N-Channel Enhancement Mode Power MOSFET

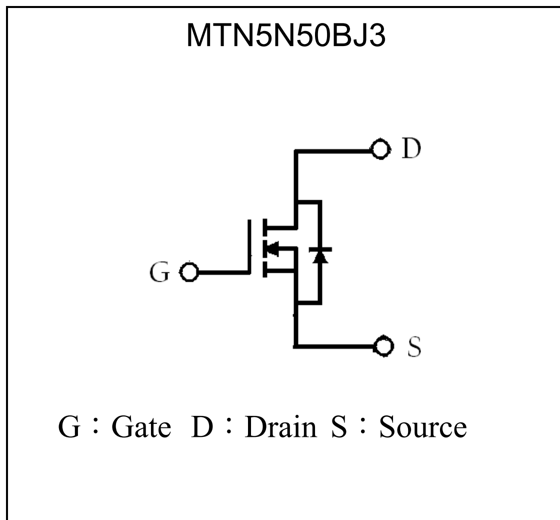
MTN5N50BJ3

BV_{DSS}	500V
I_D @ V_{GS}=10V, T_C=25°C	4.5A
$R_{DSON(TYP)}$ @ V_{GS}=10V, I_D=2.25A	1.1Ω

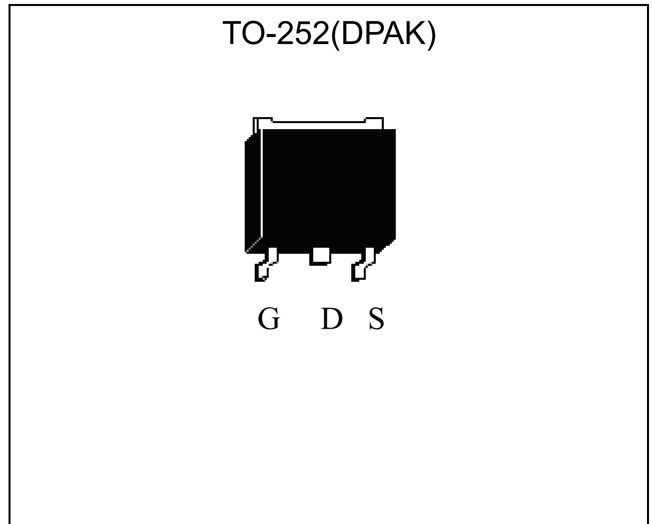
Features

- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package
- Pb-free lead plating and halogen-free package

Symbol

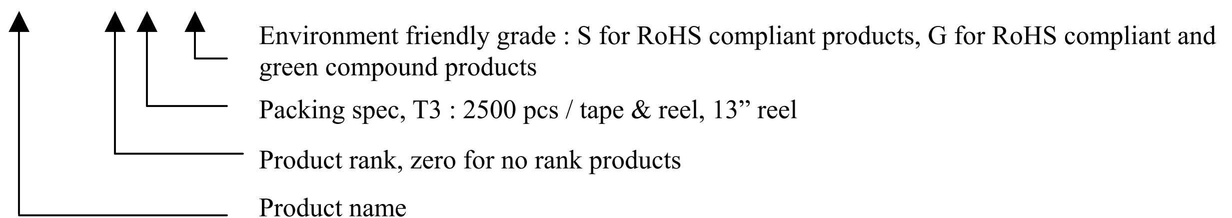


Outline



Ordering Information

Device	Package	Shipping
MTN5N50BJ3-0-T3-G	TO-252 (Pb-free lead plating and halogen-free package)	2500 pcs / Tape & Reel



Absolute Maximum Ratings (T_C=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	±30	
Continuous Drain Current @T_C=25°C, V_{GS}=10V	I_D	4.5	A
Continuous Drain Current @T_C=100°C, V_{GS}=10V		2.8	
Pulsed Drain Current (Note 1)	I_{DM}	18	
Single Pulse Avalanche Energy (Note 2)	E_{AS}	90	mJ
Avalanche Current (Note 1)	I_{AS}	4.5	A
Repetitive Avalanche Energy (Note 1)	E_{AR}	4.8	mJ
Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds	T_L	300	°C
Total Power Dissipation (T_A=25℃) (Note 4)	P_D	2	W
Total Power Dissipation (T_C=25℃)		48	W
Linear Derating Factor		0.38	W/°C
Operating Junction and Storage Temperature	Tj, Tstg	-55~+150	°C

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	2.6	°C/W
Thermal Resistance, Junction-to-ambient, max (Note 4)	$R_{th,j-a}$	50	
Thermal Resistance, Junction-to-ambient, max		110	

Note : 1.Repetitive rating; pulse width limited by maximum junction temperature.

2. I_{AS}=4.5A, V_{DD}=50V, L=8mH, R_G=25Ω, starting T_J=+25℃.
3. I_{SD}≤4.5A, dI/dt≤100A/μs, V_{DD}≤BV_{DSS}, starting T_J=+25℃.
4. When the device is mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with T_A=25°C.

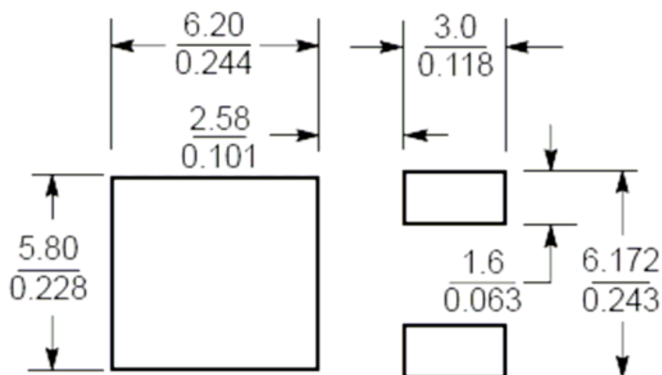
Characteristics (T_C=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	500	-	-	V	V_{GS}=0V, I_D=250μA, Tj=25℃
$\Delta BV_{DSS}/\Delta Tj$	-	0.6	-	V/°C	Reference to 25°C, I_D=250μA
$V_{GS(th)}$	2.0	-	4.0	V	V_{DS} = V_{GS}, I_D=250μA
*G_{FS}	-	5	-	S	V_{DS} =15V, I_D=2.25A
I_{GSS}	-	-	±100	nA	V_{GS}=±30V
I_{DSS}	-	-	1	μA	V_{DS} =500V, V_{GS} =0V
	-	-	10		V_{DS} =400V, V_{GS} =0V, T_C=125°C
*$R_{DS(ON)}$	-	1.1	1.5	Ω	V_{GS} =10V, I_D=2.25A
Dynamic					
*Qg	-	17.4	-	nC	I_D=4.5A, V_{DD}=400V, V_{GS}=10V
*Qgs	-	3.4	-		
*Qgd	-	7.6	-		

