

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 driver 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.

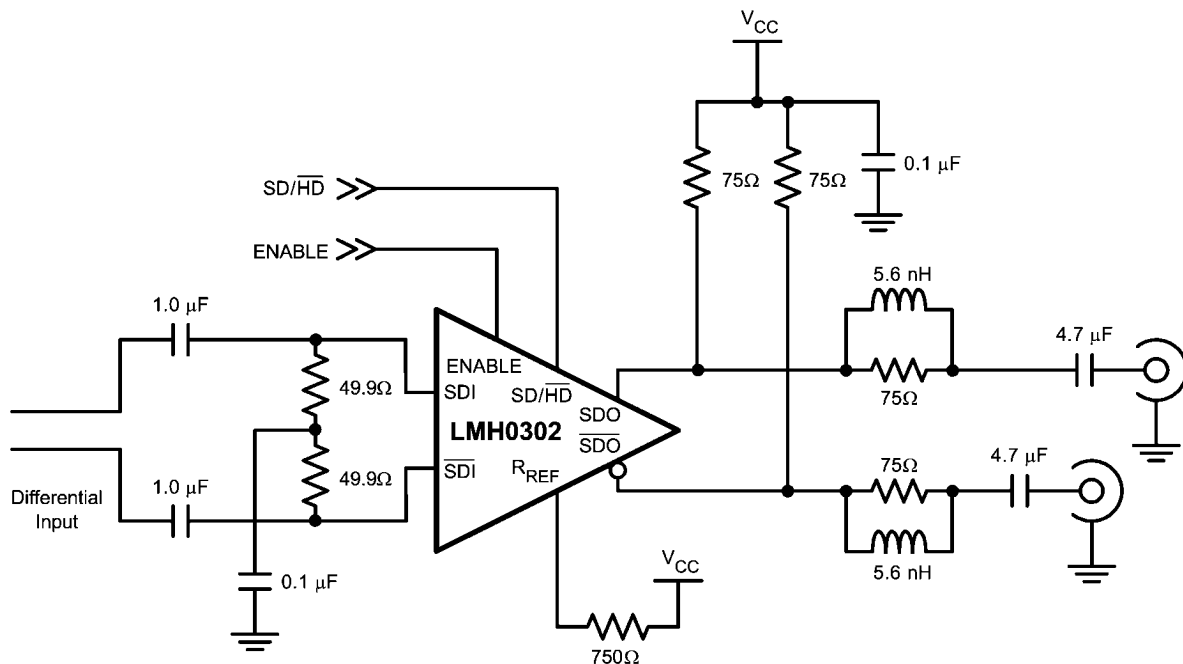
Features

- 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



20214602

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 ConditionsSupply 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, $R_{REF} = 750\Omega$ 1% | | 720 | 800 | 880 | mV _{P-P} |
| V_{IH} | Input Voltage High Level | | SD/ \overline{HD} , ENABLE | 2.0 | | | V |
| V_{IL} | Input Voltage 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%, SD/ $\overline{HD} = 1$, 20% – 80% | | | 90 | 130 | ps |
| | | | | 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.

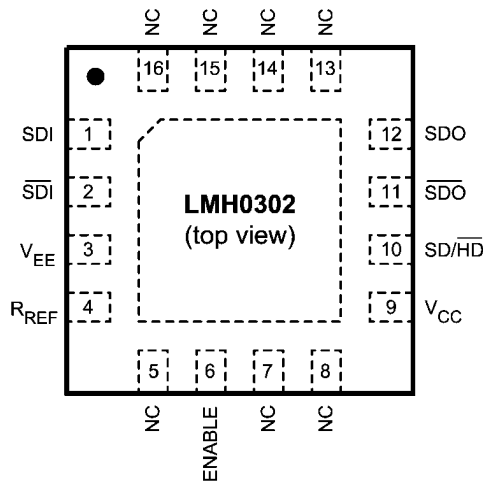
Note 2: Current flow into device pins is defined as positive. Current flow out of device pins is defined as negative. All voltages are stated referenced to $V_{EE} = 0$ Volts.

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

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



20214605

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 | $\overline{\text{SDI}}$ | 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/ $\overline{\text{SDO}}$ output driver is powered off. ENABLE has an internal pullup. |
| 7 | NC | No connect. Not bonded internally. |
| 8 | NC | No connect. Not bonded internally. |
| 9 | V_{CC} | Positive power supply (+3.3V). |
| 10 | $\overline{\text{SD/HD}}$ | Output slew rate control. Output rise/fall time complies with SMPTE 424M / 292M when low and SMPTE 259M when high. |
| 11 | $\overline{\text{SDO}}$ | 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.

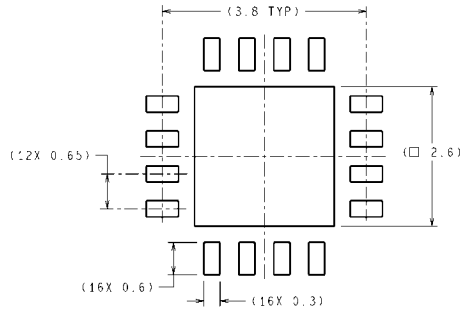
OUTPUT SLEW RATE CONTROL

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

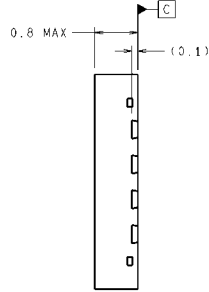
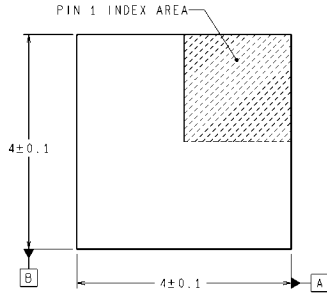
OUTPUT ENABLE

The SDO/ $\overline{\text{SDO}}$ 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.

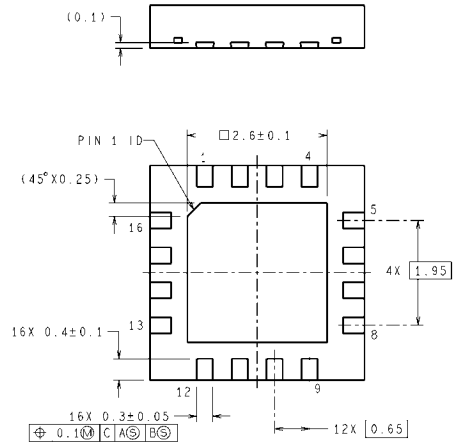
Physical Dimensions inches (millimeters) unless otherwise noted



RECOMMENDED LAND PATTERN



DIMENSIONS ARE IN MILLIMETERS
DIMENSIONS IN () FOR REFERENCE ONLY



16-Pin LLP
Order Number LMH0302SQ
NS Package Number SQB16A

SQB16A (Rev A)

Notes

LMH0302

Notes

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