

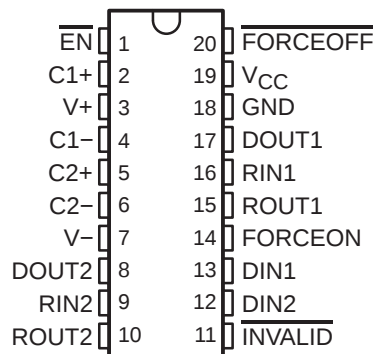
# SN65C3223, SN75C3223

## 3-V TO 5.5-V MULTICHANNEL RS-232 COMPATIBLE LINE DRIVER/RECEIVER

SLLS538B – JUNE 2002 – REVISED OCTOBER 2004

- Operate With 3-V to 5.5-V  $V_{CC}$  Supply
- Operate Up To 1 Mbit/s
- Low Standby Current . . . 1  $\mu$ A Typ
- External Capacitors . . .  $4 \times 0.1 \mu$ F
- Accept 5-V Logic Input With 3.3-V Supply
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- RS-232 Bus-Pin ESD Protection Exceeds  $\pm 15$  kV Using Human-Body Model (HBM)
- Applications
  - Battery-Powered Systems, PDAs, Notebooks, Laptops, Palmtop PCs, and Hand-Held Equipment

DB, DW, OR PW PACKAGE  
(TOP VIEW)



### description/ordering information

The SN65C3223 and SN75C3223 consist of two line drivers, two line receivers, and a dual charge-pump circuit with  $\pm 15$ -kV ESD protection pin to pin (serial-port connection pins, including GND). The devices provide the electrical interface between an asynchronous communication controller and the serial-port connector. The charge pump and four small external capacitors allow operation from a single 3-V to 5.5-V supply. The devices operate at data signaling rates up to 1 Mbit/s and a driver output slew rate of 24 V/ $\mu$ s to 150 V/ $\mu$ s.

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 and EN is high, both drivers and receivers are shut off, and the supply current is reduced to 1  $\mu$ A. Disconnecting the serial port or turning off the peripheral drivers causes auto-powerdown to occur. Auto-powerdown can be disabled when FORCEON and FORCEOFF are high. 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 the receiver input voltage is between -0.3 V and 0.3 V for more than 30  $\mu$ s. Refer to Figure 4 for receiver input levels.

### ORDERING INFORMATION

| T <sub>A</sub> | PACKAGE <sup>†</sup> |              | ORDERABLE<br>PART NUMBER | TOP-SIDE<br>MARKING |
|----------------|----------------------|--------------|--------------------------|---------------------|
| 0°C to 70°C    | SOIC – DW            | Tube of 25   | SN75C3223DW              | 75C3223             |
|                |                      | Reel of 2000 | SN75C3223DWR             |                     |
|                | SSOP – DB            | Reel of 2000 | SN75C3223DBR             | CA3223              |
|                | TSSOP – PW           | Tube of 70   | SN75C3223PW              | CA3223              |
|                |                      | Reel of 2000 | SN75C3223PWR             |                     |
| –40°C to 85°C  | SOIC – DW            | Tube of 25   | SN65C3223DW              | 65C3223             |
|                |                      | Reel of 2000 | SN65C3223DWR             |                     |
|                | SSOP – DB            | Reel of 2000 | SN65C3223DBR             | CB3223              |
|                | TSSOP – PW           | Tube of 70   | SN65C3223PW              | CB3223              |
|                |                      | Reel of 2000 | SN65C3223PWR             |                     |

