N-Channel Enhancement Mode Power MOSFET

MTN50N06E3

BV_{DSS}	60V
$R_{DSON(MAX)}$	22 mΩ
I_D	50A

Description

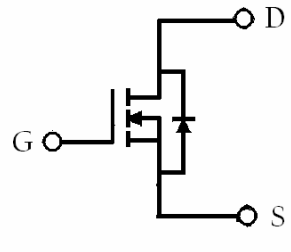
The MTN50N06E3 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness.
The TO-220 package is universally preferred for all commercial-industrial applications

Features

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

Symbol

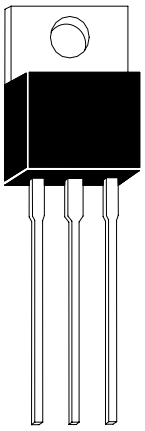
MTN50N06E3



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		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current		I_D	50	A
Continuous Drain Current @T_C=100°C		I_D	35	A
Pulsed Drain Current @ V_{GS}=10V	(Note 1)	I_{DM}	200	A
Avalanche Current	(Note 1)	I_{AR}	50	A
Single Pulse Avalanche Energy	(Note 2)	E_{AS}	500	mJ
Repetitive Avalanche Energy	(Note 1)	E_{AR}	12	
Peak Diode Recovery dV/dt	(Note 3)	dV/dt	4.5	V/ns
Total Power Dissipation (T_C=25℃)		Pd	120	W
Linear Derating Factor			0.8	W/°C
Operating Junction and Storage Temperature		Tj, Tstg	-55~+175	°C
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		T_L	300	°C

Note : *1. Pulse width limited by maximum junction temperature.
*2. L=200μH, I_{AS}=50A,V_{DD}=30V, starting T_J=+25℃
*3. I_{SD}≤50A, dI/dt<100A/μs, V_{DD}≤BV_{DSS}, T_J≤Tj(max).

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{th,j-c}$	1.24	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{th,j-a}$	62.5	°C/W

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

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	60	-	-	V	V_{GS}=0, I_D=250μA
$V_{GS(th)}$	2.0	2.8	4.0	V	V_{DS} = V_{GS}, I_D=250μA
I_{GSS}	-	-	±100	nA	V_{GS}=±20
I_{DSS}	-	-	5	μA	V_{DS} =60V, V_{GS} =0
I_{DSS}	-	-	25	μA	V_{DS} =48V, V_{GS} =0, Tj=125°C
I_{DON}	50	-	-	A	V_{DS} =10V, V_{GS}=10V (Note 1)
$R_{DS(ON)}$	-	19	22	mΩ	V_{GS} =10V, I_D=30A (Note 1)
G_{FS}	-	28	-	S	V_{DS} =10V, I_D=25A (Note 1)
Dynamic					
Qg	-		-	nC	V_{DS}=80V, I_D=30A, V_{GS}=10V (Note 1 & 2)
Qgs	-		-		
Qgd	-		-		
$t_{d(ON)}$	-		-	ns	V_{DS}=50V, I_D=1A, V_{GS}=10V, R_{GS}=6Ω (Note 1 & 2)
tr	-		-		
$t_{d(OFF)}$	-		-		
t_f	-		-		
Ciss	-		-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-		-		
Crss	-		-		
Source-Drain Diode					
I_S	-	-	50	A	
I_{SM}	-	-	200		(Note 3)
V_{SD}	-	-	1.5	V	I_S=25A, V_{GS}=0V (Note 1)
trr	-	52	-	ns	V_{GS}=0, I_F=50A, dI_F/dt=100A/μs
Qrr	-	75	-	nC	

Note : 1. Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%
2. Independent of operating temperature
3. Pulse width limited by maximum junction temperature.

