N & P-Channel Enhancement Mode Power MOSFET

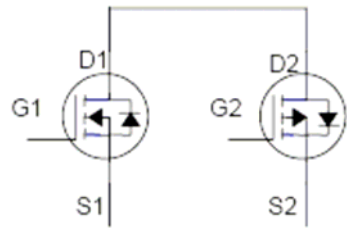
Features

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

	N-CH	P-CH
BV_{DSS}	40V	-40V
I_D@V_{GS}=10V(-10V), T_A=25°C	5.2A	-4.9A
I_D@V_{GS}=10V(-10V), T_C=25°C	21A	-20A
R_{DSON}(typ.) @V_{GS}=(-)10V	20.9 mΩ	35.8 mΩ
R_{DSON}(typ.) @V_{GS}=(-)4.5V	30.1 mΩ	46.2 mΩ

Equivalent Circuit

MTE40C04J4

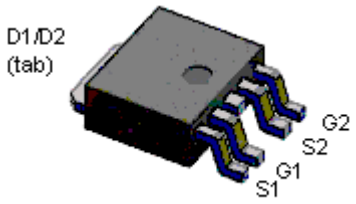


G：Gate D：Drain

S：Source

Outline

TO-252-4L



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

Parameter	Symbol	Limits		Unit
		N-channel	P-channel	
Drain-Source Voltage	V_{DS}	40	-40	V
Gate-Source Voltage	V_{GS}	±20	±20	
Continuous Drain Current @ T_C=25°C, V_{GS}=10V(-10V) (Note1)	I_D	21	-20	A
Continuous Drain Current @ T_C=100°C, V_{GS}=10V(-10V) (Note1)		14.9	-14.1	
Continuous Drain Current @ T_A=25°C, V_{GS}=10V(-10V) (Note4)		5.2	-4.9	
Continuous Drain Current @ T_A=70°C, V_{GS}=10V(-10V) (Note4)		4.2	-3.9	
Pulsed Drain Current *1 (Note3)	I_{DM}	30	-30	
Avalanche Current	I_{AS}	6.5	-9.3	
Avalanche Energy @ L=0.5mH, V_{GS}=10V(-10V), I_{AS}=6.5A(-9.3A)	E_{AS}	10.6	21.6	mJ
Total Power Dissipation (T_C=25℃) (Note1)	P_D	25		W
Total Power Dissipation (T_C=100℃) (Note1)		12.5		
Total Power Dissipation (T_A=25℃) (Note2)	P_{DSM}	2.4		
Total Power Dissipation (T_A=70℃) (Note2)		1.7		
Operating Junction and Storage Temperature Range	Tj, Tstg	-55~+175		°C

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 (Note2)	$R_{th,j-a}$	62.5	
Thermal Resistance, Junction-to-ambient, max (Note4)		90	

Note : 1.The power dissipation P_D is based on $T_{J(MAX)}$=175°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in²FR-4 board with 2 oz. copper, in a still air environment with T_A=25°C. The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.

3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=175°C. Ratings are based on low frequency and low duty cycles to keep initial T_J=25°C.

4. When mounted on the minimum pad size recommended (PCB mount), t≤10s.

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	40	-	-	V	V_{GS}=0V, I_D=250μA
$V_{GS(th)}$	1.0	-	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}=32V, V_{GS}=0V
	-	-	10		V_{DS}=30V, V_{GS}=0V, Tj=55°C
$R_{DS(ON)}$ *1	-	20.9	28	mΩ	V_{GS}=10V, I_D=10A
	-	30.1	38		V_{GS}=4.5V, I_D=4A
G_{FS} *1	-	7.7	-	S	V_{DS}=5V, I_D=5A
Dynamic					
Qg *1	-	11.2	-	nC	V_{DS}=20V, I_D=5A, V_{GS}=10V
Qgs *1	-	2.3	-		
Qgd *1	-	2.1	-		
$t_{d(ON)}$ *1	-	7	-	ns	V_{DS}=20V, I_D=1A, V_{GS}=10V, R_G=6Ω
tr *1	-	17	-		
$t_{d(OFF)}$ *1	-	23.8	-		
t_f *1	-	6.6	-		
Ciss	-	604	-	pF	V_{DS}=15V, V_{GS}=0V, f=1MHz
Coss	-	56	-		
Crss	-	45	-		
Source-Drain Diode					
I_S *1	-	-	5	A	
I_{SM} *2	-	-	30		
V_{SD} *1	-	0.74	1	V	I_S=1A, V_{GS}=0V
trr *1	-	5.9	-	ns	I_F=5A, V_{GS}=0, dI_F/dt=100A/μs
Qrr *1	-	2.4	-	nC	

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

*2.Pulse width limited by maximum junction temperature.

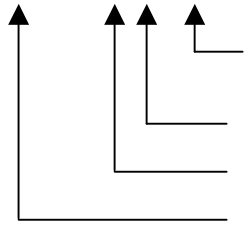
P-CH Characteristics (Tc=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	-40	-	-	V	V_{GS}=0V, I_D=-250μA
$V_{GS(th)}$	-1.0	-	-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}=-32V, V_{GS}=0V
	-	-	-10		V_{DS}=-30V, V_{GS}=0V, Tj=55°C
$R_{DS(ON)}$ *1	-	35.8	45	mΩ	V_{GS}=-10V, I_D=-7A
	-	46.2	60		V_{GS}=-4.5V, I_D=-4A
G_{FS} *1	-	10	-	S	V_{DS}=-5V, I_D=-4.9A
Dynamic					
Qg *1	-	19.2	-	nC	V_{DS}=-20V, I_D=-4.9A, V_{GS}=-10V
Qgs *1	-	3.2	-		
Qgd *1	-	2.9	-		
$t_{d(ON)}$ *1	-	7	-	ns	V_{DS}=-20V, I_D=-1A, V_{GS}=-10V, R_G=6Ω
tr *1	-	16.6	-		
$t_{d(OFF)}$ *1	-	87	-		
t_f *1	-	64.4	-		
Ciss	-	1053	-	pF	V_{DS}=-15V, V_{GS}=0V, f=1MHz
Coss	-	98	-		
Crss	-	74	-		
Source-Drain Diode					
I_S *1	-	-	-4.9	A	
I_{SM} *2	-	-	-30		
V_{SD} *1	-	-0.74	-1	V	I_S=-1A, V_{GS}=0V
trr *1	-	8.3	-	ns	I_F=-5A, V_{GS}=0, dI_F/dt=100A/μs
Qrr *1	-	3.4	-	nC	

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

Ordering Information

Device	Package	Shipping
MTE40C04J4-0-T6-G	TO-252 (RoHS compliant & Halogen-free package)	3000 pcs / Tape & Reel



