

## SNx5LBC176A 差分总线收发器

## 1 特性

- 专为信号传输速率而设计<sup>1</sup> 高达 30Mbps
- 总线引脚 ESD 保护超过 12kV HBM
- 符合 ANSI 标准 TIA/EIA-485-A 和 ISO 8482:1987(E)
- 低偏斜
- 适用于嘈杂环境中的长距离总线线路上的多点传输
- 超低禁用电源电流要求：700 mA (最大值)
- -7V 至 12V 的共模电压范围
- 热关断保护
- 驱动器正负电流限制
- 开路失效防护接收器设计
- 接收器输入灵敏度：±200mV (最大值)
- 接收器输入迟滞：50mV (典型值)
- 无干扰上电和断电保护
- 可用于 Q 级温度汽车
  - 高可靠性汽车应用
  - 支持配置控制/打印
  - 通过汽车标准认证

## 2 说明

SN65LBC176A、SN65LBC176AQ 和 SN75LBC176A 差分总线收发器是单片集成电路，旨在用于多点总线传

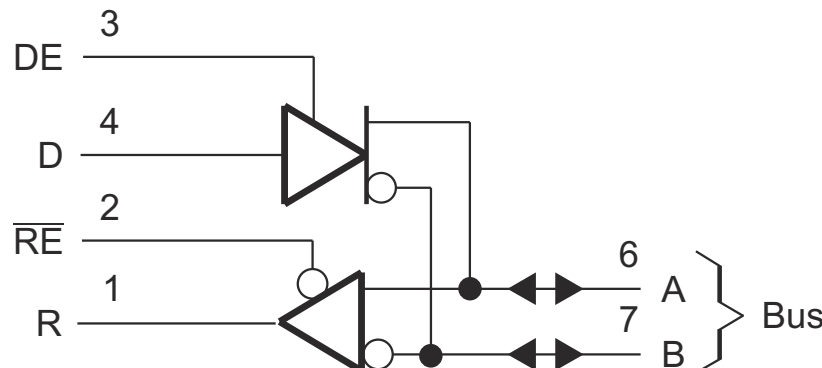
输线路上的双向数据通信。这些器件专为平衡传输线路而设计，符合 ANSI 标准 TIA/EIA-485-A 和 ISO 8482。与前代产品相比，A 版本可提供更高的开关性能，而不会显著降低功耗。

SN65LBC176A、SN65LBC176AQ 和 SN75LBC176A 整合了一个三态差分线路驱动器和一个差分输入线路接收器，两者均采用 5V 单电源供电。驱动器和接收器分别具有高电平有效和低电平有效使能端，它们可以在外部连接在一起以用作方向控制。驱动器差分输出端和接收器差分输入端在内部连接以形成差分输入/输出 (I/O) 总线端口，该端口用于在禁用驱动器或  $V_{CC} = 0$  时为总线提供最小负载。该端口具有较宽的正负共模电压范围，使得该器件适用于合用线应用。可以通过禁用驱动器和接收器来实现超低的器件待机电源电流。

## 封装信息

| 器件型号        | 封装 <sup>(1)</sup> | 封装尺寸 (标称值)       |
|-------------|-------------------|------------------|
| SN65LBC176A | D (SOIC)          | 4.9 mm x 3.91 mm |
| SN75LBC176A | P (PDIP)          | 9.81mm x 6.35mm  |

(1) 要了解所有可用封装，请见数据表末尾的可订购产品附录。



<sup>1</sup> TIA/EIA-485-A 定义规定的信号传输速率将转换时间限制在位持续时间的 30%，使用不同条件（请参阅“典型特性”部分）可以实现更高的信号传输速率。



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## 3 Revision History

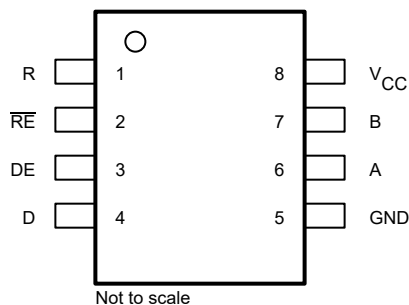
注：以前版本的页码可能与当前版本的页码不同

| <b>Changes from Revision F (January 2023) to Revision G (February 2023)</b> | <b>Page</b> |
|-----------------------------------------------------------------------------|-------------|
| • Changed the <i>Thermal Information</i> table.....                         | <b>5</b>    |

| <b>Changes from Revision E (January 2023) to Revision F (January 2023)</b>     | <b>Page</b> |
|--------------------------------------------------------------------------------|-------------|
| • Changed the SN65LBC176AQ values in the <i>Thermal Information</i> table..... | <b>5</b>    |

| <b>Changes from Revision D (August 200/8) to Revision E (January 2023)</b> | <b>Page</b> |
|----------------------------------------------------------------------------|-------------|
| • 将文档更改为了最新 TI 格式.....                                                     | <b>1</b>    |
| • Added the <i>Thermal Information</i> table.....                          | <b>5</b>    |

## 4 Pin Configuration and Functions



**图 4-1. SN65LBC176AQD (Marked as B176AQ)**  
**SN65LBC176AD (Marked as BL176A)**  
**SN65LBC176AP (Marked as 65LBC176A)**  
**SN75LBC176AD (Marked as LB176A)**  
**SN75LBC176AP (Marked as 75LBC176A)**  
**(Top View)**

**表 4-1. Pin Functions**

| NO | NAME            | TYPE | DESCRIPTION                          |
|----|-----------------|------|--------------------------------------|
| 1  | R               | O    | Receive data output                  |
| 2  | RE              | I    | Receiver enable, active low          |
| 3  | DE              | I    | Driver enable, active high           |
| 4  | D               | I    | Driver data input                    |
| 5  | GND             | GND  | Device ground                        |
| 6  | A               | I/O  | Bus I/O port, A (complementary to B) |
| 7  | B               | I/O  | Bus I/O port, B(complementary to A)  |
| 8  | V <sub>CC</sub> | P    | 5 V Supply Pin                       |

## 5 Specifications

### 5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|                                                      |                                                   | VALUE                        | UNIT |
|------------------------------------------------------|---------------------------------------------------|------------------------------|------|
| Supply voltage, $V_{CC}$ <sup>(2)</sup>              |                                                   | - 0.3 to 6                   | V    |
| Voltage range at any bus terminal (A or B)           |                                                   | - 10 to 15                   | V    |
| Input voltage, $V_I$ (D, DE, R, or $\overline{RE}$ ) |                                                   | - 0.3 to $V_{CC} + 0.5$      | V    |
| Electrostatic discharge:                             | Bus terminals and GND, Class 3, A: <sup>(3)</sup> | 12                           | kV   |
|                                                      | Bus terminals and GND, Class 3, B: <sup>(3)</sup> | 400                          | V    |
|                                                      | All terminals, Class 3, A                         | 3                            | kV   |
|                                                      | All terminals, Class 3, B                         | 400                          | V    |
| Continuous total power dissipation <sup>(4)</sup>    |                                                   | See Dissipation Rating Table |      |
| Storage temperature range, $T_{stg}$                 |                                                   | - 65 to 150                  | °C   |

- (1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) All voltage values, except differential I/O bus voltage, are with respect to network ground terminal.
- (3) The maximum operating junction temperature is internally limited. Use the dissipation rating table to operate below this temperature.
- (4) Tested in accordance with MIL-STD-883C, Method 3015.7

### 5.2 Dissipation Ratings

| PACKAGE | $T_A \leq 25^\circ\text{C}$<br>POWER RATING | DERATING FACTOR <sup>(1)</sup><br>ABOVE $T_A = 25^\circ\text{C}$ | $T_A = 70^\circ\text{C}$<br>POWER RATING | $T_A = 85^\circ\text{C}$<br>POWER RATING | $T_A = 125^\circ\text{C}$<br>POWER RATING |
|---------|---------------------------------------------|------------------------------------------------------------------|------------------------------------------|------------------------------------------|-------------------------------------------|
| D       | 725 mW                                      | 5.5 mW/°C                                                        | 464 mW                                   | 377 mW                                   | 145 mW                                    |
| P       | 1000 mW                                     | 8.0 mW/°C                                                        | 640 mW                                   | 520 mW                                   | —                                         |

- (1) This is the inverse of the junction-to-ambient thermal resistance when board-mounted and with no air flow.

