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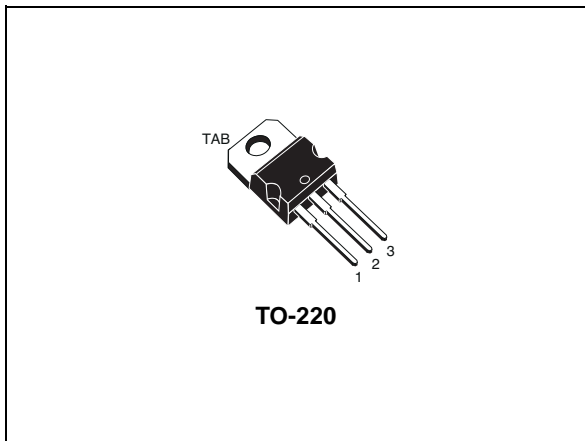
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# STP110N55F6

## N-channel 55 V, 4.5 $\Omega$ typ., 110 A STripFET™ F6 Power MOSFET in a TO-220 package

Datasheet - production data



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)</sub> max.	I <sub>D</sub>
STP110N55F6	55 V	5.2 m $\Omega$	110 A

- 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 STripFET™ F6 technology, with a new trench gate structure. The resulting Power MOSFET exhibits a very low R<sub>DS(on)</sub> in all packages.

Figure 1. Internal schematic diagram

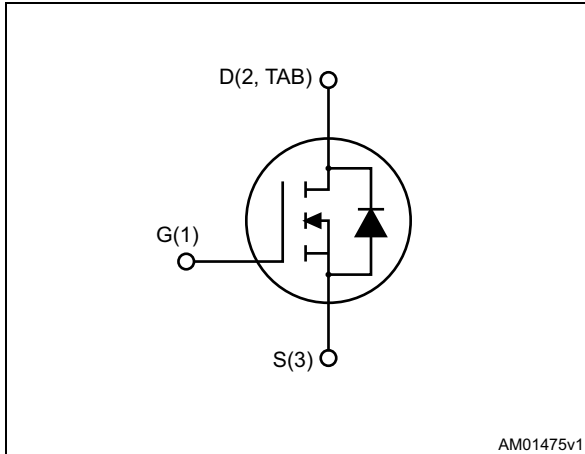


Table 1. Device summary

Order code	Marking	Packages	Packaging
STP110N55F6	110N55F6	TO-220	Tube

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## Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	55	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	110	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	85	A
$I_{DM}^{(1)}$	Drain current (pulsed)	440	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	150	W
	Derating factor	1	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	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	°C/W

Electrical characteristics

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## 2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	V <sub>GS</sub> = 0, I <sub>D</sub> = 250 μA	55			V
I <sub>DSS</sub>	Zero gate voltage	V <sub>GS</sub> = 0, V <sub>DS</sub> = 55 V			1	μA
	Drain current	V <sub>GS</sub> = 0, V <sub>DS</sub> = 55 V, T <sub>C</sub> = 125 °C			100	μA
I <sub>GSS</sub>	Gate-body leakage current	V <sub>DS</sub> = 0, V <sub>GS</sub> = ± 20 V			100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2		4	V
R <sub>DS(on)</sub>	Static drain-source on- resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 60 A		4.5	5.2	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C <sub>iss</sub>	Input capacitance	V <sub>GS</sub> = 0, V <sub>DS</sub> = 25 V, f = 1 MHz	-	7390	-	pF
C <sub>oss</sub>	Output capacitance		-	504	-	pF
C <sub>rss</sub>	Reverse transfer capacitance		-	355	-	pF
Q <sub>g</sub>	Total gate charge	V <sub>DD</sub> = 44 V, I <sub>D</sub> = 110 A, V <sub>GS</sub> = 10 V (see Figure 14)	-	126	-	nC
Q <sub>gs</sub>	Gate-source charge		-	32	-	nC
Q <sub>gd</sub>	Gate-drain charge		-	38	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 27.5 V, I <sub>D</sub> = 55 A, R <sub>G</sub> = 4.7 Ω, V <sub>GS</sub> = 10 V (see Figure 13)	-	23	-	ns
t <sub>r</sub>	Rise time		-	65	-	ns
t <sub>d(off)</sub>	Turn-off-delay time		-	503	-	ns
t <sub>f</sub>	Fall time		-	237	-	ns

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**Electrical characteristics**

