

N-Channel Enhancement Mode Power MOSFET

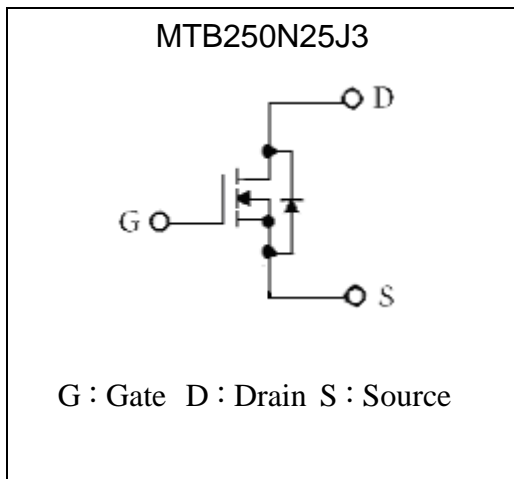
MTB250N25J3

BV_{DSS}	250V
$I_D @ V_{GS}=10V, T_C=25^\circ C$	14A
$I_D @ V_{GS}=10V, T_A=25^\circ C$	2.2A
$R_{DS(on)(TYP)} @ V_{GS}=10V, I_D=3A$	270mΩ
$R_{DS(on)(TYP)} @ V_{GS}=4.5V, I_D=3A$	285mΩ

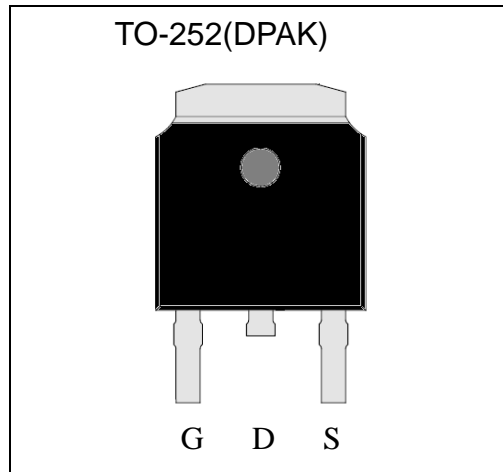
Features

- Low Gate Charge
- Simple Drive Requirement
- Fast Switching Characteristic
- Pb-free lead plating and halogen-free package

Symbol

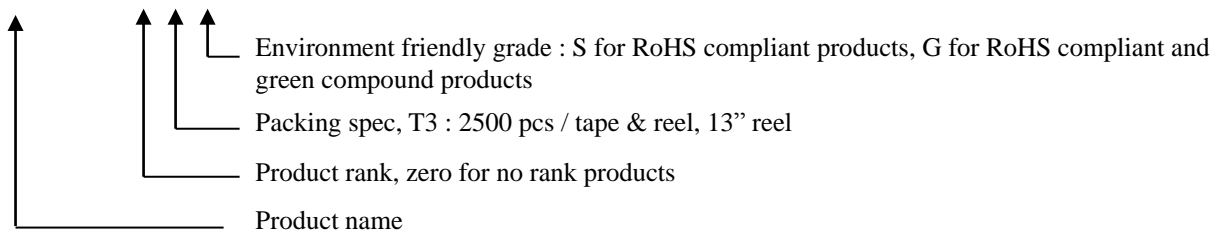


Outline



Ordering Information

Device	Package	Shipping
MTB250N25J3-0-T3-G	TO-252 (Pb-free lead plating and halogen-free package)	2500 pcs / Tape & Reel



**Absolute Maximum Ratings** ($T_C=25^\circ\text{C}$, unless otherwise noted)

Parameter		Symbol	Limits	Unit	
Drain-Source Voltage		V_{DS}	250	V	
Gate-Source Voltage		V_{GS}	± 20		
Continuous Drain Current @ $T_C=25^\circ\text{C}$	(Note 1)	I_D	14	A	
Continuous Drain Current @ $T_C=100^\circ\text{C}$	(Note 1)		8.9		
Pulsed Drain Current	(Note 3)	I_{DM}	30		
Continuous Drain Current @ $T_A=25^\circ\text{C}$	(Note 2)	I_{DSM}	2.2		
Continuous Drain Current @ $T_A=70^\circ\text{C}$	(Note 2)		1.8		
Avalanche Current @ $L=0.1\text{mH}$	(Note 3)	I_{AS}	5		
Avalanche Energy @ $L=1\text{mH}$, $I_D=4\text{A}$, $V_{DD}=50\text{V}$		(Note 5)	E_{AS}	8	mJ
Power Dissipation	$T_C=25^\circ\text{C}$	(Note 1)	P_D	83	W
	$T_C=100^\circ\text{C}$	(Note 1)		33	
Power Dissipation	$T_A=25^\circ\text{C}$	(Note 2)	P_{DSM}	2	
	$T_A=70^\circ\text{C}$	(Note 2)		1.3	
Operating Junction and Storage Temperature		T_j, T_{stg}	-55~+150	$^\circ\text{C}$	