Ordering Information

Device	Package	Shipping	Marking
MTN50N06E3	TO-220 (RoHS compliant)	50 pcs/tube, 20 tubes/box, 4 boxes / carton	50N06

Characteristic Curves

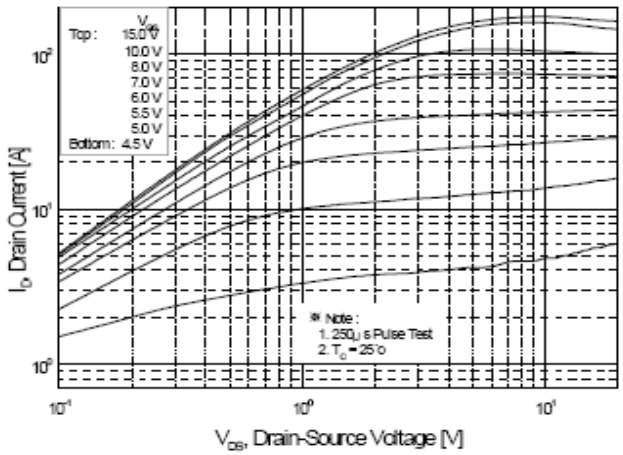


Figure 1. On-Region Characteristics

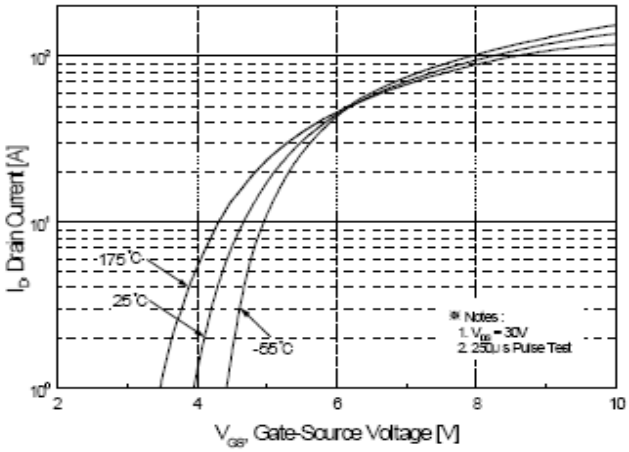


Figure 2. Transfer Characteristics

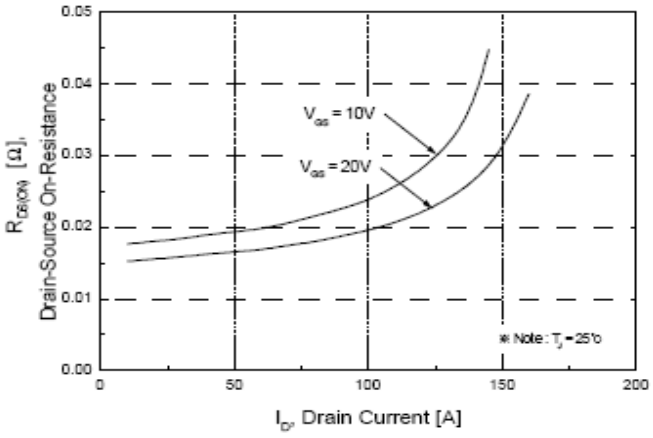


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

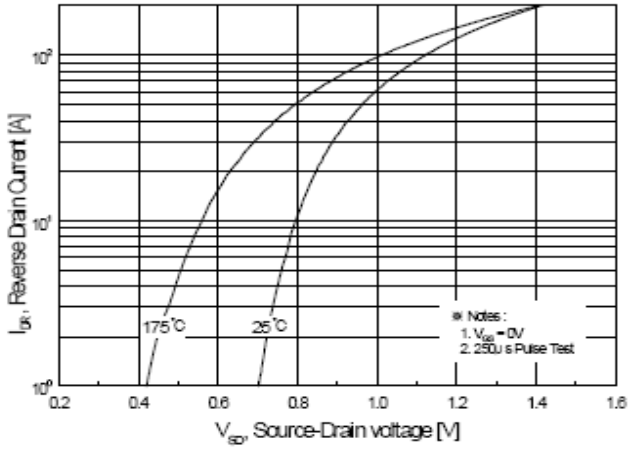


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

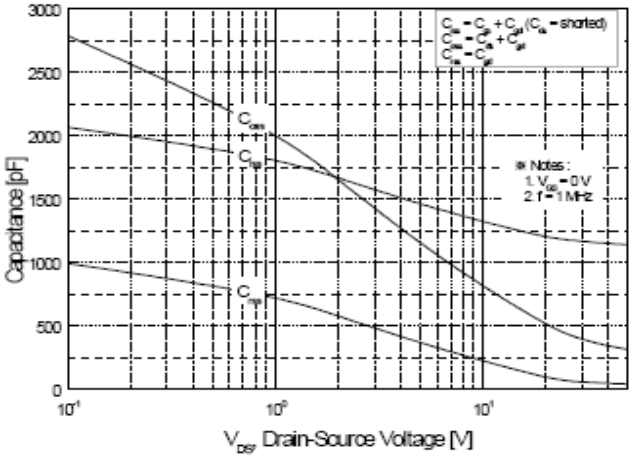


Figure 5. Capacitance Characteristics

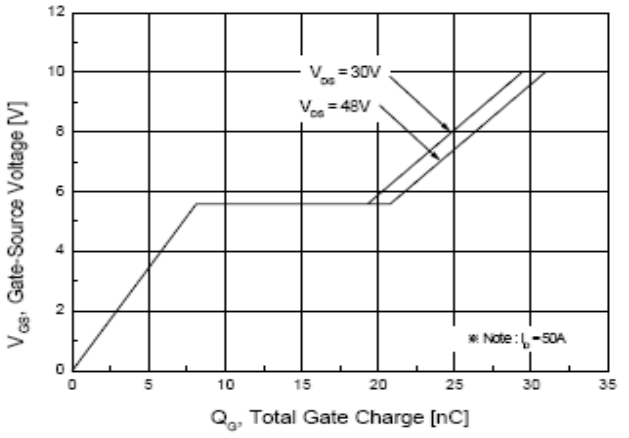


Figure 6. Gate Charge Characteristics

Characteristic Curves(Cont.)

