

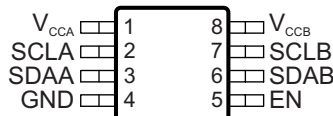
# LEVEL-TRANSLATING I<sup>2</sup>C BUS REPEATER

Check for Samples: [TCA9517A](#)

## FEATURES

- Two-Channel Bidirectional Buffer
- I<sup>2</sup>C Bus and SMBus Compatible
- Operating Supply Voltage Range of 0.9 V to 5.5 V on A Side
- Operating Supply Voltage Range of 2.7 V to 5.5 V on B Side
- Voltage-Level Translation From 0.9 V to 5.5 V and 2.7 V to 5.5 V
- Footprint and Function Replacement for PCA9515B
- Active-High Repeater-Enable Input
- Open-Drain I<sup>2</sup>C I/O
- 5.5-V Tolerant I<sup>2</sup>C and Enable Input Support
- Mixed-Mode Signal Operation
- Lockup-Free Operation
- Accommodates Standard Mode and Fast Mode I<sup>2</sup>C Devices and Multiple Masters
- Powered-Off High-Impedance I<sup>2</sup>C Pins
- 400-kHz Fast I<sup>2</sup>C Bus
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 5500-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

DGK PACKAGE  
(TOP VIEW)



## DESCRIPTION/ORDERING INFORMATION

This dual bidirectional I<sup>2</sup>C buffer is operational at 2.7 V to 5.5 V.

The TCA9517A is a BiCMOS integrated circuit intended for I<sup>2</sup>C bus and SMBus systems. It can provide bidirectional voltage-level translation (up-translation/down-translation) between low voltages (down to 0.9 V) and higher voltages (2.7 V to 5.5 V) in mixed-mode applications. This device enables I<sup>2</sup>C and similar bus systems to be extended, without degradation of performance even during level shifting.

The TCA9517A buffers both the serial data (SDA) and the serial clock (SCL) signals on the I<sup>2</sup>C bus, thus allowing two buses of 400-pF bus capacitance to be connected in an I<sup>2</sup>C application. This device can also be used to isolate two halves of a bus for voltage and capacitance.

The TCA9517A has two types of drivers—A-side drivers and B-side drivers. All inputs and I/Os are overvoltage tolerant to 5.5 V, even when the device is unpowered ( $V_{CCB}$  and/or  $V_{CCA} = 0$  V).

The TCA9517A offers a higher contention level threshold,  $V_{ILC}$ , than the TCA9517 and can be used in applications where a larger input logic low is required on the B-side.

## ORDERING INFORMATION

T <sub>A</sub>	PACKAGES <sup>(1)</sup> (2)		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	VSSOP – DGK	Tape and reel	TCA9517ADGKR	BSK

(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).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



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.

## DESCRIPTION/ORDERING INFORMATION (CONTINUED)

The B-side drivers operate from 2.7 V to 5.5 V. The output low level for this internal buffer is approximately 0.5 V, but the input voltage must be 70 mV or more below the output low level when the output internally is driven low. The higher-voltage low signal is called a buffered low. When the B-side I/O is driven low internally, the low is not recognized as a low by the input. This feature prevents a lockup condition from occurring when the input low condition is released.

This type of design on the B side prevents it from being used in series with the PCA9515B and another TCA9517A (B side). This is because these devices do not recognize buffered low signals as a valid low and do not propagate it as a buffered low again.

The A-side drivers operate from 0.9 V to 5.5 V and drive more current. They do not require the buffered low feature (or the static offset voltage). This means that a low signal on the B side translates to a nearly 0-V low on the A side, which accommodates smaller voltage swings of lower-voltage logic. The output pulldown on the A side drives a hard low, and the input level is set at  $0.3 V_{CCA}$  to accommodate the need for a lower low level in systems where the low-voltage-side supply voltage is as low as 0.9 V.

The A side of two or more TCA9517As can be connected together to allow a star topography, with the A side on the common bus. Also, the A side can be connected directly to any other buffer with static- or dynamic-offset voltage. Multiple TCA9517As can be connected in series, A side to B side, with no buildup in offset voltage and with only time-of-flight delays to consider. Because of the buffered low voltage from the B side, the TCA9517 cannot be connected B side to B side or the B side cannot be connected to a device with rise time accelerators.

The TCA9517A drivers are enabled when  $V_{CCA}$  is above 0.8 V and  $V_{CCB}$  is above 2.5 V.

The TCA9517A has an active-high enable (EN) input with an internal pullup to  $V_{CCB}$ , which allows the user to select when the repeater is active. This can be used to isolate a badly behaved slave on power-up reset. The EN input should change state only when the global bus and repeater port are in an idle state, to prevent system failures.