*$t_{d(ON)}$	-	10.6	-	ns	V_{DD}=250V, I_D=4.5A, V_{GS}=10V, R_G=25Ω
*tr	-	10	-		
*$t_{d(OFF)}$	-	35	-		
*t_f	-	31.2	-		
Ciss	-	572	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	65	-		
Crss	-	32	-		
Source-Drain Diode					
*I_S	-	-	4.5	A	
*I_{SM}	-	-	18		
*V_{SD}	-	-	1.5	V	I_S=4.5A, V_{GS}=0V
*trr	-	260	-	ns	V_{GS}=0, I_F=4.5A, dI_F/dt=100A/μs
*Qrr	-	1.1	-	μC	

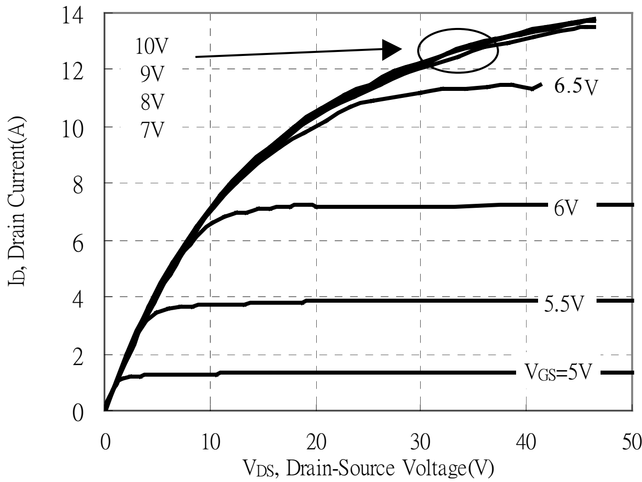
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

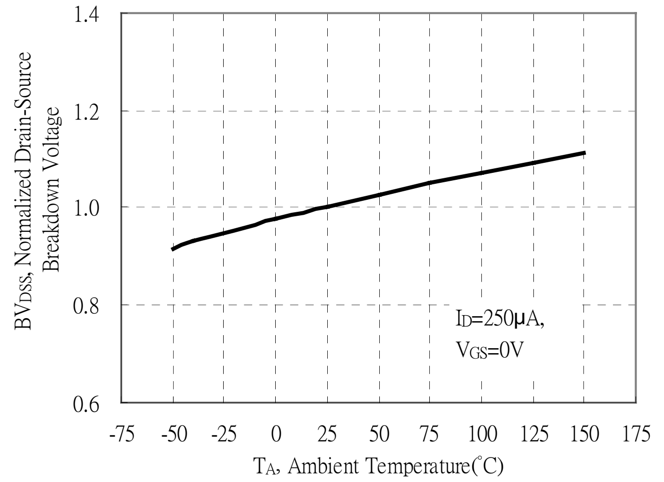
Recommended soldering footprint

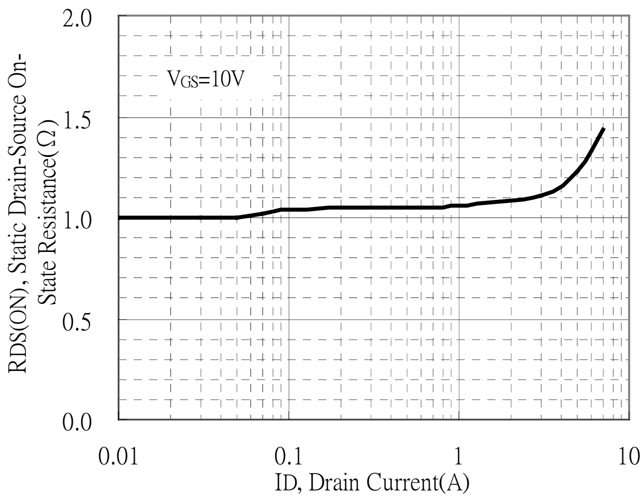


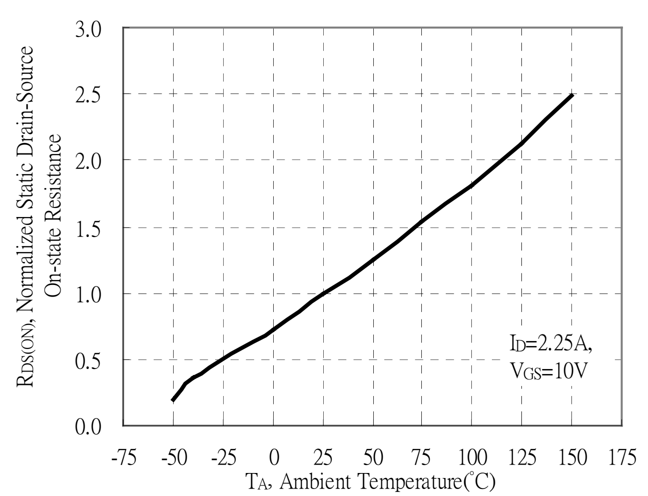
Unit (mm / inch)

