

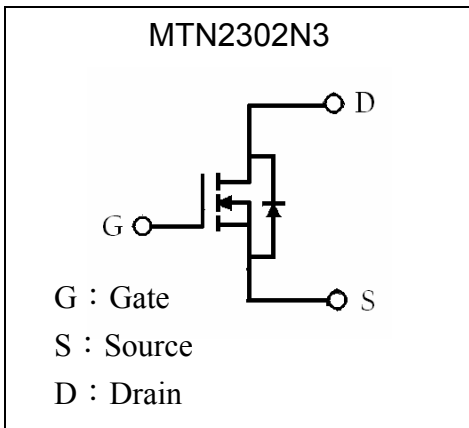
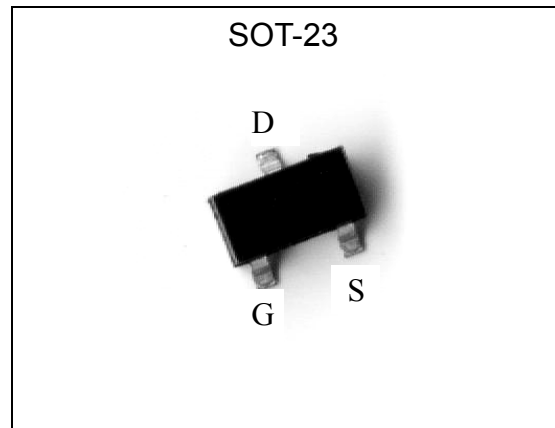
**20V N-CHANNEL Enhancement Mode MOSFET**

# MTN2302N3

$BV_{DSS}$	20V
$I_D$	3.6A
$R_{DSON(MAX)}@V_{GS}=4.5V, I_D=3.6A$	29m $\Omega$ (typ.)
$R_{DSON(MAX)}@V_{GS}=2.5V, I_D=3.1A$	39m $\Omega$ (typ.)

**Features**

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

**Symbol**

**Outline**

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

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	$V_{DS}$	20	V
Gate-Source Voltage	$V_{GS}$	$\pm 12$	V
Continuous Drain Current @ $V_{GS}=4.5V, T_A=25^\circ\text{C}$ (Note 3)	$I_D$	3.6	A
Continuous Drain Current @ $V_{GS}=4.5V, T_A=70^\circ\text{C}$ (Note 3)		2.9	A
Pulsed Drain Current (Notes 1, 2)	$I_{DM}$	10	A
Maximum Power Dissipation @ $T_A=25^\circ\text{C}$	$P_D$	1.38 (Note 3)	W
Linear Derating Factor		0.01	W/ $^\circ\text{C}$
Operating Junction and Storage Temperature	$T_j, T_{stg}$	-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,  $t \leq 5\text{s}$ ; 270 $^\circ\text{C}/\text{W}$  when mounted on minimum copper pad.



**Thermal Performance**

Parameter	Symbol	Limit	Unit
Thermal Resistance, Junction-to-Ambient, max	R $\theta$ JA	90	°C/W
Thermal Resistance, Junction-to-Case, max	R $\theta$ JC	80	°C/W

Note : Surface mounted on 1 in<sup>2</sup> copper pad of FR-4 board, t $\le$ 5s; 270°C/W when mounted on minimum copper pad.

