

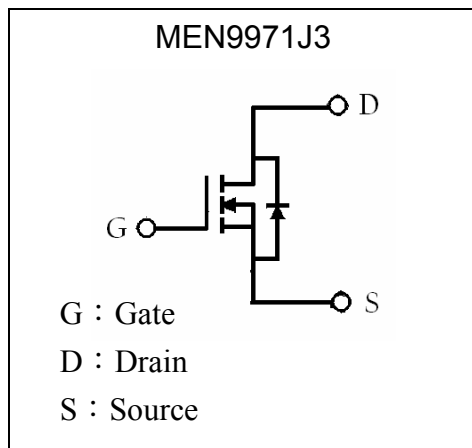
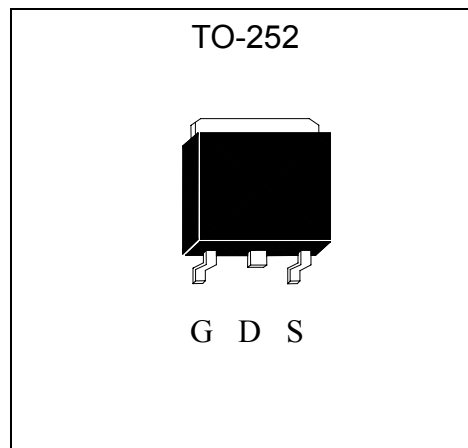
**N-Channel Enhancement Mode Power MOSFET**

# MEN9971J3

$BV_{DSS}$	60V
$I_D$	25A
$R_{DSON(MAX)}$	20m $\Omega$

**Features**

- Low Gate Charge
- Simple Drive Requirement
- Repetitive Avalanche Rated
- Fast Switching Characteristic
- RoHS compliant package

**Symbol**

**Outline**

**Absolute Maximum Ratings** ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current @ $T_C=25^\circ\text{C}$	$I_D$	25	A
Continuous Drain Current @ $T_C=100^\circ\text{C}$	$I_D$	16	
Pulsed Drain Current	$I_{DM}$	100 *1	
Avalanche Current	$I_{AS}$	20	mJ
Avalanche Energy @ $L=0.1\text{mH}$ , $I_D=20\text{A}$ , $R_G=25\Omega$	$E_{AS}$	20	
Repetitive Avalanche Energy @ $L=0.05\text{mH}$ *2	$E_{AR}$	10	
Total Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_d$	50	W
Linear Derating Factor		0.31	W/ $^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_j, T_{stg}$	-55~+175	$^\circ\text{C}$

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

 \*2. Duty cycle  $\leq 1\%$



**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	R <sub>th,j-c</sub>	3	°C/W
Thermal Resistance, Junction-to-ambient, max	R <sub>th,j-a</sub>	75	°C/W

