

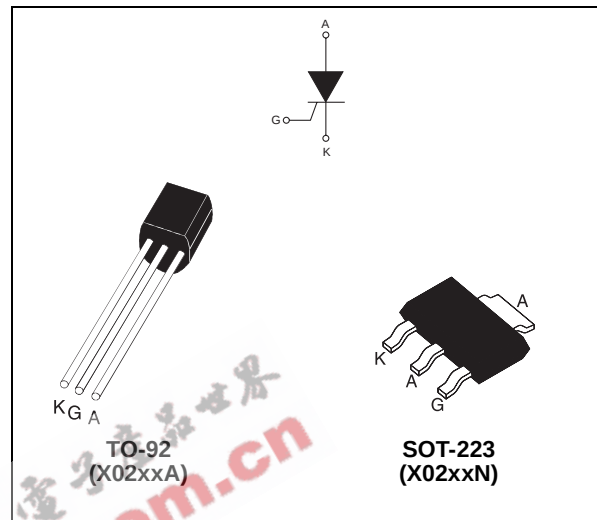
### MAIN FEATURES:

| Symbol            | Value       | Unit    |
|-------------------|-------------|---------|
| $I_{T(RMS)}$      | 1.25        | A       |
| $V_{DRM}/V_{RRM}$ | 600 and 800 | V       |
| $I_{GT}$          | 50 to 200   | $\mu A$ |

### DESCRIPTION

Thanks to highly sensitive triggering levels, the X02 SCR series is suitable for all applications where the available gate current is limited, such as ground fault circuit interruptors, overvoltage crowbar protection in low power supplies, capacitive ignition circuits, ...

Available in through-hole or surface-mount packages, these devices are optimized in forward voltage drop and inrush current capabilities, for reduced power losses and high reliability in harsh environments.



### ABSOLUTE RATINGS (limiting values)

| Symbol             | Parameter                                                                                        |                        |                         | Value                          | Unit        |
|--------------------|--------------------------------------------------------------------------------------------------|------------------------|-------------------------|--------------------------------|-------------|
| $I_{T(RMS)}$       | RMS on-state current<br>(180° conduction angle)                                                  | TO-92                  | $T_I = 55^{\circ}C$     | 1.25                           | A           |
|                    |                                                                                                  | SOT-223                | $T_{tab} = 95^{\circ}C$ |                                |             |
| $I_{T(AV)}$        | Average on-state current<br>(180° conduction angle)                                              | TO-92                  | $T_I = 55^{\circ}C$     | 0.8                            | A           |
|                    |                                                                                                  | SOT-223                | $T_{tab} = 95^{\circ}C$ |                                |             |
| $I_{TSM}$          | Non repetitive surge peak on-state current                                                       | $t_p = 8.3 \text{ ms}$ | $T_j = 25^{\circ}C$     | 25                             | A           |
|                    |                                                                                                  | $t_p = 10 \text{ ms}$  |                         | 22.5                           |             |
| $I^2t$             | $I^2t$ Value for fusing                                                                          | $t_p = 10 \text{ ms}$  | $T_j = 25^{\circ}C$     | 2.5                            | $A^2s$      |
| $di/dt$            | Critical rate of rise of on-state current<br>$I_G = 2 \times I_{GT}$ , $t_r \leq 100 \text{ ns}$ | $F = 60 \text{ Hz}$    | $T_j = 125^{\circ}C$    | 50                             | $A/\mu s$   |
| $I_{GM}$           | Peak gate current                                                                                | $t_p = 20 \mu s$       | $T_j = 125^{\circ}C$    | 1.2                            | A           |
| $P_{G(AV)}$        | Average gate power dissipation                                                                   |                        | $T_j = 125^{\circ}C$    | 0.2                            | W           |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range                       |                        |                         | - 40 to + 150<br>- 40 to + 125 | $^{\circ}C$ |

