

Six-Channel White LED Driver for LCD TV Edge Lighting

General Description

The AAT2405 is a highly integrated, high efficiency white LED backlight solution for large size LCD panels used in LCD TVs. This device operates from a wide 10.8V to 28V DC power source, making it ideal for operation with common 12V to 24V AC-DC power supplies used in LCD TV panels.

By controlling external power MOSFETs (such as the Skyworks' AAT2490 high-voltage TrenchDMOS array), the AAT2405 facilitates 6 current sink channels to provide precision constant-current drive for strings of white LEDs, where the number of series-connected LEDs per string is only limited by the system LED voltage supply. Current in each backlight string and string-to-string matching is controlled using I-Precise™ sensing and control circuitry, a novel on-chip method to accurately control drain current in external discrete power MOSFETs independent of their construction and without the need for precision sense resistors.

LED string dimming is achieved by applying an external PWM signal to the AAT2405's PWMIN input pin. An internal clock and programmable phase delay function allow accurate PWM phase adjustment to each current sink or selectable banks of current sinks. The AAT2405 has signal feed through function outputs for PWM dimming and the internal clock signals allow cascaded AAT2405 devices to successively synchronize for both channel phase and timing. The AAT2405's constant current sinks may be set for phase delays individually or in banks of 2 or 3 LED strings.

The AAT2405 provides a current sense feedback input and output feed through function so the LED string voltage level can be fed back to an external high voltage boost converter. This function permits as many AAT2405s as needed to be cascaded from a single power source. An additional ICSFB output enables accurate feedback using generic SMPS converters.

An IC enable pin is provided as a master LED on/off function that may be toggled by an external system controller.

The AAT2405 provides an active low fault output. If an LED short or open circuit is detected or if an over-temperature condition arises, the fault is reported on the $\overline{\text{FAULT}}$ pin. Thermal protection circuitry shuts down the current sinks in the event of an over-temperature condition.

The AAT2405 is available in the Pb-free 44 pin 10x10mm E-LQFP package with exposed pad.

Features

- V_{IN} Range: 10.8V – 28V
- 6 LED Current Sinks up to 250mA/ch
 - $\pm 1.5\%$ Accuracy @ 25°C (100mA)
 - $\pm 1.5\%$ Matching @ 25°C (100mA)
- Maximum LED Current Set Resistor
- Linear Current Sink Calibration Input
- External PWM Dimming
 - PWM Input Defined Period
- 50Hz to 20kHz PWM Input Frequency Range
- Wide PWM Dimming Range
- Cascade Multiple ICs:
 - PWM Signal Feed Through: PWMIN / PWMOUT
 - Chip to Chip Phase Delay Tracking
 - PWM Clock SYNC Function
 - Regulated Sink Voltage Feedback: CSFBI / CSFBO
- Programmable PWM Phase Delay
 - 0° to 180° User Set by Resistor
 - Typical $\pm 10\%$ Accuracy
- IC/LED On/Off Enable
- Integrated Fault Detection
 - Open LED (<0.3V)
 - Short Circuit LED (>6V)
 - Over-Temperature Protection
- Soft-Start to Minimize Inrush Current
- 44 Pin E-LQFP10 Package
- -40°C to +85°C Temperature Range

Applications

- Converting LCD TV CCFL to LED Backlighting
- Large Size LCD TV Panels
- LCD Monitors
- Multiple String White LED Drive Applications
- White LED Backlighting

AAT2405

Six-Channel White LED Driver for LCD TV Edge Lighting

Ordering Information

Package	Marking ¹	Part Number (Tray) ²
E-LQFP10-44	XXYY 2405	AAT2405ISF-P1



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



For additional information, refer to *Skyworks*

Definition of Green™, document number

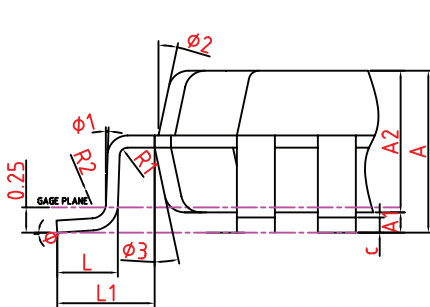
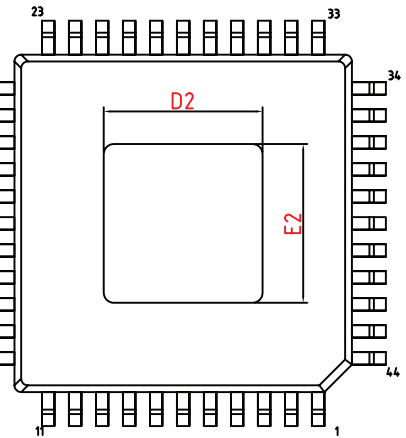
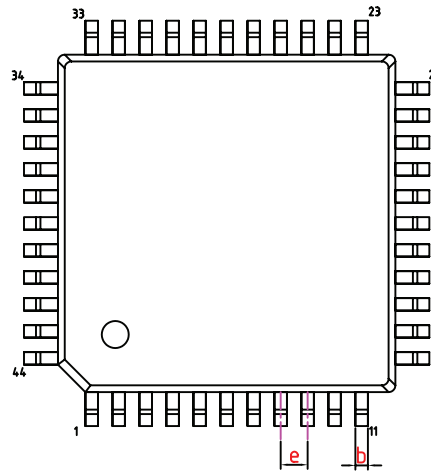
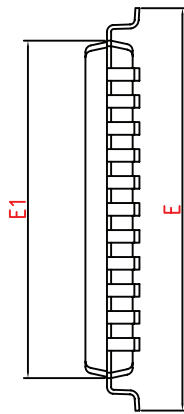
SQ04-0074.

Package Information

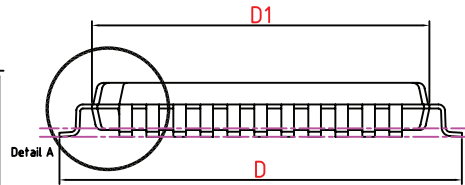
E-LQFP10-44

Dimension Table (Unit: mm or degree)

Symbol	Min	Max
A	-	1.60
A1	0.05	0.15
A2	1.35	1.45
b	0.30	0.45
c	0.09	0.20
D	11.90	12.10
D1	9.90	10.10
D2	4.51	4.91
E	11.90	12.10
E1	9.90	10.10
E2	4.51	4.91
e	0.80 BSC	
L	0.45	0.75
L1	1.00 BSC	
R1	0.08	-
R2	0.08	0.20
φ	0°	7°
φ1	0°	-
φ2	11°	13°
φ3	11°	13°



Detail A



All dimensions in millimeters.

1. XXYY = assembly and date code.

2. Sample stock is generally held on part numbers listed in **BOLD**.

AAT2405

Six-Channel White LED Driver for LCD TV Edge Lighting

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, are incorporated by reference.