Thermal Data

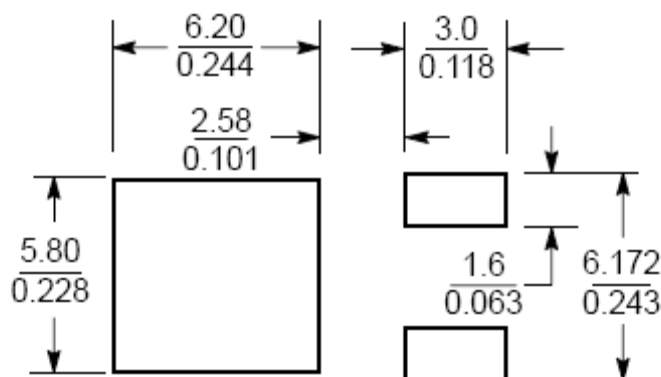
Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	1.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-ambient, max, $t \leq 10\text{s}$	$R_{th,j-a}$	62.5	
Thermal Resistance, Junction-to-ambient, max		(Note 4)	

- Note : 1. The power dissipation P_D is based on $T_{J(MAX)}=150^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with $T_A=25^\circ\text{C}$. The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C . The value in any given application depends on the user's specific board design.
3. Pulse width limited by junction temperature $T_{J(MAX)}=150^\circ\text{C}$. Ratings are based on low frequency and low duty cycles to keep initial $T_J=25^\circ\text{C}$.
4. When mounted on the minimum pad size recommended (PCB mount), $t \leq 10\text{s}$.
5. 100% tested by conditions of $L=0.1\text{mH}$, $V_{GS}=10\text{V}$, $I_D=1\text{A}$, $V_{DD}=50\text{V}$.

Characteristics (Tc=25°C, unless otherwise specified)

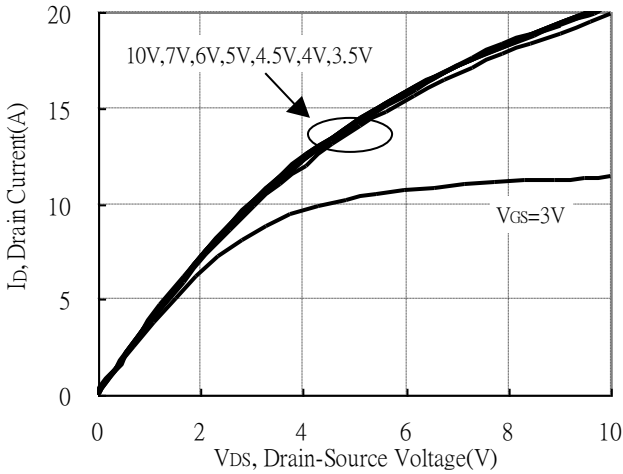
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	250	-	-	V	V _{GS} =0V, I _D =250μA
ΔBV _{DSS} /ΔT _j	-	0.26	-	V/°C	Reference to 25°C, I _D =250μA
V _{GS(th)}	1	-	2.5	V	V _{DS} = V _{GS} , I _D =250μA
G _{FS}	-	10.3	-	S	V _{DS} =10V, I _D =3A
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} =200V, V _{GS} =0V
	-	-	10		V _{DS} =200V, V _{GS} =0V, T _j =125°C
*R _{DS(ON)}	-	270	355	mΩ	V _{GS} =10V, I _D =3A
	-	285	390		V _{GS} =4.5V, I _D =3A
Dynamic					
*Q _g	-	24.5	-	nC	V _{DS} =200V, I _D =3A, V _{GS} =10V
*Q _{gs}	-	2.6	-		
*Q _{gd}	-	7.1	-		
*t _{d(ON)}	-	9.8	-	ns	V _{DS} =125V, I _D =3A, V _{GS} =10V, R _G =6Ω
*t _r	-	18	-		
*t _{d(OFF)}	-	46.2	-		
*t _f	-	90	-		
C _{iss}	-	894	-	pF	V _{GS} =0V, V _{DS} =125V, f=1MHz
C _{oss}	-	36	-		
C _{rss}	-	22	-		
R _g	-	3.2	-	Ω	f=1MHz
Source-Drain Diode					
*I _S	-	-	14	A	
*I _{SM}	-	-	30		
*V _{SD}	-	0.88	1.2	V	I _S =3A, V _{GS} =0V
*t _{rr}	-	69	-	ns	I _F =3A, V _{GS} =0, dI _F /dt=100A/μs
*Q _{rr}	-	165	-	nC	

