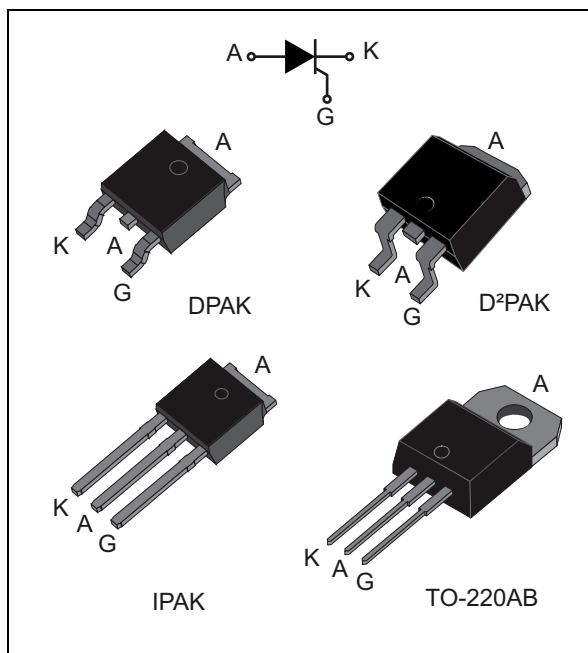




### Features

- On-state RMS current,  $I_{T(RMS)}$  12 A
- Repetitive peak off-state voltage,  $V_{DRM}$  and  $V_{RRM}$  600 V, 800 V and 1000 V
- Triggering gate current,  $I_{GT}$  5 mA or 15 mA

### Description

The standard 12 A SCR series is suitable to fit all modes of control, found in applications such as overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition and voltage regulation circuits.

Available in through-hole or surface-mount packages, they provide an optimized performance in a limited space.

Table 1. Device summary

| Order code     | Voltage $V_{DRM}$ / $V_{RRM}$ (V) |     |      | $I_{GT}$ (mA) | Package  |
|----------------|-----------------------------------|-----|------|---------------|----------|
|                | 600                               | 800 | 1000 |               |          |
| TYN1012RG      |                                   |     | x    | 15            | TO-220AB |
| TYN1012TRG     |                                   |     | x    | 5             | TO-220AB |
| TYN612RG       | x                                 |     |      | 15            | TO-220AB |
| TYN612TRG      | x                                 |     |      | 5             | TO-220AB |
| TYN812RG       |                                   | x   |      | 15            | TO-220AB |
| TYN812TRG      |                                   | x   |      | 5             | TO-220AB |
| TN1215-600B    | x                                 |     |      | 15            | DPAK     |
| TN1215-600B-TR | x                                 |     |      | 15            | DPAK     |
| TN1215-600G    | x                                 |     |      | 15            | D²PAK    |
| TN1215-600G-TR | x                                 |     |      | 15            | D²PAK    |
| TN1215-600H    | x                                 |     |      | 15            | IPAK     |
| TN1215-800B-TR |                                   | x   |      | 15            | DPAK     |
| TN1215-800G-TR |                                   | x   |      | 15            | D²PAK    |
| TN1215-800H    |                                   | x   |      | 15            | IPAK     |

# 1 Characteristics

Table 2. Absolute ratings (limiting values)

| Symbol                             | Parameter                                                                                                       |                                     |                               | Value                                 |                                                                                        | Unit             |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------|---------------------------------------|----------------------------------------------------------------------------------------|------------------|
|                                    |                                                                                                                 |                                     |                               | TN1215-x00B<br>TN1215-x00H<br>(1) (2) | TN1215-x00G <sup>(1)(2)</sup><br>TYNx12 <sup>(2)(3)</sup><br>TYNx12T <sup>(2)(3)</sup> |                  |
| I <sub>T(RMS)</sub>                | On-state RMS current<br>(180° conduction angle)                                                                 | TO-220AB ins.<br>D <sup>2</sup> PAK | T <sub>c</sub> = 110 °C       | 12                                    |                                                                                        | A                |
| I <sub>T(AV)</sub>                 | Average on-state current<br>(180° conduction angle)                                                             | DPAK<br>IPAK                        |                               | 8                                     |                                                                                        |                  |
| I <sub>TSM</sub>                   | Non repetitive surge peak<br>on-state current                                                                   | t <sub>p</sub> = 8.3 ms             | T <sub>jinitial</sub> = 25 °C | 115                                   | 145                                                                                    | A                |
|                                    |                                                                                                                 | t <sub>p</sub> = 10 ms              |                               | 110                                   | 140                                                                                    |                  |
| I <sup>2</sup> t                   | I <sup>2</sup> t value for fusing                                                                               |                                     | T <sub>jinitial</sub> = 25 °C | 60                                    | 98                                                                                     | A <sup>2</sup> S |
| di/dt                              | Critical rate of rise of on-<br>state current<br>I <sub>G</sub> = 2 x I <sub>GT</sub> , t <sub>r</sub> ≤ 100 ns | F = 60 Hz                           | T <sub>j</sub> = 125 °C       | 50                                    |                                                                                        | A/μs             |
| I <sub>GM</sub>                    | Peak gate current                                                                                               | t <sub>p</sub> = 20 μs              | T <sub>j</sub> = 125 °C       | 4                                     |                                                                                        | A                |
| P <sub>G(AV)</sub>                 | Average gate power dissipation                                                                                  |                                     | T <sub>j</sub> = 125 °C       | 1                                     |                                                                                        | W                |
| T <sub>stg</sub><br>T <sub>j</sub> | Storage junction temperature range<br>Operating junction temperature range                                      |                                     |                               | - 40 to + 150<br>- 40 to + 125        |                                                                                        | °C               |
| V <sub>RGM</sub>                   | Maximum peak reverse gate voltage                                                                               |                                     |                               | 5                                     |                                                                                        | V                |