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

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



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

**TEXAS  
INSTRUMENTS**

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SN65C3223, SN75C3223

3-V TO 5.5-V MULTICHANNEL RS-232 COMPATIBLE LINE DRIVER/RECEIVER

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Function Tables

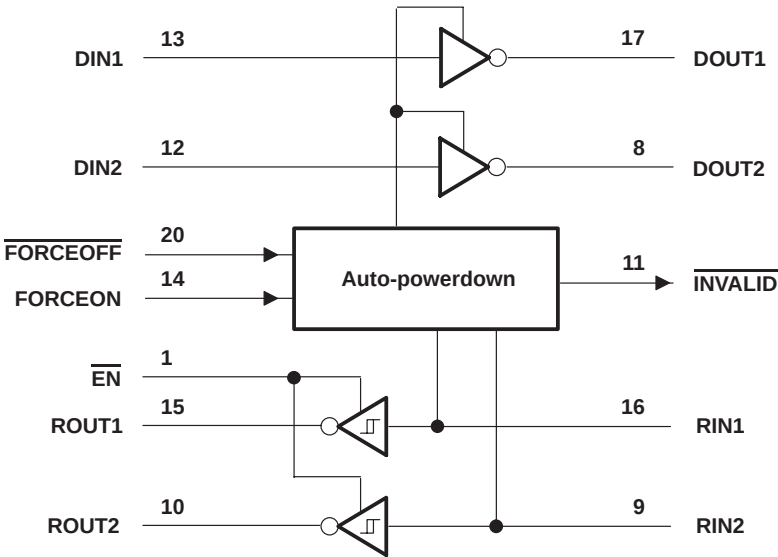
| EACH DRIVER |         |          |                        |             | DRIVER STATUS                                 |
|-------------|---------|----------|------------------------|-------------|-----------------------------------------------|
| INPUTS      |         |          | VALID RIN RS-232 LEVEL | OUTPUT DOUT |                                               |
| DIN         | FORCEON | FORCEOFF |                        |             |                                               |
| 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           |                                               |

H = high level, L = low level, X = irrelevant, Z = high impedance

| EACH RECEIVER |    |                        |             |
|---------------|----|------------------------|-------------|
| INPUTS        |    |                        | OUTPUT ROUT |
| RIN           | EN | VALID RIN RS-232 LEVEL |             |
| L             | L  | X                      | H           |
| H             | L  | X                      | L           |
| X             | H  | X                      | Z           |
| Open          | L  | No                     | H           |

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

logic diagram (positive logic)



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### absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                                          |                            |
|------------------------------------------------------------------------------------------|----------------------------|
| Supply voltage range, $V_{CC}$ (see Note 1)                                              | –0.3 V to 6 V              |
| Positive output supply voltage range, $V+$ (see Note 1)                                  | –0.3 V to 7 V              |
| Negative output supply voltage range, $V-$ (see Note 1)                                  | 0.3 V to –7 V              |
| Supply voltage difference, $V+ - V-$ (see Note 1)                                        | 13 V                       |
| Input voltage range, $V_I$ : Driver, $\overline{FORCEOFF}$ , $FORCEON$ , $\overline{EN}$ | –0.3 V to 6 V              |
| Receiver                                                                                 | –25 V to 25 V              |
| Output voltage range, $V_O$ : Driver                                                     | –13.2 V to 13.2 V          |
| Receiver, $INVALID$                                                                      | –0.3 V to $V_{CC} + 0.3$ V |
| Package thermal impedance, $\theta_{JA}$ (see Notes 2 and 3): DB package                 | 70°C/W                     |
| DW package                                                                               | 58°C/W                     |
| PW package                                                                               | 83°C/W                     |
| Operating virtual junction temperature, $T_J$                                            | 150°C                      |
| Storage temperature range, $T_{stg}$                                                     | –65°C to 150°C             |

<sup>†</sup> 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.

NOTES: 1. All voltages are with respect to network GND.

2. Maximum power dissipation is a function of  $T_J(\max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\max) - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  of 150°C can affect reliability.

3. The package thermal impedance is calculated in accordance with JESD 51-7.

### recommended operating conditions (see Note 4 and Figure 6)

|                 |                                             |                                                                         | MIN                     | NOM | MAX | UNIT |    |
|-----------------|---------------------------------------------|-------------------------------------------------------------------------|-------------------------|-----|-----|------|----|
| V <sub>CC</sub> | 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, $\overline{\text{EN}}$ , $\overline{\text{FORCEOFF}}$ ,<br>FORCEON | V <sub>CC</sub> = 3.3 V | 2   |     |      | V  |
|                 |                                             |                                                                         | V <sub>CC</sub> = 5 V   | 2.4 |     |      |    |
| V <sub>IL</sub> | Driver and control low-level input voltage  | DIN, $\overline{\text{EN}}$ , $\overline{\text{FORCEOFF}}$ , FORCEON    |                         |     |     | 0.8  | V  |
| V <sub>I</sub>  | Driver and control input voltage            | DIN, $\overline{\text{EN}}$ , $\overline{\text{FORCEOFF}}$ , FORCEON    |                         |     | 0   | 5.5  | V  |
|                 | Receiver input voltage                      |                                                                         |                         | −25 | 25  |      |    |
| T <sub>A</sub>  | Operating free-air temperature              |                                                                         | SN65C3223               | −40 | 85  |      | °C |
|                 |                                             |                                                                         | SN65C3223               | 0   | 70  |      |    |

NOTE 4: Test conditions are C1–C4 = 0.1  $\mu$ F at  $V_{CC} = 3.3$  V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at  $V_{CC} = 5$  V  $\pm$  0.5 V.

### electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 6)

| PARAMETER |                       | TEST CONDITIONS                                          | MIN                                                                                         | TYP <sup>‡</sup> | MAX     | UNIT    |
|-----------|-----------------------|----------------------------------------------------------|---------------------------------------------------------------------------------------------|------------------|---------|---------|
| $I_I$     | Input leakage current | $\overline{EN}, \overline{FORCEOFF}, \overline{FORCEON}$ |                                                                                             | $\pm 0.01$       | $\pm 1$ | $\mu$ A |
| $I_{CC}$  | Supply current        | Auto-powerdown disabled                                  | No load, $\overline{FORCEOFF}, \overline{FORCEON}$ at $V_{CC}$                              |                  | 0.3     | 1       |
|           |                       | Powered off                                              | No load, $\overline{FORCEOFF}$ at GND                                                       |                  | 1       | 10      |
|           |                       | Auto-powerdown enabled                                   | No load, $\overline{FORCEOFF}$ at $V_{CC}$ , $FORCEON$ at GND, All RIN are open or grounded |                  | 1       | 10      |

<sup>‡</sup> All typical values are at  $V_{CC} = 3.3$  V or  $V_{CC} = 5$  V, and  $T_A = 25^\circ\text{C}$ .

NOTE 4: Test conditions are C1–C4 = 0.1  $\mu$ F at  $V_{CC} = 3.3$  V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at  $V_{CC} = 5$  V  $\pm$  0.5 V.



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### DRIVER SECTION

**electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 6)**

| PARAMETER                                                 | TEST CONDITIONS                                                                    | MIN | TYP <sup>†</sup> | MAX | UNIT |
|-----------------------------------------------------------|------------------------------------------------------------------------------------|-----|------------------|-----|------|
| V <sub>OH</sub> High-level output voltage                 | DO <sub>UT</sub> at R <sub>L</sub> = 3 kΩ to GND                                   | 5   | 5.4              |     | V    |
| V <sub>OL</sub> Low-level output voltage                  | DO <sub>UT</sub> at R <sub>L</sub> = 3 kΩ to GND                                   | –5  | –5.4             |     | V    |
| I <sub>IH</sub> High-level input current                  | V <sub>I</sub> = V <sub>CC</sub>                                                   |     | ±0.01            | ±1  | μA   |
| I <sub>IL</sub> Low-level input current                   | V <sub>I</sub> at GND                                                              |     | ±0.01            | ±1  | μA   |
| I <sub>OS</sub> Short-circuit output current <sup>‡</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 | μA   |
|                                                           | V <sub>O</sub> = ±10 V, V <sub>CC</sub> = 4.5 V to 5.5 V                           |     |                  | ±25 |      |

<sup>†</sup> 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.

<sup>‡</sup> 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.

NOTE 4: 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.

**switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 6)**

| PARAMETER                                                | TEST CONDITIONS                                                                 | MIN                                                        | TYP <sup>†</sup> | MAX | UNIT   |
|----------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------|------------------|-----|--------|
| Maximum data rate<br>(see Figure 1)                      | R <sub>L</sub> = 3 kΩ,<br>One DO <sub>UT</sub> switching                        | C <sub>L</sub> = 1000 pF                                   | 250              |     | kbit/s |
|                                                          |                                                                                 | C <sub>L</sub> = 250 pF, V <sub>CC</sub> = 3 V to 4.5 V    | 1000             |     |        |
|                                                          |                                                                                 | C <sub>L</sub> = 1000 pF, V <sub>CC</sub> = 4.5 V to 5.5 V | 1000             |     |        |
| t <sub>sk(p)</sub> Pulse skew <sup>§</sup>               | C <sub>L</sub> = 150 pF to 2500 pF, R <sub>L</sub> = 3 kΩ to 7 kΩ, See Figure 2 |                                                            | 300              |     | ns     |
| SR(tr) Slew rate,<br>transition region<br>(see Figure 1) | V <sub>CC</sub> = 3.3 V,<br>R <sub>L</sub> = 3 kΩ to 7 kΩ                       | C <sub>L</sub> = 150 pF to 1000 pF                         | 18               | 150 | V/μs   |

<sup>†</sup> 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.

<sup>§</sup> Pulse skew is defined as |t<sub>pLH</sub> – t<sub>pHL</sub>| of each channel of the same device.

NOTE 4: 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.