### 5.3 Recommended Operating Conditions

|                   |                                                         |                            | MIN                 | NOM | MAX      | UNIT |
|-------------------|---------------------------------------------------------|----------------------------|---------------------|-----|----------|------|
| $V_{CC}$          | Supply voltage                                          |                            | 4.75                | 5   | 5.25     | V    |
| $V_I$ or $V_{IC}$ | Voltage at any bus terminal (separately or common mode) |                            | - 7                 |     | 12       | V    |
| $V_{IH}$          | High-level input voltage                                | D, DE, and $\overline{RE}$ | 2                   |     | $V_{CC}$ | V    |
| $V_{IL}$          | Low-level input voltage                                 | D, DE, and $\overline{RE}$ | 0                   |     | 0.8      | V    |
| $V_{ID}$          | Differential input voltage <sup>(2)</sup>               |                            | - 12 <sup>(1)</sup> |     | 12       | V    |
| $I_{OH}$          | High-level output current                               | Driver                     | - 60                |     |          | mA   |
|                   |                                                         | Receiver                   | - 8                 |     |          |      |
| $I_{OL}$          | Low-level output current                                | Driver                     |                     |     | 60       | mA   |
|                   |                                                         | Receiver                   |                     |     | 8        |      |
| $T_A$             | Operating free-air temperature                          | SN65LBC176AQ               | - 40                |     | 125      | °C   |
|                   |                                                         | SN65LBC176A                | - 40                |     | 85       |      |
|                   |                                                         | SN75LBC176A                | 0                   |     | 70       |      |

- (1) The algebraic convention, in which the least positive (most negative) limit is designated as minimum, is used in this data sheet.
- (2) Differential input/output bus voltage is measured at the noninverting terminal A with respect to the inverting terminal B.

## 5.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> |                                              | All Devices in 'P' Package | SN65LBC176ADR<br>SN65LBC176AQDR | OPNs Not Listed in Previous Column | UNIT |
|-------------------------------|----------------------------------------------|----------------------------|---------------------------------|------------------------------------|------|
|                               |                                              | P (PDIP)                   | D (SOIC)                        | D (SOIC)                           |      |
|                               |                                              | 8-Pins                     | 8-Pins                          | 8-Pins                             |      |
| $R_{\theta JA}$               | Junction-to-ambient thermal resistance       | 65.7                       | 116.7                           | 110                                | °C/W |
| $R_{\theta JC}$               | Junction-to-case thermal resistance          | 54.7                       | 56.3                            | 44.1                               | °C/W |
| $R_{\theta JB}$               | Junction-to-board thermal resistance         | 42.1                       | 63.4                            | 53.5                               | °C/W |
| $\psi_{JT}$                   | Junction-to-top characterization parameter   | 23                         | 8.8                             | 4.8                                | °C/W |
| $\psi_{JB}$                   | Junction-to-board characterization parameter | 41.7                       | 62.9                            | 52.7                               | °C/W |

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC package thermal metrics](#) application report.

## 5.5 Driver Electrical Characteristics

over recommended operating conditions (unless otherwise noted)

| PARAMETER             |                                                    | TEST CONDITIONS                                 |                                       | MIN   | TYP <sup>(1)</sup> | MAX | UNIT |
|-----------------------|----------------------------------------------------|-------------------------------------------------|---------------------------------------|-------|--------------------|-----|------|
| V <sub>IK</sub>       | Input clamp voltage                                | I <sub>I</sub> = - 18 mA                        |                                       | - 1.5 | - 0.8              |     | V    |
| V <sub>OD</sub>       | Differential output voltage                        | I <sub>O</sub> = 0                              | SN65LBC176AQ                          | 1.5   | 4                  | 6   | V    |
|                       |                                                    |                                                 | SN65LBC176A, SN75LBC176A              | 4     |                    |     |      |
|                       |                                                    | R <sub>L</sub> = 54 Ω, See 图 6-1                | SN65LBC176AQ                          | 0.9   | 1.5                | 6   | V    |
|                       |                                                    |                                                 | SN65LBC176A                           | 1     | 1.5                | 3   |      |
|                       |                                                    |                                                 | SN75LBC176A                           | 1.1   | 1.5                | 3   |      |
|                       |                                                    | V <sub>test</sub> = - 7 to 12 V, See 图 6-2      | SN65LBC176AQ                          | 0.9   | 1.5                | 6   | V    |
|                       |                                                    |                                                 | SN65LBC176A                           | 1     | 1.5                | 3   |      |
|                       |                                                    |                                                 | SN75LBC176A                           | 1.1   | 1.5                | 3   |      |
| Δ  V <sub>OD</sub>    | Change in magnitude of differential output voltage | See 图 6-1 and 图 6-2                             |                                       |       | - 0.2              | 0.2 | V    |
| V <sub>OC(ss)</sub>   | Steady-state common-mode output voltage            | See 图 6-1                                       | SN65LBC176AQ                          | 1.8   | 2.4                | 3   | V    |
|                       | SN65LBC176A, SN75LBC176A                           |                                                 | 1.8                                   | 2.4   | 2.8                |     |      |
| Δ V <sub>OC(ss)</sub> | Change in steady-state common-mode output voltage  |                                                 | SN65LBC176AQ                          | - 0.2 |                    | 0.2 | V    |
|                       |                                                    |                                                 | SN65LBC176A, SN75LBC176A              | - 0.1 |                    | 0.1 |      |
| I <sub>OZ</sub>       | High-impedance output current                      | See receiver input currents                     |                                       |       |                    |     |      |
| I <sub>IH</sub>       | High-level enable input current                    | V <sub>I</sub> = 2 V                            |                                       |       | - 100              |     | μ A  |
| I <sub>IL</sub>       | Low-level enable input current                     | V <sub>I</sub> = 0.8 V                          |                                       |       | - 100              |     | μ A  |
| I <sub>OS</sub>       | Short-circuit output current                       | - 7 V ≤ V <sub>O</sub> ≤ 12 V                   |                                       |       | - 250              | 250 | mA   |
| I <sub>CC</sub>       | Supply current                                     | V <sub>I</sub> = 0 or V <sub>CC</sub> , No load | Receiver disabled and driver enabled  | 5     |                    | 9   | mA   |
|                       |                                                    |                                                 | Receiver disabled and driver disabled | 0.4   |                    | 0.7 |      |
|                       |                                                    |                                                 | Receiver enabled and driver enabled   | 8.5   |                    | 15  |      |

- (1) All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

## 5.6 Driver Switching Characteristics

over recommended operating conditions (unless otherwise noted)

| PARAMETER                                                             | TEST CONDITIONS                                             | SN65LBC176AQ |                    |     | SN65LBC176A<br>SN75LBC176A |                    |     | UNIT |
|-----------------------------------------------------------------------|-------------------------------------------------------------|--------------|--------------------|-----|----------------------------|--------------------|-----|------|
|                                                                       |                                                             | MIN          | TYP <sup>(1)</sup> | MAX | MIN                        | TYP <sup>(1)</sup> | MAX |      |
| $t_{PLH}$ Propagation delay time, low-to-high-level output            | $R_L = 54 \Omega$ ,<br>$C_L = 50 \text{ pF}$ ,<br>See 图 6-3 | 2            |                    | 12  | 2                          | 6                  | 12  | ns   |
| $t_{PHL}$ Propagation delay time, high-to-low-level output            |                                                             | 2            |                    | 12  | 2                          | 6                  | 12  | ns   |
| $t_{sk(p)}$ Pulse skew ( $ t_{PLH} - t_{PHL} $ )                      |                                                             |              |                    | 2   |                            | 0.3                | 1   | ns   |
| $t_r$ Differential output signal rise time                            |                                                             | 1.2          |                    | 11  | 4                          | 7.5                | 11  | ns   |
| $t_f$ Differential output signal fall time                            |                                                             | 1.2          |                    | 11  | 4                          | 7.5                | 11  | ns   |
| $t_{PZH}$ Propagation delay time, high-impedance-to-high-level output | $R_L = 110 \Omega$ ,<br>See 图 6-4                           |              |                    | 22  |                            | 12                 | 22  | ns   |
| $t_{PZL}$ Propagation delay time, high-impedance-to-low-level output  | $R_L = 110 \Omega$ ,<br>See 图 6-5                           |              |                    | 25  |                            | 12                 | 22  | ns   |
| $t_{PHZ}$ Propagation delay time, high-level-to-high-impedance output | $R_L = 110 \Omega$ ,<br>See 图 6-4                           |              |                    | 22  |                            | 12                 | 22  | ns   |
| $t_{PLZ}$ Propagation delay time, low-level-to-high-impedance output  | $R_L = 110 \Omega$ ,<br>See 图 6-5                           |              |                    | 22  |                            | 12                 | 22  | ns   |

