- RS-232 Bus-Pin ESD Protection Exceeds ±15 kV Using Human-Body Model (HBM)
- Meets or Exceeds the Requirements of TIA/EIA-232-F and ITU v.28 Standards
- Operates at 5-V V_{CC} Supply
- Four Drivers and Five Receivers
- Operates Up To 120 kbit/s
- Low Supply Current in Shutdown Mode . . . 1 μA Typical
- External Capacitors . . . 4 × 0.1 μF
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- Applications
 - Battery-Powered Systems, PDAs, Notebooks, Laptops, Palmtop PCs, and Hand-Held Equipment

(TOP VIEW) DOUT3 [28 DOUT4 DOUT1 2 27 | RIN3 DOUT2 3 26 ROUT3 RIN2 4 25 SHDN 24 TEN ROUT2 5 23 | RIN4 DIN2 | 6 DIN1 7 22 ROUT4 ROUT1 ¶8 21 DIN4 RIN1 ¶9 20 DIN3 GND 10 19 ROUT5 V_{CC} ☐ 11 18 RIN5 C1+ 12 17 \ V_ V+ **1** 13 16 C2-C1− ∏ 14 15 C2+

DB OR DW PACKAGE

description/ordering information

The MAX211 device consists of four line drivers, five line receivers, and a dual charge-pump circuit with ± 15 -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 5-V supply. The devices operate at data signaling rates up to 120 kbit/s and a maximum of 30-V/ μ s driver output slew rate.

The MAX211 has both shutdown (SHDN) and enable control ($\overline{\text{EN}}$). In shutdown mode, the charge pumps are turned off, V+ is pulled down to V_{CC}, V- is pulled to GND, and the transmitter outputs are disabled. This reduces supply current typically to 1 μ A. $\overline{\text{EN}}$ is used to put the receiver outputs into the high-impedance state to allow wired-OR connection of two RS-232 ports. It has no effect on the RS-232 drivers or the charge pumps.

ORDERING INFORMATION

TA	PACKAGET		ORDERABLE PART NUMBER	TOP-SIDE MARKING
	0010 (DW)	Tube of 20	MAX211CDW	MANOMA
000 to 7000	SOIC (DW)	Reel of 1000	MAX211CDWR	MAX211C
0°C to 70°C	CCOD (DD)	Tube of 50	MAX211CDB	MAYOMO
	SSOP (DB)	Reel of 2000	MAX211CDBR	MAX211C
	COIC (DW)	Tube of 20	MAX211IDW	MANOAAL
4000 1- 0500	SOIC (DW)	Reel of 1000	MAX211IDWR	MAX211I
–40°C to 85°C	CCOD (DD)	Tube of 50	MAX211IDB	MAX211I
	SSOP (DB)	Reel of 2000	MAX211IDBR	MAXZTII

[†] 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.



5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ±15-kV ESD PROTECTION SLLS567E - MAY 2003 - REVISED JANUARY 2004

Function Tables

INPUTS		DDIVED	DECEIVED	DEVICE CTATUS
SHDN	EN	DRIVER	RECEIVER	DEVICE STATUS
L	L	All active	All active	Normal operation
L	Н	All active	Z	Normal operation
Н	X	Z	Z	Shutdown

X = don't care, Z = high impedance

EACH DRIVER

INP	UTS	OUTPUT	DDIVED OTATUO			
DIN	SHDN	DOUT	DRIVER STATUS			
L	L	Н	Name of an author			
Н	L	L	Normal operation			
Х	Н	Z	Powered off			

X = don't care, Z = high impedance

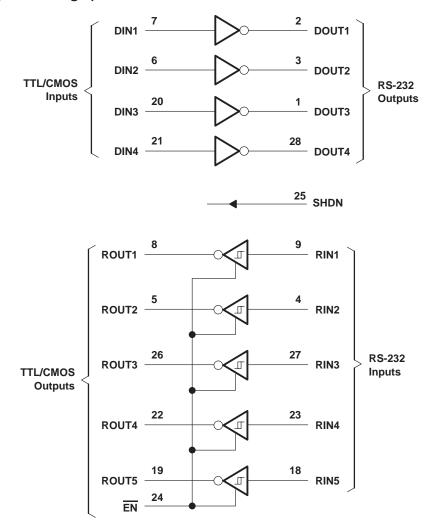
EACH RECEIVER

INP	UTS	OUTPUT	DEOCN/ED OTATUO			
RIN	EN	ROUT	RECEIVER STATUS			
L	L	Н				
Н	L	L	Normal operation			
Х	Н	Z	Powered off			

