

**N-Channel Enhancement Mode Power MOSFET**

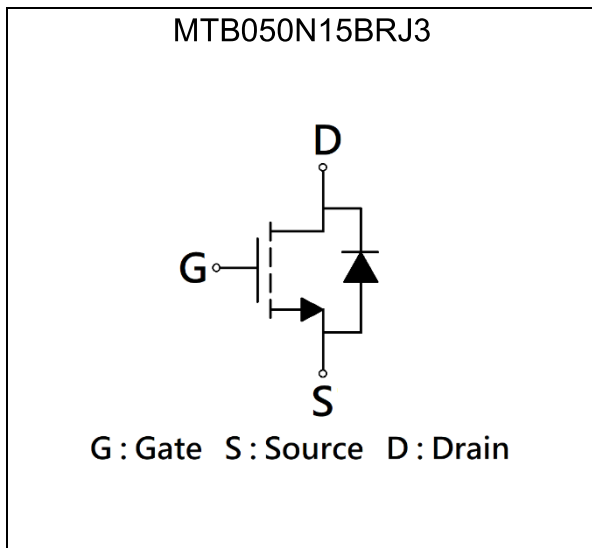
# MTB050N15BRJ3

**Features**

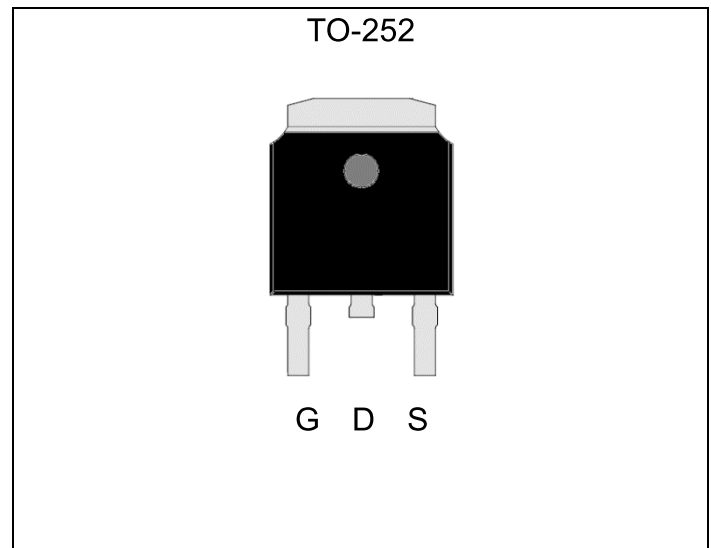
- Low On Resistance
- Low Gate Charge
- Fast Switching Characteristic

$BV_{DSS}$	150V
$I_D@V_{GS}=10V, T_C=25^\circ C$	20A
$I_D@V_{GS}=10V, T_A=25^\circ C$	4A
$R_{DS(ON) \text{ typ. @ } V_{GS}=10V, I_D=5A}$	50m $\Omega$
$R_{DS(ON) \text{ typ. @ } V_{GS}=4.5V, I_D=4A}$	55m $\Omega$

**Equivalent Circuit**

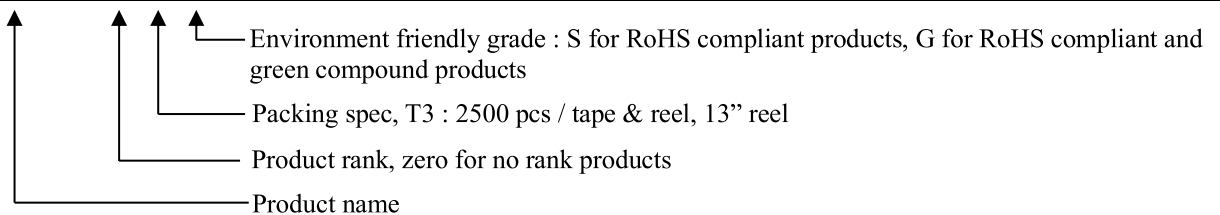


**Outline**



**Ordering Information**

Device	Package	Shipping
MTB050N15BRJ3-0-T3-G	TO-252 (Pb-free lead plating and RoHS compliant package)	2500 pcs / Tape & Reel



