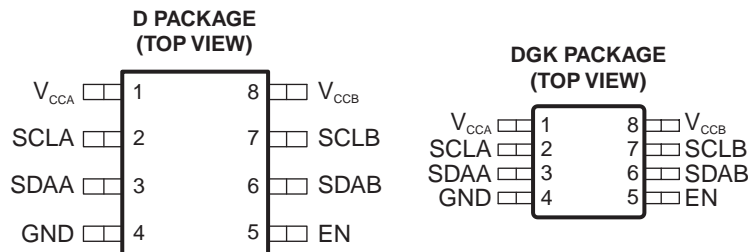


## FEATURES

- 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 PCA9515A
- 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
- Supports Arbitration and Clock Stretching Across Repeater
- 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
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)



## DESCRIPTION/ORDERING INFORMATION

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

The PCA9517 is a BiCMOS integrated circuit intended for I<sup>2</sup>C bus and SMBus systems. It can also 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 PCA9517 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 PCA9517 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<sub>CCB</sub> and/or V<sub>CCA</sub> = 0 V).

### ORDERING INFORMATION

| T <sub>A</sub> | PACKAGES <sup>(1)(2)</sup> |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|----------------------------|---------------|-----------------------|------------------|
| –40°C to 85°C  | SOIC – D                   | Tape and reel | PCA9517DR             | PD517            |
|                | MSOP – DGK                 | Tape and reel | PCA9517DGKR           | 7EA              |

(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.

## DESCRIPTION/ORDERING INFORMATION (CONTINUED)

The B-side drivers operate from 2.7 V to 5.5 V and behave like the drivers in the PCA9515A. This side also supports the standard low-level contention arbitration of the I<sup>2</sup>C bus and clock stretching. 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 PCA9515A and another PCA9517 (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 PCA9517s 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 PCA9517s 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.

The PCA9517 drivers are enabled when  $V_{CCA}$  is above 0.8 V and  $V_{CCB}$  is above 2.5 V.

The PCA9517 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. It should never change state during an I<sup>2</sup>C operation, because disabling during a bus operation hangs the bus, and enabling part way through a bus cycle could confuse the I<sup>2</sup>C parts being enabled. The EN input should change state only when the global bus and repeater port are in an idle state, to prevent system failures.

The PCA9517 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  $0.3 V_{CCA}$ . Then the B side continues to rise, being pulled up by the external pullup resistor.  $V_{CCA}$  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 PCA9517 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 PCA9517 has standard open-collector 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.

