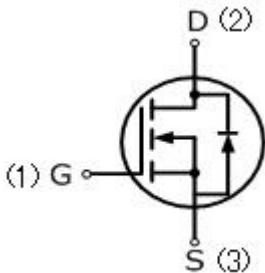


## 13N50MF

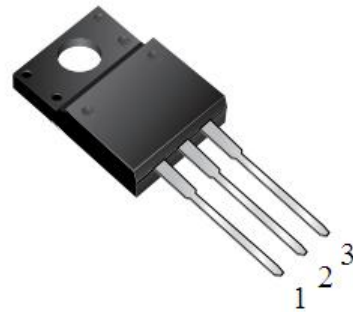
### 13 Amps, 500 Volts N-CHANNEL MOSFET

#### FEATURE

- 13A, 500V,  $R_{DS(ON)MAX}=0.48\ \Omega$  @  $V_{GS}=10V/6.5A$
- Low gate charge
- Low  $C_{iss}$
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



#### TO-220MF



Weight: 2.16 g (typ.)

#### Absolute Maximum Ratings ( $T_C=25^\circ\text{C}$ , unless otherwise noted)

Parameter	Symbol	13N50MF	UNIT
Drain-Source Voltage	$V_{DSS}$	500	V
Gate-Source Voltage	$V_{GSS}$	$\pm 30$	
Continuous Drain Current	$I_D$	13	A
Pulsed Drain Current (Note 1)	$I_{DM}$	52	
Single Pulse Avalanche Energy (Note 2)	$E_{AS}$	630	mJ
Avalanche Current (Note 1)	$I_{AR}$	11.0	A
Reverse Diode dv/dt (Note 3)	dv/dt	3.7	V/ns
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	$T_L$	260	$^\circ\text{C}$
Mounting Torque	6-32 or M3 screw	10	lbf • in
		1.1	N • m

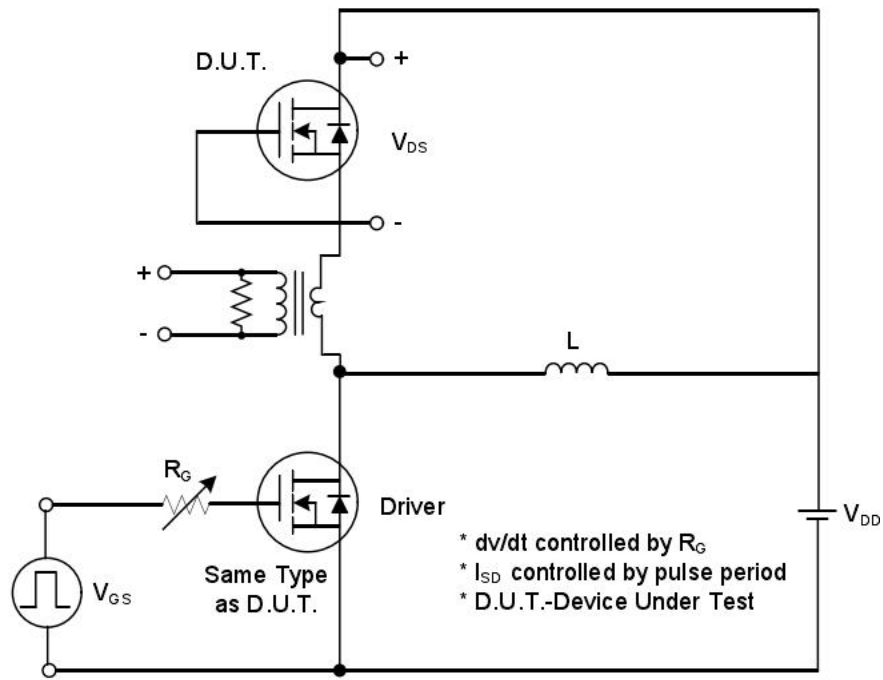
Parameter	Symbol	13N50MF	Units
Thermal resistance, Channel to Case	$R_{th(ch-c)}$	3.57	$^\circ\text{C}/\text{W}$
Thermal resistance, Channel to Ambient	$R_{th(ch-a)}$	62.5	$^\circ\text{C}/\text{W}$
Maximum Power Dissipation	$T_C=25^\circ\text{C}$ $P_D$	35	W

