

Automotive-grade N-channel 60 V, 4.4 mΩ typ., 80 A STripFET™ VI DeepGATE™ Power MOSFET in a TO-220 package

Datasheet - production data

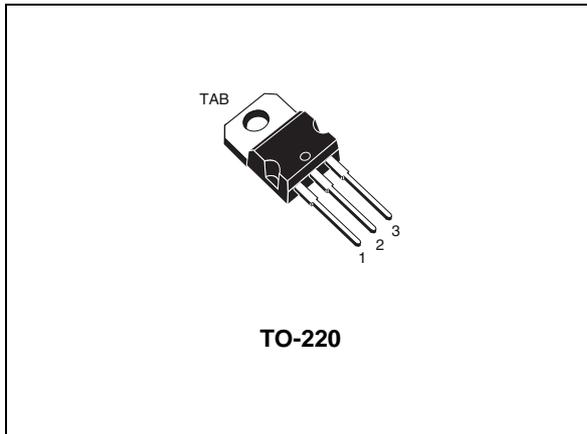
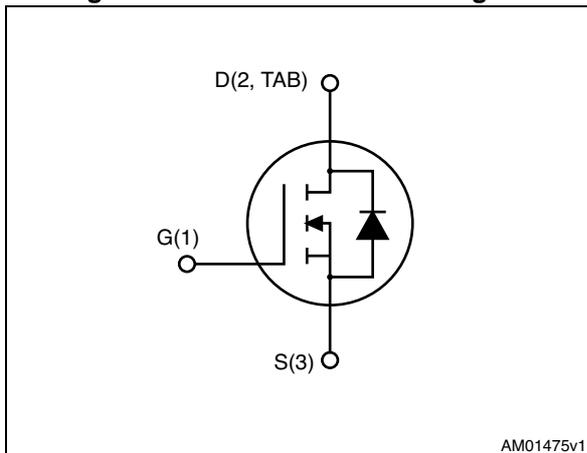


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D
STP80N6F6	60 V	5 mΩ	80 A ⁽¹⁾

1. Current limited by package

- Designed for automotive applications and AEC-Q101 qualified
- Low gate charge
- Very low on-resistance
- High avalanche ruggedness

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Table 1. Device summary

Order code	Marking	Packages	Packaging
STP80N6F6	80N6F6	TO-220	Tube

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	80	A
$I_{DM}^{(1)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	120	W
	Derating factor	0.8	W/°C
T_{stg}	Storage temperature	- 55 to 175	°C
T_j	Operating junction temperature		

1. Current limited by package

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.25	°C/W
R_{thj-a}	Thermal resistance junction-ambient max	62.5	°C/W

2 Electrical characteristics

(T_{CASE} = 25 °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)	I _D = 250 μA	60			V
I _{DSS}	Zero gate voltage Drain current (V _{GS} = 0)	V _{DS} = 60 V			1	μA
		V _{DS} = 60 V, T _C =125 °C			100	μA
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	V _{GS} = ± 20 V			± 100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	3		4.5	V
R _{DS(on)}	Static drain-source on-resistance	V _{GS} = 10 V, I _D = 40 A		4.4	5	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0	-	8325	-	pF
C _{oss}	Output capacitance		-	500	-	pF
C _{rss}	Reverse transfer capacitance		-	400	-	pF
Q _g	Total gate charge	V _{DD} = 30 V, I _D = 80 A, V _{GS} = 10 V	-	147	-	nC
Q _{gs}	Gate-source charge		-	44	-	nC
Q _{gd}	Gate-drain charge		-	46	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 30 V, I _D = 40 A R _G = 4.7 Ω V _{GS} = 10 V	-	40	-	ns
t _r	Rise time			71		ns
t _{d(off)}	Turn-off-delay time		-	132	-	ns
t _f	Fall time		-	40	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current		-		80	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		320	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 80 \text{ A}$, $V_{GS} = 0$	-		1.3	V
t_{rr}	Reverse recovery time	$I_{SD} = 80 \text{ A}$, $V_{DD} = 48 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s}$, $T_j = 150 \text{ }^\circ\text{C}$	-	46		ns
Q_{rr}	Reverse recovery charge		-	65		nC
I_{RRM}	Reverse recovery current		-	2.8		A

