

## Main Product Characteristics:

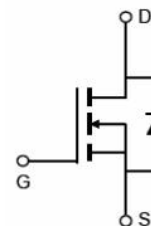
$V_{DSS}$	40V
$R_{DS(on)}$	1.65m $\Omega$ (typ.)
$I_D$	140A



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, $V_{GS} @ 10\text{V}^{\text{①}}$	140	A
$I_{DM}$	Pulsed Drain Current <sup>②</sup>	560	
$P_D @ T_C = 25^\circ\text{C}$	Power Dissipation <sup>③</sup>	83	W
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-to-Source Voltage	$\pm 20$	V
$T_J \quad T_{STG}$	Operating Junction and Storage Temperature Range	-55 to +150	$^\circ\text{C}$

## Thermal Resistance

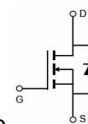
Symbol	Characteristics	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-case ③	—	1.5	°C/W
R <sub>θJA</sub>	Junction-to-ambient ④	—	20	

## Electrical Characteristics @T<sub>A</sub>=25°C unless otherwise specified

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source breakdown voltage	40	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
R <sub>DS(on)</sub>	Static Drain-to-Source on-resistance	—	1.65	2.3	mΩ	V <sub>GS</sub> =10V, I <sub>D</sub> =20A
		—	2.45	3.2		V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A
V <sub>GS(th)</sub>	Gate threshold voltage	1	—	2.5	V	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA
I <sub>DSS</sub>	Drain-to-Source leakage current T <sub>J</sub> =25°C	—	—	1	μA	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V,
I <sub>GSS</sub>	Gate-to-Source forward leakage	—	—	100	nA	V <sub>GS</sub> =20V, V <sub>DS</sub> =0V
		—	—	-100		V <sub>GS</sub> =-20V, V <sub>DS</sub> =0V
Q <sub>g</sub>	Total gate charge	—	67	—	nC	V <sub>GS</sub> =10V, V <sub>DS</sub> =32V, I <sub>D</sub> =10A
Q <sub>gs</sub>	Gate-to-Source charge	—	13.7	—		
Q <sub>gd</sub>	Gate-to-Drain("Miller") charge	—	12.7	—		
t <sub>d(on)</sub>	Turn-on delay time	—	893	—	ns	V <sub>DS</sub> =20V R <sub>G</sub> =10Ω R <sub>D</sub> =0.5Ω
t <sub>r</sub>	Rise time	—	22	—		
t <sub>d(off)</sub>	Turn-Off delay time	—	75	—		
t <sub>f</sub>	Fall time	—	35	—		
C <sub>iss</sub>	Input capacitance	—	3835	—	pF	V <sub>GS</sub> =0V V <sub>DS</sub> =25V f=1MHz
C <sub>oss</sub>	Output capacitance	—	2795	—		
C <sub>rss</sub>	Reverse transfer capacitance	—	475	—		

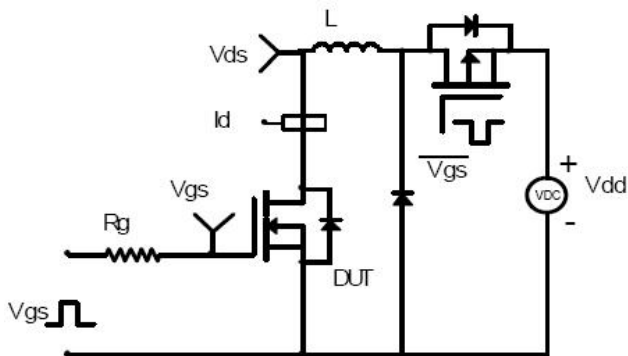
## Source-Drain Ratings and Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	140	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode)	—	—	560	A	
V <sub>SD</sub>	Diode Forward Voltage	—	—	0.78	V	I <sub>S</sub> =20A, V <sub>GS</sub> =0V
t <sub>rr</sub>	Reverse Recovery Time	—	31	—	ns	I <sub>F</sub> = I <sub>S</sub> , dI/dt=100A/μs
Q <sub>rr</sub>	Reverse Recovery Charge	—	110	—	nC	

