

### GENERAL DESCRIPTION

The XRP6840 is a controlled-current dual-cell supercapacitor charger and high power LED driver. Operating from a standard lithium-ion battery, the XRP6840 provides up to 4.3A of programmable Flash LED current and up to 600mA and 5.6V of programmable supercapacitor charging current and voltage.

The XRP6840EVB2, Exar's XRP6840 Exarizer Evaluation Board, is fitted by default with the XRP6840A supporting three channels.

With 1x, 1.5x and 2x charge pump operating modes, XRP6840EVB can provide a stable drive current for up to 3 1.5A, 4W Luxeon Flash LEDs. The evaluation board is a completely assembled and tested surface mount board which provides easy probe access points to all XRP6840 inputs and outputs for easy connection and measuring.

The XRP6840 is available in a lead-free, "green"/halogen free 20-pin TQFN package.

The Evaluation Board schematic diagram is shown in Figure 1.

### EVALUATION BOARD MANUAL



### FEATURES

- **Programmable 4.3A Flash LED Driver**
  - Torch and Flash Modes
- **Programmable Supercapacitor Charger**
  - 600mA Adjustable Charging Current
  - Programmable Supercapacitor Voltage
  - Active Voltage Balance Control
- **Tri-mode Charge Pump Architecture**
  - 1x, 1.5x, 2x Operation Modes
  - 2.4MHz Switching Frequency
- **I<sup>2</sup>C Serial Interface**

