

N-Channel Enhancement Mode Power MOSFET

MTN13N45E3

BV_{DSS} : 450V
R_{DS(ON)} : 0.55 Ω
I_D : 13A**Description**

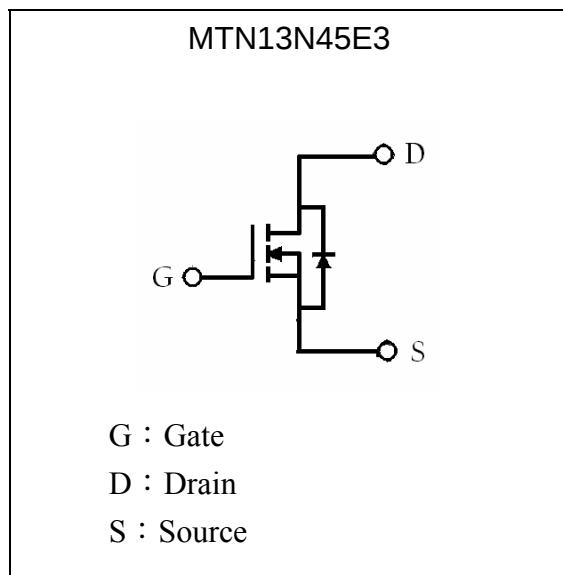
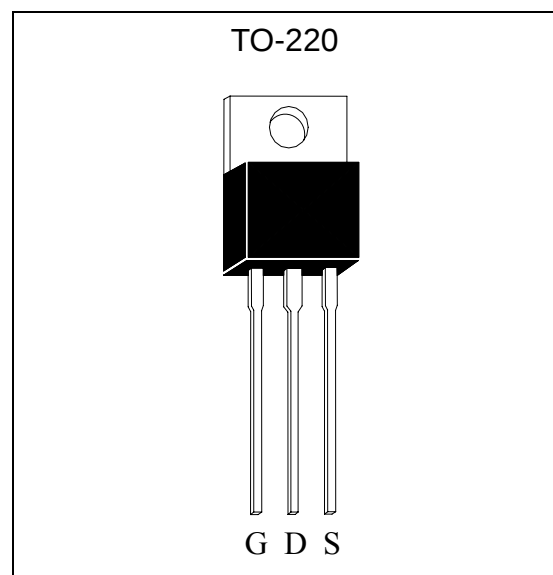
The MTN13N45E3 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-220 package is universally preferred for all commercial-industrial applications

Features

- BV_{DSS}=500V typically @ T_j=150°C
- 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**Outline**

**Absolute Maximum Ratings** ($T_C=25^{\circ}\text{C}$)

Parameter	Symbol	Limits	Unit
Drain-Source Voltage (Note 1)	V_{DS}	450	V
Gate-Source Voltage	V_{GS}	± 30	V
Continuous Drain Current	I_D	13*	A
Continuous Drain Current @ $T_C=100^{\circ}\text{C}$	I_D	7.8*	A
Pulsed Drain Current @ $V_{GS}=10\text{V}$ (Note 2)	I_{DM}	52*	A
Single Pulse Avalanche Energy (Note 3)	E_{AS}	570	mJ
Avalanche Current (Note 2)	I_{AR}	13	A
Repetitive Avalanche Energy (Note 2)	E_{AR}	16	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	4.5	V/ns
Maximum Temperature for Soldering @ Lead at 0.125in(3.175mm) from case for 10 seconds	T_L	300	$^{\circ}\text{C}$
Total Power Dissipation ($T_C=25^{\circ}\text{C}$)	P_D	160	W
Linear Derating Factor above 25°C		1.35	W/ $^{\circ}\text{C}$
Operating Junction and Storage Temperature	T_J, T_{stg}	-55~+150	$^{\circ}\text{C}$

*Drain current limited by maximum junction temperature

Note : 1. $T_J=+25^{\circ}\text{C}$ to $+150^{\circ}\text{C}$.

