

**N-Channel Logic Level Enhancement Mode Power MOSFET**

# MTB09N04H8

BV <sub>DSS</sub>		40V
I <sub>D</sub>		60A
R <sub>DSON(TYP)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =10A	6mΩ
	V <sub>GS</sub> =4.5V, I <sub>D</sub> =8A	10mΩ

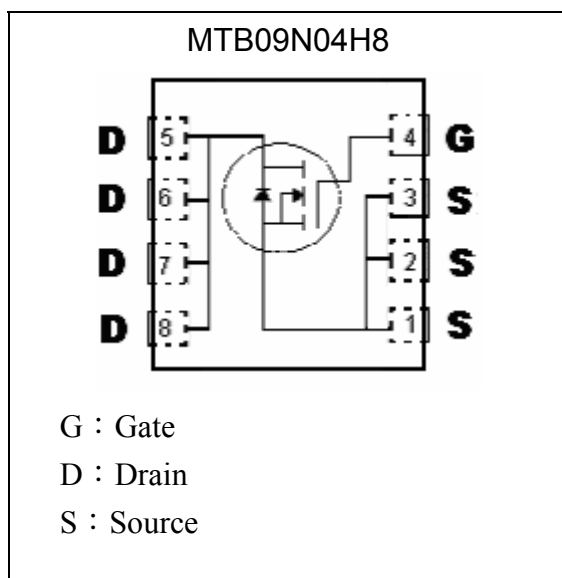
## Description

The MTB09N04H8 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness.

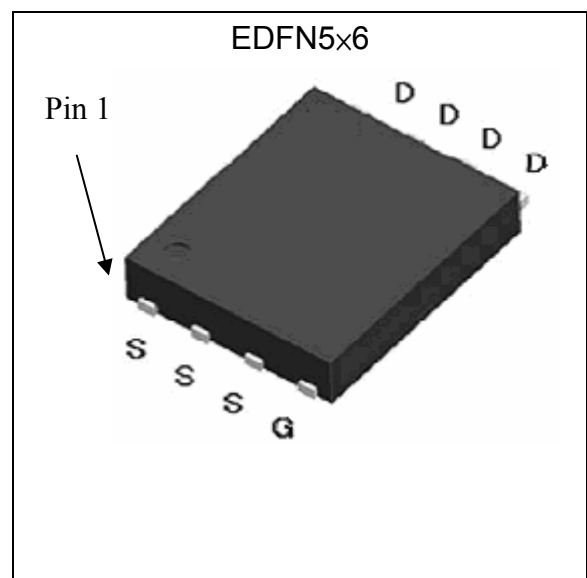
## Features

- Single Drive Requirement
- Low On-resistance
- Fast Switching Characteristic
- Dynamic dv/dt rating
- Repetitive Avalanche Rated
- Pb-free lead plating and Halogen-free package

## Symbol



## Outline





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

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, V <sub>GS</sub> =10V	I <sub>D</sub>	60	A	
Continuous Drain Current @ T <sub>C</sub> =100°C, V <sub>GS</sub> =10V		38		
Continuous Drain Current @ T <sub>A</sub> =25°C, V <sub>GS</sub> =10V		8.6 *3		
Continuous Drain Current @ T <sub>A</sub> =70°C, V <sub>GS</sub> =10V		6.9 *3		
Pulsed Drain Current	I <sub>DM</sub>	140 *1		
Avalanche Current	I <sub>AS</sub>	16		
Avalanche Energy @ L=1mH, I <sub>D</sub> =16A, R <sub>G</sub> =25Ω	E <sub>AS</sub>	128	mJ	
Repetitive Avalanche Energy @ L=0.05mH	E <sub>AR</sub>	5 *2		
Total Power Dissipation	P <sub>D</sub>	T <sub>C</sub> =25°C	50	W
		T <sub>C</sub> =100°C	30	
Operating Junction and Storage Temperature Range	T <sub>j</sub> , T <sub>stg</sub>	-55~+150	°C	

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R <sub>th,j-c</sub>	2.5	°C/W
Thermal Resistance, Junction-to-ambient, max	R <sub>th,j-a</sub>	50 *3	°C/W

- Note : 1. Pulse width limited by maximum junction temperature  
 2. Duty cycle ≤ 1%  
 3. Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board, 125°C/W when mounted on minimum copper pad

**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> =0, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1	2.1	3	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
G <sub>FS</sub> *1	-	18	-	S	V <sub>DS</sub> = 5V, I <sub>D</sub> =10A
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±20
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0
	-	-	25		V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0, T <sub>j</sub> =125°C
I <sub>D(ON)</sub> *1	60	-	-	A	V <sub>DS</sub> = 10V, V <sub>GS</sub> = 10V
R <sub>DS(ON)</sub> *1	-	6	8	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> =10A
	-	10	13	mΩ	V <sub>GS</sub> = 4.5V, I <sub>D</sub> =8A
<b>Dynamic</b>					
C <sub>iss</sub>	-	3252	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz
C <sub>oss</sub>	-	183	-		
C <sub>rss</sub>	-	155	-		



