

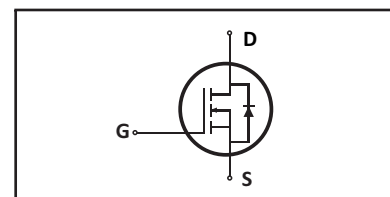
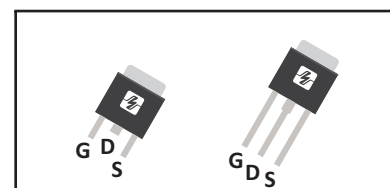
N-CHANNEL POWER MOSFET

DESCRIPTION

This MOSFET is produced with advanced VDMOS technology of SEMIWILL. This technology enable power MOSFET to have better characteristics , such as fast switching time , low on resistance, low gate charge and especially excellent avalanche characteristics . This power MOSFET is usually used at high efficient DC to DC converter block and SMPS. It's typical application is TV and monitor.

FEATURES

- High ruggedness
- $R_{DS(ON)}$ (Max. 2.3 Ω)@ $V_{GS}=10V$
- Gate Charge (Max.18nC)
- Improved dv/dt Capability
- 100% Avalanche Tested


SCHEMATIC SYMBOL

TO-251
TO-252
PACKAGE

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		TO-251	TO-252	
V_{DSS}	Drain to Source Voltage	600		V
I_D	Continuous Drain Current (@ $T_C=25^\circ C$)	4.0		A
	Continuous Drain Current (@ $T_C=100^\circ C$)	2.2		A
I_{DM}	Drain current pulsed (note 1)	16		A
V_{GS}	Gate to Source Voltage	± 30		V
E_{AS}	Single pulsed Avalanche Energy (note 2)	220		mJ
E_{AR}	Repetitive Avalanche Energy (note 1)	10.6		mJ
dv/dt	Peak diode Recovery dv/dt (note 3)	4.5		V/ns
P_D	Total power dissipation (@ $T_C=25^\circ C$)	54		W
	Derating Factor above 25 $^\circ C$	0.43		W/ $^\circ C$
T_{STG}, T_J	Operating Junction Temperature & Storage Temperature	-55 ~ + 150		$^\circ C$
T_L	Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds.	300		$^\circ C$

THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
R_{thjc}	Thermal resistance, Junction to case	2.3	$^\circ C/W$
R_{thja}	Thermal resistance, Junction to ambient	110	

ELECTRICAL CHARACTERISTIC ($T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Off characteristics						
BV_{DSS}	Drain to source breakdown voltage	$V_{GS}=0V, I_D=250\mu A$	600	-	-	V
I_{DSS}	Drain to source leakage current	$V_{DS}=600V, V_{GS}=0V$	-	-	1	μA
		$V_{DS}=480V, T_C=125^\circ\text{C}$	-	-	10	μA
I_{GSS}	Gate to source leakage current, forward	$V_{DS}=30V, V_{GS}=0V$	-	-	100	nA
	Gate to source leakage current, reverse	$V_{DS}=-30V, V_{GS}=0V$	-	-	-100	nA
On characteristics						
$V_{GS(TH)}$	Gate threshold voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	2.0	-	4.0	V
$R_{DS(ON)}$	Drain to source on state resistance	$V_{GS}=10V, I_D=2.0A$		1.9	2.3	Ω
Dynamic characteristics						
C_{iss}	Input capacitance	$V_{GS}=0V, V_{DS}=25V, f=1\text{MHz}$	-	571	740	pF
C_{oss}	Output capacitance		-	70	90	
C_{rss}	Reverse transfer capacitance		-	18	24	
$t_{d(on)}$	Turn on delay time	$V_{DS}=300V, I_D=4.0A, R_G=25\text{ohm}$ (note 4,5)	-	21	52	ns
t_r	Rising time		-	46	102	
$t_{d(off)}$	Turn off delay time		-	102	214	
t_f	Fall time		-	34	78	
Q_g	Total gate charge	$V_{DS}=480V, V_{GS}=10V, I_D=4.0A$ (note 4,5)	-	18	28	nC
Q_{gs}	Gate -source charge		-	3.0	-	
Q_{gd}	Gate -drain charge		-	6.0	-	

