MAX3223 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ±15-kV ESD PROTECTION

ROUT2 10

SLLS409K - JANUARY 2000 - REVISED MARCH 2004

11 INVALID

- 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 With 3-V to 5.5-V V_{CC} Supply
- Operates Up To 250 kbit/s
- Two Drivers and Two Receivers
- Low Standby Current . . . 1 μA Typical
- External Capacitors . . . 4 × 0.1 μF
- Accepts 5-V Logic Input With 3.3-V Supply
- Alternative High-Speed Pin-Compatible Device (1 Mbit/s)
 - SNx5C3223
- Applications
 - Battery-Powered Systems, PDAs, Notebooks, Laptops, Palmtop PCs, and Hand-Held Equipment

DB, DW, OR PW PACKAGE (TOP VIEW) ĒΝ 20 FORCEOFF 19 V_{CC} C1+ 2 V+[] 3 18 **∏** GND C1−∏4 17 DOUT1 C2+∏5 16 RIN1 15 ROUT1 C2-[] 6 V-**∏** 7 14 | FORCEON 13 DIN1 DOUT2 1 8 RIN2 ¶ 9 12 DIN2

description/ordering information

The MAX3223 consists of two line drivers, two 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 3-V to 5.5-V supply. The device operates at data signaling rates up to 250 kbit/s and a maximum of 30-V/ μ s driver output slew rate.

ORDERING INFORMATION

TA	PACKAGET		ORDERABLE PART NUMBER	TOP-SIDE MARKING
	COIC (DW)	Tube of 25	MAX3223CDW	MAYAAAA
	SOIC (DW)	Reel of 2000	MAX3223CDWR	MAX3223C
−0°C to 70°C	CCOD (DD)	Tube of 70	MAX3223CDB	MA2222
-0°C to 70°C	SSOP (DB)	Reel of 2000	MAX3223CDBR	MA3223C
	T0000 (DIA)	Tube of 70	MAX3223CPW	MA 00000
	TSSOP (PW)	Reel of 2000	MAX3223CPWR	MA3223C
	COIC (DW)	Tube of 25	MAX3223IDW	MAYAAAA
	SOIC (DW)	Reel of 2000	MAX3223IDWR	MAX3223I
4000 +- 0500	CCOD (DD)	Tube of 70	MAX3223IDB	MDaggal
–40°C to 85°C	SSOP (DB)	Reel of 2000	MAX3223IDBR	MB3223I
	TCCOD (DM)	Tube of 70	MAX3223IPW	MDaggal
	TSSOP (PW)	Reel of 2000	MAX3223IPWR	MB3223I

[†] 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 ±15-kV ESD PROTECTION

SLLS409K - JANUARY 2000 - REVISED MARCH 2004

description/ordering information (continued)

Flexible control options for power management are available when the serial port is inactive. The auto-powerdown feature functions when FORCEON is low and FORCEOFF is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If FORCEOFF is set low and EN is high, both drivers and receivers are shut off, and the supply current is reduced to 1 μA. Disconnecting the serial port or turning off the peripheral drivers causes auto-powerdown to occur. Auto-powerdown can be disabled when FORCEON and FORCEOFF are high. With auto-powerdown enabled, the device is activated automatically when a valid signal is applied to any receiver input. The INVALID output is used to notify the user if an RS-232 signal is present at any receiver input. INVALID is high (valid data) if any receiver input voltage is greater than 2.7 V or less than -2.7 V, or has been between -0.3 V and 0.3 V for less than 30 μs. INVALID is low (invalid data) if the receiver input voltage is between -0.3 V and 0.3 V for more than 30 us. Refer to Figure 4 for receiver input levels.

