SN65C3223E, SN75C3223E 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVERS/RECEIVERS

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

TRUMENTS www.ti.com

FEATURES

- ESD Protection for RS-232 Bus Pins

 ±15-kV Human-Body Model (HBM)
 ±8-kV IEC 61000-4-2, Contact Discharge
 - ±15-kV IEC 61000-4-2, Air-Gap Discharge
- Meet or Exceed the Requirements of TIA/EIA-232-F and ITU v.28 Standards
- Operate With 3-V to 5.5-V V_{cc} Supply
- Operate up to 1000 kbit/s
- Two Drivers and Two Receivers
- Low Standby Current . . . 1 μA Typ
- External Capacitors . . . 4 \times 0.1 μF
- Accepts 5-V Logic Input With 3.3-V Supply

APPLICATIONS

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

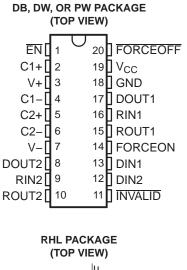
DESCRIPTION/ORDERING INFORMATION

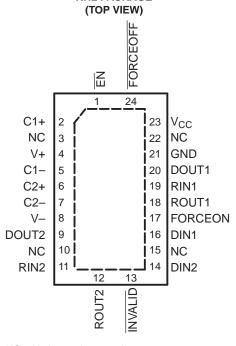
The SN65C3223E and SN75C3223E consist of two line drivers, two line receivers, and a dual charge-pump circuit with \pm 15-kV ESD protection pin to pin (serial-port connection pins, including GND). These devices meet the requirements of TIA/EIA-232-F and provide the electrical interface between an asynchronous 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 typical data signaling rates up to 1000 kbit/s.

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 devices do 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 mA. 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 devices are 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 more 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 µs. Refer to Figure 4 for receiver input levels.

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.

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NC - No internal connection

SN65C3223E, SN75C3223E 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVERS/RECEIVERS WITH ±15-kV ESD PROTECTION



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ORDERING INFORMATION

T _A	PAC	CKAGE ⁽¹⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	SOIC – DW	Tube of 25	SN75C3223EDW	75C3223E
	3010 - DW	Reel of 2000	SN75C3223EDWR	7505223E
0°C to 70°C		Tube of 70	SN75C3223EDB	MY222E
0°C to 70°C	SSOP – DB	Reel of 2000	SN75C3223EDBR	– MY223E
	TSSOP – PW	Tube of 70	SN75C3223EPW	MV000F
	1330P - PW	Reel of 2000	SN75C3223EPWR	– MY223E
	SOIC - DW	Tube of 25	SN65C3223EDW	65C3223E
	50IC - DW	Reel of 2000	SN65C3223EDWR	- 05U3223E
4000 to 0500		Tube of 70	SN65C3223EDB	MUODOE
–40°C to 85°C	SSOP – DB	Reel of 2000	SN65C3223EDBR	– MU223E
		Tube of 70	SN65C3223EPW	MUDDDE
	TSSOP – PW	Reel of 2000	SN65C3223EPWR	- MU223E

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLES

Each Driver⁽¹⁾

		INPUTS		OUTPUT	
DIN	FORCEON	FORCEOFF	VALID RIN RS-232 LEVEL	DOUT	DRIVER STATUS
Х	Х	L	Х	Z	Powered off
L	н	Н	Х	Н	Normal operation with
н	н	н	х	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

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

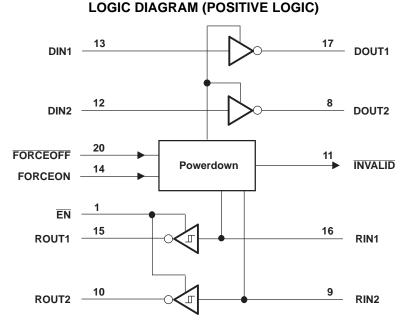
Each Receiver⁽¹⁾

	INPU	OUTPUT	
RIN	ĒN	VALID RIN RS-232 LEVEL	OUTPUT DOUT
L	L	Х	Н
н	L	Х	L
х	Н	Х	Z
Open	L	No	Н

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

SN65C3223E, SN75C3223E 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVERS/RECEIVERS WITH $\pm 15\text{-kV}$ ESD PROTECTION

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Pin numbers are for the DB, DW, and PW packages.

Absolute Maximum Ratings⁽¹⁾

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

			MIN	MAX	UNIT
V _{CC}	Supply voltage range		-0.3	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+ - V-	Supply voltage difference ⁽²⁾			13	V
	Input voltage range	Driver (FORCEOFF, FORCEON, EN)	-0.3	6	
/ _I Input vo	Input voltage range	Receiver	-25	25	V
		Driver	-13.2	13.2	
Vo	Output voltage range	Receiver (INVALID)	-0.3	V _{CC} + 0.3	V
		DB package		70	
0		DW package		58	0000
θ_{JA}	Package thermal impedance ⁽³⁾⁽⁴⁾	PW package		83	°C/W
		RHL package		TBD	
TJ	Operating virtual junction temperature	· · · ·		150	°C
T _{stg}	Storage temperature range		-65	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.

