



# SPN3006

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN3006 is the N-Channel logic enhancement mode power field effect transistors are produced using high cell density, DMOS trench technology. The SPN3006 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

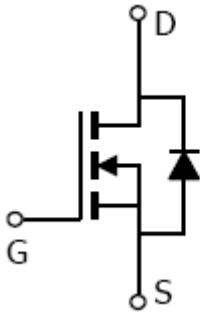
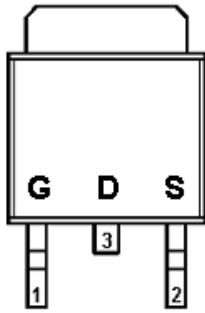
- ◆ 30V/30A,  $R_{DS(ON)} = 4.7m\Omega @ V_{GS} = 10V$
- ◆ 30V/15A,  $R_{DS(ON)} = 7.5m\Omega @ V_{GS} = 4.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-252 package design

### APPLICATIONS

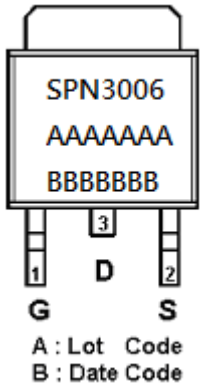
- High Frequency Synchronous Buck Converter
- DC/DC Power System
- Load Switch

### PIN CONFIGURATION

TO-252



### PART MARKING





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### PIN DESCRIPTION

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

### ORDERING INFORMATION

| Part Number    | Package | Part Marking |
|----------------|---------|--------------|
| SPN3006T252RGB | TO-252  | SPN3006      |

※ SPN3006T252RGB : Tape Reel ; 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                                       | $I_D$           | $T_A=25^{\circ}\text{C}$  | 80                          | A |
|  |                 | $T_A=100^{\circ}\text{C}$ | 57                          |   |
| Pulsed Drain Current   | $I_{DM}$        | 160                       | A                           |   |
| Avalanche Current  | $I_{AS}$        | 48                        | A                           |   |
| Single Pulse Avalanche Energy                                  | $E_{AS}$        | 259                       | mJ                          |   |
| Power Dissipation  | $P_D$           | 6                         | 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 ( $t \leq 10\text{s}$ ) | $R_{\theta JA}$ | 25                        | $^{\circ}\text{C}/\text{W}$ |   |



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### ELECTRICAL CHARACTERISTICS

(T<sub>A</sub>=25°C Unless otherwise noted)

| Parameter                       | Symbol               | Conditions  | Min. | Typ  | Max. | Unit |
|---------------------------------|----------------------|---|------|------|------|------|
| <b>Static</b>                   |                      |   |      |      |      |      |
| Drain-Source Breakdown Voltage  | V <sub>(BR)DSS</sub> | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA  | 30   |      |      | V    |
| Gate Threshold Voltage          | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                    | 1.0  |      | 2.5  |      |
| Gate Leakage Current            | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V  |      |      | ±100 | nA   |
| Zero Gate Voltage Drain Current | I <sub>DSS</sub>     | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V   |      |      | 1    | μA   |
|                                 |                      | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                             |      |      | 5    |      |
| On-State Drain Current          | I <sub>D(on)</sub>   | V <sub>DS</sub> ≥5V, V <sub>GS</sub> =10V   |      |      | 80   | A    |
| Drain-Source On-Resistance      | R <sub>DSON</sub>    | V <sub>GS</sub> =10V, I <sub>D</sub> =30A   |      | 4.7  | 5.5  | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A  |      | 7.5  | 9    |      |
| Forward Transconductance        | g <sub>fs</sub>      | V <sub>DS</sub> =5V, I <sub>D</sub> =30A  |      | 22   |      | S    |
| Diode Forward Voltage           | V <sub>SD</sub>      | I <sub>S</sub> =1A, V <sub>GS</sub> =0V   |      |      | 1    | V    |
| Single Pulse Avalanche Energy   | E <sub>AS</sub>      | V <sub>DD</sub> =25V, L=0.1mH,<br>I <sub>AS</sub> =24A                                      | 60   |      |      | mJ   |
| <b>Dynamic</b>                  |                      |   |      |      |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V<br>I <sub>D</sub> =15A                          |      | 20   | 18   | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |   |      | 7.6  |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |   |      | 7.2  |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V<br>f=1MHz   |      | 2300 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |   |      | 265  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |   |      | 210  |      |      |
| Turn-On Time                    | t <sub>d(on)</sub>   | V <sub>DD</sub> =15V,<br>I <sub>D</sub> =15A, V <sub>GEN</sub> =10V<br>R <sub>G</sub> =3.3Ω |      | 7.8  | 15   | nS   |
|                                 | t <sub>r</sub>       |   |      | 15   | 12   |      |
| Turn-Off Time                   | t <sub>d(off)</sub>  |   |      | 37   | 30   |      |
|                                 | t <sub>f</sub>       |   |      | 10.6 | 15   |      |



