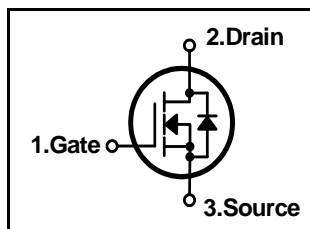


## N-Channel MOSFET

### Features

$R_{DS(on)}$  (Max 0.022  $\Omega$ )@ $V_{GS}=10V$   
 Gate Charge (Typical 36nC)  
 Improved dv/dt Capability  
 High ruggedness  
 100% Avalanche Tested



$BV_{DSS} = 60V$

$R_{DS(ON)} = 0.022 \text{ ohm}$

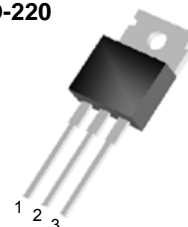
$I_D = 50A$

### General Description

This N-channel enhancement mode field-effect power transistor using DI semiconductor's advanced planar stripe, DMOS technology intended for battery operated systems like a DC-DC converter motor control, ups, audio amplifier.

Also, especially designed to minimize  $r_{ds(on)}$ , low gate charge and high rugged avalanche characteristics.

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### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain to Source Voltage	60	V
$I_D$	Continuous Drain Current(@ $T_C = 25^\circ C$ )	50	A
	Continuous Drain Current(@ $T_C = 100^\circ C$ )	38	A
$I_{DM}$	Drain Current Pulsed (Note 1)	200	A
$V_{GS}$	Gate to Source Voltage	$\pm 25$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	642	mJ
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	12	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	7.0	V/ns
$P_D$	Total Power Dissipation(@ $T_C = 25^\circ C$ )	120	W
	Derating Factor above $25^\circ C$	0.8	W/ $^\circ C$
$T_{STG}, T_J$	Operating Junction Temperature & Storage Temperature	- 55 ~ 175	$^\circ C$
$T_L$	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	-	-	1.25	$^\circ C/W$
$R_{\theta CS}$	Thermal Resistance, Case to Sink	-	0.5	-	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	62.5	$^\circ C/W$

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## Electrical Characteristics (T<sub>C</sub> = 25 °C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250uA	60	-	-	V
BV <sub>DSS</sub> / T <sub>J</sub>	Breakdown Voltage Temperature coefficient	I <sub>D</sub> = 250uA, referenced to 25 °C	-	0.06	-	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V	-	-	1	uA
		V <sub>DS</sub> = 48V, T <sub>C</sub> = 125 °C	-	-	10	uA
I <sub>GSS</sub>	Gate-Source Leakage, Forward	V <sub>GS</sub> = 25V, V <sub>DS</sub> = 0V	-	-	100	nA
	Gate-source Leakage, Reverse	V <sub>GS</sub> = -25V, V <sub>DS</sub> = 0V	-	-	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250uA	2.0	-	4.0	V
R <sub>DS(ON)</sub>	Static Drain-Source On-state Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 25A	-	0.017	0.022	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25V, f = 1MHz	-	-	1460	pF
C <sub>oss</sub>	Output Capacitance		-	-	580	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	-	90	
<b>Dynamic Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = 30V, I <sub>D</sub> = 25A, R <sub>G</sub> = 25 <b>see fig. 13.</b> (Note 4, 5)	-	50	-	ns
t <sub>r</sub>	Rise Time		-	165	-	
t <sub>d(off)</sub>	Turn-off Delay Time		-	78	-	
t <sub>f</sub>	Fall Time		-	60	-	
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 160V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 9A <b>see fig. 12.</b> (Note 4, 5)	-	36	45	nC
Q <sub>gs</sub>	Gate-Source Charge		-	8.5	-	
Q <sub>gd</sub>	Gate-Drain Charge(Miller Charge)		-	12	-	