1. Current limited by package.
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

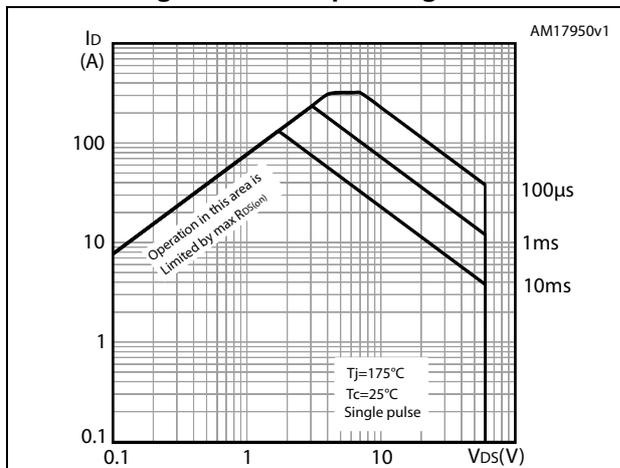


Figure 3. Thermal impedance

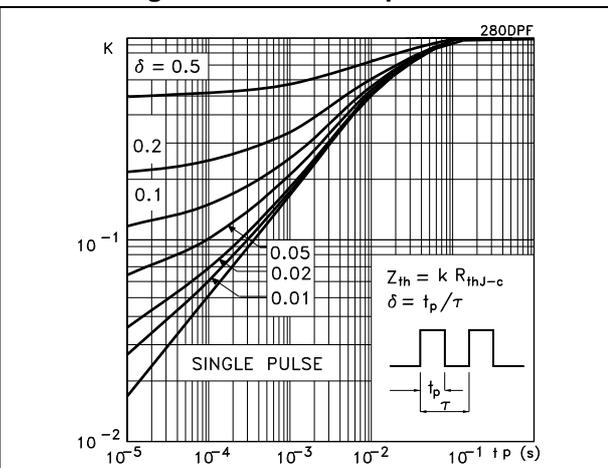


Figure 4. Output characteristics

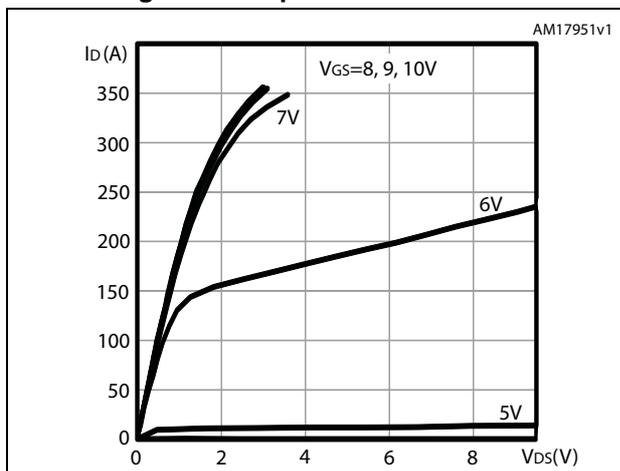


Figure 5. Transfer characteristics

