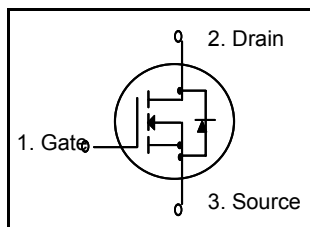


N-Channel MOSFET

Features

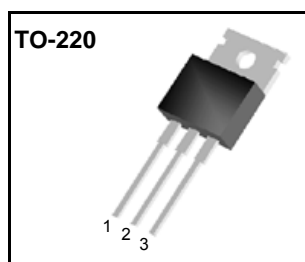
- High ruggedness
- $R_{DS(on)}$ (Max 2.5 Ω) @ $V_{GS}=10V$
- Gate Charge (Typical 25nC)
- Improved dv/dt Capability
- 100% Avalanche Tested



$BV_{DSS} = 600V$
 $R_{DS(ON)} = 2.5 \text{ ohm}$
 $I_D = 4A$

General Description

This N-channel enhancement mode field-effect power transistor using D&I 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 TO-220 pkg is well suited for adaptor power unit and small power inverter application.



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{DSS}	Drain to Source Voltage	600	V
I_D	Continuous Drain Current(@ $T_C = 25^\circ C$)	4	A
	Continuous Drain Current(@ $T_C = 100^\circ C$)	2.5	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)	262	mJ
E_{AR}	Repetitive Avalanche Energy (Note 1)	10	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5	V/ns
P_D	Total Power Dissipation(@ $T_C = 25^\circ C$)	100	W
	Derating Factor above 25 $^\circ C$	0.8	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	-	-	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_C = 25 °C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0V, I _D = 250uA	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature coefficient	I _D = 250uA, referenced to 25 °C	-	0.68	-	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} = 600V, V _{GS} = 0V	-	-	10	uA
		V _{DS} = 480V, T _C = 125 °C	-	-	100	uA
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
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250uA	2.0	-	4.0	V
R _{DS(ON)}	Static Drain-Source On-state Resistance	V _{GS} = 10 V, I _D = 2.0A	-	2.0	2.5	Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} = 0 V, V _{DS} = 25V, f = 1MHz	-	520	650	pF
C _{oss}	Output Capacitance		-	135	195	
C _{rss}	Reverse Transfer Capacitance		-	280	400	
Dynamic Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} = 300V, I _D = 4.0A, R _G = 25Ω * see fig. 13. (Note 4, 5)	-	25	32	ns
t _r	Rise Time		-	54	70	
t _{d(off)}	Turn-off Delay Time		-	120	157	
t _f	Fall Time		-	34	45	
Q _g	Total Gate Charge		V _{DS} = 480V, V _{GS} = 10V, I _D = 4.0A	-	22	
Q _{gs}	Gate-Source Charge	-		3.2	-	
Q _{gd}	Gate-Drain Charge(Miller Charge)	* see fig. 12. (Note 4, 5)		-	7.8	-

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	-	-	4.0	A
I _{SM}	Pulsed Source Current		-	-	16.0	
V _{SD}	Diode Forward Voltage	I _S = 4.0A, V _{GS} = 0V	-	-	1.4	V
t _{rr}	Reverse Recovery Time	I _S = 4.0A, V _{GS} = 0V, di/dt = 100A/us	-	560	-	ns
Q _{rr}	Reverse Recovery Charge		-	1.78	-	uC

* NOTES

1. Repeatability rating : pulse width limited by junction temperature
2. L = 30mH, I_{AS} = 4.0A, V_{DD} = 50V, R_G = 50Ω, Starting T_J = 25°C
3. I_{SD} ≤ 4.0, di/dt ≤ 300A/us, V_{DD} ≤ BV_{DSS}, Starting T_J = 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

