



# STP80N70F6

N-channel 68 V, 0.0063  $\Omega$  typ., 96 A STripFET™ VI DeepGATE™ Power MOSFET in TO-220 package

Datasheet – production data

## Features

Order code	V <sub>DSS</sub> max.	R <sub>DS(on)</sub> max.	I <sub>D</sub>	P <sub>TOT</sub>
STP80N70F6	68 V	< 0.008 $\Omega$ (V <sub>GS</sub> = 10 V)	96 A	110 W

- R<sub>DS(on)</sub> \* Q<sub>g</sub> industry benchmark
- Extremely low on-resistance R<sub>DS(on)</sub>
- High avalanche ruggedness
- Low gate drive power losses
- Very low switching gate charge

## Applications

- Switching applications

## Description

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

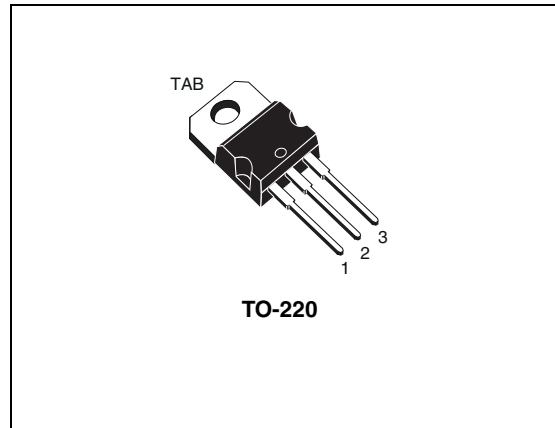
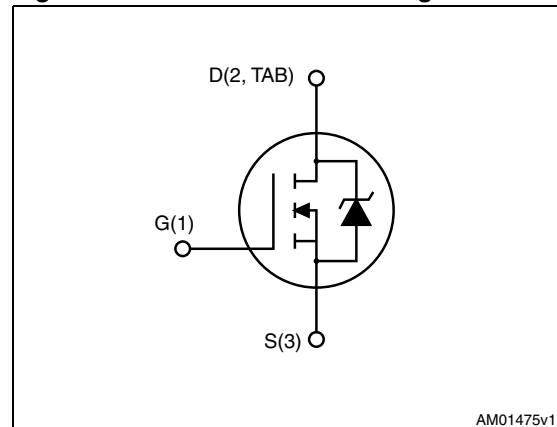


Figure 1. Internal schematic diagram



AM01475v1

Table 1. Device summary

Order code	Marking	Package	Packaging
STP80N70F6	80N70F6	TO-220	Tube

## Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	68	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	96	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	60	A
$I_{DM}^{(1)}$	Drain current (pulsed)	384	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	110	W
$T_{stg}$	Storage temperature	- 55 to 175	$^\circ\text{C}$
$T_j$	Operating junction temperature		

1. This value is rated according to  $R_{thj-c}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-c}$	Thermal resistance junction-case max	1.36	$^\circ\text{C}/\text{W}$
$R_{thj-a}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$

## 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 ( $V_{GS} = 0$ )	$I_D = 250\ \mu\text{A}$	68			V
$I_{DSS}$	Zero gate voltage Drain current ( $V_{GS} = 0$ )	$V_{DS} = 68\text{ V}$ $V_{DS} = 68\text{ V}, T_C = 125\text{ °C}$			1 100	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 48\text{ A}$		0.0063	0.008	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance			5850		pF
$C_{oss}$	Output capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0$	-	341	-	pF
$C_{rss}$	Reverse transfer capacitance			240		pF
$Q_g$	Total gate charge	$V_{DD} = 34\text{ V}, I_D = 96\text{ A},$ $V_{GS} = 10\text{ V}$ <i>(see Figure 14)</i>		99		nC
$Q_{gs}$	Gate-source charge		-	31	-	nC
$Q_{gd}$	Gate-drain charge			19		nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 10\text{ V}, I_D = 48\text{ A}$ $R_G = 4.7\ \Omega, V_{GS} = 10\text{ V}$ <i>(see Figure 13)</i>	-	23	-	ns
$t_r$	Rise time			29		ns
$t_{d(off)}$	Turn-off-delay time		-	102	-	ns
$t_f$	Fall time			23		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		96	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		384	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 96 \text{ A}, V_{GS} = 0$	-		1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 48 \text{ A}, V_{DD} = 24 \text{ V}$ $di/dt = 100 \text{ A}/\mu\text{s},$ $T_j = 150 \text{ }^\circ\text{C}$ <i>(see Figure 15)</i>	-	34 53 3		ns nC 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 2. Safe operating area