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

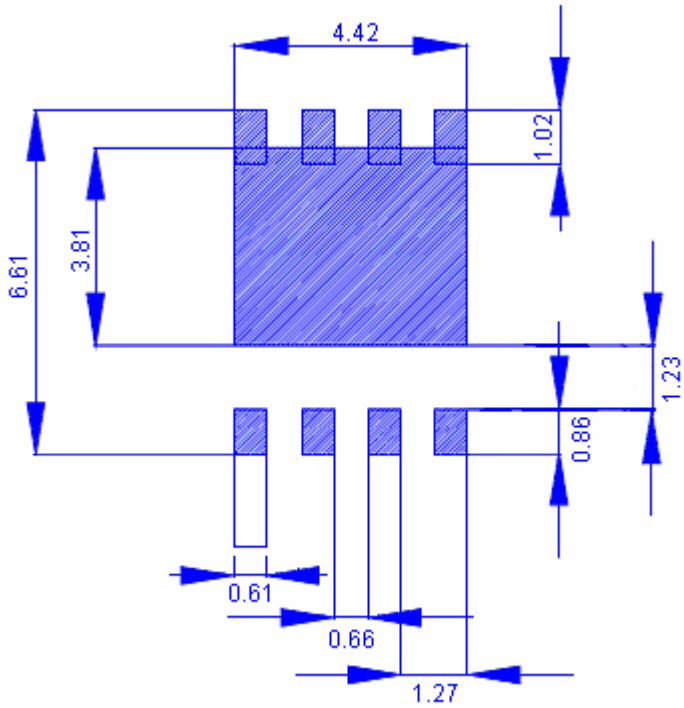
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Qg (VGS=10V) *1, 2	-	36	-	nC	VDS=20V, VGS=10V, ID=30A
Qg (VGS=4.5V) *1, 2	-	22.8	-		
Qgs *1, 2	-	10.4	-		
Qgd *1, 2	-	9.3	-		
td(ON) *1, 2	-	10	-	ns	VDS=20V, ID=10A, VGS=10V, RGS=3Ω
tr *1, 2	-	11	-		
td(OFF) *1, 2	-	35	-		
tf *1, 2	-	13	-		
Rg	2	3.5	5	Ω	VGS=15mV, VDS=0V, f=1MHz
<b>Source-Drain Diode</b>					
IS *1	-	-	60	A	
ISM *3	-	-	140		
VSD *1	-	0.7	1	V	IF=1A, VGS=0V
trr	-	34	-	ns	IF=10A, dIF/dt=100A/μs
Qrr	-	25	-	nC	

Note : \*1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%  
 \*2.Independent of operating temperature  
 \*3.Pulse width limited by maximum junction temperature.

**Ordering Information**

Device	Package	Shipping
MTB09N04H8-0-T1-G	DFN5×6 (Pb-free lead plating and halogen-free package)	3000 pcs / Tape & Reel

