









**TRS3232** SLLS812B - JULY 2007 - REVISED JUNE 2021

# TRS3232 3-V to 5.5-V Multichannel RS-232 Line Driver and Receiver With ±15-kV ESD Protection

### 1 Features

- RS-232 Bus-terminal 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<sub>CC</sub> supply
- Operates up to 250 kbps
- Two drivers and two receivers
- Low supply current: 300-µA typical
- External capacitors: 4 × 0.1 µF
- Accepts 5-V logic input with 3.3-V supply
- Alternative high-speed terminal-compatible devices s (1 Mbps)
  - SN65C3232 (-40°C to 85°C)
  - SN75C3232 (0°C to 70°C)

# 2 Applications

- **Industrial PCs**
- Wired networking
- Data cneter and enterprise computing
- **Battery-powered systems**
- Notebooks
- Laptops
- Palmtop PCs
- Hand-held equipment

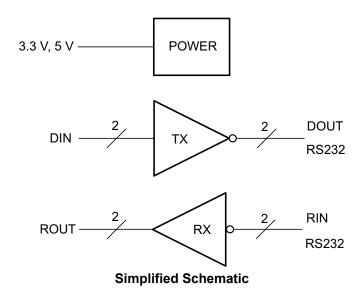
# 3 Description

The TRS3232 consists of two line drivers, two line receivers, and a dual charge-pump circuit with ±15-kV ESD protection terminal-to-terminal (serialport connection terminals, 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. The charge pump and four small external capacitors allow operation from one 3-V to 5.5-V supply. The devices operate at datasignaling rates up to 250 kbps and a maximum of 30-V/µs driver-output slew rate.

#### **Device Information**

PART NUMBER	PACKAGE <sup>(1)</sup>	BODY SIZE (NOM)
	SOIC (16)	9.90 mm × 3.91 mm
TRS3232	SSOP (16)	6.20 mm × 5.30 mm
1833232	SOIC-Wide (16)	10.30 mm × 7.50 mm
	TSSOP (16)	5.00 mm × 4.40 mm

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





## **Table of Contents**

1 Features	1	8.2 Functional Block Diagram	8
2 Applications		8.3 Feature Description	
3 Description		8.4 Device Functional Modes	
4 Revision History		9 Application and Implementation	
5 Pin Configuration and Functions		9.1 Application Information	
6 Specifications		9.2 Typical Application	
6.1 Absolute Maximum Ratings		10 Power Supply Recommendations	
6.2 ESD Ratings		11 Layout	
6.3 Recommended Operating Conditions		11.1 Layout Guidelines	
6.4 Thermal Information		11.2 Layout Example	
6.5 Electrical Characteristics—Device		12 Device and Documentation Support	
6.6 Electrical Characteristics—Driver		12.1 Receiving Notification of Documentation Up	
6.7 Electrical Characteristics—Receiver	6	12.2 Support Resources	
6.8 Switching Characteristics	6	12.3 Trademarks	13
6.9 Typical Characteristics		12.4 Electrostatic Discharge Caution	
7 Parameter Measurement Information		12.5 Glossary	
8 Detailed Description		13 Mechanical, Packaging, and Orderable	
8.1 Overview		Information	13
4 Revision History			
NOTE: Page numbers for previous revisions r	nay differ fr	rom page numbers in the current version.	
Changes from Revision A (July 2015) to Re	evision B (	June 2021)	Page
Added Applications: Industrial PCs, Wired	networking	, and Data center and enterprise computing	1
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Changes from Revision \* (July 2007) to Revision A (June 2015)

Page

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# **5 Pin Configuration and Functions**

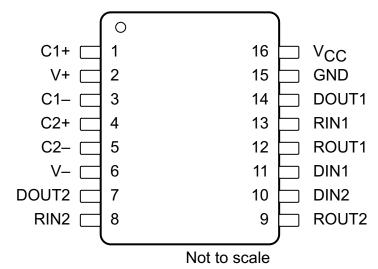


Figure 5-1. D, DB, DW, PW Packages 16-Pin SOIC, SSOP, SOIC (Wide), TSSOP Top View