The TCA9517A includes a power-up circuit that keeps the output drivers turned off until  $V_{CCB}$  is above 2.5 V and the  $V_{CCA}$  is above 0.8 V.  $V_{CCB}$  and  $V_{CCA}$  can be applied in any sequence at power up. After power up and with the EN high, a low level on the A side (below  $0.3 V_{CCA}$ ) turns the corresponding B-side driver (either SDA or SCL) on and drives the B side down to approximately 0.5 V. When the A side rises above  $0.3 V_{CCA}$ , the B-side pulldown driver is turned off and the external pullup resistor pulls the pin high. When the B side falls first and goes below  $0.3 V_{CCB}$ , the A-side driver is turned on and the A side pulls down to 0 V. The B-side pulldown is not enabled unless the B-side voltage goes below 0.4 V. If the B-side low voltage does not go below 0.5 V, the A-side driver turns off when the B-side voltage is above  $0.7 V_{CCB}$ . If the B-side low voltage goes below 0.4 V, the B-side pulldown driver is enabled, and the B side is able to rise to only 0.5 V until the A side rises above  $0.3 V_{CCA}$ .

$V_{CCA}$  is only used to provide the  $0.3 V_{CCA}$  reference to the A-side input comparators and for the power-good-detect circuit. The TCA9517A logic and all I/Os are powered by the  $V_{CCB}$  pin.

As with the standard I<sup>2</sup>C system, pullup resistors are required to provide the logic-high levels on the buffered bus. The TCA9517A has standard open-drain configuration of the I<sup>2</sup>C bus. The size of these pullup resistors depends on the system, but each side of the repeater must have a pullup resistor. The device is designed to work with Standard mode and Fast mode I<sup>2</sup>C devices in addition to SMBus devices. Standard mode I<sup>2</sup>C devices only specify 3 mA in a generic I<sup>2</sup>C system, where Standard mode devices and multiple masters are possible. Under certain conditions, higher termination currents can be used.

