National Semiconductor

PRELIMINARY
June 2007

LMH0302
3Gbps HD/SD SDI Cable Driver

General Description

The LMH0302 3Gbps HD/SD SDI Cable Driver is designed for use in SMPTE 424M, SMPTE 292M, SMPTE 344M, and SMPTE 259M serial digital video applications. The LMH0302 drives 75Ω transmission lines (Belden 1694A, Belden 8281, or equivalent) at data rates up to 2.97 Gbps.

The LMH0302 provides two selectable slew rates for SMPTE 259M and SMPTE 424M / 292M compliance. The output driver may be powered down via the output diver enable pin.

The LMH0302 is powered from a single 3.3V supply. Power consumption is typically 129 mW in SD mode and 162 mW in HD mode. The LMH0302 is available in a 16-pin LLP package.

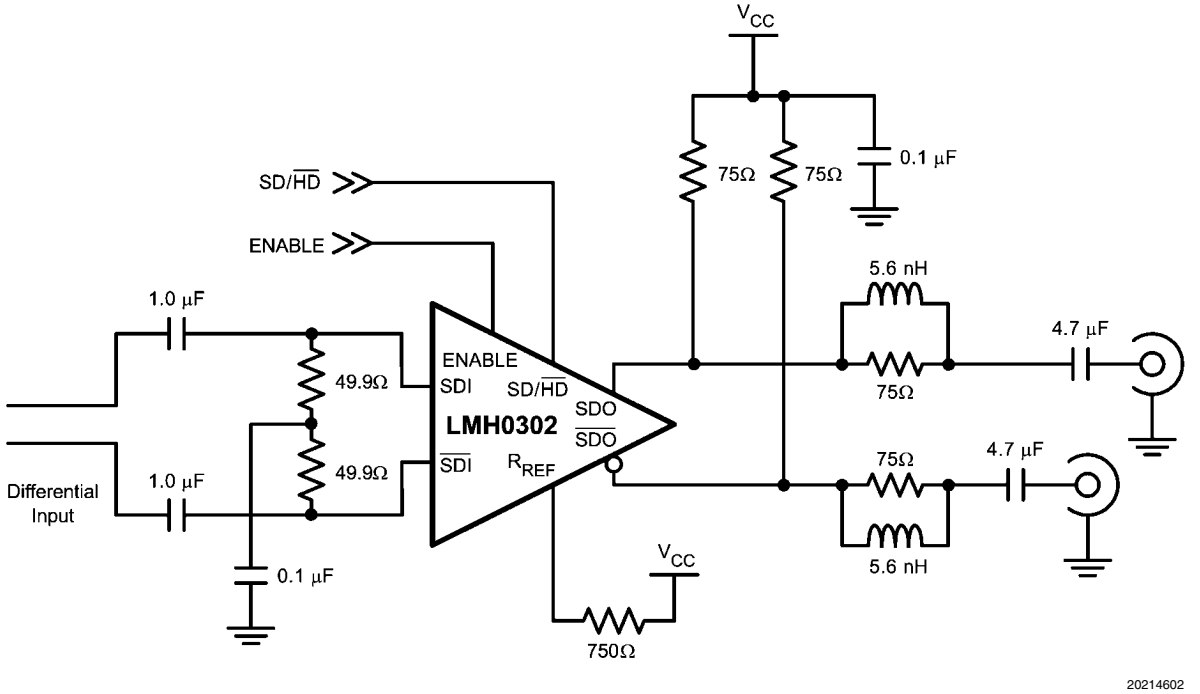
Features

- SMPTE 424M, SMPTE 292M, SMPTE 344M, and SMPTE 259M compliant
- Data rates to 2.97 Gbps
- Differential input
- 75Ω differential output
- Selectable slew rate
- Output driver power down control
- Single 3.3V supply operation
- Industrial temperature range: –40°C to +85°C
- Typical power consumption: 129 mW in SD mode and 162 mW in HD mode
- 16–pin LLP package
- Footprint compatible with the LMH0002SQ
- Replaces the Gennum GS2978

Applications

- SMPTE 424M, SMPTE 292M, SMPTE 344M, and SMPTE 259M serial digital interfaces
- Digital video routers and switches
- Distribution amplifiers

