

1 Characteristics

Table 1. Absolute maximum ratings

| Symbol | Parameters | | | Value | Unit |
|--------------------|---|-------------------------|------------------------|--------------------------|------------------|
| $I_{T(RMS)}$ | RMS on-state current (180° conduction angle) | BTA40, BTA41 | $T_c = 80\text{ °C}$ | 40 | A |
| | | BTB41 | $T_c = 95\text{ °C}$ | | |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C) | | $t_p = 16,7\text{ ms}$ | 420 | A |
| | | | $t_p = 20\text{ ms}$ | 400 | |
| I^2t | I^2t value for fusing | $t_p = 10\text{ ms}$ | | 1000 | A ² s |
| di/dt | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$ | $f = 120\text{ Hz}$ | $T_j = 125\text{ °C}$ | 50 | A/ μ s |
| V_{DSM}, V_{RSM} | Non repetitive surge peak off-state voltage | $t_p = 20\text{ ms}$ | $T_j = 25\text{ °C}$ | $V_{DRM}, V_{RRM} + 100$ | V |
| I_{GM} | Peak gate current | $t_p = 20\text{ }\mu$ s | $T_j = 125\text{ °C}$ | 8 | A |
| $P_{G(AV)}$ | Average gate power dissipation | $T_j = 125\text{ °C}$ | | 1 | W |
| T_{stg} | Storage junction temperature range | | | | -40 to +150 °C |
| T_j | Operating junction temperature range | | | | -40 to +125 °C |

Table 2. Electrical characteristics ($T_j = 25\text{ °C}$, unless otherwise specified) - standard (4 quadrants)

| Symbol | Parameters | Quadrant | | Values | Unit |
|------------------|--|--------------|------|--------|------------|
| $I_{GT}^{(1)}$ | $V_D = 12\text{ V}$, $R_L = 33\text{ }\Omega$ | I - II - III | Max. | 50 | mA |
| | | IV | | 100 | |
| V_{GT} | | I - II - III | Max. | 1.3 | V |
| V_{GD} | $V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $T_j = 125\text{ °C}$ | I - II - III | Min. | 0.2 | V |
| $I_H^{(2)}$ | $I_T = 500\text{ mA}$ | | Max. | 80 | mA |
| I_L | $I_G = 1.2 I_{GT}$ | I - III - IV | Max. | 70 | mA |
| | | II | Max. | 160 | |
| $dV/dt^{(2)}$ | $V_D = 67\text{ % } V_{DRM}$ gate open, $T_j = 125\text{ °C}$ | | Min. | 500 | V/ μ s |
| $(dV/dt)c^{(2)}$ | $(di/dt)c = 20\text{ A/ms}$, $T_j = 125\text{ °C}$ | | Min. | 10 | V/ μ 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 electrical characteristics

| Symbol | Test conditions | T_j | | Value | Unit |
|-------------------|---|--------|------|-------|------------|
| $V_{TM}^{(1)}$ | $I_{TM} = 60\text{ A}$, $t_p = 380\text{ }\mu$ s | 25 °C | Max. | 1.55 | V |
| $V_{TO}^{(1)}$ | threshold on-state voltage | 125 °C | Max. | 0.85 | V |
| $R_D^{(1)}$ | Dynamic resistance | 125 °C | Max. | 10 | m Ω |
| I_{DRM}/I_{RRM} | $V_T = V_{DRM}$, $V_T = V_{RRM}$ | 25 °C | Max. | 5 | μ A |
| | | 125 °C | | 5 | mA |

1. For both polarities of A2 referenced to A1

Table 4. Thermal resistance

| Symbol | Parameters | | Value | Unit |
|---------------|-----------------------|-----------------------|-------|------|
| $R_{th(j-c)}$ | Junction to case (AC) | BTA40 / BTA41 | 0.9 | °C/W |
| | | BTB41 | 0.6 | |
| $R_{th(j-a)}$ | Junction to ambient | BTA40 / BTA41 / BTB41 | 50 | |

