

**N- AND P-Channel Logic Level Enhancement Mode MOSFET**

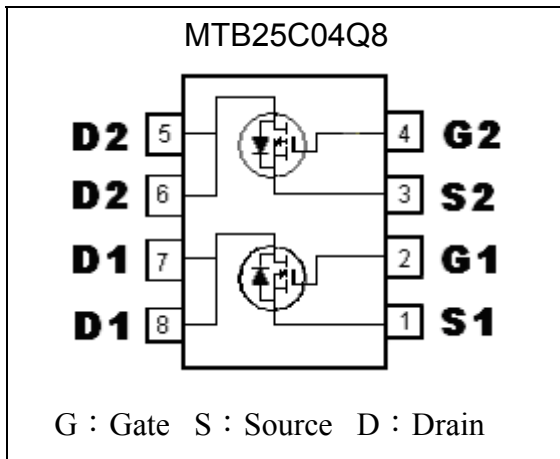
# MTB25C04Q8

	N-CH	P-CH
$BV_{DSS}$	40V	-40V
$I_D @ T_A=25^{\circ}C, V_{GS}=10V(-10V)$	5.7A	-4.9A
$I_D @ T_A=70^{\circ}C, V_{GS}=10V(-10V)$	4.8A	-4.1A
$I_D @ T_C=25^{\circ}C, V_{GS}=10V(-10V)$	10A	-8.6A
$I_D @ T_C=100^{\circ}C, V_{GS}=10V(-10V)$	7.1A	-6.1A
$R_{DSON}(typ.) @ V_{GS}=(-)10V$	21.2m $\Omega$	32.7 m $\Omega$
$R_{DSON}(typ.) @ V_{GS}=(-)4.5V$	30.1 m $\Omega$	47.8 m $\Omega$

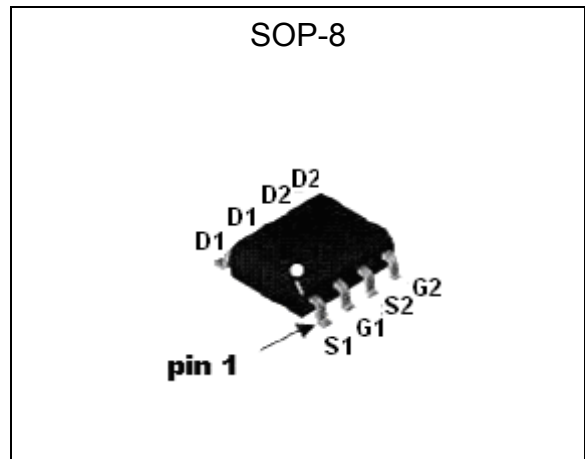
**Features**

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

**Equivalent Circuit**

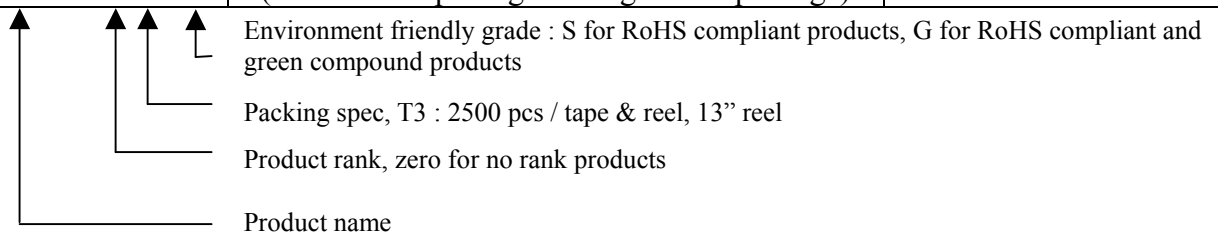


**Outline**



**Ordering Information**

Device	Package	Shipping
MTB25C04Q8-0-T3-G	SOP-8 (Pb-free lead plating & halogen-free package)	2500 pcs / Tape & Reel





**Absolute Maximum Ratings** (T<sub>C</sub>=25°C, unless otherwise noted)

Parameter	Symbol	Limits		Unit
		N-channel	P-channel	
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	40	-40	V
Gate-Source Voltage	V <sub>GS</sub>	±20	±20	
Continuous Drain Current	I <sub>D</sub>	T <sub>C</sub> =25 °C, V <sub>GS</sub> =10V (-10V)	10	A
		T <sub>C</sub> =100 °C, V <sub>GS</sub> =10V (-10V)	7.1	
Continuous Drain Current (Note 2)	I <sub>DSM</sub>	T <sub>A</sub> =25 °C, V <sub>GS</sub> =10V (-10V)	5.7	A
		T <sub>A</sub> =70 °C, V <sub>GS</sub> =10V (-10V)	4.8	
Pulsed Drain Current (Note 1)	I <sub>DM</sub>	30	-30	
Power Dissipation for Dual Operation @T <sub>C</sub> =25°C	P <sub>D</sub>	6		W
Power Dissipation for Dual Operation @T <sub>A</sub> =25°C	P <sub>DSM</sub>	3		
Power Dissipation for Single Operation @T <sub>A</sub> =25°C		1.9 (Note 2)		
		1.1 (Note 3)		
Operating Junction and Storage Temperature Range	T <sub>j</sub> ; T <sub>stg</sub>	-55~+175		°C

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R <sub>th,j-c</sub>	25	°C/W
Thermal Resistance, Junction-to-ambient, max	R <sub>th,j-a</sub>	50	
		78 (Note 2)	
		135 (Note 3)	

- Note : 1.Pulse width limited by maximum junction temperature.  
 2.Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board, pulse width≤10s, single operation.  
 3.Surface mounted on minimum copper pad, pulse width≤10s, single operation.

**N-Channel Electrical 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> =0V, I <sub>D</sub> =250μA
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	-	0.03	-	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
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> =32V, V <sub>GS</sub> =0V
	-	-	25		V <sub>DS</sub> =32V, V <sub>GS</sub> =0, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	21.2	27	mΩ	I <sub>D</sub> =7A, V <sub>GS</sub> =10V
	-	30.1	40		I <sub>D</sub> =6A, V <sub>GS</sub> =4.5V
*G <sub>FS</sub>	-	8.6	-	S	V <sub>DS</sub> =5V, I <sub>D</sub> =7A
<b>Dynamic</b>					
C <sub>iss</sub>	-	597	-	pF	V <sub>DS</sub> =20V, V <sub>GS</sub> =0, f=1MHz
C <sub>oss</sub>	-	50	-		
C <sub>rss</sub>	-	41	-		



*td(ON)	-	7.6	-	ns	V <sub>DS</sub> =20V, I <sub>D</sub> =1A, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω
*tr	-	16.2	-		
*td(OFF)	-	24	-		
*tf	-	15.2	-		
*Qg	-	11.4	-	nC	V <sub>DS</sub> =20V, I <sub>D</sub> =5A, V <sub>GS</sub> =10V
*Qgs	-	2.4	-		
*Qgd	-	2.0	-		
Rg	-	1.7	-	Ω	f=1MHz
<b>Body Diode</b>					
*I <sub>S</sub>	-	-	5.7	A	
*I <sub>SM</sub>	-	-	30		
*V <sub>SD</sub>	-	0.86	1.2	V	V <sub>GS</sub> =0V, I <sub>S</sub> =7A
trr *	-	6.3	-	ns	I <sub>F</sub> =5A, dI <sub>F</sub> /dt=100A/μs
Qrr *	-	2.6	-	nC	

