20V P-Channel Enhancement Mode MOSFET

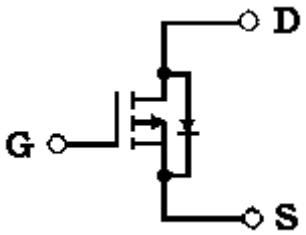
BV_{DSS}	-20V
I_D@T_A=25°C, V_{GS}=-4.5V	-2.8A
$R_{DSON(MAX)}$@V_{GS}=-4.5V, I_D=-2.8A	70mΩ(typ.)
$R_{DSON(MAX)}$@V_{GS}=-2.5V, I_D=-2.0A	87mΩ(typ.)

Features

- Advanced trench process technology
- High density cell design for ultra low on resistance
- Excellent thermal and electrical capabilities
- Compact and low profile SOT-323 package
- Pb-free lead plating and halogen-free package

Equivalent Circuit

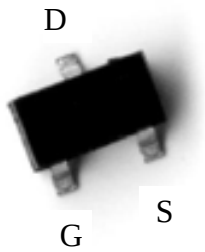
MTP2301S3



G：Gate
S：Source
D：Drain

Outline

SOT-323



Ordering Information

Device	Package	Shipping
MTP2301S3-0-T1-G	SOT-323 (Pb-free lead plating and 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, T1 : 3000 pcs / tape & reel,7” reel

Product rank, zero for no rank products

Product name

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 @T_A=25°C, V_{GS}=-4.5V		I_D	-2.8	A
Continuous Drain Current @T_A=70°C, V_{GS}=-4.5V			-1.6	
Pulsed Drain Current		I_{DM}	-10	
Maximum Power Dissipation	Ta=25℃	P_D	340 (Note)	mW
	Ta=70℃		218 (Note)	
Operating Junction and Storage Temperature Range		Tj ; Tstg	-55~+150	°C

Thermal Performance

Parameter	Symbol	Limit	Unit
Thermal Resistance, Junction-to-Ambient(PCB mounted)	Rth,ja	367 (Note)	°C/W

Note : Device mounted on minimum copper pad.

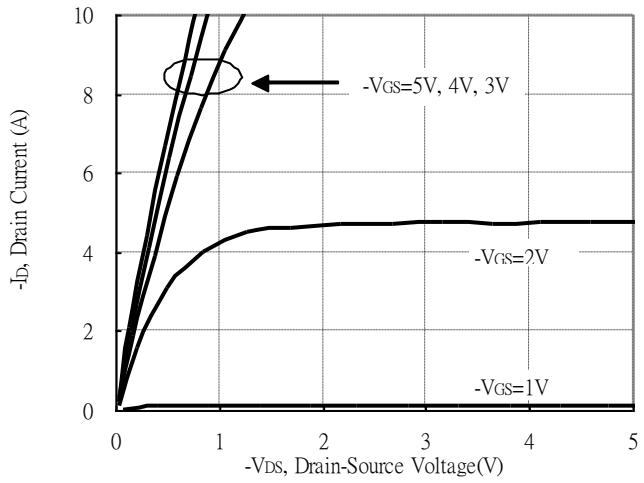
Electrical Characteristics (Ta=25°C)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	-20	-	-	V	V_{GS}=0V, I_D=-250μA
$V_{GS(th)}$	-0.45	-	-1		V_{DS}=V_{GS}, I_D=-250μA
I_{GSS}	-	-	±100	nA	V_{GS}=±8V, V_{DS}=0V
I_{DSS}	-	-	-1	μA	V_{DS}=-16V, V_{GS}=0V
*$R_{DS(ON)}$	-	70	95	mΩ	I_D=-2.8A, V_{GS}=-4.5V
	-	87	130		I_D=-2.0A, V_{GS}=-2.5V
*G_{FS}	-	4	-	S	V_{DS}=-5V, I_D=-2.8A
Dynamic					
Ciss	-	589	-	pF	V_{DS}=-10V, V_{GS}=0V, f=1MHz
Coss	-	92	-		
Crss	-	68	-		
$t_{d(ON)}$	-	9.2	20	ns	V_{DD}=-10V, I_D=-1A, V_{GS}=-4.5V, R_G=6Ω
t_r	-	7.3	60		
$t_{d(OFF)}$	-	38	50		
t_f	-	12	20		
Qg	-	4.4	-	nC	V_{DS}=-10V, I_D=-1.6A, V_{GS}=-2.5V
Qgs	-	0.5	-		
Qgd	-	1.5	-		
Source-Drain Diode					
I_S	-	-	-1.6	A	
V_{SD}	-	-0.86	-1.2	V	V_{GS}=0V, I_S=-1.6A
trr*	-	30	-	ns	I_F=-3A, dI_F/dt=100A/μs
Qrr*	-	25	-	nC	

