



STP62NS04Z

N-channel clamped 12.5mΩ - 62A - TO-220
Fully protected MESH OVERLAY™ Power MOSFET

General features

Type	V _{DSS} (@T _{jmax})	R _{DS(on)}	I _D
STP62NS04Z	Clamped	<0.015Ω	62A

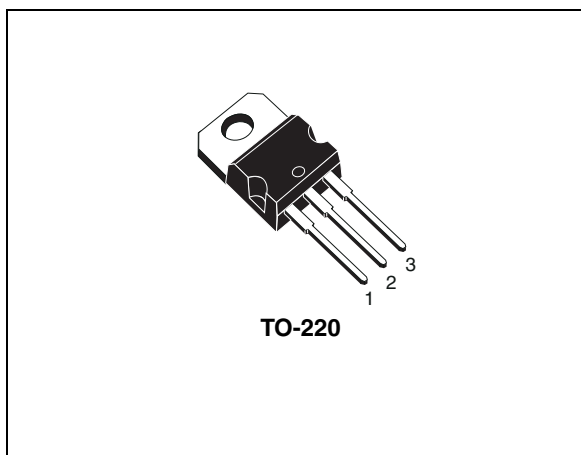
- 100% avalanche tested
- Low capacitance and gate charge
- 175° C maximum junction temperature

Description

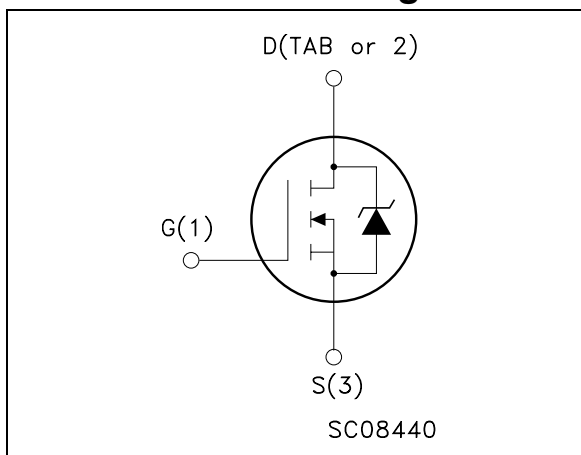
This fully clamped MOSFET is produced by using the latest advanced Company's Mesh Overlay process which is based on a novel strip layout. The inherent benefits of the new technology coupled with the extra clamping capabilities make this product particularly suitable for the harshest operation conditions such as those encountered in the automotive environment. Any other application requiring extra ruggedness is also recommended.

Applications

- Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STP62NS04Z	P62NS04Z	TO-220	Tube

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1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	Clamped	V
V_{GS}	Gate-source voltage	Clamped	V
I_D	Drain current (continuous) at $T_C = 25^\circ\text{C}$	62	A
I_D	Drain current (continuous) at $T_C = 100^\circ\text{C}$	37.5	A
I_{DG}	Drain gate current (continuous)	± 50	
I_{GS}	Gate source current (continuous)	± 50	
$I_{DM}^{(1)}$	Drain current (pulsed)	248	A
P_{TOT}	Total dissipation at $T_C = 25^\circ\text{C}$	110	W
	Derating factor	0.74	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	8	V/ns
$E_{AS}^{(3)}$	Single Pulse Avalanche Energy	500	mJ
V_{ESD}	ESD (HBM - C = 100pF, R = 1.5 k Ω)	8	V
T_J	Operating junction temperature	-55 to 175	$^\circ\text{C}$
T_{stg}	Storage temperature		

1. Pulse width limited by safe operating area
2. $I_{SD} \leq 40\text{A}$, $di/dt \leq 100\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq T_{JMAX}$
3. Starting $T_J = 25^\circ\text{C}$, $I_D = 20\text{A}$, $V_{DD} = 20\text{V}$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case Max	1.36	$^\circ\text{C}/\text{W}$
R_{thJA}	Thermal resistance junction-ambient Max	62.5	$^\circ\text{C}/\text{W}$
T_I	Maximum lead temperature for soldering purpose	300	$^\circ\text{C}$

