

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

	N-CH	P-CH
BV_{DSS}	30V	-30V
I_D	11A	-9.5A
$R_{DS(on)}(typ.) @ V_{GS}=(-)10V$	13m Ω	21m Ω
$R_{DS(on)}(typ.) @ V_{GS}=(-)4.5V$	20m Ω	34m Ω

Description

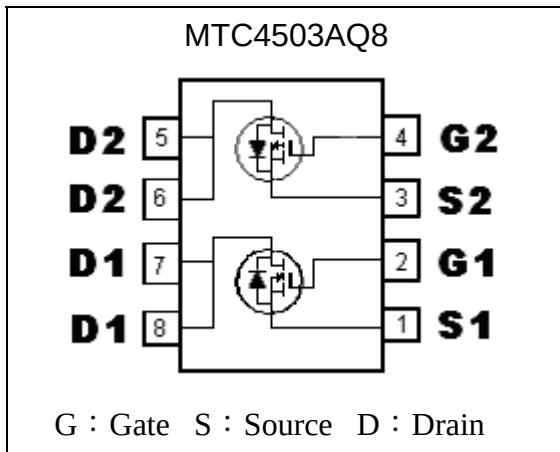
The MTC4503AQ8 consists of a N-channel and a P-channel enhancement-mode MOSFET in a single SOP-8 package, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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

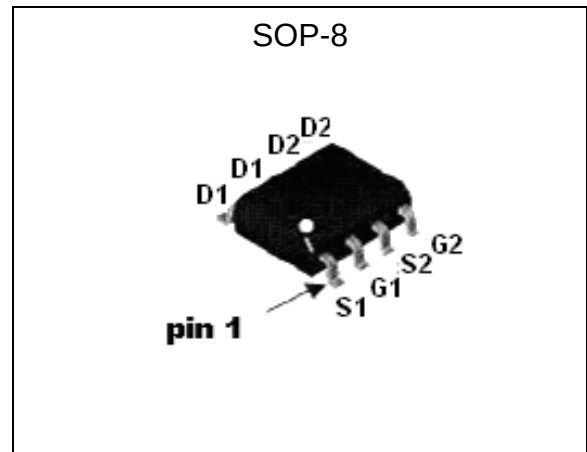
Features

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

Equivalent Circuit

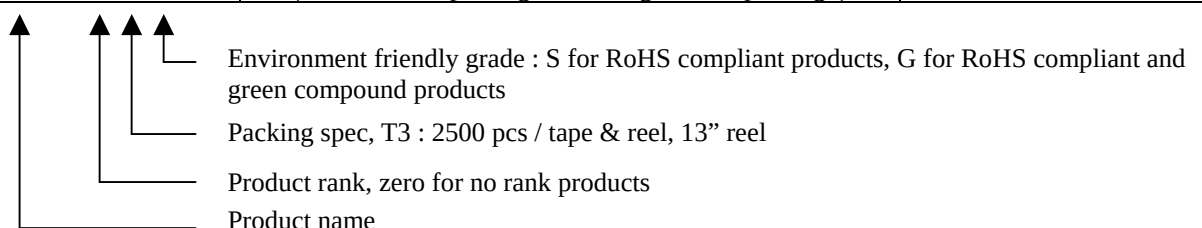


Outline



Ordering Information

Device	Package	Shipping
MTC4503AQ8-0-T3-G	SOP-8 (Pb-free lead plating and halogen-free package)	2500 pcs / tape & reel



Absolute Maximum Ratings (T_C=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 _C =25 °C, V _{GS} =10V (-10V)	I _D	11	-9.5	A
	T _C =100 °C, V _{GS} =10V (-10V)		7	-6.0	
Continuous Drain Current (Note 2)	T _A =25 °C, V _{GS} =10V (-10V)	I _{DM}	8.2	-6.8	
	T _A =100 °C, V _{GS} =10V (-10V)		5.2	-4.3	
Pulsed Drain Current (Note 1)		I _{DM}	30	-30	
Power Dissipation for Dual Operation		P _D	2		
Power Dissipation for Single Operation			1.6 (Note 2)		
			0.9 (Note 3)		
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 _{th,j-c}	40	°C/W
Thermal Resistance, Junction-to-ambient, max	R _{th,j-a}	78 (Note 2)	°C/W
		135 (Note 3)	°C/W

Note : 1.Pulse width limited by maximum junction temperature.
2.Surface mounted on 1 in² copper pad of FR-4 board, pulse width≤10s.
3.Surface mounted on minimum copper pad, pulse width≤10s.

N-Channel Electrical Characteristics (T_C=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	30	-	-	V	V _{GS} =0, I _D =250μA
V _{GS(th)}	1.0	1.6	2.5		V _{DS} =V _{GS} , I _D =250μA
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0
I _{DSS}	-	-	1	μA	V _{DS} =30V, V _{GS} =0
	-	-	25		V _{DS} =30V, V _{GS} =0, T _j =125°C
*R _{DS(ON)}	-	13	18	mΩ	V _{GS} =10V, I _D =6A
	-	20	26		V _{GS} =4.5V, I _D =4A
*G _{FS}	-	5	-	S	V _{DS} =10V, I _D =6A
Dynamic					
C _{iss}	-	729	-	pF	V _{DS} =15V, V _{GS} =0, f=1MHz
C _{oss}	-	80	-		
C _{rss}	-	71	-		
*td(ON)	-	4.1	-	ns	V _{DS} =15V, I _D =1A, V _{GS} =10V, R _G =3.3Ω
*tr	-	3.5	-		
*td(OFF)	-	20	-		
*tf	-	7.3	-		

*Qg	-	11	-	nC	V _{DS} =15V, I _D =6A, V _{GS} =10V
*Qgs	-	2.6	-		
*Qgd	-	4.2	-		
Body Diode					
*I _S	-	-	8.2	A	
*I _{SM}	-	-	30		
*V _{SD}	-	-	1.3	V	V _{GS} =0V, I _S =8.2A
*trr	-	20	-	ns	I _F =8.2A, V _{GS} =0V, dI/dt=100A/μs
*Qrr	-	12	-	nC	

