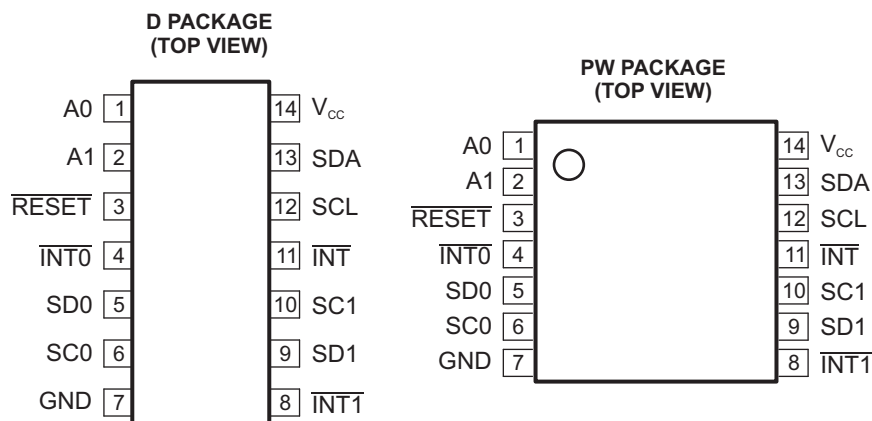


FEATURES

- 1-of-2 Bidirectional Translating Switches
- I²C Bus and SMBus Compatible
- Two Active-Low Interrupt Inputs
- Active-Low Interrupt Output
- Active-Low Reset Input
- Two Address Pins Allowing up to Four Devices on the I²C Bus
- Channel Selection Via I²C Bus, in Any Combination
- Power Up With All Switch Channels Deselected
- Low r_{on} Switches
- Allows Voltage-Level Translation Between 1.8-V, 2.5-V, 3.3-V, and 5-V Buses
- No Glitch on Power Up
- Supports Hot Insertion
- Low Standby Current
- Operating Power-Supply Voltage Range of 2.3 V to 5.5 V
- 5-V Tolerant Inputs
- 0 to 400-kHz Clock Frequency
- Latch-Up Performance Exceeds 100 mA Per JESD78
- 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

The PCA9543A is a bidirectional translating switch controlled by the I²C bus. The SCL/SDA upstream pair fans out to two downstream pairs, or channels. Any individual SCn/SDn channel or combination of channels can be selected, determined by the contents of the programmable control register. Two interrupt inputs (INT0–INT1), one for each of the downstream pairs, are provided. One interrupt output (INT) acts as an AND of the two interrupt inputs.

ORDERING INFORMATION

| T _A | PACKAGE ⁽¹⁾⁽²⁾ | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|---------------------------|--------------|-----------------------|------------------|
| –40°C to 85°C | SOIC – D | Tube of 50 | PCA9543AD | PCA9543A |
| | | Reel of 2500 | PCA9543ADR | |
| | TSSOP – PW | Tube of 90 | PCA9543APW | PD543A |
| | | Reel of 2000 | PCA9543APWR | |

- (1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
- (2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.



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.

PCA9543A

TWO-CHANNEL I²C-BUS SWITCH

WITH INTERRUPT LOGIC AND RESET

SCPS169–SEPTEMBER 2007

DESCRIPTION/ORDERING INFORMATION (CONTINUED)

An active-low reset ($\overline{\text{RESET}}$) input allows the PCA9543A to recover from a situation where one of the downstream I²C buses is stuck in a low state. Pulling $\overline{\text{RESET}}$ low resets the I²C state machine and causes all the channels to be deselected, as does the internal power-on reset function.

The pass gates of the switches are constructed such that the V_{CC} pin can be used to limit the maximum high voltage, which will be passed by the PCA9543A. This allows the use of different bus voltages on each pair, so that 1.8-V, 2.5-V, or 3.3-V parts can communicate with 5-V parts without any additional protection. External pullup resistors pull the bus up to the desired voltage level for each channel. All I/O pins are 5-V tolerant.

TERMINAL FUNCTIONS

| D AND PW PIN NUMBER | NAME | DESCRIPTION |
|------------------------|---------------------------|---|
| 1 | A0 | Address input 0. Connect directly to V_{CC} or ground. |
| 2 | A1 | Address input 1. Connect directly to V_{CC} or ground. |
| 3 | $\overline{\text{RESET}}$ | Active-low reset input. Connect to V_{CC} through a pullup resistor, if not used. |
| 4 | $\overline{\text{INT0}}$ | Active-low interrupt input 0. Connect to V_{CC} through a pullup resistor. |
| 5 | SD0 | Serial data 0. Connect to V_{CC} through a pullup resistor. |
| 6 | SC0 | Serial clock 0. Connect to V_{CC} through a pullup resistor. |
| 7 | GND | Ground |
| 8 | $\overline{\text{INT1}}$ | Active-low interrupt input 1. Connect to V_{CC} through a pullup resistor. |
| 9 | SD1 | Serial data 1. Connect to V_{CC} through a pullup resistor. |
| 10 | SC1 | Serial clock 1. Connect to V_{CC} through a pullup resistor. |
| 11 | $\overline{\text{INT}}$ | Active-low interrupt output. Connect to V_{CC} through a pullup resistor. |
| 12 | SCL | Serial clock line. Connect to V_{CC} through a pullup resistor. |
| 13 | SDA | Serial data line. Connect to V_{CC} through a pullup resistor. |
| 14 | V_{CC} | Supply power |