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

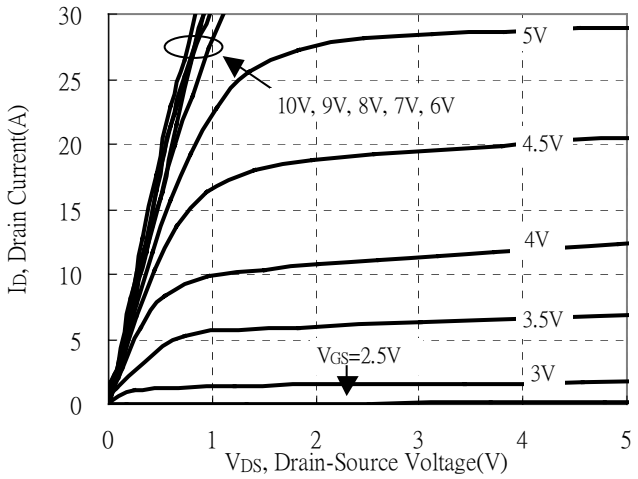
Packing spec, T6 : 3000 pcs / tape & reel, 13” reel

Product rank, zero for no rank products

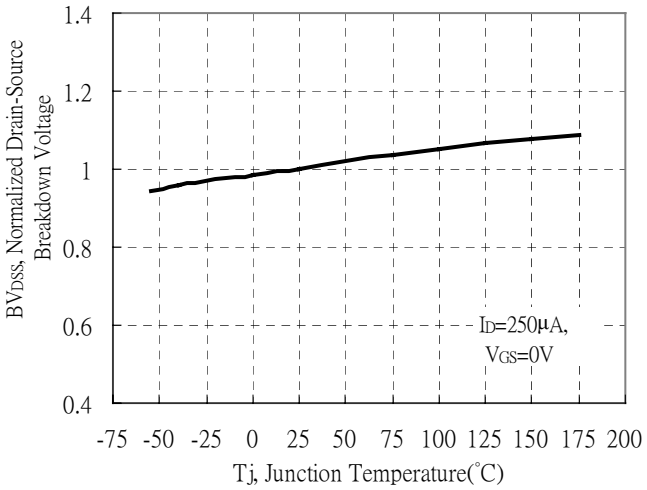
Product name

Q1, N-CH Typical Characteristics

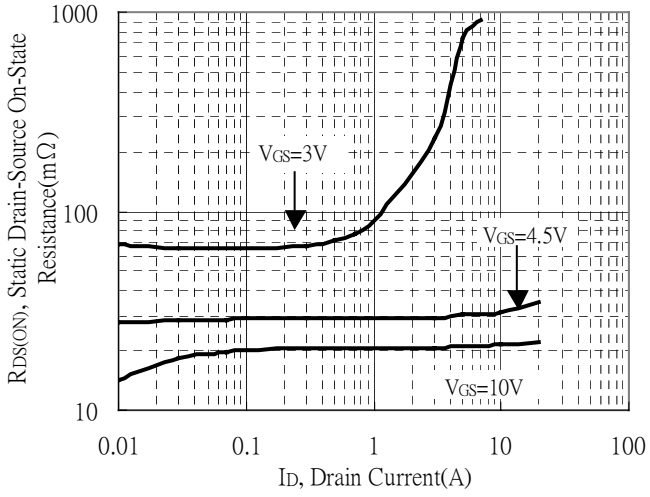
Typical Output Characteristics



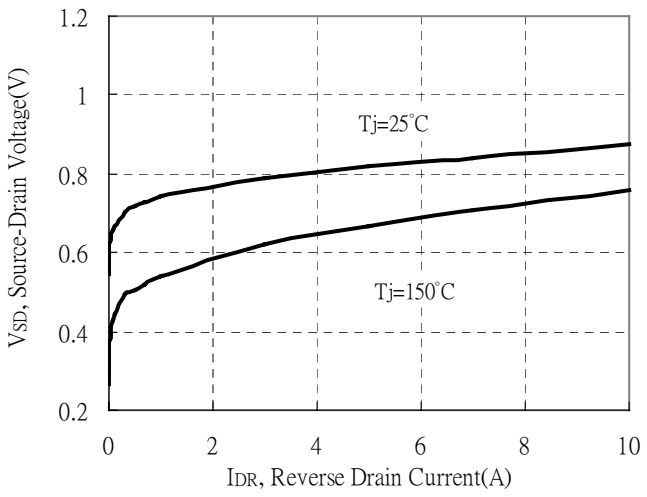
Brekdown Voltage vs Ambient Temperature



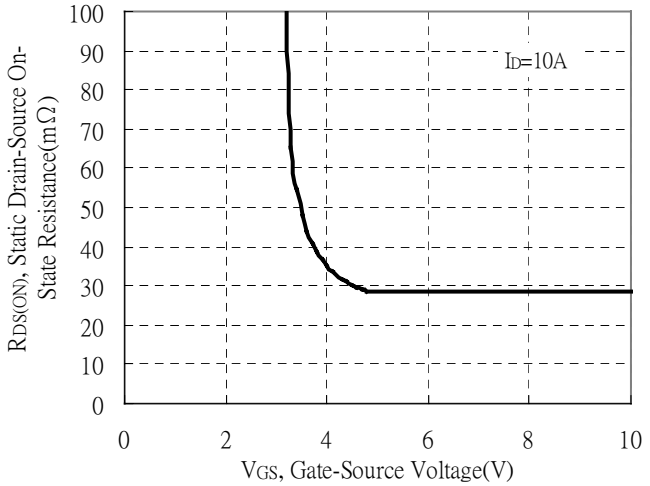
Static Drain-Source On-State resistance vs Drain Current



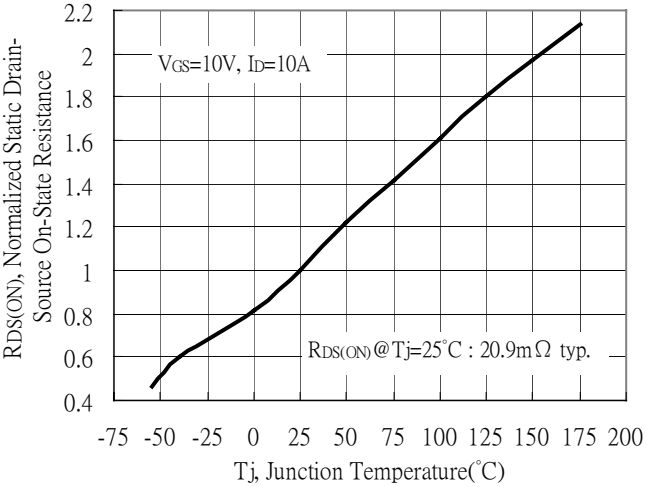
Reverse Drain Current vs Source-Drain Voltage