Function Tables

EACH DRIVER

		INPUTS		OUTPUT	
DIN	FORCEON	FORCEOFF	VALID RIN RS-232 LEVEL	DOUT	DRIVER STATUS
Х	Χ	L	Х	Z	Powered off
L	Н	Н	Х	Н	Normal operation with
Н	Н	Н	X	L	auto-powerdown disabled
L	L	Н	Yes	Н	Normal operation with
Н	L	Н	Yes	L	auto-powerdown enabled
L	L	Н	No	Z	Powered off by
Н	L	Н	No	Z	auto-powerdown feature

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

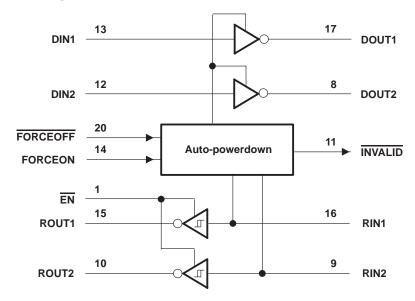
EACH RECEIVER

	INP	OUTPUT	
RIN	EN	VALID RIN RS-232 LEVEL	ROUT
L	L	Х	Н
Н	L	X	L
Х	Н	X	Z
Open	L	No	Н

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



logic diagram (positive logic)



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

Supply voltage range, V _{CC} (see Note 1)	
Positive output supply voltage range, V+ (see Note 1)	–0.3 V to 7 V
Negative output supply voltage range, V– (see Note 1)	0.3 V to –7 V
Supply voltage difference, V+ – V– (see Note 1)	
Input voltage range, V _I : Driver, FORCEOFF, FORCEON, EN	0.3 V to 6 V
Receiver	–25 V to 25 V
Output voltage range, VO: Driver	
Receiver, INVALID	$-0.3 \text{ V to V}_{CC} + 0.3 \text{ V}$
Package thermal impedance, θ _{JA} (see Notes 2 and 3): DB package	
DW package	58°C/W
PW package	83°C/W
Operating virtual junction temperature, T _J	150°C
Storage temperature range, T _{stq}	

[†] 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.



MAX3223

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

SLLS409K - JANUARY 2000 - REVISED MARCH 2004

recommended operating conditions (see Note 4 and Figure 6)

				MIN	NOM	MAX	UNIT
	Supply voltage		V _{CC} = 3.3 V	3	3.3	3.6	V
			V _{CC} = 5 V	4.5	5	5.5	V
V	Driver and control high level input voltage	DIN, EN, FORCEOFF,	$V_{CC} = 3.3 \text{ V}$	2			V
VIH	Driver and control high-level input voltage	FORCEON $V_{CC} = 5$	V _{CC} = 5 V	2.4			V
V_{IL}	Driver and control low-level input voltage	DIN, EN, FORCEOFF, FORCE	ON			0.8	V
17.	Driver and control input voltage	DIN, EN, FORCEOFF, FORCE	ON	0		5.5	V
Receiver input voltage			-25		25	V	
т.	T _A Operating free-air temperature		MAX3223C	0		70	°C
TA	Operating nee-air temperature		MAX3223I	-40		85	C

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

	PARAME	TER	TES	T CONDITIONS	MIN	TYP†	MAX	UNIT
II	Input leakage current	EN, FORCEOFF, FORCEON				±0.01	±1	μΑ
		Auto-powerdown disabled		No load, FORCEOFF and FORCEON at V _{CC}		0.3	1	mA
ICC	Supply current	Powered off	$V_{CC} = 3.3 \text{ V or 5 V},$ $T_{A} = 25^{\circ}\text{C}$	No load, FORCEOFF at GND		1	10	
		Auto-powerdown enabled	14 - 20 0	No load, FORCEOFF at V _{CC} , FORCEON at GND, All RIN are open or grounded		1	10	μΑ

† All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C. NOTE 4: 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.