## X02 Series

### ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C, unless otherwise specified)

| Symbol           | Test Conditions                                                                    |                        |      | X02xx |    | Unit |
|------------------|------------------------------------------------------------------------------------|------------------------|------|-------|----|------|
|                  |                                                                                    |                        |      | 02    | 05 |      |
| I <sub>GT</sub>  | V <sub>D</sub> = 12 V      R <sub>L</sub> = 140 Ω                                  |                        | MIN. | -     | 20 | μA   |
|                  |                                                                                    |                        | MAX. | 200   | 50 |      |
| V <sub>GT</sub>  |                                                                                    |                        | MAX. | 0.8   |    | V    |
| V <sub>GD</sub>  | V <sub>D</sub> = V <sub>DRM</sub> R <sub>L</sub> = 3.3 kΩ   R <sub>GK</sub> = 1 kΩ | T <sub>j</sub> = 125°C | MIN. | 0.1   |    | V    |
| V <sub>RG</sub>  | I <sub>RG</sub> = 10 μA                                                            |                        | MIN. | 8     |    | V    |
| I <sub>H</sub>   | I <sub>T</sub> = 50 mA   R <sub>GK</sub> = 1 kΩ                                    |                        | MAX. | 5     |    | mA   |
| I <sub>L</sub>   | I <sub>G</sub> = 1 mA   R <sub>GK</sub> = 1 kΩ                                     |                        | MAX. | 6     |    | mA   |
| dV/dt            | V <sub>D</sub> = 67 % V <sub>DRM</sub> R <sub>GK</sub> = 1 kΩ                      | T <sub>j</sub> = 110°C | MIN. | 10    | 15 | V/μs |
| V <sub>TM</sub>  | I <sub>TM</sub> = 2.5 A   t <sub>p</sub> = 380 μs                                  | T <sub>j</sub> = 25°C  | MAX. | 1.45  |    | V    |
| V <sub>t0</sub>  | Threshold voltage                                                                  | T <sub>j</sub> = 125°C | MAX. | 0.9   |    | V    |
| R <sub>d</sub>   | Dynamic resistance                                                                 | T <sub>j</sub> = 125°C | MAX. | 200   |    | mΩ   |
| I <sub>DRM</sub> | V <sub>DRM</sub> = V <sub>RRM</sub> R <sub>GK</sub> = 1 kΩ                         | T <sub>j</sub> = 25°C  | MAX. | 5     |    | μA   |
| I <sub>RRM</sub> |                                                                                    | T <sub>j</sub> = 125°C |      | 500   |    |      |

### THERMAL RESISTANCES

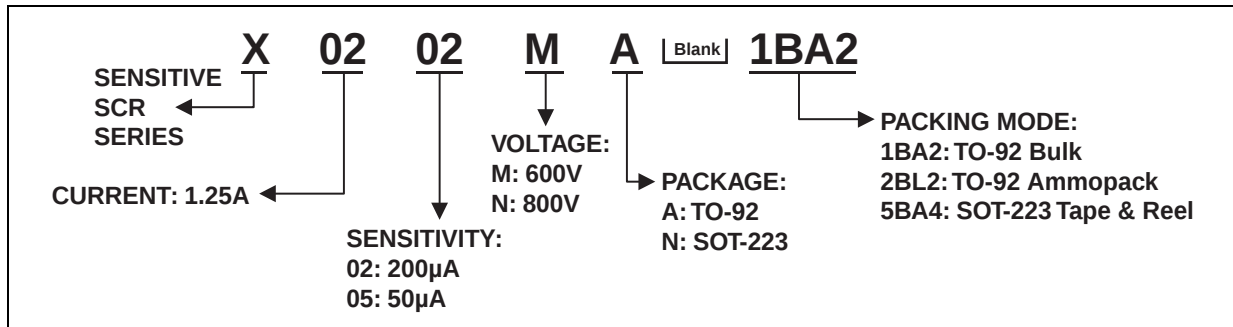
| Symbol               | Parameter                | Value   | Unit |
|----------------------|--------------------------|---------|------|
| R <sub>th(j-l)</sub> | Junction to leads (DC)   | TO-92   | °C/W |
| R <sub>th(j-t)</sub> | Junction to tab (DC)     | SOT-223 |      |
| R <sub>th(j-a)</sub> | Junction to ambient (DC) | TO-92   |      |
|                      | S = 5 cm <sup>2</sup>    | SOT-223 |      |

