3-V to 5.5-V Multichannel RS-232 Compatible Line Driver and Receiver

1 Features

- Operates with 3-V to 5.5-V V_{CC} supply
- Always-active noninverting receiver output (ROUT2B)
- Low standby current: 1 µA typical
- External capacitors: 4 × 0.1 µF
- Accepts 5-V logic input with 3.3-V supply
- Inter-operable with SN65C3238, SN75C3238
- Supports operation from 250 kbit/s to 1 Mbit/s
- RS-232 Bus-pin esd protection exceeds ±15 kV using human-body model (HBM)

2 Applications

- Battery-powered systems
- PDAs
- Notebooks
- Laptops
- Palmtop PCs
- Hand-held equipment

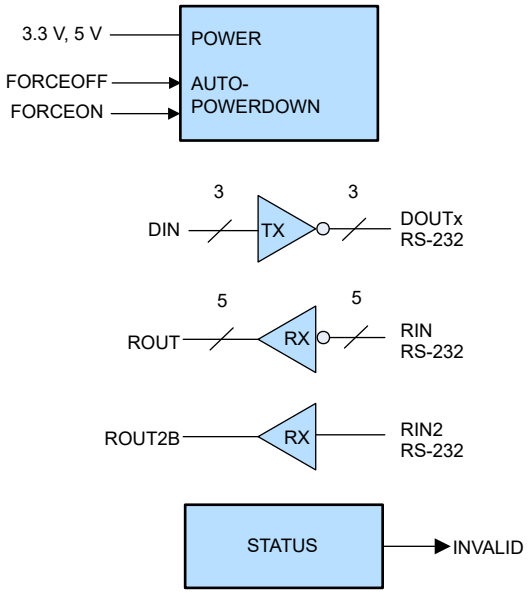
3 Description

The TRSF3243 consists of three 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). This device 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. In addition, this device includes an always-active noninverting output (ROUT2B), which allows applications using the ring indicator to transmit data while the device is powered down. The device operates at data signaling rates up to 1 Mbit/s and an increased slew-rate range of 24 V/µs to 150 V/µs.

Package Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
TRS3243	SSOP (DB)	10.20 mm × 5.30 mm
	SOIC (DW)	17.90 mm x 7.50mm
	TSSOP (PW)	9.70 mm × 4.40 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Simplified Circuit

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

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4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision A (September 2008) to Revision B (October 2022)	Page
• Deleted the *Ordering Information* table	1
• Changed the *Package Information* table	1
• Added the *Simplified Schematic*	1
• Added the Pin *Configuration and Functions*	3
• Added the *Thermal Information* table	4
• Changed the I_{CC} Supply current auto-powerdown disabled MAX value from 1 mA to 1.2 mA in the *Electrical Characteristics*	5
• Added the *Detailed Description* section	12

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5 Pin Configuration and Functions

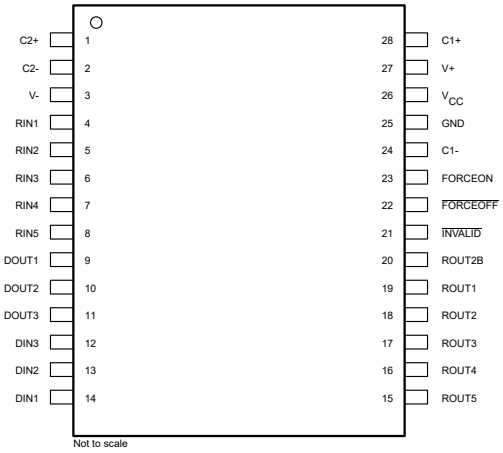


Figure 5-1. DB, DW, or PW Package, 28 Pin (SSOP, SOIC, TSSOP) (Top View)

Table 5-1. Pin Functions

PIN		TYPE	DESCRIPTION
NO.	NAME		
1	C2+	—	Positive terminal of the voltage-doubler charge-pump capacitor
2	C2-	—	Negative terminal of the voltage-doubler charge-pump capacitor
3	V-		Negative charge pump output voltage
4	RIN1	I	RS-232 receiver inputs
5	RIN2		
6	RIN3		
7	RIN4		
8	RIN5		
9	DOUT1	O	RS-232 driver outputs
10	DOUT2		
11	DOUT3		
12	DIN3	I	Driver inputs
13	DIN2		
14	DIN1		
15	ROUT5	O	Receiver outputs
16	ROUT4		
17	ROUT3		
18	ROUT2		
19	ROUT1		
20	ROUT2B	—	Always-active noninverting receiver output;
21	$\overline{\text{INVALID}}$	O	Invalid Output Pin
22	$\overline{\text{FORCEOFF}}$	I	Auto Powerdown Control input (Refer to Truth Table)
23	FORCEON	I	Auto Powerdown Control input (Refer to Truth Table)
24	C1-	—	Negative terminal of the voltage-doubler charge-pump capacitor
25	GND	—	Ground
26	V_{CC}	—	3-V to 5.5-V supply voltage
27	V+	—	Positive charge pump output voltage
28	C1+	—	Positive terminal of the voltage-doubler charge-pump capacitor

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6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) (1)

			MIN	MAX	UNIT
V_{CC}	Supply voltage(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
V_I	Input voltage range	Driver ($\overline{\text{FORCEOFF}}$, FORCEON)	–0.3	6	V
		Receiver	–25	25	
V_O	Output voltage range	Driver	–13.2	13.2	V
T_J	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.

6.2 Recommended Operating Conditions

see Figure 7-6 (1)

				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_{IH}	Driver and control high-level input voltage	DIN, $\overline{\text{FORCEOFF}}$, FORCEON	V_{CC} = 3.3 V	2			V
			V_{CC} = 5 V	2.4			
V_{IL}	Driver and control low-level input voltage	DIN, $\overline{\text{FORCEOFF}}$, FORCEON				0.8	V
V_I	Driver and control input voltage	DIN, $\overline{\text{FORCEOFF}}$, FORCEON		0		5.5	V
V_I	Receiver input voltage			–25		25	V
T_A	Operating free-air temperature		TRSF3243I	–40		85	°C
			TRSF3243C	0		70	

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

6.3 Thermal Information

THERMAL METRIC(1)		TSSOP (PW)	SOIC (DW)	DB (SSOP)	UNIT
		28 PINS	28 PINS	28 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	70.3	59.0	76.1	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	21.0	28.8	35.8	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	29.2	30.3	37.4	°C/W
ψ_{JT}	Junction-to-top characterization parameter	1.3	7.8	7.4	°C/W
ψ_{JB}	Junction-to-board characterization parameter	28.8	30.0	37.0	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC package thermal metrics* application report.