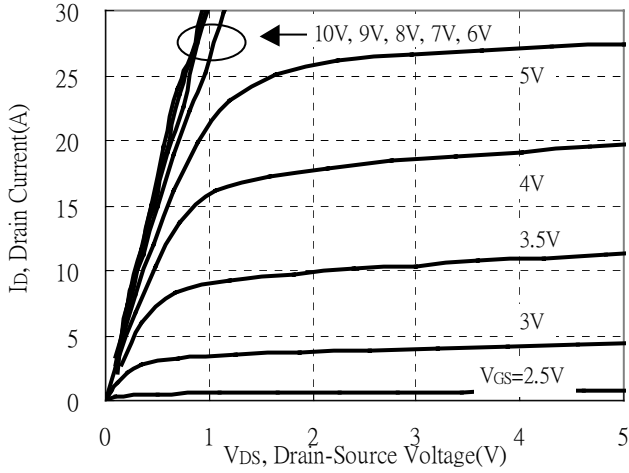
**P-Channel Electrical Characteristics (T<sub>c</sub>=25°C, unless otherwise specified)**

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	-40	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	-	-0.02	-	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
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> =-32V, V <sub>GS</sub> =0V
	-	-	-25		V <sub>DS</sub> =-32V, V <sub>GS</sub> =0, T <sub>j</sub> =125°C
*R <sub>D(S)ON</sub>	-	32.7	45	mΩ	I <sub>D</sub> =-6A, V <sub>GS</sub> =-10V
	-	47.8	65		I <sub>D</sub> =-5A, V <sub>GS</sub> =-4.5V
*G <sub>FS</sub>	-	10.7	-	S	V <sub>DS</sub> =-5V, I <sub>D</sub> =-6A
<b>Dynamic</b>					
C <sub>iss</sub>	-	1023	-	pF	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0, f=1MHz
C <sub>oss</sub>	-	88	-		
C <sub>rss</sub>	-	71	-		
*td(ON)	-	7.6	-	ns	V <sub>DS</sub> =-20V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω
*tr	-	18	-		
*td(OFF)	-	54.8	-		
*tf	-	17.2	-		
*Qg	-	19.4	-	nC	V <sub>DS</sub> =-20V, I <sub>D</sub> =-5A, V <sub>GS</sub> =-10V
*Qgs	-	3.4	-		
*Qgd	-	3.2	-		
Rg	-	17.7	-	Ω	f=1MHz
<b>Body Diode</b>					
*I <sub>S</sub>	-	-	-4.9	A	
*I <sub>SM</sub>	-	-	-30		
*V <sub>SD</sub>	-	-0.86	-1.2	V	V <sub>GS</sub> =0V, I <sub>S</sub> =-6A
trr *	-	8.8	-	ns	I <sub>F</sub> =6A, dI <sub>F</sub> /dt=100A/μs
Qrr *	-	3.8	-	nC	

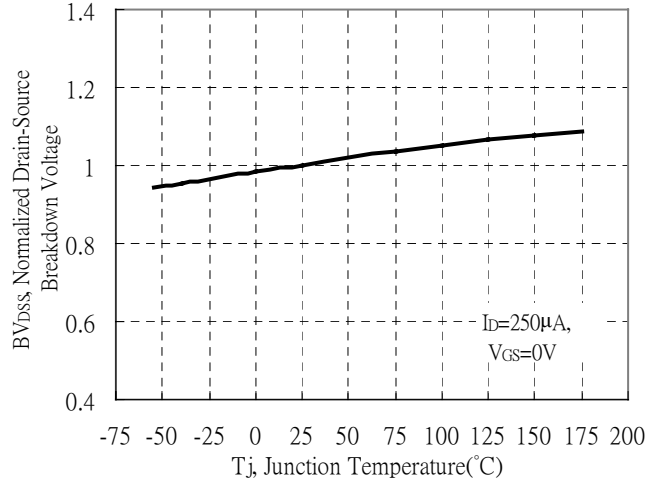
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle ≤2%

**Typical Characteristics : Q1( N-channel )**

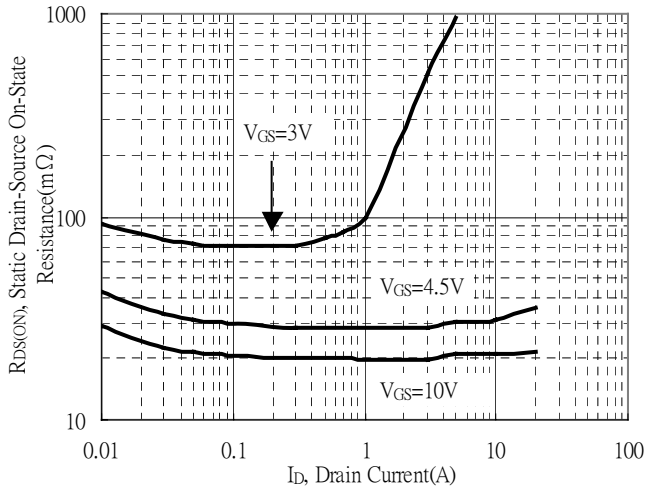
Typical Output Characteristics



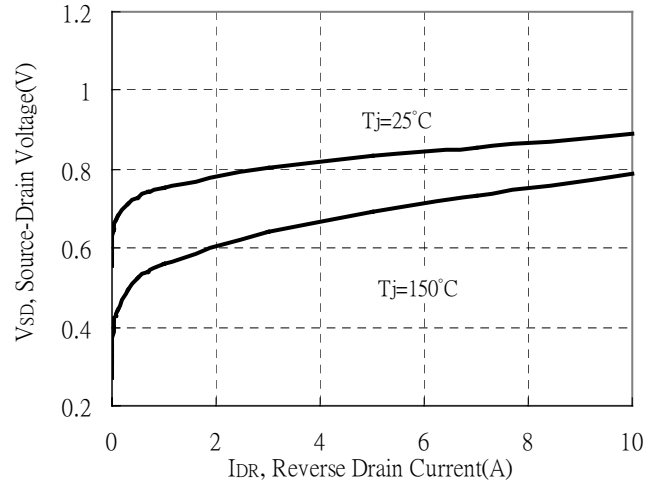
Brekdown Voltage vs Ambient Temperature



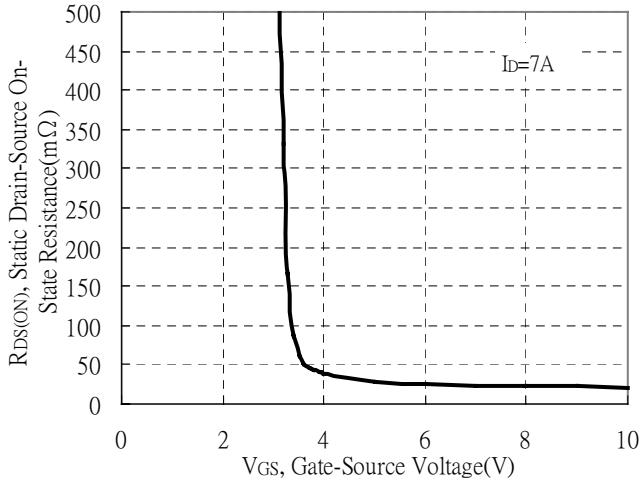
Static Drain-Source On-State resistance vs Drain Current



