



# STL75NH3LL

N-channel 30 V, 0.004  $\Omega$ , 20 A, PowerFLAT™ (6x5)  
ultra low gate charge STripFET™ Power MOSFET

## Features

Type	V <sub>DSS</sub>	R <sub>DS(on) max</sub>	I <sub>D</sub>
STL75NH3LL	30V	< 0.0057 $\Omega$	20 A <sup>(1)</sup>

1. This value is according R<sub>thj-pcb</sub>

- Improved die-to-footprint ratio
- Very low profile package (1mm max)
- Very low thermal resistance
- Very low gate charge
- Low threshold device

## Application

- Switching applications

## Description

This application specific Power MOSFET is the latest generation of STMicroelectronics unique “STripFET™” technology. The resulting transistor is optimized for low on-resistance and minimal gate charge. The chip-scaled PowerFLAT™ package allows a significant board space saving, still boosting the performance.

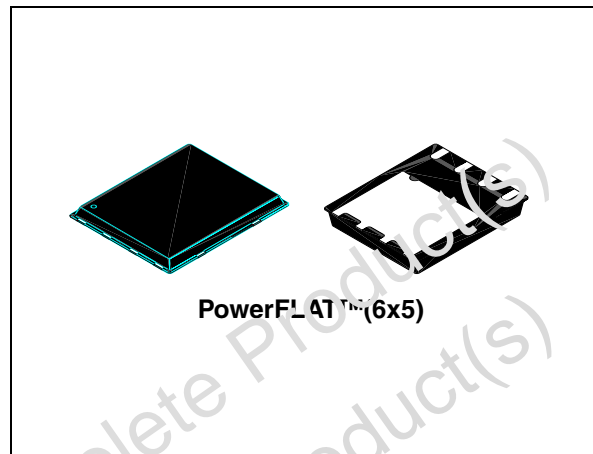


Figure 1. Internal schematic diagram

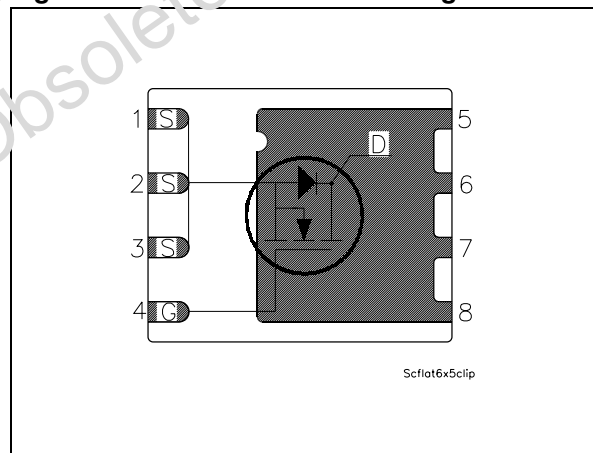


Table 1. Device summary

Order code	Marking	Package	Packaging
STL75NH3LL	L75NH3LL	PowerFLAT™ (6 x 5)	Tape and reel

# Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS} = 0$ )	30	V
$V_{GS}$	Gate-source voltage	$\pm 16$	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	75	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	47	A
$I_D^{(2)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	20	A
$I_D^{(2)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	12.5	A
$I_{DM}^{(3)}$	Drain current (pulsed)	30	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	50	W
$P_{TOT}^{(2)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	4	W
	Derating factor	0.03	W/ $^\circ\text{C}$
$T_j$	Operating junction temperature	-55 to 150	$^\circ\text{C}$
$T_{stg}$	Storage temperature		

1. The value is rated according  $R_{thj-c}$
2. This value is according  $R_{thj-pcb}$
3. Pulse width limited by safe operating area

**Table 3. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-cas}$	Thermal resistance junction-case (drain) max	2.08	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-pcb max	31.3	$^\circ\text{C}/\text{W}$