### Recommended Soldering Footprint

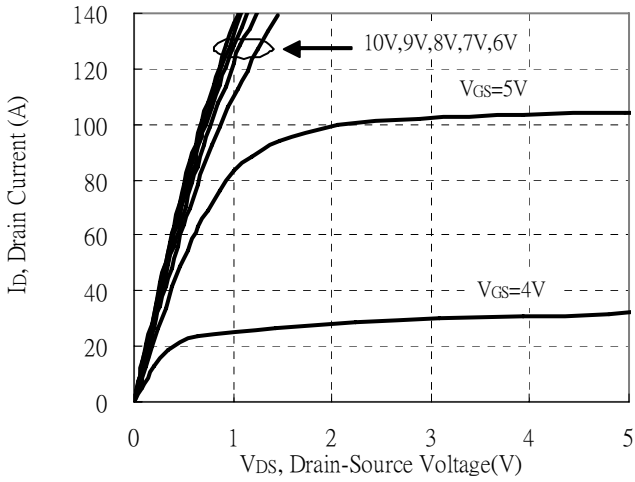


unit : mm

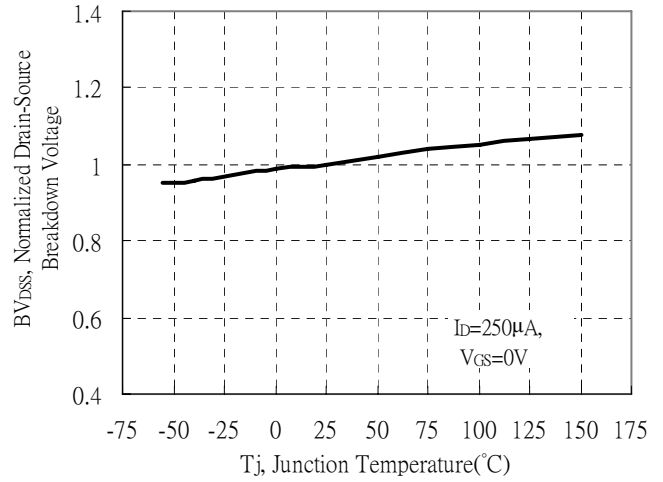


**Typical Characteristics**

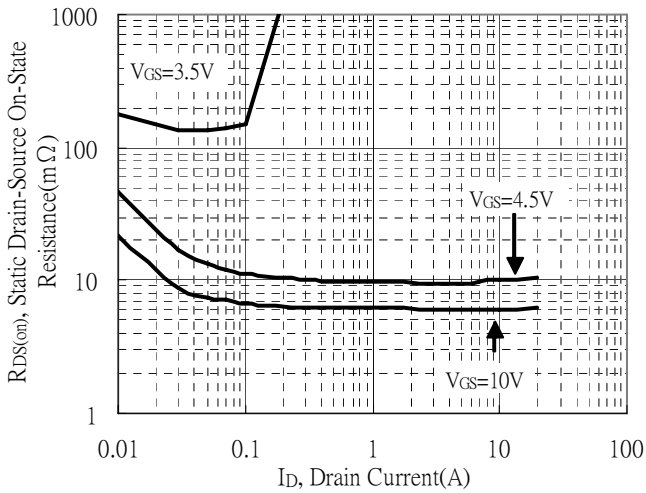
Typical Output Characteristics



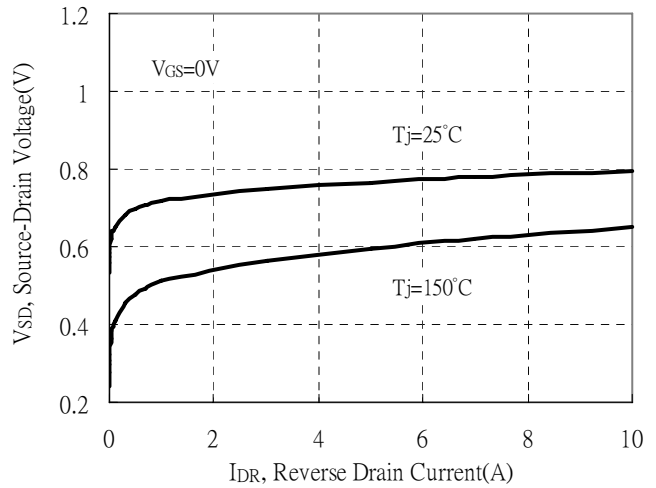
Brekdown Voltage vs Ambient Temperature



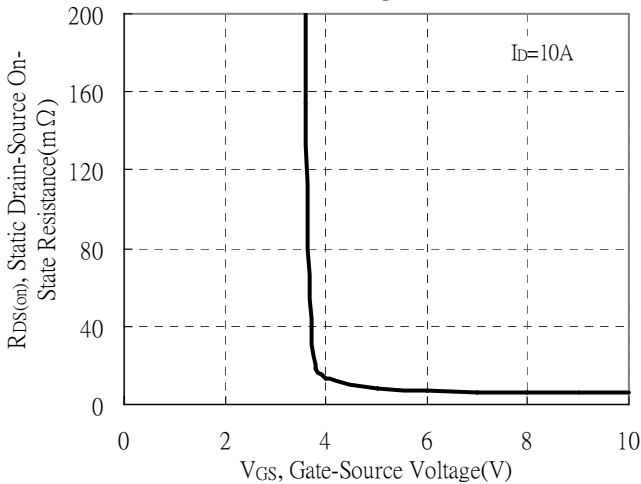
Static Drain-Source On-State resistance vs Drain Current



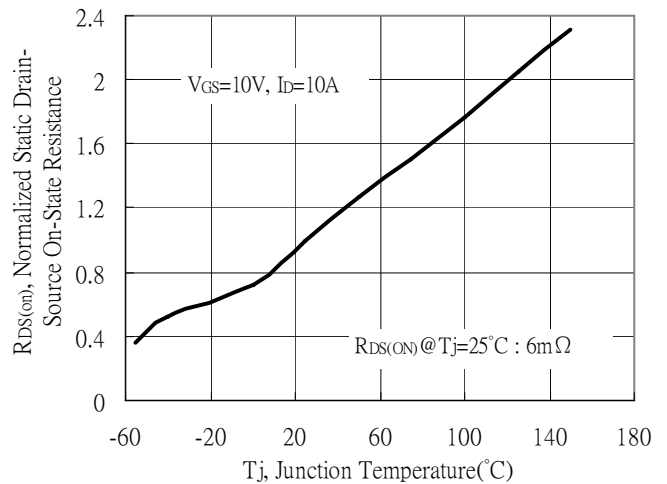
Reverse Drain Current vs Source-Drain Voltage



