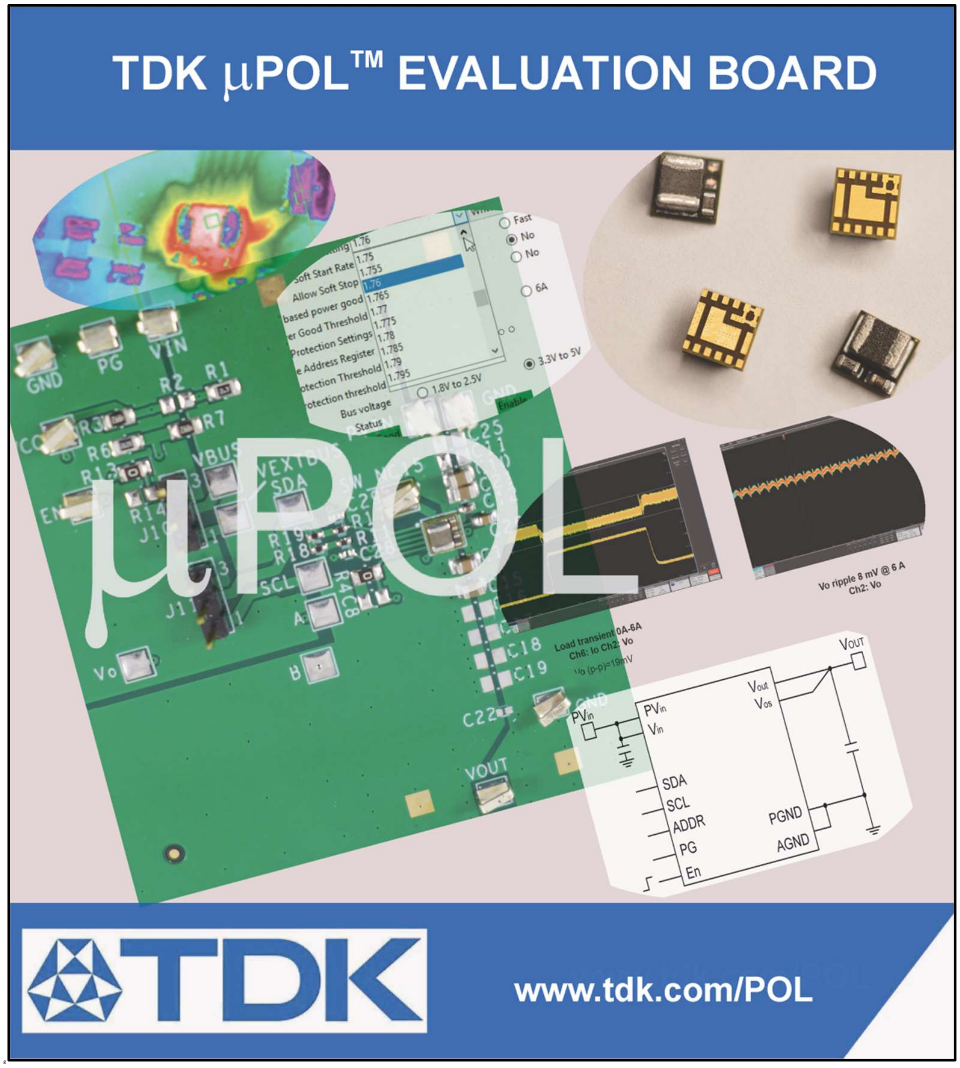


EV1003-0600-A
EVALUATION BOARD
USER GUIDE

Introduction

This user guide describes the evaluation board provided for the FS1003-0600 µPOL™ product.

The board generates an output voltage (V_{OUT}) of 1.8V* for loads of 0–3A from an input voltage (PV_{IN}) of 12V.

Specifications

- Input voltage (PV_{IN}) = +12V
- Output voltage (V_{OUT}) = +1.8V
- Output load (I_O) = 0–3A
- Switching frequency (F_{SW}) = 1.5 MHz
- Output capacitance (C_O) = 2x22µF (MLCC)
- Input capacitance (C_{IN}) = 2x22µF (MLCC)
- Dimensions (width x length x thickness) = 76.2 x 76.2 x 1.6mm

Connections

Name	Identifier	Description
PV_{IN}	J1	Input voltage (+12V)
Gnd	J1	Ground for input voltage
V_{OUT}	J2	Output voltage (+1.8V)
Gnd	J2	Ground for output voltage
En	J4	Enable
PG	J5	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} and Gnd.
2. Connect a load of 0–3A to V_{OUT} and Gnd.

NOTE – Output Voltages from 0.6V to 5V can be obtained by changing the values of Resistor Divider Components. Refer Page 5

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 FS1003, are mounted on the top side of the board.

Part reference	Quantity	Type	Description
FS1003 µPOL	1	–	Main IC
C20	1	100uF	Aluminum capacitor
C2	1	0.1uF	0402, 25V, X7R
C3,C4	2	22uF	0805, 25V, X5R, 10%
C10,C11	2	22uF	0805, 6.3V, X5R, 10%
C7	1	1uF	0603, 25V, X5R, 10%
C8	1	2.2uF	0402, 10V, X7S, 10%
C9	1	680pF	0603, 25V, COG, 5%
R8	1	12.7K	10%, 1/8W, 0805 case size
R1	1	2.7	10%, 1/8W, 0805 case size
R2	1	4.12K	10%, 1/8W, 0805 case size
R3	1	2.1K	10%, 1/8W, 0805 case size
R7,R9	2	49.9K	10%, 1/8W, 0805 case size
R4,R10	2	0	0805 case size
R11	1	0	0603 case size
R5,R6	2	4.99K	0402 case size
L1	1	0.001ohm	1206 case size
J1,J2	2		TERM BLOCK 2POS 5mm, TH
J3,J4	2		3-pin Header
J5	1		2-pin Header
T1,T2,T3,T4	4		Test point

