



# XRP7618

## 8-Channel Constant Current Linear LED Driver With Smart Talk™

August 2011

Rev. 2.2.0

### GENERAL DESCRIPTION

The XRP7618 is an 8-channel, high voltage, constant-current sink LED driver capable of sinking up to 100mA current per channel. With outputs rated at 30V, the XRP7618 can control strings of multiple LEDs with better than  $\pm 1.5\%$  channel to channel current matching.

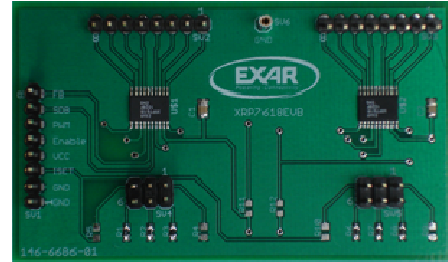
LED channel current is programmed via an external resistor within a 10mA to 100mA range. Dimming is supported up to 25kHz or through an analog signal. Featuring Exar's Smart Talk™ technology, when combined with a boost converter, XRP7618 maximizes the overall system efficiency by dynamically reporting the minimum LED voltage necessary to maintain current regulation mode.

### STANDARD CONFIGURATION

The XRP7618EVB evaluation board is configured to operate under the following conditions and parameters:

Input voltage range  $V_{CC}$ : ..... 4.2V – 5.5V  
 Input voltage range  $V_{LED}$ : ..... <30V  
 Number of LED strings: .....16 (2x8)  
 LED current per string:  
     3 selectable pre-set levels ..... 20mA-60mA-100mA  
     Adj. Level ..... 10mA to 100mA

### EVALUATION BOARD MANUAL



### FEATURES

- **8 Constant-Current Channels**
  - Adjustable up to 100mA per Channel
  - Channel Paralleling for higher Current
  - $\pm 1.5\%$  Current Matching Accuracy
- **Up to 30V LED Channel Voltage Range**
  - 5V Biasing Voltage and Control
- **Smart Talk™ Power Optimization**
- **Parallel Operations Support**
- **PWM and Analog Dimming**
- **UVLO, Open LED & Over Temperature protection**
- **20-pin TSSOP (EP) Package**

