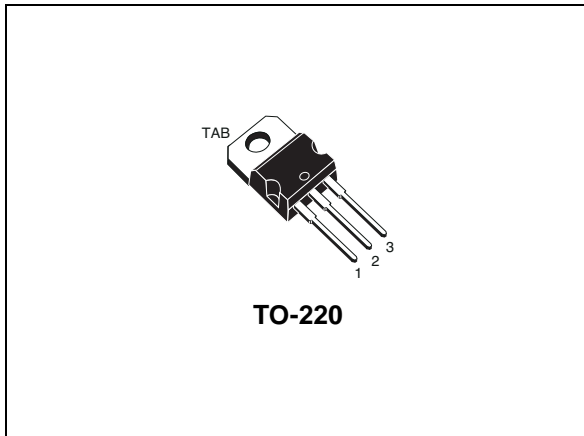
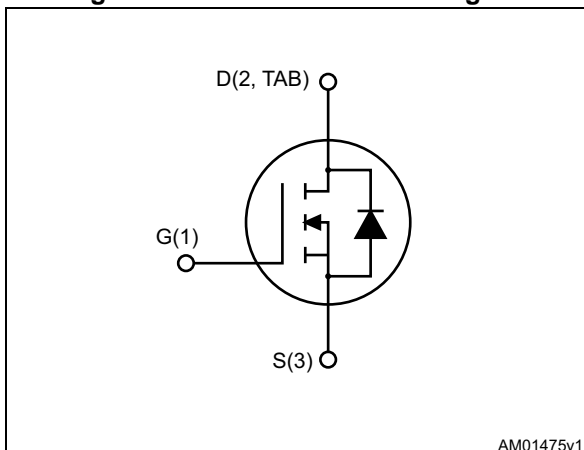


## N-channel 100 V, 0.0036 $\Omega$ typ., 110 A, STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data



**Figure 1. Internal schematic diagram**



### Features

Order code	V <sub>DS</sub>	R <sub>DS(on)max</sub>	I <sub>D</sub>	P <sub>TOT</sub>
STP15810	100 V	0.0042 $\Omega$	110 A	250 W

- 100% avalanche tested
- Ultra low on-resistance

### Applications

- Switching applications

### Description

This N-channel Power MOSFETs utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

**Table 1. Device summary**

Order code	Marking	Package	Packaging
STP15810	15810	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	100	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 $T_C = 100\text{ }^\circ\text{C}$	110	A
$I_{DM}^{(1)}$	Drain current (pulsed) $T_C = 25\text{ }^\circ\text{C}$	440	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	250	W
$E_{AS}^{(2)}$	Single pulse avalanche energy	495	mJ
$T_J$	Operating junction temperature	-55 to 175	$^\circ\text{C}$
$T_{stg}$	Storage temperature		$^\circ\text{C}$

1. Pulse width is limited by safe operating area

2. Starting  $T_j=25\text{ }^\circ\text{C}$ ,  $I_D=30\text{ A}$ ,  $V_{DD}=50\text{ V}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.6	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C/W}$

## 2 Electrical characteristics

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

**Table 4. On /off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 250\ \mu\text{A}$	100			V
$I_{DSS}$	Zero gate voltage drain current	$V_{GS} = 0, V_{DS} = 100\ \text{V}$			1	$\mu\text{A}$
		$V_{GS} = 0, V_{DS} = 100\ \text{V}, T_C = 125\text{ °C}$			100	$\mu\text{A}$
$I_{GSS}$	Gate-body leakage current	$V_{DS} = 0, V_{GS} = +20\ \text{V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\ \text{V}, I_D = 55\ \text{A}$		0.0036	0.0042	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 55\ \text{V}, f = 1\ \text{MHz}, V_{GS} = 0$	-	8115	-	pF
$C_{oss}$	Output capacitance		-	1510	-	pF
$C_{riss}$	Reverse transfer capacitance		-	67	-	pF
$Q_g$	Total gate charge	$V_{DD} = 55\ \text{V}, I_D = 90\ \text{A}, V_{GS} = 10\ \text{V}$ (see <a href="#">Figure 14</a> )	-	117	-	nC
$Q_{gs}$	Gate-source charge		-	47	-	nC
$Q_{gd}$	Gate-drain charge		-	26	-	nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50\ \text{V}, I_D = 55\ \text{A}, R_G = 4.7\ \Omega, V_{GS} = 10\ \text{V}$ (see <a href="#">Figure 13</a> )	-	33	-	ns
$t_r$	Rise time		-	57	-	ns
$t_{d(off)}$	Turn-off delay time		-	72	-	ns
$t_f$	Fall time		-	33	-	ns

