

BTB12-600TW3G

Triacs Silicon Bidirectional Thyristors

Designed for high performance full-wave ac control applications where high noise immunity and high commutating di/dt are required.

Features

- Blocking Voltage to 600 V
- On-State Current Rating of 12 A RMS at 80°C
- Uniform Gate Trigger Currents in Three Quadrants
- High Immunity to dV/dt – 10 V/μs minimum at 125°C
- Minimizes Snubber Networks for Protection
- Industry Standard TO-220AB Package
- High Commutating di/dt – 1.75 A/ms minimum at 110°C
- These are Pb-Free Devices

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage (Note 1) (T _J = -40 to 110°C, Sine Wave, 50 to 60 Hz, Gate Open) BTB12-600TW3G	V _{DRM} , V _{RRM}	600	V
On-State RMS Current (Full Cycle Sine Wave, 60 Hz, T _C = 80°C)	I _{T(RMS)}	12	A
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, T _C = 25°C)	I _{TSM}	126	A
Circuit Fusing Consideration (t = 8.3 ms)	I ² t	66	A ² sec
Non-Repetitive Surge Peak Off-State Voltage (T _J = 25°C, t = 10ms)	V _{DSM} / V _{RSM}	V _{DSM} /V _{RSM} +100	V
Peak Gate Current (T _J = 110°C, t = 20 μs)	I _{GM}	4.0	A
Peak Gate Power (Pulse Width ≤ 1.0 μs, T _C = 80°C)	P _{GM}	20	W
Average Gate Power (T _J = 110°C)	P _{G(AV)}	1.0	W
Operating Junction Temperature Range	T _J	-40 to +110	°C
Storage Temperature Range	T _{stg}	-40 to +150	°C

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.

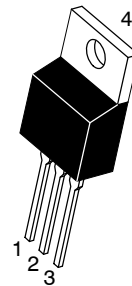
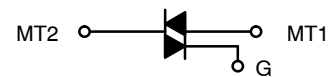
1. V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.



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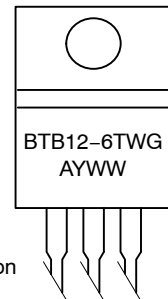
**TRIACS
12 AMPERES RMS
600 VOLTS**



**TO-220AB
CASE 221A
STYLE 4**

- A = Assembly Location
- Y = Year
- WW = Work Week
- G = Pb-Free Package

MARKING DIAGRAM



PIN ASSIGNMENT

1	Main Terminal 1
2	Main Terminal 2
3	Gate
4	Main Terminal 2

ORDERING INFORMATION

Device	Package	Shipping
BTB12-600TW3G	TO-220AB (Pb-Free)	50 Units / Rail

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

BTB12-600TW3G

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (AC)	$R_{\theta JC}$	1.8	$^{\circ}\text{C}/\text{W}$
Junction-to-Ambient	$R_{\theta JA}$	60	
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 seconds	T_L	260	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS ($T_J = 25^{\circ}\text{C}$ unless otherwise noted; Electricals apply in both directions)

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Peak Repetitive Blocking Current ($V_D = \text{Rated } V_{DRM}, V_{RRM}; \text{ Gate Open}$)	$I_{DRM}/$ I_{RRM}	-	-	0.005	mA
		-	-	1.0	

ON CHARACTERISTICS

Peak On-State Voltage (Note 2) ($I_{TM} = \pm 17 \text{ A Peak}$)	V_{TM}	-	-	1.55	V
Gate Trigger Current (Continuous dc) ($V_D = 12 \text{ V}, R_L = 30 \Omega$)	I_{GT}				mA
MT2(+), G(+)		1.2	-	5.0	
MT2(+), G(-)		1.2	-	5.0	
MT2(-), G(-)		1.2	-	5.0	
Holding Current ($V_D = 12 \text{ V}, \text{ Gate Open}, \text{ Initiating Current} = \pm 100 \text{ mA}$)	I_H	-	-	10	mA
Latching Current ($V_D = 12 \text{ V}, I_G = 7.5 \text{ mA}$)	I_L				mA
MT2(+), G(+)		-	-	15	
MT2(+), G(-)		-	-	15	
MT2(-), G(-)		-	-	15	
Gate Trigger Voltage ($V_D = 12 \text{ V}, R_L = 30 \Omega$)	V_{GT}				V
MT2(+), G(+)		0.5	-	1.3	
MT2(+), G(-)		0.5	-	1.3	
MT2(-), G(-)		0.5	-	1.3	
Gate Non-Trigger Voltage ($T_J = 110^{\circ}\text{C}$)	V_{GD}				V
MT2(+), G(+)		0.2	-	-	
MT2(+), G(-)		0.2	-	-	
MT2(-), G(-)		0.2	-	-	