BLOCK DIAGRAM

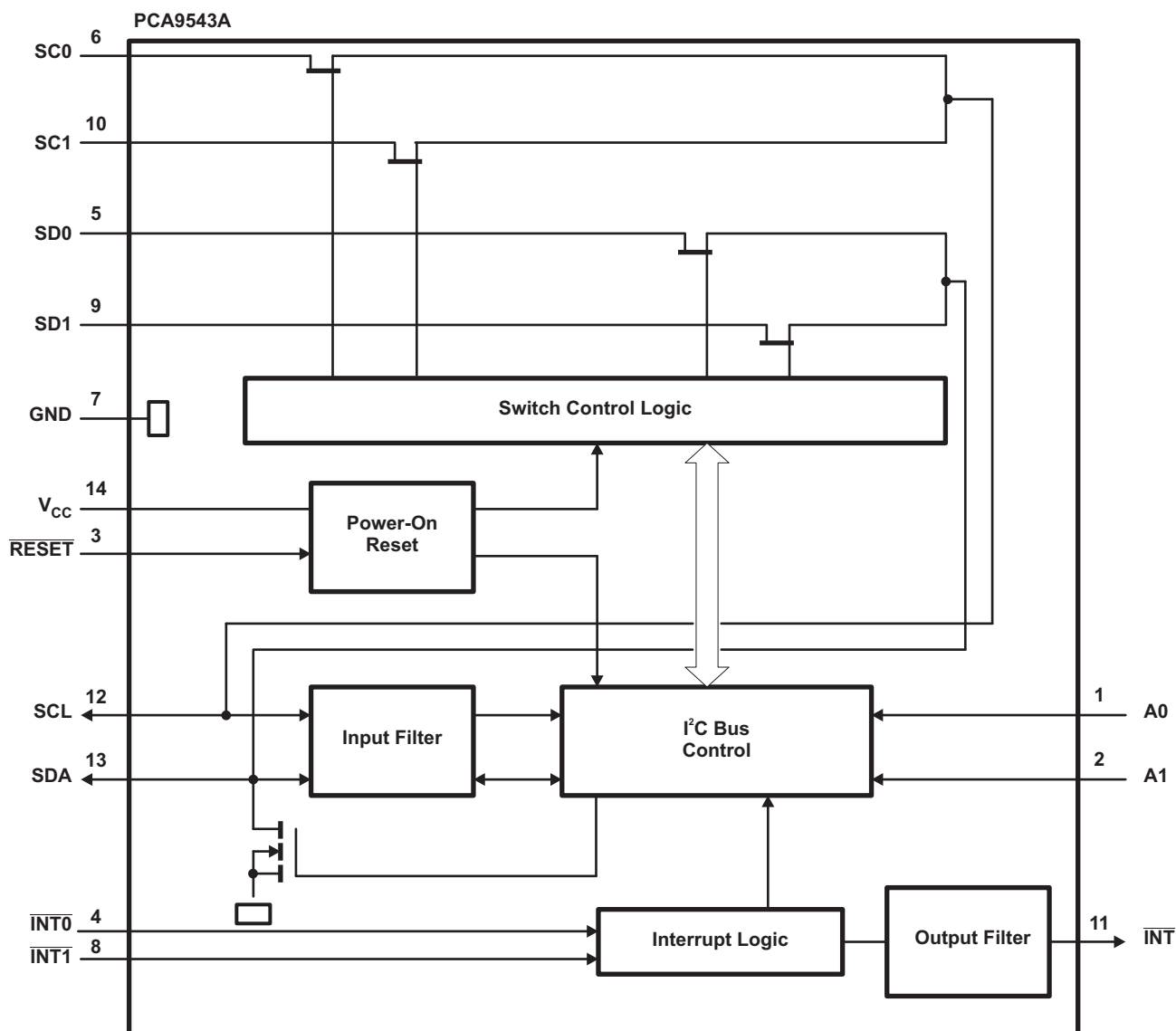


Figure 1. Block Diagram

Device Address

Following a start condition, the bus master must output the address of the slave it is accessing. The address of the PCA9543A is shown in Figure 2. To conserve power, no internal pullup resistors are incorporated on the hardware-selectable address pins and they must be pulled high or low.

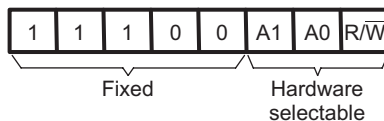


Figure 2. Slave Address PCA9543A

The last bit of the slave address defines the operation to be performed. When set to a logic 1, a read is selected, while a logic 0 selects a write operation.

Control Register

Following the successful acknowledgement of the slave address, the bus master sends a byte to the PCA9543A, which is stored in the control register (see Figure 3). If multiple bytes are received by the PCA9543A, it saves the last byte received. This register can be written and read via the I²C bus.

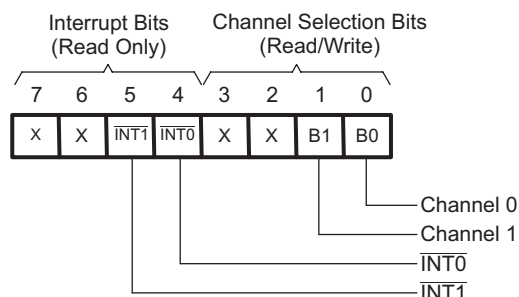


Figure 3. Control Register

Control Register Definition

One or several SCn/SDn downstream pairs, or channels, are selected by the contents of the control register (see Table 1). After the PCA9543A has been addressed, the control register is written. The two LSBs of the control byte are used to determine which channel or channels are to be selected. When a channel is selected, the channel becomes active after a stop condition has been placed on the I²C bus. This ensures that all SCn/SDn lines are in a high state when the channel is made active, so that no false conditions are generated at the time of connection. A stop condition must occur always right after the acknowledge cycle.

Table 1. Control Register Write (Channel Selection), Control Register Read (Channel Status)⁽¹⁾

| D7 | D6 | INT1 | INT0 | D3 | D2 | B1 | B0 | COMMAND |
|----|----|------|------|----|----|----|----|---|
| X | X | X | X | X | X | X | 0 | Channel 0 disabled |
| | | | | | | | 1 | Channel 0 enabled |
| X | X | X | X | X | X | 0 | X | Channel 1 disabled |
| | | | | | | 1 | | Channel 1 enabled |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No channel selected; power-up/reset default state |

(1) Channel 0 and channel 1 can be enabled at the same time. Care should be taken not to exceed the maximum bus capacitance.

Interrupt Handling

The PCA9543A provides two interrupt inputs (one for each channel) and one open-drain interrupt output (see Table 2). When an interrupt is generated by any device, it is detected by the PCA9543A and the interrupt output is driven low. The channel does not need to be active for detection of the interrupt. A bit also is set in the control register.

Bit 4 and Bit 5 of the control register correspond to the $\overline{\text{INT0}}$ and $\overline{\text{INT1}}$ inputs of the PCA9543A, respectively. Therefore, if an interrupt is generated by any device connected to channel 1, the state of the interrupt inputs is loaded into the control register when a read is accomplished. Likewise, an interrupt on any device connected to channel 0 would cause bit 4 of the control register to be set on the read. The master then can address the PCA9543A and read the contents of the control register to determine which channel contains the device generating the interrupt. The master then can reconfigure the PCA9543A to select this channel, and locate the device generating the interrupt and clear it.

It should be noted that more than one device can provide an interrupt on a channel, so it is up to the master to ensure that all devices on a channel are interrogated for an interrupt.