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6.4 Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 7-6) (2)

PARAMETER			TEST CONDITIONS	MIN	TYP(1)	MAX	UNIT
I_I	Input leakage current	$\overline{FORCEOFF}$, FORCEON			±0.01	±1	µA
I_{CC}	Supply current	Auto-powerdown disabled	No load, $\overline{FORCEOFF}$ and FORCEON = V_{CC} For DB and PW package		0.3	1.2	mA
		Auto-powerdown disabled	No load, $\overline{FORCEOFF}$ and FORCEON = V_{CC} For DW package		0.3	1	mA
		Powered off	No load, $\overline{FORCEOFF}$ = GND		1	10	µA
		Auto-powerdown enabled	No load, $\overline{FORCEOFF}$ = V_{CC}, FORCEON = GND, All RIN are open or grounded, All DIN are grounded		1	10	

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

6.5 Electrical Characteristics: Driver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 7-6)

PARAMETER		TEST CONDITIONS(3)			MIN	TYP(1)	MAX	UNIT
V_{OH}	High-level output voltage	All DOUT at R_L = 3 kΩ to GND			5	5.4		V
V_{OL}	Low-level output voltage	All DOUT at R_L = 3 kΩ to GND			–5	–5.4		V
V_O	Output voltage (mouse driveability)	DIN1 = DIN2 = GND, DIN3 = V_{CC}, 3-kΩ to GND at DOUT3, DOUT1 = DOUT2 = 2.5 mA			±5			V
I_{IH}	High-level input current	V_I = V_{CC}				±0.01	±1	µA
I_{IL}	Low-level input current	V_I = GND				±0.01	±1	µA
I_{OS}	Short-circuit output current(2)	V_{CC} = 3.6 V,	V_O = 0 V			±35	±60	mA
		V_{CC} = 5.5 V,	V_O = 0 V			±35	±90	
r_o	Output resistance	V_{CC}, V+, and V– = 0 V,	V_O = ±2 V		300	10M		Ω
I_{off}	Output leakage current	$\overline{FORCEOFF}$ = GND	V_O = ±12 V,	V_{CC} = 3 V to 3.6 V			±25	µA
			V_O = ±10 V,	V_{CC} = 4.5 V to 5.5 V			±25	

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

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6.6 Switching Characteristics: Driver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 7-6)

PARAMETER		TEST CONDITIONS[3]			MIN	TYP[1]	MAX	UNIT
	Maximum data rate (see Figure 7-1)	R_L = 3 kΩ, One DOUT switching	C_L = 1000 pF		250			kbit/s
			C_L = 250 pF,	V_{CC} = 3 V to 4.5 V	1000			
			C_L = 1000 pF,	V_{CC} = 4.5 V to 5.5 V	1000			
$t_{sk(p)}$	Pulse skew[2]	C_L = 150 pF to 2500 pF,	R_L = 3 kΩ to 7 kΩ,	See Figure 7-2		25		ns
SR(tr)	Slew rate, transition region (see Figure 7-1)	C_L = 150 pF to 1000 pF,	R_L = 3 kΩ to 7 kΩ,	V_{CC} = 3.3 V	18		150	V/µs

(1) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.
(2) Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.
(3) Test conditions are C1–C4 = 0.1 µF at V_{CC} = 3.3 V ± 0.3 V; C1 = 0.047 µF, C2–C4 = 0.33 µF at V_{CC} = 5 V ± 0.5 V.

6.7 Electrical Characteristics: Receiver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 7-6)

PARAMETER		TEST CONDITIONS[2]	MIN	TYP[1]	MAX	UNIT
V_{OH}	High-level output voltage	I_{OH} = –1 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_{IT+}	Positive-going input threshold voltage	V_{CC} = 3.3 V		1.6	2.4	V
		V_{CC} = 5 V		1.9	2.4	
$V_{IT–}$	Negative-going input threshold voltage	V_{CC} = 3.3 V	0.6	1.1		V
		V_{CC} = 5 V	0.8	1.4		
V_{hys}	Input hysteresis ($V_{IT+} – V_{IT–}$)			0.5		V
I_{off}	Output leakage current (except ROUT2B)	$\overline{FORCEOFF}$ = 0 V		±0.05	±10	µA
r_i	Input resistance	V_I = ±3 V to ±25 V	3	5	7	kΩ

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

6.8 Switching Characteristics: Receiver

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

PARAMETER		TEST CONDITIONS[3]	TYP[1]	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	C_L = 150 pF, See Figure 7-3	150	ns
t_{PHL}	Propagation delay time, high- to low-level output	C_L = 150 pF, See Figure 7-3	150	ns
t_{en}	Output enable time	C_L = 150 pF, R_L = 3 kΩ, See Figure 7-4	200	ns
t_{dis}	Output disable time	C_L = 150 pF, R_L = 3 kΩ, See Figure 7-4	200	ns
$t_{sk(p)}$	Pulse skew[2]	See Figure 7-3	50	ns

(1) All typical values are at V_{CC} = 3.3 V or V_{CC} = 5 V, and T_A = 25°C.
(2) Pulse skew is defined as $|t_{PLH} - t_{PHL}|$ of each channel of the same device.
(3) Test conditions are C1–C4 = 0.1 µF at V_{CC} = 3.3 V ± 0.3 V; C1 = 0.047 µF, C2–C4 = 0.33 µF at V_{CC} = 5 V ± 0.5 V.

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6.9 Electrical Characteristics: Auto-Powerdown

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 7-5)

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
$V_{T+(valid)}$	Receiver input threshold for $\overline{INVALID}$ high-level output voltage	FORCEON = GND, $\overline{FORCEOFF}$ = V_{CC}		2.7	V
$V_{T–(valid)}$	Receiver input threshold for $\overline{INVALID}$ high-level output voltage	FORCEON = GND, $\overline{FORCEOFF}$ = V_{CC}	–2.7		V
$V_{T(invalid)}$	Receiver input threshold for $\overline{INVALID}$ low-level output voltage	FORCEON = GND, $\overline{FORCEOFF}$ = V_{CC}	–0.3	0.3	V
V_{OH}	$\overline{INVALID}$ high-level output voltage	I_{OH} = –1 mA, FORCEON = GND, $\overline{FORCEOFF}$ = V_{CC}	V_{CC} – 0.6		V
V_{OL}	$\overline{INVALID}$ low-level output voltage	I_{OL} = 1.6 mA, FORCEON = GND, $\overline{FORCEOFF}$ = V_{CC}		0.4	V