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



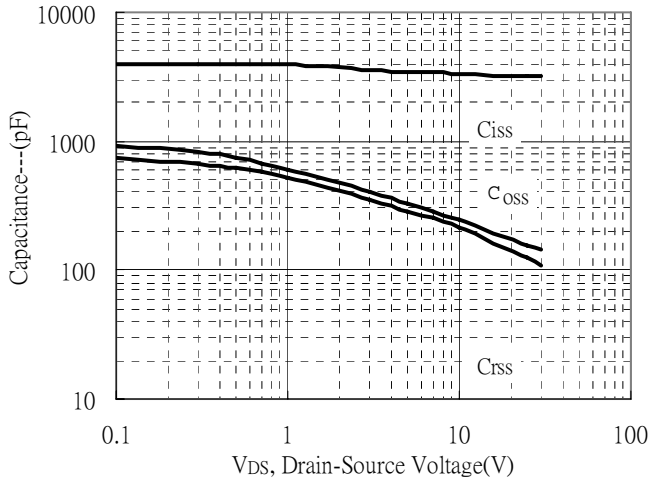
Drain-Source On-State Resistance vs Junction Temperature



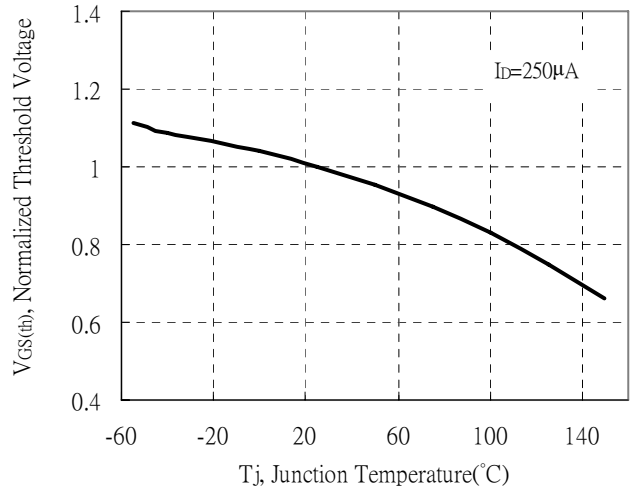


### Typical Characteristics(Cont.)

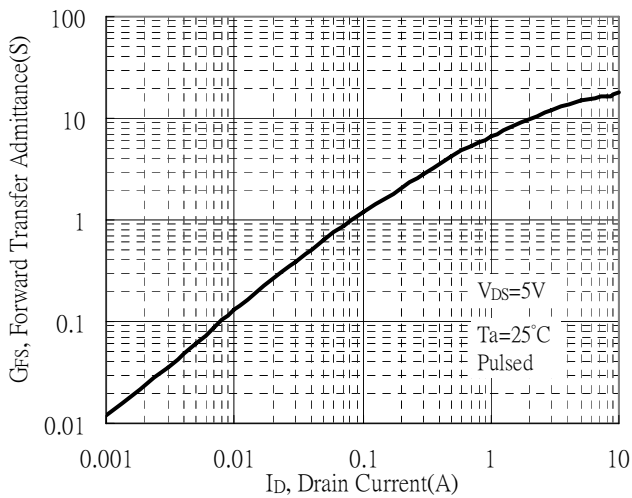
Capacitance vs Drain-to-Source Voltage



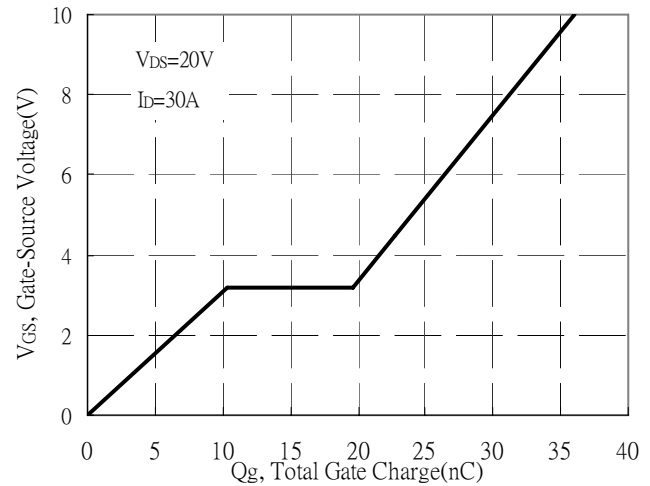
Threshold Voltage vs Junction Temperature