1. x00= 600, 800
2. Check [Table 1](#) for devices availability
3. x= 6,8,10

Table 3. Standard electrical characteristics ( $T_j = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| Symbol                                | Test conditions                                                       |                         |      | TN1215-x00 <sup>(1)(2)</sup> |     | TYN <sup>(2)</sup>  |                    | Unit |    |
|---------------------------------------|-----------------------------------------------------------------------|-------------------------|------|------------------------------|-----|---------------------|--------------------|------|----|
|                                       |                                                                       |                         |      | -B/-H                        | -G  | x12T <sup>(3)</sup> | x12 <sup>(3)</sup> |      |    |
| I <sub>GT</sub>                       | V <sub>D</sub> = 12 V, R <sub>L</sub> = 33 Ω                          |                         |      | Min.                         | 2   |                     | 0.5                | 2    | mA |
|                                       |                                                                       |                         |      | Max.                         | 15  |                     | 5                  | 15   |    |
| V <sub>GT</sub>                       |                                                                       |                         |      | Max.                         | 1.3 |                     |                    |      | V  |
| V <sub>GD</sub>                       | V <sub>D</sub> = V <sub>DRM</sub> , R <sub>L</sub> = 3.3 kΩ           | T <sub>j</sub> = 125 °C | Min. | 0.2                          |     |                     |                    | V    |    |
| I <sub>H</sub>                        | I <sub>T</sub> = 500 mA, gate open                                    |                         |      | Max.                         | 40  | 30                  | 15                 | 30   | mA |
| I <sub>L</sub>                        | I <sub>G</sub> = 1.2 I <sub>GT</sub>                                  |                         |      | Max.                         | 80  | 60                  | 30                 | 60   | mA |
| dV/dt                                 | V <sub>D</sub> = 67% V <sub>DRM</sub> , gate open                     | T <sub>j</sub> =125 °C  | Min. | 200                          |     | 40                  | 200                | V/μs |    |
| V <sub>TM</sub>                       | I <sub>TM</sub> = 24 A    t <sub>p</sub> = 380 μs                     | T <sub>j</sub> = 25 °C  | Max. | 1.6                          |     |                     |                    | V    |    |
| V <sub>to</sub>                       | Threshold voltage                                                     | T <sub>j</sub> = 125 °C | Max. | 0.85                         |     |                     |                    | V    |    |
| R <sub>d</sub>                        | Dynamic resistance                                                    | T <sub>j</sub> = 125 °C | Max. | 30                           |     |                     |                    | mΩ   |    |
| I <sub>DRM</sub><br>I <sub>R RM</sub> | V <sub>D</sub> = V <sub>R</sub> = V <sub>DRM</sub> = V <sub>RRM</sub> | T <sub>j</sub> = 25 °C  | Max. | 5                            |     |                     |                    | μA   |    |
|                                       |                                                                       | T <sub>j</sub> = 125 °C |      | 2                            |     |                     |                    | mA   |    |

1. x00= 600, 800

2. Check [Table 1](#) for devices availability

3. x= 6,8,10

Table 4. Thermal resistance

| Symbol        | Parameter                |                                                | Value | Unit                 |
|---------------|--------------------------|------------------------------------------------|-------|----------------------|
| $R_{th(j-c)}$ | Junction to case (DC)    | D <sup>2</sup> PAK, DPAK, IPAK, TO-220AB       | 1.3   | $^{\circ}\text{C/W}$ |
| $R_{th(j-a)}$ | Junction to ambient (DC) | $S^{(1)} = 0.5\text{ cm}^2$ DPAK               | 70    | $^{\circ}\text{C/W}$ |
|               |                          | $S^{(1)} = 1.0\text{ cm}^2$ D <sup>2</sup> PAK | 45    |                      |
|               |                          | IPAK                                           | 100   |                      |
|               |                          | TO-220AB                                       | 60    |                      |

1. S = Copper surface under tab

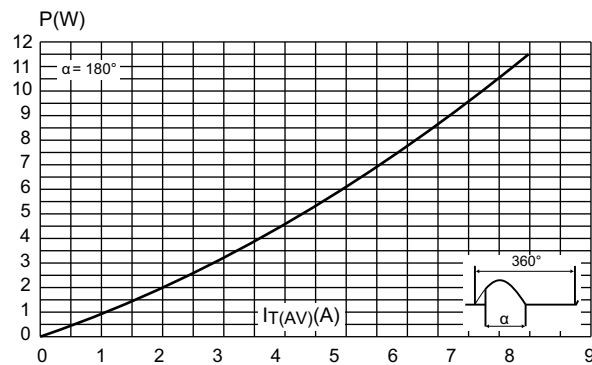
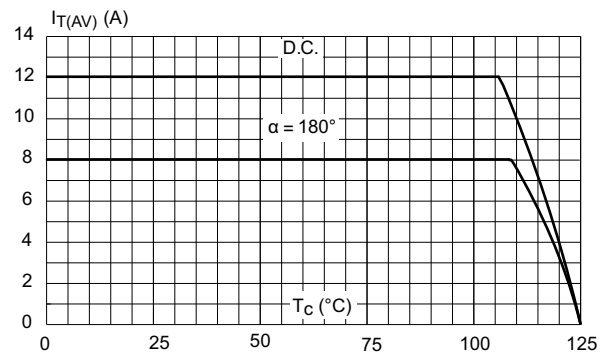
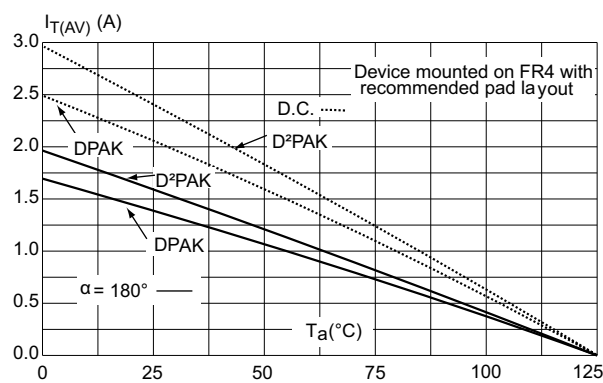
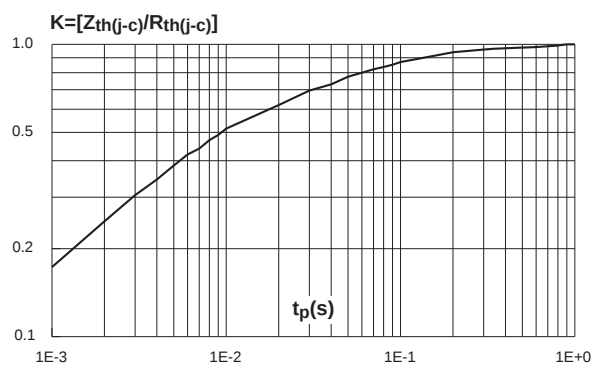
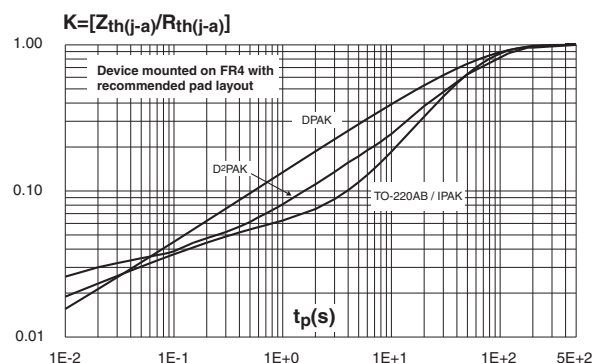
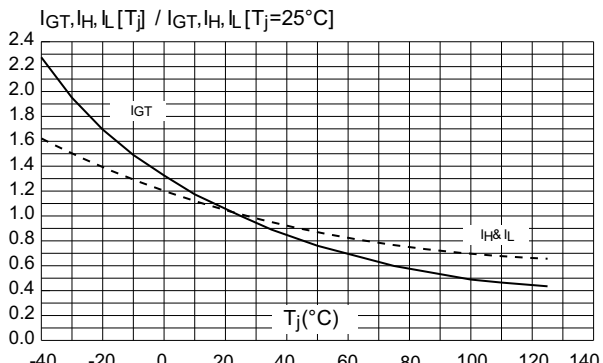
**Figure 1. Maximum average power dissipation versus average on-state current****Figure 2. Average and DC on-state current versus case temperature****Figure 3. Average and DC on-state current versus ambient temperature (DPAK, D<sup>2</sup>PAK)****Figure 4. Relative variation of thermal impedance junction to case versus pulse duration****Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration****Figure 6. Relative variation of gate trigger, latching and holding current versus junction temperature**

