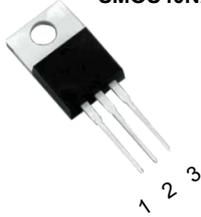


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N Channel Power MOSFETs

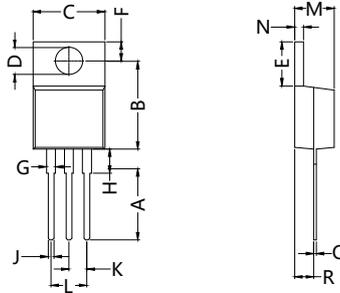
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TO-220AB

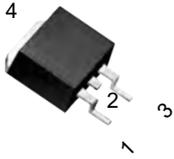
- 1, Gate
- 2, Drain
- 3, Source
- 4, Drain Fin

Dimensions TO-220AB



Dim.	Millimeter	
	Min.	Max.
A	12.70	13.97
B	14.73	16.00
C	9.91	10.66
ØD	3.54	4.08
E	5.85	6.85
F	2.54	3.18
G	1.15	1.65
H	2.79	5.84
J	0.64	1.01
K	2.45BSC	
L	5.05BSC	
M	4.32	4.82
N	1.14	1.39
Q	0.35	0.56
R	2.29	2.79

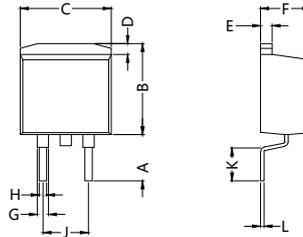
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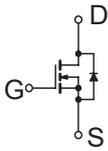
TO-263(D²PAK)

- 1, Gate
- 2, Drain
- 3, Source
- 4, Drain Fin

Dimensions TO-263 (D²PAK)



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	5.00	5.60	0.197	0.220
B	9.32	10.52	0.367	0.414
C	9.60	10.40	0.378	0.409
D	1.10	1.40	0.043	0.055
E	1.20	1.50	0.047	0.059
F	4.32	4.82	0.170	0.190
G	1.15	1.65	0.045	0.065
H	0.64	1.00	0.025	0.039
J	4.80	5.20	0.189	0.205
K	2.80	3.90	0.110	0.154
L	0.30	0.45	0.012	0.018



G=Gate, D=Drain, S=Source

Absolute Maximum Ratings ($T_C=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	200	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	40	A
Drain Current-Continuous($T_C=100^\circ\text{C}$)	$I_D(100^\circ\text{C})$	25	A
Pulsed Drain Current	I_{DM}	160	A
Maximum Power Dissipation	P_D	200	W
Single pulse avalanche energy ^(Note 5)	E_{AS}	28	mJ
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (TO-220AB)	$R_{\theta JC}$	0.50	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case (TO-263)	$R_{\theta JC}$	0.55	$^\circ\text{C/W}$

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N Channel Power MOSFETs

Electrical Characteristics

(T_J=25°C, unless otherwise specified)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _D =250μA	200	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =200V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	70	-	mΩ
Forward Transconductance	g _{FS}	V _{DS} =50V, I _D =20A	-	28	-	S
Dynamic Characteristics (Note 4)						
Input Capacitance	C _{iss}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz	-	1500	-	PF
Output Capacitance	C _{oss}		-	370	-	PF
Reverse Transfer Capacitance	C _{rss}		-	150	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =125V, I _D =40A V _{GS} =10V, R _G =25Ω	-	26	-	nS
Turn-on Rise Time	t _r		-	32	-	nS
Turn-Off Delay Time	t _{d(off)}		-	142	-	nS
Turn-Off Fall Time	t _f		-	83	-	nS
Total Gate Charge	Q _g	V _{DD} =125V, I _D =40A, V _{GS} =10V	-	50	-	nC
Gate-Source Charge	Q _{gs}		-	12	-	nC
Gate-Drain Charge	Q _{gd}		-	22	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _F =20A	-	-	1.4	V
Diode Forward Current (Note 2)	I _S		-	-	40	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F =40A di/dt = 100A/μs (Note 3)	-	220	-	nS
Reverse Recovery Charge	Q _{rr}		-	1800	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : T_J=25°C, V_{DD}=30V, V_G=10V, L=0.4mH, R_g=25Ω



