

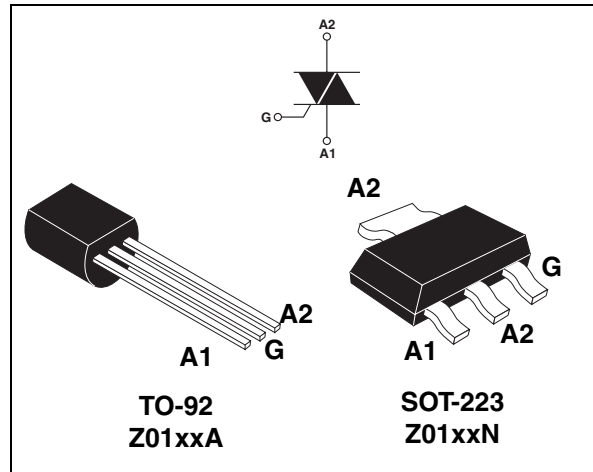
### Main Features

| Symbol            | Value      | Unit |
|-------------------|------------|------|
| $I_{T(RMS)}$      | 1          | A    |
| $V_{DRM}/V_{RRM}$ | 600 to 800 | V    |
| $I_{GT} (Q_i)$    | 3 to 25    | mA   |

### Description

The Z01 series is suitable for general purpose AC switching applications. They can be found in applications such as home appliances (electrovalve, pump, door lock, small lamp control), fan speed controllers,...

Different gate current sensitivities are available, allowing optimized performances when controlled directly from microcontrollers.



### Order Codes

| Part Number | Marking                                            |
|-------------|----------------------------------------------------|
| Z01xxA      | See <a href="#">Ordering information on page 7</a> |
| Z01xxN      |                                                    |

**Table 1. Absolute maximum ratings**

| Symbol             | Parameter                                                                                |                                |                          | Value | Unit         |
|--------------------|------------------------------------------------------------------------------------------|--------------------------------|--------------------------|-------|--------------|
| $I_{T(RMS)}$       | RMS on-state current (full sine wave)                                                    | SOT-223                        | $T_{tab} = 90^{\circ} C$ | 1     | A            |
|                    |                                                                                          | TO-92                          | $T_L = 50^{\circ} C$     |       |              |
| $I_{TSM}$          | Non repetitive surge peak on-state current (full cycle, $T_j$ initial = $25^{\circ} C$ ) | F = 50 Hz                      | t = 20 ms                | 8     | A            |
|                    |                                                                                          | F = 60 Hz                      | t = 16.7 ms              | 8.5   |              |
| $I^2t$             | $I^2t$ Value for fusing                                                                  | $t_p = 10$ ms                  |                          | 0.35  | $A^2s$       |
| di/dt              | Critical rate of rise of on-state current<br>$I_G = 2 \times I_{GT}$ , $t_r \leq 100$ ns | F = 120 Hz                     | $T_j = 125^{\circ} C$    | 20    | A/ $\mu s$   |
| $I_{GM}$           | Peak gate current                                                                        | $t_p = 20$ $\mu s$             | $T_j = 125^{\circ} C$    | 1     | A            |
| $P_{G(AV)}$        | Average gate power dissipation                                                           | $T_j = 125^{\circ} C$          |                          | 1     | W            |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range               | - 40 to + 150<br>- 40 to + 125 |                          |       | $^{\circ} C$ |

