

〈TRIGGER ELEMENT〉

BS08D, BS08E

TRIGGER APPLICATION
LEAD MOUNT TYPE, PLANE-MOUNTED TYPE (SC-59 OUTLINE)

DESCRIPTION

BS08D, BS08E is a silicon planar transistor, bilateral switching integrated circuit. It is suitable for trigger application of thyristor.

FEATURE

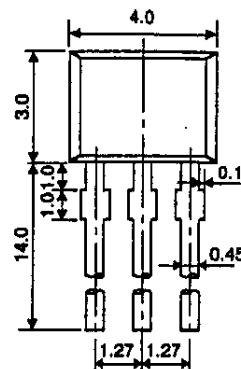
- Low switching voltage $V_s \approx 7$ to $9V$
- Good switching voltage temperature coefficient $0.01\%/^{\circ}C$
- With gate electrode, it is easy for control and synchronism of switching.

APPLICATION

Trigger circuit of thyristor · triac oscillator, timer.

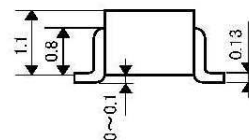
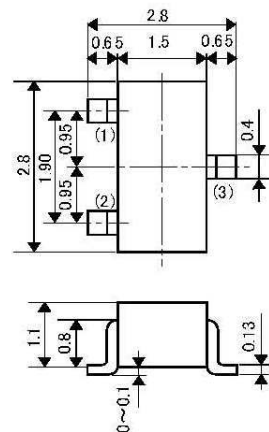
OUTLINE DRAWING

Unit:mm



TERMINAL CONNECTOR

- ①: T₂ TERMINAL
②: GATE
③: T₁ TERMINAL
- EIAJ: —
JEDEC: —
- (BS08D)



TERMINAL CONNECTOR

- ①: T₂ TERMINAL
②: T₁ TERMINAL
③: GATE
- EIAJ: SC-59
JEDEC: TO-236 resemblance
- (BS08E)

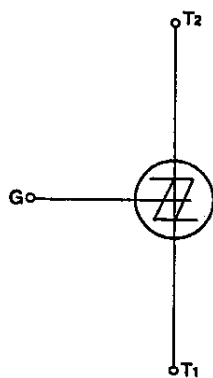
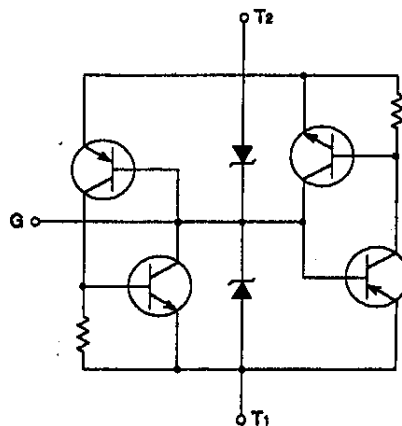
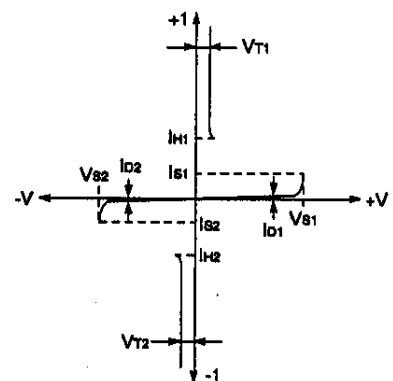
(TRIGGER ELEMENT)

BS08D, BS08ETRIGGER APPLICATION
LEAD MOUNT TYPE, PLANE-MOUNTED TYPE (SC-59 OUTLINE)**MAXIMUM RATINGS**

Symbol	Parameter	Conditions	Ratings		Unit
			BS08D	BS08E	
I_T	DC On Current	$T_a = 25^\circ\text{C}$	175	100	mA
—	Repetitive Peak On-Current	1% duty, $t_w = 10\mu\text{s}$, $T_a = 100^\circ\text{C}$	1	1	A
—	Not Repetitive Peak On-Current	$t_w = 10\mu\text{s}$, $T_a = 25^\circ\text{C}$	2	2	A
P	On-State Dissipation	$T_a = 25^\circ\text{C}$	450	150	mW
I_a	DC Gate Current		5		mA
T_j	Junction temperature		-55 to +125		$^\circ\text{C}$
T_{stg}	Storage temperature		-55 to +125		$^\circ\text{C}$

