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N-channel 30 V, 2.15 mΩ typ., 120 A Power MOSFET in a TO-220 package

Datasheet - production data

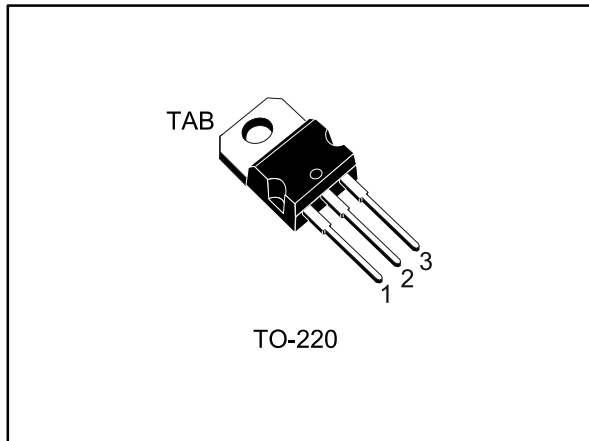
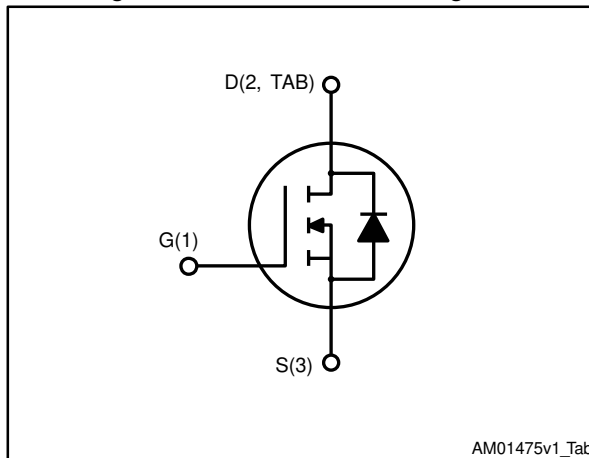


Figure 1: Internal schematic diagram



AM01475v1_Tab

Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STP200N3LL	30 V	2.4 mΩ	120 A	176.5 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 with very low R_{DS(on)} in all packages.

Table 1: Device summary

Order code	Marking	Package	Packing
STP200N3LL	200N3LL	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	30	V
V _{GS}	Gate-source voltage	±20	
I _D	Drain current (continuous) at T _{case} = 25 °C (silicon limited)	200	A
I _D ⁽¹⁾	Drain current (continuous) at T _{case} = 25 °C	120	
I _D	Drain current (continuous) at T _{case} = 100 °C	120	
I _{DM} ⁽²⁾	Drain current (pulsed)	480	
P _{TOT}	Total dissipation at T _{case} = 25 °C	176.5	W
E _{AS} ⁽³⁾	Single pulse avalanche energy	300	mJ
T _{stg}	Storage temperature range	-55 to 175	°C
T _j	Operating junction temperature range		

Notes:

- (1) Current is limited by package.
- (2) Pulse width is limited by safe operating area.
- (3) starting T_j = 25 °C, I_D = 68 A

Table 3: Thermal data

Symbol	Parameter	Value	Unit
R _{thj-case}	Thermal resistance junction-case	0.85	°C/W
R _{thj-amb}	Thermal resistance junction-ambient	62.5	

2 Electrical characteristics

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

Table 4: Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{DSS}}$	Drain-source breakdown voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 1\text{ mA}$	30			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 30\text{ V}$			1	μA
		$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 30\text{ V}$, $T_{\text{case}} = 125\text{ °C}^{(1)}$			10	
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = \pm 20\text{ V}$			± 100	nA
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	1		2.5	V
$R_{\text{DS(on)}}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 60\text{ A}$		2.15	2.4	m Ω
		$V_{\text{GS}} = 4.5\text{ V}$, $I_{\text{D}} = 60\text{ A}$		2.5	3.1	

Notes:

⁽¹⁾Defined by design, not subject to production test.