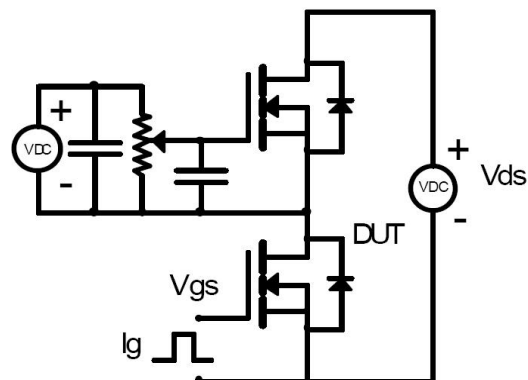


## Test Circuits and Waveforms

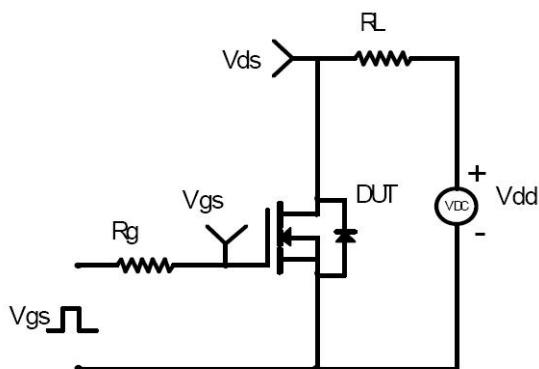
EAS Test Circuit:



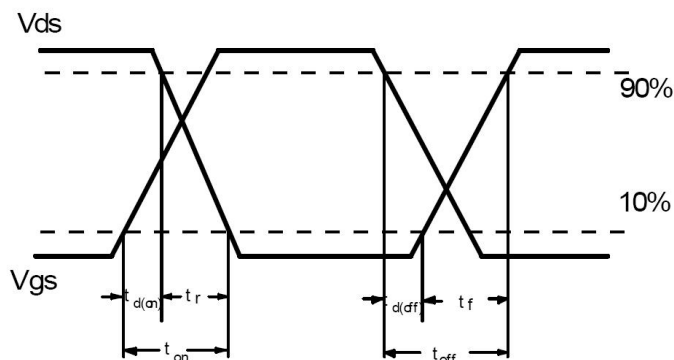
Gate Charge Test Circuit:



Switching Time Test Circuit:



Switching Waveforms:



### Notes:

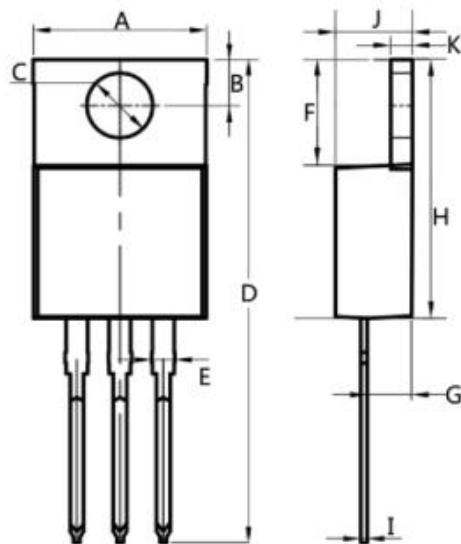
- ① Calculated continuous current based on maximum allowable junction temperature.
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ The power dissipation  $P_D$  is based on max. junction temperature, using junction-to-case thermal resistance.
- ④ The value of  $R_{\theta JA}$  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

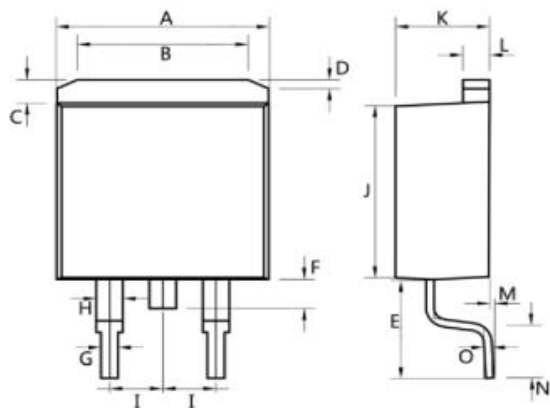
Unit:mm

TO-220AB



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		

TO-263



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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