TRS3243 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ±15-kV ESD (HBM) PROTECTION

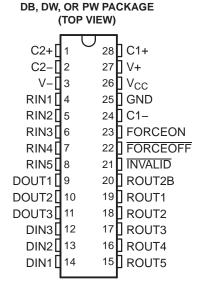
SLLS806-JUNE 2007

FEATURES

- Single-Chip and Single-Supply Interface for IBM™ PC/AT™ Serial Port
- 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
- Three Drivers and Five Receivers
- Low Standby Current . . . 1 mA Typical
- External Capacitors . . . 4 × 0.1 mF
- Accepts 5-V Logic Input With 3.3-V Supply
- Always-Active Noninverting Receiver Output (ROUT2B)
- Operating Speed
 - TRS3243C, TRS3243I . . . 250 Kbit/s
 - TRS3243FC, TRS3243FI . . . 1000 Kbit/s
- Operating Temperature
 - TRS3243C, TRS3243FC . . . 0°C to 70°C
 - TRS3243I, TRS3243FI . . . -40°C to 85°C
- Serial-Mouse Driveability
- Auto-Powerdown Feature to Disable Driver Outputs When No Valid RS-232 Signal Is Sensed

APPLICATIONS

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



DESCRIPTION/ORDERING INFORMATION

The TRS3243 consists of three line drivers, five line receivers, and a dual charge-pump circuit with ± 15 -kV ESD (HBM) 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. This combination of drivers and receivers matches that needed for the typical serial port used in an IBM PC/AT or compatible. The charge pump and four small external capacitors allow operation from a single 3-V to 5.5-V supply. In addition, the device includes an always-active noninverting output (ROUT2B), which allows applications using the ring indicator to transmit data while the device is powered down.

Flexible control options for power management are available when the serial port is inactive. The auto-powerdown feature functions when FORCEON is low and $\overline{FORCEOFF}$ is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If $\overline{FORCEOFF}$ is set low, both drivers and receivers (except ROUT2B) are shut off, and the supply current is reduced to 1 μ A. Disconnecting the serial port or turning off the peripheral drivers causes the auto-powerdown condition to occur.

Auto-powerdown can be disabled when FORCEON and $\overline{FORCEOFF}$ are high and should be done when driving a serial mouse. With auto-powerdown enabled, the device is activated automatically when a valid signal is applied to any receiver input. The $\overline{INVALID}$ output is used to notify the user if an RS-232 signal is present at any receiver input. $\overline{INVALID}$ 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 μ s. $\overline{INVALID}$ is low (invalid data) if all receiver input voltages are between -0.3 V and 0.3 V for more than 30 μ s. Refer to Figure 5 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.

IBM, PC/AT are trademarks of IBM.

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

SLLS806-JUNE 2007



ORDERING INFORMATION

T _A	PACKA	AGE ⁽¹⁾⁽²⁾	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	SOIC - DW	Tube of 20	TRS3243CDW	TRS3243C
	SOIC - DW	Reel of 1000	TRS3243CDWR	1K33243C
0°C to 70°C	SSOP – DB	Tube of 50	TRS3243CDB	TRS3243C
0.0 10 70.0	220b – DB	Reel of 2000	TRS3243CDBR	- TRS3243C
	TSSOP – PW	Tube of 50	TRS3243CPW	TRS3243
		Reel of 2000	TRS3243CPWR	- TRS3243
	SOIC - DW	Tube of 50	TRS3243IDW	TRS3243I
	SOIC - DW	Reel of 2000	TRS3243IDWR	18332431
–40°C to 85°C	SSOP – DB	Tube of 50	TRS3243IDB	TDC22421
-40°C 10 85°C	220b – DB	Reel of 2000	TRS3243IDBR	TRS3243I
	TSSOD DW	Tube of 50	TRS3243IPW	TRS3243I
	TSSOP – PW	Reel of 2000	TRS3243IPWR	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

⁽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)

	INP	UTS		OUTPUT	
DIN	FORCEON	FORCEOFF	VALID RIN RS-232 LEVEL	DOUT	DRIVER STATUS
Х	X	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	Power 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⁾

	INP	UTS		OUT	PUTS	
RIN2	RIN1, RIN3–RIN5	FORCEOFF	VALID RIN RS-232 LEVEL	ROUT2B	ROUT	RECEIVER STATUS
L	Х	L	Х	L	Z	Powered off while
Н	X	L	X	Н	Z	ROUT2B is active
L	L	Н	Yes	L	Н	
L	Н	Н	Yes	L	L	Normal operation with
Н	L	Н	Yes	Н	Н	auto-powerdown
Н	Н	Н	Yes	Н	L	disabled/enabled
Open	Open	Н	Yes	L	Н	