The interrupt inputs may be used as general-purpose inputs if the interrupt function is not required.

If unused, interrupt input(s) must be connected to V_{CC} through a pullup resistor.

Table 2. Control Register Read (Interrupt)⁽¹⁾

| D7 | D6 | INT1 | INT0 | D3 | D2 | B1 | B0 | COMMAND |
|----|----|------|------|----|----|----|----|---|
| X | X | X | 0 | X | X | X | X | No interrupt on channel 0 |
| | | | 1 | | | | | Interrupt on channel 0 |
| X | X | 0 | X | X | X | X | X | No interrupt on channel 1 |
| | | | | | | | | Interrupt on channel 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No channel selected; power-up/reset default state |

(1) Two interrupts can be active at the same time.

RESET Input

The $\overline{\text{RESET}}$ input can be used to recover the PCA9543A from a bus-fault condition. The registers and the I²C state machine within this device initialize to their default states if this signal is asserted low for a minimum of t_{WL} . All channels also are deselected in this case. $\overline{\text{RESET}}$ must be connected to V_{CC} through a pullup resistor.

Power-On Reset

When power is applied to V_{CC} , an internal power-on reset holds the PCA9543A in a reset condition until V_{CC} has reached V_{POR} . At this point, the reset condition is released and the PCA9543A registers and I²C state machine are initialized to their default states, all zeroes, causing all the channels to be deselected. Thereafter, V_{CC} must be lowered below 0.2 V to reset the device.

Voltage Translation

The pass-gate transistors of the PCA9543A are constructed such that the V_{CC} voltage can be used to limit the maximum voltage that is passed from one I²C bus to another.

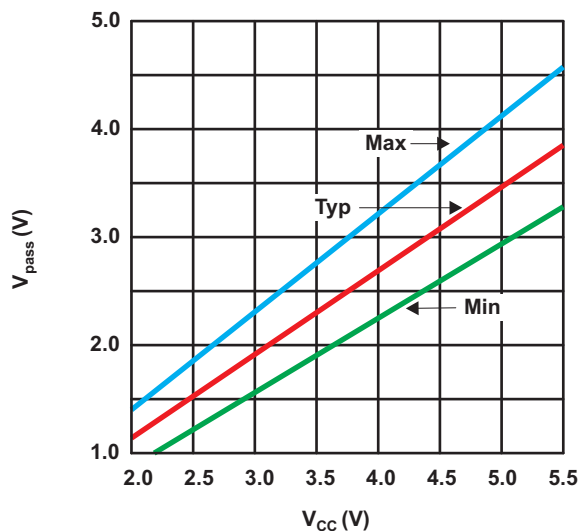


Figure 4. V_{pass} Voltage vs V_{CC}

Figure 4 shows the voltage characteristics of the pass gate transistors (note that the graph was generated using the data specified in Electrical Characteristics section of this data sheet). In order for the PCA9543A to act as a voltage translator, the V_{pass} voltage should be equal to or lower than the lowest bus voltage. For example, if the main bus is running at 5 V and the downstream buses are 3.3 V and 2.7 V, V_{pass} must be equal to or below 2.7 V to effectively clamp the downstream bus voltages. As shown in Figure 4, $V_{\text{pass(max)}}$ is at 2.7 V when the PCA9543A supply voltage is 3.5 V or lower, so the PCA9543A supply voltage could be set to 3.3 V. Pullup resistors then can be used to bring the bus voltages to their appropriate levels (see Figure 14).

I²C Interface

The I²C bus is for two-way, two-line communication between different ICs or modules. The two lines are a serial data line (SDA) and a serial clock line (SCL). Both lines must be connected to a positive supply via a pullup resistor when connected to the output stages of a device. Data transfer may be initiated only when the bus is not busy.

One data bit is transferred during each clock pulse. The data on the SDA line must remain stable during the high period of the clock pulse as changes in the data line at this time is interpreted as control signals (see Figure 5).

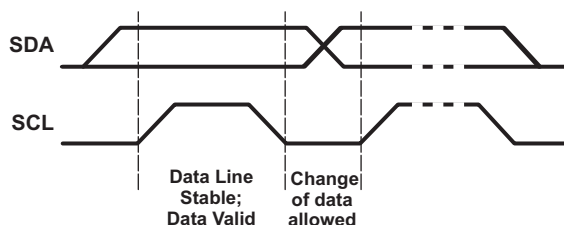


Figure 5. Bit Transfer

Both data and clock lines remain high when the bus is not busy. A high-to-low transition of the data line while the clock is high is defined as the start condition (S). A low-to-high transition of the data line while the clock is high is defined as the stop condition (P) (see Figure 6).

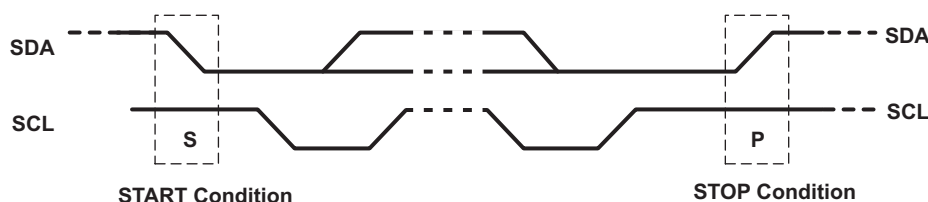


Figure 6. Definition of Start and Stop Conditions

A device generating a message is a transmitter; a device receiving a message is the receiver. The device that controls the message is the master and the devices that are controlled by the master are the slaves (see Figure 7).

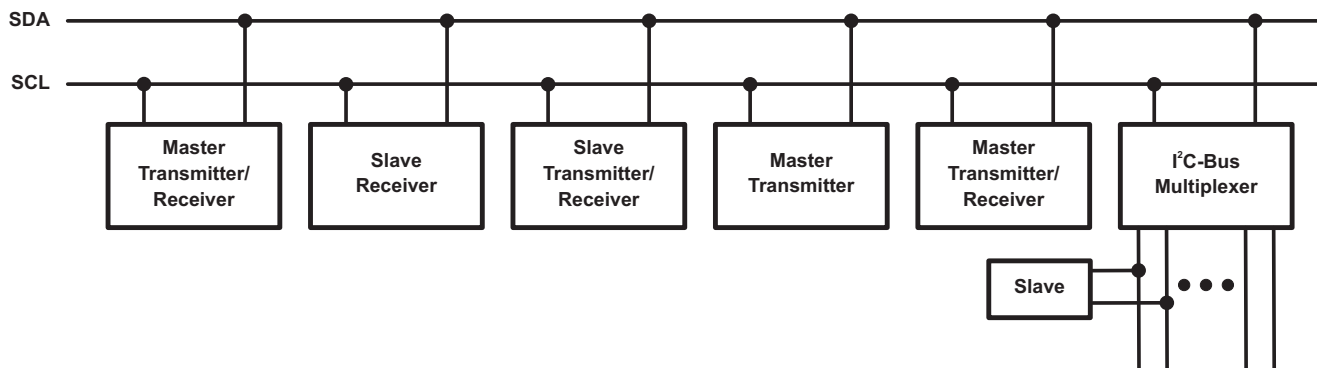


Figure 7. System Configuration

The number of data bytes transferred between the start and the stop conditions from transmitter to receiver is not limited. Each byte of eight bits is followed by one acknowledge (ACK) bit. The transmitter must release the SDA line before the receiver can send an ACK bit.

