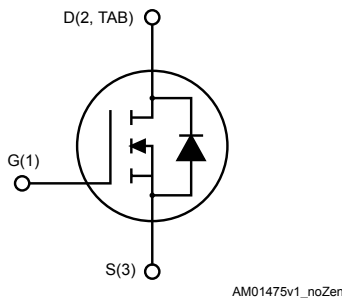
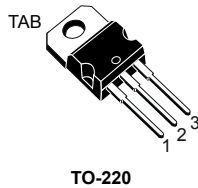


## N-channel 250 V, 0.195 $\Omega$ typ., 14 A STripFET™ II Power MOSFET in TO-220 package



### Product status link

[STP16NF25](#)

### Product summary

<b>Order code</b>	STP16NF25
<b>Marking</b>	16NF25
<b>Package</b>	TO-220
<b>Packing</b>	Tube

### Features

Order code	$V_{DS}$	$R_{DS(on)}$ max.	$I_D$	Package
STP16NF25	250 V	0.235 $\Omega$	14 A	TO-220

- Exceptional dv/dt capability
- 100% avalanche tested
- Low gate charge

### Applications

- Switching applications

### Description

This Power MOSFET series has been developed using STMicroelectronics' unique STripFET™ process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	250	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	14	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	8.8	A
$I_{DM}^{(1)}$	Drain current (pulsed)	56	A
$P_{TOT}$	Total power dissipation at $T_C = 25\text{ }^\circ\text{C}$	85	W
$dv/dt^{(2)}$	Peak diode recovery voltage slope	15	V/ns
$T_j$	Operating junction temperature range	-55 to 150	$^\circ\text{C}$
$T_{stg}$	Storage temperature range		

1. Pulse width limited by safe operating area.
2.  $I_{SD} \leq 13\text{ A}$ ,  $di/dt \leq 300\text{ A}/\mu\text{s}$ ,  $V_{DD} = 80\% V_{(BR)DSS}$ ,  $T_j \leq T_{JMAX}$ .

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	1.47	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient	62.5	

**Table 3. Avalanche characteristics**

Symbol	Parameter	Value	Unit
$I_{AR}^{(1)}$	Avalanche current, repetitive or not-repetitive	13	A
$E_{AS}^{(2)}$	Single pulse avalanche energy	100	mJ

1. Pulse width limited by  $T_{jmax}$ .
2. Starting  $T_j = 25\text{ }^\circ\text{C}$ ,  $I_D = I_{AR}$ ,  $V_{DD} = 50\text{ V}$ .

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	250			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0\text{ V}, V_{DS} = 250\text{ V}$			1	$\mu\text{A}$
		$V_{GS} = 0\text{ V}, V_{DS} = 250\text{ V}, T_C = 125\text{ °C}^{(1)}$			10	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10\text{ V}, I_D = 6.5\text{ A}$		0.195	0.235	$\Omega$

1. Defined by design, not subject to production test.

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$		680		pF
$C_{oss}$	Output capacitance			125		
$C_{riss}$	Reverse transfer capacitance			20		
$C_{oss\text{ eq.}}^{(1)}$	Equivalent output capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 0\text{ V to } 200\text{ V}$	-	48	-	pF
$R_G$	Gate input resistance	$f = 1\text{ MHz}, I_D = 0\text{ A}$	-	2.1	-	$\Omega$
$Q_g$	Total gate charge	$V_{DD} = 200\text{ V}, I_D = 13\text{ A}, V_{GS} = 0\text{ to } 10\text{ V}$ (see Figure 14. Test circuit for gate charge behavior)		18		nC
$Q_{gs}$	Gate-source charge			3		
$Q_{gd}$	Gate-drain charge			9		

1.  $C_{oss\text{ eq.}}$  is defined as a constant equivalent capacitance giving the same charging time as  $C_{oss}$  when  $V_{DS}$  increases from 0 to 80%  $V_{DSS}$ .

