

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

# MTBA5C10AQ8

	N-CH	P-CH
$BV_{DSS}$	100V	-100V
$I_D$	2.4A	-2.2A
$R_{DSON(MAX.)}$	170m $\Omega$	275m $\Omega$

**Description**

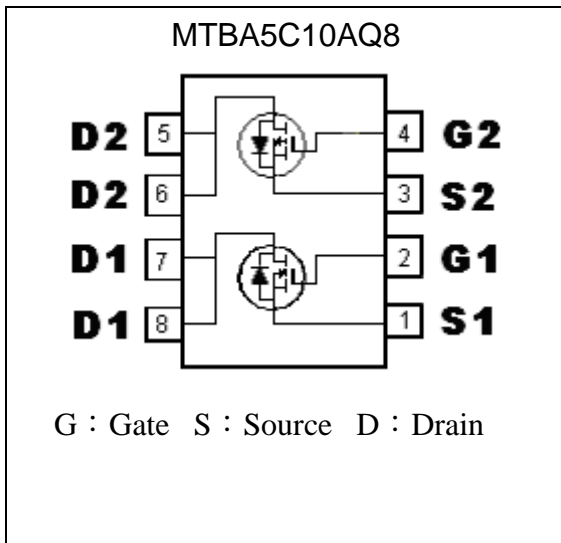
The MTBA5C10AQ8 consists of a N-channel and a P-channel enhancement-mode MOSFET in a single SOP-8 package, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOP-8 package is universally preferred for all commercial-industrial surface mount applications.

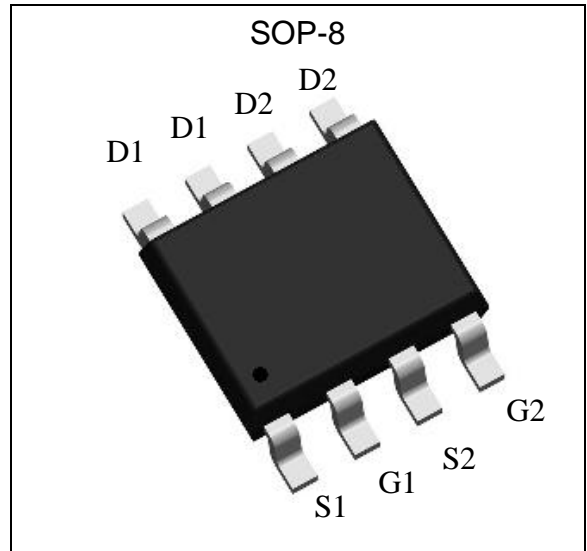
**Features**

- 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
MTBA5C10AQ8-0-T3-G	SOP-8 (Pb-free lead plating & halogen-free package)	2500 pcs / Tape & Reel
MTBA5C10AQ8-0-TF-G	SOP-8 (Pb-free lead plating & halogen-free package)	4000 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, TF : 4000 pcs/tape & reel, 13" reel

Product rank, zero for no rank products

Product name



**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>	100	-100	V
Gate-Source Voltage	V <sub>GS</sub>	±20	±20	
Continuous Drain Current (Note 2)	I <sub>D</sub>	T <sub>A</sub> =25 °C, V <sub>GS</sub> =10V (-10V)	2.4	A
		T <sub>A</sub> =100 °C, V <sub>GS</sub> =10V (-10V)	1.5	
Pulsed Drain Current (Note 1)	I <sub>DM</sub>	12	-10	
Power Dissipation for Dual Operation	P <sub>D</sub>	2		W
Power Dissipation for Single Operation		1.6 (Note 2)		
		0.9 (Note 3)		
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>	40	°C/W
Thermal Resistance, Junction-to-ambient, max	R <sub>th,j-a</sub>	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.  
 3.Surface mounted on minimum copper pad, pulse width≤10s.

**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>	100	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1.0	-	2.5		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> =80V, V <sub>GS</sub> =0V
	-	-	25		V <sub>DS</sub> =70V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	135	170	mΩ	I <sub>D</sub> =2.4A, V <sub>GS</sub> =10V
	-	140	185		I <sub>D</sub> =2A, V <sub>GS</sub> =5V
*G <sub>FS</sub>	-	8	-	S	V <sub>DS</sub> =5V, I <sub>D</sub> =2.4A
<b>Dynamic</b>					
C <sub>iss</sub>	-	782	-	pF	V <sub>DS</sub> =50V, V <sub>GS</sub> =0V, f=1MHz
C <sub>oss</sub>	-	26	-		
C <sub>rss</sub>	-	20	-		
*t <sub>d(ON)</sub>	-	10.8	-	ns	V <sub>DS</sub> =50V, I <sub>D</sub> =1A, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω
*t <sub>r</sub>	-	7.8	-		
*t <sub>d(OFF)</sub>	-	48.2	-		
*t <sub>f</sub>	-	6.2	-		
*Q <sub>g</sub>	-	19.6	-	nC	V <sub>DS</sub> =80V, I <sub>D</sub> =2.4A, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	3	-		
*Q <sub>gd</sub>	-	5.2	-		

Body Diode					
*V <sub>SD</sub>	-	-	1.3	V	V <sub>GS</sub> =0V, I <sub>S</sub> =3A
*I <sub>S</sub>	-	-	2.4	A	
*I <sub>SM</sub>	-	-	12		

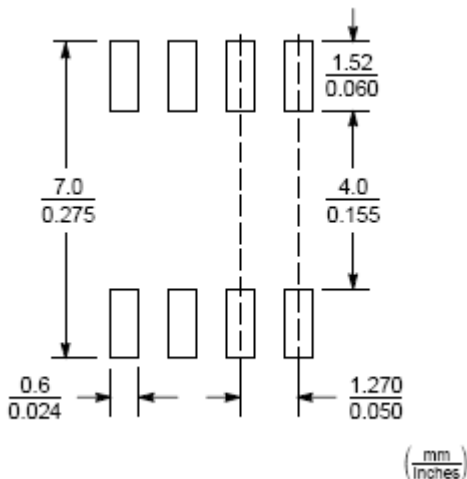
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

