EV1404-3300-A EVALUATION BOARD USER GUIDE

Introduction

This user guide describes the evaluation board provided for the FS1404 µPOL™ product.

The board generates an output voltage (V_{OUT}) of 3.3V for loads of 0–4A from an input voltage (PV_{IN}) of 12V.

Specifications

- Input voltage (PV_{IN}) = +12V
- Output voltage (V_{OUT}) = +3.3V
- Output load (I_O) = 0–4A
- Switching frequency (F_{SW}) = 1.4MHz
- Output capacitance (C_O) = 2x22µF (MLCC)
- In put capacitance (C_{IN}) = 2x22µF (MLCC)
- Dimensions (width x length x thickness) = 63 x 84 x 1.5mm

Connections

Name	Identifier	Description
PV_{IN}	J1	Input voltage (+12V)
Gnd	J2	Ground for input voltage
V_{OUT}	J8	Output voltage (+3.3V)
Gnd	J7	Ground for output voltage
V_{CC}	TP2	Internal supply (V_{CC}) – output of an LDO regulator
Gnd	TP3	Ground for internal supply
En	TP11	Enable
PG	TP12	Power Good

The board is configured for a single input supply. An internal low drop-out regulator generates the internal supply (V_{CC}) from PV_{IN}. The Enable (En) input is connected to PV_{IN} through a resistor divider, so that no Enable signal is needed.

Operation

To use the evaluation board:

1. Connect a well-regulated +12V input supply to PV_{IN} (J1) and Gnd (J2).
2. Connect a load of 0–4A to V_{OUT} (J8) and Gnd (J7).

Description

The evaluation board consists of a 4-layer PCB made from FR4 glass-reinforced epoxy laminate material. All layers use 2oz copper (equating to a thickness of 0.0694mm). The major power components, including the FS1404, are mounted on the top side of the board.

Part reference	Quantity	Type	Description
FS1404 µPOL	1	–	Main IC
C9	1	2.2µF	0402, 10V, X7S
C10, C21	2	22µF	0805, 16V, X5R
C12	1	0.1µF	0402, 16V, X7R
C13	1	68µF	25V
C14, C15	2	22µF	0805, 6.3V, X5R
C26	1	1µF	0603, 25V, X5R
J1	1	Red	Banana connector
J2, J7	2	Black	Banana connector
J8	1	Green	Banana connector
J10, J11	2	–	3-pin header
R1	1	2.7Ω	10%, 1/8W, 0805 case size
R3, R7	2	49.9kΩ	10%, 1/8W, 0805 case size
R4, R9, R11, R13, R17	5	0Ω	0402 case size
R6	1	12.7kΩ	10%, 1/8W, 0805 case size
R18, R19	2	4.99kΩ	0402 case size
TP1-TP12, SW/NC15, VBUS, VEXTBUS, SCL, SDA	17	–	Test points

Figure 1 shows the layout of the board and Figure 2 shows a schematic of the electrical circuit.

