

低功耗 RS-485 线路驱动器和接收器对

1 特性

- 专为通过长电缆进行高速多点数据传输而设计
- 以低至 30ns 的脉冲持续时间运行
- 低电源电流：5 mA (最大值)
- 符合或超出 ANSI 标准 RS-485 和 ISO 8482:1987(E) 的要求
- 用于合用总线的三态输出
- -7V 至 12V 的共模电压范围
- 过热关断保护可避免因总线争用导致的驱动器损坏
- 正负输出电流限制
- 引脚与 SN75ALS180 兼容

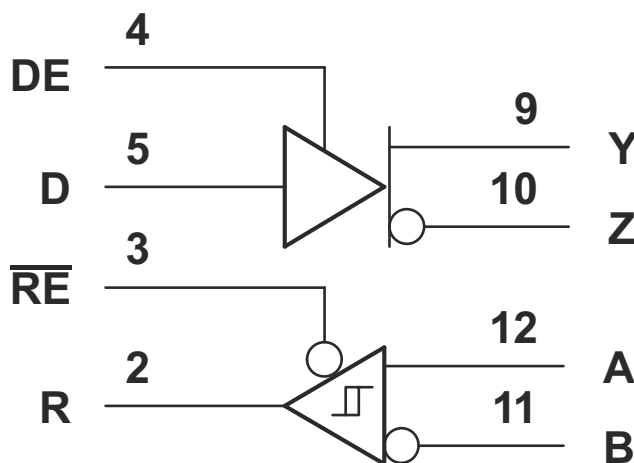
2 说明

SN55LBC180、SN65LBC180 和 SN75LBC180 差分驱动器和接收器对是单片集成电路，设计用于通过具有传输线特性的长电缆进行双向数据通信。它们是平衡或差分电压模式器件，符合或超过行业标准 ANSI RS-485 和 ISO 8482:1987(E) 的要求。这些器件采用 TI 专用 LinBiCMOS™ 进行设计，具有 CMOS 的低功耗以及同一电路中双极晶体管的精度和稳健性。

封装信息

| 器件型号 | 封装 ⁽¹⁾ | 封装尺寸 (标称值) |
|------------|-------------------|-------------------|
| SN75LBC180 | N (PDIP) | 19.3 mm x 63.5 mm |
| | D (SOIC) | 8.65mm x 3.91mm |
| SN65LBC180 | RSA (QFN) | 4mm x 4mm |
| SN55LBC180 | RSA (QFN) | 4mm x 4mm |

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。



逻辑图 (正逻辑)



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3 说明 (续)

SN55LBC180、SN65LBC180 和 SN75LBC180 将差分线路驱动器和接收器与三态输出相结合，并采用 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。驱动器差分输出和接收器差分输入连接到单独的端子以实现全双工工作，并且旨在为总线提供最小负载，无论是禁用还是断电 ($V_{CC} = 0$)。这些器件具有宽共模电压范围，使其适用于点对点或多点数据总线应用。

这些器件还提供正负输出电流限制和热关断功能，避免出现线路故障状况。线路驱动器在结温约为 172°C 时关闭。

SN75LBC180 可在 0°C 至 70°C 的商业温度范围内运行。SN65LBC180 可在 -40°C 至 85°C 的工业温度范围内运行。

SN55LBC180 的军用级温度范围为 -55°C 至 125°C。

4 Revision History

注：以前版本的页码可能与当前版本的页码不同

| Changes from Revision G (April 2009) to Revision H (June 2022) | Page |
|---|------|
| • 将“订购信息”表更改为封装信息表..... | 1 |
| • Added the <i>Pin Configuration and Functions</i> | 4 |
| • Added the <i>Thermal Information Table</i> | 6 |
| • Fixed the typo in the unit for the Receiver enable I_{IH} to change the unit from A to μ A..... | 7 |
| • Updated 图 6-1, 图 6-2, and 图 6-3, limiting the x-axis to a maximum of 70 mA driver output current..... | 9 |
| • Updated 图 9-1 to remove legacy terminology | 17 |

| Changes from Revision F (March 2009) to Revision G (April 2009) | Page |
|---|------|
| • Added 3 ESD rows to the <i>Absolute Maximum Ratings</i> | 5 |

| Changes from Revision E (February 2006) to Revision F (March 2009) | Page |
|---|------|
| • 将数据表标题中的“差分”更改为“RS-485” | 1 |
| • 添加了器件型号 SN55LBC180..... | 1 |
| • 将两个更改为这些..... | 1 |
| • 添加了“订购信息”表..... | 1 |
| • 更新了说明(续)部分..... | 2 |
| • 更改了功能表并将其从首页移到说明(续)部分..... | 2 |
| • Deleted condition, moved cross reference..... | 5 |
| • Added all symbols in text that were not appearing in the PDF..... | 5 |
| • Deleted T_A row from the <i>Absolute Maximum Ratings</i> | 5 |
| • Added the last column to <i>Dissipation Rating Table</i> | 5 |
| • Added a row to T_A in the <i>Recommended Operating Conditions</i> for SN55LBC180..... | 5 |
| • Added SN55LB180 to the $ V_{OD} $ row..... | 6 |
| • Change: moved 5 max values to the min column (-1.5, -50, -100, -0.8, -0.8)..... | 7 |
| • Added the <i>Switching Characteristics: SN55LBC180</i> table | 8 |
| • Changed moved schematics to the Typical Characteristics section..... | 16 |

5 Pin Configuration and Functions

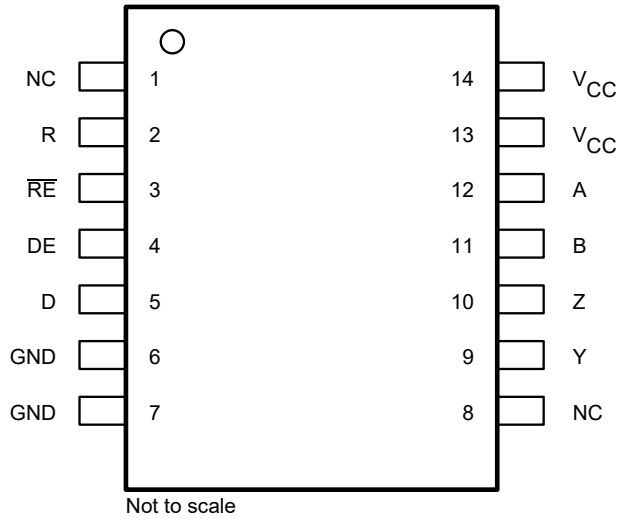


图 5-1. D OR N Package (SOIC)
(Top View)

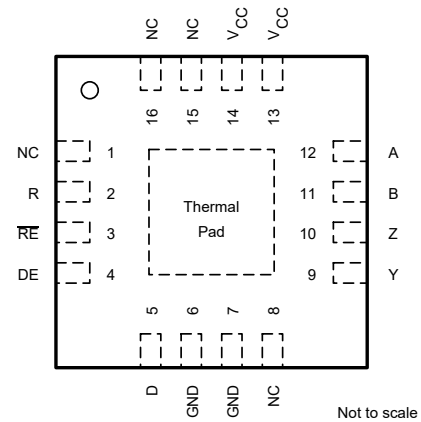


图 5-2. RSA Package (QFN)
(Top View)

表 5-1. Pin Functions

| PIN NAME | PIN NO | | TYPE ⁽¹⁾ | DESCRIPTION |
|-----------------|--------|--------|---------------------|--|
| | D Or N | RSA | | |
| NC | 1 | 1 | NC | No internal connection |
| R | 2 | 2 | O | Receiver output |
| RE | 3 | 3 | I | Receiver enable input. Active low. |
| DE | 4 | 4 | I | Driver enable input. Active high |
| D | 5 | 5 | I | Driver input pin |
| GND | 6, 7 | 6, 7 | G | Ground connection. Pins 6 and 7 are connected together internally. |
| NC | 8 | 8 | NC | No internal connection |
| Y | 9 | 9 | O | Bus output port (complementary to Z) |
| Z | 10 | 10 | O | Bus output port (complementary to Y) |
| B | 11 | 11 | I | Bus input port (complementary to A) |
| A | 12 | 12 | I | Bus input port (complementary to B) |
| V _{CC} | 13, 14 | 13, 14 | P | Supply input pins. Pins 13 and 14 are connected together internally. |
| NC | N/A | 15, 16 | NC | No internal connection |

(1) Signal Types: I = Input, O = Output, P= Power input,

6 Specifications

6.1 Absolute Maximum Ratings

See note (1)

| | | | UNIT | |
|------------------|---------------------------------------|---|------|----|
| V _{CC} | Supply voltage range (2) | - 0.3 to 7 | V | |
| V _{BUS} | Bus voltage range (A, B, Y, Z)(2) | - 10 to 15 | V | |
| | Voltage range at D, R, DE, RE (2) | - 0.3 to V _{CC} + 0.5 | V | |
| | Continuous total power dissipation(3) | Internally limited | | |
| | Total power dissipation | See Dissipation Rating Table | | |
| T _{stg} | Storage temperature range | - 65 to 150 | °C | |
| I _O | Receiver output current range | - 50 to 50 | mA | |
| ESD | Electrostatic discharge | HBM (Human Body Model) EIA/JESD22-A114 | ±4 | kV |
| | | MM (Machine Model) EIA/JESD22-A115 | 400 | V |
| | | CDM (Charge Device Model) EIA/JESD22-C101 | 1.5 | kV |

- (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 are with respect to GND.
- (3) The maximum operating junction temperature is internally limited. Use the dissipation rating table to operate below this temperature.

