



# SPN9910 N-Channel Enhancement Mode MOSFET

## DESCRIPTION

The SPN9910 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density, DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for most of synchronous buck converter applications.

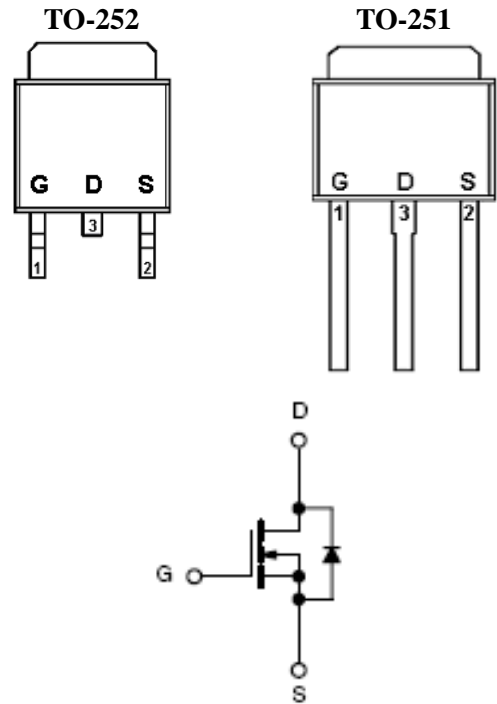
## FEATURES

- ◆ 60V/60A,  $R_{DS(ON)} = 10\text{m}\Omega @ V_{GS} = 10\text{V}$
- ◆ 60V/60A,  $R_{DS(ON)} = 12.0\text{m}\Omega @ V_{GS} = 4.5\text{V}$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-252 . TO-251 package design

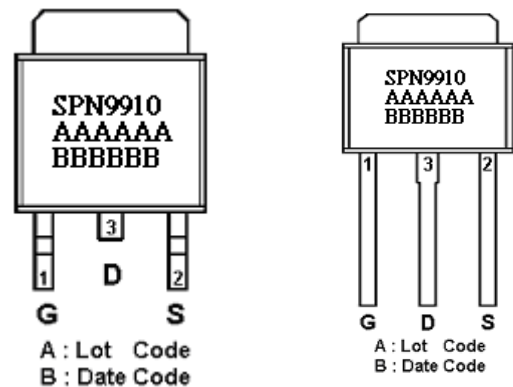
## APPLICATIONS

- DC/DC Converter
- Load Switch
- Synchronous Buck Converter

## PIN CONFIGURATION



## PART MARKING





# SPN9910

## N-Channel Enhancement Mode MOSFET

### PIN DESCRIPTION

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

### ORDERING INFORMATION

Part Number	Package	Part Marking
SPN9910T252RGB	TO-252	SPN9910
SPN9910T251TGB	TO-251	SPN9910

※ SPN9910T252RGB: Tape Reel ; Pb – Free; Halogen – Free

※ SPN9910T251TGB: Tube ; Pb – Free; Halogen – Free

### ABSOLUTE MAXIMUM RATINGS

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

Parameter	Symbol	Typical	Unit	
Drain-Source Voltage	$V_{DSS}$	60	V	
Gate –Source Voltage	$V_{GSS}$	$\pm 20$	V	
Continuous Drain Current( $T_J=150^{\circ}\text{C}$ )	$I_D$	$T_A=25^{\circ}\text{C}$	60	A
		$T_A=100^{\circ}\text{C}$	47	
Pulsed Drain Current	$I_{DM}$	120	A	
Avalanche Current	$I_{AS}$	38	A	
Power Dissipation	$P_D$	40	W	
Avalanche Energy with Single Pulse ( $T_J=25^{\circ}\text{C}$ , $L = 0.1\text{mH}$ , $I_{AS} = 38\text{A}$ , $V_{DD} = 25\text{V}$ .)	$E_{AS}$	123	mJ	
Operating Junction Temperature	$T_J$	-55/150	$^{\circ}\text{C}$	
Storage Temperature Range	$T_{STG}$	-55/150	$^{\circ}\text{C}$	
Thermal Resistance-Junction to Ambient	$R_{\theta JA}$	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	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=250\mu A$	60			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0		2.5	
Gate Leakage Current	$I_{GSS}$	$V_{DS}=0V, V_{GS}=\pm 20V$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS}=48V, V_{GS}=0V$			1	uA
		$V_{DS}=48V, V_{GS}=0V$ $T_J = 55^\circ C$			5	
On-State Drain Current	$I_{D(on)}$	$V_{DS} \geq 5V, V_{GS} = 10V$	60			A
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10V, I_D=15A$		10	12	mΩ
		$V_{GS} = 4.5V, I_D=10A$		12	15	
Forward Transconductance	$g_{fs}$	$V_{DS}=5V, I_D=15A$		47		S
Diode Forward Voltage	$V_{SD}$	$I_S=60A, V_{GS} = 0V$			1.2	V
<b>Dynamic</b>						
Total Gate Charge	$Q_g$	$V_{DS}=48V, V_{GS}=4.5V$ $I_D= 12A$		24		nC
Gate-Source Charge	$Q_{gs}$			6.9		
Gate-Drain Charge	$Q_{gd}$			10		
Input Capacitance	$C_{iss}$	$V_{DS}=15V, V_{GS}=0V$ $f=1MHz$		3200		pF
Output Capacitance	$C_{oss}$			210		
Reverse Transfer Capacitance	$C_{rss}$			145		
Turn-On Time	$t_{d(on)}$	$V_{DD}=30V, I_D=2A,$ $V_{GEN}=10V, R_G=3.3\Omega$		20		nS
	$t_r$			4		
Turn-Off Time	$t_{d(off)}$			84.5		
	$t_f$			6.5		



