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Texas Instruments MAX3318ECDBR

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# 2.5-V 460-kbps RS-232 TRANSCEIVER WITH ±15-kV ESD PROTECTION

Check for Samples: MAX3318E

## FEATURES

- ESD Protection for RS-232 I/O Pins
  - ±15 kV (Human-Body Model)
  - ±8 kV (IEC 61000-4-2, Contact Discharge)
  - ±15 kV (IEC 61000-4-2, Air-Gap Discharge)
- 300-µA Operating Supply Current
- 1-µA Low-Power Standby (With Receivers Active) Mode
- Designed to Transmit at a Data Rate of 460 kbps
- Auto-Power-Down Plus Option Features Flexible Power-Saving Mode
- Operates From a Single 2.25-V to 3-V V<sub>CC</sub> Supply

## **APPLICATIONS**

- Battery-Powered Systems
- PDAs
- Cellular Phones
- Notebooks
- Hand-Held Equipment
- Pagers

### DESCRIPTION

The MAX3318E is a dual-driver, dual-receiver, RS-232-compatible transceiver. The device features auto-power-down plus and enhanced electrostatic discharge (ESD) protection integrated into the chip. Driver output and receiver input are protected to  $\pm 15$ kV using the IEC 61000-4-2 Air-Gap Discharge method,  $\pm 8$  kV using the IEC 61000-4-2 Contact Discharge method, and  $\pm 15$  kV using the Human-Body Model (HBM).

The device operates at a data rate of 460 kbps. The transceiver has a proprietary low-dropout driver output stage, enabling RS-232-compatible operation from a 2.25-V to 3-V supply with a dual charge pump. The charge pump requires only four 0.1- $\mu$ F capacitors and features a logic-level output (READY) that asserts when the charge pump is regulating and the device is ready to begin transmitting.

The MAX3318E achieves a 1- $\mu$ A supply current using the auto-power-down feature. This device automatically enters a low-power power-down mode when the RS-232 cable is disconnected or the drivers of the connected peripherals are inactive for more than 30 s. The device turns on again when it senses a valid transition at any driver or receiver input. Auto power down saves power without changes to the existing BIOS or operating system.

This device is available in two space-saving packages: 20-pin SSOP and 20-pin TSSOP.

#### DB OR PW PACKAGE (TOP VIEW)

| READY[ | $_{1}$ $\cup$ | 20 FORCEOFF          |
|--------|---------------|----------------------|
| C1+[   | 2             | 19 🛛 V <sub>CC</sub> |
| V+[    | 3             | 18 GND               |
| C1-[   | 4             | 17 ] DOUT1           |
| C2+[   | 5             | 16 ] RIN1            |
| C2-[   | 6             | 15 <b>]</b> ROUT1    |
| V-[    | 7             | 14 FORCEON           |
| DOUT2  | 8             | 13 ] DIN1            |
| RIN2   | 9             | 12 DIN2              |
| ROUT2  | 10            | 11 ] INVALID         |



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.





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.

## DETAILED DESCRIPTION

Flexible control options for power management are featured when the serial port and driver inputs are inactive. The auto-power-down plus feature functions when FORCEON is low and FORCEOFF is high. During this mode of operation, if the device does not sense valid signal transitions on all receiver and driver inputs for approximately 30 s, the built-in charge pump and drivers are powered down, reducing the supply current to 1  $\mu$ A. By disconnecting the serial port or placing the peripheral drivers off, auto-power-down plus can be disabled when FORCEON and FORCEOFF are high. With auto-power-down plus enabled, the device activates automatically when a valid signal is applied to any receiver or driver 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 (typical number). INVALID is low (invalid data) if all receiver input voltage are between -0.3 V and 0.3 V for more than 30  $\mu$ s (typical number).

