

## 符合 RS-232 的 3V 至 5.5V 多通道线路驱动器和接收器

### 1 特性

- 由 3V 至 5.5V  $V_{CC}$  电源供电
- 始终有效同相接收器输出 (ROUT2B)
- 低待机电流:  $1\mu A$  (典型值)
- 外部电容器:  $4 \times 0.1\mu F$
- 接受 5V 逻辑输入及 3.3V 电源
- 可与 SN65C3238、SN75C3238 互操作
- 支持 250kbit/s 至 1Mbit/s 的运行速度
- 使用人体放电模型 (HBM) 时, RS-232 总线引脚 ESD 保护大于  $\pm 15kV$

### 2 应用

- 电池供电型系统
- PDA
- 笔记本电脑
- 便携式计算机
- 掌上电脑
- 手持设备

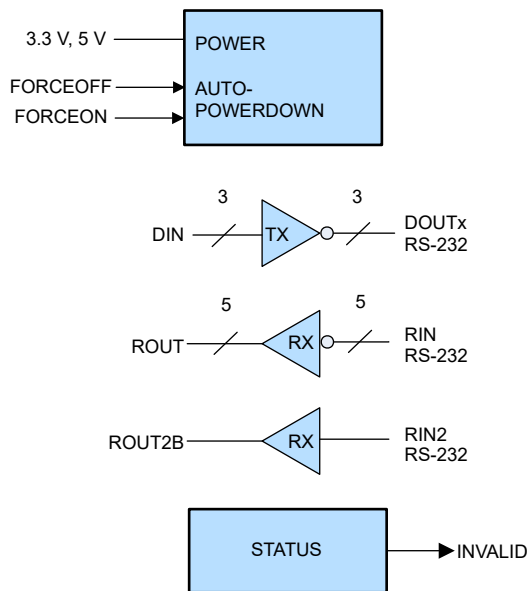
### 3 说明

TRSF3243 由 3 个线路驱动器、5 个线路接收器和一个双电荷泵电路组成, 具有引脚对引脚 (串行端口连接引脚, 包括 GND)  $\pm 15kV$  ESD 保护。该器件可在异步通信控制器和串行端口连接器之间提供电气接口。电荷泵和四个小型外部电容器支持由 3V 至 5.5V 单电源供电。另外, 该器件包括一个始终有效同相输出 (ROUT2B), 这使得使用振铃指示的应用能够在器件断电的情况下发送数据。该器件以高达 1Mbit/s 的数据信号传输速率运行, 具有从  $24V/\mu s$  至  $150V/\mu s$  的更高压摆率范围。

#### 封装信息

| 器件型号     | 封装 <sup>(1)</sup> | 封装尺寸 (标称值)        |
|----------|-------------------|-------------------|
| TRSF3243 | SSOP (DB)         | 10.20mm × 5.30mm  |
|          | SOIC (DW)         | 17.90 mm × 7.50mm |
|          | TSSOP (PW)        | 9.70mm × 4.40mm   |

(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。



简化版电路



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## 4 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 A (September 2008) to Revision B (October 2022)</b>                                                                      | <b>Page</b> |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| • 删除了 订购信息 表.....                                                                                                                                 | <b>1</b>    |
| • 更改了 封装信息 表.....                                                                                                                                 | <b>1</b>    |
| • 添加了 简化原理图 .....                                                                                                                                 | <b>1</b>    |
| • Added the <i>Pin Configuration and Functions</i> .....                                                                                          | <b>3</b>    |
| • Added the <i>Thermal Information</i> table.....                                                                                                 | <b>4</b>    |
| • Changed the I <sub>CC</sub> Supply current auto-powerdown disabled MAX value from 1 mA to 1.2 mA in the <i>Electrical Characteristics</i> ..... | <b>5</b>    |
| • Added the <i>Detailed Description</i> section.....                                                                                              | <b>12</b>   |

## 5 Pin Configuration and Functions

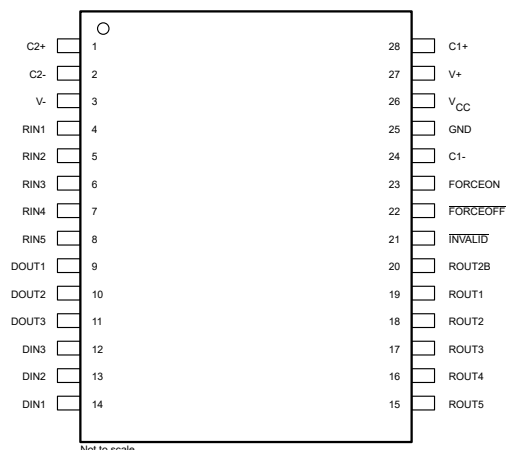


图 5-1. DB, DW, or PW Package, 28 Pin (SSOP, SOIC, TSSOP)  
(Top View)

表 5-1. Pin Functions

| PIN |                 | TYPE | DESCRIPTION                                                    |
|-----|-----------------|------|----------------------------------------------------------------|
| NO. | NAME            |      |                                                                |
| 1   | C2+             | —    | Positive terminal of the voltage-doubler charge-pump capacitor |
| 2   | C2-             | —    | Negative terminal of the voltage-doubler charge-pump capacitor |
| 3   | V-              | —    | Negative charge pump output voltage                            |
| 4   | RIN1            | I    | RS-232 receiver inputs                                         |
| 5   | RIN2            |      |                                                                |
| 6   | RIN3            |      |                                                                |
| 7   | RIN4            |      |                                                                |
| 8   | RIN5            |      |                                                                |
| 9   | DOUT1           | O    | RS-232 driver outputs                                          |
| 10  | DOUT2           |      |                                                                |
| 11  | DOUT3           |      |                                                                |
| 12  | DIN3            | I    | Driver inputs                                                  |
| 13  | DIN2            |      |                                                                |
| 14  | DIN1            |      |                                                                |
| 15  | ROUT5           | O    | Receiver outputs                                               |
| 16  | ROUT4           |      |                                                                |
| 17  | ROUT3           |      |                                                                |
| 18  | ROUT2           |      |                                                                |
| 19  | ROUT1           |      |                                                                |
| 20  | ROUT2B          | —    | Always-active noninverting receiver output;                    |
| 21  | INVALID         | O    | Invalid Output Pin                                             |
| 22  | FORCEOFF        | I    | Auto Powerdown Control input (Refer to Truth Table)            |
| 23  | FORCEON         | I    | Auto Powerdown Control input (Refer to Truth Table)            |
| 24  | C1-             | —    | Negative terminal of the voltage-doubler charge-pump capacitor |
| 25  | GND             | —    | Ground                                                         |
| 26  | V <sub>CC</sub> | —    | 3-V to 5.5-V supply voltage                                    |
| 27  | V+              | —    | Positive charge pump output voltage                            |
| 28  | C1+             | —    | Positive terminal of the voltage-doubler charge-pump capacitor |

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

|                  |                                                     |                             | MIN    | MAX  | UNIT |
|------------------|-----------------------------------------------------|-----------------------------|--------|------|------|
| V <sub>CC</sub>  | Supply voltage range <sup>(2)</sup>                 |                             | – 0.3  | 6    | V    |
| V+               | Positive-output supply voltage range <sup>(2)</sup> |                             | – 0.3  | 7    | V    |
| V –              | Negative-output supply voltage range <sup>(2)</sup> |                             | 0.3    | – 7  | V    |
| V+ – V –         | Supply voltage difference <sup>(2)</sup>            |                             |        | 13   | V    |
| V <sub>I</sub>   | Input voltage range                                 | Driver ( FORCEOFF, FORCEON) | – 0.3  | 6    | V    |
|                  |                                                     | Receiver                    | – 25   | 25   |      |
| V <sub>O</sub>   | Output voltage range                                | Driver                      | – 13.2 | 13.2 | V    |
| T <sub>J</sub>   | Operating virtual junction temperature              |                             |        | 150  | °C   |
| T <sub>stg</sub> | Storage temperature range                           |                             | – 65   | 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 voltages are with respect to network GND.

