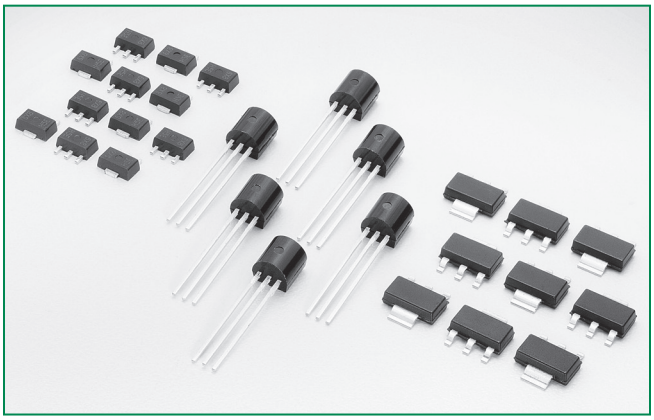
# Teccor® brand Thyristors
## EV Series 0.8 Amp Sensitive SCRs

## SxX8xSx Series

HF RoHS



## Main Features

| Symbol | Value | Unit |
|---|---|---|
| $I_{T(RMS)}$ | 0.8 | A |
| $V_{DRM}/V_{RRM}$ | 400 to 800 | V |
| $I_{GT}$ | 5 to 200 | µA |

## Applications

The SxX8xSx EV series is specifically designed for GFCI (Ground Fault Circuit Interrupter) and gas ignition applications.

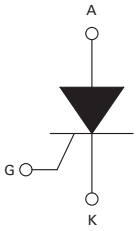
## Description

New device series offers high static dv/dt and lower turn off ($t_q$) sensitive SCR with its small die planar construction design. It is specifically designed for GFCI (Ground Fault Circuit Interrupter) and Gas Ignition applications. All SCRs junctions are glass-passivated to ensure long term reliability and parametric stability.

## Features

- RoHS compliant and Halogen-Free
- Thru-hole and surface mount packages
- Surge current capability > 10Amps
- Blocking voltage ($V_{DRM}/V_{RRM}$) capability - up to 800V
- High dv/dt noise immunity
- Improved turn-off time ($t_q$) < 25 µsec
- Sensitive gate for direct microprocessor interface

## Schematic Symbol




## Absolute Maximum Ratings

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{T(RMS)}$ | RMS on-state current (full sine wave) | TO-92 | $T_C$ = 55°C | 0.8 | A |
| | | SOT-89 | $T_C$ = 60°C | 0.8 | A |
| | | SOT-223 | $T_L$ = 60°C | 0.8 | A |
| $I_{T(AV)}$ | Average on-state current | TO-92 | $T_C$ = 55°C | 0.51 | A |
| | | SOT-89 | $T_C$ = 60°C | 0.51 | A |
| | | SOT-223 | $T_L$ = 60°C | 0.51 | A |
| $I_{TSM}$ | Non repetitive surge peak on-state current (Single cycle, $T_J$ initial = 25°C) | TO-92 SOT-89 SOT-223 | F= 50Hz | 8 | A |
| | | | F= 60Hz | 10 | A |
| $I^2t$ | $I^2t$ Value for fusing | $t_p$ = 10 ms | F = 50 Hz | 0.32 | $A^2s$ |
| | | $t_p$ = 8.3 ms | F = 60 Hz | 0.41 | $A^2s$ |
| di/dt | Critical rate of rise of on-state current $I_G$ = 10mA | TO-92 SOT-89 SOT-223 | $T_J$ = 125°C | 50 | A/µs |
| $I_{GM}$ | Peak Gate Current | $t_p$ = 10 µs | $T_J$ = 125°C | 1.0 | A |
| $P_{G(AV)}$ | Average gate power dissipation | — | $T_J$ = 125°C | 0.1 | W |
| $T_{stg}$ | Storage junction temperature range | — | — | -40 to 150 | °C |
| $T_J$ | Operating junction temperature range | — | — | -40 to 125 | °C |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## Electrical Characteristics ($T_J$ = 25°C, unless otherwise specified)

