STS25NH3LL

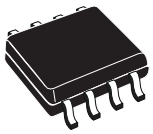
N-channel 30 V - 0.0032 Ω - 25 A - SO-8
STripFET™ III Power MOSFET for DC/DC conversion

Features

Type	V_{DSS}	$R_{DS(on)}$	I_D
STS25NH3LL	30 V	<0.0035 Ω	25 A (1)

1. This value is rated according to Rthj-pcb

- Optimal $R_{DS(on)}$ x Qg trade off @ 4.5 V
- Conduction losses reduced
- Switching losses reduced



SO-8

Applications

- Switching applications

Description

This device utilizes the advanced design rules of ST's proprietary STripFET™ technology. The innovative process coupled with unique metallization techniques makes it possible to produce the most advanced low voltage Power MOSFET in an SO-8 package. The device is therefore suitable for demanding DC-DC converter applications where high efficiency at high output current is needed.

Figure 1. Internal schematic diagram

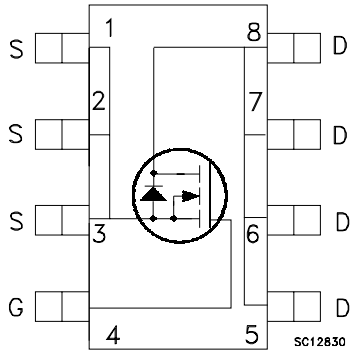


Table 1. Device summary

Order code	Marking	Package	Packaging
STS25NH3LL	25H3LL	SO-8	Tape & reel

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	± 18	V
I_D (1)	Drain current (continuous) at T_C = 25 °C	25	A
I_D	Drain current (continuous) at T_C=100 °C	18	A
I_{DM} (2)	Drain current (pulsed)	100	A
P_{TOT} (1)	Total dissipation at T_C = 25 °C	3.2	W

1. This value is rated according to Rthj-pcb
2. Pulse width limited by safe operating area

Table 3. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj\text{-}pcb}$ (1)	Thermal resistance junction-amb max	47	°C/W
T_j T_{stg}	Operation junction temperature Storage temperature	-55 to 175	°C

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

Table 4. Avalanche characteristics

Symbol	Parameter	Value	Unit
I_{AV}	Not-repetitive avalanche current (pulse width limited by Tj max.)	12.5	A
E_{AS}	Single pulse avalanche energy (starting Tj = 25 °C, I_D = I_{AV}, V_{DD} = 24 V)	1.3	J

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} = ± 18 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= 12.5 A V_{GS}= 4.5 V, I_D= 12.5 A		0.0032 0.004	0.0035 0.005	Ω Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward transconductance	V_{DS} = 10 V, I_D = 12.5 A		30		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V_{DS} =25 V, f = 1 MHz, V_{GS} = 0		4450 655 50		pF pF pF
Q_g Q_{gs} Q_{gd}	Total gate charge Gate-source charge Gate-drain charge	V_{DD} = 15 V, I_D = 25 A V_{GS} = 4.5 V *Figure 14*		30 12.5 10	40	nC nC nC
Q_{OSS} (2)	Output charge	V_{DD}= 24 V, V_{GS} = 0		23		nC
R_G	Gate input resistance	f = 1 MHz, gate DC bias =0 test signal level = 20 mV open drain	1	2	3	Ω

1. Pulsed: pulse duration=300 µs, duty cycle 1.5%
2. $Q_{OSS} = C_{oss} * \Delta V_{in}$, $C_{oss} = C_{gd} + C_{ds}$

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $t_{d(off)}$ t_f	Turn-on delay time Rise time Turn-off delay time Fall time	V_{DD}= 15 V, I_D = 12.5 A, R_G= 4.7 Ω, V_{GS} = 10 V *Figure 13*		18 50 75 8		ns ns ns ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Typ.	Max	Unit
I_{SD}	Source-drain current				25	A
I_{SDM}(1)	Source-drain current (pulsed)				100	A
V_{SD}(2)	Forward on voltage	I_{SD} = 25 A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 25 A, di/dt = 100 A/µs, V_{DD} = 25 V, T_J = 150 °C *Figure 18*		32 34 2.1		ns nC 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 2. Safe operating area

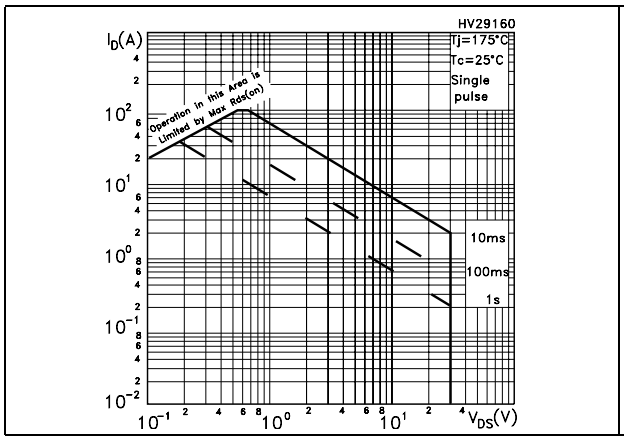


Figure 3. Thermal impedance

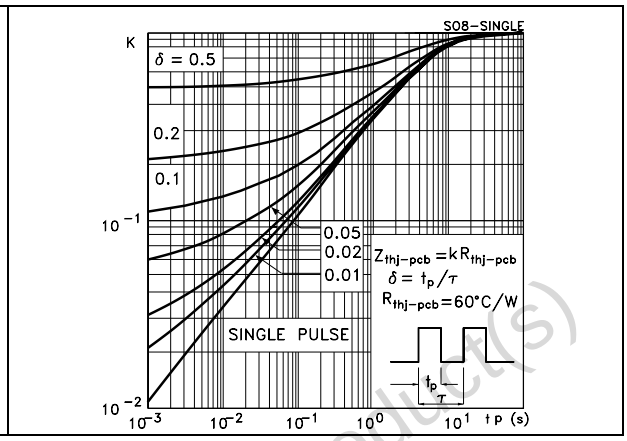


Figure 4. Output characteristics

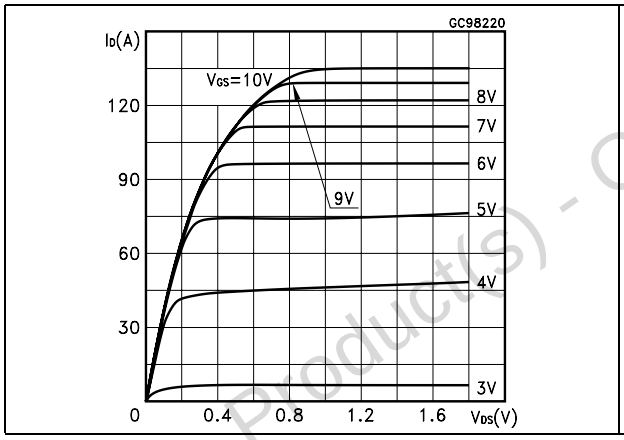


Figure 5. Transfer characteristics

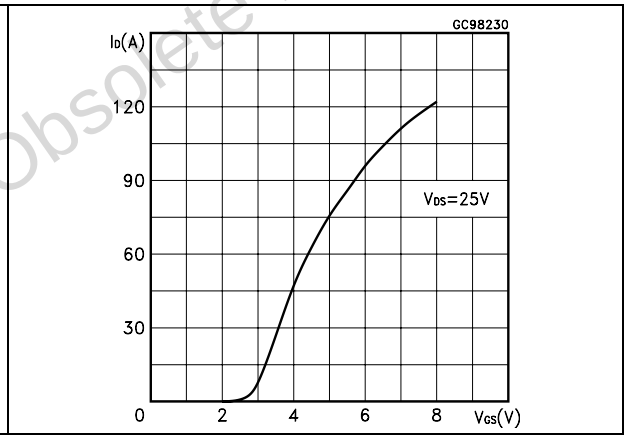


Figure 6. Normalized B_{VDSS} vs temperature

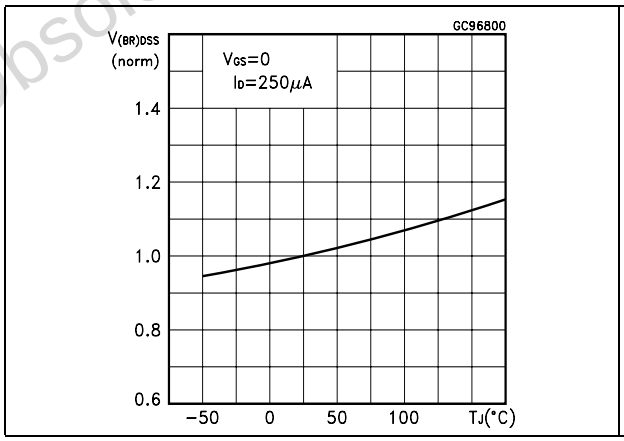


Figure 7. Static drain-source on resistance

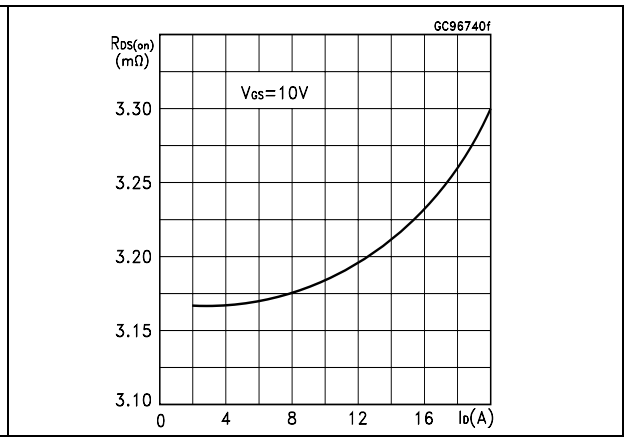


Figure 8. Gate charge vs gate-source voltage

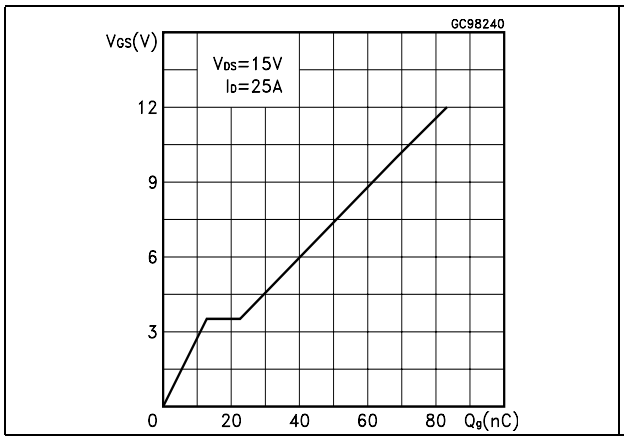


Figure 9. Capacitance variations

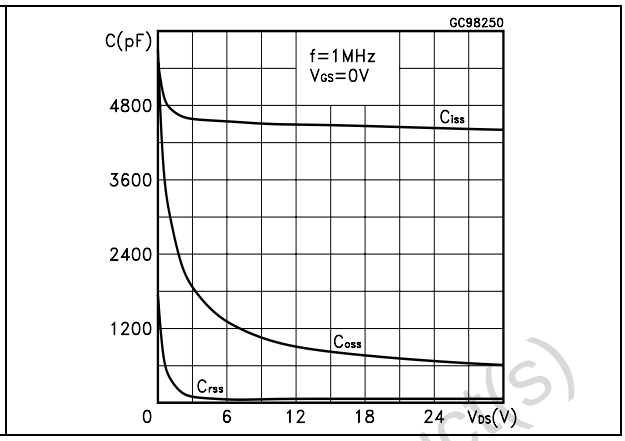


Figure 10. Normalized gate threshold voltage vs temperature

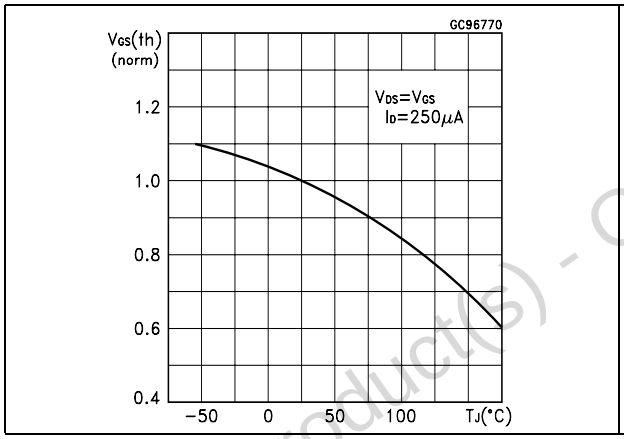


Figure 11. Normalized on resistance vs temperature

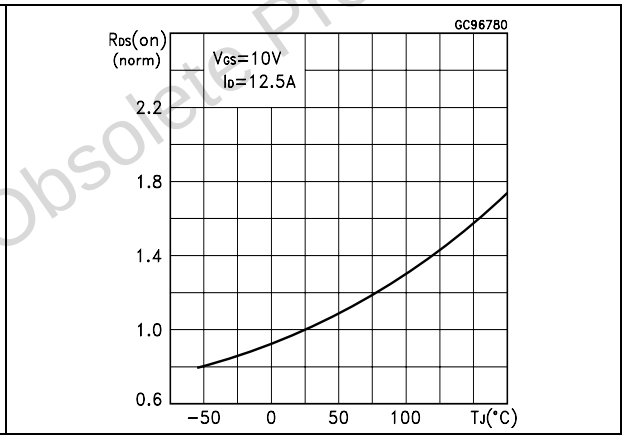
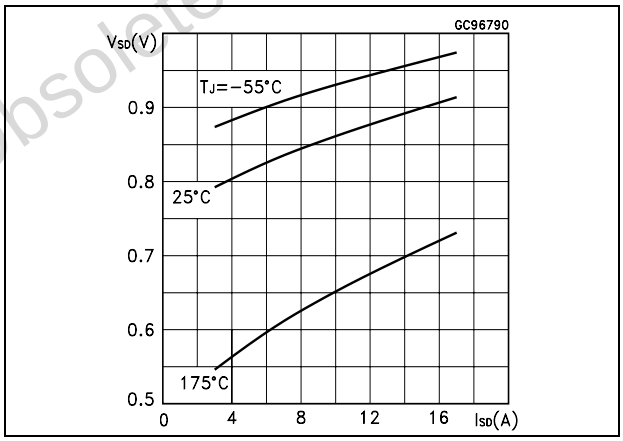


Figure 12. Source-drain diode forward characteristics



3 Test circuit

Figure 13. Switching times test circuit for resistive load

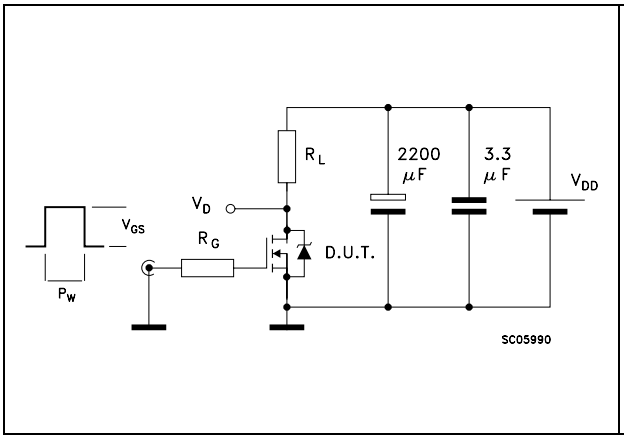


Figure 14. Gate charge test circuit

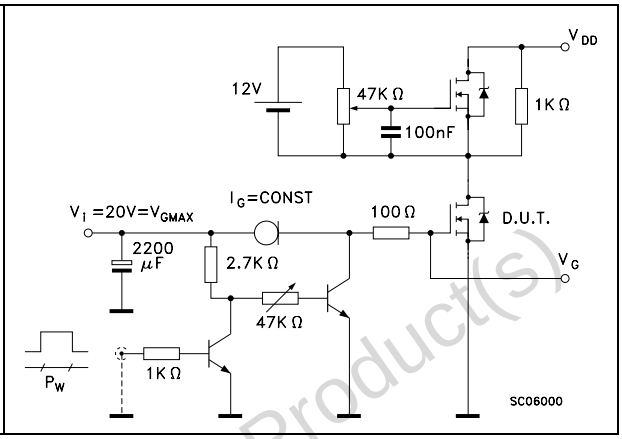


Figure 15. Test circuit for inductive load switching and diode recovery times

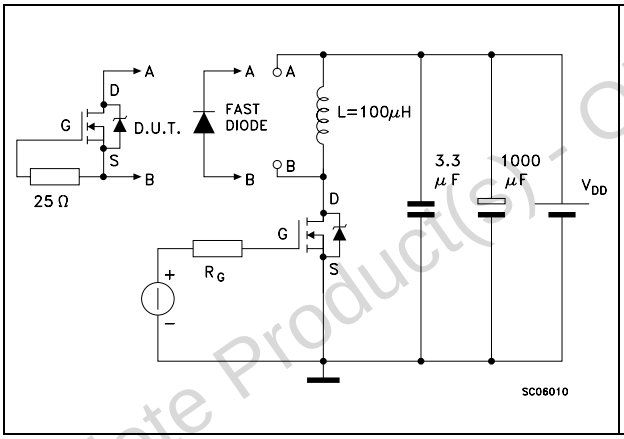


Figure 16. Unclamped inductive load test circuit

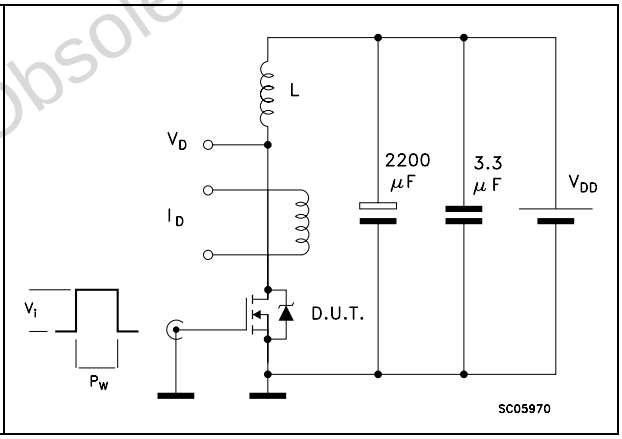