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

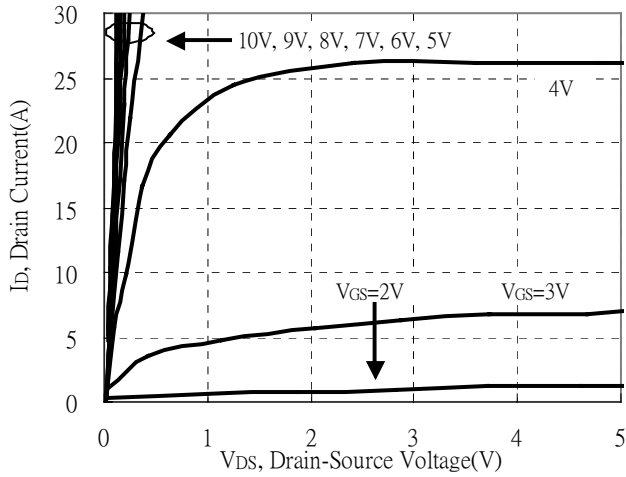
P-Channel Electrical Characteristics (T_c=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	-30	-	-	V	V _{GS} =0, I _D =-250μA
V _{GS(th)}	-1.0	-1.5	-2.5		V _{DS} =V _{GS} , I _D =-250μA
I _{GSS}	-	-	±100	nA	V _{GS} =±20V, V _{DS} =0
I _{DSS}	-	-	-1	μA	V _{DS} =-30V, V _{GS} =0
	-	-	-25		V _{DS} =-30V, V _{GS} =0, T _j =125°C
*R _{DS(ON)}	-	21	28	mΩ	V _{GS} =-10V, I _D =-6A
	-	34	45		V _{GS} =-4.5V, I _D =-4A
*G _{FS}	-	7	-	S	V _{DS} =-10V, I _D =-6A
Dynamic					
C _{iss}	-	1316	-	pF	V _{DS} =-15V, V _{GS} =0, f=1MHz
C _{oss}	-	143	-		
C _{rss}	-	118	-		
*t _{d(ON)}	-	14	-	ns	V _{DS} =-15V, I _D =-1A, V _{GS} =-10V, R _G =3.3Ω
*t _r	-	10	-		
*t _{d(OFF)}	-	37	-		
*t _f	-	10	-		
*Q _g	-	16	-	nC	V _{DS} =-15V, I _D =-6A, V _{GS} =-10V
*Q _{gs}	-	4.5	-		
*Q _{gd}	-	5.3	-		
Body Diode					
*I _S	-	-	-6.8	A	
*I _{SM}	-	-	-30		
*V _{SD}	-	-	-1.3	V	V _{GS} =0V, I _S =-6.8A
*t _{rr}	-	26	-	ns	I _F =6.8A, V _{GS} =0V, dI/dt=100A/μs
*Q _{rr}	-	20	-	nC	

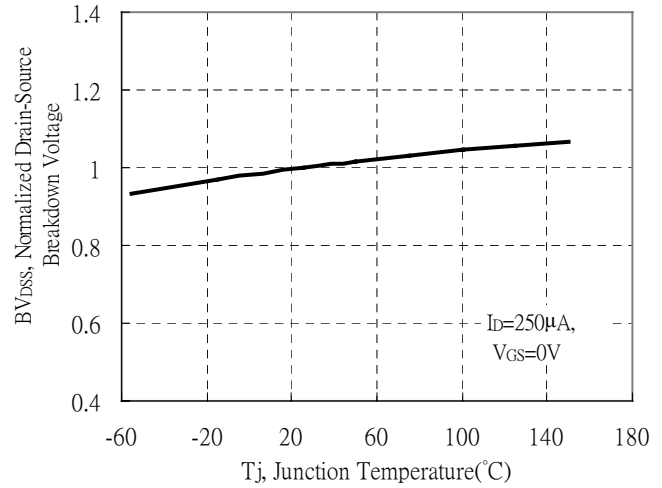
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Typical Characteristics : Q1(N-channel)

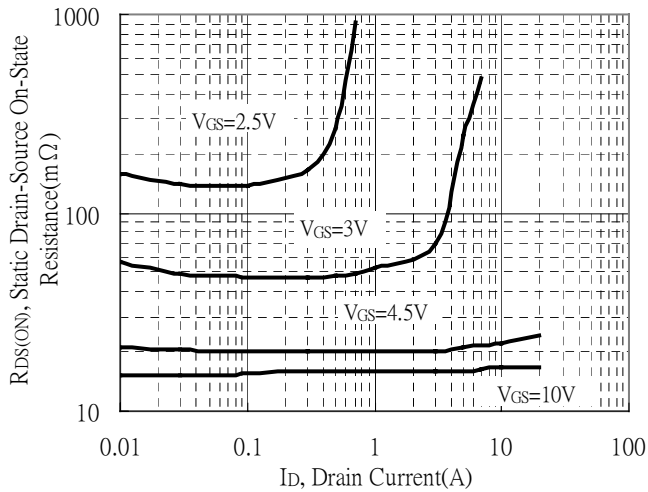
Typical Output Characteristics



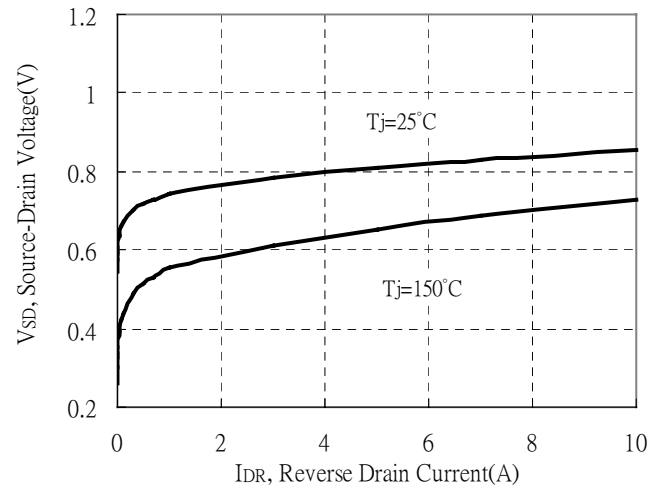
Breakdown Voltage vs Ambient Temperature



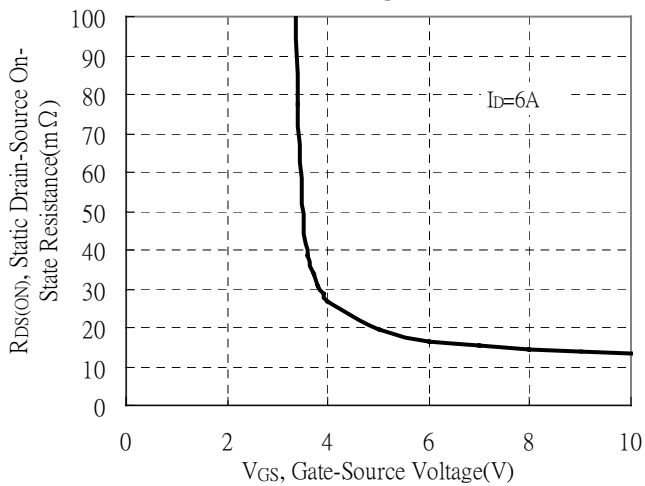
Static Drain-Source On-State resistance vs Drain Current



