



XRP7714EVB-DEMO-X

Four Channel Digital PWM Demo Boards

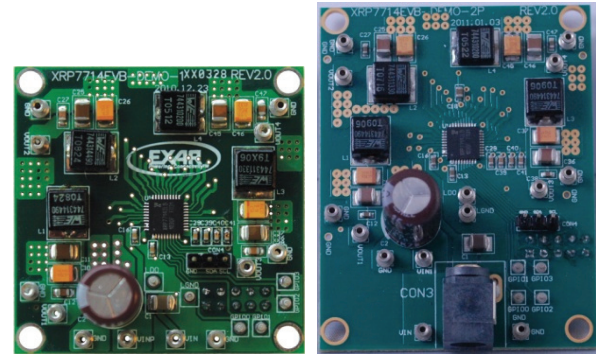
April 2011

Rev. 1.0.0

GENERAL DESCRIPTION

The XRP7714EVB-DEMO-1, XRP7714EVB-DEMO-2, and the XRP7714-DEMO-2P Demo boards are complete, working, four channel, power systems measuring either 2" x 2", or 2" by 2.5" capable of producing over 35 watts. They provide 3.3V, 2.5V 1.8V and 1V at a maximum of 4 amps per channel. The 2.5V, 1.8V and 1V supplies can be adjusted in 50mV increments, and the 3.3V supply is adjustable in 100mV increments. The order and ramp rates for each supply can be programmed to accommodate any sequencing requirement. All power supply operations can be controlled over an I²C interface. Faults, output voltages and currents can also be monitored. Four GPIO signals are available and can be programmed to provide status of power good signals enables and faults. Unused GPIO pins can be programmed as I/O expansion for a microcontroller. The board is supported by PowerArchitect™ and plugs directly onto the Exar Communications Module (XRP77xxEVB-XCM).

EVALUATION BOARD MANUAL



XRP7714EVB-DEMO-1 XRP7714EVB-DEMO-2/2P

FEATURES

- **XRP7714 Programmable Controller**
- **4 Channel Power System**
- **Wide Input Voltage Range: 4.5V-25V**
- **Over 35W Capable**
- **Small Form Factor: 2.0" x 2.0"**
- **I²C Interface**
 - Programming
 - Monitoring
 - Control

