

N-channel 80 V, 0.008 Ω typ., 100 A, STripFET™ F6 Power MOSFET in a TO-220 package

Datasheet - production data

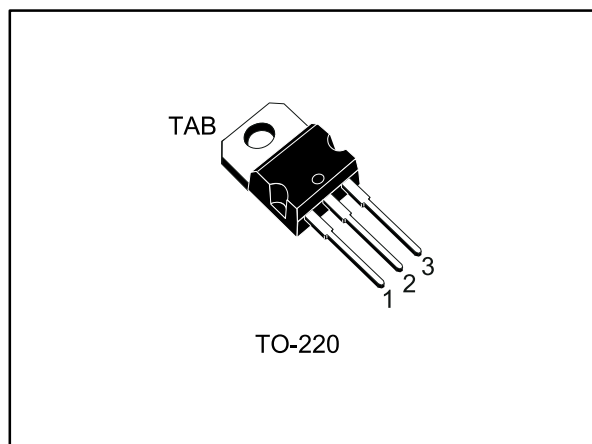
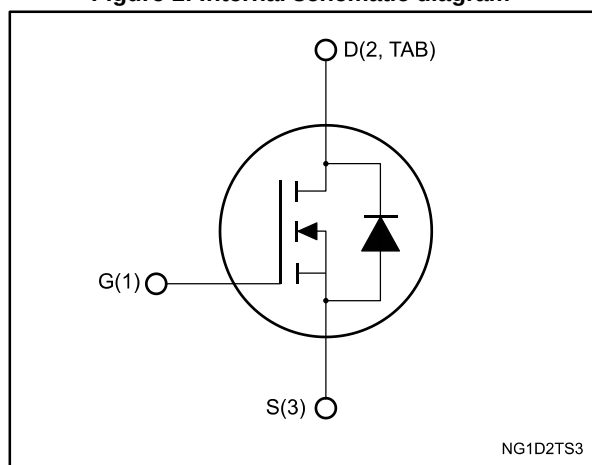


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STP100N8F6	80 V	0.009 Ω	100 A	176 W

- Very low on-resistance
- Very low gate charge
- High avalanche ruggedness
- Low gate drive power loss

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 very low R_{DS(on)} in all packages.

Table 1: Device summary

Order code	Marking	Package	Packing
STP100N8F6	100N8F6	TO-220	Tube

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
	2.1 Electrical characteristics (curves)	5
3	Test circuits	8
4	Package information	9
	4.1 TO-220 type A package information	10
	4.2 TO-220 type H package information	12
5	Revision history	14

1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	80	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	100	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	70	A
$I_{DM}^{(1)}$	Drain current (pulsed)	400	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	176	W
$E_{AS}^{(2)}$	Single pulse avalanche energy	170	mJ
T_J	Operating junction temperature range	-55 to 175	$^{\circ}\text{C}$
T_{stg}	Storage temperature range		$^{\circ}\text{C}$

Notes:

⁽¹⁾Pulse width is limited by safe operating area.

⁽²⁾Starting $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = 25\text{ A}$, $V_{dd} = 40\text{ V}$.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max.	0.85	$^{\circ}\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max.	62.5	$^{\circ}\text{C/W}$

2 Electrical characteristics

(T_C = 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	80			V
I _{DSS}	Zero-gate voltage drain current	V _{GS} = 0, V _{DS} = 80 V			1	μA
		V _{GS} = 0, V _{DS} = 80 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	2		4	V
R _{DS(on)}	Static drain-source on- resistance	V _{GS} = 10 V, I _D = 50 A		0.008	0.009	Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss}	Input capacitance	V _{GS} = 0, V _{DS} = 25 V, f = 1 MHz	-	5955	-	pF
C _{oss}	Output capacitance		-	244	-	pF
C _{rss}	Reverse transfer capacitance		-	160	-	pF
Q _g	Total gate charge	V _{DD} = 40 V, I _D = 100 A, V _{GS} = 10 V (see Figure 14: "Test circuit for gate charge behavior")	-	100	-	nC
Q _{gs}	Gate-source charge		-	30	-	nC
Q _{gd}	Gate-drain charge		-	25	-	nC

