

## / Descriptions

N TO-252 N-CHANNEL MOSFET in a TO-252 Plastic Package.

## / Features

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

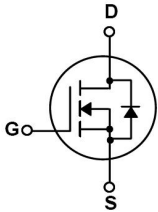
Low  $R_{DS(on)}$ , low gate charge, low  $C_{rSS}$ , fast switching.

## / Applications

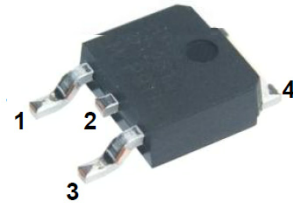
DC/DC

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      PIN 4 D

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

See Marking Instructions.

## / Absolute Maximum Ratings(Ta=25 )

Parameter	Symbol	Rating	Unit
Drain-Source Voltage	$V_{DSS}$	20	V
Drain Current <sup>G</sup>	$I_D(Tc=25 )$	30	A
	$I_D(Tc=100 )$	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	$V_{GS}$	±12	V
Avalanche Current <sup>C</sup>	$I_{AS}$	12	A
Avalanche energy L=0.5mH <sup>C</sup>	$E_{AS}$	115	mJ
Power Dissipation <sup>B</sup>	$P_D(Tc=25 )$	100	W
	$P_D(Tc=100 )$	50	W
Power Dissipation <sup>A</sup>	$P_{DSM}(T_A=25 )$	2.5	W
	$P_{DSM}(T_A=70 )$	1.6	W
Junction and Storage Temperature Range	$T_j T_{stg}$	-55 150	°C

## / Electrical Characteristics(Ta=25 )

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

## / Electrical Characteristics(Ta=25 )

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

A. The value of  $R_{JA}$  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  $R_{JA}$  and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design, and the maximum temperature of 150°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  $R_{qJA}$  is the sum of the thermal impedance from junction to case  $R_{qJC}$  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