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	$I_{SD} = 110 \text{ A}$ , $V_{GS} = 0$	-		1.2	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 110 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 80 \text{ V}$ , $T_J = 150 \text{ }^\circ\text{C}$ (see <a href="#">Figure 15</a> )	-	70		ns
$Q_{rr}$	Reverse recovery charge		-	165		nC
$I_{RRM}$	Reverse recovery current		-	4.7		A

1. Pulse width 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

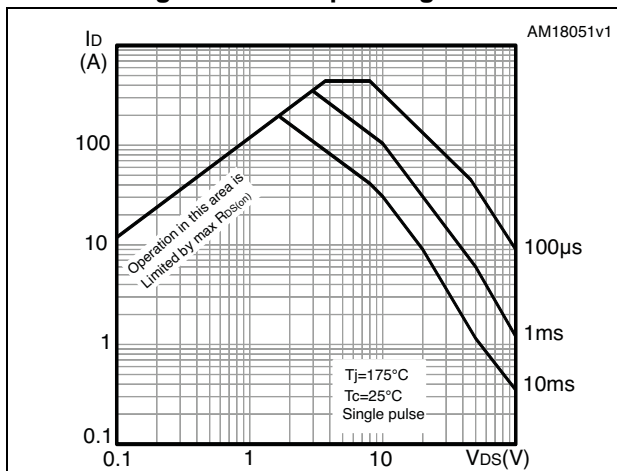


Figure 3. Thermal impedance

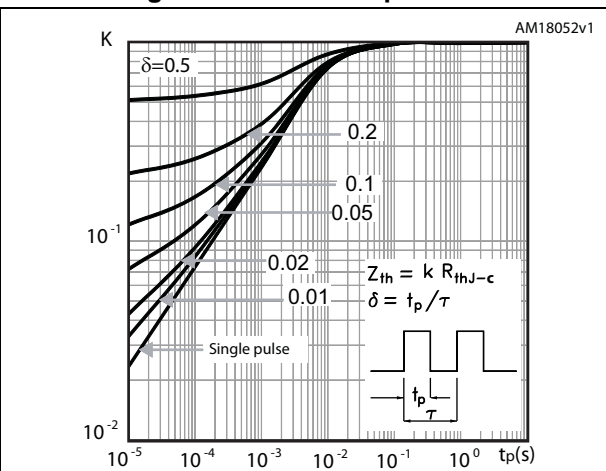


Figure 4. Output characteristics

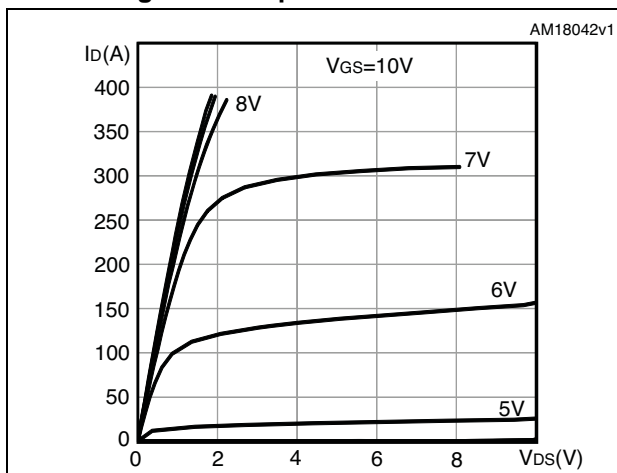


Figure 5. Transfer characteristics

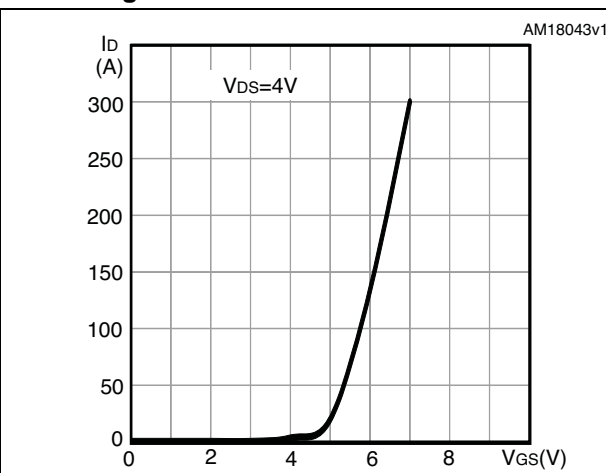


Figure 6. Gate charge vs gate-source voltage

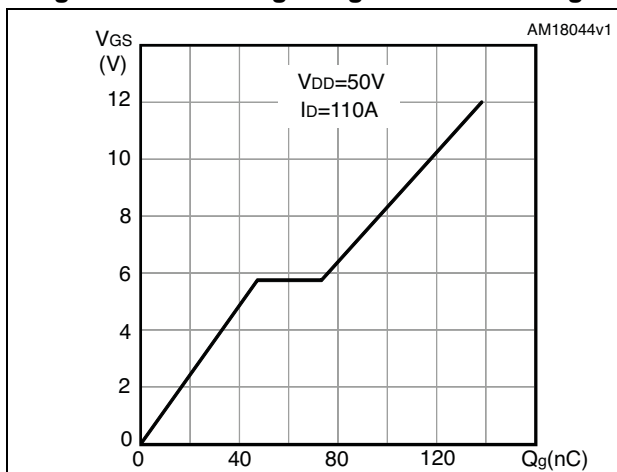


Figure 7. Static drain-source on-resistance

