

**Dual N-Channel Enhancement Mode Power MOSFET**

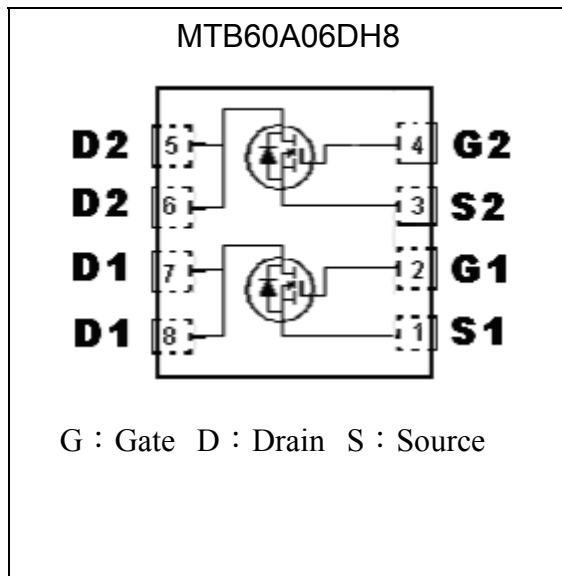
# MTB60A06DH8

<b>BV<sub>DSS</sub></b>	<b>60V</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>C</sub>=25°C</b>	<b>15A</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>C</sub>=100°C</b>	<b>9.5A</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>A</sub>=25°C</b>	<b>4.5A</b>
<b>I<sub>D</sub>@V<sub>GS</sub>=10V, T<sub>A</sub>=70°C</b>	<b>3.6A</b>
<b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=10V, I<sub>D</sub>=5A</b>	<b>34mΩ (typ)</b>
<b>R<sub>DS(ON)</sub>@V<sub>GS</sub>=4.5V, I<sub>D</sub>=5A</b>	<b>38mΩ (typ)</b>

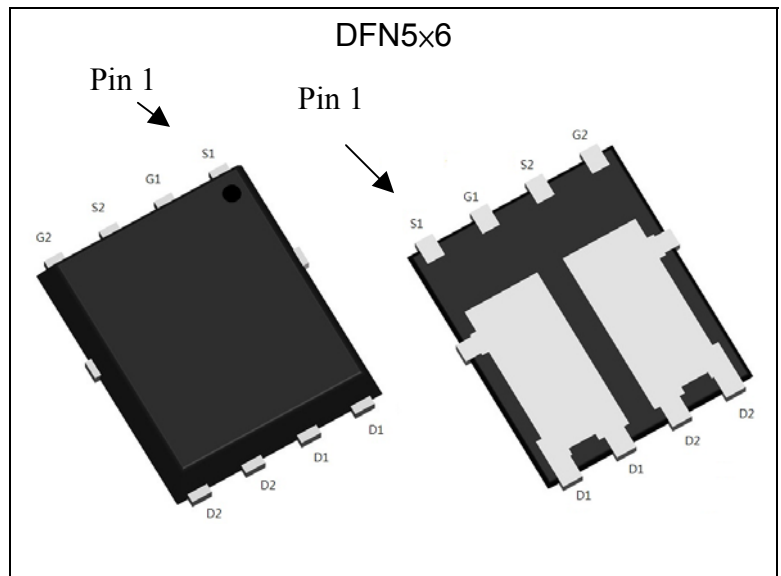
**Features**

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

**Equivalent Circuit**

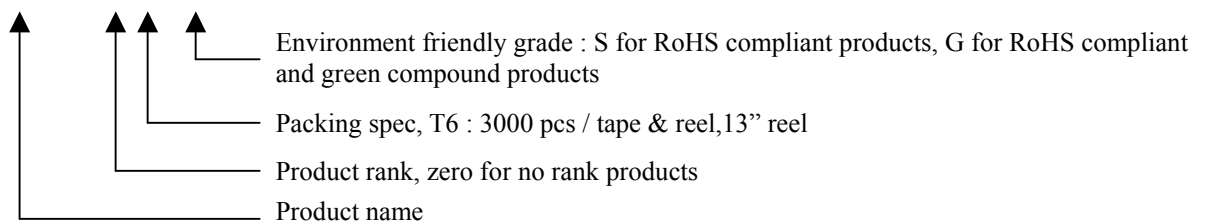


**Outline**



**Ordering Information**

Device	Package	Shipping
MTB60A06DH8-0-T6-G	DFN 5 × 6 (Pb-free lead plating and halogen-free package)	3000 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>	60	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>	15	A
Continuous Drain Current @T <sub>C</sub> =100°C, V <sub>GS</sub> =10V (Note 1)			9.5	
Continuous Drain Current @T <sub>A</sub> =25°C, V <sub>GS</sub> =10V (Note 2)		I <sub>DSM</sub>	4.5	
Continuous Drain Current @T <sub>A</sub> =70°C, V <sub>GS</sub> =10V (Note 2)			3.6	
Pulsed Drain Current @ V <sub>GS</sub> =10V (Note 3)		I <sub>DM</sub>	60	
Avalanche Current (Note 3)		I <sub>AS</sub>	15	
Single Pulse Avalanche Energy @ L=1mH, I <sub>D</sub> =10Amps, V <sub>DD</sub> =50V (Note 5)		E <sub>AS</sub>	50	mJ
Repetitive Avalanche Energy (Note 3)		E <sub>AR</sub>	2.1	
Power Dissipation	T <sub>C</sub> =25°C (Note 1)	P <sub>D</sub>	21	W
	T <sub>C</sub> =100°C (Note 1)		8.4	
	T <sub>A</sub> =25°C (Note 2)	P <sub>D</sub> <sub>SM</sub>	1.8	
	T <sub>A</sub> =70°C (Note 2)		1.2	
Operating Junction and Storage Temperature		T <sub>j</sub> , T <sub>stg</sub>	-55~+150	°C

\*Drain current limited by maximum junction temperature

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R <sub>θJC</sub>	6	°C/W
Thermal Resistance, Junction-to-ambient, max (Note 4)	R <sub>θJA</sub>	70	

- Note :
- 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.
  - 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 value in any given application depends on the user's specific board design. The power dissipation P<sub>D</sub><sub>SM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C.
  - Ratings are based on low frequency and low duty cycles to keep initial T<sub>J</sub>=25°C.
  - When mounted on 1 in<sup>2</sup> copper pad of FR-4 board ; 125°C/W when mounted on minimum copper pad.
  - 100% tested by conditions of L=0.1mH, I<sub>AS</sub>=10A, V<sub>GS</sub>=10V, V<sub>DD</sub>=25V.

