



# SPN125T06

## N-Channel Enhancement Mode MOSFET

### DESCRIPTION

The SPN125T06 is the N-Channel logic enhancement mode power field effect transistor which is produced using super high cell density DMOS trench technology. This high density process is especially tailored to minimize on-state resistance. These devices are particularly suitable for synchronous rectifier application, Motor control power management and other Power Tool circuits. It has been optimized for low gate charge, low  $R_{DS(ON)}$  and fast switching speed.

### APPLICATIONS

- AC/DC Synchronous Rectifier
- Load Switch
- UPS
- Motor Control
- Power Tool

### FEATURES

- ◆ 60V/125A ,  $R_{DS(ON)}=4.3m\Omega@V_{GS}=10V$   
60V/125A ,  $R_{DS(ON)}=5.6m\Omega@V_{GS}=4.5V$
- ◆ Super high density cell design for extremely low  $R_{DS(ON)}$
- ◆ Exceptional on-resistance and maximum DC current capability
- ◆ TO-220-3L/TO-220F-3L/TO-251S-3L/TO-252-2L /PPAK5x6-8L/TO-263-2L package design

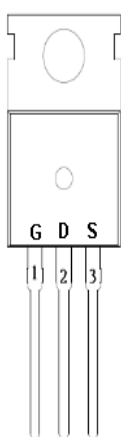


# SPN125T06

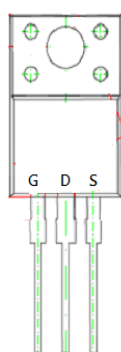
## N-Channel Enhancement Mode MOSFET

### PIN CONFIGURATION

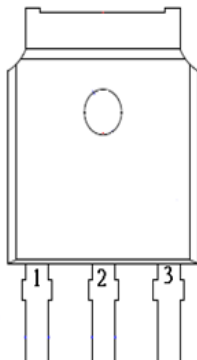
TO-220



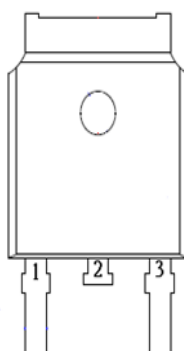
TO-220F



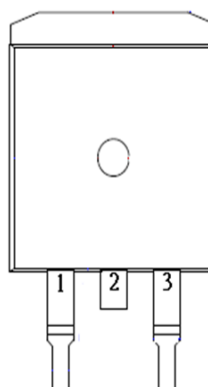
TO-251S-3L



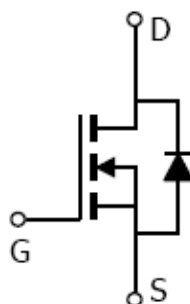
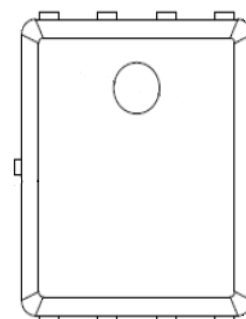
TO-252-2L



TO-263-2L



PPAK5x6



### PART MARKING



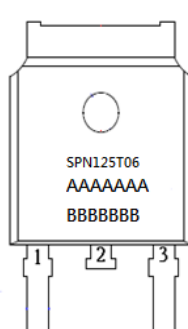
A : Lot Code  
B : Date Code



A: Lot Code  
B: Date Code  
(YYMMDD)



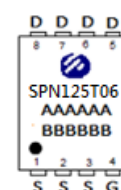
A: Lot Code  
B: Date Code



A: Lot Code  
B: Date Code



AAAAA: Wafer lot no  
BBBBBB: date code



A : Lot Code  
B : Date Code  
(YY/MM/DD)



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## N-Channel Enhancement Mode MOSFET

### TO-220/TO-220F/TO-251/TO-252/TO-263 PIN DESCRIPTION

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

### PPAK5x6 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 |
|-------------------|------------|--------------|
| SPN125T06T220TGB  | TO-220-3L  | SPN125T06    |
| SPN125T06T220FTGB | TO-220F-3L | SPN125T06    |
| SPN125T06ST251TGB | TO-251S-3L | SPN125T06    |
| SPN125T06T252RGB  | TO-252-2L  | SPN125T06    |
| SPN125T06T262RGB  | TO-263-2L  | SPN125T06    |
| SPN125T06DN8RGB   | PPAK5x6-8L | SPN125T06    |