| INPUT CONDITIONS |          |  |  |             | OUTPUT STATES |         |       |  |
|------------------|----------|--|--|-------------|---------------|---------|-------|--|
| FORCEON          | FORCEOFF | RECEIVER<br>OR DRIVER<br>EDGE<br>WITHIN 30 s | VALID<br>RS-232<br>LEVEL<br>PRESENT AT<br>RECEIVER | DRIVER      | RECEIVER      | INVALID | READY | OPERATING<br>MODE                                    |
|                  |          | L  | Auto-Power-D                                       | own Plus Co | onditions     |         |       |  |
| Н                | Н        | No   | No   | Active      | Active        | L       | н     | Normal operation<br>auto-power-down<br>plus disabled |
| н                | Н        | No   | Yes  | Active      | Active        | Н       | н     | Normal operation<br>auto-power-down<br>plus disabled |
| L                | Н        | Yes  | No   | Active      | Active        | L       | н     | Normal operation<br>auto-power-dowr<br>plus enabled  |
| L                | Н        | Yes  | Yes  | Active      | Active        | Н       | н     | Normal operation<br>auto-power-dowr<br>plus enabled  |
| L                | Н        | No   | No   | Z           | Active        | L       | L     | Power down,<br>auto-power-dowr<br>plus enabled       |
| L                | Н        | No   | Yes  | Z           | Active        | Н       | L     | Power down,<br>auto-power-dowr<br>plus enabled       |
| Х                | L        | х  | No   | Z           | Active        | L       | L     | Manual power<br>down                                 |
| Х                | L        | х  | Yes  | Z           | Active        | Н       | L     | Manual power<br>down                                 |
|                  |          |  | Auto-Powe  | r-Down Cond | ditions       |         |       |  |
| INVALID          | INVALID  | x  | No   | Z           | Active        | L       | L     | Power down, aut<br>power down<br>enabled             |
| INVALID          | INVALID  | х  | Yes  | Active      | Active        | Н       | н     | Normal operation<br>auto power down<br>enabled       |

#### FUNCTION TABLE<sup>(1)</sup>

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

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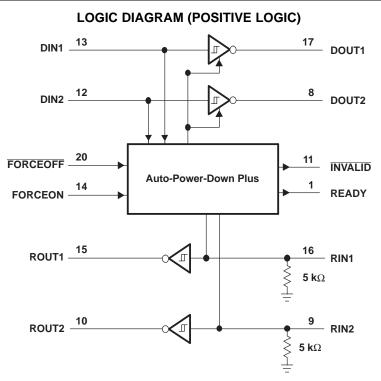
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#### **TERMINAL FUNCTIONS**

| TERMINAL        |        | DESCRIPTION   |  |  |  |
|-----------------|--------|---|--|--|--|
| NAME            | NO.    | DESCRIPTION   |  |  |  |
| C1+             | 2      | Positive voltage-doubler charge-pump capacitor  |  |  |  |
| C1–             | 4      | Negative voltage-doubler charge-pump capacitor  |  |  |  |
| C2+             | 5      | Positive inverting charge-pump capacitor  |  |  |  |
| C2-             | 6      | Negative inverting charge-pump capacitor  |  |  |  |
| DIN             | 12, 13 | CMOS driver inputs  |  |  |  |
| DOUT            | 8, 17  | RS-232 driver outputs   |  |  |  |
| FORCEOFF        | 20     | Force-off input, active low. Drive low to power down transmitters and charge pump. This overrides auto power down and FORCEON (see Function Table). |  |  |  |
| FORCEON         | 14     | Force-on input, active high. Drive high to override auto power down, keeping transmitters on (FORCEOFF must be high) (see Function Table).          |  |  |  |
| GND             | 18     | Ground  |  |  |  |
| INVALID         | 11     | Valid signal detector output, active low. A logic high indicates that a valid RS-232 level is present on a receiver input.                          |  |  |  |
| READY           | 1      | Ready to transmit output, active high. READY is enabled high when V- goes below -3.5 V and the device is ready to transmit.                         |  |  |  |
| RIN             | 9, 16  | RS-232 receiver inputs  |  |  |  |
| ROUT            | 10, 15 | CMOS receiver outputs   |  |  |  |
| V+              | 3      | $2 \times V_{CC}$ generated by the charge pump  |  |  |  |
| V–              | 7      | $-2 \times V_{CC}$ generated by the charge pump   |  |  |  |
| V <sub>CC</sub> | 19     | 2.25-V to 3-V single-supply voltage   |  |  |  |