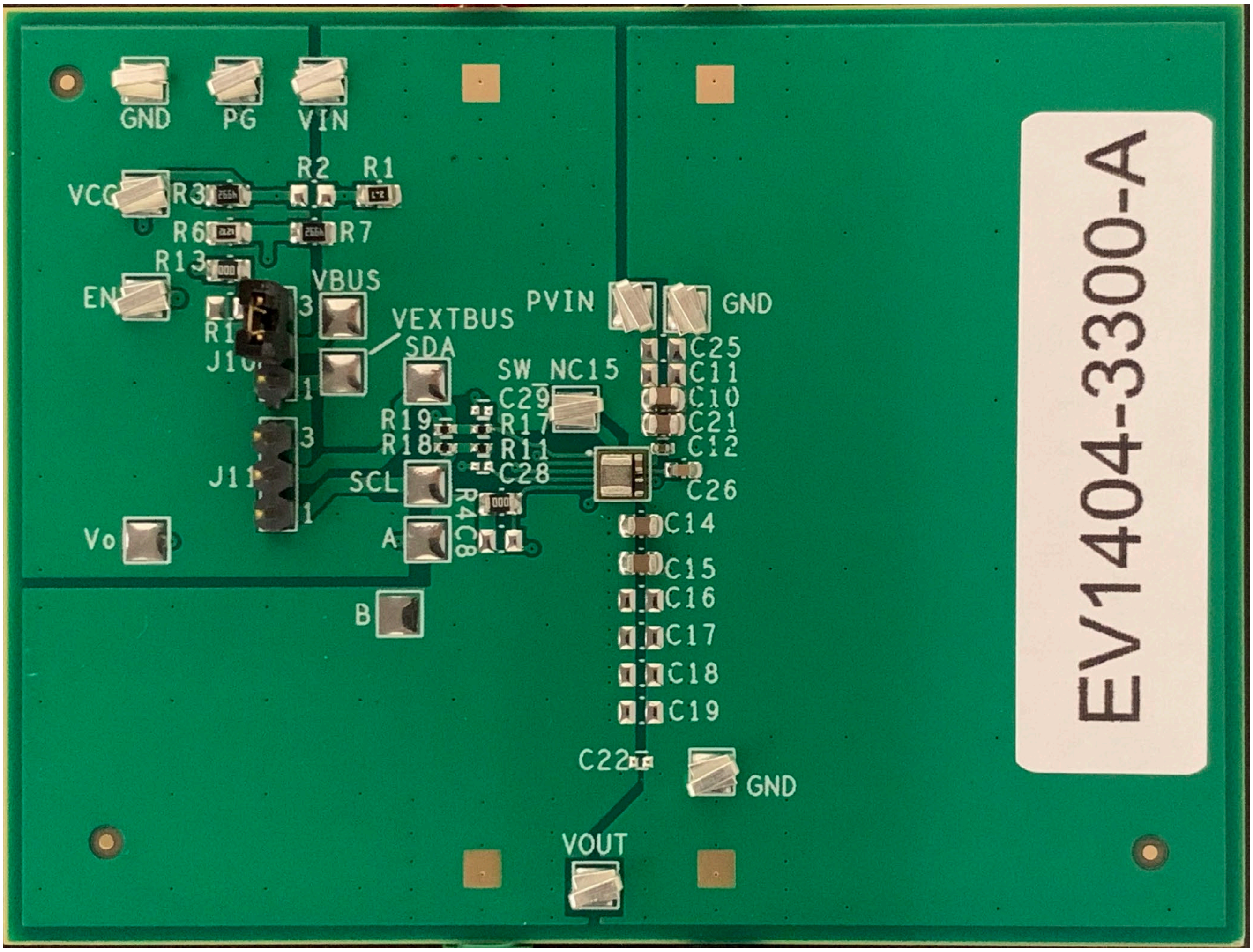

Figure 1 ***Board layout***

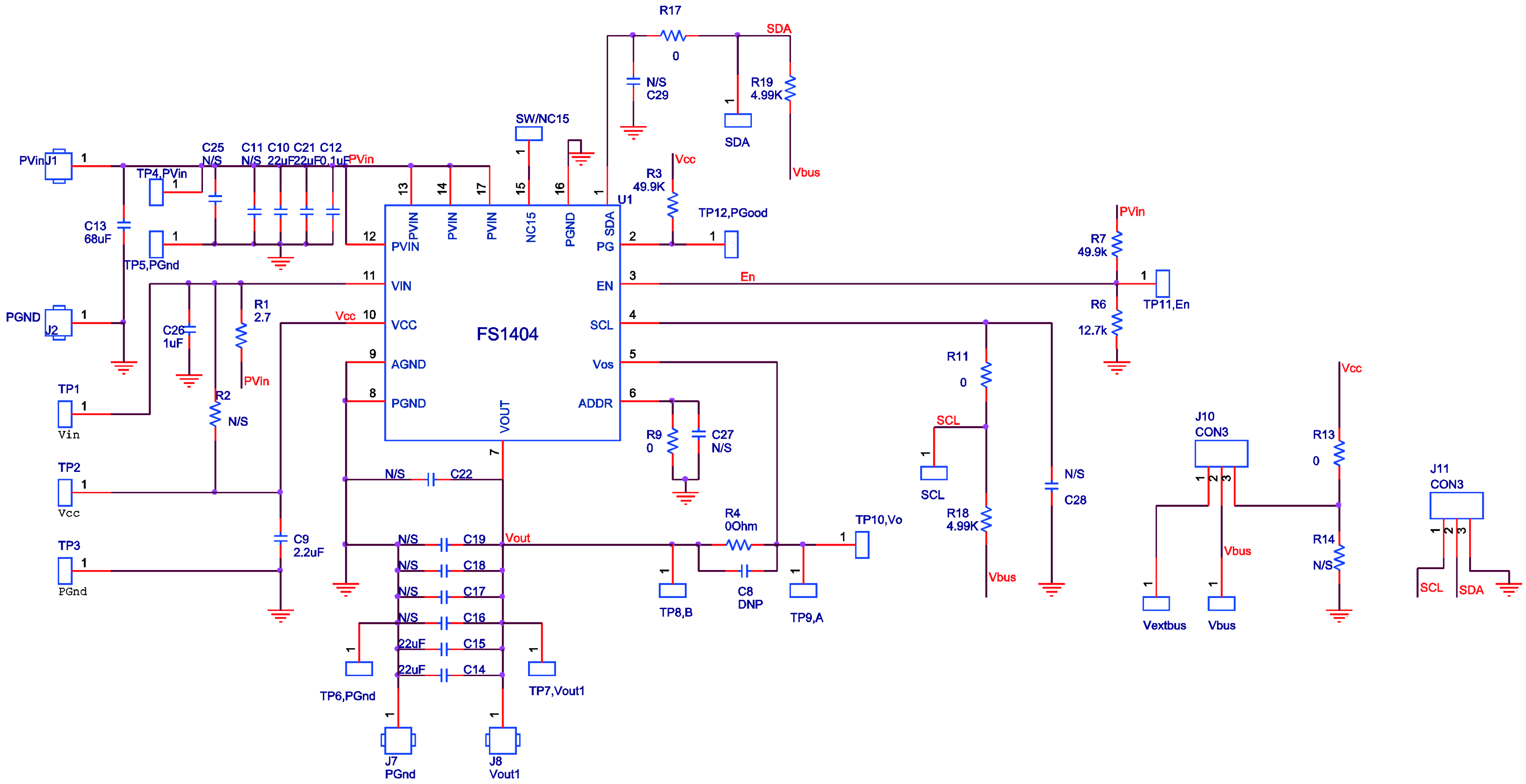

Figure 2 ***Schematic***

Typical performance

Figure 3 to Figure 16 show typical operating waveforms for the evaluation board, while Figure 17 shows a thermal image of the board in operation. In all cases, the board is operating at room temperature with no airflow; PV_{IN} is 12V, V_{OUT} is 3.3V and I_O is 0–4A.