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## TYPICAL CHARACTERISTICS

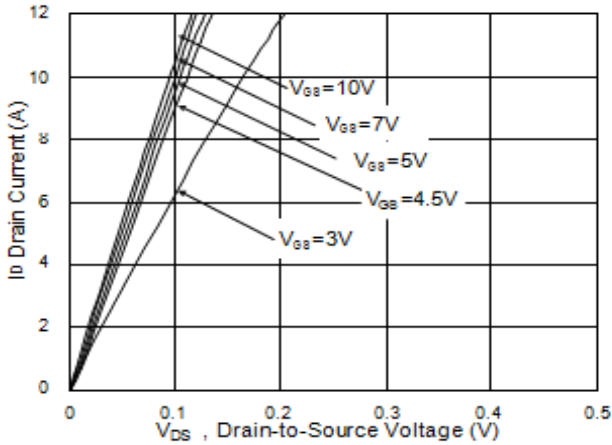


Fig. 1 Typical Output Characteristics

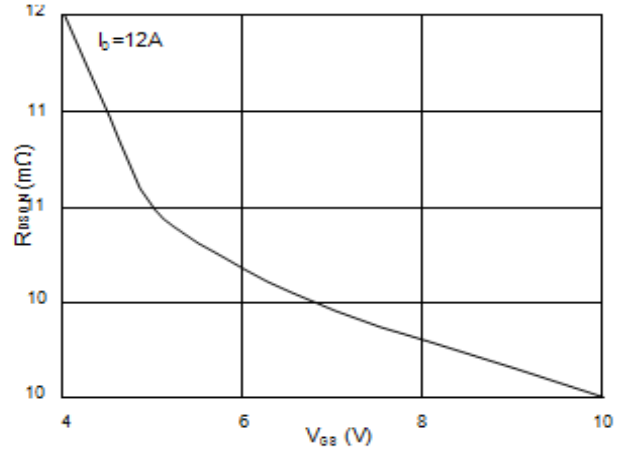


Fig. 2 On-Resistance vs. Gate Voltage

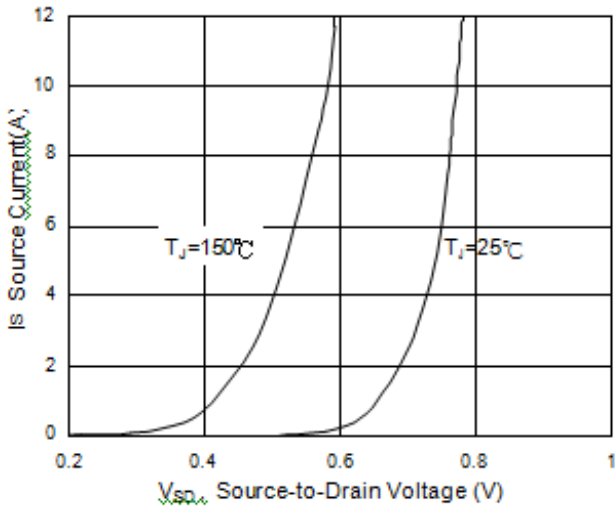


Fig. 3 Forward Characteristics  
Reverse Diodes

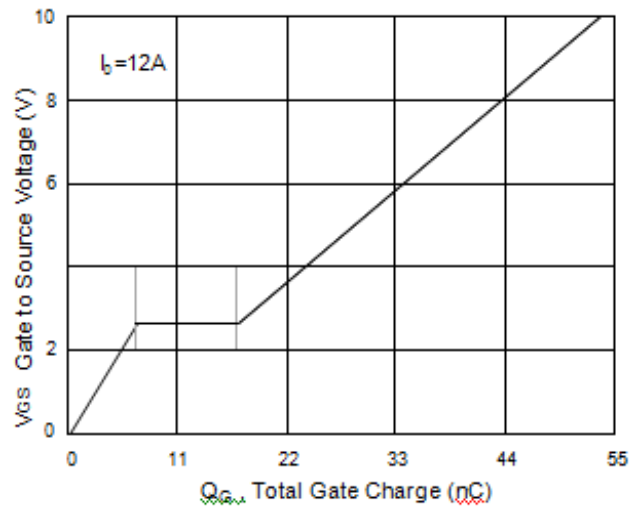


Fig. 4 Gate Charge Characteristics

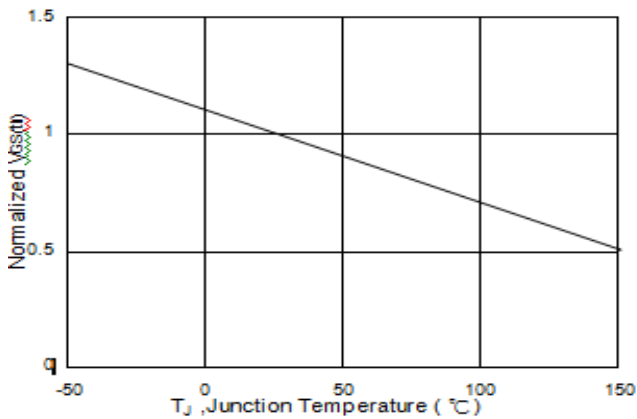


