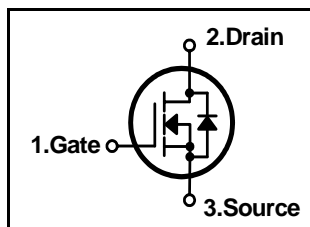


## N-Channel MOSFET

### Features

- Low  $R_{DS(on)}$  (0.04  $\Omega$ ) @  $V_{GS}=10V$
- Low Gate Charge (Typical 27nC)
- Low  $C_{rss}$  (Typical 75pF)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Maximum Junction Temperature Range

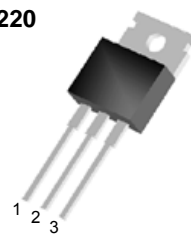


$BV_{DSS} = 60V$   
 $R_{DS(ON)} = 0.04 \text{ ohm}$   
 $I_D = 30A$

### 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(@ $T_C = 25^\circ C$ )	30	A
	Continuous Drain Current(@ $T_C = 100^\circ C$ )	21.2	A
$I_{DM}$	Drain Current Pulsed (Note 1)	120	A
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	430	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	7.0	V/ns
$P_D$	Total Power Dissipation(@ $T_C = 25^\circ C$ )	79	W
	Derating Factor above $25^\circ C$	0.53	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	-	-	1.90	$^\circ C/W$
$R_{\theta CS}$	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 ( $T_C = 25\text{ }^\circ\text{C}$ unless otherwise noted )

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu A$	60	-	-	V
$BV_{DSS}/T_J$	Breakdown Voltage Temperature coefficient	$I_D = 250\mu A$ , referenced to $25\text{ }^\circ\text{C}$	-	0.062	-	V/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 60V, V_{GS} = 0V$	-	-	1	$\mu A$
		$V_{DS} = 48V, T_C = 150\text{ }^\circ\text{C}$	-	-	10	$\mu A$
$I_{GSS}$	Gate-Source Leakage, Forward	$V_{GS} = 20V, V_{DS} = 0V$	-	-	100	nA
	Gate-Source Leakage, Reverse	$V_{GS} = -20V, V_{DS} = 0V$	-	-	-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	$V_{GS} = 10V, I_D = 15A$	-	0.029	0.04	
<b>Dynamic Characteristics</b>						
$C_{iss}$	Input Capacitance	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{MHz}$	-	930	1210	pF
$C_{oss}$	Output Capacitance		-	290	380	
$C_{rss}$	Reverse Transfer Capacitance		-	75	100	
<b>Dynamic Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 30V, I_D = 15A, R_G = 50$ <b>see fig. 13.</b> (Note 4, 5)	-	15	40	ns
$t_r$	Rise Time		-	25	60	
$t_{d(off)}$	Turn-off Delay Time		-	60	130	
$t_f$	Fall Time		-	40	90	
$Q_g$	Total Gate Charge	$V_{DS} = 48V, V_{GS} = 10V, I_D = 30A$ <b>see fig. 12.</b> (Note 4, 5)	-	27	35	nC
$Q_{gs}$	Gate-Source Charge		-	6.2	-	
$Q_{gd}$	Gate-Drain Charge(Miller Charge)		-	11.1	-	

## Source-Drain Diode Ratings and Characteristics

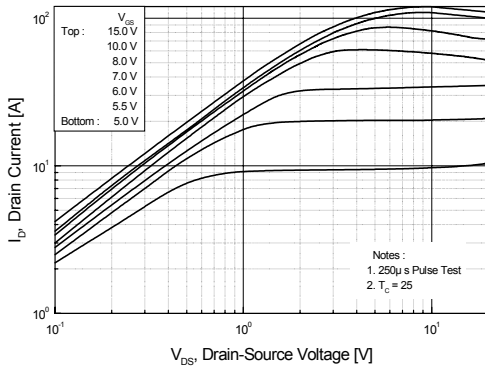
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
$I_S$	Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	-	-	30	A
$I_{SM}$	Pulsed Source Current		-	-	120	
$V_{SD}$	Diode Forward Voltage	$I_S = 30A, V_{GS} = 0V$	-	-	1.5	V
$t_{rr}$	Reverse Recovery Time	$I_S = 30A, V_{GS} = 0V, di_F/dt = 100A/\mu s$	-	45	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	65	-	nC

