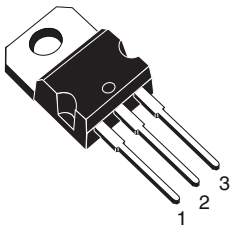
STP190N55LF3

N-channel 55 V, 2.9 mΩ, 120 A, TO-220 STripFET™ Power MOSFET

Features

Type	V_{DSS}	$R_{DS(on)}$ max	I_D	P_D
STP190N55LF3	55 V	< 3.7 mΩ	120 A	312 W

- Logic level drive
- 100% avalanche tested



TO-220

Application

- Switching applications
  - Automotive

Description

This n-channel enhancement mode Power MOSFET is the latest refinement of STMicroelectronics' unique “single feature size” strip-based process, which has decreased the critical alignment steps, offering remarkable manufacturing reproducibility. The outcome is a transistor with extremely high packing density for low on resistance, rugged avalanche characteristics and low gate charge.

Figure 1. Internal schematic diagram

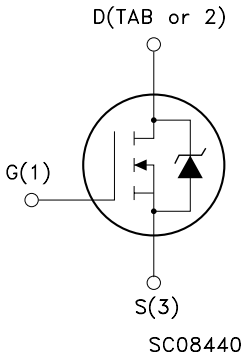


Table 1. Device summary

Order code	Marking	Package	Packaging
STP190N55LF3	190N55LF3	TO-220	Tube

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2.1 Electrical characteristics (curves) 6

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1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage (V_{GS}=0)	55	V
V_{GS}	Gate-Source voltage	± 18	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	120	A
I_D (1)	Drain current (continuous) at T_C = 100 °C	120	A
I_{DM} (2)	Drain current (pulsed)	480	A
P_{TOT}	Total dissipation at T_C = 25 °C	312	W
	Derating factor	2.08	W/°C
E_{AS} (3)	Single pulse avalanche energy	1000	mJ
T_{stg}	Storage temperature	-55 to 175	°C
T_j	Max. operating junction temperature	175	°C

1. Current limited by package
2. Pulse width limited by safe operating area
3. Starting Tj = 25 °C, I_D = 60 A, V_{DD} = 40 V

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max	0.48	°C/W
Rthj-a	Thermal resistance junction-ambient max	62.5	°C/W
T_L	Maximum lead temperature for soldering purpose	300	°C

2 Electrical characteristics

(T_{CASE} = 25 °C unless otherwise specified)

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown Voltage	I_D = 250 µA, V_{GS}= 0	55			V
I_{DSS}	Zero gate voltage drain current (V_{GS} = 0)	V_{DS} = Max rating, V_{DS} = Max rating,Tc = 125 °C			10 100	µA µA
I_{GSS}	Gate body leakage current (V_{DS} = 0)	V_{GS} = ±18 V			±200	nA
$V_{GS(th)}$	Gate threshold voltage	V_{DS}= V_{GS}, I_D = 250 µA	1		2.5	V
$R_{DS(on)}$	Static drain-source on resistance	V_{GS}= 10 V, I_D= 30 A V_{GS}= 5 V, I_D= 30 A		2.9 3.3	3.7 4.5	mΩ mΩ

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 15 V, I_D=60 A		250		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} = 25 V, f=1 MHz, V_{GS}=0		6200 1450 80		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD}= 44 V, I_D = 120 A V_{GS} = 5 V *(see Figure 16)*		60 20 30	80	nC nC nC

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

Table 6. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on delay time Rise time	V_{DD}= 27.5 V, I_D= 60 A, R_G=4.7 Ω, V_{GS}=10 V *(see Figure 15),* *(see Figure 18)*		20 40		ns ns
$t_{d(off)}$ t_f	Turn-off delay time Fall time	V_{DD}= 27.5 V, I_D= 60 A, R_G=4.7 Ω, V_{GS}=10 V *(see Figure 15),* *(see Figure 18)*		160 40		ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM}	Source-drain current Source-drain current (pulsed)(1)				120 480	A A
V_{SD}	Forward on voltage	I_{SD}= 120 A, V_{GS}=0			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD}= 120 A, di/dt = 100A/µs, V_{DD}= 35 V, Tj= 150 °C *(see Figure 17)*		50 90 3.6		ns nC A