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## TYPICAL CHARACTERISTICS

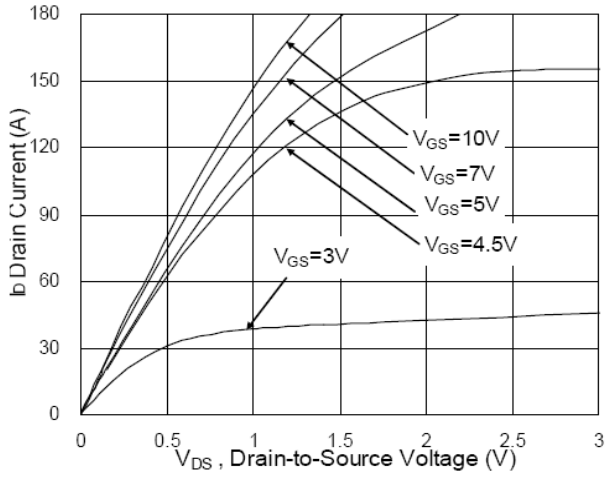


Fig. 1 Typical Output Characteristics

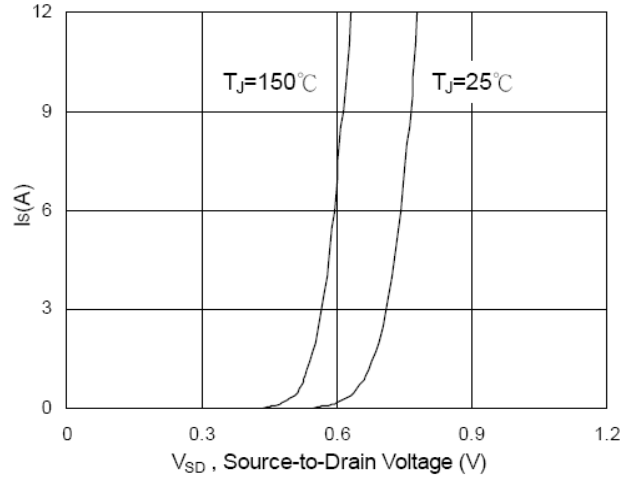


Fig. 2 Transfer Characteristics

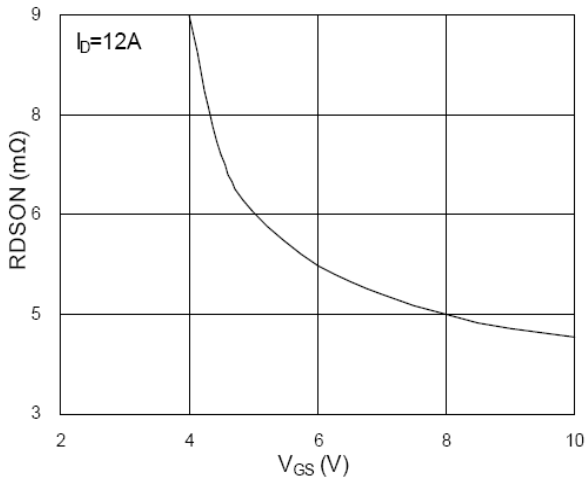


Fig. 3 On-Resistance vs Gate voltage

