# 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.

## APPLICATIONS

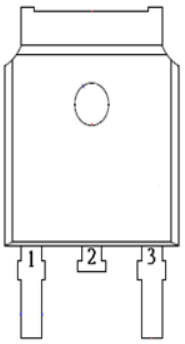
- High Frequency Synchronous Buck Converter
- DC/DC Power System
- Load Switch

## FEATURES

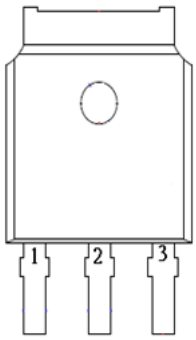
- 30V/51A,$R_{DS(ON)}$=9mΩ@$V_{GS}$=10V
- 30V/51A,$R_{DS(ON)}$=13.5mΩ@$V_{GS}$=4.5V
- Super high density cell design for extremely low $R_{DS\ (ON)}$
- Exceptional on-resistance and maximum DC current capability
- TO-252-2L/TO-251S-3L package design

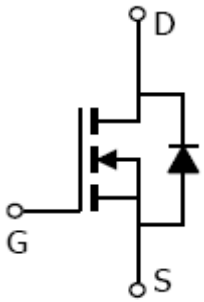
## PIN CONFIGURATION

**TO-252-2L**

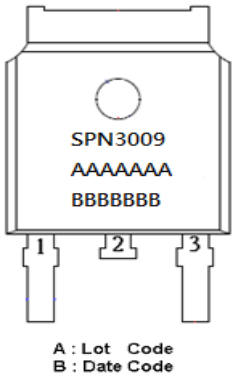


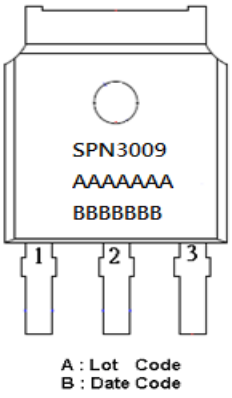

**TO-251S-3L**




## PART MARKING



# SPN3009
## N-Channel Enhancement Mode MOSFET

**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

**ABSOULTE MAXIMUM RATINGS**

($T_A$=25℃ Unless otherwise noted)

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

**ELECTRICAL CHARACTERISTICS**

($T_A$=25℃ Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V,$I_D$=250uA | 30 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250uA | 1.0 | | 2.5 | |
| Gate Leakage Current | $I_{GSS}$ | $V_{DS}$=0V,$V_{GS}$=±20V | | | ±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℃ | | | 5 | |
| On-State Drain Current | $I_{D(on)}$ | $V_{DS}$≥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 | gfs | $V_{DS}$=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 |
| **Dynamic** | | | | | | |
| 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$G_S$=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 $R_G$=3.3Ω | | 6.4 | 13 | nS |
| | $t_r$ | | | 70 | 127 | |
| Turn-Off Time | $t_{d(off)}$ | | | 22.5 | 45 | |
| | $t_f$ | | | 8 | 18 | |

