

N-Channel Enhancement Mode Power MOSFET

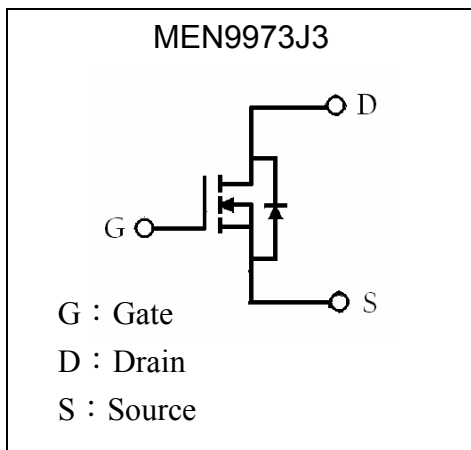
MEN9973J3

BV_{DSS}	60V
I_D	12A
R_{DSON}	100m Ω

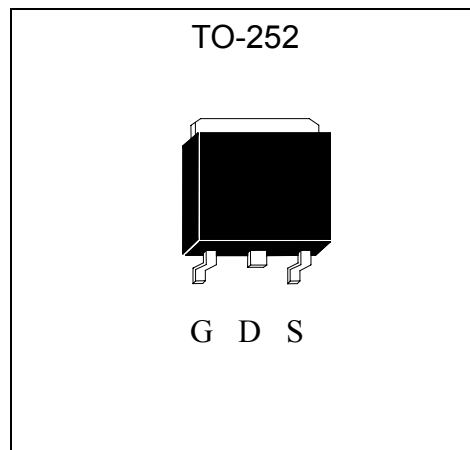
Features

- $V_{DS}=60V$
 $R_{DS(ON)}=80m\Omega$ (max.)@ $V_{GS}=10V, I_D=9A$
 $R_{DS(ON)}=100m\Omega$ (max.)@ $V_{GS}=5V, I_D=6A$
- Low Gate Charge
- Simple Drive Requirement
- Repetitive Avalanche Rated
- Fast Switching Characteristic
- RoHS compliant package

Symbol



Outline



Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current @ $V_{GS}=10V, T_C=25^\circ C$	I_D	12	A
Continuous Drain Current @ $V_{GS}=10V, T_C=100^\circ C$	I_D	8	A
Pulsed Drain Current	I_{DM}	30 *1	A
Avalanche Current	I_{AS}	12	A
Avalanche Energy @ $L=0.1mH, I_D=12A, R_G=25\Omega$	E_{AS}	7.2	mJ
Repetitive Avalanche Energy @ $L=0.05mH$	E_{AR}	3.6 *2	mJ
Total Power Dissipation ($T_C=25^\circ C$)	P_d	20	W
Linear Derating Factor		0.22	W/ $^\circ C$
Operating Junction and Storage Temperature	T_j, T_{stg}	-55~+175	$^\circ C$

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	$R_{th,j-c}$	7.5	$^{\circ}C/W$
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	80	$^{\circ}C/W$

Characteristics (T_j=25°C, unless otherwise specified)