EVALUATION BOARD

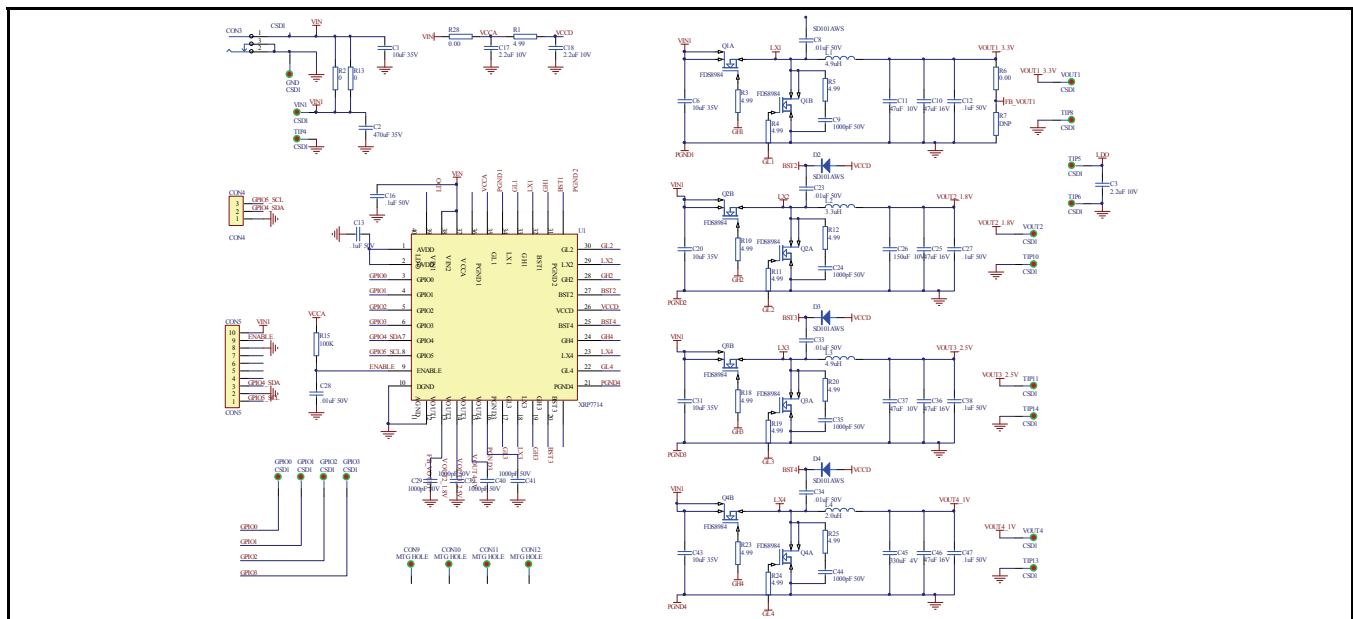


Fig. 1: XRP7713EVB-DEMO-1 Schematic

PIN ASSIGNMENT

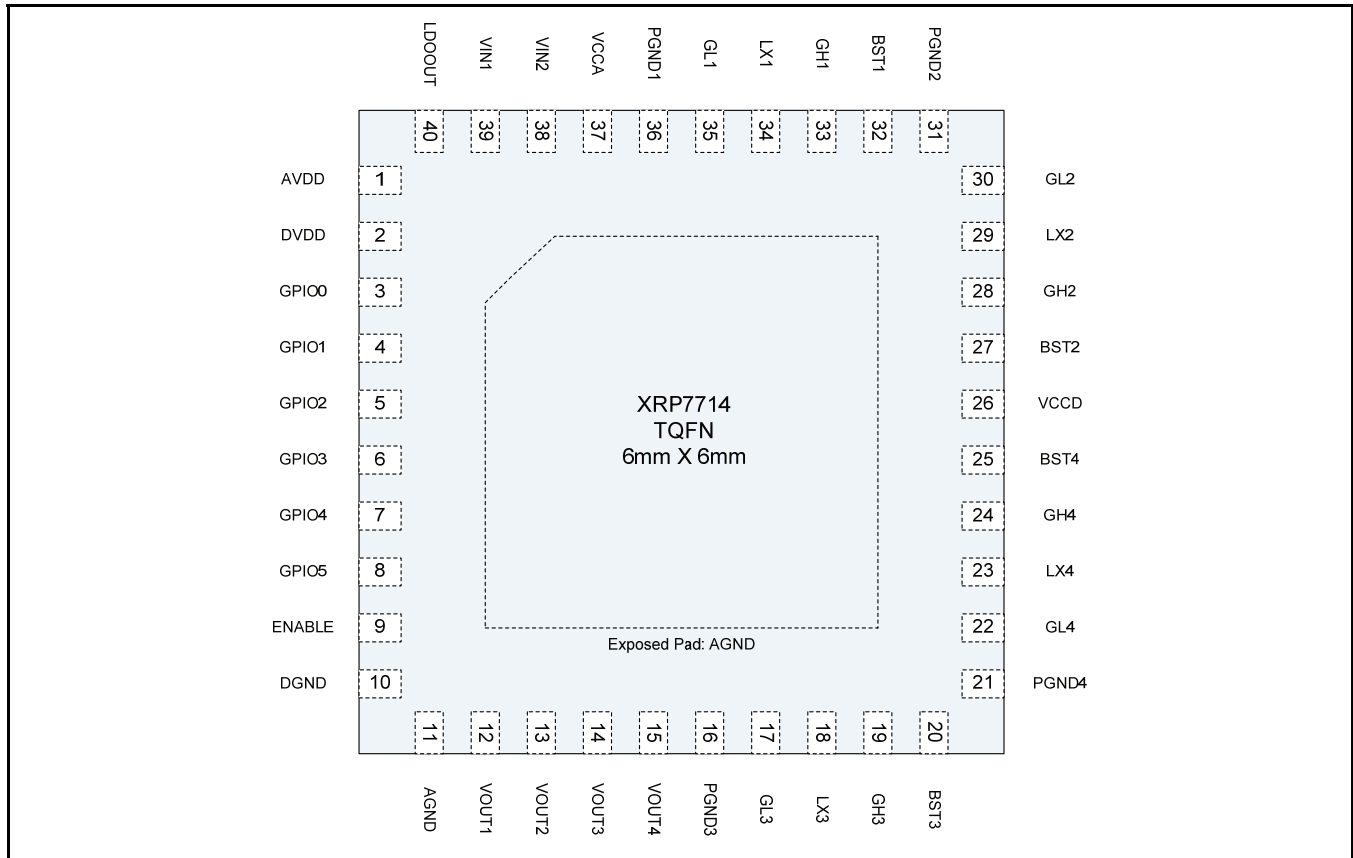


Fig. 2: XRP7714 Pin Assignment

Pin Description

Name	Pin Number	Description
VIN1	39	Power source for the internal linear regulators to generate VCCA, VDD and the Standby LDO (LDOOUT). Place a decoupling capacitor close to the controller IC. Also used in UVLO1 fault generation – if VIN1 falls below the user programmed limit, all channels are shut down. The VIN1 pin needs to be tied to VIN2 on the board with a short trace.
VIN2	38	If the Vin2 pin voltage falls below the user programmed UVLO VIN2 level all channels are shut down. The VIN2 pin needs to be tied to VIN1 on the board with a short trace.
VCCA	37	Output of the internal 5V LDO. This voltage is internally used to power analog blocks. Note that a compensation capacitor should be used on this pin (see application note).
VCCD	26	Gate Drive input voltage. This is not an output voltage. This pin can be connected to VCCA to provide power for the Gate Drive. VCCD should be connected to VCCA with the shortest possible trace and decouple with a minimum 1µF capacitor. Alternatively, VCCD could be connected to an external supply (not greater than 5V).
PGND1→4	36,31,16,21	Power Ground. Ground connection for the low side gate driver. Connect at low side FET source.
AVDD	1	Output of the internal 1.8V LDO. A decoupling capacitor should be placed between AVDD and AGND close to the chip (with short traces).
DVDD	2	Input for powering the internal digital logic. This pin should be connected to AVDD.
DGND	10	Digital Ground. Connect this pin to the ground plane at the exposed pad with a separate trace.
AGND	11	Analog Ground. Connect this pin to the ground plane at the exposed pad with a separate trace
GL1-GL4	35,30,17,22	Output pin of the low side gate driver. Connect directly to the respective gate of an external N-channel MOSFET.



XRP7714EVB-DEMO-X

Four Channel Digital PWM Demo Boards

Name	Pin Number	Description
GH1-GH4	33,28,19,24	Output pin of the high side gate driver. Connect directly to the respective gate of an external N-channel MOSFET.
LX1-LX4	34,29,18,23	Lower supply rail for the high-side gate driver (GHx). Connect this pin to the switching node at the junction between the two external power MOSFETs and the inductor. These pins are also used to measure voltage drop across bottom MOSFETs in order to provide output current information to the control engine.
BST1-BST4	32,27,20,25	High side driver supply pin(s). Connect BST to an external boost diode and a capacitor as shown in the front page diagram. The high side driver is connected between the BST pin and LX pin.
GPIO0-GPIO3	3,4,5,6	These pins can be configured as inputs or outputs to implement custom flags, power good signals and enable/disable controls. A GPIO pin can also be programmed as an input clock synchronizing IC to external clock. Refer to the "GPIO Pins" Section and the "External Clock Synchronization" Section for more information.
GPIO4_SDA, GPIO5_SCL	7,8	I2C serial interface communication pins. These pins can be re-programmed to perform GPIO functions in applications when I2C bus is not used.
VOUT1→4	12,13,14,15	Voltage sense. Connect to the output of the corresponding power stage.
LDOOUT	40	Output of the Standby LDO. It can be configured as a 5V or 3.3V output. A compensation capacitor should be used on this pin [see Application Note].
ENABLE	9	If ENABLE is pulled high, the chip powers up (logic reset, registers configuration loaded, etc.). If pulled low for longer than 100us, the XRP7714 is placed into shutdown.
AGND	Exposed Pad	Analog Ground. Connect to analog ground (as noted above for pin 11).

ORDERING INFORMATION

Refer to XRP7714's datasheet and/or www.exar.com for exact and up to date ordering information.



XRP7714EVB-DEMO-X

Four Channel Digital PWM Demo Boards

USING THE EVALUATION BOARD

INPUT VOLTAGE CONFIGURATION

The XRP7714EVB-DEMO-1 Board has several different input voltage options. The Input voltage components are rated at 35V. The power components have been optimized for a 12V input rail. When running the board at an input voltage other than 12V, use PowerArchitect™ to evaluate the system performance.

Single Wide Range, Input Voltage Rail

Both the XRP7714EVB-DEMO-1 and the XRP7714EVB-DEMO-2P ship from the factory configured for a single wide range input. The Input voltage range is from 5.5V to 25V.

Single 5V Voltage Rail

Installing a zero ohm resistor into position R28 connects VIN to VCCA. This allows operation down to 4.5V, but restricts the maximum input voltage to 5.5V.

Dual Voltage Rail Operation

The XRP7714EVB-DEMO-x boards can be configured to operate from two separate rails.

The following modifications must be made:

- Remove 0 ohm resistors R2 and R13
- Connect power for the XRP7714 between pins VIN and GND
- Connect channel power between pins VIN1 and GND

I²C INTERFACE

The XRP77XX family of controllers employs a standard I2C interface. Pull-ups for the I2C signals are not included on the demo board. If using the demo board with something other than the XRP77xxEVB-XCM, verify that the SDA and SCL lines are pulled up.

Channel Design and Limitations

Channel 1 is designed to provide an output voltage from 3.3V to 5.0V. The default voltage is 3.3V.