**Table 5-1. Pin Functions** 

PIN		TVDE	DESCRIPTION
NAME	NO.	ITPE	DESCRIPTION
C1+	1	_	Positive lead of C1 capacitor
C1-	3	_	Negative lead of C1 capacitor
C2+	4	_	Positive lead of C2 capacitor
C2-	5	_	Negative lead of C2 capacitor
DIN1	11	I	Logic data input (from UART)
DIN2	10	ı	Logic data input (from UART)
DOUT1	14	0	RS232 line data output (to remote RS232 system)
DOUT2	7	0	RS232 line data output (to remote RS232 system)
GND	15	_	Ground
RIN1	13	I	RS232 line data input (from remote RS232 system)
RIN2	8	I	RS232 line data input (from remote RS232 system)
ROUT1	12	0	Logic data output (to UART)
ROUT2	9	0	Logic data output (to UART)
V+	2	0	Positive charge pump output for storage capacitor only
V-	6	0	Negative charge pump output for storage capacitor only
V <sub>CC</sub>	16	_	Supply Voltage, Connect to external 3-V to 5.5-V power supply



# **6 Specifications**

# 6.1 Absolute Maximum Ratings

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

				MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage <sup>(2)</sup>			-0.3	6	V
V <sub>+</sub>	Positive output supply voltage <sup>(2)</sup>			-0.3	7	V
V_	Negative output supply voltage <sup>(2)</sup>			<b>-7</b>	0.3	V
V <sub>+</sub> – V <sub>-</sub>	Supply voltage difference <sup>(2)</sup>			13	V	
V	Input voltage	Drivers		-0.3	6	V
V <sub>I</sub>	input voitage	Receivers		-25	25	V
V	Output valtage	Drivers		-13.2	13.2	V
Vo	Output voltage Receivers			-0.3	V <sub>CC</sub> + 0.3	V
TJ	Operating virtual junction temperature				150	°C
T <sub>stg</sub>	Storage temperature			-65	150	°C

<sup>(1)</sup> Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

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

# 6.2 ESD Ratings

			VALUE	UNIT
	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 RIN , DOUT, and GND pins <sup>(1)</sup>	±15000		
V <sub>(ESD)</sub>	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 All other pins <sup>(1)</sup>	±3000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup>	±1000	

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

# **6.3 Recommended Operating Conditions**

(see Figure 9-1)(1)

				MIN	NOM	MAX	UNIT
\/	Supply voltage		V <sub>CC</sub> = 3.3 V	3	3.3	3.6	V
V <sub>CC</sub>	Supply voltage		V <sub>CC</sub> = 5 V	4.5	5	5.5	V
V <sub>IH</sub> Driver h	Driver high-level input voltage	DIN	V <sub>CC</sub> = 3.3 V	2			V
	Driver high-lever input voltage	DIN	V <sub>CC</sub> = 5 V	2.4			V
$V_{IL}$	Driver low-level input voltage	DIN				8.0	V
VI	Driver input voltage	DIN		0		5.5	V
•	Receiver input voltage RIN			-25		25	V
T <sub>A</sub>	Operating free-air temperature	TRS3232C		0		70	°C
'A	operating nee-an temperature	TRS3232I		-40		85	°C

Product Folder Links: TRS3232

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

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#### 6.4 Thermal Information

	THERMAL METRIC(1)		TRS3232					
			DB (SSOP)	DW (SOIC-wide)	PW (TSSOP)	UNIT		
		16 PINS	16 PINS	16 PINS	16 PINS			
$R_{\theta JA}$	Junction-to-ambient thermal resistance	73	82	57	108	°C/W		
R <sub>0JC(top)</sub>	Junction-to-case (bottom) thermal resistance	38.5	45.8	32.4	39	°C/W		
R <sub>θJB</sub>	Junction-to-board thermal resistance	36.3	44.6	31.9	54.4	°C/W		
Ψ ЈТ	Junction-to-top characterization parameter	8.0	11.1	8.4	3.3	°C/W		
Ψ <sub>JB</sub>	Junction-to-board characterization parameter	36.0	44	31.5	53.8	°C/W		
R <sub>θJC(bot)</sub>	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	°C/W		

For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report (SPRA953).

## 6.5 Electrical Characteristics—Device

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)<sup>(2)</sup> (see Figure 9-1)

	PARAMETER	TEST CONDITIONS		MIN	TYP <sup>(1)</sup>	MAX	UNIT
$I_{CC}$	Supply current	No load,	$V_{CC}$ = 3.3 V to 5 V		0.3	1	mA

