

**N-Channel Enhancement Mode Power MOSFET**

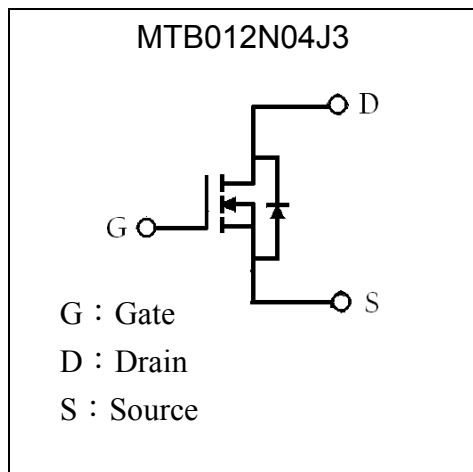
# MTB012N04J3

<b>BV<sub>DSS</sub></b>	<b>40V</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>C</sub>=25°C</b>	<b>40A</b>
<b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=10V, I<sub>D</sub>=20A</b>	<b>9.6 mΩ (typ)</b>
<b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=4.5V, I<sub>D</sub>=20A</b>	<b>13.4 mΩ (typ)</b>

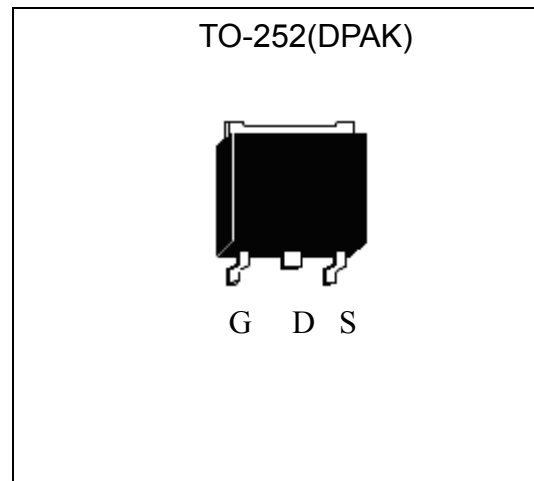
**Features**

- Simple Drive Requirement
- Repetitive Avalanche Rated
- Fast Switching Characteristic
- RoHS compliant package & Halogen-free package

**Symbol**

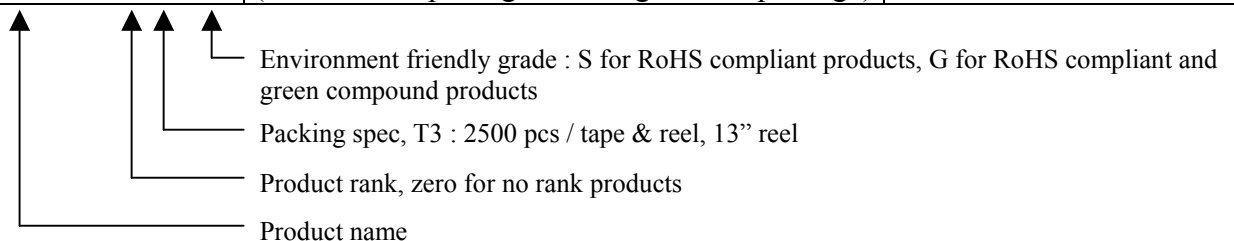


**Outline**



**Ordering Information**

Device	Package	Shipping
MTB012N04J3-0-T3-G	TO-252 (Pb-free lead plating and halogen-free package)	2500 pcs / Tape & Reel





**Absolute Maximum Ratings** (T<sub>c</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V <sub>DS</sub>	40	V
Gate-Source Voltage	V <sub>GS</sub>	±20	
Continuous Drain Current @ T <sub>c</sub> =25°C	I <sub>D</sub>	40	A
Continuous Drain Current @ T <sub>c</sub> =100°C		28	
Pulsed Drain Current (Note 1)	I <sub>DM</sub>	160	
Avalanche Current	I <sub>AS</sub>	20	
Avalanche Energy @ L=0.1mH, I <sub>D</sub> =20A, V <sub>DD</sub> =15V	E <sub>AS</sub>	20	mJ
Repetitive Avalanche Energy @ L=0.05mH (Note 2)	E <sub>AR</sub>	10	
Total Power Dissipation @ T <sub>c</sub> =25°C	P <sub>D</sub>	50	W
Total Power Dissipation @ T <sub>c</sub> =100°C		25	
Operating Junction and Storage Temperature Range	T <sub>j</sub> , T <sub>stg</sub>	-55~+175	°C

Note : 1. Pulse width limited by maximum junction temperature  
 2. Duty cycle ≤ 1%

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R <sub>θJC</sub>	3	°C/W
Thermal Resistance, Junction-to-ambient, max	R <sub>θJA</sub>	75	

