

DATA SHEET



PCA9545

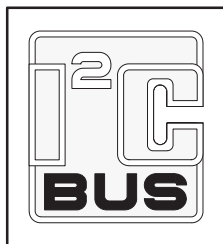
4-channel I²C switch with interrupt logic
and reset

Product data sheet
Supersedes data of 2002 Dec 13

2004 Sep 29

4-channel I²C switch with interrupt logic and reset

PCA9545



FEATURES

- 1-of-4 bi-directional translating switches
- I²C interface logic; compatible with SMBus standards
- 4 active LOW interrupt inputs
- Active LOW interrupt output
- Active LOW reset input
- 2 address pins allowing up to 4 devices on the I²C-bus
- Channel selection via I²C-bus, in any combination
- Power up with all switch channels deselected
- Low RDS_{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 stand-by current
- Operating power supply voltage range of 2.3 V to 5.5 V
- 5 V tolerant Inputs
- 0 kHz to 400 kHz clock frequency
- ESD protection exceeds 2000 V HBM per JESD22-A114, 150 V MM per JESD22-A115 and 1000 V per JESD22-C101
- Latch-up testing is done to JESDEC Standard JESD78 which exceeds 100 mA
- Three packages offered: SO20, TSSOP20, and HVQFN20

DESCRIPTION

The PCA9545 is a quad bi-directional translating switch controlled via the I²C-bus. The SCL/SDA upstream pair fans out to four downstream pairs, or channels. Any individual SCx/SDx channel or combination of channels can be selected, determined by the contents of the programmable control register. Four interrupt inputs, $\overline{\text{INT}}_0$ to $\overline{\text{INT}}_3$, one for each of the downstream pairs, are provided. One interrupt output, $\overline{\text{INT}}$, acts as an AND of the four interrupt inputs.

An active-LOW reset input allows the PCA9545 to recover from a situation where one of the downstream I²C-buses is stuck in a LOW state. Pulling the $\overline{\text{RESET}}$ pin 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_{DD} pin can be used to limit the maximum high voltage which will be passed by the PCA9545. This allows the use of different bus voltages on each pair, so that 1.8 V or 2.5 V or 3.3 V parts can communicate with 5 V parts without any additional protection. External pull-up resistors pull the bus up to the desired voltage level for each channel. All I/O pins are 5 V tolerant.

ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | ORDER CODE | DRAWING NUMBER |
|----------------------|-------------------|------------|----------------|
| 20-Pin Plastic SO | -40 °C to +85 °C | PCA9545D | SOT163-1 |
| 20-Pin Plastic TSSOP | -40 °C to +85 °C | PCA9545PW | SOT360-1 |
| 20-Pin Plastic HVQFN | -40 °C to +85 °C | PCA9545BS | SOT662-1 |

Standard packing quantities and other packaging data are available at www.standardproducts.philips.com/packaging.

4-channel I²C switch with interrupt logic and reset

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PIN CONFIGURATION — SO, TSSOP