<b>Electrical Characteristics</b> ( $T_c=25^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
Drain-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=250\mu A$	500	—	—	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=500V, V_{GS}=0V$	—	—	1	$\mu A$
Gate-Body Leakage Current, Forward	$I_{GSSF}$	$V_{GS}=30V, V_{DS}=0V$	—	—	100	nA
Gate-Body Leakage Current, Reverse	$I_{GSSR}$	$V_{GS}=-30V, V_{DS}=0V$	—	—	-100	nA
<b>On Characteristics</b>						
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	2	—	4	V
Drain-Source On-State Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=6.5A$	—	0.34	0.48	$\Omega$
<b>Dynamic Characteristics</b>						
Input Capacitance	$C_{iss}$	$V_{DS}=25V, V_{GS}=0V,$ $f=1.0\text{MHZ}$	—	1630	—	pF
Output Capacitance	$C_{oss}$		—	202	—	pF
Reverse Transfer Capacitance	$C_{rss}$		—	32	—	pF
<b>Switching Characteristics</b>						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD}=300V, I_D=0.5A,$ $R_G=25\Omega, V_{GS}=10V,$ (Note3,4)	—	14	—	ns
Turn-On Rise Time	$t_r$		—	27	—	ns
Turn-Off Delay Time	$t_{d(off)}$		—	45	—	ns
Turn-Off Fall Time	$t_f$		—	36	—	ns
Total Gate Charge	$Q_g$	$V_{DS}=50V, I_D=1.3A,$ $V_{GS}=10V, I_D=100\mu A$ (Note3,4)	—	14	—	nC
Gate-Source Charge	$Q_{gs}$		—	13	—	nC
Gate-Drain Charge	$Q_{gd}$		—	33	—	nC
<b>Drain-Source Body Diode Characteristics and Maximum Ratings</b>						
Continuous Diode Forward Current	$I_S$		—	—	13	A
Pulsed Diode Forward Current	$I_{SM}$		—	—	52	A
Diode Forward Voltage	$V_{SD}$	$I_S=13A, V_{GS}=0V$	—	—	1.5	V
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_S=13A, T_J=150^\circ\text{C}$ $dI_F/dt=100A/\mu s, \text{ (Note3)}$	—	350	—	ns
Reverse Recovery Charge	$Q_{rr}$		—	4.5	—	$\mu C$