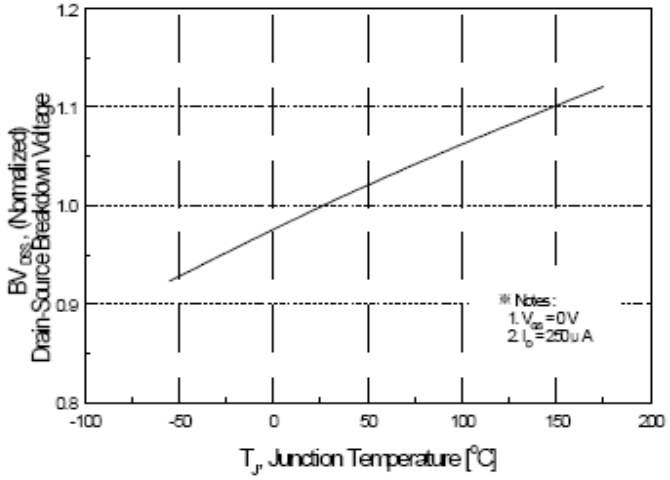


Figure 7. Breakdown Voltage Variation vs. Temperature

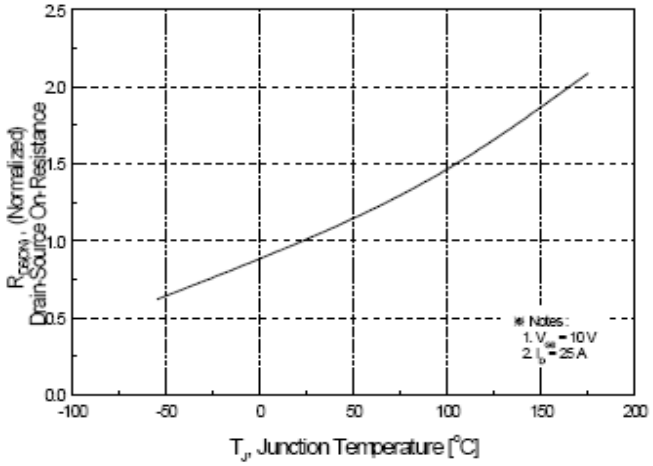


Figure 8. On-Resistance Variation vs. Temperature

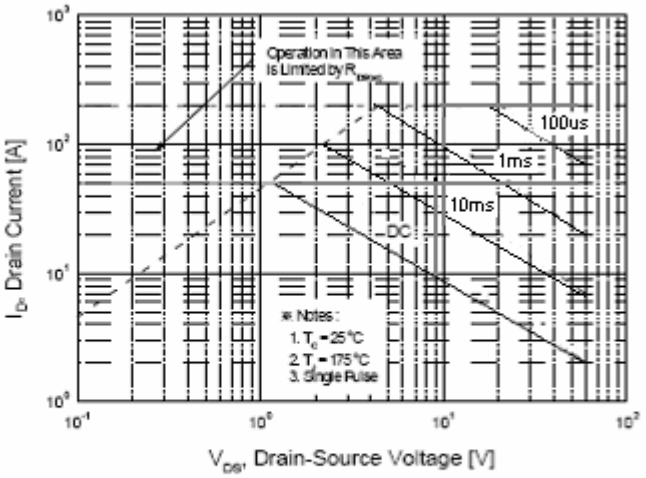