### EVALUATION BOARD SCHEMATICS

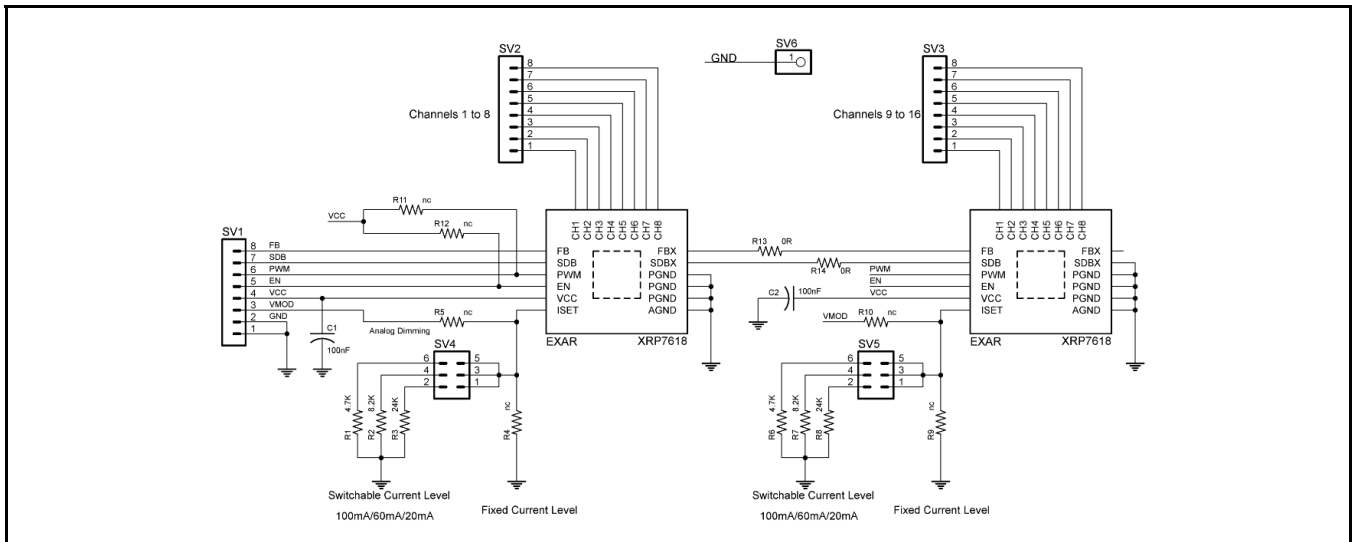


Fig. 1: XRP7618 Evaluation Board Schematics

### PIN ASSIGNMENT

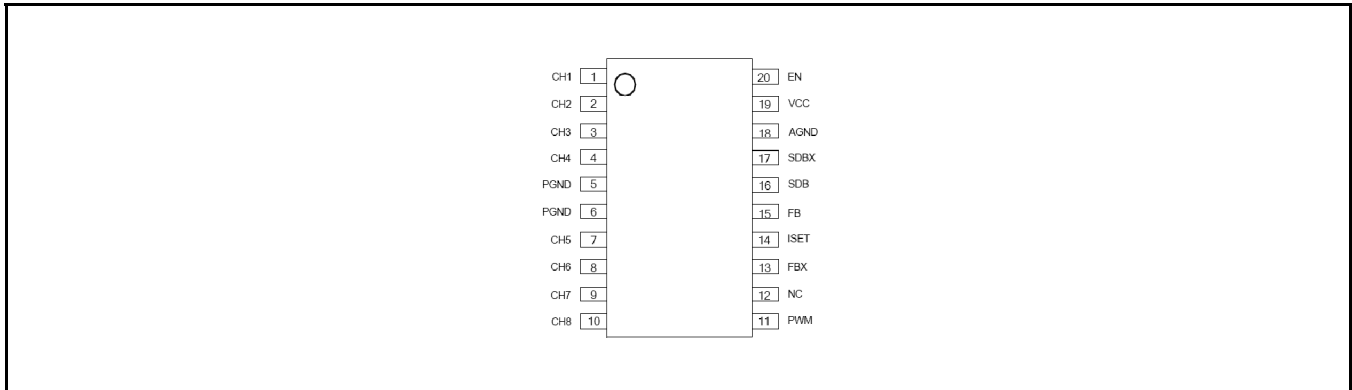


Fig. 2: XRP7618 Pin Assignment

### PIN DESCRIPTION

Name	Pin Number	Description
CHx	1, 2, 3, 4, 7, 8, 9, 10	CH1 to CH8 pins Connect an LED between each pin and LED supply rail voltage ( $V_{LED}$ ). Current value is controlled by $R_{SET}$ . Connect unused channel(s) to GND.
NC	12	Not Connected
PWM	11	PWM pin This must be held HIGH to enable the output drivers. It can be used for PWM dimming up to 25kHz. If not used, connect to $V_{CC}$ .
FBX	13	FBX input pin Used in parallel configuration as an interface terminal by connecting it to FB pin of the next XRP7618. If not used, leave it unconnected.
ISET	14	ISET pin Connect resistor $R_{SET}$ from this pin to ground to set LED channel current as per $I_{CHANNEL} = 1.194 \times 400 / R_{SET}$
FB	15	FB pin Samples the LED cathode voltage on each channel and outputs the lowest voltage to the step-up converter.
SDB	16	SDB output pin SDB signal is synchronous with the PWM signal during PWM Dimming. SDB pin outputs low logic to the step-up converter under conditions such as shutdown or when all channels are inactive.
SDBX	17	SDBX input pin Used in parallel configuration as an interface terminal by connecting it to SDB pin of the next XRP7618. If not used, connect it to GND.
AGND	18	Ground pin
VCC	19	Input Voltage pin Must be closely decoupled to GND pin with a 0.1 $\mu$ F ceramic capacitor.
EN	20	Enable pin This pin must be held HIGH to enable the XRP7618.
PGND	5, 6	Ground pin
EP	Exposed Pad	Exposed Pad Connect to ground

### ORDERING INFORMATION

Refer to XRP7618'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 XRP7618 CIRCUIT

The XRP7618 Evaluation Board can be powered from a single +4.2V to +5.5V power supply. Connect with short leads directly to the "VCC" and "GND" posts on connector SV1. Note the XRP7618 will remain in "shutdown" until the "Enable" and "PWM" pins are held high or resistors R11 and R12 are fitted with 0R resistors.

