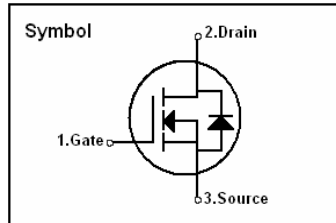


## N-Channel MOSFET

### Features

- 3.0A, 600V,  $R_{DS(on)}=4.0\ \Omega$  @  $V_{GS}=10V$
- Gate charge (Typical 7.0nC)
- High ruggedness
- Fast switching
- 100% Avalanche Tested
- Improved dv/dt capability



$$BV_{DSS} = 600V$$

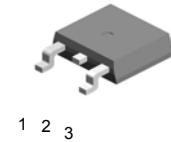
$$R_{DS(ON)} = 4.0\ \Omega$$

$$I_D = 3.0A$$

### General Description

This N-channel enhancement mode field-effect power transistor using HG semiconductor's advanced planar stripe, DMOS technology intended for off-line switch mode power supply. Also, especially designed to minimize  $r_{ds(on)}$  and high rugged avalanche characteristics. The D-PAK pkg is well suited for charger SMPS and small power inverter application.

### D-PAK



### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain to Source Voltage	600	V
$I_D$	Continuous Drain Current(@ $T_C = 25^\circ C$ )	3.0	A
	Continuous Drain Current(@ $T_C = 100^\circ C$ )	1.9	A
$I_{DM}$	Drain Current Pulsed (Note 1)	12	A
$V_{GS}$	Gate to Source Voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	148	mJ
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	4.5	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
$P_D$	Total Power Dissipation(@ $T_C = 25^\circ C$ )	45	W
	Derating Factor above $25^\circ C$	0.36	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			Units
		Min.	Typ.	Max.	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	-	2.78	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case to Sink	-	-	50	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	110	$^\circ C/W$

**Electrical Characteristics** (  $T_C = 25\text{ }^\circ\text{C}$  unless otherwise noted )

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	600	-	-	V
$BV_{DSS}/T_J$	Breakdown Voltage Temperature coefficient	$I_D = 250\mu A$ , referenced to $25\text{ }^\circ\text{C}$	-	0.4	-	$V/^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS} = 600V, V_{GS} = 0V$	-	-	10	$\mu A$
		$V_{DS} = 480V, T_C = 125\text{ }^\circ\text{C}$	-	-	100	$\mu A$
$I_{GSS}$	Gate-Source Leakage, Forward	$V_{GS} = 30V, V_{DS} = 0V$	-	-	100	nA
	Gate-source Leakage, Reverse	$V_{GS} = -30V, V_{DS} = 0V$	-	-	-100	nA
<b>On Characteristics</b>						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.0	-	4.0	V
$R_{DS(on)}$	Static Drain-Source On-state Resistance	$V_{GS} = 10V, I_D = 1.0A$	-	-	4.0 (Note4)	$\Omega$
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V, f = 1MHz$	-	570	720	pF
$C_{oss}$	Output Capacitance		-	150	215	
$C_{rss}$	Reverse Transfer Capacitance		-	310	450	
<b>Dynamic Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 300V, I_D = 2.0A, R_G = 25$ <b>see fig. 13.</b> (Note 4, 5)	-	15	35	ns
$t_r$	Rise Time		-	75	140	
$t_{d(off)}$	Turn-off Delay Time		-	30	60	
$t_f$	Fall Time		-	35	60	
$Q_g$	Total Gate Charge	$V_{DS} = 480V, V_{GS} = 10V, I_D = 2.0A$ <b>see fig. 12.</b> (Note 4, 5)	-	15	20	nC
$Q_{gs}$	Gate-Source Charge		-	1.6	-	
$Q_{gd}$	Gate-Drain Charge(Miller Charge)		-	6	-	

