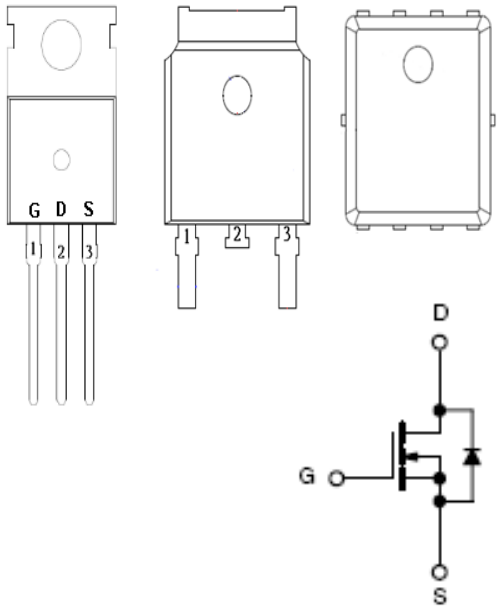
# SPN166T04A
## N-Channel Enhancement Mode MOSFET

### DESCRIPTION
The SPN166T04A is the N-Channel 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.

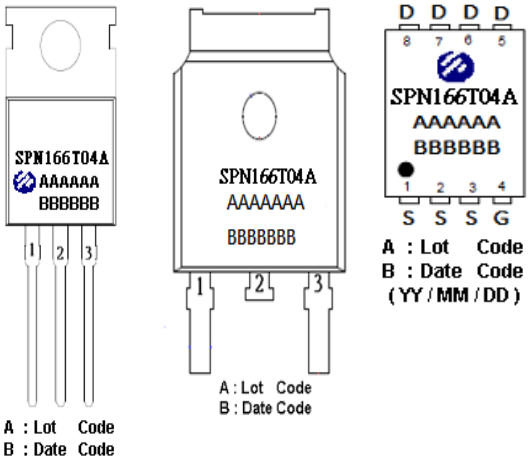
### APPLICATIONS
- DC/DC Converter
- Load Switch
- SMPS Secondary Side Synchronous Rectifier
- Motor Control
- Power Tool

### FEATURES
- 45V/166A, $R_{DS(ON)}$=3.2mΩ@$V_{GS}$=10V
- Super high density cell design for extremely low $R_{DS\ (ON)}$
- Exceptional on-resistance and maximum DC current capability
- TO-220-3L/ TO-252-2L/PPAK5x5-8L package design

### PIN CONFIGURATION
**TO-220-3L TO-252-2L PPAK5x6-8L**




### PART MARKING



# SPN166T04A
## N-Channel Enhancement Mode MOSFET

**PIN DESCRIPTION (TO-220-3L/TO-252-2L)**

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

**PIN DESCRIPTION (PPAK5x6-8L)**

| 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 |
|---|---|---|
| SPN166T04AT220TGB | TO-220-3L | SPN166T04A |
| SPN166T04AT252RGB | TO-252-2L | SPN166T04A |
| SPN166T04ADN8RGB | PPAK5x6-8L | SPN166T04A |

※ SPN166T04AT220TGB : Tube ; Pb – Free ; Halogen – Free

※ SPN166T04AT252RGB : Tape& Reel ; Pb – Free ; Halogen – Free

※ SPN166T04ADN8RGB : Tape& Reel ; Pb – Free ; Halogen – Free

# SPN166T04A
## N-Channel Enhancement Mode MOSFET

**ABSOULTE MAXIMUM RATINGS**

($T_A$=25℃ Unless otherwise noted)

