N- AND P-Channel Enhancement Mode MOSFET

MTB5D8C03RDH8

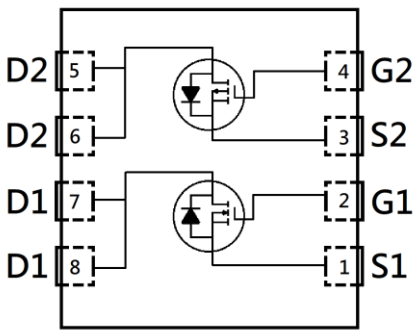
Features

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

	N-CH	P-CH
BV_{DSS}	30V	-30V
I_D@V_{GS}=10V(-10V),	15A	-8.9A
I_D@V_{GS}=10V(-10V),	43.3A	-25.8A
R_{DSON}(typ)@V_{GS}=10V(-10V)	6.2mΩ	19.2mΩ
R_{DSON}(typ)@V_{GS}=4.5V(-4.5V)	9mΩ	32mΩ

Equivalent Circuit

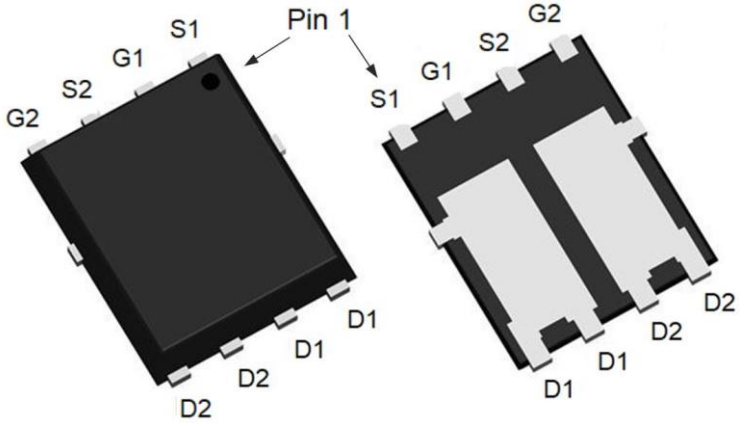
MTB5D8C03RDH8



G : Gate S : Source D : Drain

Outline

DFN5x6



Ordering Information

Device	Package	Shipping
MTB5D8C03RDH8-0-T6-G	DFN 5 ×6 (Pb-free lead plating & halogen-free package)	3000 pcs / Tape & Reel

Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, T3 : 2500 pcs / tape & reel, 13” reel

Product rank, zero for no rank products

Product name

Absolute Maximum Ratings (Tc=25°C, unless otherwise noted)

Parameter		Symbol	Limits		Unit
			N-channel	P-channel	
Drain-Source Breakdown Voltage		BV_{DSS}	30	-30	V
Gate-Source Voltage		V_{GS}	±20	±20	
Continuous Drain Current	T_A=25°C, V_{GS}=10V (-10V)	I_{DSM}	15	-8.9	A
	T_A=70°C, V_{GS}=10V (-10V)		12	-7.1	
	T_C=25°C, V_{GS}=10V (-10V)	I_D	43.3	-25.8	
	T_C=100°C, V_{GS}=10V (-10V)		27.4	-16.3	
Pulsed Drain Current (Note 1 & 2)		I_{DM}	66	-40	
Avalanche Current @ L=0.1mH		I_{AS}	15	-15	
Avalanche Energy @ L=0.5mH		E_{AS}	16	16	mJ
Power Dissipation	T_A=25 °C	P_{DSM}	2.5 (Note 3)		W
	T_A=70 °C		1.6 (Note 3)		
	T_C=25 °C	P_D	21		
	T_C=100 °C		8.4		
Operating Junction and Storage Temperature Range		T_J; T_{stg}	-55~+150		°C

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{\theta JC}$	6	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{\theta JA}$	50 (Note 3)	

Note : 1. Pulse width limited by maximum junction temperature
2. Duty cycle≤1%
3. Surface mounted on 1 in² copper pad of FR-4 board, t≤10s; 125°C/W when mounted on minimum copper pad.

N-Channel 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
$V_{GS(th)}$	1	-	2.5		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
*$R_{DS(ON)}$	-	6.2	8.2	mΩ	I_D=6A, V_{GS}=10V
	-	9	13		I_D=4A, V_{GS}=4.5V
*G_{FS}	-	13.5	-	S	V_{DS}=5V, I_D=5A
Dynamic					
Ciss	-	765	-	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz

Coss	-	418	-		
Crss	-	40	-		
*$td_{(ON)}$	-	10	-	ns	V_{DS}=15V, I_D=6A, V_{GS}=10V, R_G=1Ω
*tr	-	12.8	-		
*$td_{(OFF)}$	-	25.8	-		
*tf	-	5.6	-		
*Qg	-	14.5	-	nC	V_{DS}=15V, I_D=6A, V_{GS}=10V
*Qgs	-	3.3	-		
*Qgd	-	3.2	-		
Rg	-	1	-	Ω	f=1MHz
Body Diode					
*V_{SD}	-	0.82	1.2	V	V_{GS}=0V, I_S=6A
*trr	-	20	-	ns	I_F=6A, dI_F/dt=100A/μs
*Qrr	-	8.2	-	nC	

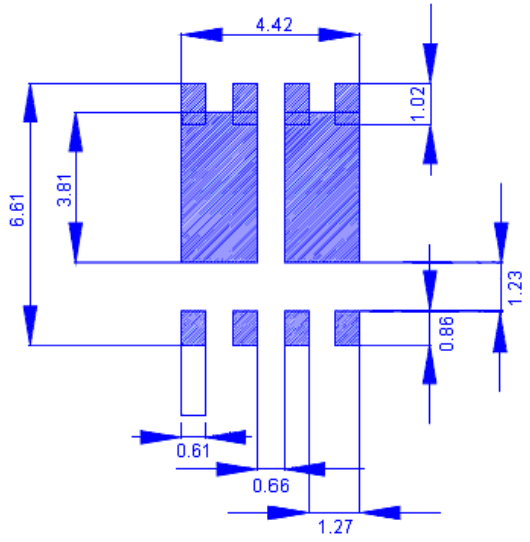
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

P-Channel 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
$V_{GS(th)}$	-1	-	-2.5		V_{DS}=V_{GS}, I_D=-250μA
I_{GSS}	-	-	±10	μA	V_{GS}=±16V, V_{DS}=0V
I_{DSS}	-	-	-1		V_{DS}=-24V, V_{GS}=0V
	-	-	-25		V_{DS}=-24V, V_{GS}=0V, T_J=125°C
*$R_{DS(ON)}$	-	19.2	26	mΩ	I_D=-6A, V_{GS}=-10V
	-	32	45		I_D=-4A, V_{GS}=-4.5V
*G_{FS}	-	14	-	S	V_{DS}=-5V, I_D=-6A
Rg	-	8.7	-	Ω	f=1MHz
Dynamic					
Ciss	-	994	-	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Coss	-	183	-		
Crss	-	146	-		
*$td_{(ON)}$	-	7	-	ns	V_{DS}=-15V, I_D=-1A, V_{GS}=-10V, R_G=6Ω
*tr	-	9	-		
*$td_{(OFF)}$	-	63	-		
*tf	-	25.4	-		
*Qg	-	21.2	-	nC	V_{DS}=-15V, I_D=-6A, V_{GS}=-10V
*Qgs	-	2.9	-		
*Qgd	-	4.8	-		
Body Diode					
*V_{SD}	-	-0.84	-1.2	V	V_{GS}=0V, I_S=-6A
*trr	-	10.7	-	ns	I_F=-5A, dI_F/dt=100A/μs
*Qrr	-	4.1	-	nC	

