



# SPN8860

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN8860 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.

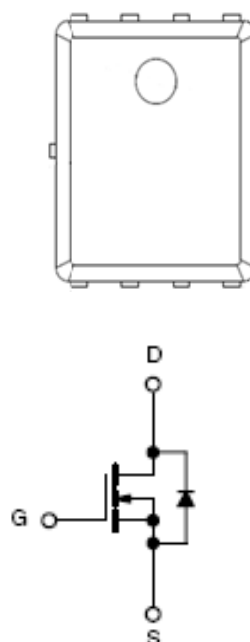
### APPLICATIONS

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

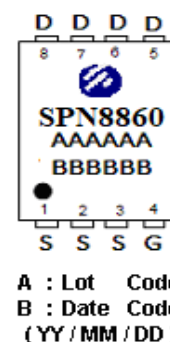
### FEATURES

- ◆ 60V/20A,  $R_{DS(ON)}=16m\Omega@V_{GS}=10V$
- ◆ 60V/20A,  $R_{DS(ON)}=19m\Omega@V_{GS}=4.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ PPAK5x6-8L package design

### PIN CONFIGURATION (PPAK5x6-8L)



### PART MARKING





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### PIN DESCRIPTION

| Pin | Symbol | Description |
|-----|--------|-------------|
| 1   | S      | Source      |
| 2   | S      | Source      |
| 3   | S      | Source      |
| 4   | G      | Gate        |
| 5   | D      | Drain       |
| 6   | D      | Drain       |
| 7   | D      | Drain       |
| 8   | D      | Drain       |

### ORDERING INFORMATION

| Part Number   | Package    | Part Marking |
|---------------|------------|--------------|
| SPN8860DN8RGB | PPAK5x6-8L | SPN8860      |

※ SPN8860DN8RGB: Tape Reel ; Pb – Free; Halogen – Free

### ABSOLUTE MAXIMUM RATINGS

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

| Parameter                                                                                         |                       | Symbol           | Typical | Unit |
|---------------------------------------------------------------------------------------------------|-----------------------|------------------|---------|------|
| Drain-Source Voltage                                                                              |                       | V <sub>DSS</sub> | 60      | V    |
| Gate –Source Voltage                                                                              |                       | V <sub>GSS</sub> | ±20     | V    |
| Continuous Drain Current(T <sub>J</sub> =150°C)                                                   | T <sub>A</sub> =25°C  | I <sub>D</sub>   | 46      | A    |
|                                                                                                   | T <sub>A</sub> =100°C |                  | 33      |      |
| Pulsed Drain Current                                                                              |                       | I <sub>DM</sub>  | 203     | A    |
| Avalanche Current                                                                                 |                       | I <sub>AS</sub>  | 27      | A    |
| Power Dissipation                                                                                 | T <sub>A</sub> =25°C  | P <sub>D</sub>   | 71      | W    |
| Avalanche Energy with Single Pulse<br>( T <sub>J</sub> =25°C , L= 0.1mH , I <sub>AS</sub> = 38A ) |                       | E <sub>AS</sub>  | 36      | mJ   |
| Operating Junction Temperature                                                                    |                       | T <sub>J</sub>   | -55/150 | °C   |
| Storage Temperature Range                                                                         |                       | T <sub>STG</sub> | -55/150 | °C   |
| Thermal Resistance-Junction to Case                                                               |                       | R <sub>θJC</sub> | 2.1     | °C/W |



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### ELECTRICAL CHARACTERISTICS

