



EV1606A-0600-A EVALUATION BOARD USER GUIDE

Introduction

This user guide describes the evaluation board provided for the FS1606A-0600 μ POL™ product.

The board generates an output voltage (V_{OUT}) of 1.8V* for loads of 0–6A from an input voltage (PV_{IN}) of 12V.

Specifications

- Input voltage (PV_{IN}) = +12V
- Output voltage (V_{OUT}) = +1.8V
- Output load (I_O) = 0–6A
- Switching frequency (F_{SW}) = 2 MHz
- Output capacitance (C_O) = 3x22 μ F (MLCC)
- Input capacitance (C_{IN}) = 2x22 μ F (MLCC)
- Dimensions (width x length x thickness) = 76.2 x 76.2 x 1.6 mm

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 0–6A 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). FS1606A is mounted on the top side of the board.

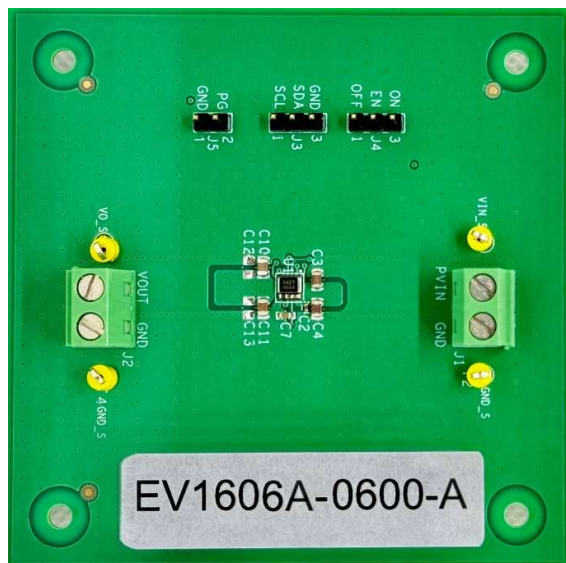


Figure 1 View of Board (Top)

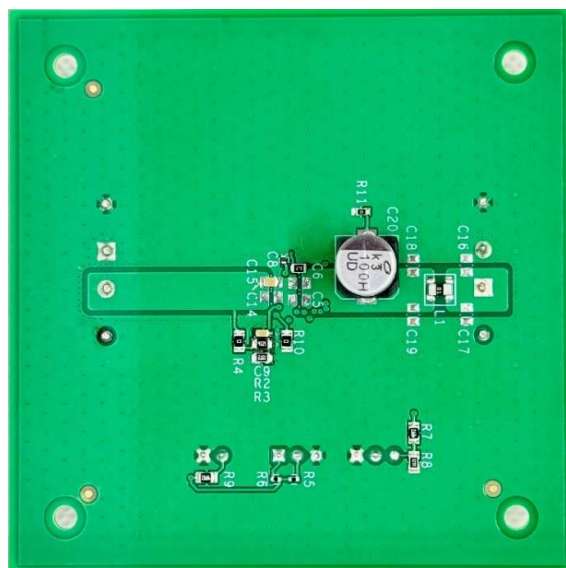


Figure 2 View of Board (Bottom)

Figure 3 to Figure 6 show the pictures of the board layers and Figure 7 shows a schematic of the electric circuit.

