

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 or 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

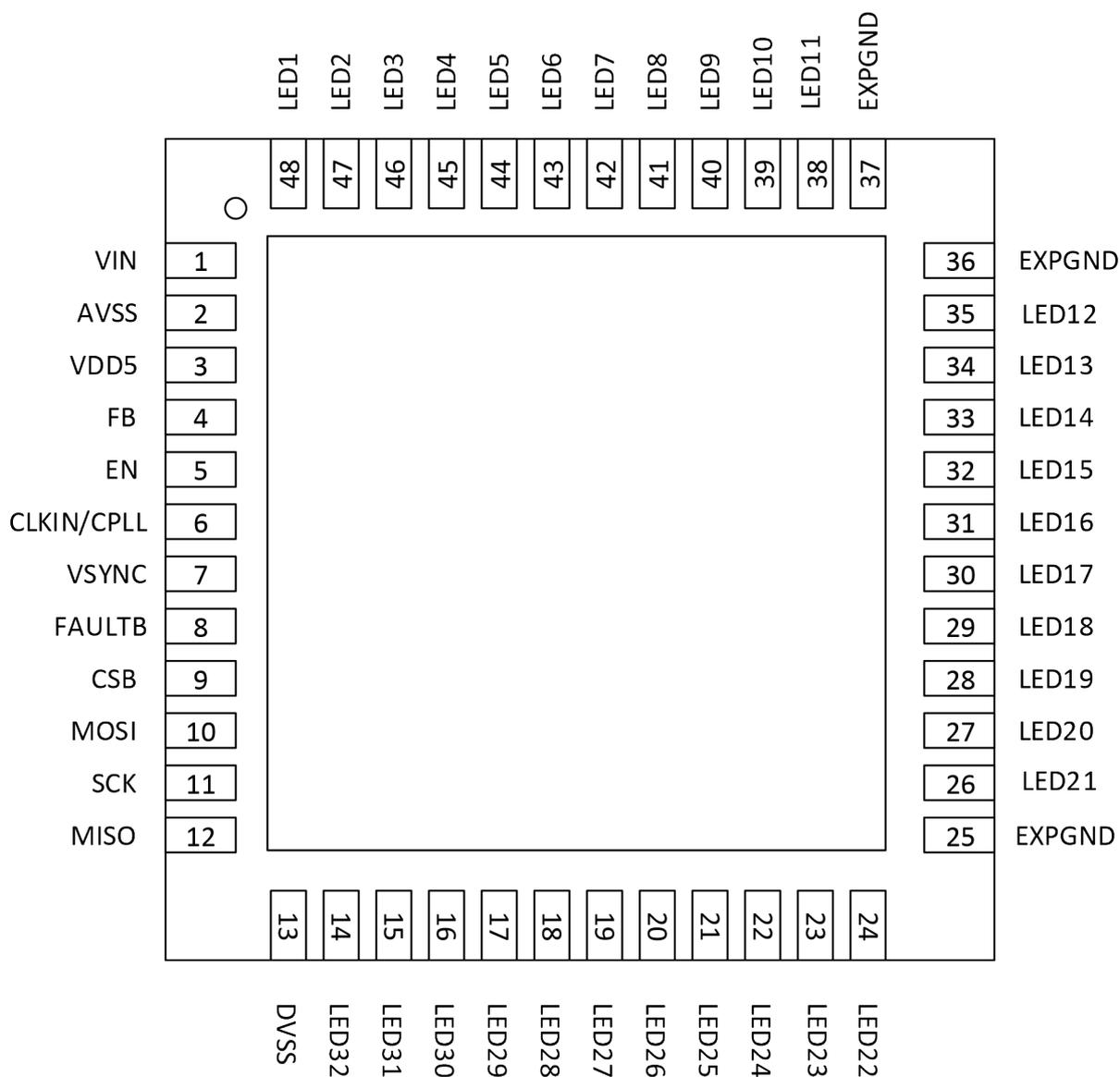


Figure 1.1: Connection Diagram

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Table 1: Pin Description

Pin #	Pin Name	Type (Table 2)	Description	If not use
1	VIN	AI	Power supply. Connect 4.7 μ F capacitor to GND.	
2	AVSS	GND	GND.	
3	VDD5	AIO	LDO output, connect 4.7 μ F capacitor to GND.	
4	FB	AO	Power supply feedback pin.	Leave open.
5	EN	DI	Chip enable pin.	
6	CLKIN/CPLL	DI/AI	H _{SYNC} signal input or connect PLL RC compensation circuit.	Leave open.
7	VSYNC	DI_PD	Frame synchronize signal input with internal programmable filter, both high and low should be hold longer than 10 μ s.	
8	FAULTB	DO_OD	Fault status output, connect a 100K resister 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.	
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.

