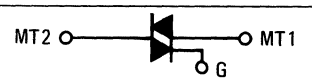
2N5441 thru 2N5446 (SILICON)
MAC40688 thru MAC40690

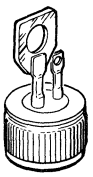


SILICON BIDIRECTIONAL THYRISTORS

. . . designed primarily for industrial and military applications for the control of ac loads in applications such as light dimmers, power supplies, heating controls, motor controls, welding equipment and power switching systems; or wherever full-wave, silicon gate controlled solid-state devices are needed.

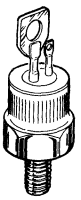
- Glass Passivated Junctions and Center Gate Fire
- Isolated Stud for Ease of Assembly
- Gate Triggering Guaranteed In All 4 Quadrants

TRIACS
(THYRISTORS)
40 AMPERES RMS



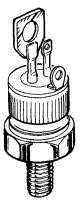
2N5441
2N5442
2N5443

CASE 237



2N5444
2N5445
2N5446

CASE 238



MAC40688
MAC40689
MAC40690

CASE 239

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
*Repetitive Peak Off-State Voltage (1) (T_J = -65 to +110°C) 1/2 Sine Wave 50 to 60 Hz, Gate Open *Peak Principal Voltage	V_{DRM}		Volts
2N5441, 2N5444, MAC40688		200	
2N5442, 2N5445, MAC40689		400	
2N5443, 2N5446, MAC40690		600	
*Peak Gate Voltage	V_{GM}	30	Volts
*On-State Current RMS (T_C = -65 to +70°C)	$I_{T(RMS)}$	40	Amp
(T_C = +100°C) Full Sine Wave, 50 to 60 Hz		20	
*Peak Surge Current (One Full Cycle of surge current at 60 Hz, preceeded and followed by a 40 A RMS current, T_J = +110°C)	I_{TSM}	300	Amp
*Peak Gate Power (Pulse Width = 10 μs Max)	P_{GM}	40	Watts
*Average Gate Power	$P_{G(AV)}$	0.75	Watt
*Peak Gate Current (10 μs Max)	I_{GM}	4.0	Amp
*Operating Junction Temperature Range	T_J	-65 to +110	°C
*Storage Temperature Range	T_{stg}	-65 to +150	°C
*Stud Torque	–	30	in. lb.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
*Thermal Resistance, Junction to Case	$R_{\theta JC}$		°C/W
2N5441, 2N5442, 2N5443		0.8	
2N5444, 2N5445, 2N5446		0.9	
MAC40688, MAC40689, MAC40690		1.0	

*Indicates JEDEC Registered Data for 2N5441 thru 2N5446.

(1) Ratings apply for open gate conditions. Thyristor devices shall not be tested with a constant current source for blocking capability such that the voltage applied exceeds the rated blocking voltage.