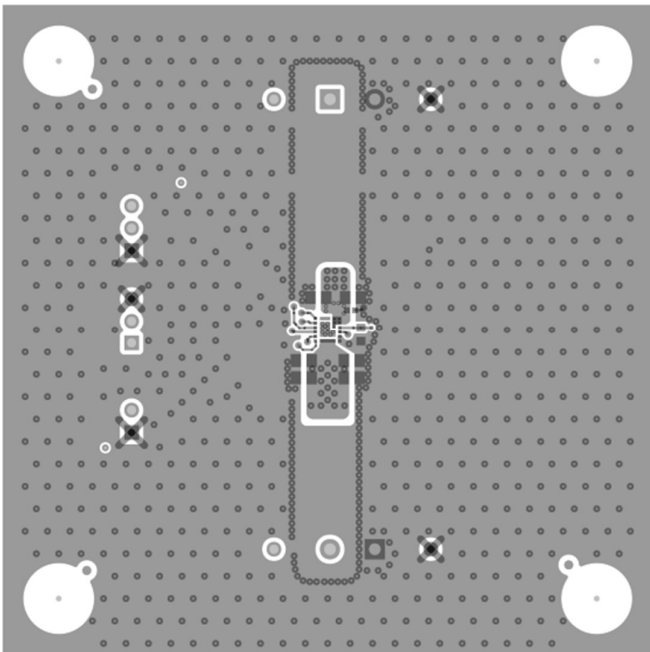


Figure 3 Board layout – layer 1

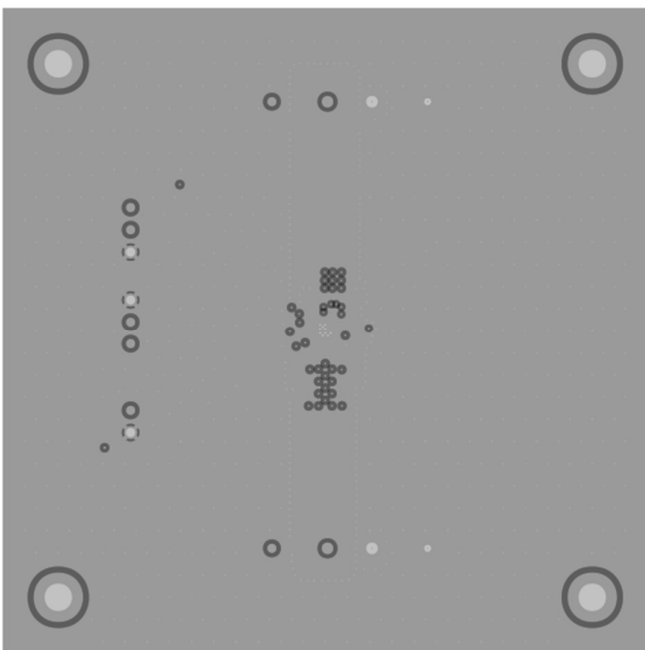


Figure 4 Board layout – layer 2

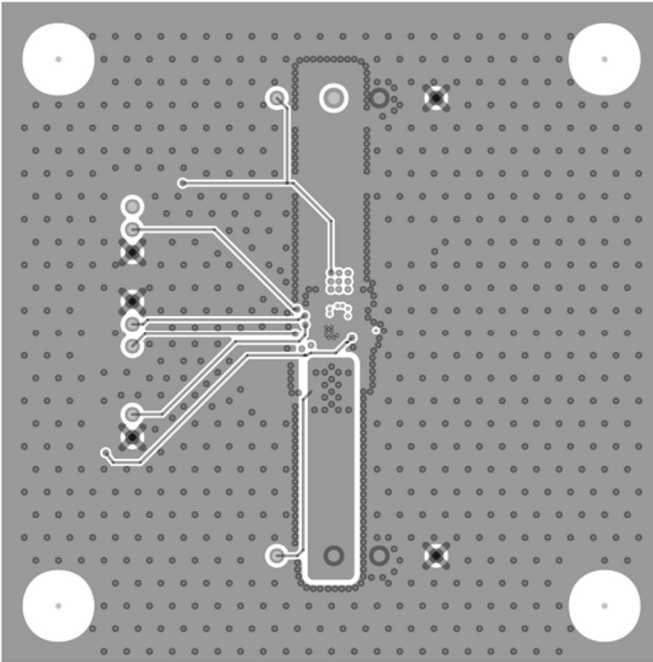


Figure 5 Board layout – layer 3

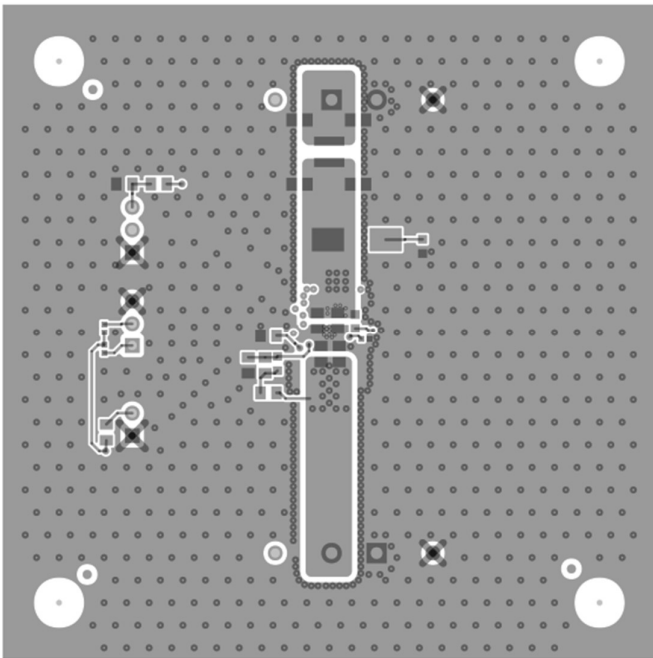


Figure 6 Board layout – layer 4

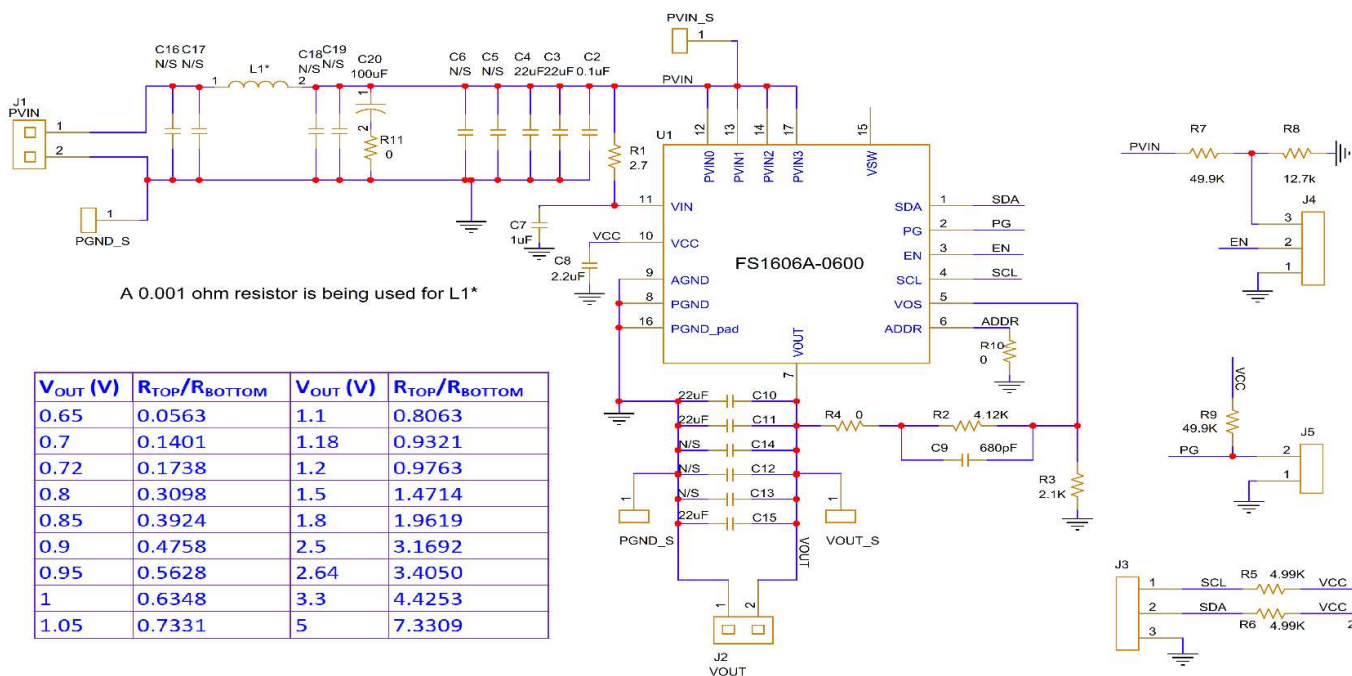


Figure 7 Schematic*

*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

Part reference	Quantity	Type	Description
FS1606A μ POL	1	—	FS1606A Module
C20	1	100uF	Aluminum capacitor
C2	1	0.1uF	0402, 25V, X7R
C3,C4	2	22uF	0805, 25V, X5R, 10%
C10,C11,C15	3	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

Typical performance

Figure 8 to Figure 22 show typical operating waveforms for the evaluation board, while Figure 23 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 0–6A.