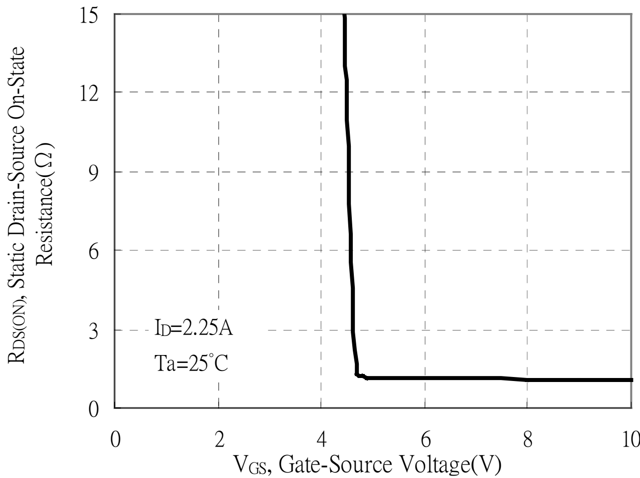
Typical Characteristics

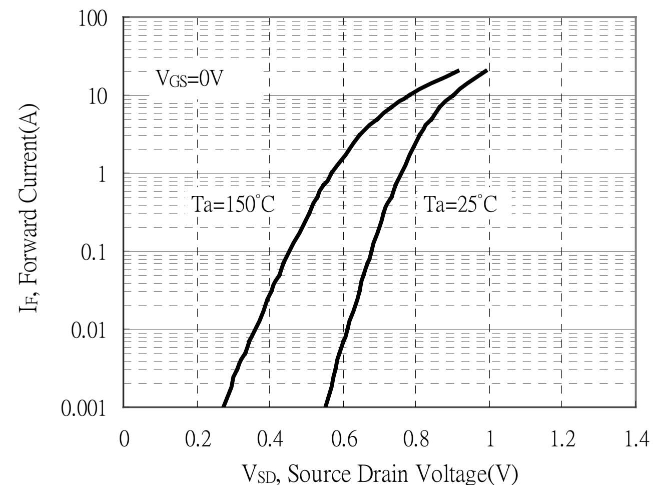




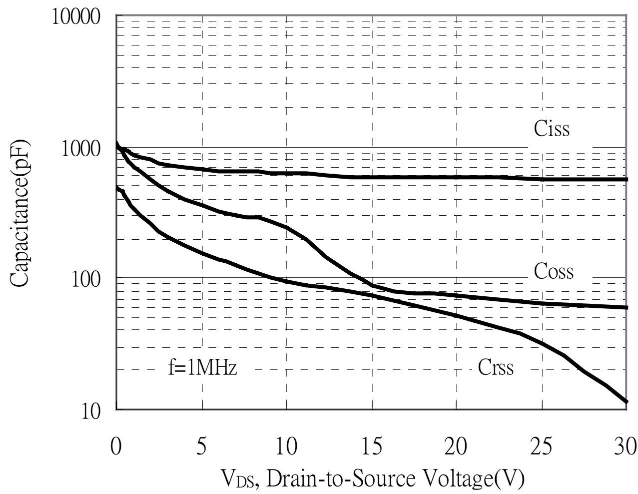


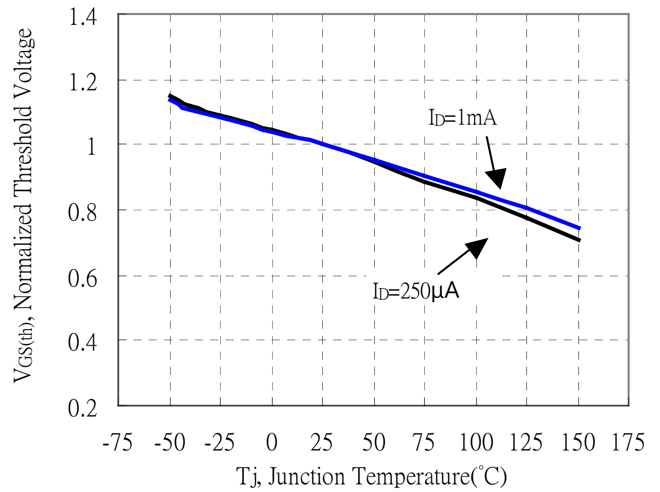


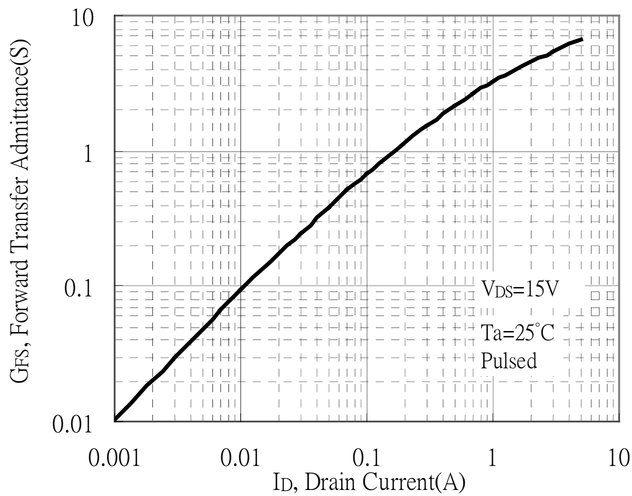


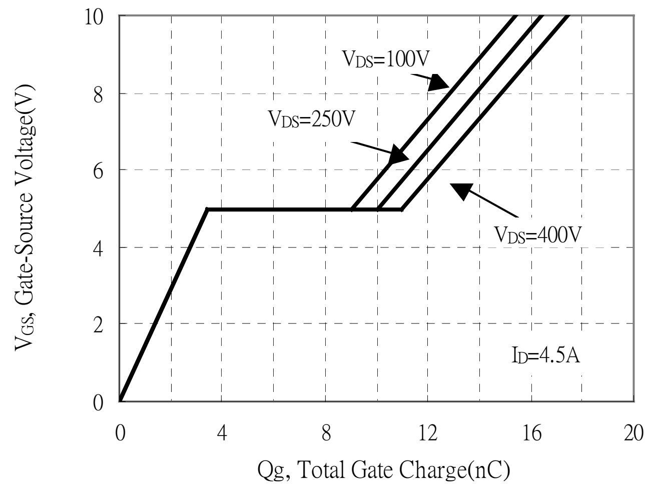


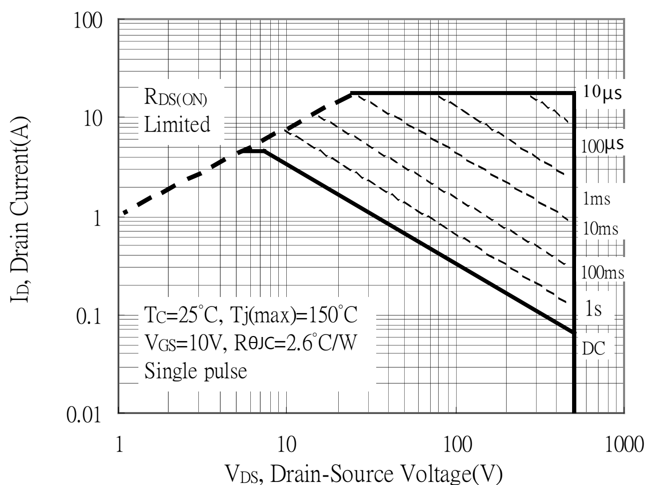
Typical Characteristics(Cont.)