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
$I_{SD}$	Source-drain current		-		110	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		440	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 110\text{ A}, V_{GS} = 0$	-		1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 110\text{ A}, V_{DD} = 44\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 150\text{ }^\circ\text{C}$ <i>(see Figure 15)</i>	-	44		ns
$Q_{rr}$	Reverse recovery charge		-	82		nC
$I_{RRM}$	Reverse recovery current		-	3.8		A

1. Current limited by package.
2. Pulsed: pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

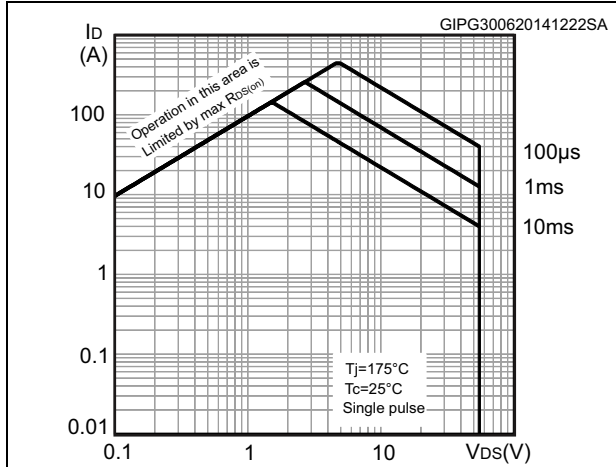


Figure 3. Thermal impedance

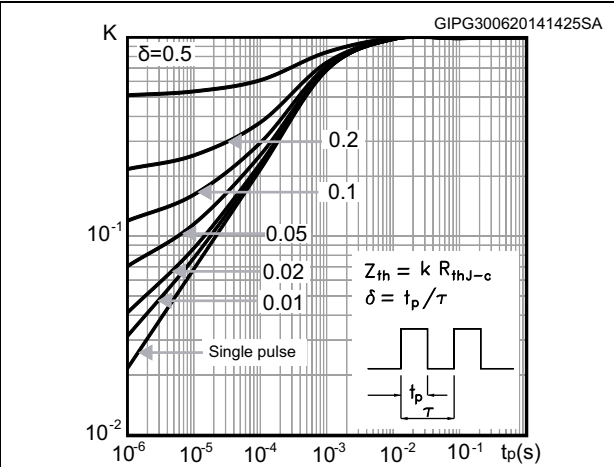


Figure 4. Output characteristics

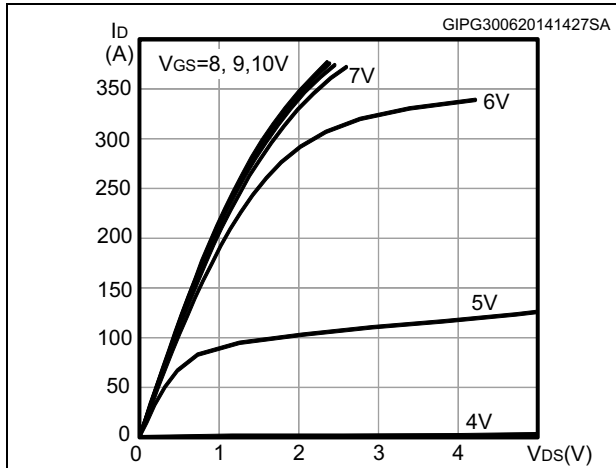


Figure 5. Transfer characteristics

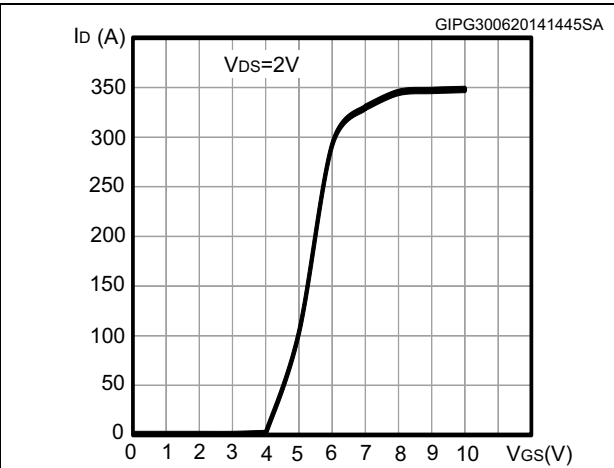


Figure 6. Gate charge vs gate-source voltage

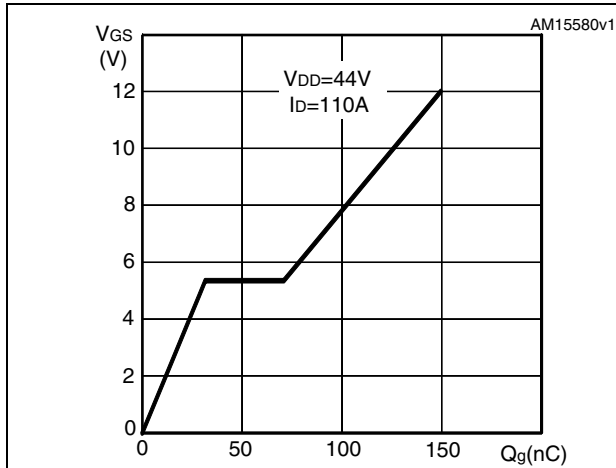
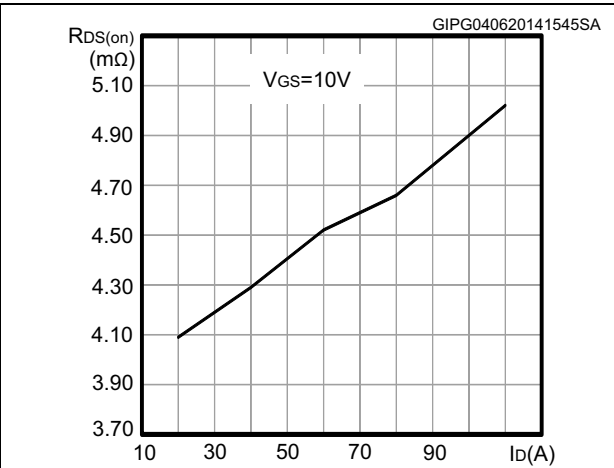


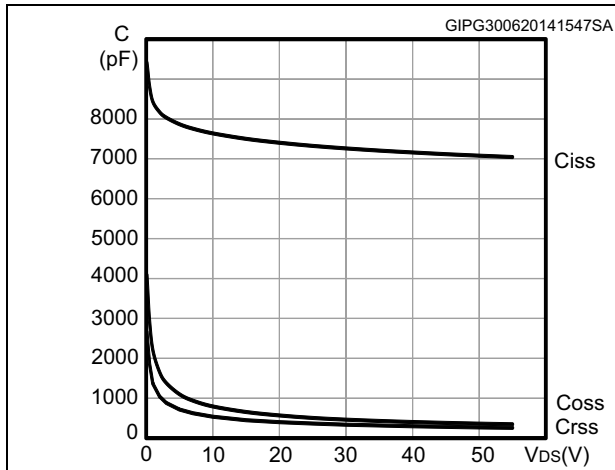
Figure 7. Static drain-source on-resistance