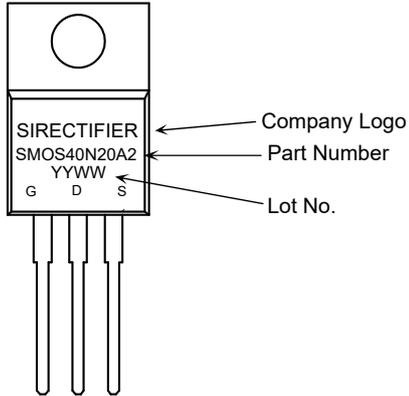
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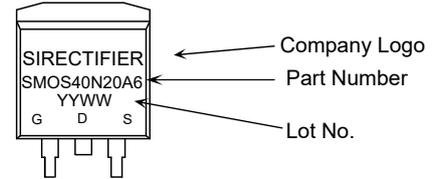
N Channel Power MOSFETs

Marking

SMOS40N20A2
(TO-220AB)



SMOS40N20A6
(TO-263)



Ordering Information

Part Number	Package	Shipping	Marking Code
SMOS40N20A2	TO-220AB	50pcs / Tube	SMOS40N20A2
SMOS40N20A6	TO-263	50pcs / Tube or 800pcs / Tape & Reel	SMOS40N20A6

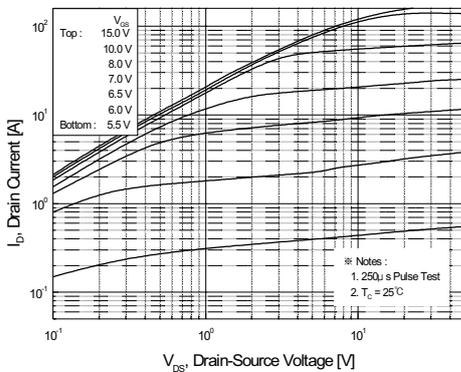


Figure 1. On-Region Characteristics

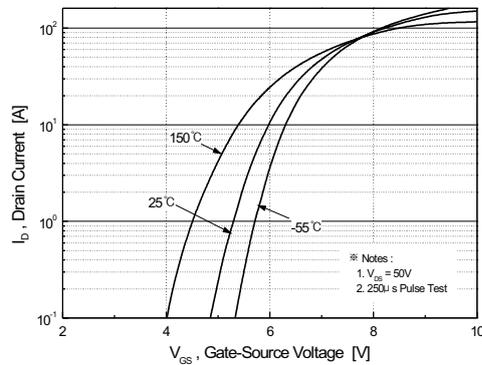


Figure 2. Transfer Characteristics

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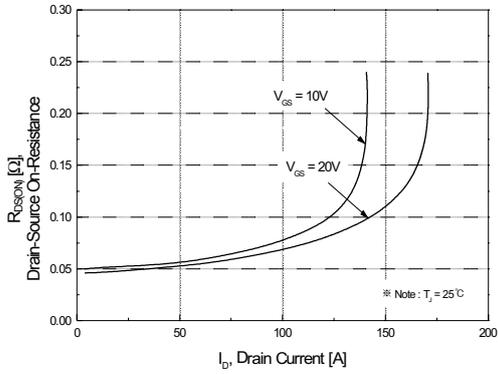