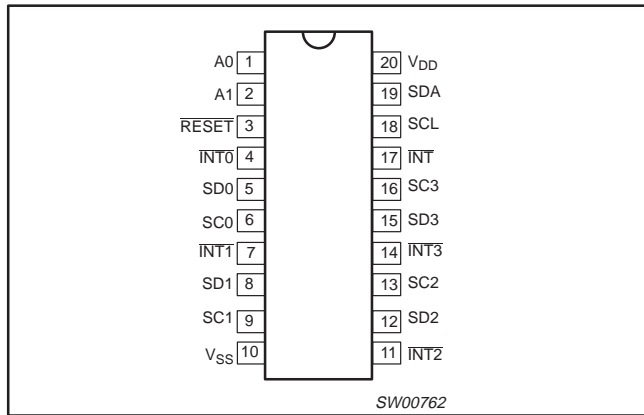


Figure 1. Pin configuration — SO, TSSOP

PIN CONFIGURATION — HVQFN

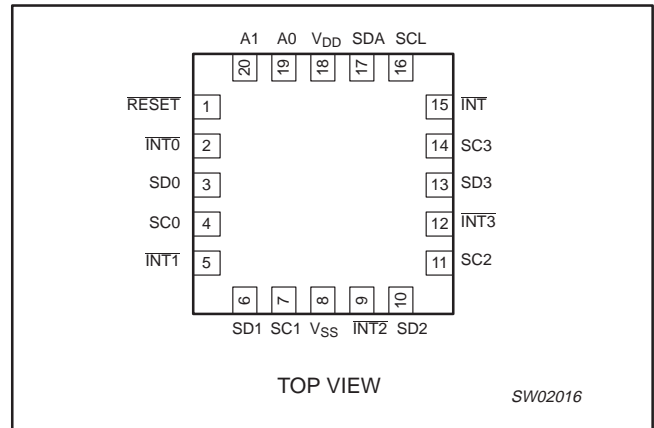


Figure 2. Pin configuration — HVQFN

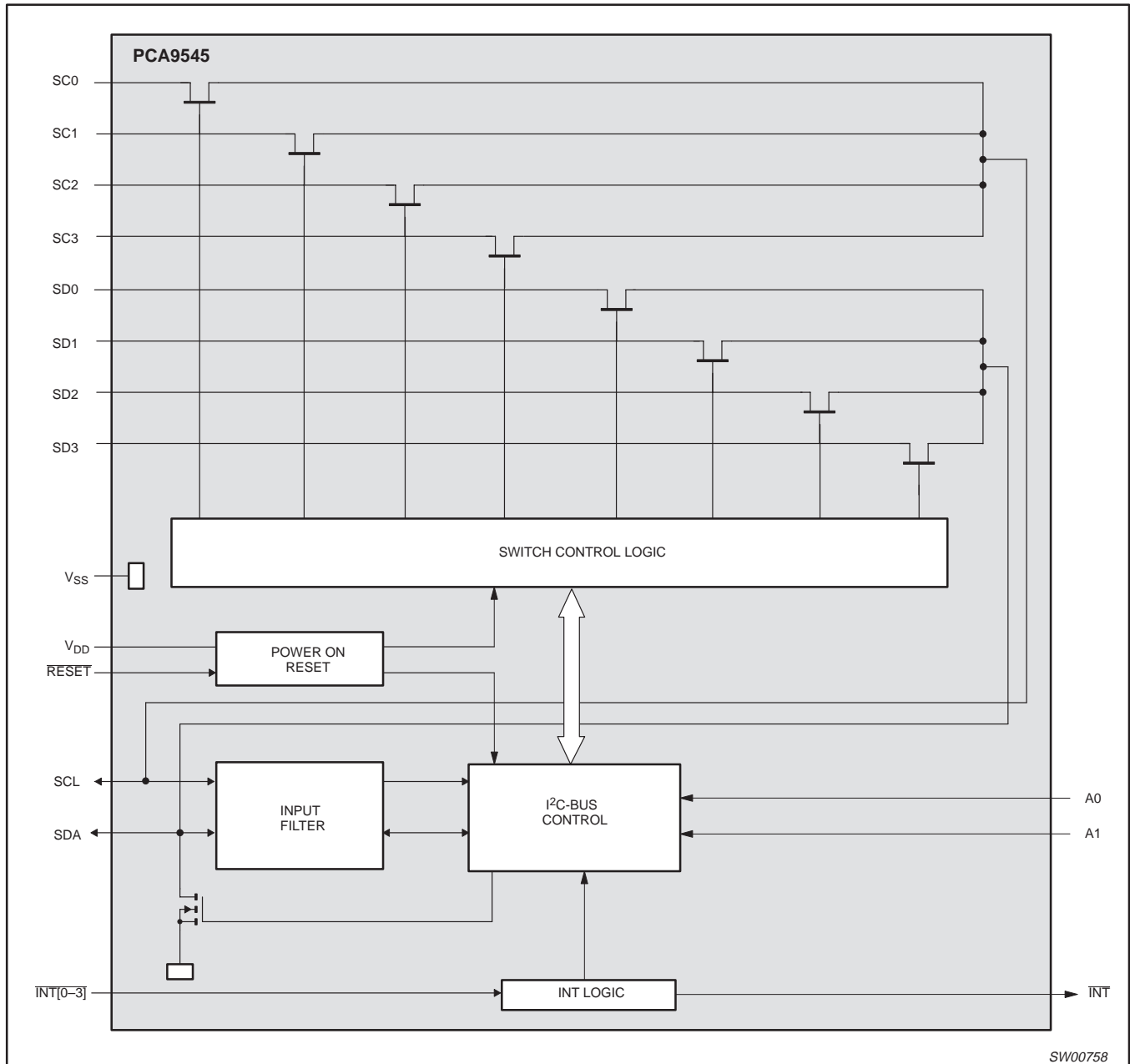
PIN DESCRIPTION

| SO, TSSOP PIN NUMBER | HVQFN PIN NUMBER | SYMBOL | FUNCTION |
|-------------------------|---------------------|-----------------|------------------------------|
| 1 | 19 | A0 | Address input 0 |
| 2 | 20 | A1 | Address input 1 |
| 3 | 1 | RESET | Active LOW reset input |
| 4 | 2 | INT0 | Active LOW interrupt input 0 |
| 5 | 3 | SD0 | Serial data 0 |
| 6 | 4 | SC0 | Serial clock 0 |
| 7 | 5 | INT1 | Active LOW interrupt input 1 |
| 8 | 6 | SD1 | Serial data 1 |
| 9 | 7 | SC1 | Serial clock 1 |
| 10 | 8 | V _{SS} | Supply ground |
| 11 | 9 | INT2 | Active LOW interrupt input 2 |
| 12 | 10 | SD2 | Serial data 2 |
| 13 | 11 | SC2 | Serial clock 2 |
| 14 | 12 | INT3 | Active LOW interrupt input 3 |
| 15 | 13 | SD3 | Serial data 3 |
| 16 | 14 | SC3 | Serial clock 3 |
| 17 | 15 | INT | Active LOW interrupt output |
| 18 | 16 | SCL | Serial clock line |
| 19 | 17 | SDA | Serial data line |
| 20 | 18 | V _{DD} | Supply voltage |

4-channel I²C switch with interrupt logic and reset

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BLOCK DIAGRAM



SW00758

Figure 3. Block diagram

4-channel I²C switch with interrupt logic and reset

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DEVICE ADDRESS

Following a START condition the bus master must output the address of the slave it is accessing. The address of the PCA9545 is shown in Figure 4. To conserve power, no internal pullup resistors are incorporated on the hardware selectable address pins and they must be pulled HIGH or LOW.

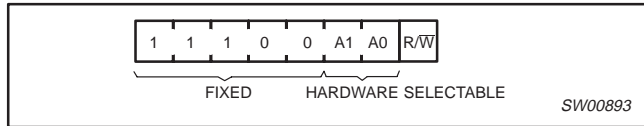


Figure 4. Slave address

The last bit of the slave address defines the operation to be performed. When set to 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 will send a byte to the PCA9545, which will be stored in the control register. If multiple bytes are received by the PCA9545, it will save the last byte received. This register can be written and read via the I²C-bus.

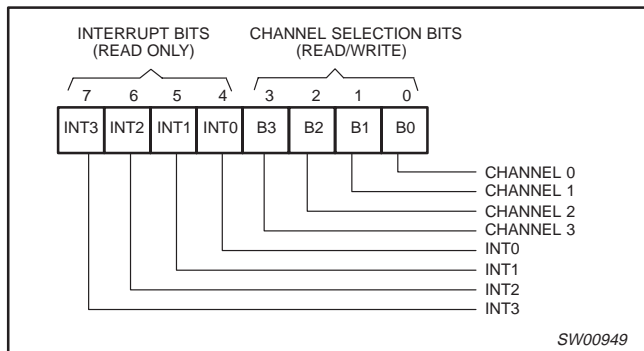


Figure 5. Control Register

CONTROL REGISTER DEFINITION

One or several SCx/SDx downstream pair, or channel, is selected by the contents of the control register. This register is written after the PCA9545 has been addressed. The 2 LSBs of the control byte are used to determine which channel is to be selected. When a channel is selected, the channel will become active after a stop condition has been placed on the I²C-bus. This ensures that all SCx/SDx lines will be in a HIGH state when the channel is made active, so that no false conditions are generated at the time of connection.

Table 1. Control Register; Write — Channel Selection/
Read — Channel Status

| INT3 | INT2 | INT1 | INT0 | B3 | B2 | B1 | B0 | COMMAND |
|------|------|------|------|----|----|----|----|---|
| X | X | X | X | X | X | X | 0 | Channel 0 disabled |
| | | | | | | | 1 | Channel 0 enabled |
| X | X | X | X | X | X | X | 0 | Channel 1 disabled |
| | | | | | | | 1 | Channel 1 enabled |
| X | X | X | X | X | X | X | 0 | Channel 2 disabled |
| | | | | | | | 1 | Channel 2 enabled |
| X | X | X | X | X | X | X | 0 | Channel 3 disabled |
| | | | | | | | 1 | Channel 3 enabled |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No channel selected; power-up/reset default state |

NOTE: Several channels can be enabled at the same time.
Ex: B3 = 0, B2 = 1, B1 = 1, B0 = 0, means that channel 0 and 3 are disabled and channel 1 and 2 are enabled.
Care should be taken not to exceed the maximum bus capacity.

4-channel I²C switch with interrupt logic and reset

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INTERRUPT HANDLING

The PCA9545 provides 4 interrupt inputs, one for each channel, and one open drain interrupt output. When an interrupt is generated by any device, it will be detected by the PCA9545 and the interrupt output will be driven LOW. The channel does not need to be active for detection of the interrupt. A bit is also set in the control register.

Bits 4 – 7 of the control register correspond to channels 0 – 3 of the PCA9545, 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 can then address the PCA9545 and read the contents of the control register to determine which channel contains the device generating the interrupt. The master can then reconfigure the PCA9545 to select this channel, and locate the device generating the interrupt and clear it.