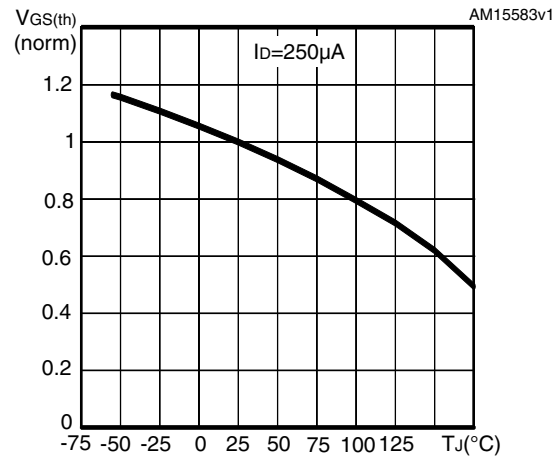
**STP110N55F6**

**Electrical characteristics**

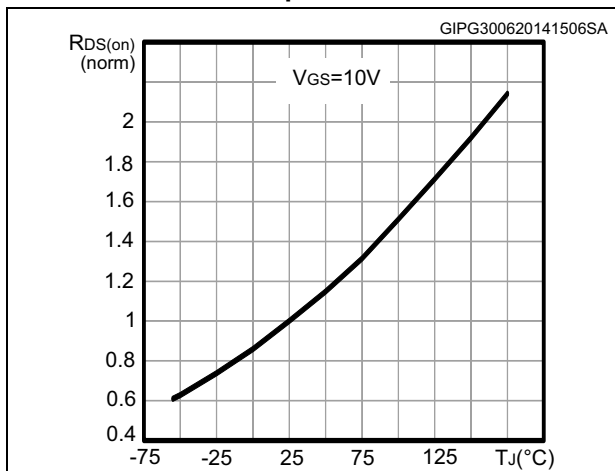
**Figure 8. Capacitance variations**



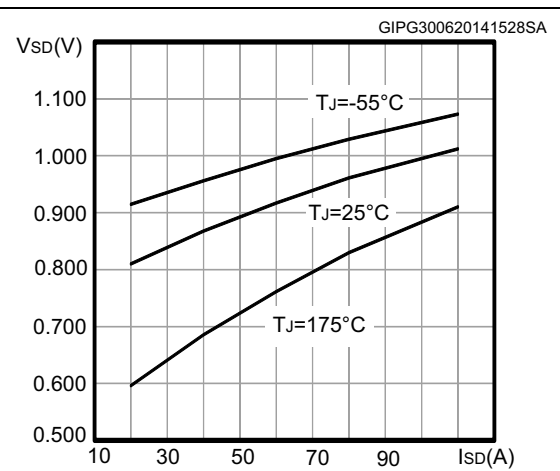
**Figure 9. Normalized gate threshold voltage vs temperature**



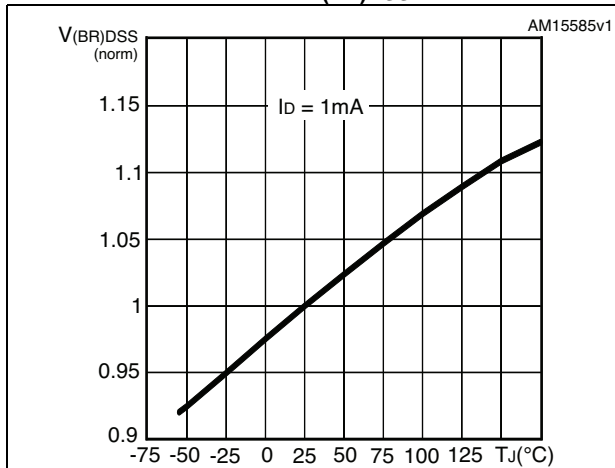
**Figure 10. Normalized on-resistance vs temperature**



**Figure 11. Source-drain diode forward characteristics**



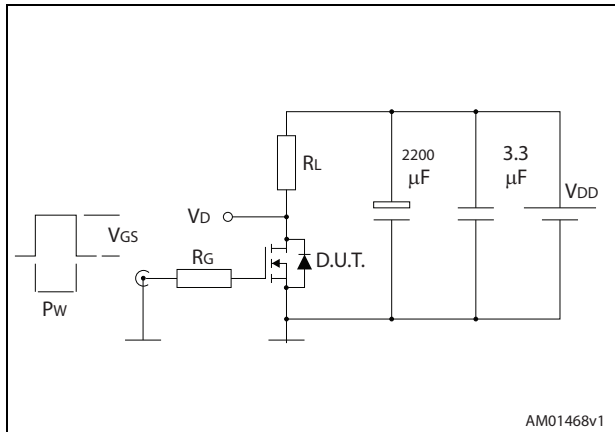
**Figure 12. Normalized  $V_{(BR)DSS}$  vs temperature**