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

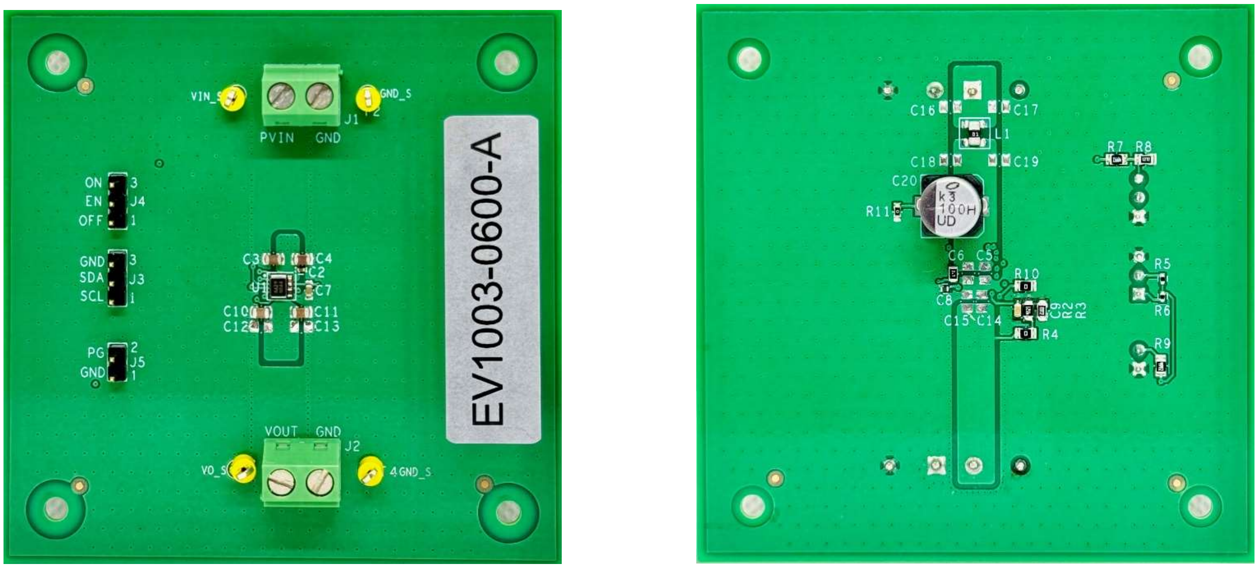
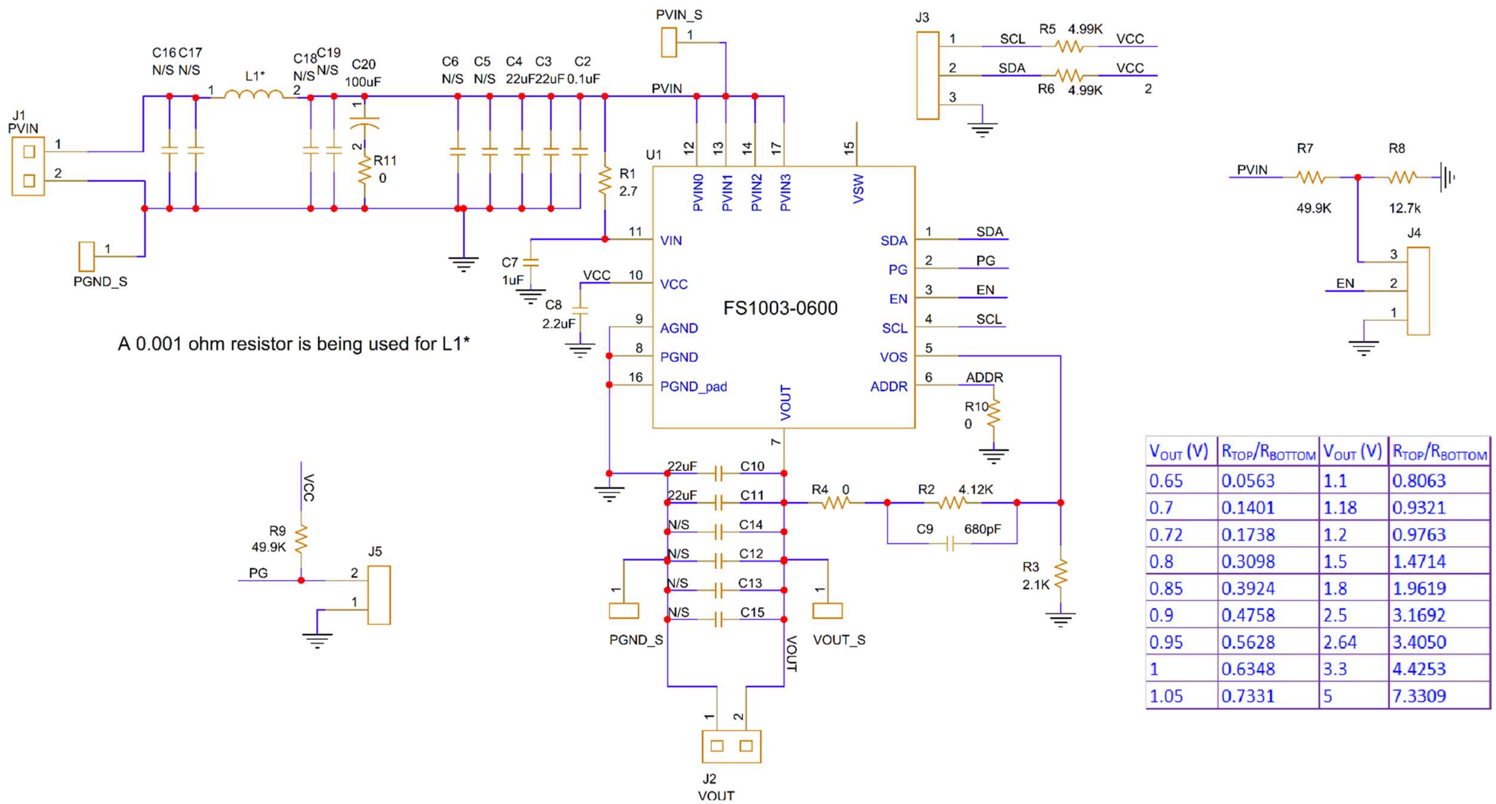


Figure 1 Board layout



V_{OUT} (V)	R_{TOP}/R_{BOTTOM}	V_{OUT} (V)	R_{TOP}/R_{BOTTOM}
0.65	0.0563	1.1	0.8063
0.7	0.1401	1.18	0.9321
0.72	0.1738	1.2	0.9763
0.8	0.3098	1.5	1.4714
0.85	0.3924	1.8	1.9619
0.9	0.4758	2.5	3.1692
0.95	0.5628	2.64	3.4050
1	0.6348	3.3	4.4253
1.05	0.7331	5	7.3309

Figure 2 Schematic*

NOTE – Modify R3 (R_{BOTTOM}) for different V_{OUT} as per the included table. R2 (R_{TOP}) = 4.12 kΩ, C9 = 680pF is recommended. For V_{OUT} =0.6V; R2 = 0Ω, C9 = DNP. R10 = 0Ω for V_{OUT} > 0.6V and R10 = 6.34 kΩ for Vout = 0.6V.