# 1 Characteristics

**Table 2. Electrical characteristics** ( $T_j = 25^\circ \text{C}$ , unless otherwise specified)

| Symbol            | Test Conditions                                                           | Quadrant     |     | Z01 |    |    |     | Unit             |
|-------------------|---------------------------------------------------------------------------|--------------|-----|-----|----|----|-----|------------------|
|                   |                                                                           |              |     | 03  | 07 | 09 | 10  |                  |
| $I_{GT}^{(1)}$    | $V_D = 12 \text{ V}$ $R_L = 30 \Omega$                                    | I - II - III | MAX | 3   | 5  | 10 | 25  | mA               |
|                   |                                                                           | IV           |     | 5   | 7  | 10 | 25  |                  |
| $V_{GT}$          |                                                                           | ALL          | MAX | 1.3 |    |    |     | V                |
| $V_{GD}$          | $V_D = V_{DRM}$ $R_L = 3.3 \text{ k}\Omega$<br>$T_j = 125^\circ \text{C}$ | ALL          | MIN | 0.2 |    |    |     | V                |
| $I_H^{(2)}$       | $I_T = 50 \text{ mA}$                                                     |              | MX. | 7   | 10 | 10 | 25  | mA               |
| $I_L$             | $I_G = 1.2 I_{GT}$                                                        | I - III - IV | MAX | 7   | 10 | 15 | 25  | mA               |
|                   |                                                                           | II           |     | 15  | 20 | 25 | 50  |                  |
| $dV/dt^{(2)}$     | $V_D = 67\% V_{DRM}$ gate open $T_j = 110^\circ \text{C}$                 |              | MIN | 10  | 20 | 50 | 100 | V/ $\mu\text{s}$ |
| $(dI/dt)_C^{(2)}$ | $(dI/dt)_C = 0.44 \text{ A/ms}$ $T_j = 110^\circ \text{C}$                |              | MIN | 0.5 | 1  | 2  | 5   | V/ $\mu\text{s}$ |

1. minimum  $I_{GT}$  is guaranteed at 5% of  $I_{GT}$  max.

2. for both polarities of A2 referenced to A1.

**Table 3. Static characteristics**

| Symbol                 | Test Conditions          |                         |                            | Value | Unit            |
|------------------------|--------------------------|-------------------------|----------------------------|-------|-----------------|
| $V_{TM}^{(1)}$         | $I_{TM} = 1.4 \text{ A}$ | $t_p = 380 \mu\text{s}$ | $T_j = 25^\circ \text{C}$  | MAX.  | 1.56 V          |
| $V_{to}^{(1)}$         | Threshold voltage        |                         | $T_j = 125^\circ \text{C}$ | MAX.  | 0.95 V          |
| $R_d^{(1)}$            | Dynamic resistance       |                         | $T_j = 125^\circ \text{C}$ | MAX.  | 400 m $\Omega$  |
| $I_{DRM}$<br>$I_{RRM}$ | $V_{DRM} = V_{RRM}$      |                         | $T_j = 25^\circ \text{C}$  | MAX.  | 5 $\mu\text{A}$ |
|                        |                          |                         | $T_j = 125^\circ \text{C}$ |       | 0.5 mA          |

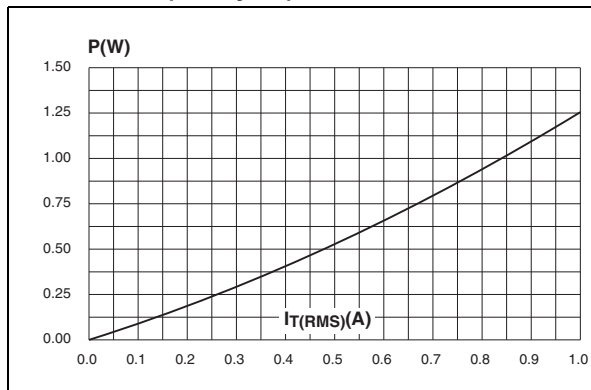
1. for both polarities of A2 referenced to A1.

**Table 4. Thermal resistances**

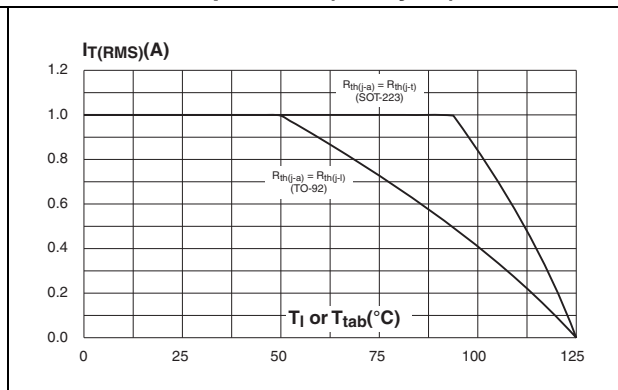
| Symbol        | Parameter             |                                    | Value | Unit                |
|---------------|-----------------------|------------------------------------|-------|---------------------|
| $R_{th(j-t)}$ | Junction to tab (AC)  | SOT-223                            | 25    | $^\circ \text{C/W}$ |
| $R_{th(j-l)}$ | Junction to lead (AC) | TO-92                              | 60    |                     |
| $R_{th(j-a)}$ | Junction to ambient   | $S^{(1)} = 5 \text{ cm}^2$ SOT-223 | 60    | $^\circ \text{C/W}$ |
|               |                       | TO-92                              | 150   |                     |

