



## STP80NF12

N-channel 120V - 0.013Ω - 80A - TO-220  
STripFET™ II Power MOSFET

### General features

Type	V <sub>DSS</sub> (@T <sub>jmax</sub> )	R <sub>DS(on)</sub>	I <sub>D</sub>
STP80NF12	120V	<0.018Ω	80A <sup>(1)</sup>

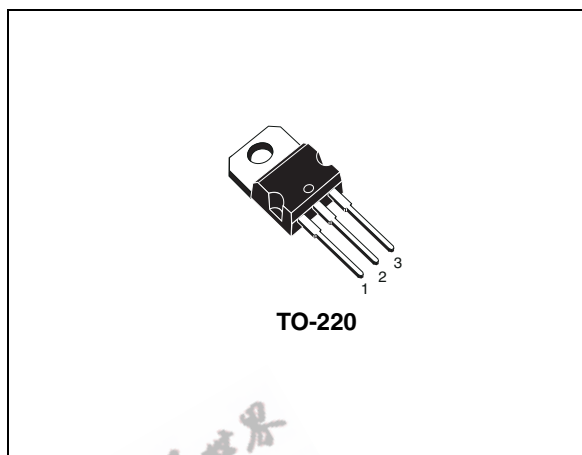
- Exceptional dv/dt capability
- 100% avalanche tested
- Application oriented characterization

### Description

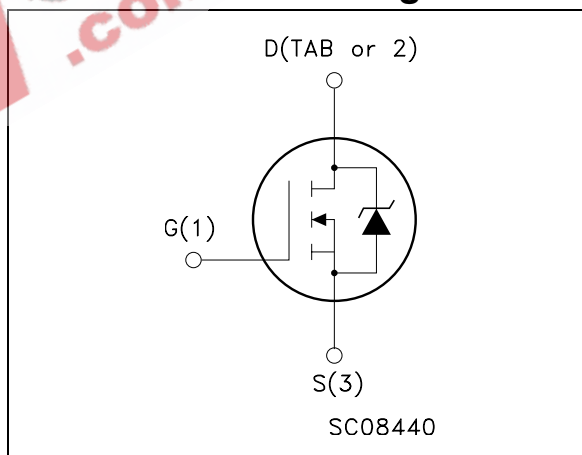
This MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency, high-frequency isolated DC-DC converters for Telecom and Computer applications. It is also intended for any applications with low gate drive requirements.

### Applications

- Switching application



### Internal schematic diagram



### Order codes

Part number	Marking	Package	Packaging
STP80NF12	P80NF12	TO-220	Tube

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# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value		Unit
		STB_P_W80NF12	STP80NF12FP	
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	120		V
$V_{DGR}$	Drain-gate voltage ( $R_{GS} = 20K\Omega$ )	120		V
$V_{GS}$	Gate-source voltage	$\pm 22$		V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25^\circ C$	80	11 <sup>(2)</sup>	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ C$	60	60 <sup>(2)</sup>	A
$I_{DM}^{(3)}$	Drain current (pulsed)	320	320 <sup>(2)</sup>	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ C$	300	45	W
	Derating factor	2.0	0.3	W/°C
$dv/dt^{(4)}$	Peak diode recovery voltage slope	10		V/ns
$V_{ISO}$	Insulation withstand voltage (DC)	--	2500	V
$T_J$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 175		°C

- Limited by Package
- Limited only by maximum temperature allowed
- Pulse width limited by safe operating area
- Starting  $T_J = 25^\circ C$ ,  $I_D = 40A$ ,  $V_{DD} = 45V$

**Table 2. Thermal data**

Symbol	Parameter	Value			Unit
		TO-247	D <sup>2</sup> PAK TO-220	TO-220FP	
$R_{thJC}$	Thermal resistance junction-case Max	0.5	0.5	3.33	°C/W
$R_{thJA}$	Thermal resistance junction-ambient Max	50	62.5	62.5	°C/W
$T_l$	Maximum lead temperature for soldering purpose	300	300	300	°C

