

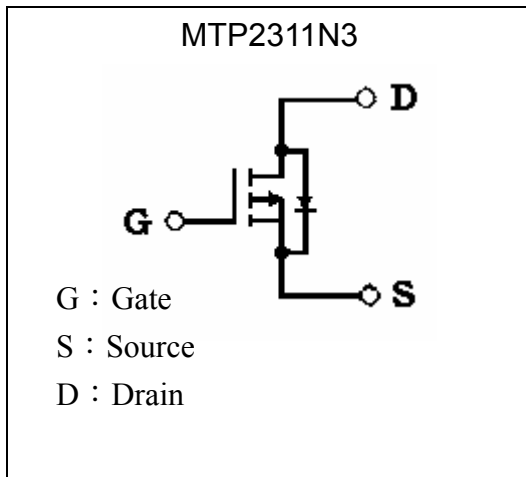
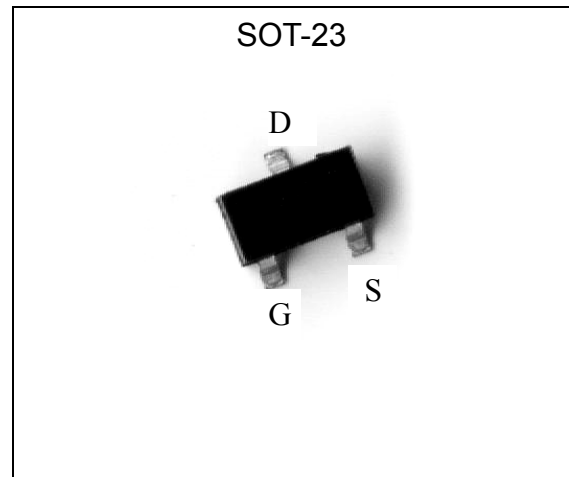
**-60V P-CHANNEL Enhancement Mode MOSFET**

# MTP2311N3

$BV_{DSS}$	-60V
$I_D$	-3.5A
$R_{DS(on)}@V_{GS}=-10V, I_D=-2A$	72m $\Omega$ (typ)
$R_{DS(on)}@V_{GS}=-4.5V, I_D=-1.7A$	98m $\Omega$ (typ)

**Features**

- Low gate charge
- Compact and low profile SOT-23 package
- Advanced trench process technology
- High density cell design for ultra low on resistance
- Pb-free lead plating package

**Symbol**

**Outline**

**Absolute Maximum Ratings** ( $T_a=25^\circ\text{C}$ )

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	$V_{DS}$	-60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Continuous Drain Current @ $T_A=25^\circ\text{C}$ (Note 3)	$I_D$	-3.5	A
Continuous Drain Current @ $T_A=100^\circ\text{C}$ (Note 3)		-2.2	A
Pulsed Drain Current (Notes 1, 2)	$I_{DM}$	-14	A
Maximum Power Dissipation (Note 3)	$P_d$	1.38	W
Linear Derating Factor		0.01	W/ $^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_j ; T_{stg}$	-55~+150	$^\circ\text{C}$

Note : 1. Pulse width limited by maximum junction temperature.

2. Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board; 270 $^\circ\text{C}/\text{W}$  when mounted on minimum copper pad



**Thermal Performance**

Parameter	Symbol	Limit	Unit
Thermal Resistance, Junction-to-Ambient(PCB mounted)	Rth,ja	90	°C/W

Note : Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board; 270°C/W when mounted on minimum copper pad

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	-60	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =-250μA
ΔBV <sub>DSS</sub> /ΔT <sub>j</sub>	-	0.04	-	V/°C	Reference to 25°C, I <sub>D</sub> =-1mA
V <sub>GS(th)</sub>	-1.0	-1.8	-3.0	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250μA
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0
I <sub>DSS</sub>	-	-	-1	μA	V <sub>DS</sub> =-48V, V <sub>GS</sub> =0
	-	-	-25		V <sub>DS</sub> =-48V, V <sub>GS</sub> =0 (T <sub>j</sub> =70°C)
*R <sub>DS(ON)</sub>	-	72	90	mΩ	I <sub>D</sub> =-2A, V <sub>GS</sub> =-10V
	-	98	120		I <sub>D</sub> =-1.7A, V <sub>GS</sub> =-4.5V
*G <sub>FS</sub>	-	5.8	-	S	V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A
<b>Dynamic</b>					
C <sub>iss</sub>	-	962	-	pF	V <sub>DS</sub> =-20V, V <sub>GS</sub> =0, f=1MHz
C <sub>oss</sub>	-	56	-		
C <sub>rss</sub>	-	40	-		
t <sub>d(ON)</sub>	-	5.9	-	ns	V <sub>DS</sub> =-20V, I <sub>D</sub> =-1A, V <sub>GS</sub> =-10V R <sub>G</sub> =6Ω
t <sub>r</sub>	-	5.7	-		
t <sub>d(OFF)</sub>	-	19.2	-		
t <sub>f</sub>	-	6	-		
Q <sub>g</sub>	-	11	-	nC	V <sub>DS</sub> =-30V, I <sub>D</sub> =-3.5A, V <sub>GS</sub> =-10V
Q <sub>gs</sub>	-	3.4	-		
Q <sub>gd</sub>	-	3.4	-		
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	-3.5	A	
*I <sub>SM</sub>	-	-	-14		
*V <sub>SD</sub>	-	-	-1.3	V	V <sub>GS</sub> =0V, I <sub>F</sub> =I <sub>S</sub>
T <sub>rr</sub>	-	12	-	ns	V <sub>GS</sub> =0V, I <sub>F</sub> =-3.5A, dI/dt=100A/μs
Q <sub>rr</sub>	-	7	-	nC	

