

Asymmetric Dual N- Channel Enhancement Mode MOSFET

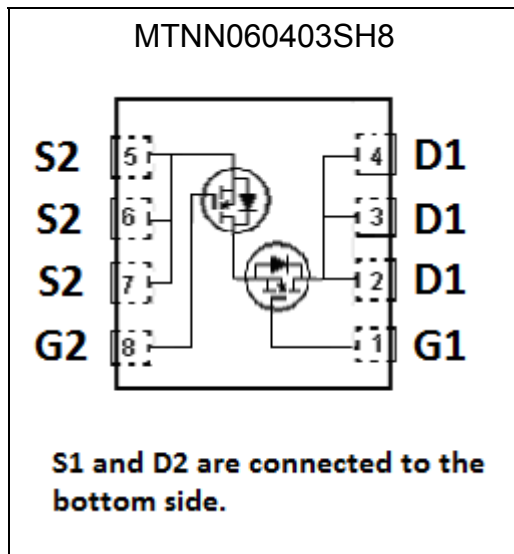
MTNN060403SH8

	Tr 1	Tr 2
BV_{DSS}	30V	30V
$I_D@V_{GS}=10V, T_A=25^\circ C$	11.9A	14.9A
$I_D@V_{GS}=10V, T_C=25^\circ C$	58A	86A
$R_{DS(on)(typ)}@V_{GS}=10V$	6.7m Ω	4.3m Ω
$R_{DS(on)(typ)}@V_{GS}=4.5V$	9.9m Ω	5.5m Ω

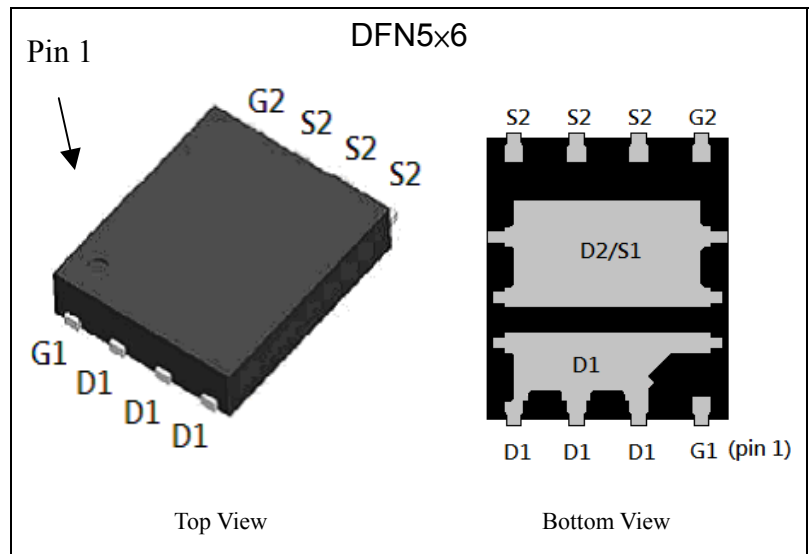
Features

- Simple drive requirement
- Low on-resistance
- Fast switching speed
- Pb-free lead plating and halogen-free package

Equivalent Circuit

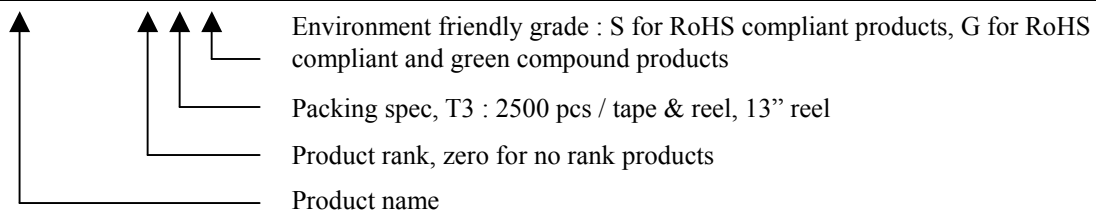


Outline



Ordering Information

Device	Package	Shipping
MTNN060403SH8-0-T6-G	DFN 5 x 6 (Pb-free lead plating & halogen-free package)	3000 pcs / Tape & Reel



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

Parameter		Symbol	Limits		Unit
			Tr 1	Tr 2	
Drain-Source Breakdown Voltage		BV_{DSS}	30	30	V
Gate-Source Voltage		V_{GS}	± 20	± 20	
Continuous Drain Current	$T_A=25^\circ\text{C}$, $V_{GS}=10\text{V}$	I_D	11.9	14.9	A
	$T_A=85^\circ\text{C}$, $V_{GS}=10\text{V}$		8.6	10.7	
	$T_A=25^\circ\text{C}$, $V_{GS}=10\text{V}$ (Note 3)		18	23.1	
	$T_A=85^\circ\text{C}$, $V_{GS}=10\text{V}$ (Note 3)		13	16.6	
	$T_C=25^\circ\text{C}$, $V_{GS}=10\text{V}$		58	86	
	$T_C=100^\circ\text{C}$, $V_{GS}=10\text{V}$		36.7	54.4	
Pulsed Drain Current (Note 1 & 2)		I_{DM}	120	180	
Single Pulse Avalanche Current @ $L=0.1\text{mH}$		I_{AS}	32	40	
Single Pulse Avalanche Energy (Note 4)		E_{AS}	51	80	mJ
Power Dissipation	$T_A=25^\circ\text{C}$ (Note 3)	P_{DSM}	2.01	2.08	W
	$T_A=70^\circ\text{C}$ (Note 3)		1.2	1.3	
	$T_C=25^\circ\text{C}$	P_D	48	69	
	$T_C=100^\circ\text{C}$		19	27	
Operating Junction and Storage Temperature Range		T_j ; T_{stg}	-55~+150		$^\circ\text{C}$

Thermal Data

Parameter	Symbol	Value		Unit
Thermal Resistance, Junction-to-case, max	$R_{\theta JC}$	2.6	1.8	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-ambient, max	$R_{\theta JA}$	62	60	
Thermal Resistance, Junction-to-ambient, max (Note 3)		27	25	

- Note : 1. Pulse width limited by maximum junction temperature
2. Duty cycle $\leq 1\%$
3. Surface mounted on 1 in² copper pad of FR-4 board, $t \leq 10\text{s}$; $125^\circ\text{C}/\text{W}$ when mounted on minimum copper pad.
4. For Tr 1, 100% tested by conditions of $L=0.5\text{mH}$, $V_{DD}=15\text{V}$, $V_{GS}=10\text{V}$, $I_{AS}=5\text{A}$; for Tr 2, 100% tested by conditions of $L=0.5\text{mH}$, $V_{DD}=15\text{V}$, $V_{GS}=10\text{V}$, $I_{AS}=12\text{A}$



Tr 1, Electrical Characteristics (Tc=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	30	-	-	V	V _{GS} =0V, I _D =250μA
ΔBV _{DSS} /ΔT _j	-	26	-	mV/°C	Reference to 25°C, I _D =1mA
V _{GS(th)}	1.0	-	2.5	V	V _{DS} =V _{GS} , I _D =250μA
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} =24V, V _{GS} =0V
	-	-	25		V _{DS} =24V, V _{GS} =0V, T _j =125°C
*R _{DS(ON)}	-	6.7	9	mΩ	V _{GS} =10V, I _D =10A
	-	9.9	14.5		V _{GS} =4.5V, I _D =10A
*G _{FS}	-	15.4	-	S	V _{DS} =10V, I _D =5A
Dynamic					
C _{iss}	-	654	-	pF	V _{DS} =15V, V _{GS} =0V, f=1MHz
C _{oss}	-	159	-		
C _{rss}	-	70	-		
*td(ON)	-	7.4	-	ns	V _{DS} =15V, I _D =10A, V _{GS} =10V, R _G =3Ω
*tr	-	13	-		
*td(OFF)	-	26	-		
*tf	-	7.6	-		
*Q _g (V _{GS} =10V)	-	13.6	-	nC	V _{DS} =15V, I _D =10A, V _{GS} =10V
*Q _g (V _{GS} =4.5V)	-	6.8	-		
*Q _{gs}	-	2.2	-		
*Q _{gd}	-	2.7	-		
Body Diode					
*V _{SD}	-	0.76	1	V	V _{GS} =0V, I _S =3A
*trr	-	11.3	-	ns	I _F =3A, dI _F /dt=100A/μs
*Q _{rr}	-	4.6	-	nC	