**Absolute Maximum Ratings (T<sub>A</sub>=25°C)**

Parameter	Symbol	Limits	Unit	
Drain-Source Voltage	V <sub>DS</sub>	150	V	
Gate-Source Voltage	V <sub>GS</sub>	±20		
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =25°C	I <sub>D</sub>	20	A	
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>C</sub> =100°C		13		
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =25°C		4		
Continuous Drain Current @ V <sub>GS</sub> =10V, T <sub>A</sub> =70°C		3.2		
Pulsed Drain Current		I <sub>DM</sub>		80
Continuous Body Diode Forward Current @ T <sub>C</sub> =25°C	I <sub>S</sub>	53		
Avalanche Current @ L=0.1mH	I <sub>AS</sub>	18		
Avalanche Energy @ L=0.5mH	E <sub>AS</sub>	25	mJ	
Total Power Dissipation	P <sub>D</sub>	T <sub>C</sub> =25°C	63	W
		T <sub>C</sub> =100°C	25	
		T <sub>A</sub> =25°C	3	
		T <sub>A</sub> =70°C	2	
Operating Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-55~+150	°C	

**Thermal Data**

Parameter	Symbol	Steady State	Unit
Thermal Resistance, Junction-to-case	R <sub>θJC</sub>	2	°C/W
Thermal Resistance, Junction-to-ambient	R <sub>θJA</sub>	40	

Note:

- \*a. The power dissipation P<sub>D</sub> is based on T<sub>J(MAX)</sub>=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- \*b. The value of R<sub>θJA</sub> is measured with the device mounted on 1 in<sup>2</sup> FR-4 board with 2 oz. copper, in a still air environment with T<sub>A</sub>=25°C. The power dissipation P<sub>D</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
- \*c. Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub>=150°C. Ratings are based on low frequency and low duty cycles to keep initial T<sub>J</sub>=25°C.



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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	150	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1	-	2.5		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA
G <sub>FS</sub>	-	14	-	S	V <sub>DS</sub> =10V, I <sub>D</sub> =10A
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> =120V, V <sub>GS</sub> =0V
R <sub>DS(ON)</sub>	-	50	65	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =5A
	-	55	77		V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A
<b>Dynamic</b>					
C <sub>iss</sub>	-	1187	-	pF	V <sub>DS</sub> =75V, V <sub>GS</sub> =0V, f=1MHz
C <sub>oss</sub>	-	70	-		
C <sub>rss</sub>	-	10	-		
R <sub>g</sub>	-	1	-	Ω	f=1MHz
Q <sub>g</sub> *1, 2	-	22	-	nC	V <sub>DS</sub> =75V, I <sub>D</sub> =5A, V <sub>GS</sub> =10V
Q <sub>gs</sub> *1, 2	-	4	-		
Q <sub>gd</sub> *1, 2	-	4	-		
t <sub>d(ON)</sub> *1, 2	-	11	-	ns	V <sub>DS</sub> =75V, I <sub>D</sub> =5A, V <sub>GS</sub> =10V, R <sub>GS</sub> =6Ω
t <sub>r</sub> *1, 2	-	16	-		
t <sub>d(OFF)</sub> *1, 2	-	34	-		
t <sub>f</sub> *1, 2	-	12	-		
<b>Source-Drain Diode</b>					
V <sub>SD</sub> *1	-	0.8	1.2	V	I <sub>S</sub> =3A, V <sub>GS</sub> =0V
t <sub>rr</sub>	-	40	-	ns	I <sub>F</sub> =3A, dI <sub>F</sub> /dt=100A/μs
Q <sub>rr</sub>	-	61	-	nC	

Note:

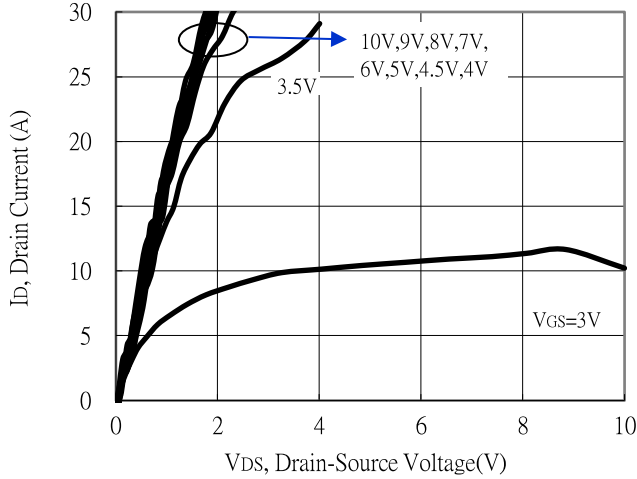
\*1. Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