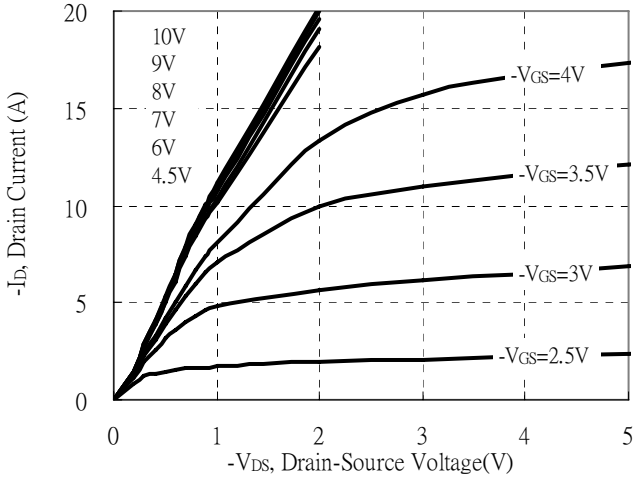
\*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

**Ordering Information**

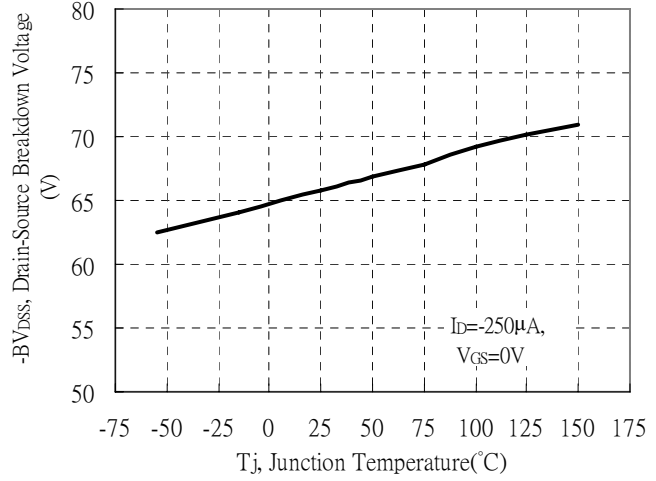
Device	Package	Shipping	Marking
MTP2311N3	SOT-23 (Pb-free lead plating package)	3000 pcs / Tape & Reel	2311