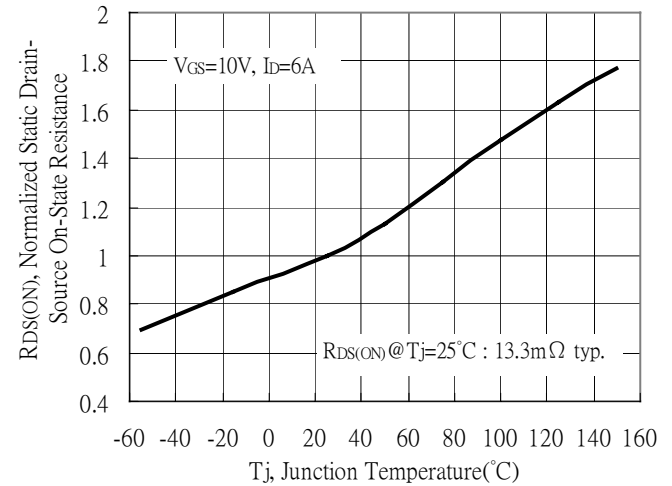
Reverse Drain Current vs Source-Drain Voltage



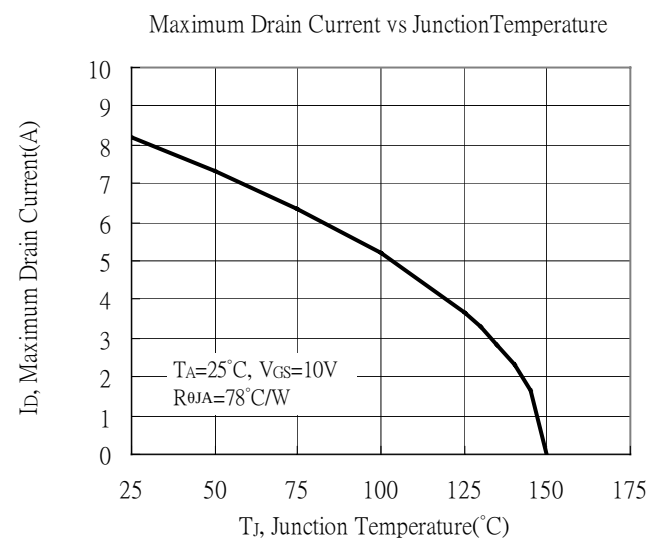
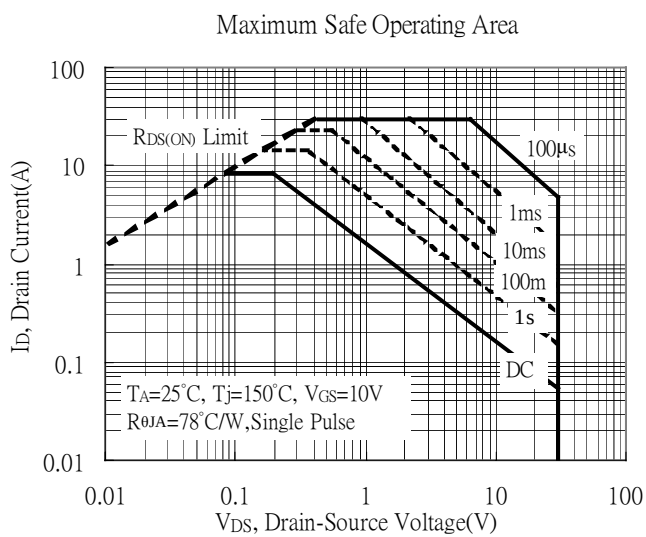
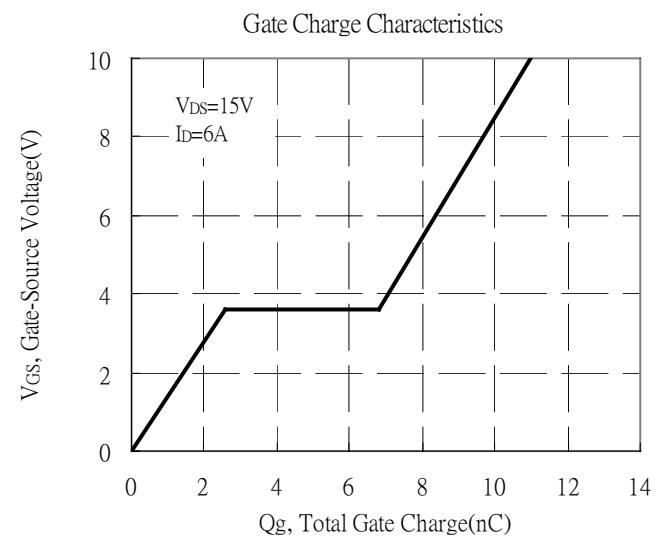
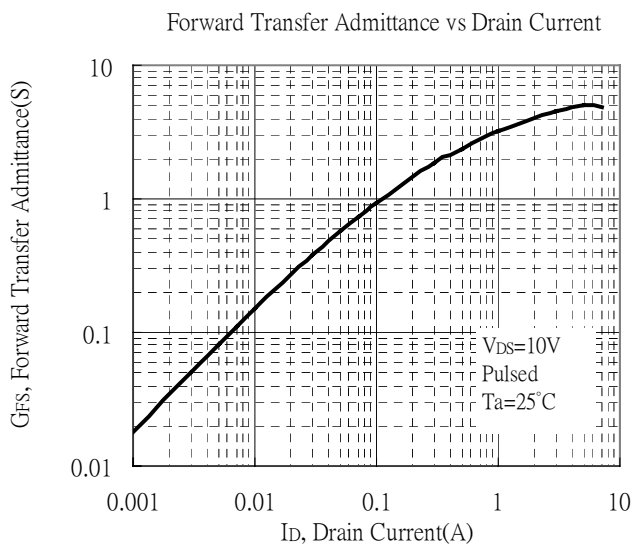
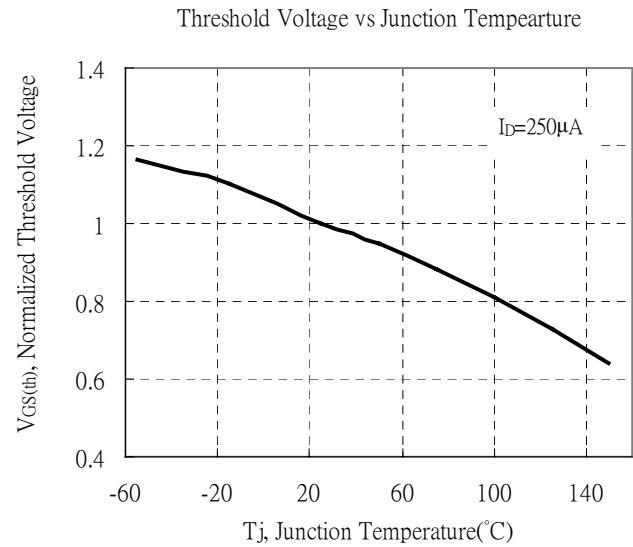
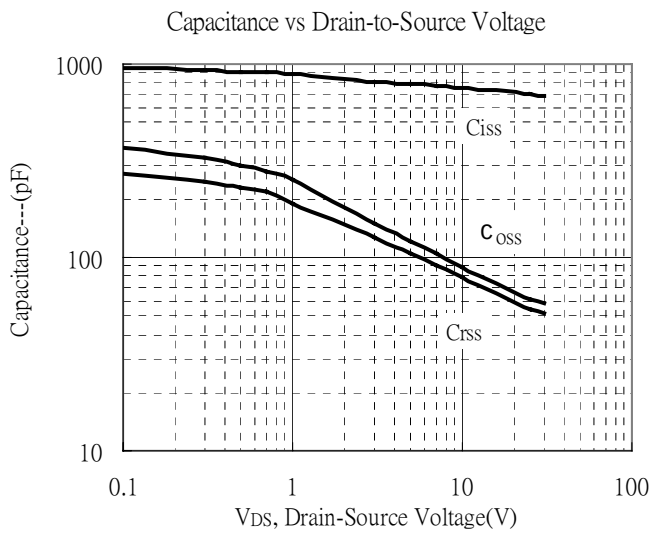
Static Drain-Source On-State Resistance vs Gate-Source Voltage