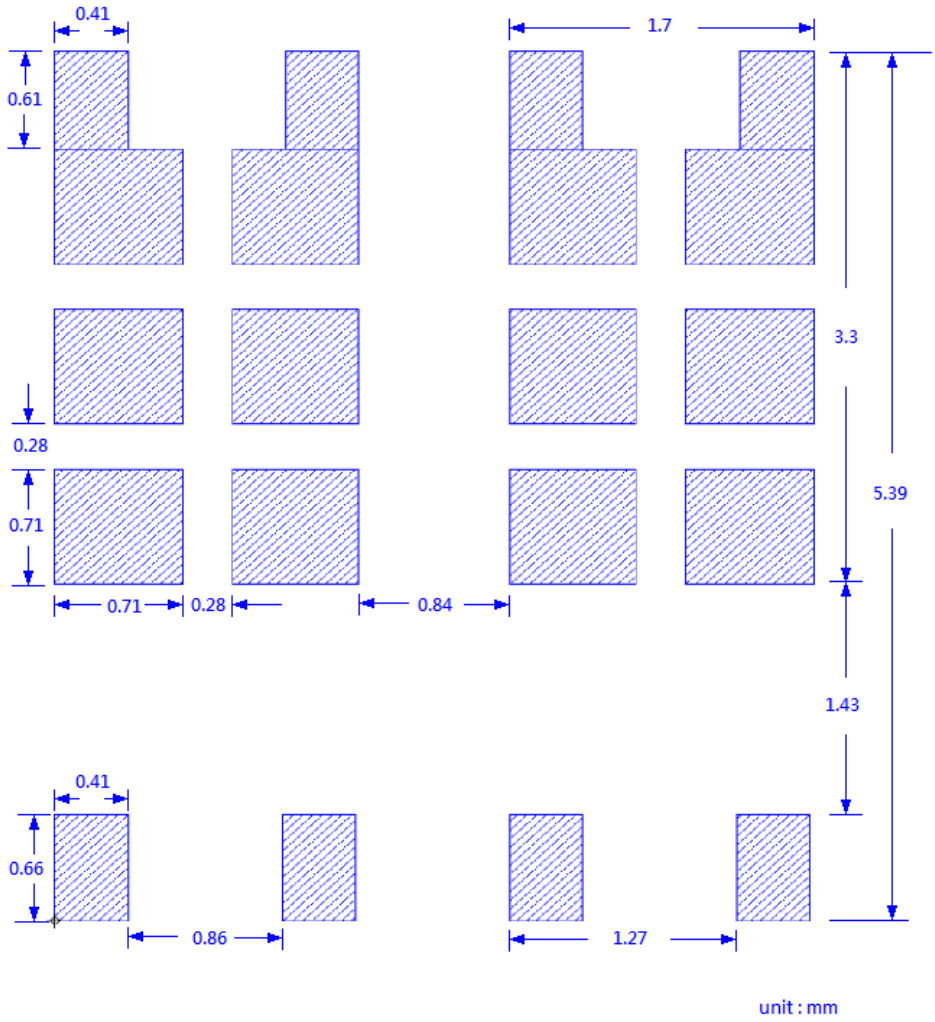
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Recommended Soldering Footprint



unit : mm

Recommended Stencil Design

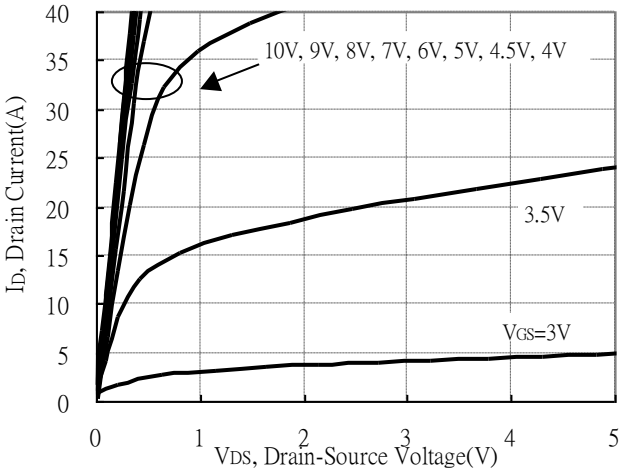


Note : 1. Stencil thickness 5 mil (0.127mm)

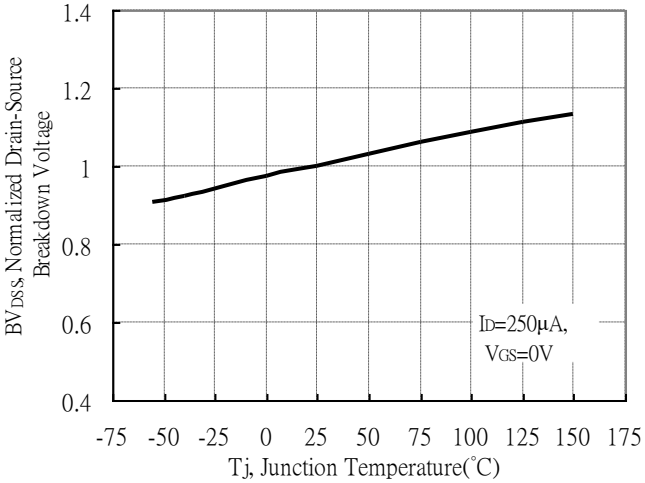
2. May need to be adjusted to specific requirements.

Typical Characteristics : Q1(N-channel)