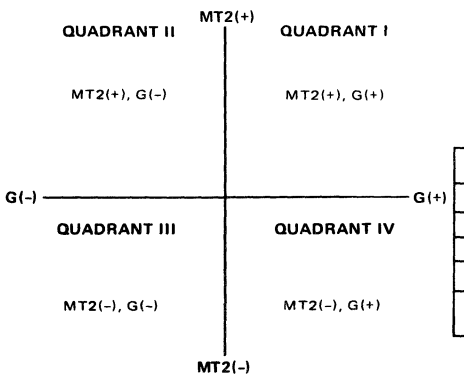
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
*Peak Blocking Current (Either Direction) Rated V_{DRM} @ T_J = 110°C	I_{DRM}	–	0.5	4.0	mA
*On-State Voltage (Either Direction) I_{TM} = 56 A Peak, Pulse Width ≤ 1.0 ms, Duty Cycle ≤ 2.0%	V_{TM}	–	1.65	1.85	Volts
Gate Trigger Current (1) Main Terminal Voltage = 12 Vdc, R_L = 50 Ohms	I_{GT}				mA
MT2 (+), G(+)		–	15	70	
MT2 (+), G(–)		–	15	70	
MT2 (–), G(–)		–	15	70	
MT2 (–), G(+)		–	20	100	
*MT2 (+), G(+); MT2 (–), G (–) T_C = -65°C		–	–	125	
*MT2 (+), G(–); MT2 (–), G(+) T_C = -65°C		–	–	240	
Gate Trigger Voltage Main Terminal Voltage = 12 Vdc, R_L = 50 Ohms	V_{GT}				Volts
MT2 (+), G(+)		–	1.1	2.0	
MT2 (+), G(–)		–	1.1	2.0	
MT2 (–), G(–)		–	1.1	2.0	
MT2 (–), G(+)		–	1.3	2.5	
*All Quadrants, T_C = -65°C)		–	–	3.4	
*Main Terminal Voltage = Rated V_{DRM} = R_L = 10 k ohms, T_J = +110°C		0.2	–	–	
Holding Current Main Terminal Voltage = 12 Vdc, Gate Open Initiating Current = 150 mA	I_H				mA
MT2 (+)		–	10	70	
MT2 (–)		–	10	70	
*Either Direction, T_C = -65°C		–	–	100	
*Turn-On Time Main Terminal Voltage = Rated V_{DRM}, I_{TM} = 56 A, Gate Source Voltage = 12 V, R_S = 12 Ohms, Rise Time = 0.1 μs, Pulse Width = 2.0 μs	t_{gt}	–	1.0	2.0	μs
*Critical Rate-of -Rise of Commutation Voltage Rated V_{DRM}, I_{TM} = 40 A, Commutating di/dt = 22 A/ms, gate energized	dv/dt				V/μs
T_C = 70°C 2N5441, 2N5442, 2N5443		5.0	30	–	
= 65°C 2N5444, 2N5445, 2N5446		5.0	30	–	
= 60°C MAC40688, MAC40689, MAC40690		5.0	30	–	
Rated V_{DRM}, Exponential Voltage Rise, Gate Open, T_C = 110°C					
2N5441, 2N5444, MAC40688		50			
2N5442, 2N5445, MAC40689		30			
2N5443, 2N5446, MAC40690		20			

*Indicates JEDEC Registered Data for 2N5441 thru 2N5446.

(1) All voltage polarity referenced to Main Terminal 1.

QUADRANT DEFINITIONS



Trigger devices are recommended for gating on Triacs. They provide:

1. Consistent predictable turn-on points.
2. Simplified circuitry.
3. Fast turn-on time for cooler, more efficient and reliable operation.

ELECTRICAL CHARACTERISTICS of RECOMMENDED BIDIRECTIONAL SWITCHES

USAGE	General		Lamp Dimmer
PART NUMBER	MBS4991	MBS4992	MBS100
V_S	6.0 – 10 V	7.5 – 9.0 V	3.0 – 5.0 V
I_S	350 μA Max	120 μA Max	100 – 400 μA
$V_{S1} - V_{S2}$	0.5 V Max	0.2 V Max	0.35 V Max
Temperature Coefficient	0.02%/°C Typ		

See AN-526 for Theory and Characteristics of Silicon Bidirectional Switches.