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ISS}	Input capacitance	$V_{\text{DS}} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	5200	-	pF
C_{OSS}	Output capacitance		-	640	-	
C_{RSS}	Reverse transfer capacitance		-	510	-	
Q_{g}	Total gate charge	$V_{\text{DD}} = 15\text{ V}$, $I_{\text{D}} = 120\text{ A}$, $V_{\text{GS}} = 4.5\text{ V}$ (see Figure 14: "Test circuit for gate charge behavior")	-	53	-	nC
Q_{gs}	Gate-source charge		-	13	-	
Q_{gd}	Gate-drain charge		-	27	-	
R_{G}	Intrinsic gate resistance	$f = 1\text{ MHz}$, $I_{\text{D}} = 0\text{ A}$, gate DC bias = 0 V , magnitude of alternative signal = 20 mV	-	1.1	-	Ω

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d(on)}}$	Turn-on delay time	$V_{\text{DD}} = 15\text{ V}$, $I_{\text{D}} = 60\text{ A}$ $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 13: "Test circuit for resistive load switching times" and Figure 18: "Switching time waveform")	-	18	-	ns
t_{r}	Rise time		-	183	-	
$t_{\text{d(off)}}$	Turn-off delay time		-	90	-	
t_{f}	Fall time		-	108	-	

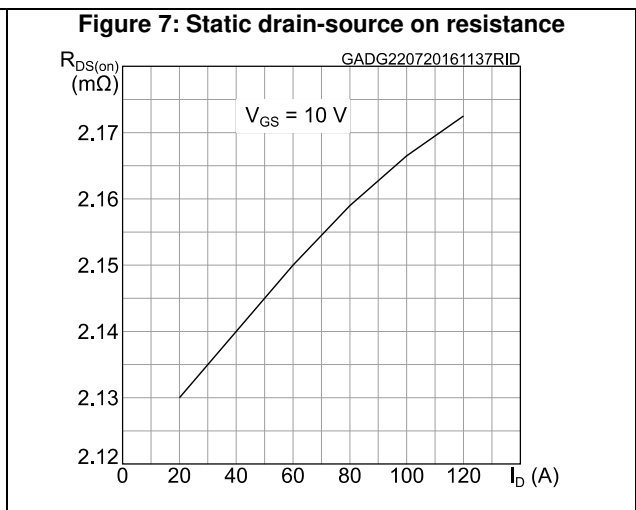
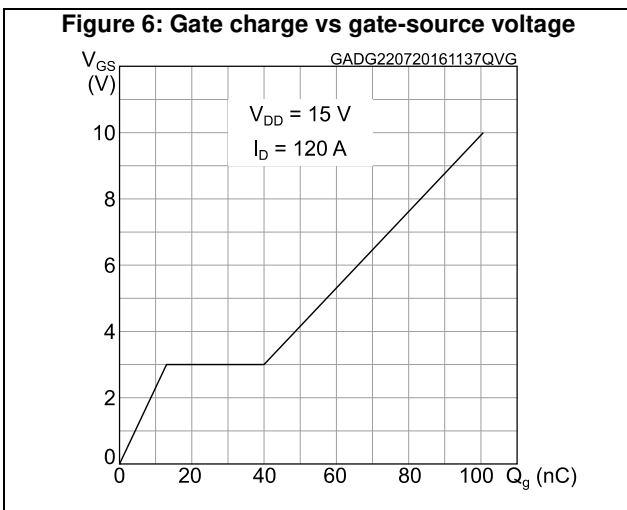
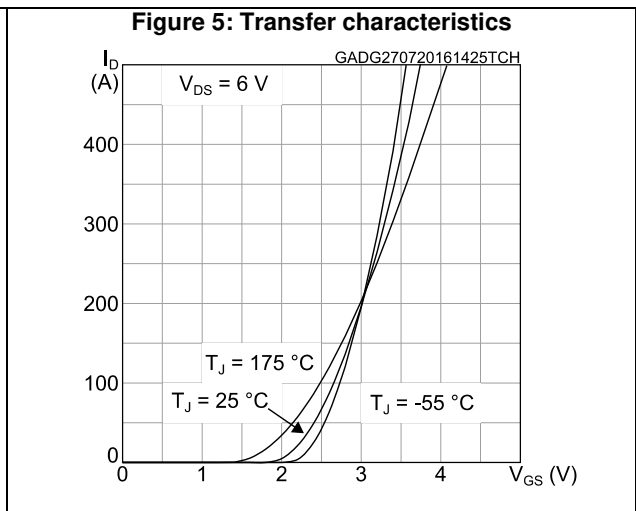
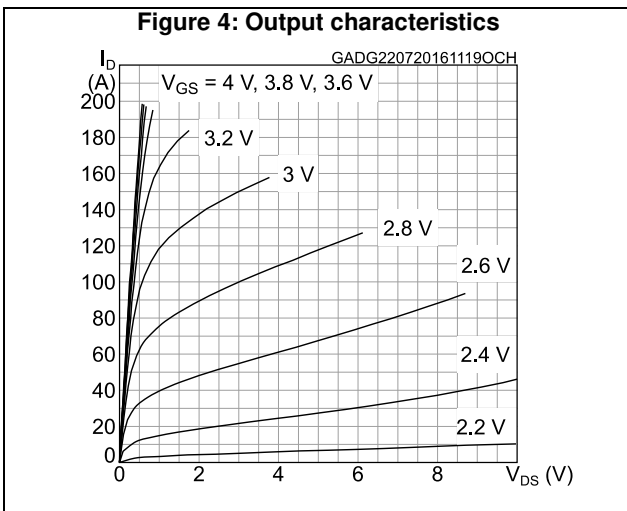
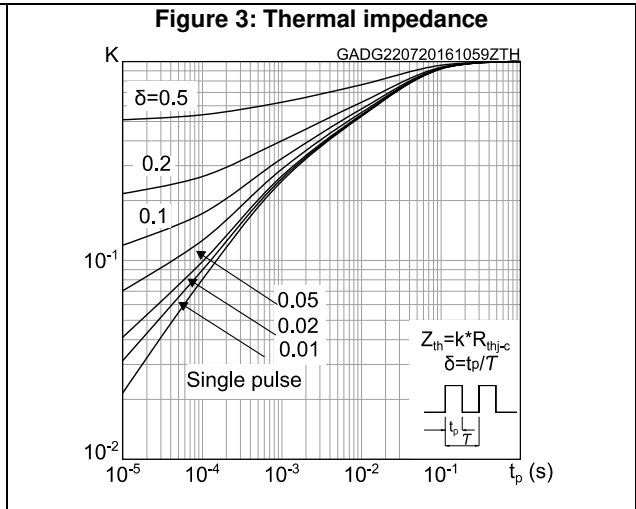
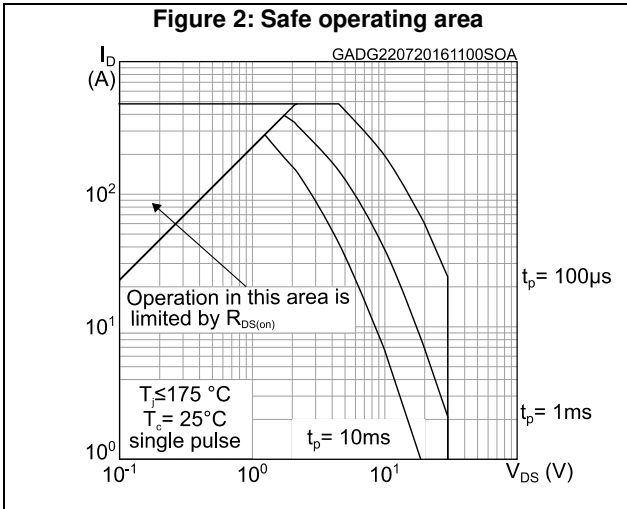
Table 7: Source-drain diode