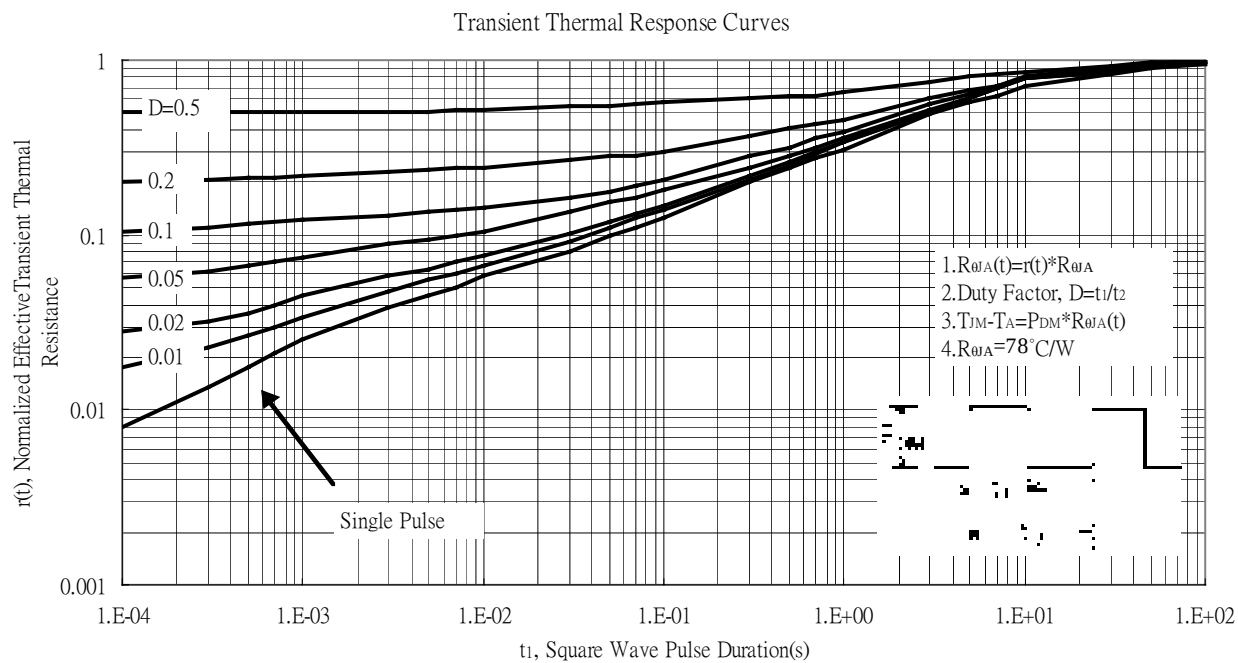
Drain-Source On-State Resistance vs Junction Temperature



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

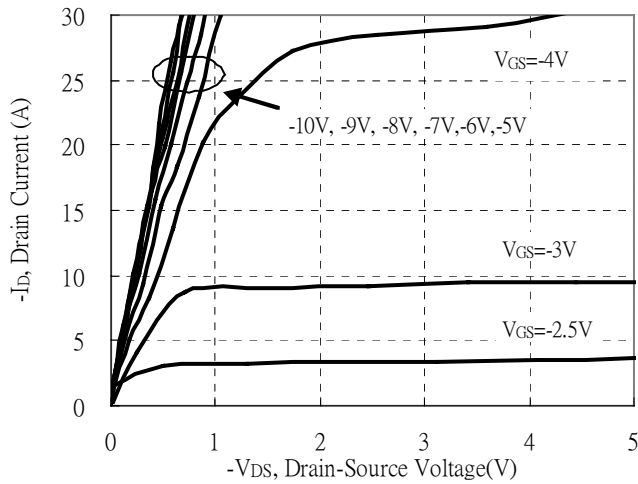


Typical Characteristics(Cont.) : Q1(N-channel)

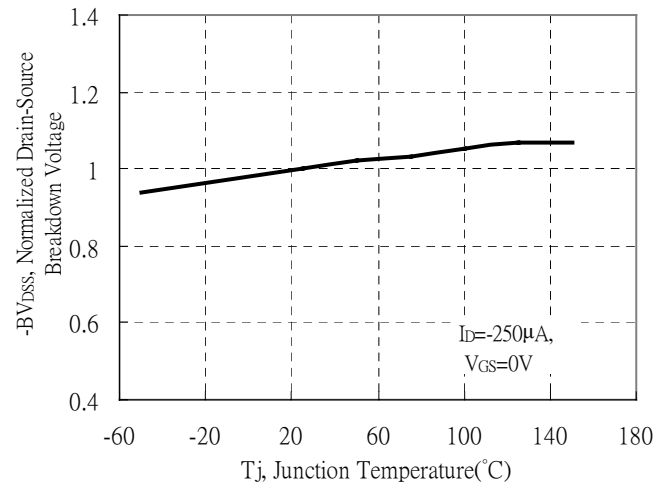


Typical Characteristics : Q2(P-channel)