**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>	-100	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA
V <sub>GS(th)</sub>	-1.0	-	-2.5		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> =-80V, V <sub>GS</sub> =0V
	-	-	-25		V <sub>DS</sub> =-70V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C
*R <sub>DS(ON)</sub>	-	210	275	mΩ	I <sub>D</sub> =-1.5A, V <sub>GS</sub> =-10V
	-	220	300		I <sub>D</sub> =-1A, V <sub>GS</sub> =-5V
*G <sub>FS</sub>	-	7	-	S	V <sub>DS</sub> =-5V, I <sub>D</sub> =-1.5A
<b>Dynamic</b>					
C <sub>iss</sub>	-	1382	-	pF	V <sub>DS</sub> =-50V, V <sub>GS</sub> =0V, f=1MHz
C <sub>oss</sub>	-	34	-		
C <sub>rss</sub>	-	27	-		
*t <sub>d(ON)</sub>	-	6.6	-	ns	V <sub>DS</sub> =-50V, I <sub>D</sub> =-2A, V <sub>GS</sub> =-10V, R <sub>G</sub> =1Ω
*t <sub>r</sub>	-	18.8	-		
*t <sub>d(OFF)</sub>	-	128.2	-		
*t <sub>f</sub>	-	46.6	-		
*Q <sub>g</sub>	-	26.6	-	nC	V <sub>DS</sub> =-80V, I <sub>D</sub> =-2.2A, V <sub>GS</sub> =-10V
*Q <sub>gs</sub>	-	3.4	-		
*Q <sub>gd</sub>	-	4.6	-		
<b>Body Diode</b>					
*V <sub>SD</sub>	-	-	-1.3	V	V <sub>GS</sub> =0V, I <sub>S</sub> =-2.5A
*I <sub>S</sub>	-	-	-2.2	A	
*I <sub>SM</sub>	-	-	-10		

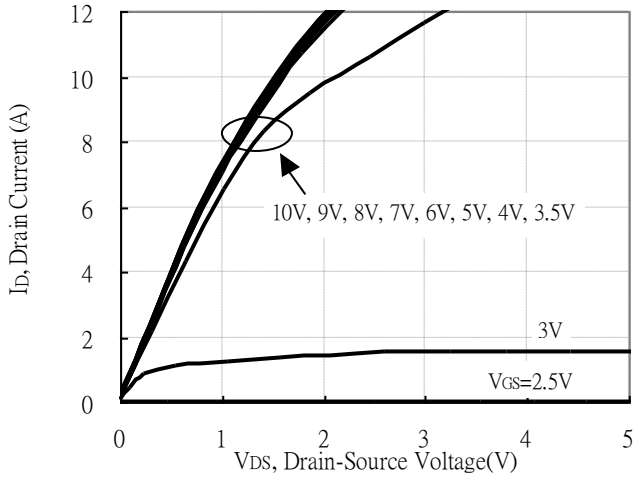
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

**Recommended Soldering Footprint**

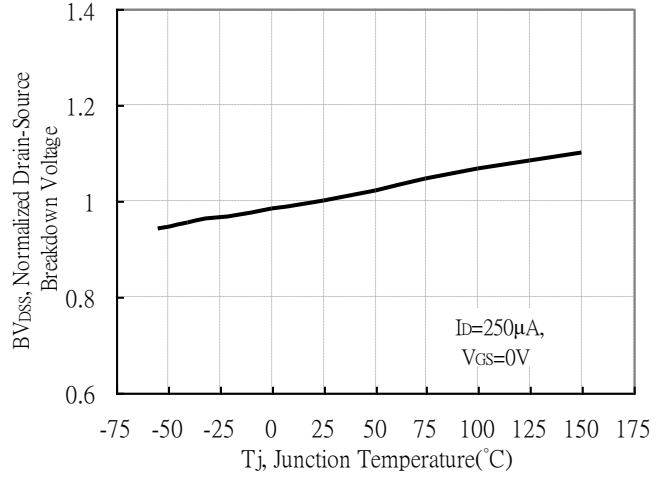


**Typical Characteristics : Q1( N-channel )**

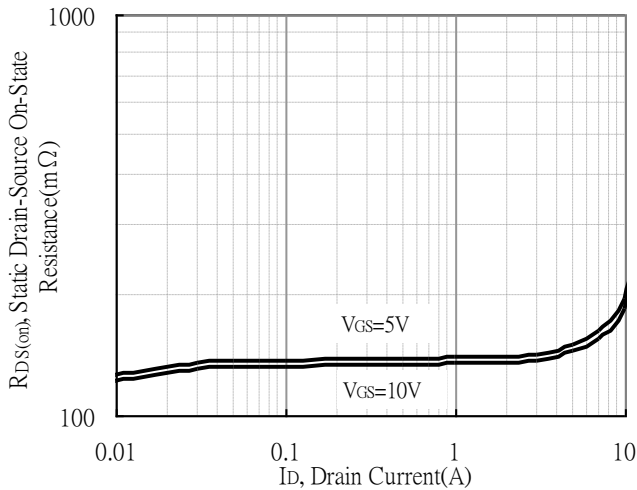
Typical Output Characteristics



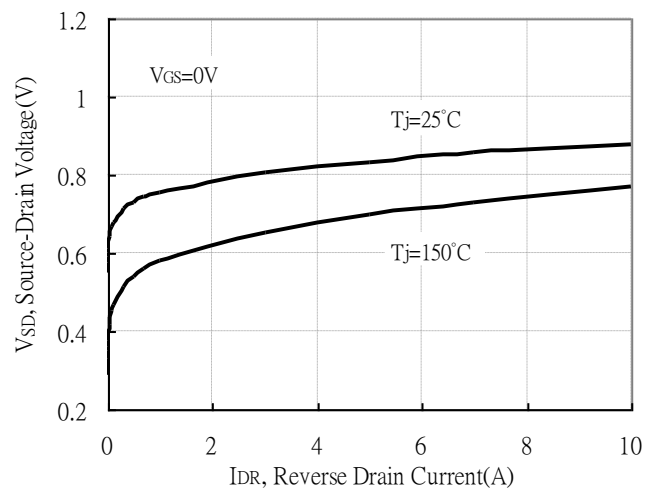
Brekdown Voltage vs Ambient Temperature



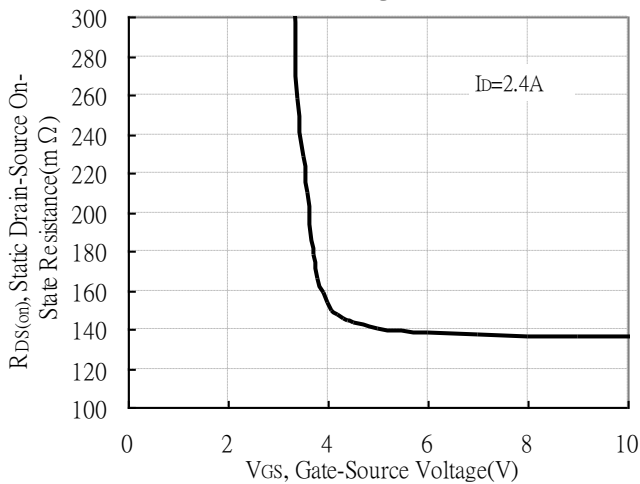
Static Drain-Source On-State resistance vs Drain Current