DYNAMIC CHARACTERISTICS

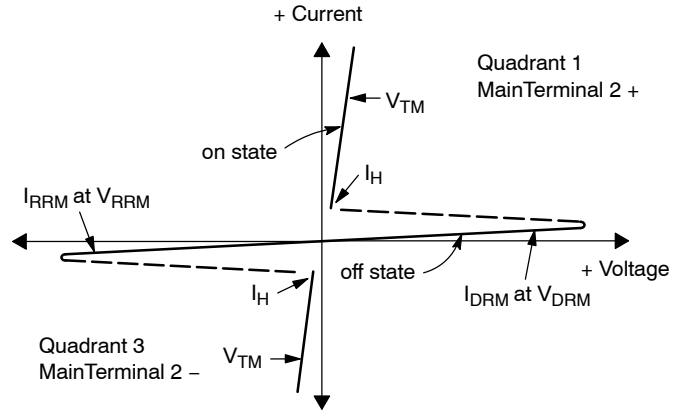
Rate of Change of Commutating Current, See Figure 10. (Gate Open, $T_J = 110^{\circ}\text{C}$, No Snubber)	$(di/dt)_c$	1.75	-	-	A/ms
Critical Rate of Rise of On-State Current ($T_J = 110^{\circ}\text{C}, f = 120 \text{ Hz}, I_G = 2 \times I_{GT}, tr \leq 100 \text{ ns}$)	di/dt	-	-	45	A/ μs
Critical Rate of Rise of Off-State Voltage ($V_D = 0.66 \times V_{DRM}$, Exponential Waveform, Gate Open, $T_J = 125^{\circ}\text{C}$)	dV/dt	10	-	-	V/ μs

2. Indicates Pulse Test: Pulse Width $\leq 2.0 \text{ ms}$, Duty Cycle $\leq 2\%$.

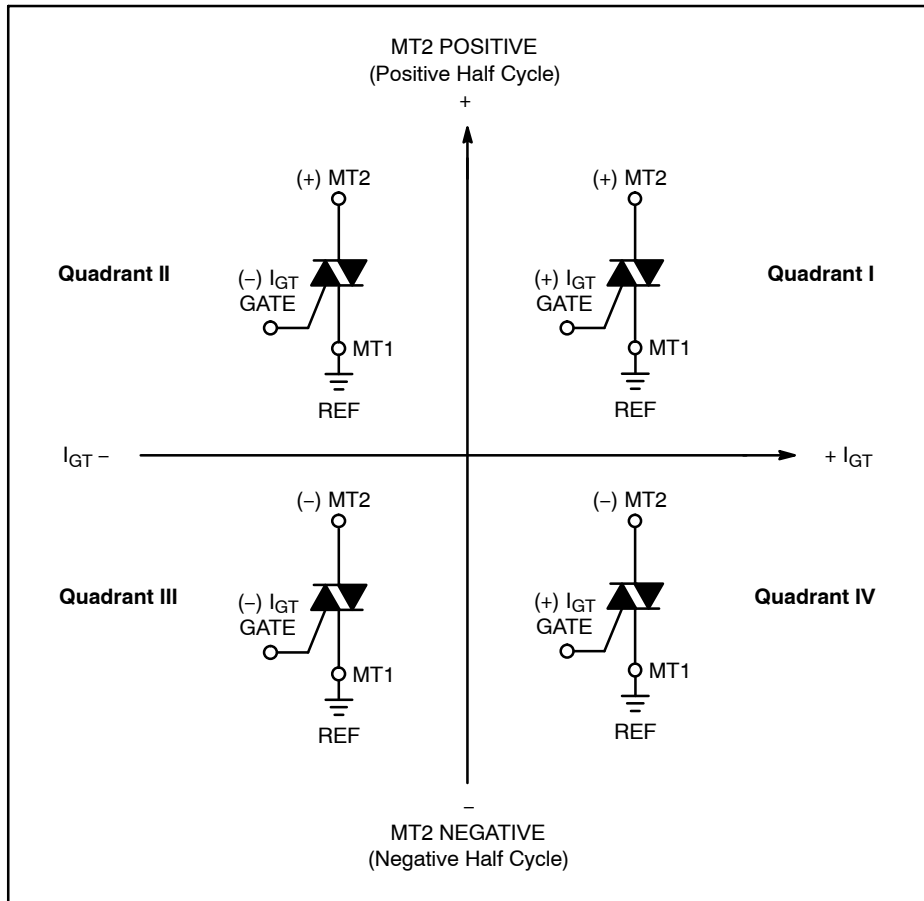
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Voltage Current Characteristic of Triacs (Bidirectional Device)