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### RECEIVER SECTION

**electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 6)**

| PARAMETER        |                                                         | TEST CONDITIONS                 | MIN                   | TYP <sup>†</sup>      | MAX | UNIT |
|------------------|---------------------------------------------------------|---------------------------------|-----------------------|-----------------------|-----|------|
| V <sub>OH</sub>  | High-level output voltage                               | I <sub>OH</sub> = -1 mA         | V <sub>CC</sub> - 0.6 | V <sub>CC</sub> - 0.1 |     | V    |
| V <sub>OL</sub>  | Low-level output voltage                                | I <sub>OL</sub> = 1.6 mA        |                       |                       | 0.4 | V    |
| V <sub>IT+</sub> | Positive-going input threshold voltage                  | V <sub>CC</sub> = 3.3 V         |                       | 1.6                   | 2.4 | V    |
|                  |                                                         | V <sub>CC</sub> = 5 V           |                       | 1.9                   | 2.4 |      |
| V <sub>IT-</sub> | Negative-going input threshold voltage                  | V <sub>CC</sub> = 3.3 V         | 0.6                   | 1.1                   |     | V    |
|                  |                                                         | V <sub>CC</sub> = 5 V           | 0.8                   | 1.4                   |     |      |
| V <sub>hys</sub> | Input hysteresis (V <sub>IT+</sub> - V <sub>IT-</sub> ) |                                 |                       | 0.5                   |     | V    |
| I <sub>off</sub> | Output leakage current                                  | $\overline{\text{EN}} = V_{CC}$ |                       | ±0.05                 | ±10 | μA   |
| r <sub>i</sub>   | Input resistance                                        | V <sub>I</sub> = ±3 V to ±25 V  | 3                     | 5                     | 7   | kΩ   |

<sup>†</sup> 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.

NOTE 4: 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.

**switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4)**

| PARAMETER          |                                                   | TEST CONDITIONS                          |                        | MIN | TYP <sup>†</sup> | MAX | UNIT |
|--------------------|---------------------------------------------------|------------------------------------------|------------------------|-----|------------------|-----|------|
| t <sub>PLH</sub>   | Propagation delay time, low- to high-level output | C <sub>L</sub> = 150 pF,                 | See Figure 3           |     | 150              |     | ns   |
| t <sub>PHL</sub>   | Propagation delay time, high- to low-level output | C <sub>L</sub> = 150 pF,                 | See Figure 3           |     | 150              |     | ns   |
| t <sub>en</sub>    | Output enable time                                | C <sub>L</sub> = 150 pF,<br>See Figure 4 | R <sub>L</sub> = 3 kΩ, |     | 200              |     | ns   |
| t <sub>dis</sub>   | Output disable time                               | C <sub>L</sub> = 150 pF,<br>See Figure 4 | R <sub>L</sub> = 3 kΩ, |     | 200              |     | ns   |
| t <sub>sk(p)</sub> | Pulse skew <sup>‡</sup>                           | See Figure 3                             |                        |     | 50               |     | ns   |

<sup>†</sup> 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.

<sup>‡</sup> Pulse skew is defined as |t<sub>PLH</sub> - t<sub>PHL</sub>| of each channel of the same device.

NOTE 4: 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.



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AUTO-POWERDOWN SECTION

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 5)

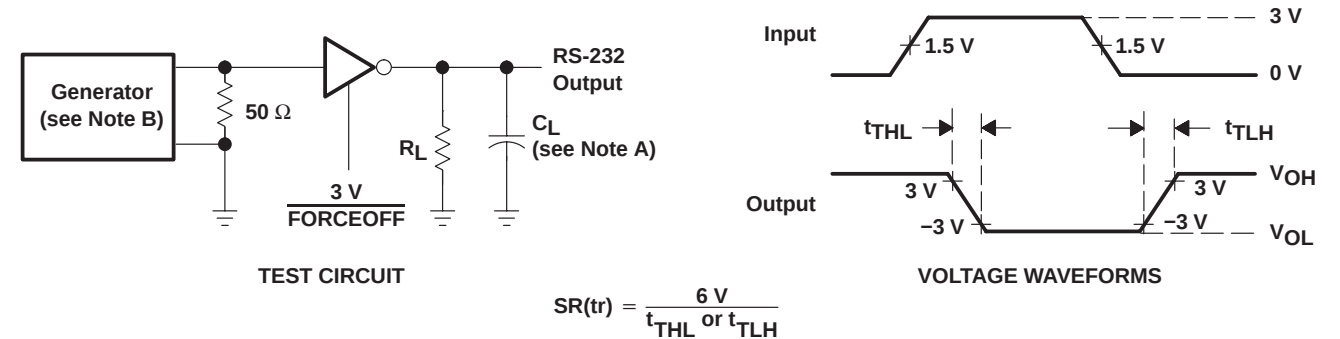
| PARAMETER               | TEST CONDITIONS                                                                                                        | MIN            | MAX | UNIT |
|-------------------------|------------------------------------------------------------------------------------------------------------------------|----------------|-----|------|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

switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 5)

| PARAMETER                                                              | TYP† | UNIT |
|------------------------------------------------------------------------|------|------|
| t <sub>valid</sub> Propagation delay time, low- to high-level output   | 1    | μs   |
| t <sub>invalid</sub> Propagation delay time, high- to low-level output | 30   | μs   |
| t <sub>en</sub> Supply enable time                                     | 100  | μs   |

† 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.