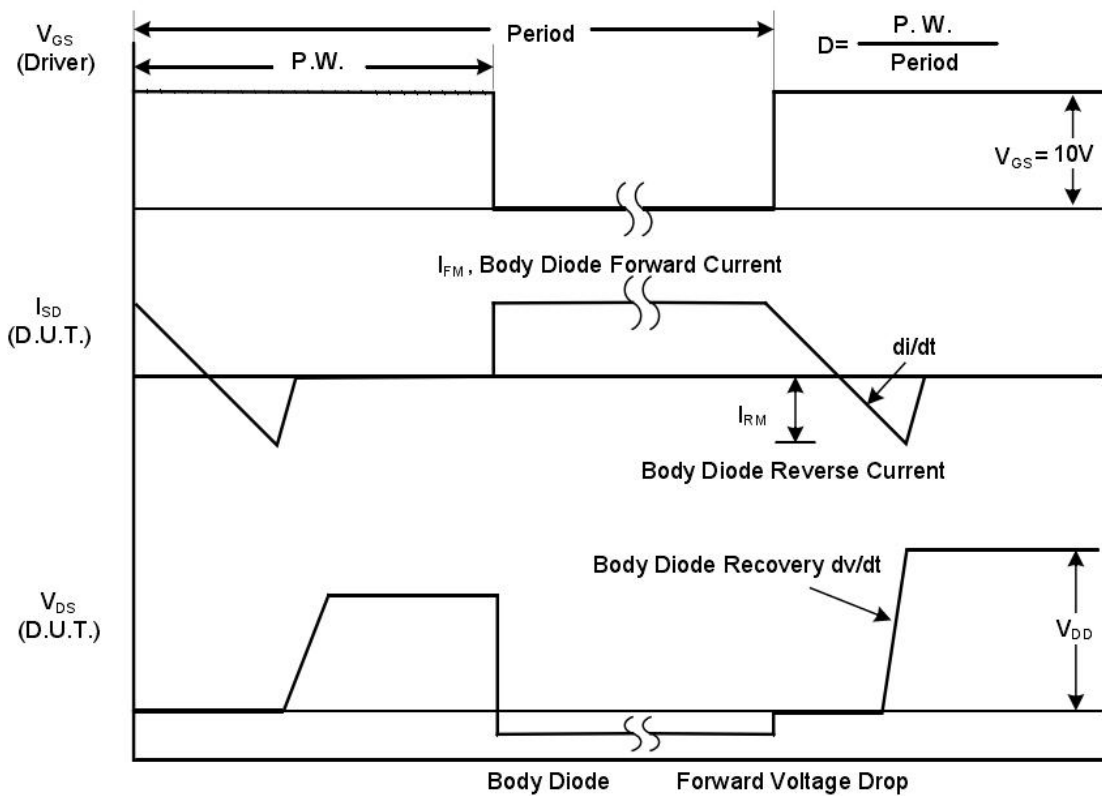
#### Notes

1. Repetitive Rating: pulse width limited by maximum junction temperature.
2.  $L=10\text{mH}, I_D=11A$ , starting  $T_J=25^\circ\text{C}$ .
3.  $I_{SD} \leq I_D, dI/dt=200A/\mu s, V_{DD} \leq BV_{DSS}$ , starting  $T_J=25^\circ\text{C}$ , Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
4. Repetitive rating; pulse width limited by maximum junction temperature.

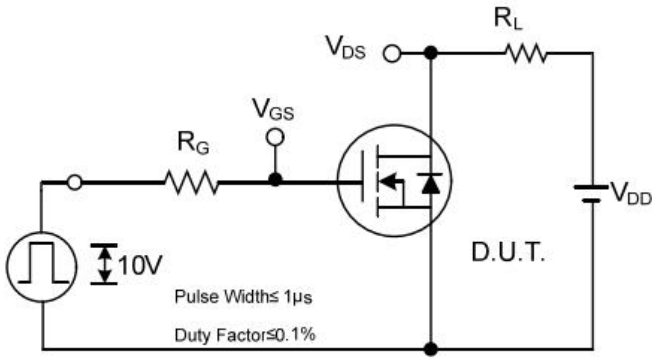
**TEST CIRCUIT AND WAVEFORM**



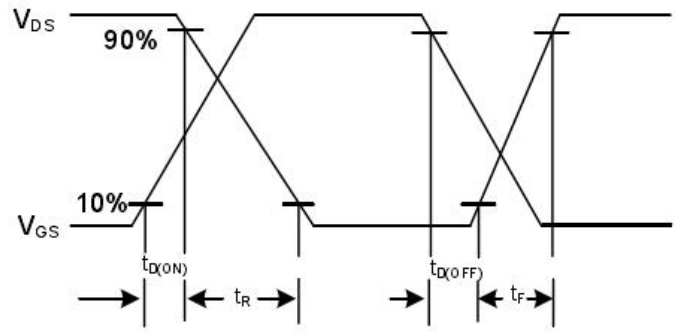
**Peak Diode Recovery dv/dt Test Circuit**