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

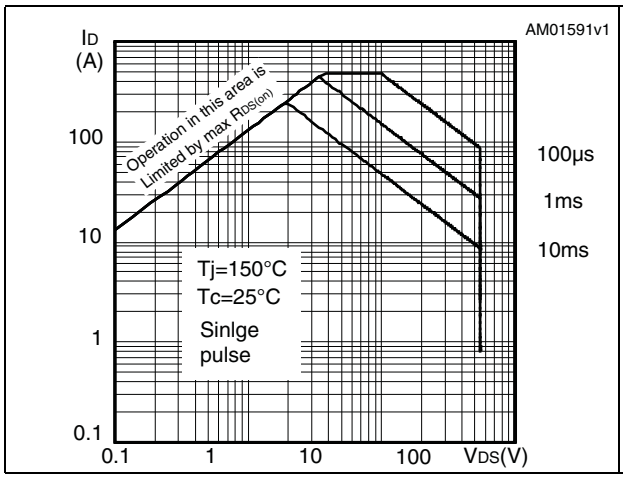


Figure 3. Thermal impedance

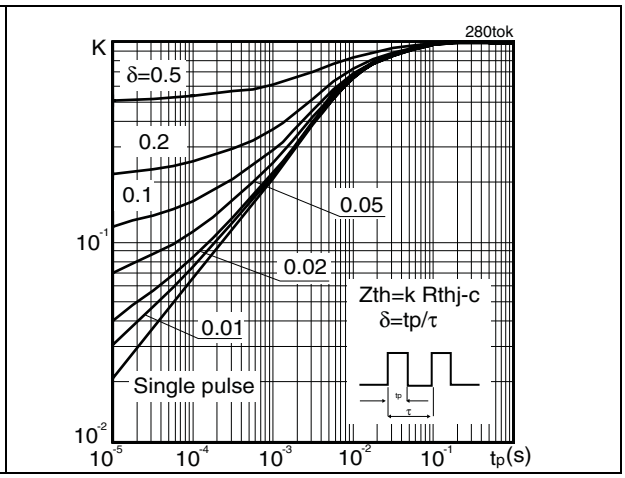


Figure 4. Output characteristics

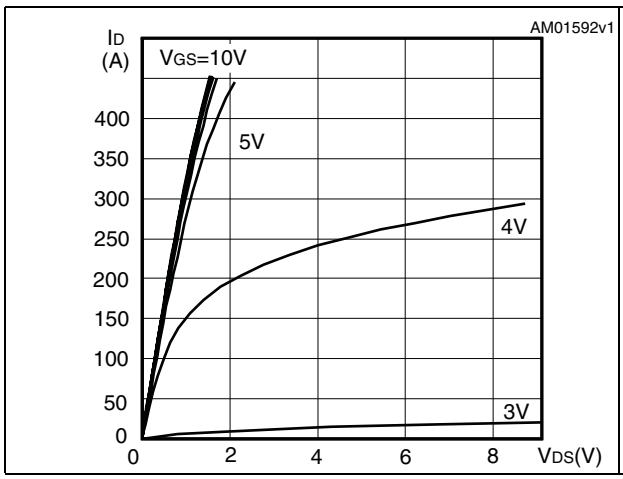


Figure 5. Transfer characteristics