When a slave receiver is addressed, it must generate an ACK after the reception of each byte. Also, a master must generate an ACK after the reception of each byte that has been clocked out of the slave transmitter. The device that acknowledges must pull down the SDA line during the ACK clock pulse, so that the SDA line is stable low during the high pulse of the ACK-related clock period (see Figure 8). Setup and hold times must be taken into account.

A master receiver must signal an end of data to the transmitter by not generating an acknowledge (NACK) after the last byte has been clocked out of the slave. This is done by the master receiver by holding the SDA line high. In this event, the transmitter must release the data line to enable the master to generate a stop condition.

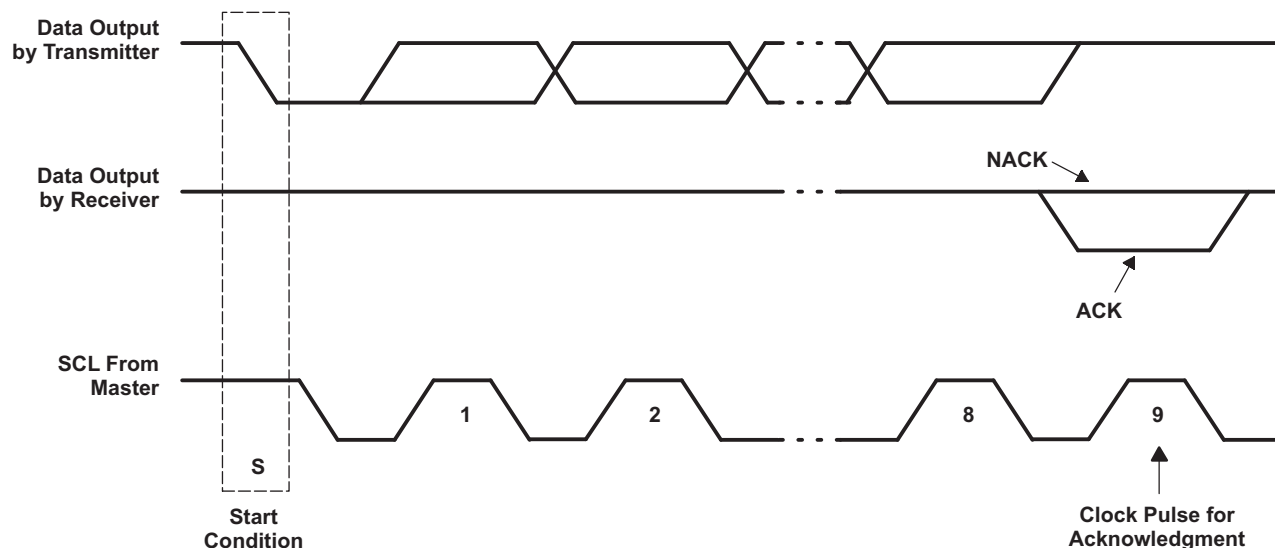


Figure 8. Acknowledgment on I²C Bus

Data is transmitted to the PCA9543A control register using the write mode shown in Figure 9.

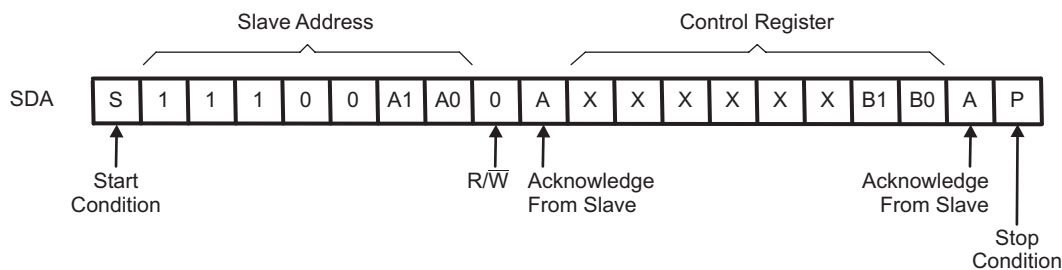


Figure 9. Write Control Register

Data is read from the PCA9543A control register using the read mode shown in Figure 10.

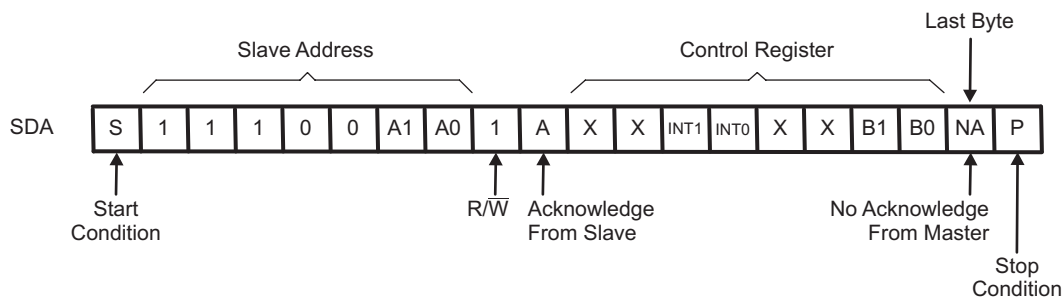


Figure 10. Read Control Register

PCA9543A

TWO-CHANNEL I²C-BUS SWITCH

WITH INTERRUPT LOGIC AND RESET

SCPS169–SEPTEMBER 2007

Absolute Maximum Ratings⁽¹⁾

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

| | | MIN | MAX | UNIT |
|------------------|--|------------|------|------|
| V _{CC} | Supply voltage range | −0.5 | 7 | V |
| V _I | Input voltage range ⁽²⁾ | −0.5 | 7 | V |
| I _I | Input current | | ±20 | mA |
| I _O | Output current | | ±25 | mA |
| | Continuous current through V _{CC} | | ±100 | mA |
| | Continuous current through GND | | ±100 | mA |
| θ _{JA} | Package thermal impedance ⁽³⁾ | D package | | 86 |
| | | PW package | | 113 |
| | | | | °C/W |
| P _{tot} | Total power dissipation | | 400 | mW |
| T _{stg} | Storage temperature range | −60 | 150 | °C |
| T _A | Operating free-air temperature range | −40 | 85 | °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 JESD 51-7.