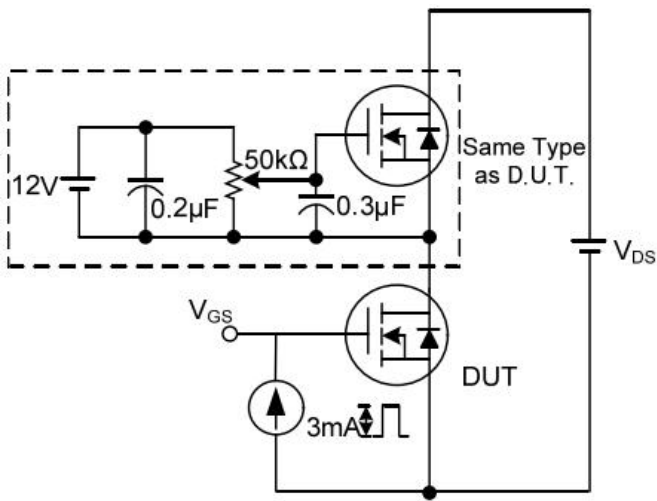
**Peak Diode Recovery dv/dt Waveforms**



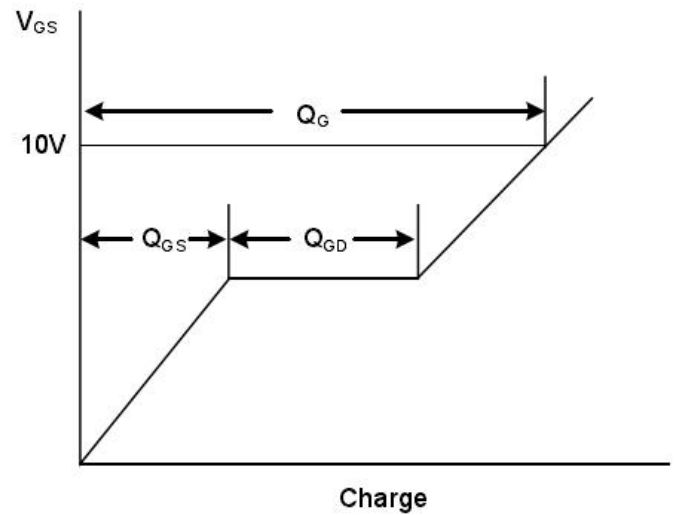
**Switching Test Circuit**



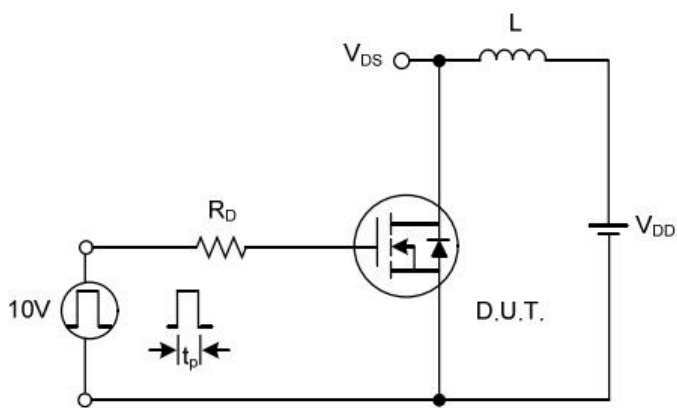
