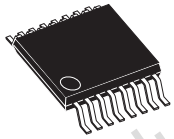
STLVDS050

High speed differential line drivers and receivers

Feature summary

- Meets or exceed the requirements of ansi eia/tia-644-1995 standard
- Signaling rates up to 400Mbit/s
- Bus terminal ESD exceeds 6kV
- Operates from a single 3.3V supply
- Low-voltage differential signaling with typical output voltage of 350mV and a 100Ω load
- Propagation delay times:
  Driver: 2ns (typ)
  Receiver: 3ns (typ)
- Power dissipation at 200MHz:
  Driver: 25mW (typ)
  Receiver: 60mW (typ)
- LVTTL input levels are 5V tolerant
- Receiver has open-circuit fail-safe



TSSOP

Description

The STLVDS050 is differential line drivers and receivers that use low-voltage differential signaling (LVDS) to achieve signaling rate as high as 400Mbps.

The EIA/TIA-644 standard compliant electrical interface provides a minimum differential output voltage magnitude of 247mV into a 100Ω load and receipt of 100mV signals with up to 1V of ground potential difference between a transmitter and receiver.

The intended application of this device an signaling technique is for point-to-point baseband data transmission over controlled impedance media of approximately 100Ω characteristic impedance.

The transmission media may be printed-circuit board traces, backplanes, or cables. (Note: The ultimate rate and distance of data transfer is dependent upon the attenuation characteristics of the media, the noise coupling to the environment, and other application specific characteristics).

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Order codes

Part number	Temperature Range	Package	Comments
STLVDS050BTR	-40 to 85 °C	TSSOP16 (Tape & Reel)	2500 parts per reel

Contents

1 Pin configuration

Figure 1. Pin connections and functional diagram

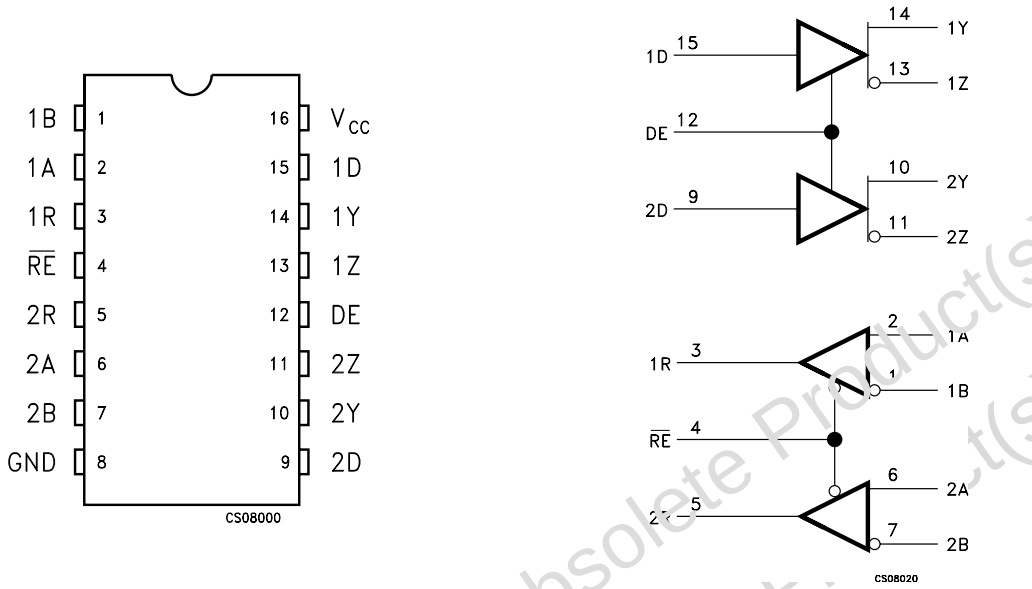


Table 1. Pin description

Pin n°	Symbol	Name and function
1,2, 6, 7	1A, 1B, 2A, 2B	Receiver inputs
3, 5	1R, 2R	Receiver outputs
4	RE	Receiver enable
9, 15	2D, 1D	Driver inputs
12	DE	Driver enable
10, 11, 13, 14	2Y, 2Z, 1Y, 1Z	Driver outputs
8	GND	Ground
16	V_{CC}	Supply voltage