SLLS409K - JANUARY 2000 - REVISED MARCH 2004

DRIVER SECTION

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

	PARAMETER	TES	T CONDITIONS	MIN	TYP†	MAX	UNIT
Vон	High-level output voltage	DOUT at $R_L = 3 \text{ k}\Omega$ to GN	D	5	5.4		V
VOL	Low-level output voltage	DOUT at R _L = 3 k Ω to GND		-5	-5.4		٧
lн	High-level input current	VI = VCC			±0.01	±1	μΑ
Ι _Ι L	Low-level input current	V _I at GND			±0.01	±1	μΑ
	Object since it and and account t	V _{CC} = 3.6 V,	VO = 0 V		±35	±60	A
los	Short-circuit output current‡	V _{CC} = 5.5 V,	VO = 0 V		±35	±60	mA
r _O	Output resistance	V_{CC} , V+, and V- = 0 V,	$V_O = \pm 2 V$	300	10M		Ω
	Outrout lealings assument	FORCEOFF = GND	$V_O = \pm 12 \text{ V}, V_{CC} = 3 \text{ V to } 3.6 \text{ V}$			±25	^
loff	Output leakage current	FORCEOFF = GND	$V_O = \pm 10 \text{ V}, V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$			±25	μA

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

NOTE 4: 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.

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

	PARAMETER	TEST CONDITIONS MIN TYP [†] MAX				UNIT	
	Maximum data rate	C _L = 1000 pF, One DOUT switching,	$R_L = 3 kΩ$, See Figure 1	250			kbit/s
t _{sk(p)}	Pulse skew§	C _L = 150 pF to 2500 pF, See Figure 2	$R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega,$		100		ns
SR(tr)	Slew rate, transition region	V _{CC} = 3.3 V,	C _L = 150 pF to 1000 pF	6		30	V/µs
SK(II)	(See Figure 1)	V_{CC} = 3.3 V, R _L = 3 kΩ to 7 kΩ	C _L = 150 pF to 2500 pF	4		30	ν/μδ

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

NOTE 4: 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.



^{\$}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 |tpLH - tpHL| of each channel of the same device.

SLLS409K - JANUARY 2000 - REVISED MARCH 2004

RECEIVER SECTION

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

	PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
Vон	High-level output voltage	$I_{OH} = -1 \text{ mA}$	V _{CC} -0.6	V _{CC} -0.1		V
VOL	Low-level output voltage	I _{OL} = 1.6 mA			0.4	V
\/-	Decisive weign inner the weekeld value	VCC = 3.3 V		1.6	2.4	V
V _{IT+}	Positive-going input threshold voltage	V _{CC} = 5 V		1.9	2.4	٧
\/_	No notive point input through old valte as	V _{CC} = 3.3 V	0.6	1.1		.,
V _{IT} –	Negative-going input threshold voltage	V _{CC} = 5 V	0.8	1.4		٧
V _{hys}	Input hysteresis (V _{IT+} - V _{IT-})			0.5		V
l _{off}	Output leakage current	EN = V _{CC}		±0.05	±10	μΑ
rį	Input resistance	$V_I = \pm 3 \text{ V to } \pm 25 \text{ V}$	3	5	7	kΩ

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

NOTE 4: 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.

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

PARAMETER		TEST C	TEST CONDITIONS		MAX	UNIT
tPLH	Propagation delay time, low- to high-level output	C _L = 150 pF,	See Figure 3	150		ns
tPHL	Propagation delay time, high- to low-level output	C _L = 150 pF,	See Figure 3	150		ns
t _{en}	Output enable time	C _L = 150 pF, See Figure 4	$R_L = 3 k\Omega$,	200		ns
t _{dis}	Output disable time	C _L = 150 pF, See Figure 4	$R_L = 3 k\Omega$,	200		ns
t _{sk(p)}	Pulse skew [‡]	See Figure 3		50		ns

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

NOTE 4: 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.



[‡] Pulse skew is defined as |tpLH - tpHL| of each channel of the same device.