Fig. 5 Vgs vs. Junction Temperature

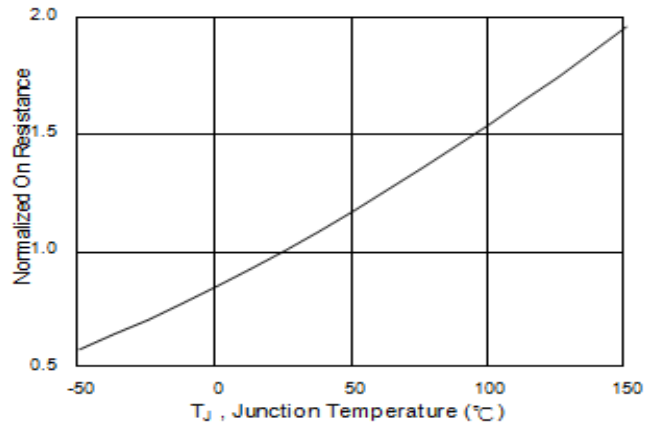


Fig. 6 On-Resistance vs. Temperature



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## TYPICAL CHARACTERISTICS

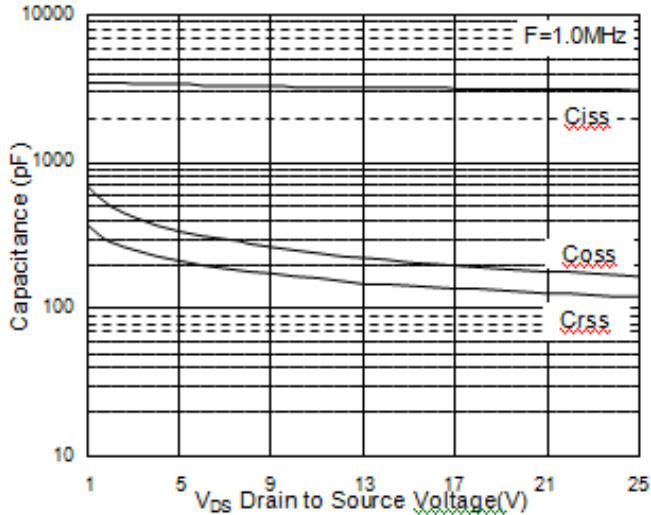


Fig. 7 Typical Capacitance Characteristics

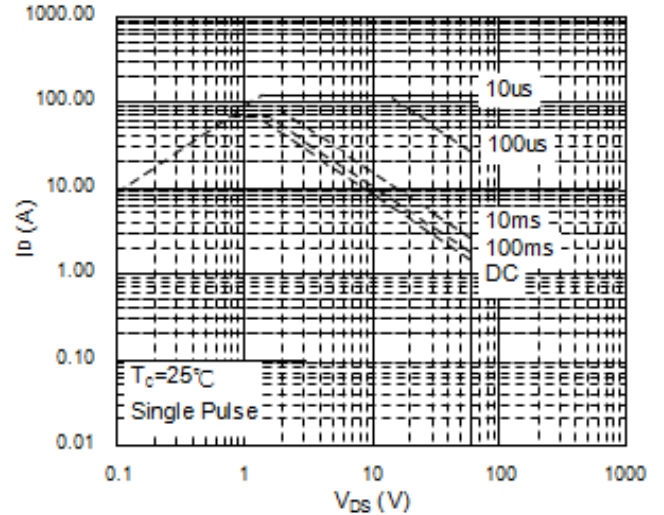


Fig. 8 Maximum Safe Operation Area

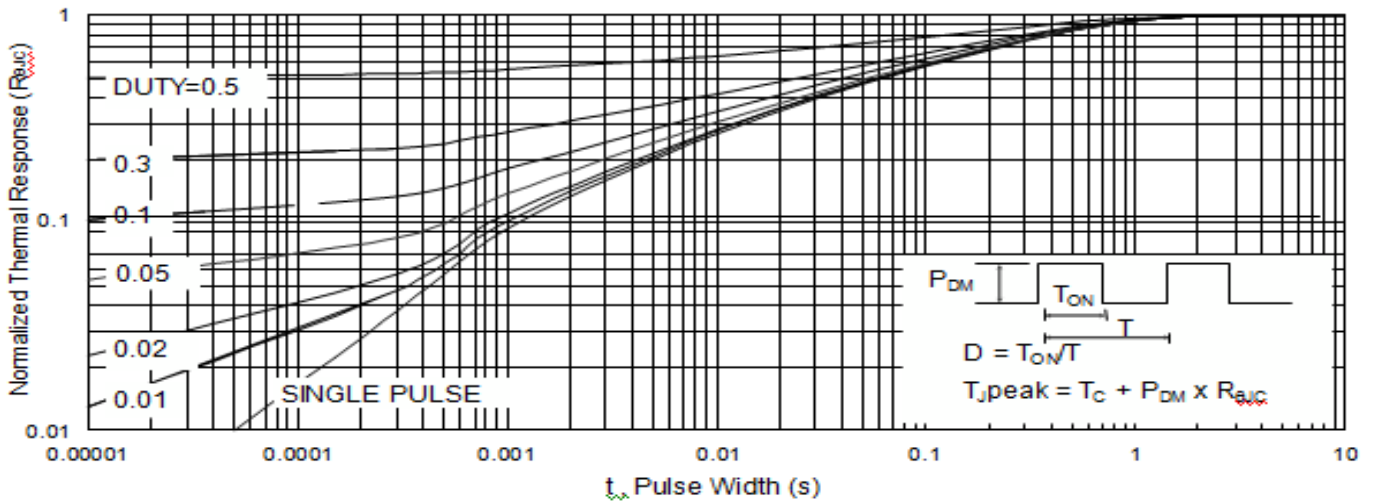


Fig. 9 Effective Transient Thermal Impedance

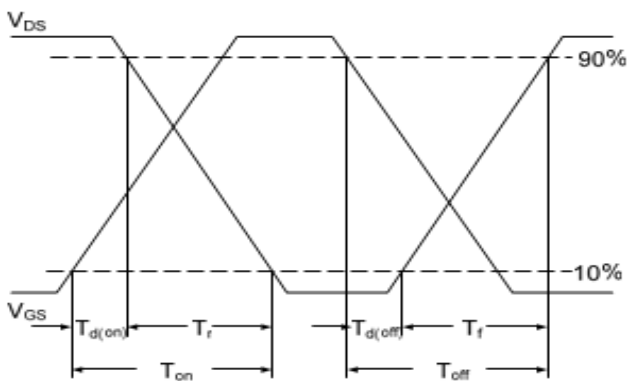