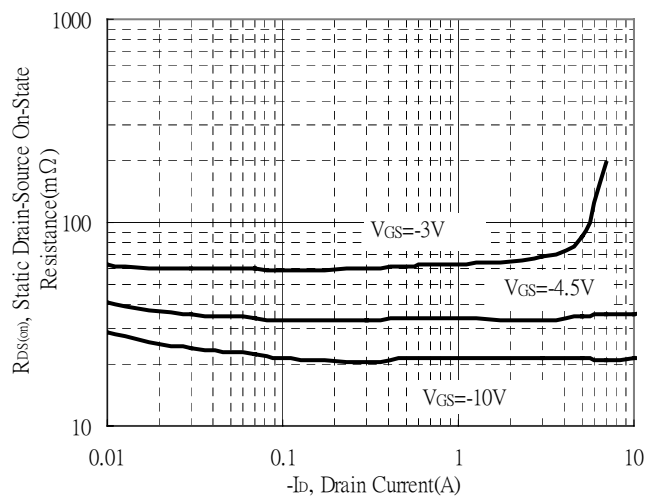
Typical Output Characteristics



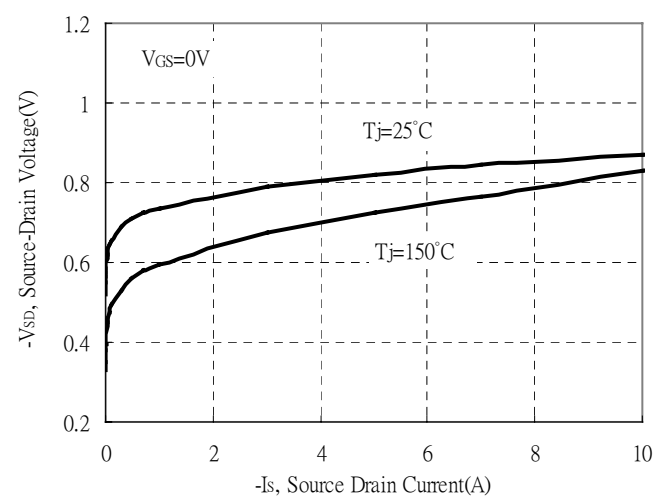
Brekdown Voltage vs Ambient Temperature



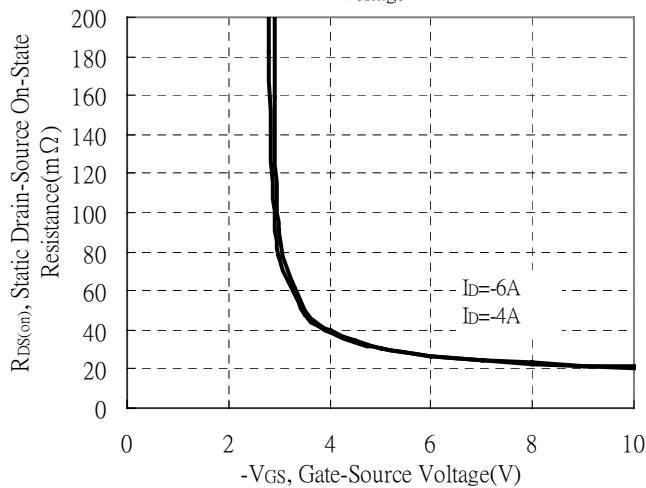
Static Drain-Source On-State resistance vs Drain Current



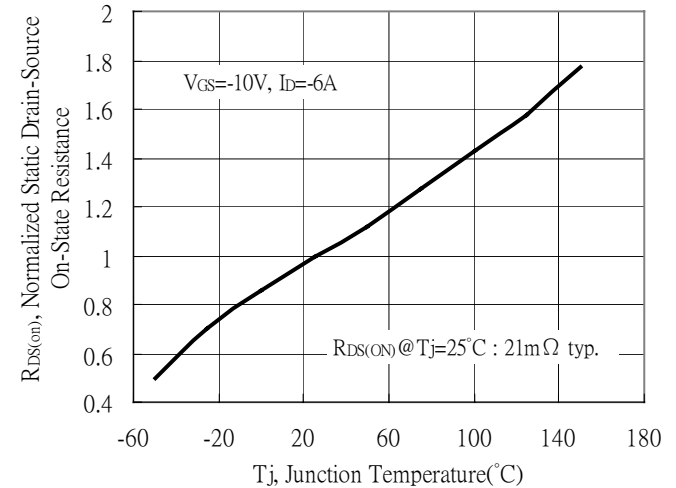
Source Drain Current vs Source-Drain Voltage