Symbol	Parameter
V_{DRM}	Peak Repetitive Forward Off State Voltage
I_{DRM}	Peak Forward Blocking Current
V_{RRM}	Peak Repetitive Reverse Off State Voltage
I_{RRM}	Peak Reverse Blocking Current
V_{TM}	Maximum On State Voltage
I_H	Holding Current



Quadrant Definitions for a Triac



All polarities are referenced to MT1.

With in-phase signals (using standard AC lines) quadrants I and III are used.

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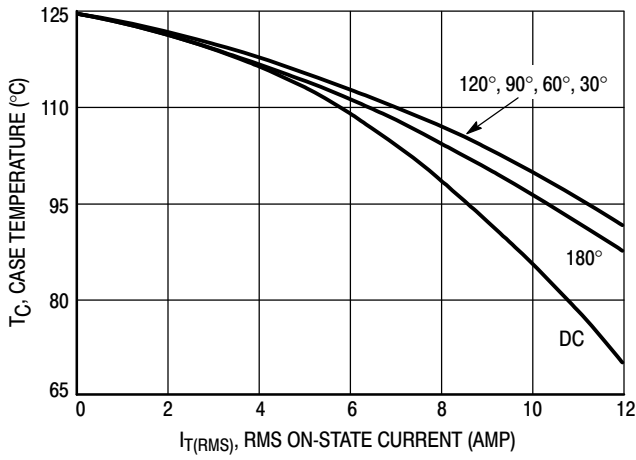


