SKYWORKS

AAT2403B

Sixteen-Channel White LED Driver Solution with Full LED Current and Timing Control

General Description

The AAT2403B is a highly integrated, high efficiency white LED backlight solution for large size LCD panels used in LCD TVs. The device operates from a wide 10.8V to 28V DC power supply. 16 precision current sinks provide constant current drive for up to 160 white LEDs. A wide range of series LEDs is possible because the current sinks can withstand 35V.

A SPI compatible interface operates up to 30MHz, allowing fast, independent digital control of each current sink. Full scale LED current is programmed from 20mA to 150mA using an external resistor. LED brightness variation is compensated by setting relative current sink magnitudes with an 8-bit resolution dot correction register for each LED current sink.

The AAT2403B provides a 12-bit resolution phase delay per LED current sink that can be used to synchronize the LEDs to V_{SYNC}. Device addressing provides for up to 256 LED strings.

A 12-bit resolution grayscale PWM brightness setting is generated via a clock from a PLL synchronized to V_{SYNC} or from the external VSYNC and GSCLK pins.

The AAT2403B provides fault handling and fault reporting through the interface. If diodes are shorted on one or more strings, the current sinks will maintain operation due to the high voltage rating of the outputs, however a fault condition will be reported on the open drain Fault pin. Similarly, if an open is detected or an over temperature condition arises, the fault is reported on the Fault pin. When a fault is reported, the nature of the fault condition can be read through the serial interface.

The LED power voltage may be regulated by using the CSFBO (current sense feedback output) signal as feedback for the LED voltage regulator. This analog signal represents the highest V_F string of LEDs. A CSFBI (current sense feedback input) signal allows for daisy chaining of multiple AAT2403B ICs.

The 3D feedback function extends the dynamic range of the feedback system by changing the V_{REG} input voltage on the AAT2410 with respect to the dropout voltage for a specific DOT setting, and the dropout/CSFBO voltage is optimized internally as DOT is changed.

Thermal protection circuitry shuts down the device in the event of an over-temperature condition.

The AAT2403B is available in the Pb-free, thermally enhanced 48-pin 7mm x 7mm TQFN package.

Features

- V_{IN} Range: 10.8V – 28V
- 16 LED Current Sinks up to 150mA/ch
  - ±1.5% Accuracy @ 25°C (61mA)
  - ±2.0% Matching @ 25°C (61mA)
- SPI Interface
  - Digitally Programmable Individual Channels
  - Up to 30MHz Clock Speed
  - Read/Write Registers
- High Resolution Digital Control for Individual Channels
  - 12-Bit Resolution Grayscale PWM Brightness
  - 12-Bit Resolution Phase Delay
  - 8-Bit Resolution Current Setting (Dot Correction)
- V_{SYNC} Derived Internal Oscillator
- V_{SYNC} PWM and Delay Synchronization
- Device Addressing
  - 16 Possible Address Settings
  - Up to 256 Current Sinks
- Integrated Fault Protection
  - Open/Short LED(s)
  - Over-Voltage Protection
  - Over-Temperature Protection
- S/W Reset Fault Indicator
- 3D Feedback Function
- TQFN77-48 Low Profile Package
- -40°C to +85°C Temperature Range

Applications

- 2D/3D Capable LCD TVs, Panels
- Large Size LCD TVs, Panels
- White LED Backlight

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Ordering Information

Package	Marking[1]	Part Number (Tape and Reel)[2]
TQFN77-48	N9XYY	**AAT2403BISZ-T1**

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

Package Information[3]

TQFN77-48

Dimension Table (Unit: mm or degree)

Symbol	Min	Max
A	0.70	0.80
A1	0.00	0.05
A2	0.203 Ref	
b	0.18	0.28
D	6.95	7.05
D1	5.25	5.35
E	6.95	7.05
E1	5.25	5.35
e	0.50 BSC	
L	0.35	0.45

TQFN77-48L
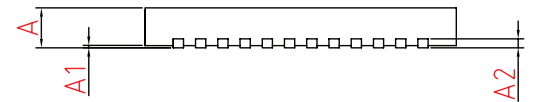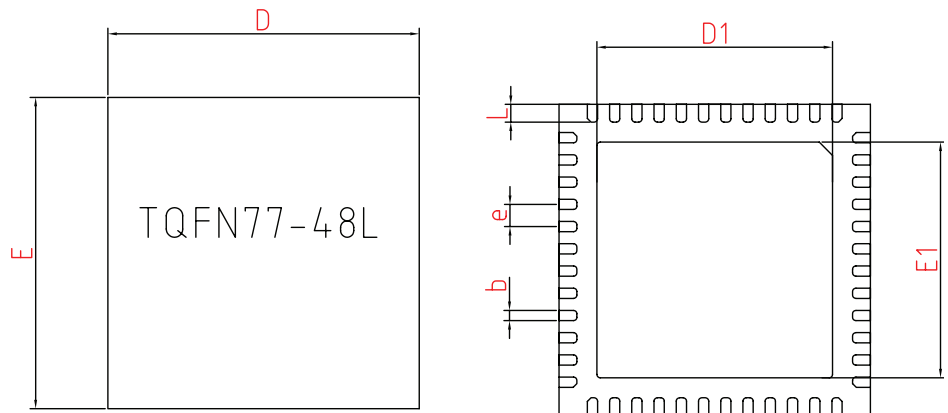
All dimensions in millimeters.

1. XYY = assembly and date code.
2. Sample stock is generally held on part numbers listed in **BOLD**.
3. The leadless package family, which includes QFN, TQFN, DFN, TDFN, and STDFN, has exposed copper (unplated) at the end of the lead terminals due to the manufacturing rocess. A solder fillet at the exposed copper edge cannot be guaranteed and is not required to ensure a proper bottom solder connection.

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