S = Copper surface under tab

### PRODUCT SELECTOR

| Part Number | Voltage |       | Sensitivity | Package |
|-------------|---------|-------|-------------|---------|
|             | 600 V   | 800 V |             |         |
| X0202MA     | X       |       | 200 μA      | TO-92   |
| X0202MN     | X       |       | 200 μA      | SOT-223 |
| X0202NA     |         | X     | 200 μA      | TO-92   |
| X0202NN     |         | X     | 200 μA      | SOT-223 |
| X0205MA     | X       |       | 50 μA       | TO-92   |
| X0205MN     | X       |       | 50 μA       | SOT-223 |
| X0205NA     |         | X     | 50 μA       | TO-92   |
| X0205NN     |         | X     | 50 μA       | SOT-223 |

## ORDERING INFORMATION

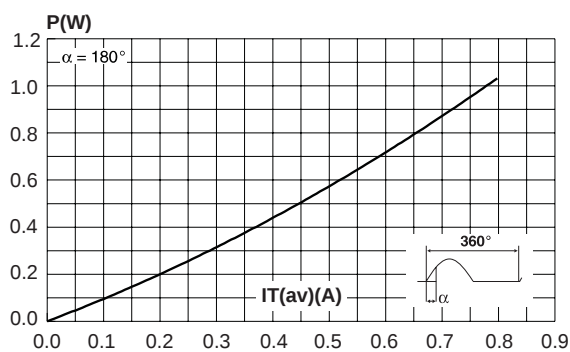


## OTHER INFORMATION

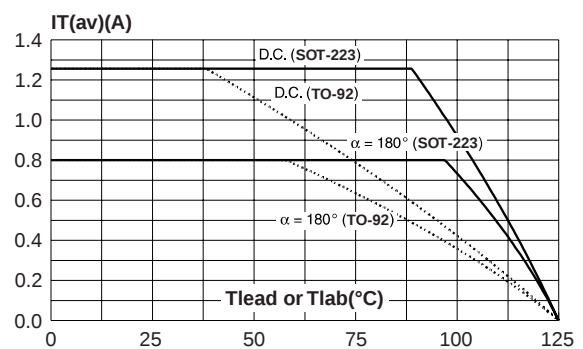
| Part Number  | Marking | Weight | Base Quantity | Packing mode |
|--------------|---------|--------|---------------|--------------|
| X02xxyA 1BA2 | X02xxyA | 0.2 g  | 2500          | Bulk         |
| X02xxyA 2BL2 | X02xxyA | 0.2 g  | 2000          | Ammopack     |
| X0202yN 5BA4 | X2y     | 0.12 g | 1000          | Tape & reel  |
| X0205yN 5BA4 | X5y     | 0.12 g | 1000          | Tape & reel  |

Note: xx = sensitivity, y = voltage

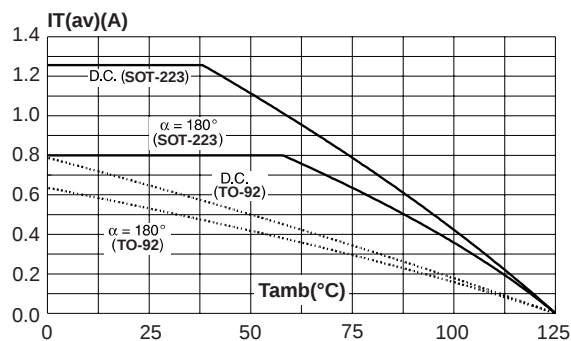
**Fig. 1:** Maximum average power dissipation versus average on-state current.



