

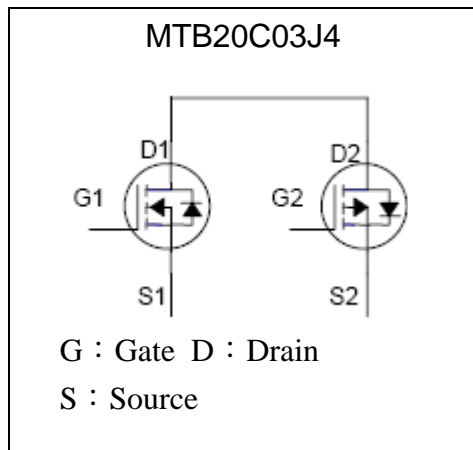
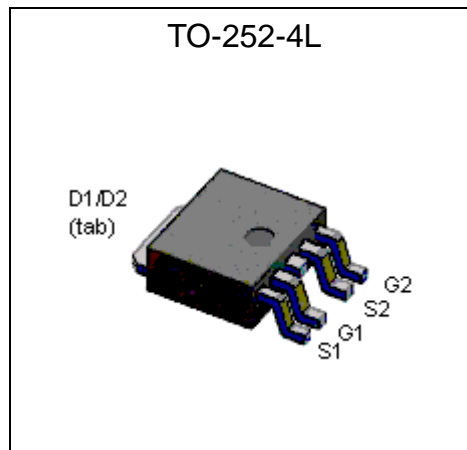
**N & P-Channel Enhancement Mode Power MOSFET**

# MTB20C03J4

	N-CH	P-CH
$BV_{DSS}$	30V	-30V
$I_D$ @ $T_C=25^\circ\text{C}$ , $V_{GS}=10\text{V}(-10\text{V})$	31A	-27A
$I_D$ @ $T_A=25^\circ\text{C}$ , $V_{GS}=10\text{V}(-10\text{V})$	8A	-7A
$R_{DS(on)(MAX)}$ @ $V_{GS}=10\text{V}(-10\text{V})$	18m $\Omega$	27m $\Omega$
$R_{DS(on)(MAX)}$ @ $V_{GS}=4.5\text{V}(-4.5\text{V})$	30m $\Omega$	45m $\Omega$

**Features**

- Low Gate Charge
- Simple Drive Requirement
- RoHS compliant & Halogen-free package

**Equivalent Circuit**

**Outline**

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

Parameter	Symbol	Limits		Unit
		N-channel	P-channel	
Drain-Source Voltage	$V_{DS}$	30	-30	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	$\pm 20$	
Continuous Drain Current @ $T_C=25^\circ\text{C}$ , $V_{GS}=10\text{V}(-10\text{V for P-CH})$	$I_D$	31	-27	A
Continuous Drain Current @ $T_C=100^\circ\text{C}$ , $V_{GS}=10\text{V}(-10\text{V})$		22	-19	
Continuous Drain Current @ $T_A=25^\circ\text{C}$ , $V_{GS}=10\text{V}(-10\text{V})$		8	-7	
Continuous Drain Current @ $T_A=70^\circ\text{C}$ , $V_{GS}=10\text{V}(-10\text{V})$		6.7	-5.9	
Pulsed Drain Current *1	$I_{DM}$	66	-45	
Avalanche Current	$I_{AS}$	15	-15	
Avalanche Energy @ $L=0.1\text{mH}$ , $I_D=15\text{A}(-15\text{A for P-ch})$ , $R_G=25\Omega$	$E_{AS}$	11.3	11.3	mJ
Repetitive Avalanche Energy @ $L=0.05\text{mH}$ *2	$E_{AR}$	2.5	2.5	
Total Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	25		W
Total Power Dissipation ( $T_C=100^\circ\text{C}$ )		12.5		
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	-55~+175		$^\circ\text{C}$

Note : \*1. Pulse width limited by maximum junction temperature

 \*2. Duty cycle  $\leq 1\%$



**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	6	°C/W
Thermal Resistance, Junction-to-ambient, max * 1	$R_{th,j-a}$	90	

Note : \*1 62.5°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
$BV_{DSS}$	30	-	-	V	$V_{GS}=0V, I_D=250\mu A$
$V_{GS(th)}$	1.4	-	2.5		$V_{DS}=V_{GS}, I_D=250\mu A$
$G_{FS}$ *1	-	9	-	S	$V_{DS}=5V, I_D=8A$
$I_{GSS}$	-	-	±100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
$I_{DSS}$	-	-	1	μA	$V_{DS}=24V, V_{GS}=0V$
	-	-	25		$V_{DS}=20V, V_{GS}=0V, T_j=125^\circ C$
$I_{D(ON)}$ *1	31	-	-	A	$V_{DS}=5V, V_{GS}=10V$
$R_{DS(ON)}$ *1	-	13	18	mΩ	$V_{GS}=10V, I_D=8A$
	-	22	30		$V_{GS}=4.5V, I_D=6A$
<b>Dynamic</b>					
$Q_g(V_{GS}=10V)$ *1	-	11	-	nC	$I_D=8A, V_{DS}=15V, V_{GS}=10V$
$Q_g(V_{GS}=4.5V)$ *1	-	6.5	-		
$Q_{gs}$ *1	-	2.5	-		
$Q_{gd}$ *1	-	3.1	-		
$t_{d(ON)}$ *1	-	8	-	ns	$V_{DS}=15V, I_D=1A, V_{GS}=10V, R_G=6\Omega$
$t_r$ *1	-	7	-		
$t_{d(OFF)}$ *1	-	34	-		
$t_f$ *1	-	12	-		
$C_{iss}$	-	543	-	pF	$V_{GS}=0V, V_{DS}=15V, f=1MHz$
$C_{oss}$	-	79	-		
$C_{rss}$	-	67	-		
<b>Source-Drain Diode</b>					
$I_S$ *1	-	-	2.3	A	
$I_{SM}$ *2	-	-	9.2		
$V_{SD}$ *1	-	-	1.2	V	$I_F=I_S, V_{GS}=0V$
$t_{rr}$ *1	-	45	-	ns	$I_F=I_S, V_{GS}=0V, dI_F/dt=100A/\mu s$
$Q_{rr}$ *1	-	1.8	-	nC	

Note : \*1.Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

\*2.Pulse width limited by maximum junction temperature.



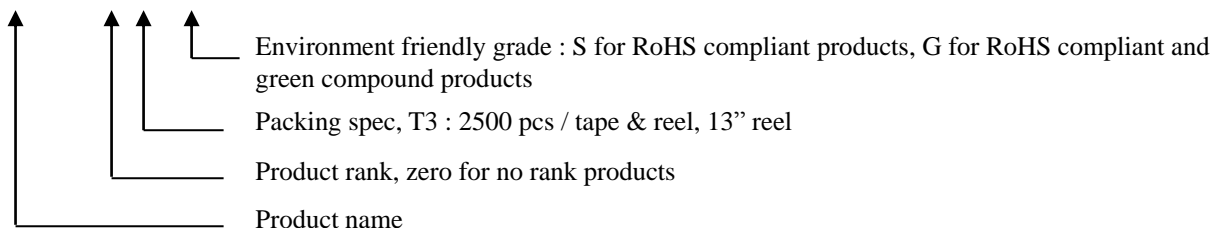
**P-CH Characteristics (Tc=25°C, unless otherwise specified)**