### 6.2 Recommended Operating Conditions

see 图 7-6 <sup>(1)</sup>

|                 |                                             |                         | MIN                     | NOM  | MAX | UNIT |    |    |
|-----------------|---------------------------------------------|-------------------------|-------------------------|------|-----|------|----|----|
| Supply voltage  |                                             | V <sub>CC</sub> = 3.3 V | 3                       | 3.3  | 3.6 | V    |    |    |
|                 |                                             | V <sub>CC</sub> = 5 V   | 4.5                     | 5    | 5.5 |      |    |    |
| V <sub>IH</sub> | Driver and control high-level input voltage | DIN, FORCEOFF, FORCEON  | V <sub>CC</sub> = 3.3 V |      |     | V    |    |    |
|                 |                                             |                         | V <sub>CC</sub> = 5 V   |      |     |      |    |    |
| V <sub>IL</sub> | Driver and control low-level input voltage  | DIN, FORCEOFF, FORCEON  |                         |      | 0.8 | V    |    |    |
| V <sub>I</sub>  | Driver and control input voltage            | DIN, FORCEOFF, FORCEON  |                         |      | 0   | 5.5  | V  |    |
| V <sub>I</sub>  | Receiver input voltage                      |                         | – 25                    |      |     | 25   | V  |    |
| T <sub>A</sub>  | Operating free-air temperature              |                         | TRSF3243I               | – 40 |     |      | 85 | °C |
|                 |                                             |                         | TRSF3243C               | 0    |     |      | 70 |    |

(1) Test conditions are C1 – C4 = 0.1 μF at V<sub>CC</sub> = 3.3 V ± 0.3 V; C1 = 0.047 μF, C2 – C4 = 0.33 μF at V<sub>CC</sub> = 5 V ± 0.5 V.

### 6.3 Thermal Information

| THERMAL METRIC <sup>(1)</sup> |                                              | TSSOP (PW) | SOIC (DW) | DB (SSOP) | UNIT |
|-------------------------------|----------------------------------------------|------------|-----------|-----------|------|
|                               |                                              | 28 PINS    | 28 PINS   | 28 PINS   |      |
| R <sub>θJA</sub>              | Junction-to-ambient thermal resistance       | 70.3       | 59.0      | 76.1      | °C/W |
| R <sub>θJC(top)</sub>         | Junction-to-case (top) thermal resistance    | 21.0       | 28.8      | 35.8      | °C/W |
| R <sub>θJB</sub>              | Junction-to-board thermal resistance         | 29.2       | 30.3      | 37.4      | °C/W |
| ψ <sub>JT</sub>               | Junction-to-top characterization parameter   | 1.3        | 7.8       | 7.4       | °C/W |
| ψ <sub>JB</sub>               | Junction-to-board characterization parameter | 28.8       | 30.0      | 37.0      | °C/W |
| R <sub>θJC(bot)</sub>         | Junction-to-case (bottom) thermal resistance | N/A        | N/A       | N/A       | °C/W |

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

## 6.4 Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see 图 7-6) <sup>(2)</sup>

| PARAMETER       |                       | TEST CONDITIONS         | MIN                                                                                                              | TYP <sup>(1)</sup> | MAX | UNIT |
|-----------------|-----------------------|-------------------------|------------------------------------------------------------------------------------------------------------------|--------------------|-----|------|
| I <sub>I</sub>  | Input leakage current | FORCEOFF, FORCEON       |                                                                                                                  | ±0.01              | ±1  | μ A  |
| I <sub>CC</sub> | Supply current        | Auto-powerdown disabled | No load,<br>FORCEOFF and FORCEON = V <sub>CC</sub><br>For DB and PW package                                      | 0.3                | 1.2 | mA   |
|                 |                       | Auto-powerdown disabled | No load,<br>FORCEOFF and FORCEON = V <sub>CC</sub><br>For DW package                                             | 0.3                | 1   | mA   |
|                 |                       | Powered off             | No load, FORCEOFF = GND                                                                                          | 1                  | 10  | μ A  |
|                 |                       | Auto-powerdown enabled  | No load, FORCEOFF = V <sub>CC</sub> ,<br>FORCEON = GND,<br>All RIN are open or grounded,<br>All DIN are grounded | 1                  | 10  |      |

(1) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

(2) Test conditions are C1 - C4 = 0.1 μ F at V<sub>CC</sub> = 3.3 V ± 0.3 V; C1 = 0.047 μ F, C2 - C4 = 0.33 μ F at V<sub>CC</sub> = 5 V ± 0.5 V.

## 6.5 Electrical Characteristics: Driver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see 图 7-6)

| PARAMETER        |                                             | TEST CONDITIONS <sup>(3)</sup>                                                           | MIN   | TYP <sup>(1)</sup> | MAX | UNIT |
|------------------|---------------------------------------------|------------------------------------------------------------------------------------------|-------|--------------------|-----|------|
| V <sub>OH</sub>  | High-level output voltage                   | All DOUT at R <sub>L</sub> = 3 kΩ to GND                                                 | 5     | 5.4                |     | V    |
| V <sub>OL</sub>  | Low-level output voltage                    | All DOUT at R <sub>L</sub> = 3 kΩ to GND                                                 | - 5   | - 5.4              |     | V    |
| V <sub>O</sub>   | Output voltage (mouse driveability)         | DIN1 = DIN2 = GND, DIN3 = V <sub>CC</sub> , 3-kΩ to GND at DOUT3, DOUT1 = DOUT2 = 2.5 mA | ±5    |                    |     | V    |
| I <sub>IH</sub>  | High-level input current                    | V <sub>I</sub> = V <sub>CC</sub>                                                         | ±0.01 | ±1                 |     | μ A  |
| I <sub>IL</sub>  | Low-level input current                     | V <sub>I</sub> = GND                                                                     | ±0.01 | ±1                 |     | μ A  |
| I <sub>OS</sub>  | Short-circuit output current <sup>(2)</sup> | V <sub>CC</sub> = 3.6 V, V <sub>O</sub> = 0 V                                            | ±35   | ±60                |     | mA   |
|                  |                                             | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 0 V                                            | ±35   | ±90                |     |      |
| r <sub>o</sub>   | Output resistance                           | V <sub>CC</sub> , V <sub>+</sub> , and V <sub>-</sub> = 0 V, V <sub>O</sub> = ±2 V       | 300   | 10M                |     | Ω    |
| I <sub>off</sub> | Output leakage current                      | FORCEOFF = GND, V <sub>O</sub> = ±12 V, V <sub>CC</sub> = 3 V to 3.6 V                   |       |                    | ±25 | μ A  |
|                  |                                             | V <sub>O</sub> = ±10 V, V <sub>CC</sub> = 4.5 V to 5.5 V                                 |       |                    | ±25 |      |

(1) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

(2) Short-circuit durations should be controlled to prevent exceeding the device absolute power dissipation ratings, and not more than one output should be shorted at a time.

