www.ti.com

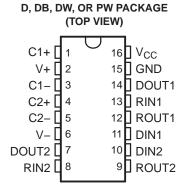
SLLS664A-AUGUST 2005-REVISED APRIL 2007

FEATURES

- ESD Protection for RS-232 Bus Pins
 - ±15 kV (HBM)
 - ±8 kV (IEC61000-4-2, Contact Discharge)
 - ±15 kV (IEC61000-4-2, Air-Gap Discharge)
- Meets or Exceeds the Requirements of TIA/EIA-232-F and ITU v.28 Standards
- Operates With 3-V to 5.5-V V_{CC} Supply
- Operates up to 250 kbit/s
- Two Drivers and Two Receivers
- Low Supply Current . . . 300 μA Typ
- External Capacitors . . . $4 \times 0.1 \mu F$
- Accepts 5-V Logic Input With 3.3-V Supply
- Pin Compatible to Alternative High-Speed Device (1 Mbit/s)
 - SNx5C3232

APPLICATIONS

- Battery-Powered Systems
- PDAs
- Notebooks
- Laptops
- Palmtop PCs
- Hand-Held Equipment



DESCRIPTION/ORDERING INFORMATION

ORDERING INFORMATION

| T _A | PACKA | GE ⁽¹⁾⁽²⁾ | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------|----------------------|-----------------------|------------------|
| | SOIC - D | Tube of 40 | MAX3232ECD | - MAX3232EC |
| | 201C – D | Reel of 2500 | MAX3232ECDR | WIAA3232EC |
| | COIC DW | Tube of 40 | MAX3232ECDW | MAY222FC |
| 0°C to 70°C | SOIC – DW | Reel of 2000 | MAX3232ECDWR | MAX3232EC |
| −0°C to 70°C | SSOP – DB | Tube of 80 | MAX3232ECDB | MD222FC |
| | 220b – DB | Reel of 2000 | MAX3232ECDBR | MP232EC |
| | TSSOP – PW | Tube of 90 | MAX3232ECPW | MP232EC |
| | 1330F - FW | Reel of 2000 | MAX3232ECPWR | WIP232EC |
| | 0010 D | Tube of 40 | MAX3232EID | MAY2220EL |
| | SOIC – D | Reel of 2500 | MAX3232EIDR | MAX3232EI |
| | SOIC - DW | Tube of 40 | MAX3232EIDW | - MAX3232EI |
| –40°C to 85°C | 301C - DW | Reel of 2000 | MAX3232EIDWR | IVIAA3232EI |
| -40 C to 65 C | CCOD DD | Tube of 80 | MAX3232EIDB | MD222EI |
| | SSOP – DB | Reel of 2000 | MAX3232EIDBR | MP232EI |
| | TSSOP – PW | Tube of 90 | MAX3232EIPW | - MP232EI |
| | 13307 - FW | Reel of 2000 | MAX3232EIPWR | IVIFZJZEI |

⁽¹⁾ Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at 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.

⁽²⁾ For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH \pm 15-kV IEC ESD PROTECTION

SLLS664A-AUGUST 2005-REVISED APRIL 2007



DESCRIPTION/ORDERING INFORMATION (CONTINUED)

The MAX3232E device consists of two line drivers, two line receivers, and a dual charge-pump circuit with ± 15 -kV IEC ESD protection pin to pin (serial-port connection pins, including GND). The device meets the requirements of TIA/EIA-232-F and provides 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 250 kbit/s and a maximum of 30-V/ μ s driver output slew rate.

FUNCTION TABLES

EACH DRIVER(1)

| INPUT DIN | OUTPUT DOUT |
|--------------|----------------|
| L | Н |
| Н | L |

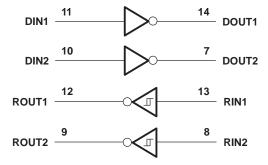
(1) H = high level, L = low level

EACH RECEIVER (1)

| INPUT RIN | OUTPUT ROUT |
|--------------|----------------|
| L | Н |
| Н | L |
| Open | Н |

 H = high level, L = low level, Open = input disconnected or connected driver off

LOGIC DIAGRAM (POSITIVE LOGIC)



MAX3232E 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ±15-kV IEC ESD PROTECTION

