

MAC9D, MAC9M, MAC9N

Preferred Device

Triacs

Silicon Bidirectional Thyristors

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

- Blocking Voltage to 800 Volts
- On-State Current Rating of 8.0 Amperes RMS at 100°C
- Uniform Gate Trigger Currents in Three Quadrants
- High Immunity to dv/dt — 500 V/μs minimum at 125°C
- Minimizes Snubber Networks for Protection
- Industry Standard TO-220AB Package
- High Commutating di/dt — 6.5 A/ms minimum at 125°C
- Device Marking: Logo, Device Type, e.g., MAC9D, Date Code

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

Rating	Symbol	Value	Unit
Peak Repetitive Off-State Voltage ⁽¹⁾ ($T_J = -40$ to 125°C , Sine Wave, 50 to 60 Hz, Gate Open) MAC9D MAC9M MAC9N	V_{DRM} , V_{RRM}	400 600 800	Volts
On-State RMS Current (Full Cycle Sine Wave, 60 Hz, $T_C = 100^\circ\text{C}$)	$I_{\text{T(RMS)}}$	8.0	Amps
Peak Non-Repetitive Surge Current (One Full Cycle Sine Wave, 60 Hz, $T_J = 125^\circ\text{C}$)	I_{TSM}	80	Amps
Circuit Fusing Consideration ($t = 8.3$ ms)	I^2t	26	A^2sec
Peak Gate Power (Pulse Width ≤ 1.0 μs, $T_C = 80^\circ\text{C}$)	P_{GM}	16	Watts
Average Gate Power ($t = 8.3$ ms, $T_C = 80^\circ\text{C}$)	$P_{\text{G(AV)}}$	0.35	Watt
Operating Junction Temperature Range	T_J	-40 to $+125$	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-40 to $+150$	$^\circ\text{C}$

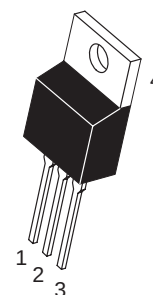
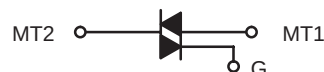
(1) V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.



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TRIACS
8 AMPERES RMS
400 thru 800 VOLTS



TO-220AB
CASE 221A
STYLE 4

PIN ASSIGNMENT

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

ORDERING INFORMATION

Device	Package	Shipping
MAC9D	TO220AB	50 Units/Rail
MAC9M	TO220AB	50 Units/Rail
MAC9N	TO220AB	50 Units/Rail

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

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THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance — Junction to Case — Junction to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.2 62.5	$^{\circ}C/W$
Maximum Lead Temperature for Soldering Purposes 1/8" from Case for 10 Seconds	T_L	260	$^{\circ}C$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Peak Repetitive Blocking Current ($V_D = \text{Rated } V_{DRM}, V_{RRM}$; Gate Open)	I_{DRM}, I_{RRM}	— —	— —	0.01 2.0	mA
$T_J = 25^{\circ}C$ $T_J = 125^{\circ}C$					

ON CHARACTERISTICS

Peak On-State Voltage* ($I_{TM} = \pm 11$ A Peak)	V_{TM}	—	1.2	1.6	Volts
Gate Trigger Current (Continuous dc) ($V_D = 12$ V, $R_L = 100 \Omega$) MT2(+), G(+) MT2(+), G(–) MT2(–), G(–)	I_{GT}	10 10 10	16 18 22	50 50 50	mA
Holding Current ($V_D = 12$ V, Gate Open, Initiating Current = ± 150 mA)	I_H	—	30	50	mA
Latching Current ($V_D = 24$ V, $I_G = 50$ mA) MT2(+), G(+); MT2(–), G(–) MT2(+), G(–)	I_L	— —	20 30	50 80	mA
Gate Trigger Voltage ($V_D = 12$ V, $R_L = 100 \Omega$) MT2(+), G(+) MT2(+), G(–) MT2(–), G(–)	V_{GT}	0.5 0.5 0.5	0.69 0.77 0.72	1.5 1.5 1.5	Volts
Gate Non-Trigger Voltage ($V_D = 12$ V, $R_L = 100 \Omega$, $T_J = 125^{\circ}C$) MT2(+), G(+); MT2(+), G(–); MT2(–), G(–)	V_{GD}	0.2	—	—	Volts

