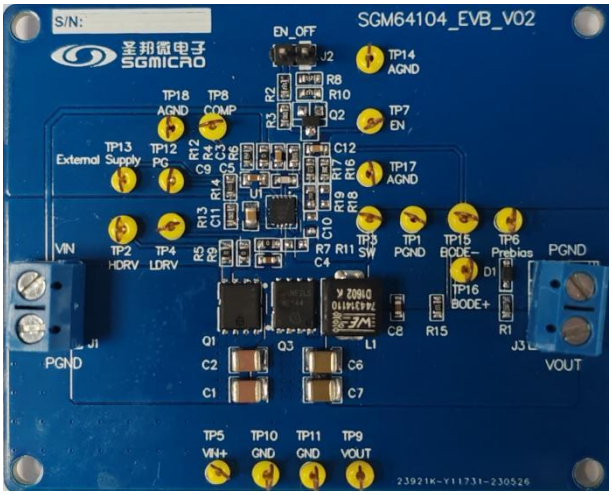
SGM64104 Demo Board Test Report

4.5V to 18V Input, 1.8V/20A(Max) Output,

Synchronous Buck Controller with Power Good

Demo Board Pictures:

Top



Bottom

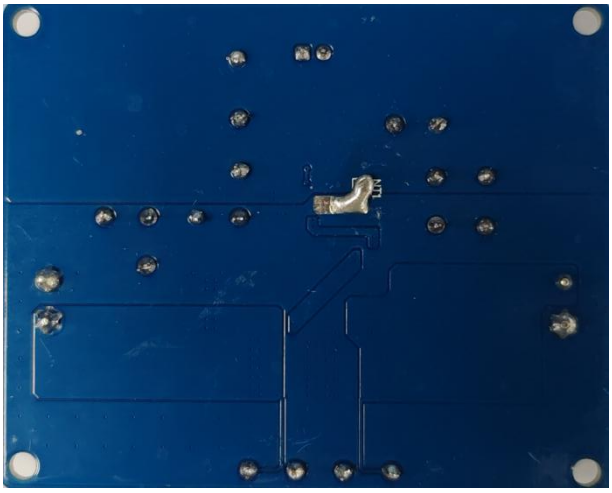
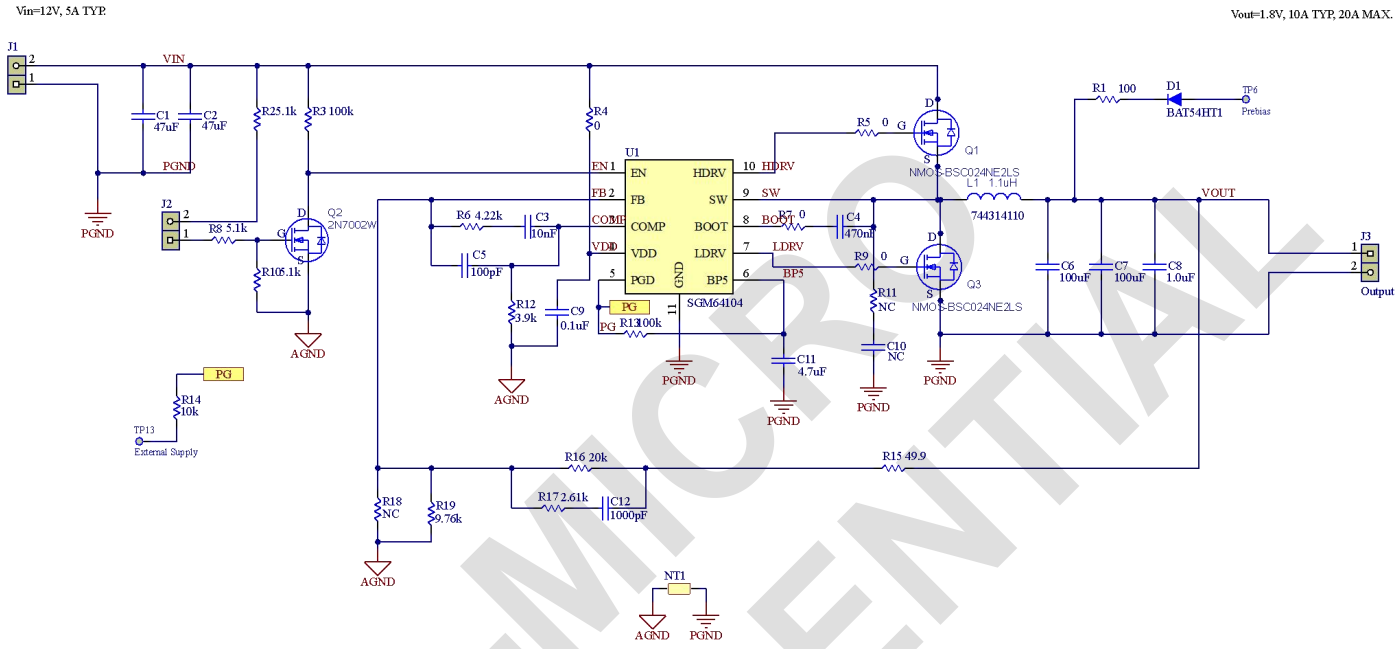