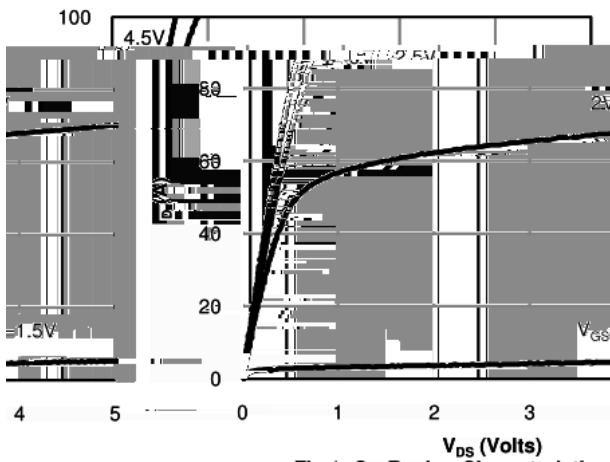


Fig 1: On-Region Characteristics

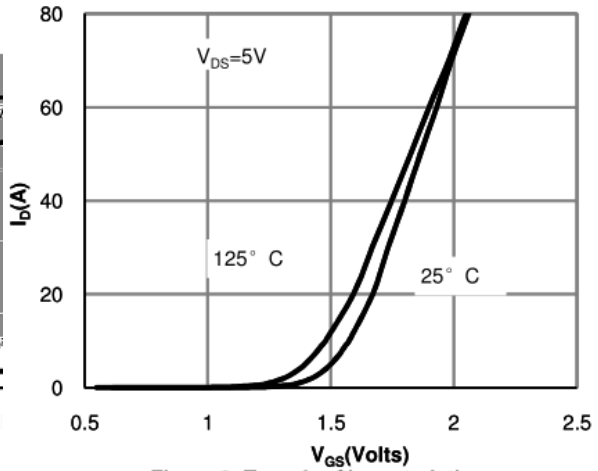


Figure 2: Transfer Characteristics

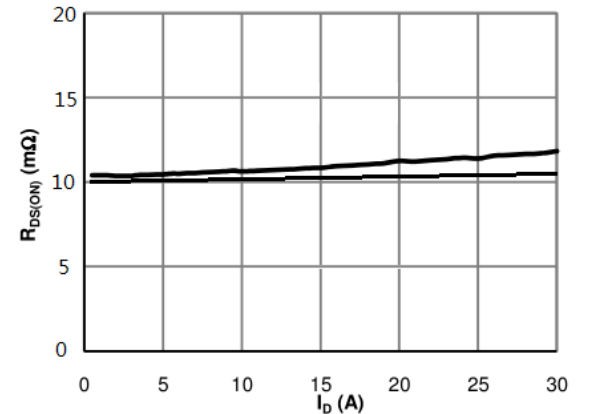
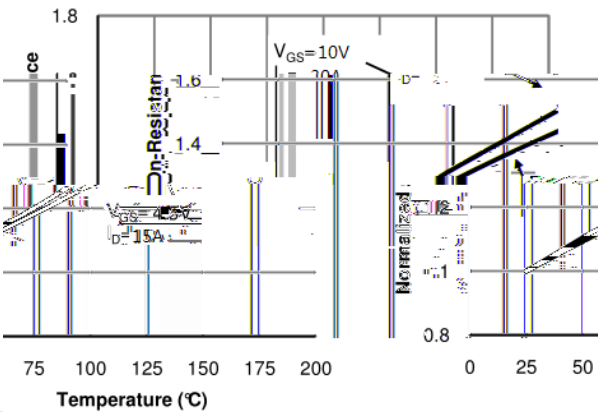


Figure 3: On-Resistance vs. Drain Current and Gate Voltage



On-Resistance vs. Junction Temperature

Figure 4: O

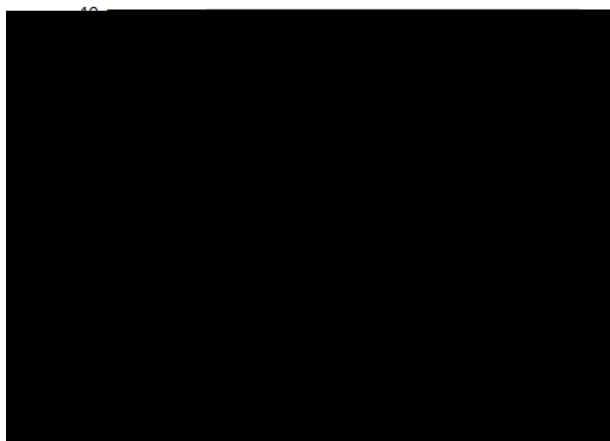
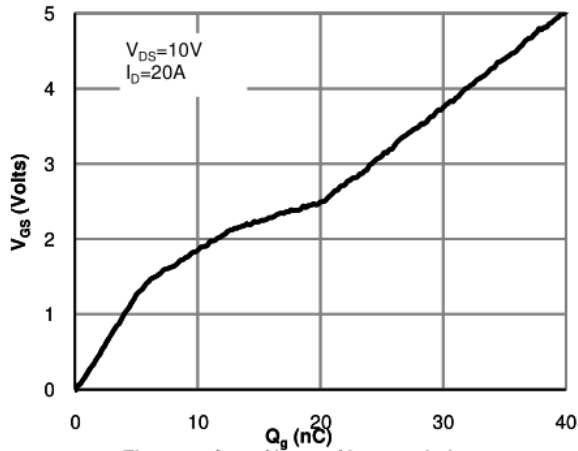
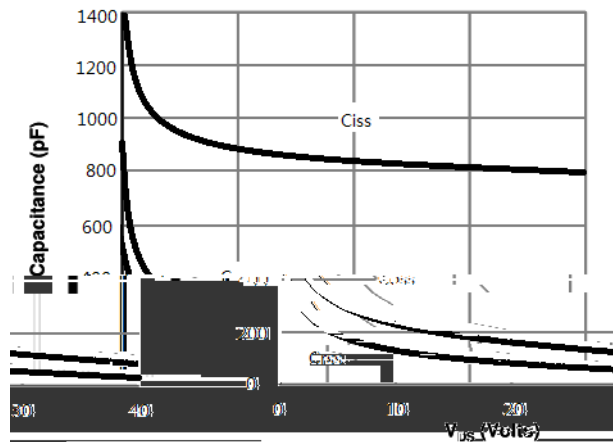


