



STP80N70F6

N-channel 68 V, 0.0063 Ω typ., 96 A STripFET™ VI DeepGATE™
Power MOSFET in TO-220 package

Datasheet — production data

Features

Order code	V _{DSS} max.	R _{DS(on)} max. (V _{GS} = 10 V)	I _D	P _{TOT}
STP80N70F6	68 V	< 0.008 Ω	96 A	110 W

- R_{DS(on)} * Q_g industry benchmark
- Extremely low on-resistance R_{DS(on)}
- High avalanche ruggedness
- Low gate drive power losses
- Very low switching gate charge

Applications

- Switching applications

Description

This device is an N-channel Power MOSFET developed using the 6th generation of STripFET™ DeepGATE™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

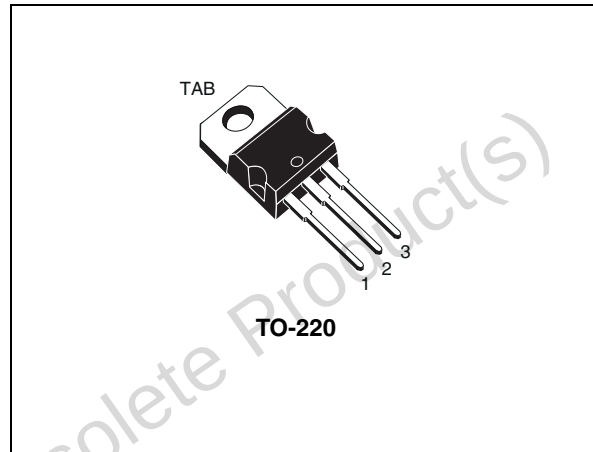


Figure 1. Internal schematic diagram

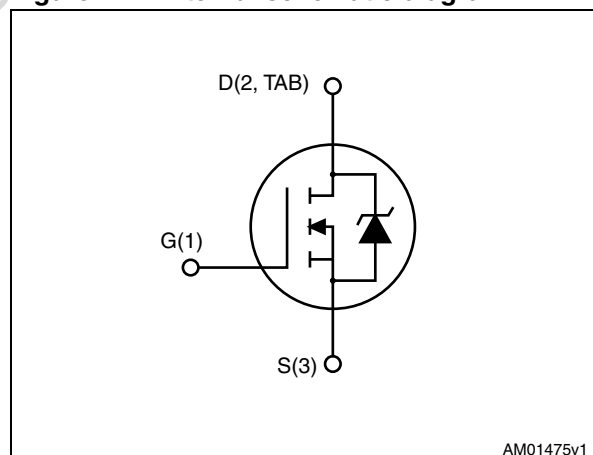


Table 1. Device summary

Order code	Marking	Package	Packaging
STP80N70F6	80N70F6	TO-220	Tube

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Obsolete Product(s) - Obsolete Product(s)



1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage	68	V
V_{GS}	Gate-source voltage	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^{\circ}\text{C}$	96	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^{\circ}\text{C}$	60	A
$I_{DM}^{(1)}$	Drain current (pulsed)	384	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^{\circ}\text{C}$	110	W
T_{stg}	Storage temperature	- 55 to 175	$^{\circ}\text{C}$
T_j	Operating junction temperature		

1. This value is rated according to R_{thj-c}

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thj-c}	Thermal resistance junction-case max	1.36	$^{\circ}\text{C/W}$
R_{thj-a}	Thermal resistance junction-ambient max	62.5	$^{\circ}\text{C/W}$

2 Electrical characteristics

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

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage ($V_{GS} = 0$)	$I_D = 250\text{ }\mu\text{A}$	68			V
I_{DSS}	Zero gate voltage Drain current ($V_{GS} = 0$)	$V_{DS} = 68\text{ V}$ $V_{DS} = 68\text{ V}, T_C = 125\text{ °C}$			1 100	μA μA
I_{GSS}	Gate-body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}, I_D = 48\text{ A}$		0.0063	0.008	Ω