Table of Contents

1. Schematic, BOM List and PCB layout

1.1 Schematic



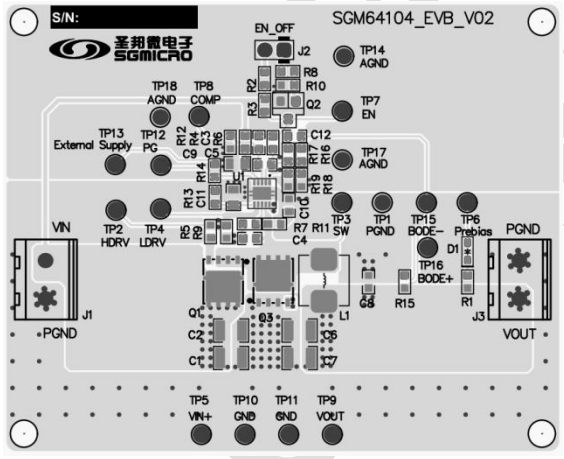
1.2 BOM List

Item	Quantity	Designator	Description	Manufactory
1	2	C1, C2	Ceramic capacitor, 47uF/25V, 1210	
2	1	C3	Ceramic capacitor, 10nF/10V, 0603	
3	1	C4	Ceramic capacitor, 470nF/10V, 0603	
4	1	C5	Ceramic capacitor, 100pF/10V, 0603	
5	2	C6, C7	Ceramic capacitor, 100uF/10V, 1210	
6	1	C8	Ceramic capacitor, 1uF/25V, 0603	
7	1	C9	Ceramic capacitor, 0.1uF/25V, 0805	
8	1	C10	NC	
9	1	C11	Ceramic capacitor, 4.7uF/25V, 0805	
10	1	C12	Ceramic capacitor, 1nF/10V, 0603	
11	1	D1	Schottky Diode, BAT54HT1, SOD323	
12	1	L1	Inductor, 1.1uH,744314110, ±20%, Irms=19.6A, Isat=13A, DCR=3.15mΩ	WURTH
13	1	NT1	Short Pad	
14	2	Q1, Q3	NMOSFET, BSC024NE2LS, PDFN-5X6-8P-1.27	

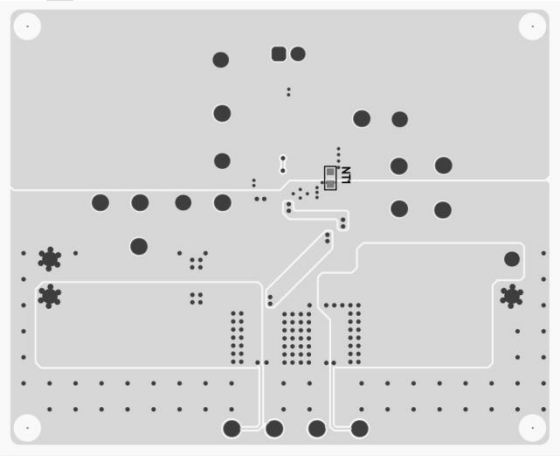
15	1	Q2	NMOSFET, 2N7002W, SOT-323-3	
16	1	R1	SMD resistor, 100Ω, 0603,1%	
17	3	R2, R8, R10	SMD resistor, 5.1kΩ, 0603,1%	
18	2	R3, R13	SMD resistor, 100kΩ, 0603,1%	
19	4	R4, R5, R7, R9	SMD resistor, 0Ω, 0603,1%	
20	1	R6	SMD resistor, 4.22kΩ, 0603,1%	
21	2	R11, R18	NC	
22	1	R12	SMD resistor, 3.9kΩ, 0603,1%	
23	1	R14	SMD resistor, 10kΩ, 0603,1%	
24	1	R15	SMD resistor, 49.9Ω, 0603,1%	
25	1	R16	SMD resistor, 20kΩ, 0603,1%	
26	1	R17	SMD resistor, 2.61kΩ, 0603,1%	
27	1	R19	SMD resistor, 9.76kΩ, 0603,1%	
28	1	U1	SGM64104, 4.5V to 18V Input, Voltage-Mode, Synchronous Buck Controller with Power Good	SG-MICRO
Conclusion: Total 38 components.				

1.3 PCB Layout

Top Layer



Bottom Layer



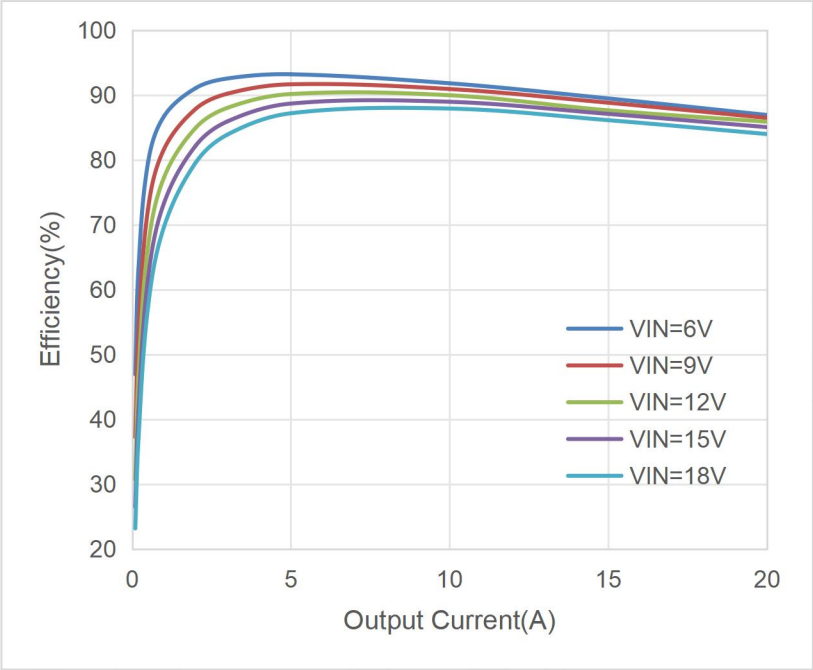
2. Demo Board Test Items

Test conditions: V_{IN}=12V, V_{EN}=V_{IN}, V_{OUT}=1.8V, PGD pulled up to BP5.

