

## LMH0202 Dual SMPTE 292M / 259M Serial Digital Cable Driver

Check for Samples: [LMH0202](#)

### FEATURES

- SMPTE 292M, SMPTE 344M and SMPTE 259M Compliant
- Data Rates to 1.485 Gbps
- Dual Differential Inputs
- Dual 75Ω Differential Outputs
- Two Selectable Slew Rates
- Adjustable Output Amplitude
- Single 3.3V Supply Operation
- Commercial Temperature Range: 0°C to +70°C
- Typical Power Consumption: 250 mW in SD Mode and 300 mW in HD Mode

### APPLICATIONS

- SMPTE 292M, SMPTE 344M, and SMPTE 259M Serial Digital Interfaces
- DVB-ASI Applications
- Sonet/SDH and ATM Interfaces
- Digital Routers and Switches
- Distribution Amplifiers
- Buffer Applications
- Video Cameras

### Connection Diagram

### DESCRIPTION

The LMH0202 Dual 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 LMH0202 drives 75Ω transmission lines (Belden 8281, Belden 1694A or equivalent) at data rates up to 1.485 Gbps.

The LMH0202 provides two selectable slew rates for SMPTE 259M and SMPTE 292M compliance. The output voltage swing is adjustable via a single external resistor.

The LMH0202 offers the flexibility to implement either dual differential inputs or a single differential input (externally routed via PCB) to dual differential outputs. The latter option provides an ideal solution for DVB-ASI applications where only the non-inverted outputs are typically used.

The LMH0202 is powered from a single 3.3V supply. Power consumption is typically 250 mW in SD mode and 300 mW in HD mode.

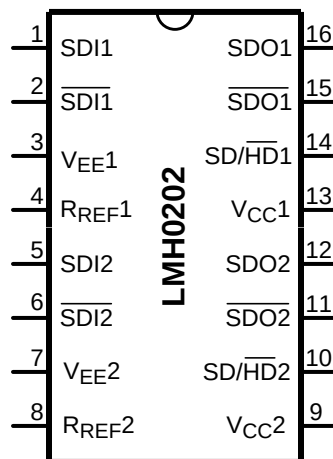


**Figure 1. 16-Pin TSSOP**  
**See PW Package**



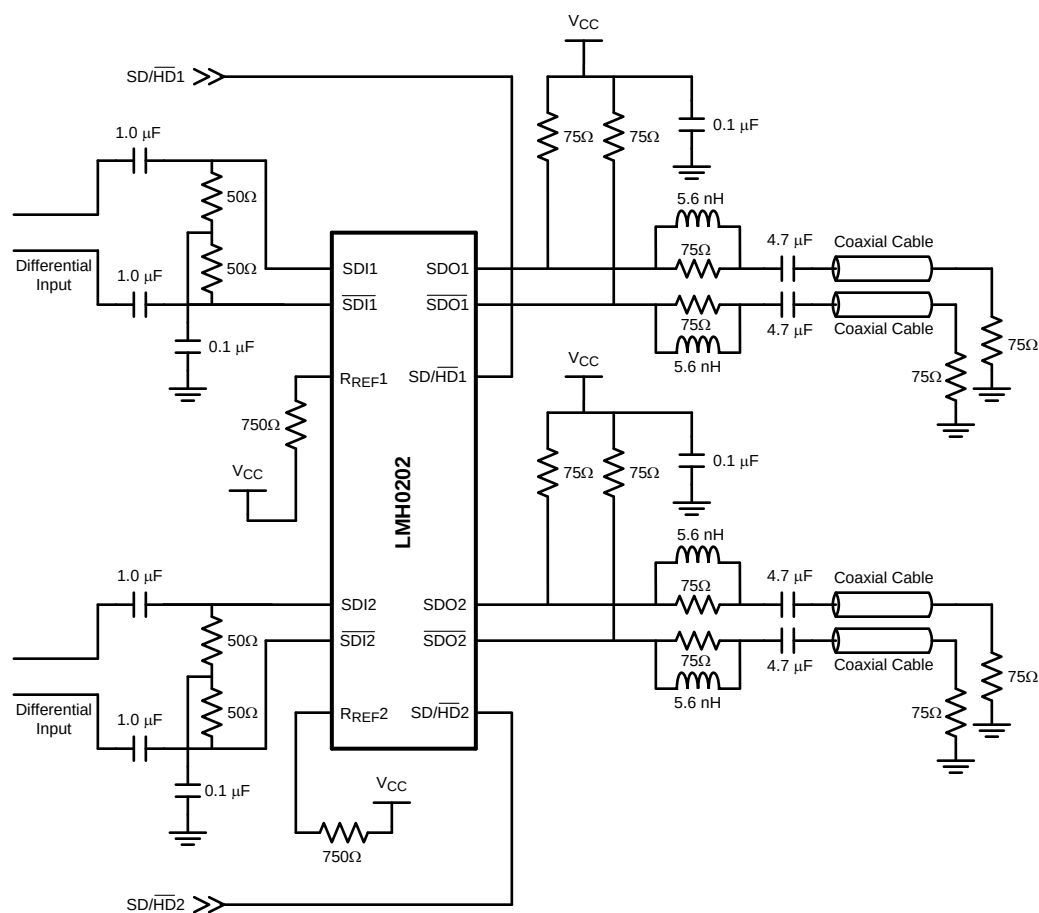
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