**TYPICAL CHARACTERISTICS**

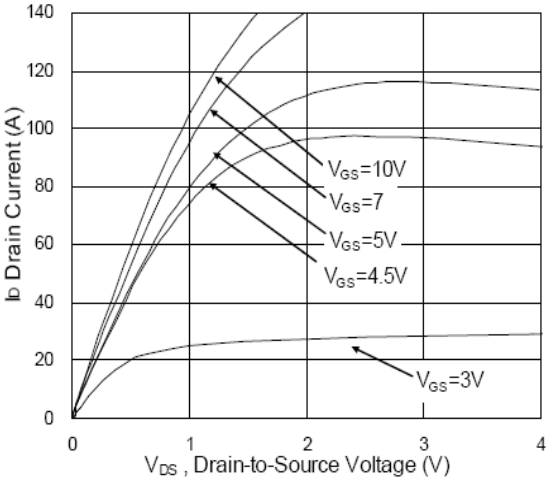



**Fig. 1 Typical Output Characteristics**

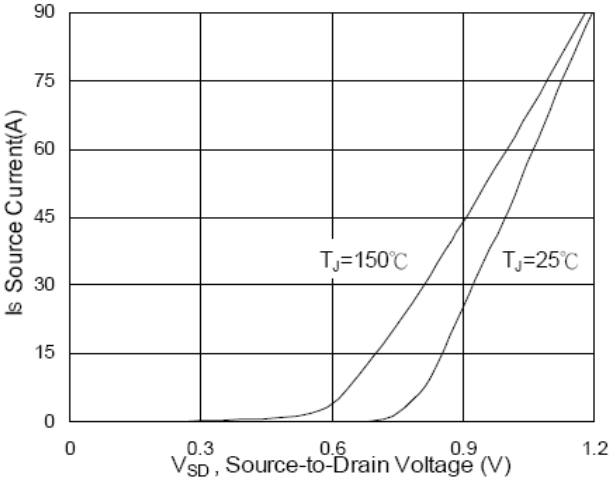



**Fig. 2 Transfer Characteristics**

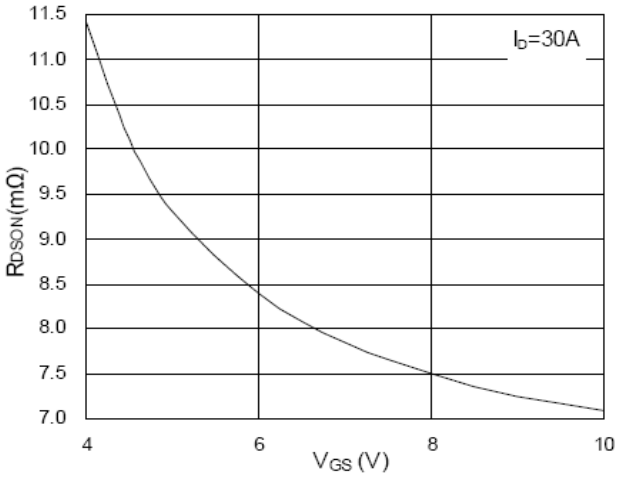



**Fig. 3 On-Resistance vs Gate voltage**

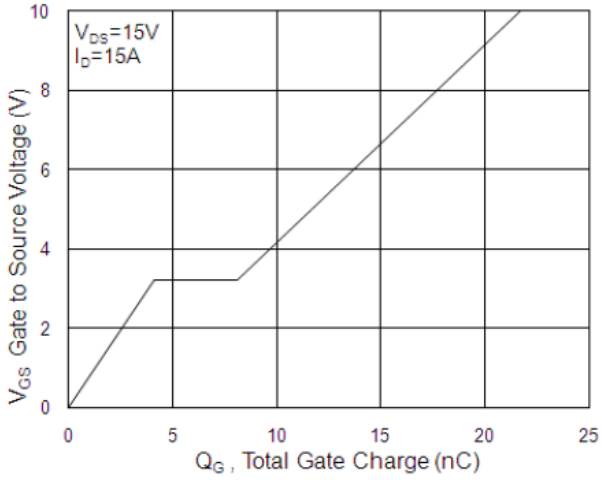