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
t _{d(on)}	Turn-on delay time	V _{DD} = 40 V, I _D = 50 A, R _G = 4.7 Ω, V _{GS} = 10 V (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	33	-	ns
t _r	Rise time		-	46	-	ns
t _{d(off)}	Turn-off delay time		-	103	-	ns
t _f	Fall time		-	21	-	ns

Table 7: Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0$, $I_{SD} = 100$ A	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 100$ A, $di/dt = 100$ A/ μ s	-	38		ns
Q_{rr}	Reverse recovery charge	$V_{DD} = 64$ V (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	63		nC
I_{RRM}	Reverse recovery current		-	3.3		A

Notes:

⁽¹⁾Pulsed: pulse duration = 300 μ s, duty cycle 1.5%.

2.1 Electrical characteristics (curves)

Figure 2: Safe operating area

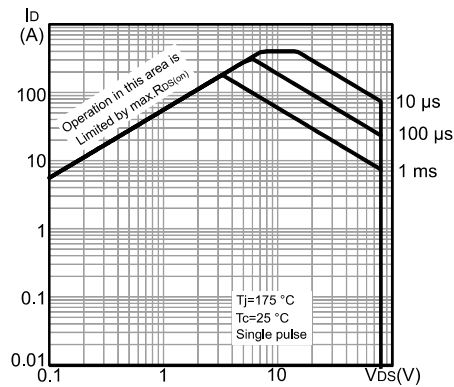


Figure 3: Thermal impedance

