N & P-Channel Enhancement Mode Power MOSFET

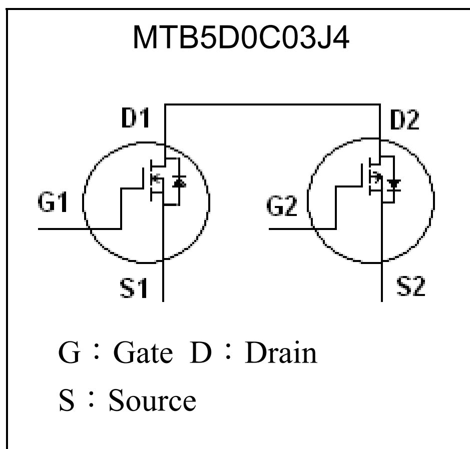
MTB5D0C03J4

	N-CH	P-CH
BV_{DSS}	30V	-30V
I_D @ V_{GS}=10V(-10V), T_A=25°C	8.6A	-6.8A
I_D @ V_{GS}=10V(-10V), T_C=25°C	33.5A	-26.5A
R_{DSON}(typ.) @V_{GS}=(-)10V	6.7 mΩ	13.4 mΩ
R_{DSON}(typ.) @V_{GS}=(-)4.5V	8.3 mΩ	20.1 mΩ

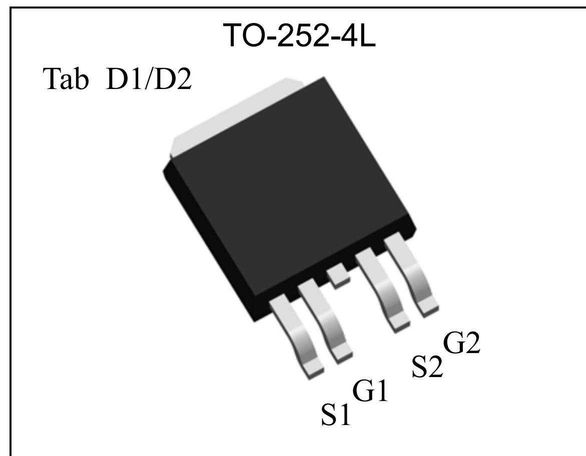
Features

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

Equivalent Circuit



Outline



Absolute Maximum Ratings (T_A=25°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}	±20	±20	V
Continuous Drain Current @ T_C=25°C, V_{GS}=10V(-10V) (Note1)	I_D	33.5	-26.5	A
Continuous Drain Current @ T_C=100°C, V_{GS}=10V(-10V) (Note1)	I_D	21.2	-16.8	A
Continuous Drain Current @ T_A=25°C, V_{GS}=10V(-10V) (Note4)	I_D	8.6	-6.8	A
Continuous Drain Current @ T_A=70°C, V_{GS}=10V(-10V) (Note4)	I_D	6.9	-5.4	A
Pulsed Drain Current *1 (Note3)	I_{DM}	134	-106	A
Single Pulse Avalanche Current @ L=0.1mH	I_{AS}	33.5	-26.5	A
Single Pulse Avalanche Energy @L=1mH (Note5)	E_{AS}	128	128	mJ
Total Power Dissipation (T_C=25℃) (Note1)	P_D	25		W
Total Power Dissipation (T_C=100℃) (Note1)	P_D	10		W
Total Power Dissipation (T_A=25℃) (Note2)	P_{DSM}	2.4		W
Total Power Dissipation (T_A=70℃) (Note2)	P_{DSM}	1.7		W
Operating Junction and Storage Temperature Range	Tj, Tstg	-55~+150		°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 $T_{J(MAX)}$=150°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 in² FR-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 $T_{J(MAX)}$=150°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.
5. L=1mH, I_{AS}=±16A, V_{GS}=±10V, V_{DD}=±15V. 100% tested by L=0.1mH, I_{AS}=±10A, V_{GS}=±10V, V_{DD}=±15V.

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	30	-	-	V	V_{GS}=0V, I_D=250μA
$\Delta BV_{DSS}/\Delta Tj$	-	0.02	-	V/°C	Reference to 25°C, I_D=250μA
$V_{GS(th)}$	1.0	-	2.5	V	V_{DS}=V_{GS}, I_D=250μA
I_{GSS}	-	-	±100	nA	V_{GS}=±20V, V_{DS}=0V
I_{DSS}	-	-	1	μA	V_{DS}=30V, V_{GS}=0V
	-	-	10		V_{DS}=24V, V_{GS}=0V, Tj=55°C
$R_{DS(ON)}$ *1	-	6.7	9.7	mΩ	V_{GS}=10V, I_D=10A
	-	8.3	12		V_{GS}=4.5V, I_D=7A
G_{FS} *1	-	14.9	-	S	V_{DS}=10V, I_D=7A
Dynamic					
Qg *1	-	34.3	-	nC	V_{DS}=24V, I_D=8A, V_{GS}=10V
Qgs *1	-	4.4	-		
Qgd *1	-	8.8	-		
$t_{d(ON)}$ *1	-	7	-	ns	V_{DS}=15V, I_D=1A, V_{GS}=10V, R_G=2.7Ω
tr *1	-	13.4	-		
$t_{d(OFF)}$ *1	-	53	-		
t_f *1	-	11.6	-		
Ciss	-	1385	-	pF	V_{DS}=25V, V_{GS}=0V, f=1MHz
Coss	-	216	-		
Crss	-	143	-		
Source-Drain Diode					
I_S *1	-	-	33.5	A	
I_{SM} *2	-	-	134		
V_{SD} *1	-	0.82	1.2	V	I_S=10A, V_{GS}=0V
trr *	-	13.9	-	ns	I_F=8A, dI_F/dt=100A/μs
Qrr *	-	6.4	-	nC	

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

*2.Pulse width limited by maximum junction temperature.

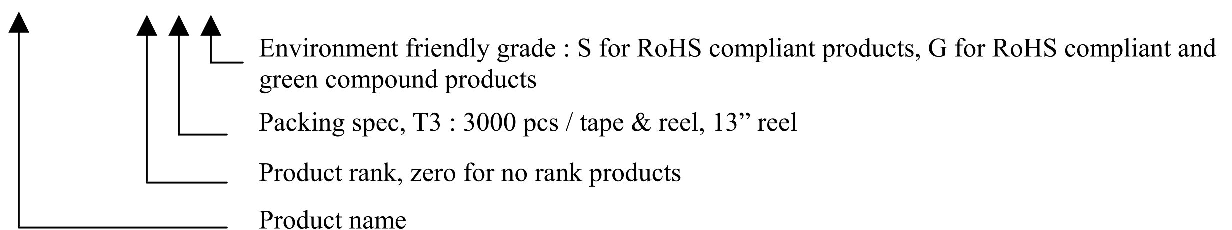
P-CH Characteristics (Tc=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	-30	-	-	V	V_{GS}=0V, I_D=-250μA
$\Delta BV_{DSS}/\Delta Tj$	-	-0.02	-	V/°C	Reference to 25°C, I_D=-250μA
$V_{GS(th)}$	-1.0	-	-2.5	V	V_{DS}=V_{GS}, I_D=-250μA
I_{GSS}	-	-	±100	nA	V_{GS}=±20V, V_{DS}=0V
I_{DSS}	-	-	-1	μA	V_{DS}=-30V, V_{GS}=0V
	-	-	-10		V_{DS}=-24V, V_{GS}=0V, Tj=55°C
$R_{DS(ON)}$ *1	-	13.4	17	mΩ	V_{GS}=-10V, I_D=-4.5A
	-	20.1	27.5		V_{GS}=-4.5V, I_D=-4A
G_{FS} *1	-	13.8	-	S	V_{DS}=-10V, I_D=-7A
Dynamic					
Qg *1	-	35.6	-	nC	V_{DS}=-24V, I_D=-6A, V_{GS}=-10V
Qgs *1	-	4.7	-		
Qgd *1	-	8.6	-		
$t_{d(ON)}$ *1	-	11.2	-	ns	V_{DS}=-15V, I_D=-1A, V_{GS}=-10V, R_G=2.7Ω
tr *1	-	21.2	-		
$t_{d(OFF)}$ *1	-	70.8	-		
t_f *1	-	16.6	-		
Ciss	-	1474	-	pF	V_{DS}=-25V, V_{GS}=0V, f=1MHz
Coss	-	154	-		
Crss	-	133	-		
Source-Drain Diode					
I_S *1	-	-	-26.5	A	
I_{SM} *2	-	-	-106		
V_{SD} *1	-	-0.87	-1.2	V	I_S=-10A, V_{GS}=0V
trr *	-	12	-	ns	I_F==-6A, dI_F/dt=100A/μs
Qrr *	-	5.7	-	nC	