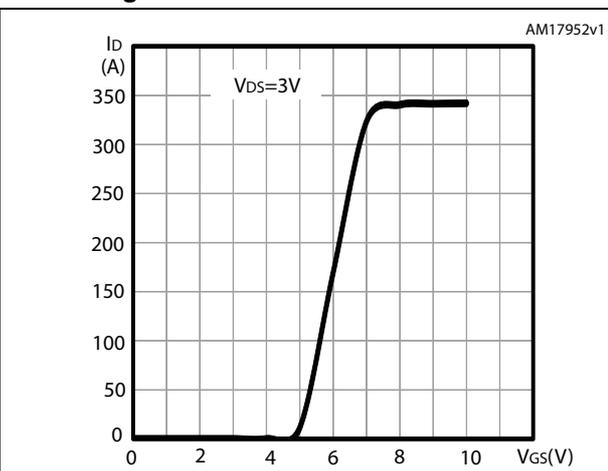


Figure 6. Gate charge vs gate-source voltage

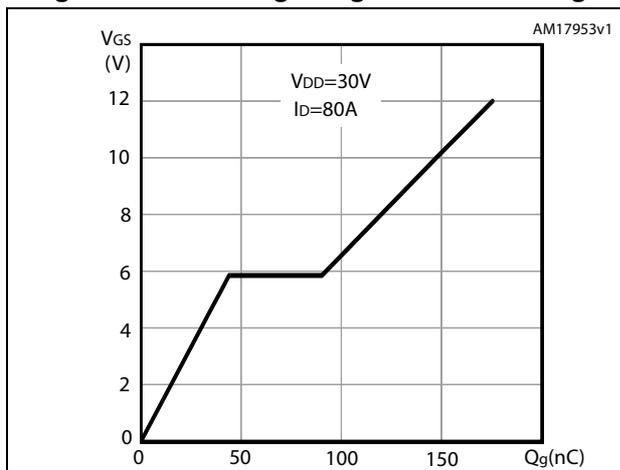


Figure 7. Static drain-source on-resistance

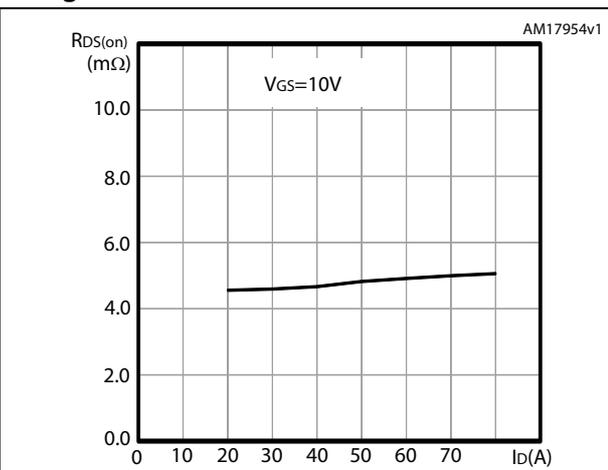


Figure 8. Capacitance variations

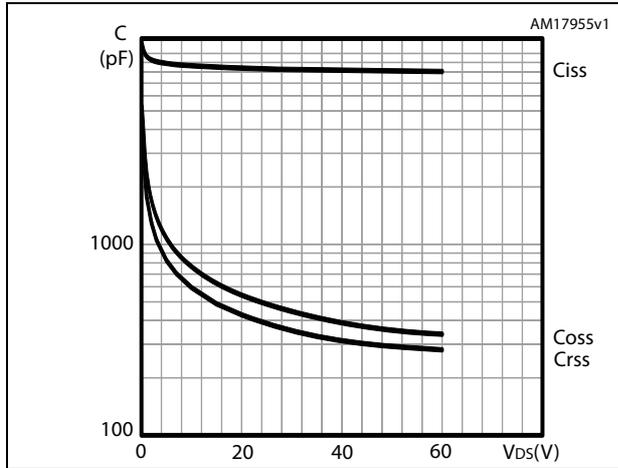