| Symbol | Description | Test Conditions | Limit | Value | | | Unit |
|---|---|---|---|---|---|---|---|
| | | | | SxX8yS1 | SxX8yS2 | SxX8yS | |
| $I_{GT}$ | DC Gate Trigger Current | $V_D$ = 6V<br>$R_L$ = 100 Ω | MIN. | 0.5 | 1 | 15 | µA |
| | | | MAX. | 5 | 50 | 200 | µA |
| $V_{GT}$ | DC Gate Trigger Voltage | $V_D$ = 6V<br>$R_L$ = 100 Ω | MAX. | 0.8 | | | V |
| $V_{GRM}$ | Peak Reverse Gate Voltage | $I_{RG}$ = 10µA | MIN. | 5 | | | V |
| $I_H$ | Holding Current | $R_{GK}$ = 1 KΩ<br>Initial Current = 20mA | MAX. | 5 | | | mA |
| (dv/dt)s | Critical Rate-of-Rise of Off-State Voltage | $T_J$ = 125°C<br>$V_D = V_{DRM}/V_{RRM}$<br>Exp. Waveform<br>$R_{GK}$ =1 kΩ | MIN. | 75 | | | V/µs |
| $V_{GD}$ | Gate Non-Trigger Voltage | $V_D = V_{DRM}$<br>$R_{GK}$ =1 kΩ<br>$T_J$ = 25°C | MIN. | 0.2 | | | V |
| $t_q$ | Turn-Off Time | $T_J$ = 25°C @ 600 V<br>$R_{GK}$ =1 kΩ | MAX. | 30 | 25 | 25 | µs |
| $t_{gt}$ | Turn-On Time | $I_G$=10mA<br>PW = 15µsec<br>$I_T$ = 1.6A(pk) | TYP. | 2.0 | 2.0 | 2.0 | µs |

Note: x = voltage, y = package

## Static Characteristics ($T_J$ = 25°C, unless otherwise specified)

| Symbol | Description | Test Conditions | Limit | Value | Unit |
|---|---|---|---|---|---|
| $V_{TM}$ | Peak On-State Voltage | $I_{TM}$ = 1.6A (pk) | MAX. | 1.70 | V |
| $I_{DRM}$ | Off-State Current, Peak Repetitive | $T_J$ = 25°C @ $V_D = V_{DRM}$<br>$R_{GK}$ =1 kΩ | MAX. | 3 | µA |
| | | $T_J$ = 125°C @ VD = $V_{DRM}$<br>$R_{GK}$ =1 kΩ | MAX. | 500 | µA |

## Thermal Resistances

| Symbol | Description | Test Conditions | | Value | Unit |
|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (AC) | $I_T = 0.8A_{(RMS)}$ [1] | TO-92 | 75 | °C/W |
| | | | SOT-223 | 30 | °C/W |
| | | | SOT-89 | 50 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient | $I_T = 0.8A_{(RMS)}$ [1] | TO-92 | 150 | °C/W |
| | | | SOT-223 | 60 | °C/W |
| | | | SOT-89 | 90 | °C/W |

[1] 60Hz AC resistive load condition, 100% conduction.


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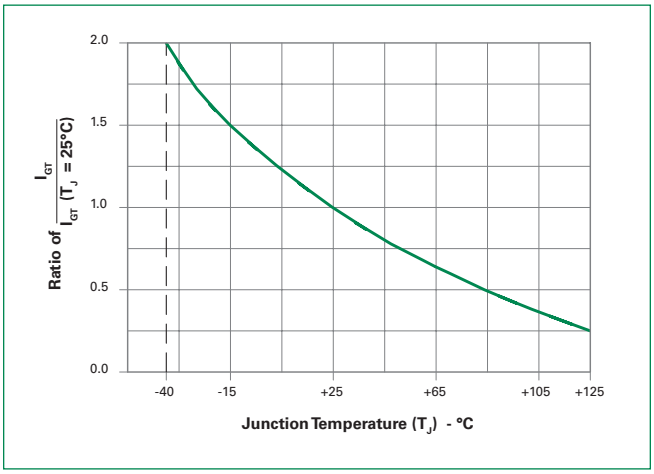
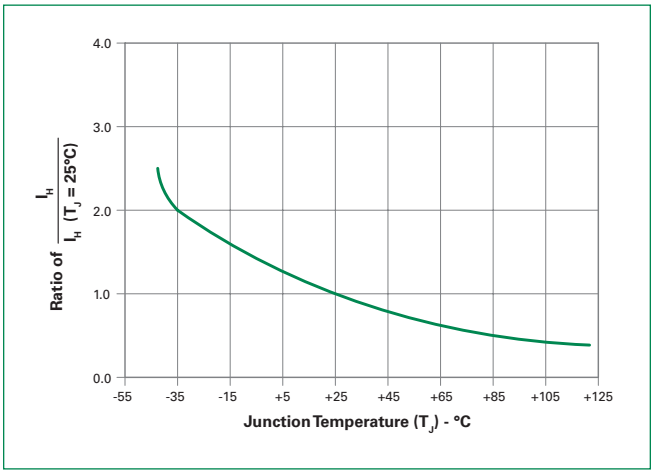
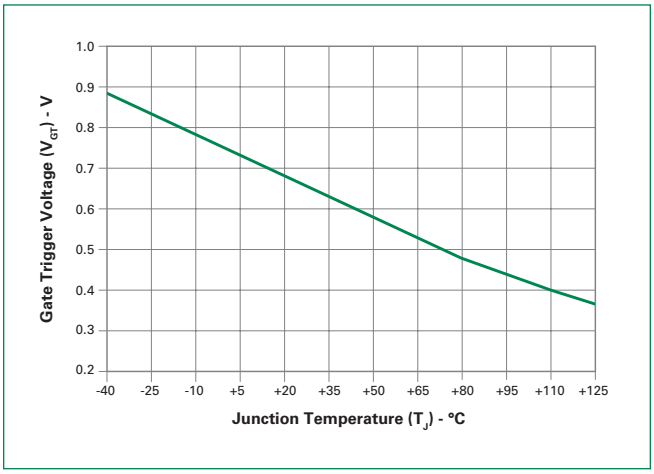
## Figure 1: Normalized DC Gate Trigger Current For All Quadrants vs. Junction Temperature