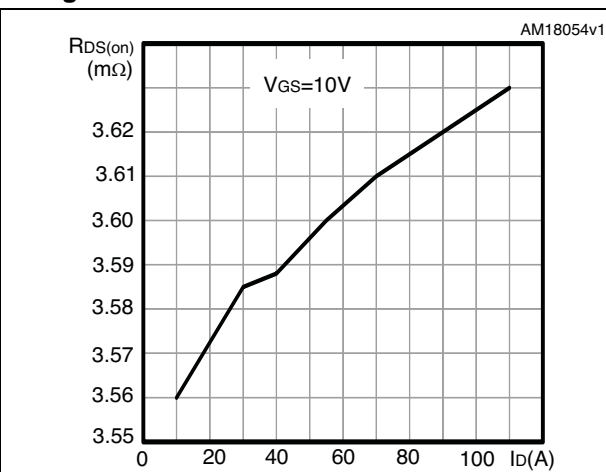


Figure 8. Capacitance variations

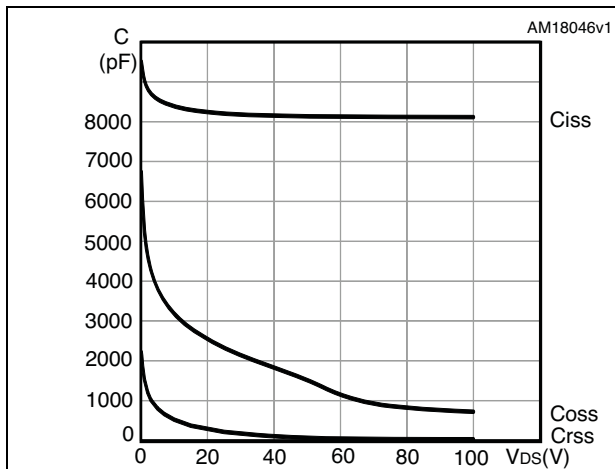


Figure 9. Normalized gate threshold voltage vs temperature

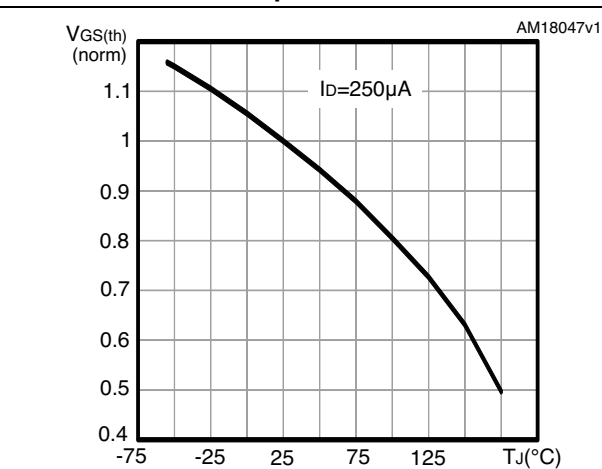


Figure 10. Normalized on-resistance vs temperature

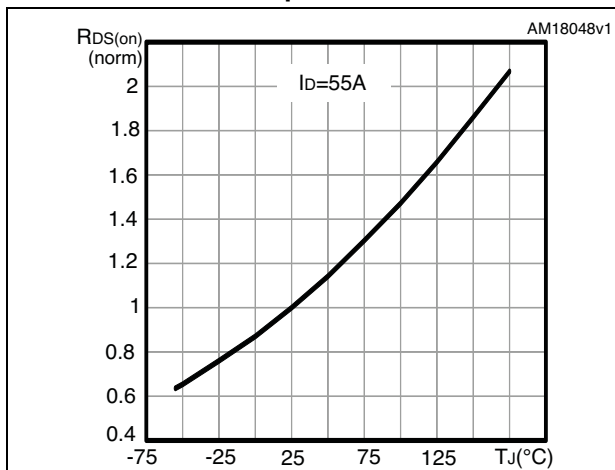


Figure 11. Normalized VDS vs temperature

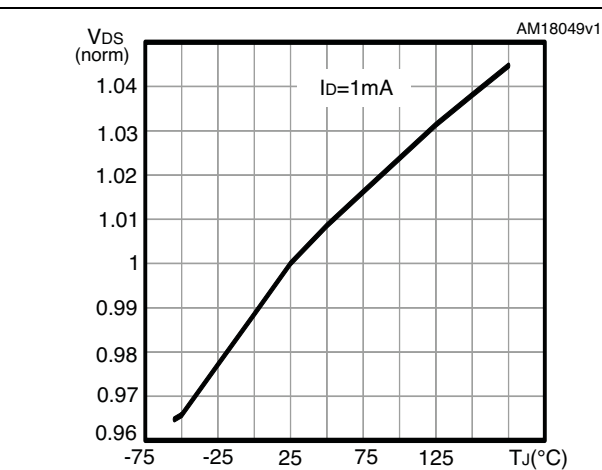
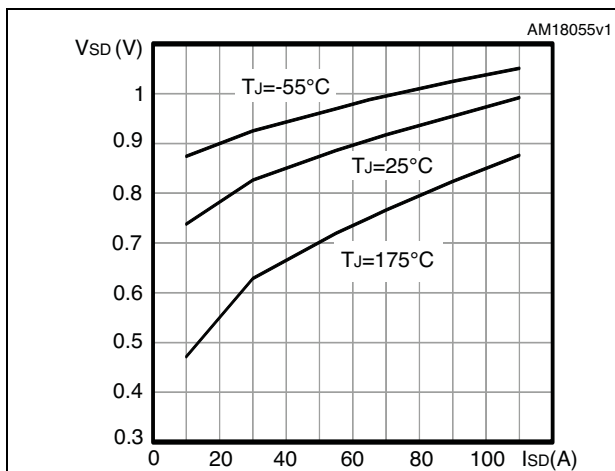