6.2 Dissipation Rating Table

| PACKAGE(1) | T _A ≤ 25°C POWER RATING | DERATING FACTOR ABOVE T _A = 25°C | T _A = 70°C POWER RATING | T _A = 85°C POWER RATING | T _A = 125°C POWER RATING |
|------------|---------------------------------------|--|---------------------------------------|---------------------------------------|--|
| D | 950 mW | 7.6 mW/°C | 608 mW | 494 mW | — |
| N | 1150 mW | 9.2 mW/°C | 736 mW | 598 mW | — |
| RSA | 3333 mW | 26.67 mW/°C | 2133 mW | 1733 mW | 400 mW |

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI Web site at www.ti.com.

6.3 Recommended Operating Conditions

| | | | MIN | NOM | MAX | UNIT |
|--|---|---------------|--------|-----|------|------|
| V _{CC} | Supply voltage | | 4.75 | 5 | 5.25 | V |
| V _{IH} | High-level input voltage | D, DE, and RE | 2 | | | V |
| V _{IL} | Low-level input voltage | D, DE, and RE | | | 0.8 | V |
| V _{ID} | Differential input voltage | | - 6(1) | | 6 | V |
| V _O , V _I , or V _{IC} | Voltage at any bus terminal (separately or common mode) | A, B, Y, or Z | - 7(1) | | 12 | V |
| I _{OH} | High-level output current | Y or Z | | | - 60 | mA |
| | | R | | | - 8 | |
| I _{OL} | Low-level output current | Y or Z | | | 60 | mA |
| | | R | | | 8 | |
| T _A | Operating free-air temperature | SN55LBC180 | - 55 | | 125 | °C |
| | | SN65LBC180 | - 40 | | 85 | |
| | | SN75LBC180 | 0 | | 70 | |

- (1) The algebraic convention where the least positive (more negative) limit is designated minimum, is used in this data sheet for the differential input voltage, voltage at any bus terminal, operating temperature, input threshold voltage, and common-mode output voltage.

6.4 Thermal Information Table

| THERMAL METRIC ⁽¹⁾ | | D (SOIC) | N (PDIP) | RSA (QFN) | UNIT |
|-------------------------------|--|----------|----------|-----------|------|
| | | 14 Pins | 14 Pins | 16 Pins | |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | 93.2 | 53.4 | 44.8 | °C/W |
| $R_{\theta JC(top)}$ | Junction-to-case (top) thermal resistance | 47.5 | 40.0 | 43.8 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 49.4 | 33.2 | 14.7 | °C/W |
| ψ_{JT} | Junction-to-top characterization parameter | 11.2 | 19.0 | 0.4 | °C/W |
| ψ_{JB} | Junction-to-board characterization parameter | 48.9 | 32.9 | 14.5 | °C/W |
| $R_{\theta JC(bot)}$ | Junction-to-case (bottom) thermal resistance | n/a | n/a | 2.6 | °C/W |

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

6.5 Driver Section

6.5.1 Electrical Characteristics

over recommended operating conditions (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | MIN | TYP ⁽¹⁾ | MAX | UNIT |
|-------------------|---|---|---------------------------------------|-----|--------------------|-----------|---------------|
| V_{IK} | Input clamp voltage | $I_I = -18 \text{ mA}$ | | | | - 1.5 | V |
| $ V_{OD} $ | Differential output voltage magnitude ⁽²⁾ | $R_L = 54 \Omega$, See 图 7-1 | SN55LBC180 | 1 | 2.5 | 5 | V |
| | | | SN65LBC180 | 1.1 | 2.5 | 5 | |
| | | | SN75LBC180 | 1.5 | 2.5 | 5 | |
| | | $R_L = 60 \Omega$, See 图 7-2 | SN55LBC180 | 1 | 2.5 | 5 | |
| | | | SN65LBC180 | 1.1 | 2 | 5 | |
| | | | SN75LBC180 | 1.5 | 2 | 5 | |
| $\Delta V_{OD} $ | Change in magnitude of differential output voltage ⁽³⁾ | See 图 7-1 and 图 7-2 | | | | ± 0.2 | V |
| V_{OC} | Common-mode output voltage | | | 1 | 2.5 | 3 | V |
| $\Delta V_{OC} $ | Change in magnitude of common-mode output voltage ⁽³⁾ | $R_L = 54 \Omega$, | See 图 7-1 | | | ± 0.2 | V |
| I_O | Output current with power off | $V_{CC} = 0$, | $V_O = -7 \text{ V to } 12 \text{ V}$ | | | ± 100 | μA |
| I_{OZ} | High-impedance-state output current | $V_O = -7 \text{ V to } 12 \text{ V}$ | | | | ± 100 | μA |
| I_{IH} | High-level input current | $V_I = 2.4 \text{ V}$ | | | | 100 | μA |
| I_{IL} | Low-level input current | $V_I = 0.4 \text{ V}$ | | | | 100 | μA |
| I_{OS} | Short-circuit output current | $-7 \text{ V} \leq V_O \leq 12 \text{ V}$ | | | | ± 250 | mA |
| I_{CC} | Supply current | Receiver disabled | Outputs enabled | | | 5 | mA |
| | | | Outputs disabled | | | 3 | |

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

(2) The minimum V_{OD} specification may not fully comply with ANSI RS-485 at operating temperatures below 0°C . System designers should take the possibly lower output signal into account in determining the maximum signal-transmission distance.

(3) $\Delta |V_{OD}|$ and $\Delta |V_{OC}|$ are the changes in the steady-state magnitude of V_{OD} and V_{OC} , respectively, that occur when the input is changed from a high level to a low level.

6.5.2 Switching Characteristics

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|-------------|-------------------------------------|-----------------------|---------------------------|-----|-----|-----|------|
| $t_{d(OD)}$ | Differential output delay time | $R_L = 54\ \Omega$, | See 图 7-3 | 7 | 12 | 18 | ns |
| $t_{t(OD)}$ | Differential output transition time | | | 5 | 10 | 20 | ns |
| t_{PZH} | Output enable time to high level | $R_L = 110\ \Omega$, | See 图 7-4 | | | 35 | ns |
| t_{PZL} | Output enable time to low level | $R_L = 110\ \Omega$, | See 图 7-5 | | | 35 | ns |
| t_{PHZ} | Output disable time from high level | $R_L = 110\ \Omega$, | See 图 7-4 | | | 50 | ns |
| t_{PLZ} | Output disable time from low level | $R_L = 110\ \Omega$, | See 图 7-5 | | | 35 | ns |

6.5.3 Switching Characteristics: SN55LBC180

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|-------------|-------------------------------------|-----------------------|---------------------------|-----|-----|-----|------|
| $t_{d(OD)}$ | Differential output delay time | $R_L = 54\ \Omega$, | See 图 7-3 | | 15 | | ns |
| $t_{t(OD)}$ | Differential output transition time | | | | 21 | | ns |
| t_{PZH} | Output enable time to high level | $R_L = 110\ \Omega$, | See 图 7-4 | | 32 | | ns |
| t_{PHZ} | Output disable time from high level | | | | 55 | | |
| t_{PZL} | Output enable time to low level | $R_L = 110\ \Omega$, | See 图 7-5 | | 32 | | ns |
| t_{PLZ} | Output disable time from low level | | | | 20 | | |

