



# STS20NHS3LL

## N-CHANNEL 30 V - 0.0032 Ω - 20 A SO-8 STripFET™III MOSFET PLUS MONOLITHIC SCHOTTKY

PRELIMINARY DATA

**Table 1: General Features**

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS20NHS3LL	30V	< 0.004Ω	20A(1)

- TYPICAL R<sub>DS(on)</sub> = 0.0032Ω @ 10V
- OPTIMAL R<sub>DS(on)</sub> x Q<sub>g</sub> TRADE-OFF @ 4.5V
- REDUCED SWITCHING LOSSES
- REDUCED CONDUCTION LOSSES
- REDUCED DIODE RECOVERY LOSSES
- IMPROVED JUNCTION-CASE THERMAL RESISTANCE

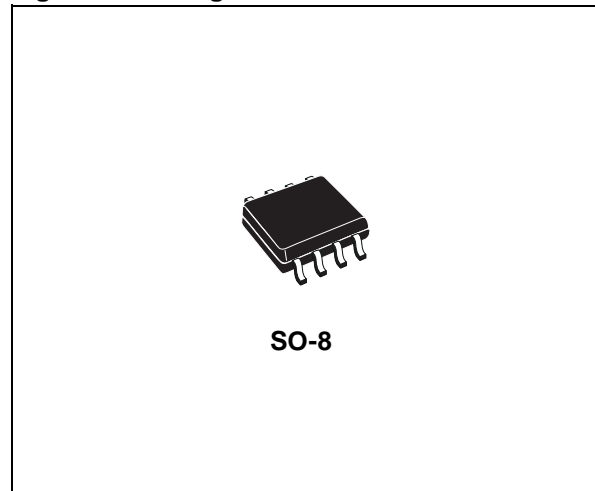
### DESCRIPTION

The **STS20NHS3LL** utilizes the latest advanced design rules of ST's proprietary STripFET™ technology, and a proprietary process for integrating a monolithic Schottky diode. The new MOSFET is optimized for the most demanding synchronous switch function in DC-DC converter for Computer and Telecom.

### APPLICATIONS

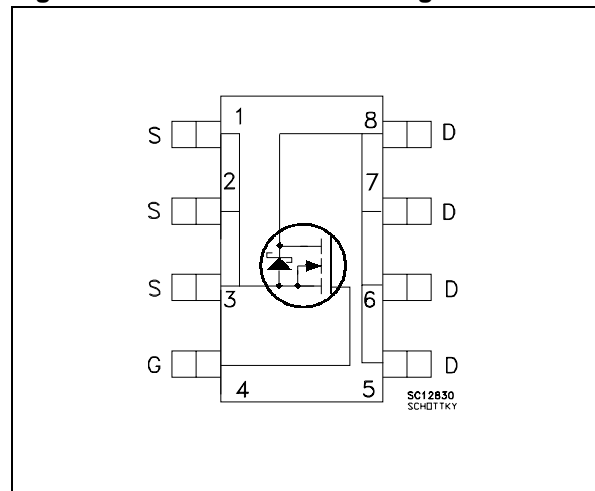
- DC-DC CONVERTERS FOR TELECOM AND NOTEBOOK CPU CORE
- SYNCHRONOUS RECTIFICATION

**Figure 1: Package**



SO-8

**Figure 2: Internal Schematic Diagram**



**Table 2: Order Codes**

SALES TYPE	MARKING	PACKAGE	PACKAGING
STS20NHS3LL	20HS3LL-	SO-8	TAPE & REEL

Rev. 2

**Table 3: Absolute Maximum ratings**

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	V
V <sub>GS</sub>	Gate- source Voltage	± 18	V
I <sub>D(1)</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	20	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	12.6	A
I <sub>DM(2)</sub>	Drain Current (pulsed)	80	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	2.7	W

**Table 4: Thermal Data**

R <sub>thj-amb</sub> (3)	Thermal Resistance Junction-ambient Max	47	°C/W
T <sub>j</sub>	Maximum Operating Junction Temperature	-55 to 150	°C
T <sub>stg</sub>	Storage Temperature	-55 to 150	°C

**Table 5: Avalanche Characteristics**

Symbol	Parameter	Max Value	Unit
I <sub>AV</sub>	Not-Repetitive Avalanche Current (pulse width limited by T <sub>j</sub> max)	12.5	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25°C, I <sub>D</sub> = I <sub>AV</sub> , V <sub>DD</sub> = 24V)	1.3	J

**ELECTRICAL CHARACTERISTICS (T<sub>J</sub> =25°C UNLESS OTHERWISE SPECIFIED)**

**Table 6: On /Off**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 1mA, V <sub>GS</sub> = 0	30			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = 24V			500	µA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 18V			±100	nA
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1mA	1		2.5	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 10A		0.0032 0.004	0.004 0.0055	Ω Ω

**Table 7: Dynamic**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (4)	Forward Transconductance	V <sub>DS</sub> =15V, I <sub>D</sub> = 12A		30		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1MHz, V <sub>GS</sub> = 0		3950		pF
C <sub>oss</sub>	Output Capacitance			720		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			70		pF

**ELECTRICAL CHARACTERISTICS (CONTINUED)**

**Table 8: Switching On**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 15V, I_D = 10A$ $R_G = 4.7\Omega, V_{GS} = 4.5V$ (see Figure 15)		TBD TBD		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD}=15V, I_D=20A$ $V_{GS}= 4.5V$ (see Figure 17)		27.5 7.9 8.7	37	nC nC nC

**Table 9: Switching Off**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 15V, I_D = 10A$ $R_G = 4.7\Omega, V_{GS} = 4.5V$ (see Figure 15)		TBD TBD		ns ns

**Table 10: Source Drain Diode**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}$	Source-drain Current Source-drain Current (pulsed)				20 80	A A
$V_{SD} (4)$	Forward On Voltage	$I_{SD} = 10A, V_{GS} = 0$			0.7	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 10A, di/dt = 100A/\mu s$ $V_{DD} = 25V, T_j = 150^\circ C$ (see Figure 16)		1.9	26 25	ns nC A

Notes:

1. This value is rated according to Rthj-pcb
2. Pulse width limited by safe operating area
3. When mounted on FR-4 board with 1 inch<sup>2</sup> pad, 2 oz of Cu and t < 10sec
4. Pulsed: pulse duration = 300μs, duty cycle 1.5%