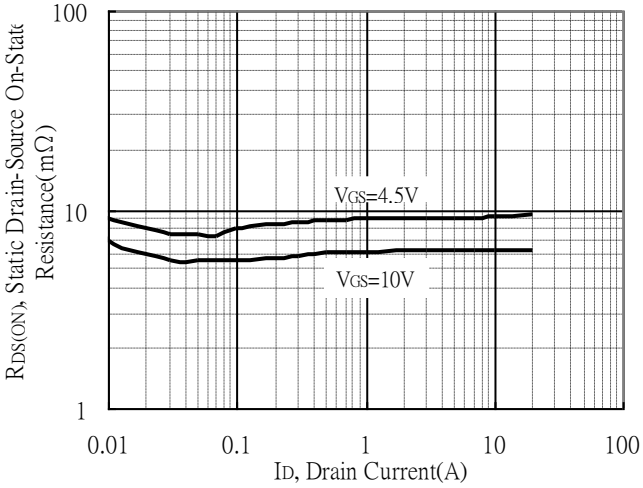
Typical Output Characteristics



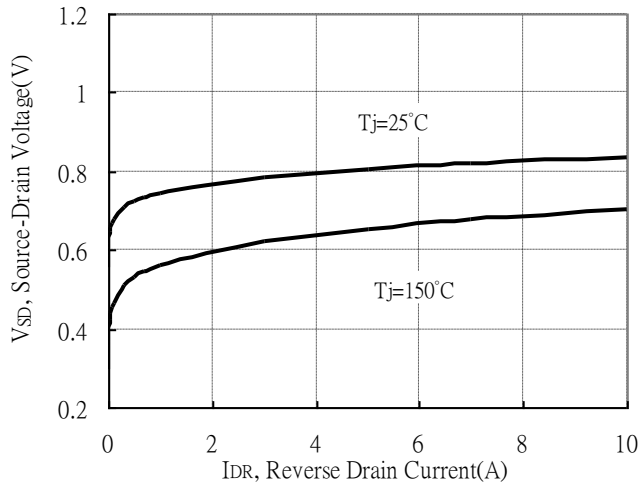
Brekdown Voltage vs Ambient Temperature



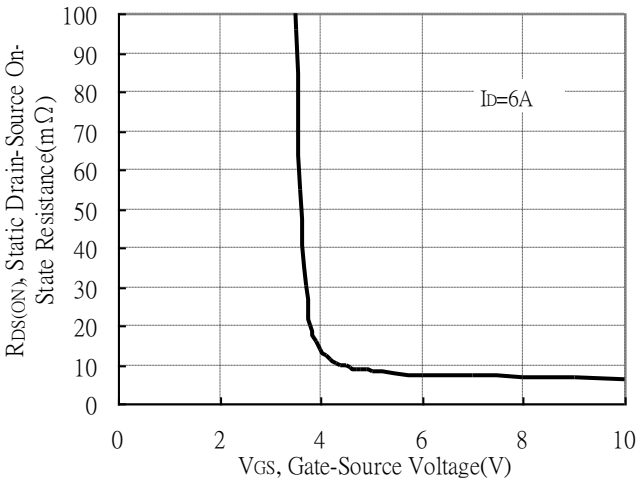
Static Drain-Source On-State resistance vs Drain Current



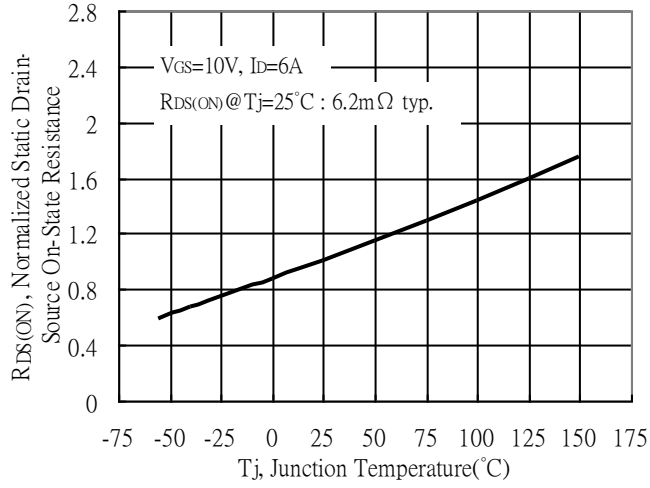
Reverse Drain Current vs Source-Drain Voltage



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

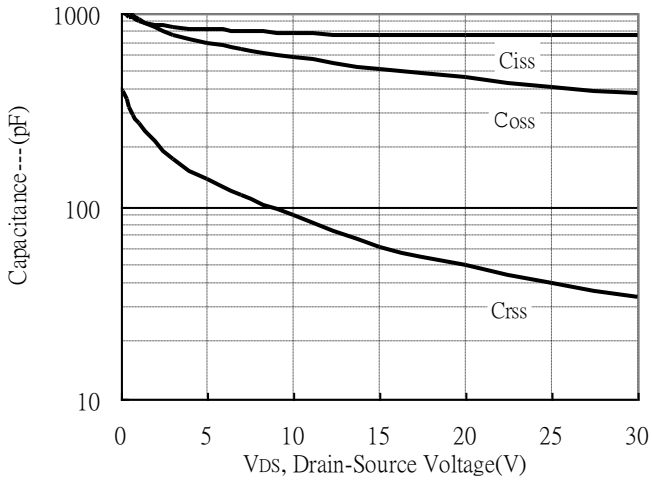


Drain-Source On-State Resistance vs Junction Tempearture

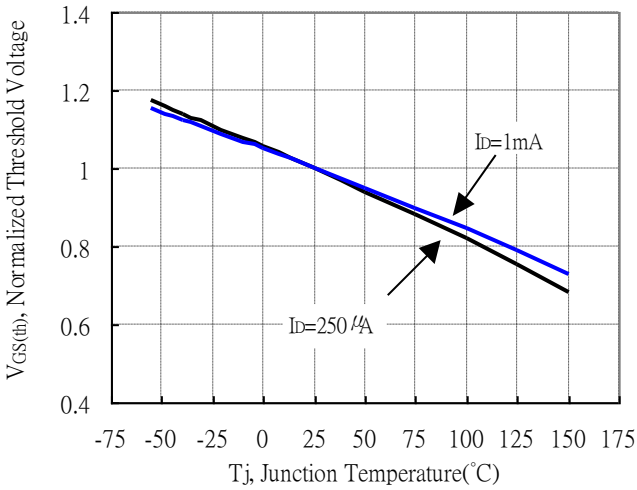


Typical Characteristics(Cont.) : Q1(N-channel)

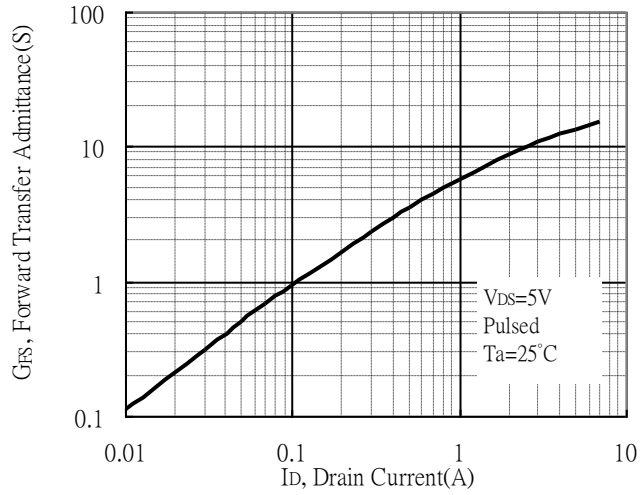
Capacitance vs Drain-to-Source Voltage



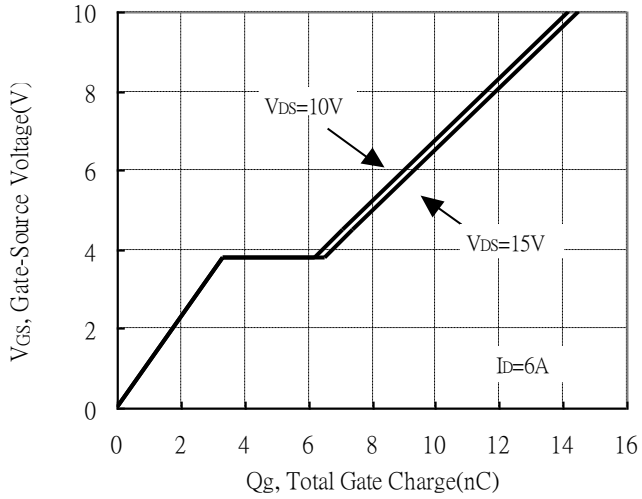
Threshold Voltage vs Junction Tempearture