Figure 7. Surge peak on-state current versus number of cycles

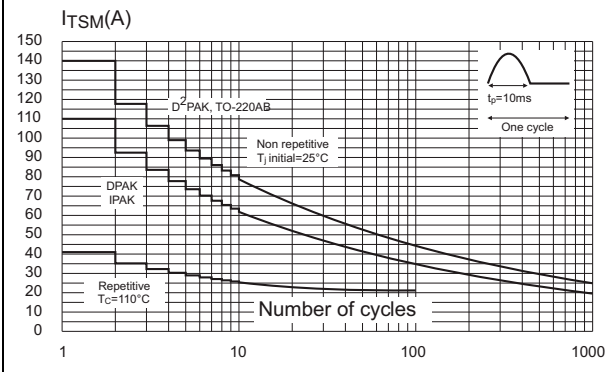


Figure 8. Non repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ ms}$

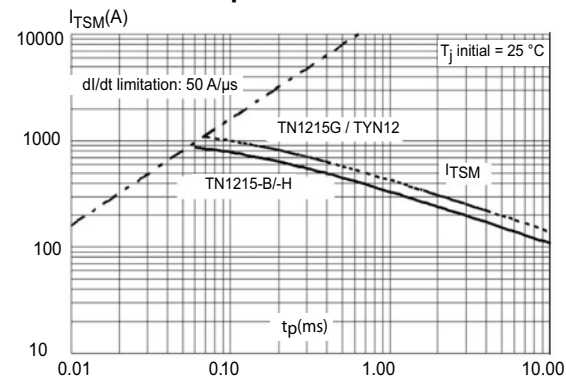


Figure 9. On-state characteristics (maximum values)

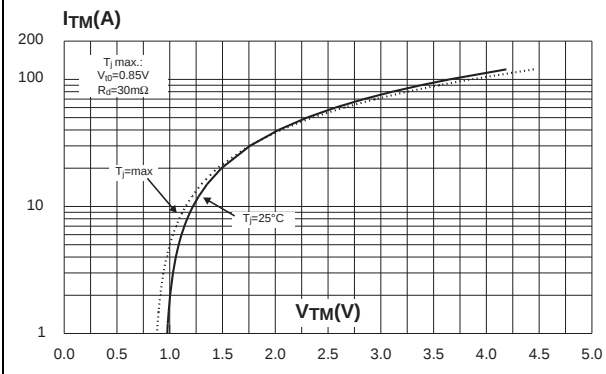
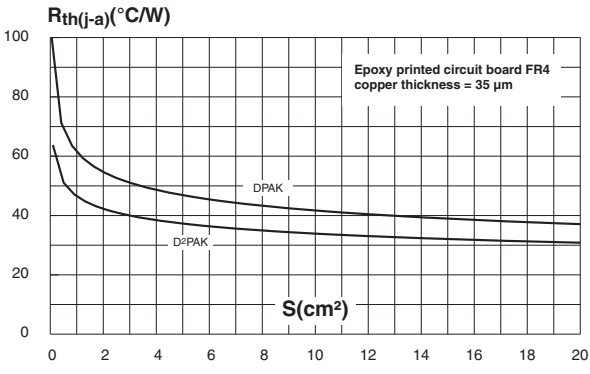


Figure 10. Thermal resistance junction to ambient versus copper surface under tab (DPAK and D²PAK)



