Designer's™ Data Sheet

Thyristor Surge Protectors

High Voltage Bidirectional TSPD

MMT05B230T3
MMT05B280T3
MMT05B330T3

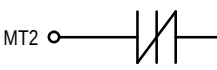
Motorola preferred devices

BIDIRECTIONAL THYRISTOR SURGE PROTECTOR

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.

- High Surge Current Capability
- 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)
- Supplied in 12mm Tape and Reel, 2500 units per reel. (T3 suffix)



CASE 403A–03
SMB

DEVICE RATINGS: @ 25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Off–State Voltage — Maximum	V_{DM}		Volts
MMT05B230T3		±165	
MMT05B280T3		±215	
MMT05B330T3		±240	
Impulse Surge Short Circuit Current Maximum Non–Repetitive double exponential wave, Notes 1, 2			A(pk)
10 x 1000 μsec	I_{PPS1}	±50	
8 x 20 μsec	I_{PPS2}	±150	
10 x 160 μsec	I_{PPS3}	±100	
10 x 560 μsec	I_{PPS4}	±70	
Maximum Non–Repetitive Rate of Change of On–State Current Double Exponential Waveform, R = 1.0, L = 1.5 μH, C = 1.67 μF, I_{pk} = 110A	di/dt	±150	A/μs

DEVICE THERMAL RATINGS

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} = 50A, 10x100 μsec @ 25°C)	P_{PK}	2000	W

Designer's Data for "Worst Case" Conditions — The Designer's Data Sheet permits the design of most circuits entirely from the information presented. SOA Limit curves — representing boundaries on device characteristics — are given to facilitate "worst case" design.

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

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristics		Symbol	Min	Typ	Max	Unit
Breakover Voltage (Both polarities)		$V_{(BO)}$				Volts
(dv/dt = 100 V/μs, I_{SC} = 1.0 A, Vdc = 1000 V)	MMT05B230T3		195	238	265	
	MMT05B280T3		240	283	320	
	MMT05B330T3		280	340	380	
(+65°C)						
	MMT05B230T3		—	—	280	
	MMT05B280T3		—	—	340	
	MMT05B330T3		—	—	400	
Breakover Voltage (Both polarities)		$V_{(BO)}$				Volts
(f = 60 Hz, I_{SC} = 1.0 A(rms), V_{OC} = 1000 V(rms),	MMT05B230T3		195	238	265	
R_I = 1.0 kΩ, t = 0.5 cycle, Note 2)	MMT05B280T3		240	283	320	
	MMT05B330T3		280	340	380	
(+65°C)						
	MMT05B230T3		—	—	280	
	MMT05B280T3		—	—	340	
	MMT05B330T3		—	—	400	
Breakover Voltage Temperature Coefficient		$dV_{(BO)}/dT_J$	—	0.08	—	%/°C
Breakdown Voltage ($I_{(BR)}$ = 1.0 mA) Both polarities		$V_{(BR)}$				Volts
	MMT05B230T3		175	—	—	
	MMT05B280T3		225	—	—	
	MMT05B330T3		265	—	—	
Off State Current (V_{D1} = 50 V) Both polarities		I_{D1}	—	—	2.0	μA
(V_{D2} = V_{DM}) Both polarities		I_{D2}	—	—	5.0	
On–State Voltage (I_T = 1.0 A)		V_T	—	1.53	3.0	Volts
(PW ≤ 300 μs, Duty Cycle ≤ 2%, Note 2)						
Breakover Current (f = 60 Hz, V_{DM} = 1000 V(rms), R_S = 1.0 kΩ) Both polarities		I_{BO}	—	230	—	mA
Holding Current (Both polarities)	Note 2	I_H	175	340	—	mA
	(+65°C)		130	—	—	
Critical Rate of Rise of Off–State Voltage		dv/dt	2000	—	—	V/μs
(Linear waveform, V_D = Rated V_{BR}, T_J = 25°C)						
Capacitance (f = 1.0 MHz, 50 V, 1.0 V)		C_O	—	22	—	pF
(f = 1.0 MHz, 2.0 V, 15 mV)			—	53	75	