1. S = Copper surface under tab.

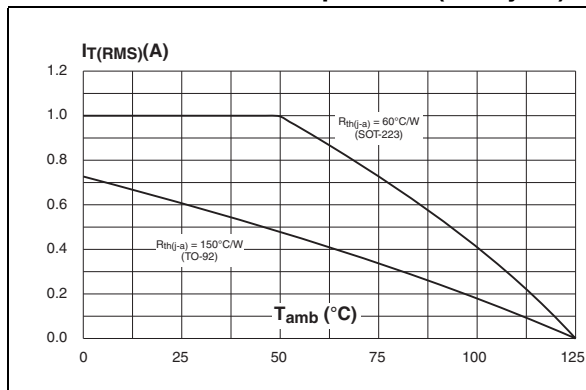
**Figure 1. Maximum power dissipation versus RMS on-state current (full cycle)**



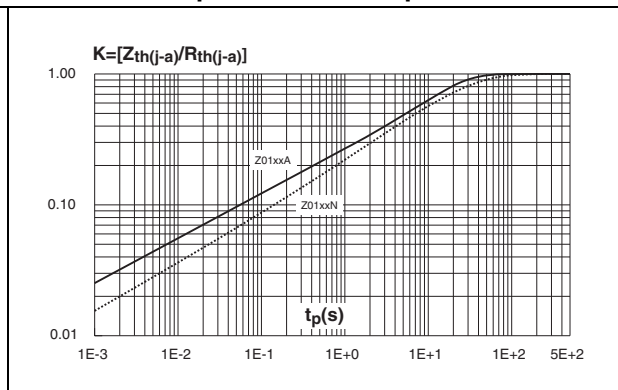
**Figure 2. RMS on-state current versus lead (TO-92) or tab (SOT-223) temperature (full cycle)**



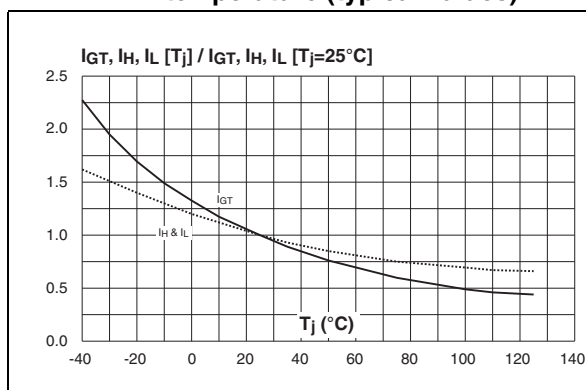
**Figure 3. RMS on-state current versus ambient temperature (full cycle)**



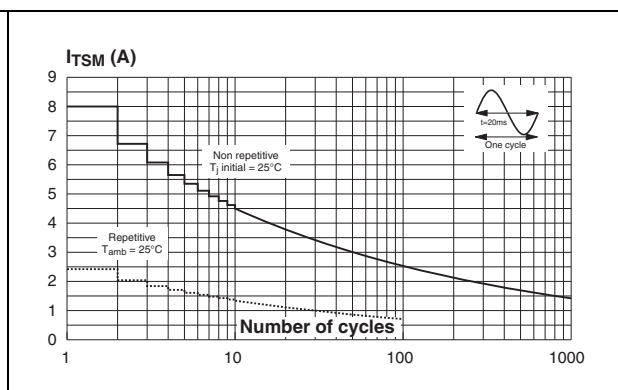
**Figure 4. Relative variation of thermal impedance versus pulse duration**



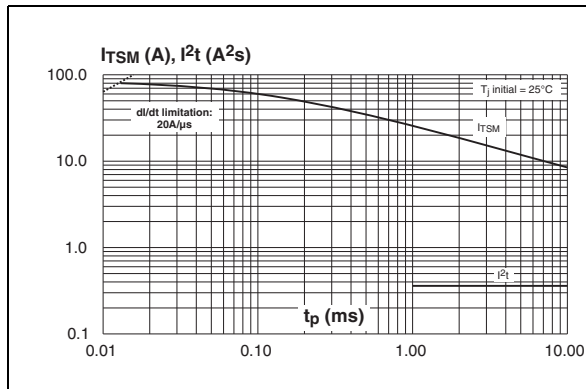
**Figure 5. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)**