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2 oz Cu, t < 10 sec

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu A, V_{GS} = 0$	30			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 ( $V_{DS} = 0$ )	$V_{DS} = \pm 16 V$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1			V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 V, I_D = 10 A$ $V_{GS} = 4.5 V, I_D = 10 A$		0.004 0.005	0.0057 0.0075	$\Omega$ $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance			1810		pF
$C_{oss}$	Output capacitance	$V_{DS} = 25 V, f = 1 \text{ MHz},$ $V_{GS} = 0$		565		pF
$C_{rss}$	Reverse transfer capacitance			41		pF
$Q_g$	Total gate charge	$V_{DD} = 15 V, I_D = 20 A,$ $V_{GS} = 4.5 V$		18	24	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5 V$		4.8		nC
$Q_{gd}$	Gate-drain charge	(see Figure 14)		5.3		nC
$R_G$	Gate input resistance	f=1 MHz Gate DC Bias = 0 Test signal level = 20 mV open drain	0.5	1.5	3	$\Omega$

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 15\text{ V}$ , $I_D = 10\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 16)		8 65		ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD} = 15\text{ V}$ , $I_D = 10\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (see Figure 16)		30 20		ns ns

**Table 7. Source drain diode**

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
$I_{SD}$	Source-drain current				20	A
$I_{SDM}$	Source-drain current (pulsed)				80	A
$V_{SD}^{(1)}$	Forward on voltage	$I_{SD} = 20\text{ A}$ , $V_{GS} = 0$			1.3	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 20\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		22		ns
$Q_{rr}$	Reverse recovery charge	$V_{DD} = 20\text{ V}$		32		nC
$I_{RRM}$	Reverse recovery current	(see Figure 15)		1.9		A

