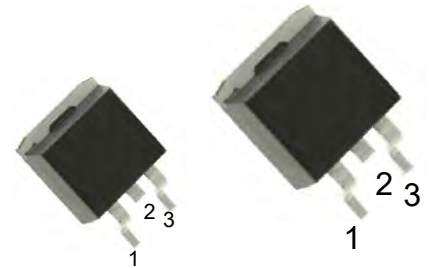


**DESCRIPTION:**

With high ability to withstand the shock loading of large current, BT151S-500R/650R/800R series of silicon controlled rectifiers provide high dv/dt rate with strong resistance to electromagnetic interference. They are especially recommended for use on solid state relay, motorcycle, power charger, T-tools etc.

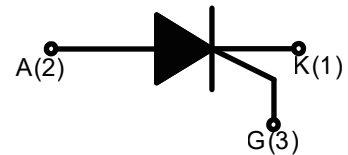


TO-252

TO-263

**MAIN FEATURES**

| Symbol            | Value       | Symbol |
|-------------------|-------------|--------|
| $V_{DRM}/V_{RRM}$ | 500/650/800 | V      |
| $I_{T(RMS)}$      | 12          | A      |
| $I_{GT}$          | $\leq 15$   | mA     |


**ABSOLUTE MAXIMUM RATINGS**

| Parameter   |                               | Symbol       | Value       | Unit        |
|---|-------------------------------|--------------|-------------|-------------|
| Storage junction temperature range                                    |                               | $T_{stg}$    | -40 - 150   | $^{\circ}C$ |
| Operating junction temperature range                                  |                               | $T_j$        | -40 - 150   | $^{\circ}C$ |
| Repetitive peak off-state voltage ( $T_j=25^{\circ}C$ )               |                               | $V_{DRM}$    | 500/650/800 | V           |
| Repetitive peak reverse voltage ( $T_j=25^{\circ}C$ )                 |                               | $V_{RRM}$    | 500/650/800 | V           |
| RMS on-state current  | TO-252 ( $T_c=115^{\circ}C$ ) | $I_{T(RMS)}$ | 12          | A           |
|   | TO-263 ( $T_c=100^{\circ}C$ ) |              |             |             |
| Non repetitive surge peak on-state current (F=50Hz $t_p=10ms$ )       |                               | $I_{TSM}$    | 120         | A           |
| Non repetitive surge peak on-state current (F=60Hz $t_p=8.3ms$ )      |                               | $I_{TSM}$    | 132         | A           |
| $I^2t$ value for fusing ( $t_p=10ms$ )                                |                               | $I^2t$       | 72          | $A^2s$      |
| Repetitive rate of rise of on-state current ( $I_G=2 \times I_{GT}$ ) |                               | $di_T/dt$    | 50          | $A/\mu s$   |
| Peak gate current   |                               | $I_{GM}$     | 2           | A           |

|                                |             |     |   |
|--------------------------------|-------------|-----|---|
| Peak gate power                | $P_{GM}$    | 5   | W |
| Average gate power dissipation | $P_{G(AV)}$ | 0.5 | W |

**ELECTRICAL CHARACTERISTICS** ( $T_j=25^\circ\text{C}$  unless otherwise specified)

| Symbol    | Test Condition  | Value |      |      | Unit             |
|-----------|---|-------|------|------|------------------|
|           |   | MIN.  | TYP. | MAX. |                  |
| $I_{GT}$  | $V_D=12\text{V } R_L=33\Omega$  | -     | 4    | 15   | mA               |
| $V_{GT}$  |   | -     | 0.75 | 1.5  | V                |
| $V_{GD}$  | $V_D=V_{DRM} T_j=150^\circ\text{C } R_L=3.3\text{K}\Omega$                        | 0.2   | -    | -    | V                |
| $I_L$     | $I_G=1.2I_{GT}$   | -     | 12   | 40   | mA               |
| $I_H$     | $I_T=500\text{mA}$  | -     | 12   | 30   | mA               |
| dV/dt     | $V_D=540\text{V}$ Gate Open $T_j=150^\circ\text{C}$                               | 50    | -    | -    | V/ $\mu\text{s}$ |
| dV/dt     | $V_D=436\text{V}$ Gate Open $T_j=150^\circ\text{C}$                               | 80    | -    | -    | V/ $\mu\text{s}$ |
| $t_{on}$  | $I_{GT}=20\text{mA } I_A=100\text{mA } I_R=10\text{mA}$<br>$T_j=25^\circ\text{C}$ | -     | 2    | -    | $\mu\text{s}$    |
| $t_{off}$ |   | -     | 30   | -    | $\mu\text{s}$    |
| $R_d$     | Dynamic resistance $T_j=125^\circ\text{C}$  | -     | -    | 35   | m $\Omega$       |