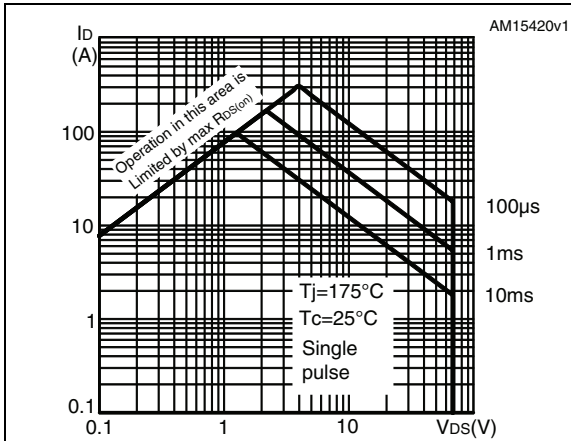


Figure 3. Thermal impedance

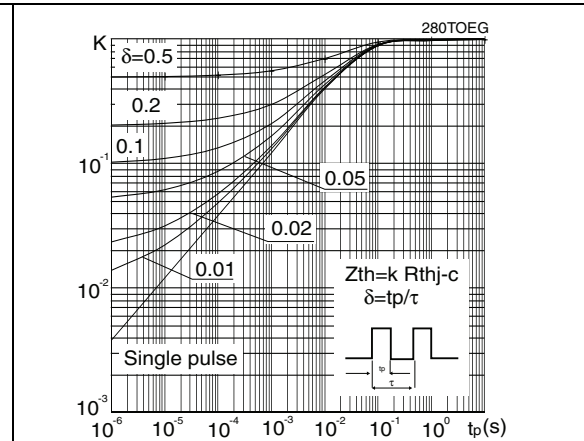


Figure 4. Output characteristics

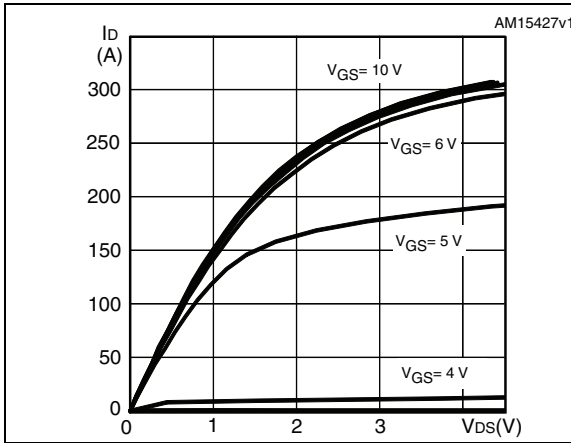


Figure 5. Transfer characteristics

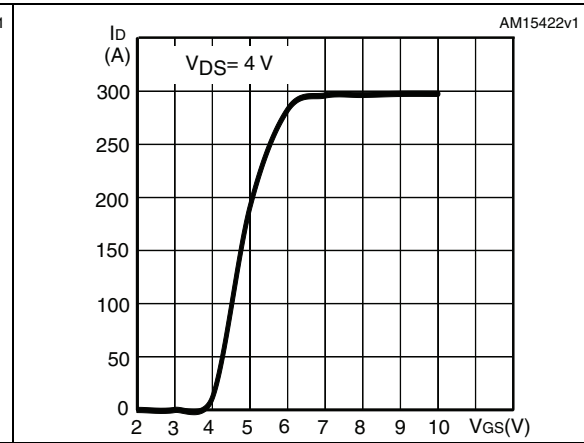


Figure 6. Gate charge vs gate-source voltage

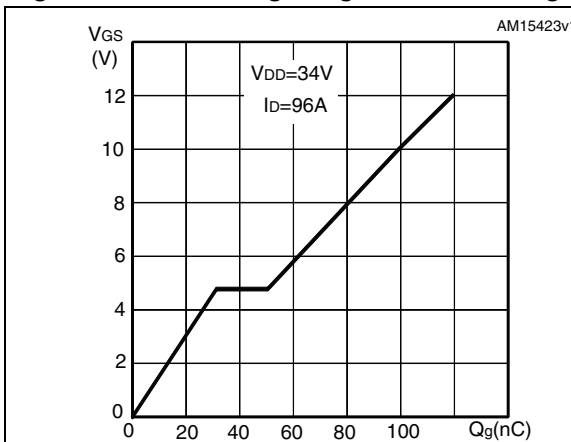


Figure 7. Static drain-source on-resistance

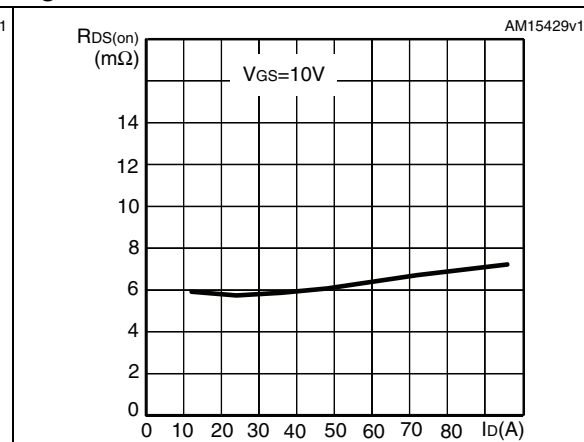