SLLS664A-AUGUST 2005-REVISED APRIL 2007

Absolute Maximum Ratings⁽¹⁾

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

| | | | MIN | MAX | UNIT |
|------------------|---|------------|-------|-----------------------|------|
| V_{CC} | Supply voltage range ⁽²⁾ | | | 6 | V |
| V ₊ | Positive output supply voltage range ⁽²⁾ | | -0.3 | 7 | V |
| V- | Negative output supply voltage range (2) | | 0.3 | -7 | V |
| V ₊ - | Supply voltage difference ⁽²⁾ | | | 13 | V |
| V | lanut valtaga ranga | Drivers | -0.3 | 6 | V |
| V _I | Input voltage range | Receivers | -25 | 25 | V |
| ., | Output voltage range | Drivers | -13.2 | 13.2 | V |
| Vo | | Receivers | -0.3 | V _{CC} + 0.3 | V |
| | | D package | | 73 | |
| 0 | Package thermal impedance (3)(4) | DB package | | 82 | °C/W |
| θ_{JA} | Fackage memai impedance (%)(1) | DW package | | 57 108 | |
| | | PW package | | | |
| T_{J} | Operating virtual junction temperature | | | 150 | °C |
| T _{stg} | Storage temperature range | | | 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.

Recommended Operating Conditions⁽¹⁾

See Figure 4

| | | | | MIN | NO MAX M | UNIT | |
|-----------------|--|--------------------------|-------------------------|-----|-------------|------|--|
| | Supply voltage | | V _{CC} = 3.3 V | 3 | 3.3 3.6 | V | |
| | | | $V_{CC} = 5 V$ | 4.5 | 5 5.5 | v | |
| \/ | Driver high-level input voltage DIN | $V_{CC} = 3.3 \text{ V}$ | 2 | 5.5 | V | | |
| V _{IH} | | DIN | $V_{CC} = 5 V$ | 2.4 | 5.5 | | |
| V_{IL} | Driver low-level input voltage | | DIN | 0 | 0.8 | V | |
| V_{I} | Receiver input voltage | | | -25 | 25 | V | |
| т | Operating free air temperature | | | 0 | 70 | °C | |
| T _A | Operating free-air temperature MAX3232EI | | MAX3232EI | -40 | 85 | | |

⁽¹⁾ Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 3.3 V \pm 0.3 V; C1 = 0.047 μ F, C2–C4 = 0.33 μ F at V_{CC} = 5 V \pm 0.5 V.

Electrical Characteristics(1)

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

| | PARAMETER | TEST CONDITIONS | MIN TYP ⁽²⁾ | MAX | UNIT |
|----------|----------------|---|------------------------|-----|------|
| I_{CC} | Supply current | No load, V _{CC} = 3.3 V or 5 V | 0.3 | 1 | mA |

⁽¹⁾ Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 3.3 V \pm 0.3 V; C1 = 0.047 μ F, C2–C4 = 0.33 μ F at V_{CC} = 5 V \pm 0.5 V. (2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

All voltages are with respect to network GND.

Maximum power dissipation is a function of $T_J(max)$, θ_{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.

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

MAX3232E

3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ±15-kV IEC ESD PROTECTION

SLLS664A-AUGUST 2005-REVISED APRIL 2007



DRIVER SECTION

Electrical Characteristics(1)

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

| | PARAMETER | TEST CONDIT | TONS | MIN | TYP ⁽²⁾ | MAX | UNIT |
|---------------------|------------------------------|---|-----------------------|----------------------|--------------------|-----|------|
| V _{OH} | High-level output voltage | DOUT at $R_L = 3 \text{ k}\Omega$ to GND, | DIN = GND | 5 | 5.4 | | V |
| V _{OL} | Low-level output voltage | DOUT at $R_L = 3 \text{ k}\Omega$ to GND, | DIN = V _{CC} | - 5 | -5.4 | | V |
| I _{IH} | High-level input current | $V_I = V_{CC}$ | | | ±0.01 | ±1 | μΑ |
| I _{IL} | Low-level input current | V _I at GND | | | ±0.01 | ±1 | μΑ |
| 1 (3) | Chart aircuit autaut aurrant | V _{CC} = 3.6 V, | V _O = 0 V | V _O = 0 V | 105 | 160 | mA |
| I _{OS} (3) | Short-circuit output current | V _{CC} = 5.5 V, | V _O = 0 V | ±35 | | ±60 | IIIA |
| r _O | Output resistance | V_{CC} , V+, and V- = 0 V, | V _O = ±2 V | 300 | 10M | | Ω |

⁽¹⁾ Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 3.3 V \pm 0.3 V; C1 = 0.047 μ F, C2–C4 = 0.33 μ F at V_{CC} = 5 V \pm 0.5 V. (2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