| Parameter | | Symbol | Typical | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 45 | V |
| Gate –Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current (Silicon Limited) (TO-220/TO-252) | Tc=25℃ | $I_D$ | 166 | A |
| | Tc=100℃ | | 118 | |
| Continuous Drain Current (Silicon Limited) (PPAK5x6) | Tc=25℃ | $I_D$ | 140 | A |
| | Tc=100℃ | | 89 | |
| Pulsed Drain Current | | $I_{DM}$ | 350 | A |
| Power Dissipation @ Tc=25℃ | TO-220 | $P_D$ | 104 | W |
| Power Dissipation @ Tc=25℃ | TO-252 | | 93 | |
| Avalanche Energy with Single Pulse ( $T_C$=25℃, L=0.5mH. ) | | $E_{AS}$ | 100 | mJ |
| Operating Junction Temperature | | $T_J$ | -55/150 | ℃ |
| Storage Temperature Range | | $T_{STG}$ | -55/150 | ℃ |
| Thermal Resistance-Junction to Case (TO-220) | | $R_{\theta JC}$ | 1.2 | ℃/W |
| Thermal Resistance-Junction to Case (TO-252) | | $R_{\theta JC}$ | 1.35 | ℃/W |
| Thermal Resistance-Junction to Case (PPAK5x6) | | $R_{\theta JC}$ | 1.5 | ℃/W |

**Note :**

The maximum current rating is package limited at 120A for TO-220-3L
The maximum current rating is package limited at 70A for TO-252-2L
The maximum current rating is package limited at 80A for PPAK5x6-8L

# SPN166T04A
## N-Channel Enhancement Mode MOSFET

**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 | 45 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250uA | 2.0 | 2.5 | 4.0 | |
| Gate Leakage Current | $I_{GSS}$ | $V_{DS}$=0V,$V_{GS}$=±20V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=36V,$V_{GS}$=0V<br>$T_J$ = 25 ℃ | | | 1 | uA |
| | | $V_{DS}$=36V, $V_{GS}$=0V<br>$T_J$ = 100 ℃ | | | 100 | |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$=10V,$I_D$=20A | | 2.5 | 3.2 | mΩ |
| Forward Transconductance | gfs | $V_{DS}$=5V,$I_D$=20A | | 85 | | S |
| Gate Resistance | $R_G$ | $V_{GS}$=0V,$V_{DS}$ open,<br>f=1MHz | | 1.5 | | Ω |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=20A,$V_{GS}$=0V | | 0.9 | 1.2 | V |
| **Dynamic** | | | | | | |
| Total Gate Charge (10V) | $Q_g$ | $V_{DS}$=20V,$V_{GS}$=10V<br>$I_D$=20A | | 54 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 14 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 7 | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=20V,$V_{GS}$=0V<br>f=1MHz | | 3834 | | pF |
| Output Capacitance | $C_{oss}$ | | | 1348 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 70 | | |
| Turn-On Time | td(on) | $V_{DD}$=20V, ID=20A<br>$V_{GEN}$=10V, $R_G$=10Ω | | 14 | | nS |
| | tr | | | 12 | | |
| Turn-Off Time | td(off) | | | 58 | | |
| | tf | | | 15 | | |

