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N-channel 80 V, 0.0056 Ω typ., 110 A, STripFET™ F6 Power MOSFET in a TO-220 package

Datasheet - production data

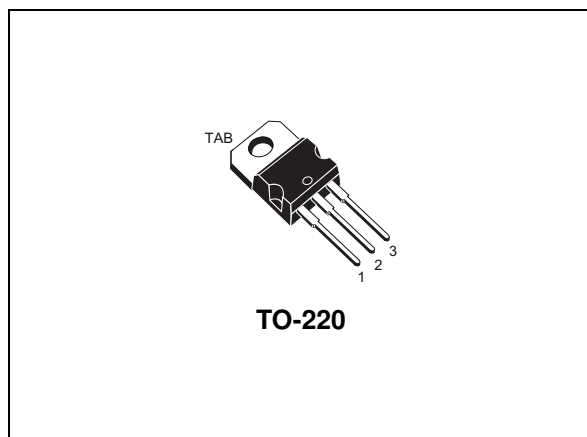
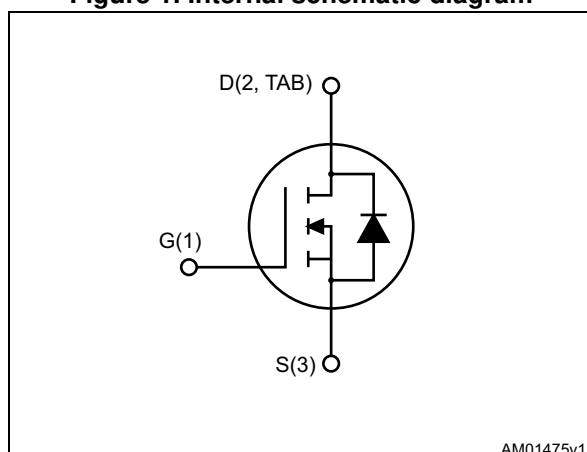


Figure 1. Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max	I _D	P _{TOT}
STP110N8F6	80 V	0.0065 Ω	110 A	200 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
STP110N8F6	110N8F6	TO-220	Tube

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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 $T_C = 25\text{ }^{\circ}\text{C}$	110	A
I_D	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	85	A
$I_{DM}^{(1)}$	Drain current (pulsed)	440	A
P_{TOT}	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	200	W
$E_{AS}^{(2)}$	Single pulse avalanche energy	180	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 $T_J = 25\text{ }^{\circ}\text{C}$, $I_D = 55\text{ A}$, $V_{DD} = 60\text{ V}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max.	0.75	$^{\circ}\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max.	62.5	$^{\circ}\text{C/W}$

2 Electrical characteristics

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

Table 4. On/off-state

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$V_{GS} = 0, I_D = 1\text{ mA}$	80			V
I_{DSS}	Zero-gate voltage drain current	$V_{GS} = 0, V_{DS} = 80\text{ V}$			1	μA
		$V_{GS} = 0, V_{DS} = 80\text{ V}, T_C = 125\text{ }^{\circ}\text{C}$			100	μA
I_{GSS}	Gate-body leakage current	$V_{DS} = 0, V_{GS} = +20\text{ V}$			100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.5		4.5	V
$R_{DS(on)}$	Static drain-source on- resistance	$V_{GS} = 10\text{ V}, I_D = 55\text{ A}$		0.0056	0.0065	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 40\text{ V}, f = 1\text{ MHz}, V_{GS} = 0$	-	9130	-	pF
C_{oss}	Output capacitance		-	320	-	pF
C_{rss}	Reverse transfer capacitance		-	225	-	pF
Q_g	Total gate charge	$V_{DD} = 40\text{ V}, I_D = 110\text{ A}, V_{GS} = 10\text{ V}$ (see Figure 14)	-	150	-	nC
Q_{gs}	Gate-source charge		-	40	-	nC
Q_{gd}	Gate-drain charge		-	30	-	nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 40\text{ V}, I_D = 55\text{ A}, R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ (see Figure 13)	-	24	-	ns
t_r	Rise time		-	61	-	ns
$t_{d(off)}$	Turn-off delay time		-	162	-	ns
t_f	Fall time		-	48	-	ns

Table 7. Source-drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 110\text{ A}$, $V_{GS} = 0$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{SD} = 110\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 64\text{ V}$ (see Figure 15)	-	30		ns
Q_{rr}	Reverse recovery charge		-	34		nC
I_{RRM}	Reverse recovery current		-	2.3		A