Table 2. Truth table for receiver

$V_{ID} = V_A - V_B$	$\overline{RE}$	R
$V_{ID} \geq 100mV$	L	H
$-100mV < V_{ID} < 100mV$	L	?
$V_{ID} \leq -100mV$	L	L
OPEN	L	H
X	H	Z

Table 3. Truth table for driver

D	DE	Y	Z
L	H	L	H
H	H	H	L
OPEN	H	L	H
X	L	Z	Z

L=Low level, H=High Level, X=Don't care, Z= High Impedance

2 Maximum ratings

Table 4. Absolute maximum ratings

Symbol	Parameter		Value	Unit
V_{CC}	Supply voltage		-0.5 to 4	V
V_I	Voltage range	D, R, DE, $\overline{RE}$	-0.5 to 6	V
ESD	ESD Protection voltage (HBM)	Y, Z, A, B, and GND	± 6	kV
		All Pins	± 3	
T_{STG}	Storage temperature range		-65 to 150	°C

Note: Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

Table 5. Recommended operating conditions

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply voltage	3.0	3.3	3.6	V
V_{IH}	HIGH level input voltage	2.0			V
V_{IL}	LOW level input voltage			0.8	V
$\|V_{ID}\|$	Magnitude of differential input voltage	0.1		0.6	V
V_{IC}	Common mode input voltage	$\|V_{ID}\|/2$		$24-\|V_{ID}\|/2$	V
				$V_{CC}-0.8$	
T_A	Operating temperature range	-40		85	°C

3 Electrical characteristics

Table 6. Electrical characteristics
(Typical values are at T_A = 25°C, V_{CC} = 3.3V ±10%, T_A = -40 to 85°C unless otherwise specified).

Symbol	Parameter	Test	Min.	Typ.	Max.	Unit
I_{CC}	Supply Current	Drivers and receivers enabled, no receiver loads, driver R_L=100Ω		12	20	mA
		Driver enabled, receivers disabled, R_L=100Ω		10	16	
		Drivers disabled, receiver enabled, no load		4	6	
		Disabled		0.5	1	

Table 7. Driver electrical characteristics
(Typical values are at T_A = 25°C, V_{CC} = 3.3V ±10%, T_A = -40 to 85°C unless otherwise specified).

Symbol	Parameter	Test		Min.	Typ.	Max.	Unit
$\|V_{OD}\|$	Differential output voltage magnitude	R_L = 100Ω		247	340	454	mV
$\Delta\|V_{OD}\|$	Change in differential output voltage magnitude between logic states	R_L = 100Ω		-50		50	mV
$\Delta V_{OC(SS)}$	Change in steady-state common mode output voltage between logic states			-50		50	mV
$V_{OC(SS)}$	Steady-state common mode output voltage			1.125	1.2	1.375	V
$V_{OC(PP)}$	Peak to peak common mode output voltage				50	150	mV
I_{IH}	High level input current	V_{IH} = 5V	DE		-0.5	-20	µA
			D		2	20	µA
I_{IL}	Low level input current	V_{IL} = 0.8V	DE		-0.5	-10	µA
			D		1	10	µA
I_{OS}	Short circuit output current	$V_{O(Y)}$ or $V_{O(Z)}$ = 0V			6	10	mA
		V_{OD} = 0			4	10	mA
I_{OZ}	High impedance output current	V_O = 600mV				± 1	µA
		V_O = 0V or V_{CC}				± 1	µA
$I_{O(OFF)}$	Power OFF output current	V_{CC} = 0VV_O = 3.6V				± 1	µA
C_{IN}	Input capacitance				3		pF

Table 8. Receiver electrical characteristics

(Typical values are at T_A = 25°C, V_{CC} = 3.3V ±10%, T_A = -40 to 85°C unless otherwise specified).

