N-Channel Enhancement Mode Power MOSFET

Features:

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

Description：

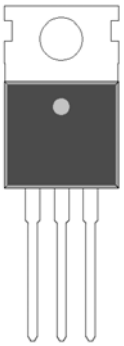
The KWP13N50CE3 is a N-channel enhancement-mode MOSFET, providing the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost effectiveness.
The TO-220 package is universally preferred for all commercial-industrial applications.

Applications：

- Adapter
- Switching Mode Power Supply

Outline

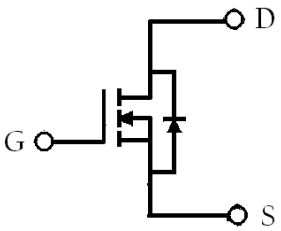
TO-220



G D S

Symbol

KWP13N50CE3



G：Gate D：Drain S：Source

BV_{DSS}	**500V**
I_D @V_{GS}=10V, T_C=25˚C	**13A**
I_D @V_{GS}=10V, T_C=100˚C	**8.2A**
$R_{DS(ON)}$@V_{GS}=10V, I_D=6.5A	**0.42Ω (typ)**

Ordering Information

Device	Package	Shipping
KWP13N50CE3	TO-220 (RoHS compliant package)	50 pcs/tube, 20 tubes/box, 4 boxes / carton

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	
Continuous Drain Current @T_C=25°C, V_{GS}=10V	I_D	13*	A
Continuous Drain Current @T_C=100°C, V_{GS}=10V		8.2*	
Pulsed Drain Current @ (Note 2)	I_{DM}	52*	
Single Pulse Avalanche Energy @ L=8mH, I_D=4Amps, V_{DD}=50V	E_{AS}	64	mJ
Single Pulse Avalanche Current (Note 2)	I_{AS}	4	A
Repetitive Avalanche Energy	E_{AR}	4.8	mJ
Maximum Temperature for Soldering @ Lead at 0.125 in(0.318mm) from case for 10 seconds	T_L	300	°C
Total Power Dissipation (T_C=25℃)	P_D	195	W
Linear Derating Factor		1.72	W/°C
Operating Junction and Storage Temperature	Tj, Tstg	-55~+150	°C

*Drain current limited by maximum junction temperature

*100% UIS testing in condition of V_{DD}=50V, L=8mH, V_G=10V, I_L=3A, Rated V_{DS}=500V

Note : 1. T_J=+25℃ to +150℃.

2. Pulse width limited by maximum junction temperature.

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-case, max	$R_{\theta JC}$	0.64	°C/W
Thermal Resistance, Junction-to-ambient, max	$R_{\theta JA}$	62.5	

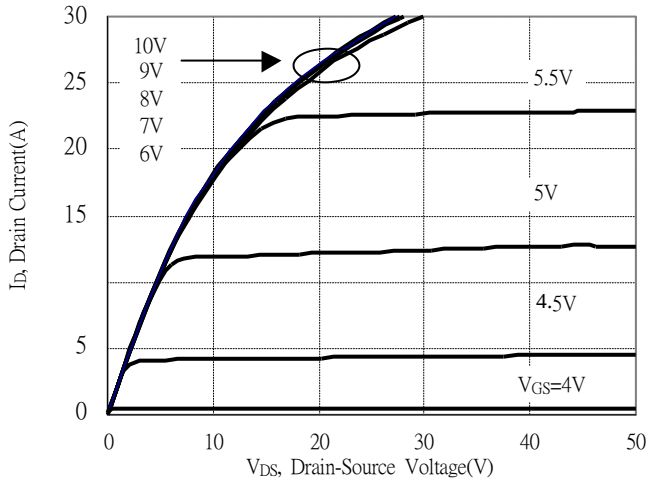
Characteristics (Tj=25°C, unless otherwise specified)

Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Static					
BV_{DSS}	500	-	-	V	V_{GS}=0V, I_D=250μA
$\Delta BV_{DSS}/\Delta Tj$	-	0.6	-	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=6.5A
I_{GSS}	-	-	±100	nA	V_{GS}=±30V, V_{DS}=0V
I_{DSS}	-	-	1	μA	V_{DS} =500V, V_{GS} =0V
I_{DSS}	-	-	10		V_{DS} =400V, V_{GS} =0V, Tj=125°C
*$R_{DS(ON)}$	-	0.42	0.53	Ω	V_{GS} =10V, I_D=6.5A
Dynamic					
*Qg	-	35.8	-	nC	I_D=13A, V_{DD}=250V, V_{GS}=10V
*Qgs	-	7.6	-		
*Qgd	-	10.8	-		
*$t_{d(ON)}$	-	17	-	ns	V_{DD}=250V, I_D=13A, V_{GS}=10V, R_G=9.1Ω
*tr	-	16.8	-		
*$t_{d(OFF)}$	-	63.4	-		
*t_f	-	31.8	-		
Ciss	-	1479	-	pF	V_{GS}=0V, V_{DS}=25V, f=1MHz
Coss	-	150	-		
Crss	-	36	-		
Source-Drain Diode					
*I_S	-	-	13	A	
*I_{SM}	-	-	52		
*V_{SD}	-	0.79	1.2	V	I_S=6.5A, V_{GS}=0V
*trr	-	318	-	ns	V_{GS}=0V, I_F=13A, dI_F/dt=100A/μs
*Qrr	-	3.02	-	μC	

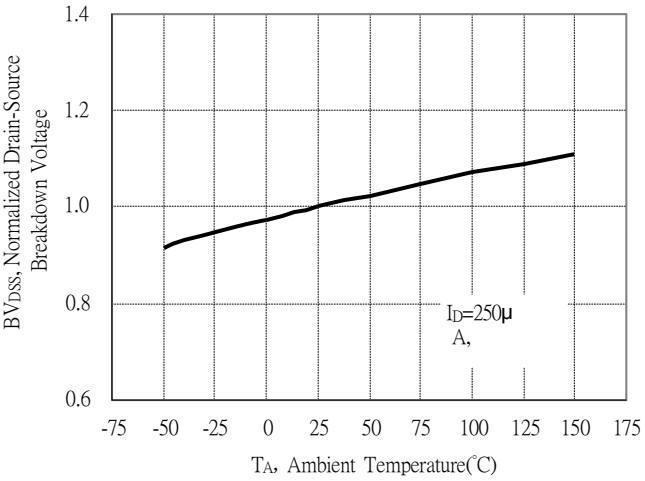
*Pulse Test : Pulse Width ≤300μs, Duty Cycle≤2%

