

**20V P-Channel Enhancement Mode MOSFET**

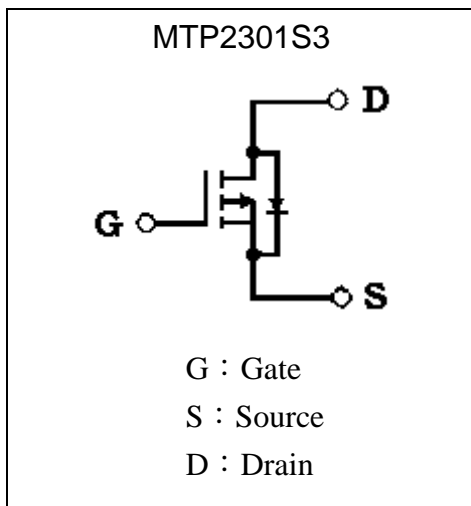
# MTP2301S3

$BV_{DSS}$	-20V
$I_D@T_A=25^{\circ}C, V_{GS}=-4.5V$	-1.6A
$R_{DS(on)(MAX)}@V_{GS}=-4.5V, I_D=-1.6A$	75mΩ (typ.)
$R_{DS(on)(MAX)}@V_{GS}=-2.5V, I_D=-1A$	113mΩ (typ.)

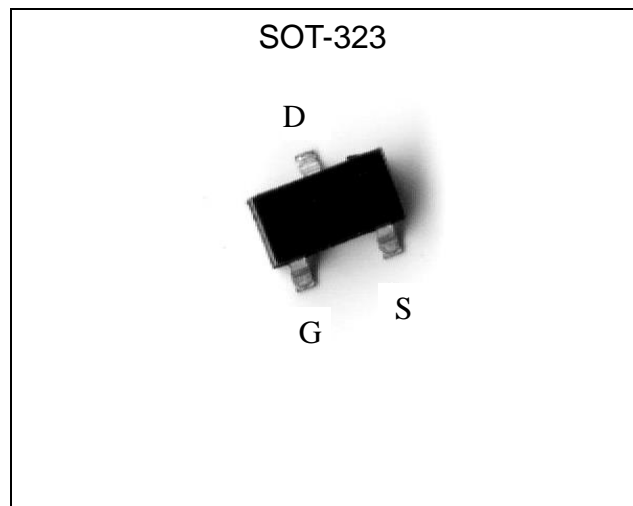
**Features**

- 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**

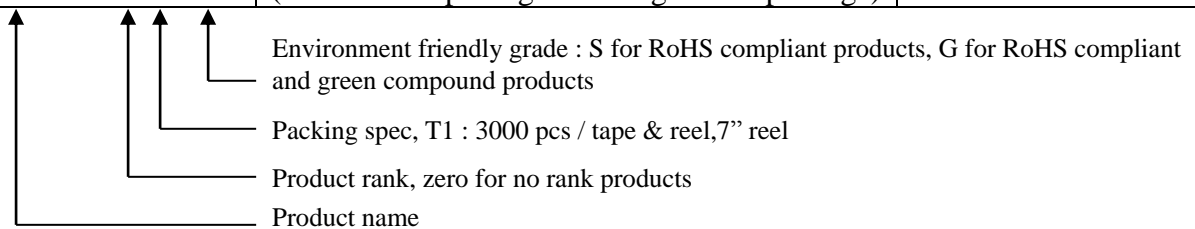


**Outline**



**Ordering Information**

Device	Package	Shipping
MTP2301S3-0-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 <sub>DS</sub>	-20	V	
Gate-Source Voltage	V <sub>GS</sub>	±8		
Continuous Drain Current @T <sub>A</sub> =25°C, V <sub>GS</sub> =-4.5V	I <sub>D</sub>	-1.6	A	
Continuous Drain Current @T <sub>A</sub> =70°C, V <sub>GS</sub> =-4.5V		-1.3		
Pulsed Drain Current	I <sub>DM</sub>	-10		
Maximum Power Dissipation	P <sub>D</sub>	Ta=25°C	340 (Note)	mW
		Ta=70°C	218 (Note)	
Operating Junction and Storage Temperature Range	T <sub>j</sub> ; T <sub>stg</sub>	-55~+150	°C	

**Thermal Performance**

Parameter	Symbol	Limit	Unit
Thermal Resistance, Junction-to-Ambient(PCB mounted)	R <sub>th,ja</sub>	367 (Note)	°C/W

Note : Device mounted on minimum copper pad.