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

2.1 Electrical characteristics (curves)

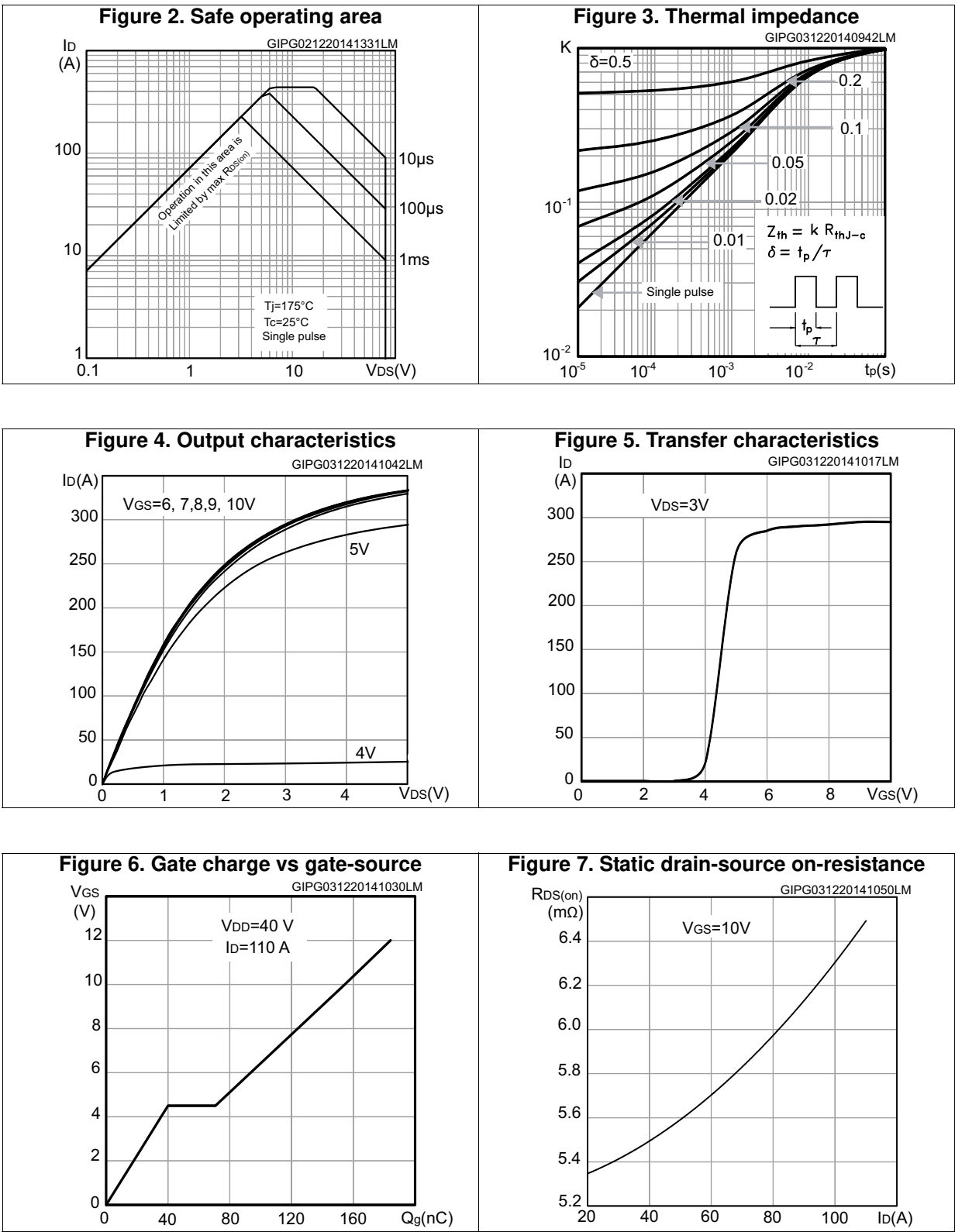


Figure 8. Capacitance variations

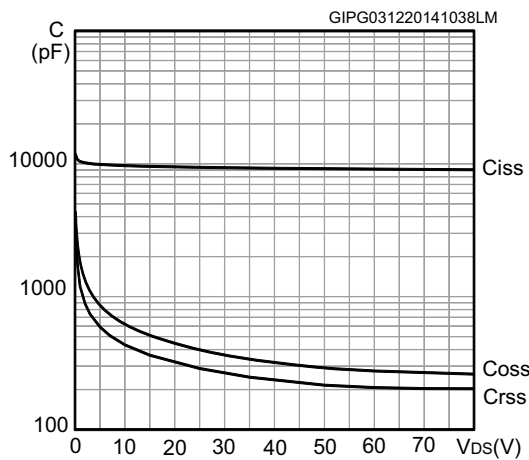


Figure 9. Normalized gate threshold voltage vs temperature

