



1 Form A
Solid State Relay

DESCRIPTION

The SP646-X is a bi-directional, single-pole, single-throw, normally open multipurpose relay. The circuit is composed of one LED on the input side which activates an optically coupled IC on the output - controlling the firing angle of two back-to-back SCRs. This circuit assures no false triggering under most adverse conditions, and a tight zero-volt window not exceeding 5V. A 300-ohm input resistor in series with the LED is also provided in this circuit.

FEATURES

- Inverse parallel SCR output
- High transient immunity
- 400V blocking voltage
- 1.2A maximum continuous current
- Low input control current
- High input-to-output isolation
- Solid state reliability
- Zero-volt switching
- 300 ohm input resistor

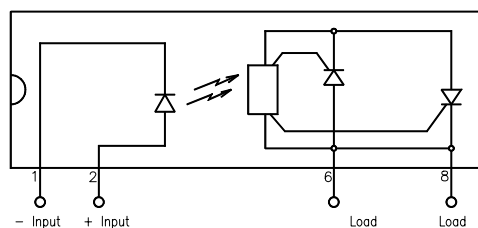
APPLICATIONS

- Programmable controls
- Valve control
- Solenoids
- Remote switching
- Home appliances
- Metering equipment
- Heating elements
- Gas pump control circuitry

OPTIONS/SUFFIXES

- -H High Output Isolation
- -TR Tape and Reel

SCHEMATIC DIAGRAM



MAXIMUM RATINGS

| PARAMETER | UNIT | MIN | TYP | MAX |
|-------------------------------|------|-----|-----|-----|
| Storage Temperature | °C | -55 | | 120 |
| Operating Temperature | °C | -40 | | 85 |
| Continuous Input Current | mA | | | 40 |
| Transient Input Current | mA | | | 400 |
| Reverse Input Control Voltage | V | 6 | | |
| Output Power Dissipation | W | | | 1.2 |

APPROVALS

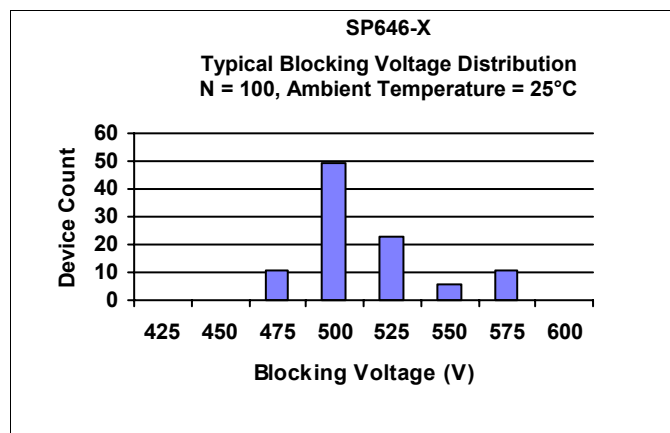
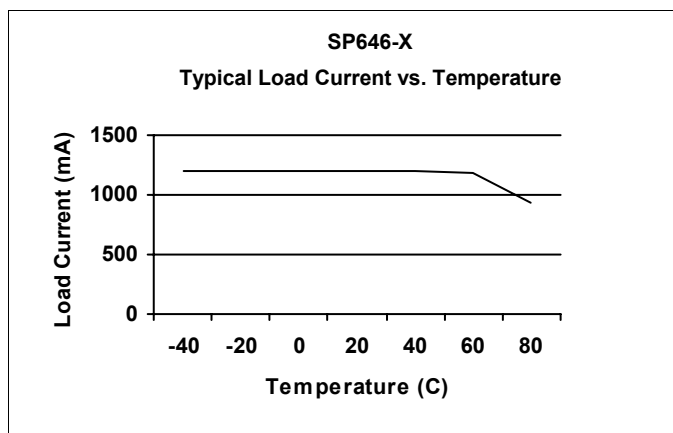
- BABT CERTIFICATE #607837:
BS EN 60950, BS EN 41003, BS EN 60065
- UL FILE #E90096


ELECTRICAL CHARACTERISTICS - 25°C

| PARAMETER | UNIT | MIN | TYP | MAX | TEST CONDITIONS |
|--------------------------------|---------|------|-----|-----|---------------------------|
| INPUT SPECIFICATIONS | | | | | |
| LED Forward Voltage | V | | 1.2 | 1.5 | If = 10mA |
| LED Reverse Voltage | V | 6 | 12 | | Ir = 10uA |
| Input Resistor | Ω | | | 300 | |
| Must Operate Current | m A | 5 | 2.5 | | Io = 1.2A, resistive load |
| Junction Capacitance | p F | | 5 | | Vf = 0V |
| OUTPUT SPECIFICATIONS | | | | | |
| Blocking Voltage | V | 400 | | | Io = 400uA |
| Continuous Load Current | A | | | 1.2 | If = 5mA |
| Surge Current Rating | A | | | 10 | T = 16ms |
| Holding Current | m A | | | 10 | |
| On-Voltage | V | | | 1.2 | Io = 1.2A |
| Voltage Across Load at Turn-On | V | | | 5 | If = 5mA |
| Leakage Current | μ A | | 100 | 250 | Vo = 250V |
| Thermal Resistance | ° C / | | 150 | | |
| Power Factor | | | 0.3 | | |
| Critical Rate of Rise (dV/dt) | V / μ s | 400 | | | |
| COUPLED SPECIFICATIONS | | | | | |
| Isolation Voltage | V | 2500 | | | T = 1 minute |
| -H Suffix | V | 3750 | | | T = 1 minute |
| Isolation Resistance | G Ω | 100 | | | |
| Coupled Capacitance | p F | | 6 | | |



