



# SPN3009

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN3009 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density, DMOS trench technology. The SPN3009 has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

### FEATURES

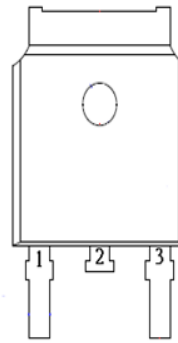
- ◆ 30V/51A,  $R_{DS(ON)}=9m\Omega@V_{GS}=10V$
- ◆ 30V/51A,  $R_{DS(ON)}=13.5m\Omega@V_{GS}=4.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-252-2L/TO-251S-3L package design

### APPLICATIONS

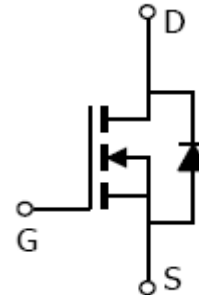
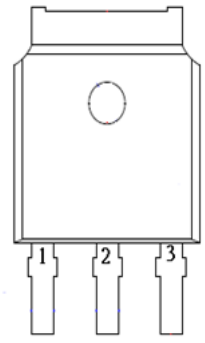
- High Frequency Synchronous Buck Converter
- DC/DC Power System
- Load Switch

### PIN CONFIGURATION

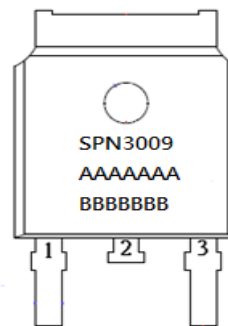
TO-252-2L



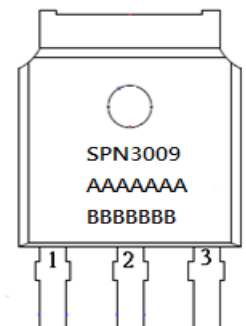
TO-251S-3L



### PART MARKING



A : Lot Code  
B : Date Code



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### PIN DESCRIPTION

Pin	Symbol	Description
1	G	Gate
2	D	Drain
3	S	Source

### ORDERING INFORMATION

Part Number	Package	Part Marking
SPN3009ST251TGB	TO-251S-3L	SPN3009
SPN3009T252RGB	TO-252-2L	SPN3009

※ SPN3009T252RGB : Tape Reel ; Pb – Free ; Halogen - Free

※ SPN3009ST251TGB: Tube ; Pb – Free; Halogen – Free

### ABSOLUTE MAXIMUM RATINGS

( $T_A=25^{\circ}\text{C}$  Unless otherwise noted)

Parameter	Symbol	Typical	Unit	
Drain-Source Voltage	$V_{DSS}$	30	V	
Gate –Source Voltage	$V_{GSS}$	$\pm 20$	V	
Continuous Drain Current	$I_D$	$T_A=25^{\circ}\text{C}$	51	A
		$T_A=100^{\circ}\text{C}$	36	
Pulsed Drain Current	$I_{DM}$	120	A	
Avalanche Current	$I_{AS}$	34	A	
Single Pulse Avalanche Energy	$E_{AS}$	130	mJ	
Power Dissipation	$P_D$	2	W	
Operating Junction Temperature	$T_J$	150	$^{\circ}\text{C}$	
Storage Temperature Range	$T_{STG}$	-55/150	$^{\circ}\text{C}$	
Thermal Resistance-Junction to Ambient ( $t \leq 10\text{s}$ )	$R_{\theta JA}$	62	$^{\circ}\text{C}/\text{W}$	



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### ELECTRICAL CHARACTERISTICS

(TA=25°C Unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	30			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0		2.5	V
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=24V, V_{GS}=0V$			1	uA
		$V_{DS}=24V, V_{GS}=0V, T_J=55^\circ C$			5	
On-State Drain Current	$I_{D(on)}$	$V_{DS} \geq 5V, V_{GS} = 10V$			51	A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS}=10V, I_D=30A$		7.5	9	mΩ
		$V_{GS}=4.5V, I_D=15A$		11	13.5	
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=30A$		42		S
Diode Forward Voltage	$V_{SD}$	$I_S=1A, V_{GS}=0V$			1	V
Single Pulse Avalanche Energy	EAS	$V_{DD}=25V, L=0.1mH,$ $I_{AS}=20A$	45			mJ
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=15V, V_{GS}=4.5V$ $I_D=15A$		10.6		nC
Gate-Source Charge	$Q_{gs}$			4.2		
Gate-Drain Charge	$Q_{gd}$			4		
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V$ $f=1MHz$		1127		pF
Output Capacitance	$C_{oss}$			194		
Reverse Transfer Capacitance	$C_{rss}$			78		
Turn-On Time	$t_{d(on)}$	$V_{DD}=15V,$ $I_D=15A, V_{GEN}=10V$ $R_G=3.3\Omega$		6.4	13	nS
	$t_r$			70	127	
Turn-Off Time	$t_{d(off)}$			22.5	45	
	$t_f$			8	18	