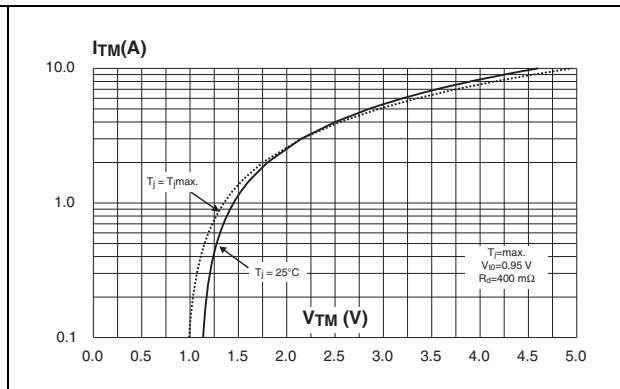
**Figure 6. Surge peak on-state current versus number of cycles**



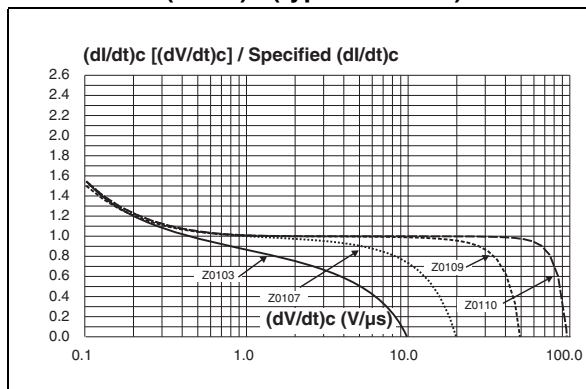
**Figure 7. Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms and corresponding value of  $I^2t$**



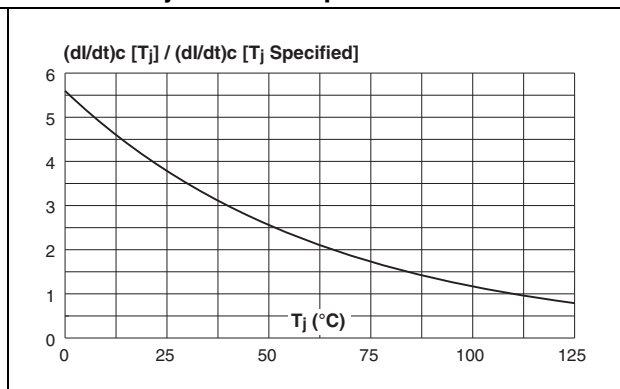
**Figure 8. On-state characteristics (maximum values)**



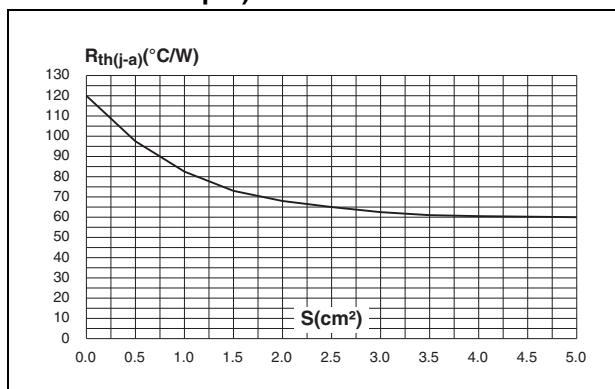
**Figure 9. Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values)**



