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STL150N3LLH6

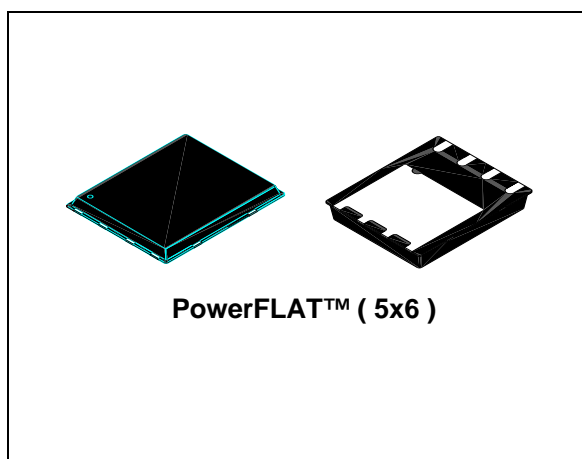
N-channel 30 V, 0.0016 Ω , 33 A PowerFLAT™ (5x6)
 STripFET™ VI DeepGATE™ Power MOSFET

Features

Type	V _{DSS}	R _{DS(on) max}	I _D
STL150N3LLH6	30 V	0.002 Ω	33 A ⁽¹⁾

1. The value is rated according R_{thj-pcb}

- R_{DS(on)} * Q_g industry benchmark
- Extremely low on-resistance R_{DS(on)}
- High avalanche ruggedness
- Low gate drive power losses
- Very low switching gate charge



Application

Switching applications

Description

The STL150N3LLH6 is a N-channel 30 V. This product utilizes the 6th generation of design rules of ST's proprietary STripFET™ technology, with a new gate structure. The resulting Power MOSFET exhibits the lowest R_{DS(on)} in all packages.

Figure 1. Internal schematic diagram

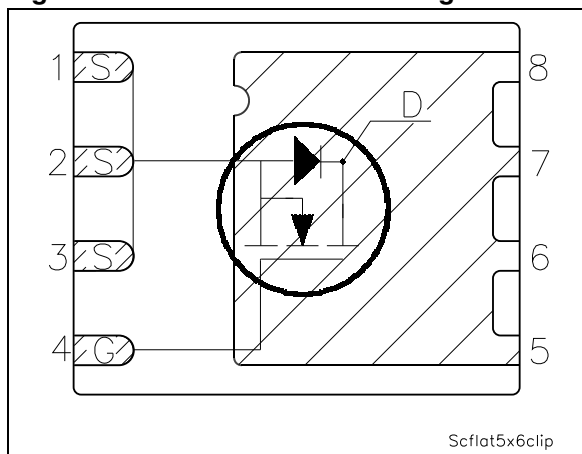


Table 1. Device summary

Order code	Marking	Package	Packaging
STL150N3LLH6	150N3LLH6	PowerFLAT™ (5x6)	Tape and reel

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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	± 20	V
$I_D^{(1)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	150	A
$I_D^{(1)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	93	A
$I_D^{(2)}$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	33	A
$I_D^{(2)}$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	20.8	A
$I_{DM}^{(3)}$	Drain current (pulsed)	132	A
$P_{TOT}^{(1)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	80	W
$P_{TOT}^{(3)}$	Total dissipation at $T_C = 25\text{ }^\circ\text{C}$	4	W
	Derating factor	0.03	W/ $^\circ\text{C}$
T_J T_{stg}	Operating junction temperature Storage temperature	-55 to 150	$^\circ\text{C}$

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

Table 3. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case (drain) (steady state)	1.56	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient	31.3	$^\circ\text{C}/\text{W}$

1. When mounted on FR-4 board of 1inch², 2oz Cu, $t < 10$ sec

Table 4. Avalanche data

Symbol	Parameter	Value	Unit
I_{AV}	Not-repetitive avalanche current, (pulse width limited by T_J Max)	20	A
E_{AS}	Single pulse avalanche energy (starting $T_J = 25\text{ }^\circ\text{C}$, $I_D = I_{AV}$)	200	mJ

Electrical characteristics

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2 Electrical characteristics

