- RS-232 Bus-Pin ESD Protection Exceeds $\pm 15$ kV Using Human-Body Model (HBM)
- Meets or Exceeds the Requirements of TIA/EIA-232-F and ITU v. 28 Standards
- Operates With 3-V to $5.5-\mathrm{V} \mathrm{V}_{\mathrm{CC}}$ Supply
- Operates Up To 250 kbit/s
- Two Drivers and Two Receivers
- Low Standby Current . . . $1 \mu \mathrm{~A}$ Typical
- External Capacitors . . . $4 \times 0.1 \mu \mathrm{~F}$
- Accepts 5-V Logic Input With 3.3-V Supply
- Alternative High-Speed Pin-Compatible Device ( $1 \mathrm{Mbit} / \mathrm{s}$ )
- SNx5C3222
- Applications
- Battery-Powered Systems, PDAs, Notebooks, Laptops, Palmtop PCs, and Hand-Held Equipment

DB, DW, OR PW PACKAGE
(TOP VIEW)

| $\overline{\mathrm{EN}} \square_{1}$ | $1 \cup_{20}$ | $\overline{\text { PWRDOWN }}$ |
| :---: | :---: | :---: |
| C1+ 2 | 219 | $\mathrm{V}_{\mathrm{CC}}$ |
| V+ 3 | 318 | $]$ GND |
| C1-4 | 417 | DOUT1 |
| $\mathrm{C} 2+5$ | 516 | RIN1 |
| C2- 6 | 615 | ROUT1 |
| V- 7 | 14 | NC |
| DOUT2 8 | 813 | DIN1 |
| RIN2[9 | 912 | DIN2 |
| ROUT2 10 | $10 \quad 11$ | ]C |

NC - No internal connection

## description/ordering information

The MAX3222 consists of two line drivers, two line receivers, and a dual charge-pump circuit with $\pm 15-\mathrm{kV}$ 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 $3-\mathrm{V}$ to $5.5-\mathrm{V}$ supply. The device operates at data signaling rates up to $250 \mathrm{kbit} / \mathrm{s}$ and a maximum of $30-\mathrm{V} / \mu \mathrm{s}$ driver output slew rate.

ORDERING INFORMATION

| $\mathrm{T}_{\text {A }}$ | PACKAGE $\dagger$ |  | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
| :---: | :---: | :---: | :---: | :---: |
| $-0^{\circ} \mathrm{C}$ to $70^{\circ} \mathrm{C}$ | SOIC (DW) | Tube of 25 | MAX3222CDW | MAX3222C |
|  |  | Reel of 2000 | MAX3222CDWR |  |
|  | SSOP (DB) | Tube of 70 | MAX3222CDB | MA3222C |
|  |  | Reel of 2000 | MAX3222CDBR |  |
|  | TSSOP (PW) | Tube of 70 | MAX3222CPW | MA3222C |
|  |  | Reel of 2000 | MAX3222CPWR |  |
| $-40^{\circ} \mathrm{C}$ to $85^{\circ} \mathrm{C}$ | SOIC (DW) | Tube of 25 | MAX3222IDW | MAX3222I |
|  |  | Reel of 2000 | MAX3222IDWR |  |
|  | SSOP (DB) | Tube of 70 | MAX3222IDB | MB3222I |
|  |  | Reel of 2000 | MAX3222IDBR |  |
|  | TSSOP (PW) | Tube of 70 | MAX3222IPW | MB3222I |
|  |  | Reel of 2000 | MAX3222IPWR |  |

$\dagger$ 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.

## 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH $\pm 15-k V$ ESD PROTECTION <br> SLLS408G - JANUARY 2000 - REVISED MARCH 2004

## description/ordering information (continued)

The MAX3222 can be placed in the power-down mode by setting $\overline{\text { PWRDOWN }}$ low, which draws only $1 \mu \mathrm{~A}$ from the power supply. When the device is powered down, the receivers remain active while the drivers are placed in the high-impedance state. Also, during power down, the onboard charge pump is disabled; $\mathrm{V}+$ is lowered to $\mathrm{V}_{\mathrm{CC}}$, and V - is raised toward GND. Receiver outputs also can be placed in the high-impedance state by setting EN high.

