

N-channel 60 V, 0.0031 Ω typ., 80 A STripFET™ F7 Power MOSFET in a TO-220 package

Datasheet - production data

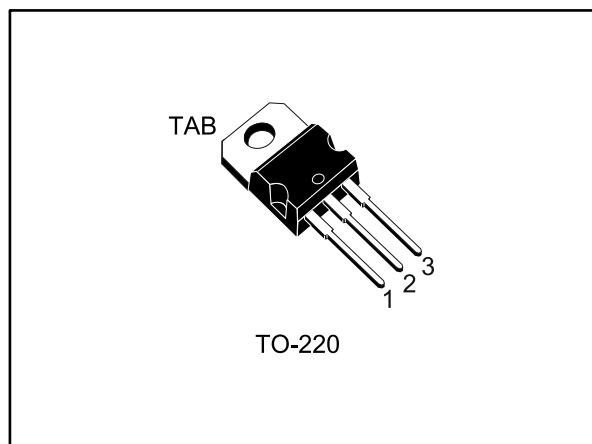
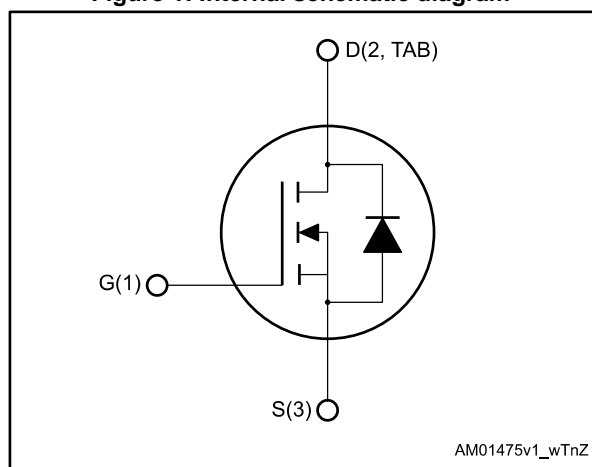


Figure 1: Internal schematic diagram



Features

Order code	V _{DS}	R _{DS(on)} max.	I _D	P _{TOT}
STP140N6F7	60 V	0.0035 Ω	80 A	158 W

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes 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 code	Marking	Package	Packing
STP140N6F7	140N6F7	TO-220	Tube

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1 Electrical ratings

Table 2: Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	60	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_{case} = 25\text{ °C}$	80	A
	Drain current (continuous) at $T_{case} = 100\text{ °C}$	80	
$I_{DM}^{(2)}$	Drain current (pulsed)	320	A
P_{TOT}	Total dissipation at $T_{case} = 25\text{ °C}$	158	W
$E_{AS}^{(3)}$	Single pulse avalanche energy	160	mJ
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Maximum junction temperature	175	

Notes:

- (1) Current is limited by package.
 (2) Pulse width is limited by safe operating area.
 (3) Starting $T_j = 25\text{ °C}$, $I_D = 40\text{ A}$, $V_{DD} = 30\text{ V}$.

Table 3: Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	0.95	°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	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{D}} = 1\text{ mA}$	60			V
I_{DSS}	Zero gate voltage drain current	$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 60\text{ V}$			1	μA
		$V_{\text{GS}} = 0\text{ V}$, $V_{\text{DS}} = 60\text{ V}$, $T_{\text{case}} = 125\text{ °C}$			100	
I_{GSS}	Gate-body leakage current	$V_{\text{DS}} = 0\text{ V}$, $V_{\text{GS}} = +20\text{ V}$			100	nA
$V_{\text{GS(th)}}$	Gate threshold voltage	$V_{\text{DS}} = V_{\text{GS}}$, $I_{\text{D}} = 250\text{ }\mu\text{A}$	2		4	V
$R_{\text{DS(on)}}$	Static drain-source on-resistance	$V_{\text{GS}} = 10\text{ V}$, $I_{\text{D}} = 40\text{ A}$		0.0031	0.0035	Ω

Table 5: Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{\text{DS}} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{\text{GS}} = 0\text{ V}$	-	3100	-	pF
C_{oss}	Output capacitance		-	1520	-	
C_{rss}	Reverse transfer capacitance		-	193	-	
Q_{g}	Total gate charge	$V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 80\text{ A}$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 14: "Gate charge test circuit")	-	55	-	nC
Q_{gs}	Gate-source charge		-	19	-	
Q_{gd}	Gate-drain charge		-	18	-	