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

Table 5. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	I _D = 250 μA, V _{GS} = 0	30			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V _{DS} = Max rating, V _{DS} = Max rating @ 125 °C			1 10	μA μA
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{GS} = ±20 V			±100	nA
V _{GS(th)}	Gate threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1			V
R _{DS(on)}	Static drain-source on resistance	V _{GS} = 10 V, I _D = 16.5 A V _{GS} = 4.5 V, I _D = 16.5 A		0.0016 0.0025	0.002 0.0034	Ω Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0	-	4040 740 425	-	pF pF pF
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	V _{DD} = 15 V, I _D = 33 A V _{GS} = 4.5 V (see Figure 14)	-	40 16.3 15.8	-	nC nC nC
R _G	Gate input resistance	f = 1 MHz Gate DC Bias = 0 Test signal level = 20 mV open drain	-	1.4	-	Ω

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Electrical characteristics

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$t_{d(on)}$	Turn-on delay time	$V_{DD}=15\text{ V}$, $I_D=16.5\text{ A}$, $R_G=4.7\ \Omega$, $V_{GS}=10\text{ V}$ <i>(see Figure 13)</i>		17		ns	
t_r	Rise time			18		ns	
$t_{d(off)}$	Turn-off delay time			-	75	-	ns
t_f	Fall time				46		ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
I_{SD}	Source-drain current		-		33	A	
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		132	A	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 33\text{ A}$, $V_{GS}=0$	-		1.1	V	
t_{rr}	Reverse recovery time	$I_{SD} = 33\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=25\text{ V}$		34		ns	
Q_{rr}	Reverse recovery charge			-	35		nC
I_{RRM}	Reverse recovery current				2.1		A