**Characteristics (T<sub>c</sub>=25°C, unless otherwise specified)**

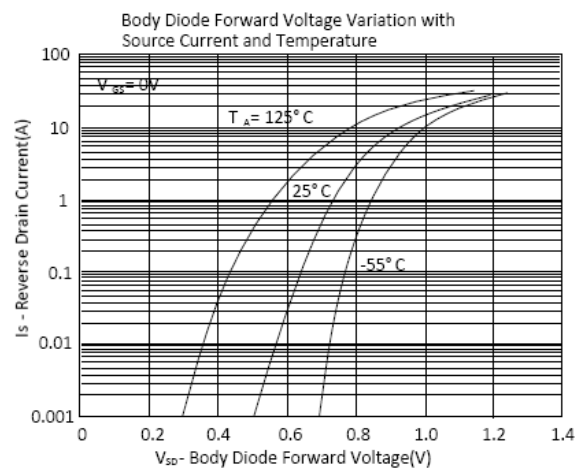
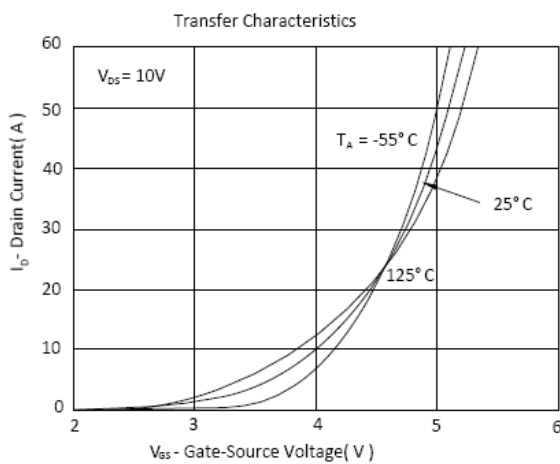
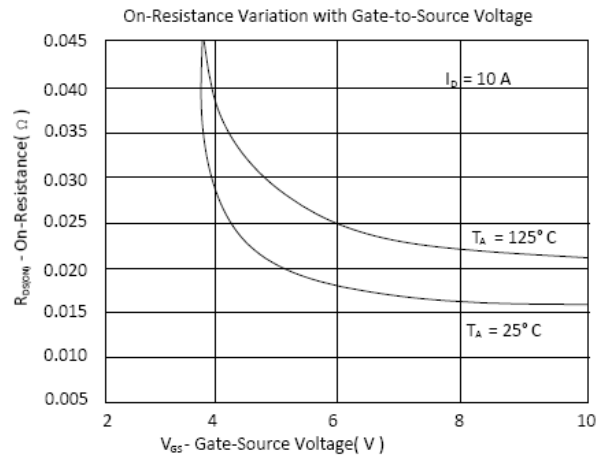
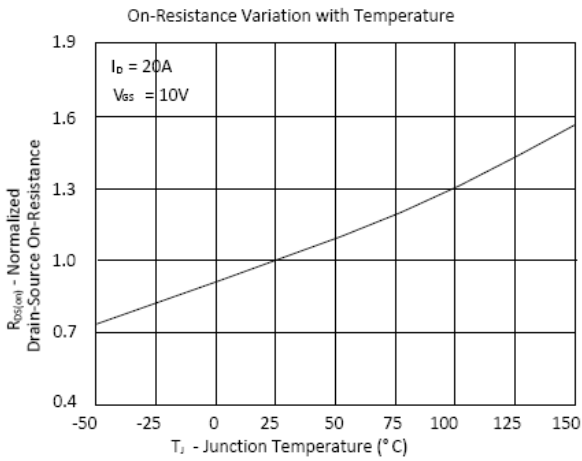
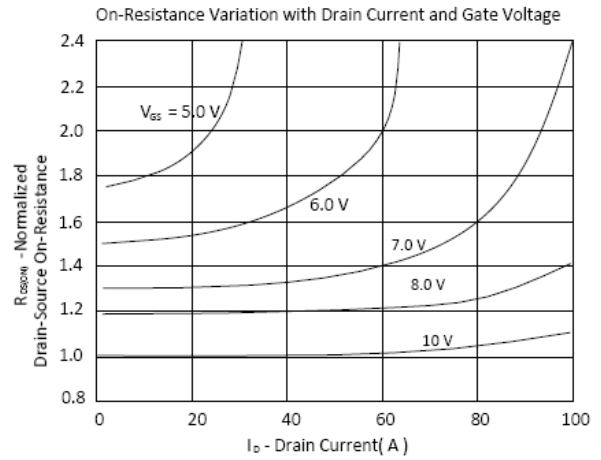
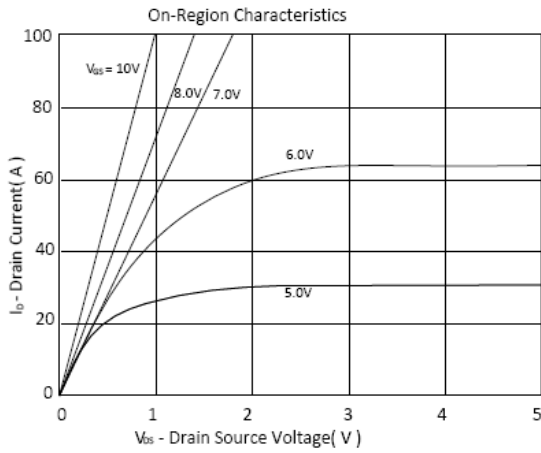
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	60	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	1	1.8	2.5	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
G <sub>FS</sub>	-	25	-	S	V <sub>DS</sub> =5V, I <sub>D</sub> =20A
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±20, V <sub>DS</sub> =0
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =48V, V <sub>GS</sub> =0
I <sub>DSS</sub>	-	-	25	μA	V <sub>DS</sub> =40V, V <sub>GS</sub> =0, T <sub>j</sub> =125°C
I <sub>D(ON)</sub>	25	-	-	A	V <sub>DS</sub> =5V, V <sub>GS</sub> =10V
*R <sub>DS(ON)</sub>	-	16	20	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =20A
