



## STD16NF06

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

### General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STD16NF06	60V	<0.070Ω	16A

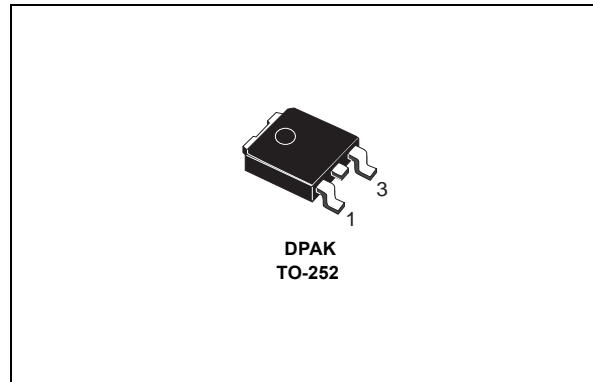
- Typical R<sub>DS(on)</sub> = 0.060Ω
- Exceptional dv/dt Capability
- 100% Avalanche Tested
- Application Oriented Characterization

### Description

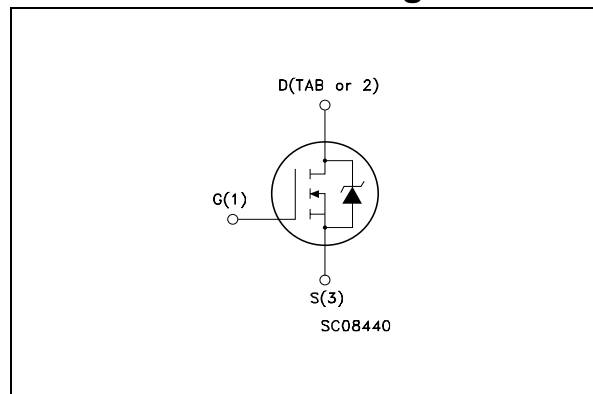
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

### Applications

- Audio Amplifiers
- Power Tools
- Automotive Environment



### Internal schematic diagram



### 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 ( $R_{GS} = 20\text{ k}\Omega$ )	60	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D$	Drain Current (continuous) at $T_C = 25^\circ\text{C}$	16	A
$I_D$	Drain Current (continuous) at $T_C = 100^\circ\text{C}$	11	A
$I_{DM}$ <i>Note 4</i>	Drain Current (pulsed)	64	A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	40	W
	Derating Factor	0.27	W/ $^\circ\text{C}$
dv/dt	Peak Diode Recovery voltage slope	10.5	V/ns
EAS	Single Pulse Avalanche Energy	178	mJ
$T_J$ $T_{stg}$	Operating Junction Temperature Storage Temperature	-55 to 175	$^\circ\text{C}$

**Table 2. Thermal data**

$R_{thJC}$	Thermal Resistance Junction-case Max	3.75	$^\circ\text{C}/\text{W}$
$R_{thJA}$	Thermal Resistance Junction-amb Max	100	$^\circ\text{C}/\text{W}$
$T_I$	Maximum Lead Temperature For Soldering Purpose	275	$^\circ\text{C}$

## 2 Electrical characteristics

( T<sub>CASE</sub> = 25 °C unless otherwise specified )

**Table 3. On/off states**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	I <sub>D</sub> = 250μA V <sub>GS</sub> = 0	60			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating T <sub>C</sub> = 125°C			1 10	μA μA
I <sub>GSS</sub>	Gate Body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±20V			±100	μA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250μA	2			V
R <sub>DS(on)</sub>	Static Drain-Source On Resistance	V <sub>GS</sub> = 10V I <sub>D</sub> = 8A		0.060	0.070	Ω

**Table 4. Dynamic**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> <i>Note 5</i>	Forward Transconductance	V <sub>DS</sub> = 25V I <sub>D</sub> = 8A		6		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>DS</sub> = 15V, f = 1MHz, V <sub>GS</sub> = 0		400 103 41.5		pF pF pF
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V <sub>DD</sub> = 30 I <sub>D</sub> = 16A V <sub>GS</sub> = 10V <i>Figure 14 on page 7</i>		14.1 2.8 5.4		nC nC nC

**Table 5. Switching times**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub>	Turn-on Delay Time Rise Time	V <sub>DD</sub> = 30V, I <sub>D</sub> = 8A, R <sub>G</sub> = 4.7Ω, V <sub>GS</sub> = 10V <i>Figure 13 on page 7</i>		4 15		ns ns
t <sub>d(off)</sub> t <sub>f</sub>	Off voltage Rise Time FallTime	V <sub>DD</sub> = 30V, I <sub>D</sub> = 8A, R <sub>G</sub> = 4.7Ω, V <sub>GS</sub> = 10V <i>Figure 15 on page 7</i>		16 5.5		ns ns