**Characteristics (T<sub>c</sub>=25°C, unless otherwise specified)**

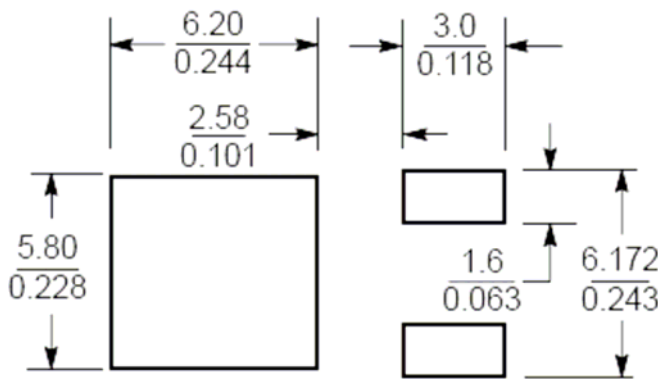
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	40	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1.0	-	2.5		V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V
	-	-	25		V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	9.6	13	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =20A
	-	13.4	20		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A
*G <sub>FS</sub>	-	25	-	S	V <sub>DS</sub> =5V, I <sub>D</sub> =20A
<b>Dynamic</b>					
*Q <sub>g</sub>	-	14.4	-	nC	I <sub>D</sub> =20A, V <sub>DS</sub> =20V, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	2.8	-		
*Q <sub>gd</sub>	-	3	-		
*t <sub>d(ON)</sub>	-	8.6	-	ns	V <sub>DS</sub> =20V, I <sub>D</sub> =1A, V <sub>GS</sub> =10V, R <sub>GS</sub> =6Ω
*t <sub>r</sub>	-	17.8	-		
*t <sub>d(OFF)</sub>	-	39.8	-		
*t <sub>f</sub>	-	10.4	-		



Ciss	-	697	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =20V, f=1MHz
Coss	-	109	-		
Crss	-	56	-		
Rg	-	3.5	-	Ω	f=1MHz
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	40	A	
*I <sub>SM</sub>	-	-	160		
*V <sub>SD</sub>	-	0.88	1.3	V	I <sub>S</sub> =25A, V <sub>GS</sub> =0V
*trr	-	11	-	ns	I <sub>F</sub> =25A, V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs
*Qrr	-	6	-	nC	

\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

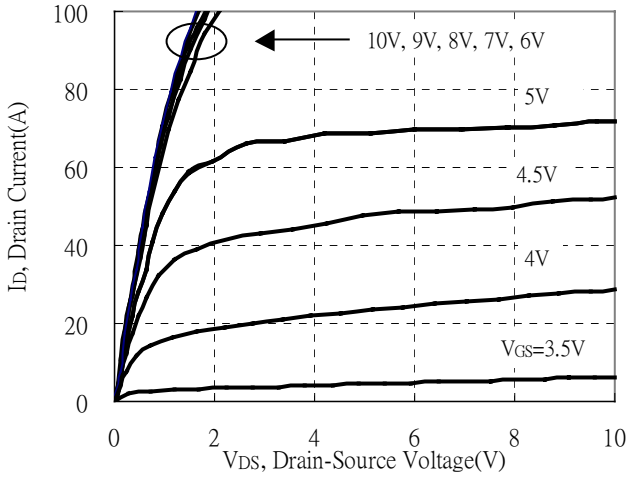
**Recommended soldering footprint**



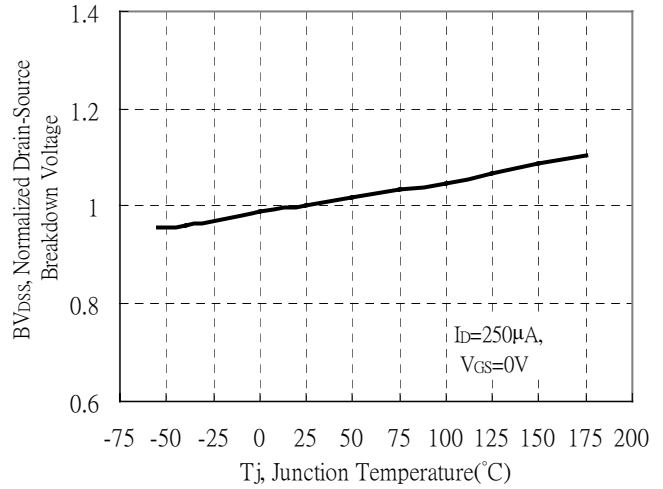
Unit (  $\frac{\text{mm}}{\text{inch}}$  )