## Source-Drain Diode Ratings and Characteristics

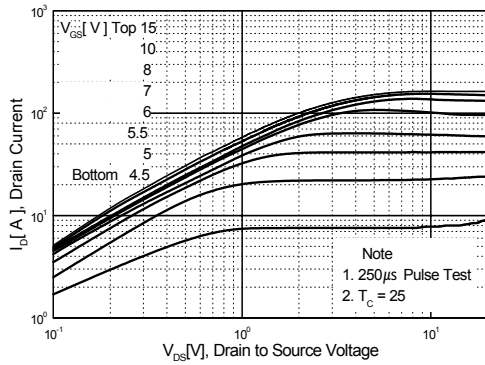
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
I <sub>S</sub>	Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	-	-	50	A
I <sub>SM</sub>	Pulsed Source Current		-	-	200	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = 50A, V <sub>GS</sub> = 0V	-	-	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> = 50A, V <sub>GS</sub> = 0V, di <sub>F</sub> /dt = 100A/us	-	95	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	250	-	uC

### NOTES

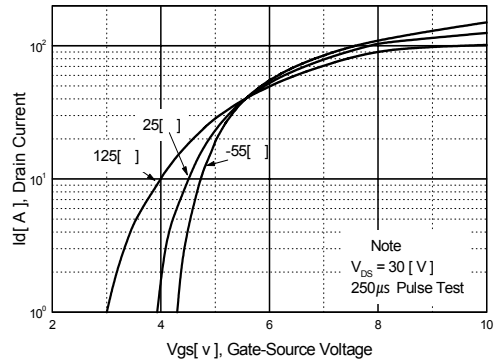
1. Repeativity rating : pulse width limited by junction temperature
2. L = 300uH, I<sub>AS</sub> = 50A, V<sub>DD</sub> = 25V, R<sub>G</sub> = 50 , Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> = 50A, di/dt = 300A/us, V<sub>DD</sub> = BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
4. Pulse Test : Pulse Width = 300us, Duty Cycle = 2%
5. Essentially independent of operating temperature.

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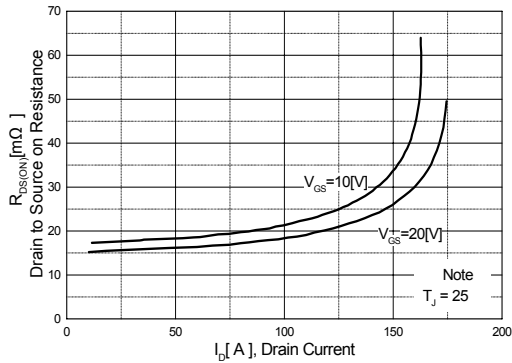
**Fig 1. On-State Characteristics**



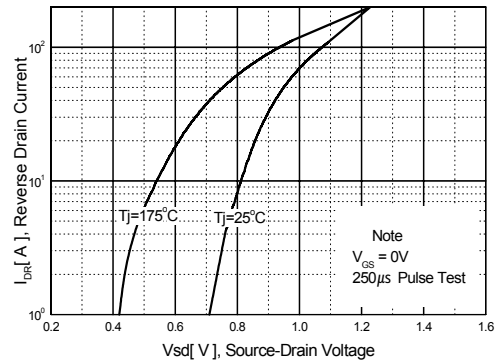
**Fig 2. Transfer Characteristics**



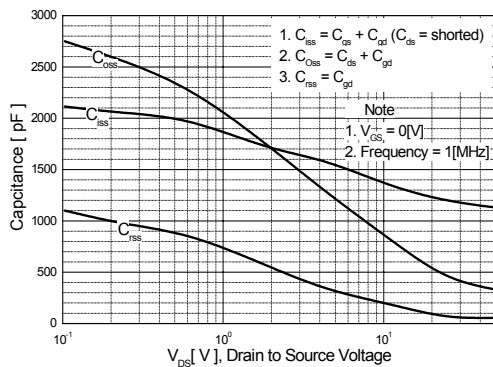
**Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage**