6.10 Switching Characteristics: Auto-Powerdown

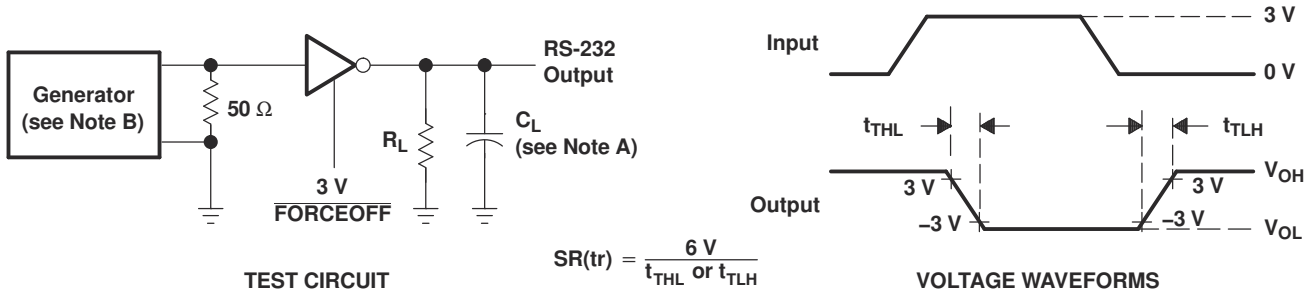
over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 7-5)

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°C.

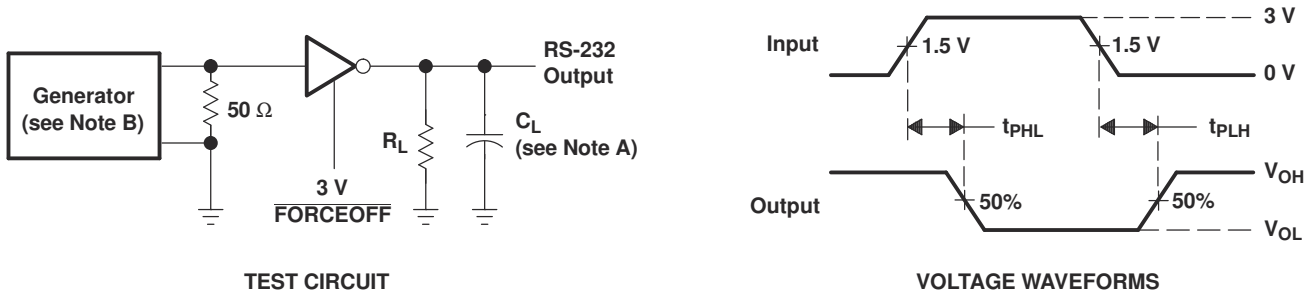
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Parameter Measurement Information



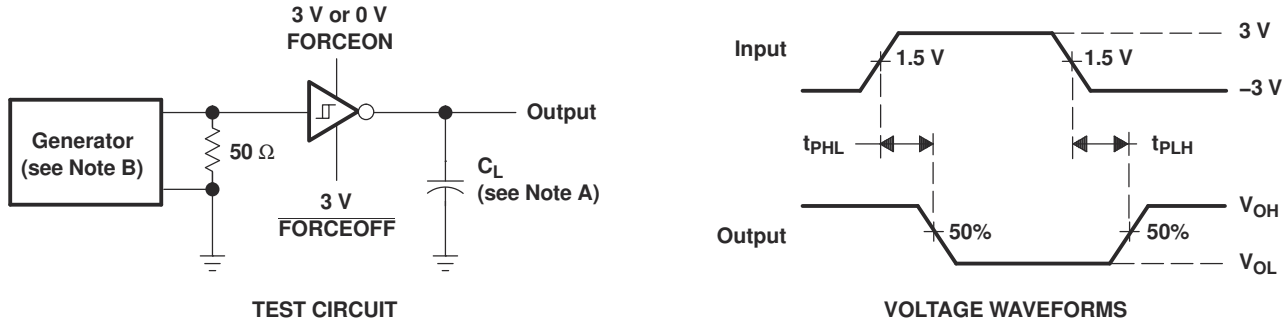
NOTES: A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: PRR = 1 Mbit/s, Z_O = 50 Ω, 50% duty cycle, $t_r \le 10$ ns, $t_f \le 10$ ns.

Figure 7-1. Driver Slew Rate



NOTES: A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: PRR = 1 Mbit/s, Z_O = 50 Ω, 50% duty cycle, $t_r \le 10$ ns, $t_f \le 10$ ns.

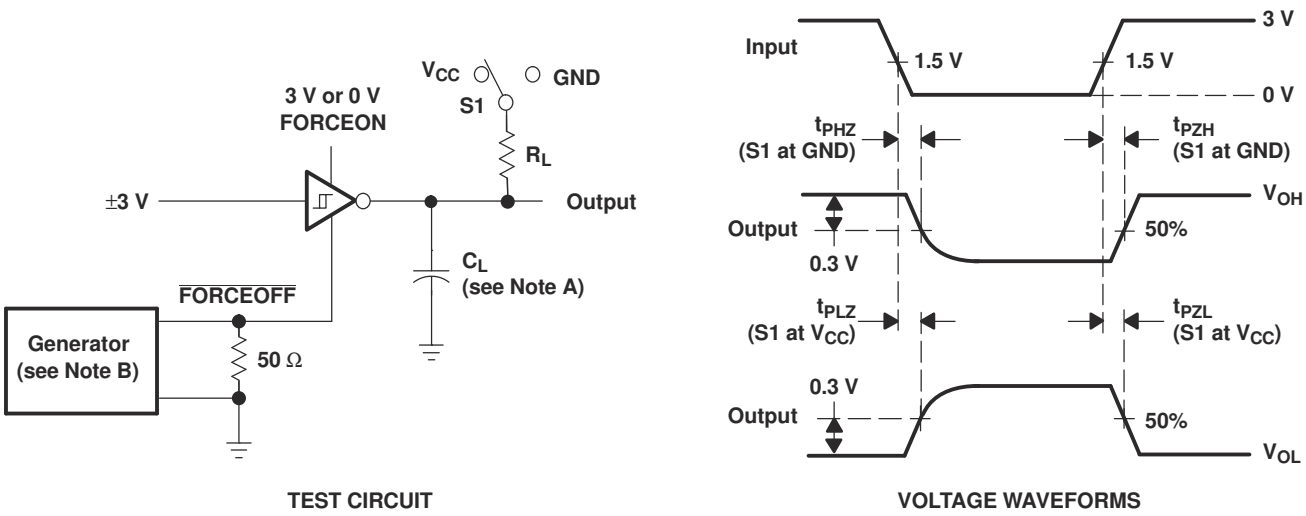
Figure 7-2. Driver Pulse Skew



NOTES: A. C_L 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.