Channel 2 is designed to provide an output voltage from 1.8V to 2.5V. The default voltage is 2.5V.

Channel 3 is designed to provide an output voltage from 1.5V to 1.8V. The default voltage is 1.8V.

Channel 4 is designed to provide an output voltage from .9 to 1.2V. The default voltage is 1.0V. The Tantalum output capacitor is has a 4V rating. If modifying the channel 3 design, do not exceed four volts unless the C45 is replaced.

ENABLE PIN

The ENABLE pin connects to an RC network This delays turn on of the device. It is pulled up to AVDD with a 100K resistor and to ground through a .01uFd capacitor. It appears on pin 9 of connector CON5. This pin can be used to turn on or turn off the device.

BOARD DIFFERENCES

The XRP7714EVB-DEMO-1 board is 2" x 2" and does not have the facility for a power connector.

The XRP7714EVB-DEMO-2 board is 2" x 2.5" and comes from the factory with wired for Single 5V operation. The Power Jack has been removed from the board. Supplying more than 5V to the board will damage the XRP7714.

The XRP7714EVB-DEMO-2P board is 2" x 2.5" and comes from the factory wired for a single wide range input. The P denotes that a power connector is installed for connection to a power supply of the customers choosing. The Center lead of the input connector is positive.

Operating the Evaluation Board

Note: The XRP7714EVB-DEMO-2, is designed to be powered from the USB voltage that is supplied to from the host PC. No additional power connections are required to demonstrate basic board functionality. If connecting the board to an external power source, Caution, Do not exceed 5.5V on the chip, or it will be damaged.

Make sure that the board is configured for the power supply(s) that you are using. Refer to the Input Voltage Configuration section if you



XRP7714EVB-DEMO-X

Four Channel Digital PWM Demo Boards

require specific board modifications for your application.

Apply Power to the board: Please refer to the appropriate board connection diagram for your specific evaluation board.

If using a single supply, Connect the input supply between the VIN pin and the GND pin. If using a dual supply, Connect the chip power between VIN/VINP pin and GND, and connect Power Vin between the VIN1 pin and GND.

Plug the PowerXR evaluation board on to the XCM as shown below.

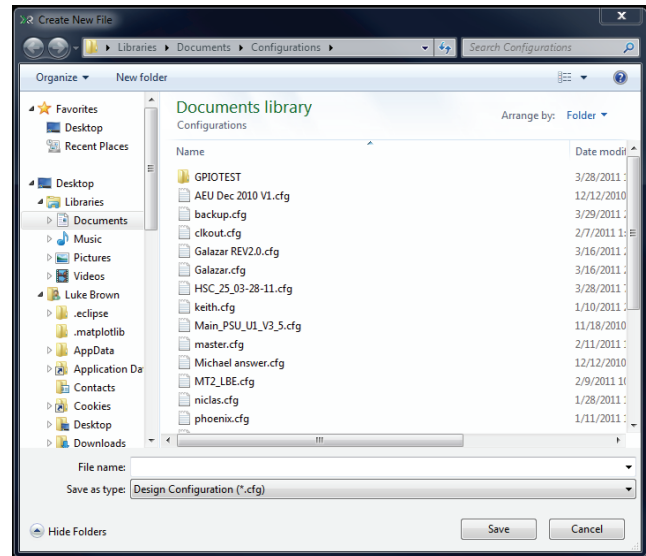
Insert the USB cable into the computer and the XCM board.

Turn on the Power supply

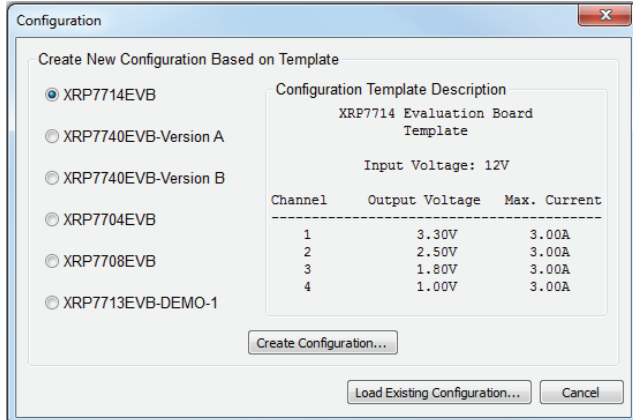
Load the PowerArchitect™ software.

Select the XRP7714EVB configuration and select create configuration..

You will be prompted for a filename by a Create New File Dialog box. Navigate to a location to save the configuration, enter a filename and select Save.



Refer to the Exar PowerArchitect™ Quick Start Guide for information on how to run the software.