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

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

|  |  | MIN  | MAX                   | UNIT |
|--|--|------|-----------------------|------|
| V <sub>CC</sub> to GND                               | -0.3                                       | 6    | V                     |      |
| V+ to GND <sup>(2)</sup>                             |  | -0.3 | 7                     | V    |
| V- to GND <sup>(2)</sup>                             |  | -7   | 0.3                   | V    |
| V+ + IV-I <sup>(2)</sup>                             |  |      | 13                    | V    |
|  | DIN, FORCEON, FORCEOFF to GND              | -0.3 | 6                     | V    |
| Input voltage  | RIN to GND                                 |      | ±25                   | V    |
| Outrast sucha and                                    | DOUT to GND                                |      | ±13.2                 |      |
| Output voltage                                       | ROUT, INVALID, READY to GND                | -0.3 | V <sub>CC</sub> + 0.3 | V    |
| Short-circuit duration                               | DOUT to GND                                |      | Continuous            |      |
|  | 16-pin SSOP (derate 7.14 mW/°C above 70°C) |      | 571                   |      |
| Continuous power dissipation (T <sub>A</sub> = 70°C) | 20-pin SSOP (derate 8 mW/°C above 70°C     |      | 640                   | mW   |
|  | 20-pin TSSOP (derate 7 mW/°C above 70°C)   |      | 559                   |      |
| Storage temperature range                            |  |      | 150                   | °C   |
| Lead temperature (soldering, 10 s)                   |  |      | 300                   | °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) V+ and V- can have maximum magnitudes of 7 V, but their absolute difference cannot exceed 13 V.

### **Recommended Operating Conditions**

#### See Figure 4

|                 |   |                           |                         | MIN                 | NOM | MAX                 | UNIT |
|-----------------|---|---------------------------|-------------------------|---------------------|-----|---------------------|------|
|                 | Supply voltage                              |                           |                         | 2.25                | 2.5 | 3                   | V    |
| VIH             | Driver and control high-level input voltage | DIN, FORCEOFF,<br>FORCEON | $V_{CC}$ = 2.5 V to 3 V | $0.7 \times V_{CC}$ |     | 5.5                 | V    |
| V <sub>IL</sub> | Driver and control low-level input voltage  | DIN, FORCEOFF,<br>FORCEON | $V_{CC}$ = 2.5 V to 3 V | 0                   |     | $0.3 \times V_{CC}$ | V    |
| VI              | VI Receiver input voltage                   |                           |                         | -25                 |     | 25                  | V    |
| -               | Operating free air temperature              | MAX3318EC                 |                         | 0                   |     | 70                  | °C   |
| IA              | Operating free-air temperature              | MAX3318EI                 |                         | -40                 |     | 85                  | C    |



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#### **Supply Current Section Electrical Characteristics**

 $V_{CC}$  = 2.25 V to 3 V, C1–C4 = 0.1  $\mu$ F, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub> (unless otherwise noted)

| PARAMETER   | TEST CONDITIONS   | MIN | TYP <sup>(1)</sup> | MAX | UNIT |
|---|---|-----|--------------------|-----|------|
| DC Characteristics ( $V_{CC} = 2.5 \text{ V}, T_A = 25^{\circ}\text{C}$ ) |   |     |                    |     |      |
| Auto-power-down plus supply current                                       | FORCEON = GND, $\overline{\text{FORCEOFF}} = V_{CC}$ , All RIN and DIN idle |     | 1                  | 10  | μA   |
| Auto-power-down supply current  | FORCEOFF = GND  |     | 1                  | 10  | μA   |
| Supply current  | $FORCEON = FORCEOFF = V_{CC}$ , No load                                     |     | 0.3                | 2   | mA   |

(1) Typical values are at  $V_{CC} = 2.5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

#### **ESD** Protection

| PARAMETER | TEST CONDITIONS                        | TYP | UNIT |
|-----------|--|-----|------|
|           | НВМ                                    | ±15 |      |
| RIN, DOUT | IEC 61000-4-2 Air-Gap Discharge method | ±15 | kV   |
|           | IEC 61000-4-2 Contact Discharge method | ±8  |      |

