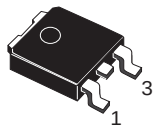
# STD16NF06

## N-Channel 60V - 0.060Ω - 16A - DPAK
## STripFET™ II Power MOSFET

### General features

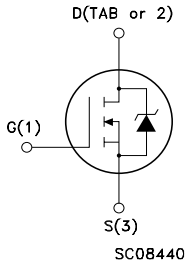
| Type | $V_{DSS}$ | $R_{DS(on)}$ | $I_D$ |
|---|---|---|---|
| STD16NF06 | 60V | <0.070Ω | 16A |

- Typical $R_{DS(on)}$ = 0.060Ω
- Exceptional dv/dt Capability
- 100% Avalanche Tested
- Application Oriented Characterization




DPAK
TO-252

### Internal schematic diagram




### Description

This Power MOSFET is the latest development of STMicroelectronis unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility

### Applications

- Audio Amplifiers
- Power Tools
- Automotive Environment

### Order codes

| Part Number | Marking | Package | Packaging |
|---|---|---|---|
| STD16NF06T4 | D16NF06 | TO-252 | TAPE & REEL |

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{DS}$ | Drain-source Voltage ($V_{GS}$ = 0V) | 60 | V |
| $V_{DGR}$ | Drain-gate Voltage ($R_{GS}$ = 20 kΩ) | 60 | V |
| $V_{GS}$ | Gate-Source Voltage | ± 20 | V |
| $I_D$ | Drain Current (continuous) at $T_C$ = 25°C | 16 | A |
| $I_D$ | Drain Current (continuous) at $T_C$ = 100°C | 11 | A |
| $I_{DM}$ *Note 4* | Drain Current (pulsed) | 64 | A |
| $P_{TOT}$ | Total Dissipation at $T_C$ = 25°C | 40 | W |
| | Derating Factor | 0.27 | W/°C |
| dv/dt | Peak Diode Recovery voltage slope | 10.5 | V/ns |
| EAS | Single Pulse Avalanche Energy | 178 | mJ |
| $T_J$<br>$T_{stg}$ | Operating Junction Temperature<br>Storage Temperature | -55 to 175 | °C |

**Table 2. Thermal data**

| | | | |
|---|---|---|---|
| $R_{thJC}$ | Thermal Resistance Junction-case Max | 3.75 | °C/W |
| $R_{thJA}$ | Thermal Resistance Junction-amb Max | 100 | °C/W |
| $T_l$ | Maximum Lead Temperature For Soldering Purpose | 275 | °C |

# 2 Electrical characteristics

( $T_{CASE}$ = 25 °C unless otherwise specified )

**Table 3. On/off states**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $I_D$ = 250µA $V_{GS}$= 0 | 60 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current ($V_{GS}$ = 0) | $V_{DS}$ = Max Rating<br>$V_{DS}$ = Max Rating $T_C$=125°C | | | 1<br>10 | µA<br>µA |
| $I_{GSS}$ | Gate Body Leakage Current ($V_{DS}$ = 0) | $V_{GS}$ = ±20V | | | ±100 | µA |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = $V_{GS}$ $I_D$ = 250µA | 2 | | | V |
| $R_{DS(on)}$ | Static Drain-Source On Resistance | $V_{GS}$ = 10V $I_D$ = 8A | | 0.060 | 0.070 | Ω |

**Table 4. Dynamic**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $g_{fs}$ *Note 5* | Forward Transconductance | $V_{DS}$ = 25V $I_D$ = 8A | | 6 | | S |
| $C_{iss}$<br>$C_{oss}$<br>$C_{rss}$ | Input Capacitance<br>Output Capacitance<br>Reverse Transfer Capacitance | $V_{DS}$ = 15V, f = 1MHz, $V_{GS}$ = 0 | | 400<br>103<br>41.5 | | pF<br>pF<br>pF |
| $Q_g$<br>$Q_{gs}$<br>$Q_{gd}$ | Total Gate Charge<br>Gate-Source Charge<br>Gate-Drain Charge | $V_{DD}$ =30 $I_D$ = 16A<br>$V_{GS}$ =10V<br>*Figure 14 on page 7* | | 14.1<br>2.8<br>5.4 | | nC<br>nC<br>nC |

