

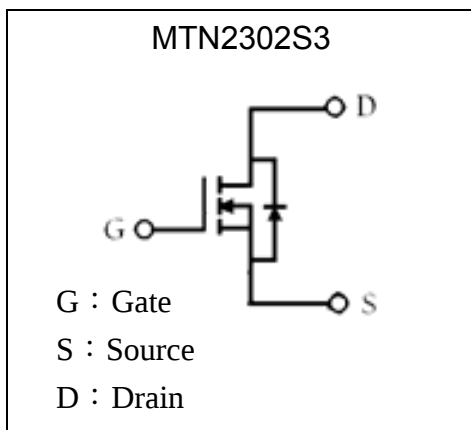
20V N-CHANNEL Enhancement Mode MOSFET

Features

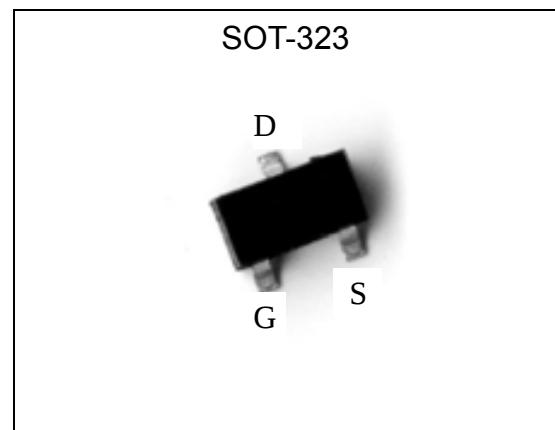
- Simple drive requirement
- Small package outline
- Capable of 2.5V gate drive
- Pb-free lead plating and halogen-free package

BV_{DSS}	20V
$I_D@V_{GS}=10V, T_A=25^{\circ}C$	2.9A
$R_{DS(on)(MAX)}@V_{GS}=4.5V, I_D=3.6A$	55m Ω (typ.)
$R_{DS(on)(MAX)}@V_{GS}=2.5V, I_D=3.1A$	65m Ω (typ.)

Symbol

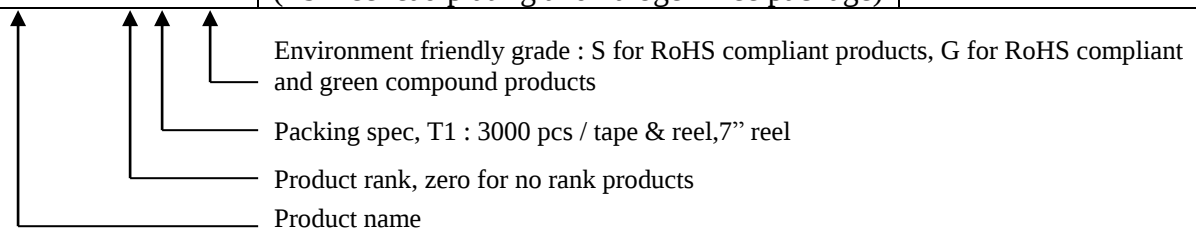


Outline



Ordering Information

Device	Package	Shipping
MTN2302S3-0-T1-G	SOT-323 (Pb-free lead plating and halogen-free package)	3000 pcs / Tape & Reel



Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V _{DS}	20	V
Gate-Source Voltage	V _{GS}	±12	
Continuous Drain Current @V _{GS} =4.5V, T _A =25°C (Note 3)	I _D	2.9	A
Continuous Drain Current @V _{GS} =4.5V, T _A =70°C (Note 3)		2.3	
Pulsed Drain Current (Notes 1, 2)	I _{DM}	20	
Maximum Power Dissipation@ T _A =25°C	P _D	0.7 (Note 3)	W
		0.43 (Note 4)	
Operating Junction and Storage Temperature	T _j , T _{stg}	-55~+150	°C

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance, Junction-to-Ambient, max (Note 3)	R _{θJA}	178	°C/W
Thermal Resistance, Junction-to-Ambient, max (Note 4)		290	
Thermal Resistance, Junction-to-Case, max	R _{θJC}	90	

Note : 1. Pulse width limited by maximum junction temperature.
2. Pulse width ≤ 300μs, duty cycle ≤ 2%.
3. Surface mounted on 1 in² copper pad of FR-4 board, 2 oz. copper.
4. Surface mounted on minimum copper pad, 2 oz. copper.

