

**N-Channel Enhancement Mode Power MOSFET**

# MTN14N45E3

<b><math>BV_{DSS}</math> : 450V</b>
<b><math>R_{DS(ON)}</math> : 0.5 <math>\Omega</math></b>
<b><math>I_D</math> : 14A</b>

**Description**

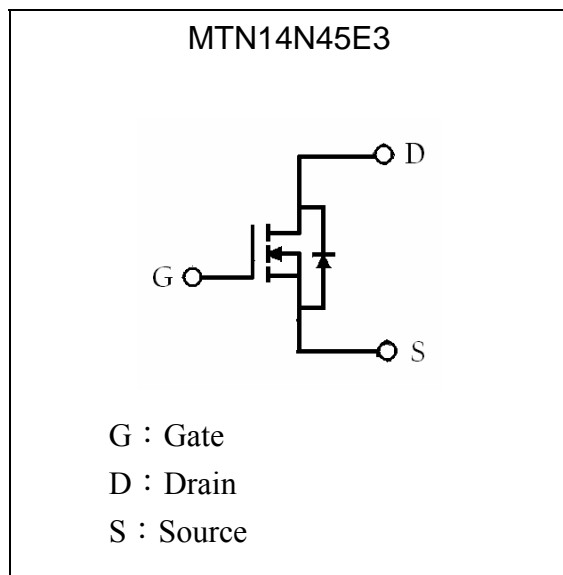
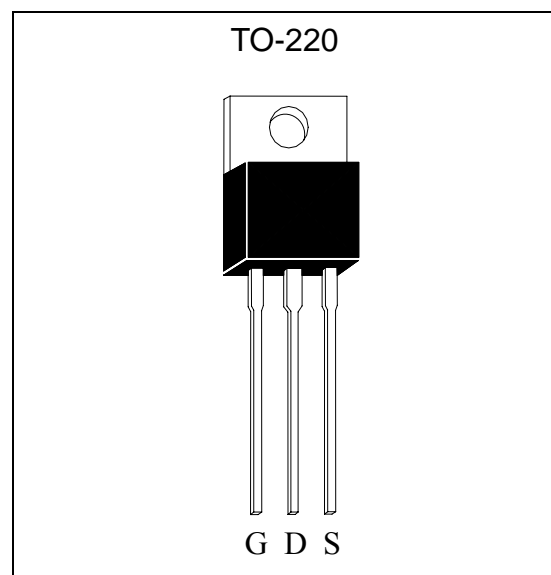
The MTN14N45E3 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness. The TO-220 package is universally preferred for all commercial-industrial applications

**Features**

- $BV_{DSS}$ =500V typically @  $T_j=150^\circ\text{C}$
- 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	$V_{GS}$	$\pm 30$	V
Continuous Drain Current	$I_D$	14*	A
Continuous Drain Current @ $T_C=100^\circ\text{C}$	$I_D$	8.4*	A
Pulsed Drain Current @ $V_{GS}=10\text{V}$ (Note 2)	$I_{DM}$	56*	A
Single Pulse Avalanche Energy (Note 3)	$E_{AS}$	660	mJ
Avalanche Current (Note 2)	$I_{AR}$	14	A
Repetitive Avalanche Energy (Note 2)	$E_{AR}$	17	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	$^\circ\text{C}$
Total Power Dissipation ( $T_C=25^\circ\text{C}$ )	$P_D$	170	W
Linear Derating Factor above $25^\circ\text{C}$		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.  $I_{SD}=14\text{A}$ ,  $dI/dt < 100\text{A}/\mu\text{s}$ ,  $V_{DD} < BV_{DSS}$ ,  $T_J=+150^\circ\text{C}$ .  
4.  $I_{AS}=14\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $L=6\text{mH}$ ,  $R_G=25\ \Omega$ , starting  $T_J=+25^\circ\text{C}$ .