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

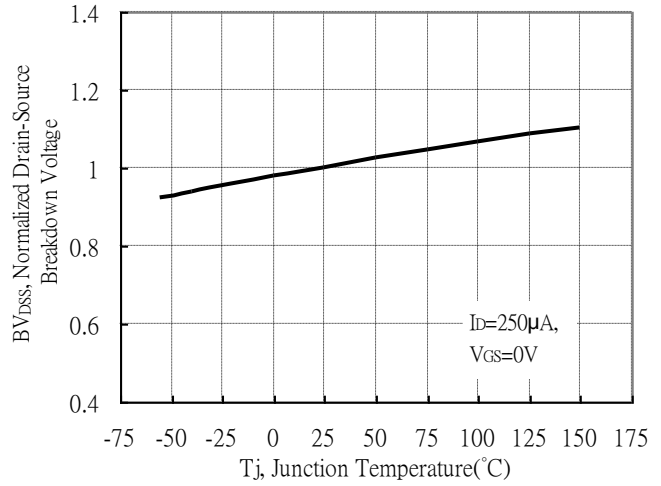
Recommended soldering footprint

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

Typical Characteristics

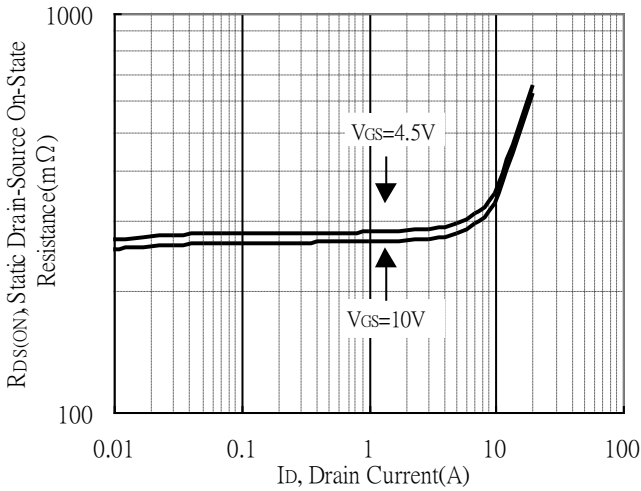
Typical Output Characteristics



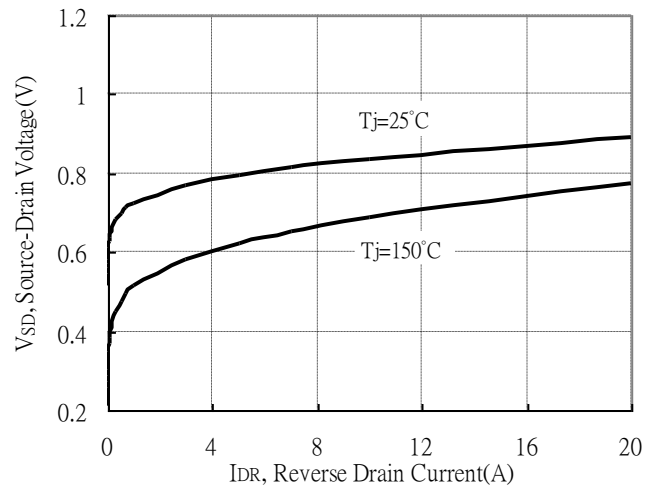
Brekdown Voltage vs Ambient Temperature



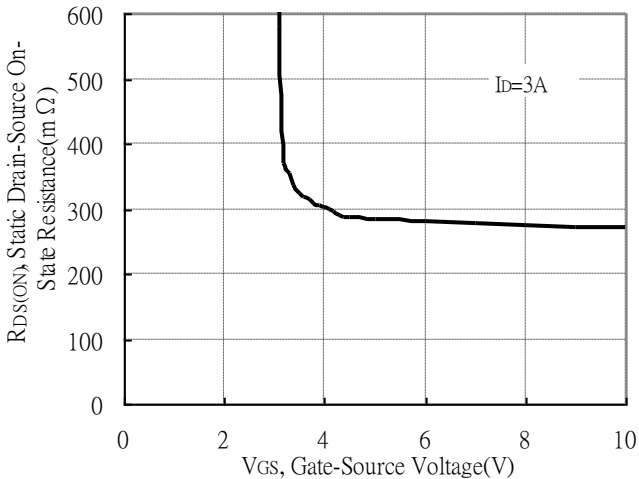
Static Drain-Source On-State resistance vs Drain Current



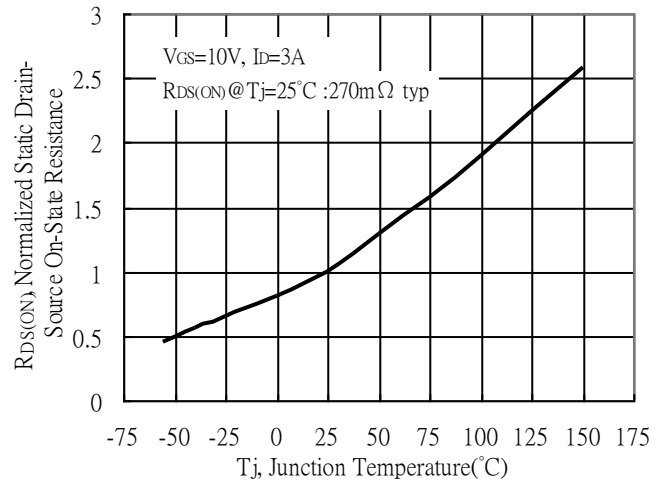
Reverse Drain Current vs Source-Drain Voltage



