



# STP75NF68

N-channel 68 V, 0.010  $\Omega$ , 80 A, TO-220  
STripFET™ II Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STP75NF68	68 V	< 0.014 $\Omega$	80 A

- Exceptional dv/dt capability
- 100% avalanche tested

## Application

- Switching applications

## Description

This Power MOSFET series realized with STMicroelectronics unique STripFET™ process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable in advanced high-efficiency switching applications.

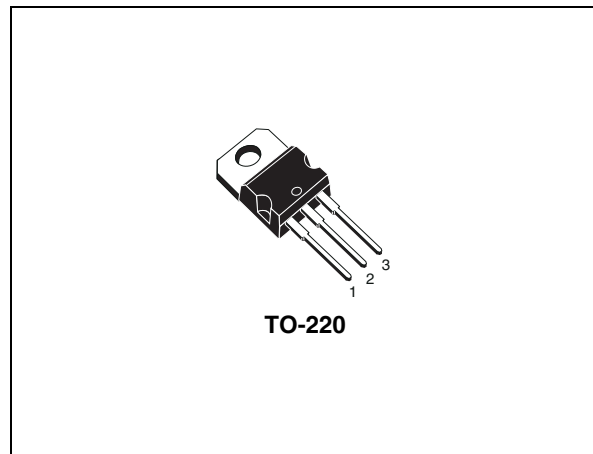


Figure 1. Internal schematic diagram

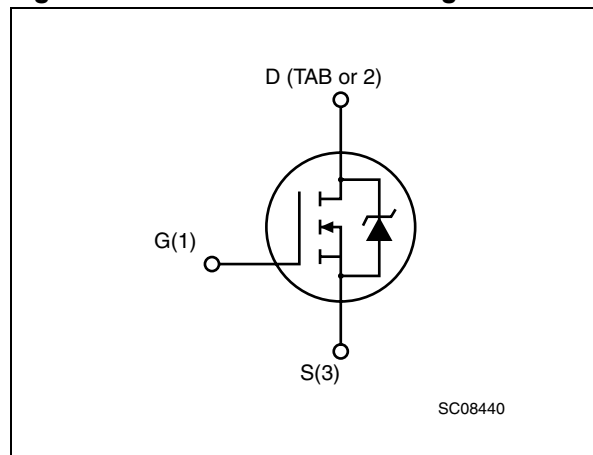


Table 1. Device summary

Order code	Marking	Package	Packaging
STP75NF68	75NF68	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 ( $V_{GS} = 0$ )	68	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	80	A
$I_D$	Drain current (continuous) at $T_C=100\text{ }^\circ\text{C}$	56	A
$I_{DM}^{(1)}$	Drain current (pulsed)	320	A
$P_{TOT}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	190	W
	Derating factor	1.27	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	13	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	700	mJ
$T_{stg}$	Storage temperature	-55 to 175	$^\circ\text{C}$
$T_J$	Operating junction temperature	175	$^\circ\text{C}$

1. Pulse width limited by safe operating area
2.  $I_{SD} \leq 80\text{ A}$ ,  $di/dt \leq 300\text{ A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq T_{JMAX}$
3. Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $I_D = 40\text{ A}$ ,  $V_{DD} = 34\text{ V}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	0.79	$^\circ\text{C}/\text{W}$
$R_{thj-amb}$	Thermal resistance junction-ambient max	62.5	$^\circ\text{C}/\text{W}$
$T_l$	Maximum lead temperature for soldering purpose <sup>(1)</sup>	300	$^\circ\text{C}$