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25\text{ V}, f = 1\text{ MHz},$ $V_{GS} = 0$	-	5850	-	pF
C_{oss}	Output capacitance			341		pF
C_{rss}	Reverse transfer capacitance			240		pF
Q_g	Total gate charge	$V_{DD} = 34\text{ V}, I_D = 96\text{ A},$ $V_{GS} = 10\text{ V}$ (see Figure 14)	-	99	-	nC
Q_{gs}	Gate-source charge			31		nC
Q_{gd}	Gate-drain charge			19		nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 10\text{ V}, I_D = 48\text{ A}$ $R_G = 4.7\text{ }\Omega, V_{GS} = 10\text{ V}$ (see Figure 13)	-	23	-	ns
t_r	Rise time			29		ns
$t_{d(off)}$	Turn-off-delay time		-	102	-	ns
t_f	Fall time			23		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit
I_{SD}	Source-drain current		-		96	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		384	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 96\text{ A}$, $V_{GS} = 0$	-		1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 48\text{ A}$, $V_{DD} = 24\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$, $T_j = 150\text{ }^{\circ}\text{C}$ (see Figure 15)	-	34		ns
Q_{rr}	Reverse recovery charge			53		nC
I_{RRM}	Reverse recovery current			3		A

1. Pulse width is 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

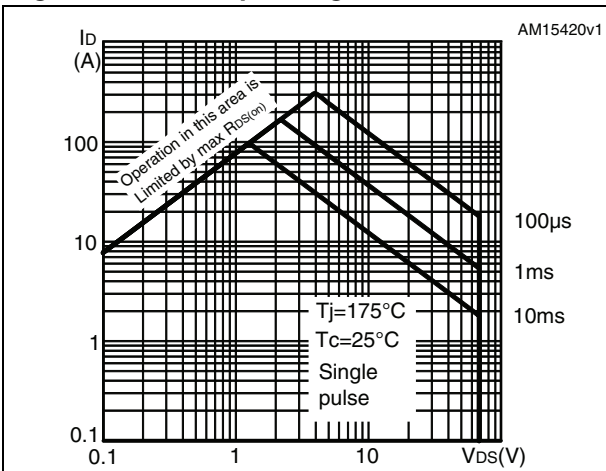


Figure 3. Thermal impedance

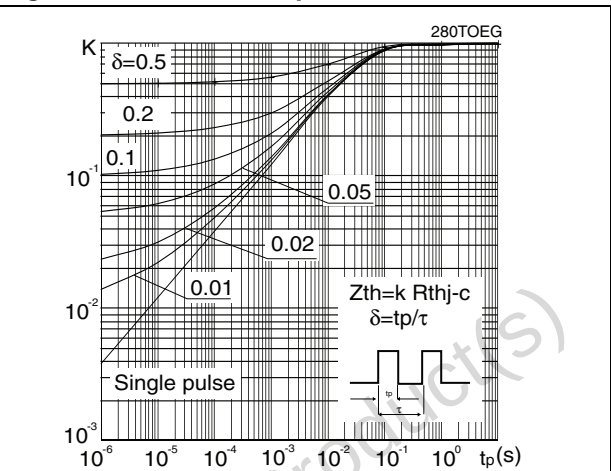


Figure 4. Output characteristics