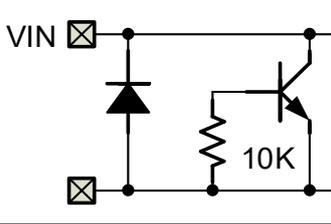
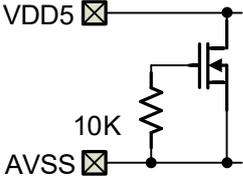
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Pin #	Pin Name	Type (Table 2)	Description	If not use
36	EXPGND	GND	GND.	
37	EXPGND	GND	GND.	
38	LED11	AI	Connect to the cathode of the LED string.	Leave open.
39	LED10	AI	Connect to the cathode of the LED string.	Leave open.
40	LED9	AI	Connect to the 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.

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 resistor	PD	Pull down with resistor
OD	Open Drain		

Table 3: Pin Equivalent Circuits

VIN	
VDD5	

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<p>FB/CPLL</p>	
<p>LEDn</p>	
<p>EN VSYNC MOSI SCK</p>	
<p>CSB</p>	
<p>MISO</p>	
<p>FaultB</p>	

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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 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

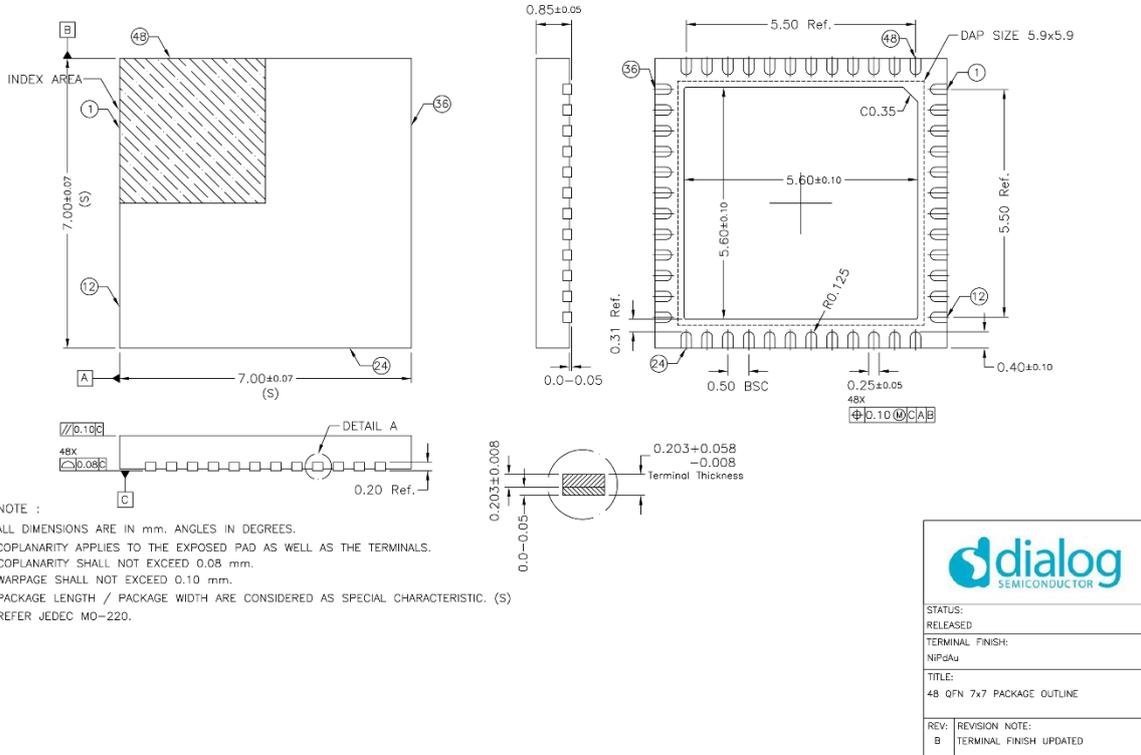


Figure 3.1: 48-Lead 7mm x 7mm QFN Package Outline Drawing

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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