# 16-Channel Fm+ I²C-Bus 57 MA/20 V Constant-Current LED Driver

## PCA9955BTW

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The PCA9955B is an I²C-bus controlled 16-channel constant current LED driver optimized for dimming and blinking 57 mA Red/Green/Blue/Amber (RGBA) LEDs in amusement products. Each LED output has its own 8-bit resolution (256 steps) fixed frequency individual PWM controller that operates at 31.25 kHz with a duty cycle that is adjustable from 0 % to 100 % to allow the LED to be set to a specific brightness value. An additional 8-bit resolution (256 steps) group PWM controller has both a fixed frequency of 122 Hz and an adjustable frequency between 15 Hz to every 16.8 seconds with a duty cycle that is adjustable from 0 % to 99.6 % that is used to either dim or blink all LEDs with the same value.

Each LED output can be off, on (no PWM control), set at its individual PWM controller value or at both individual and group PWM controller values. The PCA9955B operates with a supply voltage range of 3 V to 5.5 V and the constant current sink LED outputs to allow up to 20 V for the LED supply. The output peak current is adjustable with an 8-bit linear DAC from 225 µA to 57 mA.

Gradation control for all current sources is achieved via the I²C-bus serial interface and allows the user to ramp current automatically without MCU intervention. 8-bit DACs are available to adjust brightness levels for each LED current source. There are four selectable gradation control groups and each group has independently four registers to control ramp-up and ramp-down rate, step time, hold ON/OFF time and final hold ON output current. Two gradation operation modes are available for each group, one is single shot mode (output pattern once) and the other is continuous mode (output pattern repeat). Each channel can be set to either gradation mode or normal mode and assigned to any one of these four gradation control groups.

This device has a built-in open, short load and overtemperature detection circuitry. The error information from the corresponding register can be read via the I²C-bus. Additionally, a thermal shutdown feature protects the device when an internal junction temperature exceeds the limit allowed for the process.

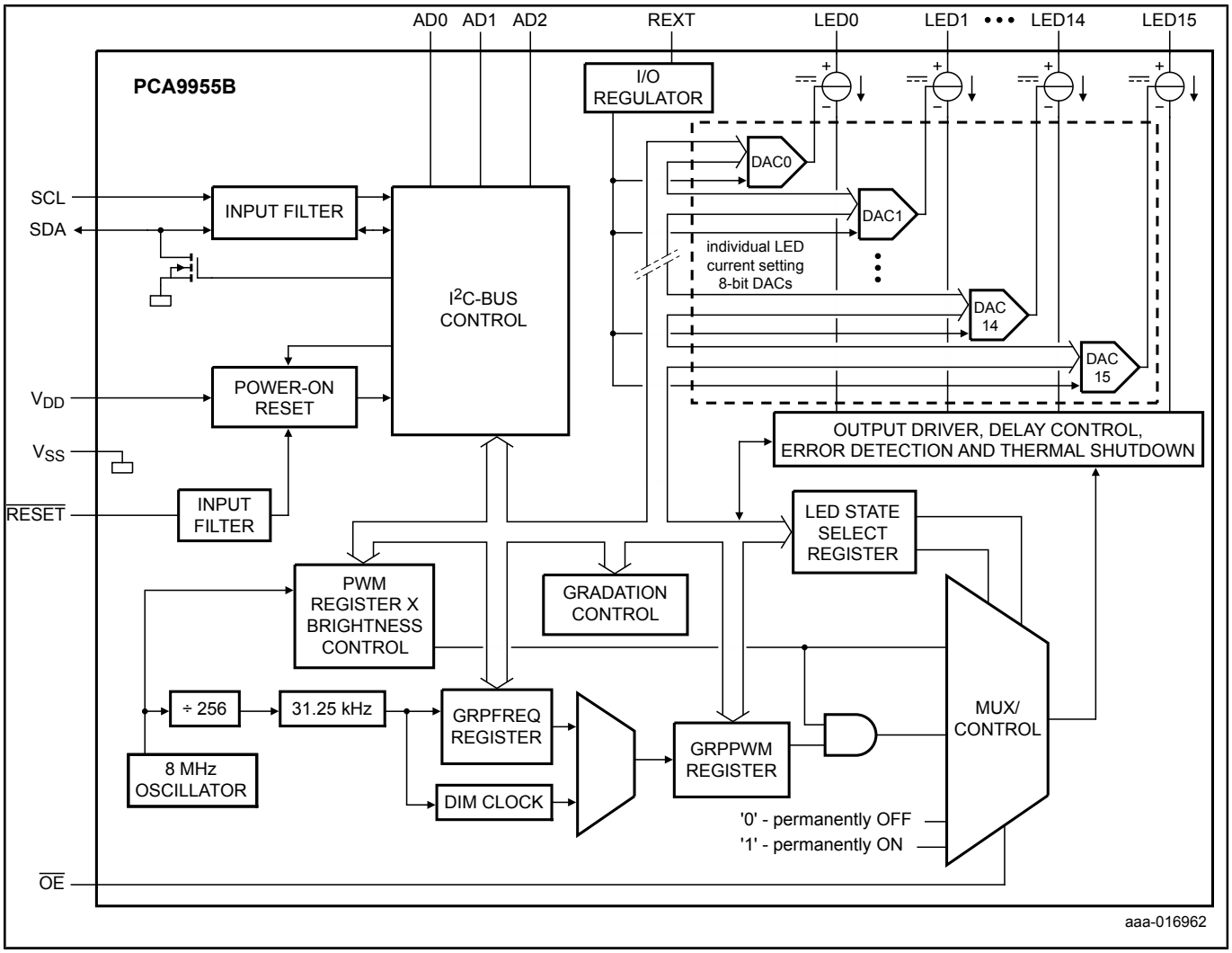
The PCA9955B device has a Fast-mode Plus (Fm+) I²C-bus interface. Fm+ devices offer higher frequency (up to 1 MHz) or more densely populated bus operation (up to 4000 pF).

The active LOW output enables input pin (OE) blinks all the LED outputs and can be used to externally PWM the outputs, which is useful when multiple devices need to be dimmed or blinked together without using software control.

Software programmable LED Group and three Sub Call I²C-bus addresses allow all or defined groups of PCA9955B devices to respond to a common I²C-bus address, allowing, for example, all red LEDs to be turned on or off at the same time or marquee chasing effect, thus minimizing I²C-bus commands. On power-up, PCA9955B has a unique Sub Call address to identify it as a 16-channel LED driver. This unique address allows mixing of devices with different channel widths. Three hardware address pins on PCA9955B allow up to 125 devices on the same bus.

The Software Reset (SWRST) function allows the controller to perform a reset of the PCA9955B through the I²C-bus, identical to the Power-On Reset (POR) that initializes the registers to their default state causing the output current switches to be OFF (LED off). This allows an easy and quick way to reconfigure all device registers to the same condition.

**16-Channel Fm+ I²C-Bus 57 MA/20 V Constant-Current LED Driver Block Diagram**



View additional information for 16-Channel Fm+ I²C-Bus 57 MA/20 V Constant-Current LED Driver.

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