1.1 Characteristics (curves)

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

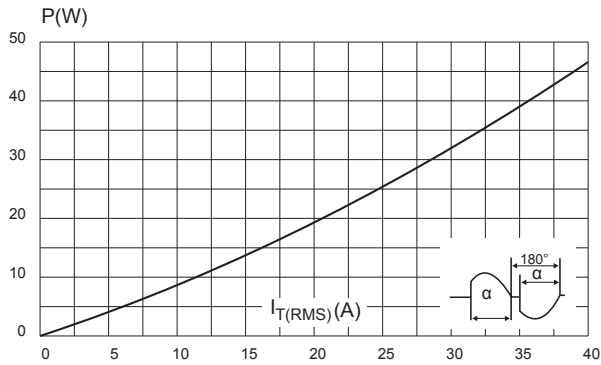


Figure 2. RMS on-state current versus case temperature (full cycle)

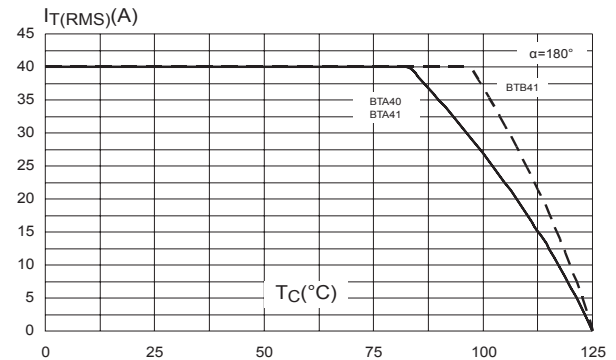


Figure 3. Relative variation of thermal impedance versus pulse duration

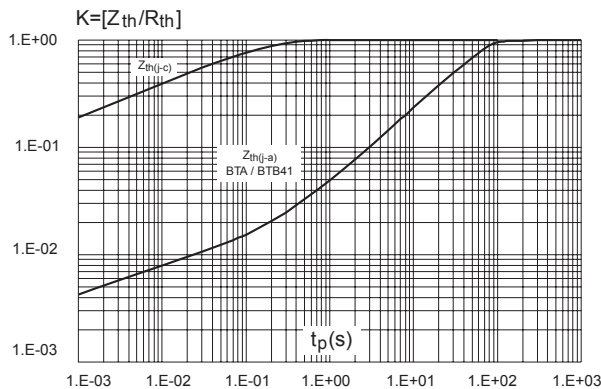


Figure 4. On-state characteristics (maximum values)

