

## Power Line Smart AC Switch Controller

### Features

- Low energizing current 60uA (typical)
- Line to Neutral voltage monitoring
- Line to Load voltage monitoring
- User adjustable maximum load voltage
- 'In-cycle' Over-Voltage load isolation
- Suitable for use with IGBT AC switch
- Zero-volt (Line to Load) AC switch connect
- Zero-volt (Line to Load) AC switch disconnect
- Compatible with 50Hz/240V and 60Hz/110V
- Output gate drive voltage of 16V
- Timing pin for programmable recovery delay
- SOIC 8-pin package

### Applications

- Industrial Automation and Controls
- Power supplies
- Motor Control & Protection
- Communication equipment
- Smart Home & Appliances
- Sensitive Electronics
- Wide AC input voltage protection

### Product Description

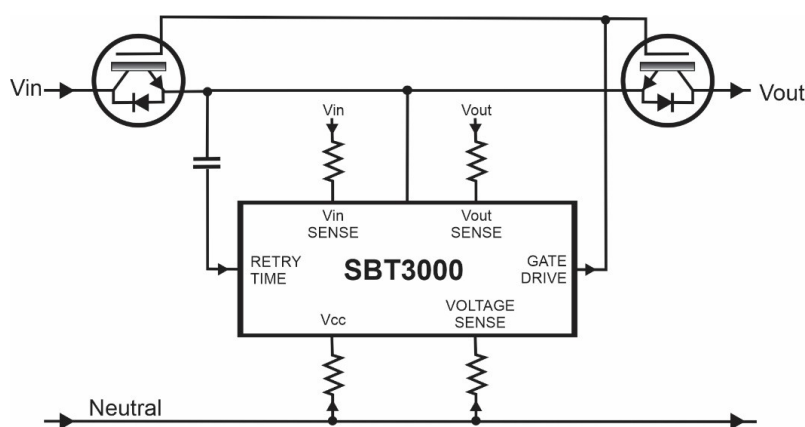
The SBT3000 is a patent-pending, high voltage AC switch controller device, which monitors incoming line voltage to ensure that the downstream load only operates within its safe maximum continuous voltage ratings. In the event of over-voltage line conditions, the SBT3000 will turn off the AC switch to protect and isolate the load, minimizing the potential of catastrophic over-voltage failures.

Once the line voltage has stabilized back within safe operating range for the duration of the recovery timer interval (user adjustable via external timing capacitor), normal load operation will resume in the following cycle and will be synchronized to zero Line to Load voltage condition thereby resulting in minimal in-rush current.

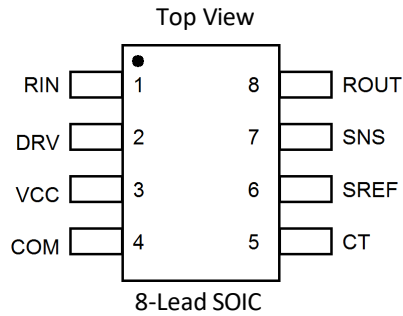
The SBT3000 has an output drive of 16V, making it an ideal solution for controlling most cost effective IGBT's. In addition, the device is housed in a convenient small form factor SOIC-8 package to suit a wide variety of applications.

Production qualified IC samples and Evaluation Boards are available including full datasheet upon request via email to [info@siliconbrite.com](mailto:info@siliconbrite.com).

**Figure 1: Simplified Application Circuit.**



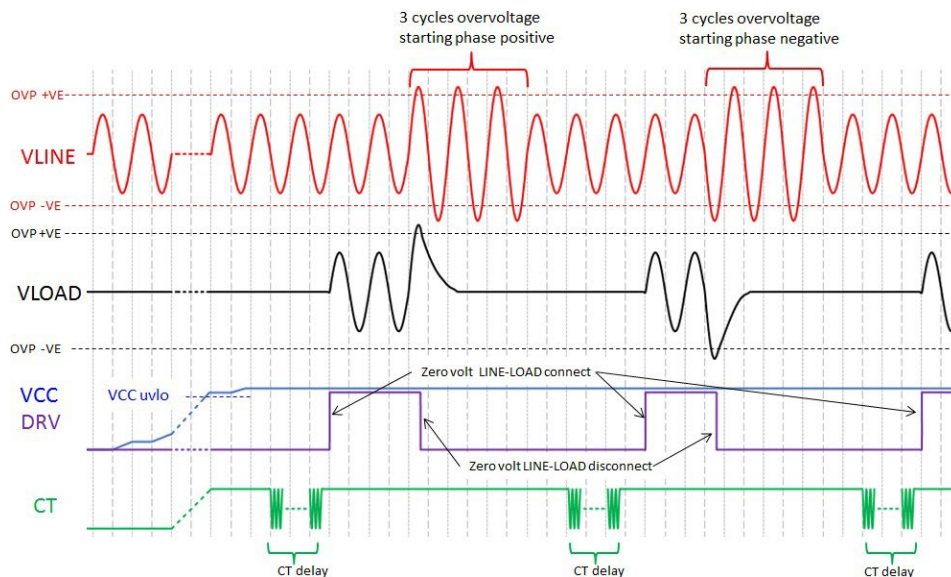
For more complete application information, please contact SiliconBrite Technologies.