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## TYPICAL CHARACTERISTICS

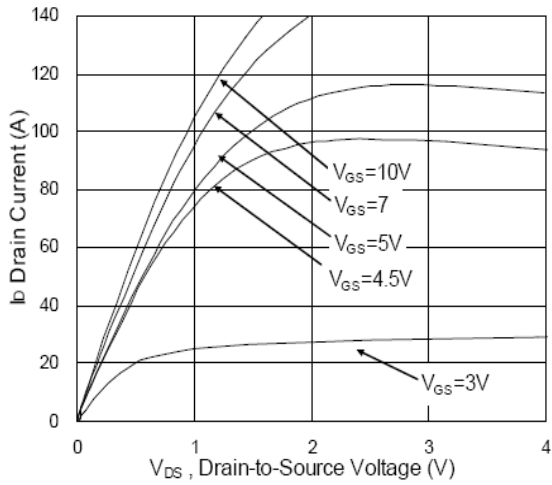


Fig. 1 Typical Output Characteristics

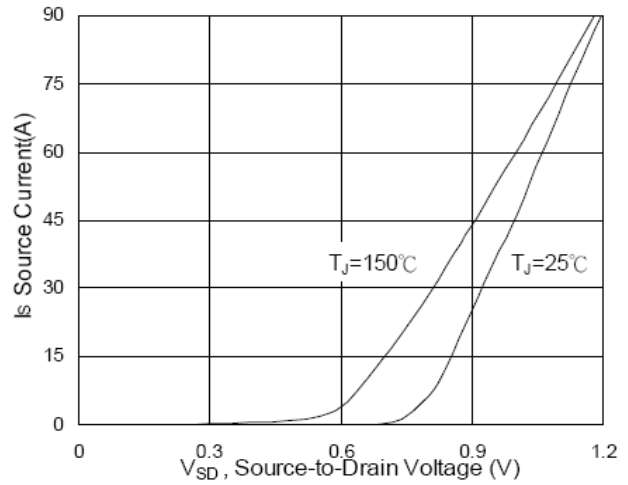


Fig. 2 Transfer Characteristics

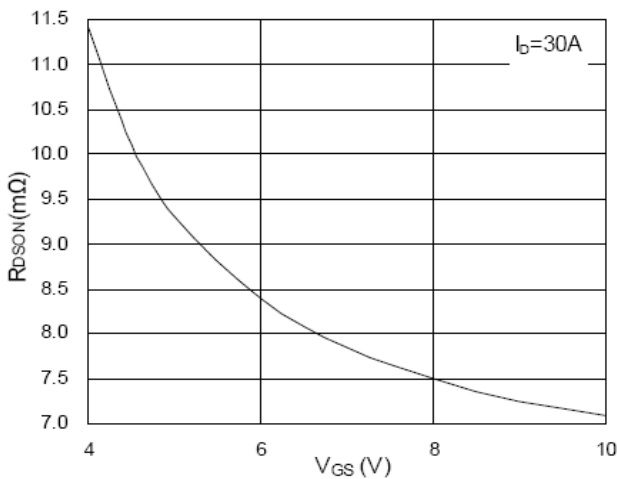


Fig. 3 On-Resistance vs Gate voltage

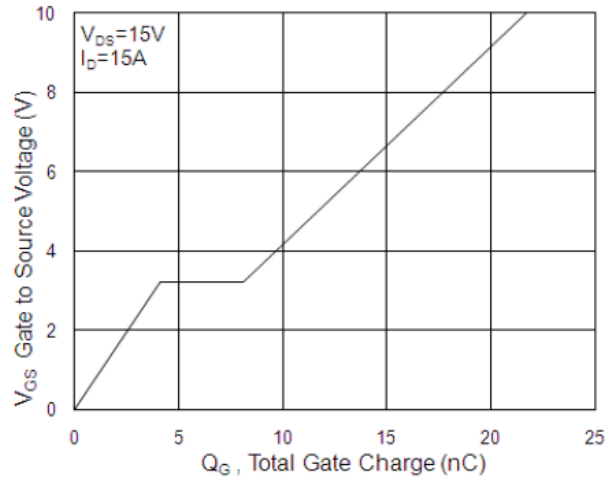