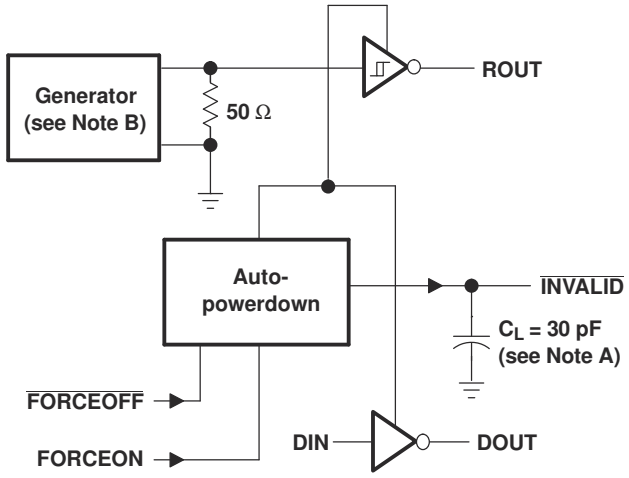
Figure 7-3. Receiver Propagation Delay Times

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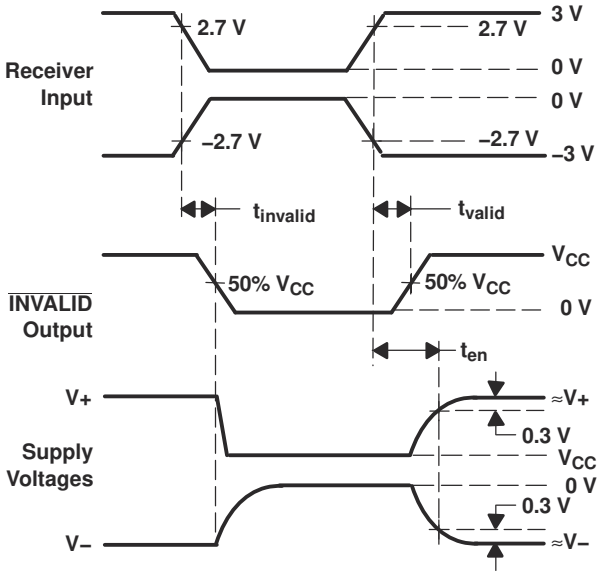


NOTES: A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: Z_O = 50 Ω, 50% duty cycle, $t_r \leq 10$ ns, $t_f \leq 10$ ns.
C. t_{PLZ} and t_{PHZ} are the same as t_{dis}.
D. t_{PZL} and t_{PZH} are the same as t_{en}.

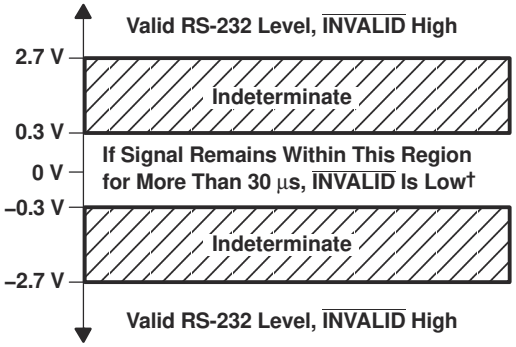
Figure 7-4. Receiver Enable and Disable Times



TEST CIRCUIT



VOLTAGE WAVEFORMS

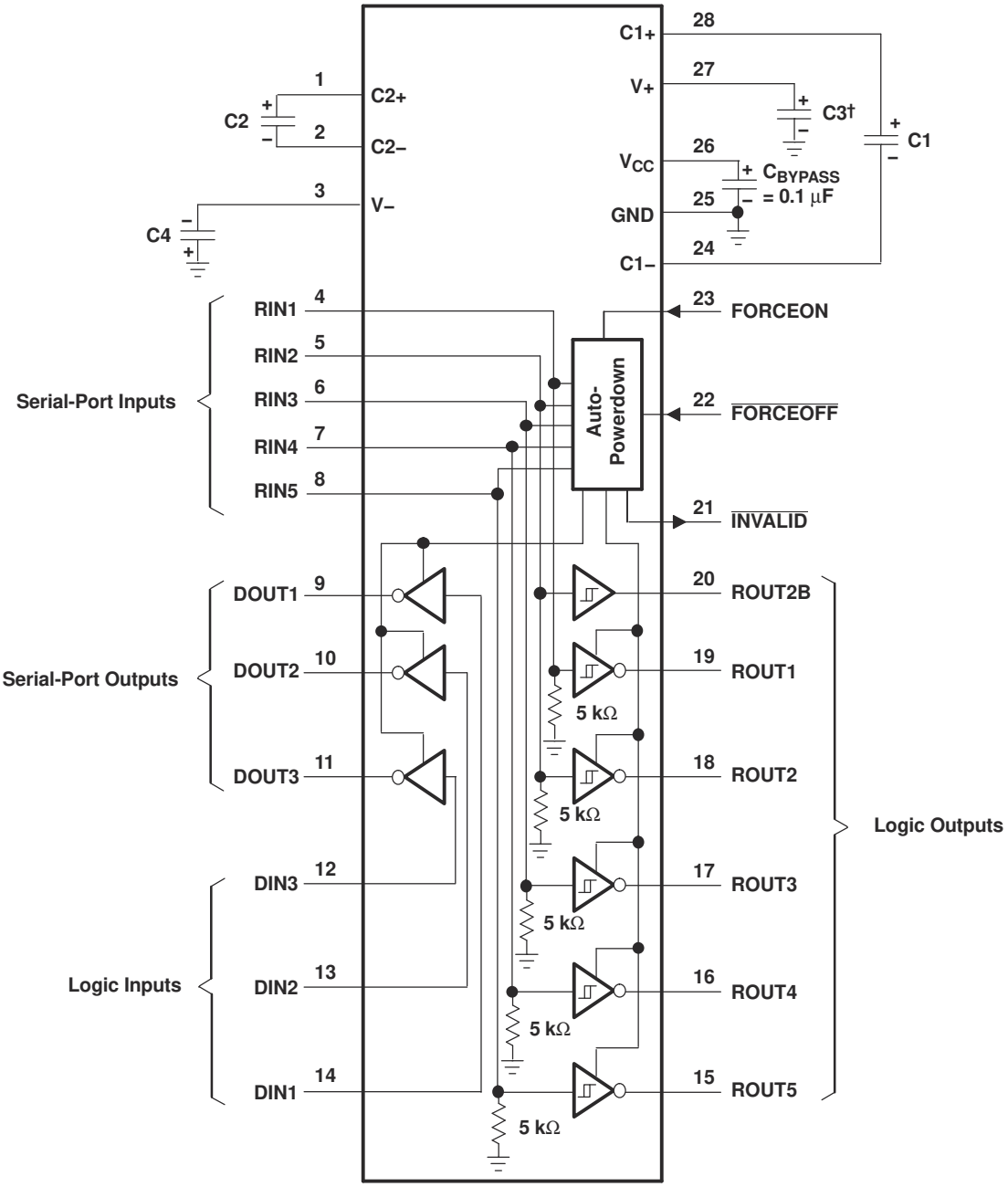


† Auto-powerdown disables drivers and reduces supply current to 1 µA.

