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## FEATURES

- Auto-Powerdown Plus
- Operates With 3-V to 5.5-V  $V_{CC}$  Supply
- Always-Active Noninverting Receiver Output (ROUT1B)
- Supports Operation From 250 kbit/s to 1 Mbit/s
- Low Standby Current . . . 1  $\mu$ A Typical
- External Capacitors . . . 4  $\times$  0.1  $\mu$ F
- Accepts 5-V Logic Input With 3.3-V Supply
- Inter-Operable With TRSF3243
- RS-232 Bus-Pin ESD Protection Exceeds  $\pm$ 15 kV Using Human-Body Model (HBM)

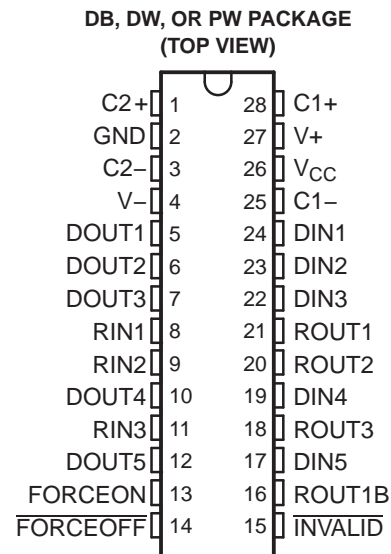
## APPLICATIONS

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

## DESCRIPTION/ORDERING INFORMATION

The TRSF3238 device consists of five line drivers, three line receivers, and a dual charge-pump circuit with  $\pm$ 15-kV ESD protection pin to pin (serial-port connection pins, including GND). 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 (ROUT1B), which allows applications using the ring indicator to transmit data while the device is powered down. This device operates at data signaling rate up to 1 Mbit/s and at an increased slew-rate range of 24 V/ $\mu$ s to 150 V/ $\mu$ s.

Flexible control options for power management are featured when the serial port and driver inputs are inactive. The auto-powerdown plus feature functions when FORCEON is low and FORCEOFF is high. During this mode of operation, if the device does not sense valid signal transitions on all receiver and driver inputs for approximately 30 s, the built-in charge pump and drivers are powered down, reducing the supply current to 1  $\mu$ A. By disconnecting the serial port or placing the peripheral drivers off, auto-powerdown plus occurs if there is no activity in the logic levels for the driver inputs. Auto-powerdown plus can be disabled when FORCEON and FORCEOFF are high. With auto-powerdown plus enabled, the device automatically activates when a valid signal is applied to any receiver or driver input. INVALID is high (valid data) if any receiver input voltage is greater than 2.7 V or less than  $-2.7$  V, or has been between  $-0.3$  V and 0.3 V for less than 30  $\mu$ s. INVALID is low (invalid data) if all receiver input voltages are between  $-0.3$  V and 0.3 V for more than 30  $\mu$ s. Refer to Figure 5 for receiver input levels.



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**ORDERING INFORMATION**

T <sub>A</sub>	PACKAGE <sup>(1)(2)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	SOIC – DW	Tube of 50	TRSF3238CDW	TRS3238EC
		Reel of 2000	TRSF3238CDWR	
	SSOP – DB	Tube of 50	TRSF3238CDB	TRS3238EC
		Reel of 2000	TRSF3238CDBR	
	TSSOP – PW	Tube of 50	TRSF3238CPW	RT38C
		Reel of 2000	TRSF3238CPWR	
–40°C to 85°C	SOIC – DW	Tube of 50	TRSF3238IDW	TRS3238EI
		Reel of 2000	TRSF3238IDWR	
	SSOP – DB	Tube of 50	TRSF3238IDB	TRS3238EI
		Reel of 2000	TRSF3238IDBR	
	TSSOP – PW	Tube of 50	TRSF3238IPW	RT38I
		Reel of 2000	TRSF3238IPWR	

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

**FUNCTION TABLES**

**Each Driver<sup>(1)</sup>**

INPUTS				OUTPUT DOUT	DRIVER STATUS
DIN	FORCEON	FORCEOFF	TIME ELAPSED SINCE LAST RIN OR DIN TRANSITION		
X	X	L	X	Z	Powered off
L	H	H	X	H	Normal operation with auto-powerdown plus disabled
H	H	H	X	L	
L	L	H	<30 s	H	Normal operation with auto-powerdown plus enabled
H	L	H	<30 s	L	
L	L	H	>30 s	Z	Powered off by auto-powerdown plus feature
H	L	H	>30 s	Z	