Switching Characteristics⁽¹⁾

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

| | PARAMETER | TEST CONDITIONS | | | TYP ⁽²⁾ | MAX | UNIT |
|--------------------|------------------------------|--|--|-----|--------------------|-----|--------|
| | Maximum data rate | C _L = 1000 pF, One DOUT switching, | $R_L = 3 \text{ k}\Omega$, See Figure 1 | 150 | 250 | | kbit/s |
| t _{sk(p)} | Pulse skew ⁽³⁾ | C_L = 150 pF to 2500 pF, See Figure 2 | $R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega,$ | | 300 | | ns |
| CD(tr) | Slew rate, transition region | $R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega,$ | C _L = 150 pF to 1000 pF | 6 | | 30 | 1//40 |
| SR(tr) | (see Figure 1) | $V_{CC} = 3.3 \text{ V}$ | C _L = 150 pF to 2500 pF | 4 | | 30 | V/μs |

⁽¹⁾ Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 3.3 V \pm 0.3 V; C1 = 0.047 μ F, C2–C4 = 0.33 μ F at V_{CC} = 5 V \pm 0.5 V.

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

⁽³⁾ 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⁾ Pulse skew is defined as |t_{PLH} - t_{PHL}| of each channel of the same device.

SLLS664A-AUGUST 2005-REVISED APRIL 2007

RECEIVER SECTION

Electrical Characteristics(1)

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

| | PARAMETER | TEST CONDITIONS | MIN | TYP ⁽²⁾ | 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 mA | | | 0.4 | V |
| V/ Daniti | Desitive going input threshold voltage | V _{CC} = 3.3 V | | 1.5 | 2.4 | V |
| V _{IT+} | Positive-going input threshold voltage | V _{CC} = 5 V | | 1.8 | 2.4 | V |
| V | Negative-going input threshold voltage | V _{CC} = 3.3 V | 0.6 | 1.2 | | V |
| V _{IT} | | V _{CC} = 5 V | 0.8 | 1.5 | | V |
| V _{hys} | Input hysteresis (V _{IT+} - V _{IT-}) | | | 0.3 | | V |
| r _i | Input resistance | $V_1 = \pm 3 \text{ V to } \pm 25 \text{ V}$ | 3 | 5 | 7 | kΩ |

⁽¹⁾ Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 3.3 V \pm 0.3 V; C1 = 0.047 μ F, C2–C4 = 0.33 μ F at V_{CC} = 5 V \pm 0.5 V. (2) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.

Switching Characteristics (1)

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 3)

| | PARAMETER | TEST CONDITIONS | TYP ⁽²⁾ | UNIT |
|--------------------|---|------------------------|--------------------|------|
| t _{PLH} | Propagation delay time, low- to high-level output | C 450 pF | 300 | ns |
| t _{PHL} | Propagation delay time, high- to low-level output | $C_L = 150 \text{ pF}$ | 300 | ns |
| t _{sk(p)} | Pulse skew ⁽³⁾ | | 300 | ns |

⁽¹⁾ Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 3.3 V ± 0.3 V; C1 = 0.047 μ F, C2–C4 = 0.33 μ F at V_{CC} = 5 V ± 0.5 V.

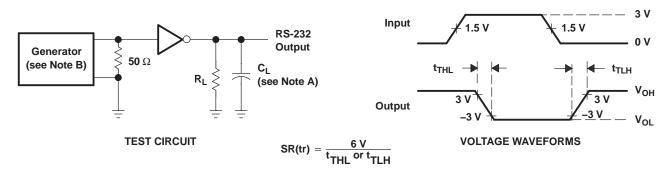
 ⁽²⁾ All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.
(3) Pulse skew is defined as |t_{PLH} - t_{PHL}| of each channel of the same device.

SLLS664A-AUGUST 2005-REVISED APRIL 2007

3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ±15-kV IEC ESD PROTECTION



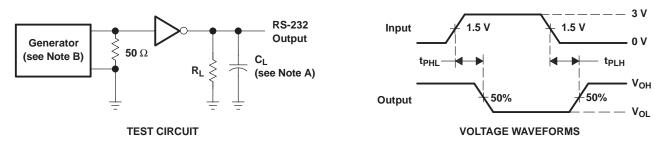
PARAMETER MEASUREMENT INFORMATION



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, $t_f \le 10$ ns, $t_f \le 10$ ns.

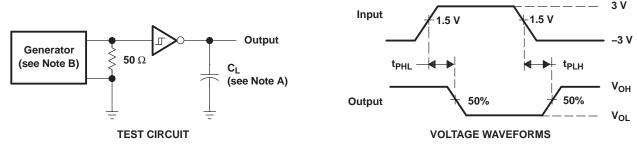
Figure 1. Driver Slew Rate



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, $t_f \le 10$ ns, $t_f \le 10$ ns.