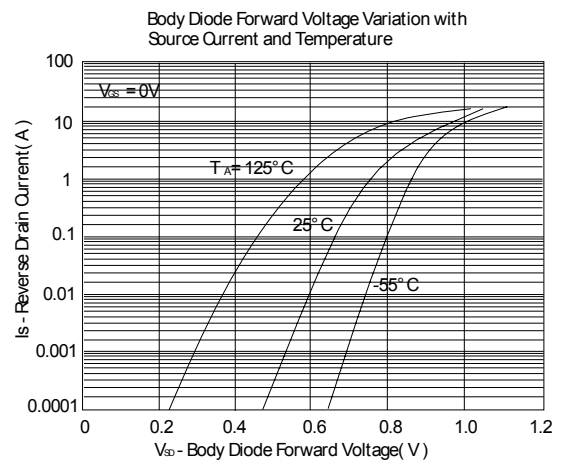
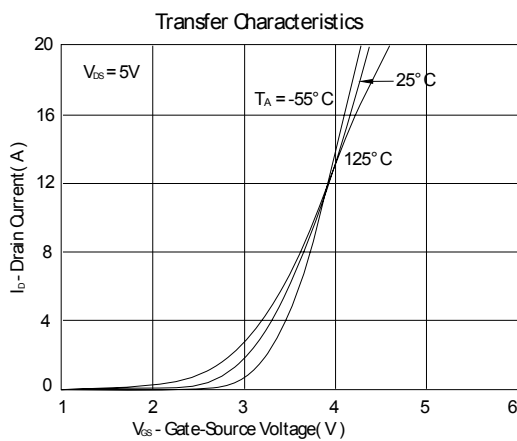
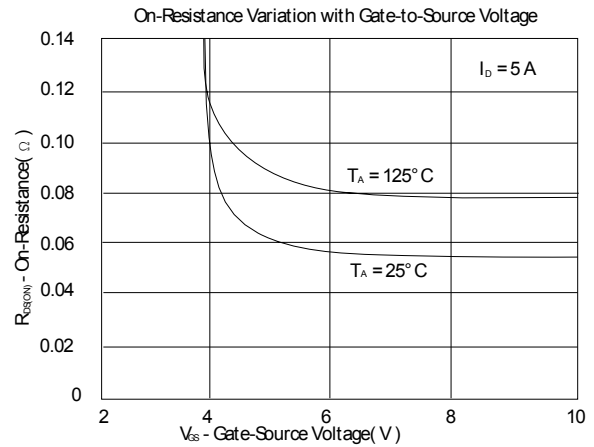
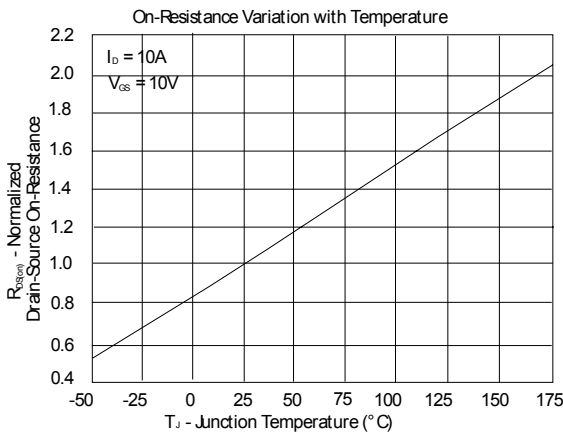
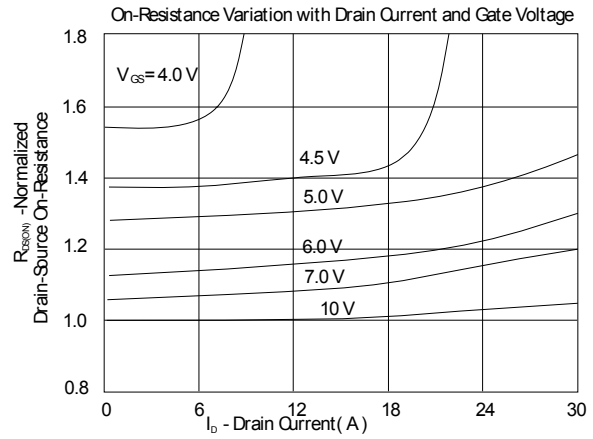
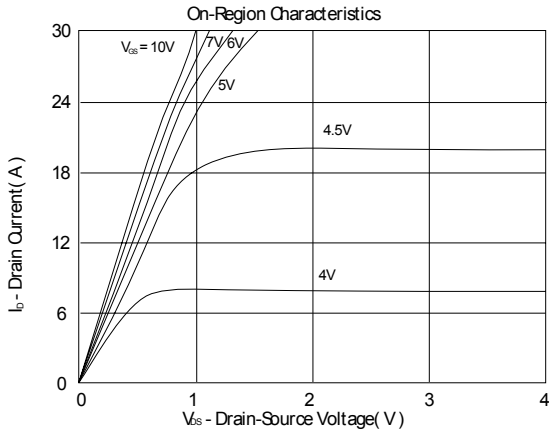
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	60	-	-	V	$V_{GS}=0, I_D=250\mu A$
$\Delta BV_{DSS}/\Delta T_j$	-	0.05	-	V/ $^{\circ}C$	Reference to 25°C, $I_D=1mA$
$V_{GS(th)}$	1.0	2.0	3.2	V	$V_{DS} = V_{GS}, I_D=250\mu A$
G_{FS}	-	19	-	S	$V_{DS} = 5V, I_D=10A$
I_{GSS}	-	-	± 100	nA	$V_{GS}=\pm 20$
I_{DSS}	-	-	1	μA	$V_{DS} = 48V, V_{GS} = 0$
	-	-	25	μA	$V_{DS} = 40V, V_{GS} = 0, T_j=150^{\circ}C$