## Typical Characteristics

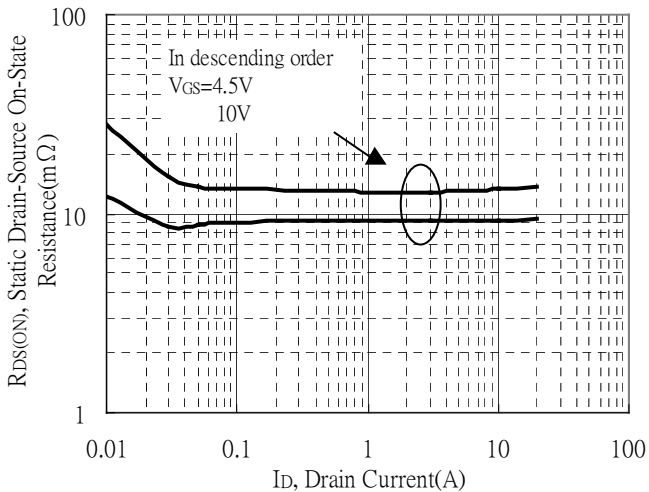
Typical Output Characteristics



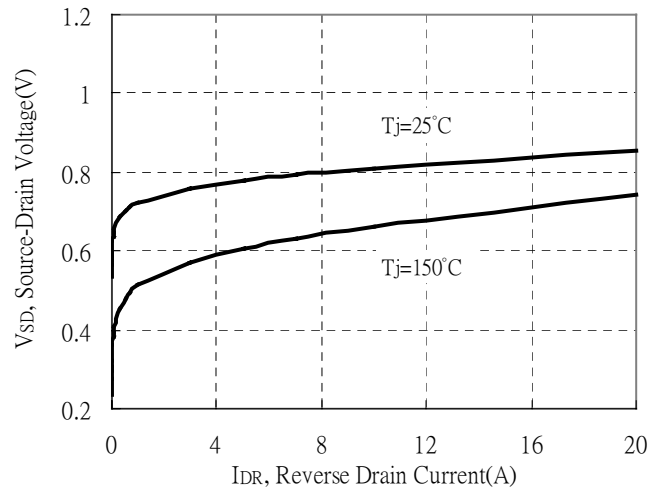
Brekdown Voltage vs Ambient Temperature



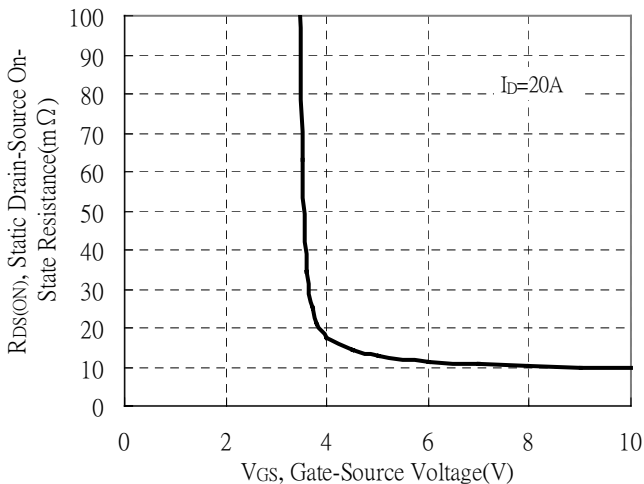
Static Drain-Source On-State resistance vs Drain Current



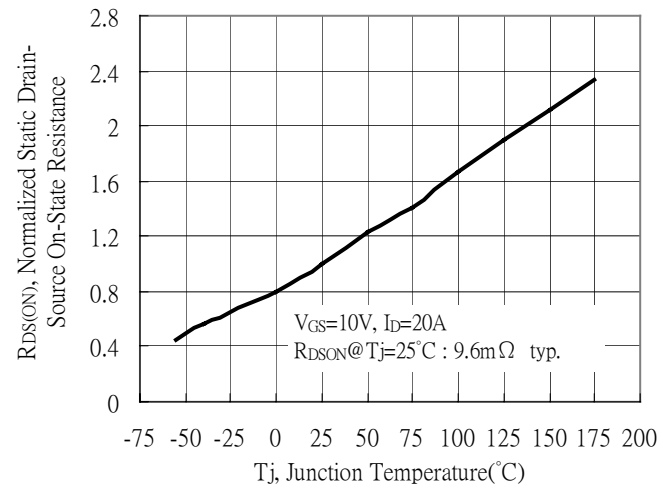
Reverse Drain Current vs Source-Drain Voltage