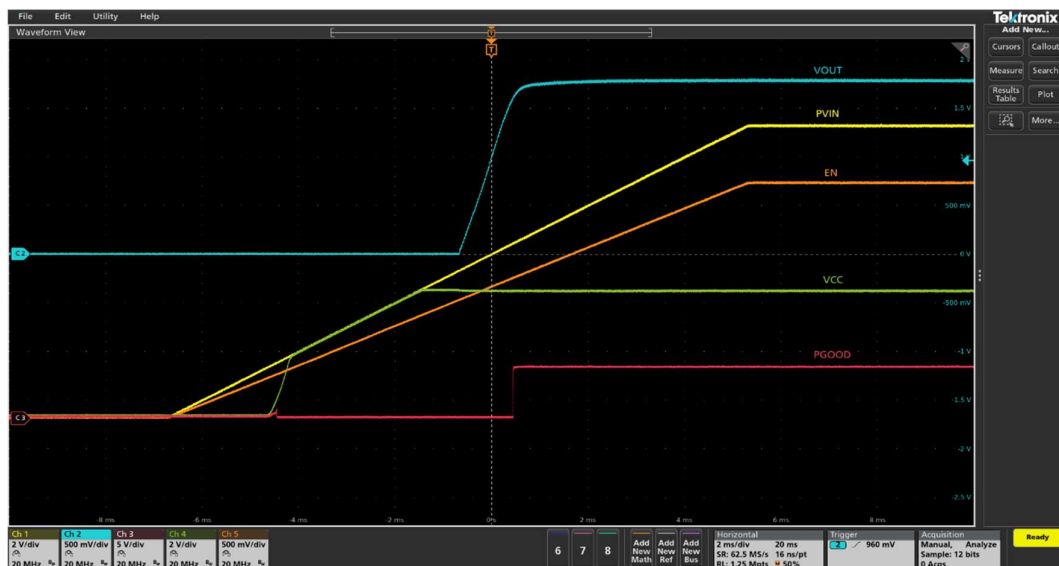


Figure 8 Startup with no load (Ch1: PV_{IN} , Ch2: V_{OUT} , Ch3: PG, Ch4: V_{CC} , Ch5: Enable)

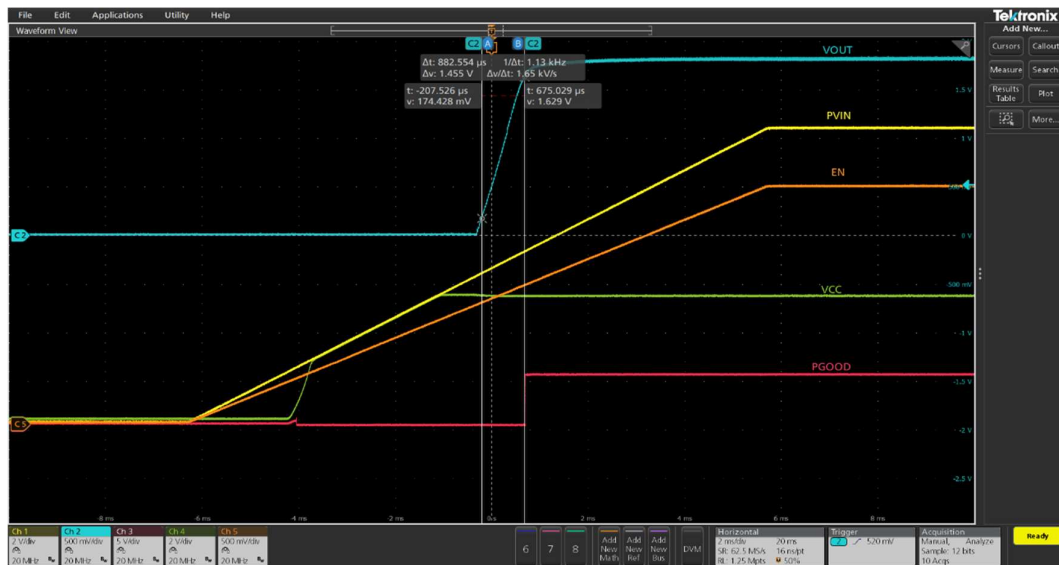


Figure 9 Startup with 6A load (Ch1: PV_{IN} , Ch2: V_{OUT} , Ch3: PG, Ch4: V_{CC} , Ch5: Enable)