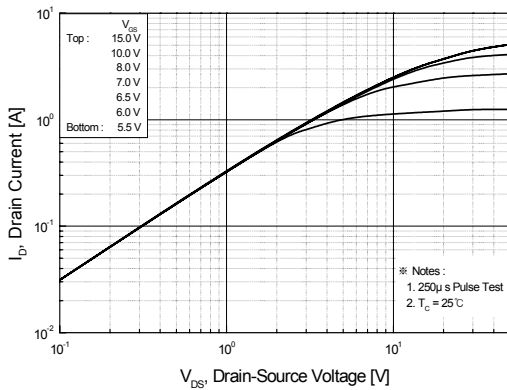


Fig 2. Transfer Characteristics

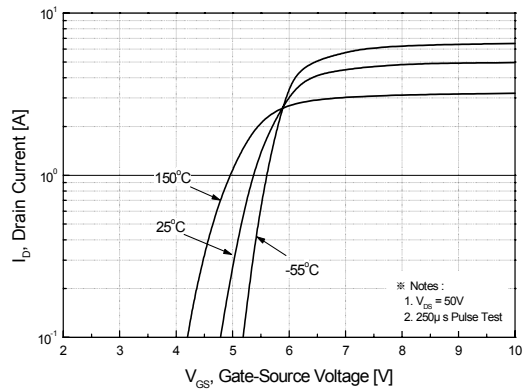


Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage

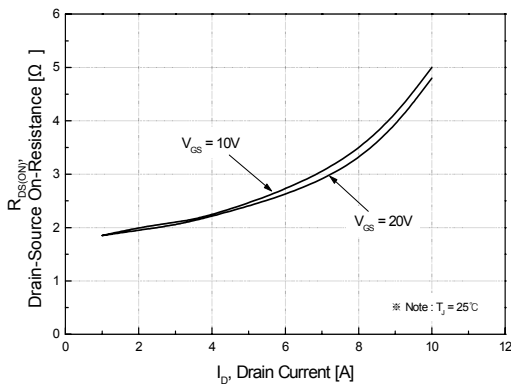


Fig 4. On State Current vs. Allowable Case Temperature

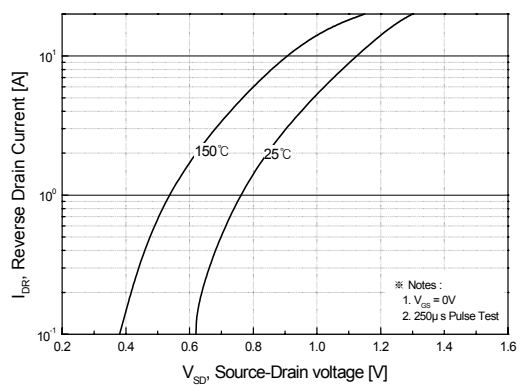


Fig 5. Capacitance Characteristics (Non-Repetitive)

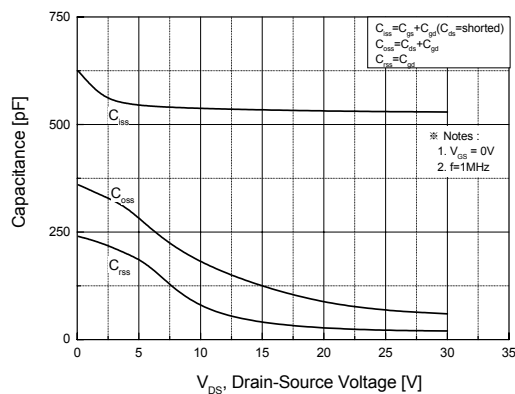
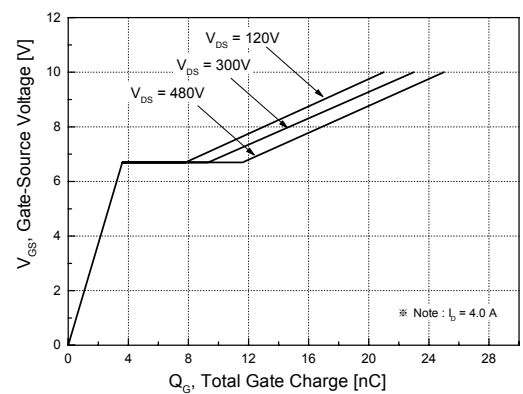


Fig 6. Gate Charge Characteristics



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Fig 7. Breakdown Voltage Variation vs. Junction Temperature