Typical performance

Figure 3 to Figure 17 show typical operating waveforms for the evaluation board, while Figure 18 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 1.8V and I_O is 0–3A.

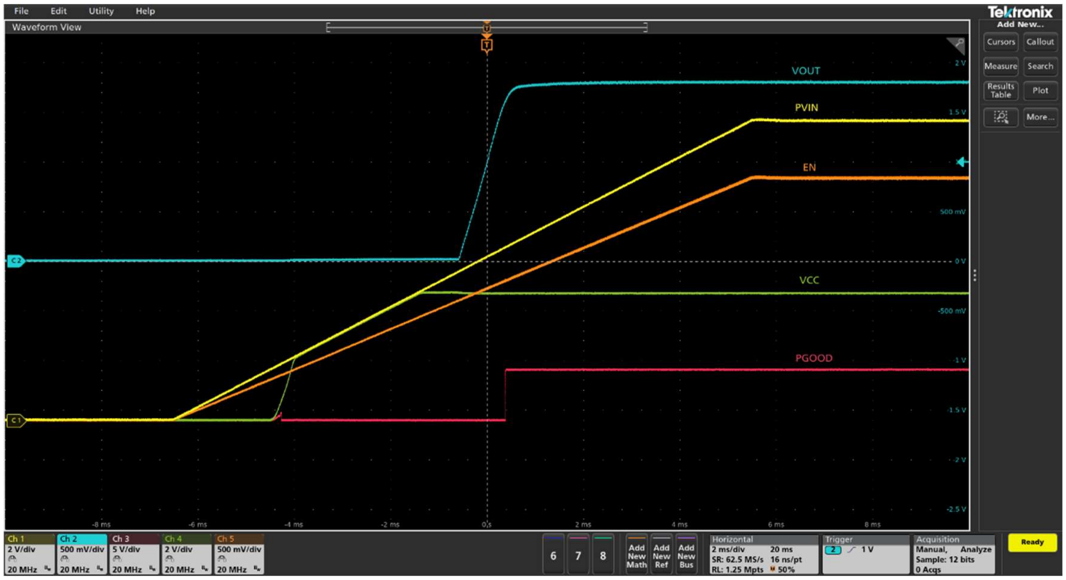


Figure 3 ***Startup with no load (Ch1 :PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)***

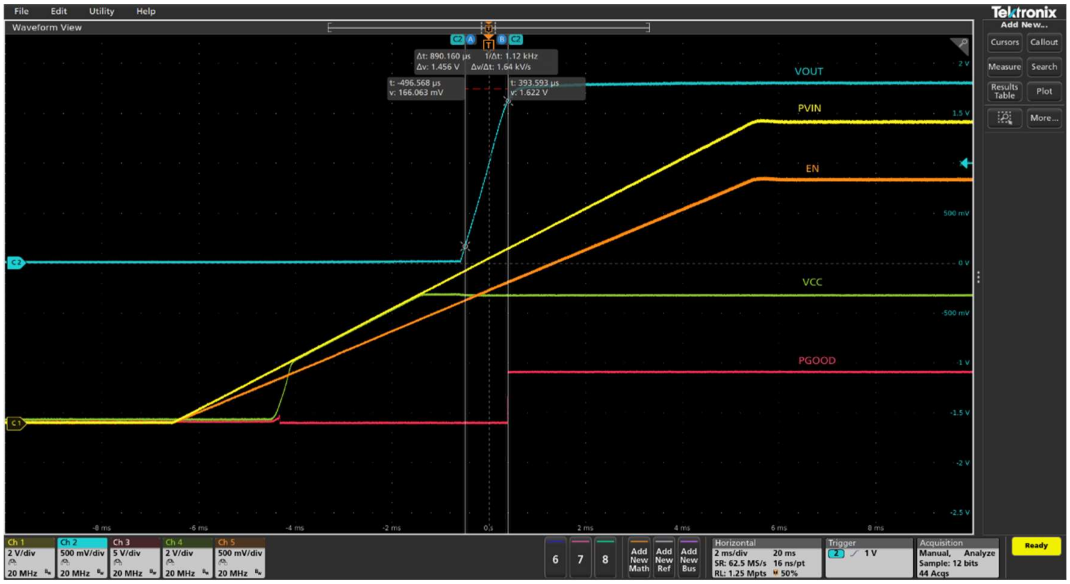


Figure 4 ***Startup with 3A load (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)***

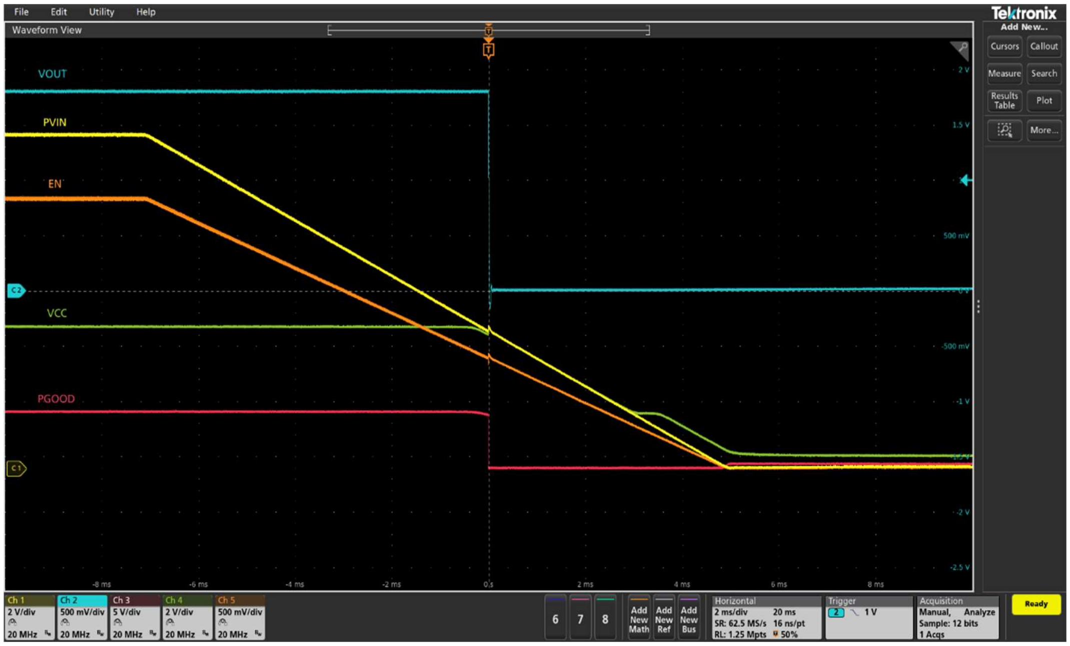


Figure 5 ***Shutdown with Enable de-assertion at 3A load (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)***