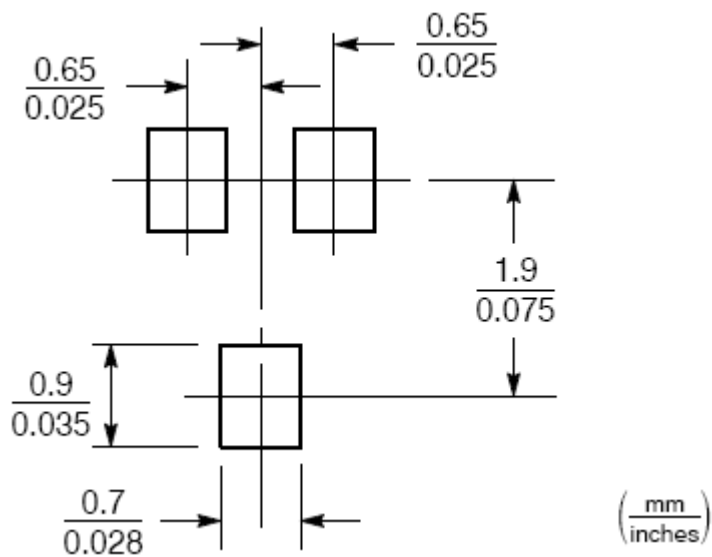
Electrical Characteristics (T_j=25°C, unless otherwise noted)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	20	-	-	V	V _{GS} =0V, I _D =250μA
ΔBV _{DSS} /ΔT _j	-	0.02	-	V/°C	Reference to 25°C, I _D =250μA
V _{GS(th)}	0.5	-	1.2	V	V _{DS} =V _{GS} , I _D =250μA
I _{GSS}	-	-	±100	nA	V _{GS} =±12V, V _{DS} =0V
I _{DSS}	-	-	1	μA	V _{DS} =20V, V _{GS} =0V
	-	-	10		V _{DS} =20V, V _{GS} =0V (T _j =70°C)
*R _{DS(ON)}	-	30	45	mΩ	I _D =3A, V _{GS} =4.5V
	-	41	55		I _D =2A, V _{GS} =2.5V
*G _{FS}	-	4	-	S	V _{DS} =5V, I _D =2A
Dynamic					
C _{iss}	-	440	-	pF	V _{DS} =10V, V _{GS} =0V, f=1MHz
C _{oss}	-	61	-		
Cr _{ss}	-	59	-		

td(ON)	-	4.5	-	ns	V _{DS} =10V, I _D =2A, V _{GS} =5V R _G =6Ω, R _D =2.8Ω
t _r	-	7.4	-		
td(OFF)	-	19	-		
t _f	-	7.2	-		
Q _g	-	4.4	-	nC	V _{DS} =10V, I _D =2A, V _{GS} =4.5V
Q _{gs}	-	0.7	-		
Q _{gd}	-	1.7	-		
Source-Drain Diode					
*V _{SD}	-	0.8	1.2	V	V _{GS} =0V, I _S =1.6A
I _S	-	-	1	A	V _D =V _G =0V, V _S =1.2V
I _{SM}	-	-	10		

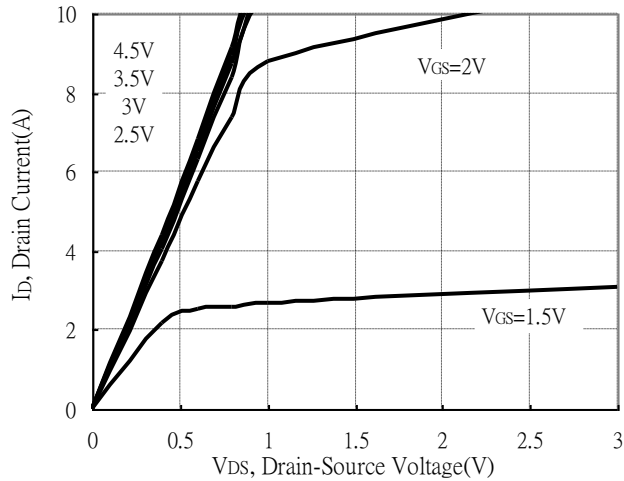
*Pulse Test : Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