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

Ordering Information

Device	Package	Shipping
MTB5D0C03J4-0-T6-G	TO-252 (RoHS compliant & Halogen-free package)	3000 pcs / Tape & Reel



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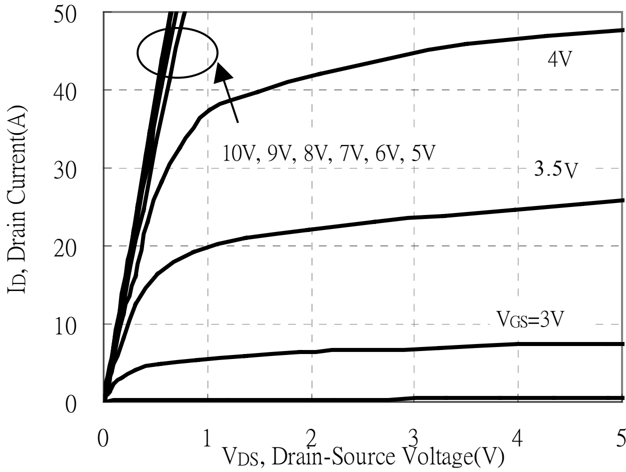

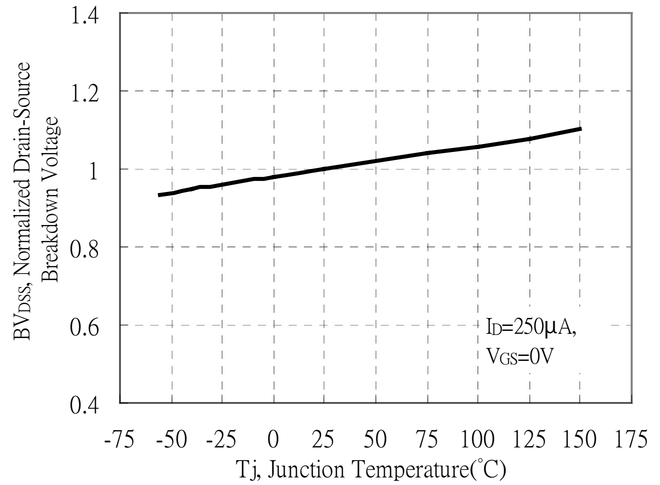

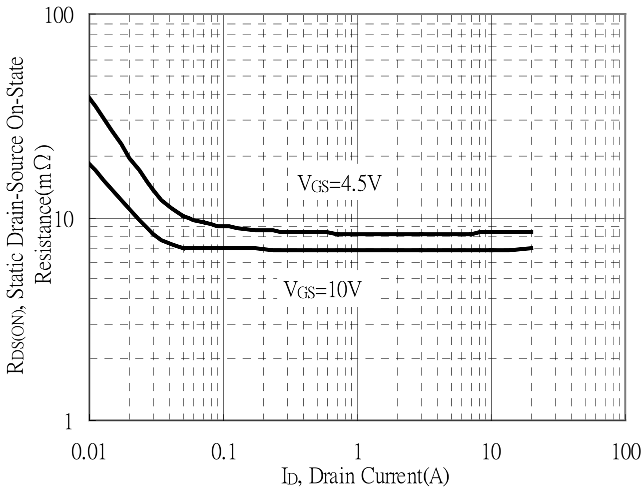

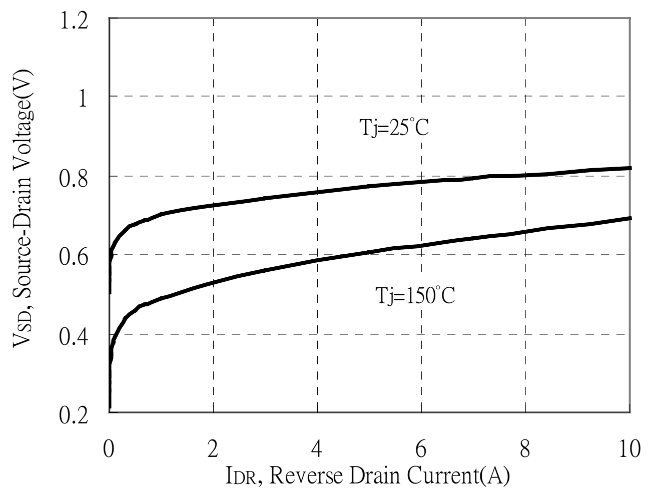

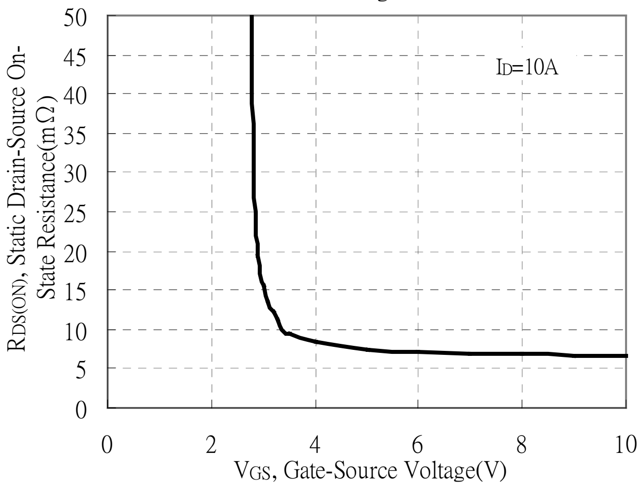

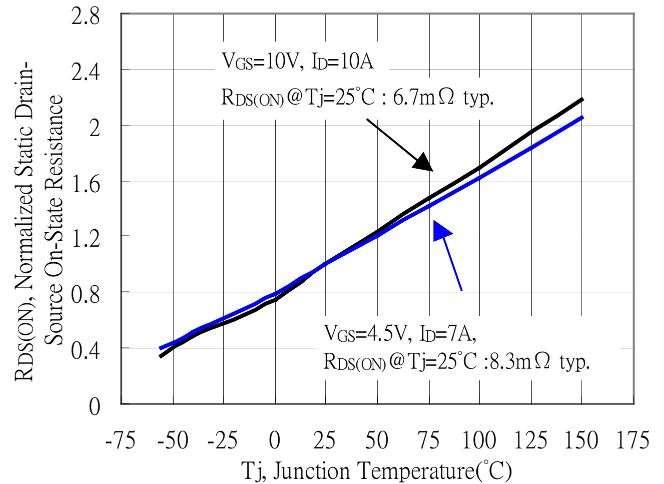

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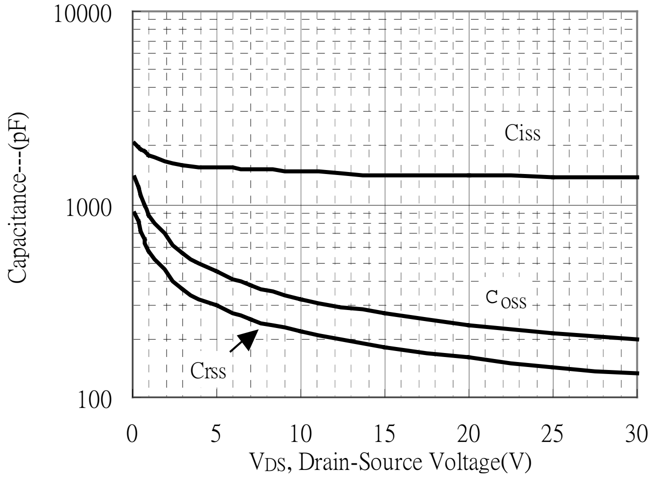

