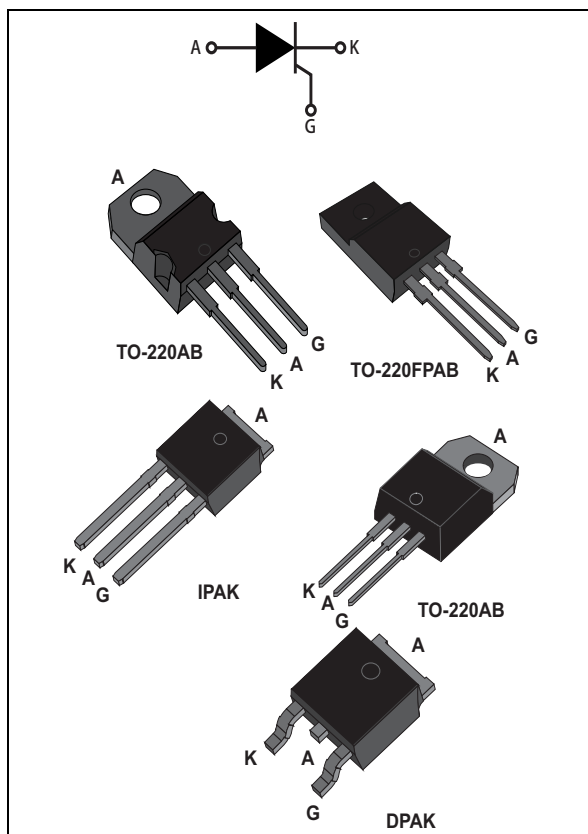




### Features

- On-state rms current,  $I_{T(RMS)}$  8 A
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$  600 and 800 V
- Triggering gate current,  $I_{GT}$  0.2 to 15 mA

### Description

Available either in sensitive (TS8) or standard (TN8 / TYN) gate triggering levels, the 8 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 (x00)<br>$V_{DRM}/V_{RRM}$ |       | Sensitivity<br>$I_{GT}$ | Package    |
|-------------|------------------------------------|-------|-------------------------|------------|
|             | 600 V                              | 800 V |                         |            |
| TS820-600B  | X                                  |       | 0.2 mA                  | DPAK       |
| TS820-600H  | X                                  |       | 0.2 mA                  | IPAK       |
| TS820-600T  | X                                  |       | 0.2 mA                  | TO-220AB   |
| TS820-600FP | X                                  |       | 0.2 mA                  | TO-220FPAB |
| TN805-600B  | X                                  |       | 5 mA                    | DPAK       |
| TN815-x00B  | X                                  | X     | 15 mA                   | DPAK       |
| TYN608RG    | X                                  |       | 15 mA                   | TO-220AB   |

# 1 Characteristics

Table 2. Absolute ratings (limiting values)

| Symbol                             | Parameter                                                                                                |                                    | Value                          |        | Unit |                  |
|------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------|--------|------|------------------|
|                                    |                                                                                                          |                                    | TN805<br>TN815<br>TS820        | TYN608 |      |                  |
| I <sub>T(RMS)</sub>                | On-state rms current (180° conduction angle)                                                             | T <sub>C</sub> = 110 °C            | 8                              |        | A    |                  |
|                                    |                                                                                                          | T0-220FPAB, T <sub>C</sub> = 91 °C |                                |        |      |                  |
| I <sub>T(AV)</sub>                 | Average on-state current (180° conduction angle)                                                         | T <sub>C</sub> = 110 °C            | 5                              |        | A    |                  |
|                                    |                                                                                                          | T0-220FPAB, T <sub>C</sub> = 91 °C |                                |        |      |                  |
| I <sub>TSM</sub>                   | Non repetitive surge peak on-state current                                                               | t <sub>p</sub> = 8.3 ms            | T <sub>j</sub> = 25 °C         | 73     | 100  | A                |
|                                    |                                                                                                          | t <sub>p</sub> = 10 ms             |                                | 70     | 95   |                  |
| I <sup>2</sup> t                   | I <sup>2</sup> t value for fusing                                                                        | t <sub>p</sub> = 10 ms             | T <sub>j</sub> = 25 °C         | 24.5   | 45   | A <sup>2</sup> S |
| dI/dt                              | Critical rate of rise of on-state current 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>RM</sub>                    | Maximum peak reverse gate voltage (for <b>TN8x5</b> and <b>TYN608</b> only)                              |                                    |                                | 5      |      | V                |

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

| Symbol                               | Test conditions                                                                      |                         | TS820 | Unit |      |
|--------------------------------------|--------------------------------------------------------------------------------------|-------------------------|-------|------|------|
| I <sub>GT</sub>                      | V <sub>D</sub> = 12 V, R <sub>L</sub> = 140 Ω                                        |                         | MAX.  | 200  | μA   |
| 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> = 220 Ω | 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> = 65% V <sub>DRM</sub> , R <sub>GK</sub> = 220 Ω                      | T <sub>j</sub> = 125 °C | MIN.  | 5    | V/μs |
| V <sub>TM</sub>                      | I <sub>TM</sub> = 16 A, t <sub>p</sub> = 380 μs                                      | T <sub>j</sub> = 25 °C  | MAX.  | 1.6  | V    |
| V <sub>t0</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.  | 46   | mΩ   |
| I <sub>DRM</sub><br>I <sub>RRM</sub> | V <sub>DRM</sub> = V <sub>RRM</sub> , R <sub>GK</sub> = 220 Ω                        | T <sub>j</sub> = 25 °C  | MAX.  | 5    | μA   |
|                                      |                                                                                      | T <sub>j</sub> = 125 °C |       | 1    | mA   |

Table 4. Standard electrical characteristics ( $T_j = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| Symbol                               | Test conditions                                             |                         | TN805 | TN815 | TYN608 | Unit |      |
|--------------------------------------|-------------------------------------------------------------|-------------------------|-------|-------|--------|------|------|
| I <sub>GT</sub>                      | V <sub>D</sub> = 12 V, R <sub>L</sub> = 33 Ω                |                         | MIN.  | 0.5   | 2      | 2    | mA   |
|                                      |                                                             |                         | MAX.  | 5     | 15     | 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> = 100 mA , gate open                         |                         | MAX.  | 25    | 40     | 30   | mA   |
| I <sub>L</sub>                       | I <sub>G</sub> = 1.2 I <sub>GT</sub>                        |                         | MAX.  | 30    | 50     | 70   | mA   |
| dV/dt                                | V <sub>D</sub> = 67% V <sub>DRM</sub> , gate open           | T <sub>j</sub> =125 °C  | MIN.  | 50    | 150    | 150  | V/μs |
| V <sub>TM</sub>                      | I <sub>TM</sub> = 16 A    t <sub>p</sub> = 380 μs           | T <sub>j</sub> = 25 °C  | MAX.  | 1.6   |        |      | V    |
| V <sub>t0</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.  | 46    |        |      | mΩ   |
| I <sub>DRM</sub><br>I <sub>RRM</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   |

