

Logic N-Channel MOSFET

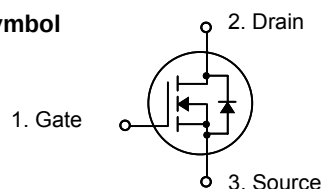
Features

- Low $R_{DS(on)}$ (0.15Ω)@ $V_{GS}=10V$
Low $R_{DS(on)}$ (0.30Ω)@ $V_{GS}=4.5V$
- Low Gate Charge (Typical 6.5nC)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Maximum Junction Temperature Range ($150^{\circ}C$)

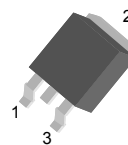
General Description

This Power MOSFET is produced using SemiWell's advanced planar stripe, DMOS technology. This latest technology has been especially designed to minimize on-state resistance, have a low gate charge with superior switching performance and rugged avalanche characteristics. This Power MOSFET is well suited for synchronous DC-DC Converters and Power Management in portable and battery operated products.

Symbol



D-PACK (TO-252)



Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{DSS}	Drain to Source Voltage	30	V
I_D	Continuous Drain Current(@ $T_C = 25^{\circ}C$)	12	A
	Continuous Drain Current(@ $T_C = 100^{\circ}C$)	7.7	A
I_{DM}	Drain Current Pulsed (Note 1)	30	A
V_{GS}	Gate to Source Voltage	± 20	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	30	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	7.0	V/ns
P_D	Total Power Dissipation(@ $T_A = 25^{\circ}C$)	2.5	W
	Total Power Dissipation(@ $T_C = 25^{\circ}C$)	42	W
	Derating Factor above $25^{\circ}C$	0.34	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	-	-	3	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	-	-	50	$^{\circ}C/W$

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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	30	-	-	V
Δ BV _{DSS} / Δ T _J	Breakdown Voltage Temperature coef- ficient	I _D = 250uA, referenced to 25 °C	-	0.027	-	V/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} = 30V, V _{GS} = 0V	-	-	1	uA
		V _{DS} = 24V, T _C = 125 °C	-	-	10	uA
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
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250uA	1.0	-	3.0	V
R _{DS(ON)}	Static Drain-Source On-state Resis- tance	V _{GS} = 10 V, I _D = 6A V _{GS} = 4.5 V, I _D = 6A	- -	0.066 0.095	0.15 0.30	Ω
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} =0 V, V _{DS} =25V, f = 1MHz	-	205	265	pF
C _{oss}	Output Capacitance		-	95	120	
C _{rss}	Reverse Transfer Capacitance		-	30	40	
Dynamic Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =15V, I _D =12A, R _G =50Ω ✱ see fig. 13. (Note 4, 5)	-	4.5	19	ns
t _r	Rise Time		-	3	16	
t _{d(off)}	Turn-off Delay Time		-	12	34	
t _f	Fall Time		-	18	46	
Q _g	Total Gate Charge	V _{DS} =24V, V _{GS} =10V, I _D =12A ✱ see fig. 12. (Note 4, 5)	-	6.5	8.5	nC
Q _{gs}	Gate-Source Charge		-	1.4	-	
Q _{gd}	Gate-Drain Charge(Miller Charge)		-	1.6	-	

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	-	-	12	A
I _{SM}	Pulsed Source Current		-	-	30	
V _{SD}	Diode Forward Voltage	I _S = 12A, V _{GS} = 0V	-	-	1.5	V
t _{rr}	Reverse Recovery Time	I _S = 12A, V _{GS} = 0V, dI _F /dt = 100A/us	-	76	-	ns
Q _{rr}	Reverse Recovery Charge		-	44	-	nC

* NOTES

1. Repeativity rating : pulse width limited by junction temperature
2. L = 200uH, I_{AS} = 12A, V_{DD} = 15V, R_G = 0Ω , Starting T_J = 25°C
3. I_{SD} ≤ 12A, 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