**Electrical Characteristics (T $_j$ =25°C, unless otherwise noted)**

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	20	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250 $\mu$ A
$\Delta$ BV <sub>DSS</sub> / $\Delta$ T <sub>j</sub>	-	0.1	-	V/°C	Reference to 25°C, I <sub>D</sub> =1mA
V <sub>GS(th)</sub>	0.5	0.7	1.2	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 $\mu$ A
I <sub>GSS</sub>	-	-	$\pm$ 100	nA	V <sub>GS</sub> = $\pm$ 12V, V <sub>DS</sub> =0
I <sub>DSS</sub>	-	-	1	$\mu$ A	V <sub>DS</sub> =20V, V <sub>GS</sub> =0
	-	-	10	$\mu$ A	V <sub>DS</sub> =20V, V <sub>GS</sub> =0 (T <sub>j</sub> =70°C)
*R <sub>DS(ON)</sub>	-	29	55	m $\Omega$	I <sub>D</sub> =3.6A, V <sub>GS</sub> =4.5V
	-	39	70		I <sub>D</sub> =3.1A, V <sub>GS</sub> =2.5V
*G <sub>FS</sub>	-	7.5	-	S	V <sub>DS</sub> =5V, I <sub>D</sub> =3.6A
<b>Dynamic</b>					
C <sub>iss</sub>	-	440	-	pF	V <sub>DS</sub> =10V, V <sub>GS</sub> =0, f=1MHz
C <sub>oss</sub>	-	61	-		
C <sub>rss</sub>	-	59	-		
t <sub>d(ON)</sub>	-	4.5	-	ns	V <sub>DS</sub> =10V, I <sub>D</sub> =3.6A, V <sub>GS</sub> =5V R <sub>G</sub> =6 $\Omega$ , R <sub>D</sub> =2.8 $\Omega$
t <sub>r</sub>	-	7.4	-		
t <sub>d(OFF)</sub>	-	19	-		
t <sub>f</sub>	-	7.2	-		
Q <sub>g</sub>	-	4.4	-	nC	V <sub>DS</sub> =10V, I <sub>D</sub> =3.6A, V <sub>GS</sub> =4.5V
Q <sub>gs</sub>	-	0.7	-		
Q <sub>gd</sub>	-	1.7	-		
<b>Source-Drain Diode</b>					
*V <sub>SD</sub>	-	0.8	1.2	V	V <sub>GS</sub> =0V, I <sub>S</sub> =1.6A
I <sub>S</sub>	-	-	1	A	V <sub>D</sub> =V <sub>G</sub> =0V, V <sub>S</sub> =1.2V
I <sub>SM</sub>	-	-	10		

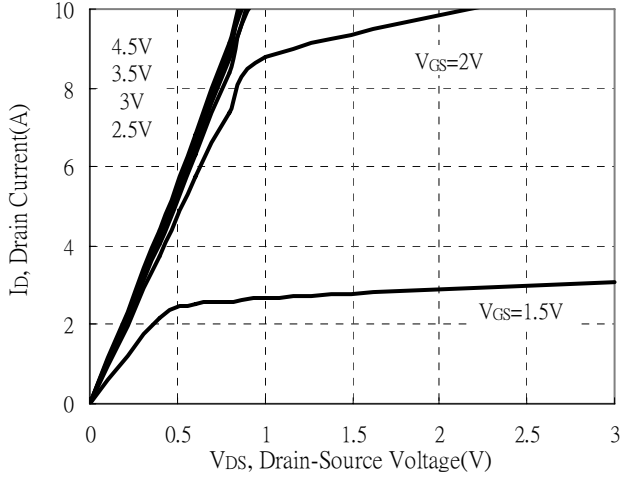
\*Pulse Test : Pulse Width  $\leq$ 300 $\mu$ s, Duty Cycle $\leq$ 2%

**Ordering Information**

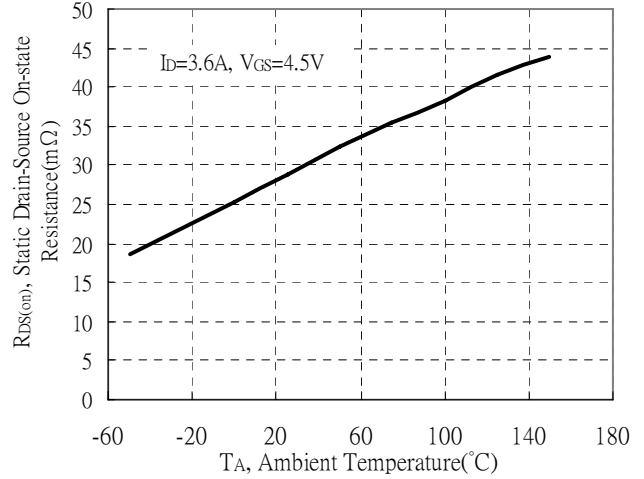
Device	Package	Shipping
MTN2302N3-0-T1-G	SOT-23 (Pb-free lead plating and halogen-free package)	3000 pcs / Tape & Reel