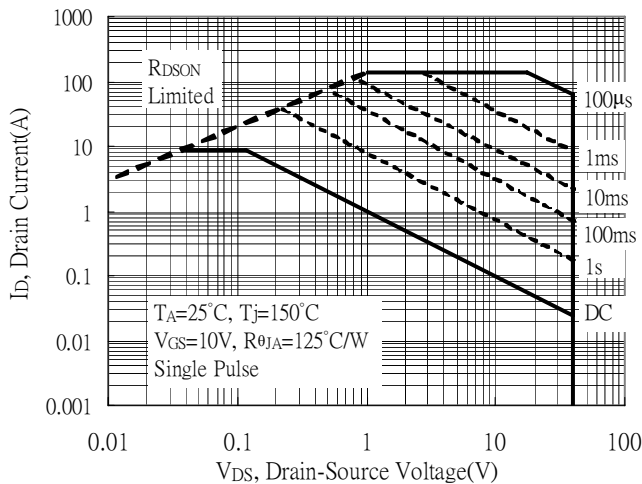
Forward Transfer Admittance vs Drain Current



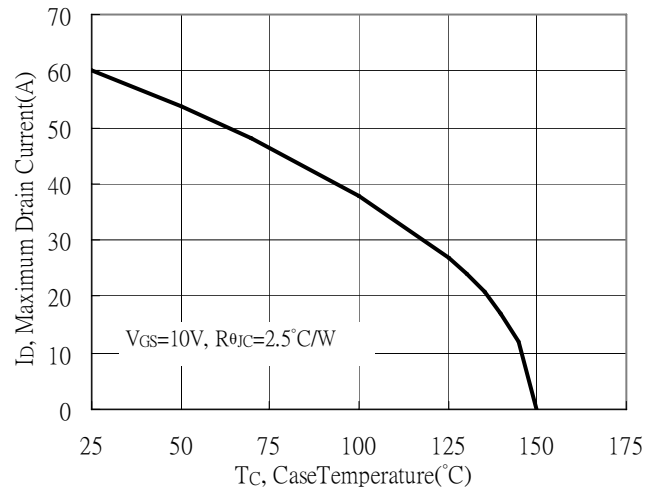
Gate Charge Characteristics



Maximum Safe Operating Area

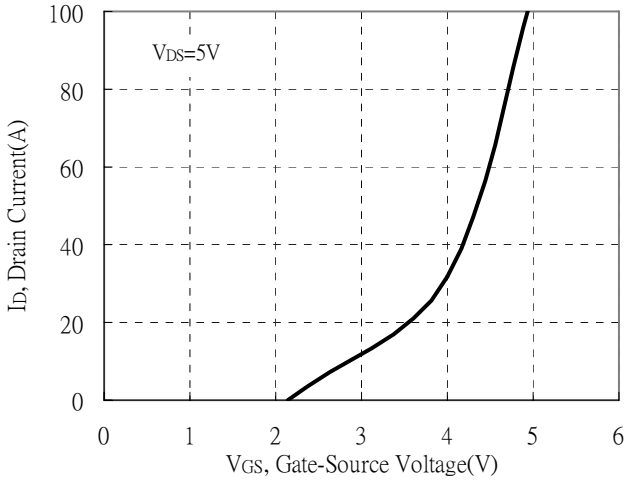


