

## N-channel 100 V, 0.0036 $\Omega$ typ., 110 A, STripFET™ F7 Power MOSFETs in I<sup>2</sup>PAK and TO-220 packages

Datasheet – production data

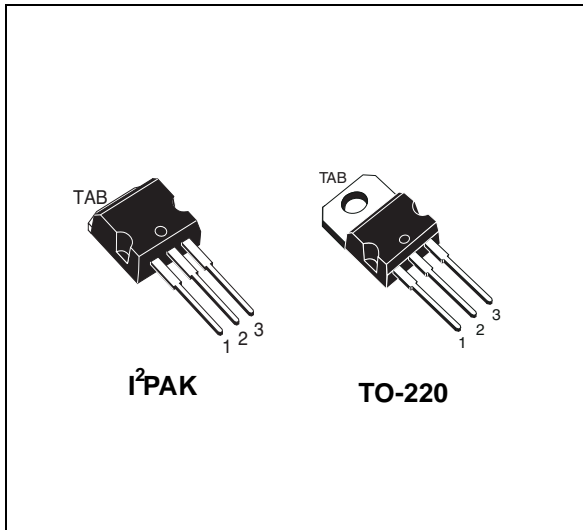
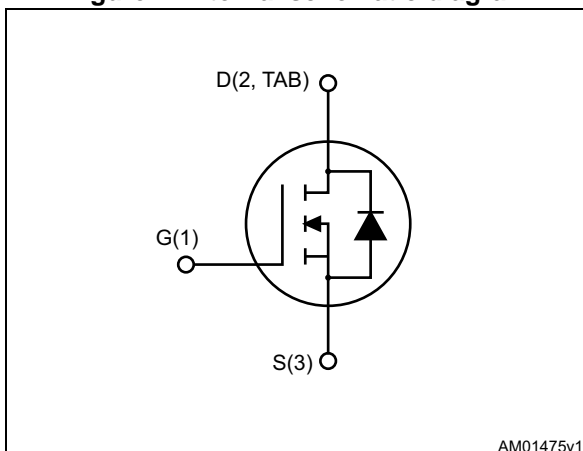


Figure 1. Internal schematic diagram



AM01475v1

### Features

Order codes	V <sub>DS</sub>	R <sub>DS(on)max</sub>	I <sub>D</sub>	P <sub>TOT</sub>
STI150N10F7	100 V	0.0042 $\Omega$	110 A	250 W
STP150N10F7				

- Among the lowest R<sub>DS(on)</sub> on the market
- Excellent figure of merit (FoM)
- Low Crss/Ciss ratio for EMI immunity
- High avalanche ruggedness

### Applications

- Switching applications

### Description

These N-channel Power MOSFETs utilize 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 codes	Marking	Package	Packaging
STI150N10F7	150N10F7	I <sup>2</sup> PAK	Tube
STP150N10F7		TO-220	

# 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)	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	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$

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

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance	$V_{DS} = 50\ V, f = 1\ MHz, V_{GS} = 0$	-	8115	-	pF
$C_{oss}$	Output capacitance		-	1510	-	pF
$C_{riss}$	Reverse transfer capacitance		-	67	-	pF
$Q_g$	Total gate charge	$V_{DD} = 50\ V, I_D = 110\ A, V_{GS} = 10\ V$ (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	$V_{DD} = 50\ V, I_D = 55\ A, R_G = 4.7\ \Omega, V_{GS} = 10\ V$ (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