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

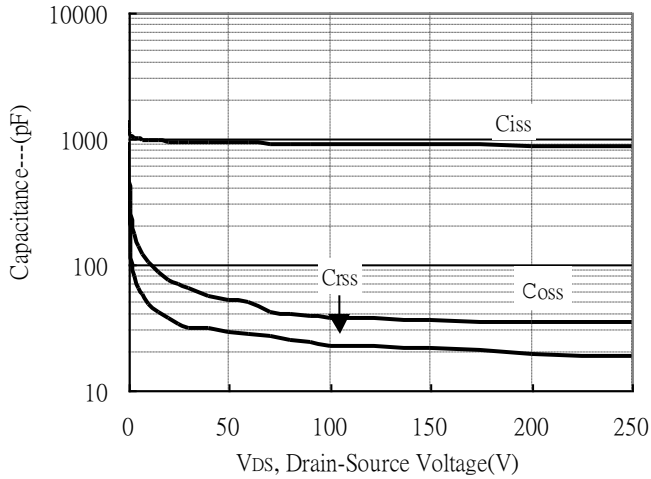


Drain-Source On-State Resistance vs Junction Temperature

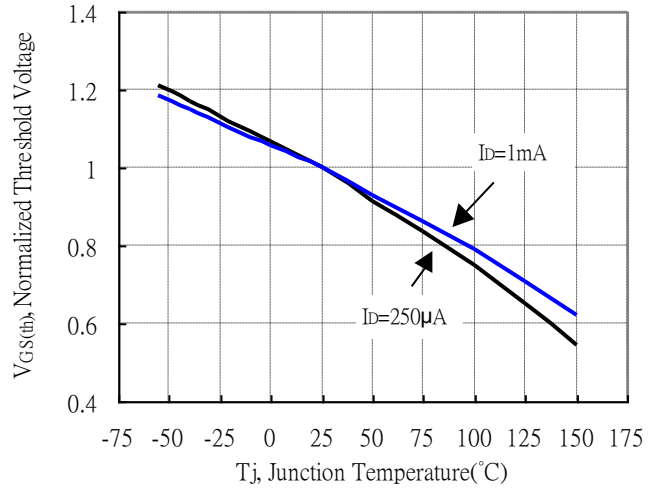


Typical Characteristics(Cont.)

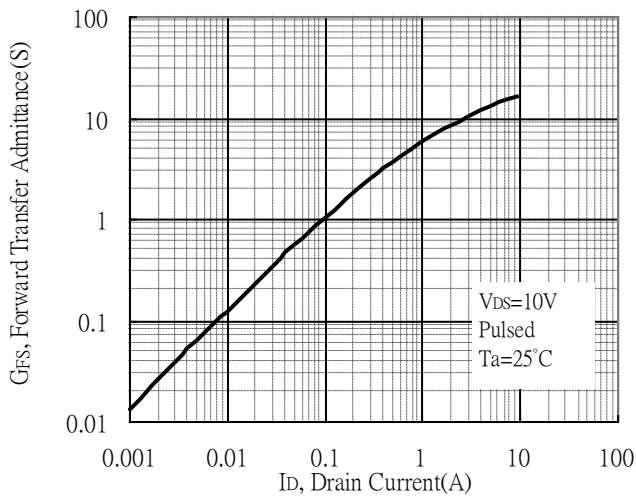
Capacitance vs Drain-to-Source Voltage



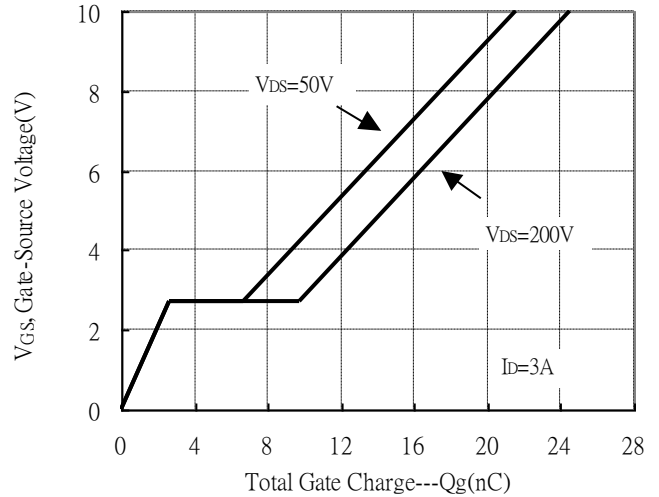
Normalized Threshold Voltage vs Junction Temperature



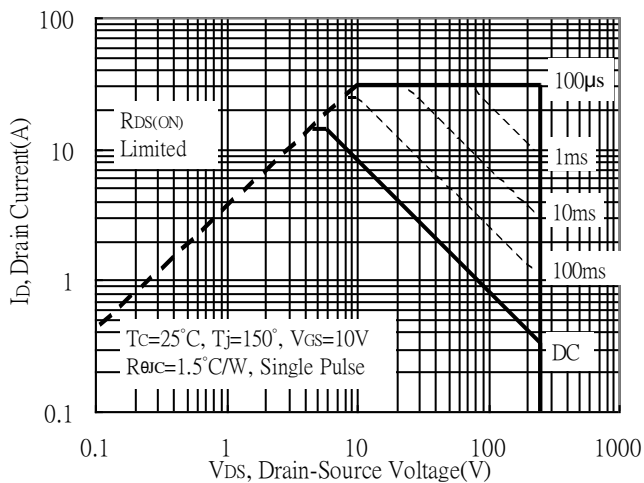
Forward Transfer Admittance vs Drain Current



