

**/ Descriptions**

N TO-251 N-CHANNEL MOSFET in a TO-251 Plastic Package.

**/ Features**

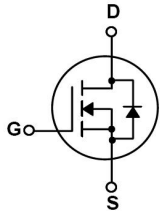
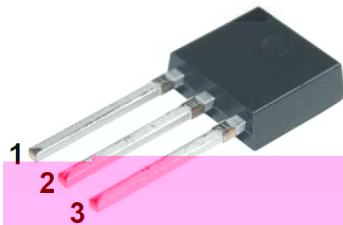
$R_{DS(on)}$   $C_{rss}$

Low  $R_{DS(on)}$ , low gate charge, low  $C_{rss}$ , fast switching.

**/ Applications**

DC/DC

Suited for low voltage applications such as automotive, DC/DC Converters, and high efficiency switching for power management in portable and battery operated products.

**/ Equivalent Circuit****/ Pinning**

PIN1 G      PIN 2 D      PIN 3 S

**/  $h_{FE}$  Classifications & Marking**

See Marking Instructions.

/ Absolute Maximum Ratings( $T_a=25^\circ\text{C}$ )

| Parameter                                          | Symbol                          | Rating         | Unit |
|----------------------------------------------------|---------------------------------|----------------|------|
| Drain-Source Voltage                               | $V_{DS}$                        | 20             | V    |
| Drain Current <sup>G</sup>                         | $I_D(T_c=25^\circ\text{C})$     | 30             | A    |
|                                                    | $I_D(T_c=100^\circ\text{C})$    | 20             | A    |
| Drain Current - Pulsed <sup>C</sup>                | $I_{DM}$                        | 120            | A    |
| Maximum Body-Diode Continuous Current <sup>G</sup> | $I_S$                           | 30             | A    |
| Gate-Source Voltage                                | $V_{GS}$                        | $\pm 12$       | V    |
| Avalanche Current <sup>C</sup>                     | $I_{AS}$                        | 12             | A    |
| Avalanche energy $L=0.5\text{mH}$ <sup>C</sup>     | $E_{AS}$                        | 115            | mJ   |
| Power Dissipation <sup>B</sup>                     | $P_D(T_c=25^\circ\text{C})$     | 100            | W    |
|                                                    | $P_D(T_c=100^\circ\text{C})$    | 50             | W    |
| Power Dissipation <sup>A</sup>                     | $P_{DSM}(T_A=25^\circ\text{C})$ | 2.5            | W    |
|                                                    | $P_{DSM}(T_A=70^\circ\text{C})$ | 1.6            | W    |
| Junction and Storage Temperature Range             | $T_j, T_{stg}$                  | $-55 \sim 150$ |      |

/ Electrical Characteristics( $T_a=25^\circ\text{C}$ )

| Parameter                         | Symbol        | Test Conditions                            | Min | Typ | Max       | Unit          |
|-----------------------------------|---------------|--------------------------------------------|-----|-----|-----------|---------------|
| Drain-Source Breakdown Voltage    | $BV_{DS}$     | $V_{GS}=0\text{V}$ $I_D=250\mu\text{A}$    | 20  |     |           | V             |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{DS}=20\text{V}$ $V_{GS}=0\text{V}$     |     |     | 1.0       | $\mu\text{A}$ |
|                                   |               | $T_J=55^\circ\text{C}$                     |     |     | 5.0       | $\mu\text{A}$ |
| Gate-Body Leakage Current Forward | $I_{GSS}$     | $V_{GS}=\pm 12\text{V}$ $V_{DS}=0\text{V}$ |     |     | $\pm 0.1$ | $\mu\text{A}$ |
| Gate Threshold Voltage            | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ $I_D=250\mu\text{A}$       | 0.4 | 1.0 | 1.2       | V             |
| Static Drain-Source On-Resistance | $R_{DS(on)1}$ | $V_{GS}=10\text{V}$ $I_D=30\text{A}$       |     | 10  | 13        | m $\Omega$    |
|                                   | $R_{DS(on)2}$ | $V_{GS}=4.5\text{V}$ $I_D=15\text{A}$      |     | 11  | 14        | m $\Omega$    |
| Diode Forward Voltage             | $V_{SD}$      | $I_S=30\text{A}$ $V_{GS}=0\text{V}$        |     | 0.9 | 1.35      | V             |