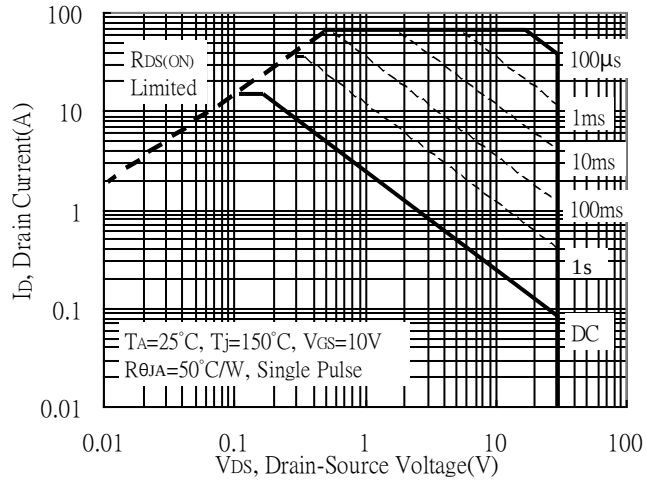
Forward Transfer Admittance vs Drain Current



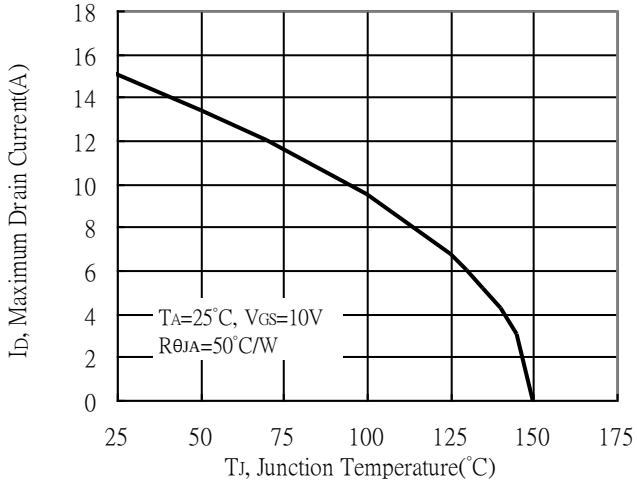
Gate Charge Characteristics



Maximum Safe Operating Area

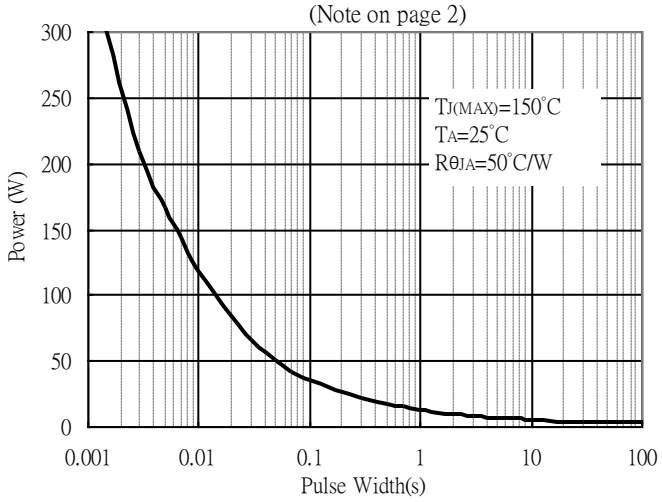


Maximum Drain Current vs JunctionTemperature

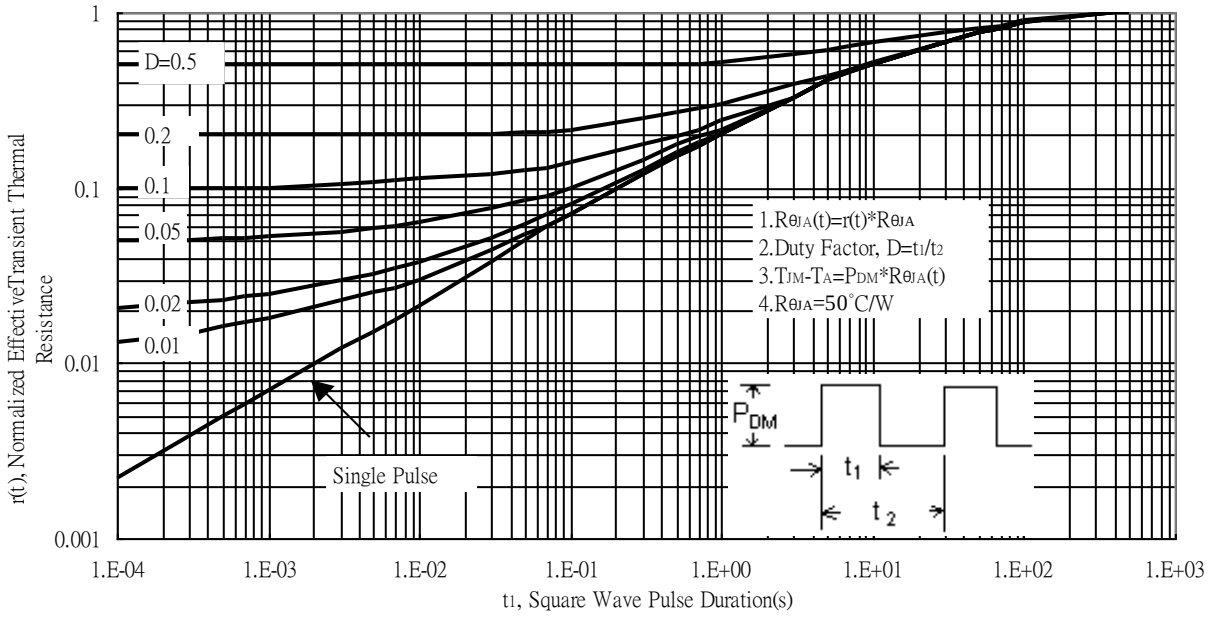


Typical Characteristics(Cont.) : Q1(N-channel)