6.6 Receiver Section

6.6.1 Electrical Characteristics

over recommended operating conditions (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|-----------|--|---|-------------------------|------|------|----------|----------------|
| V_{IT+} | Positive-going input threshold voltage | $I_O = -8\text{ mA}$ | | | | 0.2 | V |
| V_{IT-} | Negative-going input threshold voltage | $I_O = 8\text{ mA}$ | | -0.2 | | | V |
| V_{hys} | Hysteresis voltage ($V_{IT+} - V_{IT-}$) | | | | 45 | | mV |
| V_{IK} | Enable-input clamp voltage | $I_I = -18\text{ mA}$ | | -1.5 | | | V |
| V_{OH} | High-level output voltage | $V_{ID} = 200\text{ mV}$, | $I_{OH} = -8\text{ mA}$ | 3.5 | 4.5 | | V |
| V_{OL} | Low-level output voltage | $V_{ID} = -200\text{ mV}$, | $I_{OL} = 8\text{ mA}$ | | 0.3 | 0.5 | V |
| I_{OZ} | High-impedance-state output current | $V_O = 0\text{ V to }V_{CC}$ | | | | ± 20 | $\mu\text{ A}$ |
| I_{IH} | High-level enable-input current | $V_{IH} = 2.4\text{ V}$ | | -50 | | | $\mu\text{ A}$ |
| I_{IL} | Low-level enable-input current | $V_{IL} = 0.4\text{ V}$ | | -100 | | | $\mu\text{ A}$ |
| I_I | Bus input current | $V_I = 12\text{ V}$, $V_{CC} = 5\text{ V}$, | Other input at 0 V | | 0.7 | 1 | mA |
| | | $V_I = 12\text{ V}$, $V_{CC} = 0\text{ V}$, | Other input at 0 V | | 0.8 | 1 | |
| | | $V_I = -7\text{ V}$, $V_{CC} = 5\text{ V}$, | Other input at 0 V | -0.8 | -0.5 | | |
| | | $V_I = -7\text{ V}$, $V_{CC} = 0\text{ V}$, | Other input at 0 V | -0.8 | -0.5 | | |
| I_{CC} | Supply current | Driver disabled | Outputs enabled | | | 5 | mA |
| | | | Outputs disabled | | | 3 | |

6.6.2 Switching Characteristics

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------|---|--|-----|-----|-----|------|
| t_{PHL} | Propagation delay time, high- to low-level output | $V_{ID} = -1.5\text{ V to }1.5\text{ V}$, See 图 7-6 | 11 | 22 | 33 | ns |
| t_{PLH} | Propagation delay time, low- to high-level output | | 11 | 22 | 33 | ns |
| $t_{sk(p)}$ | Pulse skew ($ t_{PHL} - t_{PLH} $) | | | 3 | 6 | ns |
| t_t | Transition time | | | 5 | 8 | ns |
| t_{PZH} | Output enable time to high level | See 图 7-7 | | | 35 | ns |
| t_{PZL} | Output enable time to low level | | | | 30 | ns |
| t_{PHZ} | Output disable time from high level | | | | 35 | ns |
| t_{PLZ} | Output disable time from low level | | | | 30 | ns |

6.6.3 Switching Characteristics: SN55LBC180

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------|---|--|-----|-----|-----|------|
| t_{PHL} | Propagation delay time, high- to low-level output | $V_{ID} = -1.5\text{ V to }1.5\text{ V}$, See 图 7-6 | | 26 | | ns |
| t_{PLH} | Propagation delay time, low- to high-level output | | | 23 | | ns |
| $t_{sk(p)}$ | Pulse skew ($ t_{PHL} - t_{PLH} $) | | | 3 | | ns |
| $t_{sk(p)t}$ | Transition time | | | 4 | | ns |
| t_{PZH} | Output enable time to high level | See 图 7-4 | | 30 | | ns |
| t_{PHZ} | Output disable time from high level | | | 26 | | ns |
| t_{PZL} | Output enable time to low level | | | 30 | | ns |
| t_{PLZ} | Output disable time from low level | | | 30 | | ns |