**Switching Waveforms**



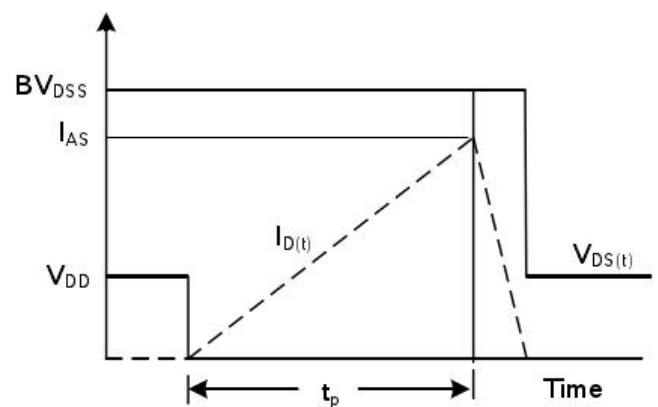
**Gate Charge Test Circuit**



**Gate Charge Waveform**

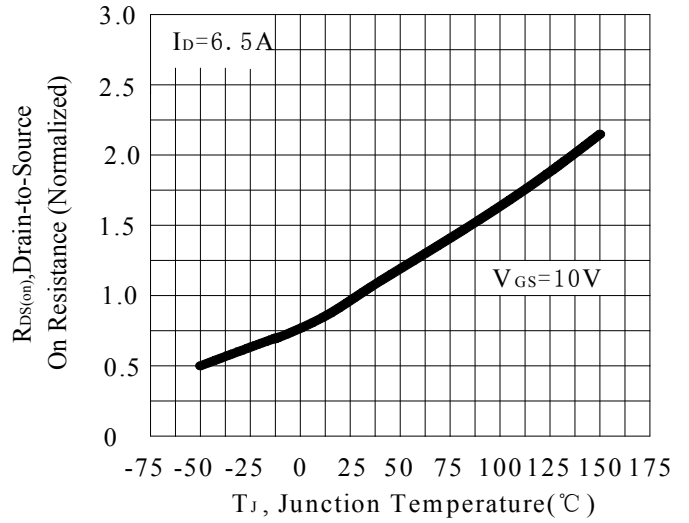