AUTO-POWERDOWN SECTION

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

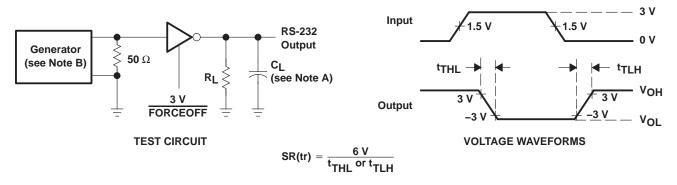
PARAMETER		TEST CO	ONDITIONS	MIN	MAX	UNIT
V _{T+(valid)}	Receiver input threshold for INVALID high-level output voltage	FORCEON = GND,	FORCEOFF = V _{CC}		2.7	٧
V _T -(valid)	Receiver input threshold for INVALID high-level output voltage	FORCEON = GND,	FORCEOFF = V _{CC}	-2.7		٧
VT(invalid)	Receiver input threshold for INVALID low-level output voltage	FORCEON = GND,	FORCEOFF = V _{CC}	-0.3	0.3	٧
VOH	INVALID high-level output voltage	$\frac{I_{OH} = -1 \text{ mA}}{FORCEOFF} = V_{CC}$	FORCEON = GND,	V _{CC} -0.6		V
VOL	INVALID low-level output voltage	I _{OL} = 1.6 mA, FORCEOFF = V _{CC}	FORCEON = GND,		0.4	V

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

	PARAMETER	TYP	UNIT
tvalid	Propagation delay time, low- to high-level output	1	μs
^t invalid	Propagation delay time, high- to low-level output	30	μs
ten	Supply enable time	100	μs

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

PARAMETER MEASUREMENT INFORMATION

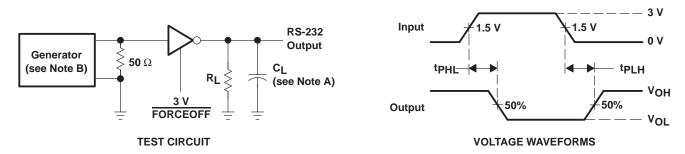


NOTES: A. C_L includes probe and jig capacitance.

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

Figure 1. Driver Slew Rate

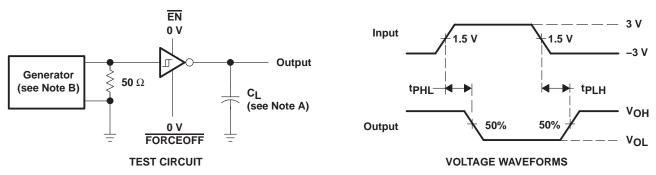
PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_L includes probe and jig capacitance.

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

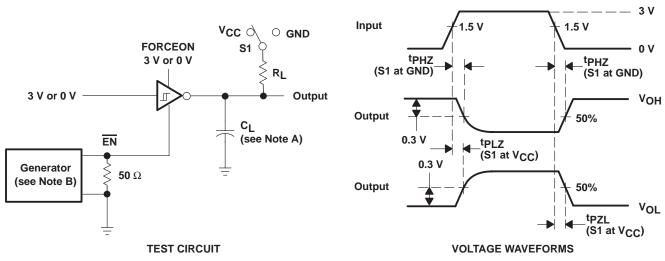
Figure 2. Driver Pulse Skew



NOTES: A. C_L includes probe and jig capacitance.

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

Figure 3. Receiver Propagation Delay Times



NOTES: A. C_I includes probe and jig capacitance.

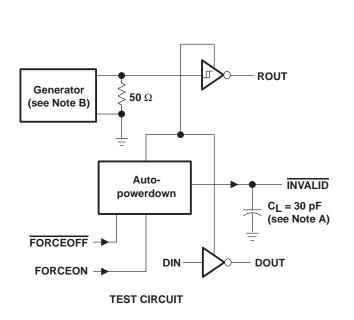
B. The pulse generator has the following characteristics: Z_O = 50 Ω , 50% duty cycle, $t_r \le$ 10 ns, $t_f \le$ 10 ns.