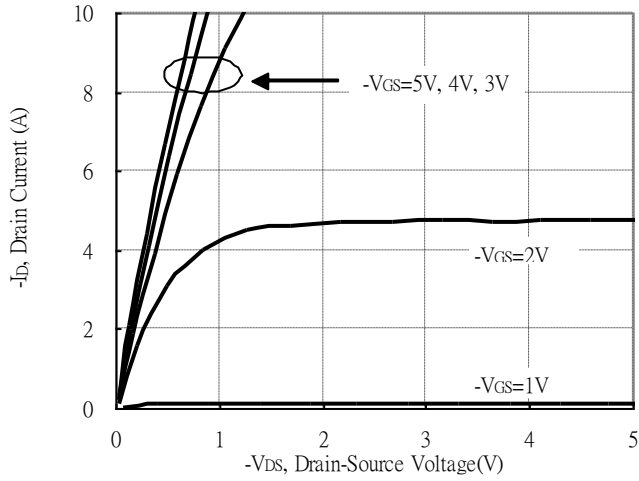
**Electrical Characteristics (Ta=25°C)**

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	-20	-	-	V	V <sub>GS</sub> =0V, I <sub>D</sub> =-250μA
V <sub>GS(th)</sub>	-0.45	-	-1		V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V
I <sub>DSS</sub>	-	-	-1	μA	V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V
*R <sub>Ds(ON)</sub>	-	75	110	mΩ	I <sub>D</sub> =-1.6A, V <sub>GS</sub> =-4.5V
	-	113	150		I <sub>D</sub> =-1A, V <sub>GS</sub> =-2.5V
*G <sub>FS</sub>	-	4.5	-	S	V <sub>DS</sub> =-5V, I <sub>D</sub> =-1.6A
<b>Dynamic</b>					
C <sub>iss</sub>	-	446	-	pF	V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz
C <sub>oss</sub>	-	57	-		
C <sub>rss</sub>	-	52	-		
t <sub>d(ON)</sub>	-	9.2	20	ns	V <sub>DD</sub> =-10V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-4.5V, R <sub>G</sub> =6Ω
t <sub>r</sub>	-	7.3	60		
t <sub>d(OFF)</sub>	-	38	50		
t <sub>f</sub>	-	12	20		
Q <sub>g</sub>	-	4.4	-	nC	V <sub>DS</sub> =-10V, I <sub>D</sub> =-1.6A, V <sub>GS</sub> =-2.5V
Q <sub>gs</sub>	-	0.5	-		
Q <sub>gd</sub>	-	1.5	-		
<b>Source-Drain Diode</b>					
I <sub>S</sub>	-	-	-1.6	A	
V <sub>SD</sub>	-	-0.86	-1.2	V	V <sub>GS</sub> =0V, I <sub>S</sub> =-1.6A
t <sub>rr</sub> *	-	30	-	ns	I <sub>F</sub> =-3A, dI <sub>F</sub> /dt=100A/μs
Q <sub>rr</sub> *	-	25	-	nC	

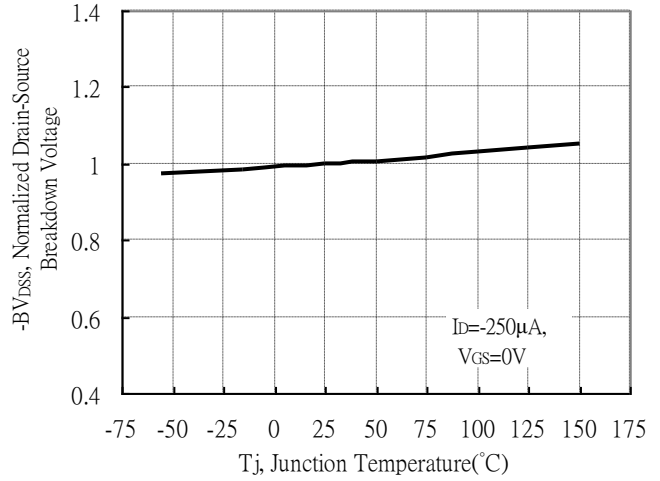
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