Table 5. Thermal resistance

| Symbol        | Parameter                |                                  | Value | Unit                 |
|---------------|--------------------------|----------------------------------|-------|----------------------|
| $R_{th(j-c)}$ | Junction to case (DC)    | DPAK, IPAK, TO-220AB             | 1.3   | $^{\circ}\text{C/W}$ |
|               |                          | TO-220FPAB                       | 4.6   |                      |
| $R_{th(j-a)}$ | Junction to ambient (DC) | $S^{(1)} = 0.5\text{ cm}^2$ DPAK | 70    | $^{\circ}\text{C/W}$ |
|               |                          | IPAK                             | 100   |                      |
|               |                          | TO-220AB, TO-220FPAB             | 60    |                      |

1.  $S$  = Copper surface under tab

Figure 1. Maximum average power dissipation versus average on-state current

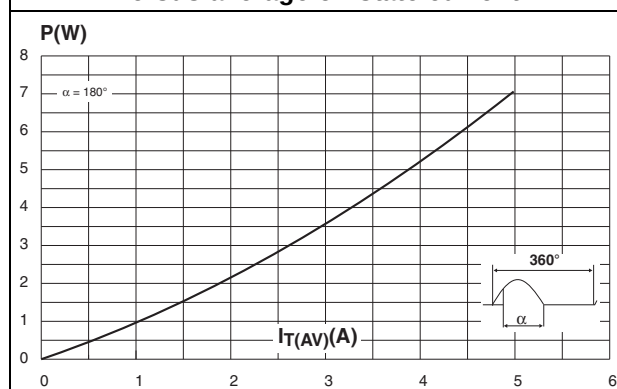
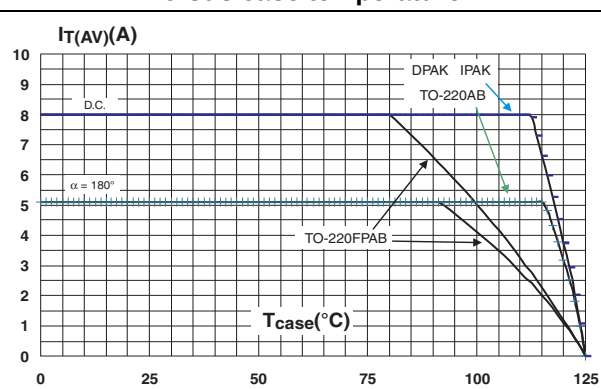
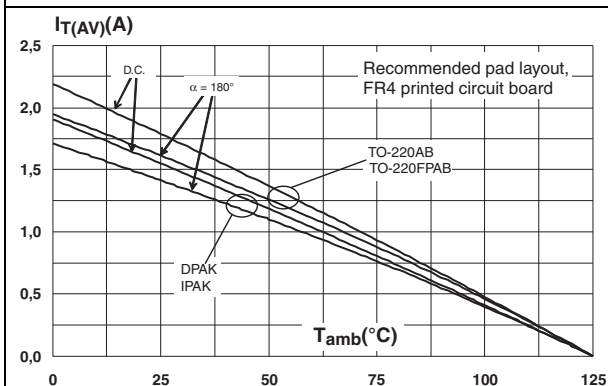
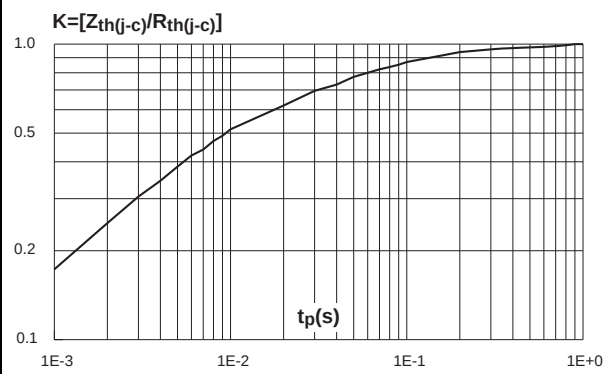
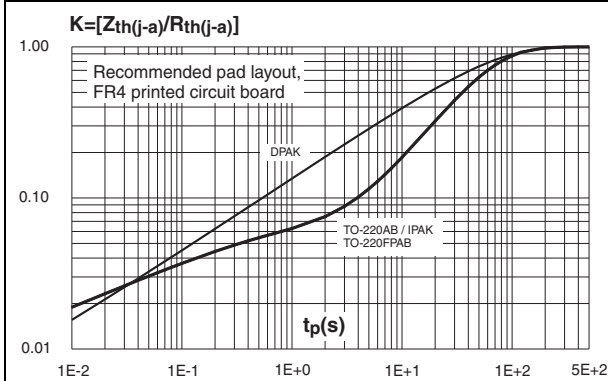
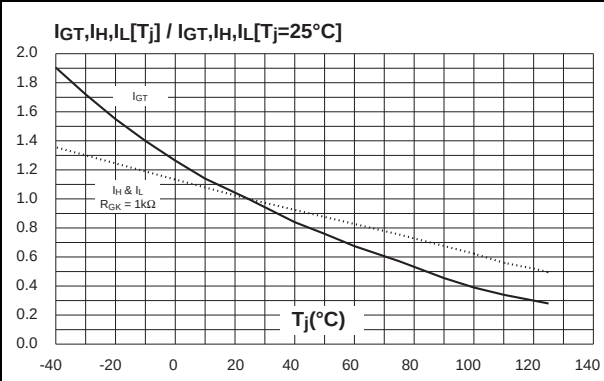
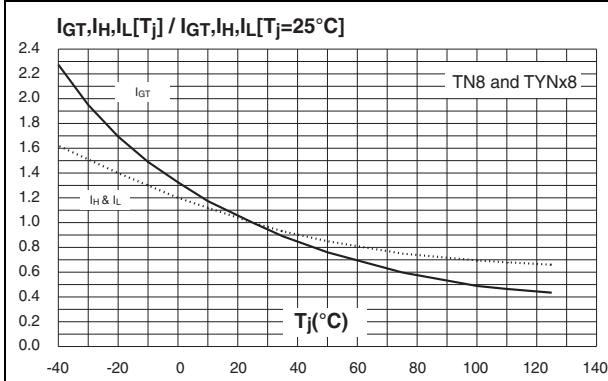
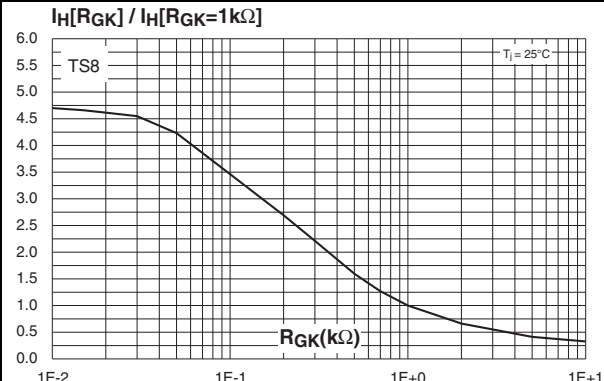
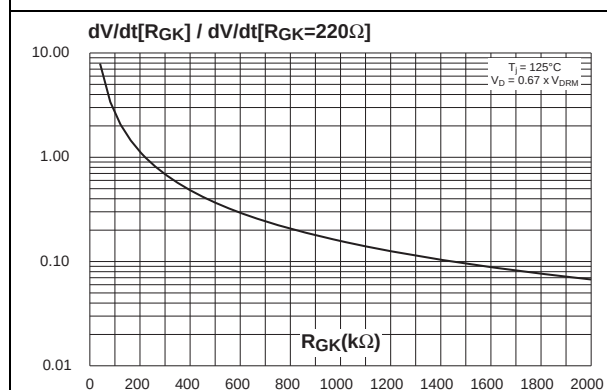