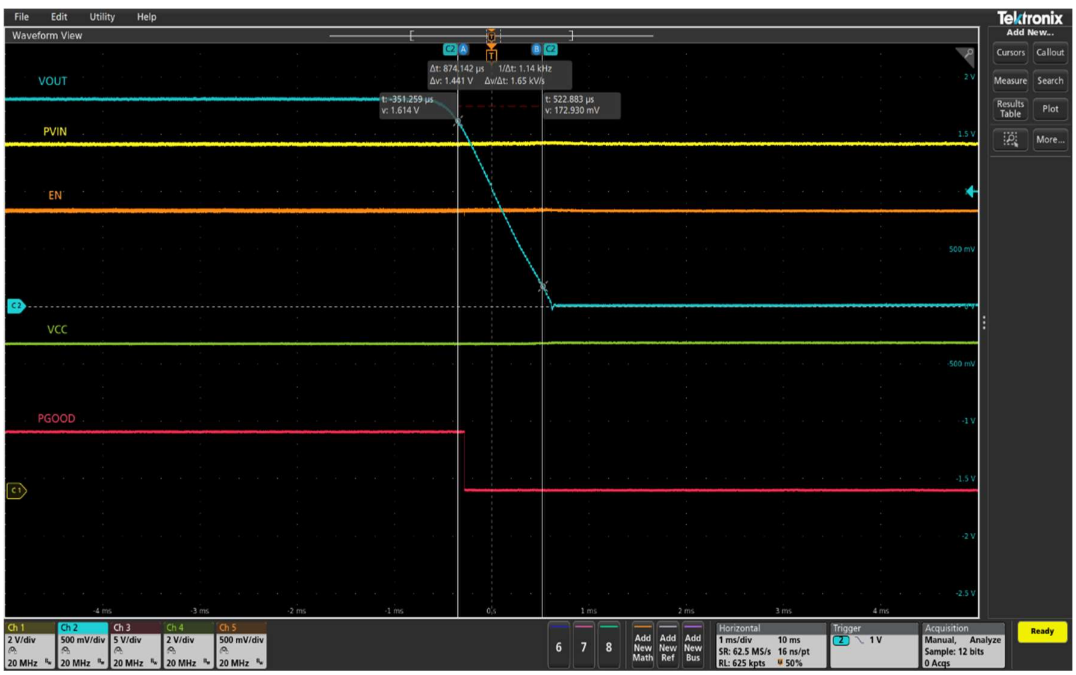


Figure 6 ***Soft turn off at 0A (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)***

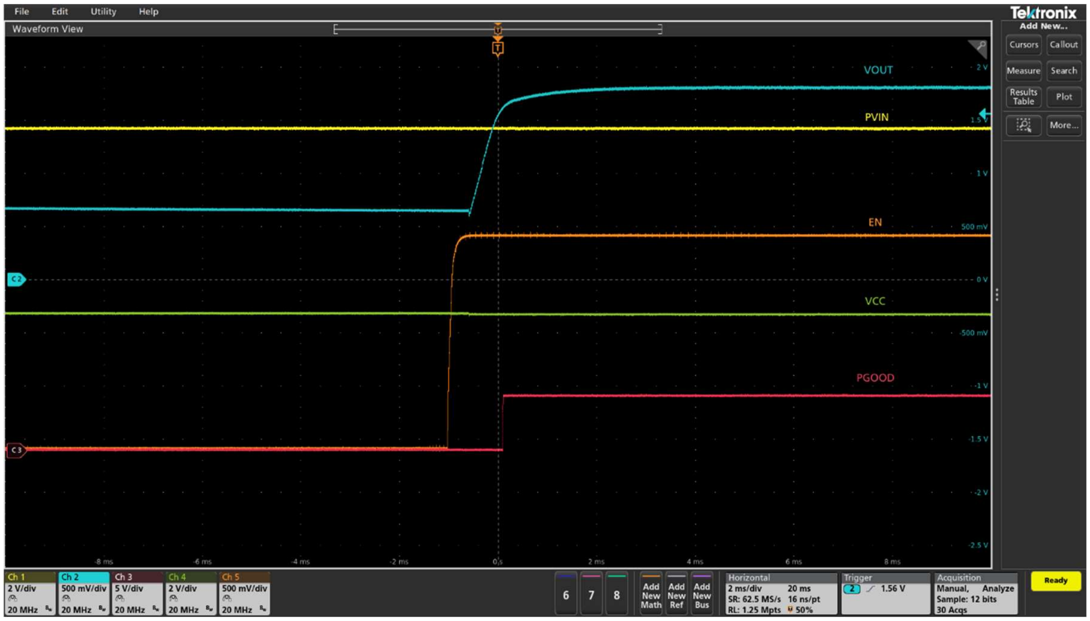


Figure 7 ***Startup into pre-bias (Ch1:PV$_{IN}$, Ch2: V$_{OUT}$, Ch3: PG, Ch4:V$_{CC}$, Ch5: Enable)***

