N-Channel Enhancement Mode Power MOSFET

MTN13N50E3

BV_{DSS} : 500V
$R_{DS(ON)}$: 0.48Ω
I_D : 13A

Description

The MTN13N50E3 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-220 package is universally preferred for all commercial-industrial applications

Features

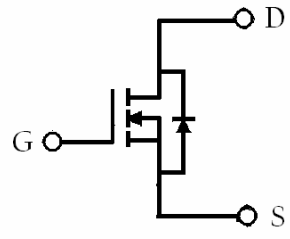
- BV_{DSS}=550V typically @ Tj=150℃
- Low On Resistance
- Simple Drive Requirement
- Low Gate Charge
- Fast Switching Characteristic
- RoHS compliant package

Applications

- Power Factor Correction
- LCD TV Power
- Full and Half Bridge Power

Symbol

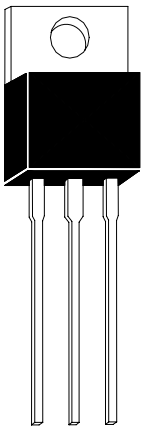
MTN13N50E3



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	13	A
Continuous Drain Current @T_C=100°C	I_D	8	A
Pulsed Drain Current @ V_{GS}=10V (Note 2)	I_{DM}	52	A
Single Pulse Avalanche Energy @ L=7.2mH, I_D=12.2 Amps	E_{AS}	250	mJ
Avalanche Current (Note 2)	I_{AR}	13	A
Peak Diode Recovery dv/dt (Note 3)	dv/dt	3.0	V/ns
Maximum Temperature for Soldering @ Lead at 0.063 in(1.6mm) from case for 10 seconds	T_L	300	°C
Maximum Temperature for Soldering @ Package Body for 10 seconds	T_{PKG}	260	°C
Total Power Dissipation (T_C=25℃)	Pd	195	W
Linear Derating Factor		1.72	W/°C
Operating Junction and Storage Temperature	Tj, Tstg	-55~+150	°C

Note : *1. TJ=+25℃ to +150℃.

*2. Repetitive rating; pulse width limited by maximum junction temperature.

*3. ISD=10A, dI/dt<100A/μs, VDD<BVDSS, TJ=+150℃.

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j\text{-}c}$	0.64	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{th,j\text{-}a}$	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
BV_{DSS}	-	550	-	V	V_{GS}=0, I_D=250μA, Tj=150°C
$\Delta BV_{DSS}/\Delta Tj$	-	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}	-	15	-	S	V_{DS} =15V, I_D=13A
I_{GSS}	-	-	±100	nA	V_{GS}=±30
I_{DSS}	-	-	20	μA	V_{DS} =500V, V_{GS} =0
I_{DSS}	-	-	200	μA	V_{DS} =400V, V_{GS} =0, Tj=125°C
*$R_{DS(ON)}$	-	0.38	0.48	Ω	V_{GS} =10V, I_D=7.8A
Dynamic					
*Qg	-	40	-	nC	I_D=13A, V_{DD}=250V, V_{GS}=10V
*Qgs	-	10	-		
*Qgd	-	15	-		
*$t_{d(ON)}$	-	16	-	ns	V_{DD}=250V, I_D=13A, V_{GS}=10V, R_G=9.1Ω
*tr	-	30	-		
*$t_{d(OFF)}$	-	48	-		
*t_f	-	34	-		
Ciss	-	2222	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	180	-		
Crss	-	17	-		
Source-Drain Diode					
*V_{SD}	-	-	1.5	V	I_S=13A, V_{GS}=0V
*I_S	-	-	13	A	V_D=V_G=0, V_S=1.3V
*I_{SM}	-	-	52		
*trr	-	392	-	ns	V_{GS}=0, I_F=13A, dI/dt=100A/μs
*Qrr	-	3529	-	nC	

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

Ordering Information

Device	Package	Shipping	Marking
MTN13N50E3	TO-220 (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton	13N50