(2) All voltages are with respect to network GND.

(3) 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.

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

SN65C3223E, SN75C3223E 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVERS/RECEIVERS WITH ±15-kV ESD PROTECTION SLLS727A-MAY 2006-REVISED JULY 2006



Recommended Operating Conditions⁽¹⁾

See Figure 6

				MIN	NOM	MAX	UNIT
	Supply voltage		$V_{CC} = 3.3 V$	3	3.3	3.6	V
	Supply voltage		$V_{CC} = 5 V$	4.5	5	5.5	v
v	Driver and control	DIN, EN, FORCEOFF, FORCEON	$V_{CC} = 3.3 V$	2			V
V _{IH}	high-level input voltage	DIN, EN, FORCEOFF, FORCEON	$V_{CC} = 5 V$	2.4			v
V_{IL}	Driver and control low-level input voltage	DIN, EN, FORCEOFF, FORCEON				0.8	V
v	Driver and control input voltage	DIN, EN, FORCEOFF, FORCEON		0		5.5	V
VI	Receiver input voltage			-25		25	v
т	Operating free air temperature		SN75C3223E	0		70	°C
Τ _Α	Operating free-air temperature		SN65C3223E	-40		85	C

(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.

Electrical Characteristics⁽¹⁾

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

	PAI	RAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
I _I	Input leakage current	EN, FORCEOFF, FORCEON			±0.01	±1	μΑ
		Auto-powerdown disabled	V_{CC} = 3.3 V or 5 V, T_A = 25°C, No load, FORCEOFF and FORCEON at V_{CC}		0.3	1	mA
I _{CC}	Supply current	Powered off	No load, FORCEOFF at GND		1	10	
		Auto-powerdown enabled	No load, FORCEOFF at $V_{CC},$ FORCEON at GND, All RIN are open or grounded		1	10	μΑ

(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.

DRIVER SECTION

Electrical Characteristics⁽¹⁾

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

	PARAMETER	TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
V _{OH}	High-level output voltage	DOUT at $R_L = 3 k\Omega$ to GND	5	5.4		V
V _{OL}	Low-level output voltage	DOUT at $R_L = 3 k\Omega$ to GND	-5	-5.4		V
I _{IH}	High-level input current	$V_{I} = V_{CC}$		±0.01	±1	μA
IIL	Low-level input current	V _I at GND		±0.01	±1	μA
	Short-circuit output current ⁽³⁾	$V_{CC} = 3.6 \text{ V}, V_{O} = 0 \text{ V}$		±35	±60	mA
IOS	Short-circuit output current.	$V_{CC} = 5.5 \text{ V}, V_{O} = 0 \text{ V}$		±30	±00	ШA
r _o	Output resistance	V _{CC} , V+, and V– = 0 V, V _O = ± 2 V	300	10M		Ω
		FORCEOFF = GND, V_{CC} = 3 V to 3.6 V, V_{O} = ±12 V			±25	
I _{OZ}	Output leakage current	$\overline{\text{FORCEOFF}}$ = GND, V_{CC} = 4.5 V to 5.5 V, V_{O} = ±12 V			±25	μA

(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) 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.

Switching Characteristics⁽¹⁾

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

Р	ARAMETER		TEST CONDITIONS		MIN	TYP ⁽²⁾	МАХ	UNIT
	Maximum	_	C _L = 1000 pF		250			
	data rate	$R_L = 3 k\Omega$, One DOUT switching	C _L = 250 pF,	V_{CC} = 3 V to 4.5 V	1000			kbit/s
	(see Figure 1)	ene beer entering	C _L = 1000 pF,	V_{CC} = 4.5 V to 5.5 V	1000			
t _{sk(p)}	Pulse skew ⁽³⁾	$C_{L} = 150 \text{ pF} \text{ to } 2500 \text{ pF},$	$R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega$,	See Figure 2		300		ns
	Slew rate,	$R_L = 7 k\Omega$,	$C_{L} = 150 \text{ pF} \text{ to } 1000 \text{ pF}$		8		90	
SR(tr)	transition region		C _L = 1000 pF		12		60	V/µs
	(see Figure 1)	$R_L = 3 k\Omega$	C_L = 150 pF to 250 pF		24		150	

(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.