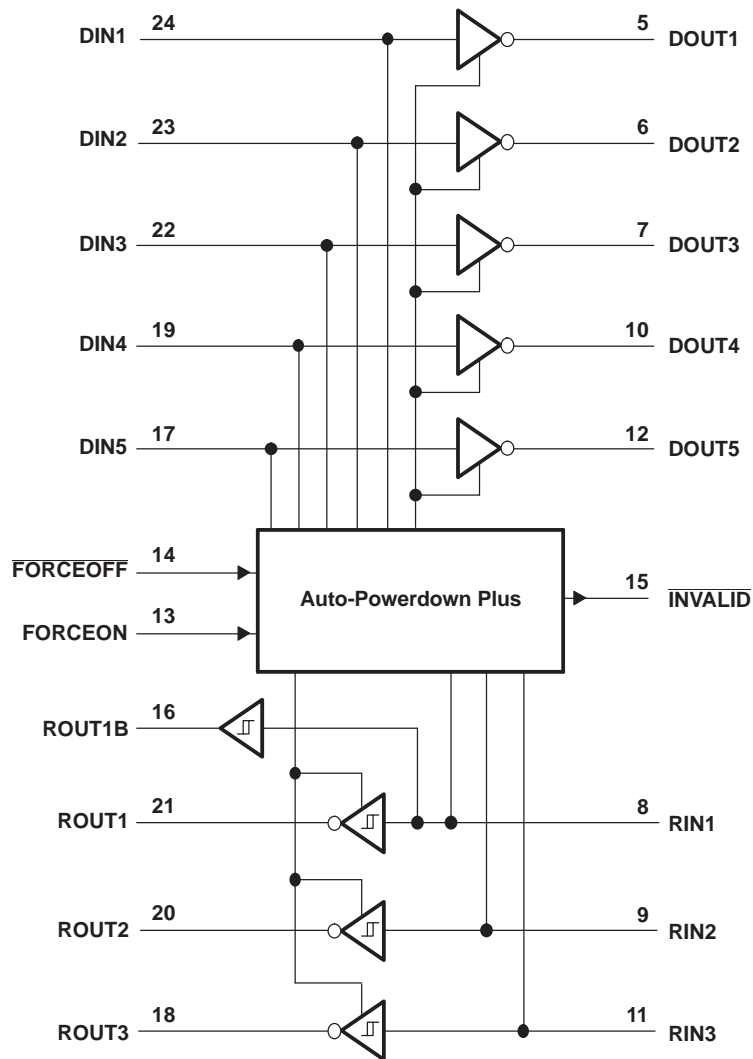
(1) H = high level, L = low level, X = irrelevant, Z = high impedance

**Each Receiver<sup>(1)</sup>**

INPUTS				OUTPUTS		RECEIVER STATUS
RIN2	RIN1, RIN3–RIN5	FORCEOFF	TIME ELAPSED SINCE LAST RIN OR DIN TRANSITION	ROUT1B	ROUT	
L	X	L	X	L	Z	Powered off while ROUT1B is active
H	X	L	X	H	Z	
L	L	H	<30 s	L	H	Normal operation with auto-powerdown plus disabled/enabled
L	H	H	<30 s	L	L	
H	L	H	<30 s	H	H	
H	H	H	<30 s	H	L	
Open	Open	H	>30 s	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)**



### Absolute Maximum Ratings<sup>(1)</sup>

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

		MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage range <sup>(2)</sup>	–0.3	6	V	
V+	Positive-output supply voltage range <sup>(2)</sup>	–0.3	7	V	
V–	Negative-output supply voltage range <sup>(2)</sup>	0.3	–7	V	
V+ – V–	Supply voltage difference <sup>(2)</sup>		13	V	
V <sub>I</sub>	Input voltage range	Driver ( $\overline{\text{FORCEOFF}}$ , FORCEON)	–0.3	6	V
		Receiver	–25	25	
V <sub>O</sub>	Output voltage range	Driver	–13.2	13.2	V
		Receiver ( $\overline{\text{INVALID}}$ )	–0.3	V <sub>CC</sub> + 0.3	
$\theta_{JA}$	Package thermal impedance <sup>(3)(4)</sup>	DB package		62	°C/W
		DW package		46	
		PW package		62	
T <sub>J</sub>	Operating virtual junction temperature		150	°C	
T <sub>stg</sub>	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<sub>J</sub>(max),  $\theta_{JA}$ , and T<sub>A</sub>. The maximum allowable power dissipation at any allowable ambient temperature is P<sub>D</sub> = (T<sub>J</sub>(max) – T<sub>A</sub>)/ $\theta_{JA}$ . Operating at the absolute maximum T<sub>J</sub> of 150°C can affect reliability.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7.

### Recommended Operating Conditions<sup>(1)</sup>

See Figure 6

		MIN	NOM	MAX	UNIT	
Supply voltage		V <sub>CC</sub> = 3.3 V	3	3.3	3.6	V
		V <sub>CC</sub> = 5 V	4.5	5	5.5	
V <sub>IH</sub>	Driver and control high-level input voltage	DIN, $\overline{\text{FORCEOFF}}$ , FORCEON	V <sub>CC</sub> = 3.3 V	2		V
			V <sub>CC</sub> = 5 V	2.4		
V <sub>IL</sub>	Driver and control low-level input voltage	DIN, $\overline{\text{FORCEOFF}}$ , FORCEON		0.8	V	
V <sub>I</sub>	Driver and control input voltage	DIN, $\overline{\text{FORCEOFF}}$ , FORCEON	0	5.5	V	
V <sub>I</sub>	Receiver input voltage		–25	25	V	
T <sub>A</sub>	Operating free-air temperature	TRSF3238C	0	70	°C	
		TRSF3238I	–40	85		