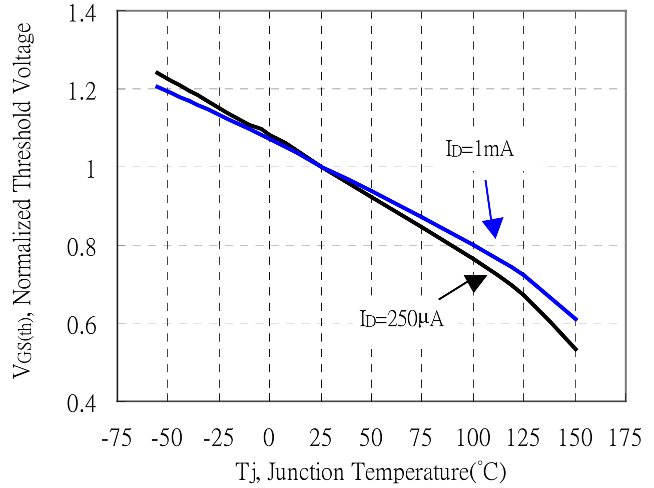

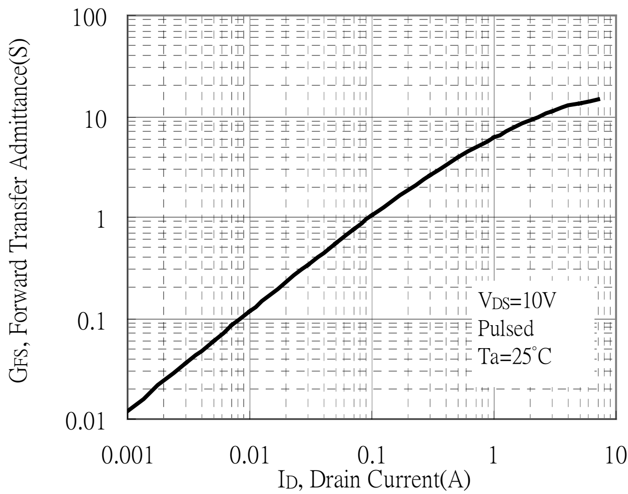

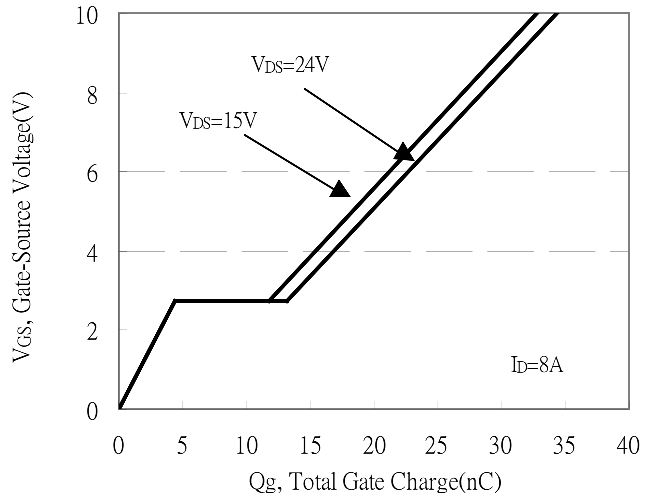

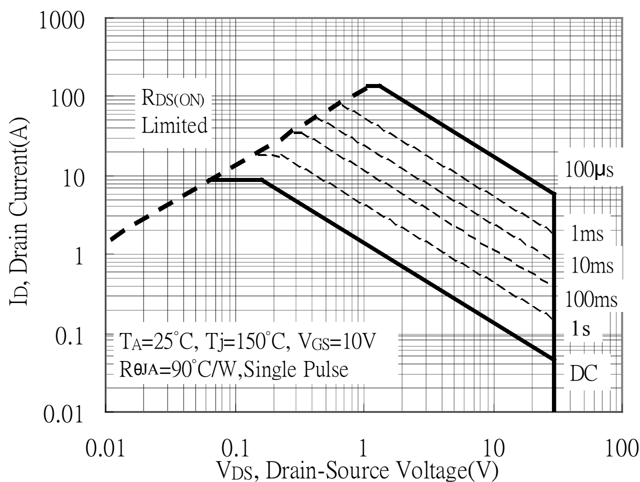

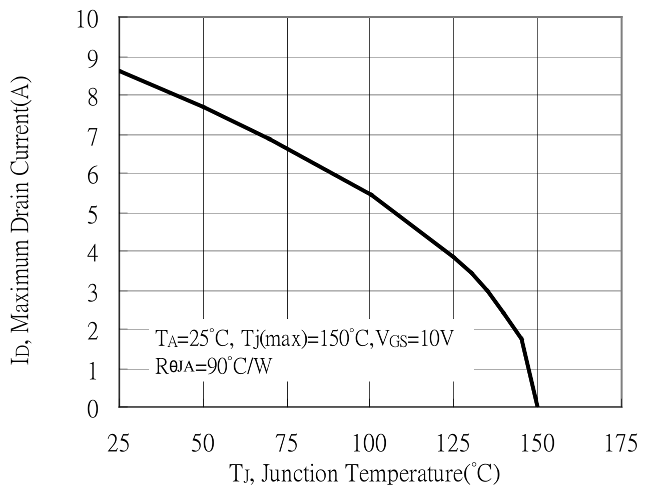