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	-30	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA
V <sub>GS(th)</sub>	-1.4	-	-2.5		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA
G <sub>FS</sub> *1	-	12	-	S	V <sub>DS</sub> =-5V, I <sub>D</sub> =-7A
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> =-24V, V <sub>GS</sub> =0V
	-	-	-25		V <sub>DS</sub> =-20V, V <sub>GS</sub> =0V, T <sub>j</sub> =125°C
I <sub>D(ON)</sub> *1	-27	-	-	A	V <sub>DS</sub> =-5V, V <sub>GS</sub> =-10V
R <sub>DS(ON)</sub> *1	-	27	35	mΩ	V <sub>GS</sub> =-10V, I <sub>D</sub> =-7A
	-	38	53		V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-5A
<b>Dynamic</b>					
Q <sub>g</sub> (V <sub>GS</sub> =-10V)*1	-	16	-	nC	I <sub>D</sub> =-7A, V <sub>DS</sub> =-15V, V <sub>GS</sub> =-10V
Q <sub>g</sub> (V <sub>GS</sub> =-4.5V)*1	-	10	-		
Q <sub>gs</sub> *1	-	3.9	-		
Q <sub>gd</sub> *1	-	4.9	-		
t <sub>d(ON)</sub> *1	-	13	-	ns	V <sub>DS</sub> =-15V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-10V, R <sub>G</sub> =6Ω
t <sub>r</sub> *1	-	10	-		
t <sub>d(OFF)</sub> *1	-	44	-		
t <sub>f</sub> *1	-	17	-		
C <sub>iss</sub>	-	951	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =-15V, f=1MHz
C <sub>oss</sub>	-	116	-		
C <sub>rss</sub>	-	94	-		
<b>Source-Drain Diode</b>					
I <sub>s</sub> *1	-	-	-2.3	A	
I <sub>SM</sub> *2	-	-	-9.2		
V <sub>SD</sub> *1	-	-	-1.2	V	I <sub>F</sub> =I <sub>s</sub> , V <sub>GS</sub> =0V
t <sub>rr</sub> *1	-	56	-	ns	I <sub>F</sub> =I <sub>s</sub> , V <sub>GS</sub> =0V, dI <sub>F</sub> /dt=100A/μs
Q <sub>rr</sub> *1	-	2.5	-	nC	

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

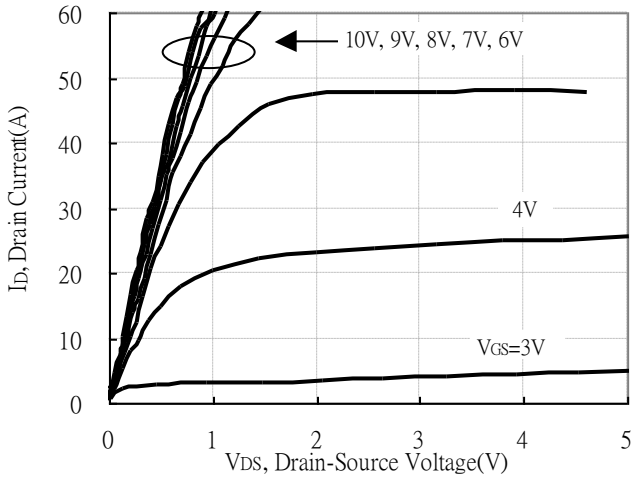
**Ordering Information**

Device	Package	Shipping
MTB20C03J4-0-T3-G	TO-252 (RoHS compliant & Halogen-free package)	2500 pcs / Tape & Reel

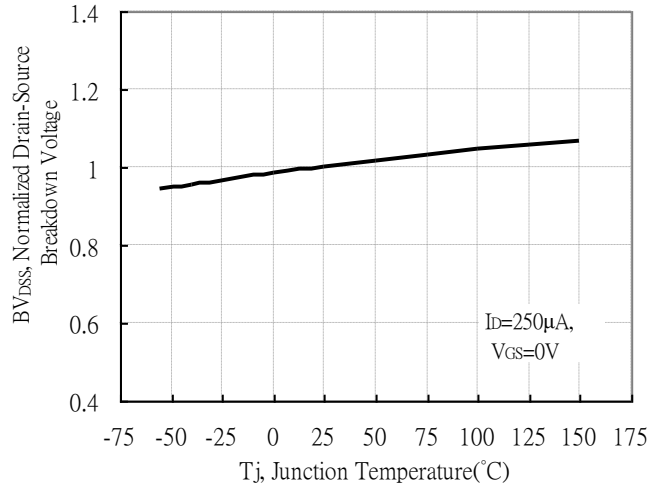


**Q1, N-CH Typical Characteristics**

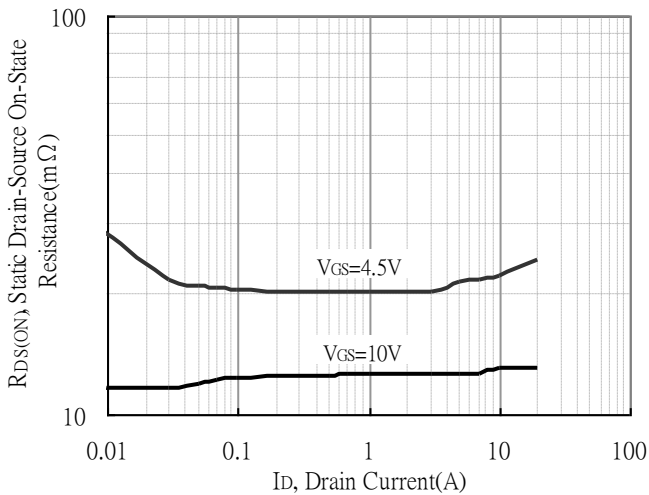
Typical Output Characteristics



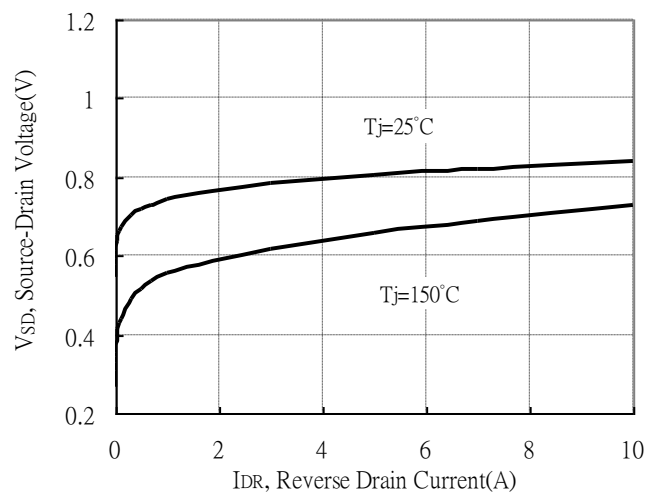
Brekdown Voltage vs Ambient Temperature



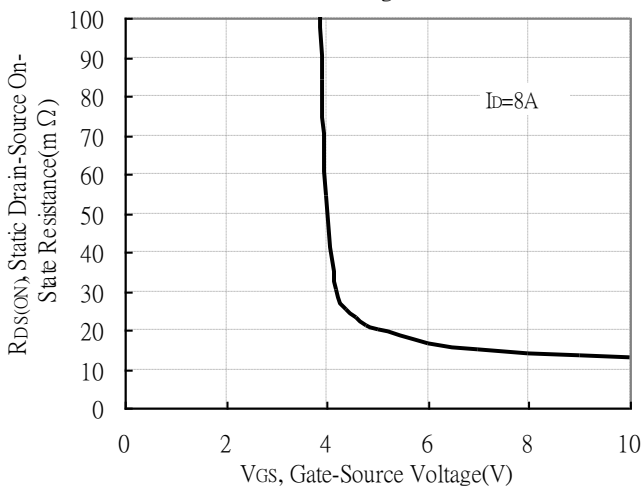
Static Drain-Source On-State resistance vs Drain Current