Figure 12. Source-drain diode forward characteristics



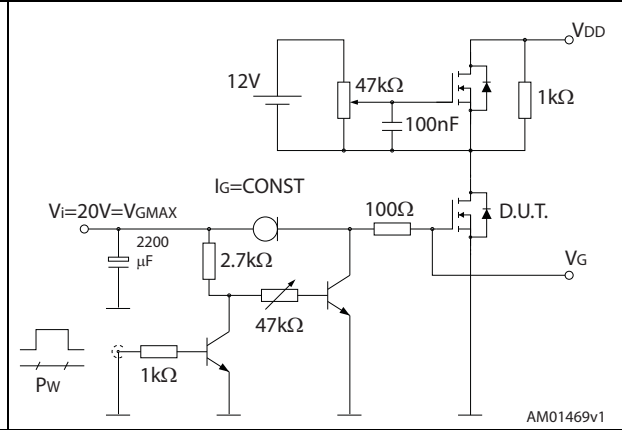
### 3 Test circuits

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



AM01468v1

**Figure 14. Gate charge test circuit**



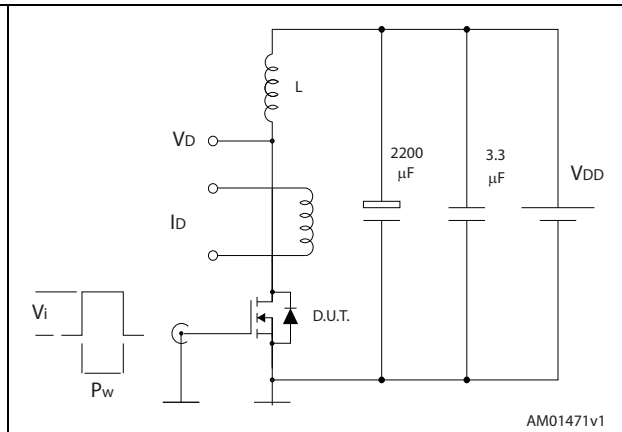
AM01469v1

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



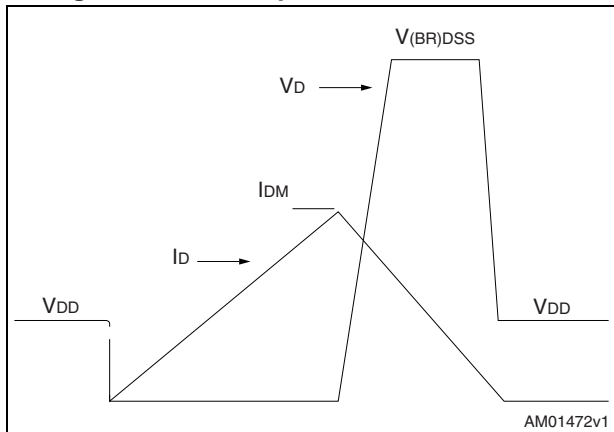
AM01470v1

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



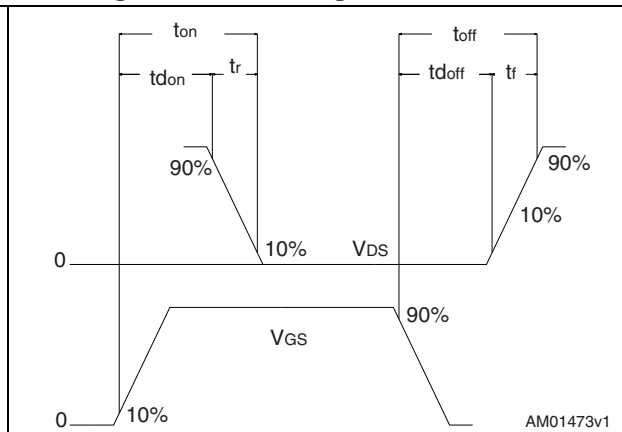
AM01471v1

**Figure 17. Unclamped inductive waveform**



AM01472v1

**Figure 18. Switching time waveform**



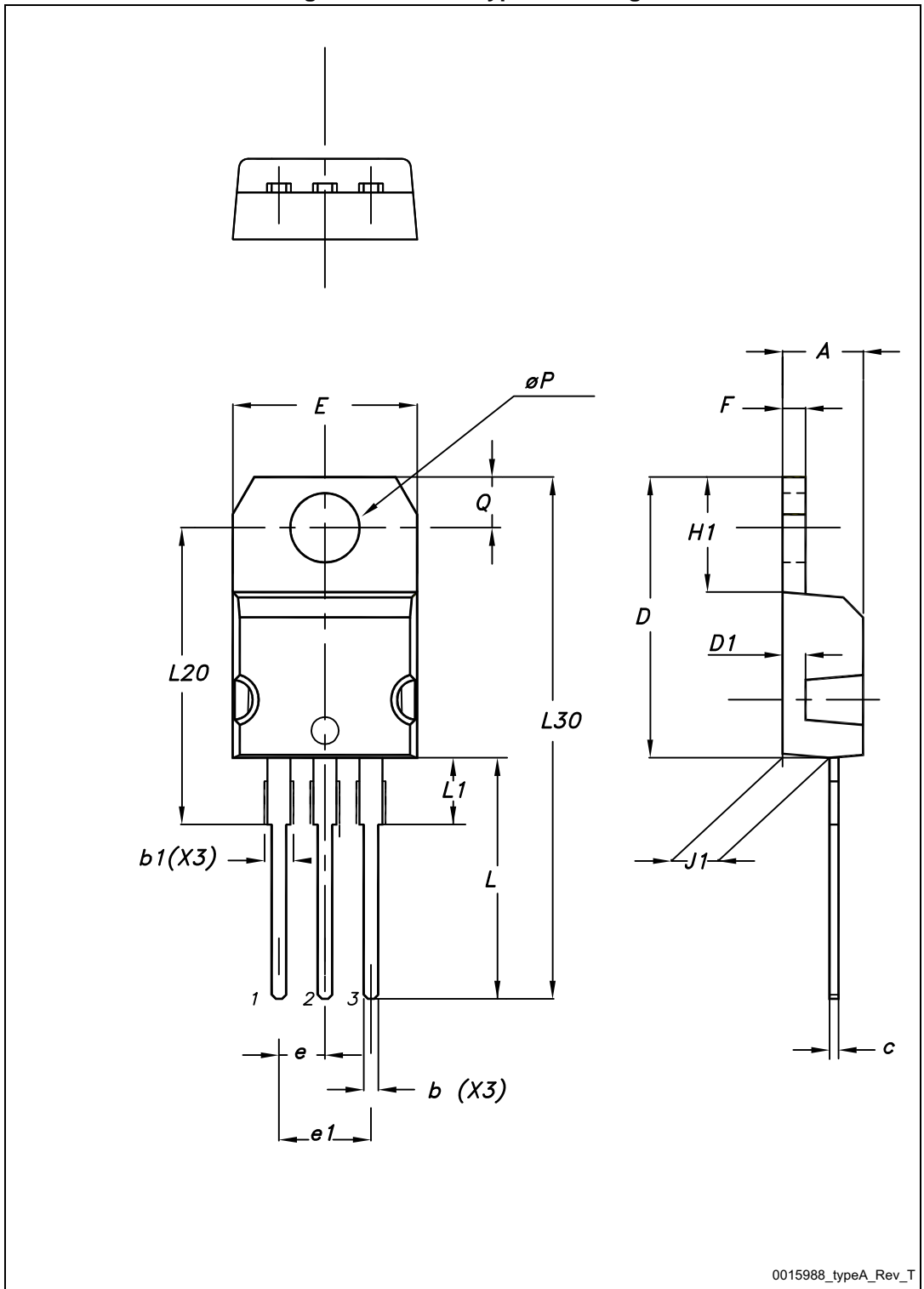
AM01473v1



## 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.

Figure 19. 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

## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
10-Jul-2013	1	First release.
21-Jan-2013	2	<ul style="list-style-type: none"> <li>– The part number STH15810-2 has been moved to a separate datasheet</li> <li>– Modified: <a href="#">Figure 1</a></li> <li>– Modified: <math>I_D</math> and <math>I_{DM}</math> values in <a href="#">Table 