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

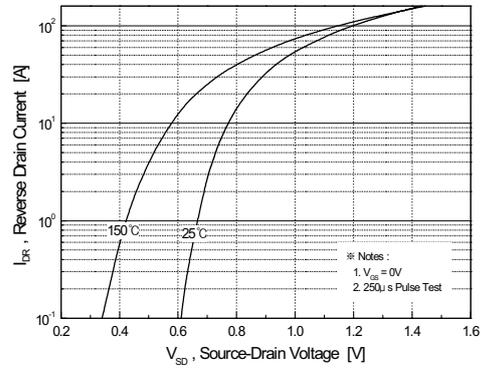


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

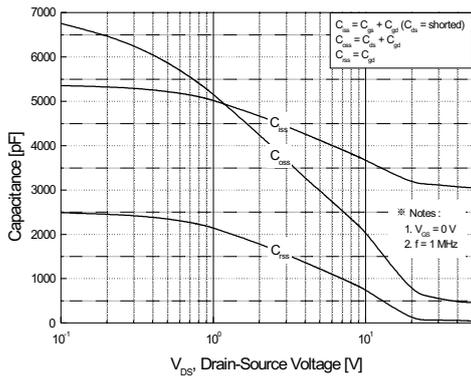


Figure 5. Capacitance Characteristics

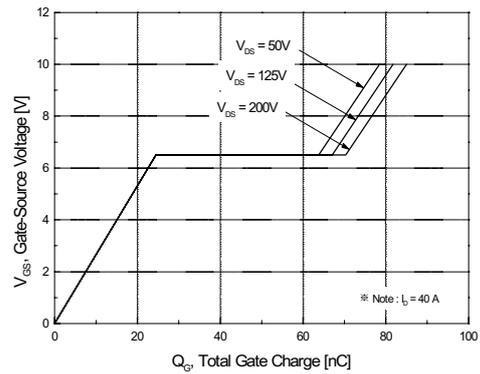


Figure 6. Gate Charge Characteristics

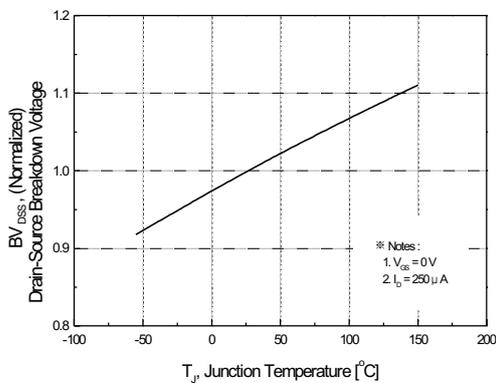


Figure 7. Breakdown Voltage Variation vs. Temperature

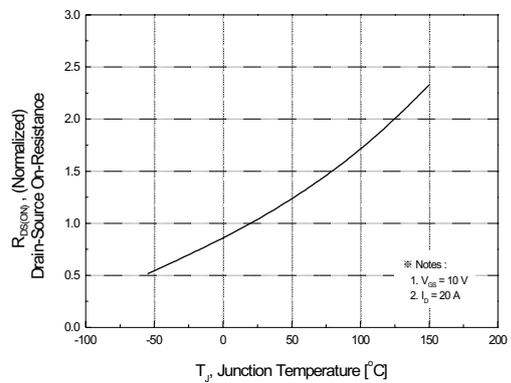


Figure 8. On-Resistance Variation vs. Temperature

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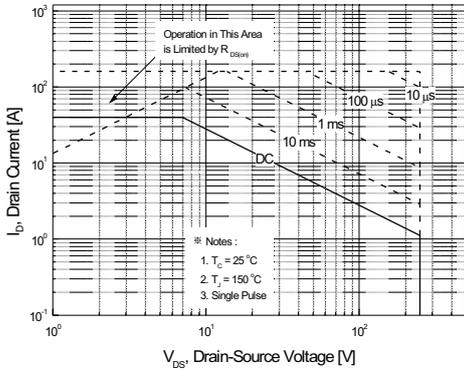


