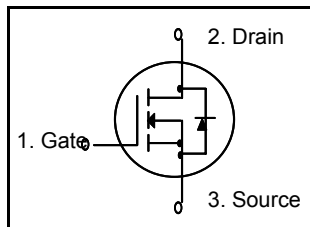


## N-Channel MOSFET

### Features

- High ruggedness
- $R_{DS(on)}$  (Max 2.5  $\Omega$ ) @  $V_{GS}=10V$
- Gate Charge (Typical 22nC)
- Improved dv/dt Capability
- 100% Avalanche Tested



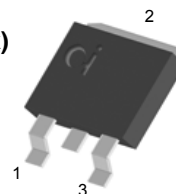
$BV_{DSS} = 600V$   
 $R_{DS(ON)} = 2.5 \text{ ohm}$   
 $I_D = 4A$

### 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.

TO-263  
(D2-Pak)



### Absolute Maximum Ratings

Symbol	Parameter	Value	Units
$V_{DSS}$	Drain to Source Voltage	600	V
$I_D$	Continuous Drain Current(@ $T_C = 25^\circ C$ )	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	$\pm 30$	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<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	600	-	-	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature coefficient	I <sub>D</sub> = 250uA, referenced to 25 °C	-	0.68	-	V/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> = 600V, V <sub>GS</sub> = 0V	-	-	10	uA
		V <sub>DS</sub> = 480V, T <sub>C</sub> = 125 °C	-	-	100	uA
I <sub>GSS</sub>	Gate-Source Leakage, Forward	V <sub>GS</sub> = 30V, V <sub>DS</sub> = 0V	-	-	100	nA
	Gate-source Leakage, Reverse	V <sub>GS</sub> = -30V, 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> = 2.0A	-	2.0	2.5	Ω
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 25V, f = 1MHz	-	520	650	pF
C <sub>oss</sub>	Output Capacitance		-	135	195	
C <sub>rss</sub>	Reverse Transfer Capacitance		-	280	400	
<b>Dynamic Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = 300V, I <sub>D</sub> = 4.0A, R <sub>G</sub> = 25Ω * see fig. 13. (Note 4, 5)	-	25	32	ns
t <sub>r</sub>	Rise Time		-	54	70	
t <sub>d(off)</sub>	Turn-off Delay Time		-	120	157	
t <sub>f</sub>	Fall Time		-	34	45	
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 480V, V <sub>GS</sub> = 10V, I <sub>D</sub> = 4.0A	-	22	28	nC
Q <sub>gs</sub>	Gate-Source Charge		-	3.2	-	
Q <sub>gd</sub>	Gate-Drain Charge(Miller Charge)		* see fig. 12. (Note 4, 5)	-	7.8	

## Source-Drain Diode Ratings and Characteristics

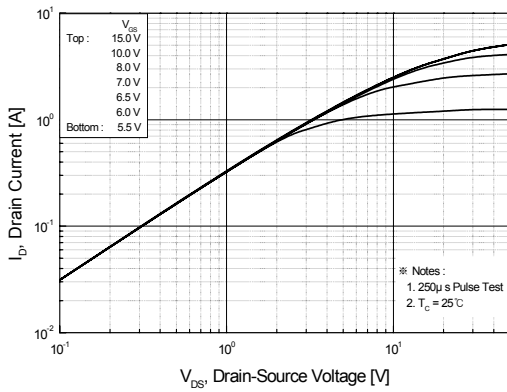
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit.
I <sub>S</sub>	Continuous Source Current	Integral Reverse p-n Junction Diode in the MOSFET	-	-	4.0	A
I <sub>SM</sub>	Pulsed Source Current		-	-	16.0	
V <sub>SD</sub>	Diode Forward Voltage	I <sub>S</sub> = 4.0A, V <sub>GS</sub> = 0V	-	-	1.4	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>S</sub> = 4.0A, V <sub>GS</sub> = 0V, di/dt = 100A/us	-	560	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	1.78	-	uC