#### **Driver Section Electrical Characteristics**

over recommended ranges of supply voltage and operating free-air temperature,

 $V_{CC}$  = 2.25 V to 3 V, C1–C4 = 0.1 µF,  $T_A = T_{MIN}$  to  $T_{MAX}$  (unless otherwise noted) (see Figure 4)

| PARAMETER                                   | TEST CONDITIONS   | MIN  | TYP <sup>(1)</sup> | MAX | UNIT |
|---|---|------|--------------------|-----|------|
| Driver input hysteresis                     |   |      | 0.3                |     | V    |
| Input leakage current                       | FORCEON, DIN, FORCEOFF  |      | ±0.01              | ±1  | μA   |
| Output voltage swing                        | All driver outputs loaded with 3 k $\Omega$ to ground                 | ±3.7 | ±4                 |     | V    |
| Output resistance                           | $V_{CC} = 0$ , Driver output = $\pm 2 V$                              | 300  | 10M                |     | Ω    |
| Output short-circuit current <sup>(2)</sup> |   |      | ±25                | ±60 | mA   |
| Output leakage current                      | $V_{CC} = 0$ or 2.25 V to 3 V, $V_{OUT} = \pm 12$ V, Drivers disabled |      |                    | ±25 | μA   |

Typical values are at  $V_{CC}$  = 2.5 V,  $T_A$  = 25°C. (1)

(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.

### **Driver Section Switching Characteristics**

over recommended ranges of supply voltage and operating free-air temperature,

 $V_{CC} = 2.25$  V to 3 V, C1–C4 = 0.1  $\mu$ F, T<sub>A</sub> = T<sub>MIN</sub> to T<sub>MAX</sub> (unless otherwise noted) (see Figure 1)

|                                     | PARAMETER                   | TEST CONDITIONS   | MIN | TYP <sup>(1)</sup> | MAX | UNIT |
|-------------------------------------|-----------------------------|---|-----|--------------------|-----|------|
|                                     | Maximum data rate           | $R_L = 3 \text{ k}\Omega$ , $C_L = 1000 \text{ pF}$ , One transmitter switching   | 460 |                    |     | kbps |
| t <sub>PHL</sub> - t <sub>PLH</sub> | Driver skew <sup>(2)</sup>  |   |     | 100                |     | ns   |
|                                     | Transition-region slew rate | $\label{eq:VCC} \begin{array}{l} V_{CC}=2.5 \mbox{ V},  T_A=25^\circ\mbox{C},  R_L=3  k\Omega \mbox{ to } 7  k\Omega, \\ \mbox{Measured from 3 V to } -3 \mbox{ V or } -3 \mbox{ V to 3 V}, \\  C_L=150  pF \mbox{ to } 2500  pF \end{array}$ | 4   |                    | 30  | V/µs |

(1)

Typical values are at V<sub>CC</sub> = 2.5 V, T<sub>A</sub> = 25°C. Pulse skew is defined as  $|t_{PLH} - t_{PHL}|$  of each channel of the same device. (2)



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UNIT

μs

ns

50

#### **Receiver Section Electrical Characteristics**

over recommended ranges of supply voltage and operating free-air temperature,

 $V_{CC}$  = 2.25 V to 3 V, C1–C4 = 0.1 µF,  $T_A = T_{MIN}$  to  $T_{MAX}$  (unless otherwise noted) (see Figure 4)

| PARAMETER              | TEST CONDITIONS             | MIN                 | TYP <sup>(1)</sup> | MAX                   | UNIT |
|------------------------|-----------------------------|---------------------|--------------------|-----------------------|------|
| Input voltage range    |                             | -25                 |                    | 25                    | V    |
| Input threshold low    | $T_A = 25^{\circ}C$         |                     |                    | $0.3 \times V_{CC}$   | V    |
| Input threshold high   | $T_A = 25^{\circ}C$         | $0.7 \times V_{CC}$ |                    |                       | V    |
| Input hysteresis       |                             |                     | 0.3                |                       | V    |
| Input resistance       | $T_A = 25^{\circ}C$         | 3                   | 5                  | 7                     | kΩ   |
| Output leakage current |                             |                     | ±0.05              | ±10                   | μA   |
| Output voltage low     | I <sub>OUT</sub> = 0.5 mA   |                     |                    | 0.1 × V <sub>CC</sub> | V    |
| Output voltage high    | $I_{OUT} = -0.5 \text{ mA}$ | $0.9 \times V_{CC}$ |                    |                       | V    |

(1) Typical values are at  $V_{CC} = 2.5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