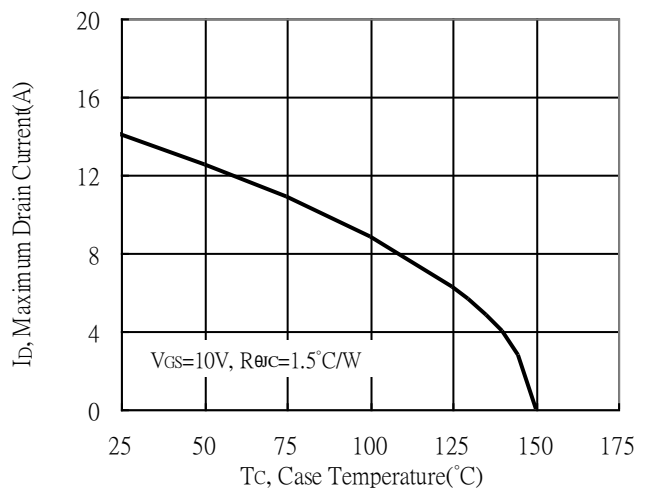
Gate Charge Characteristics



Maximum Safe Operating Area



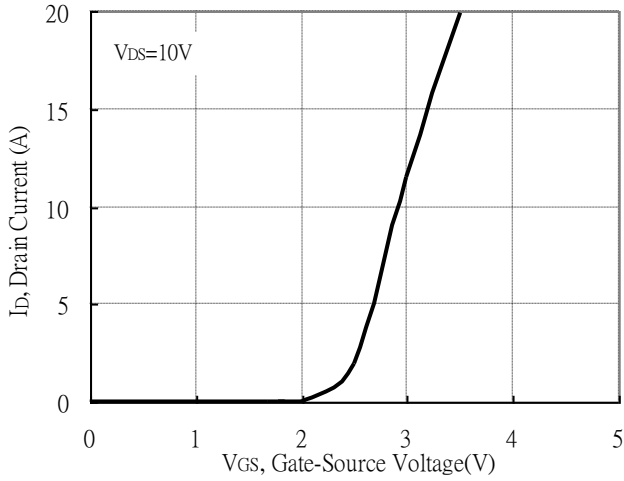
Maximum Drain Current vs Case Temperature



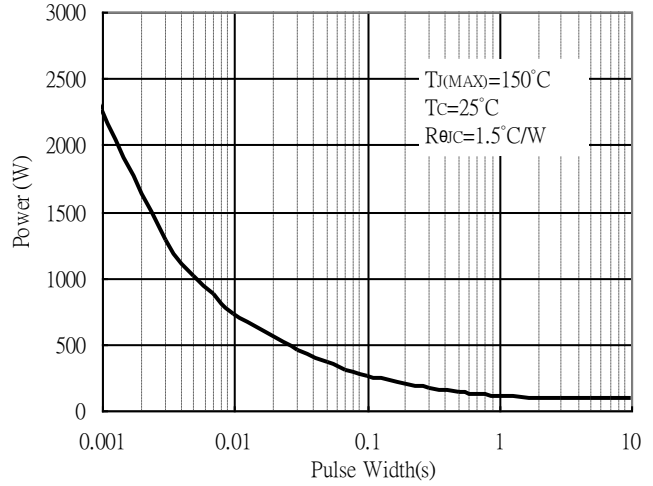


Typical Characteristics(Cont.)