Recommended Soldering Footprint

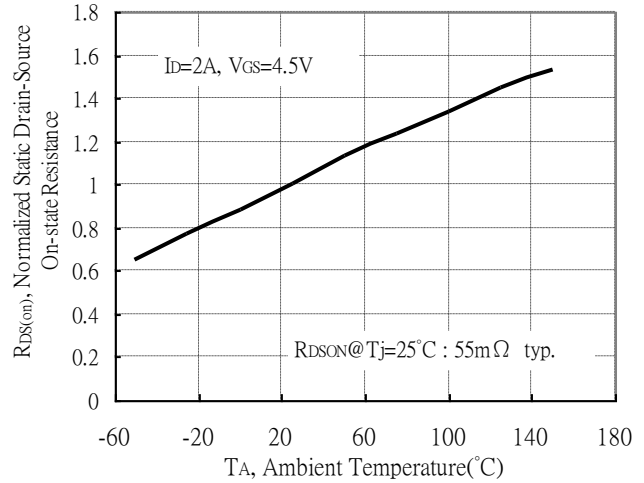


Typical Characteristics

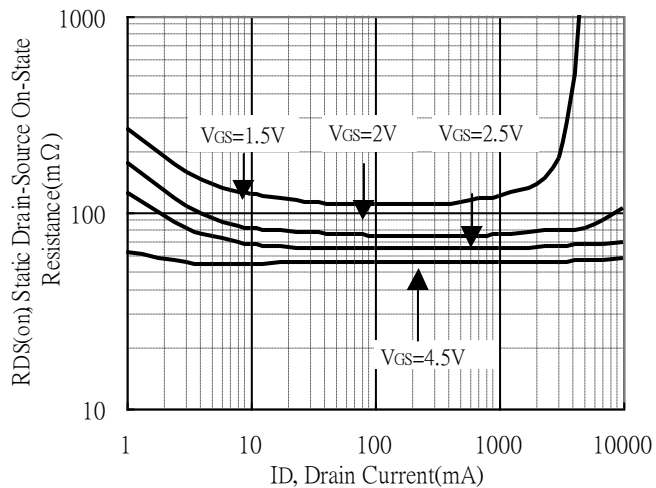
Typical Output Characteristics



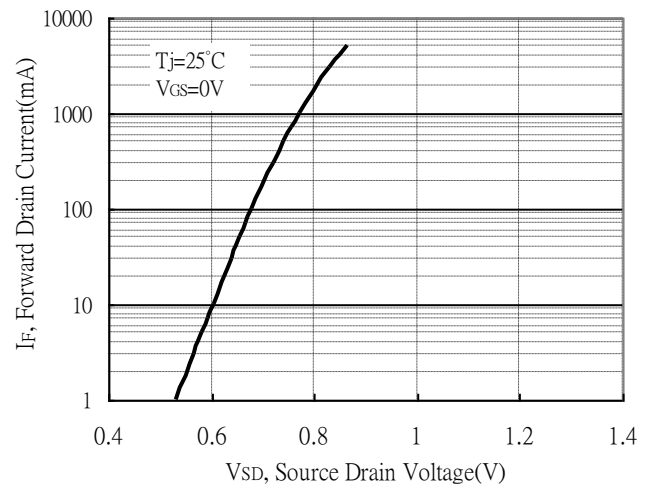
Static Drain-Source On-resistance vs Ambient Temperature



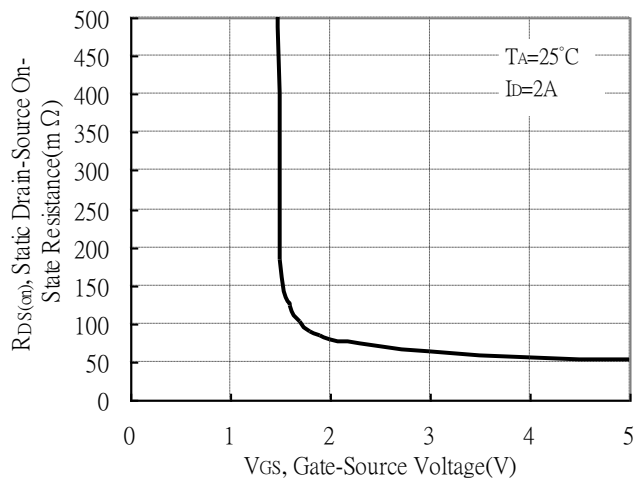
Static Drain-Source On-State resistance vs Drain Current



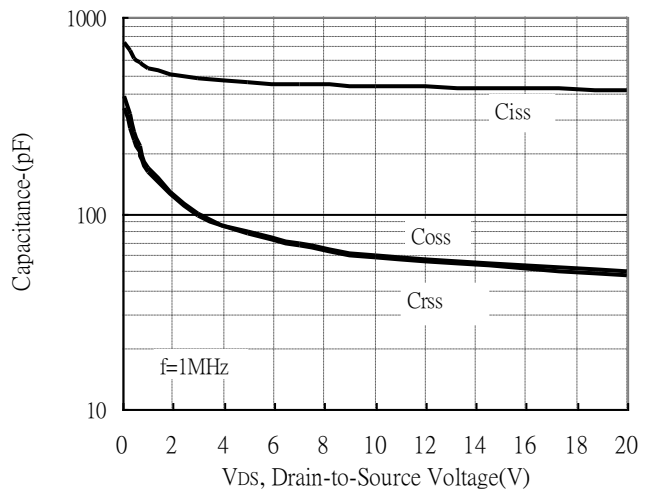
Forward Drain Current vs Source-Drain Voltage