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

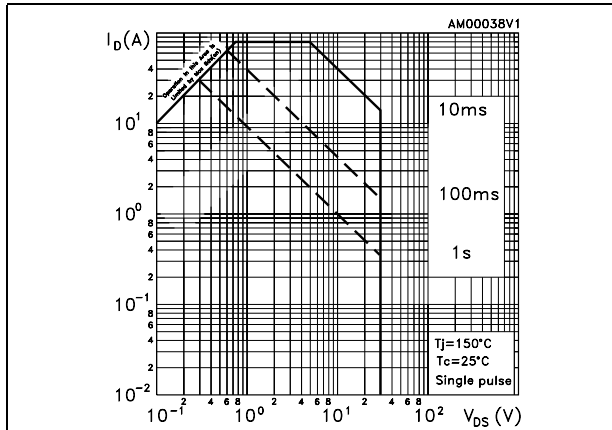


Figure 3. Thermal impedance

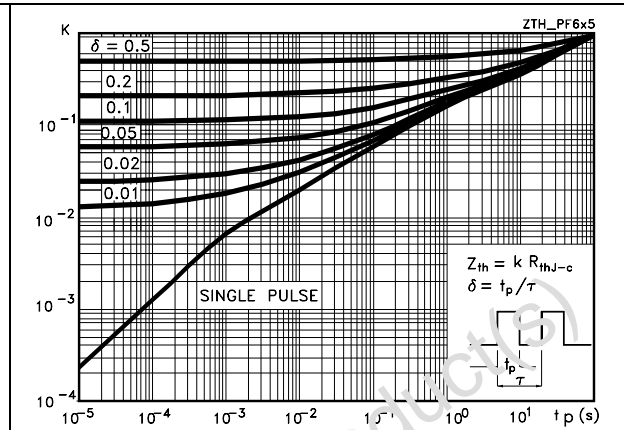


Figure 4. Output characteristics

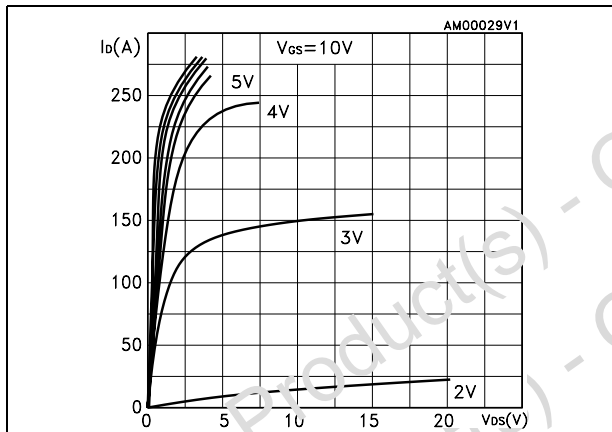


Figure 5. Transfer characteristics

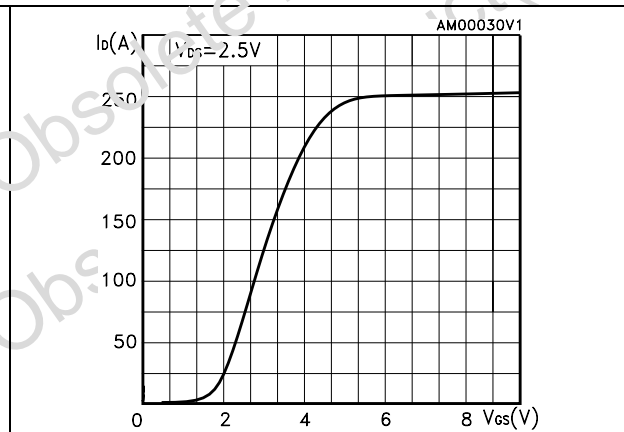


Figure 6. Normalized  $B_{V_{DS}}$  vs temperature

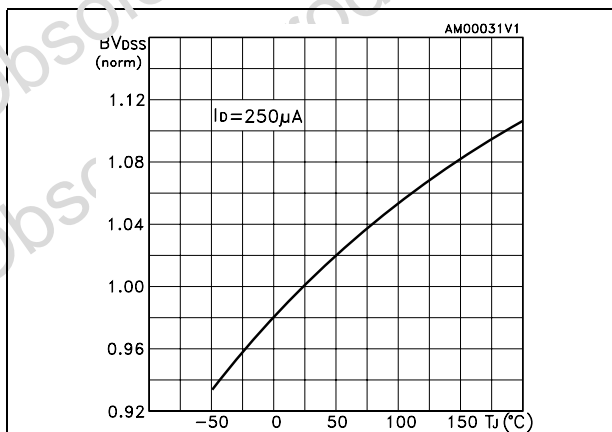


