

# LMH0002

## SMPTE 292M / 259M Serial Digital Cable Driver

### General Description

The LMH0002 SMPTE 292M / 259M serial digital cable driver is a monolithic, high-speed cable driver designed for use in SMPTE 292M / 259M serial digital video and ITU-T G.703 serial digital data transmission applications. The LMH0002 drives 75Ω transmission lines (Belden 8281, Belden 1694A or equivalent) at data rates up to 1.485 Gbps.

The LMH0002 provides two selectable slew rates for SMPTE 259M and SMPTE 292M compliance. The output voltage swing is adjustable via a single external resistor.

The LMH0002 is powered from a single 3.3V supply. Power consumption is typically 125mW in SD mode and 149mW in HD mode. The LMH0002 is available in an 8-pin SOIC or 16-pin LLP package.

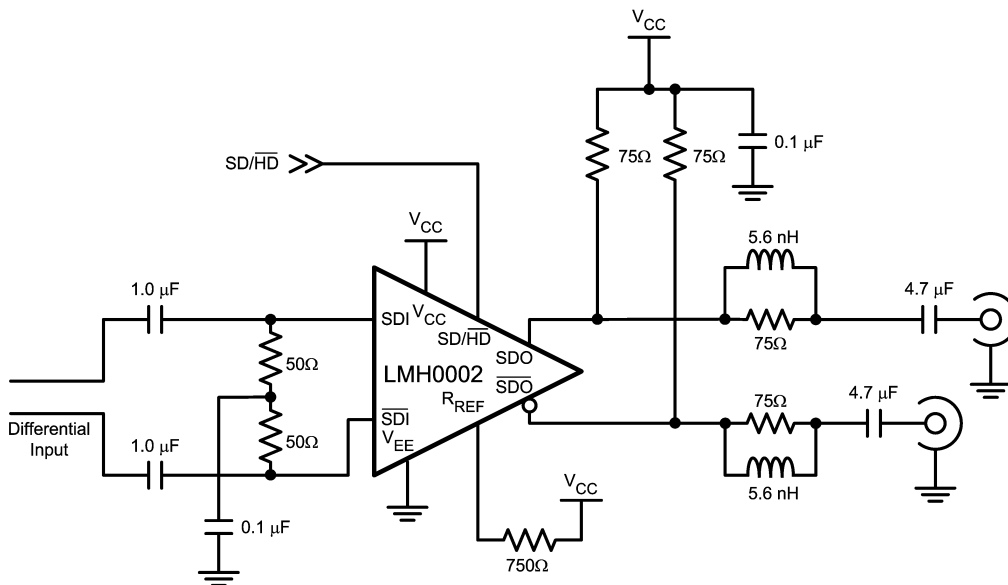
### Features

- SMPTE 292M, SMPTE 344M and SMPTE 259M compliant
- Data rates to 1.485 Gbps
- Differential input
- 75Ω differential output
- Selectable slew rate
- Adjustable output amplitude
- Single 3.3V supply operation
- Operating temperature range: Commercial 0°C to +70°C (LMH0002MA) or Industrial -40°C to +85°C (LMH0002TMA and LMH0002SQ)
- Typical power consumption: 125mW in SD mode and 149mW in HD mode
- 8-pin SOIC or 16-pin LLP package
- Replaces the GS1528, GS1528A, or GS1578A.

### Applications

- SMPTE 292M, SMPTE 344M, and SMPTE 259M serial digital interfaces
- Sonet/SDH and ATM interfaces
- Digital routers and switches
- Distribution amplifiers
- Buffer applications
- Set top boxes
- Security cameras