Symbol	Parameter	Test	Min.	Typ.	Max.	Unit
V_{ITH+}	Positive-going differential input voltage threshold				100	mV
V_{ITH-}	Negative-going differential input voltage threshold		-100			mV
V_{OH}	High level output voltage	I_{OH} = -8mA	2.4			V
V_{OL}	Low level output voltage	I_{OL} = 2mA			0.4	V
I_I	Input current (A or B Inputs)	V_I =0V	-2	-11	-20	µA
		V_I = 2.4V	-1	-3		µA
$I_{I(OFF)}$	Power OFF input current (A or B Inputs)	V_{CC} = 0V			±20	µA
I_{IH}	High level input current (Enable)	V_{IH} = 5V			±10	µA
I_{IL}	Low level input current (Enable)	V_{IL} = 0.8V			±10	µA
I_{OZ}	High impedance output current	V_O = 0 or 5V			± 10	µA
C_{IN}	Input capacitance			3		pF

Table 9. Driver switching characteristics

(Typical values are at T_A = 25°C, V_{CC} = 3.3V ±10%, T_A = -40 to 85°C unless otherwise specified).

Symbol	Parameter	Test	Min.	Typ.	Max.	Unit
t_{PLH}	Propagation delay time, low to high output	R_L = 100Ω C_L = 10pF		2	2.7	ns
t_{PHL}	Propagation delay time, high to low output			2	2.7	ns
t_r	Differential output signal rise time			0.4	1	ns
t_f	Differential output signal fall time			0.4	1	ns
$t_{sk(P)}$	Pulse skew ($\|t_{THL} - t_{TLH}\|$) (1)			50		ps
$t_{sk(O)}$	Channel-to-channel output skew (2)			40		ps
t_{PZH}	Propagation delay time, high impedance to high level output			6	10	ns
t_{PZL}	Propagation delay time, high impedance to low level output			6	10	ns
t_{PHZ}	Propagation delay time, high level to high impedance output			3	10	ns
t_{PLZ}	Propagation delay time, low level to high impedance output			3	10	ns

1. $t_{sk(P)}$ is the magnitude of the time difference between the high to low and low to high propagation delay times at an output
2. $t_{sk(O)}$ is the magnitude of the time difference between the output of a single device with all their inputs connected together

Table 10. Receiver switching characteristics

(Typical values are at T_A = 25°C, V_{CC} = 3.3V ±10%, T_A = -40 to 85°C unless otherwise specified).

Symbol	Parameter	Test	Min.	Typ.	Max.	Unit
t_{PLH}	Propagation delay time, low to high output	C_L = 10pF		3.0	4.0	ns
t_{PHL}	Propagation delay time, high to low output			3.0	4.0	ns
t_r	Differential output signal rise time			0.6	1	ns
t_f	Differential output signal fall time			0.6	1	ns
$t_{sk(P)}$	Pulse skew ($\|t_{THL} - t_{TLH}\|$) (Note 1)			0.25		ns
t_{PZH}	Propagation delay time, high impedance to high level output			2.5		ns
t_{PZL}	Propagation delay time, high impedance to low level output			2.5		ns
t_{PHZ}	Propagation delay time, high level to high impedance output			7		ns
t_{PLZ}	Propagation delay time, low level to high impedance output			4		ns

Note 1: $t_{sk(P)}$ is the magnitude of the time difference between the high to low and low to high propagation delay times at an output

Note 2: $t_{sk(O)}$ is the magnitude of the time difference between the output of a single device with all their inputs connected together.