Figure 7. Static drain-source on resistance

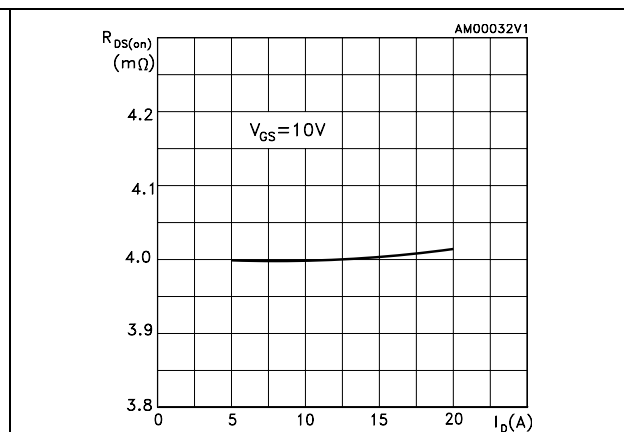


Figure 8. Gate charge vs gate-source voltage Figure 9. Capacitance variations

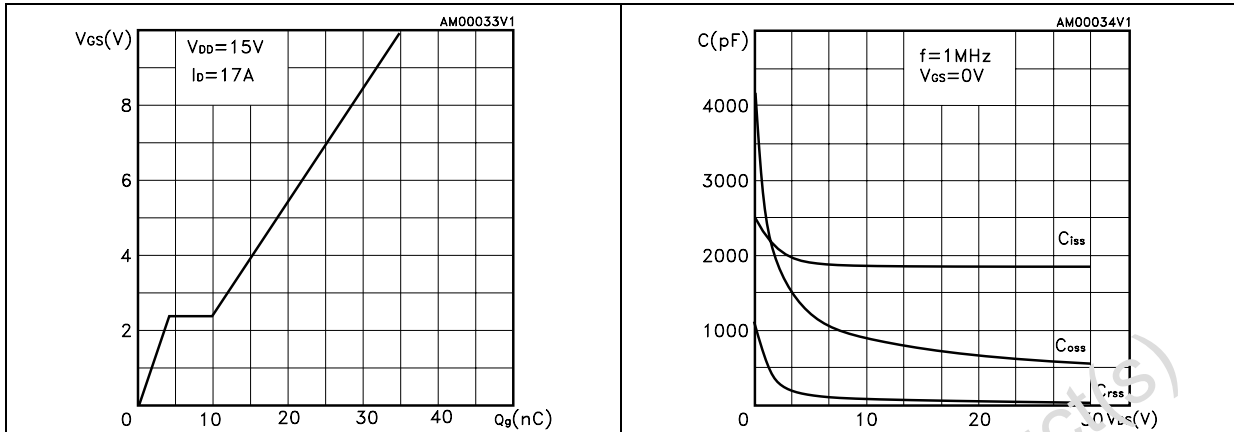


Figure 10. Normalized gate threshold voltage vs temperature Figure 11. Normalized on resistance vs temperature

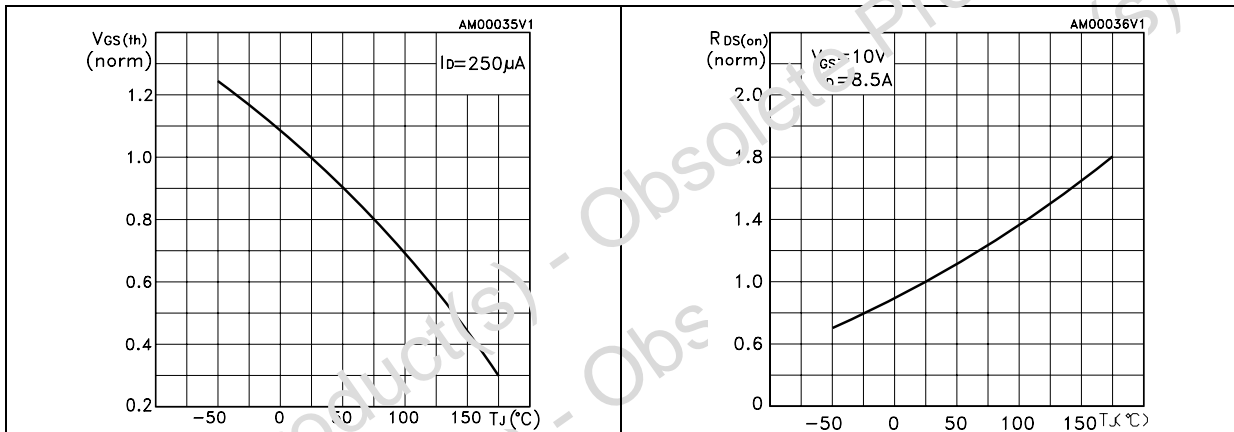
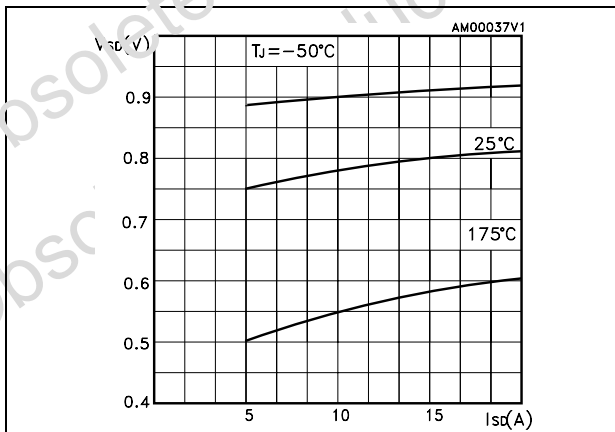