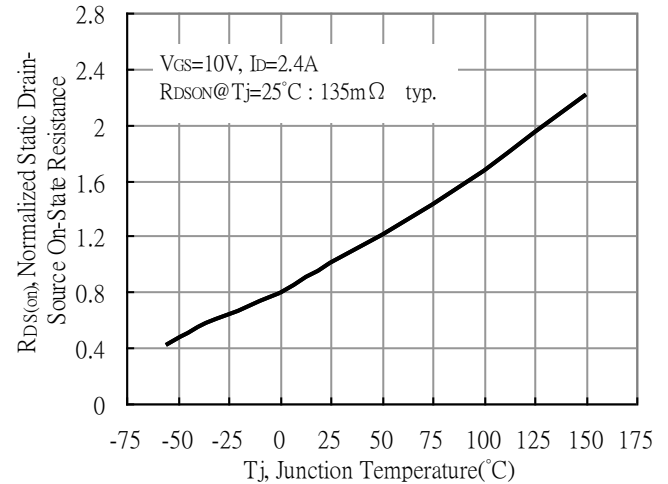
Reverse Drain Current vs Source-Drain Voltage



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

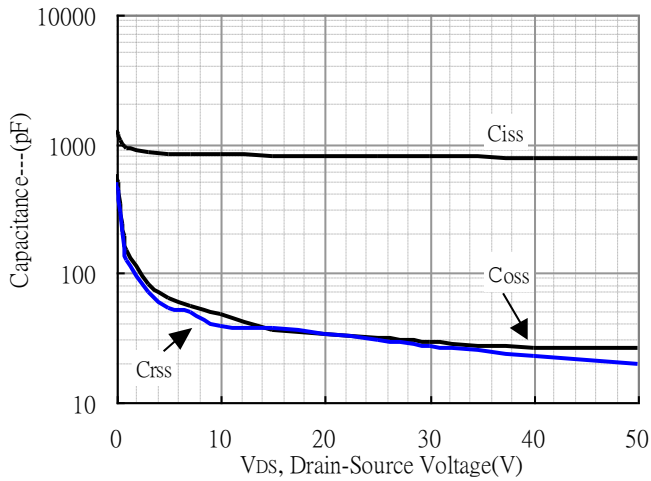


Drain-Source On-State Resistance vs Junction Temperature

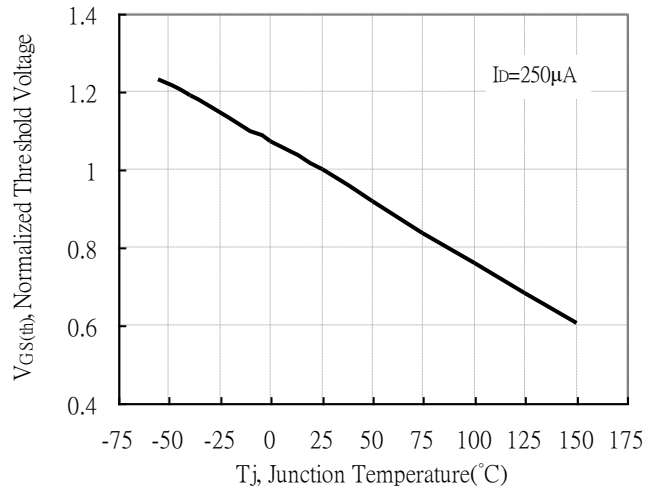


**Typical Characteristics(Cont.) : Q1( N-channel)**

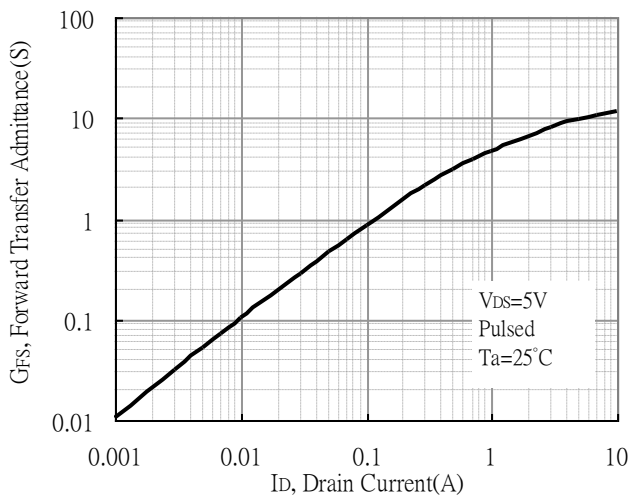
Capacitance vs Drain-to-Source Voltage



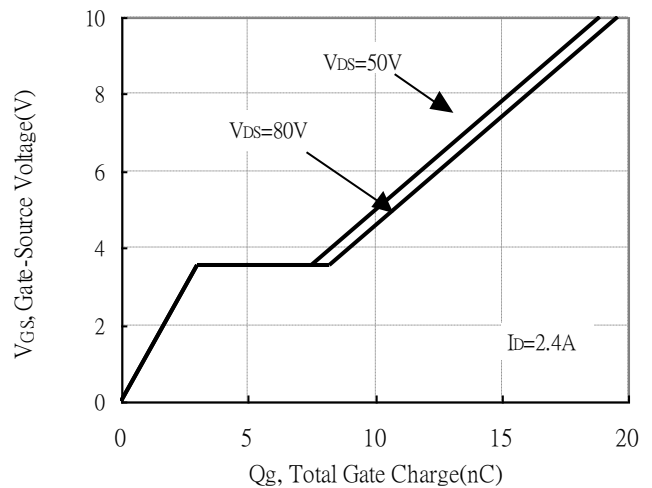
Threshold Voltage vs Junction Temperature



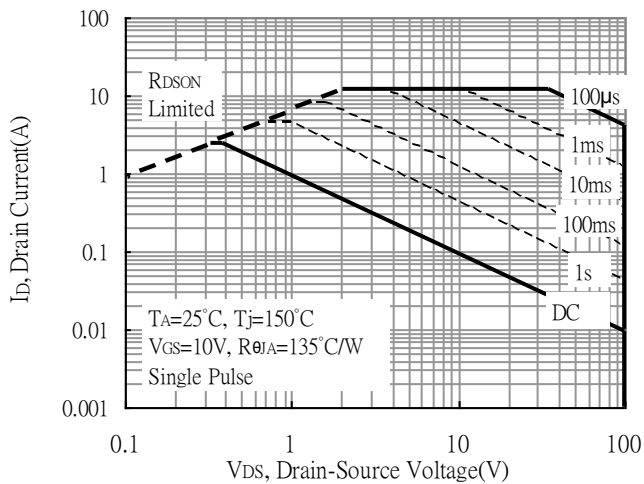
Forward Transfer Admittance vs Drain Current