Typical Characteristics

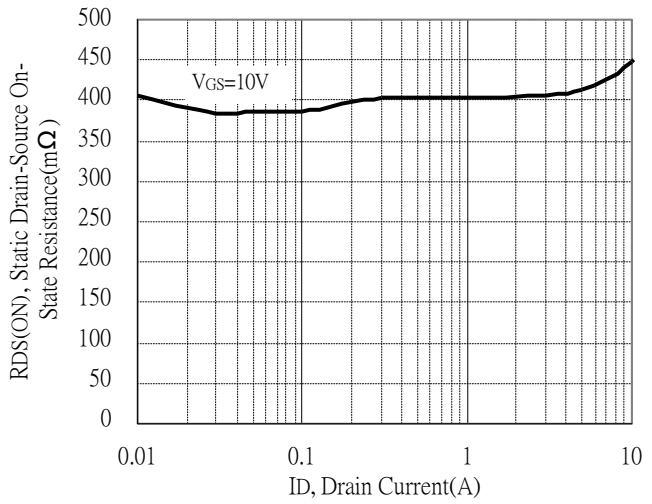
Typical Output Characteristics



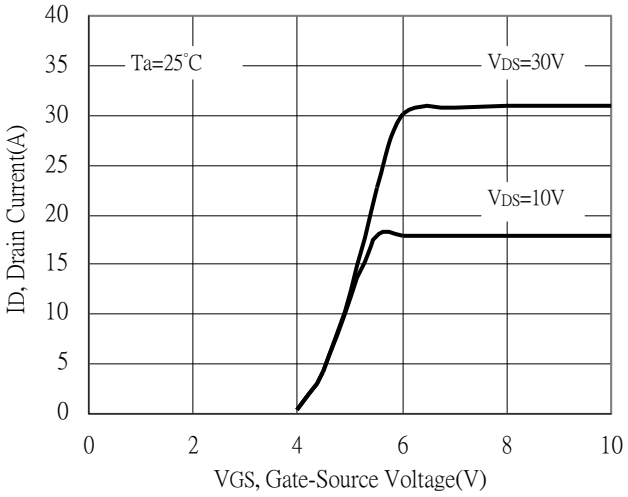
Brekdown Voltage vs Ambient Temperature



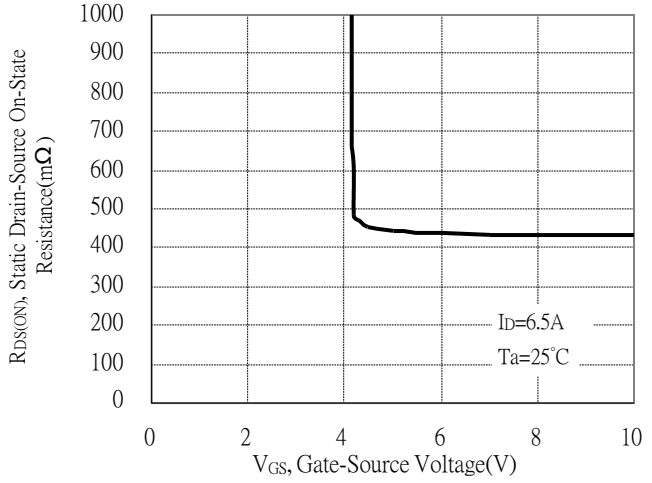
Static Drain-Source On-State resistance vs Drain Current



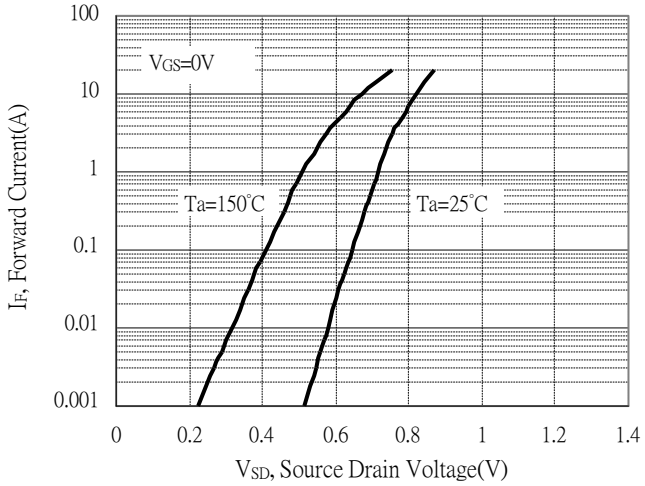
Drain Current vs Gate-Source Voltage



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

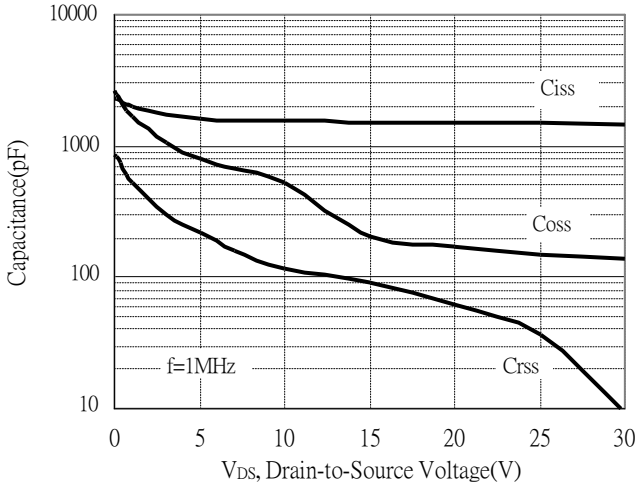


Forward Drain Current vs Source-Drain Voltage

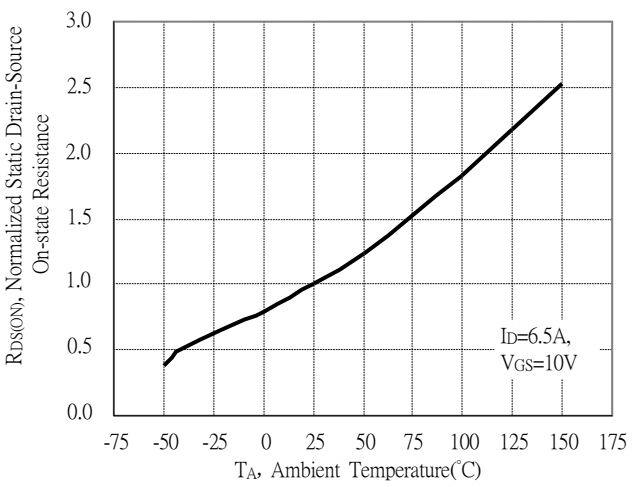


Typical Characteristics(Cont.)