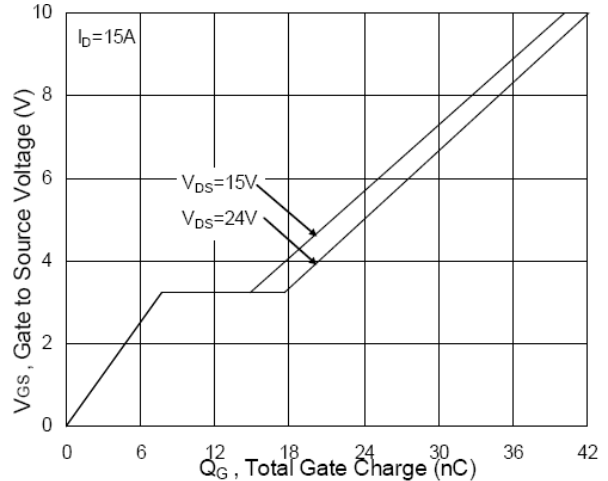


Fig. 4 Gate Charge Characteristics

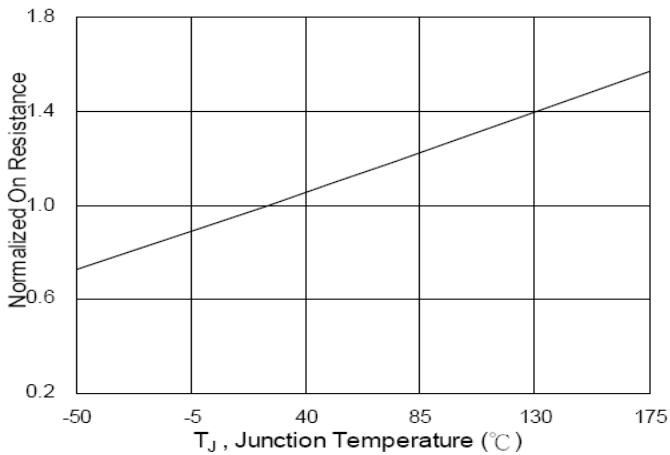


Fig. 5 On-Resistance vs Junction Temp

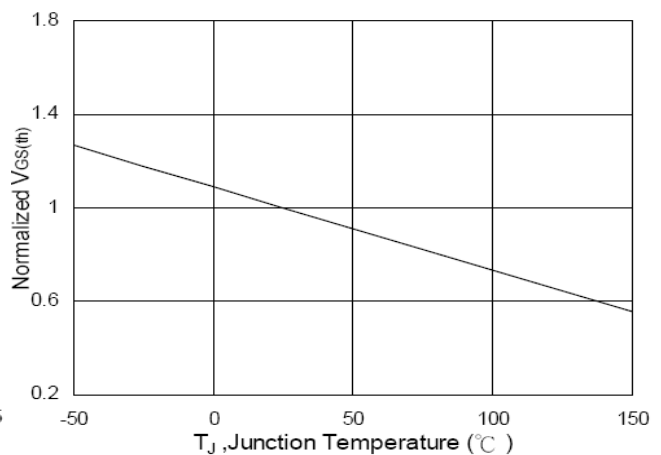


Fig. 6 Vgs vs Junction Temperature



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## TYPICAL CHARACTERISTICS