## / Electrical Characteristics(Ta=25 )

| Parameter                                 | Symbol          | Test Conditions                                                   | Min | Typ | Max | Unit     |
|-------------------------------------------|-----------------|-------------------------------------------------------------------|-----|-----|-----|----------|
| Input Capacitance                         | $C_{iss}$       | $V_{DS}=25V$ $V_{GS}=0V$<br>$f=1.0MHz$                            |     | 884 |     | pF       |
| Output Capacitance                        | $C_{oss}$       |                                                                   |     | 174 |     |          |
| Reverse Transfer Capacitance              | $C_{rss}$       |                                                                   |     | 78  |     |          |
| Gate resistance                           | $R_g$           | $V_{GS}=0V$ $V_{DS}=0V$<br>$f=1MHz$                               | 0.6 | 1.4 | 2.1 | $\Omega$ |
| Total Gate Charge                         | $Q_g(4.5V)$     | $V_{GS}=10V$ $V_{DS}=10V$<br>$I_D=20A$                            | 28  | 36  | 43  | nC       |
| Gate Source Charge                        | $Q_{gs}$        |                                                                   |     | 9   |     |          |
| Gate Drain Charge                         | $Q_{gd}$        |                                                                   |     | 12  |     |          |
| Turn-On Delay Time                        | $t_{d(on)}$     | $V_{GS}=10V$ $V_{DS}=10V$<br>$R_L=0.5\Omega$<br>$R_{GEN}=3\Omega$ |     | 7   |     | ns       |
| Turn-On Rise Time                         | $t_r$           |                                                                   |     | 8   |     |          |
| Turn-Off Delay Time                       | $t_{d(off)}$    |                                                                   |     | 70  |     |          |
| Turn-Off Fall Time                        | $t_f$           |                                                                   |     | 18  |     |          |
| Body Diode Reverse Recovery Time          | $t_{rr}$        | $I_F=20A$<br>$dI/dt=500A/ms$                                      | 13  | 17  | 20  | ns       |
| Body Diode Reverse Recovery Charge        | $Q_{rr}$        | $I_F=20A$<br>$dI/dt=500A/ms$                                      | 29  | 36  | 43  | nC       |
| Maximum Junction-to-Ambient <sup>A</sup>  | $R_{\theta JA}$ | $t \leq 10s$                                                      |     | 16  | 20  | /W       |
| Maximum Junction-to-Ambient <sup>AD</sup> |                 | steady-State                                                      |     | 41  | 50  | /W       |
| Maximum Junction-to-Case                  | $R_{\theta JC}$ | steady-State                                                      |     | 1.2 | 1.5 | /W       |

A. The value of  $R_{\theta JA}$  is measured with the device mounted on 1in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ C$ . The Power dissipation PDSM is based on  $R_{\theta JA}$  and the maximum allowed junction temperature of  $150^\circ C$ . The value in any given application depends on the user's specific board design, and the maximum temperature of  $150^\circ C$  may be used if the PCB allows it.

B. The power dissipation PD is based on  $T_{J(MAX)}=150^\circ C$ , using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

C. Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ C$ . Ratings are based on low frequency and duty cycles to keep initial  $T_J=25^\circ C$ .

D. The  $R_{\theta JA}$  is the sum of the thermal impedance from junction to case  $R_{\theta JC}$  and case to ambient.

E. The static characteristics in Figures 1to6 are obtained using <300ms pulses, duty cycle 0.5% max.

F. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of  $T_{J(MAX)}=150^\circ C$ . The SOA curve provides a single pulse rating.

G. The maximum current rating is package limited.

H. These tests are performed with the device mounted on 1 in<sup>2</sup> FR-4 board with 2oz. Copper, in a still air environment with  $T_A=25^\circ C$ .