(1) All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

## 5.7 Receiver Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

| PARAMETER        |                                                             | TEST CONDITIONS                                     |                                       |                          | MIN   | TYP <sup>(1)</sup> | MAX | UNIT |
|------------------|-------------------------------------------------------------|-----------------------------------------------------|---------------------------------------|--------------------------|-------|--------------------|-----|------|
| V <sub>IT+</sub> | Positive-going input threshold voltage                      | I <sub>O</sub> = − 8 mA                             |                                       |                          |       |                    | 0.2 | V    |
| V <sub>IT−</sub> | Negative-going input threshold voltage                      | I <sub>O</sub> = 8 mA                               |                                       |                          | − 0.2 |                    |     | V    |
| V <sub>hys</sub> | Hysteresis voltage (V <sub>IT+</sub> + - V <sub>IT−</sub> ) |                                                     |                                       |                          | 50    |                    |     | mV   |
| V <sub>IK</sub>  | Enable-input clamp voltage                                  | I <sub>I</sub> = − 18 mA                            |                                       |                          | − 1.5 | − 0.8              |     | V    |
| V <sub>OH</sub>  | High-level output voltage                                   | V <sub>ID</sub> = 200 mV, I <sub>OH</sub> = − 8 mA, | See 图 6-6                             |                          | 4     | 4.9                |     | V    |
| V <sub>OL</sub>  | Low-level output voltage                                    | V <sub>ID</sub> = − 200 mV, I <sub>OH</sub> = 8 mA, | See 图 6-6                             |                          |       | 0.1                | 0.8 | V    |
| I <sub>OZ</sub>  | High-impedance-state output current                         | V <sub>O</sub> = 0 to V <sub>CC</sub>               |                                       | SN65LBC176AQ             | − 10  |                    | 10  | μ A  |
|                  |                                                             |                                                     |                                       | SN65LBC176A, SN75LBC176A | − 1   |                    | 1   |      |
| I <sub>I</sub>   | Bus input current                                           | V <sub>IH</sub> = 12 V, V <sub>CC</sub> = 5 V       | Other input at 0 V                    |                          |       | 0.4                | 1   | mA   |
|                  |                                                             | V <sub>IH</sub> = 12 V, V <sub>CC</sub> = 0         |                                       |                          |       | 0.5                | 1   |      |
|                  |                                                             | V <sub>IH</sub> = − 7 V, V <sub>CC</sub> = 5 V      |                                       |                          | − 0.8 | − 0.4              |     |      |
|                  |                                                             | V <sub>IH</sub> = − 7 V, V <sub>CC</sub> = 0        |                                       |                          | − 0.8 | − 0.3              |     |      |
| I <sub>IH</sub>  | High-level enable-input current                             | V <sub>IH</sub> = 2 V                               |                                       |                          | − 100 |                    |     | μ A  |
| I <sub>IL</sub>  | Low-level enable-input current                              | V <sub>IL</sub> = 0.8 V                             |                                       |                          | − 100 |                    |     | μ A  |
| I <sub>CC</sub>  | Supply current                                              | V <sub>I</sub> = 0 or V <sub>CC</sub> .<br>No load  | Receiver enabled and driver disabled  |                          | 4     |                    | 7   | mA   |
|                  |                                                             |                                                     | Receiver disabled and driver disabled |                          | 0.4   |                    | 0.7 |      |
|                  |                                                             |                                                     | Receiver enabled and driver enabled   |                          | 8.5   |                    | 15  |      |

(1) All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

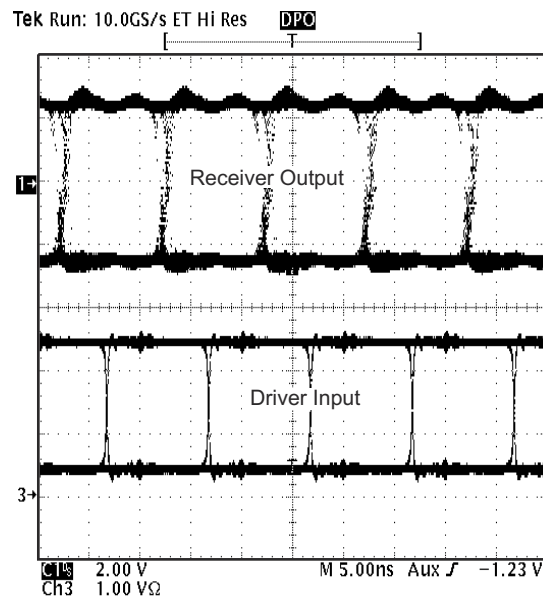
## 5.8 Receiver Switching Characteristics

over recommended operating conditions (unless otherwise noted)

| PARAMETER                                                                 | TEST CONDITIONS                                 | SN65LBC176AQ |                    |     | SN65LBC176A<br>SN75LBC176A |                    |     | UNIT |
|---------------------------------------------------------------------------|-------------------------------------------------|--------------|--------------------|-----|----------------------------|--------------------|-----|------|
|                                                                           |                                                 | MIN          | TYP <sup>(1)</sup> | MAX | MIN                        | TYP <sup>(1)</sup> | MAX |      |
| t <sub>PLH</sub> Propagation delay time output ↑                          | V <sub>ID</sub> = -1.5 V to 1.5 V,<br>See 图 6-7 | 7            |                    | 30  | 7                          | 13                 | 20  | ns   |
| t <sub>PHL</sub> Propagation delay time output ↓                          |                                                 | 7            |                    | 30  | 7                          | 13                 | 20  | ns   |
| t <sub>sk(p)</sub> Pulse skew (   t <sub>PLH</sub> - t <sub>PHL</sub>   ) |                                                 |              |                    | 6   |                            | 0.5                | 1.5 | ns   |
| t <sub>r</sub> Rise time, output                                          | See 图 6-7                                       |              |                    | 5   |                            | 2.1                | 3.3 | ns   |
| t <sub>f</sub> Fall time, output                                          |                                                 |              |                    | 5   |                            | 2.1                | 3.3 | ns   |
| t <sub>PZH</sub> Output enable time to high level                         | C <sub>L</sub> = 10 pF, See 图 6-8               |              |                    | 50  |                            | 30                 | 45  | ns   |
| t <sub>PZL</sub> Output enable time to low level                          |                                                 |              |                    | 50  |                            | 30                 | 45  | ns   |
| t <sub>PHZ</sub> Output disable time to high level                        |                                                 |              |                    | 60  |                            | 20                 | 40  | ns   |
| t <sub>PLZ</sub> Output disable time to low level                         |                                                 |              |                    | 60  |                            | 20                 | 40  | ns   |

(1) All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

## Typical Characteristics



**图 5-1. Typical Waveform of Non-Return-To-Zero (NRZ), Pseudorandom Binary Sequence (PRBS) Data at 100 Mbps Through 15m, of CAT 5 Unshielded Twisted Pair (UTP) Cable**

TIA/EIA-485-A defines a maximum signaling rate as that in which the transition time of the voltage transition of a logic-state change remains less than or equal to 30% of the bit length. Transition times of greater length perform quite well even though they do not meet the standard definition.