**Typical Characteristics**

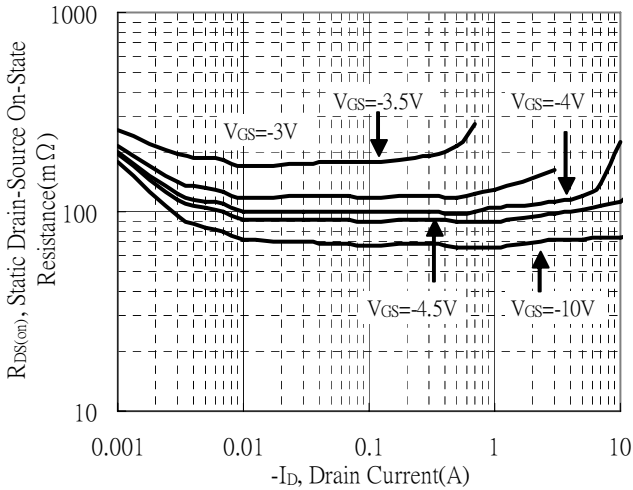
Typical Output Characteristics



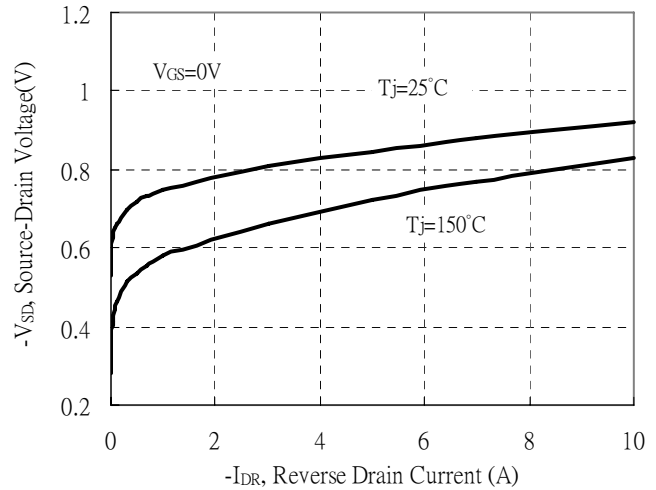
Brekdown Voltage vs Ambient Temperature



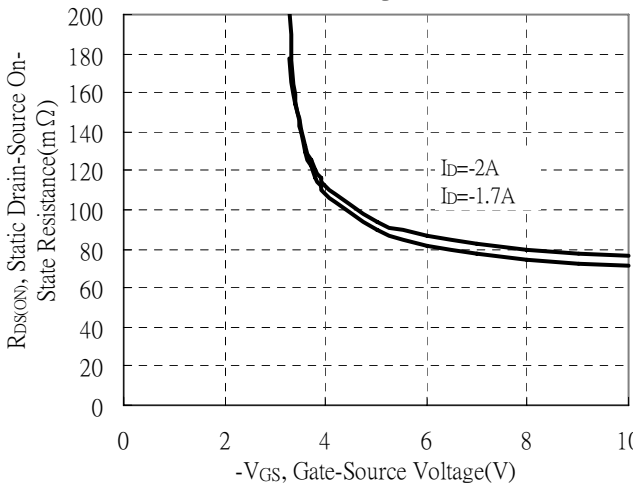
Static Drain-Source On-State resistance vs Drain Current



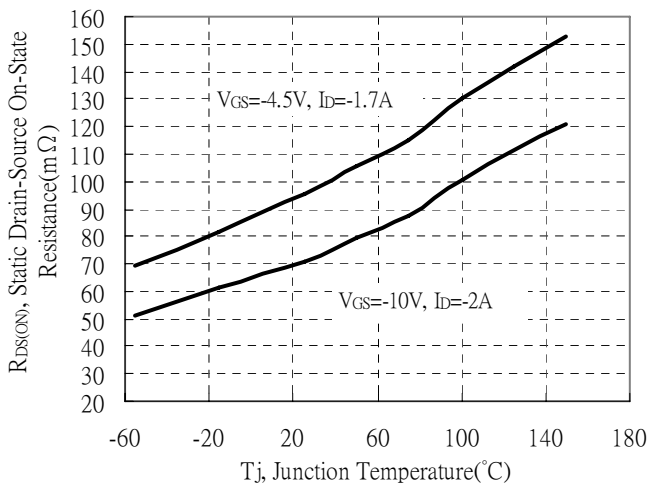
Reverse Drain Current vs Source-Drain Voltage



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



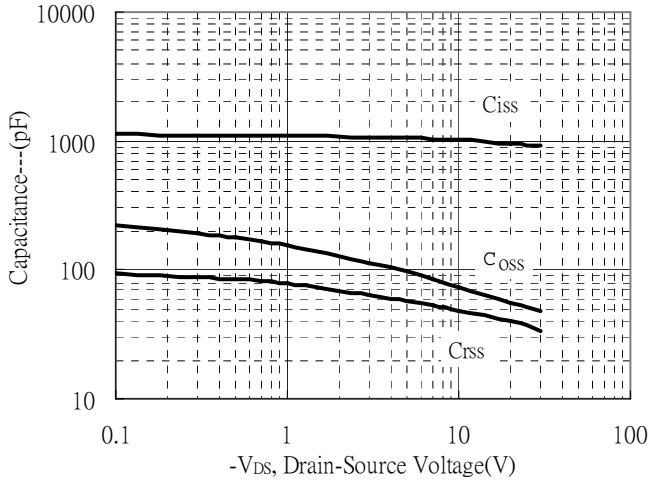
Drain-Source On-State Resistance vs Junction Temperature