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

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

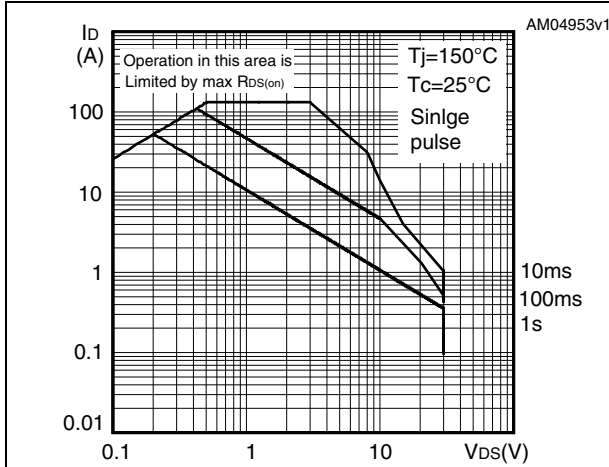


Figure 3. Thermal impedance

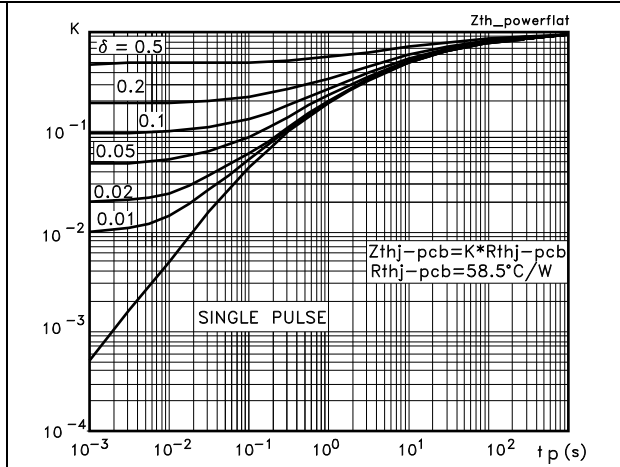


Figure 4. Output characteristics

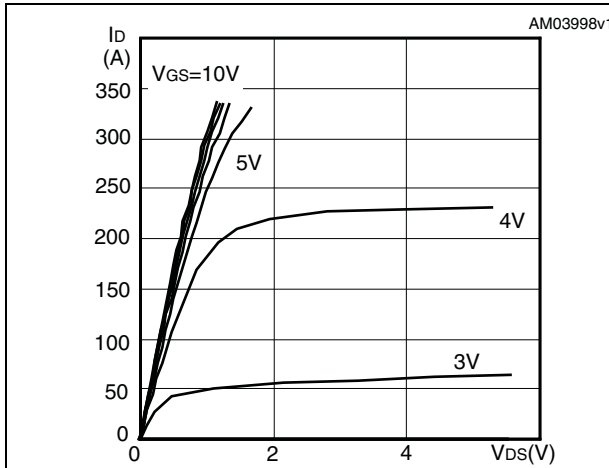


Figure 5. Transfer characteristics

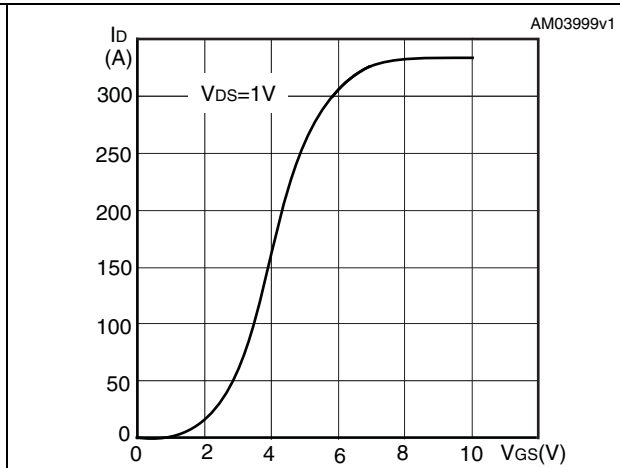


Figure 6. Normalized BV_{DSS} vs temperature

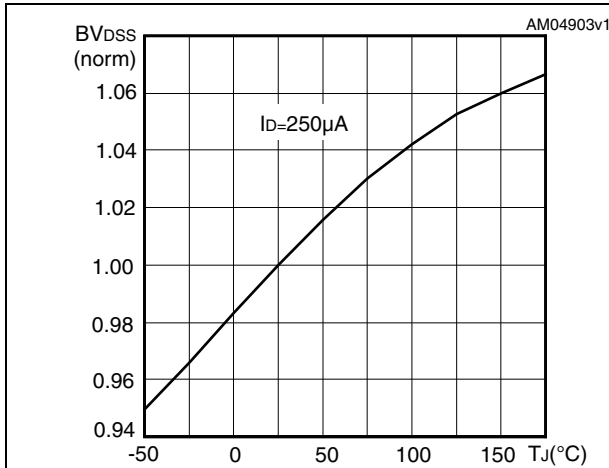
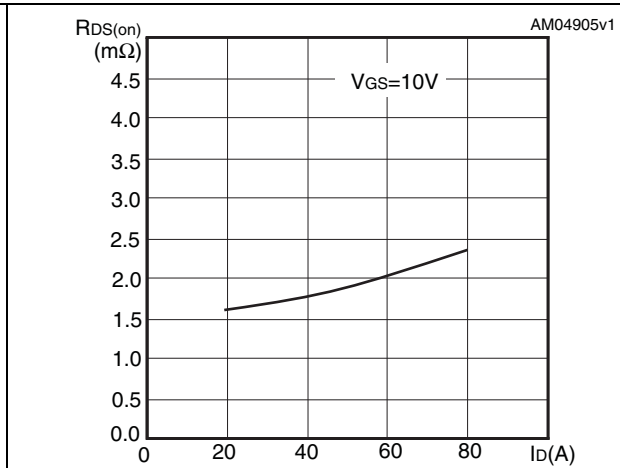