### \* NOTES

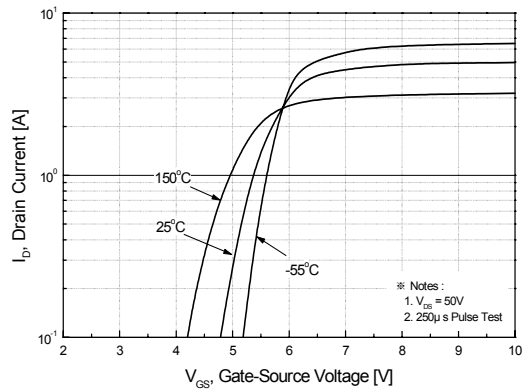
1. Repeatability rating : pulse width limited by junction temperature
2. L = 30mH, I<sub>AS</sub> = 4.0A, V<sub>DD</sub> = 50V, R<sub>G</sub> = 50Ω, Starting T<sub>J</sub> = 25°C
3. I<sub>SD</sub> ≤ 4.0, di/dt ≤ 300A/us, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, Starting T<sub>J</sub> = 25°C
4. Pulse Test : Pulse Width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially independent of operating temperature.

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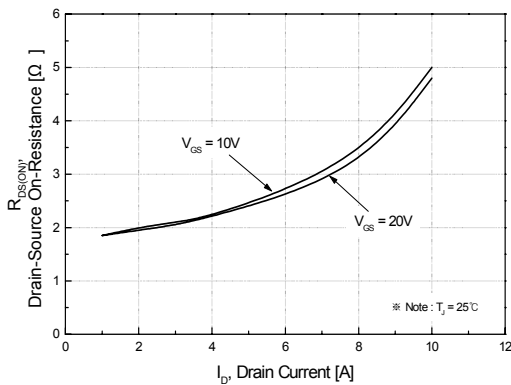
**Fig 1. On-State Characteristics**



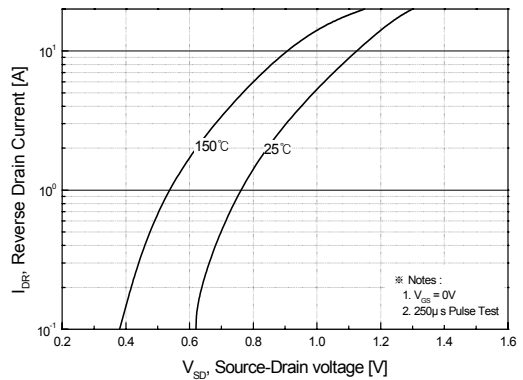
**Fig 2. Transfer Characteristics**



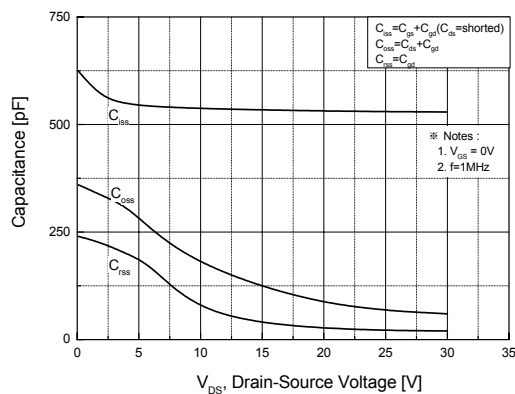
**Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage**



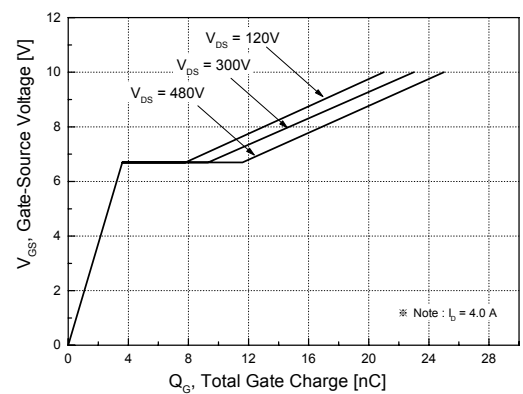
**Fig 4. On State Current vs. Allowable Case Temperature**