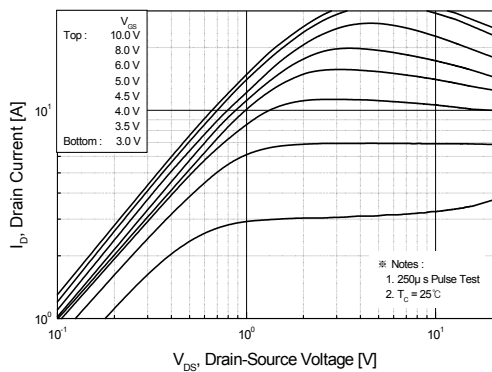


Fig 2. Transfer Characteristics

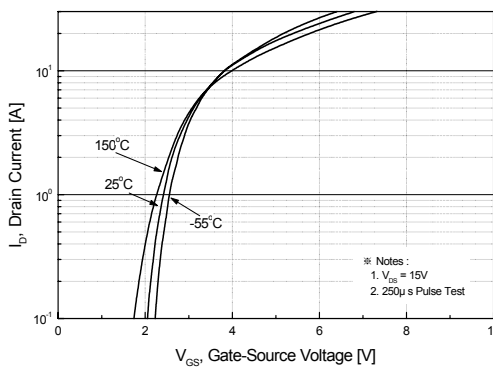


Fig 3. On Resistance Variation vs. Drain Current and Gate Voltage

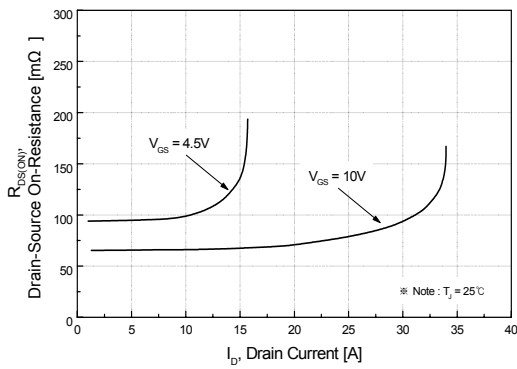


Fig 4. On State Current vs. Allowable Case Temperature

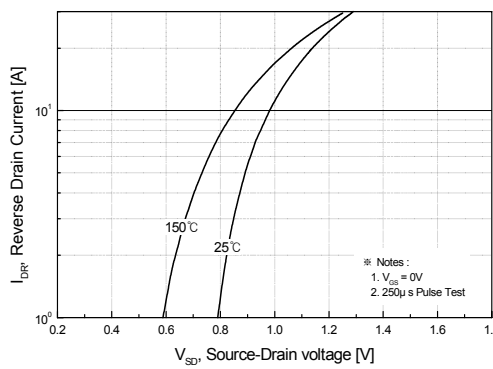


Fig 5. Capacitance Characteristics

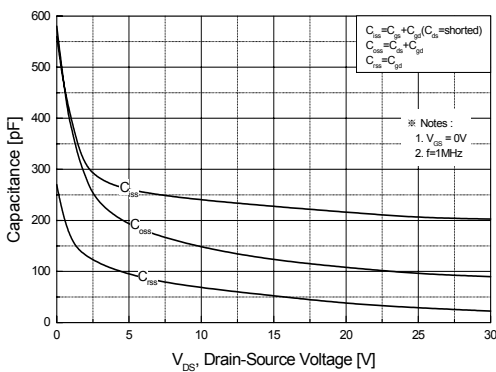
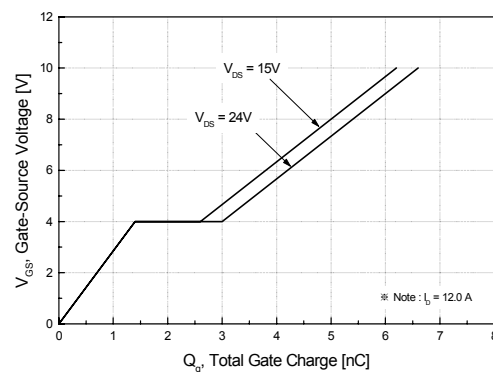


Fig 6. Gate Charge Characteristics



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Fig 7. Breakdown Voltage Variation vs. Junction Temperature

