SGM61164 Demo Board Test Report

4.5V to 18V Input (12V TYP), 3.3V/6A Output

Demo Board Pictures:

Top

Bottom

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1. Schematic, BOM List and PCB Layout

1.1 Schematic
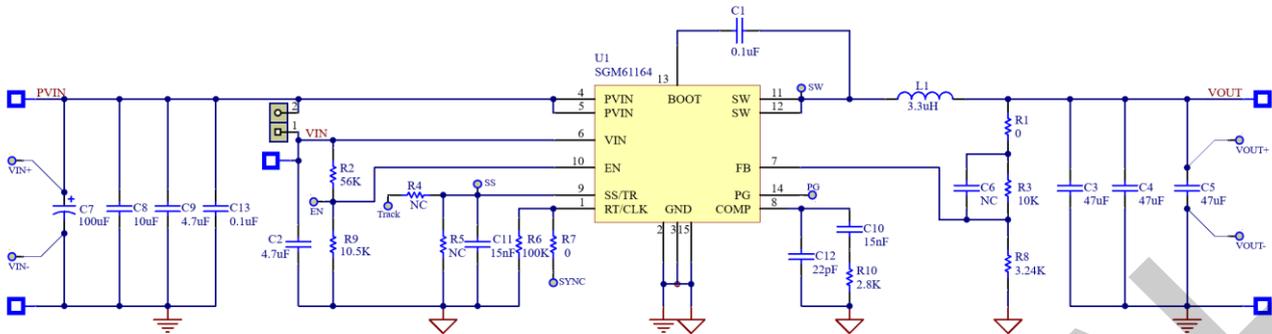
1.2 BOM List

Item	Quantity	Designator	Description	Manufactory
1	2	C1,C13	Ceramic capacitor, 0.1µF 25V, X7R, ±10%, 0603	muRata
2	1	C2	Ceramic capacitor, 4.7µF 25V, X5R, ±10%, 0805, GRM219R61E475KA73	muRata
3	3	C3,C4,C5	Ceramic capacitor, 47µF 10V, X7R, ±10%, 1210, GRM32ER71A476KE15	muRata
4	0	C6	NC	/
5	1	C7	Solid Electrolytic capacitor, 100µF, 35V	Standard
6	1	C8	Ceramic capacitor, 10µF 25V, X7R, ±10%, 1210, GCM32ER71E106KA57	muRata
7	1	C9	Ceramic capacitor, 4.7µF 50V, X7R, ±10%, 1210, GCJ32ER71H475KA12	muRata
8	2	C10,C11	Ceramic capacitor, 15nF 50V, X7R, ±10%, 0603	muRata
9	1	C12	Ceramic capacitor, 22pF 50V, C0G, ±5%, 0603	muRata
10	1	L1	Ind., 3.3µH±20%, $I_{TEMP}(40°C)$=18.2A, $I_{SAT}(30\%)$=24.7A, DCR=5.2mΩ, 7443320330	Würth
11	2	R1,R7	Film Resistor, 1%, 0Ω, 0603	Standard
12	1	R2	Film Resistor, 1%, 56KΩ, 0603	Standard
13	1	R3	Film Resistor, 1%, 10KΩ, 0603	Standard
14	0	R4,R5	NC	/
15	1	R6	Film Resistor, 1%, 100KΩ, 0603	Standard
16	1	R8	Film Resistor, 1%, 3.24KΩ, 0603	Standard
17	1	R9	Film Resistor, 1%, 10.5KΩ, 0603	Standard
18	1	R10	Film Resistor, 1%, 2.8KΩ, 0603	Standard
19	1	U1	SGM61164, 6A, 18V, Synchronous Buck Converter, TQFN-3.5×3.5-14L	SGMICRO
				Conclusion: Total 22 components