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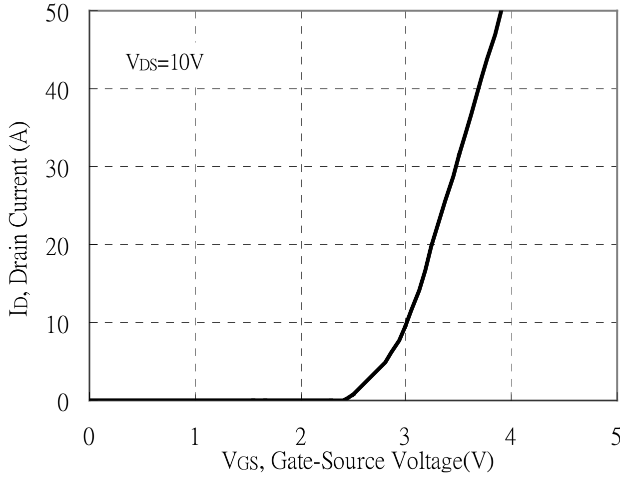
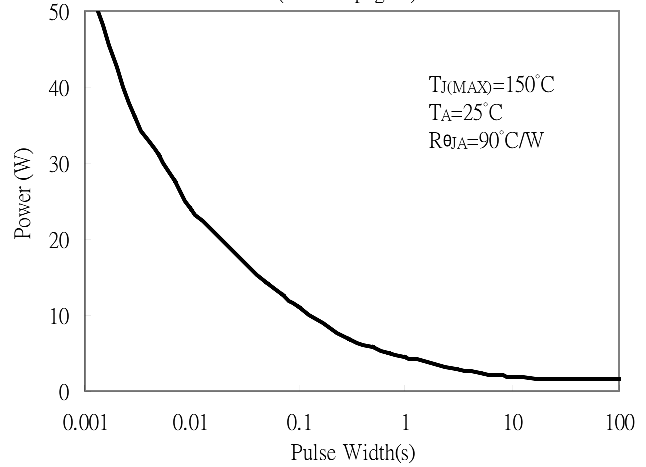
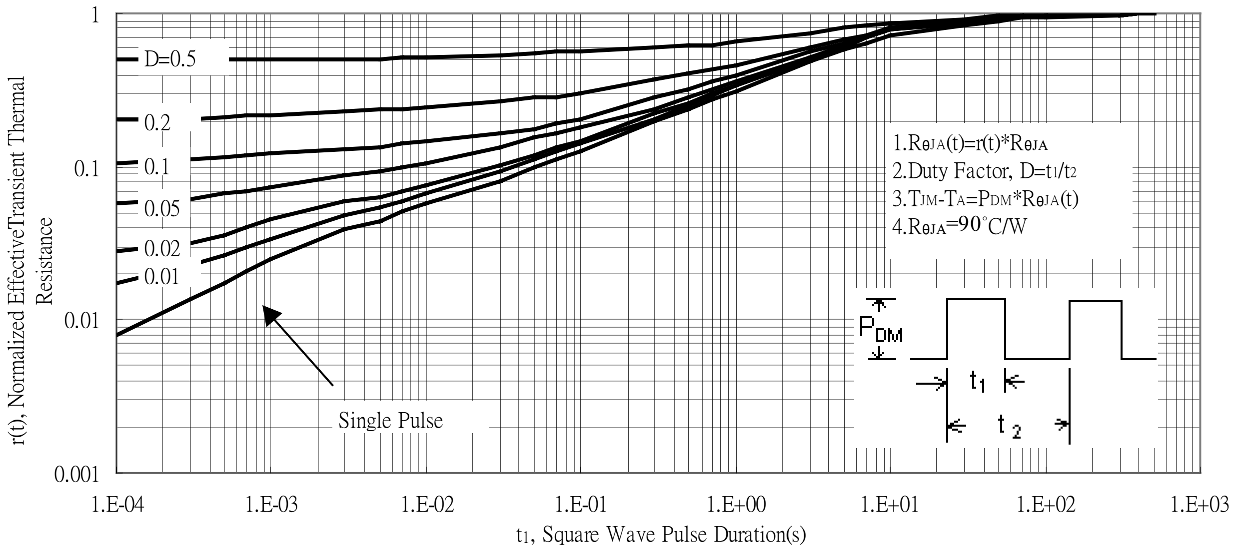
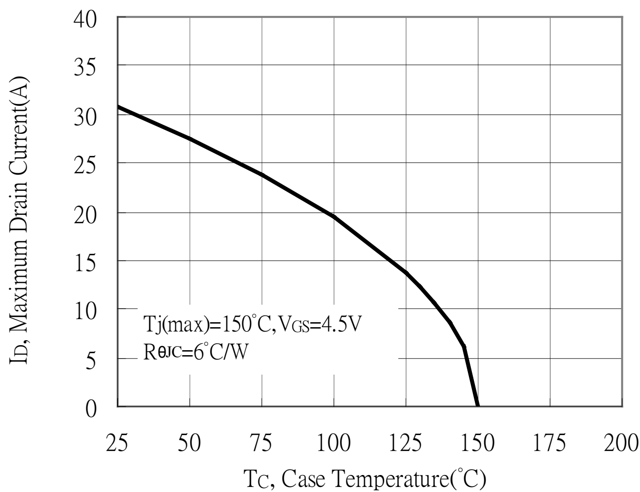
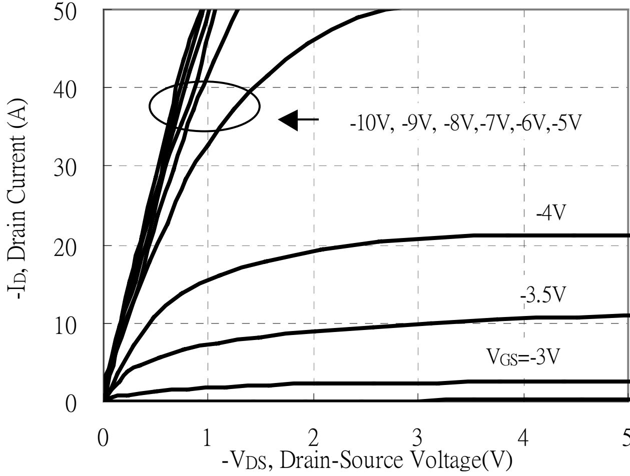