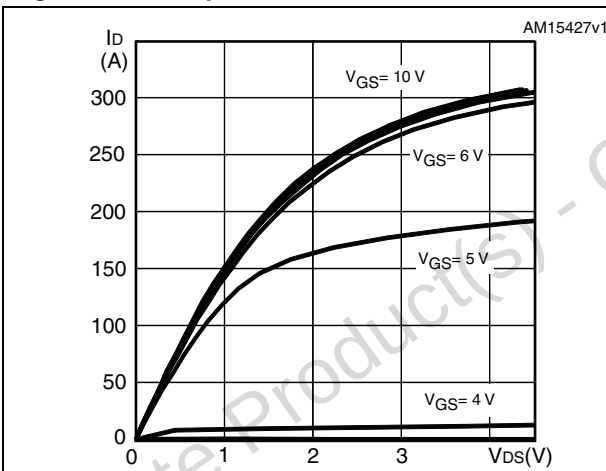


Figure 5. Transfer characteristics

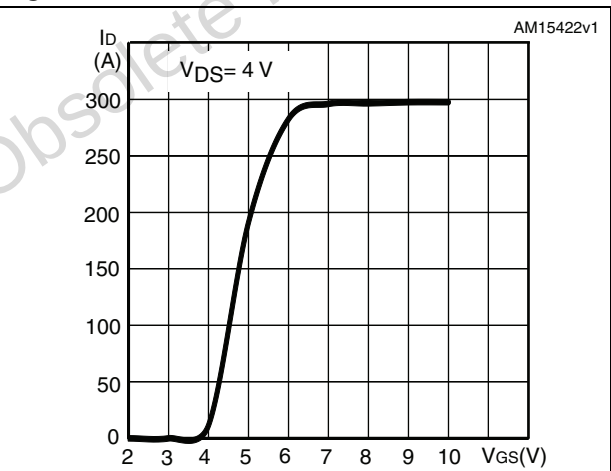


Figure 6. Gate charge vs gate-source voltage

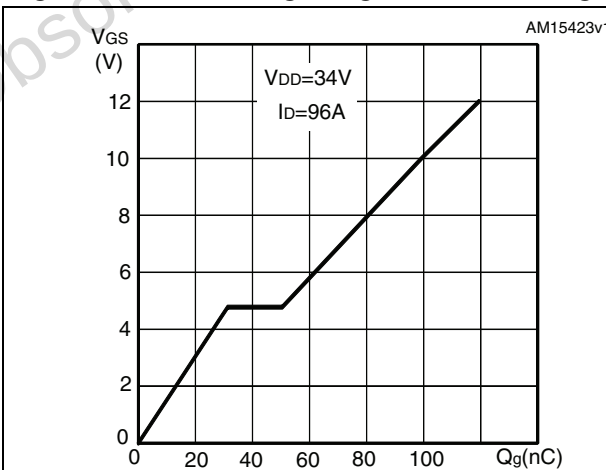


Figure 7. Static drain-source on-resistance

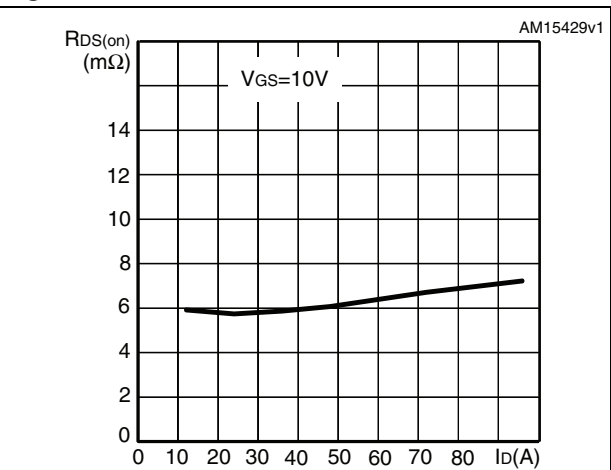


Figure 8. Capacitance variations

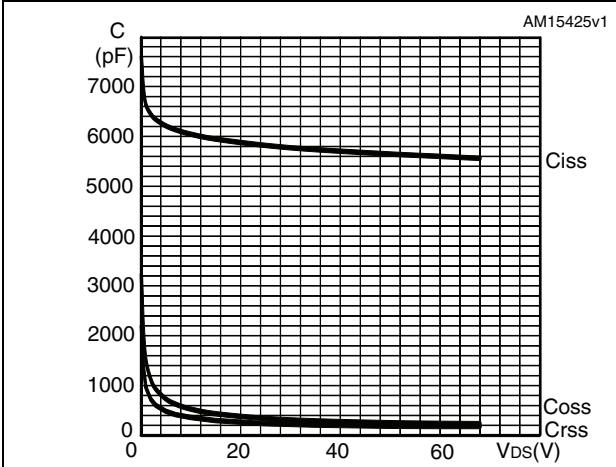


Figure 9. Normalized $B_{V_{DS}}$ vs temperature

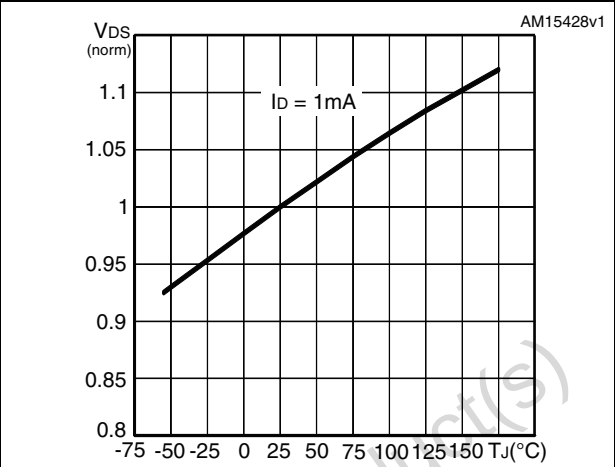


Figure 10. Normalized gate threshold voltage vs temperature

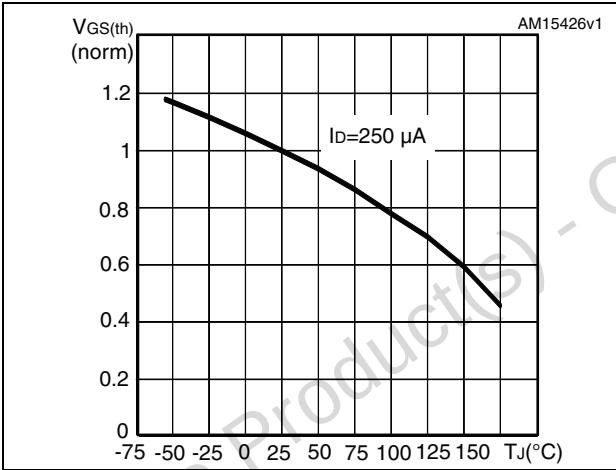


Figure 11. Normalized on-resistance vs temperature

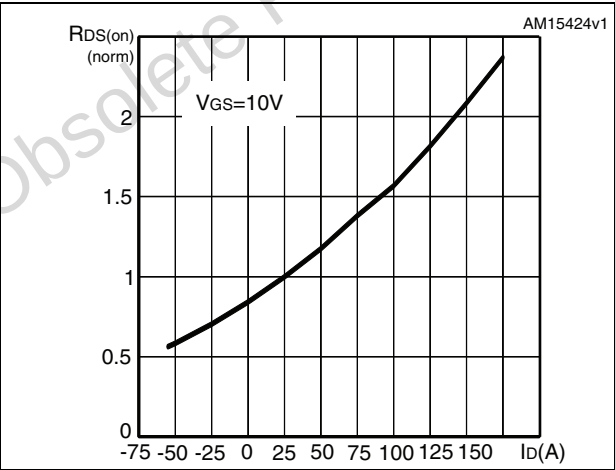
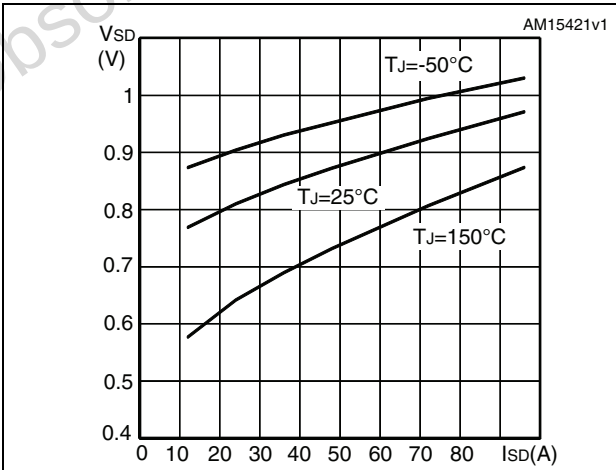