**Thermal Data**

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	0.74	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	62.5	$^\circ\text{C}/\text{W}$



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

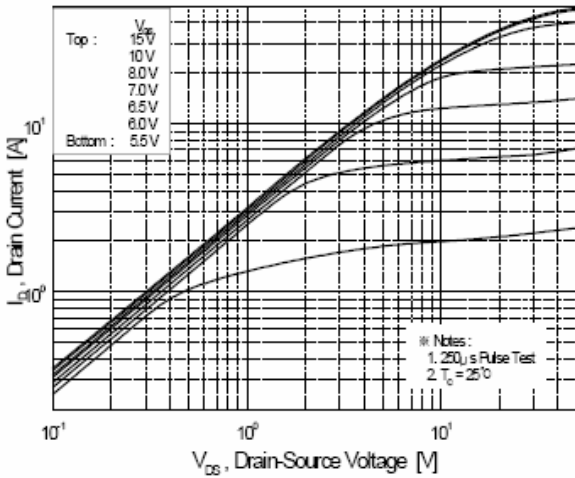
Symbol	Min.	Typ.	Max.	Unit	Test Conditions
<b>Static</b>					
BV <sub>DSS</sub>	450	-	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250μA
BV <sub>DSS</sub>	-	500	-	V	V <sub>GS</sub> =0, I <sub>D</sub> =250μA, Tj=150°C
ΔBV <sub>DSS</sub> /ΔTj	-	0.5	-	V/°C	Reference to 25°C, I <sub>D</sub> =250μA
V <sub>GS(th)</sub>	2.0	-	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA
*G <sub>FS</sub>	-	5	-	S	V <sub>DS</sub> =15V, I <sub>D</sub> =7A
I <sub>GSS</sub>	-	-	±100	nA	V <sub>GS</sub> =±30
I <sub>DSS</sub>	-	-	1	μA	V <sub>DS</sub> =450V, V <sub>GS</sub> =0
	-	-	25		V <sub>DS</sub> =360V, V <sub>GS</sub> =0, Tj=125°C
*R <sub>DS(ON)</sub>	-	-	0.5	Ω	V <sub>GS</sub> =10V, I <sub>D</sub> =7A
<b>Dynamic</b>					
*Q <sub>g</sub>	-	45	-	nC	I <sub>D</sub> =14A, V <sub>DD</sub> =250V, V <sub>GS</sub> =10V
*Q <sub>gs</sub>	-	11	-		
*Q <sub>gd</sub>	-	22	-		
*t <sub>d(ON)</sub>	-	40	-	ns	V <sub>DD</sub> =250V, I <sub>D</sub> =14A, V <sub>GS</sub> =10V, R <sub>G</sub> =10Ω
*t <sub>r</sub>	-	140	-		
*t <sub>d(OFF)</sub>	-	100	-		
*t <sub>f</sub>	-	85	-		
C <sub>iss</sub>	-	1800	-	pF	V <sub>GS</sub> =0V, V <sub>DS</sub> =25V, f=1MHz
C <sub>oss</sub>	-	245	-		
C <sub>rss</sub>	-	25	-		
<b>Source-Drain Diode</b>					
*V <sub>SD</sub>	-	-	1.5	V	I <sub>S</sub> =7A, V <sub>GS</sub> =0V
*I <sub>S</sub>	-	-	14	A	V <sub>D</sub> =V <sub>G</sub> =0, V <sub>S</sub> =1.3V
*I <sub>SM</sub>	-	-	56		
*t <sub>rr</sub>	-	290	-	ns	V <sub>GS</sub> =0, I <sub>F</sub> =14A, dI/dt=100A/μs
*Q <sub>rr</sub>	-	2.6	-	μC	

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

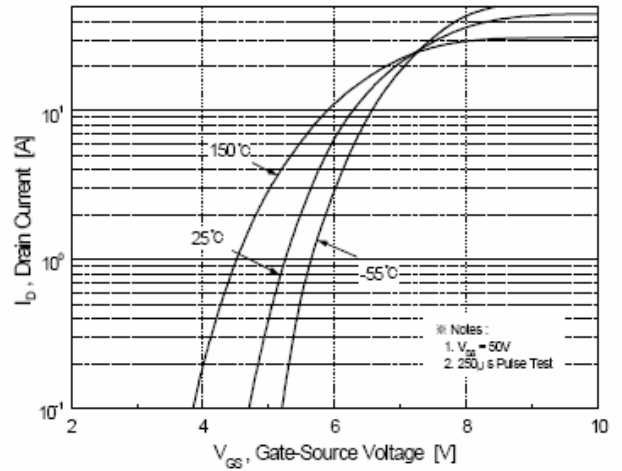
**Ordering Information**

Device	Package	Shipping	Marking
MTN14N45E3	TO-220 (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton	14N45