Typical Application



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	+64°C/W
θ_{JC} 16-pin LLP	+26°C/W
ESD Rating (HBM)	4kV
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		2200	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%		720	800	880	mV_{P-P}
V_{IH}	Input Voltage High Level		SD/$\overline{HD}$, ENABLE	2.0			V
V_{IL}	InputVoltage Low Level					0.8	V
I_{CC}	Supply Current	SD/$\overline{HD}$ = 0, SDO/$\overline{SDO}$ enabled			49	53	mA
		SD/$\overline{HD}$ = 0, SDO/$\overline{SDO}$ disabled			23	27	mA
		SD/$\overline{HD}$ = 1, SDO/$\overline{SDO}$ enabled			39	42	mA
		SD/$\overline{HD}$ = 1, SDO/$\overline{SDO}$ disabled			14	16	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		SDI, $\overline{SDI}$			2970	Mbps
t_{jit}	Additive Jitter	2.97 Gbps	SDO, $\overline{SDO}$		20		ps_{P-P}
		1.485 Gbps			18		ps_{P-P}
		270 Mbps			15		ps_{P-P}
t_r,t_f	Output Rise Time, Fall Time	SD/$\overline{HD}$ = 0, 20% – 80%,			90	130	ps
		SD/$\overline{HD}$ = 1, 20% – 80%		400		800	ps
	Mismatch in Rise/Fall Time					30	ps
	Duty Cycle Distortion	SD/$\overline{HD}$ = 0, 2.97 Gbps, (Note 4)				27	ps
		SD/$\overline{HD}$ = 0, 1.485 Gbps, (Note 4)				30	ps
		SD/$\overline{HD}$ = 1, (Note 4)				100	ps
t_{OS}	Output Overshoot	SD/$\overline{HD}$ = 0, (Note 4)				10	%
		SD/$\overline{HD}$ = 1, (Note 4)				8	%
RL_{SDO}	Output Return Loss	5 MHz - 1.5 GHz, (Note 5)		15			dB
		1.5 GHz - 3.0 GHz, (Note 5)		10			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.

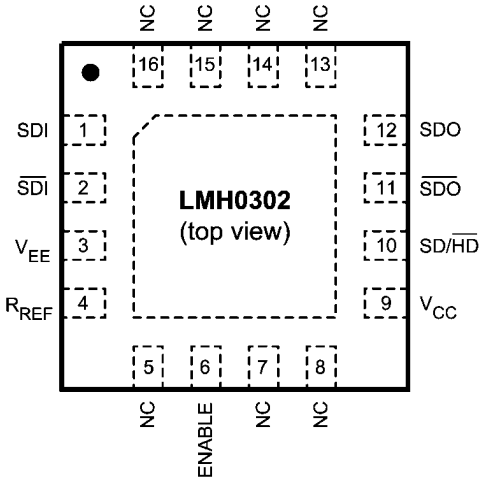
Note 2: Current flow into device pins is defined as positive. Current flow out of device pins is defined as negative. All voltages are stated referenced to V_{EE} = 0 Volts.

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: Output return loss is dependent on board design. The LMH0302 meets this specification on the SD302 evaluation board.

Connection Diagram



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The exposed die attach pad is a negative electrical terminal for this device. It should be connected to the negative power supply voltage.

16-Pin LLP
Order Number LMH0302SQ
See NS Package Number SQB16A

Pin Descriptions

LLP Pin #	Name	Description
1	SDI	Serial data true input.
2	$\overline{SDI}$	Serial data complement input.
3	V_{EE}	Negative power supply (ground).
4	R_{REF}	Output driver level control. Connect a resistor to V_{CC} to set output voltage swing.
5	NC	No connect. Not bonded internally.
6	ENABLE	Output driver enable. When low, the SDO/$\overline{SDO}$ output driver is powered off. ENABLE has an internal pulllup.
7	NC	No connect. Not bonded internally.
8	NC	No connect. Not bonded internally.
9	V_{CC}	Positive power supply (+3.3V).
10	SD/$\overline{HD}$	Output slew rate control. Output rise/fall time complies with SMPTE 424M / 292M when low and SMPTE 259M when high.
11	$\overline{SDO}$	Serial data complement output.
12	SDO	Serial data true output.
13	NC	No connect. Not bonded internally.
14	NC	No connect. Not bonded internally.
15	NC	No connect. Not bonded internally.
16	NC	No connect. Not bonded internally.
DAP	V_{EE}	Connect exposed DAP to negative power supply (ground).