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

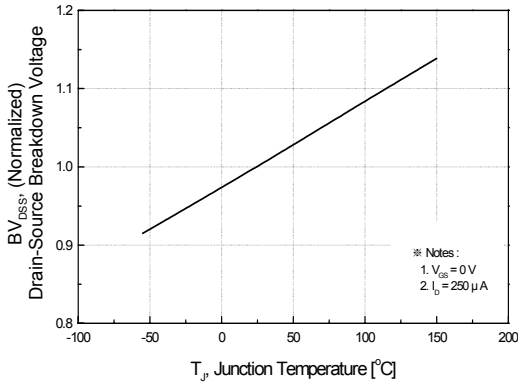


**Fig 6. Gate Charge Characteristics**

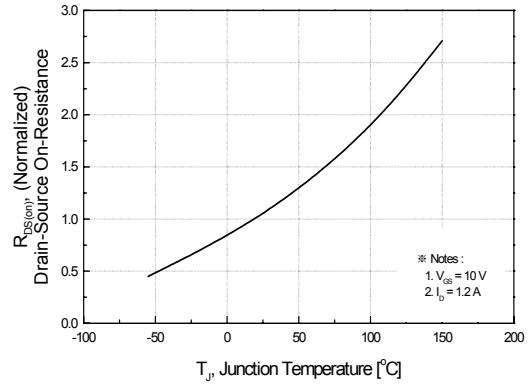


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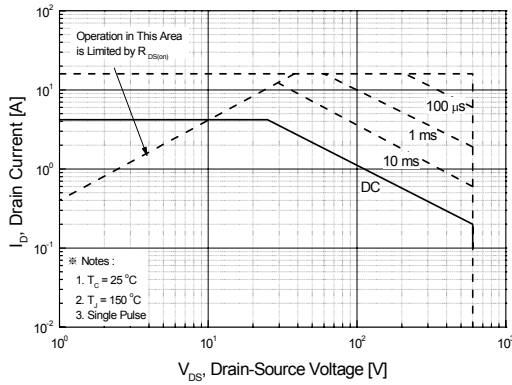
**Fig 7. Breakdown Voltage Variation vs. Junction Temperature**



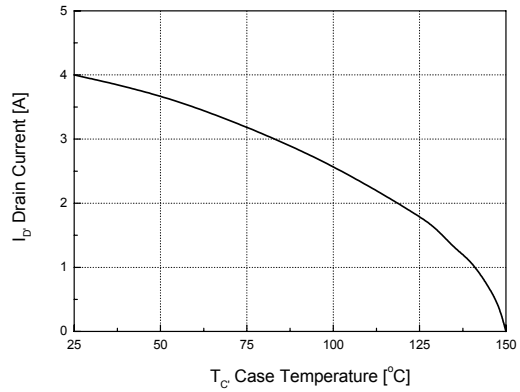
**Fig 8. On-Resistance Variation vs. Junction Temperature**