PARAMETER MEASUREMENT INFORMATION



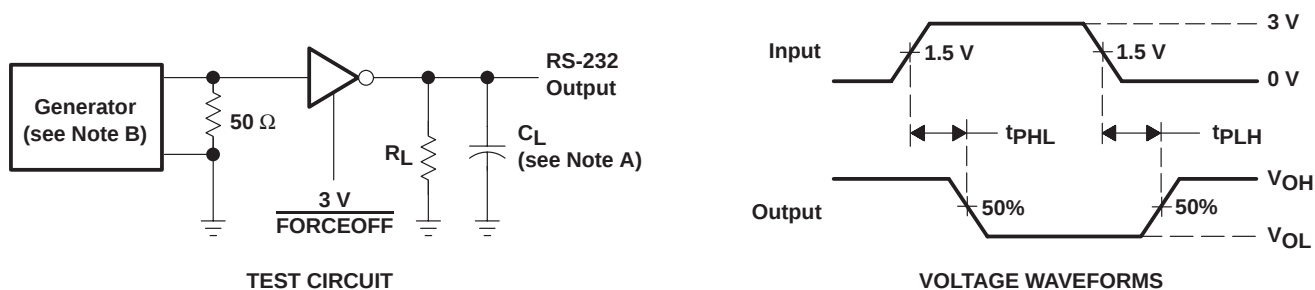
NOTES: A. C<sub>L</sub> includes probe and jig capacitance.
B. The pulse generator has the following characteristics: PRR = 250 kbit/s, Z<sub>O</sub> = 50 Ω, 50% duty cycle, t<sub>r</sub> ≤ 10 ns, t<sub>f</sub> ≤ 10 ns.

Figure 1. Driver Slew Rate

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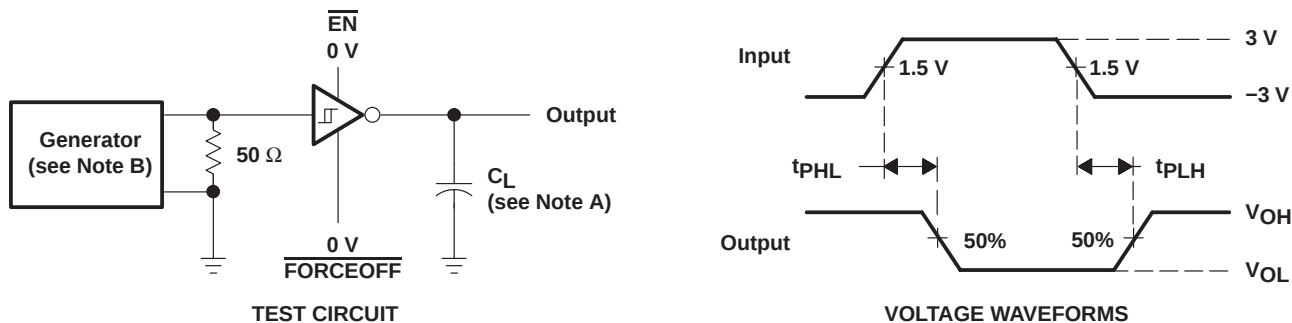
## PARAMETER MEASUREMENT INFORMATION



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

B. The pulse generator has the following characteristics: PRR = 250 kbit/s,  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