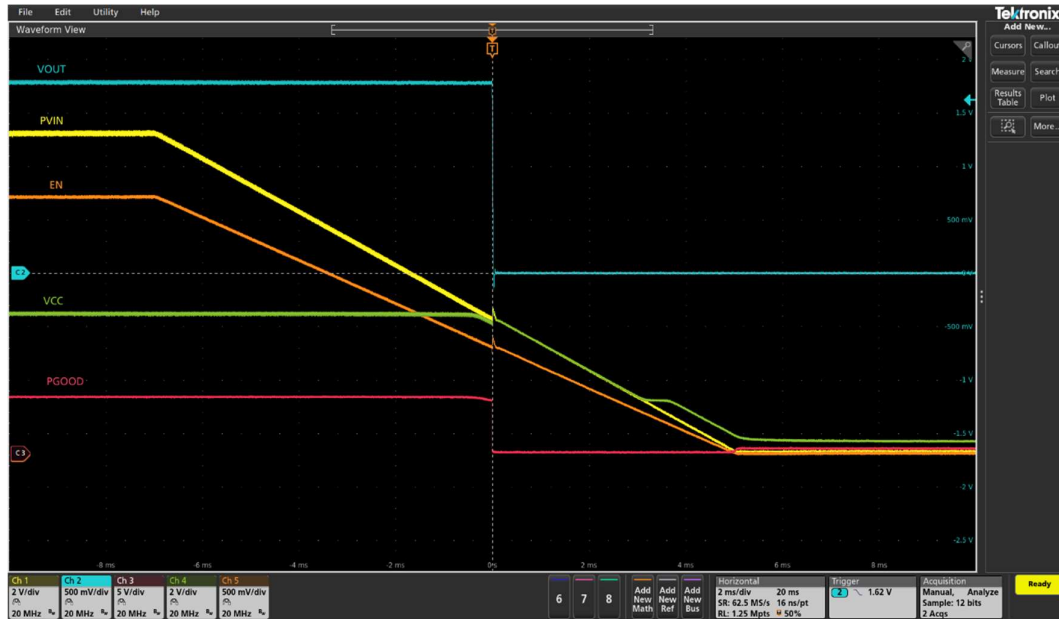


Figure 10 Shutdown with Enable de-assertion at 6A load (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)

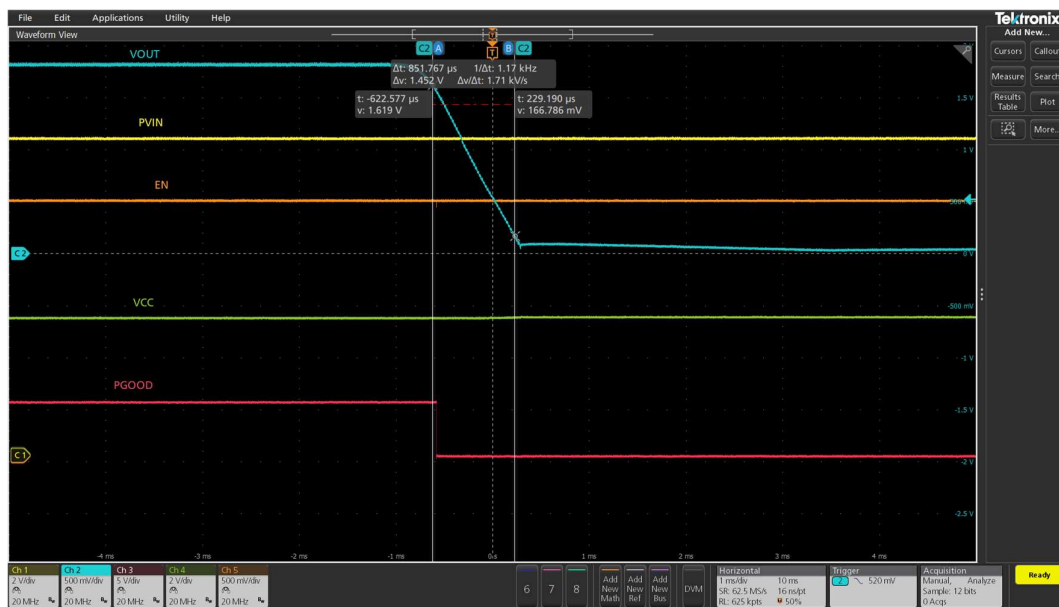


Figure 11 Soft turn off at 0A (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)

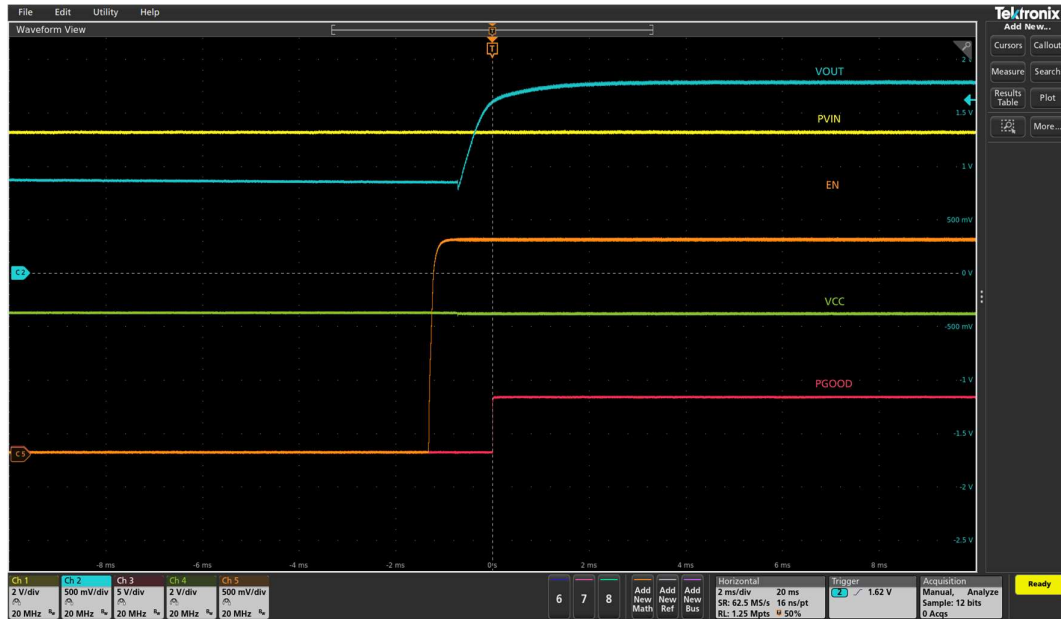


Figure 12 Startup into pre-bias (Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)