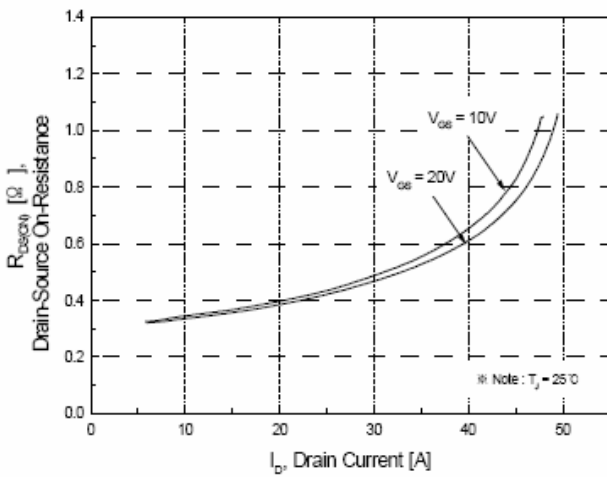
**Characteristic Curves**



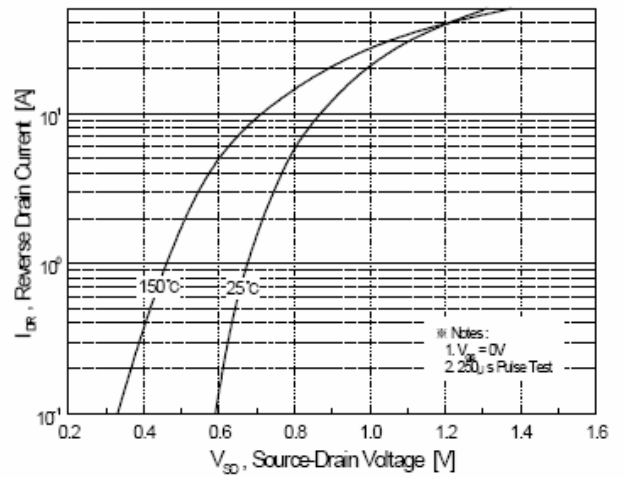
**Figure 1. On-Region Characteristics**



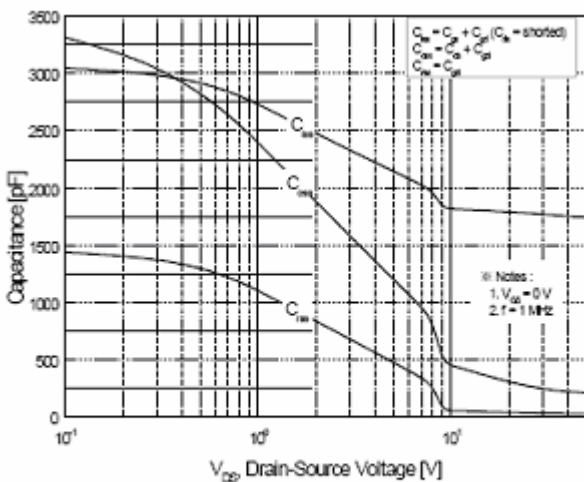
**Figure 2. Transfer Characteristics**



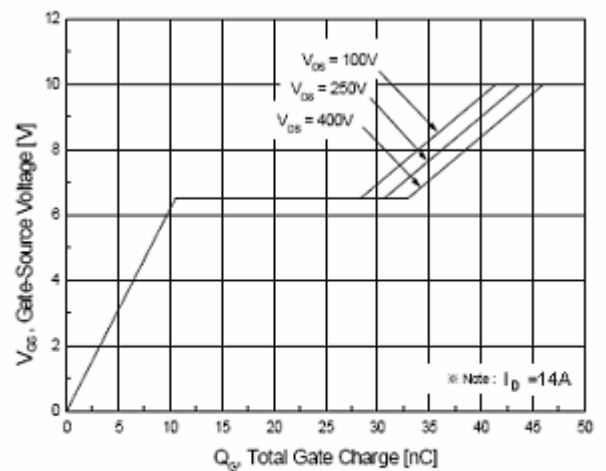
**Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage**