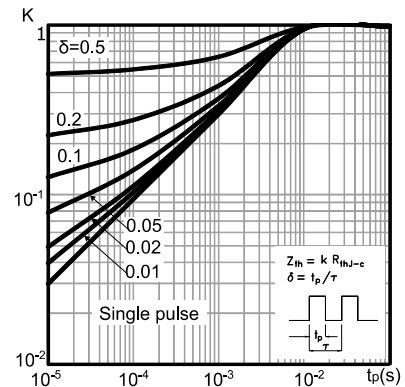


Figure 4: Output characteristics

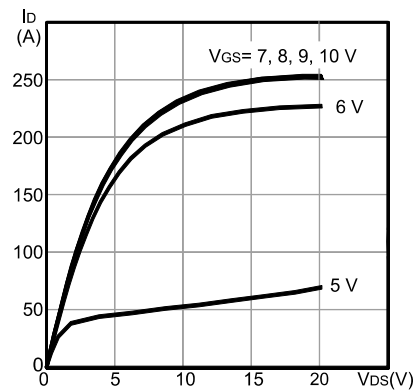


Figure 5: Transfer characteristics

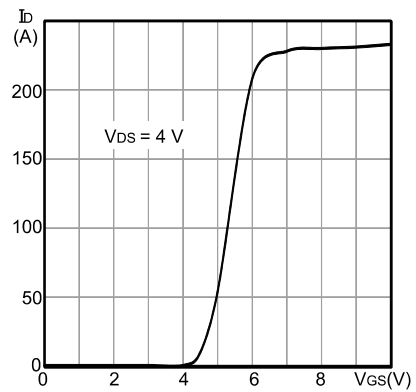


Figure 6: Normalized gate threshold voltage vs. temperature

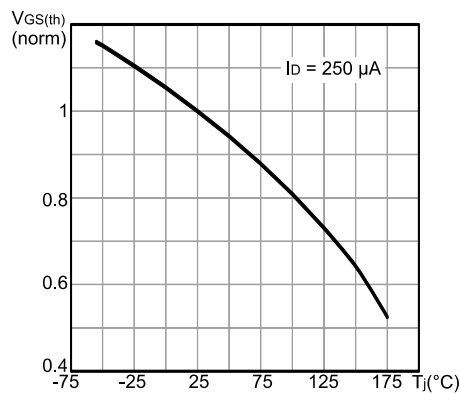
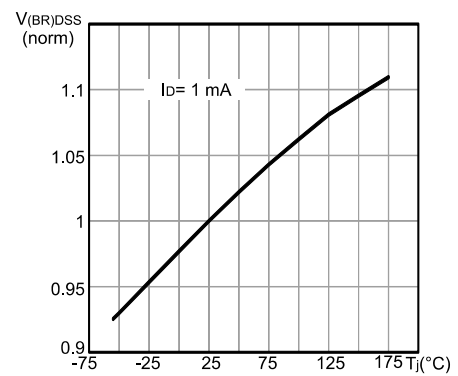
Figure 7: Normalized $V_{(BR)DSS}$ vs. temperature

Figure 8: Static drain-source on-resistance

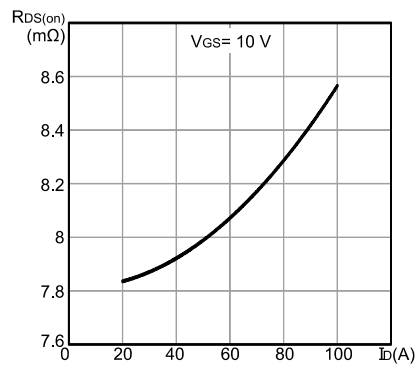


Figure 9: Normalized on-resistance vs. temperature

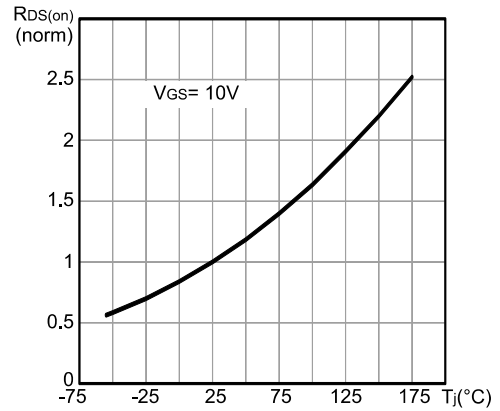


Figure 10: Gate charge vs. gate-source voltage

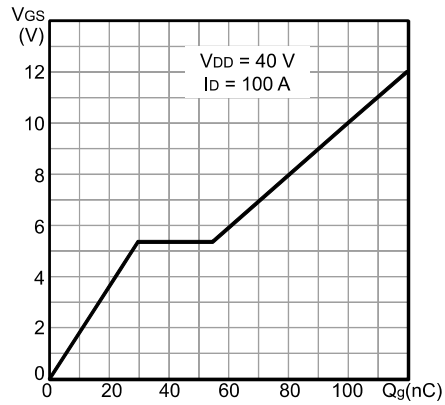


Figure 11: Capacitance variations

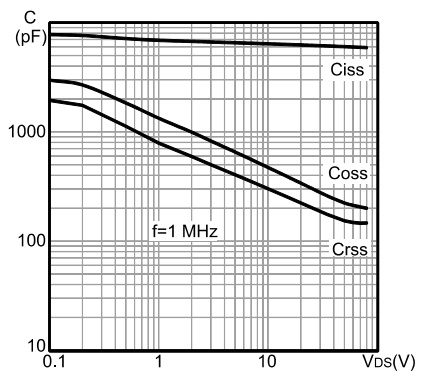
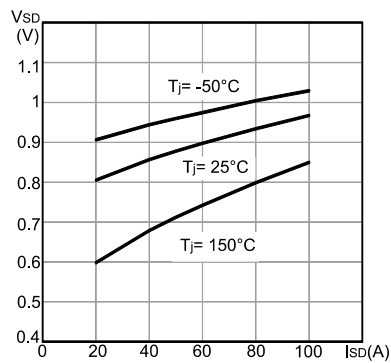
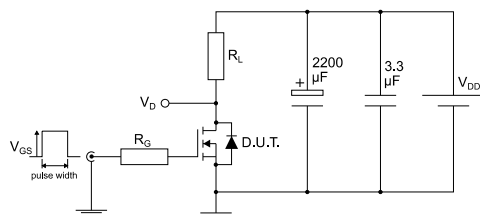