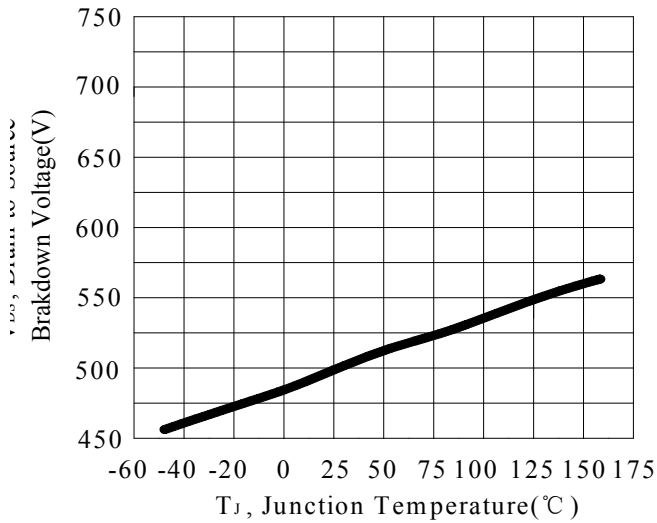
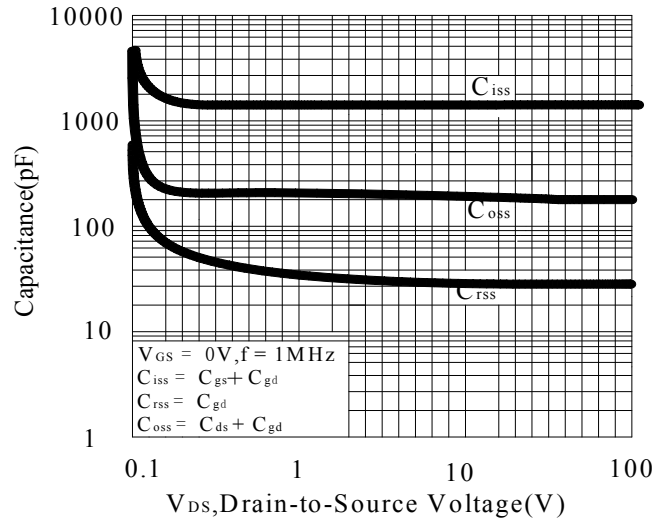
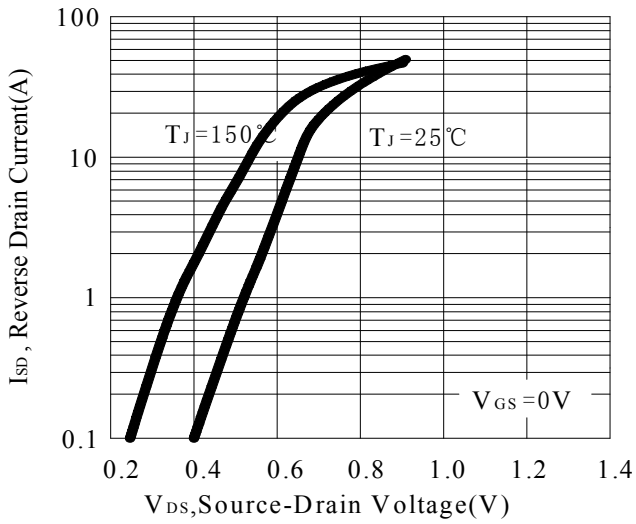
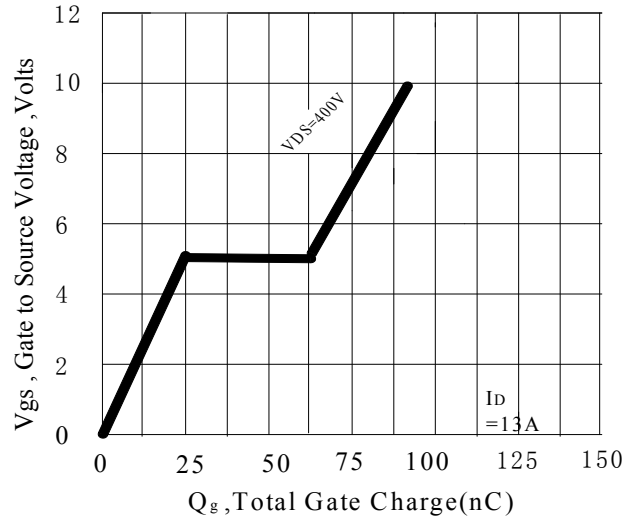
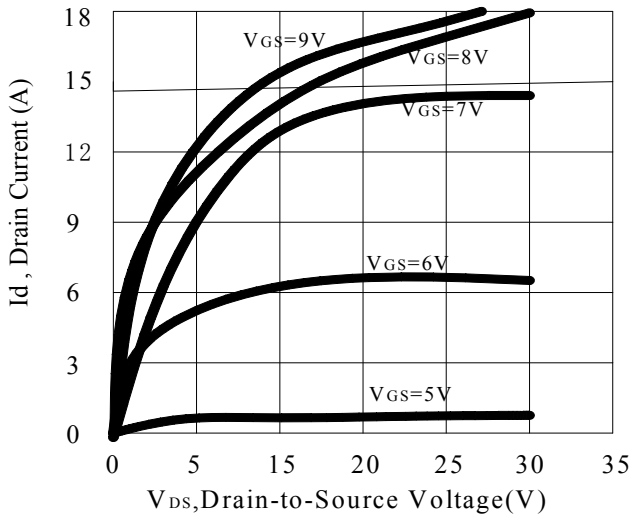