- (1) Testing supply conditions are C1–C4 = 0.1  $\mu\text{F}$  at V<sub>CC</sub> = 3.3 V  $\pm$  0.15 V; C1–C4 = 0.22  $\mu\text{F}$  at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; and C1 = 0.047  $\mu\text{F}$  and C2–C4 = 0.33  $\mu\text{F}$  at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

### Electrical Characteristics<sup>(1)</sup>

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

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
I <sub>I</sub>	Input leakage current	$\overline{\text{FORCEOFF}}$ , FORCEON		$\pm$ 0.01	$\pm$ 1	$\mu\text{A}$
I <sub>CC</sub>	Supply current	Auto-powerdown plus disabled	No load, $\overline{\text{FORCEOFF}}$ and FORCEON at V <sub>CC</sub>	0.5	2	mA
		Powered off	No load, $\overline{\text{FORCEOFF}}$ at GND	1	10	
		Auto-powerdown plus enabled	No load, $\overline{\text{FORCEOFF}}$ at V <sub>CC</sub> , FORCEON at GND, All RIN are open or grounded	1	10	$\mu\text{A}$

- (1) Testing supply conditions are C1–C4 = 0.1  $\mu\text{F}$  at V<sub>CC</sub> = 3.3 V  $\pm$  0.15 V; C1–C4 = 0.22  $\mu\text{F}$  at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; and C1 = 0.047  $\mu\text{F}$  and C2–C4 = 0.33  $\mu\text{F}$  at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.
- (2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

## DRIVER SECTION

### Electrical Characteristics<sup>(1)</sup>

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

PARAMETER	TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
V <sub>OH</sub>	High-level output voltage	All DOUT at R <sub>L</sub> = 3 kΩ to GND			V
V <sub>OL</sub>	Low-level output voltage	All DOUT at R <sub>L</sub> = 3 kΩ to GND			V
I <sub>IH</sub>	High-level input current	V <sub>I</sub> = V <sub>CC</sub>			μA
I <sub>IL</sub>	Low-level input current	V <sub>I</sub> at GND			μA
I <sub>OS</sub>	Short-circuit output current <sup>(3)</sup>	V <sub>CC</sub> = 3.6 V,	V <sub>O</sub> = 0 V		mA
		V <sub>CC</sub> = 5.5 V,	V <sub>O</sub> = 0 V		
r <sub>o</sub>	Output resistance	V <sub>CC</sub> , V+, and V- = 0 V, V <sub>O</sub> = ±2 V			Ω
I <sub>off</sub>	Output leakage current	FORCEOFF = GND		V <sub>O</sub> = ±12 V, V <sub>CC</sub> = 3 V to 3.6 V	μA
				V <sub>O</sub> = ±10 V, V <sub>CC</sub> = 4.5 V to 5.5 V	μA

(1) Testing supply conditions are C1–C4 = 0.1 μF at V<sub>CC</sub> = 3.3 V ± 0.15 V; C1–C4 = 0.22 μF at V<sub>CC</sub> = 3.3 V ± 0.3 V; and C1 = 0.047 μF and C2–C4 = 0.33 μF at V<sub>CC</sub> = 5 V ± 0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 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<sup>(1)</sup>

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

PARAMETER	TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT		
Maximum data rate (see <a href="#">Figure 1</a> )	R <sub>L</sub> = 3 kΩ, One DOUT switching	C <sub>L</sub> = 1000 pF		250	kbit/s		
		C <sub>L</sub> = 250 pF,	V <sub>CC</sub> = 3 V to 4.5 V	1000			
		C <sub>L</sub> = 1000 pF,	V <sub>CC</sub> = 4.5 V to 5.5 V	1000			
t <sub>sk(p)</sub>	Pulse skew <sup>(3)</sup>	C <sub>L</sub> = 150 pF to 2500 pF,	R <sub>L</sub> = 3 kΩ to 7 kΩ,	See <a href="#">Figure 2</a>	25	ns	
SR(tr)	Slew rate, transition region (see <a href="#">Figure 1</a> )	C <sub>L</sub> = 150 pF to 1000 pF,	R <sub>L</sub> = 3 kΩ to 7 kΩ,	V <sub>CC</sub> = 3.3 V	18	150	V/μs

(1) Testing supply conditions are C1–C4 = 0.1 μF at V<sub>CC</sub> = 3.3 V ± 0.15 V; C1–C4 = 0.22 μF at V<sub>CC</sub> = 3.3 V ± 0.3 V; and C1 = 0.047 μF and C2–C4 = 0.33 μF at V<sub>CC</sub> = 5 V ± 0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

(3) Pulse skew is defined as |t<sub>PLH</sub> – t<sub>PHL</sub>| of each channel of the same device.