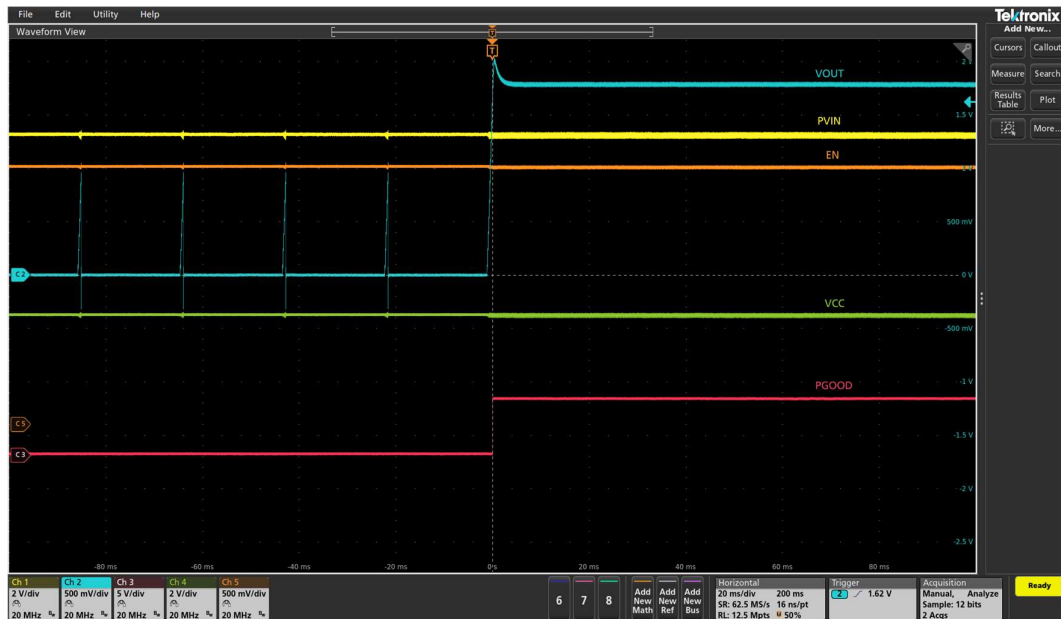


Figure 13 Over-current protection and auto-recover to 6A
(Ch1:PV_{IN}, Ch2: V_{OUT}, Ch3: PG, Ch4:V_{CC}, Ch5: Enable)