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	$I_D = 1mA, V_{GS} = 0$	33			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = 16V$			10	μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 10V$			10	μA
V_{GSS}	Gate-Source Breakdown Voltage	$I_{GS} = 100 \mu A$	18			V
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 30A$		12.5	15	m Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 15V, I_D = 30A$		20		S
C_{iss}	Input capacitance	$V_{DS} = 25V, f = 1 MHz,$ $V_{GS} = 0$		1330		pF
C_{oss}	Output capacitance			420		pF
C_{rss}	Reverse transfer capacitance			135		pF
Q_g	Total gate charge	$V_{DD} = 20V, I_D = 40A$ $V_{GS} = 10V$		34	47	nC
Q_{gs}	Gate-source charge			10		nC
Q_{gd}	Gate-drain charge			11.5		nC

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

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 20V, I_D = 20A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ <i>Figure 13 on page 8</i>		13		ns
t_r	Rise time			104		ns
$t_{d(off)}$	Turn-off delay time			41		ns
t_f	Fall time			42		ns
$t_{r(Voff)}$	Off-voltage rise time	$V_{clamp} = 30V, I_D = 40A$ $R_G = 4.7\Omega, V_{GS} = 10V$ <i>Figure 13 on page 8</i>		30		ns
t_f	Fall time			54		ns
t_c	Cross-over time			90		ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				62	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				248	A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 62A, V_{GS} = 0$			1.5	V
t_{rr}	Reverse recovery time	$I_{SD} = 40A,$ $di/dt = 100A/\mu s,$ $V_{DD} = 20V, T_J = 150^\circ C$ <i>Figure 15 on page 8</i>		45		ns
Q_{rr}	Reverse recovery charge			65		μC
I_{RRM}	Reverse recovery current			2.9		A