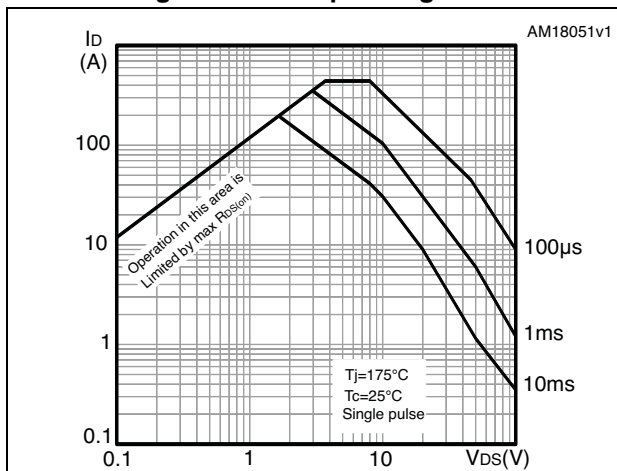


Figure 3. Thermal impedance

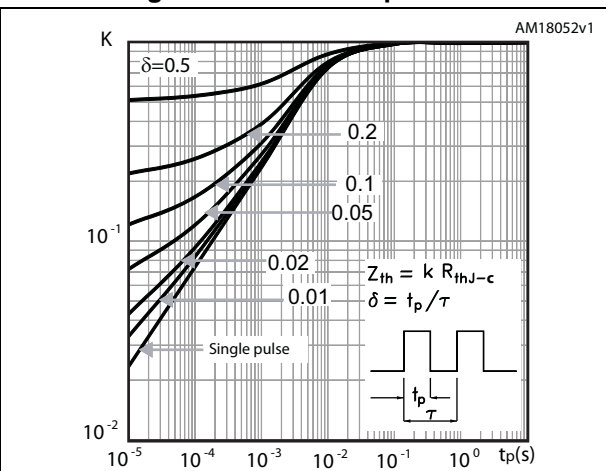


Figure 4. Output characteristics

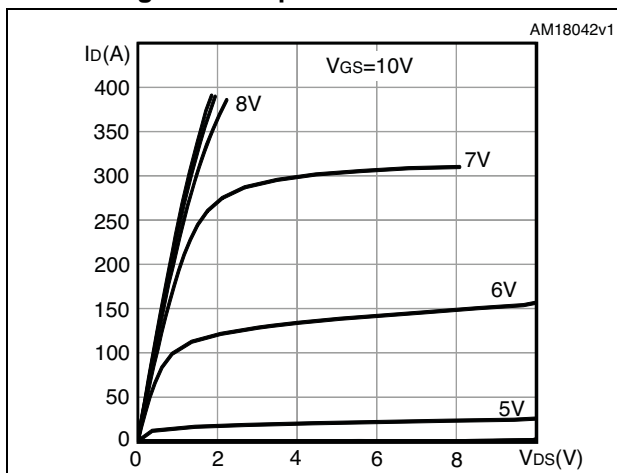


Figure 5. Transfer characteristics

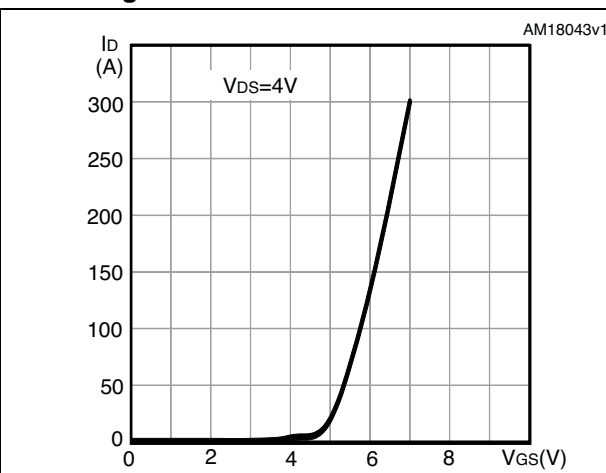


Figure 6. Gate charge vs gate-source voltage

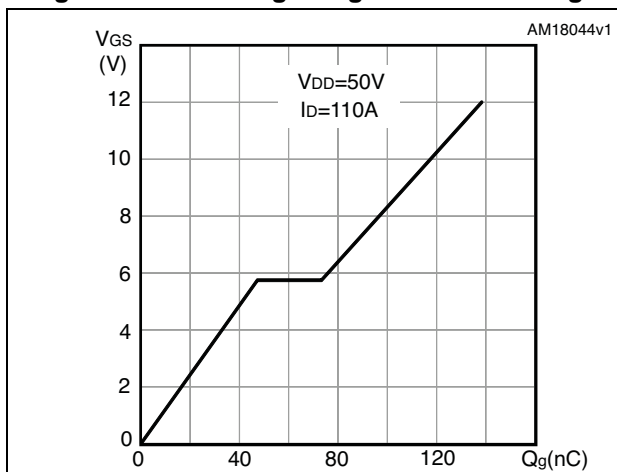


Figure 7. Static drain-source on-resistance