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

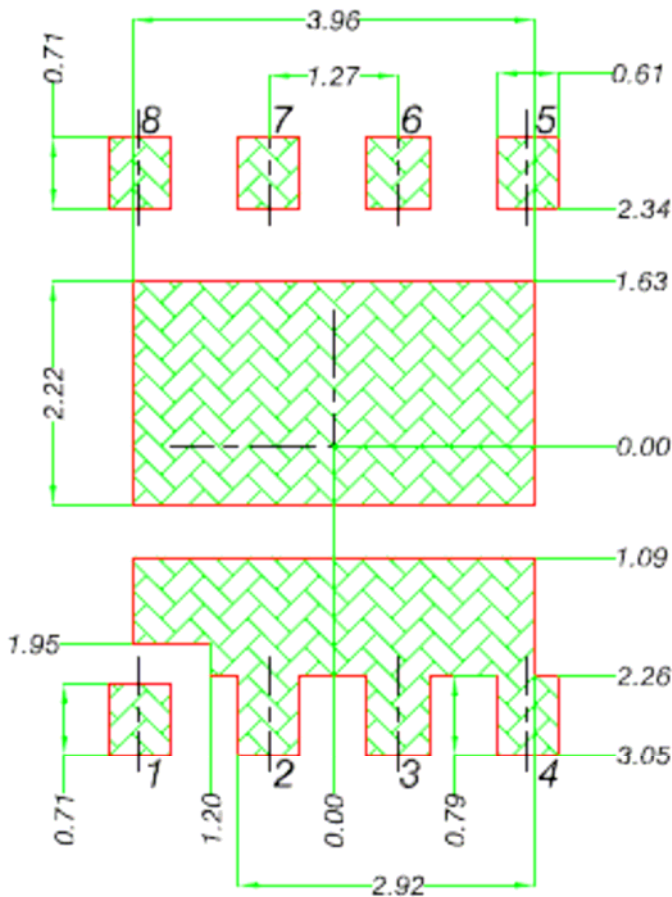
Tr 2, Electrical Characteristics (Tc=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	30	-	-	V	V _{GS} =0V, I _D =-250μA
ΔBV _{DSS} /ΔT _j	-	26	-	mV/°C	Reference to 25°C, I _D =1mA
V _{GS(th)}	1.0	-	2.5	V	V _{DS} =V _{GS} , I _D =-250μA
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} =24V, V _{GS} =0V
	-	-	25		V _{DS} =24V, V _{GS} =0V, T _j =125°C
*R _{DS(ON)}	-	4.3	5.5	mΩ	V _{GS} =10V, I _D =15A
	-	5.5	7.2		V _{GS} =4.5V, I _D =15A
*G _{FS}	-	13.6	-	S	V _{DS} =10V, I _D =7A
Dynamic					
C _{iss}	-	1459	-	pF	V _{DS} =15V, V _{GS} =0V, f=1MHz
C _{oss}	-	278	-		
C _{rss}	-	208	-		

*td(ON)	-	13	-	ns	V _{DS} =15V, I _D =15A, V _{GS} =10V, R _G =2.7Ω
*tr	-	15.8	-		
*td(OFF)	-	46.4	-		
*tf	-	10.8	-		
*Qg(V _{GS} =10V)	-	34.3	-	nC	V _{DS} =15V, I _D =15A, V _{GS} =10V
*Qg(V _{GS} =4.5V)	-	18.1	-		
*Qgs	-	4.6	-		
*Qgd	-	8.6	-		
Body Diode					
*V _{SD}	-	0.73	1	V	V _{GS} =0V, I _S =2A
*trr	-	15.7	-	ns	I _F =2A, dI _F /dt=100A/μs
*Q _{rr}	-	8.4	-	nC	

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

Recommended Soldering Footprint

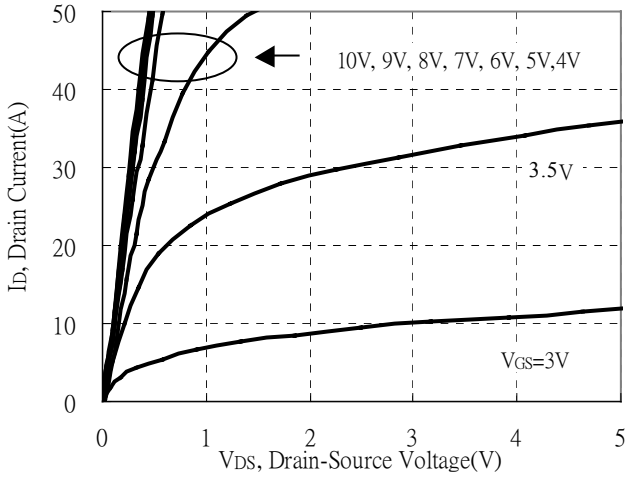


unit : mm

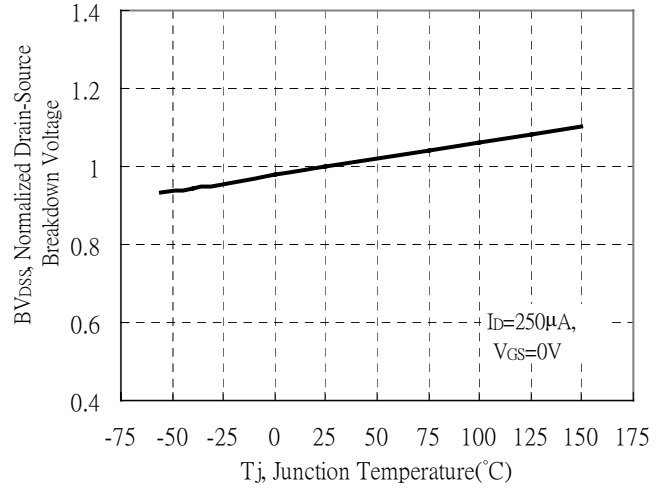


Typical Characteristics : Q1(N-channel)

