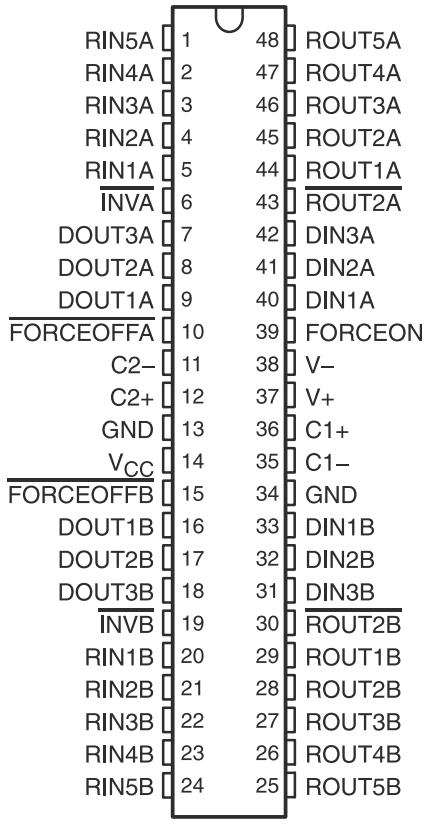
FEATURES

- **Single-Chip and Single-Supply Interface for Two IBM PC/AT Serial Ports**
- **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**
- **Always-Active Noninverting Receiver Output ($\overline{ROUT2}$) Per Port**
- **Operates Up To 250 kbit/s**
- **Low Standby Current . . . 1 µA Typical**
- **External Capacitors . . . 4 × 0.22 µF**
- **Accepts 5-V Logic Input With 3.3-V Supply**
- **Allows for Flexible Power Down of Either Serial Port**
- **Serial-Mouse Driveability**
- **RS-232 Bus-Pin ESD Protection Exceeds ±15 kV Using Human-Body Model (HBM)**

APPLICATIONS

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

DGG OR DL PACKAGE
(TOP VIEW)



DESCRIPTION/ORDERING INFORMATION

The TRSF23243 consists of two ports, each containing three line drivers and 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 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 two typical serial ports 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, this device includes an always-active noninverting output ($\overline{ROUT2}$) per port, 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 250 kbit/s and a maximum of 30-V/µs driver output slew-rate.

ORDERING INFORMATION

T_A	PACKAGE(1)(2)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	SSOP – DL	Tube of 25	TRSF23243CDL	TRSF23243C
		Reel of 1000	TRSF23243CDLR	
	TSSOP – DGG	Reel of 2000	TRSF23243CDGGR	TRSF23243C
–40°C to 85°C	SSOP – DL	Tube of 25	TRSF23243IDL	TRSF23243I
		Reel of 1000	TRSF23243IDLR	
	TSSOP – DGG	Reel of 2000	TRSF23243IDGGR	TRSF23243I

(1) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.
(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.

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DESCRIPTION/ORDERING INFORMATION (CONTINUED)

Flexible control options for power management are available when either or both serial ports are 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 of its respective port are disabled. If $\overline{\text{FORCEOFF}}$ is set low, both drivers and receivers (except $\overline{\text{ROUT2}}$) 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 RS-232 port is activated automatically when a valid signal is applied to any respective receiver input. The $\overline{\text{INV}}$ output is used to notify the user if an RS-232 signal is present at any receiver input. $\overline{\text{INV}}$ 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. $\overline{\text{INV}}$ 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 5 for receiver input levels.

FUNCTION TABLES

Each Driver(1)
(Each Port)