**Table 6. Source drain diode**

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

Note: 1 Value limited by wire bonding

2 Garanted when external  $R_g=4.7 \Omega$  and  $t_f < t_{fmax}$ .

3 Starting  $T_J = 25^\circ C, I_D = 19A, V_{DD} = 18V$

4 Pulse width limited by safe operating area

5 Pulsed: pulse duration =  $300\mu s$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 1. Safe Operating Area

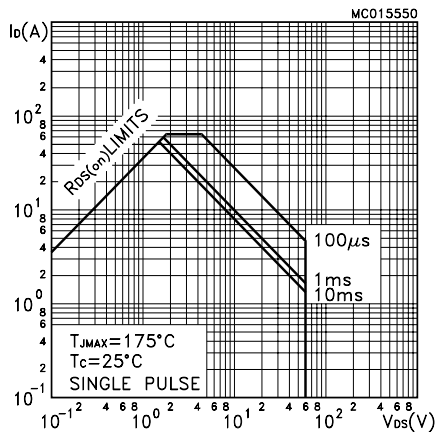


Figure 2. Thermal Impedance

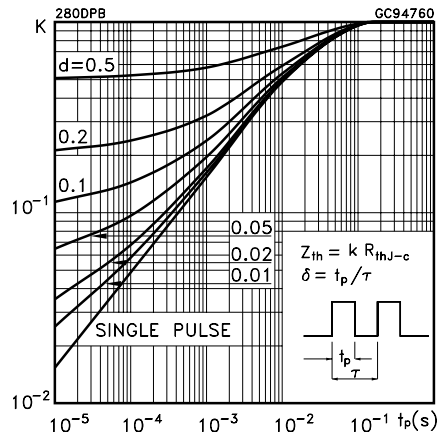


Figure 3. Output Characteristics

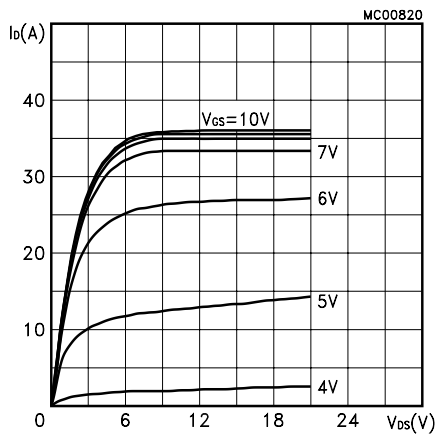


Figure 4. Transfer Characteristics