Function Tables

| EACH DRIVER |  |  |
| :--- | :---: | :---: |
| INPUTS  OUTPUT <br> DIN $\overline{\text { PWRDOWN }}$ DOUT <br> X L Z <br> L H H <br> H H L |  |  |

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

EACH RECEIVER

| INPUTS |  | OUTPUT |
| :---: | :---: | :---: |
| RIN | EN | ROUT |
| $L$ | $L$ | $H$ |
| $H$ | $L$ | $L$ |
| $X$ | $H$ | $Z$ |
| Open | $L$ | $H$ |

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

## logic diagram (positive logic)



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted) $\dagger$

$$
\begin{aligned}
& \text { Supply voltage difference, } \mathrm{V}_{+}-\mathrm{V}_{-} \text {(see Note 1) ........................................................ } 13 \mathrm{~V}
\end{aligned}
$$

$$
\begin{aligned}
& \text { Receivers .............................................................. } 25 \mathrm{~V} \text { to } 25 \mathrm{~V}
\end{aligned}
$$

$$
\begin{aligned}
& \text { Package thermal impedance, } \theta_{\mathrm{JA}} \text { (see Notes } 2 \text { and 3): DB package . .............................. } 70^{\circ} \mathrm{C} / \mathrm{W} \\
& \text { Operating virtual junction temperature, } \mathrm{T}_{\mathrm{J}} \ldots \ldots . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . ~ 150^{\circ} \mathrm{C}
\end{aligned}
$$

$\dagger$ 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 $T_{J}(\max ), \theta_{\mathrm{JA}}$, and $T_{A}$. The maximum allowable power dissipation at any allowable
ambient temperature is $P_{D}=\left(T_{J}(\max )-T_{A}\right) / \theta_{J A}$. Operating at the absolute maximum $T_{J}$ of $150^{\circ} \mathrm{C}$ can affect reliability.
3. The package thermal impedance is calculated in accordance with JESD 51-7.
recommended operating conditions (see Note 4 and Figure 5)


NOTE 4: Test conditions are $\mathrm{C} 1-\mathrm{C} 4=0.1 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V} \pm 0.3 \mathrm{~V} ; \mathrm{C} 1=0.047 \mu \mathrm{~F}, \mathrm{C} 2-\mathrm{C} 4=0.33 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V} \pm 0.5 \mathrm{~V}$.
electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 5)

| PARAMETER |  | TEST CONDITIONS | MIN | TYP\# | MAX | UNIT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | Input leakage current ( $\overline{\text { EN }}$, $\overline{\text { PWRDOWN }}$ ) |  |  | $\pm 0.01$ | $\pm 1$ | $\mu \mathrm{A}$ |
| ICC | Supply current | No load, $\overline{\text { PWRDOWN }}$ at $\mathrm{V}_{\mathrm{CC}}$ |  | 0.3 | 1 | mA |
|  | Supply current (powered off) | No load, PWRDOWN at GND |  | 1 | 10 | $\mu \mathrm{A}$ |

[^0]
## 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER

## DRIVER SECTION

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 5)