Recommended Operating Conditions⁽¹⁾

| | | | MIN | MAX | UNIT |
|-----------------|--------------------------------|---|----------------------------------|-----------------------|------|
| V _{CC} | Supply voltage | | 2.3 | 5.5 | V |
| V _{IH} | High-level input voltage | SCL, SDA | 0.7 × V _{CC} | 6 | V |
| | | A1, A0, $\overline{\text{INT1}}$, $\overline{\text{INT0}}$, $\overline{\text{RESET}}$ | V _{CC} = 2.3 V to 3.6 V | 0.7 × V _{CC} | |
| | | | V _{CC} = 3.6 V to 4.5 V | V _{CC} + 0.5 | |
| | | | V _{CC} = 4.5 V to 5.5 V | V _{CC} + 0.5 | |
| V _{IL} | Low-level input voltage | SCL, SDA | −0.5 | 0.3 × V _{CC} | V |
| | | A1, A0, $\overline{\text{INT1}}$, $\overline{\text{INT0}}$, $\overline{\text{RESET}}$ | −0.5 | 0.3 × V _{CC} | |
| T _A | Operating free-air temperature | | −40 | 85 | °C |

- (1) All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

Electrical Characteristics⁽¹⁾

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

| PARAMETER | | | TEST CONDITIONS | V _{CC} | MIN | TYP | MAX | UNIT |
|-------------------|------------------------|----------------------------|---|------------------|---|-----|-----|------|
| V _{POR} | Power-on reset voltage | | No load: V _I = V _{CC} or GND ⁽²⁾ | V _{POR} | 1.6 | | 2.1 | V |
| V _{pass} | Switch output voltage | | V _{SWin} = V _{CC} , I _{SWout} = −100 μA | 5 V | 3.6 | | | V |
| | | | | 4.5 V to 5.5 V | 2.6 | 4.5 | | |
| | | | | 3.3 V | 1.9 | | | |
| | | | | 3 V to 3.6 V | 1.6 | 2.8 | | |
| | | | | 2.5 V | 1.5 | | | |
| | | | | 2.3 V to 2.7 V | 1.1 | 2 | | |
| I _{OH} | INT | | V _O = V _{CC} | 2.3 V to 5.5 V | 100 | | μA | |
| I _{OL} | SDA | V _{OL} = 0.4 V | 2.3 V to 5.5 V | 3 | 7 | mA | | |
| | | V _{OL} = 0.6 V | | 6 | 10 | | | |
| | INT | V _{OL} = 0.4 V | | 3 | | | | |
| I _I | SCL, SDA | | V _I = V _{CC} or GND | 2.3 V to 5.5 V | −1 | 1 | μA | |
| | SC1–SC0, SD1–SD0 | | V _I = V _{CC} or GND | 2.3 V to 3.6 V | −1 | 1 | | |
| | | | | 4.5 V to 5.5 V | −1 | 100 | | |
| | A1, A0 | | V _I = V _{CC} or GND | 2.3 V to 3.6 V | −1 | 1 | | |
| | | | | 4.5 V to 5.5 V | −1 | 50 | | |
| | INT1–INT0 | | V _I = V _{CC} or GND | 2.3 V to 3.6 V | −1 | 1 | | |
| | | | | 4.5 V to 5.5 V | −1 | 50 | | |
| | RESET | | V _I = V _{CC} or GND | 2.3 V to 3.6 V | −1 | 1 | | |
| 4.5 V to 5.5 V | | | | −1 | 50 | | | |
| I _{CC} | Operating mode | f _{SCL} = 100 kHz | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | 17 | 50 | μA | |
| | | | | 3.6 V | 6 | 20 | | |
| | | | | 2.7 V | 3 | 16 | | |
| | Standby mode | Low inputs | V _I = GND, I _O = 0 | 5.5 V | 0.3 | 1 | | |
| | | | | 3.6 V | 0.1 | 1 | | |
| | | | | 2.7 V | 0.1 | 1 | | |
| | | High inputs | V _I = V _{CC} , I _O = 0 | 5.5 V | 0.3 | 1 | | |
| | | | | 3.6 V | 0.1 | 1 | | |
| 2.7 V | | | | 0.1 | 1 | | | |
| ΔI _{CC} | Supply-current change | INT1–INT0 | One INT1–INT0 input at 0.6 V, Other inputs at V _{CC} or GND | 2.3 V to 5.5 V | 8 | 20 | μA | |
| | | | | | One INT1–INT0 input at V _{CC} − 0.6 V, Other inputs at V _{CC} or GND | 8 | | 20 |
| | | SCL, SDA | | | SCL or SDA input at 0.6 V, Other inputs at V _{CC} or GND | 8 | | 20 |
| | | | | | SCL or SDA input at V _{CC} − 0.6 V, Other inputs at V _{CC} or GND | 8 | | 20 |
| C _i | A1, A0 | | V _I = V _{CC} or GND | 2.3 V to 3.6 V | 4 | 5 | pF | |
| | | | | 4.5 V to 5.5 V | 4 | 5 | | |
| | INT1–INT0 | | V _I = V _{CC} or GND | 2.3 V to 3.6 V | 4 | 6 | | |
| | | | | 4.5 V to 5.5 V | 4 | 6 | | |
| | RESET | | V _I = V _{CC} or GND | 2.3 V to 3.6 V | 4 | 5 | | |
| | | | | 4.5 V to 5.5 V | 4 | 5 | | |
| | SCL | | V _I = V _{CC} or GND | 2.3 V to 5.5 V | 9 | 12 | | |

(1) For operation between published voltage ranges, refer to the worst-case parameter in both ranges.

(2) To reset the part, either RESET must be low or V_{CC} must be lowered to 0.2 V.