Figure 9. Normalized gate threshold voltage vs temperature

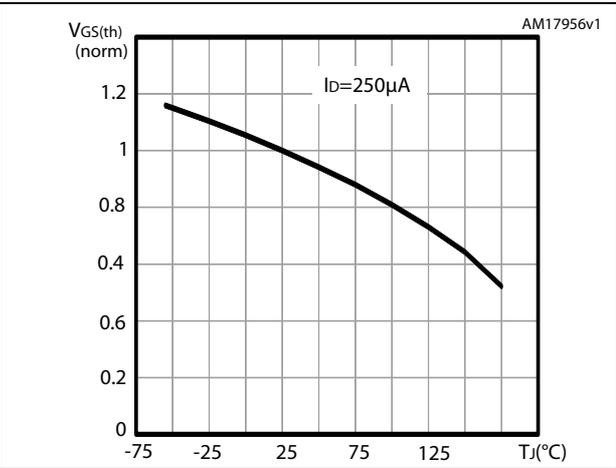


Figure 10. Normalized on-resistance vs temperature

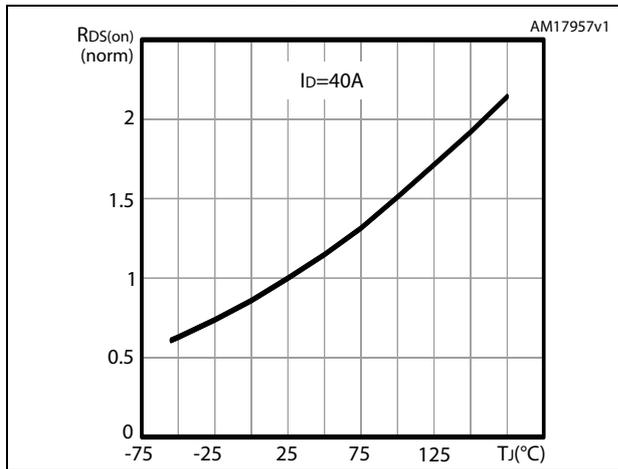


Figure 11. Normalized VDS vs temperature

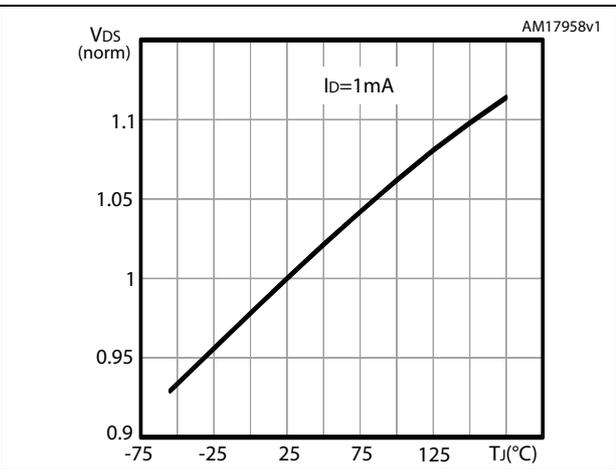
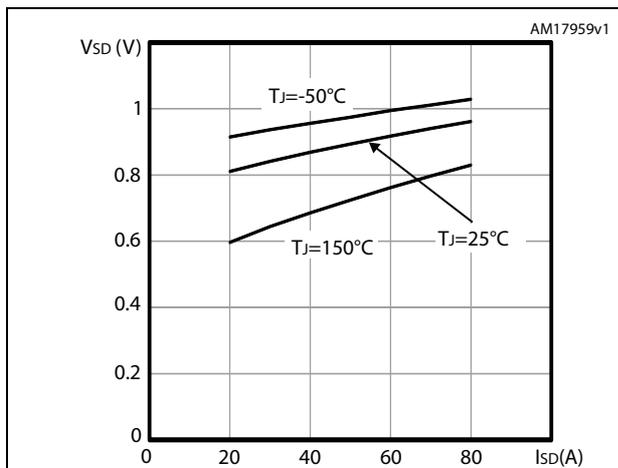