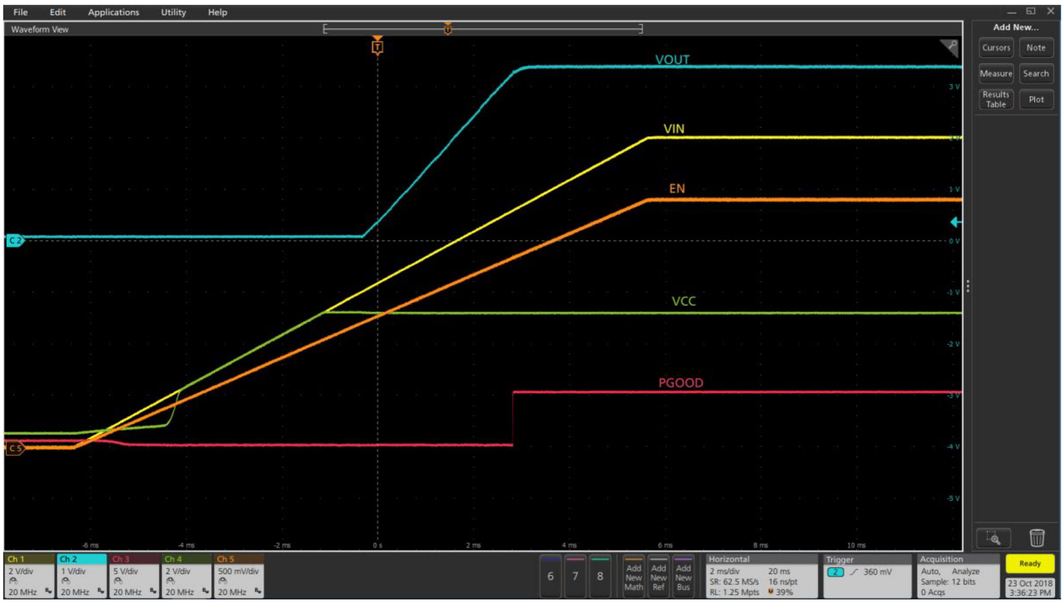

Figure 3 Startup with no load (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PGood, Ch4:V_{CC}, Ch5: Enable)

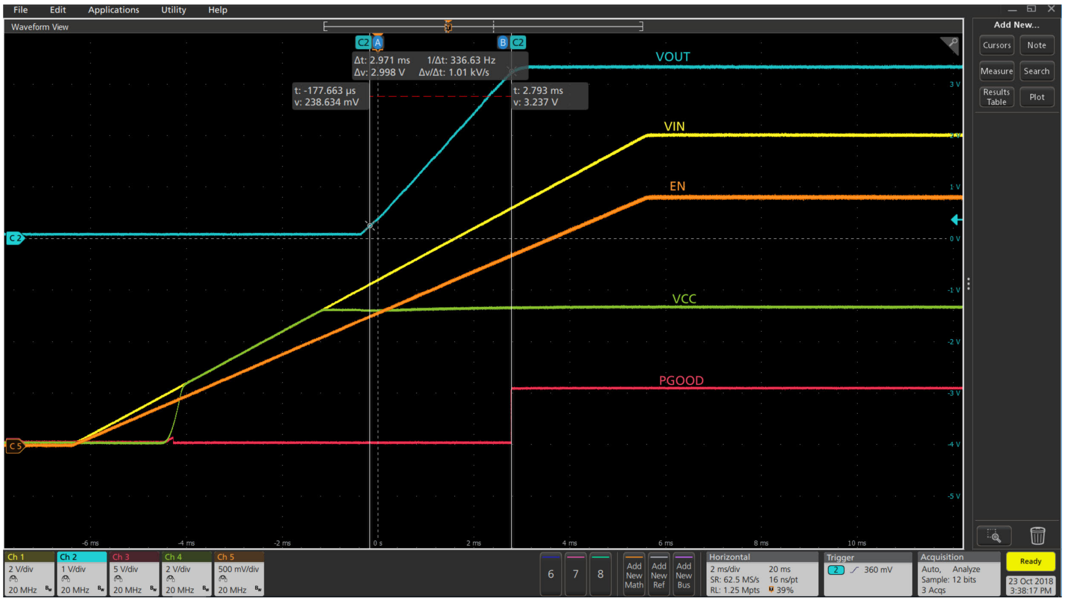

Figure 4 Startup with 4A load (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PGood, Ch4:V_{CC}, Ch5: Enable)

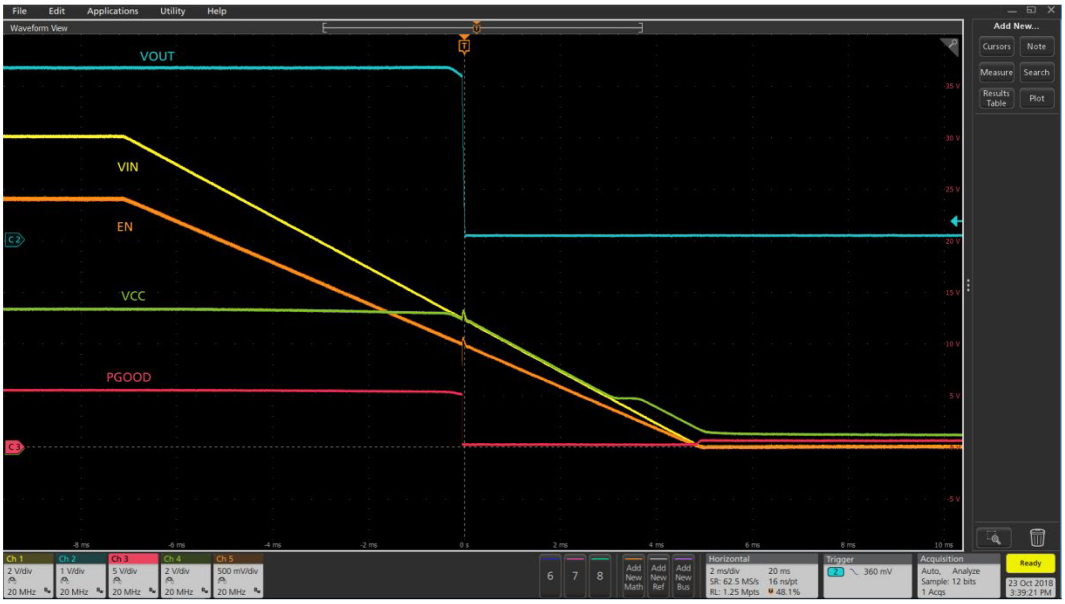

Figure 5 ***Shutdown with Enable de-assertion at 4A load***
(Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PGood, Ch4:V_{CC}, Ch5: Enable)

