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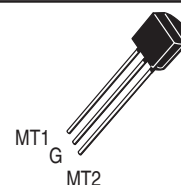
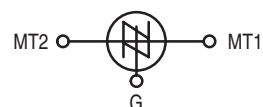
## Silicon Bidirectional Switches Diode Thyristors

... designed for full-wave triggering in Triac phase control circuits, half-wave SCR triggering application and as voltage level detectors. Supplied in an inexpensive plastic TO-226AA package for high-volume requirements, this low-cost plastic package is readily adaptable for use in automatic insertion equipment.

- Low Switching Voltage — 8 Volts Typical
- Uniform Characteristics in Each Direction
- Low On-State Voltage — 1.7 Volts Maximum
- Low Off-State Current — 0.1  $\mu$ A Maximum
- Low Temperature Coefficient — 0.02 %/°C Typical

**MBS4991**  
**MBS4992**  
**MBS4993**

**SBS**  
**(PLASTIC)**



**CASE 29-04**  
**(TO-226AA)**  
**STYLE 12**

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

Rating	Symbol	Value	Unit
Power Dissipation	$P_D$	500	mW
DC Forward Current	$I_F$	200	mA
DC Gate Current (Off-State Only)	$I_{G(\text{off})}$	5	mA
Repetitive Peak Forward Current (1% Duty Cycle, 10 $\mu$ s Pulse Width, $T_A = 100^\circ\text{C}$ )	$I_{FM(\text{rep})}$	2	Amps
Non-repetitive Forward Current (10 $\mu$ s Pulse Width, $T_A = 25^\circ\text{C}$ )	$I_{FM(\text{nonrep})}$	6	Amps
Operating Junction Temperature Range	$T_J$	-55 to +125	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{stg}}$	-65 to +150	$^\circ\text{C}$

# MBS4991 MBS4992 MBS4993

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted.)

Characteristic		Symbol	Min	Typ	Max	Unit
Switching Voltage	MBS4991 MBS4992, MBS4993	$V_S$	6 7.5	8 8	10 9	Vdc
Switching Current	MBS4991 MBS4992 MBS4993	$I_S$	— —	175 90 175	500 120 250	$\mu\text{A}$ dc
Switching Voltage Differential (See Figure 10)	MBS4991 MBS4992, MBS4993	$ V_{S1}-V_{S2} $	— —	0.3 0.1	0.5 0.2	Vdc
Gate Trigger Current ( $V_F = 5 \text{ Vdc}$ , $R_L = 1 \text{ k ohm}$ )	MBS4992 MBS4993	$I_{GF}$	— —	— —	100 500	$\mu\text{A}$ dc
Holding Current	MBS4991 MBS4992 MBS4993	$I_H$	— — —	0.7 0.2 0.3	1.5 0.5 0.75	mAdc
Off-State Blocking Current ( $V_F = 5 \text{ Vdc}$ , $T_A = 25^\circ\text{C}$ ) ( $V_F = 5 \text{ Vdc}$ , $T_A = 85^\circ\text{C}$ ) ( $V_F = 5 \text{ Vdc}$ , $T_A = 25^\circ\text{C}$ ) ( $V_F = 5 \text{ Vdc}$ , $T_A = 100^\circ\text{C}$ )	MBS4991 MBS4991 MBS4992, MBS4993 MBS4992, MBS4993	$I_B$	— — — —	0.08 2 0.08 6	1 10 0.1 10	$\mu\text{A}$ dc
Forward On-State Voltage ( $I_F = 175 \text{ mAdc}$ ) ( $I_F = 200 \text{ mAdc}$ )	MBS4991 MBS4992, MBS4993	$V_F$	— —	1.4 1.5	1.7 1.7	Vdc
Peak Output Voltage ( $C_C = 0.1 \mu\text{F}$ , $R_L = 20 \text{ ohms}$ , (Figure 7))		$V_O$	3.5	4.8	—	Vdc
Turn-On Time (Figure 8)		$t_{on}$	—	1	—	$\mu\text{s}$
Turn-Off Time (Figure 9)		$t_{off}$	—	30	—	$\mu\text{s}$
Temperature Coefficient of Switching Voltage ( $-50$ to $+125^\circ\text{C}$ )		$T_C$	—	+0.02	—	$\%/^\circ\text{C}$
Switching Current Differential (See Figure 10)		$I_{S1}-I_{S2}$	—	—	100	$\mu\text{A}$