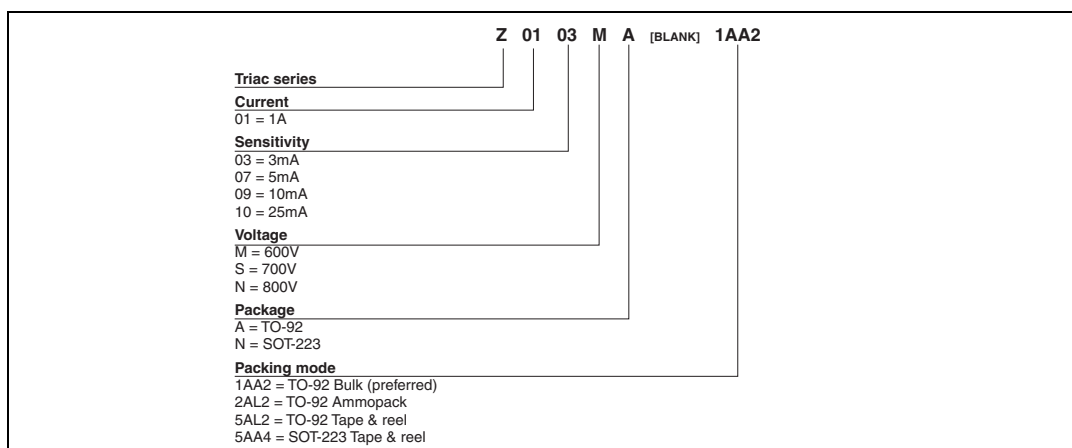
**Figure 10. Relative variation of critical rate of decrease of main current versus junction temperature**



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



## 2 Ordering information scheme



**Table 5. Product Selector**

| Part Number | Voltage |       |       | Sensitivity | Type     | Package |
|-------------|---------|-------|-------|-------------|----------|---------|
|             | 600 V   | 700 V | 800 V |             |          |         |
| Z0103MA     | X       |       |       | 3 mA        | Standard | TO-92   |
| Z0103MN     | X       |       |       | 3 mA        | Standard | SOT-223 |
| Z0103SA     |         | X     |       | 3 mA        | Standard | TO-92   |
| Z0103SN     |         | X     |       | 3 mA        | Standard | SOT-223 |
| Z0103NA     |         |       | X     | 3 mA        | Standard | TO-92   |
| Z0103NN     |         |       | X     | 3 mA        | Standard | SOT-223 |
| Z0107MA     | X       |       |       | 5 mA        | Standard | TO-92   |
| Z0107MN     | X       |       |       | 5 mA        | Standard | SOT-223 |
| Z0107SA     |         | X     |       | 5 mA        | Standard | TO-92   |
| Z0107SN     |         | X     |       | 5 mA        | Standard | SOT-223 |
| Z0107NA     |         |       | X     | 5 mA        | Standard | TO-92   |
| Z0107NN     |         |       | X     | 5 mA        | Standard | SOT-223 |
| Z0109MA     | X       |       |       | 10 mA       | Standard | TO-92   |
| Z0109MN     | X       |       |       | 10 mA       | Standard | SOT-223 |
| Z0109SA     |         | X     |       | 10 mA       | Standard | TO-92   |
| Z0109SN     |         | X     |       | 10 mA       | Standard | SOT-223 |
| Z0109NA     |         |       | X     | 10 mA       | Standard | TO-92   |
| Z0109NN     |         |       | X     | 10 mA       | Standard | SOT-223 |
| Z0110MA     | X       |       |       | 25 mA       | Standard | TO-92   |
| Z0110MN     | X       |       |       | 25 mA       | Standard | SOT-223 |
| Z0110SA     |         | X     |       | 25 mA       | Standard | TO-92   |
| Z0110SN     |         | X     |       | 25 mA       | Standard | SOT-223 |
| Z0110NA     |         |       | X     | 25 mA       | Standard | TO-92   |
| Z0110NN     |         |       | X     | 25 mA       | Standard | SOT-223 |

### 3 Packaging information

Table 6. SOT-223 Dimensions

| REF. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.80 |        |       | 0.071 |
| A1   |             | 0.02 |      |        | 0.001 |       |
| B    | 0.60        | 0.70 | 0.80 | 0.024  | 0.027 | 0.031 |
| B1   | 2.90        | 3.00 | 3.10 | 0.114  | 0.118 | 0.122 |
| c    | 0.24        | 0.26 | 0.32 | 0.009  | 0.010 | 0.013 |
| 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     |      |      |        |       |       |

Figure 12. SOT-223 Footprint dimensions (in millimeters)

