N-Channel Enhancement Mode Power MOSFET

MTN9971J3

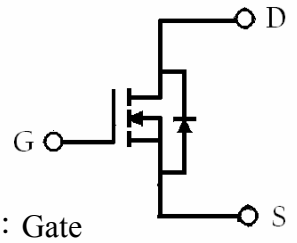
BV_{DSS}	60V
I_D	25A
R_{DSON}	36 mΩ

Features

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

Symbol

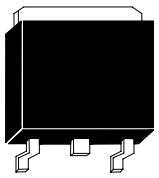
MTN9971J3



G：Gate
D：Drain
S：Source

Outline

TO-252



G D S

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°C	I_D	25	A
Continuous Drain Current @V_{GS}=10V, T_C=100°C	I_D	16	A
Pulsed Drain Current	I_{DM}	80 *1	A
Total Power Dissipation (T_C=25℃)	Pd	39	W
Linear Derating Factor		0.31	W/°C
Operating Junction and Storage Temperature	Tj, Tstg	-55~+150	°C

Note : *1. Pulse width limited by safe operating area

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	3.2	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	110	°C/W

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	60	-	-	V	V_{GS}=0, I_D=250μA
$\Delta BV_{DSS}/\Delta Tj$	-	0.05	-	V/°C	Reference to 25°C, I_D=1mA
$V_{GS(th)}$	1.0	-	3.0	V	V_{DS} = V_{GS}, I_D=250μA
G_{FS}	-	17	-	S	V_{DS} =10V, I_D=18A
I_{GSS}	-	-	±100	nA	V_{GS}=±20
I_{DSS}	-	-	1	μA	V_{DS} =60V, V_{GS} =0
I_{DSS}	-	-	25	μA	V_{DS} =48V, V_{GS} =0, Tj=150°C
*$R_{DS(ON)}$	-	-	36	mΩ	V_{GS} =10V, I_D=18A
*$R_{DS(ON)}$	-	-	50	mΩ	V_{GS} =4.5V, I_D=12A
Dynamic					
*Qg	-	18	30	nC	I_D=18A, V_{DS}=48V, V_{GS}=4.5V
*Qgs	-	6	-		
*Qgd	-	11	-		
*$t_{d(ON)}$	-	9	-	ns	V_{DS}=30V, I_D=18A, V_{GS}=10V, R_G=3.3Ω, R_D=1.67Ω
*tr	-	24	-		
*$t_{d(OFF)}$	-	26	-		
*t_f	-	7	-		
Ciss	-	1700	2700	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	160	-		
Crss	-	110	-		
Source-Drain Diode					
*V_{SD}	-	-	1.2	V	I_S=25A, V_{GS}=0V
*trr	-	37	-	ns	I_S=18A, V_{GS}=0, dI/dt=100A/μs
*Qrr	-	38	-	nC	

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

Ordering Information

Device	Package	Shipping	Marking
MTN9971J3	TO-252 (RoHS compliant)	2500 pcs / Tape & Reel	9971