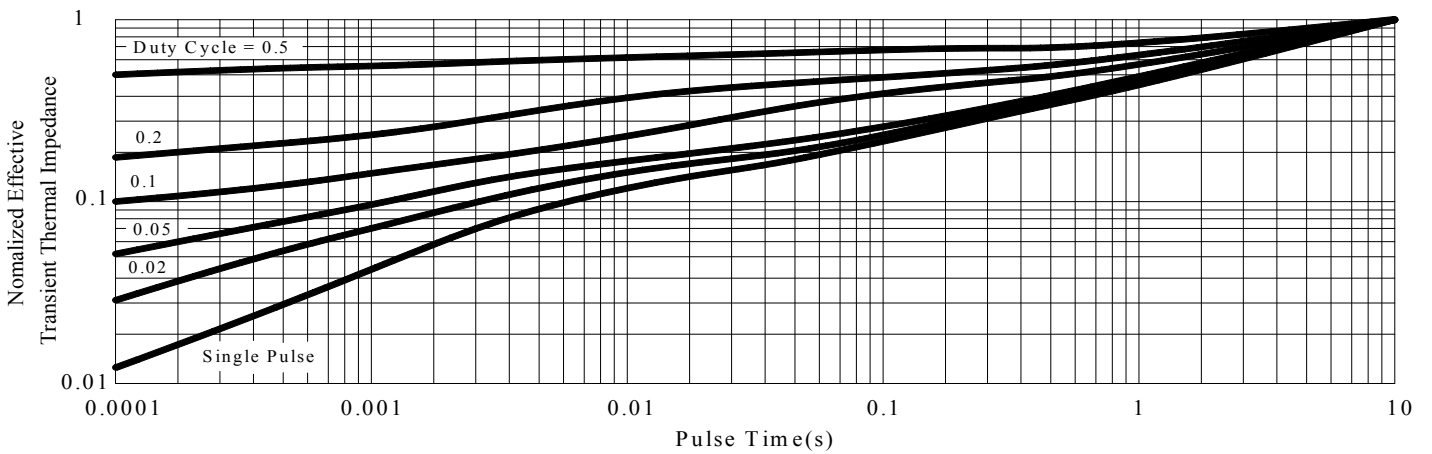
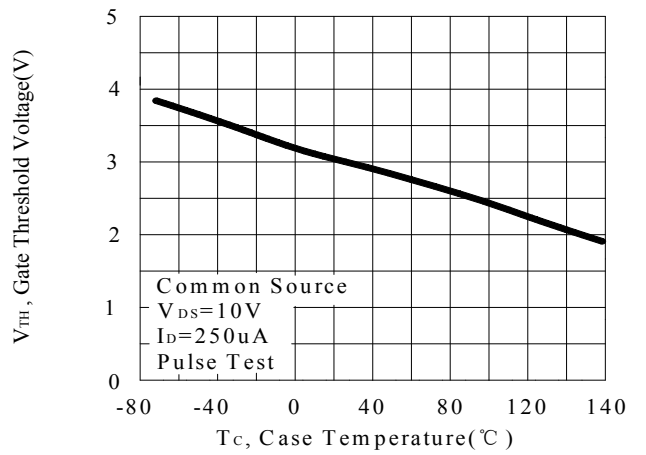
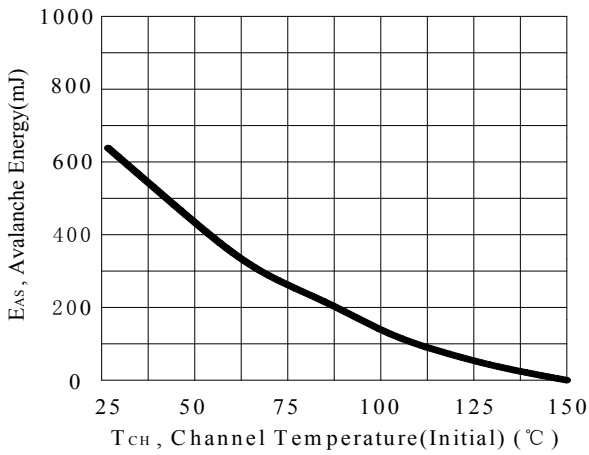
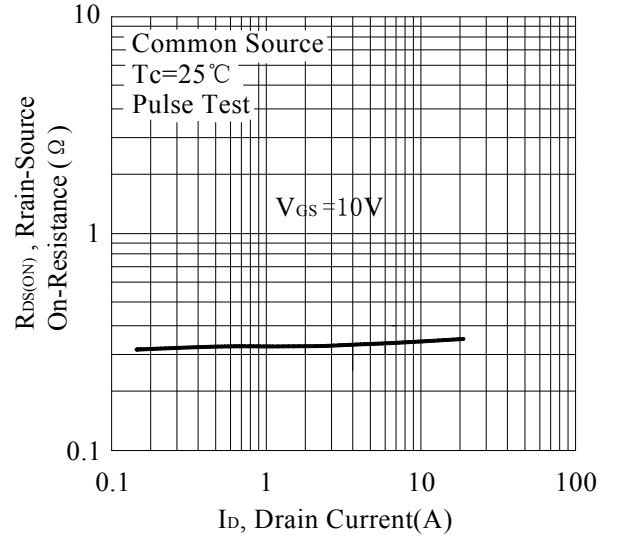
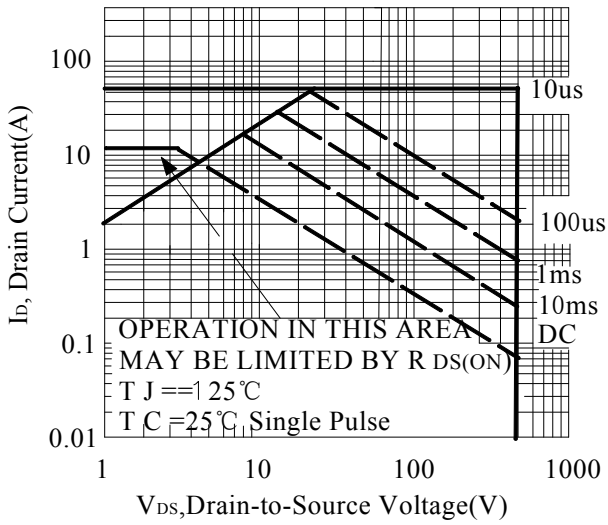
**Unclamped Inductive Switching Test Circuit**