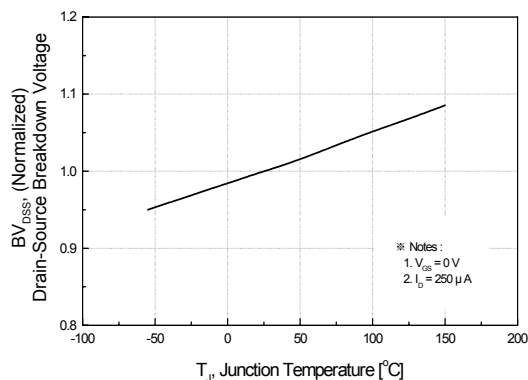


Fig 8. On-Resistance Variation vs. Junction Temperature

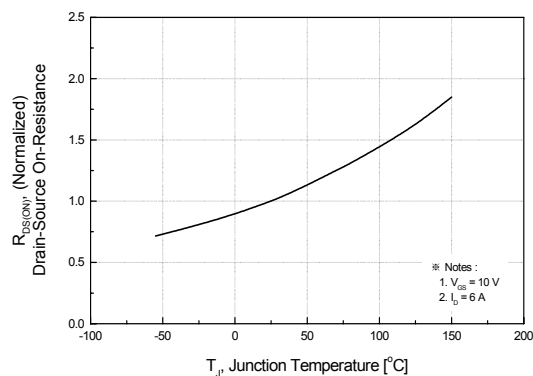


Fig 9. Maximum Safe Operating Area

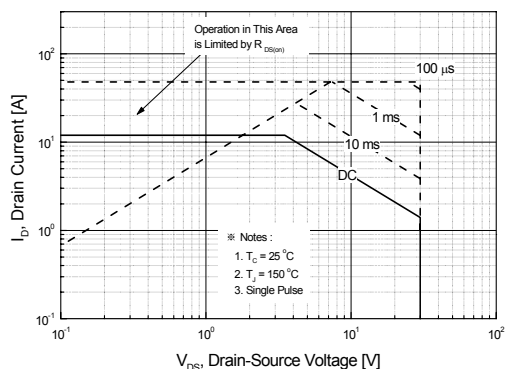


Fig 10. Maximum Drain Current vs. Case Temperature

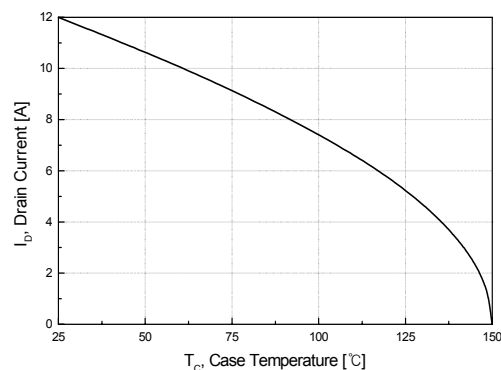
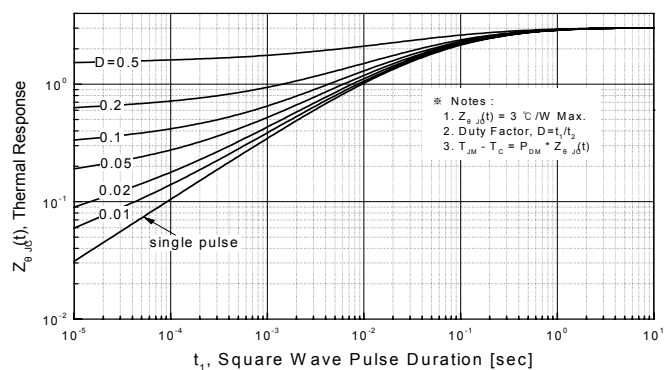


Fig 11. Transient Thermal Response Curve



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Fig. 12. Gate Charge Test Circuit & Waveforms