1.3 PCB Layout

PCB Top Layer

PCB Bottom Layer
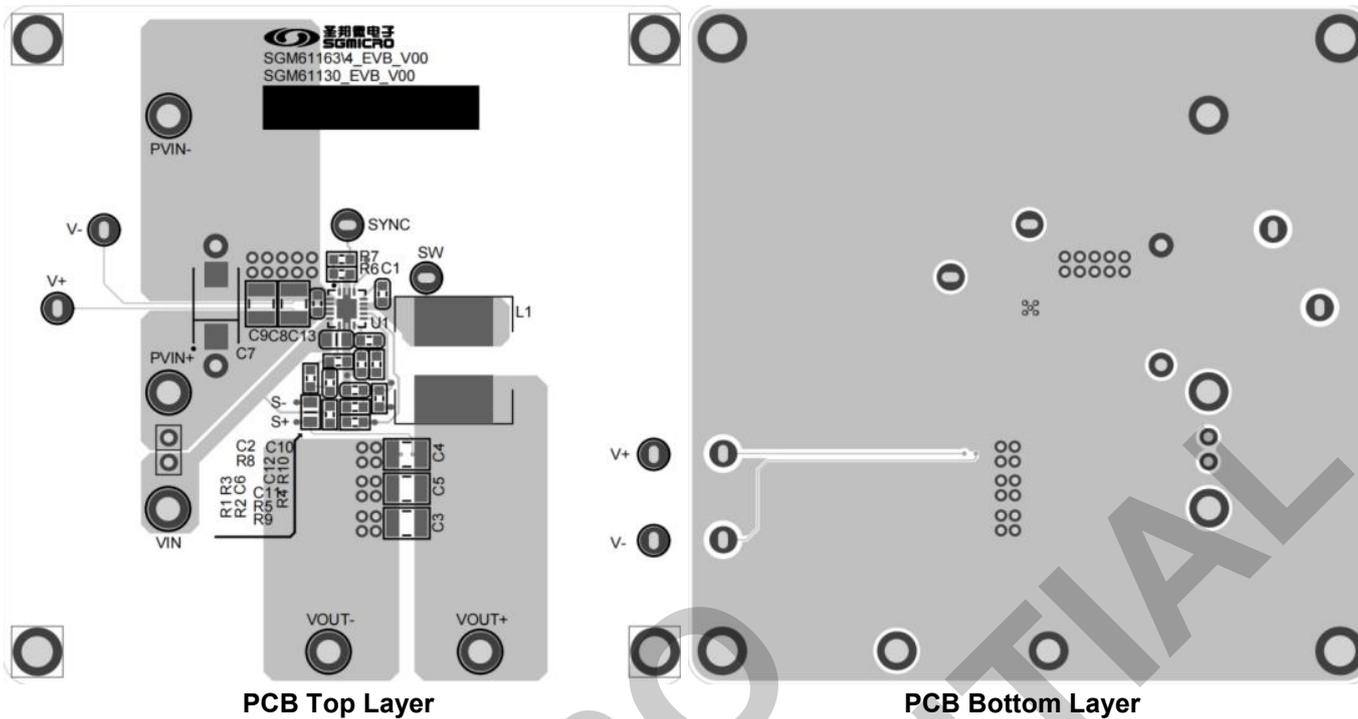
2. Efficiency

Test conditions: V_{IN}=5.5V/12V, V_{OUT}=3.3V, EN floating.
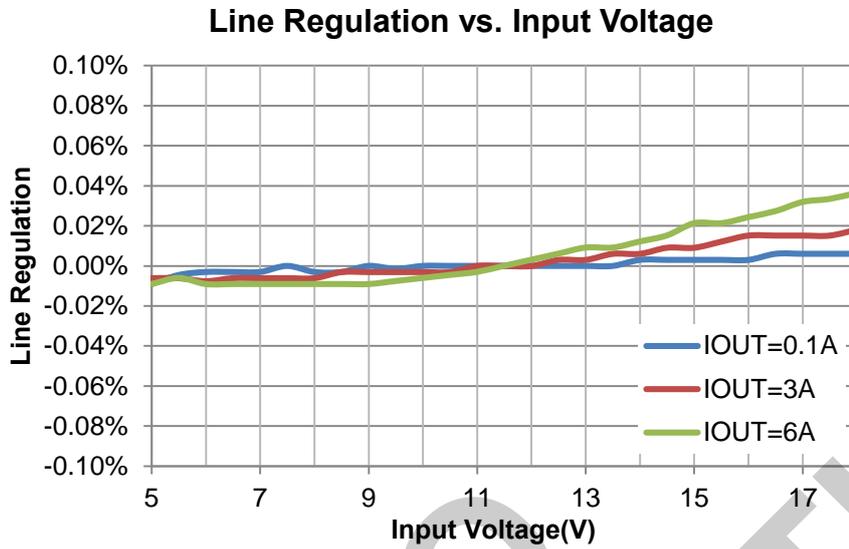
Efficiency vs. Load Current
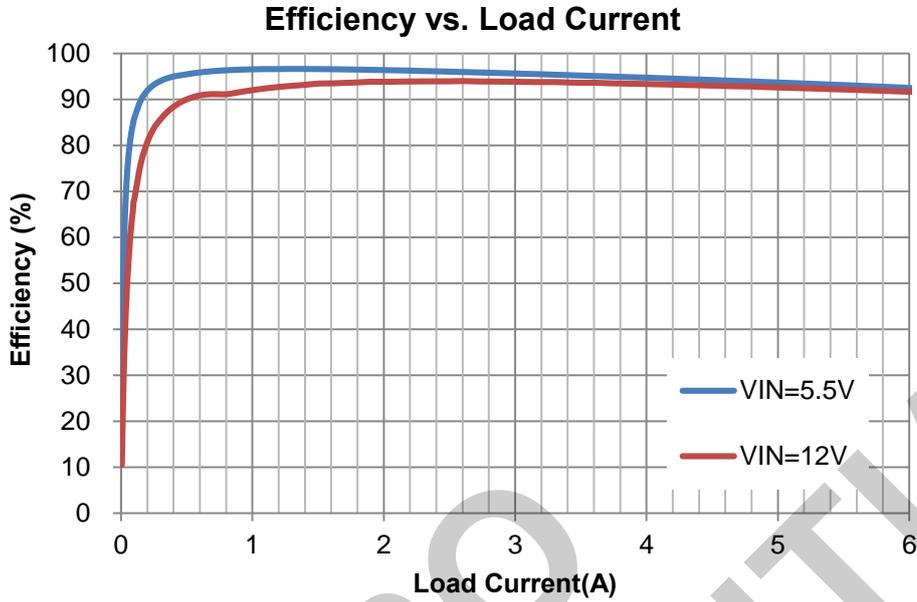
3. Load Regulation