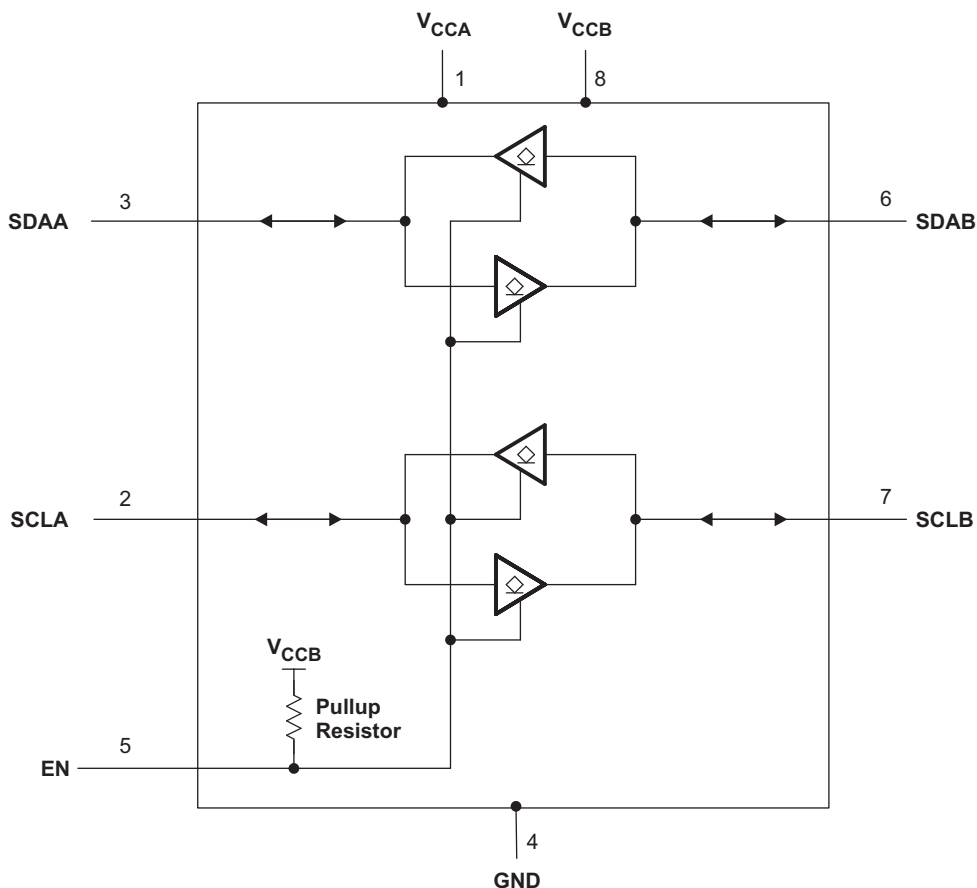
## TERMINAL FUNCTIONS

NO.	NAME	DESCRIPTION
1	V <sub>CCA</sub>	A-side supply voltage (0.9 V to 5.5 V)
2	SCLA	Serial clock bus, A side. Connect to V <sub>CCA</sub> through a pullup resistor.
3	SDAA	Serial data bus, A side. Connect to V <sub>CCA</sub> through a pullup resistor.
4	GND	Supply ground
5	EN	Active-high repeater enable input
6	SDAB	Serial data bus, B side. Connect to V <sub>CCB</sub> through a pullup resistor.
7	SCLB	Serial clock bus, B side. Connect to V <sub>CCB</sub> through a pullup resistor.
8	V <sub>CCB</sub>	B-side and device supply voltage (2.7 V to 5.5 V)

**Table 1. FUNCTION TABLE**

INPUT EN	FUNCTION
L	Outputs disabled
H	SDAA = SDAB SCLA = SCLB

**Figure 1. FUNCTIONAL BLOCK DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

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

			MIN	MAX	UNIT
V <sub>CCB</sub>	Supply voltage range		–0.5	7	V
V <sub>CCA</sub>	Supply voltage range		–0.5	7	V
V <sub>I</sub>	Enable input voltage range <sup>(2)</sup>		–0.5	7	V
V <sub>I/O</sub>	I <sup>2</sup> C bus voltage range <sup>(2)</sup>		–0.5	7	V
I <sub>IK</sub>	Input clamp current	V <sub>I</sub> < 0		–50	mA
I <sub>OK</sub>	Output clamp current	V <sub>O</sub> < 0		–50	
I <sub>O</sub>	Continuous output current			±50	mA
	Continuous current through V <sub>CC</sub> or GND			±100	mA
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) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

**THERMAL IMPEDANCE**

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

			MIN	MAX	UNIT
θ <sub>JA</sub>	Package thermal impedance <sup>(1)</sup>	DGK package		172	°C/W

- (1) The package thermal impedance is calculated in accordance with JESD 51-7.

**RECOMMENDED OPERATING CONDITIONS**

			MIN	MAX	UNIT
V <sub>CCA</sub>	Supply voltage, A-side bus		0.9 <sup>(1)</sup>	5.5	V
V <sub>CCB</sub>	Supply voltage, B-side bus		2.7	5.5	V
V <sub>IH</sub>	High-level input voltage	SDAA, SCLA	0.7 × V <sub>CCA</sub>	5.5	V
		SDAB, SCLB	0.7 × V <sub>CCB</sub>	5.5	
		EN	0.7 × V <sub>CCB</sub>	5.5	
V <sub>IL</sub>	Low-level input voltage	SDAA, SCLA		0.3 × V <sub>CCA</sub>	V
		SDAB, SCLB <sup>(2)</sup>		0.3 × V <sub>CCB</sub>	
		EN		0.3 × V <sub>CCB</sub>	
I <sub>OL</sub>	Low-level output current			6	mA
T <sub>A</sub>	Operating free-air temperature		–40	85	°C

- (1) Low-level supply voltage
- (2) V<sub>IL</sub> specification is for the first low level seen by the SDAB and SCLB lines. V<sub>ILC</sub> is for the second and subsequent low levels seen by the SDAB and SCLB lines. See [V<sub>ILC</sub> AND PULL-UP RESISTOR SIZING](#) for V<sub>ILC</sub> application information

## ELECTRICAL CHARACTERISTICS

 $V_{CCB} = 2.7\text{ V to }5.5\text{ V}$ ,  $GND = 0\text{ V}$ ,  $T_A = -40^\circ\text{C to }85^\circ\text{C}$  (unless otherwise noted)