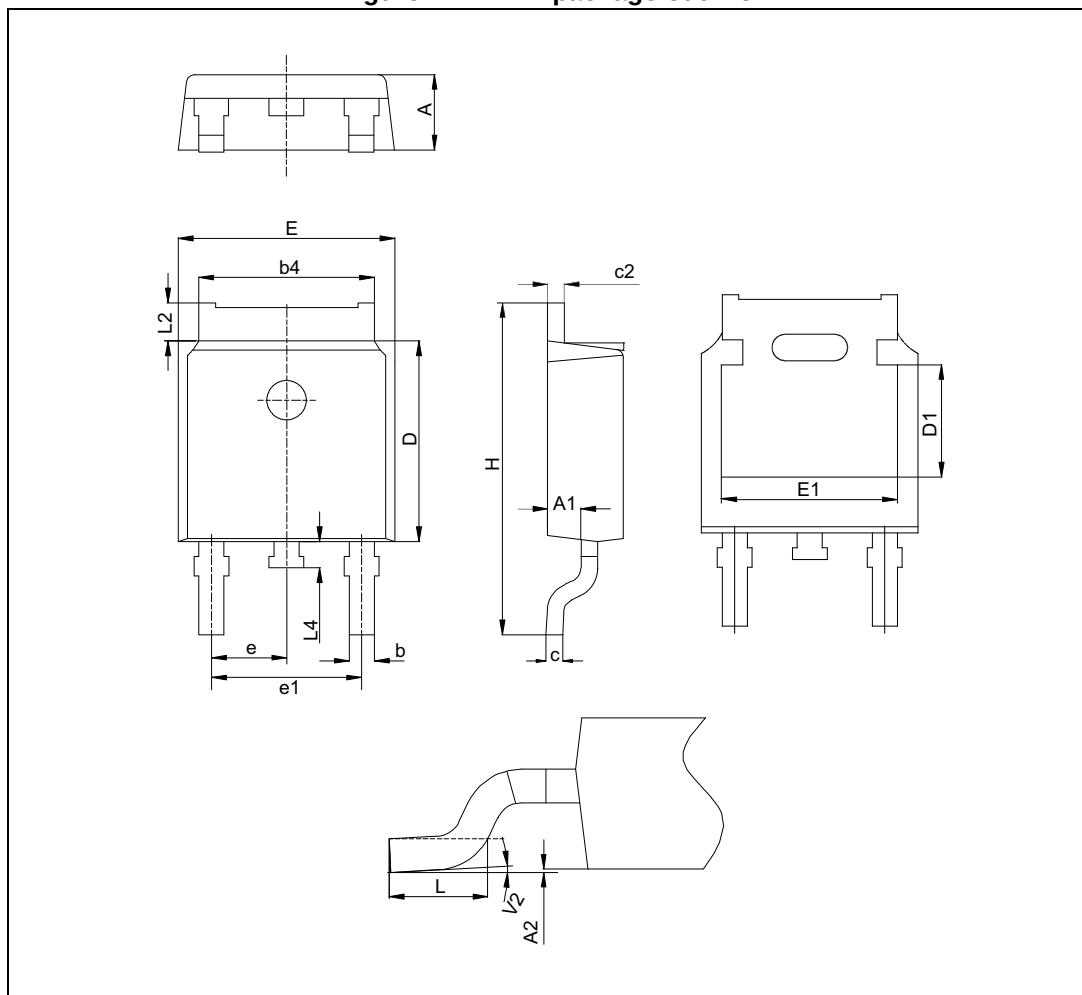
## 2 Package information

- Halogen free molding resin
- Epoxy meets UL94, V0
- Lead-free packages
- Recommended torque: 0.4 to 0.6 N·m (TO-220AB)

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

### 2.1 DPAK package information

Figure 11. DPAK package outline



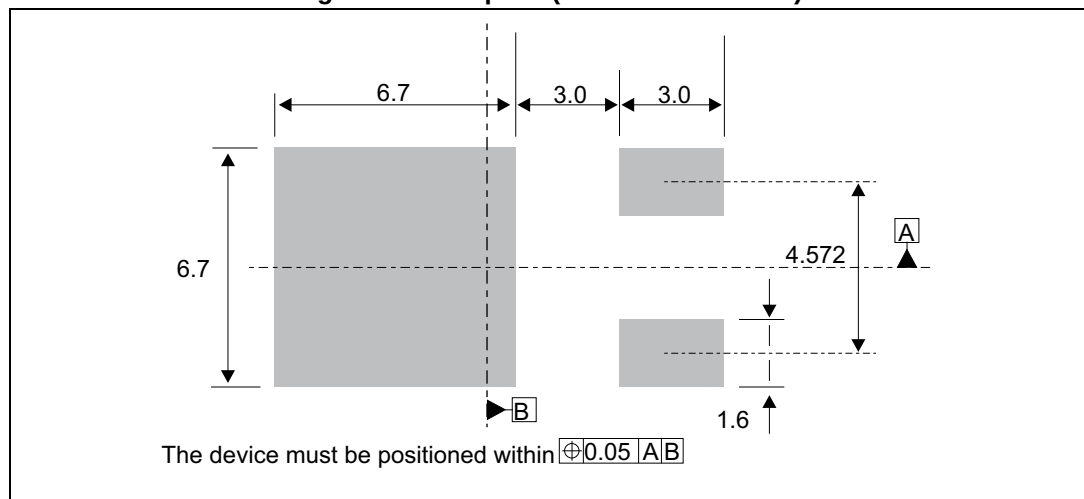
*Note:* This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 5. DPAK package mechanical data

| Ref. | Dimensions  |       |       |                       |        |        |
|------|-------------|-------|-------|-----------------------|--------|--------|
|      | Millimeters |       |       | Inches <sup>(1)</sup> |        |        |
|      | Min.        | Typ.  | Max.  | Min.                  | Typ.   | Max.   |
| A    | 2.18        |       | 2.40  | 0.0858                |        | 0.0945 |
| A1   | 0.9         |       | 1.10  | 0.0354                |        | 0.0433 |
| A2   | 0.03        |       | 0.23  | 0.0012                |        | 0.0091 |
| b    | 0.64        |       | 0.90  | 0.0252                |        | 0.0354 |
| b4   | 4.95        |       | 5.46  | 0.1949                |        | 0.2150 |
| c    | 0.46        |       | 0.61  | 0.0181                |        | 0.0236 |
| c2   | 0.46        |       | 0.60  | 0.0181                |        | 0.0236 |
| D    | 5.97        |       | 6.22  | 0.2350                |        | 0.2449 |
| D1   | 4.95        |       | 5.60  | 0.1949                |        | 0.2205 |
| E    | 6.35        |       | 6.73  | 0.2500                |        | 0.2650 |
| E1   | 4.32        |       | 5.50  | 0.1701                |        | 0.2165 |
| e    |             | 2.286 |       |                       | 0.0900 |        |
| e1   | 4.40        |       | 4.70  | 0.1732                |        | 0.1850 |
| H    | 9.35        |       | 10.40 | 0.3681                |        | 0.4094 |
| L    | 1.0         |       | 1.78  | 0.0394                |        | 0.0701 |
| L2   |             |       | 1.27  |                       |        | 0.0500 |
| L4   | 0.6         |       | 1.02  | 0.0236                |        | 0.0402 |
| V2   | -8°         |       | +8°   | -8°                   |        | +8°    |