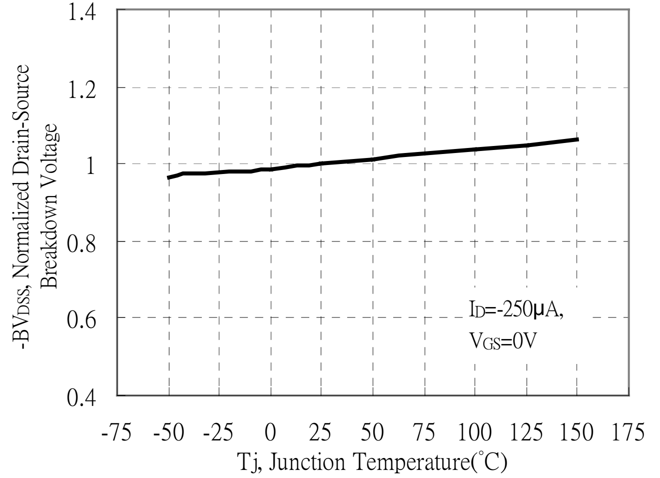


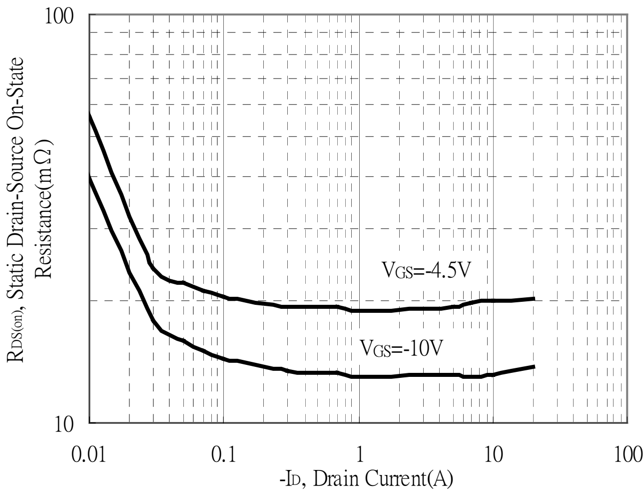


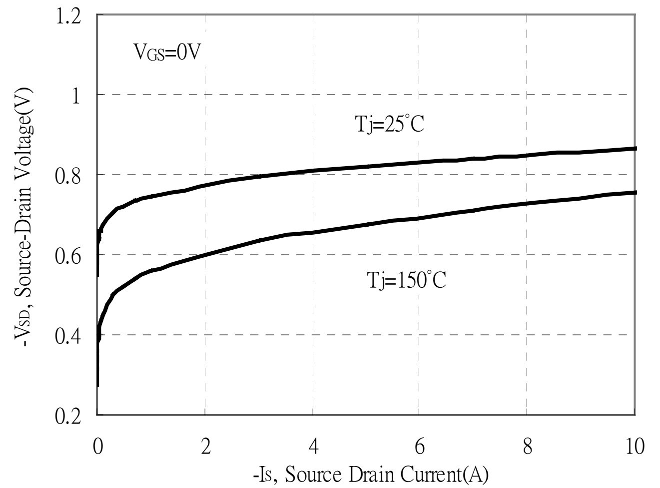


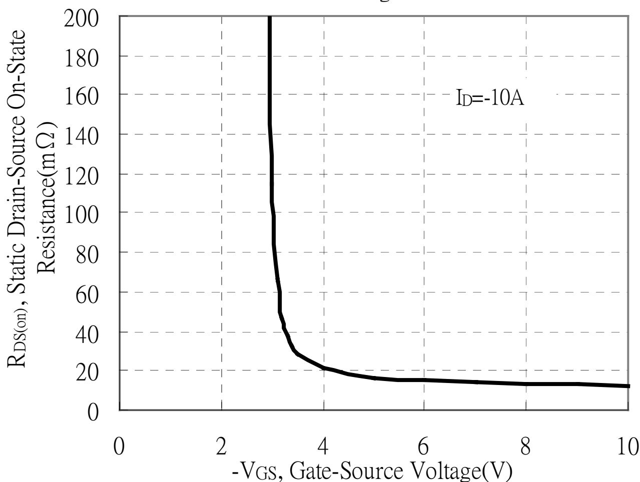
Q2, P-CH Typical Characteristics

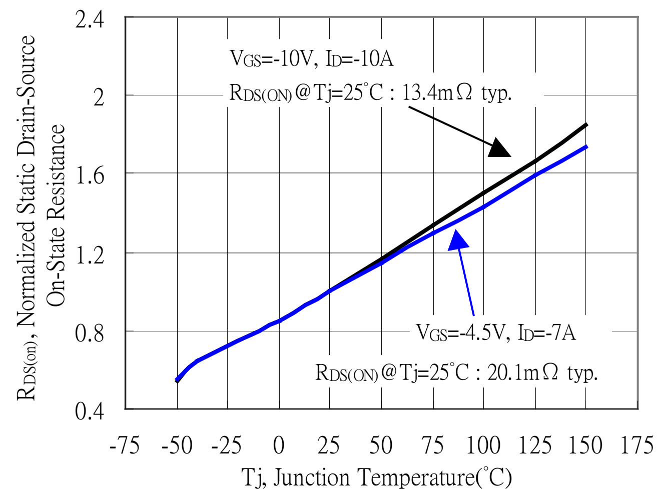












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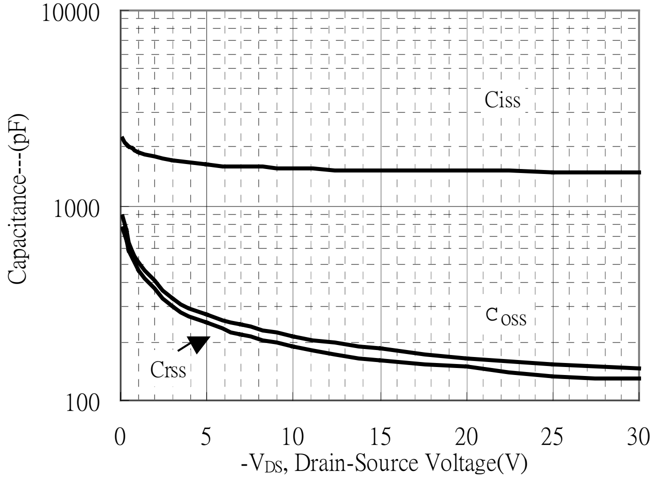

