

# N-Channel Enhancement Mode Power MOSFET

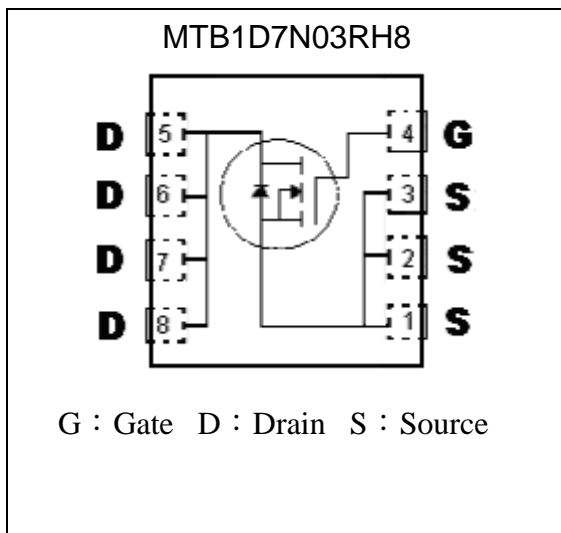
## MTB1D7N03RH8

### Features

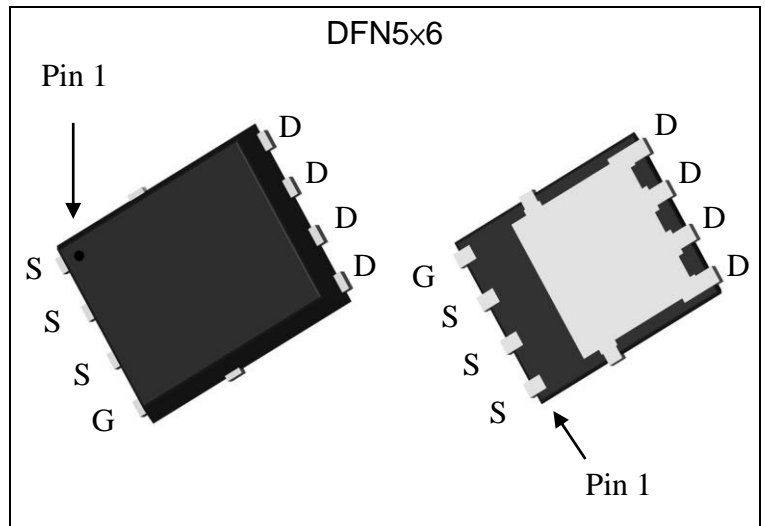
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

<b>BV<sub>DSS</sub></b>	<b>30V</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>C</sub>=25°C</b>	<b>131A(silicon limit)</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>C</sub>=25°C</b>	<b>84A(package limit)</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>A</sub>=25°C</b>	<b>26.2A</b>
<b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=10V, I<sub>D</sub>=20A</b>	<b>1.2mΩ (typ)</b>
<b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=4.5V, I<sub>D</sub>=20A</b>	<b>1.9mΩ (typ)</b>

### Symbol

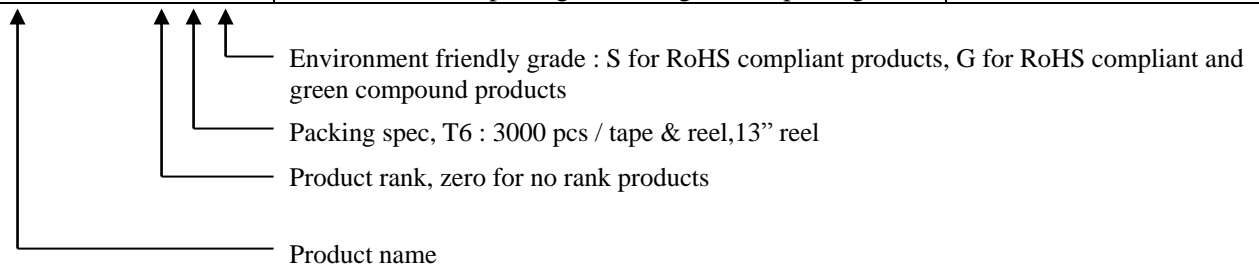


### Outline



### Ordering Information

Device	Package	Shipping
MTB1D7N03RH8-0-T6-G	DFN 5 × 6 (Pb-free lead plating and halogen-free package)	3000 pcs / tape & reel



**Absolute Maximum Ratings** (Ta=25°C)

Parameter		Symbol	10s	Steady State	Unit
Drain-Source Voltage		V <sub>DS</sub>	30		V
Gate-Source Voltage		V <sub>GS</sub>	±20		
Continuous Drain Current @ T <sub>C</sub> =25°C, V <sub>GS</sub> =10V (Note 1)		I <sub>D</sub>	131 (silicon limit)		A
Continuous Drain Current @ T <sub>C</sub> =25°C, V <sub>GS</sub> =10V (Note 1)			84 (package limit)		
Continuous Drain Current @ T <sub>C</sub> =100°C, V <sub>GS</sub> =10V (Note 1)			83		
Continuous Drain Current @ T <sub>A</sub> =25°C, V <sub>GS</sub> =10V (Note 2)		I <sub>DSM</sub>	39.5	26.2	
Continuous Drain Current @ T <sub>A</sub> =70°C, V <sub>GS</sub> =10V (Note 2)			31.6	21.0	
Continuous Drain Current @ T <sub>A</sub> =85°C, V <sub>GS</sub> =10V (Note 2)			28.5	18.9	
Pulsed Drain Current (Note 3)		I <sub>DM</sub>	386		
Avalanche Current @ L=0.1mH (Note 3)		I <sub>AS</sub>	40		
Avalanche Energy @ L=1mH, I <sub>D</sub> =24A, V <sub>DD</sub> =25V (Note 4)		E <sub>AS</sub>	288		mJ
Repetitive Avalanche Energy @ L=0.05mH (Note 3)		E <sub>AR</sub>	6		
Total Power Dissipation	T <sub>C</sub> =25°C (Note 1)	P <sub>D</sub>	62.5		W
	T <sub>C</sub> =100°C (Note 1)		25		
	T <sub>A</sub> =25°C (Note 2)	P <sub>DSM</sub>	5.7	2.5	
	T <sub>A</sub> =70°C (Note 2)		4.0	1.8	
	T <sub>A</sub> =85°C (Note 2)		3.6	1.6	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	-55~+150		°C

**Thermal Data**

Parameter	Symbol	Typical	Maximum	Unit	
Thermal Resistance, Junction-to-ambient (Note 2)	R <sub>θJA</sub>	t≤10s	18	22	°C/W
		Steady State	42	50	
Thermal Resistance, Junction-to-case	R <sub>θJC</sub>	1.6	2		