**Table 5. Switching times**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$<br>$t_r$ | Turn-on Delay Time<br>Rise Time | $V_{DD}$ = 30V, $I_D$ = 8A,<br>$R_G$ = 4.7Ω, $V_{GS}$ = 10V<br>*Figure 13 on page 7* | | 4<br>15 | | ns<br>ns |
| $t_{d(off)}$<br>$t_f$ | Off voltage Rise Time<br>FallTime | $V_{DD}$ = 30V, $I_D$ = 8A,<br>$R_G$ = 4.7Ω, $V_{GS}$ = 10V<br>*Figure 15 on page 7* | | 16<br>5.5 | | ns<br>ns |

**Table 6. Source drain diode**

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_{SD}$<br>$I_{SDM}$ *Note 4* | Source-drain Current<br>Source-drain Current (pulsed) | | | | 16<br>64 | A<br>A |
| $V_{SD}$ *Note 5* | Forward on Voltage | $I_{SD}$ = 8A $V_{GS}$ = 0 | | | 1.5 | V |
| $t_{rr}$<br>$Q_{rr}$<br>$I_{RRM}$ | Reverse Recovery Time<br>Reverse Recovery Charge<br>Reverse Recovery Current | $I_{SD}$ = 16A, di/dt = 100A/µs,<br>$V_{DD}$ = 20V, $T_J$ =150°C<br>*Figure 15 on page 7* | | 49<br>78<br>3.2 | | ns<br>µC<br>A |