Test conditions: V_{IN}=5.5V/12V, V_{OUT}=3.3V, EN floating.
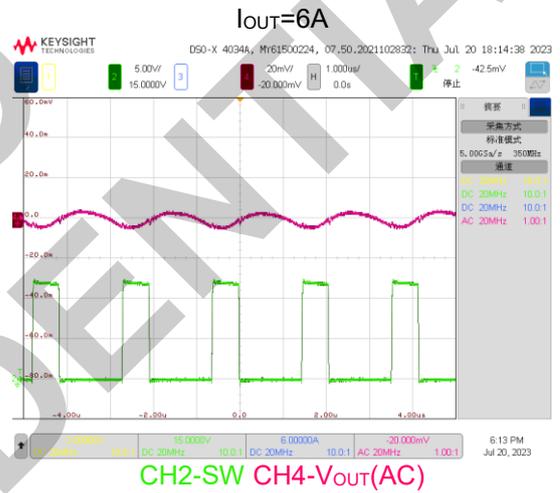
Load Regulation vs. Load Current
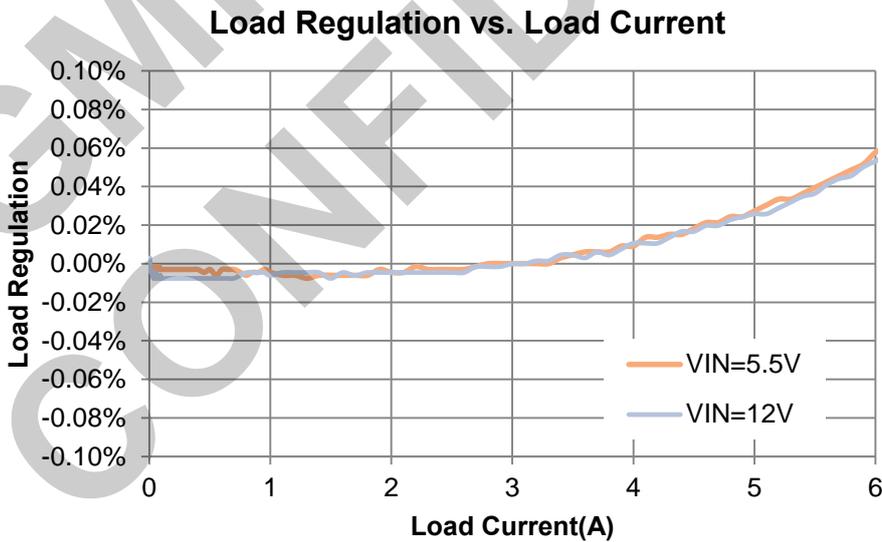
4. Line Regulation
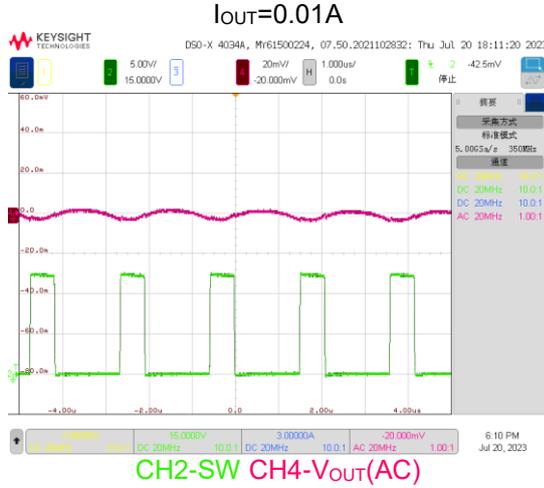
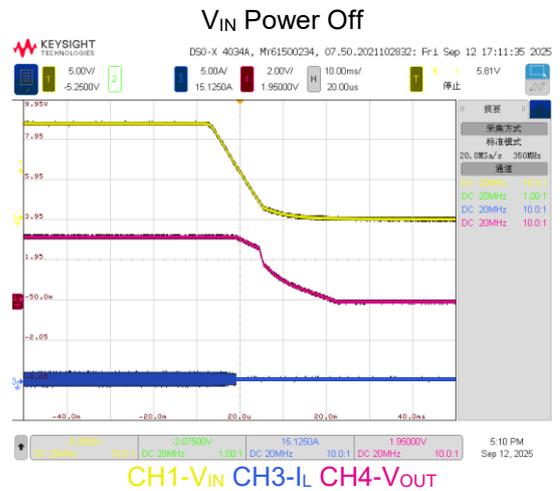Test conditions: V$_{OUT}$=3.3V, I$_{OUT}$= 0.1A/3A/6A, EN floating.

5. Output Voltage Ripple

Test conditions: V_{IN}=12V, V_{OUT}=3.3V.

I_{OUT}=0.01A

CH2-SW CH4-V_{OUT}(AC)

I_{OUT}=0.5A

CH2-SW CH4-V_{OUT}(AC)

I_{OUT}=3A

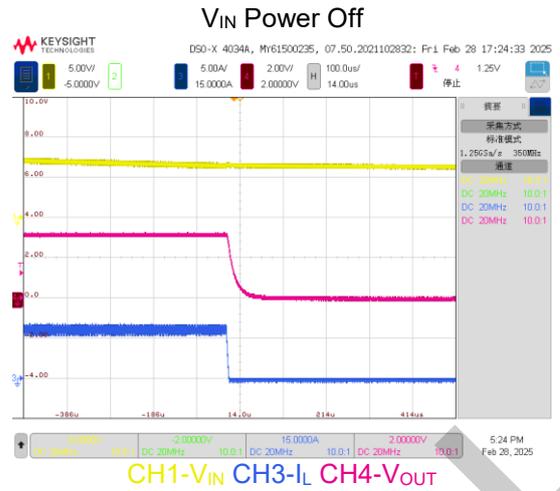CH2-SW CH4-V_{OUT}(AC)

