N-Channel Enhancement Mode Power MOSFET

MTN9N50BE3

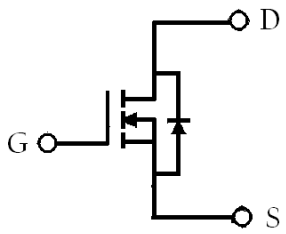
Features

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

BV_{DSS}	500V
I_D @ V_{GS}=10V, T_C=25°C	8.5A
I_D @ V_{GS}=10V, T_C=100°C	5.4A
$R_{DSON(TYP)}$ @ V_{GS}=10V, I_D=4.5A	0.71Ω

Symbol

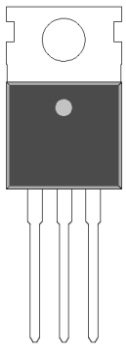
MTN9N50BE3



G：Gate D：Drain S：Source

Outline

TO-220



G D S

Ordering Information

Device	Package	Shipping
MTN9N50BE3-0-UB-X	TO-220 (RoHS compliant)	50 pcs/tube, 20 tubes/box, 5 boxes / carton

Environment friendly grade : S for RoHS compliant products, G for RoHS compliant and green compound products

Packing spec, UB : 50 pcs / tube, 20 tubes/box

Product rank, zero for no rank products

Product name

Absolute Maximum Ratings (T_C=25°C)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage (Note 1)	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	±30	
Continuous Drain Current @T_C=25°C, V_{GS}=10V	I_D	8.5*	A
Continuous Drain Current @T_C=100°C, V_{GS}=10V		5.4*	
Pulsed Drain Current @ V_{GS}=10V (Note 2)	I_{DM}	34*	
Single Pulse Avalanche Energy (Note 3)	E_{AS}	290	mJ
Avalanche Current (Note 2)	I_{AS}	8	A
Repetitive Avalanche Energy (Note 2)	E_{AR}	12.5	mJ
Maximum Temperature for Soldering @ Lead at 0.125 in(3.175mm) from case for 10 seconds	T_L	300	°C
Total Power Dissipation (T_C=25℃)	P_D	134	W
Linear Derating Factor above 25℃		1.07	W/°C
Operating Junction and Storage Temperature	Tj, Tstg	-55~+150	°C

*Drain current limited by maximum junction temperature

Note : 1. T_J=+25℃ to +150℃.
2. Repetitive rating; pulse width limited by maximum junction temperature.
3. I_{AS}=8A, V_{DD}=50V, L=5mH, R_G=25Ω, starting T_J=+25℃.

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{\theta JC}$	0.93	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{\theta JA}$	62.5	

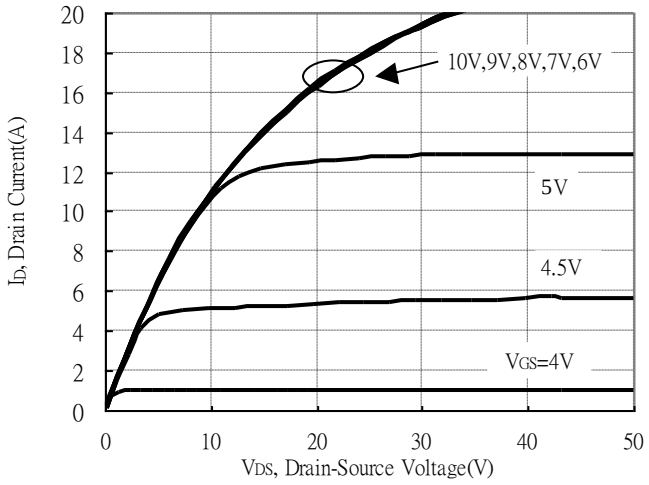
Characteristics (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	500	-	-	V	V_{GS}=0V, I_D=250μA
$V_{GS(th)}$	2.0	-	4.0	V	V_{DS} = V_{GS}, I_D=250μA
*G_{FS}	-	8	-	S	V_{DS} =15V, I_D=4A
I_{GSS}	-	-	±100	nA	V_{GS}=±30V, V_{DS}=0V
I_{DSS}	-	-	1	μA	V_{DS} =400V, V_{GS} =0V
*$R_{DS(ON)}$	-	0.71	0.9	Ω	V_{GS} =10V, I_D=4.5A
Dynamic					
*Qg	-	26.4	-	nC	I_D=4.5A, V_{DD}=250V, V_{GS}=10V
*Qgs	-	4.8	-		
*Qgd	-	9.9	-		
*$t_{d(ON)}$	-	14	-	ns	V_{DD}=250V, I_D=4.5A, V_{GS}=10V, R_G=1Ω
*tr	-	8.8	-		
*$t_{d(OFF)}$	-	42.6	-		
*t_f	-	7.8	-		
Ciss	-	975	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	108	-		
Crss	-	76	-		
Source-Drain Diode					
*I_S	-	-	8	A	
*I_{SM}	-	-	32		
*V_{SD}	-	0.8	1.2	V	I_S=4.5A, V_{GS}=0V
*trr	-	242	-	ns	V_{GS}=0V, I_F=4.5, dI_F/dt=100A/μs
*Qrr	-	1.5	-	μC	