1. 1.6mm from case for 10 sec

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0$	68			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating}$ , $V_{DS} = \text{Max rating @ } 125^{\circ}\text{C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20 \text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250 \mu\text{A}$	2	3	4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}$ , $I_D = 40 \text{ A}$		0.010	0.014	$\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15 \text{ V}$ , $I_D = 40 \text{ A}$		60		S
$C_{iss}$	Input capacitance	$V_{DS} = 25 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{GS} = 0$		2550		pF
$C_{oss}$	Output capacitance			550		pF
$C_{rss}$	Reverse transfer capacitance			175		pF
$Q_g$	Total gate charge	$V_{DD} = 34 \text{ V}$ , $I_D = 80 \text{ A}$ $V_{GS} = 10 \text{ V}$		75		nC
$Q_{gs}$	Gate-source charge			17		nC
$Q_{gd}$	Gate-drain charge			30		nC

1. Pulsed: pulse duration=300 $\mu\text{s}$ , duty cycle 1.5%

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD}=34\text{ V}$ , $I_D=40\text{ A}$ , $R_G=4.7\ \Omega$ , $V_{GS}=10\text{ V}$ <i>Figure 13 on page 8</i>		17		ns
$t_r$	Rise time			60		ns
$t_{d(off)}$	Turn-off delay time			90		ns
$t_f$	Fall time			75		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	$I_{SD}=80\text{ A}$ , $V_{GS}=0$			1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD}=80\text{ A}$ , $di/dt=100\text{ A}/\mu\text{s}$ , $V_{DD}=25\text{ V}$ , $T_J=150\text{ }^\circ\text{C}$ <i>Figure 15 on page 8</i>		70		ns
$Q_{rr}$	Reverse recovery charge			160		$\mu\text{C}$
$I_{RRM}$	Reverse recovery current			4.7		A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration=300 $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