Figure 9. Maximum Safe Operating Area

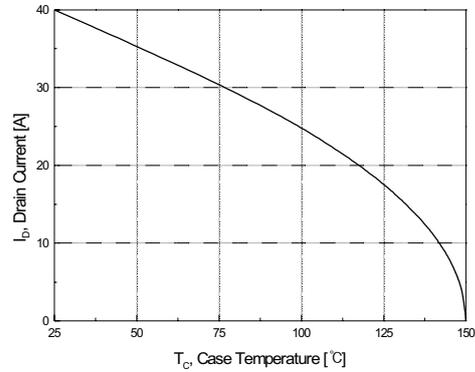


Figure 10. Maximum Drain Current vs. Case Temperature

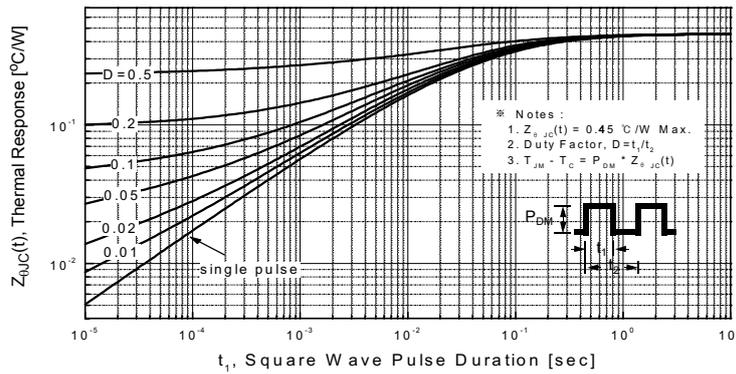


Figure 11. Transient Thermal Response Curve

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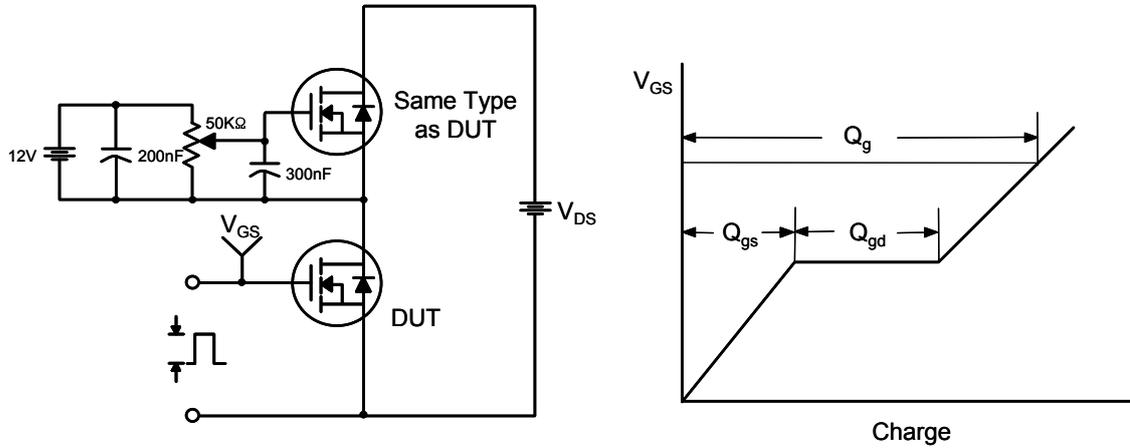