Figure 7. Static drain-source on resistance



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Electrical characteristics

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

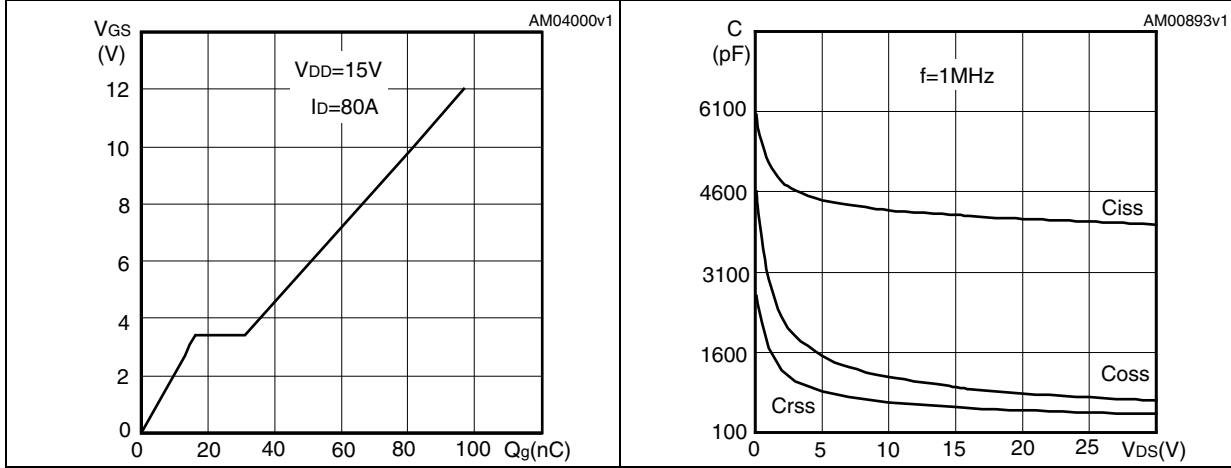


Figure 10. Normalized gate threshold voltage vs temperature **Figure 11. Normalized on resistance vs temperature**

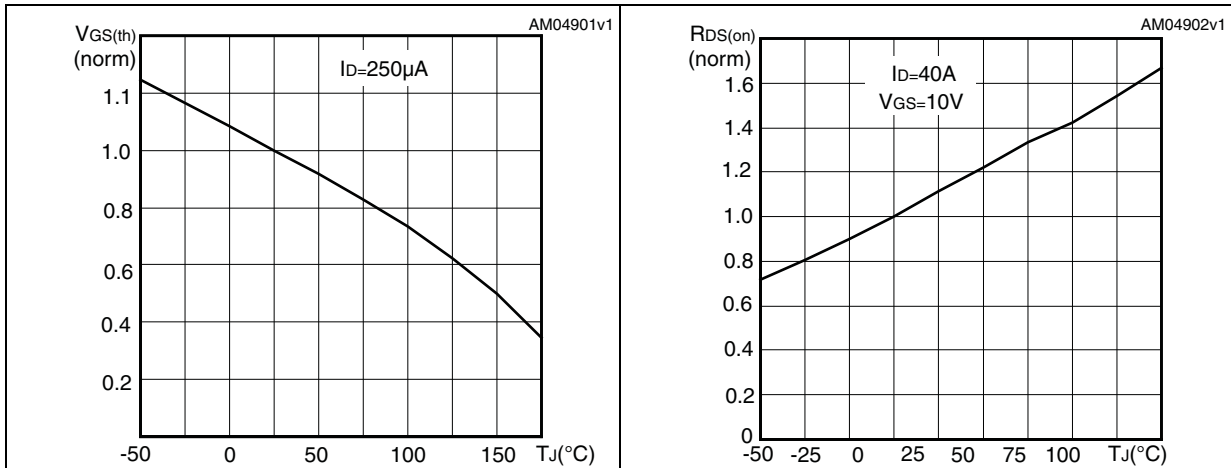
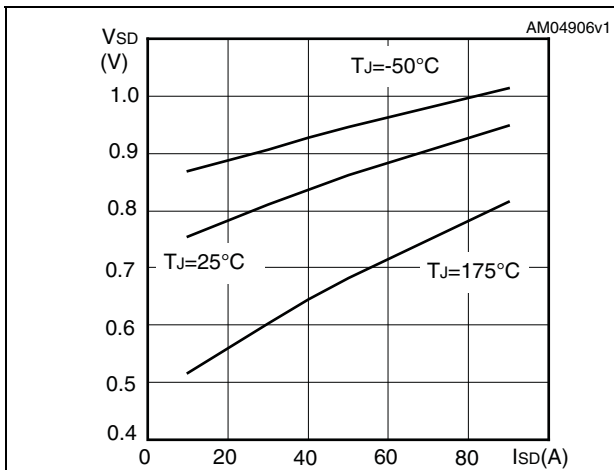


Figure 12. Source-drain diode forward characteristics



3 Test circuits

Figure 13. Switching times test circuit for resistive load

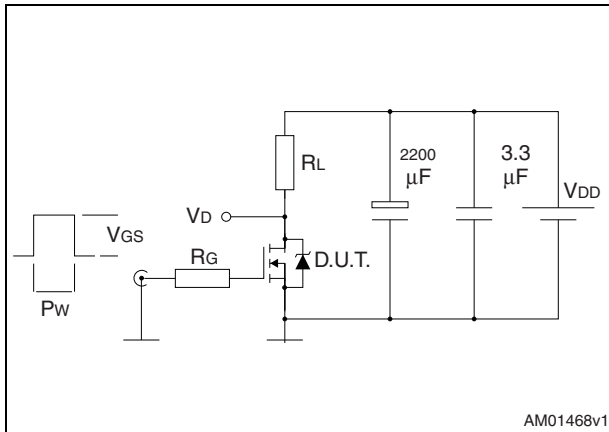


Figure 14. Gate charge test circuit

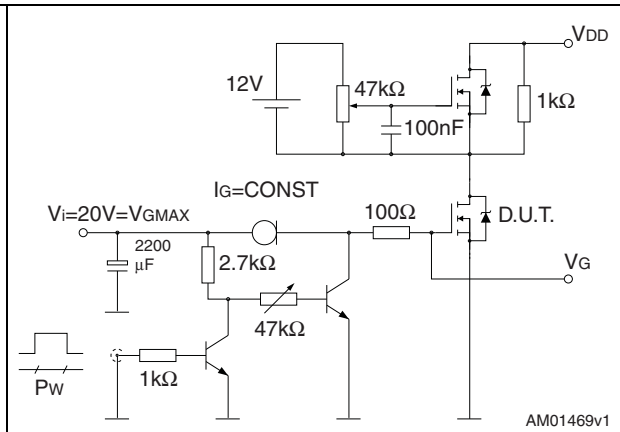


Figure 15. Test circuit for inductive load switching and diode recovery times

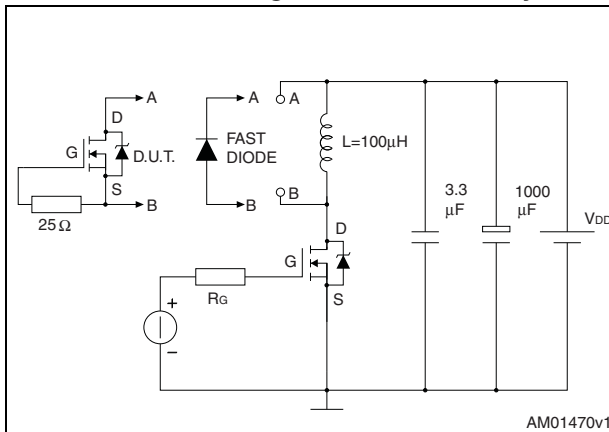


Figure 16. Unclamped inductive load test circuit

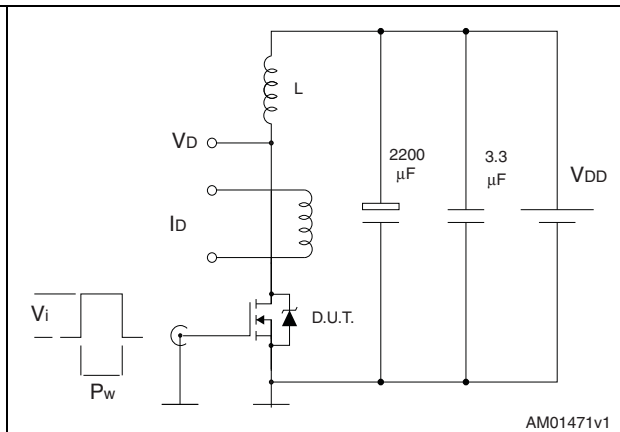


Figure 17. Unclamped inductive waveform

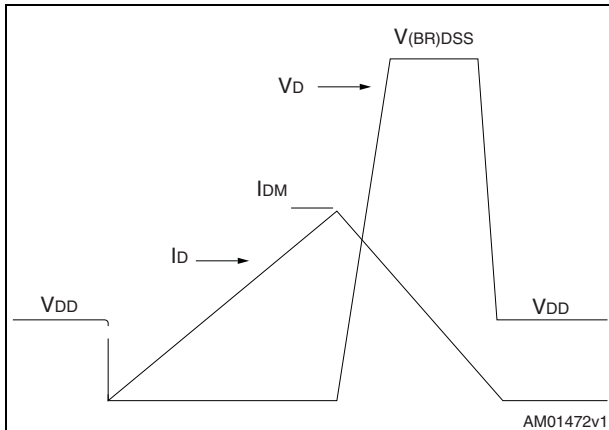
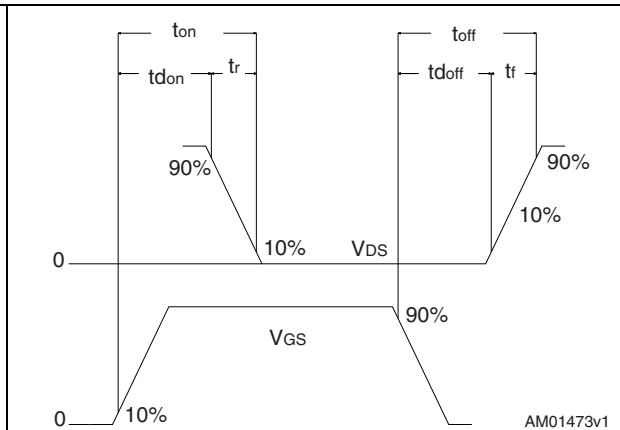


Figure 18. Switching time waveform



4 Package mechanical data