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

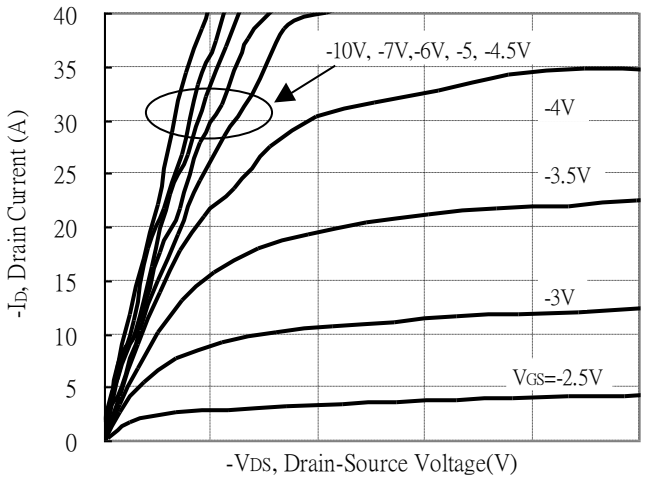


Transient Thermal Response Curves

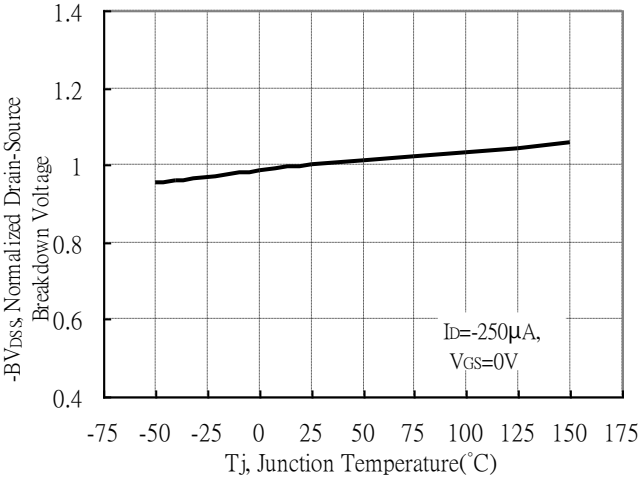


Typical Characteristics : Q2(P-channel)

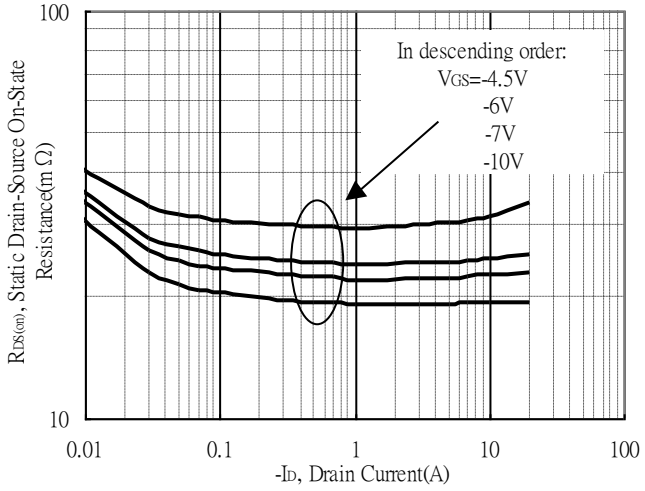
Typical Output Characteristics



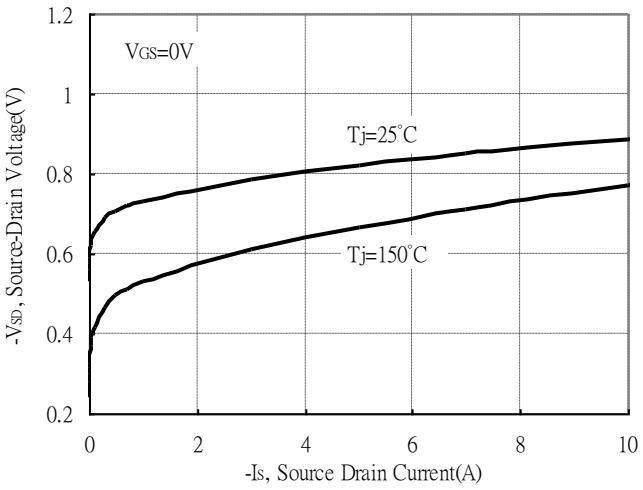
Brekdown Voltage vs Ambient Temperature



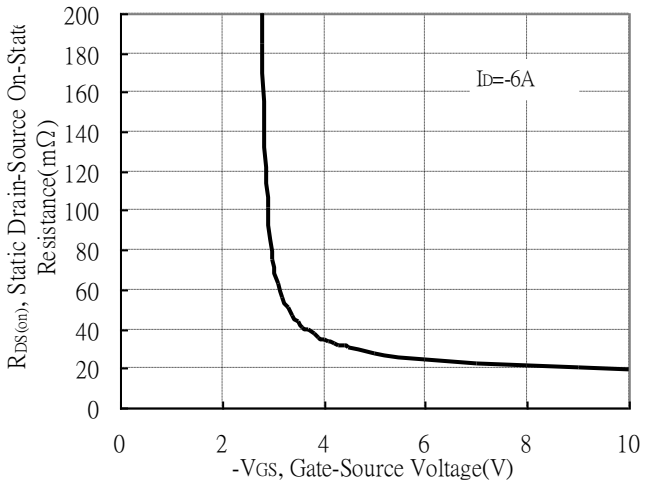
Static Drain-Source On-State resistance vs Drain Current



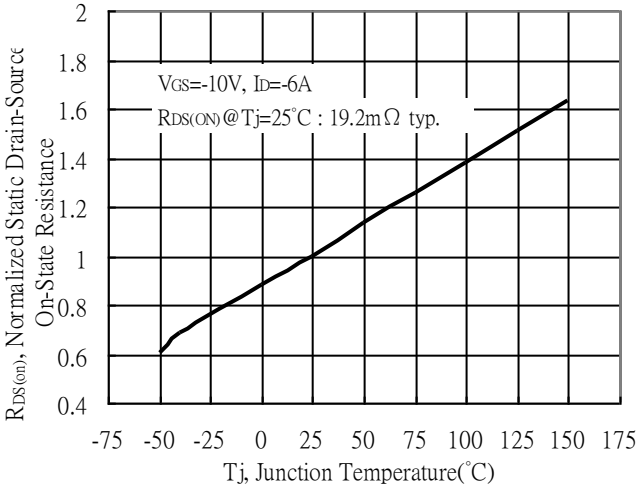
Source Drain Current vs Source-Drain Voltage



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

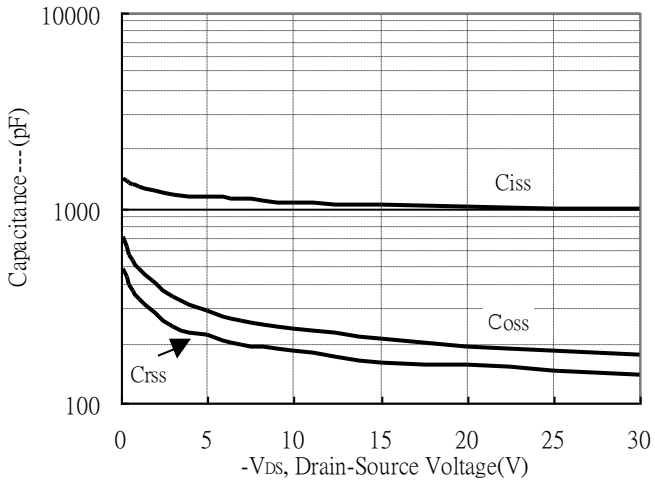


Drain-Source On-State Resistance vs Junction Tempearture

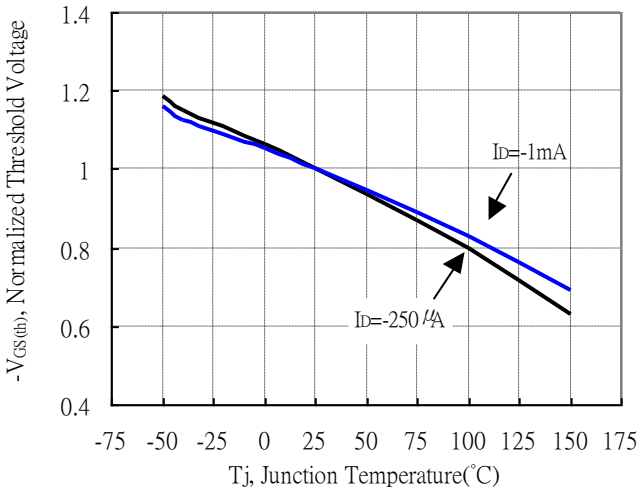


Typical Characteristics(Cont.) : Q2(P-channel)