Characteristic Curves

Figure 1. Transient Thermal Response Curve

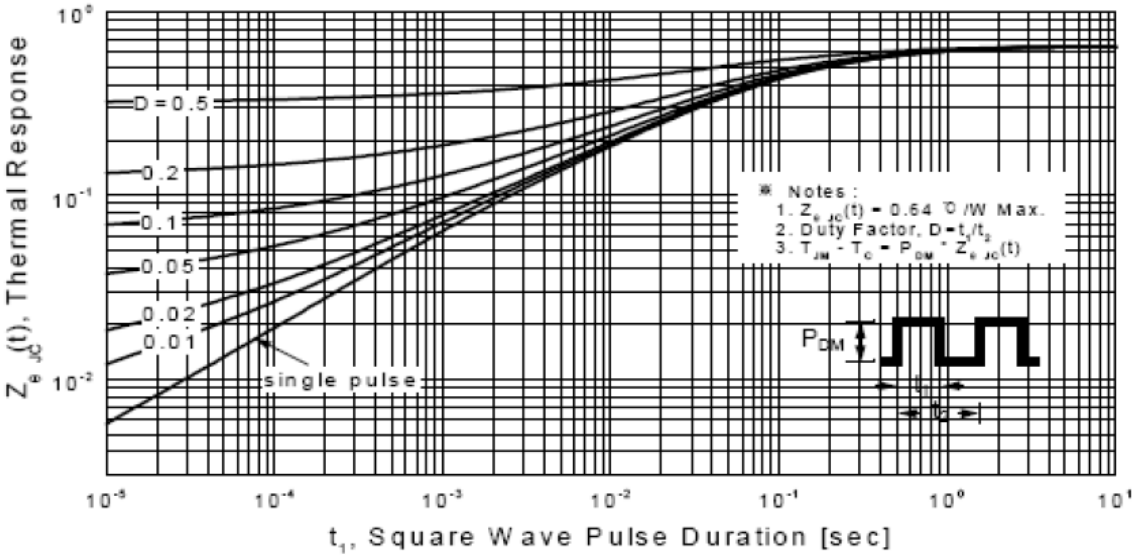


Figure 2. Maximum Drain Current vs Case Temperature

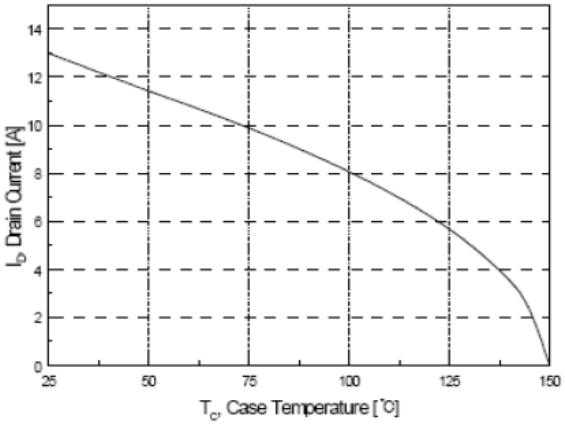


Figure 3. On-Region Characteristics

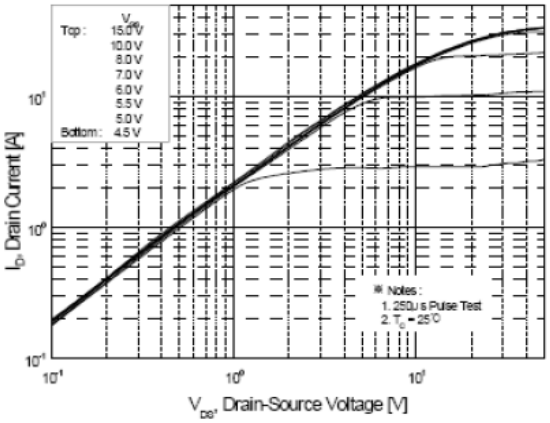


Figure 4. Transfer Characteristics

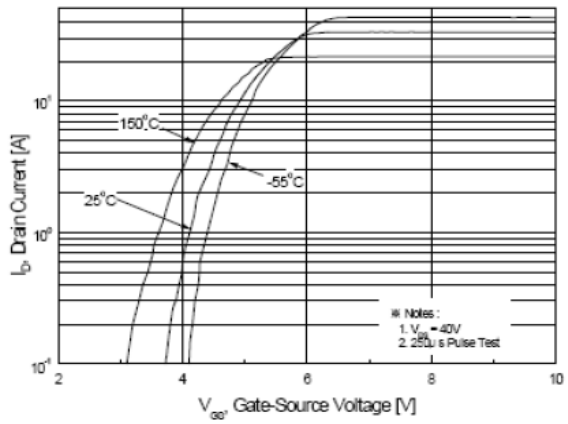
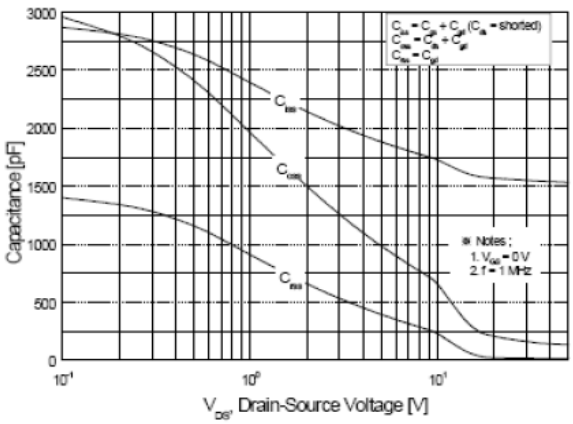