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	

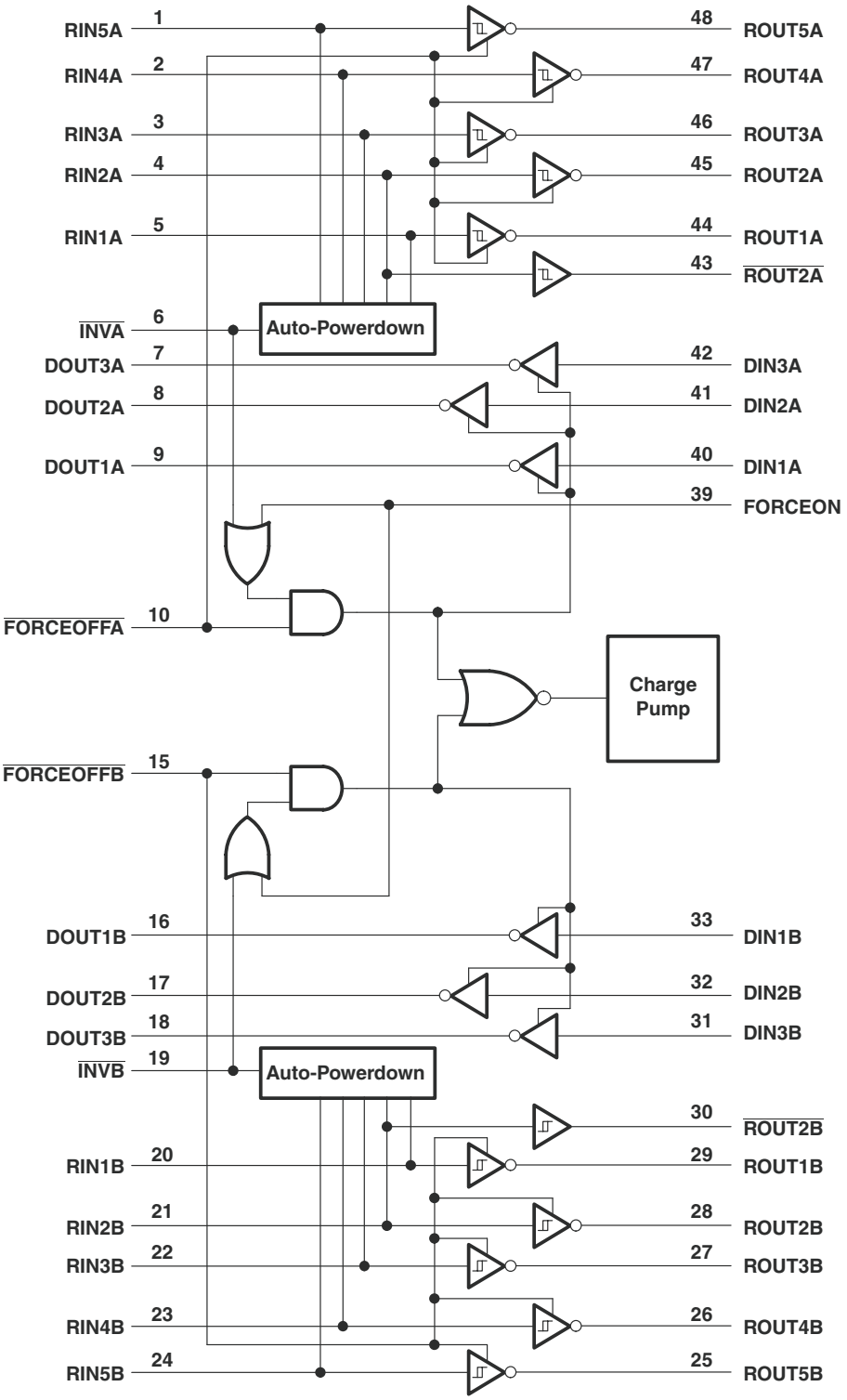
(1) H = high level, L = low level, X = irrelevant, Z = high impedance

Each Receiver(1)
(Each Port)

INPUTS				OUTPUTS		RECEIVER STATUS
RIN2	RIN1, RIN3–RIN5	$\overline{\text{FORCEOFF}}$	VALID RIN RS-232 LEVEL	$\overline{\text{ROUT2}}$	ROUT	
L	X	L	X	L	Z	Powered off while $\overline{\text{ROUT2}}$ is active
H	X	L	X	H	Z	
L	L	H	Yes	L	H	Normal operation with auto-powerdown disabled/enabled
L	H	H	Yes	L	L	
H	L	H	Yes	H	H	
H	H	H	Yes	H	L	
Open	Open	H	No	L	H	

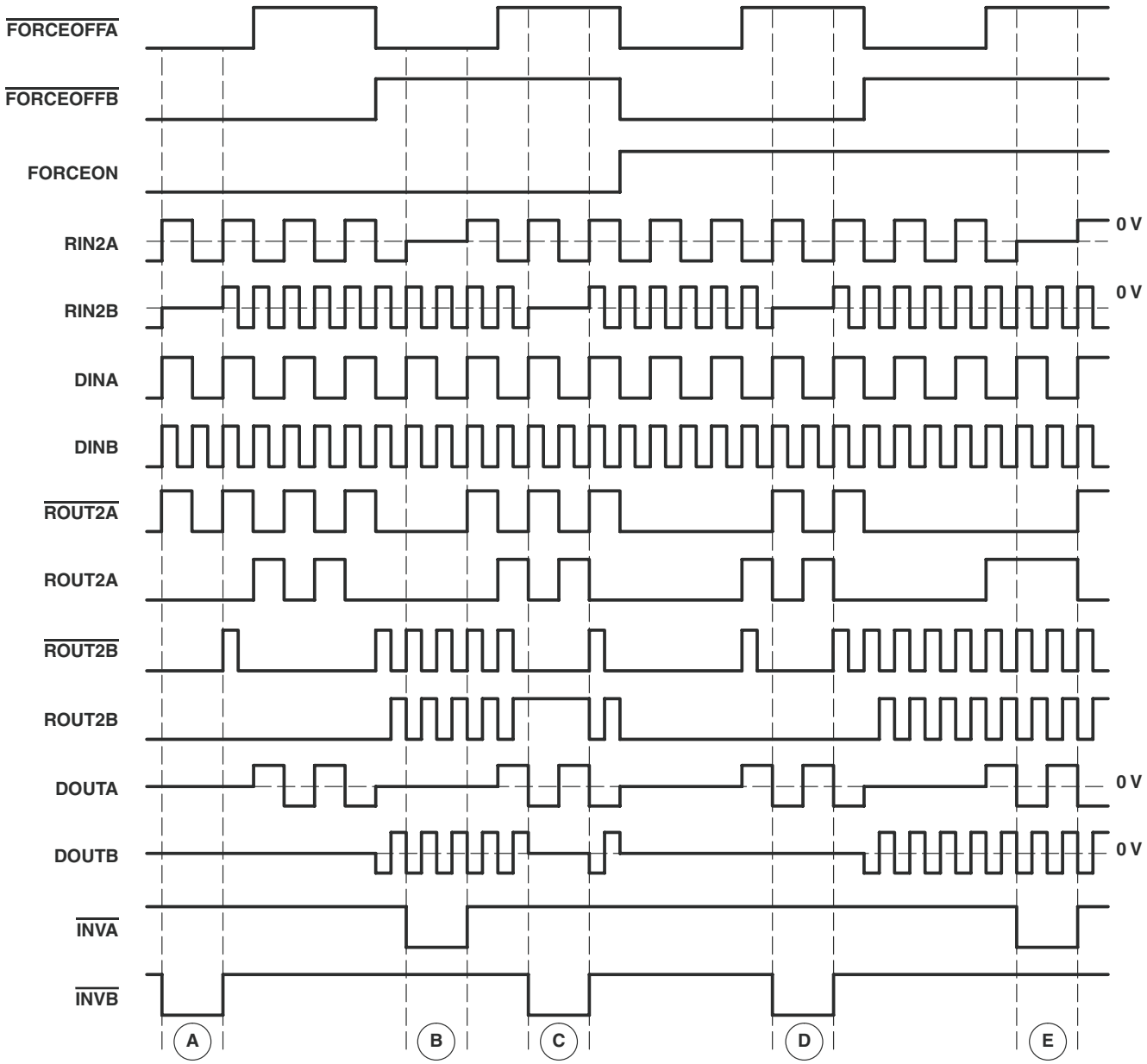
(1) H = high level, L = low level, X = irrelevant,
Z = high impedance (off),
Open = input disconnected or connected driver off