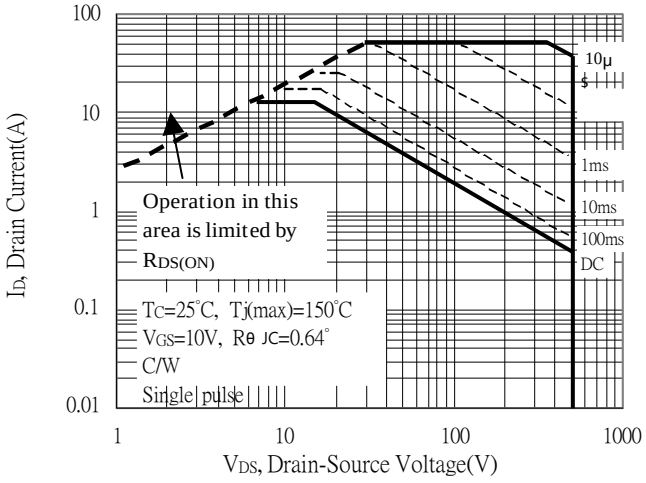
Capacitance vs Reverse Voltage



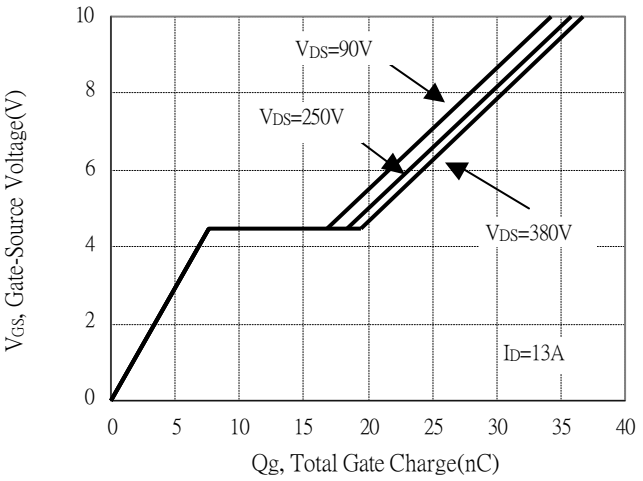
Static Drain-Source On-resistance vs Ambient Temperature