### TYPICAL ELECTRICAL CHARACTERISTICS

FIGURE 1 – SWITCHING VOLTAGE versus TEMPERATURE

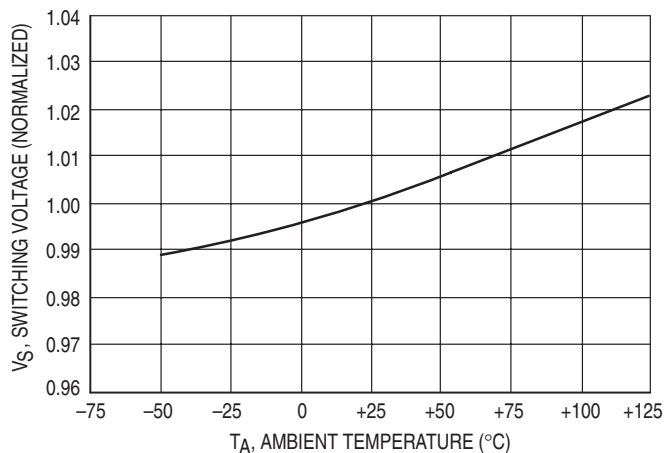


FIGURE 2 – SWITCHING CURRENT versus TEMPERATURE

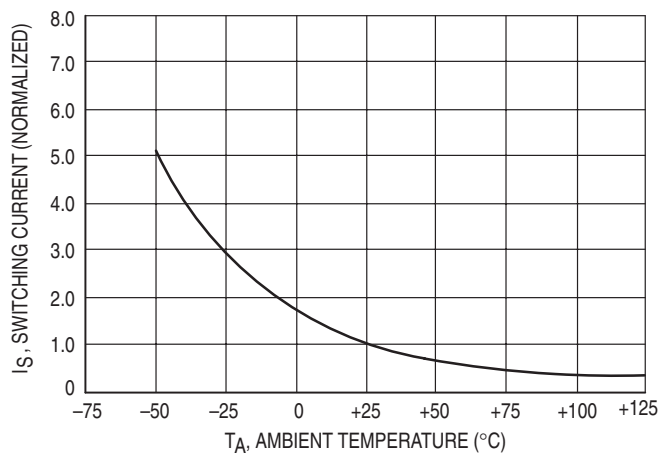


FIGURE 3 – HOLDING CURRENT versus TEMPERATURE

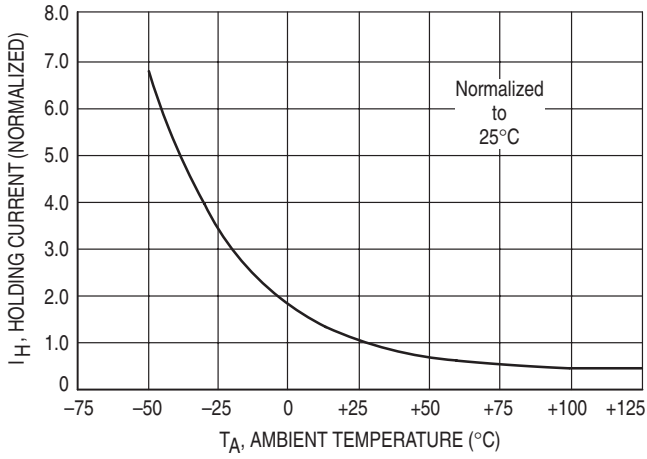


FIGURE 4 – OFF-STATE BLOCKING CURRENT versus TEMPERATURE

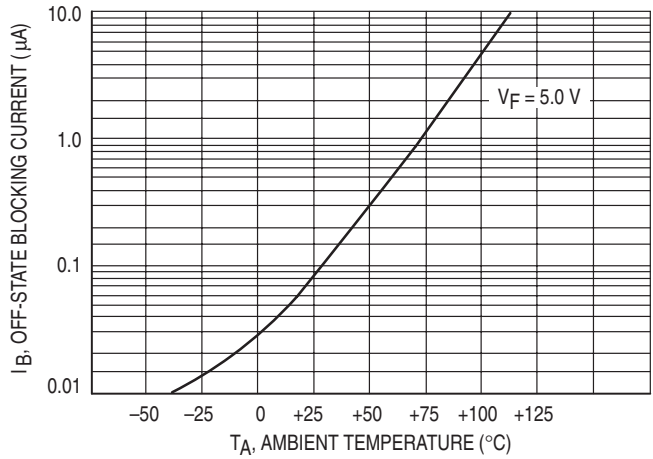


FIGURE 5 – ON-STATE VOLTAGE versus FORWARD CURRENT

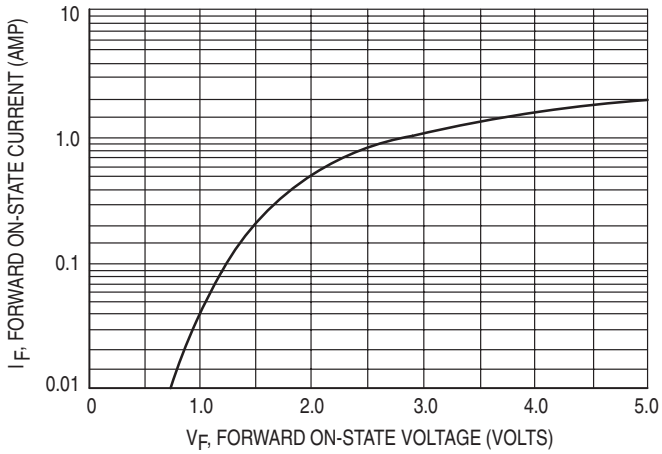


FIGURE 6 – PEAK OUTPUT VOLTAGE (FUNCTION OF R\_L AND C\_C)