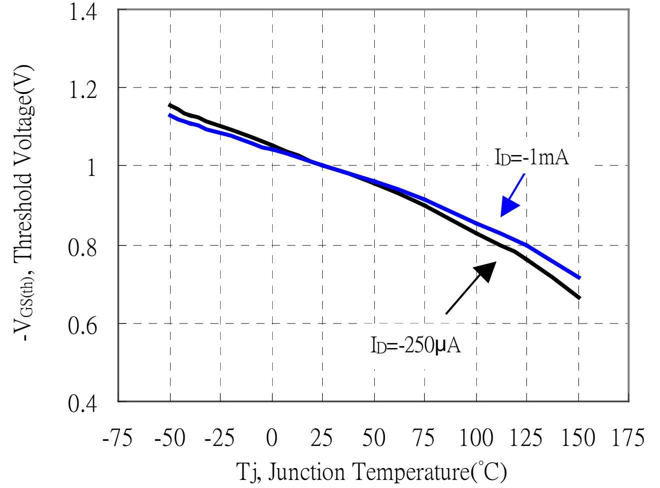

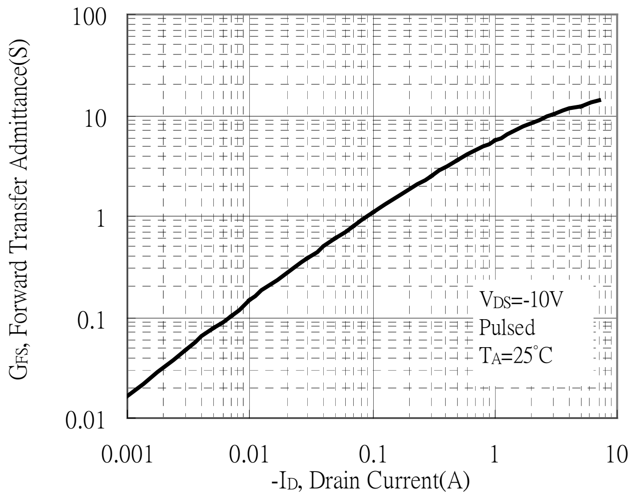

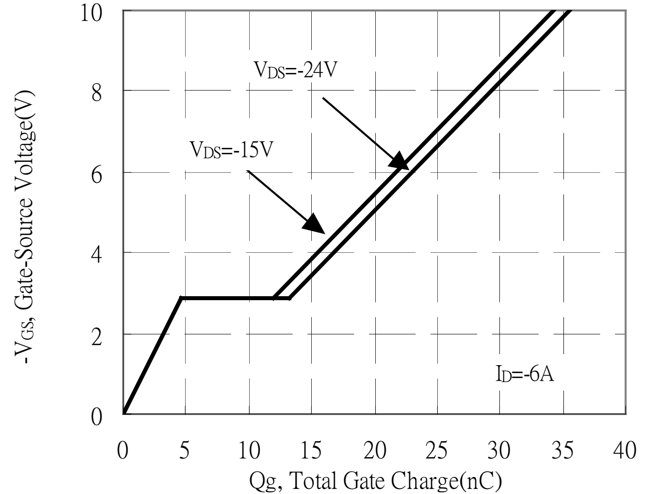

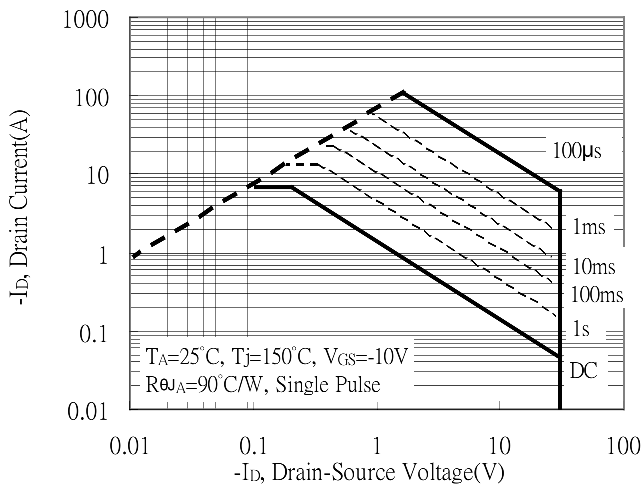

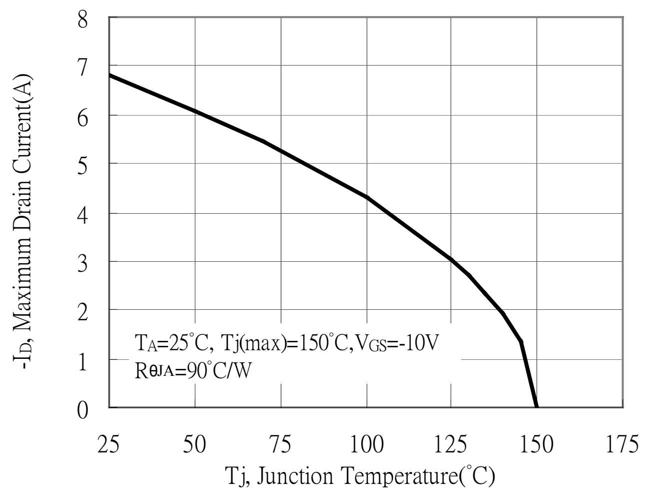