Static Drain-Source On-State Resistance vs Gate-Source Voltage

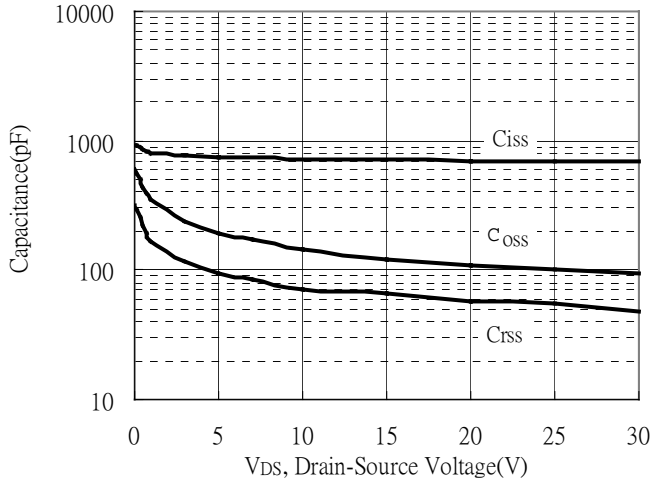


Drain-Source On-State Resistance vs Junction Temperature

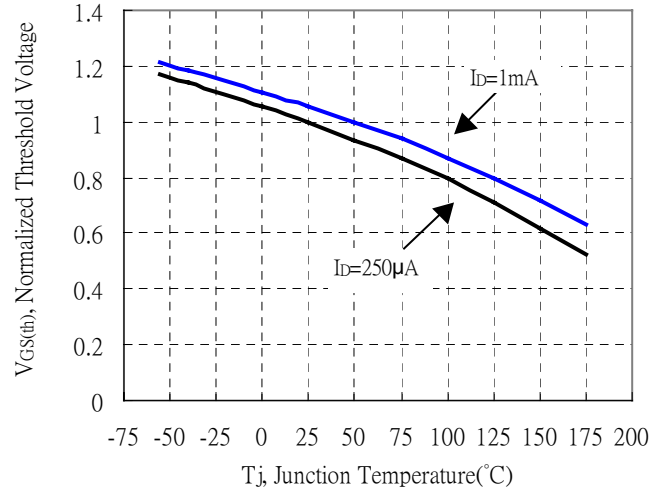


## Typical Characteristics(Cont.)

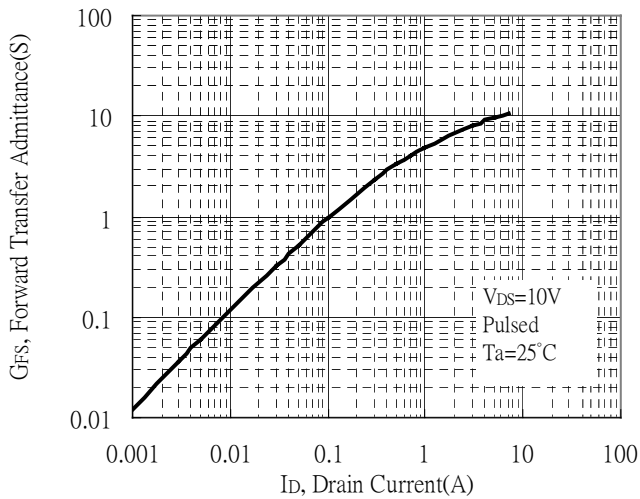
Capacitance vs Drain-to-Source Voltage



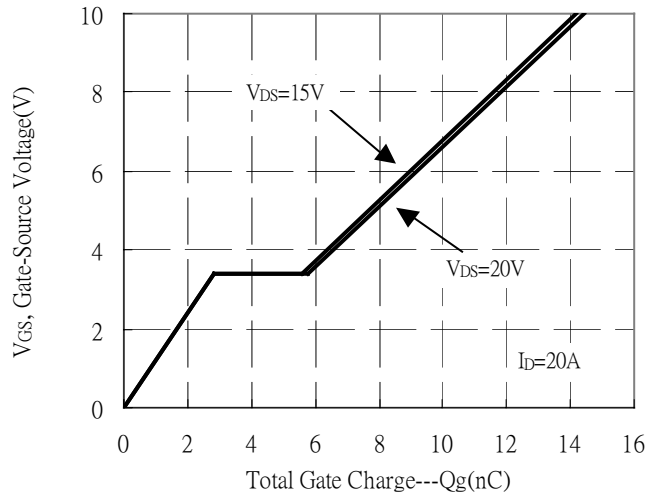
Normalized Threshold Voltage vs Junction Temperature



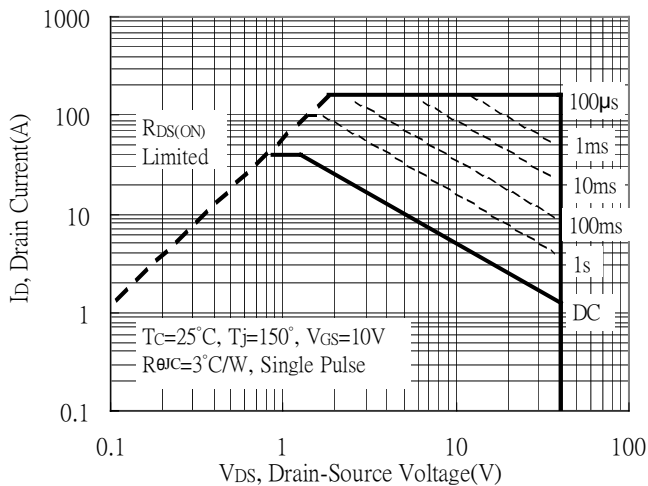
Forward Transfer Admittance vs Drain Current