Characteristic Curves

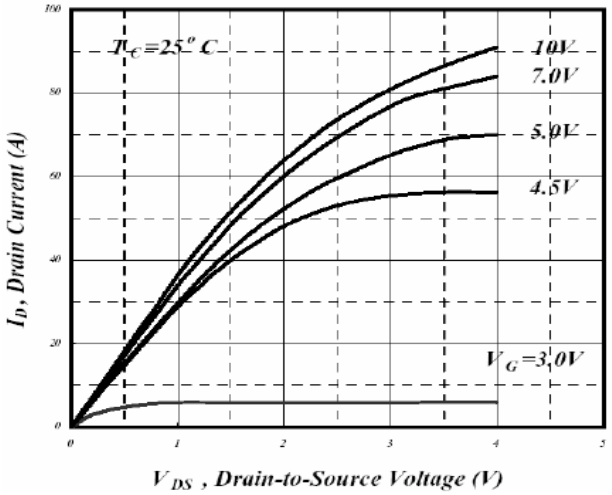


Fig 1. Typical Output Characteristics

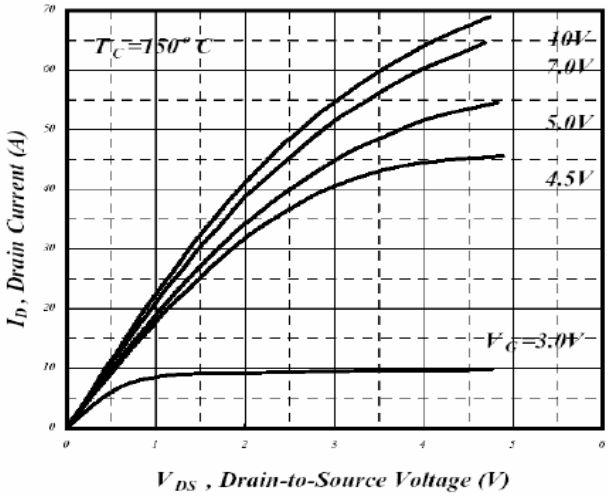


Fig 2. Typical Output Characteristics

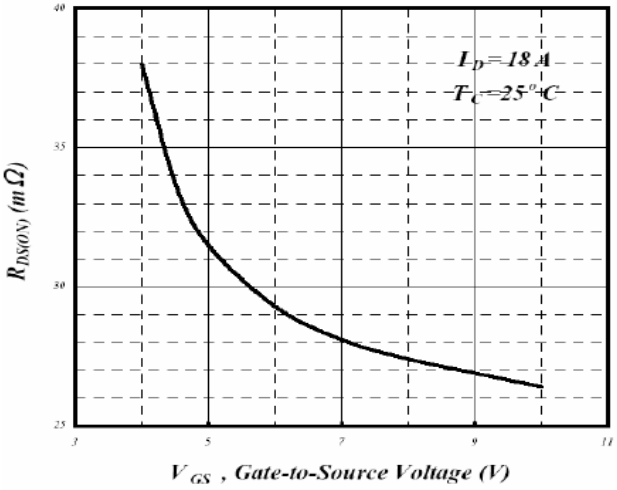


Fig 3. On-Resistance v.s. Gate Voltage

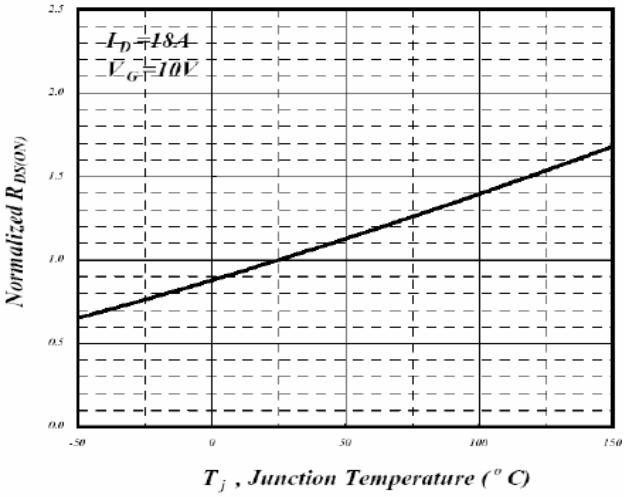