EVALUATION BOARD CONNECTIONS: DEMO-2P

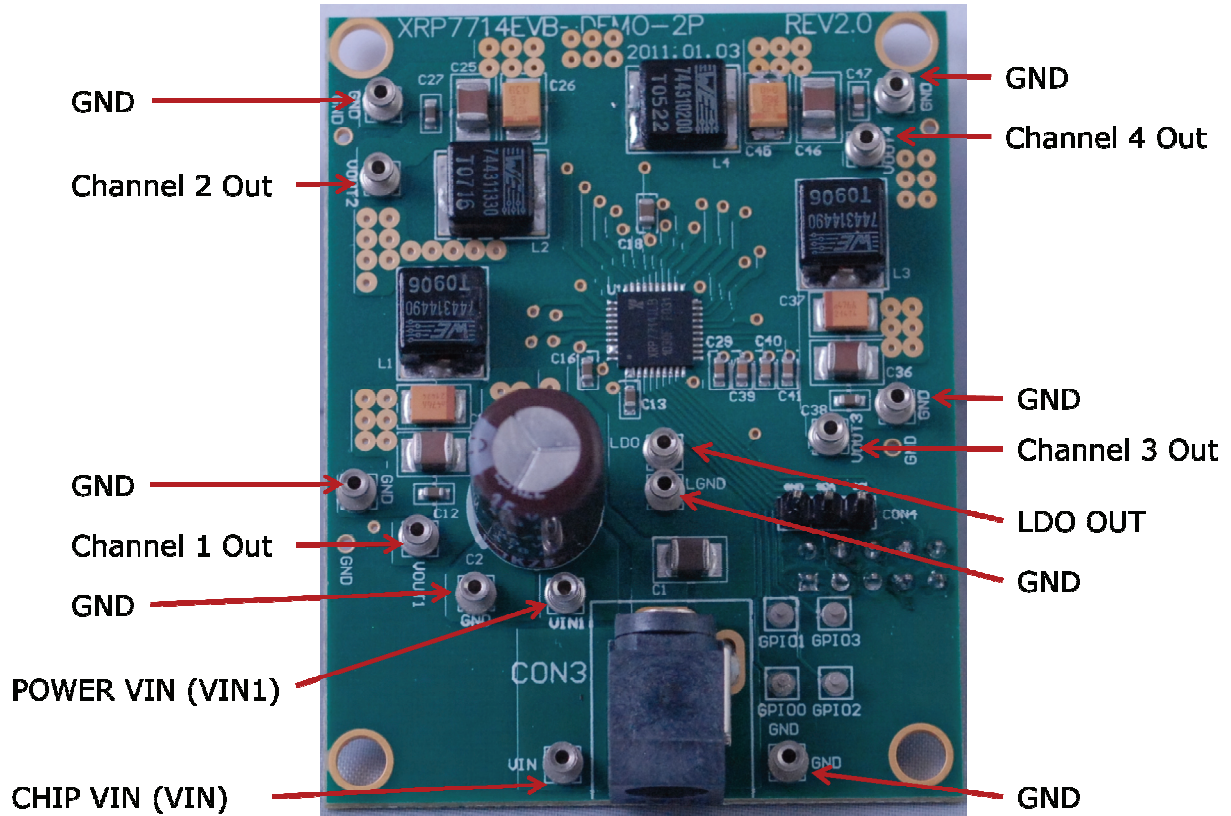


Figure 3: XRP7714EVB-DEMO-2P Board Connections

EVALUATION BOARD CONNECTIONS: DEMO-2

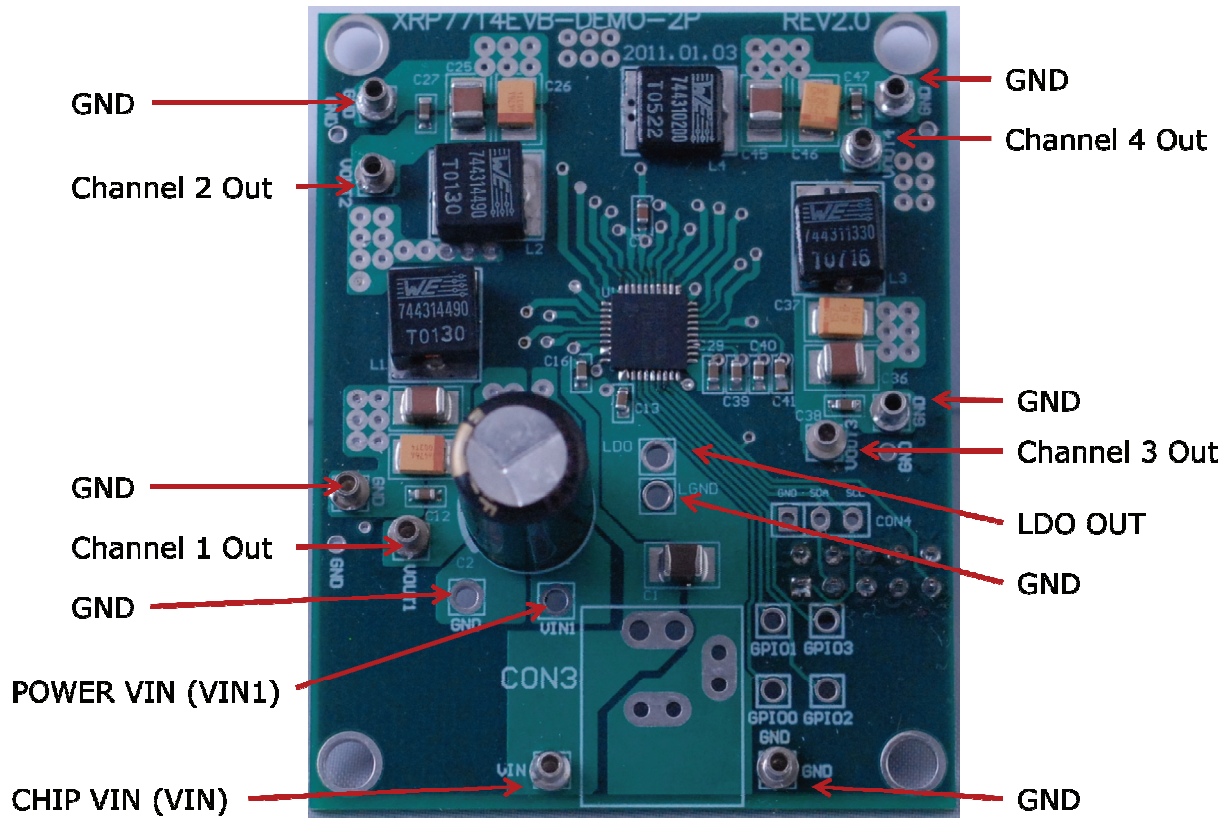


Figure 4: XRP7714EVB-DEMO-2 Board Connections

EVALUATION BOARD CONNECTIONS: DEMO-1

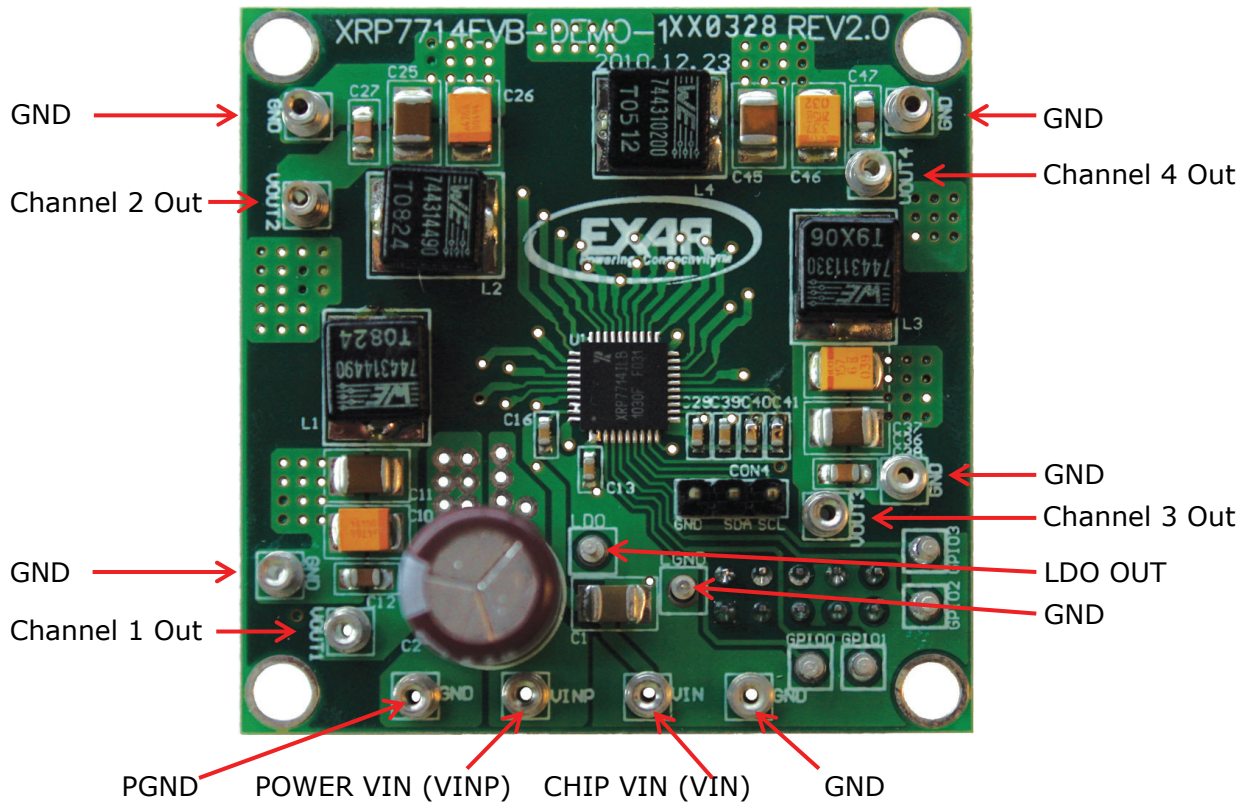


Figure 5: XRP7714EVB-DEMO-1 Board Connections



XRP7714EVB-DEMO-X

Four Channel Digital PWM Demo Boards

BILL OF MATERIAL

Ref.	Qty	Manufacturer	Part Number	Size	Description
C1, C6, C20, C31, C43	5	Murata	GRM32ER6YA106KA12L	C1210	Cap, Ceramic 10uF 35V X7R 1210
C2	1	United Chemi-Con	EKZE350ELL471MJ20S	RB2/4	Cap, Aluminum, 470uF 35V LOW ESR
C3, C17, C18	3	Murata	GRM21BR71A225KA01L	C0805	Cap, Ceramic 2.2uF 10V X7R 0805
C8, C23, C28, C33, C34	5	Murata	GRM188R71H103KA01D	C0603	Cap, Ceramic .01uF 50V X7R 0603
C9, C24, C29, C35, C39, C40, C41, C44	8	Murata	GRM188R71H102KA01D	C0603	Cap, Ceramic 1000pF 50V X7R 0603
C10, C25, C36, C46	4	Murata	GRM32ER71A476KE15L	C1210	Cap, Ceramic 47uF 16V X7R 1210
C11, C37	2	AVX	TCJB476M010R0070	C1210	Cap, Tantalum 47uF 10V LOW_ESR, CASE A
C12, C13, C16, C27, C38, C47	6	Murata	GRM21BR71H104KA01L	C0603	Cap, Ceramic .1uF 50V X7R 0603
C26	1	AVX	T520B157M006ATE070	C1210	Cap, Tantalum 150uF 10V LOW_ESR, CASE A