**Unclamped Inductive Switching Waveforms**

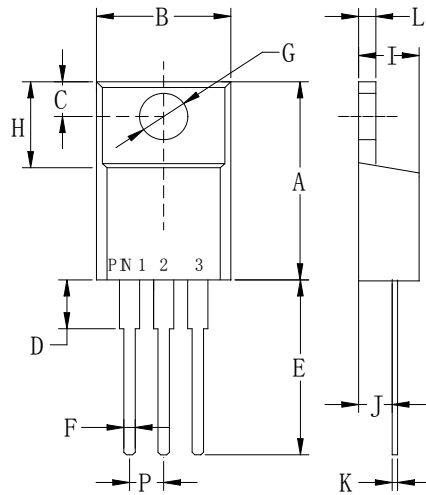
## RATING AND CHARACTERISTIC CURVES





## PACKAGE OUTLINE DIMENSIONS

### TO-220MF



TO-220MF		
Dim	Min	Max
A	.590 (15.0)	.650 (16.5)
B	.393 (10.0)	.414 (10.5)
C	.118 (3.00)	.138 (3.50)
D	.118 (3.00)	.146 (3.70)
E	.512 (13.0)	.551 (14.0)
F	.028 (0.70)	.035 (0.90)
G	.114 (2.90)	.138 (3.50)
H	.255 (6.50)	.280 (7.10)
I	.173 (4.40)	.197 (5.00)
J	.102 (2.60)	.110 (2.80)
K	.018 (0.45)	.026 (0.65)
L	.092 (2.35)	.109 (2.75)
P	.890 (2.25)	.113 (2.85)

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