FIGURE 1 – POWER DISSIPATION versus ON-STATE CURRENT

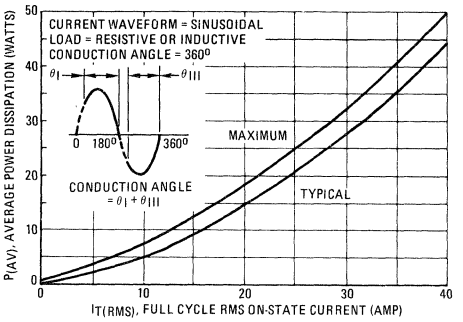


FIGURE 2 – CASE TEMPERATURE versus ON-STATE CURRENT

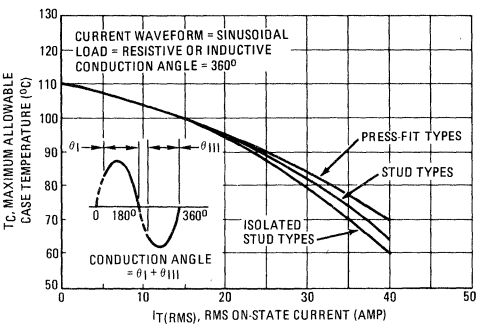


FIGURE 3 – TYPICAL GATE TRIGGER VOLTAGE

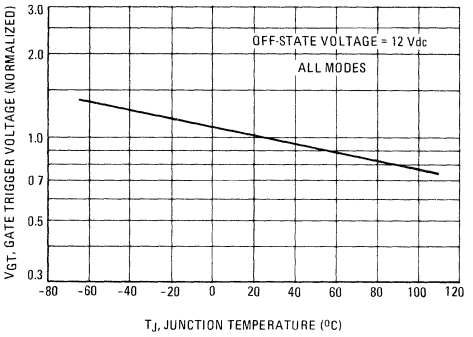


FIGURE 4 – TYPICAL GATE TRIGGER CURRENT

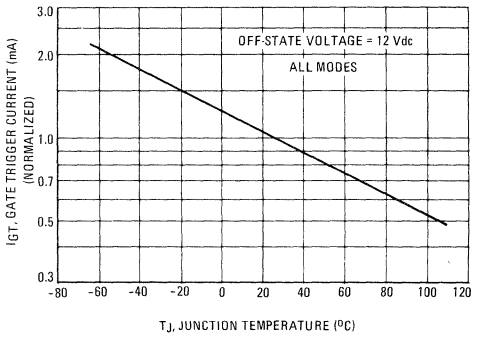


FIGURE 5 – TYPICAL THERMAL RESPONSE

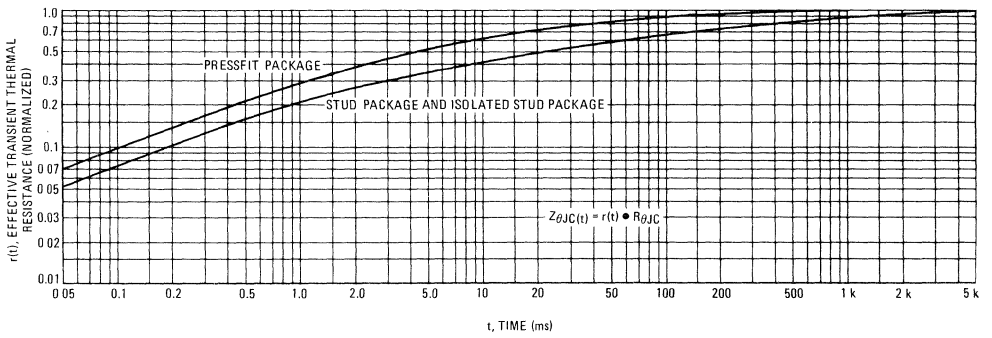


FIGURE 6 – MAXIMUM ON-STATE CHARACTERISTICS

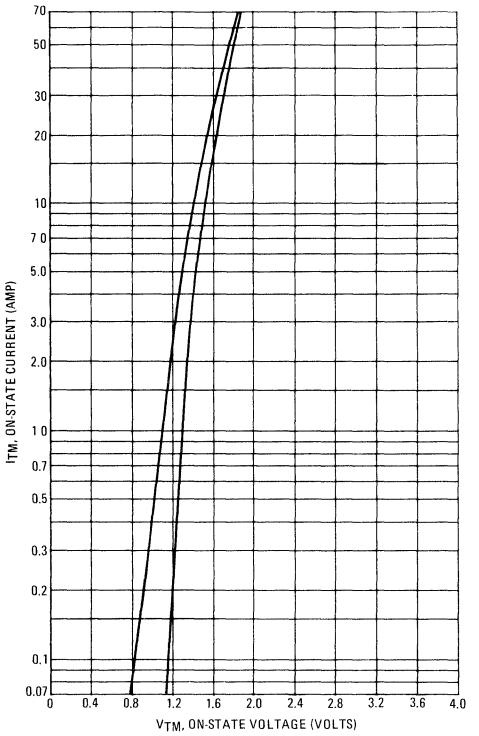


FIGURE 7 – TYPICAL HOLDING CURRENT

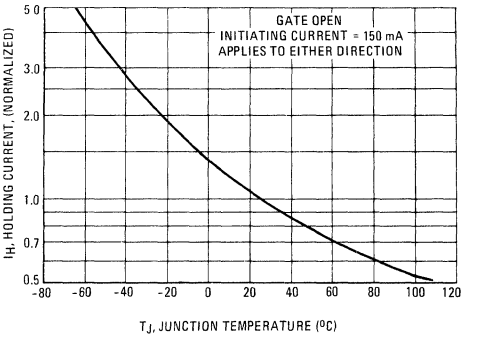
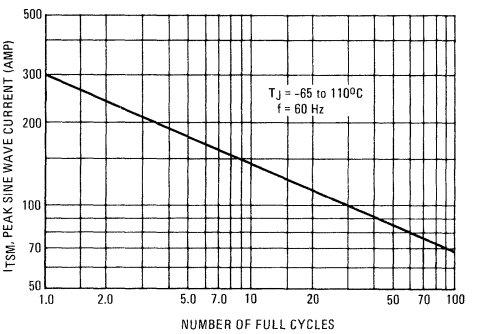
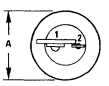


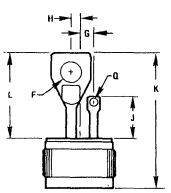
FIGURE 8 – MAXIMUM ALLOWABLE SURGE CURRENT



CASE 237



2N5441
2N5442
2N5443

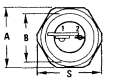


DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	12.73	12.83	0.501	0.505
F	–	4.06	–	0.160
G	2.16	2.41	0.085	0.095
H	1.52	1.78	0.060	0.070
J	6.99	7.75	0.275	0.305
K	–	26.67	–	1.050
L	–	17.02	–	0.670
Q	1.40	1.65	0.055	0.065