C45	1	AVX	T520B337M2R5ATE045	C1210	Cap, Tantalum 330uF 4V LOW_ESR, CASE A
CON3	1	Switchcraft	RAPC722X	JACK-RAPC722X	CONN POWERJACK MINI .08" R/A T/H
CON4	1	Würth Elektronik	61304011121	SIP3	CONNECTOR .1 CTR 3 pin
CON5	1	Würth Elektronik	613 010 218 21	HDR2X5F-TOP	CONN Header 5x2, 0.1 inch
D1, D2, D3, D4	4	Diodes Inc	SD101CWS-7-F	SOD-323	Diode, Schottky, 40V 400mW SOD-323
GND, TIP4, TIP5, TIP6, TIP8, TIP10, TIP11, TIP13, TIP14, VIN, VIN1, VOUT1, VOUT2, VOUT4	14	Keystone	1562-2	PAD-HOLE	Test Points
GPIO0, GPIO1, GPIO2, GPIO3	4	Keystone	1528-2	SIP1	
L1, L3	2	Würth	744314490	744310X	Inductor, Shielded 4.9uH 6.5A 17mOhm
L2	1	Würth	744311330	744310X	Inductor, Shielded 3.3uH 6.5A 17.2mOhm
L4	1	Würth	744310200	744310X	Inductor, Shielded, 2.0uH 6.5A 14.2mOhm
Q1, Q2, Q3, Q4	4	Fairchild	FDS8984	SO-MOS-8B	FDS8984
R1, R3, R4, R10, R11, R18, R19, R23, R24	9	Vishay/Dale	CRCW06034R99FKEA	0603	Resistor, 4.99 .1W 0603
R2, R13	2	Vishay/Dale	CRCW12060000Z0EA	1206	Resistor 0.00 .25W 1206
R5, R12, R20, R25	4	Vishay/Dale	CRCW08054R99FKEA	0805	Resistor, 4.99 .1W 0805
R6	1	Vishay/Dale	CRCW02010000Z0ED	0603	Resistor, 0.00 .1W 0603
R15	1	Vishay/Dale	CRCW0603100KFKEA	0603	Resistor, .100K 1W 0603
U1	1	Exar Corporation	XRP7714ILB-F	QFN40	4 Channel 25 V PWM Step Down DC-DC Controller QFN-40