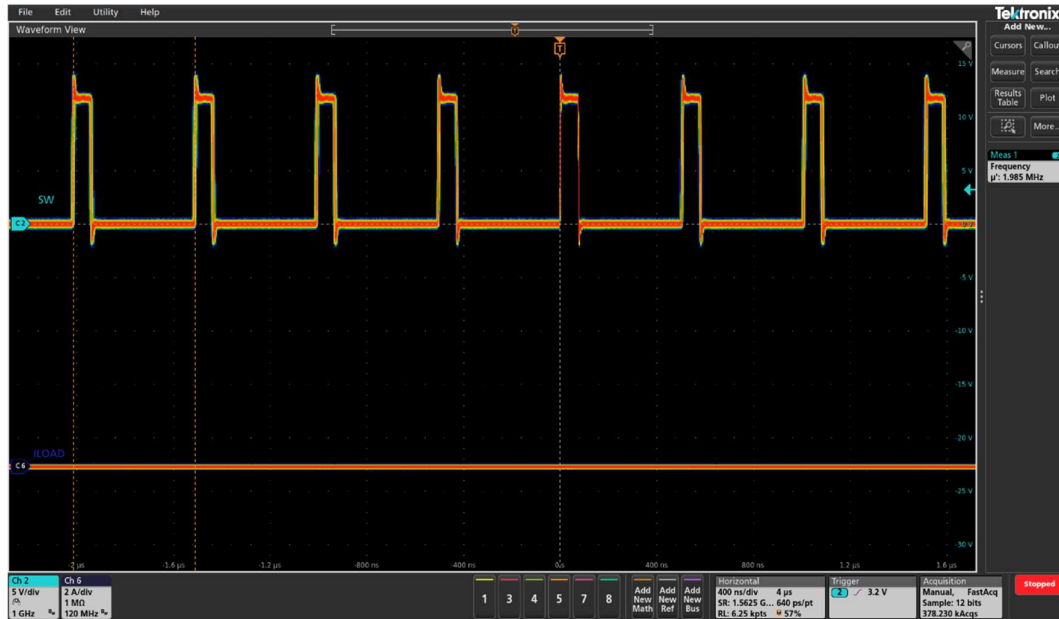


Figure 14 Sw at 0A (Ch2: Sw, Ch6: I_O), $F_{SW} = 1.98 \text{ MHz}$

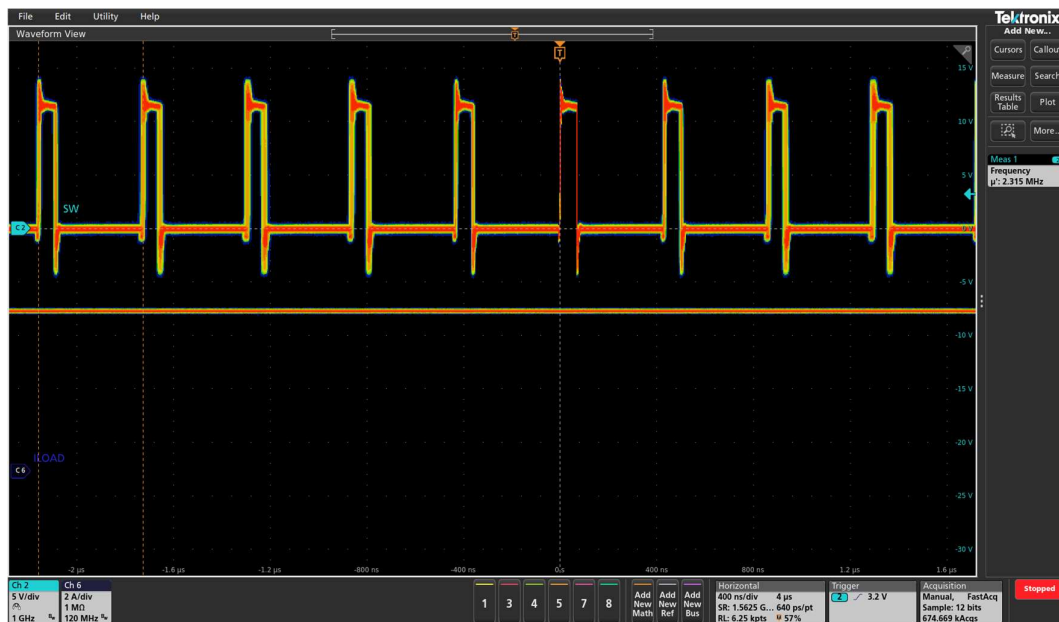


Figure 15 Sw at 6A (Ch2: Sw, Ch6: I_O), $F_{SW} = 2.32 \text{ MHz}$

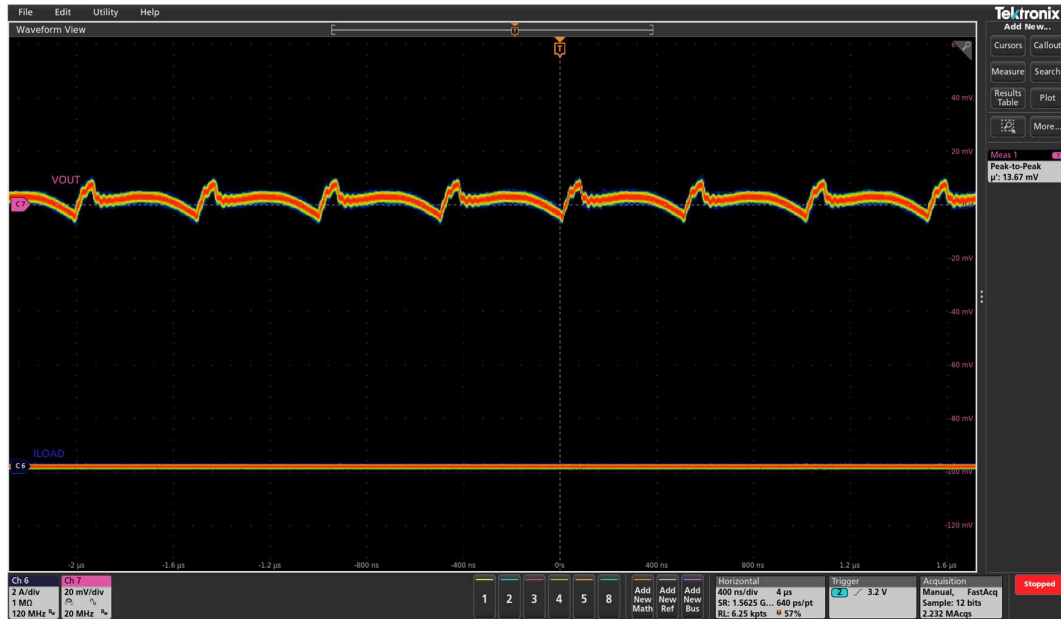


Figure 16 V_{OUT} ripple at 0A (Ch6:I_o, Ch7:V_{OUT}), Peak-Peak V_{OUT} ripple = 13.7 mV



Figure 17 V_{OUT} ripple at 6A (Ch6:I_o, Ch7:V_{OUT}), Peak-Peak V_{OUT} ripple = 16.2 mV

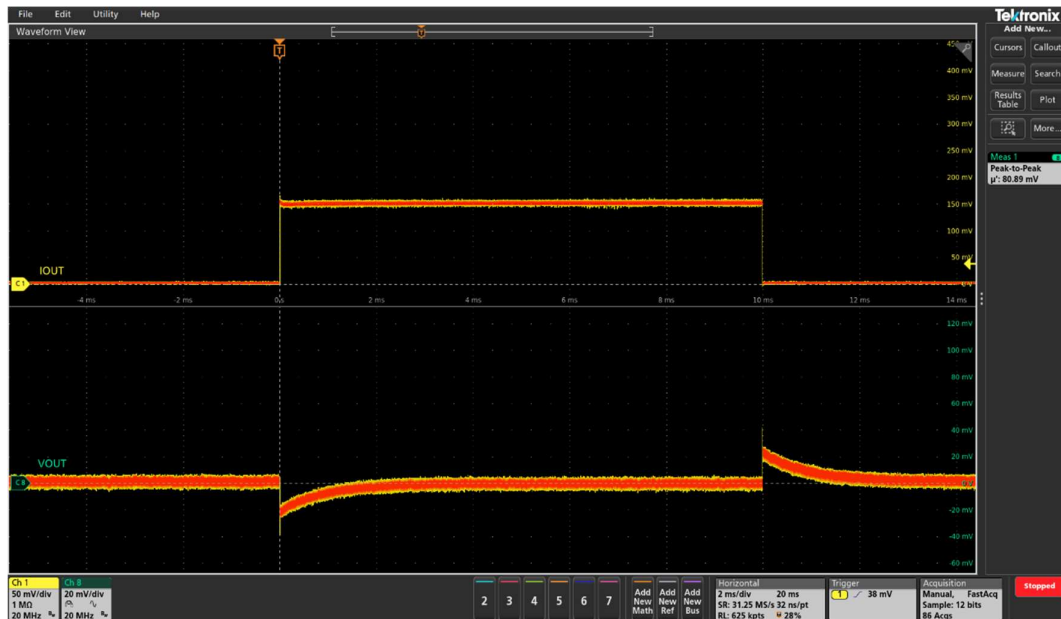


Figure 18 Transient response 0A to 3A @ 3A/us (Ch1: I_O , Ch8: V_{OUT}), peak-peak deviation = 80.9 mV