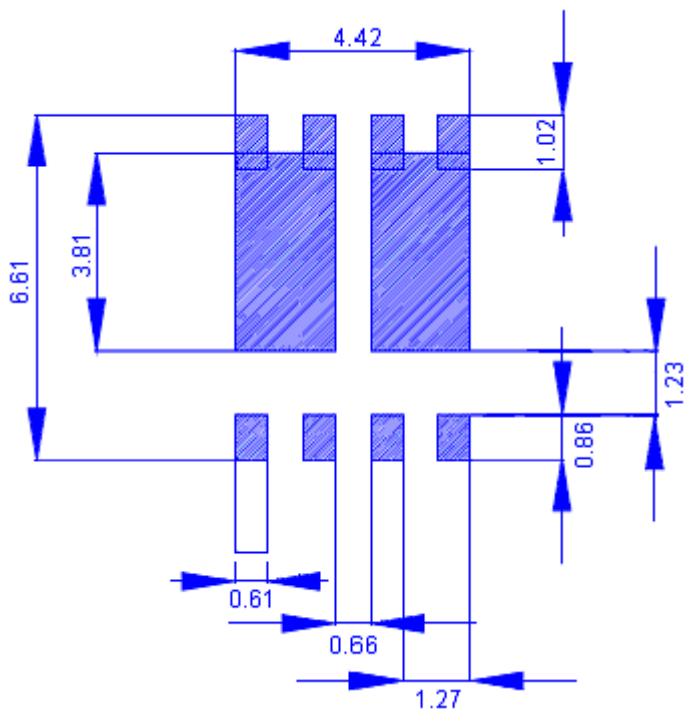
**Characteristics (T<sub>J</sub>=25°C, unless otherwise specified)**

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	60	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	-	0.06	-	V/°C	Reference to 25°C, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1.0	-	2.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
*G <sub>FS</sub>	-	7	-	S	V <sub>DS</sub> =10V, I <sub>D</sub> =5A
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±20V

IDSS	-	-	1	$\mu\text{A}$	$V_{\text{DS}}=48\text{V}, V_{\text{GS}}=0\text{V}$
	-	-	25		$V_{\text{DS}}=48\text{V}, V_{\text{GS}}=0\text{V}, T_{\text{j}}=85^{\circ}\text{C}$
*R <sub>DS(ON)</sub>	-	34	43	$\text{m}\Omega$	$V_{\text{GS}}=10\text{V}, I_{\text{D}}=5\text{A}$
	-	38	50		$V_{\text{GS}}=4.5\text{V}, I_{\text{D}}=5\text{A}$
<b>Dynamic</b>					
*Q <sub>g</sub>	-	17.4	26.1	$\text{nC}$	$V_{\text{DS}}=30\text{V}, I_{\text{D}}=5\text{A}, V_{\text{GS}}=10\text{V}$
*Q <sub>gs</sub>	-	3.1	-		
*Q <sub>gd</sub>	-	2.9	-		
*t <sub>d(ON)</sub>	-	9	13.5	$\text{ns}$	$V_{\text{DS}}=30\text{V}, I_{\text{D}}=1\text{A}, V_{\text{GS}}=10\text{V}, R_{\text{G}}=6\Omega$
*t <sub>r</sub>	-	17	25.5		
*t <sub>d(OFF)</sub>	-	34.8	52.2		
*t <sub>f</sub>	-	7	10.5		
C <sub>iss</sub>	-	882	1323	$\text{pF}$	$V_{\text{GS}}=0\text{V}, V_{\text{DS}}=30\text{V}, f=1\text{MHz}$
C <sub>oss</sub>	-	43	65		
C <sub>rss</sub>	-	37	56		
R <sub>g</sub>	-	2.3	-	$\Omega$	$f=1\text{MHz}$
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	15	$\text{A}$	
*I <sub>SM</sub>	-	-	60		
*V <sub>SD</sub>	-	0.81	1.2	$\text{V}$	$I_{\text{S}}=5\text{A}, V_{\text{GS}}=0\text{V}$
*t <sub>rr</sub>	-	11.4	-	$\text{ns}$	$V_{\text{GS}}=0\text{V}, I_{\text{F}}=5\text{A}, dI_{\text{F}}/dt=100\text{A}/\mu\text{s}$
*Q <sub>rr</sub>	-	7	-	$\text{nC}$	