Maximum Drain Current vs Case Temperature

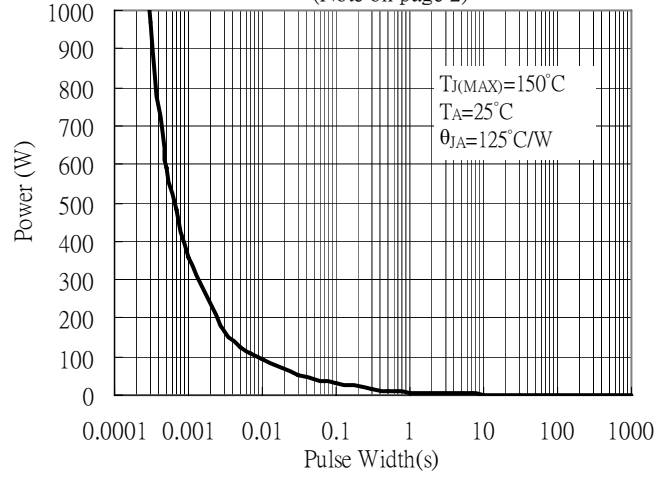


**Typical Characteristics(Cont.)**

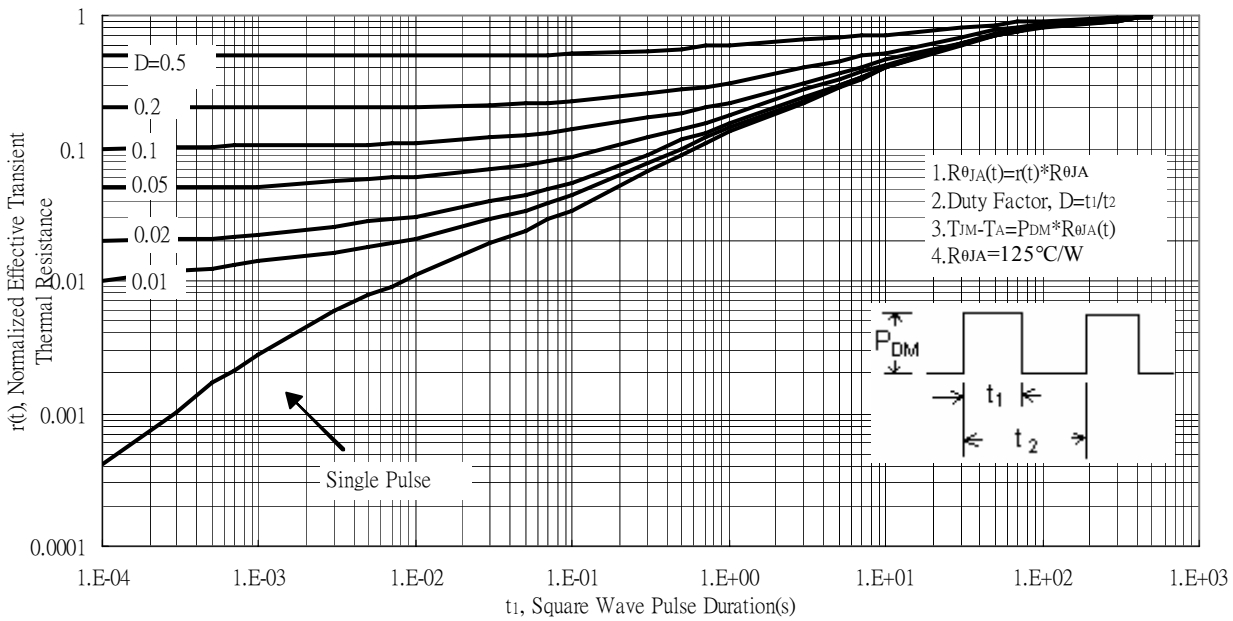
Typical Transfer Characteristics



Single Pulse Power Rating, Junction to Ambient  
 (Note on page 2)