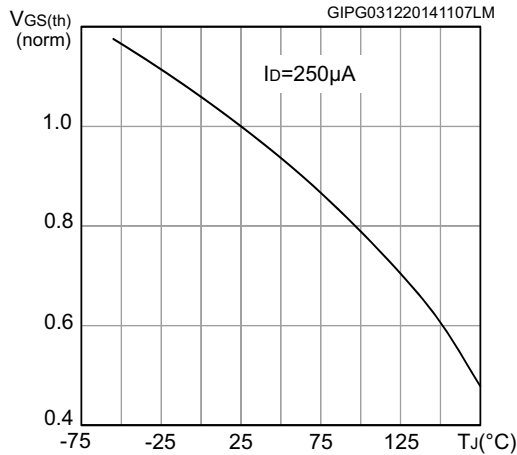


Figure 10. Normalized on-resistance

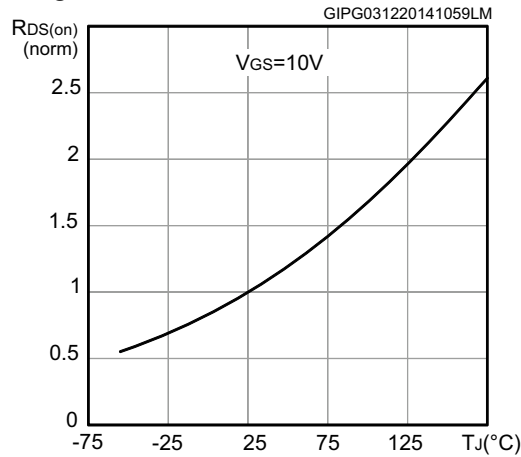


Figure 11. Normalized $V_{(BR)DSS}$ vs temperature

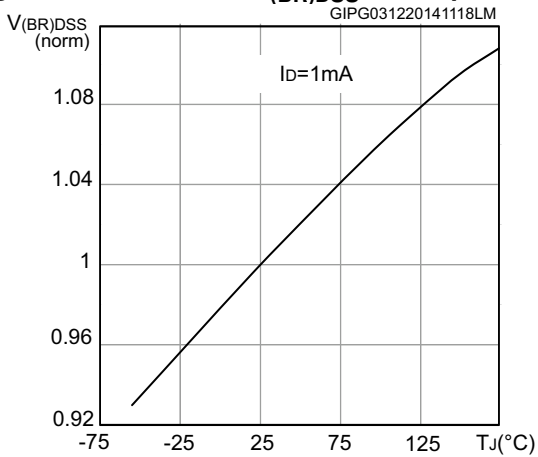
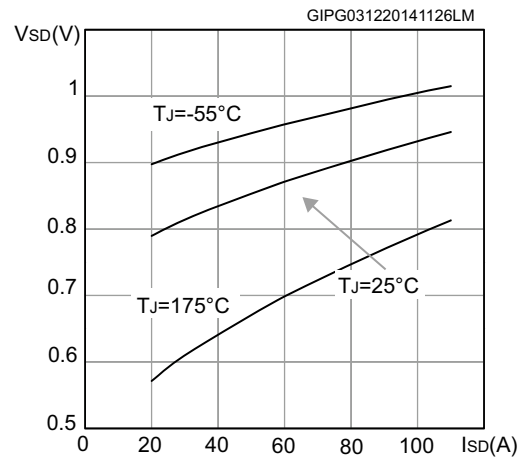