- Note : 1. 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.
2. 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>DSM</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.
3. 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.
4. 100% tested by conditions of L=0.1mH, I<sub>AS</sub>=30A, V<sub>GS</sub>=10V, V<sub>DD</sub>=15V



**Characteristics (Tj=25°C, unless otherwise specified)**

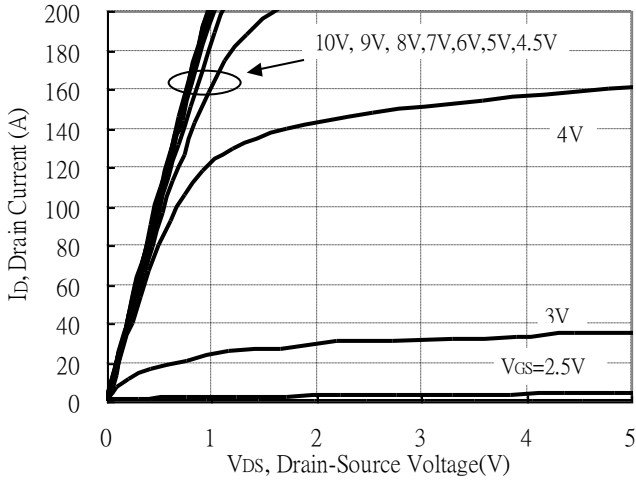
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	30	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	-	0.05	-	V/°C	Reference to 25°C, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1	-	2	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
*G <sub>FS</sub>	-	39.5	-	S	V <sub>DS</sub> =5V, I <sub>D</sub> =20A
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> =24V, V <sub>GS</sub> =0V
	-	-	25		V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	1.2	2.2	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =20A
	-	1.9	3.1		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A
<b>Dynamic</b>					
*Q <sub>g</sub>	-	64.6	97	nC	V <sub>DS</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	10.5	21		
*Q <sub>gd</sub>	-	13.1	26		
*t <sub>d(ON)</sub>	-	20	-	ns	V <sub>DS</sub> =15V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V, R <sub>GS</sub> =3Ω
*t <sub>r</sub>	-	11.2	-		
*t <sub>d(OFF)</sub>	-	61	-		
*t <sub>f</sub>	-	12.2	-		
C <sub>iss</sub>	2526	3608	4691	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =15V, f=1MHz
C <sub>oss</sub>	-	2922	-		
C <sub>rss</sub>	-	224	-		
R <sub>g</sub>	-	0.7	-	Ω	f=1MHz
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	84	A	
*I <sub>SM</sub>	-	-	386		
*V <sub>SD</sub>	-	0.76	1.2	V	I <sub>S</sub> =20A, V <sub>GS</sub> =0V
*t <sub>rr</sub>	-	51.4	-	ns	V <sub>GS</sub> =0V, I <sub>F</sub> =20A, dI <sub>F</sub> /dt=100A/μs
*Q <sub>rr</sub>	-	49.5	-	nC	

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

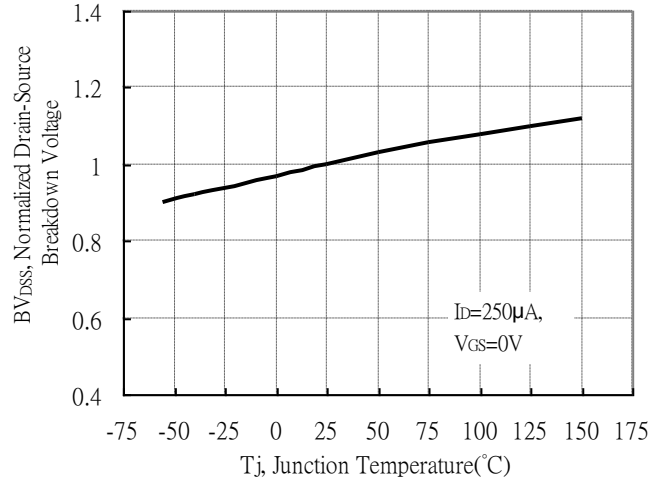


### Typical Characteristics

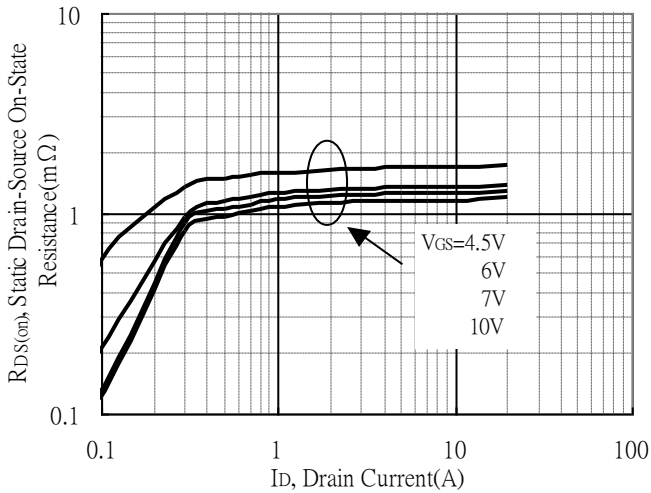
Typical Output Characteristics



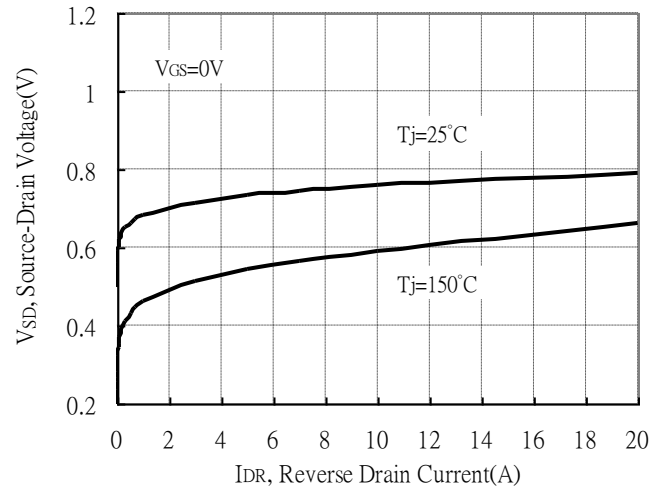
Brekdown Voltage vs Ambient Temperature



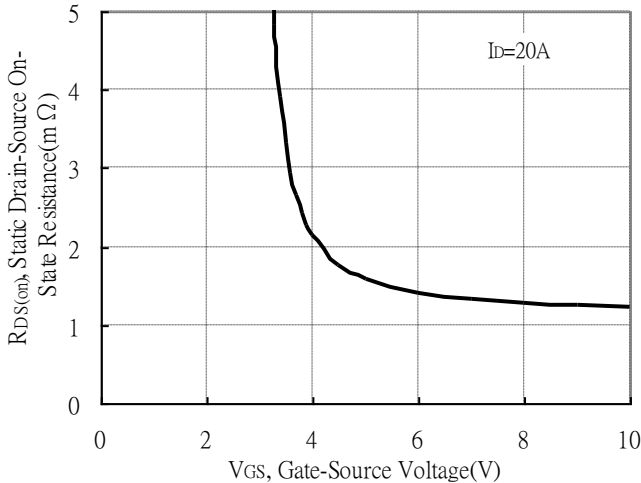
Static Drain-Source On-State resistance vs Drain Current