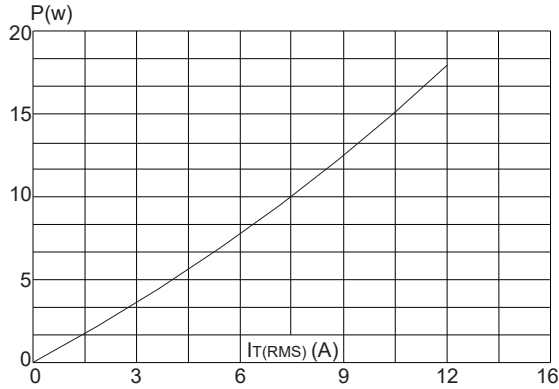
**STATIC CHARACTERISTICS**

| Symbol    | Parameter                               |                         | Value(MAX) | Unit          |
|-----------|---|-------------------------|------------|---------------|
| $V_{TM}$  | $I_{TM}=23\text{A } t_p=380\mu\text{s}$ | $T_j=25^\circ\text{C}$  | 1.6        | V             |
| $I_{DRM}$ | $V_D=V_{DRM} V_R=V_{RRM}$               | $T_j=25^\circ\text{C}$  | 10         | $\mu\text{A}$ |
| $I_{RRM}$ |   | $T_j=150^\circ\text{C}$ | 1          | mA            |

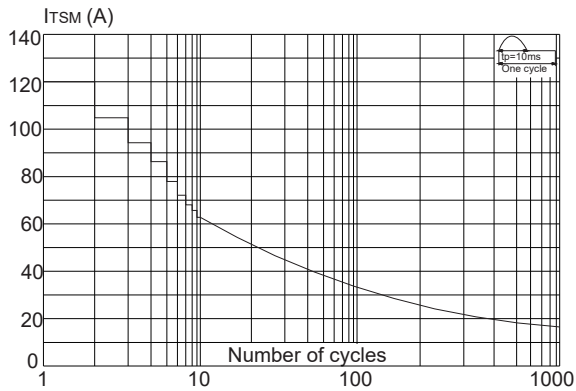
**THERMAL RESISTANCES**

| Symbol        | Parameter           |            | Value | Unit               |
|---------------|---------------------|------------|-------|--------------------|
| $R_{th(j-c)}$ | Junction to case    | TO-252 1.3 |       | $^\circ\text{C/W}$ |
|               |                     | TO-263     | 2.0   |                    |
| $R_{th(j-a)}$ | Junction to ambient | TO-252 70  |       |                    |
|               |                     | TO-263     | 45    |                    |

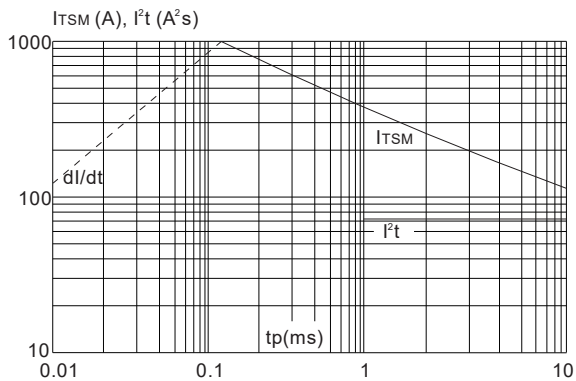
**FIG.1:** Maximum power dissipation versus RMS on-state current



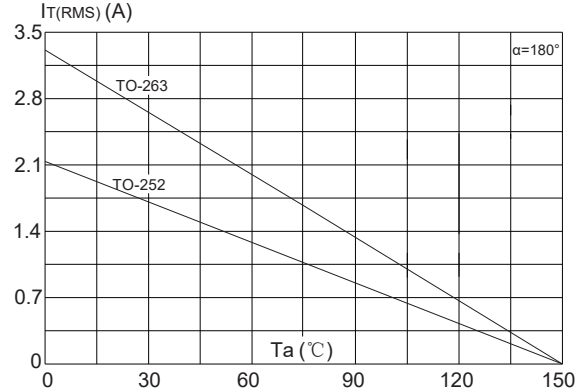
**FIG.3:** Surge peak on-state current versus number of cycles