## RECEIVER SECTION

### Electrical Characteristics<sup>(1)</sup>

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

PARAMETER		TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
V <sub>OH</sub>	High-level output voltage	I <sub>OH</sub> = –1 mA	V <sub>CC</sub> – 0.6	V <sub>CC</sub> – 0.1		V
V <sub>OL</sub>	Low-level output voltage	I <sub>OL</sub> = 1.6 mA			0.4	V
V <sub>IT+</sub>	Positive-going input threshold voltage	V <sub>CC</sub> = 3.3 V		1.5	2.4	V
		V <sub>CC</sub> = 5 V		1.8	2.4	
V <sub>IT–</sub>	Negative-going input threshold voltage	V <sub>CC</sub> = 3.3 V	0.6	1.2		V
		V <sub>CC</sub> = 5 V	0.8	1.5		
V <sub>hys</sub>	Input hysteresis (V <sub>IT+</sub> – V <sub>IT–</sub> )			0.3		V
I <sub>off</sub>	Output leakage current (except ROUT1B)	FORCEOFF = 0 V		±0.05	±10	µA
r <sub>i</sub>	Input resistance	V <sub>i</sub> = ±3 V to ±25 V	3	5	7	kΩ

(1) Testing supply conditions are C1–C4 = 0.1 µF at V<sub>CC</sub> = 3.3 V ± 0.15 V; C1–C4 = 0.22 µF at V<sub>CC</sub> = 3.3 V ± 0.3 V; and C1 = 0.047 µF and C2–C4 = 0.33 µF at V<sub>CC</sub> = 5 V ± 0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

### Switching Characteristics<sup>(1)</sup>

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

PARAMETER		TEST CONDITIONS	TYP <sup>(2)</sup>	UNIT
t <sub>PLH</sub>	Propagation delay time, low- to high-level output	C <sub>L</sub> = 150 pF, See <a href="#">Figure 3</a>	150	ns
t <sub>PHL</sub>	Propagation delay time, high- to low-level output	C <sub>L</sub> = 150 pF, See <a href="#">Figure 3</a>	150	ns
t <sub>en</sub>	Output enable time	C <sub>L</sub> = 150 pF, R <sub>L</sub> = 3 kΩ, See <a href="#">Figure 4</a>	200	ns
t <sub>dis</sub>	Output disable time	C <sub>L</sub> = 150 pF, R <sub>L</sub> = 3 kΩ, See <a href="#">Figure 4</a>	200	ns
t <sub>sk(p)</sub>	Pulse skew <sup>(3)</sup>	See <a href="#">Figure 3</a>	50	ns

(1) Testing supply conditions are C1–C4 = 0.1 µF at V<sub>CC</sub> = 3.3 V ± 0.15 V; C1–C4 = 0.22 µF at V<sub>CC</sub> = 3.3 V ± 0.3 V; and C1 = 0.047 µF and C2–C4 = 0.33 µF at V<sub>CC</sub> = 5 V ± 0.5 V.

(2) All typical values are at V<sub>CC</sub> = 3.3 V or V<sub>CC</sub> = 5 V, and T<sub>A</sub> = 25°C.

(3) Pulse skew is defined as |t<sub>PLH</sub> – t<sub>PHL</sub>| of each channel of the same device.

## AUTO-POWERDOWN PLUS 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 $\overline{INVALID}$ high-level output voltage	FORCEON = GND, FORCEOFF = $V_{CC}$		2.7	V
$V_{T-(valid)}$	Receiver input threshold for $\overline{INVALID}$ high-level output voltage	FORCEON = GND, FORCEOFF = $V_{CC}$	-2.7		V
$V_{T(invalid)}$	Receiver input threshold for $\overline{INVALID}$ low-level output voltage	FORCEON = GND, FORCEOFF = $V_{CC}$	-0.3	0.3	V
$V_{OH}$	$\overline{INVALID}$ high-level output voltage	$I_{OH} = -1$ mA, FORCEON = GND, FORCEOFF = $V_{CC}$	$V_{CC} - 0.6$		V
$V_{OL}$	$\overline{INVALID}$ low-level output voltage	$I_{OL} = 1.6$ mA, FORCEON = GND, FORCEOFF = $V_{CC}$		0.4	V

### Switching Characteristics

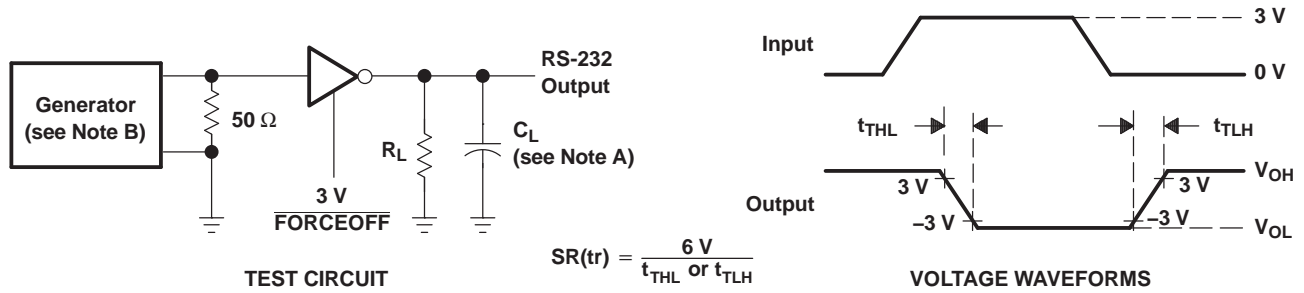
over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see [Figure 5](#))

