

Main Product Characteristics:

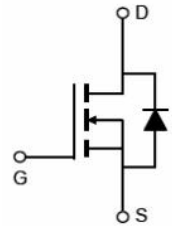
V_{DSS}	40V
$R_{DS(on)}$	1.65m Ω (typ.)
I_D	140A



TO-220
SMS004N03A1



TO-263
SMS004N03D1



Schematic Diagram

Features and Benefits:

- Advanced MOSFET process technology
- Special designed for PWM, load switching and general purpose applications
- Ultra low on-resistance with low gate charge
- Fast switching and reverse body recovery
- 150°C operating temperature


Description:

It utilizes the latest processing techniques to achieve the high cell density and reduces the on-resistance with high repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in power switching application and a wide variety of other applications.

Absolute Max Rating:

Symbol	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10V$ ①	140	A
I_{DM}	Pulsed Drain Current②	560	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation③	83	W
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-to-Source Voltage	± 20	V
$T_J \quad T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

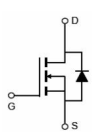
Thermal Resistance

Symbol	Characteristics	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-case ③	—	1.5	°C/W
$R_{\theta JA}$	Junction-to-ambient ④	—	20	

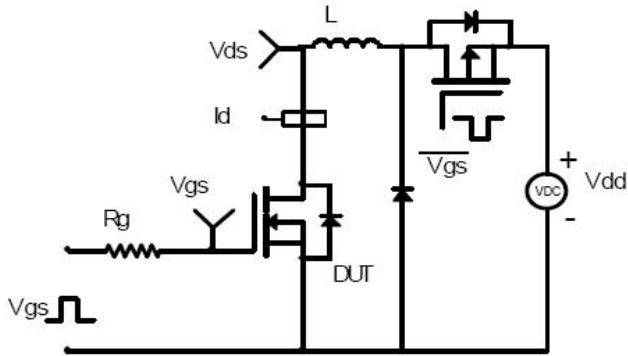
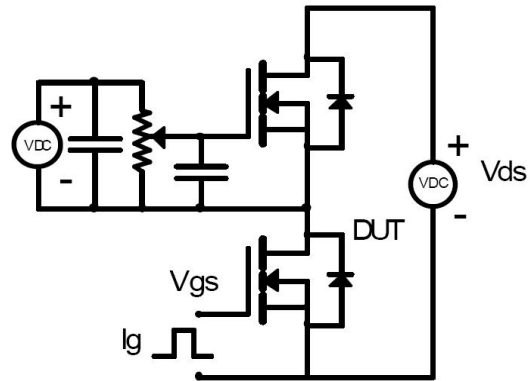
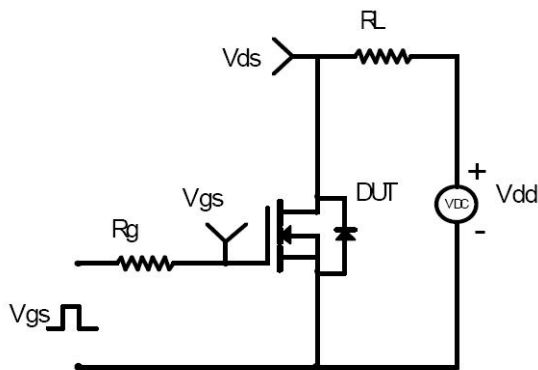
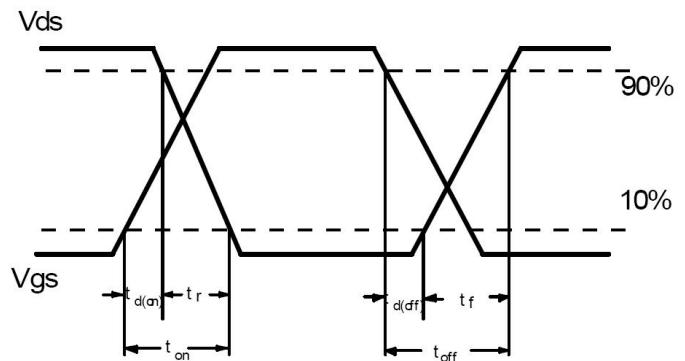
Electrical Characteristics @ $T_A=25^{\circ}\text{C}$ unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source breakdown voltage	40	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$R_{DS(on)}$	Static Drain-to-Source on-resistance	—	1.65	2.3	mΩ	$V_{GS}=10V, I_D=20A$
		—	2.45	3.2		$V_{GS}=4.5V, I_D=20A$
$V_{GS(th)}$	Gate threshold voltage	1	—	2.5	V	$V_{DS}=V_{GS}, I_D=250\mu A$
I_{DSS}	Drain-to-Source leakage current $T_J=25^{\circ}\text{C}$	—	—	1	μA	$V_{DS}=40V, V_{GS}=0V,$
I_{GSS}	Gate-to-Source forward leakage	—	—	100	nA	$V_{GS}=20V, V_{DS}=0V$
		—	—	-100		$V_{GS}=-20V, V_{DS}=0V$
Q_g	Total gate charge	—	67	—	nC	$V_{GS}=10V,$ $V_{DS}=32V,$ $I_D=10A$
Q_{gs}	Gate-to-Source charge	—	13.7	—		
Q_{gd}	Gate-to-Drain("Miller") charge	—	12.7	—		
$t_{d(on)}$	Turn-on delay time	—	893	—	ns	$V_{DS}=20V$ $R_G=10\Omega$ $R_D=0.5\Omega$
t_r	Rise time	—	22	—		
$t_{d(off)}$	Turn-Off delay time	—	75	—		
t_f	Fall time	—	35	—		
C_{iss}	Input capacitance	—	3835	—	pF	$V_{GS}=0V$ $V_{DS}=25V$ $f=1\text{MHz}$
C_{oss}	Output capacitance	—	2795	—		
C_{rss}	Reverse transfer capacitance	—	475	—		

Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	140	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode)	—	—	560	A	
V_{SD}	Diode Forward Voltage	—	—	0.78	V	$I_S=20A, V_{GS}=0V$
t_{rr}	Reverse Recovery Time	—	31	—	ns	$I_F=I_S, dI/dt=100A/\mu s$
Q_{rr}	Reverse Recovery Charge	—	110	—	nC	

Test Circuits and Waveforms

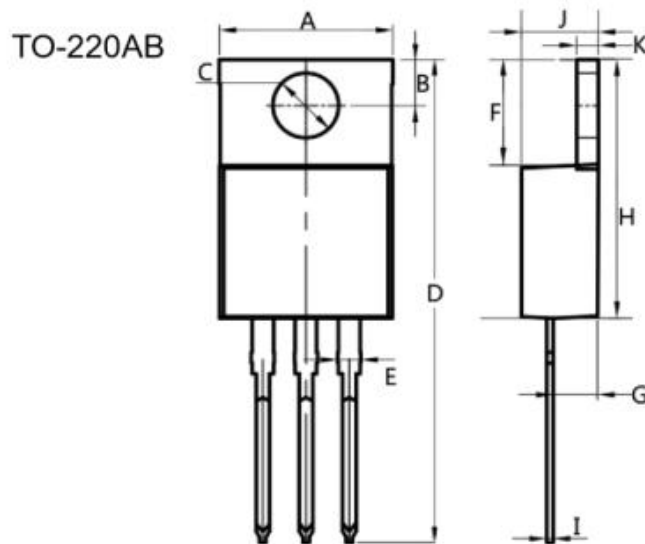
EAS Test Circuit:

Gate Charge Test Circuit:

Switching Time Test Circuit:

Switching Waveforms:


Notes:

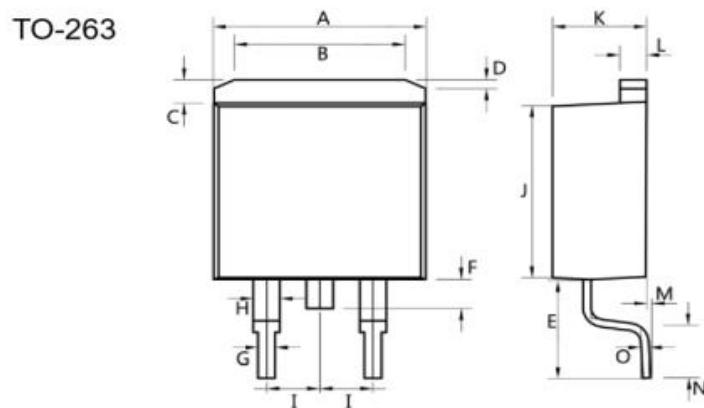
- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation P_D is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_A = 25^\circ\text{C}$.

Mechanical Data:

Product ID	Pack
SMS004N03A1	TO-220
SMS004N03D1	TO-263

Unit:mm


Dim.	Min.	Max.
A	10.0	10.4
B	2.5	3.0
C	3.5	4.0
D	28.0	30.0
E	1.1	1.5
F	6.2	6.6
G	2.9	3.3
H	15.0	16.0
I	0.35	0.45
J	4.3	4.7
K	1.2	1.4
All Dimensions in millimeter		



Dim.	Min.	Max.
A	10.0	10.5
B	7.25	7.75
C	1.3	1.5
D	0.55	0.75
E	5.0	6.0
F	1.4	1.6
G	0.75	0.95
H	1.15	1.35
I	Typ 2.54	
J	8.4	8.6
K	4.4	4.6
L	1.25	1.45
M	0.02	0.1
N	2.4	2.8
O	0.35	0.45
All Dimensions in millimeter		

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