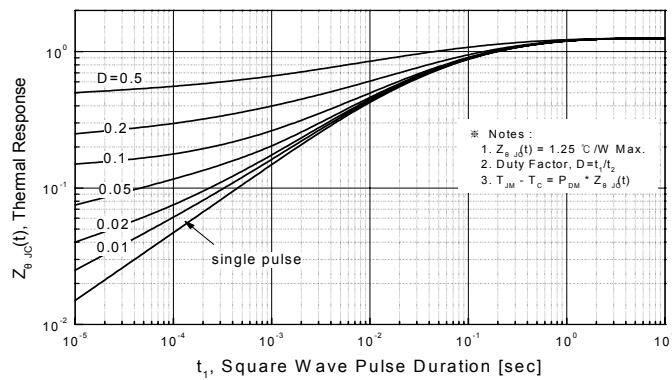
**Fig 9. Maximum Safe Operating Area**



**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

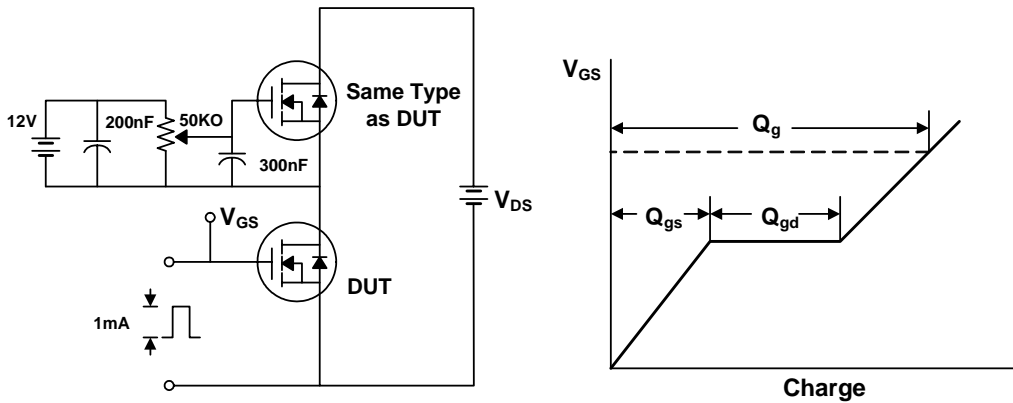


Fig 13. Switching Time Test Circuit & Waveforms

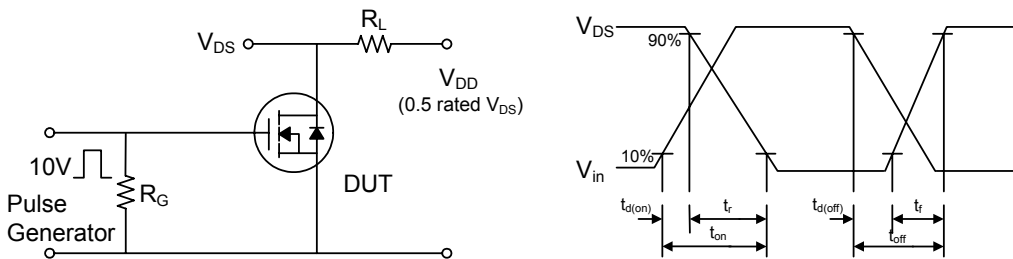
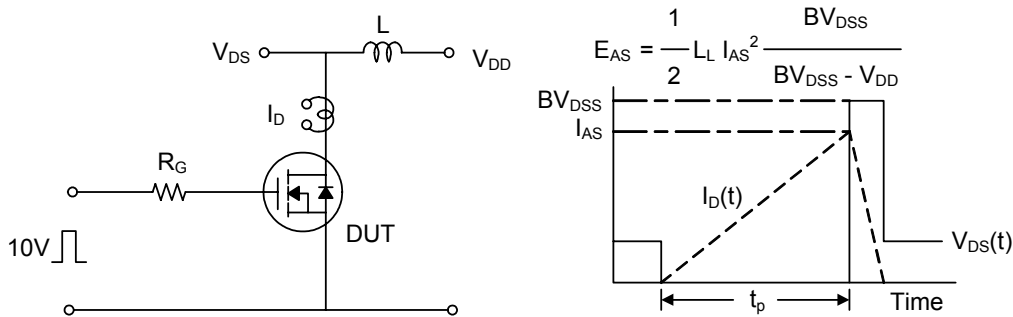
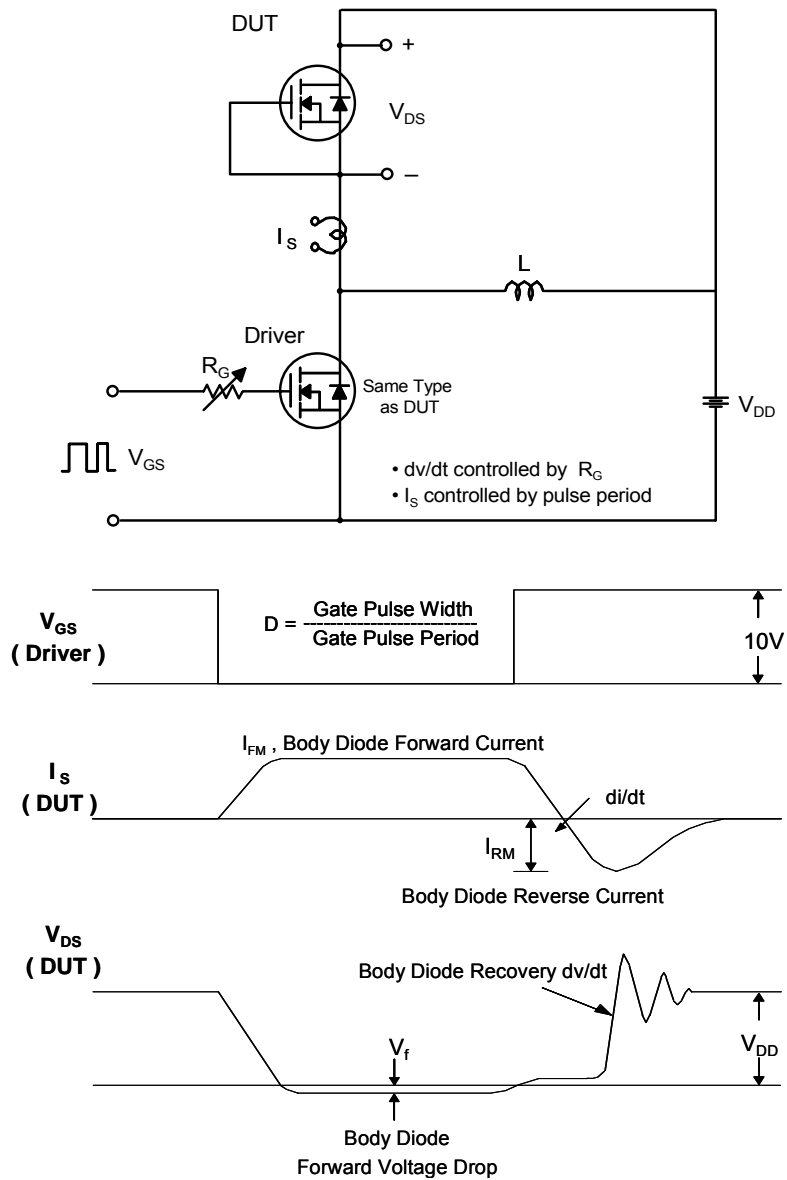