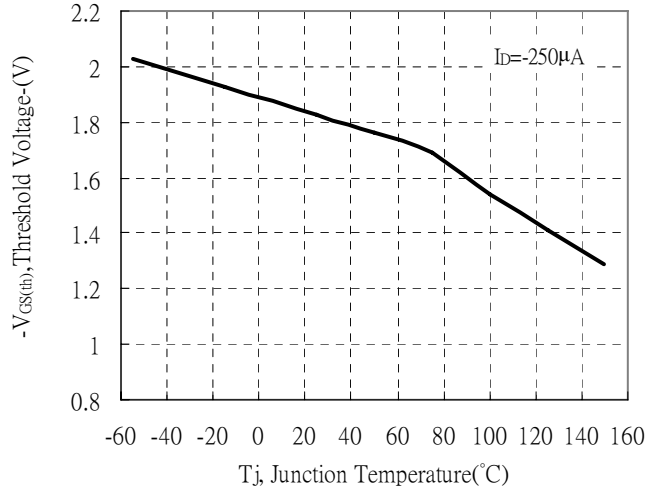


**Typical Characteristics(Cont.)**

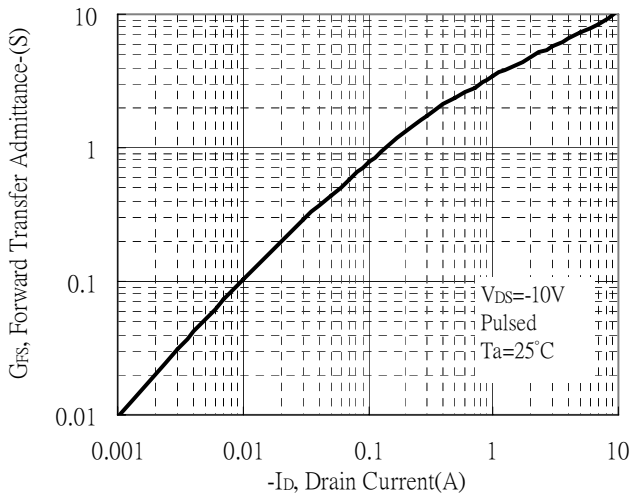
Capacitance vs Drain-to-Source Voltage



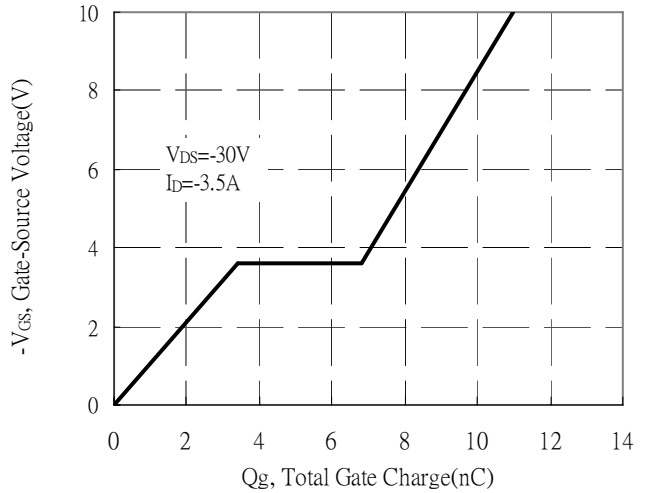
Threshold Voltage vs Junction Temperature



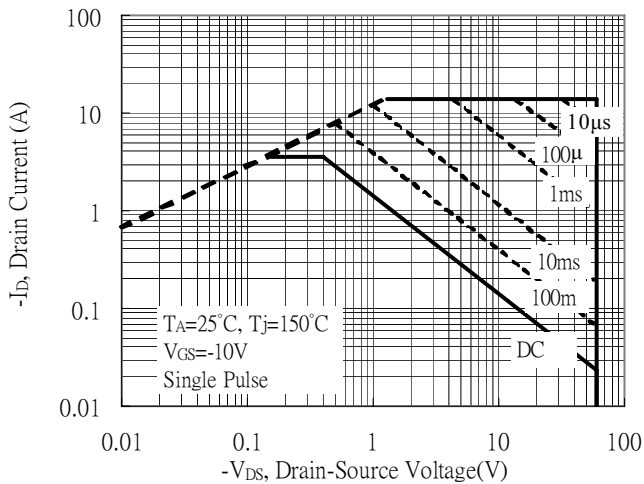
Forward Transfer Admittance vs Drain Current