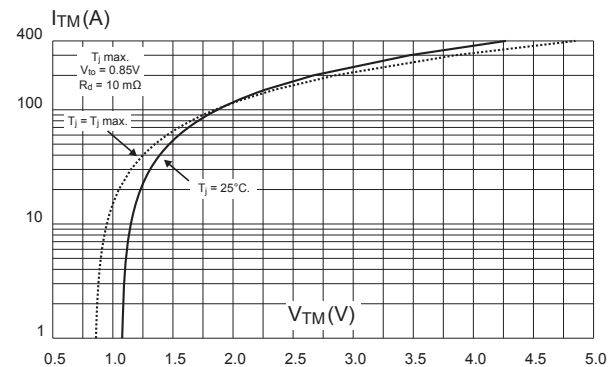


Figure 5. Surge peak on-state current versus number of cycles

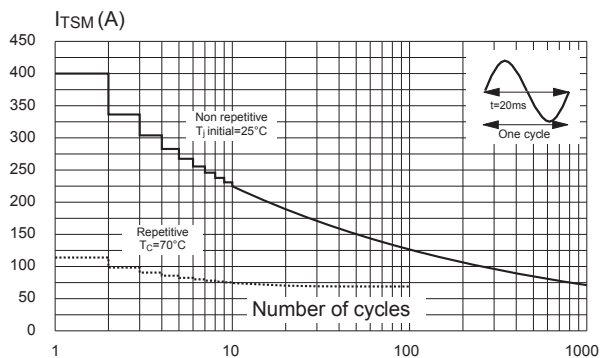


Figure 6. Non-repetitive surge peak on-state current for a sinusoidal pulse

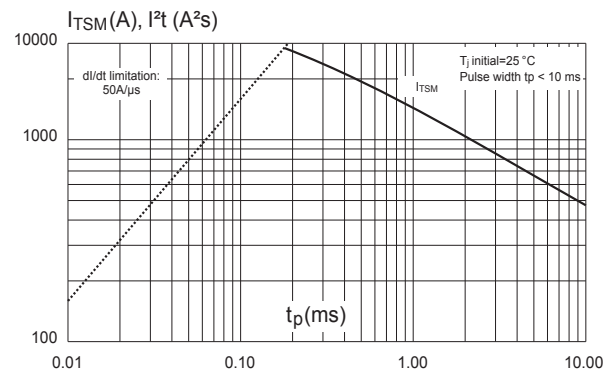


Figure 7. Relative variation of gate trigger current, holding and latching current versus junction temperature

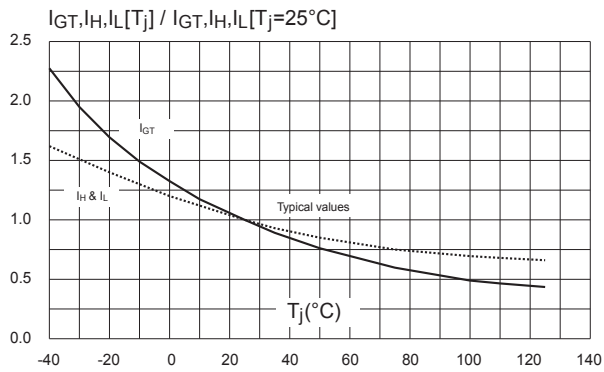


Figure 8. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

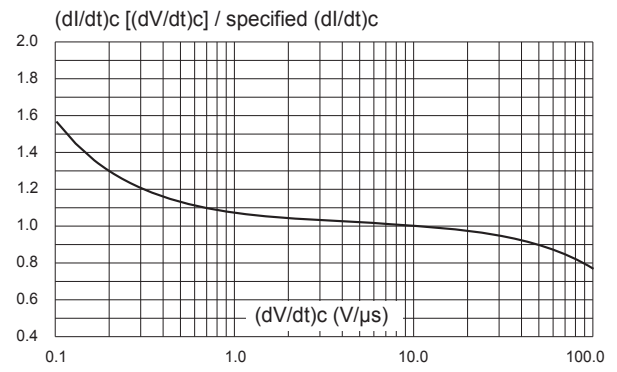
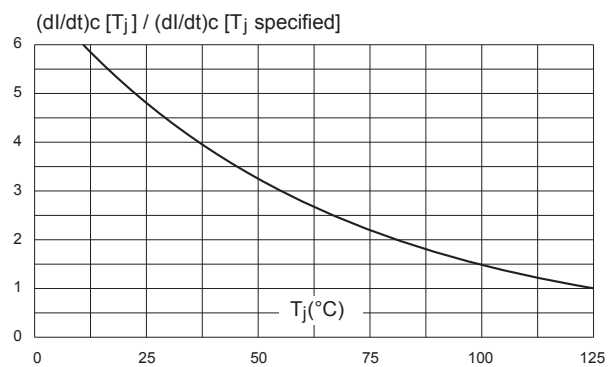


Figure 9. Relative variation of critical rate of decrease of main current versus junction temperature (typical values)



2 Package information

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. ECOPACK is an ST trademark.

2.1 TOP3 insulated and non-insulated package information

- Epoxy meets UL94, V0
- Lead-free packages
- Recommended torque: 1.05 N·m (max. torque: 1.2 N·m)