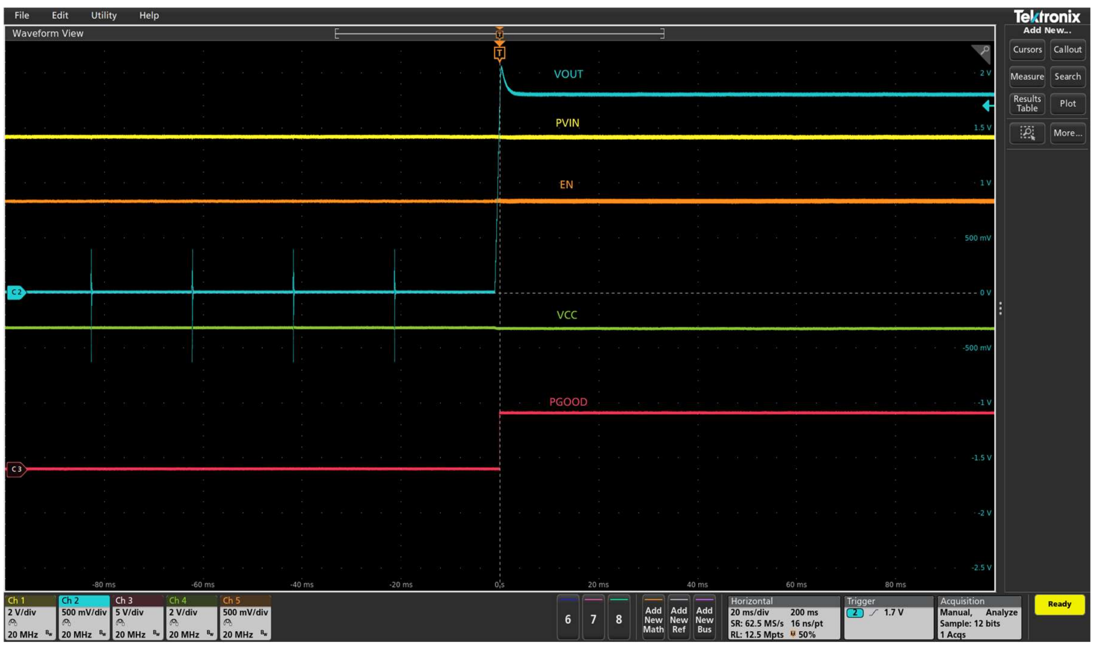


Figure 8 ***Over-current protection and auto-recover to 3A (Ch1:PV$_{IN}$, Ch2: V$_{OUT}$, Ch3: PG, Ch4:V$_{CC}$, Ch5: Enable)***