Table 6: Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{\text{d(on)}}$	Turn-on delay time	$V_{\text{DD}} = 30\text{ V}$, $I_{\text{D}} = 40\text{ A}$ $R_{\text{G}} = 4.7\text{ }\Omega$, $V_{\text{GS}} = 10\text{ V}$ (see Figure 13: "Switching times test circuit for resistive load" and Figure 18: "Switching time waveform")	-	24	-	ns
t_{r}	Rise time		-	68	-	
$t_{\text{d(off)}}$	Turn-off delay time		-	39	-	
t_{f}	Fall time		-	20	-	

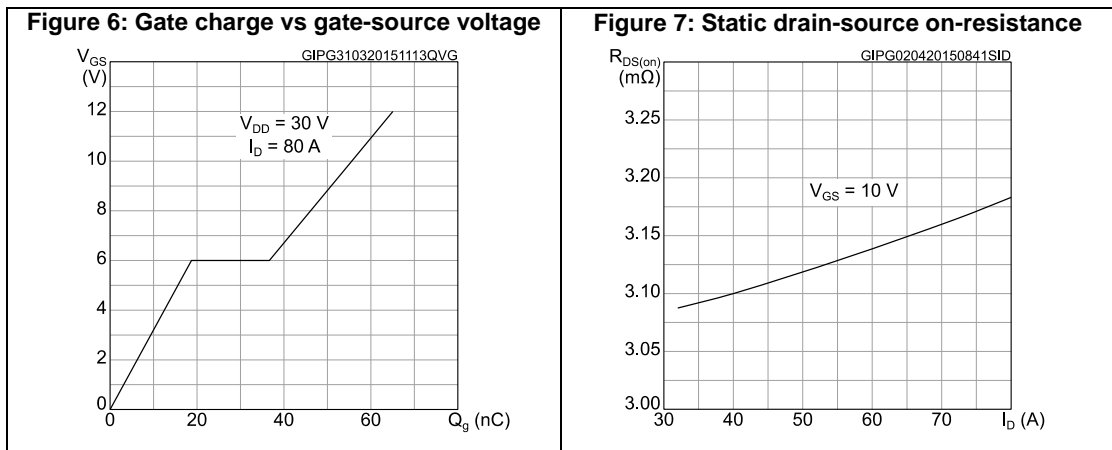
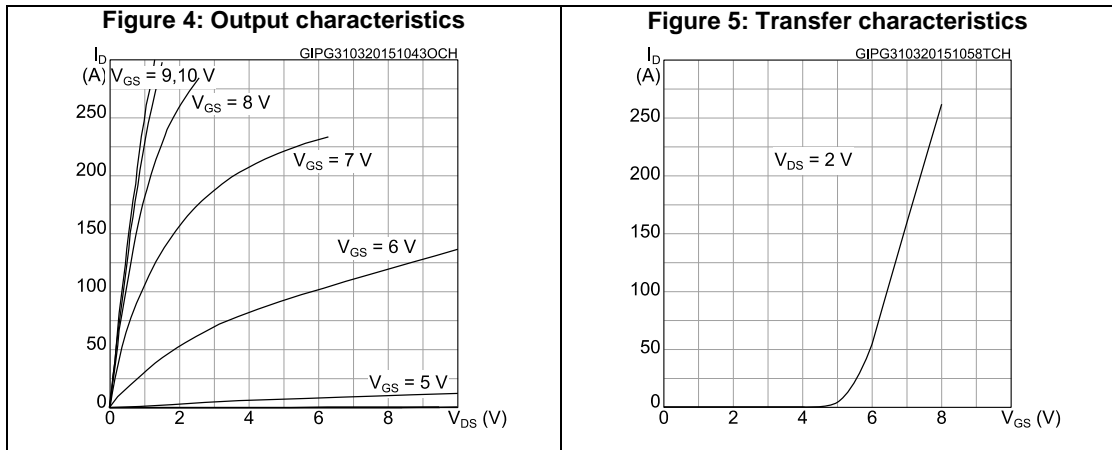
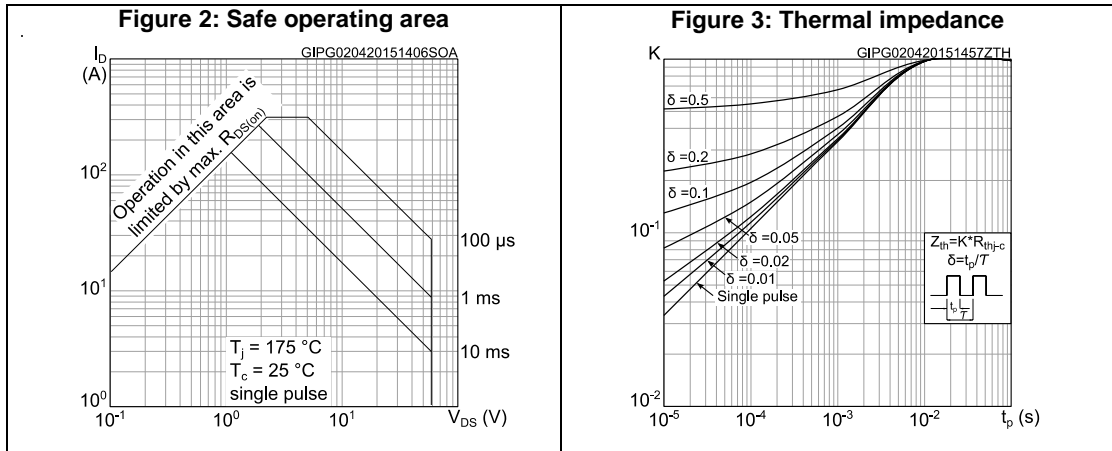
Table 7: Source-drain diode