LOGIC DIAGRAM (POSITIVE LOGIC)



Timing

Figure 1 shows how the two independent serial ports can be enabled or disabled. As shown by the logic states, depending on the $\overline{\text{FORCEOFF}}$, FORCEON, and receiver input levels, either port can be powered down. Intermediate receiver input levels indicate a 0-V input. Also, it is assumed a pulldown resistor to ground is used for the receiver outputs. The $\overline{\text{INV}}$ pin goes low when its respective receiver input does not supply a valid RS-232 level. For simplicity, voltage levels, timing differences, and input/output edge rates are not shown.



A. Ports A and B manually powered off.

B. Port A manually powered off, port B in normal operation with auto-powerdown enabled.

C. Port B powered off by auto-powerdown, port A in normal operation with auto-powerdown enabled.

D. Port A in normal operation with auto-powerdown disabled, port B manually powered off.

E. Ports A and B in normal operation with auto-powerdown disabled

Figure 1. Timing Diagram

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
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
		Receiver ($\overline{\text{INV}}$)	–0.3	V_{CC} + 0.3	
θ_{JA}	Package thermal impedance(3)(4)	DGG package		70	°C/W
		DL package		63	
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.
(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.

Recommended Operating Conditions(1)

See Figure 7

				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
	Receiver input voltage			–25		25	
T_A	Operating free-air temperature		TRSF23243C	0		70	°C
			TRSF23243I	–40		85	

(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.

Electrical Characteristics(1)

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

PARAMETER			TEST CONDITIONS	MIN	TYP(2)	MAX	UNIT
I_I	Input leakage current	$\overline{\text{FORCEOFF}}$, FORCEON			±0.01	±1	µA
I_{CC}	Supply current (T_A = 25°C)	Auto-powerdown disabled	No load, $\overline{\text{FORCEOFF}}$ and FORCEON at V_{CC}		0.6	2	mA
		Powered off	No load, $\overline{\text{FORCEOFF}}$ at GND		1	20	µA
		Auto-powerdown enabled	No load, $\overline{\text{FORCEOFF}}$ at V_{CC}, FORCEON at GND, All RIN are open or grounded		1	20	

(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.
(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 7)

PARAMETER		TEST CONDITIONS		MIN	TYP(2)	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 at GND			±0.01	±1	µA
I_{OS}	Short-circuit output current(3)	V_{CC} = 3.6 V	V_O = 0 V		±35	±60	mA
		V_{CC} = 5.5 V	V_O = 0 V				
r_o	Output resistance	V_{CC}, V+, and V– = 0 V,	V_O = ±2 V	300	10M		Ω
I_{OZ}	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) 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.
(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 7)

PARAMETER		TEST CONDITIONS		MIN	TYP(2)	MAX	UNIT
	Maximum data rate	R_L = 3 kΩ, One DOUT switching	C_L = 1000 pF, See Figure 2	250			kbit/s
$t_{sk(p)}$	Pulse skew(3)	C_L = 150 pF to 2500 pF,	R_L = 3 kΩ to 7 kΩ, See Figure 2		100		ns
SR(tr)	Slew rate, transition region (see Figure 2)	V_{CC} = 3.3 V, R_L = 3 kΩ to 7 kΩ	C_L = 150 pF to 1000 pF	6		30	V/µs
			C_L = 150 pF to 2500 pF	4		30	

(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.
(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.