## Typical Characteristics

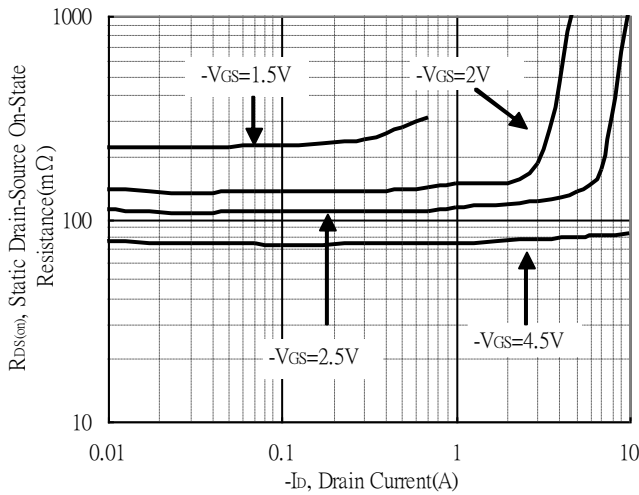
Typical Output Characteristics



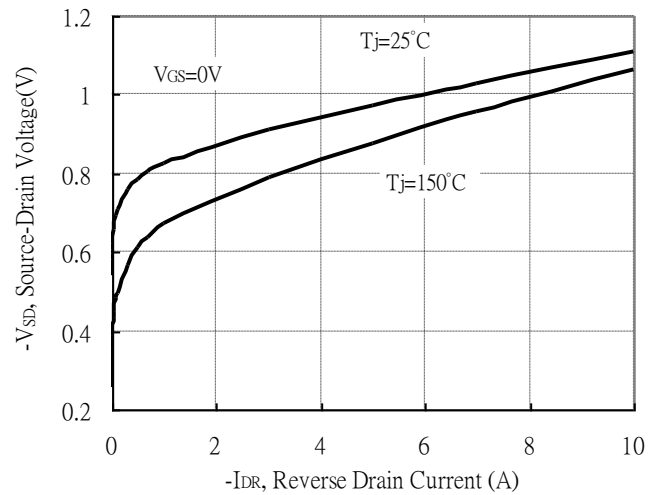
Brekdown Voltage vs Ambient Temperature



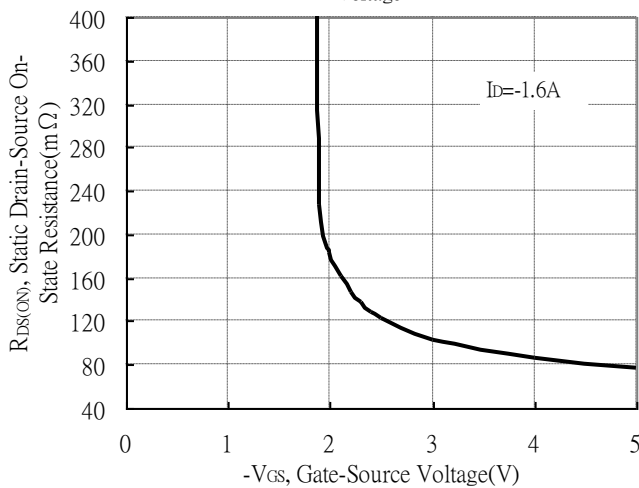
Static Drain-Source On-State resistance vs Drain Current



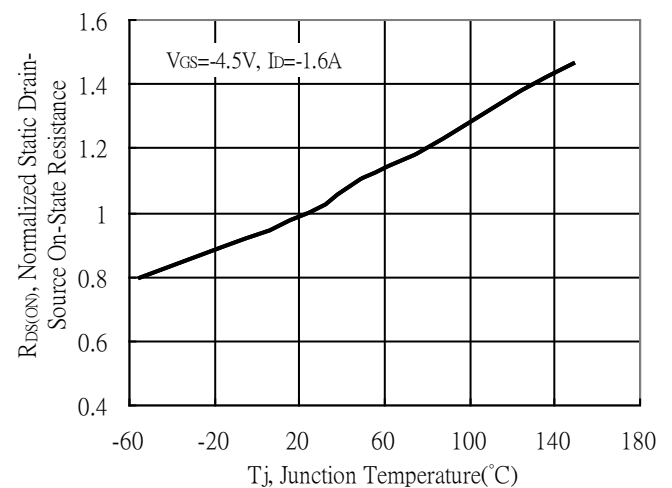
Reverse Drain Current vs Source-Drain Voltage