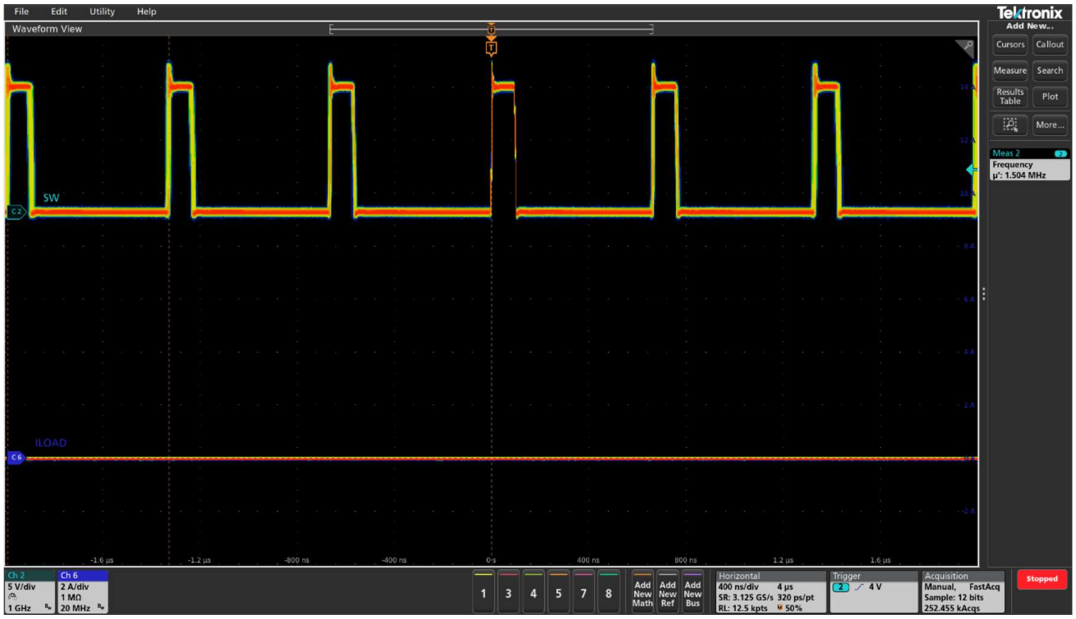


Figure 9 ***Sw at 0A (Ch2: Sw, Ch6: I_O) , F_{SW} = 1.5 MHz***

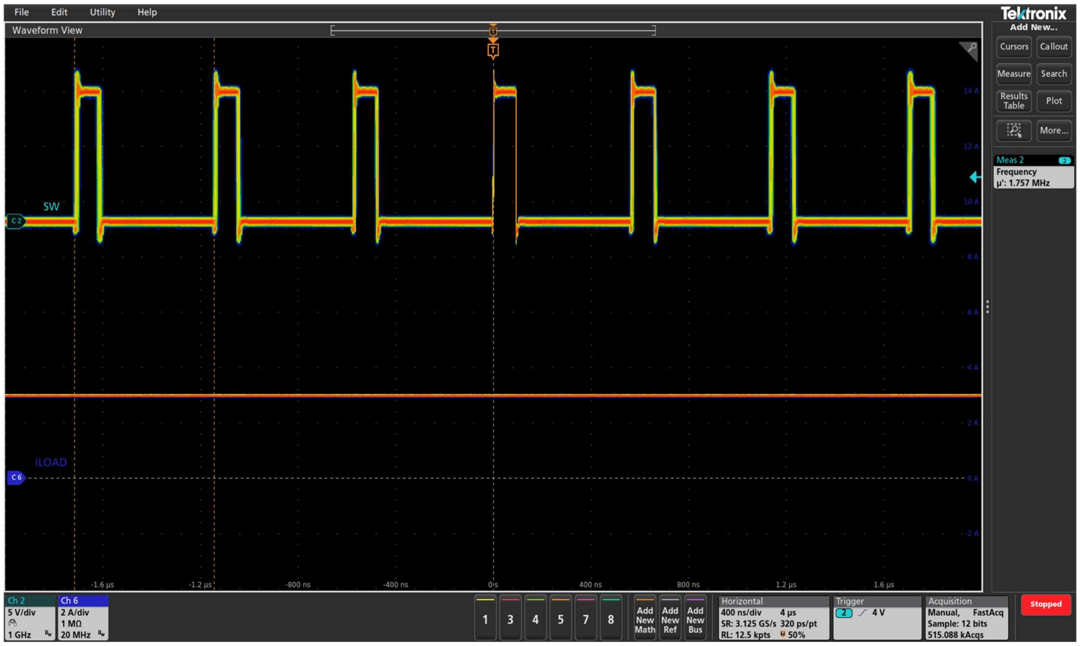


Figure 10 ***Sw at 3A (Ch2: Sw, Ch6: I_O) , F_{SW} = 1.76 MHz***

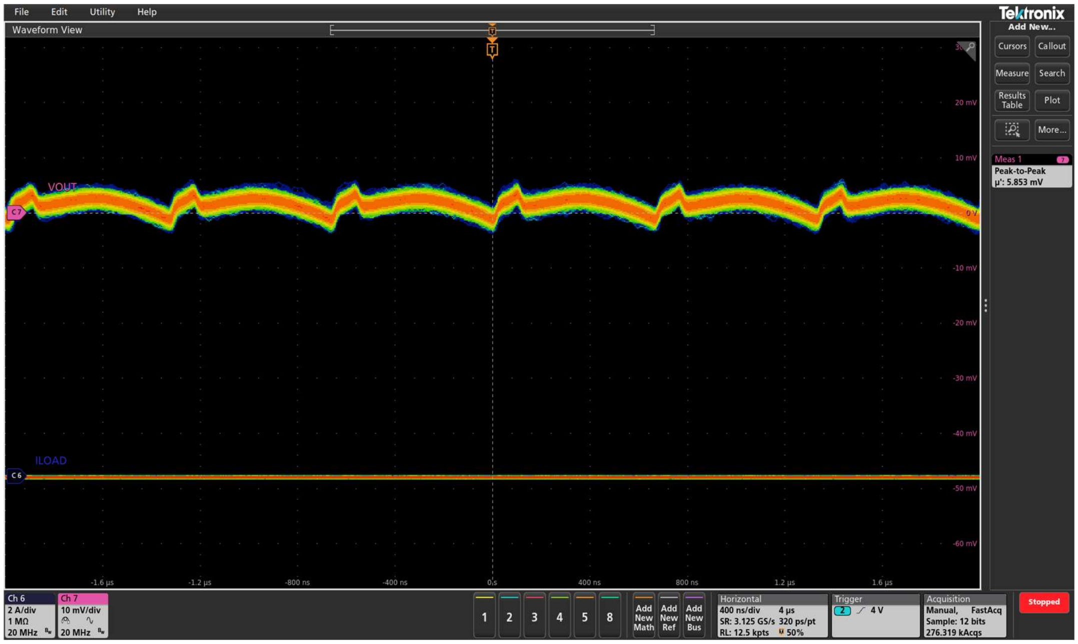


Figure 11 *V_{OUT} ripple at 0A (Ch6:I_O , Ch7:V_{OUT}), Peak-Peak V_{OUT} ripple = 5.9 mV*

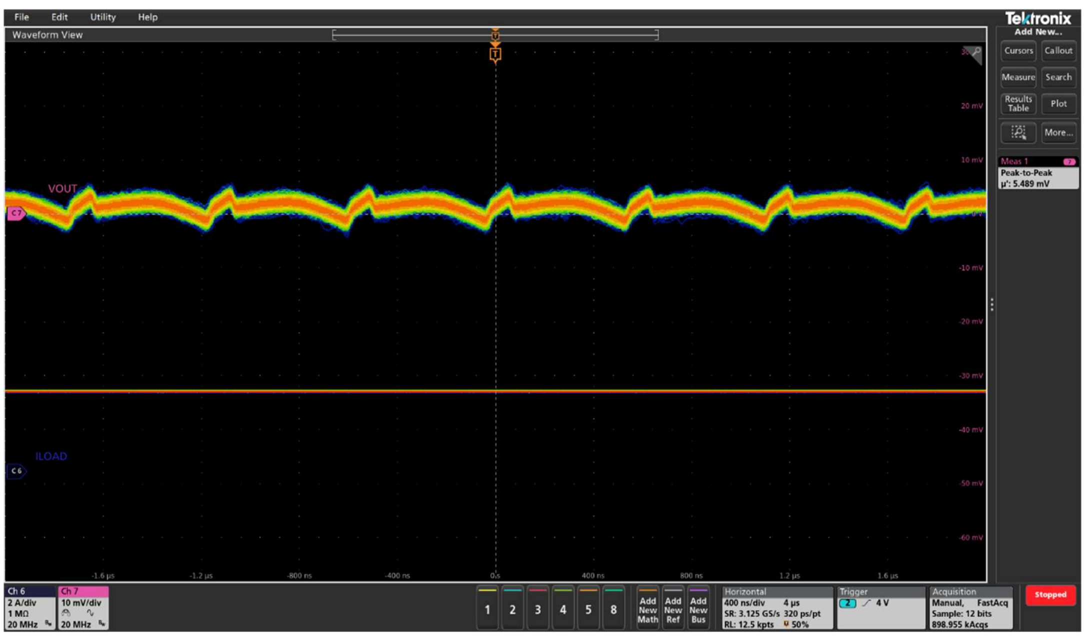


Figure 12 *V_{OUT} ripple at 3A (Ch6:I_O , Ch7:V_{OUT}), Peak-Peak V_{OUT} ripple = 5.5 mV*

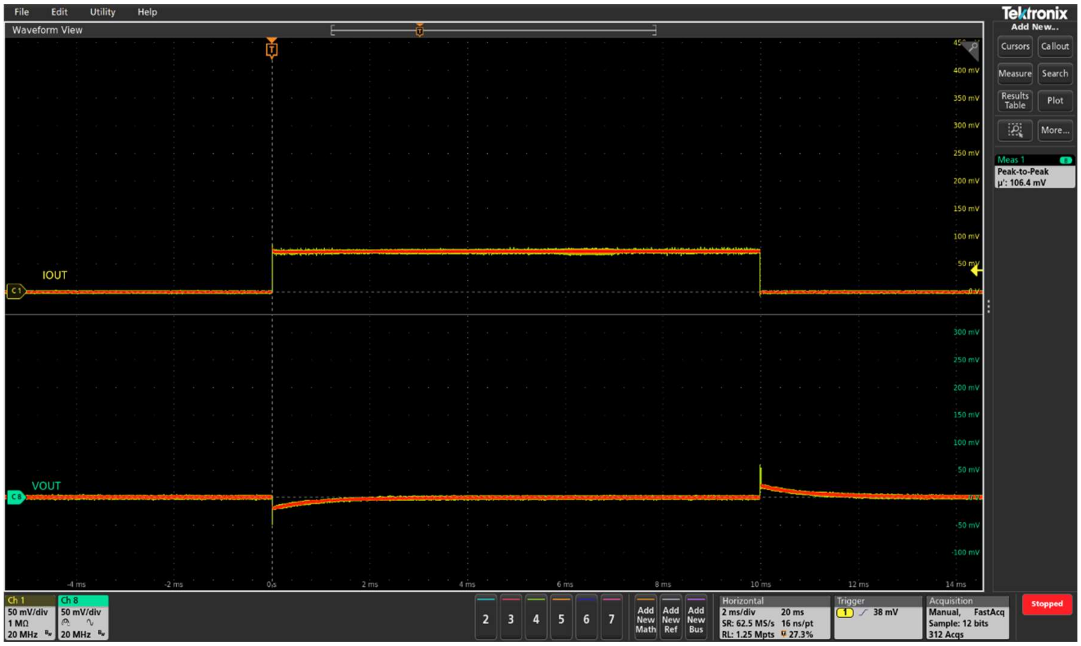


Figure 13 *Transient response 0A to 1.5A @ 3A/us (Ch1:I_O, Ch8: V_{OUT}), peak-peak deviation = 106 mV*