/ Electrical Characteristic Curve

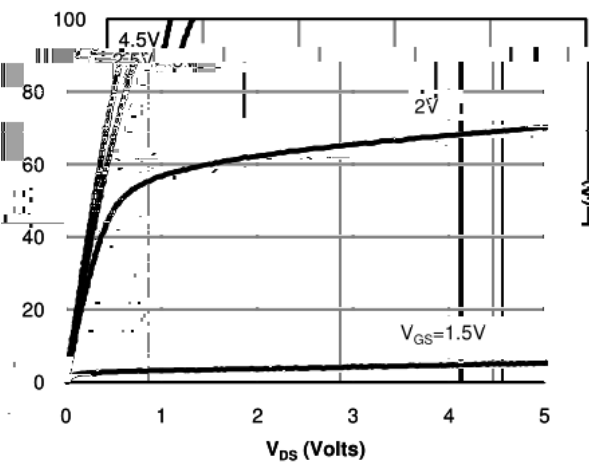


Fig 1: On-Region Characteristics

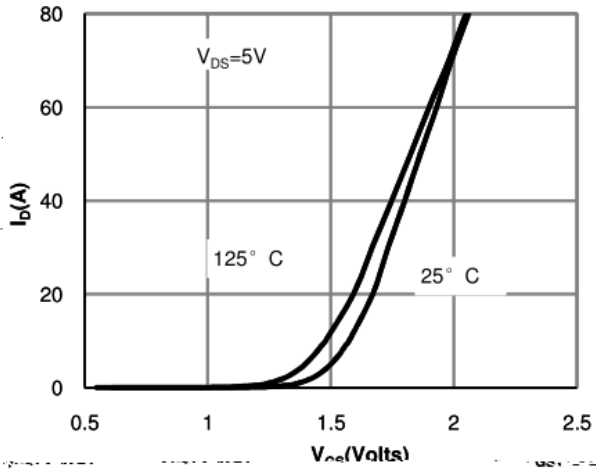


Figure 2: Transfer Characteristics

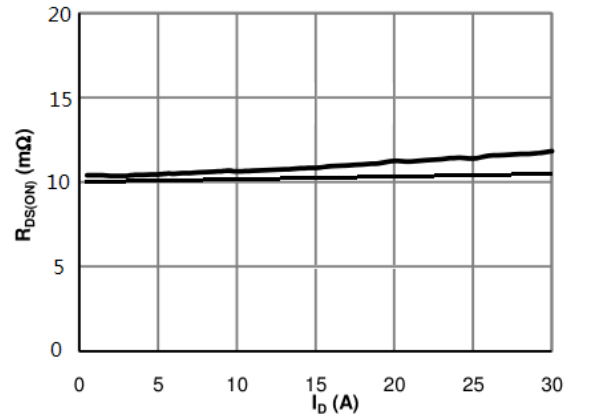