#### 6.6 Electrical Characteristics—Driver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1) (see Figure 9-1)

	PARAMETER	TEST CONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
V <sub>OH</sub>	High-level output voltage	$D_{OUT}$ at $R_L = 3 \text{ k}\Omega$ to GND, $D_{IN} = GND$	5	5.4		V
V <sub>OL</sub>	Low-level output voltage	$D_{OUT}$ at $R_L = 3 \text{ k}\Omega$ to GND, $D_{IN} = V_{CC}$	-5	-5.4		V
I <sub>IH</sub>	High-level input current	V <sub>I</sub> = V <sub>CC</sub>		±0.01	±1	μA
I <sub>IL</sub>	Low-level input current	V <sub>I</sub> at GND		±0.01	±1	μA
I <sub>OS</sub> (3)	Short-circuit output current	V <sub>CC</sub> = 3.6 V V <sub>O</sub> = 0 V		±35	±60	mA
los (7	·	$V_{CC} = 5.5 \text{ V}$ $V_{O} = 0 \text{ V}$		133	100	IIIA
r <sub>O</sub>	Output resistance	$V_{CC} = 0 \text{ V}, V_{+} = 0 \text{ V}, \text{ and } V_{-}$ = 0 V	300	10M		Ω

Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V ± 0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V ± 0.5 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.

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

<sup>(2)</sup> 

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.



#### 6.7 Electrical Characteristics—Receiver

over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)<sup>(1)</sup> (see Figure 9-1)

	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 Positive going input threshold voltage	V <sub>CC</sub> = 3.3 V		1.5	2.4	V	
VIT+	V <sub>IT+</sub> Positive-going input threshold voltage	V <sub>CC</sub> = 5 V		1.8	2.4	V
V	Negative-going input threshold voltage	V <sub>CC</sub> = 3.3 V	0.6	1.2		V
V <sub>IT</sub>	Negative-going input threshold voltage	V <sub>CC</sub> = 5 V	0.8	1.5		V
V <sub>hys</sub>	Input hysteresis (V <sub>IT+</sub> – V <sub>IT-</sub> )			0.3		V
r <sub>l</sub>	Input resistance	V <sub>I</sub> = ±3 V to ±25 V	3	5	7	kΩ

Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V.

## 6.8 Switching Characteristics

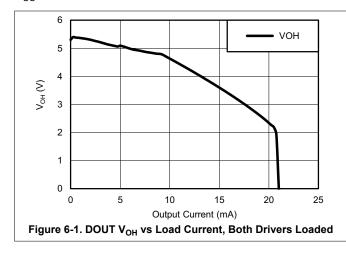
over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)(1) (see Figure 9-1)

	PARAMETER	TEST CO	ONDITIONS	MIN	TYP <sup>(2)</sup>	MAX	UNIT
	Maximum data rate	$R_L = 3 k\Omega$ ,	C <sub>L</sub> = 1000 pF	150	250		kbps
	Maximum data rate	One D <sub>OUT</sub> switching,	See Figure 7-1	130	230		Kups
	Driver Pulse skew <sup>(3)</sup>	$R_1 = 3 k\Omega$ to $7 k\Omega$ ,	C <sub>L</sub> = 150 to 2500 pF		300		no
t <sub>sk(p)</sub>	Dilver Fuise skew	N <sub>L</sub> = 3 K12 to 7 K12,	See Figure 7-2		300		ns
SR(tr)	Driver Slew rate, transition region	11 0 1122 10 7 1132,	C <sub>L</sub> = 150 to 1000 pF	6		30	V/µs
SK(II)	(see Figure 7-1)		C <sub>L</sub> = 150 to 2500 pF	4		30	v/µs
t <sub>PLH</sub>	Receiver Propagation delay time, low-to high-level output	C <sub>1</sub> = 150 pF			300		ns
t <sub>PHL</sub>	Receiver Propagation delay time, high- to low-level output	Ο[ – 100 μι			300		ns
t <sub>sk(p)</sub>	Receiver Pulse skew <sup>(1)</sup>				300		ns

Test conditions are C1–C4 = 0.1  $\mu$ F at V<sub>CC</sub> = 3.3 V  $\pm$  0.3 V; C1 = 0.047  $\mu$ F, C2–C4 = 0.33  $\mu$ F at V<sub>CC</sub> = 5 V  $\pm$  0.5 V. 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.