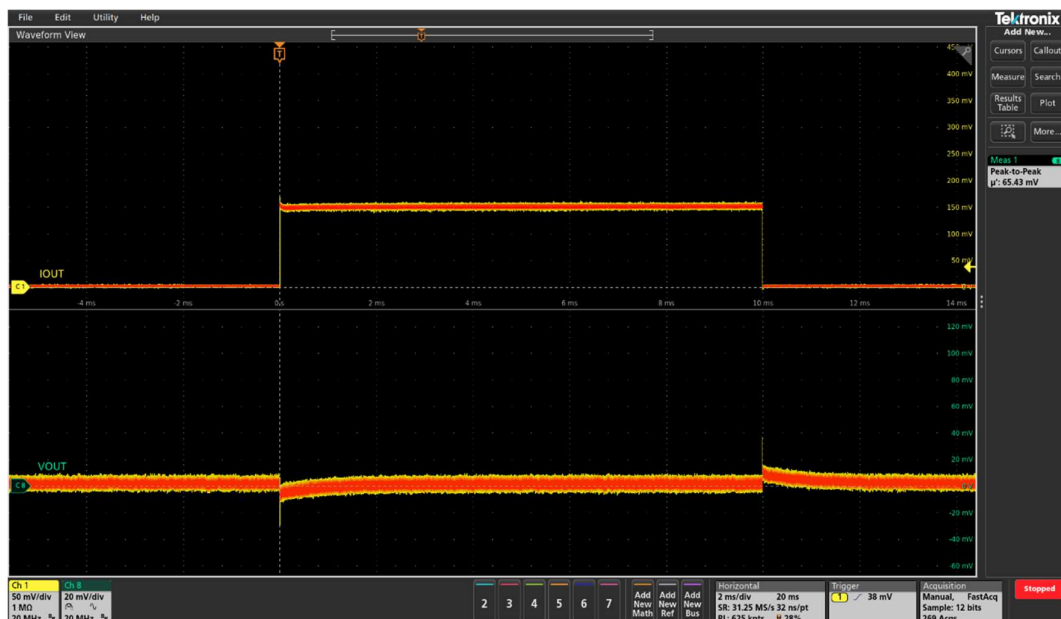


Figure 19 Transient response 3A to 6A @ 3A/us (Ch1: I_O , Ch8: V_{OUT}), peak-peak deviation = 65.4 mV