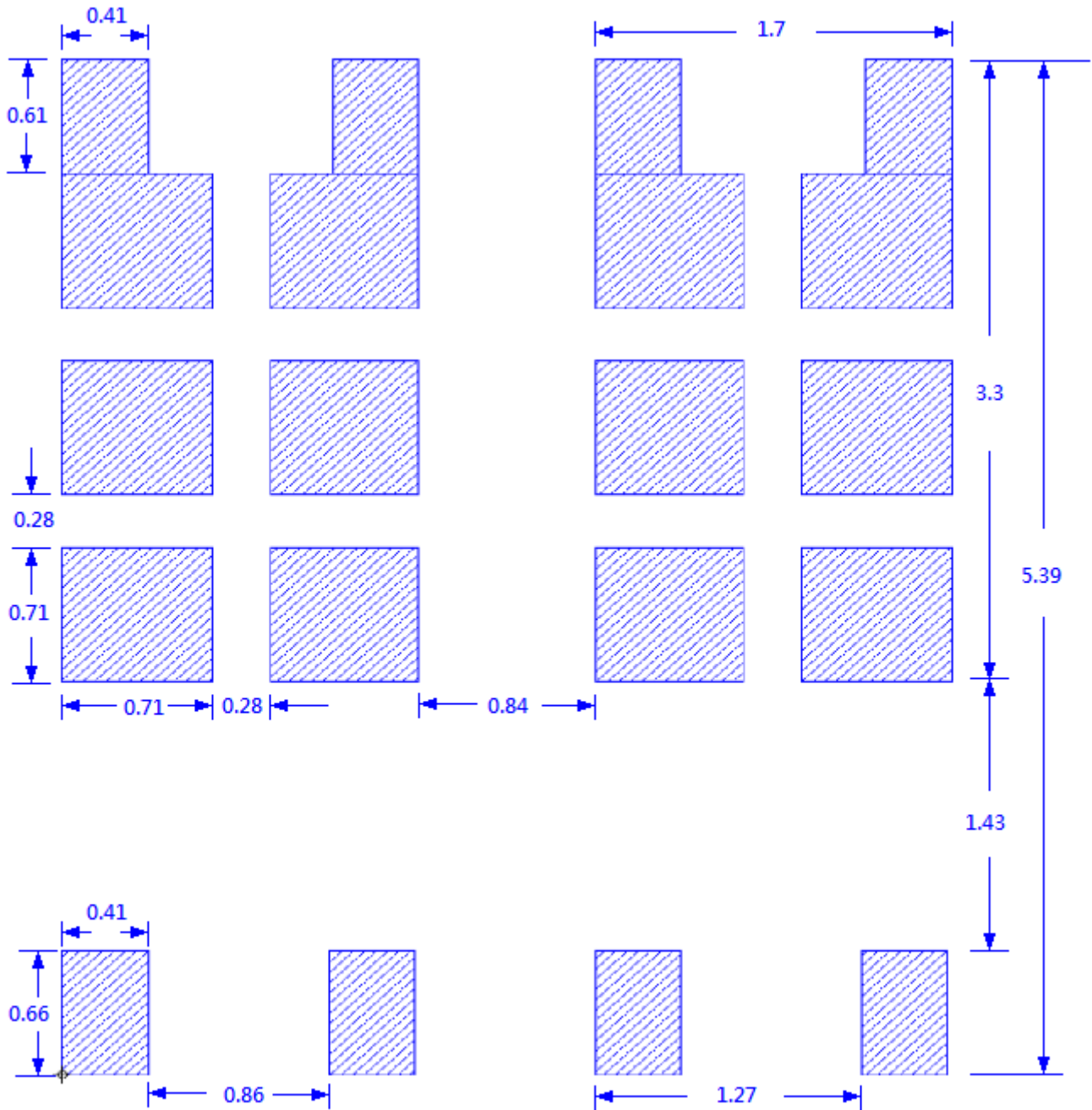
\*Pulse Test : Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$

## Recommended Soldering Footprint



unit : mm

**Recommended Stencil Design**

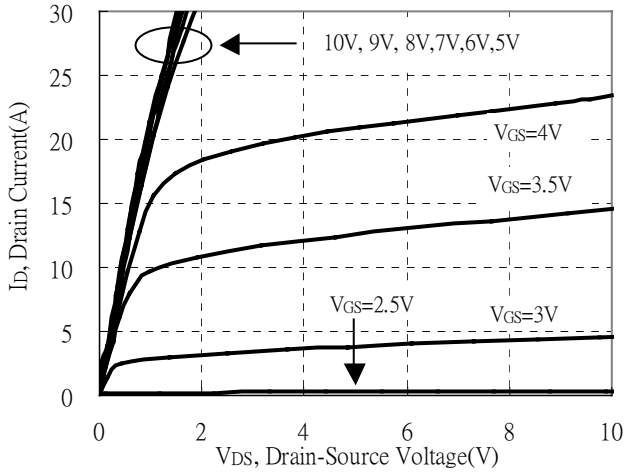


unit : mm

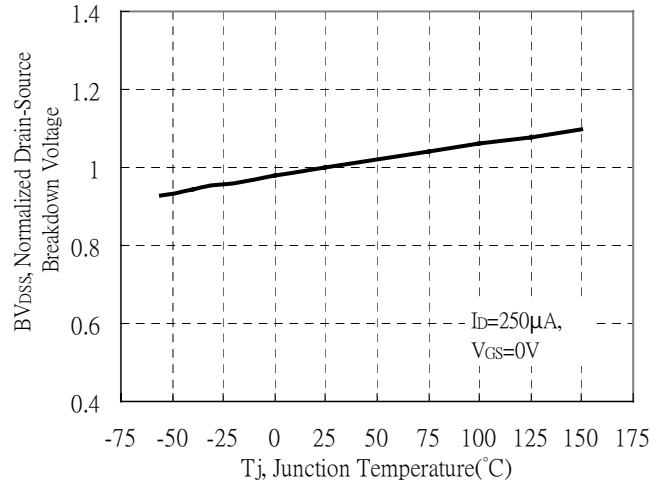
- Note :**
1. Stencil thickness 5 mil (0.127mm)
  2. May need to be adjusted to specific requirements.