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

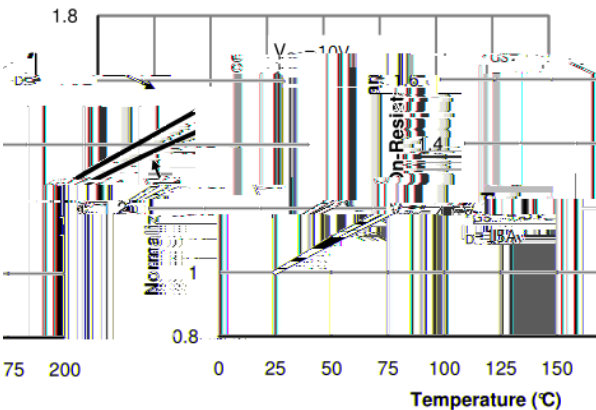


Figure 4: On-Resistance vs. Junction Temperature

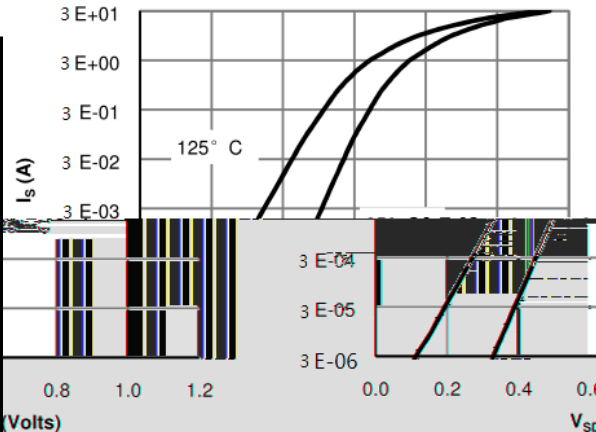
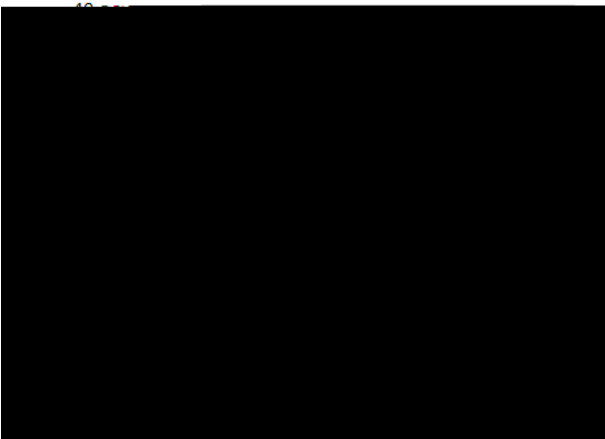