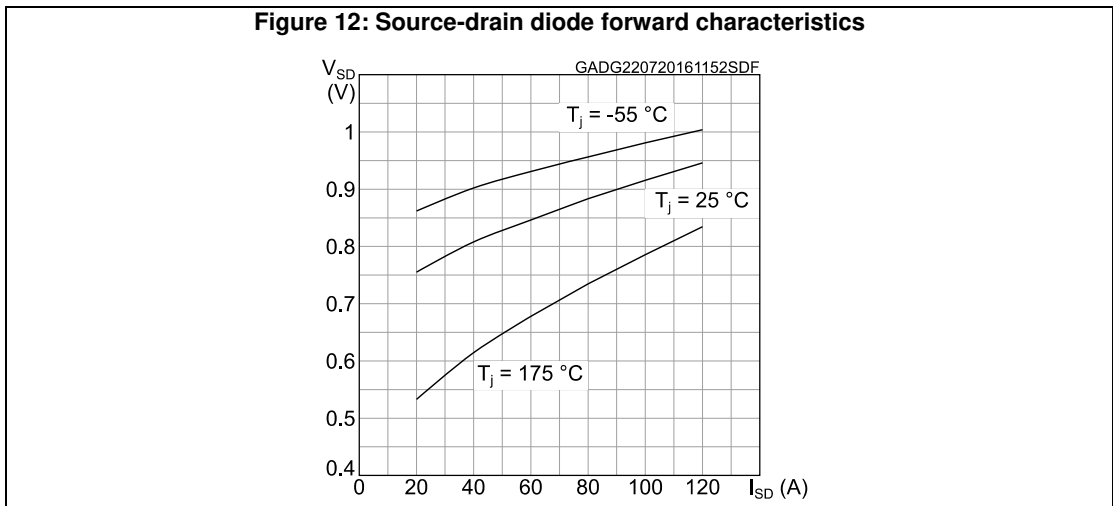
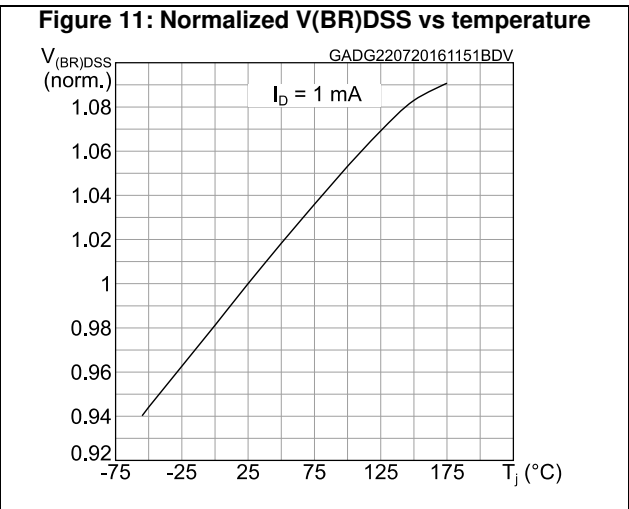
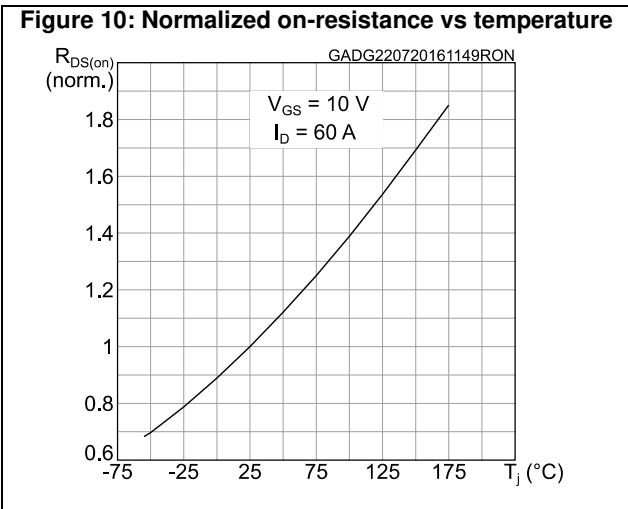
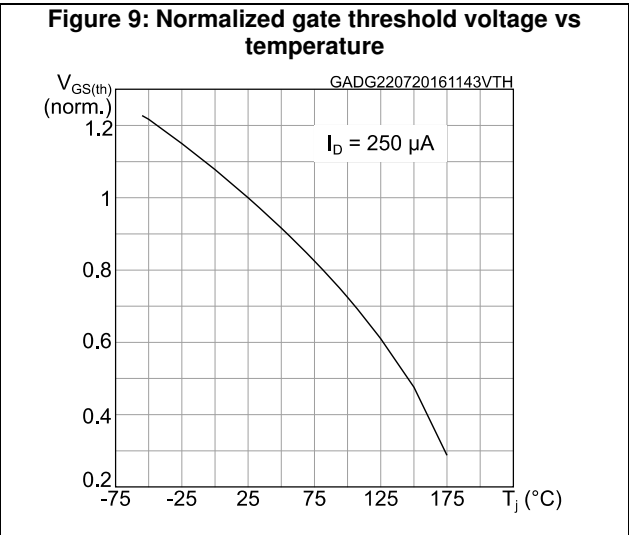
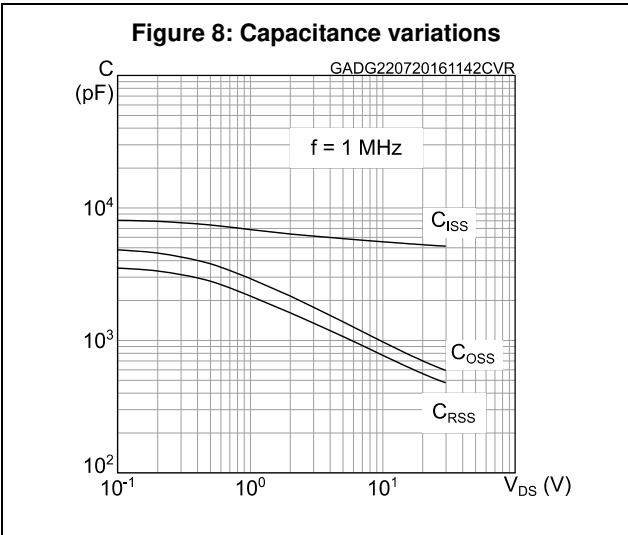
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$V_{GS} = 0 \text{ V}$, $I_{SD} = 60 \text{ A}$	-		1.1	V
t_{rr}	Reverse recovery time	$I_{SD} = 120 \text{ A}$, $di/dt = 100 \text{ A}/\mu\text{s}$, $V_{DD} = 24 \text{ V}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	35		ns
Q_{rr}	Reverse recovery charge		-	34		nC
I_{RRM}	Reverse recovery current		-	2		A

