

32-Channel Internal Current Sink LED Backlighting Driver

General Description

The iW7039 is a 32-channel, internal current sink, high precision, LED backlighting driver for high dynamic range (HDR) LCD TVs, monitors and notebook displays. The device combines adaptive DC/DC feedback control with Dialog's **BroadLED™** digital adaptive switch mode technology to enable best system efficiency and thermal performance.

The iW7039 integrates the ability to use either analog or digital dimming methods in one device. With a 10-bit/11-bit global or individual channel analog dimming and 12-bit PWM digital dimming, the device improved contrast ratio in HDR displays. The current sinks can drive up to 66mA per channel and have very tightly controlled current accuracy.

A full array of protection circuits are integrated, including built-in LED open/short detection, over temperature protection and protection during both start-up and normal operation.

Key Features

- 32 channel LED driver, pin map compatible with 16 channel iW7038
 - Internal Current sink
- Support 12V or 5V Single power supply
- 65V max. LED pin rating
- 66mA x 100% duty x 32ch output current, support channel grouping.
- 12-bit PWM dimming.
- 10-bit global and independent analog dimming (I-dimming), optional 66mA/44mA/22mA full range.
- Head mode with optional off time control.
- Optional 350/650/950/1600ns PWM output slew rate.
- Optional 0.5ms to 10ms (0.5ms per step), LED current rising and falling slop control in analog dimming.
- 44Hz to 32KHz V_{SYNC} input, 44Hz to 64KHz PWM output.
- 9-bit adaptive external DC/DC feedback control
- 3 PWM-generator clock options
 - External H_{SYNC} (up to 26MHz)
 - APLL (15MHz to 26.6MHz)
 - DPLL (10MHz), support gaming monitor VRR (Variable Refresh Rate)
- 26.6MHz Max SPI with Daisy chain
- Programmable LED open/short detection threshold and protection
- Programmable over temperature protection
- Optional Key registers write protection with password
- Optional data packet CRC/CHECKSUM for noisy SPI
- Fault interrupt output (open drain, need external pull up)
- -20 to +85°C operating ambient temperature range
- 145°C max. operating junction temperature
- Package: 7mm x 7mm QFN48-EP package

