National Semiconductor

January 9, 2008

LMH0001
SMPTE 259M / 344M Serial Digital Cable Driver

General Description

The LMH0001 SMPTE 259M / 344M Serial Digital Driver is designed for use in SMPTE 259M / 344M serial digital video applications. The LMH0001 drives 75Ω transmission lines (Belden 8281, Belden 1694A or equivalent) at data rates up to 540 Mbps.

The output voltage swing of the LMH0001 is adjustable via a single external resistor.

The LMH0001 is powered from a single 3.3V supply. Power consumption is typically 125mW. The LMH0001 is available in a 16-pin LLP package.
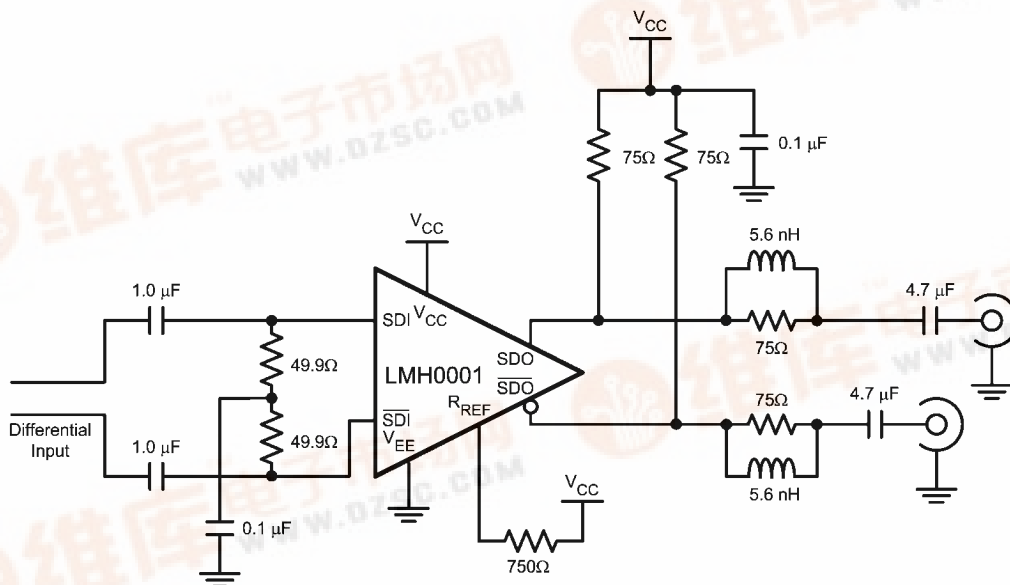
Features

- SMPTE 259M and SMPTE 344M compliant
- Data rates to 540 Mbps
- Supports DVB-ASI at 270 Mbps
- Differential input
- 75Ω differential output
- Adjustable output amplitude
- Single 3.3V supply operation
- Industrial temperature range: −40°C to +85°C
- 125mW typical power consumption
- 16–pin LLP package
- Footprint compatible with the LMH0002SQ and the GS9078A.

Applications

- SMPTE 259M and SMPTE 344M serial digital interfaces
- DVB-ASI applications
- Sonet/SDH and ATM interfaces
- Digital routers and switches
- Distribution amplifiers
- Buffer applications
- Set top boxes
- Security cameras

Typical Application

30027202

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Absolute Maximum Ratings (Note 1)

Supply Voltage:	−0.5V to 3.6V
Input Voltage (all inputs)	−0.3V to V_{CC}+0.3V
Output Current	28mA
Storage Temperature Range	−65°C to +150°C
Junction Temperature	+150°C
Lead Temperature (Soldering 4 Sec)	+260°C
Package Thermal Resistance	
θ_{JA} 16-pin LLP	+78.9°C/W
θ_{JC} 16-pin LLP	+42.7°C/W

ESD Rating (HBM)	5kV
ESD Rating (MM)	250V

Recommended Operating Conditions

Supply Voltage ($V_{CC} - V_{EE}$):	3.3V ±5%
Operating Free Air Temperature (T_A)	−40°C to +85°C

DC Electrical Characteristics

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified (Notes 2, 3).