Figure 5. Capacitance Characteristics



Characteristic Curves(Cont.)

Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature

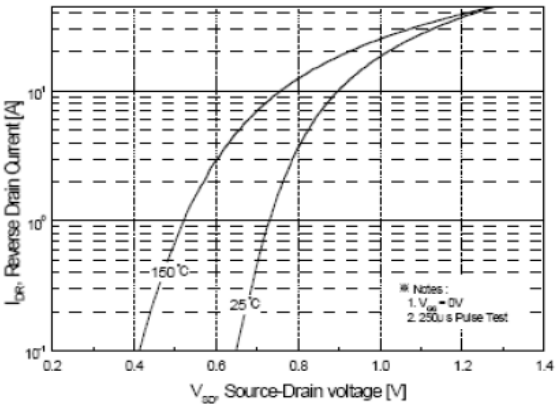


Figure 7. On-Resistance Variation vs Drain Current and Gate Voltage

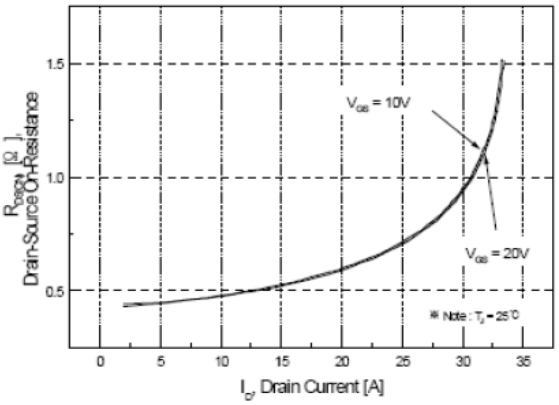


Figure 8. Breakdown Voltage Variation vs Temperature

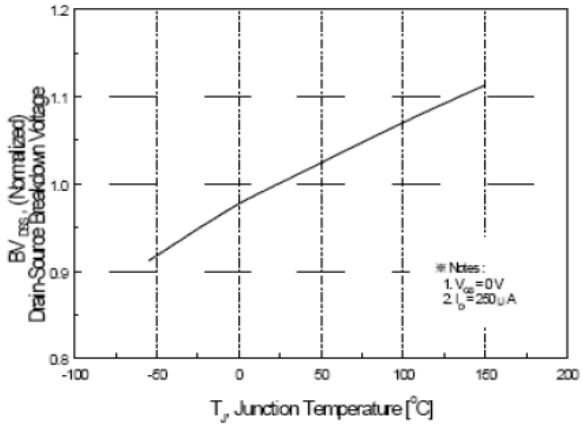


Figure 9. Gate Charge Characteristics

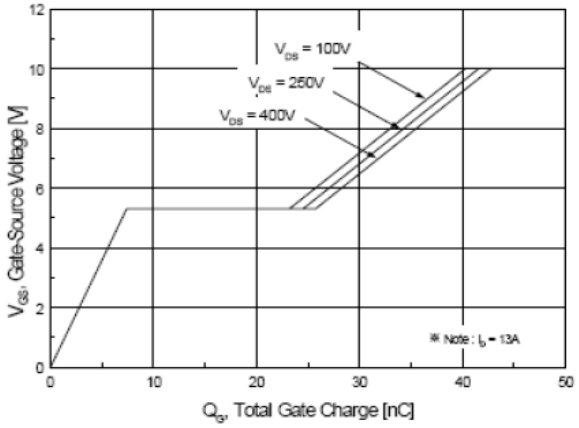


Figure 10. On-Resistance Variation vs Temperature

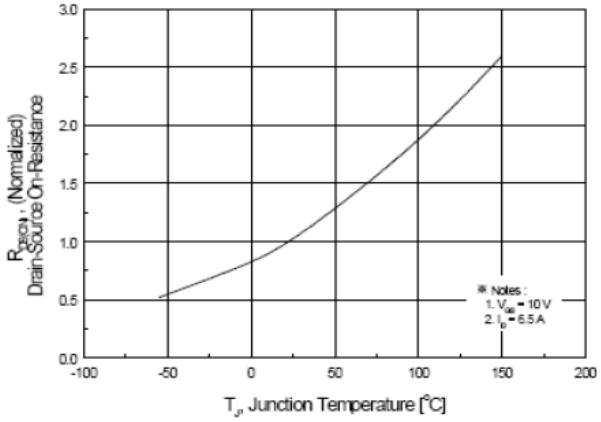
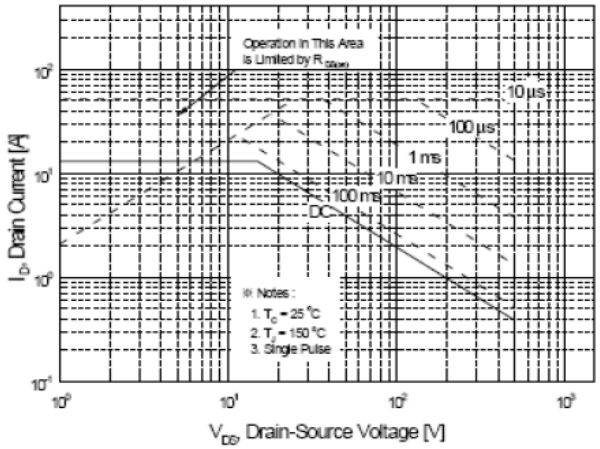