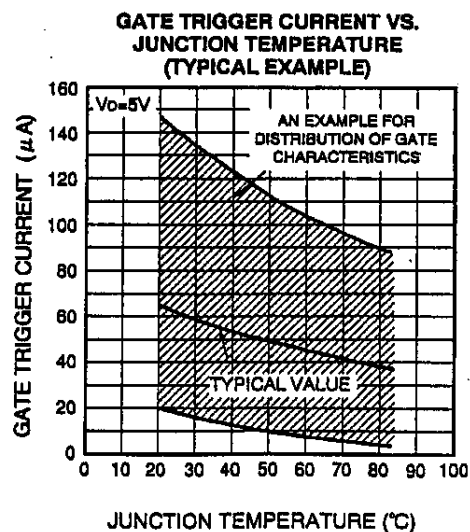
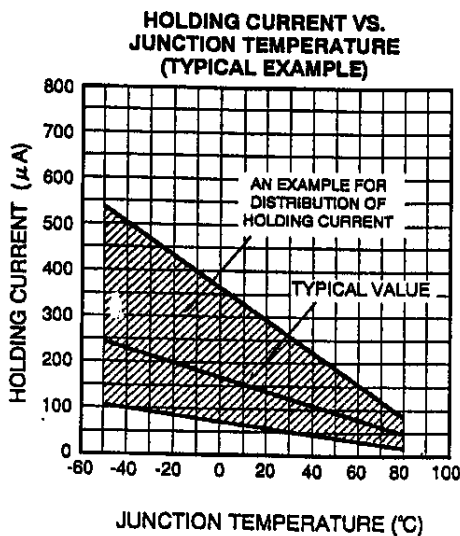
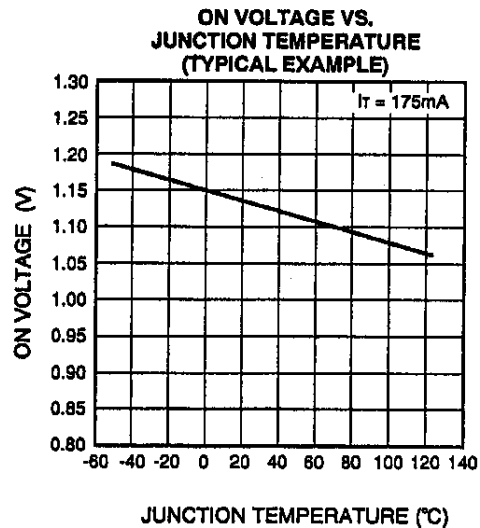
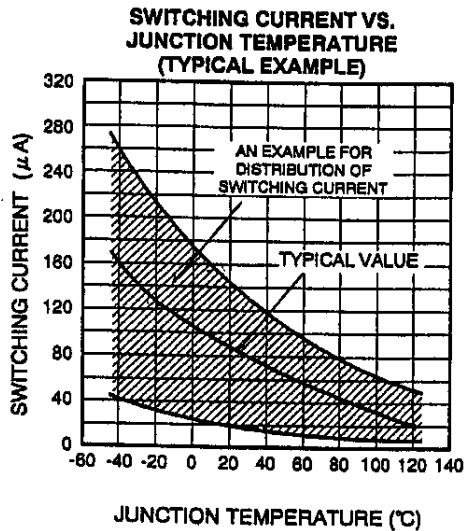
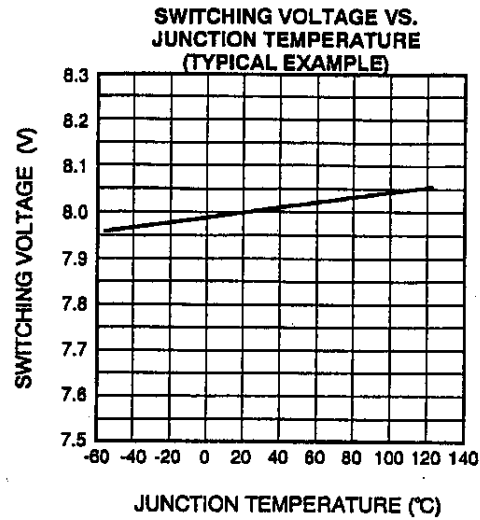
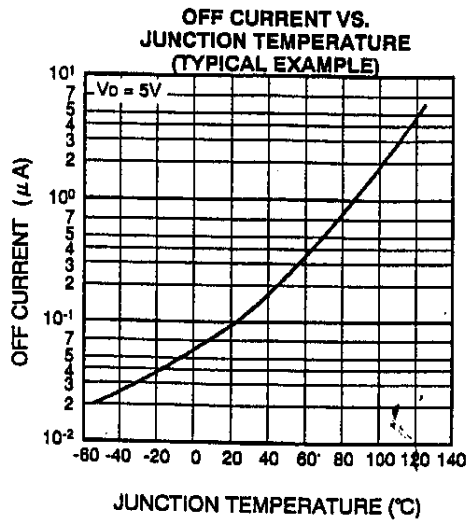
ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
V_s	Switching voltage	$T_a = 25^\circ\text{C}$	7	8	9	V
I_s	Switching current	$T_a = 25^\circ\text{C}$	—	—	200	μA
$ V_{s1} - V_{s2} $	Switching voltage difference	$T_a = 25^\circ\text{C}$	—	—	0.5	V
$ I_{s1} - I_{s2} $	Switching current difference	$T_a = 25^\circ\text{C}$	—	—	100	μA
I_H	Holding current	$T_a = 25^\circ\text{C}$	—	—	1.5	mA
I_D	Off current	$V_D = 5\text{V}$, $T_a = 25^\circ\text{C}$	—	—	1.0	μA
		$V_D = 5\text{V}$, $T_a = 85^\circ\text{C}$	—	—	10	
—	Switching voltage temperature coefficient	$T_a = -55^\circ\text{C}$ to $+85^\circ\text{C}$	—	± 0.01	—	%/ $^\circ\text{C}$
V_T	On voltage	$I_T = 175\text{mA}$, $T_a = 25^\circ\text{C}$	—	—	1.4	V
I_{GT}	Gate trigger current	$V_D = 5\text{V}$, $T_a = 25^\circ\text{C}$	10	—	200	μA
V_{GD}	Gate not trigger voltage	$V_D = 5\text{V}$, $T_a = 85^\circ\text{C}$	0.2	—	—	V