6.7 Typical Characteristics

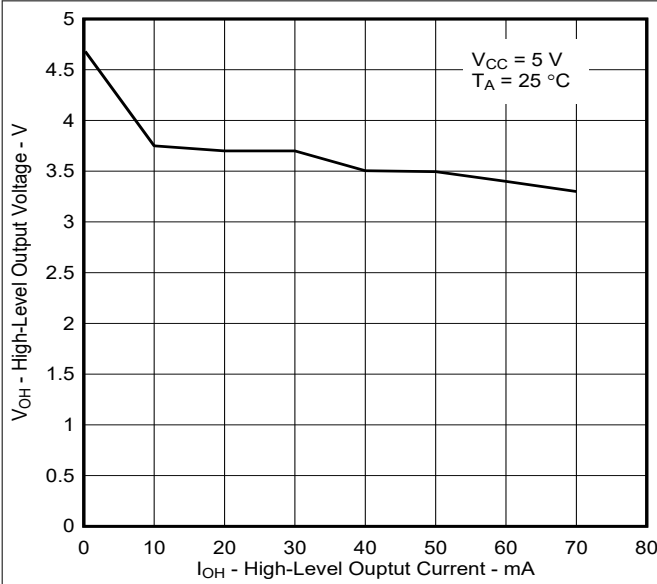


图 6-1. Driver High-Level Output Voltage vs High-Level Output Current

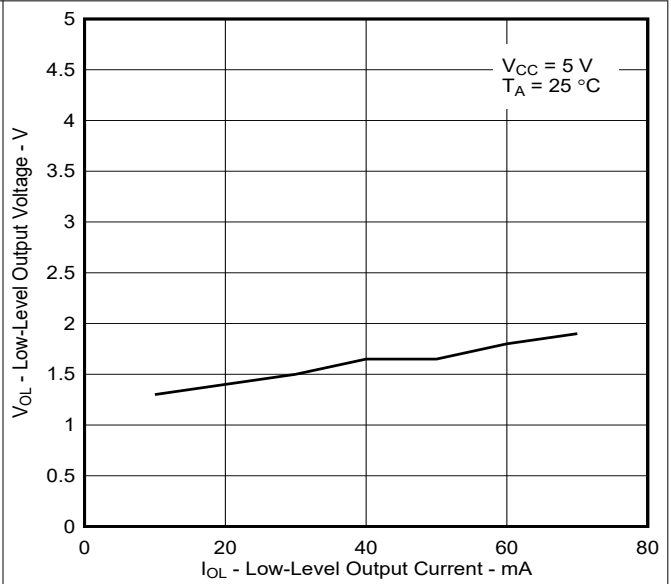


图 6-2. Driver Low-Level Output Voltage vs Low-Level Output Current

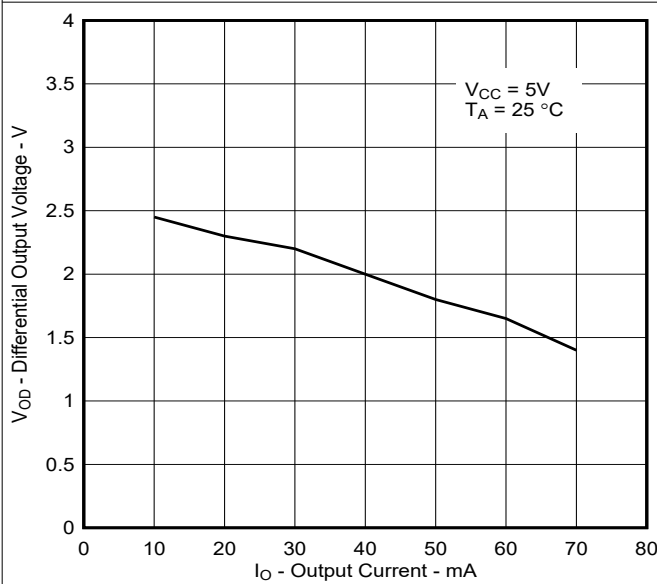


图 6-3. Driver Differential Output Voltage vs Output Current

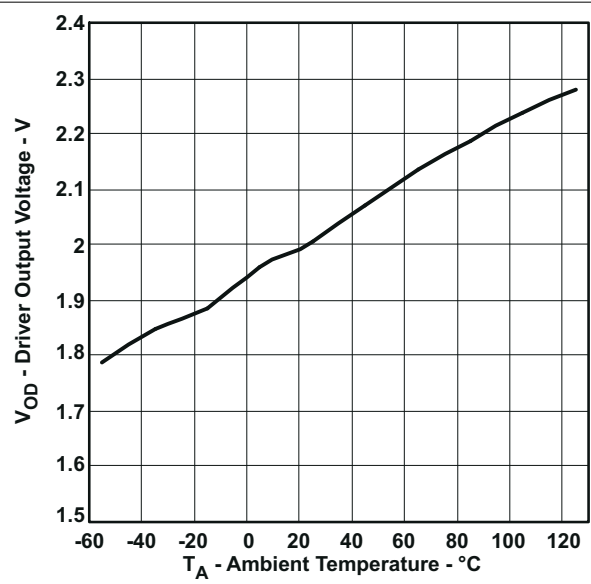


图 6-4. Driver Differential Output Voltage vs Free-Air Temperature

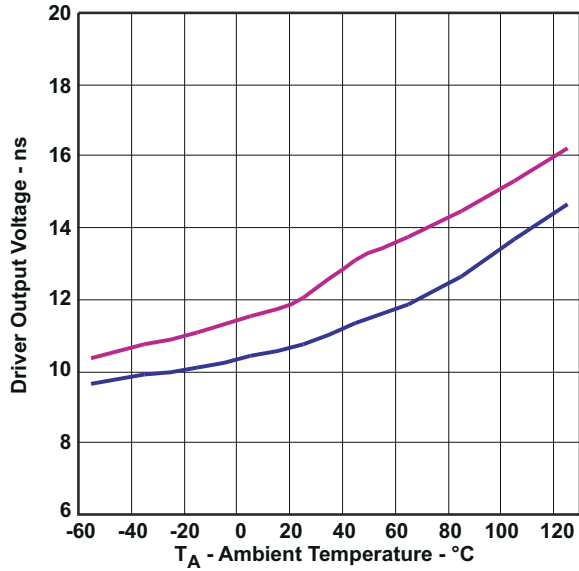


图 6-5. Driver Differential Delay Times vs Free-Air Temperature

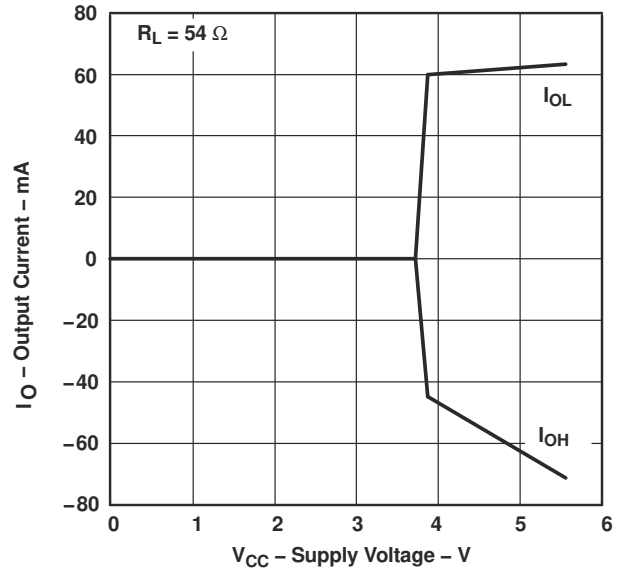


图 6-6. Driver Output Current vs Supply Voltage

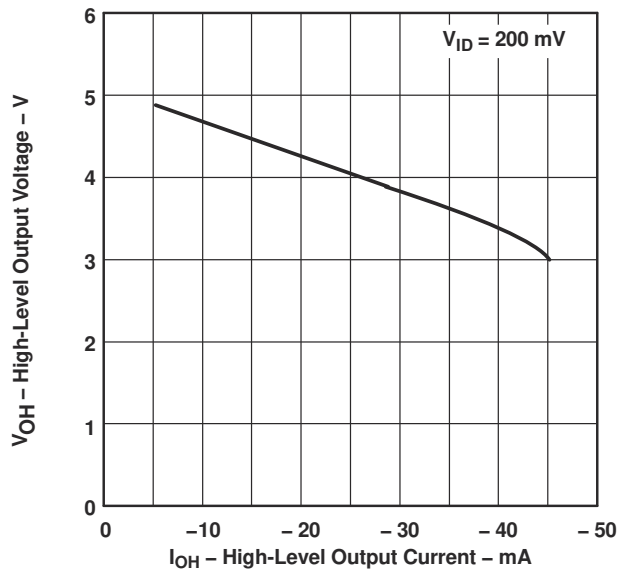


图 6-7. Receiver High-Level Output Voltage vs High-Level Output Current

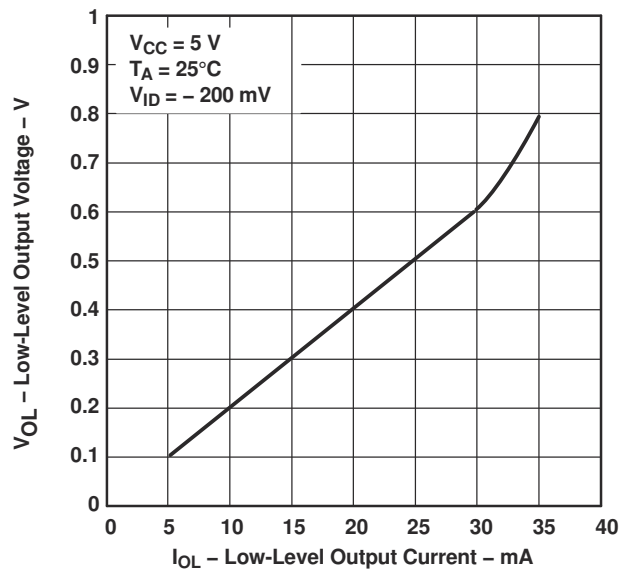


图 6-8. Receiver Low-Level Output Voltage vs Low-Level Output Current

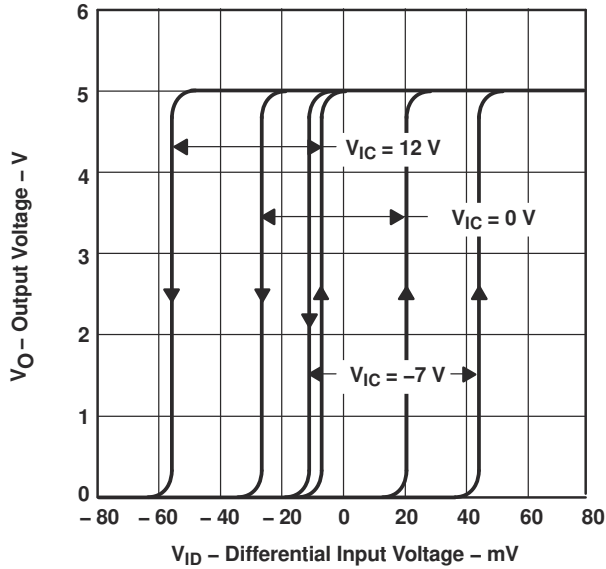


图 6-9. Receiver Output Voltage vs Differential Input Voltage

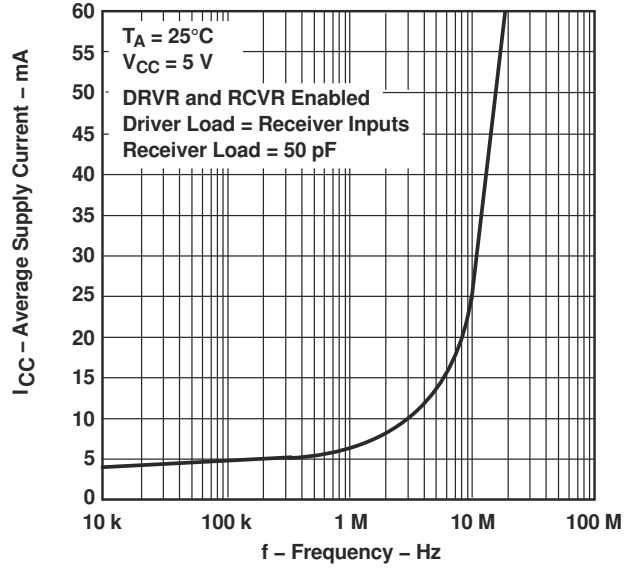


图 6-10. Average Supply Current vs Frequency

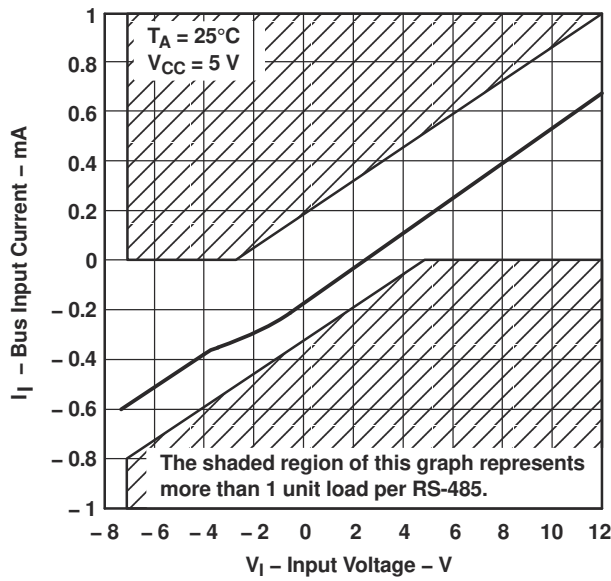


图 6-11. Receiver Bus Input Current vs Input Voltage (Complementary Input at 0 V)