Figure 11. Maximum Safe Operating Area



Test Circuit and Waveforms

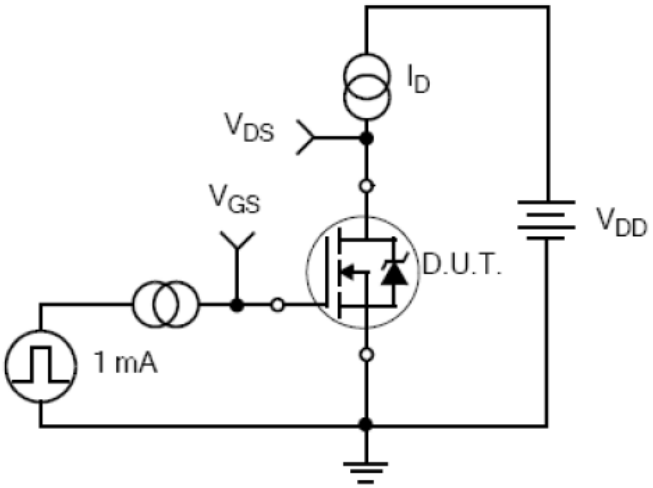


Figure 12. Gate Charge Test Circuit

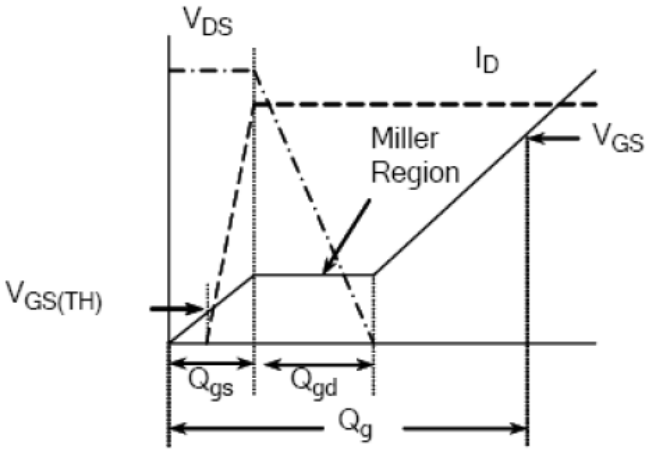


Figure 13. Gate Charge Waveform

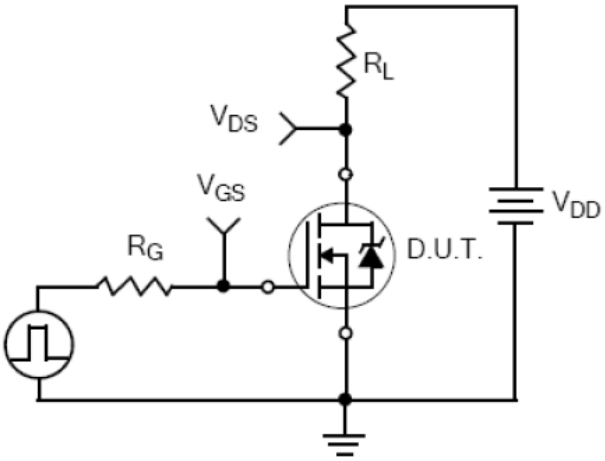


Figure 14. Resistive Switching Test Circuit

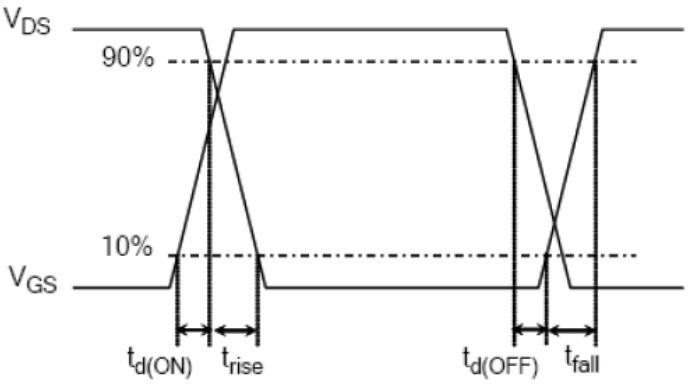


Figure 15. Resistive Switching Waveforms

Test Circuit and Waveforms(Cont.)