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



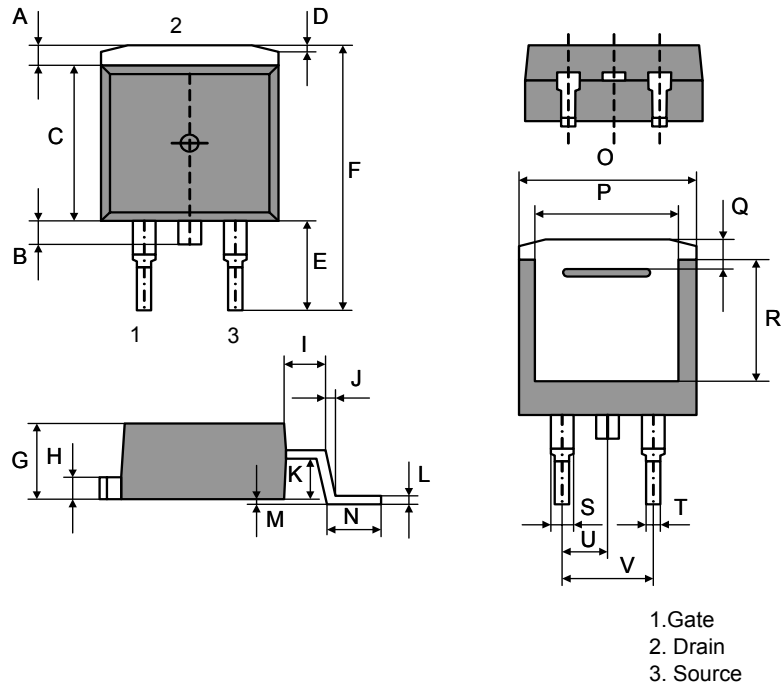
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Fig. 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



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## TO-263(D2-Pak) Package Dimension



DIMENSION	A	B	C	D	E	F	G	H	I	J	K
mm	Nih	100	120	900		40	160	40	125	190	20
	Typ	120	140	920	040	40	160	45	130	200	075
	Max	140	160	940		50	160	40	140	20	260

DIMENSION	L	M	N	O	P	Q	R	S	T	U	V
mm	Nih	045	-005	224	980				17	070	
	Typ	060	010	234	100	800	175	720	127	080	234
	Max	060	025	234	100				137	090	