*Note: 1 Value limited by wire bonding*

2 Garanted when external Rg=4.7 Ω and $t_f < t_{fmax}$.

*3 Starting $T_J$ = 25°C, $I_D$ = 19A, $V_{DD}$ = 18V*

*4 Pulse width limited by safe operating area*

*5 Pulsed: pulse duration = 300µs, duty cycle 1.5%*

## 2.1 Electrical chraracteristics (curves)

**Figure 1. Safe Operating Area**

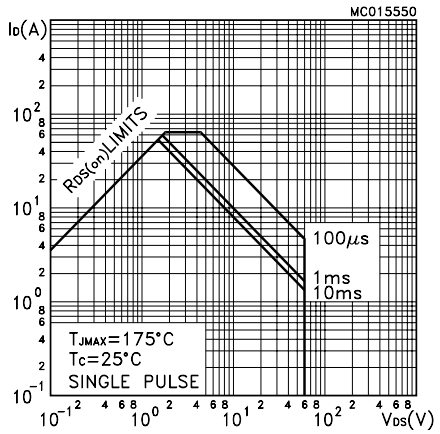



**Figure 2. Thermal Impedance**

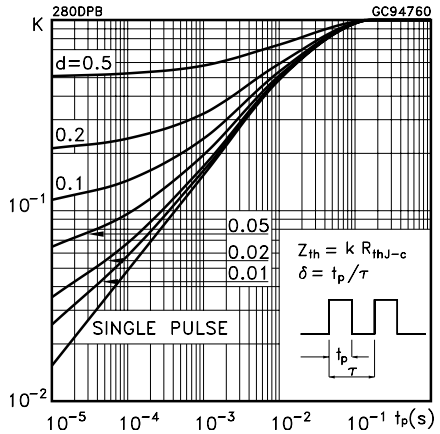



**Figure 3. Output Characteristics**

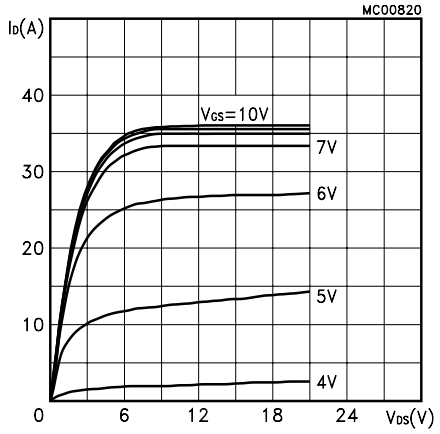



**Figure 4. Transfer Characteristics**

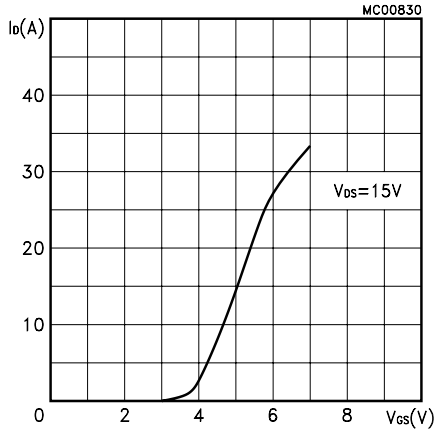