\*2. Independent of operating temperature

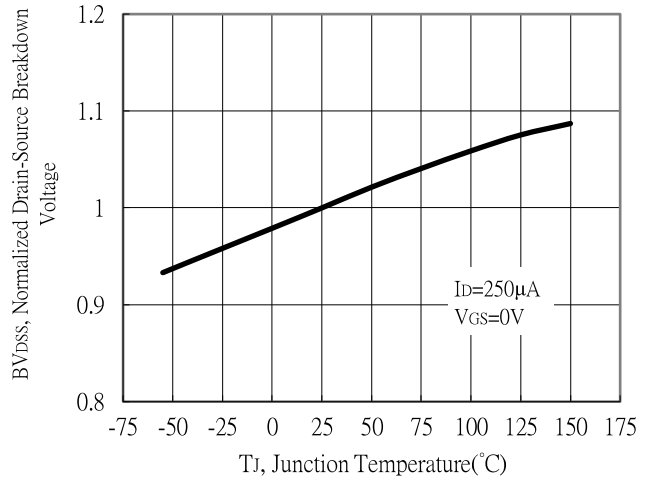


**Typical Characteristics**

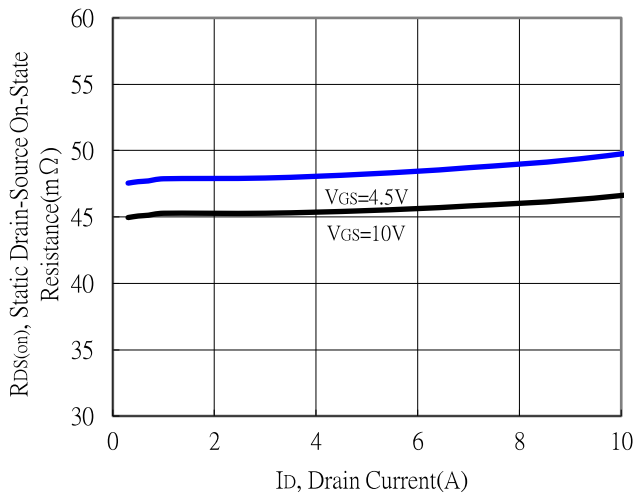
Typical Output Characteristics



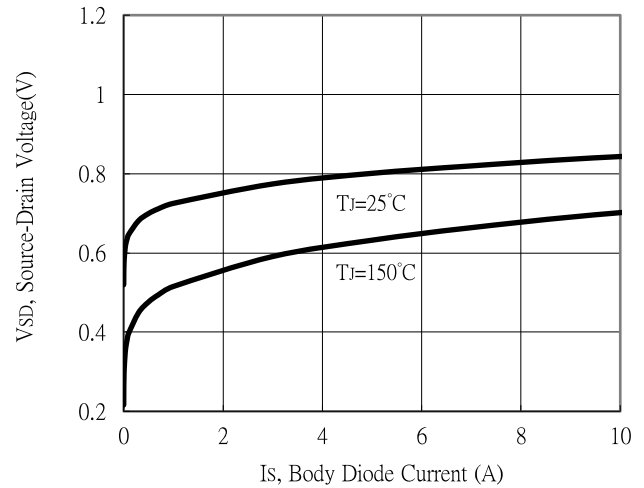
Breakdown Voltage vs Ambient Temperature



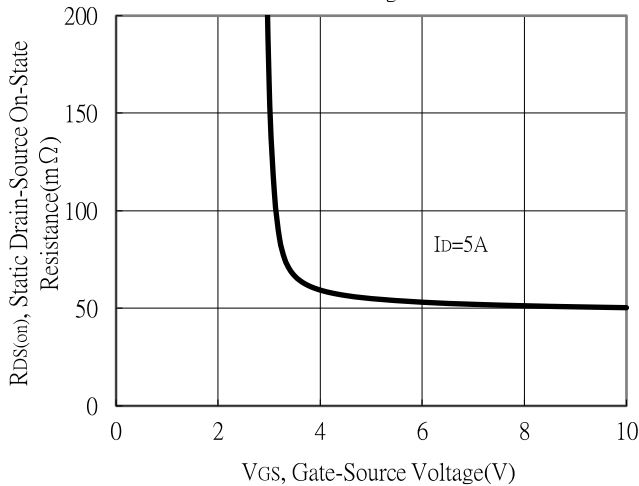
Static Drain-Source On-State resistance vs Drain Current