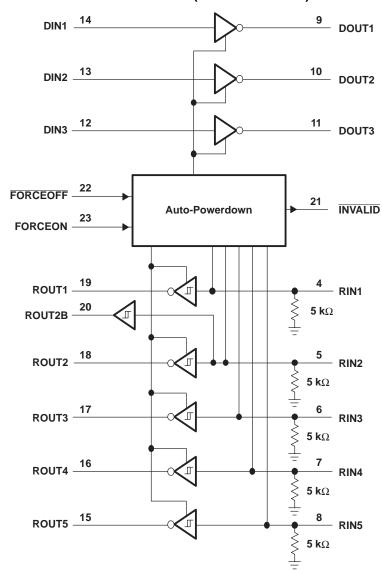
⁽¹⁾ H = high level, L = low level, X = irrelevant, Z = high impedance (off), Open = input disconnected or connected driver off

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

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

SLLS806-JUNE 2007

LOGIC DIAGRAM (POSITIVE LOGIC)



TRS3243

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

www.ti.com

SLLS806-JUNE 2007

Absolute Maximum Ratings⁽¹⁾

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

			MIN	MAX	UNIT	
V _{CC}	Supply voltage range (2)		-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)	-0.3	6	V	
V _I	input voltage range	Receiver	-25	25	V	
	Output voltage range	Driver	-13.2	13.2	V	
Vo	Output voltage range	Receiver (INVALID)	-0.3	V _{CC} + 0.3		
		DB package		62		
θ_{JA}	Package thermal impedance (3)(4)	DW package		46	°C/W	
		PW package		62		
T _J	Operating virtual junction temperature			150	°C	
T _{stg}	Storage temperature range	Storage temperature range		150	°C	

⁽¹⁾ Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Recommended Operating Conditions⁽¹⁾

See Figure 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	
\/	H Driver and control high-level input voltage	DIN, FORCEOFF,	$V_{CC} = 3.3 \text{ V}$	2			V
V _{IH}		FORCEON	V _{CC} = 5 V	2.4			V
V_{IL}	Driver and control low-level input voltage	DIN, FORCEOFF, FORCE	DIN, FORCEOFF, FORCEON			0.8	V
V_{I}	Driver and control input voltage	DIN, FORCEOFF, FORCE	EON	0		5.5	V
V_{I}	Receiver input voltage			-25		25	V
_	Operating free air temperature		TRS3243C, TRS3243FC	0		70	∘c
IA	Operating free-air temperature		TRS3243I, TRS3243FI	-40		85	

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

Electrical Characteristics(1)

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

	PARAMETER		TEST CONDITIONS	MIN	TYP ⁽²⁾	MAX	UNIT
I_{\parallel}	Input leakage current	FORCEOFF, FORCEON			±0.01	±1	μA
	I_{CC} Supply current $(T_A = 25^{\circ}C)$	Auto-powerdown disabled	No load, FORCEOFF and FORCEON at V _{CC}		0.3	1	mA
		Powered off	No load, FORCEOFF at GND		1	10	
I _{CC}		Auto-powerdown enabled	No load, FORCEOFF at V _{CC} , FORCEON at GND, All RIN are open or grounded, All DIN are grounded		1	10	μА

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

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.

SLLS806-JUNE 2007

DRIVER SECTION

Electrical Characteristics(1)

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

	PARAMETER	TES	ST CONDITIONS	j	MIN	TYP ⁽²⁾	MAX	UNIT
V_{OH}	High-level output voltage	All DOUT at $R_L = 3 \text{ k}\Omega$ to Ω	GND		5	5.4		V
V_{OL}	Low-level output voltage	All DOUT at $R_L = 3 \text{ k}\Omega$ to GND		-5	-5.4		V	
Vo	Output voltage (mouse driveability)	DIN1 = DIN2 = GND, DIN3 = V_{CC} , 3- $k\Omega$ to GND at DOUT3, DOUT1 = DOUT2 = 2.5 mA		±5			V	
I _{IH}	High-level input current	$V_I = V_{CC}$				±0.01	±1	μΑ
I _{IL}	Low-level input current	V _I at GND				±0.01	±1	μA
V_{hys}	Input hysteresis						±1	V
	Chart siravit autout aurrant(3)	V _{CC} = 3.6 V,	V _O = 0 V			±35	±60	m Λ
Ios	Short-circuit output current ⁽³⁾	V _{CC} = 5.5 V,	V _O = 0 V			±35	±60	mA
ro	Output resistance	V_{CC} , V+, and V- = 0 V,	V _O = ±2 V		300	10M		Ω
	Output lastrage summent	FORCEOFF CND	$V_{O} = \pm 12 \text{ V},$	$V_{CC} = 3 \text{ V to } 3.6 \text{ V}$			±25	
I _{off}	Output leakage current	FORCEOFF = GND,	$V_{O} = \pm 10 \text{ V},$	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$			±25	μΑ