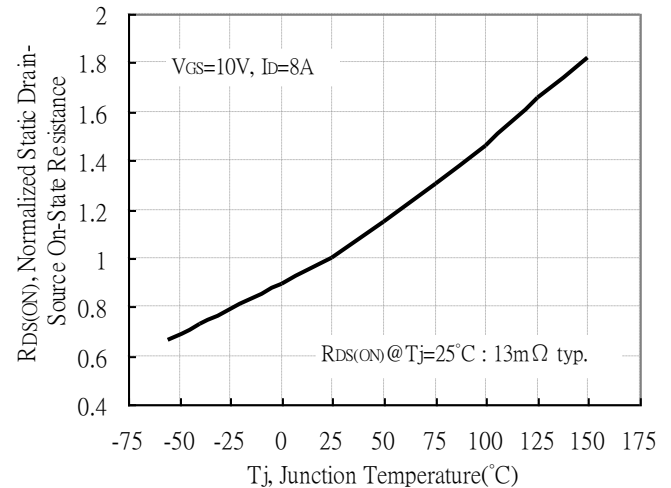
Reverse Drain Current vs Source-Drain Voltage



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

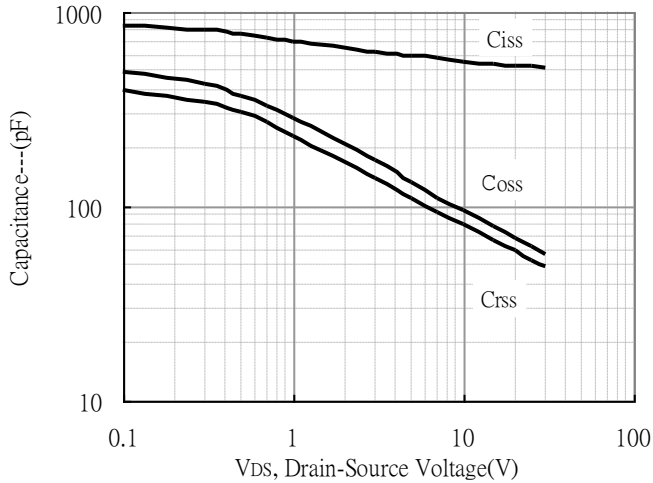


Drain-Source On-State Resistance vs Junction Temperature

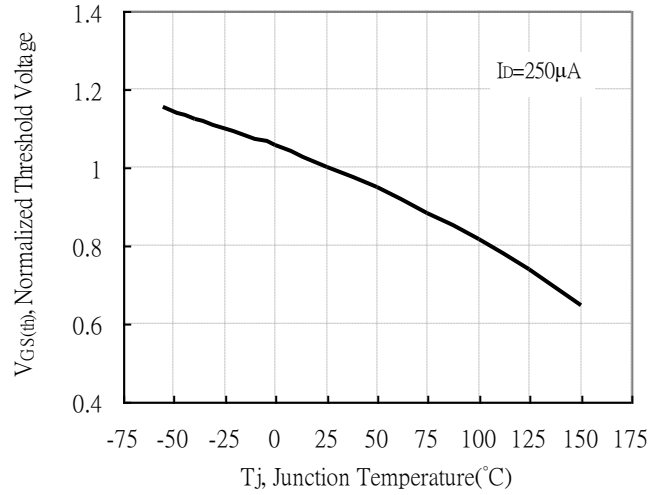


## Q1, N-CH Typical Characteristics(Cont.)

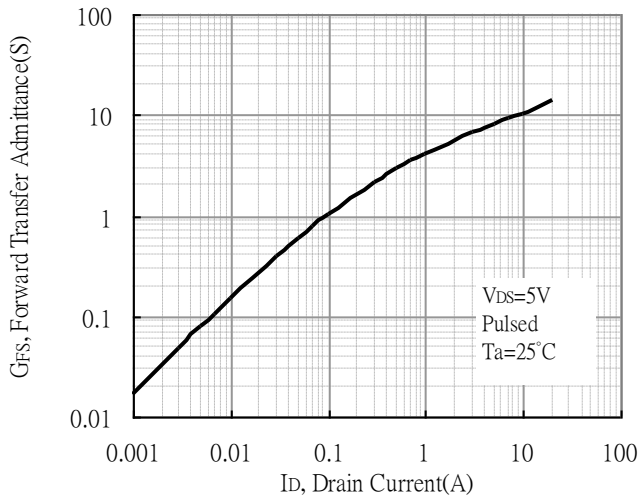
Capacitance vs Drain-to-Source Voltage



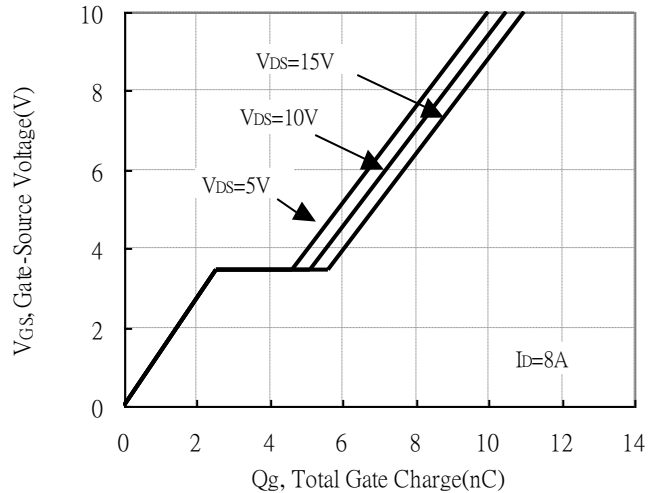
Threshold Voltage vs Junction Temperature



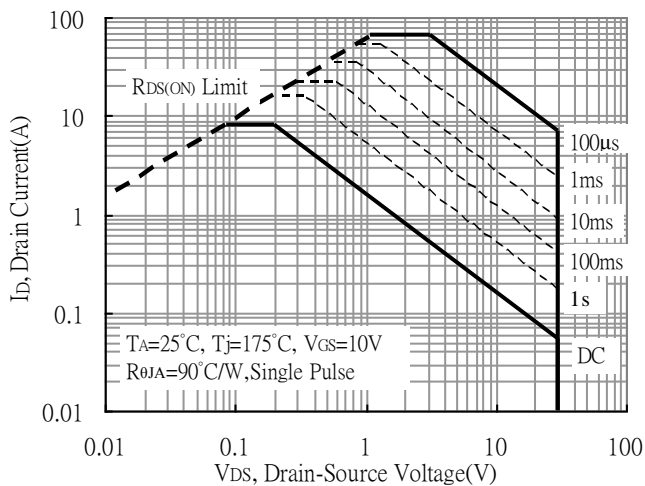
Forward Transfer Admittance vs Drain Current