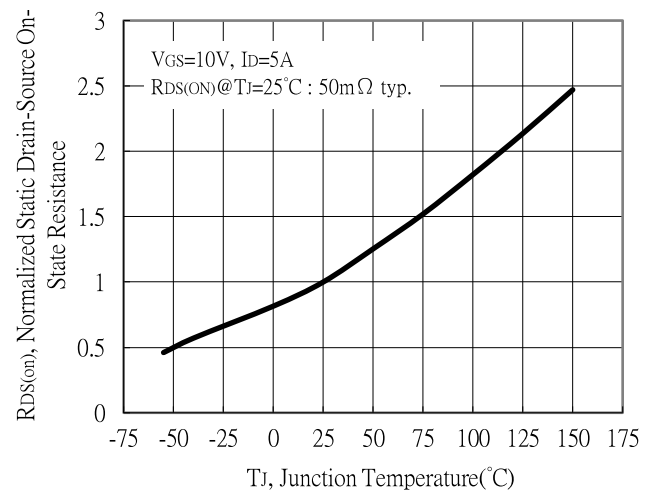
Body Diode Current vs Source-Drain Voltage



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

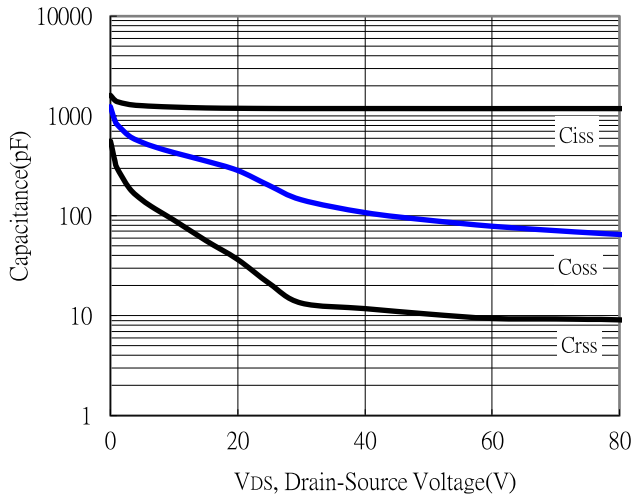


Drain-Source On-State Resistance vs Junction Temperature

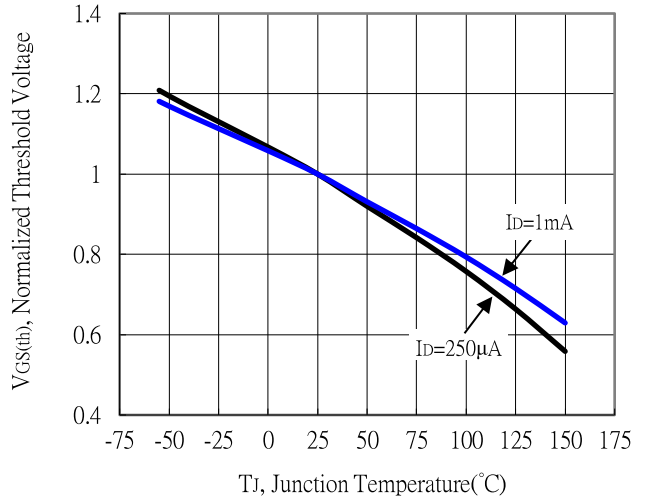