Device Operation

INPUT INTERFACING

The LMH0302 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.

OUTPUT INTERFACING

The LMH0302 uses current mode outputs. Single-ended output levels are 800 mV_{P-P} into 75Ω AC-coupled coaxial cable with an R_{REF} resistor of 750Ω. The R_{REF} resistor is connected between the R_{REF} pin and V_{CC}. The only resistor value that should be used for R_{REF} is 750Ω..

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.

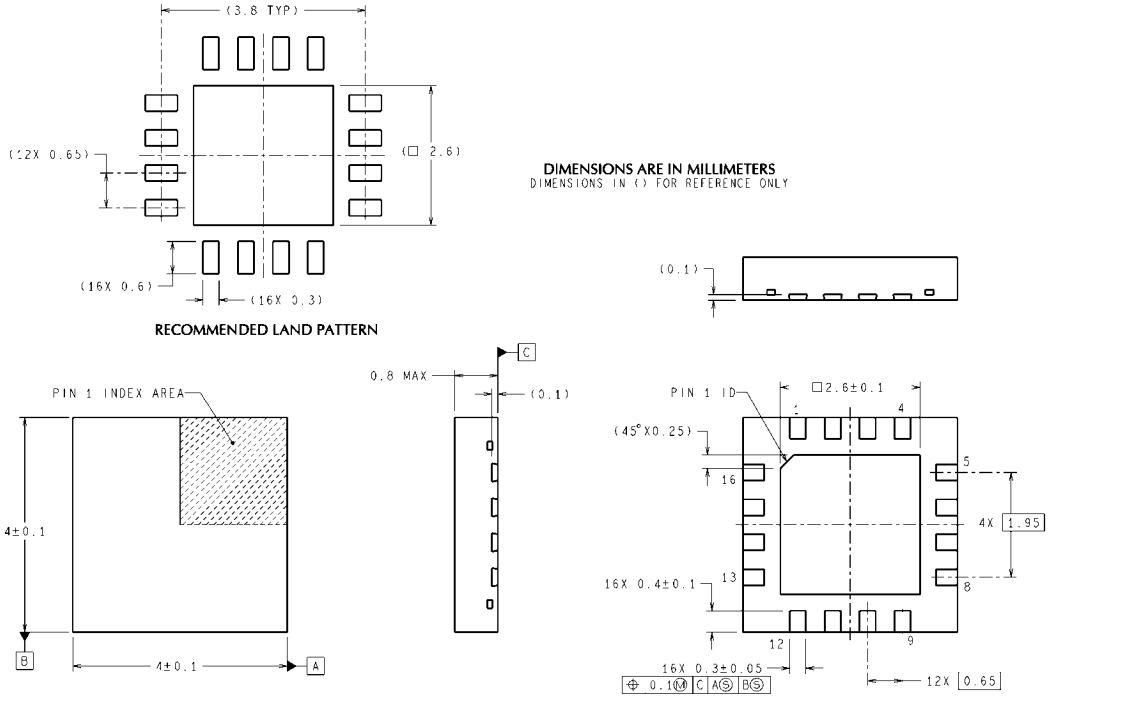
OUTPUT SLEW RATE CONTROL

The LMH0302 output rise and fall times are selectable for either SMPTE 259M or SMPTE 424M / 292M compliance via the SD/$\overline{HD}$ pin. For slower rise and fall times, or SMPTE 259M compliance, SD/$\overline{HD}$ is set high. For faster rise and fall times, or SMPTE 424M and SMPTE 292M compliance, SD/$\overline{HD}$ is set low.

OUTPUT ENABLE

The SDO/$\overline{SDO}$ output driver can be enabled or disabled with the ENABLE pin. When set low, the output driver is powered off. ENABLE has an internal pullup.

Physical Dimensions inches (millimeters) unless otherwise noted



16-Pin LLP
Order Number LMH0302SQ
NS Package Number SQB16A

Notes

Notes

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