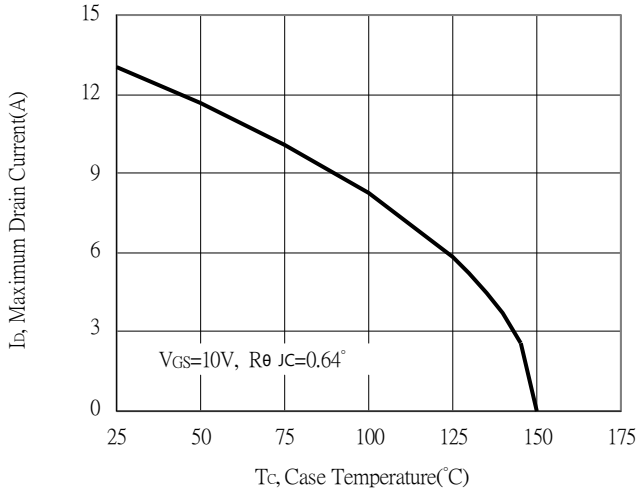
Maximum Safe Operating Area



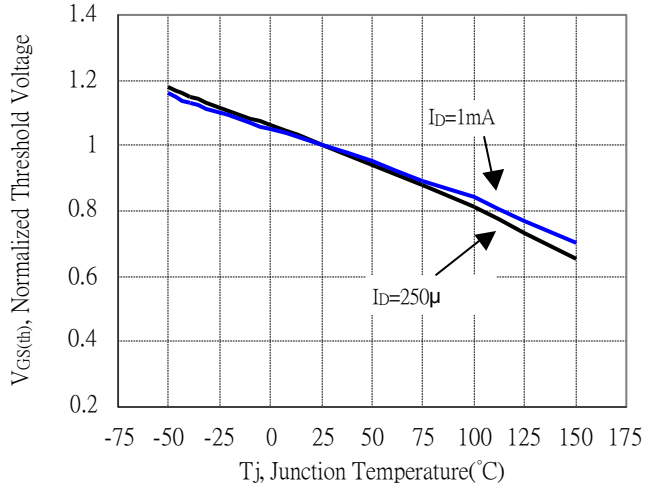
Gate Charge Characteristics



Maximum Drain Current vs Case Temperature

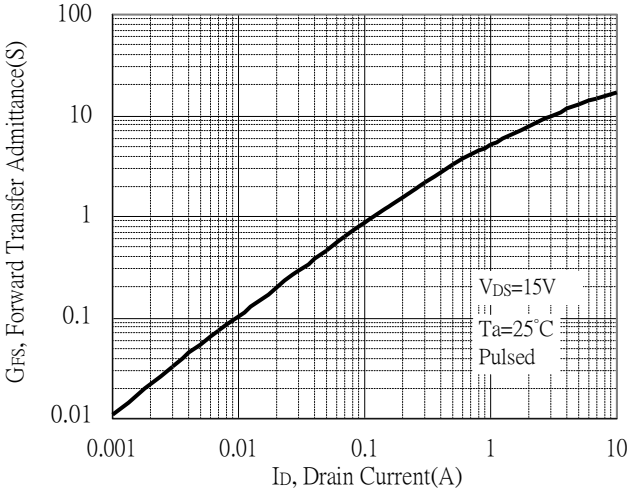


Threshold Voltage vs Junction Tempearture

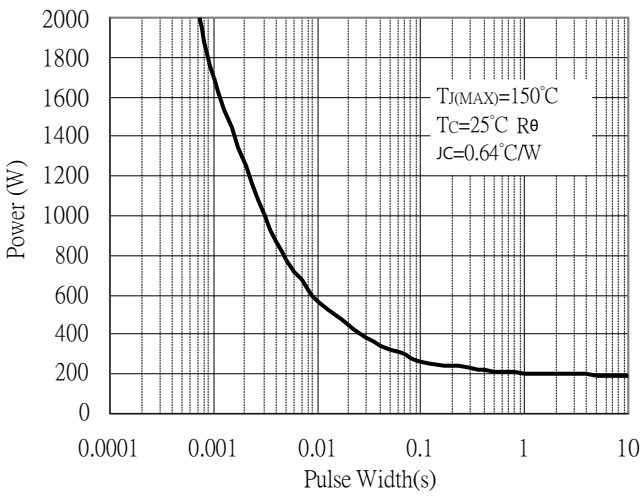


Typical Characteristics(Cont.)