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

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

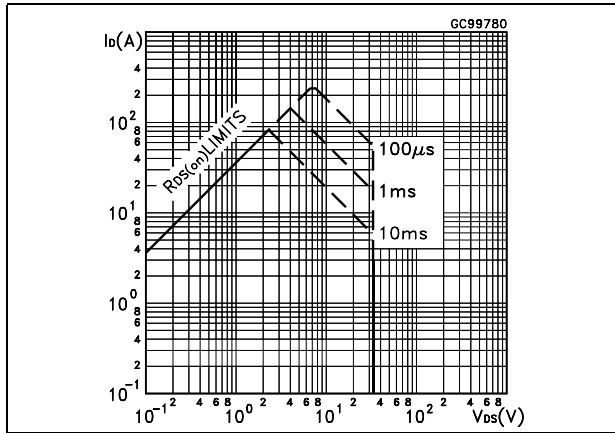


Figure 2. Thermal impedance

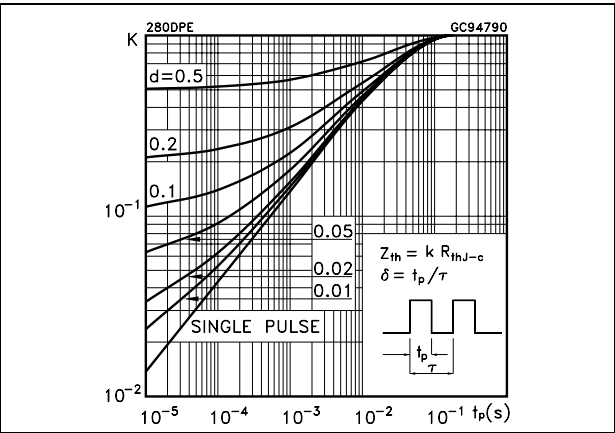


Figure 3. Output characteristics

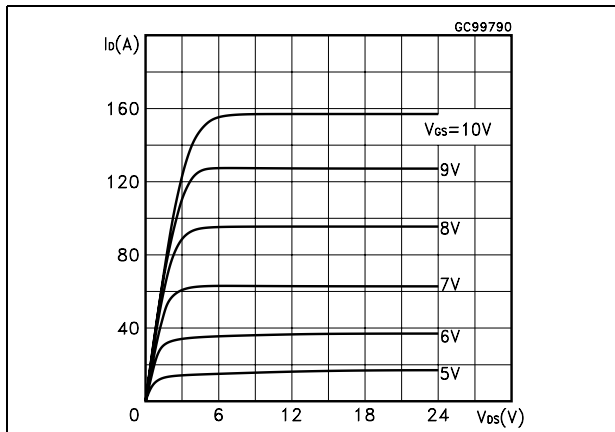


Figure 4. Transfer characteristics

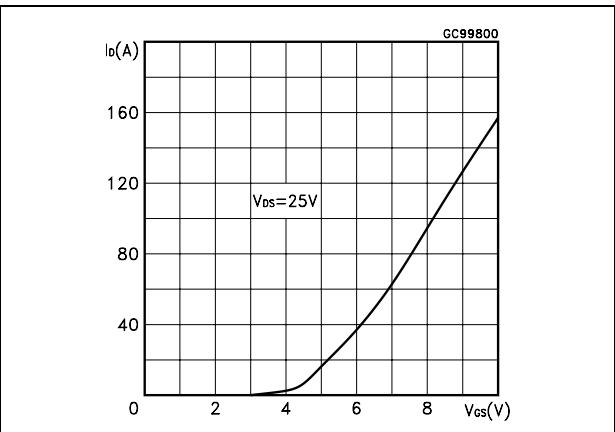


Figure 5. Transconductance