NOTES: A. C_L includes probe and jig capacitance.
B. The pulse generator has the following characteristics: PRR = 5 kbit/s, Z_O = 50 Ω, 50% duty cycle, $t_r \le 10$ ns, $t_f \le 10$ ns.

Figure 7-5. $\overline{\text{INVALID}}$ Propagation Delay Times and Supply Enabling Time

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† C3 can be connected to V_{CC} or GND.
NOTE A: Resistor values shown are nominal.

V_{CC} vs CAPACITOR VALUES

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

Figure 7-6. Typical Operating Circuit and Capacitor Values

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7 Detailed Description

7.1 Overview

Flexible control options for power management are available when the serial port is inactive. The auto-powerdown feature functions when FORCEON is low and $\overline{\text{FORCEOFF}}$ is high. During this mode of operation, if the device does not sense a valid RS-232 signal, the driver outputs are disabled. If $\overline{\text{FORCEOFF}}$ is set low, both drivers and receivers (except ROUT2B) are shut off, and the supply current is reduced to 1 µA. 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 $\overline{\text{FORCEOFF}}$ 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 $\overline{\text{INVALID}}$ output is used to notify the user if an RS-232 signal is present at any receiver input. $\overline{\text{INVALID}}$ 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. $\overline{\text{INVALID}}$ is low (invalid data) if all receiver input voltages are between –0.3 V and 0.3 V for more than 30 µs. Refer to Figure 7-5 for receiver input levels.

7.2 Device Functional Modes

7.2.1 Function Tables

EACH DRIVER(1)

INPUTS				OUTPUT DOUT	DRIVER STATUS
DIN	FORCEON	$\overline{\text{FORCEOFF}}$	VALID RIN RS-232 LEVEL		
X	X	L	X	Z	Powered off
L	H	H	X	H	Normal operation with auto-powerdown disabled
H	H	H	X	L	
L	L	H	Yes	H	Normal operation with auto-powerdown enabled
H	L	H	Yes	L	
L	L	H	No	Z	Powered off by auto-powerdown feature
H	L	H	No	Z	

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

EACH RECEIVER(1)

INPUTS				OUTPUTS			RECEIVER STATUS
RIN2	RIN1, RIN3–RIN5	$\overline{\text{FORCEOFF}}$	VALID RIN RS-232 LEVEL	ROUT2B	ROUT2	ROUT1, ROUT3–5	
L	X	L	X	L	Z	Z	Powered off while ROUT2B is active
H	X	L	X	H	Z	Z	
L	L	H	YES	L	H	H	Normal operation with auto-powerdown disabled/enabled
L	H	H	YES	L	L	L	
H	L	H	YES	H	H	H	
H	H	H	YES	H	L	L	
Open	Open	H	YES	L	H	H	

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

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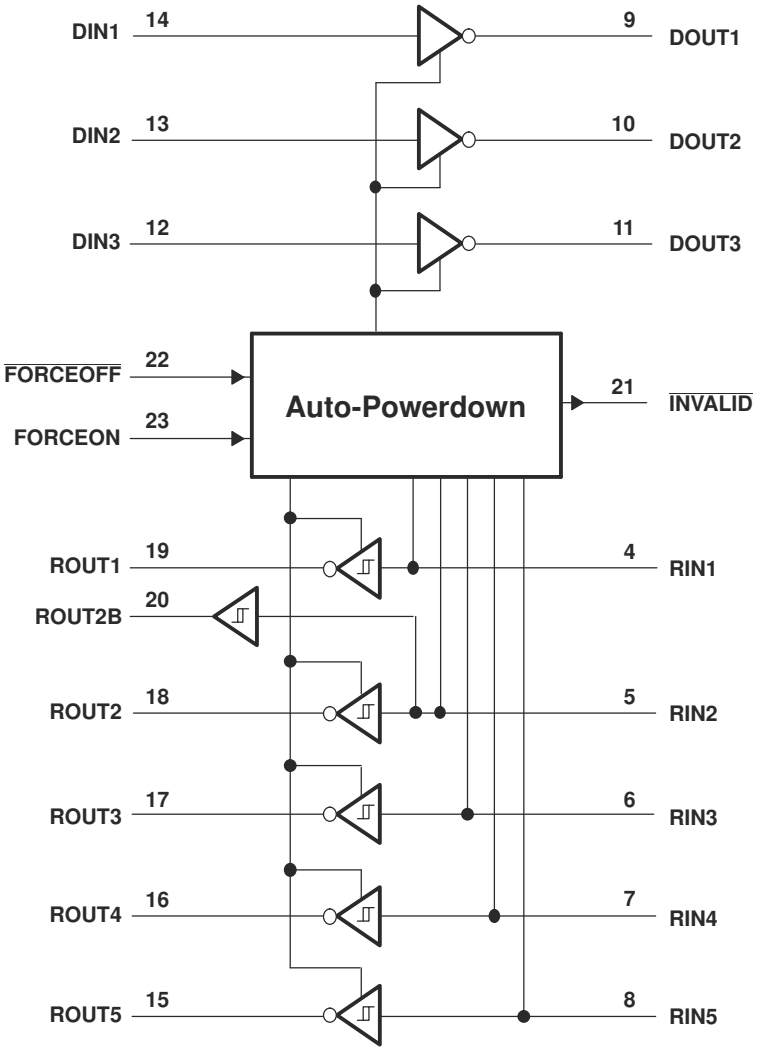


Figure 7-1. LOGIC DIAGRAM (POSITIVE LOGIC)

8 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

8.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

8.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

8.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
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8.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8.5 Glossary

TI Glossary	This glossary lists and explains terms, acronyms, and definitions.