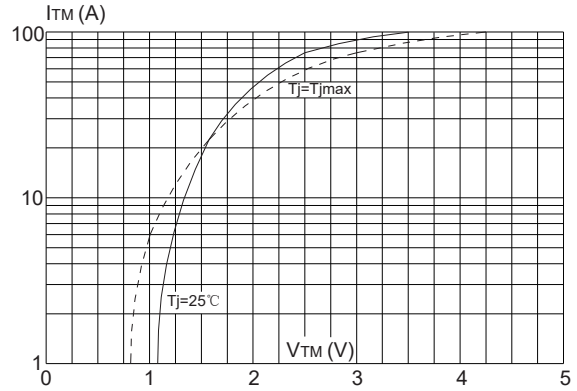
**FIG.5:** Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I^2t$  ( $di/dt < 50\text{A}/\mu\text{s}$ )



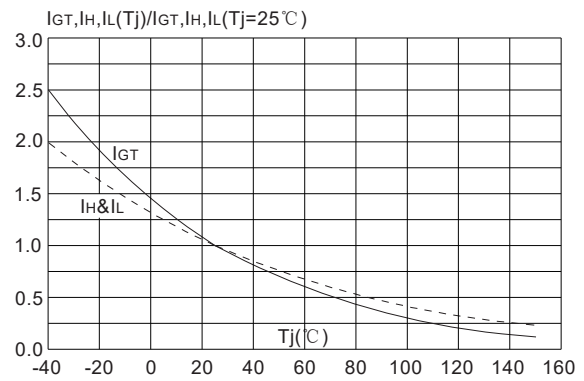
**FIG.2:** RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness:  $35\mu\text{m}$ ) (full cycle)



