N-Channel Enhancement Mode Power MOSFET

MTN15N50E3

BV_{DSS} : 500V
$R_{DS(ON)}$: 0.38Ω (typ.)
I_D : 15A

Description

The MTN15N50E3 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness.
The TO-220package is universally preferred for all commercial-industrial applications

Features

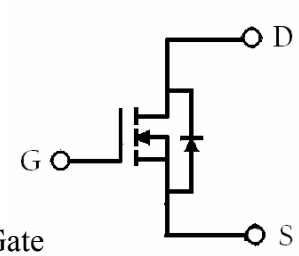
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

Applications

- Power Factor Correction
- Flat Panel Power
- Full and Half Bridge Power Supplies
- Two-Transistor Forward Power Supplies

Symbol

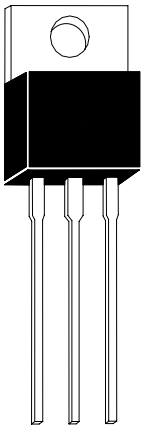
MTN15N50E3



G：Gate
D：Drain
S：Source

Outline

TO-220



G D S

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	V
Continuous Drain Current	I_D	15*	A
Continuous Drain Current @T_C=100°C	I_D	9*	A
Pulsed Drain Current @ V_{GS}=10V (Note 2)	I_{DM}	60*	A
Single Pulse Avalanche Energy (Note 3)	E_{AS}	750	mJ
Avalanche Current (Note 2)	I_{AR}	15	A
Repetitive Avalanche Energy (Note 2)	E_{AR}	25	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
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	250	W
Linear Derating Factor above 25℃		2	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_{SD}=15A, dI/dt<100A/μs, V_{DD}<BV_{DSS}, T_J=+150℃.
4. I_{AS}=15A, V_{DD}=50V, L=6mH, R_G=25Ω, starting T_J=+25℃.

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	0.5	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	62.5	°C/W

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	500	-	-	V	V_{GS}=0, I_D=250μA
$\Delta BV_{DSS}/\Delta Tj$	-	0.5	-	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}	-	8	-	S	V_{DS} =15V, I_D=7.5A
I_{GSS}	-	-	±100	nA	V_{GS}=±30
I_{DSS}	-	-	1	μA	V_{DS} =500V, V_{GS} =0
	-	-	25		V_{DS} =400V, V_{GS} =0, Tj=125°C
*$R_{DS(ON)}$	-	0.38	0.42	Ω	V_{GS} =10V, I_D=7.5A
Dynamic					
*Qg	-	45	-	nC	I_D=15A, V_{DD}=250V, V_{GS}=10V
*Qgs	-	11	-		
*Qgd	-	22	-		
*$t_{d(ON)}$	-	40	-	ns	V_{DD}=250V, I_D=15A, V_{GS}=10V, R_G=10Ω
*tr	-	140	-		
*$t_{d(OFF)}$	-	100	-		
*t_f	-	85	-		
Ciss	-	3090	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	250	-		
Crss	-	120	-		
Source-Drain Diode					
*V_{SD}	-	-	1.5	V	I_S=15A, V_{GS}=0V
*I_S	-	-	15	A	
*I_{SM}	-	-	60		
*trr	-	420	-	ns	V_{GS}=0, I_F=15A, dI/dt=100A/μs
*Qrr	-	5	-	μC	

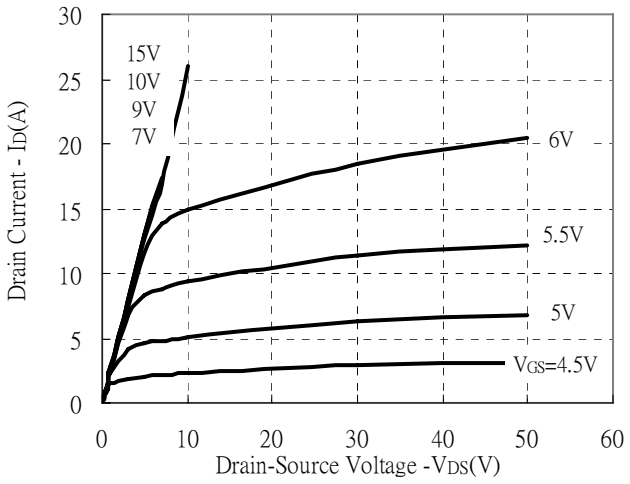
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Ordering Information

