover Voltage
$I_{BO}$	Breakover Current
$I_H$	Holding Current
$V_{TM}$	On State Voltage

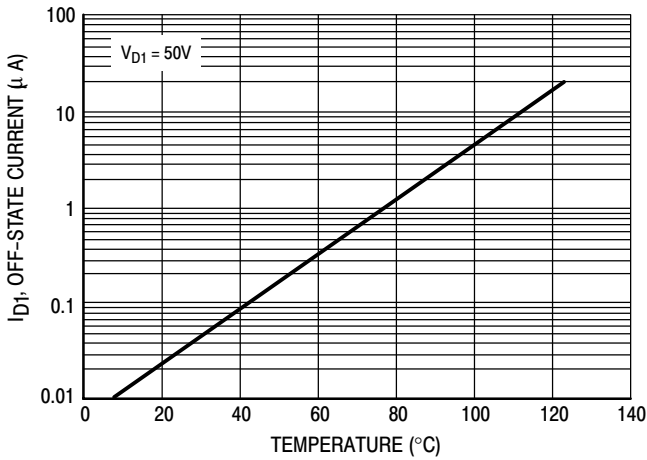
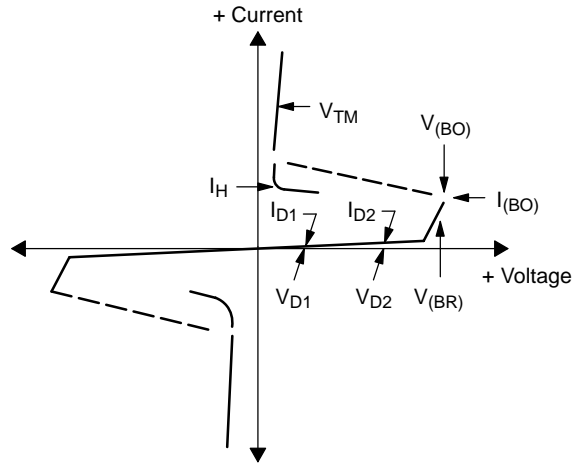