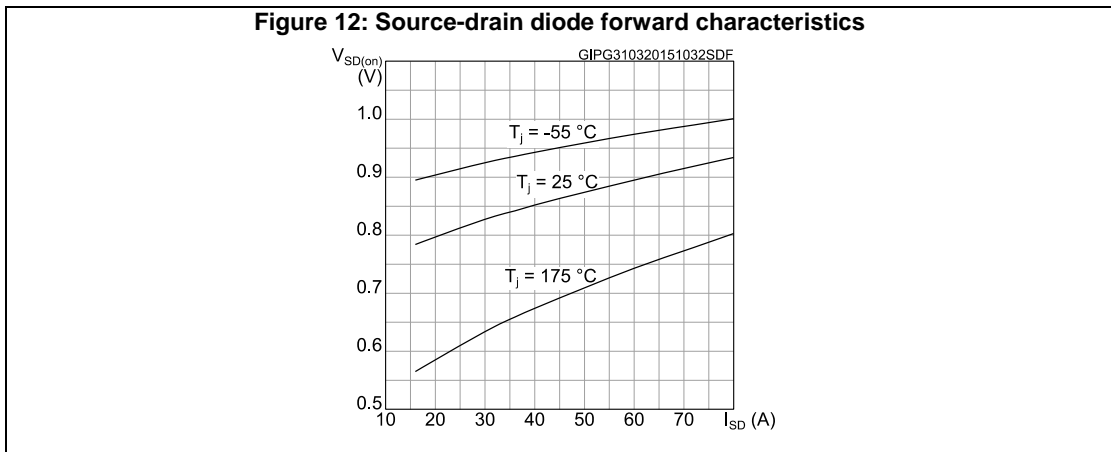
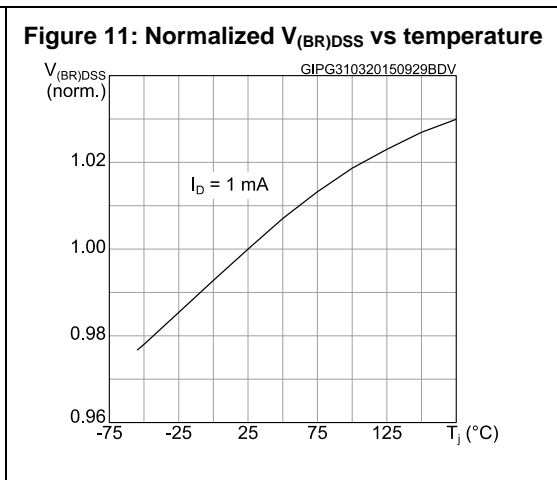
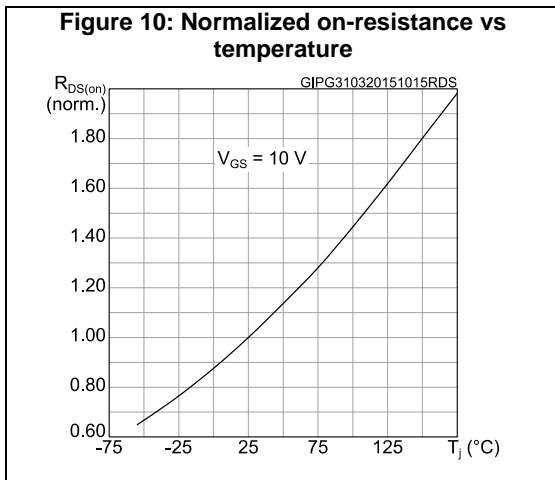
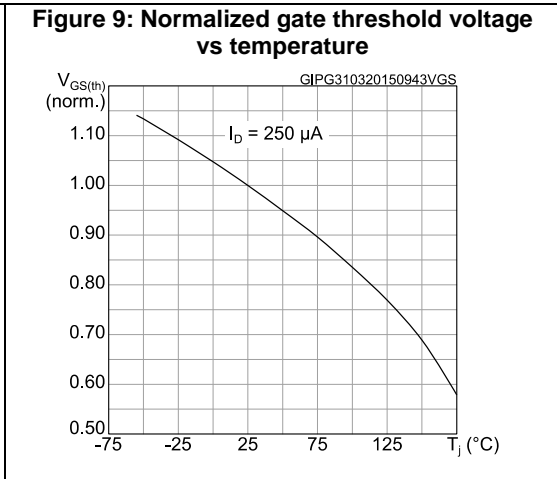
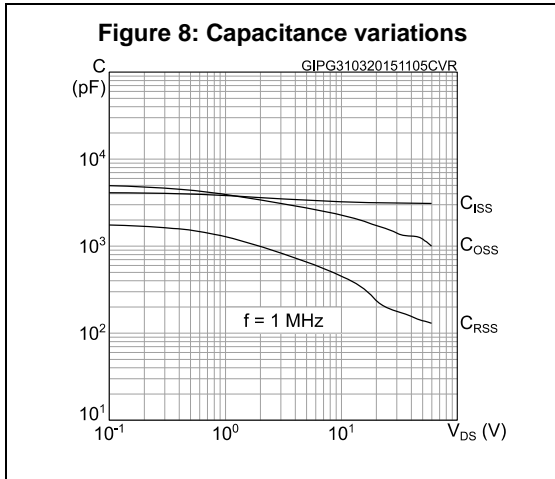
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{\text{SD}}^{(1)}$	Forward on voltage	$V_{\text{GS}} = 0\text{ V}$, $I_{\text{SD}} = 80\text{ A}$	-		1.2	V
t_{rr}	Reverse recovery time	$I_{\text{SD}} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{\text{DD}} = 48\text{ V}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times")	-	42.4		ns
Q_{rr}	Reverse recovery charge		-	38.2		nC
I_{RRM}	Reverse recovery current		-	1.8		A