Figure 12: Source-drain diode forward characteristics



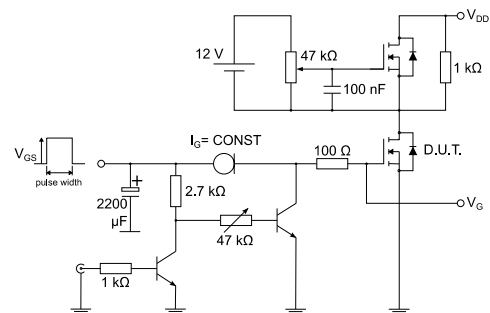
3 Test circuits

Figure 13: Test circuit for resistive load switching times



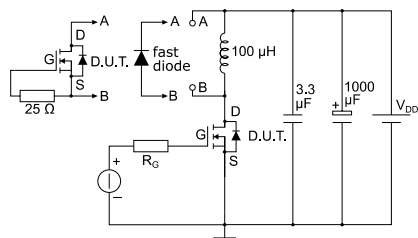
AM01468v1

Figure 14: Test circuit for gate charge behavior



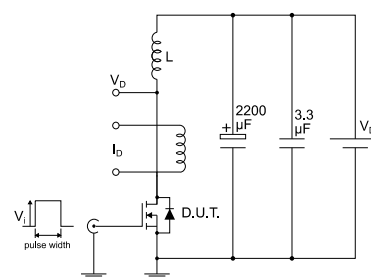
AM01469v1

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



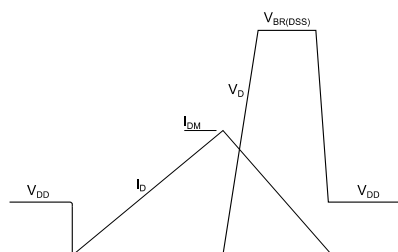
AM01470v1

Figure 16: Unclamped inductive load test circuit



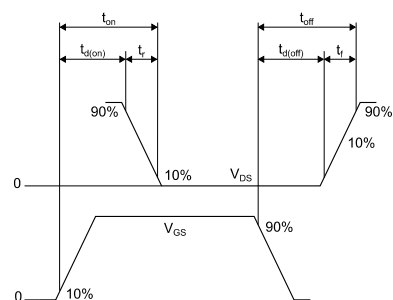
AM01471v1

Figure 17: Unclamped inductive waveform



AM01472v1

Figure 18: Switching time waveform



AM01473v1

4 Package information

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.