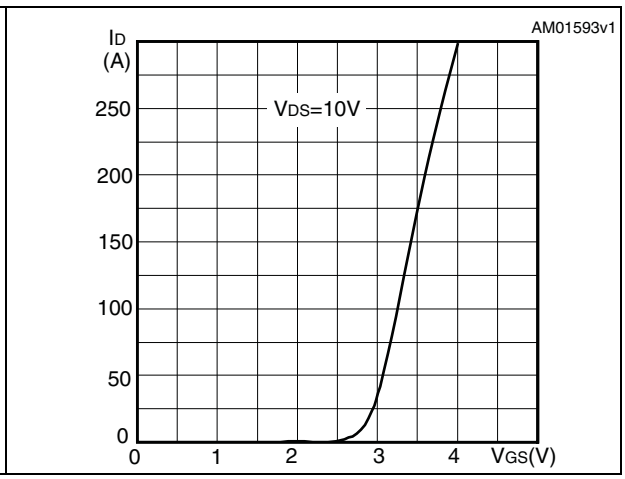


Figure 6. Normalized B_{VDSS} vs temperature

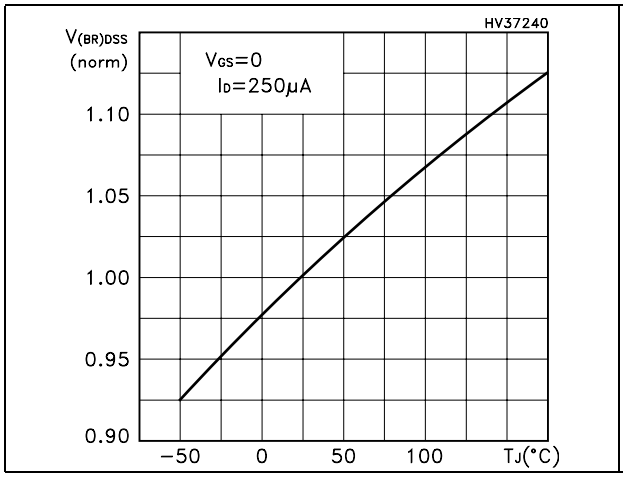


Figure 7. Static drain-source on resistance

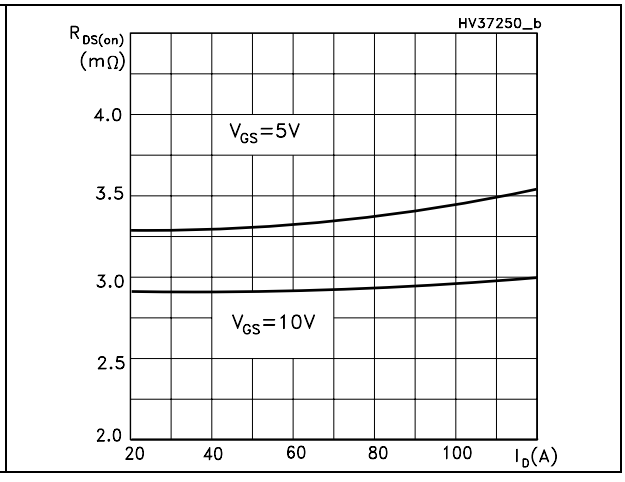


Figure 8. Gate charge vs gate-source voltage

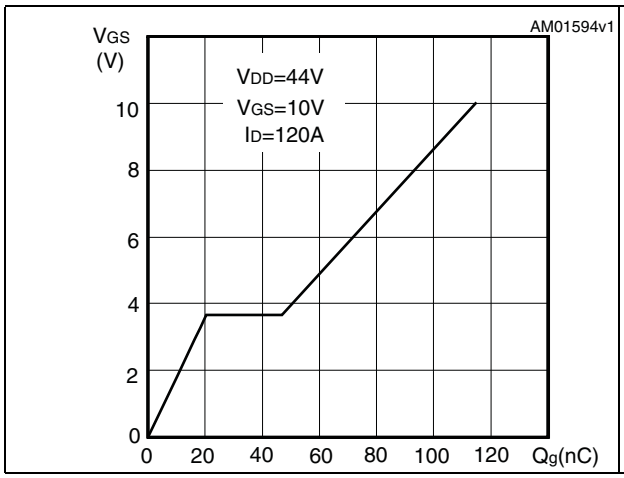