PARAMETER		MIN	TYP <sup>(1)</sup>	MAX	UNIT
$t_{valid}$	Propagation delay time, low- to high-level output		0.1		$\mu$ s
$t_{invalid}$	Propagation delay time, high- to low-level output		50		$\mu$ s
$t_{en}$	Supply enable time		25		$\mu$ s
$t_{dis}$	Receiver or driver edge to auto-powerdown plus	15	30	60	s

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

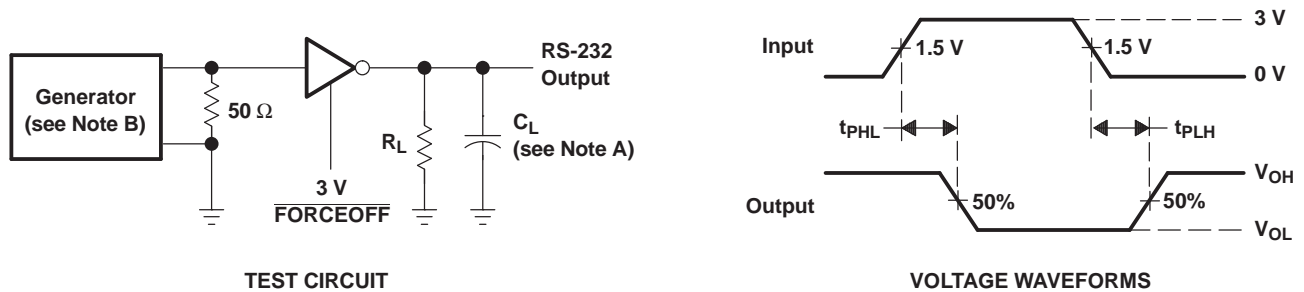


PARAMETER MEASUREMENT INFORMATION



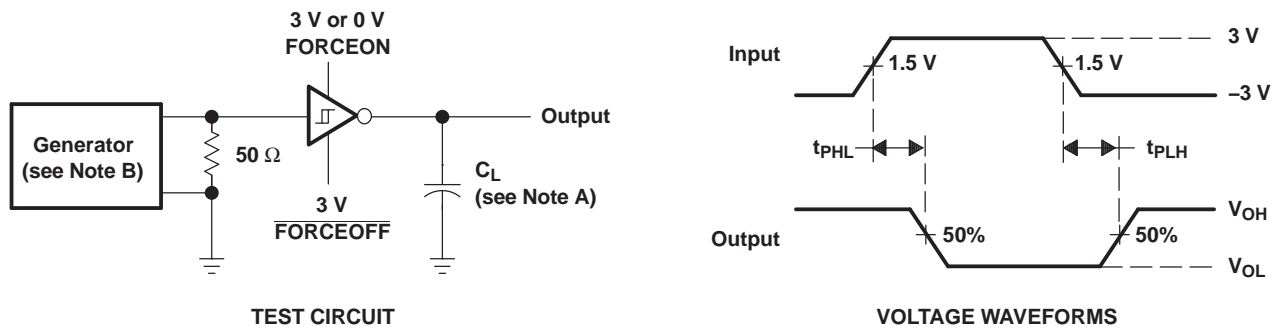
- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: PRR = 1 Mbit/s,  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

Figure 1. Driver Slew Rate



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

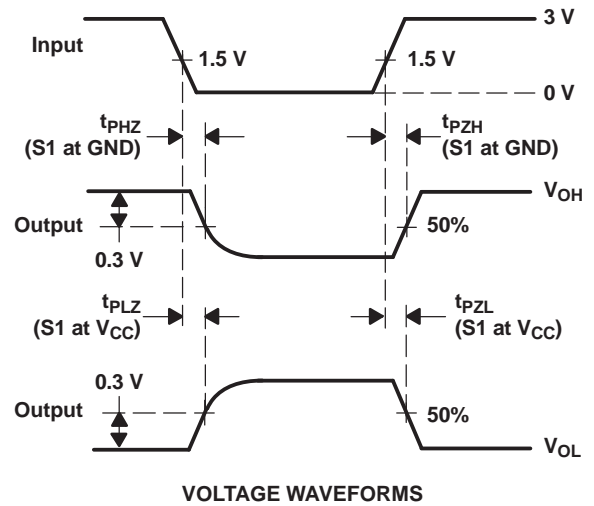
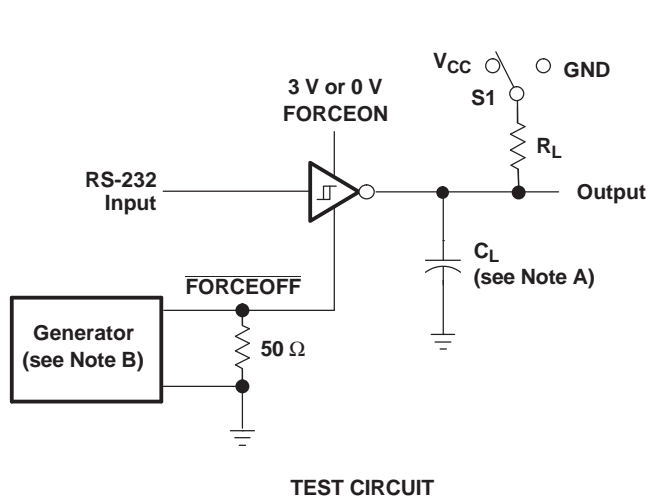
Figure 2. Driver Pulse Skew



- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

Figure 3. Receiver Propagation Delay Times

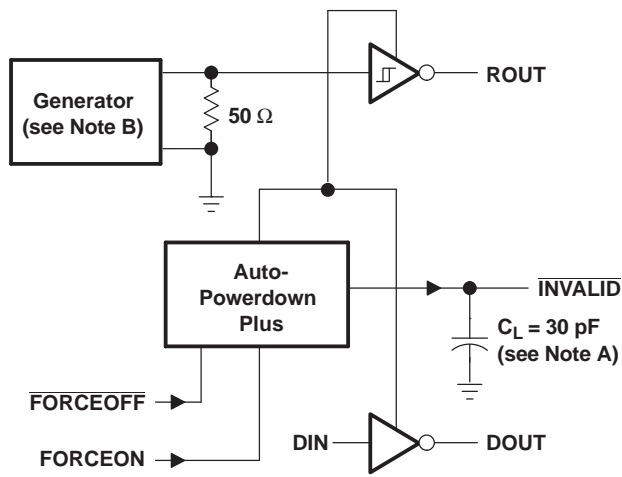
PARAMETER MEASUREMENT INFORMATION (continued)



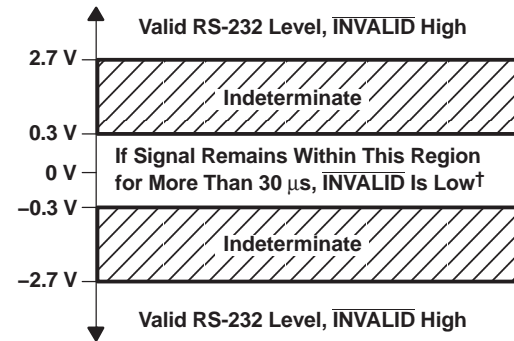
- A.  $C_L$  includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $Z_O = 50 \Omega$ , 50% duty cycle,  $t_r \leq 10 \text{ ns}$ ,  $t_f \leq 10 \text{ ns}$ .
- C.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- D.  $t_{PZL}$  and  $t_{PZH}$  are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

Figure 4. Receiver Enable and Disable Times

PARAMETER MEASUREMENT INFORMATION (continued)



TEST CIRCUIT



† Auto-powerdown plus disables drivers and reduces supply current to 1  $\mu$ A.