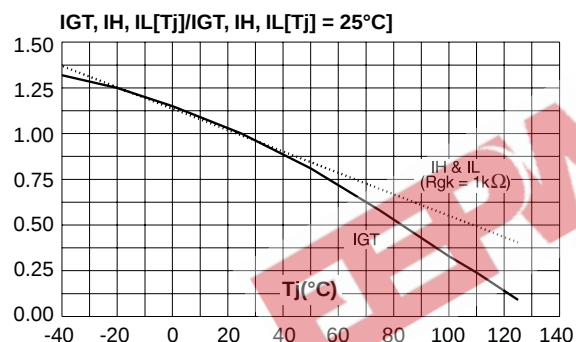
**Fig. 2-1:** Average and D.C. on-state current versus lead temperature (SOT-223/TO-92).



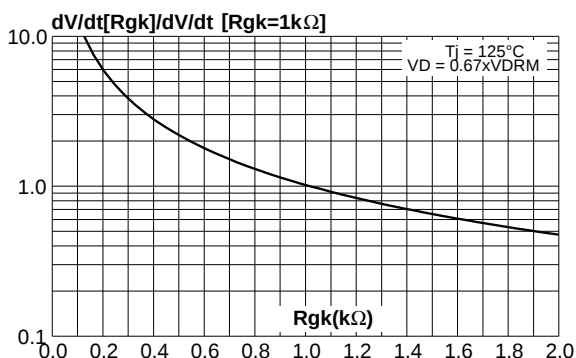
**Fig. 2-2:** Average and D.C. on-state current versus ambient temperature (device mounted on FR4 with recommended pad layout) (SOT-223/TO-92).



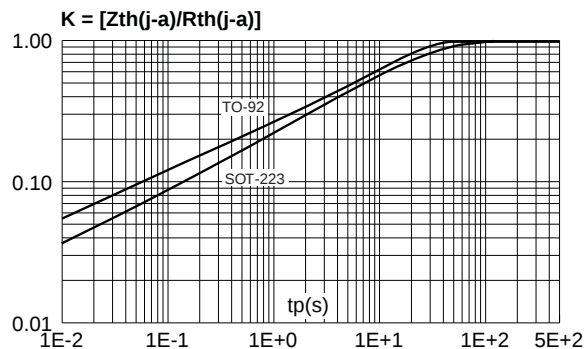
**Fig. 4:** Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values).



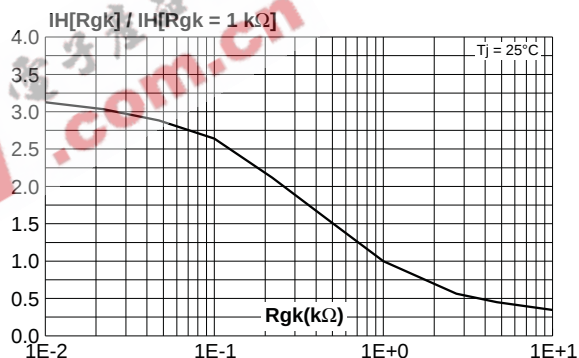
**Fig. 6:** Relative variation of dV/dt immunity versus gate-cathode resistance (typical values).



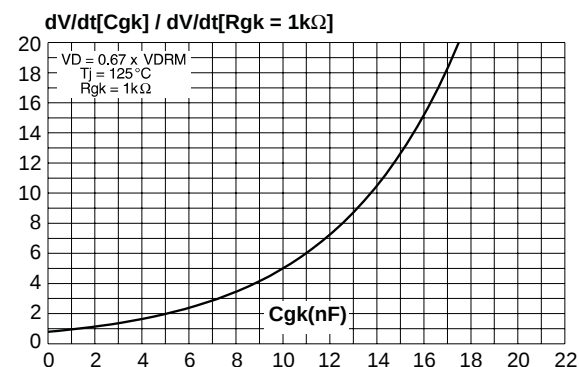
**Fig. 3:** Relative variation of thermal impedance junction to ambient versus pulse duration (SOT-223/TO-92).