**Typical Characteristics**

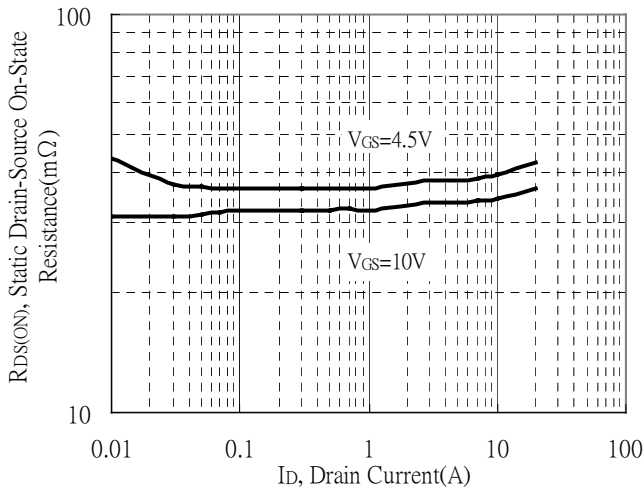
Typical Output Characteristics



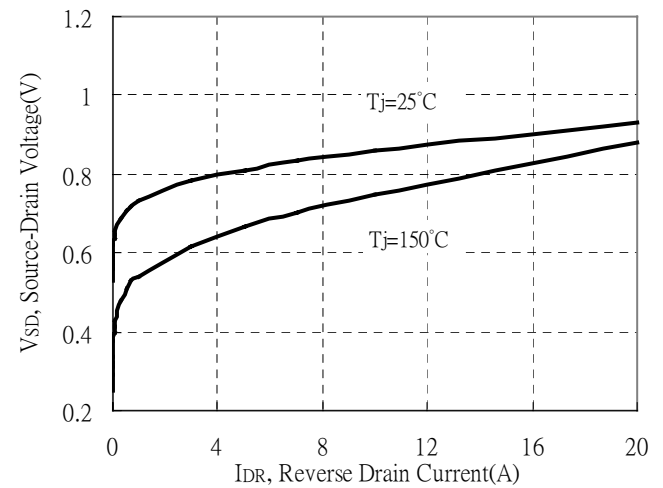
Brekdown Voltage vs Ambient Temperature



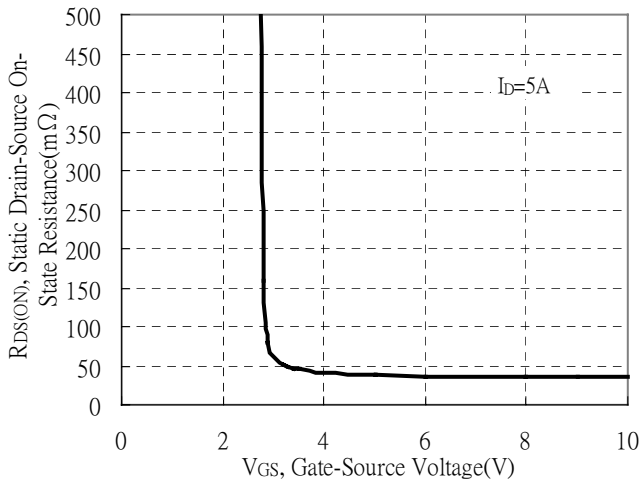
Static Drain-Source On-State resistance vs Drain Current



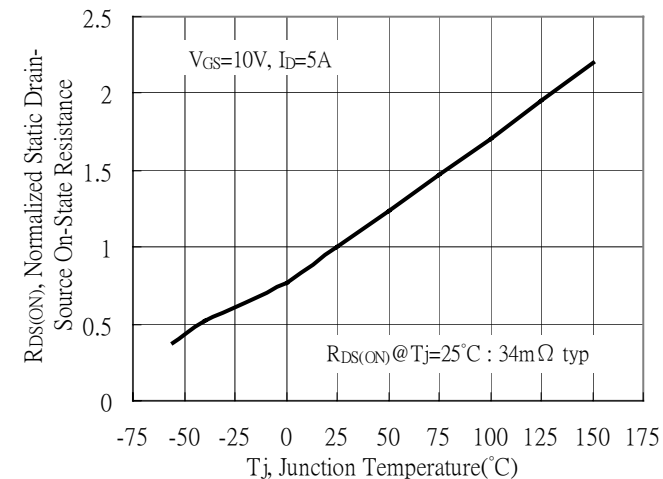
Reverse Drain Current vs Source-Drain Voltage