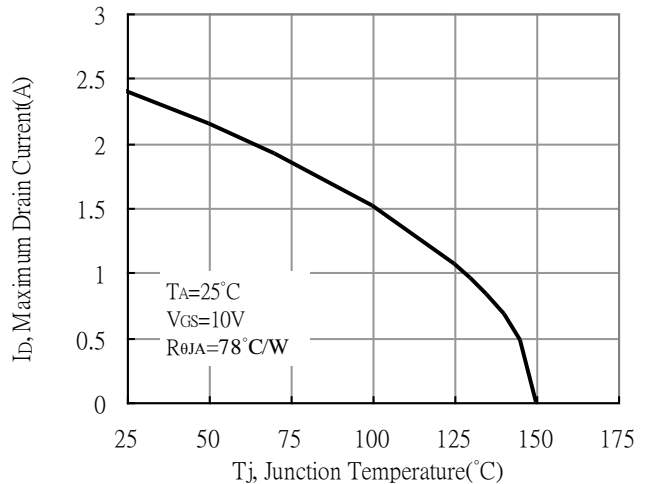
Gate Charge Characteristics



Maximum Safe Operating Area

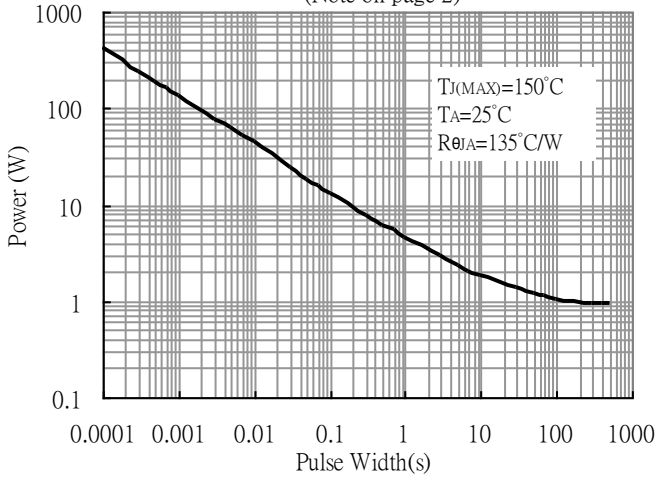


Maximum Drain Current vs Case Temperature

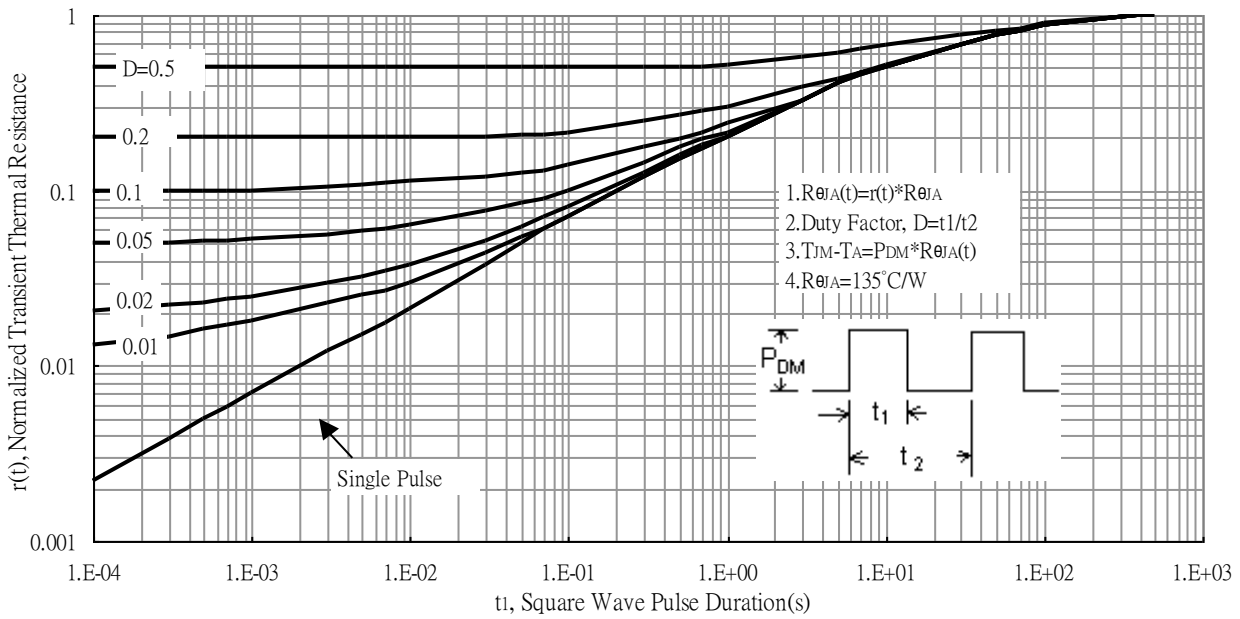


**Typical Characteristics(Cont.) : Q1( N-channel)**

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

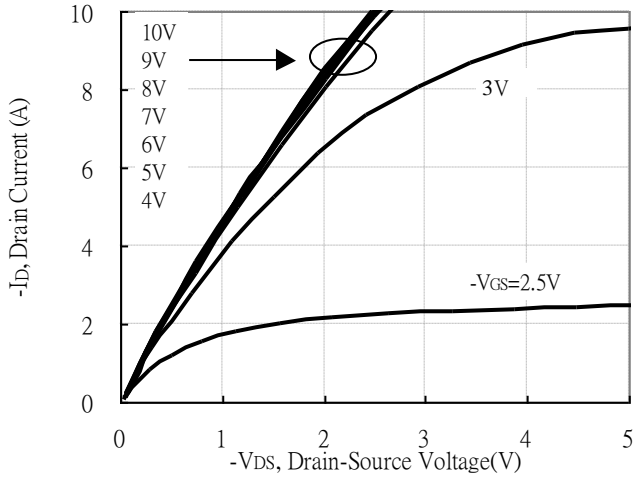


Transient Thermal Response Curves

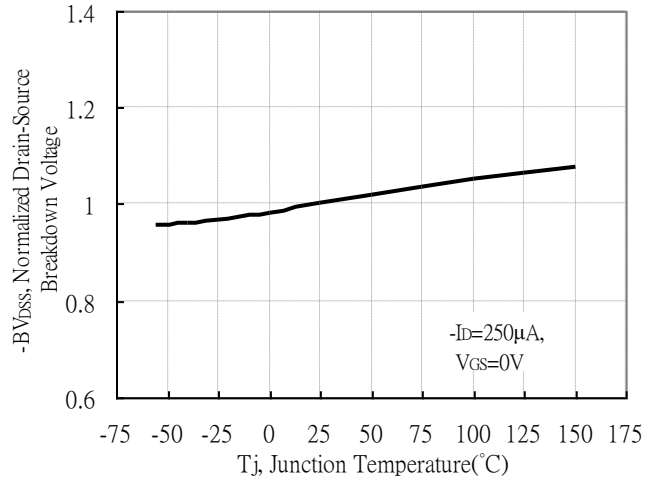


**Typical Characteristics : Q2( P-channel)**

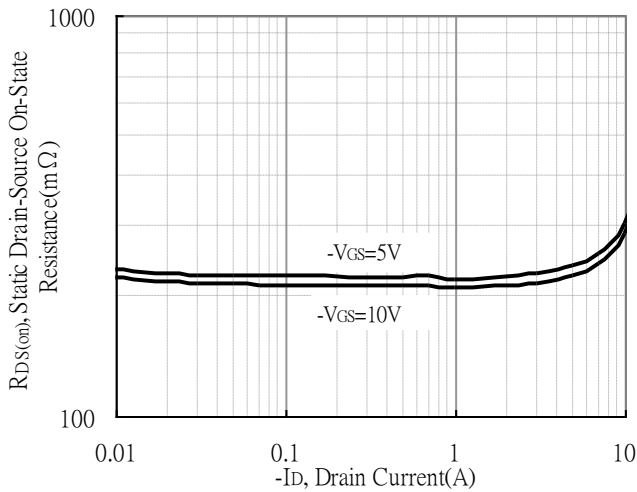