Figure 12. Gate Charge Test Circuit & Waveform

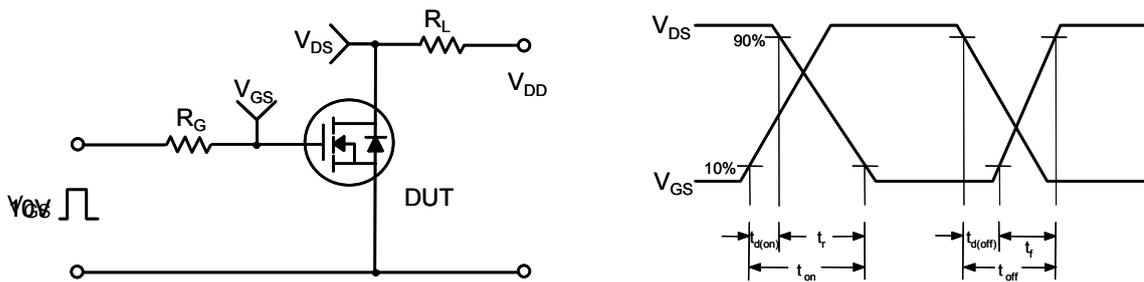


Figure 13. Resistive Switching Test Circuit & Waveforms

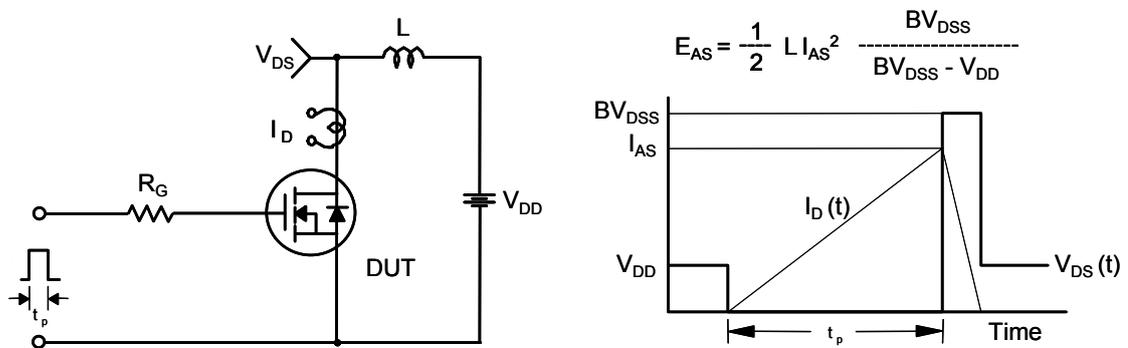


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

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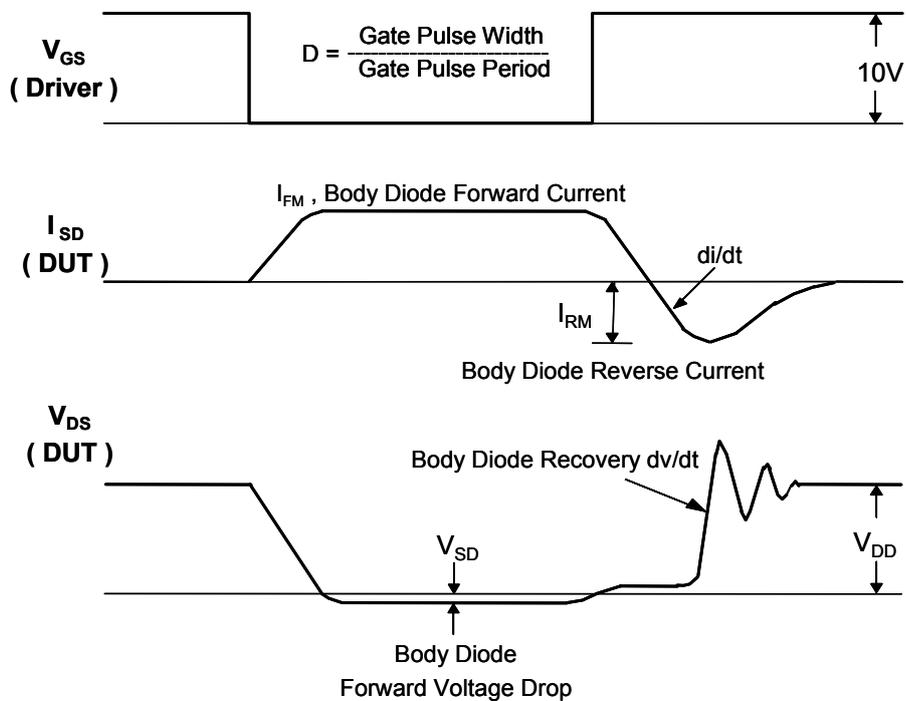
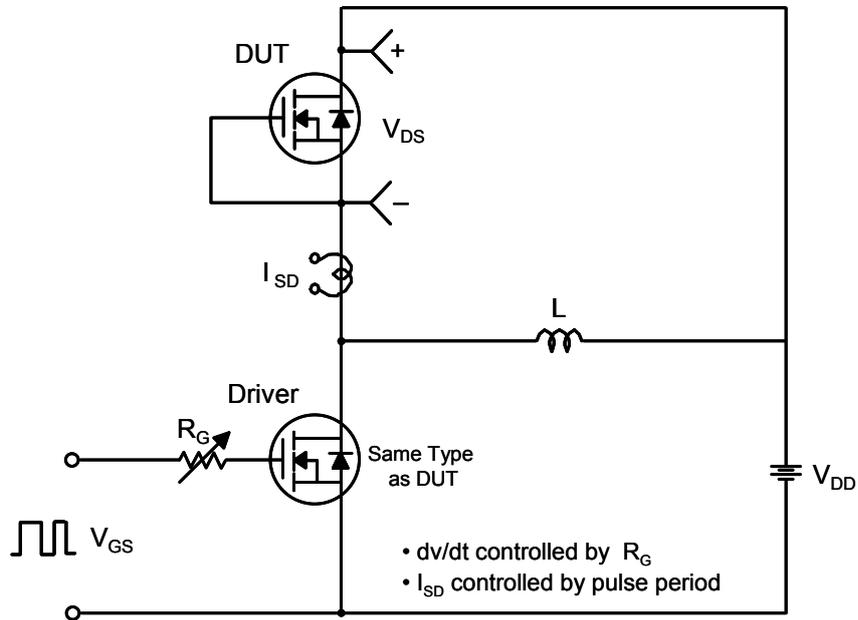


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms