

N-Channel Enhancement Mode MOSFET

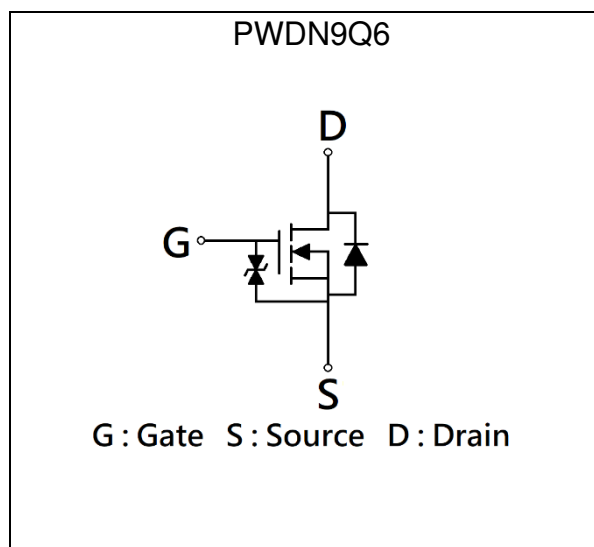
PWDN9Q6

Features

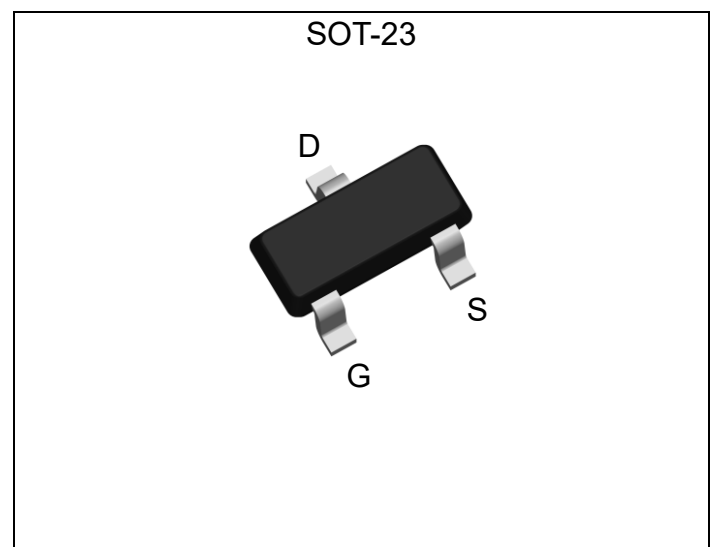
- ESD protected gate, typical 2kV (HBM)
- High speed switching
- Easily designed drive circuits
- Low-voltage drive
- Easy to use in parallel
- RoHS compliant package

BV_{DSS}	60V
$I_D @ V_{GS}=4.5V, T_A=25^\circ C$	0.5A
$R_{DS(ON) typ.} @ V_{GS}=4.5V, I_D=0.2A$	1.3Ω
$R_{DS(ON) typ.} @ V_{GS}=2.5V, I_D=0.1A$	1.7Ω

Equivalent Circuit



Outline



Ordering Information

Device	Package	Shipping
PWDN9Q6-3-W4-J	SOT-23 (Pb-free lead plating and halogen-free package)	3000 pcs / Tape & Reel

- ↑ Environment friendly grade : V for RoHS compliant products, J for RoHS compliant and green compound products
- ↑ Packing spec, W4 : 3000 pcs / tape & reel, 7" reel
- ↑ Product rank, 3 for no rank products
- ↑ Product name

Absolute Maximum Ratings (T_A=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V _{DS}	60	V
Gate-Source Voltage	V _{GS}	±20	
Continuous Drain Current @ V _{GS} =4.5V, T _A =25°C	I _D	0.5	A
Continuous Drain Current @ V _{GS} =4.5V, T _A =70°C		0.4	
Pulsed Drain Current *a	I _{DM}	2	
Continuous Body Diode Forward Current @ T _A =25°C	I _S	0.5	
ESD susceptibility *b	V _{ESD}	2000	V
Total Power Dissipation @ T _A =25°C	P _D	0.7	W
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55~+150	°C

Thermal Data

Parameter	Symbol	Steady State	Unit
Thermal Resistance, Junction-to-ambient	R _{θJA}	180	°C/W

Note:

*a. 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.

*b. Human body model, 1.5kΩ in series with 100pF.

Electrical Characteristics (T_A=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	60	-	-	V	V _{GS} =0V, I _D =250μA
V _{GS(th)}	0.5	-	1.5		V _{DS} =V _{GS} , I _D =250μA
G _{FS}	-	0.5	-	S	V _{DS} =5V, I _D =0.2A
I _{GSS}	-	-	±10	μA	V _{GS} =±16V, V _{DS} =0V
I _{DSS}	-	-	1		V _{DS} =48V, V _{GS} =0V
R _{DS(ON)}	-	1.3	3	Ω	V _{GS} =4.5V, I _D =0.2A
	-	1.7	5		V _{GS} =2.5V, I _D =0.1A
Dynamic					
C _{iss}	-	25	-	pF	V _{DS} =30V, V _{GS} =0V, f=1MHz
C _{oss}	-	8	-		
C _{rss}	-	7	-		
R _g	-	2.7	-	Ω	f=1MHz
Q _g *1, 2	-	0.75	-	nC	V _{DS} =30V, I _D =0.2A, V _{GS} =4.5V
Q _{gs} *1, 2	-	0.35	-		
Q _{gd} *1, 2	-	0.15	-		
t _{d(ON)} *1, 2	-	3	-	ns	V _{DS} =30V, I _D =0.2A, V _{GS} =10V, R _{GS} =25 Ω
t _r *1, 2	-	16	-		
t _{d(OFF)} *1, 2	-	11	-		
t _f *1, 2	-	16	-		
Source-Drain Diode					
V _{SD} *1	-	0.8	1.2	V	I _S =0.2A, V _{GS} =0V
t _{rr}	-	9	-	ns	I _F =0.2A, dI _F /dt=100A/μs
Q _{rr}	-	2.7	-	nC	

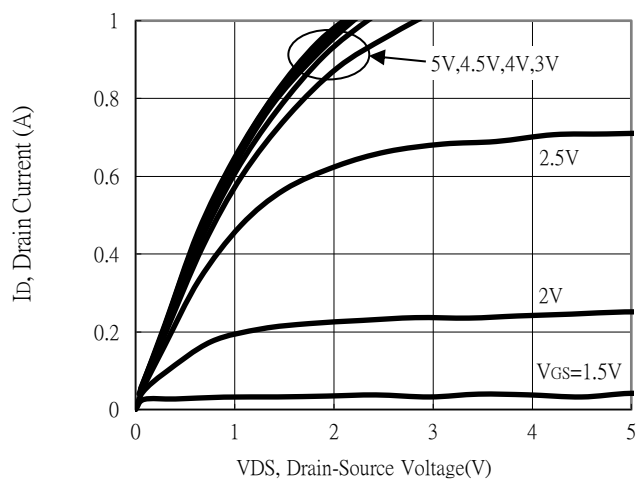
Note:

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

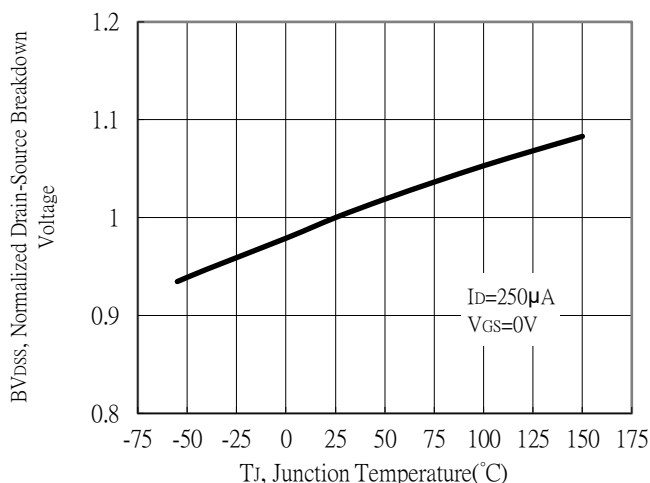
*2. Independent of operating temperature

Typical Characteristics

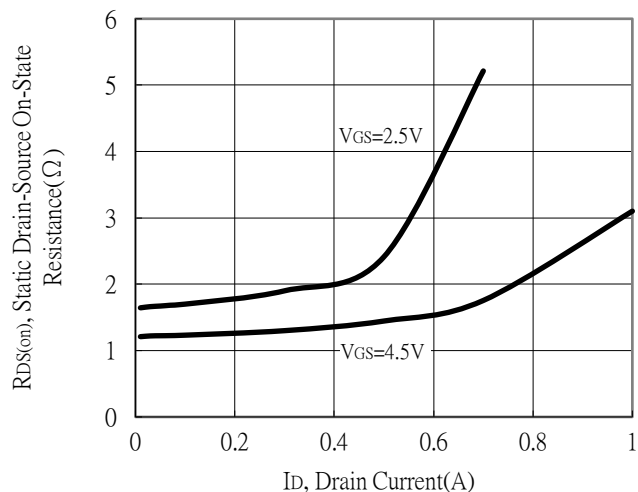
Typical Output Characteristics



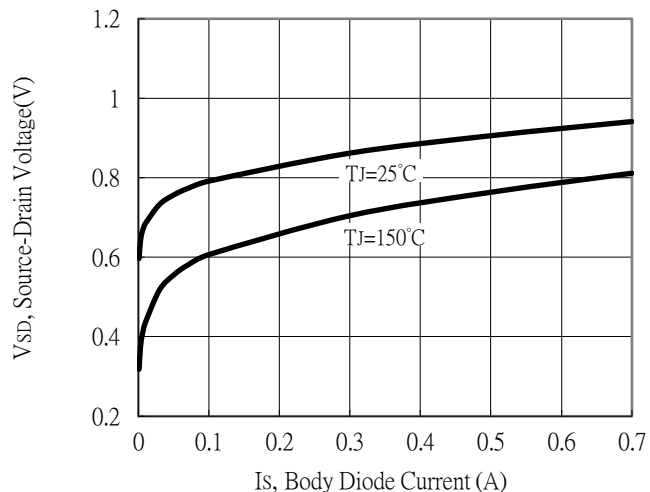
Breakdown Voltage vs Ambient Temperature



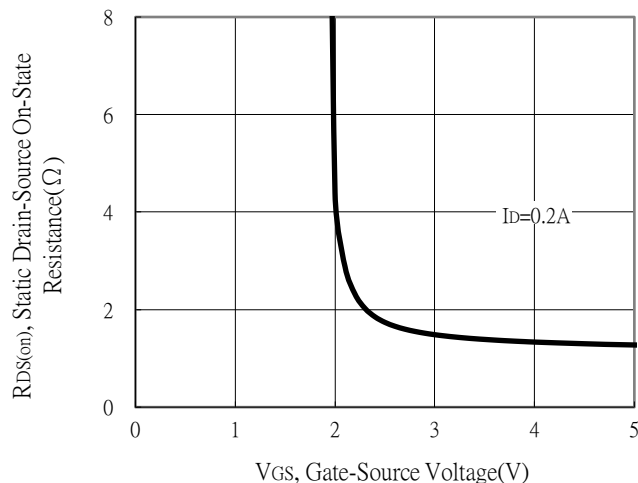
Static Drain-Source On-State resistance vs Drain Current



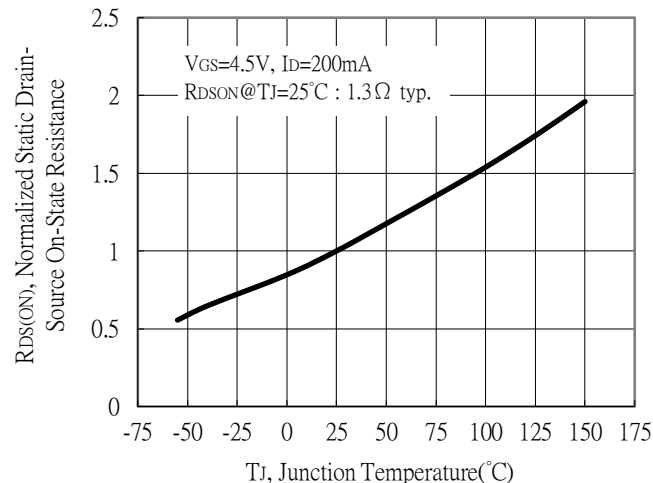
Body Diode Current vs Source-Drain Voltage



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

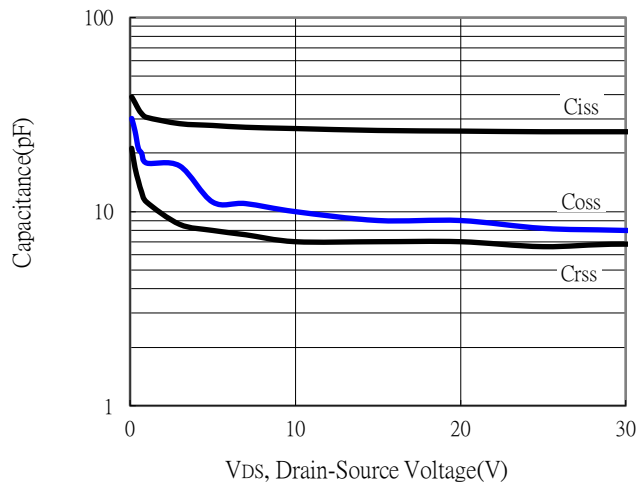


Drain-Source On-State Resistance vs Junction Temperature

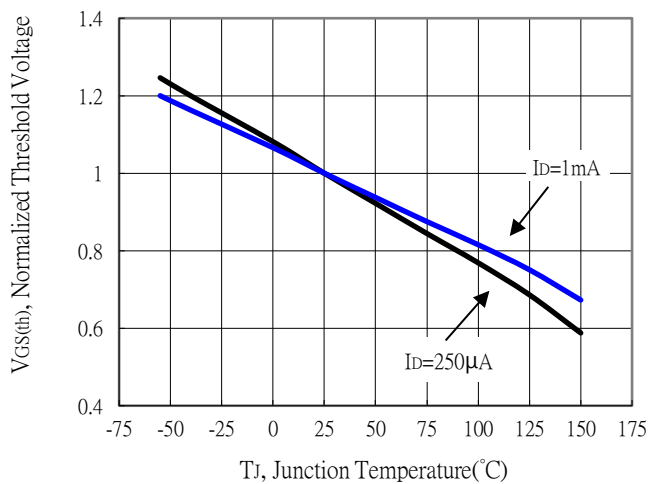


Typical Characteristics (Cont.)

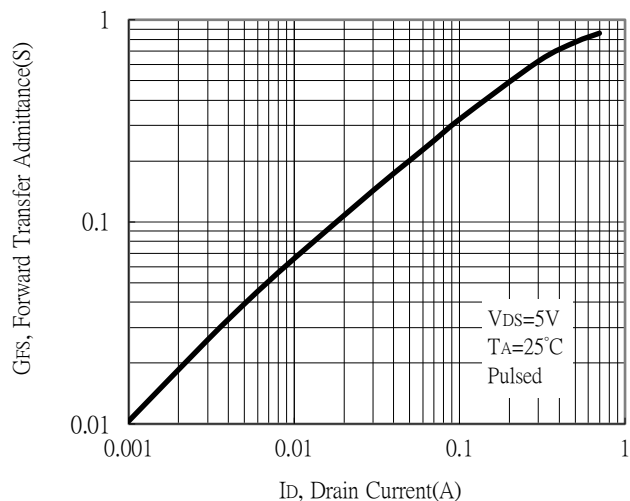
Capacitance vs Drain-to-Source Voltage



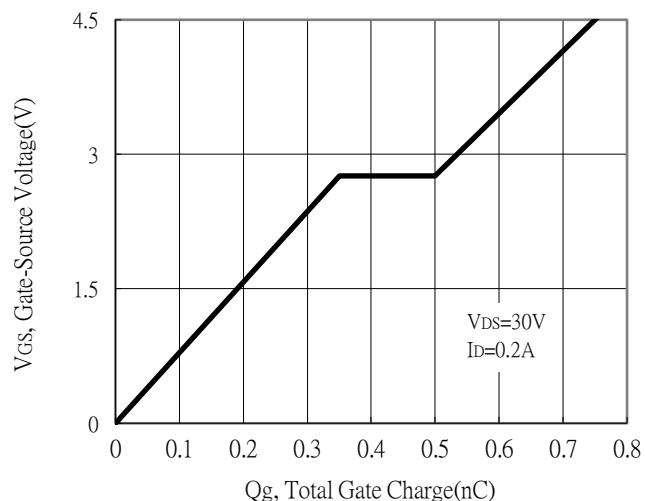
Threshold Voltage vs Junction Temperature



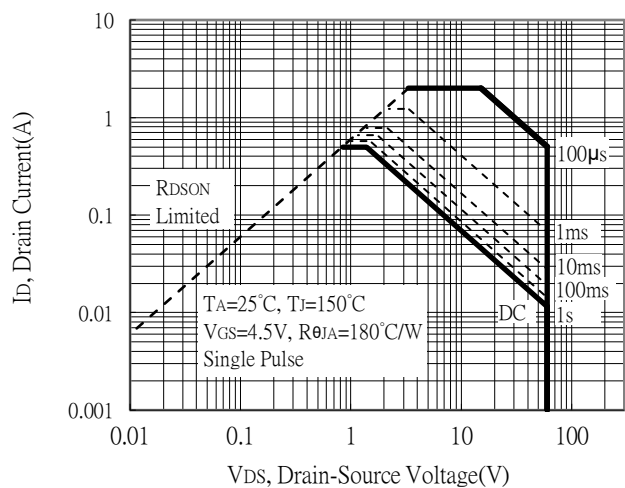
Forward Transfer Admittance vs Drain Current



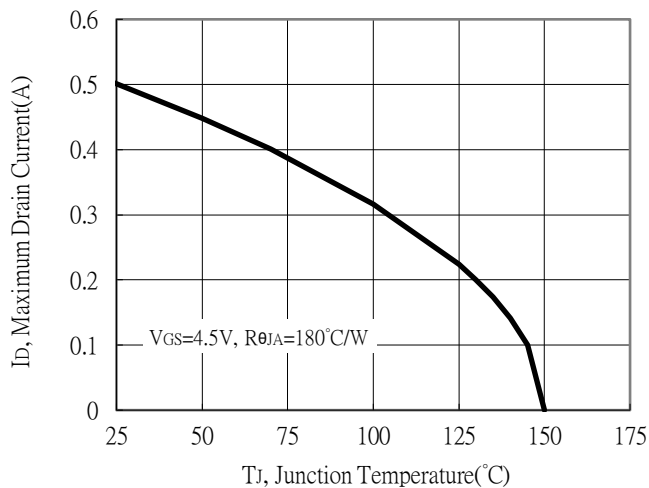
Gate Charge Characteristics



Maximum Safe Operating Area

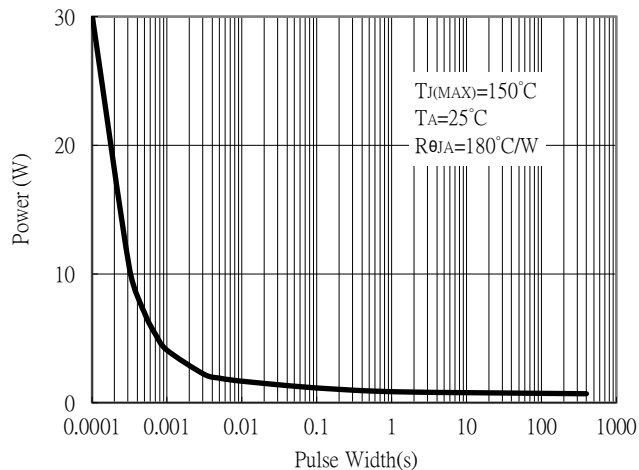


Maximum Drain Current vs Junction Temperature

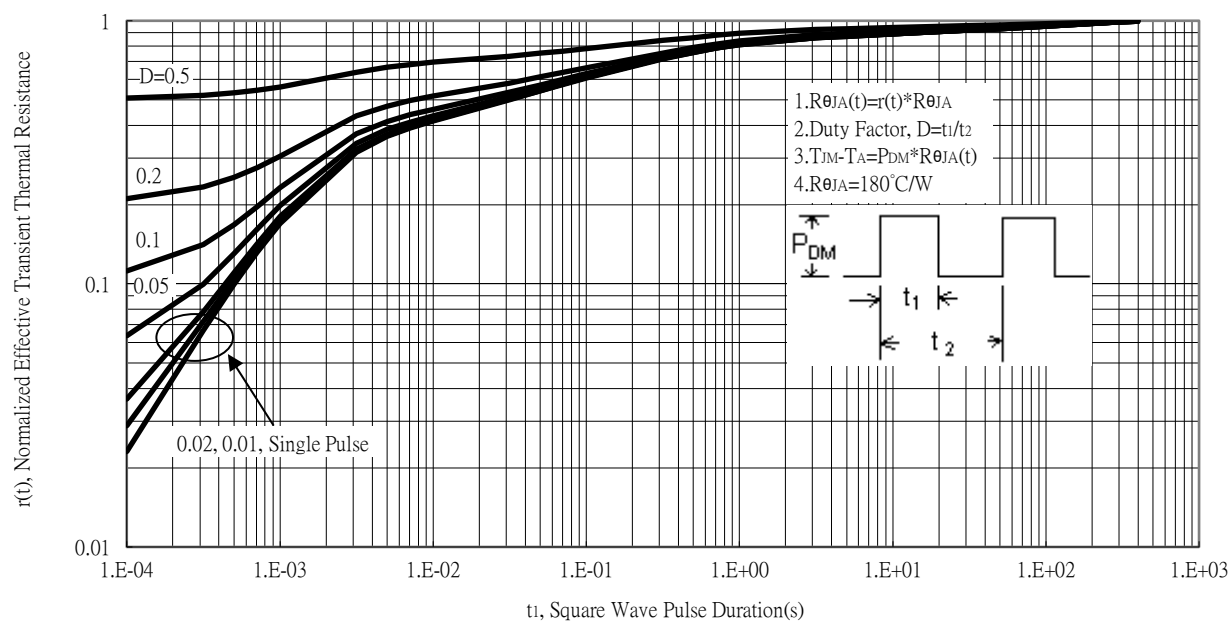


Typical Characteristics (Cont.)

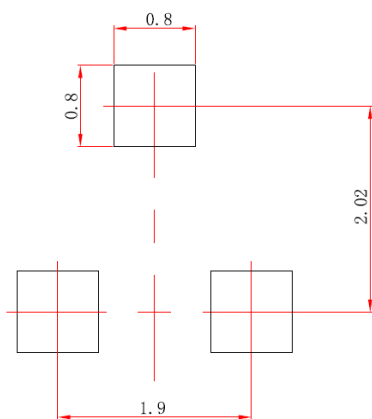
Single Pulse Power Rating, Junction to Ambient