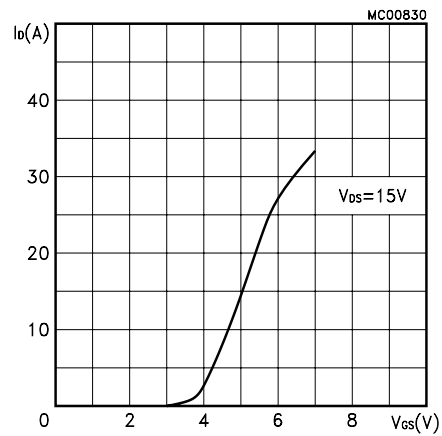


Figure 5. Transconductance

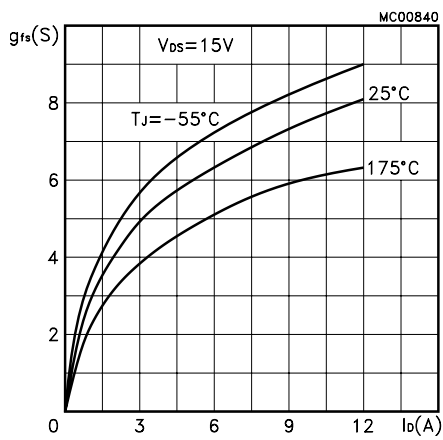


Figure 6. Static Drain-Source on Resistance

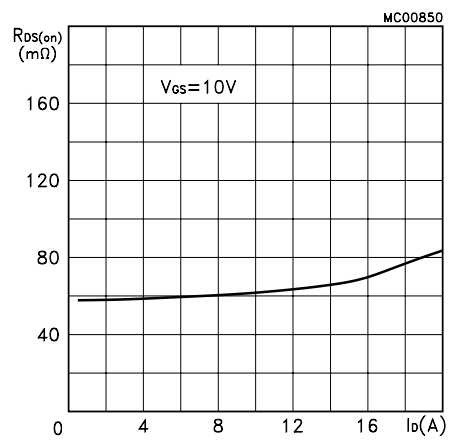


Figure 7. Gate Charge vs Gate-Source Voltage Figure 8. Capacitance Variations

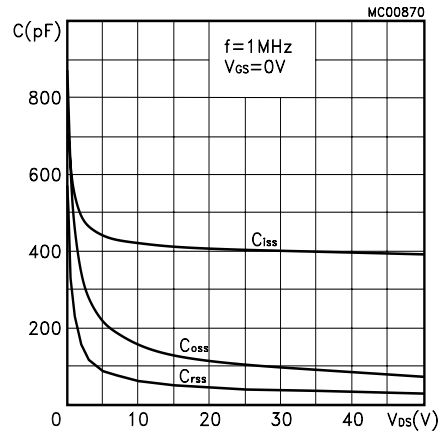
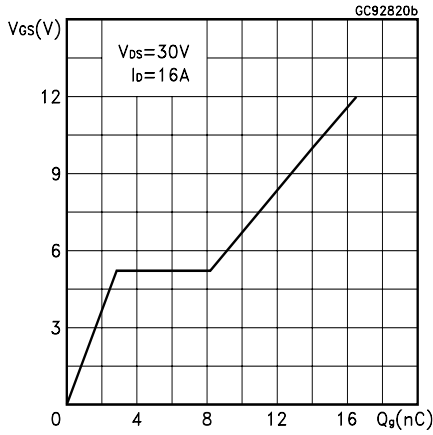


Figure 9. Normalized Gate Threshold Voltage vs Temperature Figure 10. Normalized on Resistance vs Temperature

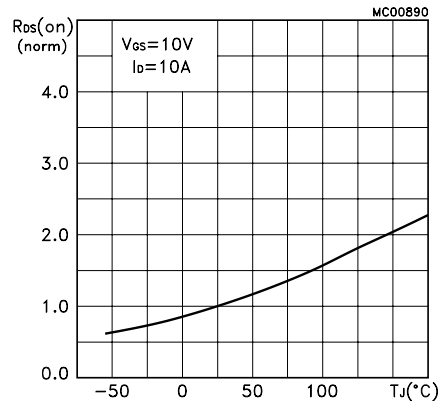
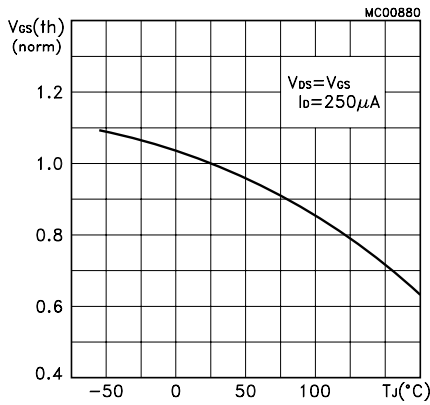
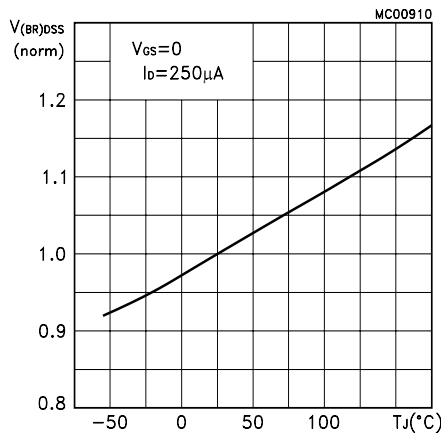
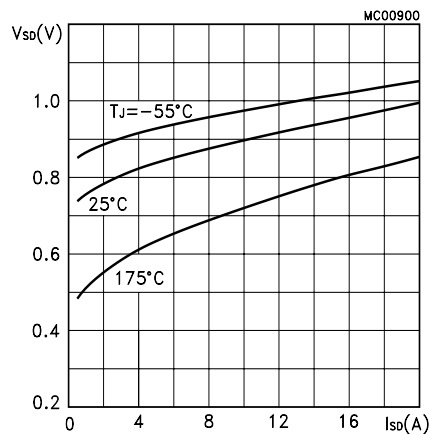