Figure 9. Maximum Safe Operating Area

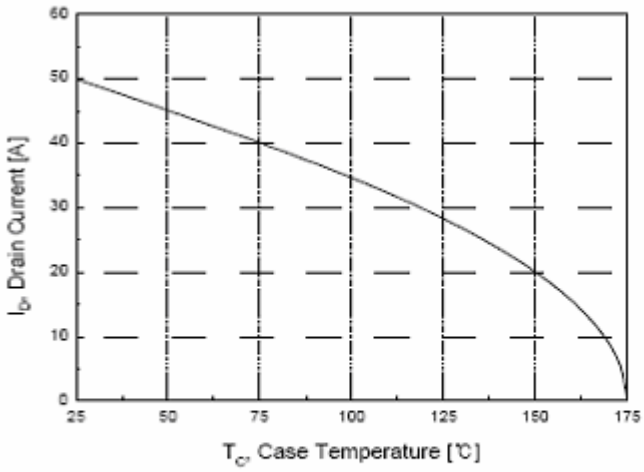


Figure 10. Maximum Drain Current vs. Case Temperature

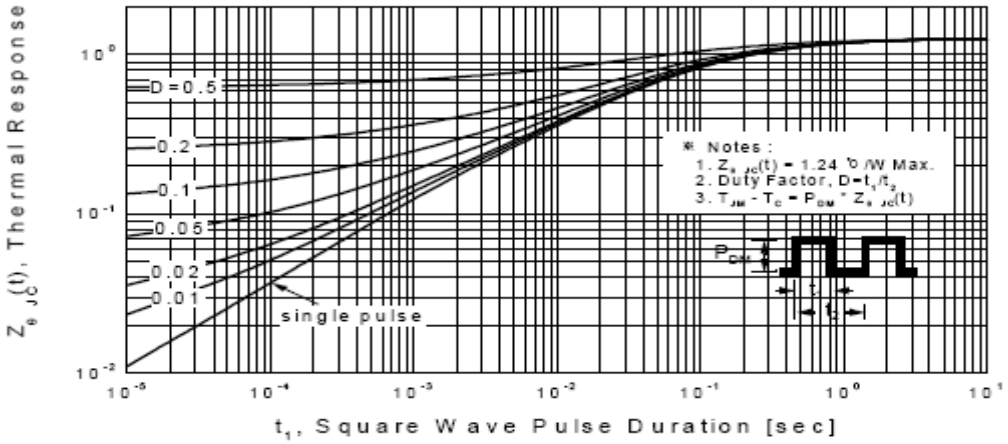
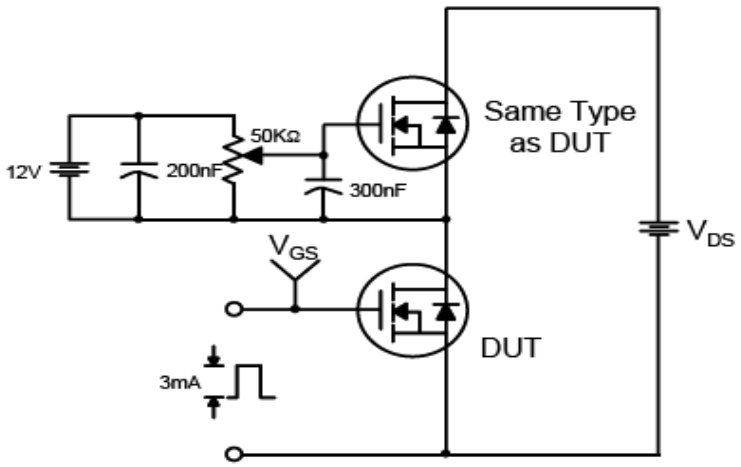
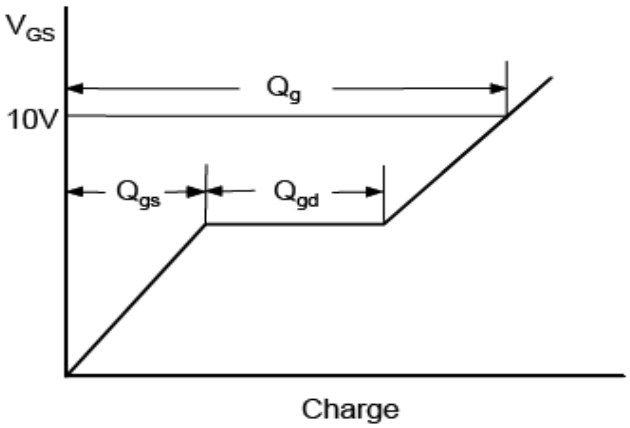