**TYPICAL CHARACTERISTICS**

Fig 1. Typical Output Characteristics

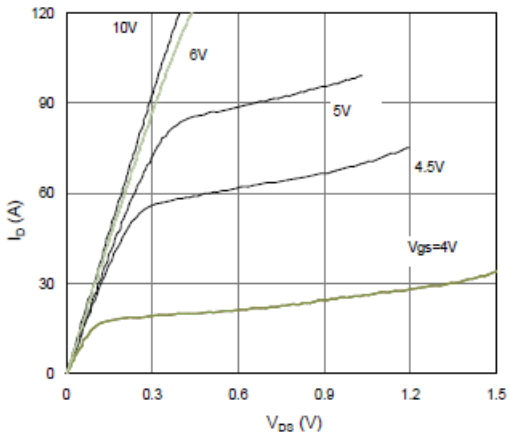



Figure 2. On-Resistance vs. Gate-Source Voltage

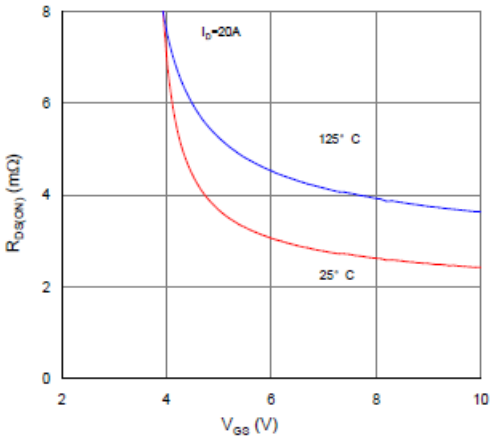



Figure 3. On-Resistance vs. Drain Current and Gate Voltage

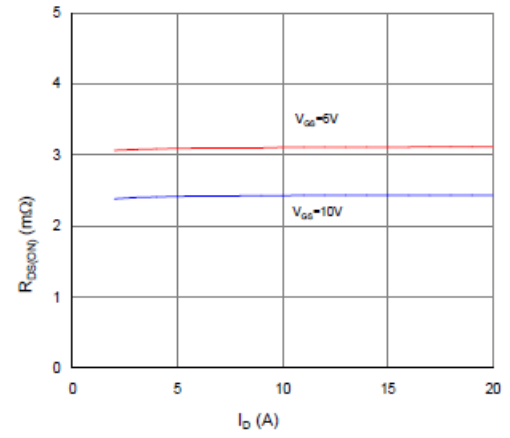



Figure 4. Normalized On-Resistance vs. Junction Temperature

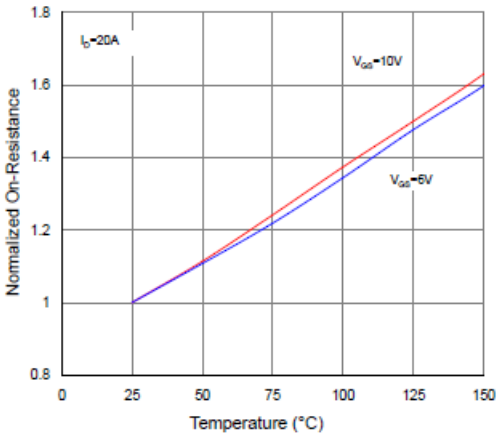



Figure 5. Typical Transfer Characteristics

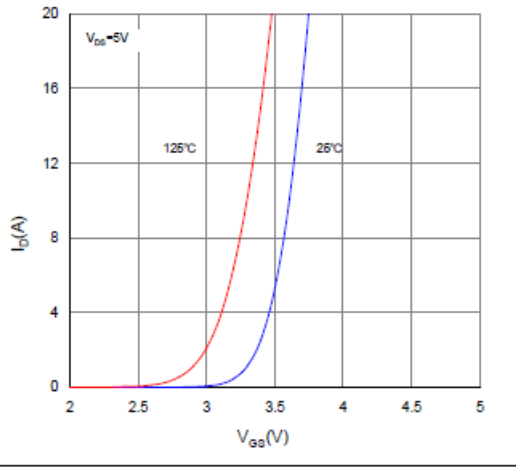
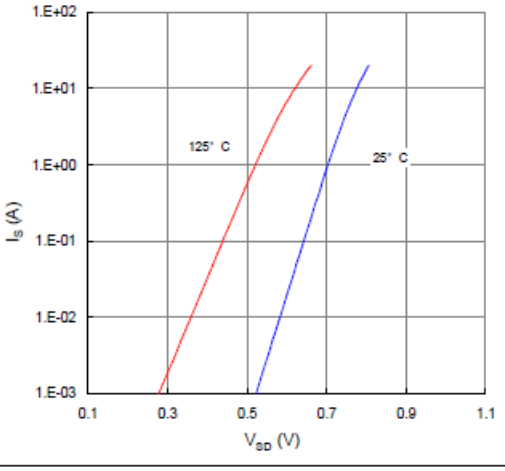