I_{OUT}=6A

CH2-SW CH4-V_{OUT}(AC)
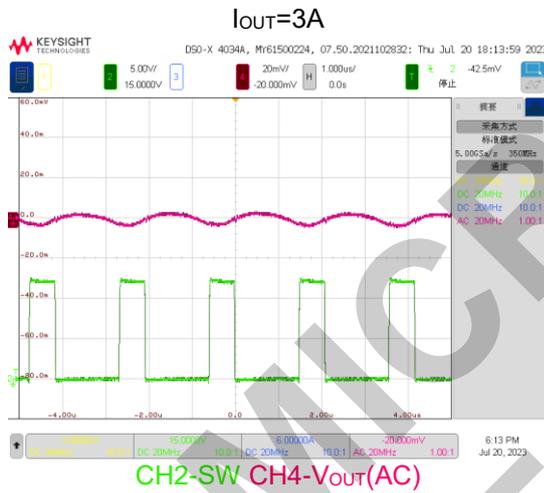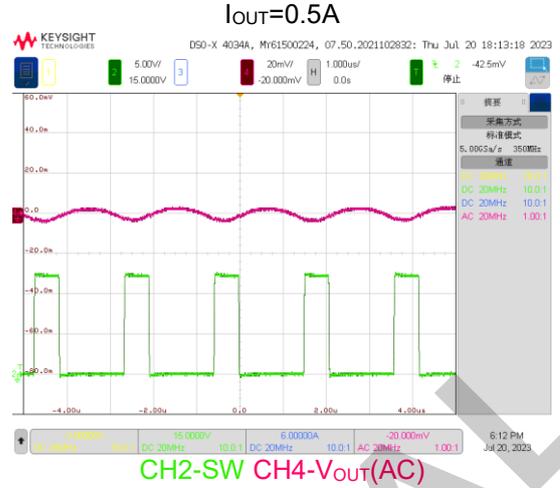
6. VIN Power On/Off

Test conditions: V_{OUT}=3.3V, I_{OUT}=0A.
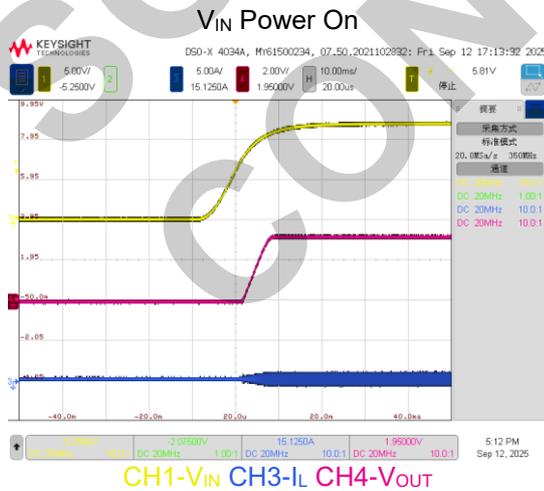
V_{IN} Power On

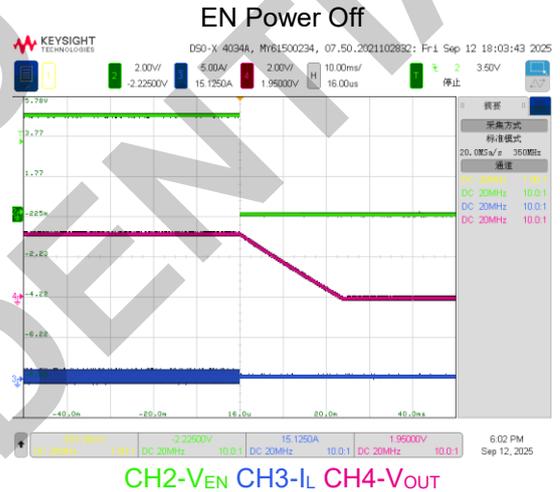CH1-V_{IN} CH3-I_L CH4-V_{OUT}

V_{IN} Power Off

CH1-V_{IN} CH3-I_L CH4-V_{OUT}

Test conditions: V_{OUT}=3.3V, I_{OUT}=6A.

V_{IN} Power On

CH1-V_{IN} CH3-I_L CH4-V_{OUT}

V_{IN} Power Off

CH1-V_{IN} CH3-I_L CH4-V_{OUT}

7. EN On/Off

Test conditions: V_{OUT}=3.3V, I_{OUT}=0A.

EN Power On

CH2-V_{EN} CH3-I_L CH4-V_{OUT}

EN Power Off

CH2-V_{EN} CH3-I_L CH4-V_{OUT}
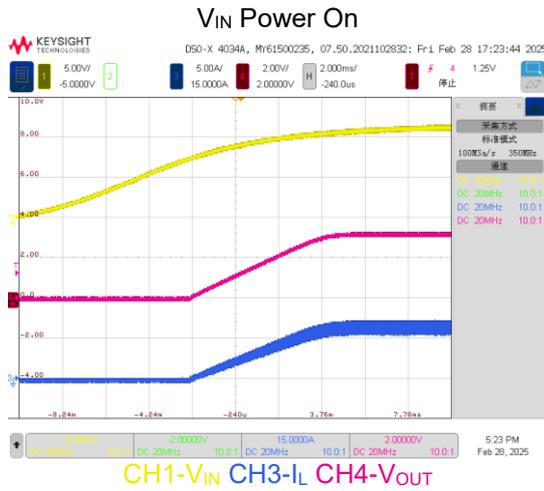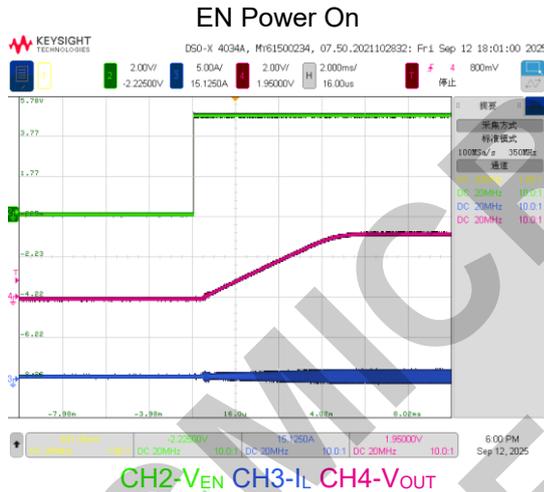
Test conditions: V_{OUT}=3.3V, R_{LOAD}=0.55Ω.