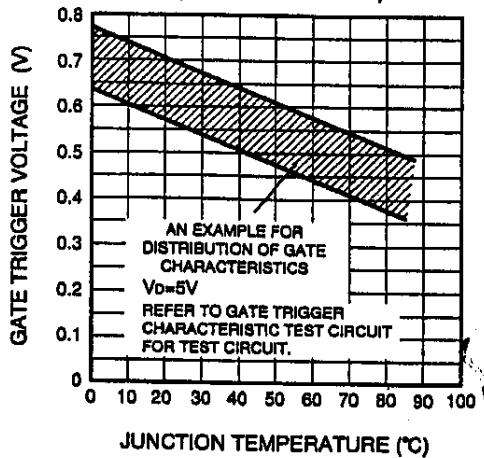
SYMBOL**EQUIVALENT CIRCUIT****STATIC CHARACTERISTICS**

TRIGGER APPLICATION
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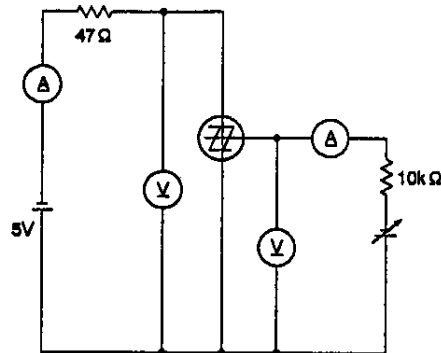
PERFORMANCE CURVES