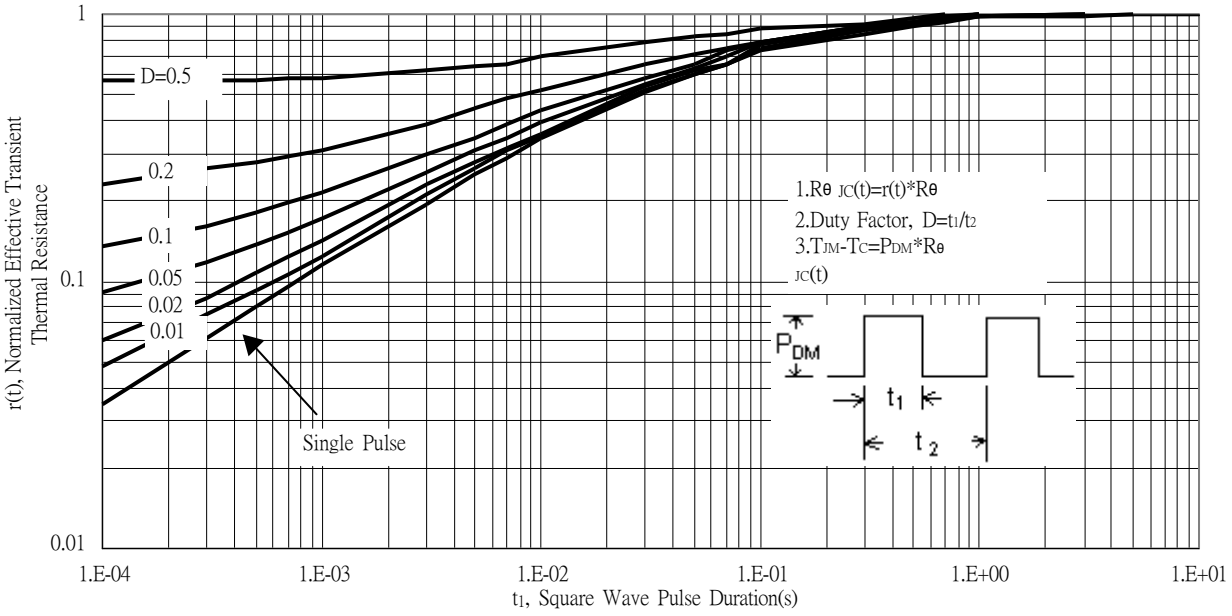
Forward Transfer Admittance vs Drain Current



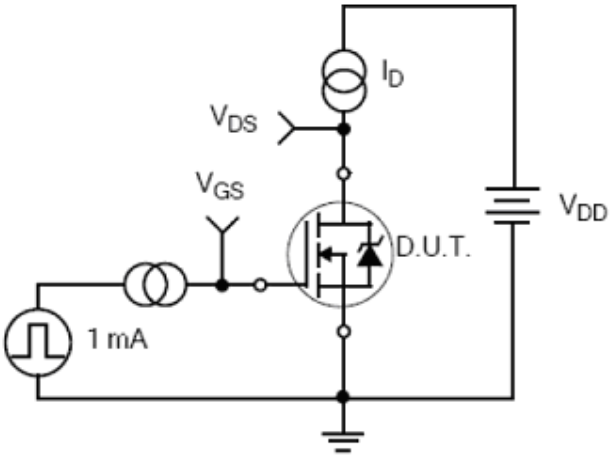
Single Pulse Power Rating, Junction to Case