Notes:

(1) Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

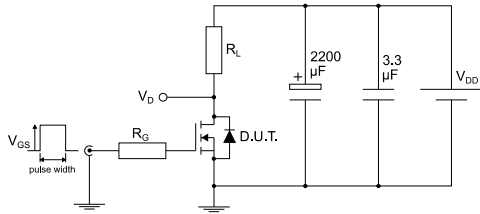
2.1 Electrical characteristics (curves)





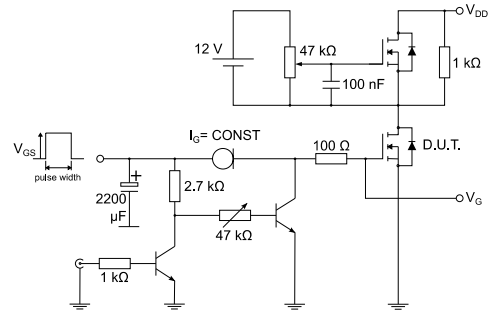
3 Test circuits

Figure 13: Test circuit for resistive load switching times



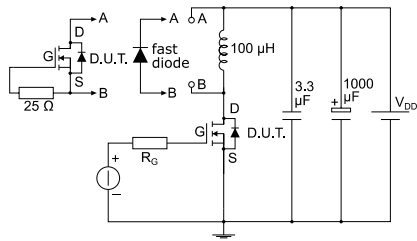
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Figure 14: Test circuit for gate charge behavior



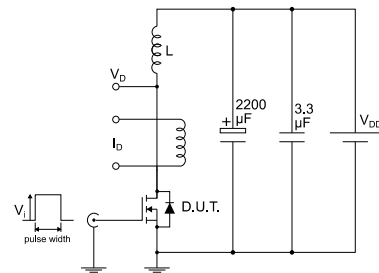
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Figure 15: Test circuit for inductive load switching and diode recovery times



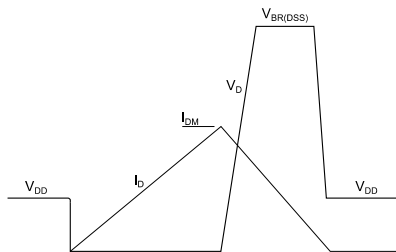
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Figure 16: Unclamped inductive load test circuit



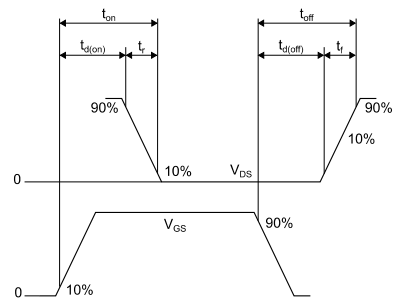
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Figure 17: Unclamped inductive waveform



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Figure 18: Switching time waveform