PARAMETER			TEST CONDITIONS	V <sub>CCB</sub>	MIN	TYP	MAX	UNIT
V <sub>IK</sub>	Input clamp voltage		I <sub>I</sub> = −18 mA	2.7 V to 5.5 V			−1.2	V
V <sub>OL</sub>	Low-level output voltage	SDAB, SCLB	I <sub>OL</sub> = 100 μA or 6 mA, V <sub>ILA</sub> = V <sub>ILB</sub> = 0 V	2.7 V to 5.5 V	0.45	0.52	0.6	V
		SDAA, SCLA	I <sub>OL</sub> = 6 mA			0.1	0.2	
V <sub>OL</sub> − V <sub>ILC</sub>	Low-level input voltage below low-level output voltage	SDAB, SCLB	guaranteed by design	2.7 V to 5.5 V		70		mV
V <sub>ILC</sub>	SDA and SCL low-level input voltage contention	SDAB, SCLB		2.7 V to 5.5 V		0.45		V
I <sub>CC</sub>	Quiescent supply current for V <sub>CCA</sub>		Both channels low, SDAA = SCLA = GND and SDAB = SCLB = open, or SDAA = SCLA = open and SDAB = SCLB = GND				1	mA
I <sub>CC</sub>	Quiescent supply current		Both channels high, SDAA = SCLA = V <sub>CCA</sub> and SDAB = SCLB = V <sub>CCB</sub> and EN = V <sub>CCB</sub>	5.5 V		1.5	5	mA
			Both channels low, SDAA = SCLA = GND and SDAB = SCLB = open			1.5	5	
			In contention, SDAA = SCLA = GND and SDAB = SCLB = GND			3	5	
I <sub>I</sub>	Input leakage current	SDAB, SCLB	V <sub>I</sub> = V <sub>CCB</sub>	2.7 V to 5.5 V			±1	μA
			V <sub>I</sub> = 0.2 V				10	
		SDAA, SCLA	V <sub>I</sub> = V <sub>CCB</sub>				±1	
			V <sub>I</sub> = 0.2 V				10	
		EN	V <sub>I</sub> = V <sub>CCB</sub>				±1	
			V <sub>I</sub> = 0.2 V			−10	−30	
I <sub>OH</sub>	High-level output leakage current	SDAB, SCLB	V <sub>O</sub> = 3.6 V	2.7 V to 5.5 V			10	μA
		SDAA, SCLA					10	
C <sub>I</sub>	Input capacitance	EN	V <sub>I</sub> = 3 V or 0 V	3.3 V		6	10	pF
		SCLA, SCLB	V <sub>I</sub> = 3 V or 0 V	3.3 V		8	13	
				0 V		7	11	
C <sub>IO</sub>	Input/output capacitance	SDAA, SDAB	V <sub>I</sub> = 3 V or 0 V	3.3 V		8	13	pF
				0 V		7	11	

## TIMING REQUIREMENTS

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

	MIN	MAX	UNIT
$t_{su}$ Setup time, EN high before Start condition <sup>(1)</sup>	100		ns
$t_h$ Hold time, EN high after Stop condition <sup>(1)</sup>	100		ns

(1) EN should change state only when the global bus and the repeater port are in an idle state.

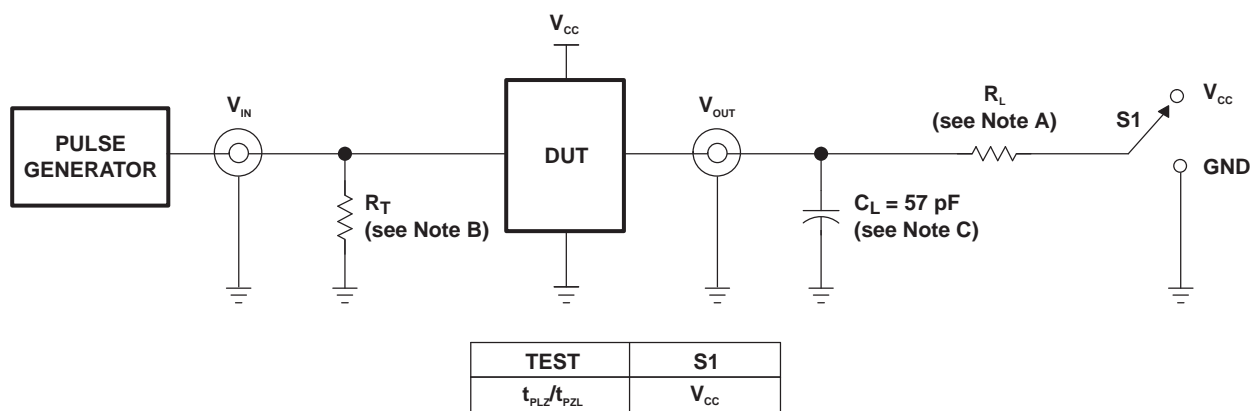
## I<sup>2</sup>C INTERFACE TIMING REQUIREMENTS

$V_{CCB} = 2.7\text{ V to }5.5\text{ V}$ ,  $GND = 0\text{ V}$ ,  $T_A = -40^\circ\text{C to }85^\circ\text{C}$  (unless otherwise noted)<sup>(1)(2)</sup>