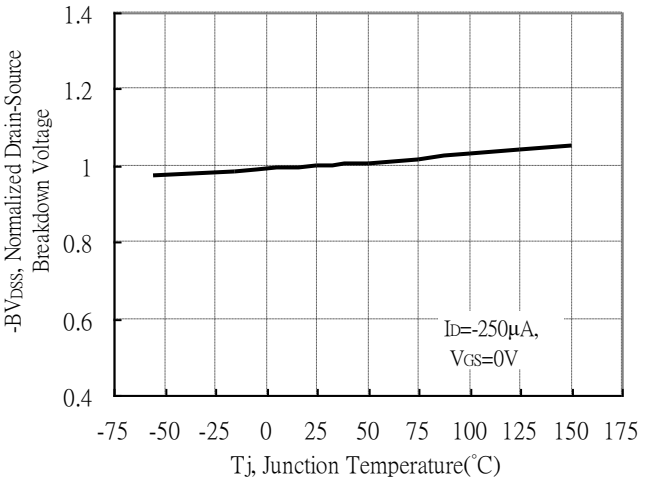
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Typical Characteristics

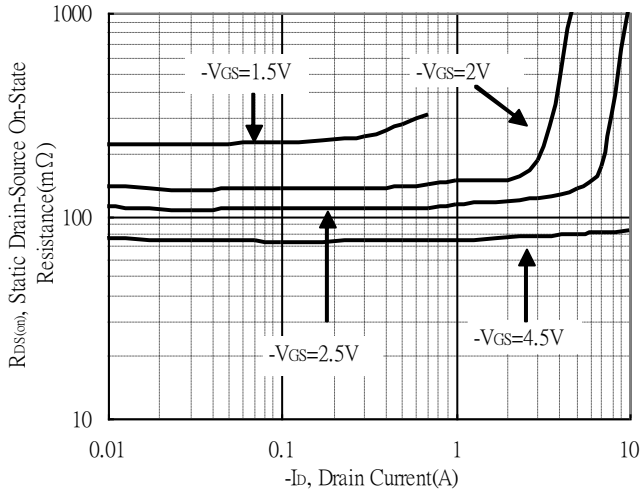
Typical Output Characteristics



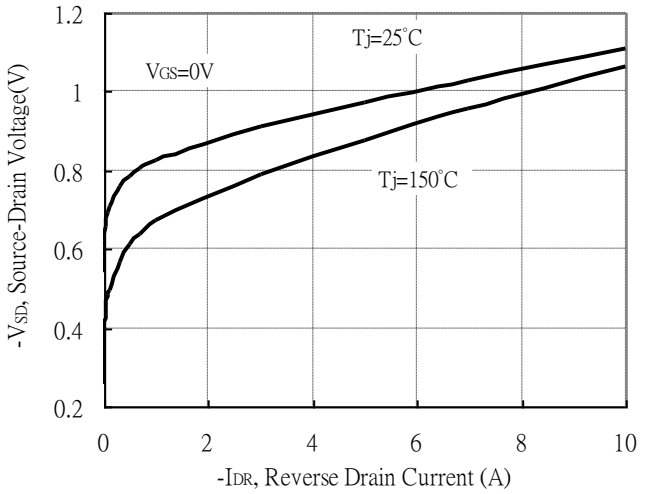
Brekdown Voltage vs Ambient Temperature



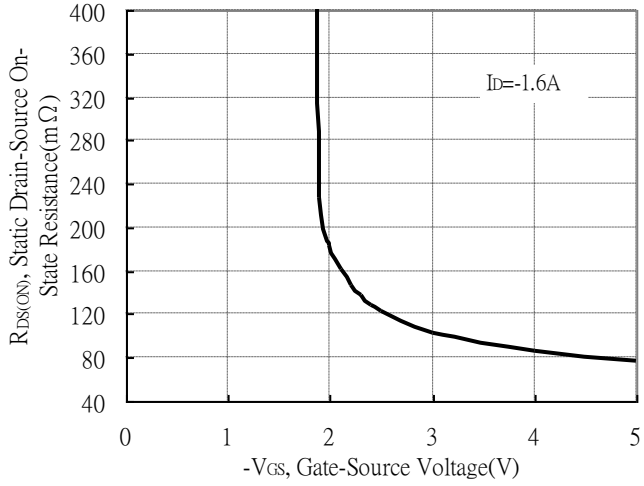
Static Drain-Source On-State resistance vs Drain Current