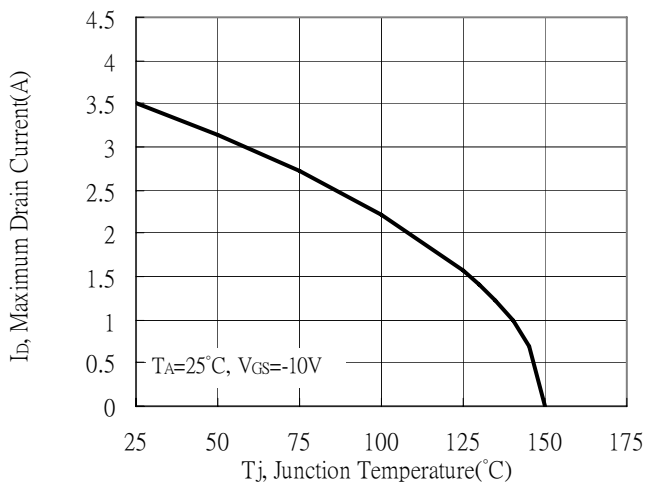
Gate Charge Characteristics



Maximum Safe Operating Area

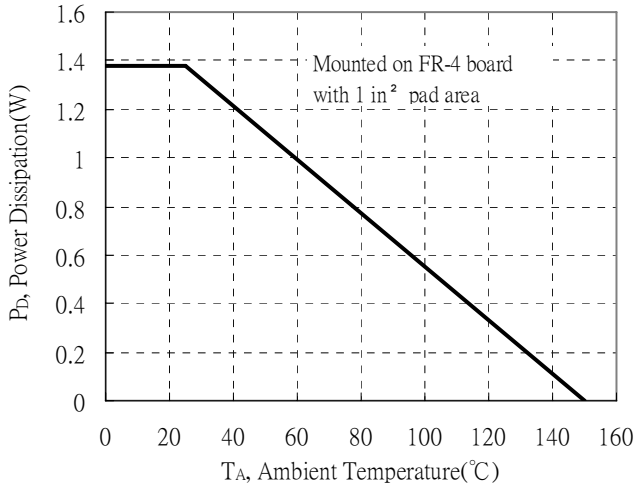


Maximum Drain Current vs Junction Temperature

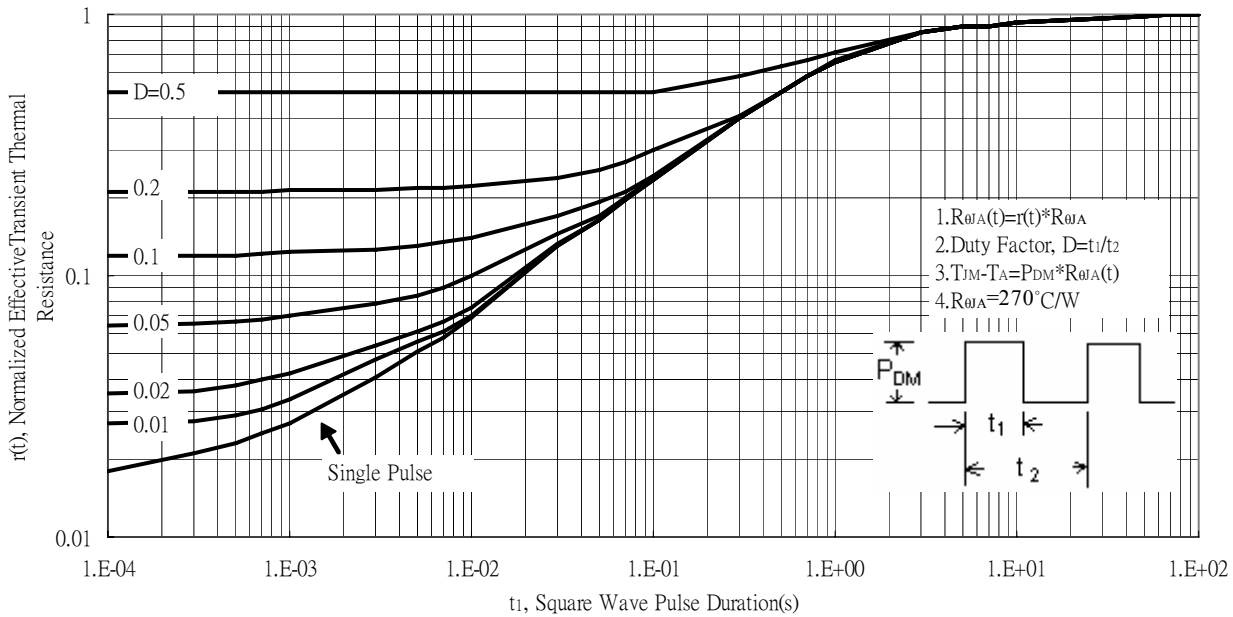


**Typical Characteristics(Cont.)**

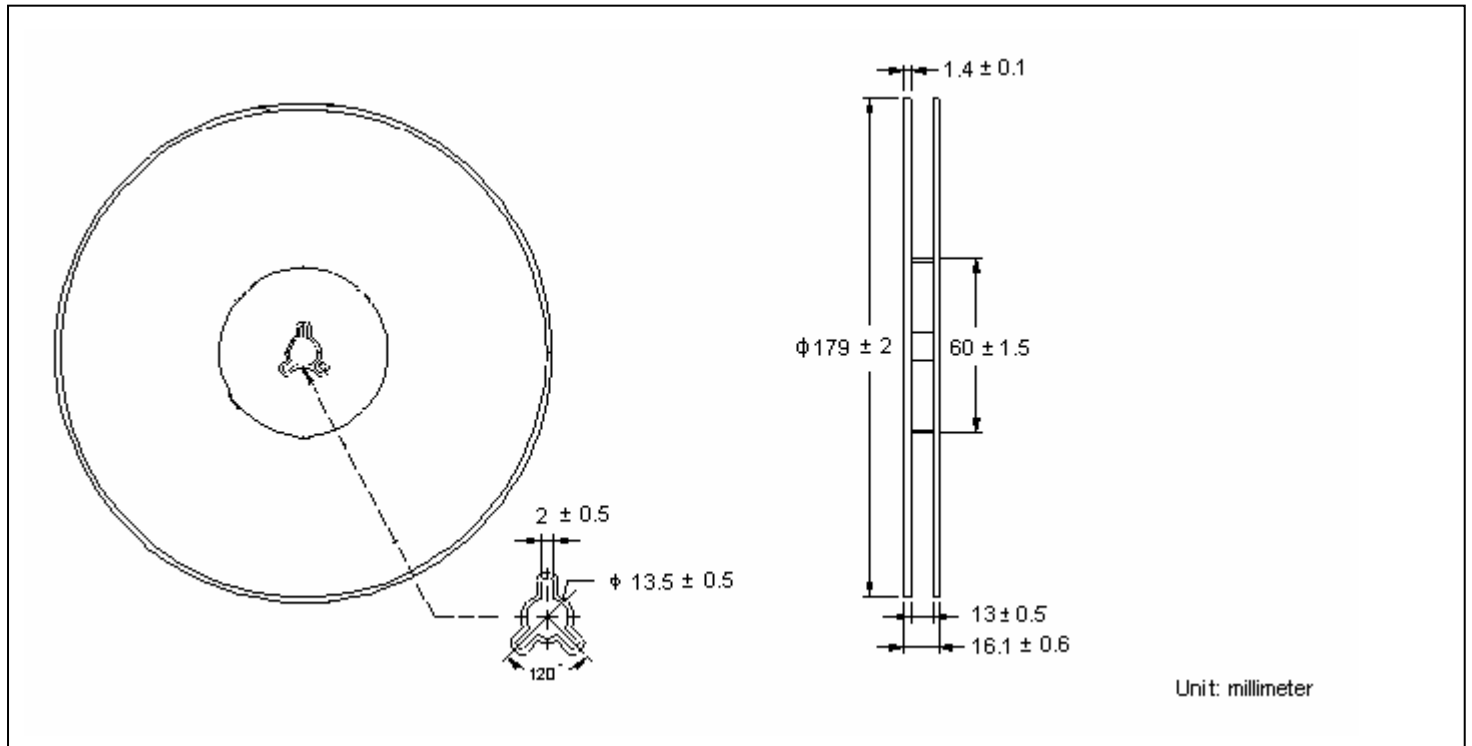
Power Derating Curve