Typical Output Characteristics



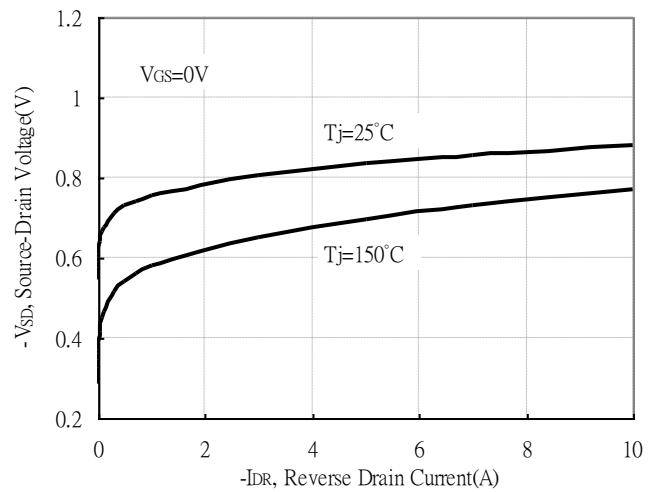
Brekdown Voltage vs Ambient Temperature



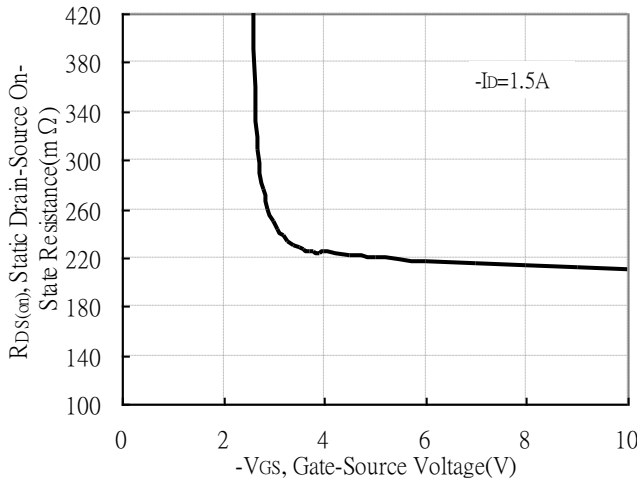
Static Drain-Source On-State resistance vs Drain Current



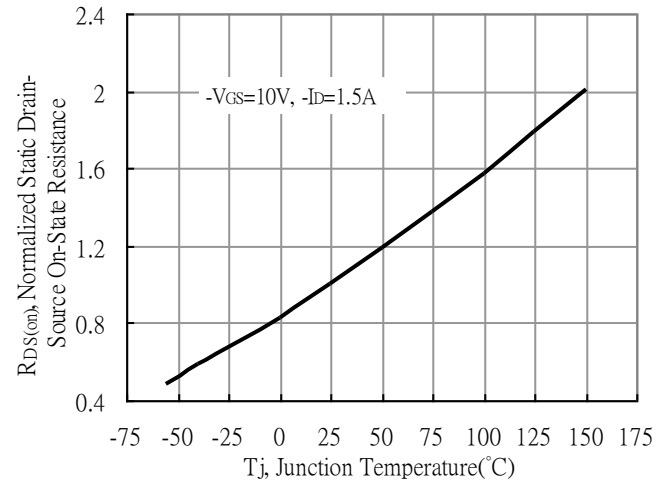
Reverse Drain Current vs Source-Drain Voltage



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



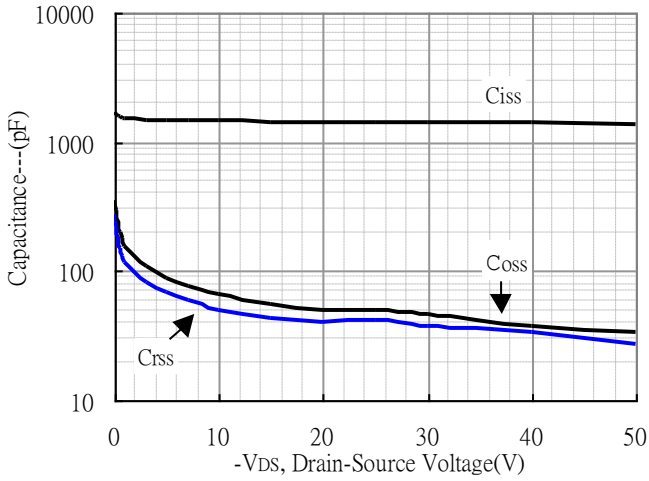
Drain-Source On-State Resistance vs Junction Temperature