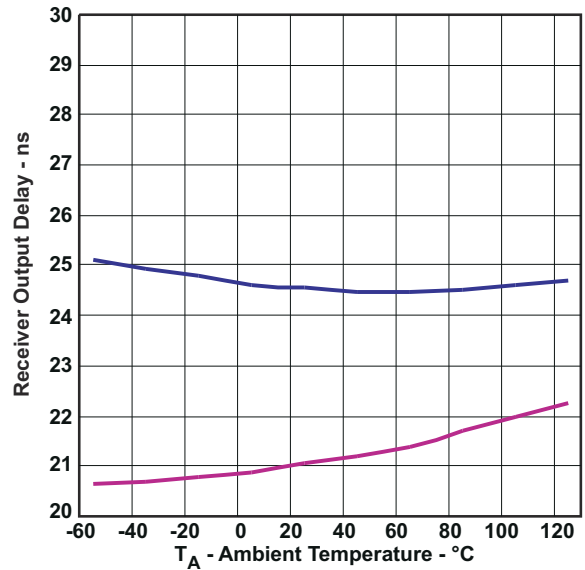


图 6-12. Receiver Propagation DELAY T_I vs Free-Air Temperature

7 Parameter Measurement Information

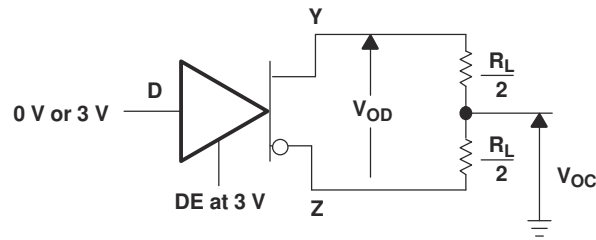


图 7-1. Differential and Common-Mode Output Voltages

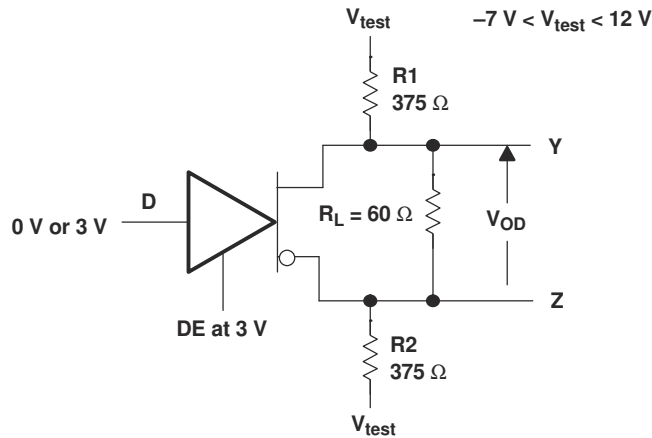
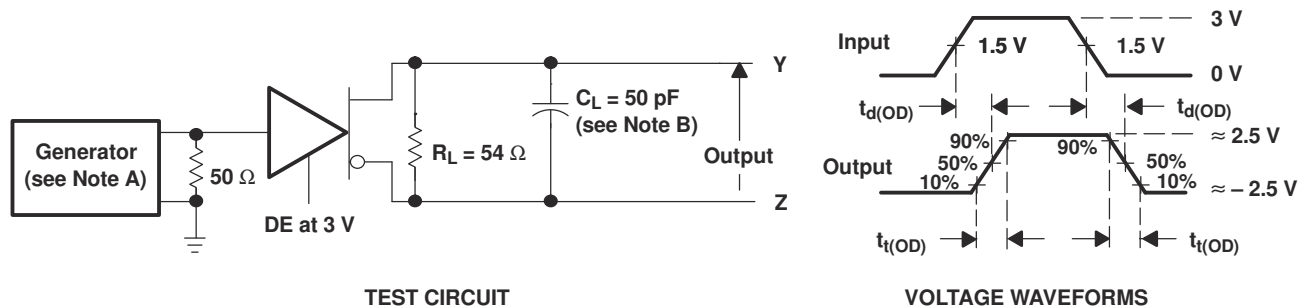


图 7-2. Driver V_{OD} Test Circuit



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR > 1 MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
 B. C_L includes probe and jig capacitance.

图 7-3. Driver Test Circuit and Differential Output Delay and Transition Time Voltage Waveforms

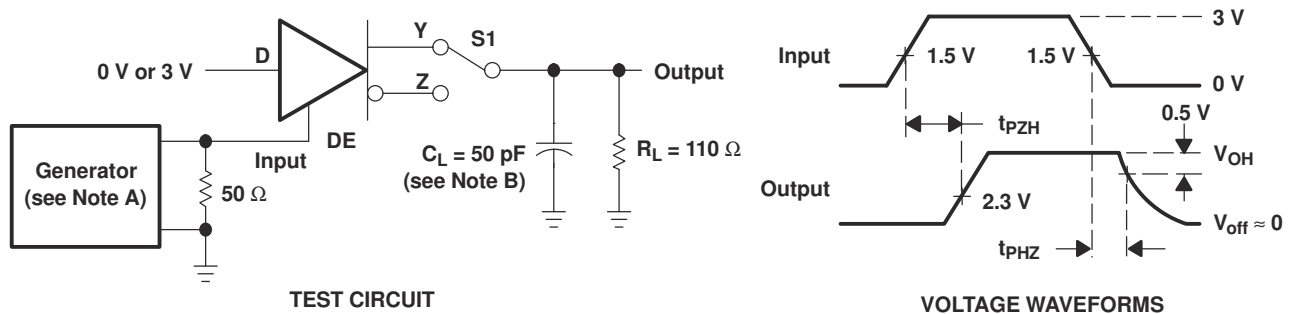
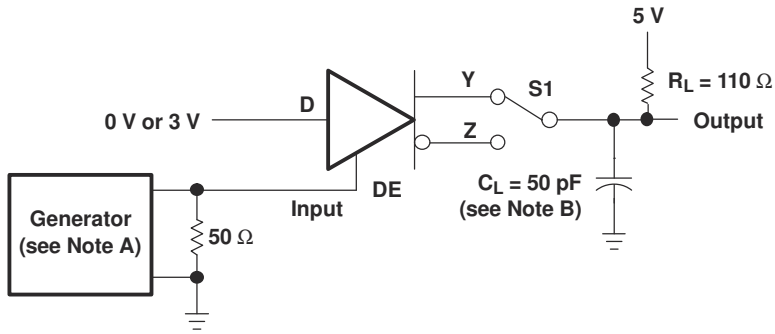
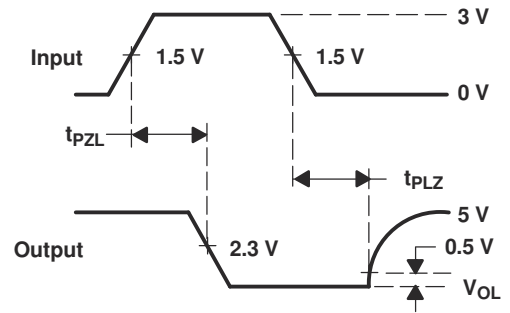