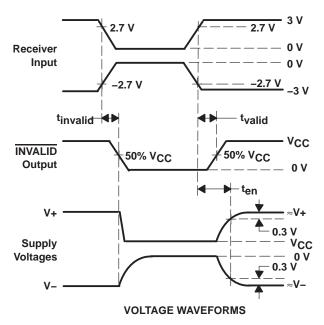
Figure 4. Receiver Enable and Disable Times

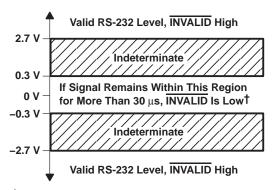


SLLS409K - JANUARY 2000 - REVISED MARCH 2004

PARAMETER MEASUREMENT INFORMATION







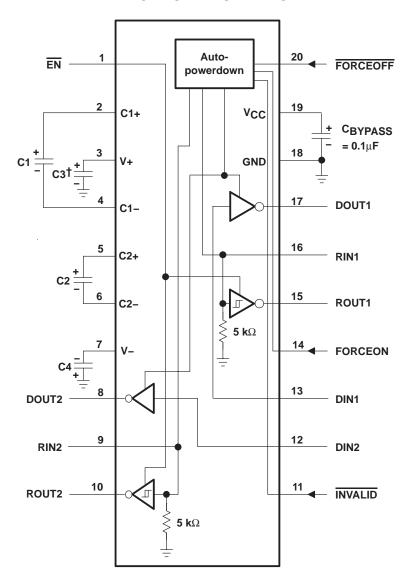
 \dagger Auto-powerdown disables drivers and reduces supply current to 1 μ A.

NOTES: A. C_L includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 5 kbit/s, $Z_O = 50 \Omega$, 50% duty cycle, $t_f \le 10$ ns. $t_f \le 10$ ns.

Figure 5. INVALID Propagation Delay Times and Supply Enabling Time

APPLICATION INFORMATION



†C3 can be connected to VCC 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

VCC	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 6. 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⁾
MAX3223CDB	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDBE4	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDBG4	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CDWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CPW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CPWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CPWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CPWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CPWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223CPWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDB	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDBE4	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDBG4	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM





com 18-Sep-2008

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp (3)
MAX3223IDWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IDWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IPW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IPWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IPWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IPWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IPWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
MAX3223IPWRG4	ACTIVE	TSSOP	PW	20	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.

(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.

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 MAX3223:

● Enhanced Product: MAX3223-EP



PACKAGE OPTION ADDENDUM

18-Sep-2008

I	N	\bigcirc	τ⊏⋅	Qualified	١,	arcian	Definitions:
	IV	w	1 -	CJUAIIIIEO	v	ersion	Delinilions

• Enhanced Product - Supports Defense, Aerospace and Medical Applications

PACKAGE MATERIALS INFORMATION

www.ti.com 5-May-2011

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
MAX3223CDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
MAX3223CDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
MAX3223CPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
MAX3223IDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
MAX3223IDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
MAX3223IPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

www.ti.com 5-May-2011



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
MAX3223CDBR	SSOP	DB	20	2000	346.0	346.0	33.0
MAX3223CDWR	SOIC	DW	20	2000	346.0	346.0	41.0
MAX3223CPWR	TSSOP	PW	20	2000	346.0	346.0	33.0
MAX3223IDBR	SSOP	DB	20	2000	346.0	346.0	33.0
MAX3223IDWR	SOIC	DW	20	2000	346.0	346.0	41.0
MAX3223IPWR	TSSOP	PW	20	2000	346.0	346.0	33.0

DW (R-PDSO-G20)

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 AC.



DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



NOTES:

- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Refer to IPC7351 for alternate board 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
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



NOTES:

- 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



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.

Applications

Automotive and Transportation www.ti.com/automotive

e2e.ti.com

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:

		•	
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video

RFID <u>www.ti-rfid.com</u>
OMAP Mobile Processors www.ti.com/omap

Products

Audio

Wireless Connectivity www.ti.com/wirelessconnectivity

www.ti.com/audio

TI E2E Community Home Page

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265 Copyright © 2012, Texas Instruments Incorporated