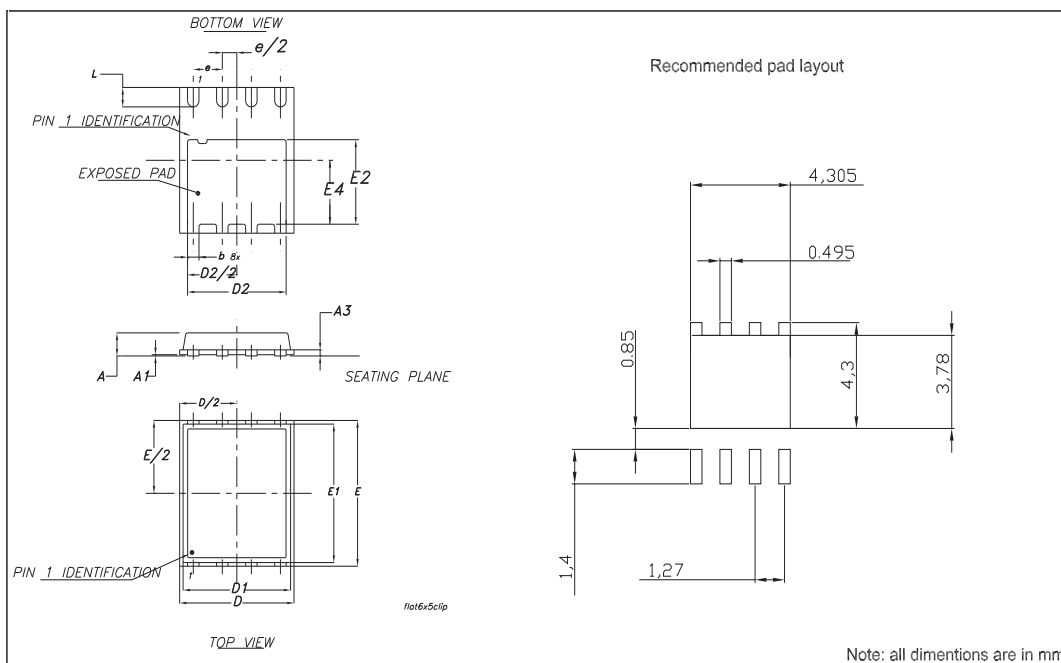
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Package mechanical data

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PowerFLAT™ (5x6) mechanical data

DIM.	mm.			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.80	0.83	0.93	0.031	0.32	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 9. Document revision history

Date	Revision	Changes
21-Jan-2009	1	First release
08-Sep-2009	2	Document status promoted from preliminary data to datasheet
11-Nov-2010	3	Corrected title in first page $R_{DS(on)}$ max value has been corrected.

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