## 2 Electrical characteristics

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

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu A, V_{GS} = 0$	120			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating} @ 125^{\circ}C$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 40A$		0.013	0.018	$\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15V, I_D = 40A$		80		S
$C_{iss}$	Input capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, V_{GS} = 0$		4300		pF
$C_{oss}$	Output capacitance			600		pF
$C_{rss}$	Reverse transfer capacitance			230		pF
$Q_g$	Total gate charge	$V_{DD} = 80V, I_D = 80A$ $V_{GS} = 10V$		140	189	nC
$Q_{gs}$	Gate-source charge			23		nC
$Q_{gd}$	Gate-drain charge			51		nC

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

**Table 5. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 50 \text{ V}, I_D = 40A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ <i>Figure 13 on page 8</i>		40		ns
$t_r$	Rise time			145		ns
$t_{d(off)}$	Turn-off delay time			134		ns
$t_f$	Fall time			115		ns

Table 6. 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	$I_{SD}=80A, V_{GS}=0$			1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD}=80A,$ $di/dt = 100A/\mu s,$ $V_{DD}=35V, T_J = 150^\circ C$		155		ns
$Q_{rr}$	Reverse recovery charge			0.85		$\mu C$
$I_{RRM}$	Reverse recovery current			11		A

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

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## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