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

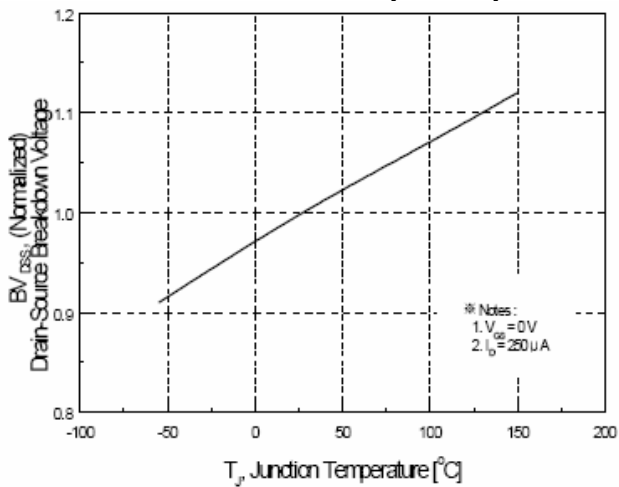


**Figure 5. Capacitance Characteristics**

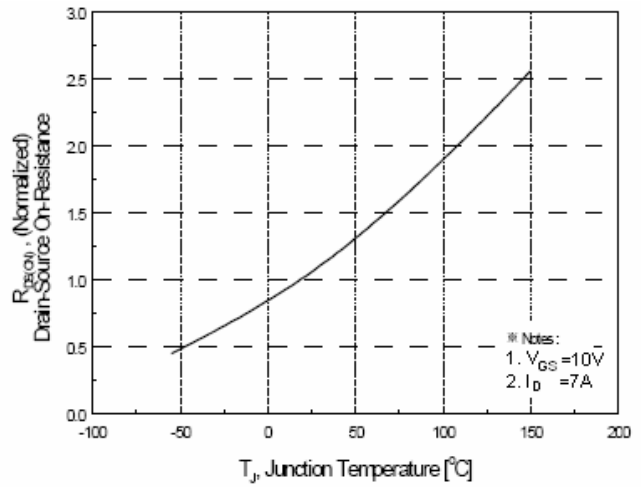


**Figure 6. Gate Charge Characteristics**

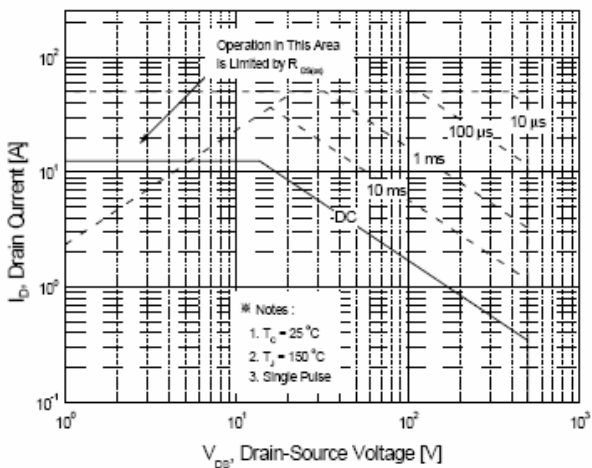
**Characteristic Curves(Cont.)**



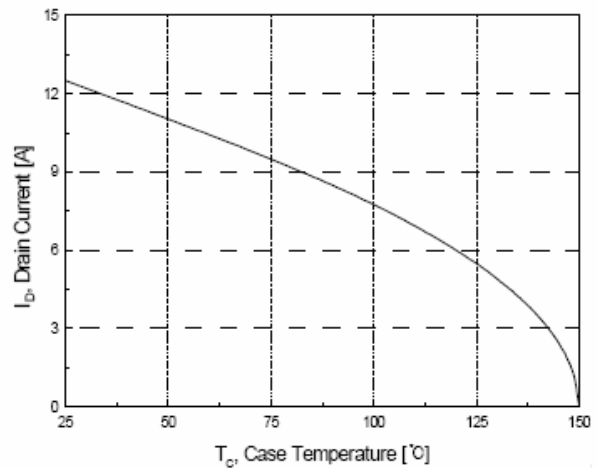
**Figure 7. Breakdown Voltage Variation vs. Temperature**