4.1 TO-220 type A package information

Figure 19: TO-220 type A package outline

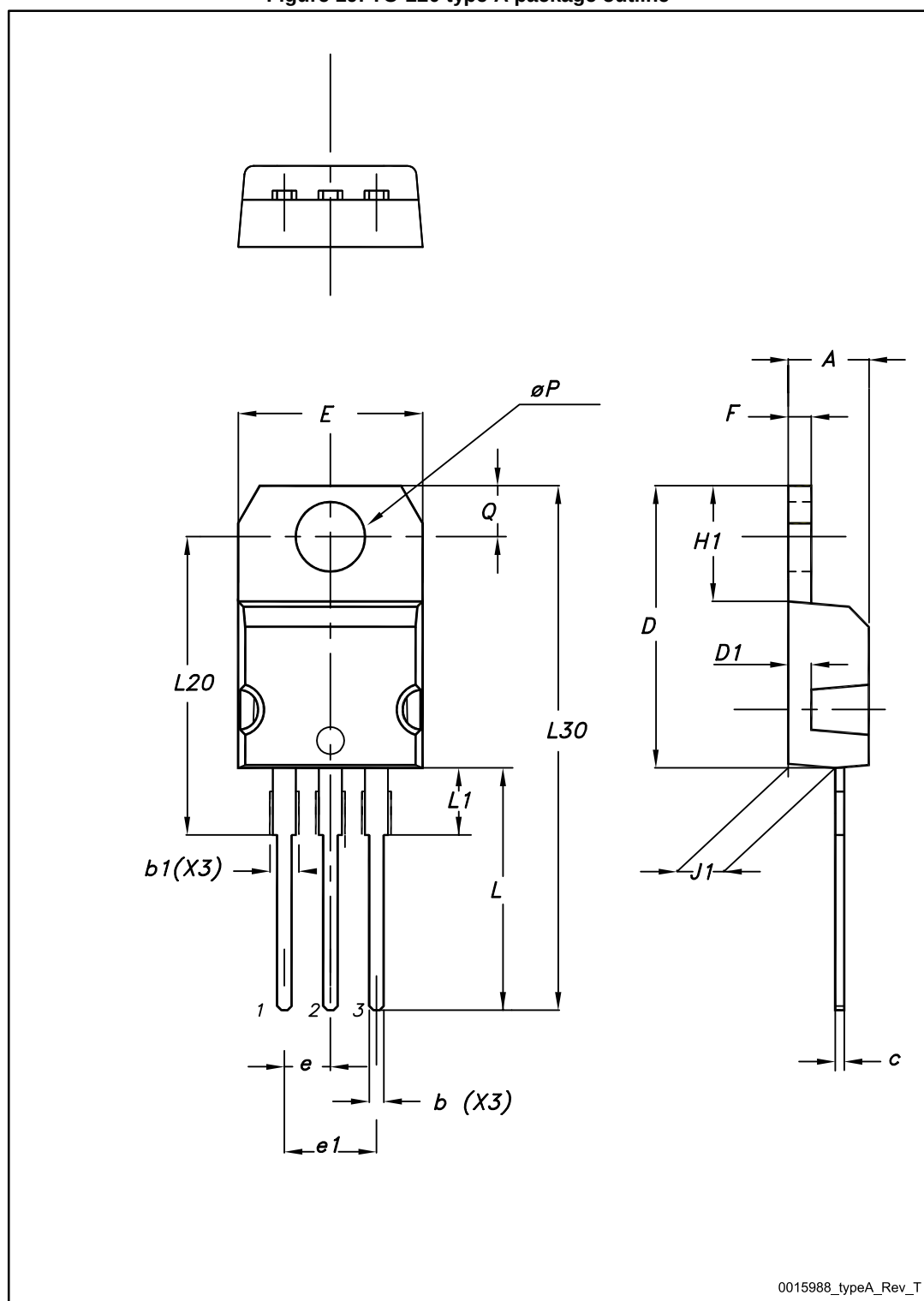


Table 8: TO-220 type A mechanical data

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

4.2 TO-220 type H package information

Figure 20: TO-220 type H package outline

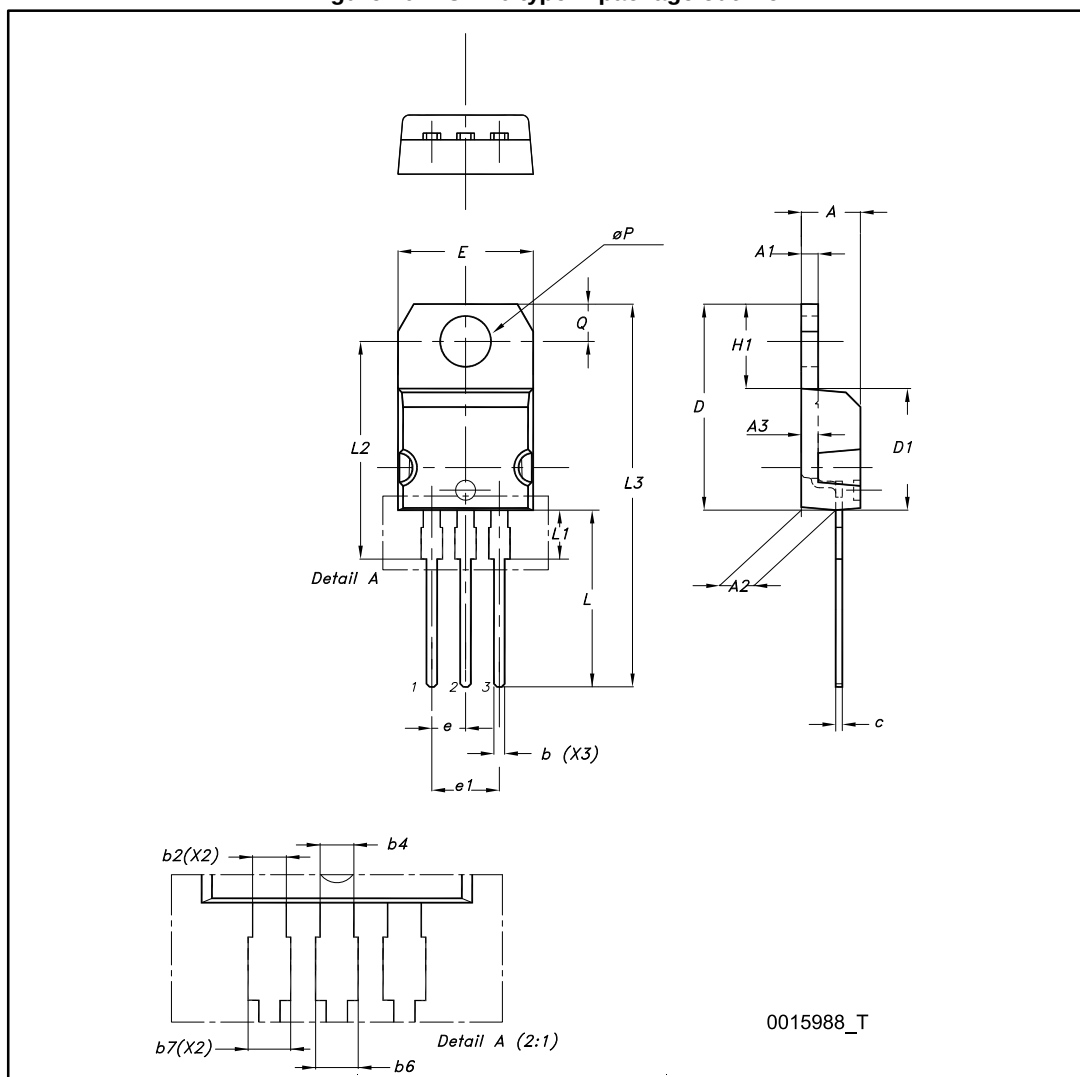


Table 9: TO-220 type H package mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.40	4.45	4.50
A1	1.22		1.32
A2	2.49	2.59	2.69
A3	1.17	1.27	1.37
b	0.78		0.87
b2	1.25		1.34
b4	1.20		1.29
b6			1.50
b7			1.45
c	0.49		0.56
D	15.40	15.50	15.60
D1	9.05	9.15	9.25
E	10.08	10.18	10.28
e	2.44	2.54	2.64
e1	4.98	5.08	5.18
H1	6.25	6.35	6.45
L	13.20	13.40	13.60
L1	3.50	3.70	3.90
L2	16.30	16.40	16.50
L3	28.70	28.90	29.10
øP	3.75	3.80	3.85
Q	2.70	2.80	2.90

5 Revision history

Table 10: Document revision history

Date	Revision	Changes
02-Sep-2014	1	Initial release.
02-Dec-2014	2	Document status promoted from preliminary to production data. Added the section of electrical characteristics (curves). Minor text changes.
08-Feb-2016	3	Added Section 4.2: "TO-220 type H package information" .

IMPORTANT NOTICE – PLEASE READ CAREFULLY

STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST's terms and conditions of sale in place at the time of order acknowledgement.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of Purchasers' products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2016 STMicroelectronics – All rights reserved