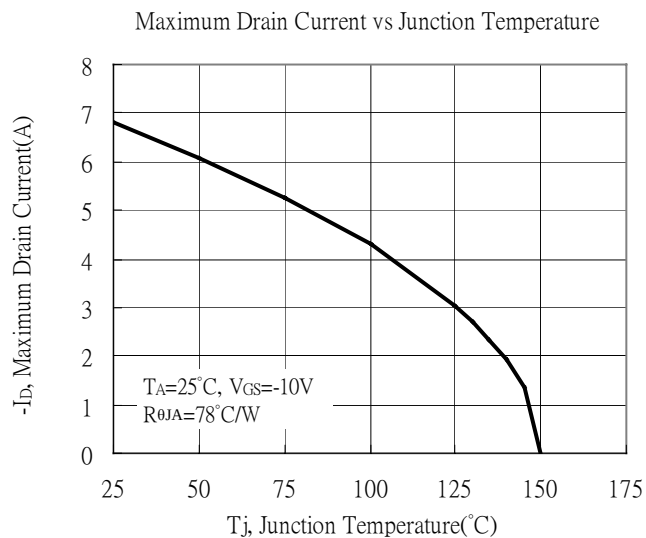
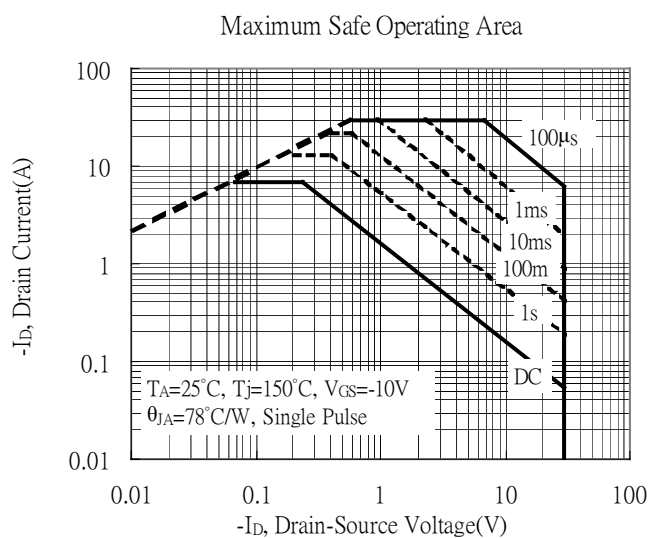
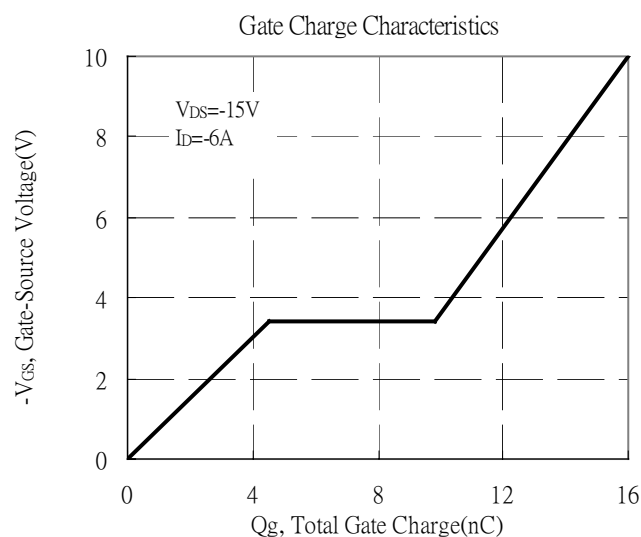
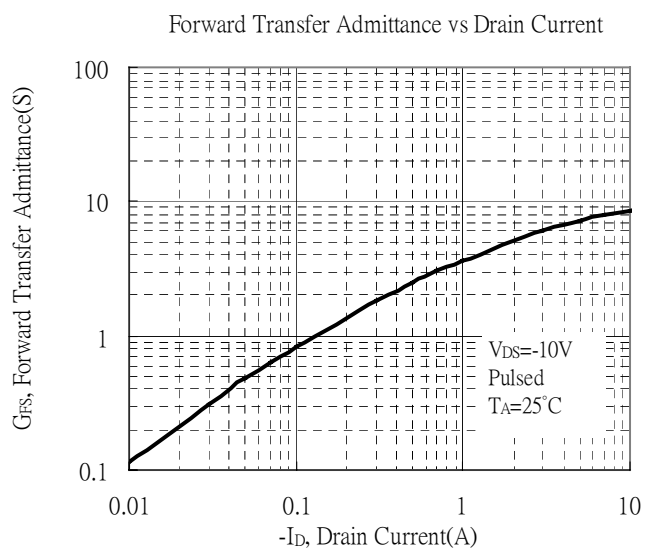
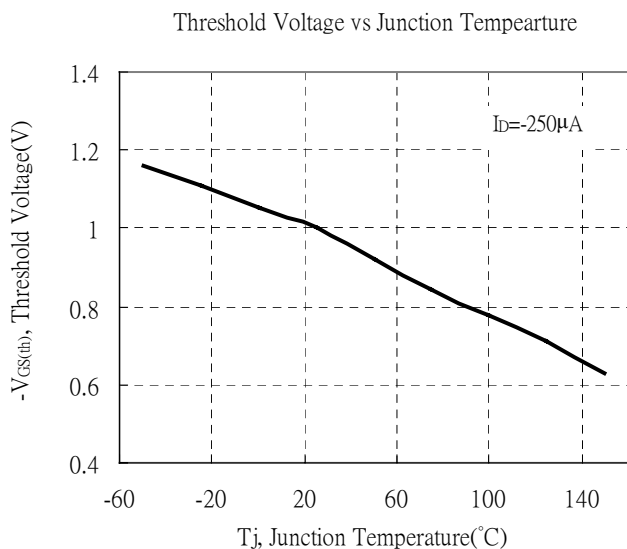
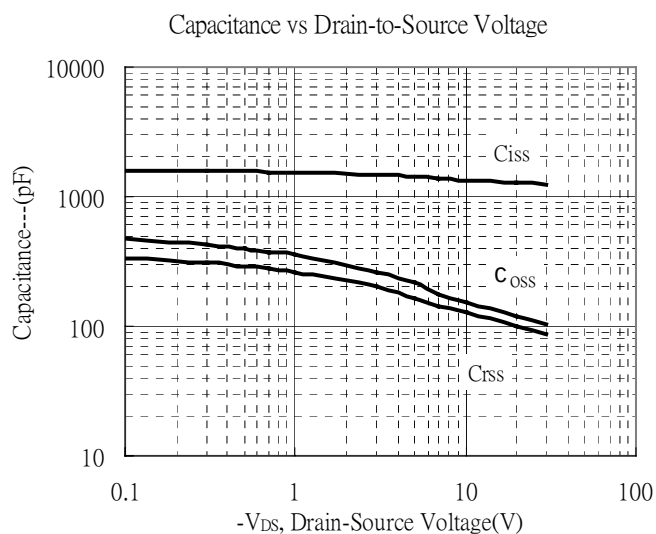