Note 3: $t_{sk(PP)}$ is the magnitude of the difference between any specified terminals of two devices when both devices operate with the same supply voltages, same temperature, and have identical packages and test circuit

4 Typical performance characteristics

(Unless otherwise specified T_J = 25°C)

Figure 2. Output current vs output high voltage for receiver

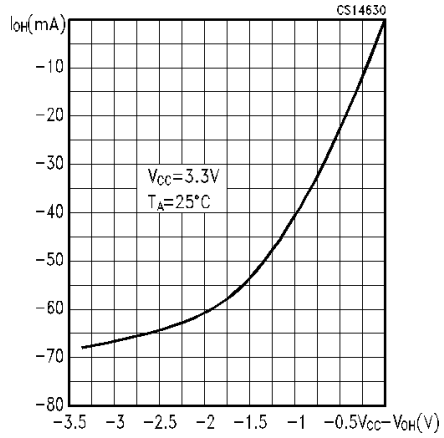


Figure 3. Output current vs output low voltage for receiver

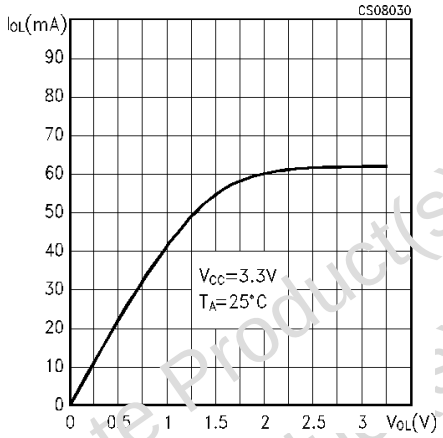


Figure 4. Output current vs output high voltage for driver

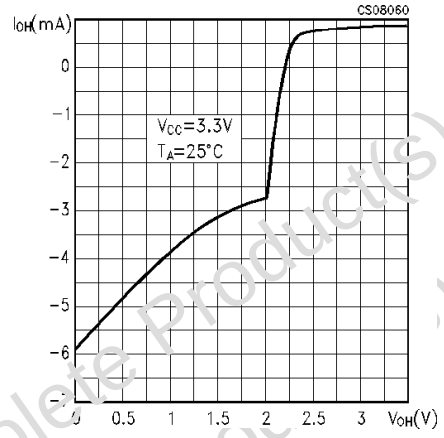