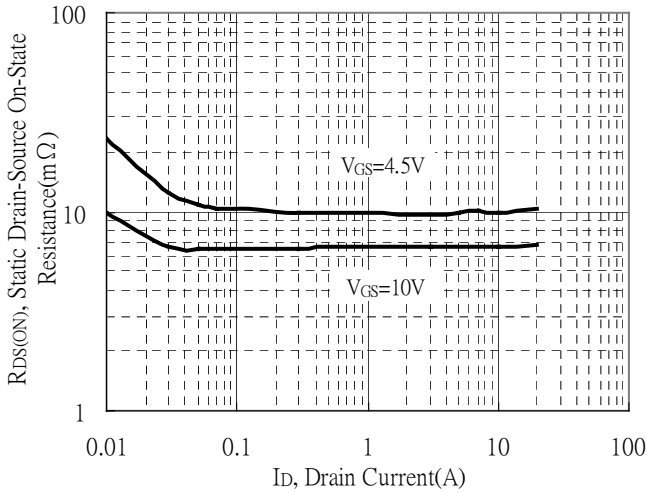
Typical Output Characteristics



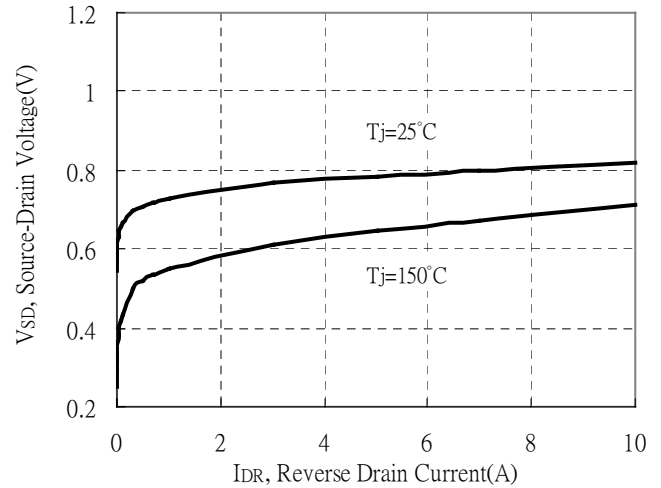
Brekdown Voltage vs Ambient Temperature



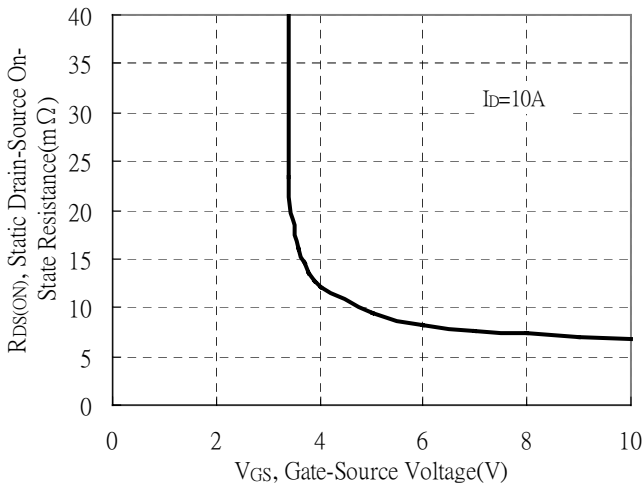
Static Drain-Source On-State resistance vs Drain Current



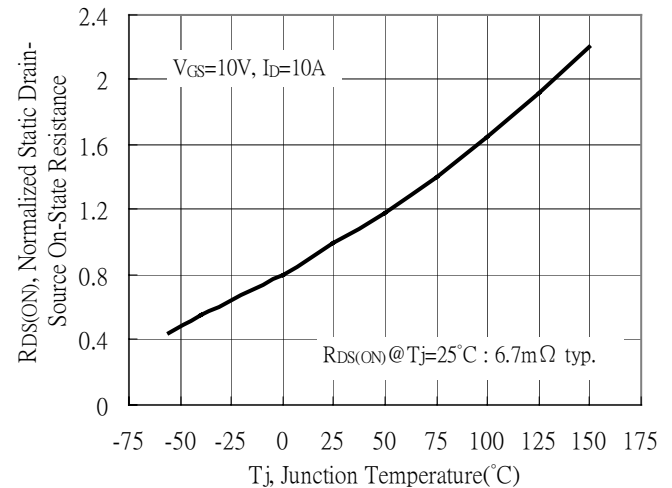
Reverse Drain Current vs Source-Drain Voltage



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

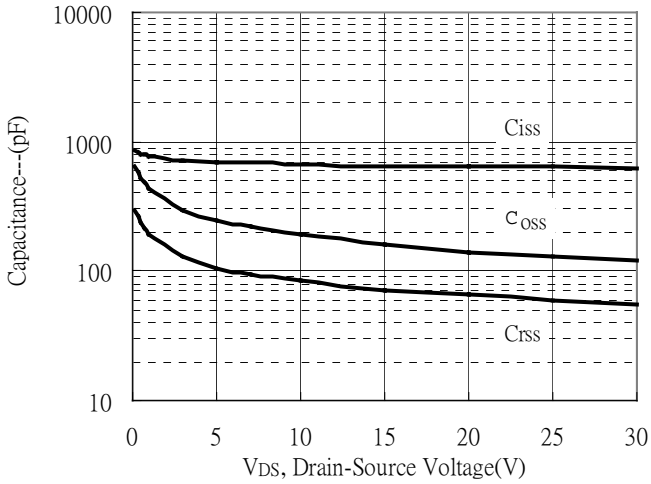


Drain-Source On-State Resistance vs Junction Temperature

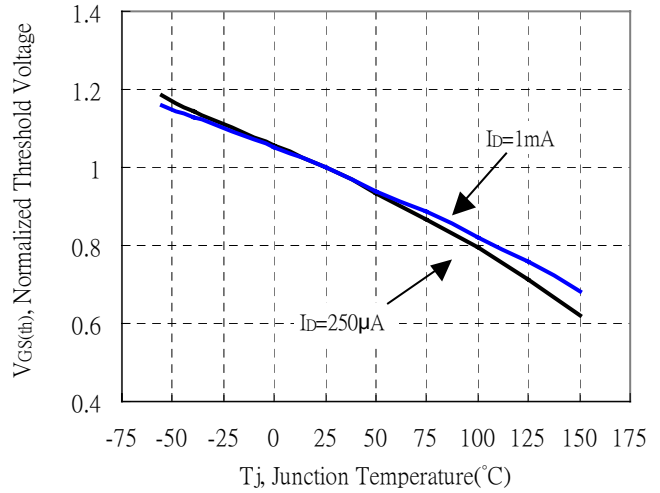


Typical Characteristics(Cont.) : Q1(N-channel)

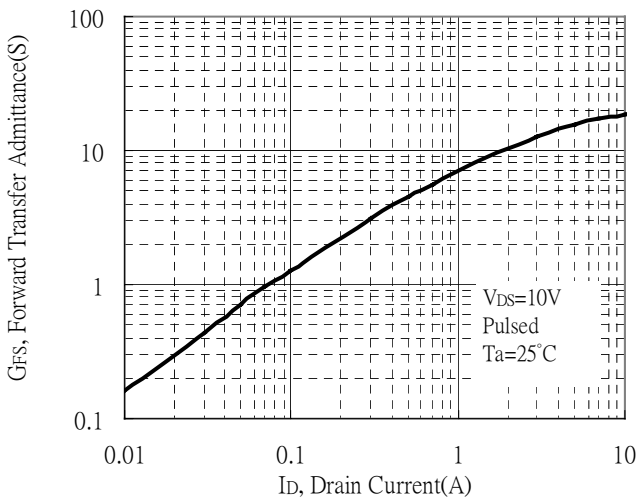
Capacitance vs Drain-to-Source Voltage



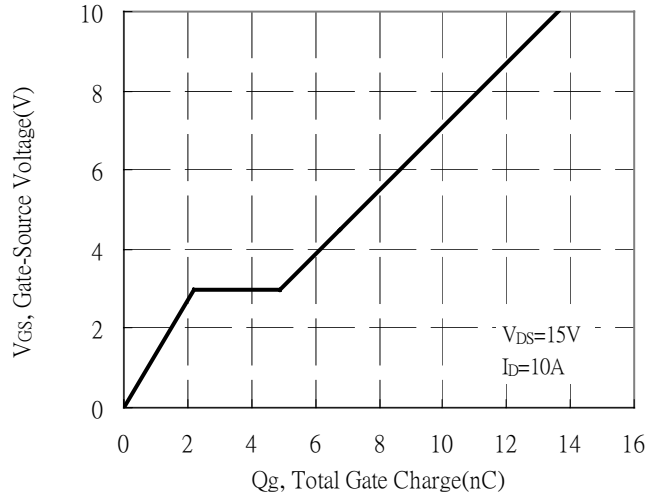
Threshold Voltage vs Junction Temperature



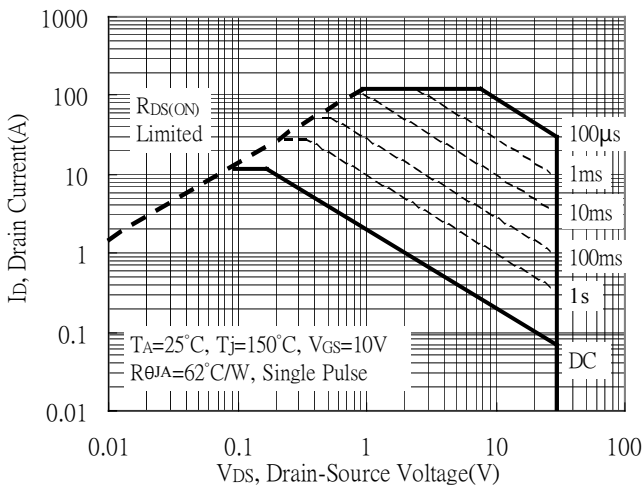
Forward Transfer Admittance vs Drain Current