- ※ SPN125T06T220TGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN125T06T220FTGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN125T06ST251TGB : Tube ; Pb – Free ; Halogen – Free
- ※ SPN125T06T252RGB : Tape&Reel ; Pb – Free ; Halogen – Free
- ※ SPN125T06T262RGB : Tape&Reel ; Pb – Free ; Halogen – Free
- ※ SPN125T06DN8RGB : Tape&Reel ; Pb – Free ; Halogen - Free



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## N-Channel Enhancement Mode MOSFET

### 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(Silicon Limited)                             | T <sub>c</sub> =25°C   | I <sub>D</sub>   | 125     | A    |
|                                                                       | T <sub>c</sub> =70°C   |                  | 88      |      |
| Pulsed Drain Current                                                  |                        | I <sub>DM</sub>  | 400     | A    |
| Power Dissipation@ T <sub>c</sub> =25°C                               | TO-220/TO-263          | P <sub>D</sub>   | 104     | W    |
| Power Dissipation@ T <sub>c</sub> =25°C                               | TO-251S/TO-252/TO-220F |                  | 93      |      |
| Power Dissipation@ T <sub>c</sub> =25°C                               | PPAK5x6                |                  | 83      |      |
| Avalanche Energy with Single Pulse ( T <sub>c</sub> =25°C , L=0.1mH.) |                        | EAS              | 219     | 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 (TO-220/TO-220F/TO-263)           |                        | R <sub>θJC</sub> | 1.2     | °C/W |
| Thermal Resistance-Junction to Case (TO-251S/TO-252)                  |                        | R <sub>θJC</sub> | 1.35    | °C/W |
| Thermal Resistance-Junction to Case (PPAK5x6)                         |                        | R <sub>θJC</sub> | 1.5     | °C/W |

#### Note :

The maximum current rating is package limited at 120A for TO-263-2L and TO-220-3L

The maximum current rating is package limited at 78A for TO-220F-3L

The maximum current rating is package limited at 70A for TO-251S-3L and TO-252-2L

The maximum current rating is package limited at 80A for PPAK5x6-8L



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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                                              | 60   |      |      | V    |
| Gate Threshold Voltage          | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                | 1.0  |      | 2.4  |      |
| 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<br>T <sub>J</sub> = 25 °C                     |      |      | 1    | μA   |
|                                 |                      | V <sub>DS</sub> =48V, V <sub>GS</sub> =0V<br>T <sub>J</sub> = 100 °C                    |      |      | 100  |      |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                               |      | 3.6  | 4.3  | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A                                              |      | 4.5  | 5.6  |      |
| Forward Transconductance        | g <sub>fs</sub>      | V <sub>DS</sub> =5V, I <sub>D</sub> =20A                                                |      | 75   |      | S    |
| Gate Resistance                 | R <sub>G</sub>       | V <sub>GS</sub> =0V, V <sub>DS</sub> =Open,<br>f=1MHz                                   |      | 1.6  |      | Ω    |
| Diode Forward Voltage           | V <sub>SD</sub>      | I <sub>S</sub> =20A, V <sub>GS</sub> =0V                                                |      |      | 1.2  | V    |
| <b>Dynamic</b>                  |                      |                                                                                         |      |      |      |      |
| Total Gate Charge (10V)         | Q <sub>g</sub>       | V <sub>DS</sub> =30V, V <sub>GS</sub> =10V<br>I <sub>D</sub> = 20A                      |      | 54   |      | nC   |
| Total Gate Charge (4.5V)        | Q <sub>g</sub>       |                                                                                         |      | 27   |      |      |
| Gate-Source Charge              | Q <sub>gs</sub>      |                                                                                         |      | 14   |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |                                                                                         |      | 6    |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V<br>f=1MHz                                     |      | 3800 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |                                                                                         |      | 520  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |                                                                                         |      | 50   |      |      |
| Turn-On Time                    | td(on)               | V <sub>DD</sub> =30V, I <sub>D</sub> =20A<br>V <sub>GEN</sub> =10V, R <sub>G</sub> =10Ω |      | 16   |      | nS   |
|                                 | tr                   |                                                                                         |      | 36   |      |      |
| Turn-Off Time                   | td(off)              |                                                                                         |      | 55   |      |      |
|                                 | tf                   |                                                                                         |      | 35   |      |      |