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

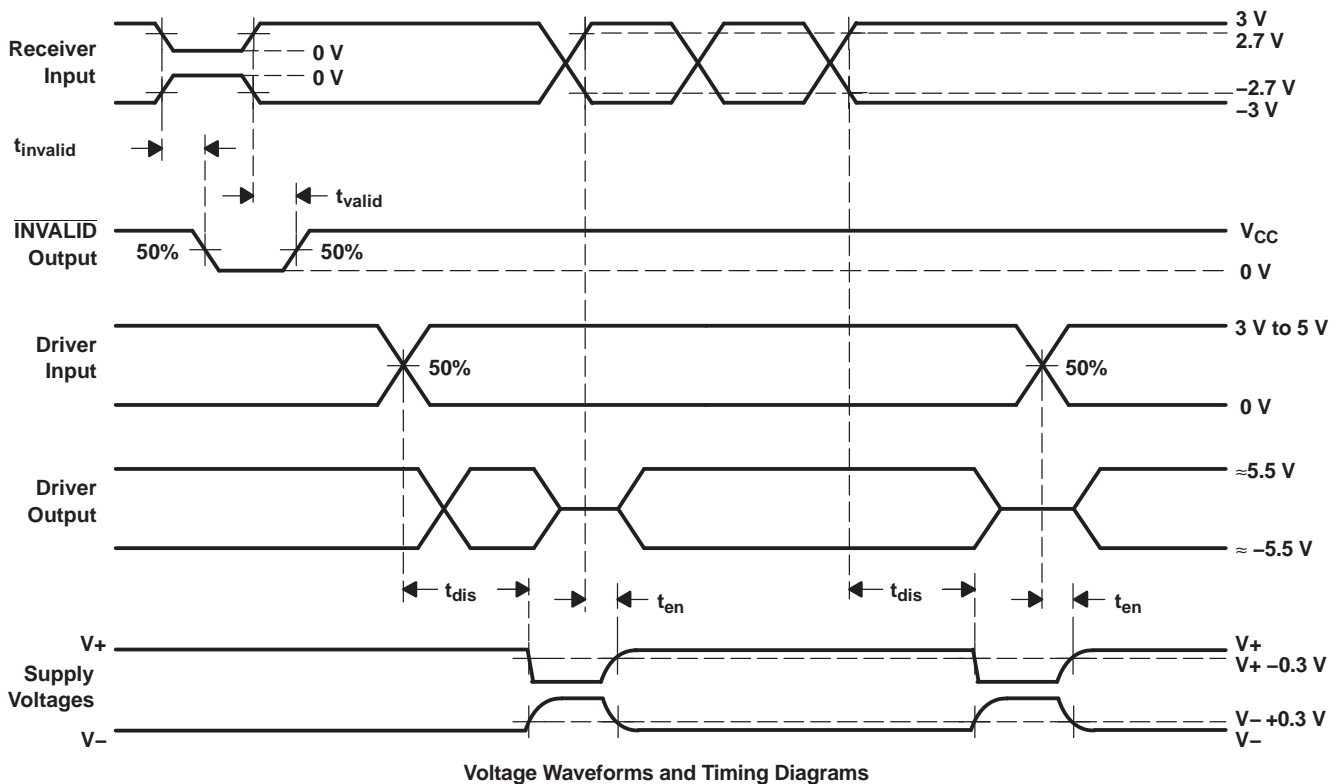
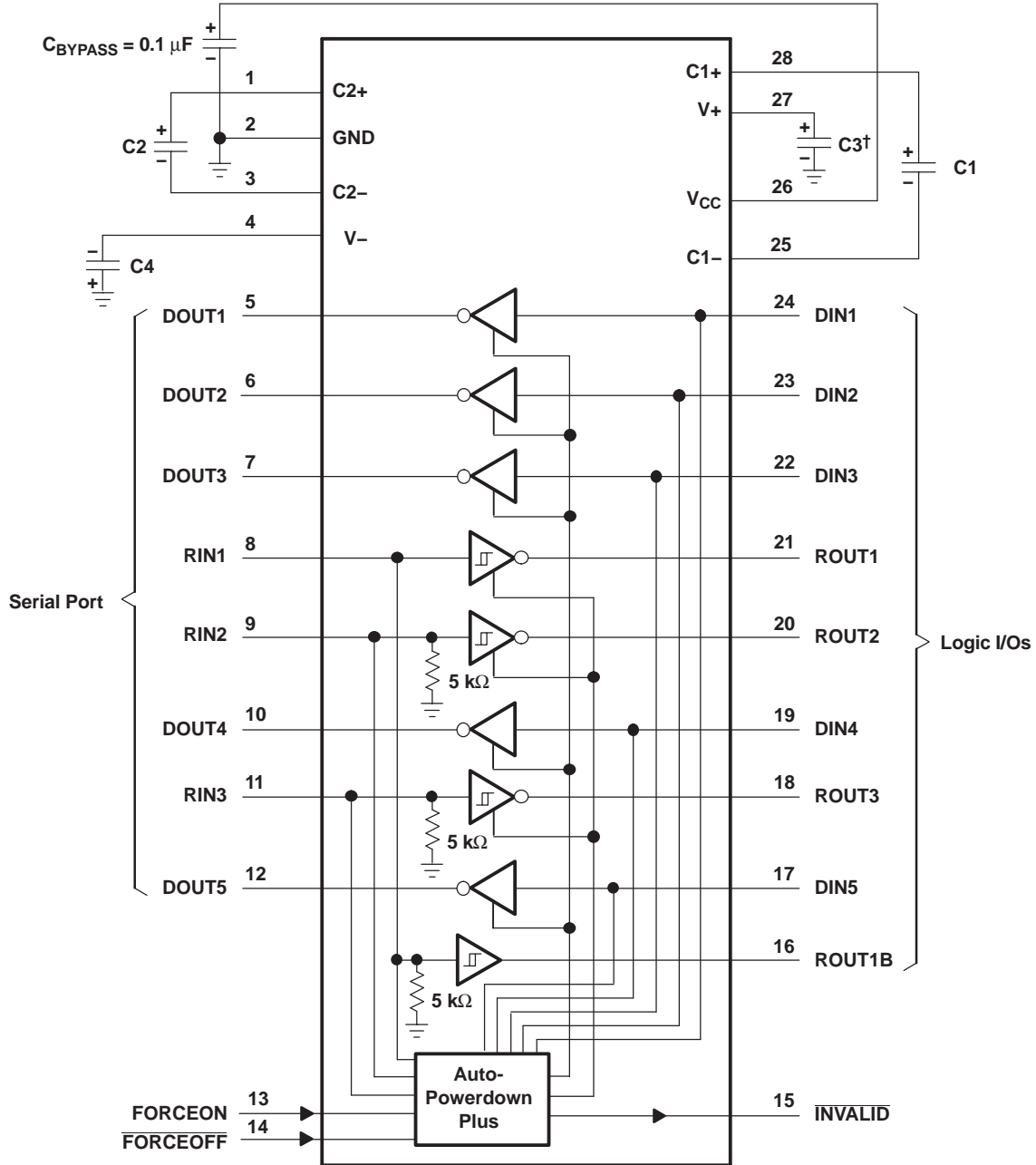


Figure 5.  $\overline{\text{INVALID}}$  Propagation-Delay Times and Supply-Enabling Time

APPLICATION INFORMATION



† C3 can be connected to V<sub>CC</sub> or GND.  
A. Resistor values shown are nominal.