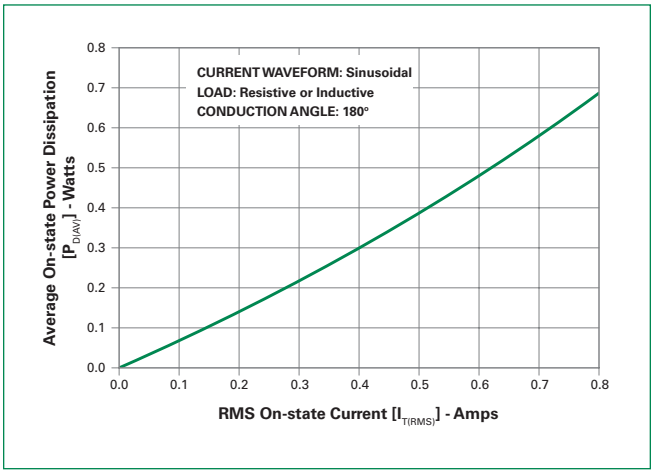

## Figure 2: Normalized DC Holding Current vs. Junction Temperature



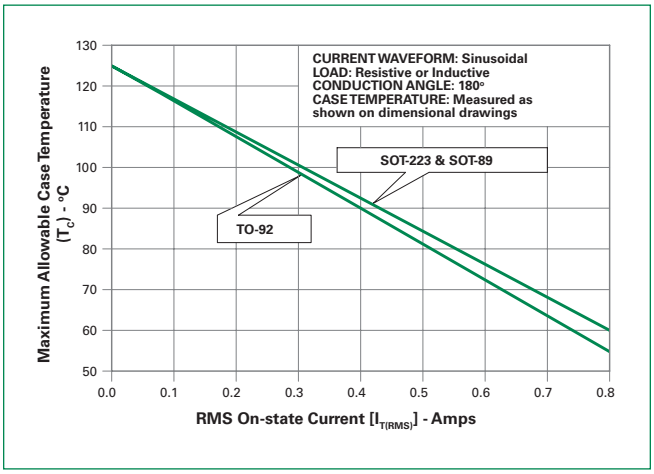

## Figure 3: Normalized DC Gate Trigger Voltage vs. Junction Temperature




## Figure 4: Power Dissipation (Typical) vs. RMS On-State Current




## Figure 5: Maximum Allowable Case Temperature vs. On-State Current





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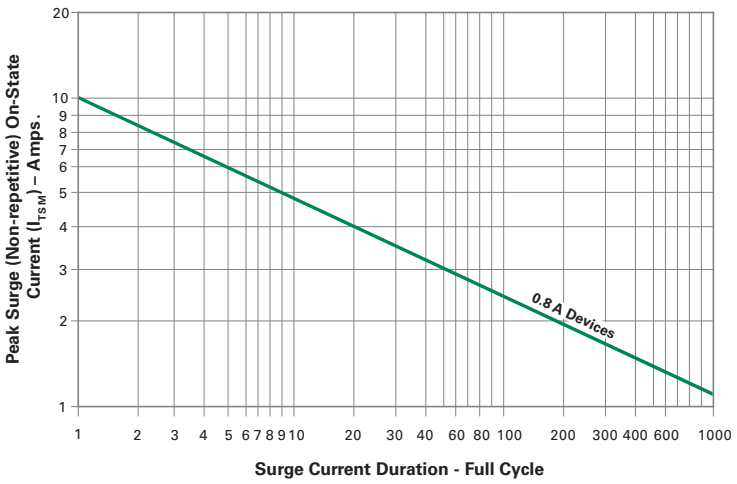
## Figure 6: Surge Peak On-State Current vs. Number of Cycles