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 125\text{ V}, I_D = 6.5\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ (see Figure 13. Test circuit for resistive load switching times and Figure 18. Switching time waveform)		9		ns
$t_r$	Rise time			17		
$t_{d(off)}$	Turn-off delay time			35		
$t_f$	Fall time			17		

**Table 7. Source-drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current		-		14	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		56	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 13\text{ A}$ , $V_{GS} = 0\text{ V}$	-		1.6	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 13\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	-	133		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 60\text{ V}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	651		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current		-	10		A
$t_{rr}$	Reverse recovery time	$I_{SD} = 13\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$	-	157		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 60\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$ (see Figure 15. Test circuit for inductive load switching and diode recovery times)	-	895		nC
$I_{RRM}$	Reverse recovery current		-	11		A

1. Pulse width is limited by safe operating area.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%.

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

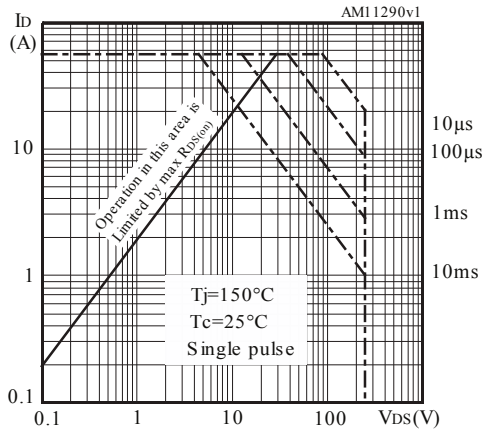


Figure 2. Thermal impedance

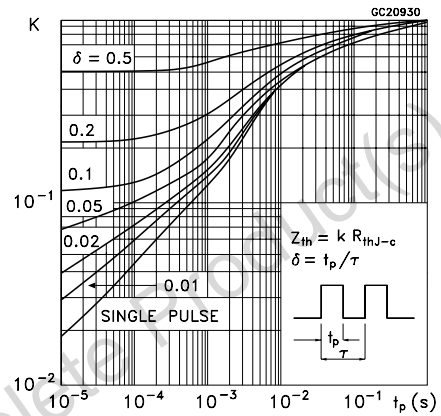


Figure 3. Output characteristics

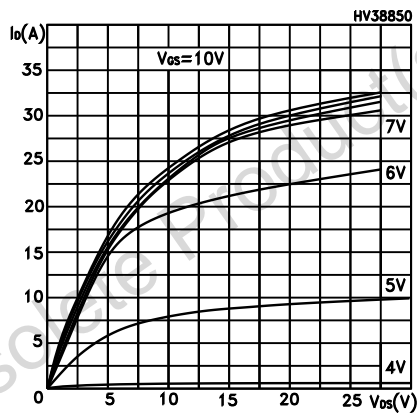


Figure 4. Transfer characteristics

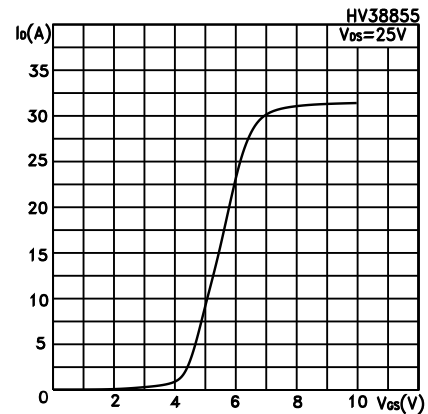


Figure 5. Normalized  $V_{(BR)DSS}$  vs temperature

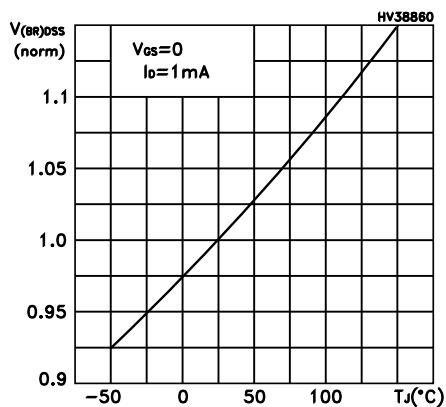
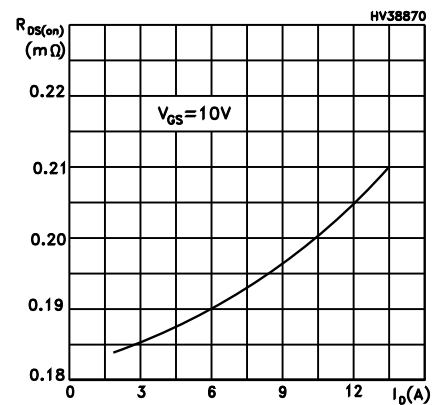
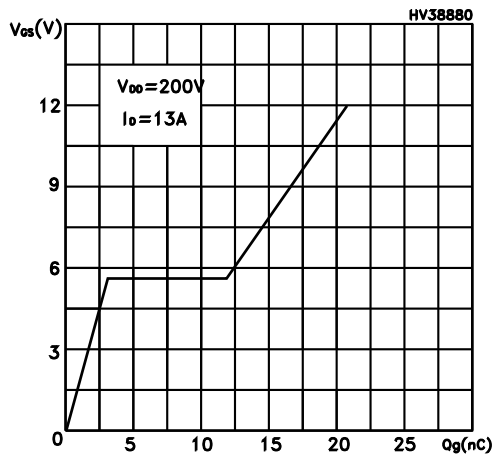
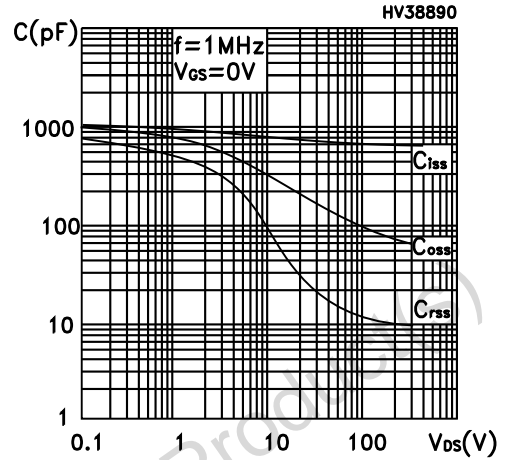
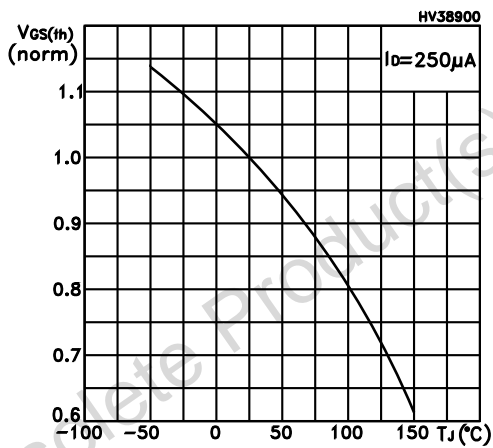
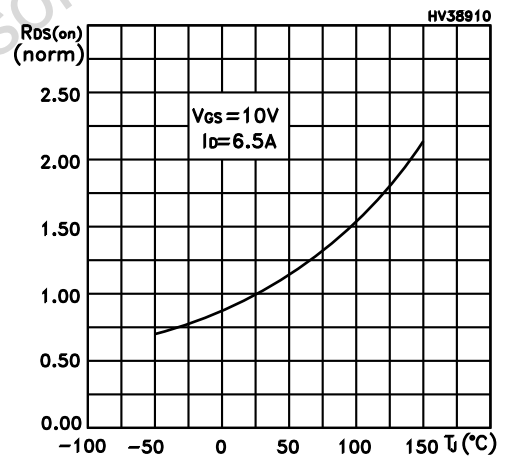
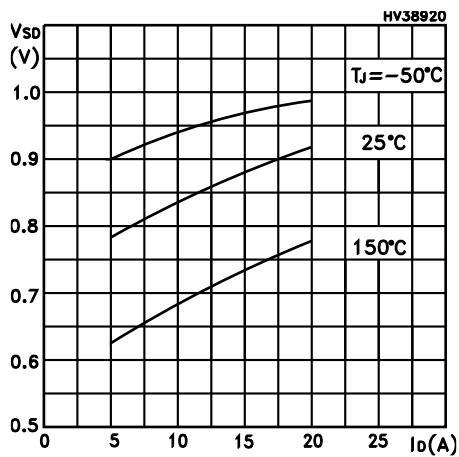
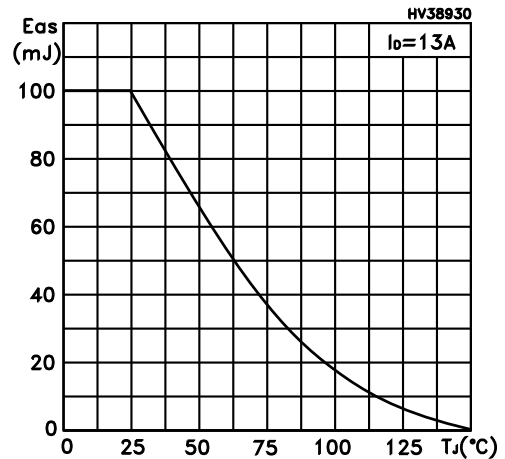
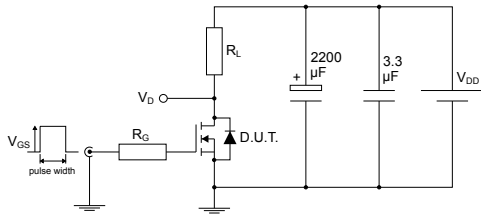