#### **Receiver Section Switching Characteristics**

over recommended ranges of supply voltage and operating free-air temperature,

| $V_{CC} = 2.25$ V to 3 V, C1–C4 = 0.1 µF, $I_A = I_{MIN}$ to $I_{MAX}$ (unless otherwise noted) (see Figure 4) |                  |                            |                                       |                    |  |
|--|------------------|----------------------------|---------------------------------------|--------------------|--|
|  | PARAMETER        |                            | TEST CONDITIONS                       | TYP <sup>(1)</sup> |  |
|  | t <sub>PHL</sub> | Passiver propagation dalay | RIN to ROUT, $C_1 = 150 \text{ pF}$   | 0.175              |  |
| t <sub>PLH</sub> Receiver propagation delay  |                  | Receiver propagation delay | RIN to ROOT, $C_{L} = 150 \text{ pr}$ | 0.175              |  |

Receiver skew<sup>(2)</sup> (1)Typical values are at  $V_{CC} = 2.5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

|t<sub>PHL</sub> - t<sub>PLH</sub>|

Pulse skew is defined as |t<sub>PLH</sub> - t<sub>PHL</sub>| of each channel of the same device. (2)

### **Auto-Power-Down Plus Section Electrical Characteristics**

over recommended ranges of supply voltage and operating free-air temperature,

| $V_{CC}$ = 2.25 V to 3 V, C1–C4 = 0.1 µF, T <sub>A</sub> = T <sub>MIN</sub> t | o T <sub>MAX</sub> (unless otherwise noted) (see Figure 4) |
|---|--|
|   |  |

| PARAMETER                                | TEST CONDITIONS             | MIN                 | MAX                 | UNIT |
|--|-----------------------------|---------------------|---------------------|------|
| Receiver input threshold to INVALID high | Positive threshold          |                     | 2.7                 | V    |
| Receiver input theshold to invALID high  | Negative threshold          | -2.7                |                     | v    |
| Receiver input threshold INVALID low     |                             | -0.3                | 0.3                 | V    |
| INVALID, READY voltage low               | $I_{OUT} = 0.5 \text{ mA}$  |                     | $0.1 \times V_{CC}$ | V    |
| INVALID, READY voltage high              | $I_{OUT} = -0.5 \text{ mA}$ | $0.8 \times V_{CC}$ |                     | V    |

#### Auto-Power-Down Plus Section Switching Characteristics

over recommended ranges of supply voltage and operating free-air temperature,

 $V_{CC}$  = 2.25 V to 3 V, C1–C4 = 0.1 µF,  $T_A = T_{MIN}$  to  $T_{MAX}$  (unless otherwise noted) (see Figure 4)

|                       | PARAMETER   | TEST CONDITIONS         | MIN | TYP <sup>(1)</sup> | MAX | UNIT |
|-----------------------|---|-------------------------|-----|--------------------|-----|------|
| t <sub>INVH</sub>     | Receiver positive or negative threshold to INVALID high | V <sub>CC</sub> = 2.5 V |     | 1                  |     | μs   |
| t <sub>INVL</sub>     | Receiver positive or negative threshold to INVALID low  | V <sub>CC</sub> = 2.5 V |     | 30                 |     | μs   |
| t <sub>WU</sub>       | Receiver or driver edge to driver enabled               | V <sub>CC</sub> = 2.5 V |     | 100                |     | μs   |
| t <sub>AUTOPRDN</sub> | Receiver or driver edge to driver shutdown              | V <sub>CC</sub> = 2.5 V | 15  | 30                 | 60  | s    |

(1) Typical values are at  $V_{CC} = 2.5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

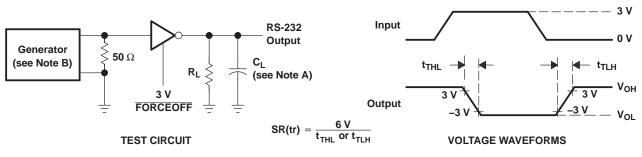


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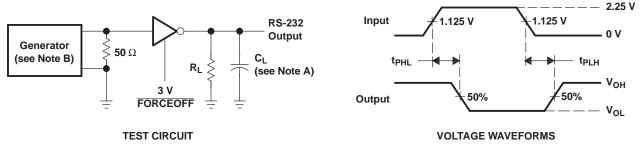
#### PARAMETER MEASUREMENT INFORMATION



NOTES: A. CL includes probe and jig capacitance.