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

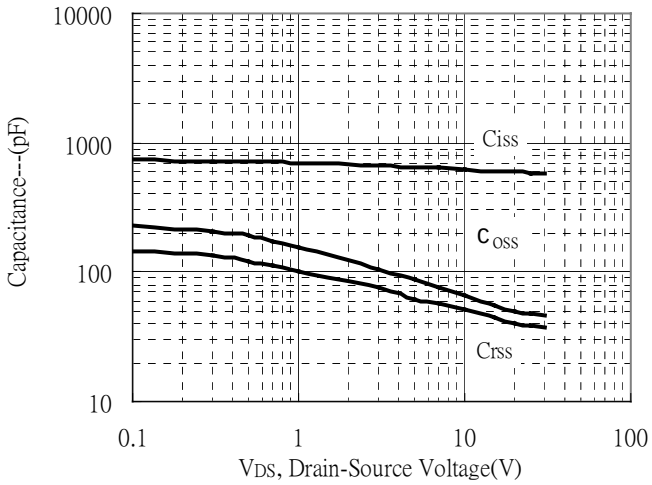


Drain-Source On-State Resistance vs Junction Tempearture

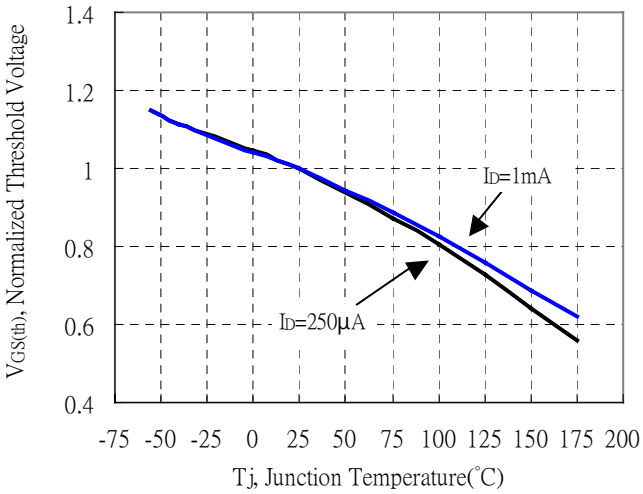


Q1, N-CH Typical Characteristics(Cont.)

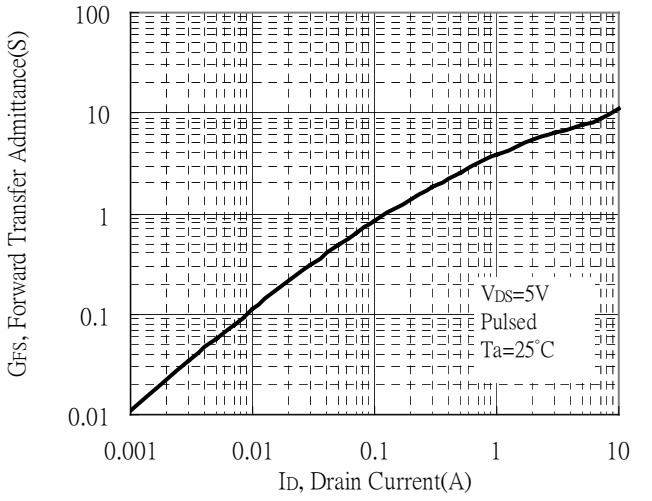
Capacitance vs Drain-to-Source Voltage



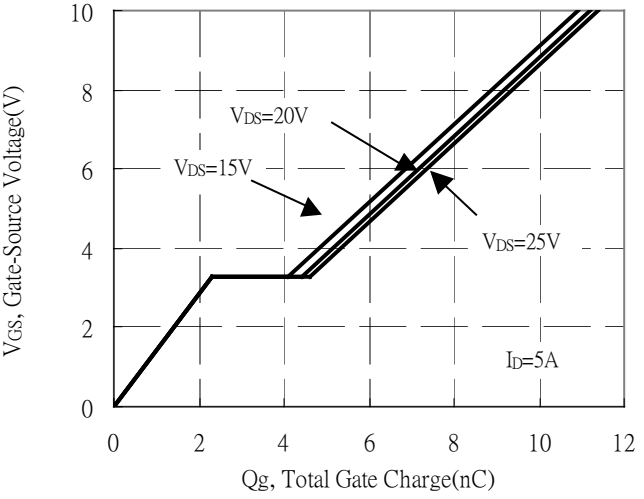
Threshold Voltage vs Junction Tempearture



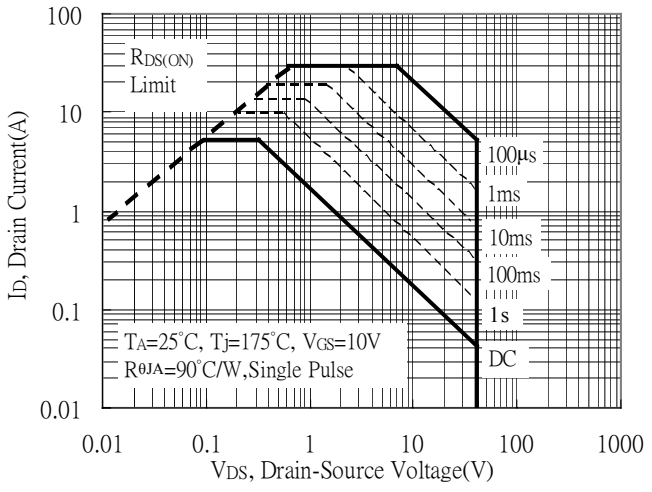
Forward Transfer Admittance vs Drain Current



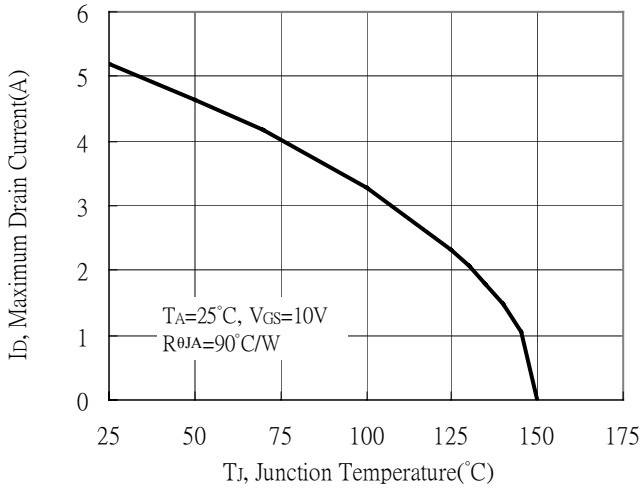
Gate Charge Characteristics



Maximum Safe Operating Area

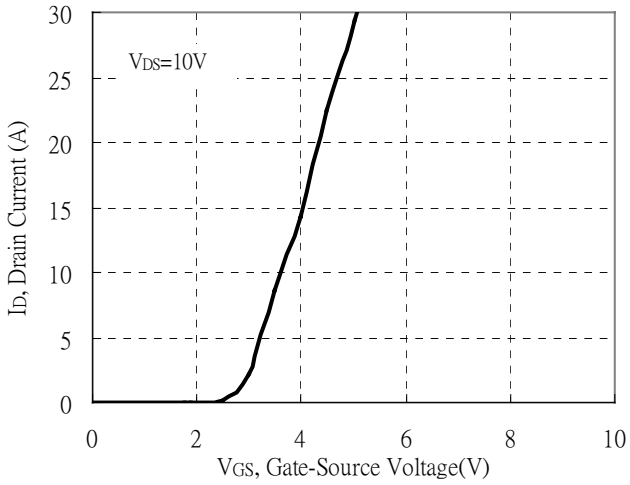


Maximum Drain Current vs Junction Temperature

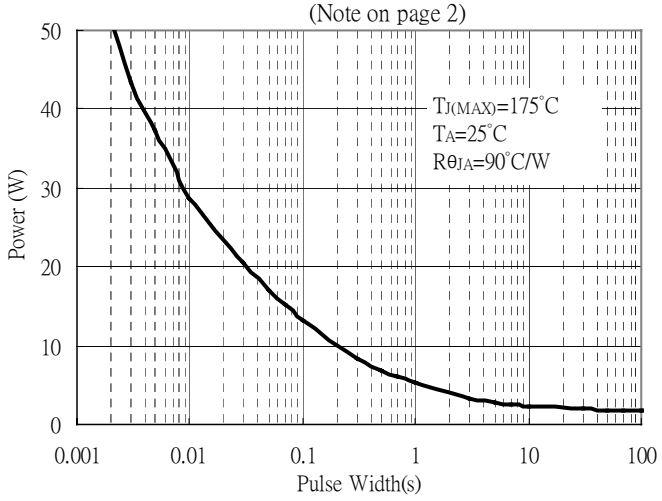


Q1, N-CH Typical Characteristics(Cont.)