Static Drain-Source On-State Resistance vs Gate-Source Voltage

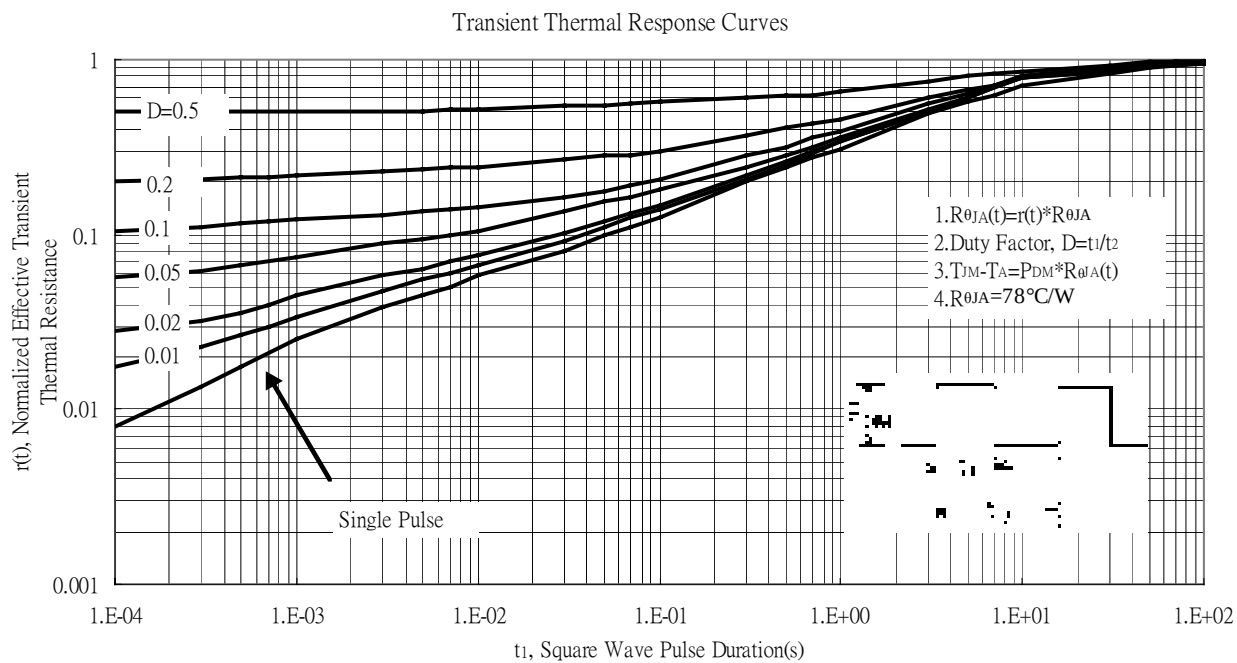


Drain-Source On-State Resistance vs Junction Temperature

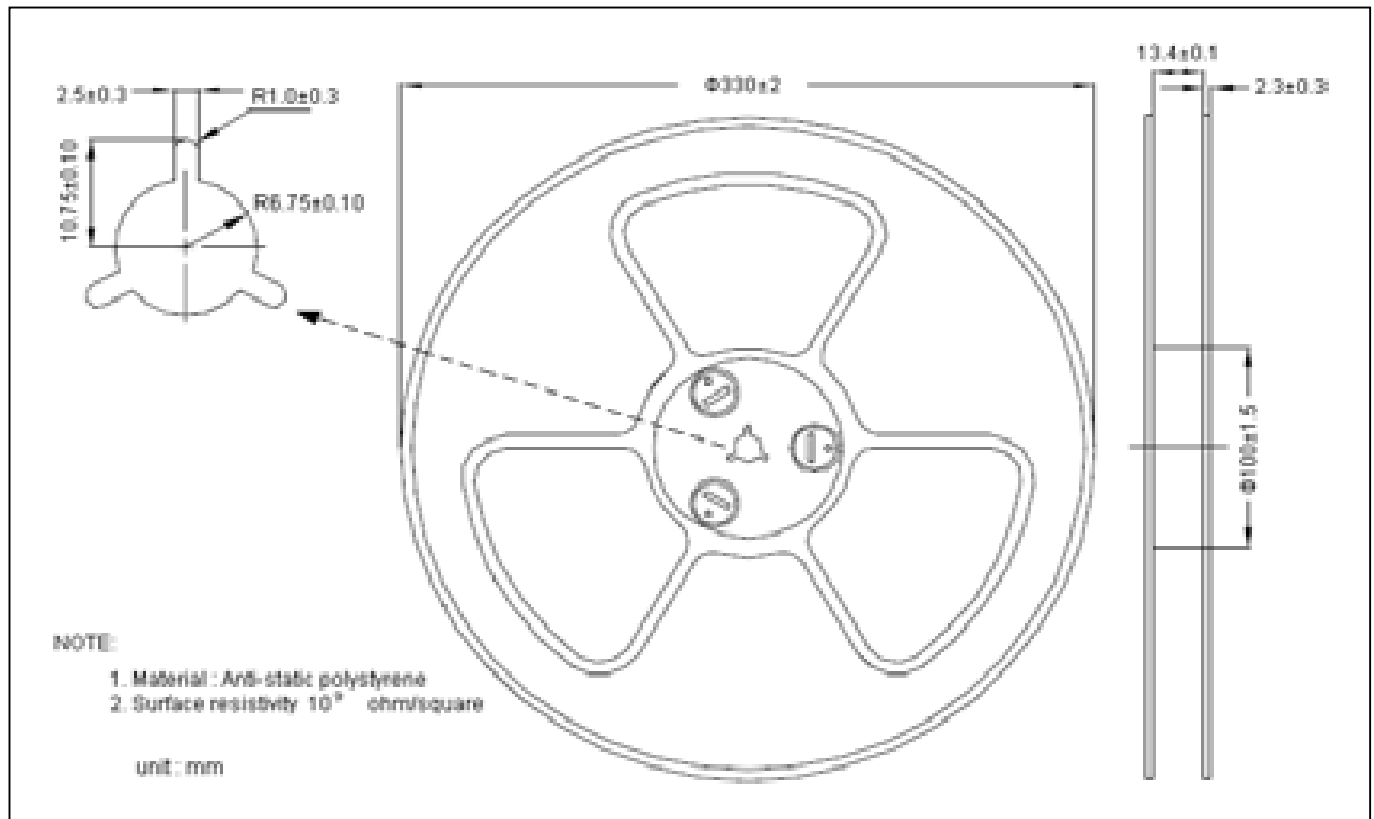


Typical Characteristics(Cont.) : Q2(P-channel)


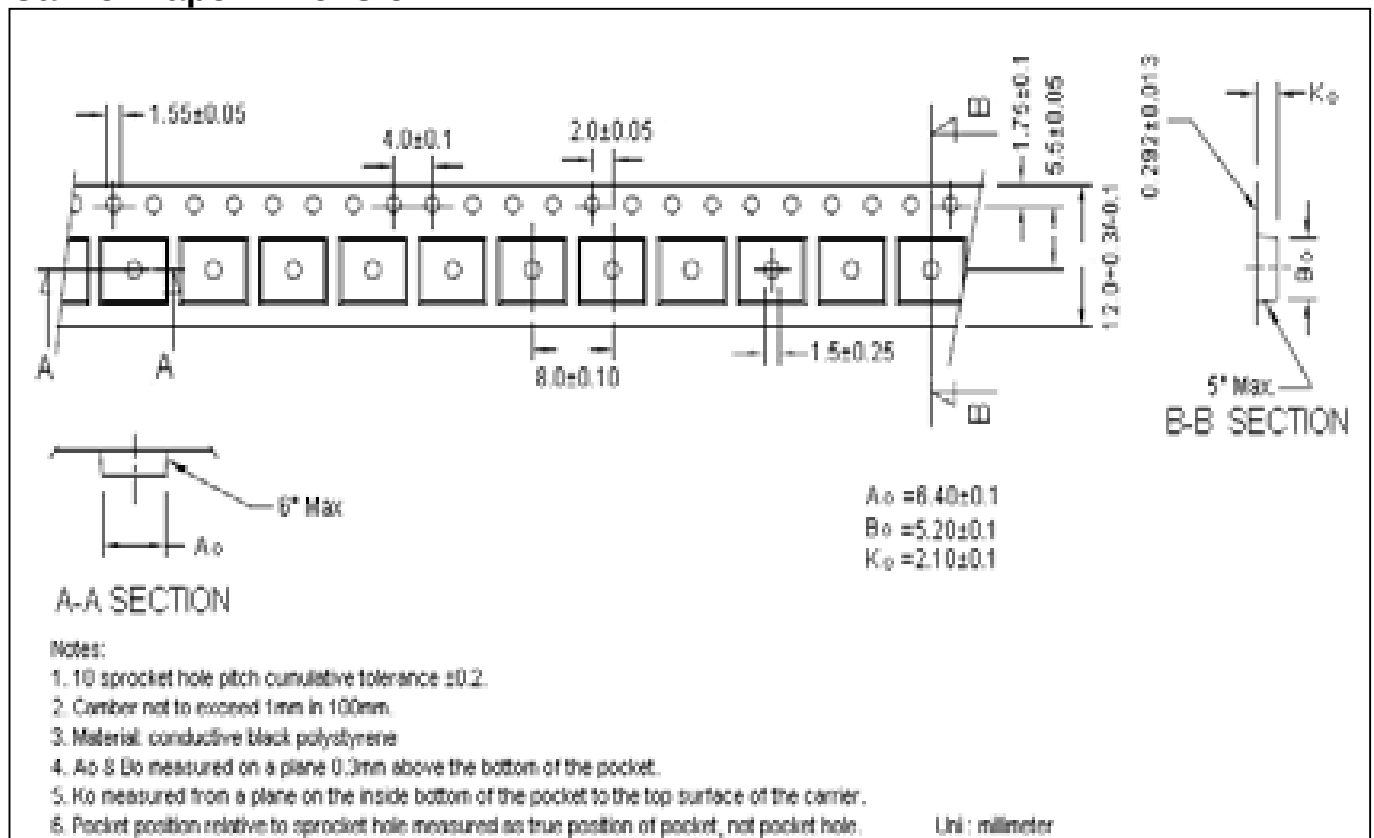
Typical Characteristics(Cont.) : Q2(P-channel)