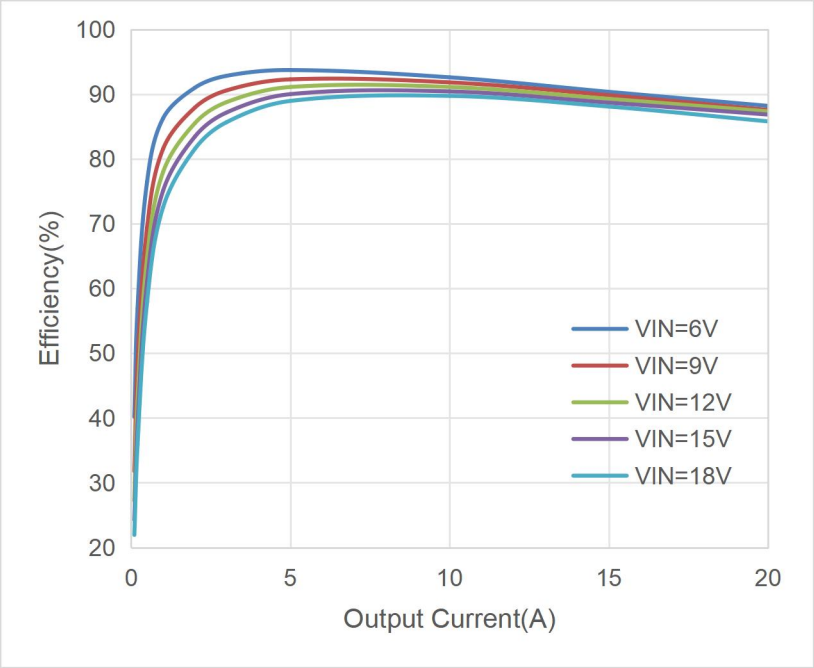
(NOTE: Unless otherwise noted, the test conditions are used in all test items.)

2.1 Efficiency

Test conditions: SGM64104A, V_{IN}=6V/9V/12V/15V/18V, V_{OUT}=1.8V, I_{OUT}=0.1A to 20A, measure the efficiency.

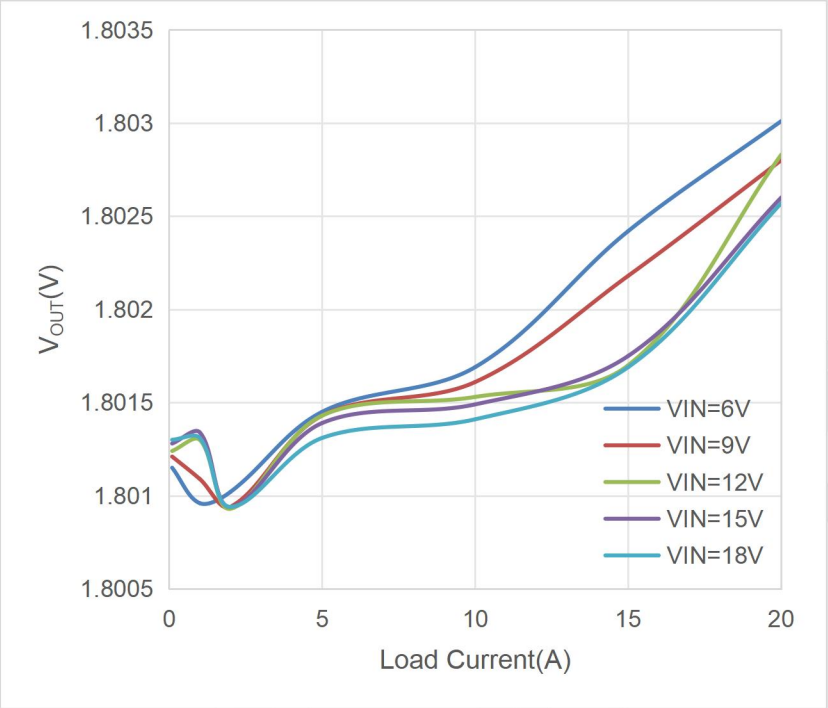


Test conditions: SGM64104B, V_{IN}=6V/9V/12V/15V/18V, V_{OUT}=1.8V, I_{OUT}=0.1A to 20A, measure the efficiency.

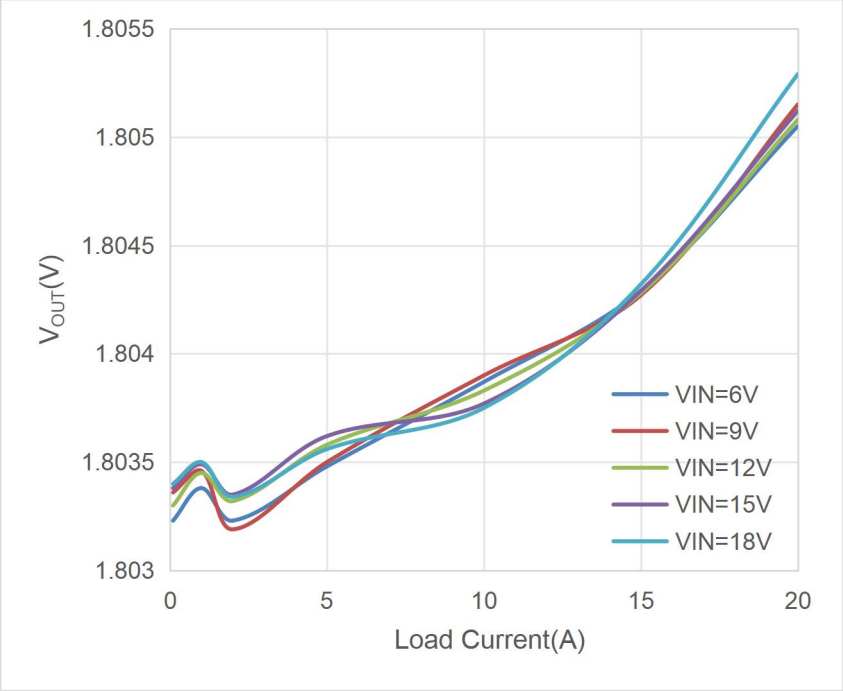


2.2 Load Regulation

Test conditions: SGM64104A, V_{IN}=6V/9V/12V/15V/18V, V_{OUT}=1.8V, I_{OUT}=0.1A to 20A, measure the load regulation.