**Fig. 4 Gate Charge Characteristics**

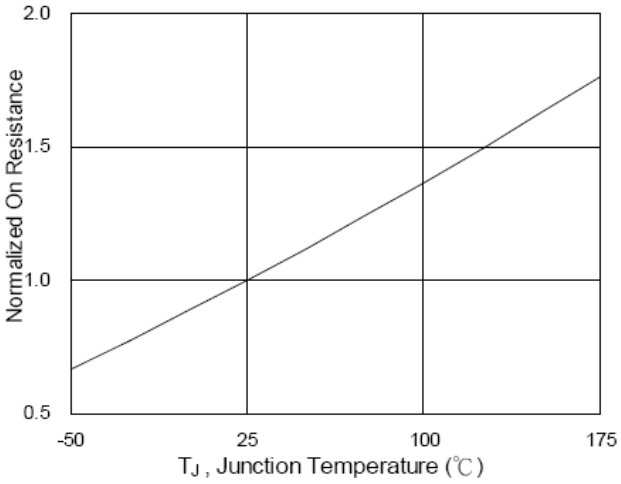



**Fig. 5 On-Resistance vs Junction Temp**

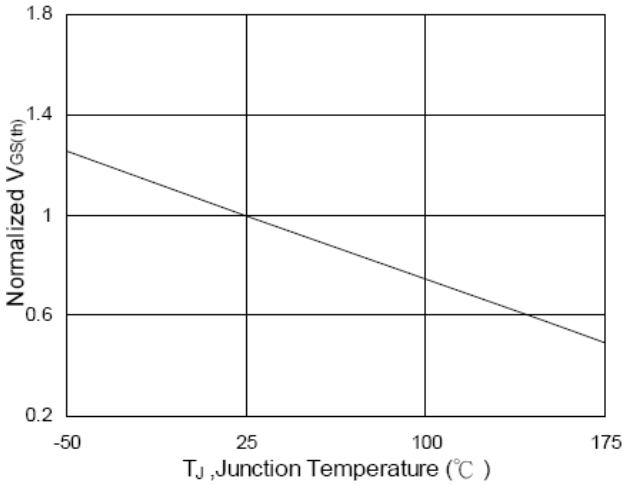



**Fig. 6 Vgs vs Junction Temperature**

## TYPICAL CHARACTERISTICS

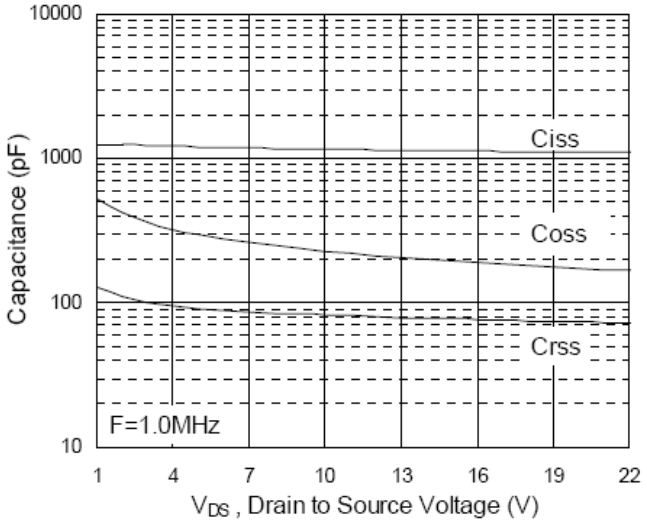



Fig. 7 Typical Capacitance Characteristics

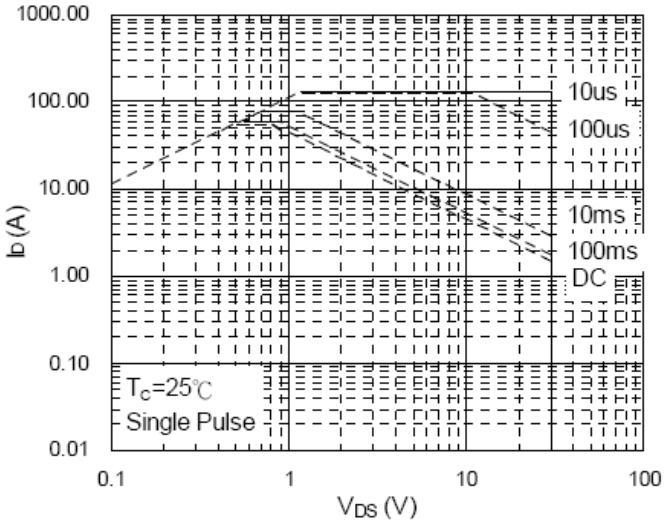



