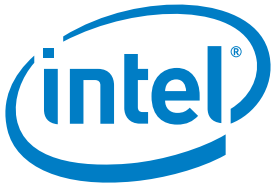

Intel® Enpirion® Power Solutions

EM2130 Evaluation Board User Guide

User Guide

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1. Description

The EM2130 is a 30A PowerSoC synchronous buck converter from the Intel® Enpirion® Power Solutions family. The EM2130 features an advanced digital controller, gate drivers, synchronous MOSFET switches, and a high performance inductor. Only input and output filter capacitors and a few small signal components are required for a complete solution. A PMBus™ version 1.2 compliant interface provides setup, control, and telemetry.

Differential remote sensing and ±0.5% set-point accuracy provide precise regulation over line, load and temperature variation. Very low ripple further reduces accuracy uncertainty to provide best in class static regulation for today's FPGAs, ASICs, processors, and DDR memory devices.

2. Required Equipment

Table 1: Required Equipment

Item #	Equipment	Recommended
1	DC Power Supply	20V/30A, adjustable
2	Electronic Load	50...100A with dynamic load capabilities
3	Intel Enpirion PMBus Communication Interface Dongle	
4	Intel 25A Mini Slammer Load	Fits the on-board LD1 socket
5	DMM	6 ½ digit
6	Oscilloscope	4 channels, 0.5 GHz BW
7	Cables	>30A capability, eyelet terminal, 4 mm diameter hole, 10 mm outer diameter