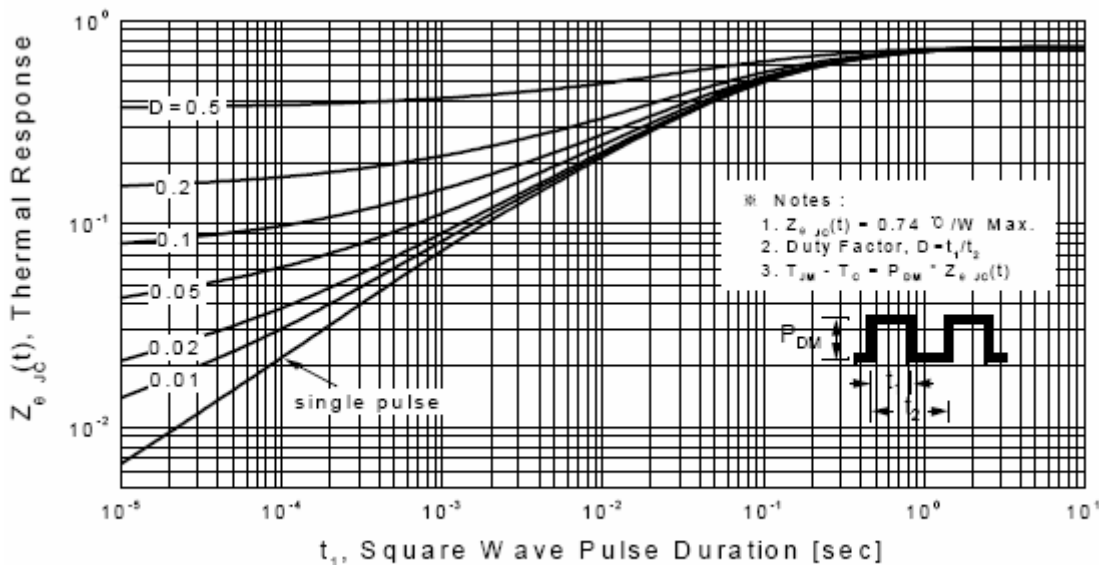
**Figure 8. On-Resistance Variation vs. Temperature**



**Figure 9. Maximum Safe Operating Area**

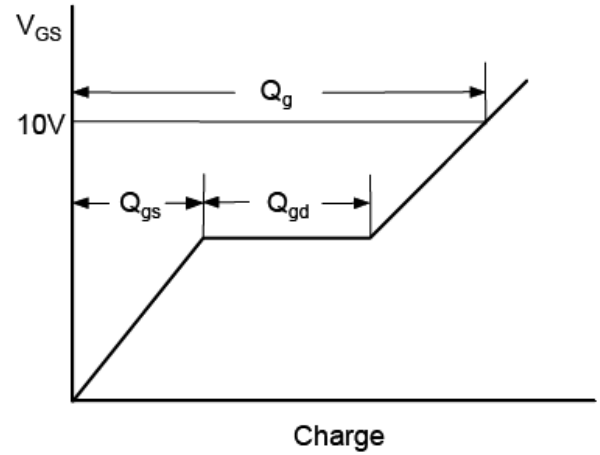
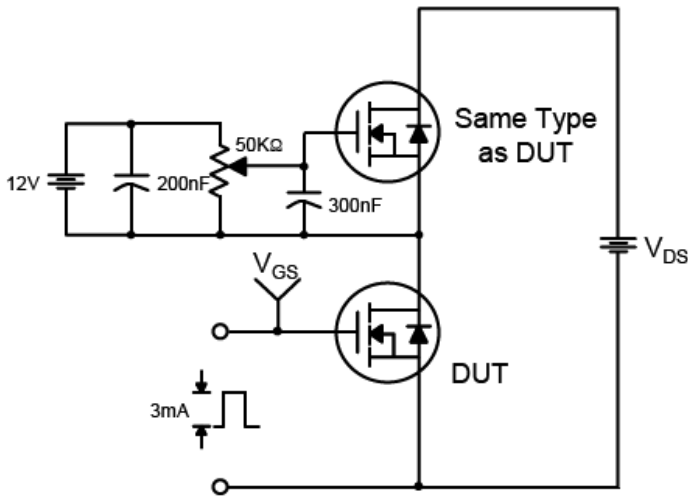