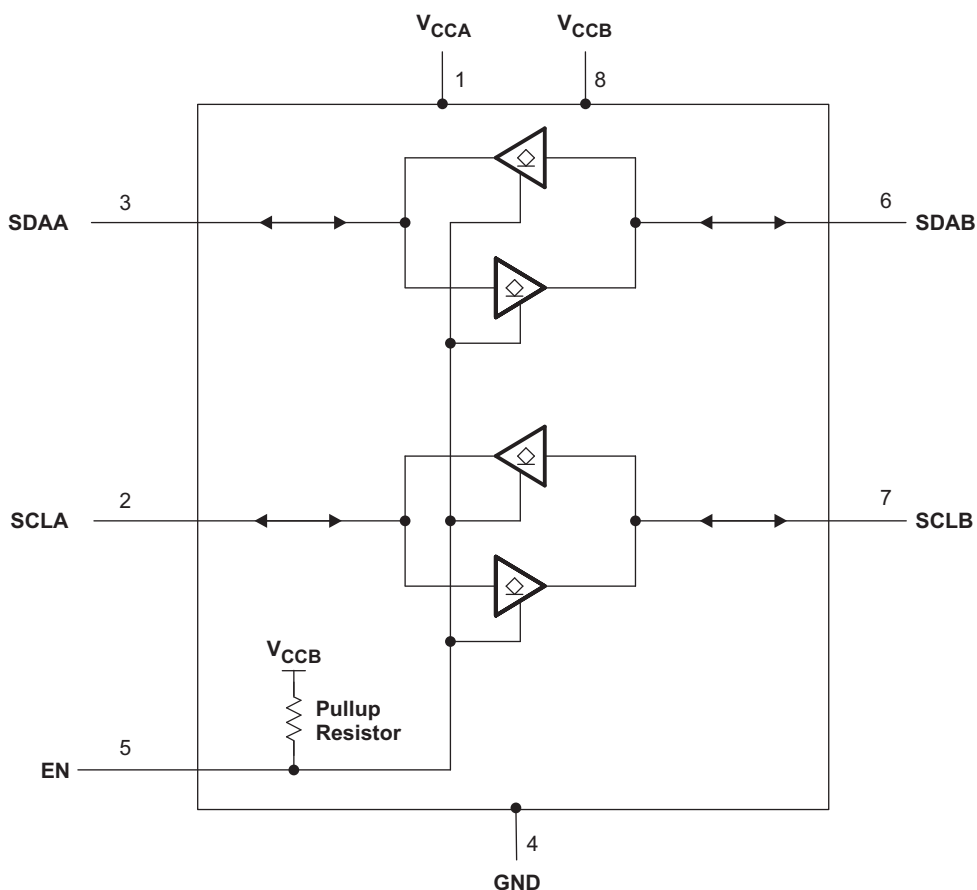
**TERMINAL FUNCTIONS**

| 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)                                |

**FUNCTION TABLE**

| INPUT EN | FUNCTION                   |
|----------|----------------------------|
| L        | Outputs disabled           |
| H        | SDAA = SDAB<br>SCLA = SCLB |

**FUNCTIONAL BLOCK DIAGRAM**



# PCA9517 LEVEL-TRANSLATING I<sup>2</sup>C BUS REPEATER

SCPS157A–DECEMBER 2007–REVISED FEBRUARY 2008

## 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 |     | mA   |
| I <sub>OK</sub>  | Output clamp current                              | V <sub>O</sub> < 0 |     |      |
| I <sub>O</sub>   | Continuous output current                         |                    |     | ±50  |
|                  | Continuous current through V <sub>CC</sub> or GND |                    |     | ±100 |
| θ <sub>JA</sub>  | Package thermal impedance <sup>(3)</sup>          | D package          |     | 97   |
|                  |   | DGK package        |     | 172  |
| 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.
- (3) The package thermal impedance is calculated in accordance with JEDEC 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               |     | V    |
|                  |                                | SDAB, SCLB               |     |      |
|                  |                                | EN                       |     |      |
| V <sub>IL</sub>  | Low-level input voltage        | SDAA, SCLA               |     | V    |
|                  |                                | SDAB, SCLB               |     |      |
|                  |                                | EN                       |     |      |
| I <sub>OL</sub>  | Low-level output current       | V <sub>CCB</sub> = 2.7 V |     | 6    |
|                  |                                | V <sub>CCB</sub> = 3 V   |     | 6    |
| 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.