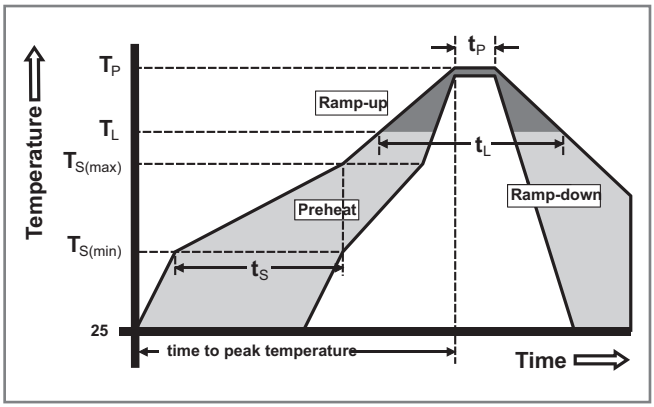



Supply Frequency: 60Hz Sinusoidal
Load: Resistive
RMS On-State Current [$I_{T(RMS)}$]: Max Rated Value at Specific Case Temperature

Notes:
1. Gate control may be lost during and immediately following surge current interval.
2. Overload may not be repeated until junction temperature has returned to steady-state rated value.

## Soldering Parameters

| Reflow Condition | | Pb – Free assembly |
|---|---|---|
| Pre Heat | -Temperature Min ($T_{s(min)}$) | 150°C |
| | -Temperature Max ($T_{s(max)}$) | 200°C |
| | -Time (min to max) ($t_s$) | 60 – 180 secs |
| Average ramp up rate (Liquidus Temp) ($T_L$) to peak | | 5°C/second max |
| $T_{S(max)}$ to $T_L$ - Ramp-up Rate | | 5°C/second max |
| Reflow | -Temperature ($T_L$) (Liquidus) | 217°C |
| | -Time (min to max) ($t_s$) | 60 – 150 seconds |
| Peak Temperature ($T_P$) | | $260^{+0/-5}$ °C |
| Time within 5°C of actual peak Temperature ($t_p$) | | 20 – 40 seconds |
| Ramp-down Rate | | 5°C/second max |
| Time 25°C to peak Temperature ($T_P$) | | 8 minutes Max. |
| Do not exceed | | 280°C |





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## Physical Specifications

| | |
|---|---|
| **Terminal Finish** | 100% Matte Tin-plated. |
| **Body Material** | UL recognized epoxy meeting flammability classification 94V-0. |
| **Lead Material** | Copper Alloy |

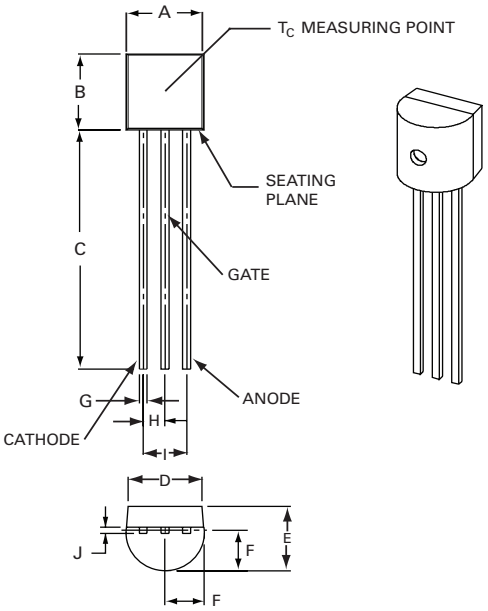
## Design Considerations

Careful selection of the correct device for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the device rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

## Reliability/Environmental Tests

| Test | Specifications and Conditions |
|---|---|
| **AC Blocking** | MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 110°C for 1008 hours |
| **Temperature Cycling** | MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time |
| **Temperature/ Humidity** | EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity |
| **High Temp Storage** | MIL-STD-750, M-1031, 1008 hours; 150°C |
| **Low-Temp Storage** | 1008 hours; -40°C |
| **Thermal Shock** | MIL-STD-750, M-1056 10 cycles; 0°C to 100°C; 5-min dwell-time at each temperature; 10 sec (max) transfer time between temperature |
| **Autoclave** | EIA / JEDEC, JESD22-A102 168 hours (121°C at 2 ATMs) and 100% R/H |
| **Resistance to Solder Heat** | MIL-STD-750 Method 2031 |
| **Solderability** | ANSI/J-STD-002, category 3, Test A |
| **Lead Bend** | MIL-STD-750, M-2036 Cond E |