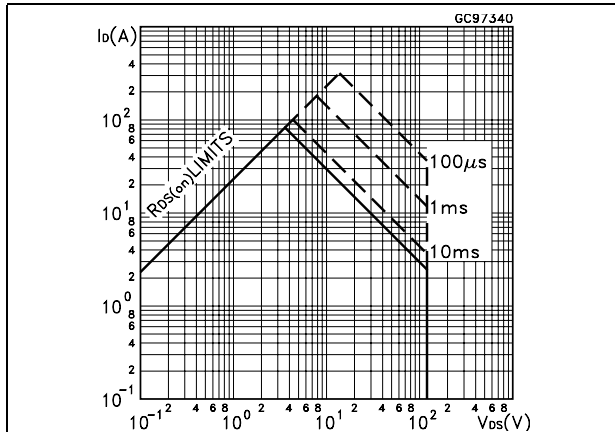


Figure 2. Thermal impedance

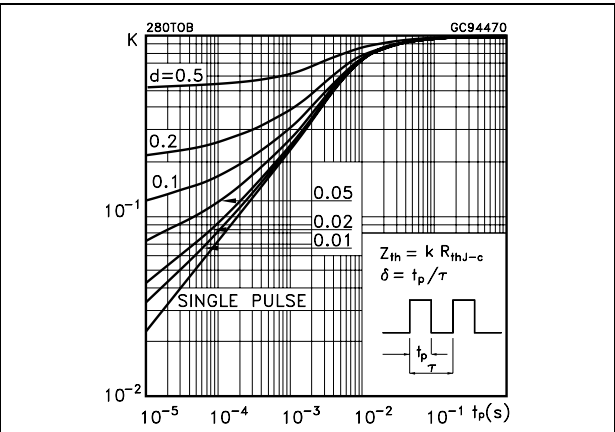


Figure 3. Output characteristics

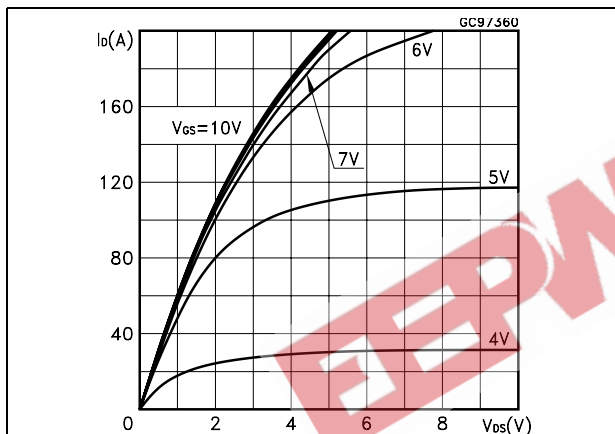


Figure 4. Transfer characteristics

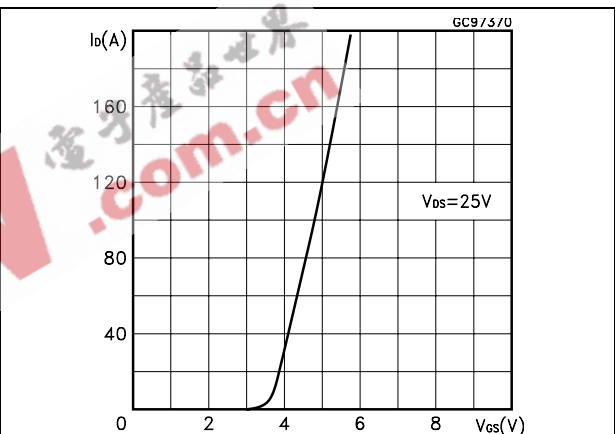


Figure 5. Transconductance

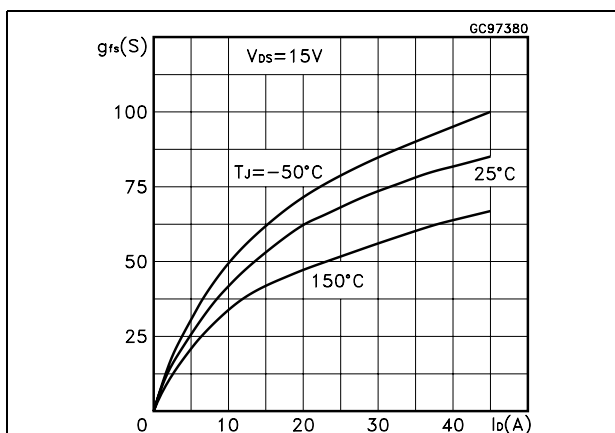


Figure 6. Static drain-source on resistance