## Electrical Characteristics

V<sub>CCB</sub> = 2.7 V to 5.5 V, GND = 0 V, T<sub>A</sub> = –40°C to 85°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<br>I <sub>OL</sub> = 100 μA or 6 mA,<br>V <sub>ILA</sub> = V <sub>ILB</sub> = 0 V                             | 2.7 V to 5.5 V              | 0.45                              | 0.52 | 0.7     | V    |
|                                    |  | SDAA, SCLA<br>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   | 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              | –0.5                              | 0.4  |         | V    |
| I <sub>CC</sub>                    | Quiescent supply current for V <sub>CCA</sub>          | Both channels low,<br>SDAA = SCLA = GND and<br>SDAB = SCLB = open, or<br>SDAA = SCLA = open and<br>SDAB = SCLB = GND     |                             |                                   |      | 1       | mA   |
| I <sub>CC</sub>                    | Quiescent supply current                               | Both channels high,<br>SDAA = SCLA = V <sub>CCA</sub> and<br>SDAB = SCLB = V <sub>CCB</sub> and<br>EN = V <sub>CCB</sub> | 5.5 V                       |                                   | 1.5  | 4       | mA   |
|                                    |  | Both channels low,<br>SDAA = SCLA = GND and<br>SDAB = SCLB = open, or<br>SDAA = SCLA = open and<br>SDAB = SCLB = GND     |                             |                                   | 1.5  | 5       |      |
|                                    |  | In contention,<br>SDAA = SCLA = GND and<br>SDAB = SCLB = GND   |                             |                                   | 1.5  | 5       |      |
| I <sub>I</sub>                     | Input leakage current                                  | SDAB, SCLB   | 2.7 V to 5.5 V              | V <sub>I</sub> = V <sub>CCB</sub> |      | ±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   | 2.7 V to 5.5 V              |                                   |      | 10      | μA   |
|                                    |  | SDAA, SCLA   |                             | V <sub>O</sub> = 3.6 V            |      |         |      |
| C <sub>I</sub>                     | Input capacitance                                      | EN   | V <sub>I</sub> = 3 V or 0 V | 3.3 V                             | 6    | 7       | pF   |
|                                    |  | SCLA, SCLB   | V <sub>I</sub> = 3 V or 0 V | 3.3 V                             | 6    | 9       |      |
|                                    |  |  | 0 V                         |                                   | 6    | 8       |      |
| C <sub>IO</sub>                    | Input/output capacitance                               | SDAA, SDAB   | V <sub>I</sub> = 3 V or 0 V | 3.3 V                             | 6    | 9       | pF   |
|                                    |  |  | 0 V                         |                                   | 6    | 8       |      |

## Timing Requirements

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

|                 |   | MIN | MAX | UNIT |
|-----------------|---|-----|-----|------|
| t <sub>SU</sub> | Setup time, EN high before Start condition <sup>(1)</sup> | 100 |     | ns   |
| t <sub>H</sub>  | 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.

# PCA9517 LEVEL-TRANSLATING I<sup>2</sup>C BUS REPEATER

SCPS157A–DECEMBER 2007–REVISED FEBRUARY 2008

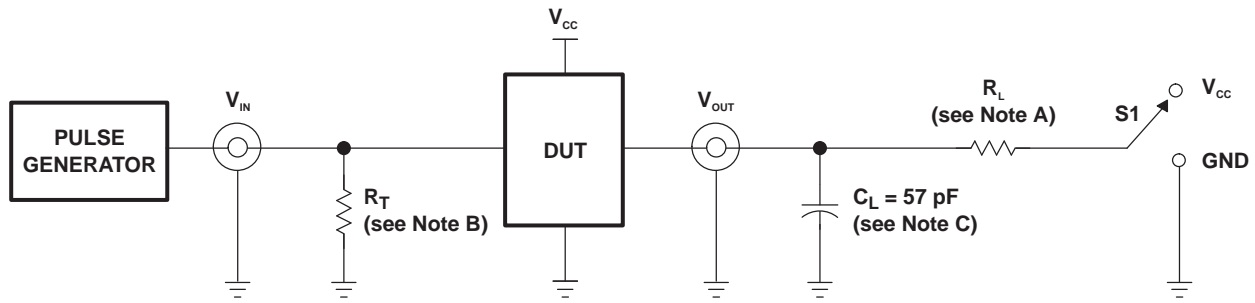
## I<sup>2</sup>C Interface Timing Requirements