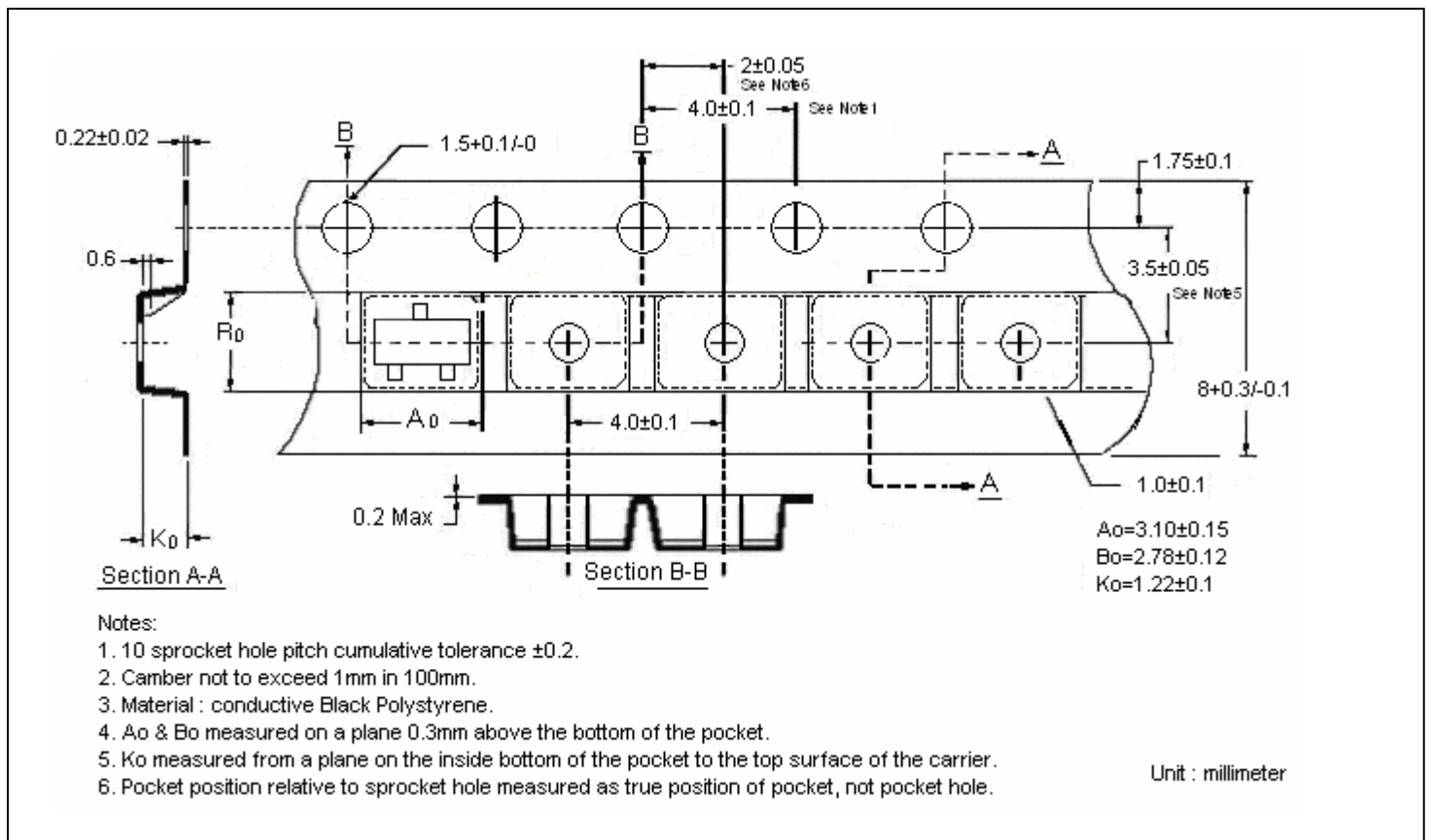
Transient Thermal Response Curves



**Reel Dimension**



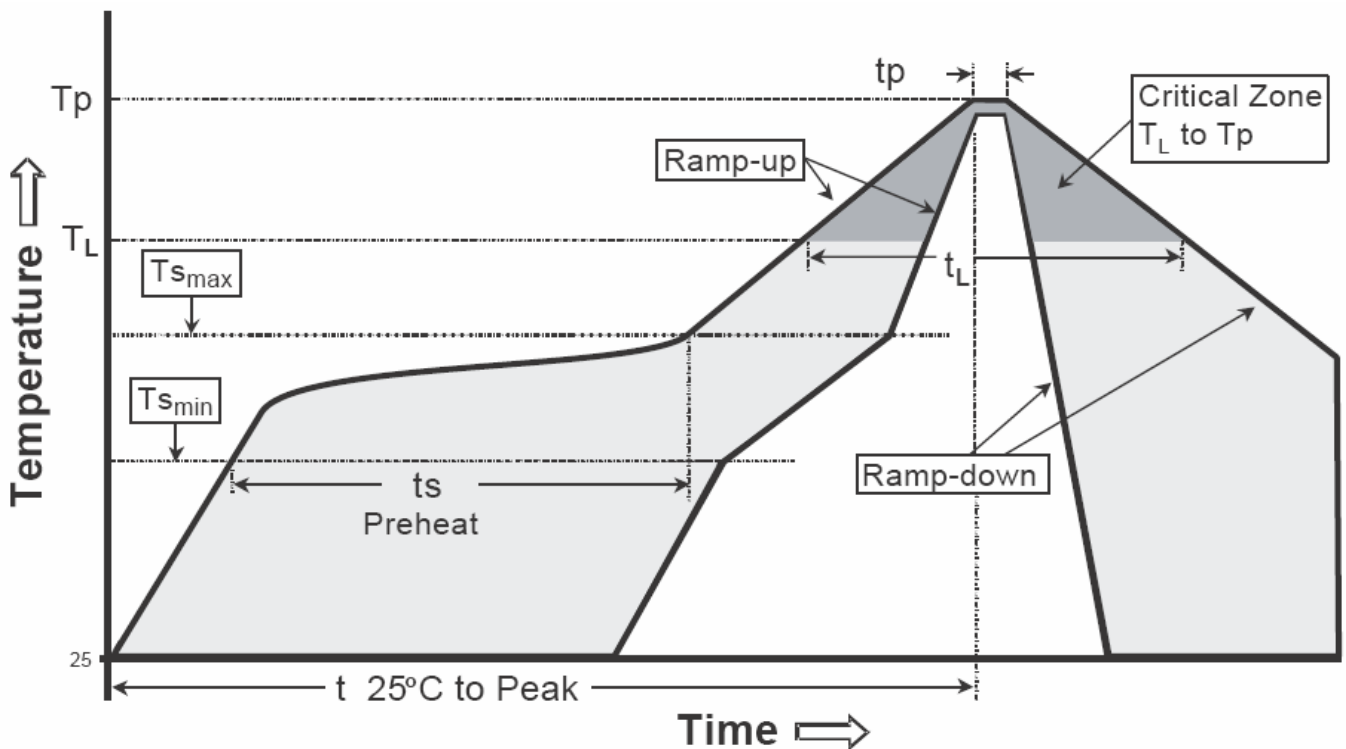
**Carrier Tape Dimension**



**Recommended wave soldering condition**

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

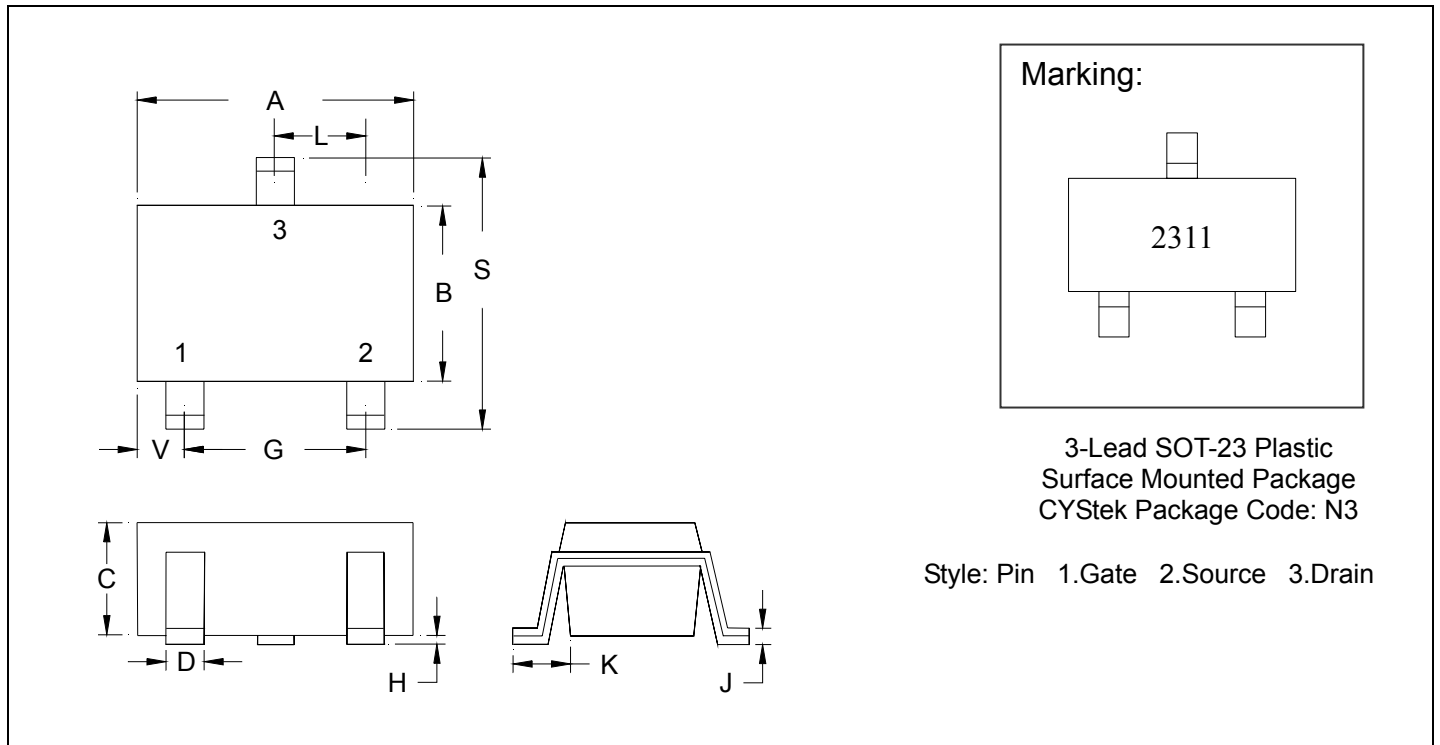
**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Ts_max 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 (T_L)	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-23 Dimension**



\*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.1102	0.1204	2.80	3.04	J	0.0034	0.0070	0.085	0.177
B	0.0472	0.0630	1.20	1.60	K	0.0128	0.0266	0.32	0.67
C	0.0335	0.0512	0.89	1.30	L	0.0335	0.0453	0.85	1.15
D	0.0118	0.0197	0.30	0.50	S	0.0830	0.1161	2.10	2.95
G	0.0669	0.0910	1.70	2.30	V	0.0098	0.0256	0.25	0.65
H	0.0005	0.0040	0.013	0.10					

- Notes:**
- Controlling dimension: millimeters.
  - Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
  - 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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