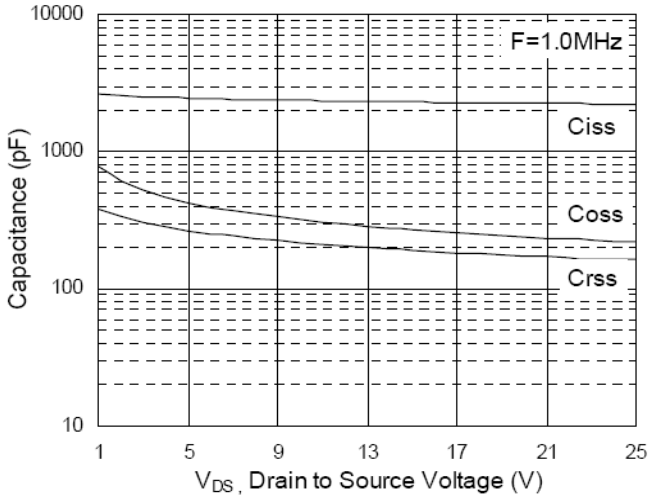


Fig. 7 Typical Capacitance Characteristics

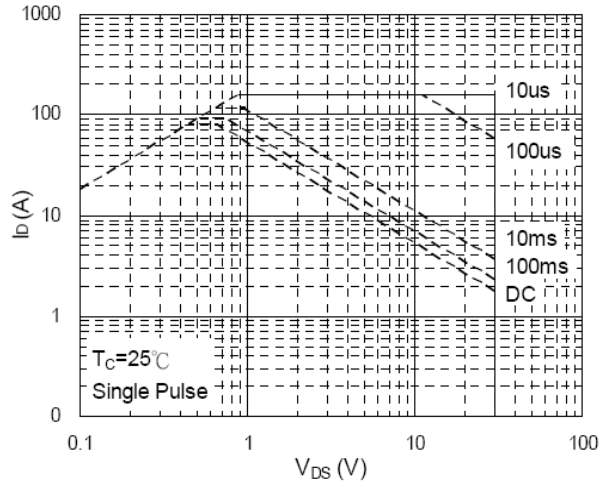


Fig. 8 Maximum Safe Operation Area

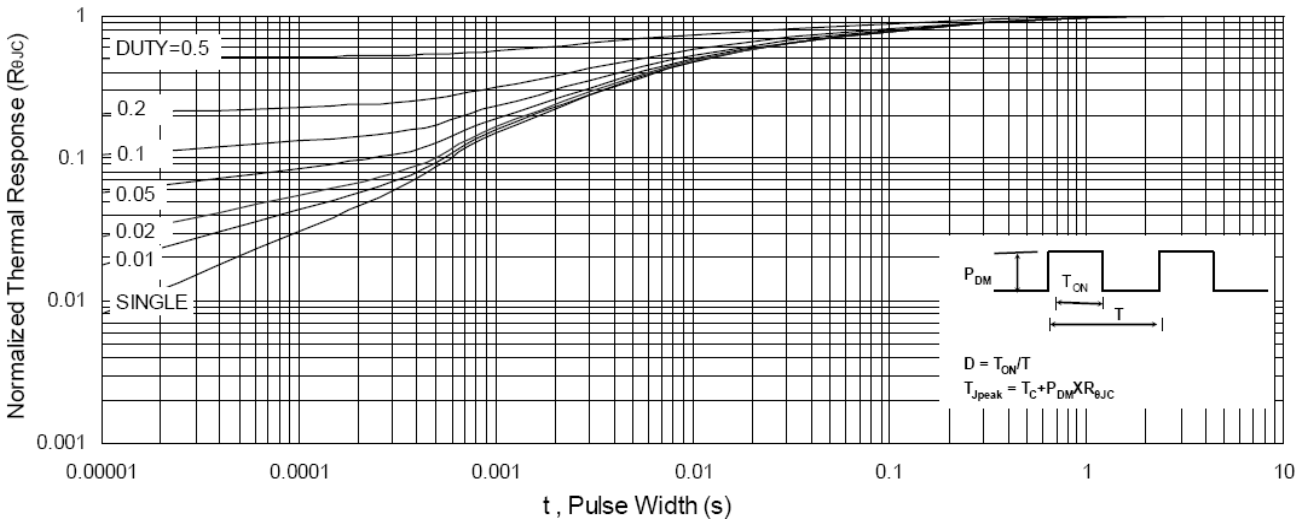


Fig. 9 Effective Transient Thermal Impedance

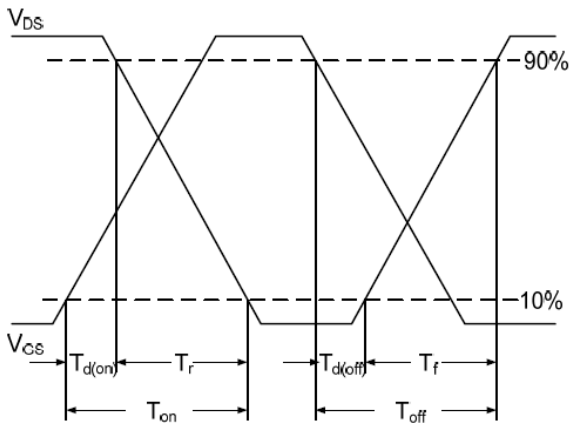