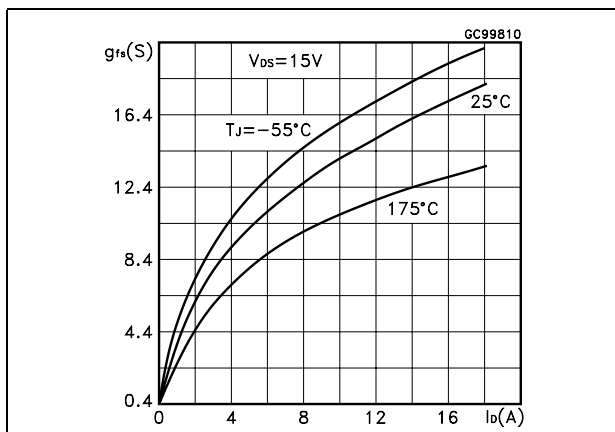


Figure 6. Static drain-source on resistance

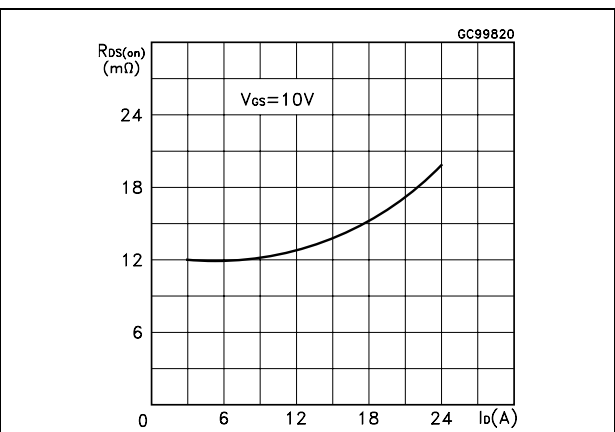


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

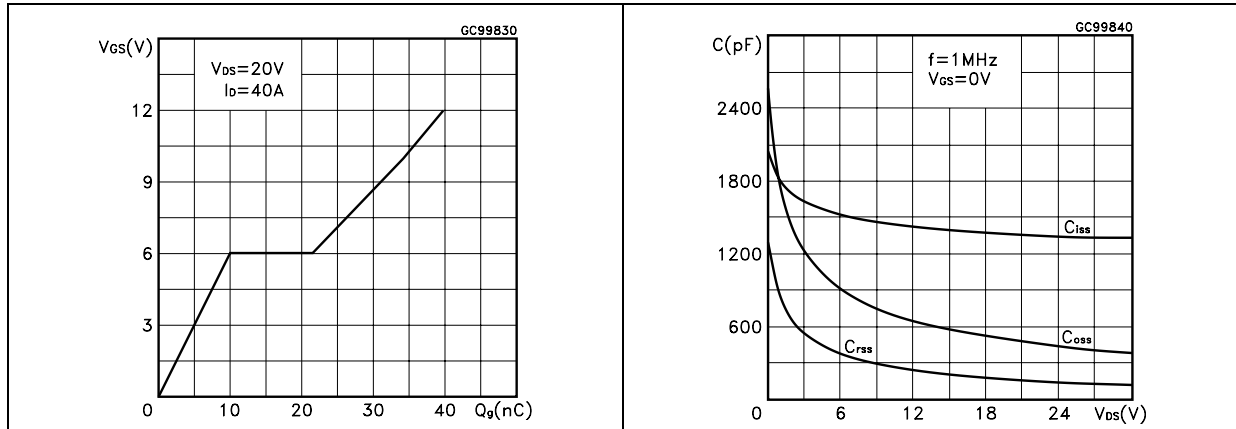


Figure 9. Normalized gate threshold voltage vs temperature Figure 10. Normalized on resistance vs temperature

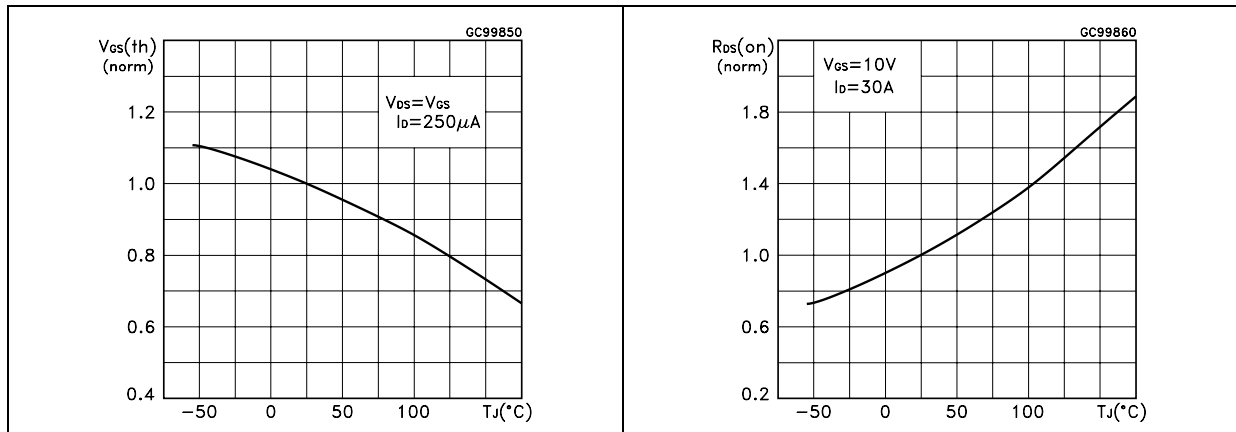
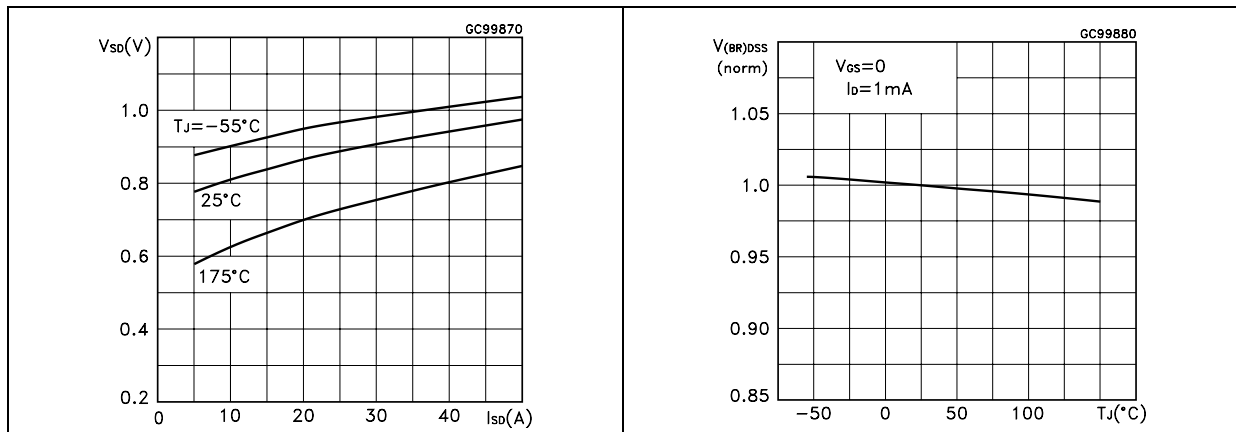