* $I_{D(ON)}$	12	-	-	A	$V_{DS} = 10V, V_{GS}=10V$
* $R_{DS(ON)}$	-	-	80	m Ω	$V_{GS} = 10V, I_D=9A$
* $R_{DS(ON)}$	-	-	100	m Ω	$V_{GS} = 5V, I_D=6A$
Dynamic					
* Q_g	-	11	-	nC	$I_D=10A, V_{DS}=20V, V_{GS}=10V$
* Q_{gs}	-	2.2	-		
* Q_{gd}	-	2.4	-		
* $t_{d(ON)}$	-	10	-	ns	$V_{DS}=20V, I_D=1A, V_{GS}=10V,$ $R_G=6\Omega, R_D=20\Omega$
* t_r	-	7.5	-		
* $t_{d(OFF)}$	-	18	-		
* t_f	-	6	-		
C_{iss}	-	913	-	pF	$V_{GS}=0V, V_{DS}=20V, f=1MHz$
C_{oss}	-	65	-		
C_{rss}	-	53	-		
R_g	-	2.5	-	Ω	$V_{GS}=15mV, V_{DS}=0V, f=1MHz$
Source-Drain Diode					
* I_S	-	-	12	A	
* I_{SM}	-	-	48		
* V_{SD}	-	-	1.3	V	$I_S=12A, V_{GS}=0V$
* t_{rr}	-	15	-	ns	$I_S=5A, V_{GS}=0, dI/dt=100A/\mu s$
* Q_{rr}	-	8	-	nC	