It should be noted that more than one device can be providing 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_{DD} through a pull-up resistor.

Table 2. Control Register Read — Interrupt

| INT3 | INT2 | INT1 | INT0 | B3 | B2 | 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 |
| | | 1 | | | | | | Interrupt on channel 1 |
| X | 0 | X | X | X | X | X | X | No interrupt on channel 2 |
| | 1 | | | | | | | Interrupt on channel 2 |
| 0 | X | X | X | X | X | X | X | No interrupt on channel 3 |
| 1 | | | | | | | | Interrupt on channel 3 |

NOTE: Several interrupts can be active at the same time.
 Ex: INT3 = 0, INT2 = 1, INT1 = 1, INT0 = 0, means that there is no interrupt on channels 0 and 3, and there is interrupt on channels 1 and 2.

RESET INPUT

The RESET input is an active-LOW signal which may be used to recover from a bus fault condition. By asserting this signal LOW for a minimum of t_{WL}, the PCA9545 will reset its registers and I²C state machine and will deselect all channels. The RESET input must be connected to V_{DD} through a pull-up resistor.

POWER-ON RESET

When power is applied to V_{DD}, an internal Power On Reset holds the PCA9545 in a reset state until V_{DD} has reached V_{POR}. At this point, the reset condition is released and the PCA9545 registers and I²C state machine are initialized to their default states, all zeroes causing all the channels to be deselected.

VOLTAGE TRANSLATION

The pass gate transistors of the PCA9545 are constructed such that the V_{DD} voltage can be used to limit the maximum voltage that will be passed from one I²C-bus to another.

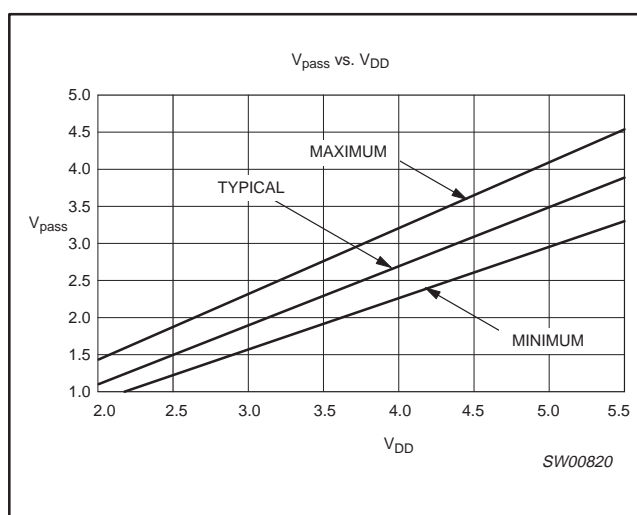


Figure 6. V_{pass} voltage vs. V_{DD}

Figure 6 shows the voltage characteristics of the pass gate transistors (note that the graph was generated using the data specified in the DC Characteristics section of this datasheet). In order for the PCA9545 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 was running at 5 V, and the downstream buses were 3.3 V and 2.7 V, then V_{pass} should be equal to or below 2.7 V to effectively clamp the downstream bus voltages. Looking at Figure 6, we see that V_{pass} (max.) will be at 2.7 V when the PCA9545 supply voltage is 3.5 V or lower so the PCA9545 supply voltage could be set to 3.3 V. Pull-up resistors can then be used to bring the bus voltages to their appropriate levels (see Figure 13).

More Information can be found in Application Note AN262 PCA954X family of I²C/SMBus multiplexers and switches.

4-channel I²C switch with interrupt logic and reset

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CHARACTERISTICS OF THE I²C-BUS

The I²C-bus is for 2-way, 2-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 pull-up resistor when connected to the output stages of a device. Data transfer may be initiated only when the bus is not busy.

Bit transfer

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 will be interpreted as control signals (see Figure 7).

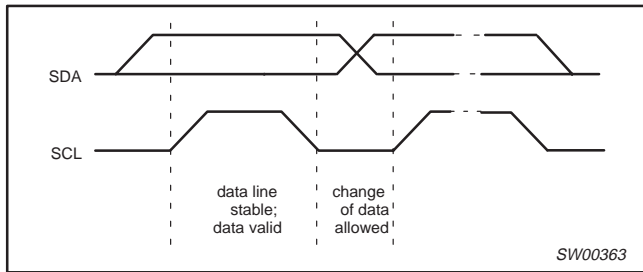


Figure 7. Bit transfer

Start and stop conditions

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 8).

System configuration

A device generating a message is a 'transmitter', a device receiving is the 'receiver'. The device that controls the message is the 'master' and the devices which are controlled by the master are the 'slaves' (see Figure 9).

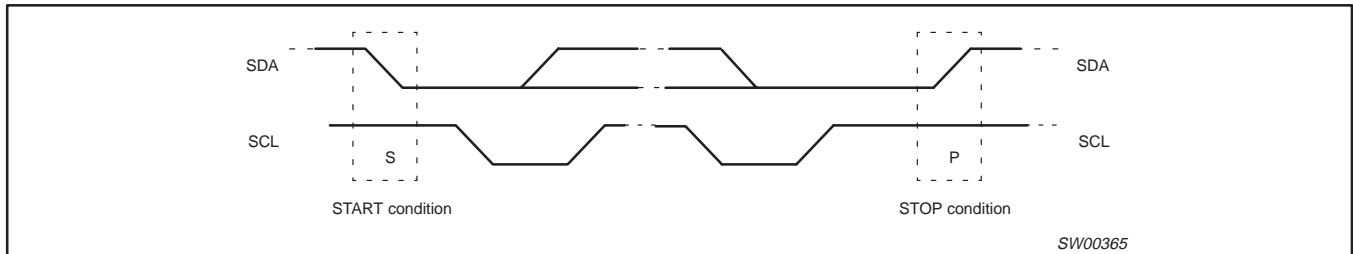


Figure 8. Definition of start and stop conditions

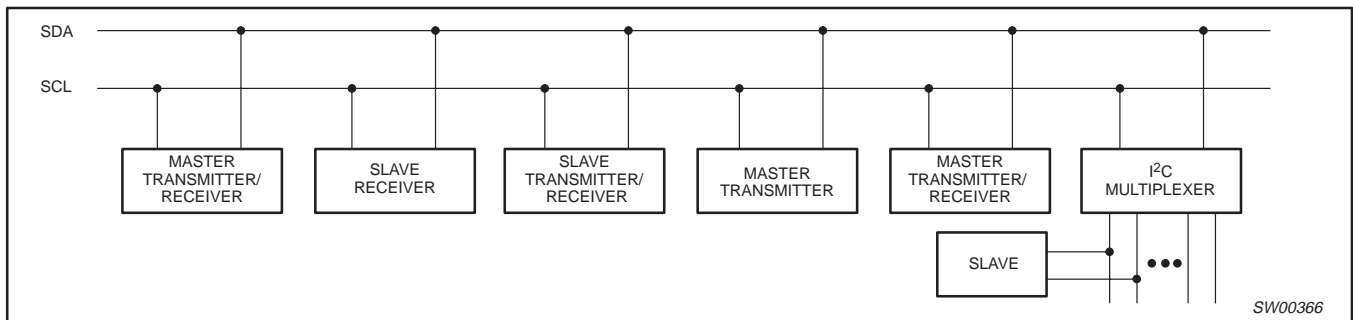


Figure 9. System configuration

4-channel I²C switch with interrupt logic and reset

PCA9545

Acknowledge

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 bit. The acknowledge bit is a HIGH level put on the bus by the transmitter whereas the master generates an extra acknowledge related clock pulse.