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

| Parameter                       | Symbol                | Conditions                                                                                | Min. | Typ  | Max. | Unit |
|---------------------------------|-----------------------|-------------------------------------------------------------------------------------------|------|------|------|------|
| Static                          |                       |                                                                                           |      |      |      |      |
| Drain-Source Breakdown Voltage  | V <sub>(BR)DSS</sub>  | V <sub>GS</sub> =0V,I <sub>D</sub> =250uA                                                 | 60   |      |      | V    |
| Gate Threshold Voltage          | V <sub>GS(th)</sub>   | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250uA                                   | 1.0  |      | 3.0  |      |
| 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> =48V,V <sub>GS</sub> =0V                                                  |      |      | 1    | uA   |
|                                 |                       | V <sub>DS</sub> =48V,V <sub>GS</sub> =0V<br>T <sub>J</sub> =150°C                         |      |      | 100  |      |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>   | V <sub>GS</sub> =10V,I <sub>D</sub> =20A                                                  |      | 13   | 16   | mΩ   |
|                                 |                       | V <sub>GS</sub> =4.5V,I <sub>D</sub> =20A                                                 |      | 16   | 19   |      |
| Gate Resistance                 | R <sub>G</sub>        |                                                                                           |      | 1.3  |      | Ω    |
| Forward Transconductance        | g <sub>fs</sub>       | V <sub>DS</sub> =15V,I <sub>D</sub> =20A                                                  |      | 15   |      | S    |
| Dynamic                         |                       |                                                                                           |      |      |      |      |
| Total Gate Charge               | Q <sub>g</sub> (10V)  | V <sub>DS</sub> =48V,V <sub>GS</sub> =10V<br>I <sub>D</sub> =40A                          |      | 29   |      | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>       |                                                                                           |      | 4    |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>       |                                                                                           |      | 8    |      |      |
| Total Gate Charge               | Q <sub>g</sub> (4.5V) | V <sub>DS</sub> =48V,V <sub>GS</sub> =4.5V<br>I <sub>D</sub> =40A                         |      | 15   |      |      |
| Input Capacitance               | C <sub>iss</sub>      | V <sub>DS</sub> =25V,V <sub>GS</sub> =0V<br>f=1MHz                                        |      | 1400 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>      |                                                                                           |      | 137  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>      |                                                                                           |      | 95   |      |      |
| Turn-On Time                    | t <sub>d(on)</sub>    | V <sub>DD</sub> =48V, I <sub>D</sub> =40A,<br>V <sub>GEN</sub> =10V, R <sub>G</sub> =2.5Ω |      | 8.4  |      | nS   |
|                                 | t <sub>r</sub>        |                                                                                           |      | 12.4 |      |      |
| Turn-Off Time                   | t <sub>d(off)</sub>   |                                                                                           |      | 26   |      |      |
|                                 | t <sub>f</sub>        |                                                                                           |      | 4.4  |      |      |
| Diode                           |                       |                                                                                           |      |      |      |      |
| Diode Forward Voltage           | V <sub>SD</sub>       | I <sub>S</sub> =40A,V <sub>GS</sub> =0V                                                   |      |      | 1.2  | V    |
| Reverse Recovery Time           | t <sub>rr</sub>       | V <sub>GS</sub> =0V,I <sub>S</sub> =1A ,                                                  |      | 19   |      | nS   |
| Reverse Recovery Charge         | Q <sub>rr</sub>       | di/dt=100A/μs                                                                             |      | 5    |      | nC   |

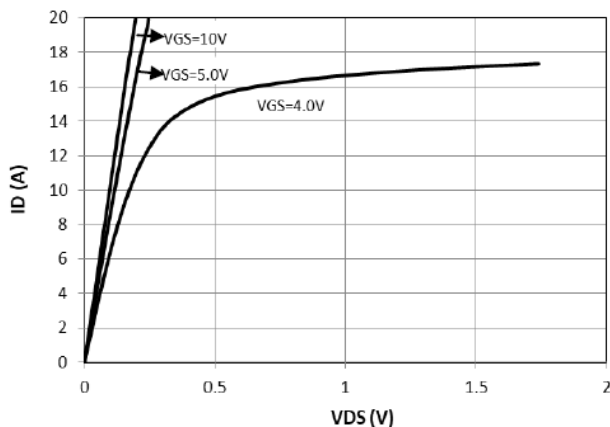


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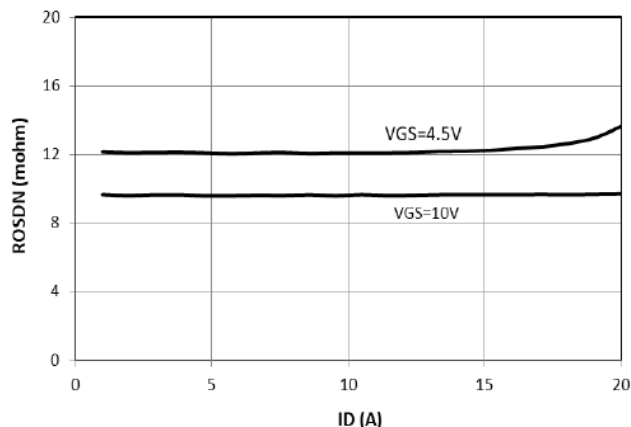
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### TYPICAL CHARACTERISTICS