9 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

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PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TRSF3243IDB	Active	Production	SSOP (DB) | 28	50 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-	TRSF3243I
TRSF3243IDB.A	Active	Production	SSOP (DB) | 28	50 | TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	TRSF3243I
TRSF3243IPWR	Active	Production	TSSOP (PW) | 28	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	RT43I
TRSF3243IPWR.A	Active	Production	TSSOP (PW) | 28	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	RT43I

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

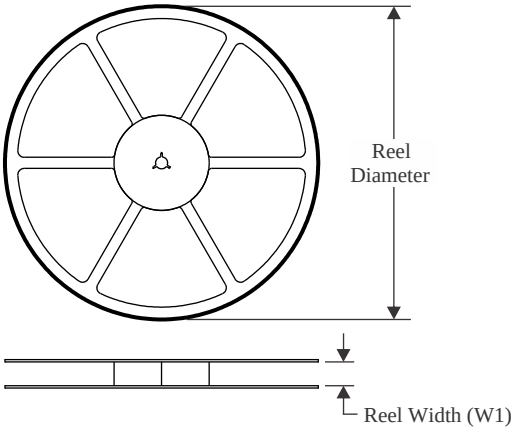
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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.

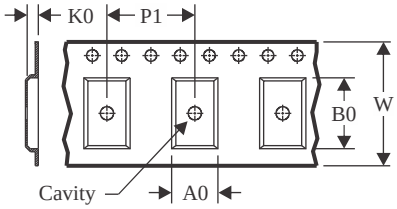
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

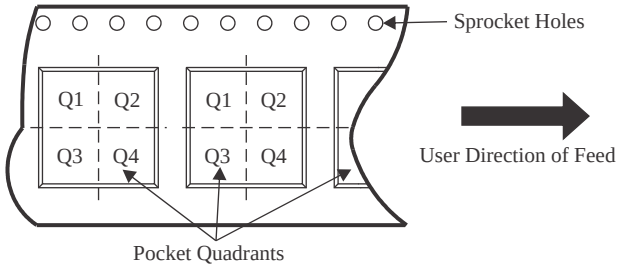


TAPE DIMENSIONS



A0	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

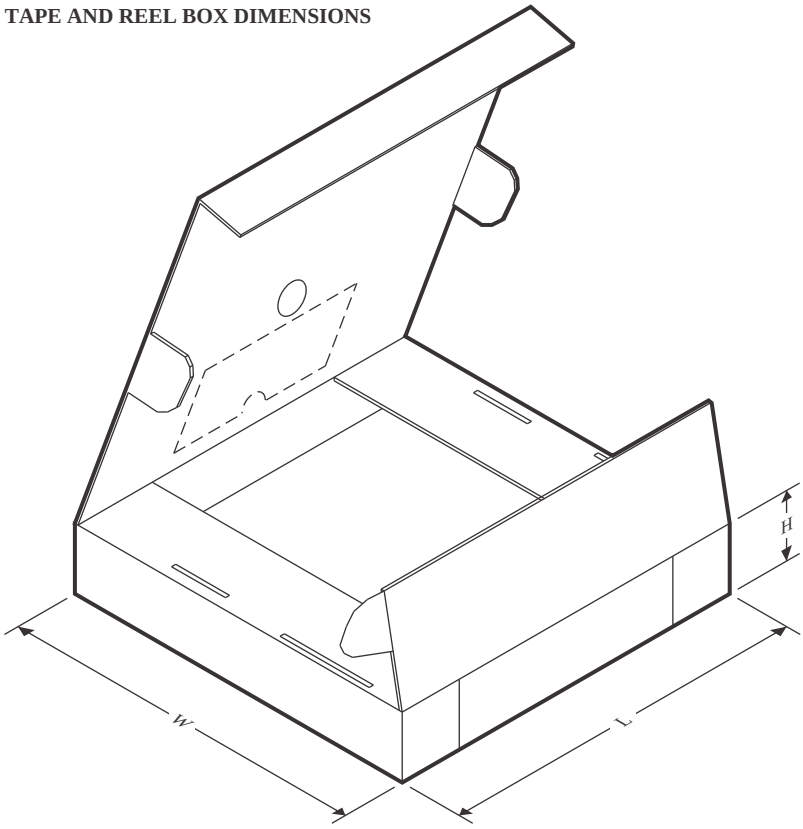
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TRSF3243IPWR	TSSOP	PW	28	2000	330.0	16.4	6.75	10.1	1.8	12.0	16.0	Q1

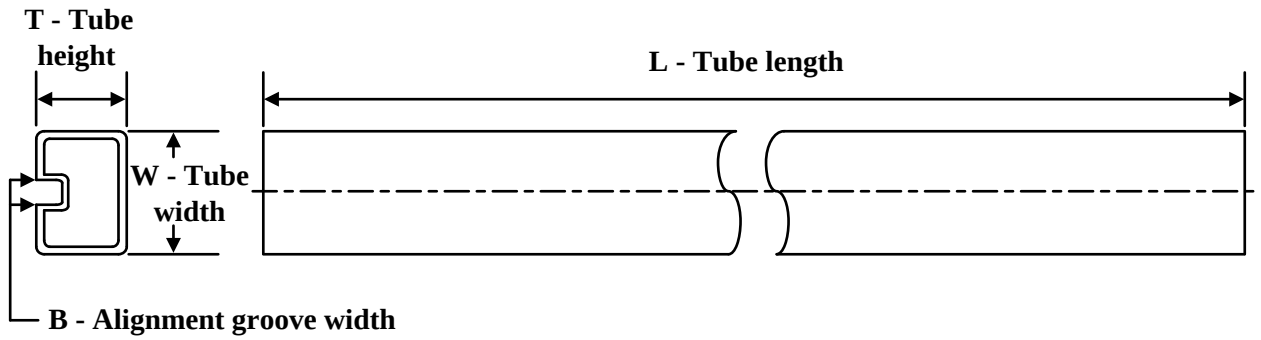
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TRSF3243IPWR	TSSOP	PW	28	2000	353.0	353.0	32.0