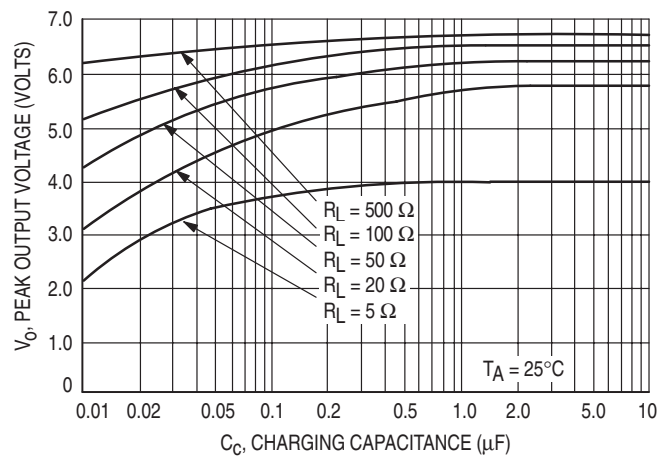


FIGURE 7 – PEAK OUTPUT VOLTAGE TEST CIRCUIT

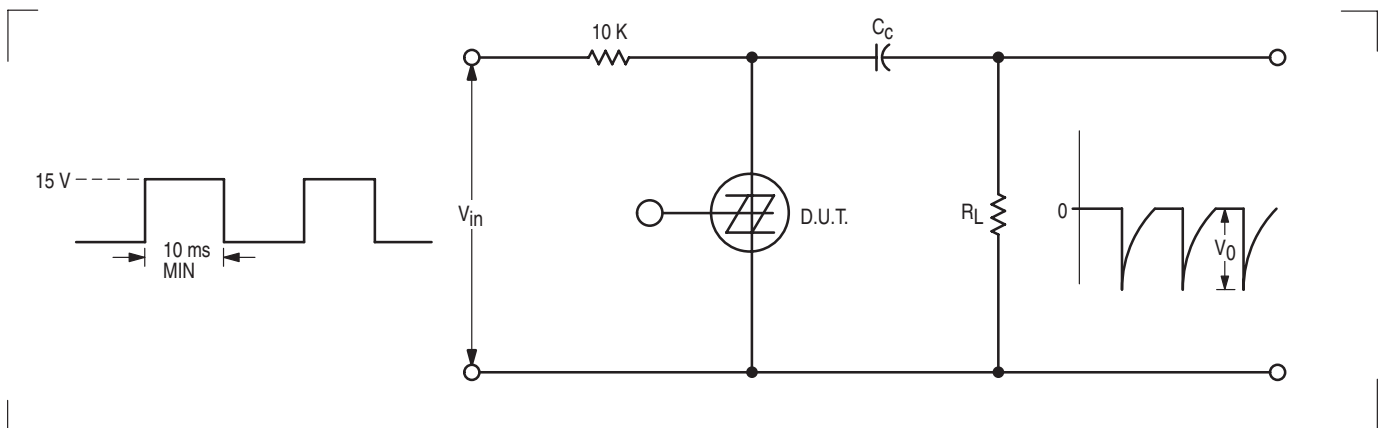
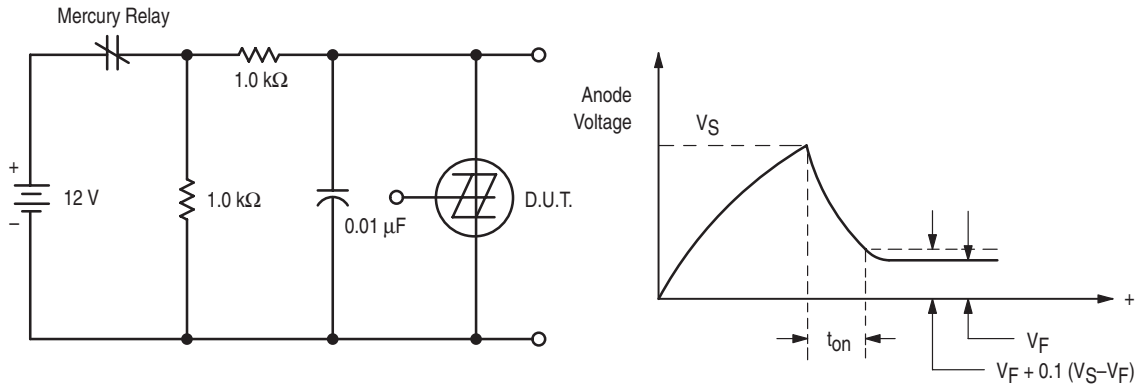
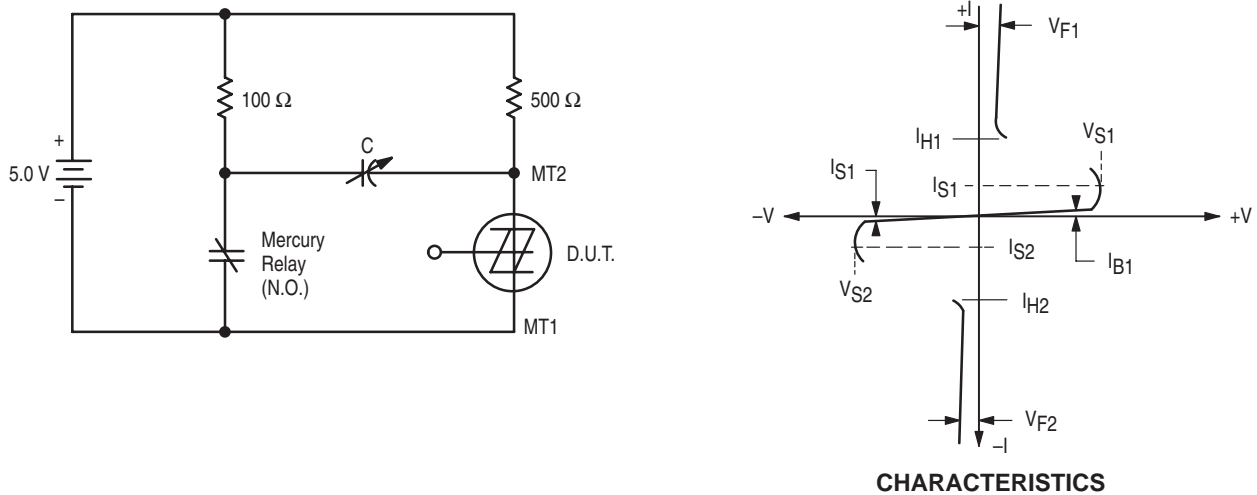


FIGURE 8 – TURN-ON TIME TEST CIRCUIT



Turn-on time is measured from the time  $V_S$  is achieved to the time when the anode voltage drops to within 90% of the difference between  $V_S$  and  $V_F$ .