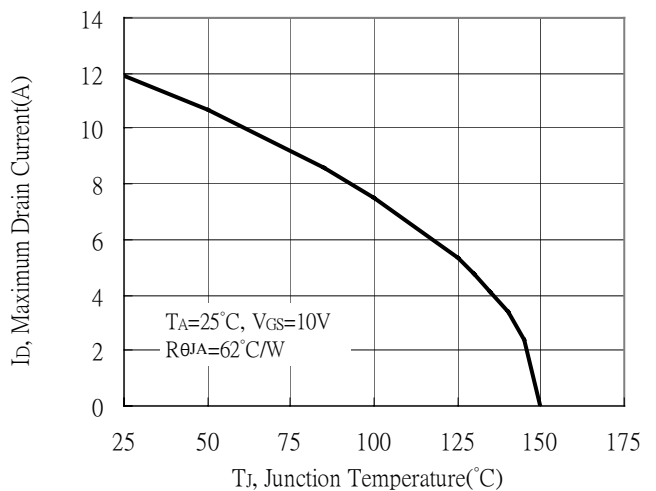
Gate Charge Characteristics



Maximum Safe Operating Area

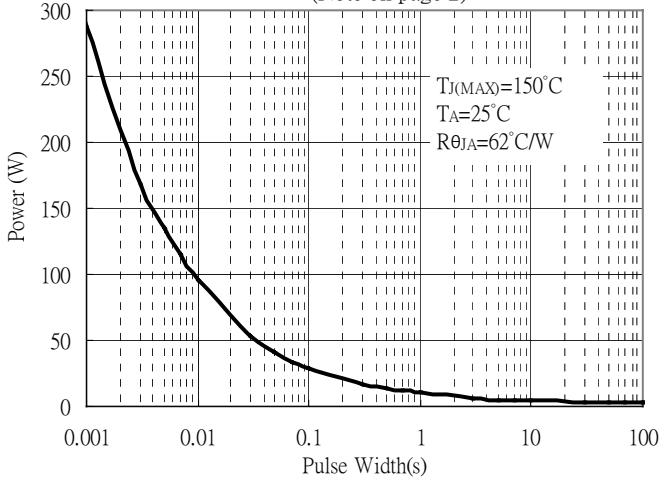


Maximum Drain Current vs Junction Temperature

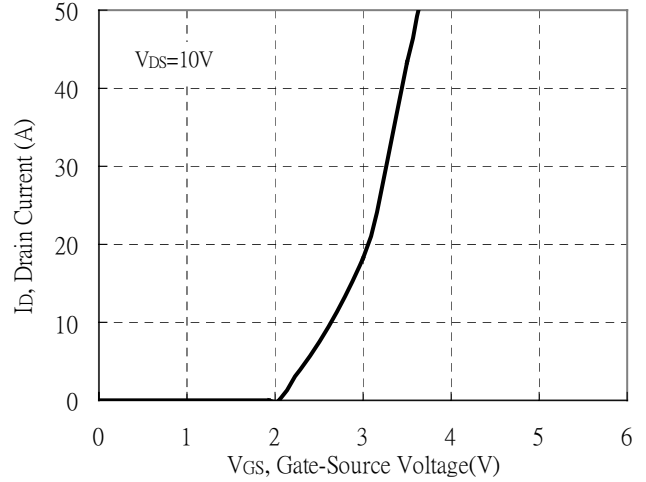


Typical Characteristics(Cont.) : Q1(N-channel)

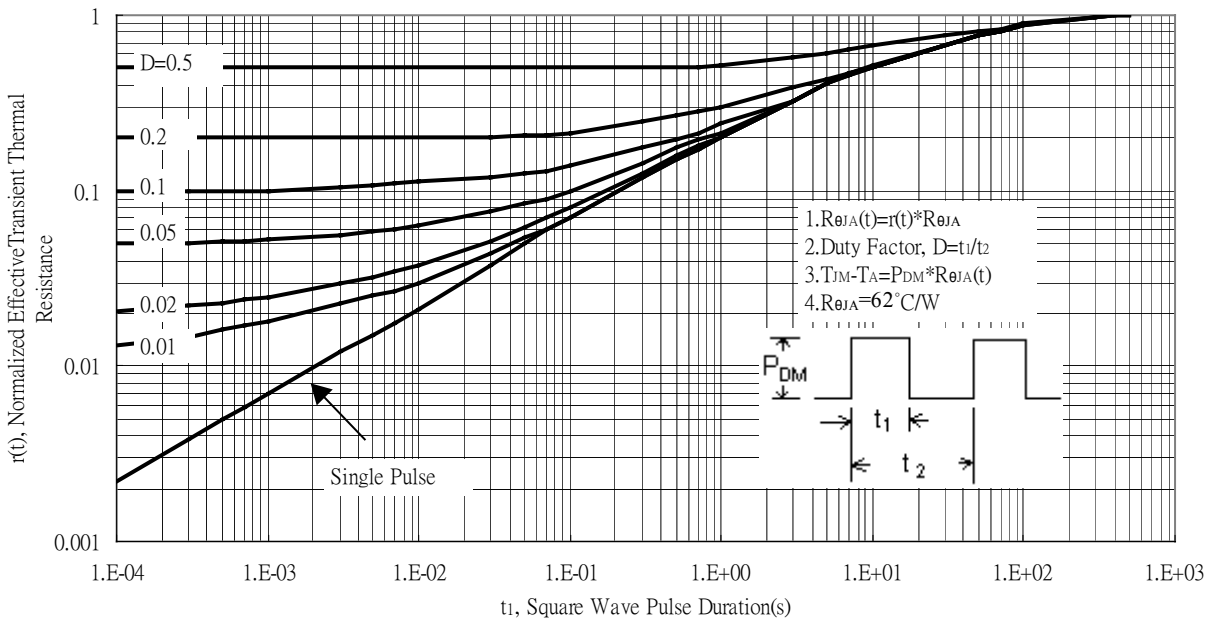
Single Pulse Power Rating, Junction to Ambient
 (Note on page 2)



Typical Transfer Characteristics



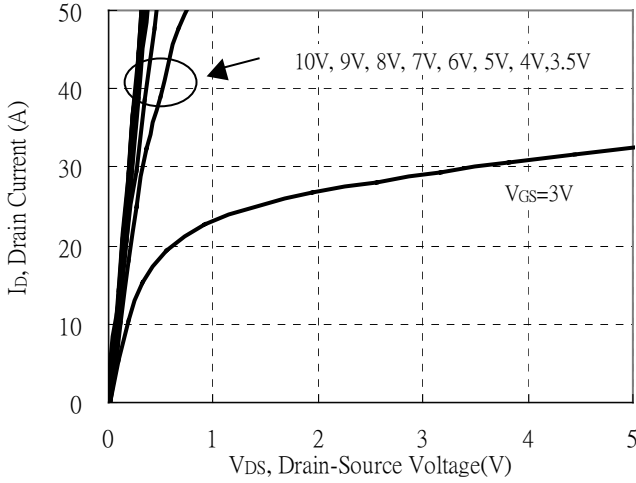
Transient Thermal Response Curves



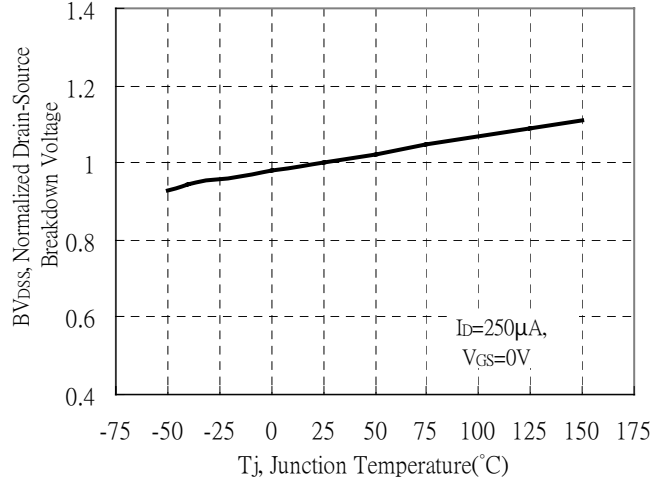


Typical Characteristics : Q2(N-channel)