*R <sub>DS(ON)</sub>	-	19	24	mΩ	V <sub>GS</sub> =7V, I <sub>D</sub> =15A
<b>Dynamic</b>					
*Q <sub>g</sub>	-	43	-	nC	I <sub>D</sub> =20A, V <sub>DS</sub> =30V, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	7.2	-		
*Q <sub>gd</sub>	-	11	-		
*t <sub>d(ON)</sub>	-	20	-	ns	V <sub>DS</sub> =30V, I <sub>D</sub> =1A, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω
*t <sub>r</sub>	-	12	-		
*t <sub>d(OFF)</sub>	-	50	-		
*t <sub>f</sub>	-	25	-		
C <sub>iss</sub>	-	3330	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz
C <sub>oss</sub>	-	256	-		
C <sub>rss</sub>	-	207	-		
R <sub>g</sub>	-	2	-	Ω	V <sub>GS</sub> =15mV, V <sub>DS</sub> =0, f=1MHz
<b>Source-Drain Diode</b>					
*I <sub>S</sub>	-	-	25	A	
*I <sub>SM</sub>	-	-	100		
*V <sub>SD</sub>	-	-	1.3	V	I <sub>F</sub> =I <sub>S</sub> , V <sub>GS</sub> =0V
*t <sub>rr</sub>	-	60	-	ns	I <sub>F</sub> =25A, V <sub>GS</sub> =0, dI <sub>F</sub> /dt=100A/μs
*Q <sub>rr</sub>	-	42	-	nC	