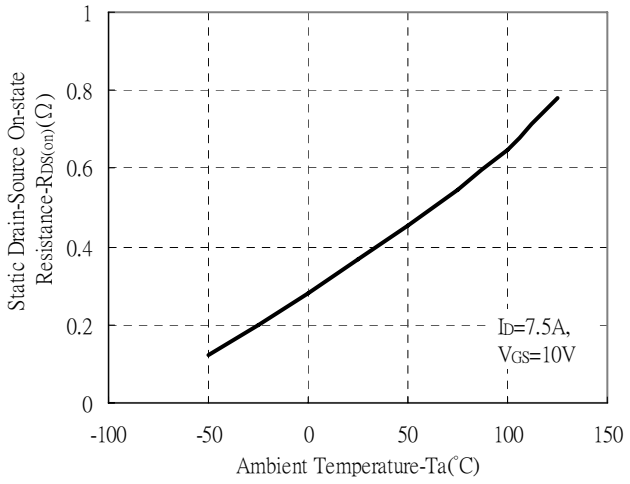
Device	Package	Shipping	Marking
MTN15N50E3-0-UB-S	TO-220 (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton	15N50

Typical Characteristics

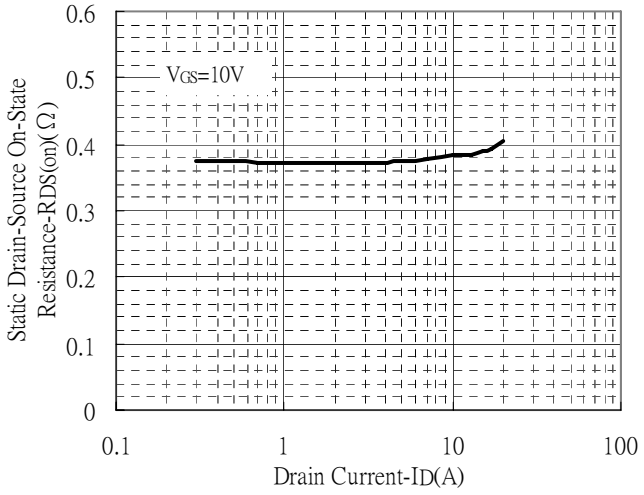
Typical Output Characteristics



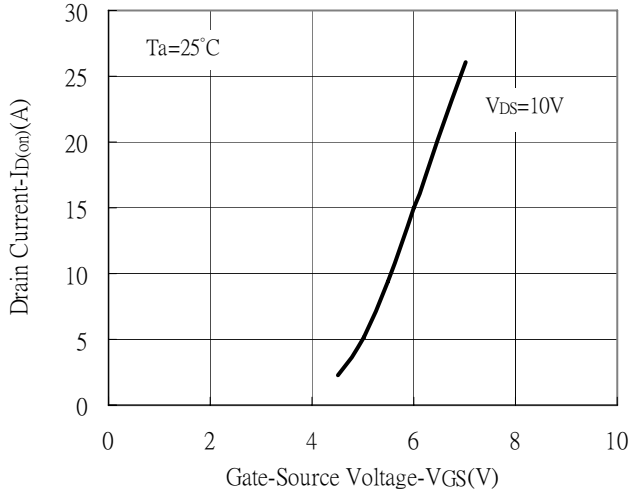
Static Drain-Source On-resistance vs Ambient Temperature



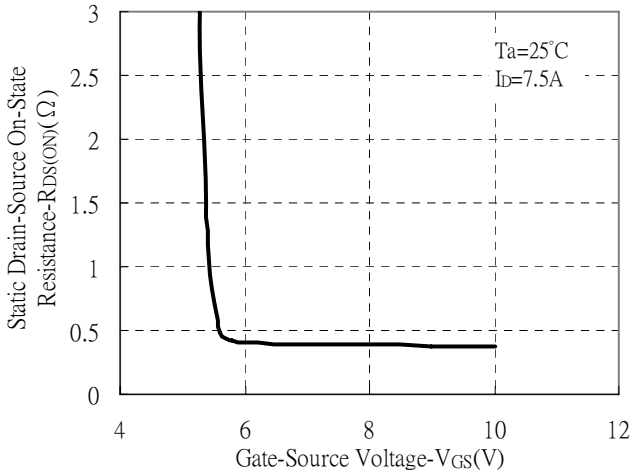
Static Drain-Source On-State resistance vs Drain Current