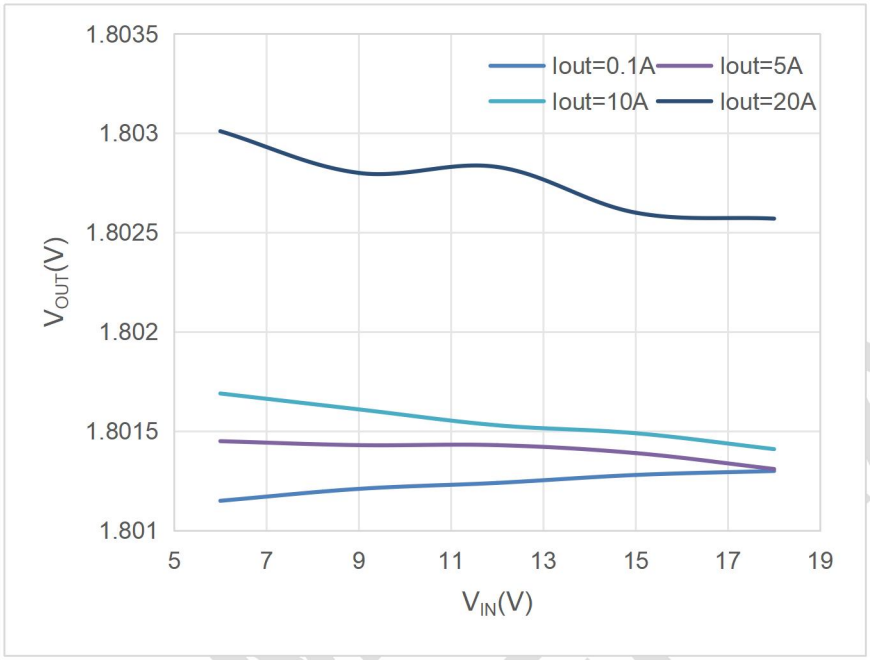


Test conditions: SGM64104B, V_{IN}=6V/9V/12V/15V/18V, V_{OUT}=1.8V, I_{OUT}=0.1A to 20A, measure the load regulation.

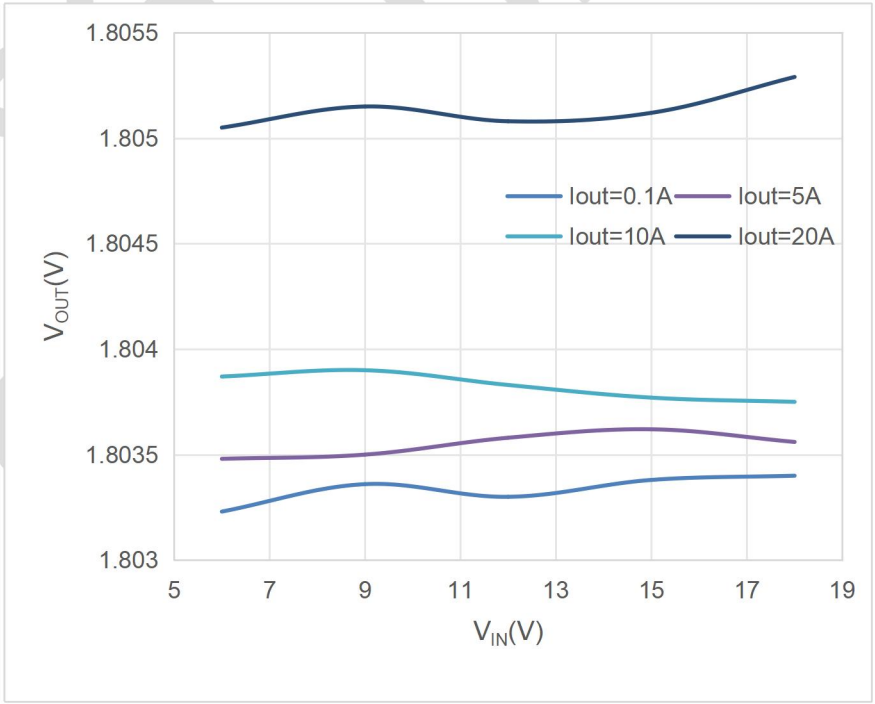


2.3 Line Regulation

Test conditions: SGM64104A, V_{IN}=6V/9V/12V/15V/18V, V_{OUT}=1.8V, I_{OUT}=0.1A to 20A, measure the load regulation.



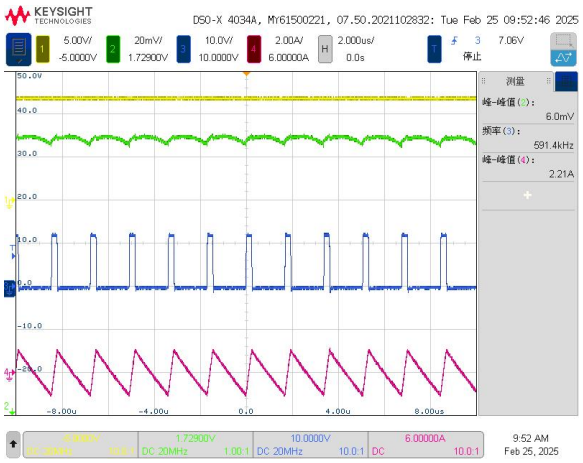
Test conditions: SGM64104B, V_{IN}=6V/9V/12V/15V/18V, V_{OUT}=1.8V, I_{OUT}=0.1A to 20A, measure the load regulation.