**Typical Characteristics (Cont.)**

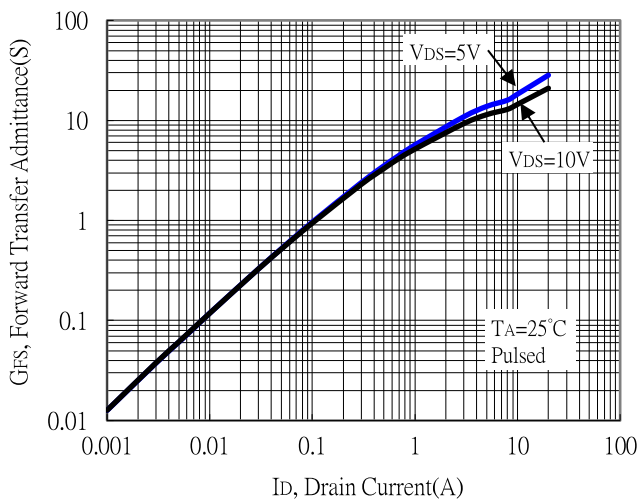
Capacitance vs Drain-to-Source Voltage



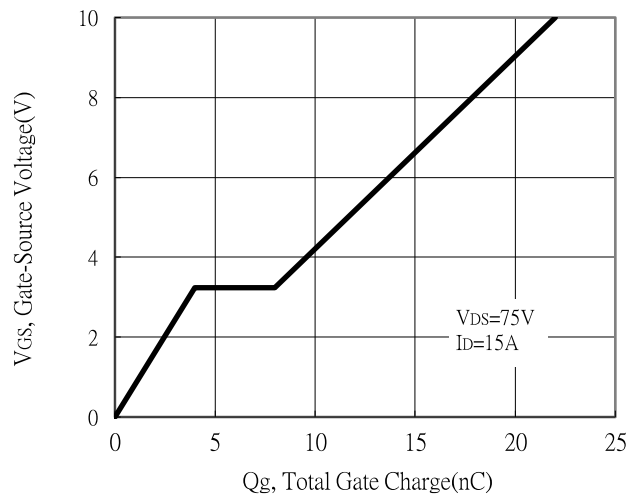
Threshold Voltage vs Junction Temperature



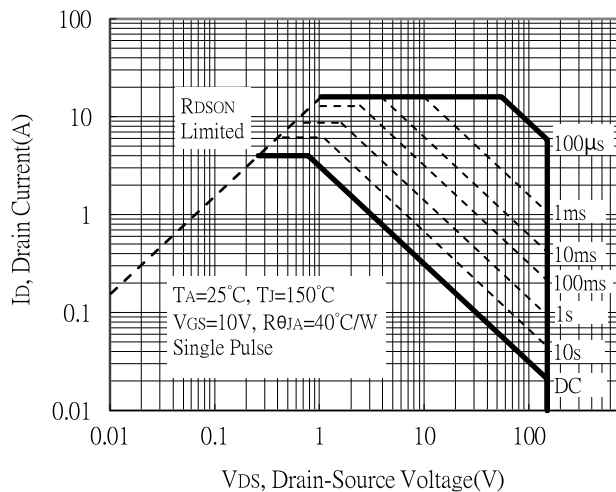
Forward Transfer Admittance vs Drain Current