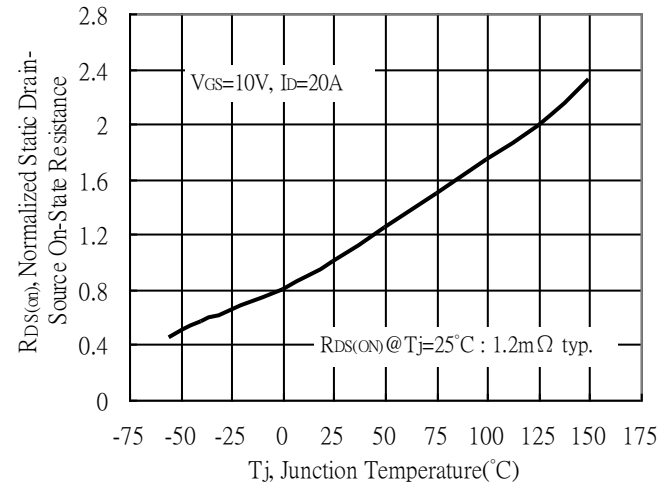
Reverse Drain Current vs Source-Drain Voltage



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

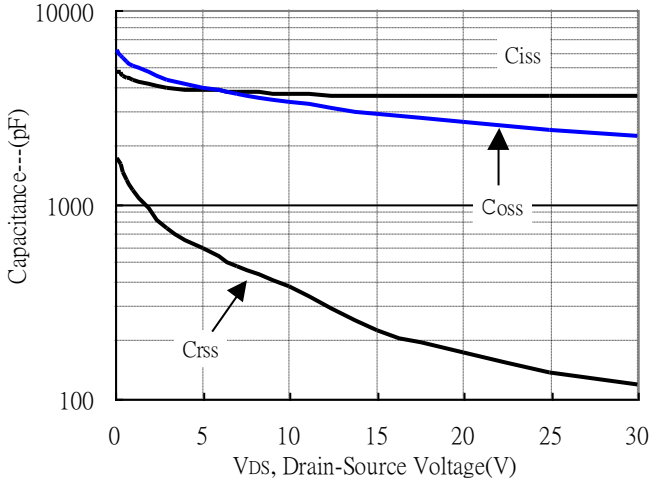


Drain-Source On-State Resistance vs Junction Temperature

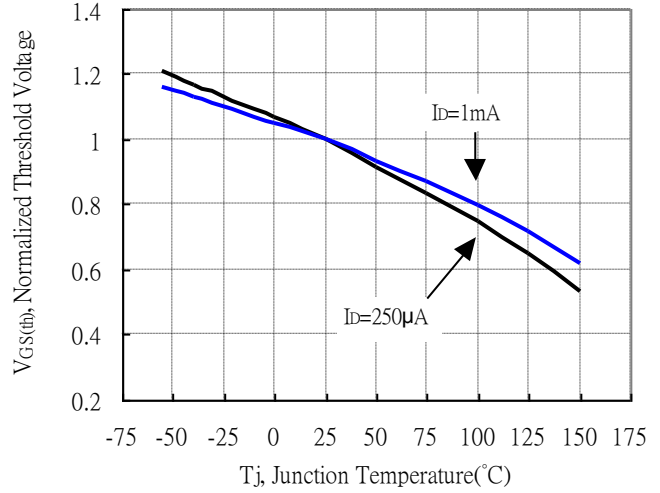


**Typical Characteristics(Cont.)**

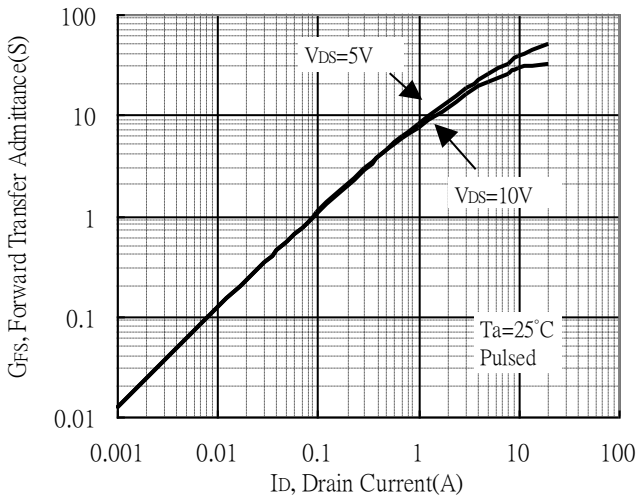
Capacitance vs Drain-to-Source Voltage



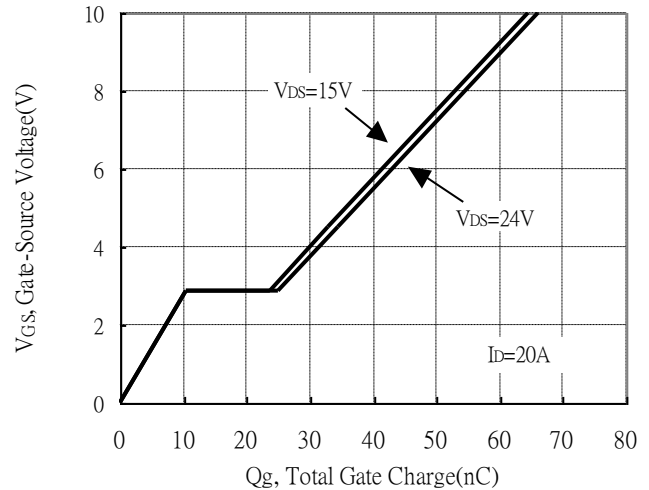
Threshold Voltage vs Junction Temperature