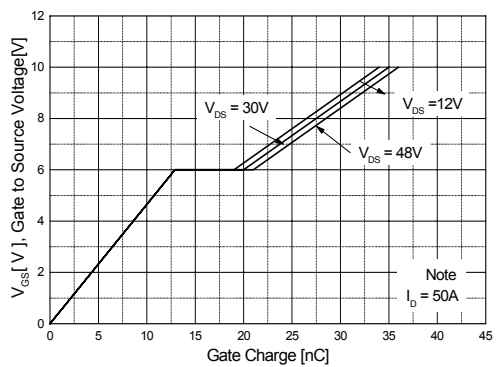
**Fig 4. On State Current vs. Allowable Case Temperature**



**Fig 5. Capacitance Characteristics**

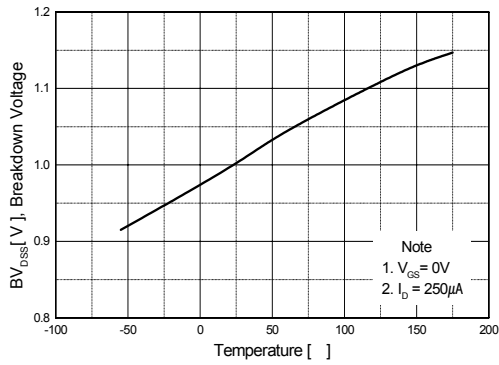


**Fig 6. Gate Charge Characteristics**

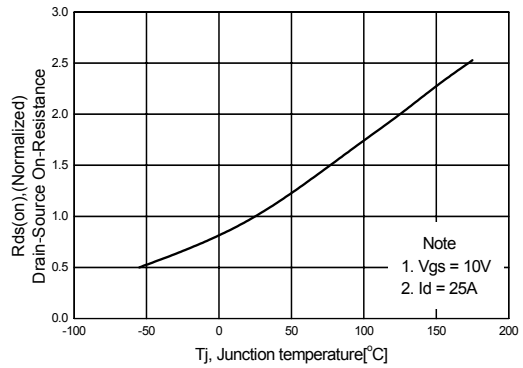


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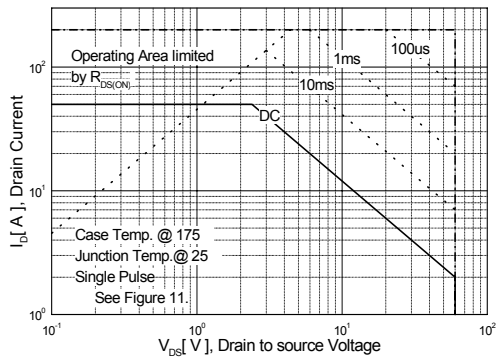
**Fig 7. Breakdown Voltage variation vs. Temperature**



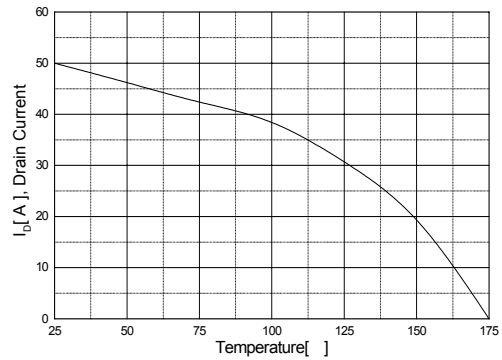
**Fig 8. On Resistance variation vs. Temperature**



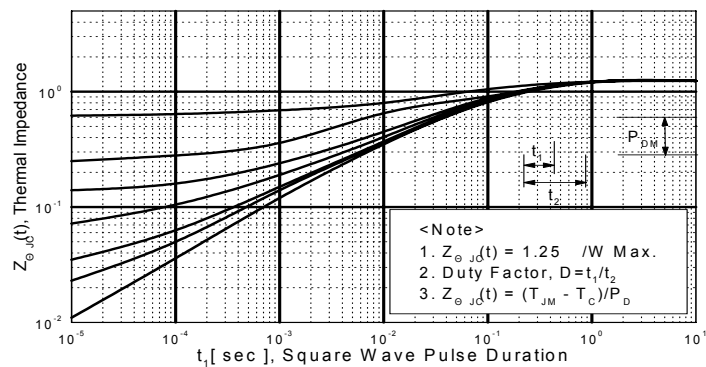
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Maximum Drain Current vs. Case Temperature**