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

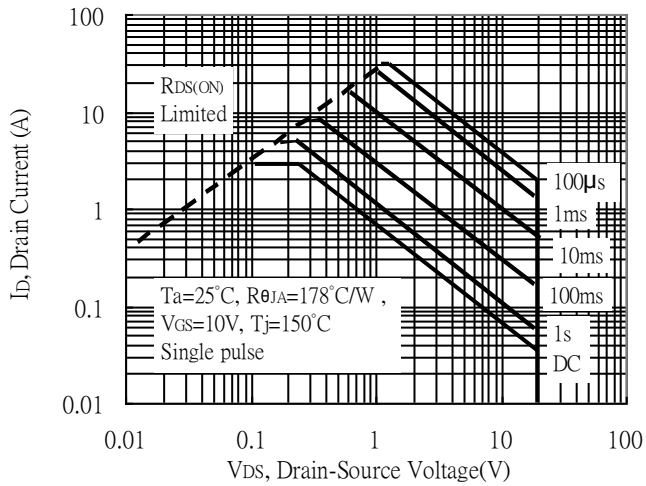


Capacitance vs Reverse Voltage

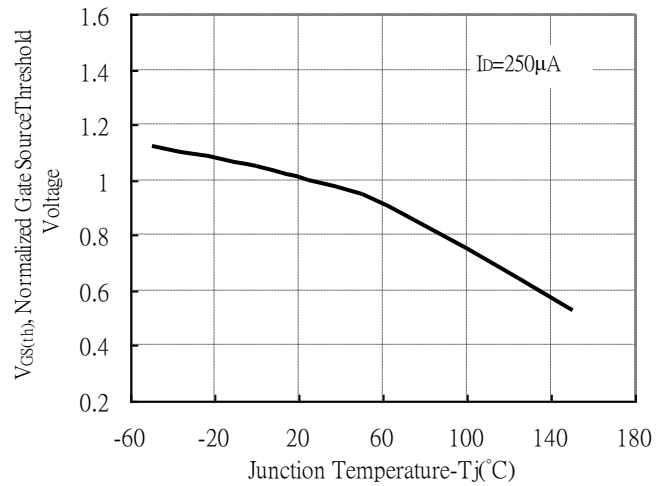


Typical Characteristics(Cont.)

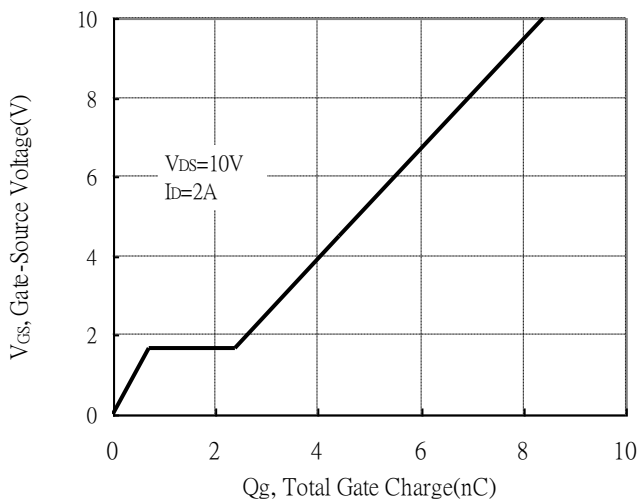
Maximum Safe Operating Area



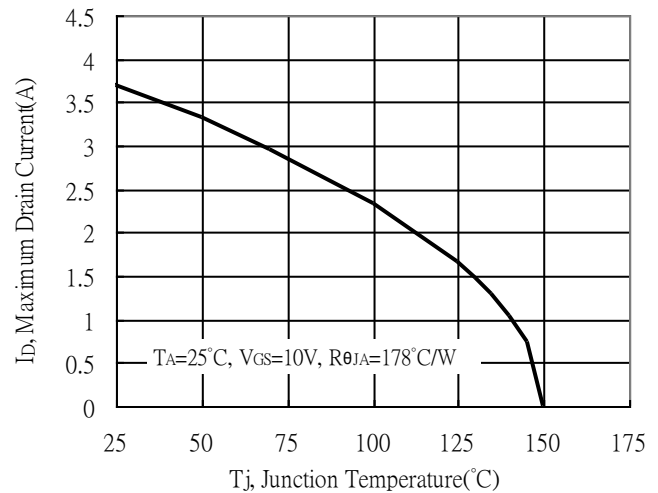
Gate Threshold Voltage vs Ambient Temperature



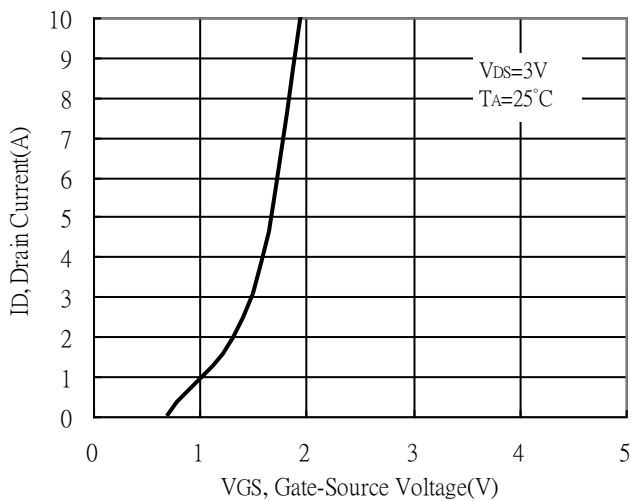
Gate Charge Characteristics



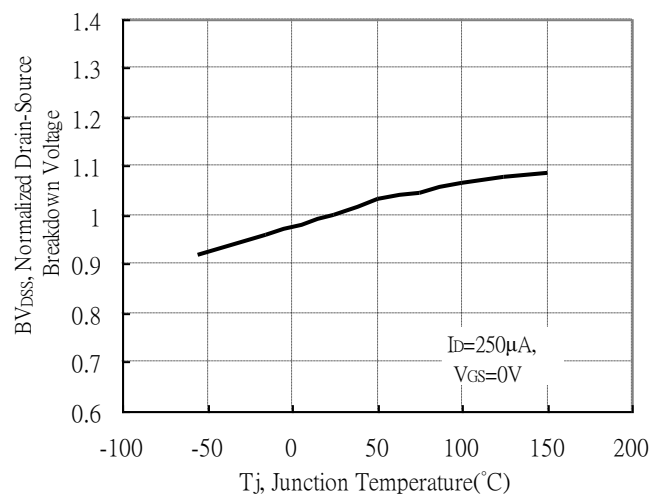
Maximum Drain Current vs Junction Temperature