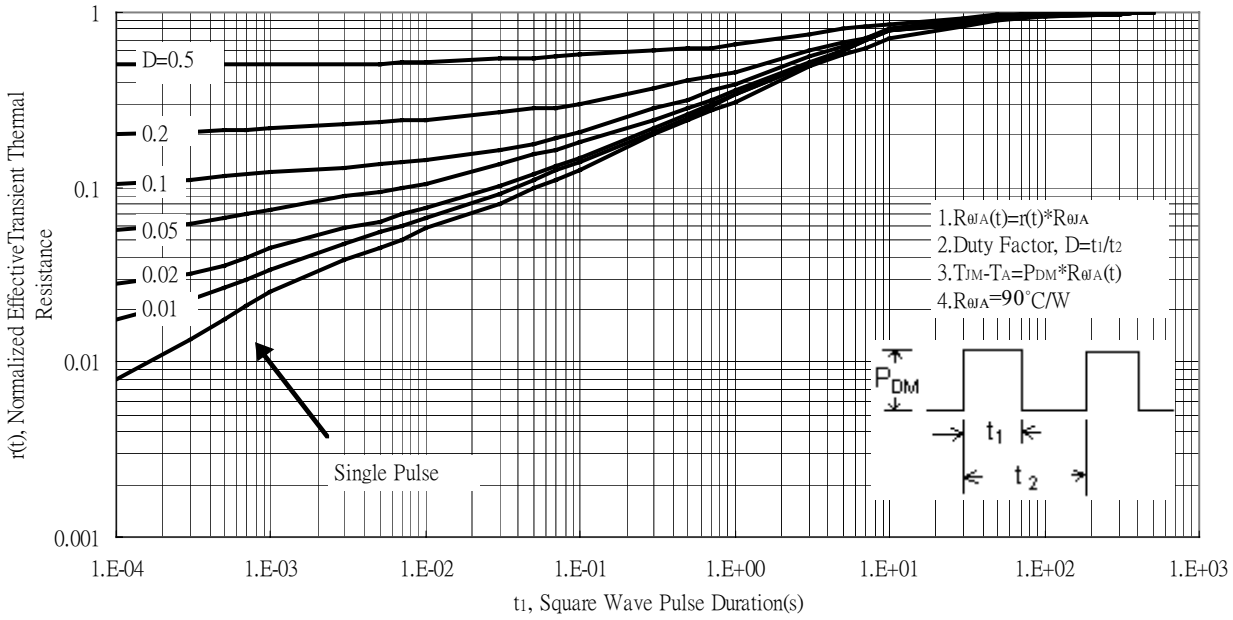
Typical Transfer Characteristics



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

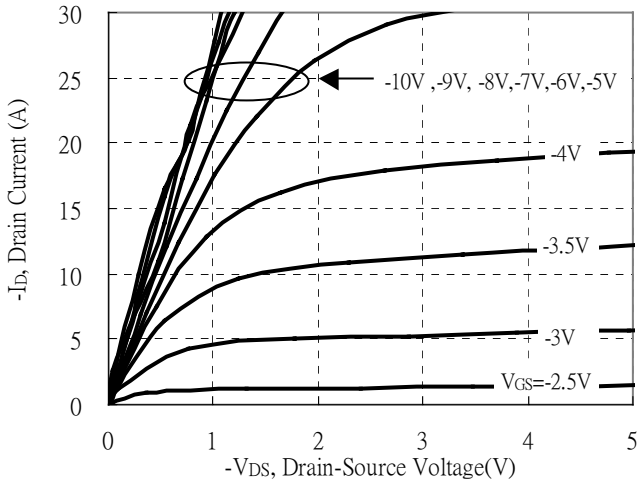


Transient Thermal Response Curves

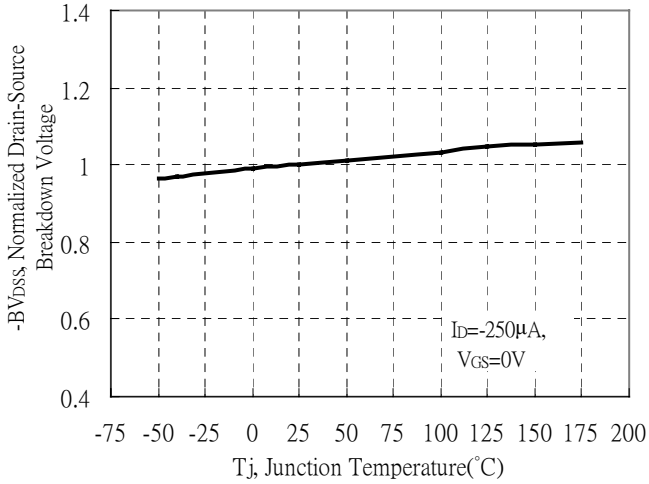


Q2, P-CH Typical Characteristics

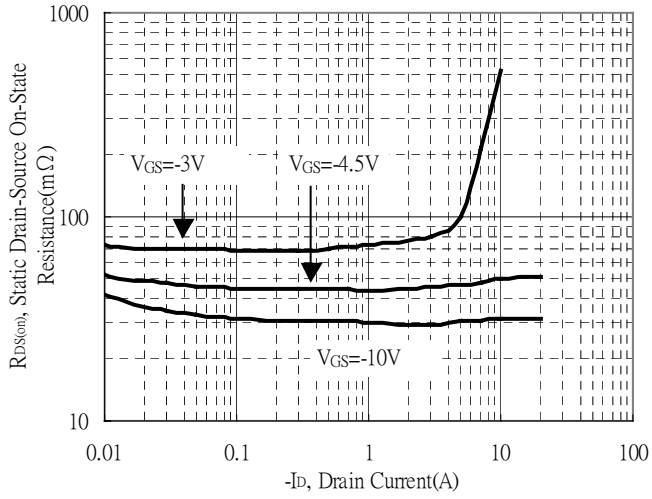
Typical Output Characteristics



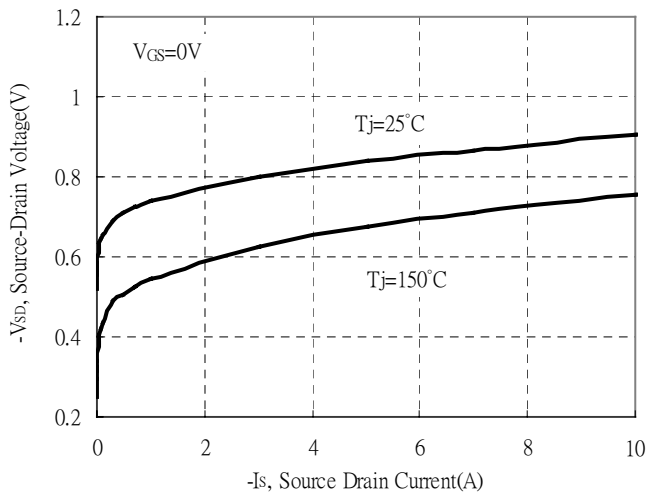
Brekdown Voltage vs Ambient Temperature



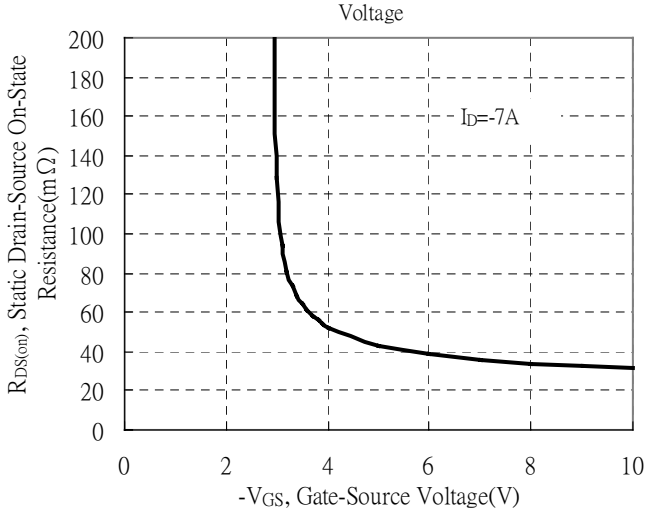
Static Drain-Source On-State resistance vs Drain Current