2.4 Output Voltage Ripple

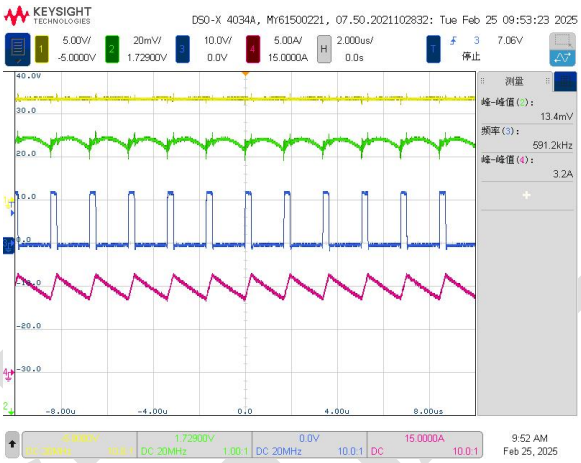
Test conditions: V_{IN}=12V, V_{OUT}=1.8V, V_{EN}=V_{IN}.

SGM64104A, VIN = 12V, No Load.



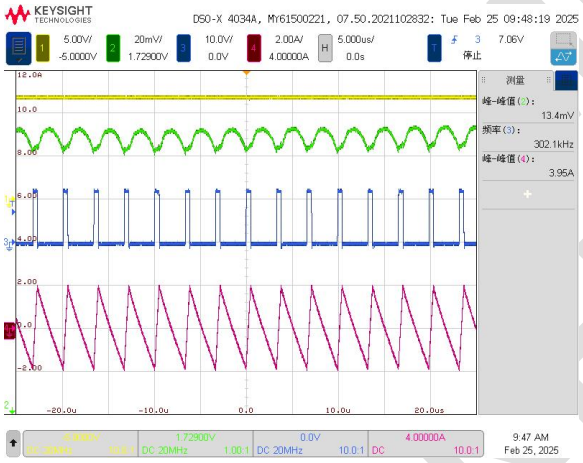
CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104A, VIN = 12V, I_{OUT}=10A.



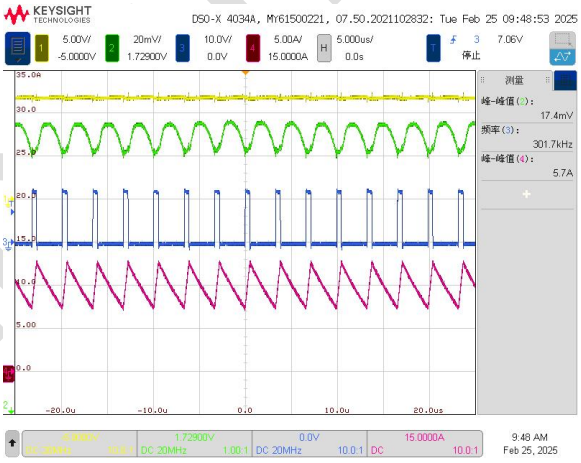
CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104B, VIN = 12V, No Load.



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104B, VIN = 24V, I_{OUT}=10A.

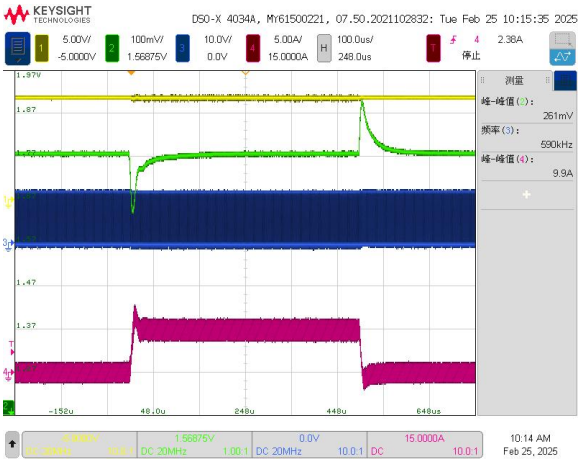


CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

2.5 Load Transient

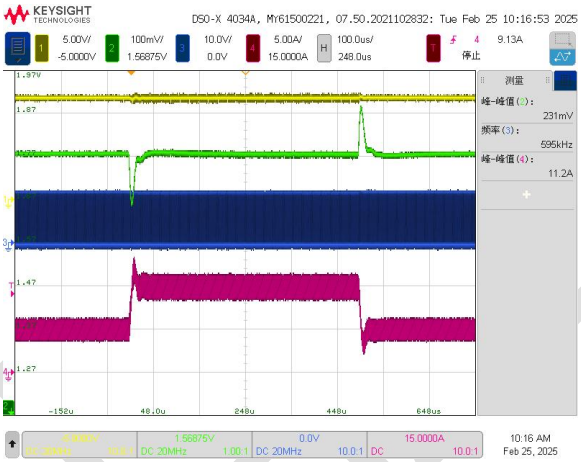
Test conditions: V_{IN}=12V, V_{OUT}=1.8V, V_{EN}=V_{IN}, E-load slew rate is 10A/us, change I_{OUT} and measure the load transient.

SGM64104A, I_{OUT}= 0A to 5A to 0A.



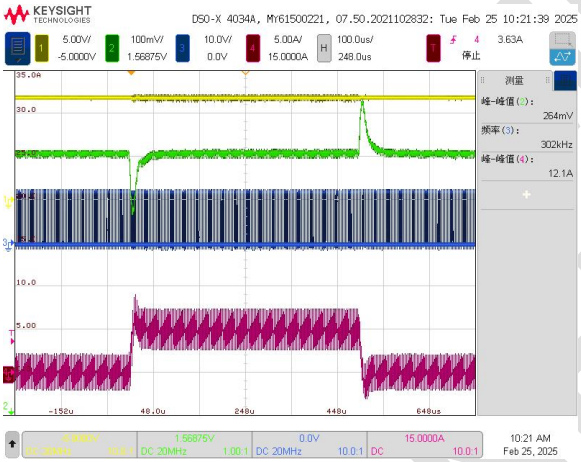
CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104A, I_{OUT}= 5A to 10A to 5A.