EVALUATION BOARD LAYOUT

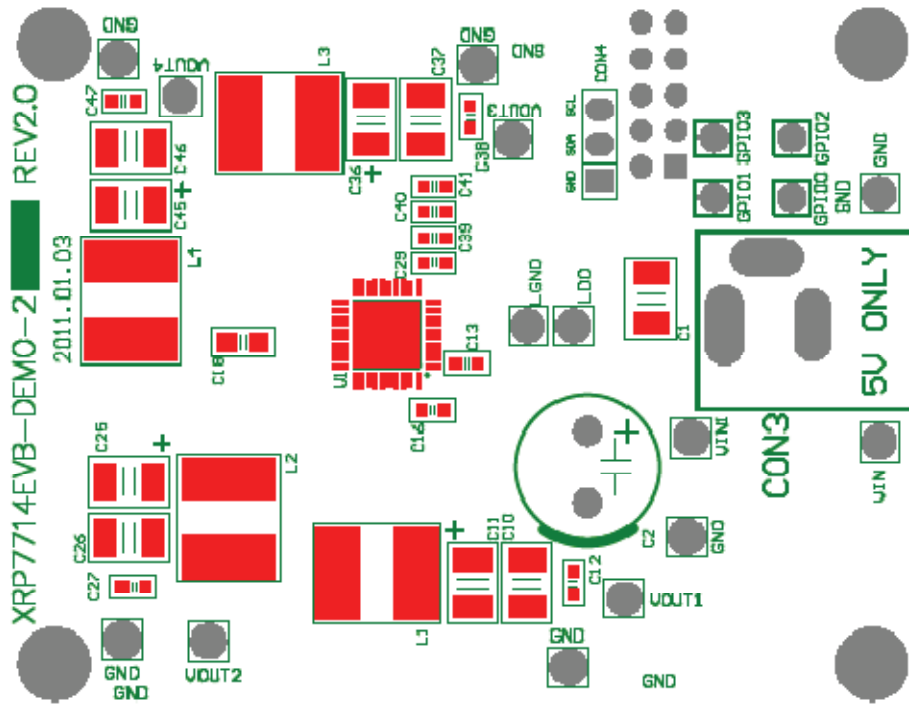


Fig. 3: Component Placement – Top Side

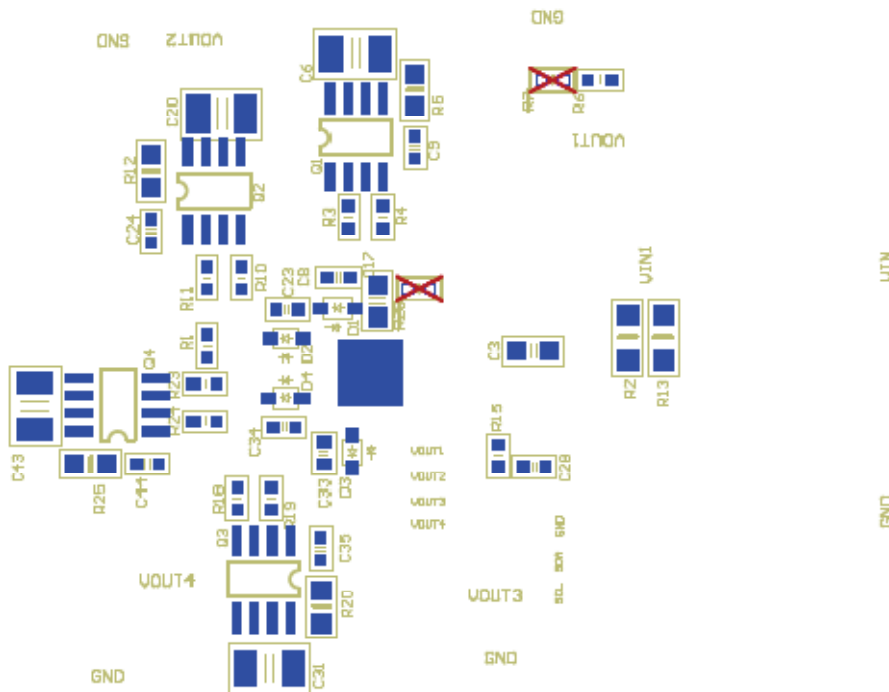


Fig. 4: Component Placement – Bottom Side

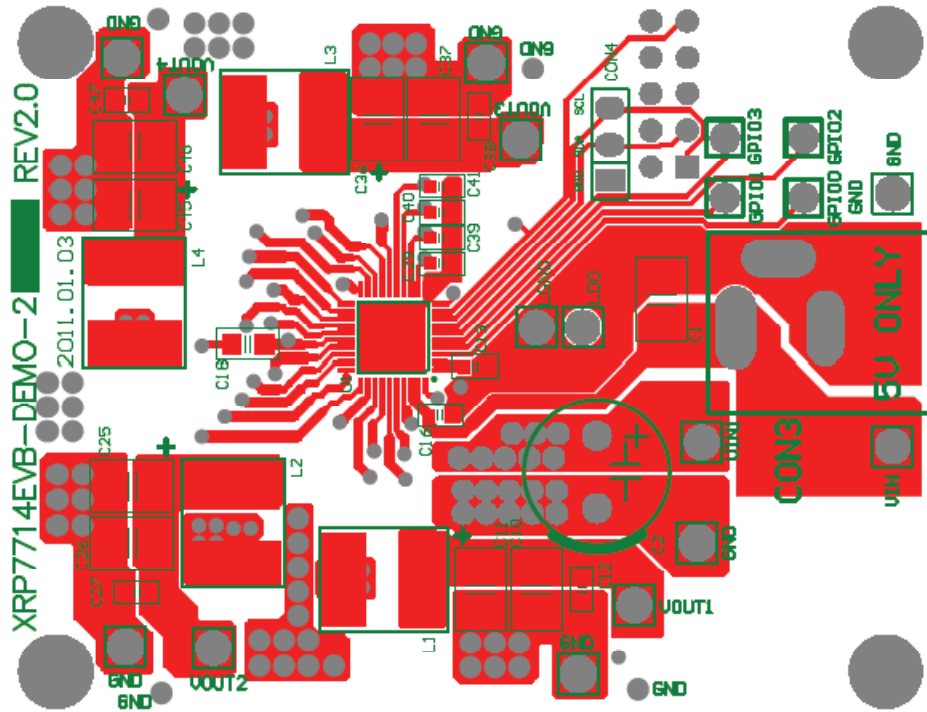


Fig. 5: Layout – Top Side

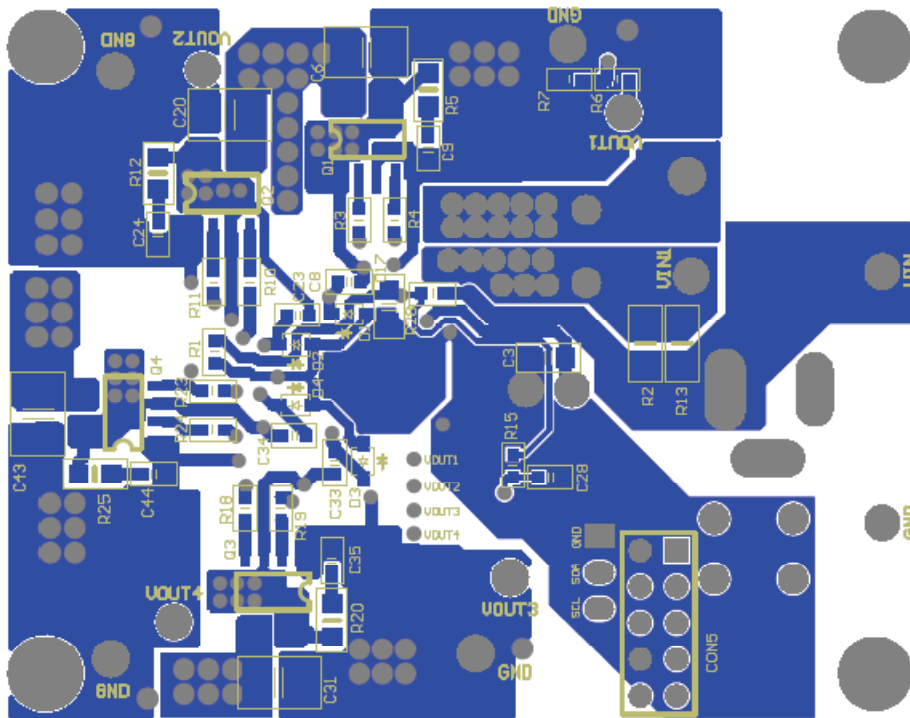


Fig. 6: Layout – Bottom

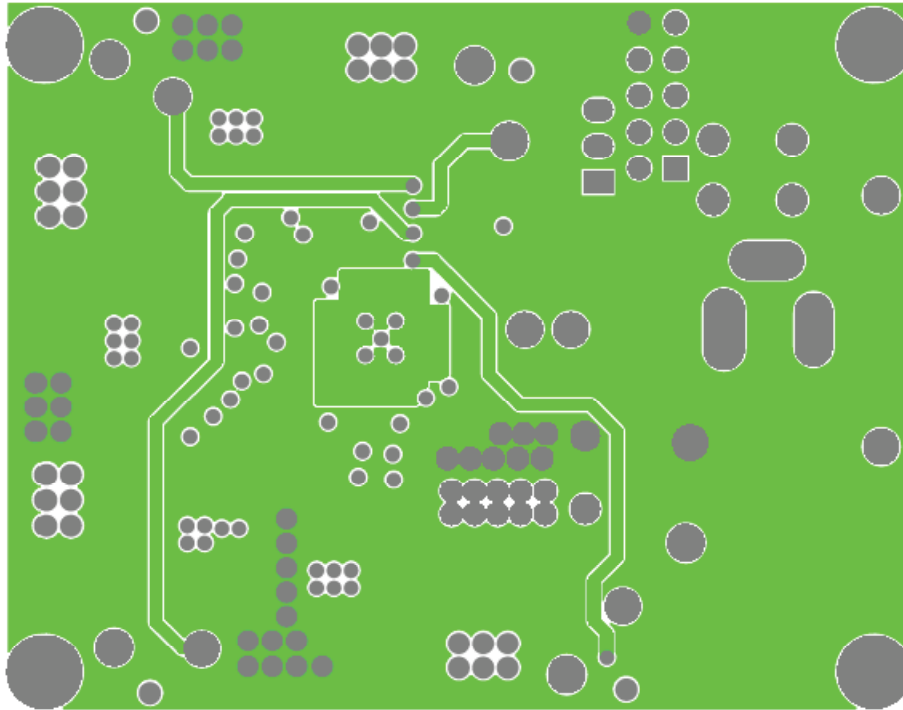


Fig. 7: Layout – Internal Plane

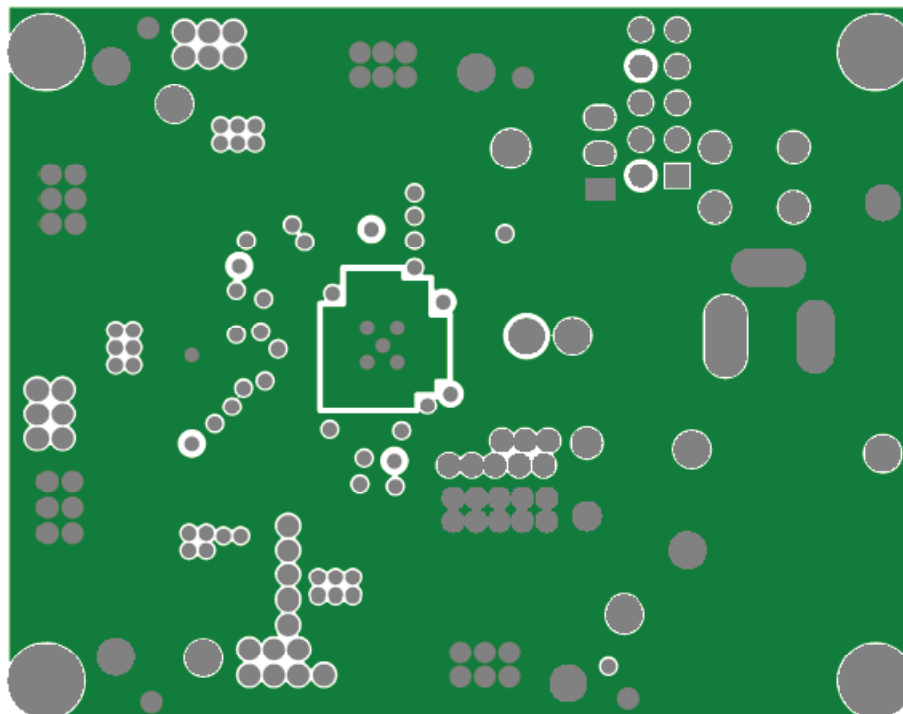


Fig. 8: Layout – Internal Plane



EVALUATION BOARD EFFICIENCY PERFORMANCE

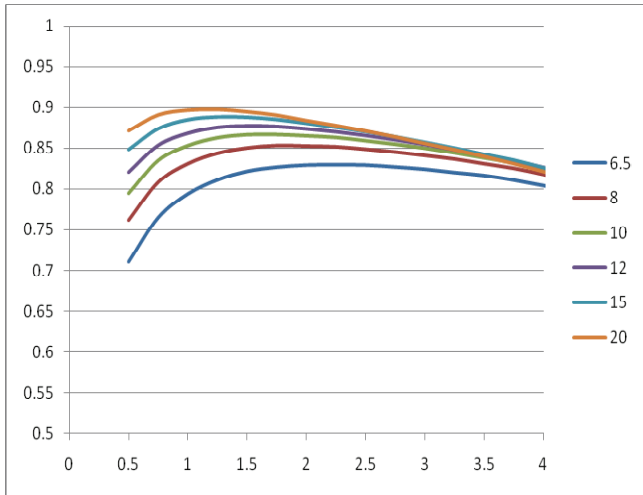