## Typical Characteristics

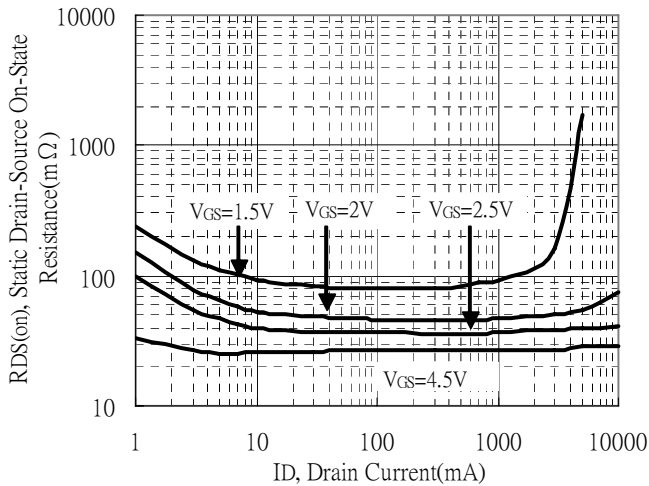
Typical Output Characteristics



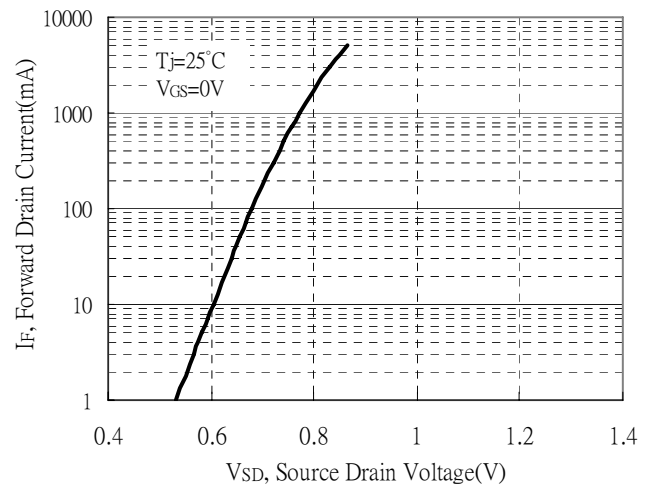
Static Drain-Source On-resistance vs Ambient Temperature



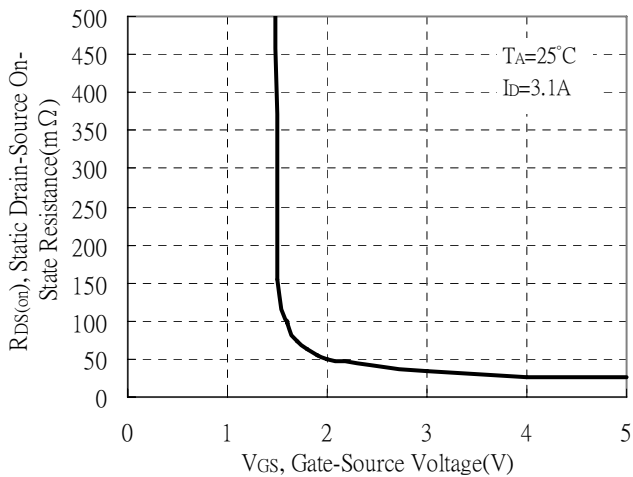
Static Drain-Source On-State resistance vs Drain Current



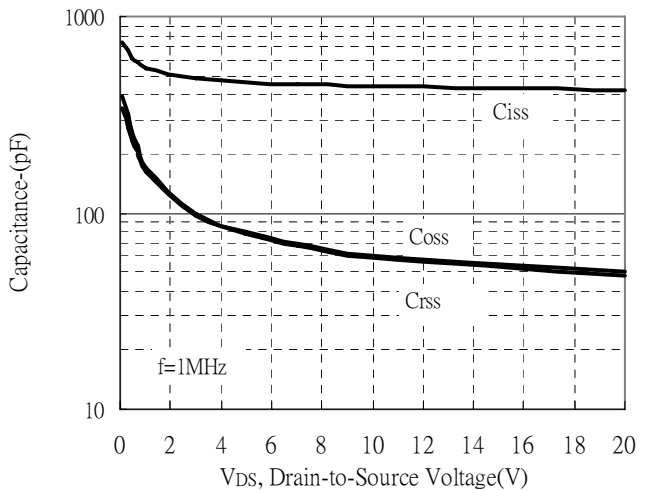
Forward Drain Current vs Source-Drain Voltage