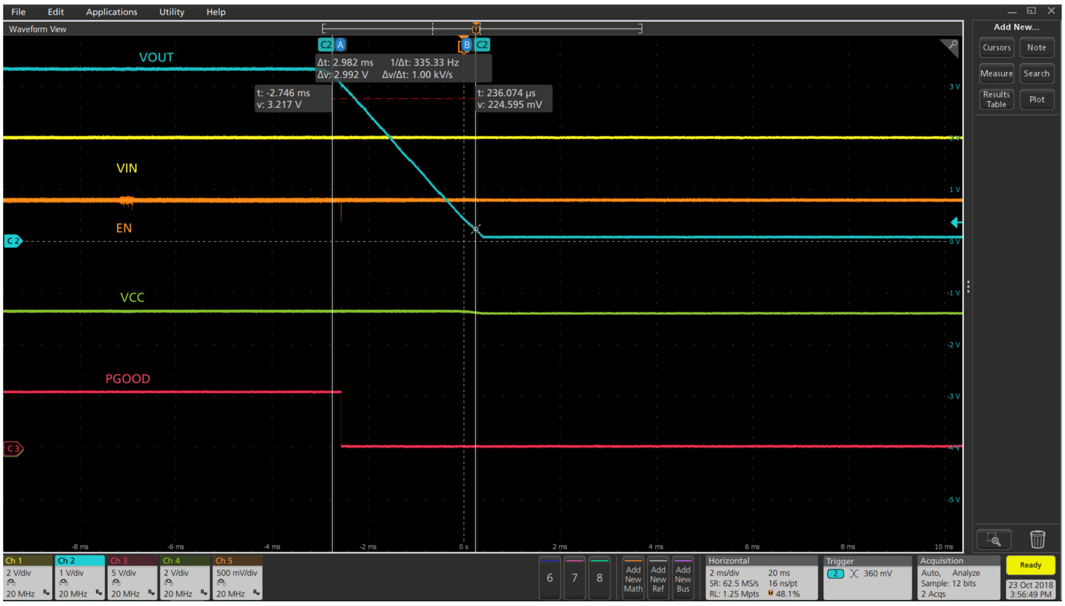

Figure 6 ***Soft turn off at 4A load (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PGood, Ch4:V_{CC}, Ch5: Enable)***

Figure 7   Startup into pre-bias (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PGood, Ch4:V_{CC}, Ch5: Enable)

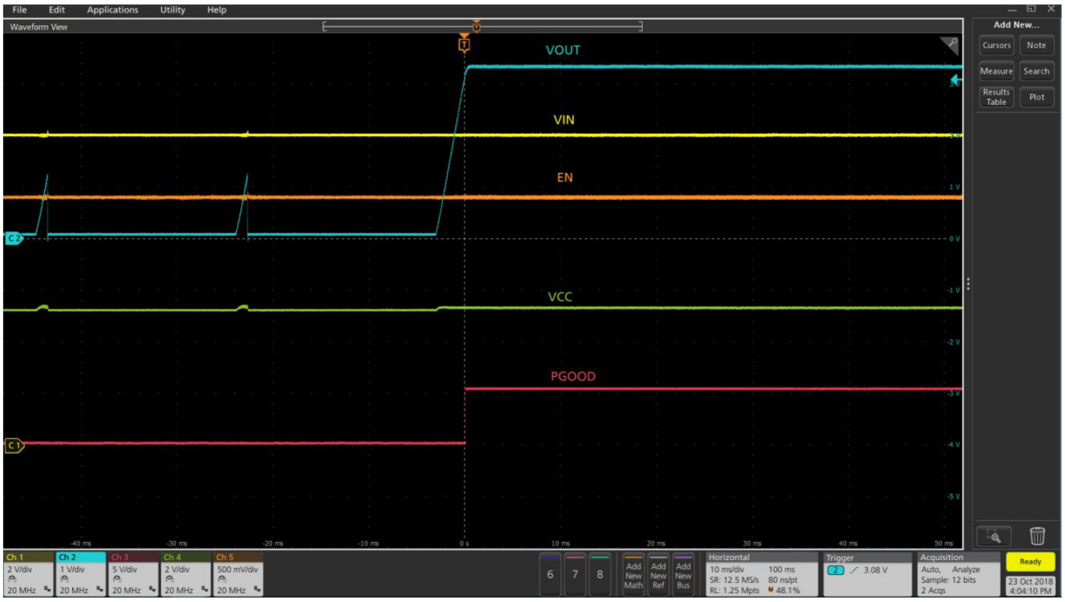

Figure 8   Over-current protection and auto-recover to 4A (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PGood, Ch4:V_{CC}, Ch5: Enable)