Copyright © 2006–2013, Texas Instruments Incorporated

## Typical Application





These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

## Absolute Maximum Ratings<sup>(1)</sup>

|                                                                                        |                        |
|----------------------------------------------------------------------------------------|------------------------|
| Supply Voltage:                                                                        | –0.5V to 3.6V          |
| Input Voltage (all inputs)                                                             | –0.3V to $V_{CC}+0.3V$ |
| Output Current                                                                         | 28 mA                  |
| Storage Temperature Range                                                              | –65°C to +150°C        |
| Junction Temperature                                                                   | +150°C                 |
| Lead Temperature (Soldering 4 Sec)                                                     | +260°C                 |
| Package Thermal Resistance<br>$\theta_{JA}$ 16-pin TSSOP<br>$\theta_{JC}$ 16-pin TSSOP | +125°C/W<br>+105°C/W   |
| ESD Rating (HBM)                                                                       | 5 kV                   |
| ESD Rating (MM)                                                                        | 250V                   |

- (1) Absolute Maximum Ratings are those parameter values beyond which the life and operation of the device cannot be ensured. 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.

## Recommended Operating Conditions

|                                          |              |
|------------------------------------------|--------------|
| Supply Voltage ( $V_{CC} - V_{EE}$ ):    | 3.3V ±5%     |
| Operating Free Air Temperature ( $T_A$ ) | 0°C to +70°C |

## DC Electrical Characteristics

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified<sup>(1)(2)</sup>.