X = don't care, Z = high impedance



logic diagram (positive logic)



MAX211

5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH \pm 15-kV ESD PROTECTION

SLLS567E - MAY 2003 - REVISED JANUARY 2004

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V _{CC} (see Note 1)	0.3 V to 6 V
Positive charge pump voltage range, V+ (see Note 1)	
Negative charge pump voltage range, V- (see Note 1)	0.3 V to –14 V
Input voltage range, V _I : Drivers	0.3 V to V+ + 0.3 V
Receivers	±30 V
Output voltage range, VO: Drivers	V 0.3 V to V+ + 0.3 V
Short-circuit duration: DOUT	Continuous
Package thermal impedance, θ_{JA} (see Notes 2 and 3): DB package	ckage 62°C/W
DW pa	ckage 46°C/W
Operating virtual junction temperature, T _J	150°C
Storage temperature range, T _{Sto}	–65°C to 150°C

[†] 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 $T_J(max)$, 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.
 - 3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 4 and Figure 4)

			MIN	NOM	MAX	UNIT
	Supply voltage		4.5	5	5.5	V
.,	Driver high-level input voltage	igh-level input voltage DIN				.,
VIH	Control high-level input voltage	EN, SHDN	2.4			V
VIL	Driver and control low-level input voltage	DIN, EN, SHDN			8.0	V
.,	Driver and control input voltage	DIN, EN, SHDN	0		5.5	.,
VI	Receiver input voltage		-30		30	V
Τ.		MAX211C	0		70	00
TA	Operating free-air temperature	MAX211I	-40		85	°C

NOTE 4: Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 5 V \pm 0.5 V.

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

PARAMETER		TEST CONDITIONS		MIN	TYP [‡]	MAX	UNIT
ICC	Supply current	No load,	See Figure 6		14	20	mA
	Shutdown supply current	T _A = 25°C,	See Figure 1		1	10	μΑ

[‡] All typical values are at V_{CC} = 5 V, and T_A = 25°C.

NOTE 4: Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 5 V \pm 0.5 V.



DRIVER SECTION

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT	
Vон	High-level output voltage	DOUT at R _L = $3 \text{ k}\Omega$ to GND		5	9		V	
VOL	Low-level output voltage	DOUT at R _L = $3 \text{ k}\Omega$ to GND		-5	-9		V	
Γ.	Driver high-level input current	$\begin{array}{c} \text{DIN} = \text{V}_{\text{CC}} \\ \hline \text{EN}, \text{SHDN} = \text{V}_{\text{CC}} \end{array}$			15	200	•	
ΙΗ	Control high-level input current				3	10	μΑ	
	Driver low-level input current	DIN = 0 V			-15	-200		
IIL	Control low-level input current	EN, SHDN = 0 V			-3	-10	μΑ	
los‡	Short-circuit output current	V _{CC} = 5.5 V,	V _O = 0 V		±10	±60	mA	
r _O	Output resistance	V _{CC} , V+, and V- = 0 V,	V _O = ±2 V	300		·	Ω	

[†] All typical values are at $V_{CC} = 5$ V, and $T_A = 25$ °C.

NOTE 4: Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 5 V \pm 0.5 V.

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

	PARAMETER	TEST CO	ONDITIONS	MIN	TYP [†]	MAX	UNIT
	Maximum data rate	C _L = 50 pF to 1000 pF, One DOUT switching,	$R_L = 3 kΩ$ to $7 kΩ$, See Figure 2	120			kbit/s
^t PLH (D)	Propagation delay time, low- to high-level output	C _L = 2500 pF, All drivers loaded,	$R_L = 3 kΩ$, See Figure 2		2		μs
^t PHL (D)	Propagation delay time, high- to low-level output	C _L = 2500 pF, All drivers loaded,	$R_L = 3 kΩ$, See Figure 2		2		μs
tsk(p)	Pulse skew§	C _L = 150 pF to 2500 pF,	R_L = 3 kΩ to 7 kΩ, See Figure 3		300		ns
SR(tr)	Slew rate, transition region (see Figure 2)	C _L = 50 pF to 1000 pF, V _{CC} = 5 V	$R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega,$	3	6	30	V/μs

[†] All typical values are at $V_{CC} = 5$ V, and $T_A = 25$ °C.