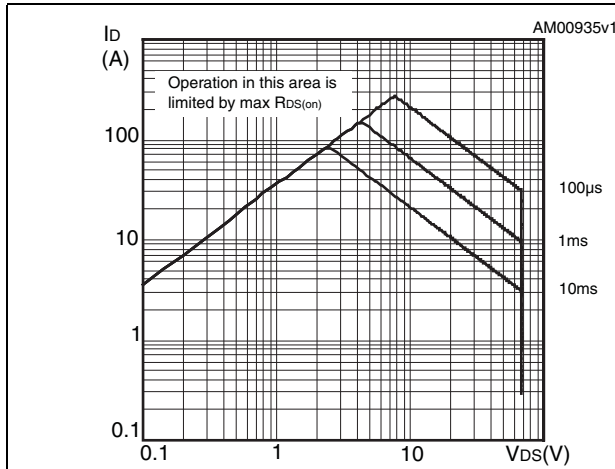


Figure 3. Thermal impedance

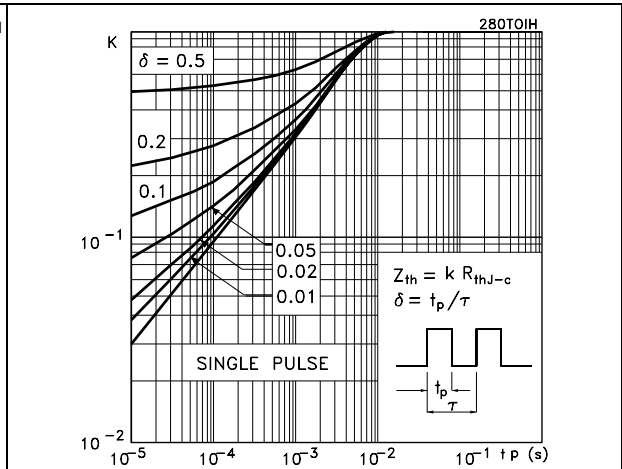


Figure 4. Output characteristics

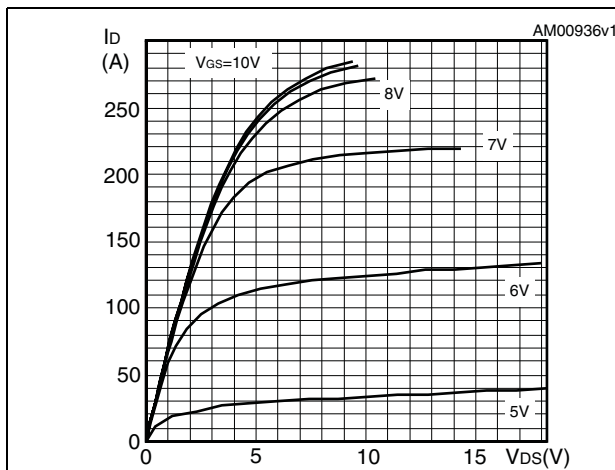


Figure 5. Transfer characteristics

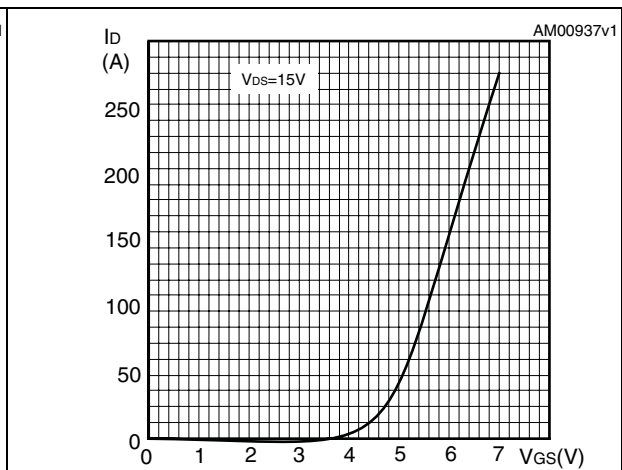


Figure 6. Normalized  $BV_{DSS}$  vs temperature

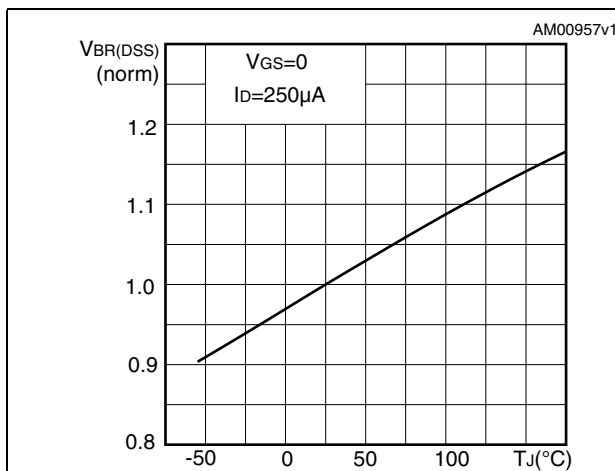