## Dimensions – TO-92




| Dimension | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.175 | 0.205 | 4.450 | 5.200 |
| B | 0.170 | 0.210 | 4.320 | 5.330 |
| C | 0.500 | | 12.70 | |
| D | 0.135 | | 3.430 | |
| E | 0.125 | 0.165 | 3.180 | 4.190 |
| F | 0.080 | 0.105 | 2.040 | 2.660 |
| G | 0.016 | 0.021 | 0.407 | 0.533 |
| H | 0.045 | 0.055 | 1.150 | 1.390 |
| I | 0.095 | 0.105 | 2.420 | 2.660 |
| J | 0.015 | 0.020 | 0.380 | 0.500 |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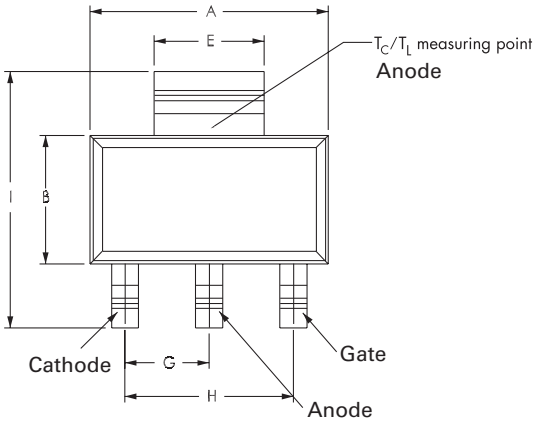
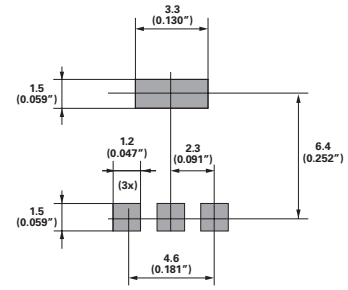
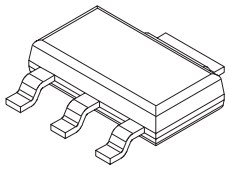
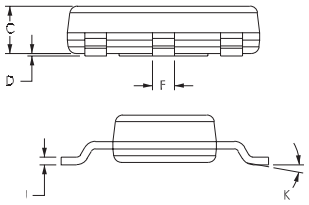
## Dimensions – SOT-223



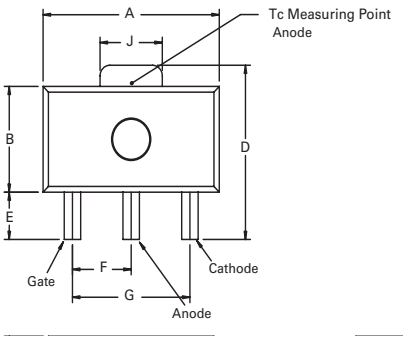

Dimensions in Millimeters (Inches)



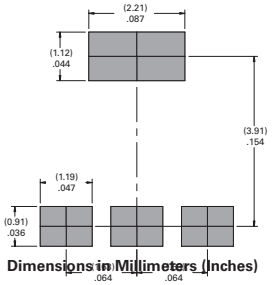



| Dimensions | Inches | | | Millimeters | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.248 | 0.256 | 0.264 | 6.30 | 6.50 | 6.70 |
| B | 0.130 | 0.138 | 0.146 | 3.30 | 3.50 | 3.70 |
| C | — | — | 0.071 | — | — | 1.80 |
| D | 0.001 | — | 0.004 | 0.02 | — | 0.10 |
| E | 0.114 | 0.118 | 0.124 | 2.90 | 3.00 | 3.15 |
| F | 0.024 | 0.027 | 0.034 | 0.60 | 0.70 | 0.85 |
| G | — | 0.090 | — | — | 2.30 | — |
| H | — | 0.181 | — | — | 4.60 | — |
| I | 0.264 | 0.276 | 0.287 | 6.70 | 7.00 | 7.30 |
| J | 0.009 | 0.010 | 0.014 | 0.24 | 0.26 | 0.35 |
| K | 10° MAX | | | | | |

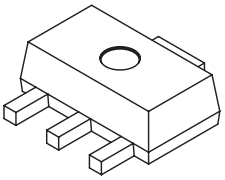
## Dimensions – SOT-89

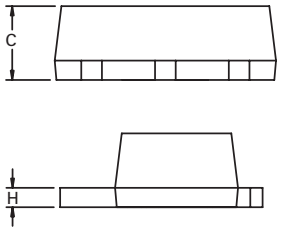



Pad Layout for SOT-89




Dimensions in Millimeters (Inches)