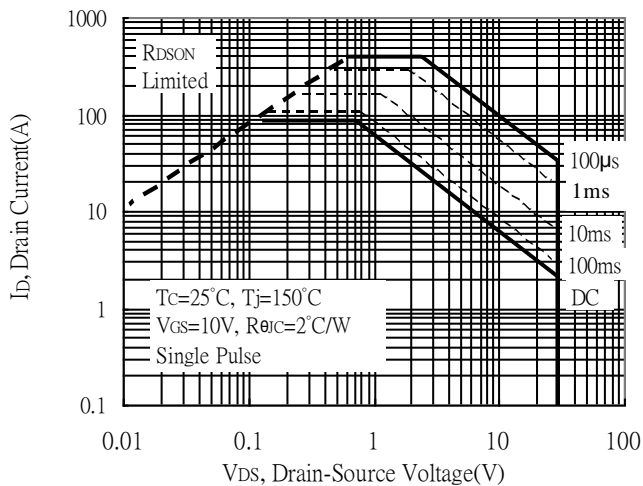
Forward Transfer Admittance vs Drain Current



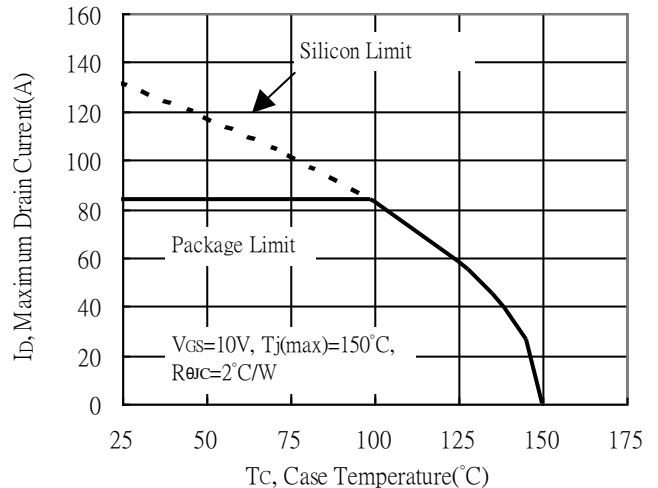
Gate Charge Characteristics



Maximum Safe Operating Area

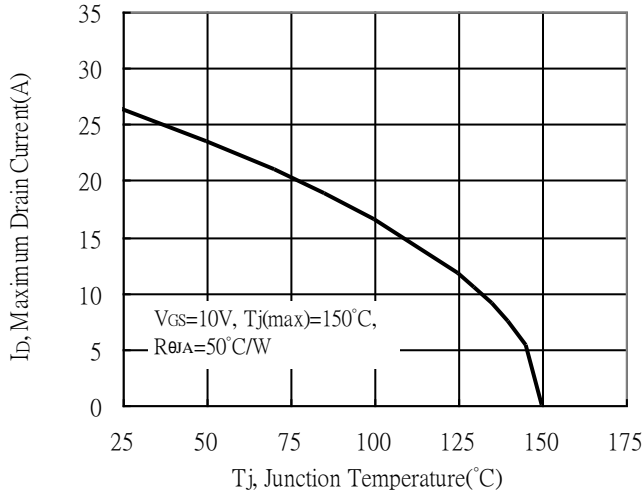


Maximum Drain Current vs Case Temperature

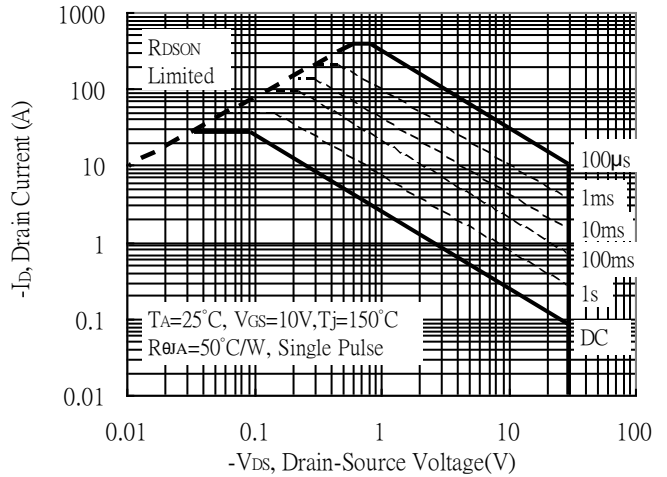


**Typical Characteristics (Cont.)**

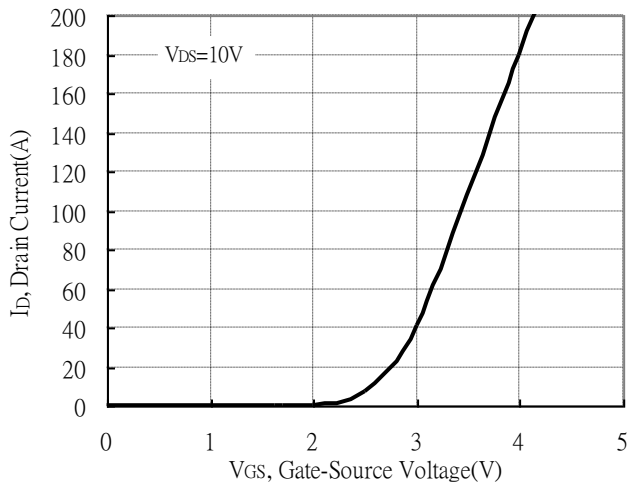
Maximum Drain Current vs Junction Temperature