Fig. 10 Switching Time Waveform

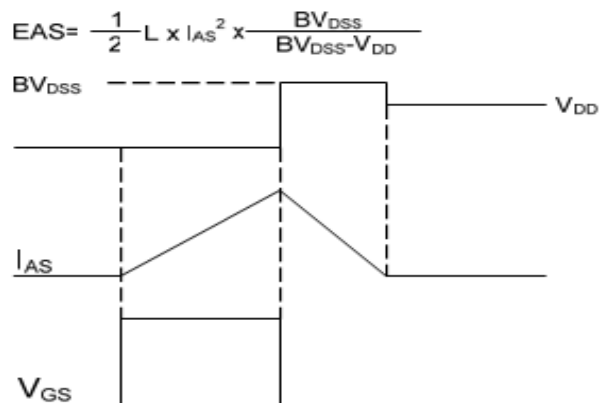


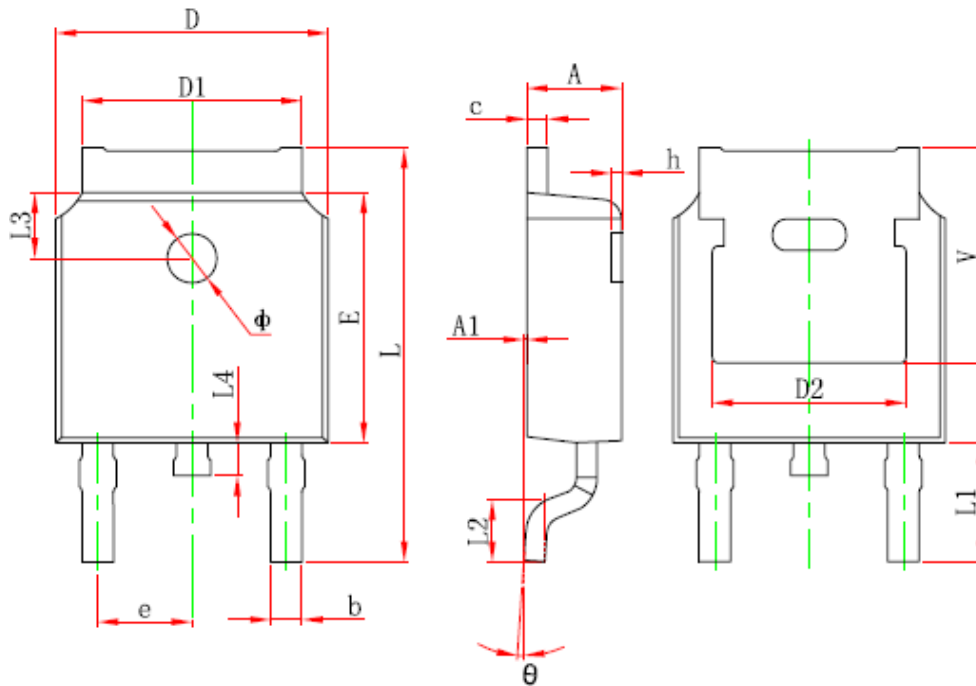
Fig. 11 Unclamped Inductive Waveform



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## N-Channel Enhancement Mode MOSFET

### TO-252 PACKAGE OUTLINE



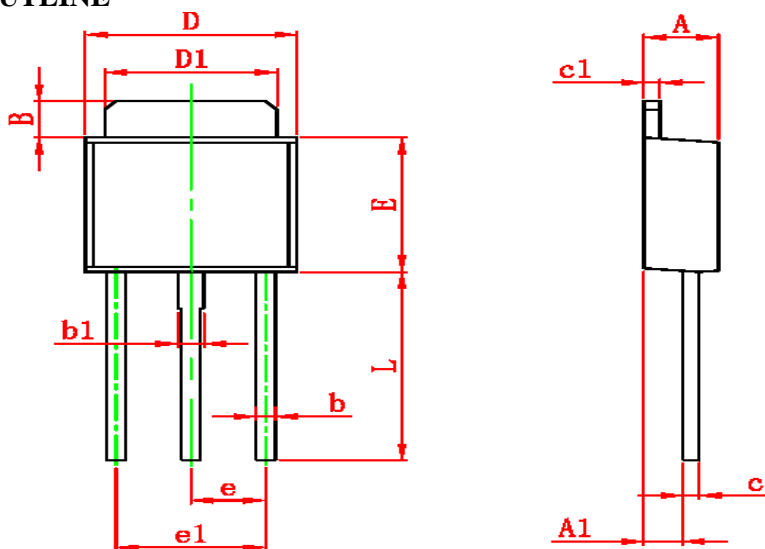
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 REF.		0.211 REF.	



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### TO-251 PACKAGE OUTLINE



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	2.200	2.400	0.087	0.094
A1	1.020	1.270	0.040	0.050
B	1.350	1.650	0.053	0.065
b	0.500	0.700	0.020	0.028
b1	0.700	0.900	0.028	0.035
c	0.430	0.580	0.017	0.023
c1	0.430	0.580	0.017	0.023
D	6.350	6.650	0.250	0.262
D1	5.200	5.400	0.205	0.213
E	5.400	5.700	0.213	0.224
e	2.300 TYP		0.091 TYP	
e1	4.500	4.700	0.177	0.185
L	7.500	7.900	0.295	0.311



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