**Figure 5. Transconductance**

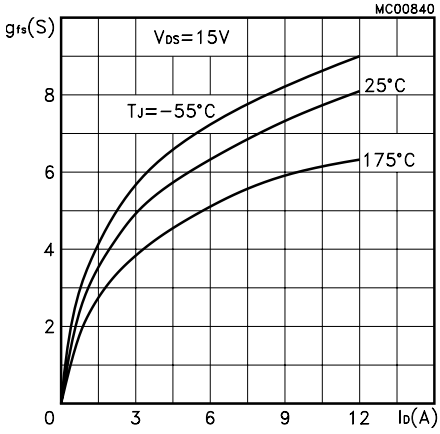



**Figure 6. Static Drain-Source on Resistance**

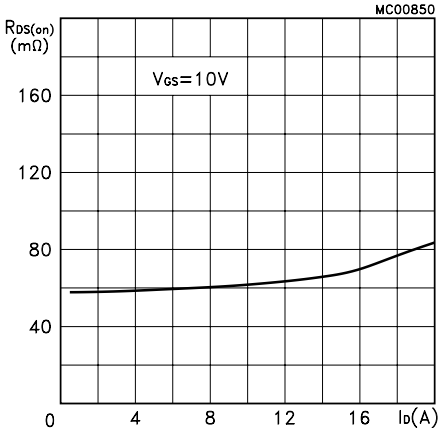


**Figure 7. Gate Charge vs Gate-Source Voltage**

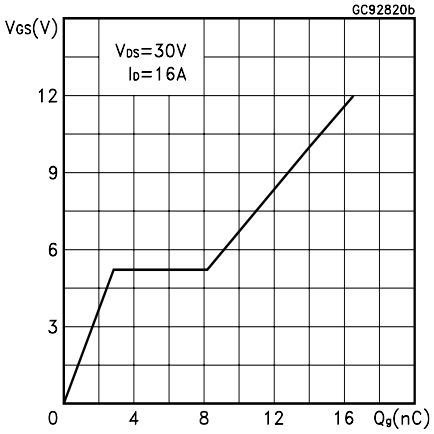



**Figure 8. Capacitance Variations**

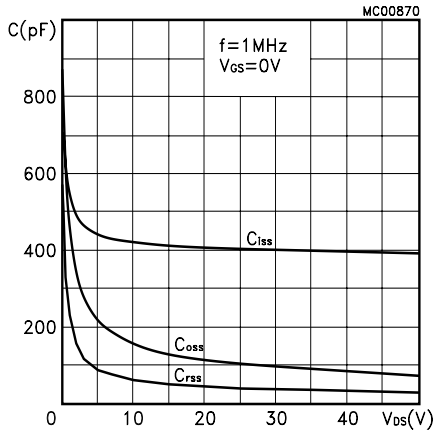



**Figure 9. Normalized Gate Threshold Voltage vs Temperature**

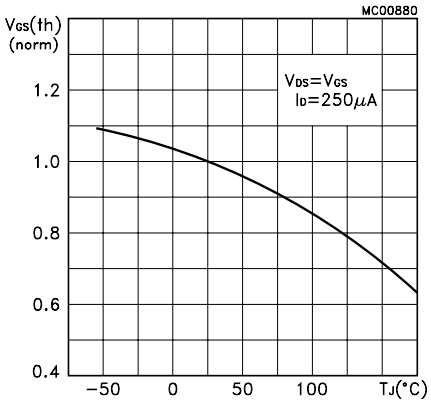



**Figure 10. Normalized on Resistance vs Temperature**

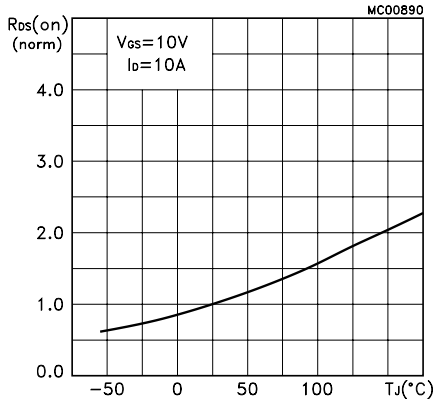



**Figure 11. Source-drain Diode Forward Characteristics**

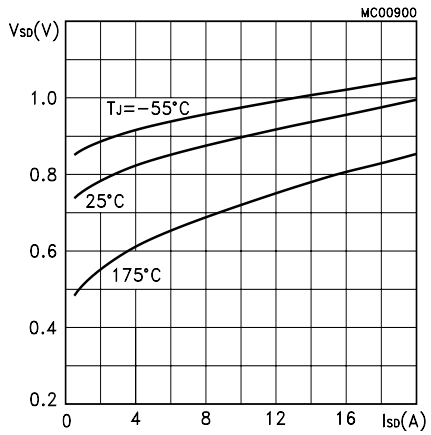
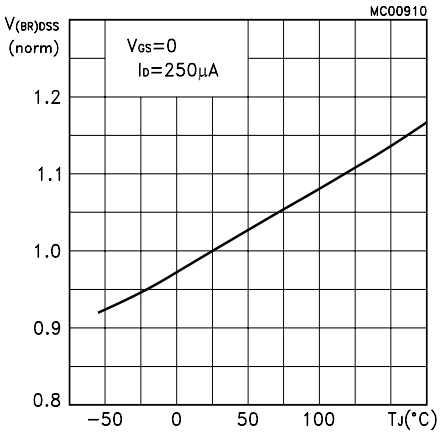



