

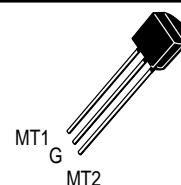
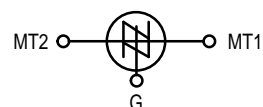
## Silicon Bidirectional Switches Diode Thyristors

... 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

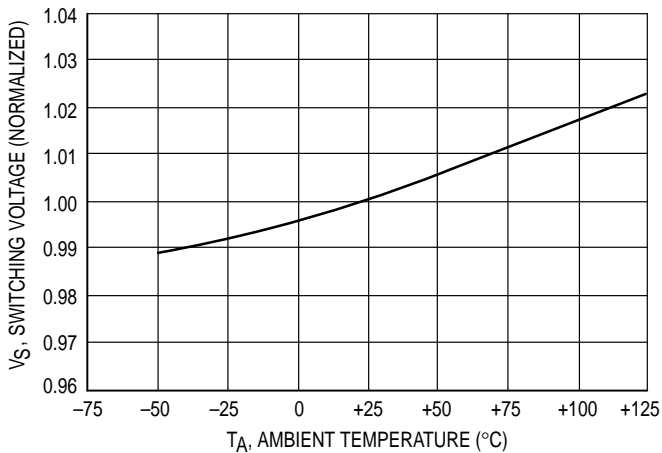


FIGURE 2 – SWITCHING CURRENT versus TEMPERATURE

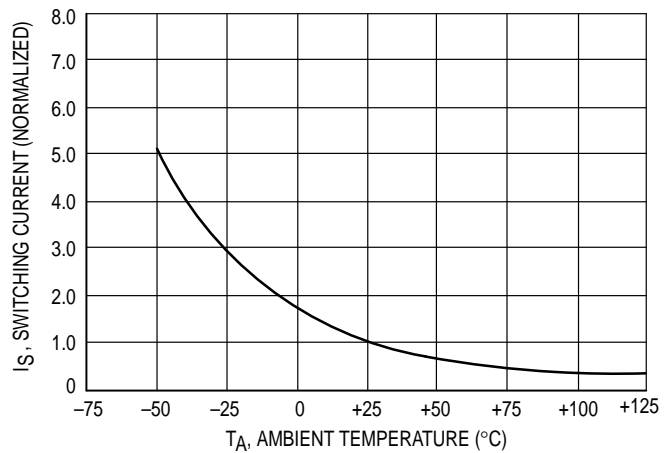


FIGURE 3 – HOLDING CURRENT versus TEMPERATURE

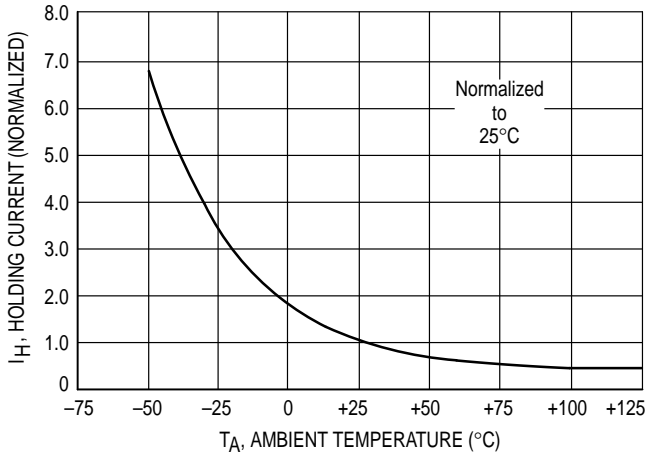


FIGURE 4 – OFF-STATE BLOCKING CURRENT versus TEMPERATURE

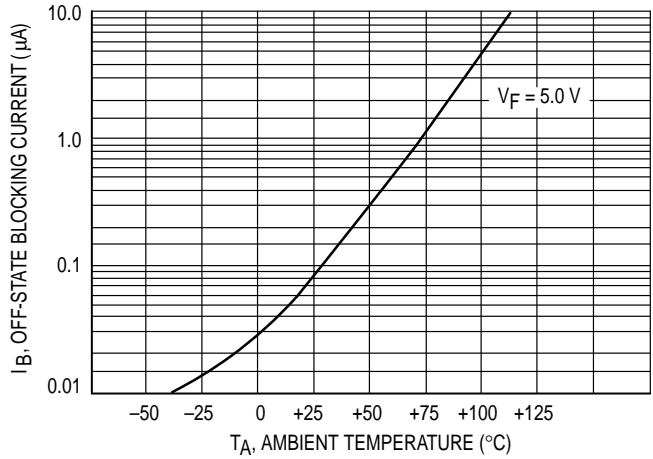


FIGURE 5 – ON-STATE VOLTAGE versus FORWARD CURRENT

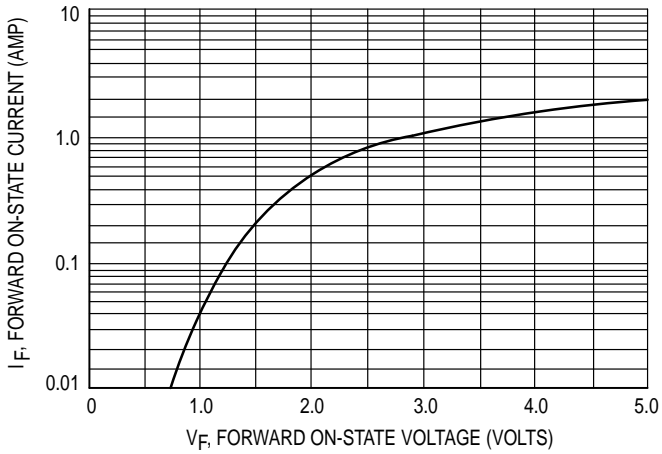


FIGURE 6 – PEAK OUTPUT VOLTAGE (FUNCTION OF  $R_L$  AND  $C_C$ )

