STP105N3LL

N-channel 30 V, 2.7 mΩ typ., 150 A, STripFET™ H6 Power MOSFET in a TO-220 package

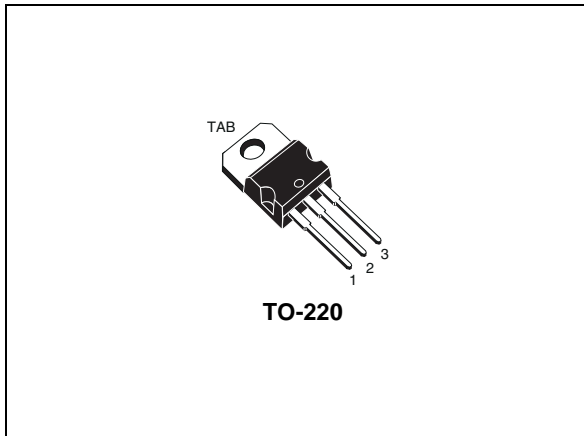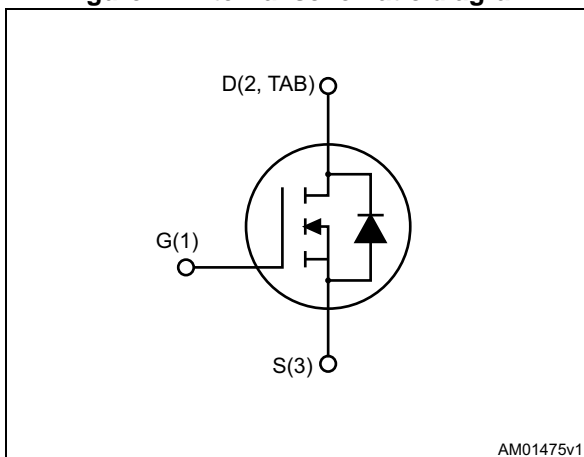**Datasheet − production data**

TO-220

Figure 1. Internal schematic diagram

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Features

Order code	V_{DS}	$R_{DS(on)}$ max.	I_D
STP105N3LL	30 V	3.5 mΩ	150 A

- 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™ H6 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	Packages	Packaging
STP105N3LL	P105N3LL	TO-220	Tube

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Contents

1   Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	30	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Continuous drain current at T_C = 25 °C (silicon limited)	150	A
I_D	Continuous drain current at T_C = 100 °C (silicon limited)	105	A
I_D	Continuous drain current at T_C = 25 °C (package limited)	80	A
I_{DM} [1]	Pulsed drain current	320	A
P_{TOT}	Total dissipation at T_C = 25 °C	140	W
	Derating factor	0.9	W/°C
E_{AS} [2]	Single pulse avalanche energy	150	mJ
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Max. operating junction temperature	175	°C

1.   Pulse width limited by safe operating area

2.   Starting T_j = 25°C, I_{AV} = 40 A

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.1	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	°C/W

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified).

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	I_D = 250 µA, V_{GS}= 0	30			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = 30 V			1	µA
		V_{DS} = 30 V, Tc = 125 °C			10	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	1		2.5	V
$R_{DS(on)}$	Static drain-source on-resistance	V_{GS} = 10 V, I_D = 40 A		2.7	3.5	mΩ
		V_{GS} = 4.5 V, I_D = 40 A		3.5	4.5	mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
C_{iss}	Input capacitance	V_{DS} = 25 V, f=1 MHz, V_{GS} = 0	-	3500	-	pF
C_{oss}	Output capacitance		-	400	-	pF
C_{rss}	Reverse transfer capacitance		-	380	-	pF
Q_g	Total gate charge	V_{DD} = 15 V, I_D = 80 A V_{GS} = 4.5 V *Figure 14*	-	42	-	nC
Q_{gs}	Gate-source charge		-	9	-	nC
Q_{gd}	Gate-drain charge		-	18	-	nC
R_g	Gate input resistance	f = 1 MHz, gate DC Bias = 0, test signal level = 20 mV, I_D = 0	-	1	-	Ω