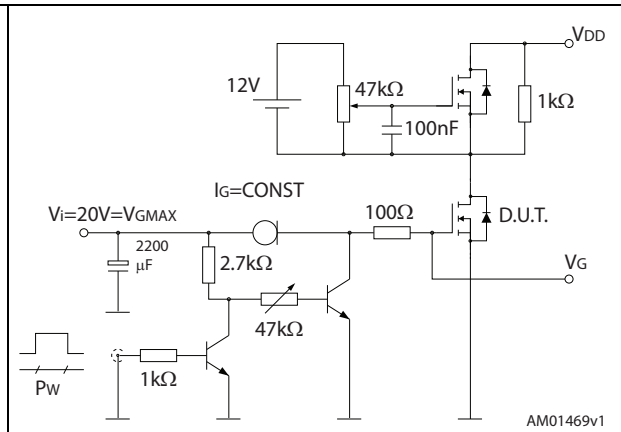


### 3 Test circuits

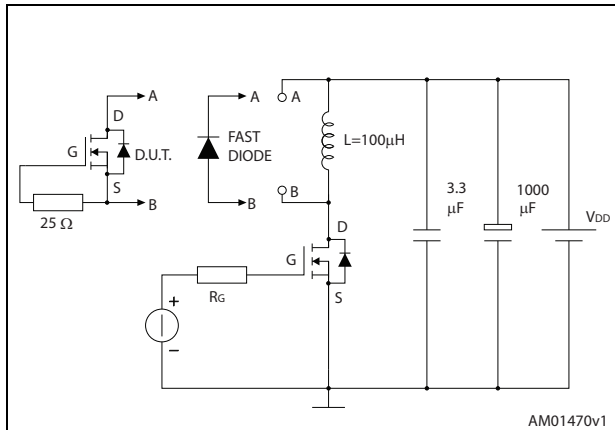
**Figure 13. Switching times test circuit for resistive load**



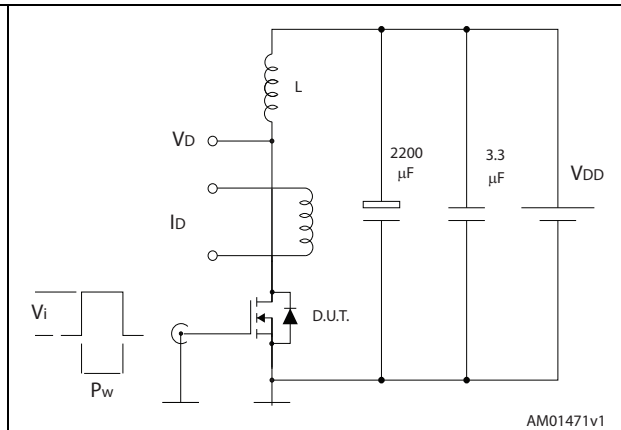
**Figure 14. Gate charge test circuit**



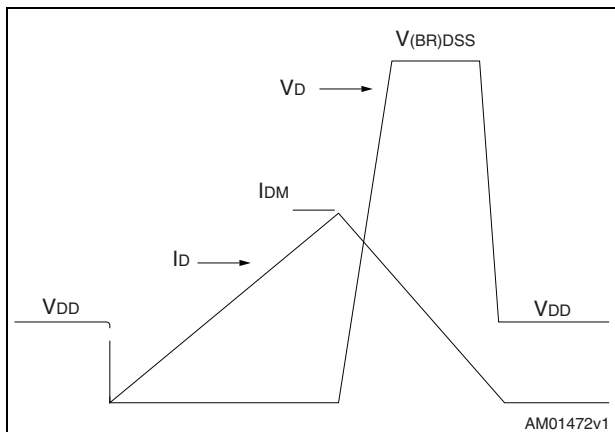
**Figure 15. Test circuit for inductive load switching and diode recovery times**



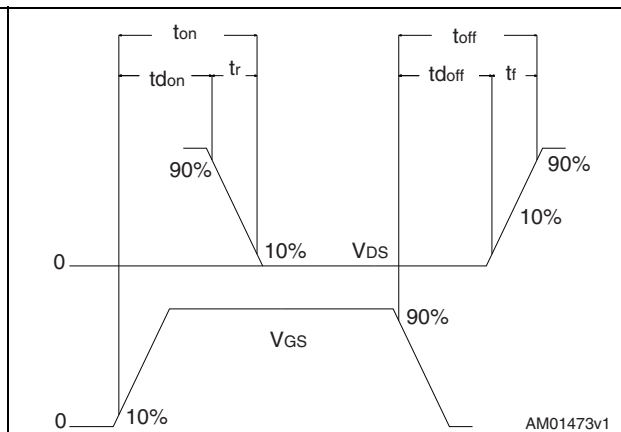
**Figure 16. Unclamped inductive load test circuit**