Fig. 9: All Channels Efficiency

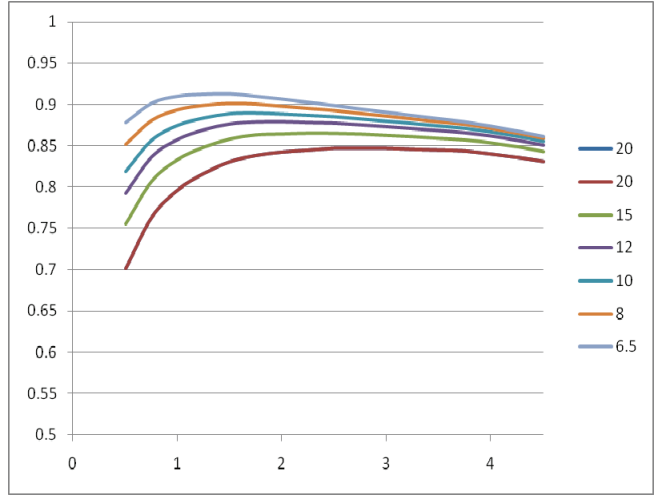


Fig. 10: 3.3V Efficiency

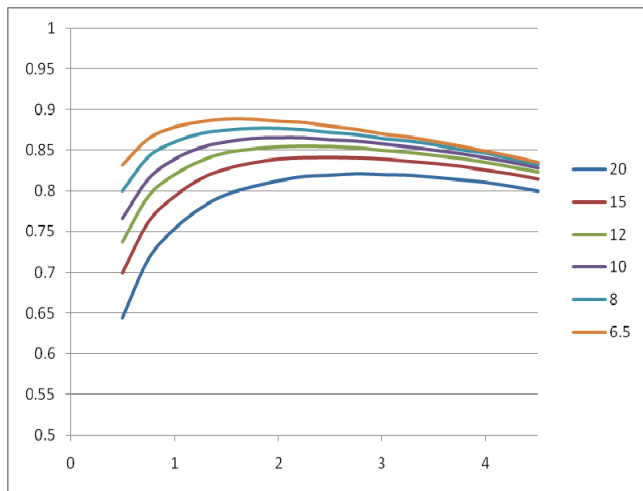


Fig. 11: 2.5V Efficiency

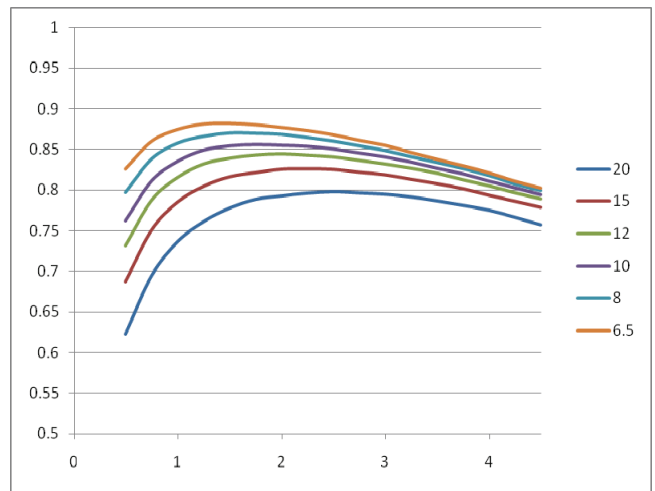


Fig. 12: 1.8V Efficiency

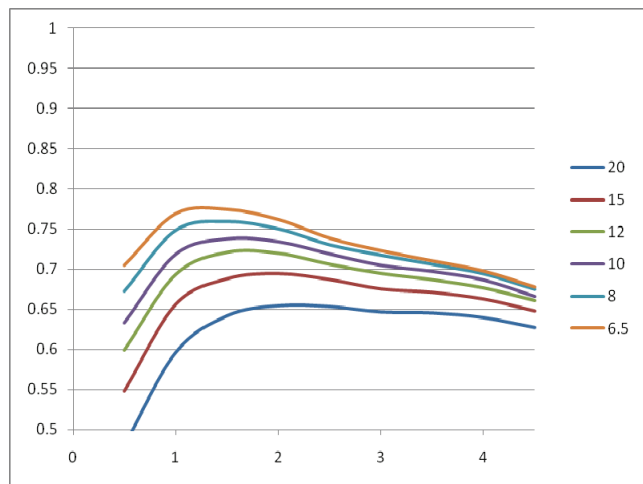


Fig. 13: 1V Efficiency



EVALUATION BOARD LINE LOAD REGULATION PERFORMANCE

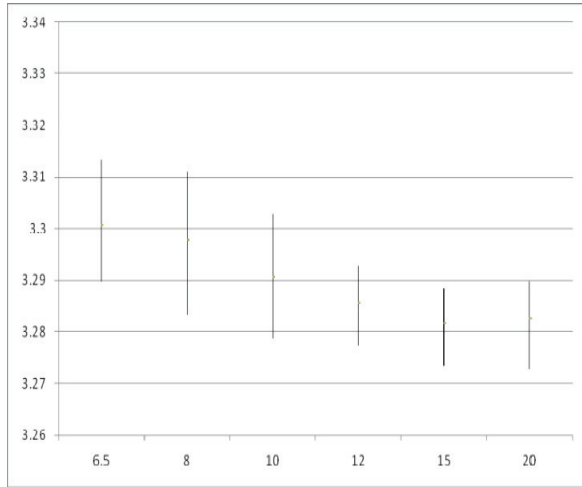


Fig. 14: Line Load Regulation 3.3V

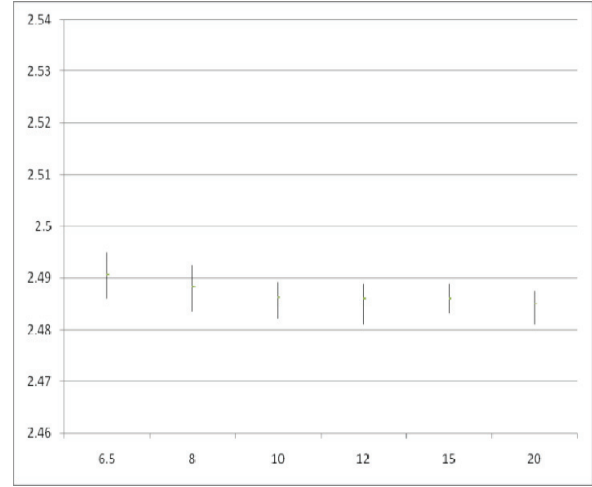


Fig. 15: Line Load Regulation 2.5V

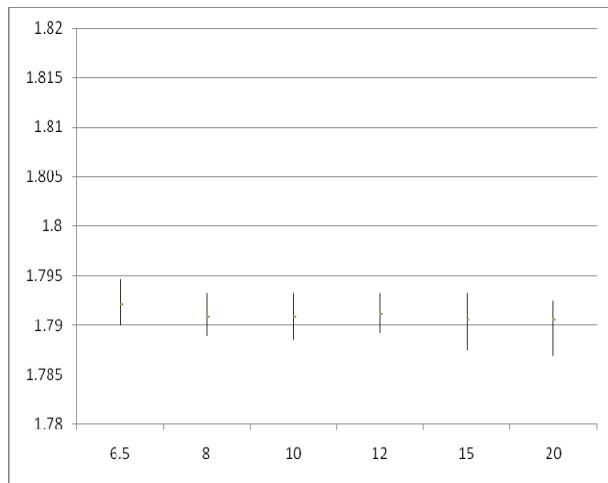