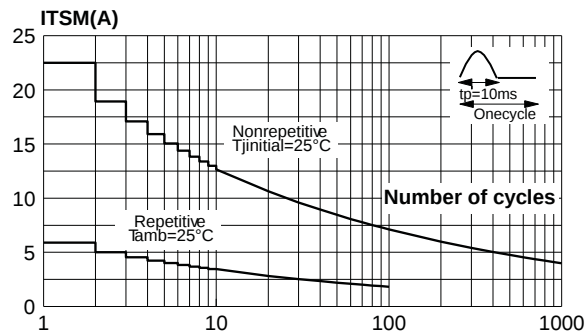
**Fig. 5:** Relative variation of holding current versus gate-cathode resistance (typical values).



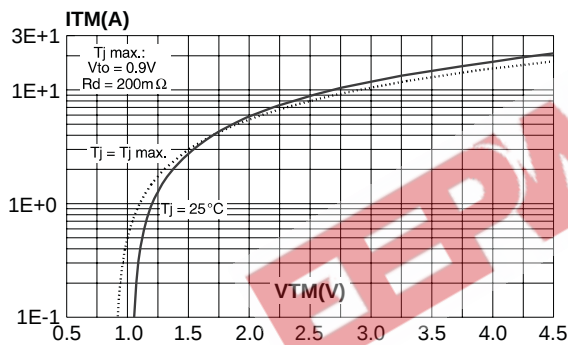
**Fig. 7:** Relative variation of dV/dt immunity versus gate-cathode capacitance (typical values).



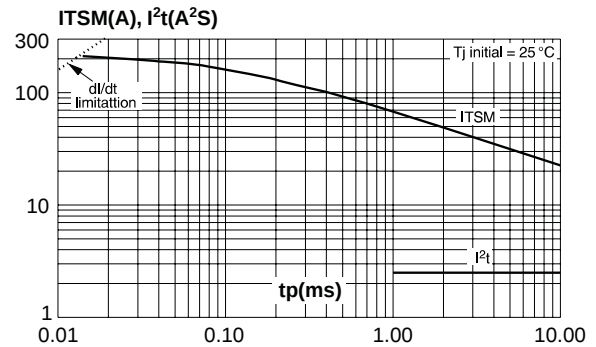
**Fig. 8:** Surge peak on-state current versus number of cycles.



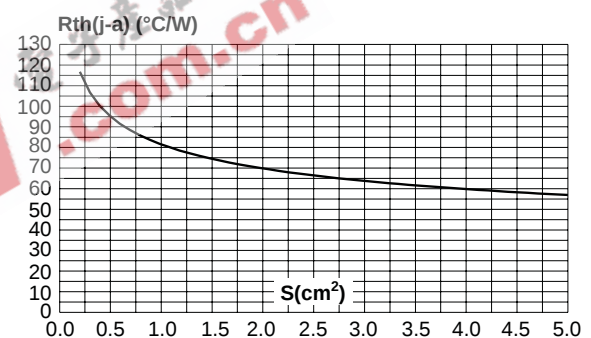
**Fig. 10:** On-state characteristics (maximum values).