Transient Thermal Response Curves

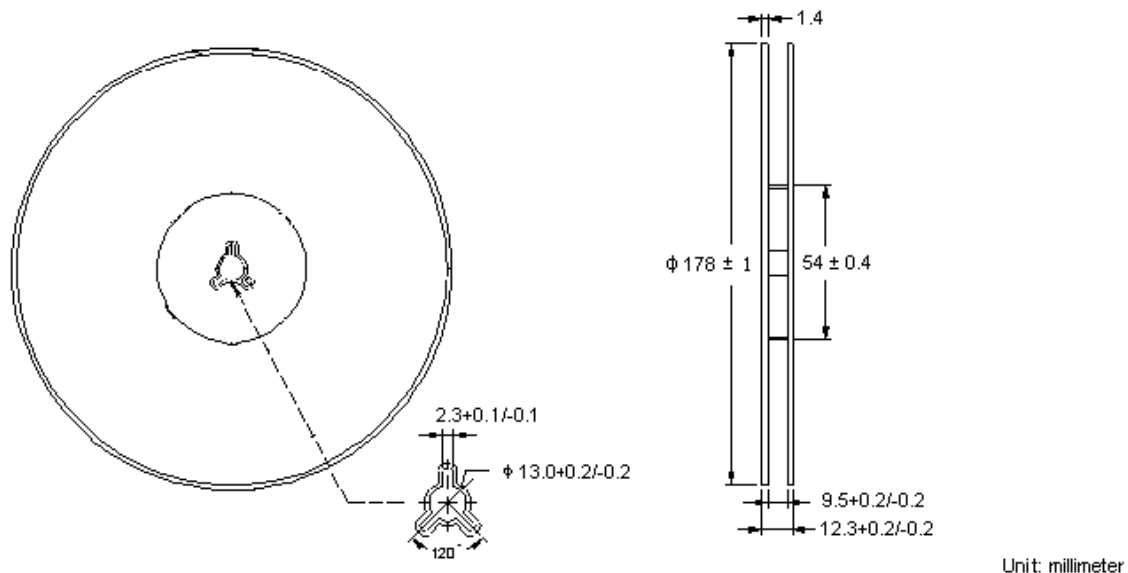


Recommended Soldering Footprint

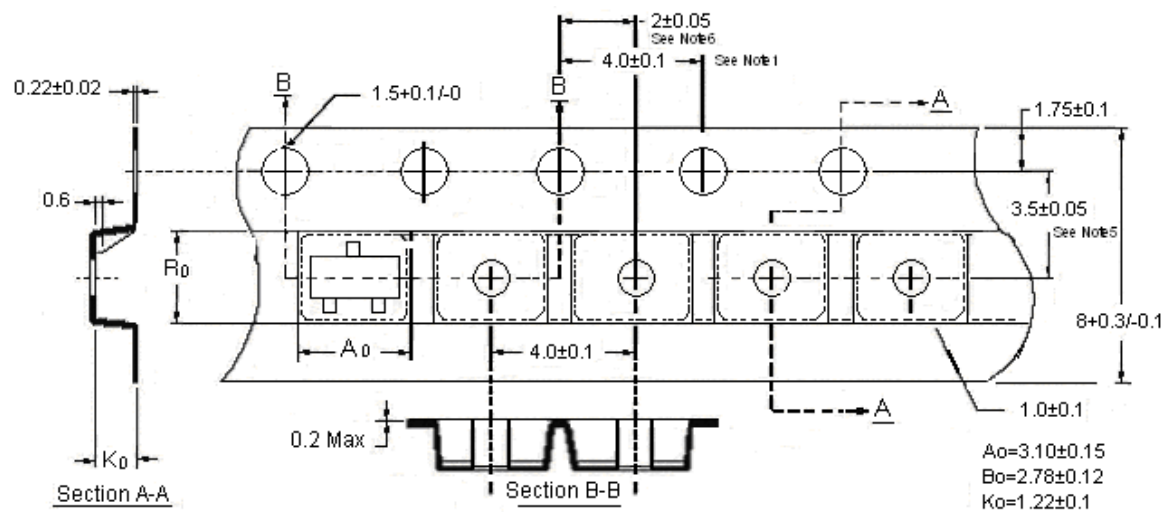


Unit : mm

Reel Dimension



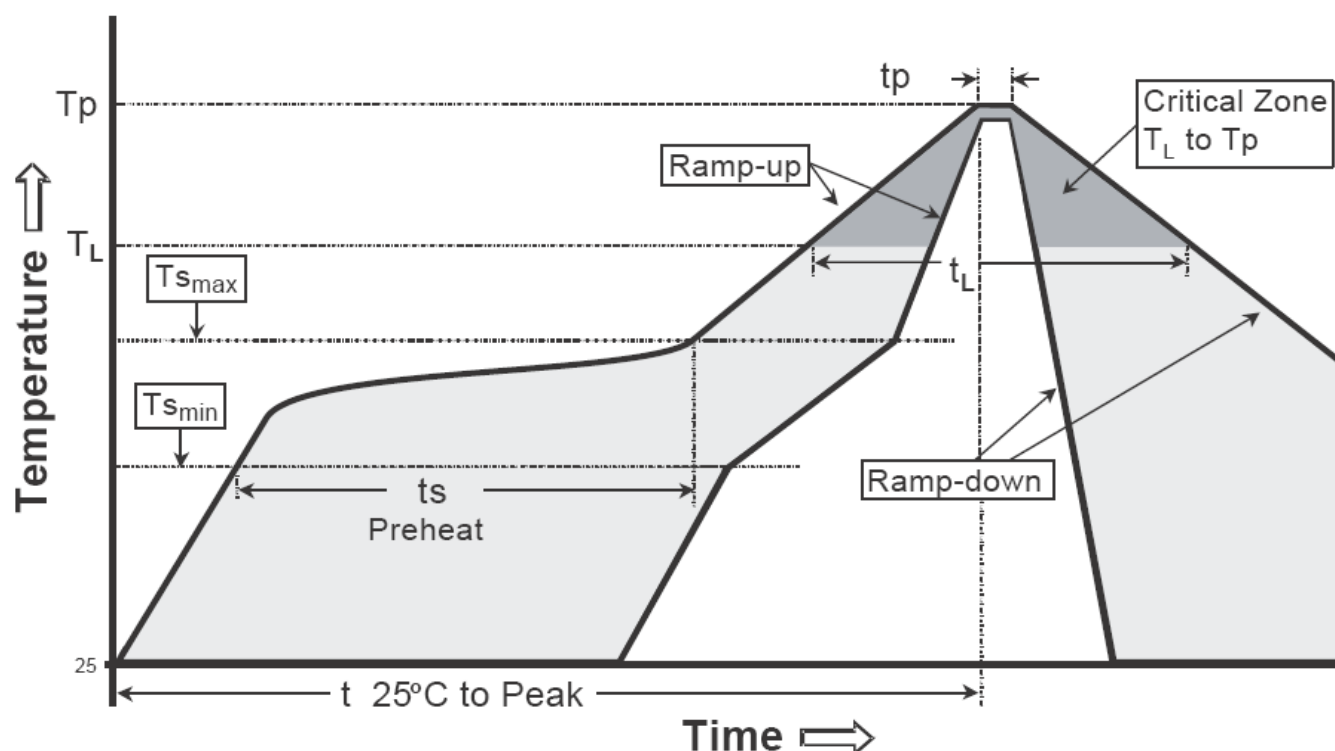
Carrier Tape Dimension



Recommended wave soldering condition

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