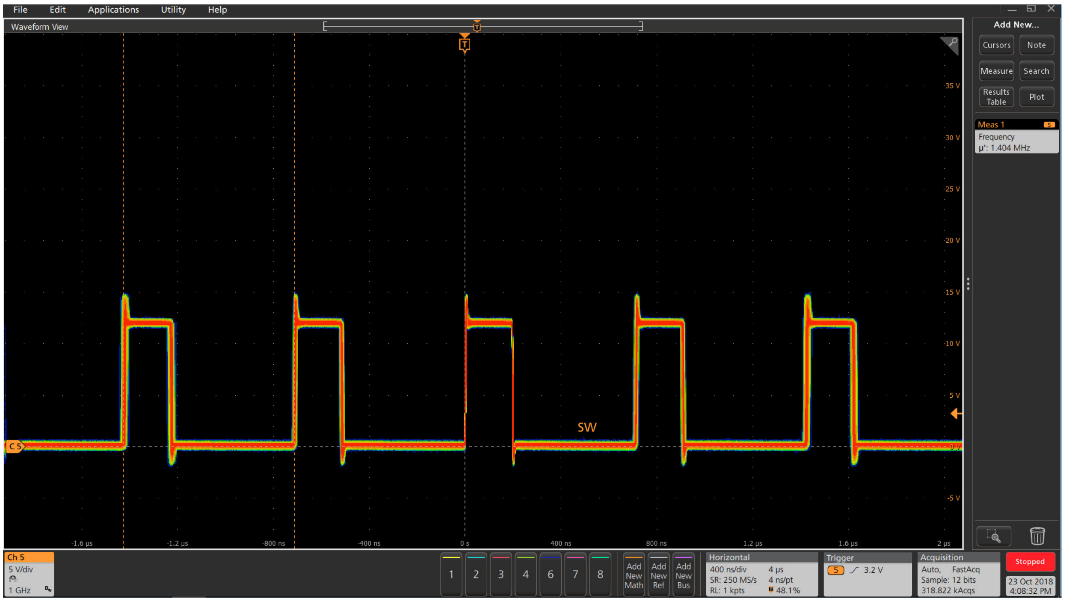

Figure 9 Sw at 0A (Ch5: Sw)

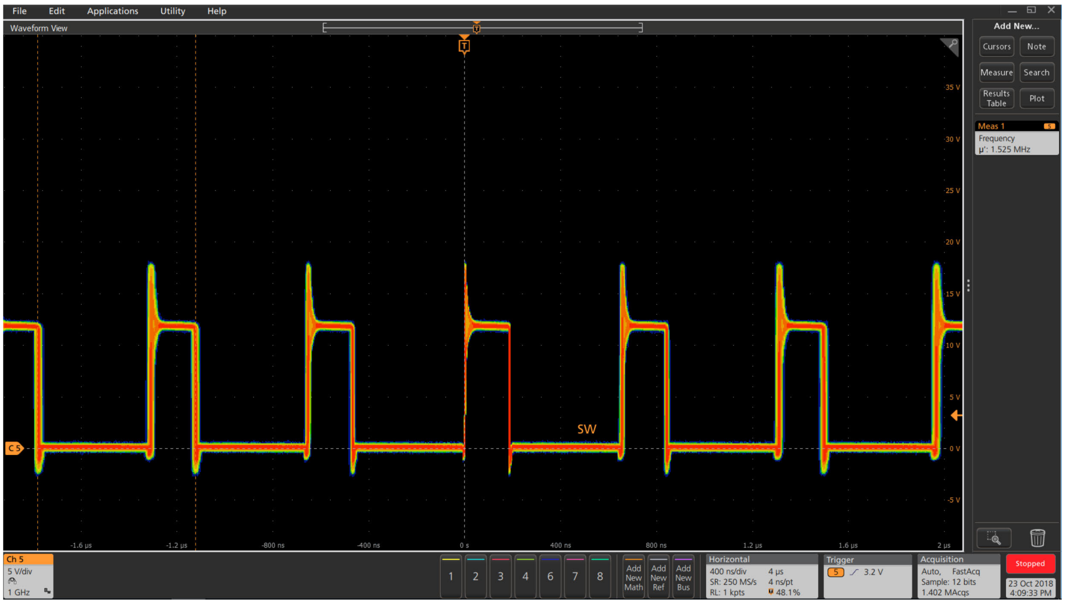

Figure 10 Sw at 4A (Ch5: Sw)