**Source-Drain Diode Ratings and Characteristics**

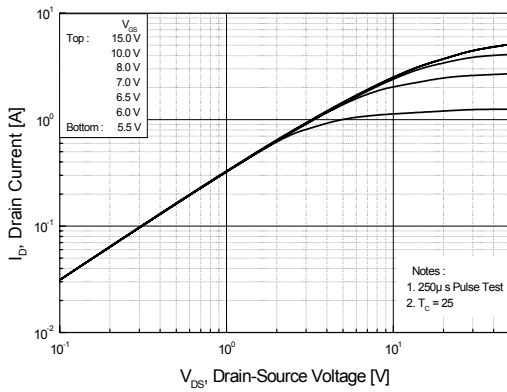
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
$I_S$	Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	-	-	2.0	A
$I_{SM}$	Pulsed Source Current		-	-	8.0	
$V_{SD}$	Diode Forward Voltage	$I_S = 1.5A, V_{GS} = 0V$	-	-	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S = 2.0A, V_{GS} = 0V, di/dt = 100A/\mu s$	-	600	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	1.1	-	$\mu C$

**\* NOTES**

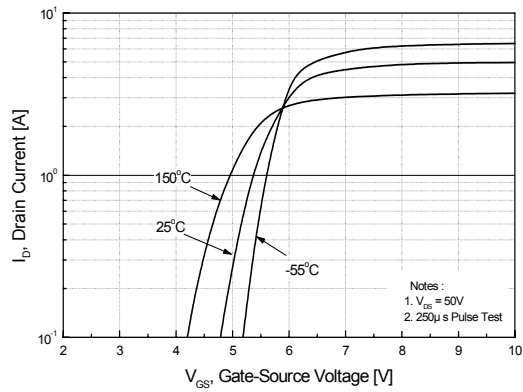
1. Repeativity rating : pulse width limited by junction temperature
2.  $L = 14.2mH, I_{AS} = 10.3A, V_{DD} = 50V, R_G = 50\Omega$ , Starting  $T_J = 25^\circ\text{C}$
3.  $I_{SD} \leq 10.3A, di/dt \leq 300A/\mu s, V_{DD} \leq BV_{DSS}$ , Starting  $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$
5. Essentially independent of operating temperature.



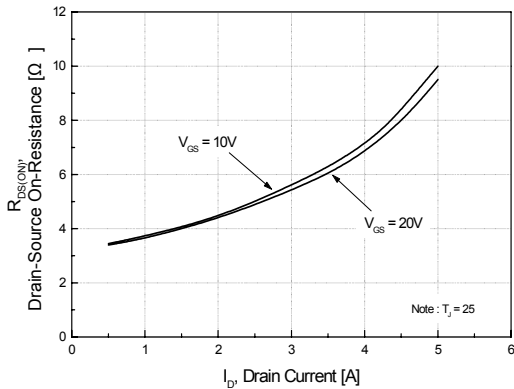
**Fig 1. On-State Characteristics**



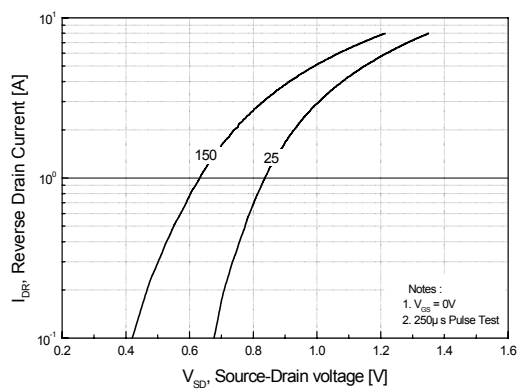
**Fig 2. Transfer Characteristics**



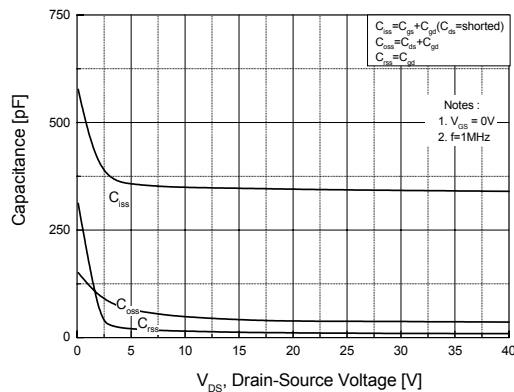
**Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage**