PARAMETER		FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP <sup>(3)</sup>	MAX	UNIT
$t_{PLZ}$	Propagation delay	SDAB, SCLB <sup>(4)</sup> (see Figure 5)	SDAA, SCLA <sup>(4)</sup> (see Figure 5)		80	141	350	ns
		SDAA, SCLA <sup>(5)</sup> (see Figure 4)	SDAB, SCLB <sup>(5)</sup> (see Figure 4)		25	74	110	
$t_{PZL}$	Propagation delay	SDAB, SCLB	SDAA, SCLA	$V_{CCA} \leq 2.7\text{ V}$ (see Figure 3)	30	76 <sup>(6)</sup>	110	ns
				$V_{CCA} \geq 3\text{ V}$ (see Figure 3)	10	86	230	
		SDAA, SCLA <sup>(5)</sup> (see Figure 4)	SDAB, SCLB <sup>(5)</sup> (see Figure 4)		60	107	230	
$t_{TLH}$	Transition time	80%	20%	$V_{CCA} \leq 2.7\text{ V}$ (see Figure 4)	10	12	15	ns
				$V_{CCA} \geq 3\text{ V}$ (see Figure 4)	40	42	45	
					110	125	140	
$t_{THL}$	Transition time	80%	20%	$V_{CCA} \leq 2.7\text{ V}$ (see Figure 4)	1	52 <sup>(6)</sup>	105	ns
				$V_{CCA} \geq 3\text{ V}$ (see Figure 4)	20	67	175	
					30	48	90	

- (1) Times are specified with loads of 1.35-k $\Omega$  pullup resistance and 50-pF load capacitance on the B side and 167- $\Omega$  pullup and 57-pF load capacitance on the A side. Different load resistance and capacitance alter the RC time constant, thereby changing the propagation delay and transition times.
- (2) Pullup voltages are  $V_{CCA}$  on the A side and  $V_{CCB}$  on the B side.
- (3) Typical values were measured with  $V_{CCA} = V_{CCB} = 3.3\text{ V}$  at  $T_A = 25^\circ\text{C}$ , unless otherwise noted.
- (4) The  $t_{PLH}$  delay data from B to A side is measured at 0.4 V on the B side to 0.5  $V_{CCA}$  on the A side when  $V_{CCA}$  is less than 2 V, and 1.5 V on the A side if  $V_{CCA}$  is greater than 2 V.
- (5) The proportional delay data from A to B side is measured at 0.3  $V_{CCA}$  on the A side to 1.5 V on the B side.
- (6) Typical value measured with  $V_{CCA} = 2.7\text{ V}$  at  $T_A = 25^\circ\text{C}$

## PARAMETER MEASUREMENT INFORMATION



### TEST CIRCUIT FOR OPEN-DRAIN OUTPUT

- A.  $R_L = 167 \Omega$  (0.9 V to 2.7 V) and  $R_L = 450 \Omega$  (3.0 V to 5.5 V) on the A side and 1.35 k $\Omega$  on the B side
- B.  $R_T$  termination resistance should be equal to  $Z_{OUT}$  of pulse generators.
- C.  $C_L$  includes probe and jig capacitance.
- D. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10$  MHz,  $Z_O = 50 \Omega$ , slew rate  $\geq 1$  V/ns.
- E. The outputs are measured one at a time, with one transition per measurement.
- F.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
- G.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
- H.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .

Figure 2. Test Circuit

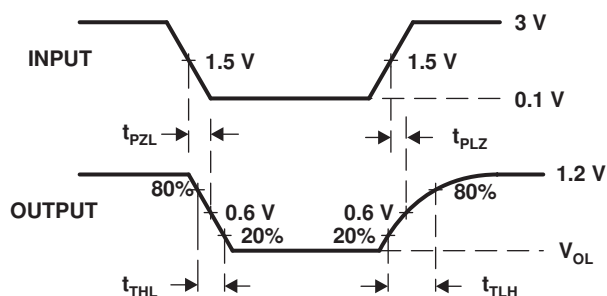


Figure 3. Waveform 1 – Propagation Delay and Transition Times for B Side to A Side

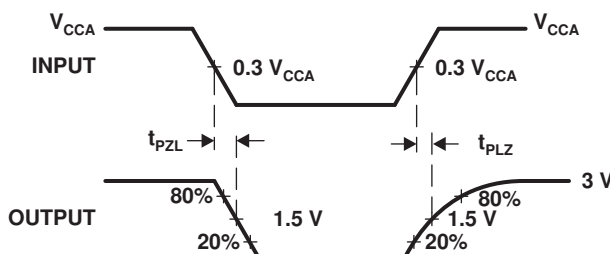


Figure 4. Waveform 2 – Propagation Delay and Transition Times for A Side to B Side