| Dimension | Inches | | | Millimeters | | |
|---|---|---|---|---|---|---|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.173 | — | 0.181 | 4.40 | — | 4.60 |
| B | 0.090 | — | 0.102 | 2.29 | — | 2.60 |
| C | 0.055 | — | 0.063 | 1.40 | — | 1.60 |
| D | 0.155 | — | 0.167 | 3.94 | — | 4.25 |
| E | 0.035 | — | 0.047 | 0.89 | — | 1.20 |
| F | 0.056 | — | 0.062 | 1.42 | — | 1.57 |
| G | 0.115 | — | 0.121 | 2.92 | — | 3.07 |
| H | 0.014 | — | 0.017 | 0.35 | — | 0.44 |
| I | 0.014 | — | 0.019 | 0.36 | — | 0.48 |
| J | 0.064 | — | 0.072 | 1.62 | — | 1.83 |



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## Product Selector

| Part Number | Voltage | | | Gate Sensitivity | Package |
|---|---|---|---|---|---|
| | 400V | 600V | 800V | | |
| S4X8ES | X | — | — | 200 µA | TO-92 |
| S6X8ES | — | X | — | 200 µA | TO-92 |
| S8X8ES | — | — | X | 200 µA | TO-92 |
| S4X8TS | X | — | — | 200 µA | SOT-223 |
| S6X8TS | — | X | — | 200 µA | SOT-223 |
| S8X8TS | — | — | X | 200 µA | SOT-223 |
| S4X8BS | X | — | — | 200 µA | SOT-89 |
| S6X8BS | — | X | — | 200 µA | SOT-89 |
| S4X8ES1 | X | — | — | 5 µA | TO-92 |
| S6X8ES1 | — | X | — | 5 µA | TO-92 |
| S8X8ES1 | — | — | X | 5 µA | TO-92 |
| S4X8TS1 | X | — | — | 5 µA | SOT-223 |
| S6X8TS1 | — | X | — | 5 µA | SOT-223 |
| S8X8TS1 | — | — | X | 5 µA | SOT-223 |
| S4X8ES2 | X | — | — | 50 µA | TO-92 |
| S6X8ES2 | — | X | — | 50 µA | TO-92 |
| S8X8ES2 | — | — | X | 50 µA | TO-92 |
| S4X8TS2 | X | — | — | 50 µA | SOT-223 |
| S6X8TS2 | — | X | — | 50 µA | SOT-223 |
| S8X8TS2 | — | — | X | 50 µA | SOT-223 |

## Packing Options

| Part Number | Marking | Weight | Packing Mode | Base Quantity |
|---|---|---|---|---|
| SxX8ESy | SxX8ESy | 0.170g | Bulk | 2500 |
| SxX8ESyAP | SxX8ESy | 0.170g | Ammo Pack | 2000 |
| SxX8ESyRP | SxX8ESy | 0.170g | Tape & Reel | 2000 |
| SxX8TSyRP | SxX8TSy | 0.120g | Tape & Reel | 1000 |
| SxX8BSRP | xX8 | 0.053g | Tape & Reel | 1000 |
| SxX8BSRP1 | xX8 | 0.053g | Tape & Reel | 1000 |