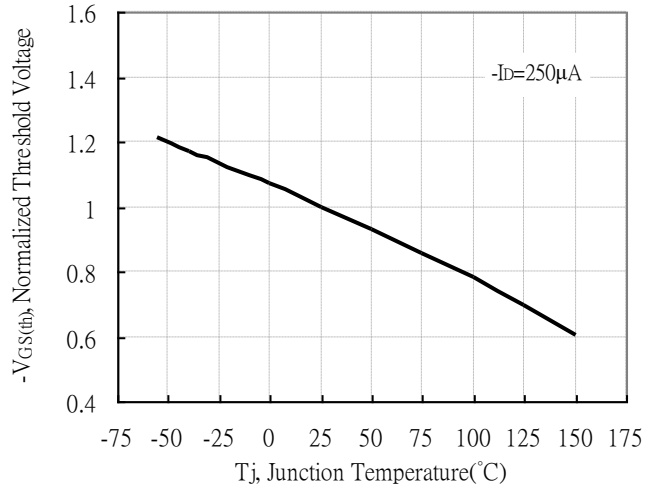


### Typical Characteristics(Cont.) : Q2(P-channel)

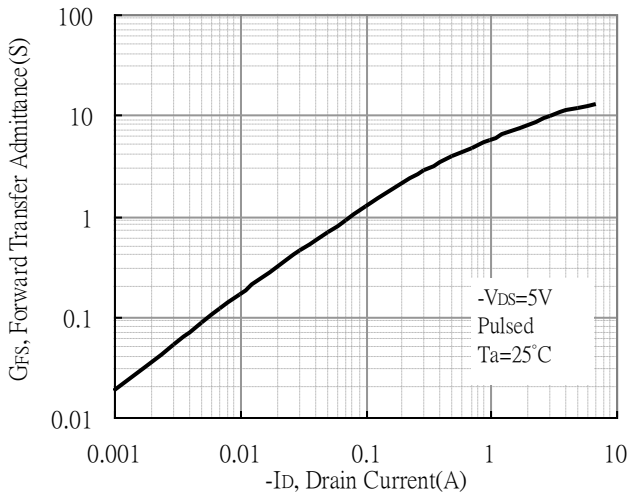
Capacitance vs Drain-to-Source Voltage



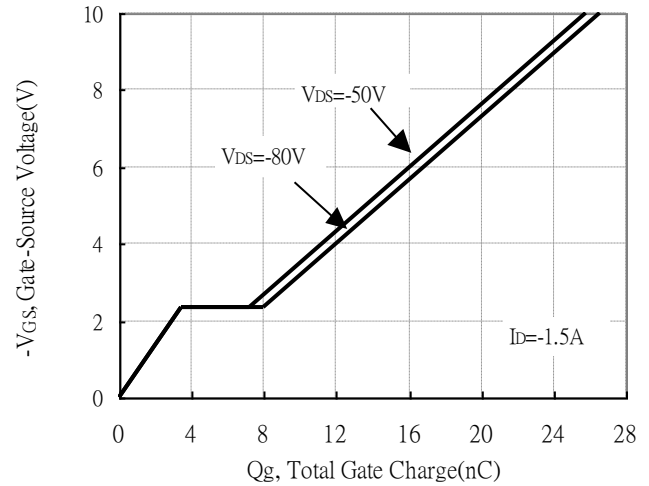
Threshold Voltage vs Junction Temperature



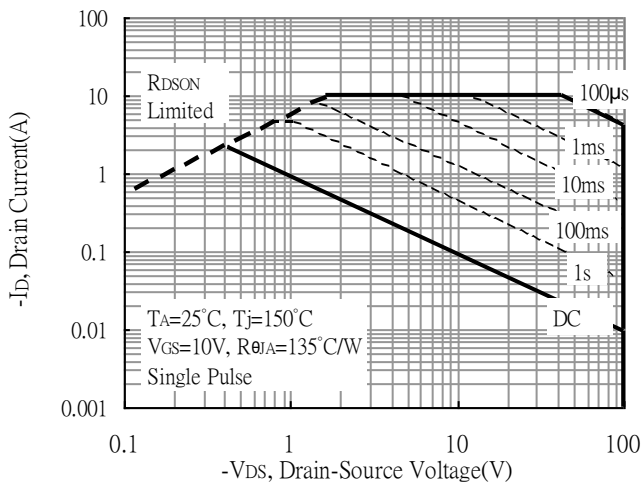
Forward Transfer Admittance vs Drain Current



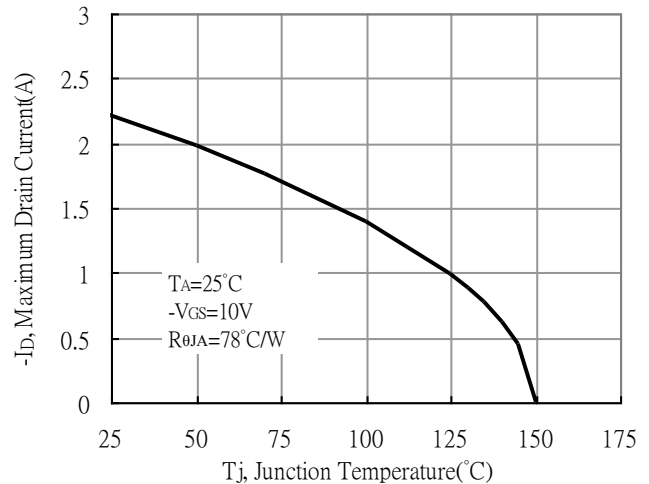
Gate Charge Characteristics



Maximum Safe Operating Area



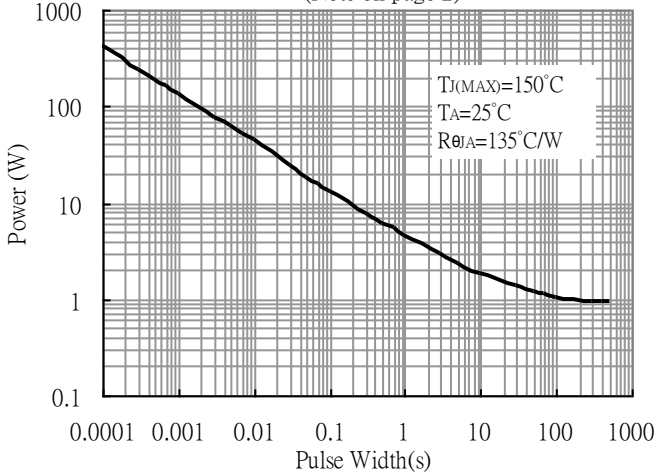
Maximum Drain Current vs Case Temperature