Fig 4. Normalized On-Resistance v.s. Junction Temperature

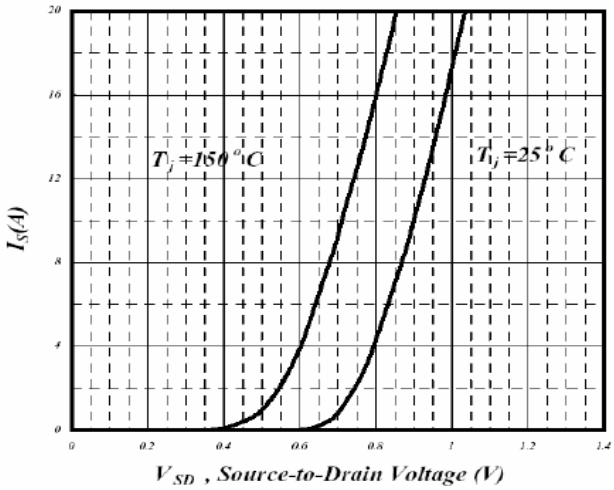


Fig 5. Forward Characteristics of Reverse Diode

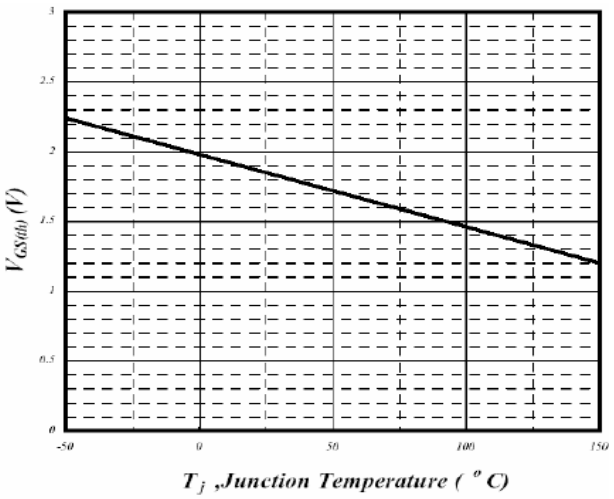


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

Characteristic Curves(Cont.)