| Symbol      | Parameter                         | Conditions                                                                         | Reference                                               | Min               | Typ                | Max                  | Units             |
|-------------|-----------------------------------|------------------------------------------------------------------------------------|---------------------------------------------------------|-------------------|--------------------|----------------------|-------------------|
| $V_{CMIN}$  | Input Common Mode Voltage         |                                                                                    | SDI1, $\overline{SDI1}$ ,<br>SDI2, $\overline{SDI2}$    | $1.6 + V_{SDI}/2$ |                    | $V_{CC} - V_{SDI}/2$ | V                 |
| $V_{SDI}$   | Input Voltage Swing               | Differential                                                                       |                                                         | 100               |                    | 2000                 | mV <sub>P-P</sub> |
| $V_{CMOUT}$ | Output Common Mode Voltage        |                                                                                    | SDO1,<br>$\overline{SDO1}$ ,<br>SDO2, $\overline{SDO2}$ |                   | $V_{CC} - V_{SDO}$ |                      | V                 |
| $V_{SDO}$   | Output Voltage Swing              | Single-ended, 75Ω load,<br>$R_{REF1} = 750\Omega$ 1%,<br>$R_{REF2} = 750\Omega$ 1% |                                                         | 750               | 800                | 850                  | mV <sub>P-P</sub> |
|             |                                   | Single-ended, 75Ω load,<br>$R_{REF1} = 590\Omega$ 1%,<br>$R_{REF2} = 590\Omega$ 1% |                                                         | 900               | 1000               | 1100                 | mV <sub>P-P</sub> |
| $V_{SDHD}$  | SD/ $\overline{HD}$ Input Voltage | Min for SD                                                                         | SD/ $\overline{HD1}$ ,<br>SD/ $\overline{HD2}$          | 2.4               |                    |                      | V                 |
|             |                                   | Max for HD                                                                         |                                                         |                   |                    | 0.8                  | V                 |
| $I_{SDHD}$  | SD/ $\overline{HD}$ Input Current |                                                                                    |                                                         |                   | 3.7                |                      | μA                |
| $I_{CC}$    | Supply Current                    | SD/ $\overline{HD1} = 0$ , SD/ $\overline{HD2} = 0$ <sup>(3)</sup>                 |                                                         |                   | 90                 | 98                   | mA                |
|             |                                   | SD/ $\overline{HD1} = 1$ , SD/ $\overline{HD2} = 1$ <sup>(3)</sup>                 |                                                         |                   | 76                 | 86                   | mA                |

- (1) 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.  
 (2) Typical values are stated for  $V_{CC} = +3.3V$  and  $T_A = +25^\circ C$ .  
 (3) Maximum  $I_{CC}$  is measured at  $V_{CC} = +3.465V$  and  $T_A = +70^\circ C$ .

## AC Electrical Characteristics

Over Supply Voltage and Operating Temperature ranges, unless otherwise specified<sup>(1)</sup>.

| Symbol            | Parameter                   | Conditions                                                                                    | Reference                                                                         | Min | Typ | Max  | Units |
|-------------------|-----------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----|-----|------|-------|
| DR <sub>SDI</sub> | Input Data Rate             |                                                                                               | <sup>(2)</sup> SDI1, $\overline{\text{SDI1}}$ ,<br>SDI2, $\overline{\text{SDI2}}$ |     |     | 1485 | Mbps  |
| $t_{jit}$         | Additive Jitter             | 1.485 Gbps                                                                                    | SDO1, $\overline{\text{SDO1}}$ ,<br>SDO2, $\overline{\text{SDO2}}$                |     | 26  |      | pSp-p |
|                   |                             | 270 Mbps                                                                                      |                                                                                   |     | 18  |      | pSp-p |
| $t_r, t_f$        | Output Rise Time, Fall Time | $\overline{\text{SD/HD1}} = 0$ , $\overline{\text{SD/HD2}} = 0$ ,<br>20% – 80% <sup>(3)</sup> |                                                                                   |     | 120 | 220  | ps    |
|                   |                             | $\overline{\text{SD/HD1}} = 1$ , $\overline{\text{SD/HD2}} = 1$ ,<br>20% – 80% <sup>(3)</sup> |                                                                                   | 400 | 560 | 800  | ps    |
|                   | Mismatch in Rise/Fall Time  | <sup>(2)</sup>                                                                                |                                                                                   |     |     | 30   | ps    |
| $t_{OS}$          | Output Overshoot            | <sup>(2)</sup>                                                                                |                                                                                   |     |     | 8    | %     |
| RL <sub>SDO</sub> | Output Return Loss          | <sup>(4)</sup>                                                                                |                                                                                   | 15  | 20  |      | dB    |

(1) Typical values are stated for  $V_{CC} = +3.3V$  and  $T_A = +25^\circ C$ .

(2) Specification is ensured by characterization.

(3) Specification is ensured by characterization and verified by test.

(4) Output return loss is dependent on board design. The LMH0202 meets this specification on the SD202 evaluation board from 5 MHz to 1.5 GHz.