### EVALUATION BOARD SCHEMATIC

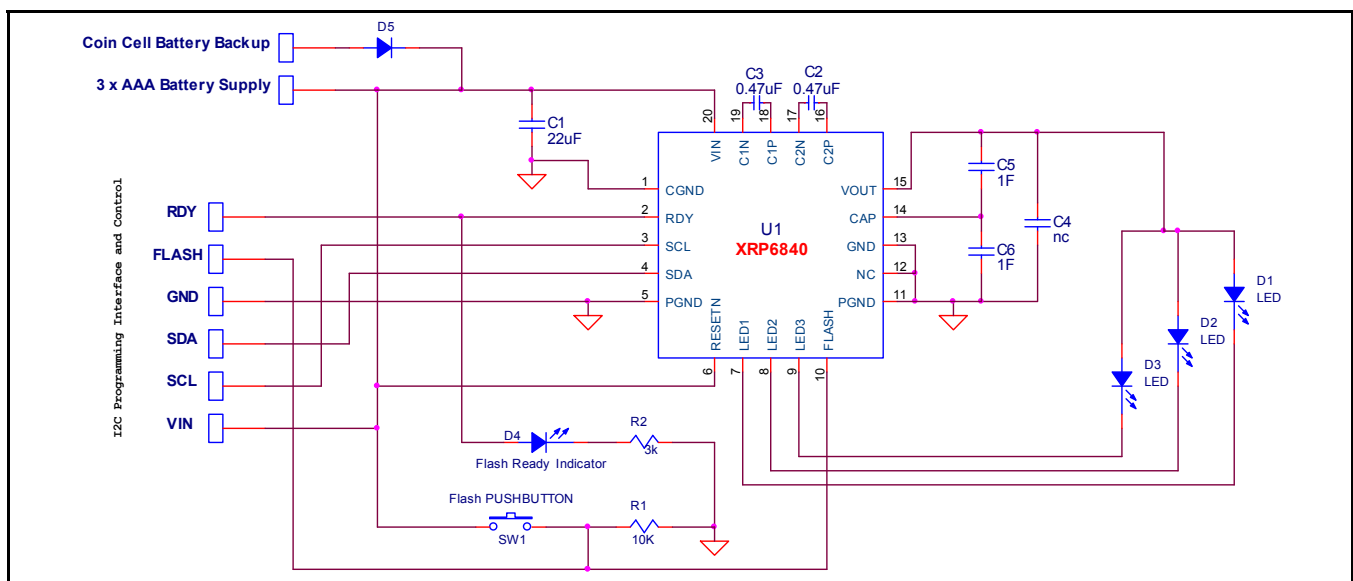


Fig. 1: XRP6840 Exarizer Evaluation Board Schematic

### PIN ASSIGNMENT

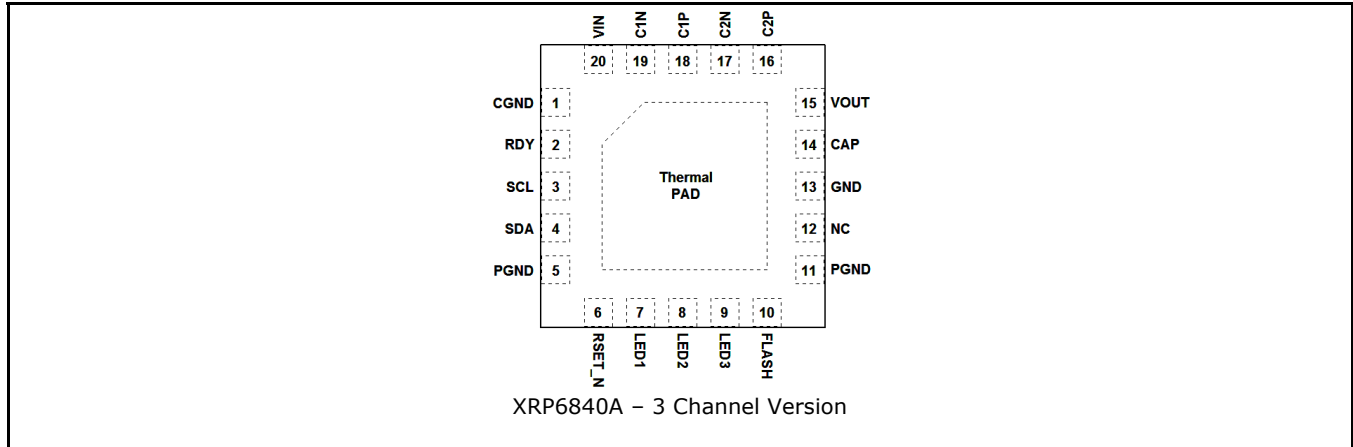


Fig. 2: XRP6840 Pin Assignment

### PIN DESCRIPTION

| Name   | Pin Number | Description  |
|--|------------|--|
| C <sub>GND</sub>   | 1          | Charge pump ground pin.  |
| RDY  | 2          | Active high push-pull output. RDY is high when V <sub>OUT</sub> reached to 100mV below its V <sub>OUT_LIMIT</sub> voltage. The V <sub>OUT_LIMIT</sub> for Flash mode is determined by STATUS2 register [B7 B6 B5]. The V <sub>OUT_LIMIT</sub> for Torch mode is 4.50V.   |
| SCL, SDA   | 3, 4       | The SDA and SCL pins connect to the I <sup>2</sup> C bus. Multiple functions can be programmed through its interface. They can also be used for read-back.   |
| P <sub>GND</sub>   | 5, 11      | Power ground pin. The Source of internal NMOS is connected to this pin.  |
| RESET_N  | 6          | Active Low input pin.<br>If RESET_N = 0, then XRP6840 is in Shut-down mode<br>If RESET_N = 0 and STATUS1 register [B5] = 0, then reset all registers to logic low.<br>If RESET_N = 0 and STATUS1 register [B5] = 1, then all bits of all registers will be saved.  |
| LED <sub>1</sub> , LED <sub>2</sub> , LED <sub>3</sub><br>(XRP6840A) | 7, 8, 9    | LED <sub>1</sub> , LED <sub>2</sub> , LED <sub>3</sub> connect to the drain of the internal NMOS which are current sources for LED current. These current sources are controlled by LEDFLASH or LEDTORCH registers which is programmed through I <sup>2</sup> C to provide the Torch and Flash current for the LEDs. LED <sub>1</sub> , LED <sub>2</sub> , LED <sub>3</sub> pins can be connected together to provide higher LED current. <b>If a pin is not used connect it to V<sub>OUT</sub>.</b> The XRP6840 incorporates a short LED protection circuit which shut-down LED current if LED voltage approaches to V <sub>OUT_LIMIT</sub> . |