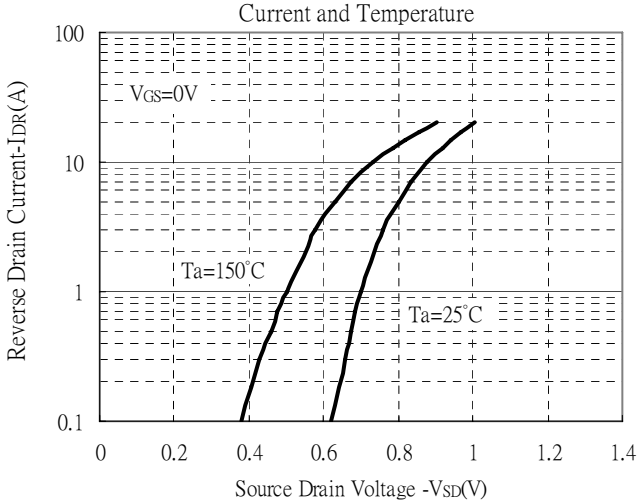
Drain Current vs Gate-Source Voltage



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

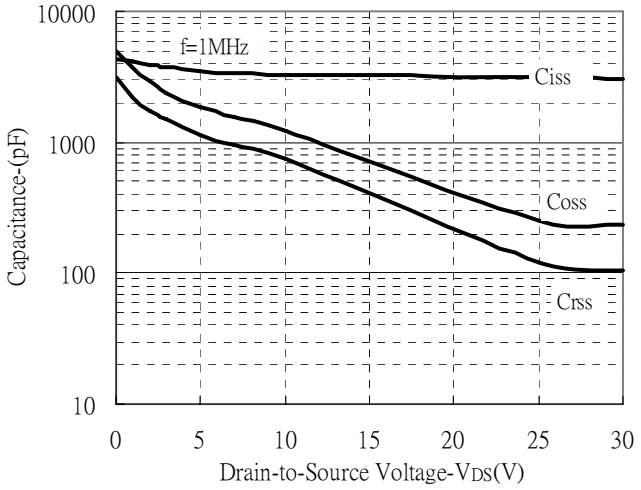


Body Diode Forward Voltage Variation vs Source Current and Temperature

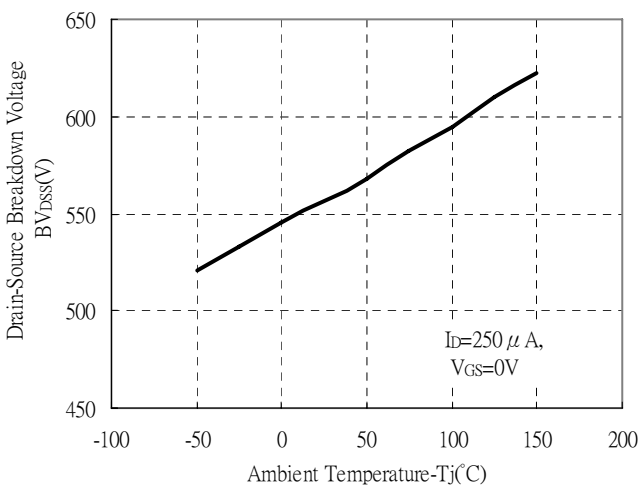


Characteristic Curves(Cont.)