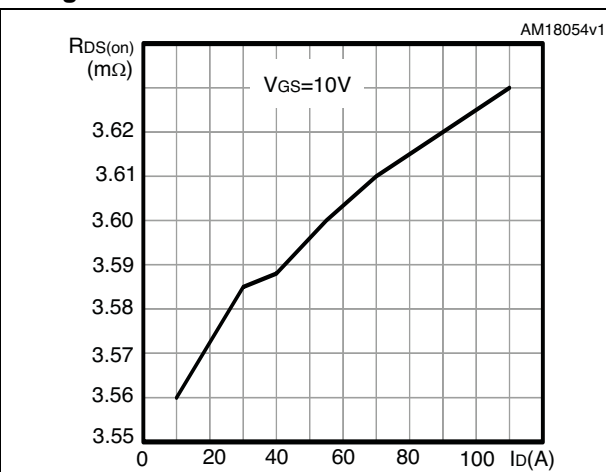


Figure 8. Capacitance variations

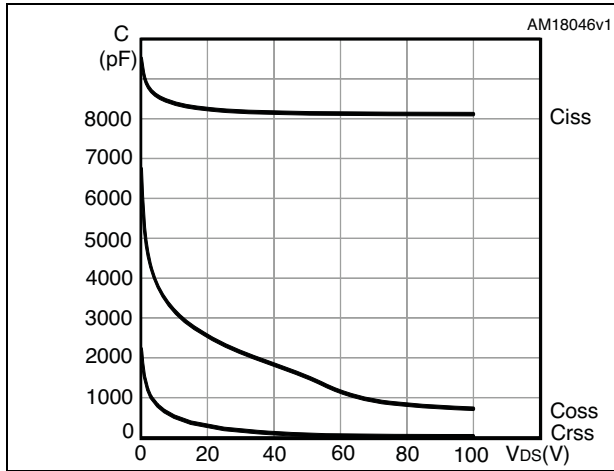


Figure 9. Normalized gate threshold voltage vs temperature

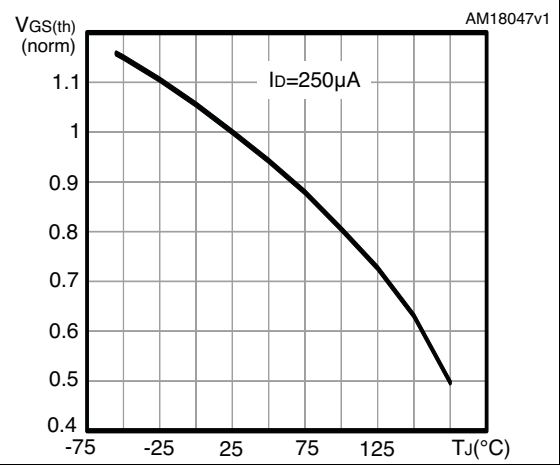


Figure 10. Normalized on-resistance vs temperature

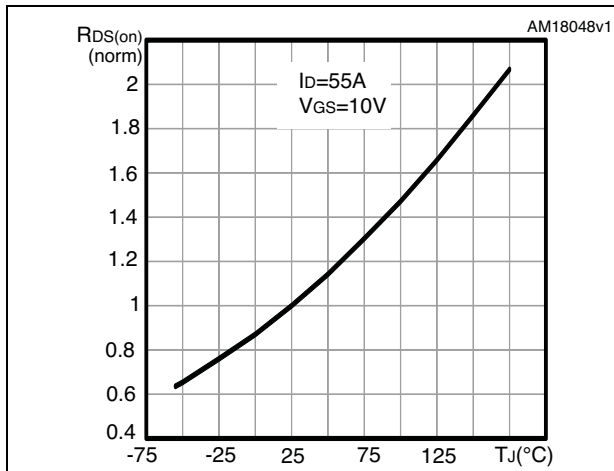


Figure 11. Normalized  $V_{(BR)DSS}$  vs temperature

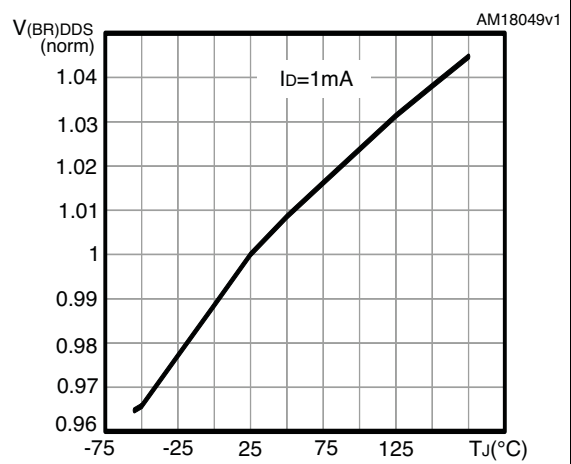