DYNAMIC CHARACTERISTICS

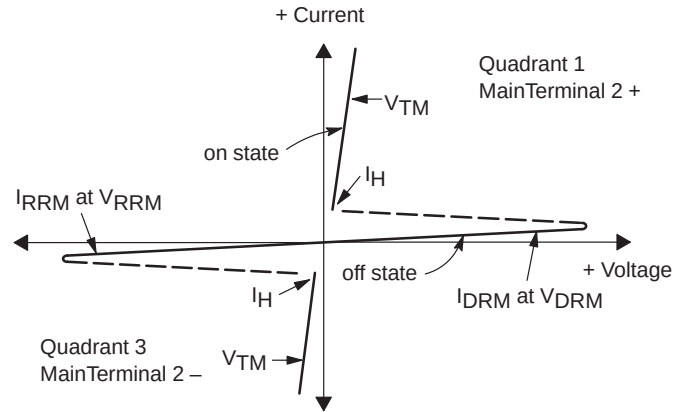
Rate of Change of Commutating Current; See Figure 10. ($V_D = 400$ V, $I_{TM} = 4.4$ A, Commutating $dv/dt = 18$ V/ μs , Gate Open, $T_J = 125^{\circ}C$, $f = 250$ Hz, No Snubber) $C_L = 10 \mu F$ $L_L = 40$ mH	$(di/dt)_C$	6.5	—	—	A/ms
Critical Rate of Rise of Off-State Voltage ($V_D = \text{Rated } V_{DRM}$, Exponential Waveform, Gate Open, $T_J = 125^{\circ}C$)	dv/dt	500	—	—	V/ μs

*Indicates Pulse Test: Pulse Width ≤ 2.0 ms, Duty Cycle $\leq 2\%$.

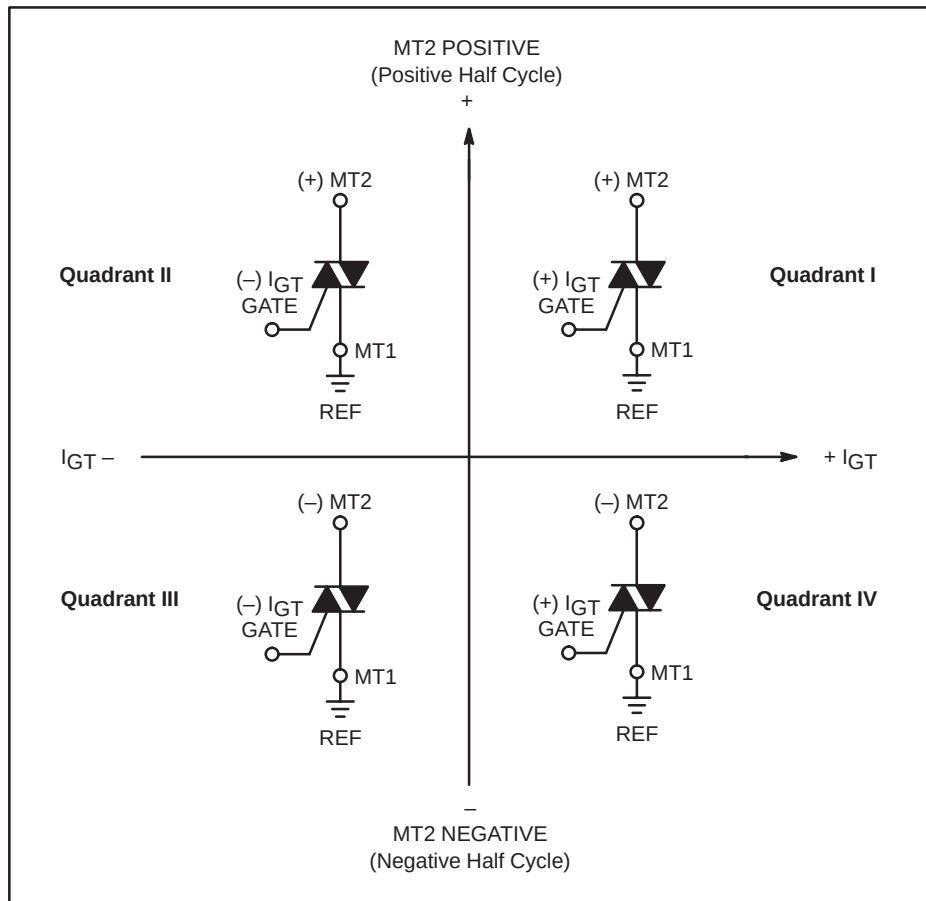
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Voltage Current Characteristic of Triacs (Bidirectional Device)