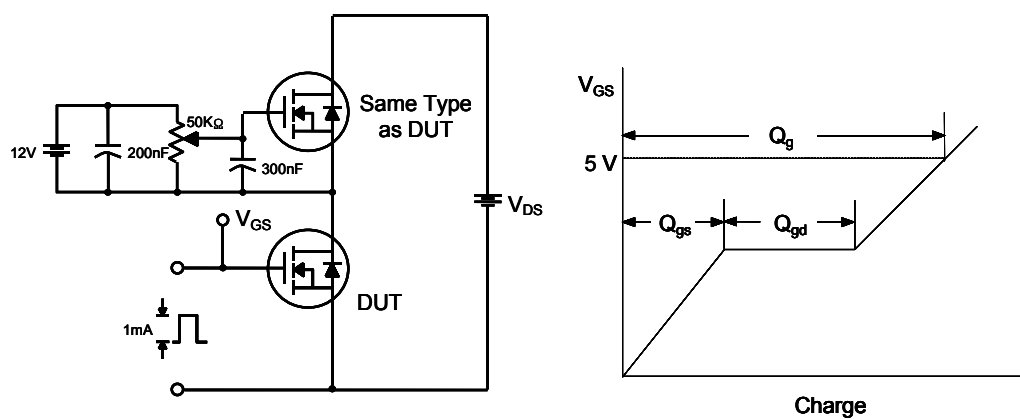


Fig 13. Switching Time Test Circuit & Waveforms

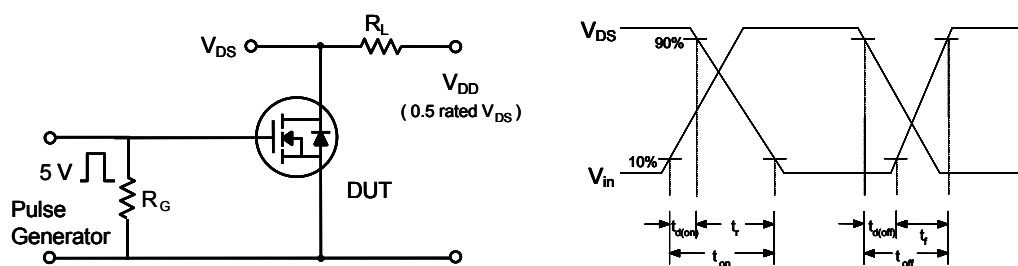
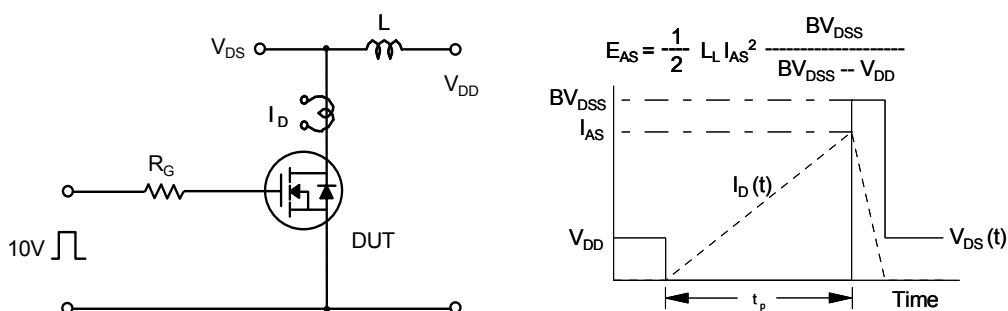
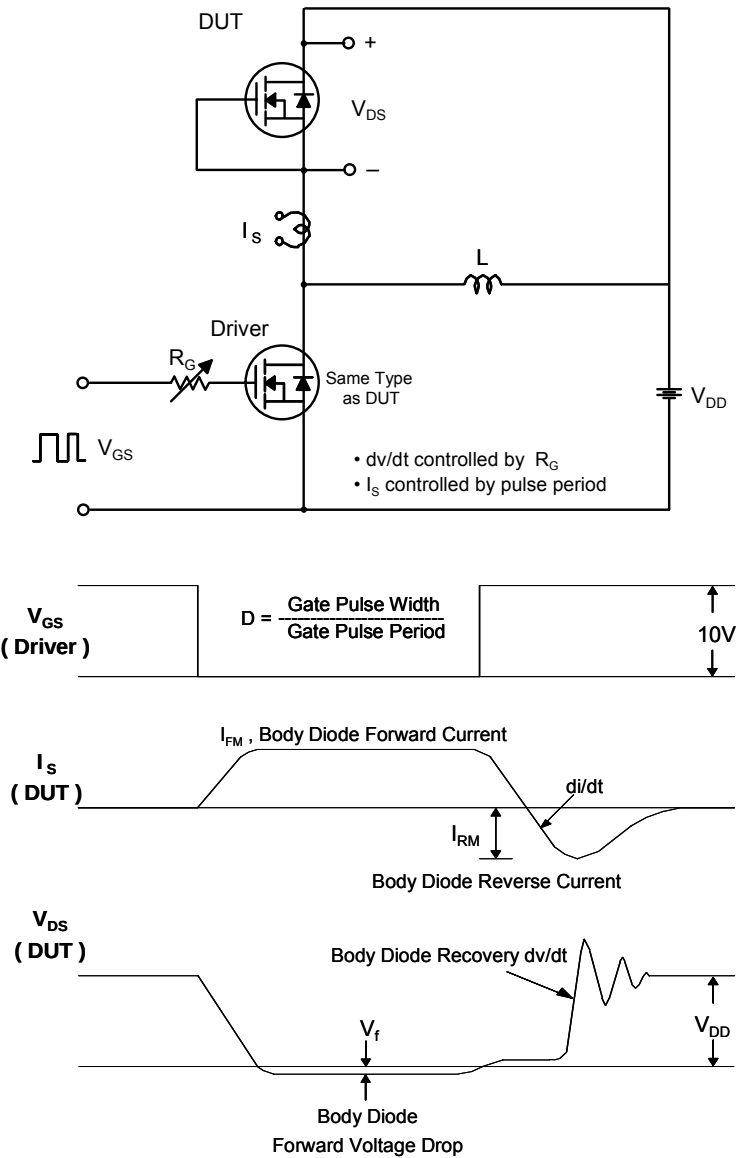


Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms



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



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TO-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	
ϕ		1.57			0.06	