Figure 17. Unclamped inductive waveform

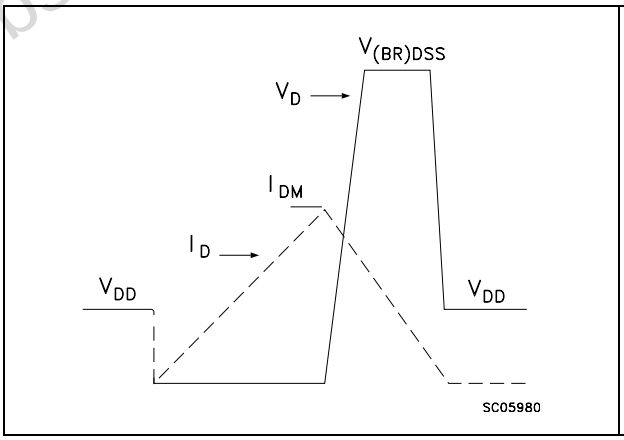
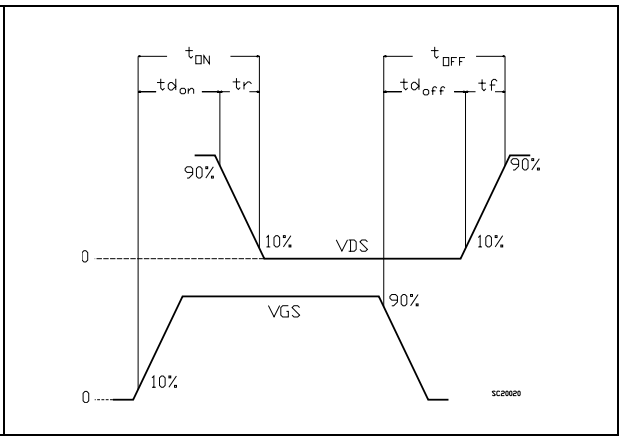


Figure 18. Switching time waveform

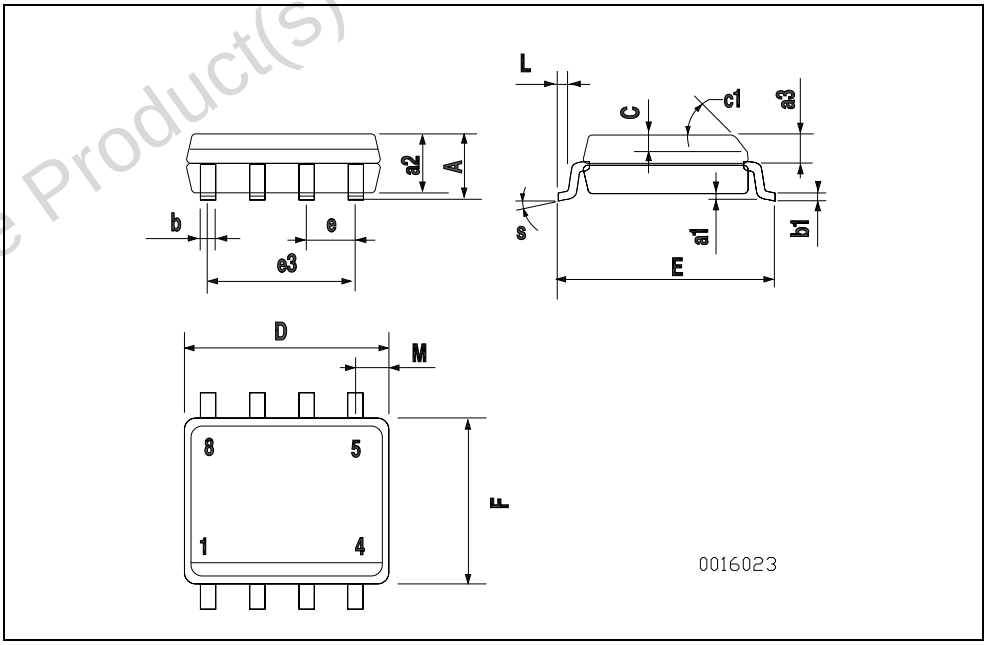


4 Package mechanical data

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*

SO-8 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8 (max.)					



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
19-Nov-2007	10	Document status promoted from preliminary data to datasheet