Figure 2. Average and DC on-state current versus case temperature

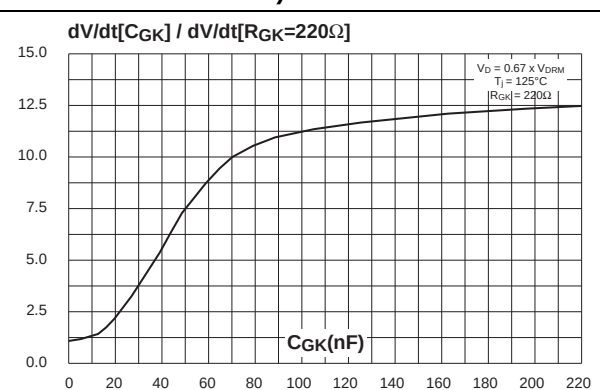


**Figure 3. Average and DC on-state current versus ambient temperature****Figure 4. Relative variation of thermal impedance junction to case versus pulse duration****Figure 5. Relative variation of thermal impedance junction to ambient versus pulse duration****Figure 6. Relative variation of gate trigger current and holding current versus junction temperature for TS820****Figure 7. Relative variation of gate trigger and holding current versus junction temperature****Figure 8. Relative variation of holding current versus gate-cathode resistance (typical values)**

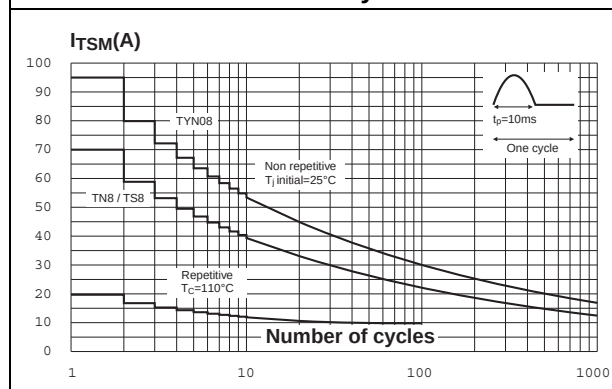
**Figure 9. Relative variation of  $dV/dt$  immunity versus gate-cathode resistance (typical values) for TS820**



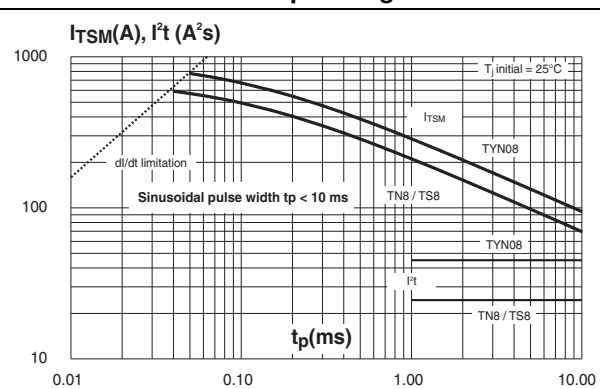
**Figure 10. Relative variation of  $dV/dt$  immunity versus gate-cathode capacitance (typical values) for TS820**



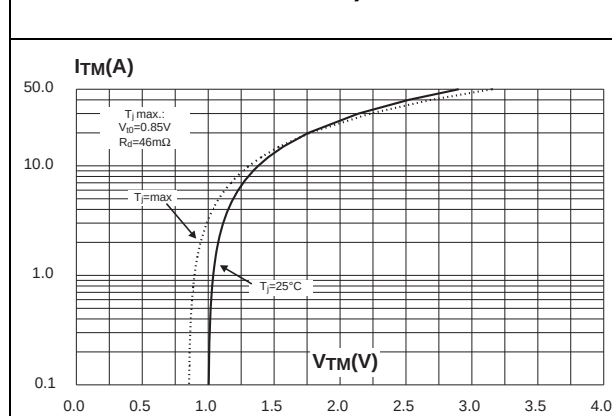
**Figure 11. Surge peak on-state current versus number of cycles**



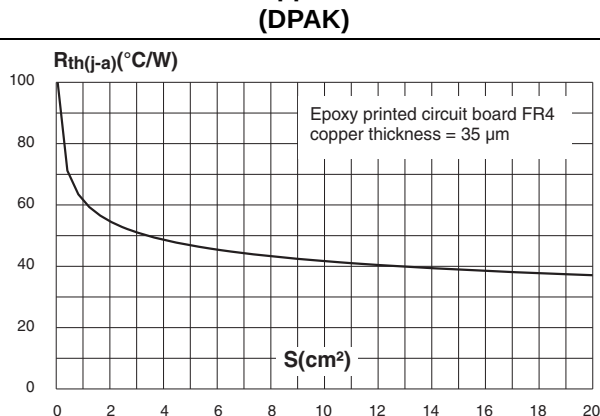
**Figure 12. Non-repetitive surge peak on-state current and corresponding values of  $I^2t$**