Figure 3: Safe Operating Area

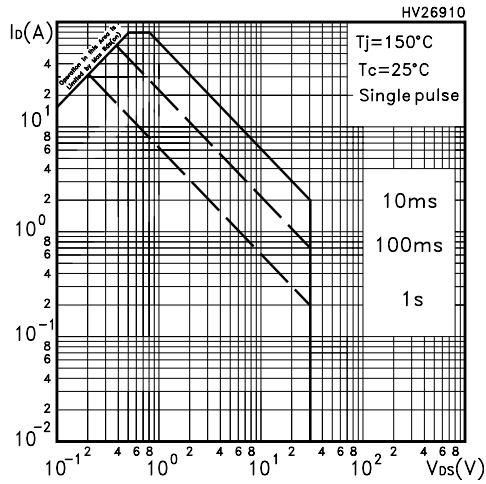


Figure 4: Output Characteristics

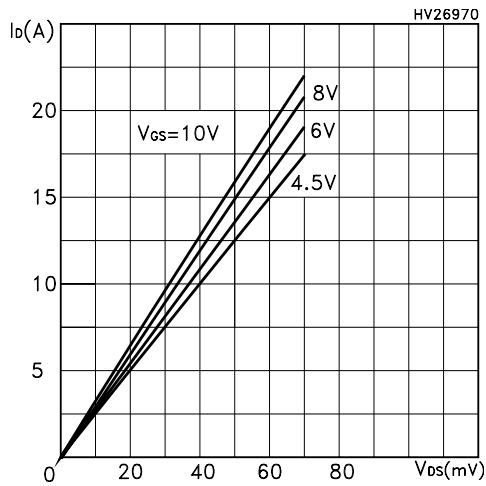


Figure 5: Transconductance

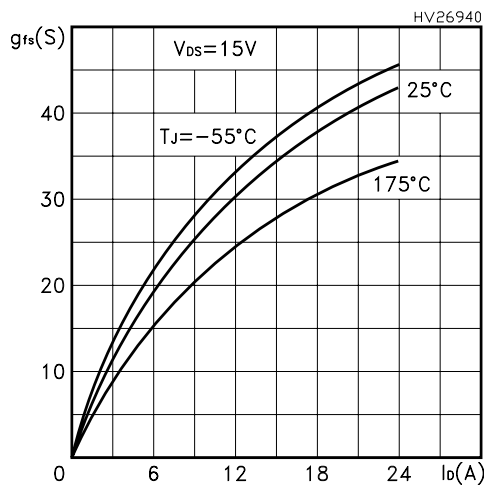


Figure 6: Thermal Impedance

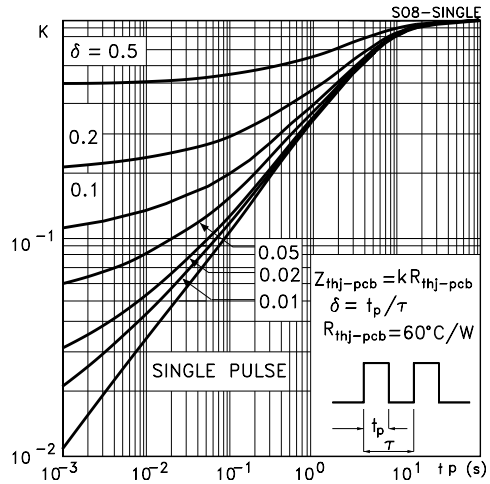


Figure 7: Transfer Characteristics

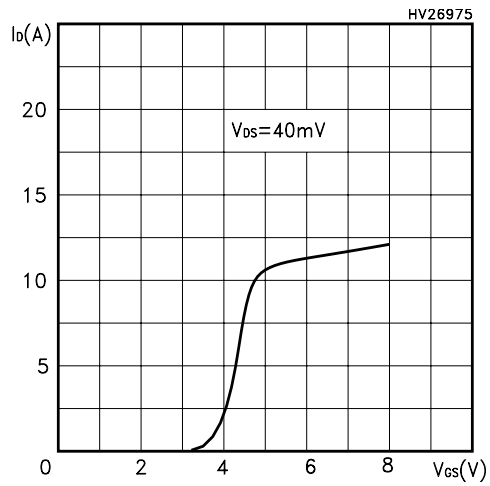


Figure 8: Static Drain-source On Resistance

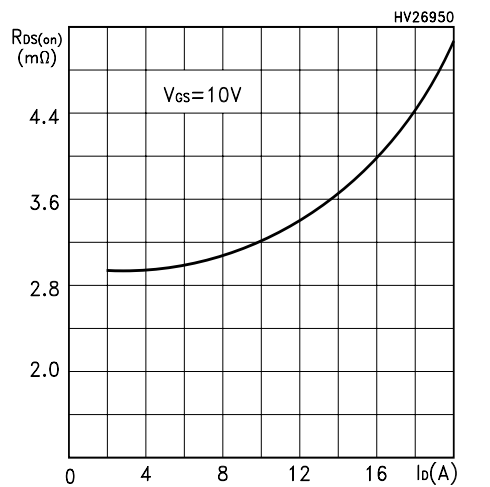


Figure 9: Gate Charge vs Gate-source Voltage

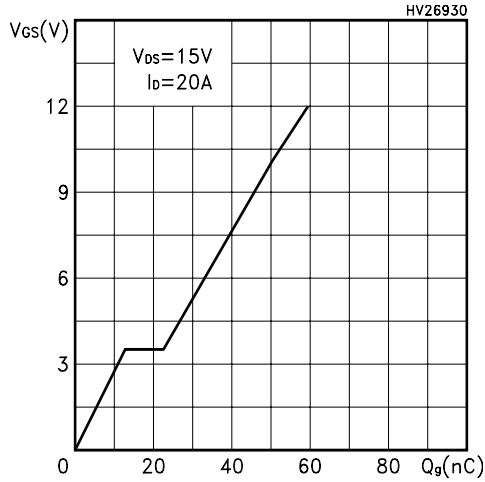