A slave receiver which is addressed must generate an acknowledge after the reception of each byte. Also a master must generate an acknowledge after the reception of each byte that has been clocked out of the slave transmitter. The device that acknowledges has to pull down the SDA line during the acknowledge clock pulse, so that the SDA line is stable LOW during the HIGH period of the acknowledge related clock pulse, set-up 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 on the last byte that has been clocked out of the slave. In this event, the transmitter must leave the data line HIGH to enable the master to generate a stop condition.

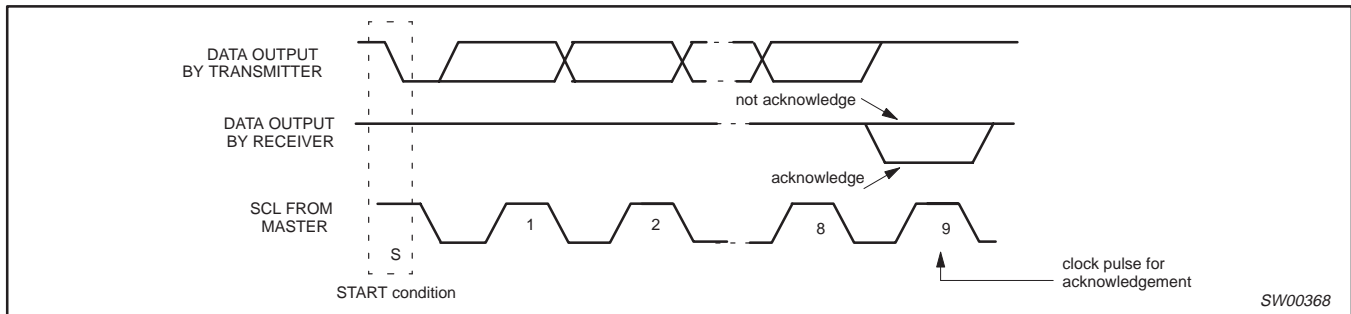


Figure 10. Acknowledgement on the I²C-bus

Bus transactions

Data is transmitted to the PCA9545 control register using the write mode as shown in Figure 11.

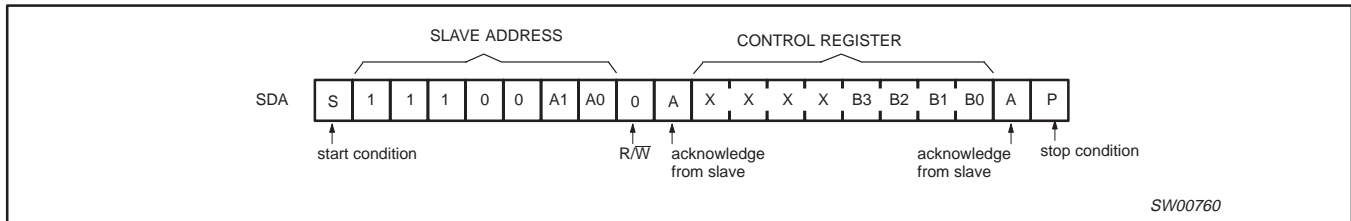


Figure 11. WRITE control register

Data is read from PCA9545 control register using the read mode as shown in Figure 12.