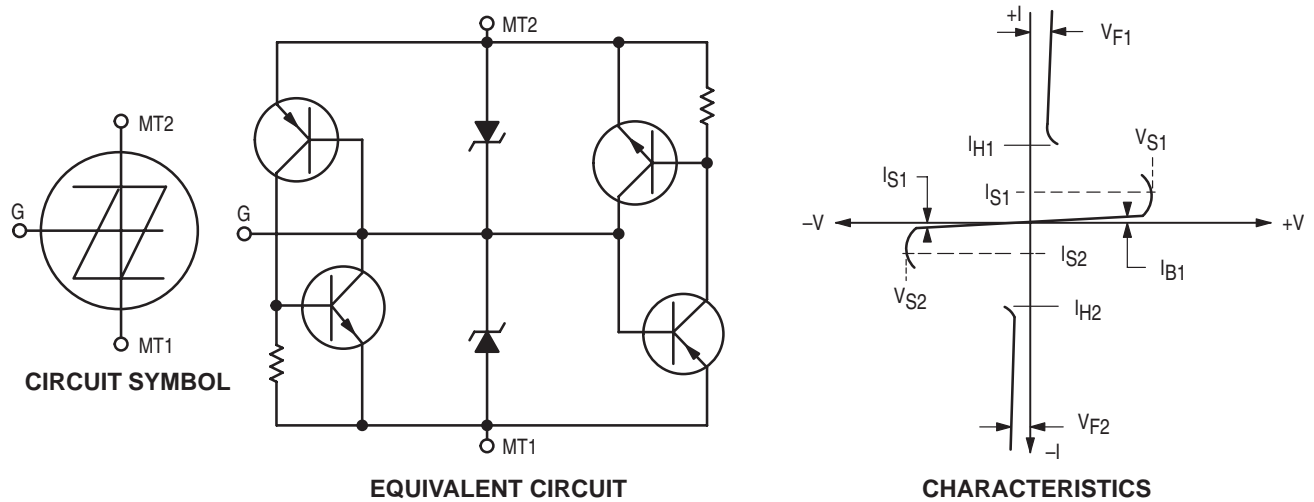
FIGURE 9 – TURN-OFF TIME TEST CIRCUIT



CHARACTERISTICS

With the SBS in conduction and the relay contacts open, close the contacts to cause anode A2 to be driven negative. Decrease C until the SBS just remains off when anode A2 becomes positive. The turn off time,  $t_{off}$ , is the time from initial contact closure and until anode A2 voltage reaches zero volts.

FIGURE 10 – DEVICE EQUIVALENT CIRCUIT, CHARACTERISTICS AND SYMBOLS

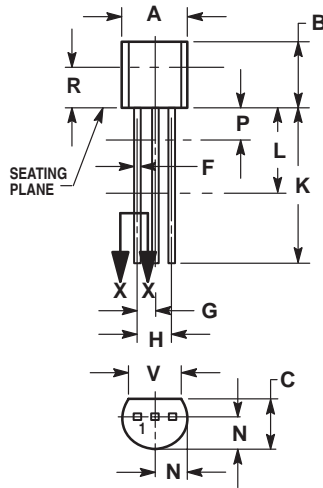


CIRCUIT SYMBOL

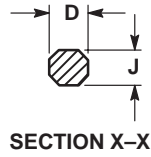
EQUIVALENT CIRCUIT

CHARACTERISTICS

PACKAGE DIMENSIONS



STYLE 12:  
 PIN 1. MAIN TERMINAL 1  
 2. GATE  
 3. MAIN TERMINAL 2




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.022	0.41	0.55
F	0.016	0.019	0.41	0.48
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	—	12.70	—
L	0.250	—	6.35	—
N	0.080	0.105	2.04	2.66
P	—	0.100	—	2.54
R	0.115	—	2.93	—
V	0.135	—	3.43	—

CASE 29-04  
 (TO-226AA)

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