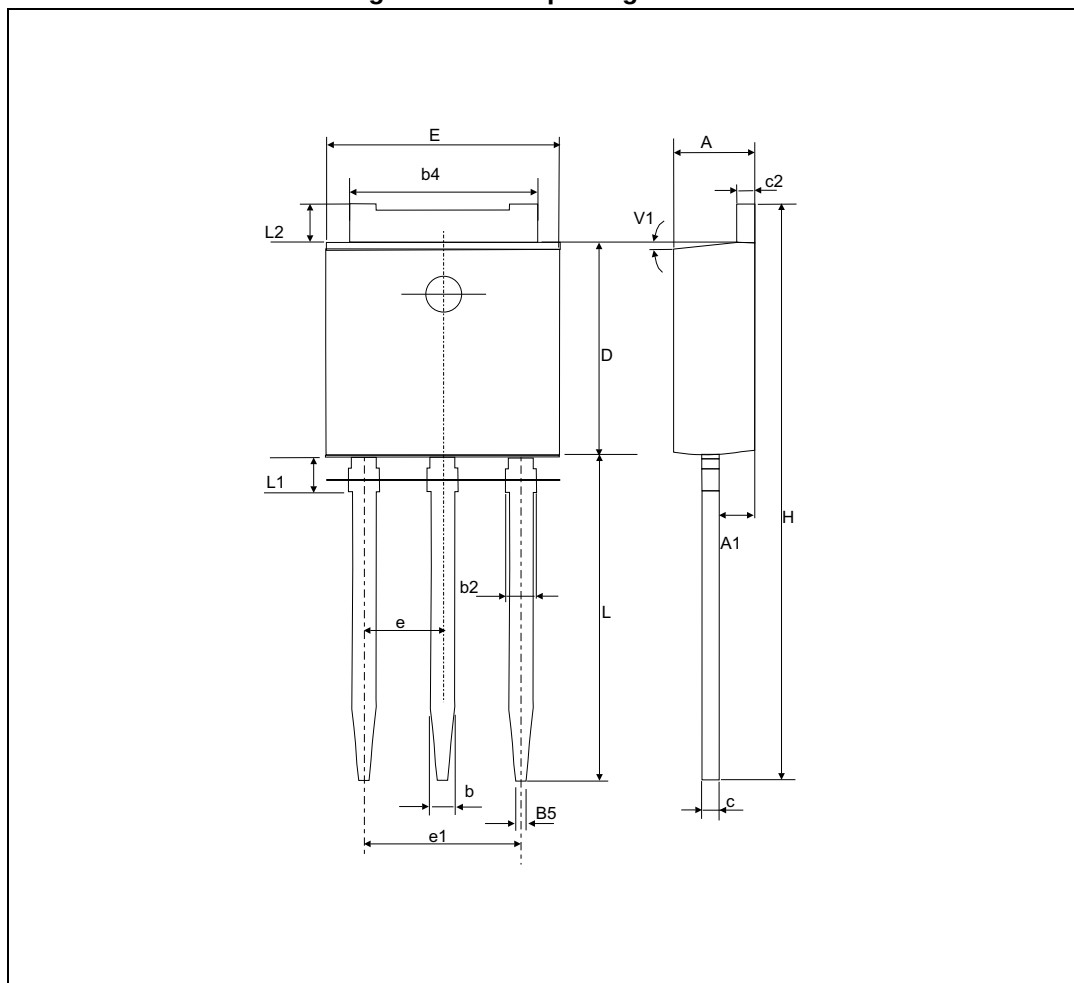
1. Inches only for reference.

Figure 12. Footprint (dimensions in mm)



## 2.2 IPAK package information

Figure 13. IPAK package outline



**Note:** This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. IPAK package mechanical data

| Ref. | Dimensions  |       |      |                       |        |        |
|------|-------------|-------|------|-----------------------|--------|--------|
|      | Millimeters |       |      | Inches <sup>(1)</sup> |        |        |
|      | Min.        | Typ.  | Max. | Min.                  | Typ.   | Max.   |
| A    | 2.20        |       | 2.40 | 0.0866                |        | 0.0945 |
| A1   | 0.90        |       | 1.10 | 0.0354                |        | 0.0433 |
| b    | 0.64        |       | 0.90 | 0.0252                |        | 0.0354 |
| b2   |             |       | 0.95 |                       |        | 0.0374 |
| b4   | 5.20        |       | 5.43 | 0.2047                |        | 0.2138 |
| B5   |             | 0.30  |      |                       | 0.0118 |        |
| c    | 0.45        |       | 0.60 | 0.0177                |        | 0.0236 |
| c2   | 0.46        |       | 0.60 | 0.0181                |        | 0.0236 |
| D    | 6.00        |       | 6.20 | 0.2362                |        | 0.2441 |
| E    | 6.40        |       | 6.65 | 0.2520                |        | 0.2618 |
| e    |             | 2.28  |      |                       | 0.0898 |        |
| e1   | 4.40        |       | 4.60 | 0.1732                |        | 0.1811 |
| H    |             | 16.10 |      |                       | 0.6339 |        |
| L    | 9.00        |       | 9.60 | 0.3543                |        | 0.3780 |
| L1   | 0.80        |       | 1.20 | 0.0315                |        | 0.0472 |
| L2   |             | 0.80  | 1.25 |                       | 0.0315 | 0.0492 |
| V1   |             | 10°   |      |                       | 10°    |        |