## PARAMETER MEASUREMENT INFORMATION (continued)

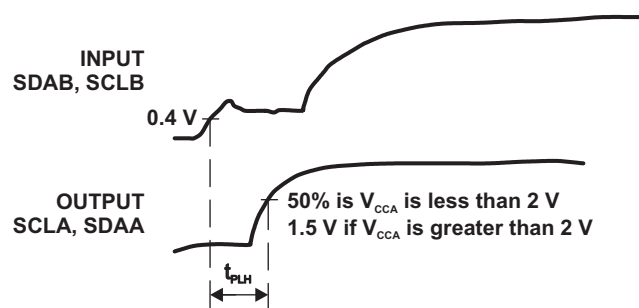


Figure 5. Waveform 3



## APPLICATION INFORMATION

A typical application is shown in Figure 6. In this example, the system master is running on a 3.3-V I<sup>2</sup>C bus, and the slave is connected to a 1.2-V bus. Both buses run at 400 kHz. Master devices can be placed on either bus.

The TCA9517A is 5-V tolerant, so it does not require any additional circuitry to translate between 0.9-V to 5.5-V bus voltages and 2.7-V to 5.5-V bus voltages.

When the A side of the TCA9517A is pulled low by a driver on the I<sup>2</sup>C bus, a comparator detects the falling edge when it goes below 0.3 V<sub>CCA</sub> and causes the internal driver on the B side to turn on, causing the B side to pull down to about 0.5 V. When the B side of the TCA9517A falls, first a CMOS hysteresis-type input detects the falling edge and causes the internal driver on the A side to turn on and pull the A-side pin down to ground. In order to illustrate what would be seen in a typical application, refer to Figure 8 and Figure 9. If the bus master in Figure 6 were to write to the slave through the TCA9517A, waveforms shown in Figure 8 would be observed on the A bus. This looks like a normal I<sup>2</sup>C transmission, except that the high level may be as low as 0.9 V, and the turn on and turn off of the acknowledge signals are slightly delayed.

On the B-side bus of the TCA9517A, the clock and data lines would have a positive offset from ground equal to the V<sub>OL</sub> of the TCA9517A. After the eighth clock pulse, the data line is pulled to the V<sub>OL</sub> of the slave device, which is very close to ground in this example. At the end of the acknowledge, the level rises only to the low level set by the driver in the TCA9517A for a short delay, while the A-bus side rises above 0.3 V<sub>CCA</sub> and then continues high.

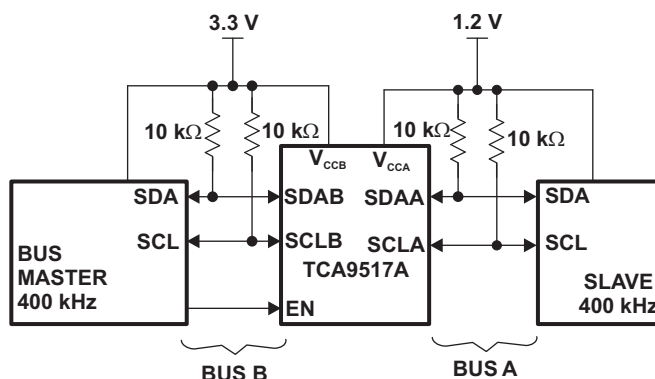


Figure 6. Typical Application

## V<sub>ILC</sub> AND PULL-UP RESISTOR SIZING

For the TCA9517A to function correctly, all devices on the B-side must be able to pull the B-side below the voltage input low contention level (V<sub>ILC</sub>). This means that the V<sub>OL</sub> of any device on the B-side must be below 0.45V.

V<sub>OL</sub> of a device can be adjusted by changing the I<sub>OL</sub> through the device which is set by the pull-up resistance value. The pull-up resistance on the B-side must be carefully selected to ensure that logic levels will be transferred correctly to the A-side.