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RECEIVER SECTION

Electrical Characteristics⁽¹⁾

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

	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	Positivo going input throshold voltage	$V_{CC} = 3.3 V$		1.6	2.4	V
V _{IT+}	Positive-going input threshold voltage	$V_{CC} = 5 V$		1.9	2.4	v
v	Negotive going input threshold veltage	V _{CC} = 3.3 V	0.6	1.1		V
V _{IT-}	Negative-going input threshold voltage	$V_{CC} = 5 V$	0.6	1.4		v
V_{hys}	Input hysteresis (V _{IT+} – V _{IT-})			0.5		V
I _{OZ}	Output leakage current	$\overline{EN} = V_{CC}$		±0.05		μA
r _i	Input resistance	$V_1 = \pm 3 V$ to $\pm 25 V$	3	5		kΩ

(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.

Switching Characteristics⁽¹⁾

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

	PARAMETER	TEST CONDITIONS	TYP ⁽²⁾	UNIT
t _{PLH}	Propagation delay time, low- to high-level output	C _L = 150 pF, See Figure 3	150	ns
t _{PHL}	Propagation delay time, high- to low-level output	C _L = 150 pF, See Figure 3	150	ns
t _{en}	Output enable time	$C_L = 150 \text{ pF}, R_L = 3 \text{ k}\Omega$, See Figure 4	200	ns
t _{dis}	Output disable time	$C_L = 150 \text{ pF}, R_L = 3 \text{ k}\Omega$, See Figure 4	200	ns
t _{sk(p)}	Pulse skew ⁽³⁾	See Figure 3	50	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.

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AUTO-POWERDOWN SECTION

Electrical Characteristics

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

	PARAMETER	TEST	CONDITIONS	MIN	MAX	UNIT
V _{T+(valid)}	Receiver input threshold for INVALID high-level output voltage	FORCEON = GND,	$FORCEOFF = V_{CC}$		2.7	V
V _{T(valid)}	Receiver input threshold for INVALID high-level output voltage	FORCEON = GND,	$\overline{FORCEOFF} = V_{CC}$	-2.7		V
V _{T(invalid)}	Receiver input threshold for INVALID low-level output voltage	FORCEON = GND,	$\overline{FORCEOFF} = V_{CC}$	-0.3	0.3	V
V _{OH}	INVALID high-level output voltage	$I_{OH} = 1 \text{ mA},$ FORCEOFF = V _{CC}	FORCEON = GND,	V _{CC} – 0.6		V
V _{OL}	INVALID low-level output voltage	$I_{OL} = 1.6 \text{ mA},$ 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)

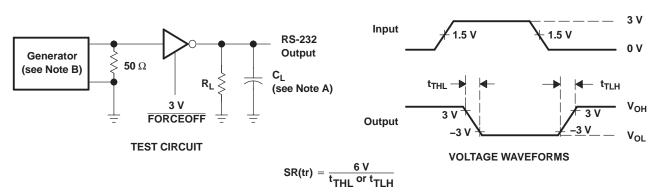
	PARAMETER	TYP ⁽¹⁾	UNIT
t _{valid}	Propagation delay time, low- to high-level output	1	μs
t _{invalid}	Propagation delay time, high- to low-level output	30	μs
t _{en}	Supply enable time	100	μs

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

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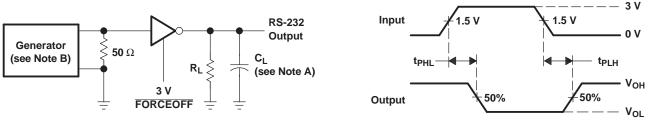
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PARAMETER MEASUREMENT INFORMATION

- 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.

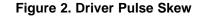
Figure 1. Driver Slew Rate

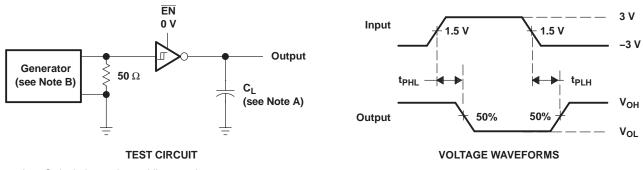


TEST CIRCUIT

VOLTAGE WAVEFORMS

- A. C_L includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: PRR = 250 kbit/s, Z_O = 50 Ω , 50% duty cycle, $t_r \le 10$ ns, $t_f \le 10$ ns.





A. C_L includes probe and jig capacitance.

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

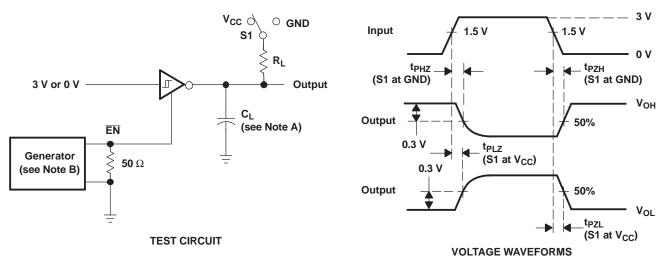
Figure 3. Receiver Propagation Delay Times

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PARAMETER MEASUREMENT INFORMATION (continued)



- A. C_L includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: Z₀ = 50 Ω , 50% duty cycle, t_r ≤ 10 ns, t_f ≤ 10 ns.