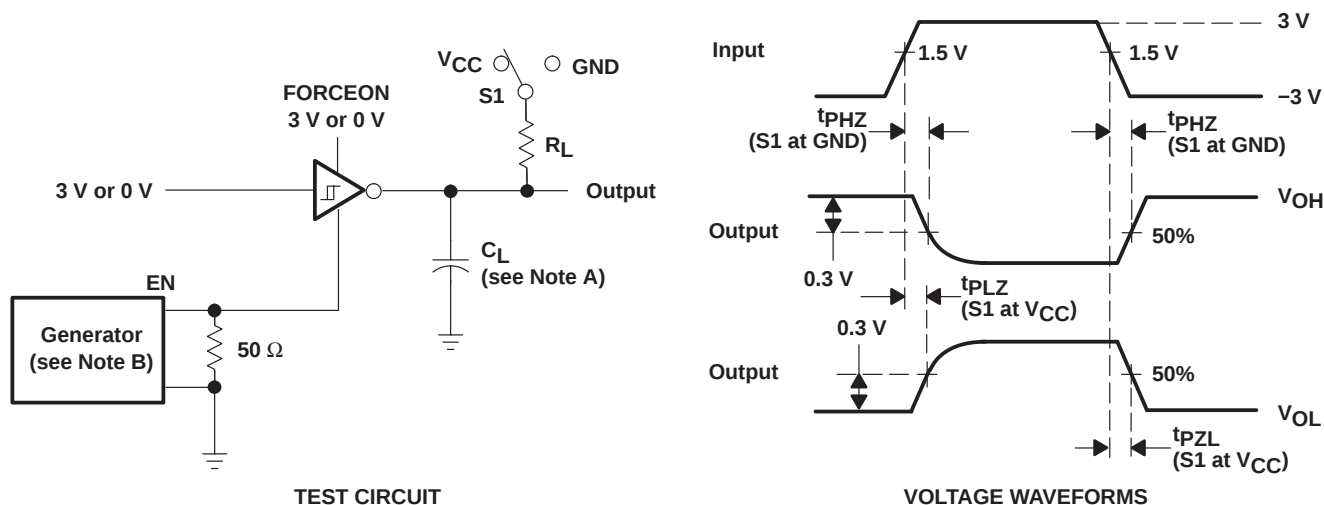
Figure 2. Driver Pulse Skew



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

B. The pulse generator has the following characteristics:  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

Figure 3. Receiver Propagation Delay Times



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

B. The pulse generator has the following characteristics:  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

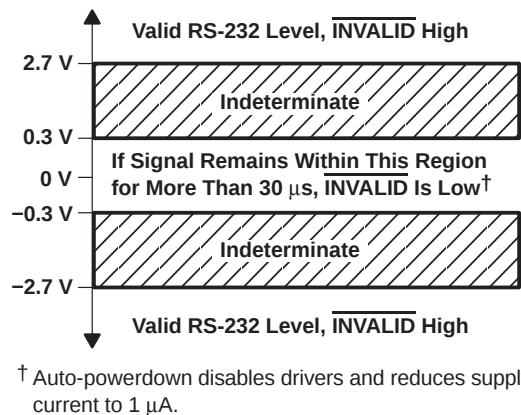
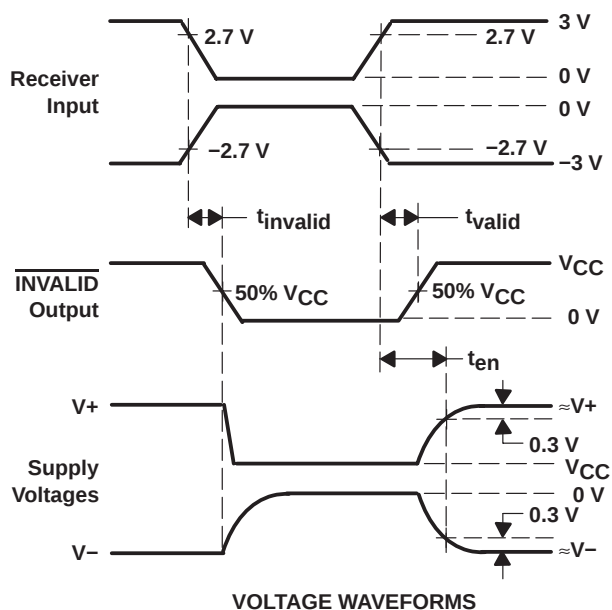
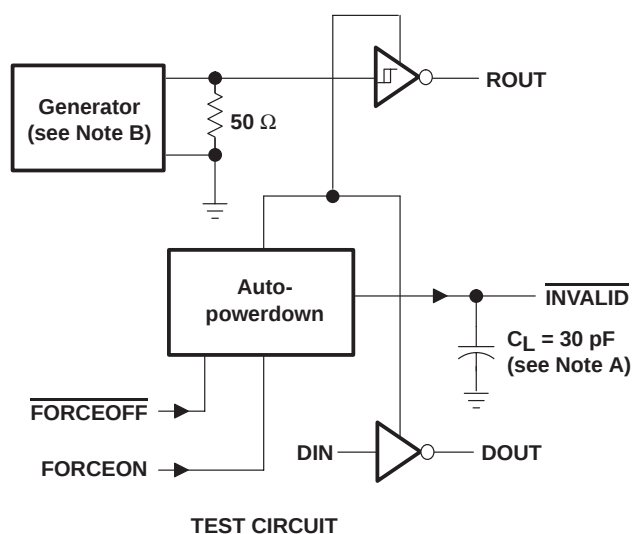
Figure 4. Receiver Enable and Disable Times

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### PARAMETER MEASUREMENT INFORMATION



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,  $t_r \leq 10 \text{ ns}$ ,  $t_f \leq 10 \text{ ns}$ .