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

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

Switching Characteristics⁽¹⁾

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

PARAMETER		TEST	TEST CONDITIONS		TRS3243C, TRS3243I			
				MIN	TYP ⁽²⁾	MAX		
	Maximum data rate	C _L = 1000 pF, One DOUT switching,	$R_L = 3 \text{ k}\Omega$, See Figure 1	150	250		kbit/s	
t _{sk(p)}	Pulse skew ⁽³⁾	C _L = 150 pF to 2500 pF,	$R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega, \text{ See Figure 2}$		100		ns	
CD/tr\	Slew rate, transition region $V_{CC} = 3.3 \text{ V}$,		C _L = 150 pF to 1000 pF	6		30	1//40	
SR(tr)	(see Figure 1)	$R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega$	C _L = 150 pF to 2500 pF	4		30	30 V/µs	

⁽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 \pm 0.5 V.

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

Switching Characteristics⁽¹⁾

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

PARAMETER		TEST CONDITIONS			TRS3243FC, TRS3243FI			UNIT
			_			TYP ⁽²⁾	MAX	
			C _L = 1000 pF		250			
	Maximum data rate (see Figure 1)	$R_L = 3 \text{ k}\Omega$, One DOUT switching,	$C_L = 250 \text{ pF},$	$V_{CC} = 3 \text{ V to } 4.5 \text{ V}$	1000			kbit/s
	(see Figure 1) One DOUT switching,	C _L = 1000 pF,	$V_{CC} = 4.5 \text{ V to } 4.5 \text{ V}$	1000				
t _{sk(p)}	Pulse skew ⁽³⁾	$C_L = 150 \text{ pF to } 2500 \text{ pF},$	$R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega,$	See Figure 2		25		ns
SR(tr)	Slew rate, transition region (see Figure 1)	$C_L = 150 \text{ pF to } 1000 \text{ pF},$	$R_L = 3 \text{ k}\Omega \text{ to } 7 \text{ k}\Omega,$	V _{CC} = 3.3 V	18		150	V/µs

⁽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 \pm 0.5 V.

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

⁽³⁾ Short-circuit durations should be controlled to prevent exceeding the device absolute power dissipation ratings, and not more than one output should be shorted at a time.

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

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

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

SLLS806-JUNE 2007



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 _{OH} = 1.6 mA			0.4	V
V	Positive-going input threshold voltage	V _{CC} = 3.3 V		1.6	2.4	V
V _{IT+}	Fositive-going input tilleshold voltage	V _{CC} = 5 V		1.9		v
V	Negative-going input threshold voltage	V _{CC} = 3.3 V	0.6	1.1		V
V _{IT}	Negative-going input threshold voltage	V _{CC} = 5 V	0.8	1.4		v
V_{hys}	Input hysteresis (V _{IT+} – V _{IT-})			0.5		V
I _{off}	Output leakage current (except ROUT2B)	FORCEOFF = 0 V		±0.05	±10	μΑ
r _i	Input resistance	$V_I = \pm 3 \text{ V or } \pm 25 \text{ V}$	3	5	7	kΩ

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

Switching Characteristics⁽¹⁾

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

	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		150	ns
t _{en}	Output enable time	C_L = 150 pF, R_L = 3 k Ω , See Figure 4	200	ns
t _{dis}	Output disable time		200	ns
t _{sk(p)}	Puse skew ⁽³⁾	See Figure 3	50	ns

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

TRS3243 3-V TO 5.5-V MULTICHANNEL RS-232 LINE DRIVER/RECEIVER WITH ± 15 -kV ESD (HBM) PROTECTION

SLLS806-JUNE 2007

AUTO-POWERDOWN SECTION

Electrical Characteristics

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

	PARAMETER	TEST CONDITI	ONS	MIN	MAX	UNIT
V _{IT+(valid})	Receiver input threshold for INVALID high-level output voltage	FORCEON = GND,	FORCEOFF = V _{CC}		2.7	V
V _{IT-(valid})	Receiver input threshold for INVALID high-level output voltage	FORCEON = GND,	FORCEOFF = V _{CC}	-2.7		V
V _{T(invalid})	Receiver input threshold for INVALID low-level output voltage	FORCEON = GND,	FORCEOFF = V _{CC}	-0.3	0.3	V
V _{OH}	INVALID high-level output voltage	I _{OH} = -1 mA, FORCEON = GND,	FORCEOFF = V _{CC}	V _{CC} - 0.6		V
V _{OL}	INVALID low-level output voltage	I _{OL} = 1.6 mA, FORCEON = GND,	FORCEOFF = V _{CC}		0.4	V