Drain Current vs Gate-Source Voltage

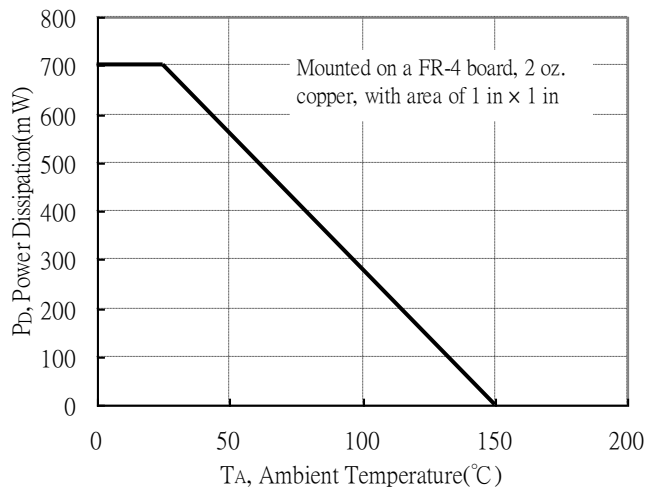


Brekdown Voltage vs Ambient Temperature

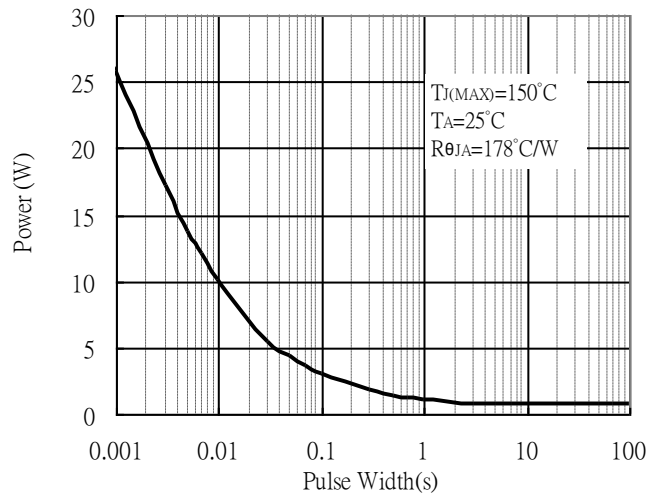


Typical Characteristics(Cont.)