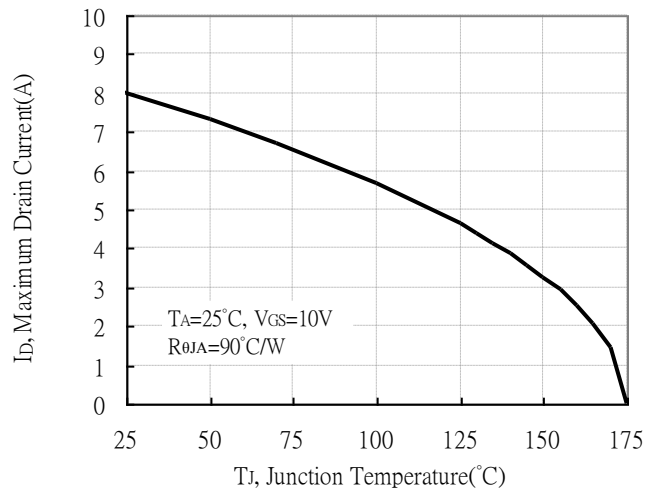
Gate Charge Characteristics



Maximum Safe Operating Area

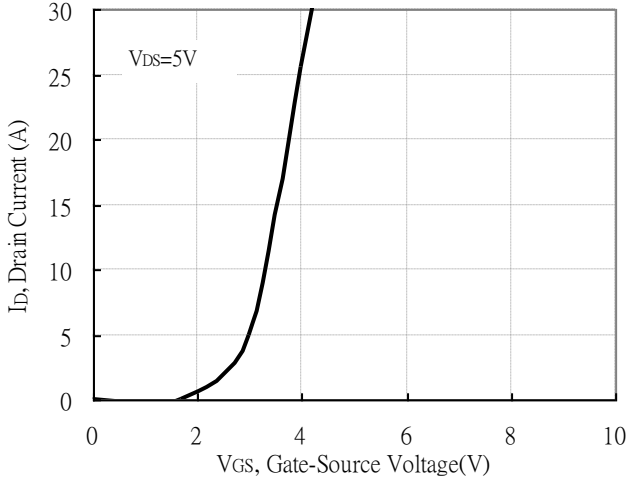


Maximum Drain Current vs Junction Temperature

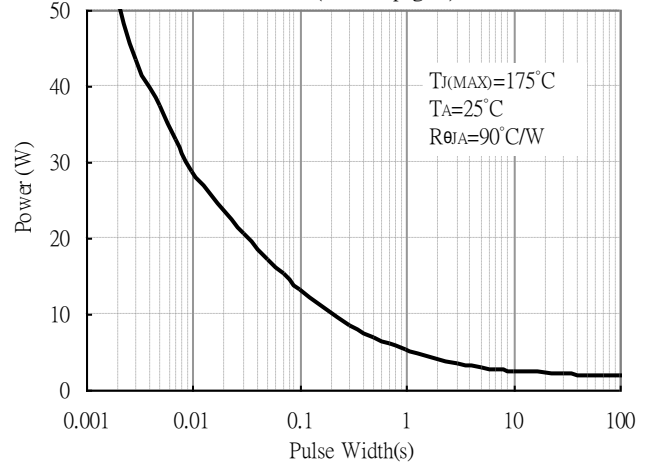


**Q1, N-CH Typical Characteristics(Cont.)**

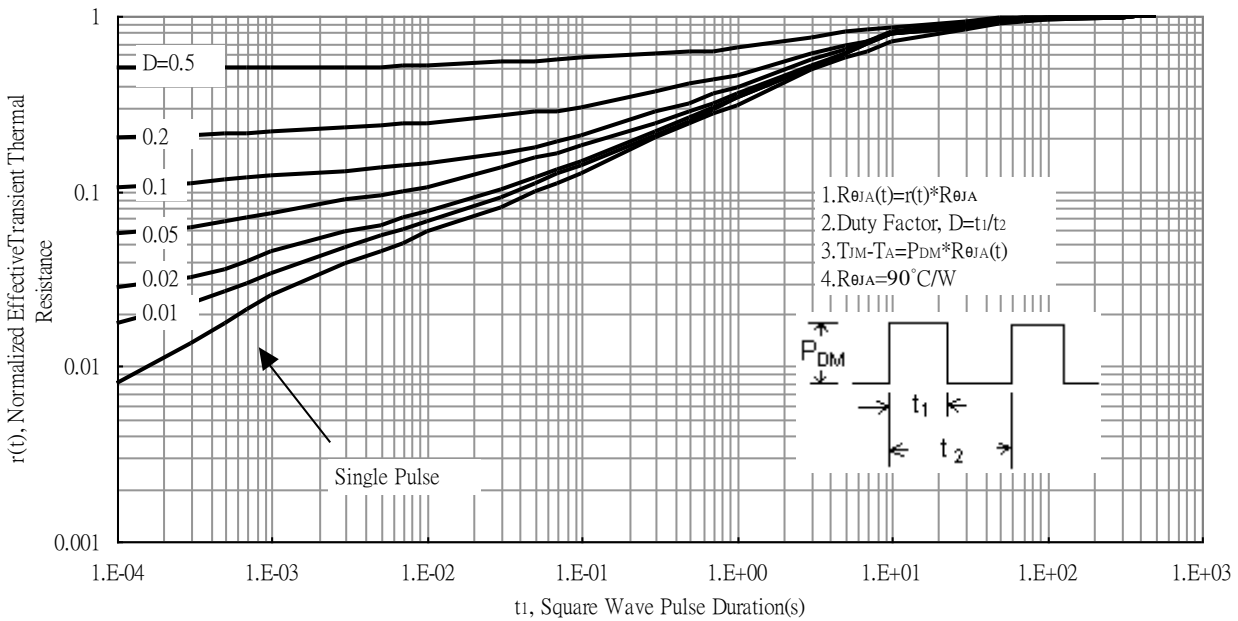
Typical Transfer Characteristics



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



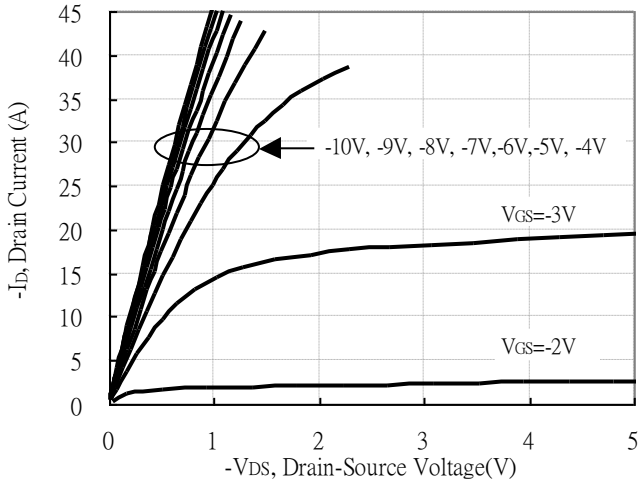
Transient Thermal Response Curves



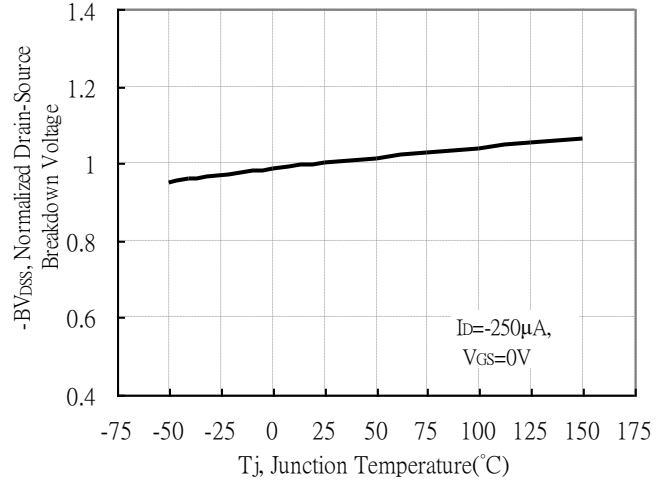


### Q2, P-CH Typical Characteristics

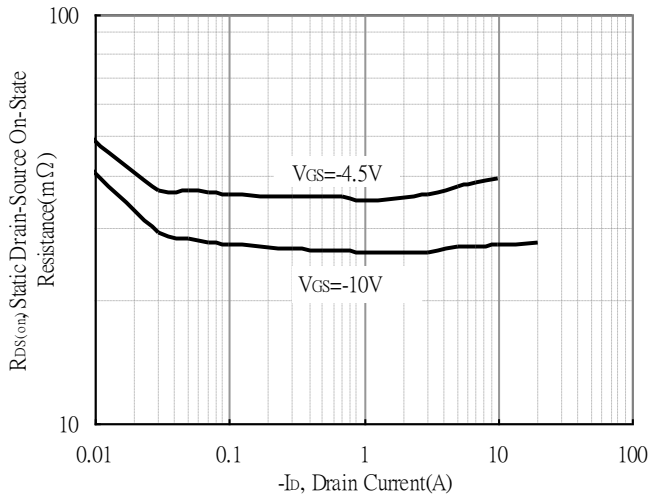
Typical Output Characteristics