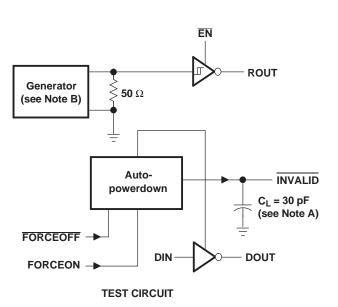
Figure 4. Receiver Enable and Disable Times

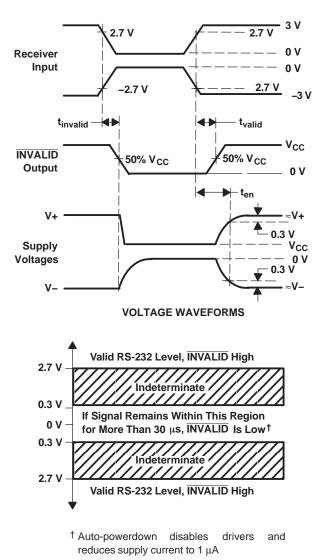
SN65C3223E, SN75C3223E 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVERS/RECEIVERS WITH $\pm 15\text{-kV}$ ESD PROTECTION

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PARAMETER MEASUREMENT INFORMATION (continued)





A. C_{L} includes probe and jig capacitance.

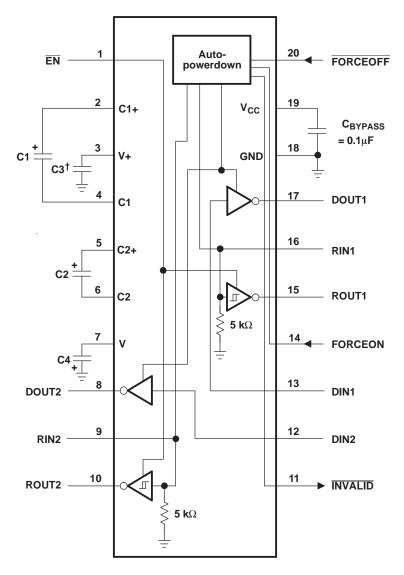
B. The pulse generator has the following characteristics: PRR = 250 kbit/s, $Z_0 = 50 \Omega$, 50% duty cycle, $t_r \le 10$ ns, $t_f \le 10$ ns.

Figure 5. INVALID Propagation Delay Times and Supply Enabling Time

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APPLICATION INFORMATION



^{\dagger} 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.
 V_{CC} vs CAPACITOR VALUES

V _{CC}	C1	C2, C3, and C4
3.3 V \pm 0.3 V	0.1 μF	0.1 μF
5 V \pm 0.5 V	0.047 μF	0.33 μF
3 V to 5.5 V	0.1 μF	0.47 μF



6-Dec-2006

PACKAGING INFORMATION

TEXAS INSTRUMENTS www.ti.com

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN65C3223EDB	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EDBG4	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EDBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EDBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EDWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EDWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EPW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EPWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EPWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN65C3223EPWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDB	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDBG4	ACTIVE	SSOP	DB	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EDWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EPW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EPWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EPWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75C3223EPWRG4	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.

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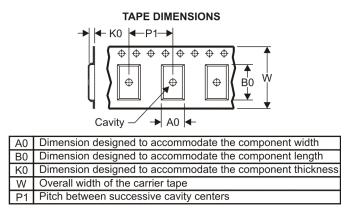
PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





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
SN65C3223EDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN65C3223EDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN65C3223EPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN75C3223EDBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN75C3223EDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1
SN75C3223EPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1

TEXAS INSTRUMENTS

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PACKAGE MATERIALS INFORMATION

5-May-2011



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN65C3223EDBR	SSOP	DB	20	2000	346.0	346.0	33.0
SN65C3223EDWR	SOIC	DW	20	2000	346.0	346.0	41.0
SN65C3223EPWR	TSSOP	PW	20	2000	346.0	346.0	33.0
SN75C3223EDBR	SSOP	DB	20	2000	346.0	346.0	33.0
SN75C3223EDWR	SOIC	DW	20	2000	346.0	346.0	41.0
SN75C3223EPWR	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.



LAND PATTERN DATA



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. β . 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



MECHANICAL DATA

MSSO002E - JANUARY 1995 - REVISED DECEMBER 2001

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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