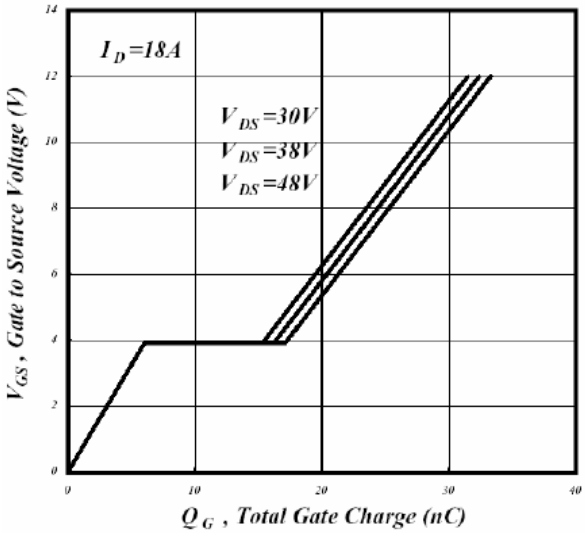


Fig 7. Gate Charge Characteristics

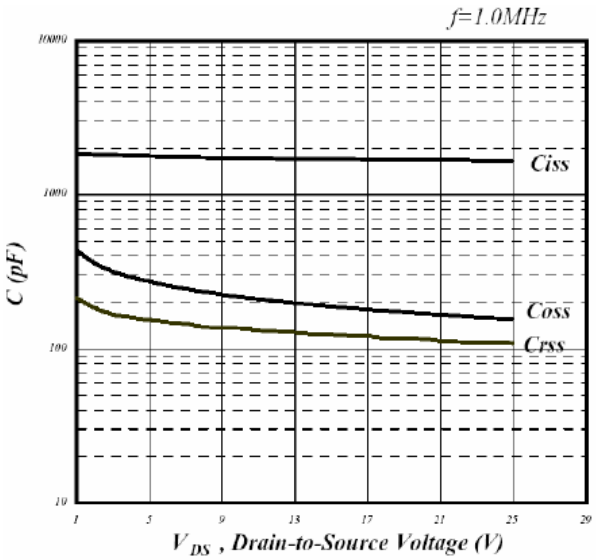


Fig 8. Typical Capacitance Characteristics