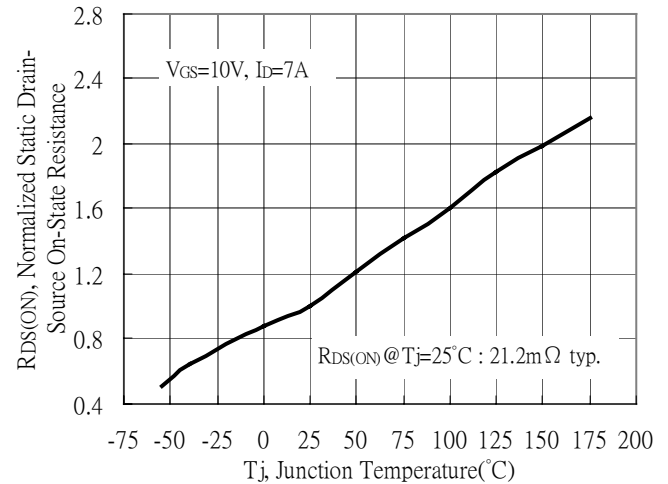
Reverse Drain Current vs Source-Drain Voltage



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

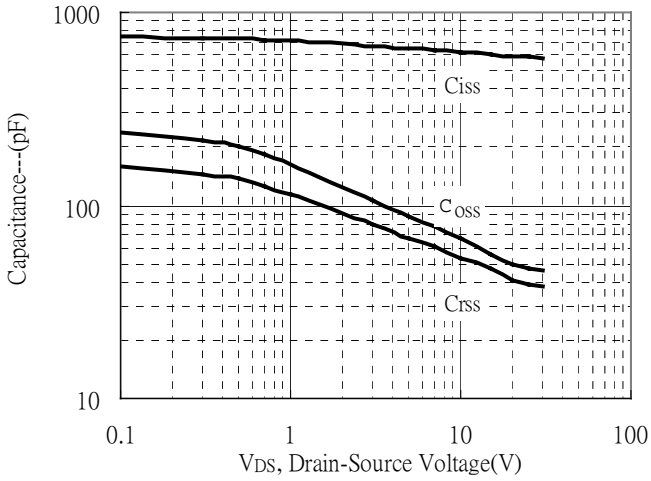


Drain-Source On-State Resistance vs Junction Temperature

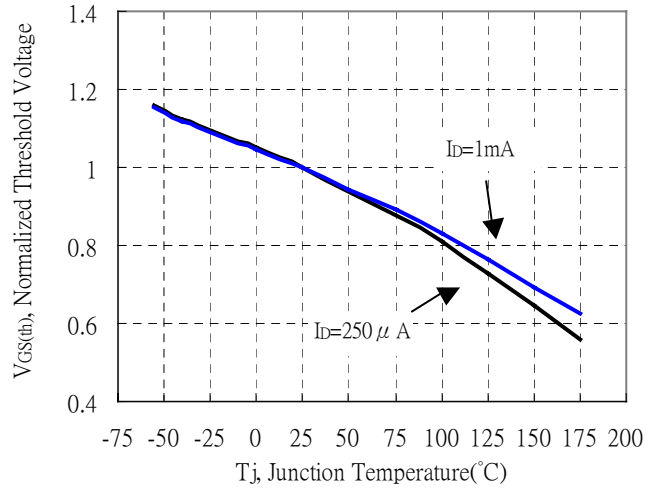


**Typical Characteristics(Cont.) : Q1( N-channel)**

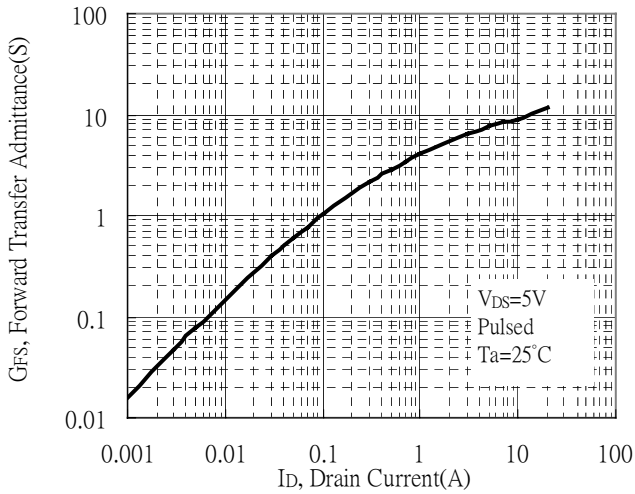
Capacitance vs Drain-to-Source Voltage



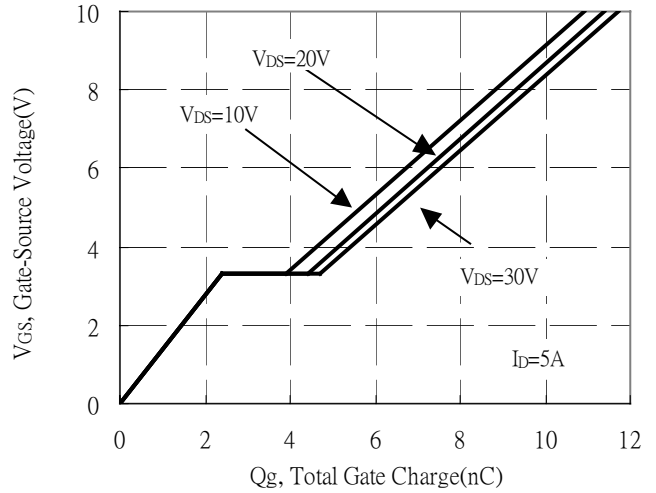
Threshold Voltage vs Junction Temperature



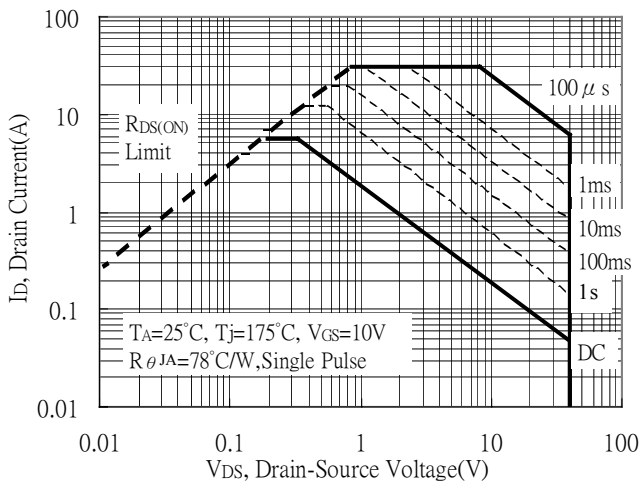
Forward Transfer Admittance vs Drain Current