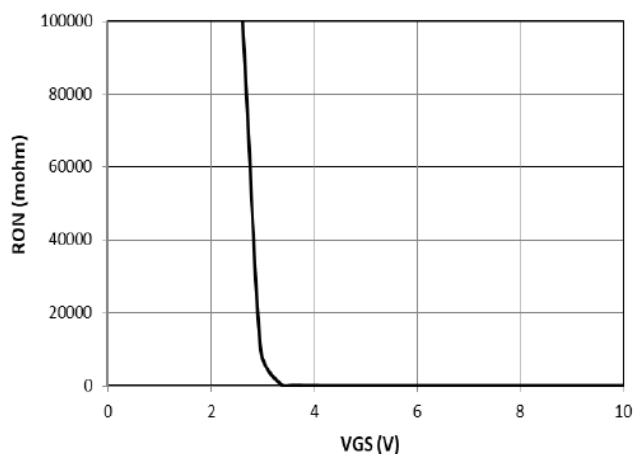
TYPICAL OUTPUT CHARACTERISTICS



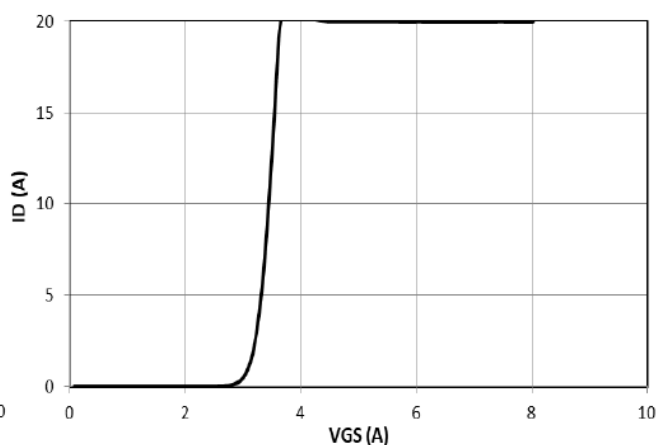
ON-RESISTANCE VS. DRAIN CURRENT AND GATE VOLTAGE



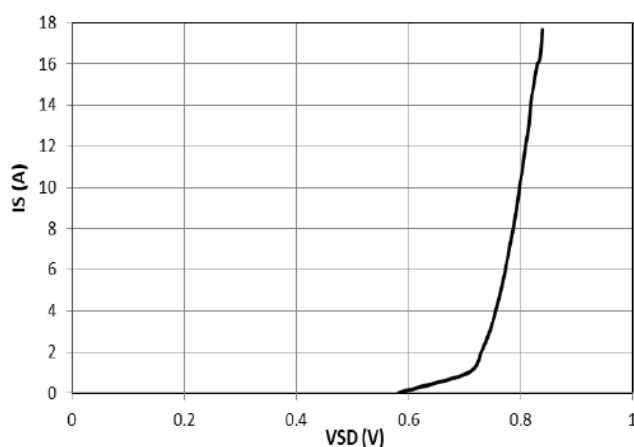
ON-RESISTANCE VS. GATE-SOURCE VOLTAGE



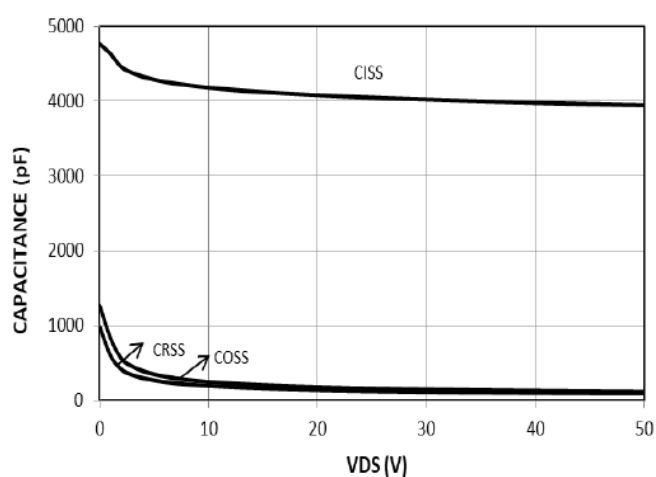
TYPICAL TRANSFER CHARACTERISTICS



TYPICAL SOURCE-DRAIN DIODE FORWARD VOLTAGE



TYPICAL CAPACITANCE VS. DRAIN-SOURCE VOLTAGE

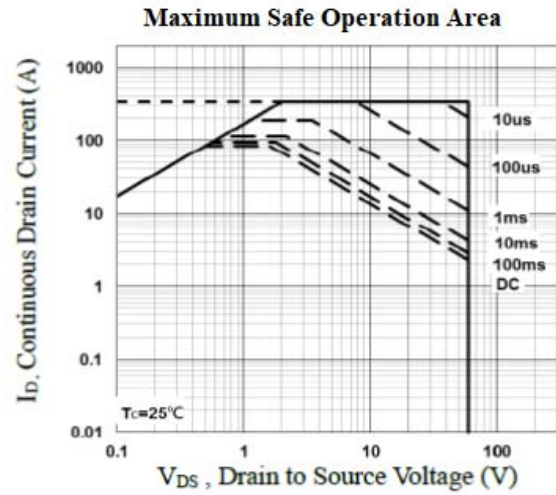
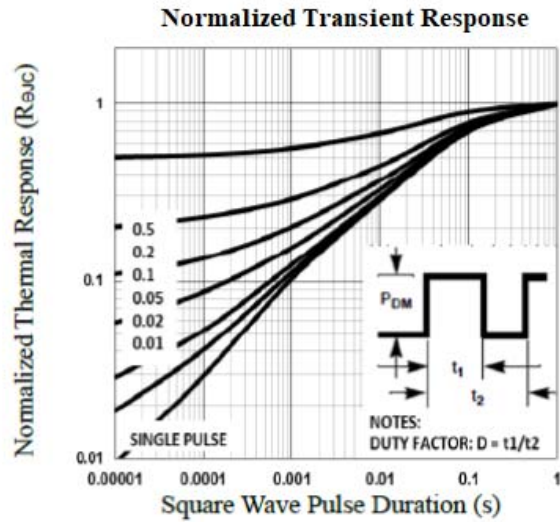




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### TYPICAL CHARACTERISTICS





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