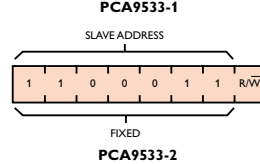
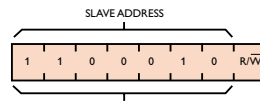
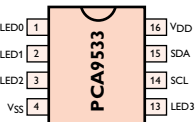
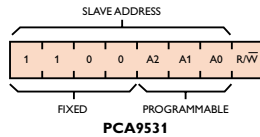
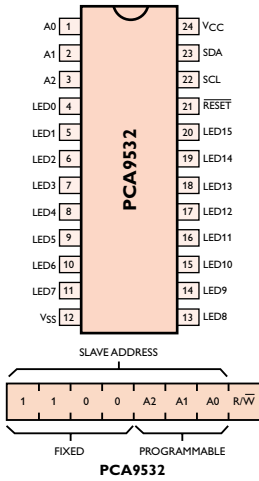
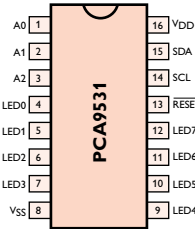
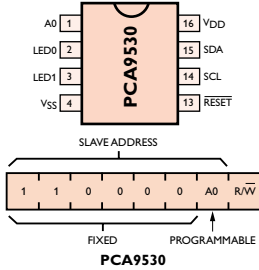


# PCA9530, PCA9533, PCA9531 & PCA9532

## 2, 4, 8 and 16-bit I<sup>2</sup>C and SMBus LED Dimmers with Reset

The PCA9530, PCA9533, PCA9531 and PCA9532 are I<sup>2</sup>C & SMBus I/O expanders optimized for dimming LEDs. Two user programmable blink rates allow dimming and blinking of LEDs without overloading the bus or tying up the I<sup>2</sup>C Master.

### Pin Configurations



### Features/Benefits

- I<sup>2</sup>C and SMBus compatible
- Two User Programmable Blink Rates and Duty Cycles
- Blink rate between 0.625 sec and 1.6 sec (160 Hz to 0.656 Hz)
- Duty cycle between 0% and 99.6%
- 256 programmable brightness levels
- Internal oscillator is accurate to +/- 10% and requires no external components
- Open drain outputs can directly drive LEDs to a maximum of 25 mA sink per bit
- Maximum device limits of 50 mA for the PCA9530, 100 mA for the PCA9531/33 and 200 mA (100 mA per 8-bit group) for the PCA9532
- Input/Output states readable via I<sup>2</sup>C/SMBus
- Any bit not used to drive an LED can be used as a normal GPIO
- Active low hardware reset ( $\overline{\text{RESET}}$ ) or Power On Reset (POR) initialize the registers to their default state, all zeroes, causing all the outputs to be off (PCA9533 does not have the reset operation)
- Low standby current (I<sub>stb</sub>) of 1.5  $\mu$ A max
- ESD protection exceeds 2000 V HBM per JESD22-A114, 150 V MM per JESD22-A115 and 1000 V CDM per JESD22-C101
- JESDEC Standard JESD78 Latch-up testing exceeds 100 mA
- Offered in SO (D), TSSOP (DP or PW) or HVQFN (BS)
- Manufactured in a high-volume CMOS process



### Description

The PCA9530, PCA9531, PCA9532 and PCA9533 dim LEDs in I<sup>2</sup>C and SMBus applications. Each LED may be dimmed at one of 256 brightness levels, on, off or flashing at one of two programmable rates without tying up the bus master or overloading the I<sup>2</sup>C bus. These devices are useful for LED backlighting, LED color mixing applications and LED status applications.

The blink rate can vary between a period of 0.625 sec to 1.6 sec (160 Hz to 0.625 Hz) in 256 steps. The duty cycle is programmable in 256 steps. LEDs are dimmed by varying the duty cycle that changes the average current as the LEDs blink at 160 Hz. More information on the LED Blinkers and Dimmers can be found in Application Note AN264.

Any bits that are not used for controlling the LEDs can be used for General Purpose Parallel Input/Output (GPIO) expansion. I/O expansion provides a simple solution when additional I/O is needed for sensors, pushbuttons, alarm monitoring, LEDs, fans, etc... Philips Semiconductors' GPIO devices are detailed in Application Note AN469.