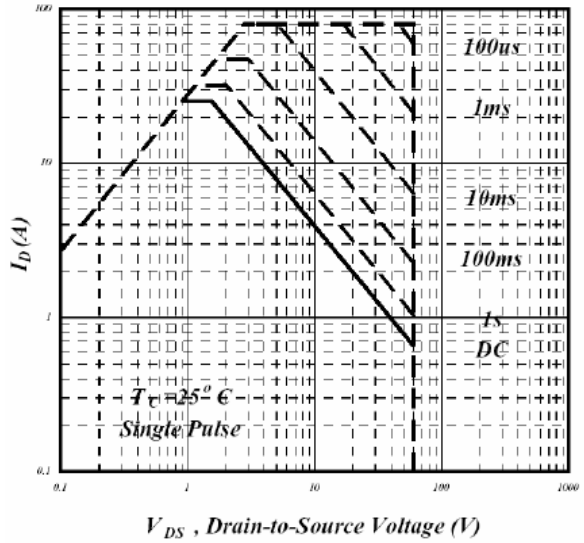


Fig 9. Maximum Safe Operating Area

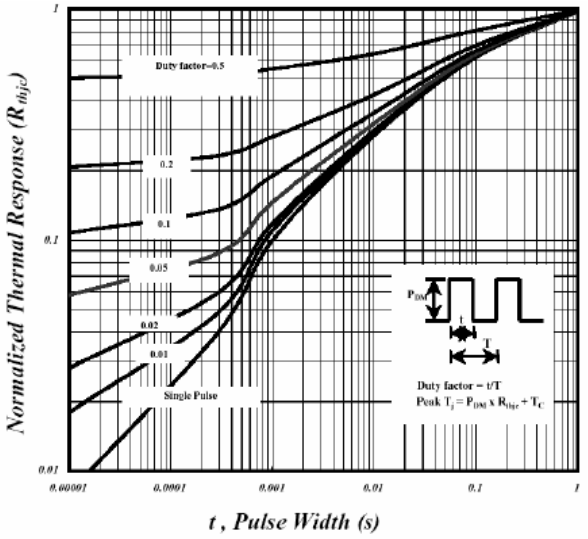


Fig 10. Effective Transient Thermal Impedanc

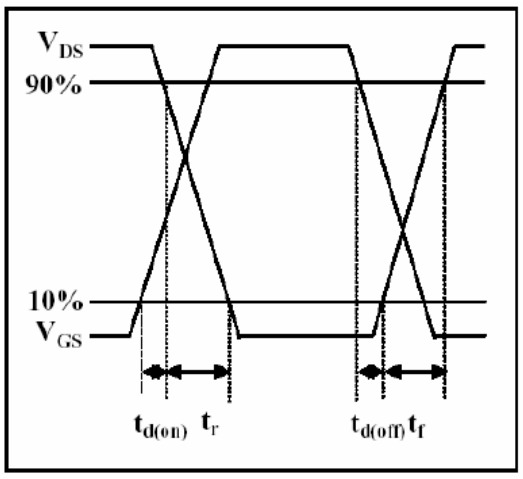