图 7-4. Driver Test Circuit and Enable and Disable Time Waveforms

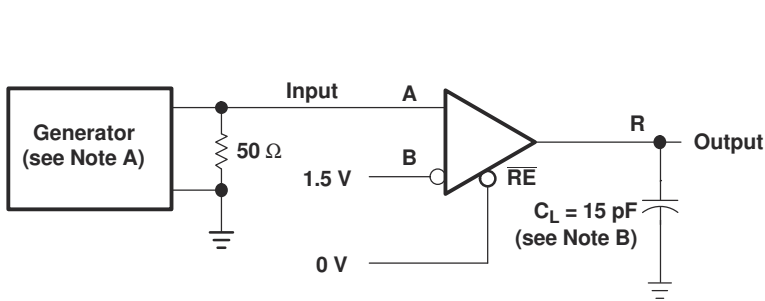


TEST CIRCUIT

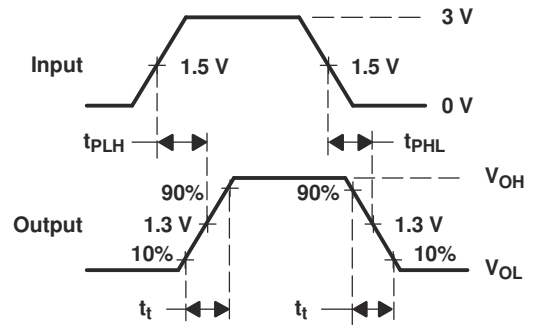


VOLTAGE WAVEFORMS

图 7-5. Driver Test Circuit and Enable and Disable Time Voltage Waveforms



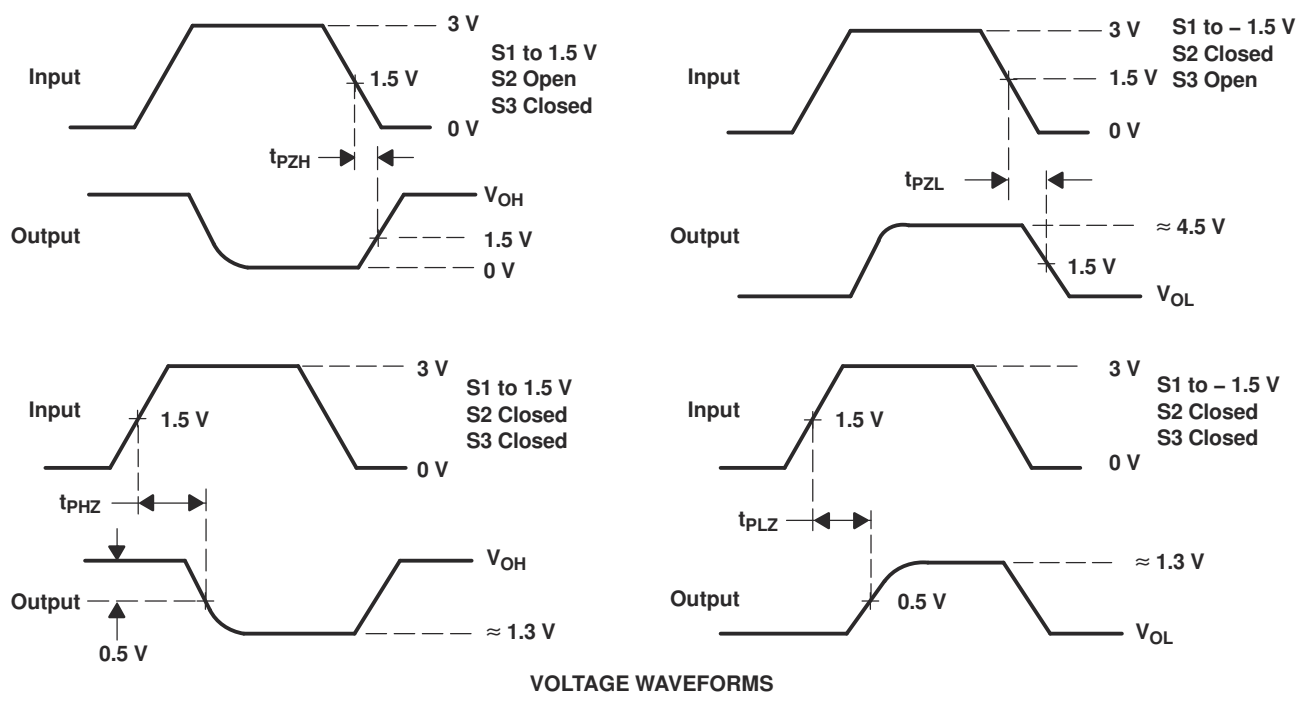
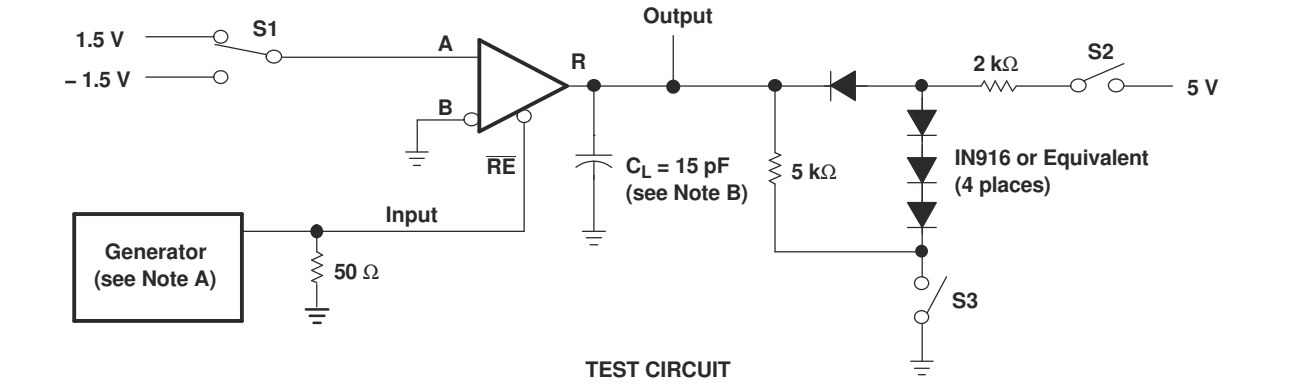
TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1$ MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_0 = 50 \Omega$.
B. C_L includes probe and jig capacitance.

图 7-6. Receiver Test Circuit and Propagation Delay Time Voltage Waveforms



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: PRR ≤ 1 MHz, 50% duty cycle, $t_r \leq 6$ ns, $t_f \leq 6$ ns, $Z_O = 50 \Omega$.
 B. C_L includes probe and jig capacitance.

图 7-7. Receiver Output Enable and Disable Times

8 Detailed Description

8.1 Function Tables

表 8-1. DRIVER

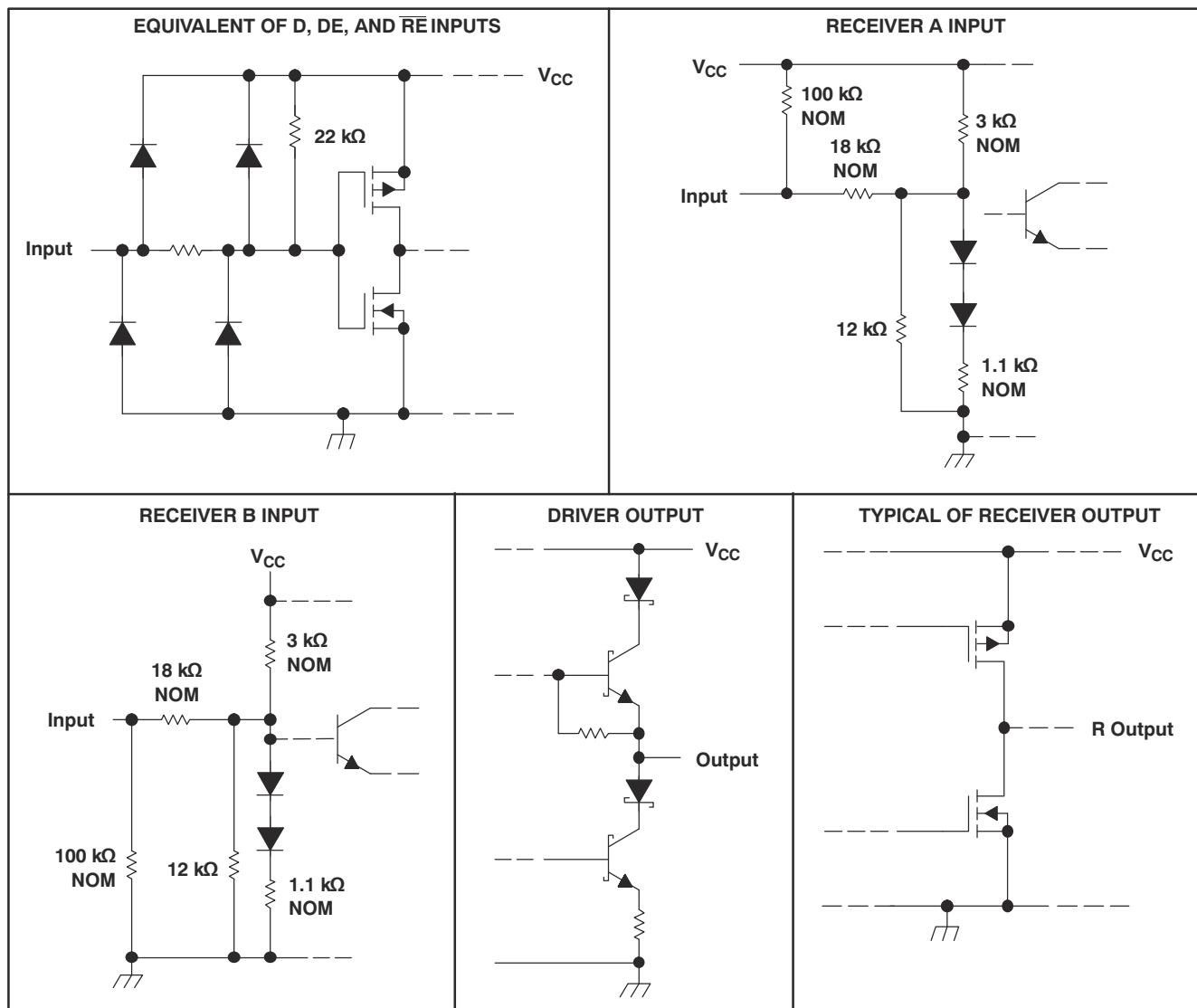
| INPUT D ⁽¹⁾ | ENABLE DE | OUTPUTS | |
|---------------------------|--------------|---------|---|
| | | Y | Z |
| H | H | H | L |
| L | H | L | H |
| X | L | Z | Z |

(1) H = high level, L = low level, ? = Indeterminate, X = irrelevant,
Z = high impedance (off)

表 8-2. RECEIVER

| DIFFERENTIAL INPUTS A - B | ENABLE RE | OUTPUT R | |
|------------------------------|--------------|-------------|---|
| | | Y | Z |
| $V_{ID} \geq 0.2 V$ | L | H | |
| $-0.2 V < V_{ID} < 0.2 V$ | L | ? | |
| $V_{ID} \leq -0.2 V$ | L | L | |
| X | H | Z | |
| Open circuit | L | H | |

8.2 Schematics of Inputs and Outputs



9 Application and Implementation

备注

以下应用部分中的信息不属于 TI 器件规格的范围，TI 不担保其准确性和完整性。TI 的客户应负责确定器件是否适用于其应用。客户应验证并测试其设计，以确保系统功能。