Figure 10: Normalized Gate Threshold Voltage vs Temperature

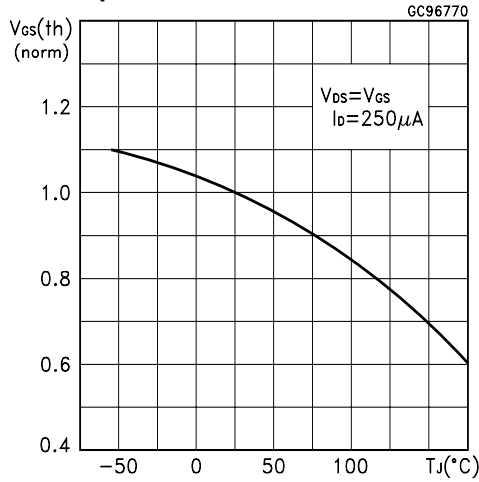


Figure 11: Normalized On Resistance vs Temperature

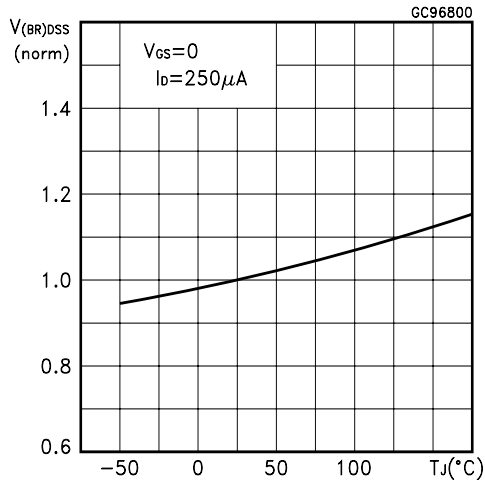


Figure 12: Capacitance Variations

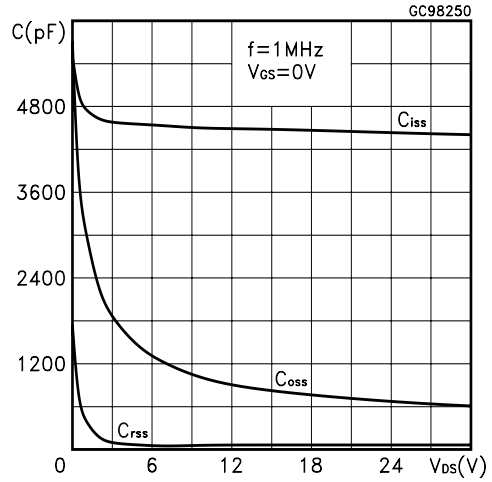


Figure 13: Normalized BVDSS vs Temperature

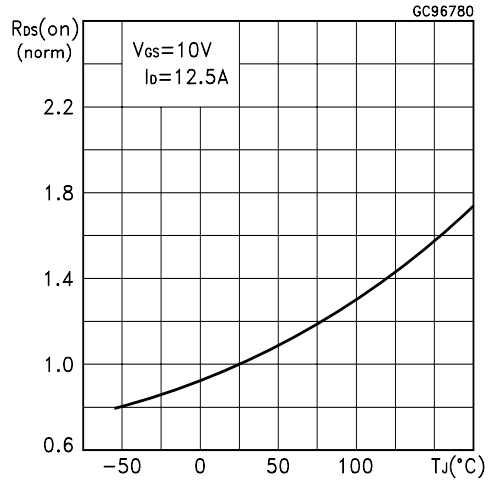


Figure 14: Source-Drain Diode Forward Characteristics

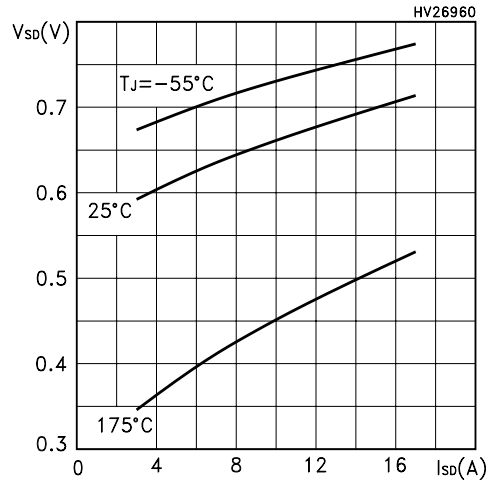


Figure 15: Switching Times Test Circuit For Resistive Load