Figure 8. Capacitance variations

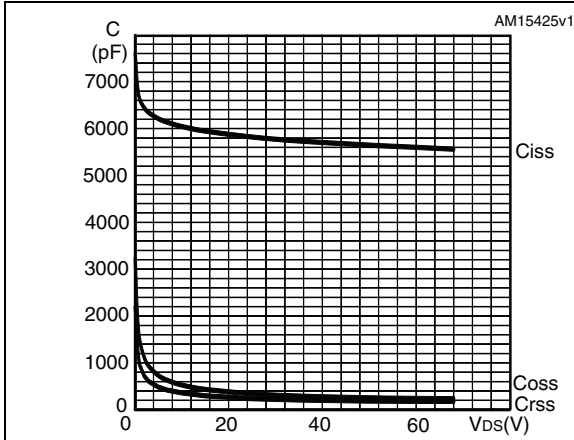


Figure 9. Normalized  $B_{V_{DSS}}$  vs temperature

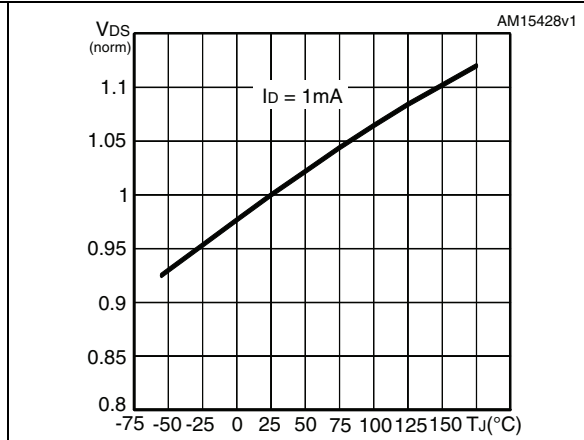


Figure 10. Normalized gate threshold voltage vs temperature

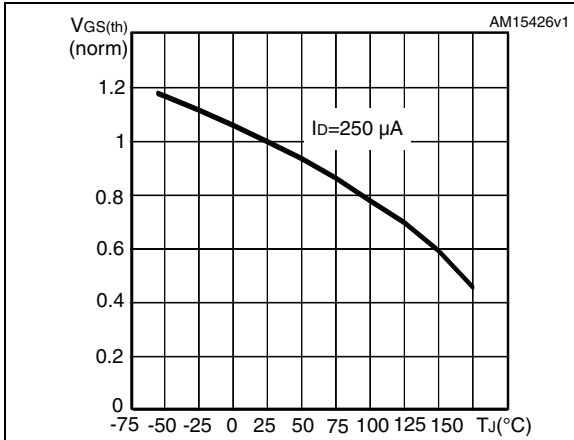


Figure 11. Normalized on-resistance vs temperature

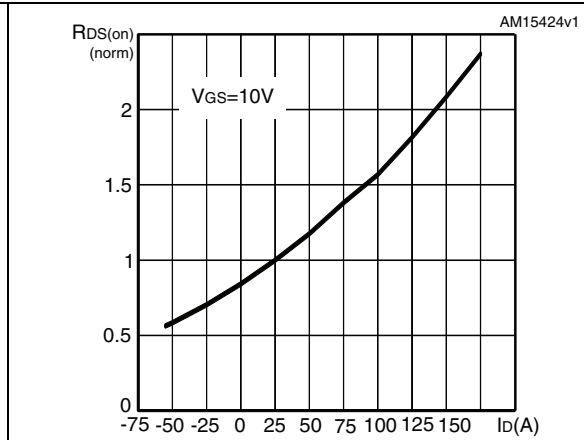
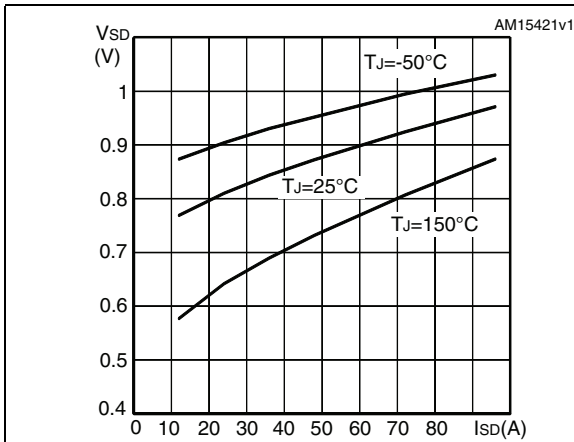