**Figure 13. On-state characteristics (maximum values)**



**Figure 14. Thermal resistance junction to ambient versus copper surface under tab (DPAK)**

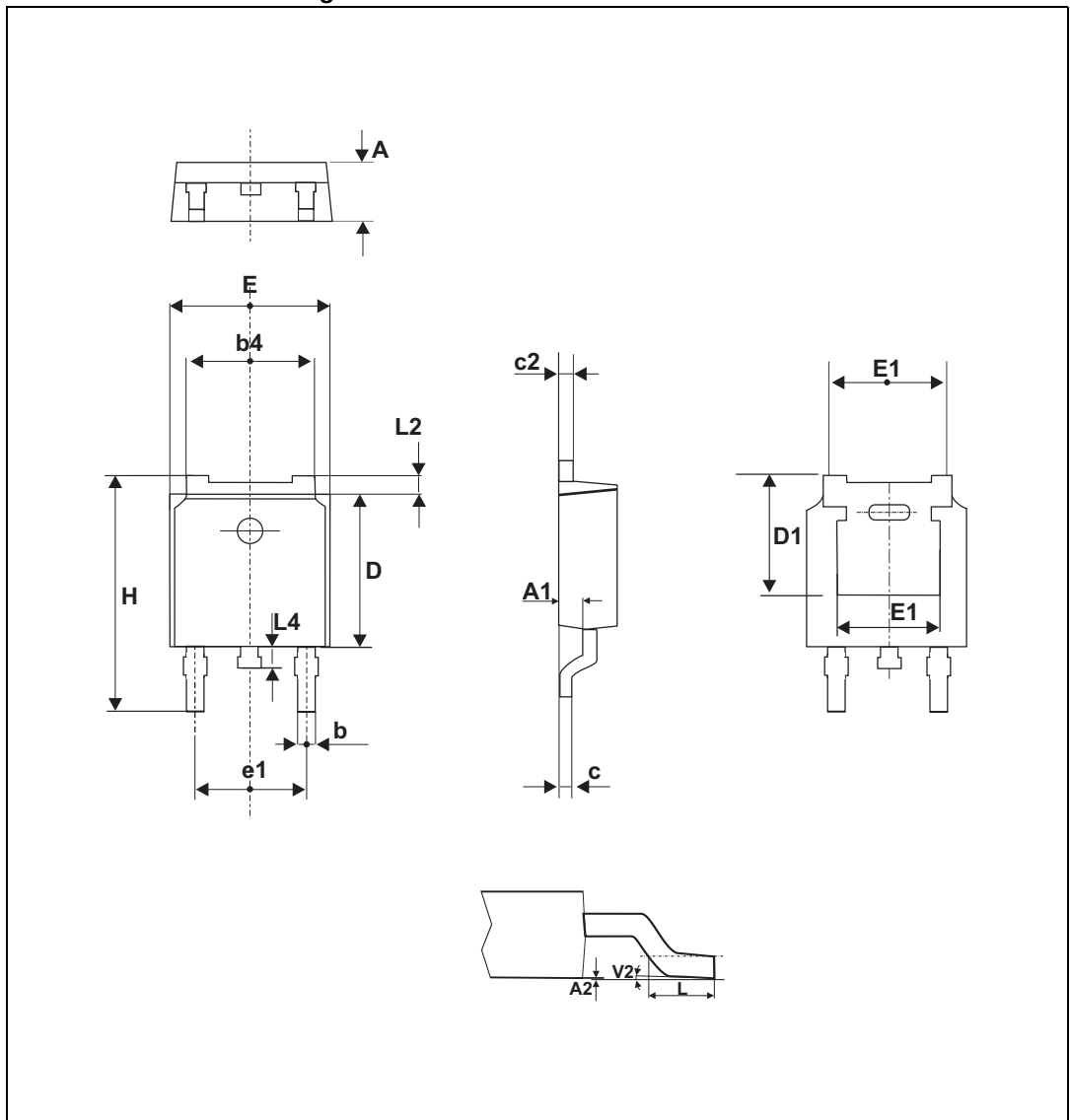


## 2 Package information

- Epoxy meets UL94, V0
- Lead-free packages
- Recommended torque: 0.4 to 0.6 N·m

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.

**Figure 15. DPAK dimension definitions**



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

### Table 6. DPAK dimension values

| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 2.18        |      | 2.40  | 0.086  |       | 0.094 |
| A1   | 0.90        |      | 1.10  | 0.035  |       | 0.043 |
| A2   | 0.03        |      | 0.23  | 0.001  |       | 0.009 |
| b    | 0.64        |      | 0.90  | 0.025  |       | 0.035 |
| b4   | 4.95        |      | 5.46  | 0.195  |       | 0.215 |
| c    | 0.46        |      | 0.61  | 0.018  |       | 0.024 |
| c2   | 0.46        |      | 0.60  | 0.018  |       | 0.023 |
| D    | 5.97        |      | 6.22  | 0.235  |       | 0.244 |
| D1   | 5.10        |      |       | 0.201  |       |       |
| E    | 6.35        |      | 6.73  | 0.250  |       | 0.264 |
| E1   |             | 4.32 |       |        | 0.170 |       |
| e1   | 4.40        |      | 4.70  | 0.173  |       | 0.185 |
| H    | 9.35        |      | 10.40 | 0.368  |       | 0.409 |
| L    | 1.00        |      | 1.78  | 0.039  |       | 0.070 |
| L2   |             |      | 1.27  |        |       | 0.05  |
| L4   | 0.60        |      | 1.02  | 0.023  |       | 0.040 |
| V2   | 0°          |      | 8°    | 0°     |       | 8°    |