| PARAMETER |  | TEST CONDITIONS |  | MIN | TYPt | MAX | $\begin{gathered} \hline \text { UNIT } \\ \hline \mathrm{V} \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{V}_{\mathrm{OH}}$ | High-level output voltage | DOUT at $\mathrm{R}_{\mathrm{L}}=3 \mathrm{k} \Omega$ to GND, | DIN = GND | 5 | 5.4 |  |  |
| $\mathrm{V}_{\mathrm{OL}}$ | Low-level output voltage | DOUT at $\mathrm{R}_{\mathrm{L}}=3 \mathrm{k} \Omega$ to GND, | $\mathrm{DIN}=\mathrm{V}_{\mathrm{CC}}$ | -5 | -5.4 |  | V |
| ${ }_{\text {IIH }}$ | High-level input current | $\mathrm{V}_{\mathrm{I}}=\mathrm{V}_{\text {CC }}$ |  |  | $\pm 0.01$ | $\pm 1$ | $\mu \mathrm{A}$ |
| IIL | Low-level input current | $V_{1}$ at GND |  |  | $\pm 0.01$ | $\pm 1$ | $\mu \mathrm{A}$ |
| Ios | Short-circuit output current $\ddagger$ | $\mathrm{V}_{\mathrm{CC}}=3.6 \mathrm{~V}$, | $\mathrm{V}_{\mathrm{O}}=0 \mathrm{~V}$ | $\pm 35$ |  | $\pm 60$ | mA |
|  |  | $\mathrm{V}_{\mathrm{CC}}=5.5 \mathrm{~V}$, | $\mathrm{V}_{\mathrm{O}}=0 \mathrm{~V}$ |  |  |  |  |
| ro | Output resistance | $\mathrm{V}_{\mathrm{CC}}, \mathrm{V}_{+}$, and $\mathrm{V}-=0 \mathrm{~V}$, | $\mathrm{V}_{\mathrm{O}}= \pm 2 \mathrm{~V}$ | 300 | 10M |  | $\Omega$ |
| loff | Output leakage current | $\begin{aligned} & \hline \text { PWRDOWN }=\mathrm{GND}, \\ & \mathrm{~V}_{\mathrm{CC}}=3 \mathrm{~V} \text { to } 3.6 \mathrm{~V} \end{aligned}$ | $\mathrm{V}_{\mathrm{O}}= \pm 12 \mathrm{~V},$ |  |  | $\pm 25$ | $\mu \mathrm{A}$ |
|  |  | $\begin{aligned} & \hline \text { PWRDOWN }=\text { GND, } \\ & \mathrm{V}_{\mathrm{CC}}=4.5 \mathrm{~V} \text { to } 5.5 \mathrm{~V} \end{aligned}$ | $\mathrm{V}_{\mathrm{O}}= \pm 10 \mathrm{~V}$, |  |  | $\pm 25$ |  |

$\dagger$ All typical values are at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$, and $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$.
$\ddagger$ 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 $\mathrm{C} 1-\mathrm{C} 4=0.1 \mu \mathrm{~F}$ at $\mathrm{V} \mathrm{CC}=3.3 \mathrm{~V} \pm 0.3 \mathrm{~V} ; \mathrm{C} 1=0.047 \mu \mathrm{~F}, \mathrm{C} 2-\mathrm{C} 4=0.33 \mu \mathrm{~F}$ at $\mathrm{V} \mathrm{CC}=5 \mathrm{~V} \pm 0.5 \mathrm{~V}$.
switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 5)

|  | PARAMETER | TEST CONDITIONS |  | MIN | TYP† | MAX | UNIT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Maximum data rate |  | $C_{L}=1000 \mathrm{pF},$ <br> One DOUT switching, | $\mathrm{R}_{\mathrm{L}}=3 \mathrm{k} \Omega,$ <br> See Figure 1 | 150 | 250 |  | kbit/s |
| $t_{\text {sk( }}(\mathrm{p})$ | Pulse skew§ | $C_{L}=150 \mathrm{pF} \text { to } 2500 \mathrm{pF} \text {, }$ <br> See Figure 2 | $\mathrm{R}_{\mathrm{L}}=3 \mathrm{k} \Omega$ to $7 \mathrm{k} \Omega$, | 300 |  |  | ns |
| SR(tr) | Slew rate, transition region (See Figure 1) | $\begin{aligned} & \mathrm{R}_{\mathrm{L}}=3 \mathrm{k} \Omega \text { to } 7 \mathrm{k} \Omega, \\ & \mathrm{~V}_{\mathrm{CC}}=3.3 \mathrm{~V} \end{aligned}$ | $\mathrm{C}_{\mathrm{L}}=150 \mathrm{pF}$ to 1000 pF | 6 |  | 30 | V/us |
|  |  |  | $C_{L}=150 \mathrm{pF}$ to 2500 pF | 4 |  | 30 |  |

$\dagger$ All typical values are at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$, and $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$.
§ Pulse skew is defined as |tpLH - tpHL| of each channel of the same device.
NOTE 4: Test conditions are $\mathrm{C} 1-\mathrm{C} 4=0.1 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V} \pm 0.3 \mathrm{~V} ; \mathrm{C} 1=0.047 \mu \mathrm{~F}, \mathrm{C} 2-\mathrm{C} 4=0.33 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V} \pm 0.5 \mathrm{~V}$.