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

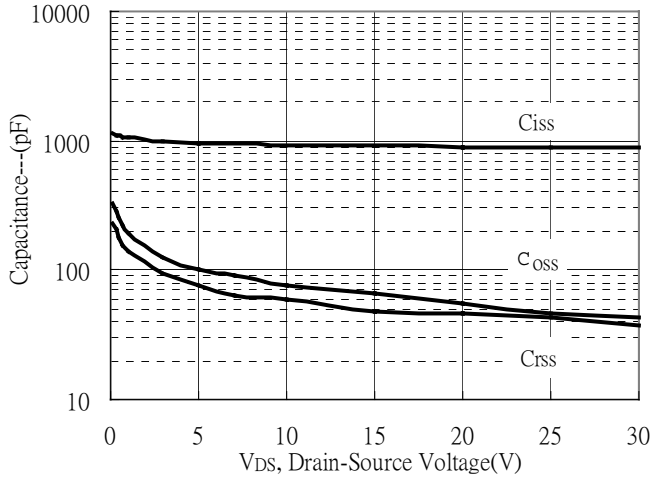


Drain-Source On-State Resistance vs Junction Temperature

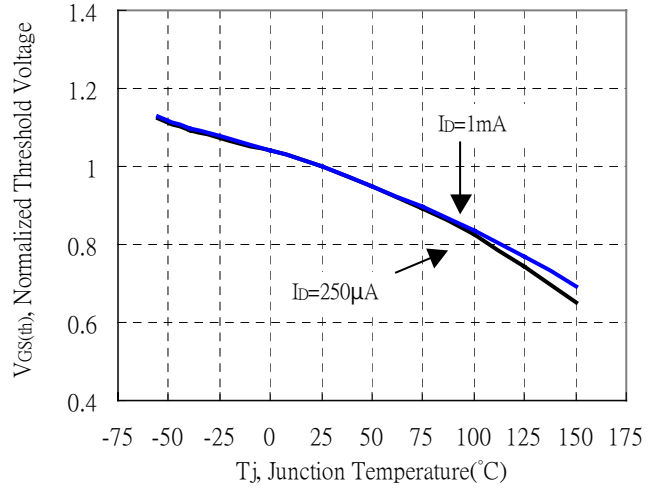


## Typical Characteristics(Cont.)

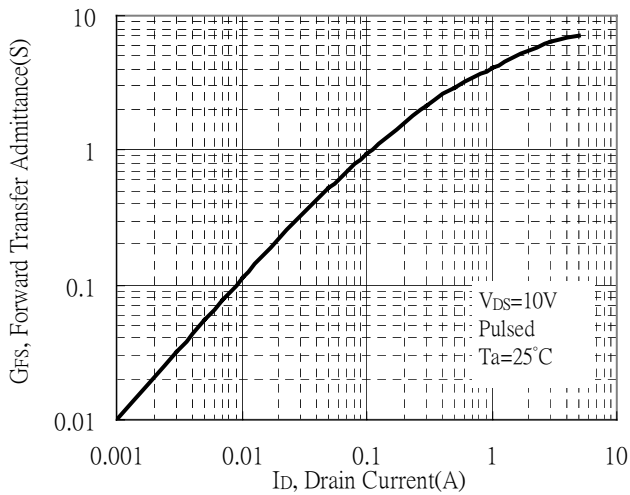
Capacitance vs Drain-to-Source Voltage



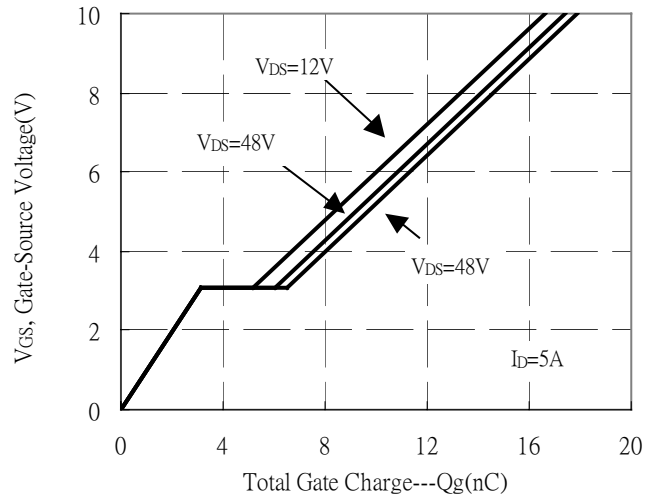
Normalized Threshold Voltage vs Junction Temperature



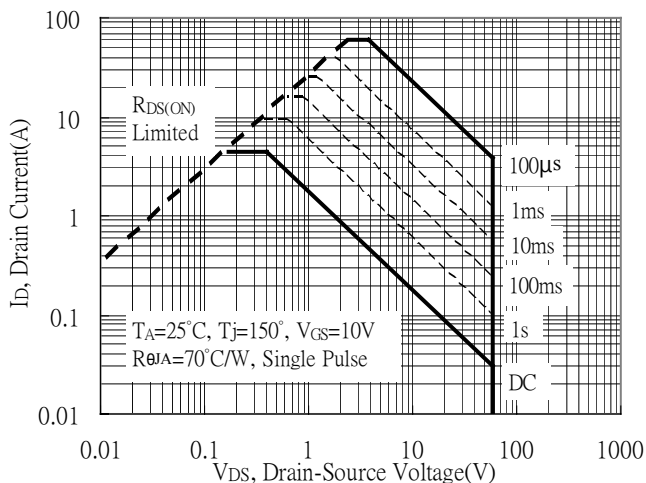
Forward Transfer Admittance vs Drain Current