#### LED CHANNELS CURRENT SETTING

The maximum LED current per channel ( $I_{LEDMAX}$ ) can be set up to 100mA per channel through the ISET pin for each XRP7618 through an external resistor  $R_{SET}$ . The value can be calculated by the following formula:

$$R_{SET} = \frac{K \times 1.194V}{I_{LEDMAX}} = \frac{400 \times 1.194V}{I_{LEDMAX}}$$

The XRP7618 Evaluation Board implements three switchable preset levels of current per channel (20mA, 60mA and 100mA). These levels are selected via jumpers SV4 and SV5. Additionally, resistors R4 and R19 (not populated by default) provide support for a fixed current level (jumpers SV4 and SV5 must be taken off). XRP7618EVB comes with the SV4 and SV5 jumpers set to 20mA current setting by default.

Connect the LEDs between each channel pin and an external LED supply rail voltage ( $V_{LED}$ ). Connect unused channel(s) to GND.

#### PWM DIMMING

The LED current can be adjusted by applying a PWM signal to the PWM pin. In this mode, all enabled channels are adjusted at the same time and brightness is adjusted from 1% to 100% of  $I_{LEDMAX}$ .

The supported external PWM signal frequency is 100Hz to 25kHz.

#### ANALOG DIMMING CONTROL

Besides PWM dimming control, the LED current can be controlled continuously (from highest to lowest LED current) by raising the voltage at the bottom of RSET from 0V normally to 1V max, respectively. RSET value may be determined as

$$R_{SET} = \frac{(1.194 - V_{MOD}) \times 400}{I_{LEDMAX}}$$

where, 1.194V is a typical ISET pin voltage,  $V_{MOD}$  is an adjustment voltage applied to the bottom side of RSET, 400 is the typical current multiplication ratio, and  $I_{LEDMAX}$  is the required LED current per channel.

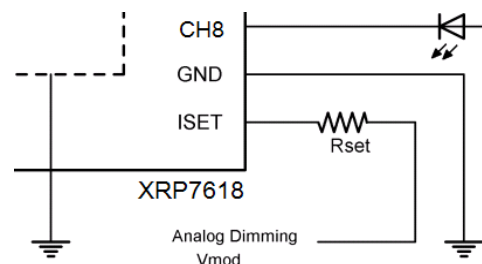


Fig. 3: XRP7618 Analog Dimming Control

If adjustment voltage  $V_{MOD}$  isn't used, RSET resistor should be connected to ground. Resistors R5 and R10 (not populated by default) support the analog dimming scheme (jumpers SV4 and SV5 must be taken off).

#### PARALLEL MODE OF OPERATION

Multiple XRP7618s can be placed in parallel to drive over 8 strings of LEDs; unused channels should be tied to ground. XRP7618 Evaluation Board comes with two XRP7618s connected to each other through their respective FBX and SDBX pins with 0Ω resistors R13 and R14.

### TYPICAL PERFORMANCE CHARACTERISTICS

All data taken at  $V_{CC} = 5V$ ,  $R_{ISET} = 8k\Omega$ ,  $T_A = 25^\circ C$ , unless otherwise specified - Schematic and BOM from Application Information section of this datasheet.