Figure 1. Typical RMS Current Derating

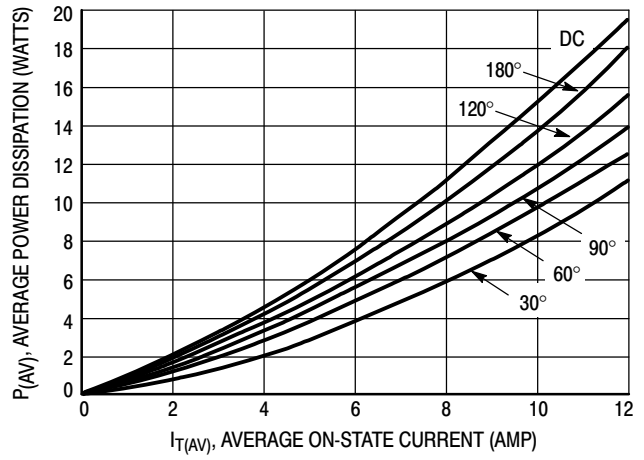


Figure 2. On-State Power Dissipation

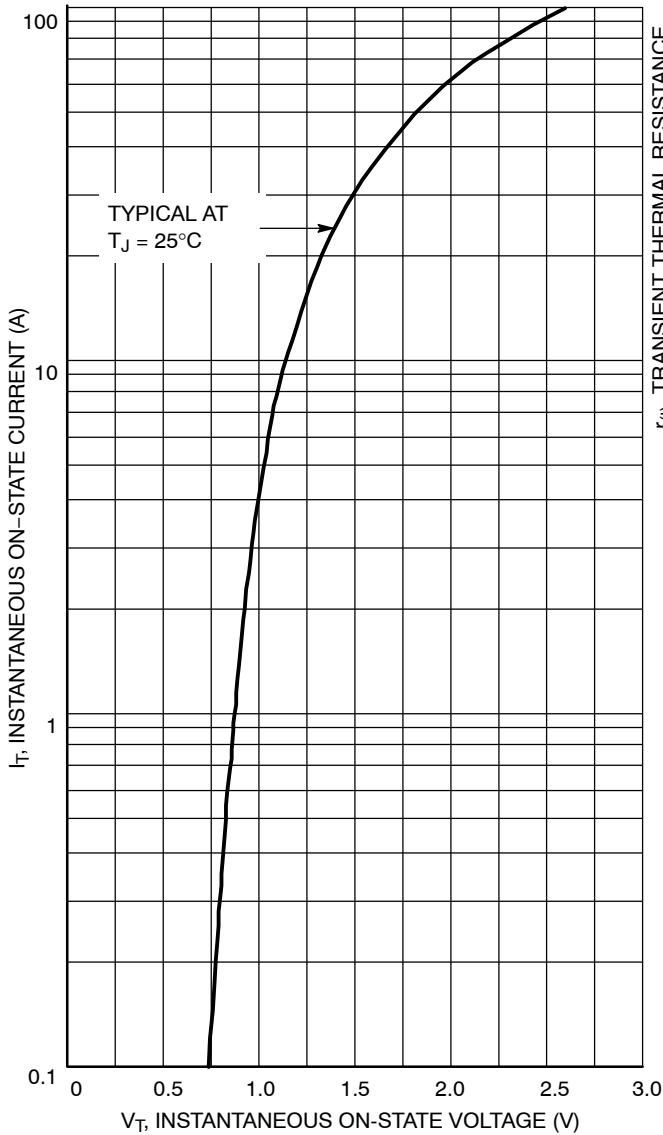


Figure 3. On-State Characteristics

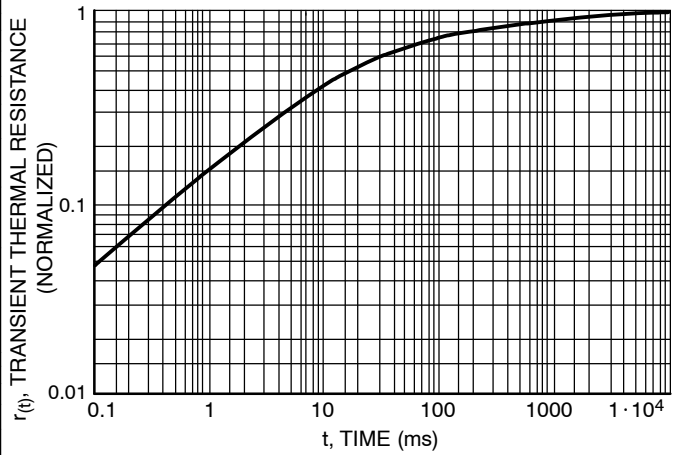