1. Inches dimensions given only for reference.

## 2.3 TO-220AB package information

Figure 14. TO-220AB package outline

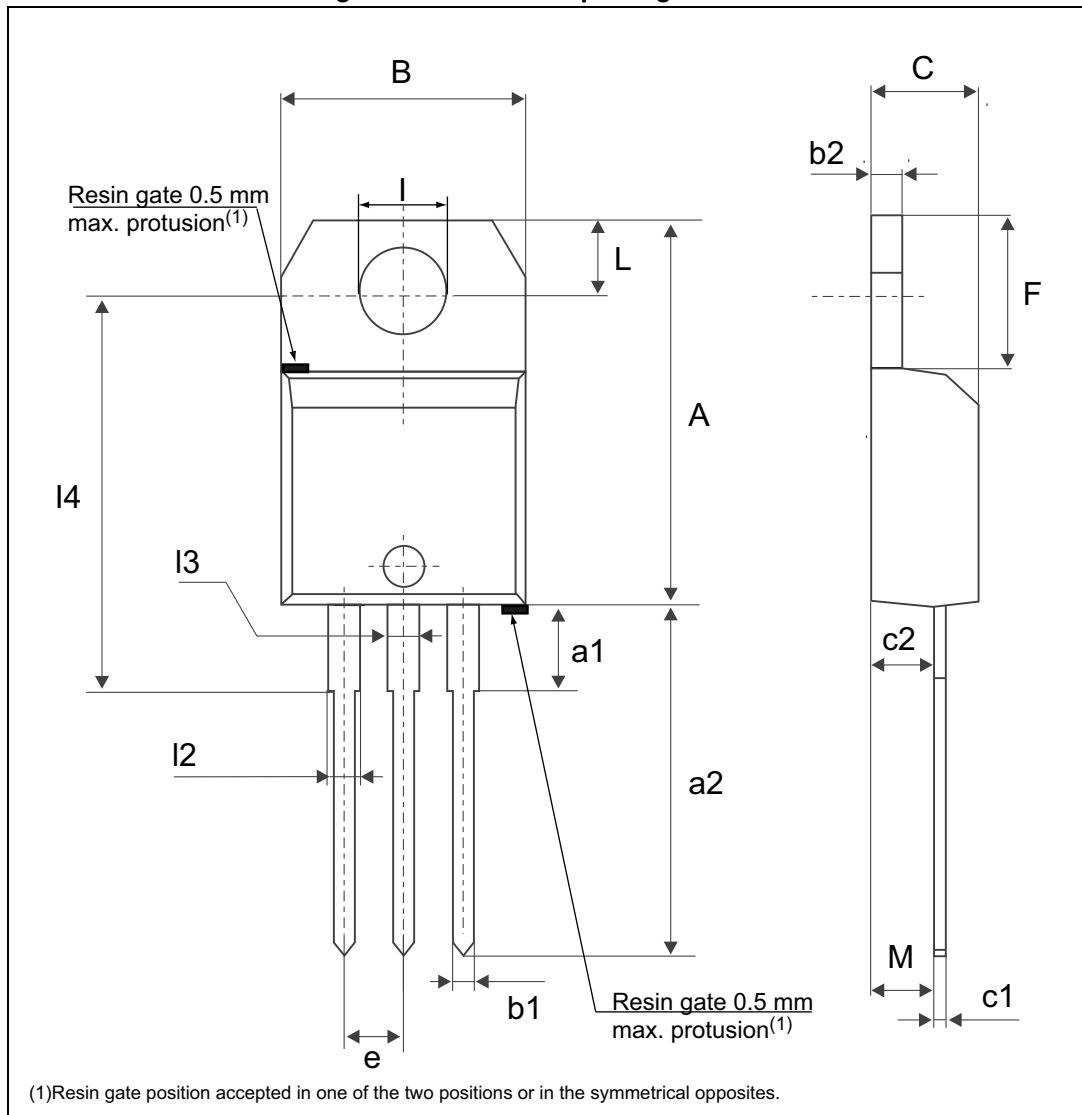


Table 7. TO-220AB package mechanical data

| Ref. | Dimensions  |      |      |                       |        |        |
|------|-------------|------|------|-----------------------|--------|--------|
|      | Millimeters |      |      | Inches <sup>(1)</sup> |        |        |
|      | Min.        | Typ. | Max. | Min.                  | Typ.   | Max.   |
| A    | 15.2        |      | 15.9 | 0.5984                |        | 0.6260 |
| a1   |             | 3.75 |      |                       | 0.1476 |        |
| a2   | 13          |      | 14   | 0.5118                |        | 0.5512 |
| B    | 10          |      | 10.4 | 0.3937                |        | 0.4094 |
| b1   | 0.61        |      | 0.88 | 0.0240                |        | 0.0346 |
| b2   | 1.23        |      | 1.32 | 0.0484                |        | 0.0520 |
| C    | 4.4         |      | 4.6  | 0.1732                |        | 0.1811 |
| c1   | 0.49        |      | 0.7  | 0.0193                |        | 0.0276 |
| c2   | 2.4         |      | 2.72 | 0.0945                |        | 0.1071 |
| e    | 2.40        |      | 2.70 | 0.0945                |        | 0.1063 |
| F    | 6.2         |      | 6.6  | 0.2441                |        | 0.2598 |
| I    | 3.73        |      | 3.88 | 0.1469                |        | 0.1528 |
| L    | 2.65        |      | 2.95 | 0.1043                |        | 0.1161 |
| I2   | 1.14        |      | 1.7  | 0.0449                |        | 0.0669 |
| I3   | 1.14        |      | 1.7  | 0.0449                |        | 0.0669 |
| I4   | 15.8        | 16.4 | 16.8 | 0.6220                | 0.6457 | 0.6614 |
| M    |             | 2.6  |      |                       | 0.1024 |        |

1. Inches dimensions given only for reference.

## 2.4 D<sup>2</sup>PAK package information

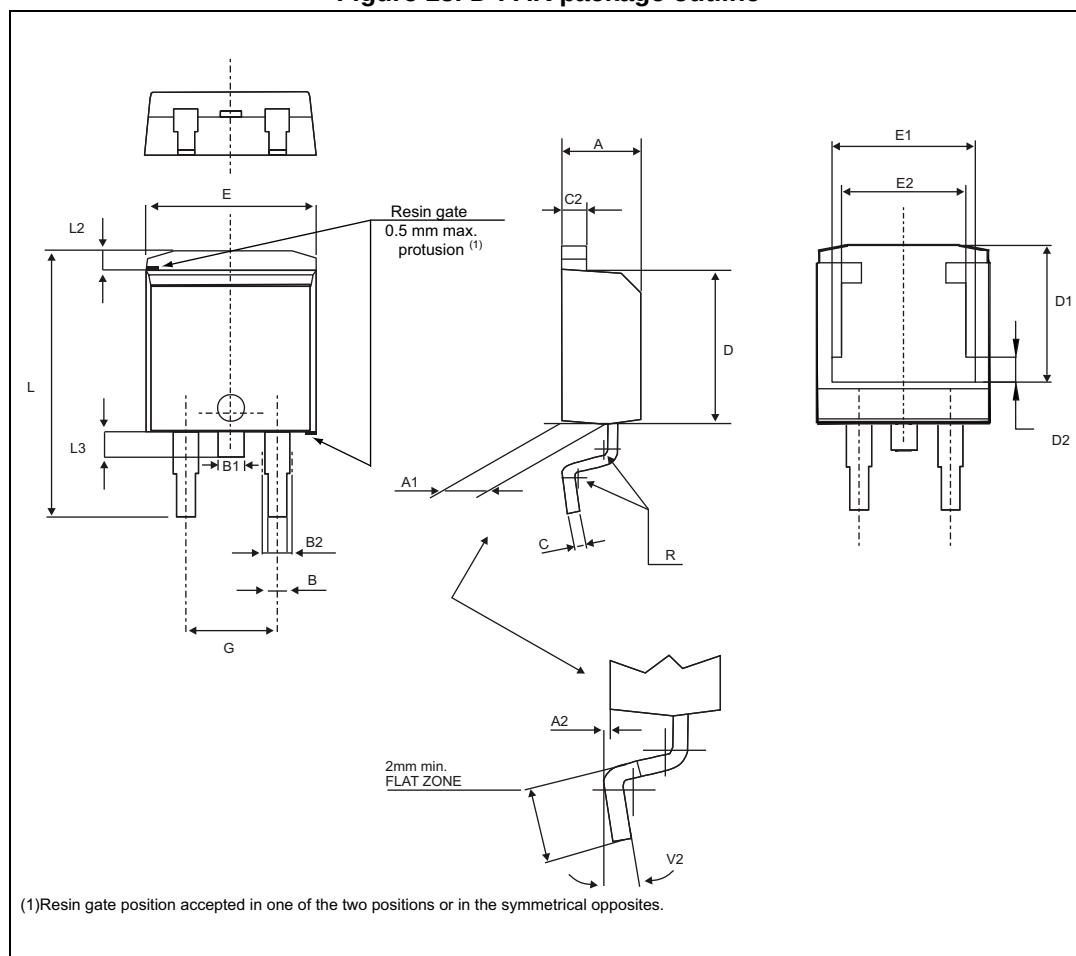
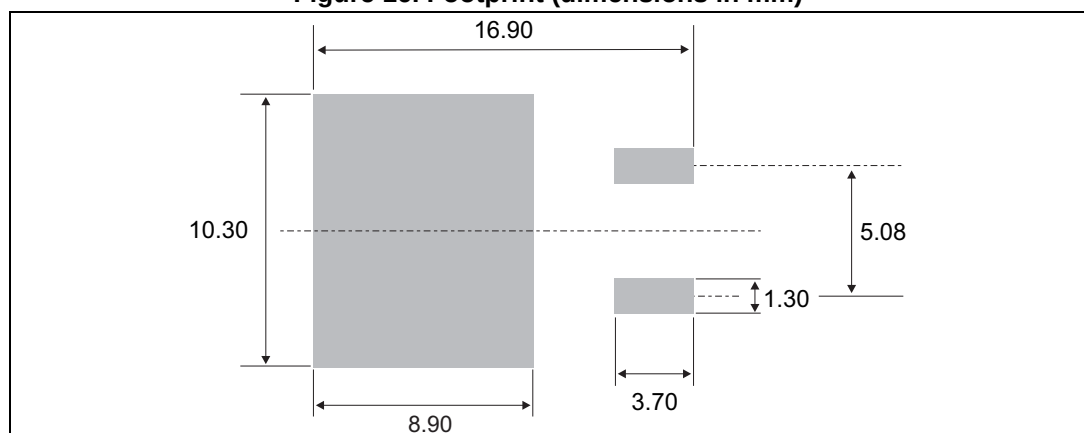
Figure 15. D<sup>2</sup>PAK package outline