Figure 12. Source-drain diode forward characteristics



### 3 Test circuits

Figure 13. Switching times test circuit for resistive load



Figure 14. Gate charge test circuit

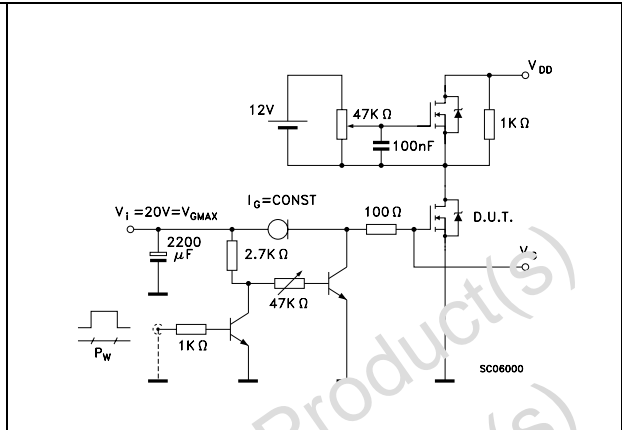


Figure 15. Test circuit for inductive load switching and diode recovery times

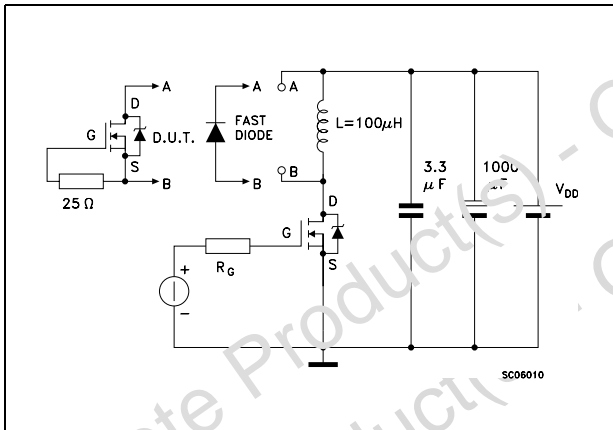


Figure 16. Unclamped inductive load test circuit

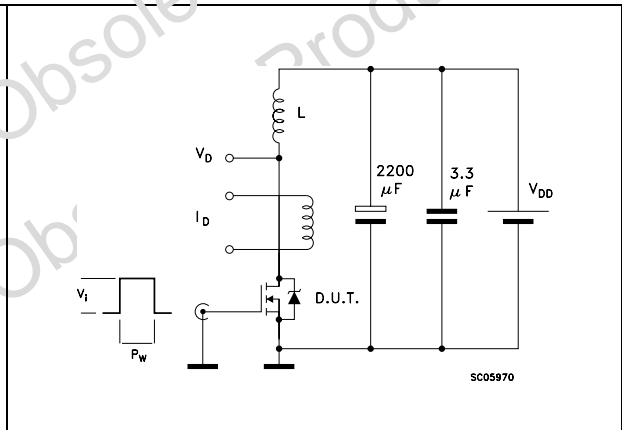


Figure 17. Unclamped inductive waveform

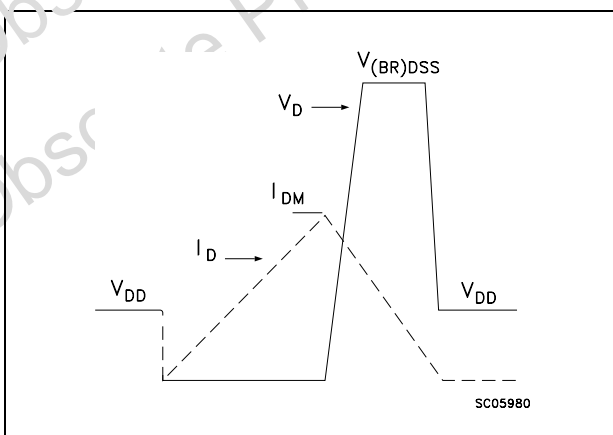


Figure 18. Switching time waveform





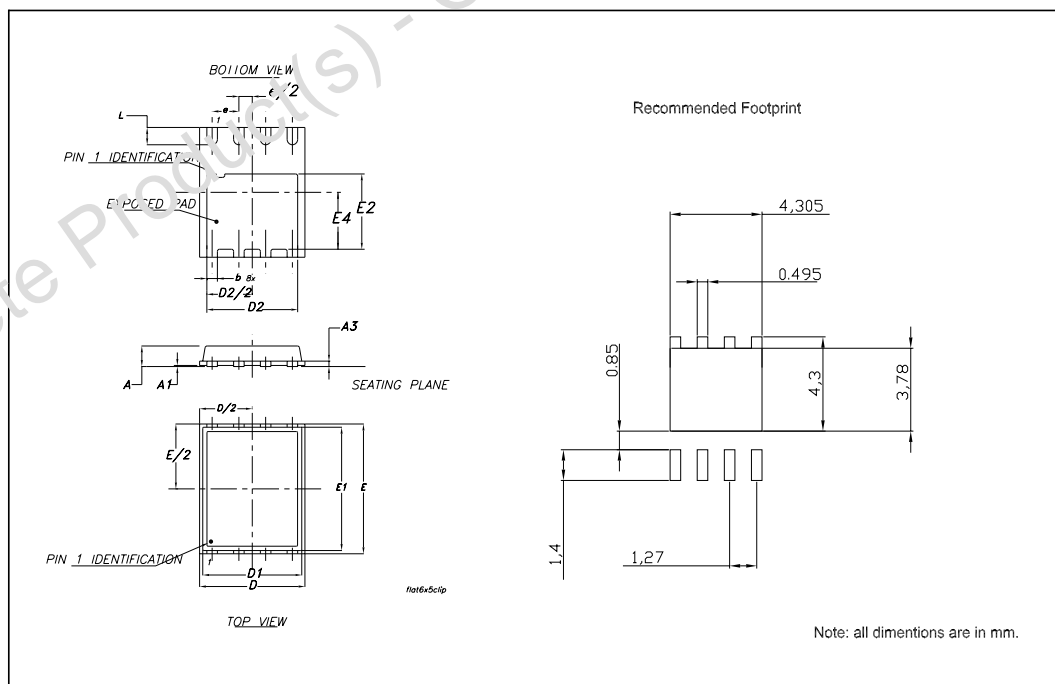
## 4 Package mechanical data

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](http://www.st.com)

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**PowerFLAT™ (6x5) MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	0.80	0.83	0.93	0.031	0.032	0.036
A1		0.02	0.05		0.0007	0.0019
A3		0.20			0.007	
b	0.35	0.40	0.47	0.013	0.015	0.018
D		5.00			0.196	
D1		4.75			0.187	
D2	4.15	4.20	4.25	0.163	0.165	0.167
E		6.00			0.236	
E1		5.75			0.226	
E2	3.43	3.48	3.53	0.135	0.137	0.139
E4	2.58	2.63	2.68	0.103	0.105	
e		1.27			0.050	
L	0.70	0.80	0.90	0.027	0.031	0.035



## 5 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
12-Jun-2008	1	First release

Obsolete Product(s) - Obsolete Product(s)  
Obsolete Product(s) - Obsolete Product(s)

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