Figure 7. Static drain-source on resistance

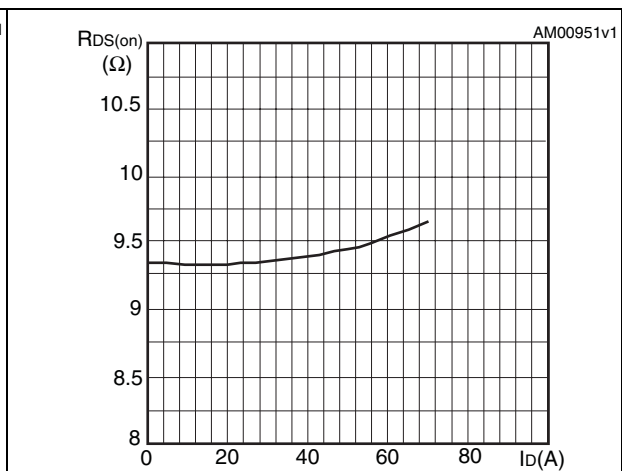


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

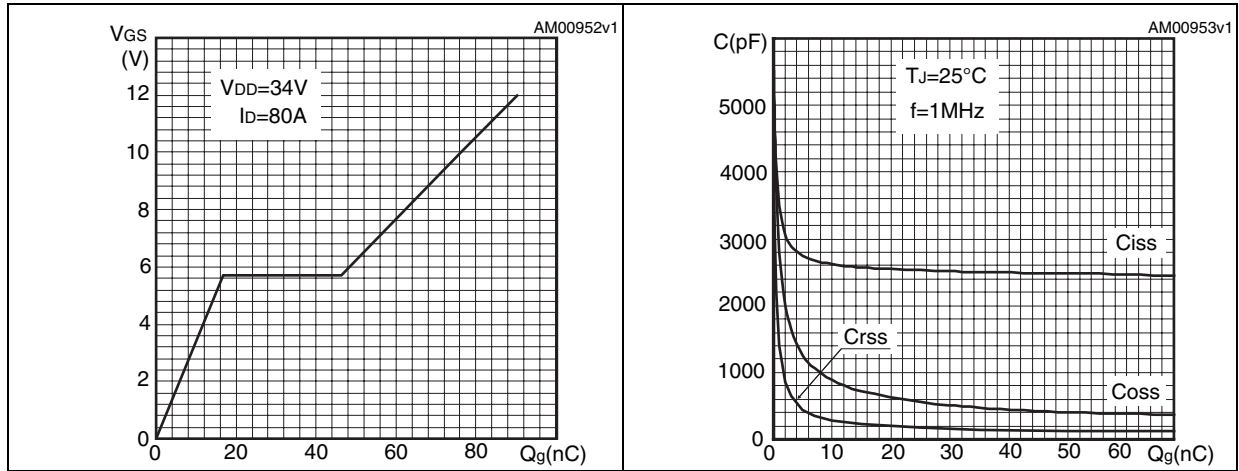


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

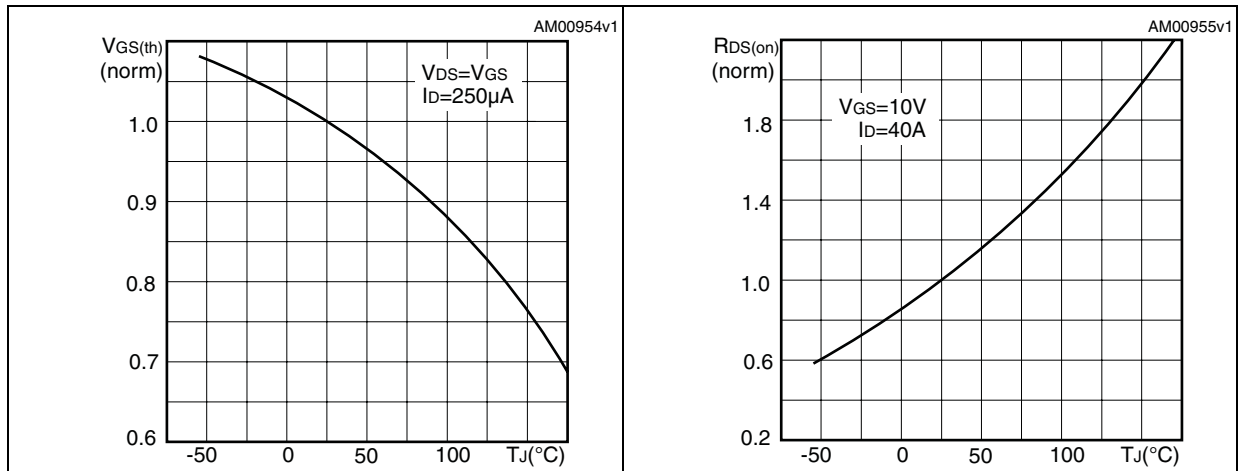
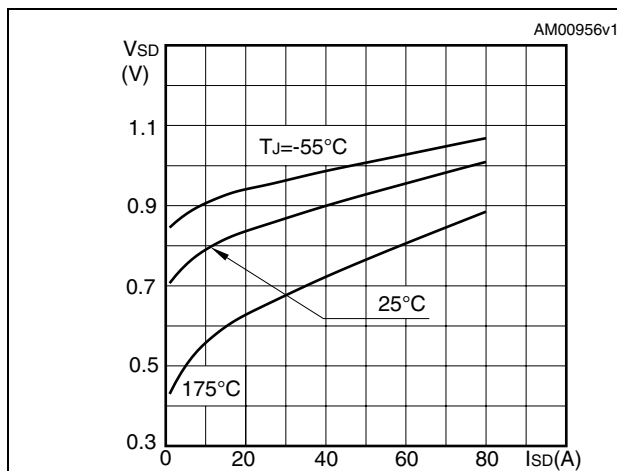