**Fig 11. Transient Thermal Response Curve**



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Fig. 12. Gate Charge Test Circuit & Waveforms

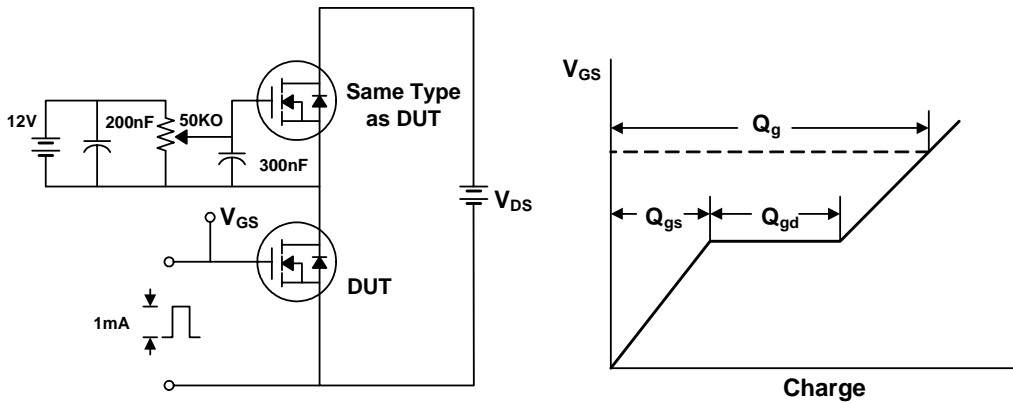


Fig 13. Switching Time Test Circuit & Waveforms

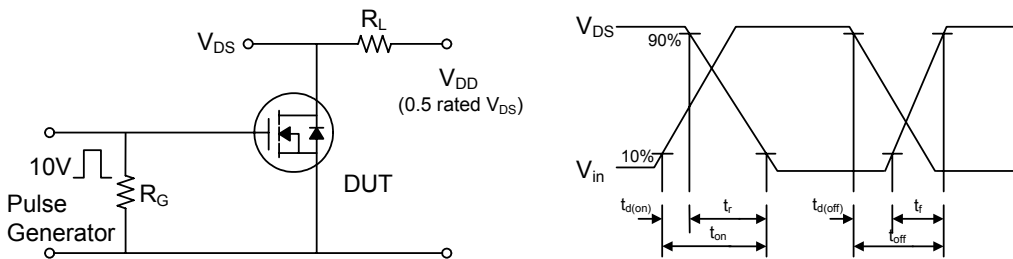
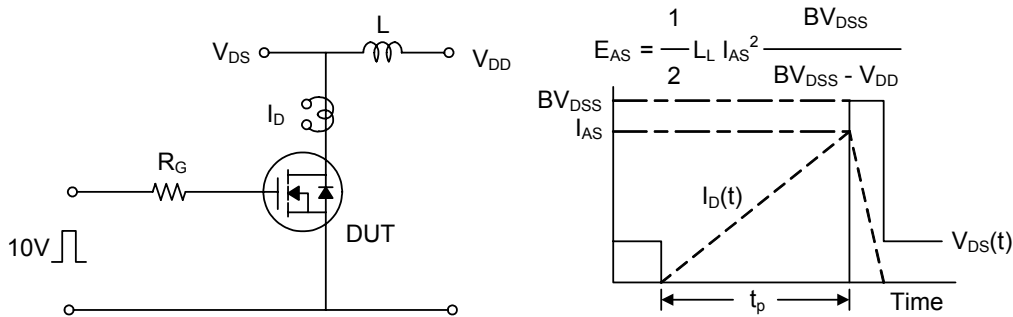
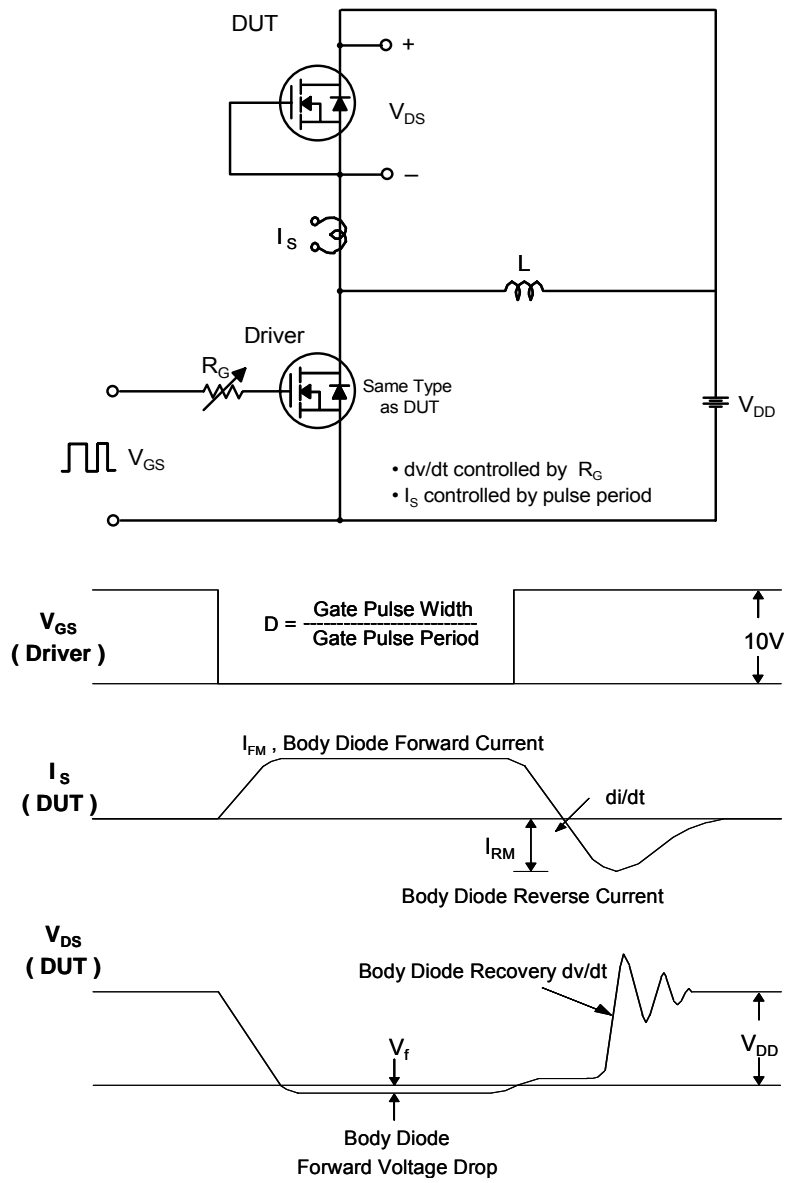


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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



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## TO-220 Package Dimension

Dim.	mm			Inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	6.12	6.32	6.52	0.241	0.249	0.257
B	9.00	9.20	9.40	0.354	0.362	0.370
C	12.88	13.08	13.28	0.507	0.515	0.523
D	2.70	2.80	2.90	0.106	0.110	0.114
E	1.20	1.30	1.40	0.047	0.051	0.055
F	15.12	15.52	15.92	0.595	0.611	0.627
G	2.70	3.00	3.30	0.106	0.118	0.130
H	4.30	4.50	4.70	0.169	0.177	0.185
I	1.25	1.30	1.40	0.049	0.051	0.055
J	0.45	0.50	0.60	0.018	0.020	0.024
K	2.30	2.40	2.50	0.091	0.094	0.098
L		9.90			0.390	
M	1.42	1.52	1.62	0.056	0.060	0.064
N	0.75	0.85	0.95	0.030	0.033	0.037
O	2.44	2.54	2.64	0.096	0.100	0.104
P	4.88	5.08	5.28	0.192	0.200	0.208
		3.60			0.142	