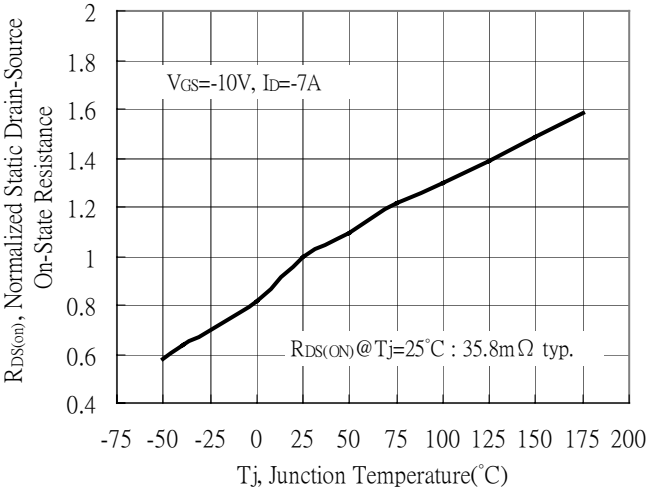
Source Drain Current vs Source-Drain Voltage



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

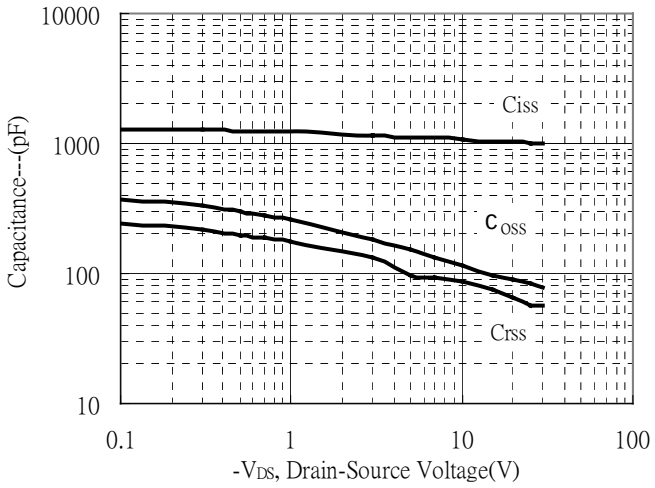


Drain-Source On-State Resistance vs Junction Tempearture

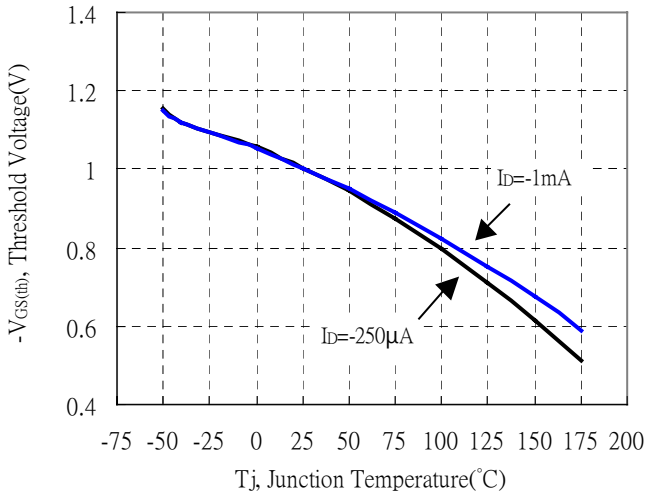


Q2, P-CH Typical Characteristics(Cont.)

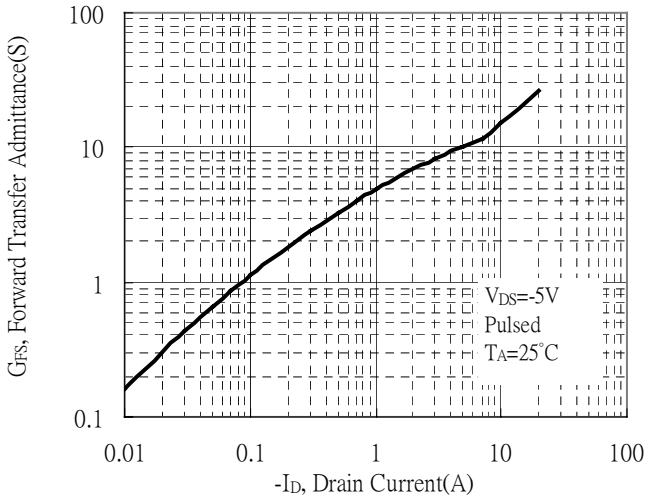
Capacitance vs Drain-to-Source Voltage



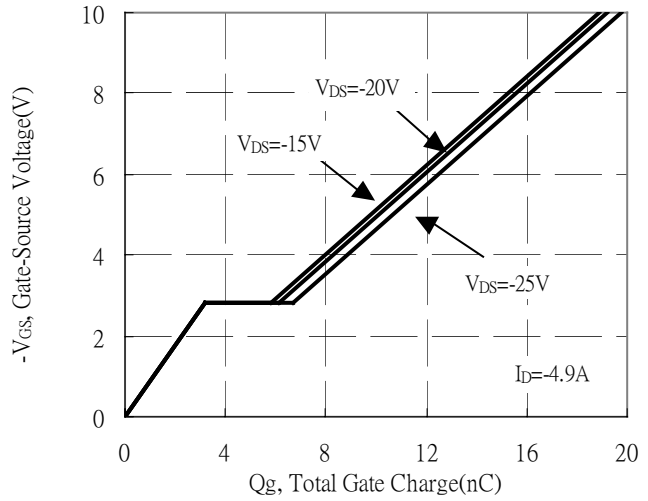
Threshold Voltage vs Junction Tempearture