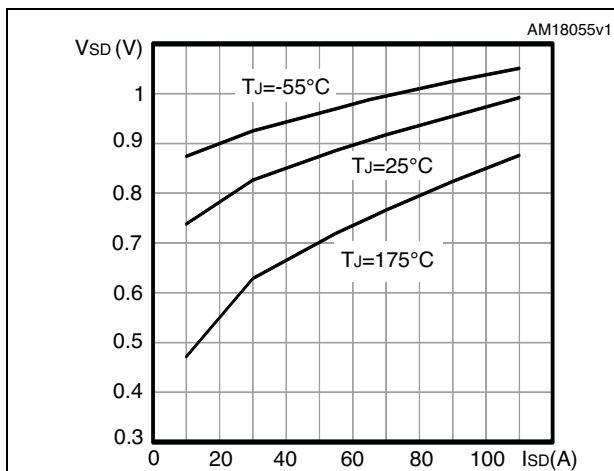
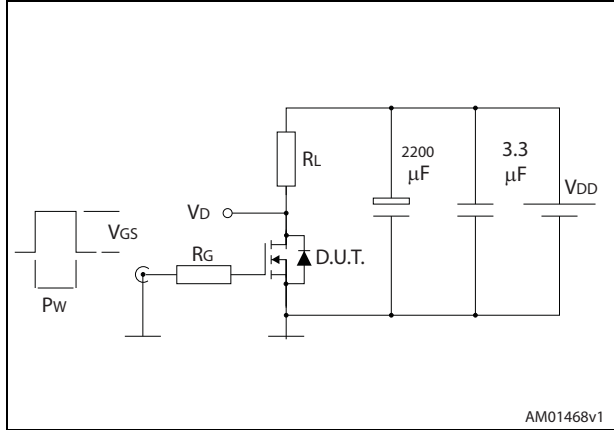


Figure 12. Source-drain diode forward characteristics



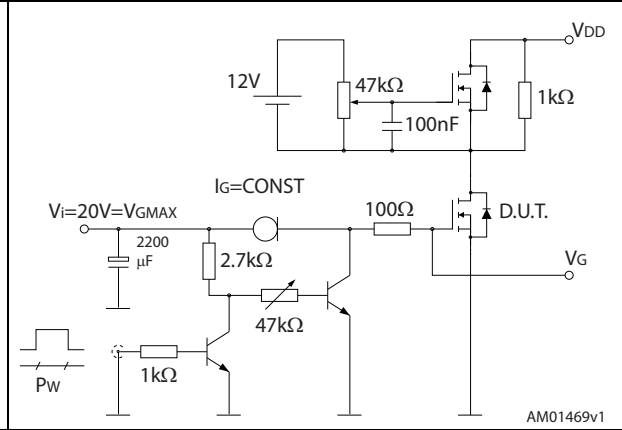
### 3 Test circuits

Figure 13. Switching times test circuit for resistive load



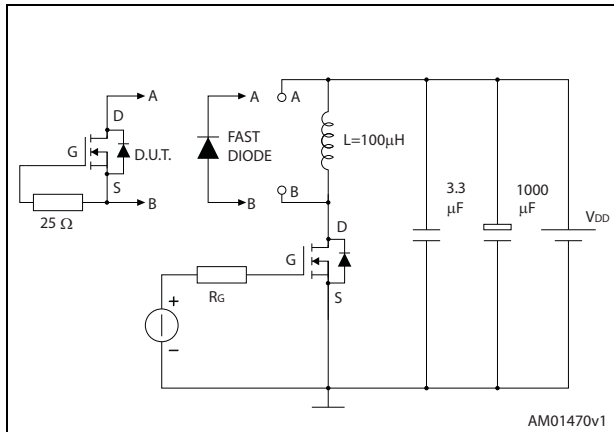
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Figure 14. Gate charge test circuit