Fig. 10 Switching Time Waveform

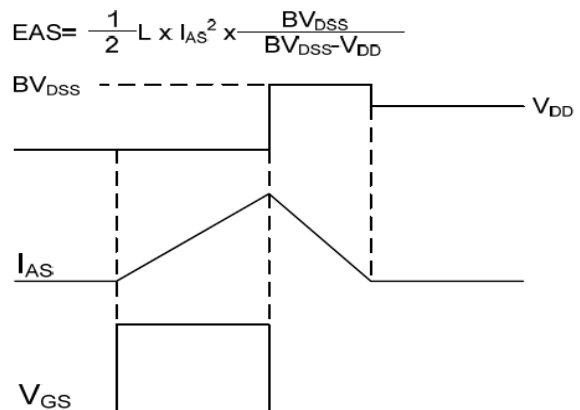


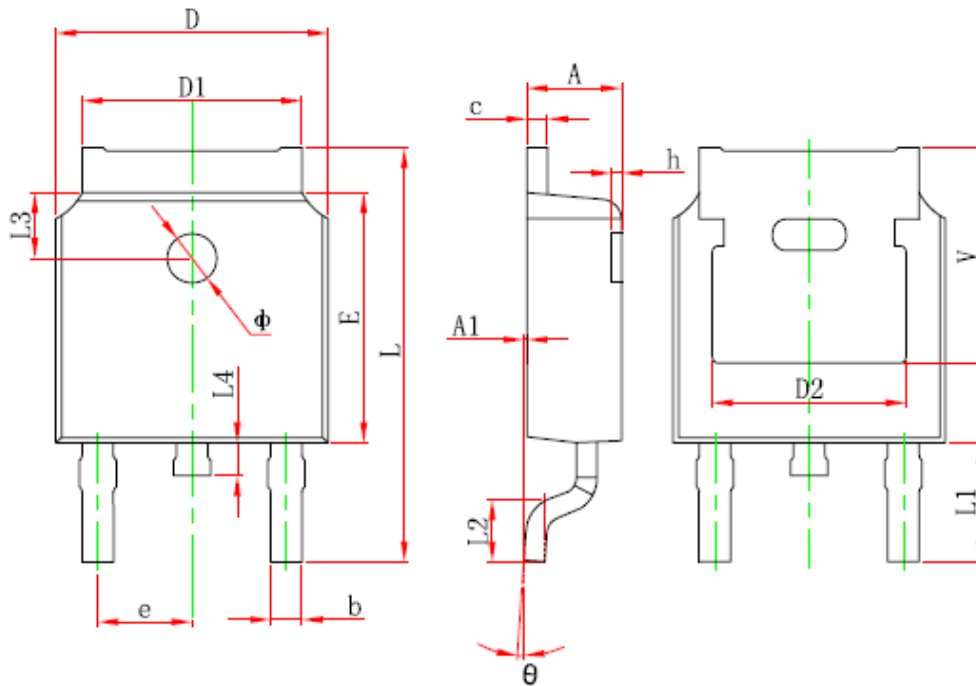
Fig. 11 Unclamped Inductive Waveform



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### 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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