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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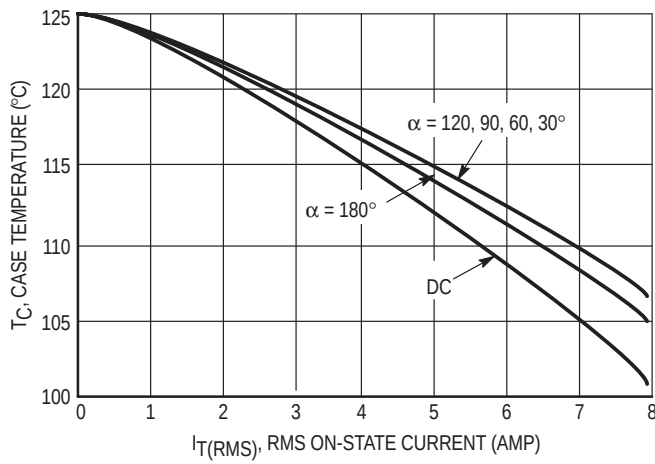


Figure 1. RMS Current Derating

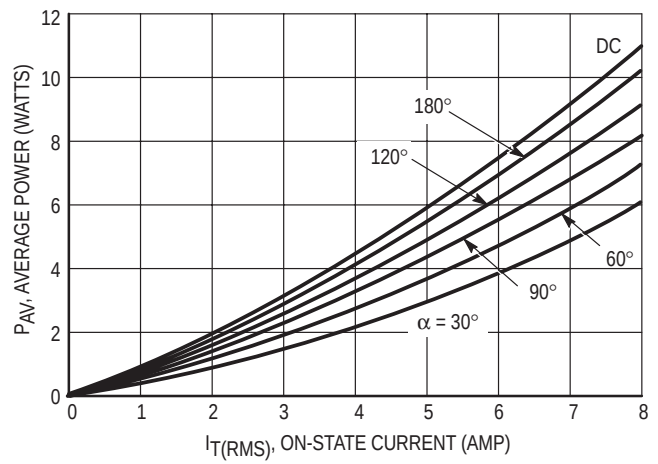


Figure 2. On-State Power Dissipation