Figure 6. Typical Source-Drain Diode Forward Voltage



**TYPICAL CHARACTERISTICS**

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

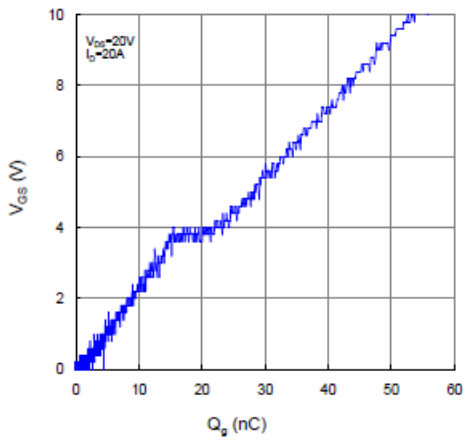



Figure 8. Typical Capacitance vs. Drain-to-Source Voltage

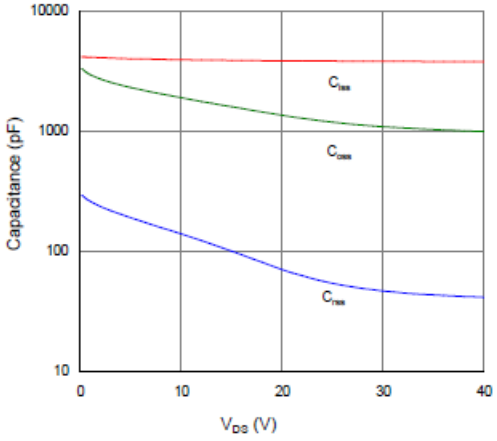



Figure 9. Maximum Safe Operating Area

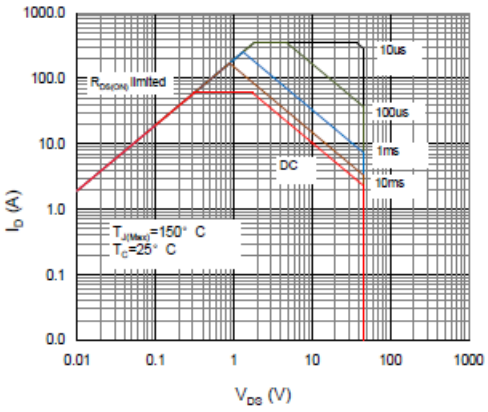



Figure 10. Maximun Drain Current vs. Case Temperature

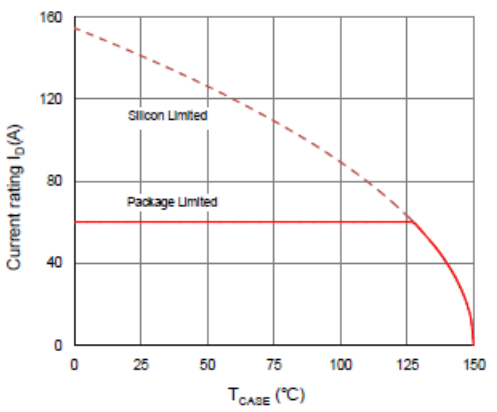
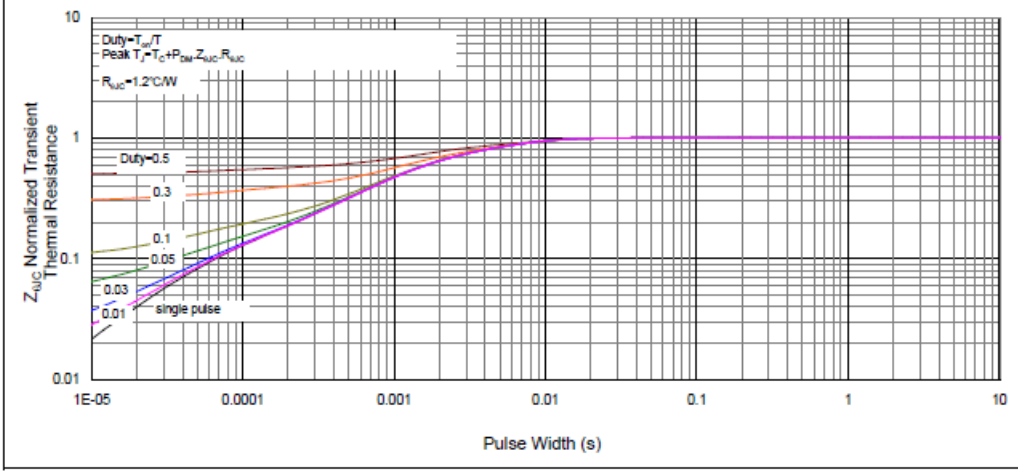



Figure 11. Normalized Maximum Transient Thermal Impedance, Junction-to-Case



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