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load

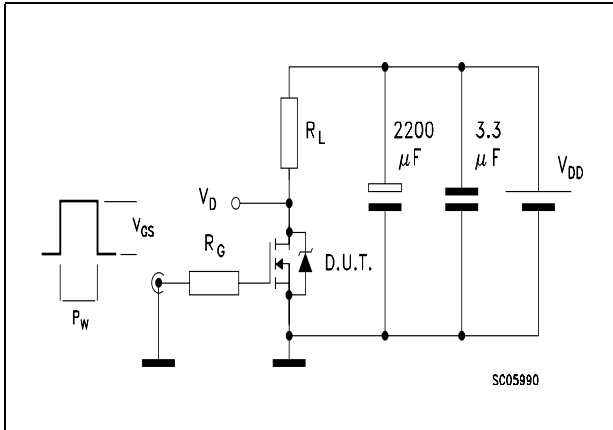


Figure 14. Gate charge test circuit

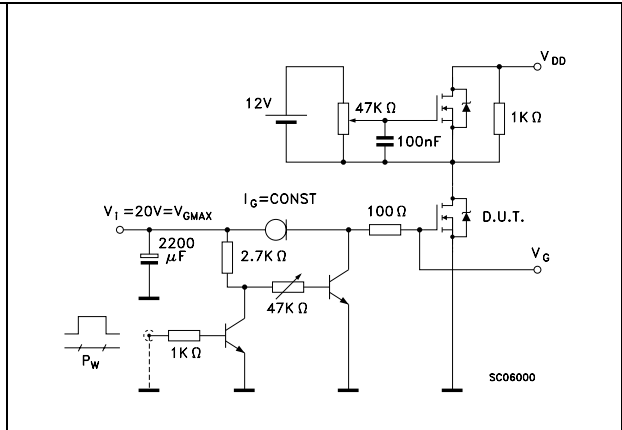


Figure 15. Test circuit for inductive load switching and diode recovery times

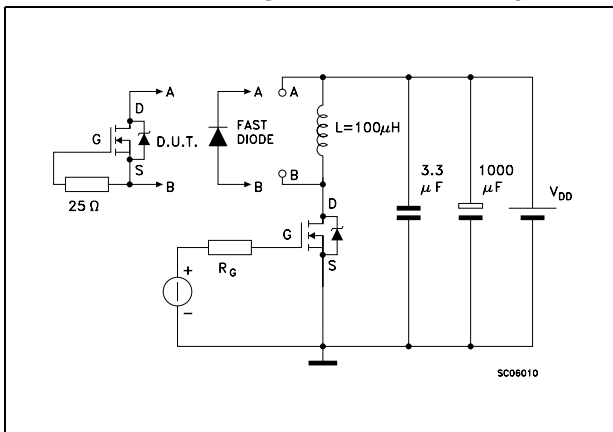


Figure 16. Unclamped inductive load test circuit

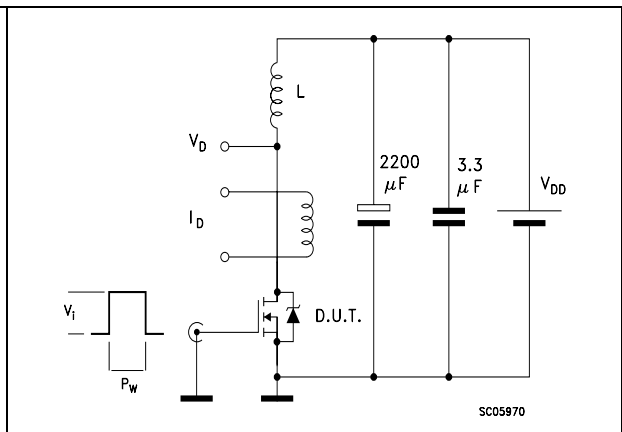
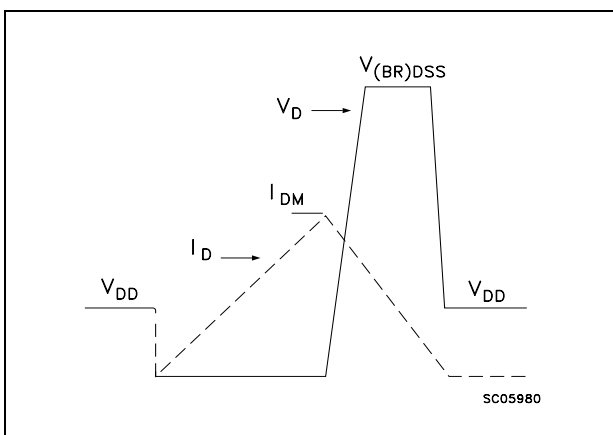


