

***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  $V_{\text{SYNC}}$ . 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  $V_{\text{SYNC}}$  or from the external VSYNC and GCLK 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  $V_{\text{REG}}$  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

- $V_{\text{IN}}$  Range: 10.8V – 28V
- 16 LED Current Sinks up to 150mA/ch
  - $\pm 1.5\%$  Accuracy @ 25°C (61mA)
  - $\pm 2.0\%$  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)
- $V_{\text{SYNC}}$  Derived Internal Oscillator
- $V_{\text{SYNC}}$  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

# AAT2403B

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

## Ordering Information

Package	Marking <sup>1</sup>	Part Number (Tape and Reel) <sup>2</sup>
TQFN77-48	N9XYY	<b>AAT2403BISZ-T1</b>



Skyworks Green™ products are compliant with all applicable legislation and are halogen-free.

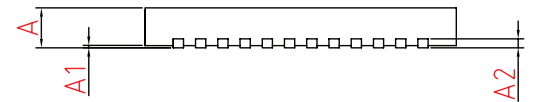
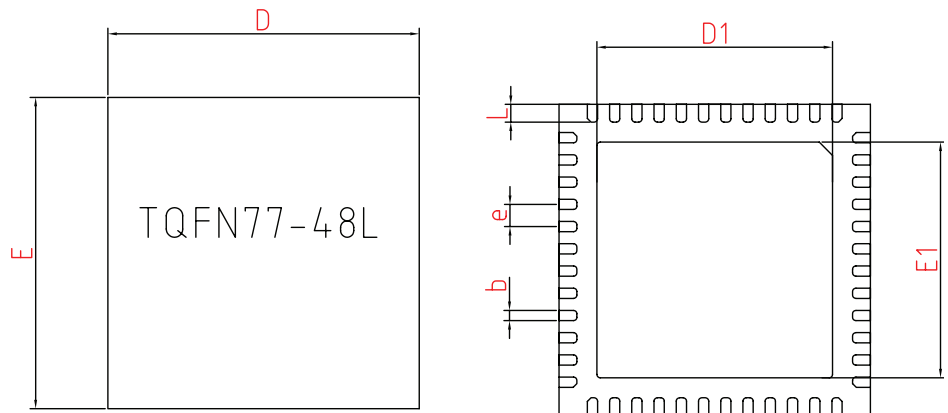
For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

## Package Information<sup>3</sup>

### 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



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 process. A solder fillet at the exposed copper edge cannot be guaranteed and is not required to ensure a proper bottom solder connection.

# AAT2403B

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

Copyright © 2012 Skyworks Solutions, Inc. All Rights Reserved.

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products or services. These materials, including the information contained herein, are provided by Skyworks as a service to its customers and may be used for informational purposes only by the customer. Skyworks assumes no responsibility for errors or omissions in these materials or the information contained herein. Skyworks may change its documentation, products, services, specifications or product descriptions at any time, without notice. Skyworks makes no commitment to update the materials or information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from any future changes.

No license, whether express, implied, by estoppel or otherwise, is granted to any intellectual property rights by this document. Skyworks assumes no liability for any materials, products or information provided hereunder, including the sale, distribution, reproduction or use of Skyworks products, information or materials, except as may be provided in Skyworks Terms and Conditions of Sale.

THE MATERIALS, PRODUCTS AND INFORMATION ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, WHETHER EXPRESS, IMPLIED, STATUTORY, OR OTHERWISE, INCLUDING FITNESS FOR A PARTICULAR PURPOSE OR USE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT; ALL SUCH WARRANTIES ARE HEREBY EXPRESSLY DISCLAIMED. SKYWORKS DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY DAMAGES, INCLUDING BUT NOT LIMITED TO ANY SPECIAL, INDIRECT, INCIDENTAL, STATUTORY, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THE MATERIALS OR INFORMATION, WHETHER OR NOT THE RECIPIENT OF MATERIALS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Skyworks products are not intended for use in medical, lifesaving or life-sustaining applications, or other equipment in which the failure of the Skyworks products could lead to personal injury, death, physical or environmental damage. Skyworks customers using or selling Skyworks products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

Customers are responsible for their products and applications using Skyworks products, which may deviate from published specifications as a result of design defects, errors, or operation of products outside of published parameters or design specifications. Customers should include design and operating safeguards to minimize these and other risks. Skyworks assumes no liability for applications assistance, customer product design, or damage to any equipment resulting from the use of Skyworks products outside of stated published specifications or parameters.

Skyworks, the Skyworks symbol, and "Breakthrough Simplicity" are trademarks or registered trademarks of Skyworks Solutions, Inc., in the United States and other countries. Third-party brands and names are for identification purposes only, and are the property of their respective owners. Additional information, including relevant terms and conditions, posted at [www.skyworksinc.com](http://www.skyworksinc.com), are incorporated by reference.