

# LMH0001

## SMPTE 259M / 344M Serial Digital Cable Driver

### General Description

The LMH0001 SMPTE 259M / 344M Serial Digital Cable Driver is designed for use in SMPTE 259M / 344M serial digital video applications. The LMH0001 drives 75 $\Omega$  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.

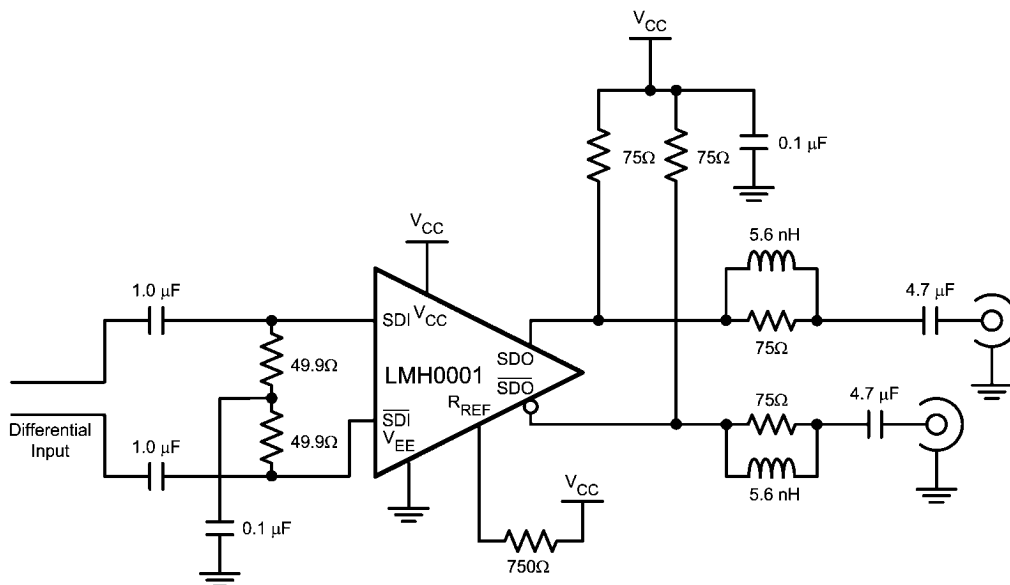
### Features

- SMPTE 259M and SMPTE 344M compliant
- Data rates to 540 Mbps
- Supports DVB-ASI at 270 Mbps
- Differential input
- 75 $\Omega$  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

**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	
$\theta_{JA}$ 16-pin LLP	+78.9°C/W
$\theta_{JC}$ 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 <sub>P-P</sub>
$V_{CMOUT}$	Output Common Mode Voltage		SDO, $\overline{SDO}$		$V_{CC} -$ $V_{SDO}$		V
$V_{SDO}$	Output Voltage Swing	Single-ended, 75Ω load, $R_{REF} = 750\Omega$ 1%		750	800	850	mV <sub>P-P</sub>
		Single-ended, 75Ω load, $R_{REF} = 590\Omega$ 1%		900	1000	1100	mV <sub>P-P</sub>
$I_{CC}$	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 <sub>P-P</sub>
$t_r, t_f$	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.

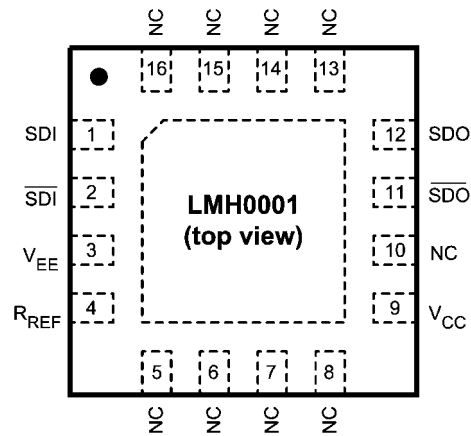
**Note 3:** Typical values are stated for  $V_{CC} = +3.3V$  and  $T_A = +25^\circ C$ .