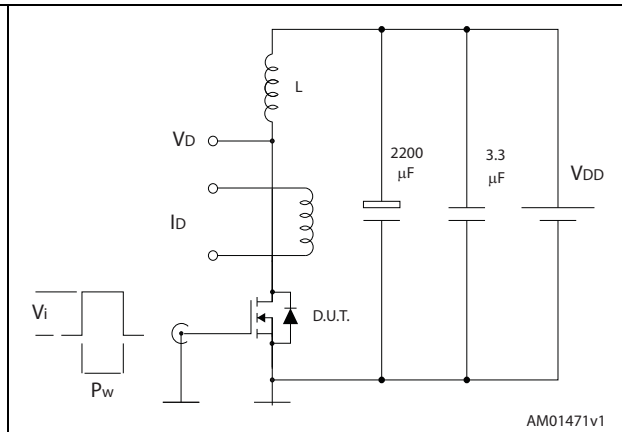
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Figure 15. Test circuit for inductive load switching and diode recovery times



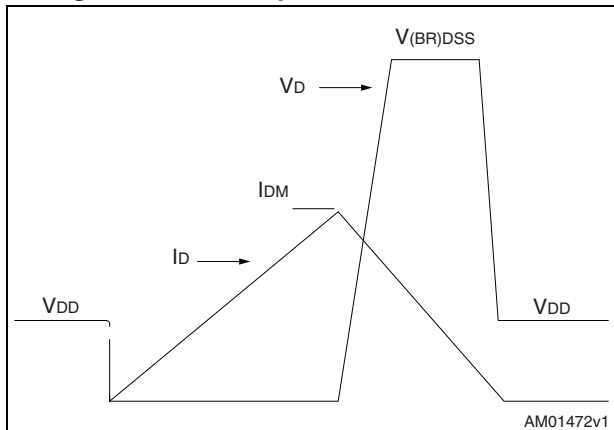
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Figure 16. Unclamped inductive load test circuit



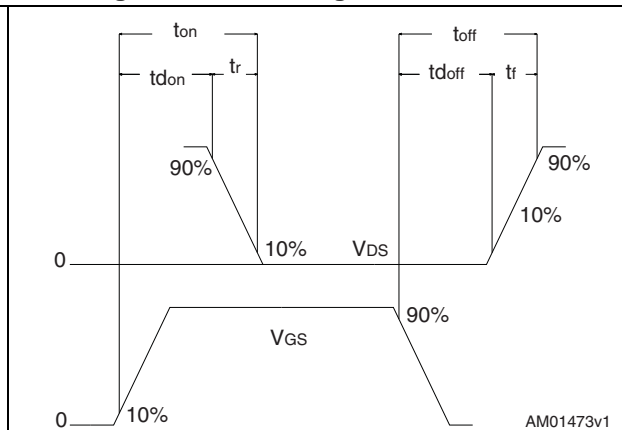
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Figure 17. Unclamped inductive waveform



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Figure 18. Switching time waveform