**Figure 10. Maximum Drain Current vs. Case Temperature**

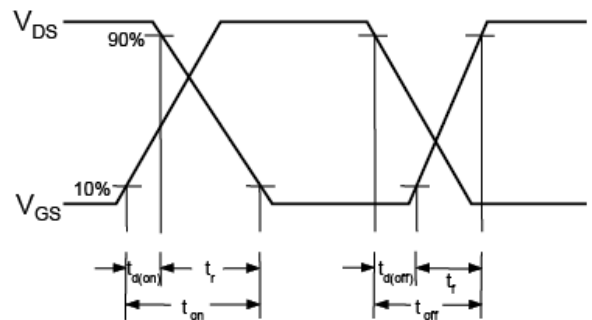
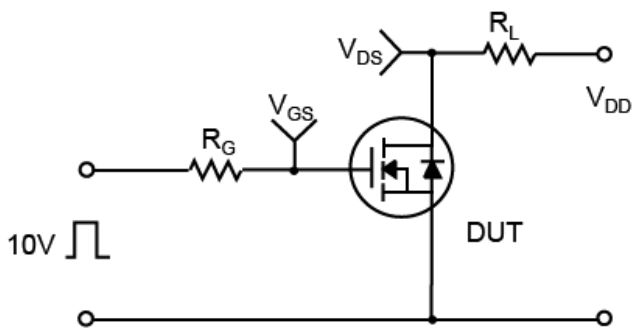


**Figure 11. Transient Thermal Response Curve**

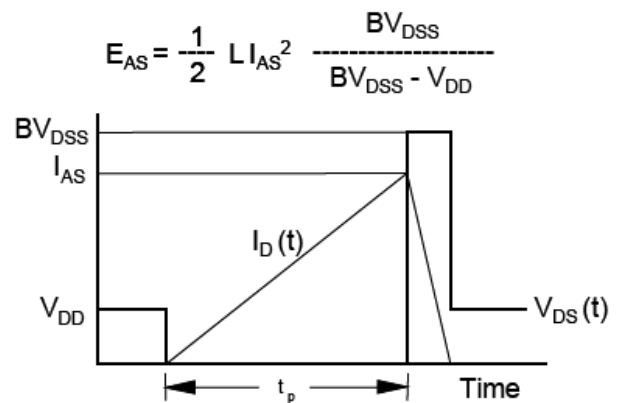
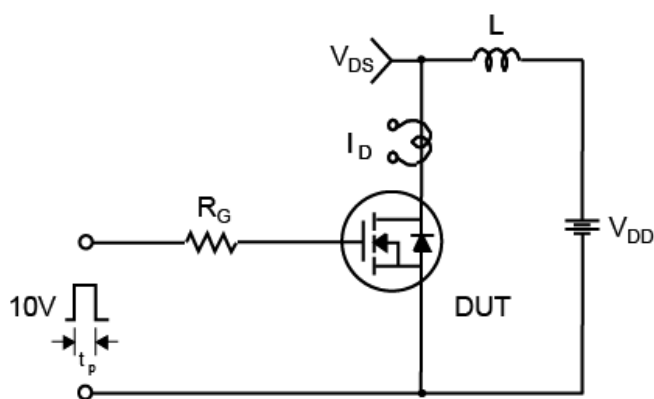
**Test Circuit and Waveforms**