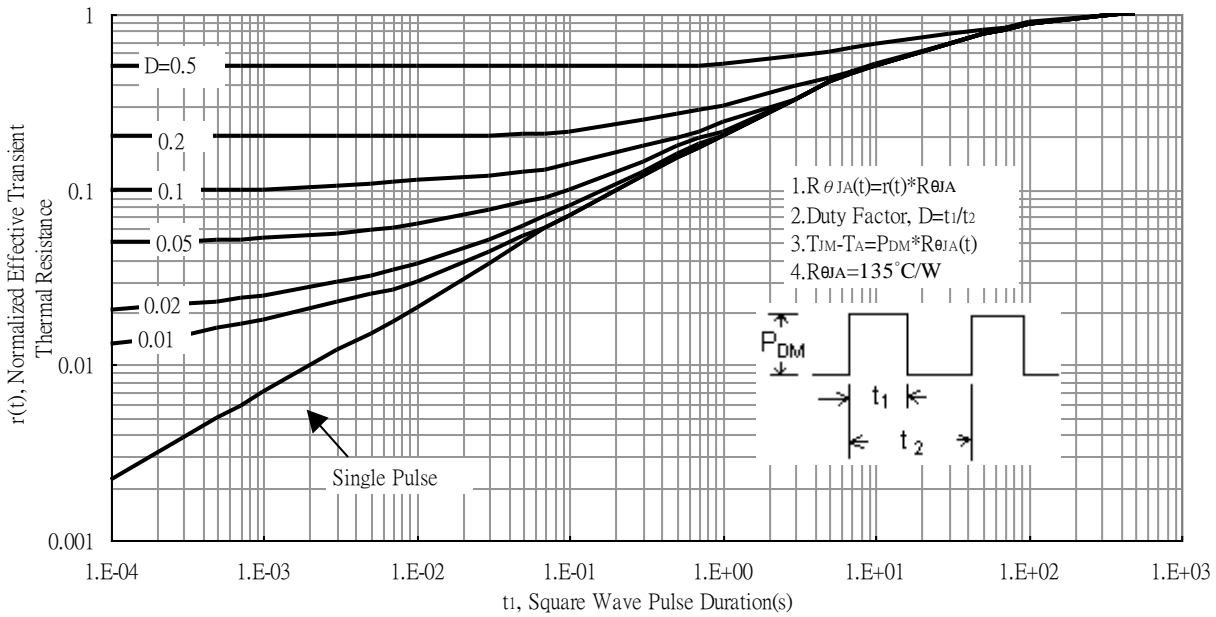


**Typical Characteristics(Cont.) : Q2(P-channel)**

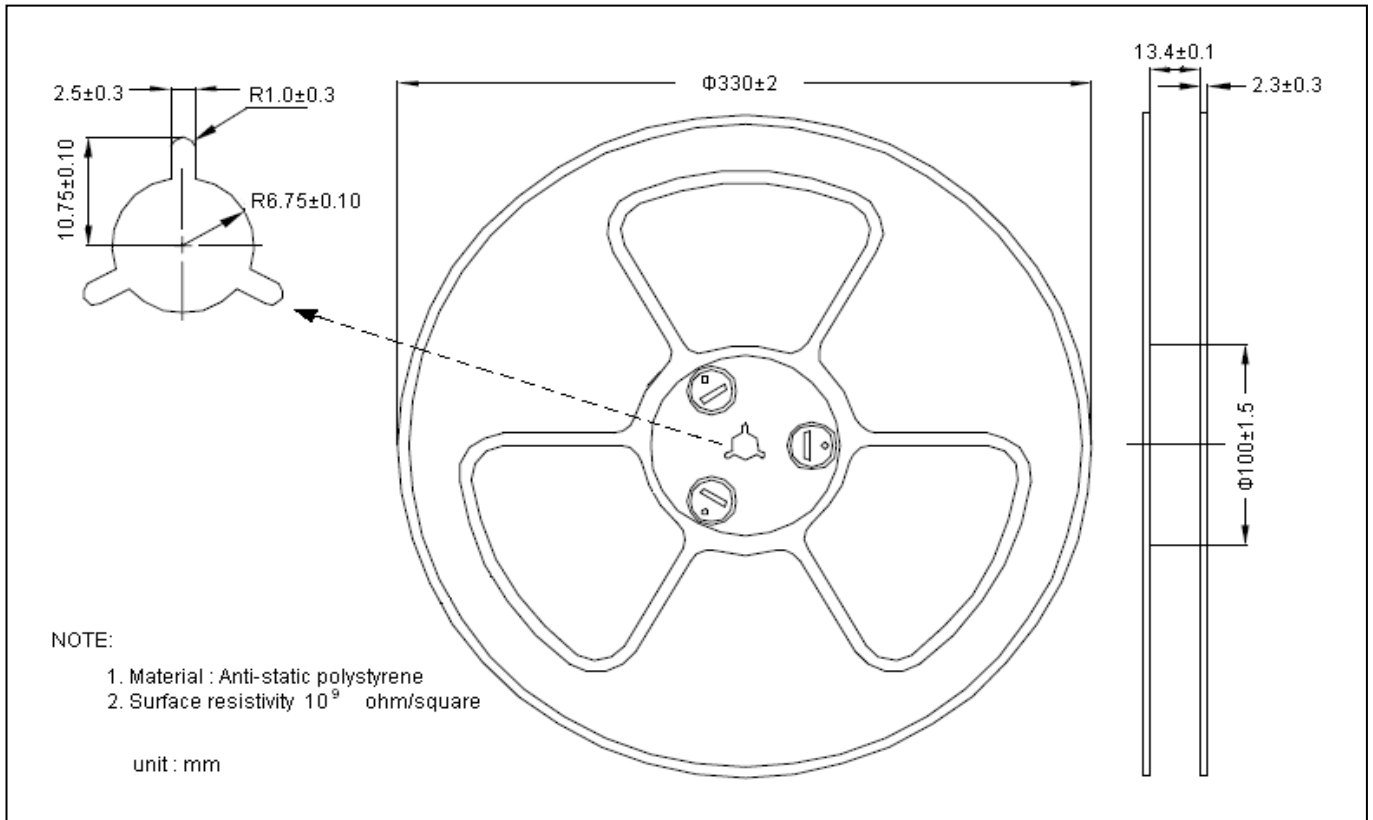
Single Pulse Power Rating, Junction to Ambient  
 (Note on page 2)