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{DD} = 15 V, I_D = 40 A, R_G = 4.7 Ω, V_{GS} = 5 V *Figure 13*	-	19	-	ns
t_r	Rise time		-	91	-	ns
$t_{d(off)}$	Turn-off delay time		-	24.5	-	ns
t_f	Fall time		-	23.4	-	ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain current		-		80	A
I_{SDM}[1]	Source-drain current (pulsed)		-		320	A
V_{SD}[2]	Forward on voltage	I_{SD} = 40 A, V_{GS} = 0	-		1.1	V
t_{rr}	Reverse recovery time	I_{SD} = 80 A, di/dt = 100 A/µs, V_{DD} = 24 V *Figure 15*	-	28.6		ns
Q_{rr}	Reverse recovery charge		-	22.8		nC
I_{RRM}	Reverse recovery current		-	1.6		A

1. Pulse width limited by safe operating area

2. Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area
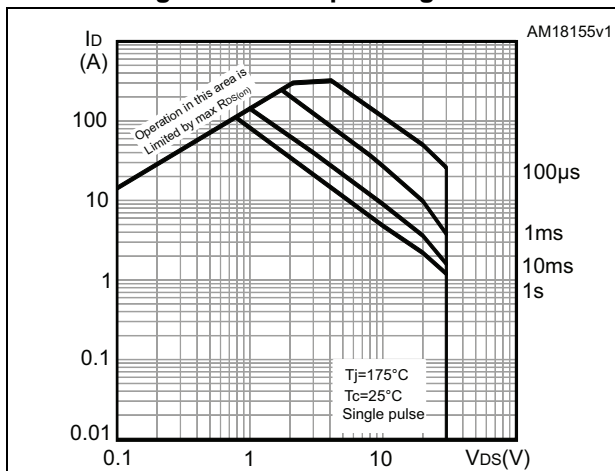
Figure 3. Thermal impedance
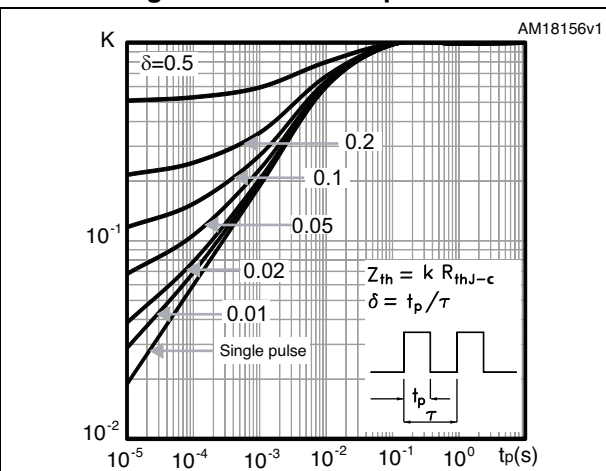
Figure 4. Output characteristics
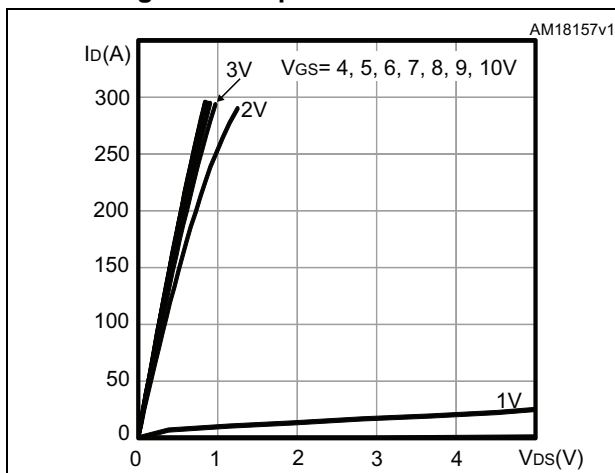
Figure 5. Transfer characteristics
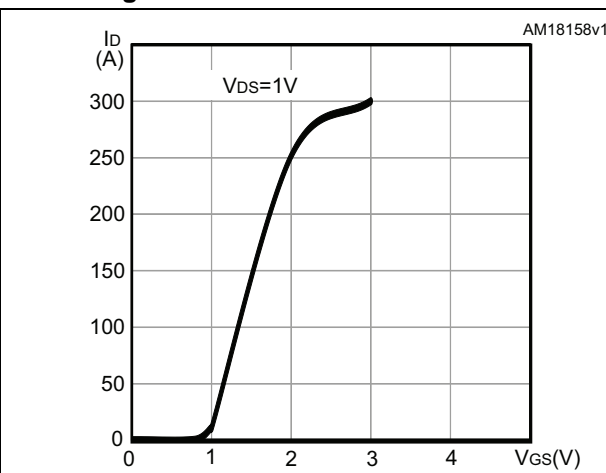
Figure 6. Gate charge vs gate-source voltage
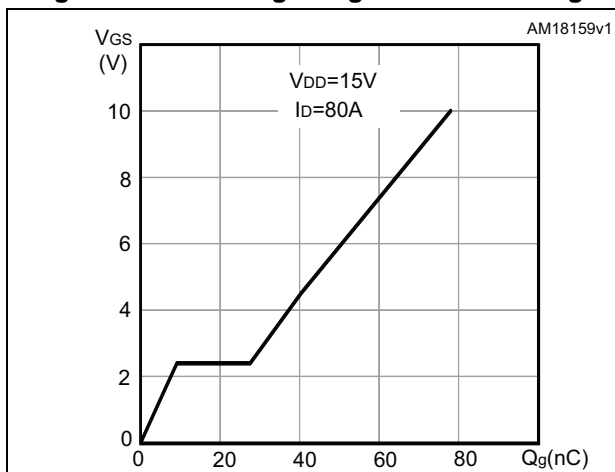
Figure 7. Static drain-source on-resistance
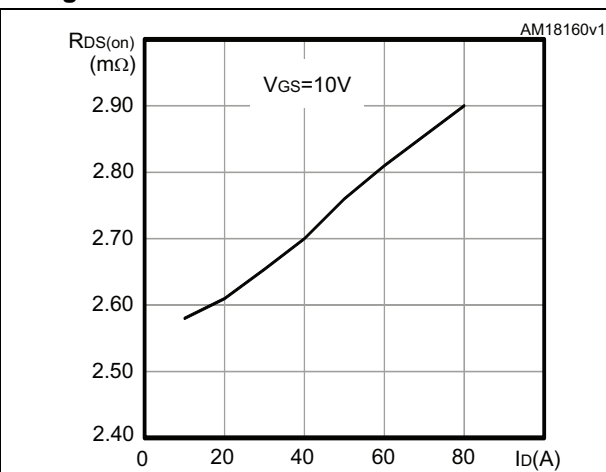
Figure 8. Capacitance variations