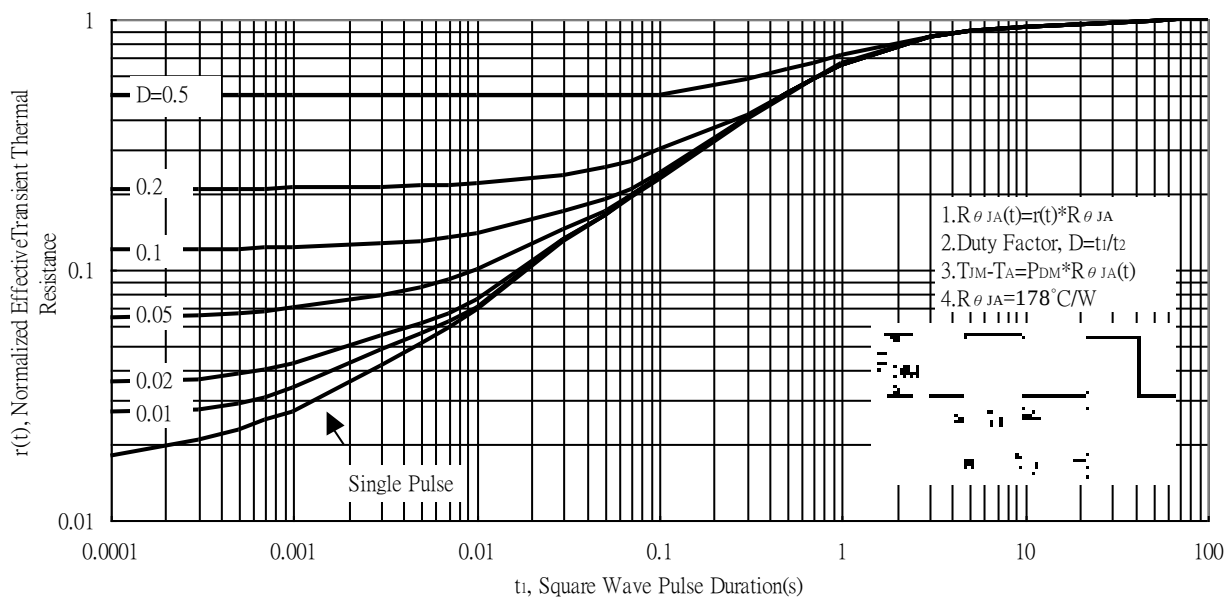
Power Derating Curve



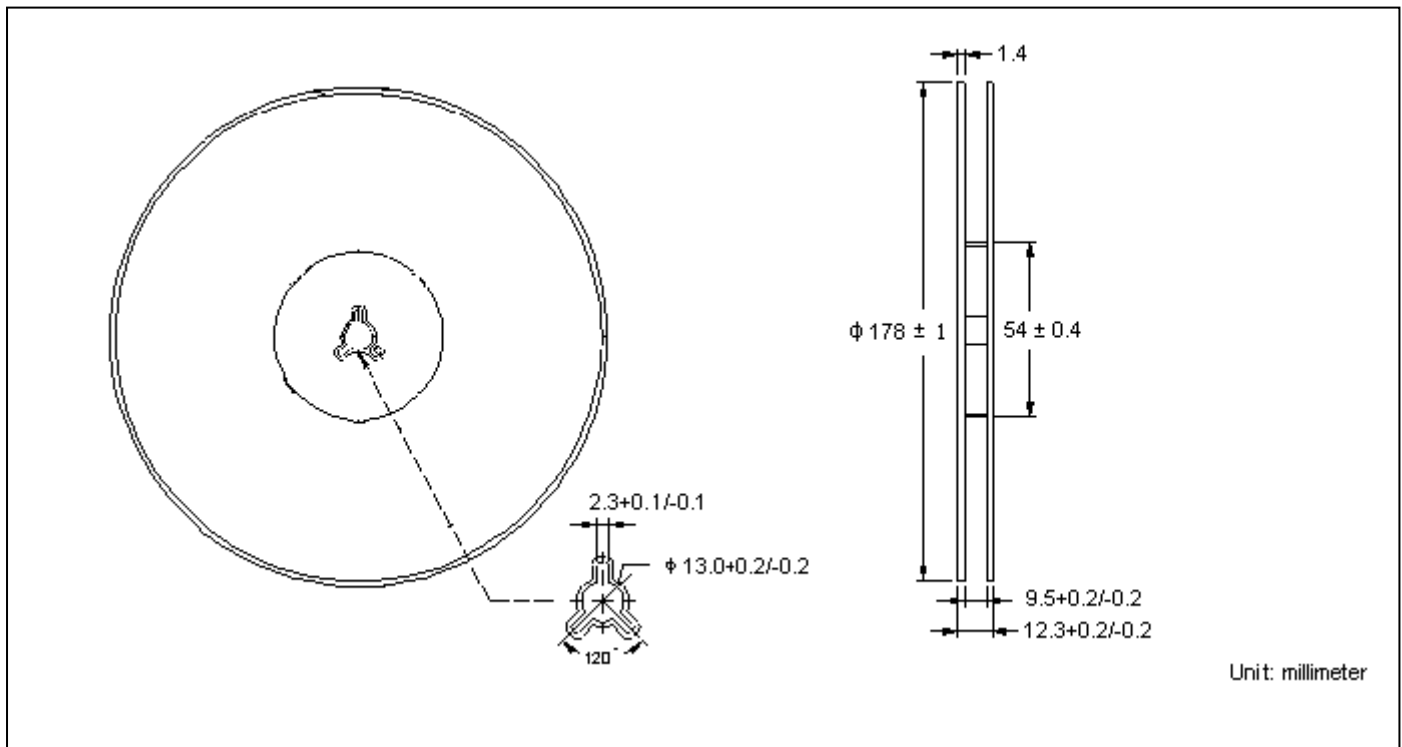
Single Pulse Power Rating, Junction to Ambient