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

| PARAMETER        |                   | FROM (INPUT)                                | TO (OUTPUT)                                 | TEST CONDITIONS   | MIN   | TYP <sup>(1)</sup> | MAX               | UNIT |    |
|------------------|-------------------|---|---|---|---|--------------------|-------------------|------|----|
| t <sub>PLZ</sub> | Propagation delay | SDAB, SCLB <sup>(2)</sup><br>(see Figure 4) | SDAA, SCLA <sup>(2)</sup><br>(see Figure 4) |   | 100   | 169                | 255               | ns   |    |
|                  |                   | SDAA, SCLA <sup>(3)</sup><br>(see Figure 3) | SDAB, SCLB <sup>(3)</sup><br>(see Figure 3) |   | 25  | 67                 | 110               |      |    |
| t <sub>PZL</sub> | Propagation delay | SDAB, SCLB                                  | SDAA, SCLA                                  | $V_{CCA} \leq 2.7\text{ V}$<br>(see Figure 2)                 | 15  | 68 <sup>(4)</sup>  | 110               | ns   |    |
|                  |                   |   |   | $2.7\text{ V} \leq V_{CCA} \leq 3\text{ V}$<br>(see Figure 2) | 20  | 79                 | 130               |      |    |
|                  |                   |   |   | $V_{CCA} \geq 3\text{ V}$<br>(see Figure 2)                   | 10  | 103 <sup>(5)</sup> | 300               |      |    |
|                  |                   | SDAA, SCLA <sup>(3)</sup><br>(see Figure 3) | SDAB, SCLB <sup>(3)</sup><br>(see Figure 3) |   | 45  | 118                | 230               |      |    |
| t <sub>TLH</sub> | Transition time   | B side to A side<br>(see Figure 3)          | 20%   | 80%   |   | 1                  | 6                 | 30   | ns |
|                  |                   | A side to B side<br>(see Figure 2)          |   |   |   | 20                 | 31                | 170  |    |
| t <sub>THL</sub> | Transition time   | B side to A side                            | 80%   | 20%   | $V_{CCA} \leq 2.7\text{ V}$<br>(see Figure 3)                 | 1                  | 3 <sup>(4)</sup>  | 105  | ns |
|                  |                   |   |   |   | $2.7\text{ V} \leq V_{CCA} \leq 3\text{ V}$<br>(see Figure 2) | 1                  | 6                 | 120  |    |
|                  |                   |   |   |   | $V_{CCA} \geq 3\text{ V}$<br>(see Figure 3)                   | 1                  | 25 <sup>(5)</sup> | 175  |    |
|                  |                   | A side to B side<br>(see Figure 2)          |   | 1   | 12  | 90                 |                   |      |    |

- (1) Typical values were measured with  $V_{CCA} = V_{CCB} = 2.7\text{ V}$  at  $T_A = 25^\circ\text{C}$ , unless otherwise noted.
- (2) The t<sub>PLH</sub> delay data from B to A side is measured at 0.5 V on the B side to 0.5 V<sub>CCA</sub> on the A side when V<sub>CCA</sub> is less than 2 V, and 1.5 V on the A side if V<sub>CCA</sub> is greater than 2 V.
- (3) The proportional delay data from A to B side is measured at 0.3 V<sub>CCA</sub> on the A side to 1.5 V on the B side.
- (4) Typical value measured with  $V_{CCA} = 0.9\text{ V}$  at  $T_A = 25^\circ\text{C}$
- (5) Typical value measured with  $V_{CCA} = 5.5\text{ V}$  at  $T_A = 25^\circ\text{C}$

PARAMETER MEASUREMENT INFORMATION



| TEST              | S1       |
|-------------------|----------|
| $t_{PLZ}/t_{PZL}$ | $V_{CC}$ |

TEST CIRCUIT FOR OPEN-DRAIN OUTPUT

- A.  $R_L = 167 \Omega$  on the A side and  $1.35 \text{ k}\Omega$  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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ , slew rate  $\geq 1 \text{ V/ns}$ .
- 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 1. Test Circuit

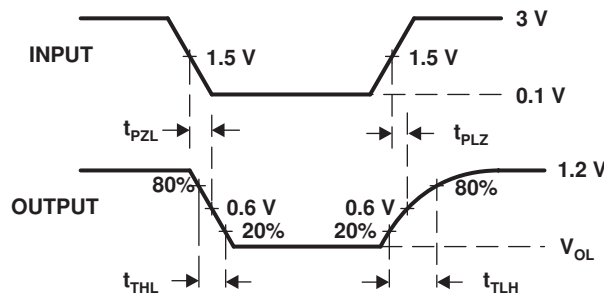


Figure 2. Waveform 1 – Propagation Delay and Transition Times for B Side to A Side