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

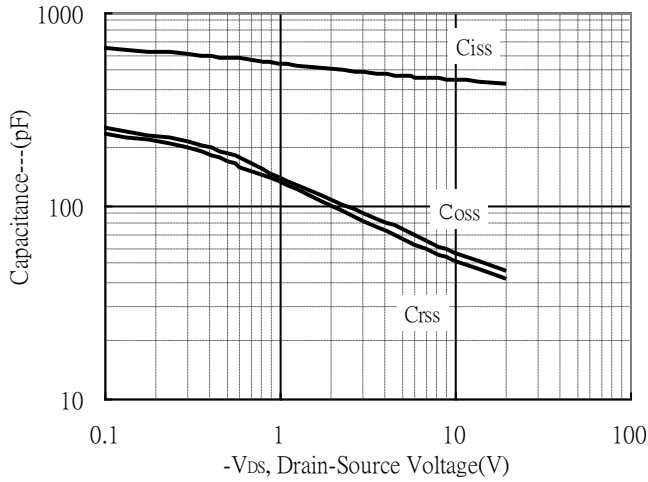


Drain-Source On-State Resistance vs Junction Temperature

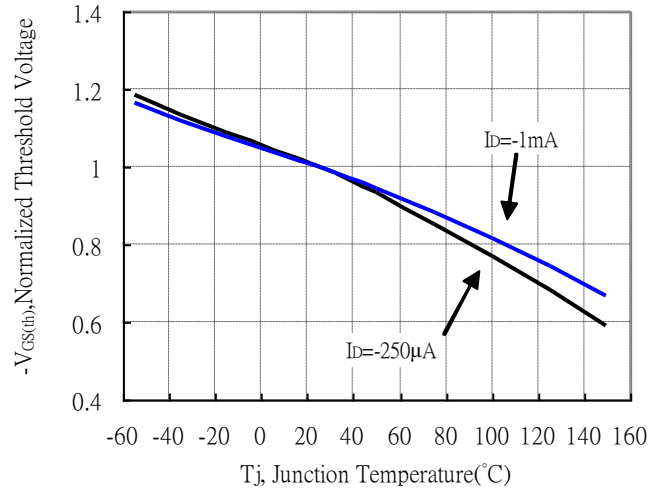


## Typical Characteristics(Cont.)

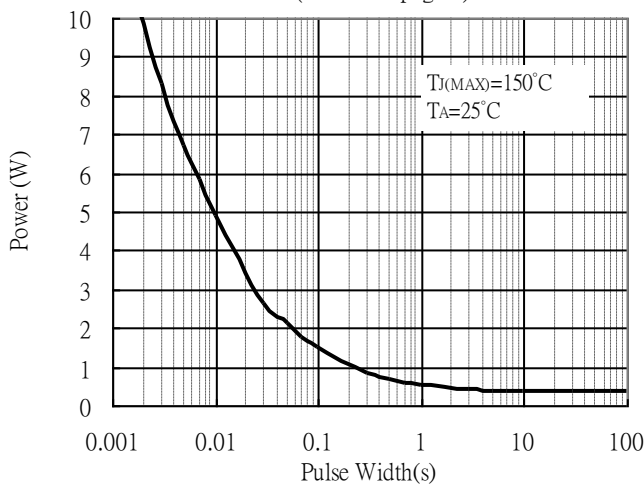
Capacitance vs Drain-to-Source Voltage



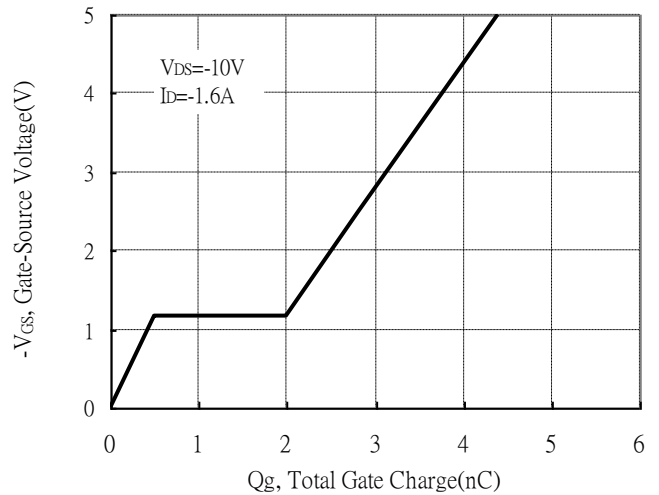
Threshold Voltage vs Junction Temperature



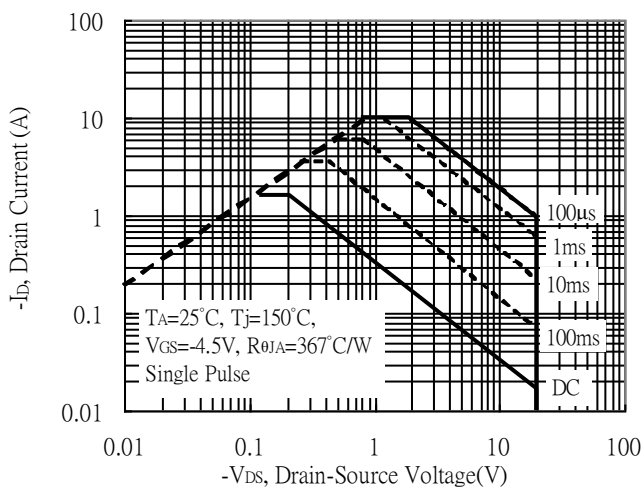
Single Pulse Power Rating, Junction to Ambient  
 (Note 1 on page 2)