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

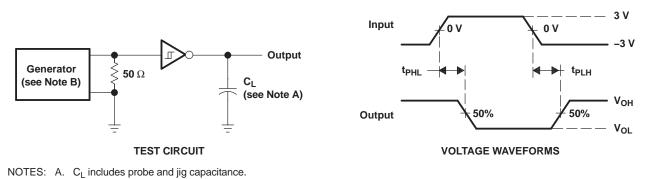
#### Figure 1. Driver Slew Rate



NOTES: A. C<sub>L</sub> includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 250 kbit/s,  $Z_0$  = 50  $\Omega$ , 50% duty cycle,  $t_r \le 10$  ns,  $t_f \le 10$  ns.

Figure 2. Driver Pulse Skew



B. The pulse generator has the following characteristics:  $Z_0 = 50 \Omega$ , 50% duty cycle,  $t_r \le 10$  ns,  $t_f \le 10$  ns.

#### Figure 3. Receiver Propagation Delay Times

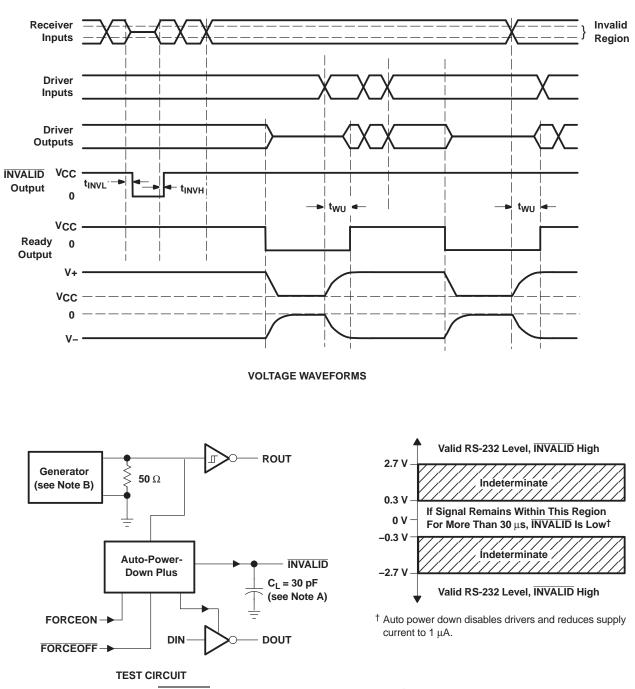


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# Figure 4. INVALID Propagation Delay Times and Supply Enabling Time



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### PARAMETER MEASUREMENT INFORMATION

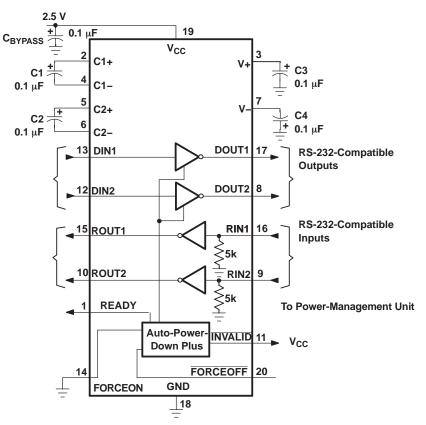


Figure 5. Typical Application Circuit





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### **REVISION HISTORY**

| C | Changes from Original (June 2006) to Revision A Page                    |   |  |  |  |  |  |  |
|---|---|---|--|--|--|--|--|--|
| • | Updated document to new TI datasheet format - no specification changes. | 1 |  |  |  |  |  |  |
| • | Removed Ordering Information Table.                                     | 2 |  |  |  |  |  |  |
| • | Updated TERMINAL FUNCTIONS table to fix inconsistency.                  | 3 |  |  |  |  |  |  |