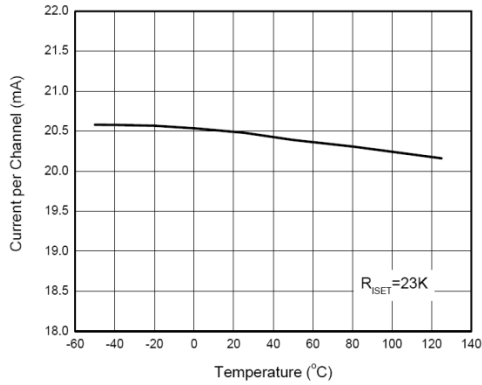


Fig. 4: Current per Channel vs Temperature

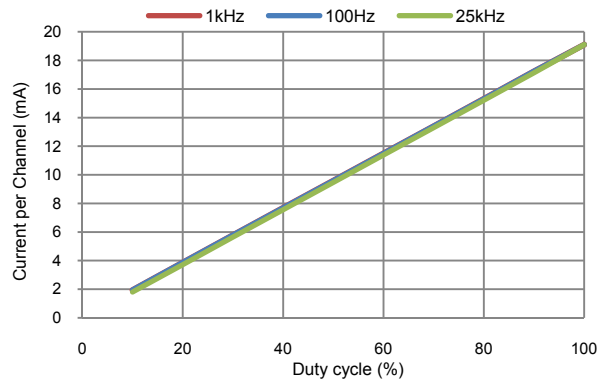


Fig. 5: PWM Dimming: Current per Channel vs Duty Cycle

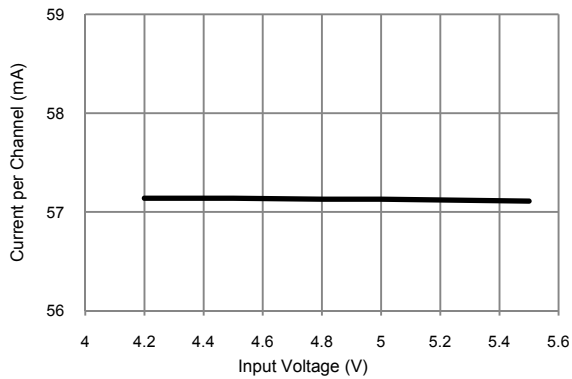


Fig. 6: Current per Channel vs Input Voltage

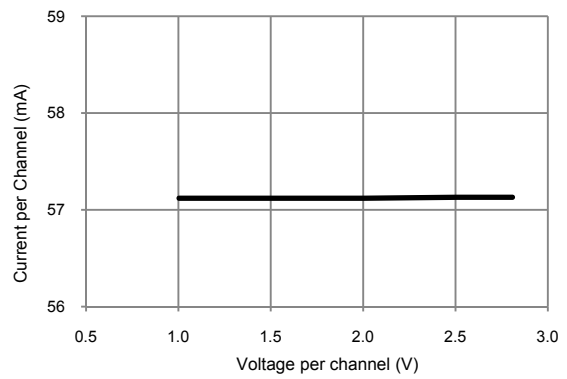


Fig. 7: Current per Channel vs Voltage per Channel