ESD protection

PIN	TEST CONDITIONS	TYP	UNIT
D _{OUT} , R _{IN}	Human-Body Model	±15	kV

^{\$} 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.

[§] Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device. NOTE 4: Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 5 V \pm 0.5 V.

RECEIVER SECTION

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

	PARAMETER	TEST C	CONDITIONS	MIN	TYP†	MAX	UNIT
Vон	High-level output voltage	$I_{OH} = -1 \text{ mA}$		3.5	V _{CC} -0.4V		V
VOL	Low-level output voltage	$I_{OL} = 1.6 \text{ mA}$				0.4	V
V _{IT+}	Positive-going input threshold voltage	$V_{CC} = 5 V$,	T _A = 25°C		1.7	2.4	V
VIT-	Negative-going input threshold voltage	$V_{CC} = 5 V$,	T _A = 25°C	0.8	1.2		V
V _{hys}	Input hysteresis (V _{IT+} – V _{IT} –)			0.2	0.5	1	V
rį	Input resistance	$V_{CC} = 5 V$,	$T_A = 25^{\circ}C$	3	5	7	kΩ
	Output leakage current	$\overline{EN} = V_{CC},$	$0 \leq ROUT \leq V_{CC}$		±0.05	±10	μΑ

 $[\]overline{\dagger}$ All typical values are at V_{CC} = 5 V, and T_A = 25°C.

NOTE 4: Test conditions are C1–C4 = 0.1 μ F at V_{CC} = 5 V \pm 0.5 V.

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

	PARAMETER		TEST CONDITIONS		TYP	MAX	UNIT
^t PLH (R)	Propagation delay time, low- to high-level output	C _L = 150 pF,	See Figure 4		0.5	10	μs
tPHL (R)	Propagation delay time, high- to low-level output	C _L = 150 pF,	See Figure 4		0.5	10	μs
t _{en}	Output enable time	C _L = 150 pF, See Figure 5	$R_L = 1 \text{ k}\Omega$,		600		ns
^t dis	Output disable time	C _L = 150 pF, See Figure 5	$R_L = 1 k\Omega$,		200		ns
tsk(p)	Pulse skew [‡]	See Figure 3			300	·	ns

 $^{^{\}dagger}$ All typical values are at V_{CC} = 5 V, and T_A = 25°C.



[‡] Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device. NOTE 4: Test conditions are C1–C4 = 0.1 μ F, at V_{CC} = 5 $V \pm 0.5$ V.

PARAMETER MEASUREMENT INFORMATION

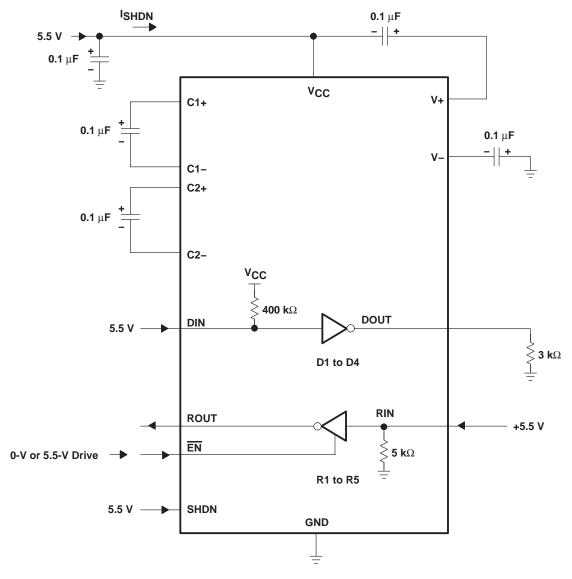
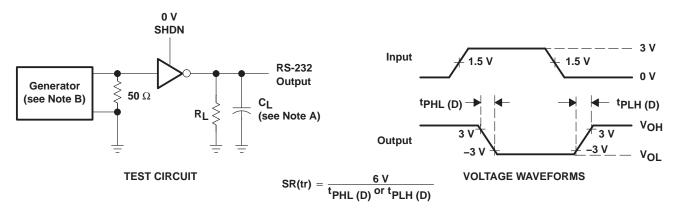