Figure 5. Output current vs output low voltage for driver

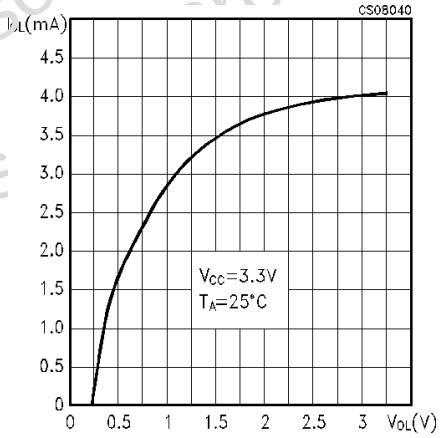


Figure 6. High to low propagation delay time for receiver

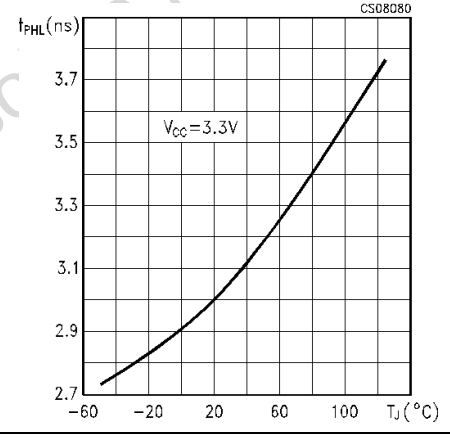


Figure 7. Low to high propagation delay time for receiver

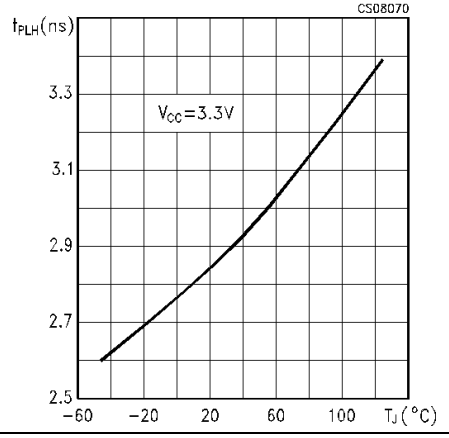


Figure 8. High to low propagation delay time for driver

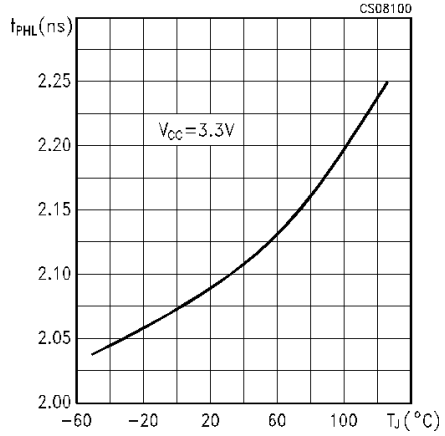
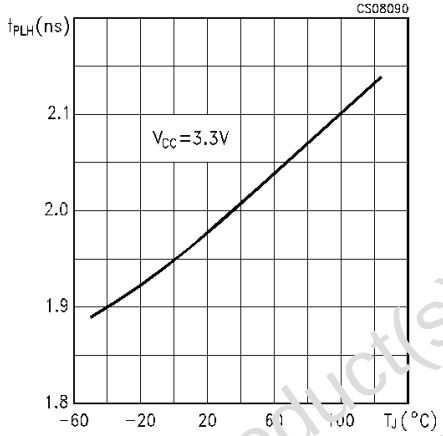


Figure 9. Low to high propagation delay time for driver

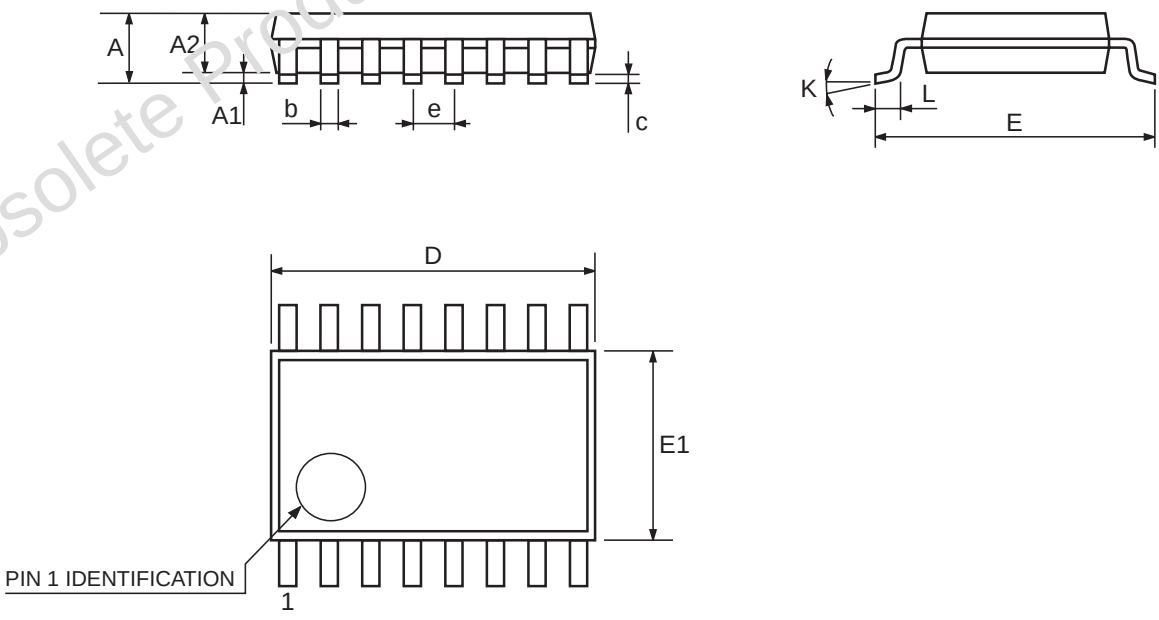


5 Package mechanical data

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.