Fig. 16: Line Load Regulation 1.8V

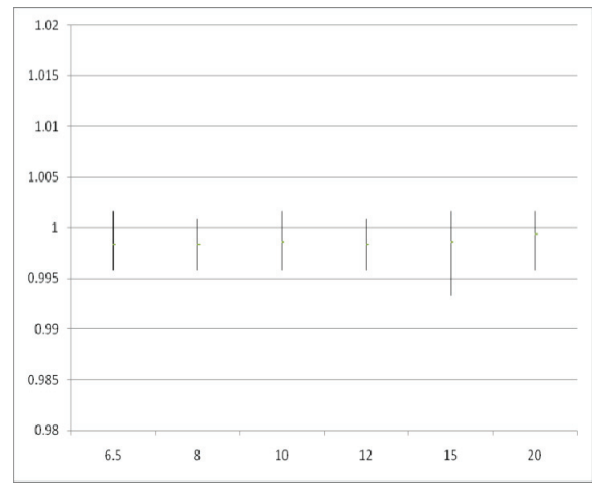


Fig. 17: Line Load Regulation 1.0V



XRP7714EVB-DEMO-X

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Document Revision History

Revision	Date	Description
1.0.0	04/15/2011	Initial release of document

BOARD REVISION HISTORY

Board Revision	Date	Description
REV2.0	01/03/2011	Initial release of evaluation boards 2 and 2P.
REV2.0	12/23/2010	Initial release of evaluation board 1. Note: Limited to a production of 150 units.

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