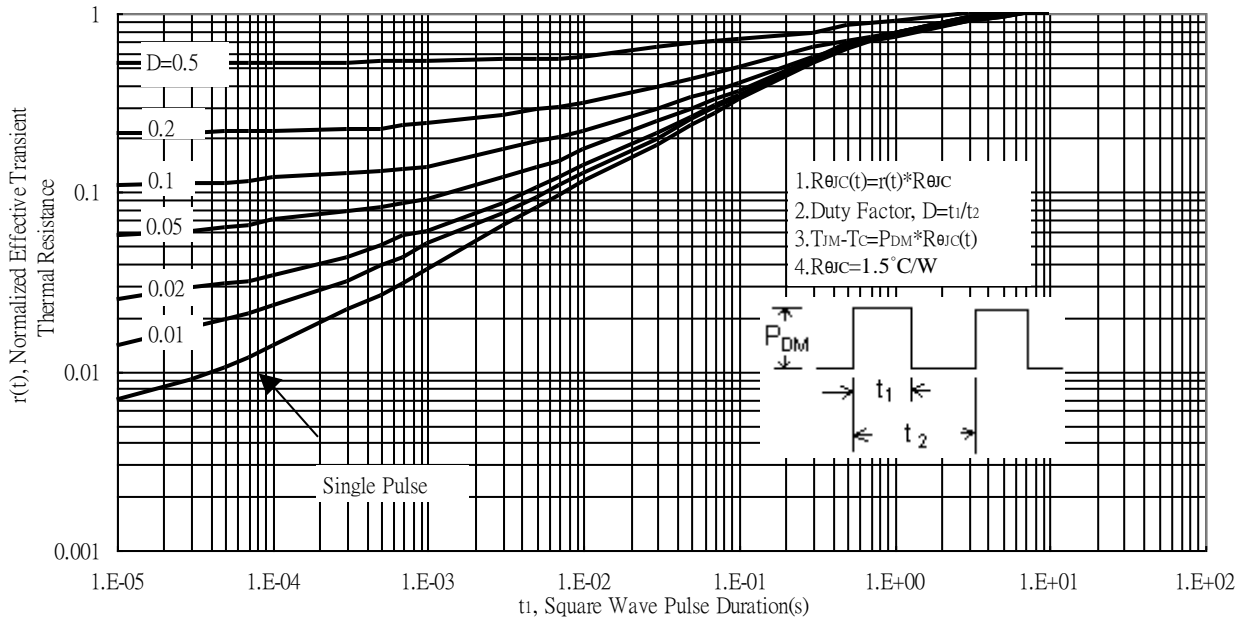
Typical Transfer Characteristics



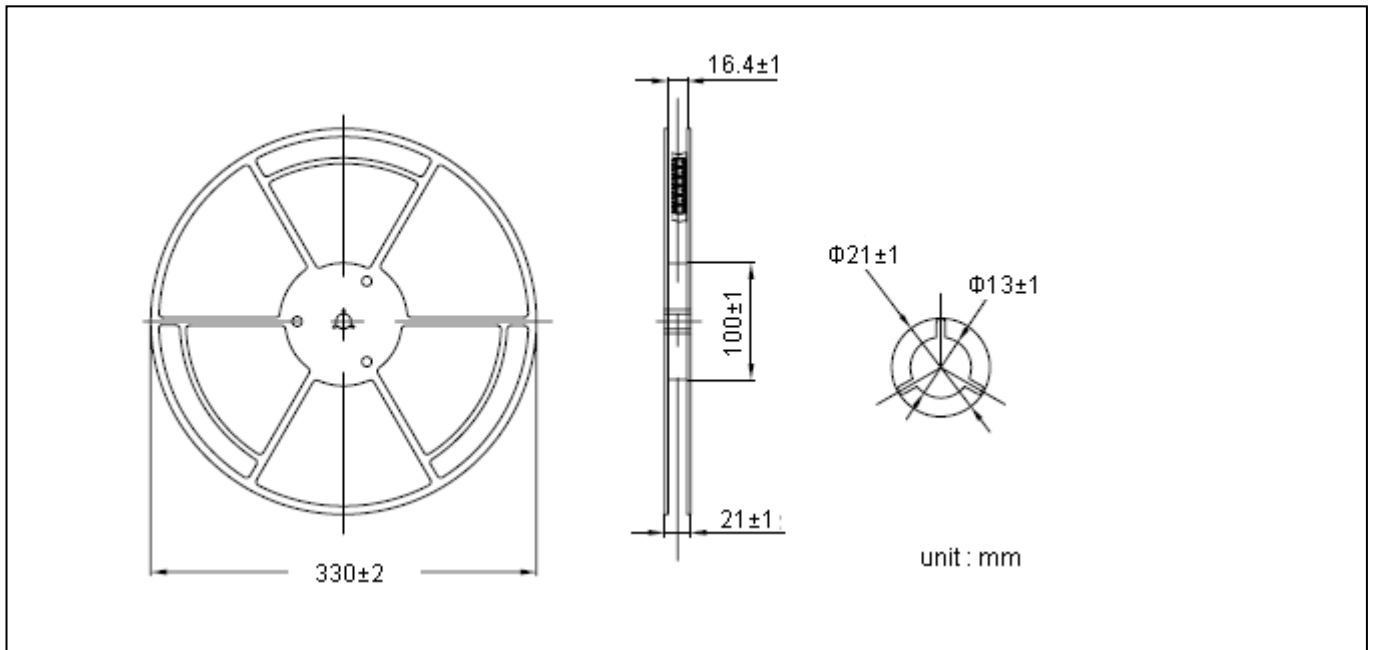
Single Pulse Maximum Power Dissipation



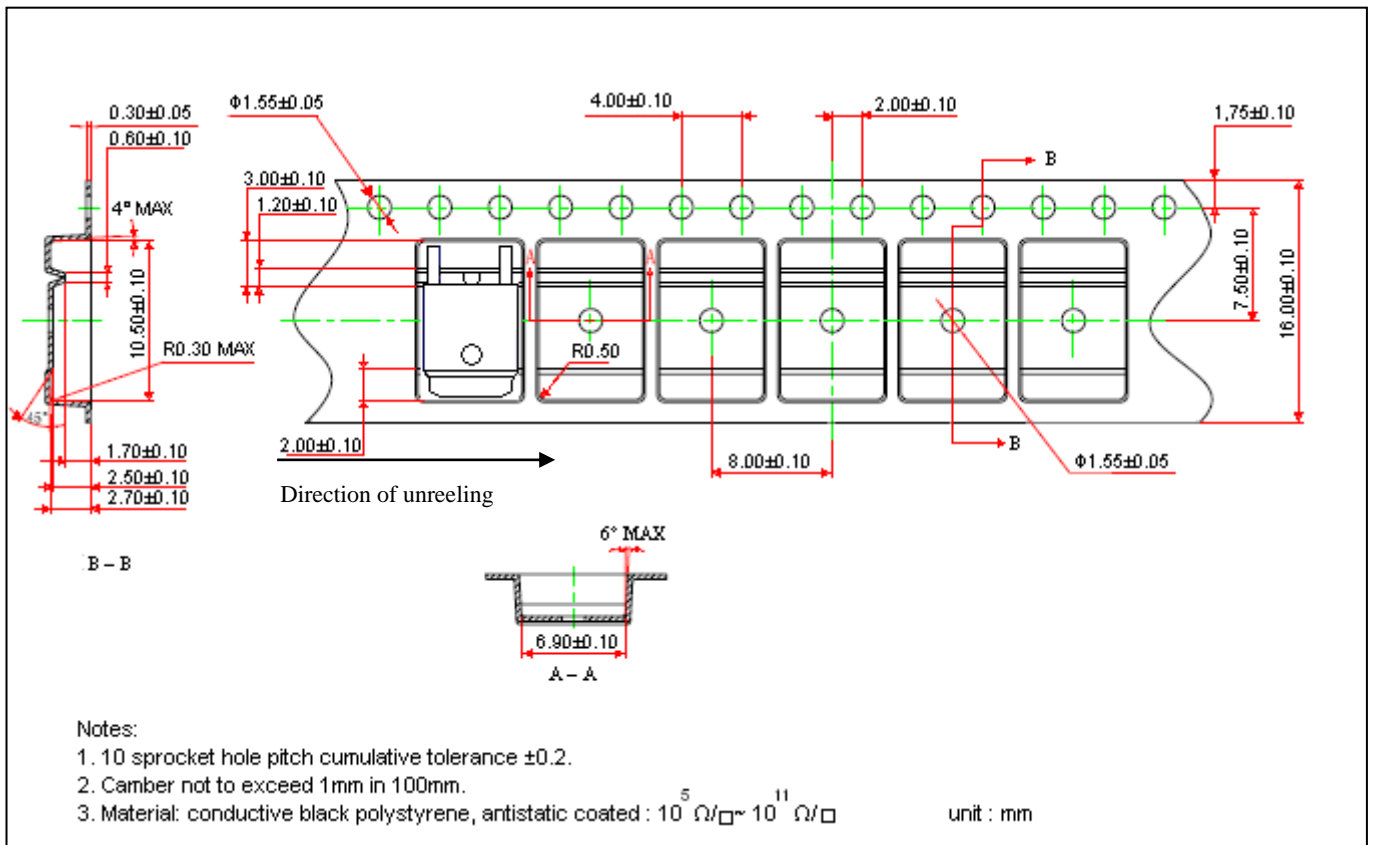
Transient Thermal Response Curves



Reel Dimension



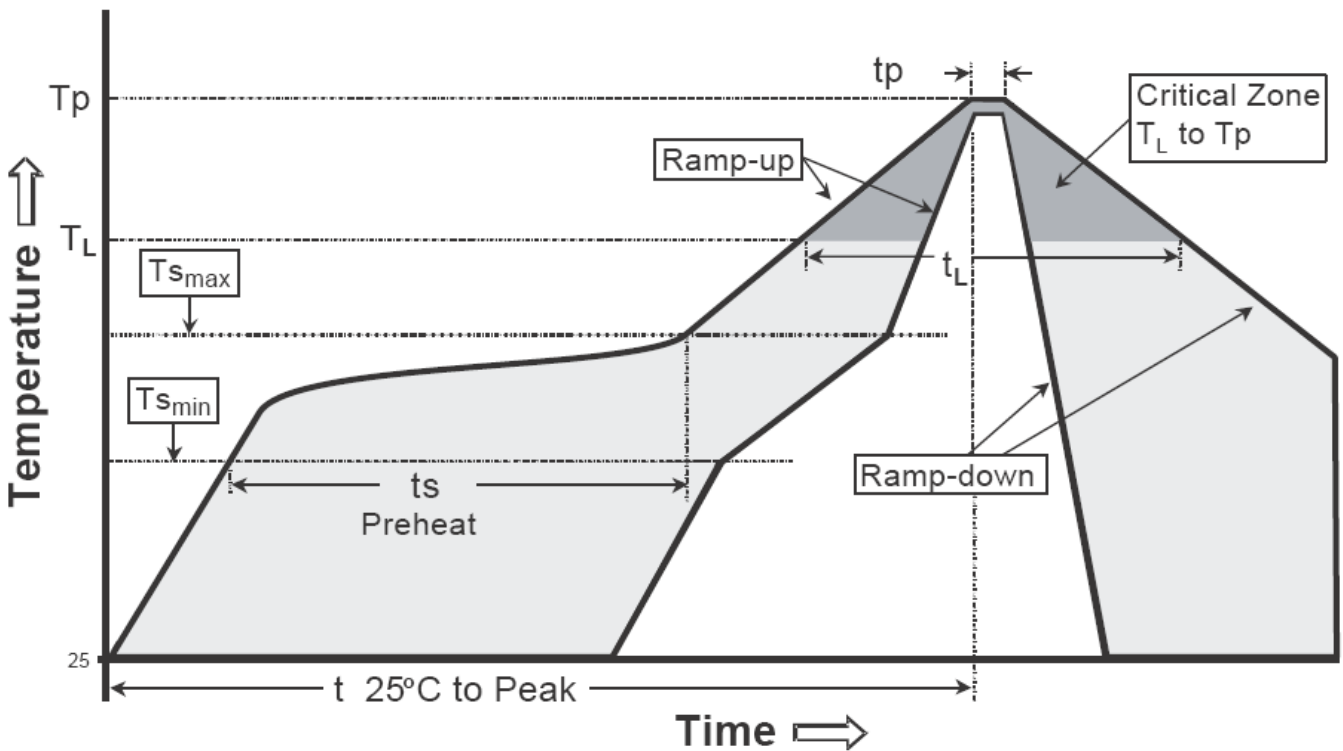
Carrier Tape Dimension



Recommended wave soldering condition

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

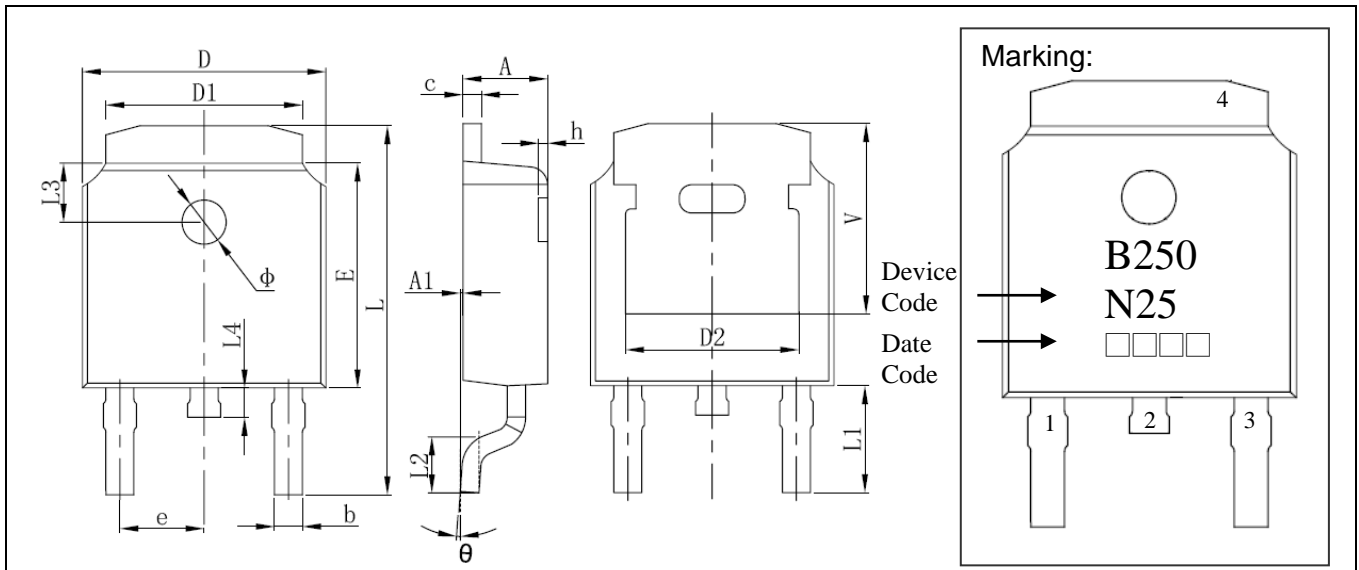
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T _{s min})	100°C	150°C
-Temperature Max(T _{s max})	150°C	200°C