Fig 11. Switching Time Waveform

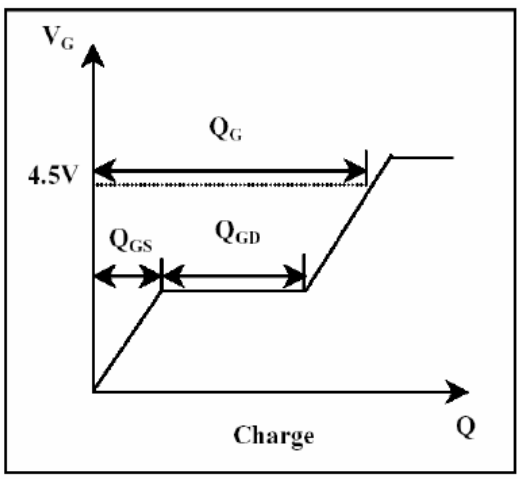
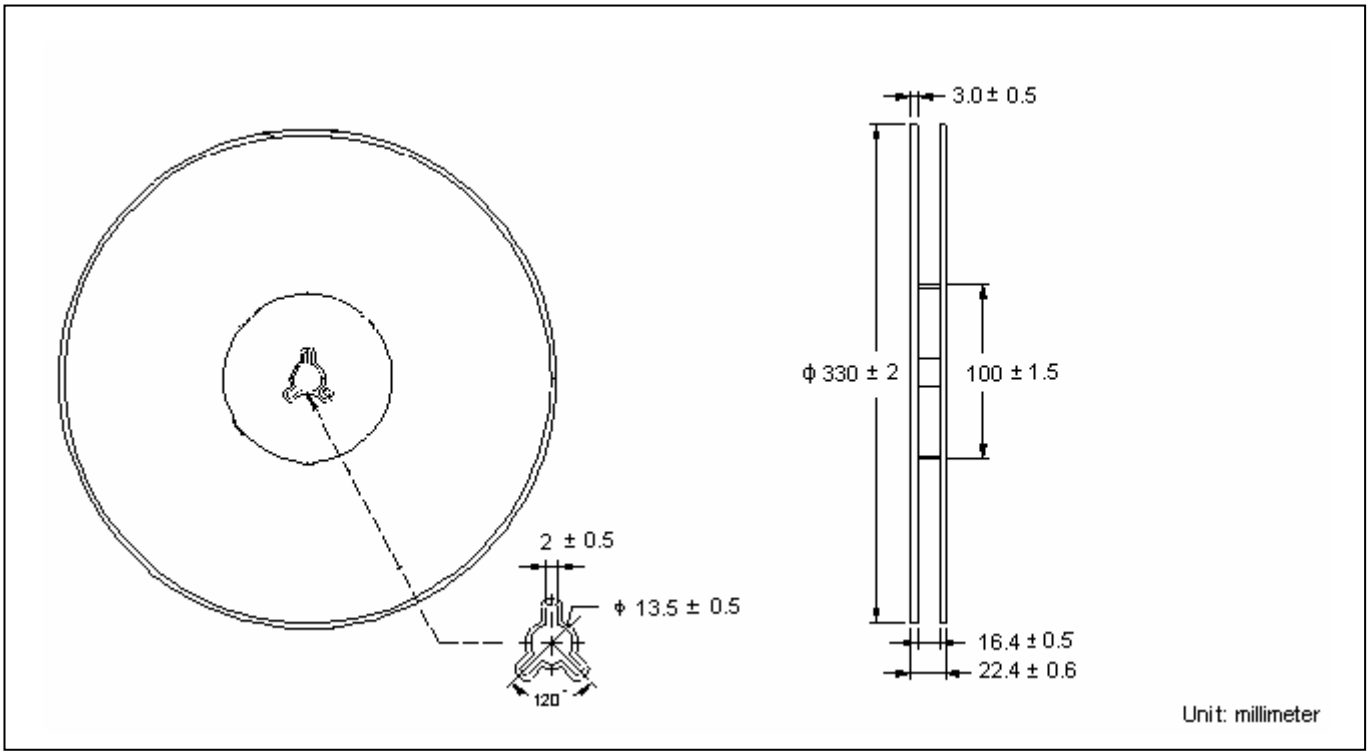
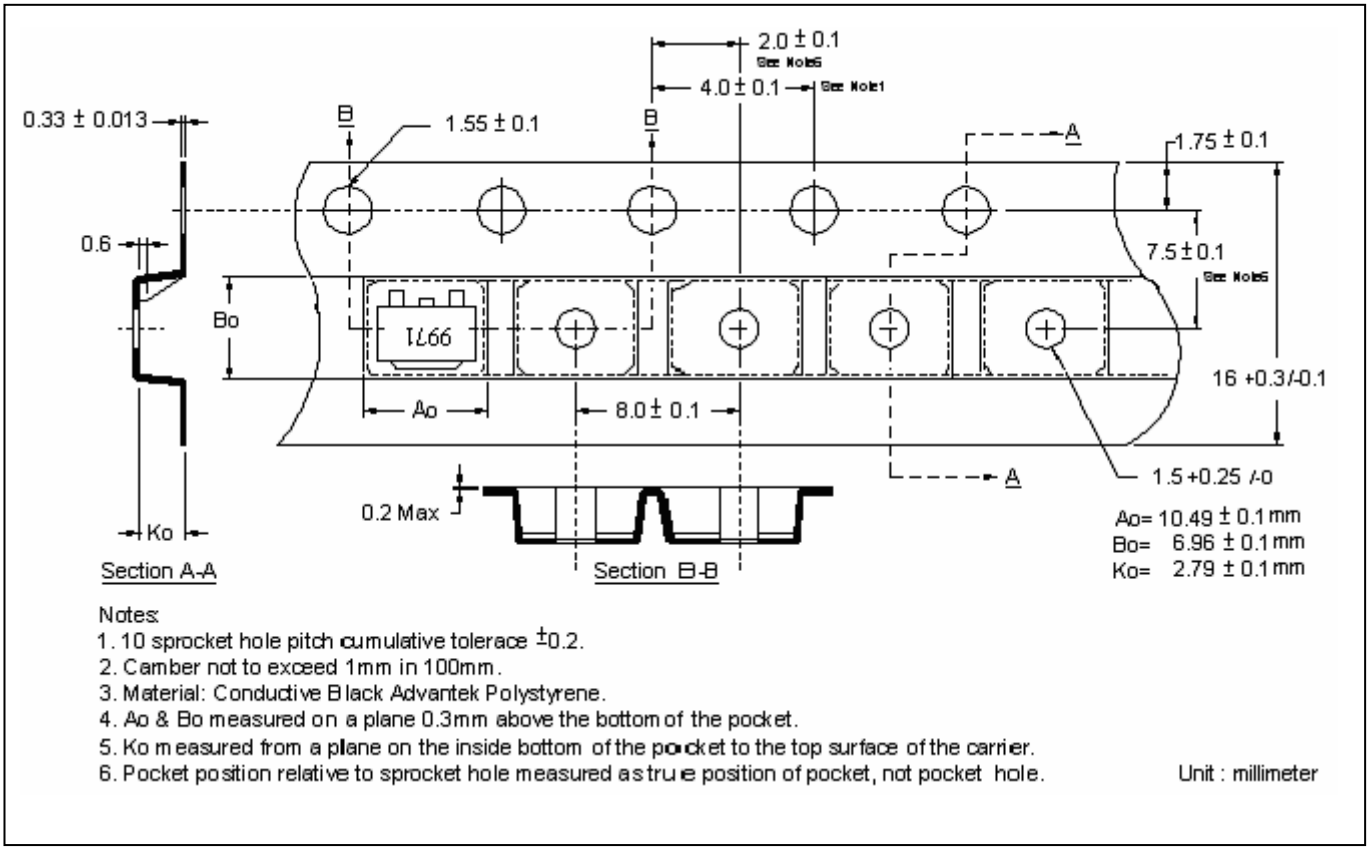