2</a></li> <li>– Modified: <math>R_{thj-case}</math> value in <a href="#">Table 3</a></li> <li>– Modified: <math>R_{DS(on)}</math> values in <a href="#">Table 4</a></li> <li>– Modified: <math>V_{SD}</math>, <math>I_D</math> and the entire typical values in <a href="#">Table 5</a>, <a href="#">6</a> and <a href="#">7</a></li> <li>– Updated: <a href="#">Figure 13</a>, <a href="#">14</a>, <a href="#">15</a> and <a href="#">16</a></li> <li>– Updated: <a href="#">Section 4: Package mechanical data</a></li> <li>– Added: <a href="#">Section 2.1: Electrical characteristics (curves)</a></li> <li>– Minor text changes</li> </ul>
29-Jan-2013	3	<ul style="list-style-type: none"> <li>– Document status promoted from preliminary data to production data</li> <li>– Modified: title</li> <li>– Modified: <math>R_{DS(on)}</math> typical value in <a href="#">Table 4</a></li> <li>– Minor text changes</li> </ul>
20-Aug-2014	4	<ul style="list-style-type: none"> <li>Updated title in cover page.</li> <li>Added <math>E_{AS}</math> parameter in <a href="#">Table 2: Absolute maximum ratings</a>.</li> </ul>

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