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

3. $I_{SD}=13\text{A}$, $dI/dt < 100\text{A}/\mu\text{s}$, $V_{DD} < BV_{DSS}$, $T_J=+150^{\circ}\text{C}$.4. $I_{AS}=13\text{A}$, $V_{DD}=50\text{V}$, $L=6\text{mH}$, $R_G=25\Omega$, starting $T_J=+25^{\circ}\text{C}$.**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	0.78	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	62.5	$^{\circ}\text{C}/\text{W}$

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV _{DSS}	450	-	-	V	V _{GS} =0, I _D =250μA
BV _{DSS}	-	500	-	V	V _{GS} =0, I _D =250μA, T _j =150°C
ΔBV _{DSS} /ΔT _j	-	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}	-	5	-	S	V _{DS} =15V, I _D =6.5A
I _{GSS}	-	-	±100	nA	V _{GS} =±30
I _{DSS}	-	-	1	μA	V _{DS} =450V, V _{GS} =0
	-	-	25		V _{DS} =360V, V _{GS} =0, T _j =125°C
*R _{DS(ON)}	-	-	0.55	Ω	V _{GS} =10V, I _D =6.5A
Dynamic					
*Q _g	-	43	-	nC	I _D =13A, V _{DD} =250V, V _{GS} =10V
*Q _{gs}	-	11	-		
*Q _{gd}	-	20	-		
*t _{d(ON)}	-	38	-	ns	V _{DD} =250V, I _D =13A, V _{GS} =10V, R _G =25 Ω
*t _r	-	135	-		
*t _{d(OFF)}	-	90	-		
*t _f	-	80	-		
C _{iss}	-	1650	-	pF	V _{GS} =0V, V _{DS} =25V, f=1MHz
C _{oss}	-	235	-		
C _{rss}	-	22	-		
Source-Drain Diode					
*V _{SD}	-	-	1.5	V	I _S =6.5A, V _{GS} =0V
*I _S	-	-	13	A	V _D =V _G =0, V _S =1.3V
*I _{SM}	-	-	52		
*t _{rr}	-	270	-	ns	V _{GS} =0, I _F =13A, dI/dt=100A/μs
*Q _{rr}	-	2.5	-	μC	

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

Ordering Information

Device	Package	Shipping	Marking
MTN13N45E3	TO-220 (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton	13N45