EN Power On

CH2-V_{EN} CH3-I_L CH4-V_{OUT}

EN Power Off

CH2-V_{EN} CH3-I_L CH4-V_{OUT}
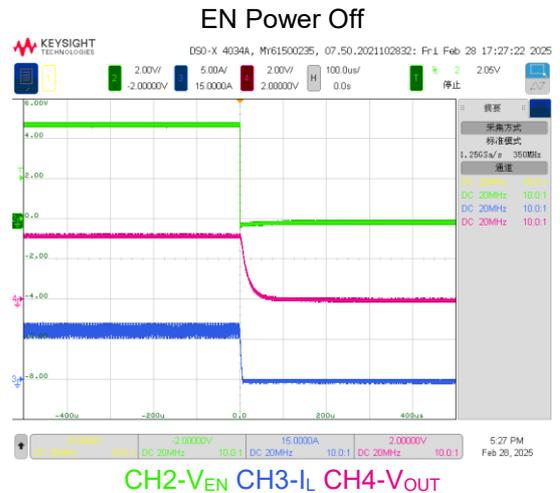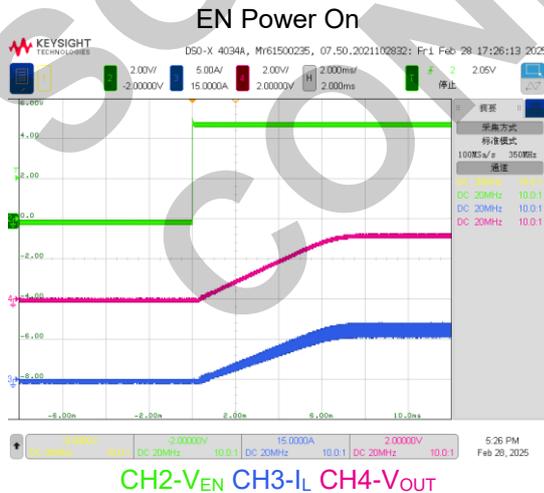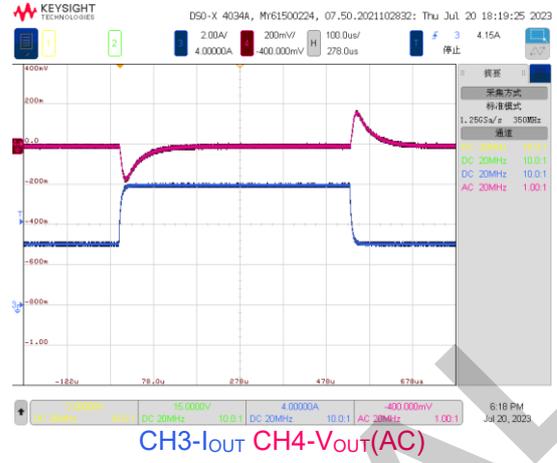
8.   Load Transient

Test conditions: V_{IN}=12V, V_{OUT}=3.3V, Slew rate=0.5A/µs.
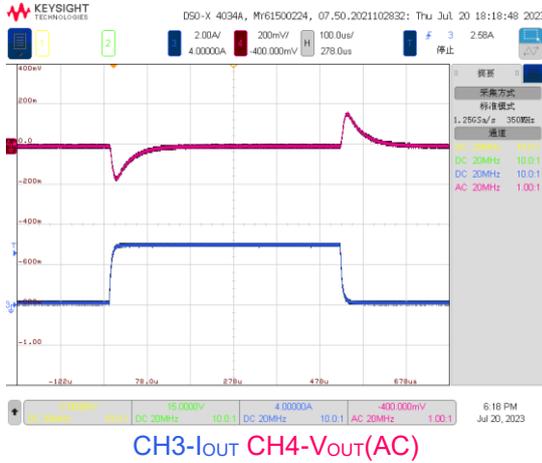
I_{OUT}=50mA to 3A to 50mA

I_{OUT}=3A to 6A to 3A
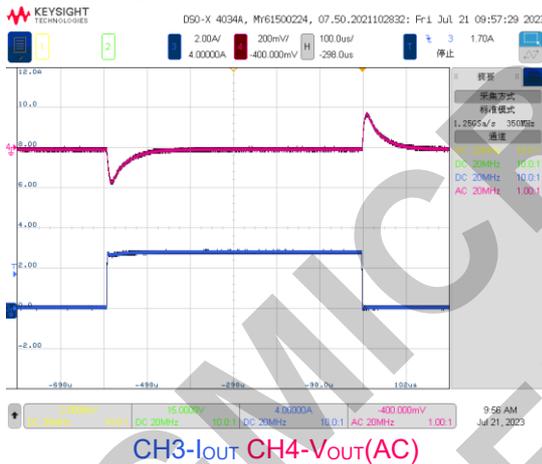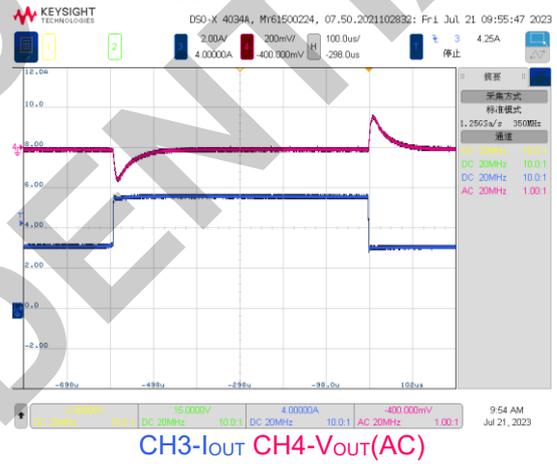

CH3-I_{OUT} CH4-V_{OUT}(AC)

CH3-I_{OUT} CH4-V_{OUT}(AC)

Test conditions: V_{IN}=12V, V_{OUT}=3.3V, Slew rate=4A/µs.