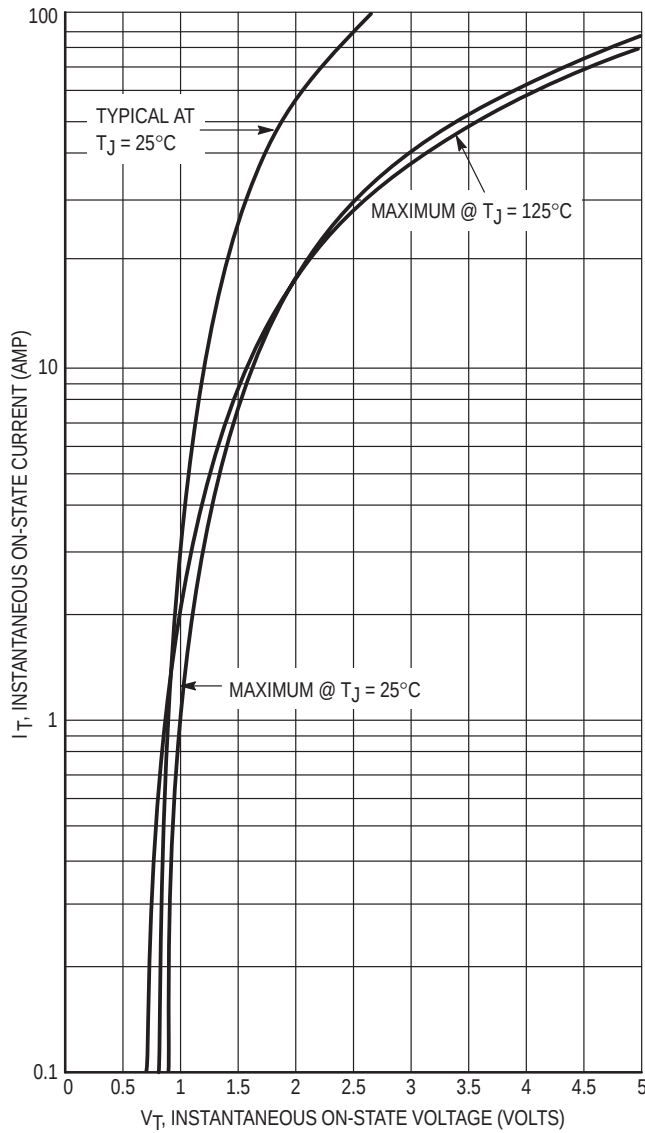


Figure 3. On-State Characteristics

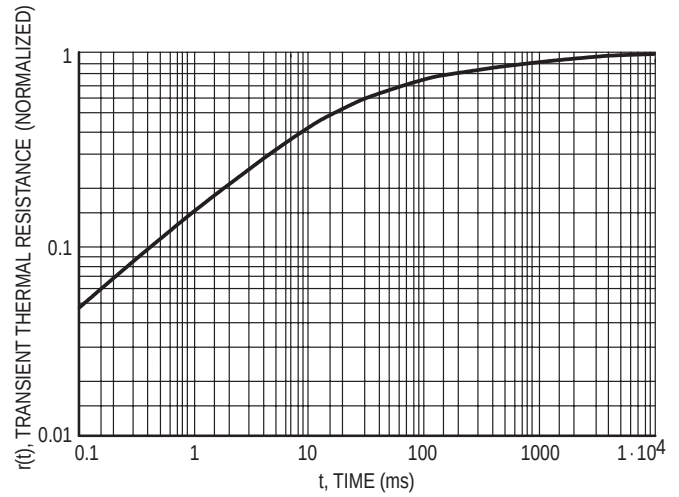


Figure 4. Thermal Response

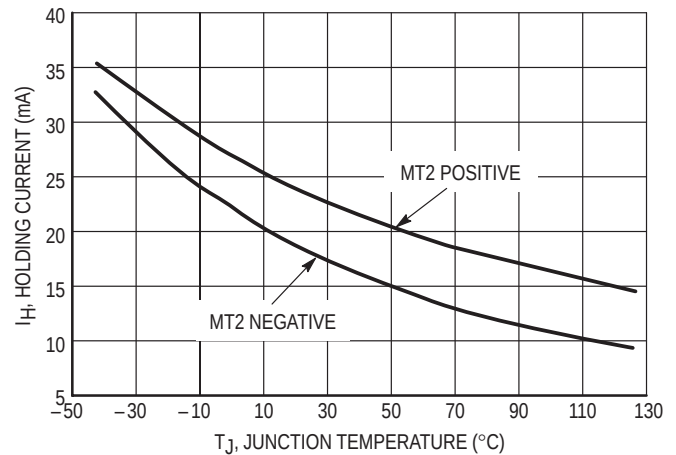


Figure 5. Holding Current Variation

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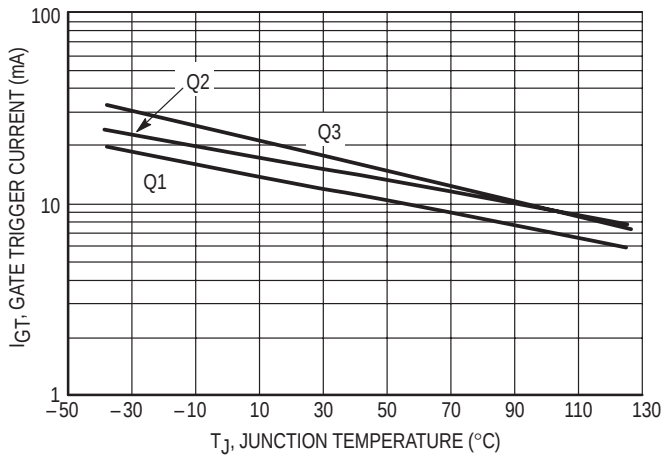