Figure 9. Capacitance variations

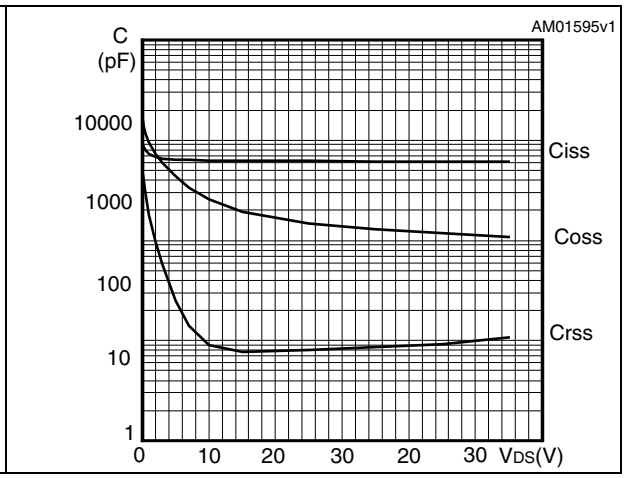


Figure 10. Normalized gate threshold voltage vs temperature

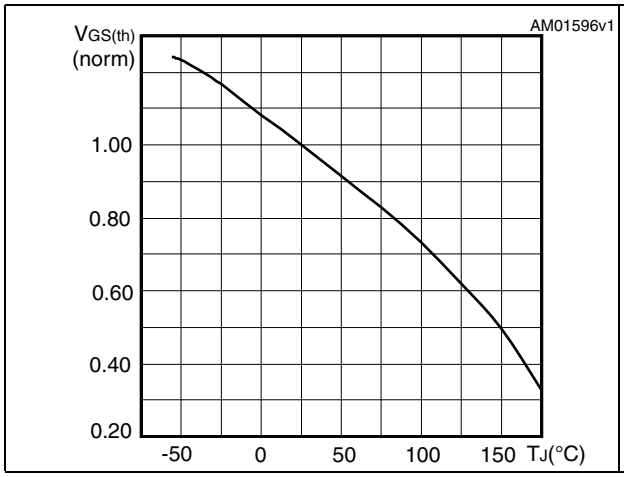


Figure 11. Normalized on resistance vs temperature

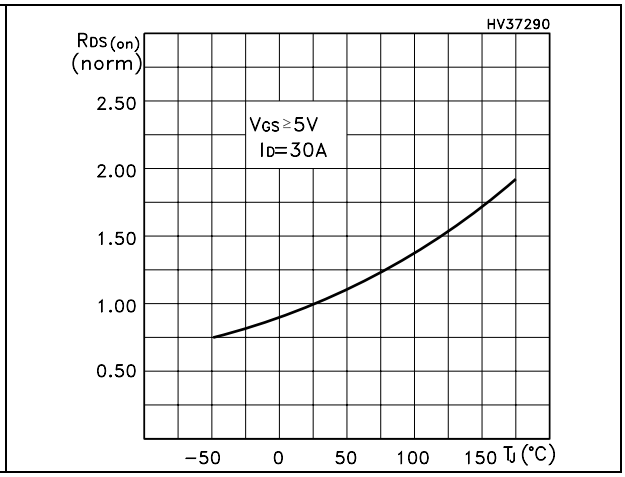
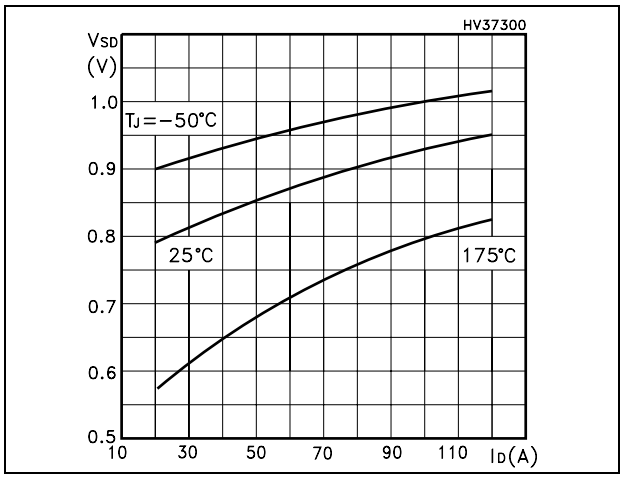