I_{OUT}=50mA to 3A to 50mA

I_{OUT}=3A to 6A to 3A

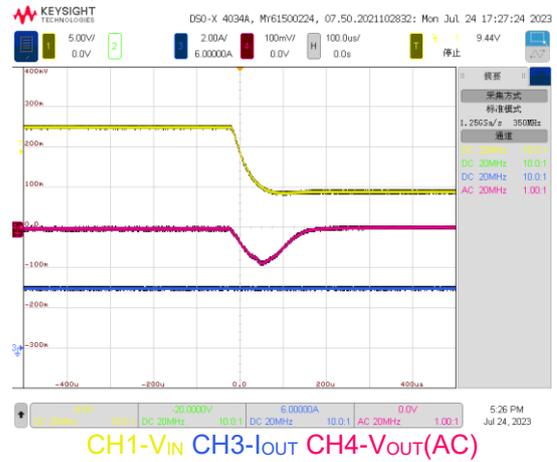CH3-I_{OUT} CH4-V_{OUT}(AC)

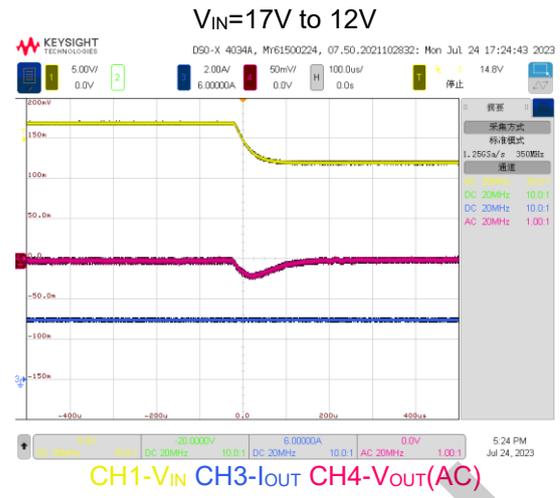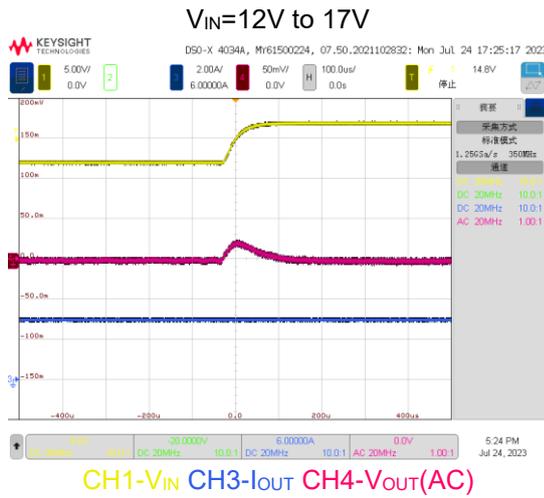

CH3-I_{OUT} CH4-V_{OUT}(AC)

9.   Line Transient

Test conditions: V_{OUT}=3.3V, I_{OUT}=3A, EN floating.

V_{IN}=5V to 12V

V_{IN}=12V to 5V

CH1-V_{IN} CH3-I_{OUT} CH4-V_{OUT}(AC)

CH1-V_{IN} CH3-I_{OUT} CH4-V_{OUT}(AC)

V_{IN}=12V to 17V

CH1-V_{IN} CH3-I_{OUT} CH4-V_{OUT}(AC)

V_{IN}=17V to 12V

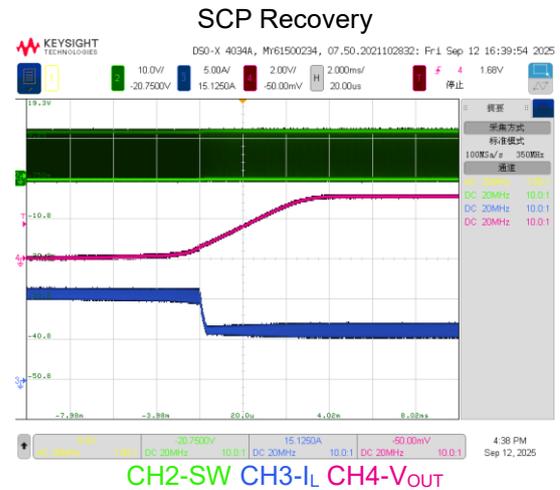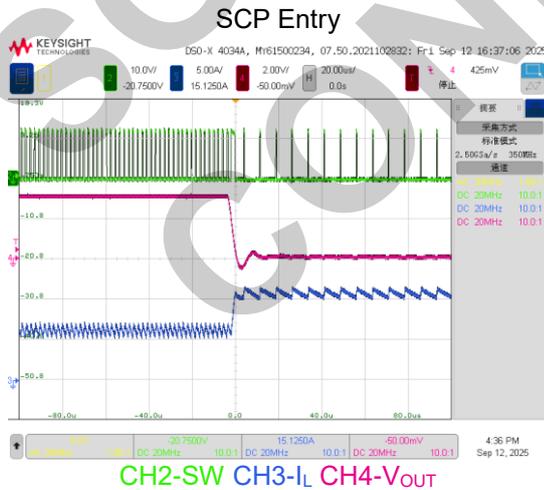CH1-V_{IN} CH3-I_{OUT} CH4-V_{OUT}(AC)
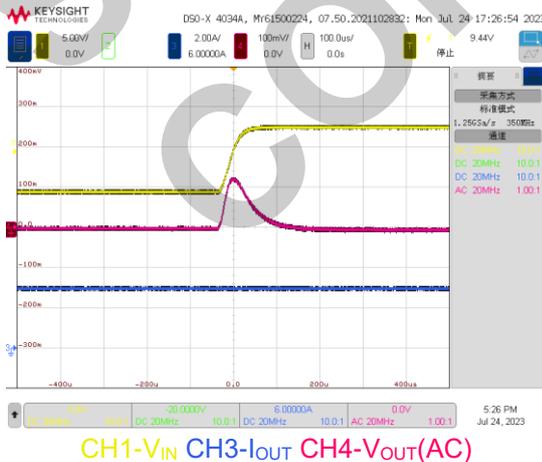
10. SCP Entry and Recovery