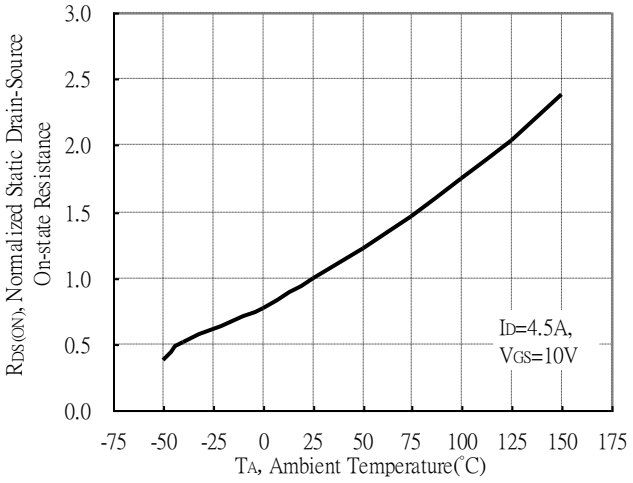
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Typical Characteristics

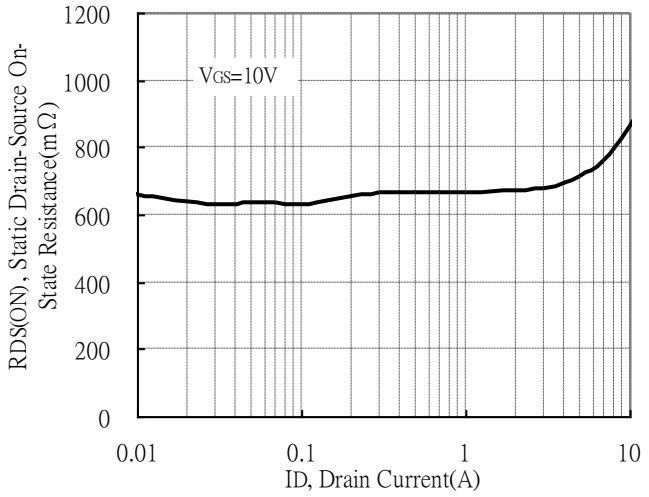
Typical Output Characteristics



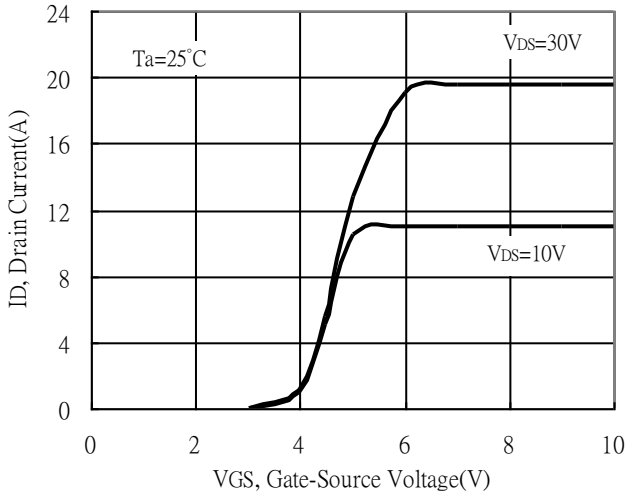
Static Drain-Source On-resistance vs Ambient Temperature