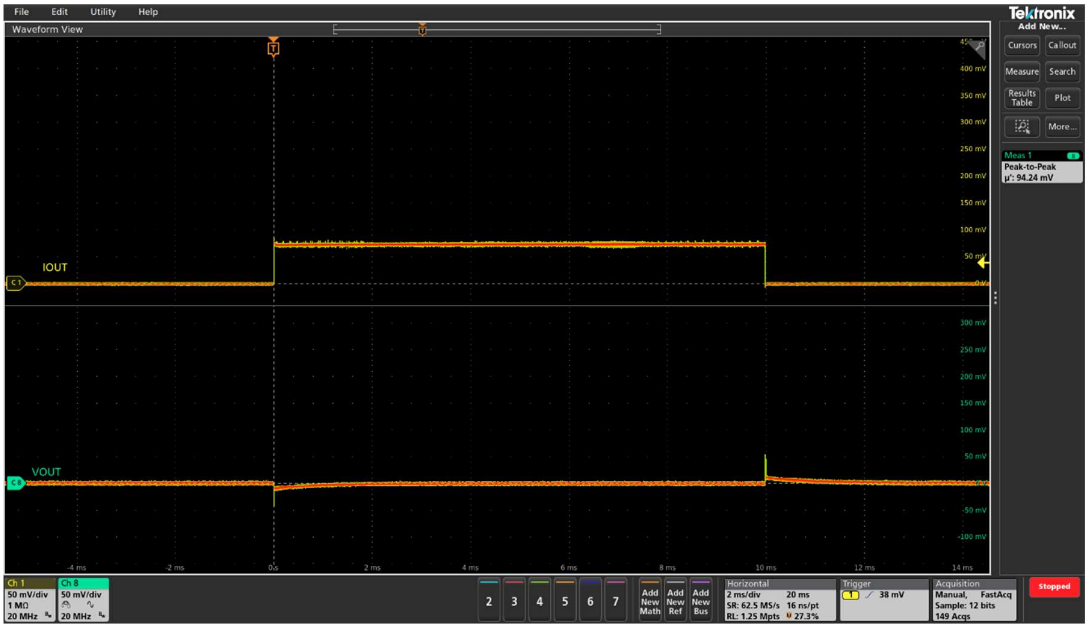


Figure 14 *Transient response 1.5A to 3A @ 3A/us (Ch1:I_O, Ch8: V_{OUT}), peak-peak deviation = 94 mV*