10-Jun-2014

#### PACKAGING INFORMATION

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| Orderable Device | Status | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish<br>(6) | MSL Peak Temp      | Op Temp (°C) | Device Marking<br>(4/5) | Samples |
|------------------|--------|--------------|--------------------|------|----------------|----------------------------|-------------------------|--------------------|--------------|-------------------------|---------|
| MAX3318ECDB      | ACTIVE | SSOP         | DB                 | 20   | 70             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | 0 to 70      | MP318EC                 | Samples |
| MAX3318ECDBR     | ACTIVE | SSOP         | DB                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | 0 to 70      | MP318EC                 | Samples |
| MAX3318ECPW      | ACTIVE | TSSOP        | PW                 | 20   | 70             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | 0 to 70      | MP318EC                 | Samples |
| MAX3318ECPWR     | ACTIVE | TSSOP        | PW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | 0 to 70      | MP318EC                 | Samples |
| MAX3318EIDB      | ACTIVE | SSOP         | DB                 | 20   | 70             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |
| MAX3318EIDBG4    | ACTIVE | SSOP         | DB                 | 20   | 70             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |
| MAX3318EIDBR     | ACTIVE | SSOP         | DB                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |
| MAX3318EIDBRG4   | ACTIVE | SSOP         | DB                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |
| MAX3318EIPW      | ACTIVE | TSSOP        | PW                 | 20   | 70             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |
| MAX3318EIPWG4    | ACTIVE | TSSOP        | PW                 | 20   | 70             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |
| MAX3318EIPWR     | ACTIVE | TSSOP        | PW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |
| MAX3318EIPWRG4   | ACTIVE | TSSOP        | PW                 | 20   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM | -40 to 85    | MP318EI                 | Samples |

<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.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), 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.

Addendum-Page 1



10-Jun-2014

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. Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above. 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)

(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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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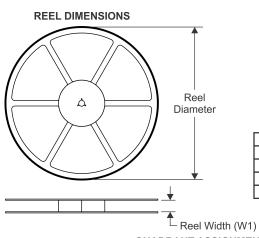


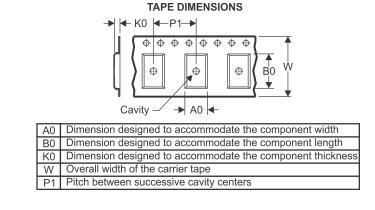
TEXAS INSTRUMENTS

## PACKAGE MATERIALS INFORMATION

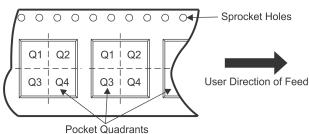
11-Oct-2013

# TAPE AND REEL INFORMATION





### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



| *All dimensions are nominal |                 |                    |    |      |                          |                          |            |            |            |            |           |                  |
|-----------------------------|-----------------|--------------------|----|------|--------------------------|--------------------------|------------|------------|------------|------------|-----------|------------------|
| Device                      | Package<br>Type | Package<br>Drawing |    | SPQ  | Reel<br>Diameter<br>(mm) | Reel<br>Width<br>W1 (mm) | A0<br>(mm) | B0<br>(mm) | K0<br>(mm) | P1<br>(mm) | W<br>(mm) | Pin1<br>Quadrant |
| MAX3318ECDBR                | SSOP            | DB                 | 20 | 2000 | 330.0                    | 16.4                     | 8.2        | 7.5        | 2.5        | 12.0       | 16.0      | Q1               |
| MAX3318ECPWR                | TSSOP           | PW                 | 20 | 2000 | 330.0                    | 16.4                     | 6.95       | 7.1        | 1.6        | 8.0        | 16.0      | Q1               |
| MAX3318EIDBR                | SSOP            | DB                 | 20 | 2000 | 330.0                    | 16.4                     | 8.2        | 7.5        | 2.5        | 12.0       | 16.0      | Q1               |
| MAX3318EIPWR                | TSSOP           | PW                 | 20 | 2000 | 330.0                    | 16.4                     | 6.95       | 7.1        | 1.6        | 8.0        | 16.0      | Q1               |

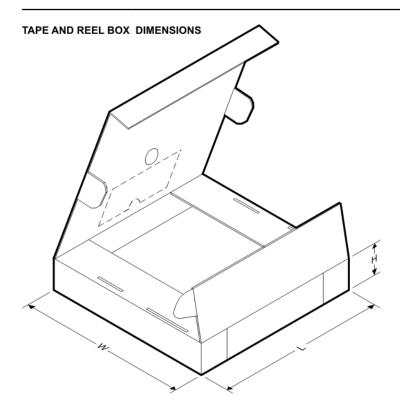


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## PACKAGE MATERIALS INFORMATION