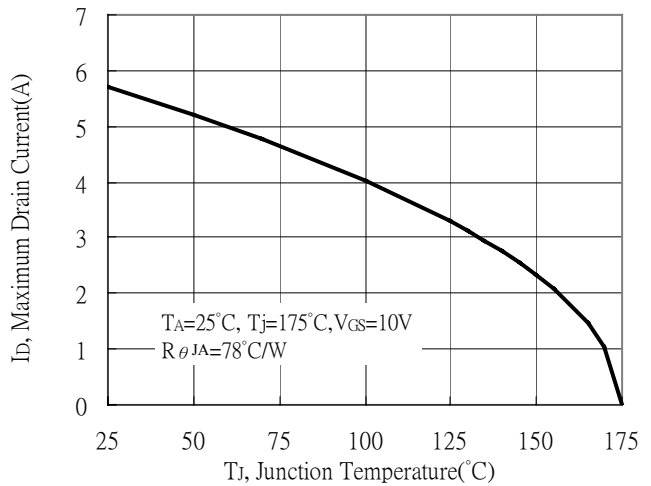
Gate Charge Characteristics



Maximum Safe Operating Area

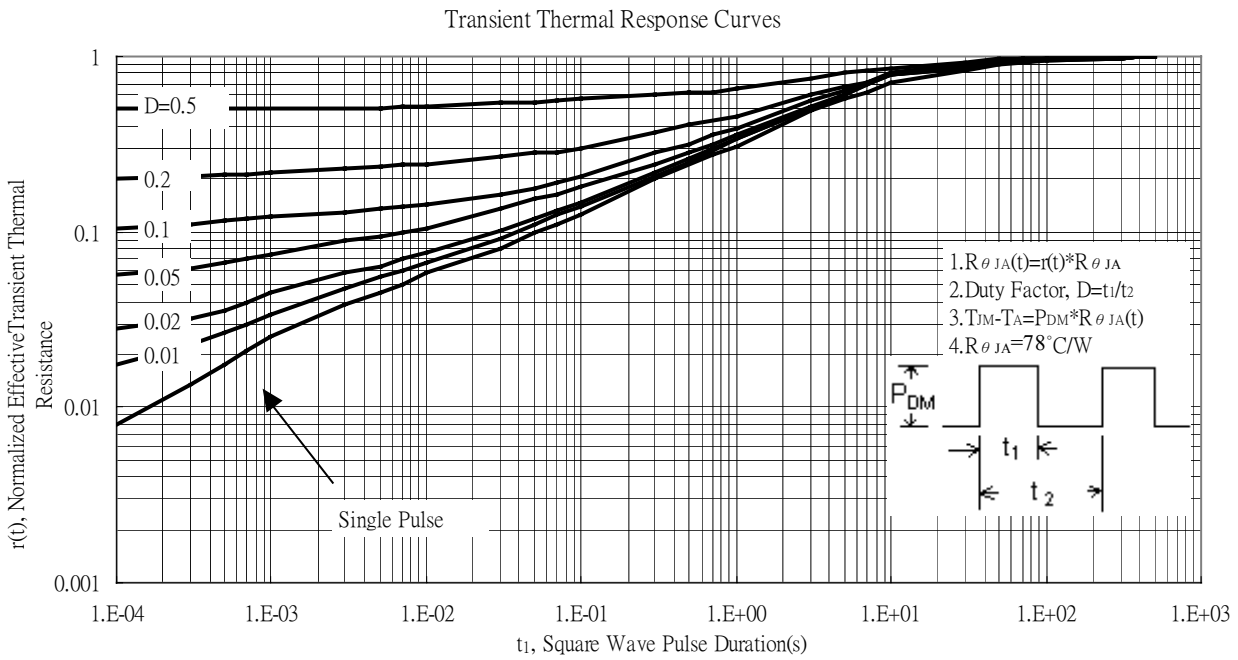
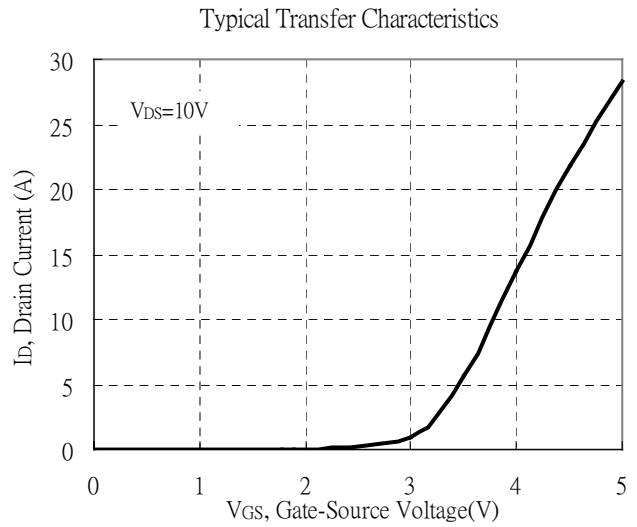
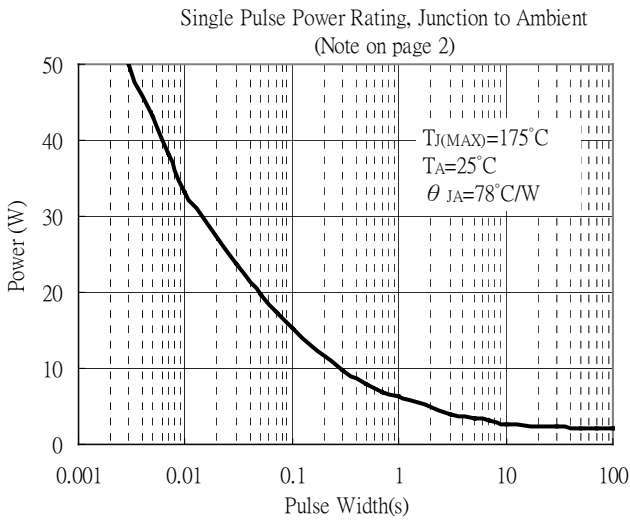


Maximum Drain Current vs Junction Temperature





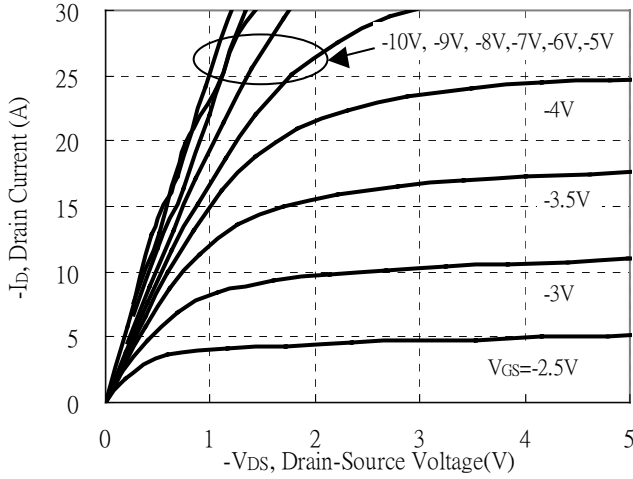
**Typical Characteristics(Cont.) : Q1( N-channel)**