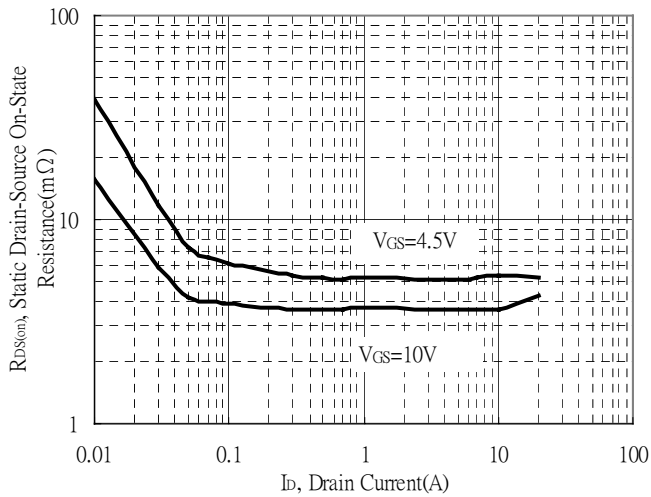
Typical Output Characteristics



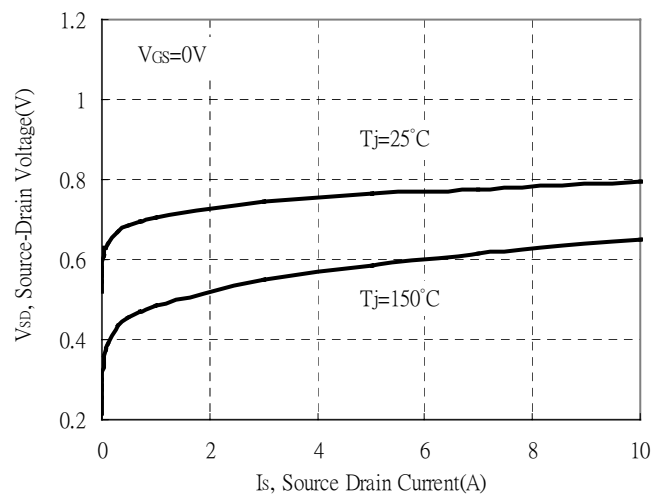
Brekdown Voltage vs Ambient Temperature



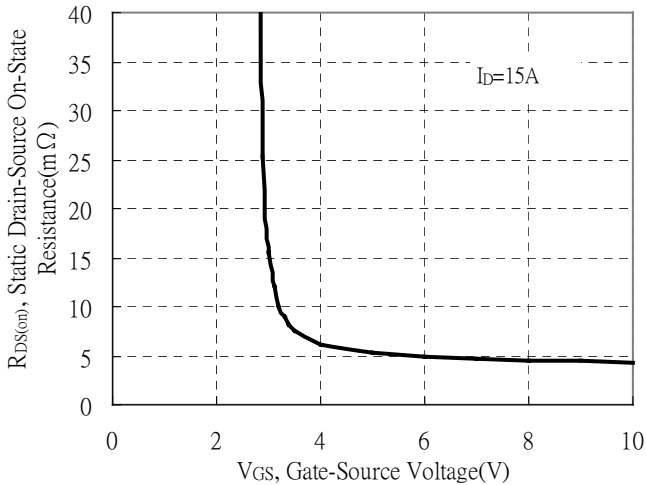
Static Drain-Source On-State resistance vs Drain Current



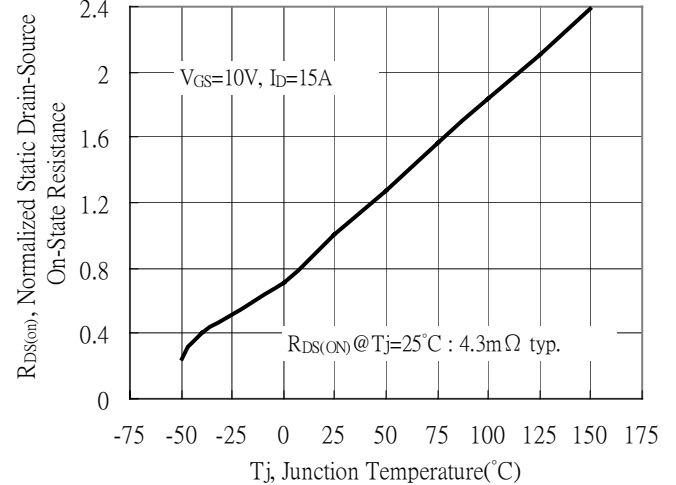
Source Drain Current vs Source-Drain Voltage



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

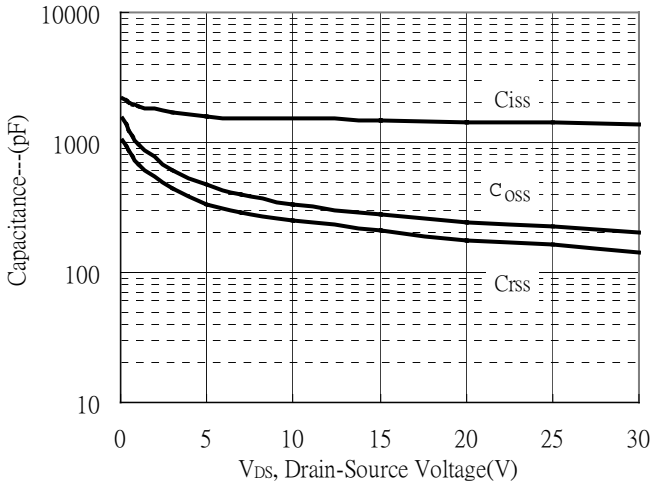


Drain-Source On-State Resistance vs Junction Temperature

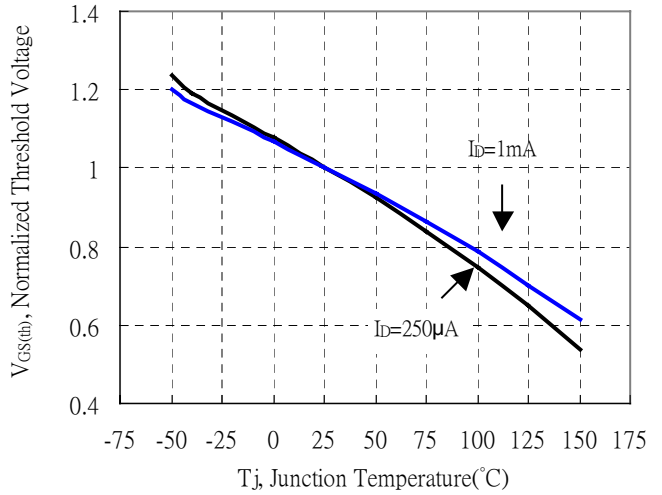


Typical Characteristics(Cont.) : Q2(N-channel)