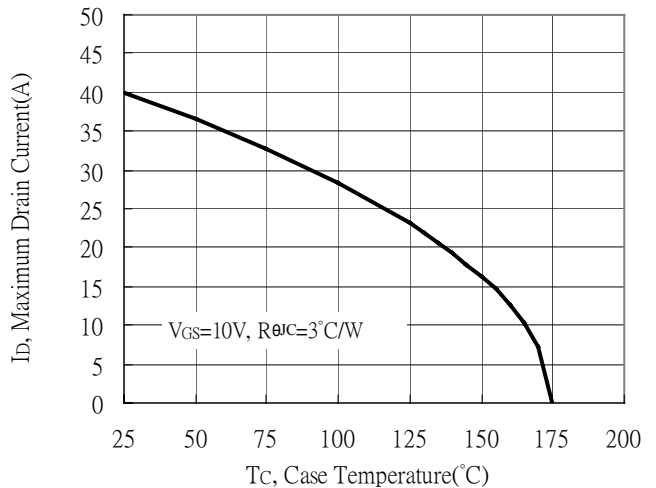
Gate Charge Characteristics



Maximum Safe Operating Area



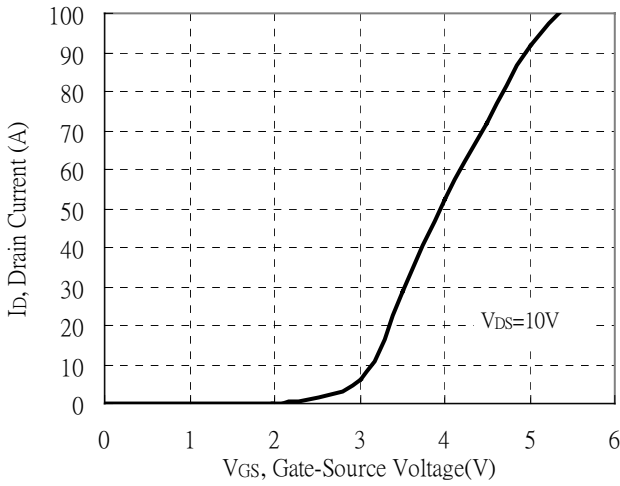
Maximum Drain Current vs Case Temperature