Figure 1. Shutdown Current Test Circuit

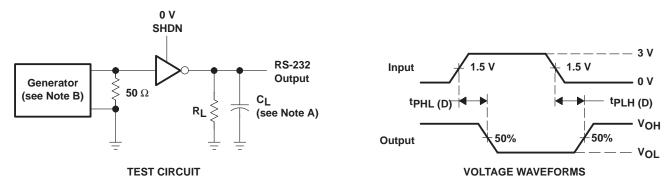
PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_L includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 120 kbit/s, $Z_O = 50 \Omega$, 50% duty cycle, $t_f \le 10$ ns. $t_f \le 10$ ns.

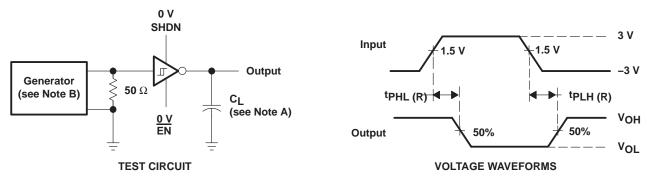
Figure 2. Driver Slew Rate and Propagation Delay Times



NOTES: A. C_L includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 120 kbit/s, $Z_O = 50 \Omega$, 50% duty cycle, $t_f \le 10$ ns.

Figure 3. Driver Pulse Skew



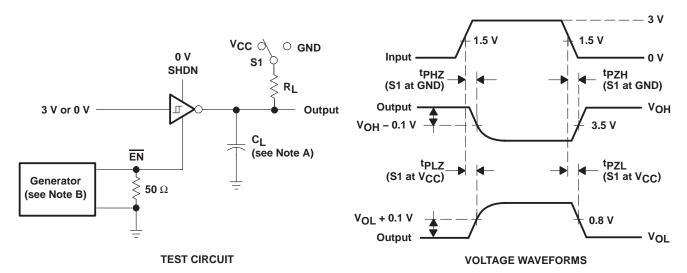
NOTES: A. C_L includes probe and jig capacitance.

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

Figure 4. Receiver Propagation Delay Times



PARAMETER MEASUREMENT INFORMATION

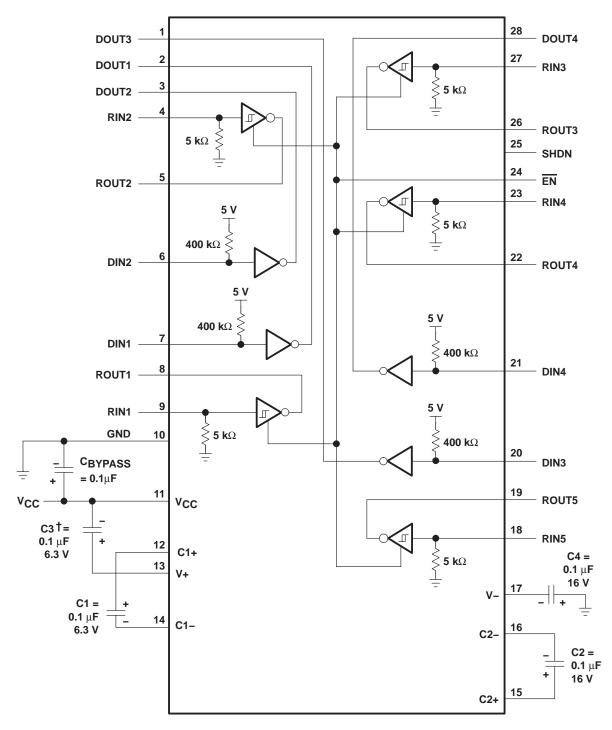


NOTES: A. C_L includes probe and jig capacitance.

- 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.
- C. tpLz and tpHz are the same as tdis.
- D. tpzL and tpzH are the same as ten.

Figure 5. Receiver Enable and Disable Times

APPLICATION INFORMATION



†C3 can be connected to V_{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.