### NOTES

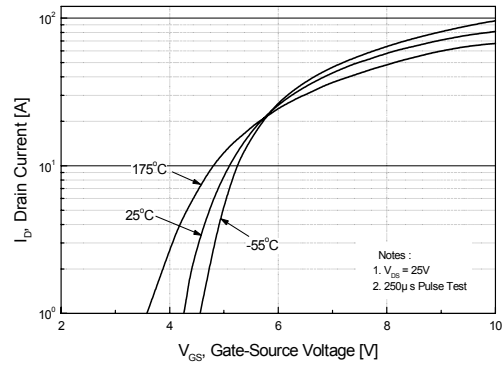
1. Repeativity rating : pulse width limited by junction temperature
2.  $L = 560\mu H, I_{AS} = 30A, V_{DD} = 25V, R_G = 0$  , Starting  $T_J = 25\text{ }^\circ\text{C}$
3.  $I_{SD} = 30A, di/dt = 300A/\mu s, V_{DD} = BV_{DSS}$ , Starting  $T_J = 25\text{ }^\circ\text{C}$
4. Pulse Test : Pulse Width  $300\mu s$ , Duty Cycle 2%
5. Essentially independent of operating temperature.

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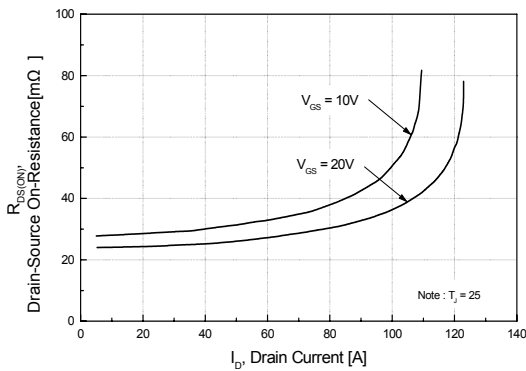
**Fig 1. On-State Characteristics**



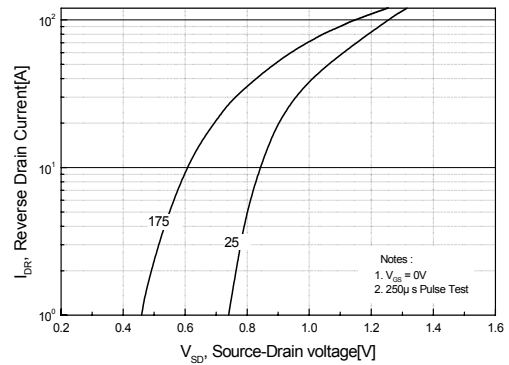
**Fig 2. Transfer Characteristics**



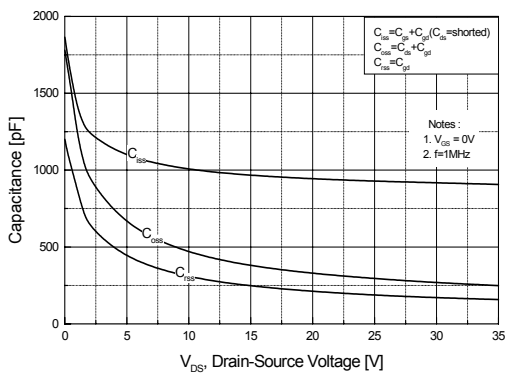
**Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage**



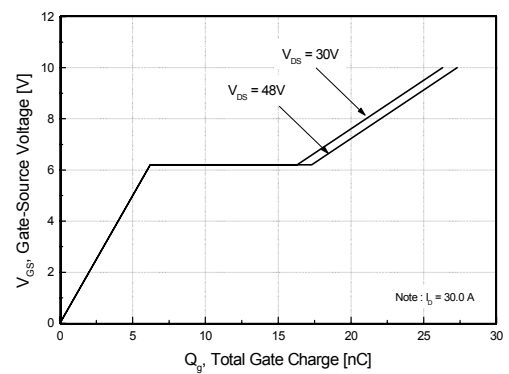
**Fig 4. On State Current vs. Allowable Case Temperature**