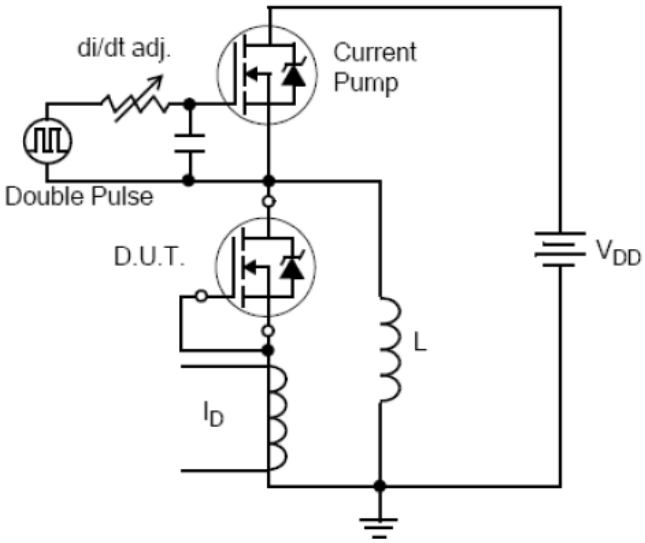


Figure 16. Diode Reverse Recovery Test Circuit

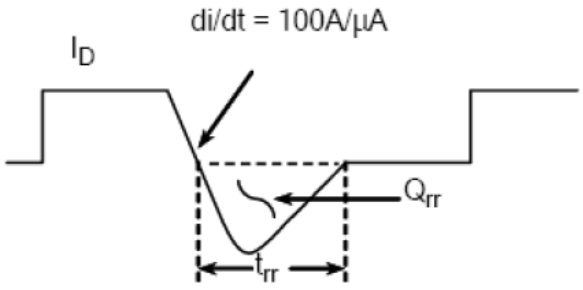


Figure 17. Diode Reverse Recovery Waveform

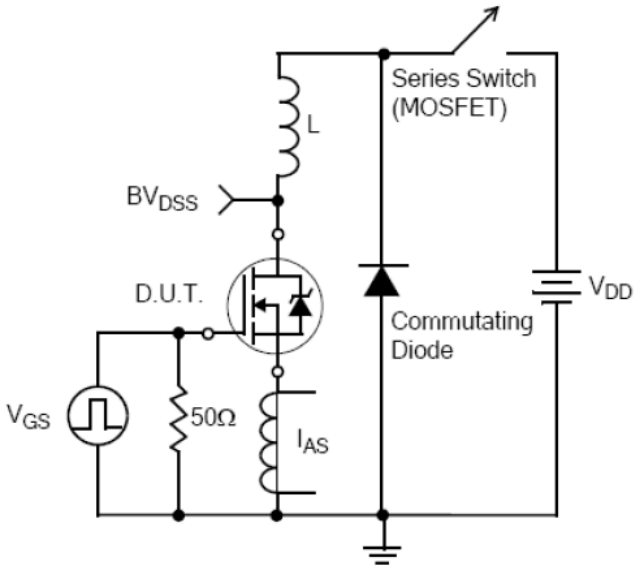


Figure 18. Unclamped Inductive Switching Test Circuit

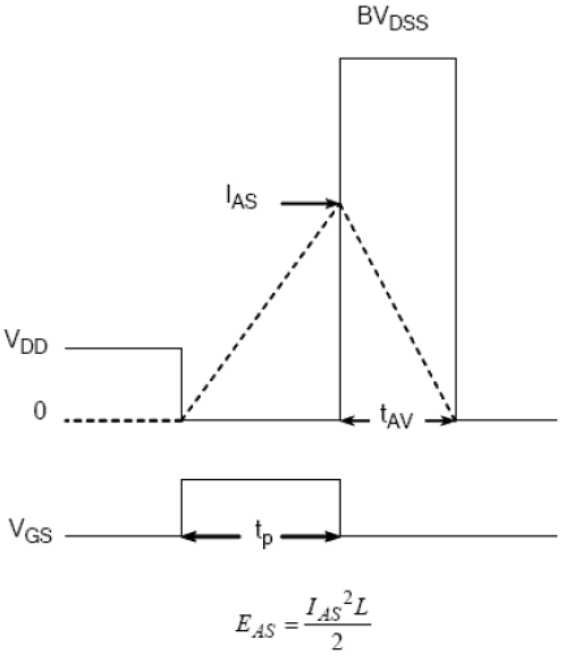
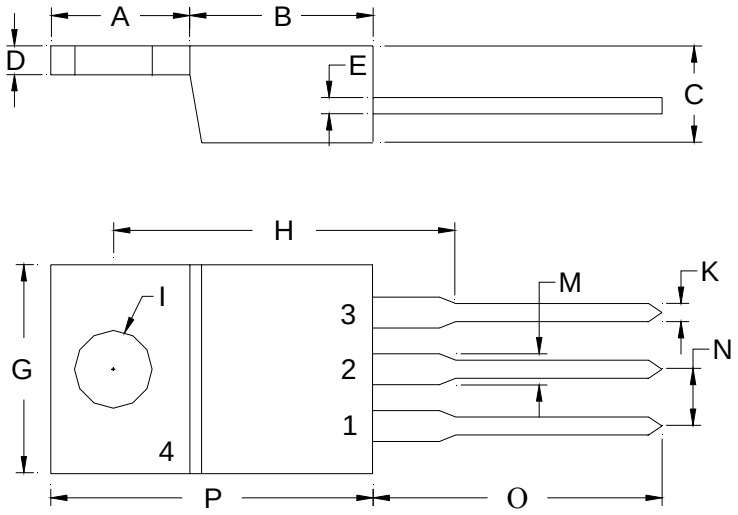


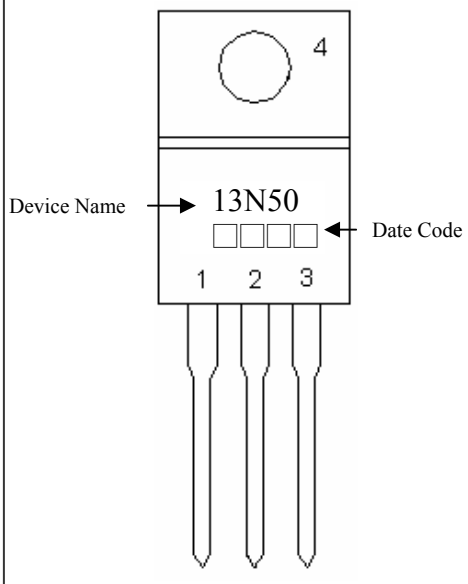
Figure 19. Unclamped Inductive Switching Waveforms

TO-220AB Dimension



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

Marking:



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

*: Typical

DIM	Inches		Millimeters		DIM	Inches		Millimeters	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	0.2441	0.2598	6.20	6.60	I	-	*0.1508	-	*3.83
B	0.3386	0.3543	8.60	9.00	K	0.0299	0.0394	0.76	1.00
C	0.1732	0.1890	4.40	4.80	M	0.0461	0.0579	1.17	1.47
D	0.0492	0.0571	1.25	1.45	N	-	*0.1000	-	*2.54
E	0.0142	0.0197	0.36	0.50	O	0.5217	0.5610	13.25	14.25
G	0.3858	0.4094	9.80	10.40	P	0.5787	0.6024	14.70	15.30
H	-	*0.6398	-	*16.25					

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