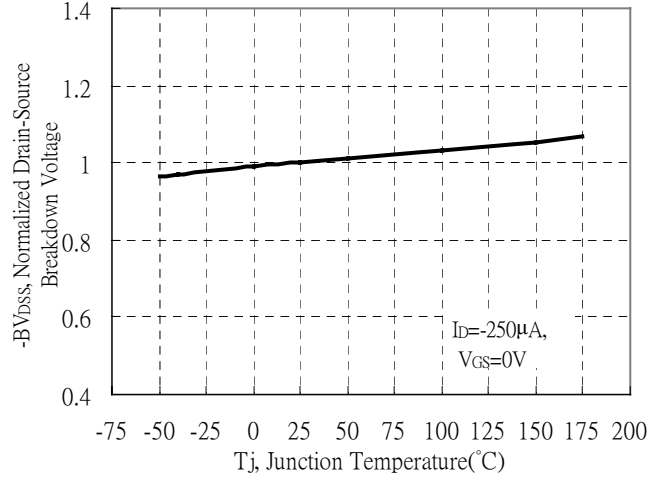


**Typical Characteristics : Q2( P-channel)**

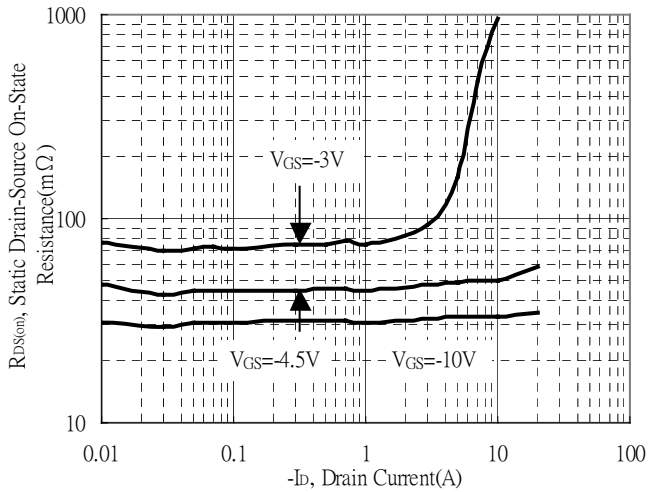
Typical Output Characteristics



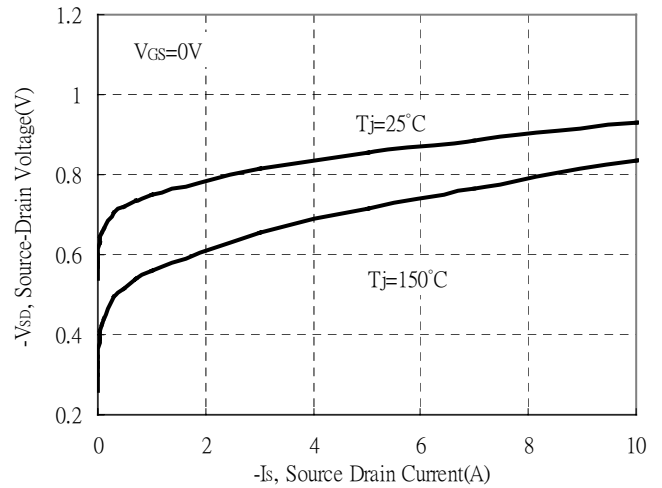
Breakdown Voltage vs Ambient Temperature



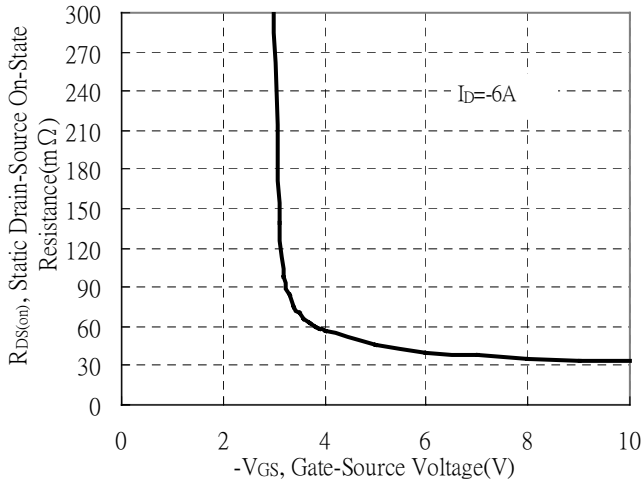
Static Drain-Source On-State resistance vs Drain Current



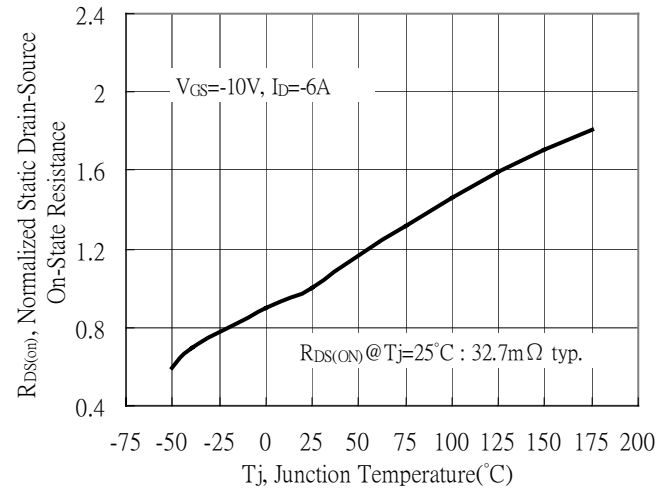
Source Drain Current vs Source-Drain Voltage



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

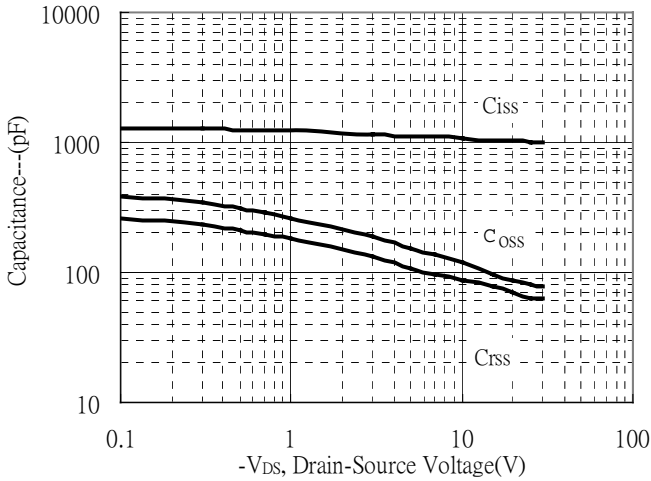


Drain-Source On-State Resistance vs Junction Temperature

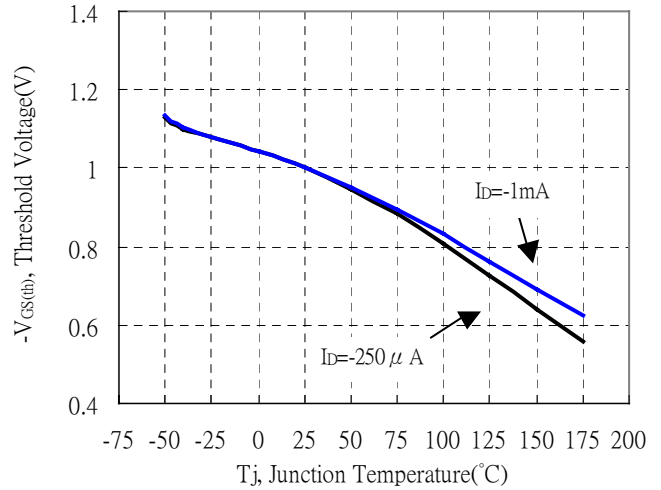


**Typical Characteristics(Cont.) : Q2(P-channel)**

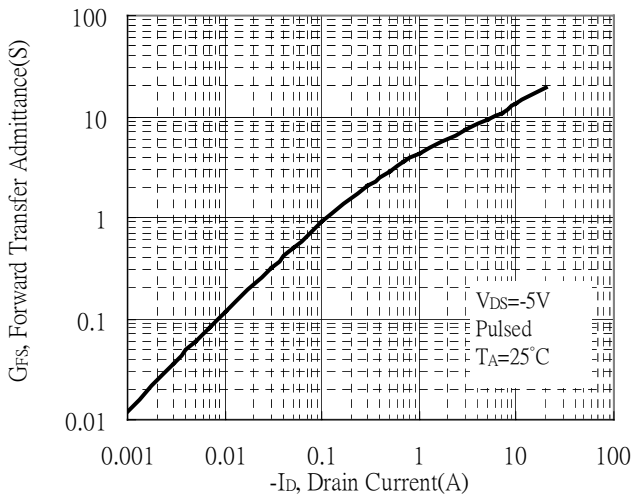
Capacitance vs Drain-to-Source Voltage



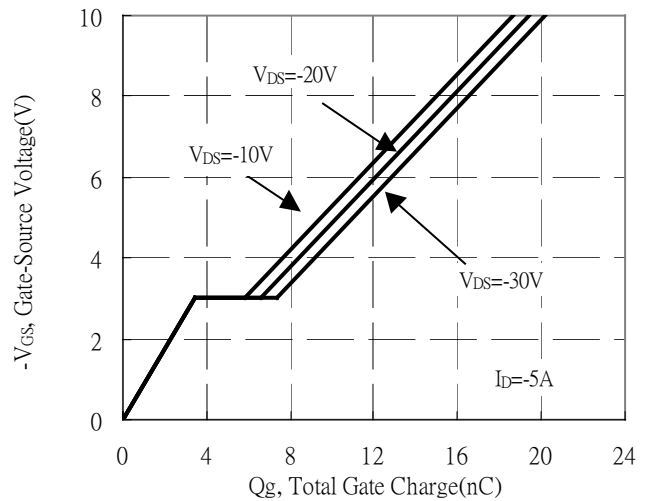
Threshold Voltage vs Junction Temperature