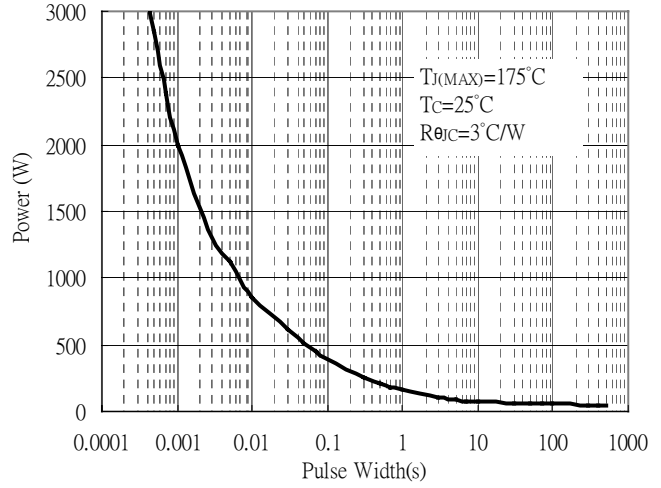


**Typical Characteristics(Cont.)**

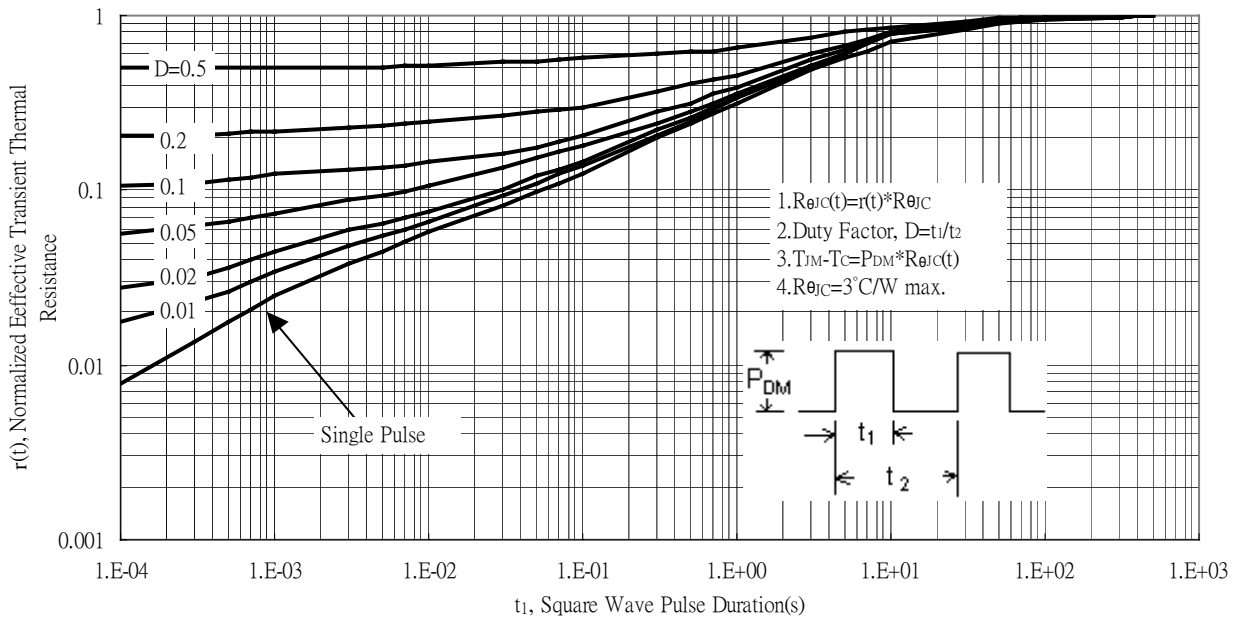
Typical Transfer Characteristics



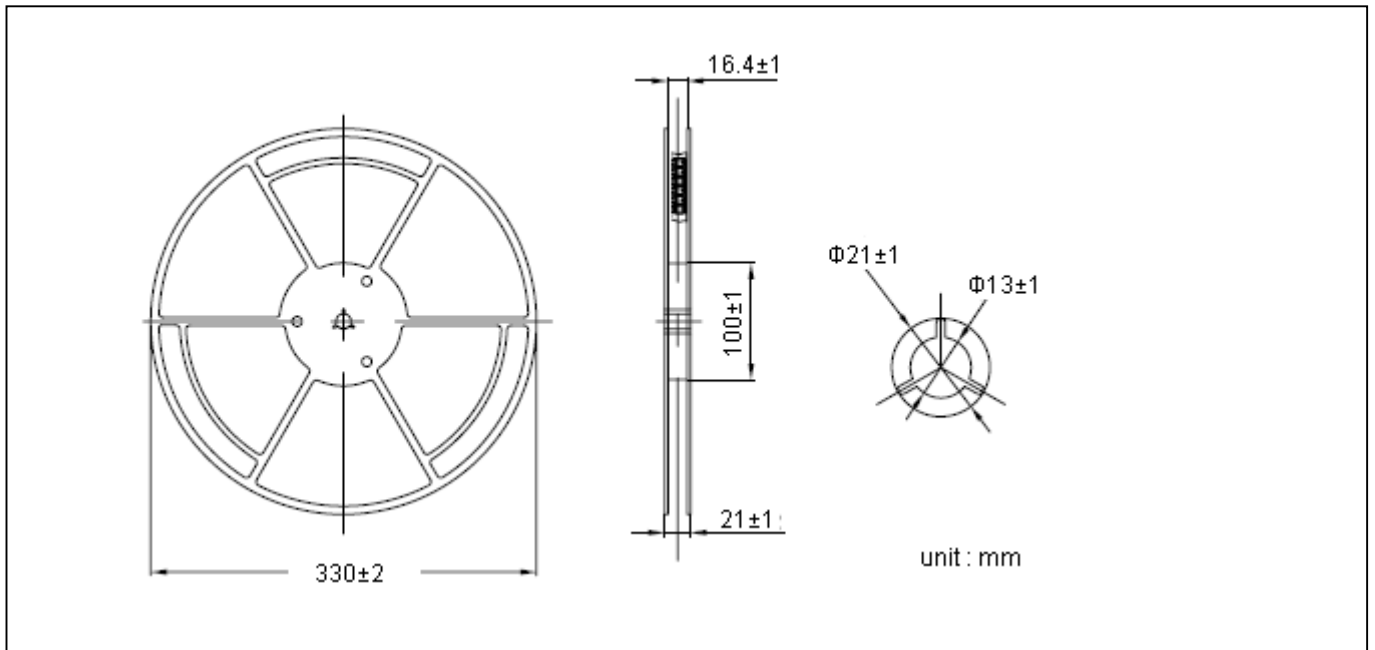
Single Pulse Maximum Power Dissipation



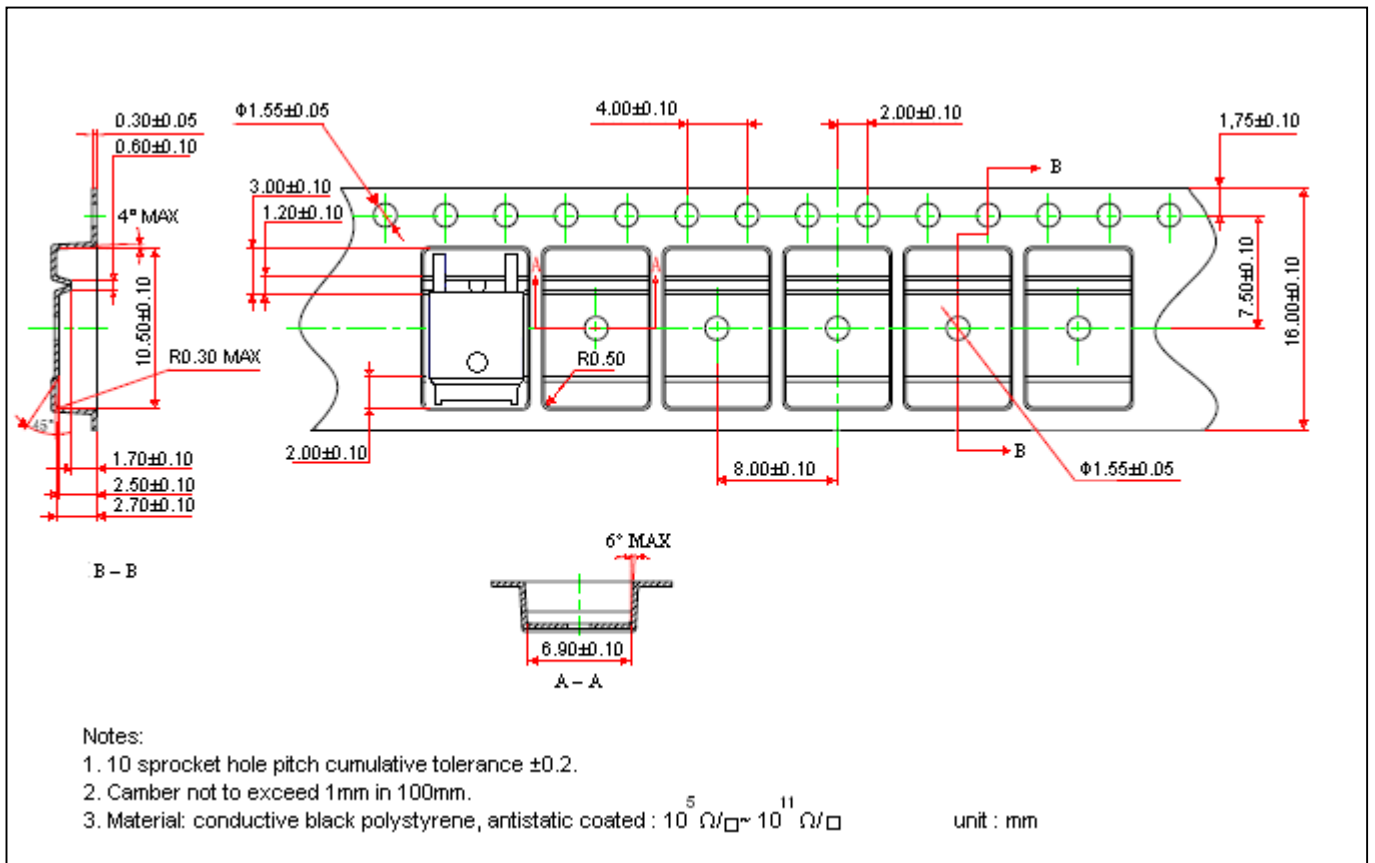
Transient Thermal Response Curves



**Reel Dimension**



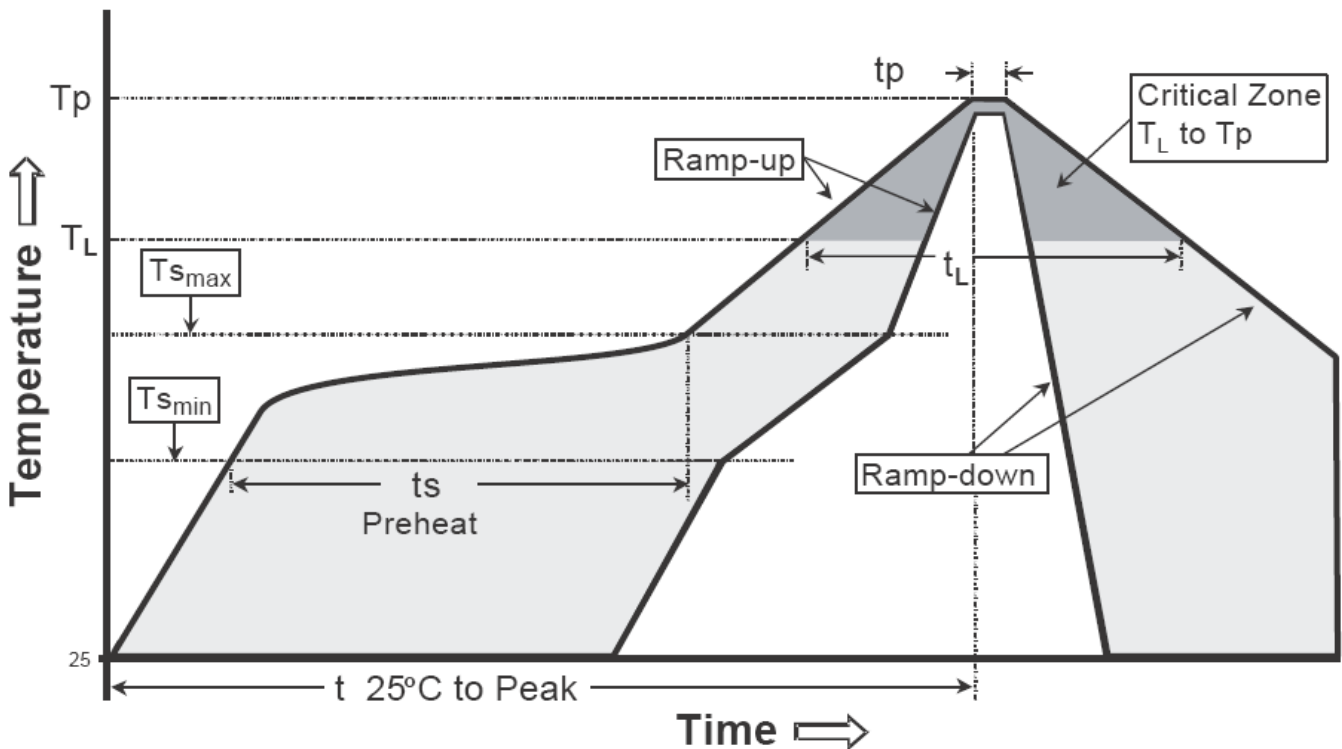
**Carrier Tape Dimension**



**Recommended wave soldering condition**

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

**Recommended temperature profile for IR reflow**

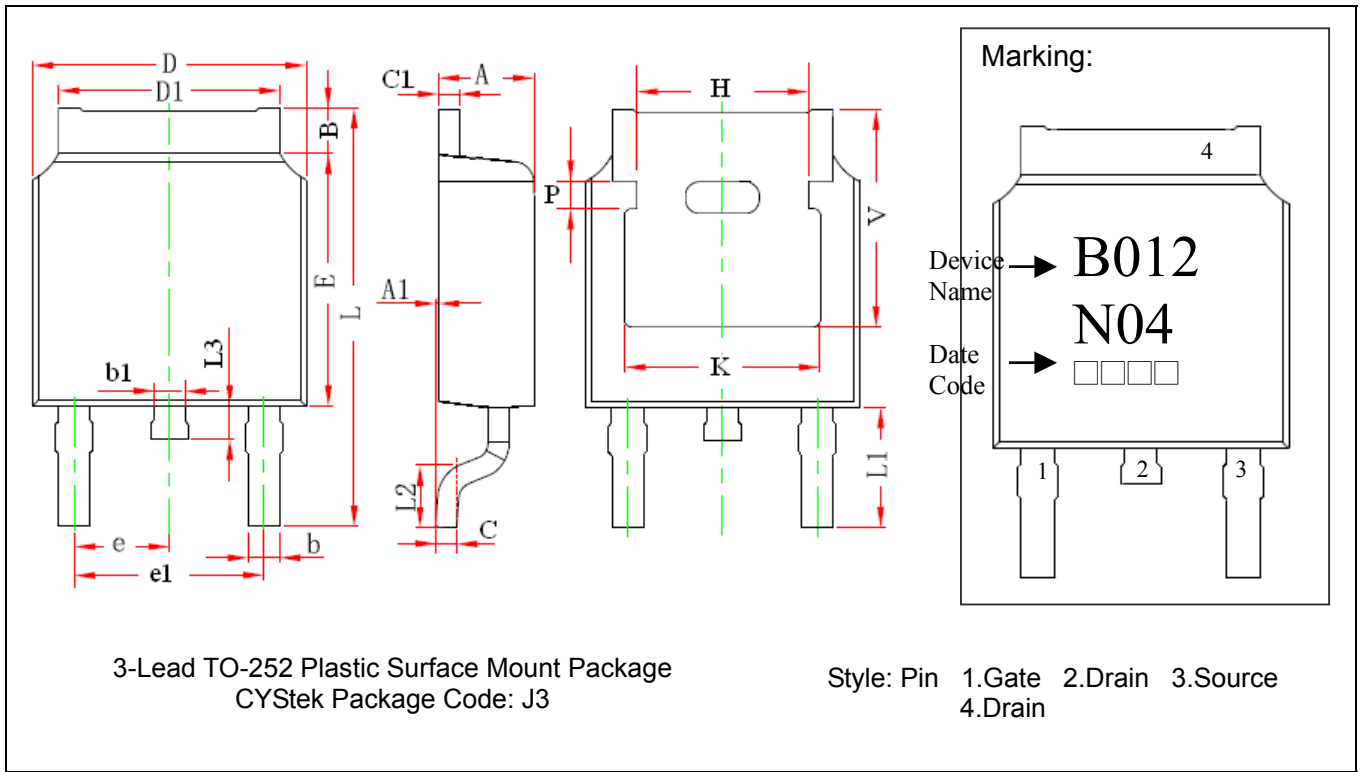


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	60-150 seconds
Peak Temperature(T <sub>P</sub> )	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.



**TO-252 Dimension**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	e	0.086	0.094	2.186	2.386
A1	0.000	0.005	0.000	0.127	e1	0.172	0.188	4.372	4.772
B	0.039	0.048	0.990	1.210	H	0.163	REF	4.140	REF
b	0.026	0.034	0.660	0.860	K	0.190	REF	4.830	REF
b1	0.026	0.034	0.660	0.860	L	0.386	0.409	9.800	10.400
C	0.018	0.023	0.460	0.580	L1	0.114	REF	2.900	REF
C1	0.018	0.023	0.460	0.580	L2	0.055	0.067	1.400	1.700
D	0.256	0.264	6.500	6.700	L3	0.024	0.039	0.600	1.000
D1	0.201	0.215	5.100	5.460	P	0.026	REF	0.650	REF
E	0.236	0.244	6.000	6.200	V	0.211	REF	5.350	REF

- Notes:**
- Controlling dimension: millimeters.
  - Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
  - If there is any question with packing specification or packing method, please contact your local CYStek sales office.

**Material:**

- Lead : Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

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