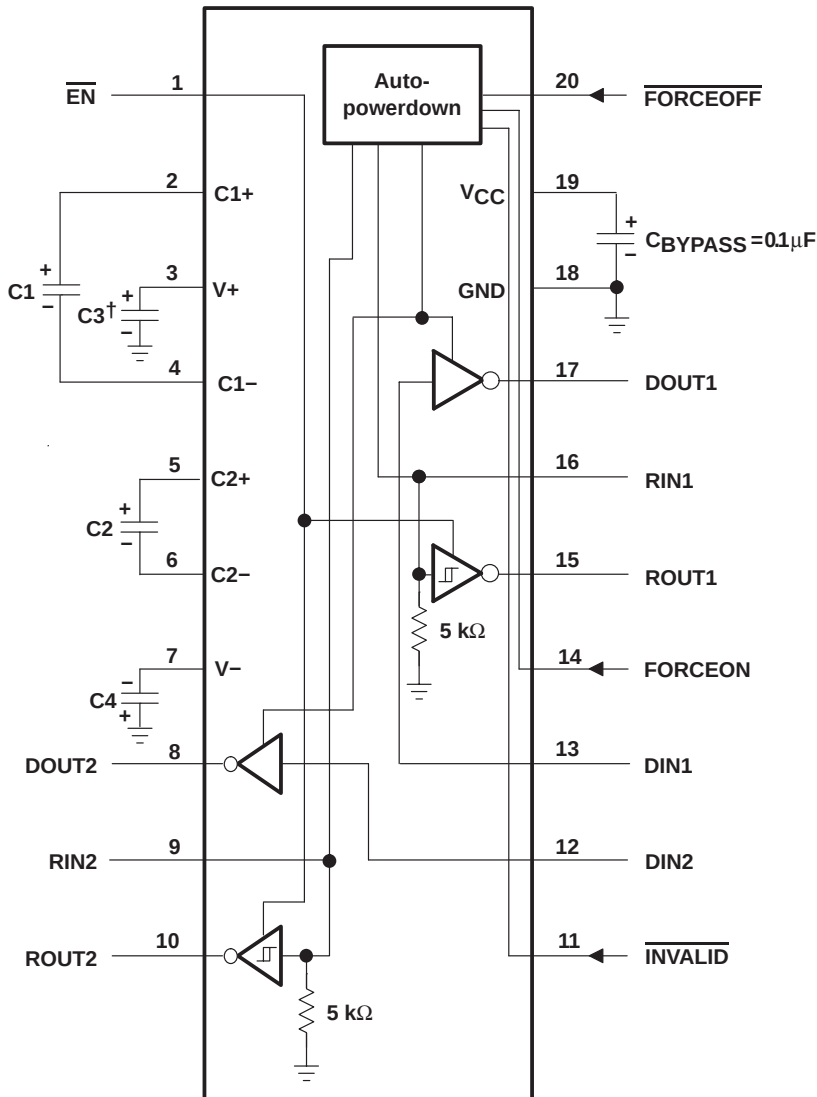
Figure 5.  $\overline{\text{INVALID}}$  Propagation Delay Times and Supply Enabling Time

# SN65C3223, SN75C3223

## 3-V TO 5.5-V MULTICHANNEL RS-232 COMPATIBLE LINE DRIVER/RECEIVER

SLLS538B – JUNE 2002 – REVISED OCTOBER 2004

### APPLICATION INFORMATION



† C3 can be connected to V<sub>CC</sub> or GND.

NOTE A: Resistor values shown are nominal.