11-Oct-2013



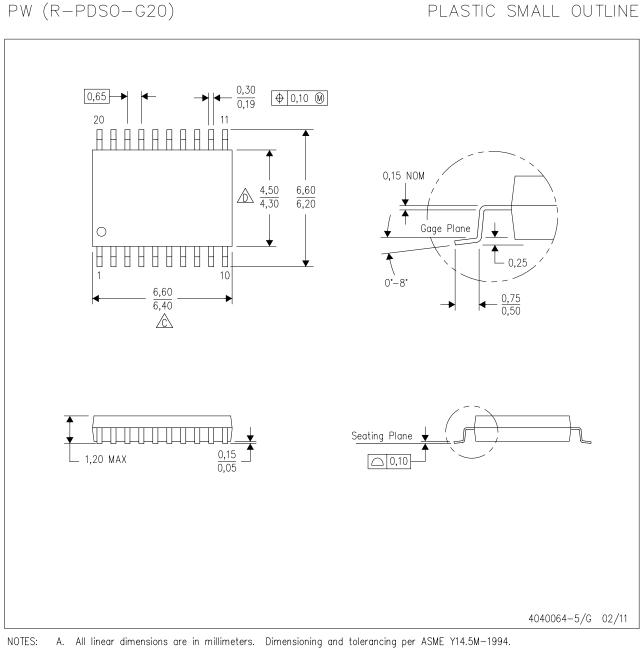
\*All dimensions are nominal

| Device       | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| MAX3318ECDBR | SSOP         | DB              | 20   | 2000 | 367.0       | 367.0      | 38.0        |
| MAX3318ECPWR | TSSOP        | PW              | 20   | 2000 | 367.0       | 367.0      | 38.0        |
| MAX3318EIDBR | SSOP         | DB              | 20   | 2000 | 367.0       | 367.0      | 38.0        |
| MAX3318EIPWR | TSSOP        | PW              | 20   | 2000 | 367.0       | 367.0      | 38.0        |



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## **MECHANICAL DATA**



This drawing is subject to change without notice. Ŗ.  $\triangle$ Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall

not exceed 0,15 each side. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

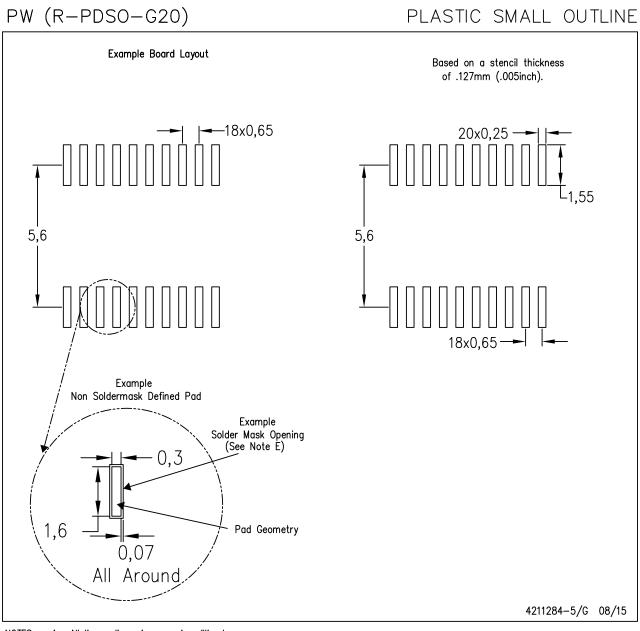
E. Falls within JEDEC MO-153





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## LAND PATTERN DATA



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 design.
- D. 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.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.





## **MECHANICAL DATA**

MSSO002E - JANUARY 1995 - REVISED DECEMBER 2001

#### DB (R-PDSO-G\*\*) PLASTIC SMALL-OUTLINE **28 PINS SHOWN** 0,38 0,65 $\oplus$ 0,15 M 0,22 28 15 0,25 0,09 8,20 5,60 5,00 7,40 $\bigcirc$ Gage Plane **1** 9,25 1 14 0 0,95 0,55 Seating Plane △ 0,10 2,00 MAX 0,05 MIN PINS \*\* 24 14 16 20 28 30 38 DIM 6,50 8,50 10,50 10,50 12,90 A MAX 6,50 7,50 A MIN 5,90 5,90 6,90 7,90 9,90 9,90 12,30 4040065 /E 12/01

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





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