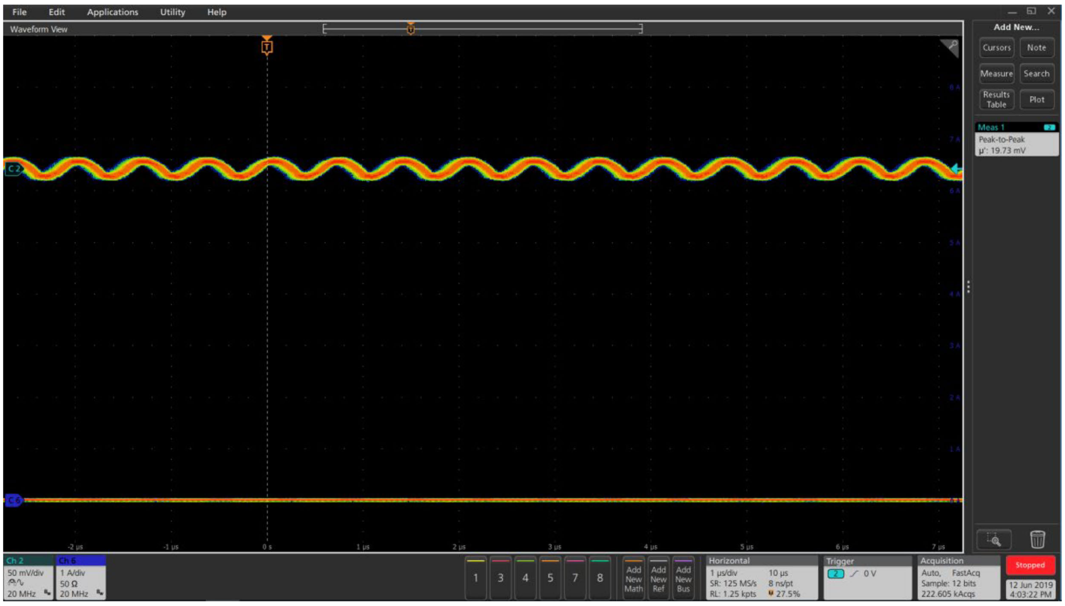

Figure 11 V_{OUT} ripple at 0A (Ch2: V_{out}), Peak-Peak V_{OUT} ripple=20mV

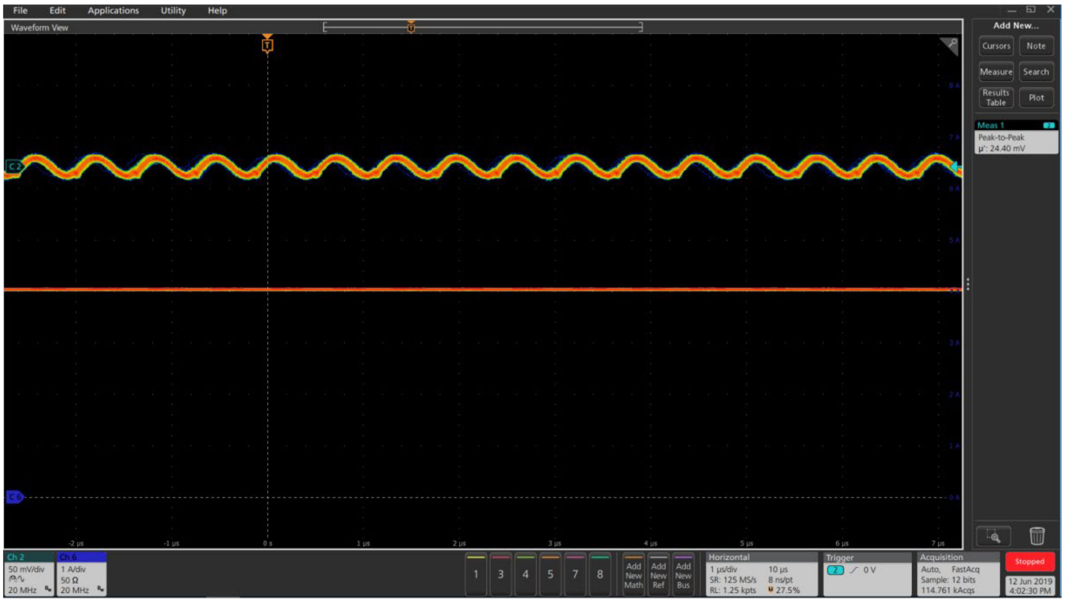

Figure 12 V_{OUT} ripple at 4A (Ch2: V_{out}), Peak-Peak V_{OUT} ripple=25mV

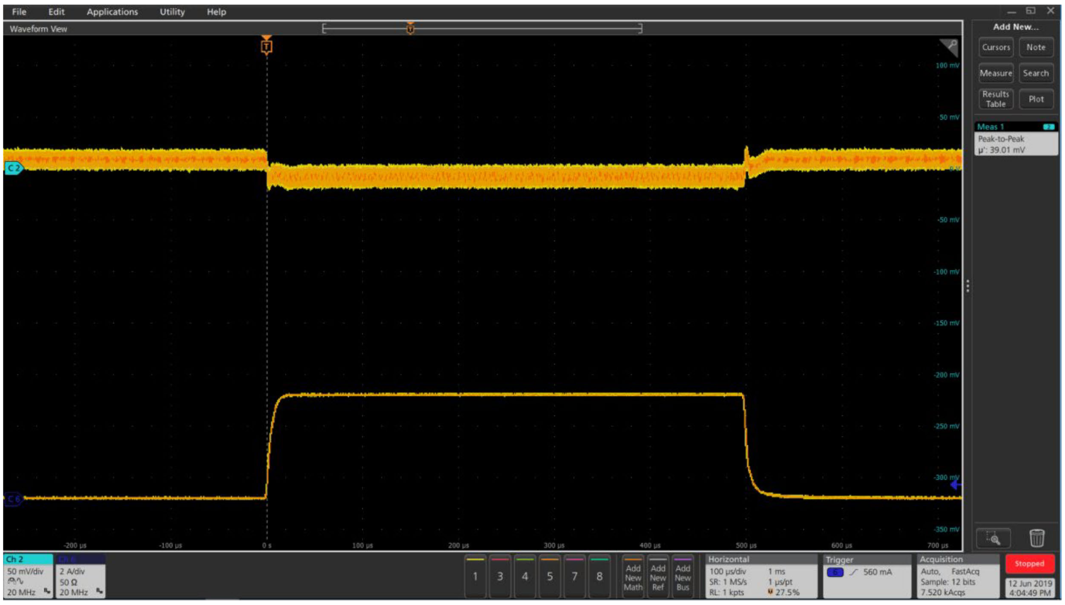

Figure 13 Transient response 0A to 4A (Ch6:I_O, Ch2: V_{OUT}), peak-peak deviation=40mV