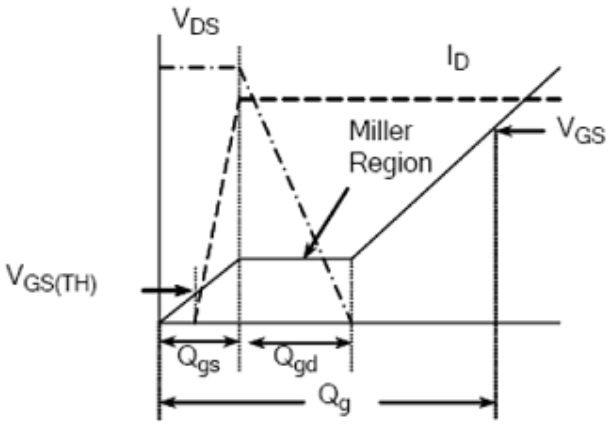
Transient Thermal Response Curves



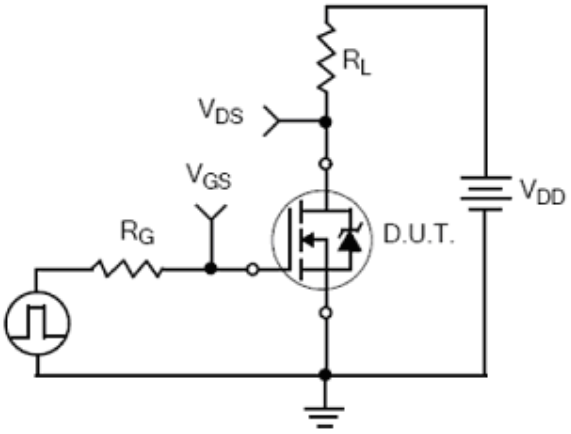
Test Circuit and Waveforms



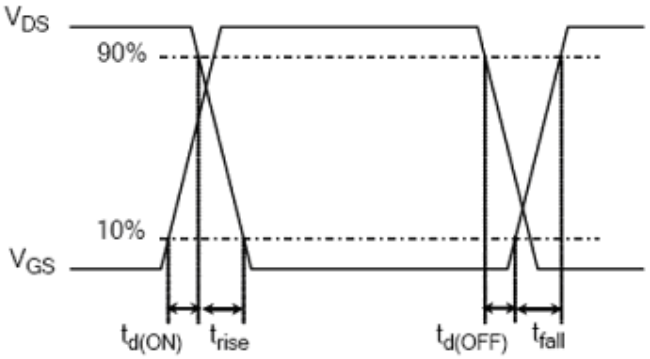
Gate Charge Test Circuit



Gate Charge Waveform

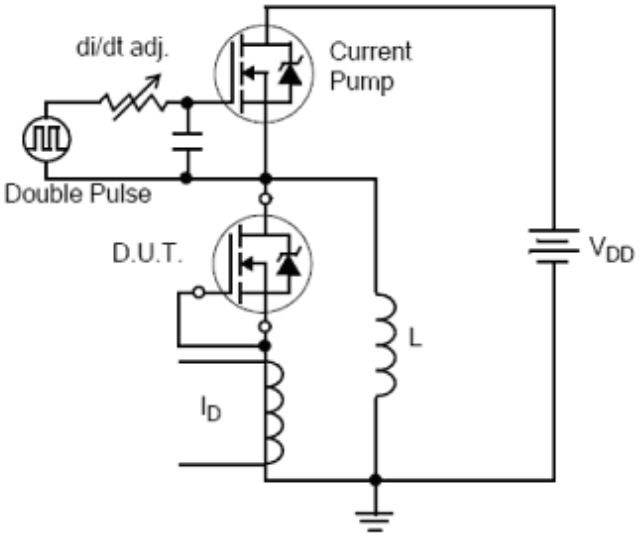


Resistive Switching Test Circuit

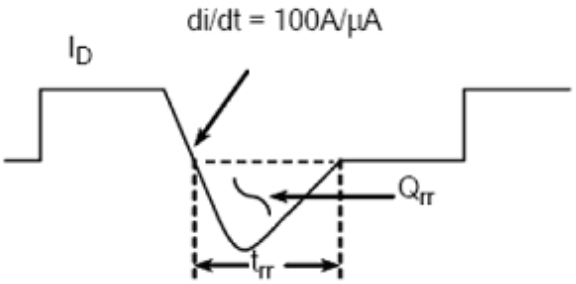


Resistive Switching Waveforms

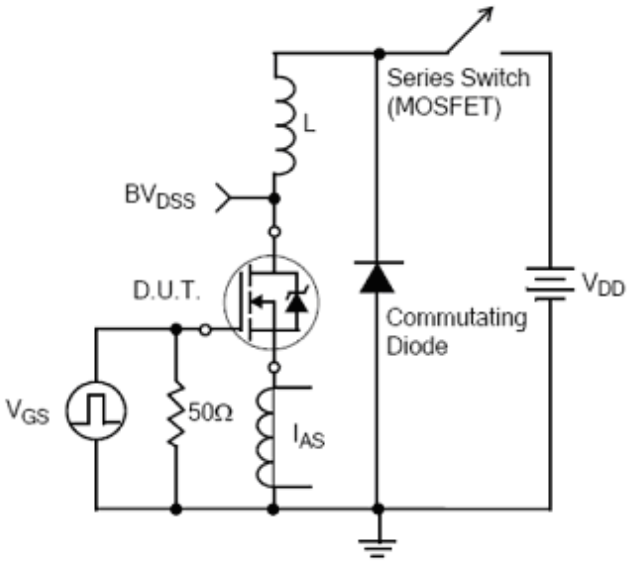
Test Circuit and Waveforms(Cont.)