3. Evaluation Board Overview

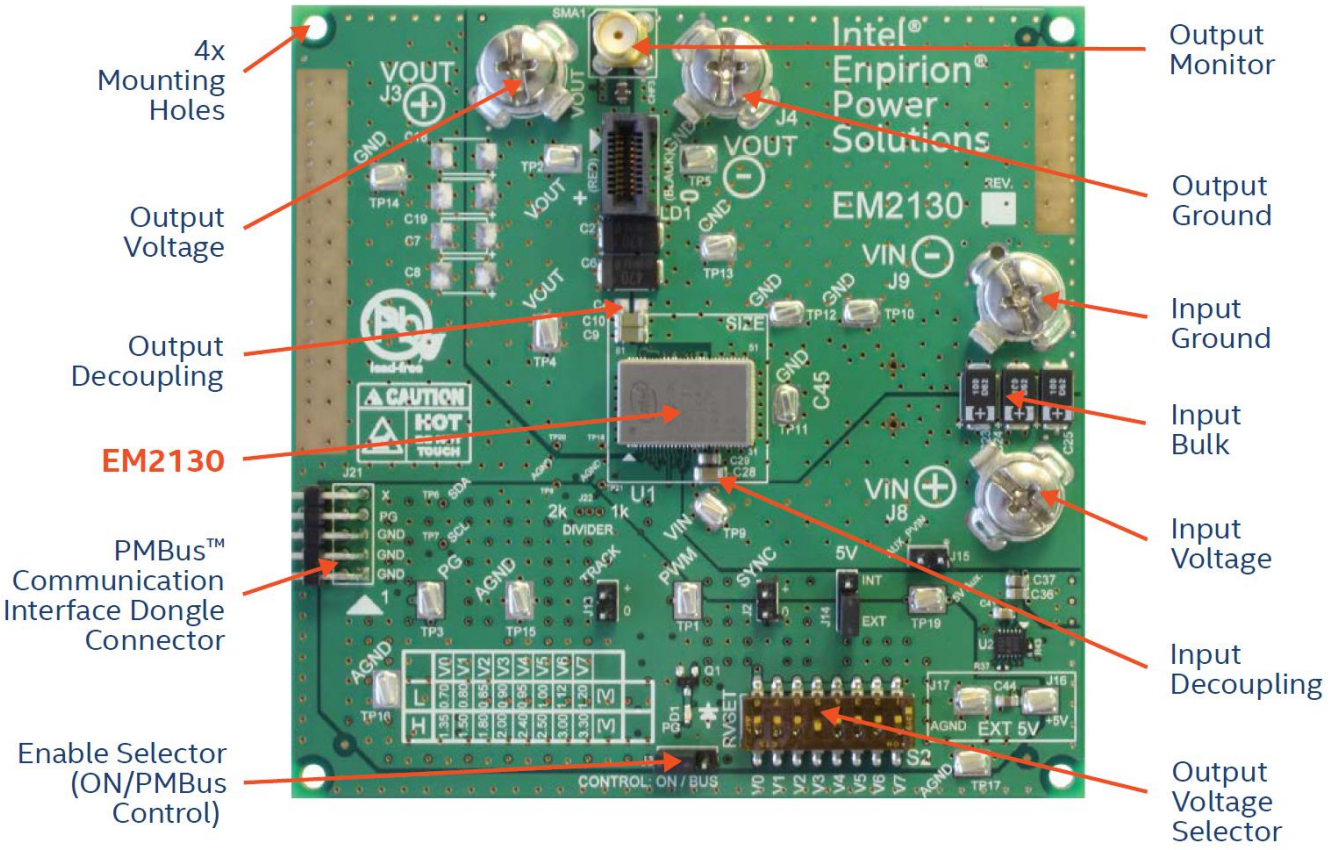


Figure 1: EM2130 Evaluation Board Overview (View From Top)

4. Instructions

1) Connect the power supply

- Set the Power Supply to 12V/10A.
- Connect the power supply to the board (make sure that the power supply is OFF) with two patch cables, not longer than 12 inches (30 cm). Using longer wires is possible, provided that additional bulk is added to the board (the C45 through-hole capacitor footprint is available for this purpose) and the input voltage is monitored at the board level. Please use INPUT GROUND and INPUT VOLTAGE eyelet-terminated cables to connect the power.
- Please observe the correct polarity.

CAUTION: *Incorrect polarity of the power supply may cause permanent board damage!*

CAUTION: *Power supply voltage above 20V may cause permanent board damage!*

2) Connect the load

- Connect the load to the OUTPUT GROUND and OUTPUT voltage with patch cables, no longer than 12 inches (30 cm).
- Please observe the correct polarity.

3) Check jumper settings

- The board will arrive with one jumper on the J6 (BUS – enabling control through PMBUS), one jumper on J14 (INT – this enables the on-board 5V power supply) and one jumper on J15 (AUX_PVIN – this biases the 5V on board DC-DC converter). If an auxiliary 5V power supply is needed (connected between J16 (+) and J17 (-)), J14 should be placed across the “EXT” position while J15 can be removed.
- Although “TRACK” and “SYNC” use 100 mils headers, they are NOT to be shorted by jumpers.

4) Connect the PMBUS GUI interface dongle

- The USB Dongle can be inserted only in the correct position, with pin one towards GND. All pins must be properly inserted.
- Prerequisite: the latest GUI software must be installed on a Windows PC.

5) Set the output voltage

- Using the chart from the silkscreen, please select the desired output voltage, using ONLY ONE switch ON. This setting will be read by the module when the part is powered on or by PMBus command; changing the resistor on the fly will not have any effect.

6) Power-up the board

- After all preparations above, the board should be ready to perform. If the GUI interface dongle is not used, the jumper J6 should be moved to the "ON" position; else the jumper J6 should be in the "BUS" position.
- The voltage range (High/Low) is marked on the board, as shown in Figure 2:

Figure 2: "L" and "H" Jumper Table, Marked On The EM2130 Evaluation Board Silk Screen

- For instruction on how to use the EM2130 GUI, please read "GUI User Guide."