**Figure 16. Footprint (dimensions in mm)**

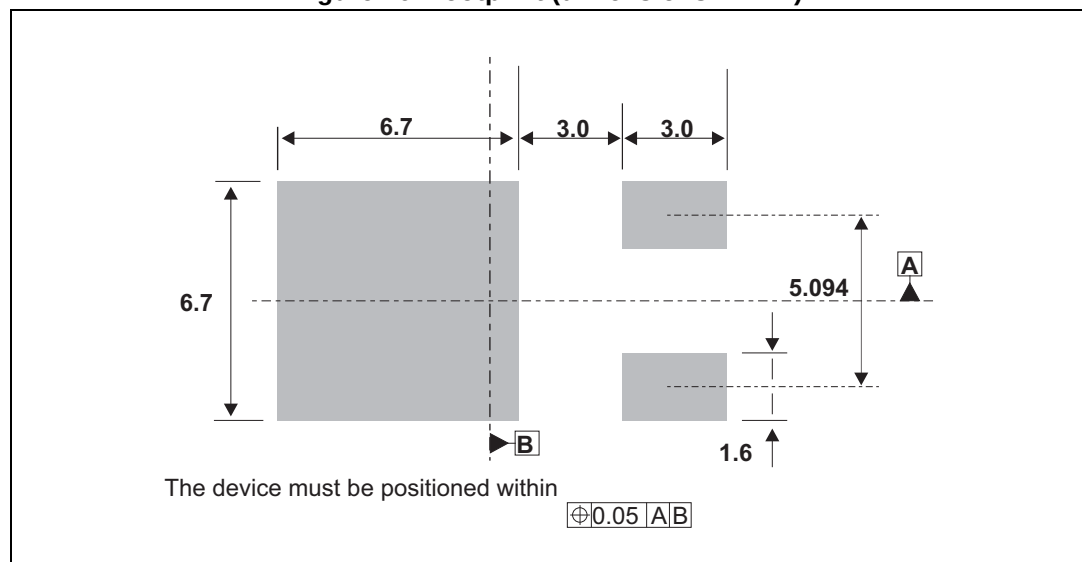
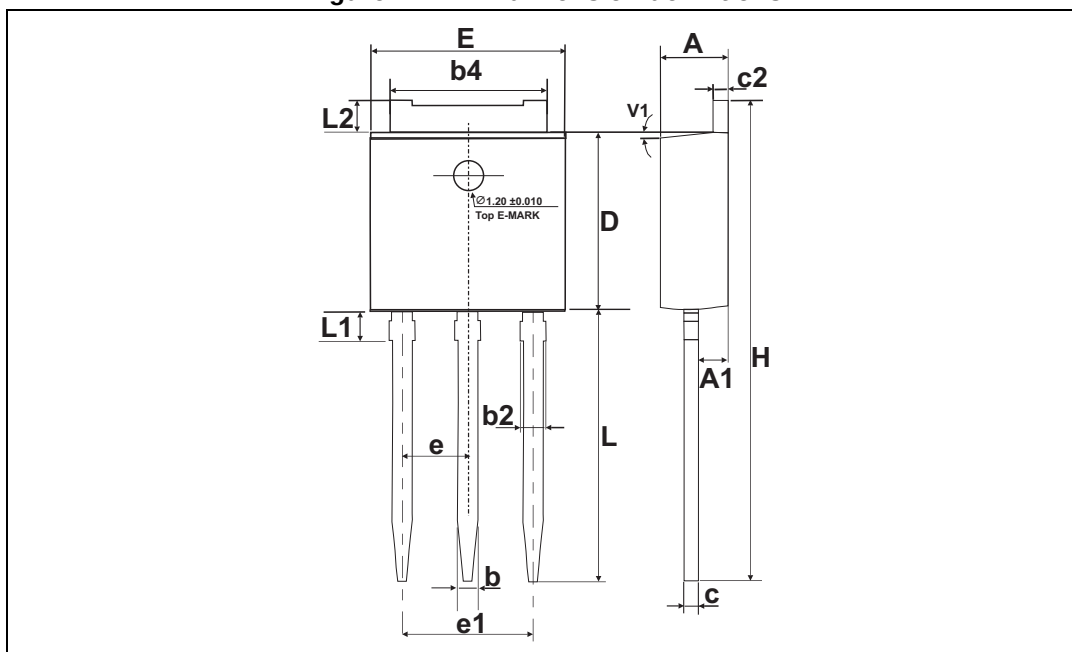


Figure 17. IPAK dimension definitions



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

Table 7. IPAK dimension values

| Ref. | Dimensions  |       |      |        |       |       |
|------|-------------|-------|------|--------|-------|-------|
|      | Millimeters |       |      | Inches |       |       |
|      | Min.        | Typ.  | Max. | Min.   | Typ.  | Max.  |
| A    | 2.20        |       | 2.40 | 0.086  |       | 0.094 |
| A1   | 0.90        |       | 1.10 | 0.035  |       | 0.043 |
| b    | 0.64        |       | 0.90 | 0.025  |       | 0.035 |
| b2   |             |       | 0.95 |        |       | 0.037 |
| b4   | 5.20        |       | 5.43 | 0.204  |       | 0.213 |
| c    | 0.45        |       | 0.60 | 0.017  |       | 0.023 |
| c2   | 0.46        |       | 0.60 | 0.018  |       | 0.023 |
| D    | 6           |       | 6.20 | 0.236  |       | 0.244 |
| E    | 6.40        |       | 6.70 | 0.252  |       | 0.263 |
| e    |             | 2.28  |      |        | 0.090 |       |
| e1   | 4.40        |       | 4.60 | 0.173  |       | 0.181 |
| H    |             | 16.10 |      |        | 0.634 |       |
| L    | 9           |       | 9.60 | 0.354  |       | 0.377 |
| L1   | 0.8         |       | 1.20 | 0.031  |       | 0.047 |



Table 7. IPAK dimension values

|    |  |      |      |  |       |       |
|----|--|------|------|--|-------|-------|
| L2 |  | 0.80 | 1.25 |  | 0.031 | 0.049 |
| V1 |  | 10°  |      |  | 10°   |       |