Switching Characteristics

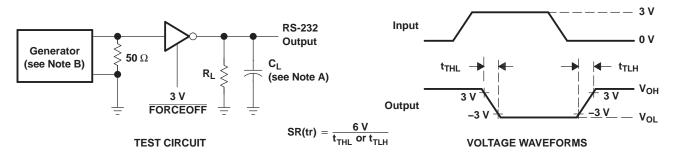
over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 5)

	PARAMETER	TEST CONDITIONS	TYP ⁽¹⁾	UNIT
t _{valid}	Propagation delay time, low- to high-level output	V _{CC} = 5 V	1	μs
t _{invalid}	Propagation delay time, high- to low-level output	V _{CC} = 5 V	30	μs
t _{en}	Supply enable time	V _{CC} = 5 V	100	μs

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



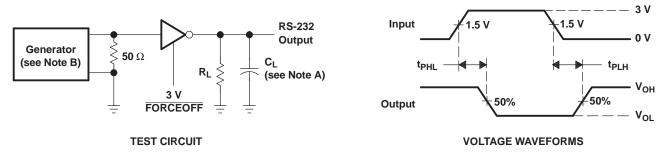
PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_L includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 250 kbit/s (MAX3243C/I) and 1 Mbit/s (MAX3243FC/I), $Z_O = 50 \Omega$, 50% duty cycle, $t_f \le 10$ ns, $t_f \le 10$ ns.

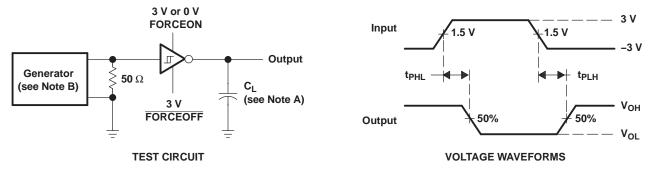
Figure 1. Driver Slew Rate



NOTES: A. C_L includes probe and jig capacitance.

B. The pulse generator has the following characteristics: PRR = 250 kbit/s (MAX3243C/I) and 1 Mbit/s (MAX3243FC/I), $Z_O = 50 \Omega$, 50% duty cycle, $t_f \le 10$ ns.

Figure 2. Driver Pulse Skew



NOTES: A. C_L includes probe and jig capacitance.

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

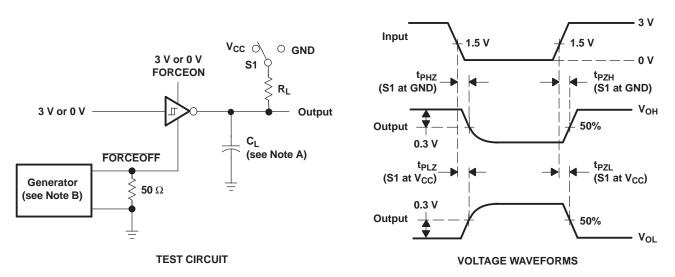
Figure 3. Receiver Propagation Delay Times

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

TRS3243

SLLS806-JUNE 2007

PARAMETER MEASUREMENT INFORMATION (continued)



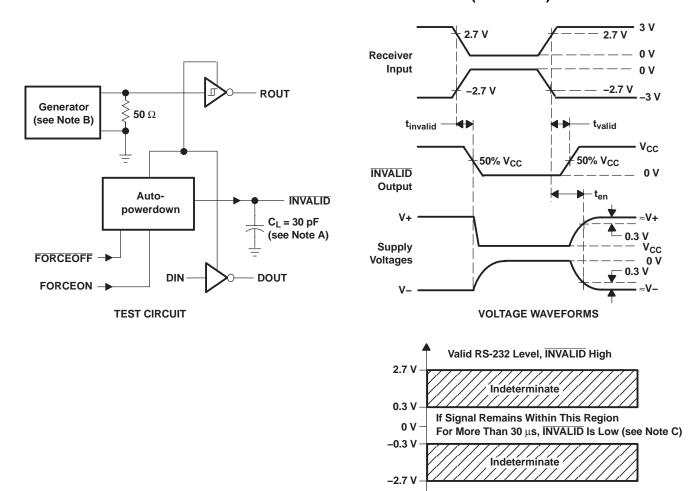
NOTES: A. C_L includes probe and jig capacitance.