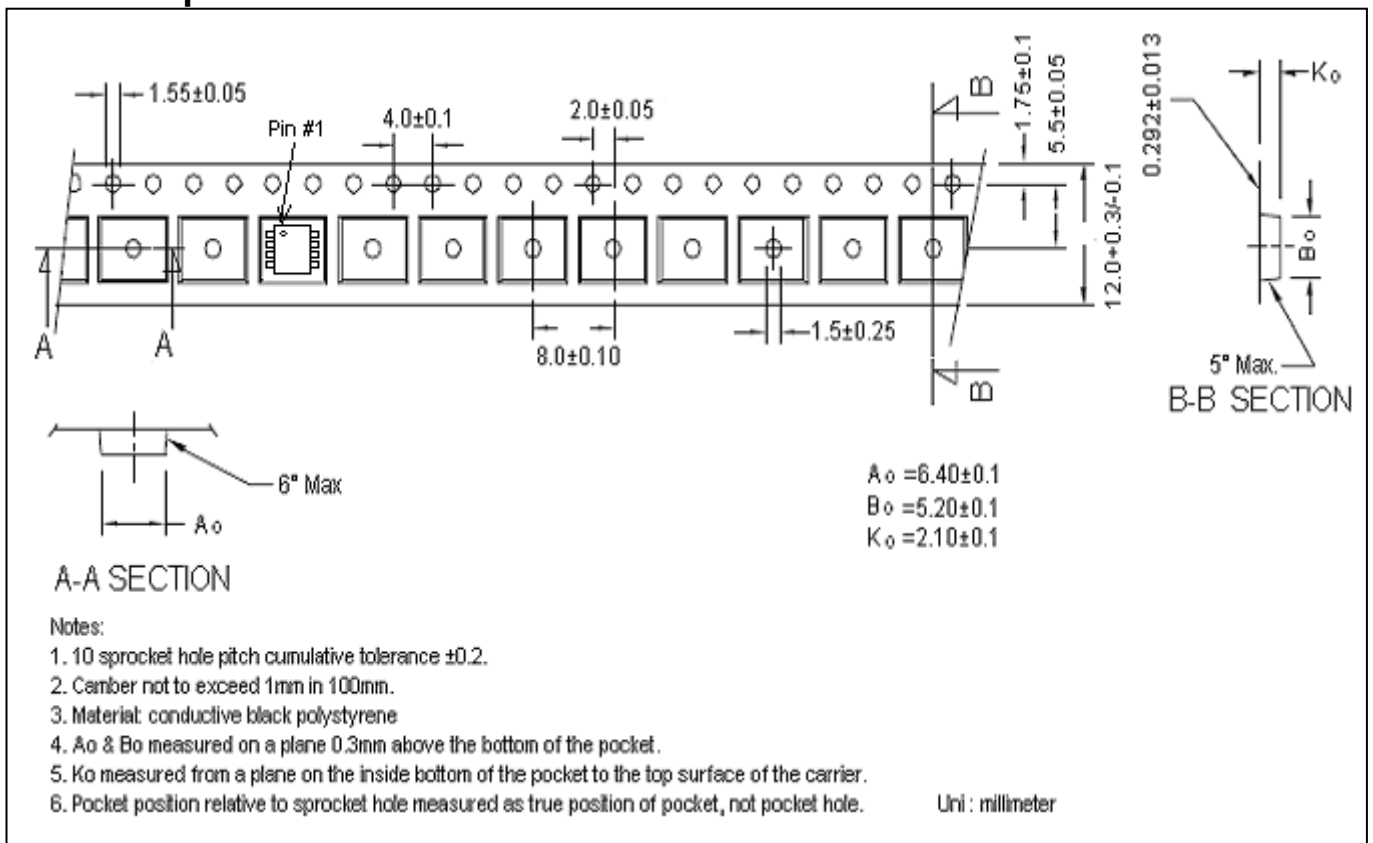
Transient Thermal Response Curves



**Reel Dimension**



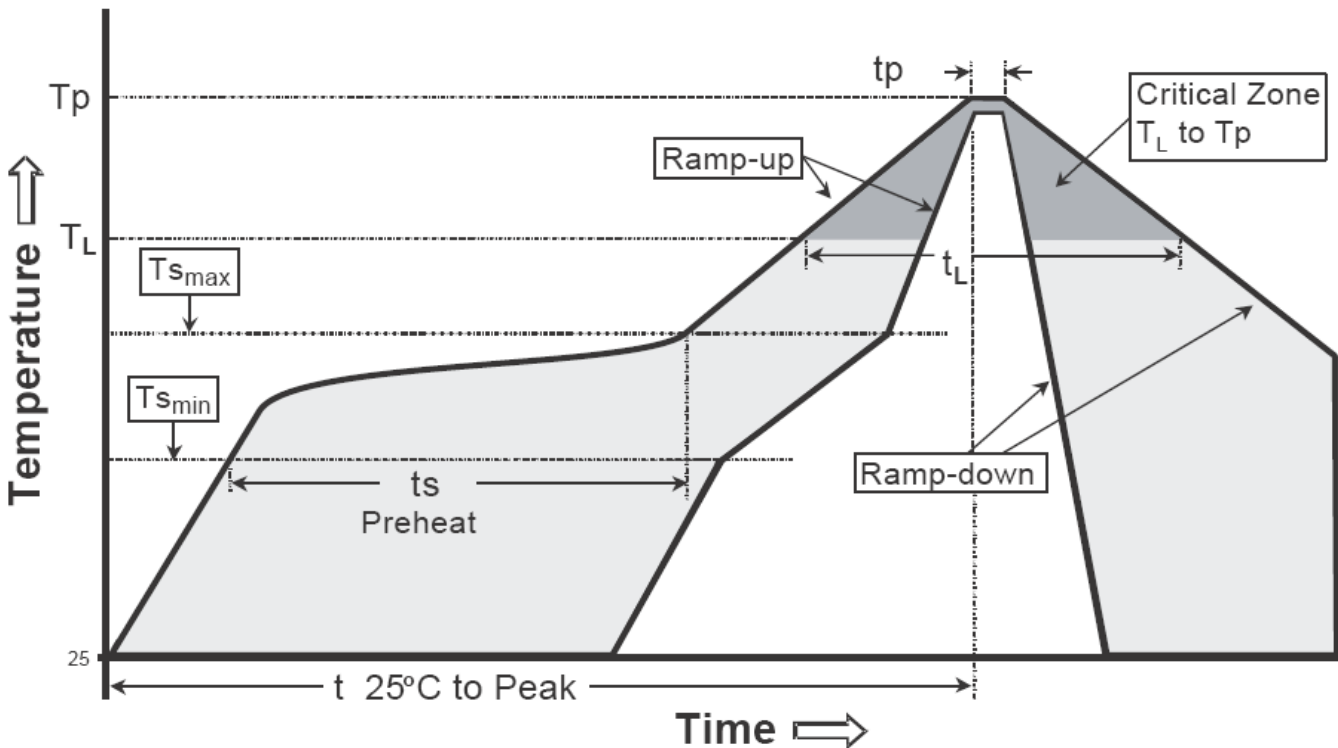
**Carrier Tape Dimension**



**Recommended wave soldering condition**

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

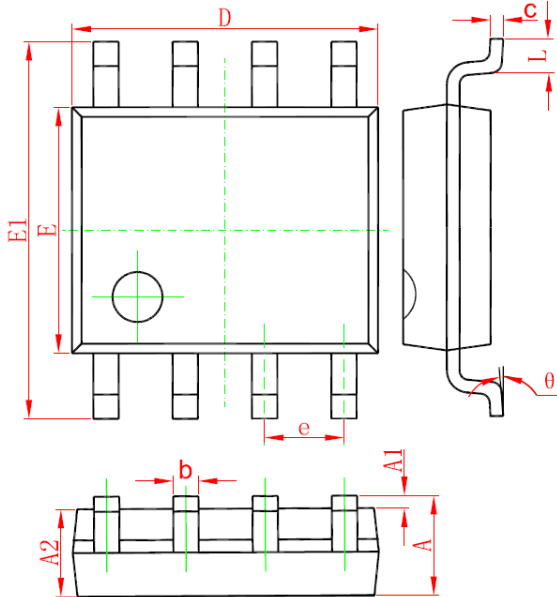
**Recommended temperature profile for IR reflow**



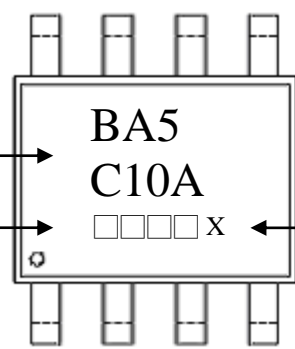
Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T <sub>s min</sub> )	100°C	150°C
-Temperature Max(T <sub>s max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub>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



**Marking:**



Device Code → BA5  
 Date Code → C10A  
 Assembly site code → X

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

Production site code : blank→site 1, G →site 2

**8-Lead SOP-8 Plastic Package  
 CYStek Package Code: Q8**

\*: Typical

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069	E	3.800	4.000	0.150	0.157
A1	0.100	0.250	0.004	0.010	E1	5.800	6.200	0.228	0.244
A2	1.350	1.550	0.053	0.061	e	*1.270		*0.050	
b	0.330	0.510	0.013	0.020	L	0.400	1.270	0.016	0.050
c	0.170	0.250	0.006	0.010	θ	0°	8°	0°	8°
D	4.700	5.100	0.185	0.200					

- 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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