Figure 10. TOP3 insulated and non-insulated package outline

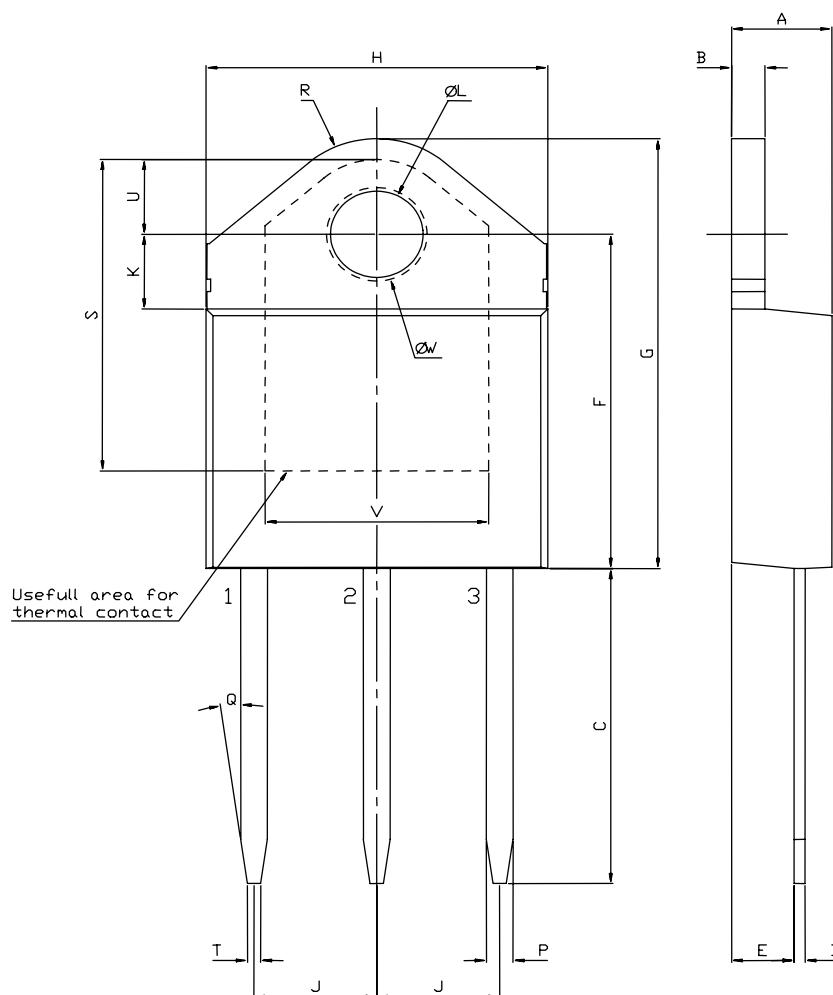


Table 5. TOP3 insulated and non-insulated mechanical data

| Ref. | Dimensions | | | | | |
|------|------------|------|-------|-----------------------|--------|--------|
| | mm | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 0.1732 | | 0.1812 |
| B | 1.45 | | 1.55 | 0.0570 | | 0.0611 |
| C | 14.35 | | 15.60 | 0.5649 | | 0.6142 |
| D | 0.50 | | 0.70 | 0.0196 | | 0.0276 |
| E | 2.70 | | 2.90 | 0.1062 | | 0.1142 |
| F | 15.80 | | 16.50 | 0.6220 | | 0.6497 |
| G | 20.40 | | 21.10 | 0.8031 | | 0.8308 |
| H | 15.10 | | 15.50 | 0.5944 | | 0.6103 |
| J | 5.40 | | 5.65 | 0.2125 | | 0.2225 |
| K | 3.40 | | 3.65 | 0.1338 | | 0.1438 |
| L | 4.08 | | 4.17 | 0.1606 | | 0.1642 |
| M | 1.20 | | 1.40 | 0.0472 | | 0.0552 |
| R | | 4.60 | | | 0.1811 | |

1. Inches given for reference only

2.2 RD91 package information

- Epoxy meets UL94, V0
- Cooling method: Conduction
- Recommended torque: 0.9 to 1.2 N·m