Notes:

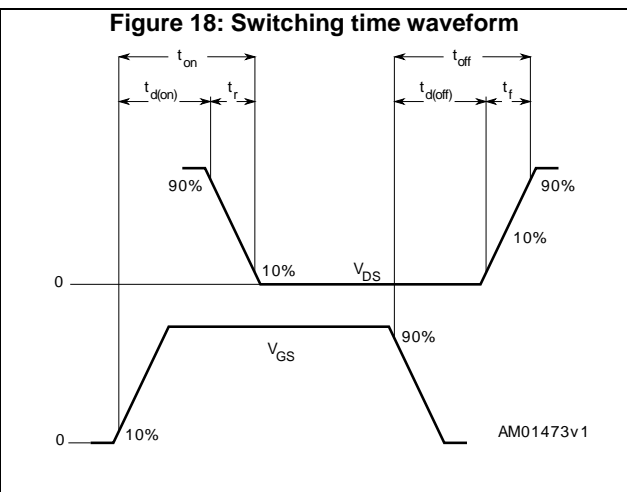
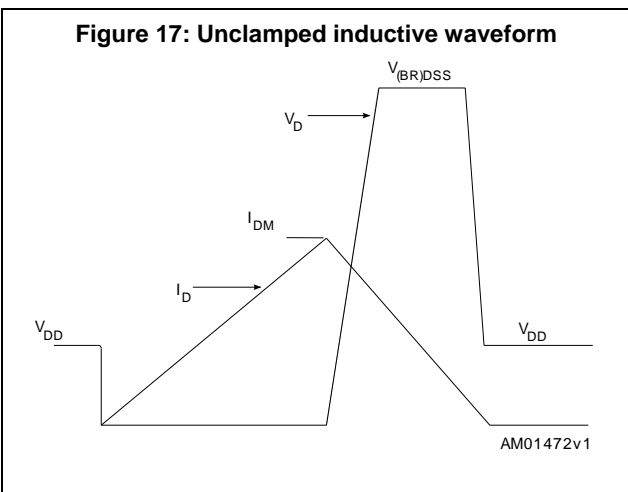
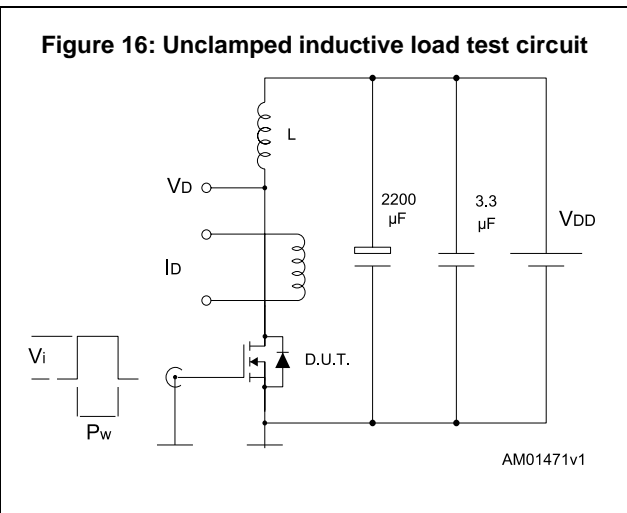
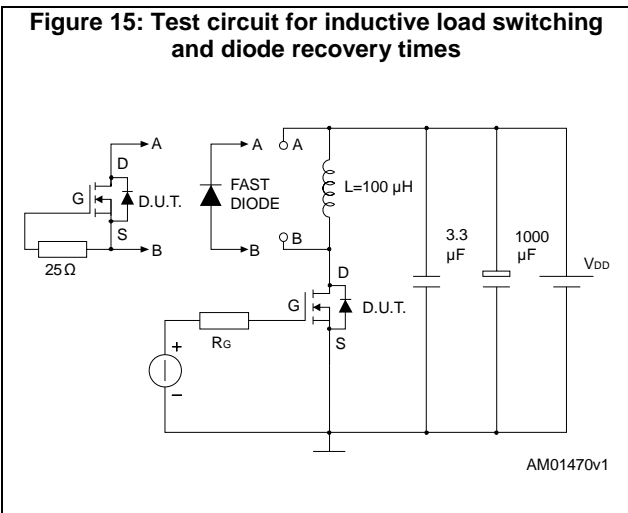