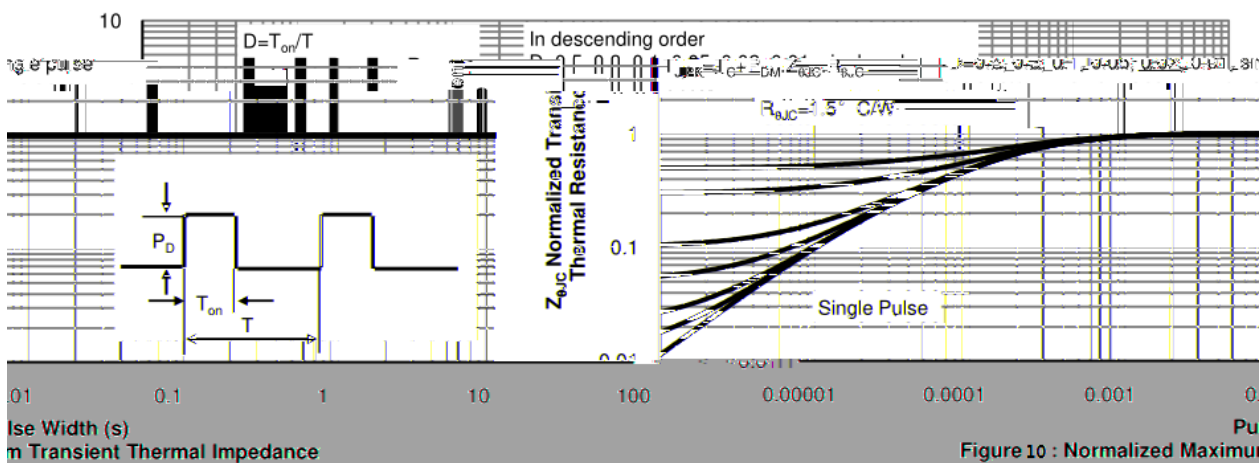
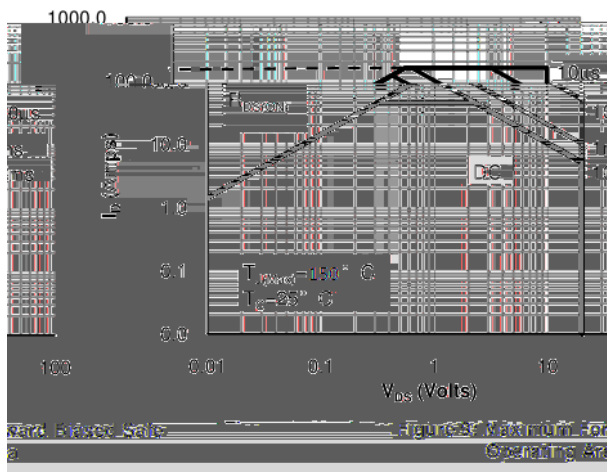
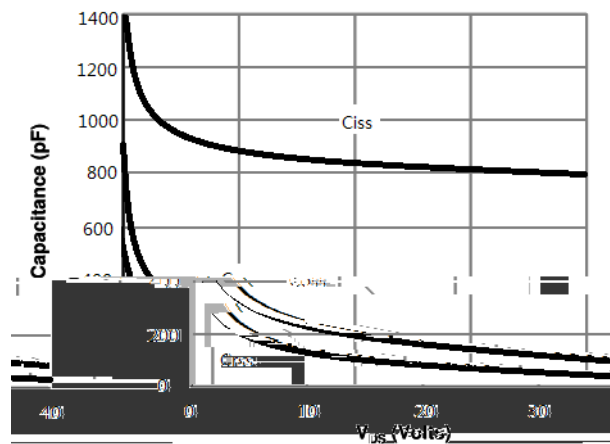
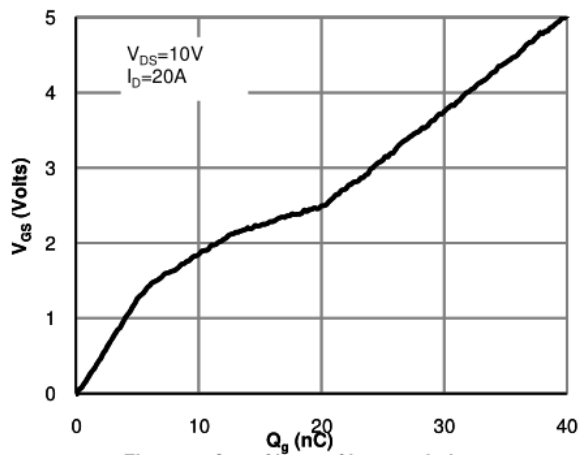
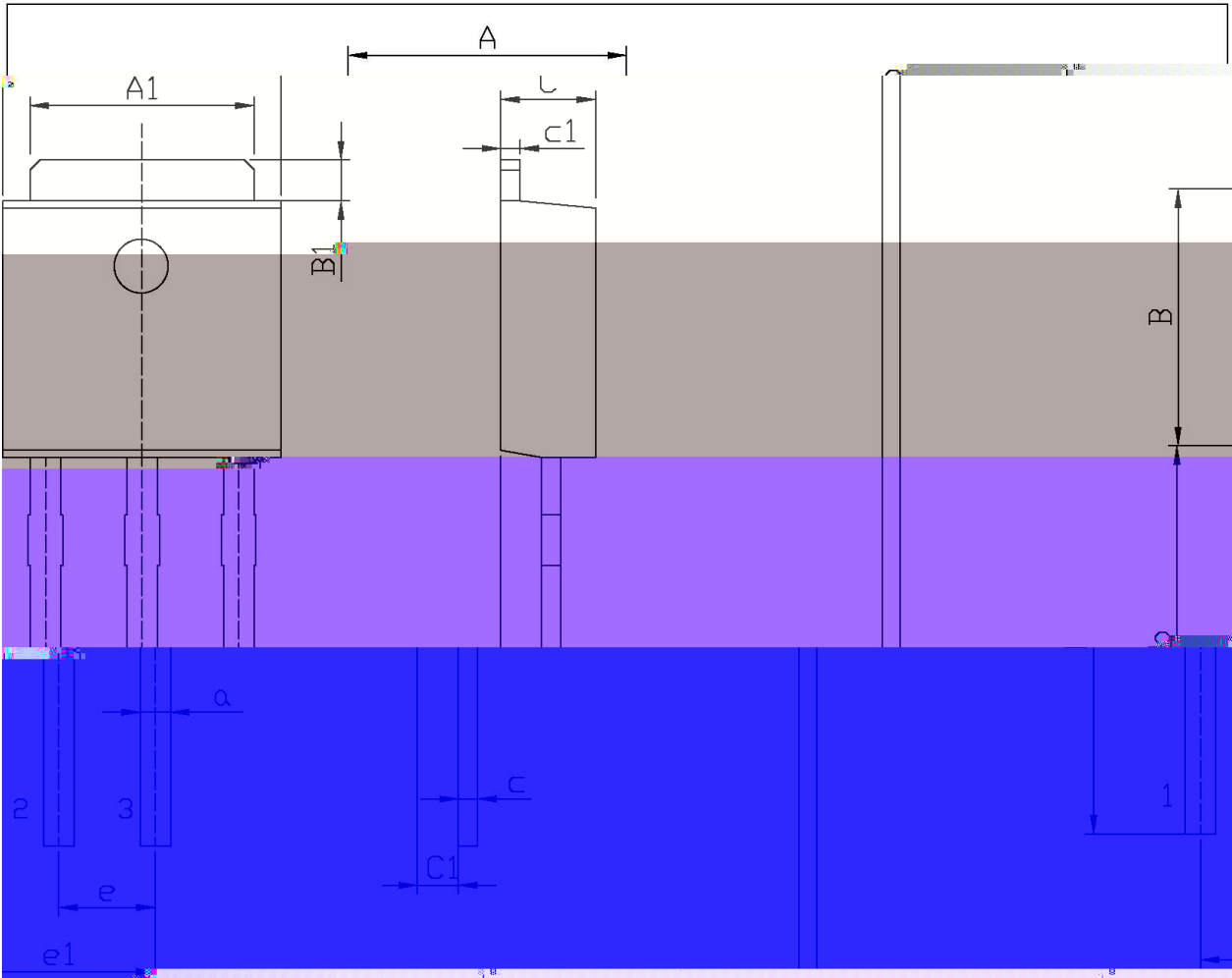