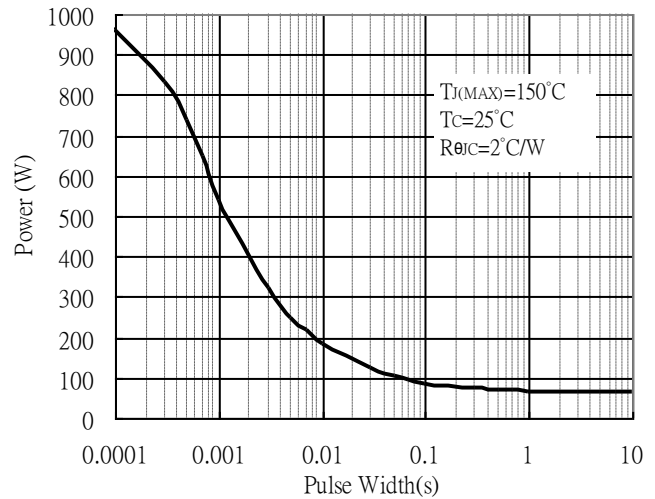
Maximum Safe Operating Area



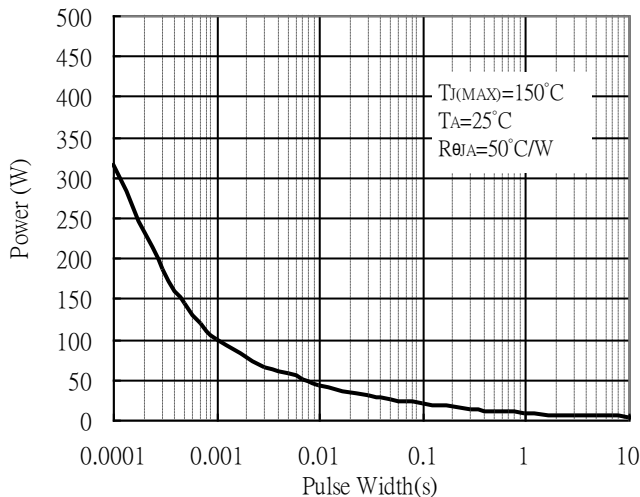
Typical Transfer Characteristics



Single Pulse Power Rating, Junction to Case

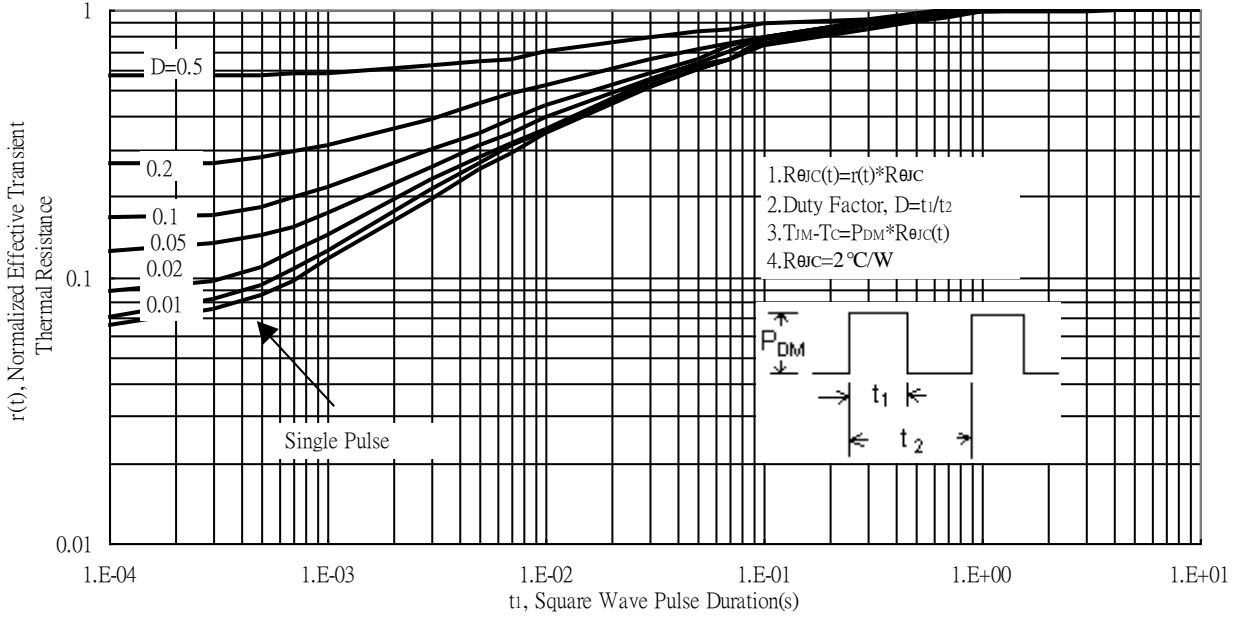


Single Pulse Power Rating, Junction to Case

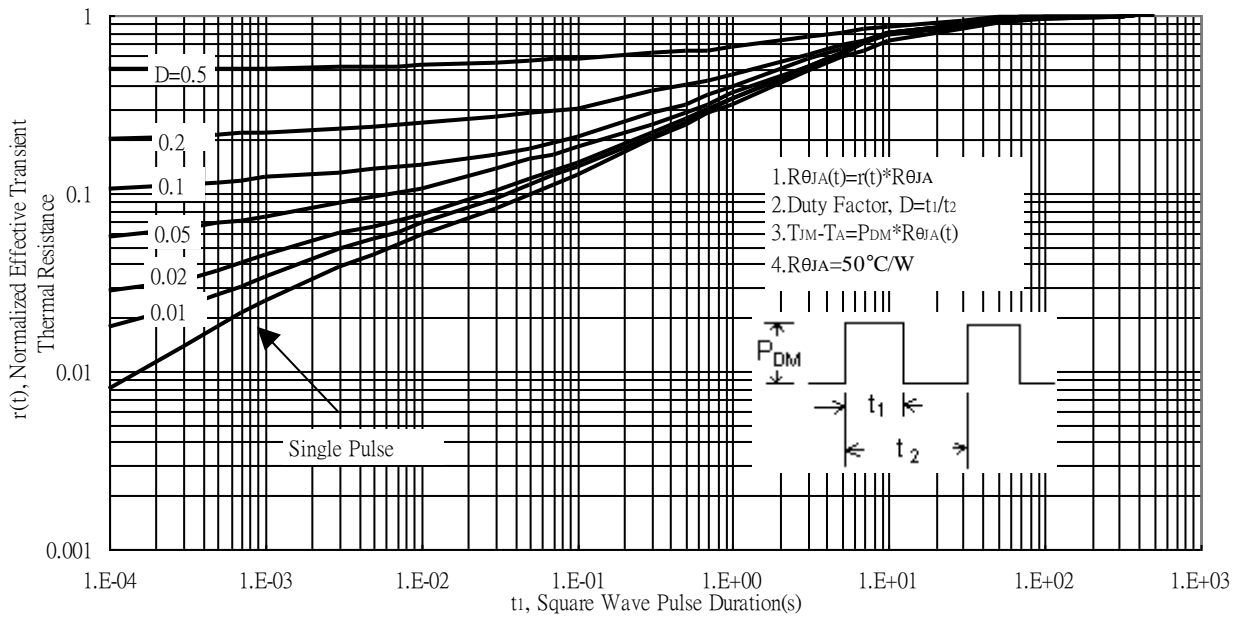


**Typical Characteristics (Cont.)**

Transient Thermal Response Curves

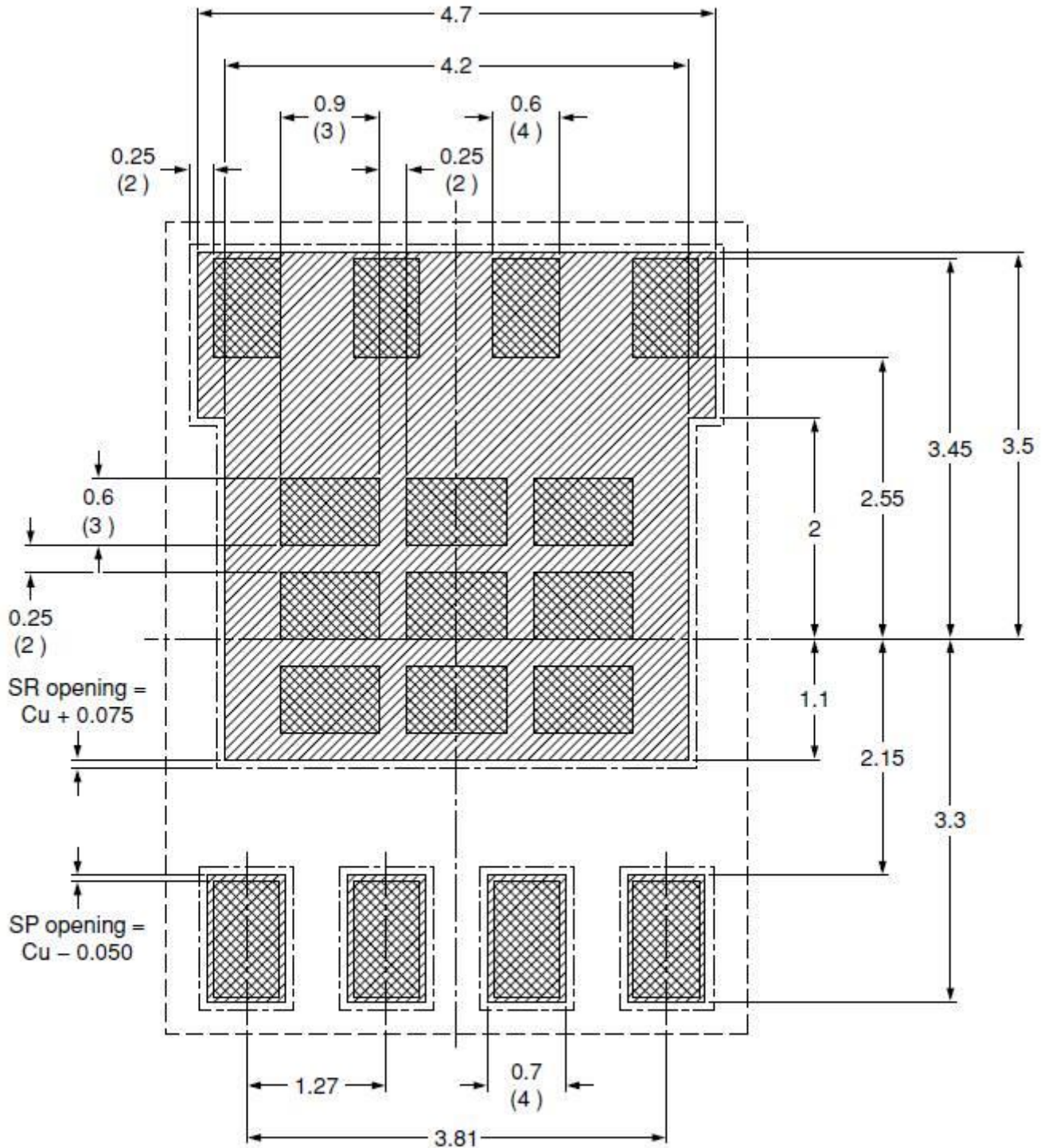




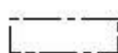
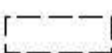
Transient Thermal Response Curves