- B. The pulse generator has the following characteristics: Z_0 = 50 Ω , 50% duty cycle, $t_r \le$ 10 ns, $t_f \le$ 10 ns.
- C. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
- D. t_{PZL} and t_{PZH} are the same as t_{en}.

Figure 4. Receiver Enable and Disable Times



PARAMETER MEASUREMENT INFORMATION (continued)



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

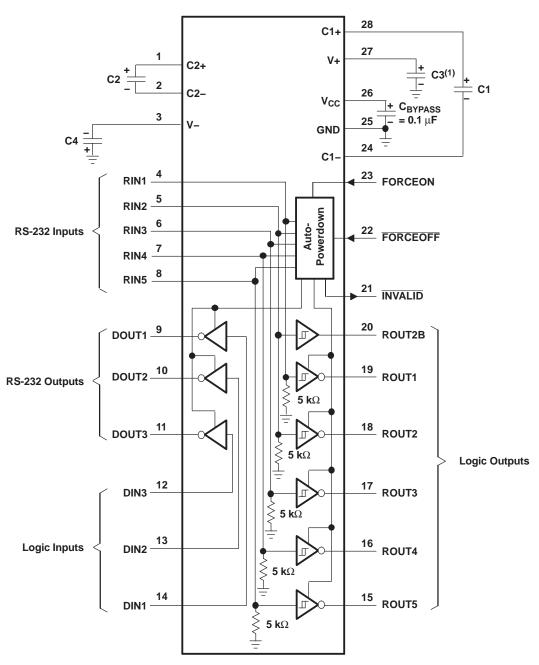
Valid RS-232 Level, INVALID High

C. Auto-powerdown disables drivers and reduces supply current to 1 μA .

Figure 5. INVALID Propagation Delay Times and Supply Enabling Time

SLLS806-JUNE 2007

APPLICATION INFORMATION



(1) 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
$\begin{array}{c} \textbf{3.3 V} \pm \textbf{0.3 V} \\ \textbf{5 V} \pm \textbf{0.5 V} \\ \textbf{3 V to 5.5 V} \end{array}$	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





www.ti.com 16-Apr-2009

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	e Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp (3)
TRS3243CDB	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CDBG4	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CDBR	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CDBRG4	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CDW	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CDWG4	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CDWR	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CDWRG4	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CPW	ACTIVE	TSSOP	PW	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CPWG4	ACTIVE	TSSOP	PW	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CPWR	ACTIVE	TSSOP	PW	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243CPWRG4	ACTIVE	TSSOP	PW	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDB	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDBG4	ACTIVE	SSOP	DB	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDBR	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDBRG4	ACTIVE	SSOP	DB	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDW	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDWG4	ACTIVE	SOIC	DW	28	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDWR	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IDWRG4	ACTIVE	SOIC	DW	28	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IPW	ACTIVE	TSSOP	PW	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IPWG4	ACTIVE	TSSOP	PW	28	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IPWR	ACTIVE	TSSOP	PW	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TRS3243IPWRG4	ACTIVE	TSSOP	PW	28	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

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



PACKAGE OPTION ADDENDUM

www.ti.com 16-Apr-2009

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.

PACKAGE MATERIALS INFORMATION

www.ti.com 8-Jul-2011

TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
В0	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
TRS3243CDBR	SSOP	DB	28	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
TRS3243CDWR	SOIC	DW	28	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
TRS3243CPWR	TSSOP	PW	28	2000	330.0	16.4	7.1	10.4	1.6	12.0	16.0	Q1
TRS3243IDBR	SSOP	DB	28	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
TRS3243IDWR	SOIC	DW	28	1000	330.0	32.4	11.35	18.67	3.1	16.0	32.0	Q1
TRS3243IPWR	TSSOP	PW	28	2000	330.0	16.4	7.1	10.4	1.6	12.0	16.0	Q1

www.ti.com 8-Jul-2011



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TRS3243CDBR	SSOP	DB	28	2000	346.0	346.0	33.0
TRS3243CDWR	SOIC	DW	28	1000	346.0	346.0	49.0
TRS3243CPWR	TSSOP	PW	28	2000	346.0	346.0	33.0
TRS3243IDBR	SSOP	DB	28	2000	346.0	346.0	33.0
TRS3243IDWR	SOIC	DW	28	1000	346.0	346.0	49.0
TRS3243IPWR	TSSOP	PW	28	2000	346.0	346.0	33.0

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.



PW (R-PDSO-G28)

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.

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

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

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

TI E2E Community Home Page

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

e2e.ti.com