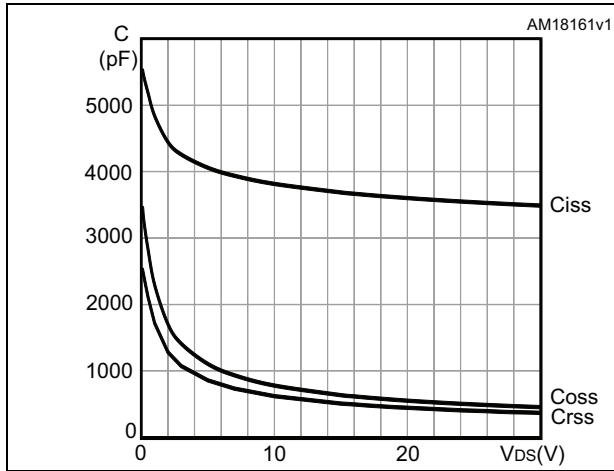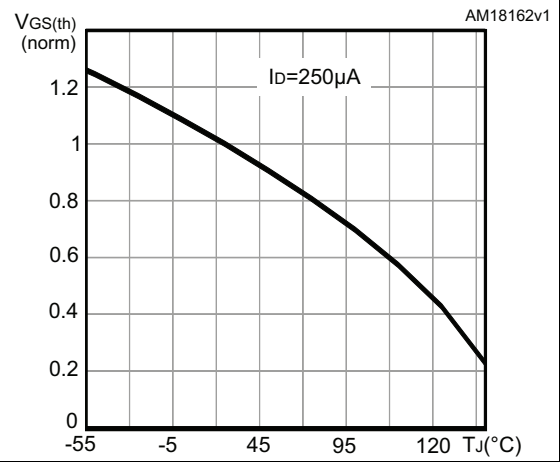**Figure 9. Normalized gate threshold voltage vs temperature**
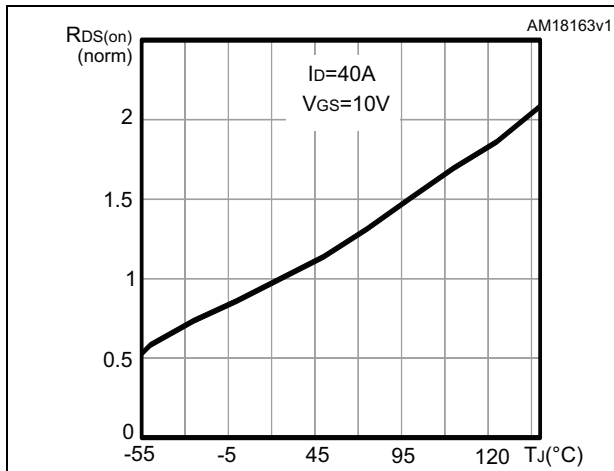