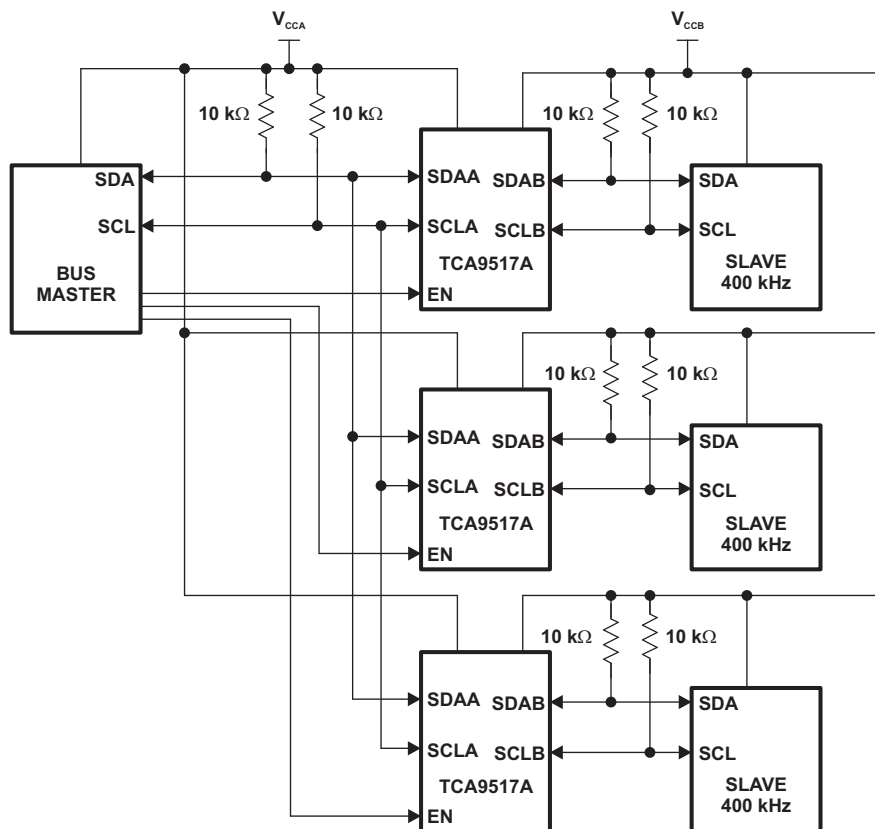


Figure 7. Typical Star Application

Multiple TCA9517A A sides can be connected in a star configuration, allowing all nodes to communicate with each other.

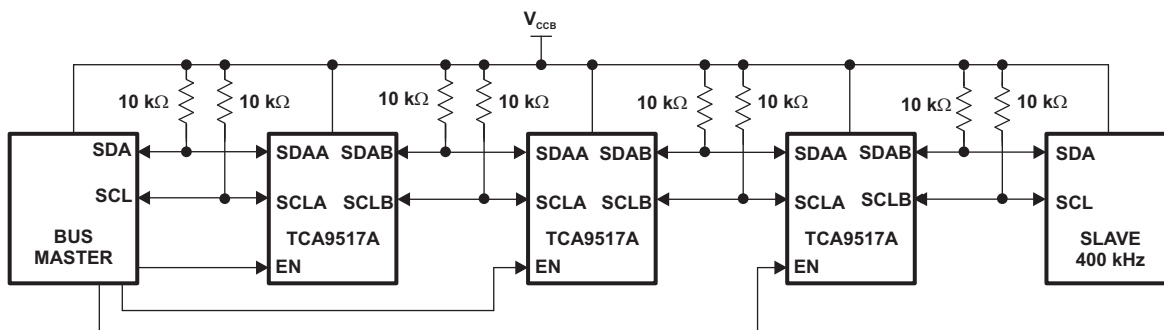


Figure 8. Typical Series Application

Multiple TCA9517As can be connected in series as long as the A side is connected to the B side. I<sup>2</sup>C bus slave devices can be connected to any of the bus segments. The number of devices that can be connected in series is limited by repeater delay/time-of-flight considerations on the maximum bus speed requirements.