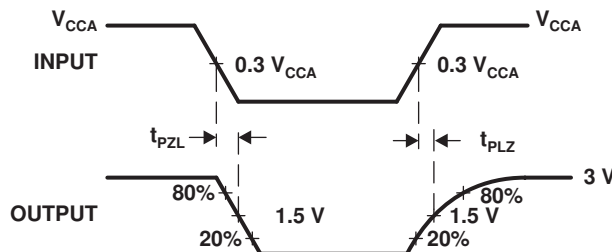


Figure 3. Waveform 2 – Propagation Delay and Transition Times for A Side to B Side

PARAMETER MEASUREMENT INFORMATION (continued)

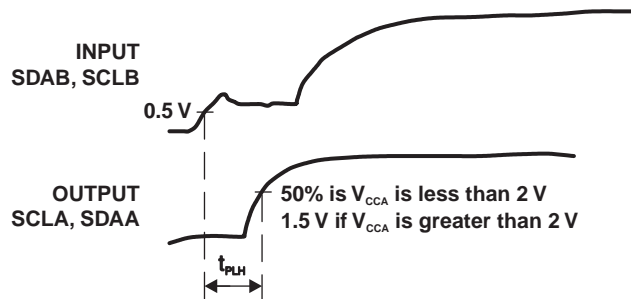


Figure 4. Waveform 3



## APPLICATION INFORMATION

A typical application is shown in [Figure 5](#). 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 PCA9517 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 PCA9517 is pulled low by a driver on the I<sup>2</sup>C bus, a comparator detects the falling edge when it goes below  $0.3 V_{CCA}$  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 PCA9517 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 7](#) and [Figure 8](#). If the bus master in [Figure 5](#) were to write to the slave through the PCA9517, waveforms shown in [Figure 7](#) 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 PCA9517, the clock and data lines would have a positive offset from ground equal to the  $V_{OL}$  of the PCA9517. After the eighth clock pulse, the data line is pulled to the  $V_{OL}$  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 PCA9517 for a short delay, while the A-bus side rises above  $0.3 V_{CCA}$  and then continues high. It is important to note that any arbitration or clock stretching events require that the low level on the B-bus side at the input of the PCA9517 ( $V_{IL}$ ) be at or below 0.4 V to be recognized by the PCA9517 and then transmitted to the A-bus side.