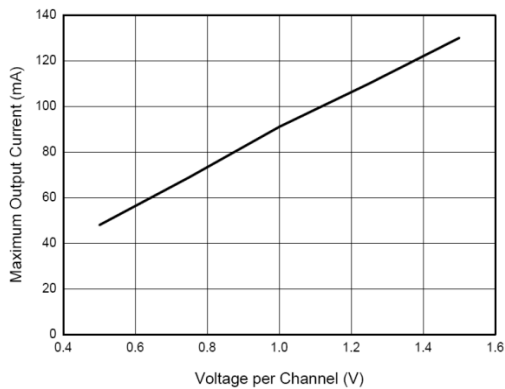


Fig. 8: Maximum Output Current vs Voltage per Channel

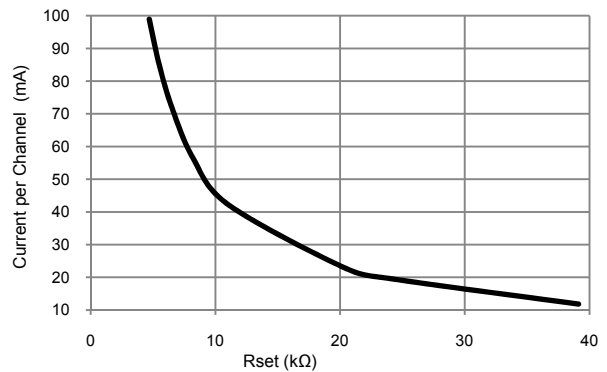


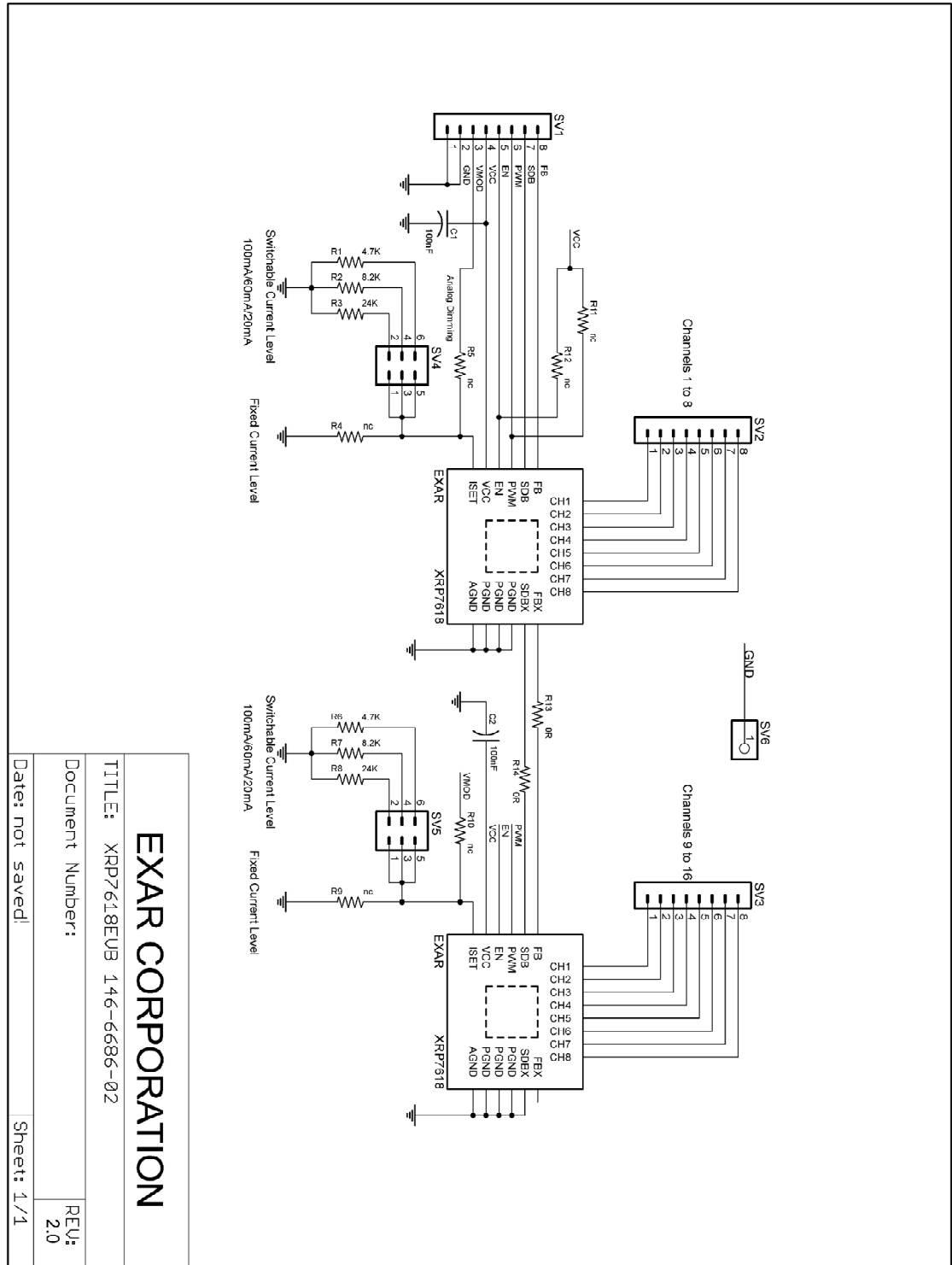
Fig. 9: Current per Channel vs RSET resistor



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## 8-Channel Constant Current Linear LED Driver With Smart Talk™