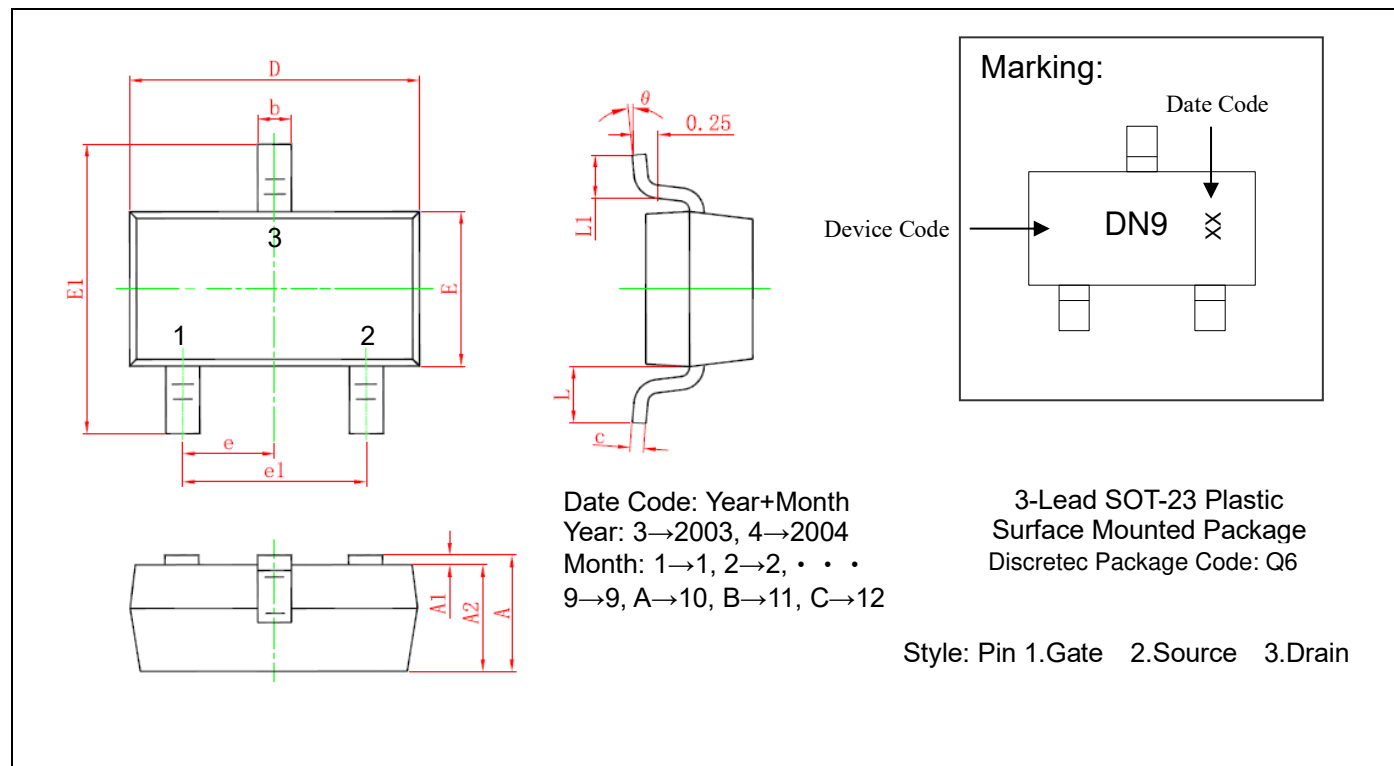
Recommended temperature profile for IR reflow



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.

SOT-23 Dimension



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.035	0.045	0.900	1.150	E1	0.089	0.100	2.250	2.550
A1	0.000	0.004	0.000	0.100	e	0.037 TYP		0.950 TYP	
A2	0.035	0.041	0.900	1.050	e1	0.071	0.079	1.800	2.000
b	0.012	0.020	0.300	0.500	L	0.022 REF		0.550 REF	
c	0.003	0.006	0.080	0.150	L1	0.012	0.020	0.300	0.500
D	0.110	0.118	2.800	3.000	θ	0°	8°	0°	8°
E	0.047	0.055	1.200	1.400					

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 Discretec sales office.

Material:

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

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