## RECEIVER SECTION

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4 and Figure 5)

| PARAMETER |  | TEST CONDITIONS | MIN | TYPt | MAX | UNIT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $\mathrm{V}_{\mathrm{OH}}$ | High-level output voltage | $\mathrm{I}^{\mathrm{OH}}=-1 \mathrm{~mA}$ | $\mathrm{V}_{\mathrm{CC}}-0.6 \mathrm{~V}$ | $\mathrm{V}_{\mathrm{CC}}-0.1 \mathrm{~V}$ |  | V |
| VOL | Low-level output voltage | $\mathrm{IOL}=1.6 \mathrm{~mA}$ |  |  | 0.4 | V |
| $\mathrm{V}_{\text {IT }+}$ | Positive-going input threshold voltage | $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}$ |  | 1.5 | 2.4 | V |
|  |  | $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$ |  | 1.8 | 2.4 |  |
| $V_{\text {IT }}$ | Negative-going input threshold voltage | $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}$ | 0.6 | 1.2 |  | V |
|  |  | $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$ | 0.8 | 1.5 |  |  |
| Vhys | Input hysteresis ( $\mathrm{V}_{\text {IT+}}-\mathrm{V}_{\text {IT-}}$ ) |  |  | 0.3 |  | V |
| loff | Output leakage current | $\overline{\mathrm{EN}}=\mathrm{V}_{\mathrm{CC}}$ |  | $\pm 0.05$ | $\pm 10$ | $\mu \mathrm{A}$ |
| $\mathrm{r}_{\mathrm{i}}$ | Input resistance | $\mathrm{V}_{\mathrm{I}}= \pm 3 \mathrm{~V}$ to $\pm 25 \mathrm{~V}$ | 3 | 5 | 7 | $\mathrm{k} \Omega$ |

$\dagger$ All typical values are at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$, and $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$.
NOTE 4: Test conditions are $\mathrm{C} 1-\mathrm{C} 4=0.1 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V} \pm 0.3 \mathrm{~V} ; \mathrm{C} 1=0.047 \mu \mathrm{~F}, \mathrm{C} 2-\mathrm{C} 4=0.33 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V} \pm 0.5 \mathrm{~V}$.
switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Note 4)

| PARAMETER |  | TEST CONDITIONS | MIN | TYPt | MAX | UNIT |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| tplH | Propagation delay time, low- to high-level output | $\mathrm{C}_{\mathrm{L}}=150 \mathrm{pF}$, See Figure 3 |  | 300 |  | ns |
| tPHL | Propagation delay time, high- to low-level output | $\mathrm{C}_{\mathrm{L}}=150 \mathrm{pF}$, See Figure 3 |  | 300 |  | ns |
| ten | Output enable time | $\mathrm{C}_{\mathrm{L}}=150 \mathrm{pF}, \mathrm{R}_{\mathrm{L}}=3 \mathrm{k} \Omega \text {, }$ $\text { See Figure } 4$ |  | 200 |  | ns |
| $t_{\text {dis }}$ | Output disable time | $\mathrm{C}_{\mathrm{L}}=150 \mathrm{pF}, \mathrm{R}_{\mathrm{L}}=3 \mathrm{k} \Omega \text {, }$ <br> See Figure 4 |  | 200 |  | ns |
| $\mathrm{t}_{\text {sk }}(\mathrm{p})$ | Pulse skew $\ddagger$ | See Figure 3 |  | 300 |  | ns |

$\dagger$ All typical values are at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$, and $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$.
$\ddagger$ Pulse skew is defined as |tpLH - tpHL| of each channel of the same device.
NOTE 4: Test conditions are $\mathrm{C} 1-\mathrm{C} 4=0.1 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V} \pm 0.3 \mathrm{~V}$; $\mathrm{C} 1=0.047 \mu \mathrm{~F}, \mathrm{C} 2-\mathrm{C} 4=0.33 \mu \mathrm{~F}$ at $\mathrm{V} \mathrm{CC}=5 \mathrm{~V} \pm 0.5 \mathrm{~V}$.