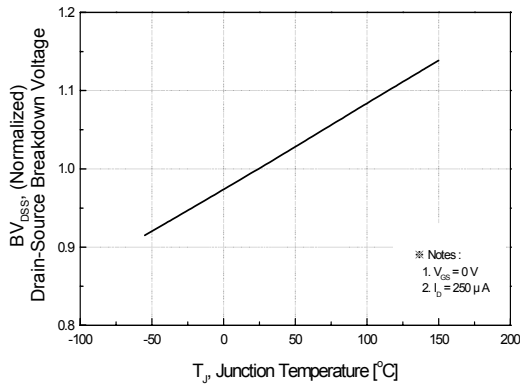


Fig 8. On-Resistance Variation vs. Junction Temperature

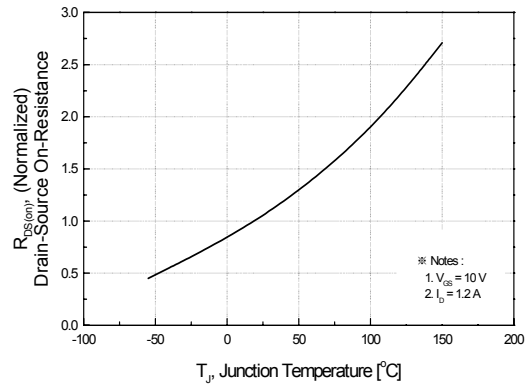


Fig 9. Maximum Safe Operating Area

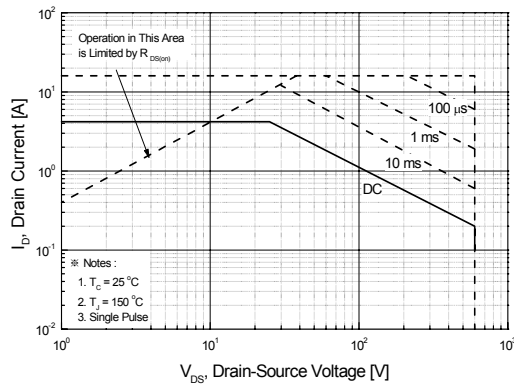


Fig 10. Maximum Drain Current vs. Case Temperature

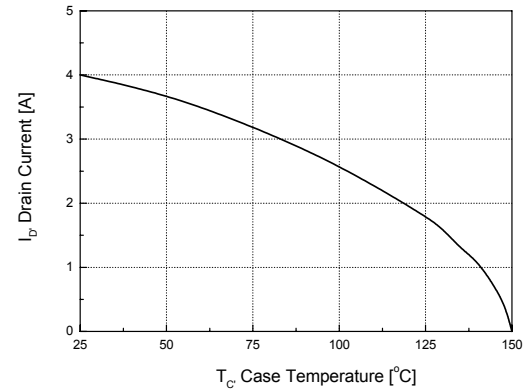
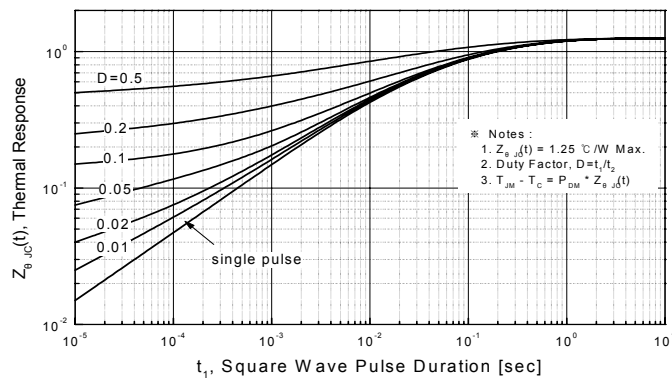


Fig 11. Transient Thermal Response Curve



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Fig. 12. Gate Charge Test Circuit & Waveforms