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

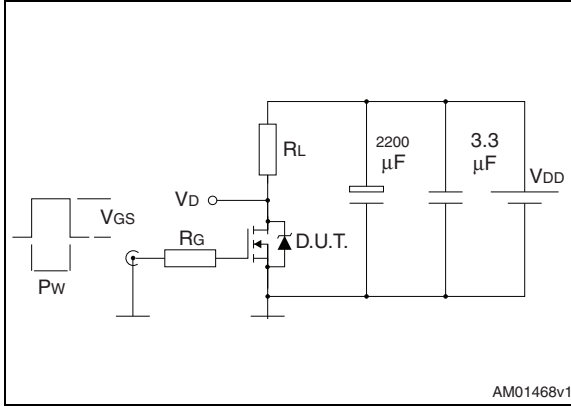


Figure 14. Gate charge test circuit

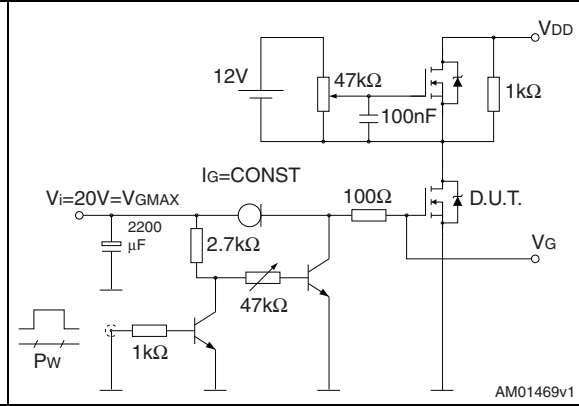


Figure 15. Test circuit for inductive load switching and diode recovery times

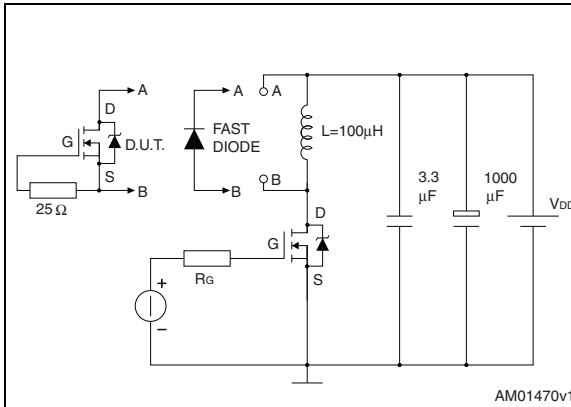


Figure 16. Unclamped inductive load test circuit

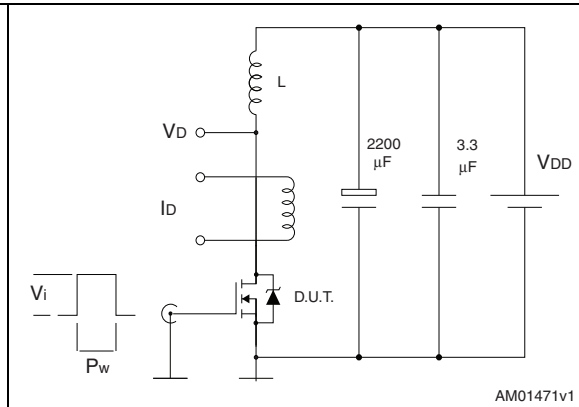


Figure 17. Unclamped inductive waveform

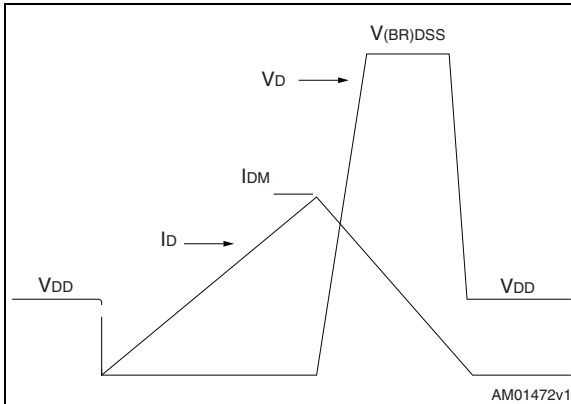