Characteristic Curves

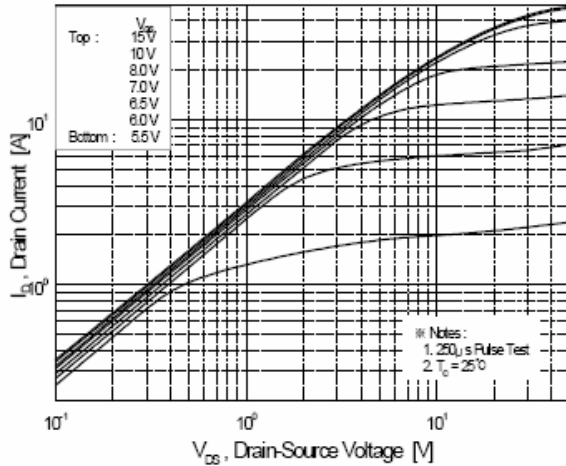


Figure 1. On-Region Characteristics

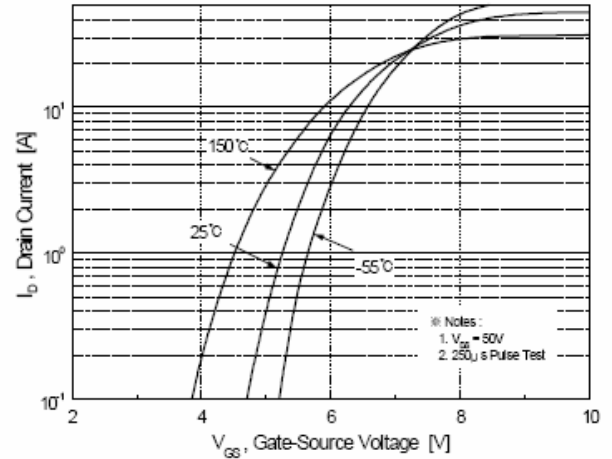


Figure 2. Transfer Characteristics

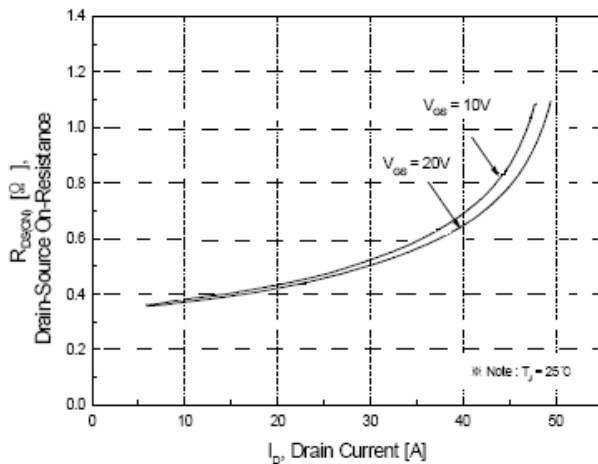


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

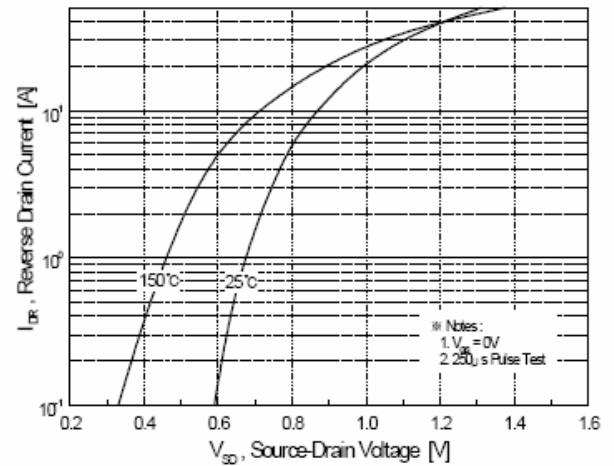


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

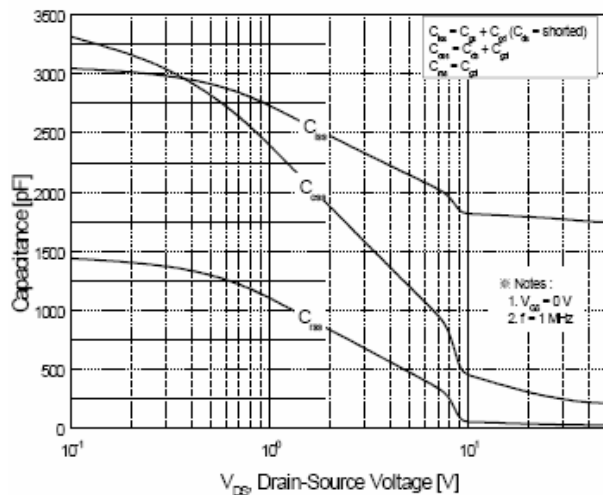


Figure 5. Capacitance Characteristics

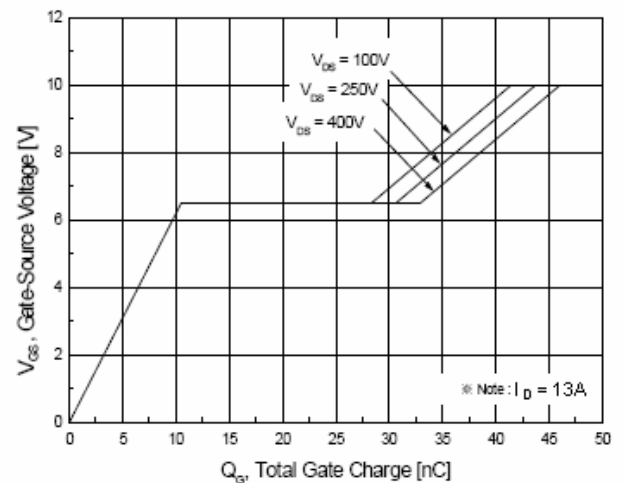


Figure 6. Gate Charge Characteristics

Characteristic Curves(Cont.)