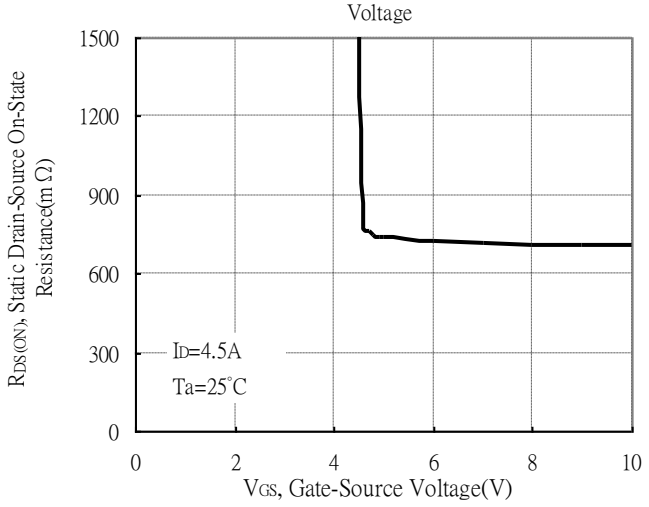
Static Drain-Source On-State resistance vs Drain Current



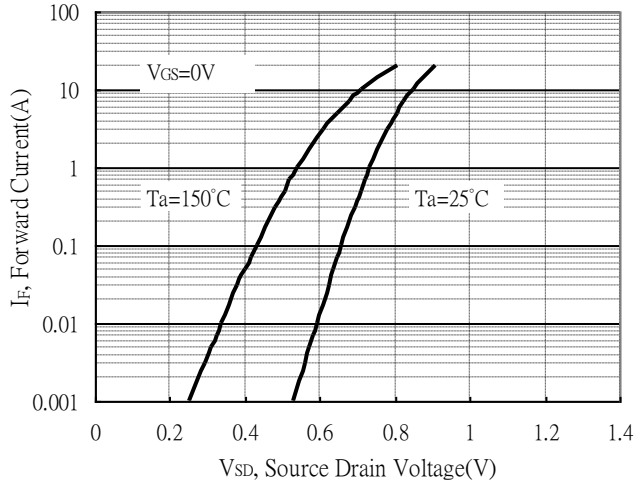
Drain Current vs Gate-Source Voltage



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

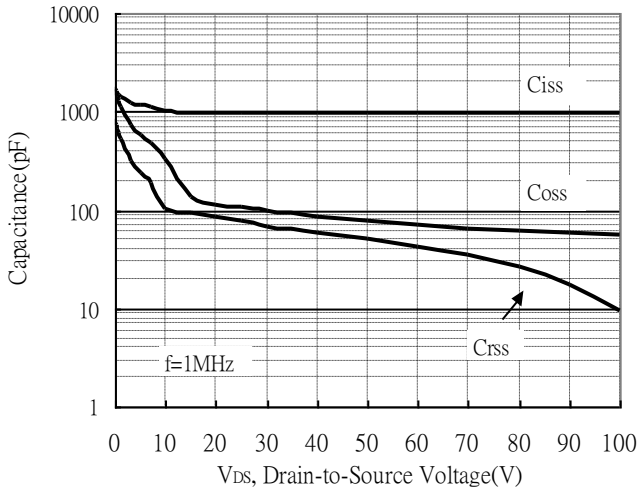


Forward Drain Current vs Source-Drain Voltage

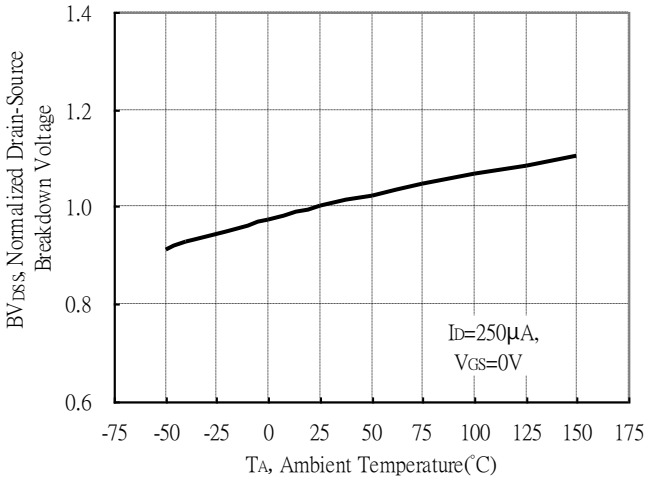


Typical Characteristics(Cont.)