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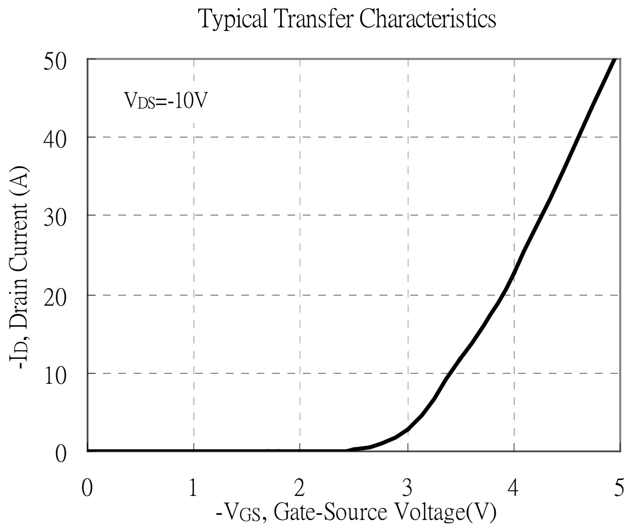
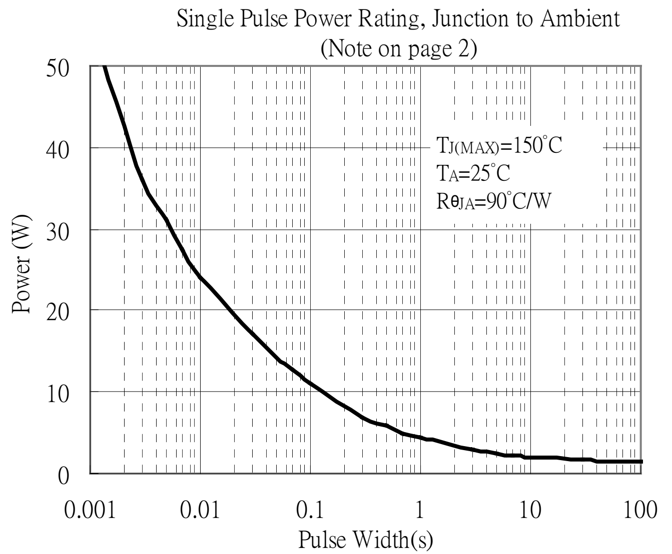
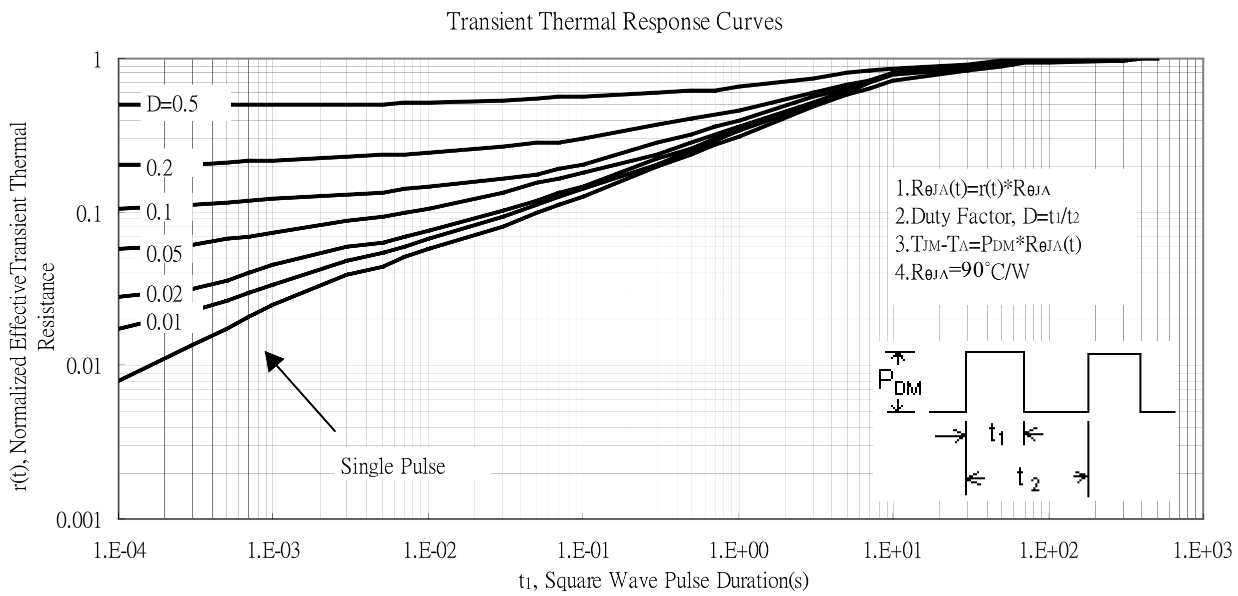
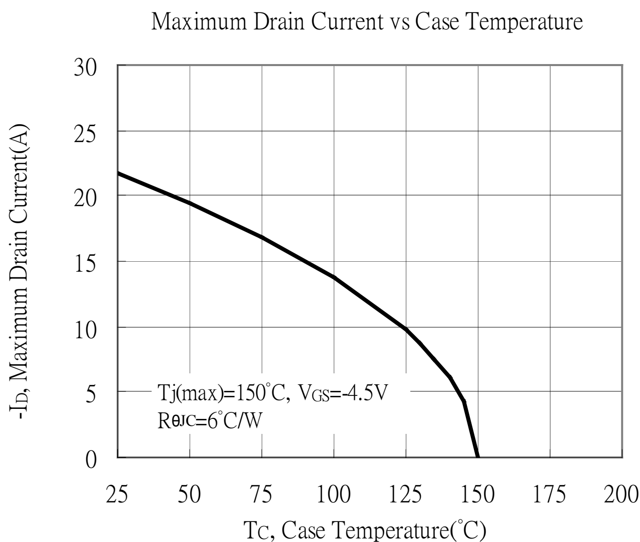
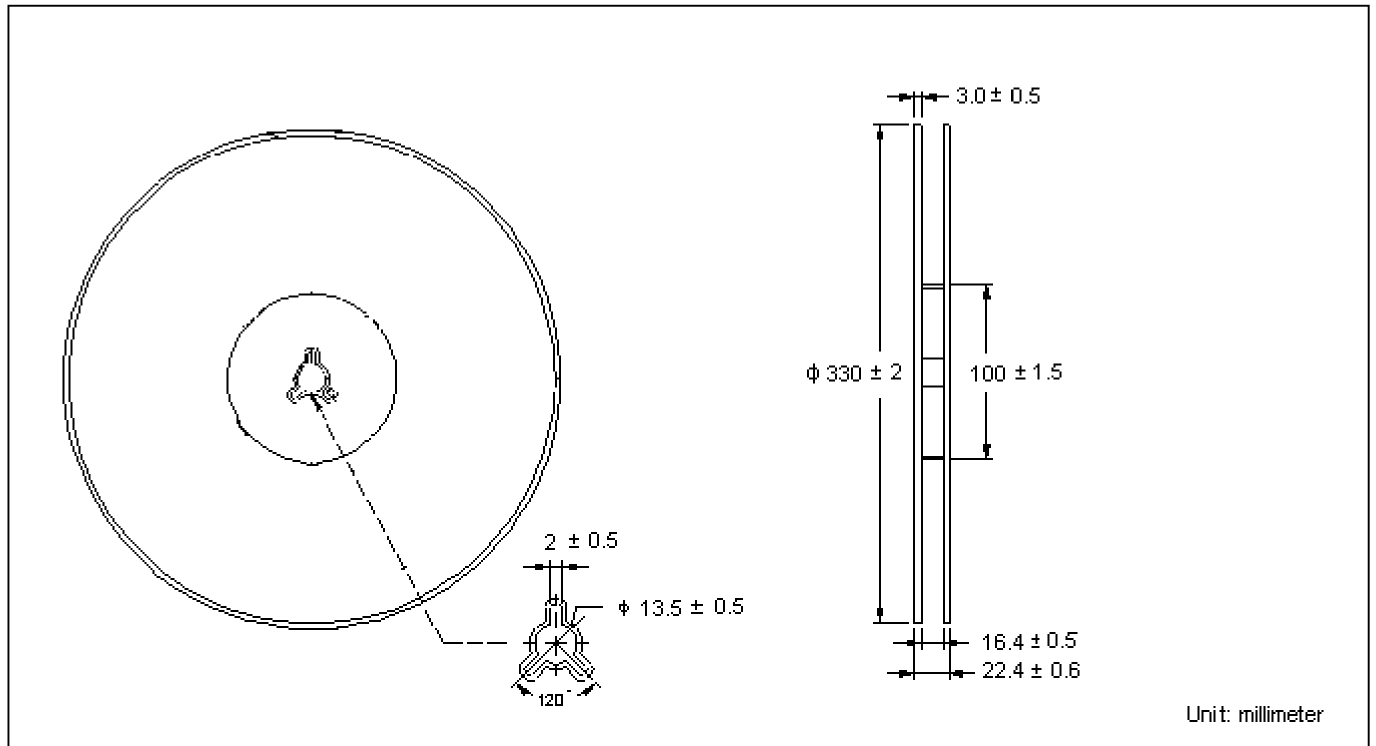