The 3 hardware pins (A0, A1, A2) on the PCA9531/32 allow up to 8 identical devices to share the same I<sup>2</sup>C/SMBus. The single hardware pin (A0) on the PCA9530 allows up to 2 identical devices on the same bus. Due to hardware pin limitations, the PCA9533 has no address pins and two version are offered, PCA9533-1 and PCA9533-2, with different fixed addresses so two 4-bit devices can be used on the same I<sup>2</sup>C bus.

An external active low hardware reset pin ( $\overline{\text{RESET}}$ ) is provided on the PCA9530/31/32 to reset the registers to the default state should the bus lock up without having to cycle power to the equipment.

### Operating Characteristics

- 2.3 V to 5.5 V operating voltage
- 5.5 V tolerant I/Os
- -40 °C to 85 °C operating temperature range
- 0 Hz to 400 kHz clock frequency

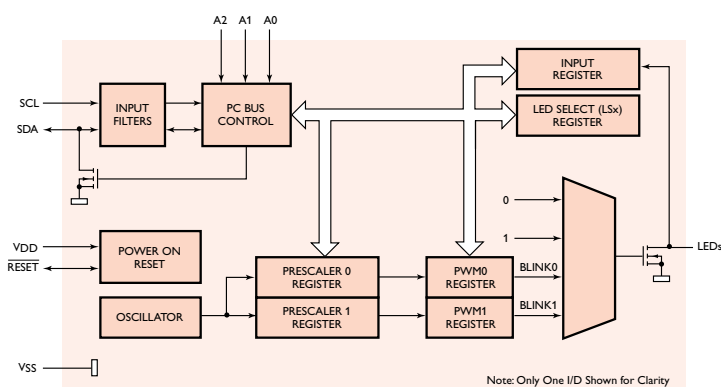


# PCA9530, PCA9533, PCA9531 & PCA9532

2, 4, 8 and 16-bit I<sup>2</sup>C and SMBus LED Dimmers with Reset

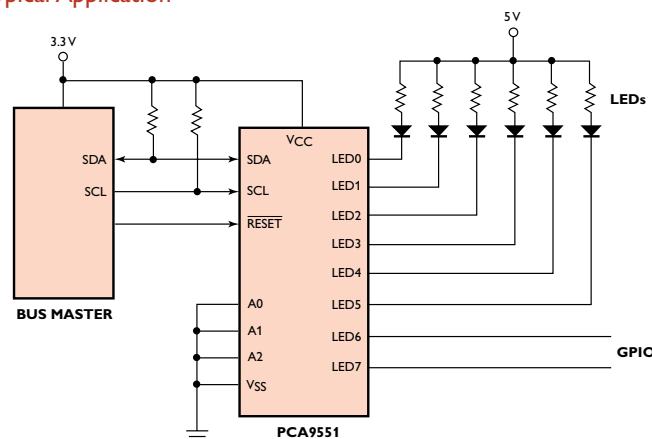


## Block Diagram



The PCA9530/31/32/33 functional diagram and I/O schematic are identical except for the number of bits and address pins.

## Typical Application



The LED Dimmers feature open drain outputs that sink 25 mA per bit with a maximum of 50 mA for the PCA9530, 100 mA for the PCA9531/33 and 200 mA (100 mA per 8-bit group) for the PCA9532.

Any bits not used to control LEDs can be used as normal general purpose I/O bits.

## Order Information

Package	Container	PCA9530	PCA9531	PCA9532	PCA9533-1	PCA9533-2
SO	Tube	PCA9530D	PCA9531D	PCA9532D	PCA9533-1D	PCA9533-2D
	T & R	PCA9530D-T	PCA9531D-T	PCA9532D-T	PCA9533-1D-T	PCA9533-2D-T
TSSOP	Tube	—	PCA9551PW	PCA9532PW	—	—
	T & R	PCA9530DP-T	PCA9531PW-T	PCA9532PW-T	PCA9533-1DP-T	PCA9533-2DP-T
HVQFN	T & R	—	PCA9531BS-T	PCA9532BS-T	—	—

[www.semiconductors.philips.com/logic/i2c](http://www.semiconductors.philips.com/logic/i2c)



Purchase of Philips I<sup>2</sup>C components conveys a license under the Philips' patent to use the components in the I<sup>2</sup>C system provided the system conforms to the I<sup>2</sup>C specification defined by Philips.



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