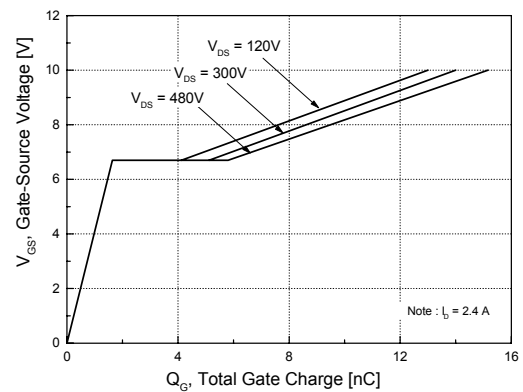
**Fig 4. On State Current vs. Allowable Case Temperature**



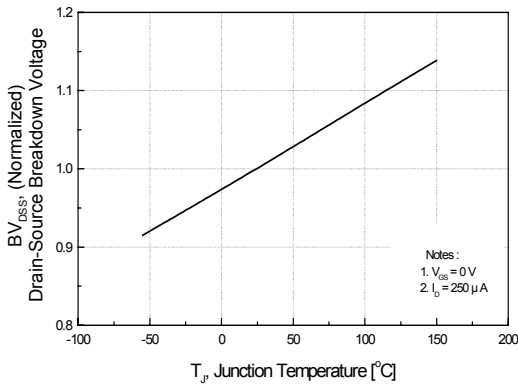
**Fig 5. Capacitance Characteristics ( Non-Repetitive )**



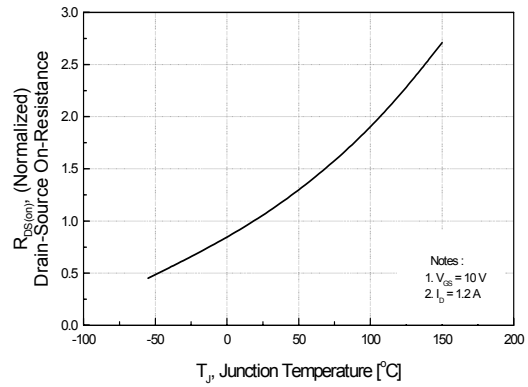
**Fig 6. Gate Charge Characteristics**



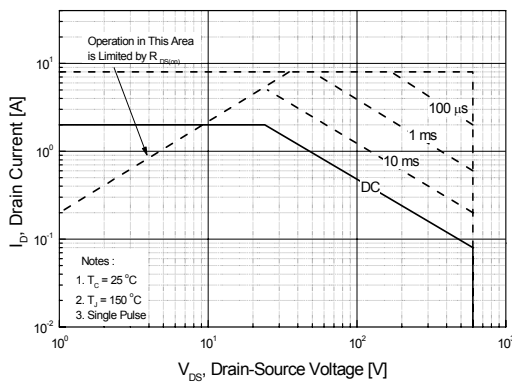
**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**



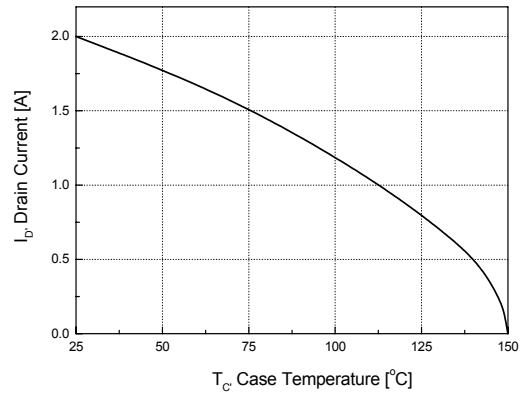
**Fig 8. On-Resistance Variation vs. Junction Temperature**