Figure 1. Off-State Current versus Temperature

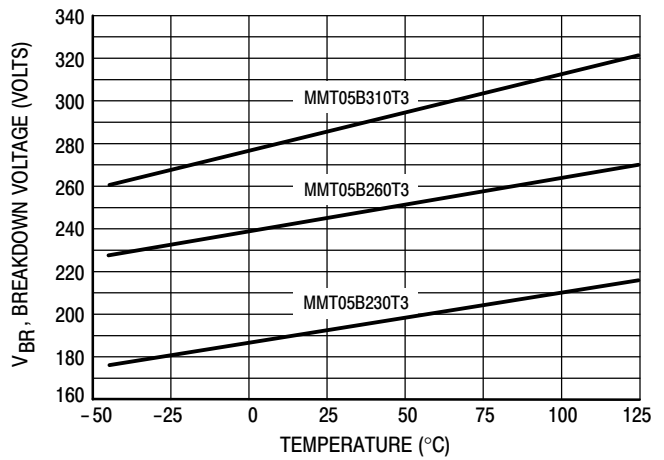


Figure 2. Breakdown Voltage versus Temperature

# MMT05B230T3, MMT05B260T3, MMT05B310T3

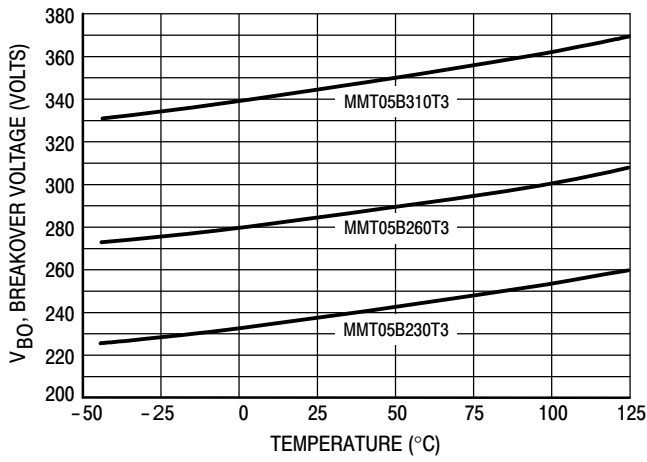


Figure 3. Breakover Voltage versus Temperature

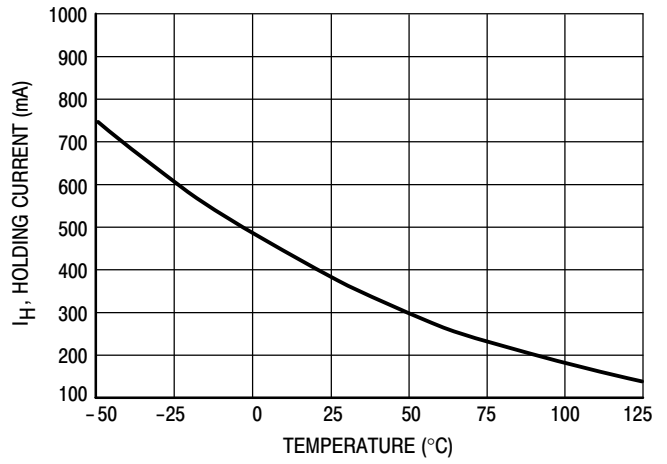


Figure 4. Holding Current versus Temperature

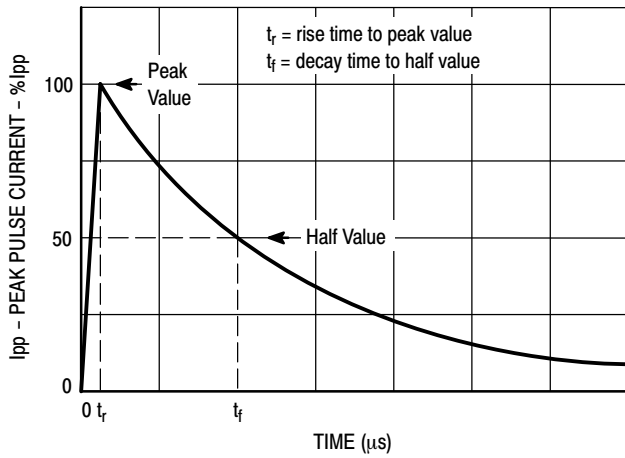


Figure 5. Exponential Decay Pulse Waveform

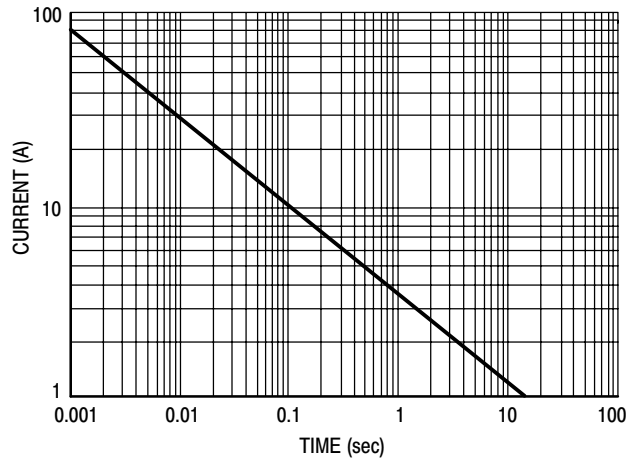
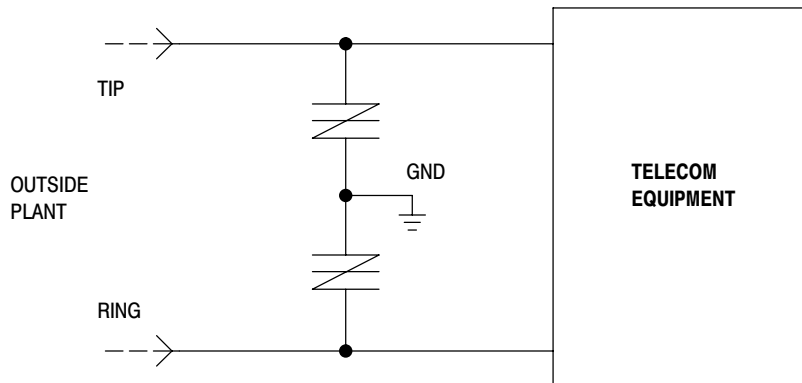
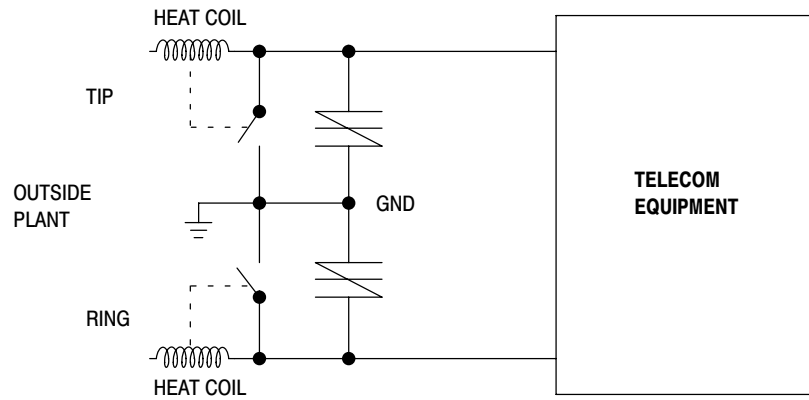
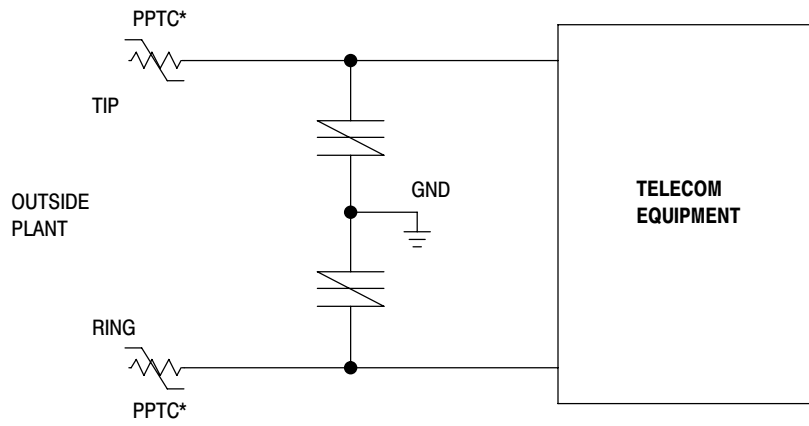