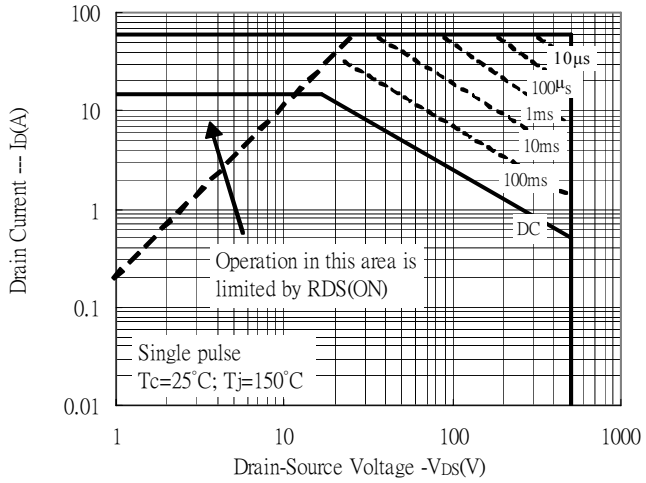
Capacitance vs Reverse Voltage



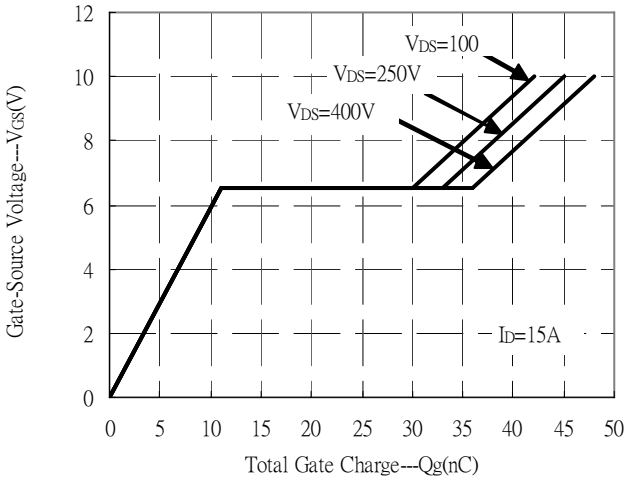
Brekdown Voltage vs Ambient Temperature



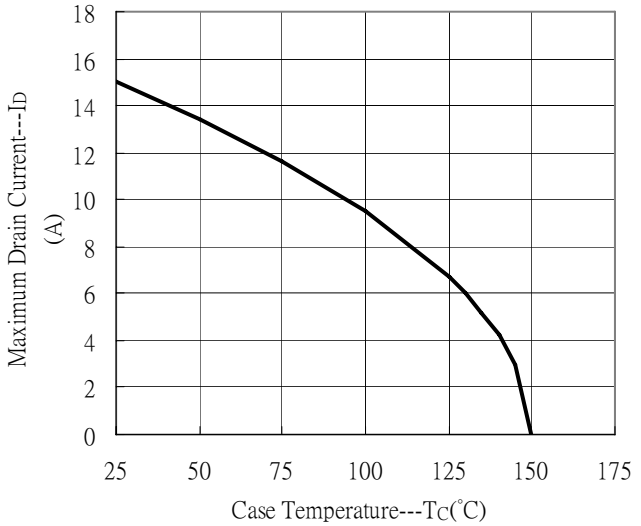
Maximum Safe Operating Area