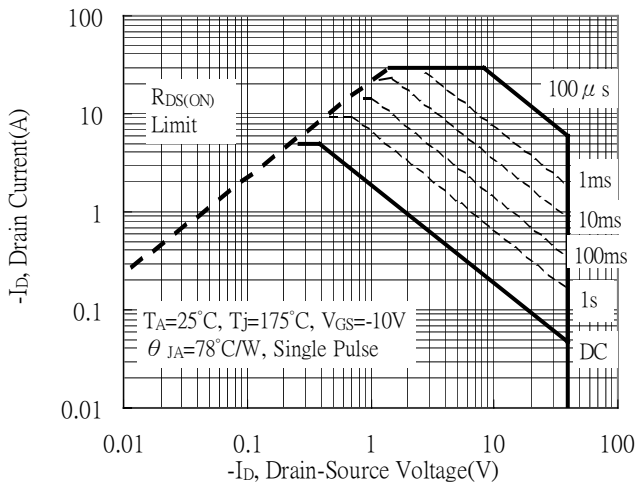
Forward Transfer Admittance vs Drain Current



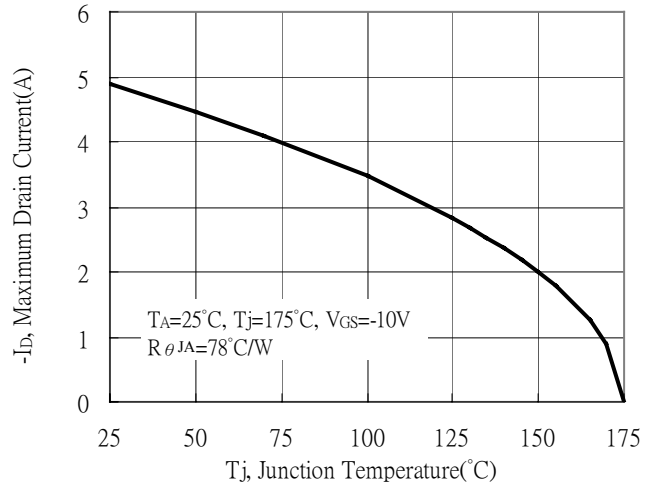
Gate Charge Characteristics



Maximum Safe Operating Area

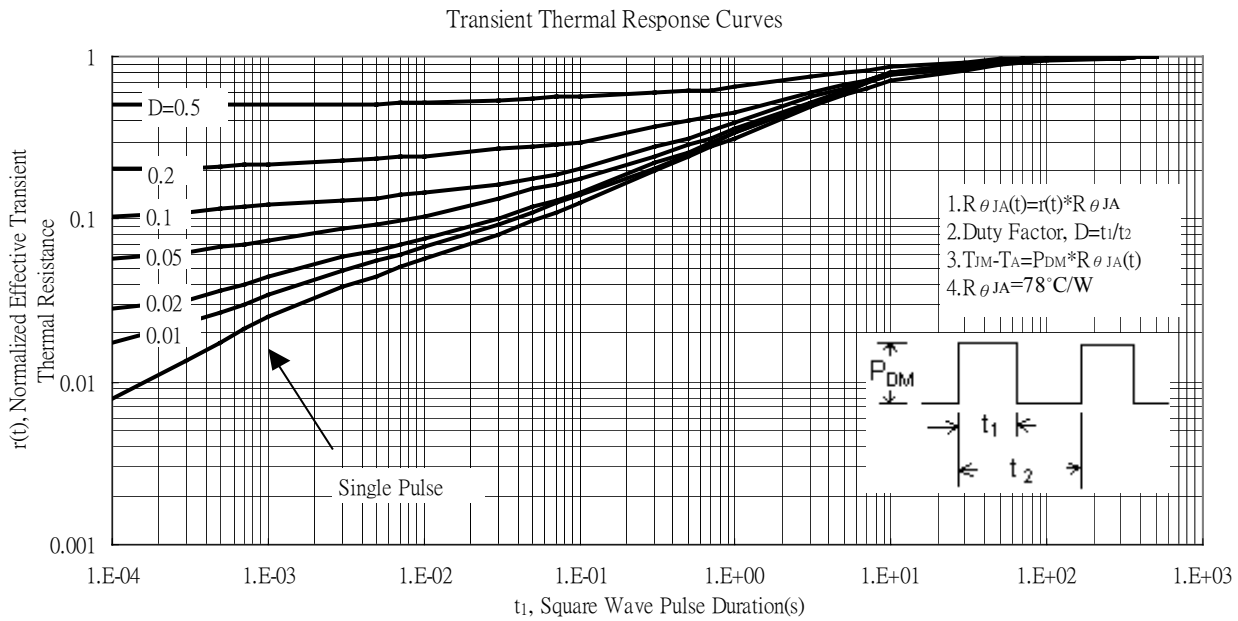
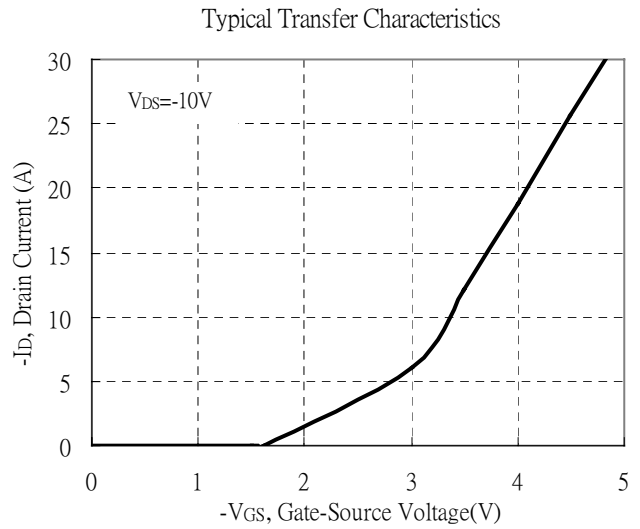
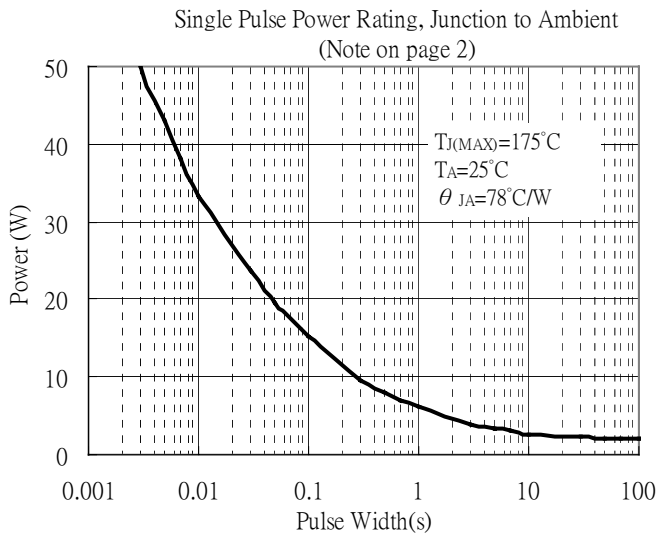