### Typical Application



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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	
$\theta_{JA}$ 8-pin SOIC	+160°C/W
$\theta_{JA}$ 16-pin LLP	+78.9°C/W
$\theta_{JC}$ 8-pin SOIC	+105°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 ( $T_A$ )	
LMH0002MA	0°C to +70°C
LMH0002TMA, LMH0002SQ	-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>
	SD/ $\overline{HD}$ Input Voltage	Min for SD	SD/ $\overline{HD}$	2.4			V
		Max for HD				0.8	V
	SD/ $\overline{HD}$ Input Current				3.7		μA
$I_{CC}$	Supply Current	SD/ $\overline{HD} = 0$ , (Note 5)			45	49	mA
		SD/ $\overline{HD} = 1$ , (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, $\overline{SDI}$			1485	Mbps
$t_{jit}$	Additive Jitter	1.485 Gbps	SDO, $\overline{SDO}$		26		ps <sub>P-P</sub>
		270 Mbps			18		ps <sub>P-P</sub>
$t_r, t_f$	Output Rise Time, Fall Time	SD/ $\overline{HD} = 0$ , 20% – 80%, (Note 6)			120	220	ps
		SD/ $\overline{HD} = 1$ , 20% – 80%		400	560	800	ps
	Mismatch in Rise/Fall Time	(Note 4)				30	ps
	Duty Cycle Distortion	SD/ $\overline{HD} = 0$ , (Note 4)				30	ps
		SD/ $\overline{HD} = 1$ , (Note 4)				100	ps
$t_{OS}$	Output Overshoot	(Note 4)				8	%
$RL_{SDO}$	Output Return Loss	(Note 7)		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  $T_A = +25^\circ C$ .

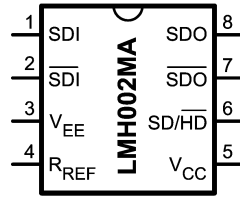
**Note 4:** Specification is guaranteed by characterization.

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

**Note 6:** Specification is guaranteed by characterization and verified by test.

**Note 7:** Output return loss is dependent on board design. The LMH0002 meets this specification on the SD002 evaluation board from 5MHz to 1.5GHz.

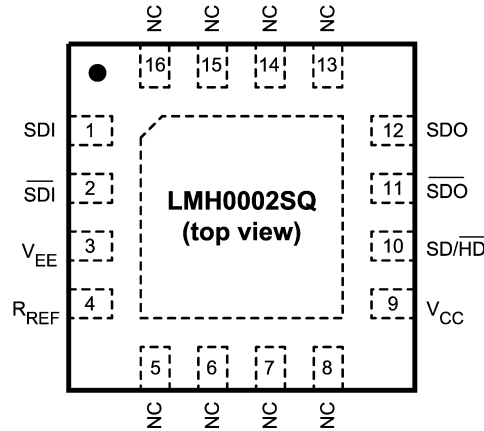
## Connection Diagrams



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### 8-Pin SOIC

Order Number LMH0002MA or LMH0002TMA  
See NS Package Number M08A



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### 16-Pin LLP

Order Number LMH0002SQ  
See NS Package Number SQB16A

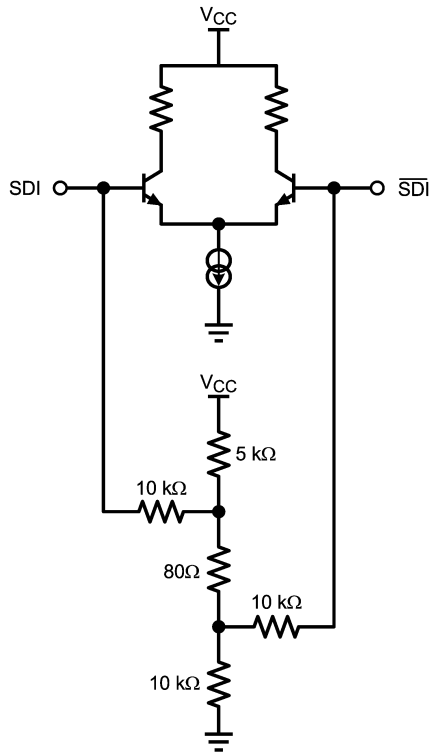
## Pin Descriptions

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).
6	10	$\overline{\text{SD/HD}}$	Output slew rate control. Output rise/fall time complies with SMPTE 292M when low and SMPTE 259M when high.
7	11	$\overline{\text{SDO}}$	Serial data complement output.
8	12	SDO	Serial data true output.
—	5, 6, 7, 8, 13, 14, 15, 16	NC	No connect.
—	DAP	$V_{EE}$	Connect exposed DAP to negative power supply (ground).