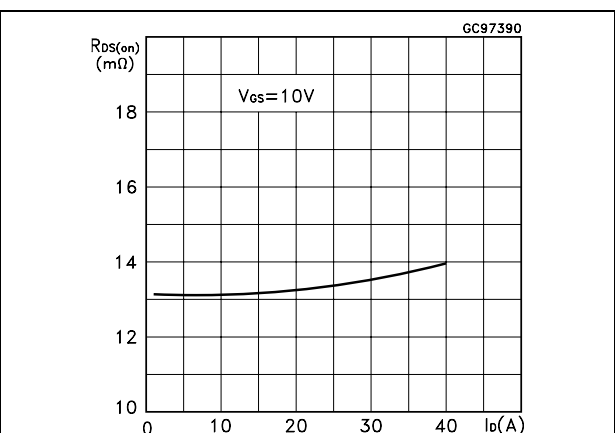


Figure 7. Gate charge vs. gate-source voltage Figure 8. Capacitance variations

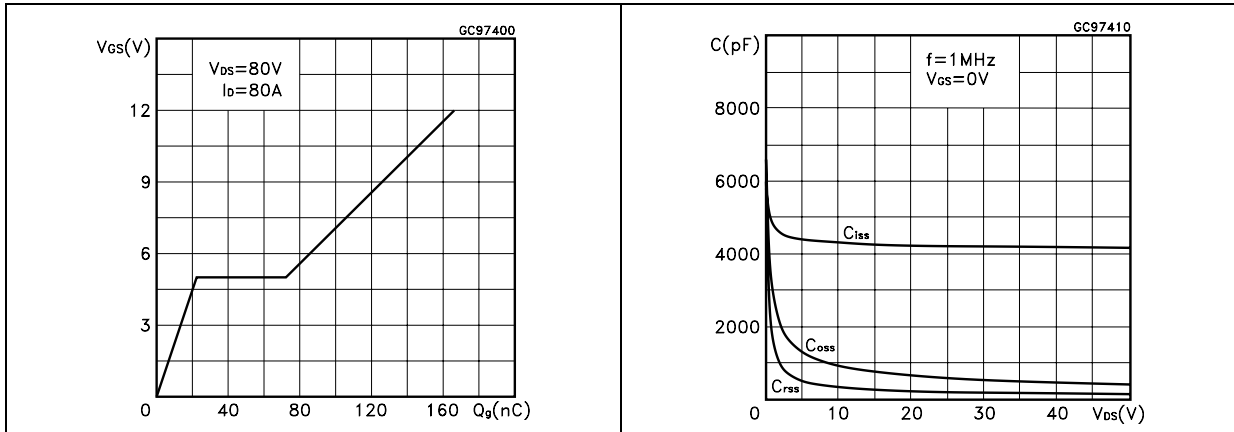


Figure 9. Normalized gate threshold voltage vs. temperature

Figure 10. Normalized on resistance vs. temperature

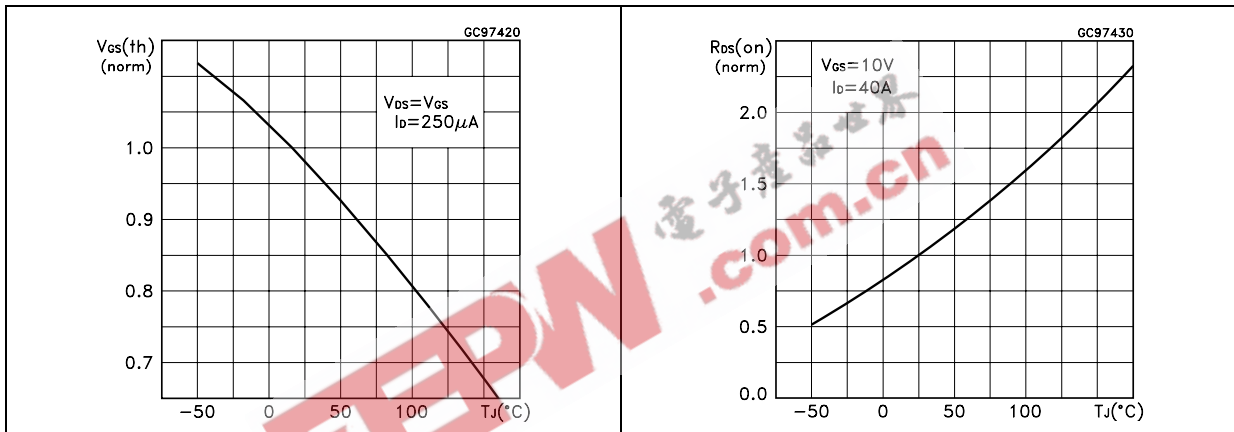
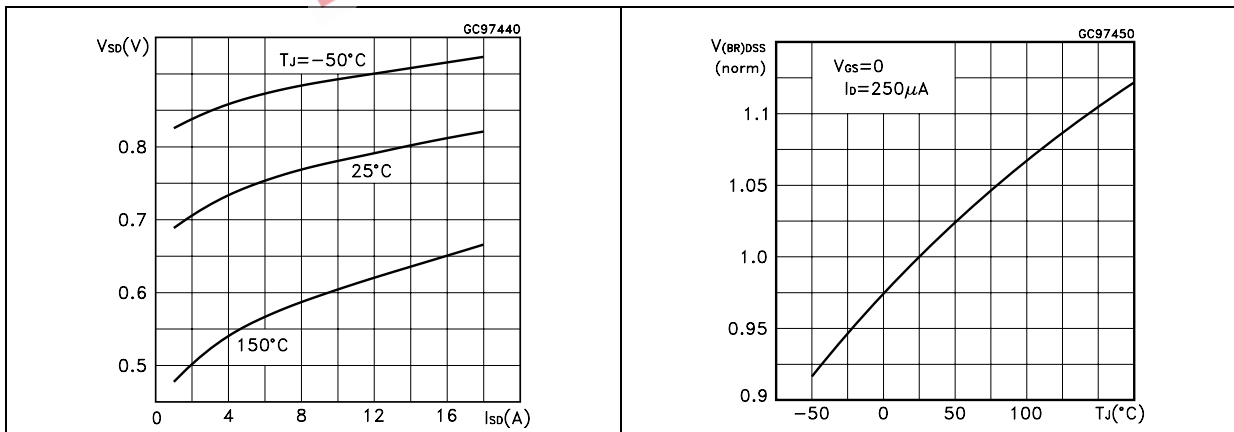