Figure 10. Normalized on-resistance vs temperature

Figure 11. Normalized V$_{(BR)DSS}$ vs temperature
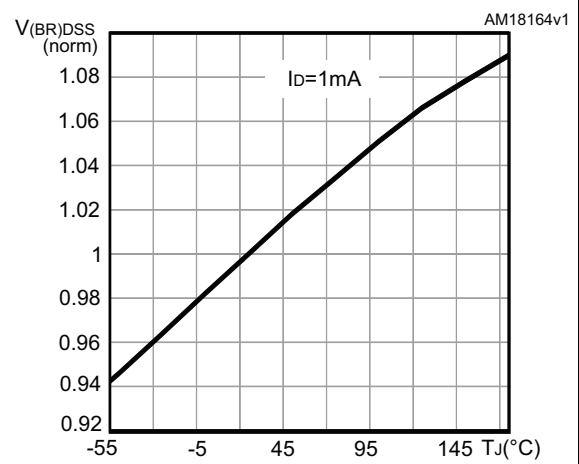
Figure 12. Source-drain diode forward characteristics
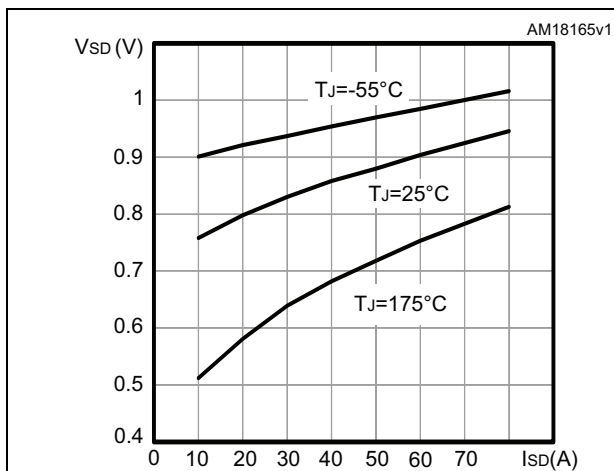
3 Test circuits