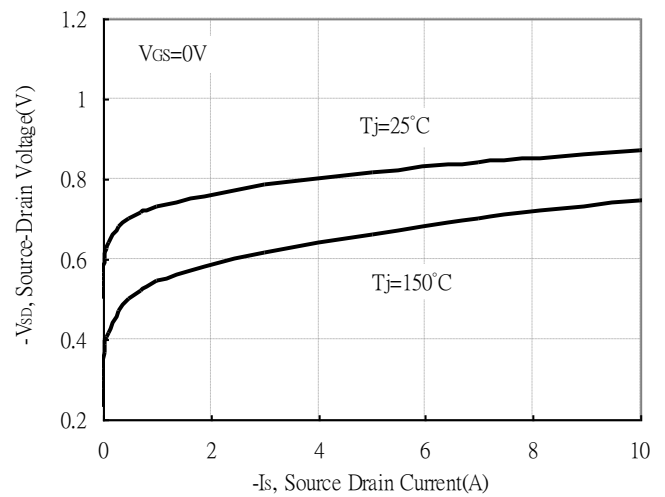
Brekdown Voltage vs Ambient Temperature



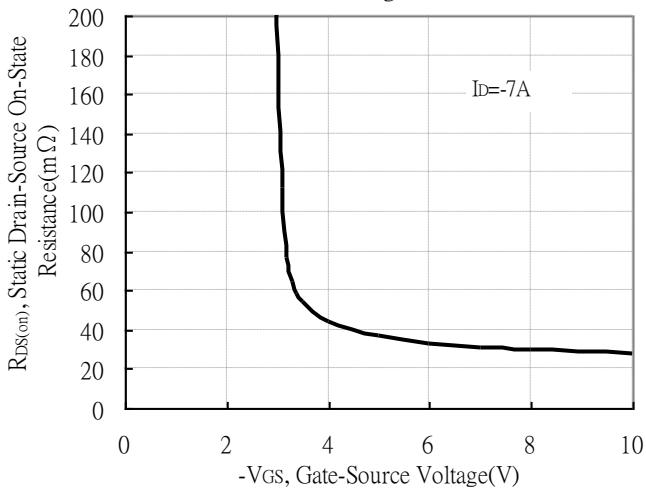
Static Drain-Source On-State resistance vs Drain Current



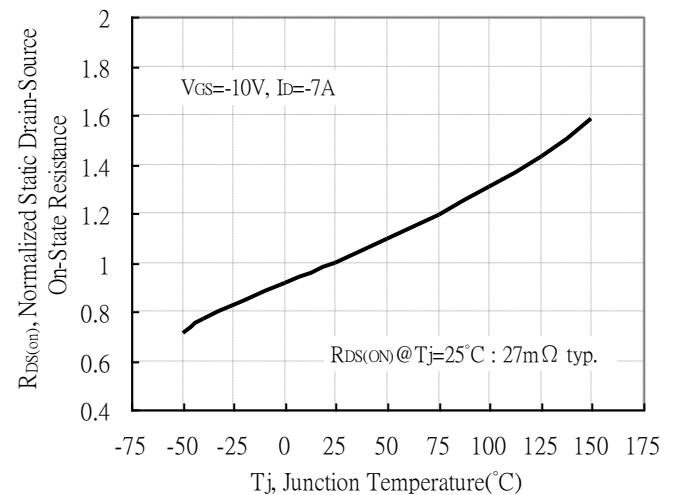
Source Drain Current vs Source-Drain Voltage



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

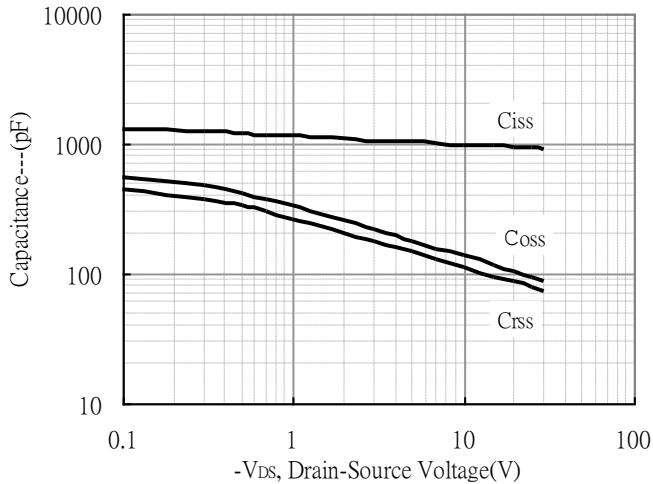


Drain-Source On-State Resistance vs Junction Temperature

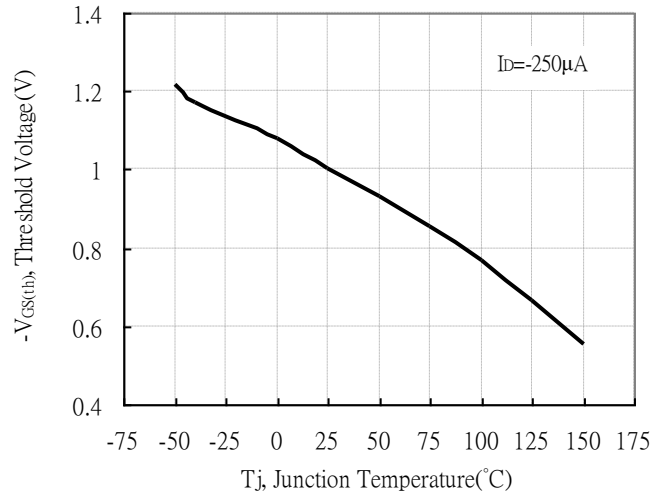


## Q2, P-CH Typical Characteristics(Cont.)

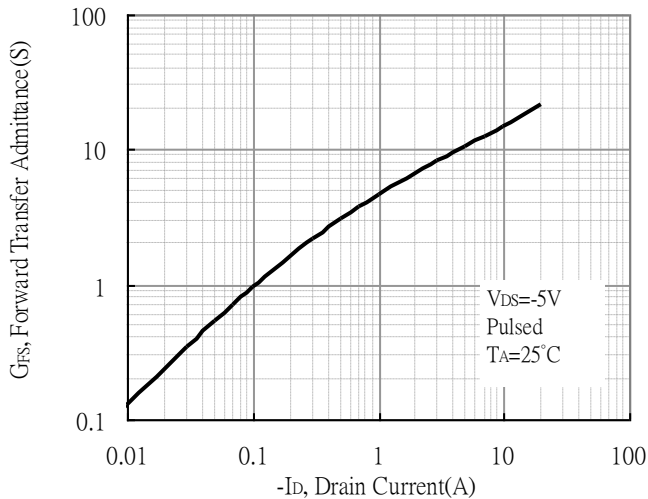
Capacitance vs Drain-to-Source Voltage



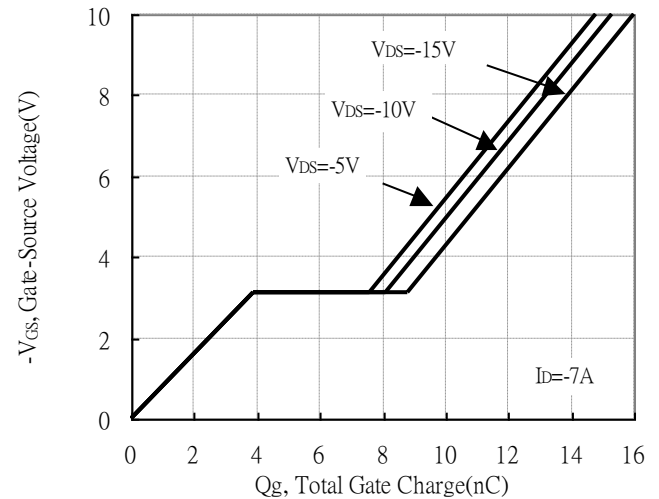
Threshold Voltage vs Junction Temperature