Note: x = voltage, y = gate sensitivity



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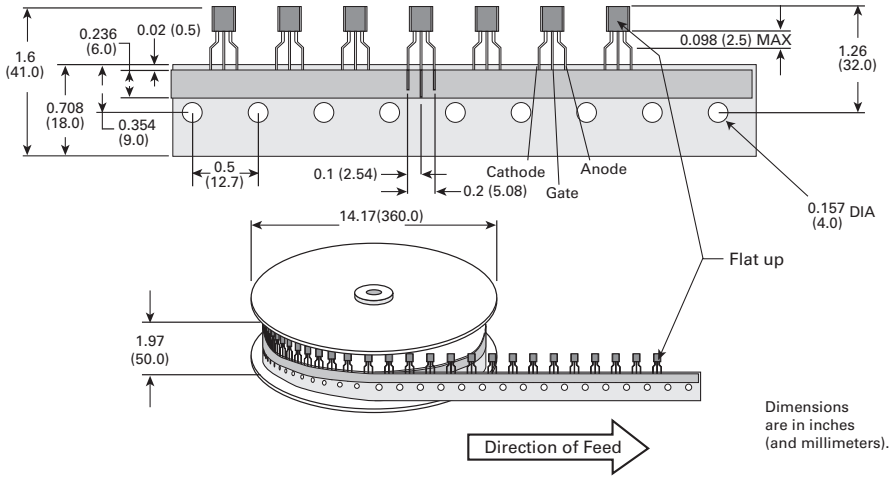
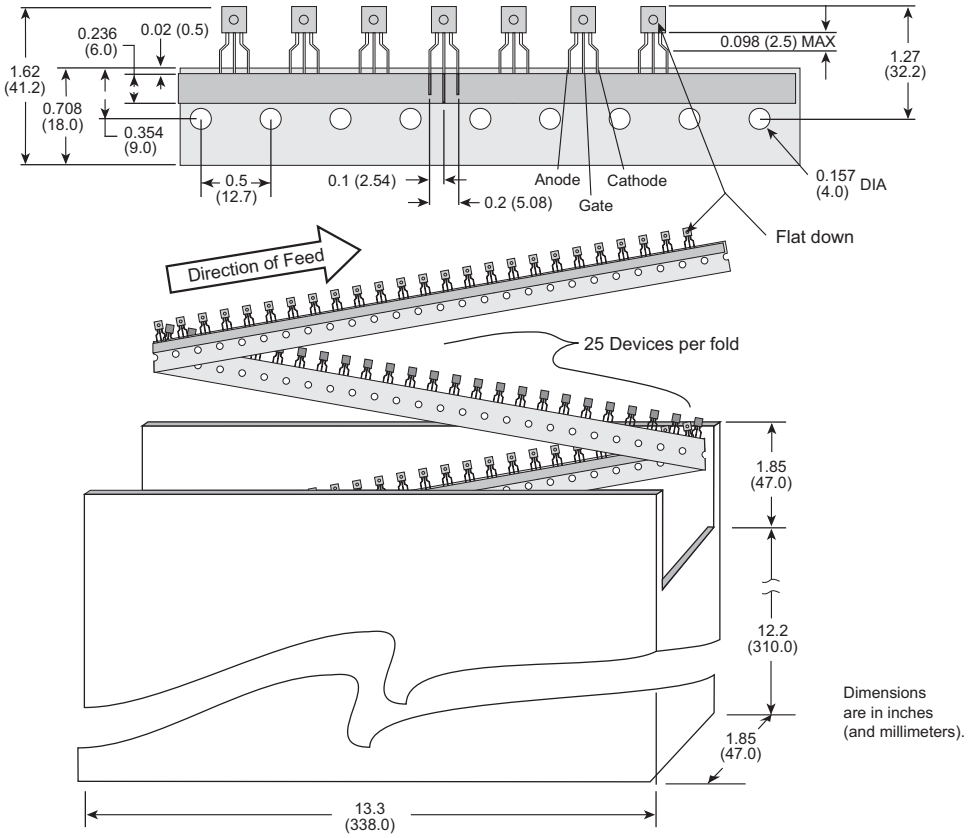
## TO-92 (3-lead) Reel Pack (RP) Radial Leaded Specifications

### Meets all EIA-468-C Standards




## TO-92 (3-lead) Ammo Pack (AP) Radial Leaded Specifications

### Meets all EIA-468-C Standards





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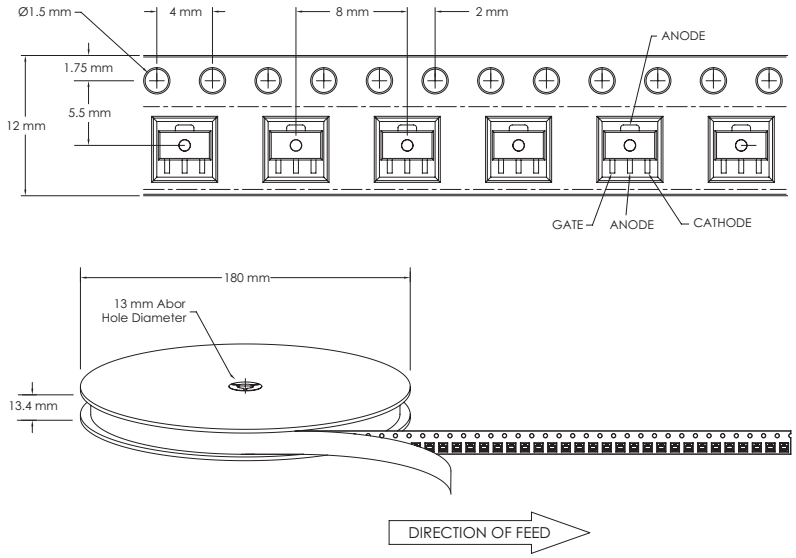
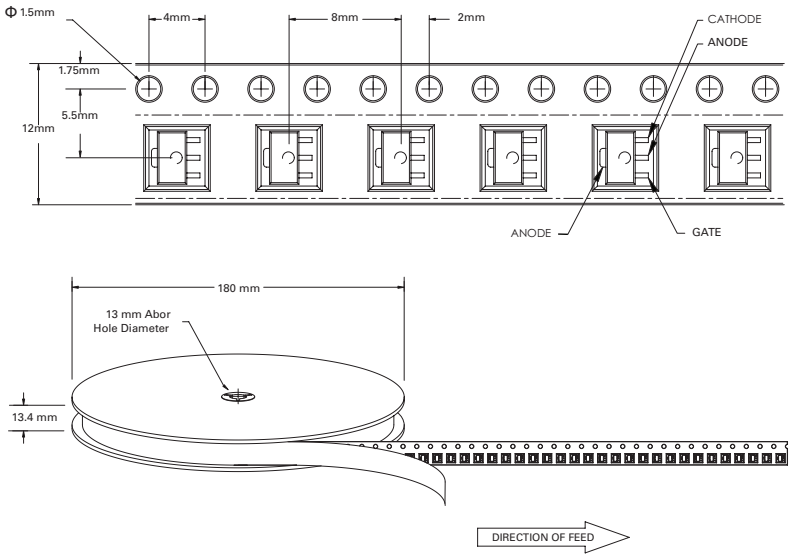
## SOT-89 Reel Pack (RP) Specifications