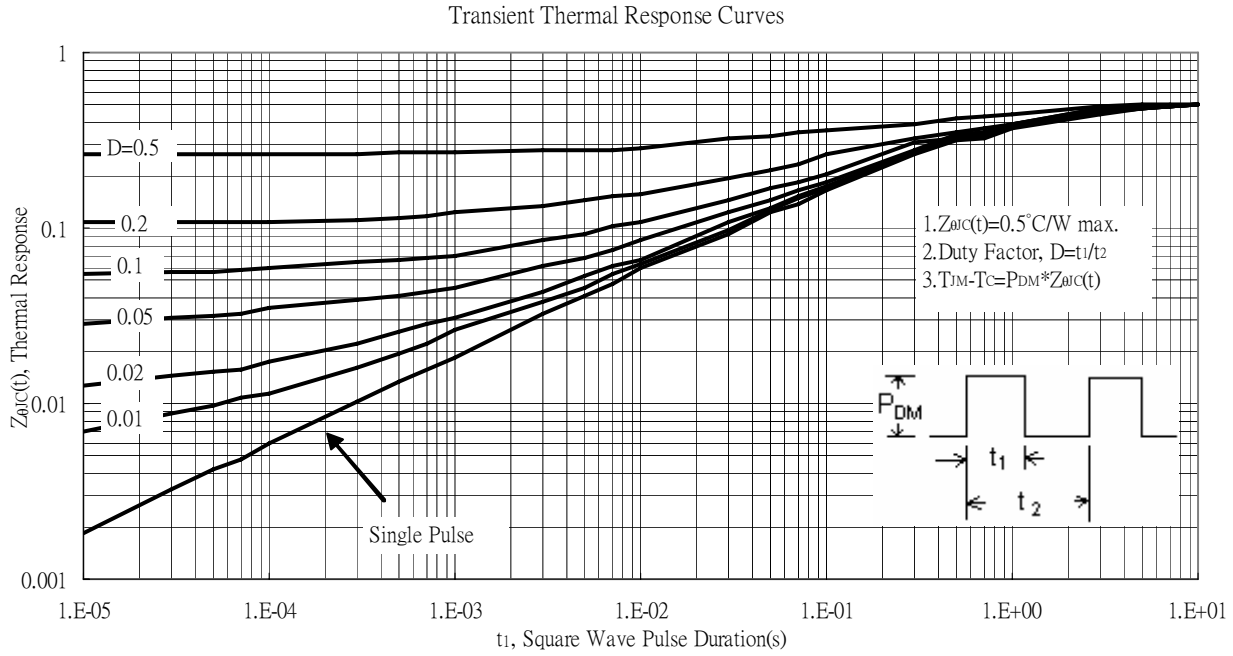
Gate Charge Characteristics



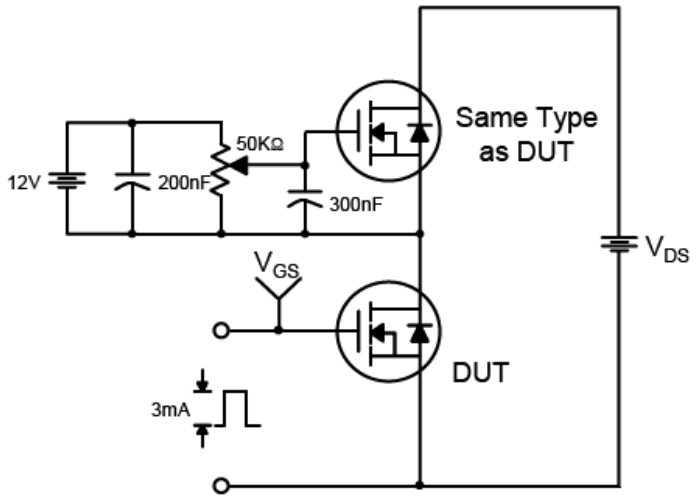
Maximum Drain Current vs Case Temperature

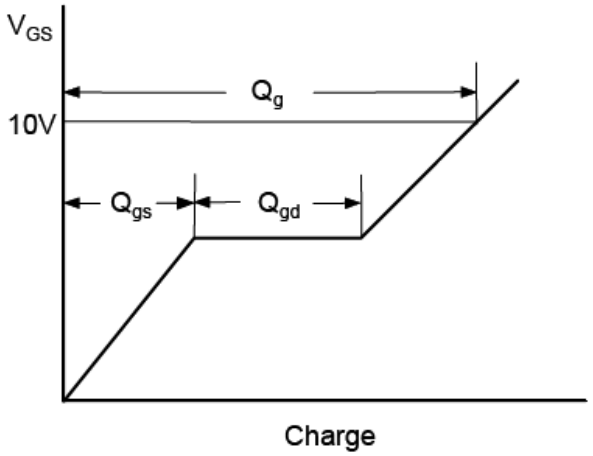


Characteristic Curves(Cont.)