**GATE TRIGGER VOLTAGE VS.
JUNCTION TEMPERATURE
(TYPICAL EXAMPLE)**

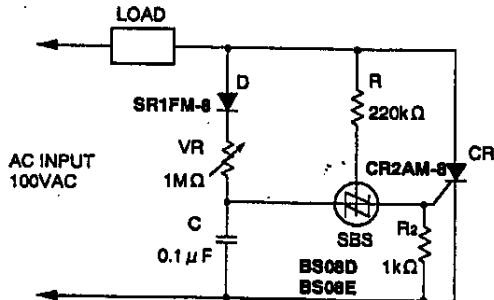


GATE TRIGGER CHARACTERISTIC TEST CIRCUIT

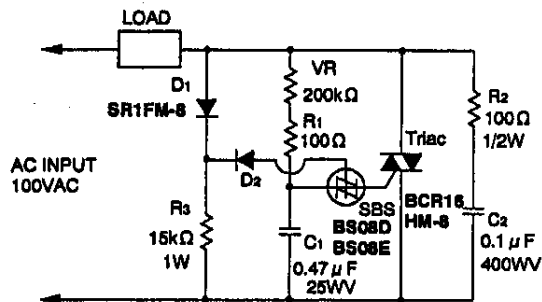


APPLICATION EXAMPLE

THYRISTOR TRIGGER CIRCUIT



TRIAC TRIGGER CIRCUIT



The above circuit is a thyristor phase control circuit making use of an SBS. In this circuit, using the SBS gate, the residual charge on C is reset, reducing the hysteresis characteristics. Therefore, over the range of the variable resistor, phase control (in the range 5 to 175°C) is possible, making this circuit widely useful in DC motor control and other control applications.

The above circuit is a triac phase control circuit making use of an SBS. In this circuit, an SBS gate is used to reduce the hysteresis characteristics. Thus, by using the variable resistance, phase control is possible over the wide range of 10 to 160 °C. Therefore, this circuit is widely usable in such applications as lighting control circuits, electric heater control, and other load control applications.

TRIGGER APPLICATION LEAD MOUNT TYPE, PLANE-MOUNTED TYPE (SC-59 OUTLINE)

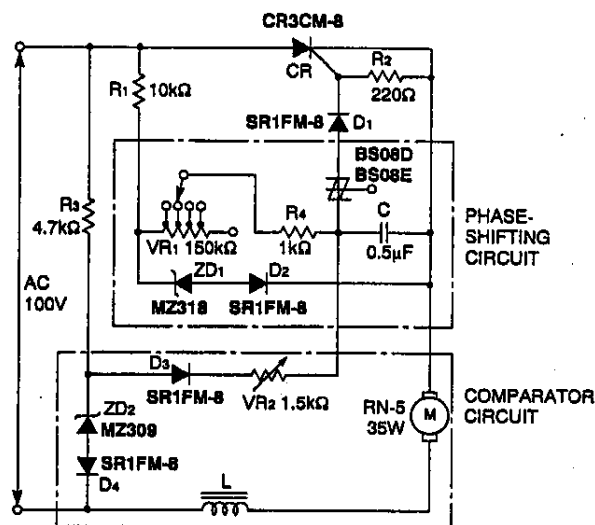
Constant-speed control circuit of an universal motor

FEATURES

- (1) The feedback amount is automatically controlled by the motor speed for easy constant-speed operation.
- (2) The feedback amount required for each motor type can be adjusted by resistor VR2, thus enabling control of various types of motors.

OPERATING PRINCIPLE

The speed of motor is adjusted by VR1 in the phase-shifting circuit. In the comparison circuit, the reference voltage supplied by the Zener diode and the armature voltage are compared, and C in the phase-shifting circuit is charged by the difference of voltages. The effect of feedback is negligible as the sum of VR1 and C is small during high-speed operation, but, during low-speed operation, when the sum of VR1 and C is large, even a small feedback is effective and constant operation is improved at low-speed operation. (Patented by Mitsubishi Electric)