-Time(t _{s min} to t _{s max})	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T _L)	183°C	217°C
- Time (t _L)	60-150 seconds	60-150 seconds
Peak Temperature(T _P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(t _p)	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



3-Lead TO-252 Plastic Surface Mount Package
 CYStek Package Code: J3

Style: Pin 1.Gate 2.Drain 3.Source 4.Drain

Date Code :
 First Code : Last digit of Christian Year
 Second Code : Month Code : Jan→A, Feb→B, Mar→C, Apr→D, May→E, Jun→F, Jul→G,
 Aug→H, Sep→J, Oct→K, Nov→L, Dec→M
 Last Two Codes : Production Serial Code, 01~99

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	L	0.382	0.406	9.712	10.312
A1	0.000	0.005	0.000	0.127	L1	0.114	REF	2.900	REF
b	0.025	0.030	0.635	0.770	L2	0.055	0.067	1.400	1.700
c	0.018	0.023	0.460	0.580	L3	0.063	REF	1.600	REF
D	0.256	0.264	6.500	6.700	L4	0.024	0.039	0.600	1.000
D1	0.201	0.215	5.100	5.460	Φ	0.043	0.051	1.100	1.300
D2	0.190	REF	4.830	REF	θ	0°	8°	0°	8°
E	0.236	0.244	6.000	6.200	h	0.000	0.012	0.000	0.300
e	0.086	0.094	2.186	2.386	v	0.207	REF	5.250	REF

Notes: 1.Controlling dimension: millimeters.
 2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
 3.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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