PCA9543A

TWO-CHANNEL I²C-BUS SWITCH

WITH INTERRUPT LOGIC AND RESET

SCPS169–SEPTEMBER 2007

Electrical Characteristics (continued)

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

| PARAMETER | | TEST CONDITIONS | V _{CC} | MIN | TYP | MAX | UNIT |
|-------------------------------------|----------------------------|---|-----------------|-----|-----|-----|------|
| C _{io(OFF)} ⁽³⁾ | SDA | V _I = V _{CC} or GND, Switch OFF | 2.3 V to 5.5 V | 11 | | 13 | pF |
| | SC1–SC0, SD1–SD0 | | | 6 | | 8 | |
| r _{on} | Switch on-state resistance | V _O = 0.4 V, I _O = 15 mA | 4.5 V to 5.5 V | 4 | 9 | 20 | Ω |
| | | | 3 V to 3.6 V | 5 | 11 | 25 | |
| | | V _O = 0.4 V, I _O = 10 mA | 2.3 V to 2.7 V | 7 | 16 | 50 | |

(3) C_{io(ON)} depends on the device capacitance and load that is downstream from the device.

I²C Interface Timing Requirements

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 11](#))

| | | | STANDARD MODE I ² C BUS | | FAST MODE I ² C BUS | | UNIT |
|------------------------|--|---|---------------------------------------|------|---------------------------------------|-----|------|
| | | | MIN | MAX | MIN | MAX | |
| f _{scl} | I ² C clock frequency | | 0 | 100 | 0 | 400 | kHz |
| t _{sch} | I ² C clock high time | | 4 | | 0.6 | | μs |
| t _{scl} | I ² C clock low time | | 4.7 | | 1.3 | | μs |
| t _{sp} | I ² C spike time | | | 50 | | 50 | ns |
| t _{sds} | I ² C serial-data setup time | | 250 | | 100 | | ns |
| t _{sdh} | I ² C serial-data hold time | | 0 ⁽¹⁾ | | 0 ⁽¹⁾ | | μs |
| t _{icr} | I ² C input rise time | | | 1000 | 20 + 0.1C _b ⁽²⁾ | 300 | ns |
| t _{icf} | I ² C input fall time | | | 300 | 20 + 0.1C _b ⁽²⁾ | 300 | ns |
| t _{ocf} | I ² C output fall time | 10-pF to 400-pF bus | | 300 | 20 + 0.1C _b ⁽²⁾ | 300 | ns |
| t _{buf} | I ² C bus free time between stop and start | | 4.7 | | 1.3 | | μs |
| t _{sts} | I ² C start or repeated start condition setup | | 4.7 | | 0.6 | | μs |
| t _{sth} | I ² C start or repeated start condition hold | | 4 | | 0.6 | | μs |
| t _{sps} | I ² C stop condition setup | | 4 | | 0.6 | | μs |
| t _{vdL(Data)} | Valid-data time (high to low) ⁽³⁾ | SCL low to SDA output low valid | | 1 | | 1 | μs |
| t _{vdH(Data)} | Valid-data time (low to high) ⁽³⁾ | SCL low to SDA output high valid | | 0.6 | | 0.6 | μs |
| t _{vd(ack)} | Valid-data time of ACK condition | ACK signal from SCL low to SDA output low | | 1 | | 1 | μs |
| C _b | I ² C bus capacitive load | | | 400 | | 400 | pF |

(1) A device internally must provide a hold time of at least 300 ns for the SDA signal (referred to as the V_{IH} min of the SCL signal), in order to bridge the undefined region of the falling edge of SCL.

(2) C_b = total bus capacitance of one bus line in pF

(3) Data taken using a 1-kΩ pullup resistor and 50-pF load (see [Figure 11](#))

Switching Characteristics

over recommended operating free-air temperature range, $C_L \leq 100$ pF (unless otherwise noted) (see [Figure 13](#))

| PARAMETER | | FROM (INPUT) | TO (OUTPUT) | MIN | MAX | UNIT |
|----------------|---|--|------------------|------------|-----|---------------|
| $t_{pd}^{(1)}$ | Propagation delay time | $R_{ON} = 20\ \Omega, C_L = 15\ \text{pF}$ | SDA or SCL | SDn or SCn | 0.3 | ns |
| | | $R_{ON} = 20\ \Omega, C_L = 50\ \text{pF}$ | | | 1 | |
| t_{iv} | Interrupt valid time ⁽²⁾ | \overline{INTn} | \overline{INT} | | 4 | μs |
| t_{ir} | Interrupt reset delay time ⁽²⁾ | \overline{INTn} | \overline{INT} | | 2 | μs |

(1) The propagation delay is the calculated RC time constant of the typical ON-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

(2) Data taken using a 4.7-k Ω pullup resistor and 100-pF load (see [Figure 13](#))

Interrupt and Reset Timing Requirements

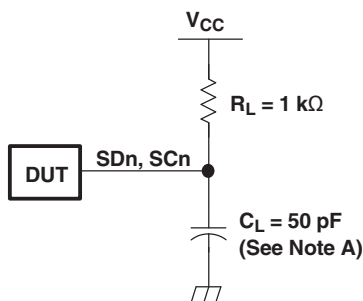
over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 13](#))

| PARAMETER | | MIN | MAX | UNIT |
|-----------------|---|-----|-----|---------|
| t_{PWRL} | Required low-level pulse duration of \overline{INTn} inputs ⁽¹⁾ | 1 | | μ s |
| t_{PWRH} | Required high-level pulse duration of \overline{INTn} inputs ⁽¹⁾ | 0.5 | | μ s |
| t_{WL} | Pulse duration, \overline{RESET} low | 4 | | ns |
| $t_{rst}^{(2)}$ | \overline{RESET} time (SDA clear) | | 500 | ns |
| t_{REC} | Recovery time from \overline{RESET} to start | 0 | | ns |

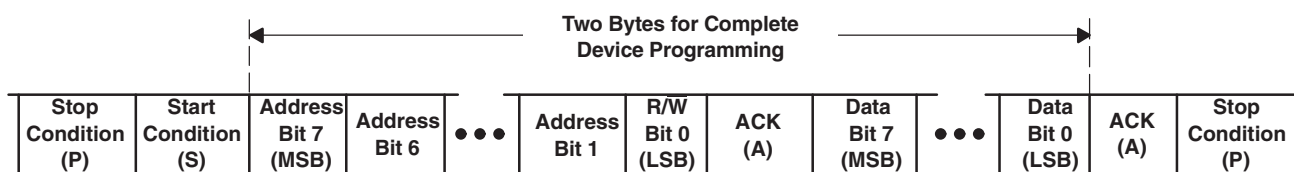
(1) The device has interrupt input rejection circuitry for pulses less than the listed minimum.