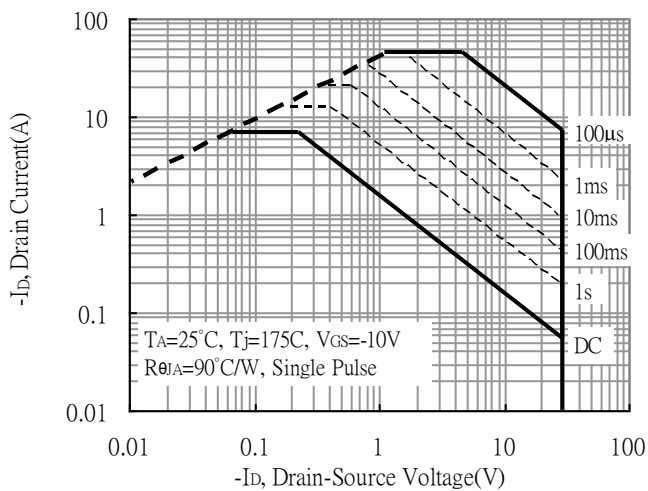
Forward Transfer Admittance vs Drain Current



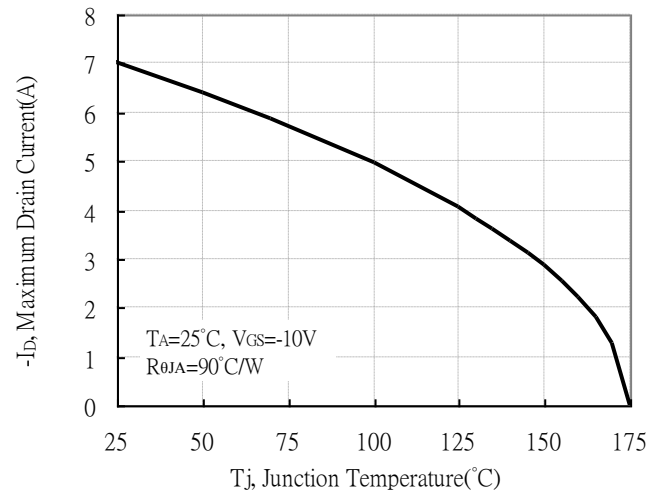
Gate Charge Characteristics



Maximum Safe Operating Area



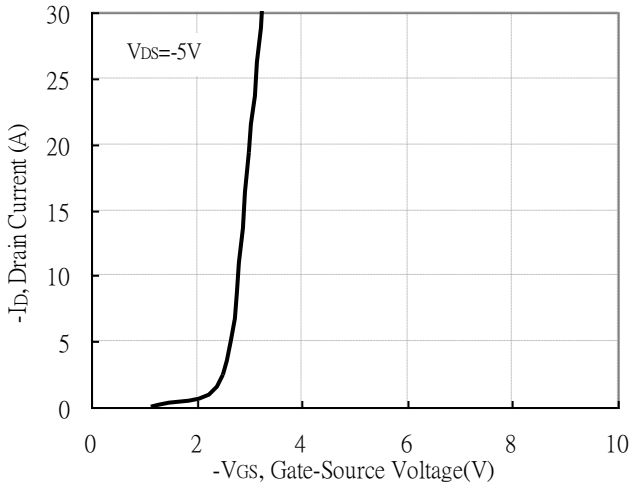
Maximum Drain Current vs Junction Temperature