Figure 4. Thermal Response

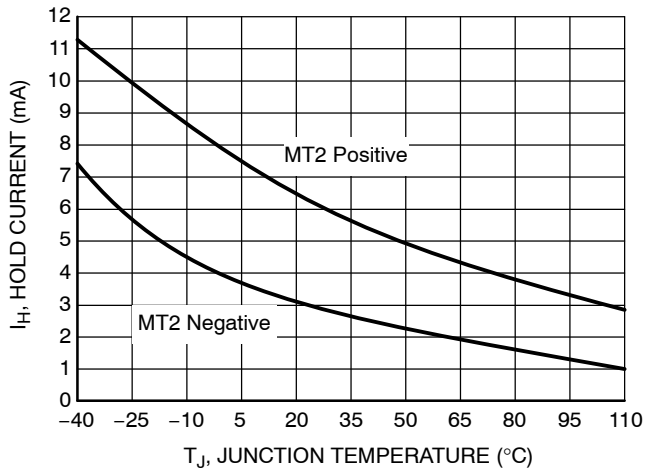


Figure 5. Typical Hold Current Variation

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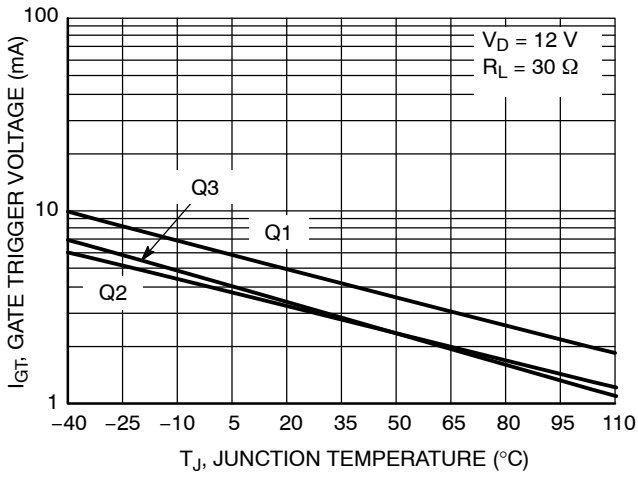