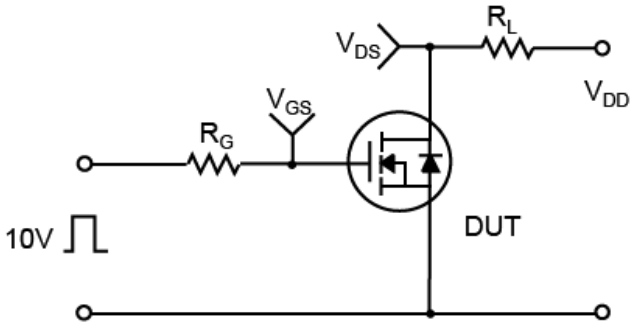


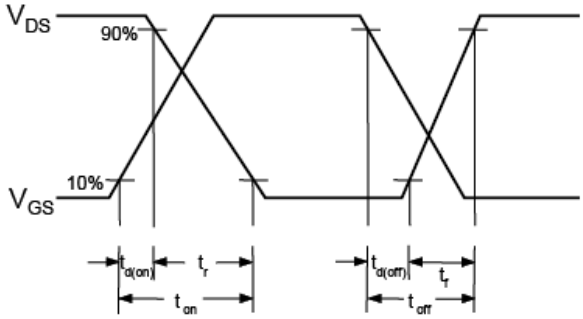
Test Circuit and Waveforms



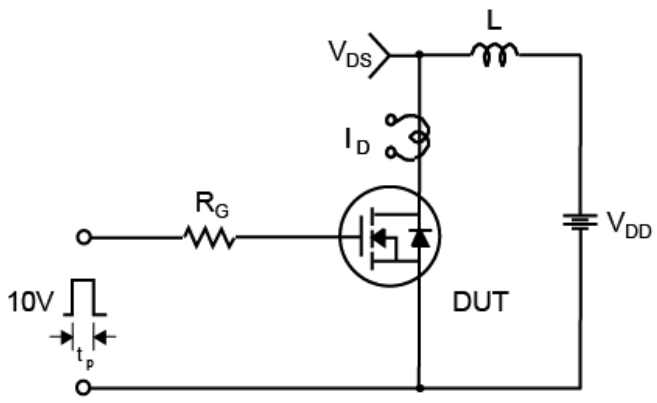


Resistive Switching Test Circuit & Waveforms

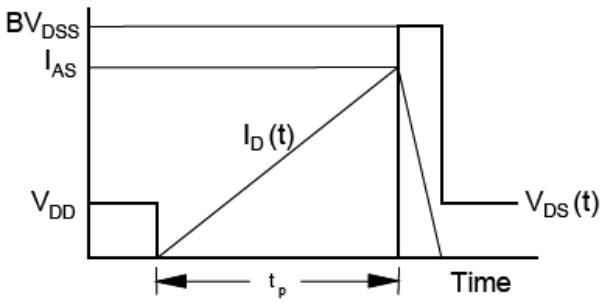




Unclamped Inductive Switching Test Circuit & Waveforms

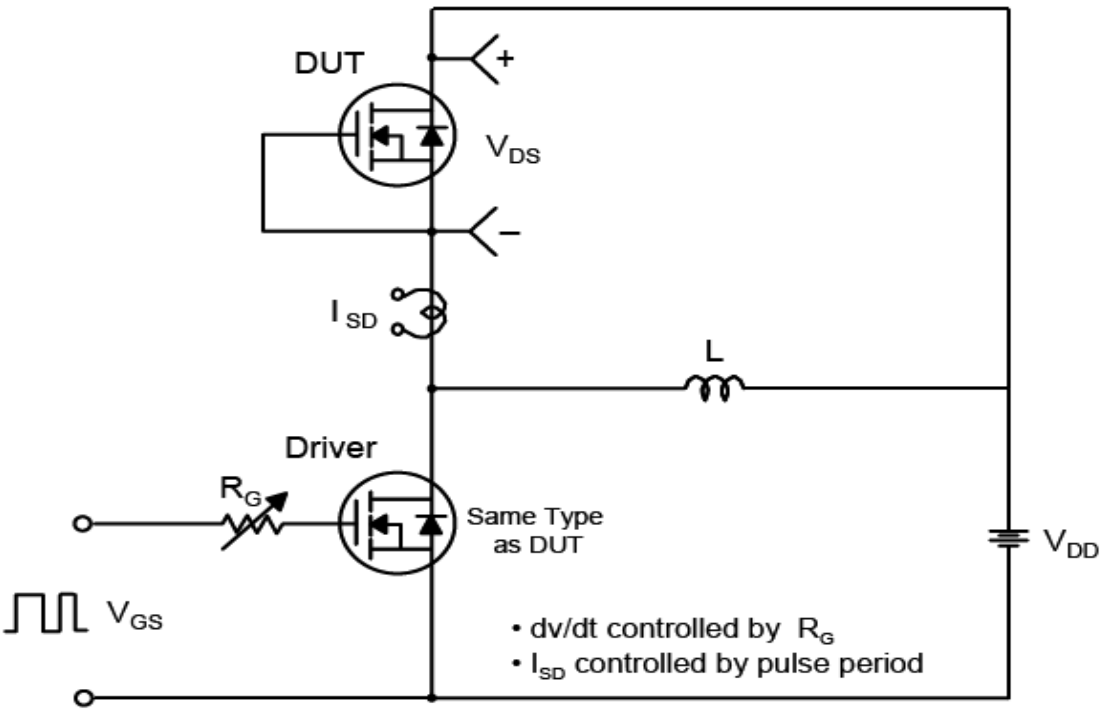


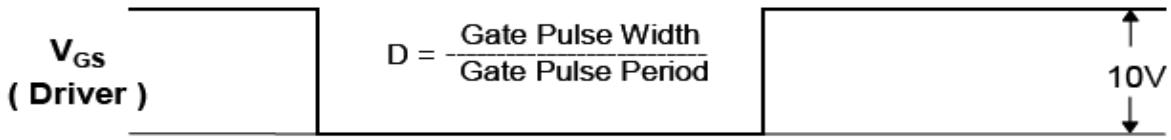
$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