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### TYPICAL CHARACTERISTICS

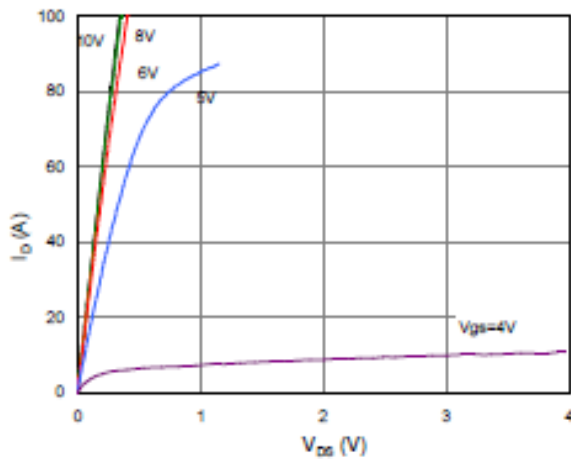


Fig. 1 Output Characteristics

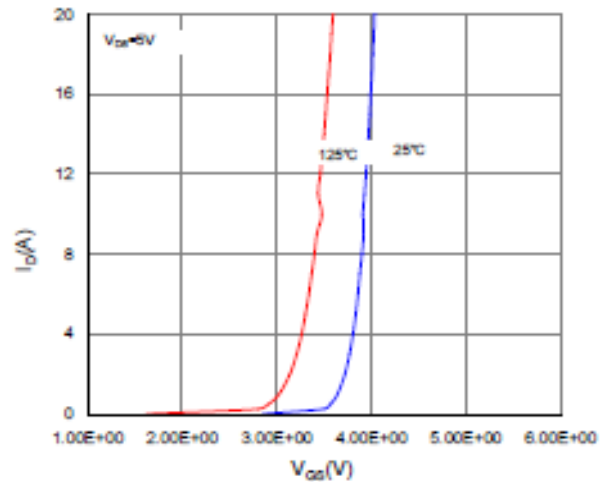


Fig. 2 Transfer Characteristics

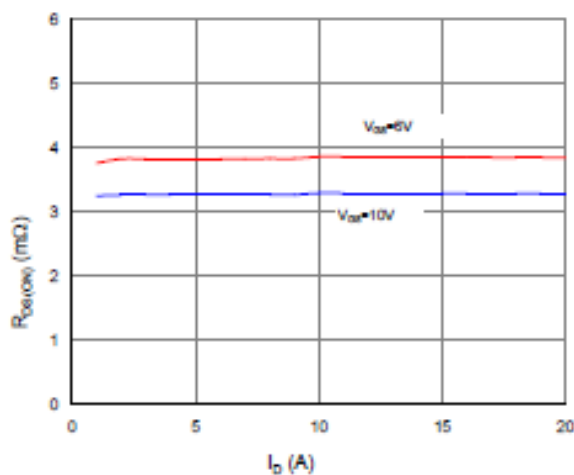


Fig. 3 On Resistances vs. Drain Current

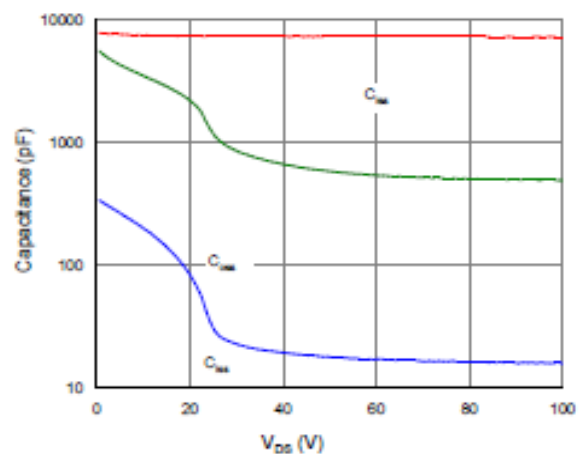


Fig. 4 Capacitance

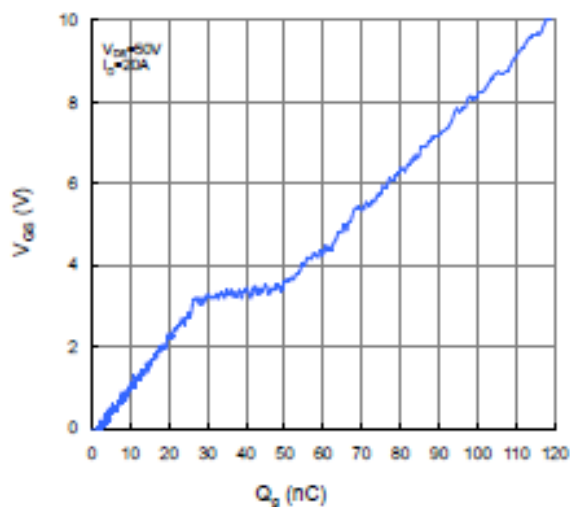


Fig. 5 Gate Charge