(3) Test conditions are C1 - C4 = 0.1 μ F at V<sub>CC</sub> = 3.3 V ± 0.3 V; C1 = 0.047 μ F, C2 - C4 = 0.33 μ F at V<sub>CC</sub> = 5 V ± 0.5 V.

## 6.6 Switching Characteristics: Driver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 7-6](#))

| PARAMETER                                                                   | TEST CONDITIONS <sup>(3)</sup>                                                                                                 | MIN                                                              | TYP <sup>(1)</sup> | MAX | UNIT              |
|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|--------------------|-----|-------------------|
| Maximum data rate<br>(see <a href="#">Figure 7-1</a> )                      | $R_L = 3\text{ k}\Omega$ ,<br>One DOUT switching                                                                               | $C_L = 1000\text{ pF}$                                           | 250                |     | kbit/s            |
|                                                                             |                                                                                                                                | $C_L = 250\text{ pF}$ , $V_{CC} = 3\text{ V to }4.5\text{ V}$    | 1000               |     |                   |
|                                                                             |                                                                                                                                | $C_L = 1000\text{ pF}$ , $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ | 1000               |     |                   |
| $t_{sk(p)}$ Pulse skew <sup>(2)</sup>                                       | $C_L = 150\text{ pF to }2500\text{ pF}$ , $R_L = 3\text{ k}\Omega\text{ to }7\text{ k}\Omega$ , See <a href="#">Figure 7-2</a> |                                                                  | 25                 |     | ns                |
| SR(tr) Slew rate,<br>transition region<br>(see <a href="#">Figure 7-1</a> ) | $C_L = 150\text{ pF to }1000\text{ pF}$ , $R_L = 3\text{ k}\Omega\text{ to }7\text{ k}\Omega$ , $V_{CC} = 3.3\text{ V}$        |                                                                  | 18                 | 150 | V/ $\mu\text{ s}$ |

(1) All typical values are at  $V_{CC} = 3.3\text{ V}$  or  $V_{CC} = 5\text{ V}$ , and  $T_A = 25^\circ\text{C}$ .

(2) Pulse skew is defined as  $|t_{PLH} - t_{PHL}|$  of each channel of the same device.

(3) Test conditions are  $C_1 - C_4 = 0.1\text{ }\mu\text{F}$  at  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ ;  $C_1 = 0.047\text{ }\mu\text{F}$ ,  $C_2 - C_4 = 0.33\text{ }\mu\text{F}$  at  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ .

## 6.7 Electrical Characteristics: Receiver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 7-6](#))

| PARAMETER                                          | TEST CONDITIONS <sup>(2)</sup>             | MIN            | TYP <sup>(1)</sup> | MAX      | UNIT           |
|----------------------------------------------------|--------------------------------------------|----------------|--------------------|----------|----------------|
| $V_{OH}$ High-level output voltage                 | $I_{OH} = -1\text{ mA}$                    | $V_{CC} - 0.6$ | $V_{CC} - 0.1$     |          | V              |
| $V_{OL}$ Low-level output voltage                  | $I_{OL} = 1.6\text{ mA}$                   |                |                    | 0.4      | V              |
| $V_{IT+}$ Positive-going input threshold voltage   | $V_{CC} = 3.3\text{ V}$                    |                | 1.6                | 2.4      | V              |
|                                                    | $V_{CC} = 5\text{ V}$                      |                | 1.9                | 2.4      |                |
| $V_{IT-}$ Negative-going input threshold voltage   | $V_{CC} = 3.3\text{ V}$                    | 0.6            | 1.1                |          | V              |
|                                                    | $V_{CC} = 5\text{ V}$                      | 0.8            | 1.4                |          |                |
| $V_{hys}$ Input hysteresis ( $V_{IT+} - V_{IT-}$ ) |                                            |                | 0.5                |          | V              |
| $I_{off}$ Output leakage current (except ROUT2B)   | FORCEOFF = 0 V                             |                | $\pm 0.05$         | $\pm 10$ | $\mu\text{ A}$ |
| $r_i$ Input resistance                             | $V_I = \pm 3\text{ V to } \pm 25\text{ V}$ | 3              | 5                  | 7        | k $\Omega$     |

(1) All typical values are at  $V_{CC} = 3.3\text{ V}$  or  $V_{CC} = 5\text{ V}$ , and  $T_A = 25^\circ\text{C}$ .

(2) Test conditions are  $C_1 - C_4 = 0.1\text{ }\mu\text{F}$  at  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ ;  $C_1 = 0.047\text{ }\mu\text{F}$ ,  $C_2 - C_4 = 0.33\text{ }\mu\text{F}$  at  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ .

## 6.8 Switching Characteristics: Receiver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

| PARAMETER                                                   | TEST CONDITIONS <sup>(3)</sup>                                                    | TYP <sup>(1)</sup> | UNIT |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------|------|
| $t_{PLH}$ Propagation delay time, low- to high-level output | $C_L = 150\text{ pF}$ , See <a href="#">Figure 7-3</a>                            | 150                | ns   |
| $t_{PHL}$ Propagation delay time, high- to low-level output | $C_L = 150\text{ pF}$ , See <a href="#">Figure 7-3</a>                            | 150                | ns   |
| $t_{en}$ Output enable time                                 | $C_L = 150\text{ pF}$ , $R_L = 3\text{ k}\Omega$ , See <a href="#">Figure 7-4</a> | 200                | ns   |
| $t_{dis}$ Output disable time                               | $C_L = 150\text{ pF}$ , $R_L = 3\text{ k}\Omega$ , See <a href="#">Figure 7-4</a> | 200                | ns   |
| $t_{sk(p)}$ Pulse skew <sup>(2)</sup>                       | See <a href="#">Figure 7-3</a>                                                    | 50                 | ns   |

(1) All typical values are at  $V_{CC} = 3.3\text{ V}$  or  $V_{CC} = 5\text{ V}$ , and  $T_A = 25^\circ\text{C}$ .

(2) Pulse skew is defined as  $|t_{PLH} - t_{PHL}|$  of each channel of the same device.

(3) Test conditions are  $C_1 - C_4 = 0.1\text{ }\mu\text{F}$  at  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ ;  $C_1 = 0.047\text{ }\mu\text{F}$ ,  $C_2 - C_4 = 0.33\text{ }\mu\text{F}$  at  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ .

## 6.9 Electrical Characteristics: Auto-Powerdown

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see 图 7-5)

| PARAMETER               |                                                                       | TEST CONDITIONS                                               | MIN            | MAX | UNIT |
|-------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------|----------------|-----|------|
| $V_{T+}(\text{valid})$  | Receiver input threshold for <b>INVALID</b> high-level output voltage | FORCEON = GND, FORCEOFF = $V_{CC}$                            |                | 2.7 | V    |
| $V_{T-}(\text{valid})$  | Receiver input threshold for <b>INVALID</b> high-level output voltage | FORCEON = GND, FORCEOFF = $V_{CC}$                            | - 2.7          |     | V    |
| $V_{T}(\text{invalid})$ | Receiver input threshold for <b>INVALID</b> low-level output voltage  | FORCEON = GND, FORCEOFF = $V_{CC}$                            | - 0.3          | 0.3 | V    |
| $V_{OH}$                | <b>INVALID</b> high-level output voltage                              | $I_{OH} = -1\text{ mA}$ , FORCEON = GND, FORCEOFF = $V_{CC}$  | $V_{CC} - 0.6$ |     | V    |
| $V_{OL}$                | <b>INVALID</b> low-level output voltage                               | $I_{OL} = 1.6\text{ mA}$ , FORCEON = GND, FORCEOFF = $V_{CC}$ |                | 0.4 | V    |

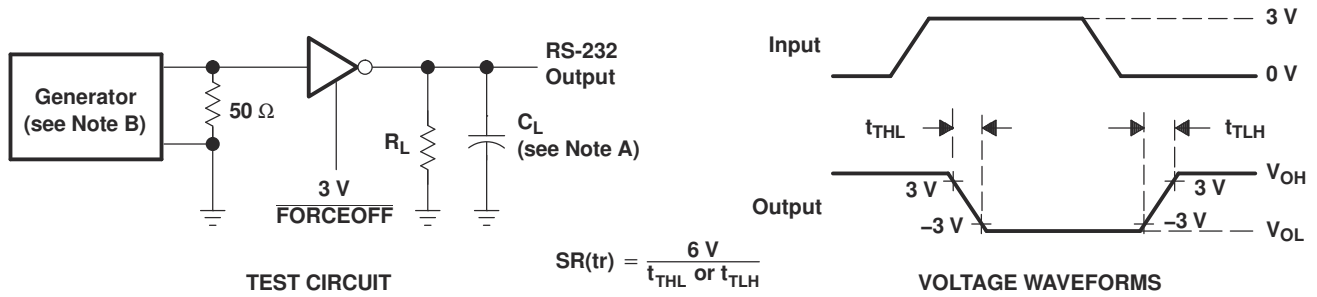
## 6.10 Switching Characteristics: Auto-Powerdown

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see 图 7-5)

| PARAMETER            |                                                   | TYP <sup>(1)</sup> | UNIT           |
|----------------------|---------------------------------------------------|--------------------|----------------|
| $t_{\text{valid}}$   | Propagation delay time, low- to high-level output | 1                  | $\mu\text{ s}$ |
| $t_{\text{invalid}}$ | Propagation delay time, high- to low-level output | 30                 | $\mu\text{ s}$ |
| $t_{\text{en}}$      | Supply enable time                                | 100                | $\mu\text{ s}$ |

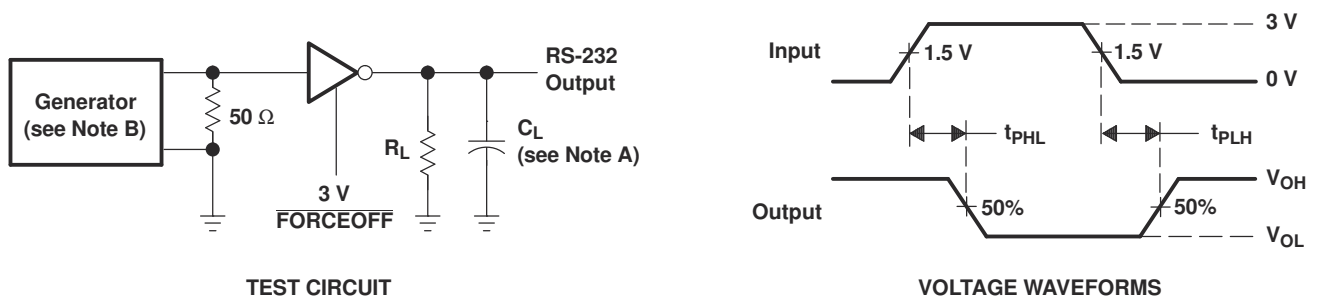
(1) All typical values are at  $V_{CC} = 3.3\text{ V}$  or  $V_{CC} = 5\text{ V}$ , and  $T_A = 25^\circ\text{C}$ .

## Parameter Measurement Information



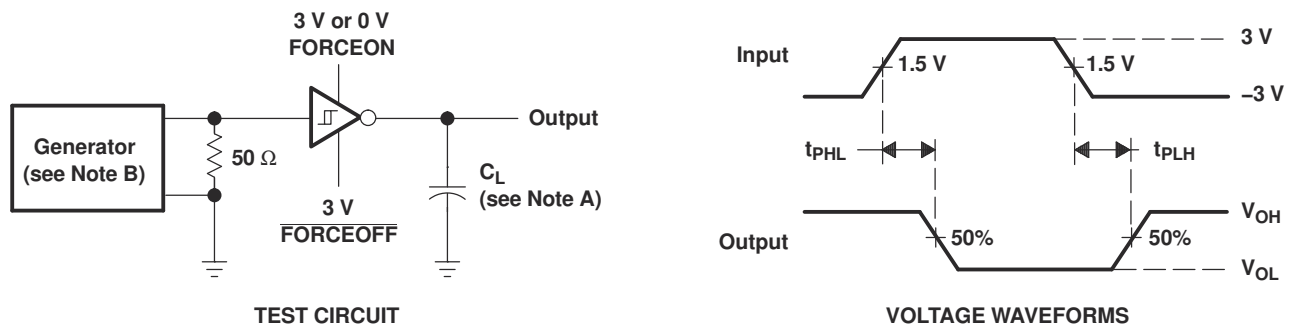
NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. The pulse generator has the following characteristics: PRR = 1 Mbit/s,  $Z_O = 50\ \Omega$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

图 7-1. Driver Slew Rate



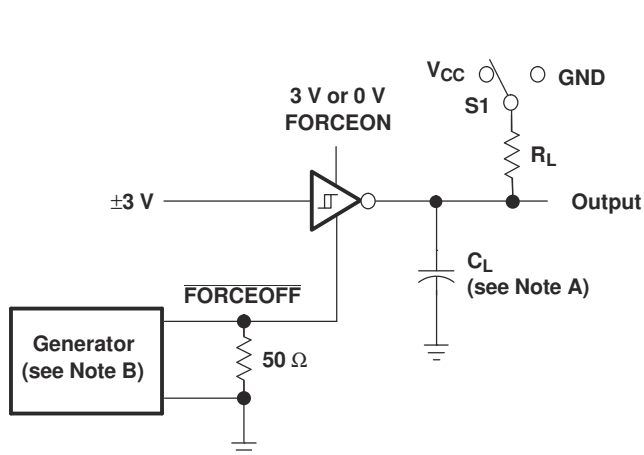
NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. The pulse generator has the following characteristics: PRR = 1 Mbit/s,  $Z_O = 50\ \Omega$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

图 7-2. Driver Pulse Skew

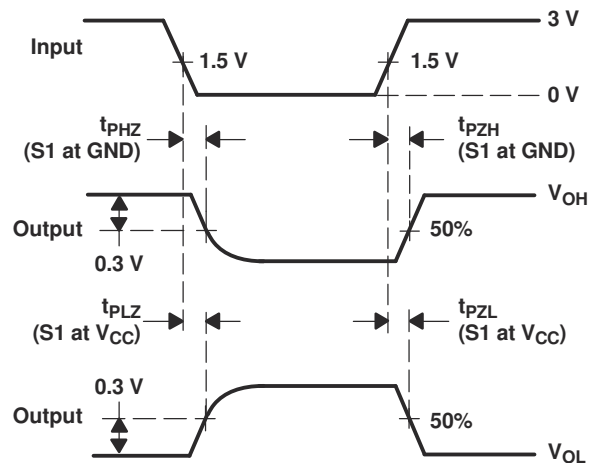


NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. The pulse generator has the following characteristics:  $Z_O = 50\ \Omega$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