**Resistive Switching Test Circuit & Waveforms**

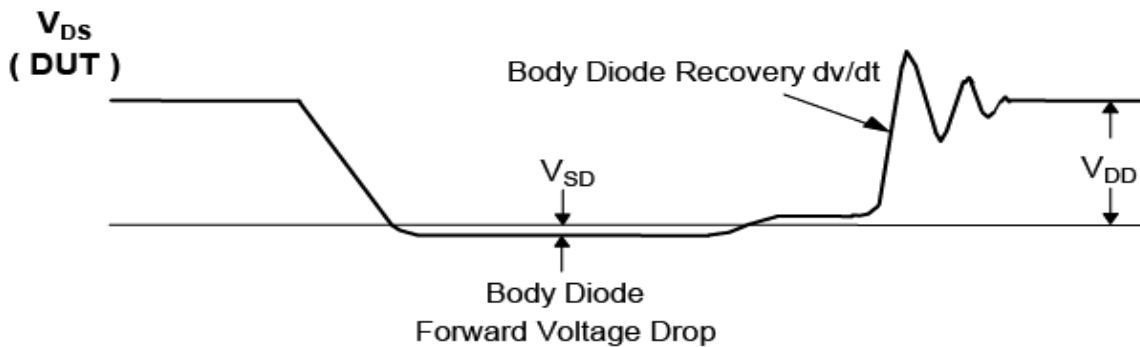
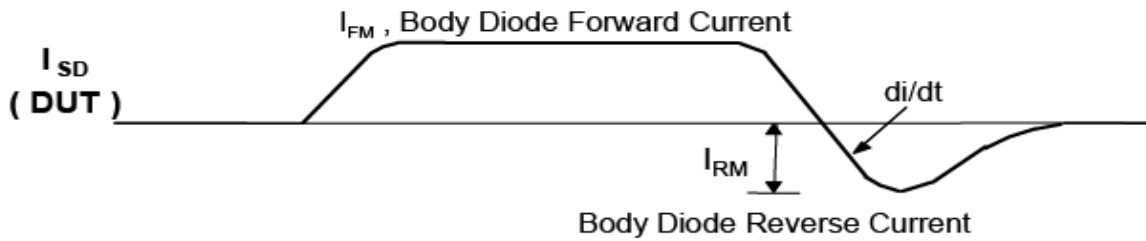
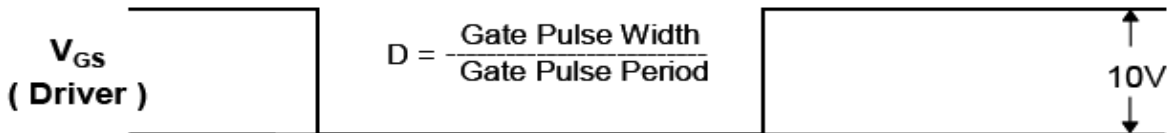
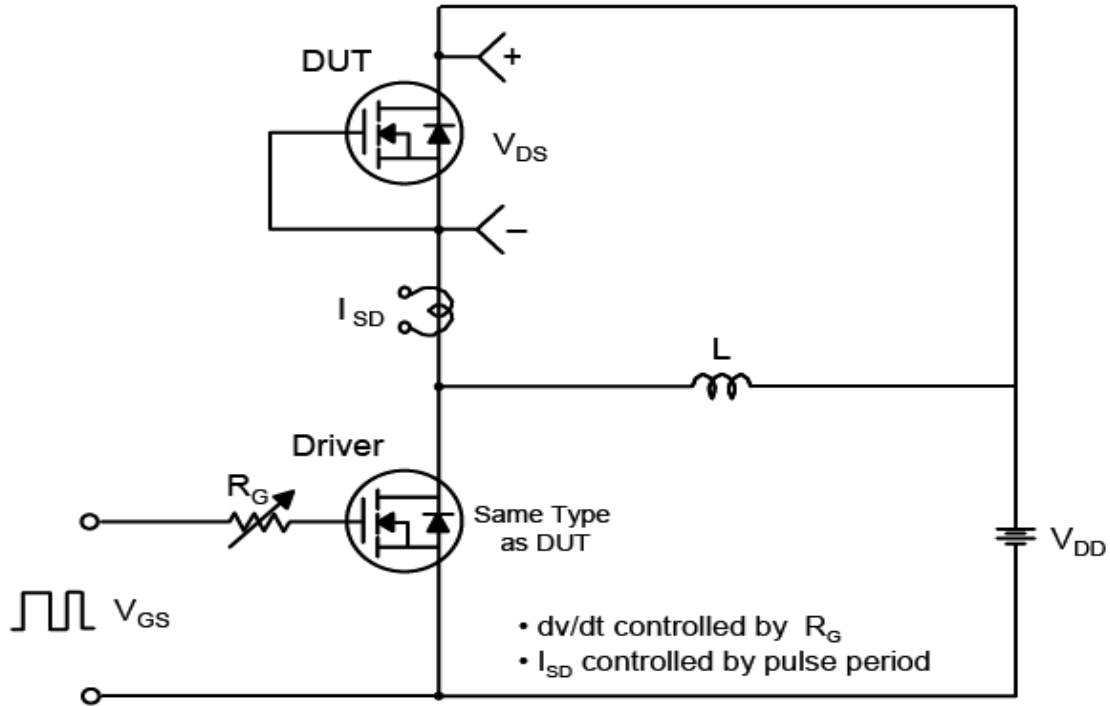