**Figure 12. Normalized Breakdown Voltage vs Temperature**



# 3 Test circuits

**Figure 13. Switching Times Test Circuit For Resistive Load**

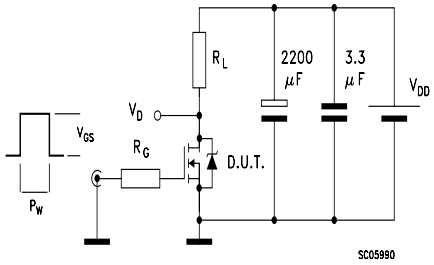



**Figure 14. Gate Charge Test Circuit**

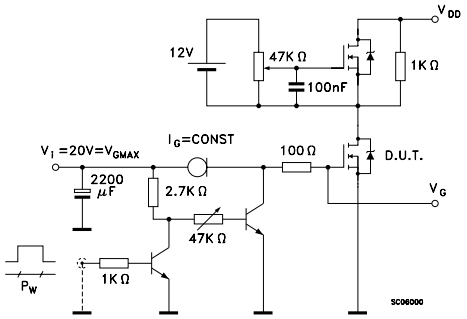



**Figure 15. Test Circuit For Inductive Load Switching and Diode Recovery Times**

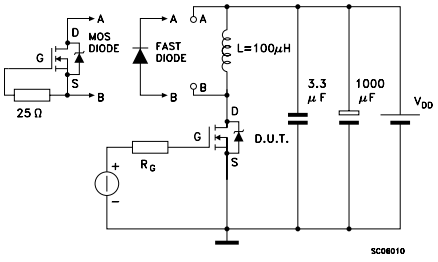



**Figure 17. Unclamped Inductive Load Test Circuit**

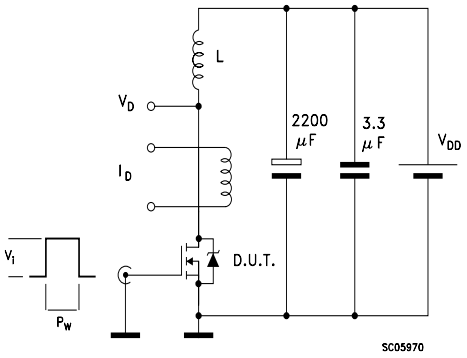
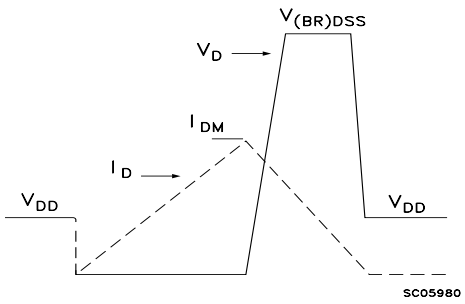



**Figure 16. Unclamped Inductive Waveform**

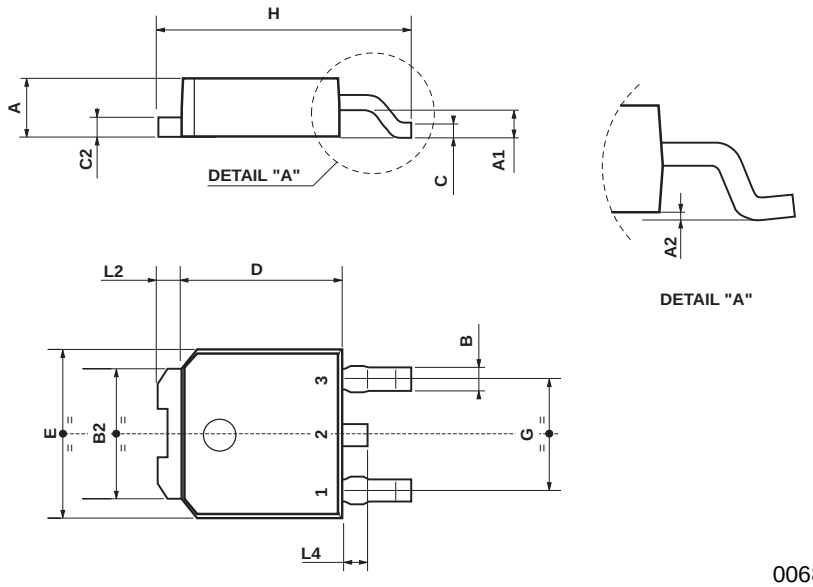


# 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

## TO-252 (DPAK) MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 2.2 | | 2.4 | 0.086 | | 0.094 |
| A1 | 0.9 | | 1.1 | 0.035 | | 0.043 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.64 | | 0.9 | 0.025 | | 0.035 |
| B2 | 5.2 | | 5.4 | 0.204 | | 0.212 |
| C | 0.45 | | 0.6 | 0.017 | | 0.023 |
| C2 | 0.48 | | 0.6 | 0.019 | | 0.023 |
| D | 6 | | 6.2 | 0.236 | | 0.244 |
| E | 6.4 | | 6.6 | 0.252 | | 0.260 |
| G | 4.4 | | 4.6 | 0.173 | | 0.181 |
| H | 9.35 | | 10.1 | 0.368 | | 0.397 |
| L2 | | 0.8 | | | 0.031 | |
| L4 | 0.6 | | 1 | 0.023 | | 0.039 |



# 5 Revision History

| Date | Revision | Description of changes |
|---|---|---|
| 10-Jan-2006 | 1 | First release |

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