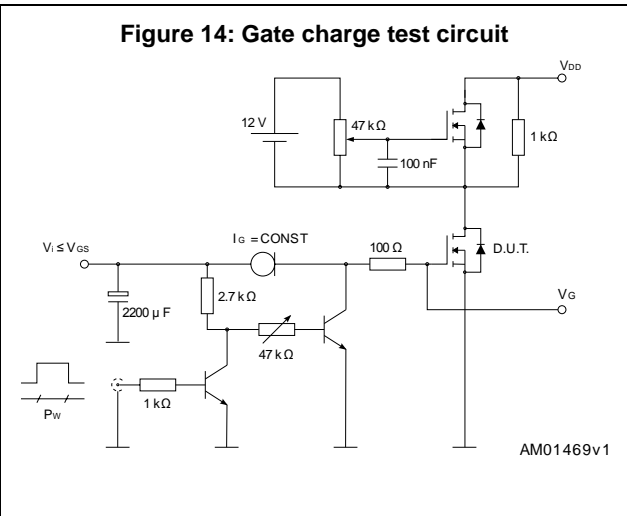
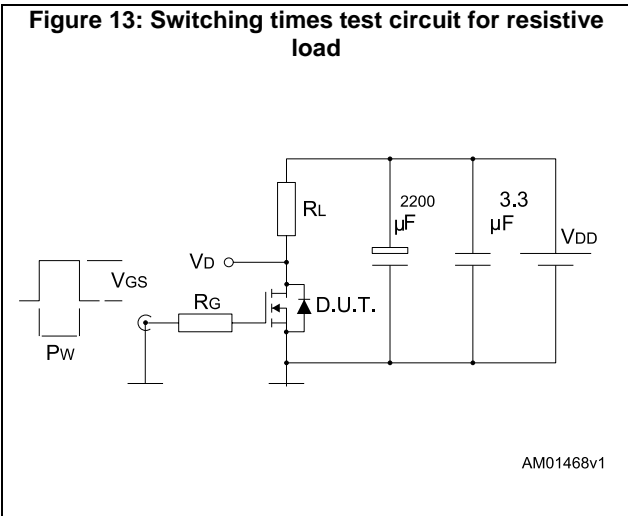
⁽¹⁾ Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)