### EVALUATION BOARD SCHEMATICS



**EXAR CORPORATION**

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### EVALUATION BOARD LAYOUT

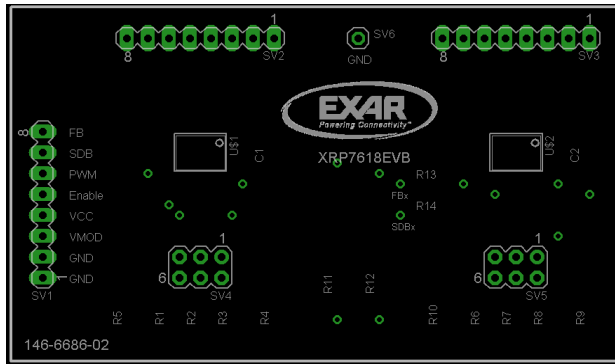


Fig. 10: Components Placement & Dimensions

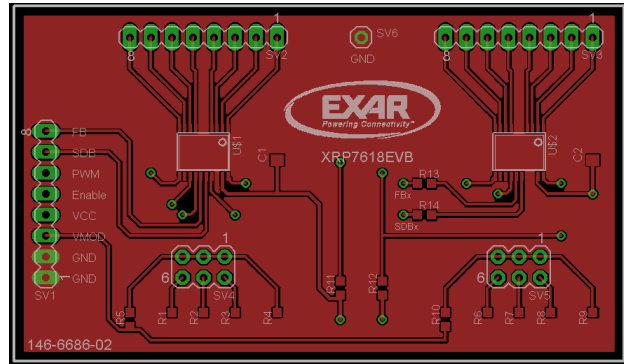


Fig. 11: Top Side Layout

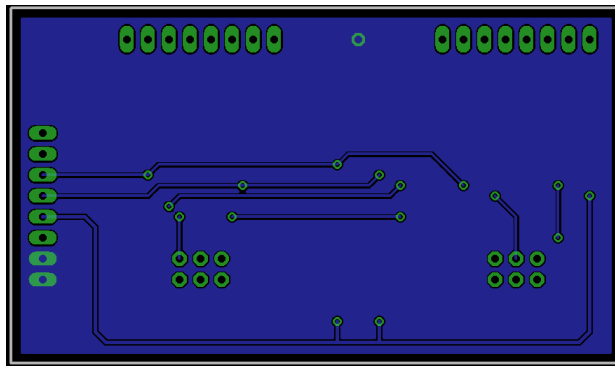


Fig. 12: Bottom Side Layout

### BILL OF MATERIAL

Ref.	Qty	Manufacturer	Part Number	Size	Component
EVAL BD	1	Exar Corp.	146-6686-02		XRP7618 Evaluation Board
U1, U2	2	Exar Corp.	XRP7618IGB-F	TSSOP20 (EP)	XRP7618
C1, C2	2	Murata Corp.	GRM21BR71H104KA01L	0805	Ceramic 0.1uF, 50V, X7R
R1, R6	2	Panasonic Corp.	ERJ-3EKF4701V	0603	4.7KΩ Resistor, 0.1W, 1%
R2, R7	2	Panasonic Corp.	ERJ-3EKF8201V	0603	8.2KΩ Resistor, 0.1W, 1%
R3, R8	2	Panasonic Corp.	ERJ-3EKF2402V	0603	24KΩ Resistor, 0.1W, 1%
R13, R14	2	Panasonic Corp.	ERJ-3GEY0R00V	0603	0Ω Resistor
R4, R5, R9, R10, R11, R12	6			0603	Not populated
SV1, SV2, SV3	3	Würth Elektronik	61300811121	CONN.HEAD 0.1"	1x8 Pin Header
SV4, SV5	2	Würth Elektronik	61300621121	CONN.HEAD 0.1"	2x3 Pin Header
SV6	1	Würth Elektronik	61300111121	CONN.HEAD 0.1"	1x1 Pin Header



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## 8-Channel Constant Current Linear LED Driver With Smart Talk™

### REVISION HISTORY

Revision	Date	Description
1.0.0	08/05/2010	Initial release of document
1.1.0	09/22/2010	Added evaluation board picture
2.0.0	03/28/2011	Added R13 and R14 to isolate FBx and SBDx
2.1.0	07/29/2011	Modified schematics C1 and C2 to 100nF
2.2.0	08/18/2011	Added default settings information Corrected schematics for inclusion of R13 and R14

### BOARD REVISION HISTORY

Board Revision	Date	Description
146-6686-01	10/29/2010	Initial release of evaluation board
146-6686-02	03/28/2011	Added R13 and R14 to isolate FBx and SBDx

### FOR FURTHER ASSISTANCE

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Exar Technical Documentation:

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



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