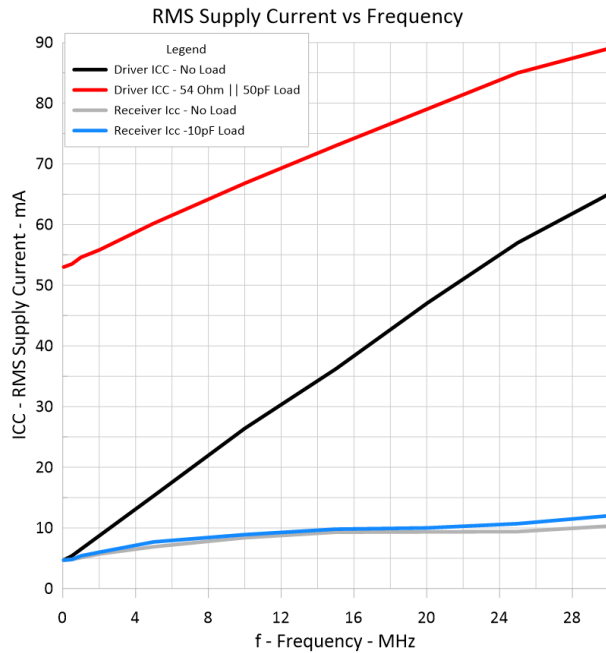


图 5-2. RMS Supply Current vs Frequency

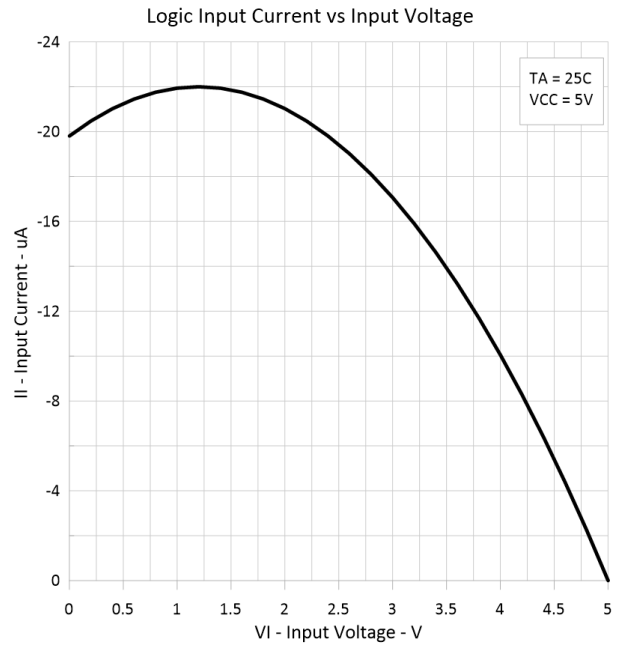


图 5-3. Logic Input Current vs Input Voltage

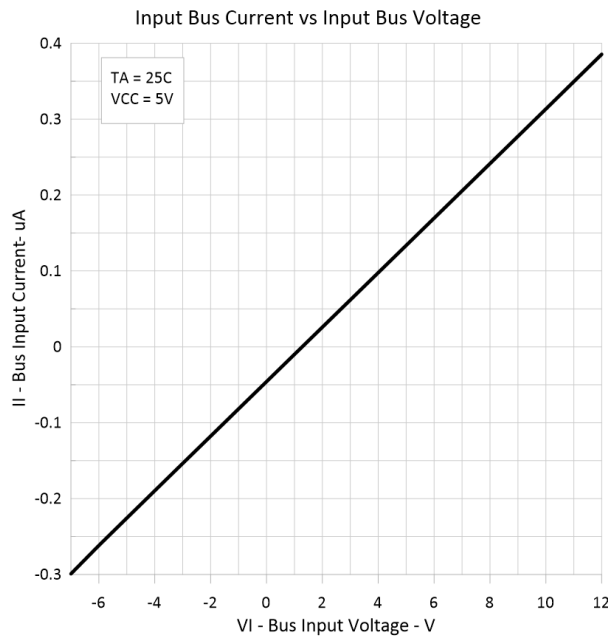


图 5-4. Input Current vs Input Voltage

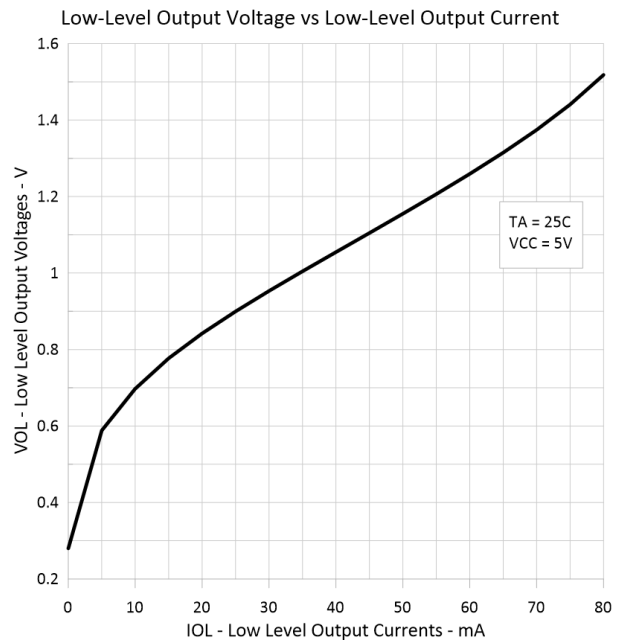


图 5-5. Low-Level Output Voltage vs Low-Level Output Current

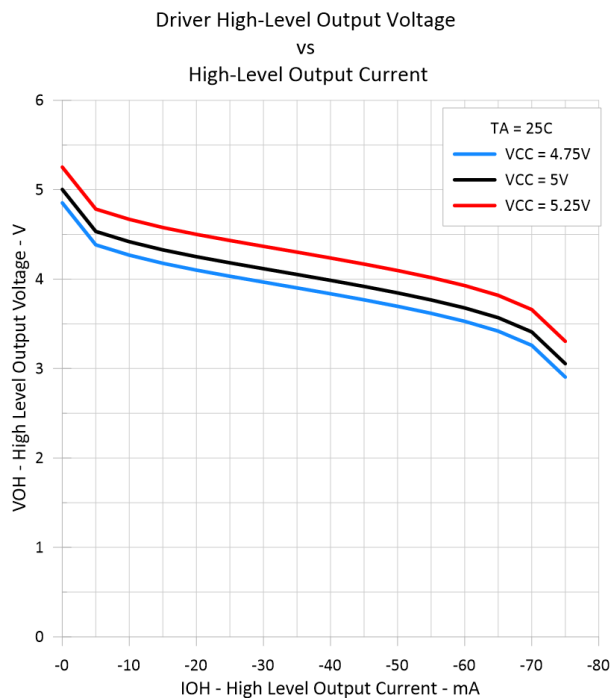


图 5-6. Driver High-Level Output Voltage vs High-Level Output Current

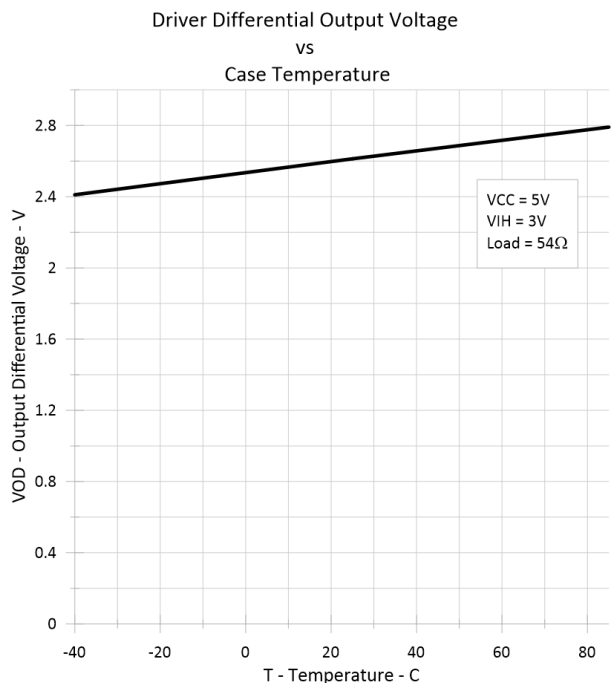


图 5-7. Driver Differential Output Voltage vs Case Temperature

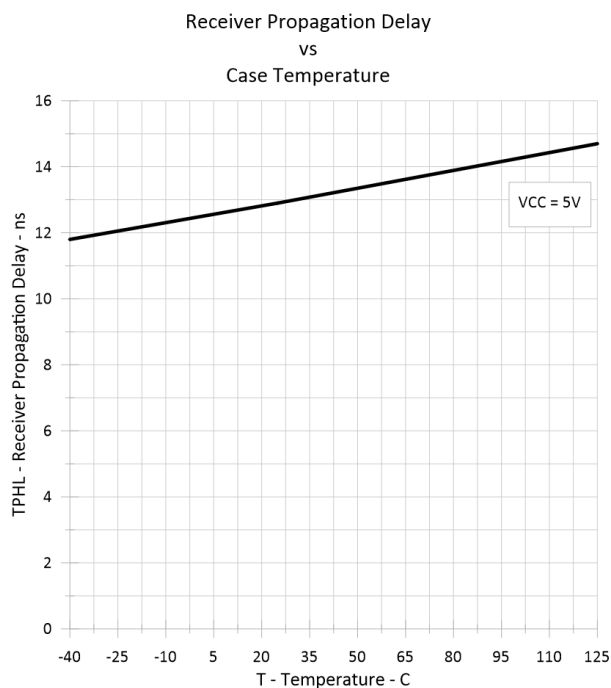


图 5-8. Receiver Propagation Time vs Case Temperature

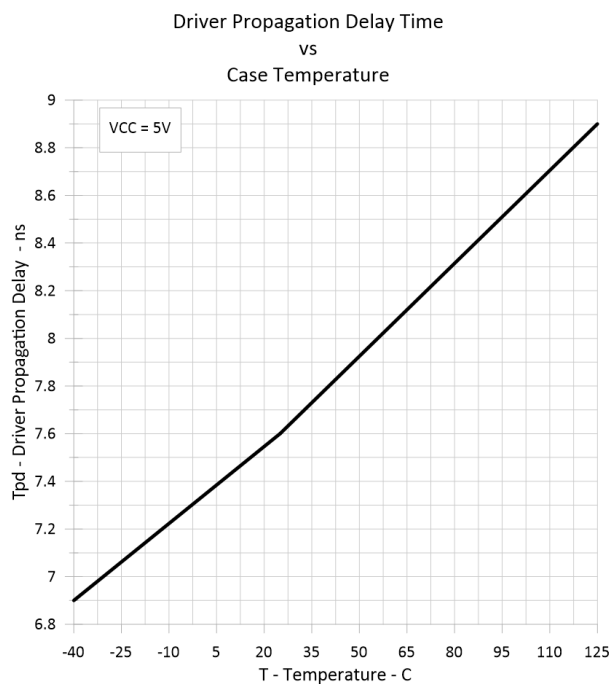


图 5-9. Driver Propagation Delay Time vs Case Temperature

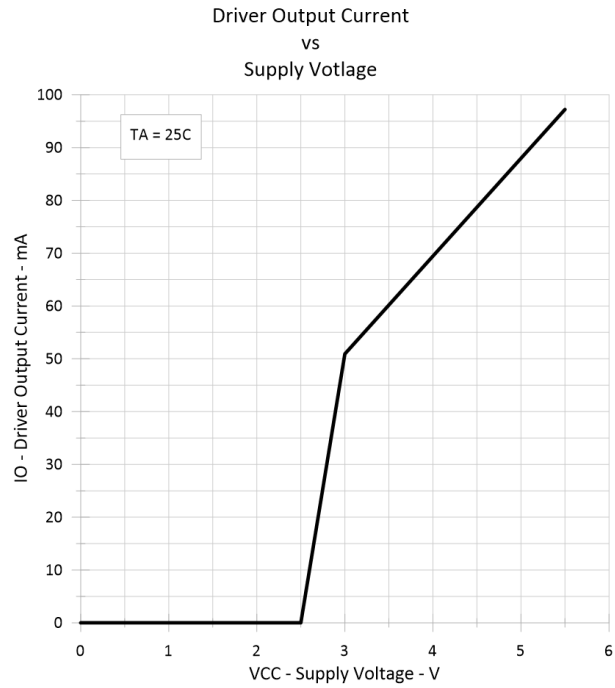