Figure 12. Source-drain diode forward characteristics



3 Test circuit

Figure 13. Unclamped inductive load test circuit

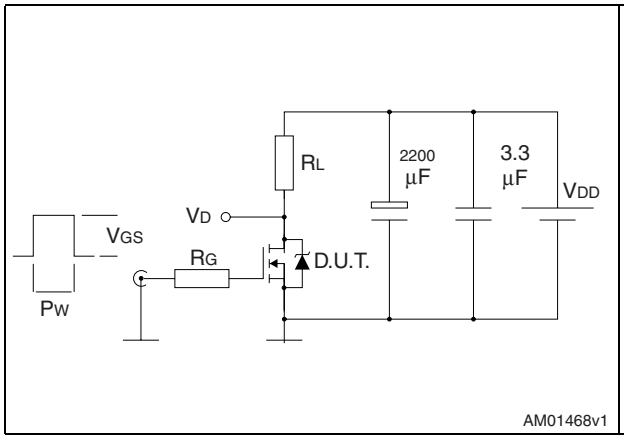


Figure 14. Unclamped inductive waveform

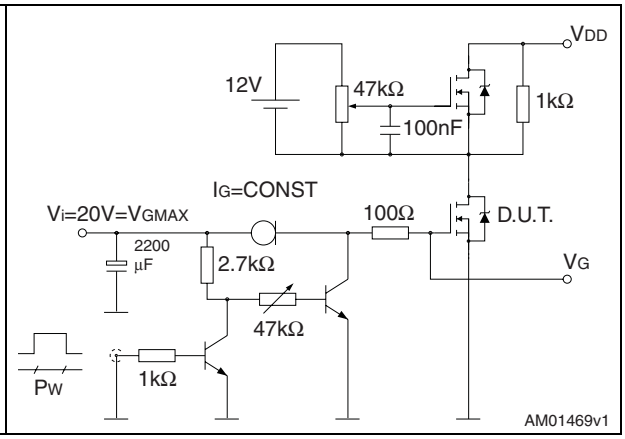


Figure 15. Switching times test circuit for resistive load

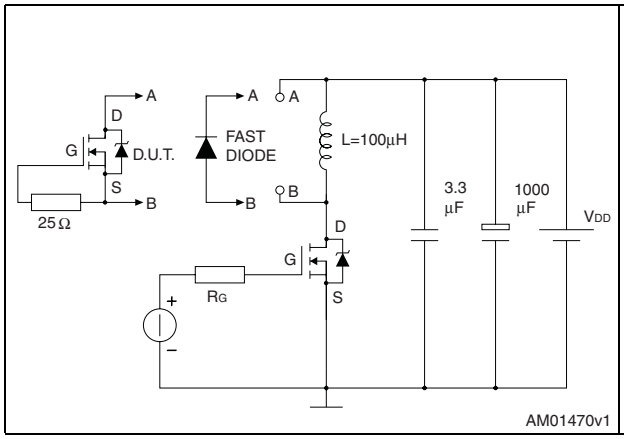


Figure 16. Gate charge test circuit

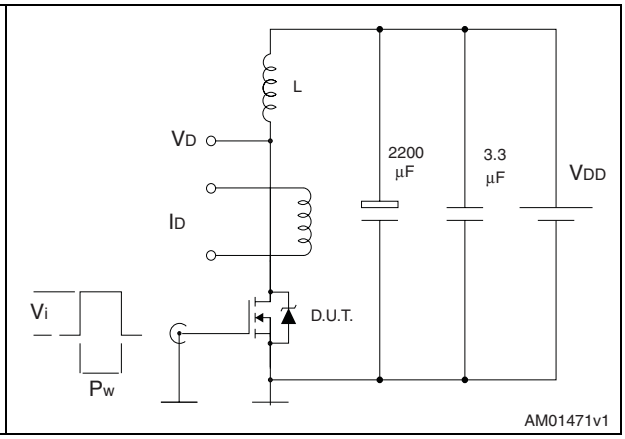


Figure 17. Test circuit for inductive load switching and diode recovery times