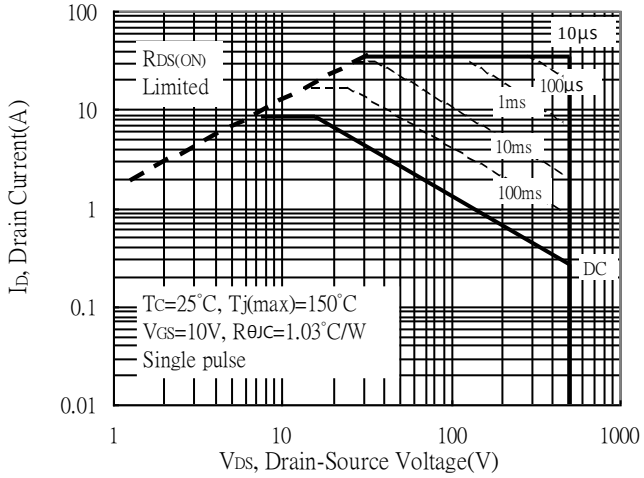
Capacitance vs Reverse Voltage



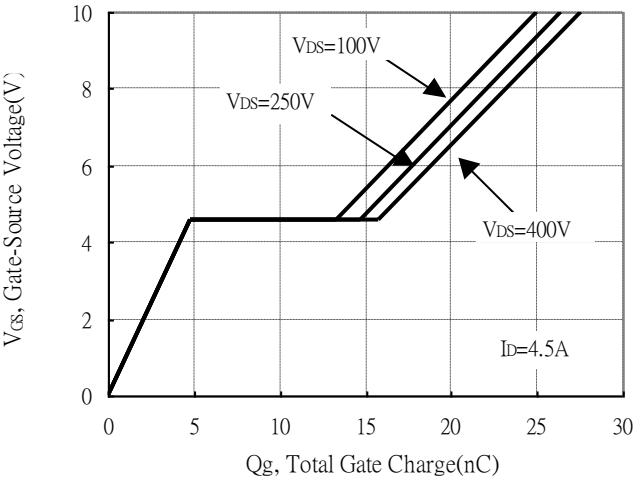
Brekdown Voltage vs Ambient Temperature



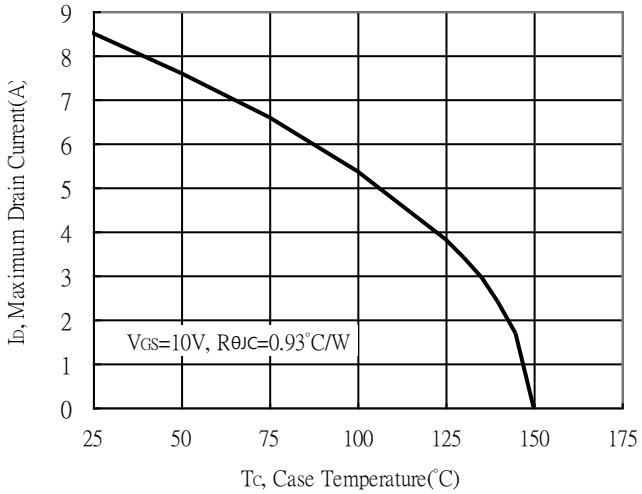
Maximum Safe Operating Area



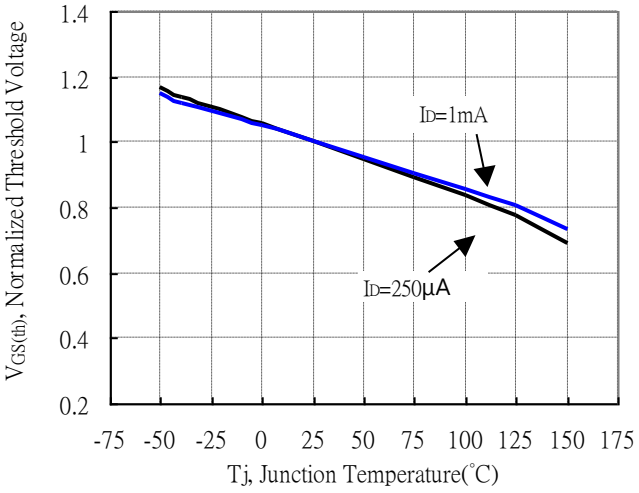
Gate Charge Characteristics