Figure 6: Body-Diode Characteristics

# / Electrical Characteristic Curve



/ Package Dimensions

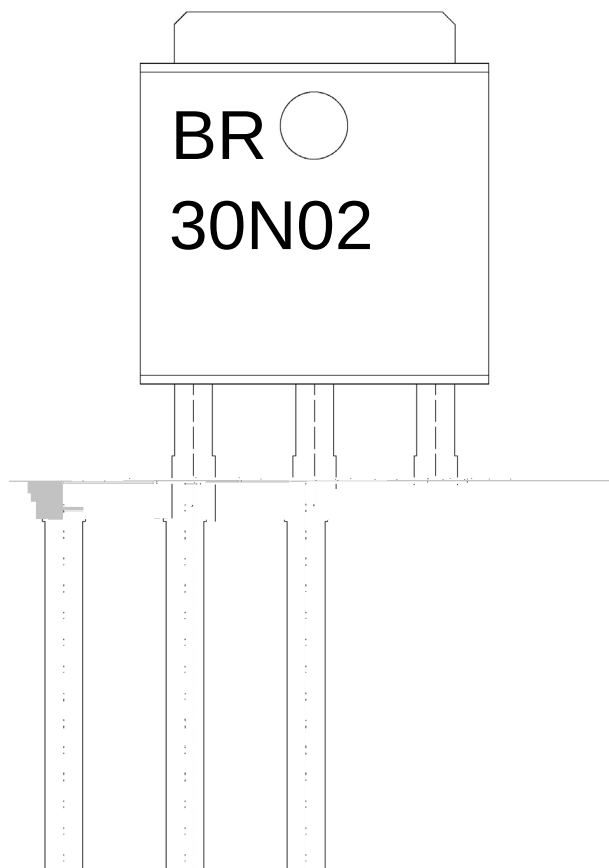


单位: mm

| Symbol | Dimensions In Millimeters |      | Symbol | Dimensions In Millimeters |      |
|--------|---------------------------|------|--------|---------------------------|------|
|        | Min                       | Max  |        | Min                       | Max  |
| a      | 0.50                      | 0.75 | A      | 6.45                      | 6.75 |
| b      | 9.00                      | 9.40 | A1     | 5.10                      | 5.50 |



## / Marking Instructions



BR

30N02

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Note:

BR: Company Code

30N02: Product Type Code.

\*\*\*\*: Lot No. Code, code change with Lot No.


**( ) / Temperature Profile for Dip Soldering(Pb-Free)**


Note:

- |   |       |     |           |                                         |                                      |
|---|-------|-----|-----------|-----------------------------------------|--------------------------------------|
| 1 | 25    | 150 | 60        | 90sec;                                  | 1.Preheating:25~150 , Time:60~90sec. |
| 2 | 255±5 |     | 5±0.5sec; | 2.Peak Temp.:255±5 , Duration:5±0.5sec. |                                      |
| 3 |       | 2   | 10        | /sec.                                   | 3. Cooling Speed: 2~10 /sec.         |

**/ Resistance to Soldering Heat Test Conditions**

|       |           |             |               |
|-------|-----------|-------------|---------------|
| 270±5 | 10±1 sec. | Temp.:270±5 | Time:10±1 sec |
|-------|-----------|-------------|---------------|

**/ Packaging SPEC.**
**/ REEL**

| Package Type<br>封装形式 | Units 包装数量 |      |     |     |     | Dimension 包装尺寸 (unit: mm <sup>3</sup> ) |   |   |
|----------------------|------------|------|-----|-----|-----|-----------------------------------------|---|---|
|                      | 只 卷盘       | 卷盘 盒 | 只 盒 | 盒 箱 | 只 箱 |                                         | 盒 | 箱 |
|                      |            |      |     |     |     |                                         |   |   |

**/ TUBE**

| Package Type<br>封装形式 | Units 包装数量 |      |     |     |     | Dimension 包装尺寸 (unit: mm <sup>3</sup> ) |   |   |
|----------------------|------------|------|-----|-----|-----|-----------------------------------------|---|---|
|                      | 只 套管       | 套管 盒 | 只 盒 | 盒 箱 | 只 箱 | 套管                                      | 盒 | 箱 |
|                      |            |      |     |     |     |                                         |   |   |

**/ Notices**