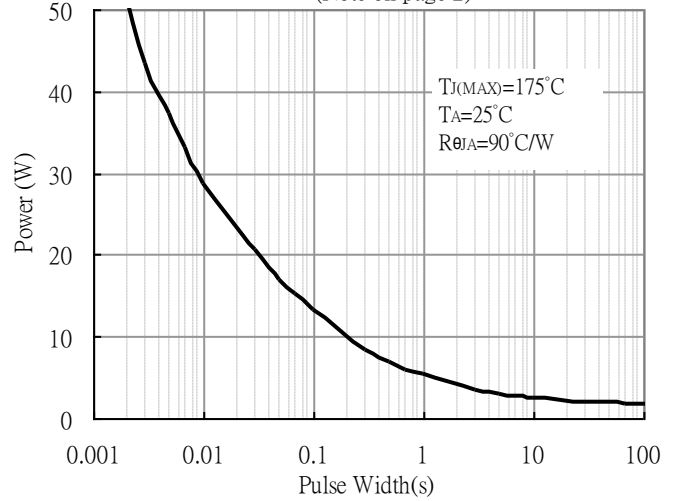


**Q2, P-CH Typical Characteristics(Cont.)**

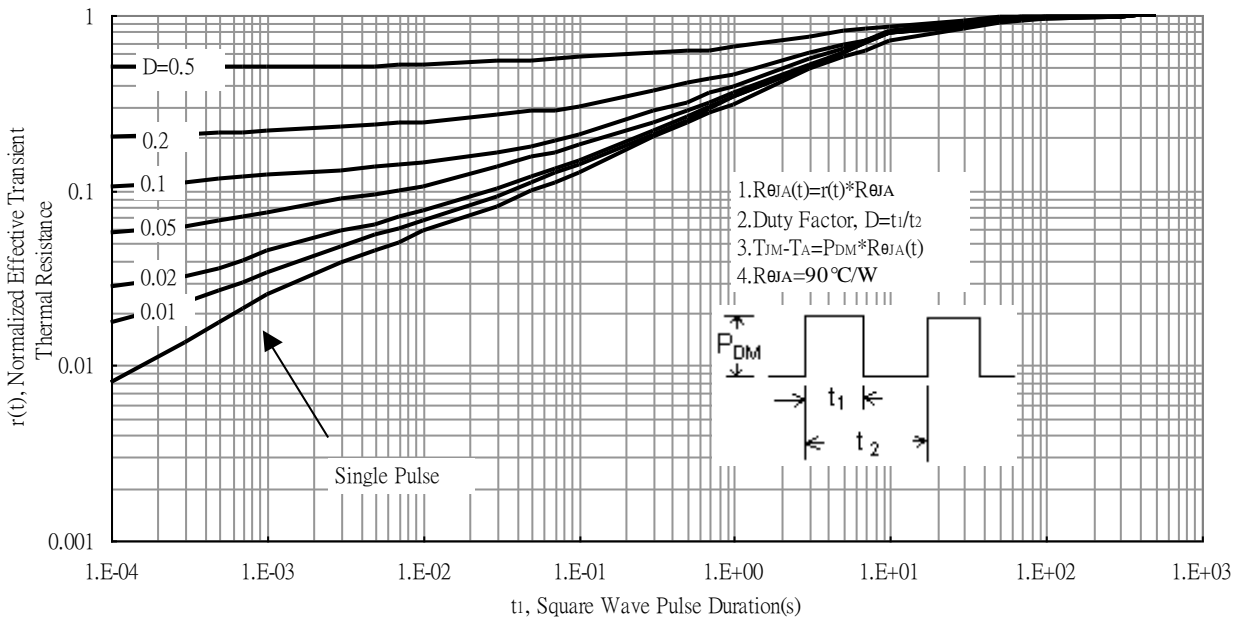
Typical Transfer Characteristics



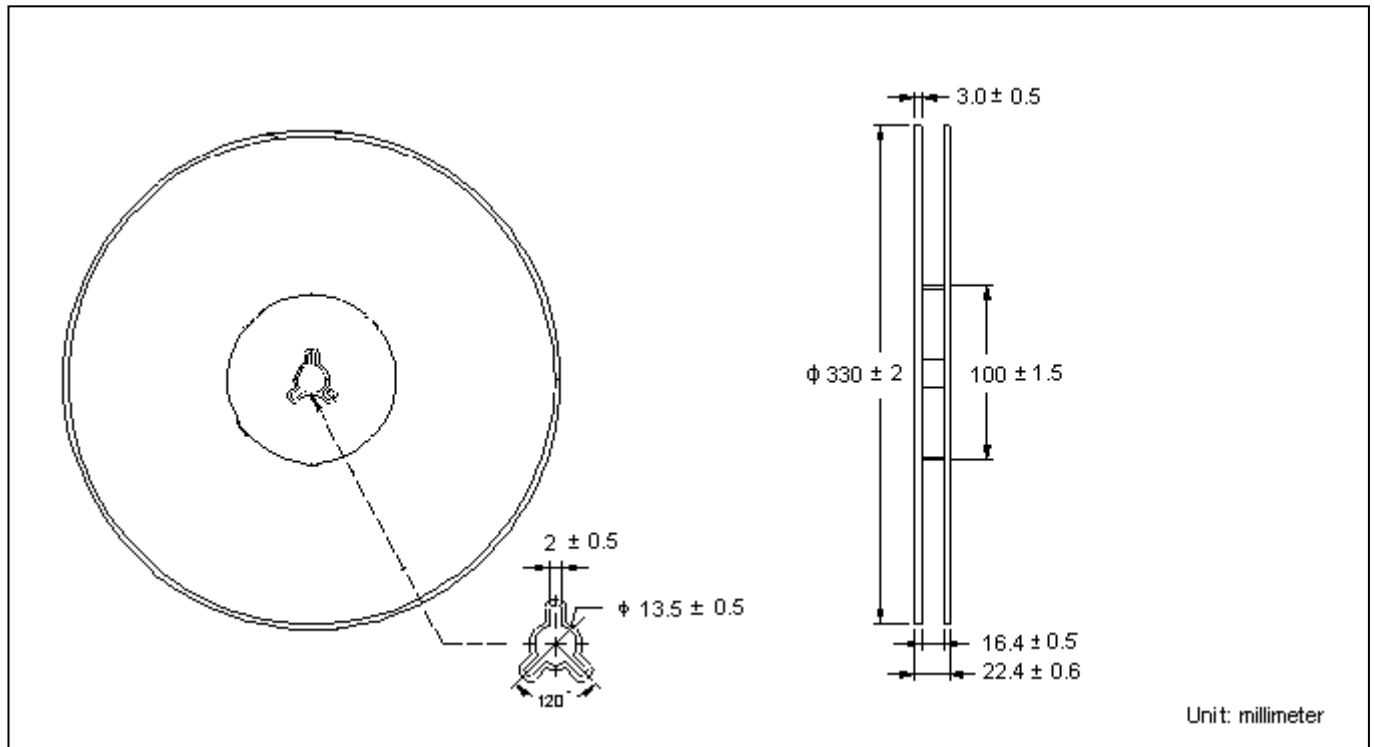
Single Pulse Power Rating, Junction to Ambient  
 (Note on page 2)