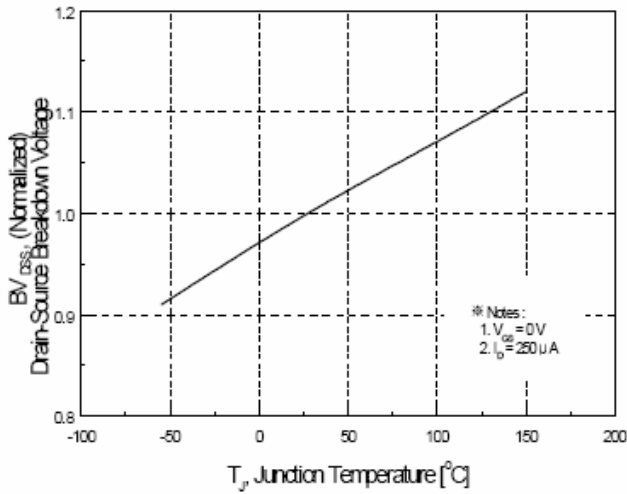


Figure 7. Breakdown Voltage Variation vs. Temperature

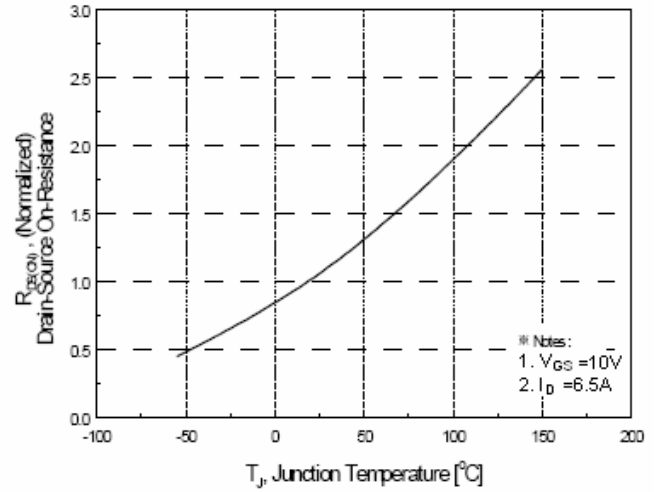


Figure 8. On-Resistance Variation vs. Temperature

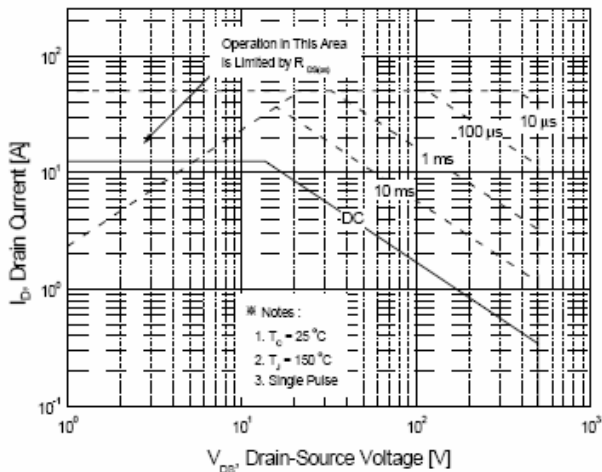


Figure 9. Maximum Safe Operating Area