9.1 Application Information

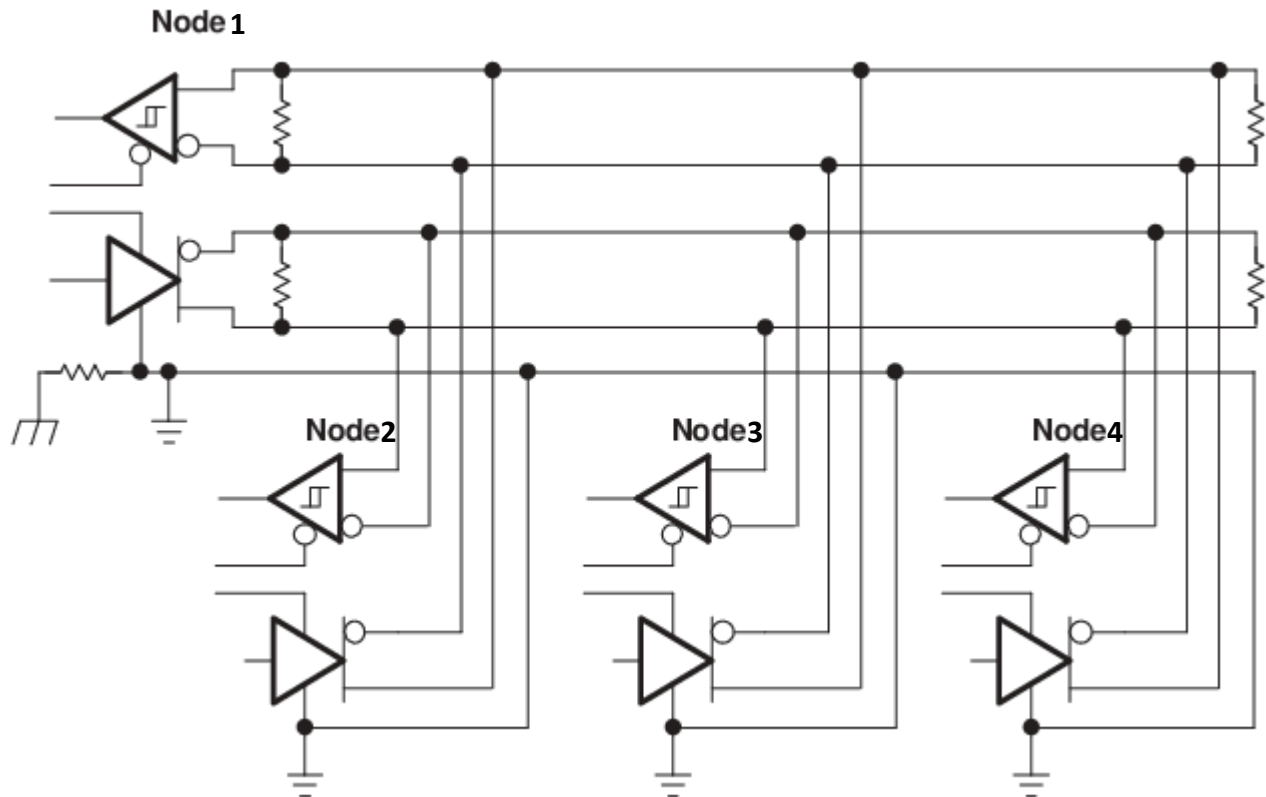


图 9-1. Full Duplex Application Circuit

10 Device and Documentation Support

10.1 接收文档更新通知

要接收文档更新通知，请导航至 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。

10.2 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](#)》。

10.3 Trademarks

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TI E2E™ is a trademark of Texas Instruments.

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10.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

10.5 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。

11 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 Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN55LBC180RSAR | ACTIVE | QFN | RSA | 16 | 3000 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | -55 to 125 | SN55 LBC180 | Samples |
| SN55LBC180RSAT | ACTIVE | QFN | RSA | 16 | 250 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | -55 to 125 | SN55 LBC180 | Samples |
| SN65LBC180D | NRND | SOIC | D | 14 | 50 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 6LB180 | |
| SN65LBC180DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 6LB180 | Samples |
| SN65LBC180DRG4 | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | 6LB180 | Samples |
| SN65LBC180N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -40 to 85 | SN65LBC180N | Samples |
| SN65LBC180RSAR | ACTIVE | QFN | RSA | 16 | 3000 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | -40 to 85 | BL180 | Samples |
| SN65LBC180RSAT | ACTIVE | QFN | RSA | 16 | 250 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | -40 to 85 | BL180 | Samples |
| SN75LBC180D | NRND | SOIC | D | 14 | 50 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 7LB180 | |
| SN75LBC180DG4 | NRND | SOIC | D | 14 | 50 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 7LB180 | |
| SN75LBC180DR | NRND | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 7LB180 | |
| SN75LBC180DRG4 | NRND | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 7LB180 | |
| SN75LBC180N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN75LBC180N | Samples |
| SN75LBC180RSAT | ACTIVE | QFN | RSA | 16 | 250 | RoHS & Green | NIPDAU | Level-2-260C-1 YEAR | 0 to 70 | LB180 | Samples |

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

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OTHER QUALIFIED VERSIONS OF SN55LBC180, SN65LBC180, SN75LBC180 :

- Catalog : [SN75LBC180](#)

- Automotive : [SN65LBC180-Q1](#)

- Military : [SN55LBC180](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN55LBC180RSAR | QFN | RSA | 16 | 3000 | 330.0 | 12.4 | 4.25 | 4.25 | 1.15 | 8.0 | 12.0 | Q2 |
| SN55LBC180RSAT | QFN | RSA | 16 | 250 | 180.0 | 12.4 | 4.25 | 4.25 | 1.15 | 8.0 | 12.0 | Q2 |
| SN65LBC180DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN65LBC180DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN65LBC180RSAR | QFN | RSA | 16 | 3000 | 330.0 | 12.4 | 4.25 | 4.25 | 1.15 | 8.0 | 12.0 | Q2 |
| SN65LBC180RSAR | QFN | RSA | 16 | 3000 | 330.0 | 12.4 | 4.35 | 4.35 | 1.1 | 8.0 | 12.0 | Q2 |
| SN65LBC180RSAT | QFN | RSA | 16 | 250 | 330.0 | 12.5 | 4.35 | 4.35 | 1.1 | 8.0 | 12.0 | Q2 |
| SN65LBC180RSAT | QFN | RSA | 16 | 250 | 180.0 | 12.4 | 4.25 | 4.25 | 1.15 | 8.0 | 12.0 | Q2 |
| SN75LBC180DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN75LBC180RSAT | QFN | RSA | 16 | 250 | 180.0 | 12.4 | 4.25 | 4.25 | 1.15 | 8.0 | 12.0 | Q2 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN55LBC180RSAR | QFN | RSA | 16 | 3000 | 356.0 | 356.0 | 35.0 |
| SN55LBC180RSAT | QFN | RSA | 16 | 250 | 210.0 | 185.0 | 35.0 |
| SN65LBC180DR | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| SN65LBC180DR | SOIC | D | 14 | 2500 | 340.5 | 336.1 | 32.0 |
| SN65LBC180RSAR | QFN | RSA | 16 | 3000 | 356.0 | 356.0 | 35.0 |
| SN65LBC180RSAR | QFN | RSA | 16 | 3000 | 338.0 | 355.0 | 50.0 |
| SN65LBC180RSAT | QFN | RSA | 16 | 250 | 338.0 | 355.0 | 50.0 |
| SN65LBC180RSAT | QFN | RSA | 16 | 250 | 210.0 | 185.0 | 35.0 |
| SN75LBC180DR | SOIC | D | 14 | 2500 | 340.5 | 336.1 | 32.0 |
| SN75LBC180RSAT | QFN | RSA | 16 | 250 | 210.0 | 185.0 | 35.0 |