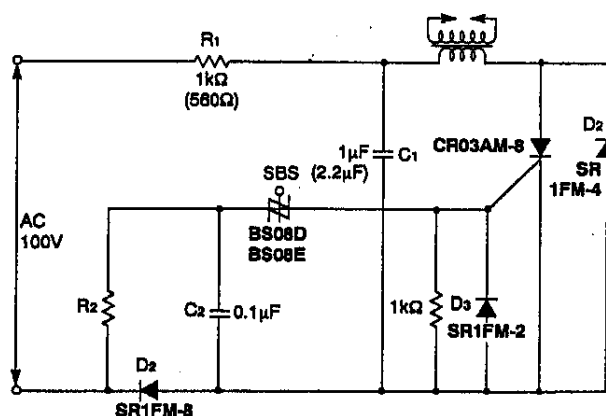
Gas/Petroleum ignition circuit

FEATURES

- (1) When the power supply is in the negative half cycle, spark discharge occurs. Compact and small-capacity resistor R1 and a thyristor can be used as the current does not flow from the power supply of the thyristor.
- (2) High-voltage pulses of more than 14kV are output to cause certain ignition of gas or kerosene.

OPERATING PRINCIPLE

Capacitor C1 is charged through R1 and D1 during the half cycle of positive power supply and C2 is charged through R2 using the reverse voltage applied to D1. In this case, R1, R2, C1 and C2 should be selected to make $R_1 C_1 \ll R_2 C_2$. SBS is turned on as C2 reaches the switching voltage after C1 is fully charged, and the gate current flows to the thyristor CR. The electric charge charged in C1 is instantly discharged through CR, and after C1 is charged with the reverse polarity, it is discharged again through D2 and the coil, and then C1 is charged again with the original polarity. Thus high voltage is generated (more than 14kV) on the secondary side of the coil by the current flowing through the coil to produce spark discharge at the discharge gap.



GAS IGNITION UNIT..... $R_1=1k\Omega$, $C_1=1\mu F$
PETROLEUM IGNITION UNIT..... $R_1=580\Omega$, $C_1=2.2\mu F$

Electric foot warmer (kotatsu)

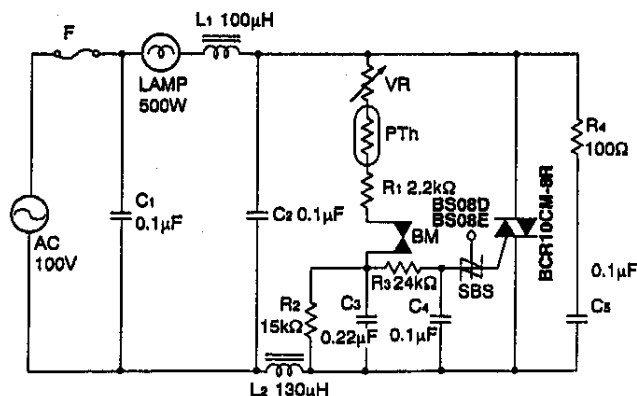
FEATURES

Non-stage and wide-range control of the temperature of kotatsu is possible.

OPERATING PRINCIPLE

The temperature is controlled by trigger pulses generated by VR, PTh, R1, BM, R2 and C4 and by the control of the trigger phase of triac BCR. If the temperature exceeds a specified value after the temperature is set by VR, the resistive value of positive-type thermistor PTh increases and the conductive angle of BCR becomes smaller and so the temperature falls. If the value decreases, the conductive angle becomes larger and the temperature rises.

The bimetal switch BM detects sudden temperature rises and turns the BCR to an off state and stops the power supply. R2 is provided to prevent re-triggering of SBS.



TRIGGER APPLICATION LEAD MOUNT TYPE, PLANE-MOUNTED TYPE (SC-59 OUTLINE)

Example of a basic phase control circuit using BS08D,BS08E and BCR (or CR)