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

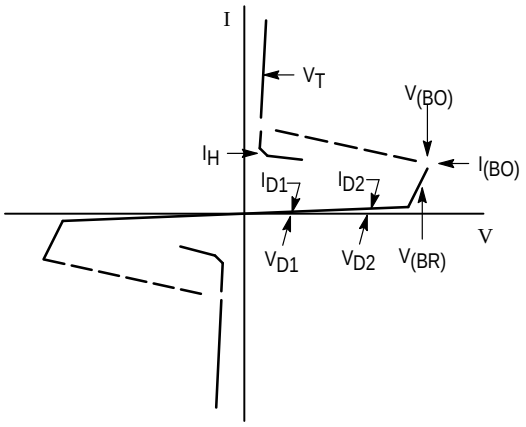


Figure 1. Voltage – Current Characteristics

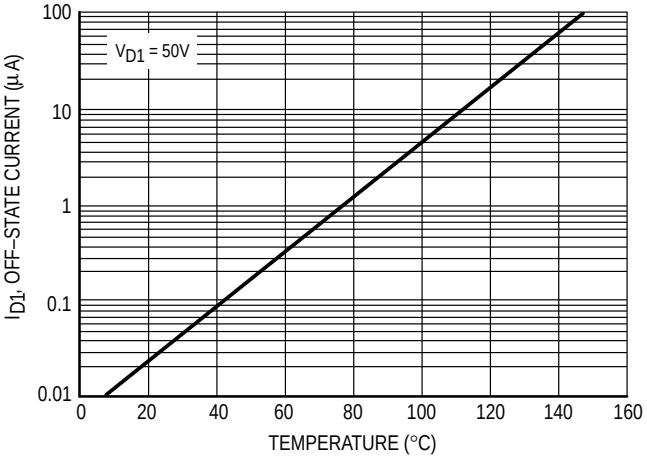


Figure 2. Off–State Current versus Temperature

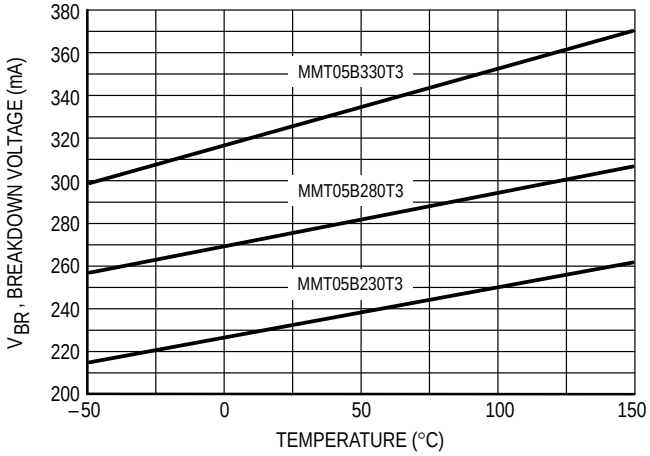


Figure 3. Breakdown Voltage versus Temperature

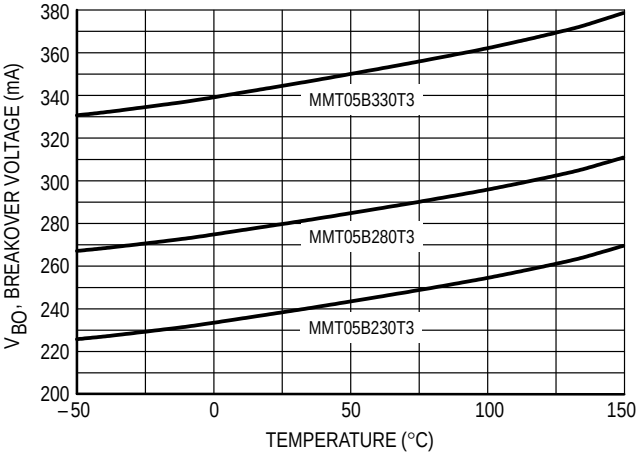


Figure 4. Breakover Voltage versus Temperature

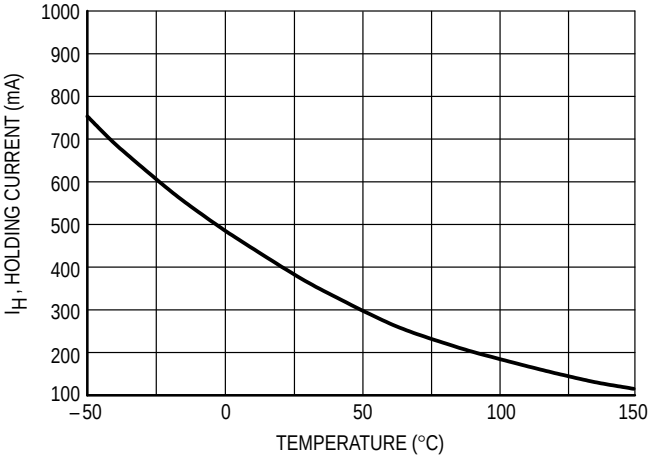


Figure 5. Holding Current versus Temperature

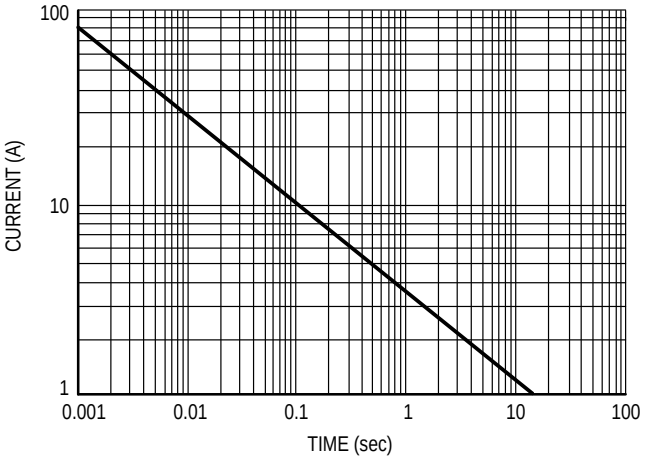
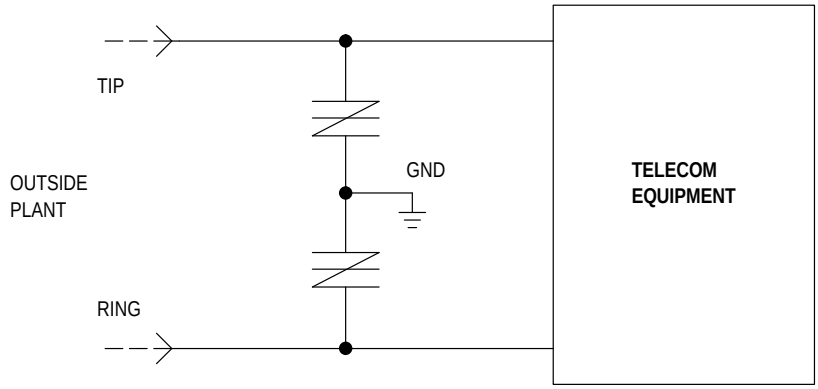