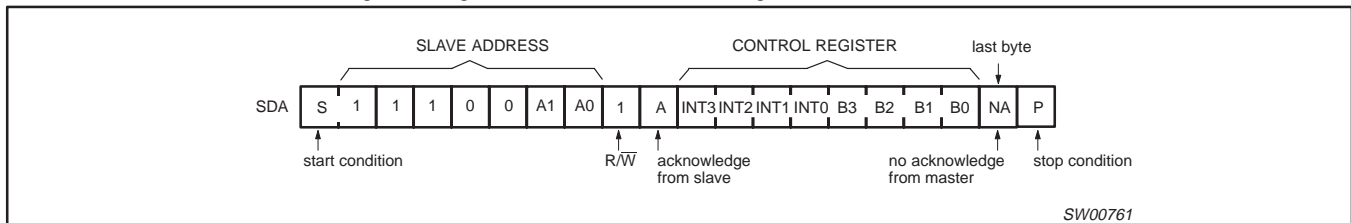


Figure 12. READ control register

4-channel I²C switch with interrupt logic and reset

PCA9545

TYPICAL APPLICATION

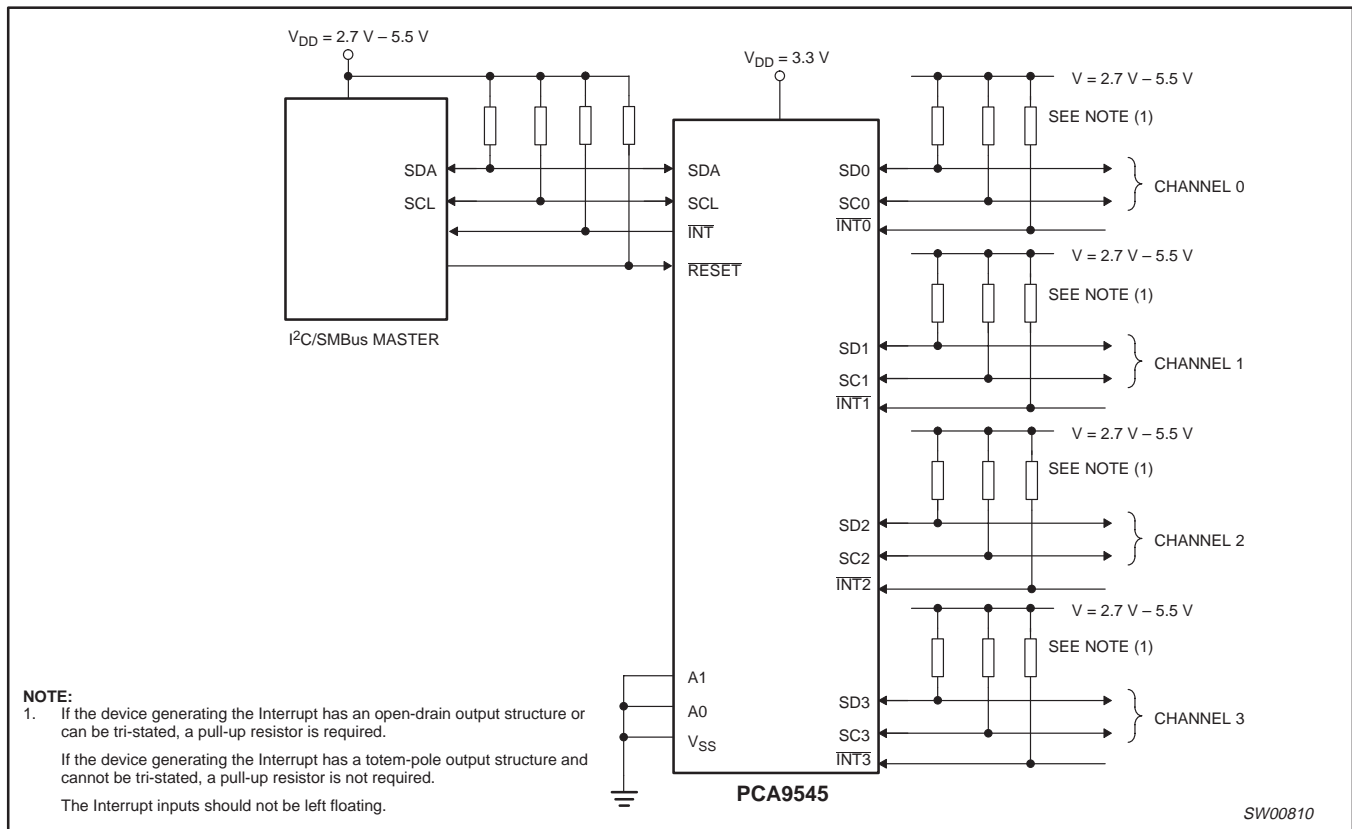


Figure 13. Typical application

ABSOLUTE MAXIMUM RATINGS^{1, 2}

In accordance with the Absolute Maximum Rating System (IEC 134). Voltages are referenced to GND (ground = 0 V).

| SYMBOL | PARAMETER | CONDITIONS | RATING | | UNIT |
|------------------|-------------------------------|------------|--------|------|------|
| | | | MIN | MAX | |
| V _{DD} | DC supply voltage | | -0.5 | +7.0 | V |
| V _I | DC input voltage | | -0.5 | +7.0 | V |
| I _I | DC input current | | — | ±20 | mA |
| I _O | DC output current | | — | ±25 | mA |
| I _{DD} | DC Supply current | | — | ±100 | mA |
| I _{SS} | DC Supply current | | — | ±100 | mA |
| P _{tot} | total power dissipation | | — | 400 | mW |
| T _{stg} | Storage temperature range | | -60 | +150 | °C |
| T _{amb} | Operating ambient temperature | | -40 | +85 | °C |

NOTES:

1. Stresses beyond those listed 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 performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

4-channel I²C switch with interrupt logic and reset

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DC CHARACTERISTICSV_{DD} = 2.3 V to 3.6 V; V_{SS} = 0 V; T_{amb} = -40 °C to +85 °C; unless otherwise specified. (See page 11 for V_{DD} = 3.6 V to 5.5 V.)

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | UNIT |
|--|---------------------------|--|--------------------|-----|-----------------------|------|
| | | | MIN | TYP | MAX | |
| Supply | | | | | | |
| V _{DD} | Supply voltage | | 2.3 | — | 3.6 | V |
| I _{DD} | Supply current | Operating mode; V _{DD} = 3.6 V; no load; V _I = V _{DD} or V _{SS} ; f _{SCL} = 100 kHz | — | 30 | 100 | μA |
| I _{stb} | Standby current | Standby mode; V _{DD} = 3.6 V; no load; V _I = V _{DD} or V _{SS} | — | 20 | 100 | μA |
| V _{POR} | Power-on reset voltage | no load; V _I = V _{DD} or V _{SS} | — | 1.6 | 2.1 | V |
| Input SCL; input/output SDA | | | | | | |
| V _{IL} | LOW-level input voltage | | -0.5 | — | 0.3V _{DD} | V |
| V _{IH} | HIGH-level input voltage | | 0.7V _{DD} | — | 6 | V |
| I _{OL} | LOW-level output current | V _{OL} = 0.4 V | 3 | — | — | mA |
| | | V _{OL} = 0.6 V | 6 | — | — | |
| I _L | Leakage current | V _I = V _{DD} or V _{SS} | -1 | — | +1 | μA |
| C _i | Input capacitance | V _I = V _{SS} | — | 12 | 13 | pF |
| Select inputs A0 to A1 / INT0 to INT3 / RESET | | | | | | |
| V _{IL} | LOW-level input voltage | | -0.5 | — | +0.3V _{DD} | V |
| V _{IH} | HIGH-level input voltage | | 0.7V _{DD} | — | V _{DD} + 0.5 | V |
| I _{LI} | Input leakage current | pin at V _{DD} or V _{SS} | -1 | — | +1 | μA |
| C _i | Input capacitance | V _I = V _{SS} | — | 1.6 | 3 | pF |
| Pass Gate | | | | | | |
| R _{ON} | Switch resistance | V _{DD} = 3.0 V to 3.6 V; V _O = 0.4 V; I _O = 15 mA | 5 | 20 | 30 | Ω |
| | | V _{DD} = 2.3 V to 2.7 V; V _O = 0.4 V; I _O = 10 mA | 7 | 26 | 55 | |
| V _{Pass} | Switch output voltage | V _{swin} = V _{DD} = 3.3 V; I _{swout} = -100 μA | — | 2.2 | — | V |
| | | V _{swin} = V _{DD} = 3.0 V to 3.6 V; I _{swout} = -100 μA | 1.6 | — | 2.8 | |
| | | V _{swin} = V _{DD} = 2.5 V; I _{swout} = -100 μA | — | 1.5 | — | |
| | | V _{swin} = V _{DD} = 2.3 V to 2.7 V; I _{swout} = -100 μA | 1.1 | — | 2.0 | |
| I _L | Leakage current | V _I = V _{DD} or V _{SS} | -1 | — | +1 | μA |
| C _{io} | Input/output capacitance | V _I = V _{SS} | — | 3 | 5 | pF |
| INT Output | | | | | | |
| I _{OL} | LOW-level output current | V _{OL} = 0.4 V | 3 | — | — | mA |
| I _{OH} | HIGH-level output current | | — | — | +100 | μA |

4-channel I²C switch with interrupt logic and reset

PCA9545

DC CHARACTERISTICSV_{DD} = 3.6 V to 5.5 V; V_{SS} = 0 V; T_{amb} = -40 °C to +85 °C; unless otherwise specified. (See page 10 for V_{DD} = 2.3 V to 3.6 V.)