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

Ordering Information

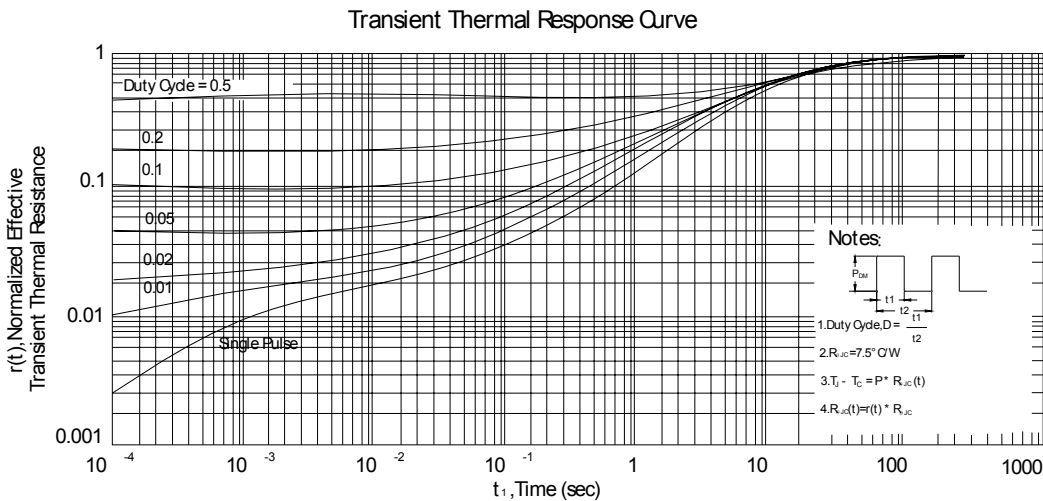
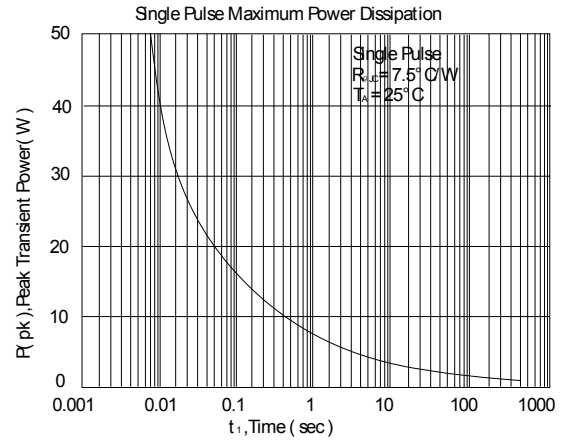
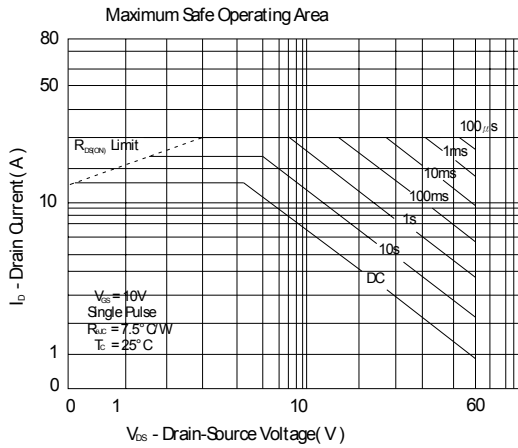
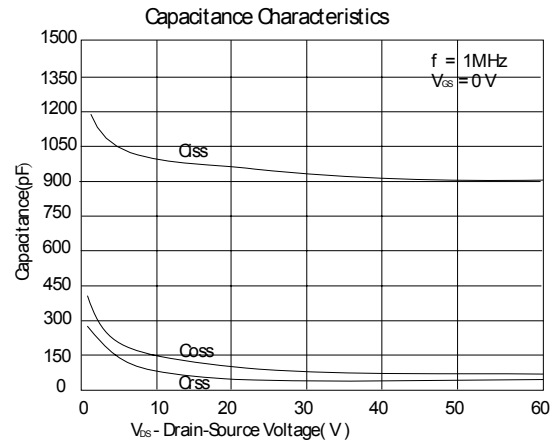
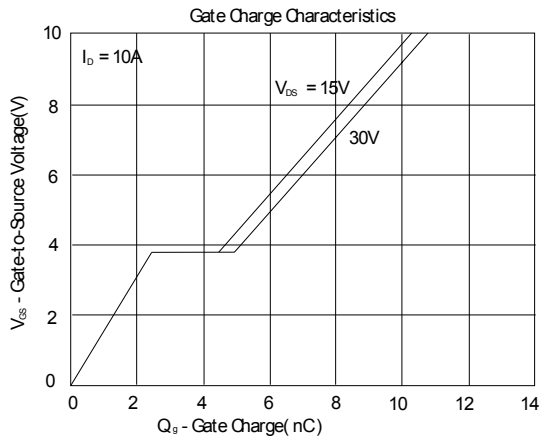
Device	Package	Shipping	Marking
MEN9973J3	TO-252 (RoHS compliant)	2500 pcs / Tape & Reel	9973