Table 8. D<sup>2</sup>PAK package mechanical data

| Ref. | Dimensions  |      |       |                       |        |        |
|------|-------------|------|-------|-----------------------|--------|--------|
|      | Millimeters |      |       | Inches <sup>(1)</sup> |        |        |
|      | Min.        | Typ. | Max.  | Min.                  | Typ.   | Max.   |
| A    | 4.30        |      | 4.60  | 0.1693                |        | 0.1811 |
| A1   | 2.49        |      | 2.69  | 0.0980                |        | 0.1059 |
| A2   | 0.03        |      | 0.23  | 0.0012                |        | 0.0091 |
| B    | 0.70        |      | 0.93  | 0.0276                |        | 0.0366 |
| B2   | 1.25        | 1.40 |       | 0.0492                | 0.0551 |        |
| C    | 0.45        |      | 0.60  | 0.0177                |        | 0.0236 |
| C2   | 1.21        |      | 1.36  | 0.0476                |        | 0.0535 |
| D    | 8.95        |      | 9.35  | 0.3524                |        | 0.3681 |
| D1   | 7.50        |      | 8.0   | 0.2953                |        | 0.3150 |
| D2   | 1.3         |      | 1.7   | 0.0512                |        | 0.0669 |
| E    | 10.00       |      | 10.28 | 0.3937                |        | 0.4047 |
| E1   | 8.3         |      | 8.7   | 0.3268                |        | 0.3425 |
| E2   | 6.85        |      | 7.25  | 0.2697                |        | 0.2854 |
| G    | 4.88        |      | 5.28  | 0.1921                |        | 0.2079 |
| L    | 15.00       |      | 15.85 | 0.5906                |        | 0.6240 |
| L2   | 1.27        |      | 1.40  | 0.0500                |        | 0.0551 |
| L3   | 1.40        |      | 1.75  | 0.0551                |        | 0.0689 |
| R    | 0.40        |      |       | 0.0157                |        |        |
| V2   | 0°          |      | 8°    | 0°                    |        | 8°     |

1. Inches dimensions given only for reference.

Figure 16. Footprint (dimensions in mm)