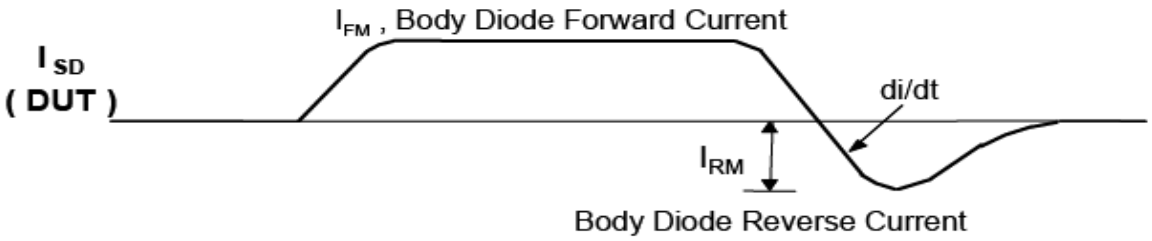


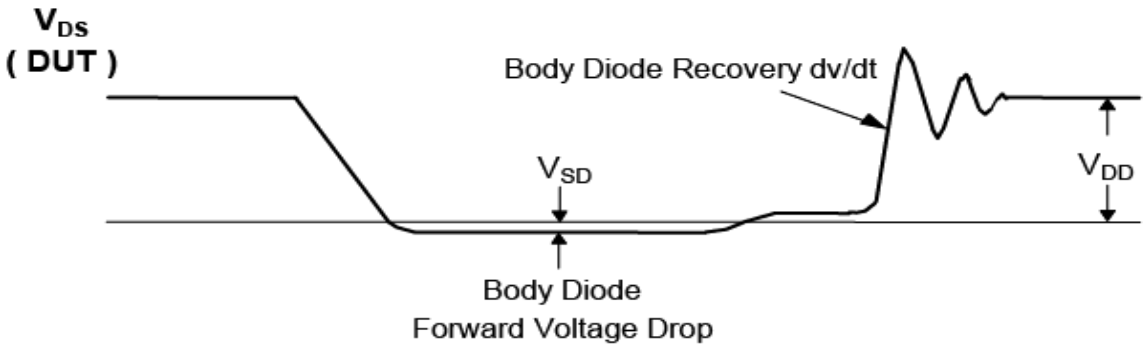
Test Circuit and Waveforms(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms





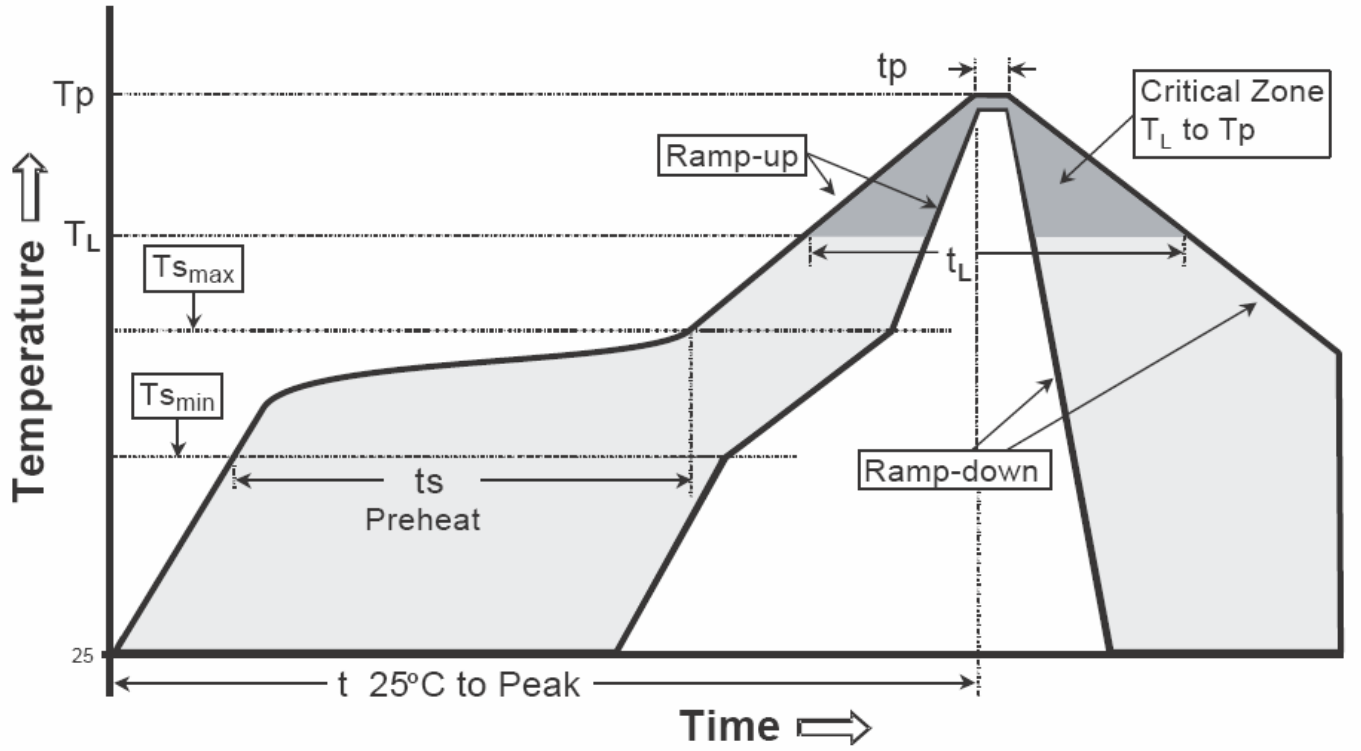




Recommended wave soldering condition

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

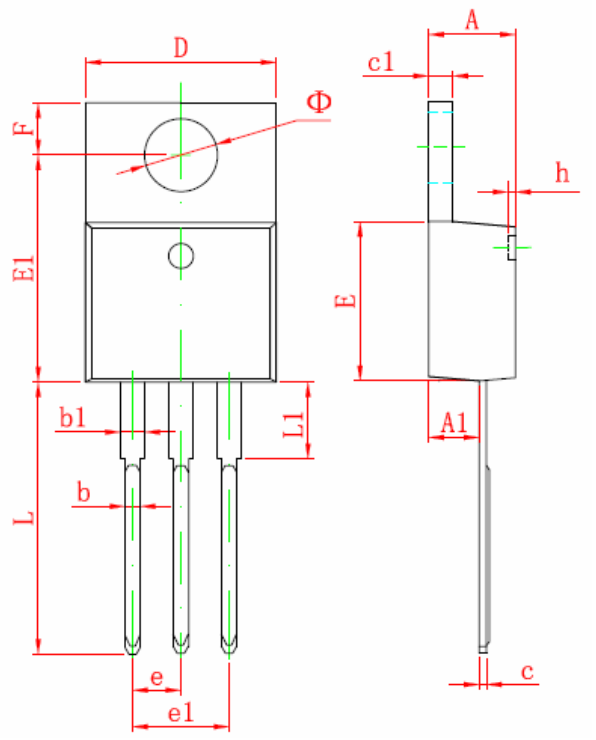
Recommended temperature profile for IR reflow



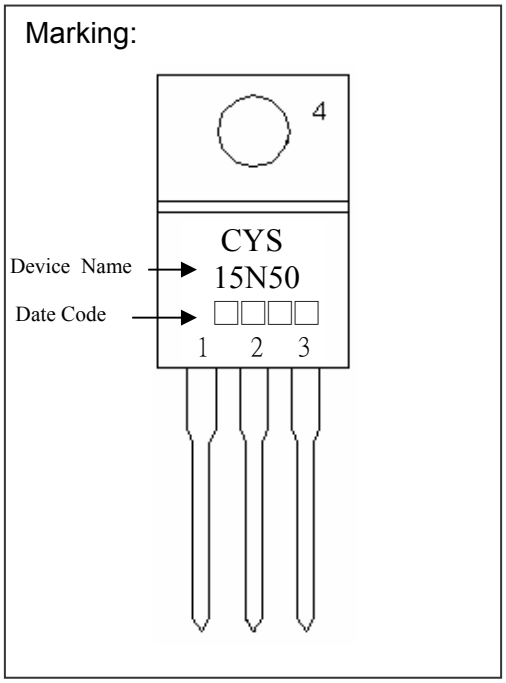
Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (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-220 Dimension



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



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	4.470	4.670	0.176	0.184	E1	12.060	12.460	0.475	0.491
A1	2.520	2.820	0.099	0.111	e	2.540*		0.100*	
b	0.710	0.910	0.028	0.036	e1	4.980	5.180	0.196	0.204
b1	1.170	1.370	0.046	0.054	F	2.590	2.890	0.102	0.114
c	0.310	0.530	0.012	0.021	h	0.000	0.300	0.000	0.012
c1	1.170	1.370	0.046	0.054	L	13.400	13.800	0.528	0.543
D	10.010	10.310	0.394	0.406	L1	3.560	3.960	0.140	0.156
E	8.500	8.900	0.335	0.350	Φ	3.735	3.935	0.147	0.155

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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