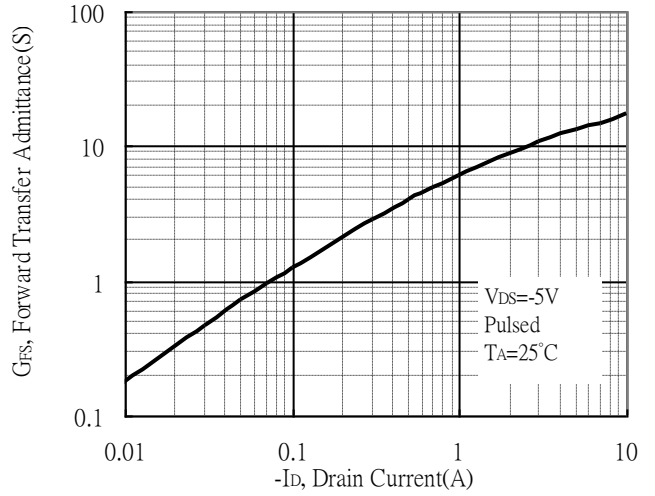
Capacitance vs Drain-to-Source Voltage



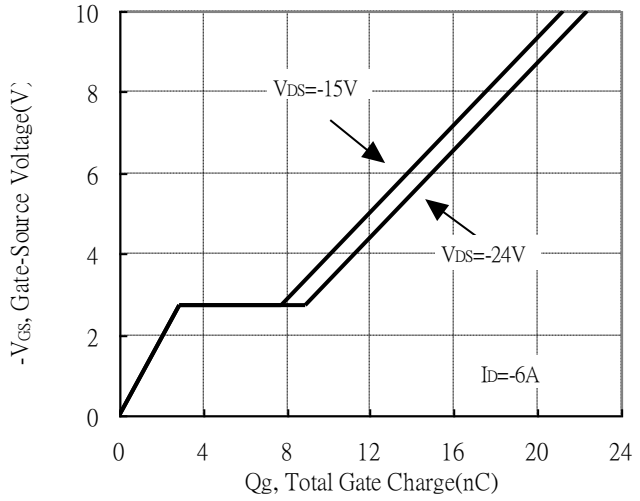
Threshold Voltage vs Junction Tempearture



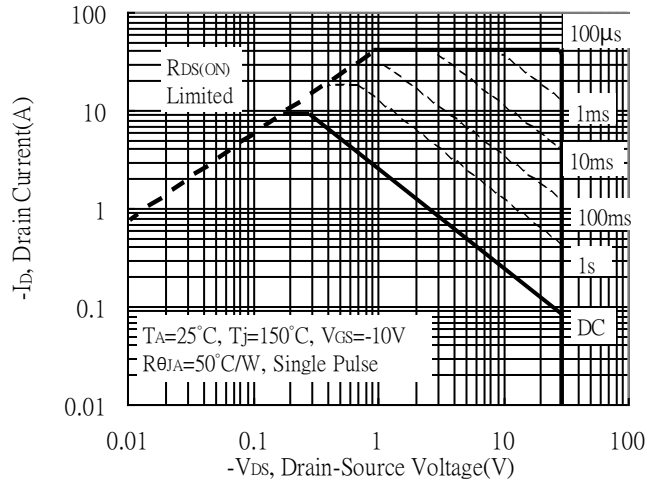
Forward Transfer Admittance vs Drain Current