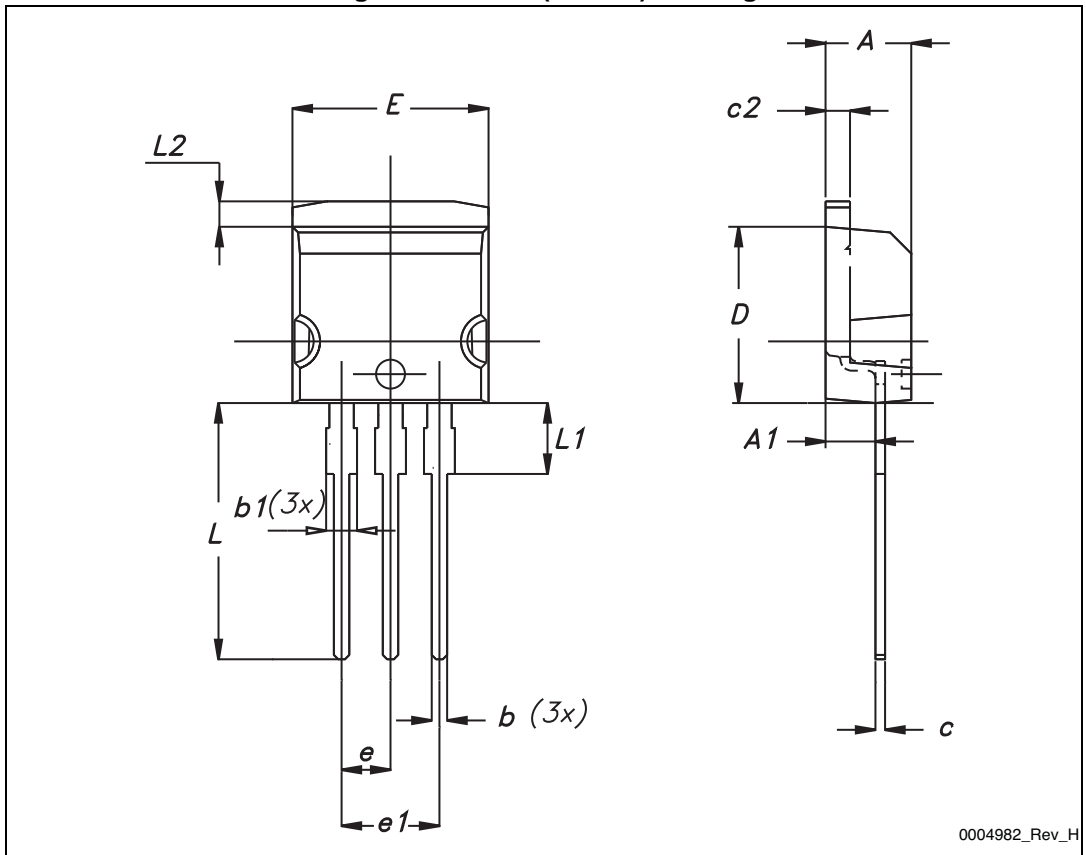
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## 4 Package mechanical data

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. I<sup>2</sup>PAK (TO-262) drawing



0004982\_Rev\_H

Table 8. I<sup>2</sup>PAK (TO-262) mechanical data

DIM.	mm.		
	min.	typ	max.
A	4.40		4.60
A1	2.40		2.72
b	0.61		0.88
b1	1.14		1.70
c	0.49		0.70
c2	1.23		1.32
D	8.95		9.35
e	2.40		2.70
e1	4.95		5.15
E	10		10.40
L	13		14
L1	3.50		3.93
L2	1.27		1.40