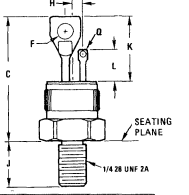
NOTE
1 DIM "G" & "H" TO BE MEASURED AT CAN

CASE 237-01

CASE 238



2N5444
2N5445
2N5446



Pin 1 MT1
2 Gate
Stud MT2

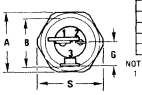
DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.00	14.20	0.551	0.559
B	12.73	12.83	0.501	0.505
C	–	30.23	–	1.190
F	–	4.06	–	0.160
H	2.16	2.41	0.085	0.095
J	10.67	11.56	0.420	0.455
K	–	17.02	–	0.670
L	6.99	7.75	0.275	0.305
Q	1.40	1.65	0.055	0.065
R	1.52	1.78	0.060	0.070
S	15.34	15.60	0.604	0.614

NOTE
1 DIM "H" & "R" TO BE MEASURED AT CAN

CASE 238-01

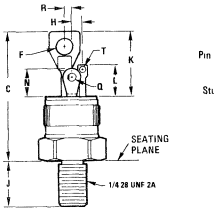
CASE 239

MAC40688
MAC40689
MAC40690



DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	14.00	14.20	0.551	0.559
B	12.73	12.83	0.501	0.505
C	–	32.51	–	1.280
F	–	4.06	–	0.160
G	–	6.48	–	0.255
H	2.16	2.41	0.085	0.095
J	10.67	11.56	0.420	0.455
K	–	17.02	–	0.670
L	6.99	7.75	0.275	0.305
N	6.48	6.99	0.255	0.275
Q	3.43	3.81	0.135	0.150
R	1.52	1.78	0.060	0.070
S	15.34	15.60	0.604	0.614
T	1.40	1.65	0.055	0.065

NOTE
1 DIM "G", "H" & "R" TO BE MEASURED AT CAN



Pin 1 MT1
2 Gate
3. MT2
Stud Isolated