Figure 11. Source-drain diode forward characteristics Figure 12. Normalized $B_{V_{DSS}}$ vs temperature



3 Test circuit

Figure 13. Switching times test circuit for resistive load

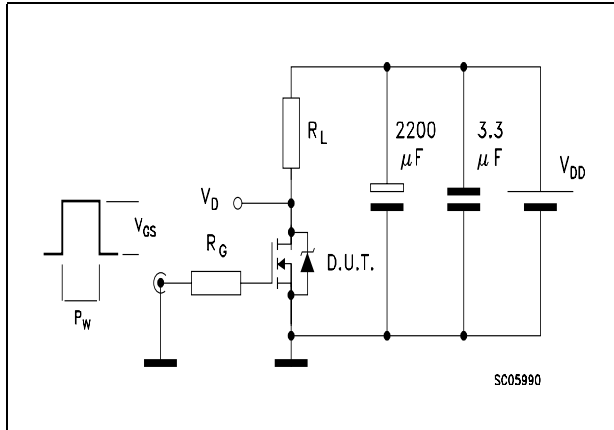


Figure 14. Gate charge test circuit

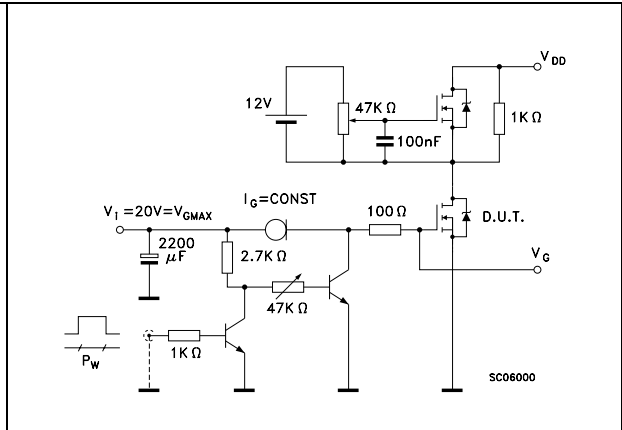


Figure 15. Test circuit for inductive load switching and diode recovery times

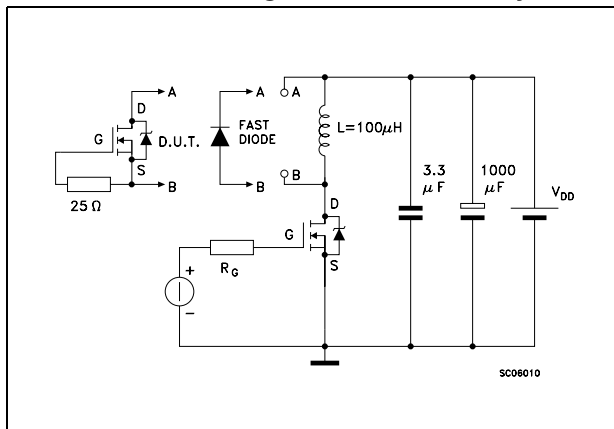


Figure 16. Unclamped Inductive load test circuit