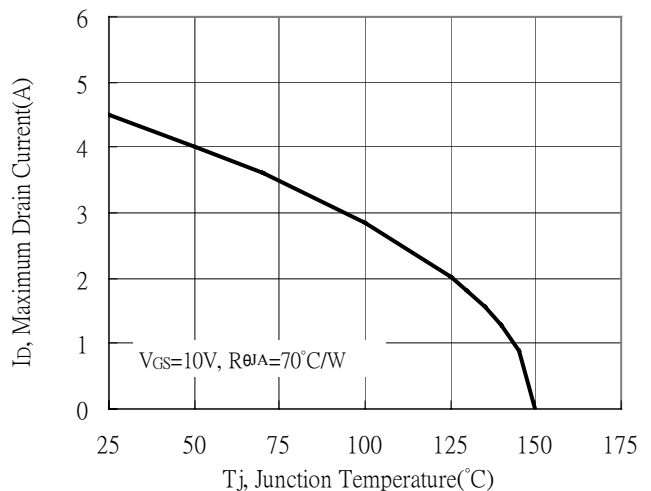
Gate Charge Characteristics



Maximum Safe Operating Area

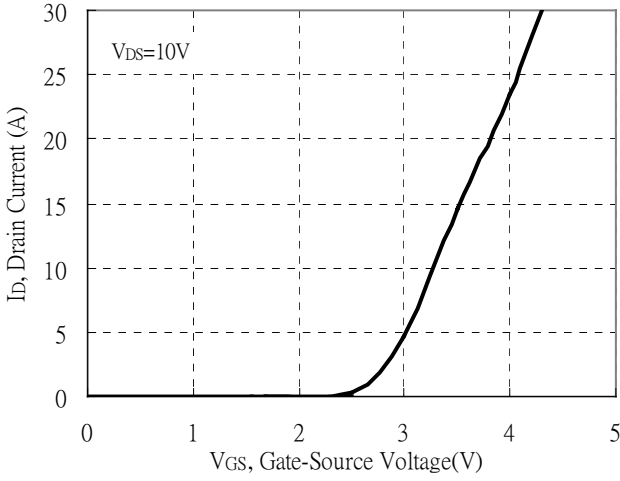


Maximum Drain Current vs Junction Temperature

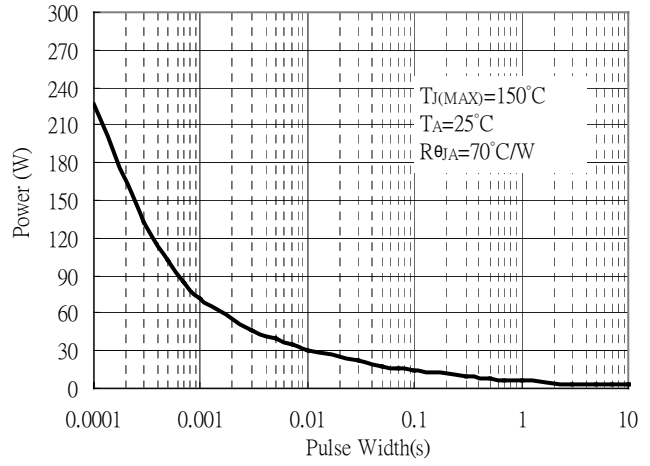


**Typical Characteristics(Cont.)**

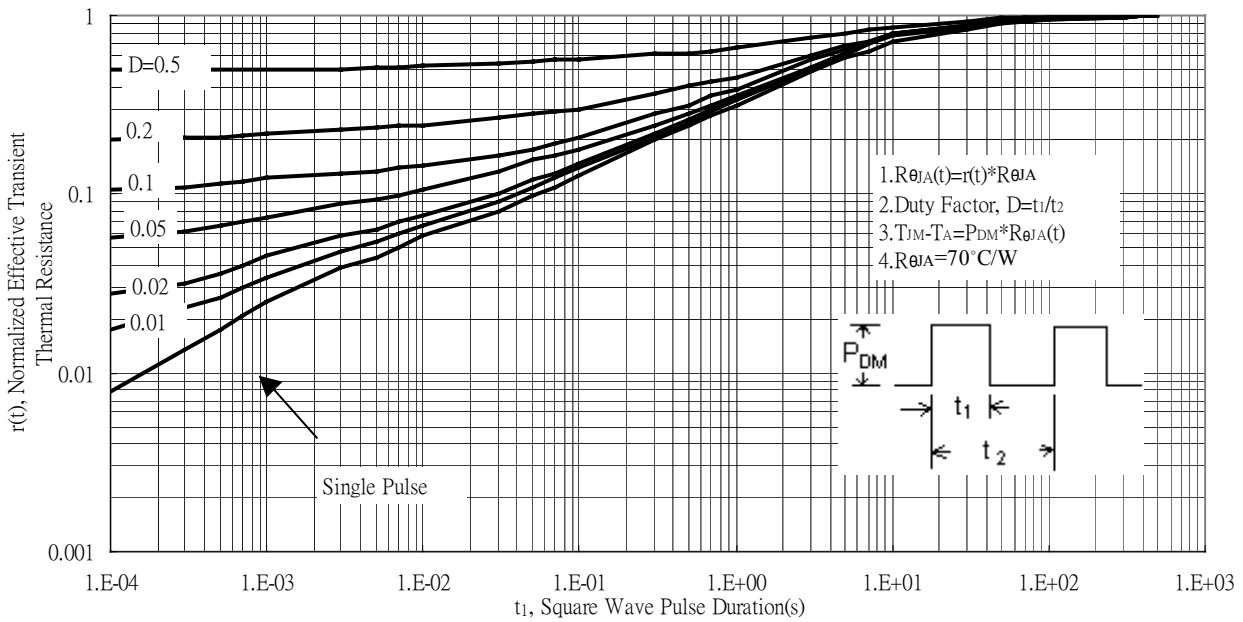
Typical Transfer Characteristics



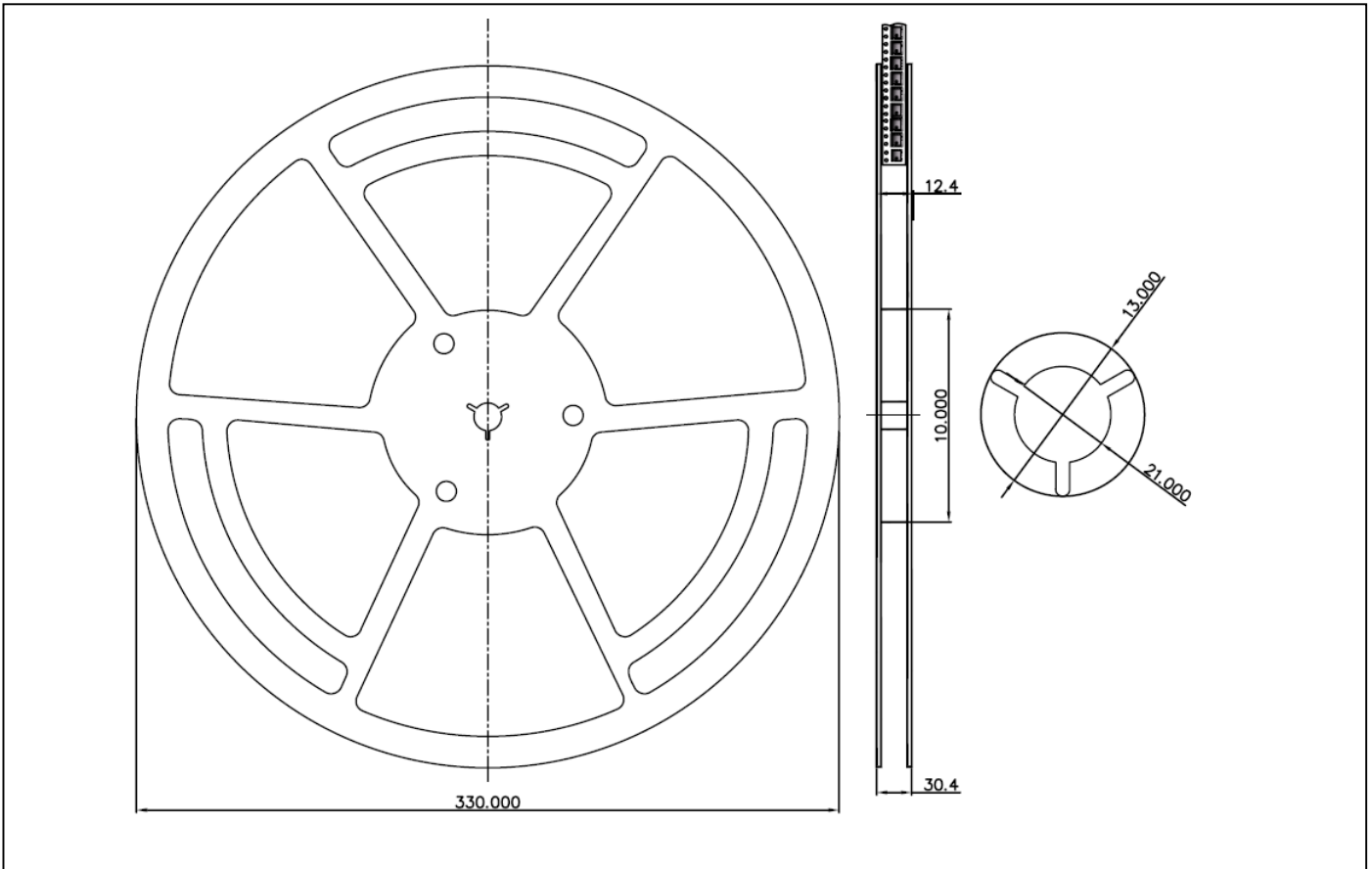
Single Pulse Maximum Power Dissipation  
 (Please see Note on page 2)