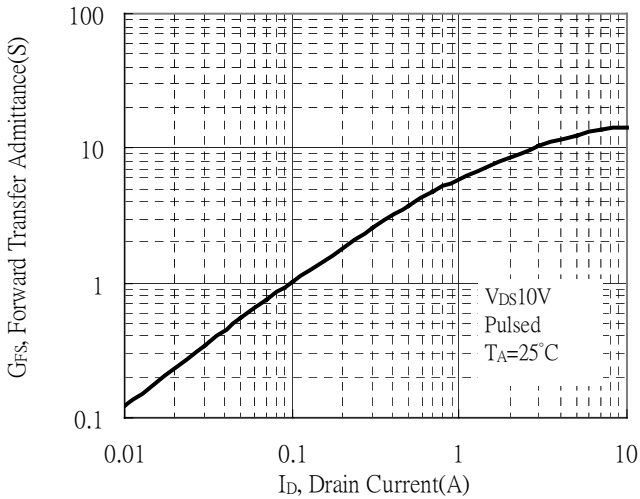
Capacitance vs Drain-to-Source Voltage



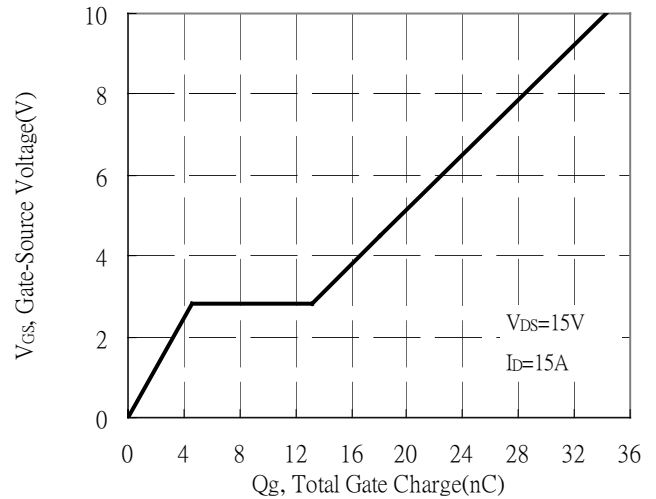
Threshold Voltage vs Junction Temperature



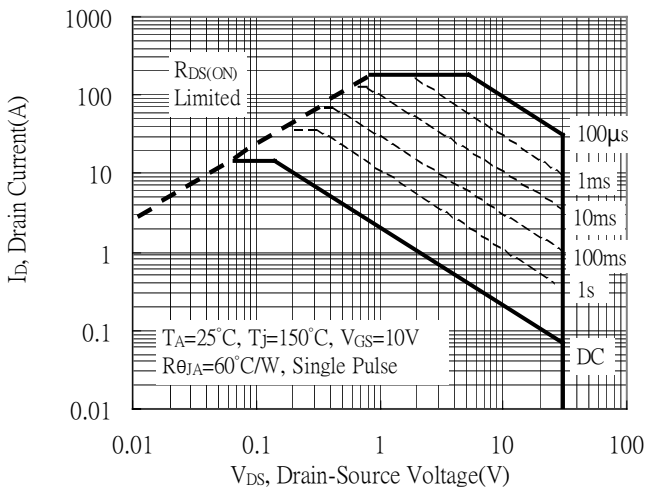
Forward Transfer Admittance vs Drain Current



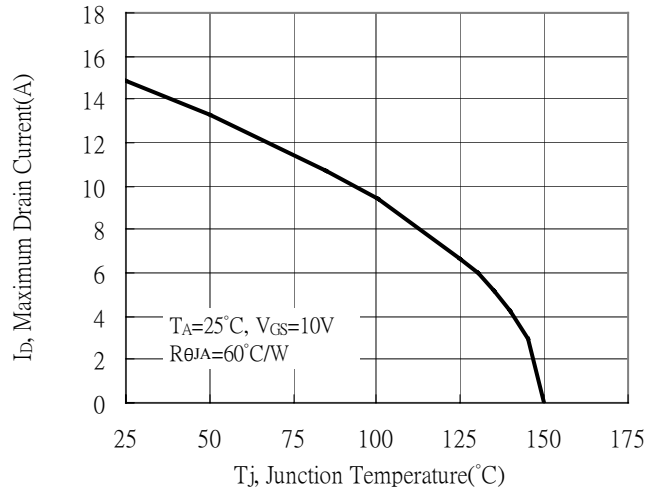
Gate Charge Characteristics



Maximum Safe Operating Area

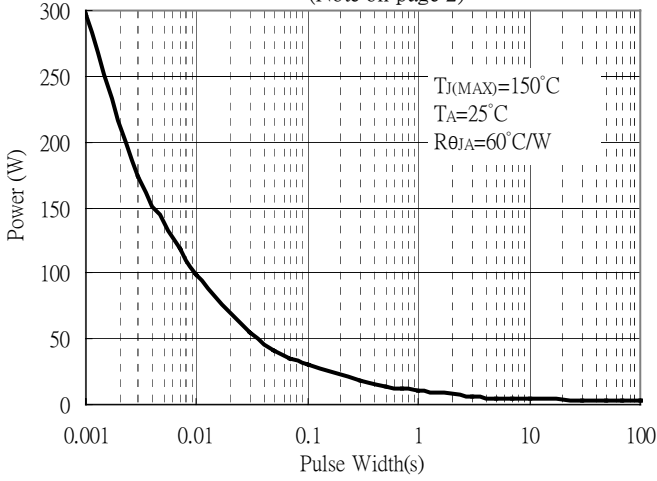


Maximum Drain Current vs Junction Temperature

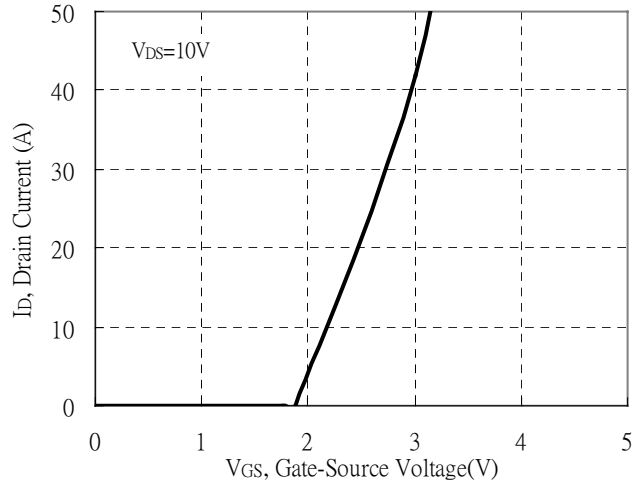


Typical Characteristics(Cont.) : Q2(N-channel)

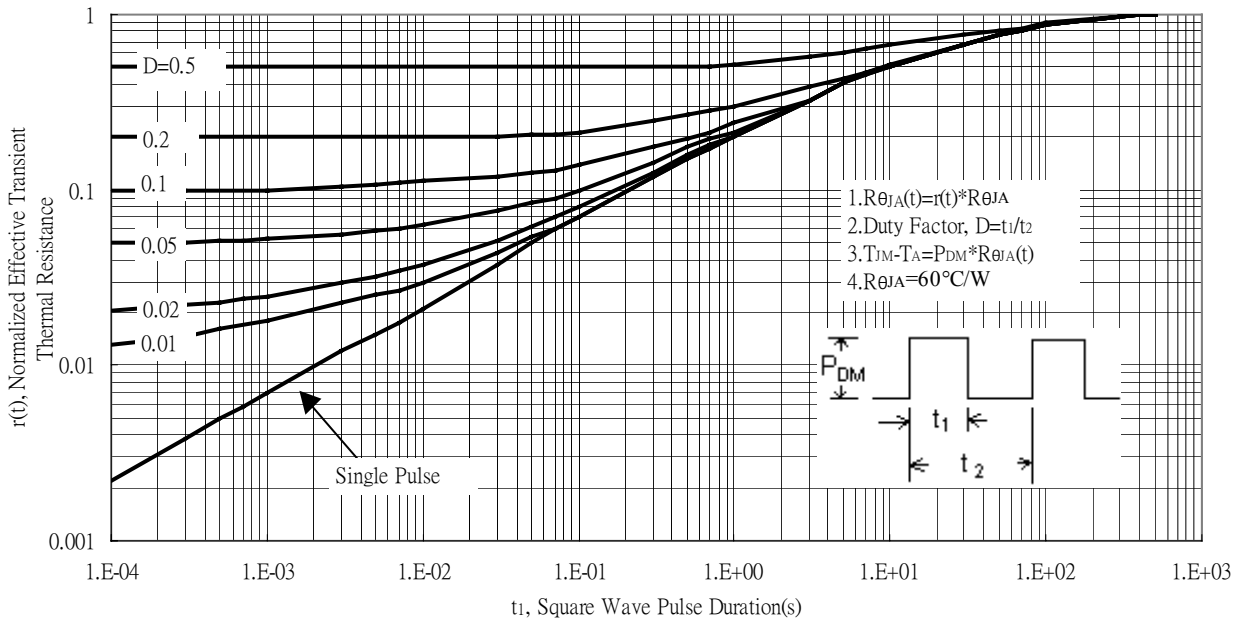
Single Pulse Power Rating, Junction to Ambient
 (Note on page 2)