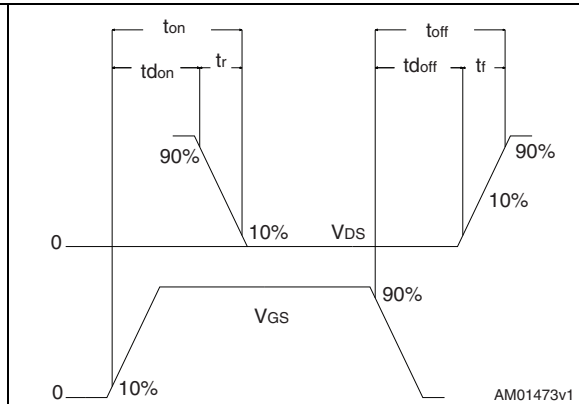


Figure 18. Switching time waveform





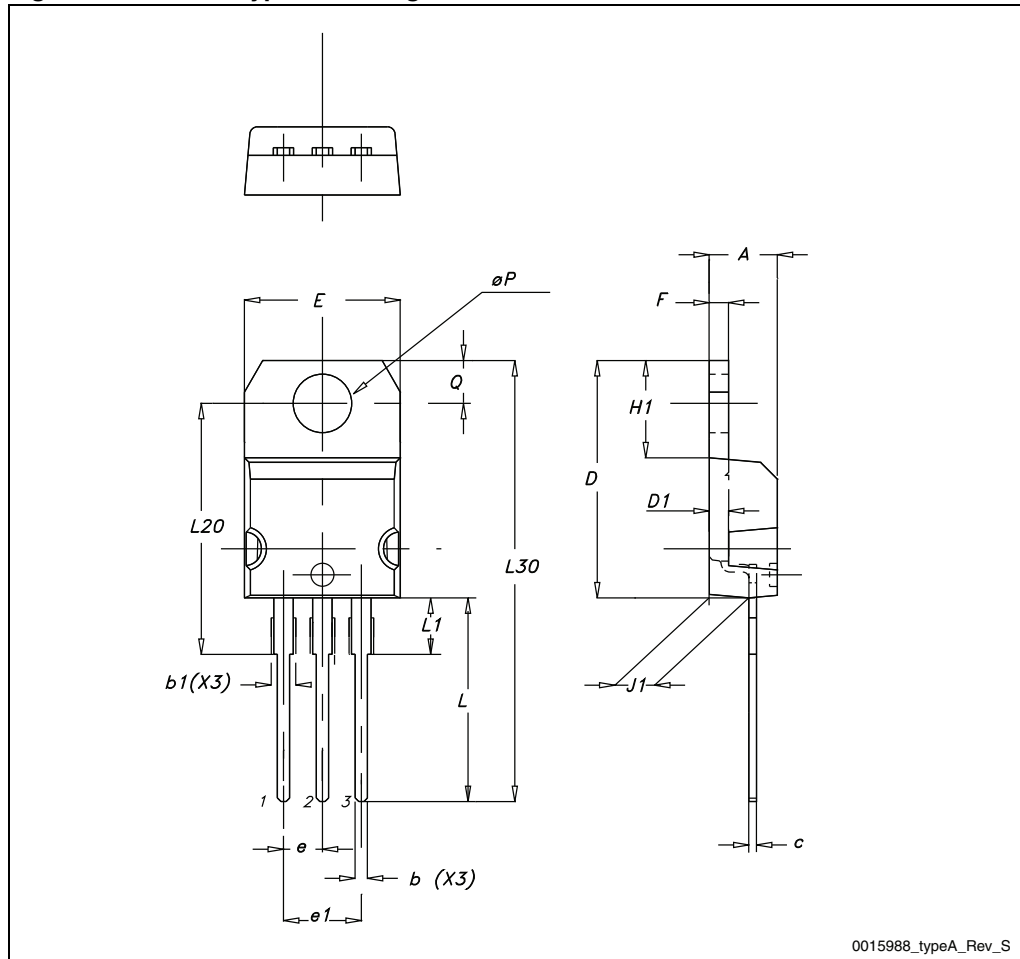
## 4 Package mechanical data

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

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

Figure 19. TO-220 type A drawing



## 5 Revision history

Table 9. Document revision history

Date	Revision	Changes
06-Dec-2012	1	First release.

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