Figure 6. Typical Operating Circuit and Capacitor Values



APPLICATION INFORMATION

capacitor selection

The capacitor type used for C1–C4 is not critical for proper operation. The MAX211 requires 0.1- μ F capacitors, although capacitors up to 10 μ F can be used without harm. Ceramic dielectrics are suggested for the 0.1- μ F capacitors. When using the minimum recommended capacitor values, make sure the capacitance value does not degrade excessively as the operating temperature varies. If in doubt, use capacitors with a larger (e.g., 2×) nominal value. The capacitors' effective series resistance (ESR), which usually rises at low temperatures, influences the amount of ripple on V+ and V–.

Use larger capacitors (up to 10 μ F) to reduce the output impedance at V+ and V-.

Bypass V_{CC} to ground with at least 0.1 μ F. In applications sensitive to power-supply noise generated by the charge pumps, decouple V_{CC} to ground with a capacitor the same size as (or larger than) the charge-pump capacitors (C1–C4).

electrostatic discharge (ESD) protection

Texas Instruments MAX211 devices have standard ESD protection structures incorporated on the pins to protect against electrostatic discharges encountered during assembly and handling. In addition, the RS232 bus pins (driver outputs and receiver inputs) of these devices have an extra level of ESD protection. Advanced ESD structures were designed to successfully protect these bus pins against ESD discharge of ± 15 kV when powered down.

ESD test conditions

ESD testing is stringently performed by TI, based on various conditions and procedures. Please contact TI for a reliability report that documents test setup, methodology, and results.

Human-Body Model

The Human-Body Model (HBM) of ESD testing is shown in Figure 7. Figure 8 shows the current waveform that is generated during a discharge into a low impedance. The model consists of a 100-pF capacitor charged to the ESD voltage of concern and subsequently discharged into the DUT through a 1.5-k Ω resistor.

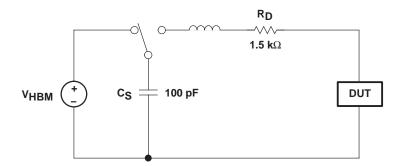


Figure 7. HBM ESD Test Circuit



APPLICATION INFORMATION

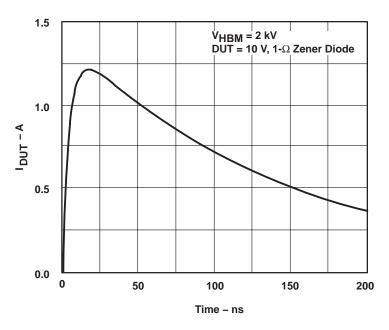


Figure 8. Typical HBM Current Waveform

Machine Model

The Machine Model (MM) ESD test applies to all pins, using a 200-pF capacitor with no discharge resistance. The purpose of the MM test is to simulate possible ESD conditions that can occur during the handling and assembly processes of manufacturing. In this case, ESD protection is required for all pins, not just RS-232 pins. However, after PC board assembly, the MM test no longer is as pertinent to the RS-232 pins.





PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
MAX211CDB	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDBE4	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDBG4	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDBR	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDBRE4	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDBRG4	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDW	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDWE4	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDWG4	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDWR	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDWRE4	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211CDWRG4	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDB	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDBE4	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDBG4	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDBR	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDBRE4	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDBRG4	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDW	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDWE4	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDWG4	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDWR	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDWRE4	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX211IDWRG4	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

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



PACKAGE OPTION ADDENDUM

28-May-2007

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.

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.

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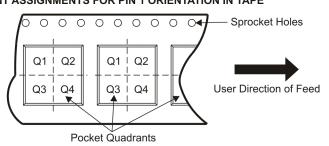
TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
	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
MAX211CDBR	SSOP	DB	28	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
MAX211CDWR	SOIC	DW	28	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
MAX211IDBR	SSOP	DB	28	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
MAX211IDWR	SOIC	DW	28	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1





*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
MAX211CDBR	SSOP	DB	28	2000	346.0	346.0	33.0
MAX211CDWR	SOIC	DW	28	1000	346.0	346.0	49.0
MAX211IDBR	SSOP	DB	28	2000	346.0	346.0	33.0
MAX211IDWR	SOIC	DW	28	1000	346.0	346.0	49.0

DW (R-PDSO-G28)

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 AE.



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

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