**Note 4:** Specification is guaranteed by characterization.

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

**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



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

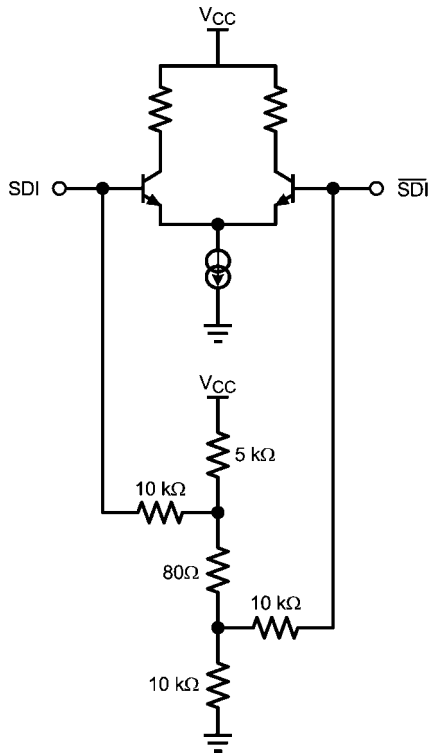
## Pin Descriptions

SOIC Pin #	LLP Pin #	Name	Description
1	1	SDI	Serial data true input.
2	2	$\overline{\text{SDI}}$	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	$\overline{\text{SDO}}$	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

### 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  $\overline{\text{SDI}}$  are self-biased at approximately 2.1V with  $V_{CC} = 3.3\text{V}$ . Figure 1 shows the differential input stage for SDI and  $\overline{\text{SDI}}$ .



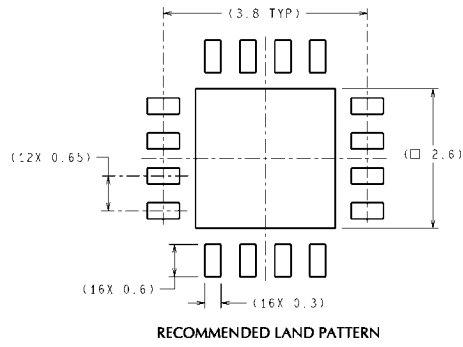
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FIGURE 1. Differential Input Stage for SDI and  $\overline{\text{SDI}}$ .

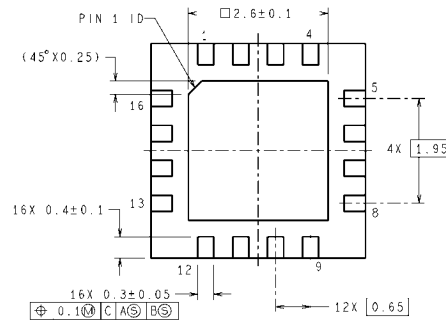
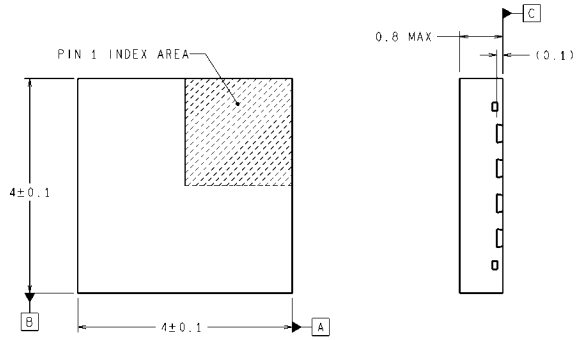
### OUTPUT INTERFACING

The LMH0001 uses current mode outputs. Single-ended output levels are 800 mV<sub>P-P</sub> into 75Ω AC-coupled coaxial cable (with  $R_{REF} = 750\Omega$ ). 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



**DIMENSIONS ARE IN MILLIMETERS**  
DIMENSIONS IN ( ) FOR REFERENCE ONLY



SQB16A (Rev A)

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

## Notes

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Displays	<a href="http://www.national.com/displays">www.national.com/displays</a>	Green Compliance	<a href="http://www.national.com/quality/green">www.national.com/quality/green</a>
Ethernet	<a href="http://www.national.com/ethernet">www.national.com/ethernet</a>	Packaging	<a href="http://www.national.com/packaging">www.national.com/packaging</a>
Interface	<a href="http://www.national.com/interface">www.national.com/interface</a>	Quality and Reliability	<a href="http://www.national.com/quality">www.national.com/quality</a>
LVDS	<a href="http://www.national.com/lvds">www.national.com/lvds</a>	Reference Designs	<a href="http://www.national.com/refdesigns">www.national.com/refdesigns</a>
Power Management	<a href="http://www.national.com/power">www.national.com/power</a>	Feedback	<a href="http://www.national.com/feedback">www.national.com/feedback</a>
Switching Regulators	<a href="http://www.national.com/switchers">www.national.com/switchers</a>		
LDOs	<a href="http://www.national.com/lido">www.national.com/lido</a>		
LED Lighting	<a href="http://www.national.com/led">www.national.com/led</a>		
PowerWise	<a href="http://www.national.com/powerwise">www.national.com/powerwise</a>		
Serial Digital Interface (SDI)	<a href="http://www.national.com/sdi">www.national.com/sdi</a>		
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