Figure 11. Transient Thermal Response Curve

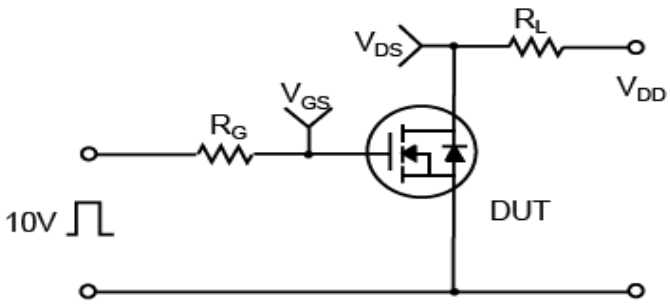
Test Circuit and Waveforms

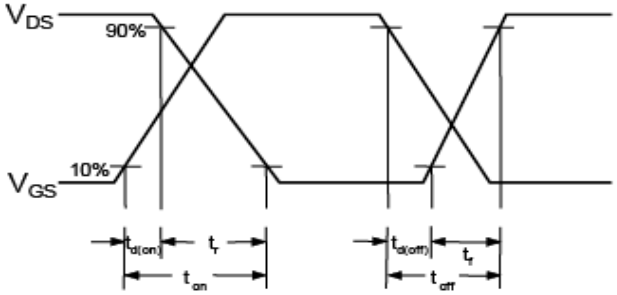
Gate Charge Test Circuit & Waveform



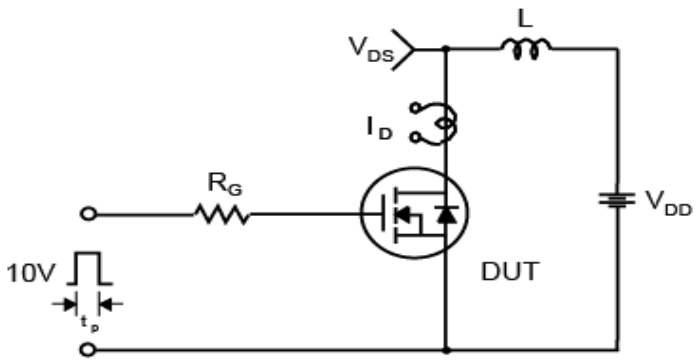


Resistive Switching Test Circuit & Waveforms