Figure 2. Driver Pulse Skew



NOTES: A. C_L includes probe and jig capacitance.

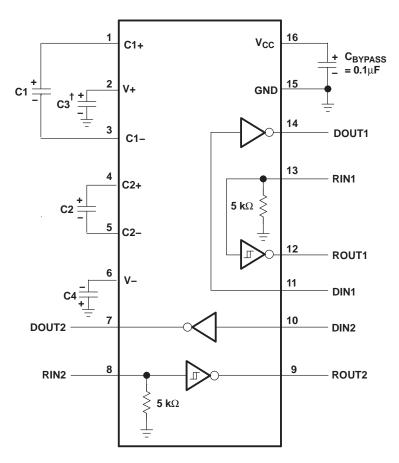
B. The pulse generator has the following characteristics: $Z_O = 50~\Omega$, 50% duty cycle, $t_f \le 10~ns$, $t_f \le 10~ns$.

Figure 3. Receiver Propagation Delay Times

3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ±15-kV IEC ESD PROTECTION

SLLS664A-AUGUST 2005-REVISED APRIL 2007

APPLICATION INFORMATION



 $^{^{\}dagger}$ C3 can be connected to $V_{\mbox{\footnotesize CC}}$ or GND.

NOTES: A. Resistor values shown are nominal.

B. Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown.

V_{CC} vs CAPACITOR VALUES

| V _{CC} | C1 | C2, C3, C4 | | |
|--|------------------------------|------------------------------|--|--|
| $\begin{array}{c} \textbf{3.3 V} \pm \textbf{0.3 V} \\ \textbf{5 V} \pm \textbf{0.5 V} \\ \textbf{3 V to 5.5 V} \end{array}$ | 0.1 μF 0.047 μF 0.1 μF | 0.1 μF 0.33 μF 0.47 μF | | |

Figure 4. Typical Operating Circuit and Capacitor Values



PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | e Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|-----------------|--------------------|------|----------------|---------------------------|------------------|------------------------------|
| MAX3232ECD | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDB | ACTIVE | SSOP | DB | 16 | 80 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDBE4 | ACTIVE | SSOP | DB | 16 | 80 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDBG4 | ACTIVE | SSOP | DB | 16 | 80 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDBR | ACTIVE | SSOP | DB | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDBRE4 | ACTIVE | SSOP | DB | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDBRG4 | ACTIVE | SSOP | DB | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDG4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDR | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDRE4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDRG4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDWR | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECDWRG4 | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECPW | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECPWE4 | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECPWG4 | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECPWR | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECPWRE4 | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232ECPWRG4 | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EID | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDB | ACTIVE | SSOP | DB | 16 | 80 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDBE4 | ACTIVE | SSOP | DB | 16 | 80 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |





nn 18-Sep-2008

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Packag Qty | e Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|-----------------|--------------------|------|---------------|---------------------------|------------------|------------------------------|
| MAX3232EIDBG4 | ACTIVE | SSOP | DB | 16 | 80 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDBR | ACTIVE | SSOP | DB | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDBRE4 | ACTIVE | SSOP | DB | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDBRG4 | ACTIVE | SSOP | DB | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDG4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDR | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDRE4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDRG4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDW | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDWG4 | ACTIVE | SOIC | DW | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDWR | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIDWRG4 | ACTIVE | SOIC | DW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIPW | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIPWE4 | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIPWG4 | ACTIVE | TSSOP | PW | 16 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIPWR | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIPWRE4 | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3232EIPWRG4 | ACTIVE | TSSOP | PW | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

 $^{^{(1)}}$ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

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

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

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

OBSOLETE: TI has discontinued the production of the device.

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.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and

⁽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.



PACKAGE OPTION ADDENDUM

18-Sep-2008

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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF MAX3232E:

Automotive: MAX3232E-Q1

NOTE: Qualified Version Definitions:

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

PACKAGE MATERIALS INFORMATION

www.ti.com 1-Nov-2010

TAPE AND REEL INFORMATION





| | Dimension designed to accommodate the component width |
|----|---|
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|-----------------|--------------------|----|------|--------------------------|--------------------------|------------|------------|------------|------------|-----------|------------------|
| MAX3232ECDBR | SSOP | DB | 16 | 2000 | 330.0 | 16.4 | 8.2 | 6.6 | 2.5 | 12.0 | 16.0 | Q1 |
| MAX3232ECDR | SOIC | D | 16 | 2500 | 330.0 | 16.4 | 6.5 | 10.3 | 2.1 | 8.0 | 16.0 | Q1 |
| MAX3232ECDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |
| MAX3232ECPWR | TSSOP | PW | 16 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| MAX3232EIDBR | SSOP | DB | 16 | 2000 | 330.0 | 16.4 | 8.2 | 6.6 | 2.5 | 12.0 | 16.0 | Q1 |
| MAX3232EIDR | SOIC | D | 16 | 2500 | 330.0 | 16.4 | 6.5 | 10.3 | 2.1 | 8.0 | 16.0 | Q1 |
| MAX3232EIDWR | SOIC | DW | 16 | 2000 | 330.0 | 16.4 | 10.75 | 10.7 | 2.7 | 12.0 | 16.0 | Q1 |
| MAX3232EIPWR | TSSOP | PW | 16 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |

www.ti.com 1-Nov-2010



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| MAX3232ECDBR | SSOP | DB | 16 | 2000 | 346.0 | 346.0 | 33.0 |
| MAX3232ECDR | SOIC | D | 16 | 2500 | 346.0 | 346.0 | 33.0 |
| MAX3232ECDWR | SOIC | DW | 16 | 2000 | 346.0 | 346.0 | 33.0 |
| MAX3232ECPWR | TSSOP | PW | 16 | 2000 | 346.0 | 346.0 | 29.0 |
| MAX3232EIDBR | SSOP | DB | 16 | 2000 | 346.0 | 346.0 | 33.0 |
| MAX3232EIDR | SOIC | D | 16 | 2500 | 346.0 | 346.0 | 33.0 |
| MAX3232EIDWR | SOIC | DW | 16 | 2000 | 346.0 | 346.0 | 33.0 |
| MAX3232EIPWR | TSSOP | PW | 16 | 2000 | 346.0 | 346.0 | 29.0 |

D (R-PDS0-G16)

PLASTIC SMALL OUTLINE



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



D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. 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.



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE

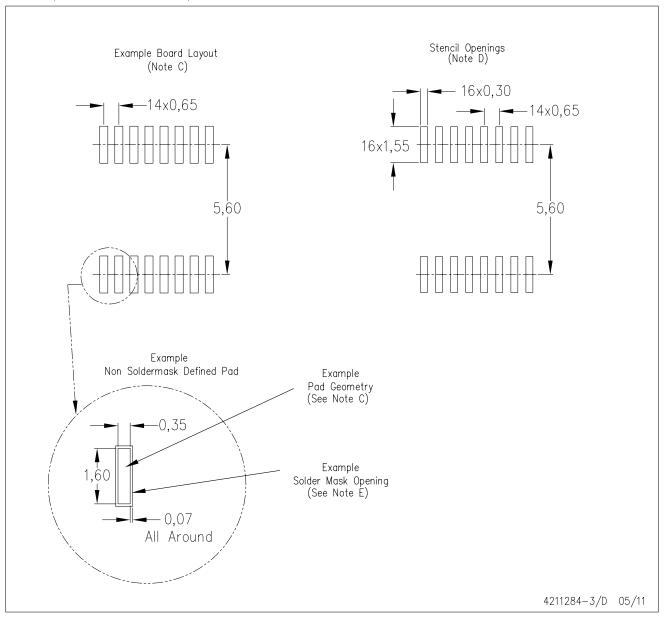


- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- D. 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.



DW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.

- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
- D. Falls within JEDEC MS-013 variation AA.



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

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

| Products | | Applications | | | |
|-----------------------------|------------------------|----------------------------------|-----------------------------------|--|--|
| Audio | www.ti.com/audio | Communications and Telecom | www.ti.com/communications | | |
| Amplifiers | amplifier.ti.com | Computers and Peripherals | www.ti.com/computers | | |
| Data Converters | dataconverter.ti.com | Consumer Electronics | www.ti.com/consumer-apps | | |
| DLP® Products | www.dlp.com | Energy and Lighting | www.ti.com/energy | | |
| DSP | dsp.ti.com | Industrial | www.ti.com/industrial | | |
| Clocks and Timers | www.ti.com/clocks | Medical | www.ti.com/medical | | |
| Interface | interface.ti.com | Security | www.ti.com/security | | |
| Logic | logic.ti.com | Space, Avionics and Defense | www.ti.com/space-avionics-defense | | |
| Power Mgmt | power.ti.com | Transportation and Automotive | www.ti.com/automotive | | |
| Microcontrollers | microcontroller.ti.com | Video and Imaging | www.ti.com/video | | |
| RFID | www.ti-rfid.com | Wireless | www.ti.com/wireless-apps | | |
| RF/IF and ZigBee® Solutions | www.ti.com/lprf | | | | |

TI E2E Community Home Page

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2011, Texas Instruments Incorporated

e2e.ti.com