Test conditions: V_{IN}=12V, V_{OUT}=3.3V, I_{OUT}=0A, Output Shorted Protection.

SCP Entry

CH2-SW CH3-I_L CH4-V_{OUT}

SCP Recovery

CH2-SW CH3-I_L CH4-V_{OUT}
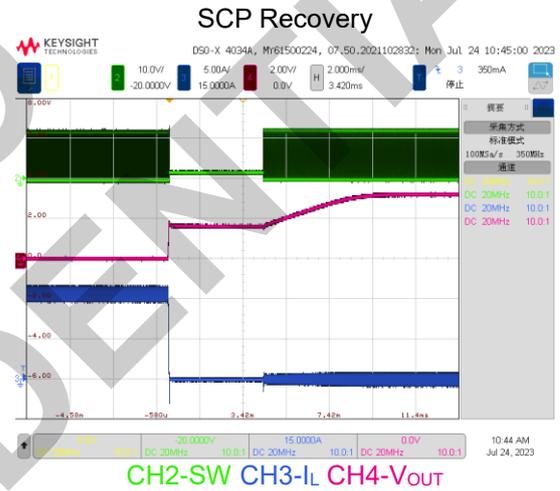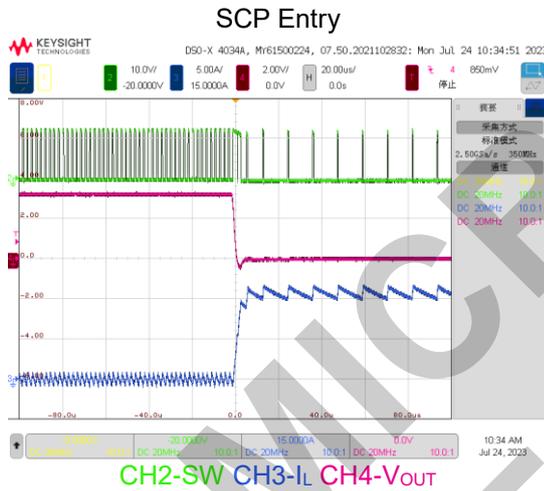
Test conditions: V_{IN}=12V, V_{OUT}=3.3V, I_{OUT}=6A, Output Shorted Protection.

SCP Entry

CH2-SW CH3-I_L CH4-V_{OUT}

SCP Recovery

CH2-SW CH3-I_L CH4-V_{OUT}

11. VIN/EN On/Off during SCP

Test conditions: V_{IN}=12V, V_{OUT}=3.3V, Output Shorted.