| FLASH  | 10         | Digital Input pin. Active high. If STATUS1 register [B7 B6] = 11 and FLASH = 1 then LEDs are ON for one Flash timeout duration. Flash Timeout duration is controlled by STATUS1 register [B1 B0].  |
| NC   | 12         | No connection. This pin can be connected to P <sub>GND</sub> pin for heat sink.  |
| GND  | 13         | Ground pin. This ground pin doesn't carry high internal current.   |
| CAP  | 14         | This pin is the output of an internal Op-Amp which is powered by V <sub>OUT</sub> . The output voltage is half of V <sub>OUT</sub> , output resistance is 470Ω. The sink and source current is limited by 470Ω output resistance. This provides active balancing between two internal sections of the super cap.   |
| V <sub>OUT</sub>   | 15         | Output voltage. Connect positive terminal of SuperCap here. Connect the LEDs between this pin and the corresponding internal current source. Decouple with 10μF ceramic capacitor close to the pins of the IC.   |
| C <sub>2P</sub> , C <sub>2N</sub>                                    | 16, 17     | Connect C <sub>2</sub> external flying capacitor between these pins.   |
| C <sub>1P</sub> , C <sub>1N</sub>                                    | 18, 19     | Connect C <sub>1</sub> external flying capacitor between these pins.   |
| V <sub>IN</sub>  | 20         | Power supply input. Decouple with 10μF ceramic capacitor close to the pins of the IC.  |
| Thermal Pad  | -          | Connect thermal pad to P <sub>GND</sub> pins.  |