## 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH $\pm 15-k V$ ESD PROTECTION <br> SLLS408G - JANUARY 2000 - REVISED MARCH 2004

## PARAMETER MEASUREMENT INFORMATION



NOTES: A. $C_{L}$ includes probe and jig capacitance.
B. The pulse generator has the following characteristics: $\mathrm{PRR}=250 \mathrm{kbit} / \mathrm{s}, \mathrm{Z}_{\mathrm{O}}=50 \Omega, 50 \%$ duty cycle, $\mathrm{t}_{\mathrm{r}} \leq 10 \mathrm{~ns}, \mathrm{t}_{\mathrm{f}} \leq 10 \mathrm{~ns}$.

Figure 1. Driver Slew Rate


NOTES: A. $C_{L}$ includes probe and jig capacitance.
B. The pulse generator has the following characteristics: $\mathrm{PRR}=250 \mathrm{kbit} / \mathrm{s}, \mathrm{Z}_{\mathrm{O}}=50 \Omega, 50 \%$ duty cycle, $\mathrm{tr}_{\mathrm{r}} \leq 10 \mathrm{~ns}, \mathrm{t}_{\mathrm{f}} \leq 10 \mathrm{~ns}$.

Figure 2. Driver Pulse Skew


NOTES: A. $\mathrm{C}_{\mathrm{L}}$ includes probe and jig capacitance.
B. The pulse generator has the following characteristics: $Z_{O}=50 \Omega, 50 \%$ duty cycle, $\mathrm{t}_{\mathrm{r}} \leq 10 \mathrm{~ns}, \mathrm{t}_{\mathrm{f}} \leq 10 \mathrm{~ns}$.

Figure 3. Receiver Propagation Delay Times

## PARAMETER MEASUREMENT INFORMATION



vOLTAGE WAVEFORMS

NOTES: A. $C_{L}$ includes probe and jig capacitance.
B. The pulse generator has the following characteristics: $\mathrm{Z}_{\mathrm{O}}=50 \Omega, 50 \%$ duty cycle, $\mathrm{t}_{\mathrm{r}} \leq 10 \mathrm{~ns}, \mathrm{t}_{\mathrm{f}} \leq 10 \mathrm{~ns}$.

Figure 4. Receiver Enable and Disable Times

APPLICATION INFORMATION

$\dagger \mathrm{C} 3$ can be connected to $\mathrm{V}_{\mathrm{CC}}$ or GND.
NOTES: A. Resistor values shown are nominal.
B. NC - No internal connection
C. Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they should be connected as shown.

VCC vs CAPACITOR VALUES

| $\mathrm{V}_{\mathrm{CC}}$ | C 1 | $\mathrm{C} 2, \mathrm{C} 3$, and $\mathbf{C 4}$ |
| :---: | :---: | :---: |
| $3.3 \mathrm{~V} \pm 0.3 \mathrm{~V}$ | $0.1 \mu \mathrm{~F}$ | $0.1 \mu \mathrm{~F}$ |
| $5 \mathrm{~V} \pm 0.5 \mathrm{~V}$ | $0.047 \mu \mathrm{~F}$ | $0.33 \mu \mathrm{~F}$ |
| 3 V to 5.5 V | $0.1 \mu \mathrm{~F}$ | $0.47 \mu \mathrm{~F}$ |

Figure 5. Typical Operating Circuit and Capacitor Values

## PACKAGE OPTION ADDENDUM

## PACKAGING INFORMATION

| Orderable Device | Status ${ }^{(1)}$ | Package Type | Package Drawing |  | Package Qty | $\text { e Eco Plan }{ }^{(2)}$ | Lead/Ball Finish | MSL Peak Temp ${ }^{(3)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| MAX3222CDB | ACTIVE | SSOP | DB | 20 | 70 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDBE4 | ACTIVE | SSOP | DB | 20 | 70 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDBG4 | ACTIVE | SSOP | DB | 20 | 70 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDBR | ACTIVE | SSOP | DB | 20 | 2000 | $\begin{gathered} \hline \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDBRE4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDBRG4 | ACtive | SSOP | DB | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDW | ACTIVE | SOIC | DW | 20 | 25 | $\begin{gathered} \hline \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDWE4 | ACTIVE | SOIC | DW | 20 | 25 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CDWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CPW | ACTIVE | TSSOP | PW | 20 | 70 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CPWE4 | ACTIVE | TSSOP | PW | 20 | 70 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CPWG4 | ACTIVE | TSSOP | PW | 20 | 70 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CPWR | ACTIVE | TSSOP | PW | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CPWRE4 | ACTIVE | TSSOP | PW | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222CPWRG4 | ACTIVE | TSSOP | PW | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDB | ACTIVE | SSOP | DB | 20 | 70 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDBE4 | ACTIVE | SSOP | DB | 20 | 70 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDBG4 | ACTIVE | SSOP | DB | 20 | 70 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDBR | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDBRE4 | ACTIVE | SSOP | DB | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDBRG4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDW | ACTIVE | SOIC | DW | 20 | 25 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |


| Orderable Device | Status ${ }^{(1)}$ | Package Type | Package Drawing | Pins | Package Qty | $\text { Eco Plan }{ }^{(2)}$ | Lead/Ball Finish | MSL Peak Temp ${ }^{(3)}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| MAX3222IDWE4 | ACTIVE | SOIC | DW | 20 | 25 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no } \mathrm{Sb} / \mathrm{Br} \text { ) } \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br})$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IDWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IPW | ACTIVE | TSSOP | PW | 20 | 70 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no } \mathrm{Sb} / \mathrm{Br} \text { ) } \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IPWE4 | ACTIVE | TSSOP | PW | 20 | 70 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no } \mathrm{Sb} / \mathrm{Br} \text { ) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IPWG4 | ACTIVE | TSSOP | PW | 20 | 70 | $\begin{gathered} \hline \text { Green (RoHS \& } \\ \text { no } \mathrm{Sb} / \mathrm{Br}) \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IPWR | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS \& no $\mathrm{Sb} / \mathrm{Br}$ ) | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IPWRE4 | ACTIVE | TSSOP | PW | 20 | 2000 | $\begin{gathered} \hline \text { Green (RoHS \& } \\ \text { no } \mathrm{Sb} / \mathrm{Br} \text { ) } \\ \hline \end{gathered}$ | CU NIPDAU | Level-1-260C-UNLIM |
| MAX3222IPWRG4 | ACTIVE | TSSOP | PW | 20 | 2000 | $\begin{gathered} \text { Green (RoHS \& } \\ \text { no Sb/Br) } \end{gathered}$ | 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.
${ }^{(2)}$ 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 $\mathrm{Pb}-\mathrm{Free} / \mathrm{Green}$ 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 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 $\mathbf{S b} / \mathbf{B r}$ ): 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.

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DW (R-PDSO-G2O)

## PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).
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 AC.


| DIM PINS ** | $\mathbf{1 4}$ | $\mathbf{1 6}$ | $\mathbf{2 0}$ | $\mathbf{2 4}$ | $\mathbf{2 8}$ | $\mathbf{3 0}$ | $\mathbf{3 8}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A MAX | 6,50 | 6,50 | 7,50 | 8,50 | 10,50 | 10,50 | 12,90 |
| A MIN | 5,90 | 5,90 | 6,90 | 7,90 | 9,90 | 9,90 | 12,30 |

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


| PIMS $^{* *}$ | $\mathbf{8}$ | $\mathbf{1 4}$ | $\mathbf{1 6}$ | $\mathbf{2 0}$ | $\mathbf{2 4}$ | $\mathbf{2 8}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| A MAX | 3,10 | 5,10 | 5,10 | 6,60 | 7,90 | 9,80 |
| A MIN | 2,90 | 4,90 | 4,90 | 6,40 | 7,70 | 9,60 |

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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[^0]:    $\ddagger$ All typical values are at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V}$ or $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V}$, and $\mathrm{T}_{\mathrm{A}}=25^{\circ} \mathrm{C}$
    NOTE 4: Test conditions are $\mathrm{C} 1-\mathrm{C} 4=0.1 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=3.3 \mathrm{~V} \pm 0.3 \mathrm{~V} ; \mathrm{C} 1=0.047 \mu \mathrm{~F}, \mathrm{C} 2-\mathrm{C} 4=0.33 \mu \mathrm{~F}$ at $\mathrm{V}_{\mathrm{CC}}=5 \mathrm{~V} \pm 0.5 \mathrm{~V}$.