## 6.9 Typical Characteristics

 $V_{CC} = 3.3 \text{ V}$ 



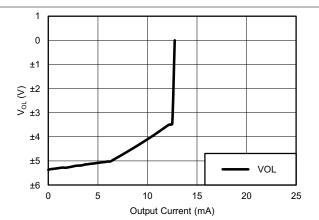
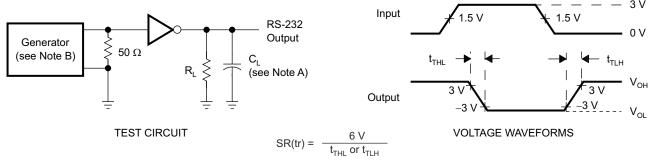


Figure 6-2. DOUT  $V_{OL}$  vs Load Current, Both Drivers Loaded

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

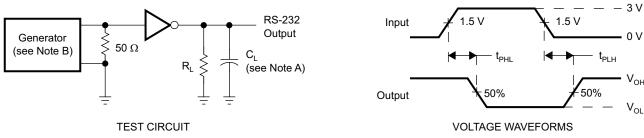
Pulse skew is defined as  $|t_{PLH} - t_{PHL}|$  of each channel of the same device.

## 7 Parameter Measurement Information



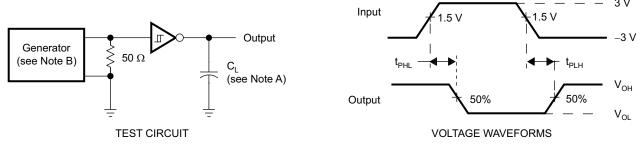
- C<sub>L</sub> includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: PRR = 250 kbps,  $Z_0$  = 50  $\Omega$ , 50% duty cycle,  $t_r \le 10$  ns.  $t_f \le 10$  ns.

Figure 7-1. Driver Slew Rate



- C<sub>L</sub> includes probe and jig capacitance.
- B. The pulse generator has the following characteristics: PRR = 250 kbps,  $Z_0$  = 50  $\Omega$ , 50% duty cycle,  $t_r \le 10$  ns.

Figure 7-2. Driver Pulse Skew



- A. C<sub>L</sub> includes probe and jig capacitance.
- B. The pulse generator has the following characteristics:  $Z_0 = 50 \Omega$ , 50% duty cycle,  $t_r \le 10$  ns,  $t_f \le 10$  ns.

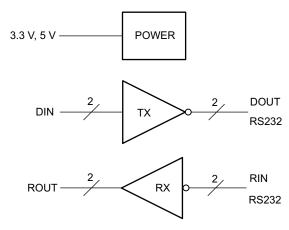
Figure 7-3. Receiver Propagation Delay Times

# **8 Detailed Description**

### 8.1 Overview

The TRS3232 device consists of two line drivers, two line receivers, and a dual charge-pump circuit with ±15-kV ESD protection terminal to terminal (serial-port connection terminals, 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. The charge pump and four small external capacitors allow operation from one 3-V to 5.5-V supply. The device operates at data signaling rates up to 250 kbps and a maximum of 30-V/µs driver output slew rate. Outputs are protected against shorts to ground.

### 8.2 Functional Block Diagram



### 8.3 Feature Description

#### 8.3.1 Power

The power block increases, inverts, and regulates voltage at  $V_+$  and  $V_-$  pins using a charge pump that requires four external capacitors.

### 8.3.2 RS232 Driver

Two drivers interface the standard logic level to RS232 levels. Both DIN inputs must be valid high or low.

#### 8.3.3 RS232 Receiver

Two receivers interface RS232 levels to standard logic levels. An open input results in a high output on ROUT. Each RIN input includes an internal standard RS232 load.

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### **8.4 Device Functional Modes**

Table 8-1. Each Driver

INPUT DIN <sup>(1)</sup>	OUTPUT DOUT
L	Н
Н	L

(1) H = high level, L = low level

Table 8-2. Each Receiver

INPUT RIN <sup>(1)</sup>	OUTPUT ROUT
L	Н
Н	L
Open	Н

H = high level, L = low level,
 Open = input disconnected or connected driver off

# 8.4.1 V<sub>CC</sub> Powered by 3 V to 5.5 V

The device is in normal operation.

# 8.4.2 $V_{CC}$ Unpowered, $V_{CC} = 0 V$

When the TRS3232 device is unpowered, it can be safely connected to an active remote RS232 device.



# 9 Application and Implementation

#### **Note**

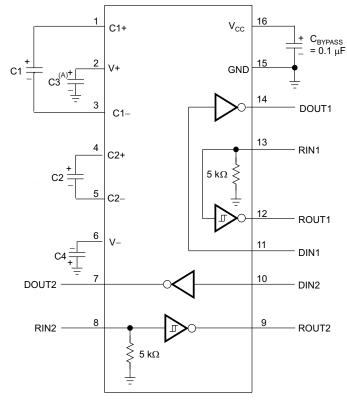
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

### 9.1 Application Information

The TRS3232 is designed to convert single-ended signals into RS232-compatible signals, and vice-versa.