Figure 12. Drain-source diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

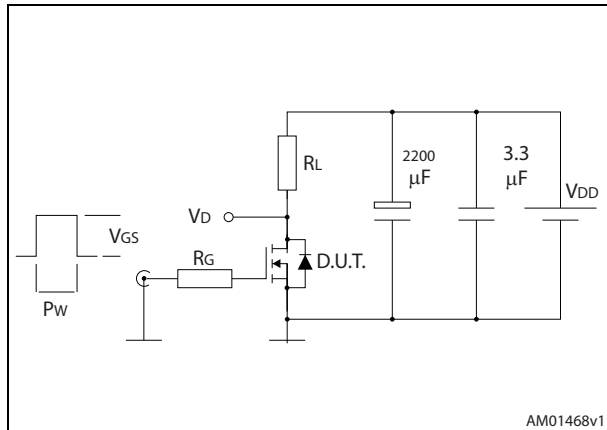


Figure 14. Gate charge test circuit

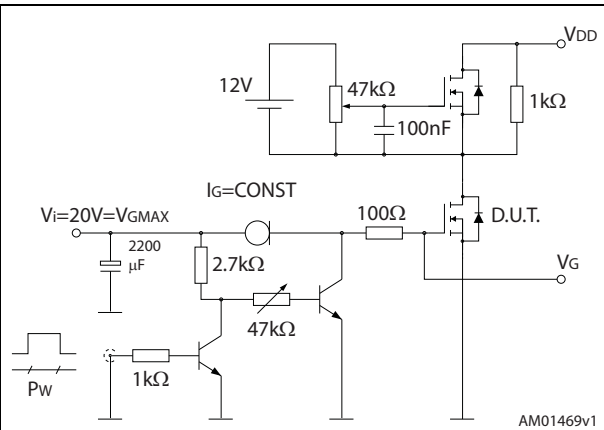


Figure 15. Test circuit for inductive load switching and diode recovery times

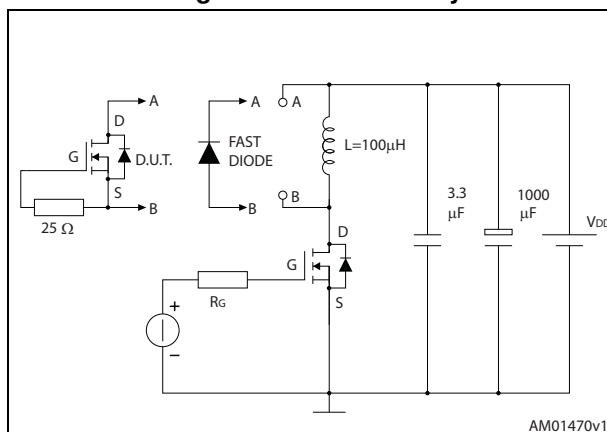


Figure 16. Unclamped inductive load test circuit

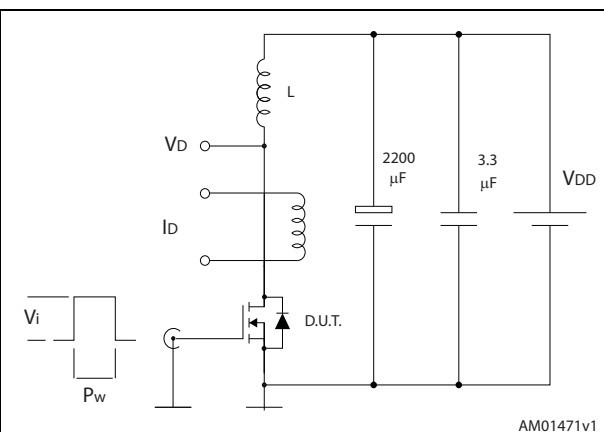


Figure 17. Unclamped inductive waveform

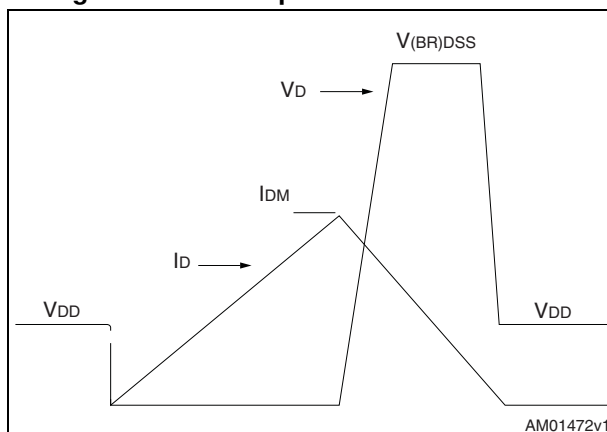
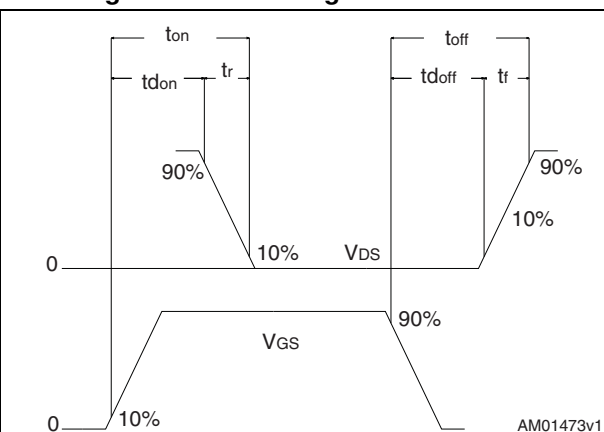