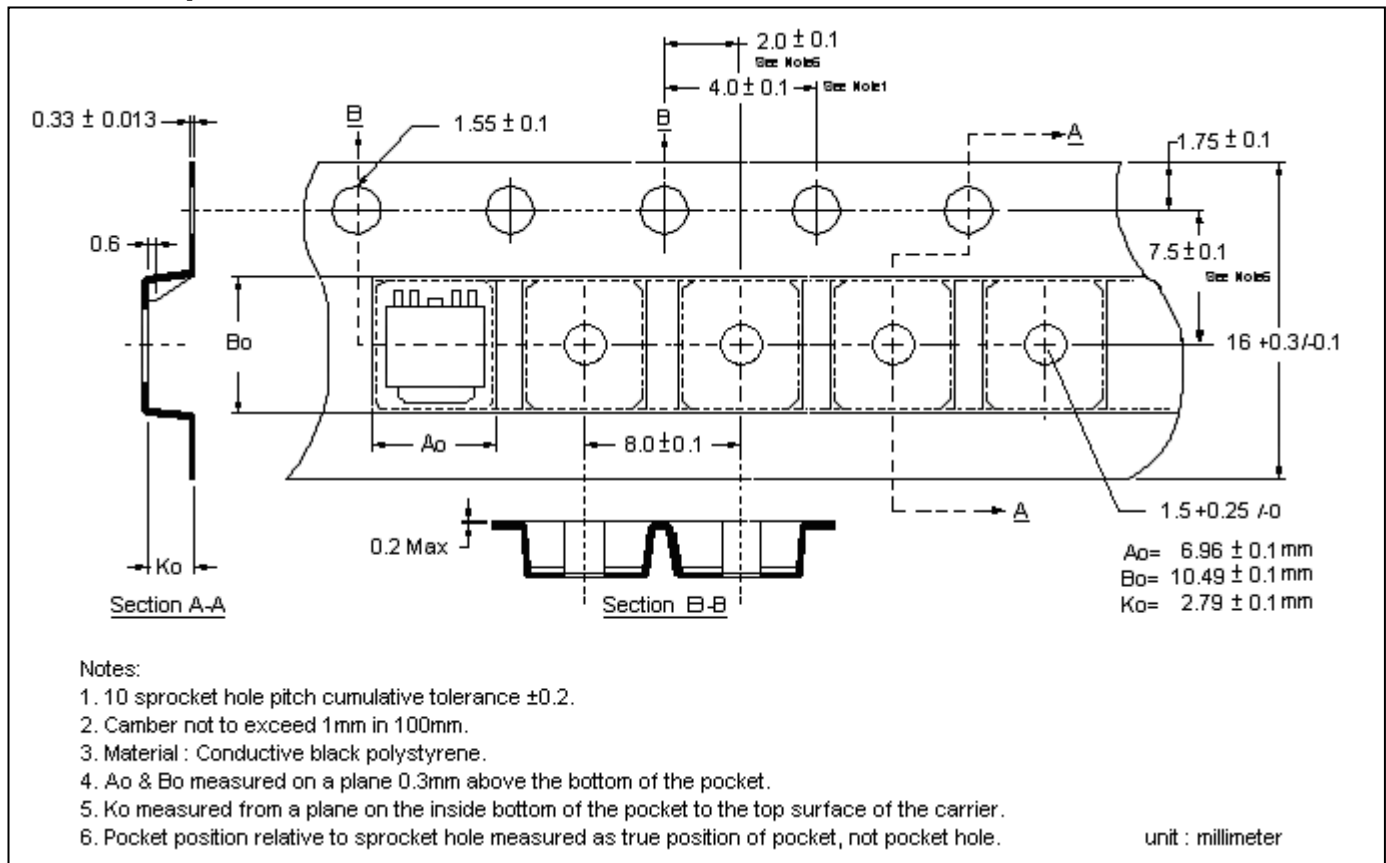
Transient Thermal Response Curves



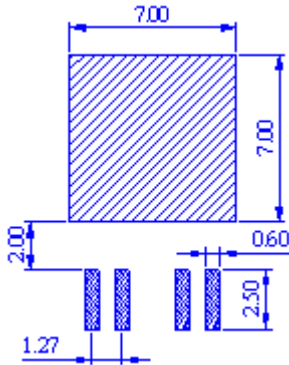
**Reel Dimension**



**Carrier Tape Dimension**



**Recommended soldering footprint**

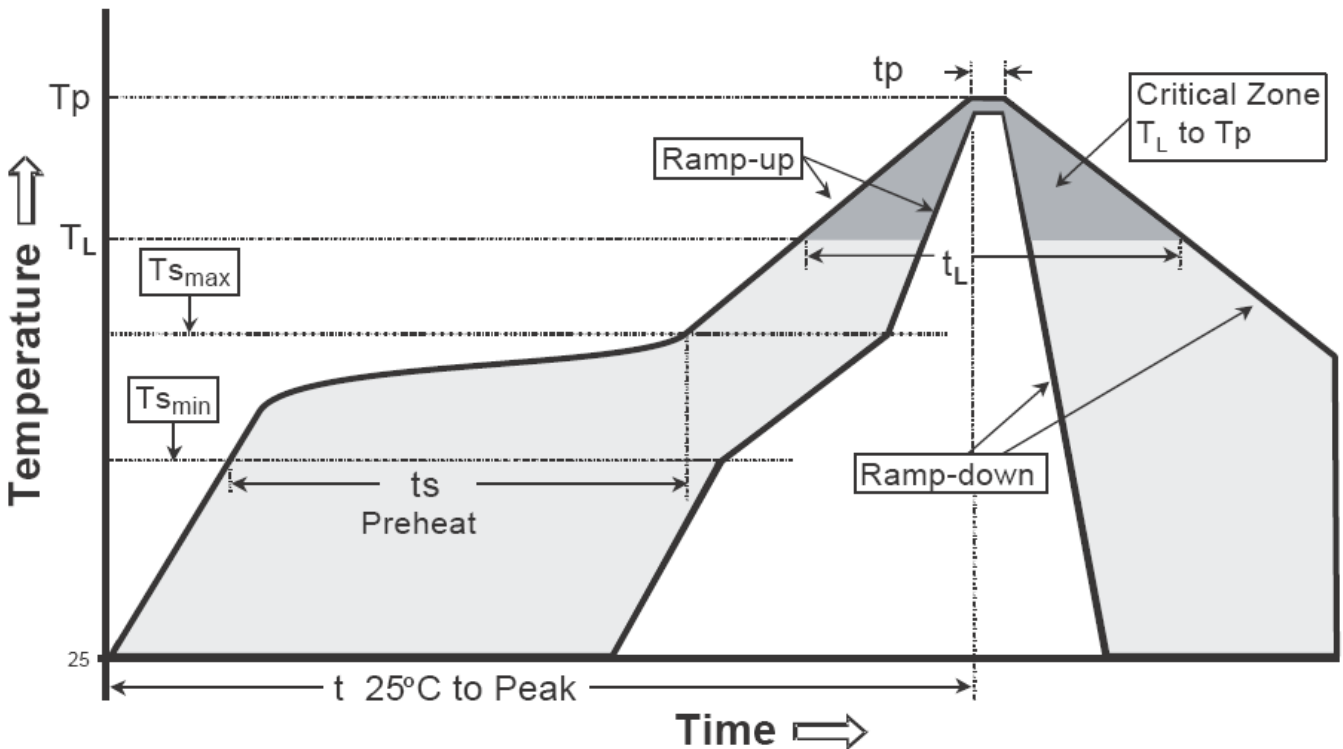


Unit : mm

**Recommended wave soldering condition**

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

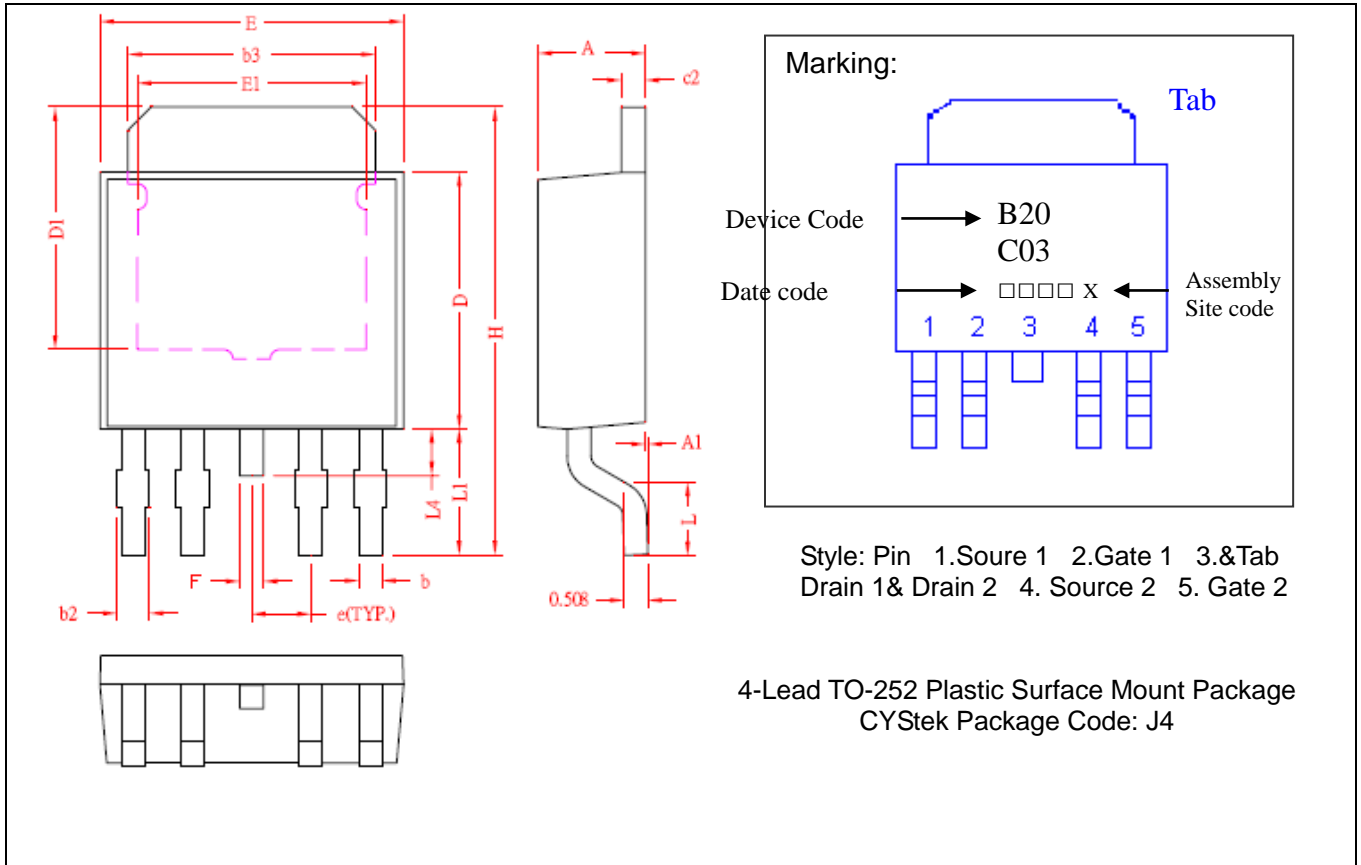
**Recommended temperature profile for IR reflow**



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

**TO-252 Dimension**



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.0866	0.0945	2.20	2.40	E	0.2520	0.2677	6.40	6.80
A1	0.0000	0.0059	0.00	0.15	E1	0.1500	-	3.81	-
b	0.0157	0.0236	0.40	0.60	e	0.0500	REF	1.27	REF
b2	0.0199	0.0315	0.50	0.80	F	0.0157	0.0236	0.40	0.60
b3	0.2047	0.2165	5.20	5.50	H	0.3701	0.4016	9.40	10.20
c2	0.0177	0.0217	0.45	0.55	L	0.0551	0.0697	1.40	1.77
D	0.2126	0.2283	5.40	5.80	L1	0.0945	0.1181	2.40	3.00
D1	0.1799	-	4.57	-	L4	0.0315	0.0472	0.80	1.20

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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