Figure 17. Unclamped inductive waveform



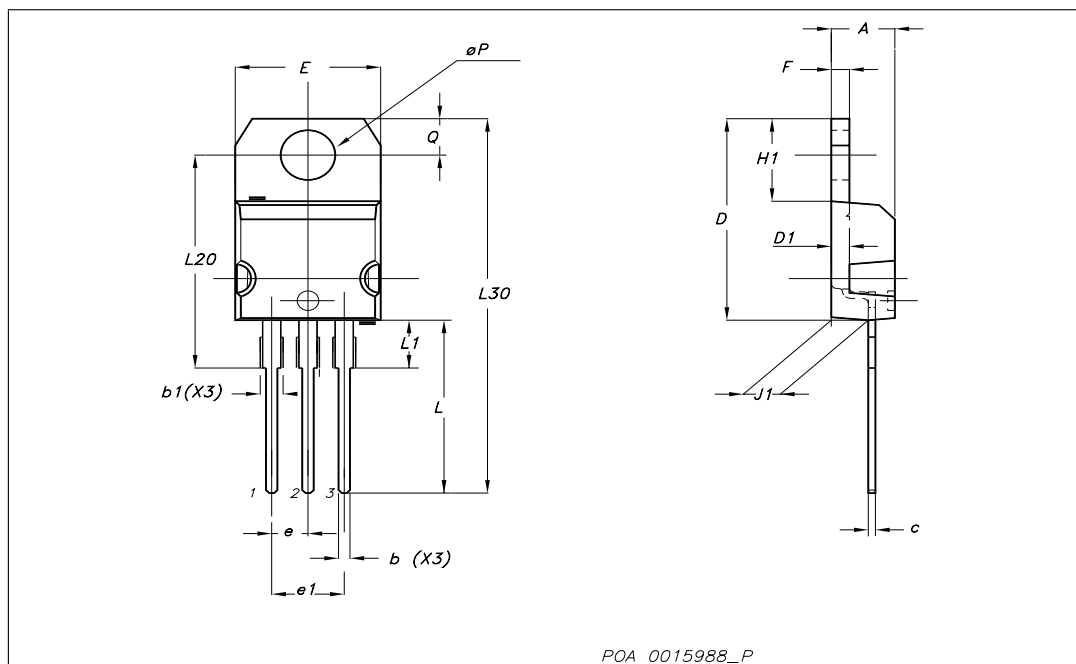


## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



## 5 Revision history

**Table 8. Document revision history**

<b>Date</b>	<b>Revision</b>	<b>Changes</b>
24-Jul-2008	1	First release
06-Aug-2008	2	Document status promoted from preliminary data to datasheet

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