图 7-3. Receiver Propagation Delay Times



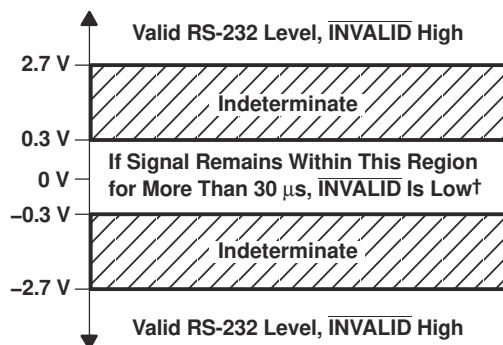
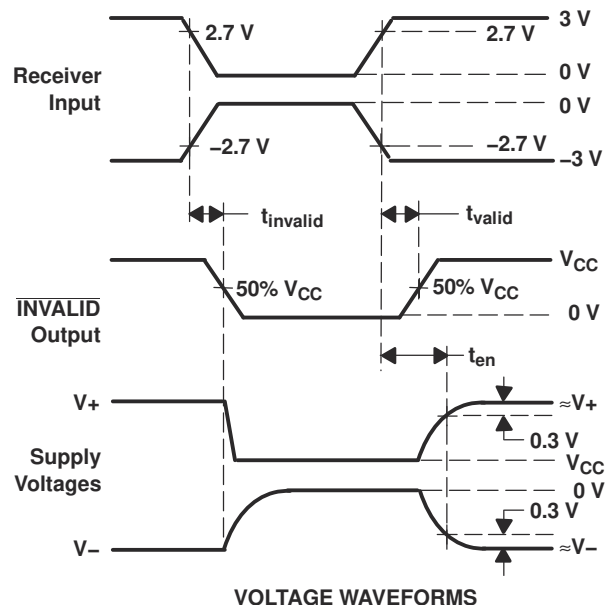
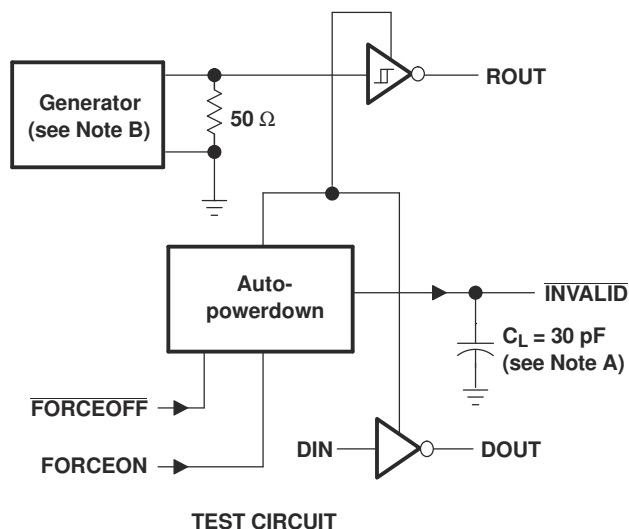
TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. C<sub>L</sub> includes probe and jig capacitance.  
B. The pulse generator has the following characteristics: Z<sub>O</sub> = 50 Ω, 50% duty cycle, t<sub>r</sub> ≤ 10 ns, t<sub>f</sub> ≤ 10 ns.  
C. t<sub>PLZ</sub> and t<sub>PHZ</sub> are the same as t<sub>dis</sub>.  
D. t<sub>PZL</sub> and t<sub>PZH</sub> are the same as t<sub>en</sub>.

图 7-4. Receiver Enable and Disable Times

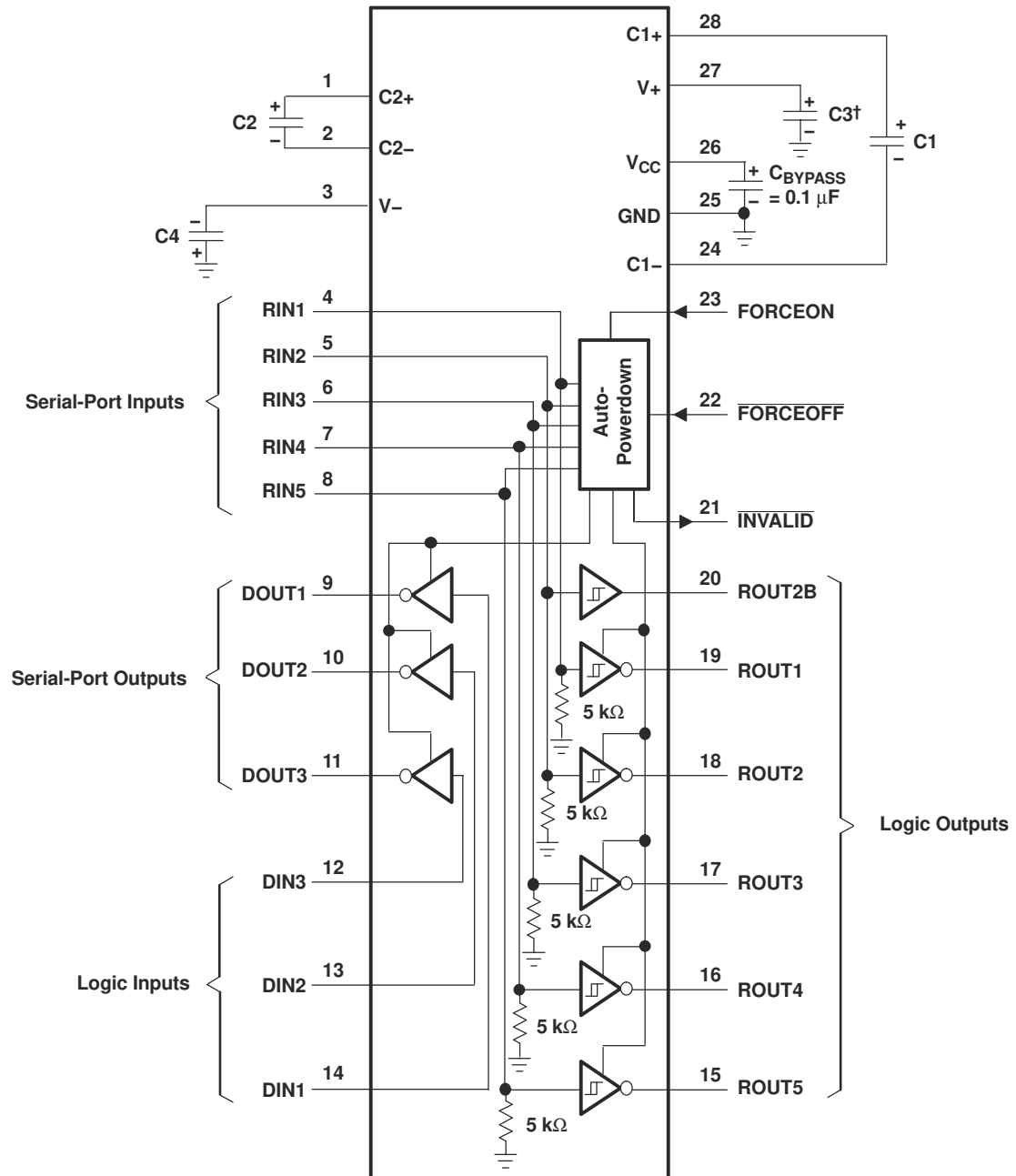


† Auto-powerdown disables drivers and reduces supply current to 1  $\mu\text{A}$ .

NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 5 kbit/s,  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10 \text{ ns}$ ,  $t_f \leq 10 \text{ ns}$ .

图 7-5.  $\overline{\text{INVALID}}$  Propagation Delay Times and Supply Enabling Time



† C3 can be connected to  $V_{CC}$  or GND.

NOTE A: Resistor values shown are nominal.

**$V_{CC}$  vs CAPACITOR VALUES**

| $V_{CC}$          | C1            | C2, C3, and C4 |
|-------------------|---------------|----------------|
| 3.3 V $\pm$ 0.3 V | 0.1 $\mu$ F   | 0.1 $\mu$ F    |
| 5 V $\pm$ 0.5 V   | 0.047 $\mu$ F | 0.33 $\mu$ F   |
| 3 V to 5.5 V      | 0.1 $\mu$ F   | 0.47 $\mu$ F   |

**图 7-6. Typical Operating Circuit and Capacitor Values**

## 7 Detailed Description

### 7.1 Overview

Flexible control options for power management are available when the serial port is inactive. The auto-powerdown feature functions when FORCEON is low and FORCEOFF is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If FORCEOFF is set low, both drivers and receivers (except ROUT2B) are shut off, and the supply current is reduced to 1  $\mu$ A. Disconnecting the serial port or turning off the peripheral drivers causes the auto-powerdown condition to occur.

Auto-powerdown can be disabled when FORCEON and FORCEOFF are high and should be done when driving a serial mouse. With auto-powerdown enabled, the device is activated automatically when a valid signal is applied to any receiver input. The INVALID output is used to notify the user if an RS-232 signal is present at any receiver input. INVALID is high (valid data) if any receiver input voltage is greater than 2.7 V or less than  $-2.7$  V or has been between  $-0.3$  V and 0.3 V for less than 30  $\mu$ s. INVALID is low (invalid data) if all receiver input voltages are between  $-0.3$  V and 0.3 V for more than 30  $\mu$ s. Refer to [Figure 7-5](#) for receiver input levels.

### 7.2 Device Functional Modes

#### 7.2.1 Function Tables

**EACH DRIVER<sup>(1)</sup>**

| INPUTS |         |          |                           | OUTPUT<br>DOUT | DRIVER STATUS                                 |
|--------|---------|----------|---------------------------|----------------|-----------------------------------------------|
| DIN    | FORCEON | FORCEOFF | VALID RIN<br>RS-232 LEVEL |                |                                               |
| X      | X       | L        | X                         | Z              | Powered off                                   |
| L      | H       | H        | X                         | H              | Normal operation with auto-powerdown disabled |
| H      | H       | H        | X                         | L              |                                               |
| L      | L       | H        | Yes                       | H              | Normal operation with auto-powerdown enabled  |
| H      | L       | H        | Yes                       | L              |                                               |
| L      | L       | H        | No                        | Z              | Powered off by auto-powerdown feature         |
| H      | L       | H        | No                        | Z              |                                               |

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

**EACH RECEIVER<sup>(1)</sup>**

| INPUTS |                      |          |                              | OUTPUTS |       |                     | RECEIVER STATUS                                             |
|--------|----------------------|----------|------------------------------|---------|-------|---------------------|-------------------------------------------------------------|
| RIN2   | RIN1,<br>RIN3 – RIN5 | FORCEOFF | VALID RIN<br>RS-232<br>LEVEL | ROUT2B  | ROUT2 | ROUT1,<br>ROUT3 – 5 |                                                             |
| L      | X                    | L        | X                            | L       | Z     | Z                   | Powered off while<br>ROUT2B is active                       |
| H      | X                    | L        | X                            | H       | Z     | Z                   |                                                             |
| L      | L                    | H        | YES                          | L       | H     | H                   | Normal operation with<br>auto-powerdown<br>disabled/enabled |
| L      | H                    | H        | YES                          | L       | L     | L                   |                                                             |
| H      | L                    | H        | YES                          | H       | H     | H                   |                                                             |
| H      | H                    | H        | YES                          | H       | L     | L                   |                                                             |
| Open   | Open                 | H        | YES                          | L       | H     | H                   |                                                             |

(1) H = high level, L = low level, X = irrelevant, Z = high impedance (off), Open = input disconnected or connected driver off

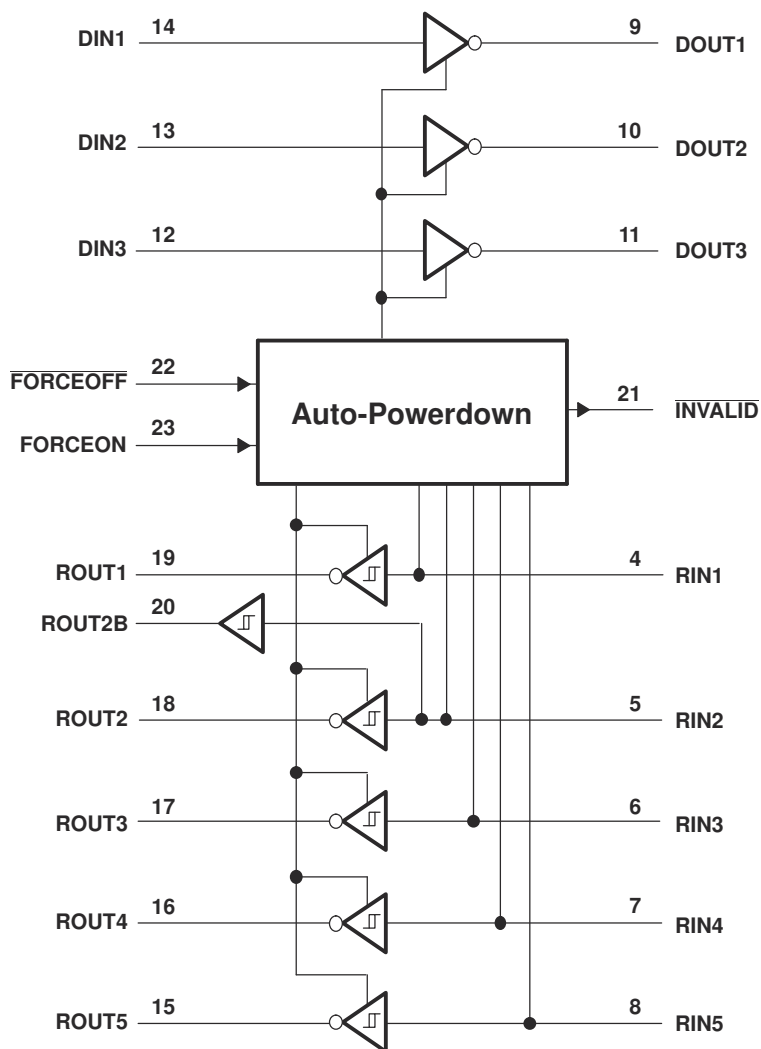


图 7-1. LOGIC DIAGRAM (POSITIVE LOGIC)

## 8 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

### 8.1 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。

### 8.2 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》。

### 8.3 商标

TI E2E™ is a trademark of Texas Instruments.