图 5-10. Driver Output Current vs Supply Voltage

## 参数测量信息

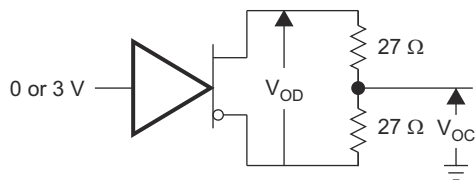


图 6-1. 驱动器  $V_{OD}$  和  $V_{OC}$

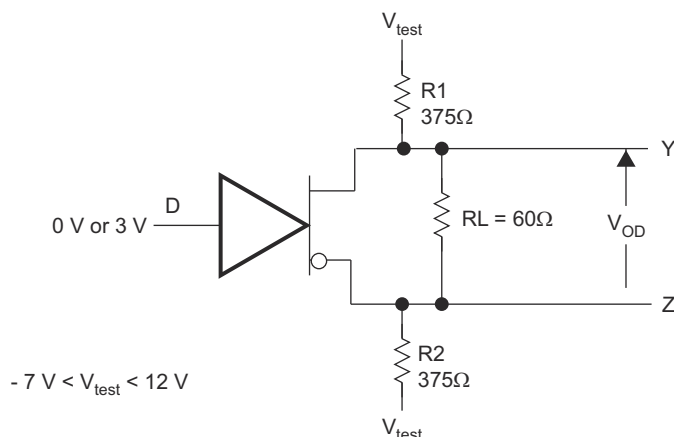
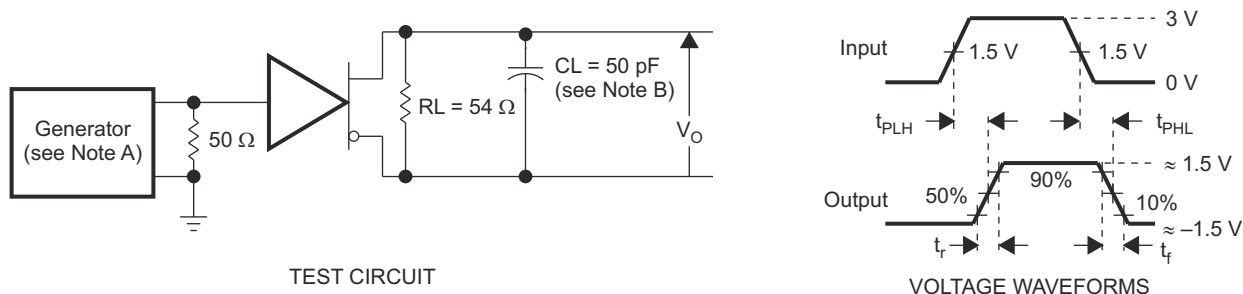
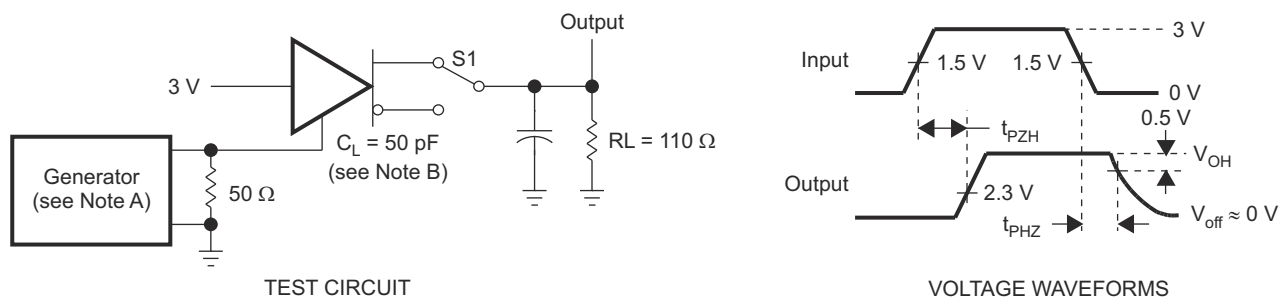


图 6-2. 驱动器  $V_{OD3}$



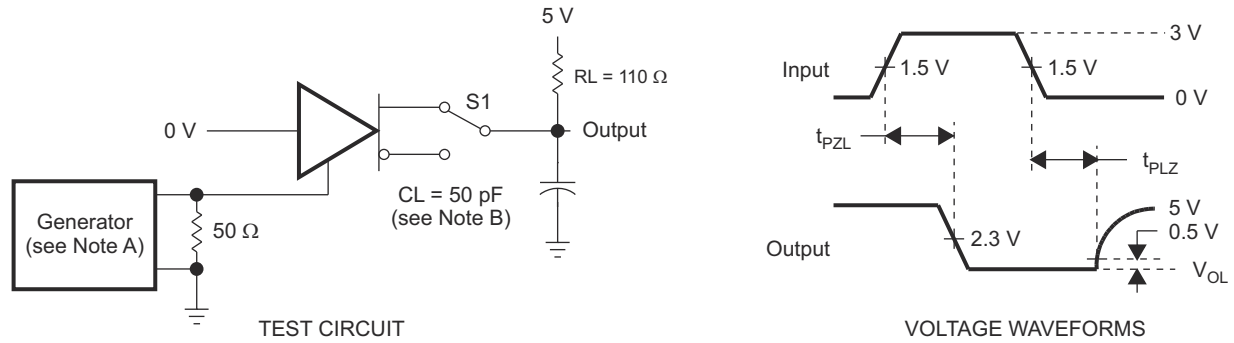
- A. 输入脉冲由具有以下特性的发生器提供：PRR  $\leq 1\text{MHz}$ ，50% 占空比， $t_r \leq 6\text{ns}$ ， $t_f \leq 6\text{ns}$ ， $Z_O = 50\Omega$ 。  
B.  $C_L$  包括探头和夹具电容。

图 6-3. 驱动器测试电路和电压波形



- A. 输入脉冲由具有以下特性的发生器提供：PRR  $\leq 1\text{MHz}$ ，50% 占空比， $t_r \leq 6\text{ns}$ ， $t_f \leq 6\text{ns}$ ， $Z_O = 50\Omega$ 。  
B.  $C_L$  包括探头和夹具电容。

图 6-4. 驱动器测试电路和电压波形



- A. 输入脉冲由具有以下特性的发生器提供：PRR  $\leq 1\text{MHz}$ ，50% 占空比， $t_r \leq 6\text{ns}$ ， $t_f \leq 6\text{ns}$ ， $Z_O = 50\Omega$ 。  
B.  $C_L$  包括探头和夹具电容。