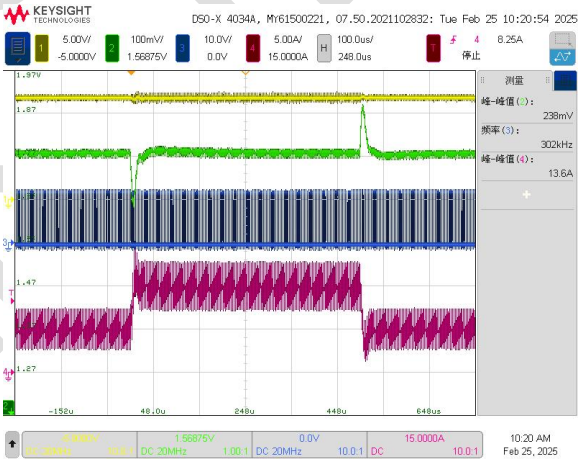
CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104B, I_{OUT}= 0A to 5A to 0A.



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104B, I_{OUT}= 5A to 10A to 5A.

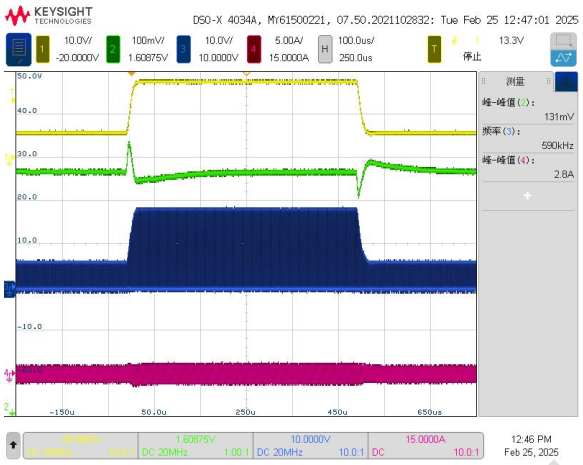


CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

2.6 Line Transient

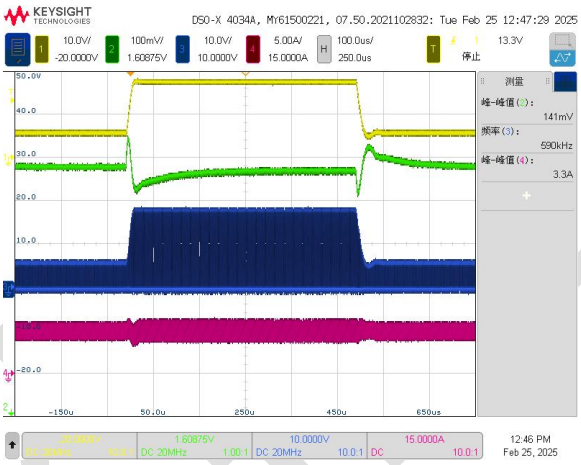
Test conditions: V_{OUT}=1.8V, V_{EN}=V_{IN}, change V_{IN} and measure the line transient.

SGM64104A, V_{IN}=6V to 18V to 6V, I_{OUT}= 0A, Rising Time=35us.



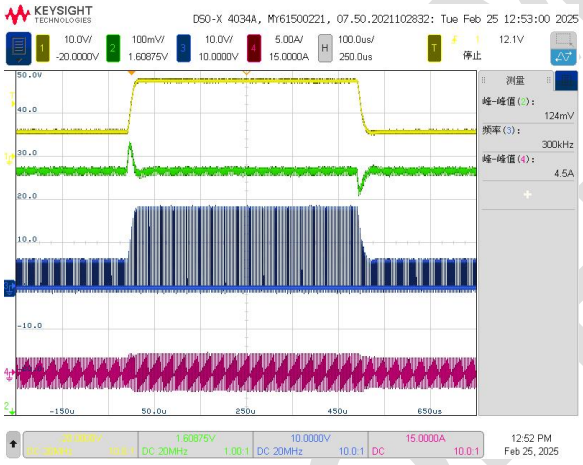
CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104A, V_{IN}=6V to 18V to 6V, I_{OUT}= 5A, , Rising Time=35us.



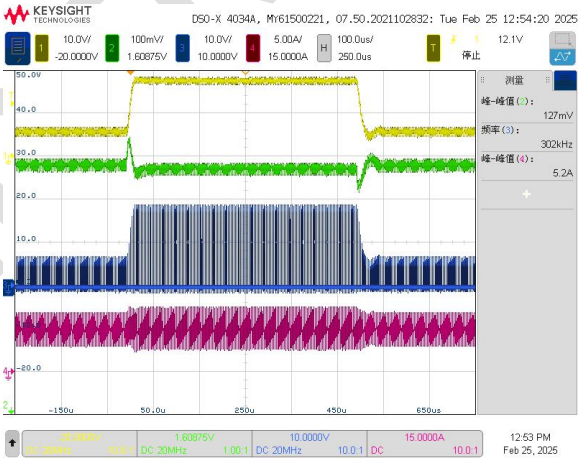
CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104B, V_{IN}=6V to 18V to 6V, I_{OUT}= 0A, Rising Time=35us.



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104B, V_{IN}=6V to 18V, I_{OUT}= 5A, Rising Time=35us.