**Pin Configuration**

**Ordering Information**

Part Number	Package	Qty/Reel	Marking
SBT3000	SOIC-8	3000	YYWWS


**Pin Table**

Pin	Name	Description
1	RIN	Positive sense input for Line to Load monitor (external resistor to Line side)
2	DRV	Output to control IGBT gate drive
3	VCC	Supply bias voltage input
4	COM	Ground reference point for all voltages (connect to IGBT common emitter point)
5	CT	Restart timing delay control (external capacitor to COM pin)
6	SREF	Sense reference pin for Line-Neutral monitor (connect with 33uF capacitor to COM pin and 10k resistor to SNS pin)
7	SNS	Sense input voltage for over-voltage monitoring (external resistor to Neutral)
8	ROUT	Negative sense input for Line to Load monitor (external resistor to Load side)

**Figure 2: Over-Voltage Protection Timing Diagram Example**


**Table 1: Absolute Maximum Ratings**

Stress levels that exceed the absolute maximum ratings may cause damage to the device.

Functional operation at conditions other than the recommended operating conditions is not implied.

All electrical parameters are with respect to COM pin.

Parameters	Value	Unit
VCC , DRV	-0.3 to +20	V
RIN, ROUT, CT, SNS, SREF	-0.3 to 5.5	V
Clamping current VCC to COM	0 to +20	mA
Clamping current RIN, ROUT, SNS	-2 to +2	mA
Operating Junction Temperature	-40 to +150	°C
Storage Junction Temperature	-65 to +150	°C
Package Thermal Resistance (Theta-JA, Junction to Ambient)	170	°C/W

**Table 2: Compliance Ratings**

Parameters	Value	Unit
Human Body Model , ESD immunity , JS-001-2017	±2	kV
Charge Device Model ESD immunity, JS-002-2018	±1	kV
Latch-up Immunity , JESD78E, Class2, +125°C	±100	mA
Moisture Sensitivity Level	MSL1	

**Table 3: Recommended Operating Conditions**

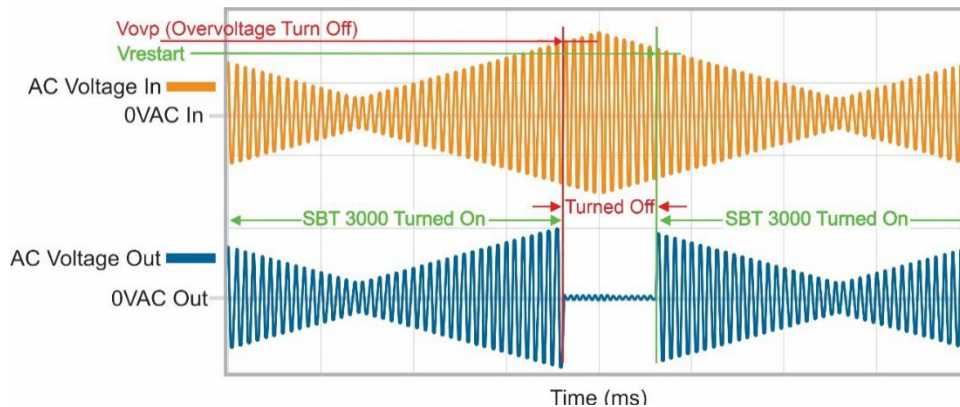
Refer to Figure 1, Typical Application Circuit, for component designators

Symbol	Parameters	Value	Unit
I <sub>cc peak</sub>	Peak bias current into Vcc pin (1)	0 to +10	mA
R <sub>cc</sub>	VCC bias resistor	100 to 360	kΩ
C <sub>vcc</sub>	VCC bypass supply capacitor	2.2 to 3.3	μF
R <sub>sref</sub>	SREF resistor	9 to 11	kΩ
C <sub>sref</sub>	Sense reference filter capacitor	22 to 47	μF
R <sub>in/Rout</sub>	Line-load sense resistors	2.2 to 3.3	MΩ
DRV <sub>C-LOAD</sub>	DRV pin load capacitance	< 30	nF
T <sub>AMB</sub>	Ambient Operating temperature	-40 to +105	°C