(2) t_{rst} is the propagation delay measured from the time the \overline{RESET} pin is first asserted low to the time the SDA pin is asserted high, signaling a stop condition. It must be a minimum of t_{WL} .

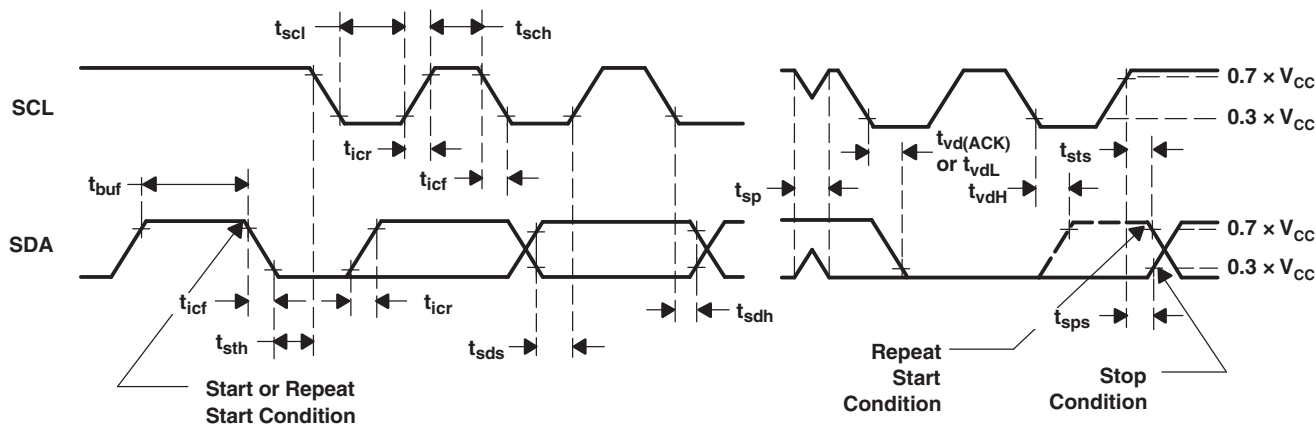
PARAMETER MEASUREMENT INFORMATION



I²C PORT LOAD CONFIGURATION



| BYTE | DESCRIPTION |
|------|--------------------------------|
| 1 | I ² C address + R/W |
| 2 | Control register data |



VOLTAGE WAVEFORMS

- A. C_L includes probe and jig capacitance.
- B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r/t_f = 30 \text{ ns}$.
- C. The outputs are measured one at a time, with one transition per measurement.

Figure 11. I²C Interface Load Circuit, Byte Descriptions, and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION (continued)

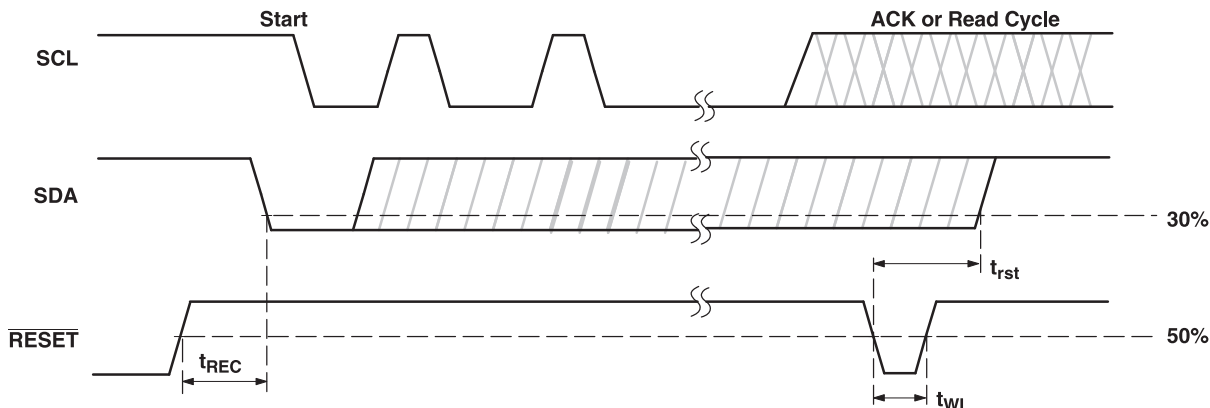
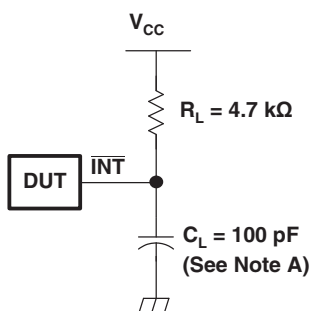
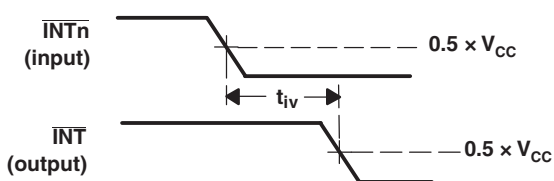


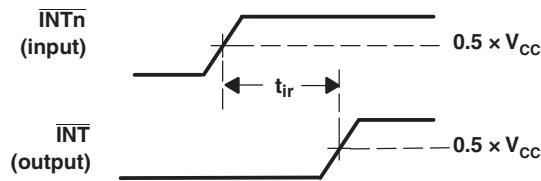
Figure 12. Reset Timing



INTERRUPT LOAD CONFIGURATION



VOLTAGE WAVEFORMS (t_{iv})