Fig. 4 Gate Charge Characteristics

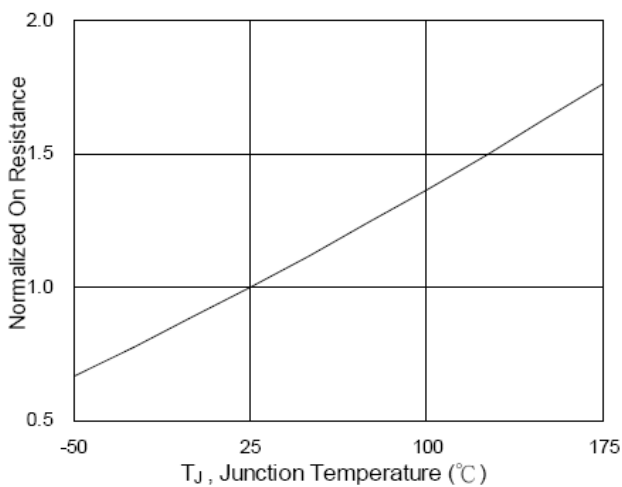


Fig. 5 On-Resistance vs Junction Temp

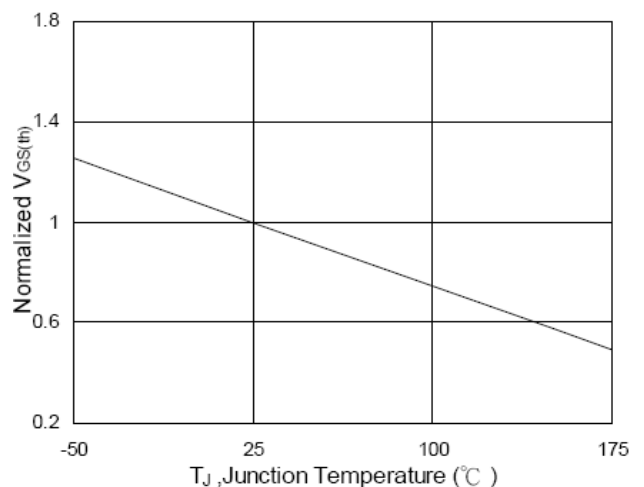


Fig. 6 Vgs vs Junction Temperature



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## TYPICAL CHARACTERISTICS

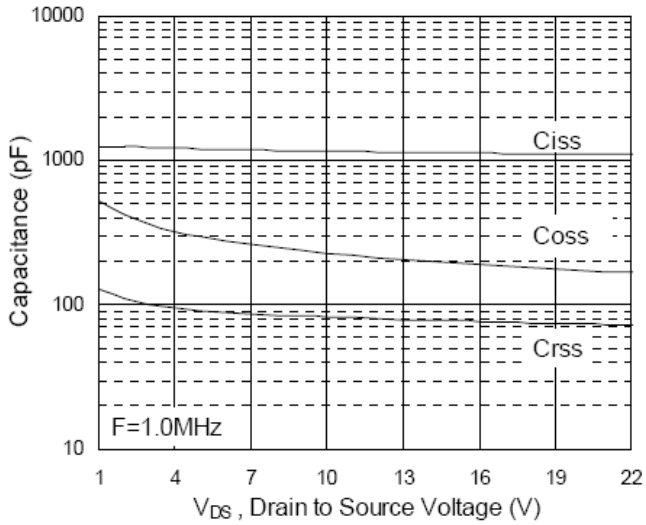


Fig. 7 Typical Capacitance Characteristics