**Unclamped Inductive Switching Test Circuit & Waveforms**

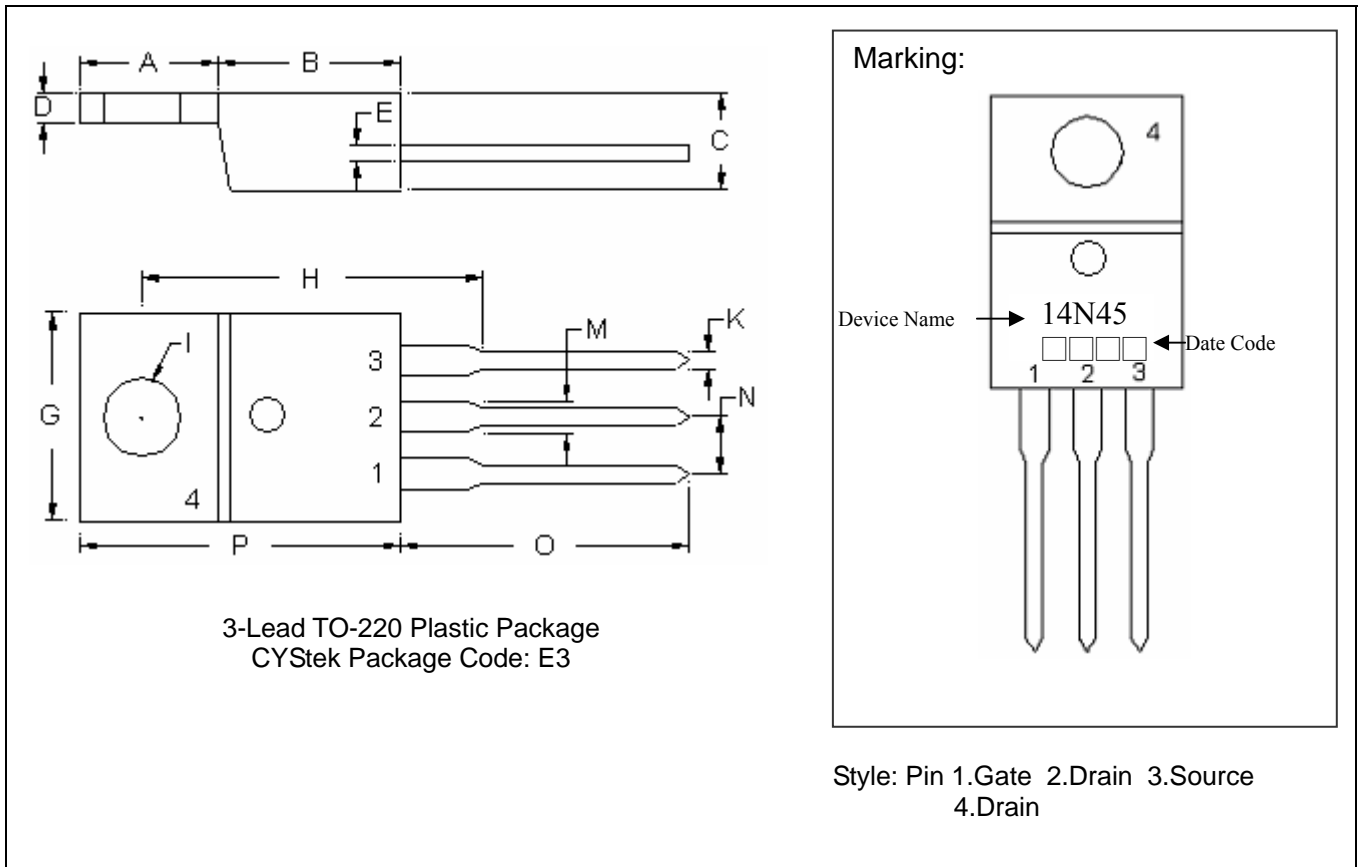


**Test Circuit and Waveforms(Cont.)**

**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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