Note 1: I<sub>cc peak</sub> current applies to worst case maximum continuous VAC peak voltage: (VAC peak voltage-18V)/R<sub>cc</sub>

### Application Measurements

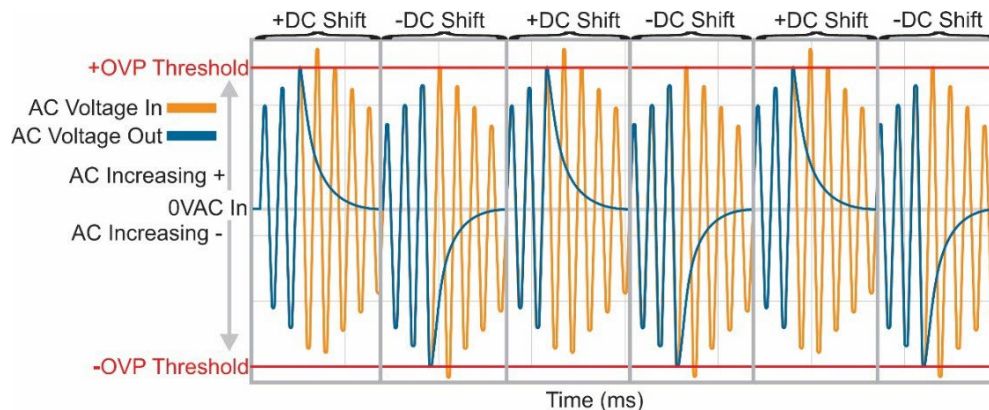
The following oscilloscope plots demonstrate the operation of the SBT3000.



**Figure 3.** Overvoltage Turn-Off Function of the SBT3000

Figure 3 shows a 750VAC peak to peak, 50Hz sinusoidal signal modulated by a triangular waveform to produce a signal that goes above and below the turn on threshold voltages of

the SBT3000. Figure 3 also shows the operation of the IC turning off, and back on, protecting a load from an over-voltage condition.



**Figure 4.** Positive and Negative Overvoltage Response of the SBT3000

Figure 4 shows both positive and negative overvoltage response of the SBT3000. Each alternate cycle group (8 cycles) is DC shifted so that the voltage condition which causes the shutdown event is visible. When the absolute magnitude of the input voltage goes above the over-voltage shutoff voltage, the SBT3000 turns off. Figure 4 also shows

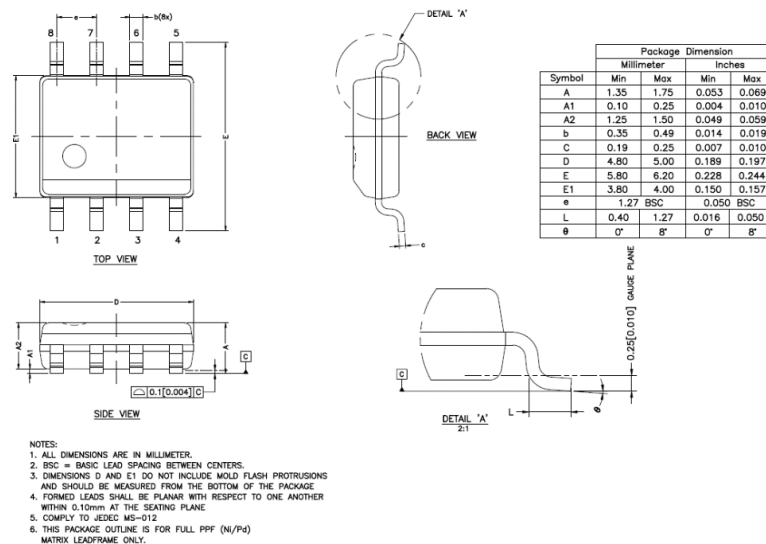
that the SBT3000 turns off just after the peak of the line voltage as the load in this test, is a capacitor. The SBT3000 stays turned off for the period set by the CT pin capacitor value and then turns on after the CT timer period.

### Application Brief

The SBT3000 is a solid-state IC for protecting against "swell" type AC line over-voltage conditions. Metal Oxide Varistors (MOV) however are normally required in conjunction with the SBT3000 to protect against fast, short duration kilovolt type surges that would normally exceed the voltage limits of the

IGBTs. The MOV may be located in front of the SBT3000 circuit (Line to Neutral), and if desired, across the input-to-output to limit the differential voltage, to the voltage rating of the IGBTs. For more info, please visit [www.siliconbrite.com](http://www.siliconbrite.com).

### SOIC-8 Package Dimensions



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