**Table 1. PIN DESCRIPTIONS**

| Pin # | Name                     | Description                                                                                                 |
|-------|--------------------------|-------------------------------------------------------------------------------------------------------------|
| 1     | SDI1                     | Serial data true input.                                                                                     |
| 2     | $\overline{\text{SDI1}}$ | Serial data complement input.                                                                               |
| 3     | $V_{EE1}$                | Negative power supply (ground).                                                                             |
| 4     | $R_{REF1}$               | Output driver level control. Connect a resistor to $V_{CC}$ to set output voltage swing.                    |
| 5     | SDI2                     | Serial data true input.                                                                                     |
| 6     | $\overline{\text{SDI2}}$ | Serial data complement input.                                                                               |
| 7     | $V_{EE2}$                | Negative power supply (ground).                                                                             |
| 8     | $R_{REF2}$               | Output driver level control. Connect a resistor to $V_{CC}$ to set output voltage swing.                    |
| 9     | $V_{CC2}$                | Positive power supply (+3.3V).                                                                              |
| 10    | SD/HD2                   | Output slew rate control. Output rise/fall time complies with SMPTE 292M when low and SMPTE 259M when high. |
| 11    | $\overline{\text{SDO2}}$ | Serial data complement output.                                                                              |
| 12    | SDO2                     | Serial data true output.                                                                                    |
| 13    | $V_{CC1}$                | Positive power supply (+3.3V).                                                                              |
| 14    | SD/HD1                   | Output slew rate control. Output rise/fall time complies with SMPTE 292M when low and SMPTE 259M when high. |
| 15    | $\overline{\text{SDO1}}$ | Serial data complement output.                                                                              |
| 16    | SDO1                     | Serial data true output.                                                                                    |

## DEVICE OPERATION

### INPUT INTERFACING

The LMH0202 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 2 shows the differential input stage for SDI and  $\overline{\text{SDI}}$ .

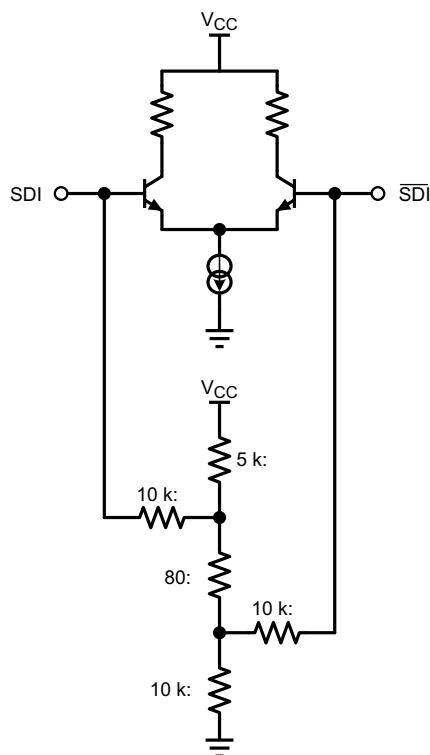


**Figure 2. Differential Input Stage for SDI and  $\overline{\text{SDI}}$ .**

## DVB-ASI APPLICATIONS

The dual differential inputs of the LMH0202 may be externally routed to a single differential input as shown in Figure 3. This provides a solution for DVB-ASI applications where two non-inverted outputs are needed.

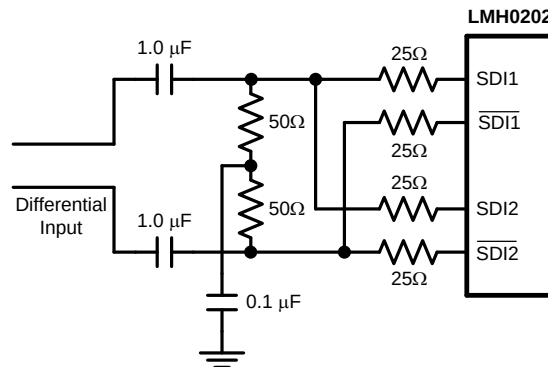


Figure 3. Single Differential Input for DVB-ASI

## OUTPUT INTERFACING

The LMH0202 uses current mode outputs. Single-ended output levels are 800 mV<sub>P-P</sub> into 75 Ω AC-coupled coaxial cable (with  $R_{REF} = 750\Omega$ ). Output level is controlled by the value of the 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 LMH0202 output rise and fall times are selectable for either SMPTE 259M or SMPTE 292M compliance via the  $\overline{SD/HD}$  pin. For slower rise and fall times, or SMPTE 259M compliance,  $\overline{SD/HD}$  is set high. For faster rise and fall times, or SMPTE 292M compliance,  $\overline{SD/HD}$  is set low.