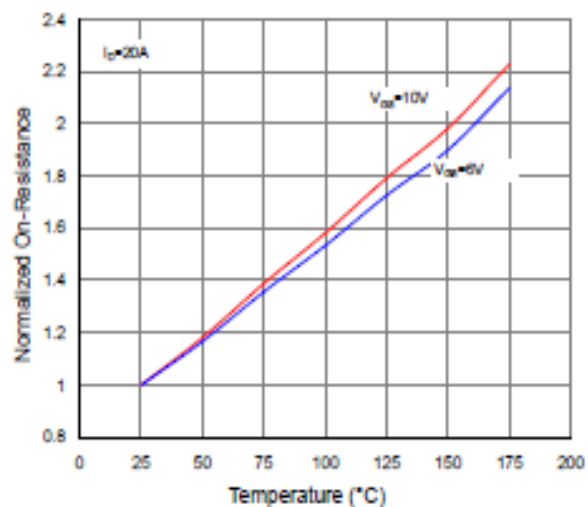


Fig. 6 On- Resistance vs. Junction Temperature



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### TYPICAL CHARACTERISTICS

Figure 7. Typical Gate-Charge vs. Gate-to-Source Voltage

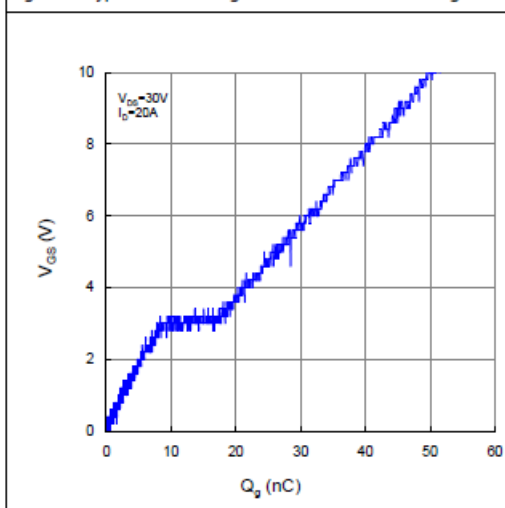


Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

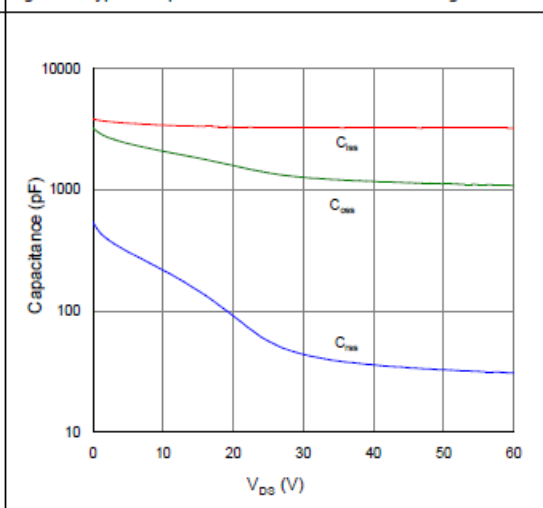


Figure 9. Maximum Safe Operating Area

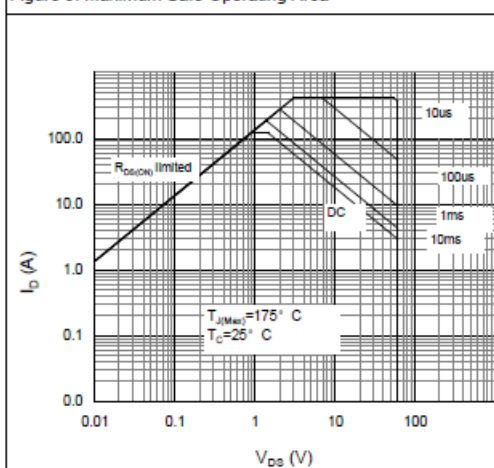