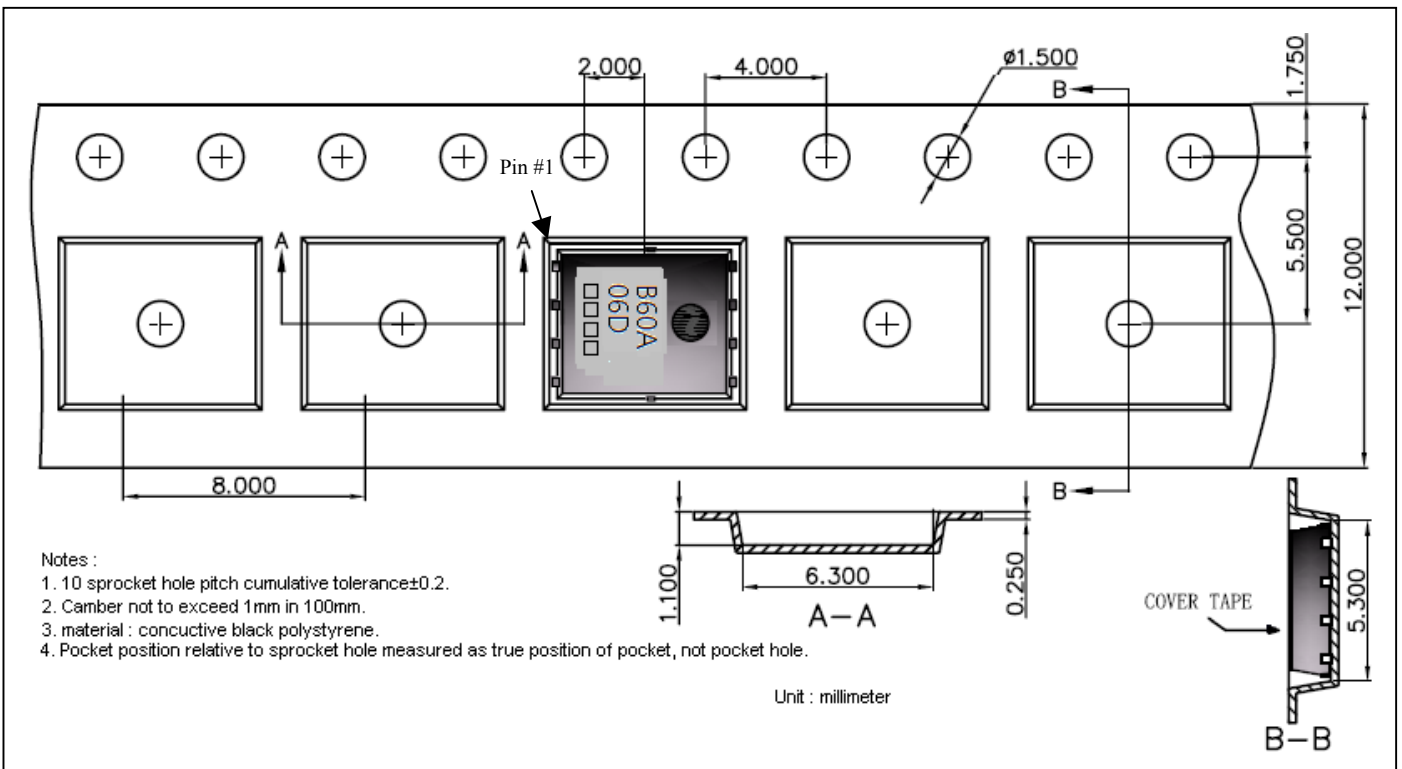
Transient Thermal Response Curves



**Reel Dimension**



**Carrier Tape Dimension**



Notes :