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

**Ordering Information**

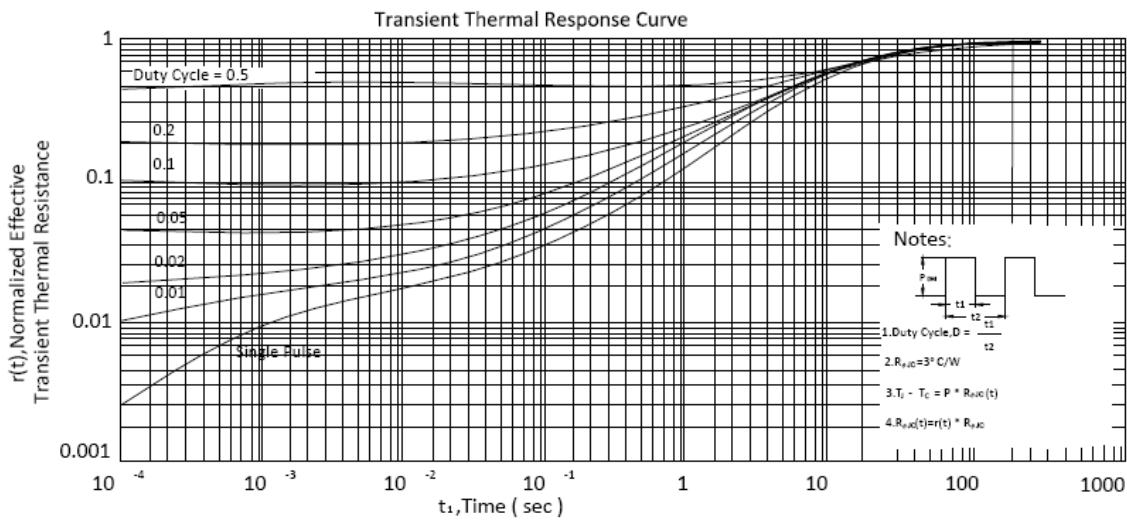
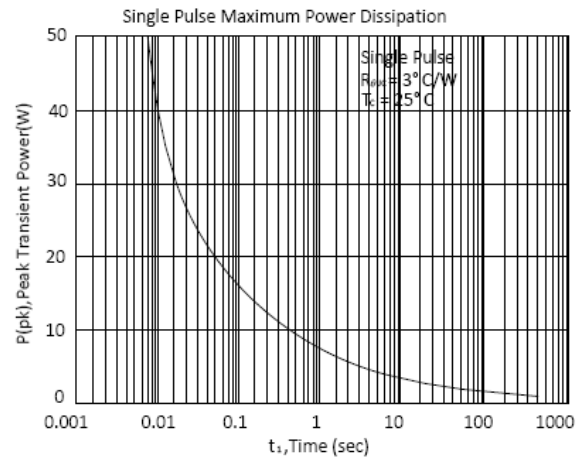
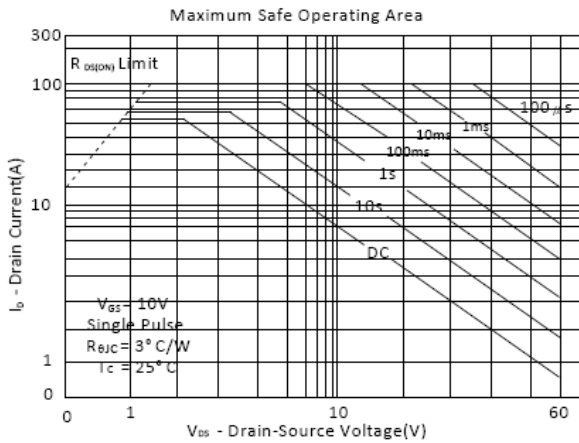
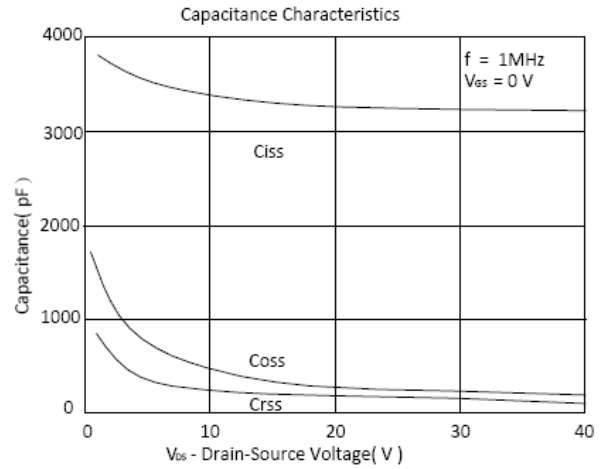
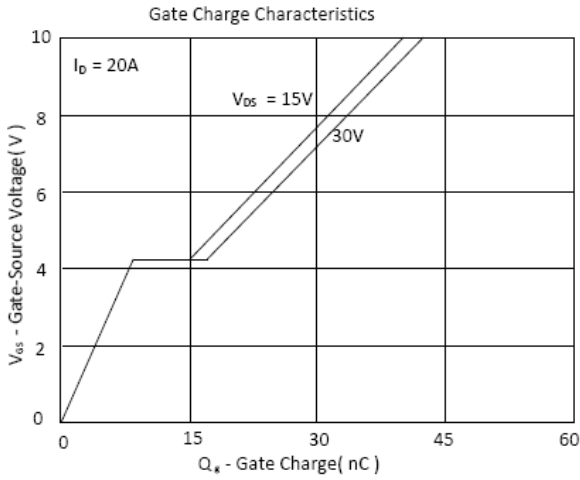
Device	Package	Shipping	Marking
MEN9971J3	TO-252 (RoHS compliant)	2500 pcs / Tape & Reel	9971