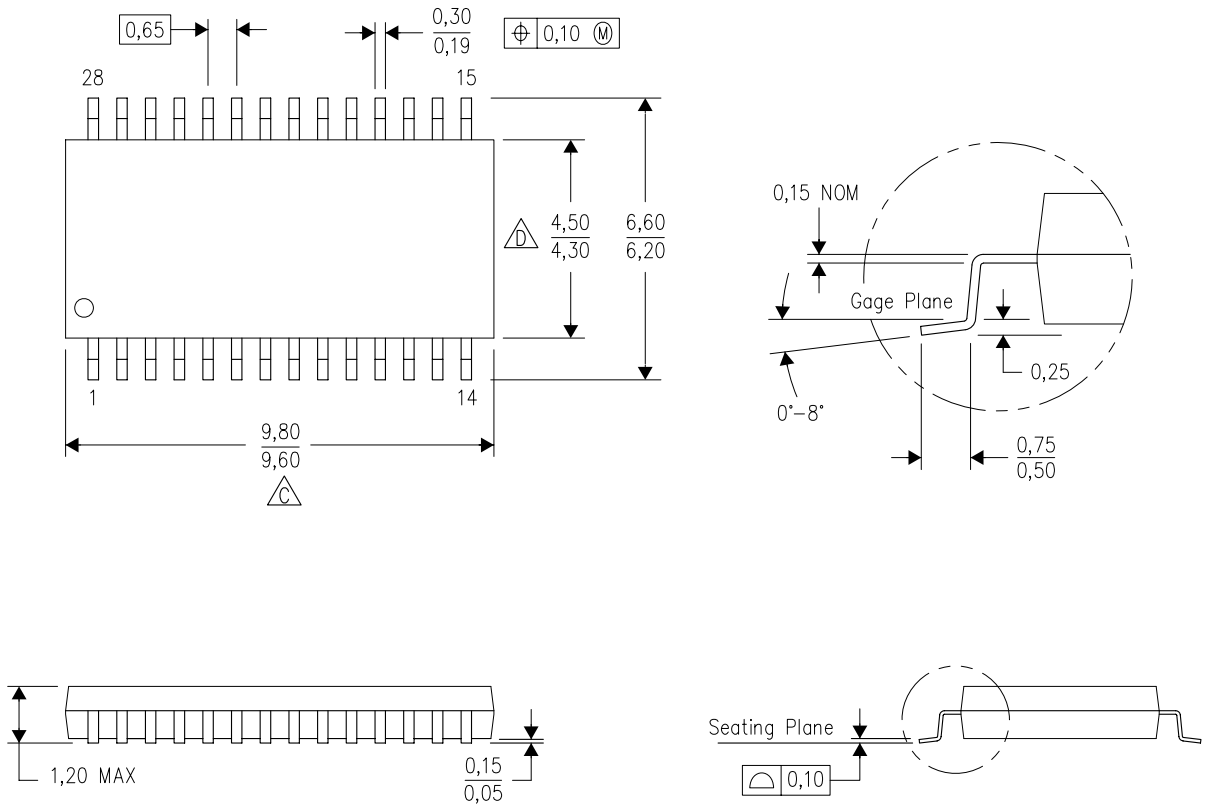
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
TRSF3243IDB	DB	SSOP	28	50	530	10.5	4000	4.1
TRSF3243IDB.A	DB	SSOP	28	50	530	10.5	4000	4.1

PW (R–PDSO–G28) PLASTIC SMALL OUTLINE



4040064–7/G 02/11

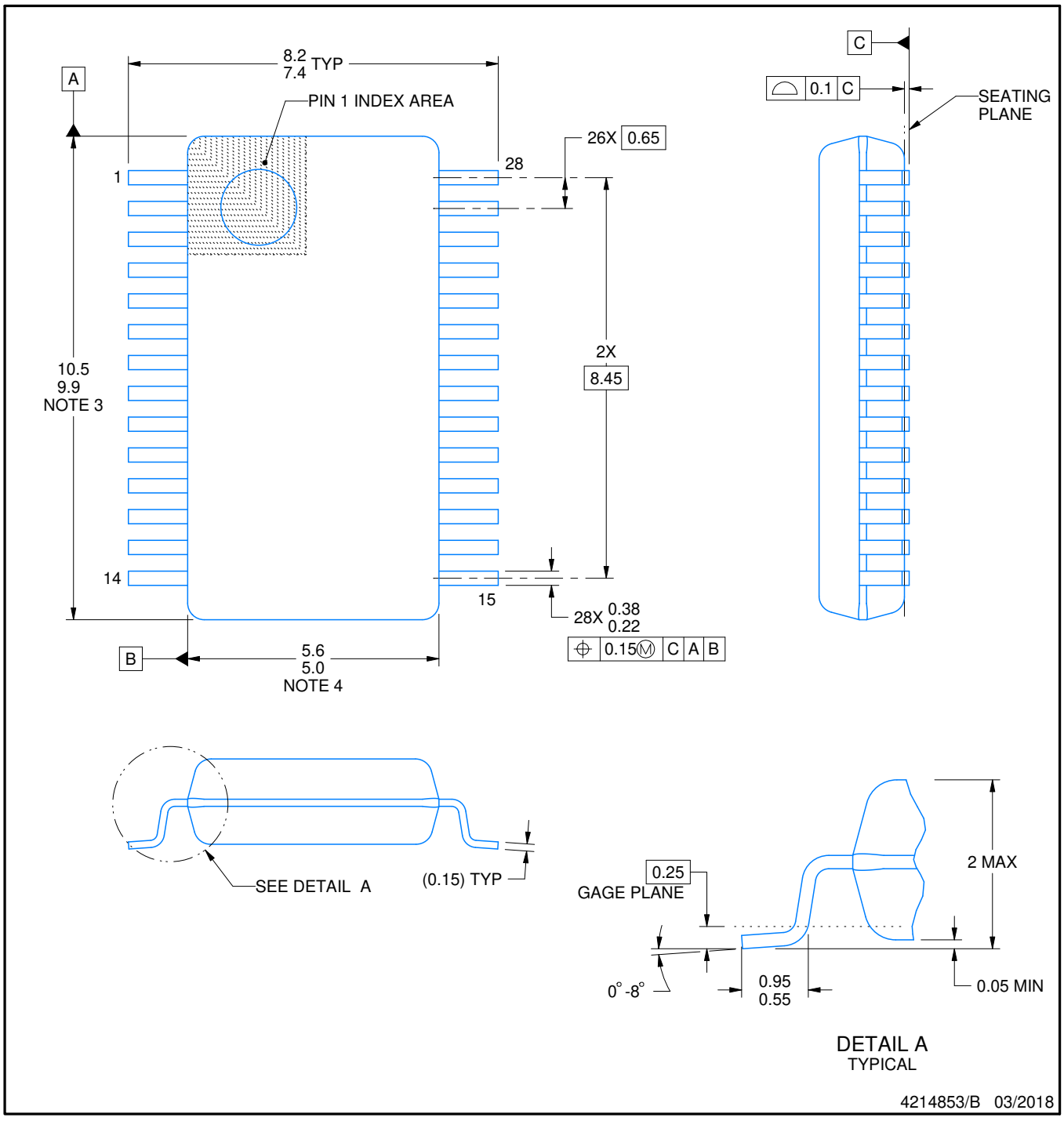
NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
E. Falls within JEDEC MO–153