## REVISION HISTORY

### Changes from Revision B (April 2013) to Revision C

### Page

- Changed layout of National Data Sheet to TI format ..... [6](#)

## PACKAGING INFORMATION

| Orderable part number          | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|--------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">LMH0202MT/NOPB</a> | Active        | Production           | TSSOP (PW)   16 | 92   TUBE             | Yes         | SN                                   | Level-1-260C-UNLIM                | 0 to 70      | L202                |
| LMH0202MT/NOPB.A               | Active        | Production           | TSSOP (PW)   16 | 92   TUBE             | Yes         | SN                                   | Level-1-260C-UNLIM                | 0 to 70      | L202                |
| LMH0202MT/NOPB.B               | Active        | Production           | TSSOP (PW)   16 | 92   TUBE             | Yes         | SN                                   | Level-1-260C-UNLIM                | 0 to 70      | L202                |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

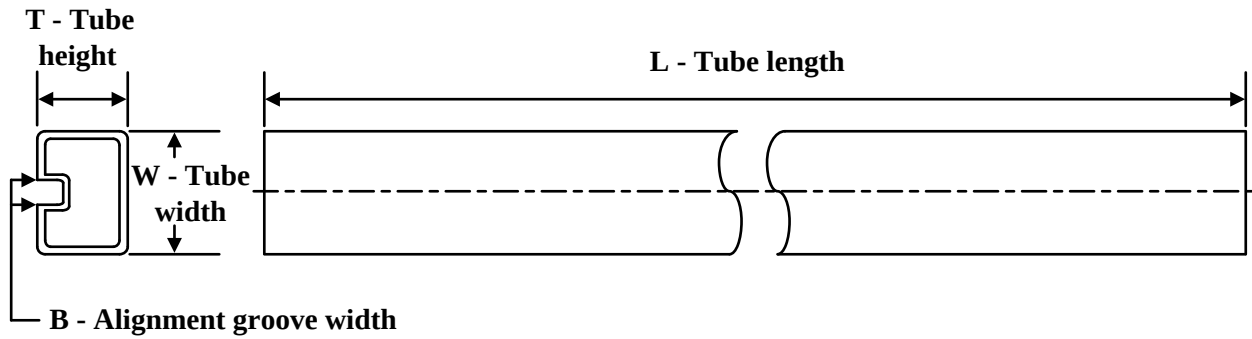
<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