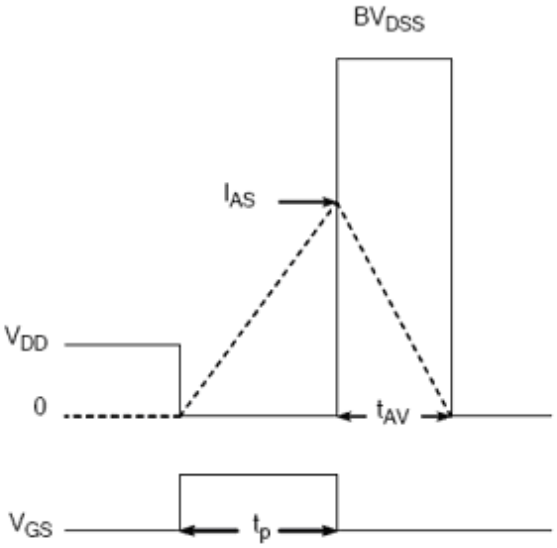
Diode Reverse Recovery Test Circuit



Diode Reverse Recovery Waveform



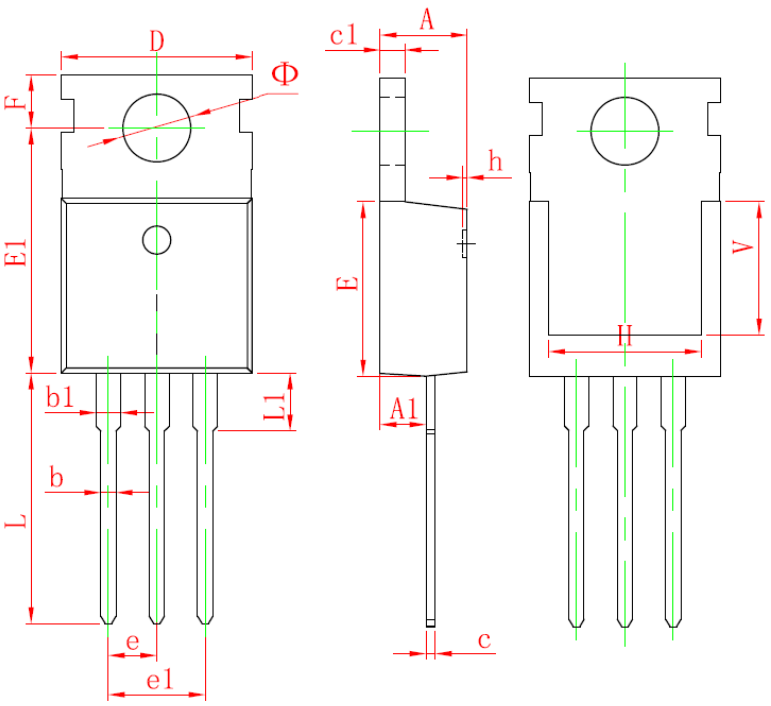
Unclamped Inductive Switching Test Circuit



$$E_{AS} = \frac{I_{AS}^2 L}{2}$$

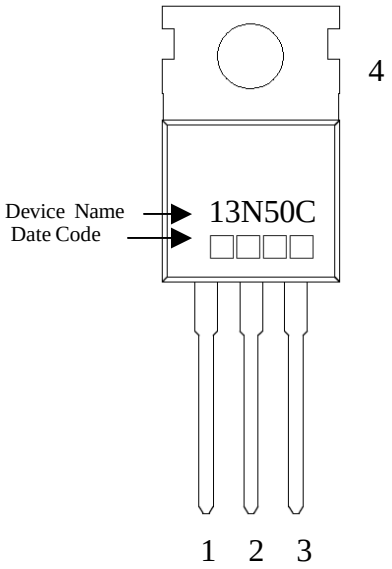
Unclamped Inductive Switching Waveforms

TO-220 Dimension



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

Marking:



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	4.400	4.600	0.173	0.181	e	2.540*		0.100*	
A1	2.250	2.550	0.089	0.100	e1	4.980	5.180	0.196	0.204
b	0.710	0.910	0.028	0.036	F	2.650	2.950	0.104	0.116
b1	1.170	1.370	0.046	0.054	H	7.900	8.100	0.311	0.319
c	0.330	0.650	0.013	0.026	h	0.000	0.300	0.000	0.012
c1	1.200	1.400	0.047	0.055	L	12.900	13.400	0.508	0.528
D	9.910	10.250	0.390	0.404	L1	2.850	3.250	0.112	0.128
E	8.950	9.750	0.352	0.384	V	7.500 REF		0.295 REF	
E1	12.650	12.950	0.498	0.510	Φ	3.400	3.800	0.134	0.150