Maximum Drain Current vs Junction Temperature

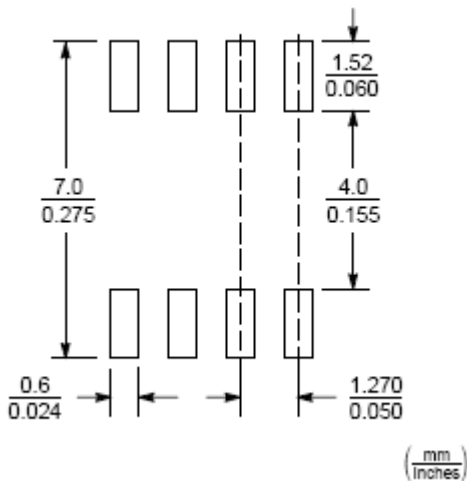




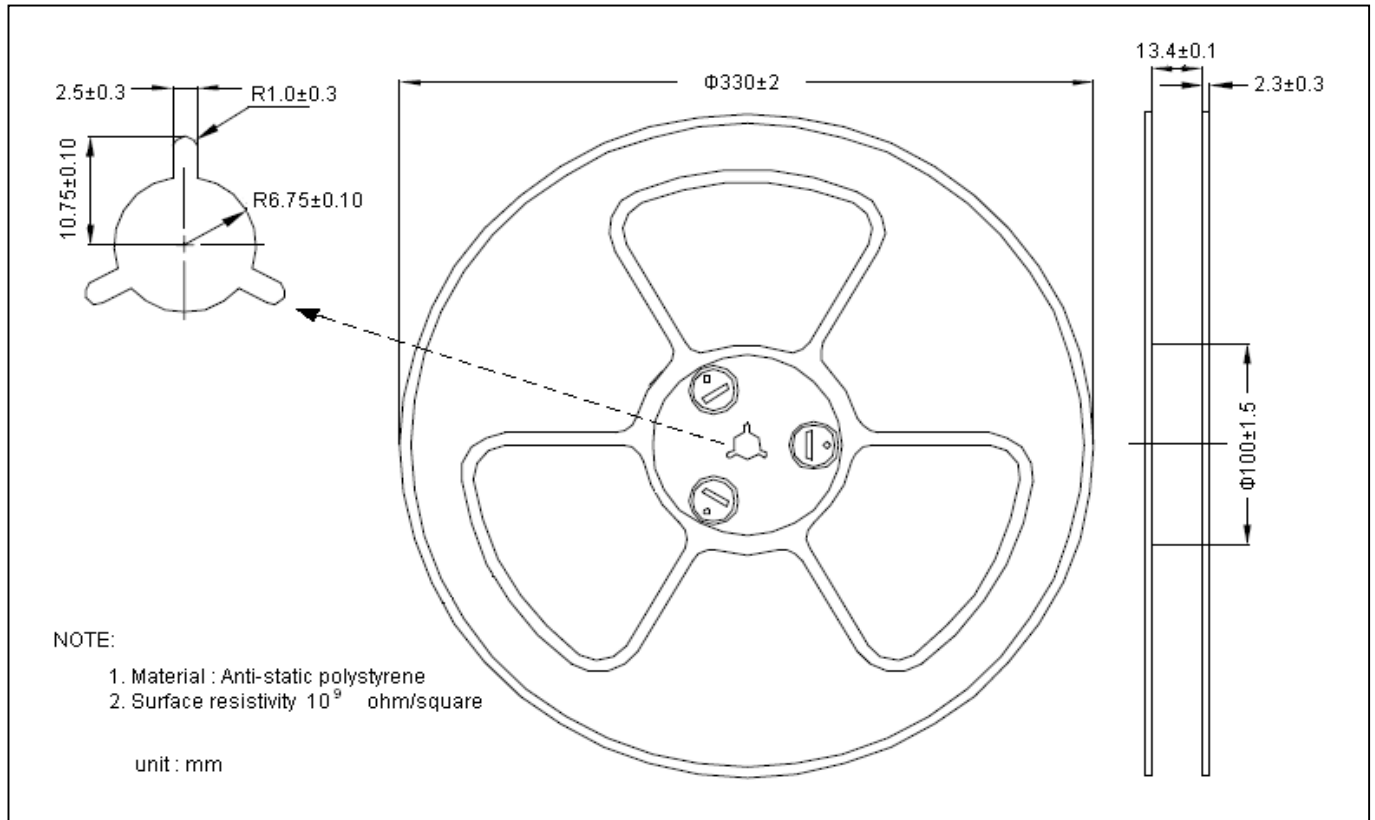
**Typical Characteristics(Cont.) : Q2(P-channel)**