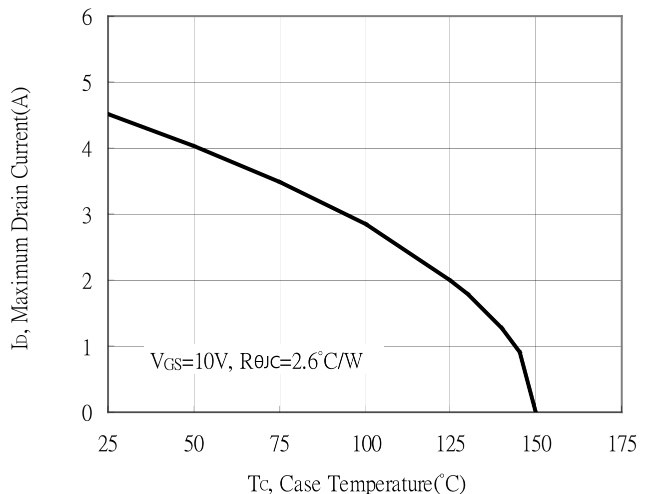




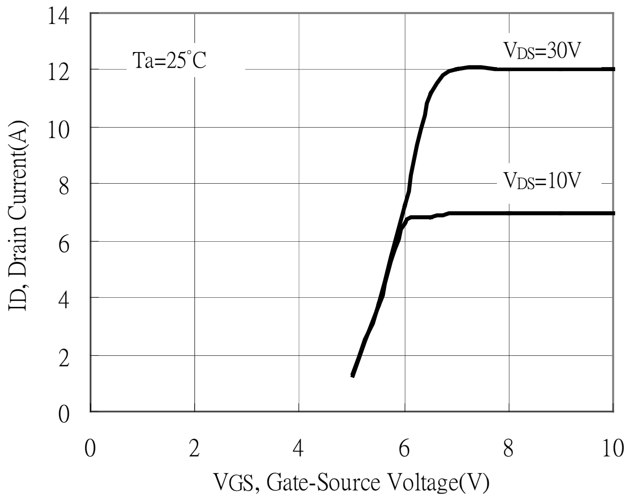


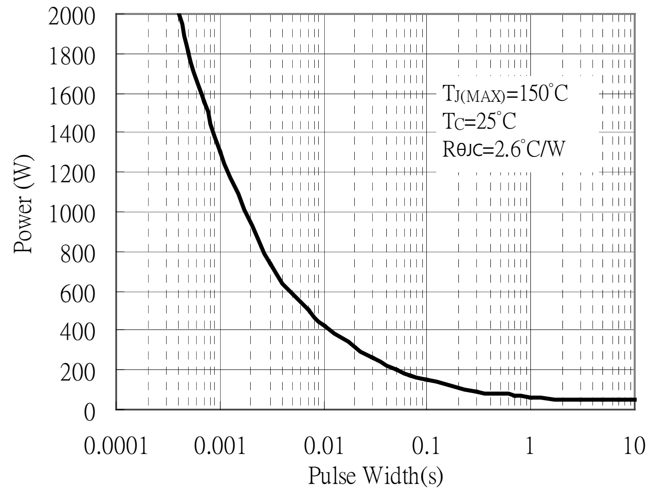


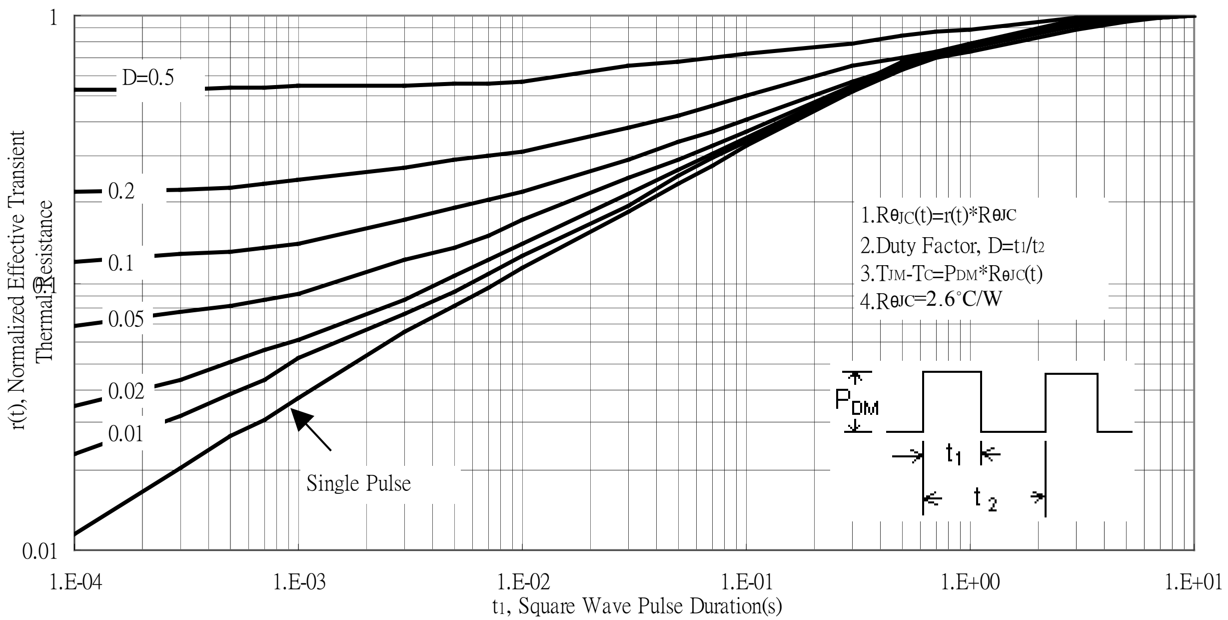




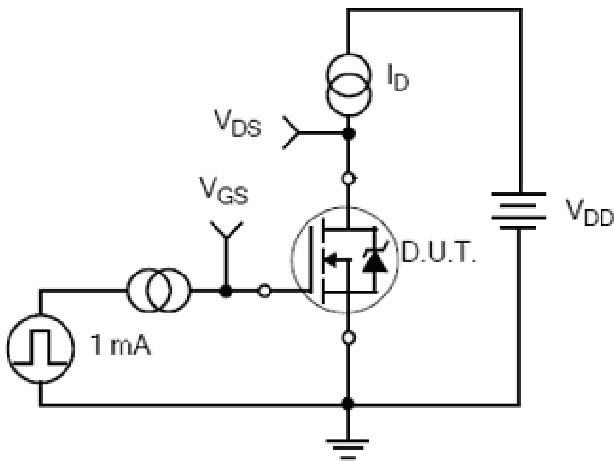
Typical Characteristics(Cont.)