Figure 6. Gate Trigger Current Variation

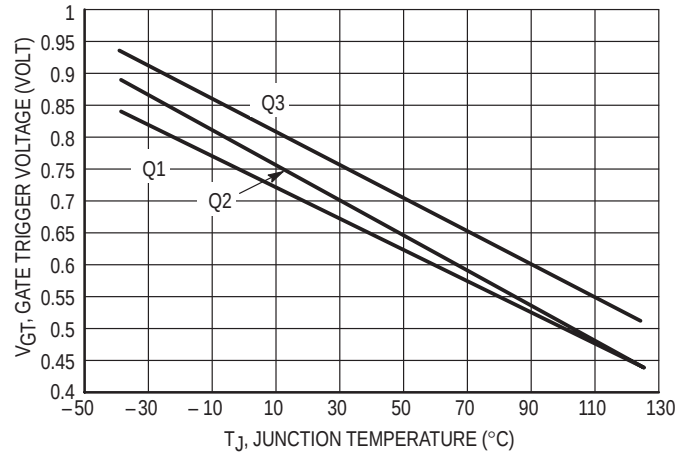


Figure 7. Gate Trigger Voltage Variation

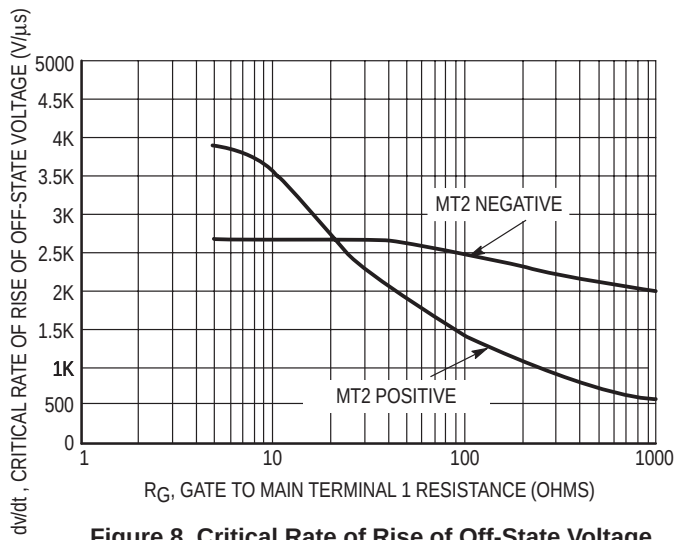


Figure 8. Critical Rate of Rise of Off-State Voltage (Exponential)