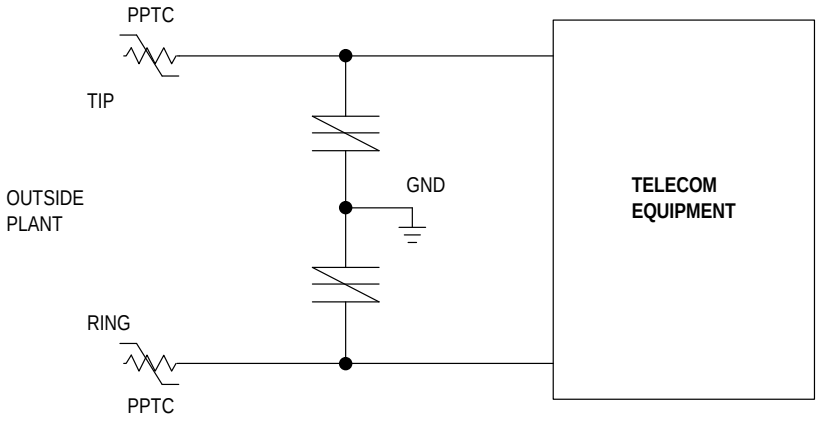


Figure 6. Peak Surge On–State Current versus Surge Current Duration


TIP
OUTSIDE
PLANT
GND
RING
TELECOM
EQUIPMENT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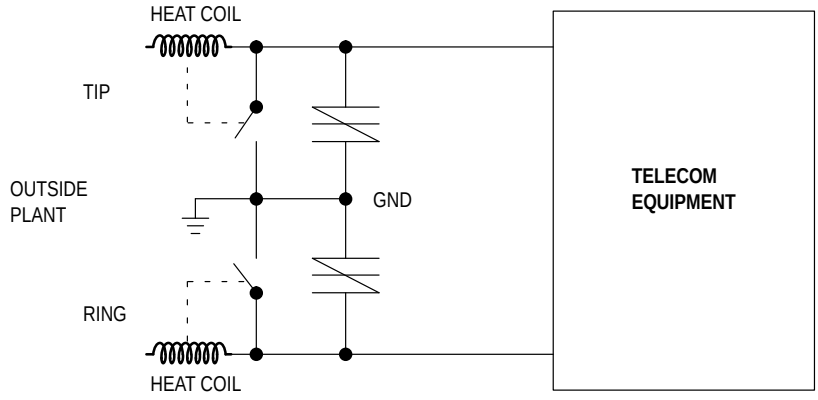
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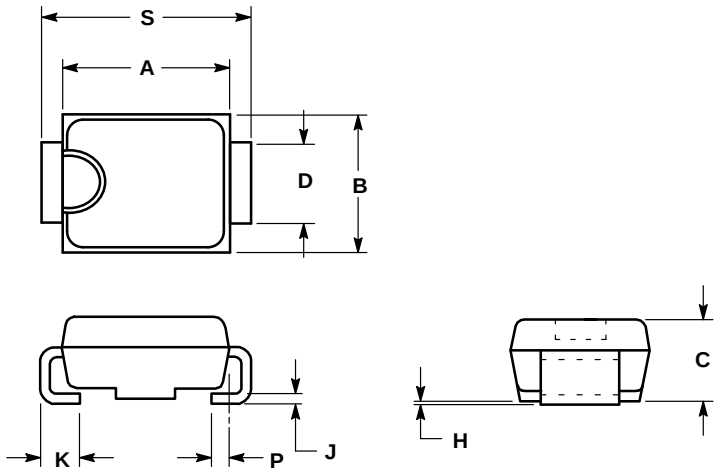
PACKAGE DIMENSIONS



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

	INCHES		MILLIMETERS	
DIM	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

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ISSUE C

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