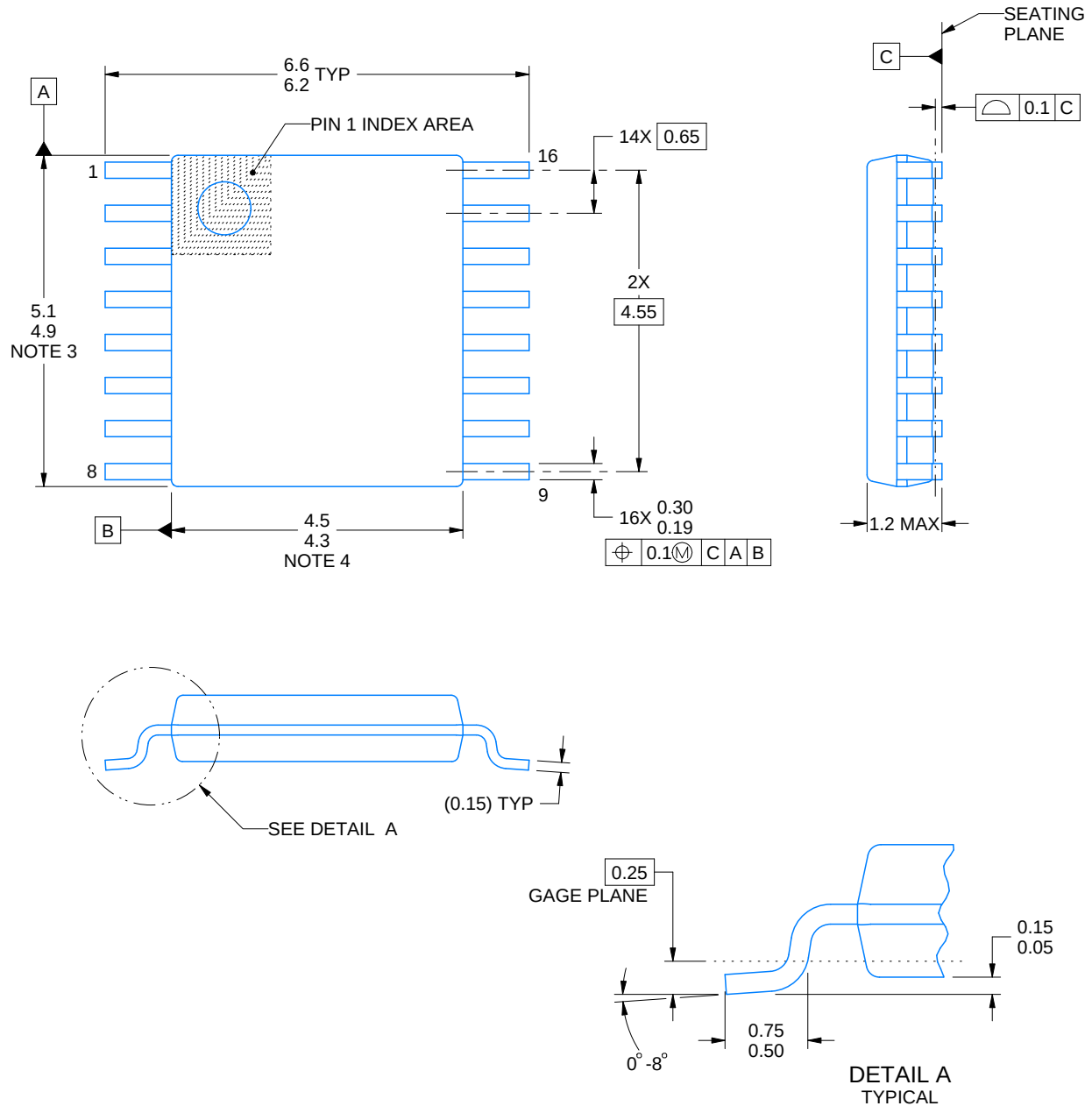
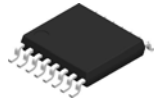
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

## TUBE



\*All dimensions are nominal

| Device           | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| LMH0202MT/NOPB   | PW           | TSSOP        | 16   | 92  | 495    | 8      | 2514.6 | 4.06   |
| LMH0202MT/NOPB.A | PW           | TSSOP        | 16   | 92  | 495    | 8      | 2514.6 | 4.06   |
| LMH0202MT/NOPB.B | PW           | TSSOP        | 16   | 92  | 495    | 8      | 2514.6 | 4.06   |