## SOT-89 Reel Pack (RP1) Specifications





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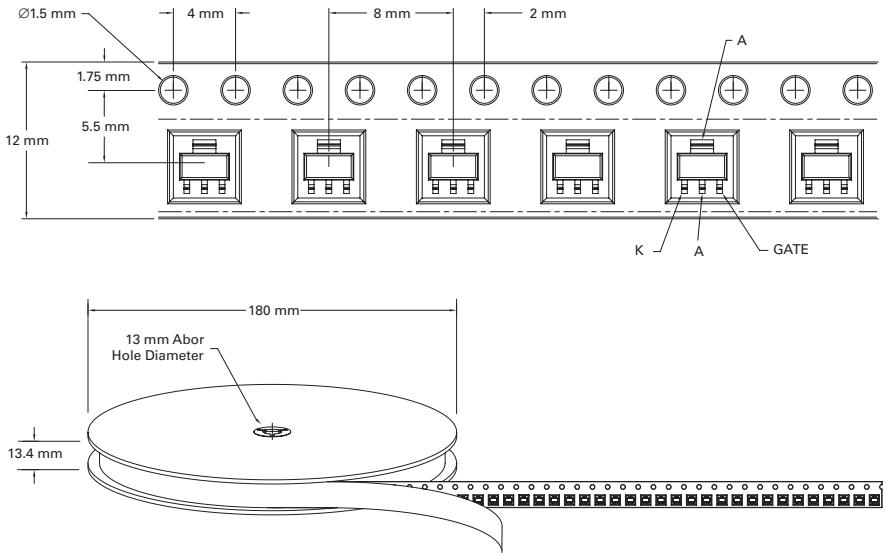
## SOT-223 Reel Pack (RP) Specifications




## Part Numbering System

**S x X8 x xx xx**

**SERIES**
**S:** SCR

**VOLTAGE**
**4:** 400V
**6:** 600V
**8:** 800V

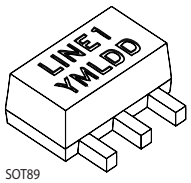
**CURRENT**
**X8:** 0.8A

**SENSITIVITY & TYPE**
**S1:** 5µA Sensitive SCR
**S2:** 50µA Sensitive SCR
**S:** 200µA Sensitive SCR

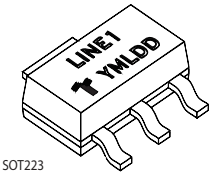
**PACKAGE TYPE**
**E:** TO-92
**T:** SOT-223
**B:** SOT-89

**PACKING TYPE**
**Blank:** Bulk Pack
**RP:** Reel Pack (TO-92)
Embossed Carrier Pack (SOT-223)
Embossed Carrier Pack (SOT-89)
**RP1:** Embossed Carrier Pack (SOT-89)
(alternate orientation)
**AP:** Ammo Pack (TO-92)

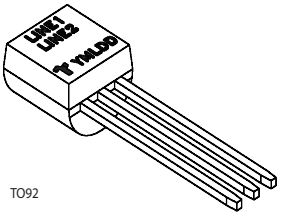
## Part Marking System



SOT89



SOT223



TO92

Line1 = Littelfuse Part Number
Line2 = continuation…Littelfuse Part Number
Y = Last Digit of Calendar Year
M = Letter Month Code (A-L for Jan-Dec)
L = Location Code
DD = Calendar Date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Specifications are subject to change without notice.
Please refer to http://www.littelfuse.com for current information.

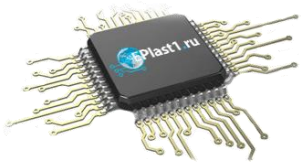
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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