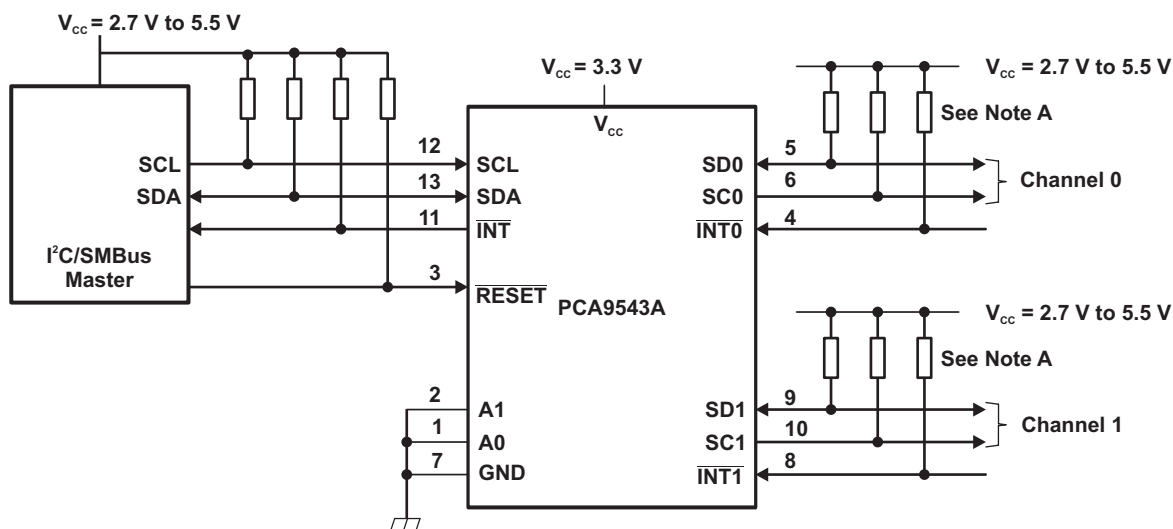
VOLTAGE WAVEFORMS (t_{ir})

- A. C_L includes probe and jig capacitance.
- B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r/t_f = 30\text{ ns}$.

Figure 13. Interrupt Load Circuit and Voltage Waveforms

APPLICATION INFORMATION

Figure 14 shows an application in which the PCA9543A can be used.



- NOTE:
- A. If the device generating the interrupt has an open-drain output structure or can be 3-stated, a pullup resistor is required.
 If the device generating the interrupt has a totem-pole output structure and cannot be 3-stated, a pullup resistor is not required.
 The interrupt inputs should not be left floating.
 - B. Pin numbers shown are for the D and PW packages.

Figure 14. Typical Application

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| PCA9543AD | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| PCA9543ADG4 | ACTIVE | SOIC | D | 14 | 50 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| PCA9543ADR | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| PCA9543ADRG4 | ACTIVE | SOIC | D | 14 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| PCA9543APW | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| PCA9543APWG4 | ACTIVE | TSSOP | PW | 14 | 90 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| PCA9543APWR | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| PCA9543APWRG4 | ACTIVE | TSSOP | PW | 14 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

⁽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.

OBSELETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


| | |
|----|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| PCA9543APWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 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) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| PCA9543APWR | TSSOP | PW | 14 | 2000 | 367.0 | 367.0 | 35.0 |

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



4040047-5/M 06/11

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 0.006 (0,15) each side.
- D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

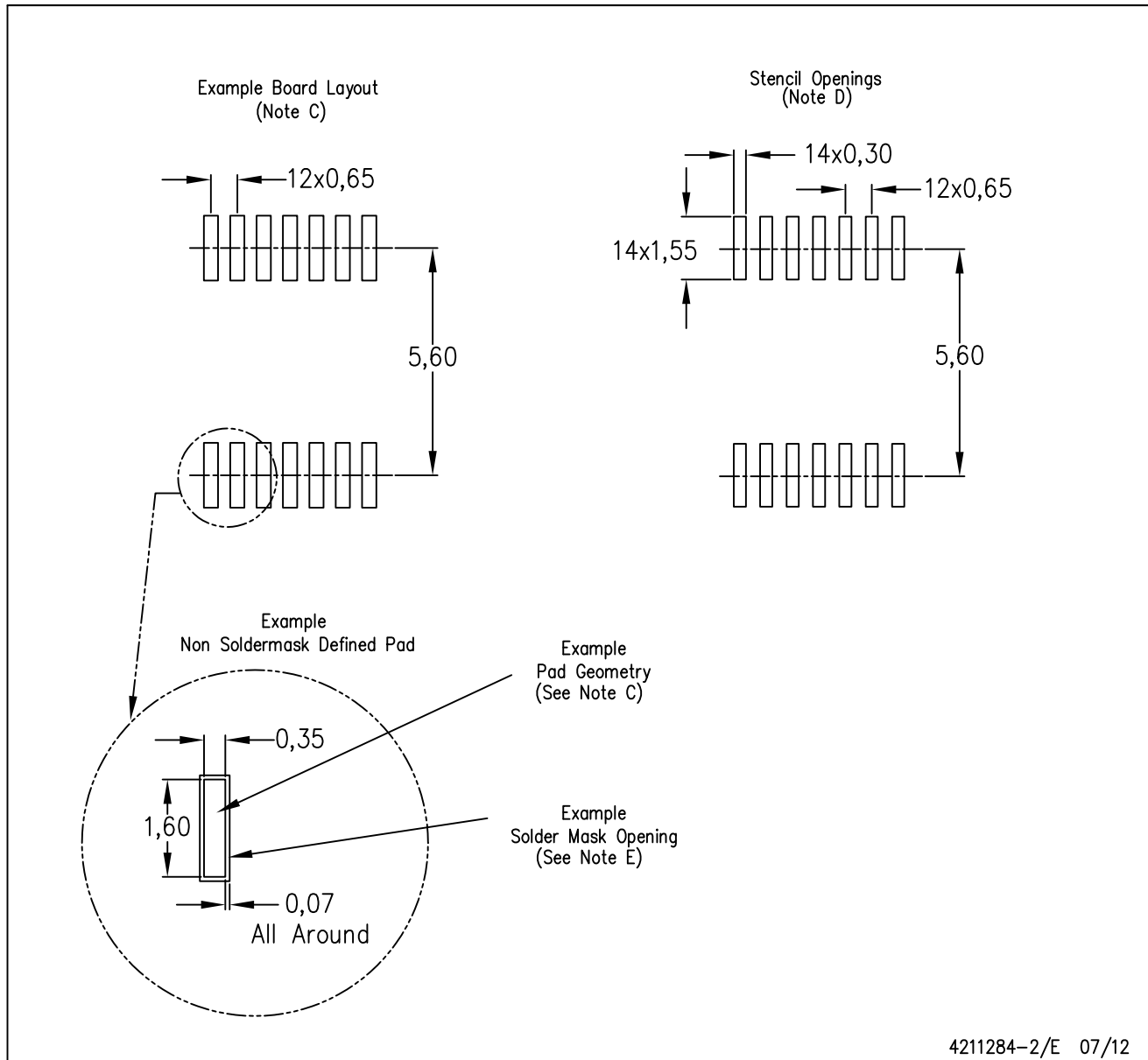


4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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