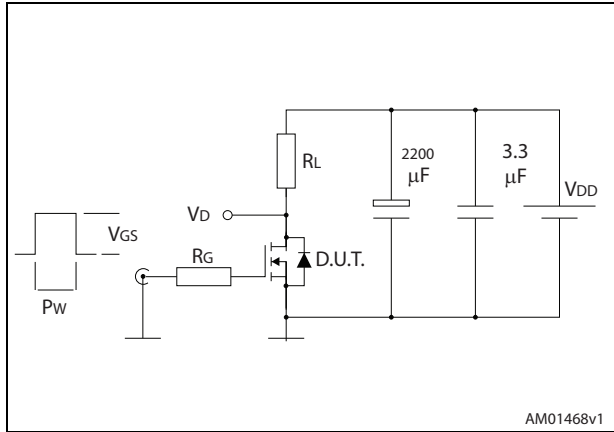**Figure 13. Switching times test circuit for resistive load**

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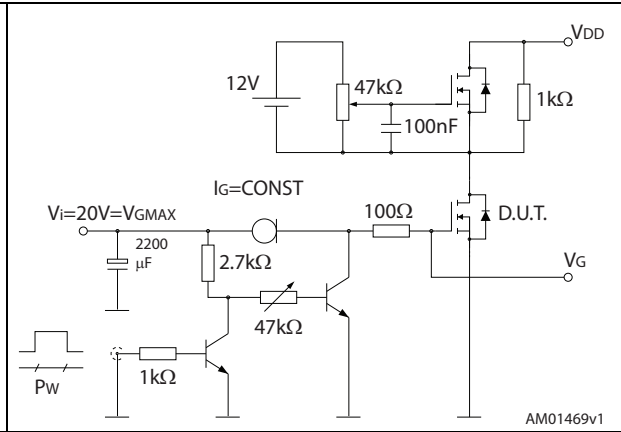
Figure 14. Gate charge test circuit

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

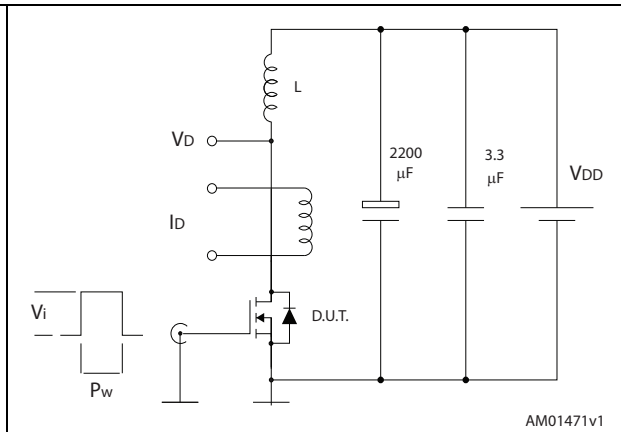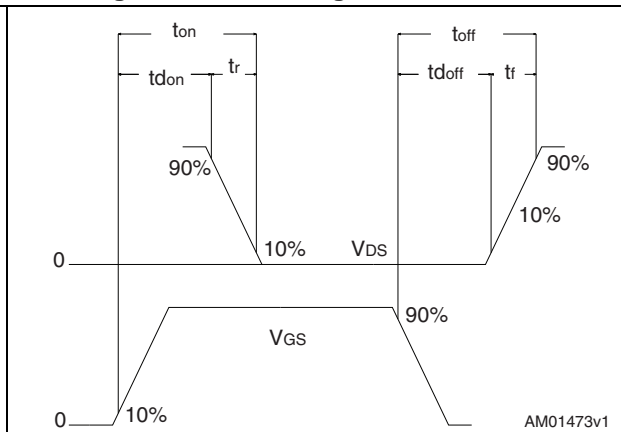AM01470v1

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 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.