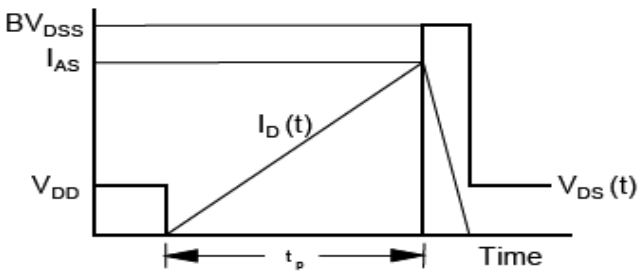




Unclamped Inductive Switching Test Circuit & Waveforms

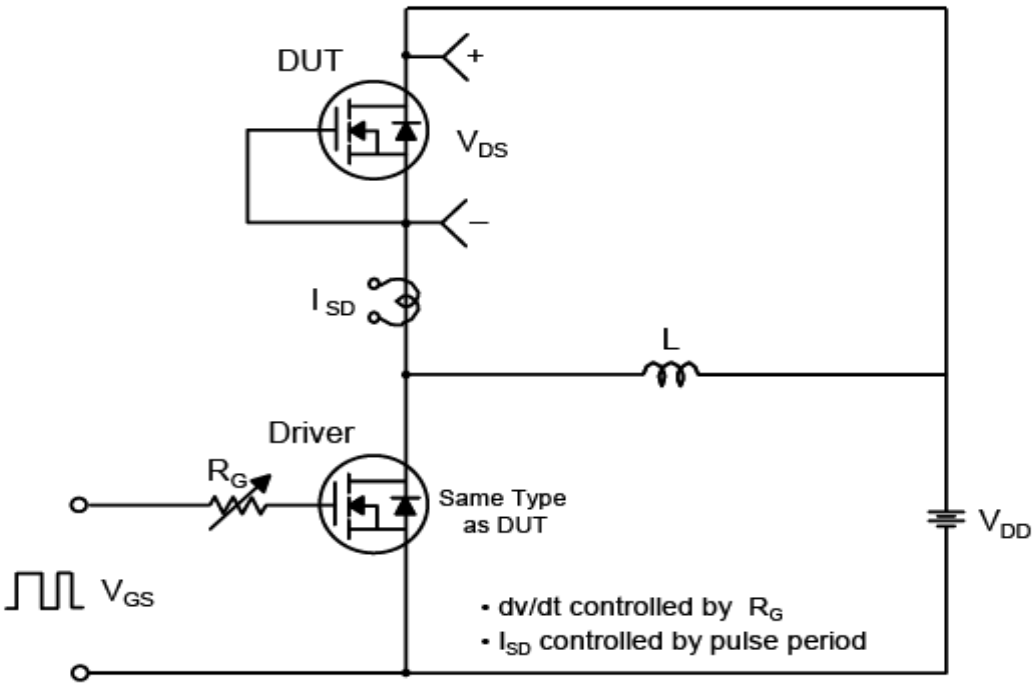


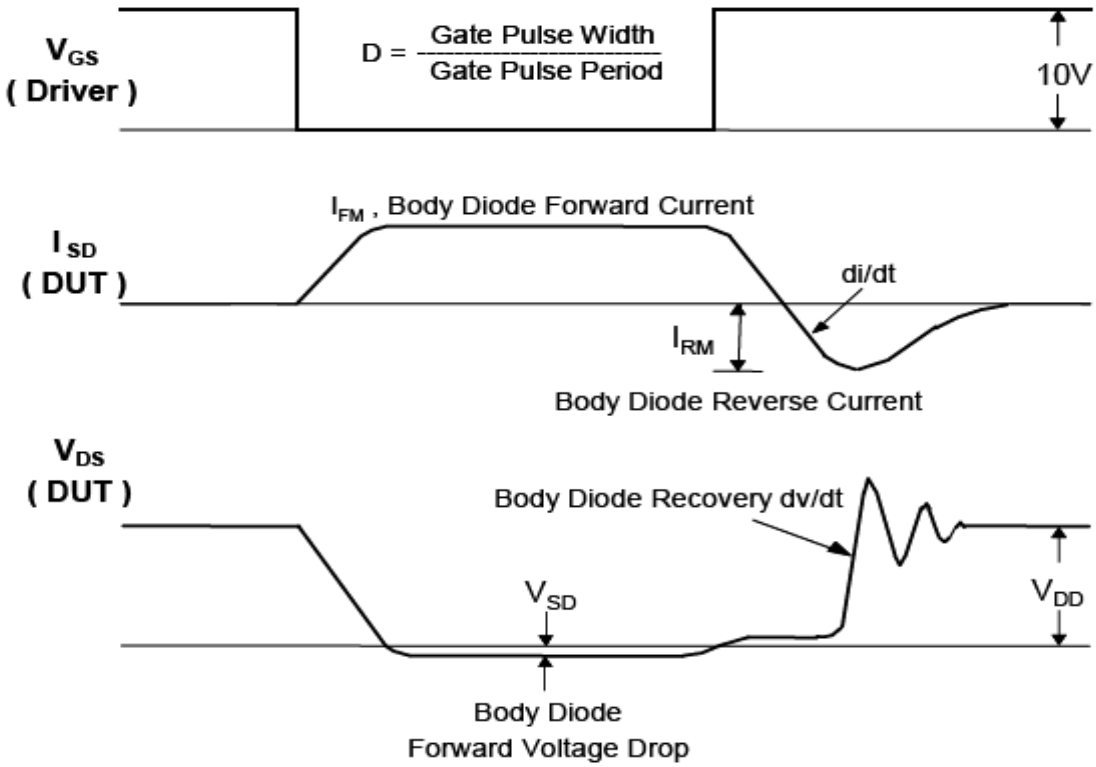
$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