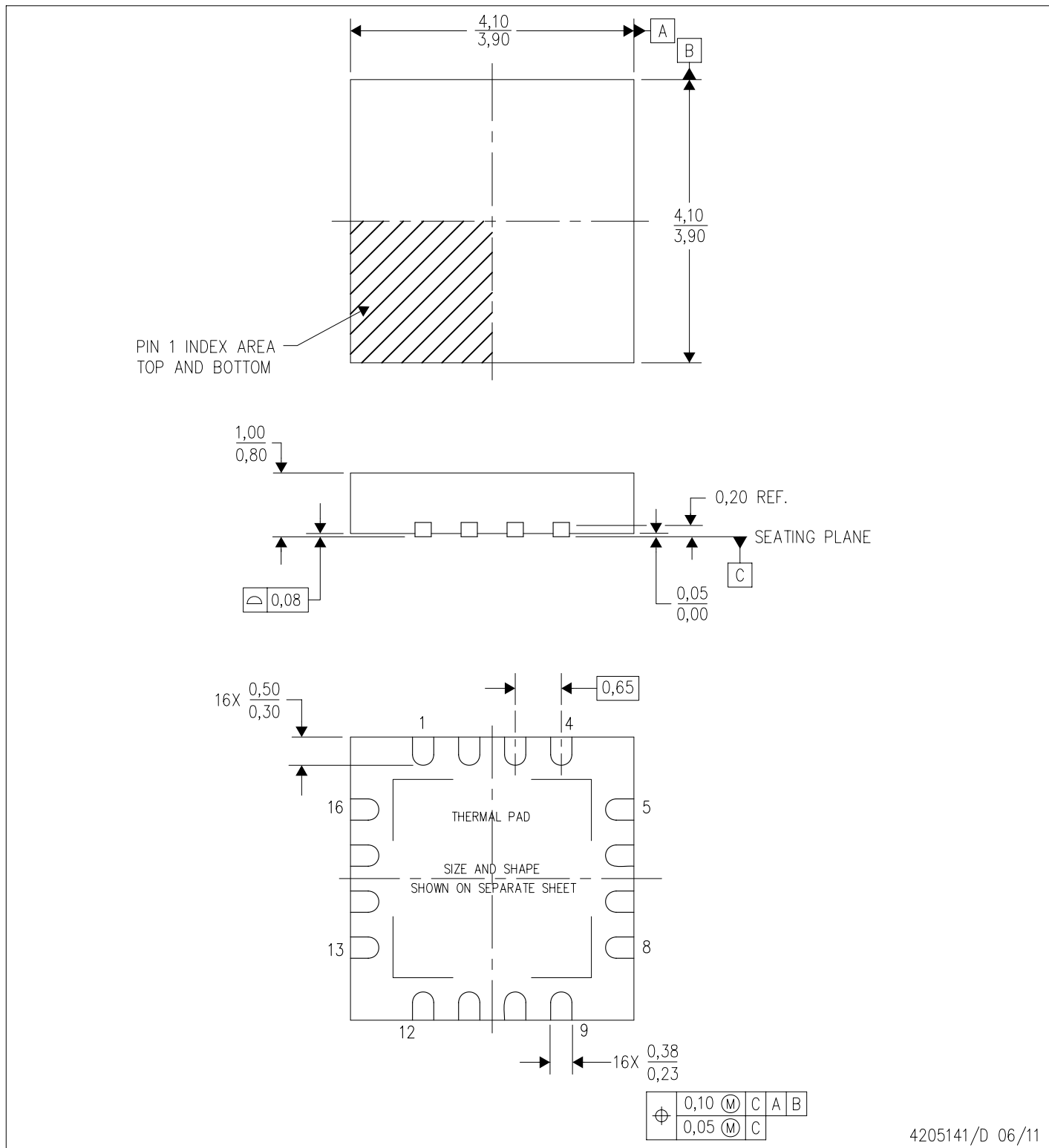
TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|---------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN65LBC180D | D | SOIC | 14 | 50 | 507 | 8 | 3940 | 4.32 |
| SN65LBC180N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN75LBC180D | D | SOIC | 14 | 50 | 507 | 8 | 3940 | 4.32 |
| SN75LBC180DG4 | D | SOIC | 14 | 50 | 507 | 8 | 3940 | 4.32 |
| SN75LBC180N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |

RSA (S-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



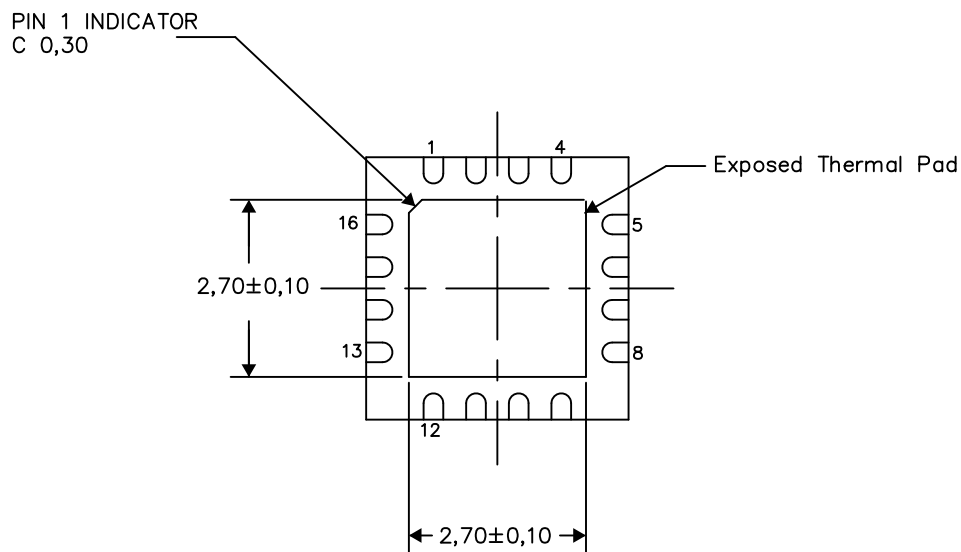
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Quad Flatpack, No-leads (QFN) package configuration.
 - D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
 - E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
 - F. Falls within JEDEC MO-220.

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

Exposed Thermal Pad Dimensions

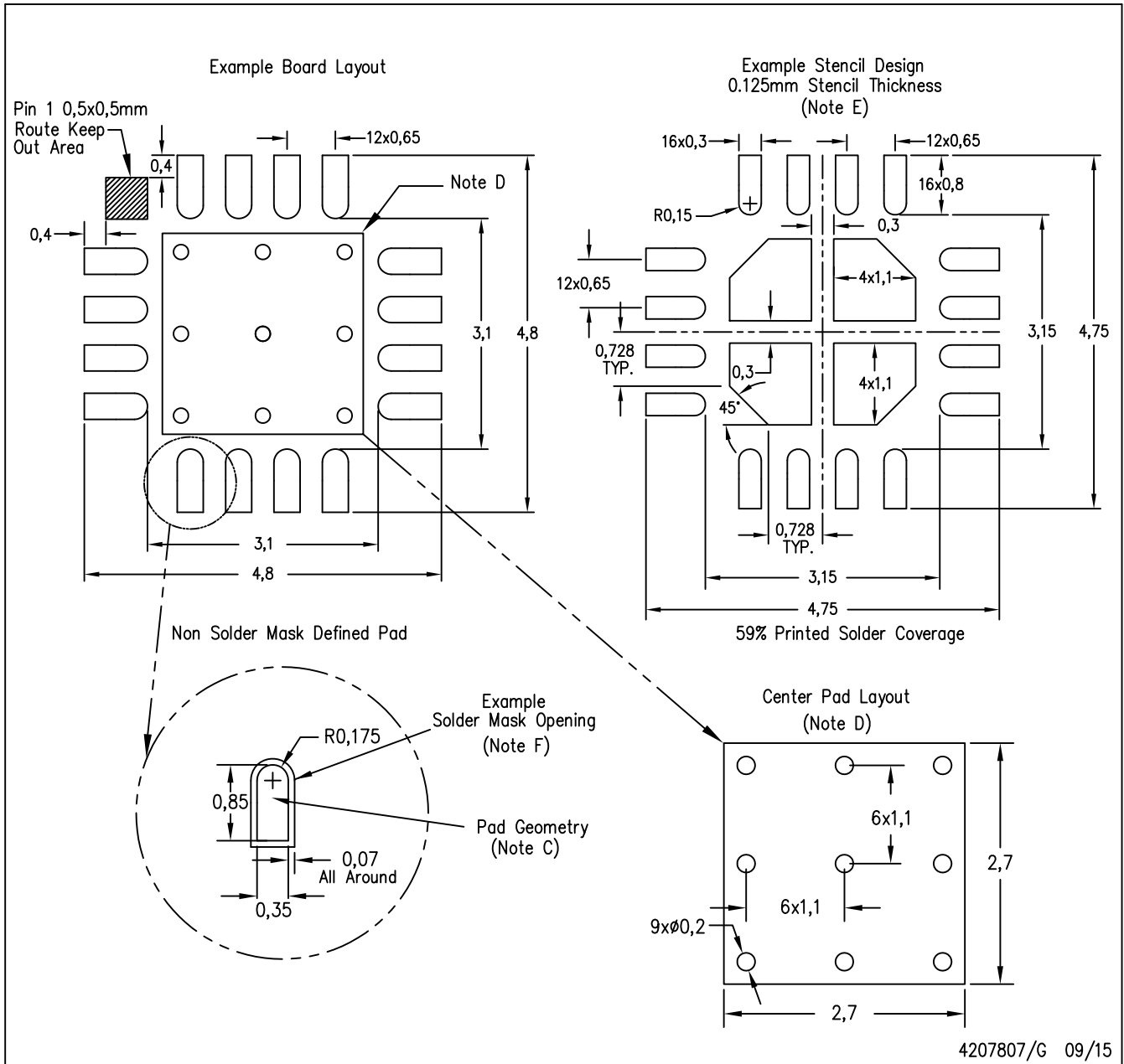
4206364-2/0 09/15

NOTES:

- A. All linear dimensions are in millimeters

RSA (S-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



4207807/G 09/15

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, QFN Packages, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>.
 - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - F. Customers should contact their board fabrication site for solder mask tolerances.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
 - Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
 - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4211283-3/E 08/12

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - $\triangle D$ The 20 pin end lead shoulder width is a vendor option, either half or full width.

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