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | UNIT |
|--|---------------------------|--|--------------------|-----|-----------------------|------|
| | | | MIN | TYP | MAX | |
| Supply | | | | | | |
| V _{DD} | Supply voltage | | 3.6 | — | 5.5 | V |
| I _{DD} | Supply current | Operating mode; V _{DD} = 5.5 V; no load; V _I = V _{DD} or V _{SS} ; f _{SCL} = 100 kHz | — | 575 | 600 | μA |
| I _{stb} | Standby current | Standby mode; V _{DD} = 5.5 V; no load; V _I = V _{DD} or V _{SS} | — | 130 | 200 | μA |
| V _{POR} | Power-on reset voltage | no load; V _I = V _{DD} or V _{SS} | — | 1.6 | 2.1 | V |
| Input SCL; input/output SDA | | | | | | |
| V _{IL} | LOW-level input voltage | | -0.5 | — | 0.3V _{DD} | V |
| V _{IH} | HIGH-level input voltage | | 0.7V _{DD} | — | 6 | V |
| I _{OL} | LOW-level output current | V _{OL} = 0.4 V | 3 | — | — | mA |
| | | V _{OL} = 0.6 V | 6 | — | — | mA |
| I _{IL} | LOW-level input current | V _I = V _{SS} | -10 | — | +10 | μA |
| I _{IH} | HIGH-level input current | V _I = V _{DD} | — | — | +100 | μA |
| C _i | Input capacitance | V _I = V _{SS} | — | 12 | 13 | pF |
| Select inputs A0 to A1 / INT0 to INT3 / RESET | | | | | | |
| V _{IL} | LOW-level input voltage | | -0.5 | — | +0.3V _{DD} | V |
| V _{IH} | HIGH-level input voltage | | 0.7V _{DD} | — | V _{DD} + 0.5 | V |
| I _{LI} | Input leakage current | pin at V _{DD} or V _{SS} | -1 | — | +50 | μA |
| C _i | Input capacitance | V _I = V _{SS} | — | 1.6 | 3 | pF |
| Pass Gate | | | | | | |
| R _{ON} | Switch resistance | V _{CC} = 4.5 V to 5.5 V; V _O = 0.4 V; I _O = 15 mA | 4 | 11 | 24 | Ω |
| V _{Pass} | Switch output voltage | V _{swin} = V _{DD} = 5.0 V; I _{swout} = -100 μA | — | 3.5 | — | V |
| | | V _{swin} = V _{DD} = 4.5 V to 5.5 V; I _{swout} = -100 μA | 2.6 | — | 4.5 | V |
| I _L | Leakage current | V _I = V _{DD} or V _{SS} | -1 | — | +100 | μA |
| C _{io} | Input/output capacitance | V _I = V _{SS} | — | 3 | 5 | pF |
| INT Output | | | | | | |
| I _{OL} | LOW-level output current | V _{OL} = 0.4 V | 3 | — | — | mA |
| I _{OH} | HIGH-level output current | | — | — | +100 | μA |

4-channel I²C switch with interrupt logic and reset

PCA9545

AC CHARACTERISTICS

| SYMBOL | PARAMETER | STANDARD-MODE I ² C-BUS | | FAST-MODE I ² C-BUS | | UNIT |
|----------------------|---|------------------------------------|------------------|-------------------------------------|------------------|------|
| | | MIN | MAX | MIN | MAX | |
| t _{pd} | Propagation delay from SDA to SD _n or SCL to SC _n | — | 0.3 ¹ | — | 0.3 ¹ | ns |
| f _{SCL} | SCL clock frequency | 0 | 100 | 0 | 400 | kHz |
| t _{BUF} | Bus free time between a STOP and START condition | 4.7 | — | 1.3 | — | μs |
| t _{HD;STA} | Hold time (repeated) START condition After this period, the first clock pulse is generated | 4.0 | — | 0.6 | — | μs |
| t _{LOW} | LOW period of the SCL clock | 4.7 | — | 1.3 | — | μs |
| t _{HIGH} | HIGH period of the SCL clock | 4.0 | — | 0.6 | — | μs |
| t _{SU;STA} | Set-up time for a repeated START condition | 4.7 | — | 0.6 | — | μs |
| t _{SU;STO} | Set-up time for STOP condition | 4.0 | — | 0.6 | — | μs |
| t _{HD;DAT} | Data hold time | 0 ² | 3.45 | 0 ² | 0.9 | μs |
| t _{SU;DAT} | Data set-up time | 250 | — | 100 | — | ns |
| t _R | Rise time of both SDA and SCL signals | — | 1000 | 20 + 0.1C _b ³ | 300 | ns |
| t _F | Fall time of both SDA and SCL signals | — | 300 | 20 + 0.1C _b ³ | 300 | μs |
| C _b | Capacitive load for each bus line | — | 400 | — | 400 | μs |
| t _{SP} | Pulse width of spikes which must be suppressed by the input filter | — | 50 | — | 50 | ns |
| t _{VD;DATL} | Data valid (HL) | — | 1 | — | 1 | μs |
| t _{VD;DATH} | Data valid (LH) | — | 0.6 | — | 0.6 | μs |
| t _{VD;ACK} | Data valid Acknowledge | — | 1 | — | 1 | μs |
| INT | | | | | | |
| t _{IV} | INT _n to INT active valid time | — | 4 | — | 4 | μs |
| t _{IR} | INT _n to INT inactive delay time | — | 2 | — | 2 | μs |
| L _{pwr} | LOW level pulse width rejection or INT _n inputs | 1 | — | 1 | — | μs |
| H _{pwr} | HIGH level pulse width rejection or INT _n inputs | 0.5 | — | 0.5 | — | μs |
| RESET | | | | | | |
| t _{WL(rst)} | Pulse width low reset | 4 | — | 4 | — | ns |
| t _{rst} | Reset time (SDA clear) | 500 | — | 500 | — | ns |
| t _{REC;STA} | Recovery to Start | 0 | — | 0 | — | ns |

NOTES:

1. Pass gate propagation delay is calculated from the 20 Ω typical R_{ON} and the 15 pF load capacitance.
2. A device must internally provide a hold time of at least 300 ns for the SDA signal (referred to the V_{IH(min)} of the SCL signal) in order to bridge the undefined region of the falling edge of SCL.
3. C_b = total capacitance of one bus line in pF.