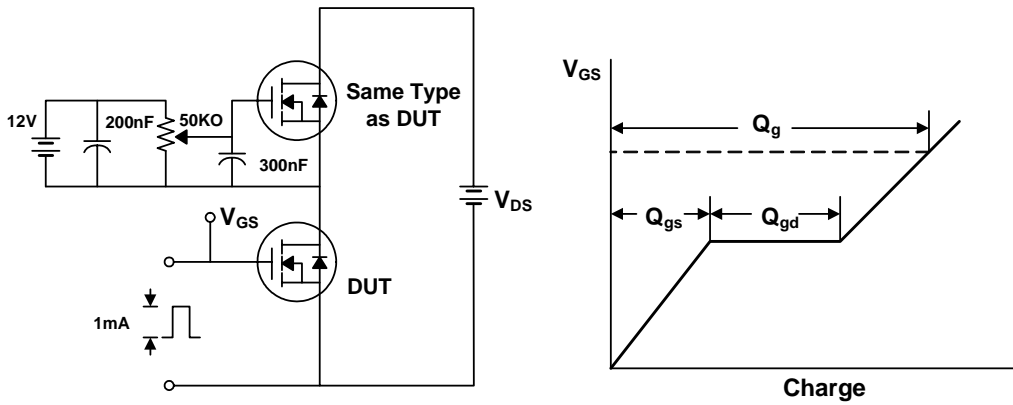


Fig 13. Switching Time Test Circuit & Waveforms

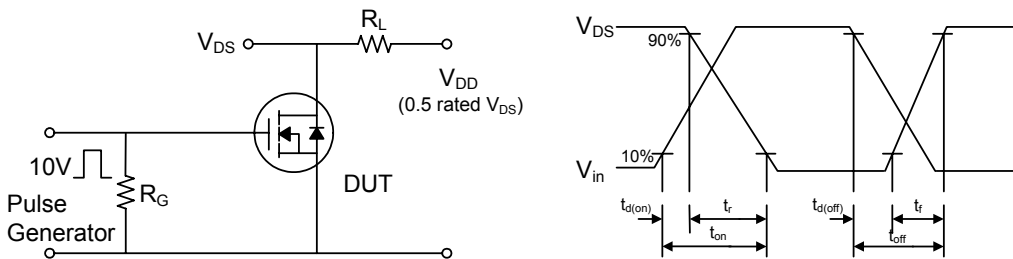
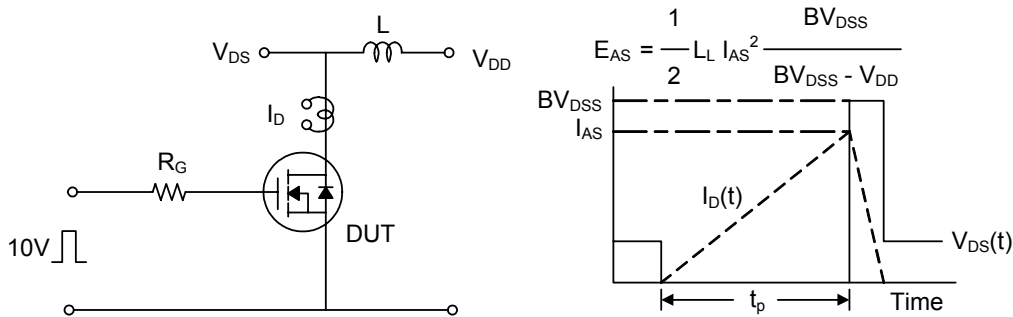
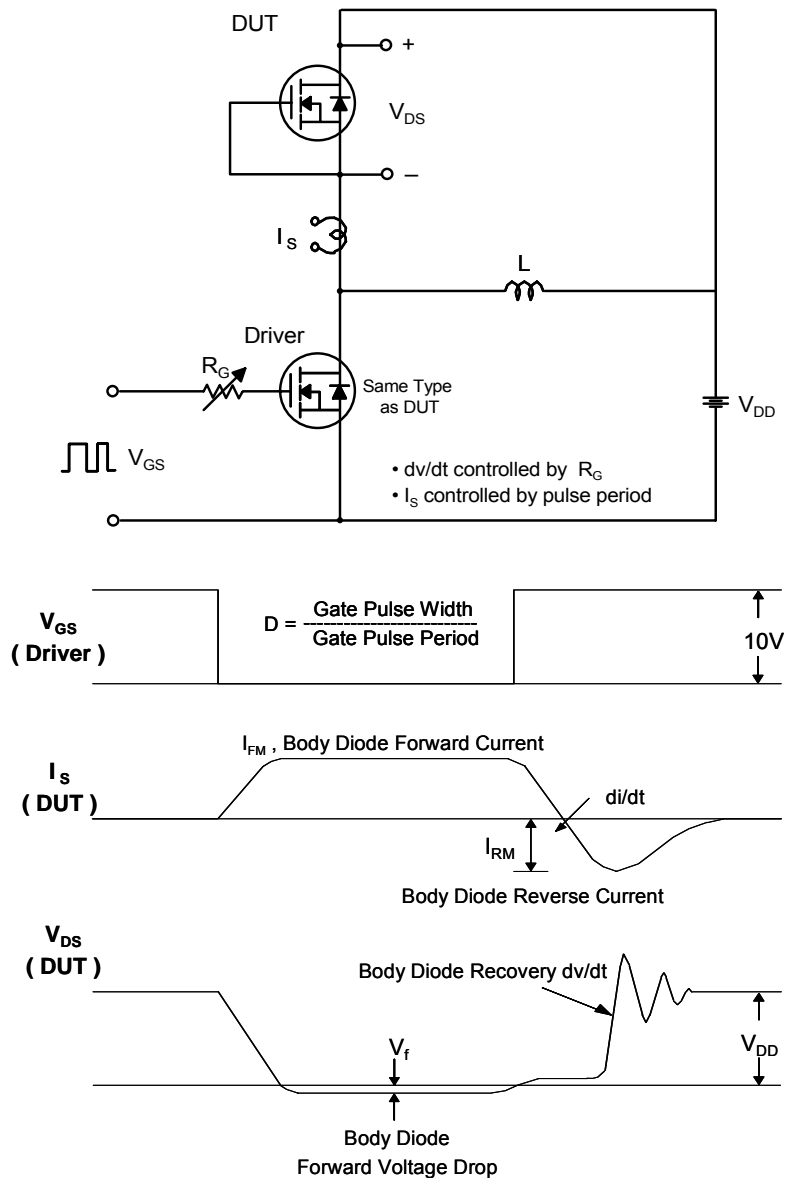