### ORDERING INFORMATION

Refer to XRP6840's datasheet and/or [www.exar.com](http://www.exar.com) for exact and up to date ordering information.



**USING THE EVALUATION BOARD**

**POWERING UP THE XRP6840 CIRCUIT**

The XRP6840 Exarizer Evaluation Board can be powered using three standard AAA batteries in series to add up to about 4.5V. The Evaluation board provides cell holders for this purpose. Additionally, a standard lithium coin battery can be used as a supply backup to maintain the XRP6840 programming while AAA batteries are replaced. The board comes with the RESET\_N connected to VIN. The I<sup>2</sup>C can be programmed through SCL, SDA pins at the jumper.

**GETTING STARTED ON XRP6840EVB2**

1. Insert three standard AAA batteries in the two AAA cell holders.
2. Insert a 3V lithium coin battery in the coin cell holder.
3. Connect I<sup>2</sup>C Interface pins: SDA, SCL, and GND.
4. Program Torch or Flash Mode and the desired operating current through I<sup>2</sup>C.
5. For Flash Mode, the push button can be used to power LEDs after each Flash Duration Timeout.

The I<sup>2</sup>C Interface and the available Registers are described in XRP6840 datasheet in detail. The datasheet also explains the procedure for programming the registers in the different operating modes.

**PROGRAMMING EXAMPLE**

**XRP6840 4.3A Flash Configuration**

By default the XRP6840EVB Exarizer is configured as following:

Address: 0x28  
 Status1: E0  
 Status2: 00  
 LEDFLASH: FC  
 LEDTORCH: 02

**XRP6840 Configuration Tool** Revision 1.0

|                                       |                      |          |
|---------------------------------------|----------------------|----------|
| Device Selection                      | XRP6840A             |          |
| Number of Channels                    | 3                    | Channels |
| Flash/Torch Mode and Gain             | Auto Gain Flash Mode |          |
| Shut Down Control                     | Config Saved         |          |
| Flash Maximum Duration                | 110                  | ms       |
| Flash Mode Voltage Programming        | 4.55                 | V        |
| Flash Output Current per Channel      | 1445                 | mA       |
| Torch Mode Output Current per Channel | 23                   | mA       |

|                       |       |  |
|-----------------------|-------|--|
| Flash/Torch Selection | Flash |  |
| LED 1                 | ON    |  |
| LED 2                 | ON    |  |
| LED 3                 | ON    |  |

| XRP6840 Registers | Hexadecimal | Binary    |          |
|-------------------|-------------|-----------|----------|
| Address           | 28          | 0101 000X | (7 bits) |
| STATUS1           | E0          | 1110 0000 |          |
| STATUS2           | 00          | 0000 0000 |          |
| LEDFLASH          | FC          | 1111 1100 |          |
| LEDTORCH          | 02          | 0000 0010 |          |

This configuration tool is available on the XRP6840 product page at [www.exar.com](http://www.exar.com).