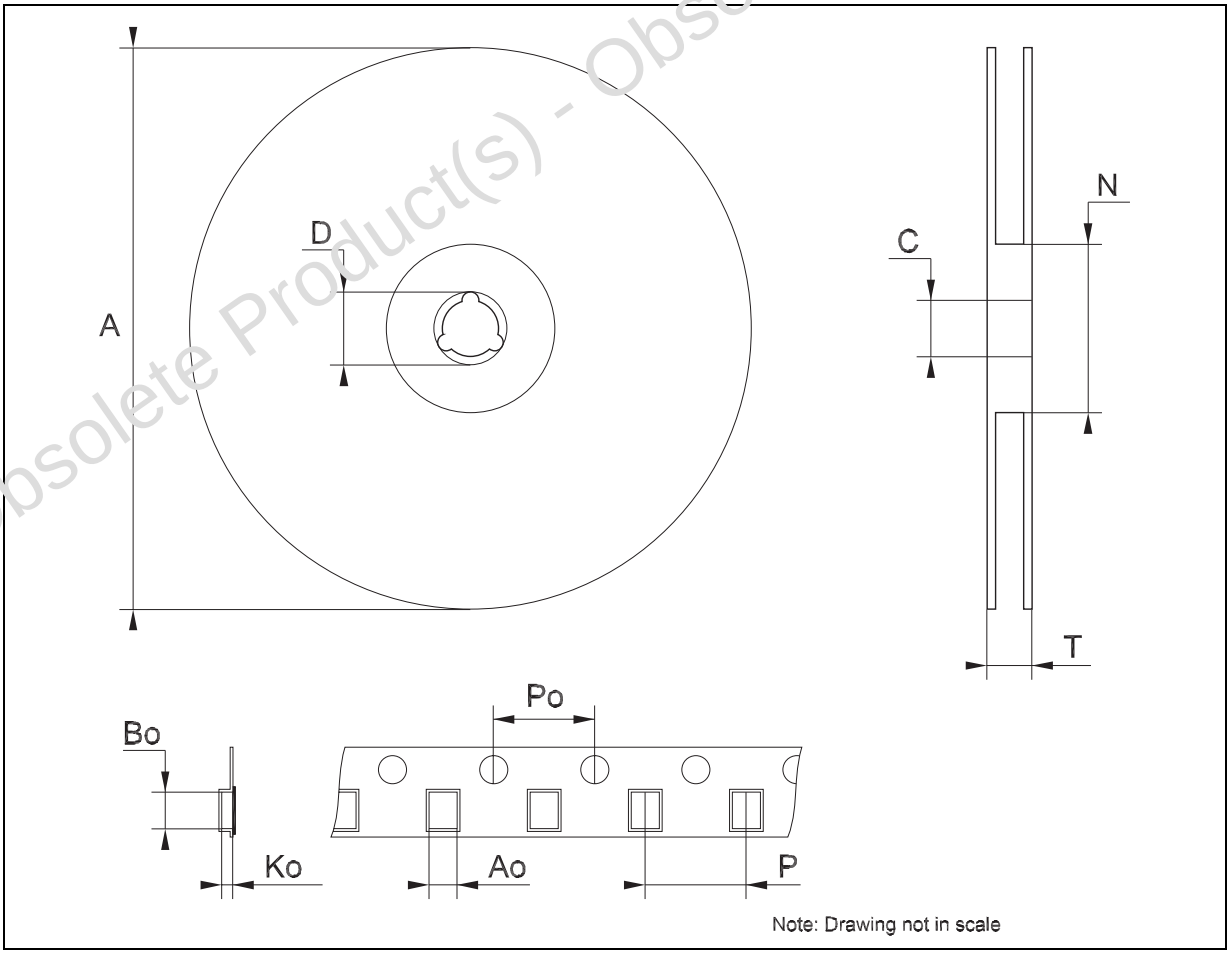
TSSOP16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030



Tape & Reel TSSOP16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.7		6.9	0.264		0.272
Bo	5.3		5.5	0.209		0.217
Ko	1.6		1.8	0.063		0.071
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



Note: Drawing not in scale

6 Revision history

Table 11. Revision history

Date	Revision	Changes
22-Mar-2006	4	Order codes has been updated and new template.