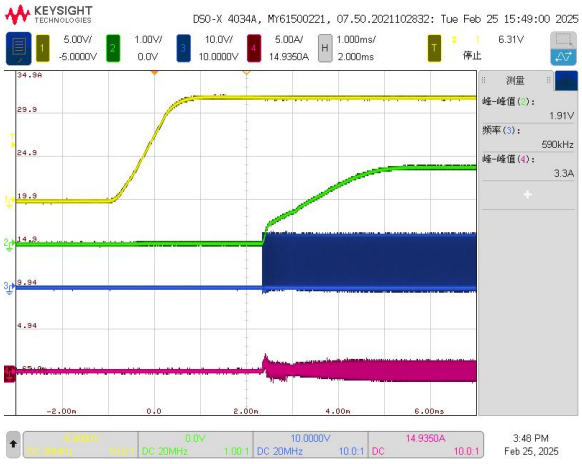


CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

2.7 V_{IN} Power On/Off

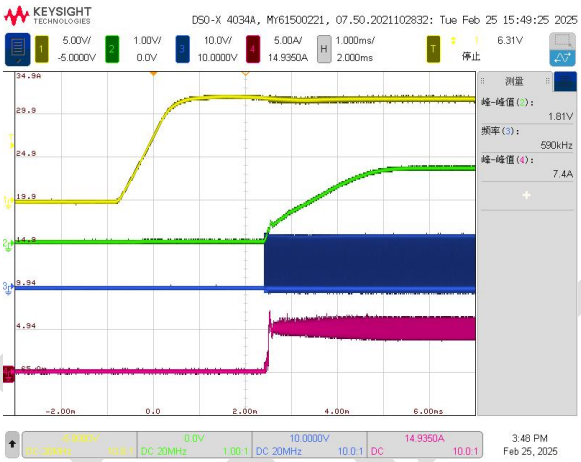
Test conditions: SGM64104A, V_{EN}=3.3V, V_{IN} power on.

SGM64104A, V_{IN}=12V, I_{OUT}= 0A



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

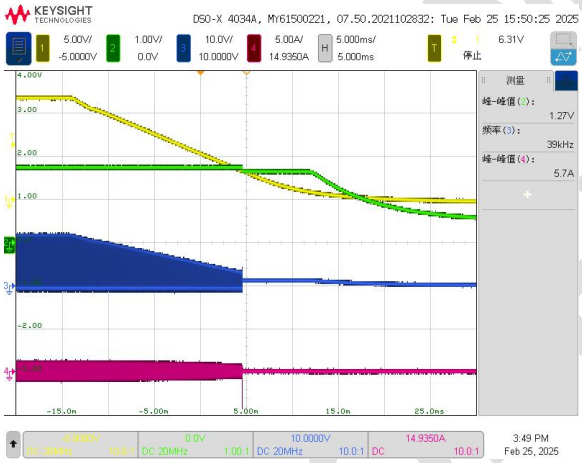
SGM64104A, V_{IN}=12V, I_{OUT}= 5A



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

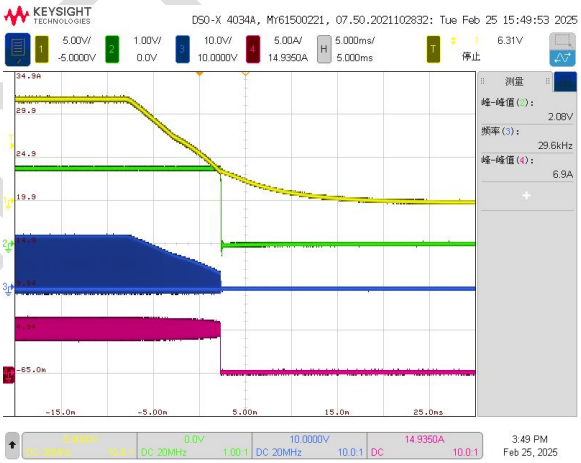
Test conditions: SGM64104A, V_{EN}=3.3V, V_{IN} power off.

SGM64104A, V_{IN}=12V, I_{OUT}= 0A



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104A, V_{IN}=12V, I_{OUT}= 5A

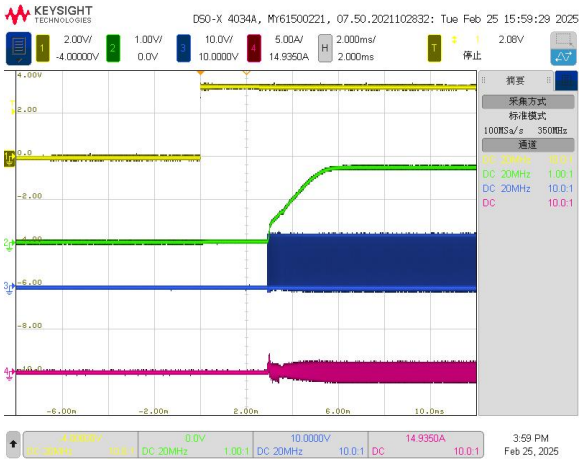


CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

2.8 EN Power On/Off

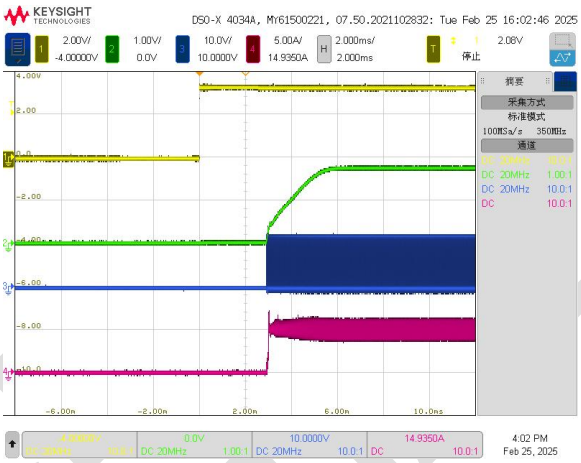
Test conditions: SGM64104A,V_{IN}=12V, V_{OUT}=1.8V, EN power on.