**Characteristic Curves**

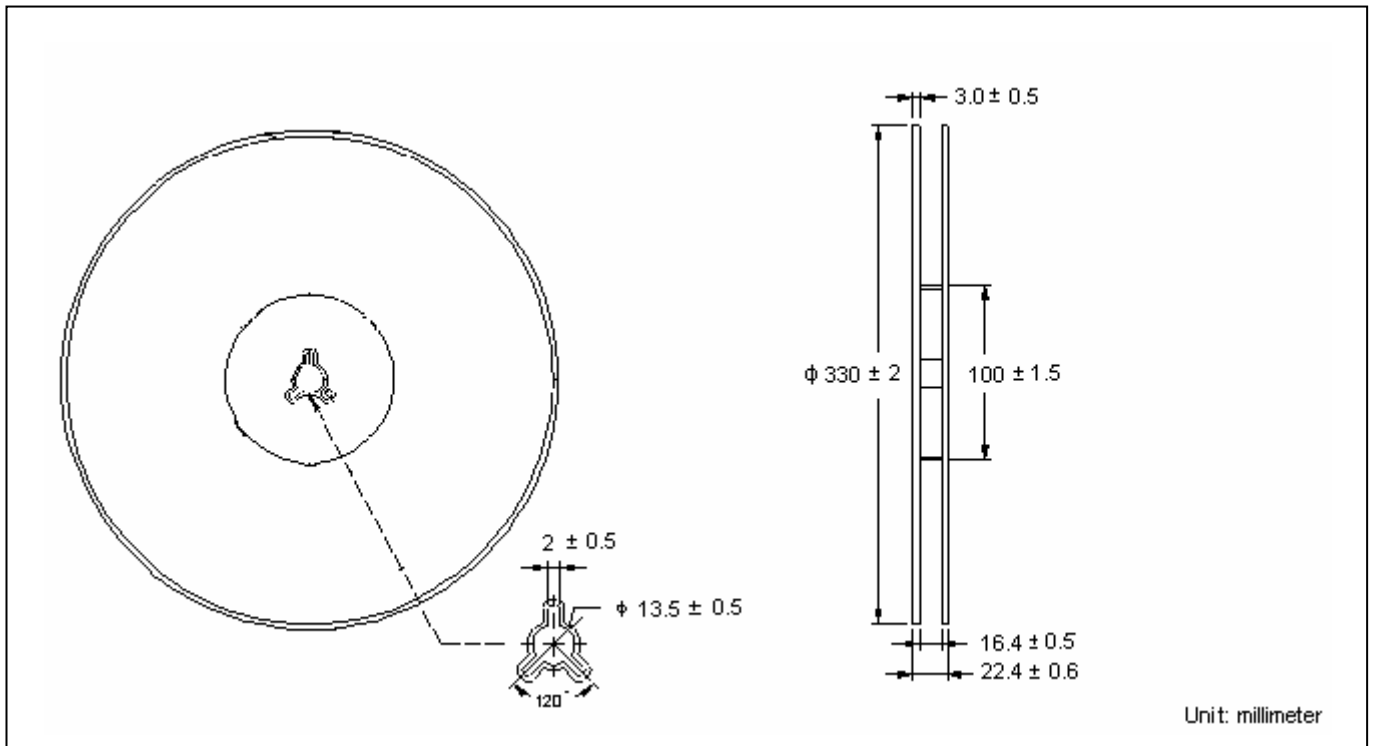




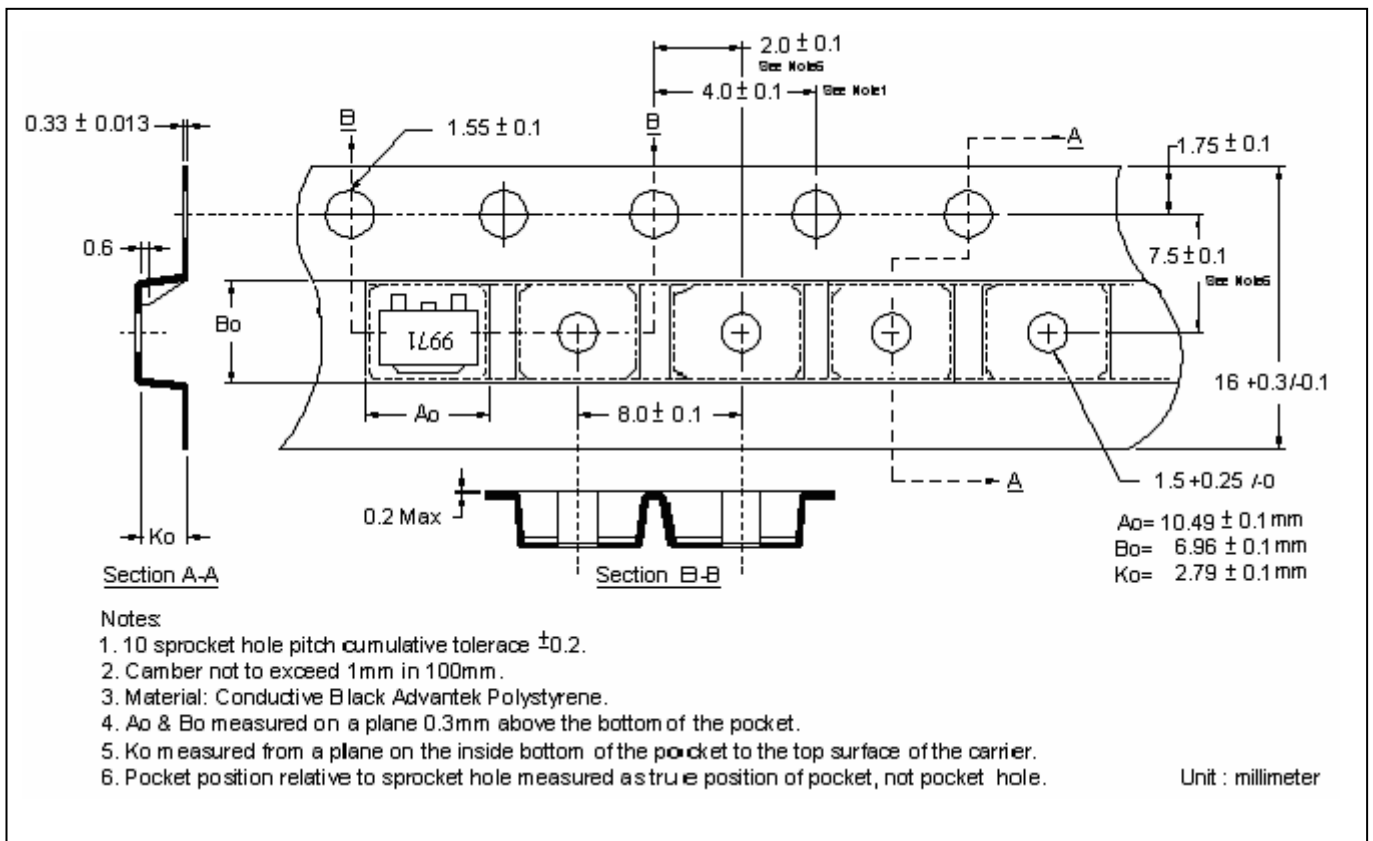
**Characteristic Curves(Cont.)**



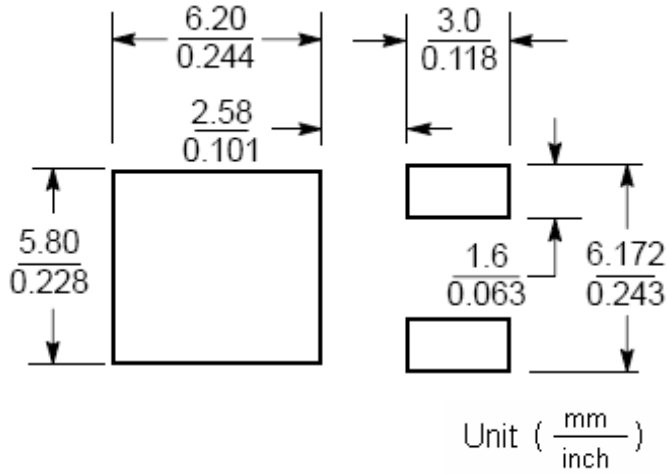
### Reel Dimension



### Carrier Tape Dimension



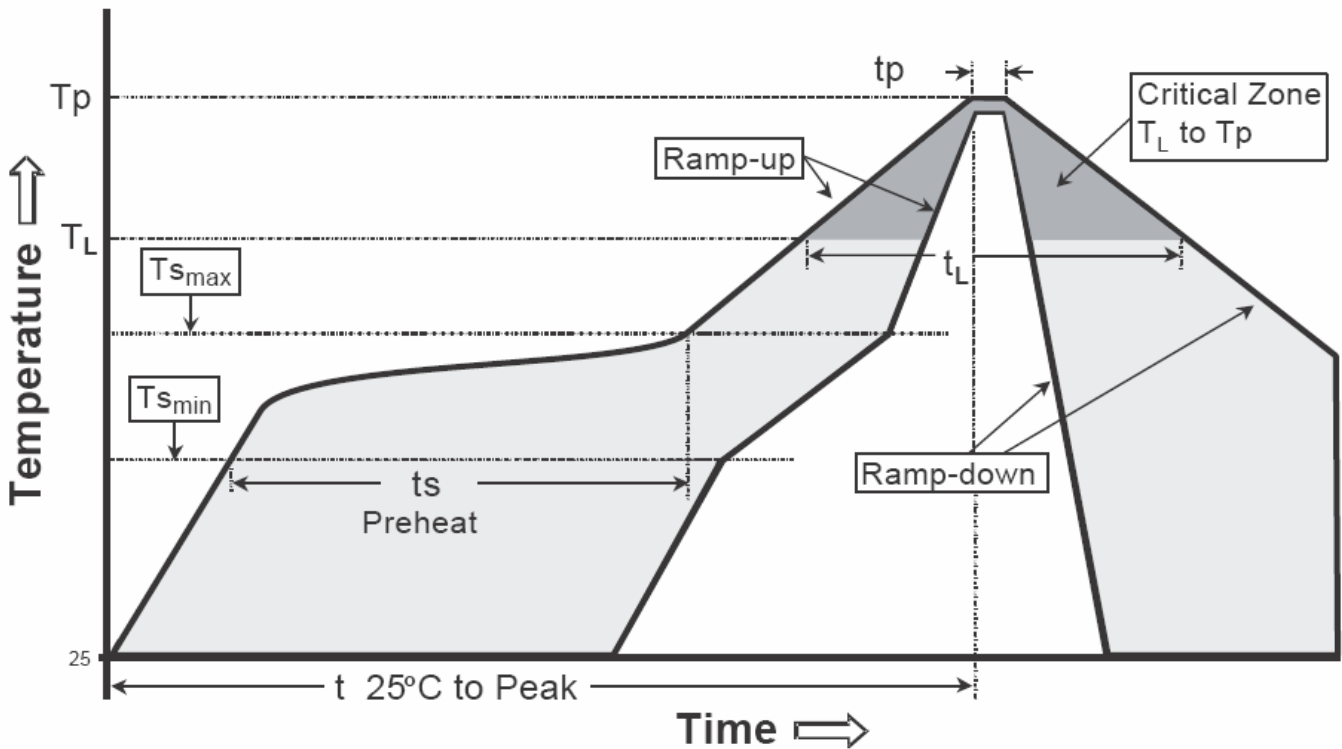
**Recommended soldering footprint**



**Recommended wave soldering condition**

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