Figure 11. Source-drain diode forward characteristics

Figure 12. Normalized BV<sub>DSS</sub> vs. temperature



### 3 Test circuit

Figure 13. Switching times test circuit for resistive load

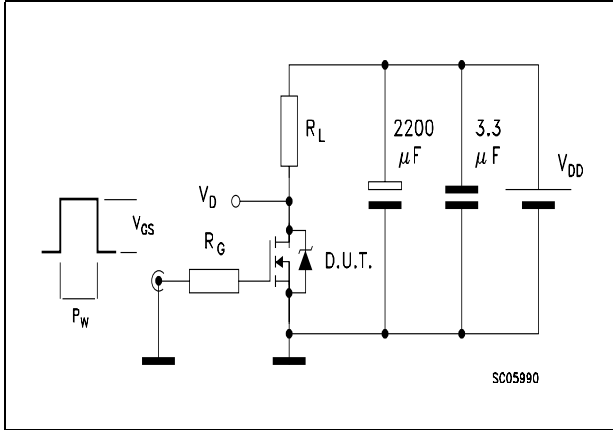


Figure 14. Gate charge test circuit

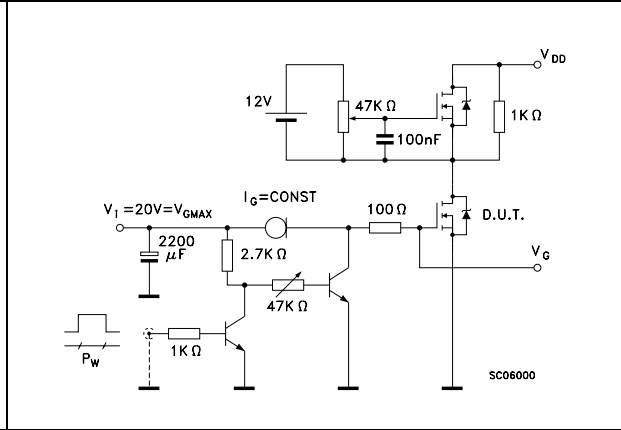


Figure 15. Test circuit for inductive load switching and diode recovery times

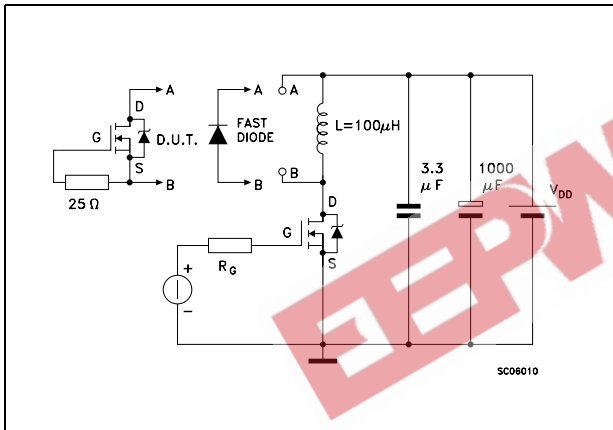


Figure 16. Unclamped Inductive load test circuit

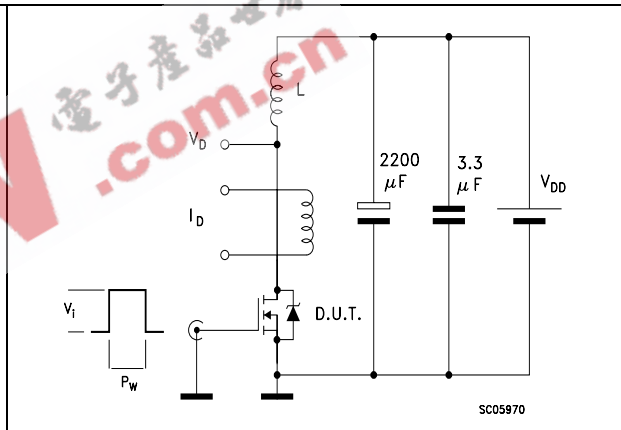
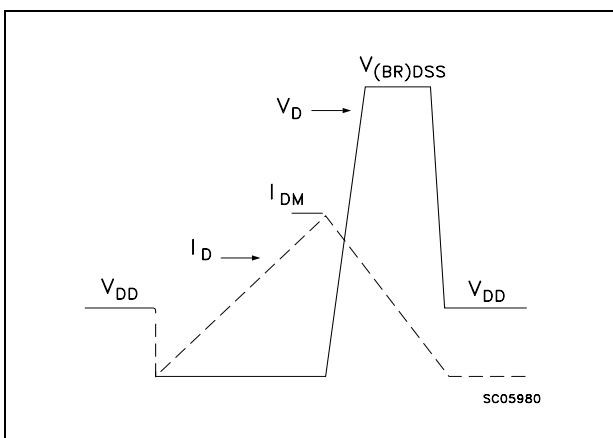


Figure 17. Unclamped inductive waveform





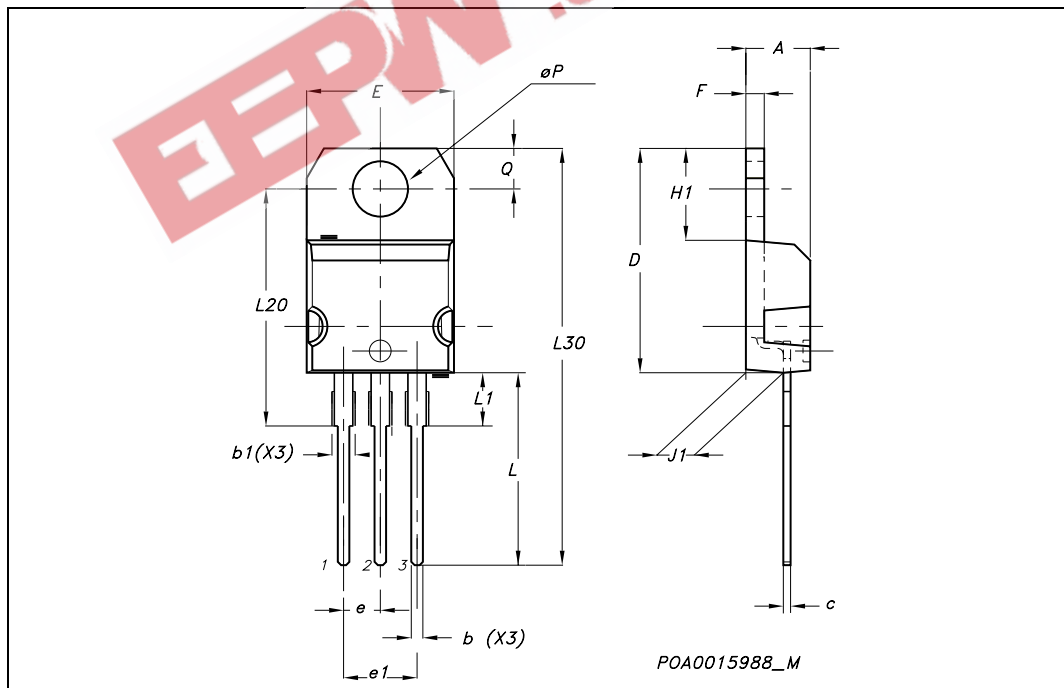
## 4 Package mechanical data

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)

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**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	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
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		0.052
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	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



## 5 Revision history

Table 7. Revision history

Date	Revision	Changes
21-Jun-2004	2	Preliminary version
24-Jul-2006	3	The document has been reformatted, SOA updated
31-Jan-2007	4	Typo mistake on <a href="#">Table 1</a> .

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