Circuit diagram	Features	Operating principle
<p>BCR : Triacs of 1A to 30A class can be used.</p>	<ul style="list-style-type: none"> • Smooth control is possible in the range of 5 to 99% of the load power supply for AC input voltage. • Suitable for resistive load. • Phase control range is 10 to 150° 	<p>The triac BCR trigger phase is controlled by the CR phase-shifting circuit consisting of VR and C₁, and hysteresis is reduced by D₁,D₂,R₁ and the gate of BS08D,BS08E.</p>
<p>BCR : Triacs of 1A to 30A class can be used.</p>	<ul style="list-style-type: none"> • Smooth control is possible in the range of 5 to 99% of the load power supply for AC input voltage. • Suitable for resistive load. • Phase control range is 10 to 150° 	<p>The triac BCR trigger phase is controlled by the CR phase-shifting circuit consisting of VR and C₁, and hysteresis is reduced by D₁,D₂,R₁ and the gate of BS08D,BS08E.</p>
<p>BCR : Triacs of 1A to 30A class can be used.</p>	<ul style="list-style-type: none"> • Smooth control is possible in the range of 5 to 99% of the load power supply for AC input voltage. • Suitable for inductive load. • Phase control range is 10 to 150° 	<p>The triac BCR trigger phase is controlled by the CR phase-shifting circuit consisting of VR and C₁, and hysteresis is reduced by D₁,D₂,D₃,D₄,R₁,R₃.</p>
<p>CR : Thyristors of 0.3A to 20A class can be used.</p>	<ul style="list-style-type: none"> • Smooth control is possible in the range of 1 to 99% of the load power supply for AC input voltage. • Suitable for both resistive and inductive loads. • Phase control range is 10 to 170° 	<p>The thyristor CR trigger phase is controlled by the CR phase-shifting circuit consisting of VR and C₁. The voltage of C₁ is reset and hysteresis is reduced by applying the gate current of BS08D,BS08E to C₁, and by switching the BS08D,BS08E, applying the gate, R₁, load, power supply and circuit C₁.</p>

Electric starter for fluorescent lamps**FEATURES**

Employment of a non-linear saturable capacitor, triac and reverse-blocking two-terminal thyristor provides a cheap, compact and light-weight electric starter for fluorescent lamp with short turn-on time.

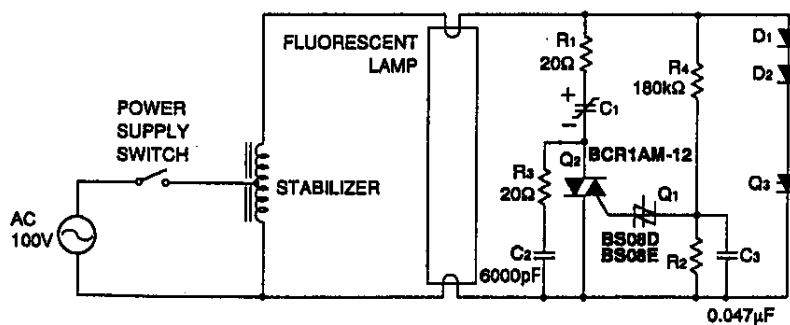
OPERATING PRINCIPLE

If the power supply switch is turned on, the bilateral switching device Q_1 is set on at a proper phase θ_1 of the positive half cycle of the power supply at the early stage of startup, and triac Q_2 is triggered. If Q_2 is turned on, non-linear saturable capacitor C_1 with charge saturation characteristic under a specified charge voltage is charged quickly by the power supply through the stabilizer with polarity as illustrated.

C_1 enters quickly into the saturation area and the current flowing to the stabilizer decreases instantly, and the high-voltage pulses of $e = L (di/dt)$ are generated in the stabilizer. The reverse-blocking two-terminal thyristor Q_3 is triggered by this pulse, and a pre-

heating current flows to the filament of the fluorescent lamp. The conducting current of Q_3 becomes zero at the phase θ_2 of the negative half cycle of power supply, and Q_3 is turned off. Then, the near-the-peak voltage of the negative half cycle of the supply voltage is suddenly applied at both ends of the fluorescent lamp, Q_1 and Q_2 are turned on again and C_1 is charged quickly, with the reverse polarity as illustrated. With the same mechanism, high-voltage pulses (about 1.5kV) with the reverse polarity are generated in the stabilizer and the turn-on pulse is applied at both ends of the fluorescent lamp.

Then the same operation continues and the light is turned on if the filament is sufficiently heated. (Approximately 0.5 seconds after the power is supplied.) If the lamp is turned on, the voltage applied at both ends of the lamp decrease, and Q_1 , Q_2 and Q_3 are set off. Then preheating and high voltage pulses are stopped.



(CIRCUIT CONSTANTS ARE USED FOR 32W TYPE)



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