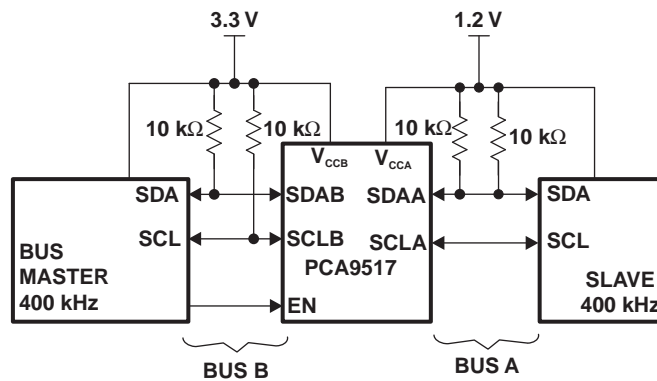


Figure 5. Typical Application

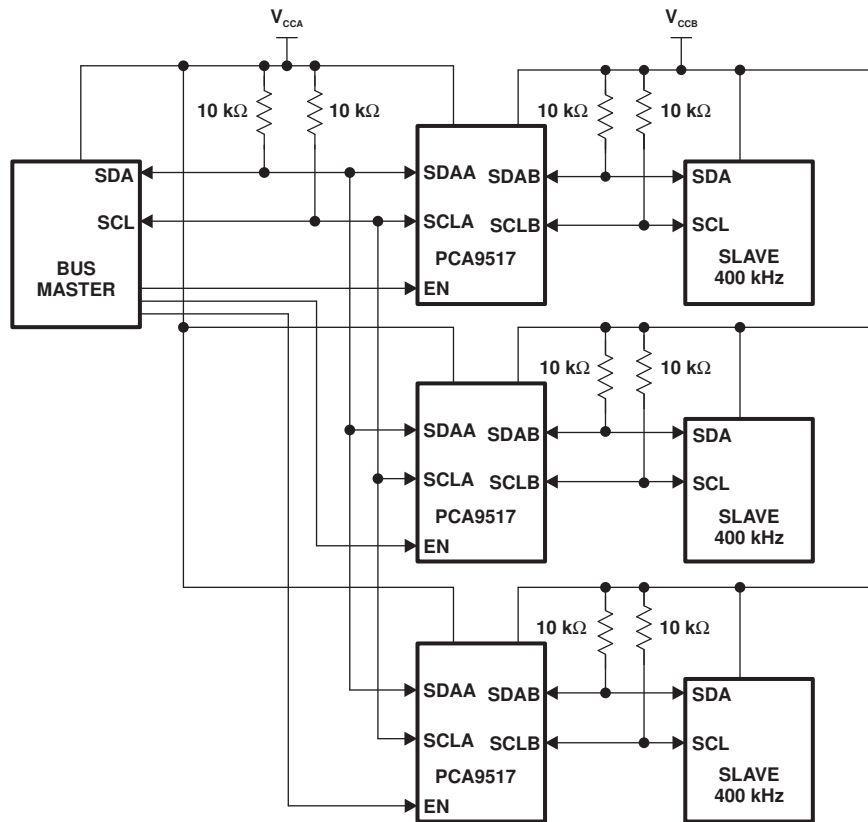


Figure 6. Typical Star Application

Multiple PCA9517 A sides can be connected in a star configuration, allowing all nodes to communicate with each other.

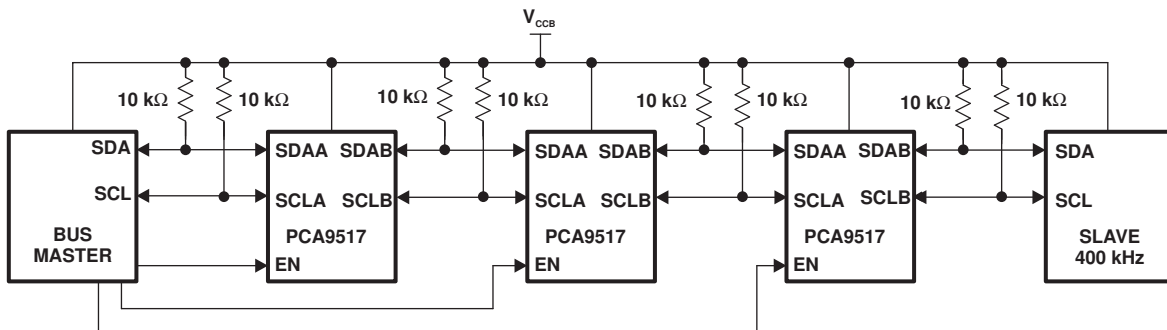


Figure 7. Typical Series Application

Multiple PCA9517s 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.