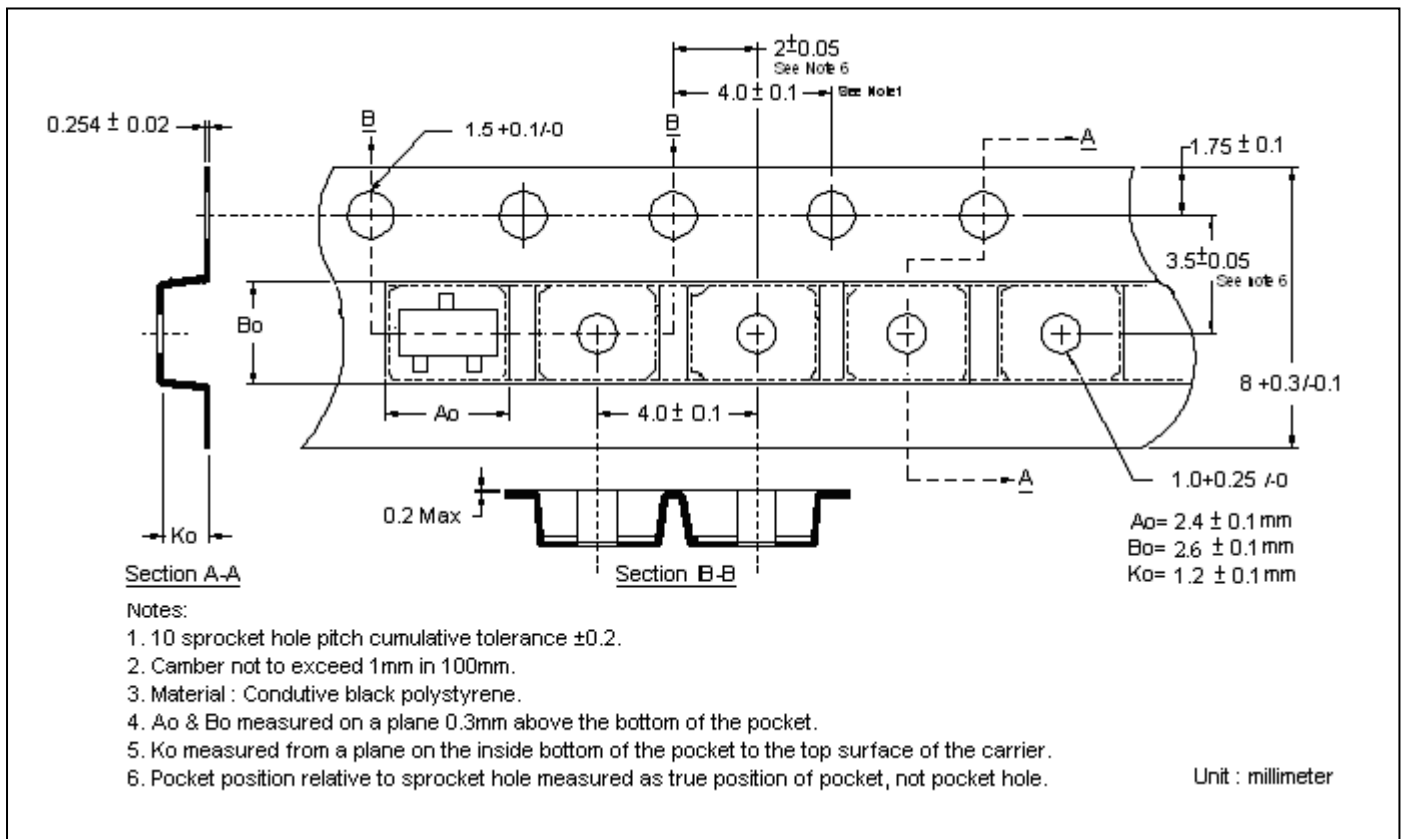
Transient Thermal Response Curves



Reel Dimension

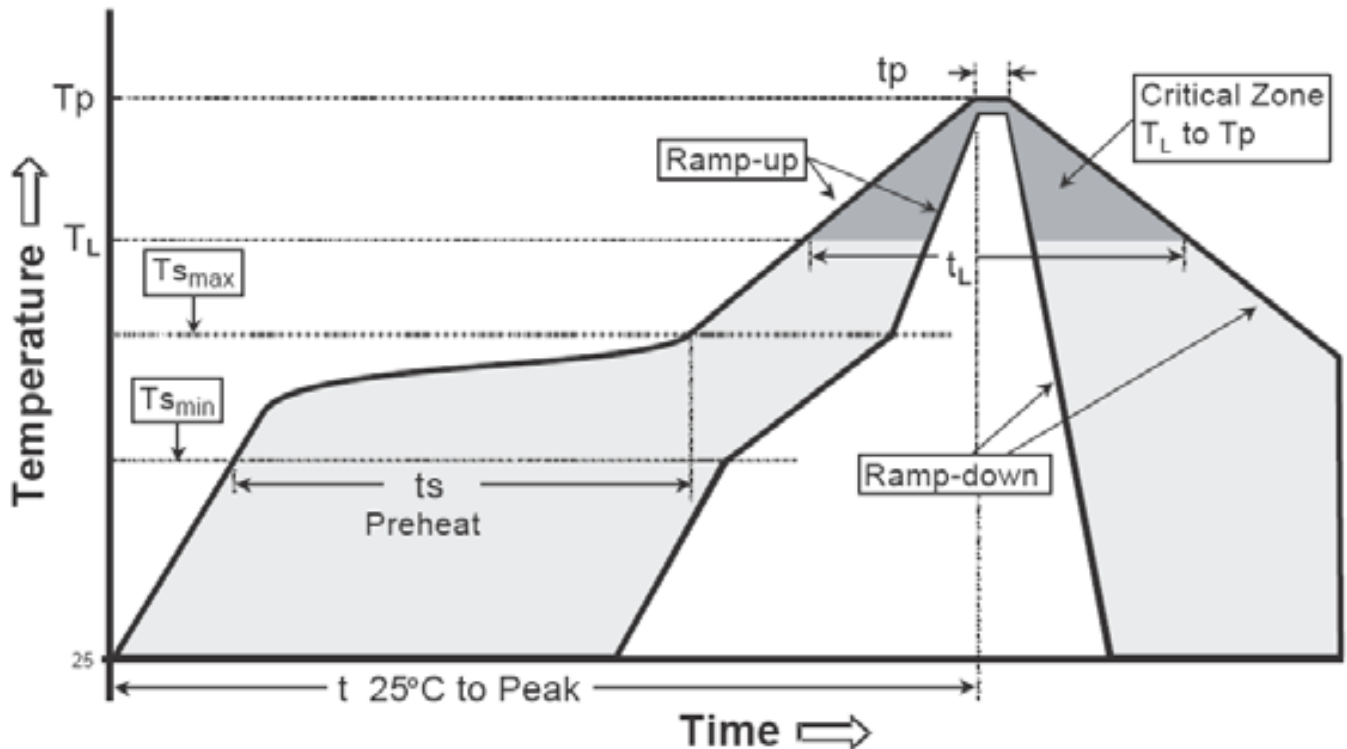


Carrier Tape Dimension



Recommended wave soldering condition

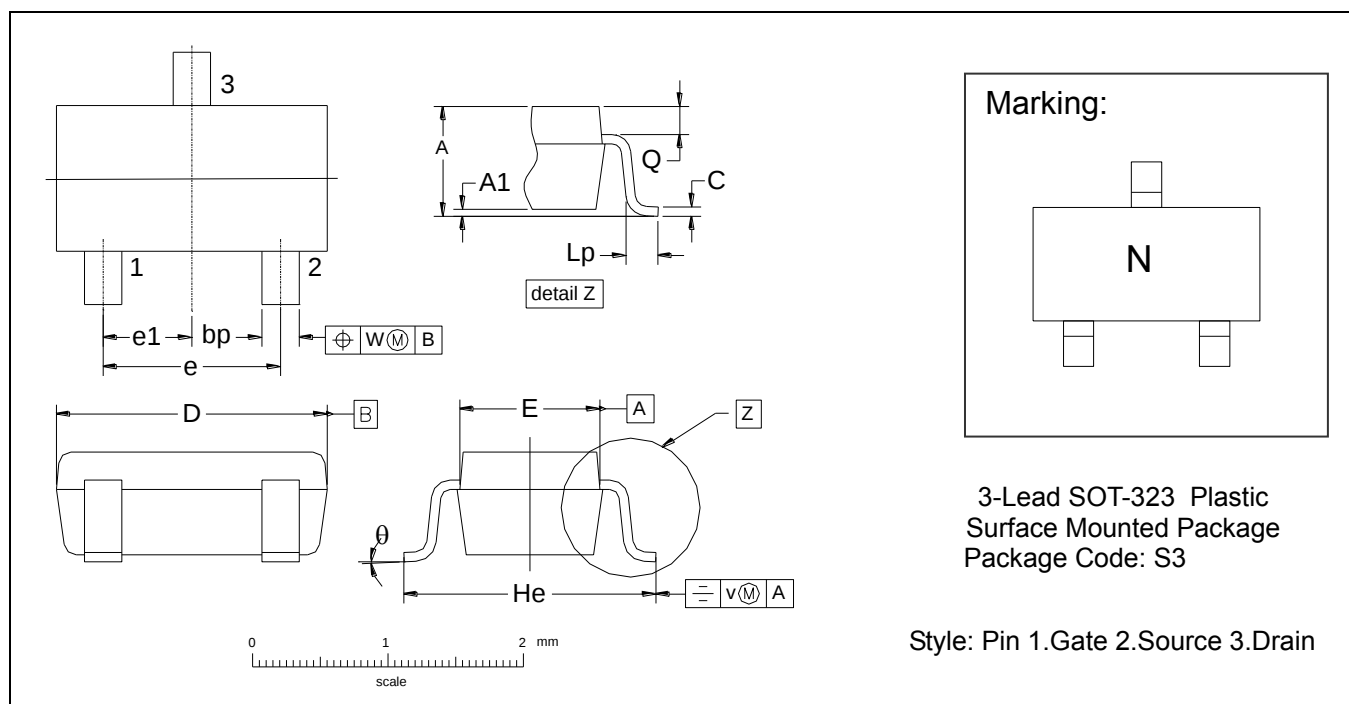
Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

Recommended temperature profile for IR reflow


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate ($T_{s_{max}}$ to T_p)	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min($T_{s_{min}}$)	100°C	150°C
-Temperature Max($T_{s_{max}}$)	150°C	200°C
-Time($t_{s_{min}}$ to $t_{s_{max}}$)	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T_L)	183°C	217°C
- Time (t_L)	60-150 seconds	60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(t_p)	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-323 Dimension



DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.0354	0.0433	0.90	1.10	e1	0.0256 TYP		0.65	TYP
A1	0.0000	0.0039	0.00	0.10	He	0.0846	0.0965	2.15	2.45
bp	0.0079	0.0157	0.20	0.40	Lp	0.0102	0.0181	0.26	0.46
C	0.0031	0.0059	0.08	0.15	Q	0.0051	0.0091	0.13	0.23
D	0.0787	0.0866	2.00	2.20	v	0.0079	-	0.2	-
E	0.0453	0.0531	1.15	1.35	w	0.0079	-	0.2	-
e	0.0472	0.0551	1.20	1.40	θ	0°	8°	0°	8°

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