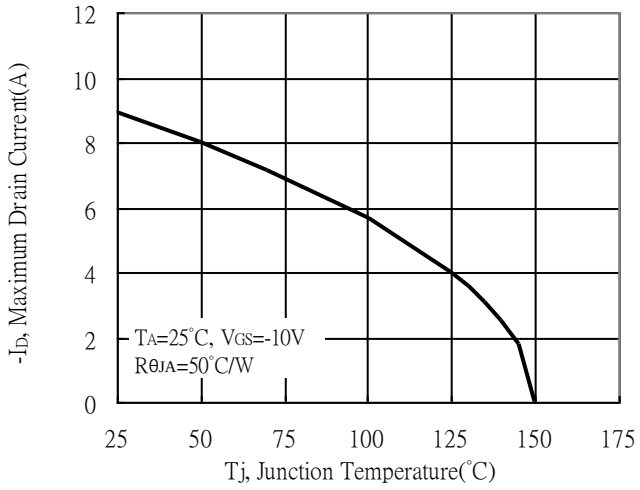
Gate Charge Characteristics



Maximum Safe Operating Area

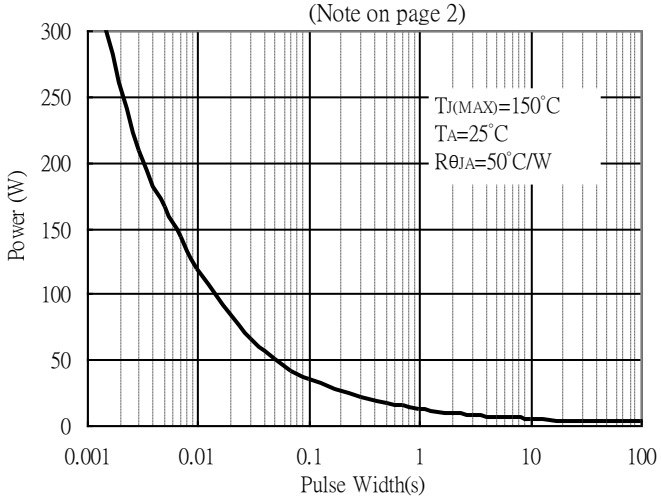


Maximum Drain Current vs Junction Temperature

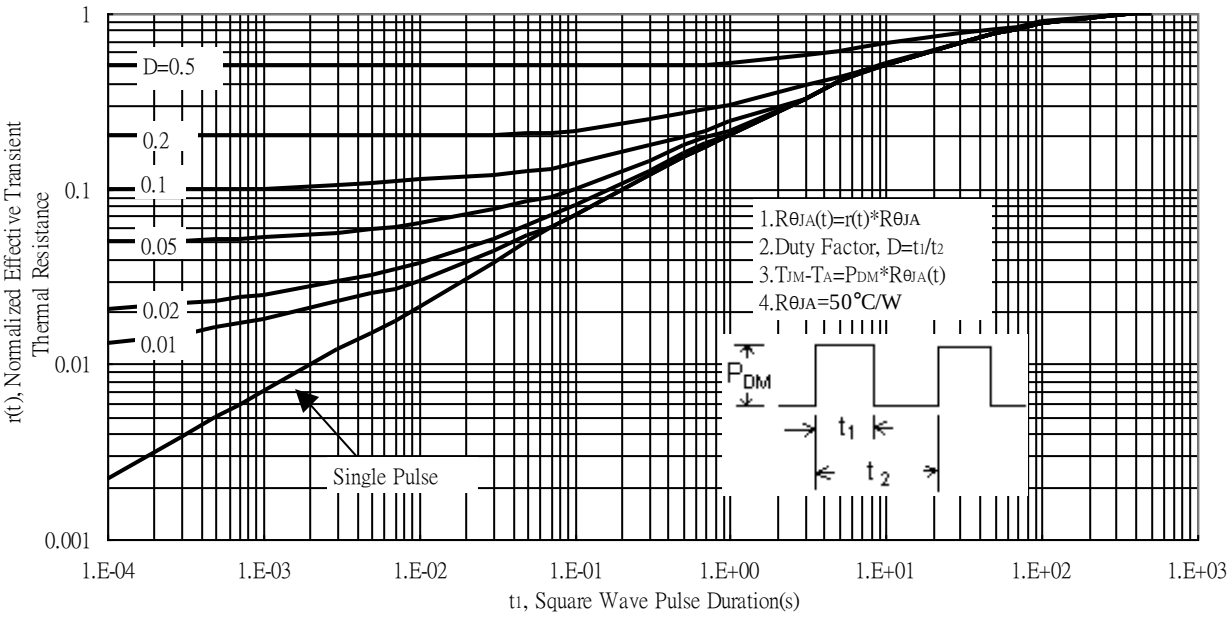


Typical Characteristics(Cont.) : Q2(P-channel)

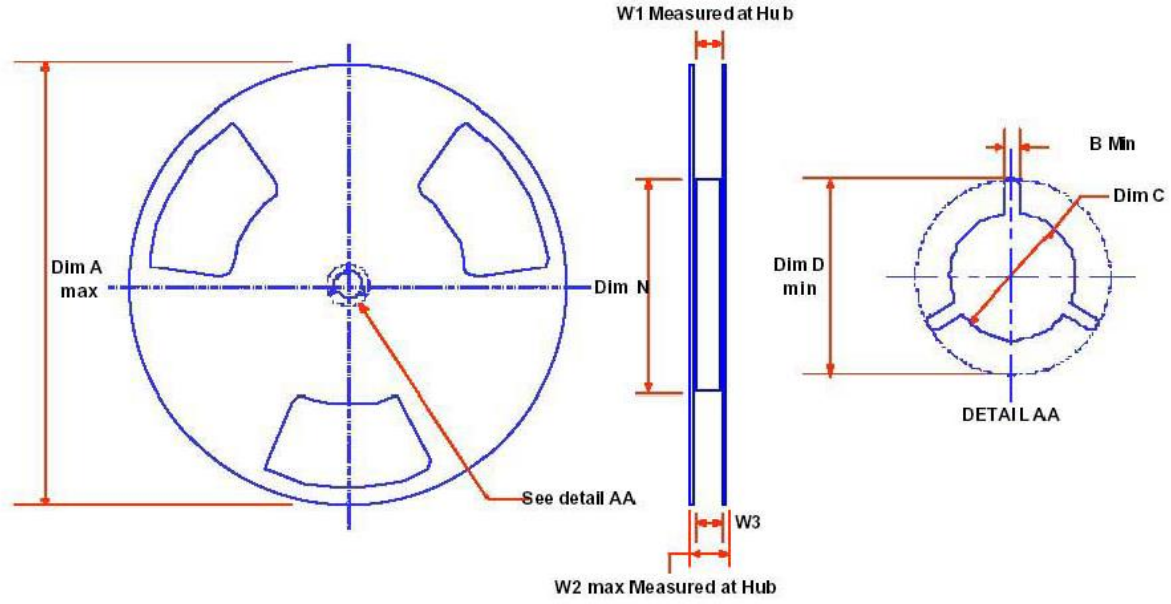
Single Pulse Power Rating, Junction to Ambient
(Note on page 2)



Transient Thermal Response Curves



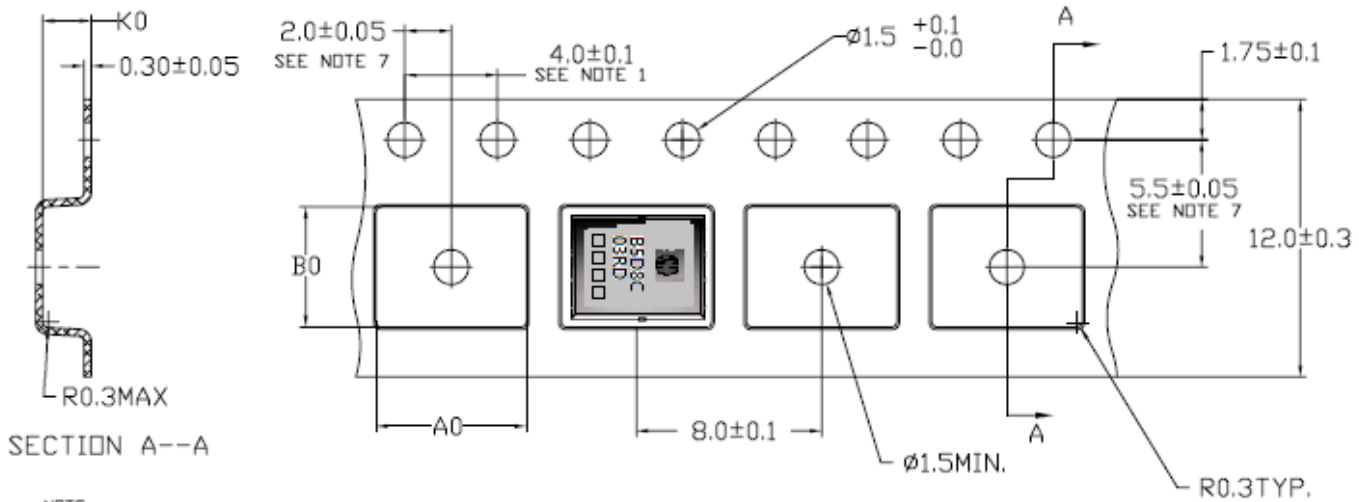
Reel Dimension



Dimensions are in inches and millimeters

Tape Size	Reel Option	Dim A	Dim B	Dim C	Dim D	Dim N	Dim W1	Dim W2	Dim W3 (LSL-USL)
12mm	13" Dia (STD/L99Z)	13.00 330+/-1	0.059 1.5 Min.	0.512 13.0 Min.	0.795 20.2(ref.)	7.00 178+0/-2	0.488 +0.078/-0.000 12.4 +2/0	0.724 18.4(ref.)	0.469 – 0.606 11.9 – 15.4