V<sub>CC</sub> vs CAPACITOR VALUES

| V <sub>CC</sub> | C1       | C2, C3, C4 |
|-----------------|----------|------------|
| 3.3 V ± 0.3 V   | 0.1 μF   | 0.1 μF     |
| 5 V ± 0.5 V     | 0.047 μF | 0.33 μF    |
| 3 V to 5.5 V    | 0.1 μF   | 0.47 μF    |

Figure 6. Typical Operating Circuit and Capacitor Values

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--------------------------------------------|
| SN65C3223DBR     | ACTIVE                | SSOP         | DB              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN65C3223DW      | ACTIVE                | SOIC         | DW              | 20   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN65C3223DWR     | ACTIVE                | SOIC         | DW              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN65C3223PW      | ACTIVE                | TSSOP        | PW              | 20   | 70          | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN65C3223PWR     | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN75C3223DBR     | ACTIVE                | SSOP         | DB              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN75C3223DW      | ACTIVE                | SOIC         | DW              | 20   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN75C3223DWR     | ACTIVE                | SOIC         | DW              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN75C3223PW      | ACTIVE                | TSSOP        | PW              | 20   | 70          | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN75C3223PWR     | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |

<sup>(1)</sup> 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.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

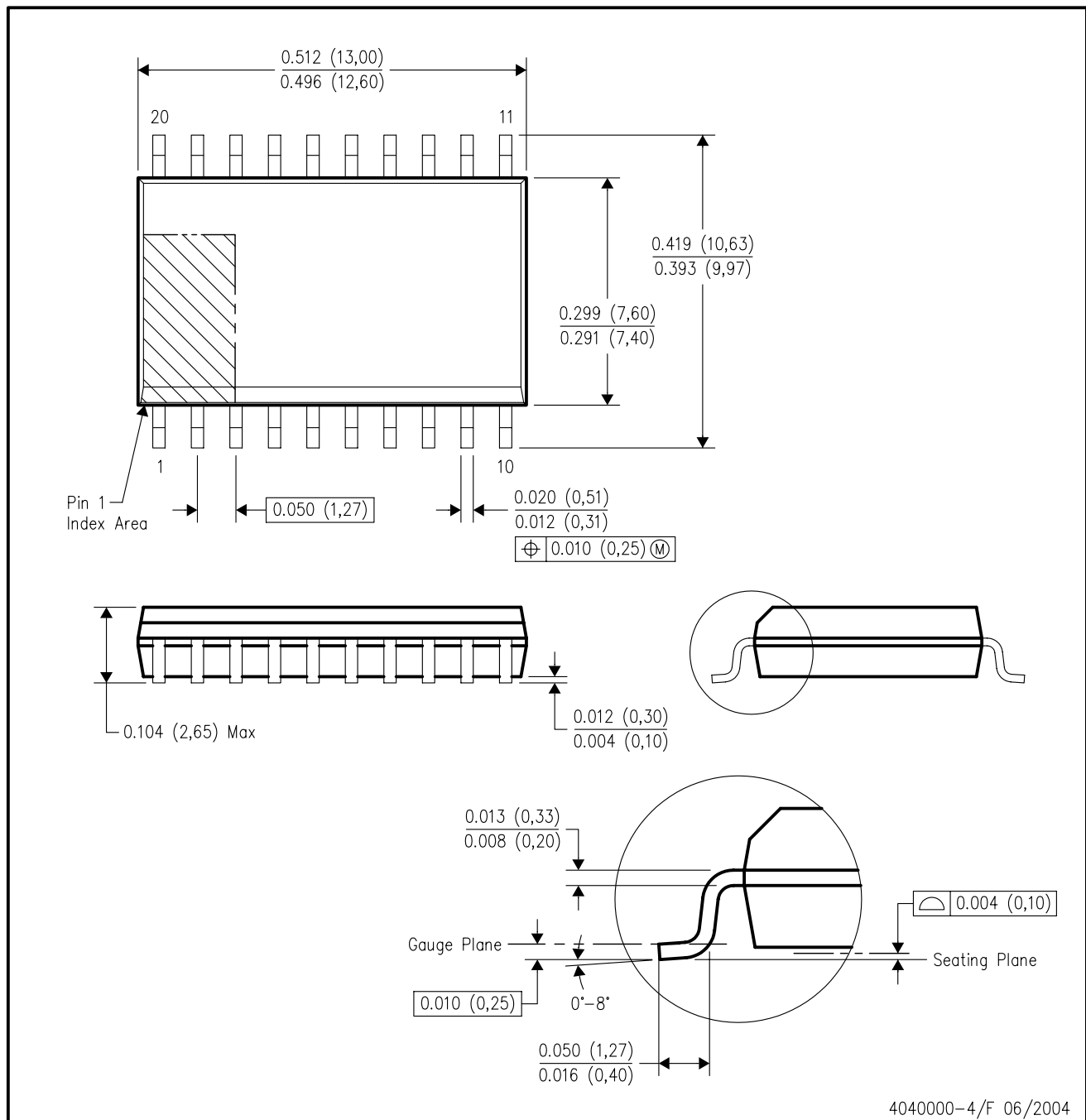
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AC.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

## PW (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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