图 6-5. 驱动器测试电路和电压波形

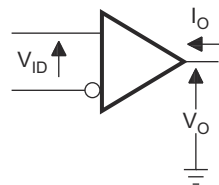
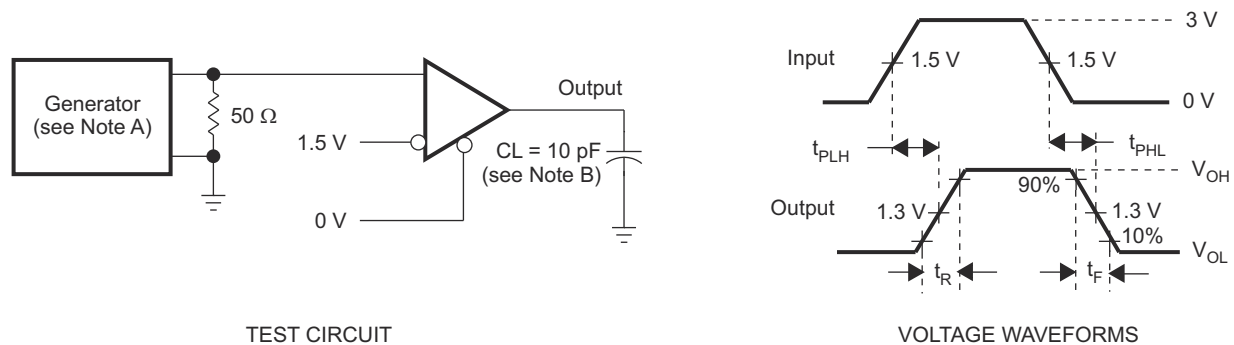
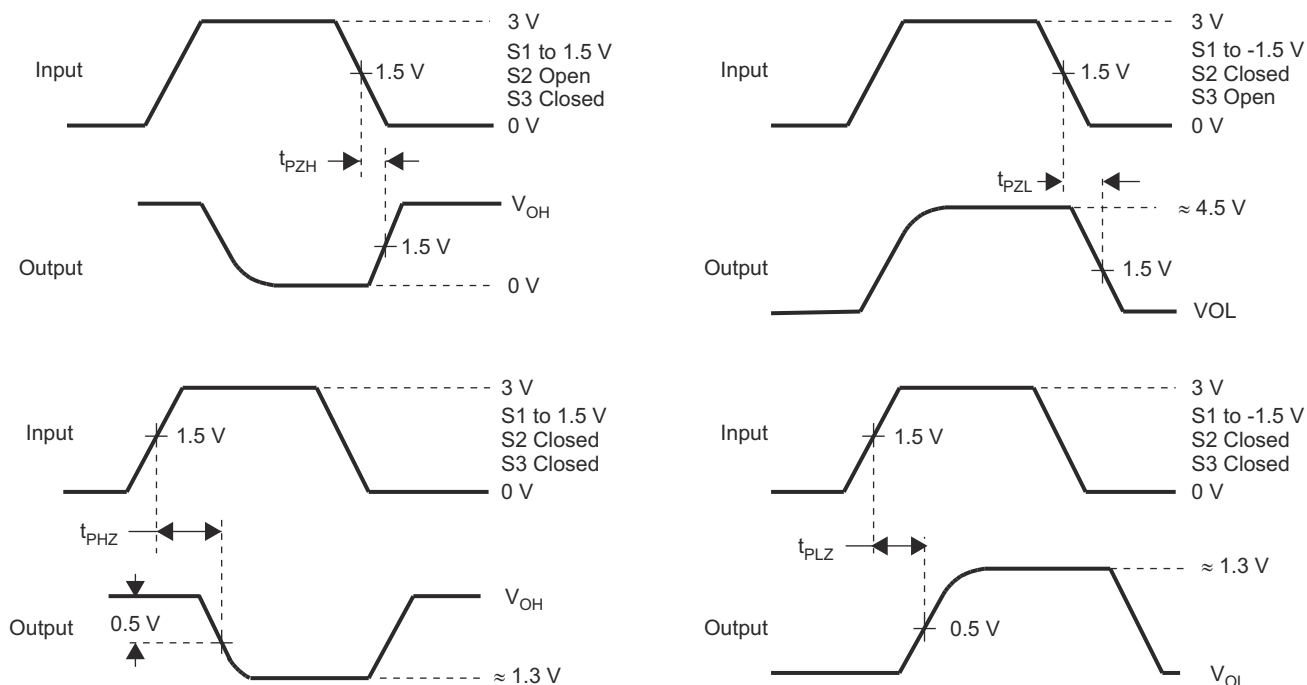
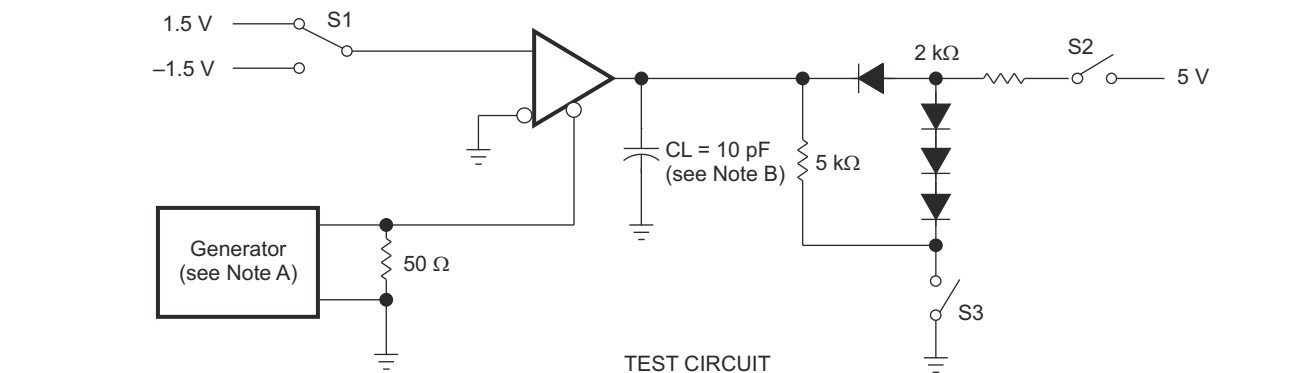


图 6-6. 接收器  $V_{OH}$  和  $V_{OL}$



- A. 输入脉冲由具有以下特性的发生器提供：PRR  $\leq 1\text{MHz}$ ，50% 占空比， $t_r \leq 6\text{ns}$ ， $t_f \leq 6\text{ns}$ ， $Z_O = 50\Omega$ 。  
B.  $C_L$  包括探头和夹具电容。

图 6-7. 接收器测试电路和电压波形



A. 输入脉冲由具有以下特性的发生器提供：PRR ≤ 1MHz，50% 占空比， $t_r \leq 6\text{ns}$ ， $t_f \leq 6\text{ns}$ ， $Z_O = 50\Omega$ 。

B.  $C_L$  包括探头和夹具电容。

图 6-8. 接收器测试电路和电压波形

## 6 Detailed Description

### 6.1 Device Functional Modes

#### 6.1.1 Function Tables

| DRIVER     |              |         |   |
|------------|--------------|---------|---|
| INPUT<br>D | ENABLE<br>DE | OUTPUTS |   |
|            |              | A       | B |
| H          | H            | H       | L |
| L          | H            | L       | H |
| X          | L            | Z       | Z |
| Open       | H            | H       | L |

| RECEIVER                                  |  |                             |                            |
|-------------------------------------------|--|-----------------------------|----------------------------|
| DIFFERENTIAL INPUTS<br>$V_A - V_B$        |  | ENABLE <sup>(1)</sup><br>RE | OUTPUT <sup>(1)</sup><br>R |
| $V_{ID} \geq 0.2 \text{ V}$               |  | L                           | H                          |
| $-0.2 \text{ V} < V_{ID} < 0.2 \text{ V}$ |  | L                           | ?                          |
| $V_{ID} \leq -0.2 \text{ V}$              |  | L                           | L                          |
| X                                         |  | H                           | Z                          |
| Open                                      |  | L                           | H                          |

(1) H = high level, L = low level, ? = indeterminate,  
X = Irrelevant, Z = high impedance (off)