RECEIVER SECTION

Electrical Characteristics(1)

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

PARAMETER		TEST CONDITIONS	MIN	TYP(2)	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_{OZ}	Output leakage current (except $\overline{ROUT2B}$)	$\overline{FORCEOFF}$ = 0 V		±0.05	±10	µA
r_I	Input resistance	V_I = ±3 V to ±25 V	3	5	7	kΩ

(1) Test conditions are C1–C4 = 0.22 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.
(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) (see Figure 3)

PARAMETER		TEST CONDITIONS		TYP(2)	UNIT
t_{PLH}	Propagation delay time, low- to high-level output	C_L = 150 pF,	See Figure 4	150	ns
t_{PHL}	Propagation delay time, high- to low-level output	C_L = 150 pF,	See Figure 4	150	ns
t_{en}	Output enable time	C_L = 150 pF, See Figure 5	R_L = 3 kΩ,	200	ns
t_{dis}	Output disable time	C_L = 150 pF, See Figure 5	R_L = 3 kΩ,	200	ns
$t_{sk(p)}$	Pulse skew(3)	See Figure 4		50	ns

(1) Test conditions are C1–C4 = 0.22 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.
(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.

AUTO-POWERDOWN SECTION

Electrical Characteristics

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

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

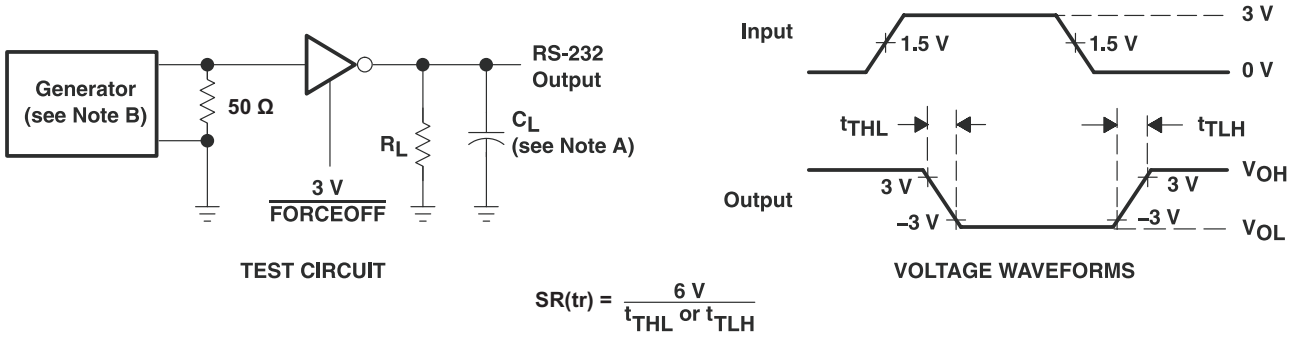
Switching Characteristics

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

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.