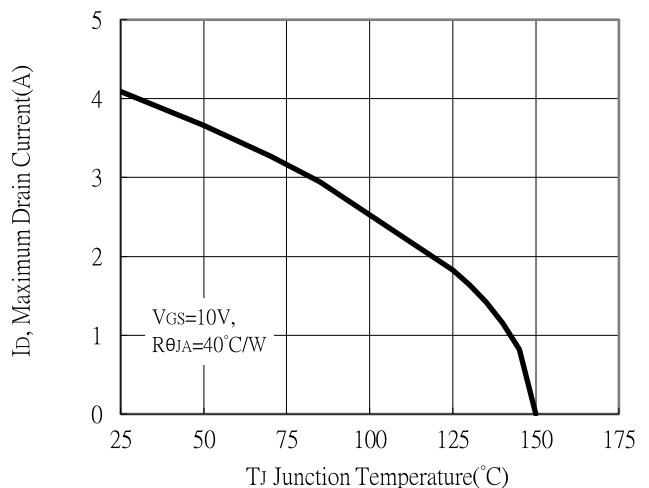
Gate Charge Characteristics



Maximum Safe Operating Area

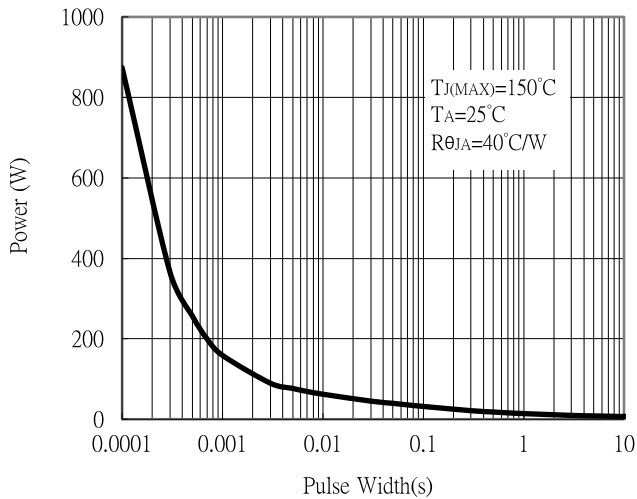


Maximum Drain Current vs Junction Temperature

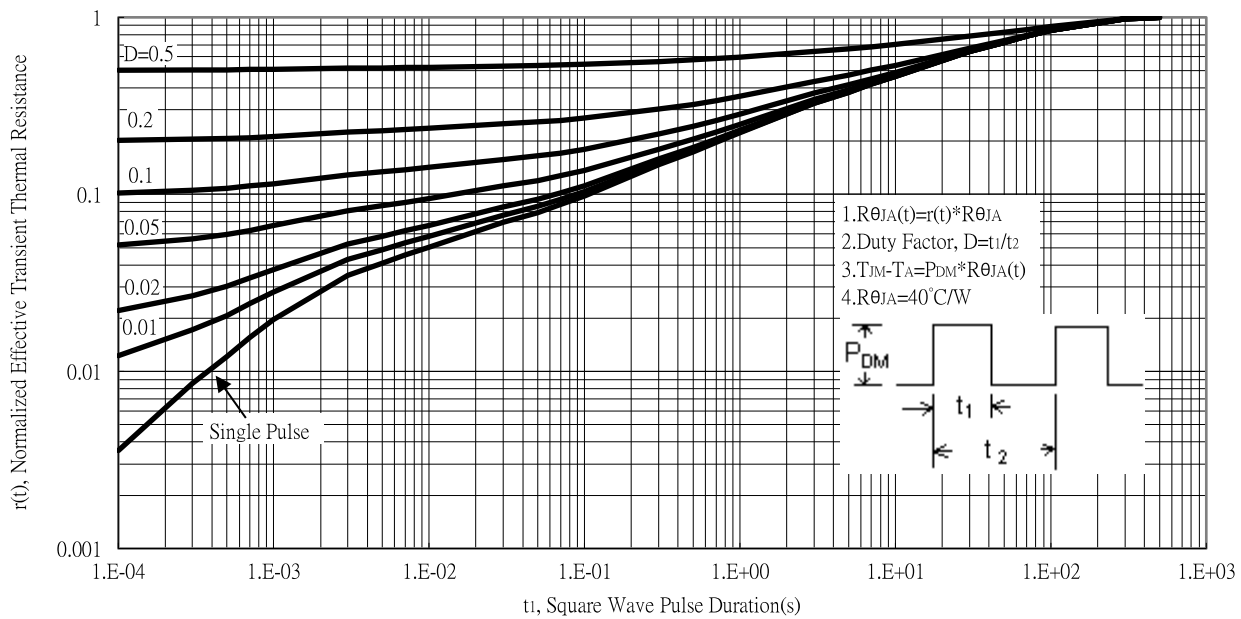


**Typical Characteristics (Cont.)**

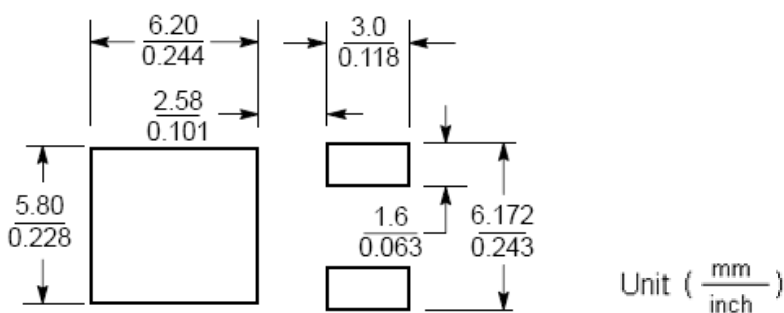
Single Pulse Power Rating, Junction to Ambient