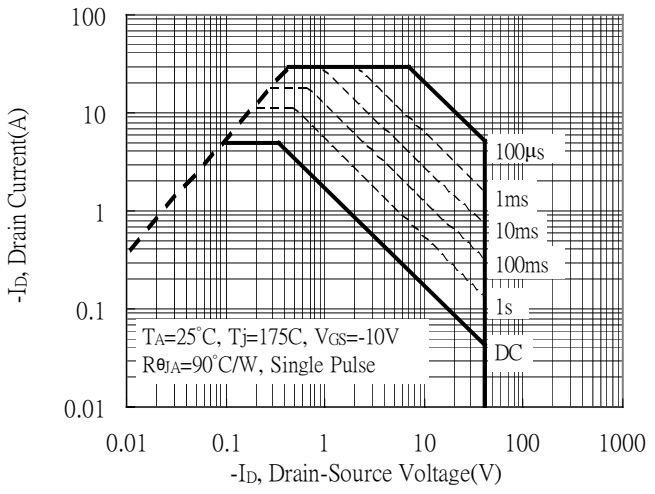
Forward Transfer Admittance vs Drain Current



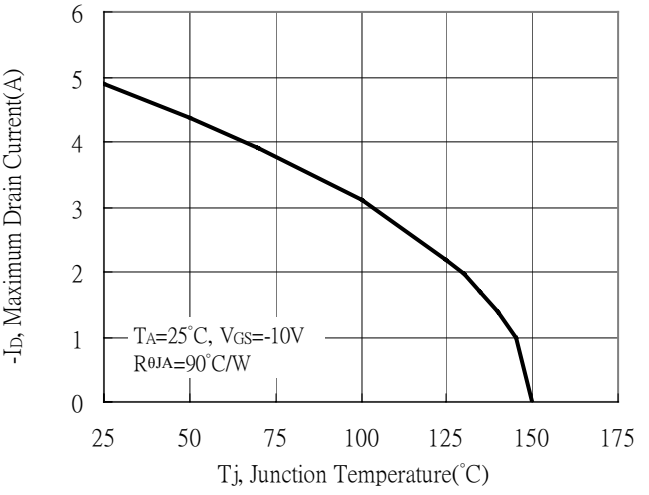
Gate Charge Characteristics



Maximum Safe Operating Area

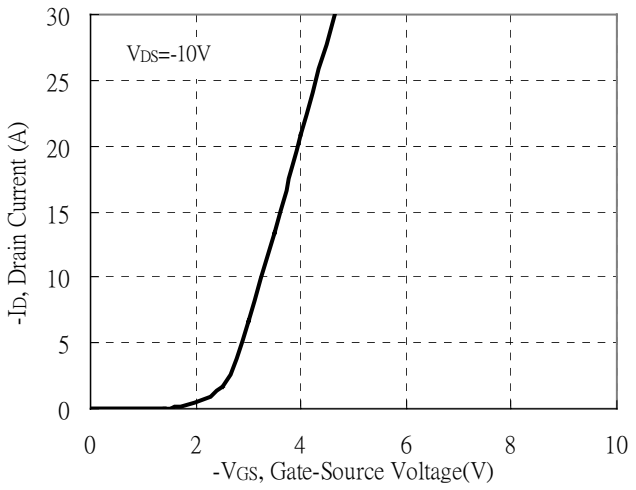


Maximum Drain Current vs Junction Temperature

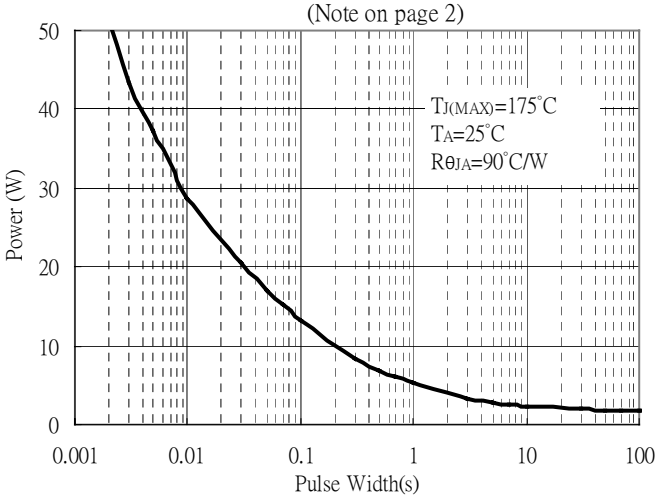


Q2, P-CH Typical Characteristics(Cont.)