PARAMETER MEASUREMENT INFORMATION

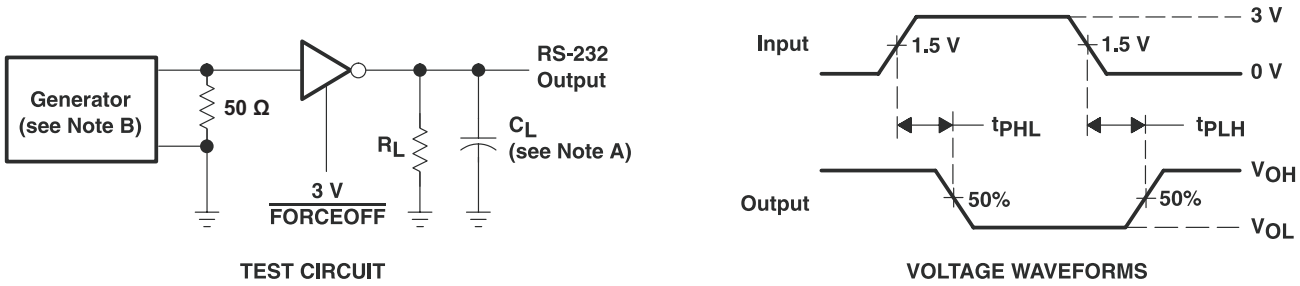


$$SR(tr) = \frac{6\ V}{t_{THL} \text{ or } t_{TLH}}$$

A. C_L includes probe and jig capacitance.

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

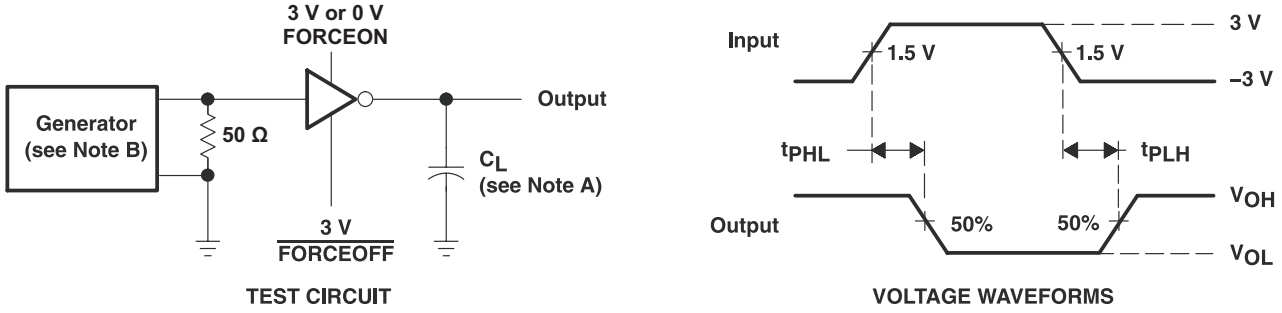
Figure 2. Driver Slew Rate



A. C_L includes probe and jig capacitance.

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

Figure 3. Driver Pulse Skew

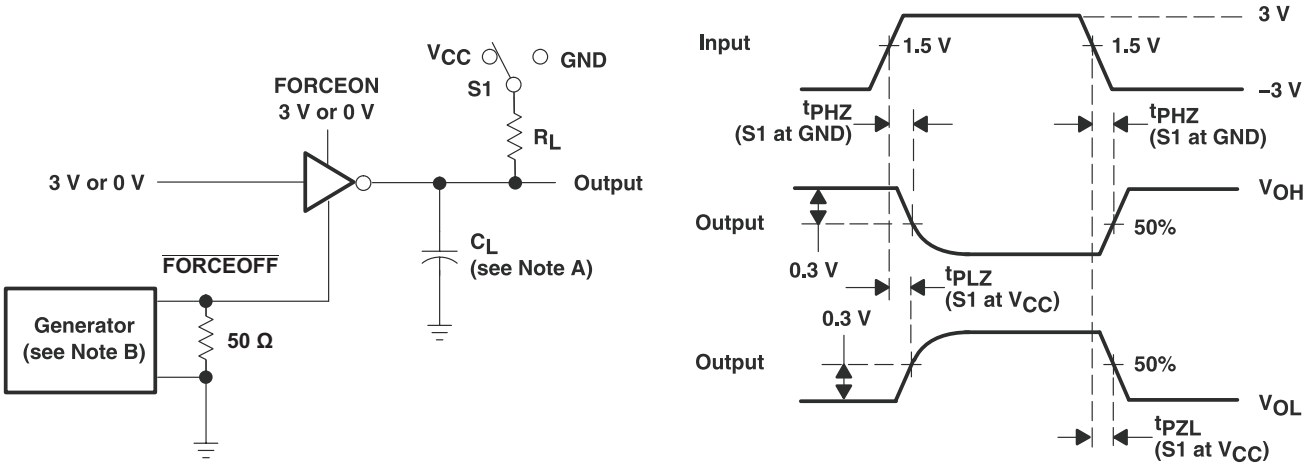


A. C_L includes probe and jig capacitance.

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

Figure 4. Receiver Propagation Delay Times

PARAMETER MEASUREMENT INFORMATION (continued)



TEST CIRCUIT VOLTAGE WAVEFORMS

A. C_L includes probe and jig capacitance.

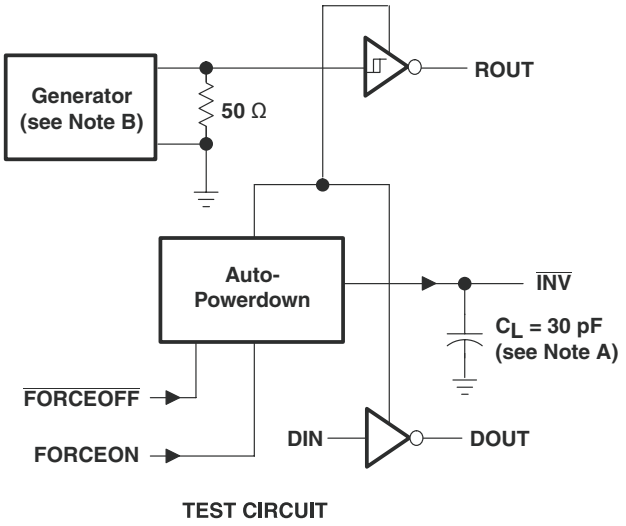
B. The pulse generator has the following characteristics: PRR = 250 kbits/s, Z_O = 50 Ω, 50% duty cycle, $t_r \le 10$ ns, $t_f \le 10$ ns.

C. t_{PLZ} and t_{PHZ} are the same as t_{dis}.

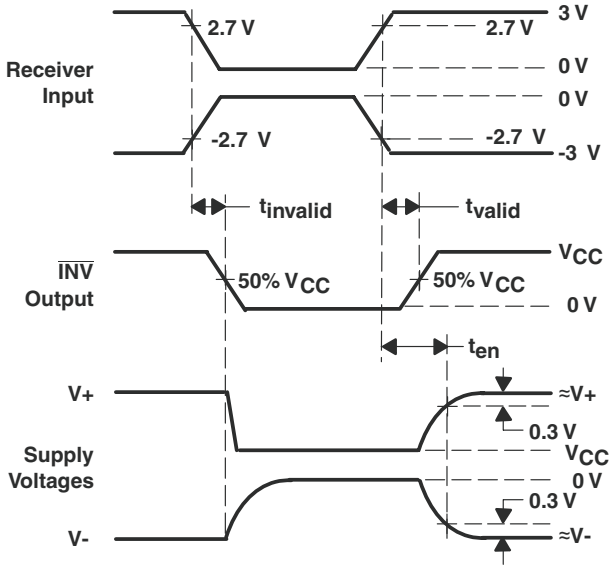
D. t_{PZL} and t_{PZH} are the same as t_{en}.