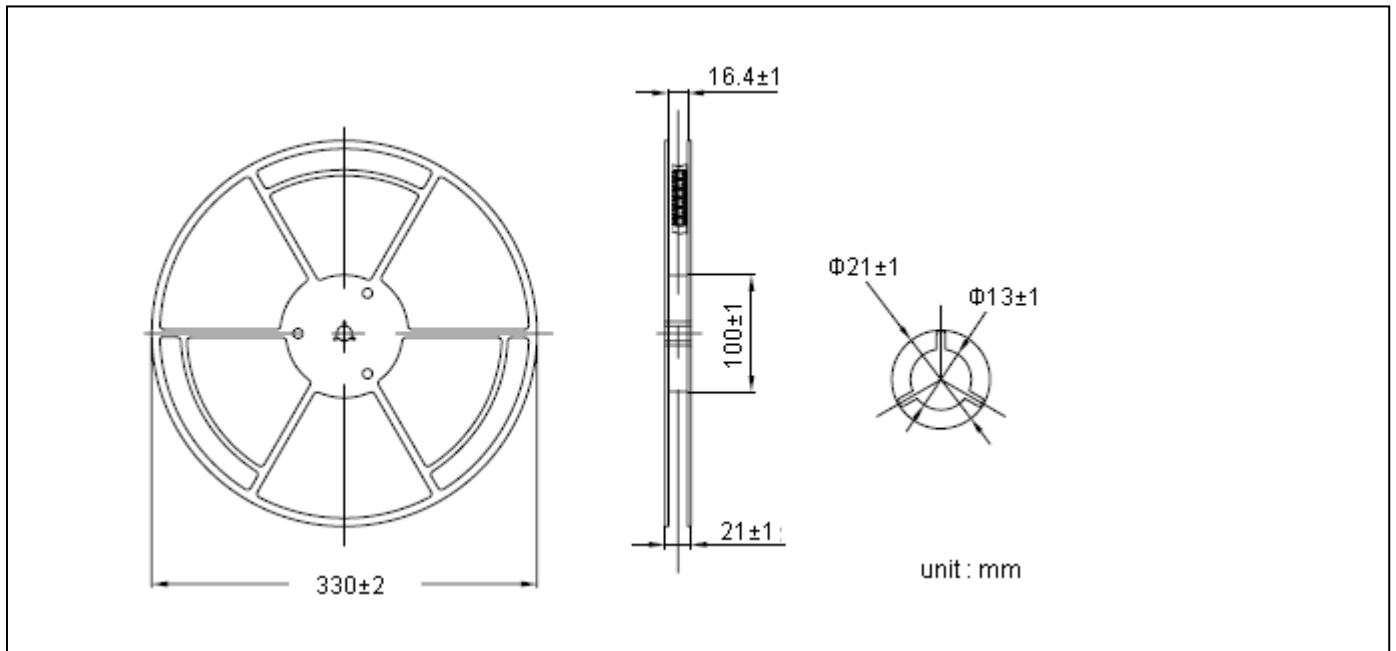
Transient Thermal Response Curves



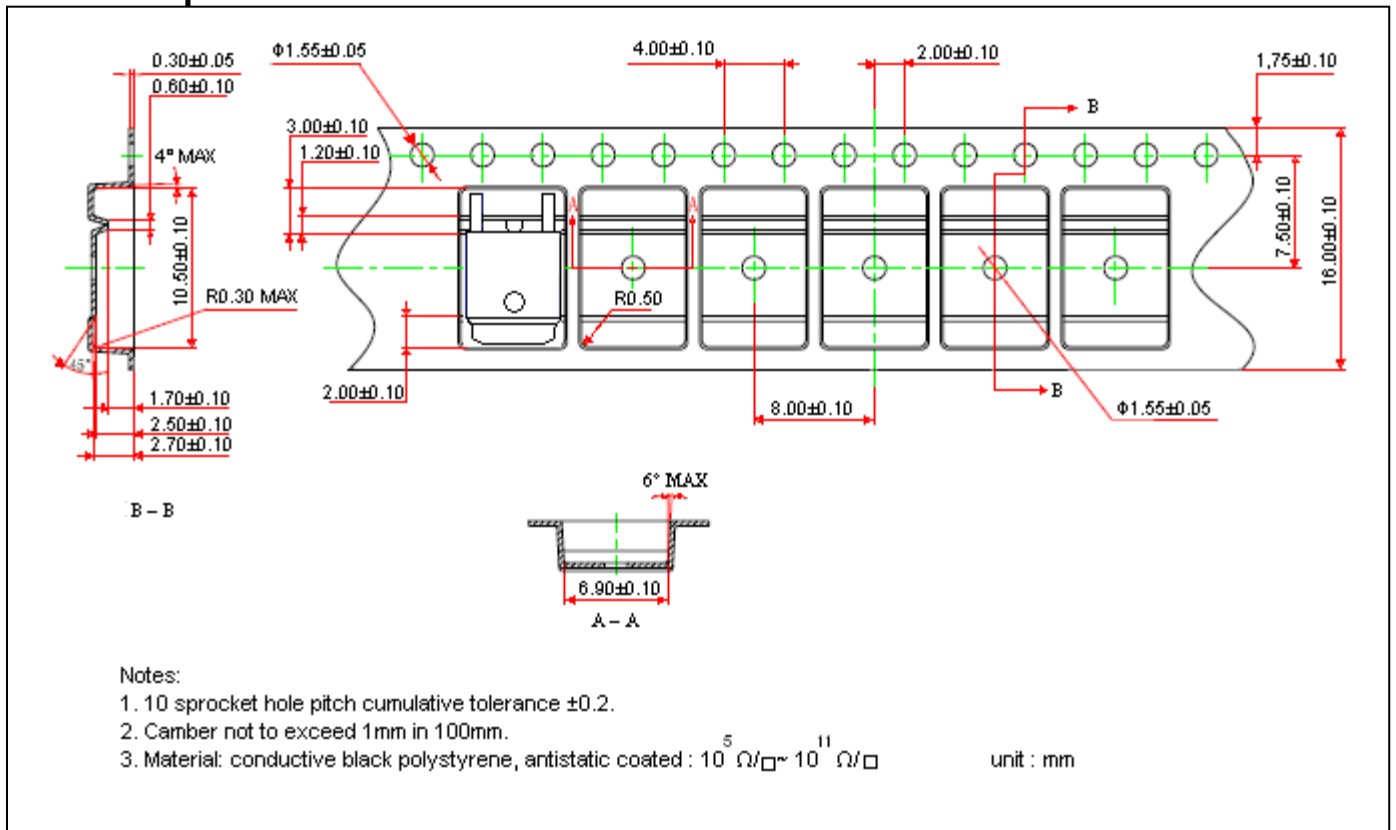
**Recommended soldering footprint**