Figure 6. Static drain-source on resistance

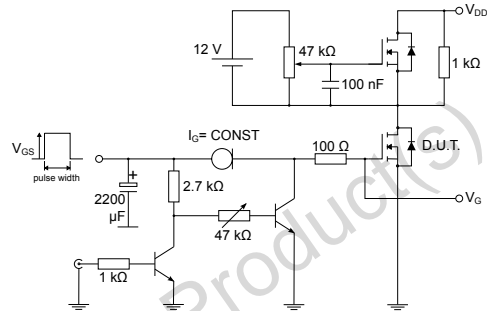


**Figure 7. Gate charge vs gate-source voltage**

**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. Maximum avalanche energy vs temperature**


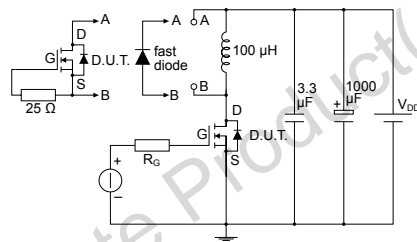
### 3 Test circuits

**Figure 13. Test circuit for resistive load switching times**


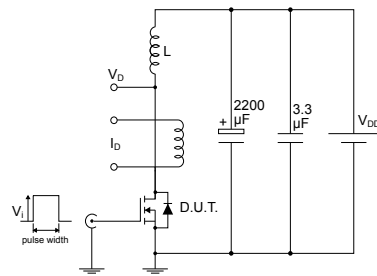
AM01468v1

**Figure 14. Test circuit for gate charge behavior**


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**Figure 15. Test circuit for inductive load switching and diode recovery times**


AM01470v1

**Figure 16. Unclamped inductive load test circuit**


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**Figure 17. Unclamped inductive waveform**


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**Figure 18. Switching time waveform**