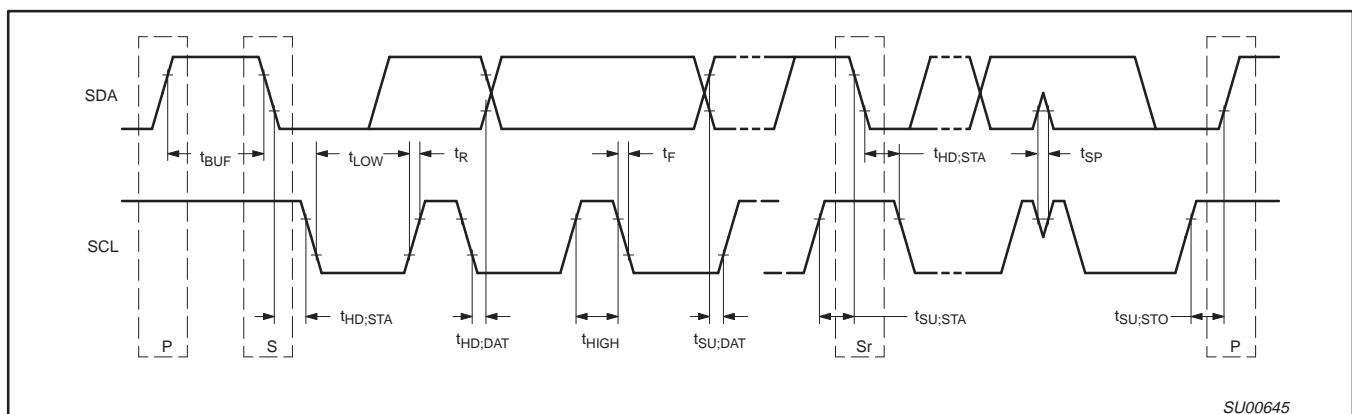


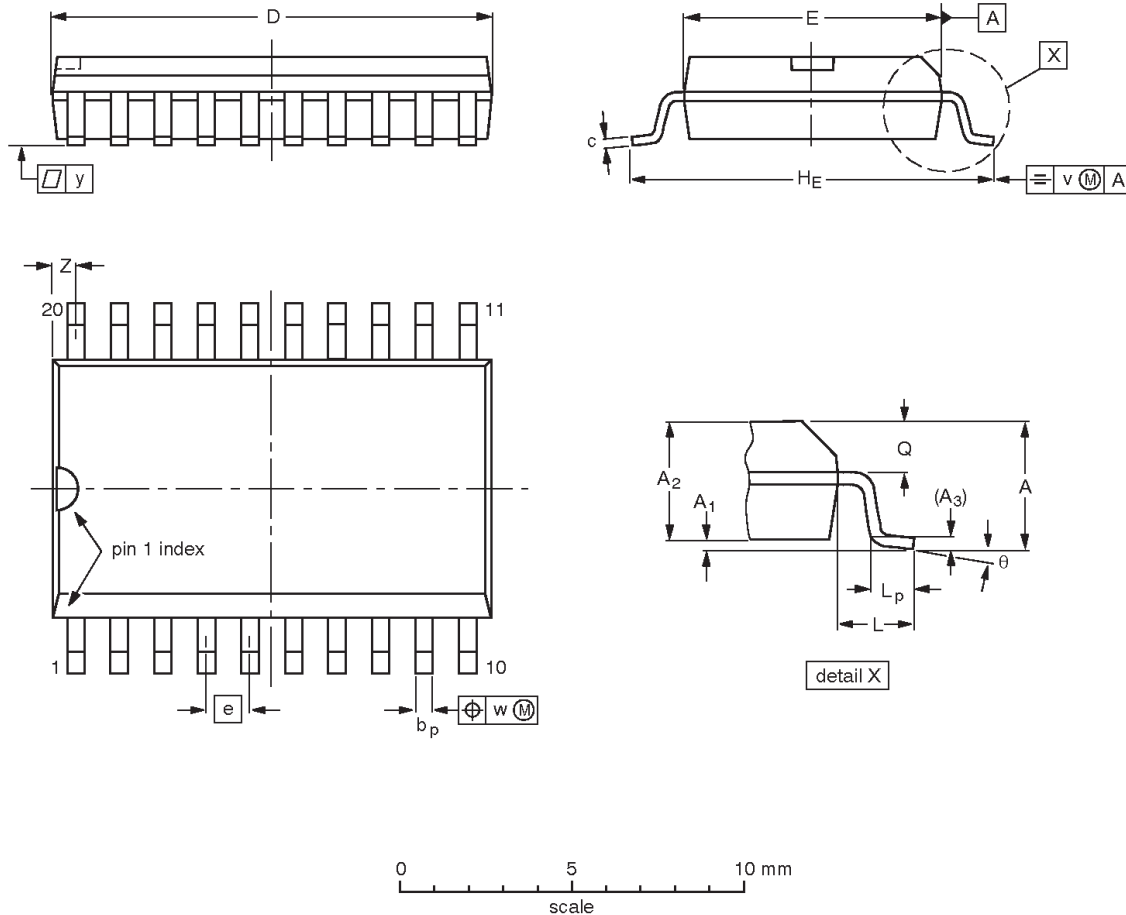
Figure 14. Definition of timing on the I²C-bus

4-channel I²C switch with interrupt logic and reset

PCA9545

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 2.65 | 0.3 0.1 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 13.0 12.6 | 7.6 7.4 | 1.27 | 10.65 10.00 | 1.4 | 1.1 0.4 | 1.1 1.0 | 0.25 | 0.25 | 0.1 | 0.9 0.4 | 8° 0° |
| inches | 0.1 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.51 0.49 | 0.30 0.29 | 0.05 | 0.419 0.394 | 0.055 | 0.043 0.016 | 0.043 0.039 | 0.01 | 0.01 | 0.004 | 0.035 0.016 | |

Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

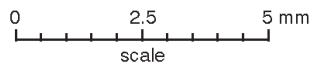
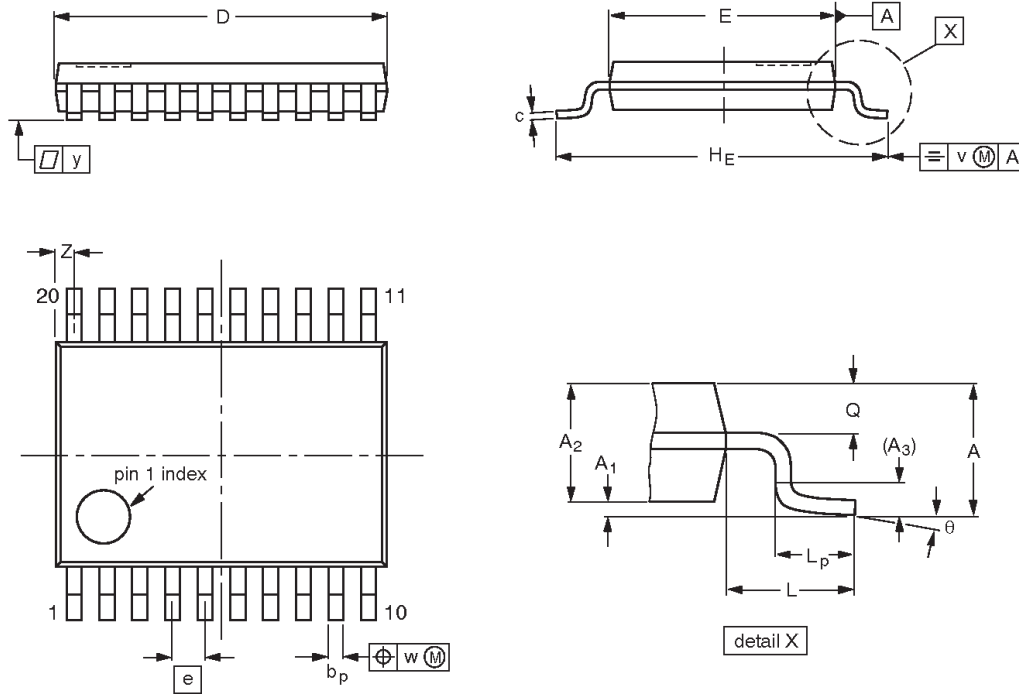
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|-----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT163-1 | 075E04 | MS-013 | | | | -99-12-27 03-02-19 |