**Fig 5. Capacitance Characteristics**

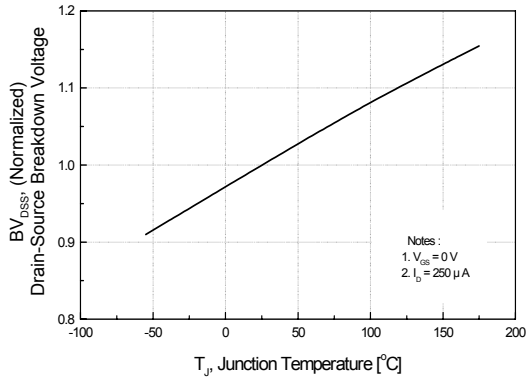


**Fig 6. Gate Charge Characteristics**

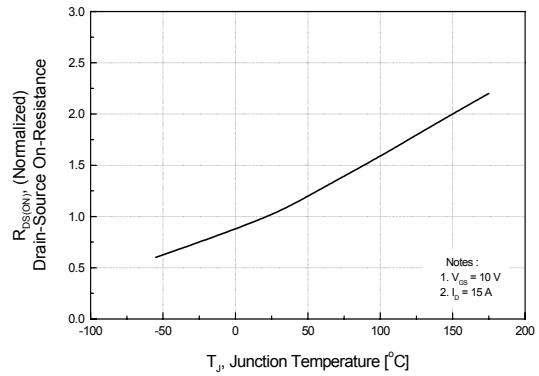


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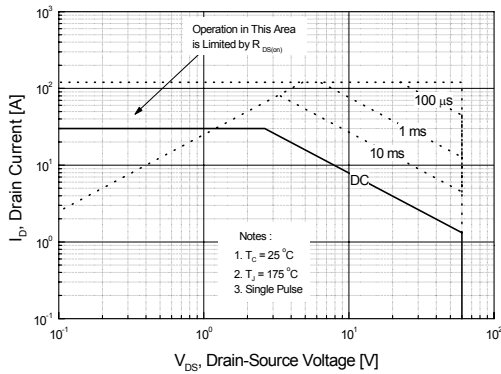
**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**



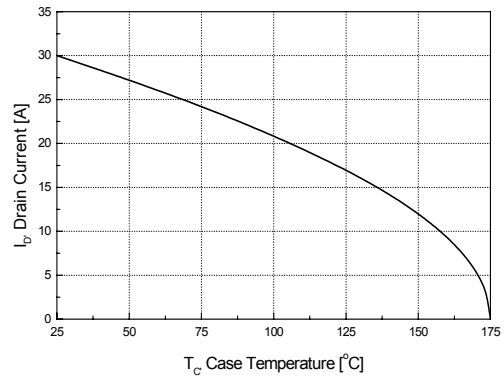
**Fig 8. On-Resistance Variation vs. Junction Temperature**