#### 6.1.2 Schematics

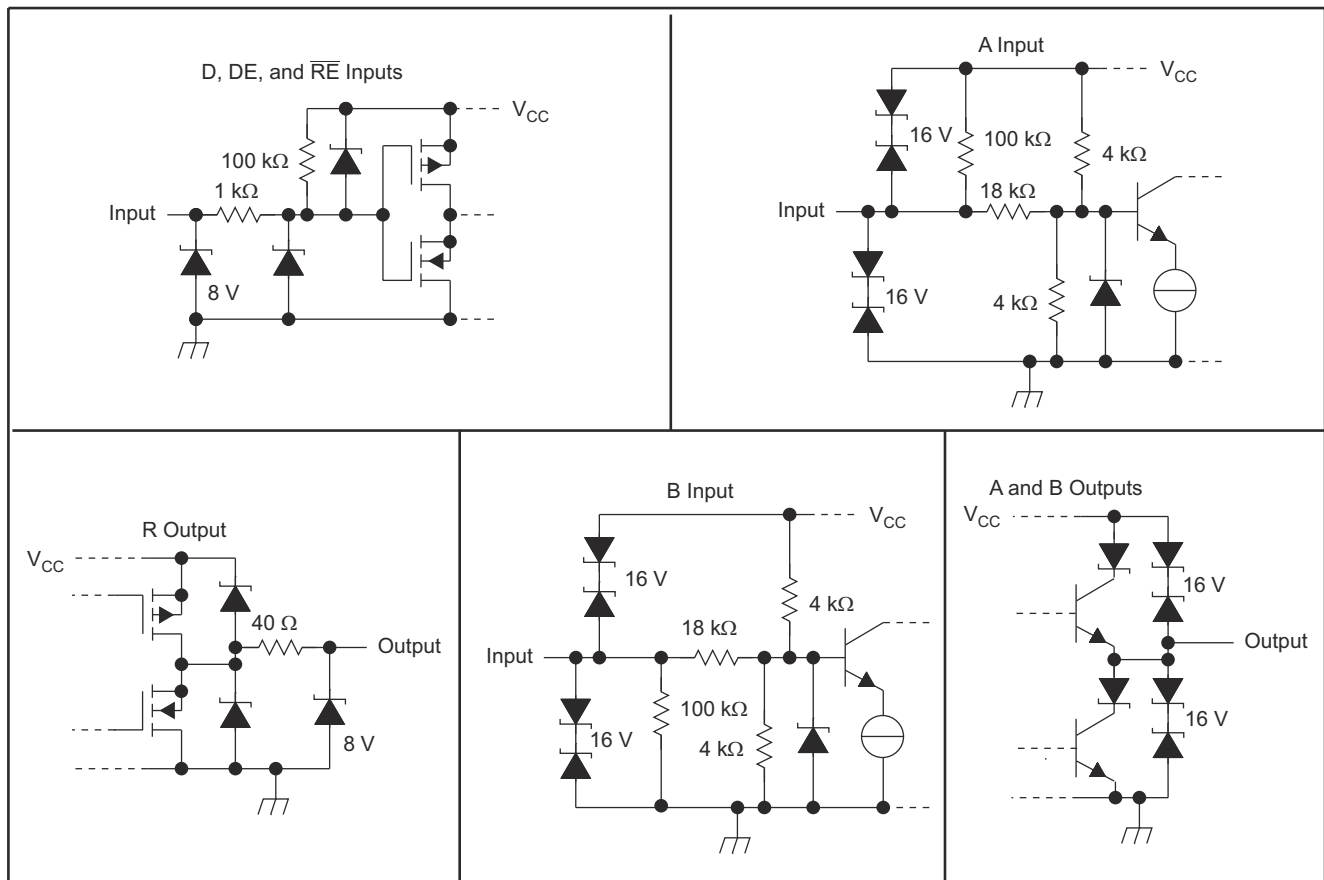


图 6-1. Schematics of Inputs and Outputs

## 7 Device and Documentation Support

### 7.1 接收文档更新通知

要接收文档更新通知，请导航至 [ti.com](http://ti.com) 上的器件产品文件夹。点击 [订阅更新](#) 进行注册，即可每周接收产品信息更改摘要。有关更改的详细信息，请查看任何已修订文档中包含的修订历史记录。

### 7.2 支持资源

[TI E2E™ 支持论坛](#) 是工程师的重要参考资料，可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者“按原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的《[使用条款](#)》。

### 7.3 商标

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### 7.4 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

### 7.5 术语表

[TI 术语表](#) 本术语表列出并解释了术语、首字母缩略词和定义。

## 8 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

## 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="#">SN65LBC176AD</a>     | Obsolete      | Production           | SOIC (D)   8   | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | BL176A              |
| <a href="#">SN65LBC176ADR</a>    | Active        | Production           | SOIC (D)   8   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | BL176A              |
| SN65LBC176ADR.A                  | Active        | Production           | SOIC (D)   8   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | BL176A              |
| SN65LBC176ADRG4                  | Active        | Production           | SOIC (D)   8   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | BL176A              |
| SN65LBC176ADRG4.A                | Active        | Production           | SOIC (D)   8   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | BL176A              |
| <a href="#">SN65LBC176AP</a>     | Active        | Production           | PDIP (P)   8   | 50   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | 65LBC176A           |
| SN65LBC176AP.A                   | Active        | Production           | PDIP (P)   8   | 50   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | 65LBC176A           |
| <a href="#">SN65LBC176AQD</a>    | Obsolete      | Production           | SOIC (D)   8   | -                     | -           | Call TI                              | Call TI                           | -40 to 125   | B176AQ              |
| <a href="#">SN65LBC176AQDG4</a>  | Obsolete      | Production           | SOIC (D)   8   | -                     | -           | Call TI                              | Call TI                           | -40 to 125   | B176AQ              |
| <a href="#">SN65LBC176AQDR</a>   | Active        | Production           | SOIC (D)   8   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | B176AQ              |
| SN65LBC176AQDR.A                 | Active        | Production           | SOIC (D)   8   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | B176AQ              |
| <a href="#">SN65LBC176AQDRG4</a> | Obsolete      | Production           | SOIC (D)   8   | -                     | -           | Call TI                              | Call TI                           | -40 to 125   | B176AQ              |
| <a href="#">SN75LBC176AP</a>     | Active        | Production           | PDIP (P)   8   | 50   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | 75LBC176A           |
| SN75LBC176AP.A                   | Active        | Production           | PDIP (P)   8   | 50   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | 0 to 70      | 75LBC176A           |

<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.

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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.

**OTHER QUALIFIED VERSIONS OF SN65LBC176A :**

- Enhanced Product : [SN65LBC176A-EP](#)

NOTE: Qualified Version Definitions:

- Enhanced Product - Supports Defense, Aerospace and Medical Applications

## TAPE AND REEL INFORMATION



\*All dimensions are nominal

| Device          | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN65LBC176ADR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| SN65LBC176ADRG4 | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

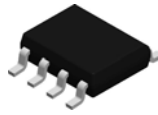
| Device          | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN65LBC176ADR   | SOIC         | D               | 8    | 2500 | 340.5       | 336.1      | 25.0        |
| SN65LBC176ADRG4 | SOIC         | D               | 8    | 2500 | 353.0       | 353.0      | 32.0        |

## TUBE



\*All dimensions are nominal

| Device         | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN65LBC176AP   | P            | PDIP         | 8    | 50  | 506    | 13.97  | 11230  | 4.32   |
| SN65LBC176AP.A | P            | PDIP         | 8    | 50  | 506    | 13.97  | 11230  | 4.32   |
| SN75LBC176AP   | P            | PDIP         | 8    | 50  | 506    | 13.97  | 11230  | 4.32   |
| SN75LBC176AP.A | P            | PDIP         | 8    | 50  | 506    | 13.97  | 11230  | 4.32   |