### Reel Dimension



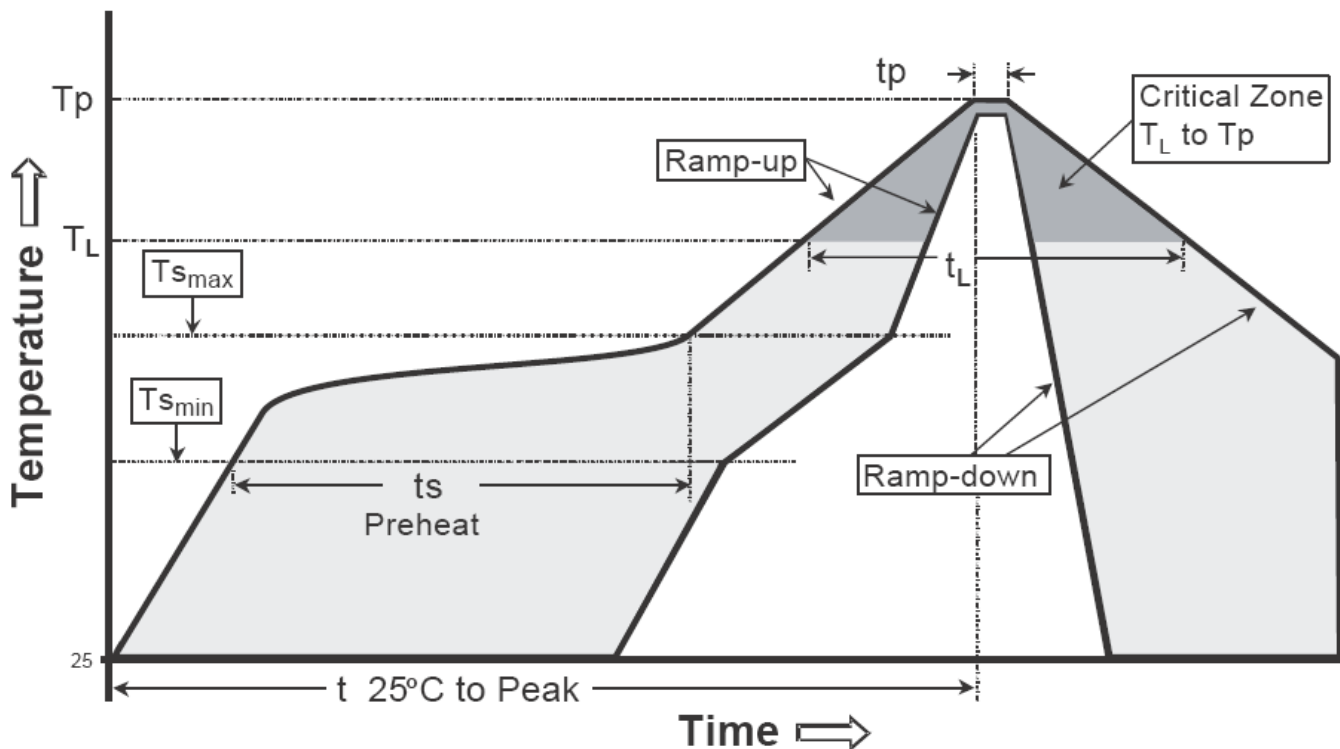
### Carrier Tape Dimension



**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.