Figure 6. Peak Surge On-State Current versus Surge Current Duration, Sinusoidal Waveform



## MMT05B230T3, MMT05B260T3, MMT05B310T3



### ORDERING INFORMATION

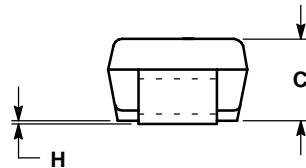
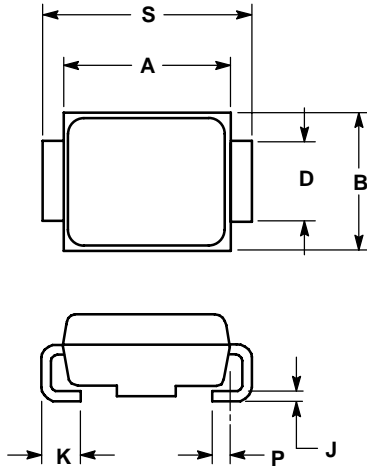
Device	Package	Shipping <sup>†</sup>
MMT05B230T3	SMB	2500 / Tape & Reel
MMT05B230T3G	SMB (Pb-Free)	
MMT05B260T3	SMB	
MMT05B260T3G	SMB (Pb-Free)	
MMT05B310T3	SMB	
MMT05B310T3G	SMB (Pb-Free)	

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# MMT05B230T3, MMT05B260T3, MMT05B310T3

## PACKAGE DIMENSIONS

**SMB**  
(No Polarity)  
(Essentially JEDEC DO-214AA)  
CASE 403C-01  
ISSUE A

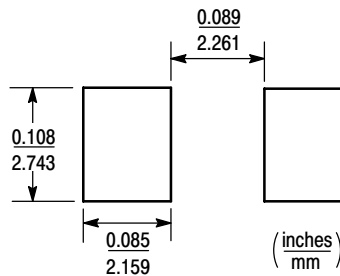


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.160	0.180	4.06	4.57
B	0.130	0.150	3.30	3.81
C	0.075	0.095	1.90	2.41
D	0.077	0.083	1.96	2.11
H	0.0020	0.0060	0.051	0.152
J	0.006	0.012	0.15	0.30
K	0.030	0.050	0.76	1.27
P	0.020 REF		0.51 REF	
S	0.205	0.220	5.21	5.59

## SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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