4-channel I²C switch with interrupt logic and reset

PCA9545

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽²⁾ | e | H _E | L | L _p | Q | v | w | y | Z ⁽¹⁾ | θ |
|------|--------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm | 1.1 | 0.15 0.05 | 0.95 0.80 | 0.25 | 0.30 0.19 | 0.2 0.1 | 6.6 6.4 | 4.5 4.3 | 0.65 | 6.6 6.2 | 1 | 0.75 0.50 | 0.4 0.3 | 0.2 | 0.13 | 0.1 | 0.5 0.2 | 8° 0° |

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

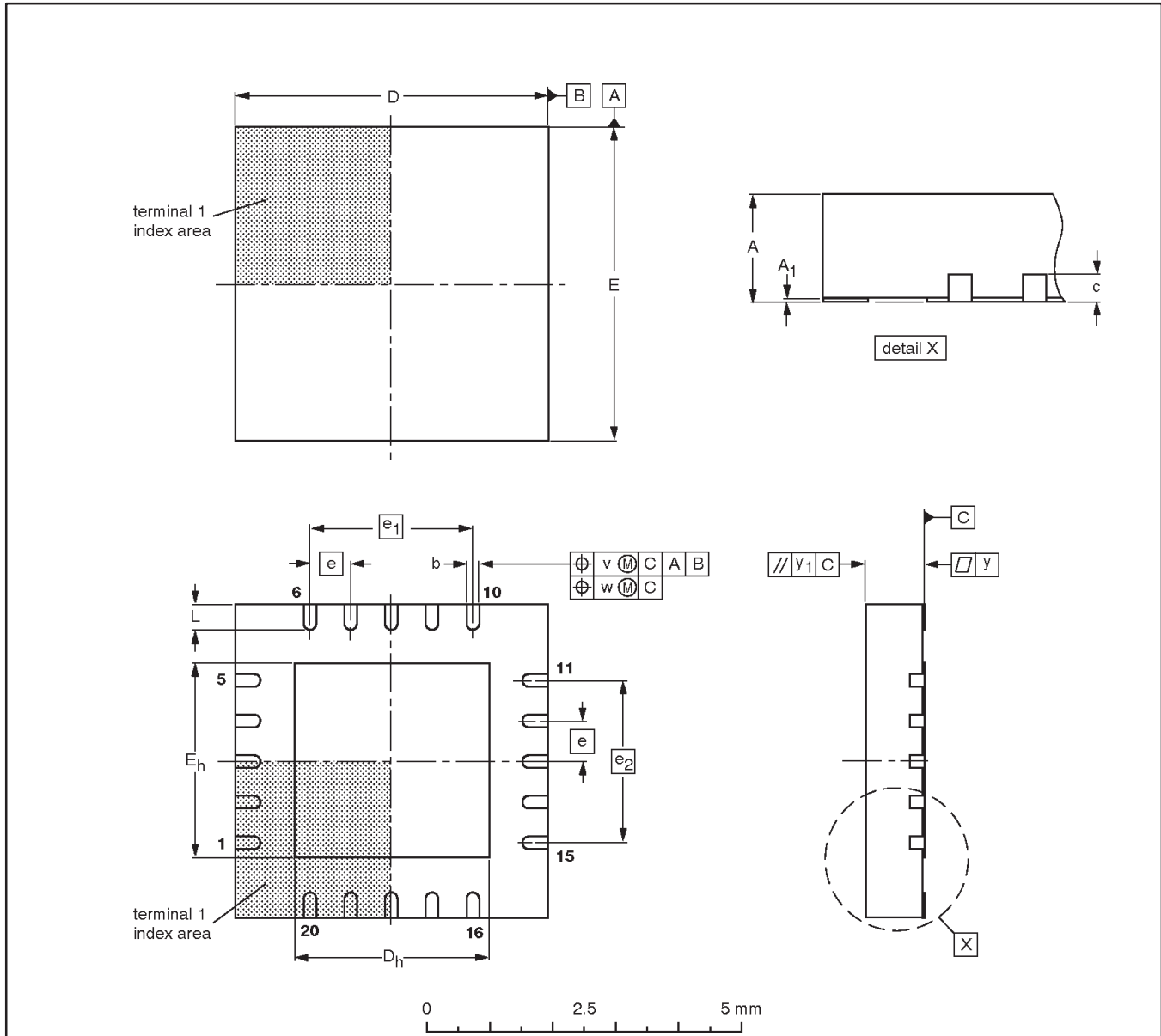
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|-----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT360-1 | | MO-153 | | | | -99-12-27 03-02-19 |

4-channel I²C switch with interrupt logic and reset

PCA9545

HVQFN20: plastic thermal enhanced very thin quad flat package; no leads; 20 terminals; body 5 x 5 x 0.85 mm

SOT662-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A ⁽¹⁾ max. | A ₁ | b | c | D ⁽¹⁾ | D _h | E ⁽¹⁾ | E _h | e | e ₁ | e ₂ | L | v | w | y | y ₁ |
|------|-----------------------|----------------|--------------|-----|------------------|----------------|------------------|----------------|------|----------------|----------------|--------------|-----|------|------|----------------|
| mm | 1 | 0.05 0.00 | 0.38 0.23 | 0.2 | 5.1 4.9 | 3.25 2.95 | 5.1 4.9 | 3.25 2.95 | 0.65 | 2.6 | 2.6 | 0.75 0.50 | 0.1 | 0.05 | 0.05 | 0.1 |

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT662-1 | --- | MO-220 | --- | | | 01-08-08 02-10-22 |

4-channel I²C switch with interrupt logic and reset

PCA9545

REVISION HISTORY

| Rev | Date | Description |
|-----|----------|--|
| _4 | 20040929 | Product data sheet (9397 750 14114). Supersedes data of 2002 Dec 13 (9397 750 10873). Modifications: <ul style="list-style-type: none">• Table 1. "Control Register; Write — Channel Selection / Read — Channel Status" on page 5: add 'No channel selected; power-up/reset default state' row to bottom of table. |
| _3 | 20021213 | Product data (9397 750 10873); ECN 853-2302 29160 of 06 November 2002. |
| _2 | 20020328 | Product data (9397 750 09608); ECN 853-2302 27940 of 28 March 2002. |

4-channel I²C switch with interrupt logic and reset

PCA9545



Purchase of Philips I²C components conveys a license under the Philips' I²C patent to use the components in the I²C system provided the system conforms to the I²C specifications defined by Philips. This specification can be ordered using the code 9398 393 40011.

Data sheet status

| Level | Data sheet status ^[1] | Product status ^[2] [3] | Definitions |
|-------|----------------------------------|-----------------------------------|--|
| I | Objective data sheet | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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