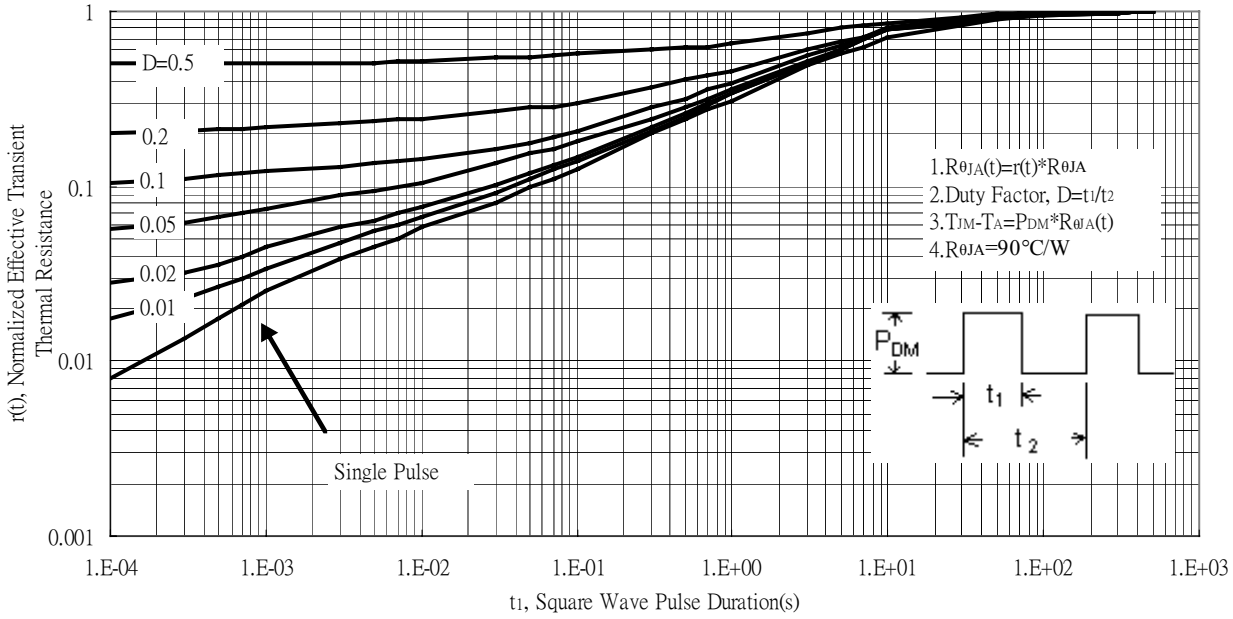
Typical Transfer Characteristics



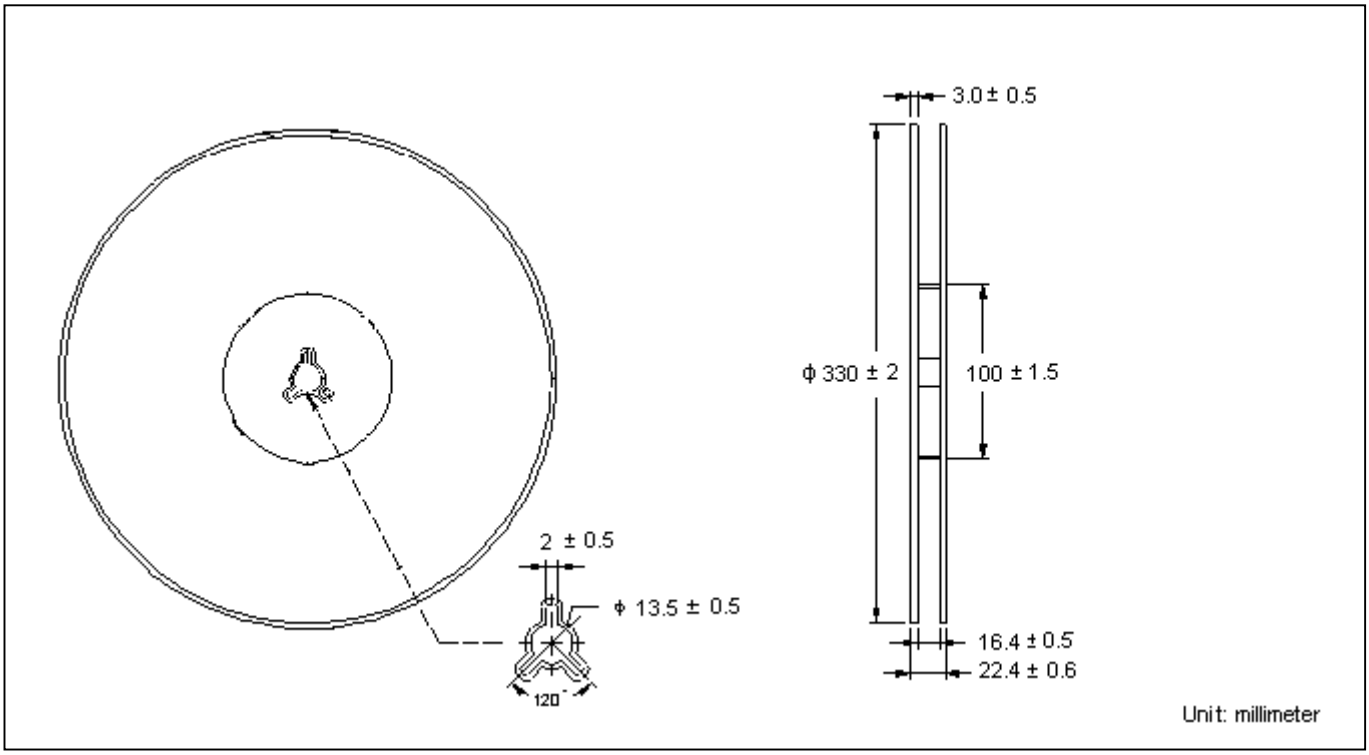
Single Pulse Power Rating, Junction to Ambient
(Note on page 2)