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

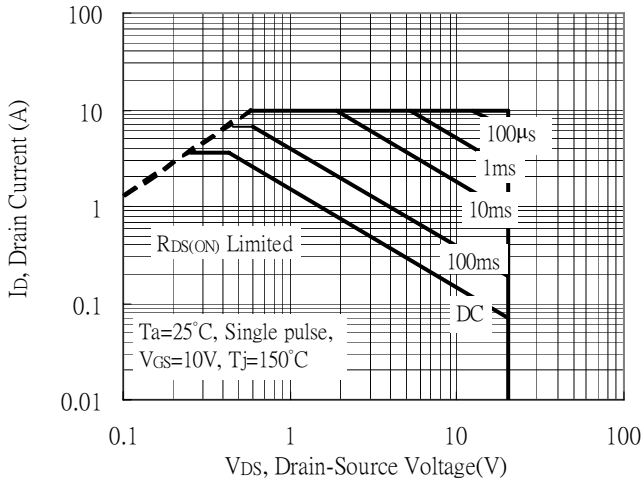


Capacitance vs Reverse Voltage

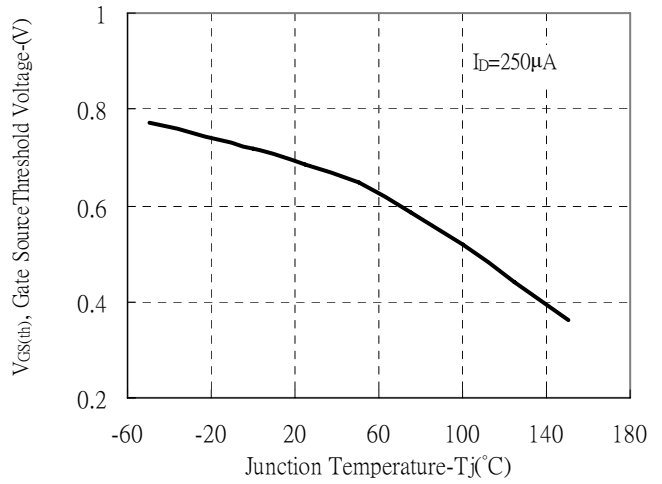


**Typical Characteristics(Cont.)**

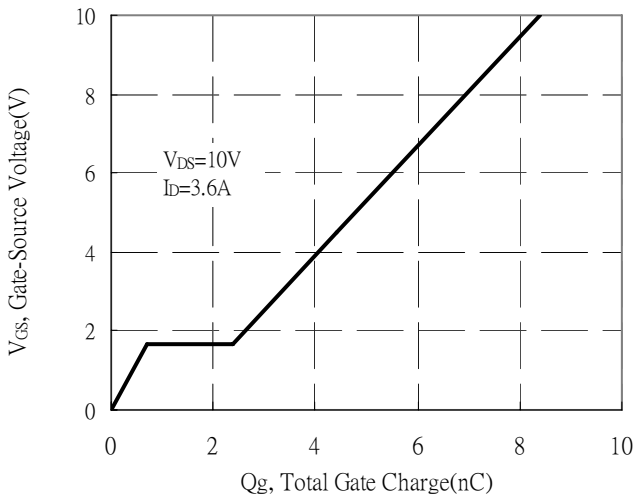
Maximum Safe Operating Area



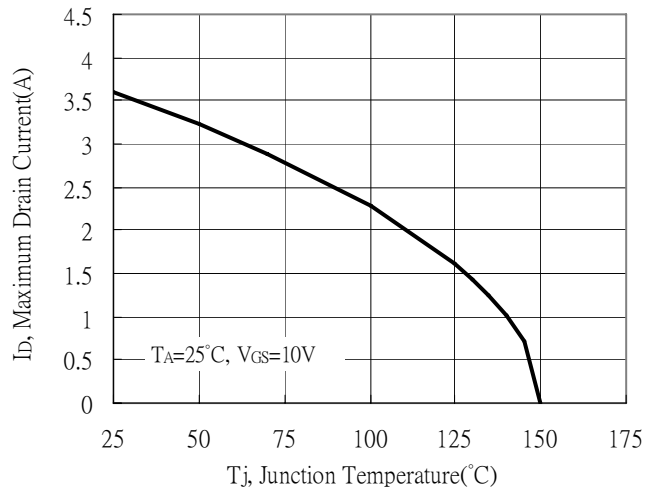
Gate Threshold Voltage vs Ambient Temperature