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

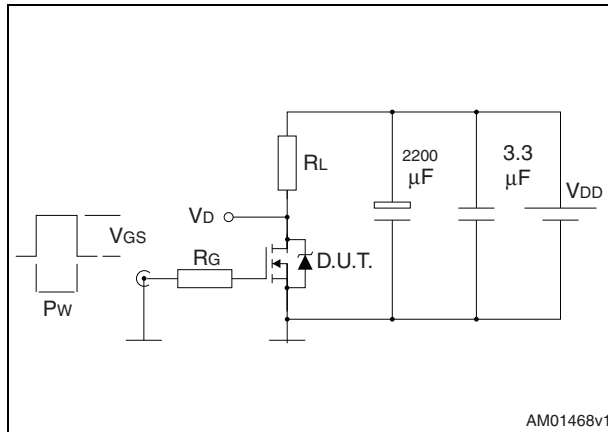


Figure 14. Gate charge test circuit

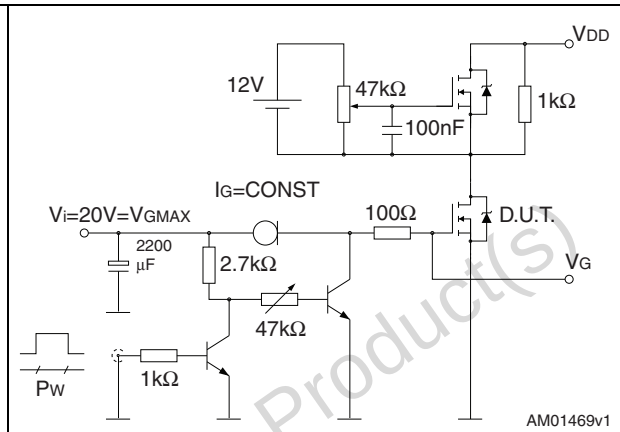


Figure 15. Test circuit for inductive load switching and diode recovery times

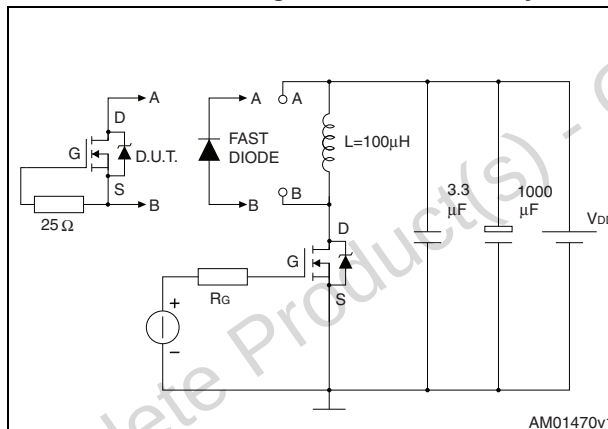


Figure 16. Unclamped inductive load test circuit

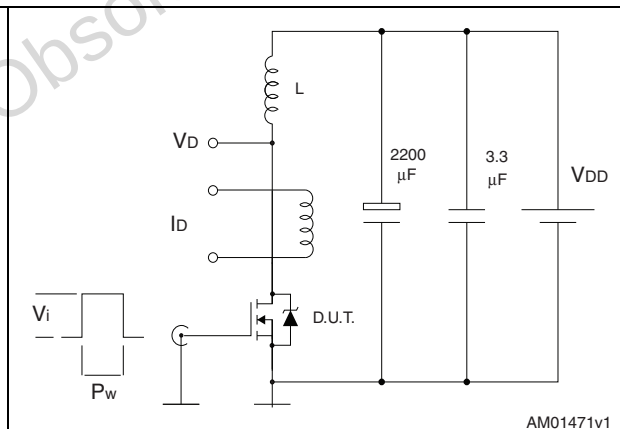


Figure 17. Unclamped inductive waveform

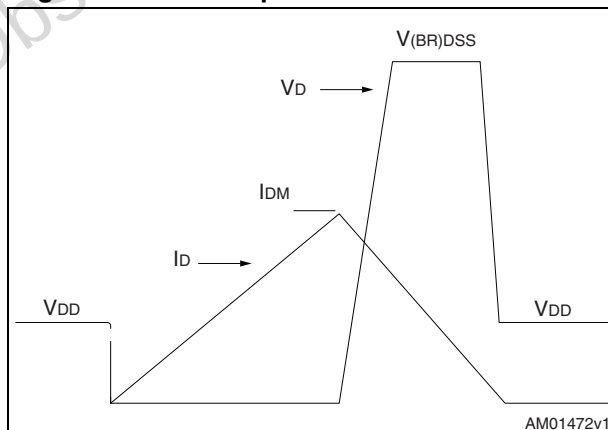
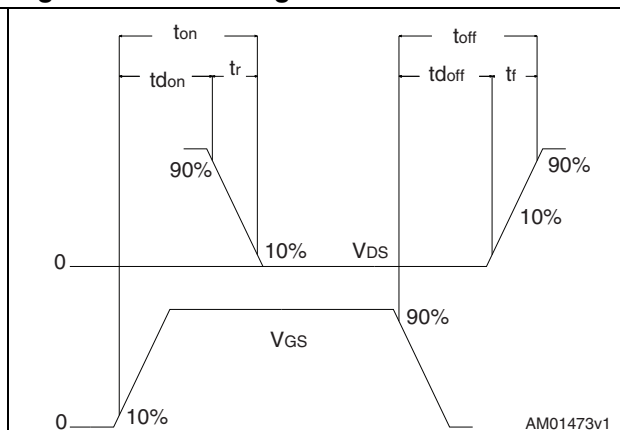