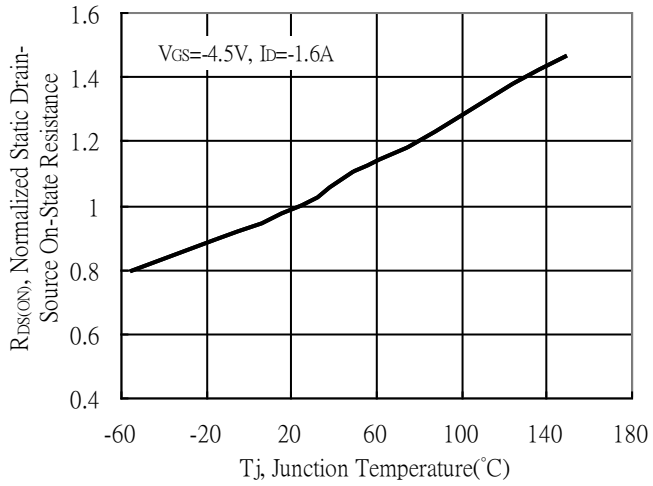
Reverse Drain Current vs Source-Drain Voltage



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

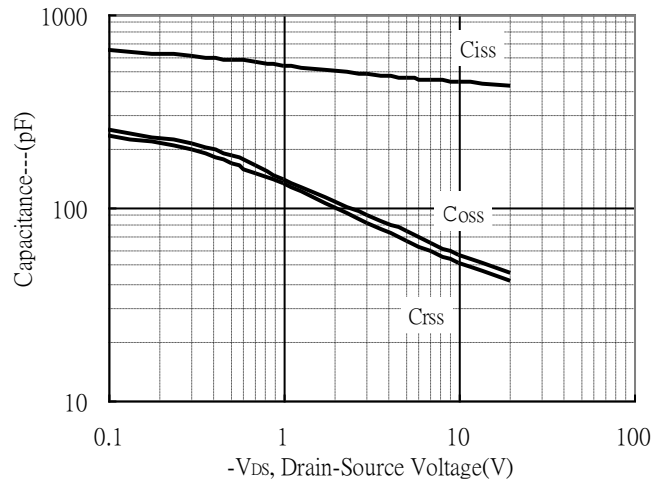


Drain-Source On-State Resistance vs Junction Tempearture

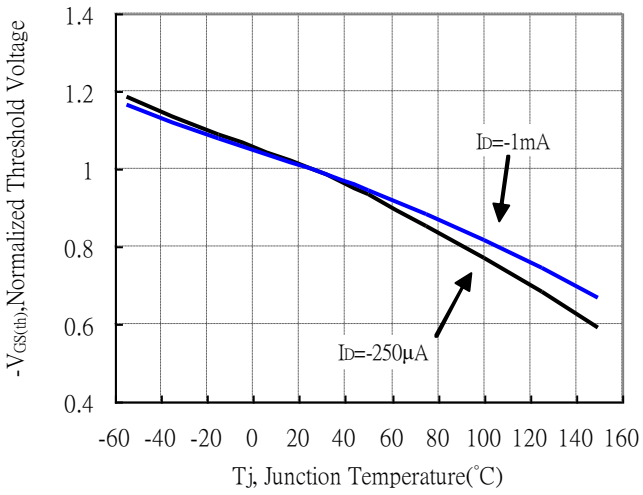


Typical Characteristics(Cont.)

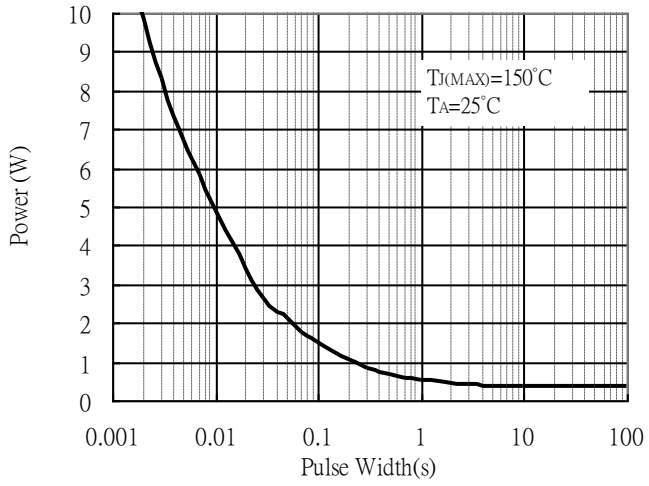
Capacitance vs Drain-to-Source Voltage



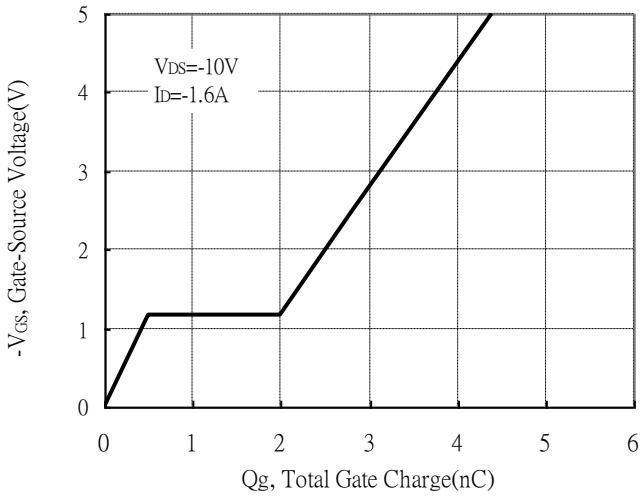
Threshold Voltage vs Junction Tempearture



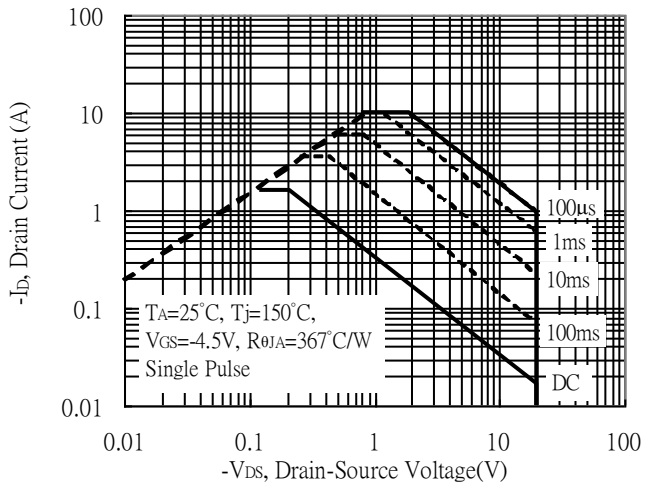
Single Pulse Power Rating, Junction to Ambient
(Note 1 on page 2)



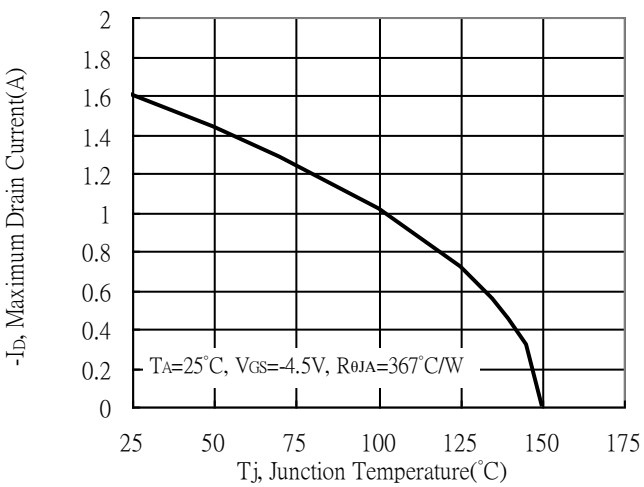
Gate Charge Characteristics



Maximum Safe Operating Area

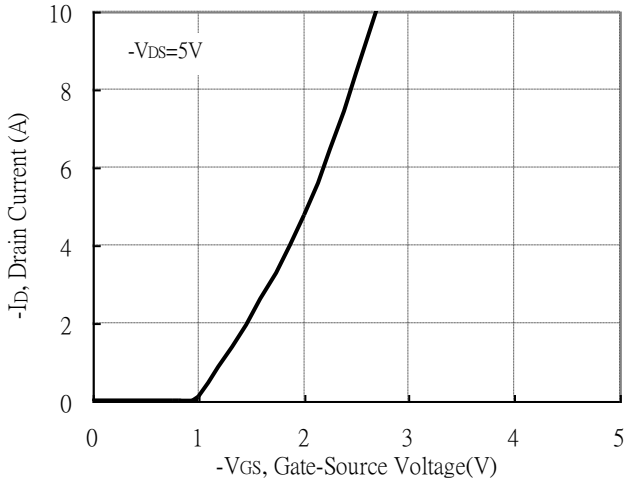


Maximum Drain Current vs JunctionTemperature

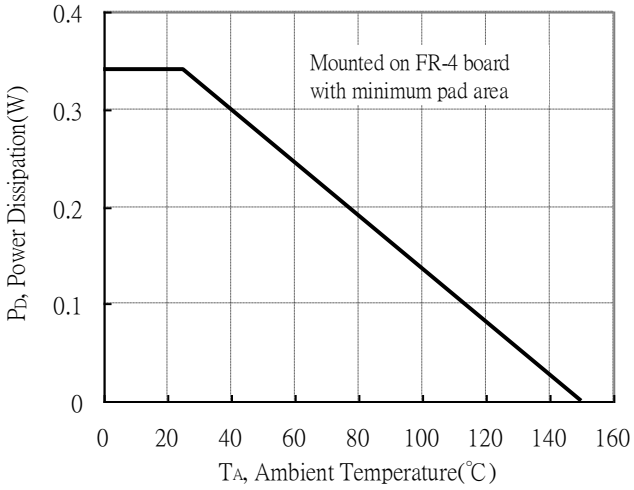


Typical Characteristics(Cont.)

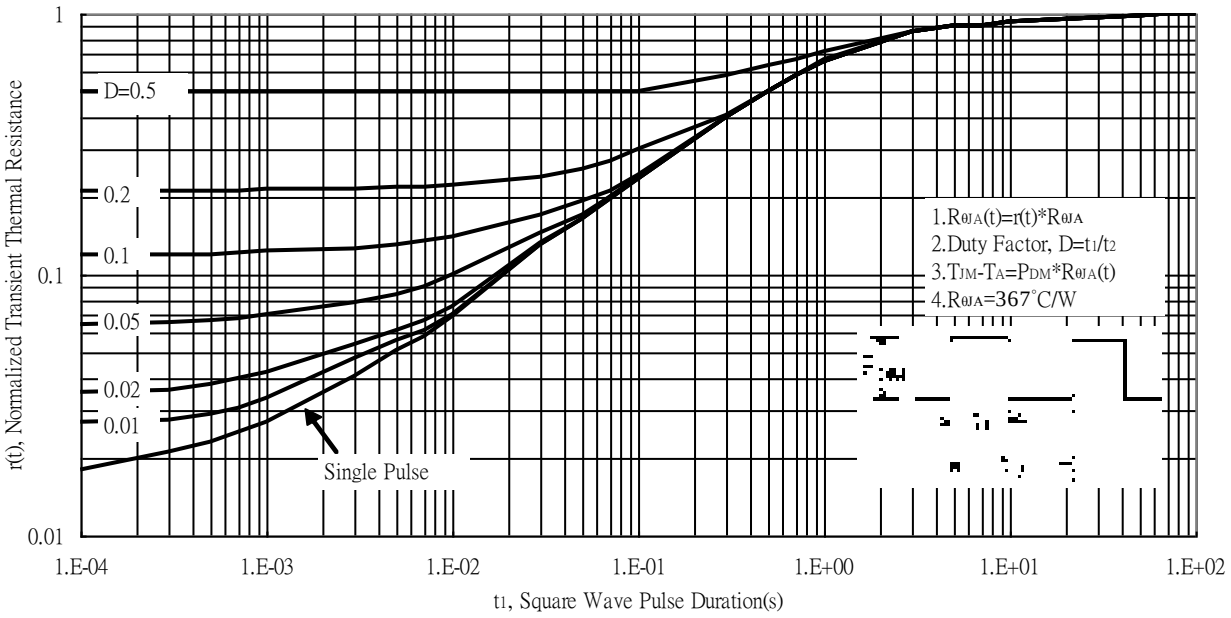
Typical Transfer Characteristics



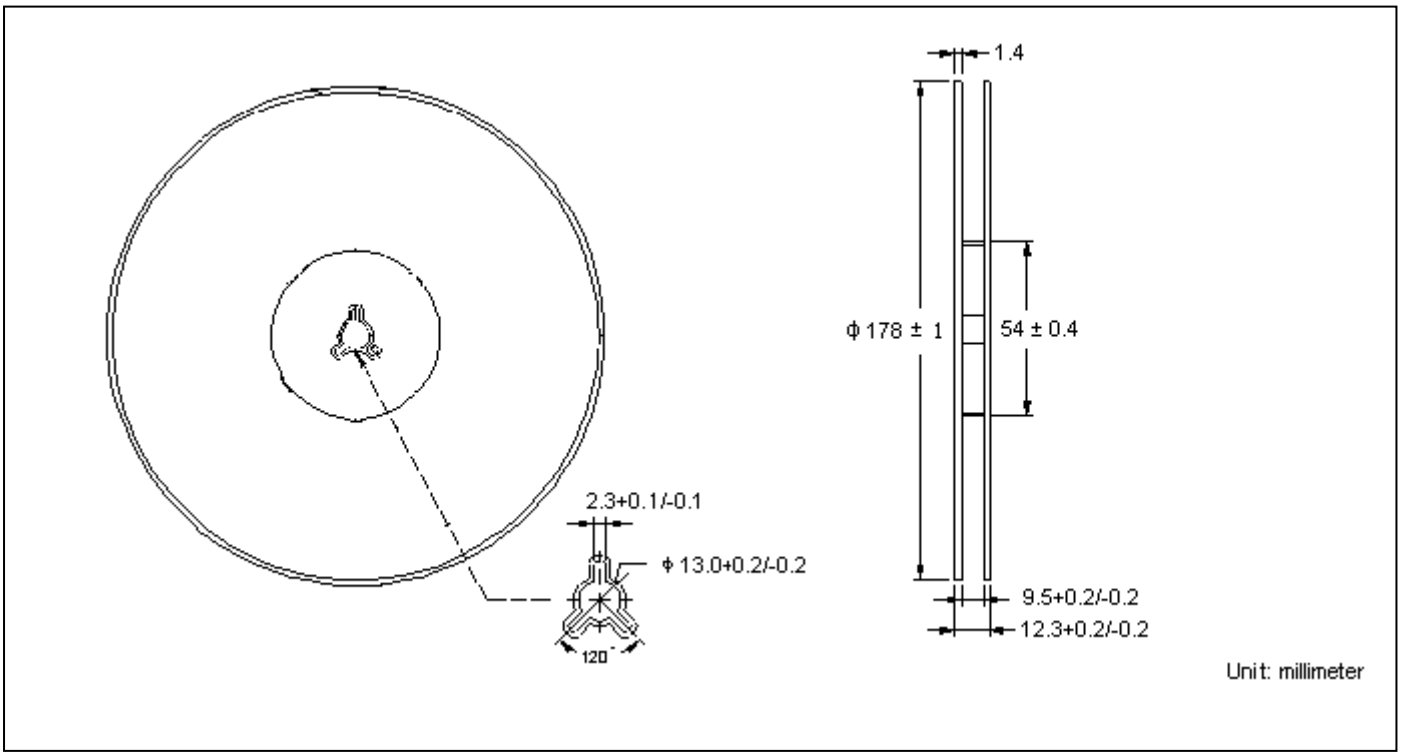
Power Derating Curve



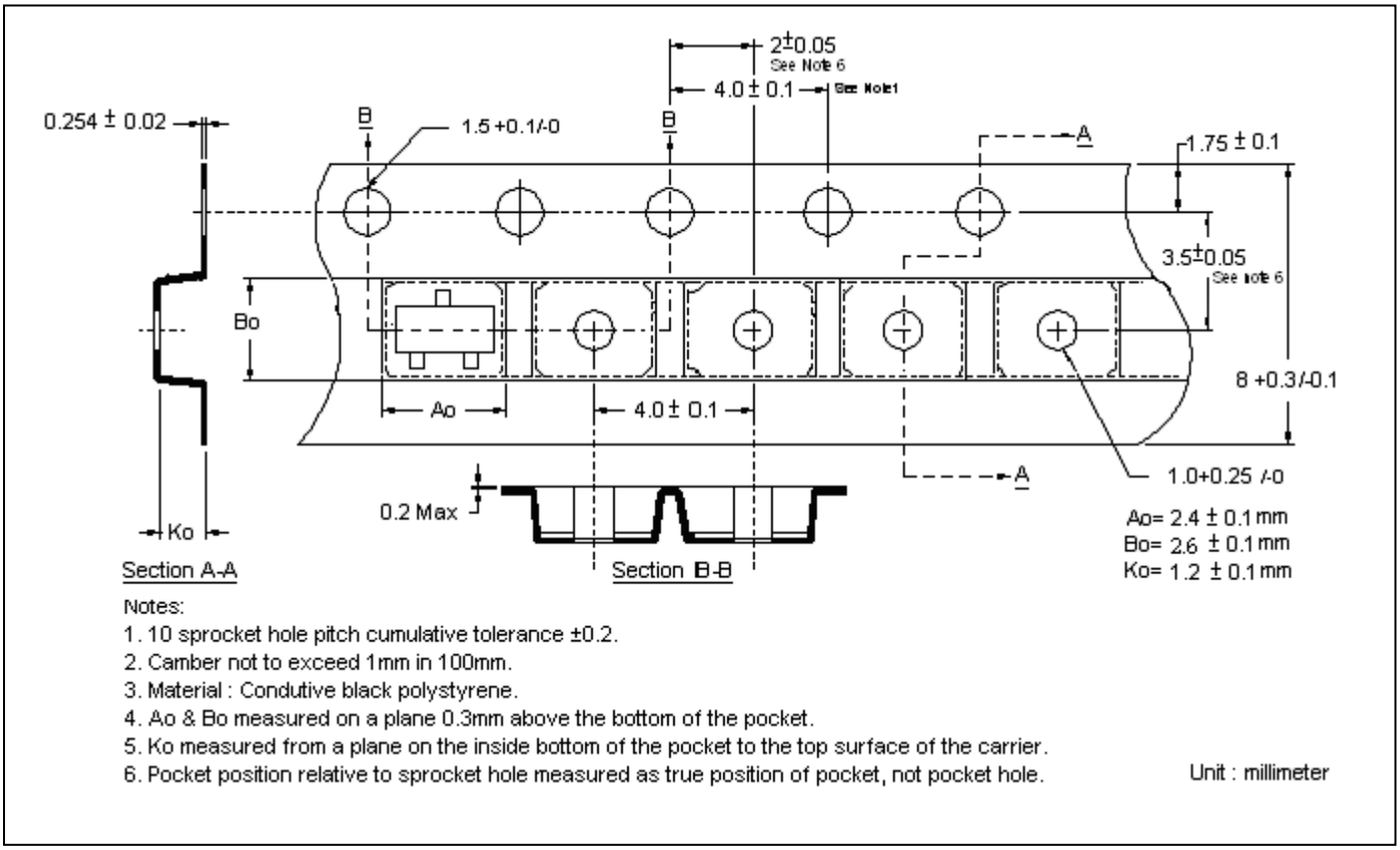
Transient Thermal Response Curves



Reel Dimension



Carrier Tape Dimension



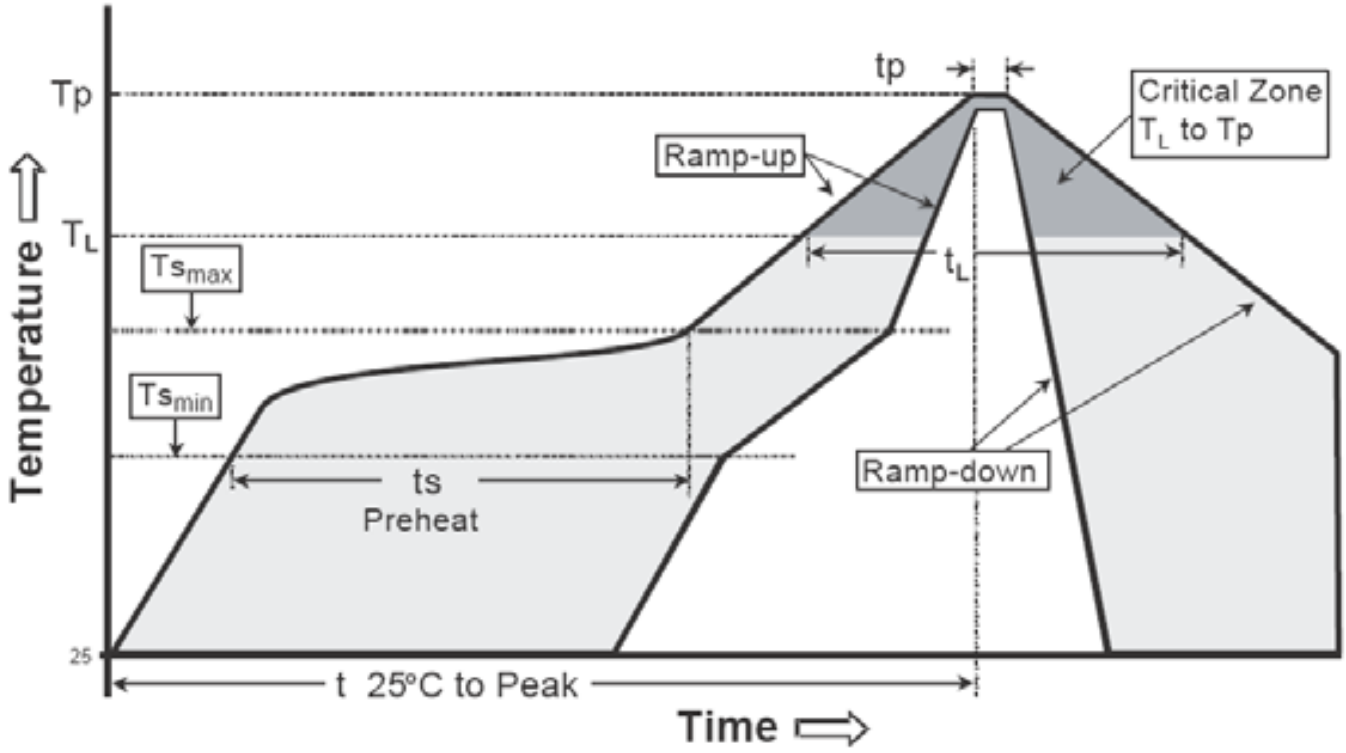
Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material : Condutive black polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.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

Unit : millimeter

Recommended wave soldering condition

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

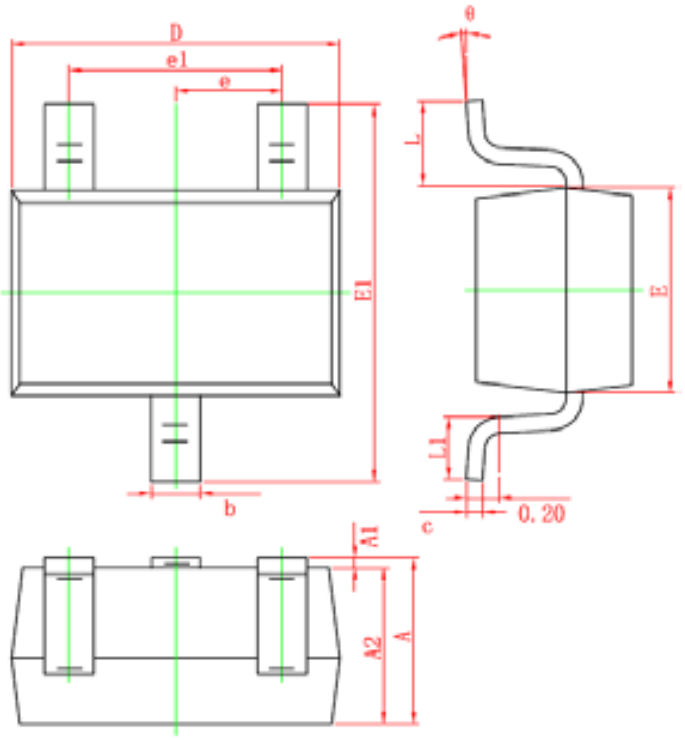
Recommended wave soldering condition



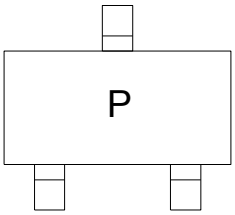
Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(Ts min) −Temperature Max(Ts max) −Time(ts min to ts max)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (TL) − 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-323 Dimension



Marking:



3-Lead SOT-323 Plastic
Surface Mounted Package
Package Code: S3

Style: Pin 1.Gate 2.Source 3.Drain

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.900	1.100	0.035	0.043	E1	2.150	2.450	0.085	0.096
A1	0.000	0.100	0.000	0.004	e	0.650 TYP		0.026 TYP	
A2	0.900	1.000	0.035	0.039	e1	1.200	1.400	0.047	0.055
b	0.200	0.400	0.008	0.016	L	0.525 REF		0.021 REF	
c	0.080	0.150	0.003	0.006	L1	0.260	0.460	0.010	0.018
D	2.000	2.200	0.079	0.087	θ	0°	8°	0°	8°
E	1.150	1.350	0.045	0.053					

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.