Figure 11. RD91 package outline

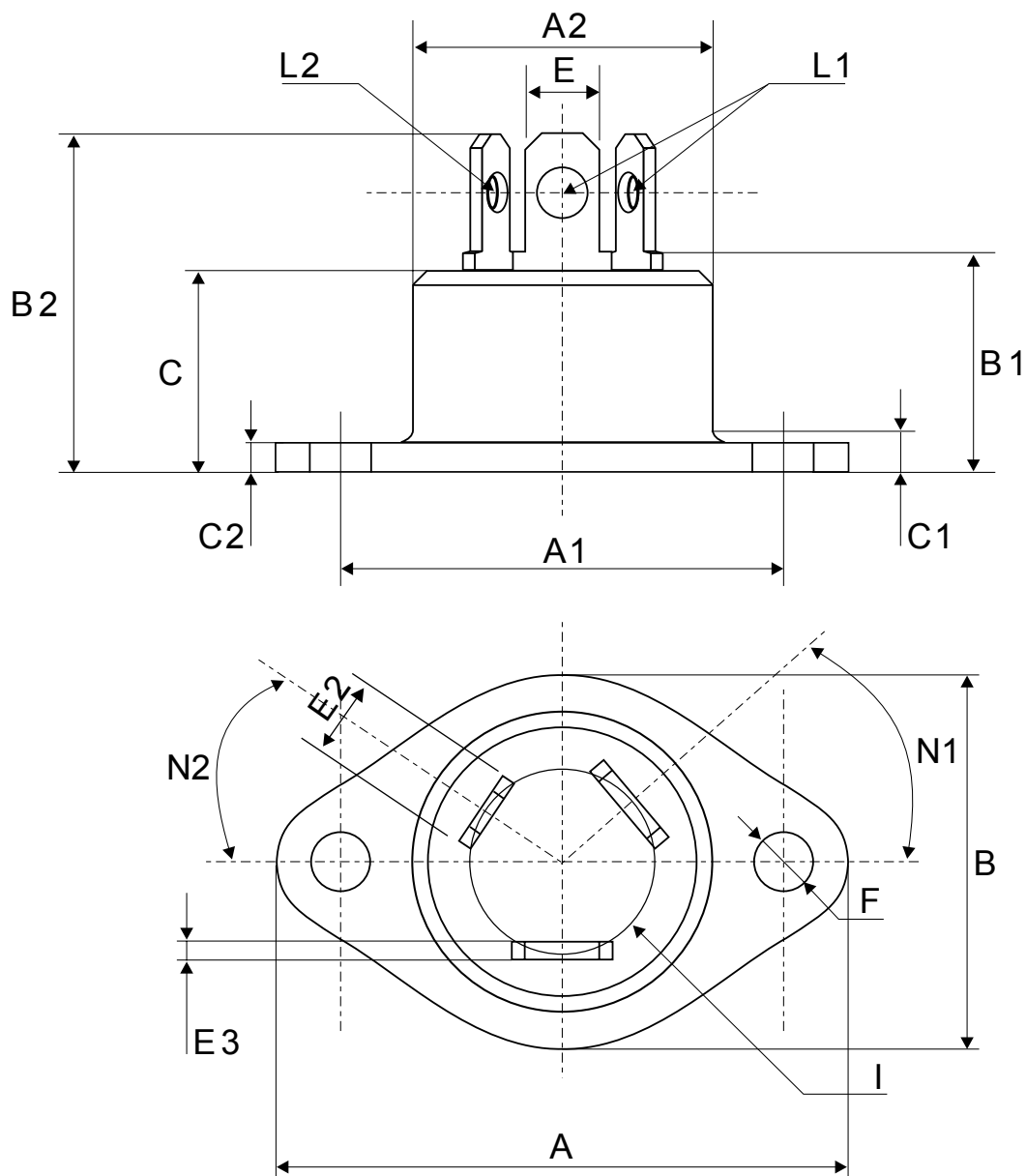


Table 6. RD91 mechanical data

| Ref. | Dimensions | | | | | |
|------|------------|------|-------|-----------------------|------|-------|
| | mm | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | | | 40.00 | | | 1.575 |
| A1 | 30.10 | | 30.30 | 1.185 | | 1.193 |
| A2 | | | 22.00 | | | 0.867 |
| B | | | 27.00 | | | 1.063 |
| B1 | 13.50 | | 16.50 | 0.531 | | 0.650 |
| B2 | | | 24.00 | | | 0.945 |
| C | | | 14.00 | | | 0.552 |
| C1 | | | 3.50 | | | 0.138 |
| C2 | 1.90 | | 2.10 | 0.074 | | 0.083 |
| E | 6.10 | | 6.50 | 0.240 | | 0.256 |
| E2 | 4.80 | | 5.20 | 0.188 | | 0.205 |
| E3 | 0.70 | | 0.90 | 0.027 | | 0.036 |
| F | 4.00 | | 4.30 | 0.157 | | 0.170 |
| I | 11.20 | | 11.60 | 0.440 | | 0.536 |
| L1 | 3.10 | | 3.50 | 0.122 | | 0.138 |
| L2 | 1.70 | | 1.90 | 0.066 | | 0.075 |
| N1 | 33° | | 43° | 33° | | 43° |
| N2 | 28° | | 38° | 28° | | 38° |