Figure 5. Receiver Enable and Disable Times

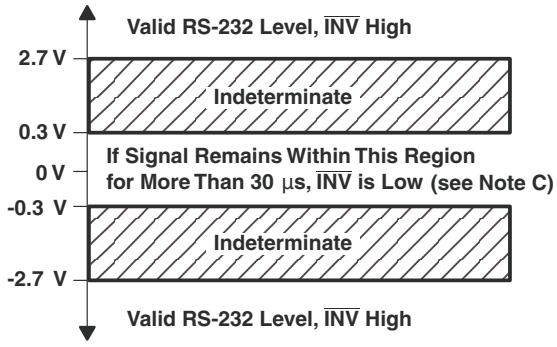
PARAMETER MEASUREMENT INFORMATION (continued)



TEST CIRCUIT



VOLTAGE WAVEFORMS

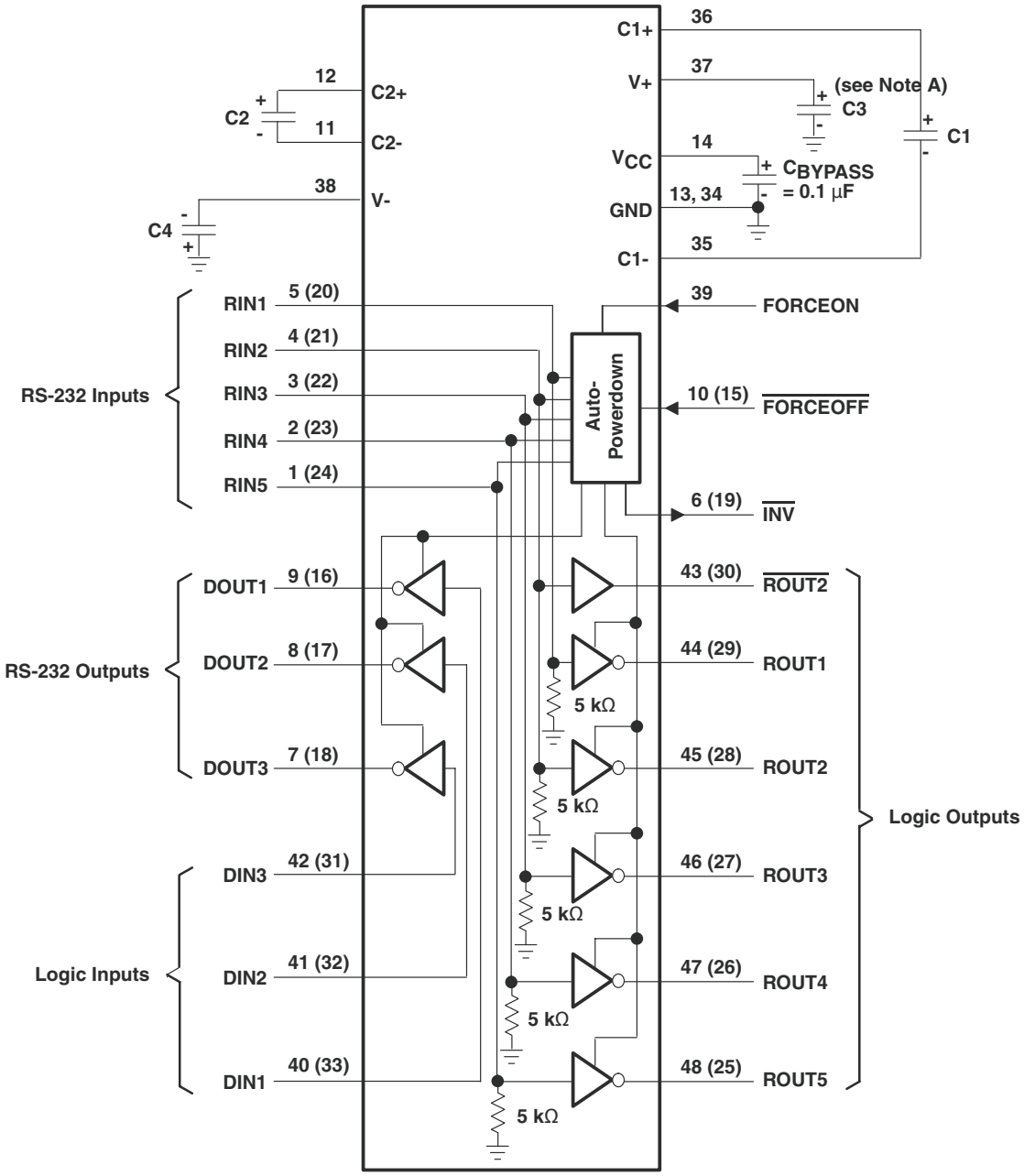


A. C_L includes probe and jig capacitance.

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

Figure 6. $\overline{INV}$ Propagation Delay Times and Supply Enabling Times

APPLICATION INFORMATION



V_{CC} vs CAPACITOR VALUES

V_{CC}	C1	C2, C3, and C4
3.3 V ± 0.3 V	0.22 µF	0.22 µF
5 V ± 0.5 V	0.047 µF	0.33 µF
3 V to 5.5 V	0.22 µF	1 µF