NOTE: *To measure the Bode Plot of the DC-DC converter, R12 must be replaced with 50Ω resistor across which to inject the signal, while TP18, TP20, TP8 and TP21 should be used to connect the probes of the phase analyzer.*

5. Evaluation Board Schematic

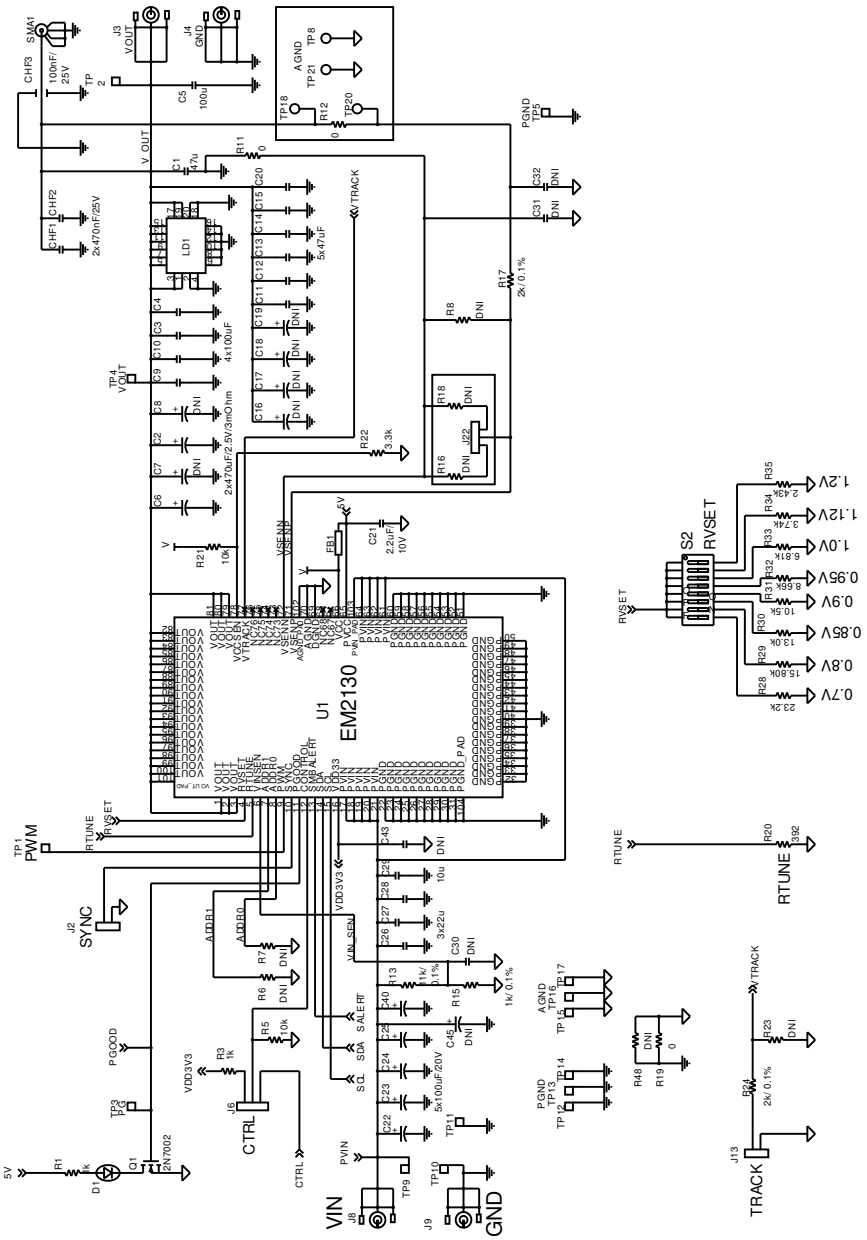


Figure 3: Evaluation Board Schematic – Power

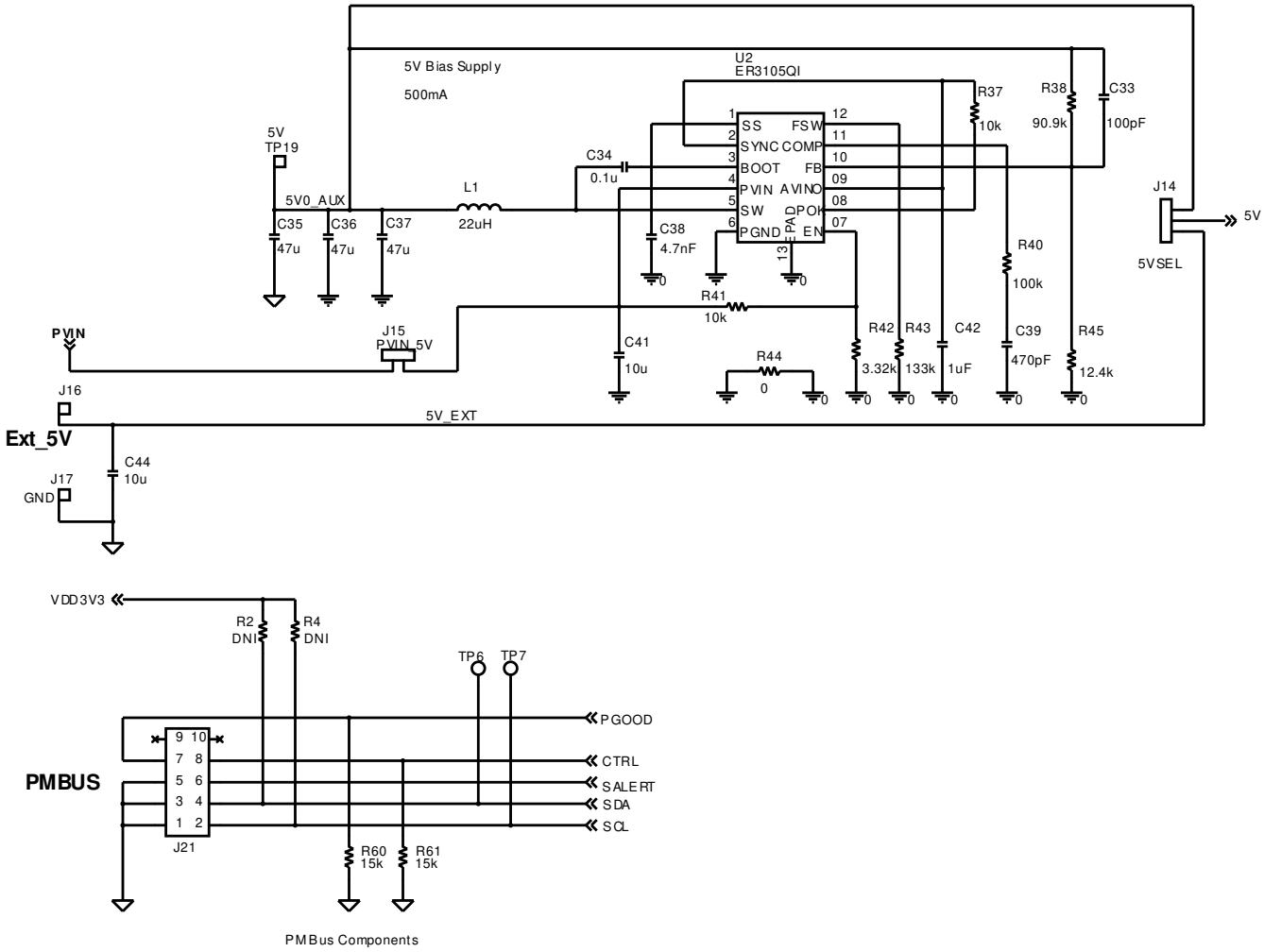


Figure 4: Evaluation Board Schematic – AUX

6. Bill of Materials

Table 2: Bill of Materials

Type	Description	Qty.	BOM Ref Des	Mfr. Name
Capacitor	CAP CER 0.1UF X7R 0402 10V 10%	1	C34	Murata
Capacitor	CAP CER 4.7NF X7R 0402 25V 10%	1	C38	Murata
Capacitor	CAP CER 100UF 6.3V X5R 1206	5	C3,C4,C5,C9,C10	Kemet
Capacitor	CAP CER 47UF 6.3V X5R 0805	3	C35,C36,C37	Taiyo Yuden
Capacitor	CAP CER 47UF 6.3V X5R 1206	7	C1,C11,C12,C13, C14,C15,C20	Murata
Capacitor	CAP CER 22UF 25V 10% X5R 1206	3	C26,C27,C28	Murata
Capacitor	CAP CER 2.2UF 16V 10% X6S 0402	1	C21	TDK
Capacitor	CAP CER 100PF 50V 5% NP0 0402	1	C33	Taiyo Yuden