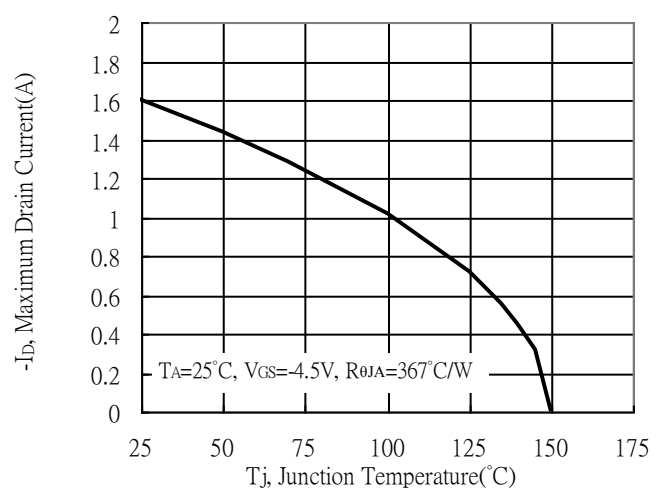
Gate Charge Characteristics



Maximum Safe Operating Area



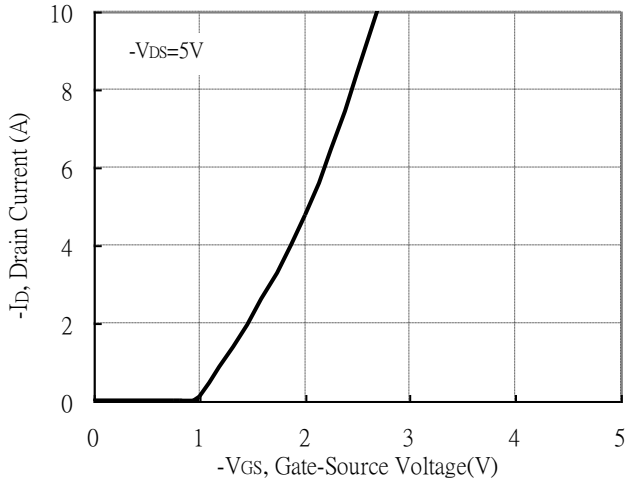
Maximum Drain Current vs Junction Temperature