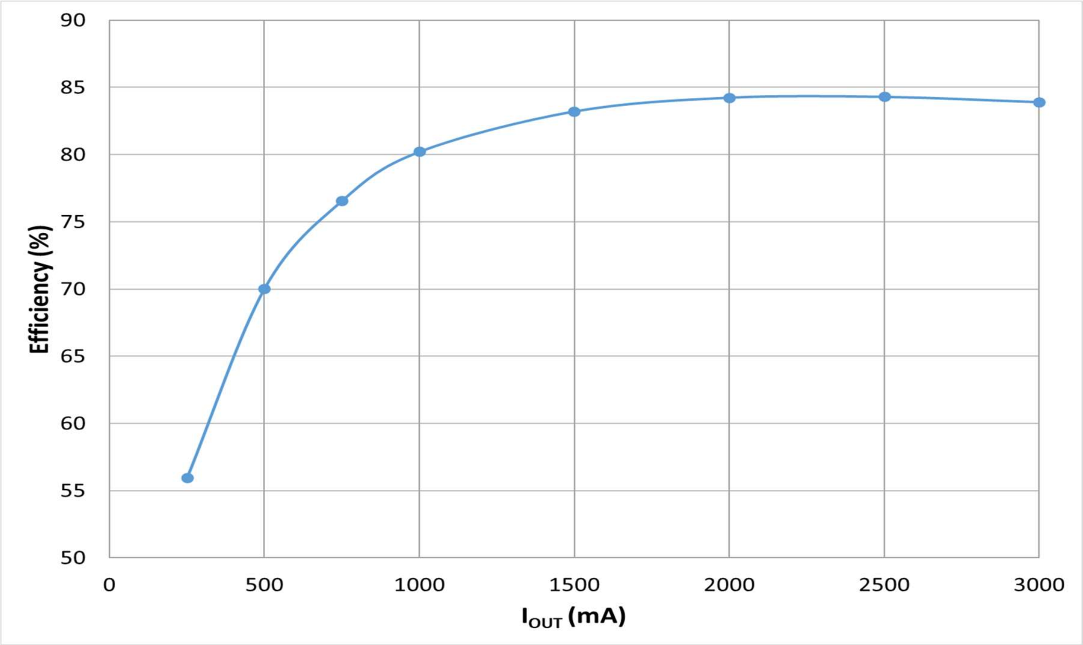


Figure 15 *Efficiency*

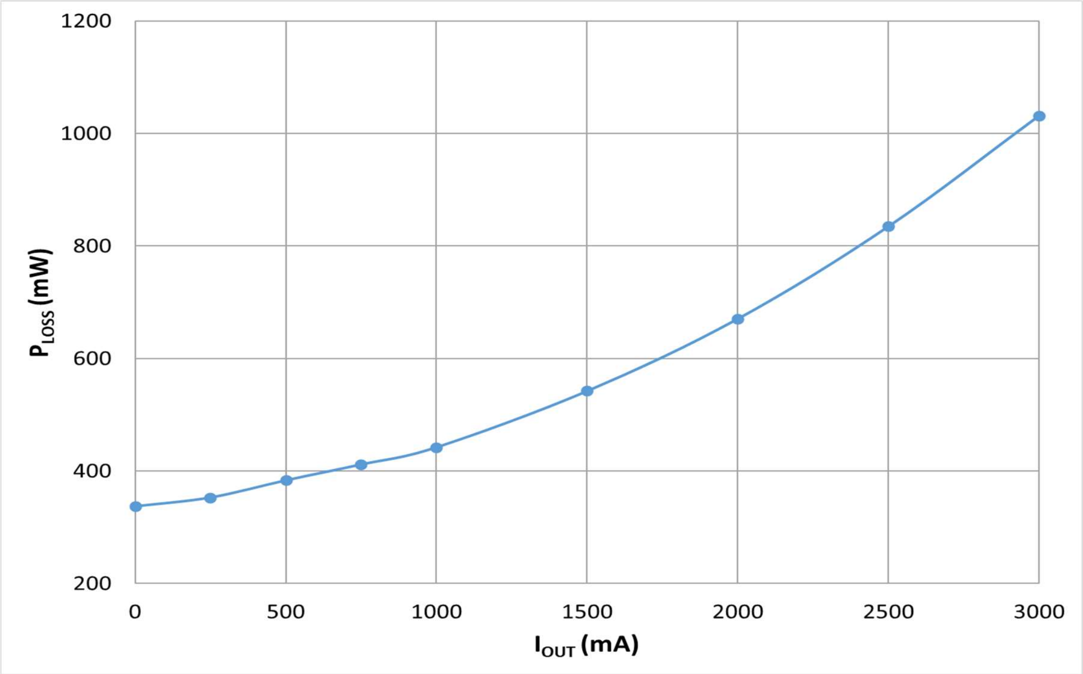


Figure 16 *Power loss*

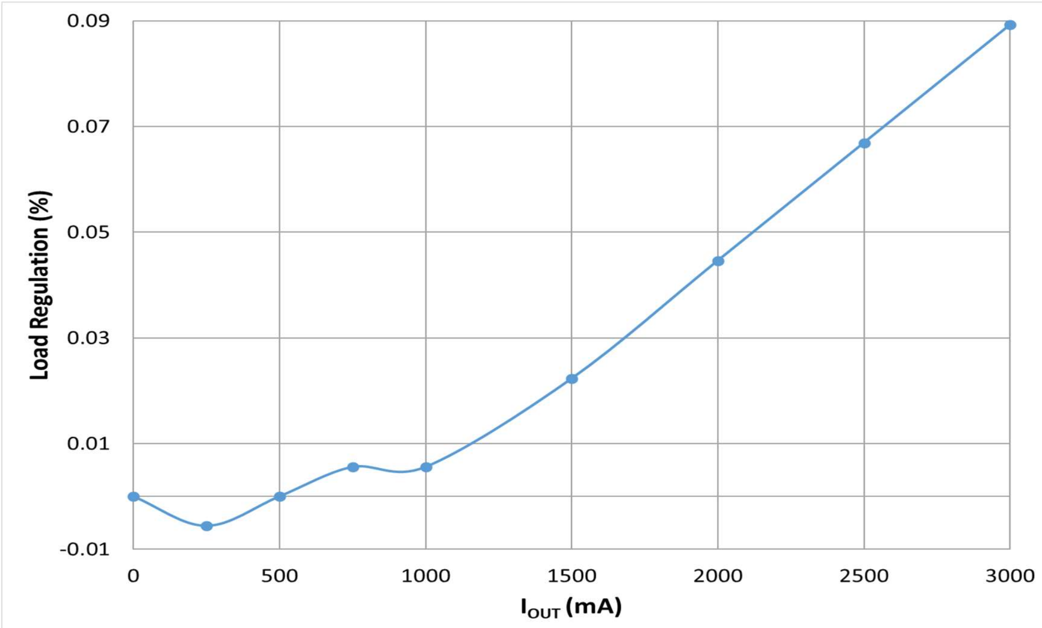


Figure 17 *Load regulation – <±0.1% (I_{O} = 0–3A)*

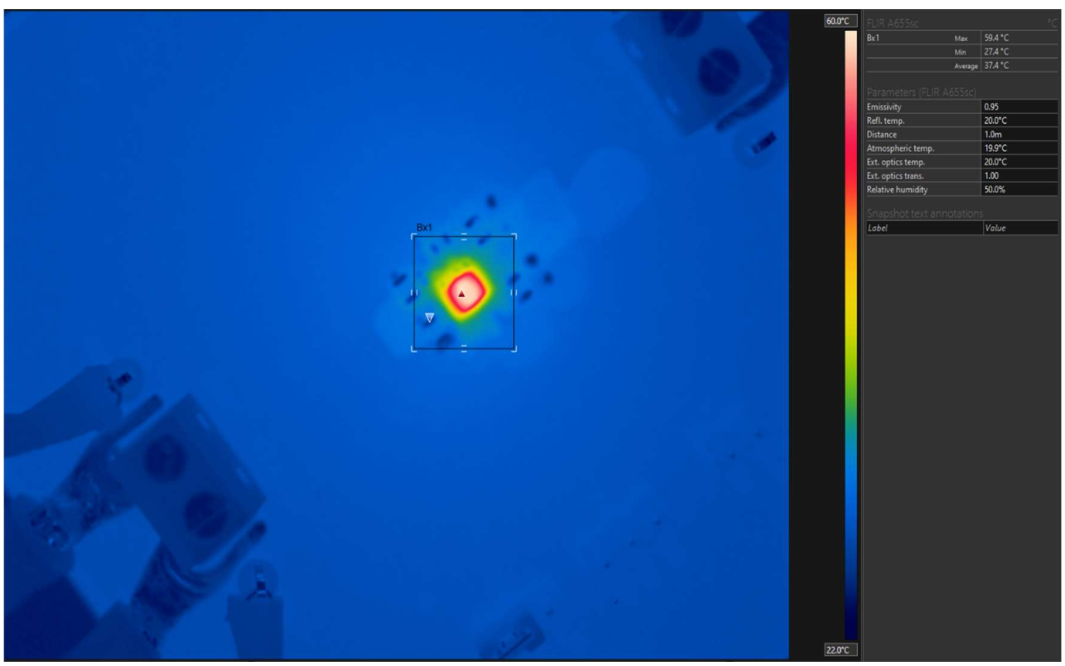


Figure 18 *Thermal image(PVIN=12V, I_{OUT}=3A) – maximum temperature rise = 37°C*

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