Figure 18. Switching time waveform



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 package information

Figure 19. TO-220 type A outline

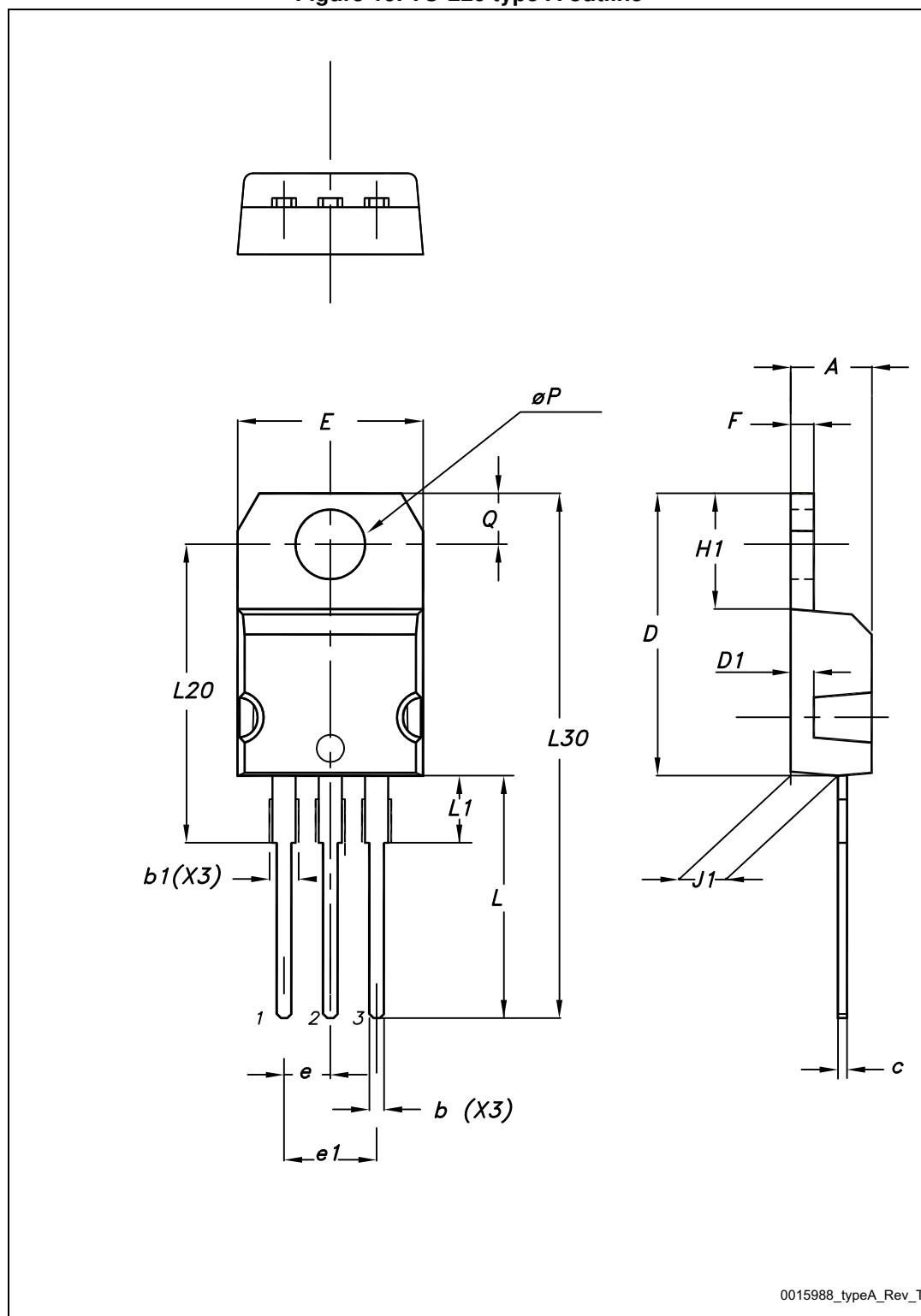


Table 8. TO-220 type A mechanical data

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

5 Revision history

Table 9. Document revision history

Date	Revision	Changes
26-Sep-2014	1	First release.
05-Dec-2014	2	Updated in cover page the title and features. Product status promoted from preliminary to production data. Updated E_{AS} parameter in Table 2 and $R_{DS(on)}$ in Table 4 . Updated Table 5 , Table 6 and Table 7 . Inserted Section 2.1 .

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