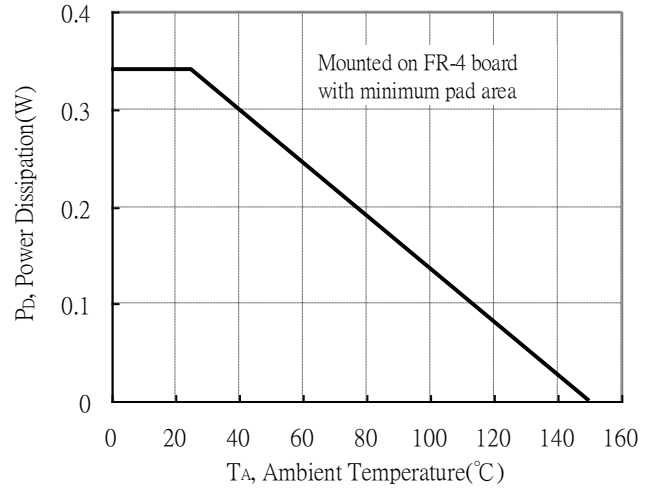


### Typical Characteristics(Cont.)

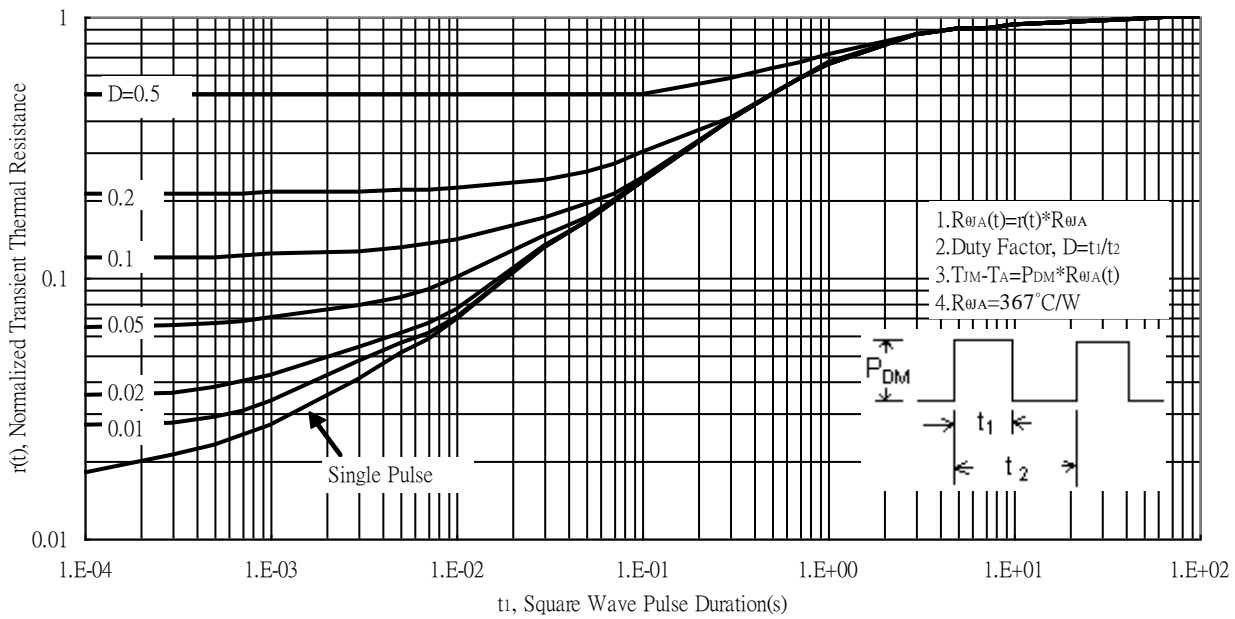
Typical Transfer Characteristics



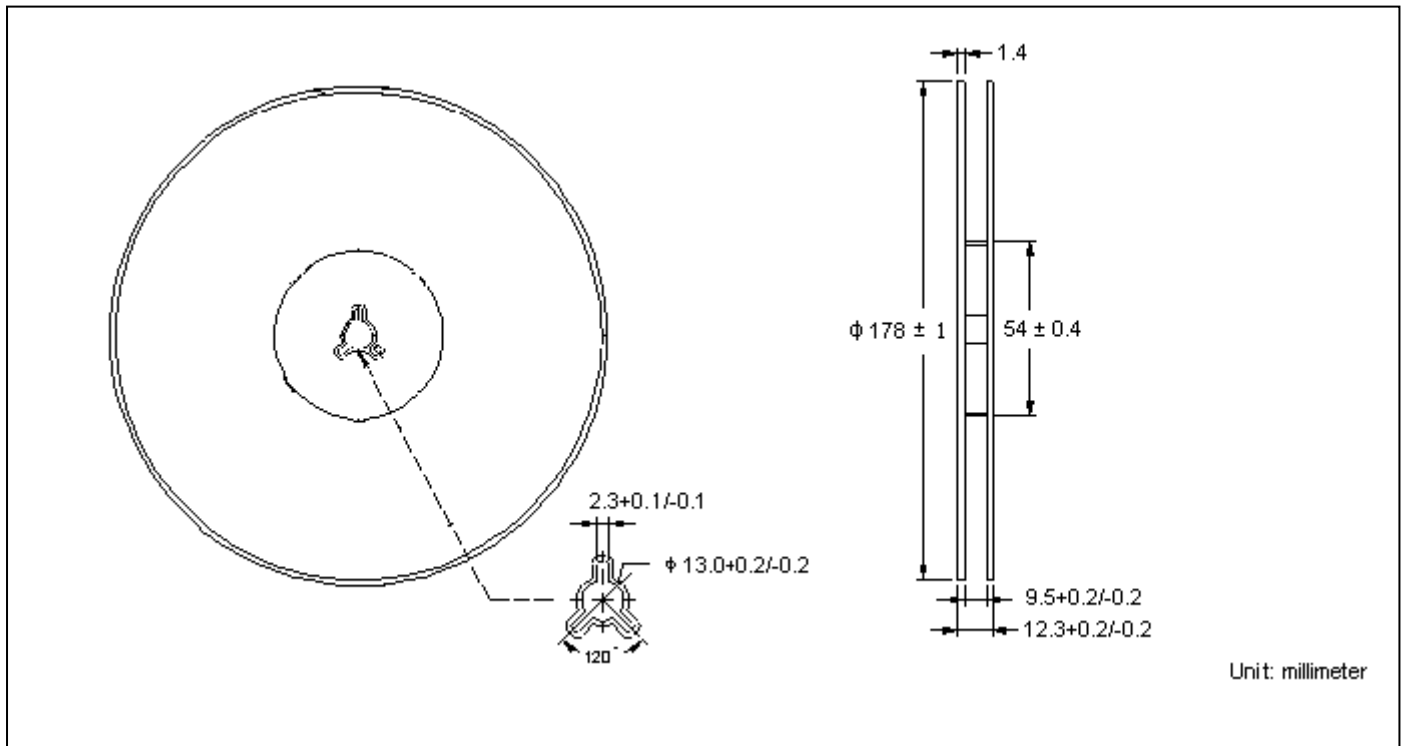
Power Derating Curve



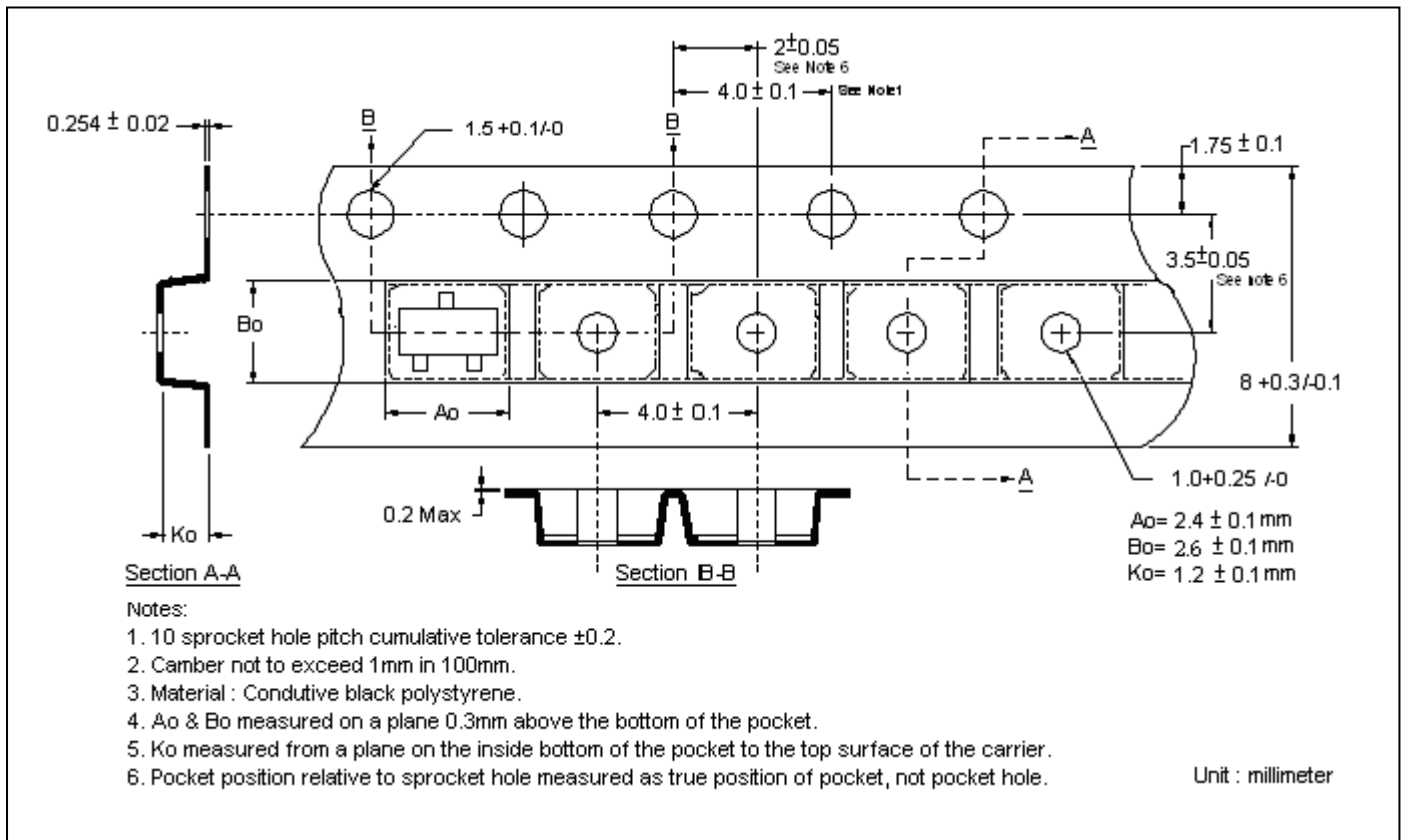
Transient Thermal Response Curves



**Reel Dimension**



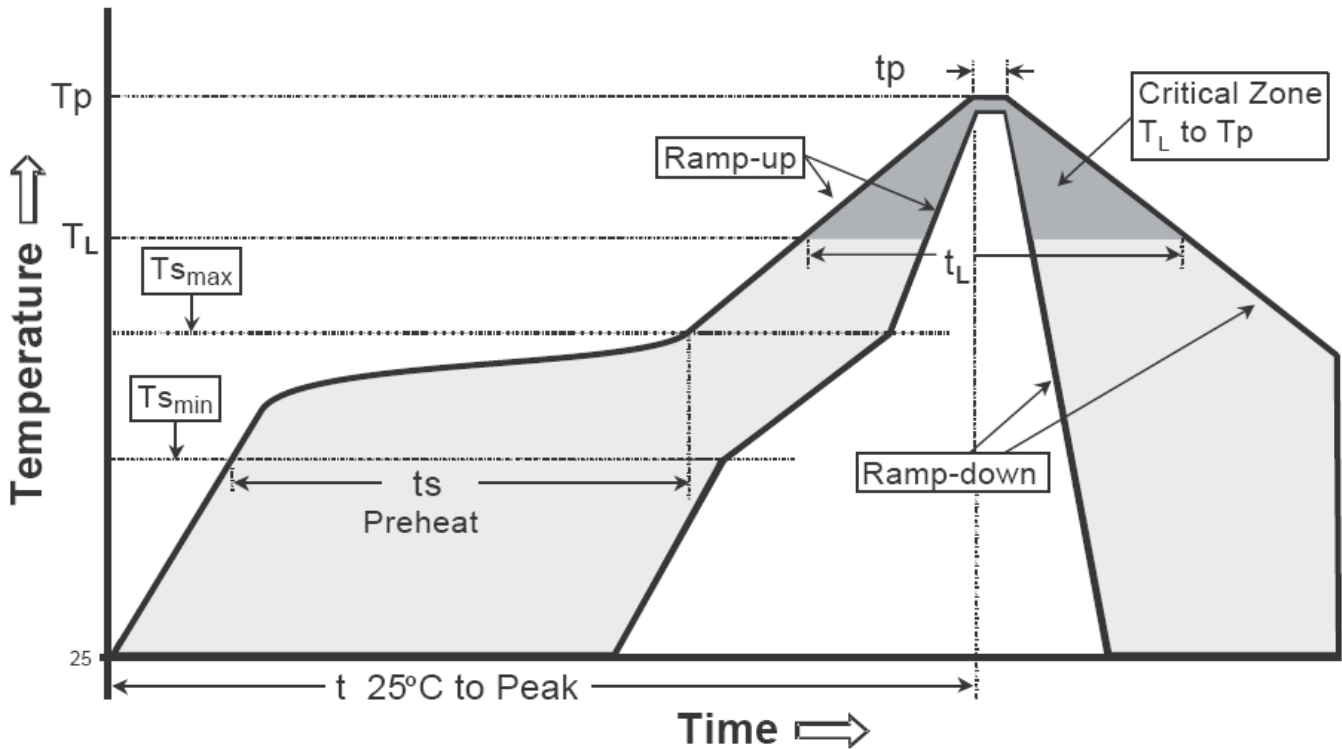