PERFORMANCE DATA



ZERO-VOLT SWITCHING

This solid state relay has been designed with a driver circuit that controls the operation of two back-to-back silicon controlled rectifiers (SCRs), each responsible for one half of the AC cycle. If an AC signal is examined, the turn on, turn off and zero-volt switching can be seen. Figure 1 shows a typical 60 Hz, 120Vac signal with a corresponding relay input signal:

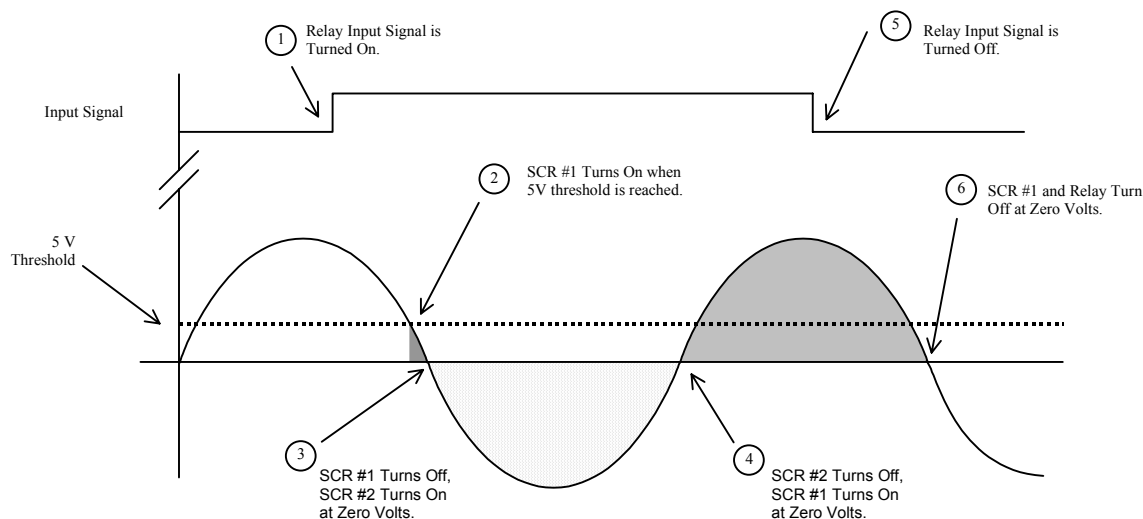


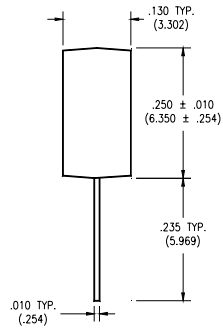
Figure 1 shows the sequence of zero-volt switching operation. At Stage 1, an input signal is applied to the relay. The relay will not turn on until the threshold voltage of 5V is reached. Once this point is reached (Stage 2), SCR #1 (designated as the SCR which controls positive AC voltage) turns on. However, SCR #1 only conducts for an instant, as the cycle quickly crosses zero. At this point (Stage 3), SCR #1 will turn off and SCR #2 (negative AC voltage) turns on. Likewise, at the next zero cross (Stage 4), SCR #2 will turn off and SCR #1 conducts again. Even though the input signal is terminated at Stage 5, the relay will continue to conduct (typical SCR behavior) until Stage 6, when SCR #1 crosses zero and ceases to conduct. Please note that turn on can likewise begin on the negative phase of the AC cycle with a -5V threshold, though only the positive phase is shown here.



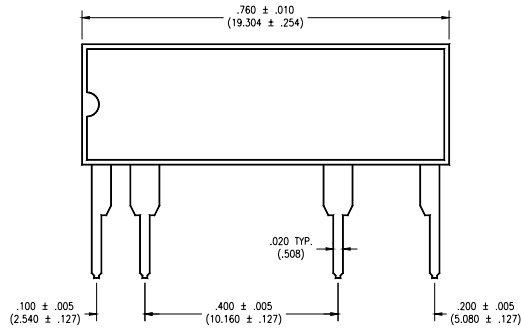
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MECHANICAL DIMENSIONS

16 PIN SINGLE IN-LINE PACKAGE



END VIEW



SIDE VIEW