**Fig 9. Maximum Safe Operating Area**



**Fig 10. Maximum Drain Current**



**Fig 11. Transient Thermal Response Curve**

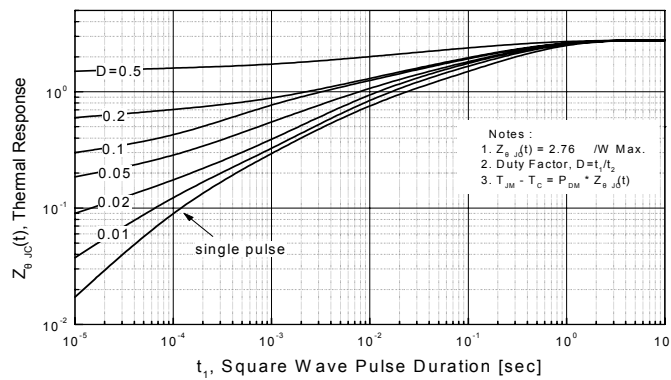


Fig. 12. Gate Charge Test Circuit & Waveforms

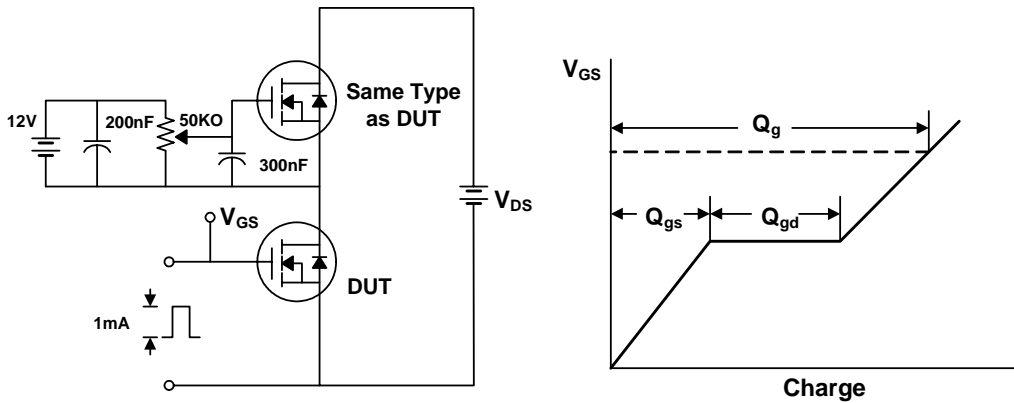


Fig 13. Switching Time Test Circuit & Waveforms

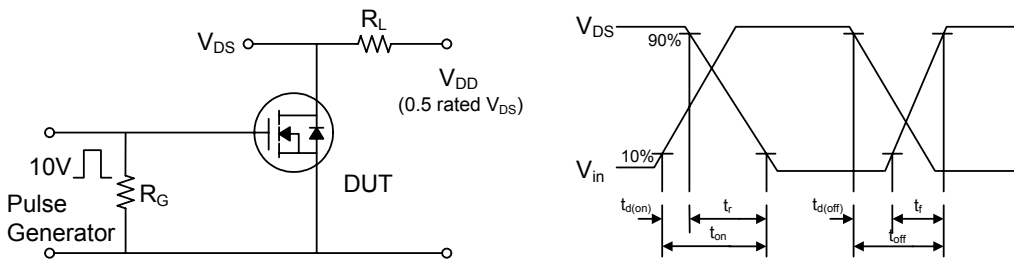


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms

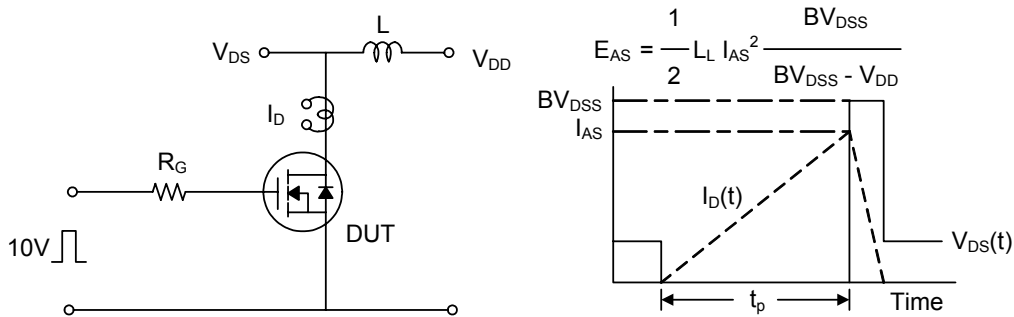
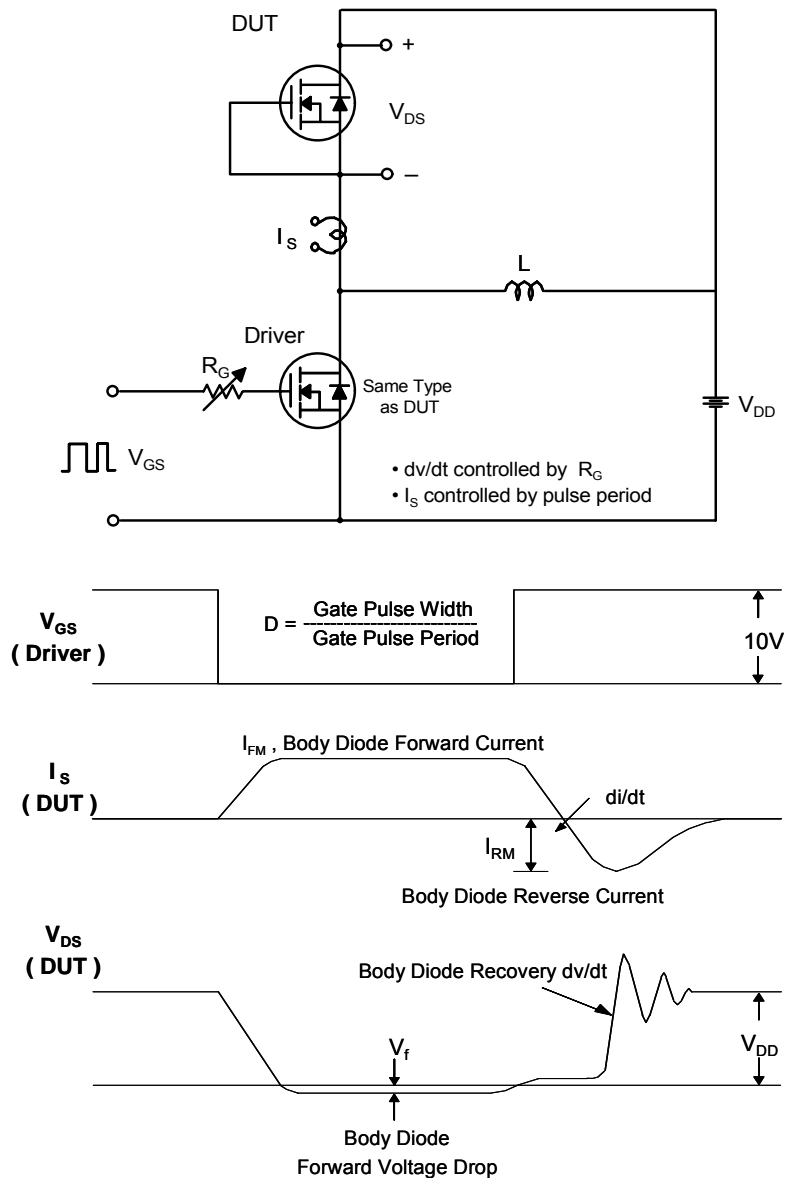


Fig. 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



## TO-252(D-PAK) Package Dimension

Dim.	mm			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.48	6.604	6.73	0.255	0.26	0.265
B	5.0	5.08	5.21	0.197	0.2	0.205
C	7.42	7.8	8.18	0.292	0.307	0.322
D	2.184	2.286	2.388	0.086	0.09	0.094
E	0.762	0.813	0.864	0.03	0.032	0.034
F	1.016	1.067	1.118	0.04	0.042	0.044
G		2.286			0.09	
H		2.286			0.09	
I	0.534	0.61	0.686	0.021	0.024	0.027
J	1.016	1.067	1.118	0.04	0.042	0.044
K		0.508			0.02	
L		0.762			0.03	
		1.57			0.06	