SOURCE TO DRAIN DIODE RATINGS CHARACTERISTICS

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_S	Continuous source current	Integral reverse p-n Junction diode in the MOSFET	-	-	4.0	A
I_{SM}	Pulsed source current		-	-	16	A
V_{SD}	Diode forward voltage drop.	$I_S=4.0A, V_{GS}=0V$	-	-	1.4	V
T_{rr}	Reverse recovery time	$I_S=4.0A, V_{GS}=0V$	-	390	-	ns
Q_{rr}	Breakdown voltage temperature	$di/dt=100A/\mu s$	-	1.6	-	nC

Notes

1. Repeattive rating : pulse width limited by junction temperature.
2. $L = 25\text{mH}, I_{AS} = 4.0A, V_{DD} = 50V, R_G = 25\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 4.0A, di/dt = 200A/\mu s, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse Width $\leq 300\mu s$, duty cycle $\leq 2\%$
5. Essentially independent of operating temperature.

Fig. 1. Gate charge test circuit & waveform

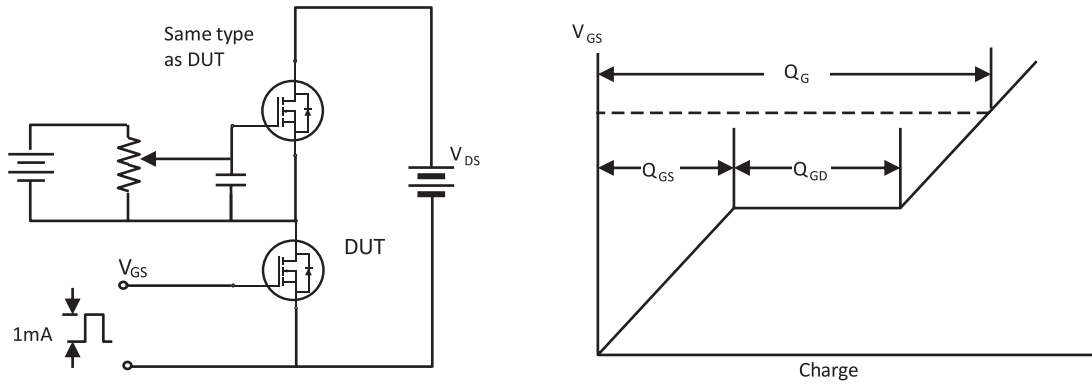


Fig. 2. Switching time test circuit & waveform

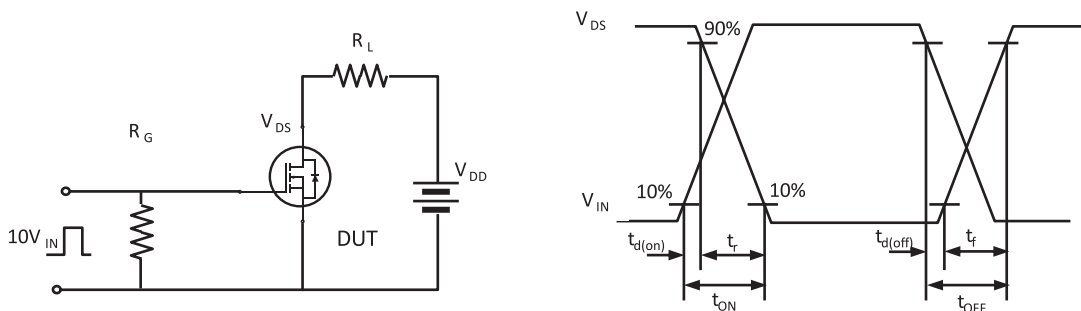


Fig. 3. Unclamped Inductive switching test circuit & waveform

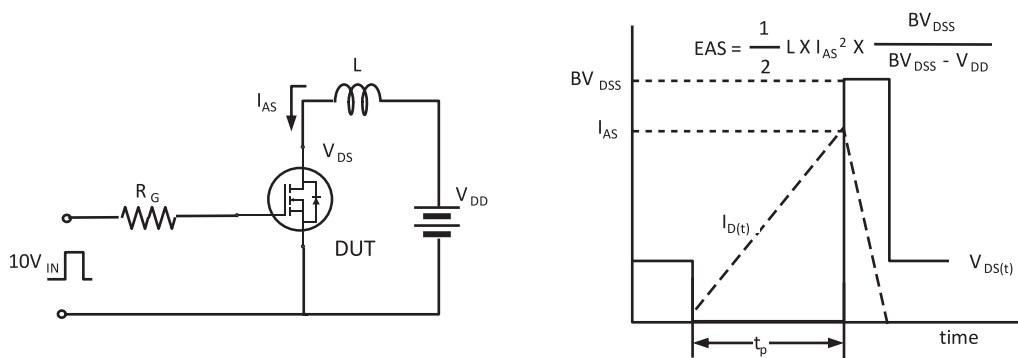