Capacitor	CAP CER 1UF 25V 20% X5R 0402	1	C42	Taiyo Yuden
Capacitor	CAP CER 0.47UF 25V 20% X7R 0612	2	CHF1,CHF2	Murata
Capacitor	CAP CER 10UF 25V 10% X5R 0805	3	C29,C41,C44	Murata
Capacitor	CAP CER 470PF 25V X7R 10% 0402	1	C39	Vishay
Capacitor	CAP - POSCAP, 100UF, 20V, ESR=55 mΩ	5	C22,C23,C24,C25, C40	Panasonic
Capacitor	CAP 100NF 25V 0805 FEED-THROUGH	1	CHF3	TDK
Capacitor	CAP ALUM POLY 470UF 20% 2.5V	2	C2,C6	Panasonic
Resistor	1K 1% 0805 CHIP RESISTOR 1/8W	1	R1	Panasonic
Resistor	RES 100K OHM 1/16W 1% 0402	1	R40	Panasonic
Resistor	RES ZERO OHM 1/10W 5% 0603	1	R19	Panasonic
Resistor	RESISTOR ZERO OHM 1/10W 5% 0402	3	R11,R12,R44	Panasonic
Resistor	RESISTOR 15K OHM 1/16W 5% 0402	2	R60	Stackpole Electronics
Resistor	RES 90.9K OHM 1/16W 1% 0402	1	R38	Yageo
Resistor	RES 390 OHM 1/16W 0.1% 0603	1	R20	Panasonic
Resistor	RES 8.66K OHM 1/10W 1% 0603	1	R32	Panasonic
Resistor	RES 2.43K OHM 1/10W 1% 0603	1	R35	Vishay/Dale

Type	Description	Qty.	BOM Ref Des	Mfr. Name
Resistor	RES 133K OHM 1/10W 1% 0402	1	R43	Panasonic