### EVALUATION BOARD LAYOUT

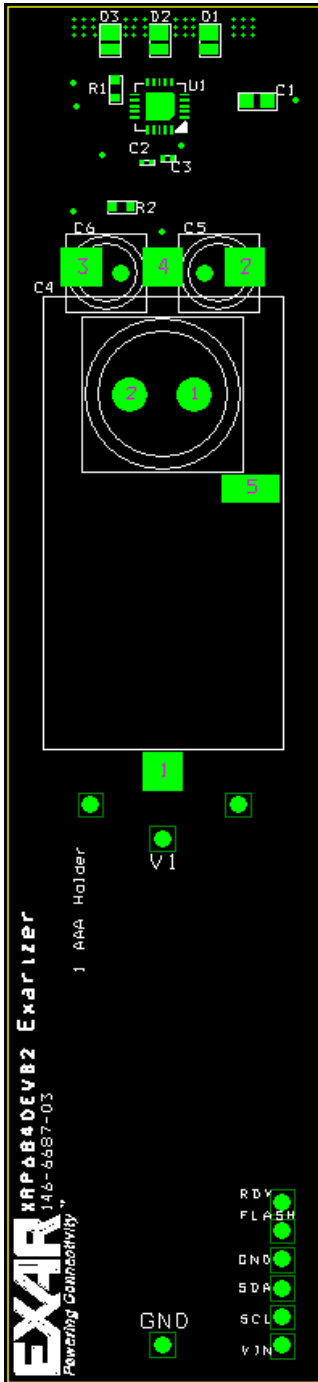


Fig. 3: Components Placement – Top side

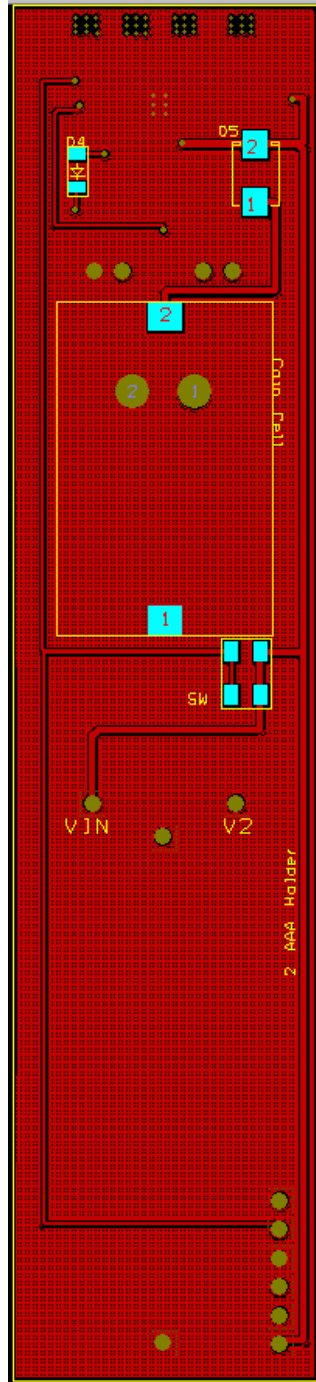


Fig. 4: Bottom side layout

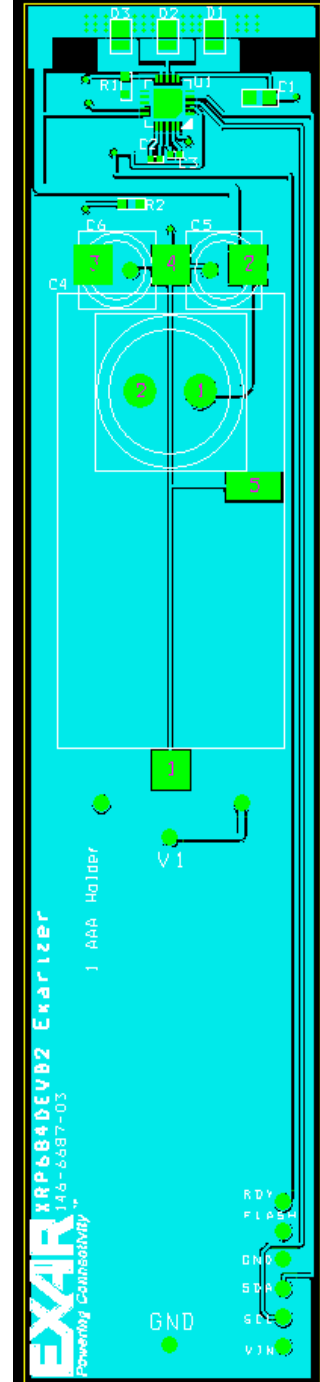


Fig. 5: Top side layout



**BILL OF MATERIAL**

| Ref.   | Qty | Manufacturer                 | Part Number         | Size               | Component  |
|--|-----|------------------------------|---------------------|--------------------|--|
| EVAL BD  | 1   | Exar Corp                    | 146-6687-03         | 4.8"x1.06"         | XRP6840EVB2 Evaluation Board                               |
| U1   | 1   | Exar Corp                    | XRP6840AILB-F       | TQFN-20L           | 4.3A Supercapacitor Flash LED Driver with I <sup>2</sup> C |
| C1   | 1   | Taiyo Yuden                  | LMK212BJ226MG-T     | 0805               | Ceramic 22µF 10V X5R                                       |
| C2, C3   | 2   | Murata                       | GRM155B31A474KE14B  | 0402               | Ceramic 0.47µF 10V X5R                                     |
| C5, C6   | 2   | Rubycon                      | 2.7DMA1M            | 6.5x30mm           | 1F, 2.7V   |
| D1, D2, D3   | 3   | Lumileds                     | LXCL-PWF4W-0001     | 2.04x1.64x0.75mm   | 1.5A Luxeon Flash LED                                      |
| D4   | 1   | Panasonic                    | LNJ311G83RA         | 1206               | Green Color Mini LED                                       |
| D5   | 1   | Central Semiconductor        | CMSH2-20L           | SMB                | Schottky Diode, 20V, 2A                                    |
| R1   | 1   | Rohm Semiconductor           | MCR03EZPFX1002      | 0603               | 10KΩ Resistor, 0.1W, 1%                                    |
| R2   | 1   | Panasonic                    | ERJ3EKF3011V        | 0603               | 3.01KΩ Resistor, 0.1W, 1%                                  |
| SW1  | 1   | Bourn Inc.                   | 7914J-1-000         | 4.8x5.0 mm         | Push Button Switch   |
| AAA –<br>1 Cell Holder                             | 1   | Keystone Electronics         | 2466                | 50x13x12.7mm       | Battery Holder – 1 Cell AAA                                |
| AAA –<br>2 Cell Holder                             | 1   | Keystone Electronics         | 2468                | 53x24.6x12.7mm     | Battery Holder – 2 Cell AAA                                |
| Coin cell<br>Holder                                | 1   | Memory Protection<br>Devices | BH600SM-G           | 19.05x23.37x8.38mm | Coin Cell Holder   |
| Test Point<br>VIN, SCL,<br>SDA, GND,<br>FLASH, RDY | 6   | Mill-Max                     | 0300-115-01-4727100 | 0.042" diameter    | Test Point Female Pin                                      |



# XRP6840 Exarizer

## 4.3A Supercapacitor Flash LED Driver with I2C

### REVISION HISTORY

| Revision | Date       | Description                 |
|----------|------------|-----------------------------|
| 1.0.0    | 03/24/2011 | Initial release of document |
|          |            |                             |
|          |            |                             |

### FOR FURTHER ASSISTANCE

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Exar Technical Documentation:

<http://www.exar.com/TechDoc/default.aspx?>



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