Figure 5: Body-Diode Characteristics

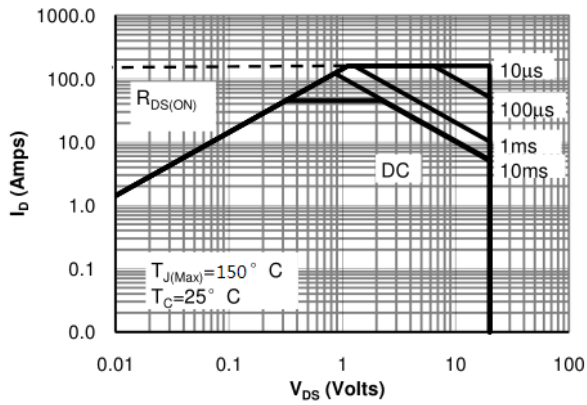
**/ Electrical Characteristic Curve**



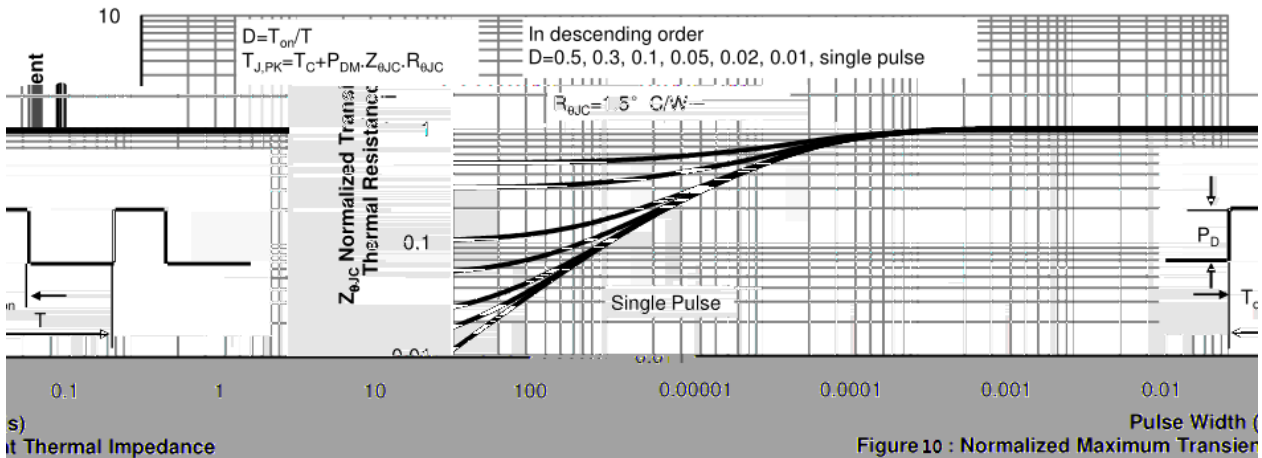
**Figure 7: Gate-Charge Characteristics**