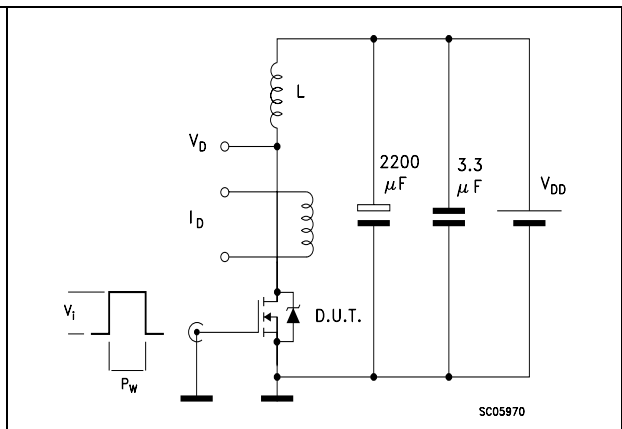
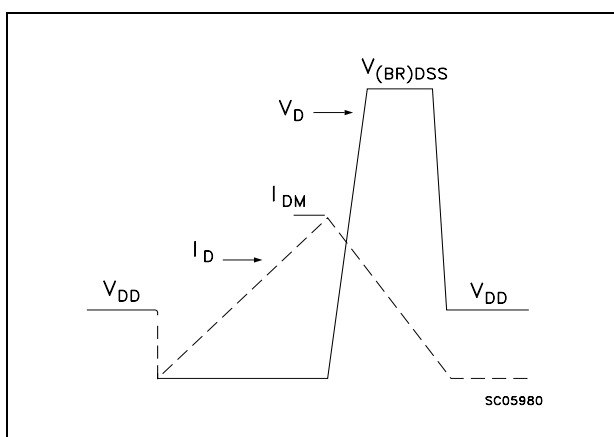


Figure 17. Unclamped inductive waveform

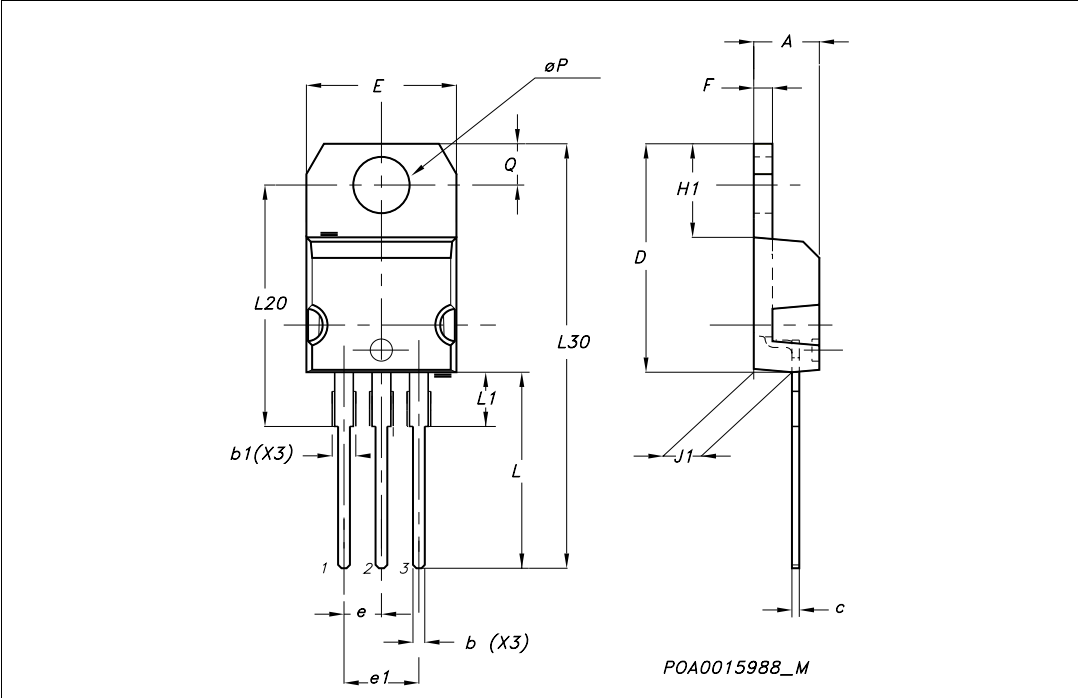


4 Package mechanical data

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

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 datasheet
22-Aug-2005	3	Complete document with curves
21-Jan-2006	4	New ECOPAK label
02-Oct-2006	5	New template, no content change

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