**Figure 17. Unclamped inductive waveform**



**Figure 18. Switching time waveform**



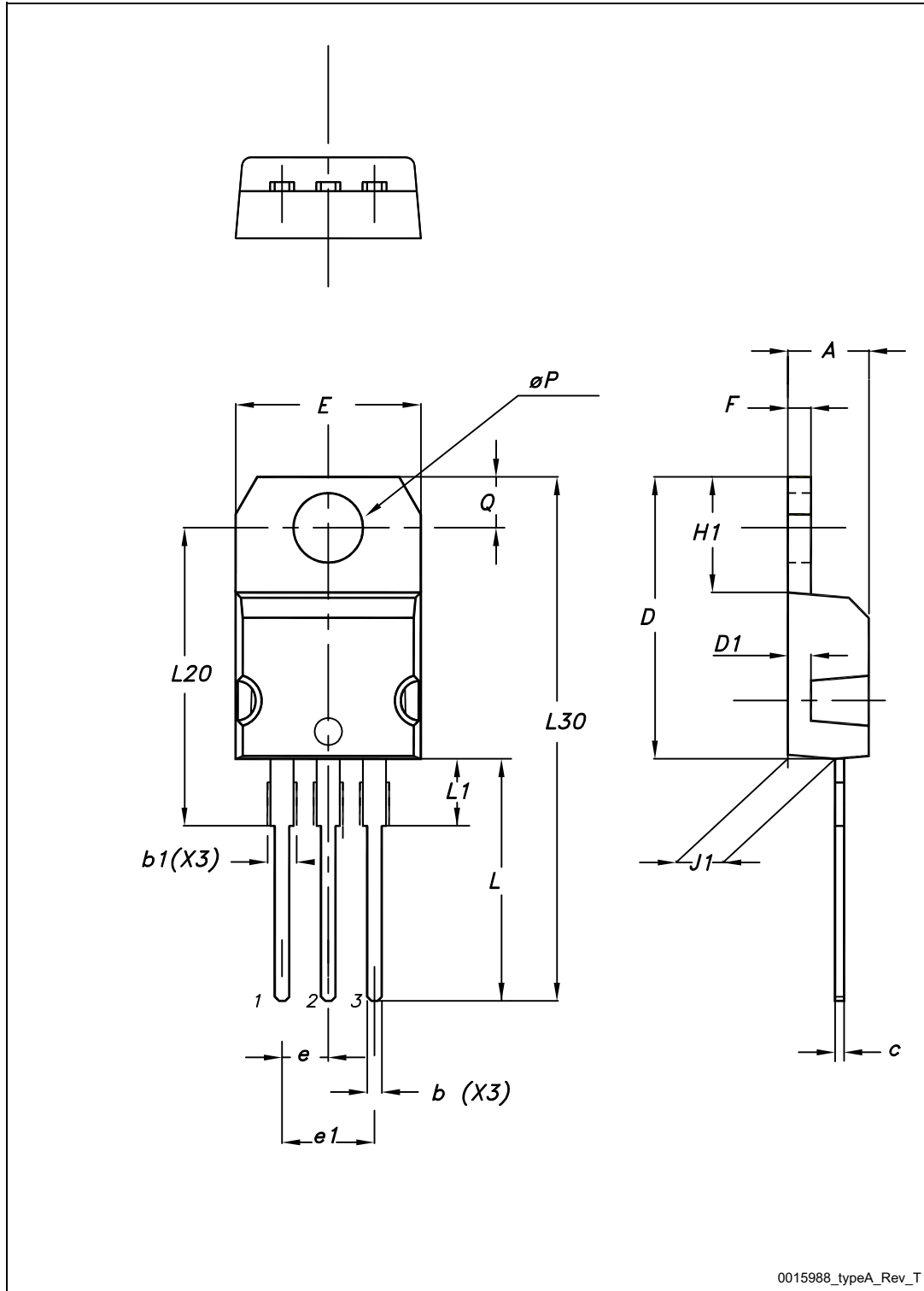
## 4 Package mechanical data

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 is an ST trademark.

Package mechanical data

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Figure 19. TO-220 type A drawing



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**Package mechanical data**

**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

## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
18-Jul-2011	1	First release.
11-Jul-2014	2	<ul style="list-style-type: none"> <li>– Modified: title and <i>Description</i></li> <li>– Modified: <math>I_D</math> (at <math>T_C = 100\text{ °C}</math>) value in <i>Table 2</i></li> <li>– Modified: <math>R_{DS(on)}</math> typical value</li> <li>– Modified: the entire typical values in <i>Table 5, 6 and 7</i></li> <li>– Added: <i>Section 2.1: Electrical characteristics (curves)</i></li> <li>– Updated: <i>Section 4: Package mechanical data</i></li> <li>– Minor text changes</li> </ul>

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