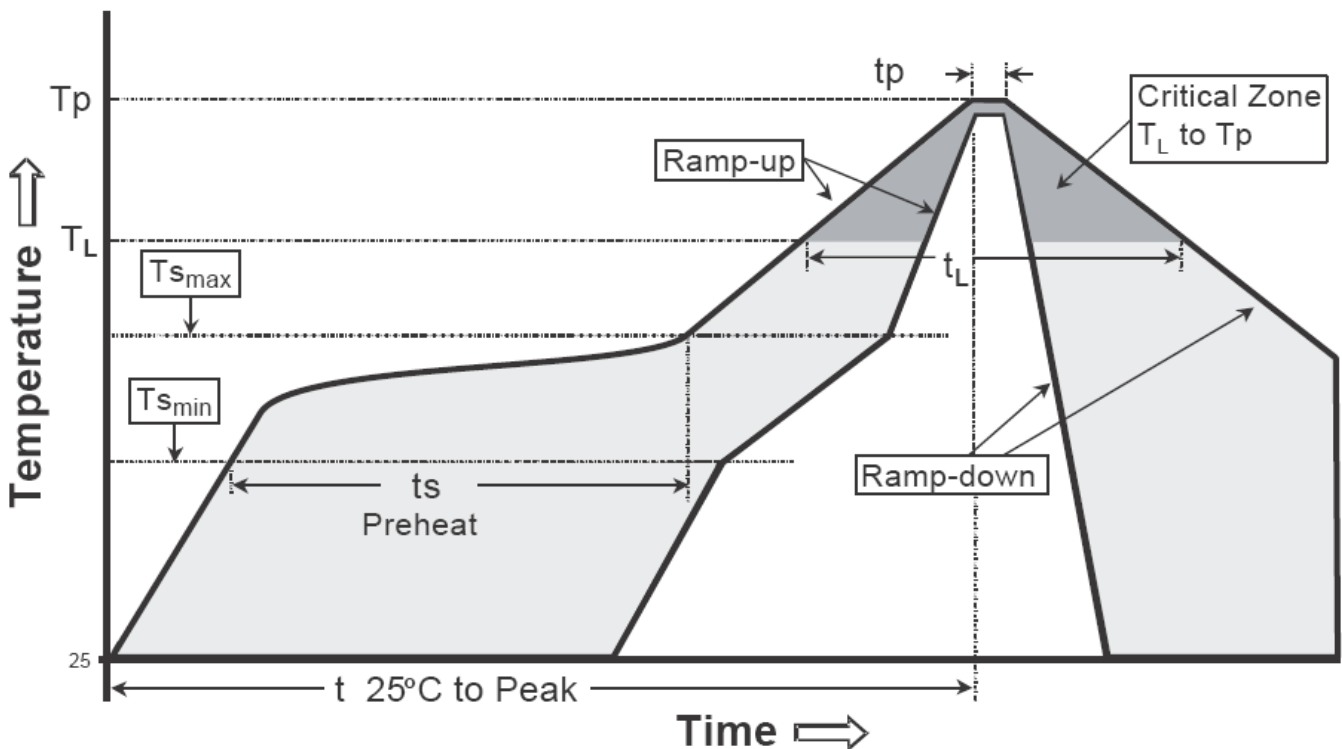
1. 10 sprocket hole pitch cumulative tolerance±0.2.
2. Camber not to exceed 1mm in 100mm.
3. material : conductive black polystyrene.
4. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

**Recommended wave soldering condition**

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

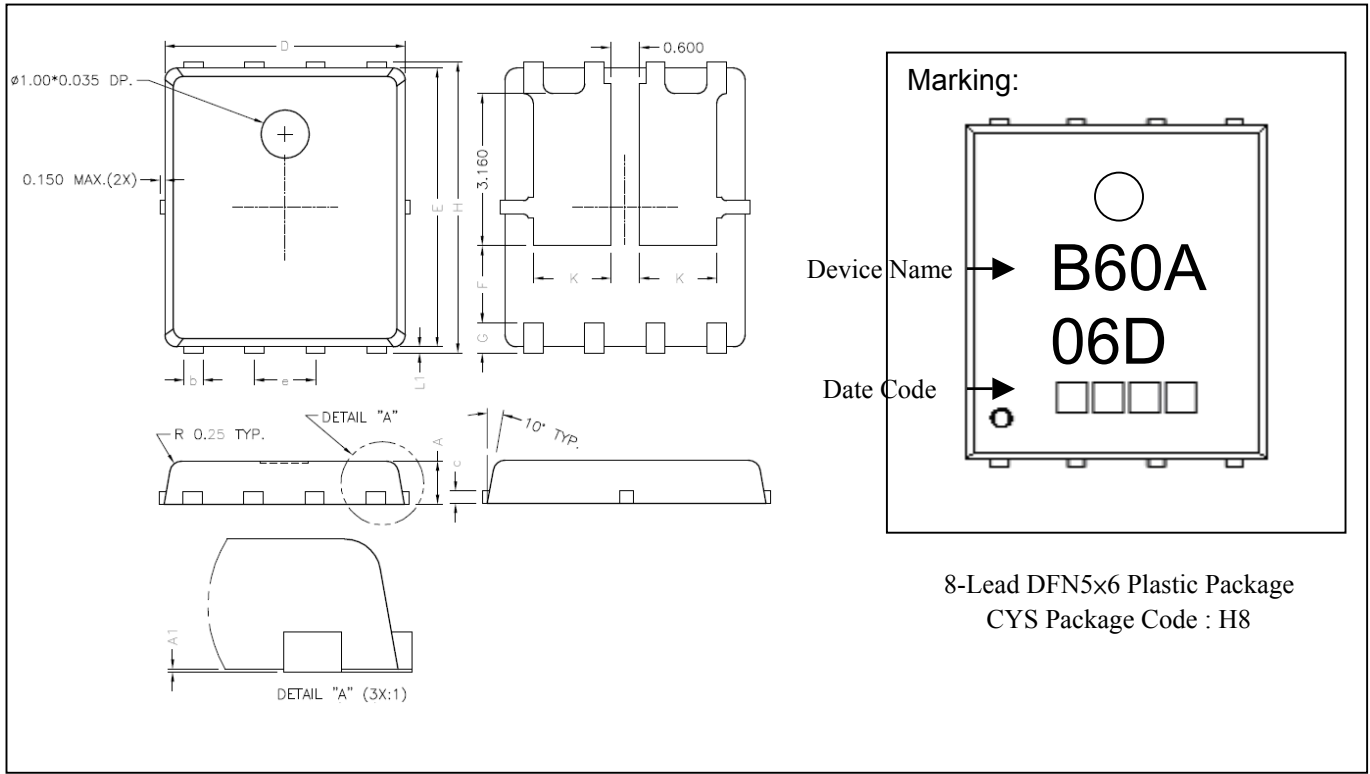
**Recommended temperature profile for IR reflow**



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.

**DFN5x6 Dimension**



8-Lead DFN5x6 Plastic Package  
 CYS Package Code : H8

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.80	1.00	0.031	0.039	E	5.70	5.90	0.224	0.232
A1	0.00	0.05	0.000	0.002	e	1.27 BSC		0.050	BSC
b	0.35	0.49	0.014	0.019	H	5.95	6.20	0.234	0.244
c	0.254 REF		0.010 REF		L1	0.10	0.18	0.004	0.007
D	4.90	5.10	0.193	0.201	G	0.60 REF		0.024	REF
F	1.60 REF		0.063 REF		K	1.60 REF		0.063	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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