**Figure 8: Capacitance Characteristics**

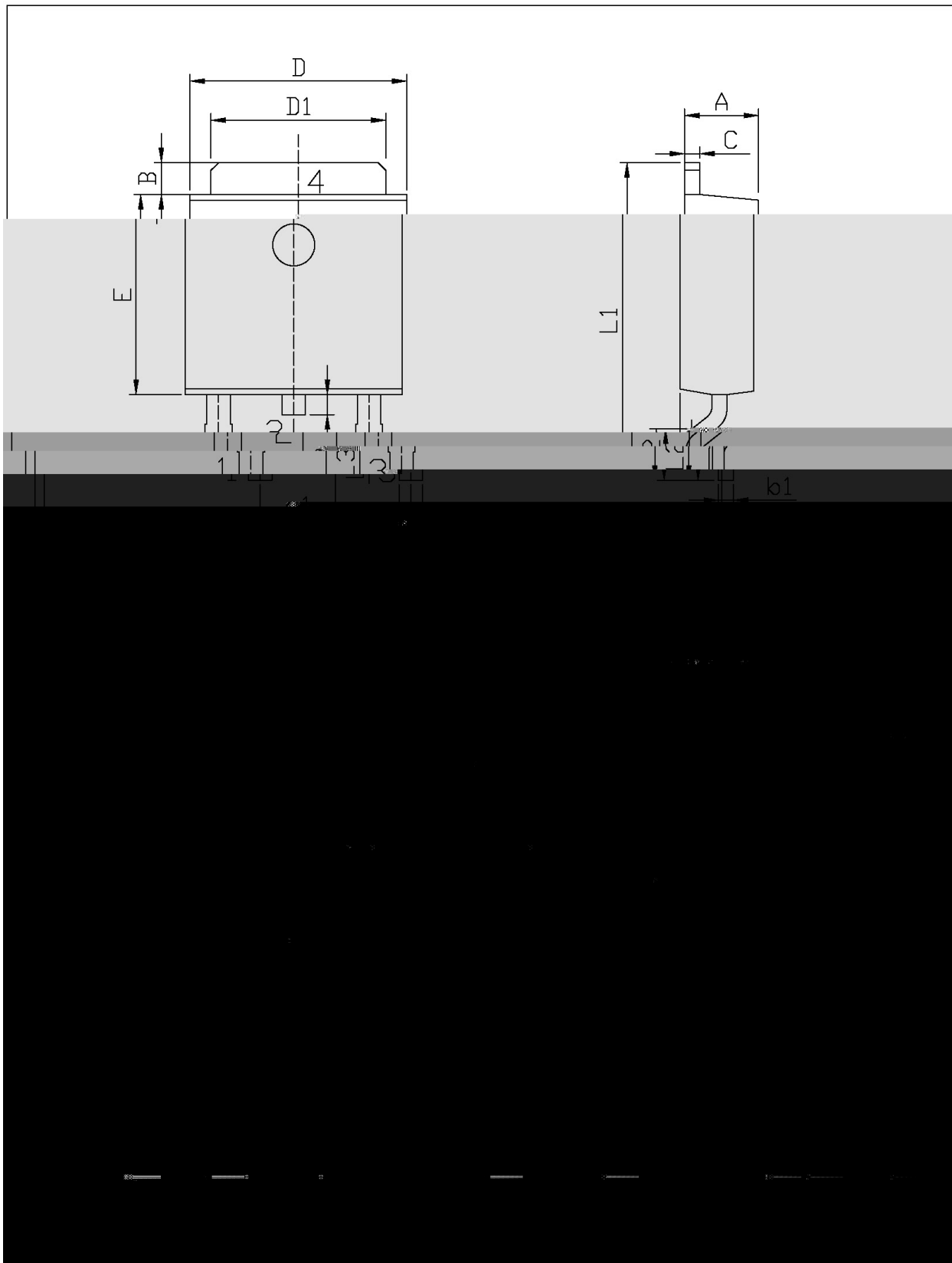


**Figure 9: Maximum Forward Biased Safe Operating Area**

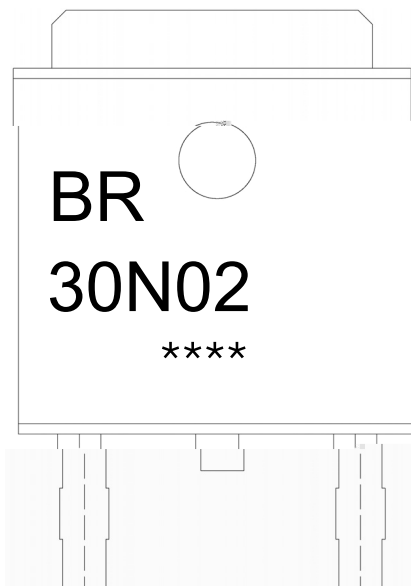


**Figure 10: Normalized Maximum Transient Thermal Impedance**

/ Package Dimensions



/ Marking Instructions



BR

30N02

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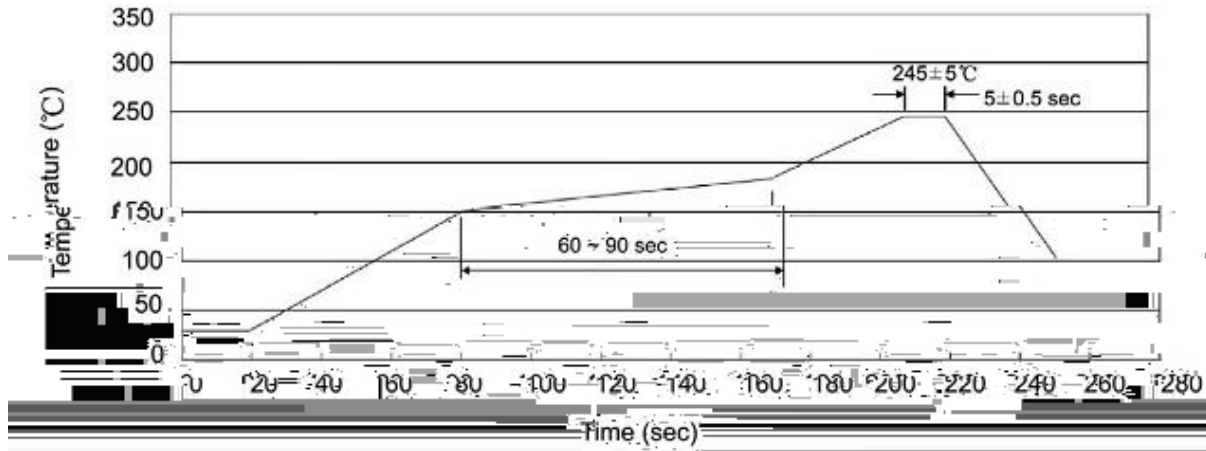
Note:

BR: Company Code

30N02: Product Type Code.

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

( ) / Temperature Profile for IR Reflow Soldering(Pb-Free)



Note:

- |   |       |     |    |           |   |
|---|-------|-----|----|-----------|---|
| 1 | 150   | 180 | 60 | 90sec;    | 1.Preheating:150~180 , Time:60~90sec.   |
| 2 | 245±5 |     |    | 5±0.5sec; | 2.Peak Temp.:245±5 , Duration:5±0.5sec. |
| 3 |       |     | 2  | 10 /sec.  | 3. Cooling Speed: 2~10 /sec.            |

/ Resistance to Soldering Heat Test Conditions

260±5                      10±1 sec.                      Temp.:260±5°C                      Time:10±1 sec

/ Packaging SPEC.

/ REEL

Package Type	Units					Dimension (unit mm <sup>3</sup> )		
	Units/Reel	Reels/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Reel	Inner Box	Outer Box
TO-252	2,500	2	5,000	5	25,000	13 ×16	360×360×50	385×257×392

/ TUBE

Package Type	Units					Dimension (unit mm <sup>3</sup> )		
	Units/Tube	Tubes/Inner Box	Units/Inner Box	Inner Boxes/Outer Box	Units/Outer Box	Tube	Inner Box	Outer Box
TO-251/252	75	48	3,600	5	18,000	526×20.5×5.25	555×164×50	575×290×180

/ Notices