Symbol	Parameter	Conditions	Reference	Min	Typ	Max	Units
V_{CMIN}	Input Common Mode Voltage		SDI, $\overline{SDI}$	$1.6 + V_{SDI}/2$		$V_{CC} - V_{SDI}/2$	V
V_{SDI}	Input Voltage Swing	Differential		100		2000	mV_{P-P}
V_{CMOUT}	Output Common Mode Voltage		SDO, $\overline{SDO}$		$V_{CC} - V_{SDO}$		V
V_{SDO}	Output Voltage Swing	Single-ended, 75Ω load, $R_{REF} = 750Ω$ 1%		750	800	850	mV_{P-P}
		Single-ended, 75Ω load, $R_{REF} = 590Ω$ 1%		900	1000	1100	mV_{P-P}
I_{CC}	Supply Current	(Note 5)			38	43	mA

AC Electrical Characteristics

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified (Note 3).

Symbol	Parameter	Conditions	Reference	Min	Typ	Max	Units
DR_{SDI}	Input Data Rate	(Note 4)	SDI, $\overline{SDI}$			540	Mbps
t_{jit}	Additive Jitter	270 Mbps	SDO, $\overline{SDO}$		18		ps_{P-P}
t_r, t_f	Output Rise Time, Fall Time	20% – 80%		400	560	800	ps
	Mismatch in Rise/Fall Time	(Note 4)				30	ps
	Duty Cycle Distortion	(Note 4)				100	ps
t_{OS}	Output Overshoot	(Note 4)				8	%
RL_{SDO}	Output Return Loss	(Note 6)		15	20		dB

Note 1: "Absolute Maximum Ratings" are those parameter values beyond which the life and operation of the device cannot be guaranteed. The stating herein of these maximums shall not be construed to imply that the device can or should be operated at or beyond these values. The table of "Electrical Characteristics" specifies acceptable device operating conditions.

Note 2: Current flow into device pins is defined as positive. Current flow out of device pins is defined as negative. All voltages are stated referenced to $V_{EE} = 0$ Volts.
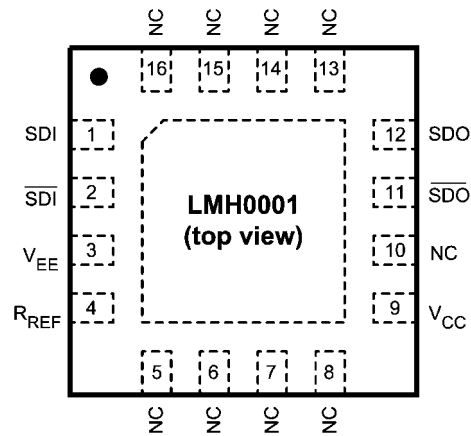
Note 3: Typical values are stated for $V_{CC} = +3.3V$ and $T_A = +25°C$.

Note 4: Specification is guaranteed by characterization.

Note 5: Maximum I_{CC} is measured at $V_{CC} = +3.465V$ and $T_A = +70°C$.

Note 6: Output return loss is dependent on board design. The LMH0001 meets this specification on the SD001SQ evaluation board from 5MHz to 1.5GHz.

Connection Diagram

16-Pin LLP
Order Number LMH0001SQ
**See NS Package Number SQB16A**

Pin Descriptions

SOIC Pin #	LLP Pin #	Name	Description
1	1	SDI	Serial data true input.
2	2	$\overline{SDI}$	Serial data complement input.
3	3	V_{EE}	Negative power supply (ground).
4	4	R_{REF}	Output driver level control. Connect a resistor to V_{CC} to set output voltage swing.
5	9	V_{CC}	Positive power supply (+3.3V).
7	11	$\overline{SDO}$	Serial data complement output.
8	12	SDO	Serial data true output.
—	5, 6, 7, 8, 10, 13, 14, 15, 16	NC	No connect.
—	DAP	V_{EE}	Connect exposed DAP to negative power supply (ground).