Resistor	RES 3.32K OHM 1/10W 1% 0402	1	R42	Panasonic
Resistor	RES 12.4K OHM 1/10W 1% 0402	1	R45	Panasonic
Resistor	RES 1K OHM 1% 1/10W 0402	1	R3	Panasonic
Resistor	RES 11K OHM 1/16W 0.1% 0402	1	R13	Susumu
Resistor	RES - 6.81K OHM 0603 1/16W 1%	1	R33	Panasonic
Resistor	RES 1K OHM 1/16W 0.1% 0402	2	R15,R16	Susumu
Resistor	RES 2K OHM 1/16W 0.1% 0402	3	R17,R18,R24	Susumu
Resistor	RES 23.2K OHM 1/10W 1% 0603	1	R28	Vishay Dale
Resistor	RES - 3.74K OHM 0603 1/10W 1%	1	R34	Yageo
Resistor	RES 13K OHM 1/16W 1% 0603	1	R30	Yageo
Resistor	RES 3.3K OHM 1/16W 1% 0402	1	R22	Panasonic
Resistor	RES - 10.5K OHM, 1%,1/10W, 0603	1	R31	Panasonic
Resistor	RES 10K OHM 1/10W 1% 0402	4	R5,R21,R37,R41	Panasonic
Resistor	RES - 15.8K,0603,1%,	1	R29	KOA Speer
LED	LED GREEN CLEAR 0603	1	D1	LITE-ON INC
Inductor	INDUCTOR, 22UH, 1.3A,	1	L1	Taiyo Yuden
MOSFET	MOSFET N-CH 60V 300MA SOT23	1	Q1	Fairchild
Inductor	FERRITE BEAD 220 OHM 0402 1LN	1	FB1	Wurth Electronik
Connector	INTEL 25A SLAM LOAD CONNECTOR	1	LD1	Samtec