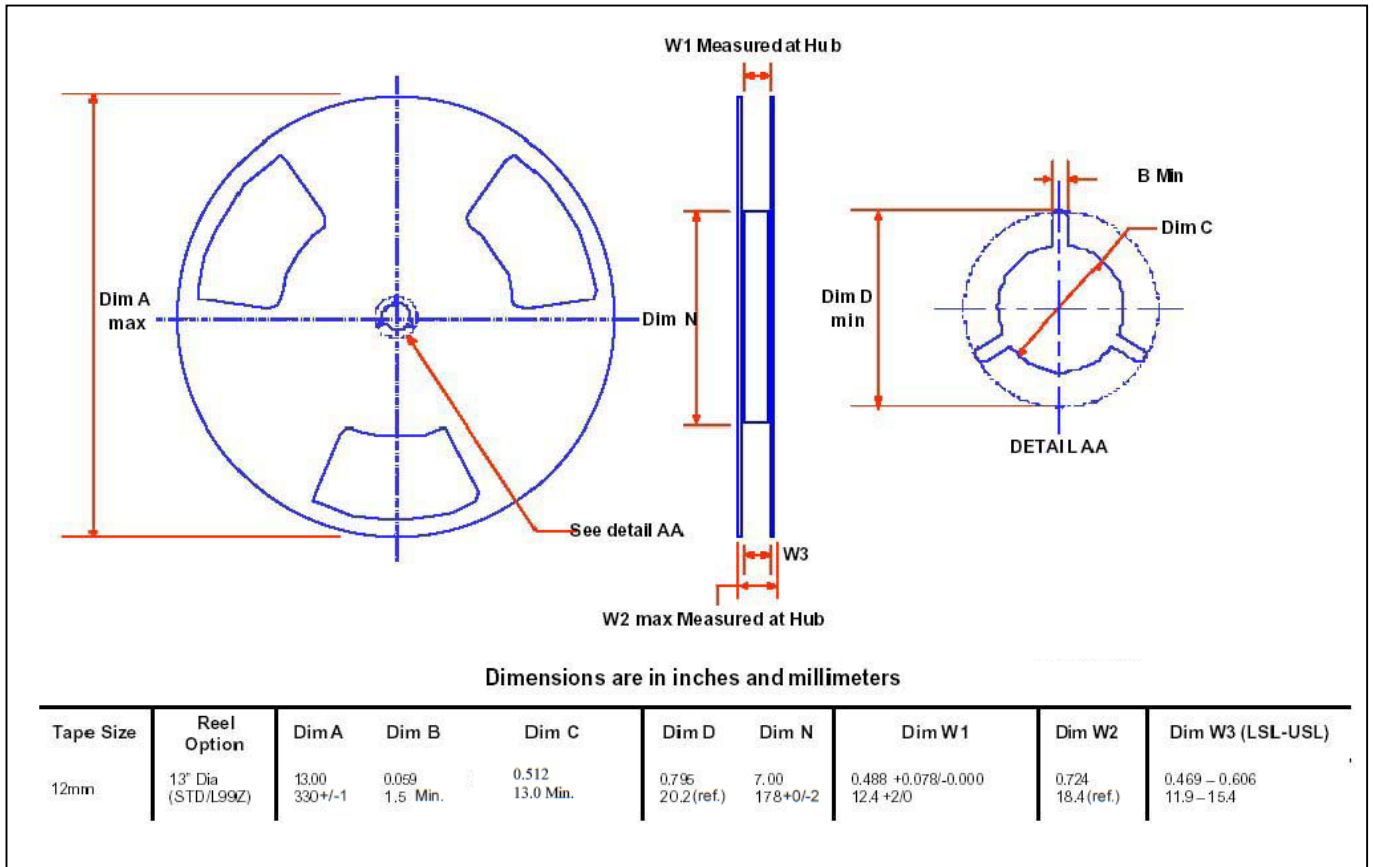
Typical Transfer Characteristics



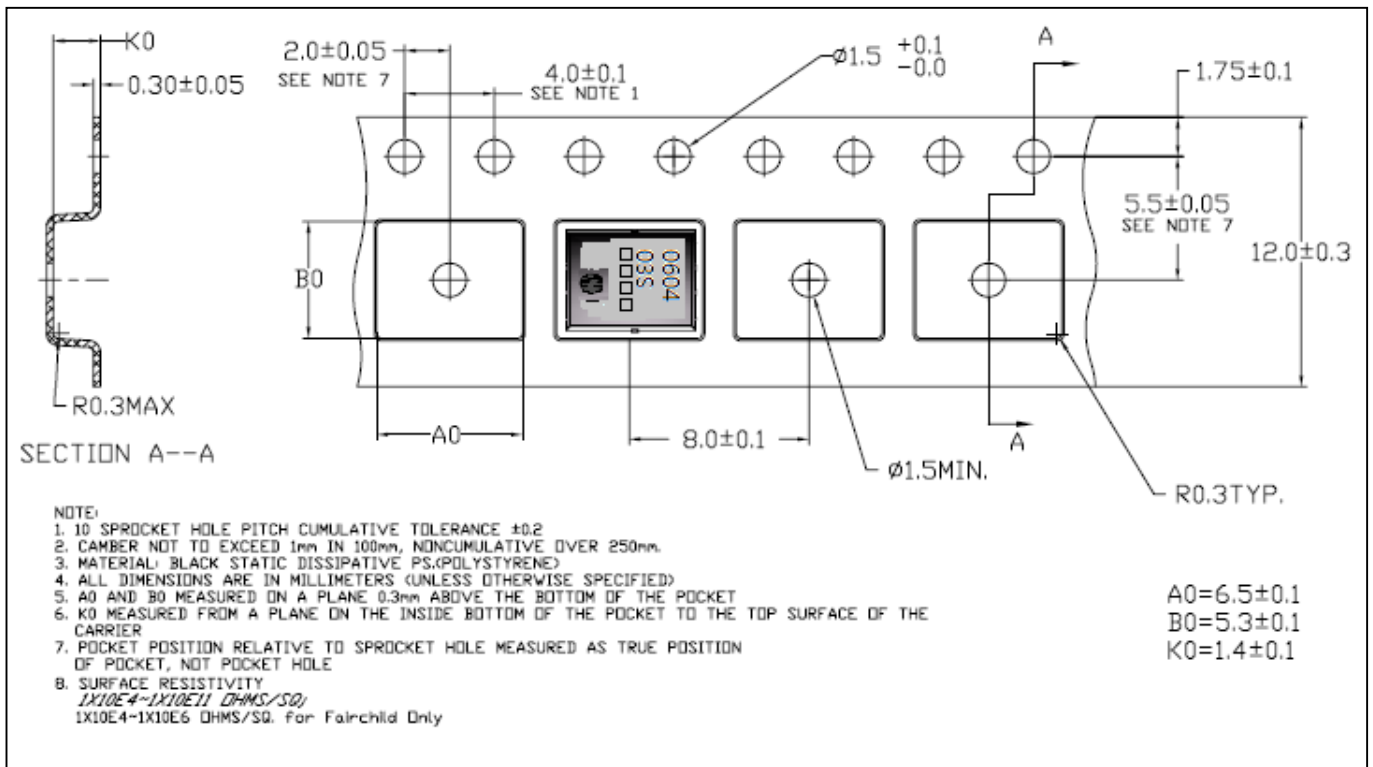
Transient Thermal Response Curves



Reel Dimension



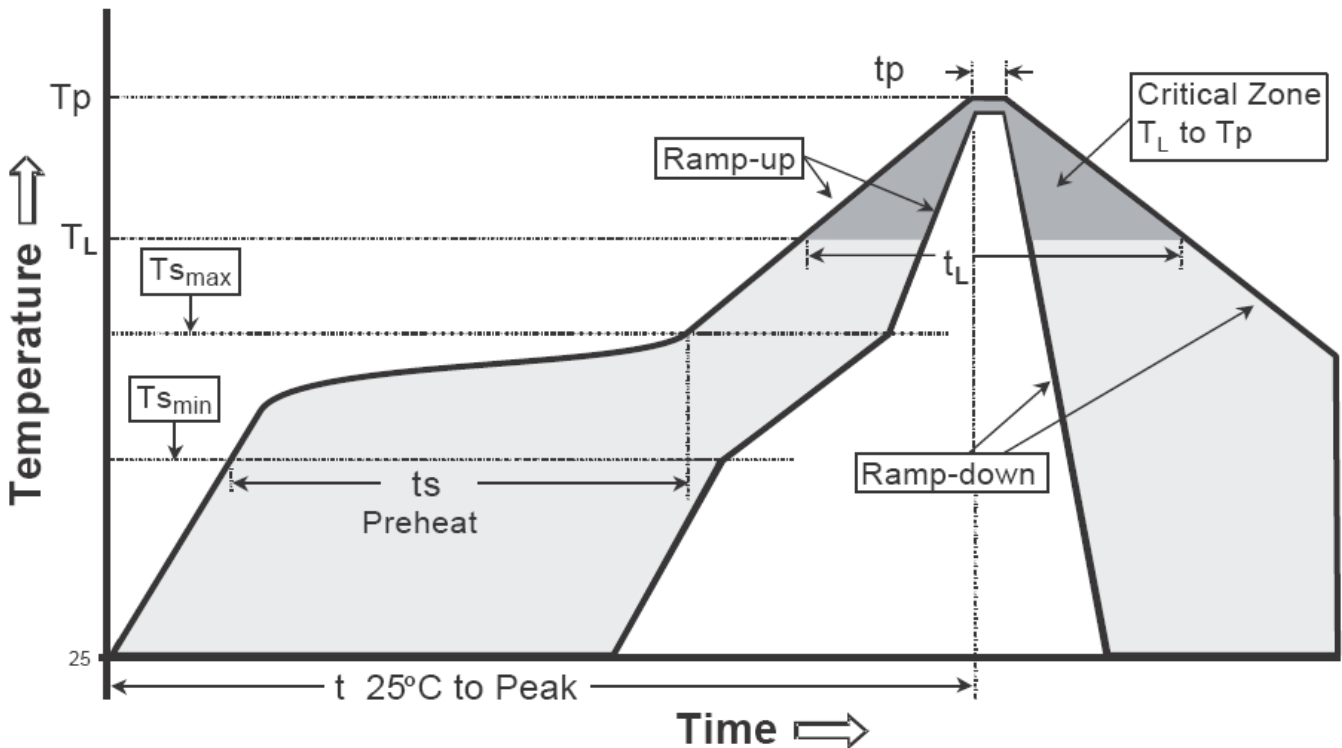
Carrier Tape Dimension



Recommended wave soldering condition

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

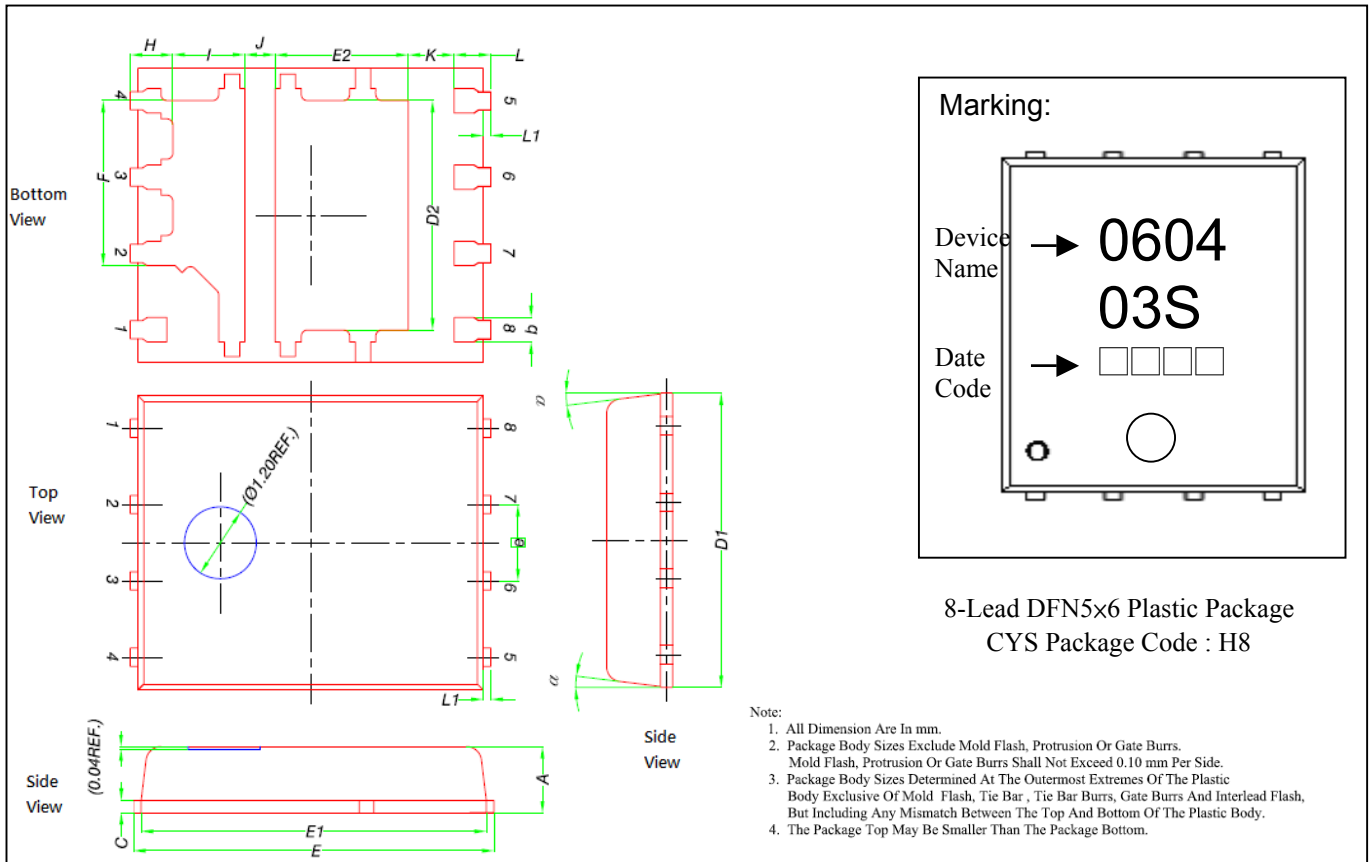
Recommended temperature profile for IR reflow



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(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



DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.90	1.10	0.035	0.043	F	2.55	2.90	0.100	0.114
b	0.33	0.51	0.013	0.020	H	0.61	0.81	0.024	0.032
C	0.20	0.30	0.008	0.012	I	1.10	1.30	0.043	0.051
D1	4.80	5.00	0.189	0.197	J	0.40	0.60	0.016	0.024
D2	3.61	3.96	0.142	0.156	K	0.50	-	0.020	-
E	5.90	6.10	0.232	0.240	L	0.51	0.71	0.020	0.028
E1	5.70	5.80	0.224	0.228	L1	0.06	0.20	0.002	0.008
E2	2.02	2.42	0.080	0.095	α	0°	12°	0°	12°
\square	1.27 BSC		0.050 BSC						

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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