Figure 20. TO-220 type A drawing

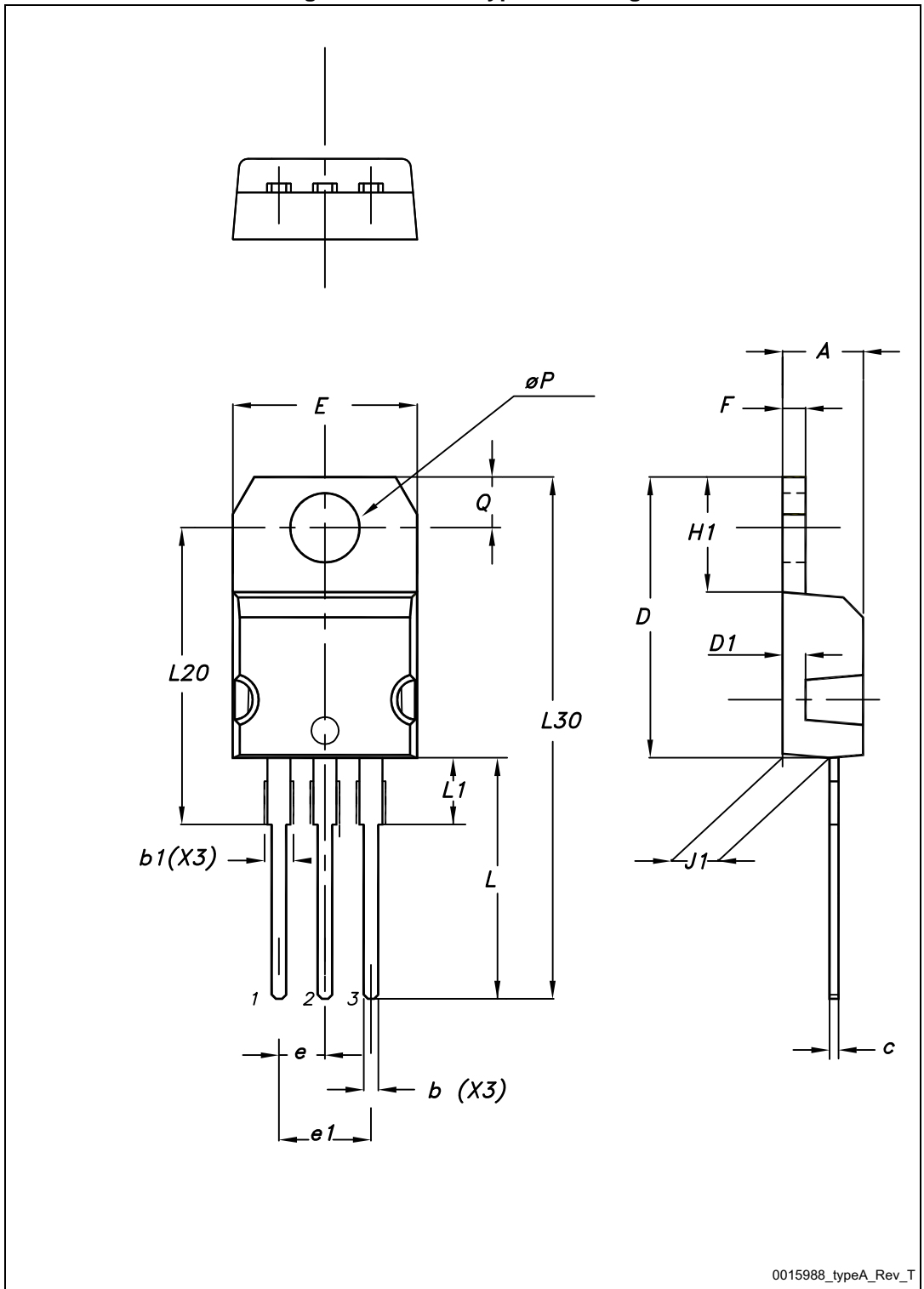


Table 9. TO-220 type A mechanical data

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	
∅P	3.75		3.85
Q	2.65		2.95

## 5 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
16-Apr-2013	1	First release.
22-Jan-2014	2	<ul style="list-style-type: none"> <li>- The part number STH150N10F7-2 has been moved to a separate datasheet</li> <li>- Added: I<sup>2</sup>PAK package</li> <li>- Modified: <a href="#">Figure 1</a></li> <li>- Modified: I<sub>D</sub> and I<sub>DM</sub> values in <a href="#">Table 2</a></li> <li>- Modified: R<sub>thj-case</sub> value in <a href="#">Table 3</a></li> <li>- Modified: R<sub>DS(on)</sub> values in <a href="#">Table 4</a></li> <li>- Modified: V<sub>SD</sub>, I<sub>D</sub> 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>
24-Feb-2014	3	<ul style="list-style-type: none"> <li>- Datasheet status promoted from preliminary data to production data</li> <li>- Modified: <a href="#">Figure 10</a></li> <li>- Minor text changes</li> </ul>
20-Aug-2014		<ul style="list-style-type: none"> <li>- Updated title, features and description in cover page.</li> <li>- Added E<sub>AS</sub> parameter in <a href="#">Table 2: Absolute maximum ratings</a>.</li> <li>- Minor text changes</li> </ul>

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