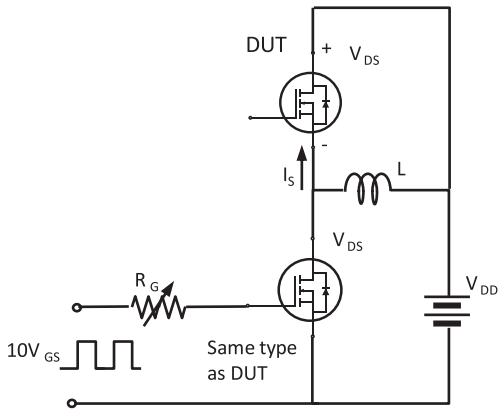
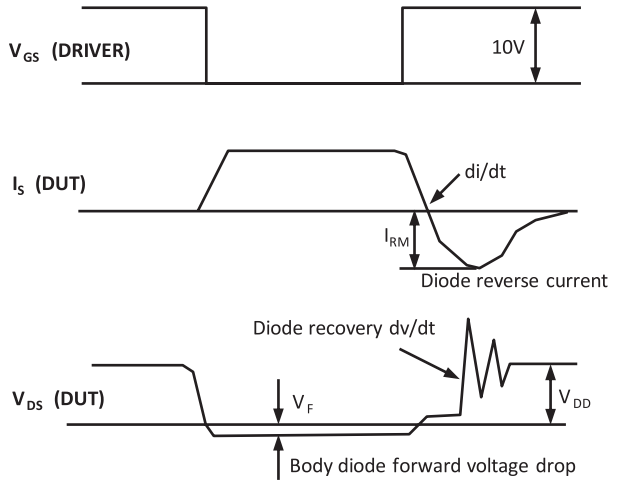


Fig. 4. Peak diode recovery dv/dt test circuit & waveform



*. dv/dt controlled by RG
 *. IS controlled by pulse period



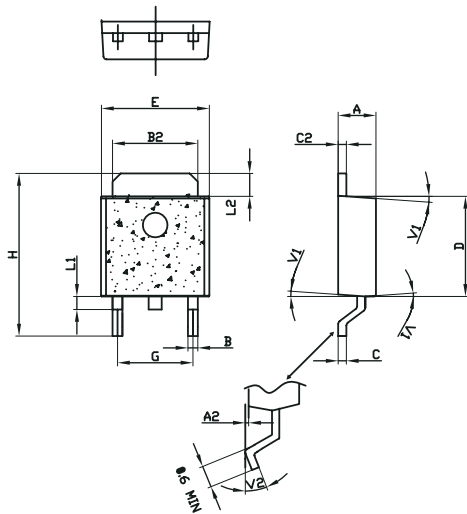
PACKAGE DIMENSIONS

TO-251

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.10	2.40	0.083	0.094
A1	0.89	1.50	0.035	0.059
b	0.50	0.70	0.020	0.028
b1	0.70	0.90	0.028	0.035
b2	5.20	5.40	0.205	0.213
C	0.46	0.61	0.018	0.024
C1	0.46	0.89	0.018	0.035
D	6.35	6.73	0.250	0.265
E	5.33	6.30	0.210	0.248
e	2.29TYP		0.09TYP	
L	6.50	7.90	0.256	0.311
L1	1.42	1.82	0.056	0.072
L2	1.35	1.65	0.053	0.065

TO-252

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.40	0.086	0.095
A2	0.03	0.23	0.001	0.009
B	0.55	0.65	0.021	0.026
B2	5.10	5.40	0.200	0.212
C	0.45	0.62	0.017	0.024
C2	0.48	0.62	0.019	0.024
D	6.00	6.20	0.236	0.244
E	6.40	6.70	0.252	0.264
G	4.40	4.70	0.173	0.185
H	9.35	10.10	0.368	0.397
L1	0.80TYP		0.031TYP	
L2	1.37	1.50	0.05	0.06
V1	4° TYP		4° TYP	
V2	0°	8°	0°	8°



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