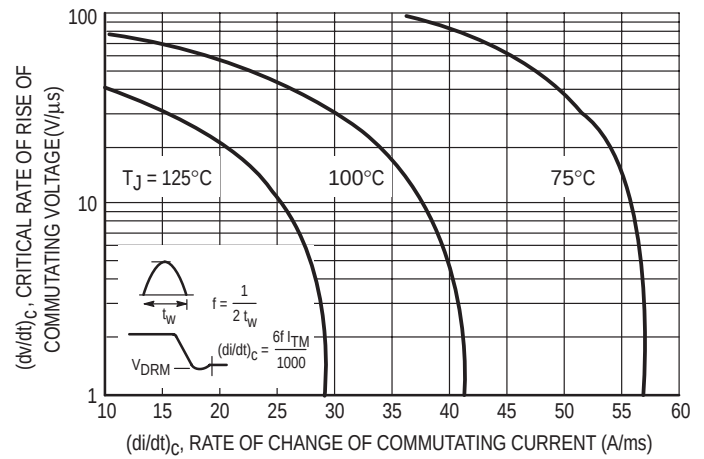
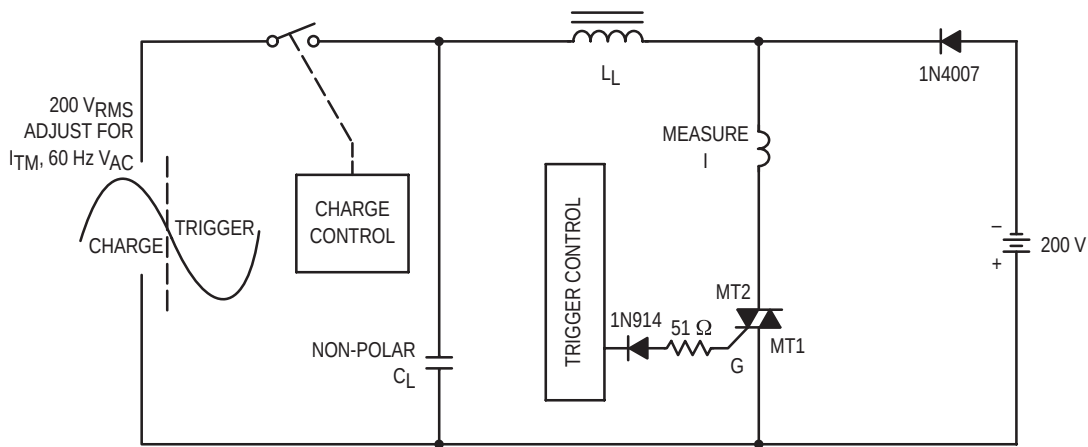


Figure 9. Critical Rate of Rise of Commutating Voltage



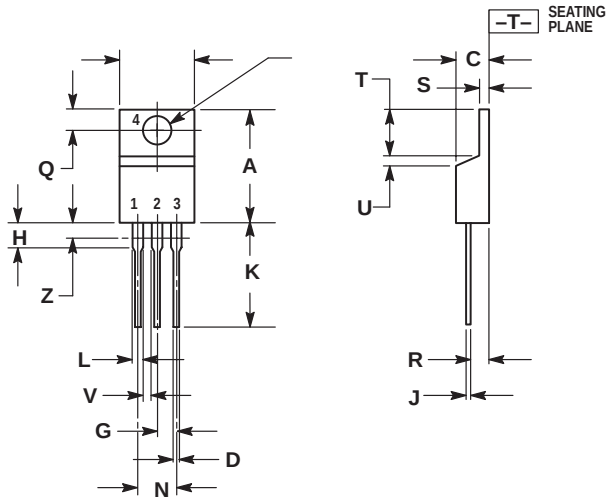
Note: Component values are for verification of rated $(di/dt)_c$. See AN1048 for additional information.

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-220AB CASE 221A-09 ISSUE Z



- 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	0.018	0.025	0.46	0.64
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

Notes

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