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### 8.4 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.

### 8.5 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。

## 9 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="#">TRSF3243IDB</a>  | Active        | Production           | SSOP (DB)   28  | 50   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -            | TRSF3243I           |
| TRSF3243IDB.A                | Active        | Production           | SSOP (DB)   28  | 50   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | TRSF3243I           |
| <a href="#">TRSF3243IPWR</a> | Active        | Production           | TSSOP (PW)   28 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | RT43I               |
| TRSF3243IPWR.A               | Active        | Production           | TSSOP (PW)   28 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | RT43I               |

<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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## 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 |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| TRSF3243IPWR | TSSOP        | PW              | 28   | 2000 | 330.0              | 16.4               | 6.75    | 10.1    | 1.8     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device       | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| TRSF3243IPWR | TSSOP        | PW              | 28   | 2000 | 353.0       | 353.0      | 32.0        |

## TUBE

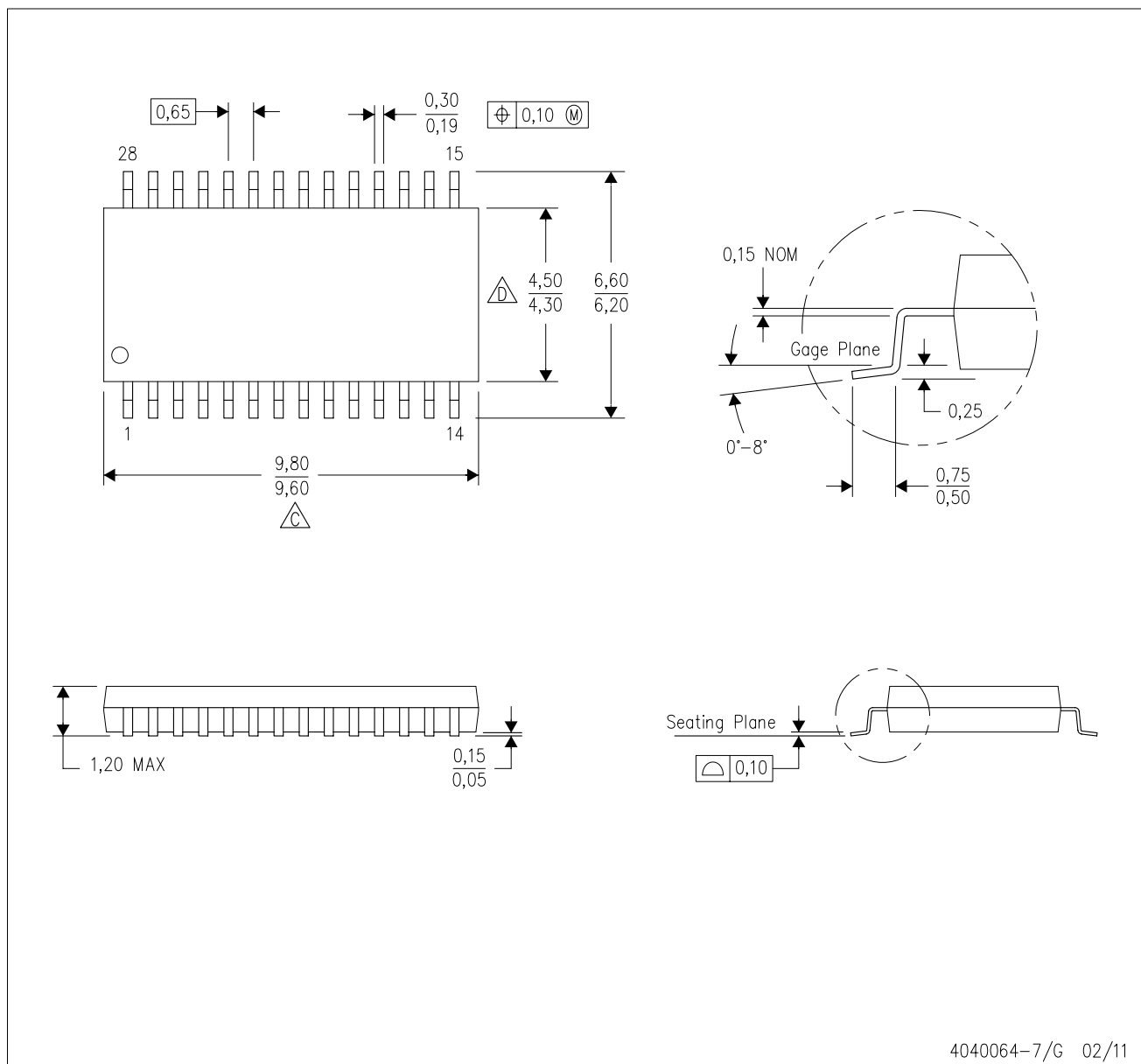


\*All dimensions are nominal

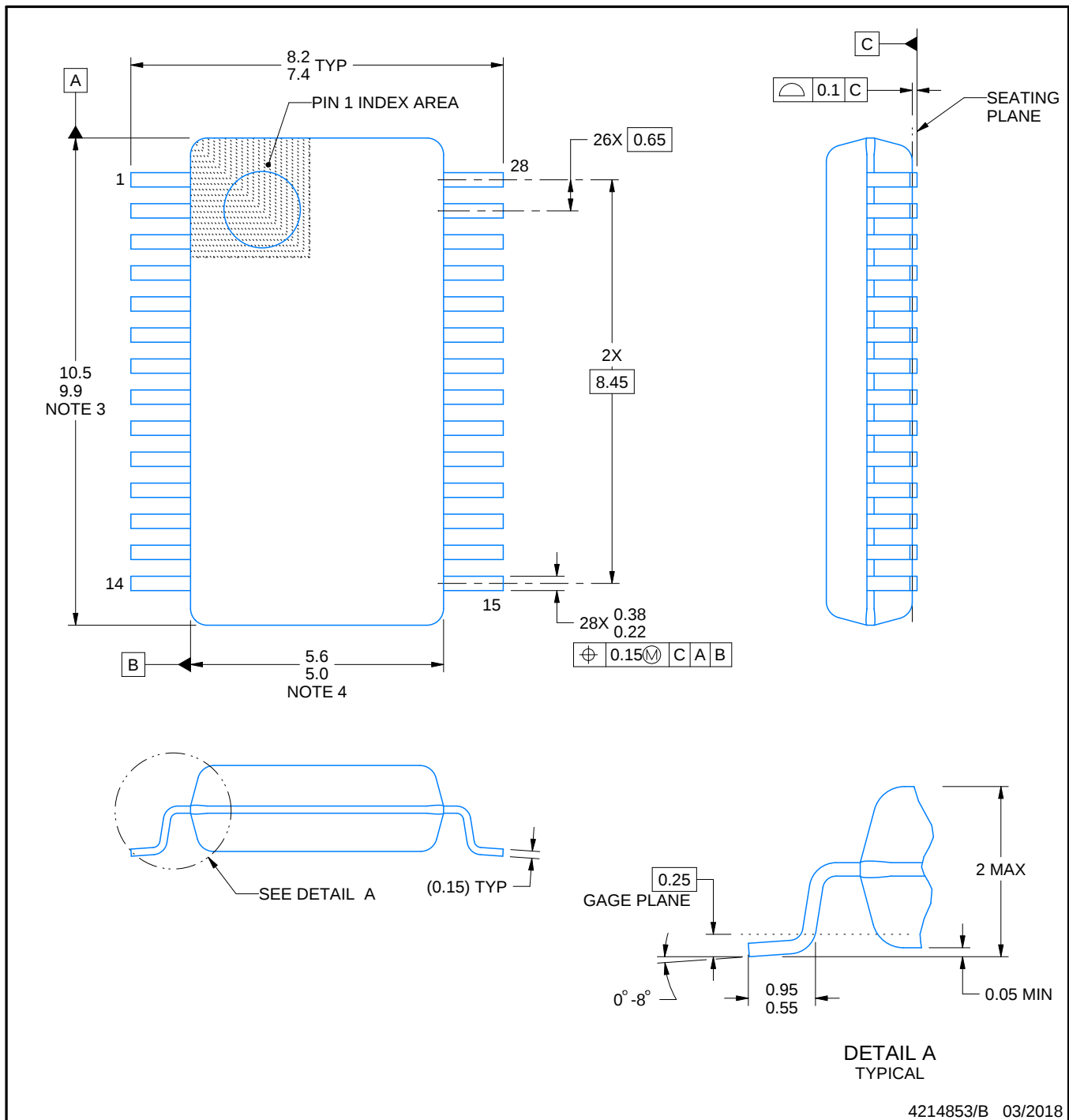
| Device        | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|---------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| TRSF3243IDB   | DB           | SSOP         | 28   | 50  | 530    | 10.5   | 4000   | 4.1    |
| TRSF3243IDB.A | DB           | SSOP         | 28   | 50  | 530    | 10.5   | 4000   | 4.1    |