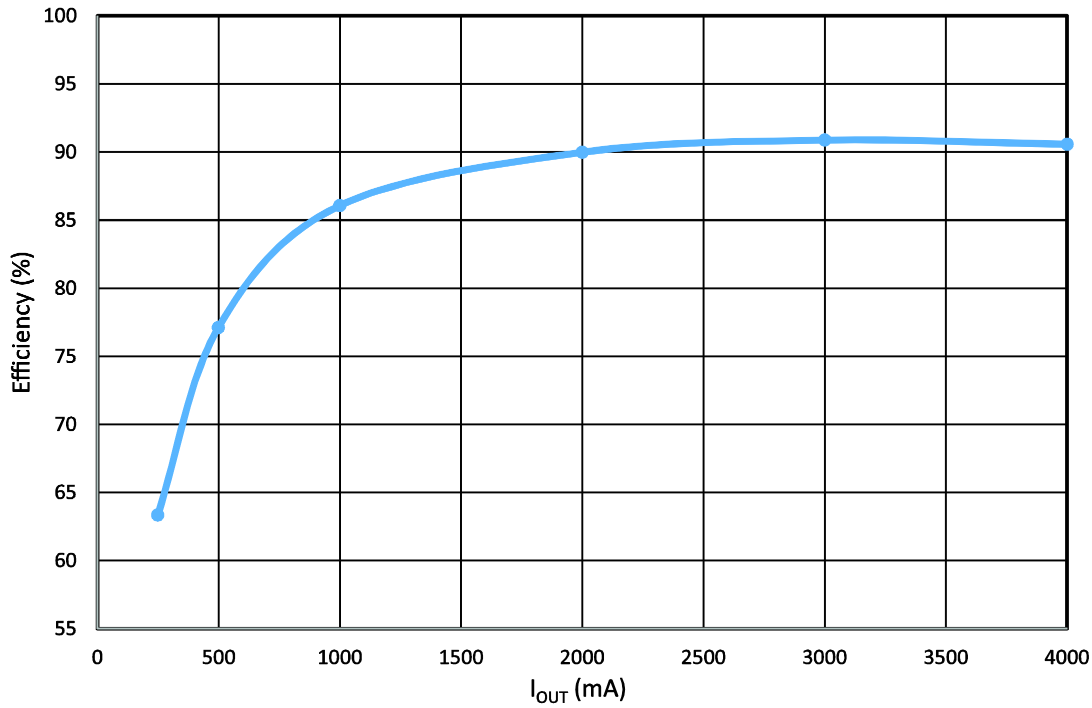

Figure 14 ***Efficiency (V_{IN} = 12V, V_{OUT} = 3.3V)***

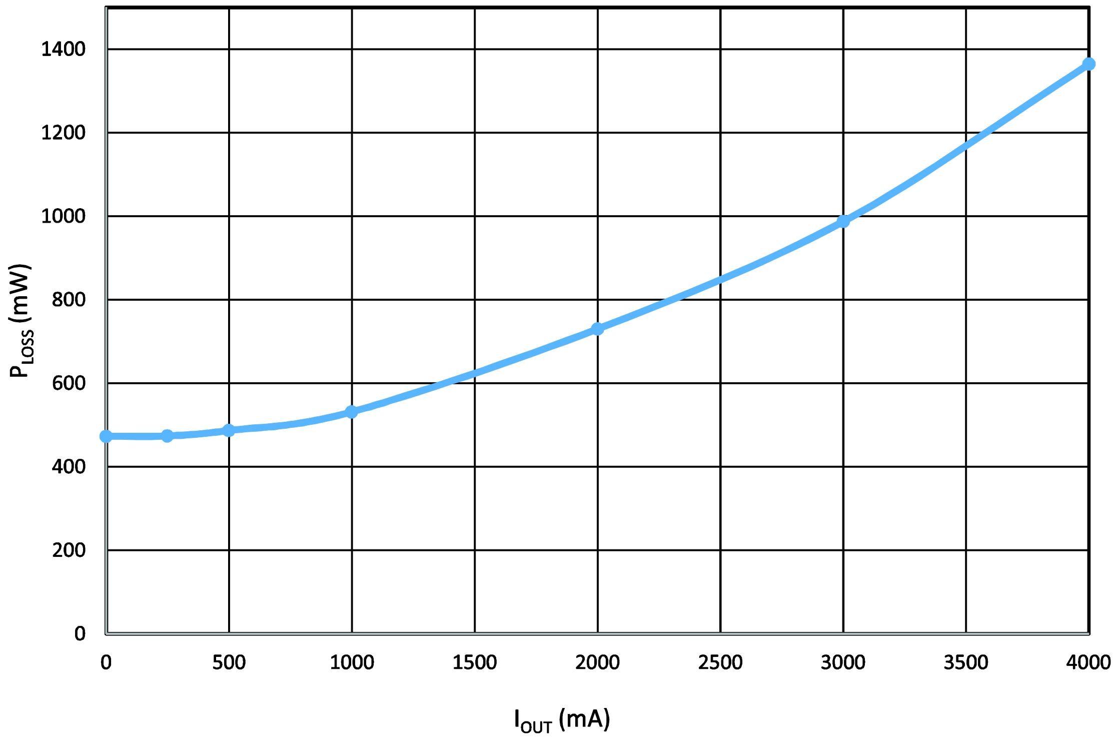

Figure 15 *Power loss (V_{IN} = 12V, V_{OUT} = 3.3V)*

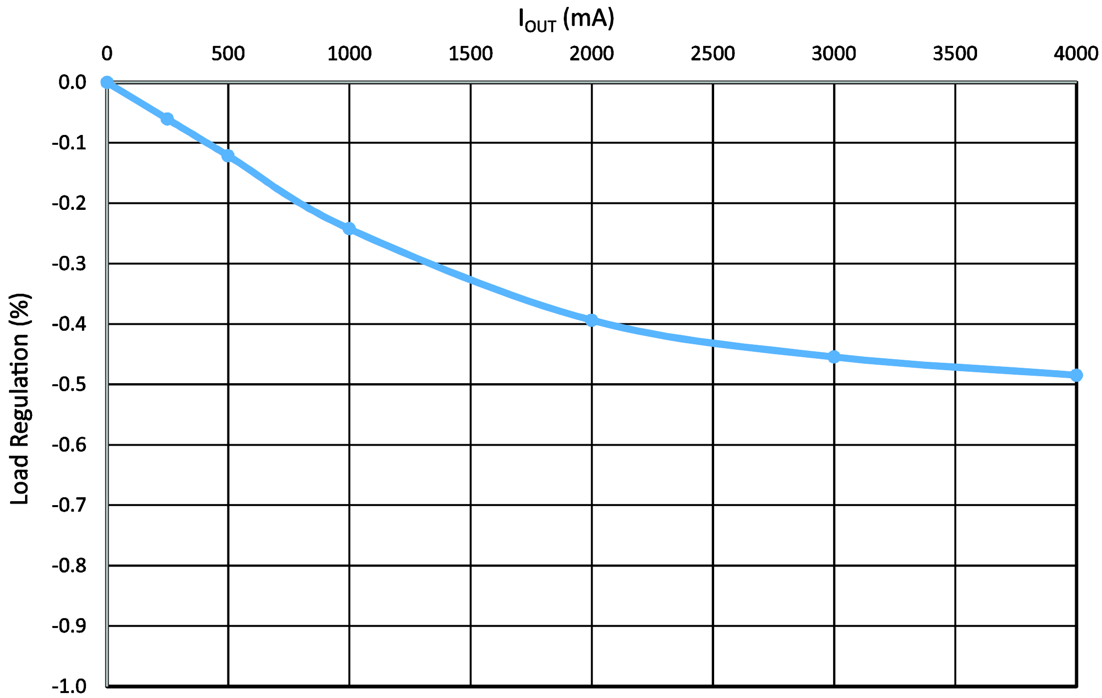