Figure 6. Typical Gate Trigger Current Variation

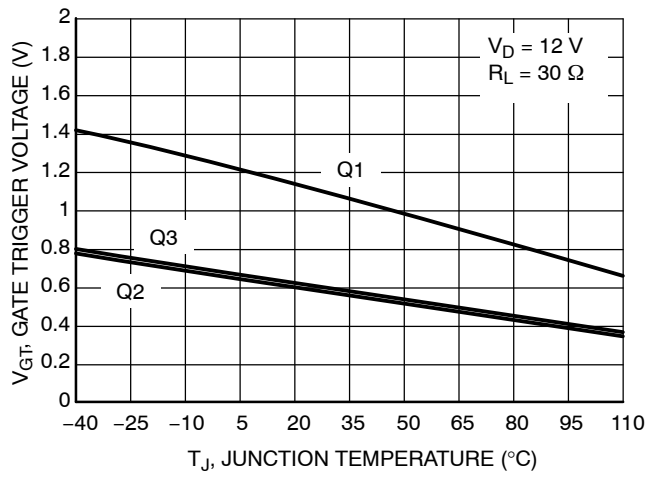


Figure 7. Typical Gate Trigger Voltage Variation

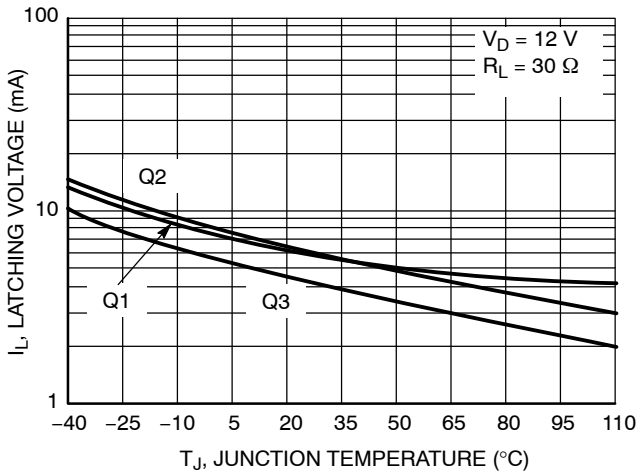


Figure 8. Typical Latching Current Variation

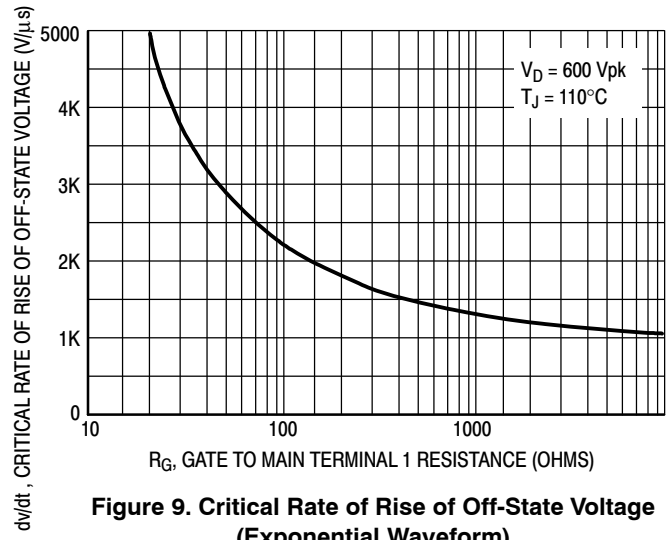
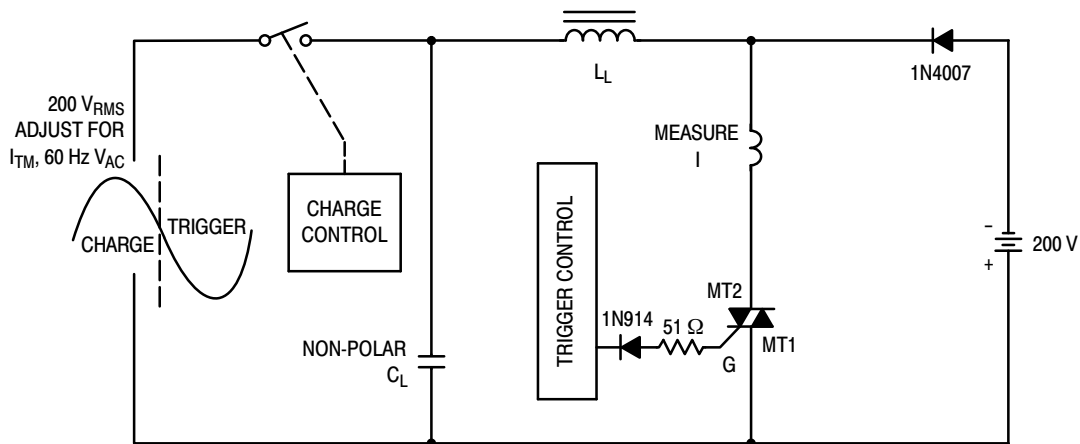


Figure 9. Critical Rate of Rise of Off-State Voltage (Exponential Waveform)



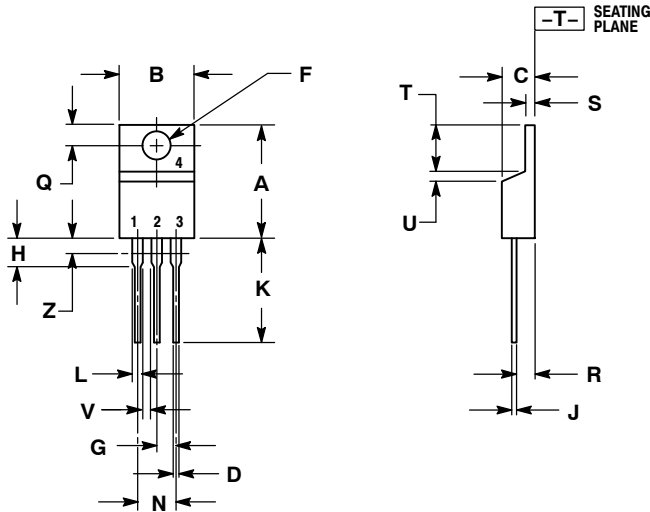
Note: Component values are for verification of rated $(di/dt)_c$. See AN1048 for additional information.

Figure 10. Simplified Test Circuit to Measure the Critical Rate of Rise of Commutating Current $(di/dt)_c$

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PACKAGE DIMENSIONS

TO-220
CASE 221A-07
ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.022	0.36	0.55
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 4:

- PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

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