**Fig. 9:** Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms, and corresponding value of  $I^2t$ .

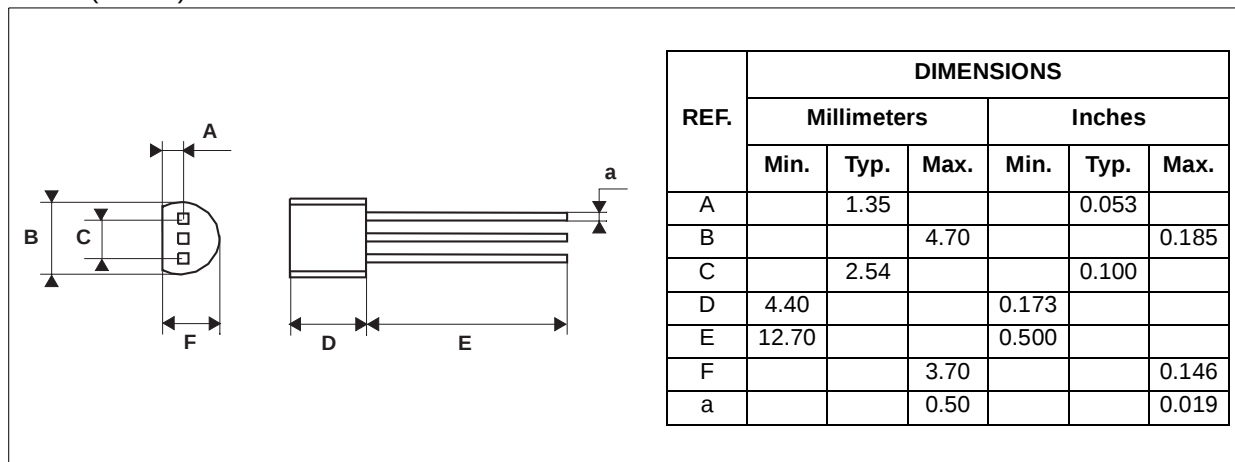


**Fig. 11:** Thermal resistance junction to ambient versus copper surface under tab (Epoxy printed circuit board FR4, copper thickness: 35  $\mu$ m) (SOT-223).



## PACKAGE MECHANICAL DATA

TO-92 (Plastic)



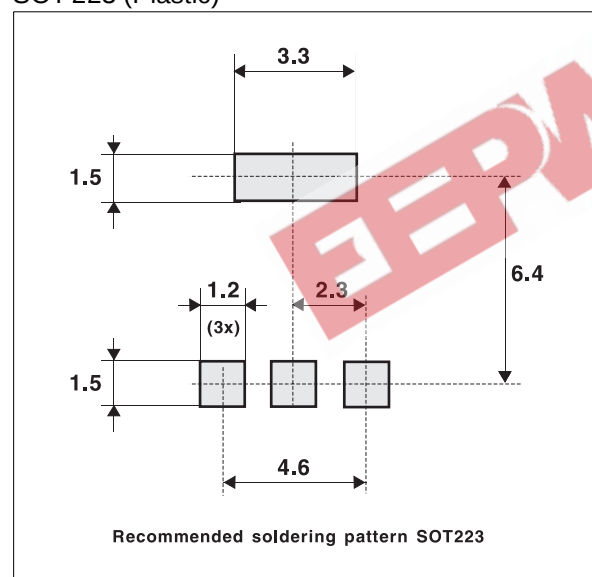
## PACKAGE MECHANICAL DATA

## SOT-223 (Plastic)

| REF. | DIMENSIONS  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.80 |        |       | 0.071 |
| A1   | 0.02        |      | 0.1  | 0.0008 |       | 0.004 |
| B    | 0.60        | 0.70 | 0.85 | 0.024  | 0.027 | 0.034 |
| B1   | 2.90        | 3.00 | 3.15 | 0.114  | 0.118 | 0.124 |
| c    | 0.24        | 0.26 | 0.35 | 0.009  | 0.010 | 0.014 |
| D    | 6.30        | 6.50 | 6.70 | 0.248  | 0.256 | 0.264 |
| e    |             | 2.3  |      |        | 0.090 |       |
| e1   |             | 4.6  |      |        | 0.181 |       |
| E    | 3.30        | 3.50 | 3.70 | 0.130  | 0.138 | 0.146 |
| H    | 6.70        | 7.00 | 7.30 | 0.264  | 0.276 | 0.287 |
| V    | 10° max     |      |      |        |       |       |

## FOOTPRINT DIMENSIONS (in millimeters)

## SOT-223 (Plastic)



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