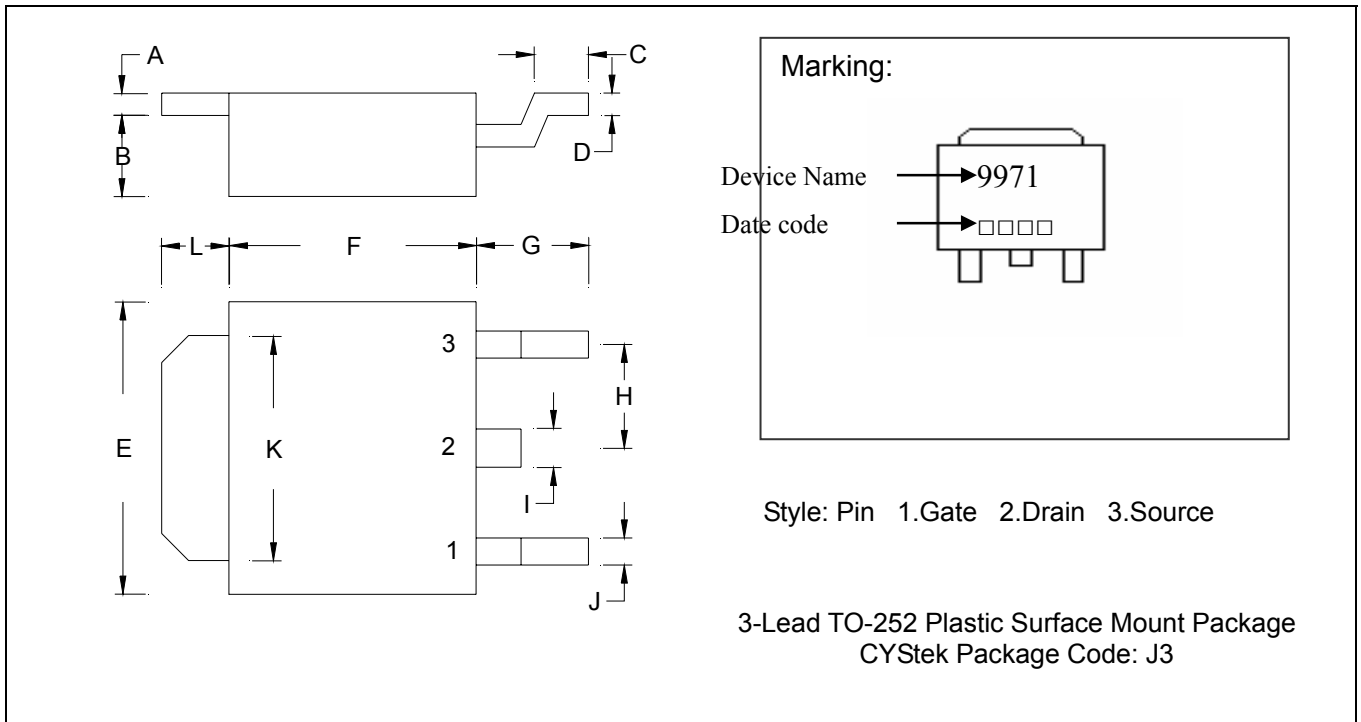
**Recommended temperature profile for IR reflow**



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> )	100°C	150°C
-Temperature Max(T <sub>S max</sub> )	150°C	200°C
-Time(t <sub>s min</sub> to t <sub>s max</sub> )	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T <sub>L</sub> )	183°C	217°C
- Time (t <sub>L</sub> )	60-150 seconds	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(t <sub>p</sub> )	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.

**TO-252 Dimension**



\*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.0177	0.0217	0.45	0.55	G	0.0866	0.1102	2.20	2.80
B	0.0650	0.0768	1.65	1.95	H	-	*0.0906	-	*2.30
C	0.0354	0.0591	0.90	1.50	I	-	0.0449	-	1.14
D	0.0177	0.0236	0.45	0.60	J	-	0.0346	-	0.88
E	0.2441	0.2677	6.20	6.80	K	0.2047	0.2165	5.20	5.50
F	0.2125	0.2283	5.40	5.80	L	0.0551	0.0630	1.40	1.60

**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 : KFC; Pure tin plated
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

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