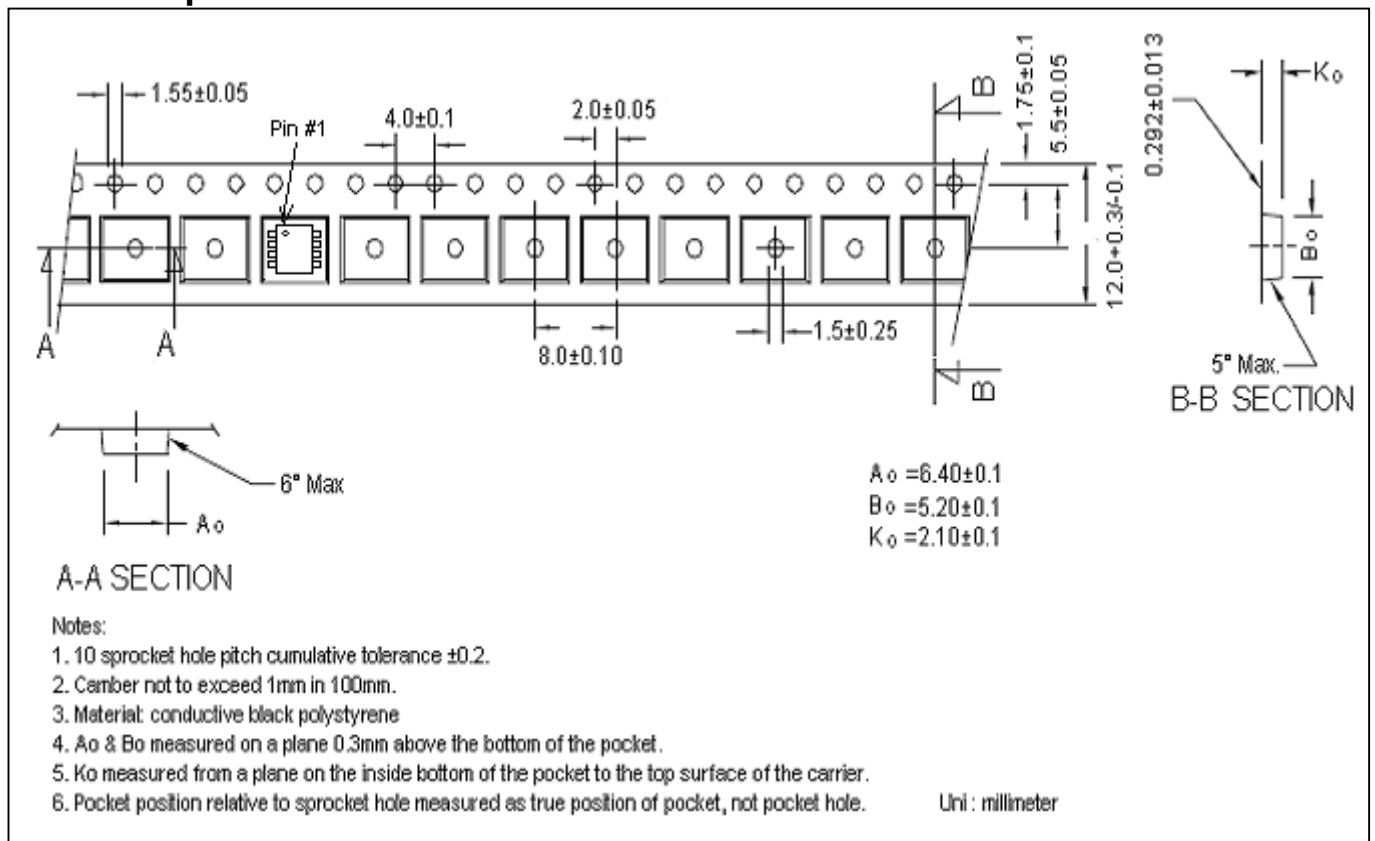
**Recommended Soldering Footprint**



**Reel Dimension**



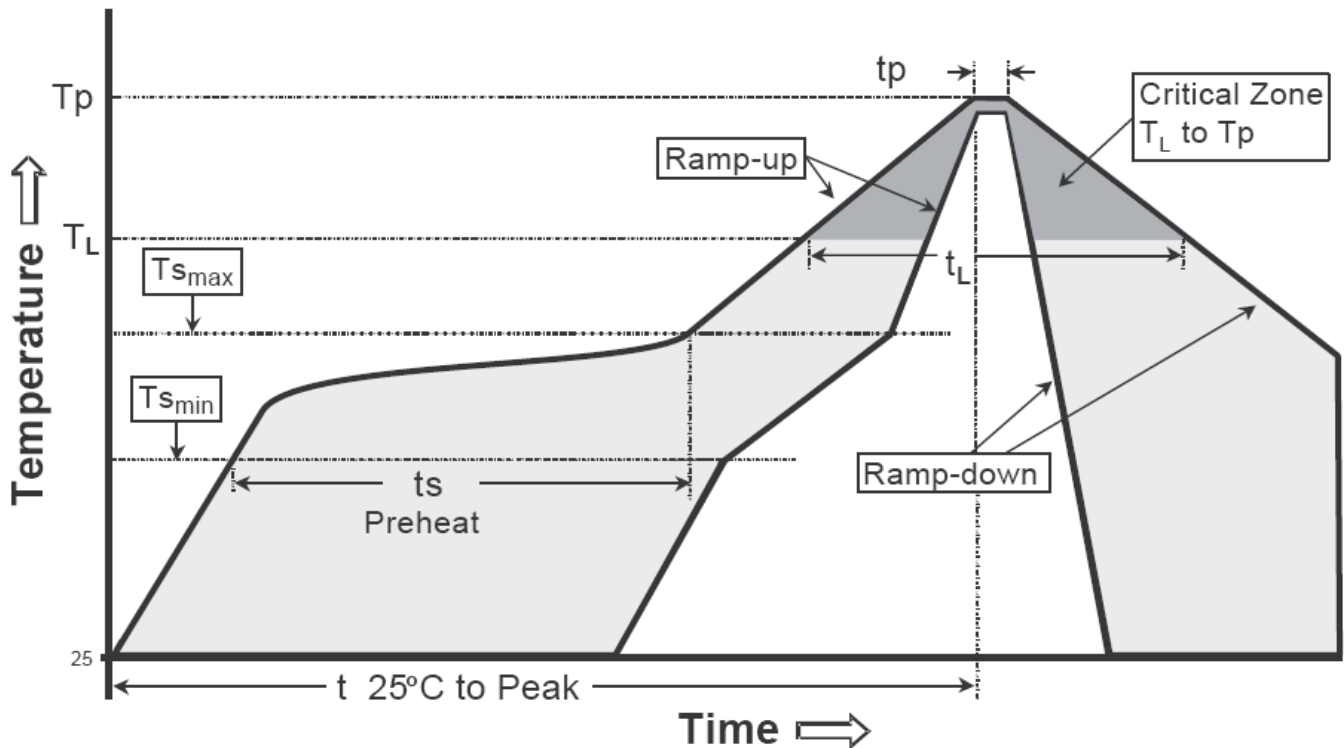
**Carrier Tape Dimension**



**Recommended wave soldering condition**

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

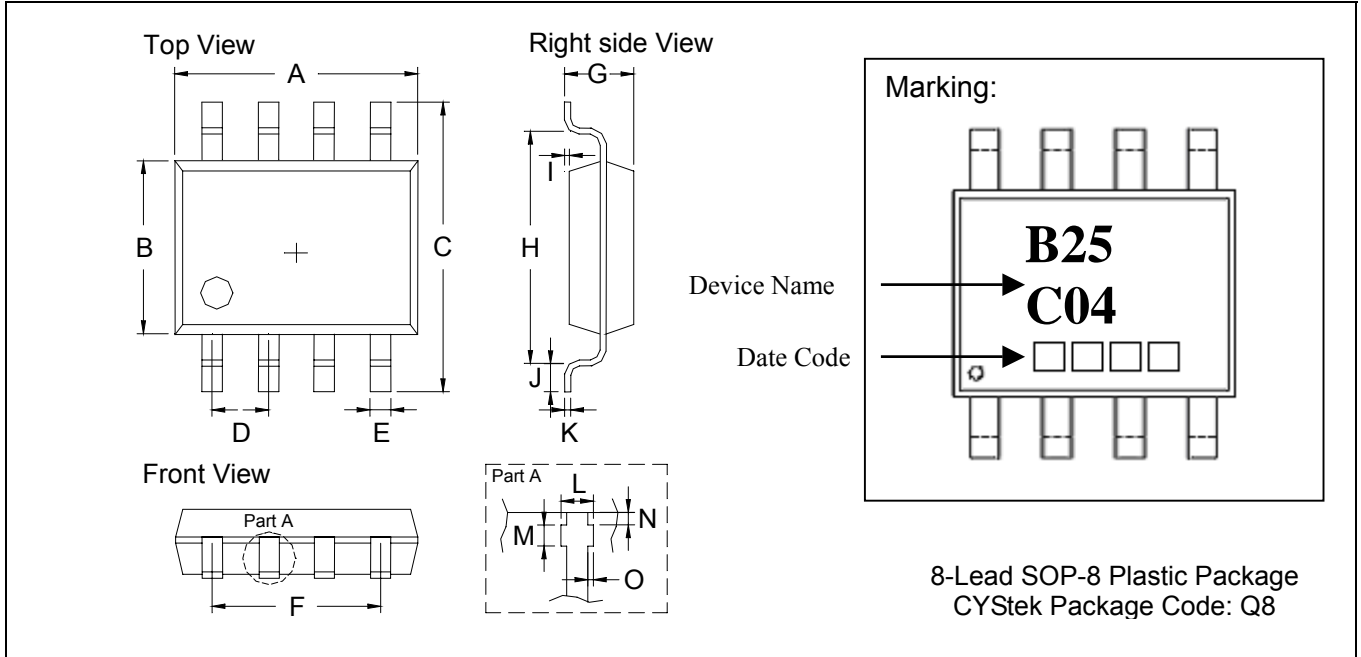
**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>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.

**SOP-8 Dimension**



\*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1909	0.2007	4.85	5.10	I	0.0019	0.0078	0.05	0.20
B	0.1515	0.1555	3.85	3.95	J	0.0118	0.0275	0.30	0.70
C	0.2283	0.2441	5.80	6.20	K	0.0074	0.0098	0.19	0.25
D	0.0480	0.0519	1.22	1.32	L	0.0145	0.0204	0.37	0.52
E	0.0145	0.0185	0.37	0.47	M	0.0118	0.0197	0.30	0.50
F	0.1472	0.1527	3.74	3.88	N	0.0031	0.0051	0.08	0.13
G	0.0570	0.0649	1.45	1.65	O	0.0000	0.0059	0.00	0.15
H	0.1889	0.2007	4.80	5.10					

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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