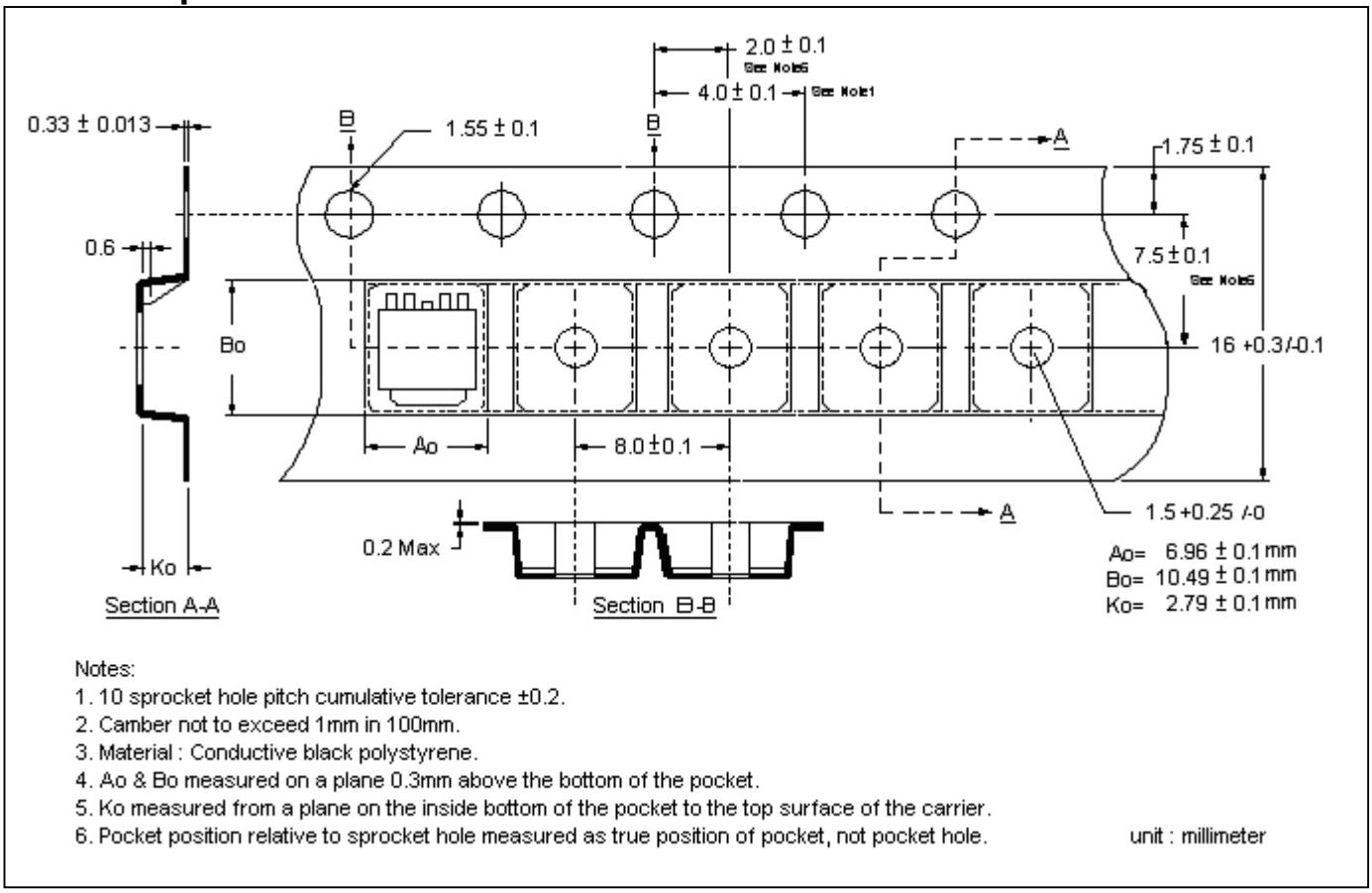
Transient Thermal Response Curves



Reel Dimension



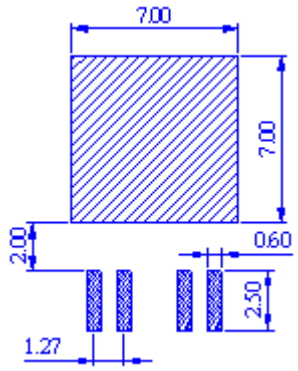
Carrier Tape Dimension



Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material : Conductive black polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

unit : millimeter

Recommended soldering footprint

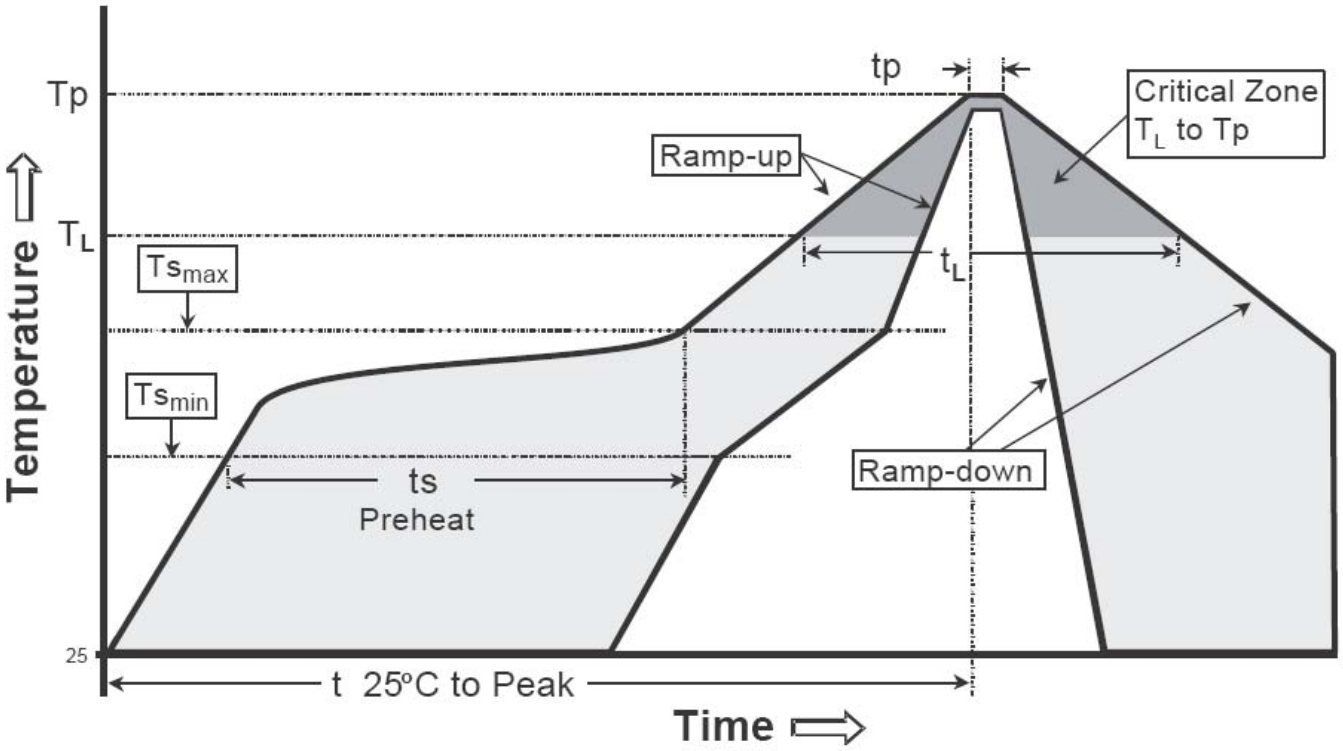


Unit : mm

Recommended wave soldering condition

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

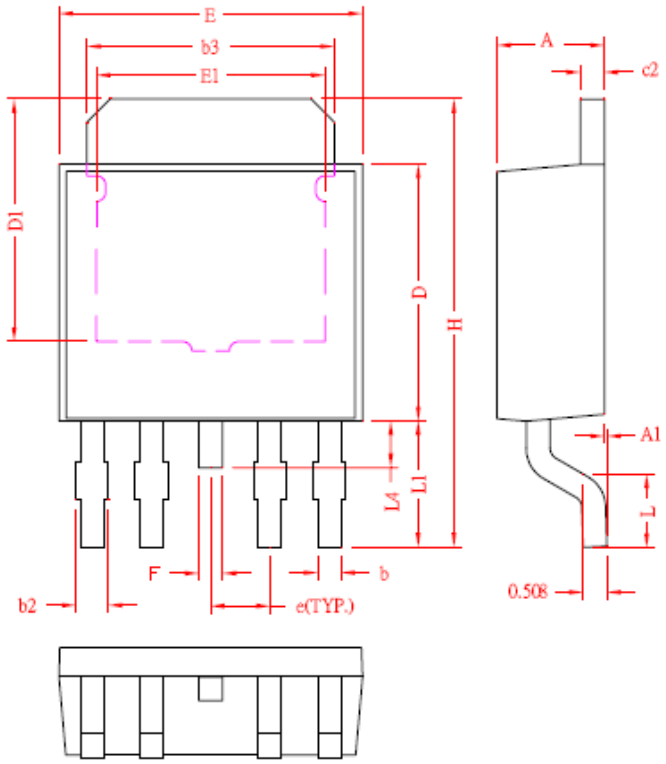
Recommended temperature profile for IR reflow



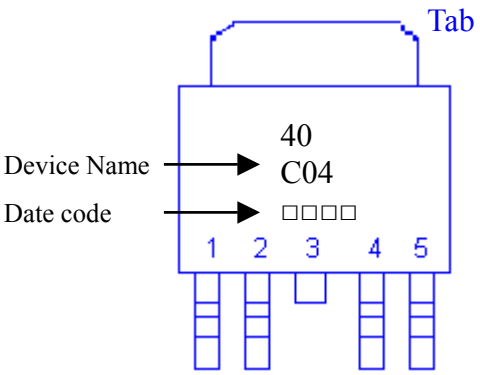
Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(Ts min) −Temperature Max(Ts max) −Time(ts min to ts max)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (TL)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

TO-252 Dimension



Marking:



Style: Pin 1.Soure 1 2.Gate 1 3.&Tab
Drain 1& Drain 2 4. Source 2 5. Gate 2

4-Lead TO-252 Plastic Surface Mount Package
Package Code: J4

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.

Material:

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