PACKAGE OUTLINE

DB0028A

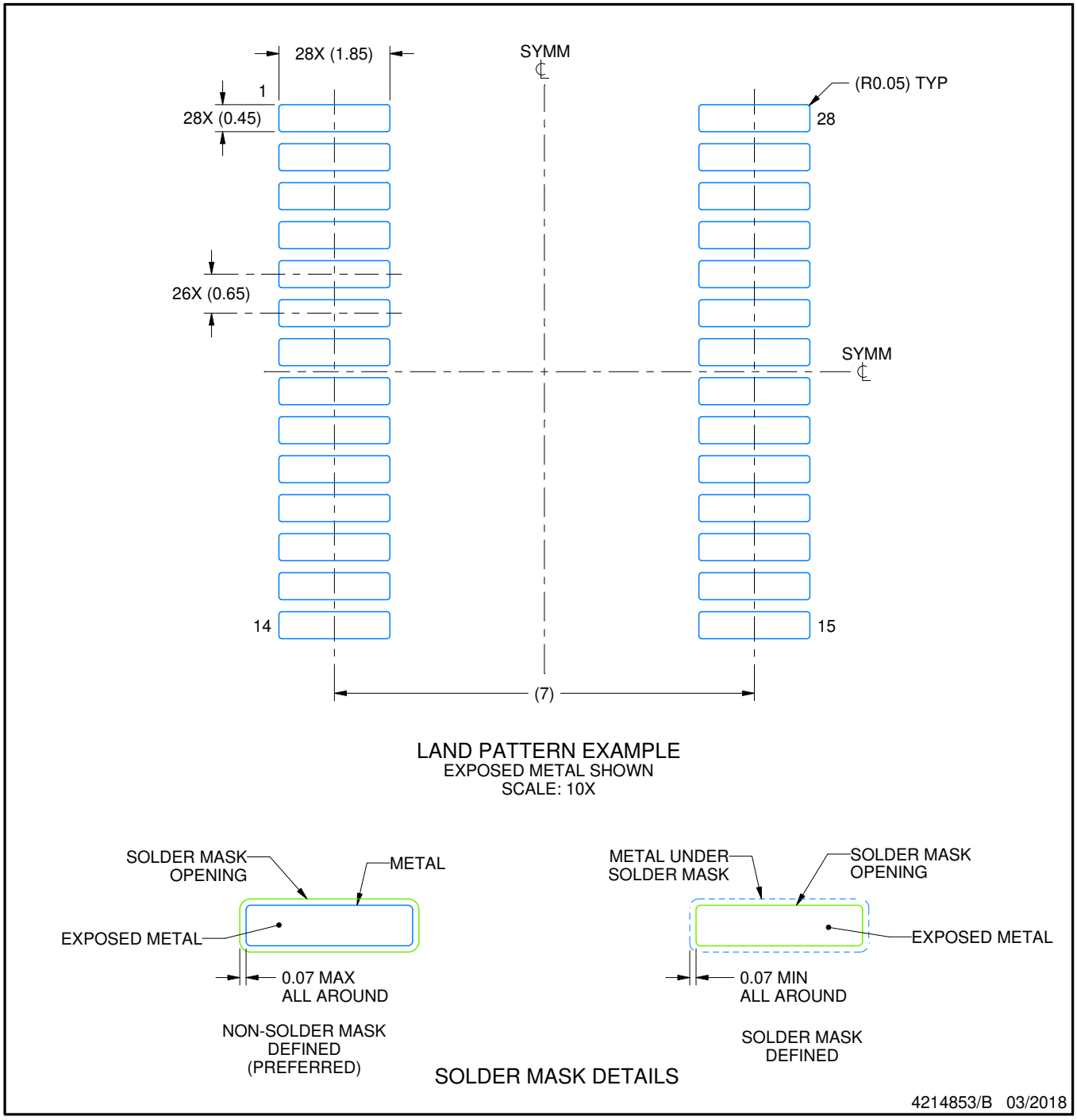
SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



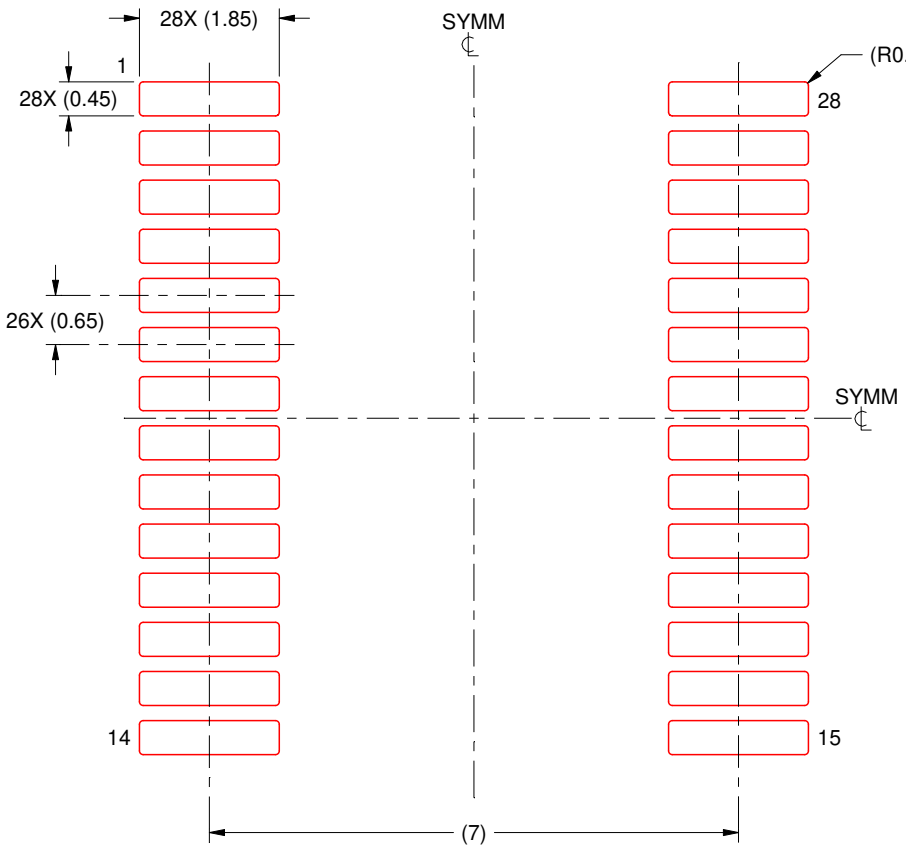
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-150.



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4214853/B 03/2018

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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