Applications

- TV
- Monitor
- Notebook

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Pinout

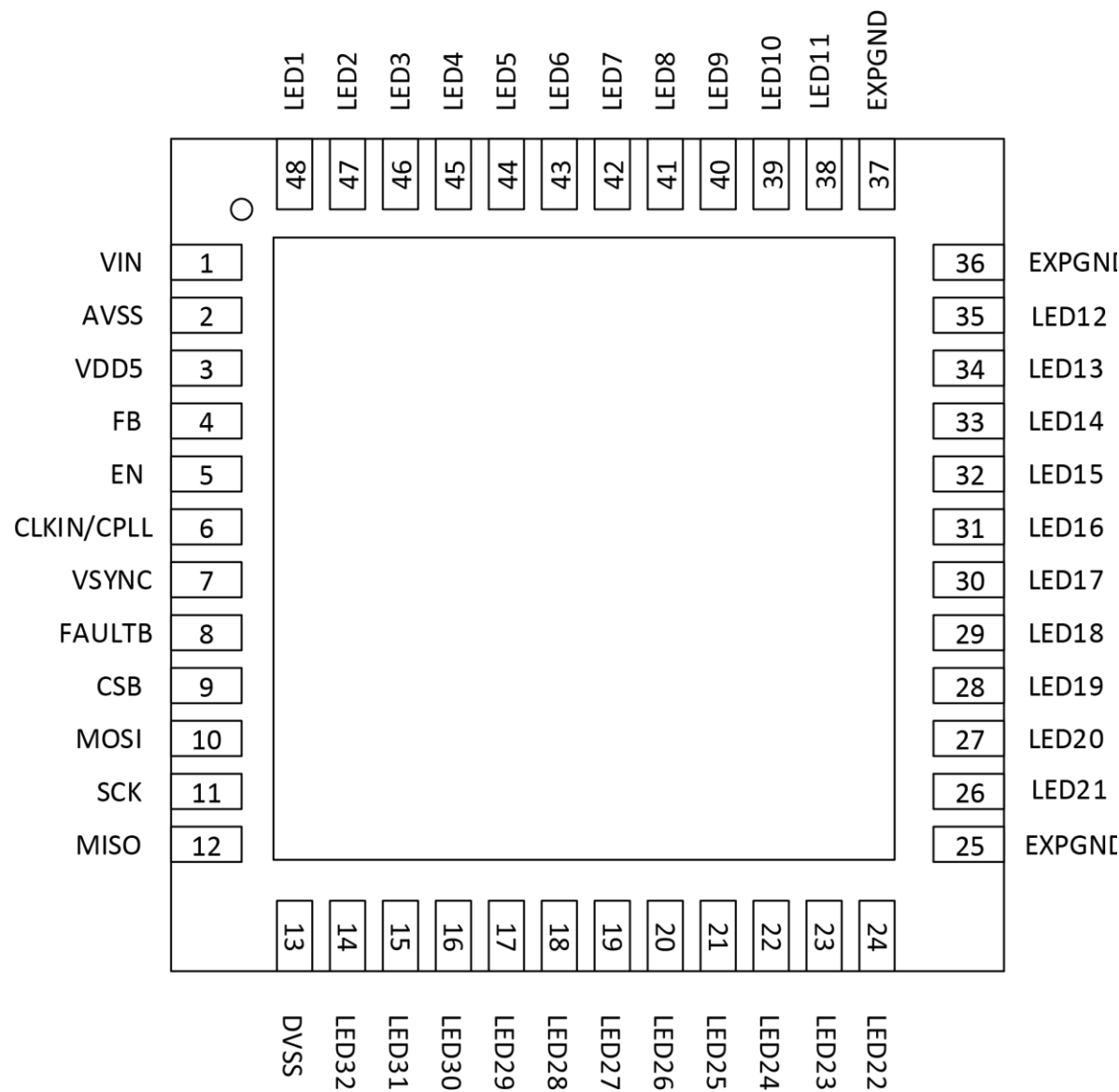


Figure 1.1: Connection Diagram

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Table 1: Pin Description

| Pin # | Pin Name | Type (Table 2) | Description | If not use |
|-------|-------------|----------------|---|-------------|
| 1 | VIN | AI | Power supply. Connect 4.7μF capacitor to GND. | |
| 2 | AVSS | GND | GND. | |
| 3 | VDD5 | AIO | LDO output, connect 4.7μF capacitor to GND. | |
| 4 | FB | AO | Power supply feedback pin. | Leave open. |
| 5 | EN | DI | Chip enable pin. | |
| 6 | CLKIN/CPL L | DI/AI | H _{SYNC} signal input or connect PLL RC compensation circuit. | Leave open. |
| 7 | VSYNC | DI_PD | Frame synchronize signal input with internal programable filter, both high and low should be hold longer than 10μs. | |
| 8 | FAULTB | DO_OD | Fault status output, connect a 100K resistor to external pull up. | Leave open. |
| 9 | CSB | DI_PU | SPI interface chip select. | |
| 10 | MOSI | DI_PD | SPI interface data input. | |
| 11 | SCK | DI_PD | SPI interface clock. | |
| 12 | MISO | DO | SPI interface data output. | Leave open. |
| 13 | DVSS | GND | GND. | |
| 14 | LED32 | AI | Connect to the cathode of the LED string. | Leave open. |
| 15 | LED31 | AI | Connect to the cathode of the LED string. | Leave open. |
| 16 | LED30 | AI | Connect to the cathode of the LED string. | Leave open. |
| 17 | LED29 | AI | Connect to the cathode of the LED string. | Leave open. |
| 18 | LED28 | AI | Connect to the cathode of the LED string. | Leave open. |
| 19 | LED27 | AI | Connect to the cathode of the LED string. | Leave open. |
| 20 | LED26 | AI | Connect to the cathode of the LED string. | Leave open. |
| 21 | LED25 | AI | Connect to the cathode of the LED string. | Leave open. |
| 22 | LED24 | AI | Connect to the cathode of the LED string. | Leave open. |
| 23 | LED23 | AI | Connect to the cathode of the LED string. | Leave open. |
| 24 | LED22 | AI | Connect to the cathode of the LED string. | Leave open. |
| 25 | EXPGND | GND | GND. | |

