

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

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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.

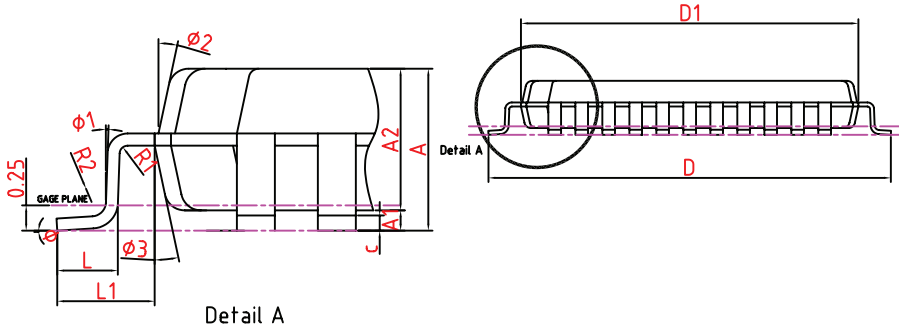
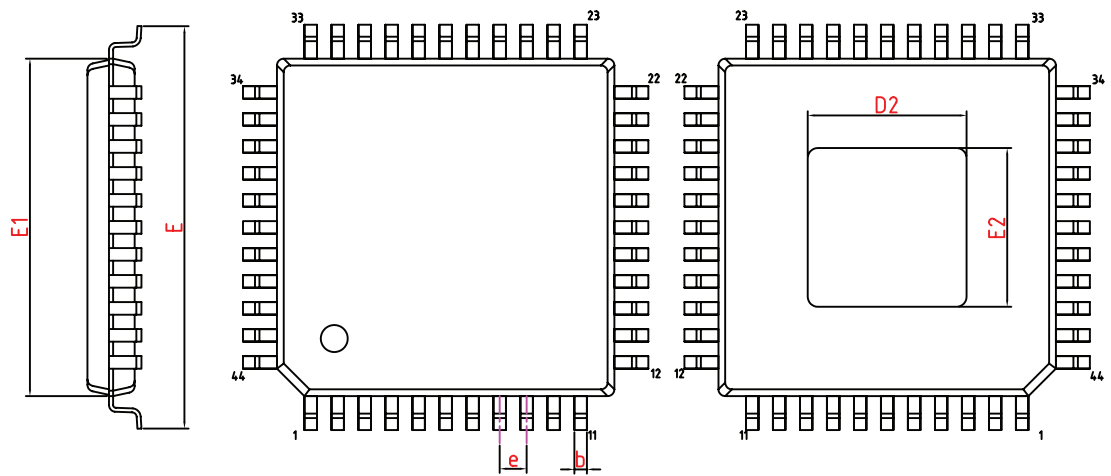
For additional information, refer to *Skyworks Definition of Green™*, document number SQ04-0074.

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° |



All dimensions in millimeters.

1. XXYY = assembly and date code.
2. Sample stock is generally held on part numbers listed in **BOLD**.

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