7. Typical Performance

7.1 Pre-bias Monotonic Startup

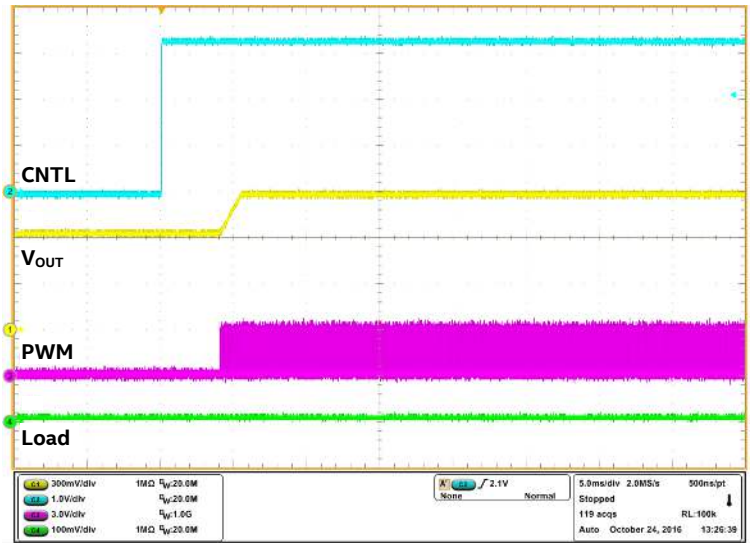


Figure 5: Pre-bias Monotonic Startup, V_{IN} = 12V, V_{OUT} = 0.9V, Pre-bias = 0.6V

7.2 Transient Performance

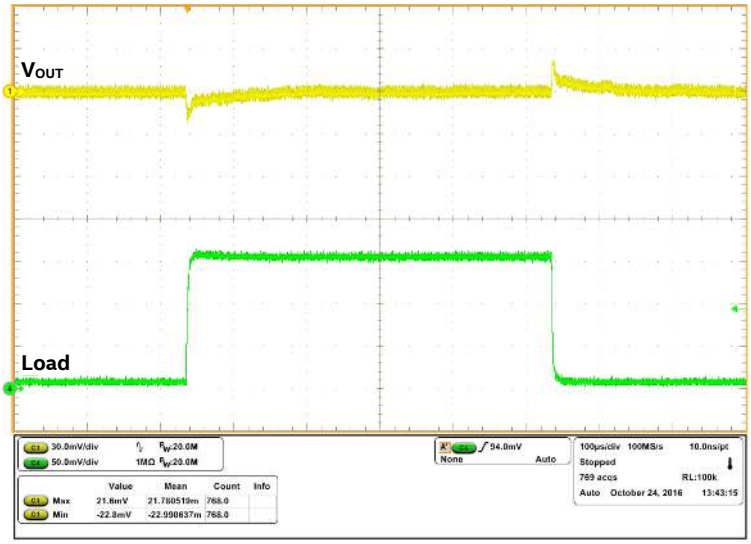


Figure 6: Transient Performance, V_{IN} = 12V, V_{OUT} = 0.9V, ΔI_{LOAD} = 0 to 15A (15A/µs)