3 Test circuits



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

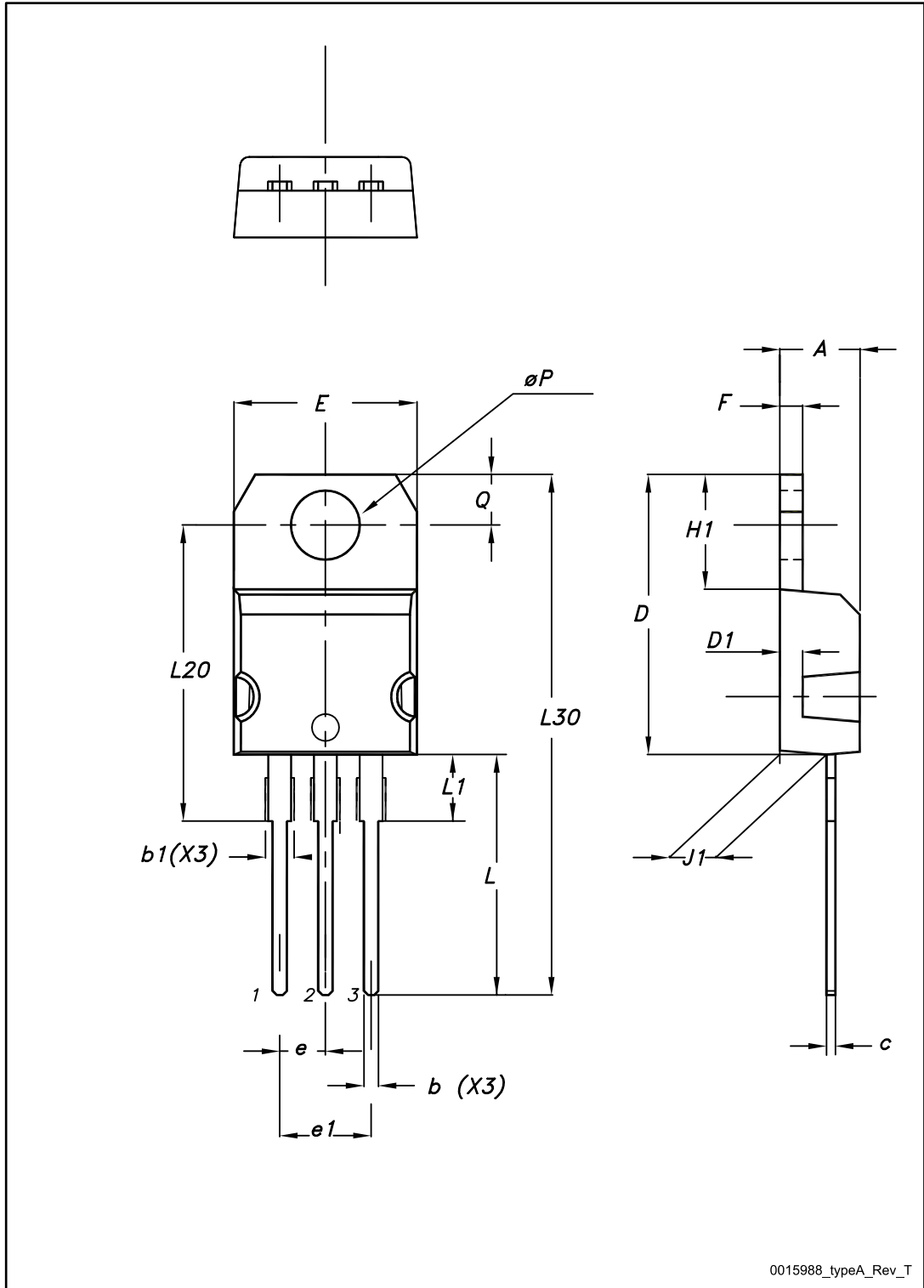


Table 8: TO-220 type A mechanical data

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

5 Revision history

Table 9: Document revision history

Date	Revision	Changes
07-Apr-2015	1	First release.
19-May-2015	2	In section 2.1 Electrical characteristics (curves): - updated Figure 8: Capacitance variations

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