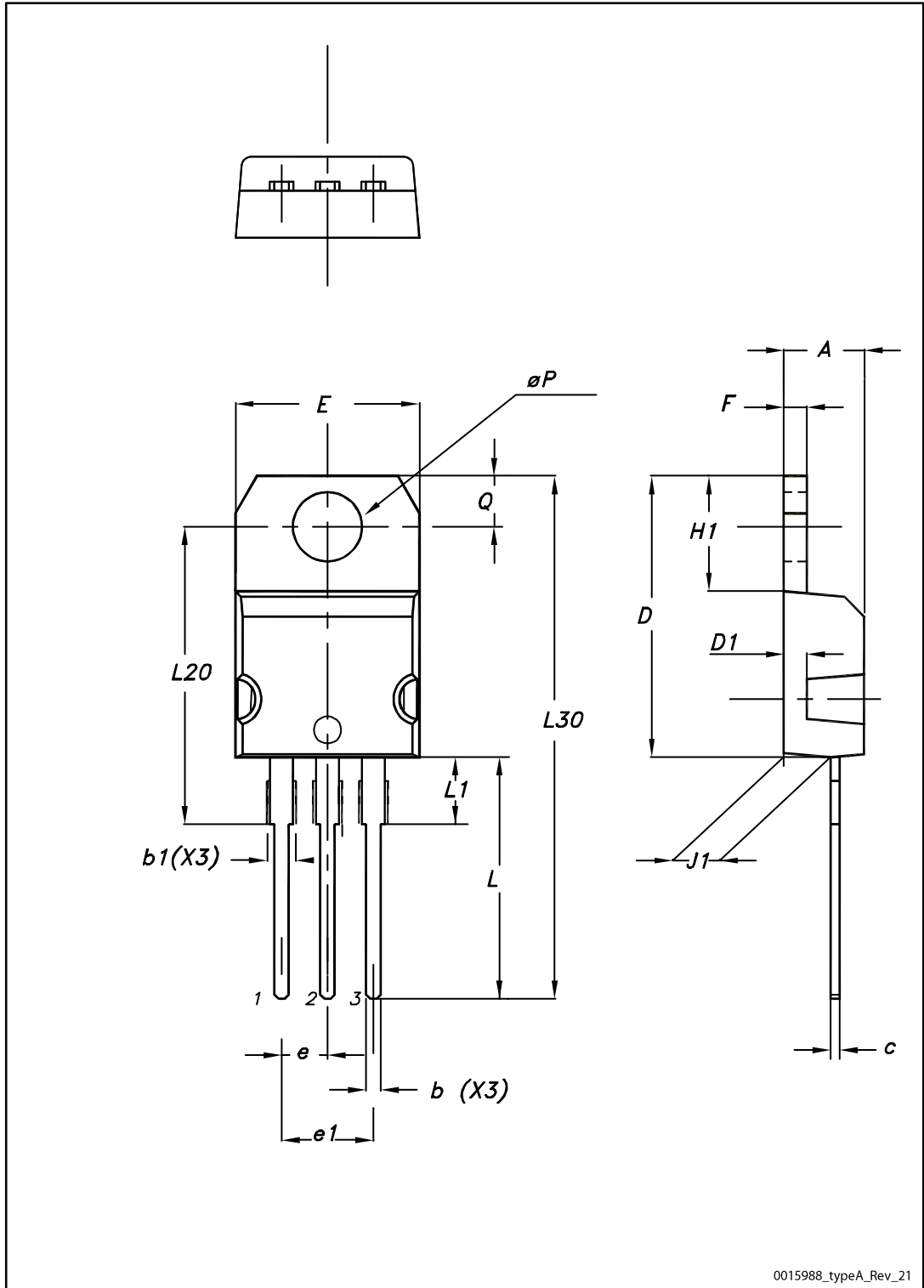
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4 Package information

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



0015988_typeA_Rev_21

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		1.55
c	0.48		0.70
D	15.25		15.75
D1		1.27	
E	10.00		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	13.00		14.00
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
14-Dec-2015	1	First release.
27-Jul-2016	2	Document status promoted from preliminary to production data. Updated <i>Section 2: "Electrical ratings"</i> and <i>Section 3: "Electrical characteristics"</i> . Added <i>Section 3.1: "Electrical characteristics (curves)"</i> . Minor text changes.

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