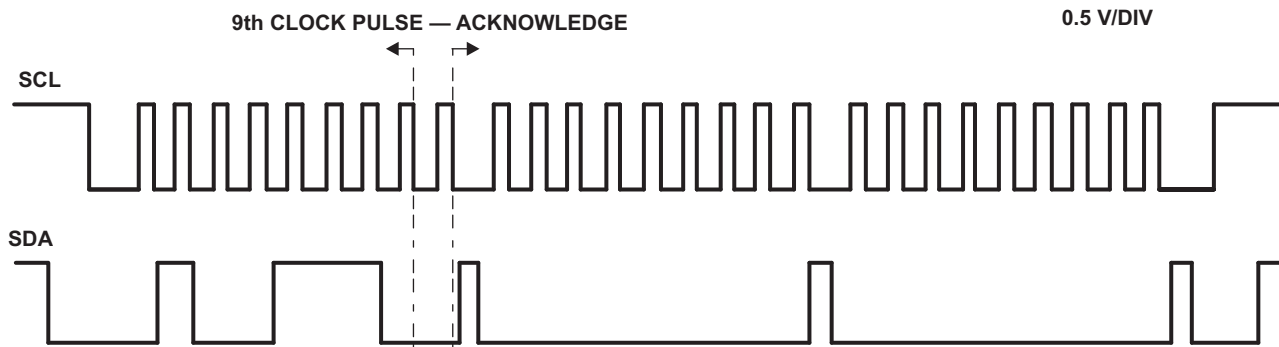


Figure 8. Bus A (0.9-V to 5.5-V Bus) Waveform

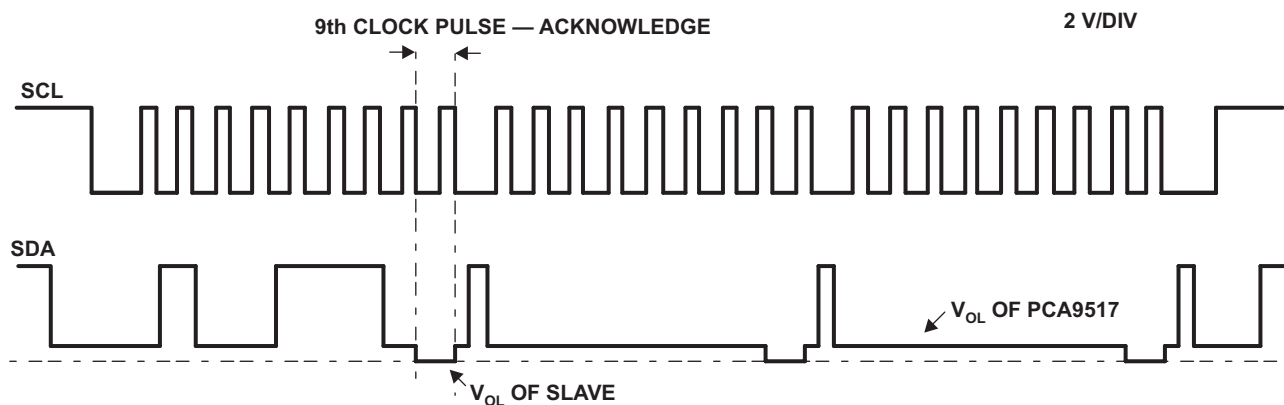


Figure 9. Bus B (2.7-V to 5.5-V Bus) Waveform

**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> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| PCA9517D         | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| PCA9517DG4       | ACTIVE                | SOIC         | D               | 8    | 75          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| PCA9517DGKR      | ACTIVE                | MSOP         | DGK             | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| PCA9517DGKRG4    | ACTIVE                | MSOP         | DGK             | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| PCA9517DR        | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| PCA9517DRG4      | ACTIVE                | SOIC         | D               | 8    | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

<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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**TAPE AND REEL INFORMATION**



**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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| PCA9517DGKR | MSOP         | DGK             | 8    | 2500 | 330.0              | 13.0               | 5.3     | 3.4     | 1.4     | 8.0     | 12.0   | Q1            |
| PCA9517DR   | SOIC         | D               | 8    | 2500 | 330.0              | 12.4               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**