AM01473v1

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## 4 Package information

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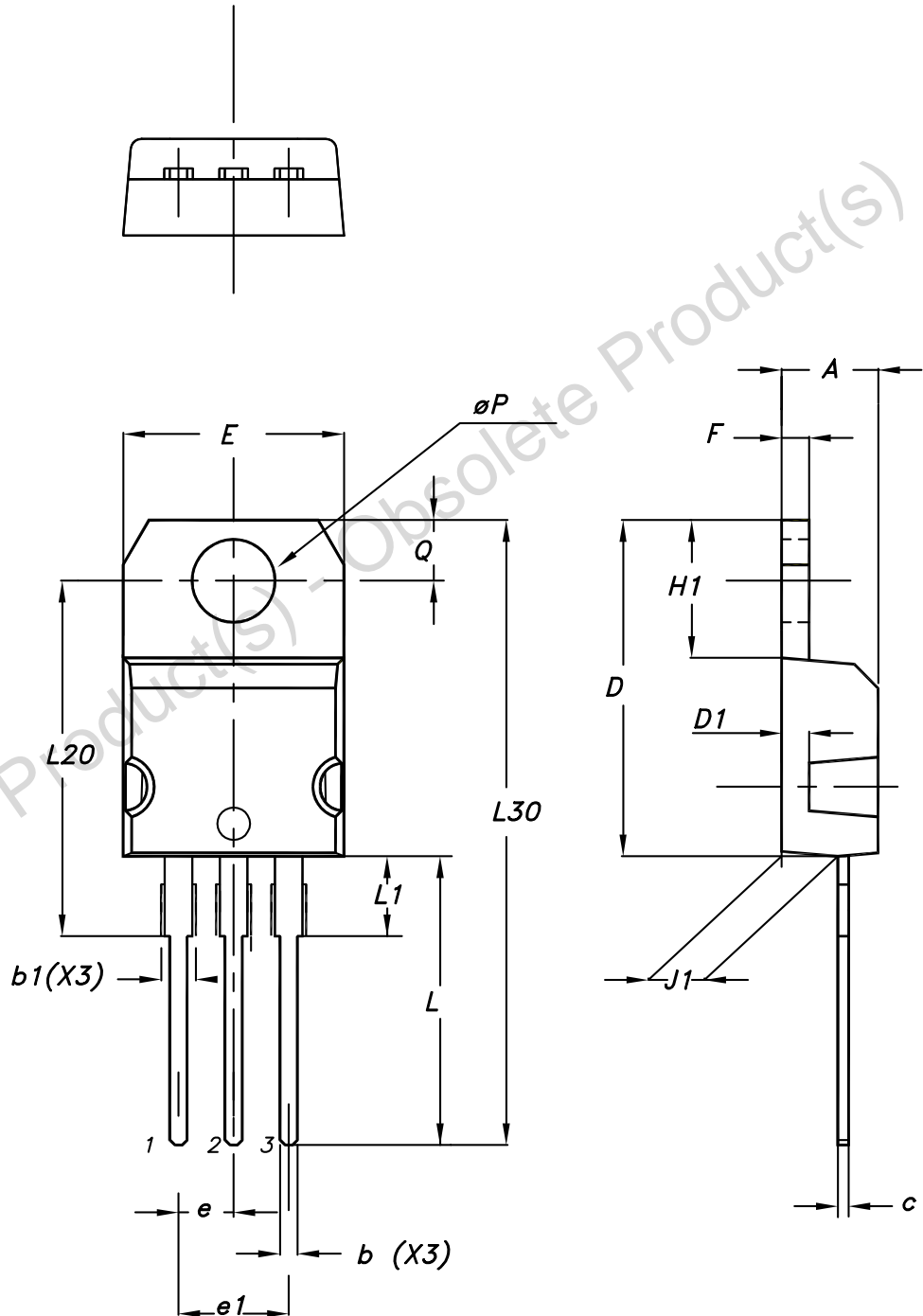
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#### 4.1 TO-220 type A package information

Figure 19. TO-220 type A package outline



0015988\_typeA\_Rev\_22

**Table 8. TO-220 type A package mechanical data**

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		10.40
e	2.40		2.70
e1	4.95		5.15
F	1.23		1.32
H1	6.20		6.60
J1	2.40		2.72
L	13.00		14.00
L1	3.50		3.93
L20		16.40	
L30		28.90	
øP	3.75		3.85
Q	2.65		2.95

## Revision history

**Table 9. Document revision history**

Date	Version	Changes
21-Feb-2019	1	First release. Part number previously included in datasheet DocID14007.

Obsolete Product(s) - Obsolete Product(s)

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