

STLED325

Advanced LED front-panel controller with standby power management and real-time clock (RTC)



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The STLED325 provides a cost-efficient and simplified design for LED front panels. It integrates the controller and driver functions in a single chip, so freeing the host of front panel activities.

The STLED325 provides standby power management for the host to meet the stringent Blue Angel and Energy Star low-power requirements. The device combines a constant-current LED driver with a real-time clock (RTC) and key-scan with a simple I²C serial interface to the main MCU.

The STLED325 reduces the number of peripheral components and is a suitable solution with a limited number of I/Os and simple PCB routing.

Key features

- Drives 32 outputs (4 grids and 8 segments)
- Additional 8 discrete LEDs (through 5th grid)
- Provides standby power management to host
- Integrates a low-power and accurate RTC
- Internal remote control (RC) decoding for common RC protocols (Philips, Thomson, NEC and R-STEP)
- Drive capability of up to 40 mA per output
- Continuous key-scanning up to 16 keys
- I²C serial interface eases software implementation
- 16-step dimming capability for each digit
- Uniform brightness over the entire panel
- Wake-up from several sources (RC, RTC, keys, pins)
- Interrupt output to main CPU eliminates the need for CPU to poll the device continuously
- Additional 2 GPIOs for other front-panel functions
- Integrated watchdog timers
- Minimizes the peripheral component count
- Available in easy-to-mount QFN-32 (0.5 mm pitch)

Main applications

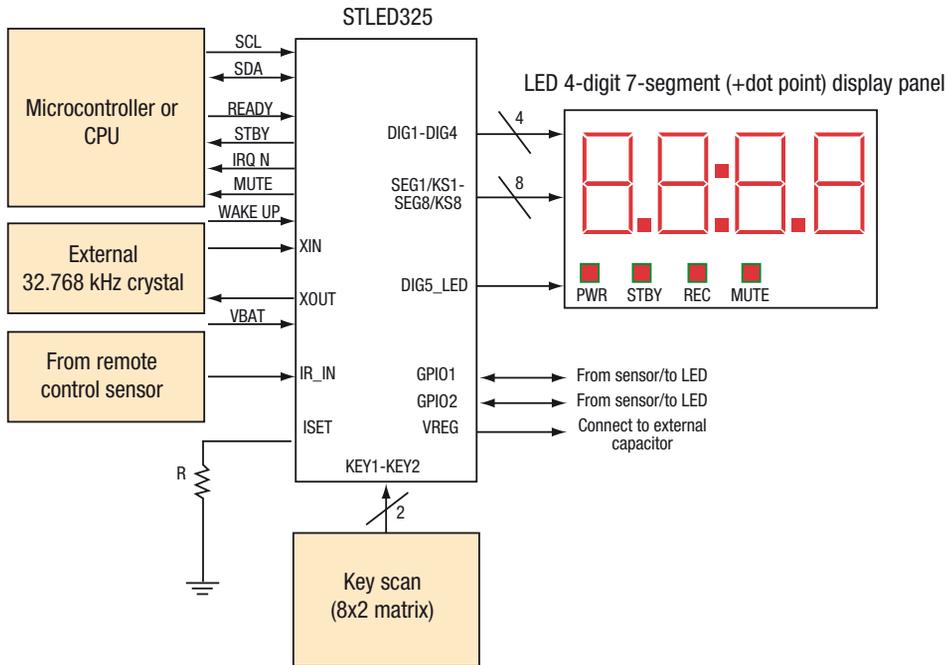
- DVD recorders
- Blu-ray players
- Set-top boxes (IP-STB, digital STB)
- Home appliances
- Home multimedia

A typical front panel consists of a keypad, a LED display panel and various discrete LEDs. The most popular solution today is to control the front-panel activities through a sub-MCU with crystal and Darlington array ICs to drive the LEDs with standard CMOS logic ICs. This solution increases the total BOM cost and complicates the PCB routing compared to the STLED325 solution. The sub-MCU is used to manage the standby power and the remote control decoding, whereas the real-time clock function is performed by a timer in the sub-MCU or main CPU based on information relayed by the broadcaster.

The STLED325 is a common-anode LED driver capable of driving red, green or blue LEDs directly. It is designed to work with a limited number of peripheral components, reducing the total BOM cost.

During device power-up, or when the device has not been configured or is idling, the STLED325 is in standby mode, during which the IC typically consumes below 1 mA. The main CPU provides configuration and display data directly to the STLED325 via a serial I²C interface.

Application diagram using STLED325



The main advantage of the STLED325 is that it integrates the key functions for standby power management with a mute function to eliminate pop sound, a real-time clock and remote-control decoding with analog drivers, thus simplifying the front panel design and saving costs. The STLED325 power management ensures low system power below 0.1 W during standby so the customer achieves Blue Angel or Energy Star compliance for the end product.

For most standard LED front panels, a single STLED325 is sufficient, as it can drive up to 4 digits and 8 segments (7 segments + 1 decimal point). In addition to driving 4 digits and 8 segments, the STLED325 also drives up to eight independent discrete LEDs through a single additional digital output pin. These discrete LEDs are frequently used as indicators, for example, for standby mode (red LED) and power-on mode (green or amber LED).

Another advantage of the STLED325 over an MCU is its current-driving capability. It is able to drive up to 40 mA constant-current per output segment. The constant output current with a typical 5% segment current matching ensures uniform brightness of the display irrespective of the manufacturing, aging and temperature variations of LEDs. The maximum current can be easily set through one external resistor. This feature is useful to ensure that the maximum current specifications for the LEDs are not exceeded. Furthermore, the STLED325 allows the designer to adjust the brightness of LEDs by means of the software control using the PWM method.

The STLED325 includes an 8 x 2 key-scan matrix such that a maximum of 16 keys can be scanned automatically and continuously. Multiple key presses can be recognized by the device. Whenever a key is pressed, it is detected and its corresponding data is latched into the key-data memory block. An IRQ (interrupt request) signal is then asserted to inform the main CPU of any front-panel events. The main CPU then takes the necessary action by instructing the STLED325 through the I²C command. This feature allows the CPU to go into sleep mode while the STLED325 continuously detects any key-press at low current consumption.

Features	STLED316S	STLED325
Number of keys	16	16
Package	SO-24	QFN-32
Number of digits/segments	6 digits/8 segments	4 digits/8 segments
Number of discrete LEDs	8	8
Interrupt output	Yes	Yes
Brightness control	Both analog and digital	Both analog and digital
Remote-control protocols	None	Philips, Thomson, NEC, R-STEP
Interface to host	Serial SPI	Serial I ² C
Wake-up	None	Pin, RTC, RC, keys
Reset function	Hardware and POR	Hardware and POR
External crystal	None	Needs 32.768 kHz crystal for RTC
Battery	None	External back-up battery or super-cap
Number of wake-up keys	None	All keys or desired number
RC device address	None	Multiple (up to 8)
GPIO pins	None	Two for additional functions
Main advantages	Low-cost LED driver	Full-function LED driver for standby power management



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