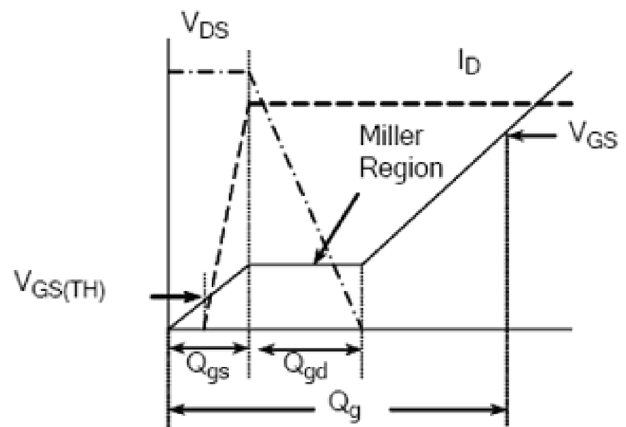




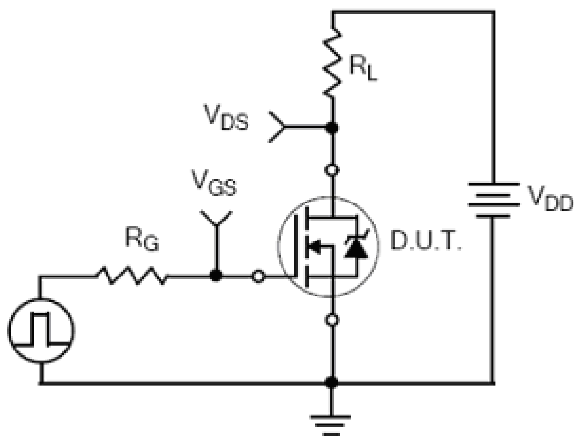
Test Circuit and Waveforms



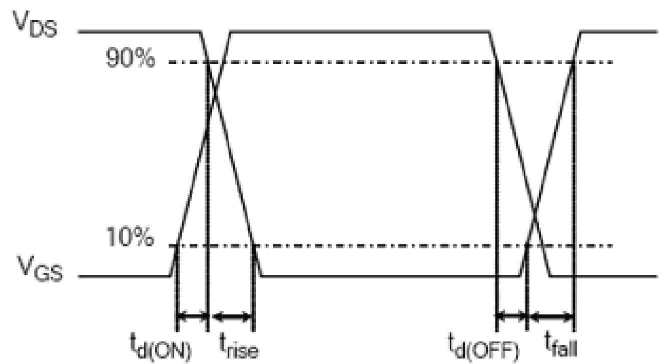
Gate Charge Test Circuit



Gate Charge Waveform

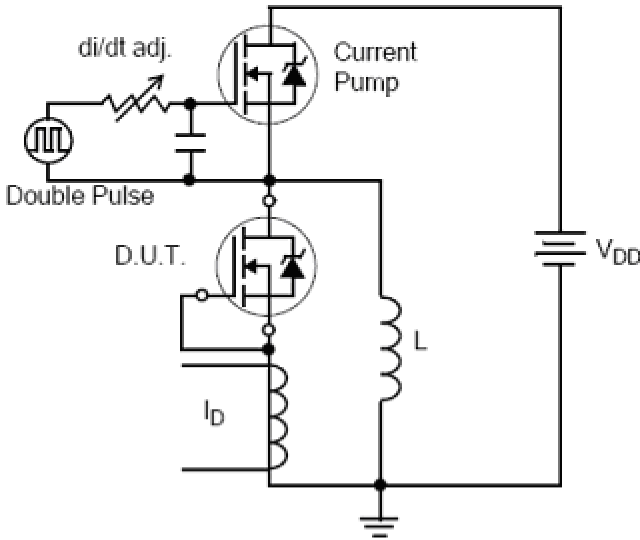


Resistive Switching Test Circuit

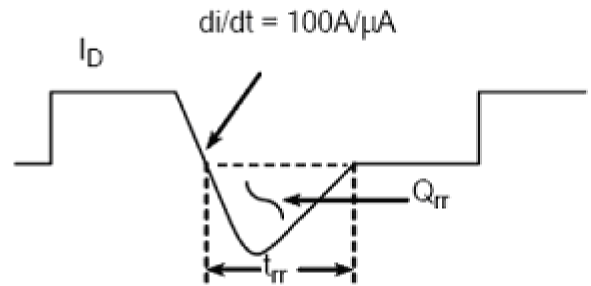