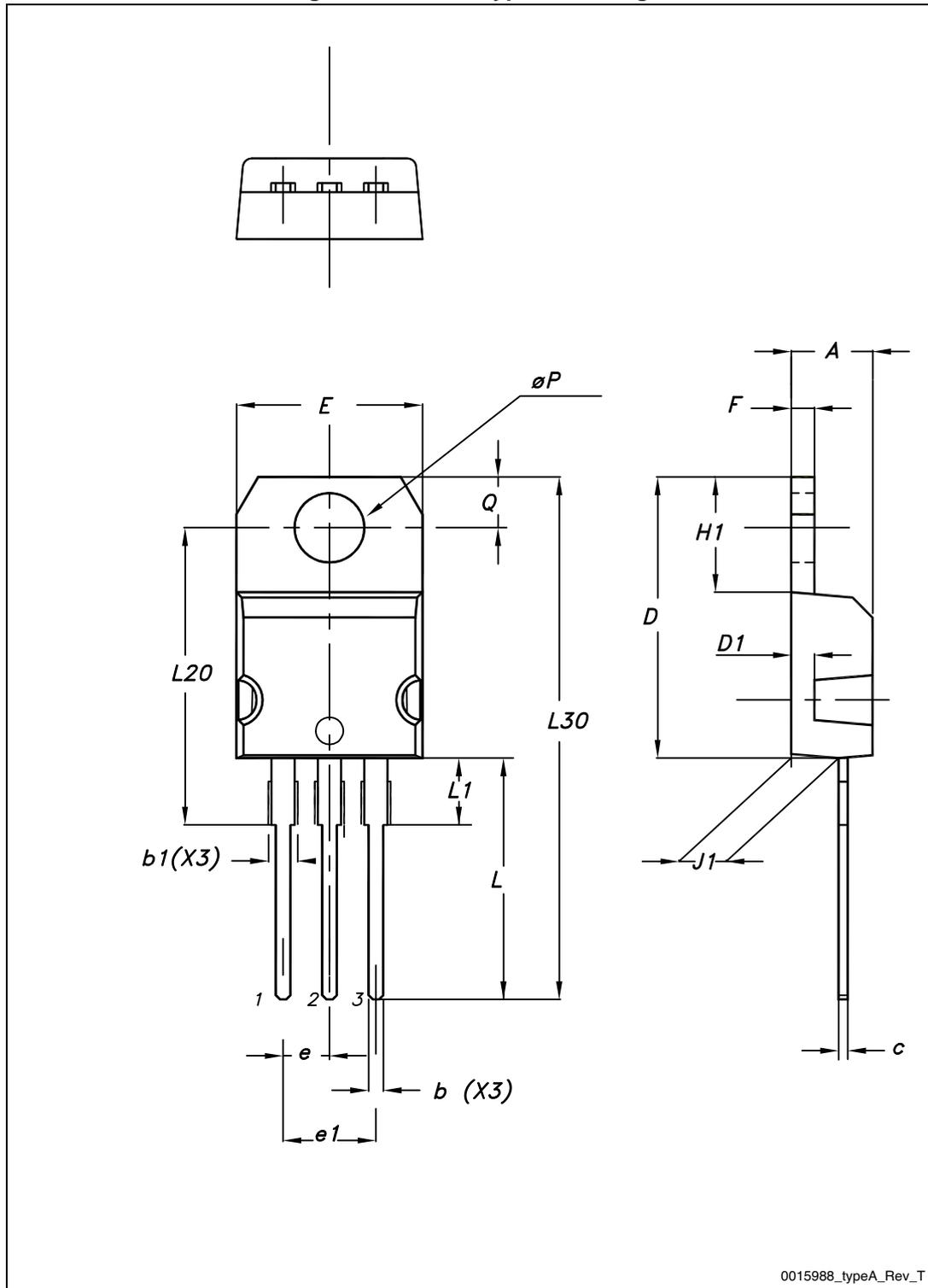
Figure 12. Source-drain diode forward characteristics



3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

Figure 13. TO-220 type A drawing



0015988_typeA_Rev_T

Table 8. TO-220 type A mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40		4.60
b	0.61		0.88
b1	1.14		1.70
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10		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		14
L1	3.50		3.93
L20		16.40	
L30		28.90	
ØP	3.75		3.85
Q	2.65		2.95

4 Revision history

Table 9. Document revision history

Date	Revision	Changes
08-Aug-2012	1	Initial release.
21-Jan-2014	2	<ul style="list-style-type: none"> – Document status promoted from preliminary to production data – Modified: title – Modified: <i>Features</i> – Added: <i>note 1</i> in cover page – Modified: $R_{DS(on)max}$ and I_D values in cover page – Modified: I_D (at $TC = 25\text{ °C}$ and at $TC = 100\text{ °C}$) values, I_D, I_{DM} values and added <i>note 1</i> in <i>Table 2</i> – Modified: $R_{thj-case}$ value in <i>Table 3</i> – Modified: $R_{DS(on)}$ values in <i>Table 4</i> – Modified: I_D and the entire typical values in <i>Table 5, 6 and 7</i> – Added: <i>Section 2.1: Electrical characteristics (curves)</i> – Updated: <i>Section 3: Package mechanical data</i> – Minor text changes

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