Characteristic Curves

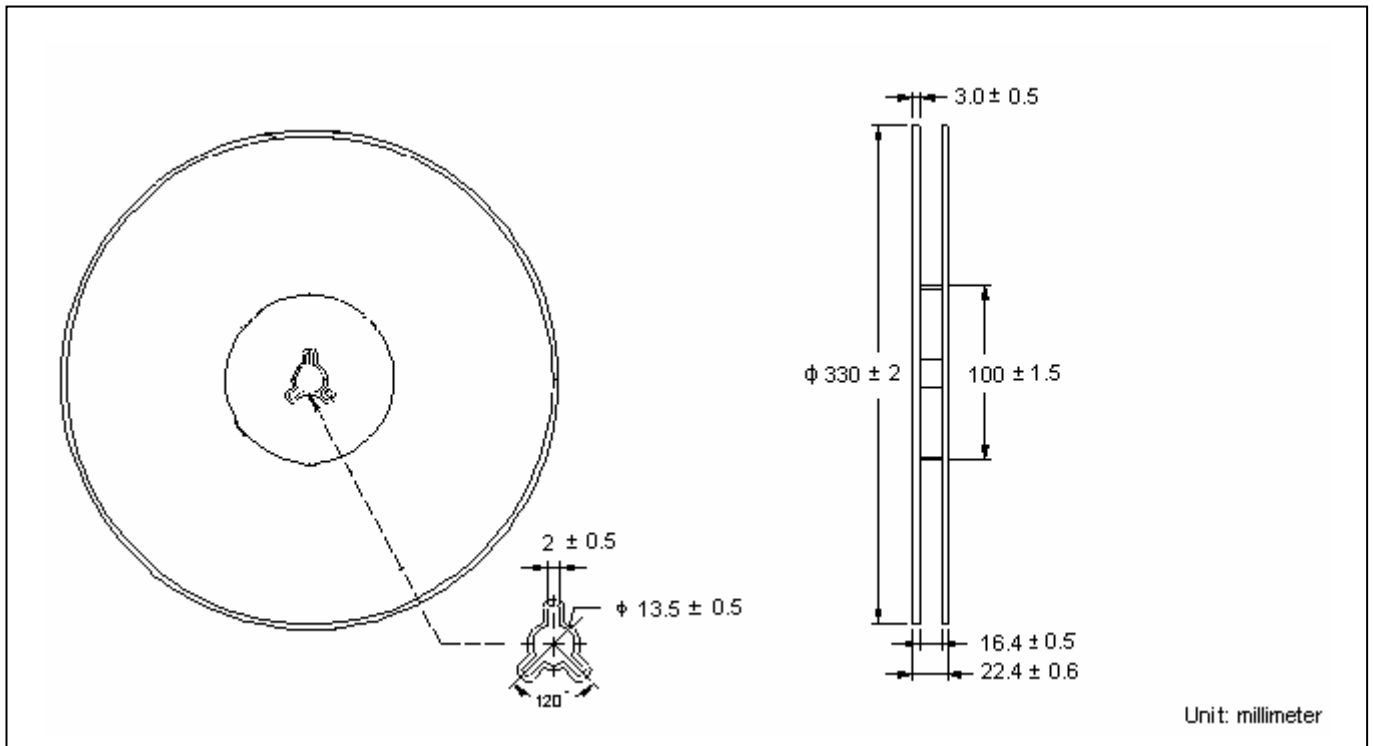