Resistive Switching Waveforms

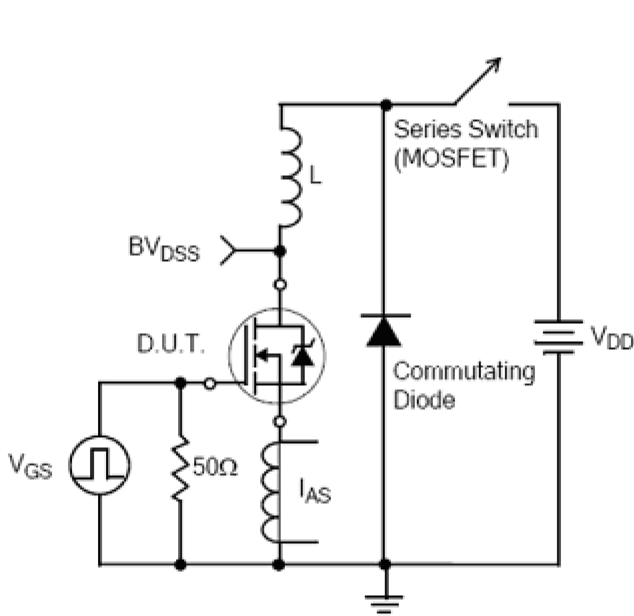
Test Circuit and Waveforms(Cont.)



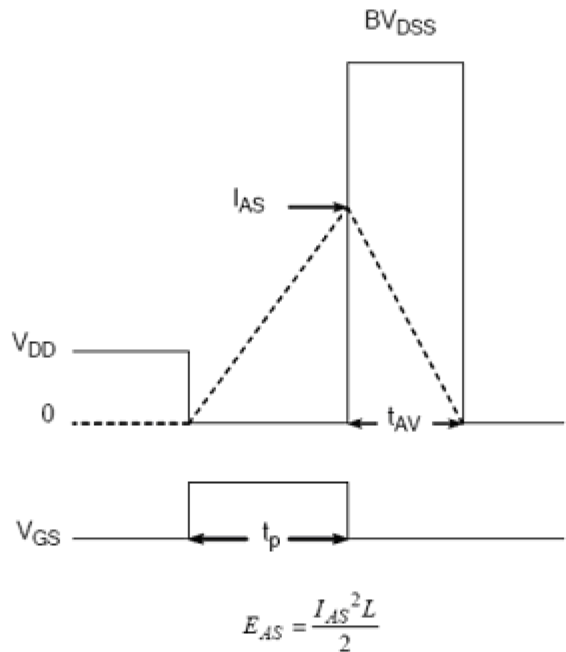
Diode Reverse Recovery Test Circuit



Diode Reverse Recovery Waveform



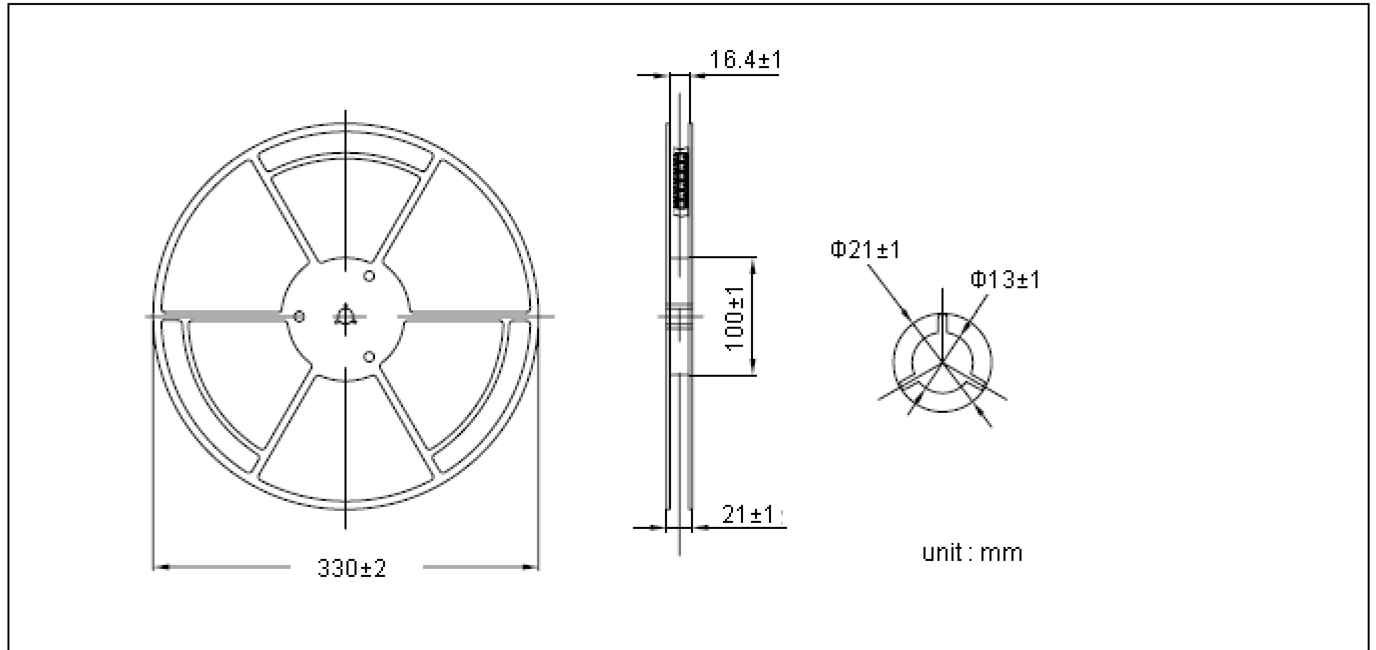
Unclamped Inductive Switching Test Circuit