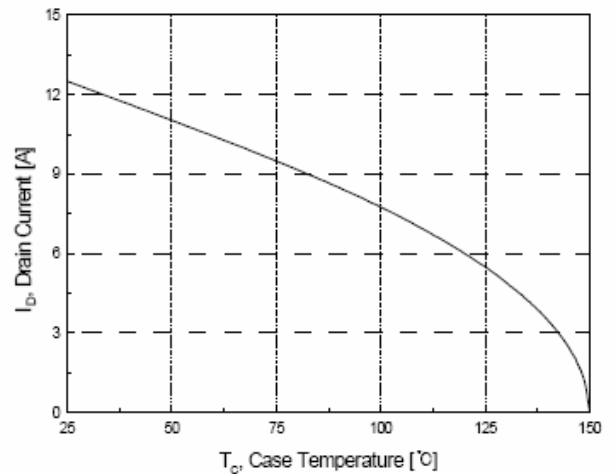


Figure 10. Maximum Drain Current vs. Case Temperature

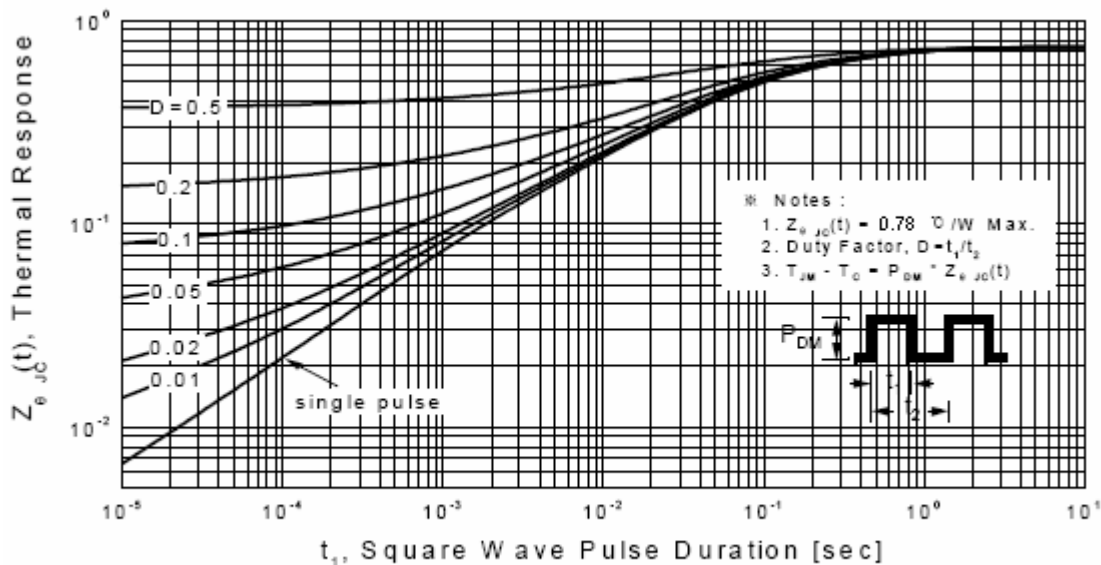
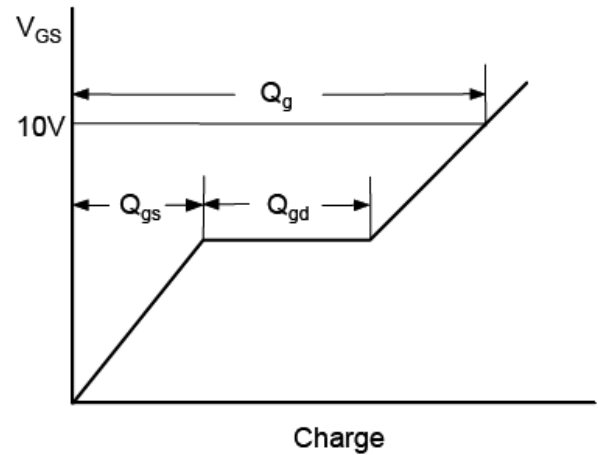
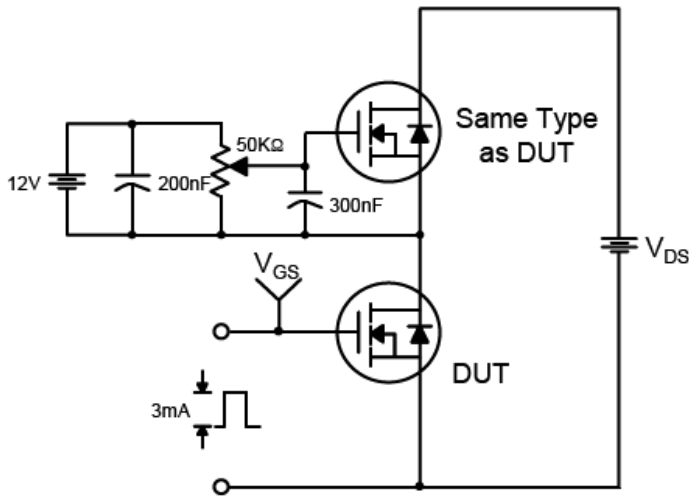
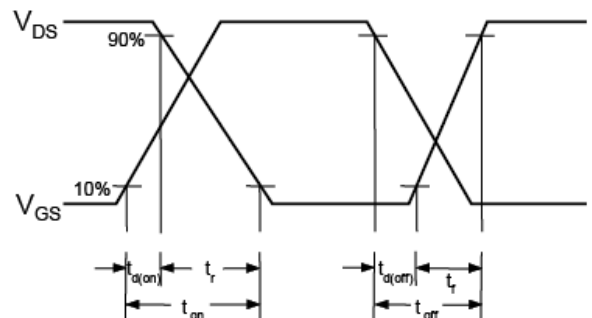
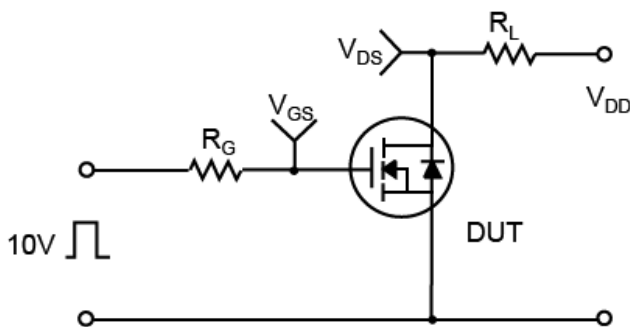