Figure 19. TO-220 type A package outline
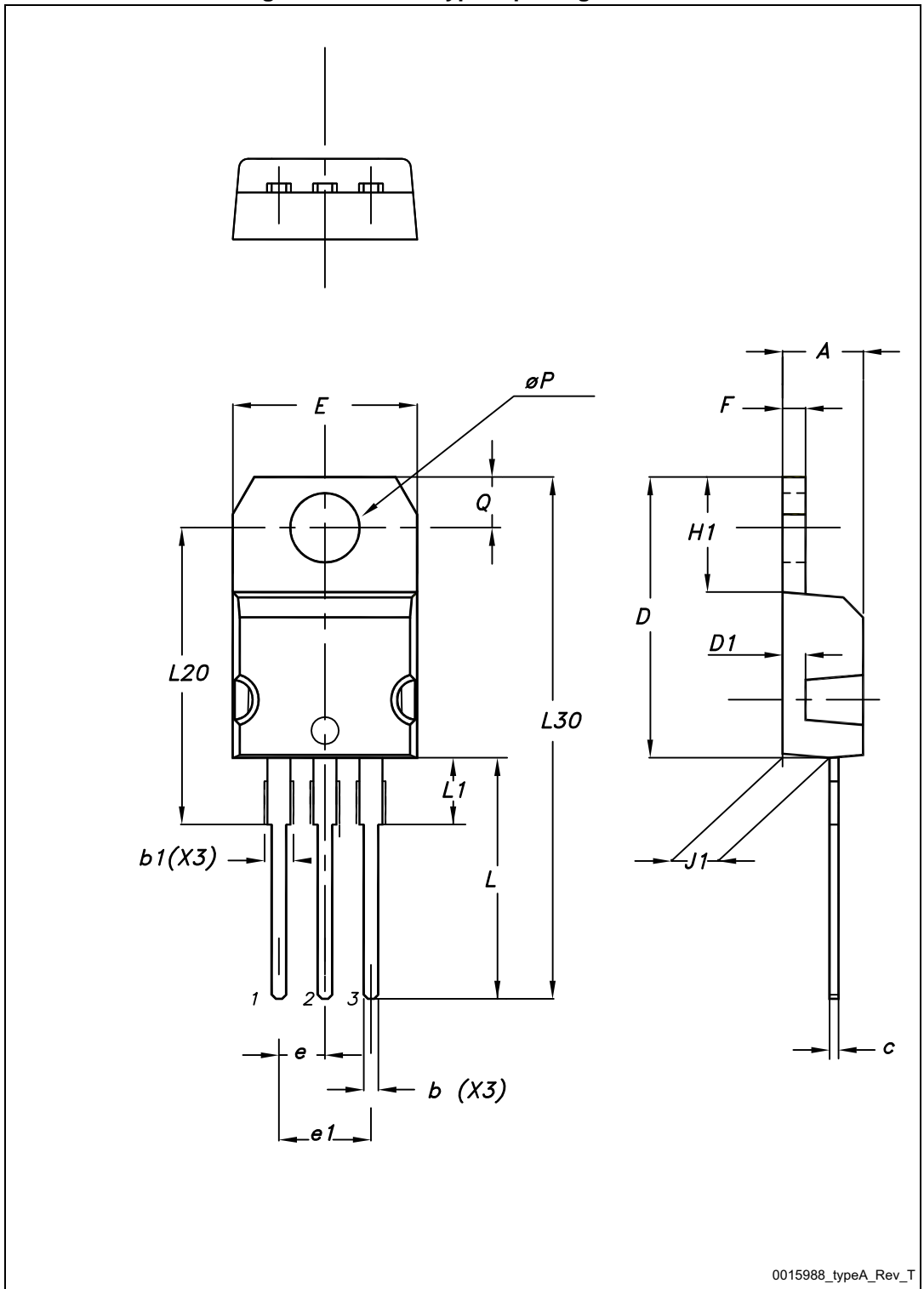
0015988_typeA_Rev_T

Table 8. TO-220 type A package 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 9. Document revision history

Date	Revision	Changes
13-Dec-2012	1	First release.
03-Apr-2014	2	– Added: *Section 2.1: Electrical characteristics (curves)* – Minor text changes
06-Jul-2015	3	– Updated *Table 1: Device summary*. – Updated title, features and description in cover page. – Minor text changes.

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