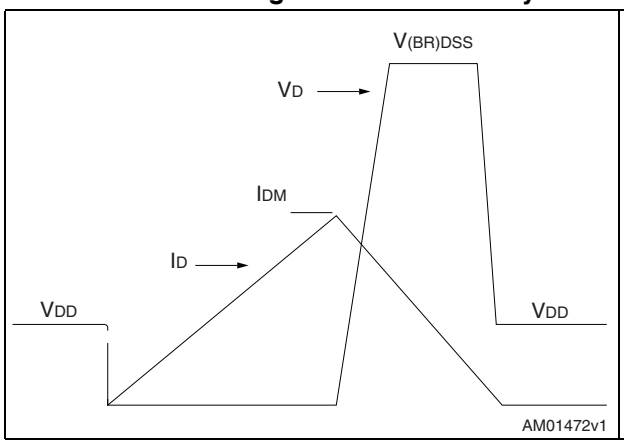
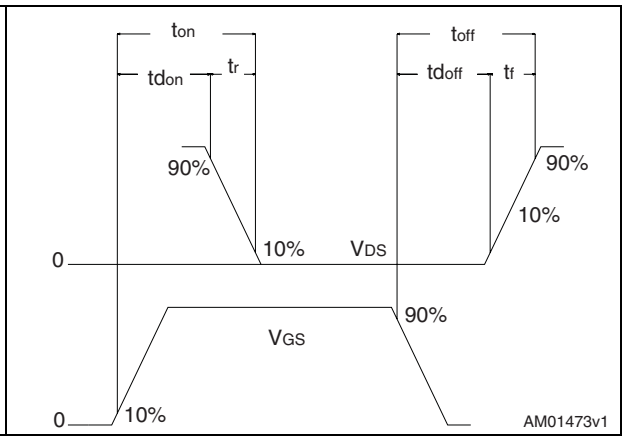


Figure 18. Switching time waveform

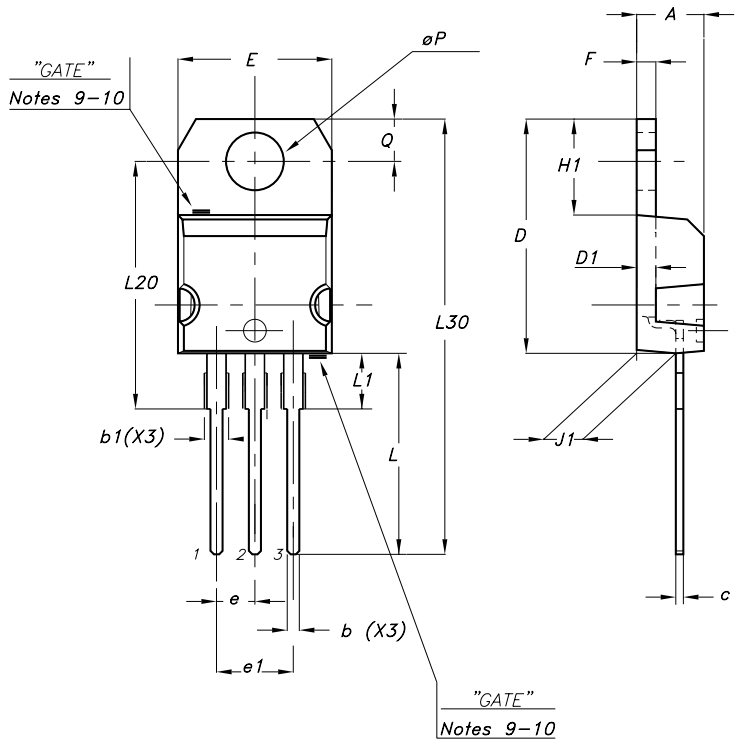


4 Package mechanical data

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	1.14		1.70	0.044		0.066
c	0.48		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

Date	Revision	Changes
05-Nov-2008	1	First release

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