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



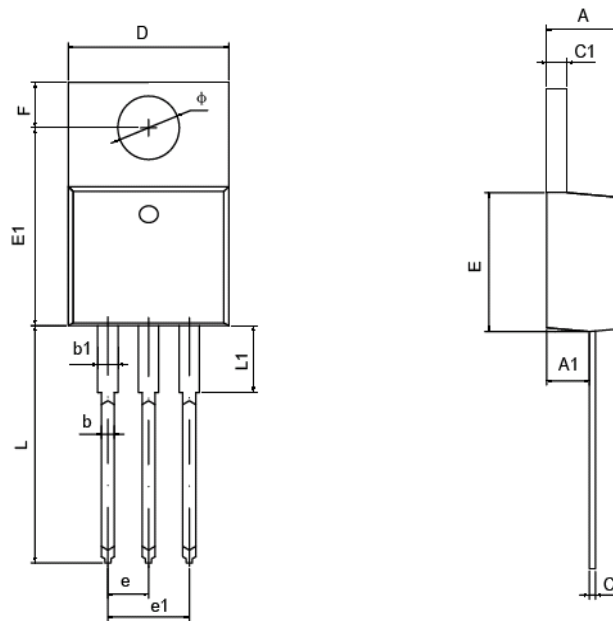
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Fig. 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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TO-220 Package Dimension



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.420	4.720	1.174	0.186
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.360	0.460	0.014	0.018
c1	1.170	1.370	0.046	0.054
D	9.950	10.250	0.392	0.404
E	8.990	9.290	0.354	0.366
E1	12.550	12.850	0.494	0.506
e	2.540TYP		0.100TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
L	13.080	13.480	0.515	0.531
L1	2.470	2.870	0.097	0.113
ϕ	3.790	3.890	0.149	0.153