Figure 18. Switching time waveform



4 Package mechanical data

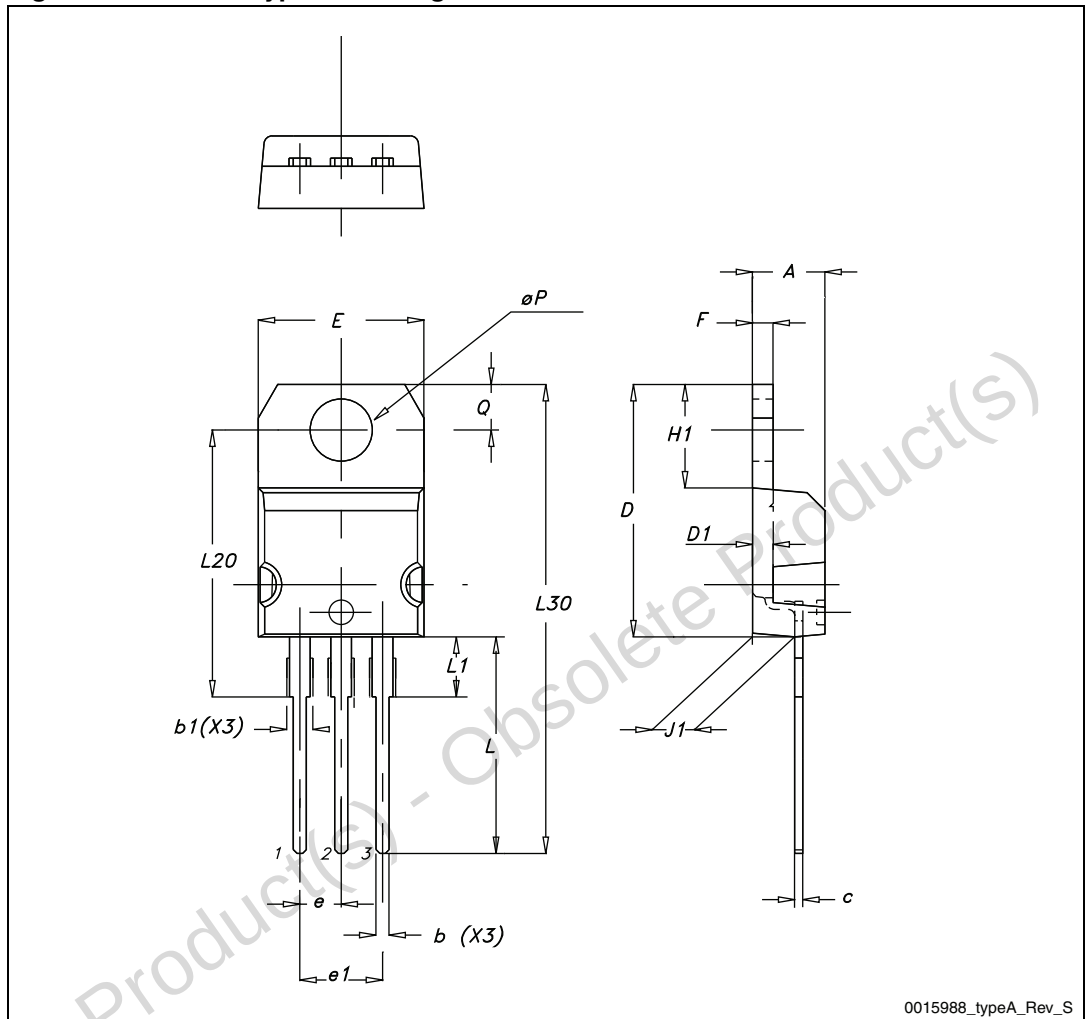
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Table 8. TO-220 type A mechanical data

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

Figure 19. TO-220 type A drawing



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
06-Dec-2012	1	First release.

Obsolete Product(s) - Obsolete Product(s)

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