V$_{IN}$ Power On

CH1-V$_{IN}$ CH3-I$_L$ CH4-V$_{OUT}$

V$_{IN}$ Power Off

CH1-V$_{IN}$ CH3-I$_L$ CH4-V$_{OUT}$
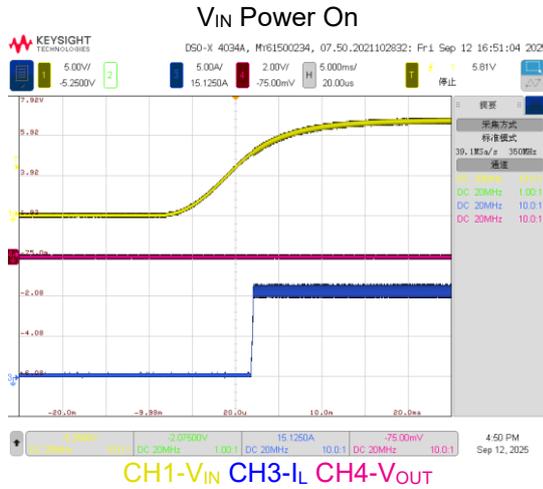

EN On

CH2-V$_{EN}$ CH3-I$_L$ CH4-V$_{OUT}$

EN Off

CH2-V$_{EN}$ CH3-I$_L$ CH4-V$_{OUT}$
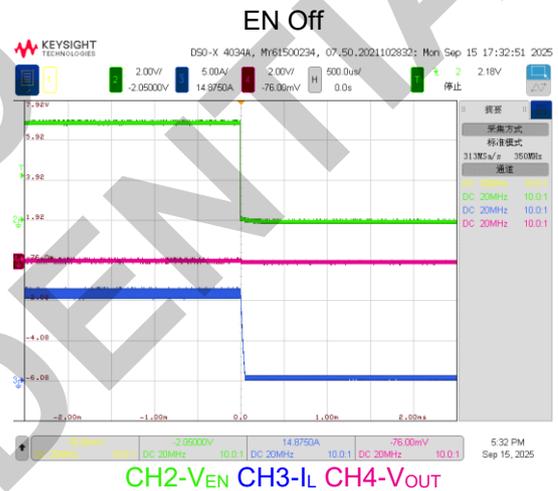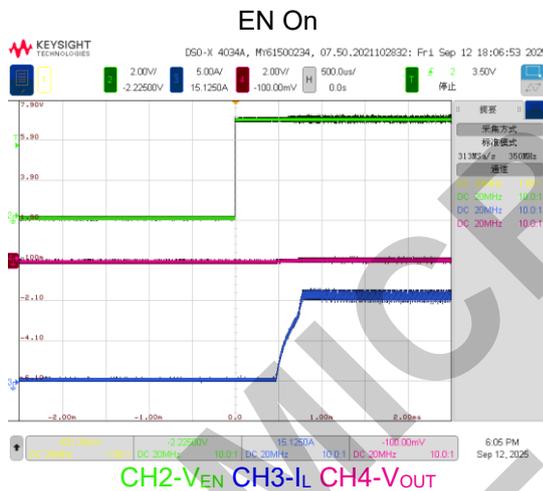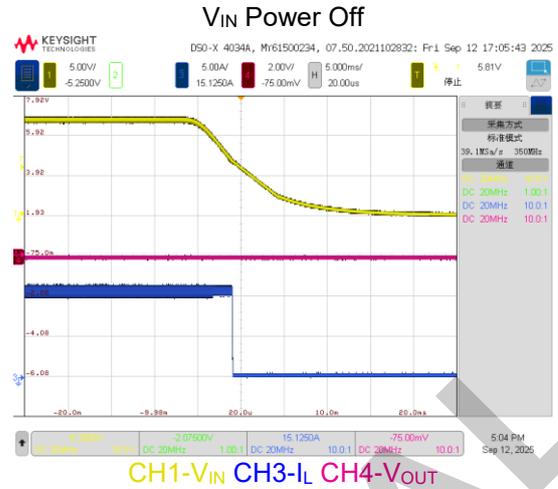
12. OTP Entry

Test conditions: V_{IN}=12V, V_{OUT}=3.3V, R_{LOAD}=1Ω, Over temperature Protection.

OTP Entry

CH2-SW CH3-I$_L$ CH4-V$_{OUT}$
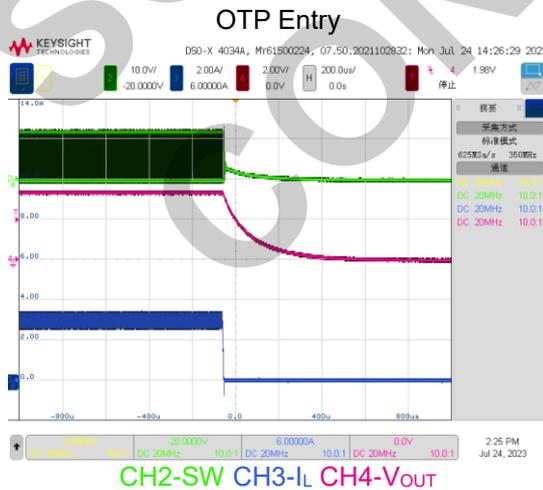
13. Thermal Test

Test conditions: V$_{IN}$=12V, V$_{OUT}$=3.3V, Room temperature test, Natural air convection heat dissipation.

Temperature Rise at 12V Input / 3.3V Output
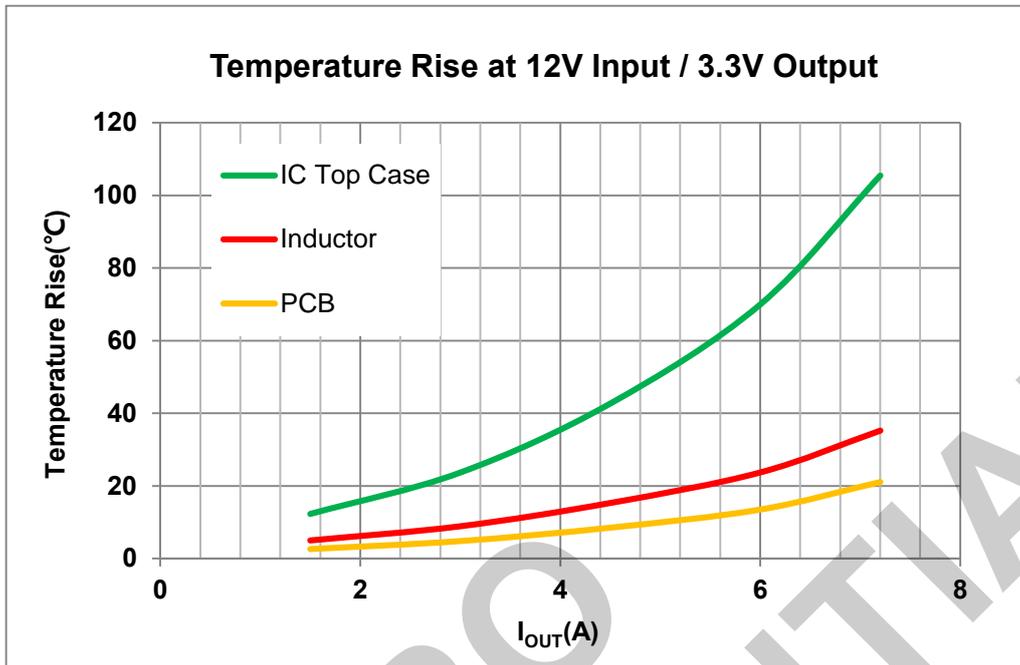
I$_{OUT}$(A)	1.5	3	4.5	6	7.2
IC Top Case(℃)	40.4	51.9	71.1	98.0	133.7
Inductor(℃)	33.1	37.1	43.7	51.7	63.4
PCB(℃)	30.7	33.0	36.9	41.5	49.3
Ambient(℃)	28.1	28.2	28.4	28.0	28.2