Carrier Tape Dimension



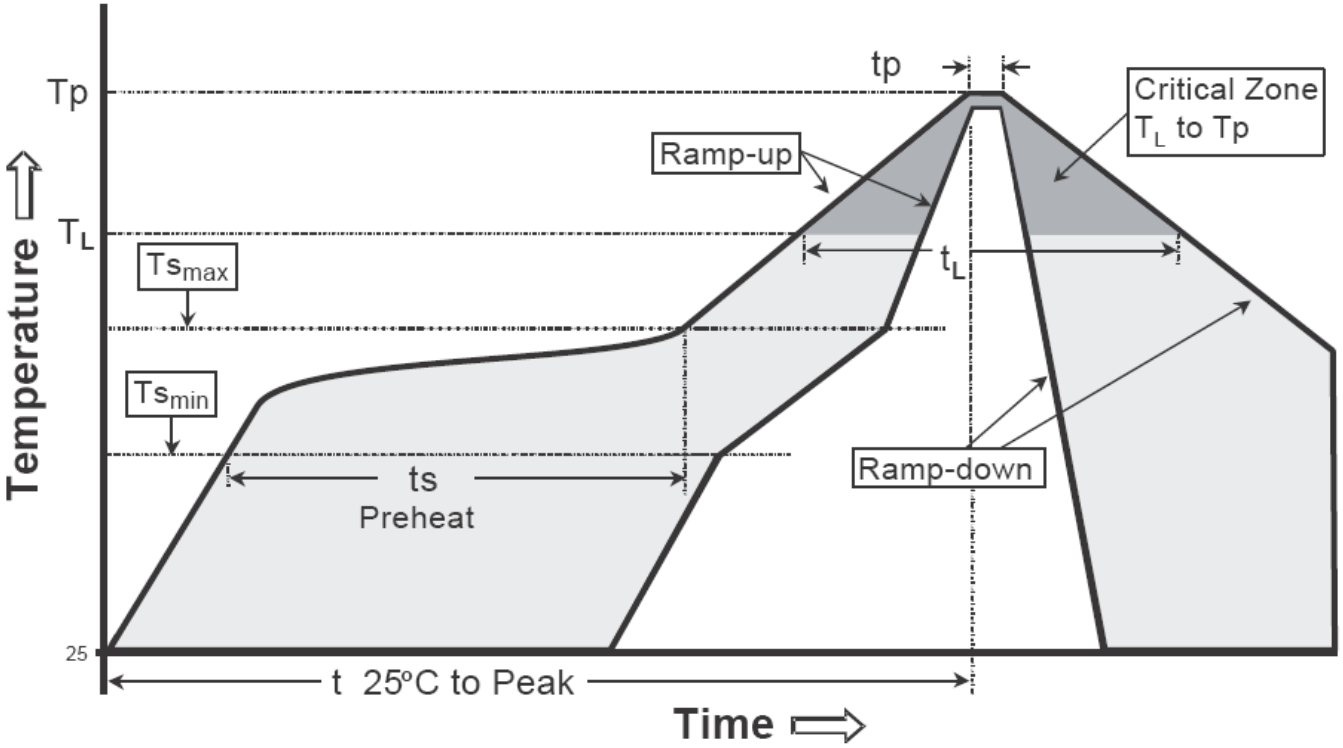
NOTE:
1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ±0.2
2. CAMBER NOT TO EXCEED 1mm IN 100mm, NONCUMULATIVE OVER 250mm.
3. MATERIAL: BLACK STATIC DISSIPATIVE PS.(POLYSTYRENE)
4. ALL DIMENSIONS ARE IN MILLIMETERS (UNLESS OTHERWISE SPECIFIED)
5. A0 AND B0 MEASURED ON A PLANE 0.3mm ABOVE THE BOTTOM OF THE POCKET
6. K0 MEASURED FROM A PLANE ON THE INSIDE BOTTOM OF THE POCKET TO THE TOP SURFACE OF THE CARRIER
7. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE
8. SURFACE RESISTIVITY
   1X10E4~1X10E11 OHMS/SQ.

A0=6.5±0.1
B0=5.3±0.1
K0=1.4±0.1

Recommended wave soldering condition

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

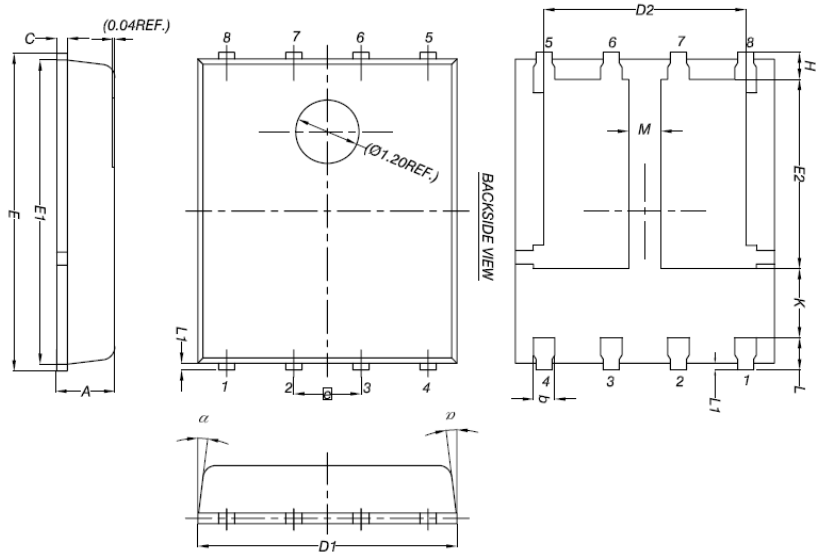
Recommended temperature profile for IR reflow

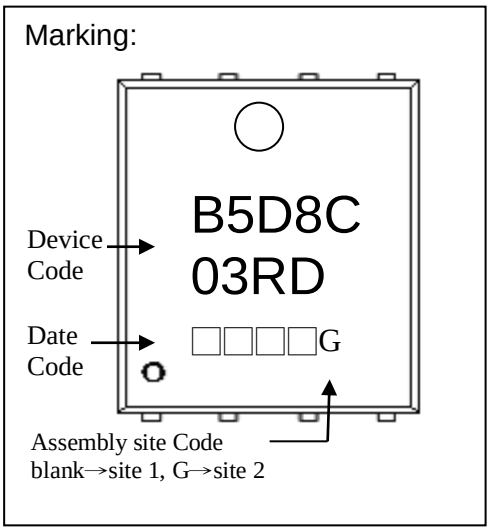


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 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 :1. All temperatures refer to topside of the package, measured on the package body surface.
2.For devices mounted on FR-4 PCB of 1.6mm or equivalent grade PCB. If other grade PCB is used, care should be taken to match the coefficients of thermal expansion between components and PCB. If they are not matched well, the solder joints may crack or the bodies of the parts may crack or shatter as the assembly cools.

DFN5x6 Dimension





8-Lead DFN5x6 Plastic Package
CYS Package Code : H8

Date Code(counting from left to right) :
1st code: year code, the last digit of Christian year
2nd 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
3rd and 4th codes : production serial number, 01~99

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043	e	1.270 BSC		0.050 BSC	
b	0.330	0.510	0.013	0.020	H	0.410	0.610	0.016	0.024
C	0.200	0.300	0.008	0.012	K	1.100	-	0.043	-
D1	4.800	5.000	0.189	0.197	L	0.510	0.710	0.020	0.028
D2	3.610	3.960	0.142	0.156	L1	0.060	0.200	0.002	0.008
E	5.900	6.100	0.232	0.240	M	0.500	-	0.020	-
E1	5.700	5.800	0.224	0.228	α	0°	12°	0°	12°
E2	3.380	3.780	0.133	0.149					

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.