This device can be used in any application where an RS232 line driver or receiver is required. One benefit of this device is its ESD protection, which helps protect other components on the board when the RS232 lines are tied to a physical connector.

# 9.2 Typical Application



- A. C3 can be connected to  $V_{CC}$  or GND.
- B. Resistor values shown are nominal.
- C. Nonpolarized ceramic capacitors are acceptable. If polarized tantalum or electrolytic capacitors are used, they must be connected as shown.
- D. See Table 9-1 for capacitor values.

Figure 9-1. Typical Operating Circuit

Product Folder Links: TRS3232



### 9.2.1 Design Requirements

- Recommended V<sub>CC</sub> is 3.3 V or 5 V
  - 3 V to 5.5 V is also possible
- Maximum recommended bit rate is 250 kbites

Table 9-1. V<sub>CC</sub> versus Capacitor Values

V <sub>CC</sub>	C1	C2, C3, 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

# 9.2.2 Detailed Design Procedure

For proper operation, add capacitors as shown in Figure 9-1 and Table 9-1.

All DIN inputs must be connected to valid low or high logic levels.

Select capacitor values based on  $V_{\mbox{\footnotesize{CC}}}$  level for best performance.

## 9.2.3 Application Curve

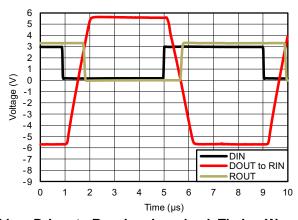


Figure 9-2. 250 kbps Driver to Receiver Loopback Timing Waveform, V<sub>CC</sub>= 3.3 V

# 10 Power Supply Recommendations

V<sub>CC</sub> must be between 3 V and 5.5 V. Charge pump capacitors must be chosen using Table 9-1.



# 11 Layout

# 11.1 Layout Guidelines

Keep the external capacitor traces short. This is more important on C1 and C2 nodes that have the fastest rise and fall times.

# 11.2 Layout Example

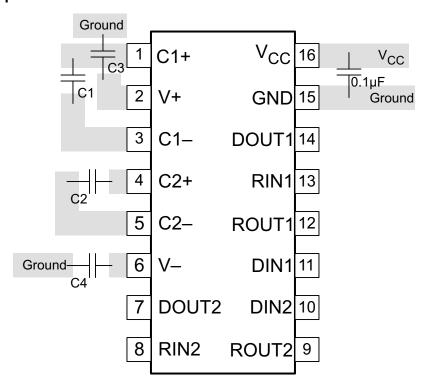


Figure 11-1. Layout Diagram



# 12 Device and Documentation Support

# 12.1 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.

### 12.2 Support Resources

TI E2E<sup>™</sup> 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.

#### 12.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 12.4 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.

## 12.5 Glossary

TI Glossary

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

# 13 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	Material type	Package   Pins	Package qty   Carrier	RoHS	Lead finish/	MSL rating/	Op temp (°C)	Part marking
	(1)	(2)			(3)	Ball material	Peak reflow		(6)
						(4)	(5)		
TRS3232CDBR	Obsolete	Production	SSOP (DB)   16	-	-	Call TI	Call TI	0 to 70	RS32C
TRS3232CDR	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	0 to 70	TRS3232C
TRS3232CDWR	Obsolete	Production	SOIC (DW)   16	-	-	Call TI	Call TI	0 to 70	TRS3232C
TRS3232IDR	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	-40 to 85	TRS3232I
TRS3232IPWR	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	RS32I
TRS3232IPWR.A	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	RS32I
TRS3232IPWRG4	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	RS32I

<sup>(1)</sup> Status: For more details on status, see our product life cycle.

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.

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<sup>(6)</sup> 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.



# **PACKAGE OPTION ADDENDUM**

www.ti.com 9-Nov-2025

# **PACKAGE MATERIALS INFORMATION**

www.ti.com 12-Nov-2025

## TAPE AND REEL INFORMATION





A0	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
TRS3232IPWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
TRS3232IPWRG4	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

www.ti.com 12-Nov-2025



## \*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TRS3232IPWR	TSSOP	PW	16	2000	356.0	356.0	35.0
TRS3232IPWRG4	TSSOP	PW	16	2000	356.0	356.0	35.0

# D (R-PDS0-G16)

# PLASTIC SMALL OUTLINE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- 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 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.







### 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. Reference JEDEC registration MO-150.





NOTES: (continued)

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





NOTES: (continued)

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



7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.







### 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-153.





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.





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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