**FIG.4:** On-state characteristics (maximum values)

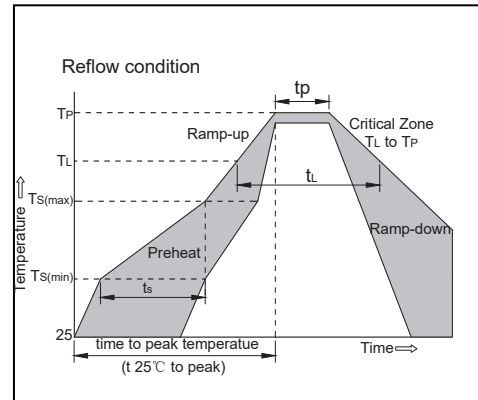


**FIG.6:** Relative variations of gate trigger current, holding current and latching current versus junction temperature

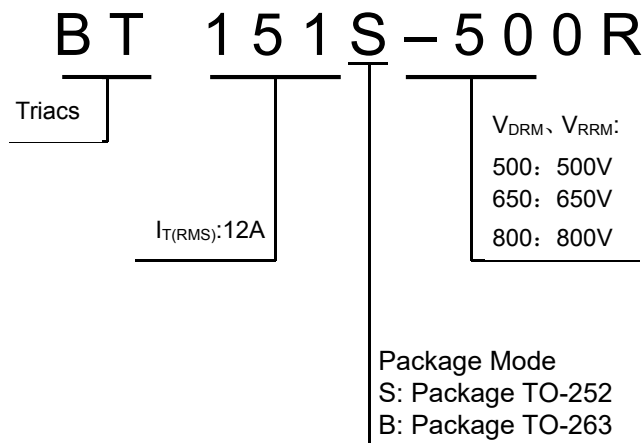


**SOLDERING PARAMETERS**

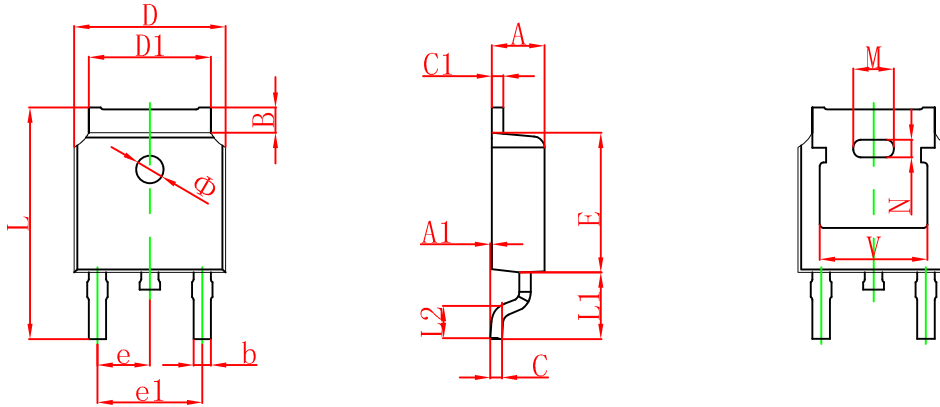
|   |                                      |   |
|---|--------------------------------------|---|
| Reflow Condition  |                                      | Pb-Free assembly<br>(see figure at right) |
| Pre Heat  | -Temperature Min<br>( $T_{s(min)}$ ) | +150°C                                    |
|   | -Temperature<br>Max( $T_{s(max)}$ )  | +200°C                                    |
|   | -Time (Min to Max) ( $t_s$ )         | 60-180 secs.                              |
| Average ramp up rate<br>(Liquidus Temp ( $T_L$ ) to peak) |                                      | 3°C/sec. Max                              |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                      |                                      | 3°C/sec. Max                              |
| Reflow  | -Temperature( $T_L$ )<br>(Liquidus)  | +217°C                                    |
|   | -Temperature( $t_L$ )                | 60-150 secs.                              |
| Peak Temp ( $T_p$ )                                       |                                      | +260(+0/-5)°C                             |
| Time within 5°C of actual<br>Peak Temp ( $t_p$ )          |                                      | 20-40secs.                                |
| Ramp-down Rate  |                                      | 6°C/sec. Max                              |
| Time 25°C to Peak Temp ( $T_p$ )                          |                                      | 8 min. Max                                |
| Do not exceed   |                                      | +260°C                                    |



**ORDERING INFORMATION**

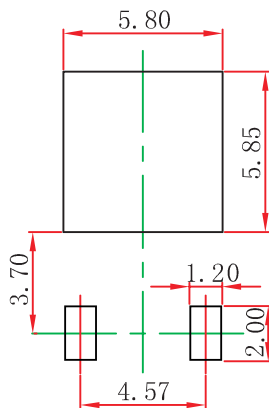


TO-252 Package Outline Dimensions



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.380  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.100  | 0.000                | 0.004 |
| B      | 0.800                     | 1.400  | 0.031                | 0.055 |
| b      | 0.710                     | 0.810  | 0.028                | 0.032 |
| c      | 0.460                     | 0.560  | 0.018                | 0.022 |
| c1     | 0.460                     | 0.560  | 0.018                | 0.022 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.130                     | 5.460  | 0.202                | 0.215 |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.286 TYP.                |        | 0.090 TYP.           |       |
| e1     | 4.327                     | 4.727  | 0.170                | 0.186 |
| M      | 1.778 REF.                |        | 0.070 REF.           |       |
| N      | 0.762 REF.                |        | 0.018 REF.           |       |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.9 REF.                  |        | 0.114 REF.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| V      | 4.830 REF.                |        | 0.190 REF.           |       |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |

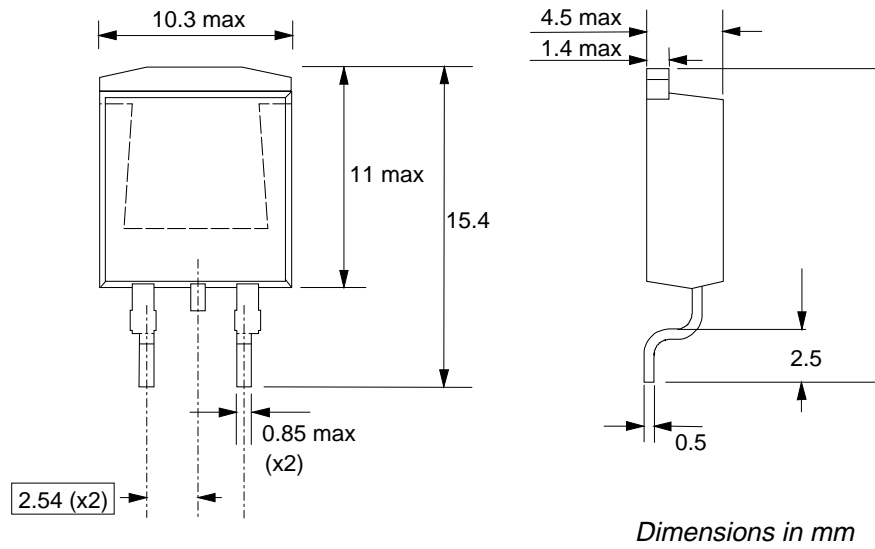
Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance:  $\pm 0.05\text{mm}$ .
3. The pad layout is for reference purposes only.

TO-263(D2PAK) Package Outline Dimensions



Suggested Pad Layout