1. Inches given for reference only

3 Ordering information

Figure 12. Ordering information scheme (BTA40, BTA41 and BTB-41 series)

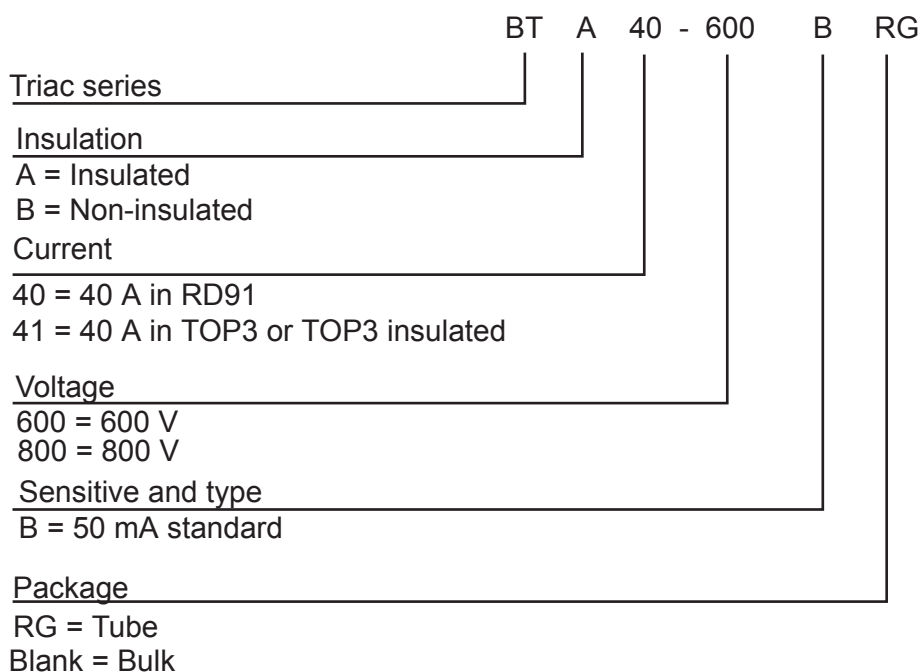


Table 7. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|--------------|-----------|-----------|--------|-----------|---------------|
| BTA40-600B | BTA40600B | RD91 | 20 g | 25 | Bulk |
| BTA40-800B | BTA40800B | RD91 | 20 g | 25 | Bulk |
| BTA41-600BRG | BTA41600B | TOP3 Ins. | 4.5 g | 30 | Tube |
| BTA41-800BRG | BTA41800B | TOP3 Ins. | 4.5 g | 30 | Tube |
| BTB41-600BRG | BTB41600B | TOP3 | 4.5 g | 30 | Tube |
| BTB41-800BRG | BTB41800B | TOP3 | 4.5 g | 30 | Tube |

Revision history

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| Sep-2003 | 5 | Last update. |
| 25-Mar-2005 | 6 | TOP3 delivery mode changed from bulk to tube. |
| 14-Oct-2005 | 7 | T _c values for I _T changed in Table 3. ECOPACK statement added. |
| 10-Aug-2009 | 8 | Updated Table 2 to correctly place packages. Updated Figure 2. Table 5 changed to correctly place TOP3. Updated ECOPACK statement. |
| 02-Dec-2020 | 9 | Updated Figure 6 and Figure 12 . Added Application section. Minor text change. |
| 28-Jan-2021 | 10 | Updated Table 1 and Table 4 . |
| 24-Mar-2021 | 11 | Updated coverimage. |

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, please refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2021 STMicroelectronics – All rights reserved