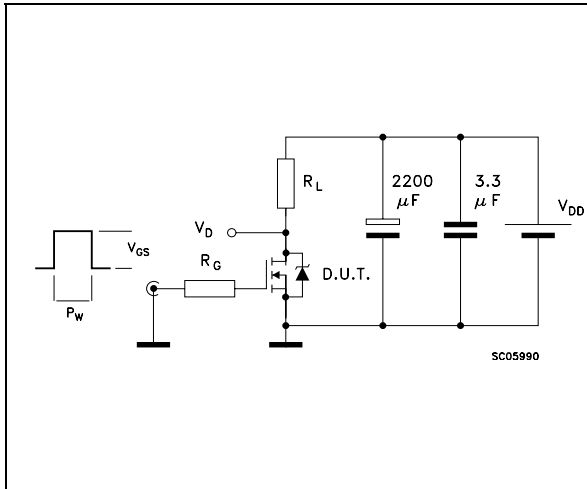


Figure 16: Test Circuit For Diode Recovery Times

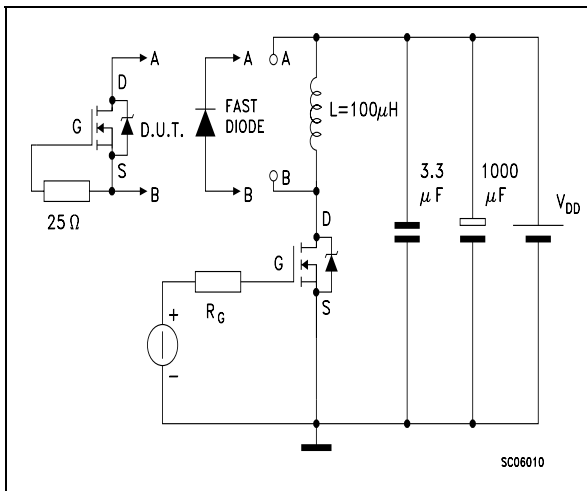
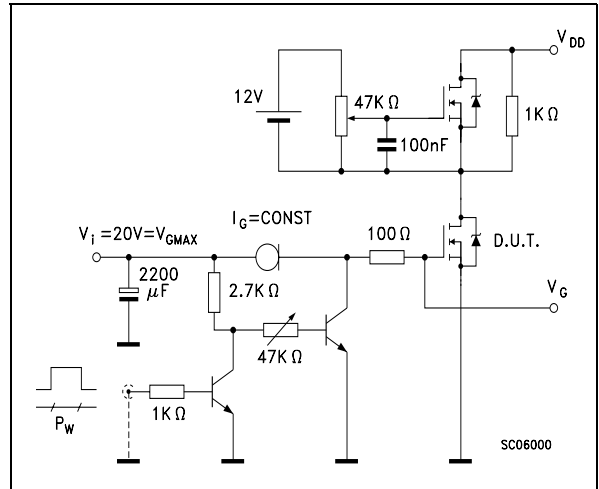
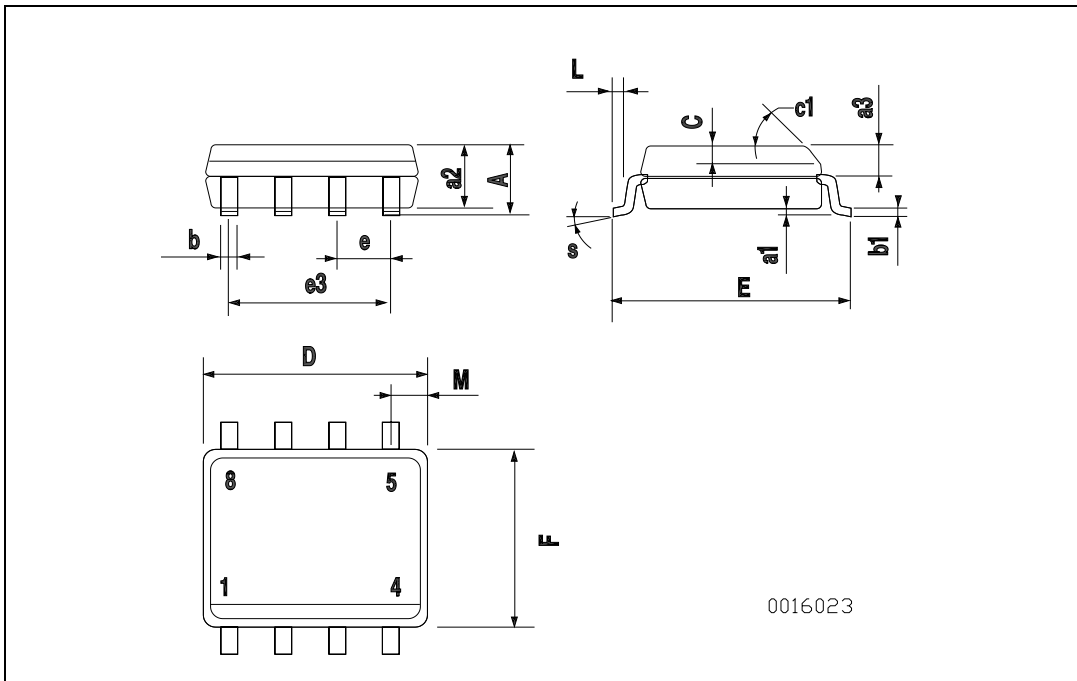


Figure 17: Gate Charge Test Circuit



**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.)					



**Table 11: Revision History**

<b>Date</b>	<b>Revision</b>	<b>Description of Changes</b>
24-May-2005	1	First release
19-Dec-2005	2	Inserted curves



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