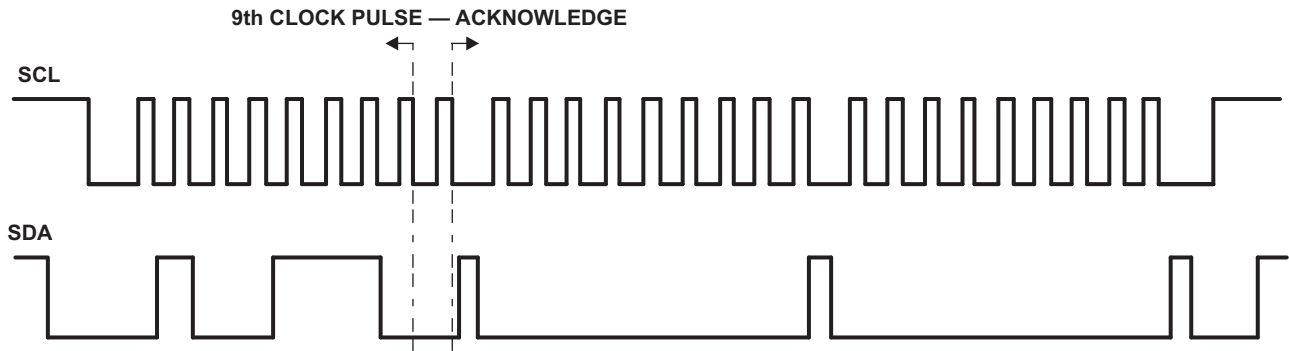


Figure 9. Bus A (0.9-V to 5.5-V Bus) Waveform

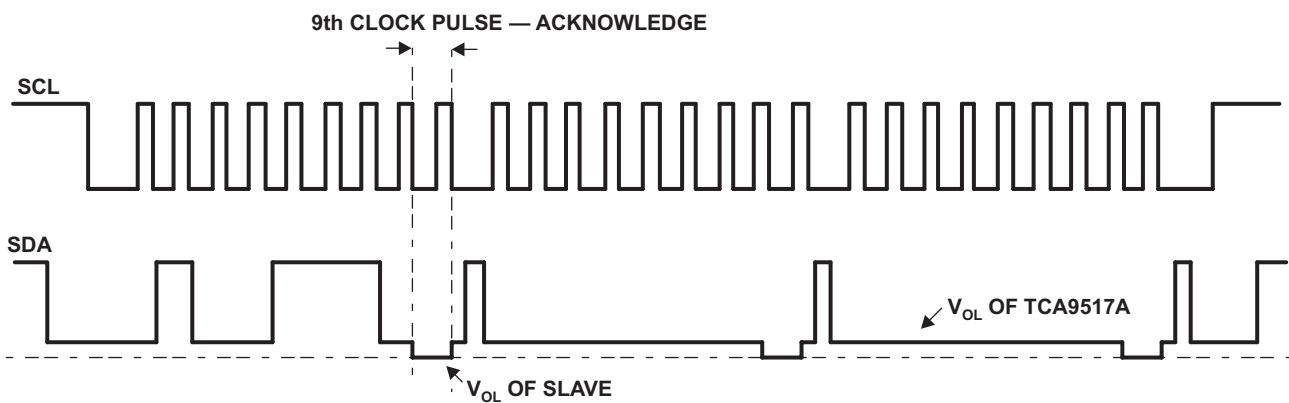


Figure 10. Bus B (2.7-V to 5.5-V Bus) Waveform

## REVISION HISTORY

### Changes from Original (December 2012) to Revision A

### Page

- Updated the TOP-SIDE MARKING column of the ORDERING INFORMATION TABLE. .... [1](#)

## PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TCA9517ADGKR	ACTIVE	VSSOP	DGK	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	BSK	<a href="#">Samples</a>

(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.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device 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**


\*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
TCA9517ADGKR	VSSOP	DGK	8	2500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TCA9517ADGKR	VSSOP	DGK	8	2500	364.0	364.0	27.0

## DGK (S-PDSO-G8)

## PLASTIC SMALL-OUTLINE PACKAGE



## NOTES:

- A. All linear dimensions are in millimeters.
- 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 per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
- E. Falls within JEDEC MO-187 variation AA, except interlead flash.



## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

### Products

Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
DLP® Products	<a href="http://www.dlp.com">www.dlp.com</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>
Clocks and Timers	<a href="http://www.ti.com/clocks">www.ti.com/clocks</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
RFID	<a href="http://www.ti-rfid.com">www.ti-rfid.com</a>
OMAP Applications Processors	<a href="http://www.ti.com/omap">www.ti.com/omap</a>
Wireless Connectivity	<a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a>

### Applications

Automotive and Transportation	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
Communications and Telecom	<a href="http://www.ti.com/communications">www.ti.com/communications</a>
Computers and Peripherals	<a href="http://www.ti.com/computers">www.ti.com/computers</a>
Consumer Electronics	<a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>
Energy and Lighting	<a href="http://www.ti.com/energy">www.ti.com/energy</a>
Industrial	<a href="http://www.ti.com/industrial">www.ti.com/industrial</a>
Medical	<a href="http://www.ti.com/medical">www.ti.com/medical</a>
Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
Space, Avionics and Defense	<a href="http://www.ti.com/space-avionics-defense">www.ti.com/space-avionics-defense</a>
Video and Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>

### TI E2E Community

[e2e.ti.com](http://e2e.ti.com)



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.