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| 26 | LED21 | AI | Connect to the cathode of the LED string. | Leave open. |
|-------|----------|----------------|---|-------------|
| 27 | LED20 | AI | Connect to the cathode of the LED string. | Leave open. |
| 28 | LED19 | AI | Connect to the cathode of the LED string. | Leave open. |
| 29 | LED18 | AI | Connect to the cathode of the LED string. | Leave open. |
| 30 | LED17 | AI | Connect to the cathode of the LED string. | Leave open. |
| 31 | LED16 | AI | Connect to the cathode of the LED string. | Leave open. |
| 32 | LED15 | AI | Connect to the cathode of the LED string. | Leave open. |
| 33 | LED14 | AI | Connect to the cathode of the LED string. | Leave open. |
| 34 | LED13 | AI | Connect to the cathode of the LED string. | Leave open. |
| 35 | LED12 | AI | Connect to the cathode of the LED string. | Leave open. |
| Pin # | Pin Name | Type (Table 2) | Description | If not use |
| 36 | EXPGND | GND | GND. | |
| 37 | EXPGND | GND | GND. | |
| 38 | LED11 | AI | Connect to the cathode of the LED string. | Leave open. |
| 39 | LED10 | AI | Connect to the cathode of the LED string. | Leave open. |
| 40 | LED9 | AI | Connect to the cathode of the LED string. | Leave open. |
| 41 | LED8 | AI | Connect to the cathode of the LED string. | Leave open. |
| 42 | LED7 | AI | Connect to the cathode of the LED string. | Leave open. |
| 43 | LED6 | AI | Connect to the cathode of the LED string. | Leave open. |
| 44 | LED5 | AI | Connect to the cathode of the LED string. | Leave open. |
| 45 | LED4 | AI | Connect to the cathode of the LED string. | Leave open. |
| 46 | LED3 | AI | Connect to the cathode of the LED string. | Leave open. |
| 47 | LED2 | AI | Connect to the cathode of the LED string. | Leave open. |
| 48 | LED1 | AI | Connect to the cathode of the LED string. | Leave open. |

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Table 2: Pin Type Definition

| Pin type | Description | Pin type | Description |
|----------|-----------------------|----------|-------------------------|
| DI | Digital Input | AI | Analog Input |
| DO | Digital Output | AO | Analog Output |
| DIO | Digital Input/Output | AIO | Analog Input/Output |
| PU | Pull up with resister | PD | Pull down with resister |
| OD | Open Drain | | |
| | | | |

Table 3: Pin Equivalent Circuits

| | |
|----------------------------|--|
| VIN | |
| VDD5 | |
| FB/CPLL | |
| LEDn | |
| EN VSYNC MOSI SCK | |

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| | |
|--------|--|
| CSB | |
| MISO | |
| FaultB | |

1. Absolute Maximum Ratings

Table 4: Absolute Maximum Ratings

| Symbol | Parameter | Min | Max | Unit |
|---|--|-------|-------|------|
| VIN | VIN supply voltage | -0.3 | 20 | V |
| VDD5 | 5V LDO output or input (VIN short to VDD5) | -0.3 | 7 | V |
| LEDn | LEDn pin voltage | -0.3 | 65 | V |
| CSB, SCK, MISO, MOSI, VSYNC, CLKIN/CPLL, EN | Logic I/O | -0.3 | 7 | V |
| ESD level | JEDEC JS-001-2017- HBM | -2000 | +2000 | V |

Note 1 Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other

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conditions beyond those indicated in the operational sections of the specification are not implied.
Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