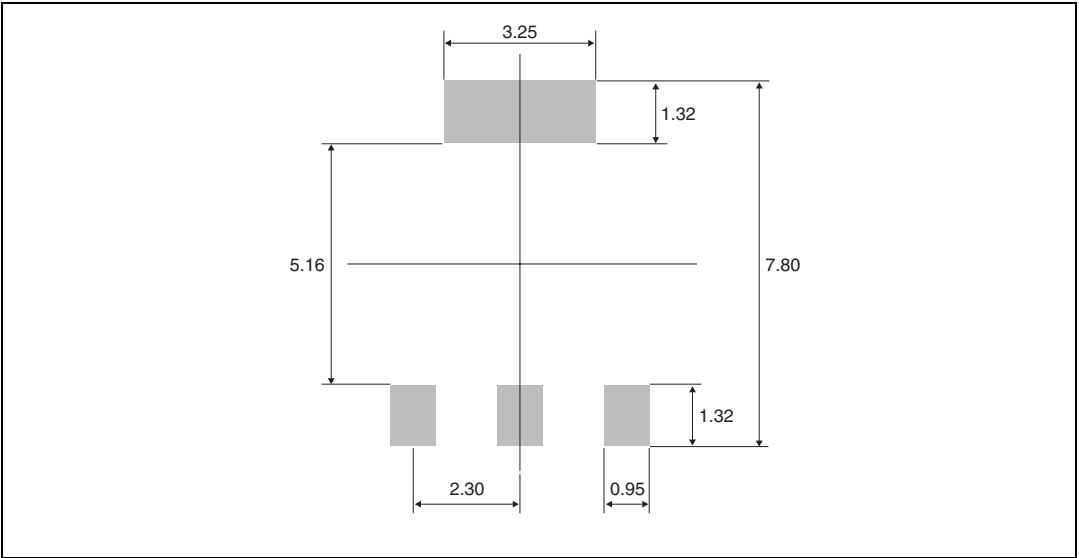


Table 7. TO-92 Dimensions

| REF. | DIMENSIONS  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Millimeters |      |      | Inches |       |       |
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             | 1.35 |      |        | 0.053 |       |
| B    |             |      | 4.70 |        |       | 0.185 |
| C    |             | 2.54 |      |        | 0.100 |       |
| D    | 4.40        |      |      | 0.173  |       |       |
| E    | 12.70       |      |      | 0.500  |       |       |
| F    |             |      | 3.70 |        |       | 0.146 |
| a    |             |      | 0.50 |        |       | 0.019 |

## 4 Ordering information

| Ordering type <sup>(1)</sup> | Marking <sup>(1)</sup> | Package | Weight | Base quantity | Delivery mode |
|------------------------------|------------------------|---------|--------|---------------|---------------|
| Z01xxyA 1AA2                 | Z01xxyA                | TO-92   | 0.2 g  | 2500          | Bulk          |
| Z01xxyA 2AL2                 | Z01xxyA                | TO-92   | 0.2 g  | 2000          | Ammopack      |
| Z01xxyA 5AL2                 | Z01xxyA                | TO-92   | 0.2 g  | 2000          | Tape and reel |
| Z0103yN 5AA4                 | Z3y                    | SOT-223 | 0.12 g | 1000          | Tape and reel |
| Z0107yN 5AA4                 | Z7y                    | SOT-223 | 0.12 g | 1000          | Tape and reel |
| Z0109yN 5AA4                 | Z9y                    | SOT-223 | 0.12 g | 1000          | Tape and reel |

1. xx = sensitivity, y = voltage

## 5 Revision History

| Date        | Revision | Description of Changes                                                                                                     |
|-------------|----------|----------------------------------------------------------------------------------------------------------------------------|
| Oct-2001    | 4        | Last update.                                                                                                               |
| 10-Feb-2005 | 5        | Package: TO-92 tape and reel delivery mode 5AL2 added.                                                                     |
| 09-May-2005 | 6        | Table 4 on page 2: typo. mistake corrected<br>1. $(dV/dt)_c$ instead of $(dI/dt)_c$<br>2. $V/\mu s$ unit instead of $A/ms$ |
| 21-Apr-2006 | 7        | Reformatted to current standard. Table 2 on page 2: Typo corrected. Values for $I_{GT}$ split into two separate rows.      |
| 10-Oct-2006 | 8        | Table 2: modified test conditions for $(dV/dt)_c$ . Changed “ambient” to “lead or tab” in Figure 2.                        |

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