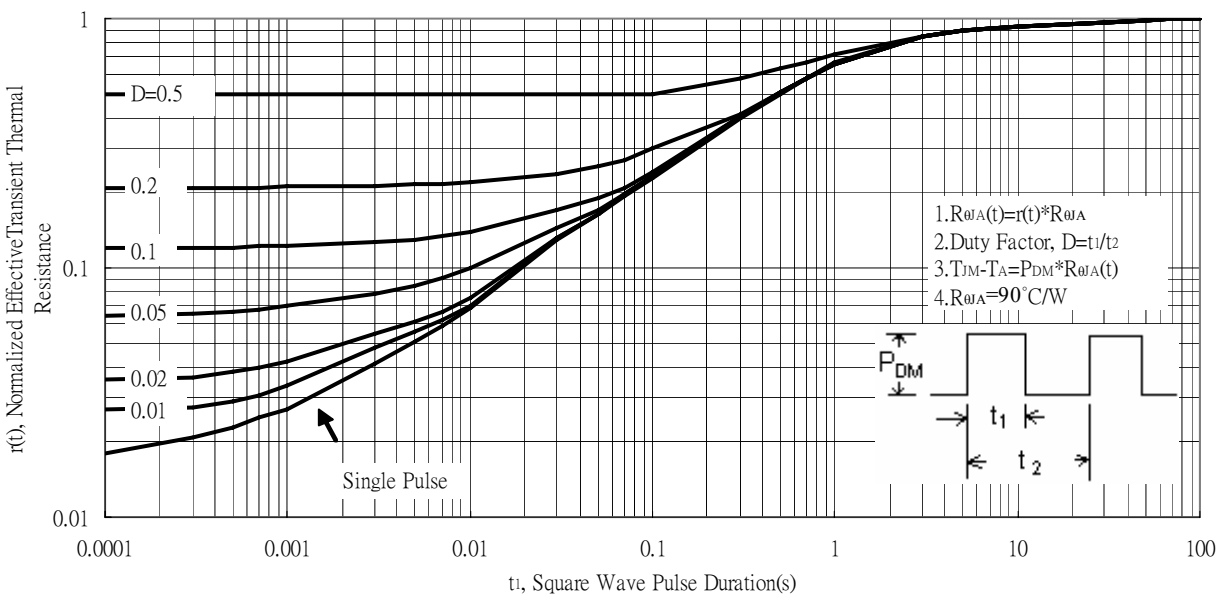
Gate Charge Characteristics



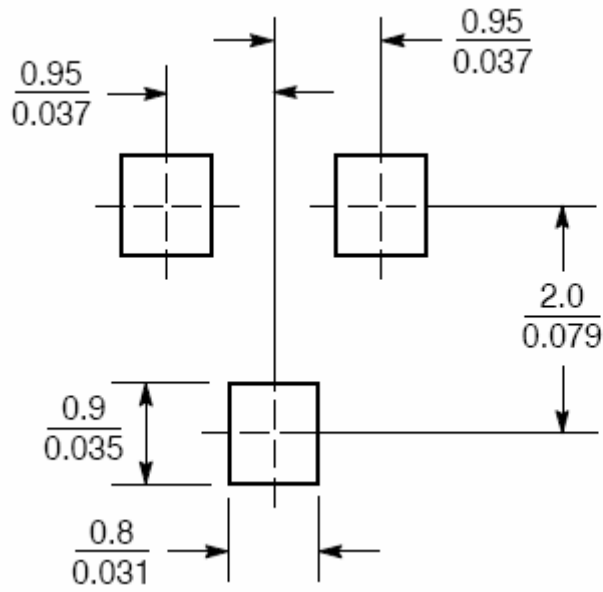
Maximum Drain Current vs Junction Temperature