Reel Dimension



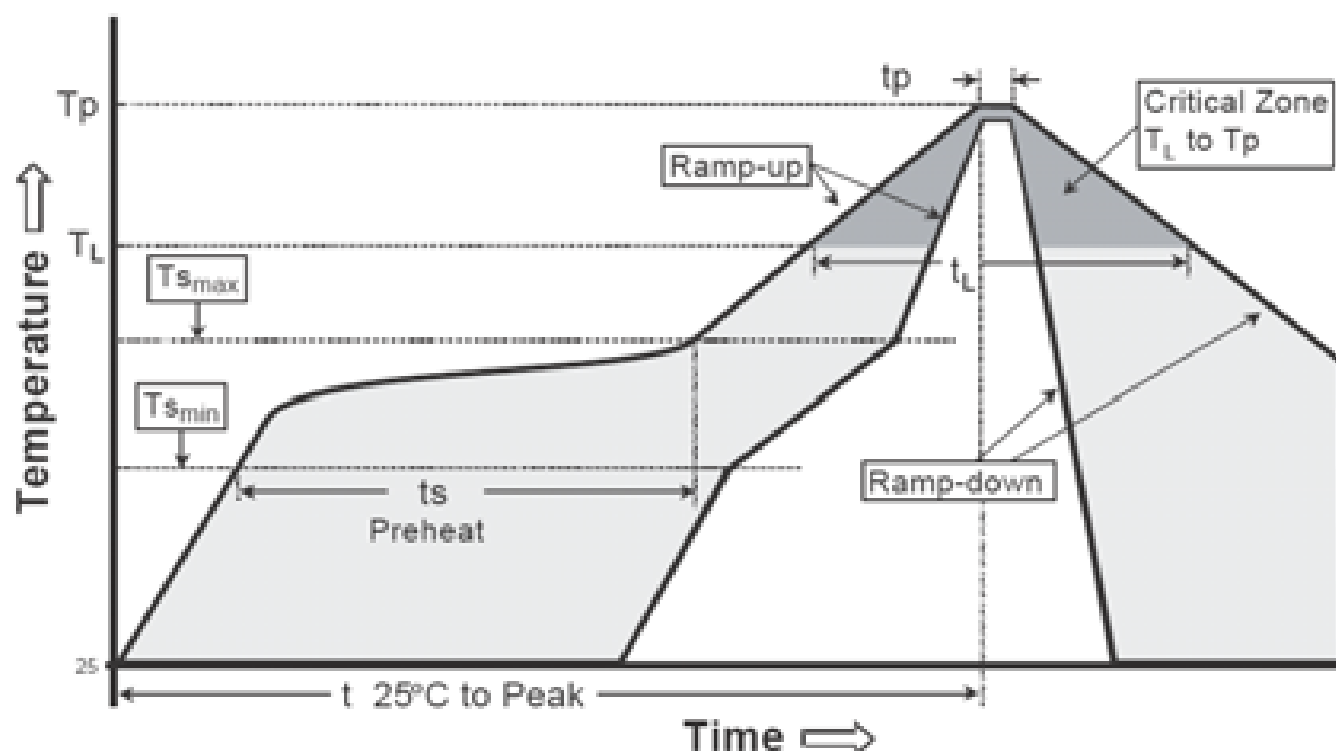
Carrier Tape Dimension



Recommended wave soldering condition

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

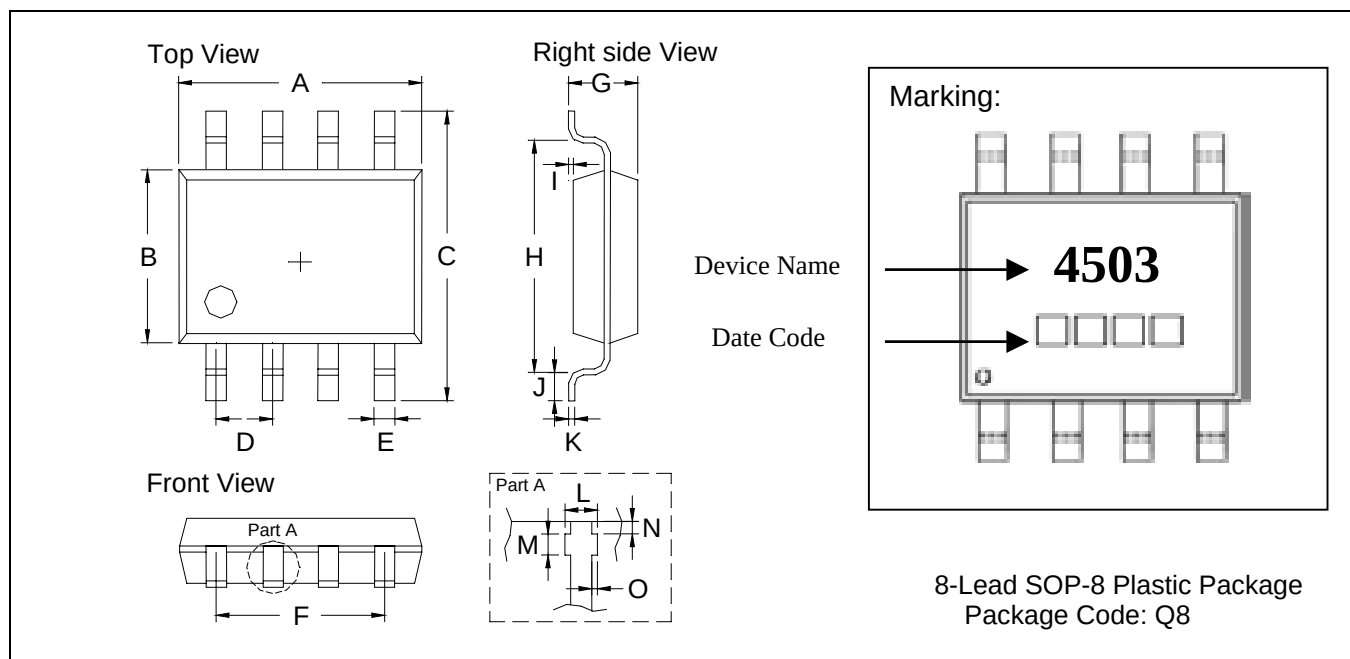
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat -Temperature Min(Ts min) -Temperature Max(Ts max) -Time(ts min to ts max)	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (TL) - Time (tL)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(TP)	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.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.