Device Operation
"LMH0001"
INPUT INTERFACING

The LMH0001 accepts either differential or single-ended input. The inputs are self-biased, allowing for simple AC or DC coupling. DC-coupled inputs must be kept within the specified common-mode range. SDI and $\overline{SDI}$ are self-biased at approximately 2.1V with V_{CC} = 3.3V. *Figure 1* shows the differential input stage for SDI and $\overline{SDI}$.
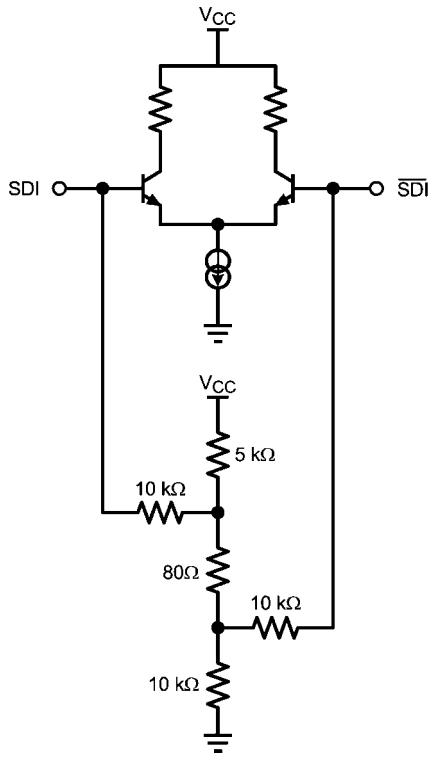
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FIGURE 1. Differential Input Stage for SDI and $\overline{SDI}$.

OUTPUT INTERFACING

The LMH0001 uses current mode outputs. Single-ended output levels are 800 mV$_{P-P}$ into 75Ω AC-coupled coaxial cable (with R_{REF} = 750Ω). Output level is controlled by the value of the R_{REF} resistor connected between the R_{REF} pin and V_{CC}.

The R_{REF} resistor should be placed as close as possible to the R_{REF} pin. In addition, the copper in the plane layers below the R_{REF} network should be removed to minimize parasitic capacitance.

Physical Dimensions inches (millimeters) unless otherwise noted
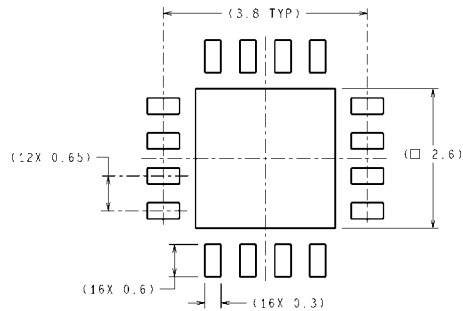
"LMH0001"

DIMENSIONS ARE IN MILLIMETERS
DIMENSIONS IN ( ) FOR REFERENCE ONLY

RECOMMENDED LAND PATTERN

PIN 1 INDEX AREA

PIN 1 ID
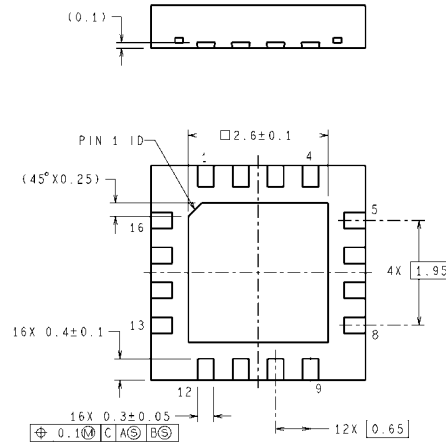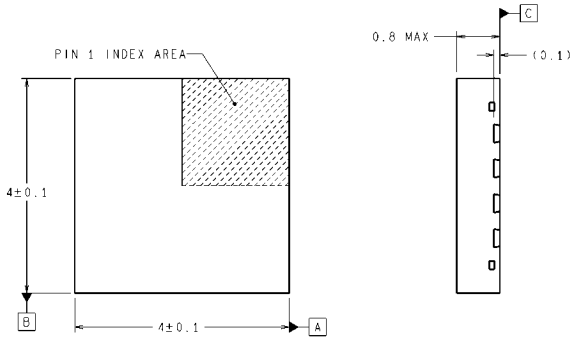
SQB16A (Rev A)

16-Pin LLP
Order Number LMH0001SQ
NS Package Number SQB16A

"LMH0001"

Notes

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