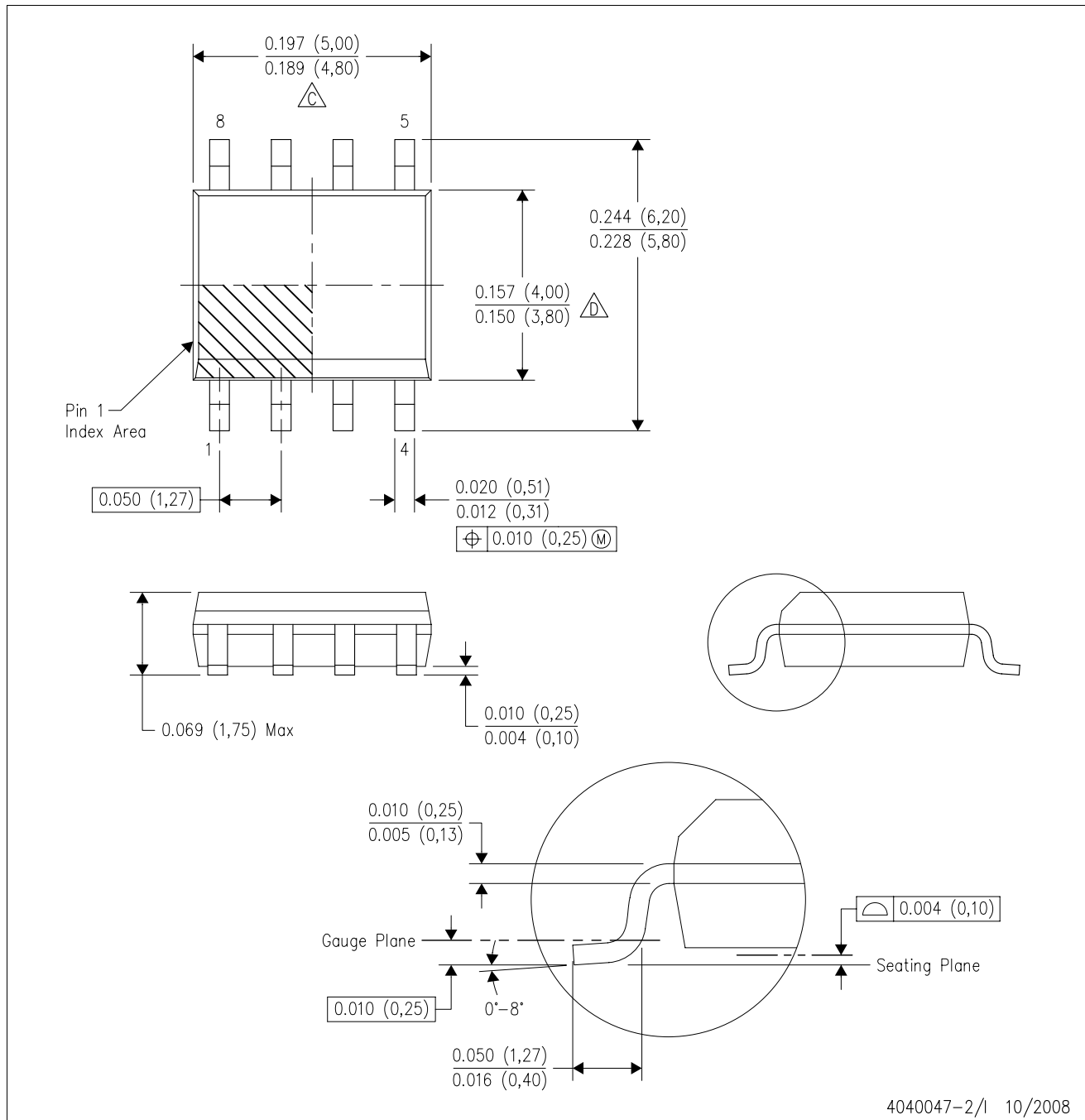


\*All dimensions are nominal

| Device      | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| PCA9517DGKR | MSOP         | DGK             | 8    | 2500 | 358.0       | 335.0      | 35.0        |
| PCA9517DR   | SOIC         | D               | 8    | 2500 | 346.0       | 346.0      | 29.0        |

D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES: A. All linear dimensions are in inches (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 .006 (0,15) per end.  
 D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.  
 E. Reference JEDEC MS-012 variation AA.

DGK (S-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



4073329/E 05/06

- 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.



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