Figure 11-1. Transient Thermal Response Curve

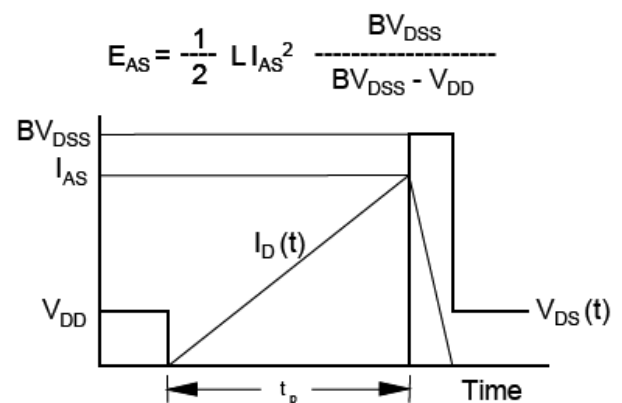
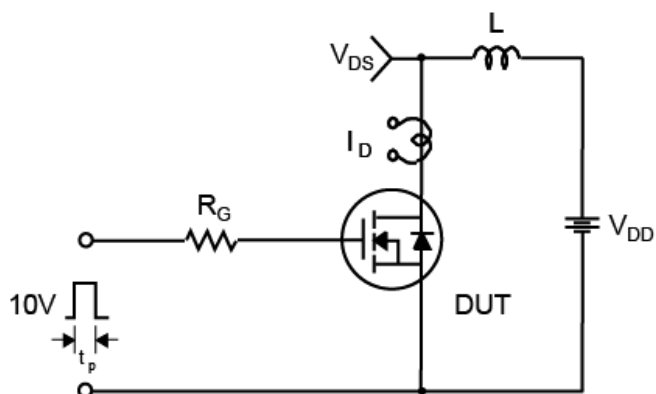
Test Circuit and Waveforms