Figure 10. Maximum Drain Current vs. Case Temperature

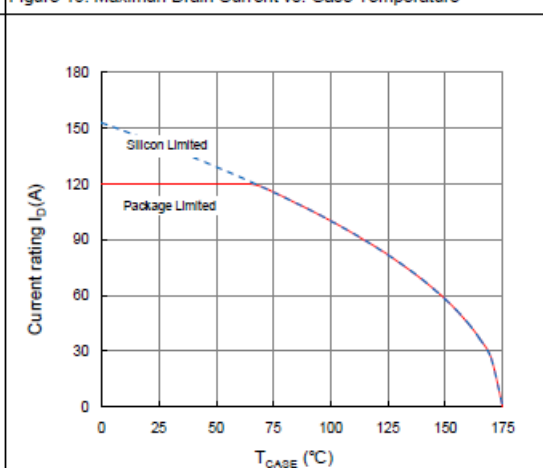
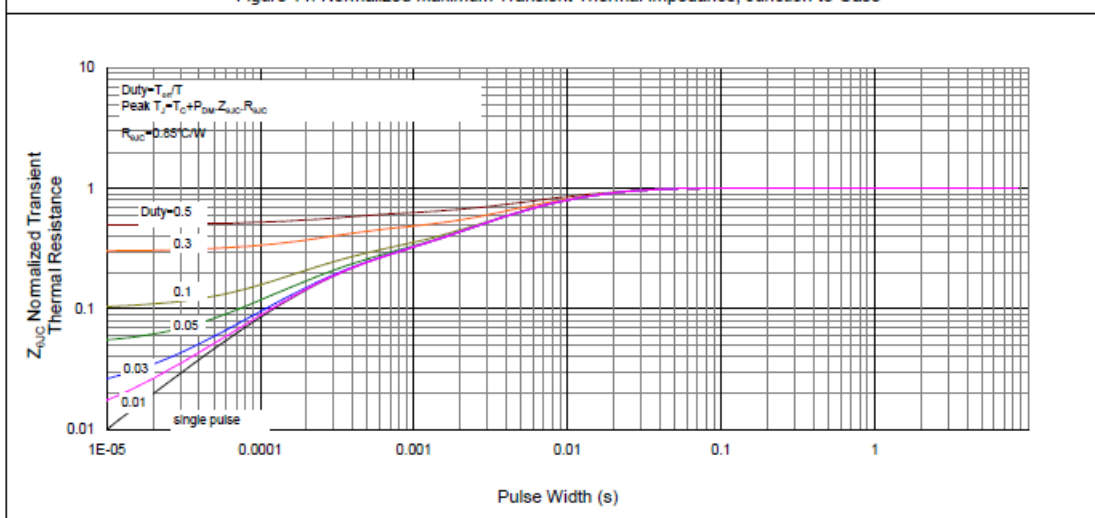


Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case





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SYNC Power Corporation

7F-2, No.3-1, Park Street

NanKang District (NKSP), Taipei, Taiwan 115

Phone: 886-2-2655-8178

Fax: 886-2-2655-8468

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