Transient Thermal Response Curves

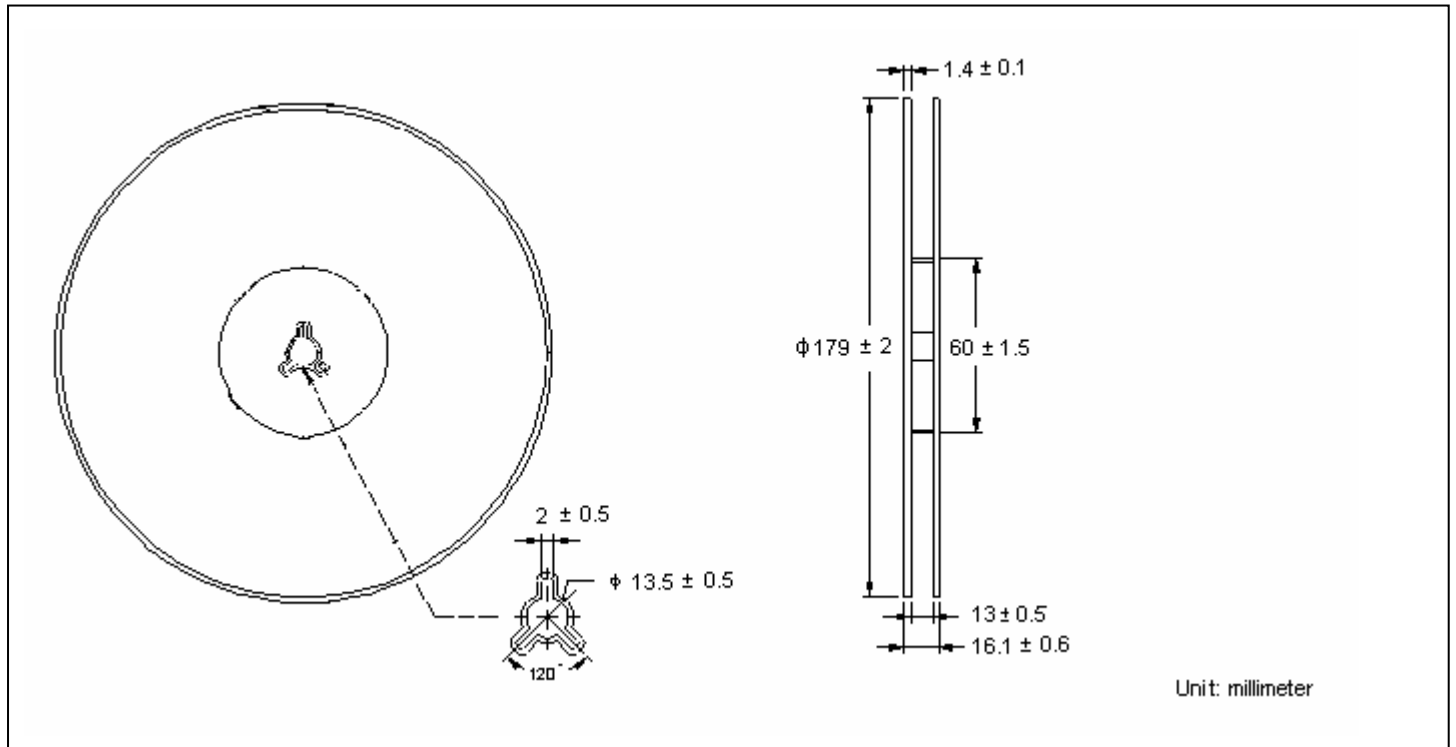


### Recommended Soldering Footprint

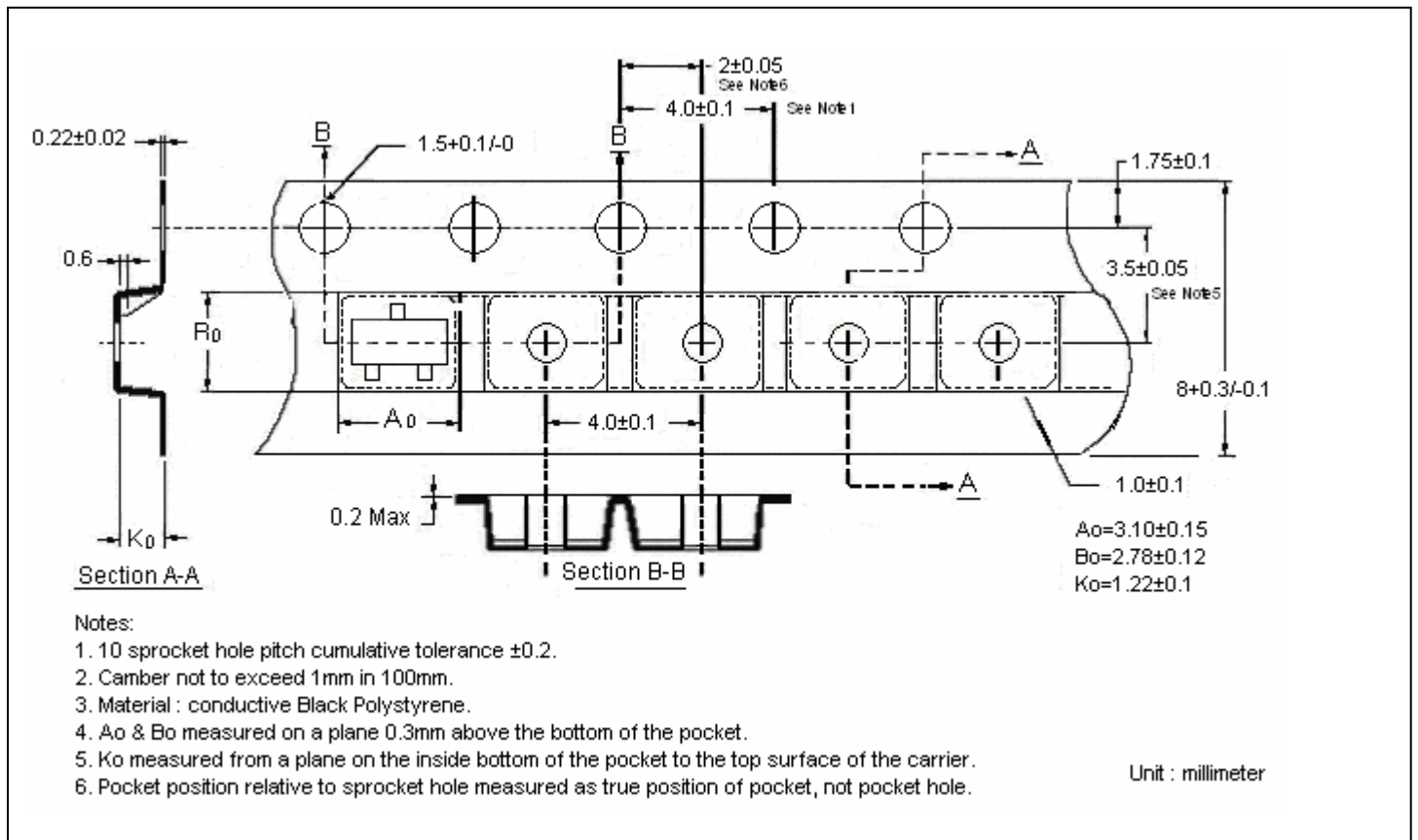


Unit :  $\frac{\text{mm}}{\text{inches}}$

**Reel Dimension**



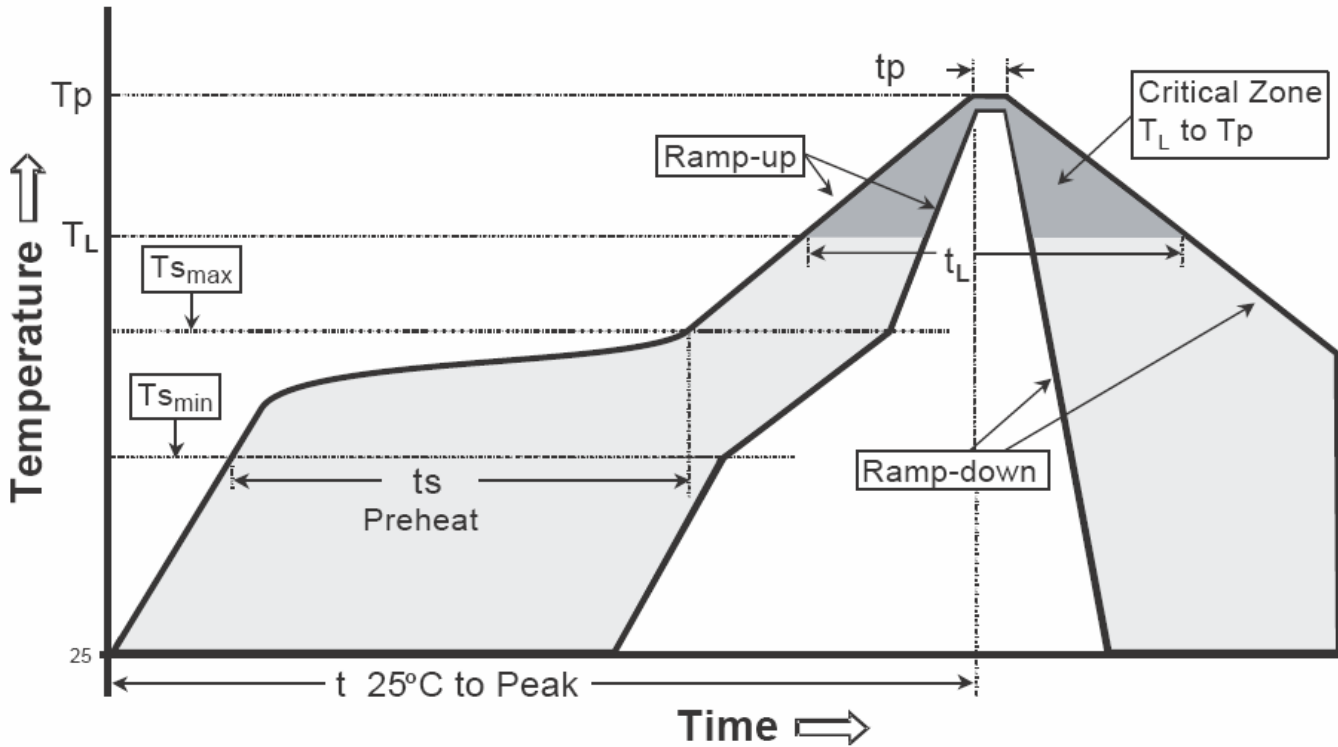
**Carrier Tape Dimension**



**Recommended wave soldering condition**

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

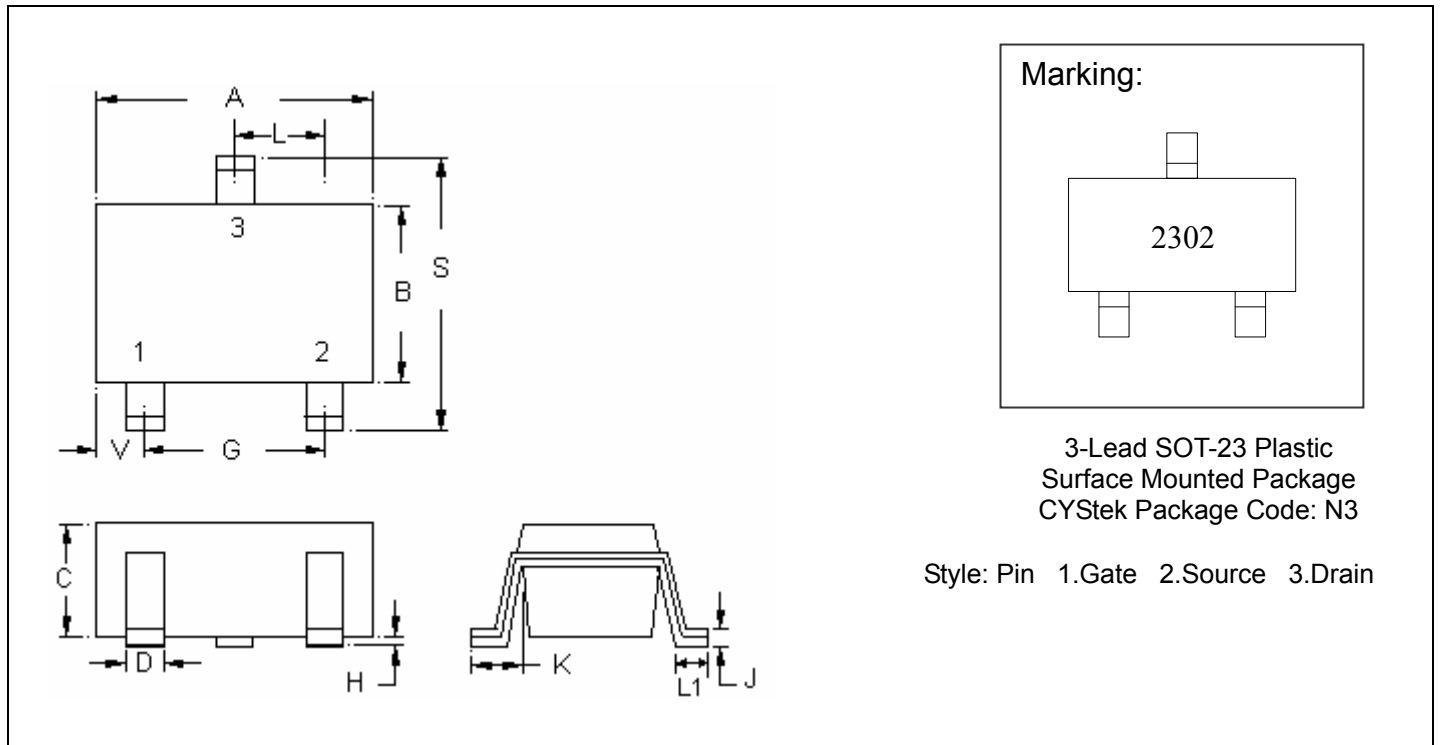
**Recommended temperature profile for IR reflow**



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T <sub>smax</sub> to T <sub>p</sub> )	3°C/second max.	3°C/second max.
Preheat -Temperature Min(T <sub>s min</sub> ) -Temperature Max(T <sub>s max</sub> ) -Time(t <sub>s min</sub> to t <sub>s max</sub> )	100°C 150°C 60-120 seconds	150°C 200°C 60-180 seconds
Time maintained above: -Temperature (T <sub>L</sub> ) - Time (t <sub>L</sub> )	183°C 60-150 seconds	217°C 60-150 seconds
Peak Temperature(T <sub>P</sub> )	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	0.0032	0.0079	0.08	0.20
B	0.0472	0.0669	1.20	1.70	K	0.0118	0.0266	0.30	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	0.0000	0.0040	0.00	0.10	L1	0.0118	0.0197	0.30	0.50

- 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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