3      Ordering information

Figure 17. TN1215 series

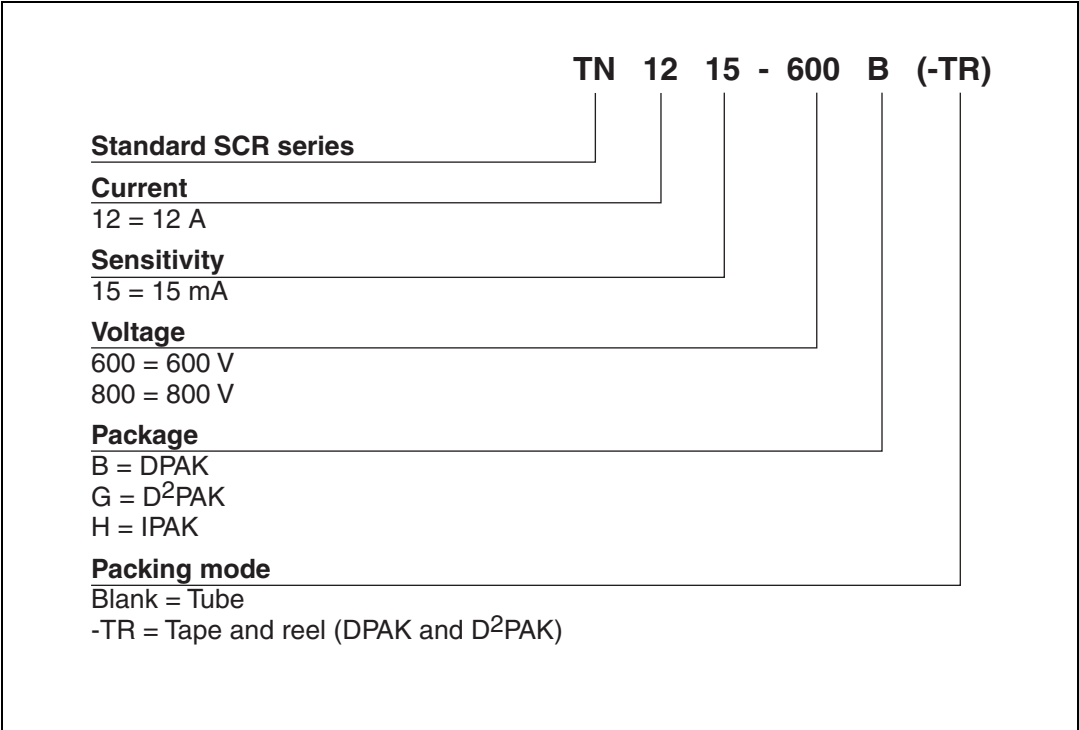


Figure 18. TYNx12 series

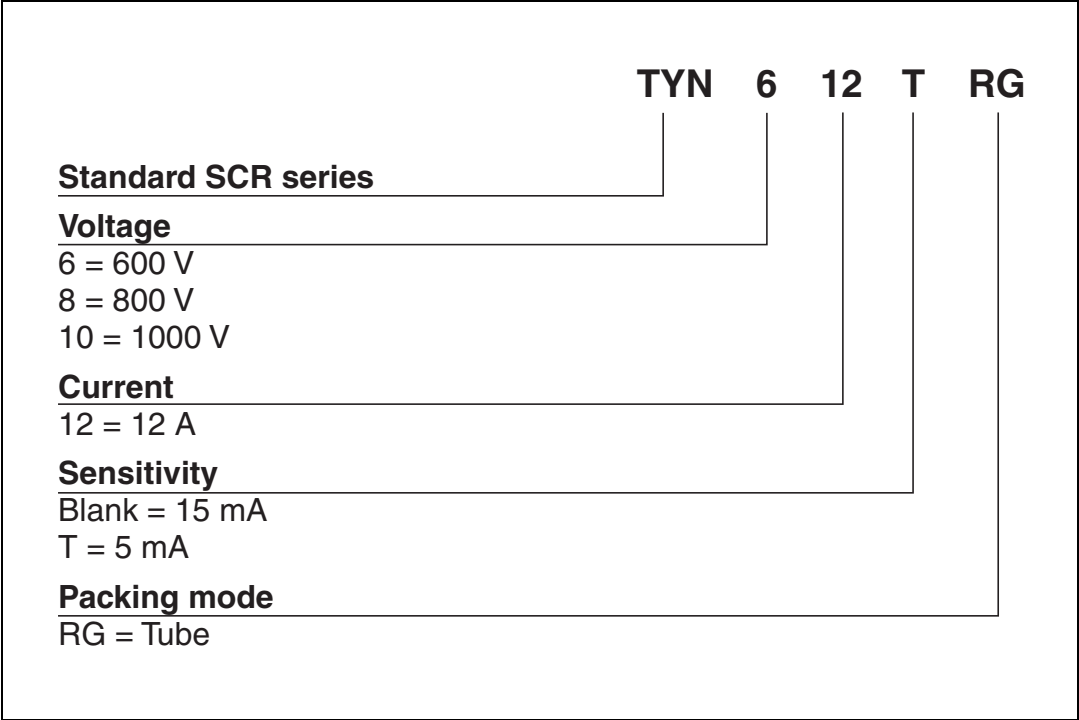


Table 9. Ordering information

| Order code     | Voltage $V_{\text{DRM}} / V_{\text{RRM}}$ (V) |     |      | $I_{\text{GT}}$ (mA) | Package            | Weight (g) | Base qty. (pc) | Delivery mode |
|----------------|-----------------------------------------------|-----|------|----------------------|--------------------|------------|----------------|---------------|
|                | 600                                           | 800 | 1000 |                      |                    |            |                |               |
| TYN1012RG      |                                               |     | x    | 15                   | TO-220AB           | 2.3        | 50             | Tube          |
| TYN1012TRG     |                                               |     | x    | 5                    | TO-220AB           | 2.3        | 50             | Tube          |
| TYN612RG       | x                                             |     |      | 15                   | TO-220AB           | 2.3        | 50             | Tube          |
| TYN612TRG      | x                                             |     |      | 5                    | TO-220AB           | 2.3        | 50             | Tube          |
| TYN812RG       |                                               | x   |      | 15                   | TO-220AB           | 2.3        | 50             | Tube          |
| TYN812TRG      |                                               | x   |      | 5                    | TO-220AB           | 2.3        | 50             | Tube          |
| TN1215-600B    | x                                             |     |      | 15                   | DPAK               | 0.3        | 75             | Tube          |
| TN1215-600B-TR | x                                             |     |      | 15                   | DPAK               | 0.3        | 2500           | Tape and reel |
| TN1215-600G    | x                                             |     |      | 15                   | D <sup>2</sup> PAK | 1.5        | 50             | Tube          |
| TN1215-600G-TR | x                                             |     |      | 15                   | D <sup>2</sup> PAK | 1.5        | 1000           | Tape and reel |
| TN1215-600H    | x                                             |     |      | 15                   | IPAK               | 0.3        | 75             | Tube          |
| TN1215-800B-TR |                                               | x   |      | 15                   | DPAK               | 0.3        | 2500           | Tape and reel |
| TN1215-800G-TR |                                               | x   |      | 15                   | D <sup>2</sup> PAK | 1.5        | 1000           | Tape and reel |
| TN1215-800H    |                                               | x   |      | 15                   | IPAK               | 0.3        | 75             | Tube          |

## 4 Revision history

**Table 10. Document revision history**

| Date        | Revision | Changes                                                                                                                                                |
|-------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sep-2000    | 3        | Last update.                                                                                                                                           |
| 25-Mar-2005 | 4        | TO-220AB delivery mode changed from bulk to tube.                                                                                                      |
| 14-Oct-2005 | 5        | Changed sensitivity values in <i>Table 1</i> for TYNx12 (30 to 15 mA) and TYNx12T (15 to 5 mA). Added ECOPACK statement.                               |
| 08-Mar-2007 | 6        | Reformatted to current standard.<br><i>Figure 17: TN1215 series product name corrected.</i><br><i>Figure 23: TS1220 series product name corrected.</i> |
| 23-Oct-2009 | 7        | Added TS1220-xxxT device.                                                                                                                              |
| 03-Jun-2014 | 8        | Updated DPAK and IPAK package information and reformatted to current standard.                                                                         |
| 25-Feb-2015 | 9        | The part number TS1220 series has been moved to a separate document. Removed TO-220AB insulated package information.                                   |
| 29-Jul-2015 | 10       | Updated <i>Figure 11</i> .                                                                                                                             |
| 05-Oct-2016 | 11       | Updated <a href="#">Section 2: Package information</a> .<br>Minor text changes.                                                                        |

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