PW (R-PDSO-G28)

PLASTIC SMALL OUTLINE



- 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. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153



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## NOTES:

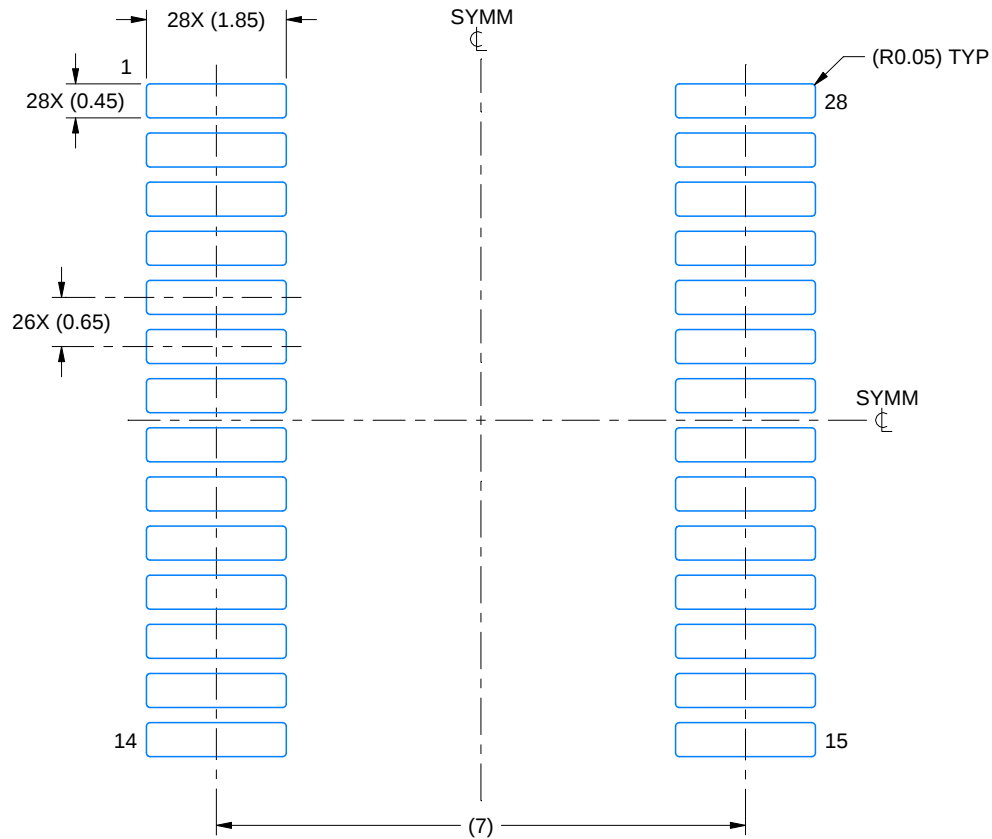
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or 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-150.

# EXAMPLE BOARD LAYOUT

DB0028A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

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NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

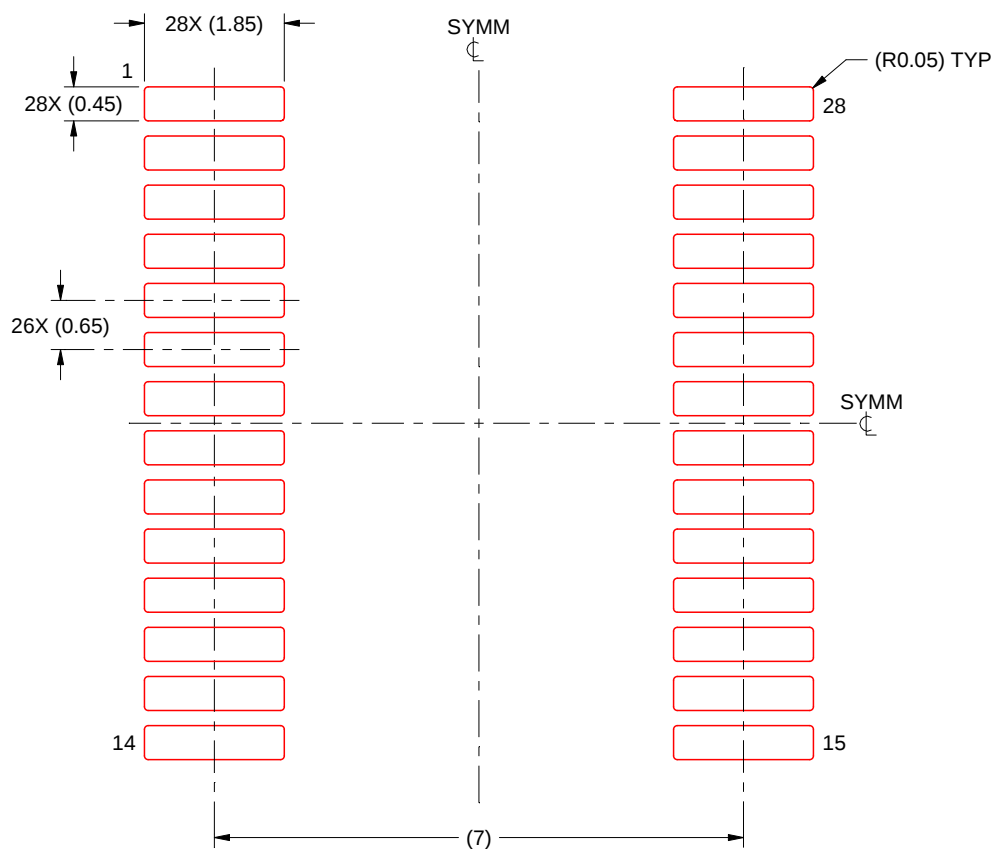
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DB0028A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

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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.

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