V<sub>CC</sub> vs CAPACITOR VALUES

V <sub>CC</sub>	C1	C2, C3, and C4
3.3 V ± 0.15 V	0.1 μF	0.1 μF
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

Figure 6. Typical Operating Circuit and Capacitor Values

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
TRSF3238CDB	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CDBG4	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CDBR	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CDBRG4	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CDW	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CDWG4	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CDWR	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CDWRG4	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CPW	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CPWG4	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CPWR	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238CPWRG4	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDB	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDBG4	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDBR	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDBRG4	ACTIVE	SSOP	DB	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDW	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDWG4	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDWR	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IDWRG4	ACTIVE	SOIC	DW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IPW	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IPWG4	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IPWR	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TRSF3238IPWRG4	ACTIVE	TSSOP	PW	28		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>

<sup>(1)</sup> 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.

<sup>(2)</sup> 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)

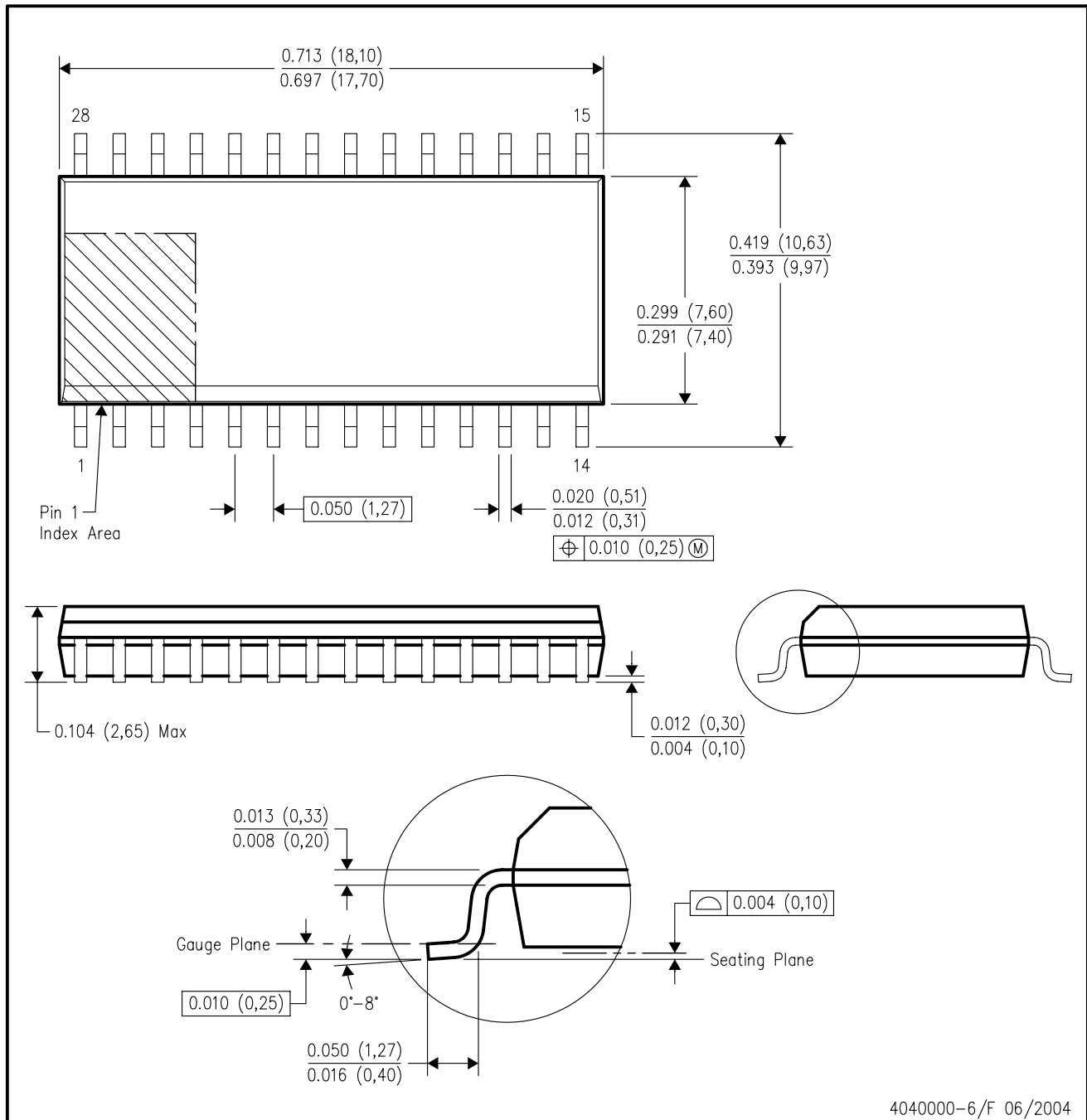
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DW (R-PDSO-G28)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AE.

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



PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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-153

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Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>	Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>	Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Energy	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>	Space, Avionics & Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
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