Figure 18. TO-220AB dimension definitions

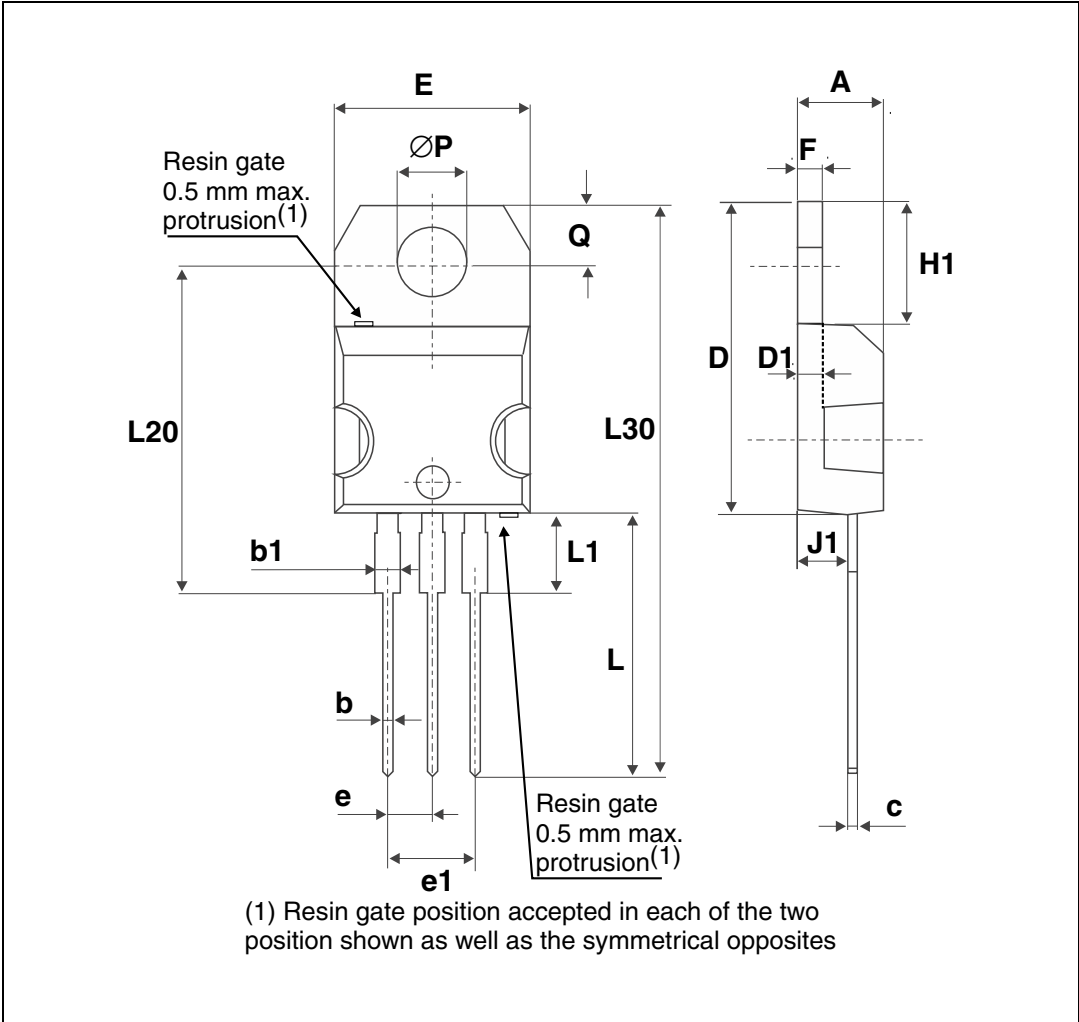


Table 8. TO-220AB dimension values

| Ref. | Dimensions  |       |           |       |
|------|-------------|-------|-----------|-------|
|      | Millimeters |       | Inches    |       |
|      | Min.        | Max.  | Min.      | Max.  |
| A    | 4.40        | 4.60  | 0.17      | 0.18  |
| b    | 0.61        | 0.88  | 0.024     | 0.035 |
| b1   | 1.14        | 1.70  | 0.045     | 0.067 |
| c    | 0.48        | 0.70  | 0.019     | 0.027 |
| D    | 15.25       | 15.75 | 0.60      | 0.62  |
| D1   | 1.27 typ.   |       | 0.05 typ. |       |
| E    | 10          | 10.40 | 0.39      | 0.41  |
| e    | 2.40        | 2.70  | 0.094     | 0.106 |
| e1   | 4.95        | 5.15  | 0.19      | 0.20  |
| F    | 1.23        | 1.32  | 0.048     | 0.052 |
| H1   | 6.20        | 6.60  | 0.24      | 0.26  |
| J1   | 2.40        | 2.72  | 0.094     | 0.107 |
| L    | 13          | 14    | 0.51      | 0.55  |
| L1   | 3.50        | 3.93  | 0.137     | 0.154 |
| L20  | 16.40 typ.  |       | 0.64 typ. |       |
| L30  | 28.90 typ.  |       | 1.13 typ. |       |
| ØP   | 3.75        | 3.85  | 0.147     | 0.151 |
| Q    | 2.65        | 2.95  | 0.104     | 0.116 |