Fig 12. Gate Charge Waveform

Reel Dimension



Carrier Tape Dimension



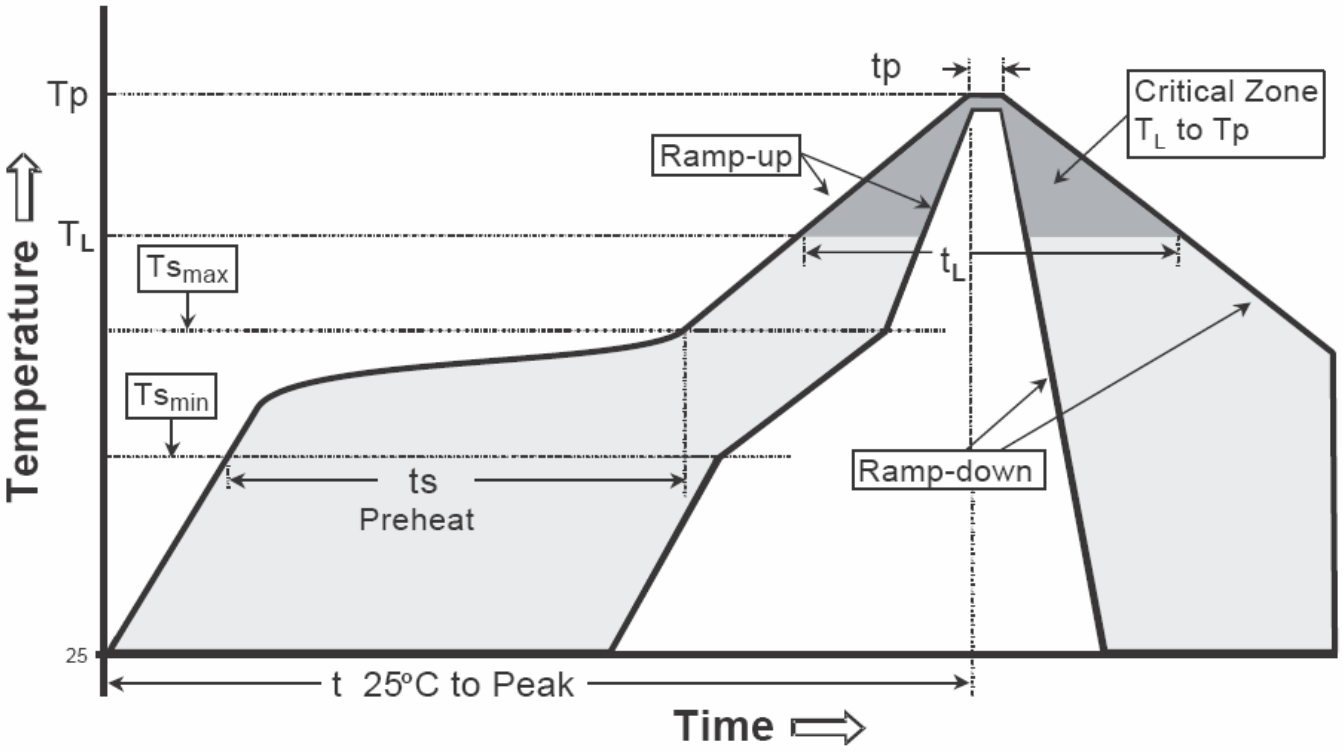
Notes:
1. 10 sprocket hole pitch cumulative tolerace ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: Conductive Black Advantek Polystyrene.
4. Ao & Bo measured on a plane 0.3mm above the bottom of the pocket.
5. Ko measured from a plane on the inside bottom of the pocket to the top surface of the carrier.
6. Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Unit : millimeter

Recommended wave soldering condition

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

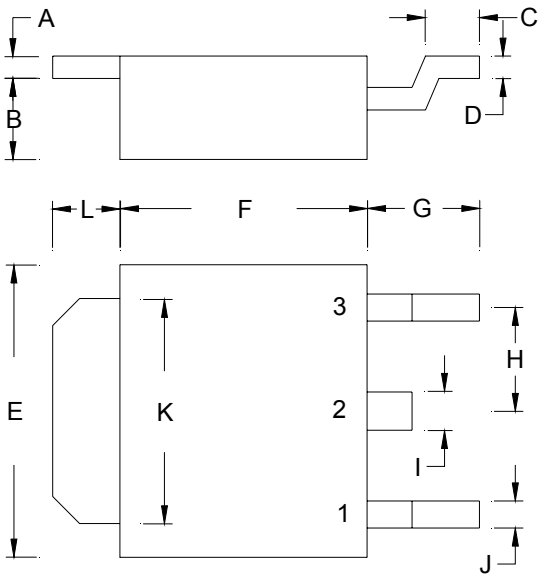
Recommended temperature profile for IR reflow

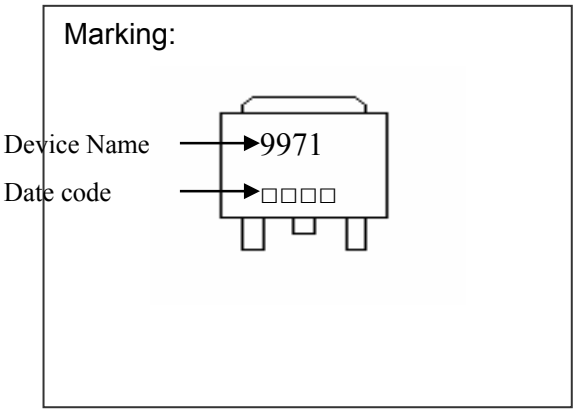


Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 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





Style: Pin 1.Gate 2.Drain 3.Source

3-Lead TO-252 Plastic Surface Mount Package
CYStek Package Code: J3

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