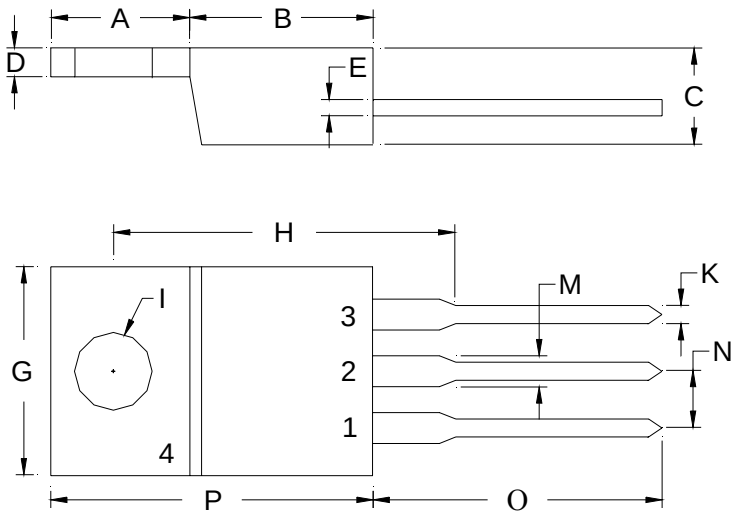
Test Circuit and Waveforms(Cont.)

Peak Diode Recovery dv/dt Test Circuit & Waveforms



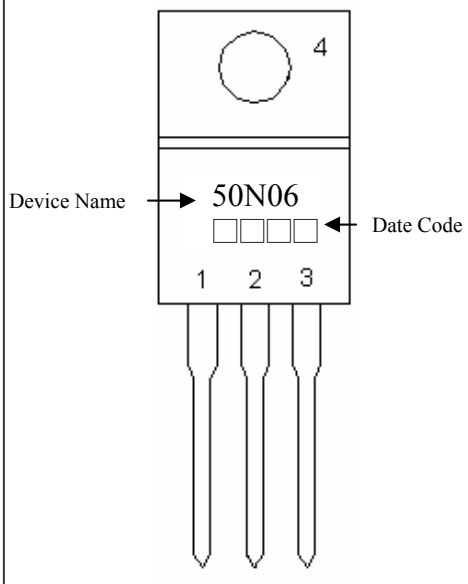


TO-220 Dimension



3-Lead TO-220 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

Important Notice:

- All rights are reserved. Reproduction in whole or in part is prohibited without the prior written approval of CYStek.
- CYStek reserves the right to make changes to its products without notice.
- CYStek ***semiconductor products are not warranted to be suitable for use in Life-Support Applications, or systems.***
- CYStek assumes no liability for any consequence of customer product design, infringement of patents, or application assistance.