A. C3 can be connected to V_{CC} or GND.

B. Resistor values shown are nominal.

C. Numbers in parentheses are for B section.

Figure 7. Typical Operating Circuit and Capacitor Values

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/ Ball Finish	MSL Peak Temp [3]	Samples (Requires Login)
TRSF23243CDGG	ACTIVE	TSSOP	DGG	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243CDGGG4	ACTIVE	TSSOP	DGG	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243CDGGR	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Request Free Samples
TRSF23243CDGGRG4	ACTIVE	TSSOP	DGG	48	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Request Free Samples
TRSF23243CDL	ACTIVE	SSOP	DL	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243CDLG4	ACTIVE	SSOP	DL	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243CDLR	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Request Free Samples
TRSF23243CDLRG4	ACTIVE	SSOP	DL	48	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Request Free Samples
TRSF23243IDGG	ACTIVE	TSSOP	DGG	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243IDGGG4	ACTIVE	TSSOP	DGG	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243IDGGR	ACTIVE	TSSOP	DGG	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243IDGGRG4	ACTIVE	TSSOP	DGG	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243IDL	ACTIVE	SSOP	DL	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243IDLG4	ACTIVE	SSOP	DL	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243IDLR	ACTIVE	SSOP	DL	48		TBD	Call TI	Call TI	Purchase Samples
TRSF23243IDLRG4	ACTIVE	SSOP	DL	48		TBD	Call TI	Call TI	Purchase Samples

[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)

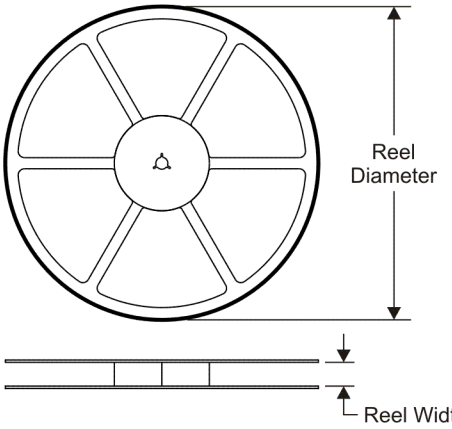
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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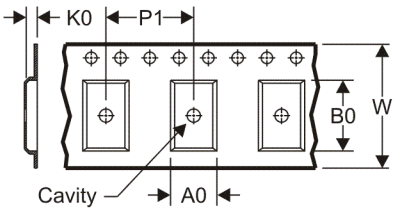
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TAPE AND REEL INFORMATION

REEL DIMENSIONS

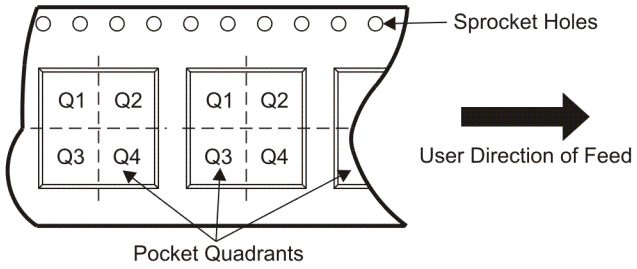


TAPE DIMENSIONS



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

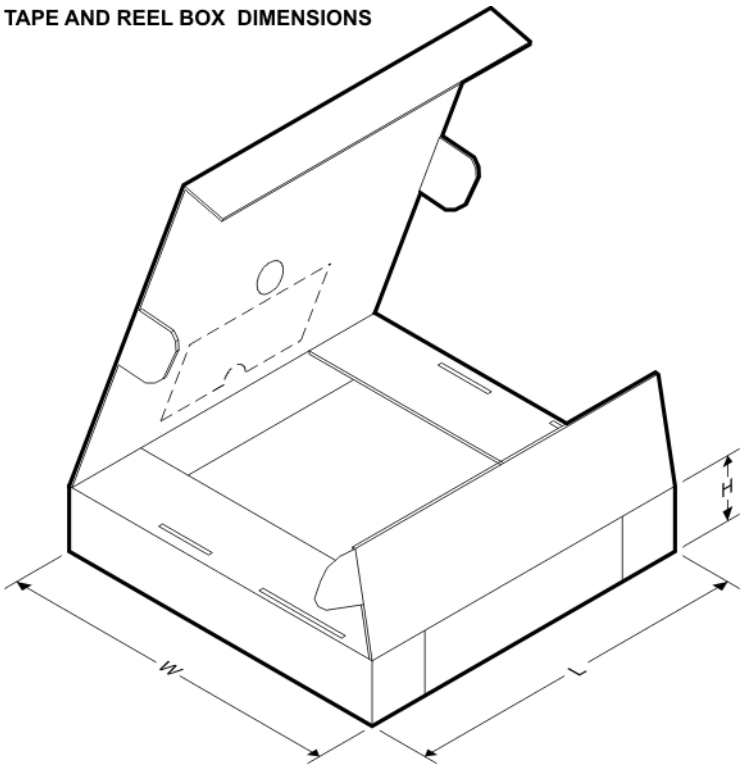
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TRSF23243CDGGR	TSSOP	DGG	48	2000	330.0	24.4	8.6	15.8	1.8	12.0	24.0	Q1
TRSF23243CDLR	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