**Recommended Soldering Footprint & Stencil Design**

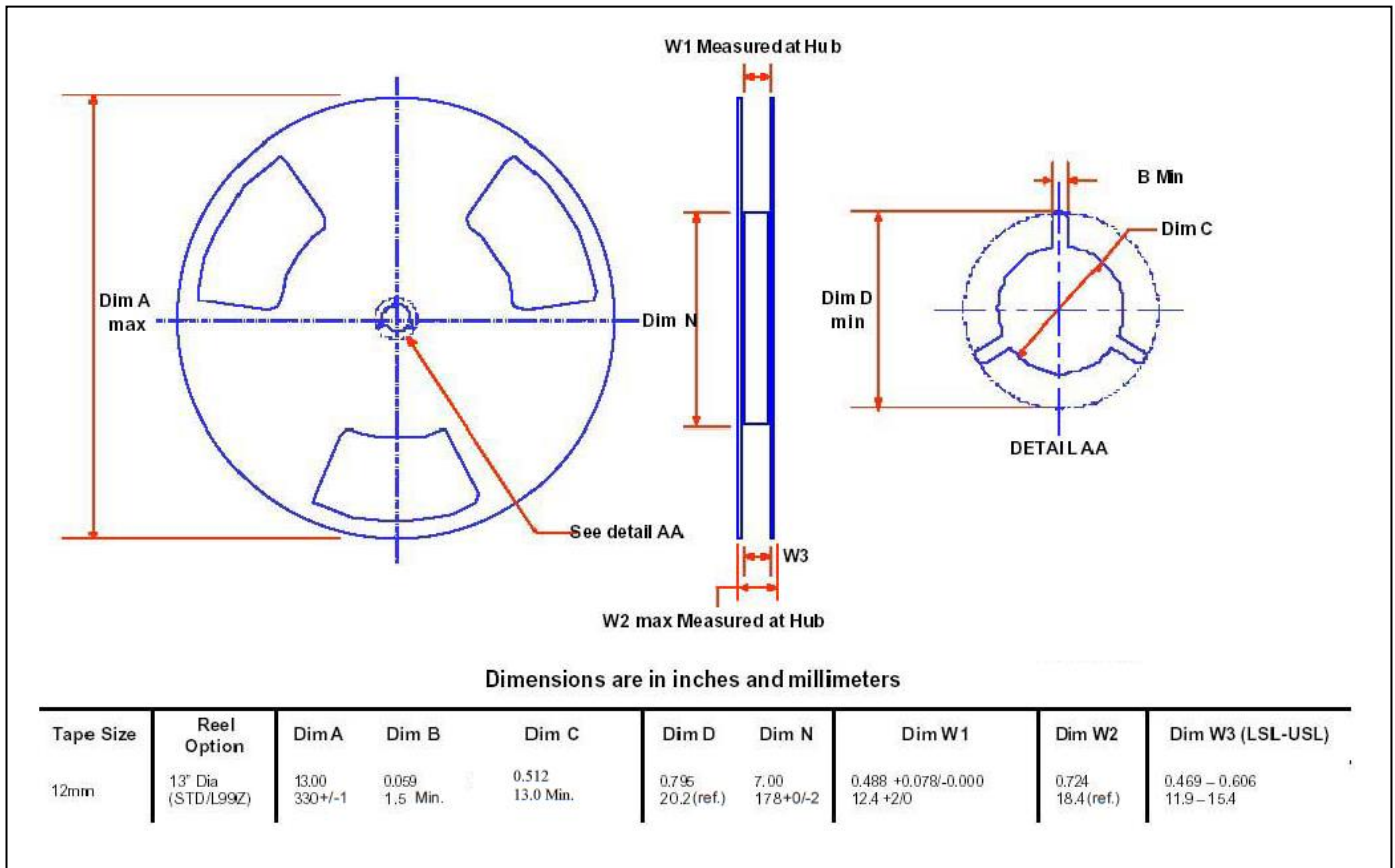


-  solder lands
-  solder paste  
125  $\mu$ m stencil
-  solder resist
-  occupied area