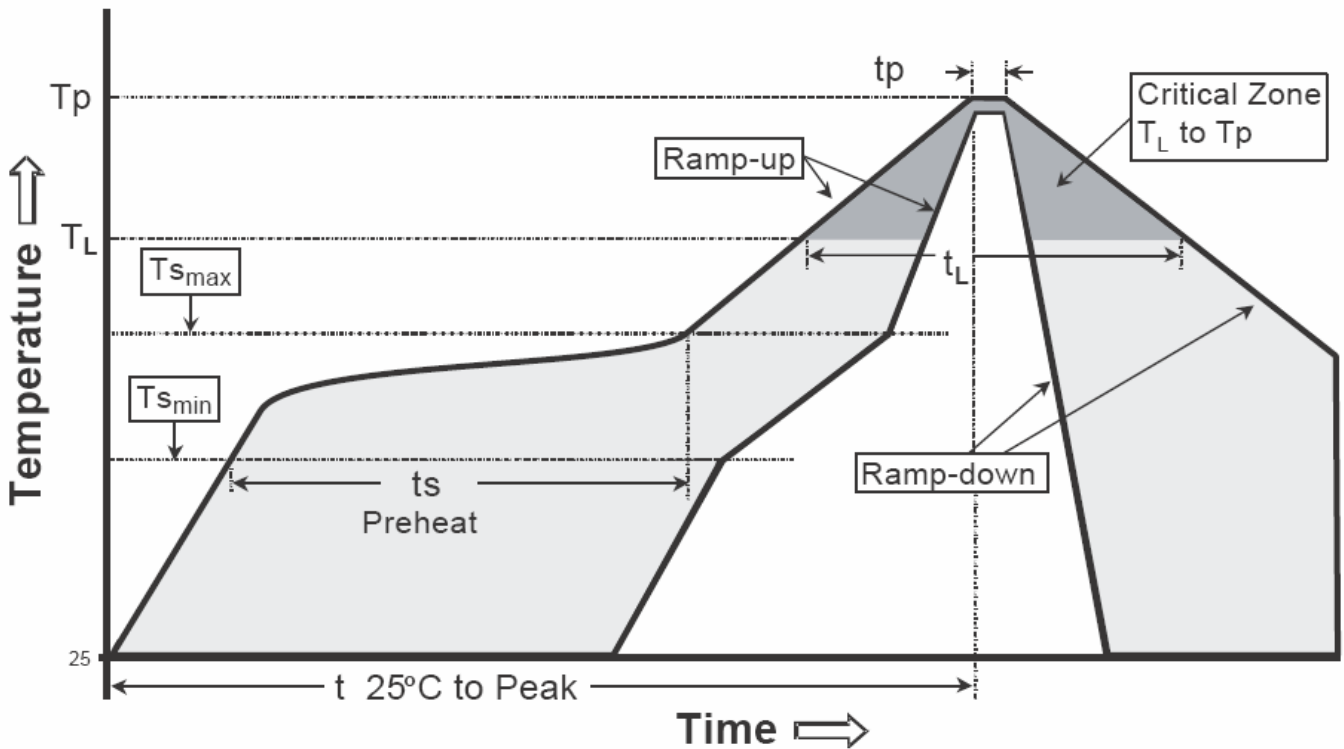
Transient Thermal Response Curves



**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**

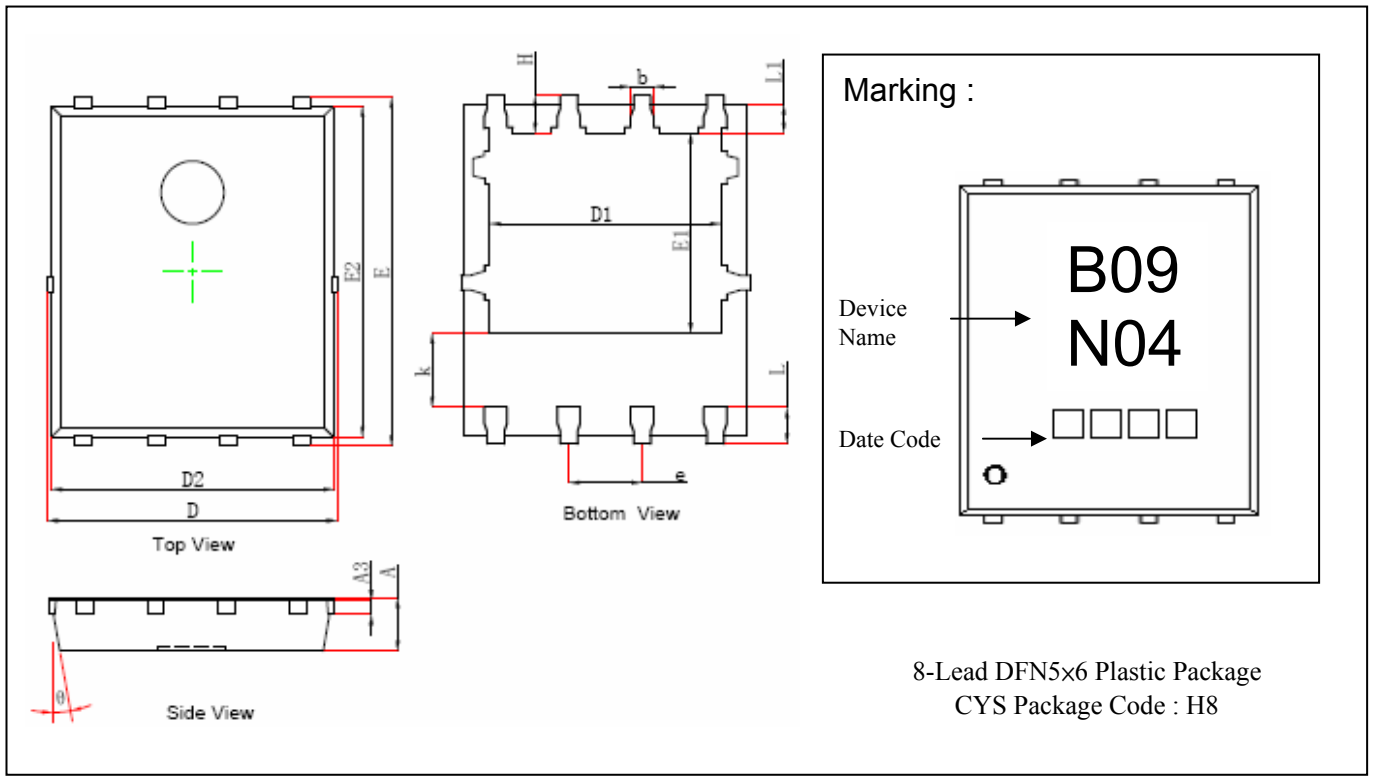


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub>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