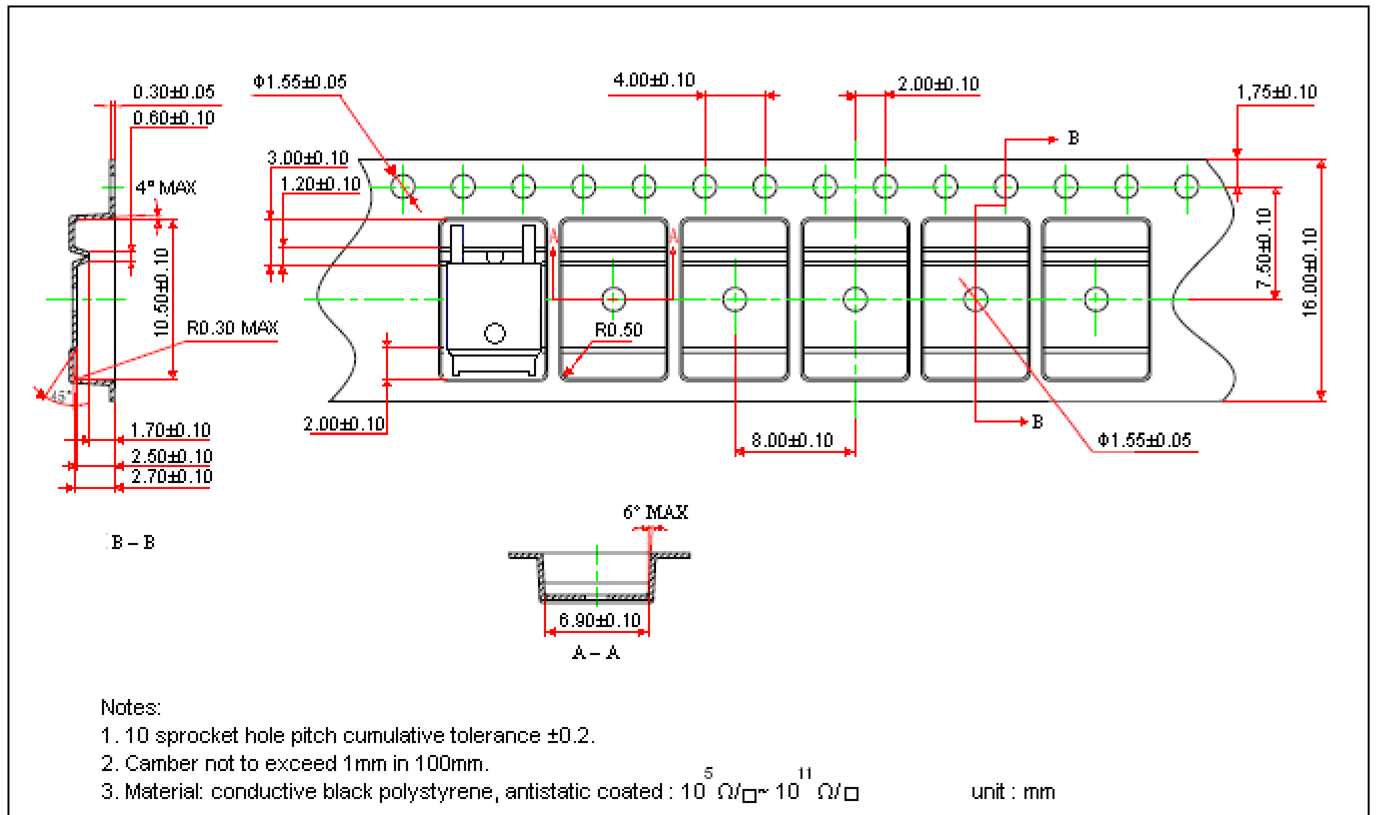
$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

Unclamped Inductive Switching Waveforms

Reel Dimension



Carrier Tape Dimension



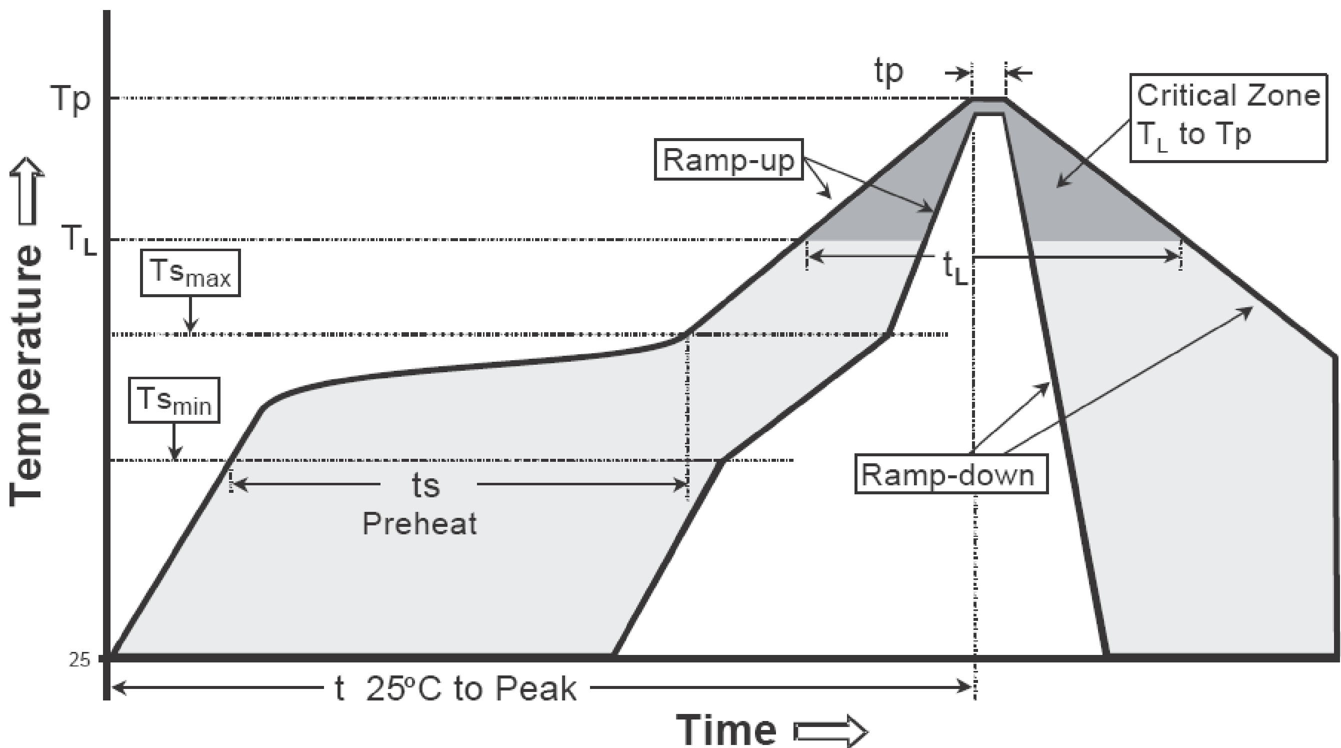
Notes:
1. 10 sprocket hole pitch cumulative tolerance ±0.2.
2. Camber not to exceed 1mm in 100mm.
3. Material: conductive black polystyrene, antistatic coated : 10^{5} Ω/□~ 10^{11} Ω/□

unit : mm

Recommended wave soldering condition

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

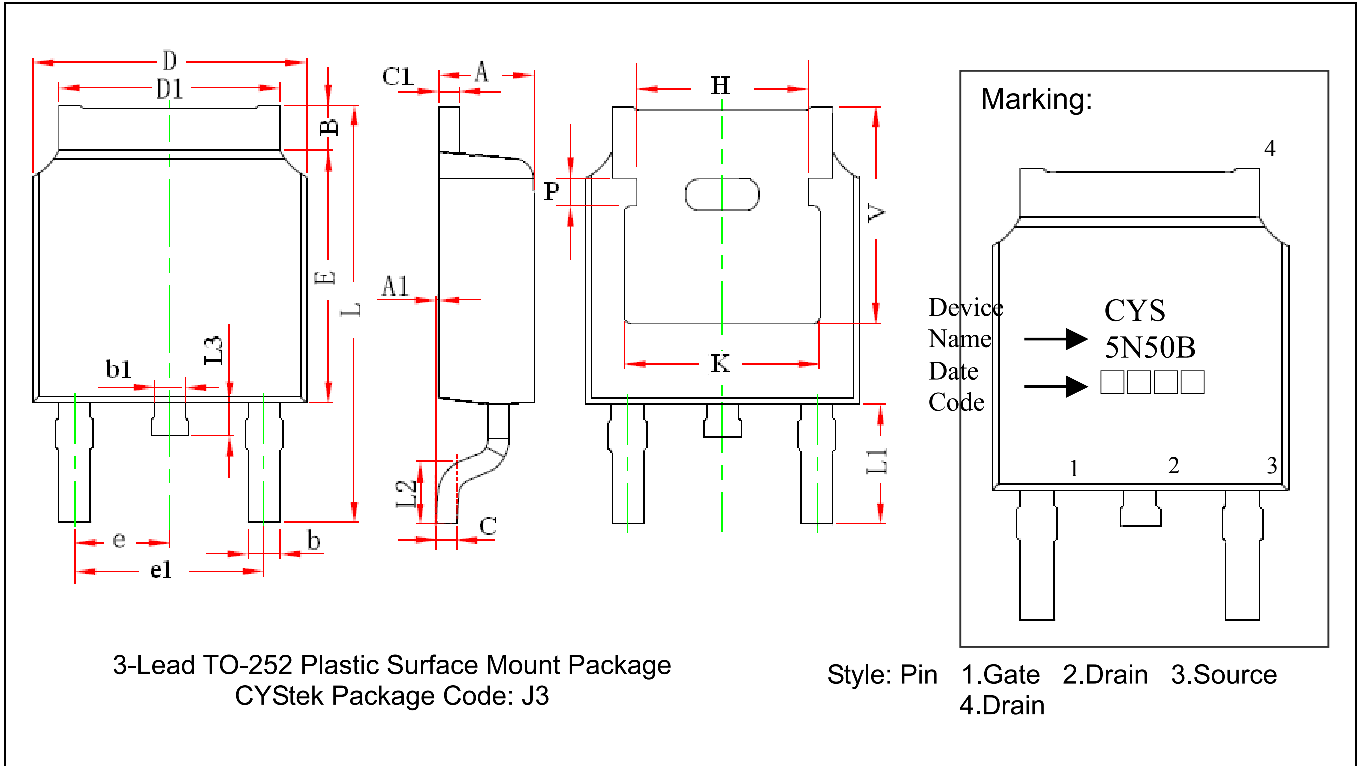
Recommended temperature profile for IR reflow



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(Ts min) −Temperature Max(Ts max) −Time(ts min to ts 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



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

Style: Pin 1.Gate 2.Drain 3.Source 4.Drain

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.087	0.094	2.200	2.400	e	0.086	0.094	2.186	2.386
A1	0.000	0.005	0.000	0.127	e1	0.172	0.188	4.372	4.772
B	0.039	0.048	0.990	1.210	H	0.163	REF	4.140	REF
b	0.026	0.034	0.660	0.860	K	0.190	REF	4.830	REF
b1	0.026	0.034	0.660	0.860	L	0.386	0.409	9.800	10.400
C	0.018	0.023	0.460	0.580	L1	0.114	REF	2.900	REF
C1	0.018	0.023	0.460	0.580	L2	0.055	0.067	1.400	1.700
D	0.256	0.264	6.500	6.700	L3	0.024	0.039	0.600	1.000
D1	0.201	0.215	5.100	5.460	P	0.026	REF	0.650	REF
E	0.236	0.244	6.000	6.200	V	0.211	REF	5.350	REF

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

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