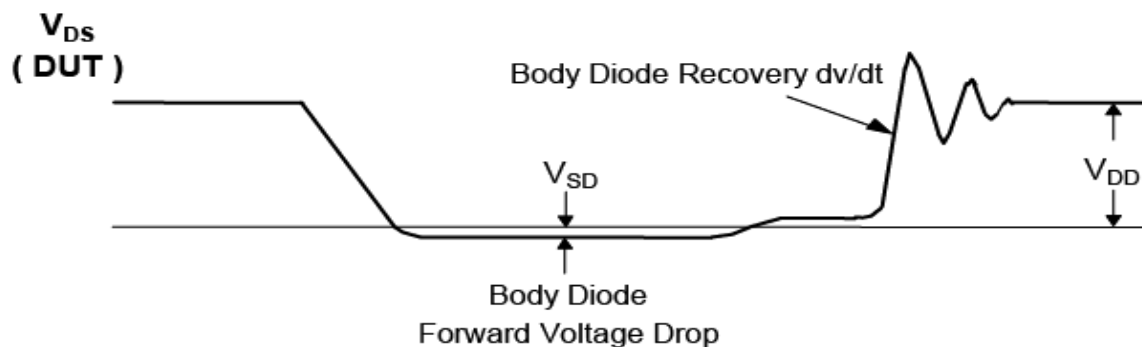
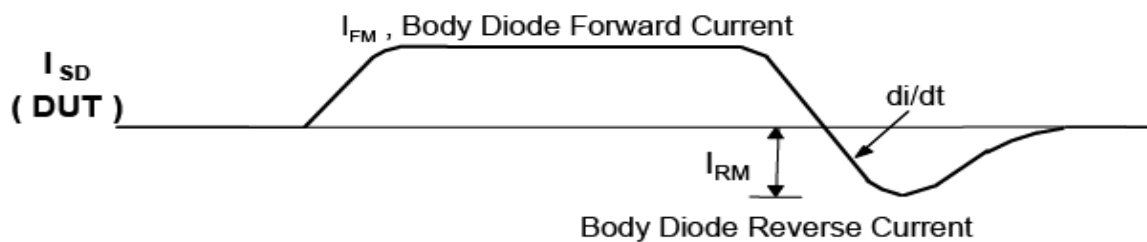
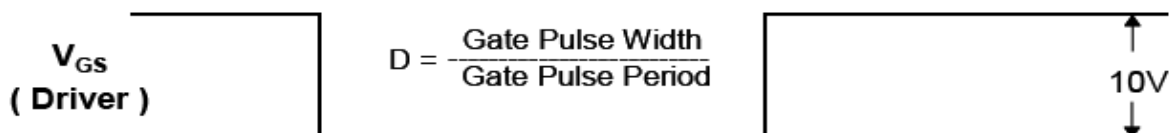
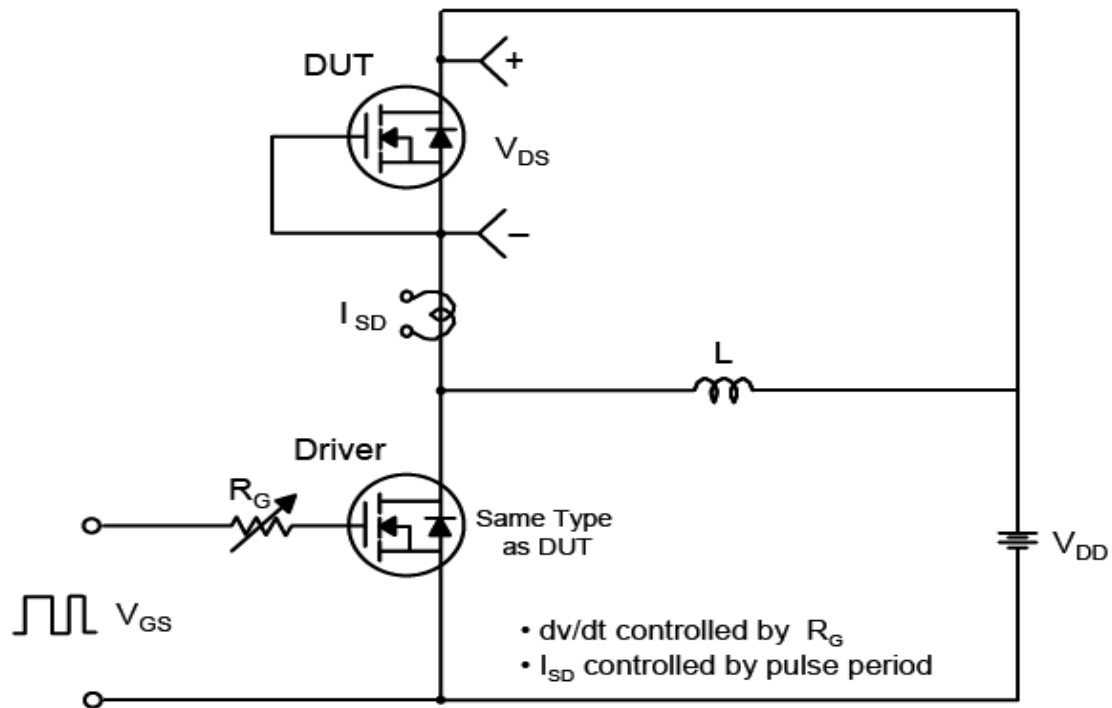


Resistive Switching Test Circuit & Waveforms

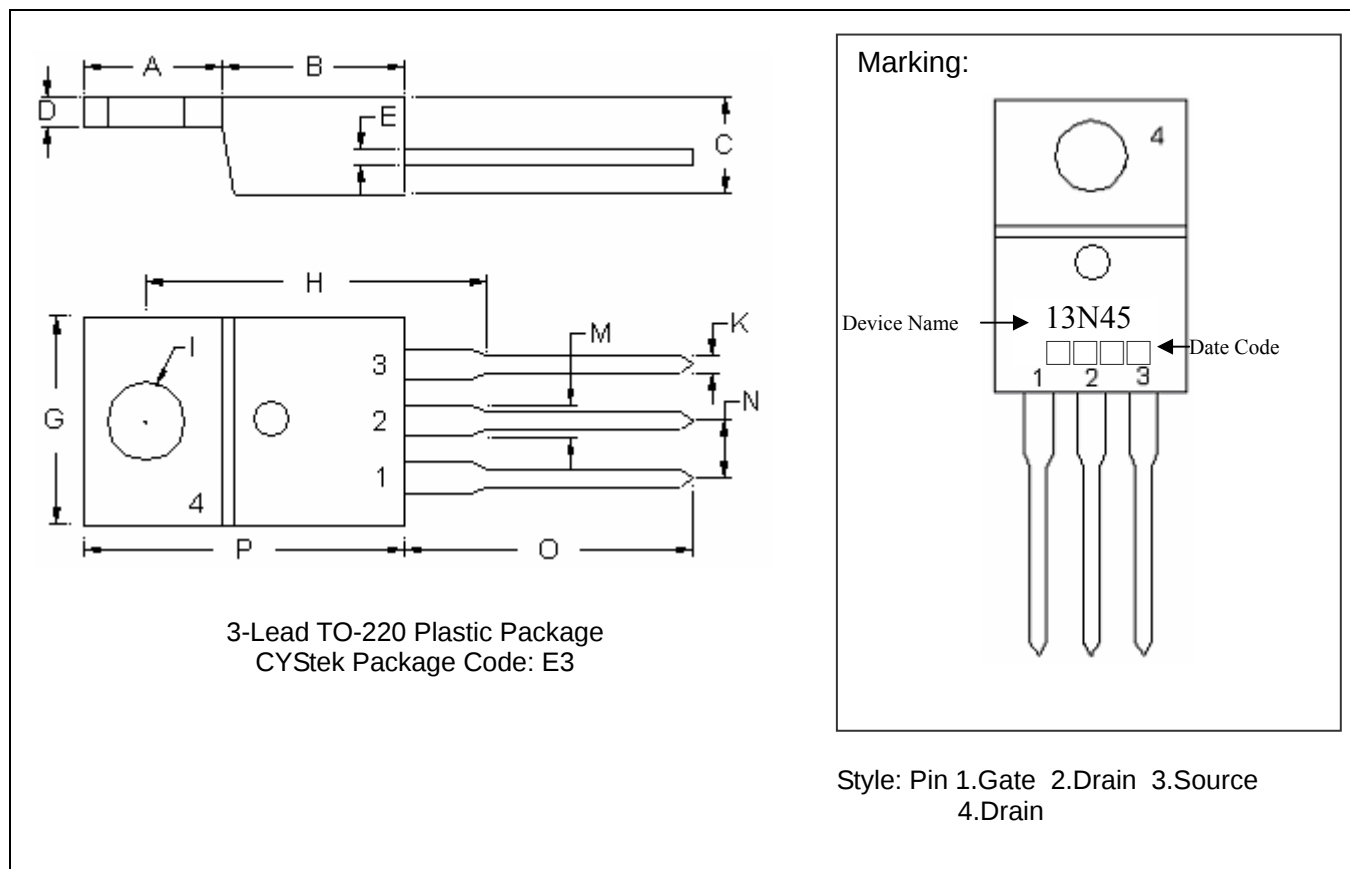


Unclamped Inductive Switching Test Circuit & Waveforms



Test Circuit and Waveforms(Cont.)
Peak Diode Recovery dv/dt Test Circuit & Waveforms


TO-220 Dimension



*: 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

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