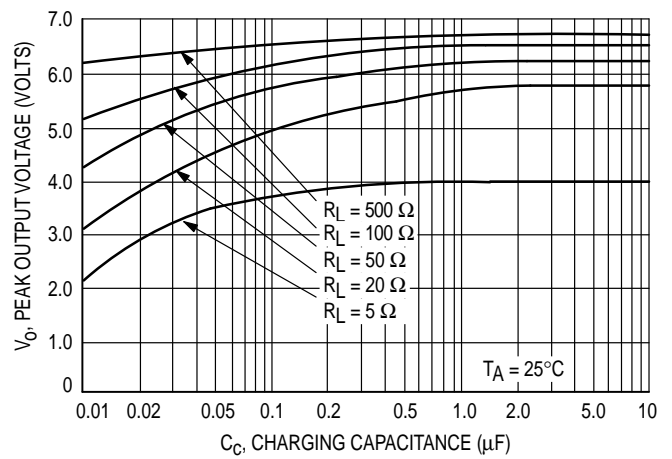


FIGURE 7 – PEAK OUTPUT VOLTAGE TEST CIRCUIT

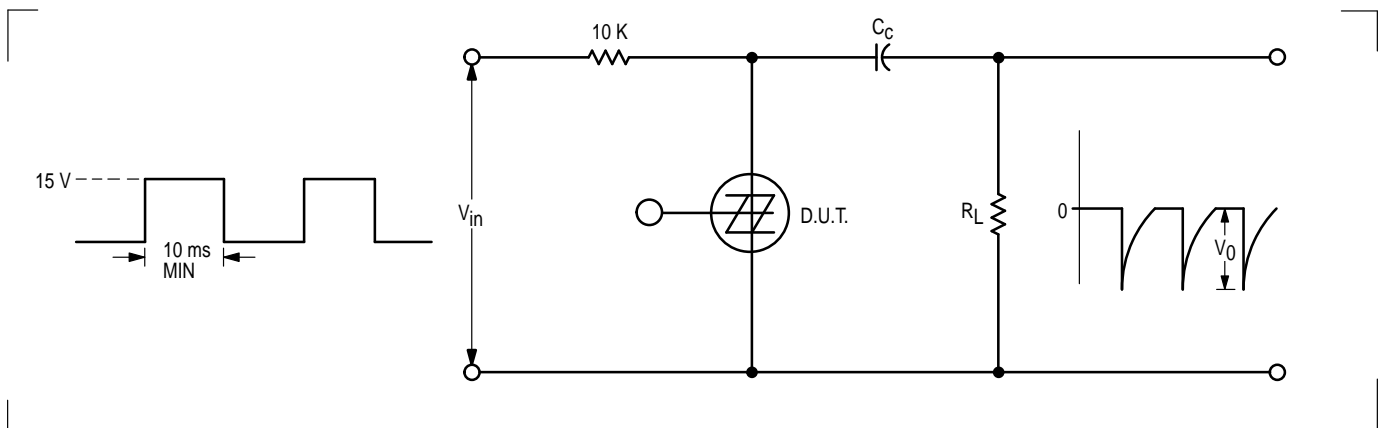
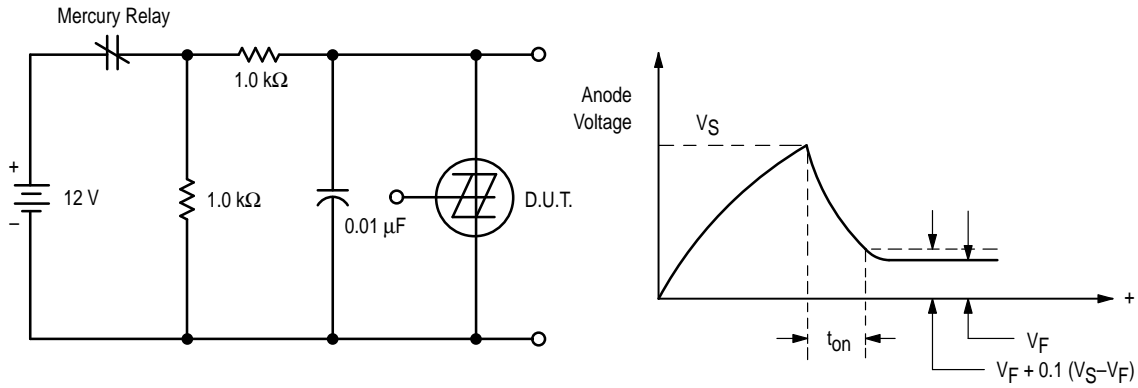