2. Recommended Operating Conditions

Table 5: Recommended Operating Conditions

| Symbol | Parameter | Min | Typ | Max | Unit |
|-----------------------|---|-----|-----|-----|------|
| VIN | VIN supply voltage | 9 | 12 | 16 | V |
| VDD5 | VDD5 as power supply, VIN pin short to VDD5 pin | 4.5 | | 5.5 | V |
| LEDn | LEDn pin operating voltage rating or maximum LED string voltage | | | 65 | V |
| Operating Temperature | | -20 | | 85 | °C |

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3. Package Information

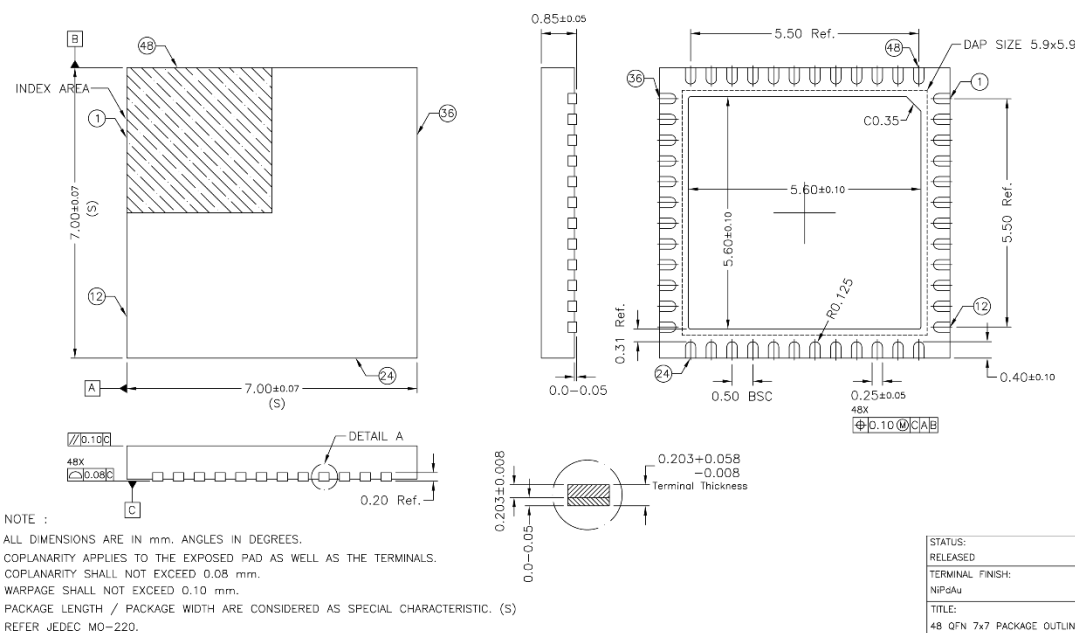


Figure 3.1: 48-Lead 7mm x 7mm QFN Package Outline Drawing

4. Ordering Information

| Part Number | Package | Description |
|----------------|-----------------------------|--------------------------|
| iW7039-00-QFN4 | QFN-7mm x 7mm 48pin with EP | Tape & Reel ¹ |

Note 1 Tape & Reel packing quantity is 4,000/reel. Minimum packing quantity is 4,000.

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Status Definitions

| Revision | Datasheet Status | Product Status | Definition |
|----------|------------------|----------------|--|
| 1.<n> | Target | Development | This datasheet contains the design specifications for product development. Specifications may be changed in any manner without notice. |
| 2.<n> | Preliminary | Qualification | This datasheet contains the specifications and preliminary characterization data for products in pre-production. Specifications may be changed at any time without notice in order to improve the design. |
| 3.<n> | Final | Production | This datasheet contains the final specifications for products in volume production. The specifications may be changed at any time in order to improve the design, manufacturing and supply. Major specification changes are communicated via Customer Product Notifications. Datasheet changes are communicated via www.dialog-semiconductor.com . |
| 4.<n> | Obsolete | Archived | This datasheet contains the specifications for discontinued products. The information is provided for reference only. |

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