Figure 16 *Load regulation (V_{IN} = 12V, V_{OUT} = 3.3V, I_{O} = 0–4A)*

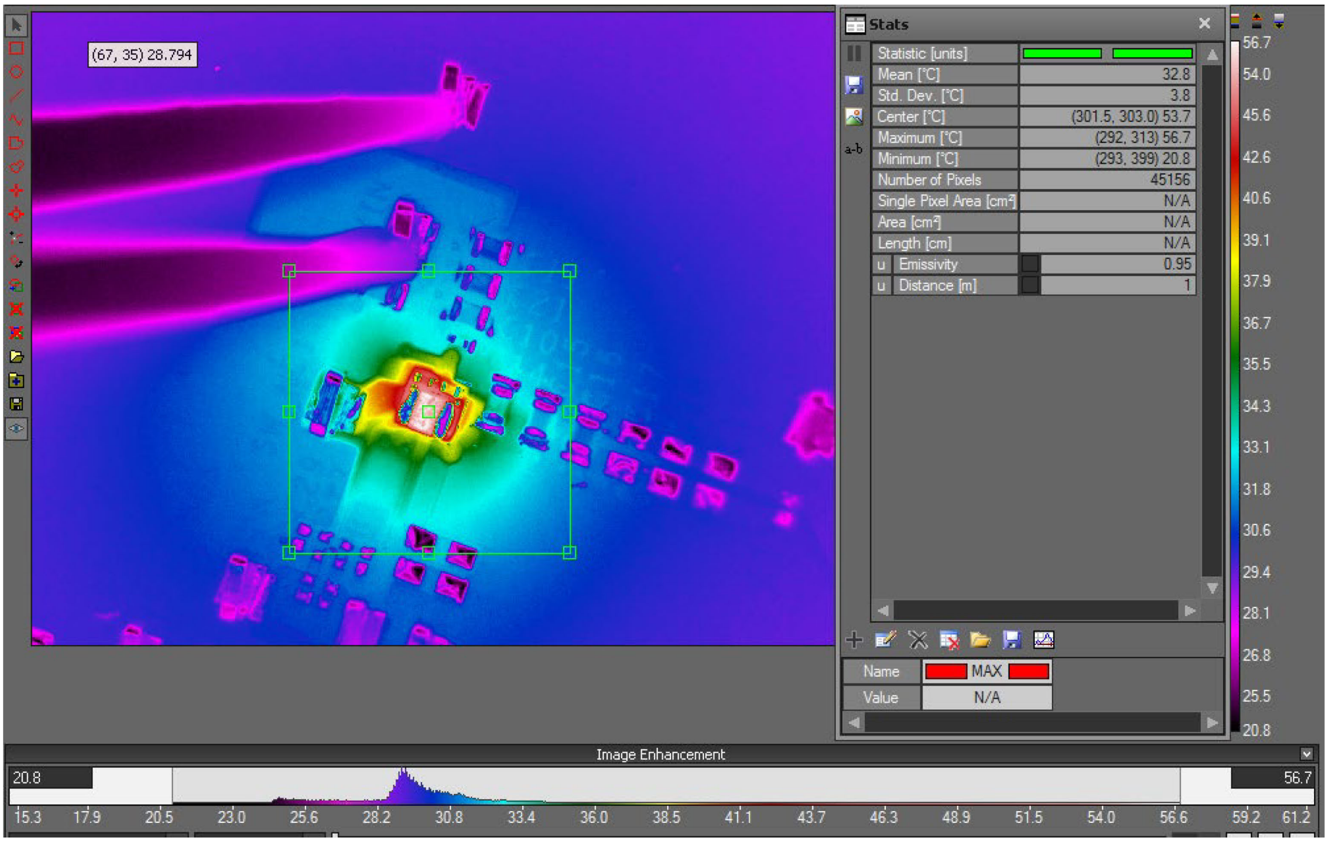

Figure 17 ***Thermal image at PV_{IN} = 12V, V_{OUT} = 3.3V, I_O = 4A, room temperature, no airflow, FS1404 maximum temperature = 57°C***

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