Figure 11. Source-drain Diode Forward Characteristics

Figure 12. Normalized Breakdown Voltage vs Temperature



### 3 Test circuits

Figure 13. Switching Times Test Circuit For Resistive Load

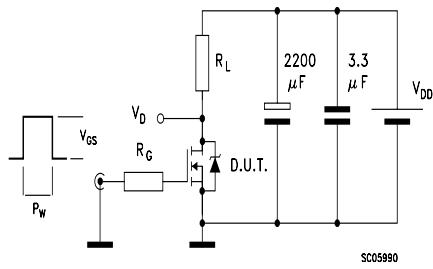


Figure 14. Gate Charge Test Circuit

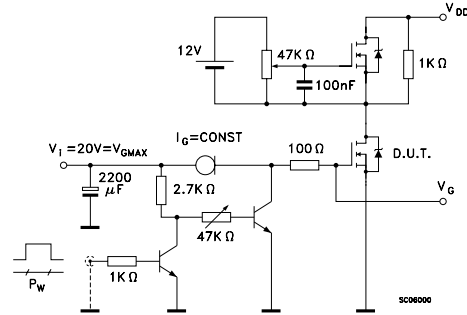


Figure 15. Test Circuit For Inductive Load Switching and Diode Recovery Times

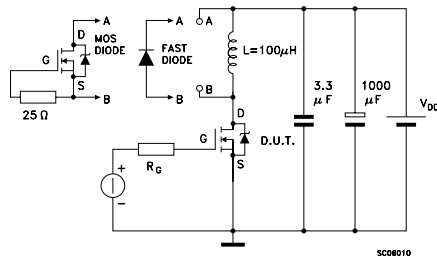


Figure 17. Unclamped Inductive Load Test Circuit

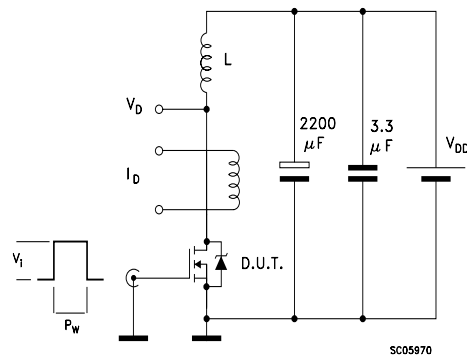
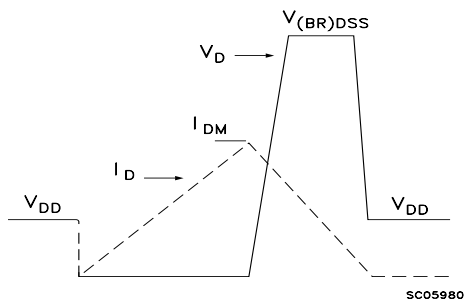


Figure 16. Unclamped Inductive Waveform



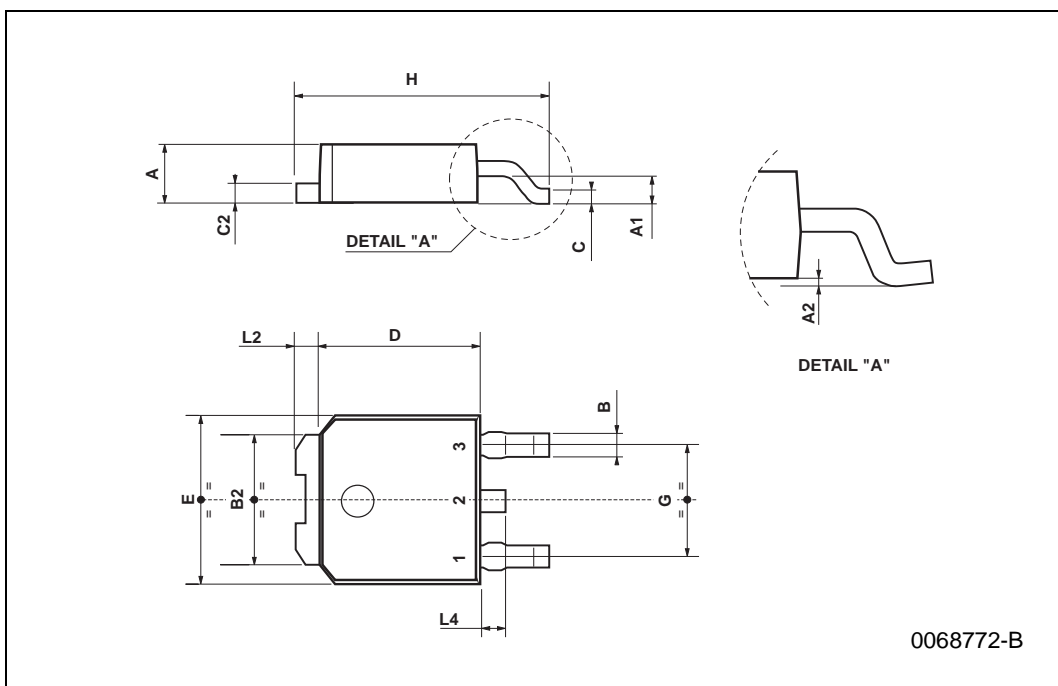
## 4 Package mechanical data

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](http://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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