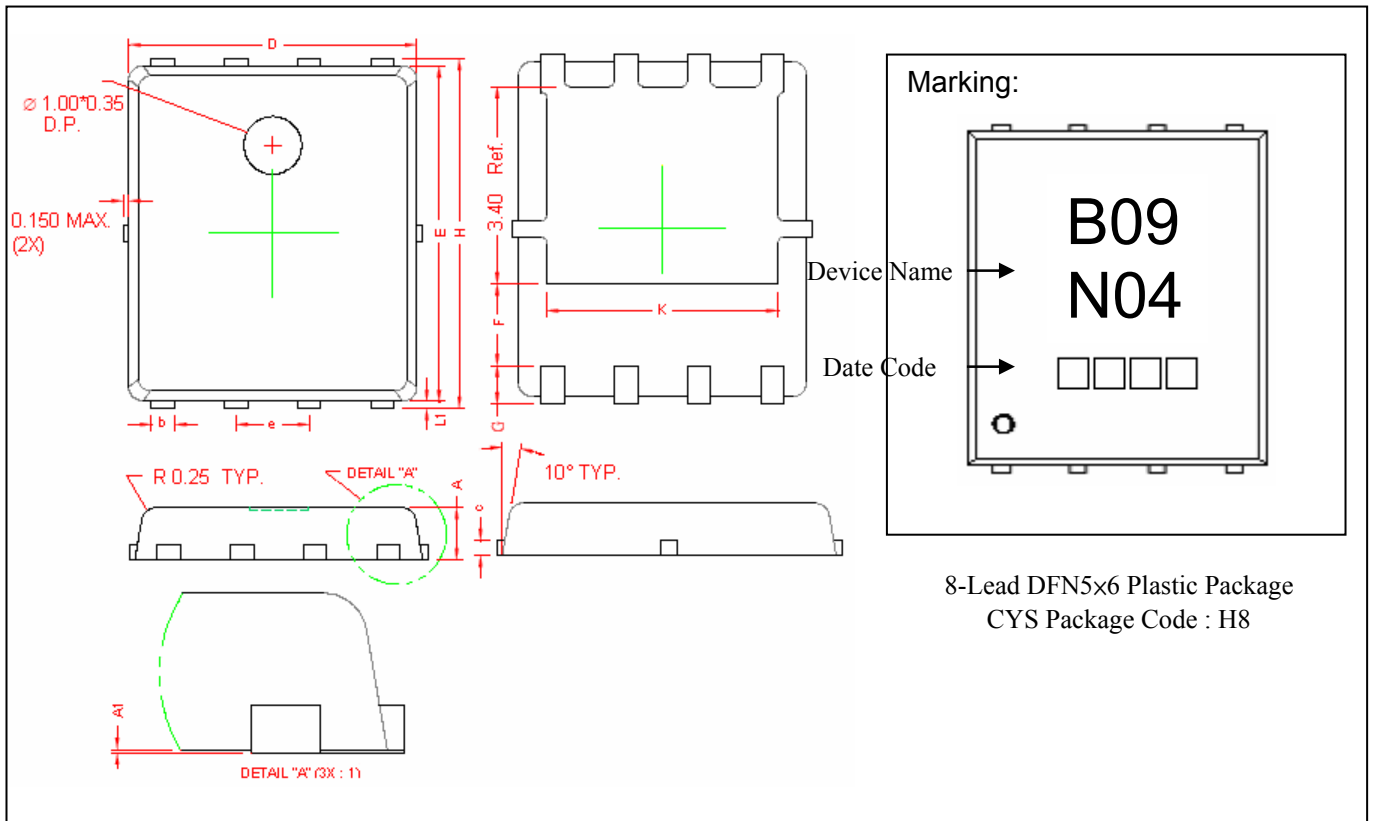
DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.900	1.000	0.035	0.039	k	1.190	1.390	0.047	0.055
A3	0.254	REF	0.010	REF	b	0.350	0.450	0.014	0.018
D	4.944	5.096	0.195	0.201	e	1.270	TYP.	0.050	TYP.
E	5.974	6.126	0.235	0.241	L	0.559	0.711	0.022	0.028
D1	3.910	4.110	0.154	0.162	L1	0.424	0.576	0.017	0.023
E1	3.375	3.575	0.133	0.141	H	0.574	0.726	0.023	0.029
D2	4.824	4.976	0.190	0.196	θ	10°	12°	10°	12°
E2	5.674	5.826	0.223	0.229					

**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.

**DFN5x6 Dimension (G Forming)**



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	1.40 REF		0.055 REF		K	4.00 REF		0.157	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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