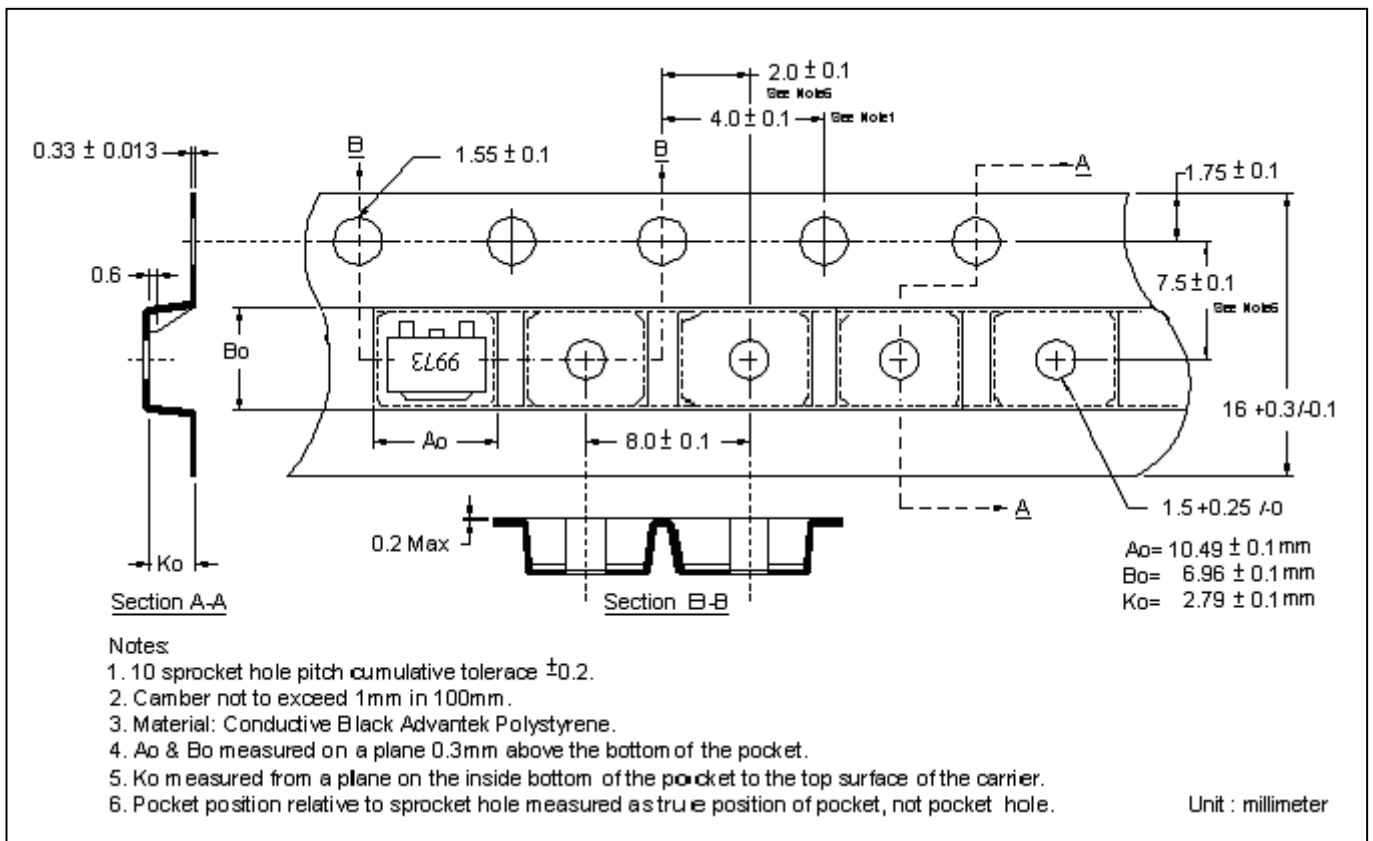
Characteristic Curves(Cont.)