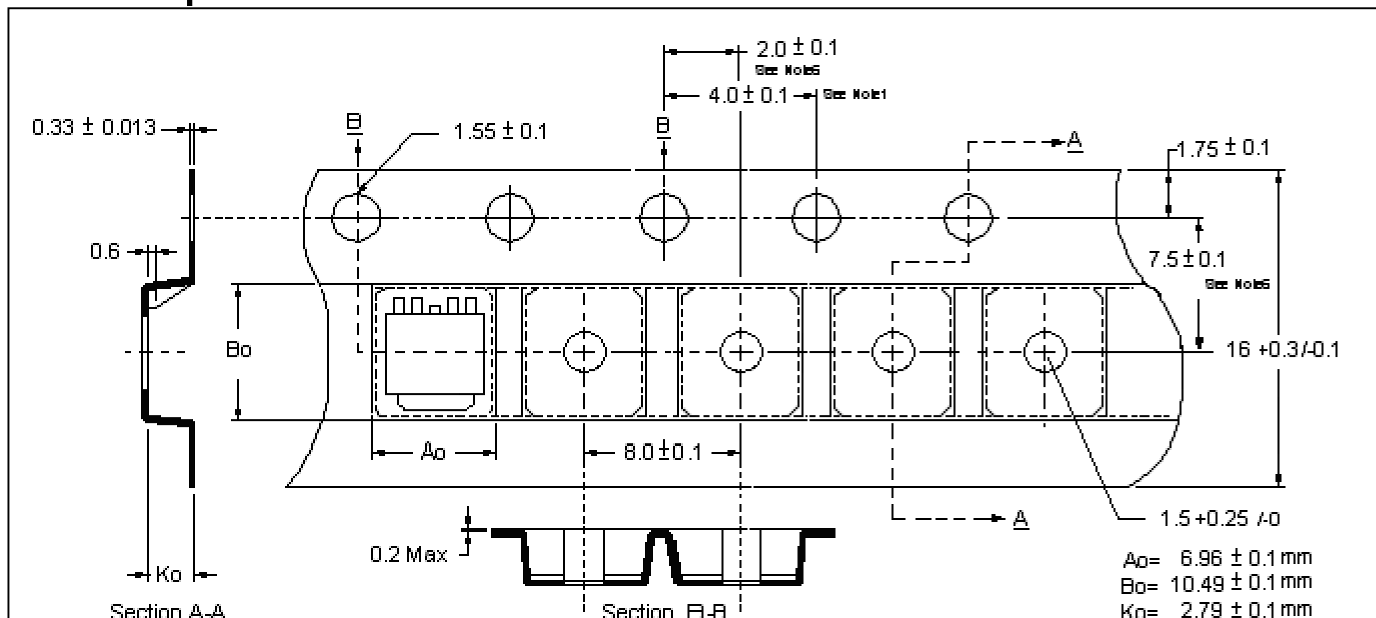




Reel Dimension



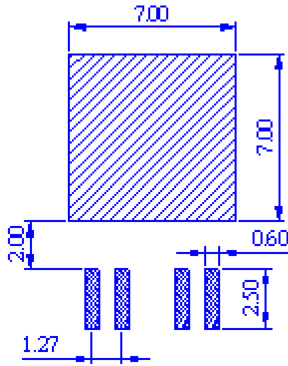
Carrier Tape Dimension



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

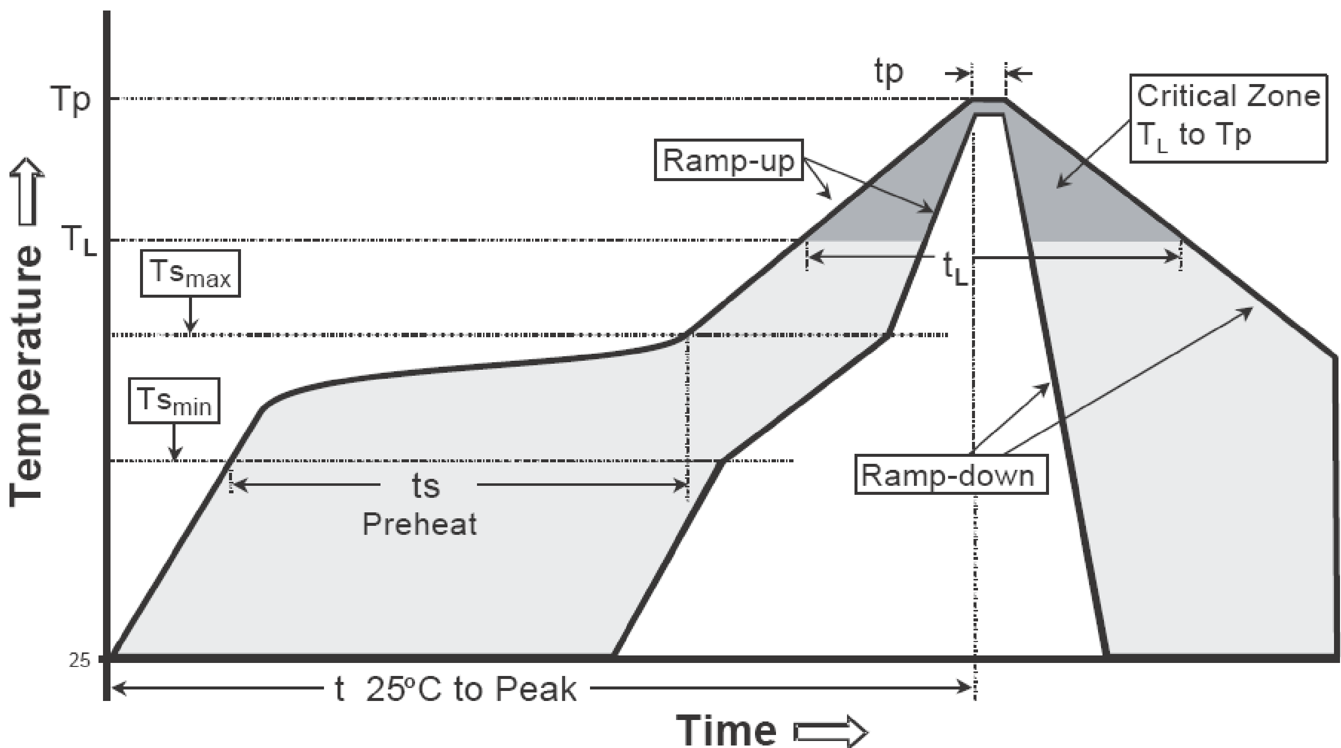


Unit : mm

Recommended wave soldering condition

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

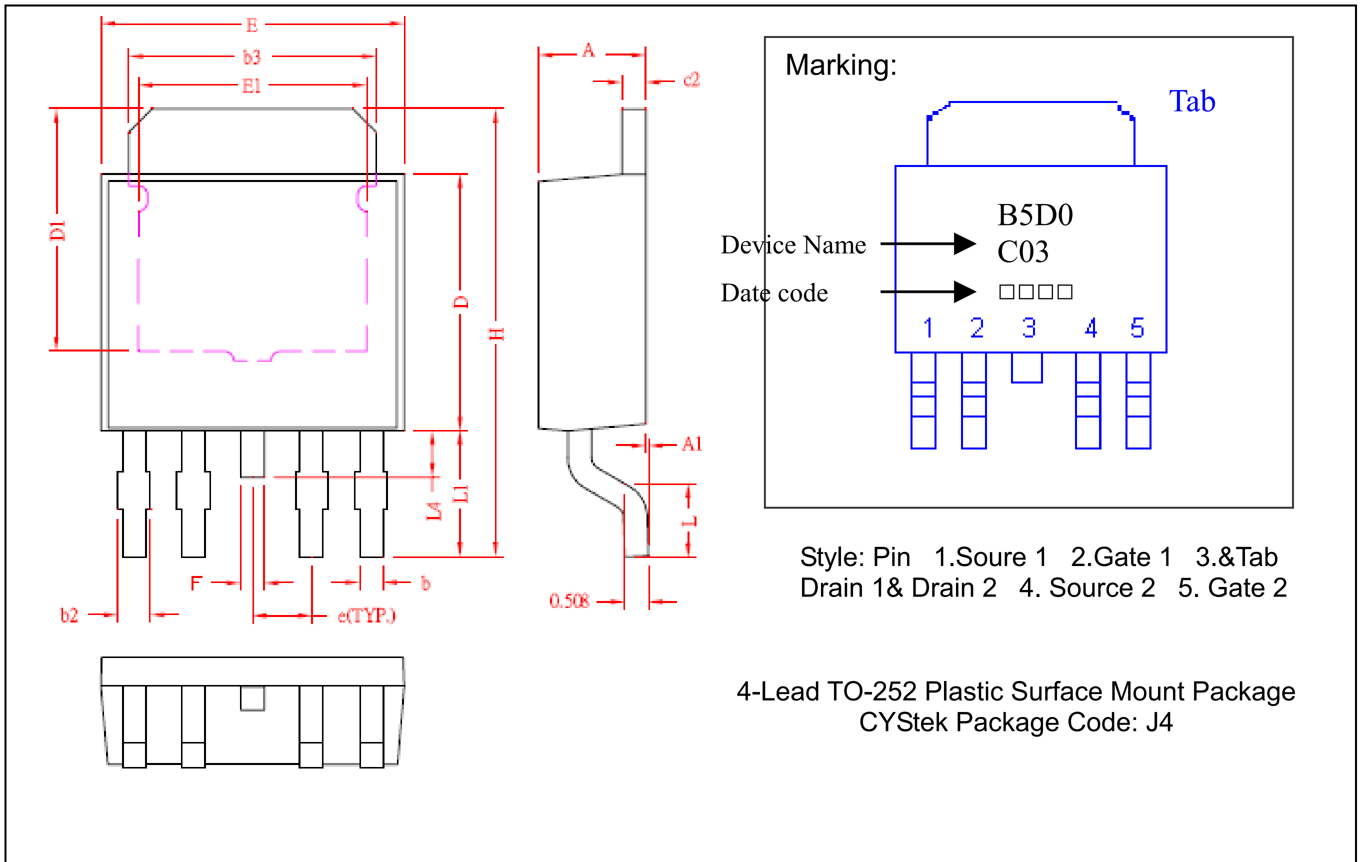
Recommended temperature profile for IR reflow



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(T_S min) −Temperature Max(T_S 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 (T_L) − Time (t_L)	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(T_P)	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



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
CYStek 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.
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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