4220204/A 02/2017

## NOTES:

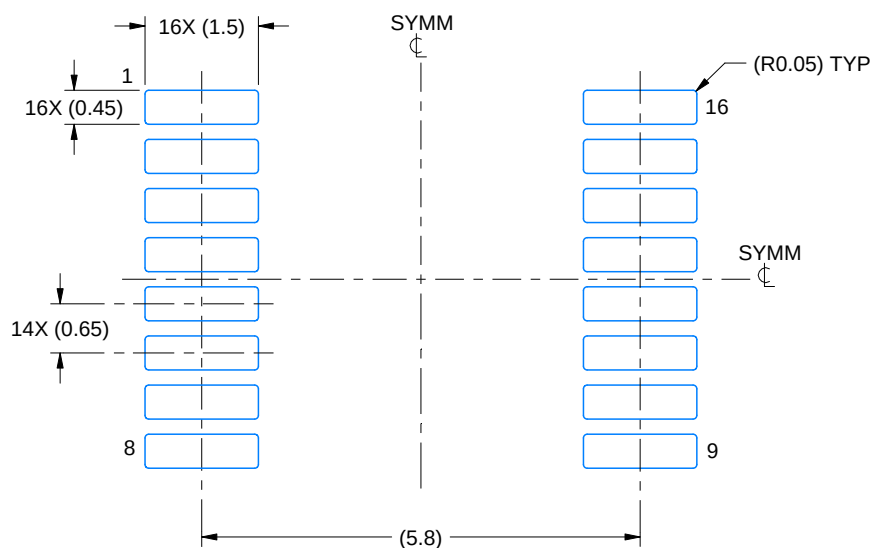
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

# EXAMPLE BOARD LAYOUT

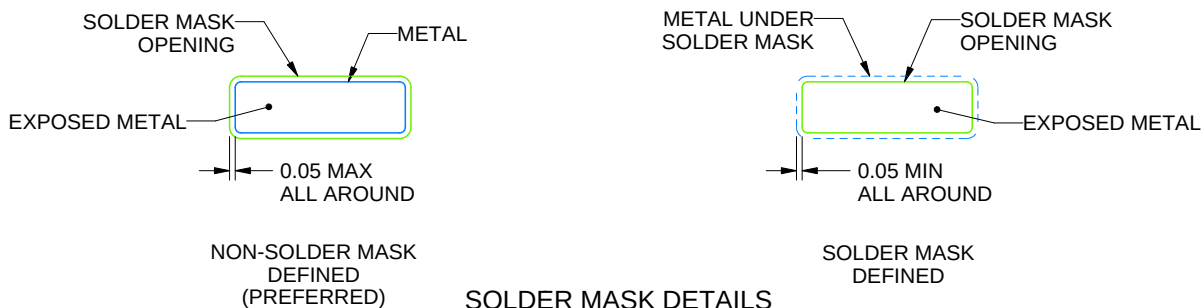
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220204/A 02/2017

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

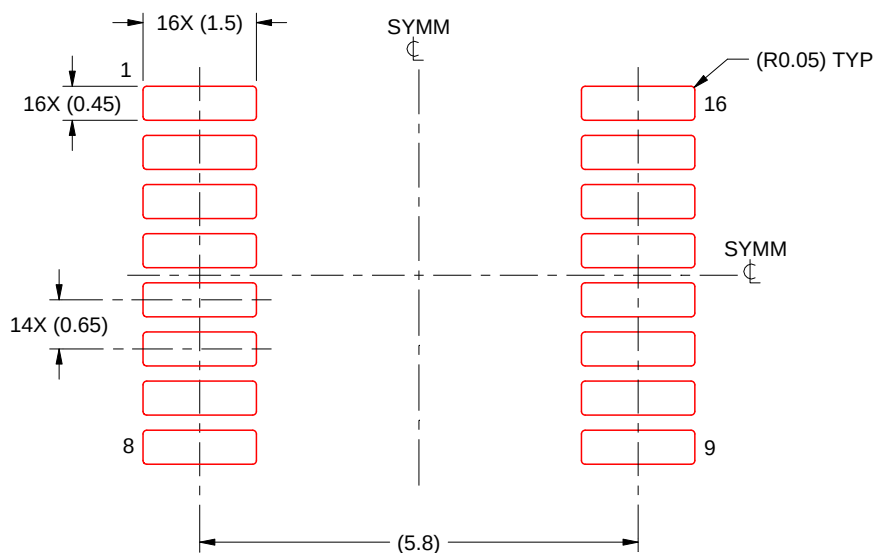
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220204/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2025, Texas Instruments Incorporated