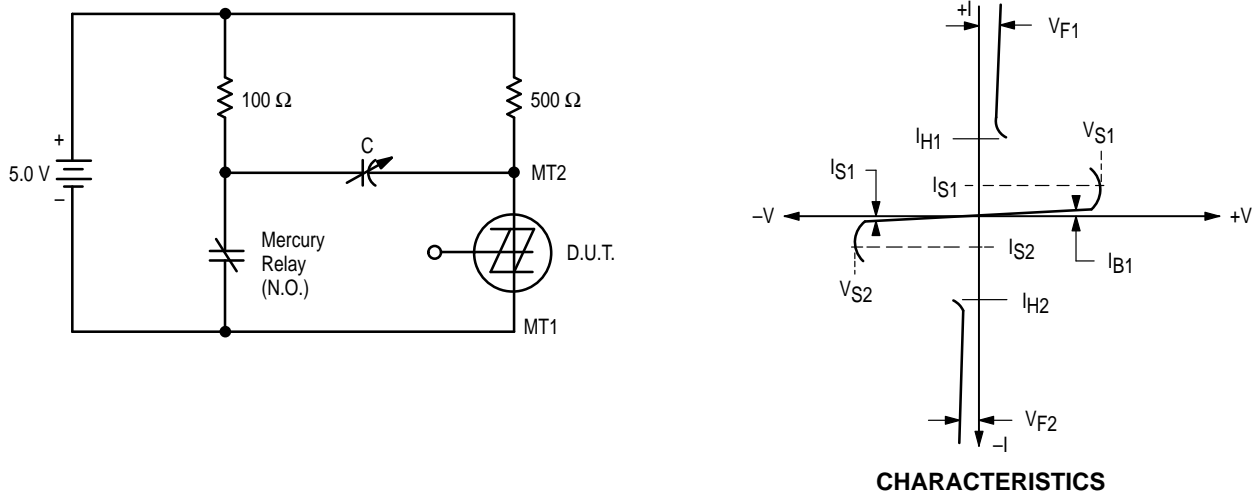


FIGURE 8 – TURN-ON TIME TEST CIRCUIT



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  $V_F$ .

