



24-Channel SPI Serial Bus 63 mA/5.5 V Constant Current LED Driver

PCA9959

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The PCA9959 is a daisy-chain SPI-compatible 4-wire serial bus controlled by a 24-channel constant preset current LED driver optimized for dimming and blinking 63 mA Red/green/blue/amber (RGBA) LEDs.

Each LED output has its own 6-bit resolution (64 steps) preset current configuration, with an absolute accuracy of $\pm 8\%$.

PCA9959 supports up to four groups of LED gradation control, with each LED channel assigned to one of the groups. For each group, PCA9959 supports 64-grid brightness control, with the time duration of each grid adjustable from 2.5 μs to 1 ms. Each LED output can be off, on or set at its individual preset current value within each grid. Once gradation control enabled, PCA9959 will automatically change each LED preset current with the setup from grid0 to grid63. Once finished, it can hold grid63 or repeat from grid0 as configured.

The block diagram illustrates the internal architecture of the PCA9959 LED driver. Key components and their connections include:

- Power and Ground:** V_{DDIO}, V_{DD}, and V_{SS} pins are connected to the power management section.
- Control and Status:** SCLK, SDI, CS, and SDO pins are connected to the 4-WIRE SERIAL BUS CONTROL block. A RESET pin is connected to an INPUT FILTER and then to the POWER-ON RESET block.
- Oscillator and Timing:** An 8MHz OSCILLATOR is connected to the SERIAL BUS CONTROL. An OSCIN pin is connected to an OSC DRIVER, which in turn connects to the GRADATION CONTROL block. An OSCOUT pin is also connected to the GRADATION CONTROL block.
- LED Control:** The GRADATION CONTROL block (responsible for SIDE, GRID, GROUP, and CHANNEL control) sends signals to the LED STATE SELECT REGISTER and the MUX/CONTROL block. The MUX/CONTROL block also receives an OE (Output Enable) signal.
- LED Drivers:** The LED STATE SELECT REGISTER and MUX/CONTROL block interface with the OUTPUT DRIVER AND THERMAL SHUTDOWN block, which controls 24 LEDs (LED0 to LED23).
- Internal DACs:** Individual LED current setting 8-bit DACs (DAC0 to DAC23) are shown, each receiving data from the SERIAL BUS CONTROL and the LED STATE SELECT REGISTER. These DACs drive the LEDs through current sources.
- Other Features:** An I/O REGULATOR is connected to the power supply and the SERIAL BUS CONTROL. A POWER-ON RESET block is connected to the power supply and the SERIAL BUS CONTROL.

View additional information for [24-Channel SPI Serial Bus 63 mA/5.5 V Constant Current LED Driver](#).

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