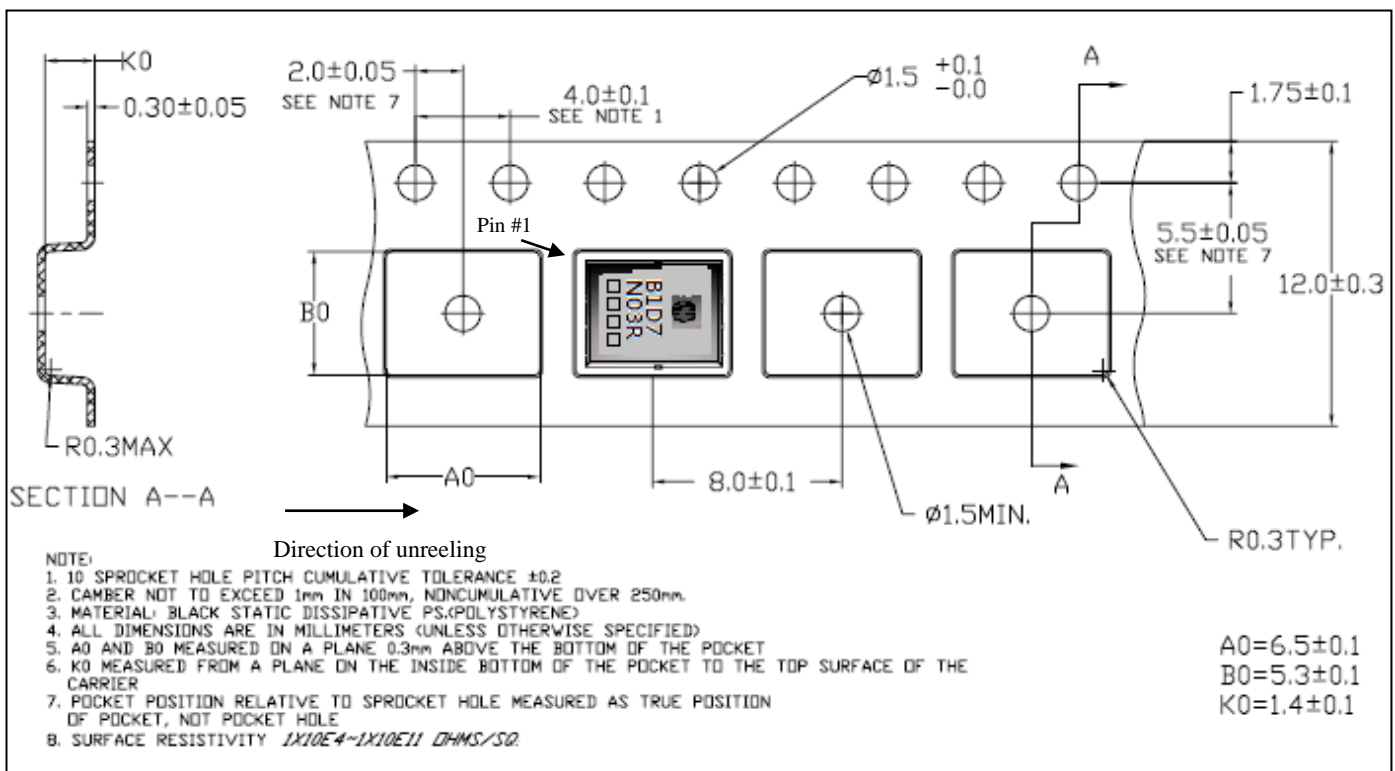
unit : mm



## Reel Dimension



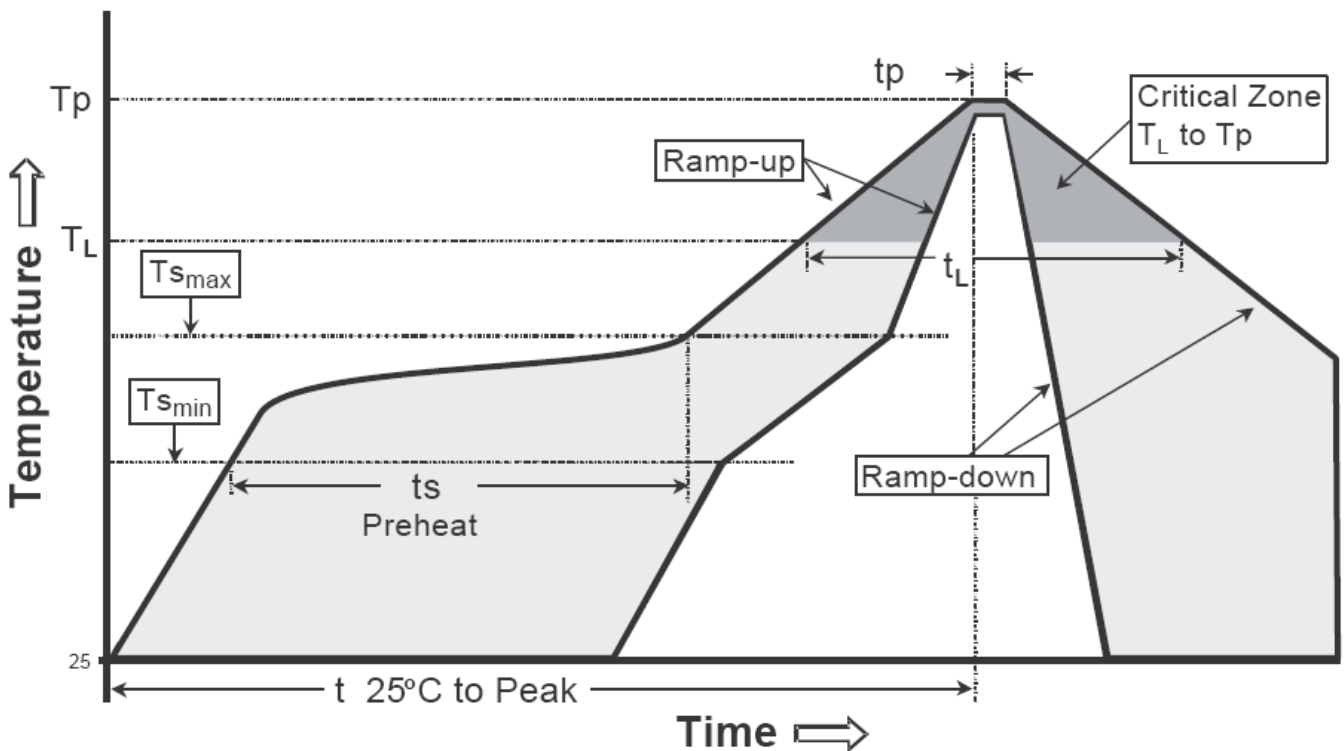
## Carrier Tape Dimension



**Recommended wave soldering condition**

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

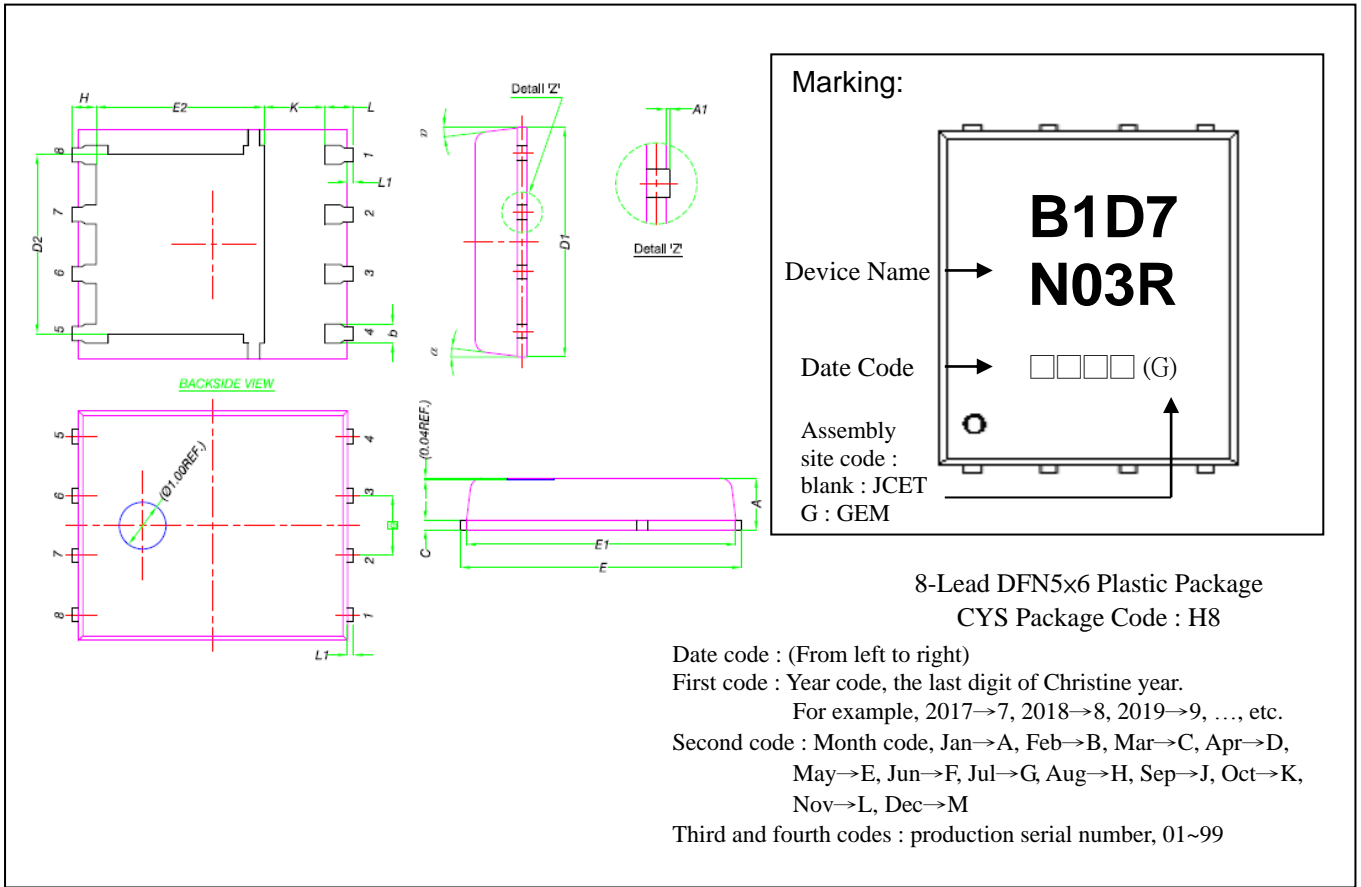
**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>s</sub> max to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s</sub> min)	100°C	150°C
-Temperature Max(T <sub>s</sub> max)	150°C	200°C
-Time(t <sub>s</sub> min to t <sub>s</sub> max)	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.

**DFN5x6 Dimension**



**Marking:**

Device Name → **B1D7  
N03R**

Date Code → □□□□ (G)

Assembly site code :  
 blank : JCET  
 G : GEM

**8-Lead DFN5x6 Plastic Package**  
 CYS Package Code : H8

Date code : (From left to right)  
 First code : Year code, the last digit of Christine year.  
 For example, 2017→7, 2018→8, 2019→9, ..., etc.  
 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  
 Third and fourth codes : production serial number, 01~99

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.90	1.10	0.035	0.043	E2	3.38	3.78	0.133	0.149
A1	0.00	0.05	0.000	0.002	e	1.27	BSC	0.050	BSC
b	0.33	0.51	0.013	0.020	H	0.41	0.61	0.016	0.024
C	0.20	0.30	0.008	0.012	K	1.10	-	0.043	-
D1	4.80	5.00	0.189	0.197	L	0.51	0.71	0.020	0.028
D2	3.61	3.96	0.142	0.156	L1	0.06	0.20	0.002	0.008
E	5.90	6.10	0.232	0.240	θ	8°	12°	8°	12°
E1	5.70	5.80	0.224	0.228					

**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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