## Device Operation

### INPUT INTERFACING

The LMH0002 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 LMH0002 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.

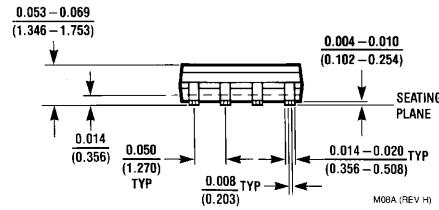
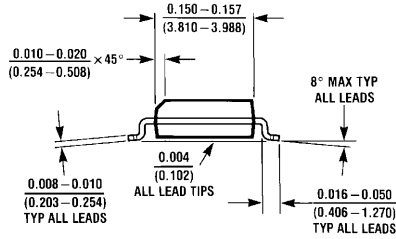
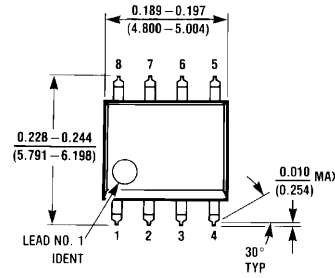
### OUTPUT SLEW RATE CONTROL

The LMH0002 output rise and fall times are selectable for either SMPTE 259M or SMPTE 292M compliance via the SD/ $\overline{\text{HD}}$  pin. For slower rise and fall times, or SMPTE 259M compliance, SD/ $\overline{\text{HD}}$  is set high. For faster rise and fall times, or SMPTE 292M compliance, SD/ $\overline{\text{HD}}$  is set low.

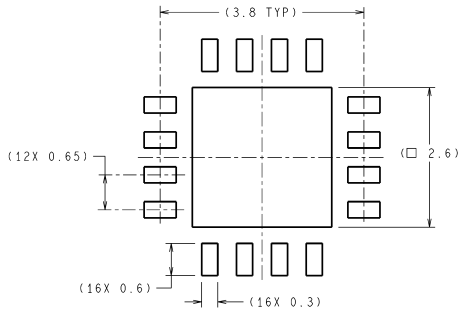
### REPLACING THE GENNUM GS1528, GS1528A, and GS1578A

The LMH0002MA is form-fit-function compatible with the Gennum GS1528 and GS1528A. The LMH0002SQ is form-fit-function compatible with the Gennum GS1578A.

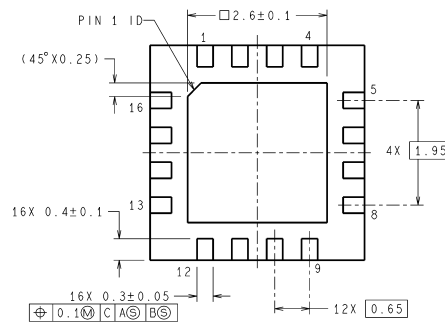
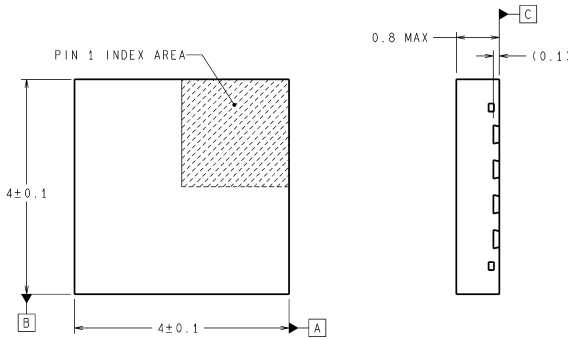
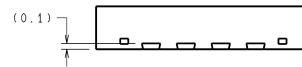
**Physical Dimensions** inches (millimeters) unless otherwise noted



**8-Pin SOIC**  
**Order Number LMH0002MA or LMH0002TMA**  
**NS Package Number M08A**



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



SQB16A (Rev A)

**16-Pin LLP**  
**Order Number LMH0002SQ**  
**NS Package Number SQB16A**

## Notes

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