Figure 19. TO-220AB (NIns. &amp; Ins. 20-up) dimension definitions

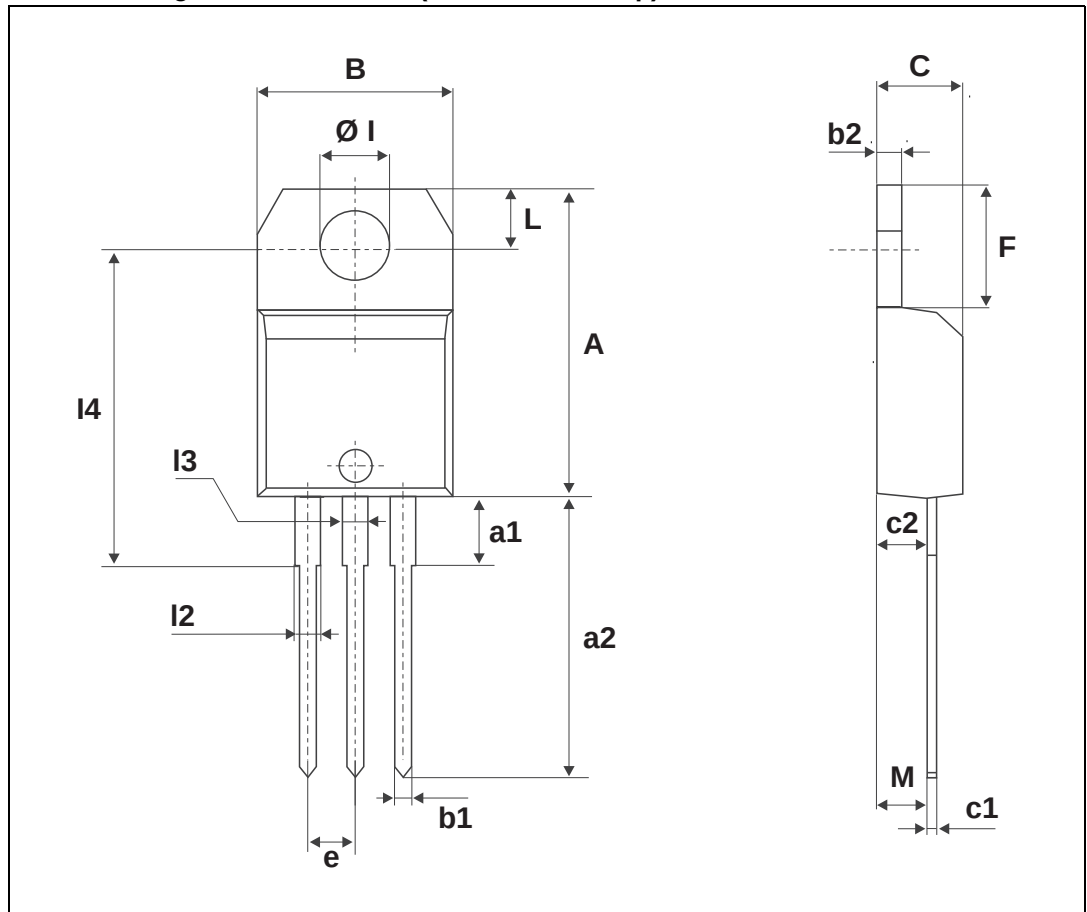


Table 9. TO-220AB (NIns. &amp; Ins. 20-up) dimension values

| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| A    | 15.20       |       | 15.90 | 0.598  |       | 0.625 |
| a1   |             | 3.75  |       |        | 0.147 |       |
| a2   | 13.00       |       | 14.00 | 0.511  |       | 0.551 |
| B    | 10.00       |       | 10.40 | 0.393  |       | 0.409 |
| b1   | 0.61        |       | 0.88  | 0.024  |       | 0.034 |
| b2   | 1.23        |       | 1.32  | 0.048  |       | 0.051 |
| C    | 4.40        |       | 4.60  | 0.173  |       | 0.181 |
| c1   | 0.49        |       | 0.70  | 0.019  |       | 0.027 |
| c2   | 2.40        |       | 2.72  | 0.094  |       | 0.107 |
| e    | 2.40        |       | 2.70  | 0.094  |       | 0.106 |
| F    | 6.20        |       | 6.60  | 0.244  |       | 0.259 |
| Øl   | 3.75        |       | 3.85  | 0.147  |       | 0.151 |
| l4   | 15.80       | 16.40 | 16.80 | 0.622  | 0.646 | 0.661 |
| L    | 2.65        |       | 2.95  | 0.104  |       | 0.116 |
| l2   | 1.14        |       | 1.70  | 0.044  |       | 0.066 |
| l3   | 1.14        |       | 1.70  | 0.044  |       | 0.066 |
| M    |             | 2.60  |       |        | 0.102 |       |

Figure 20. TO-220FPAB dimension definitions

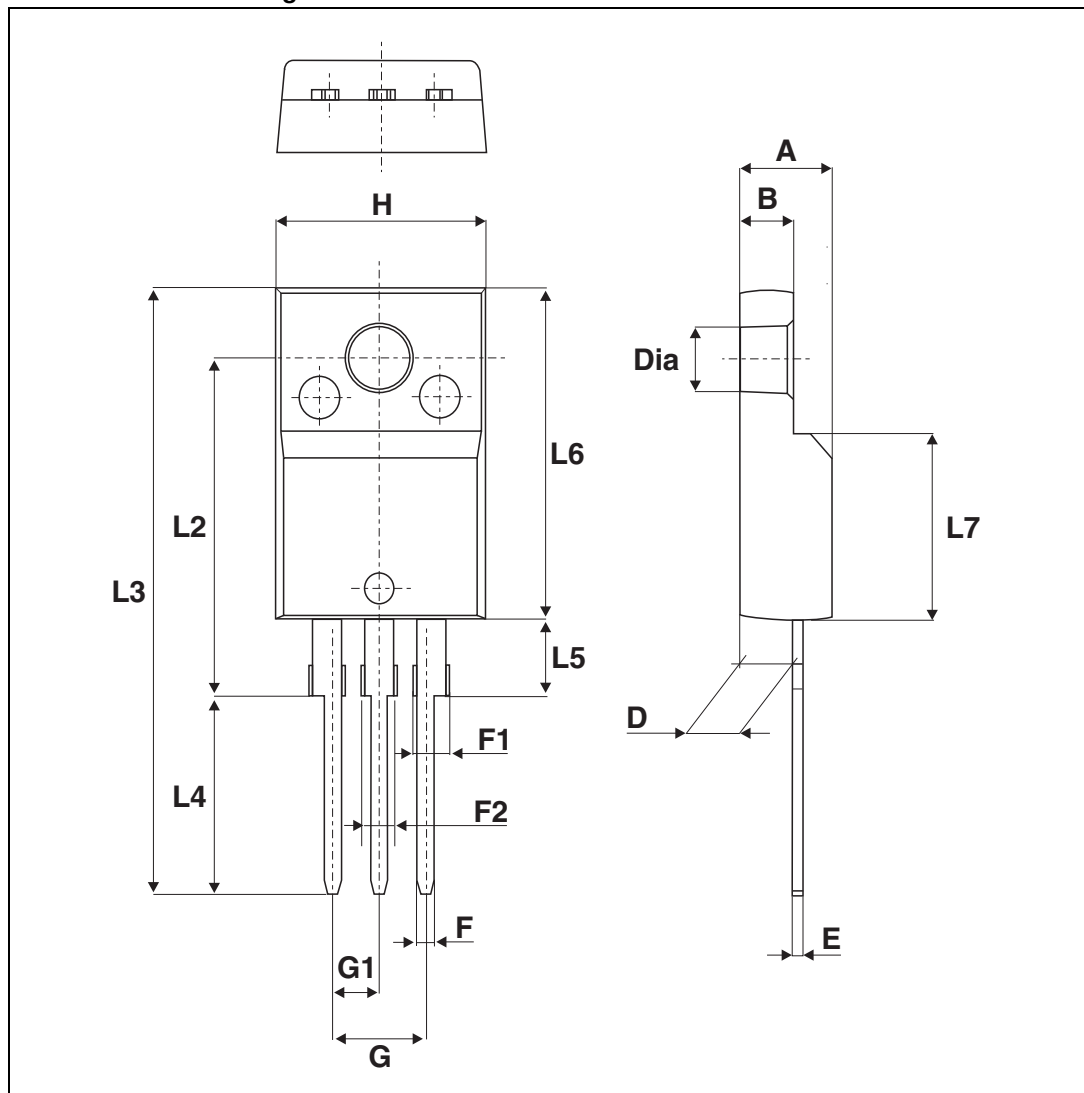


Table 10. TO-220FPAB dimension values

| Ref. | Dimensions  |      |      |        |      |       |
|------|-------------|------|------|--------|------|-------|
|      | Millimeters |      |      | Inches |      |       |
|      | Min.        | Typ. | Max. | Min.   | Typ. | Max.  |
| A    | 4.4         |      | 4.6  | 0.173  |      | 0.181 |
| B    | 2.5         |      | 2.7  | 0.098  |      | 0.106 |
| D    | 2.5         |      | 2.75 | 0.098  |      | 0.108 |
| E    | 0.45        |      | 0.70 | 0.018  |      | 0.027 |
| F    | 0.75        |      | 1    | 0.030  |      | 0.039 |
| F1   | 1.15        |      | 1.70 | 0.045  |      | 0.067 |
| F2   | 1.15        |      | 1.70 | 0.045  |      | 0.067 |
| G    | 4.95        |      | 5.20 | 0.195  |      | 0.205 |
| G1   | 2.4         |      | 2.7  | 0.094  |      | 0.106 |
| H    | 10          |      | 10.4 | 0.393  |      | 0.409 |
| L2   |             | 16   |      |        | 0.63 |       |
| L3   | 28.6        |      | 30.6 | 1.126  |      | 1.205 |
| L4   | 9.8         |      | 10.6 | 0.386  |      | 0.417 |
| L5   | 2.9         |      | 3.6  | 0.114  |      | 0.142 |
| L6   | 15.9        |      | 16.4 | 0.626  |      | 0.646 |
| L7   | 9.00        |      | 9.30 | 0.354  |      | 0.366 |
| Dia. | 3.00        |      | 3.20 | 0.118  |      | 0.126 |