Reel Dimension



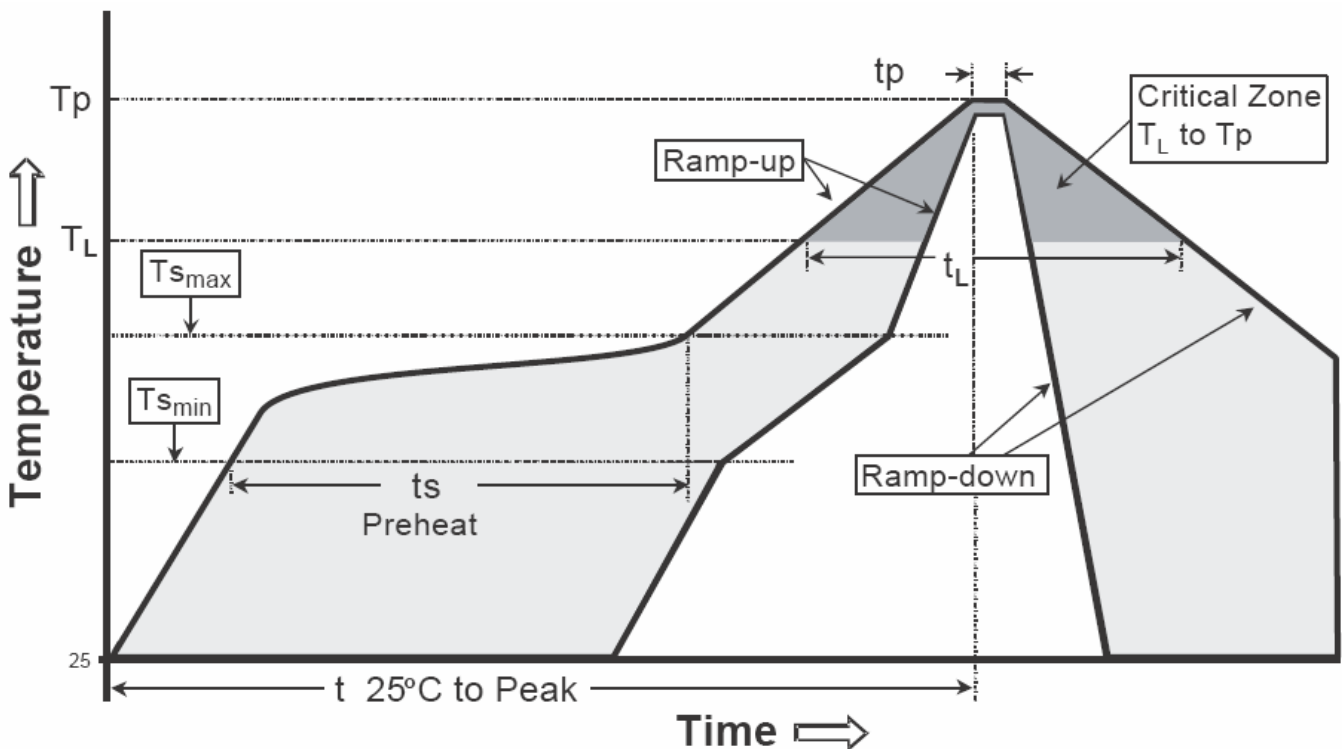
Carrier Tape Dimension



Recommended wave soldering condition

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

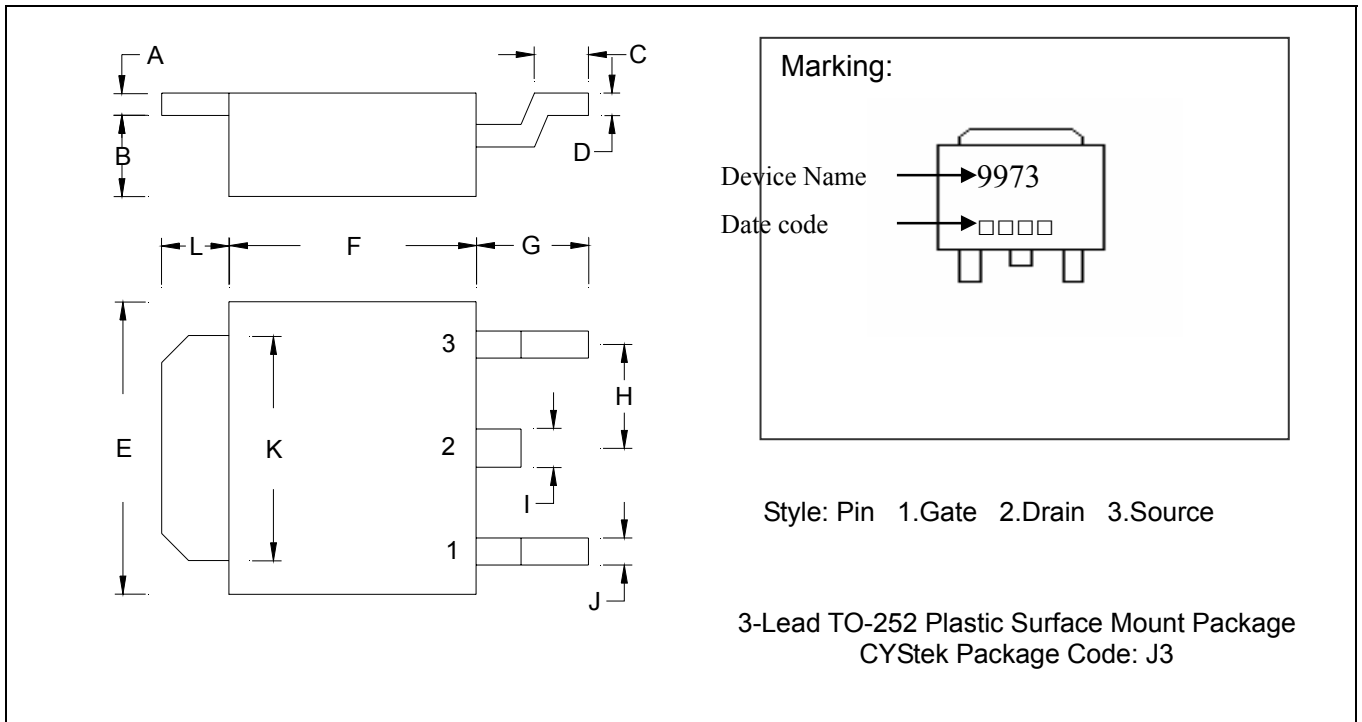
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.	3°C/second max.
Preheat		
-Temperature Min(T _{s min})	100°C	150°C
-Temperature Max(T _{s max})	150°C	200°C
-Time(t _{s min} to t _{s max})	60-120 seconds	60-180 seconds
Time maintained above:		
-Temperature (T _L)	183°C	217°C
- Time (t _L)	60-150 seconds	60-150 seconds
Peak Temperature(T _P)	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.

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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