Maximum Drain Current vs Case Temperature

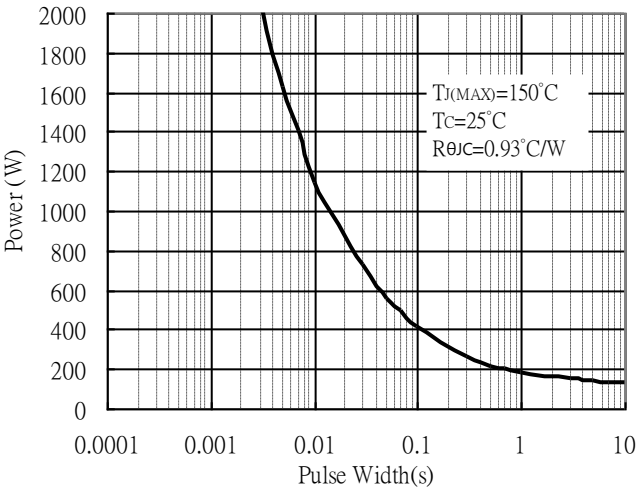


Threshold Voltage vs Junction Tempearture

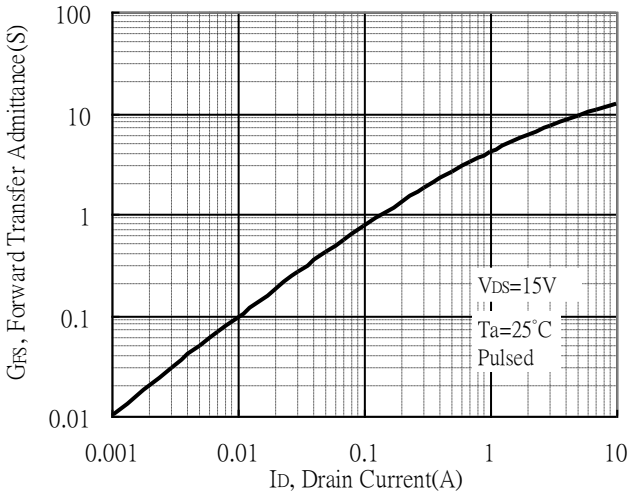


Typical Characteristics(Cont.)

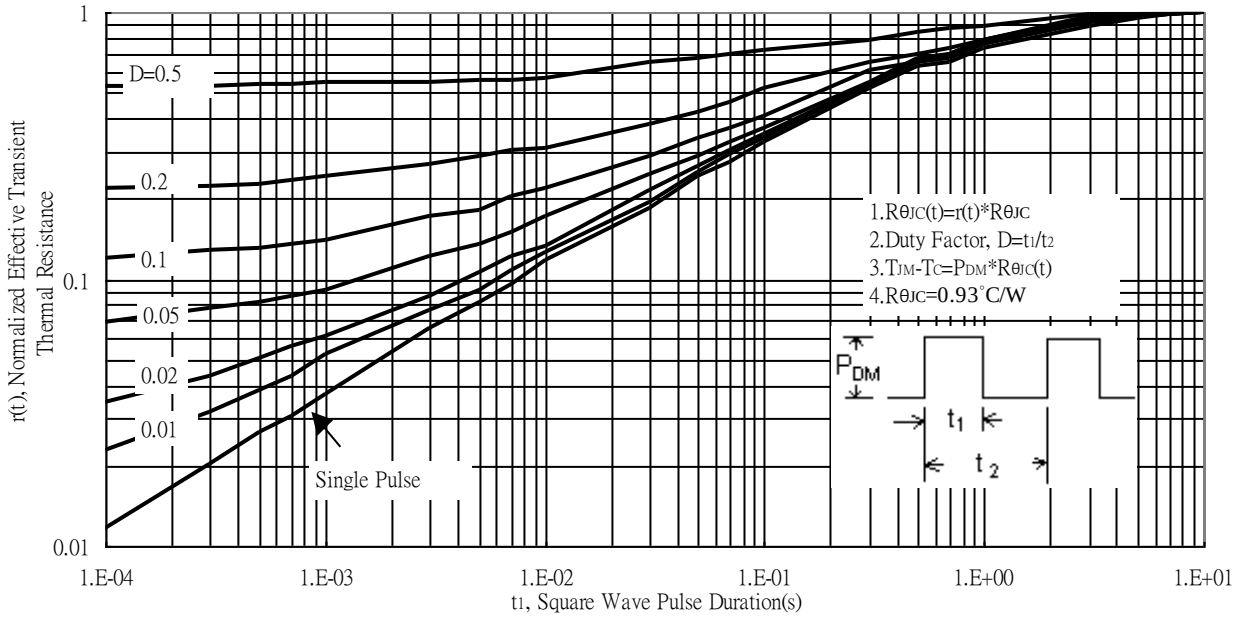
Single Pulse Power Rating, Junction to Case