Fig. 8 Maximum Safe Operation Area

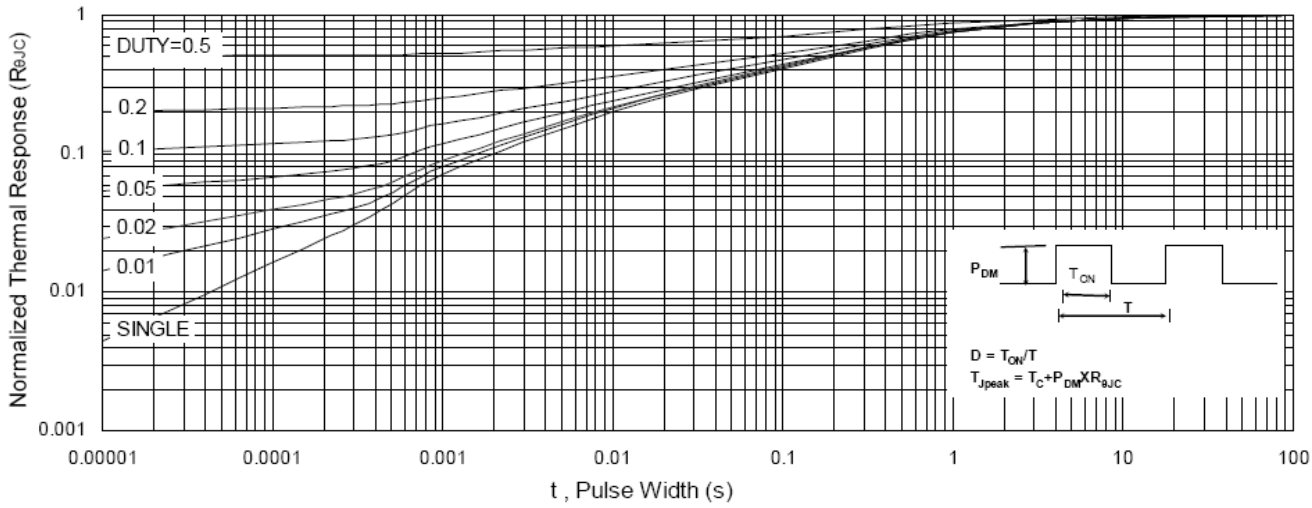



Fig. 9 Effective Transient Thermal Impedance

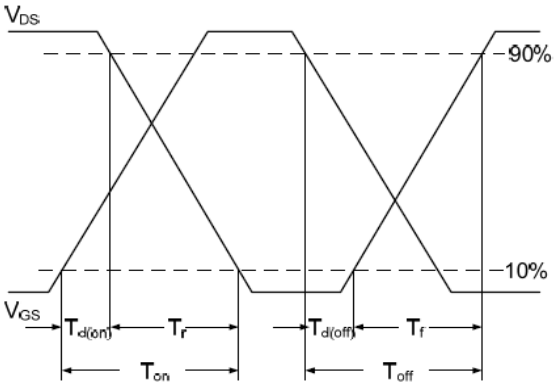



Fig. 10 Switching Time Waveform

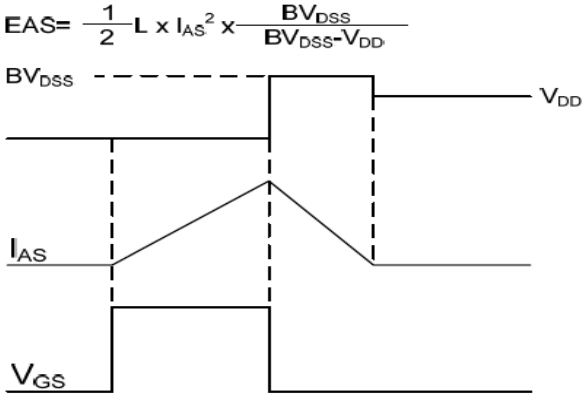



Fig. 11 Unclamped Inductive Waveform

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