TAPE AND REEL BOX DIMENSIONS

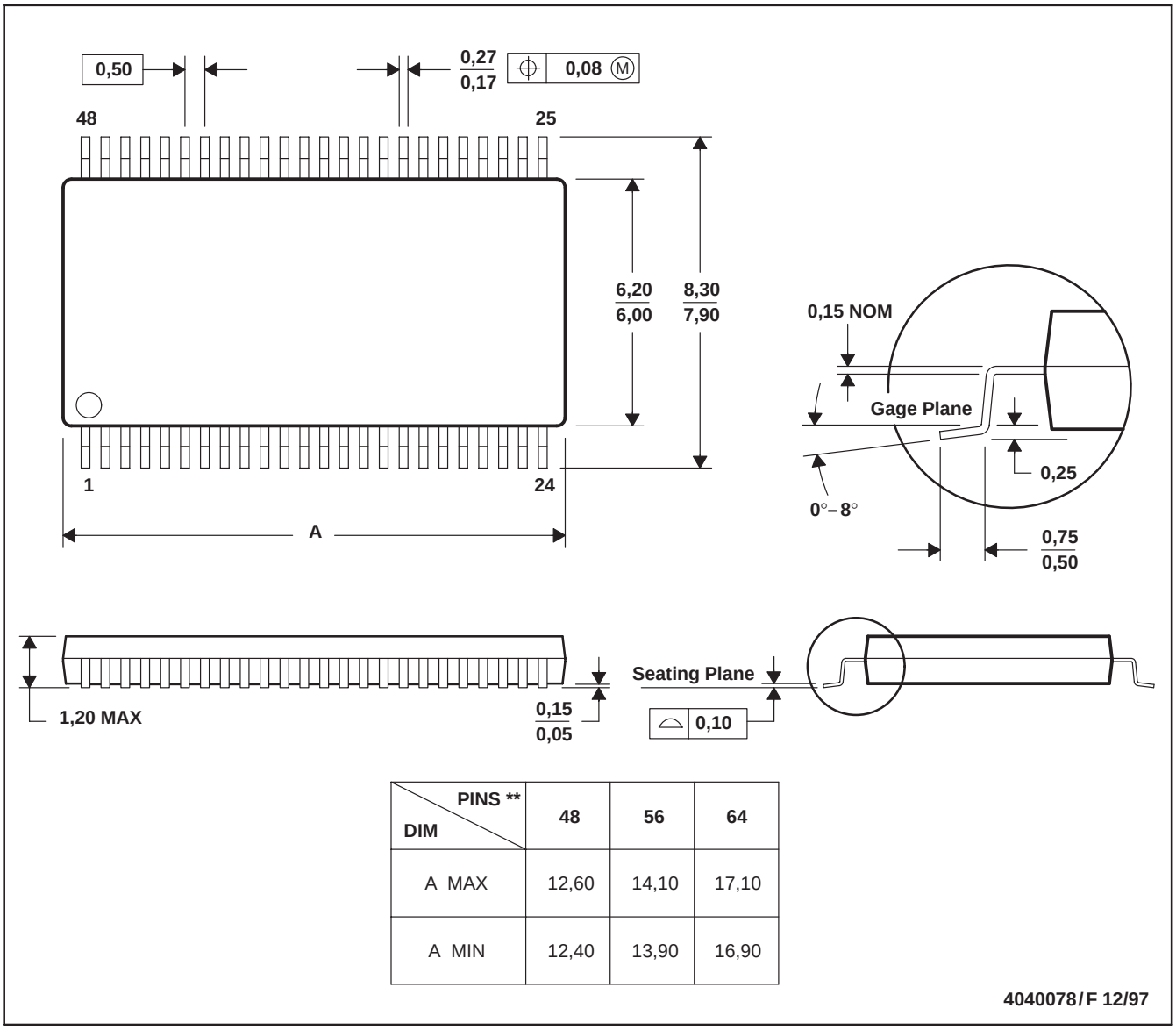


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TRSF23243CDGGR	TSSOP	DGG	48	2000	346.0	346.0	41.0
TRSF23243CDLR	SSOP	DL	48	1000	346.0	346.0	49.0

DGG (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

48 PINS SHOWN



DIM \ PINS **	48	56	64
A MAX	12,60	14,10	17,10
A MIN	12,40	13,90	16,90

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold protrusion not to exceed 0,15.
D. Falls within JEDEC MO-153

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