Forward Transfer Admittance vs Drain Current



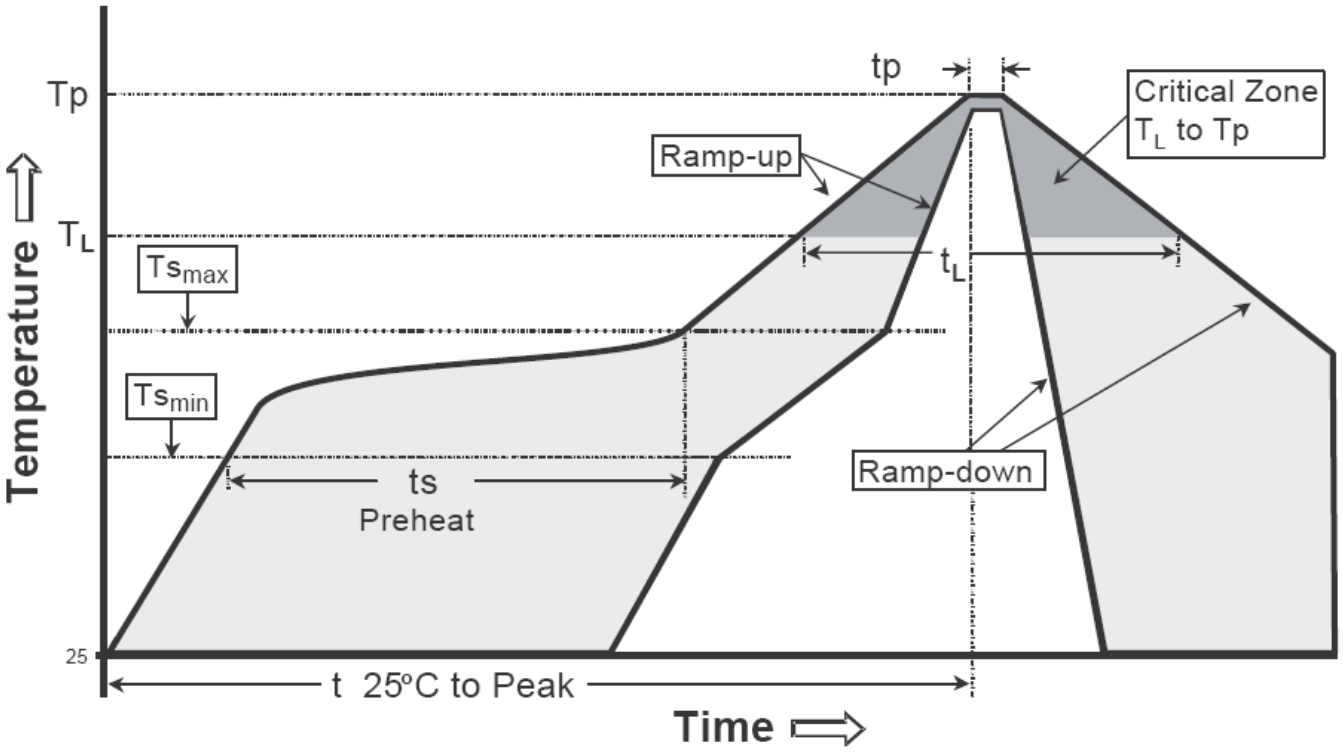
Transient Thermal Response Curves



Recommended wave soldering condition

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

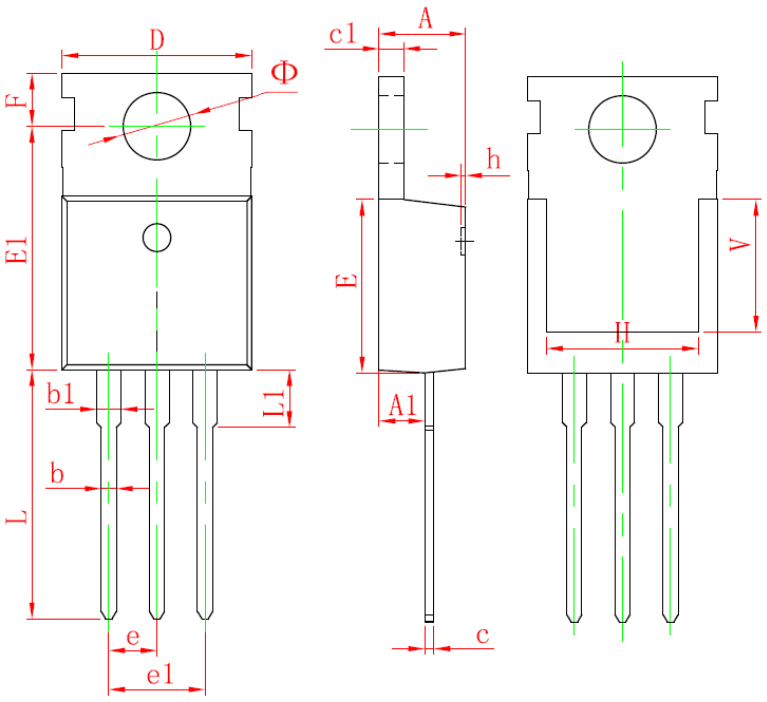
Recommended temperature profile for IR reflow



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(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.

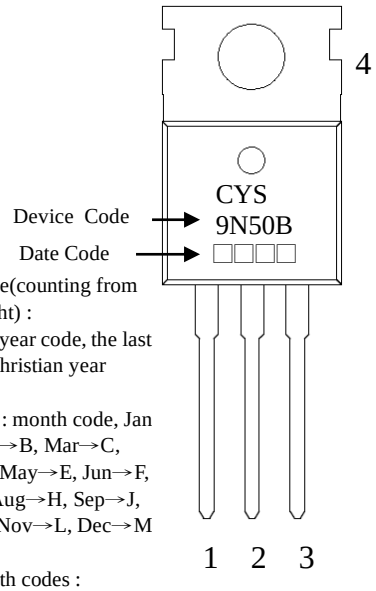
Note : All temperatures refer to topside of the package, measured on the package body surface.

TO-220 Dimension



3-Lead TO-220 Plastic Package
CYStek Package Code: E3

Marking:



Date Code(counting from left to right) :
1st code: year code, the last digit of Christian year

2nd code : month code, Jan →A, Feb→B, Mar→C, Apr→D, May→E, Jun→F, Jul→G, Aug→H, Sep→J, Oct→K, Nov→L, Dec→M

3rd and 4th codes : production serial number, 01~99

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

*: Typical

DIM	Millimeters		Inches		DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181	e	2.540*		0.100*	
A1	2.250	2.550	0.089	0.100	e1	4.980	5.180	0.196	0.204
b	0.710	0.910	0.028	0.036	F	2.650	2.950	0.104	0.116
b1	1.170	1.370	0.046	0.054	H	7.900	8.100	0.311	0.319
c	0.330	0.650	0.013	0.026	h	0.000	0.300	0.000	0.012
c1	1.200	1.400	0.047	0.055	L	12.900	13.400	0.508	0.528
D	9.910	10.250	0.390	0.404	L1	2.850	3.250	0.112	0.128
E	8.950	9.750	0.352	0.384	V	7.500 REF		0.295 REF	
E1	12.650	12.950	0.498	0.510	Φ	3.400	3.800	0.134	0.150

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.