7.3 Ripple

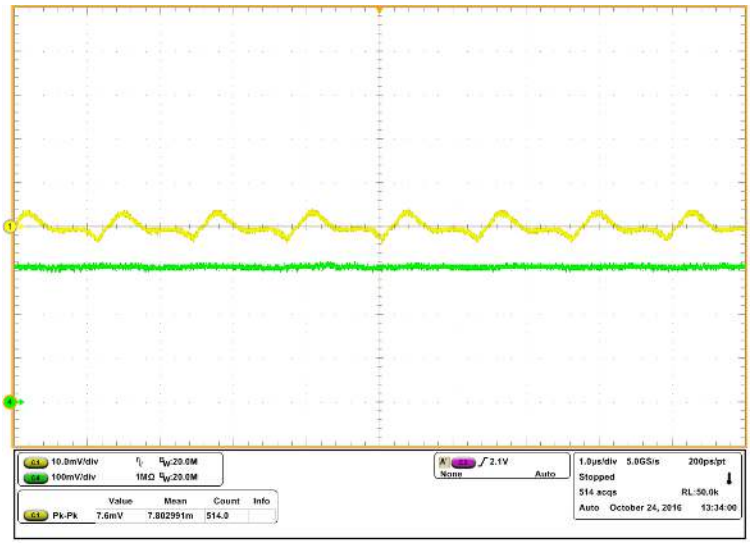


Figure 7: Ripple, V_{IN} = 12V, V_{OUT} = 0.9V, I_{LOAD} = 30A, f_{SW} = 800 kHz

7.4 Efficiency

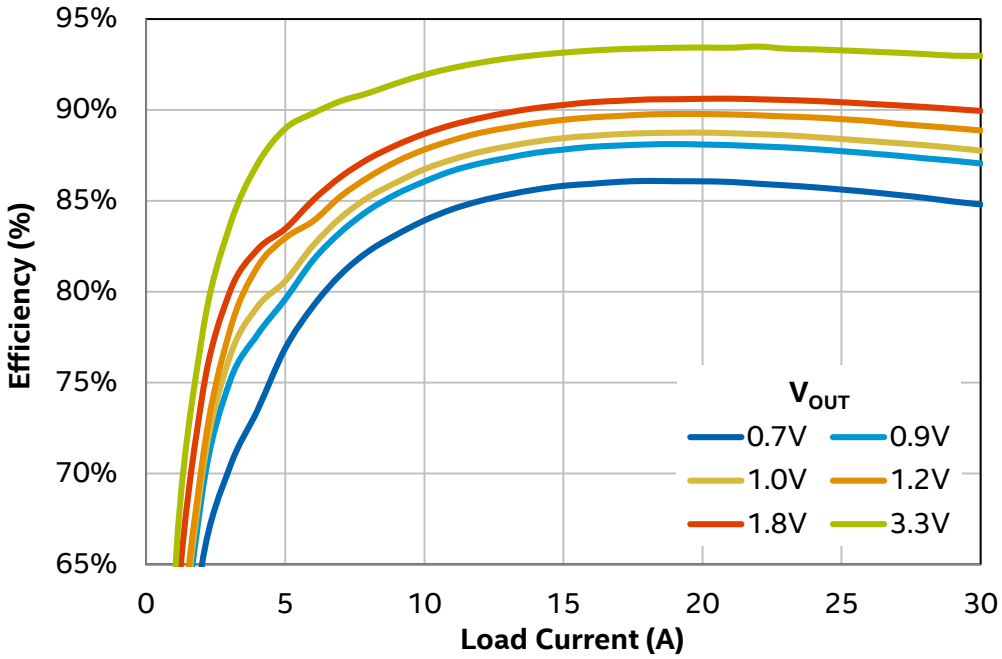
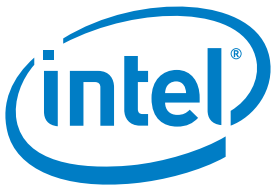


Figure 8: Efficiency Measured, V_{IN} = 12V and Various V_{OUT}



8. Revision History

Revision Number	Description	Revision Date
001	Initial release.	March 2017