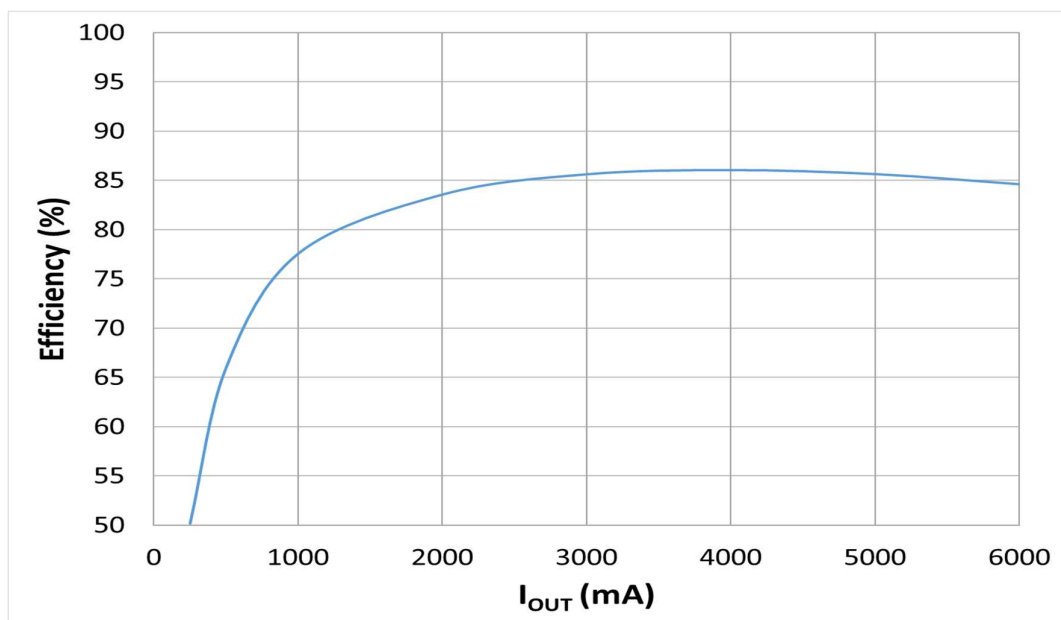


Figure 20 *Efficiency*

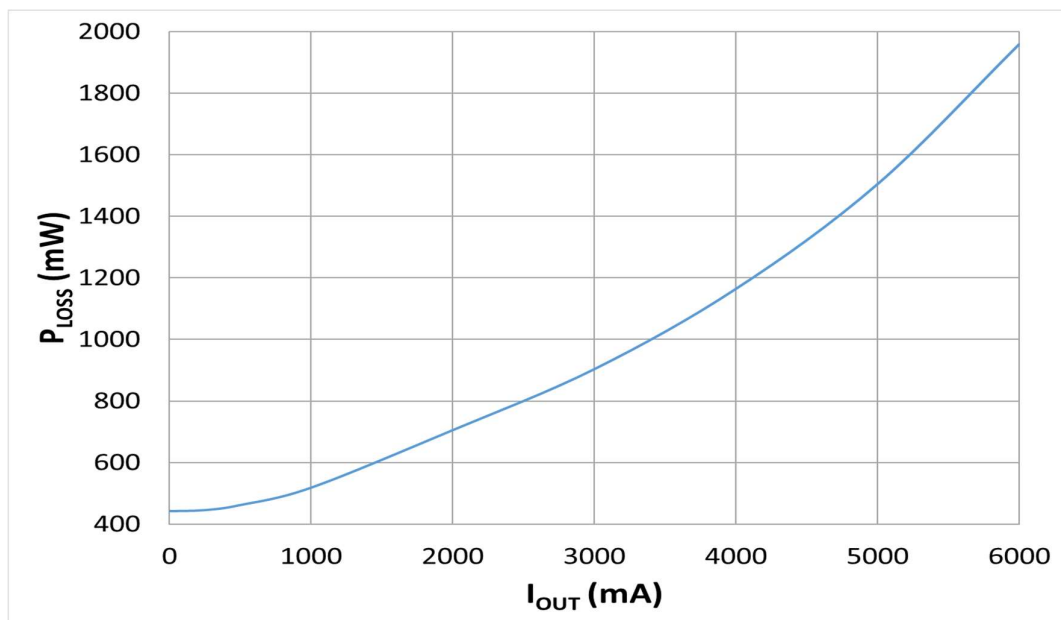


Figure 21 *Power loss*

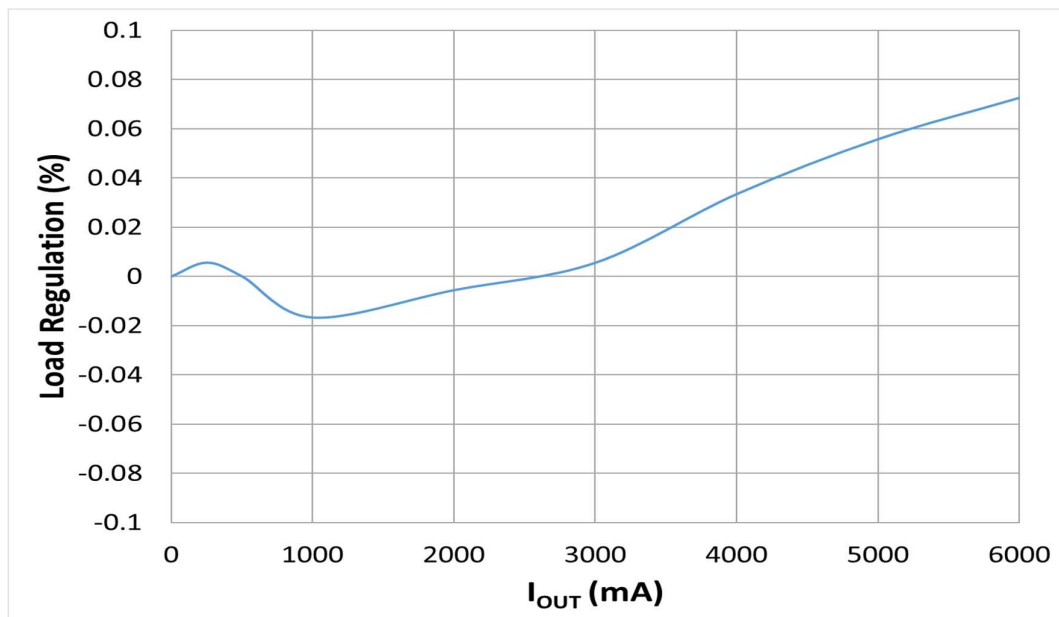


Figure 22 Load regulation – $<\pm 0.1\%$ ($I_O = 0-6A$)

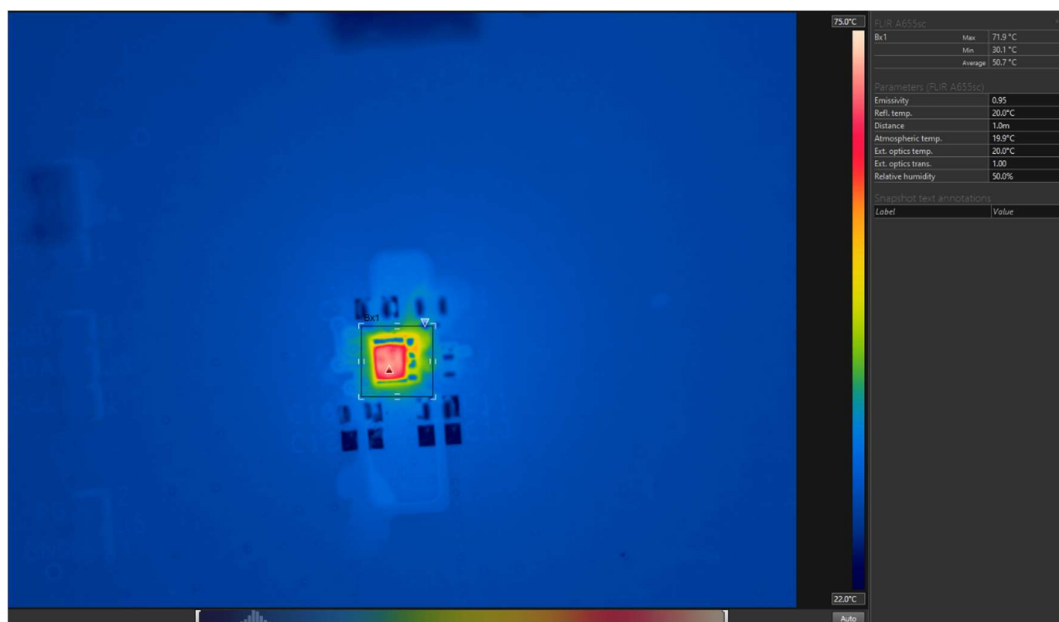


Figure 23 Thermal image($P_{VIN}=12V$, $I_{OUT}=6A$) – maximum temperature rise = 50°C

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REMINDER

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5. Atomic energy related equipment
6. Seabed equipment
7. Transportation control equipment
8. Public Information-processing equipment
9. Military equipment
10. Electric heating apparatus, burning equipment
11. Disaster prevention/crime prevention equipment
12. Safety equipment
13. Other applications that are not considered general-purpose applications

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