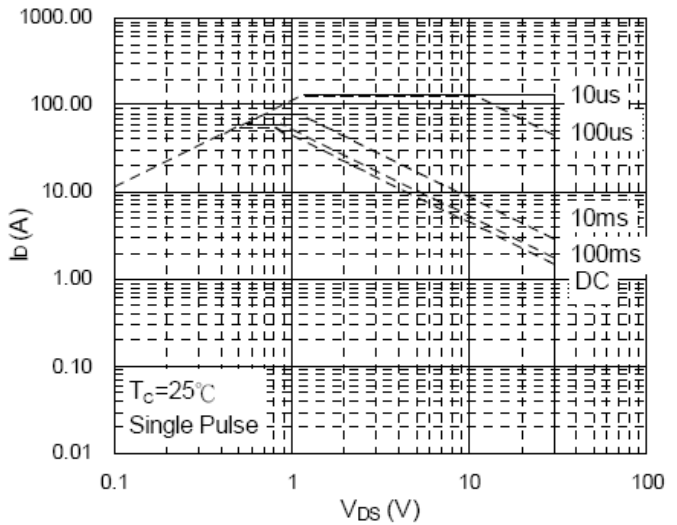


Fig. 8 Maximum Safe Operation Area

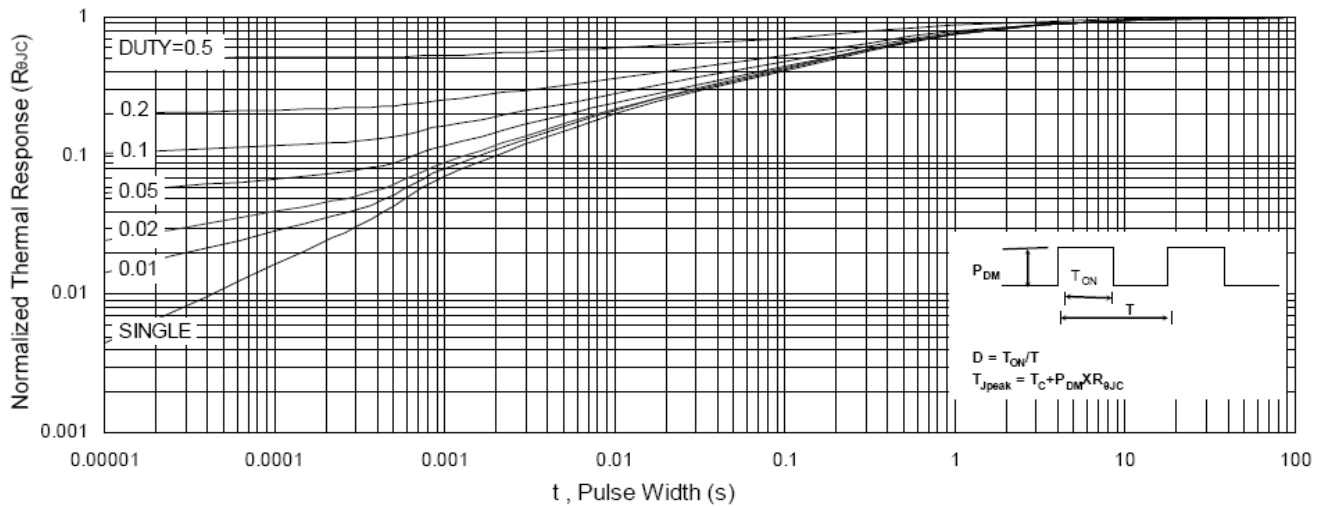


Fig. 9 Effective Transient Thermal Impedance

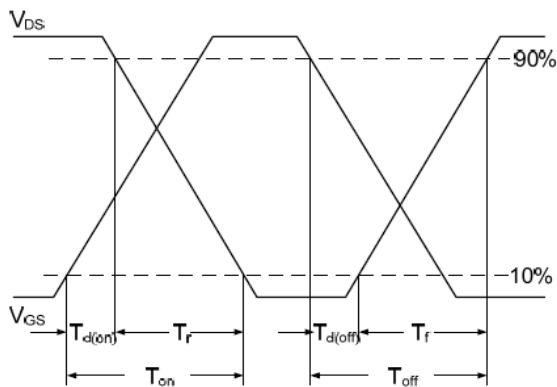


Fig. 10 Switching Time Waveform

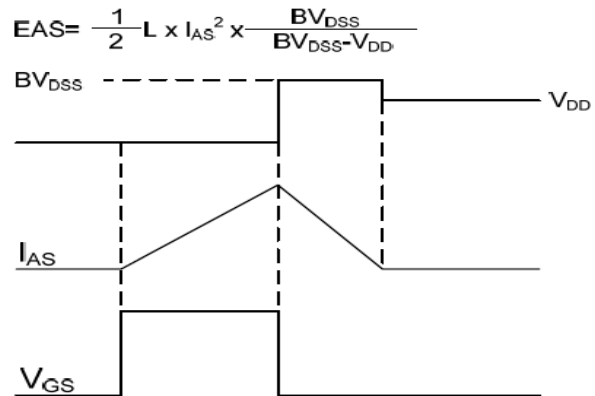


Fig. 11 Unclamped Inductive Waveform



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