**Carrier Tape Dimension**



**Recommended wave soldering condition**

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

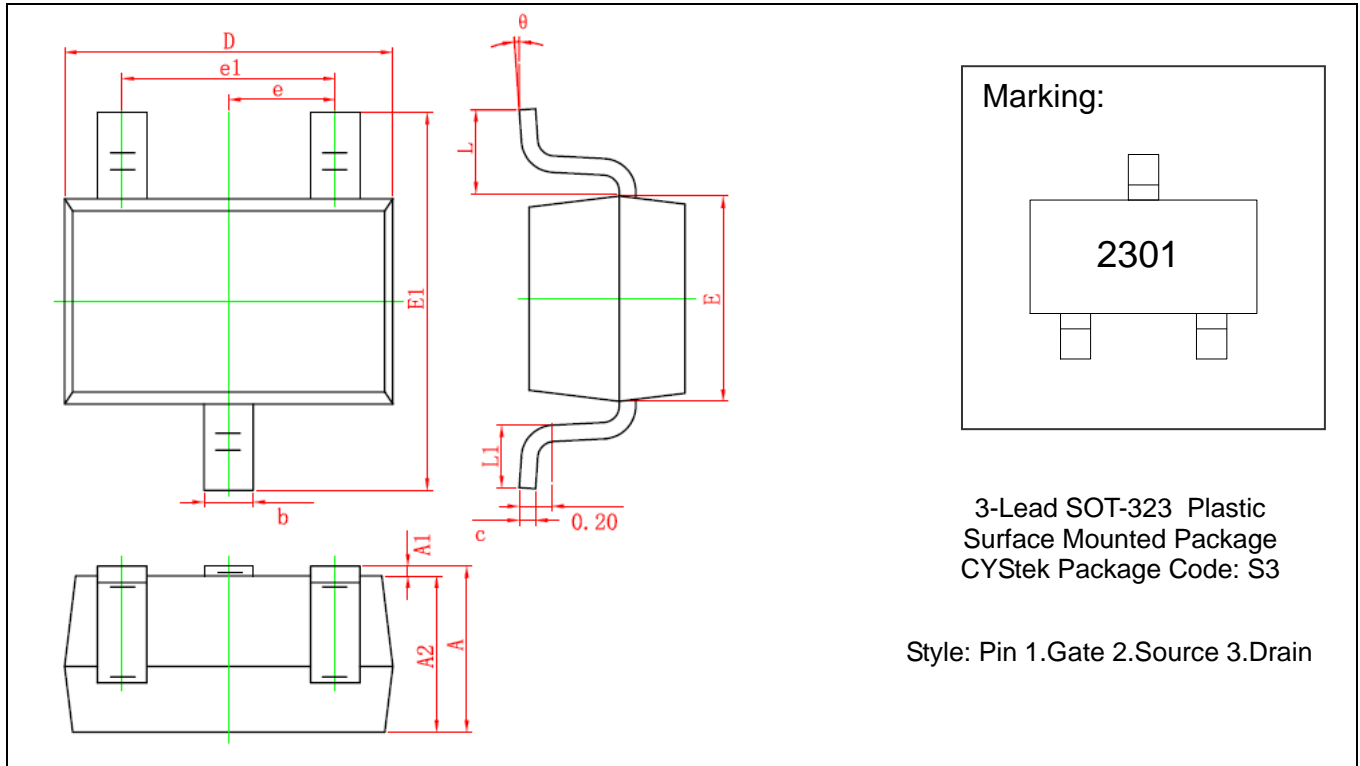
**Recommended wave soldering condition**



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)	100°C	150°C
-Temperature Max(Ts max)	150°C	200°C
-Time(ts min to ts max)	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (Tl)	183°C	217°C
- Time (tL)	60-150 seconds	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**



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.  
 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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