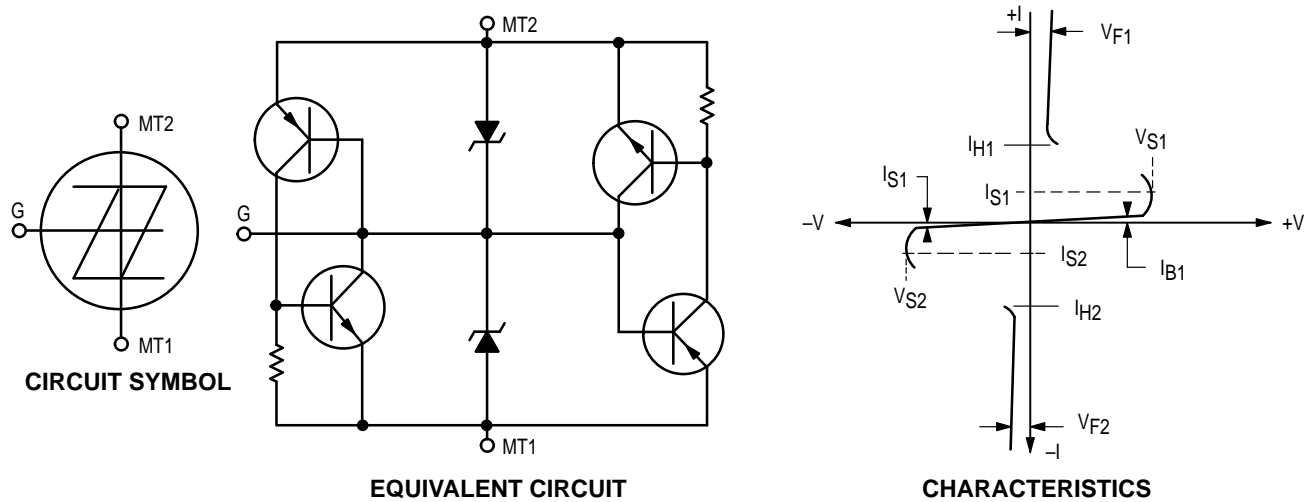
FIGURE 9 – TURN-OFF TIME TEST CIRCUIT



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

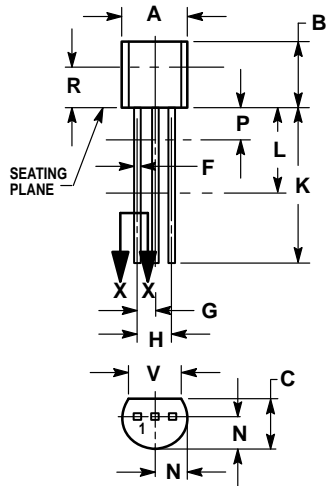


CIRCUIT SYMBOL

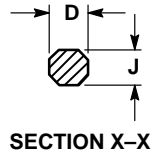
EQUIVALENT CIRCUIT

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)

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters can and do vary in different applications. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and <sup>TM</sup> are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

**Literature Distribution Centers:**

USA: Motorola Literature Distribution; P.O. Box 20912; Phoenix, Arizona 85036.

EUROPE: Motorola Ltd.; European Literature Centre; 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP, England.

JAPAN: Nippon Motorola Ltd.; 4-32-1, Nishi-Gotanda, Shinagawa-ku, Tokyo 141, Japan.

ASIA PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong.



This datasheet has been download from:

[www.datasheetcatalog.com](http://www.datasheetcatalog.com)

Datasheets for electronics components.