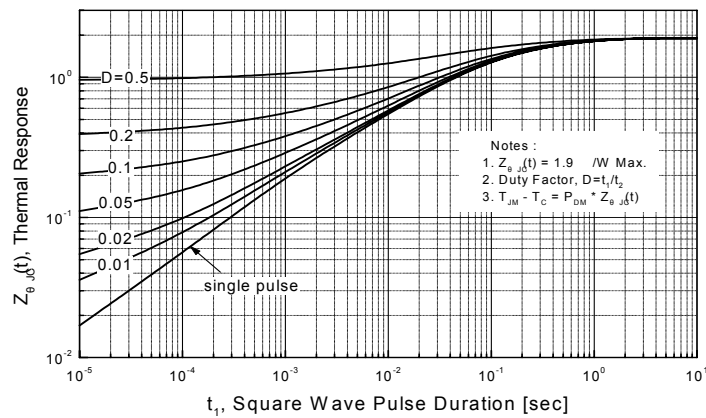
**Fig 9. Maximum Safe Operating Area**



**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

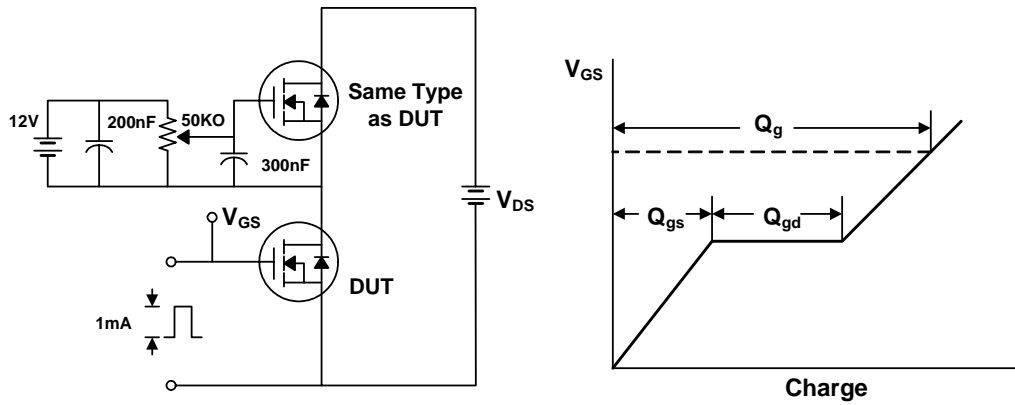


Fig 13. Switching Time Test Circuit & Waveforms

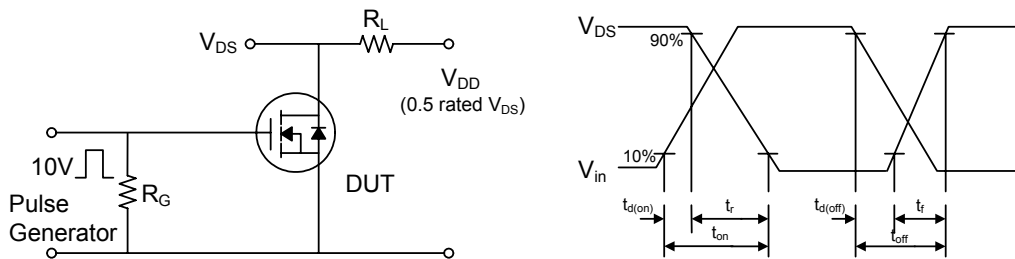
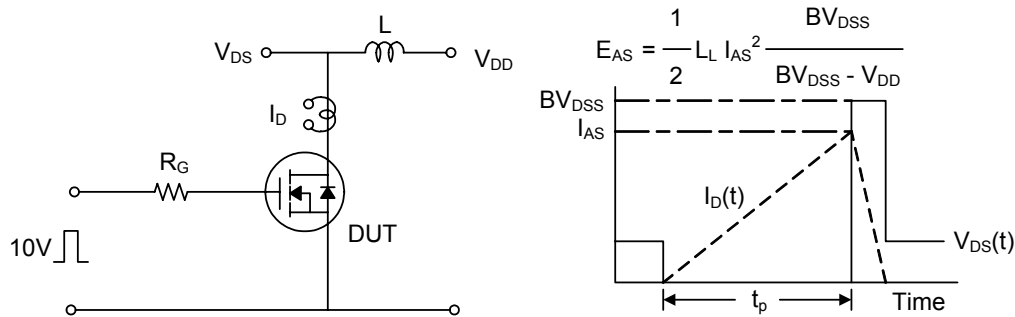
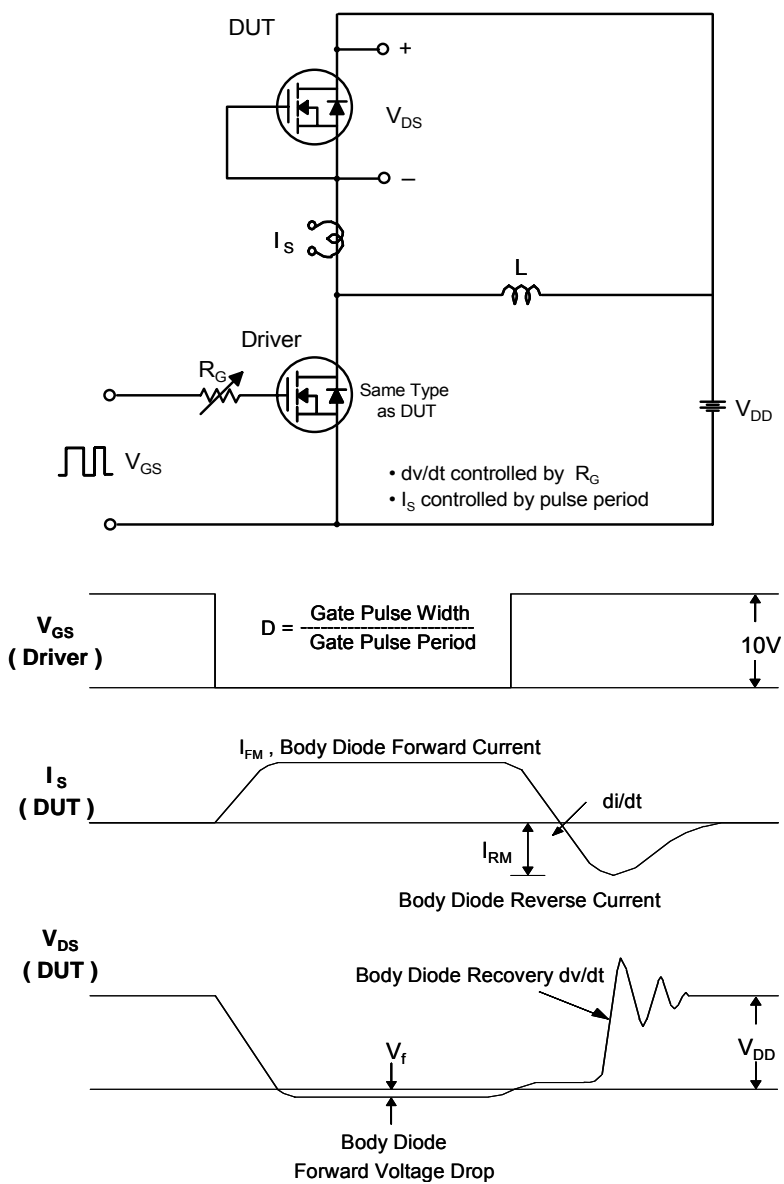


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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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	