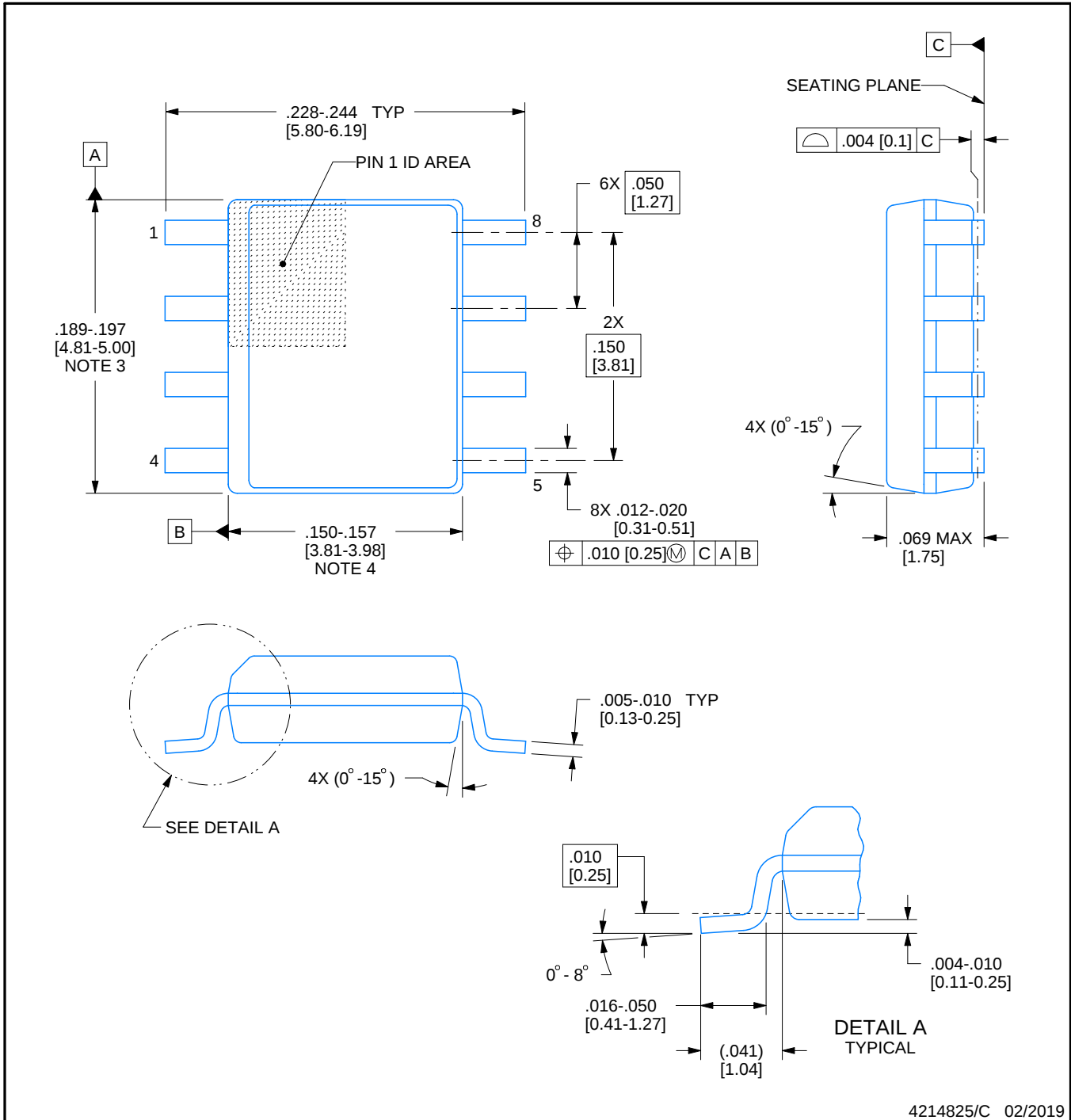


**D0008A**

# PACKAGE OUTLINE

**SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4214825/C 02/2019

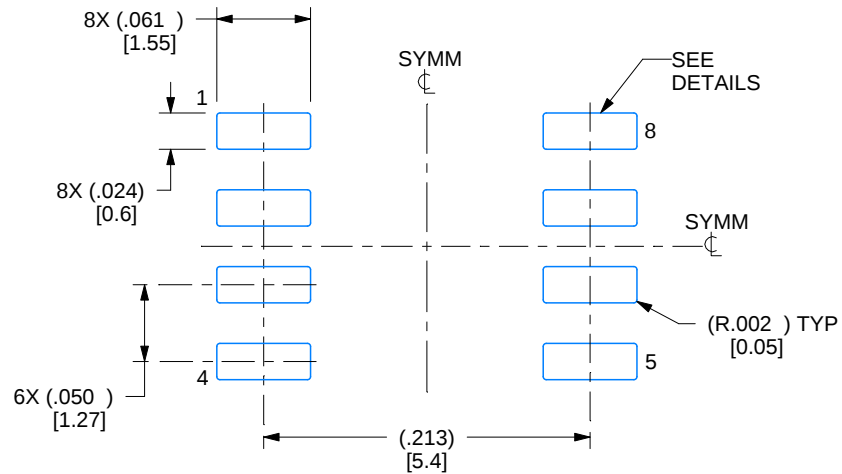
## NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. 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 .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.

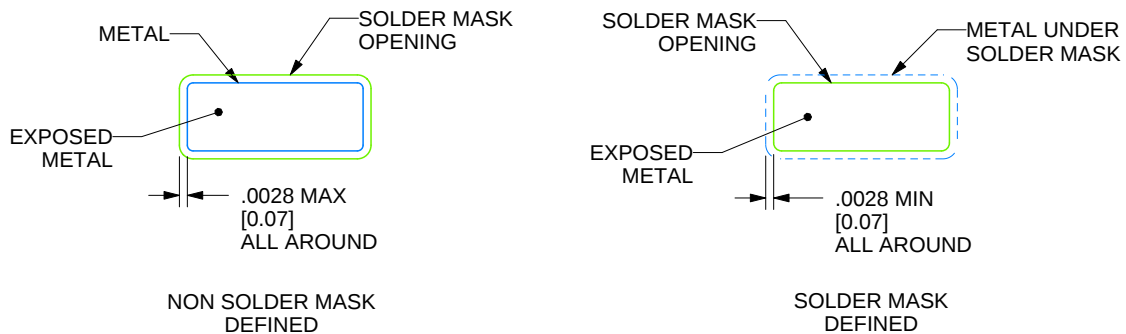
**D0008A**

**SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:8X



## SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

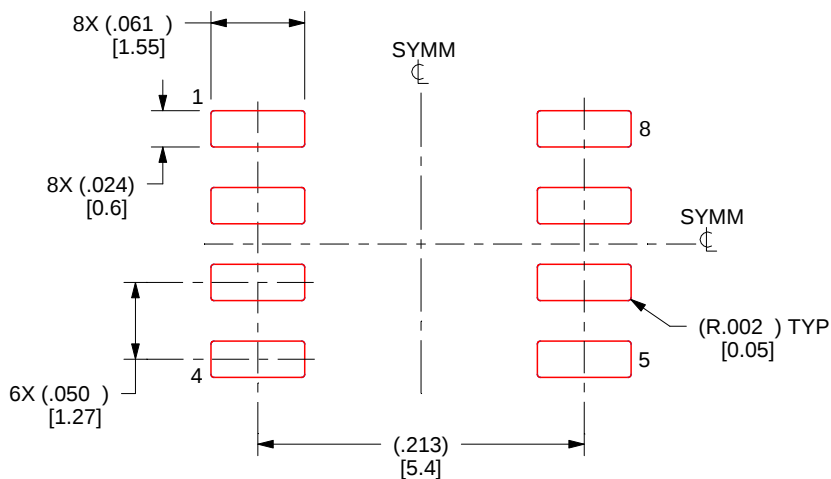
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

D0008A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE  
BASED ON .005 INCH [0.125 MM] THICK STENCIL  
SCALE:8X

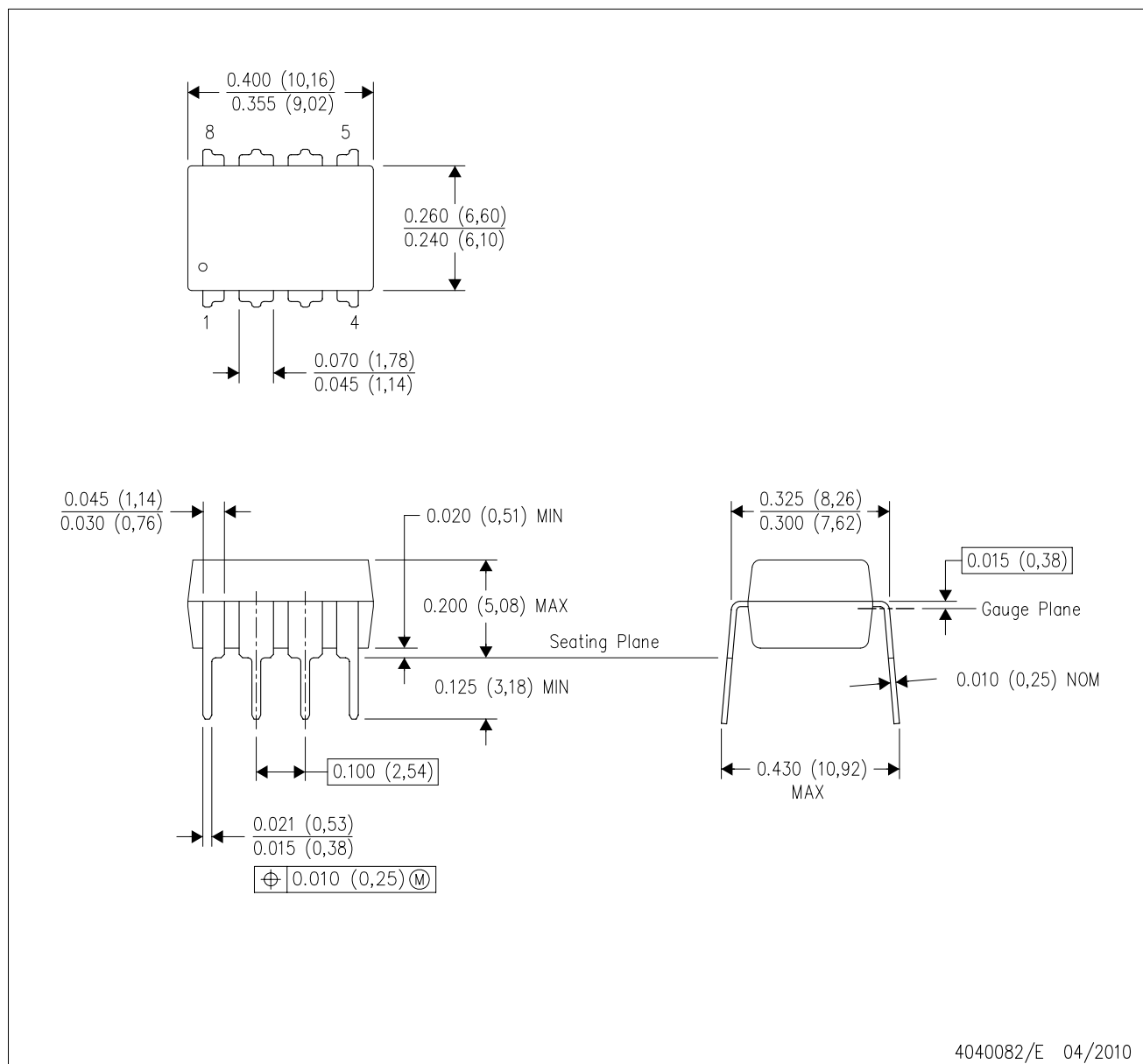
4214825/C 02/2019

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.

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001 variation BA.

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最后更新日期：2025 年 10 月