### 3 Ordering information

Figure 21. TN8 series

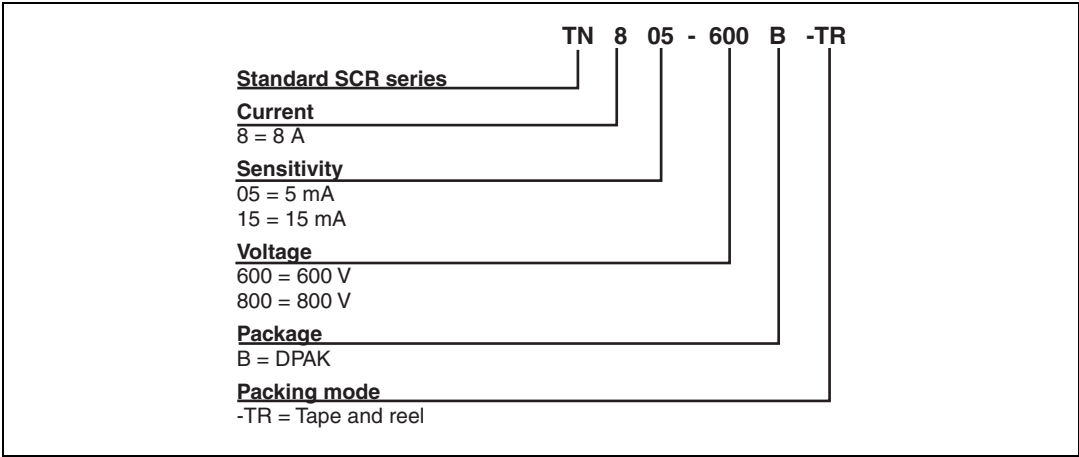


Figure 22. TS8 series

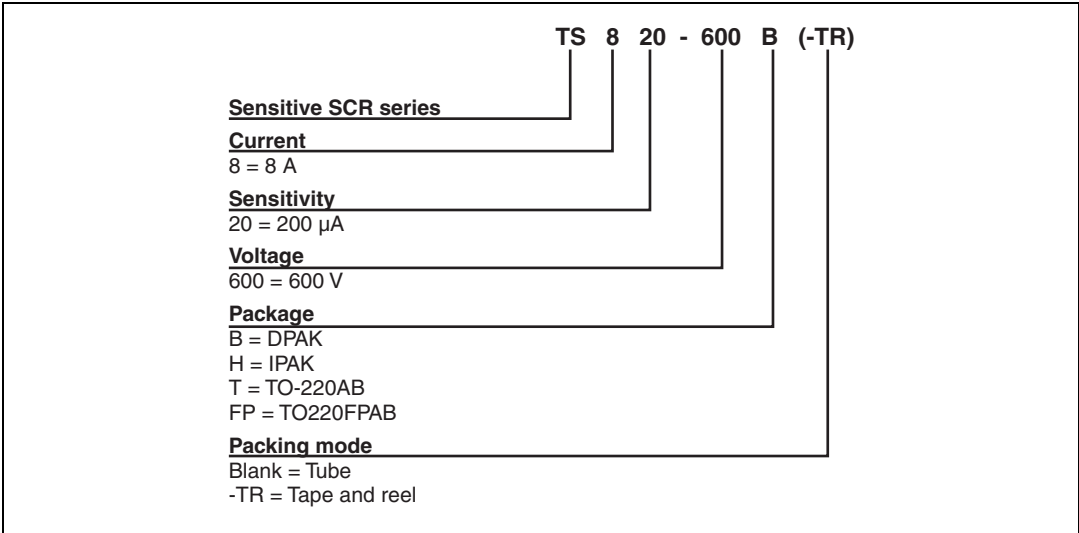


Figure 23. TYNx08 series

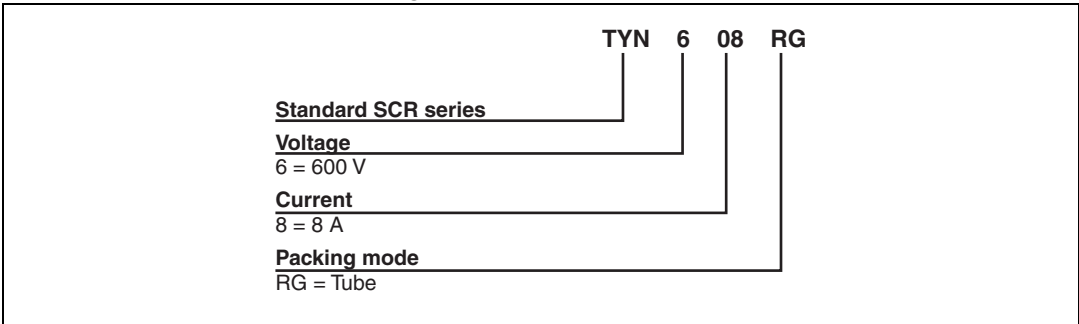


Table 11. Ordering information

| Order code    | Marking   | Package    | Weight | Base qty | Delivery mode |
|---------------|-----------|------------|--------|----------|---------------|
| TN805-600B-TR | TN805600  | DPAK       | 0.3 g  | 2500     | Tape and reel |
| TN815-600B-TR | TN815600  | DPAK       | 0.3 g  | 2500     | Tape and reel |
| TN815-800B-TR | TN815800  | DPAK       | 0.3 g  | 2500     | Tape and reel |
| TS820-600B    | TS820600  | DPAK       | 0.3 g  | 75       | Tube          |
| TS820-600B-TR | TS820600  | DPAK       | 0.3 g  | 2500     | Tape and reel |
| TS820-600H    | TS820600  | IPAK       | 0.4 g  | 75       | Tube          |
| TS820-600T    | TS820600T | TO-220AB   | 2.3 g  | 50       | Tube          |
| TS820-600FP   | TS820600  | TO-220FPAB | 2.0 g  | 50       | Tube          |
| TYN608RG      | TYN608    | TO-220AB   | 2.3 g  | 50       | Tube          |

## 4 Revision history

Table 12. Document revision history

| Date        | Revision | Changes                                                                                                                           |
|-------------|----------|-----------------------------------------------------------------------------------------------------------------------------------|
| Apr-2002    | 4A       | Last update.                                                                                                                      |
| 13-Feb-2006 | 5        | TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added.                                                        |
| 22-Jan-2010 | 6        | Alpha definition updated in <a href="#">Figure 1</a> . Thermal resistance, junction to case, updated in <a href="#">Table 5</a> . |
| 10-Oct-2011 | 7        | Added TO-220FPAB package. Removed 700 V and 1000 V products.                                                                      |
| 14-May-2014 | 8        | Updated DPAK and IPAK package information and reformatted to current standard.                                                    |



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