SGM64104A, V_{IN}=12V, I_{OUT}=0A



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

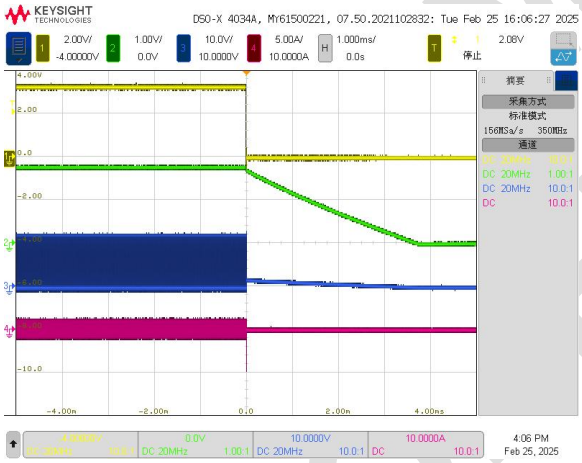
SGM64104A, V_{IN}=12V, I_{OUT}=5A



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

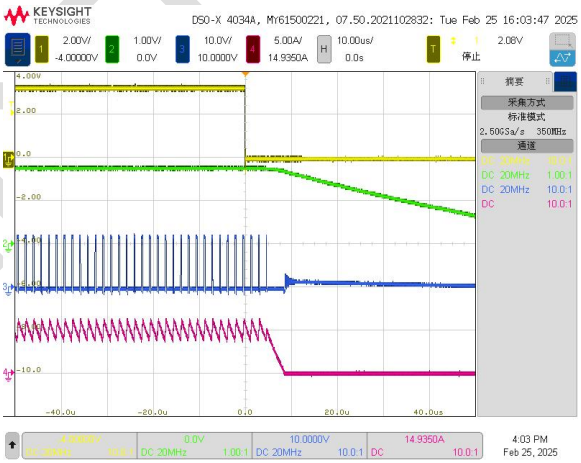
Test conditions: SGM64104A,V_{IN}=12V, V_{OUT}=1.8V, EN power off.

SGM64104A, V_{IN}=12V, I_{OUT}=0.1A



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

SGM64104A, V_{IN}=12V, I_{OUT}=5A

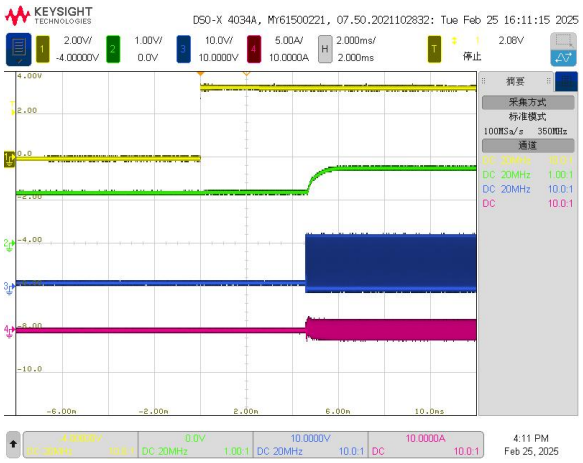


CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_L

2.9 Output Prebias-On

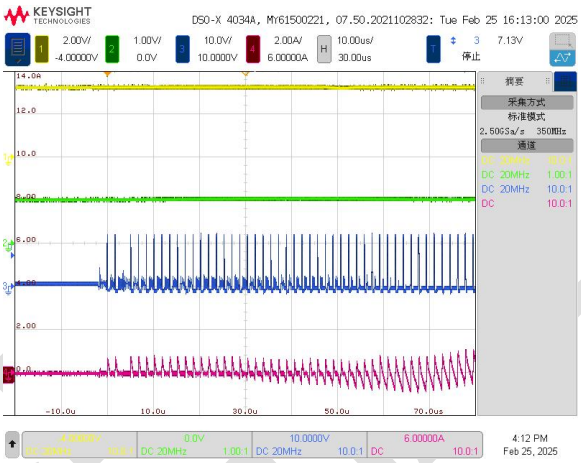
Test conditions: SGM64104A,V_{IN}=12V, I_{OUT}=0A, $V_{OUT\_Prebias}$=1V, EN power on.

$V_{OUT\_Prebias}$=1V, EN on



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

ZOOM IN



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

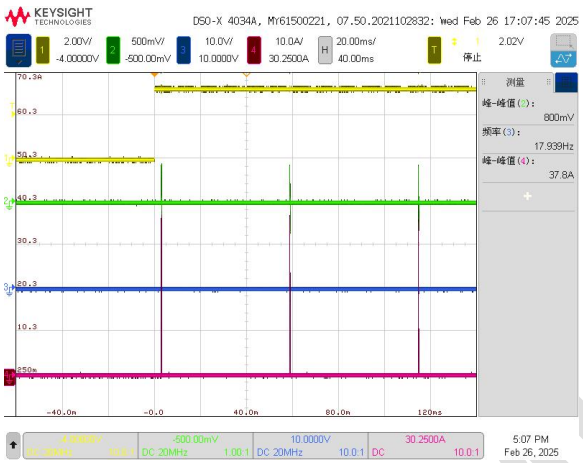
2.10 Short-Circuit / Over-Current Protections

2.10.1 Short-Circuit before Power-on

Test conditions: SGM64104A,V_{IN}=12V, V_{EN}=V_{IN}, short V_{OUT} to GND before power-on.

Low-side Short-Circuit Protection

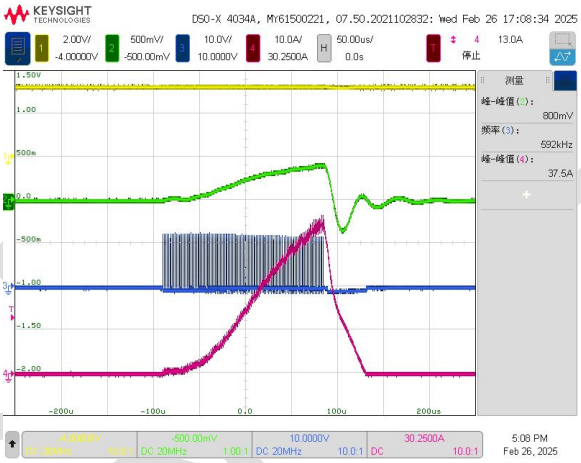
HMOS_ILIM=203A, LMOS_LIM=37A



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

Low-side Short-Circuit Protection

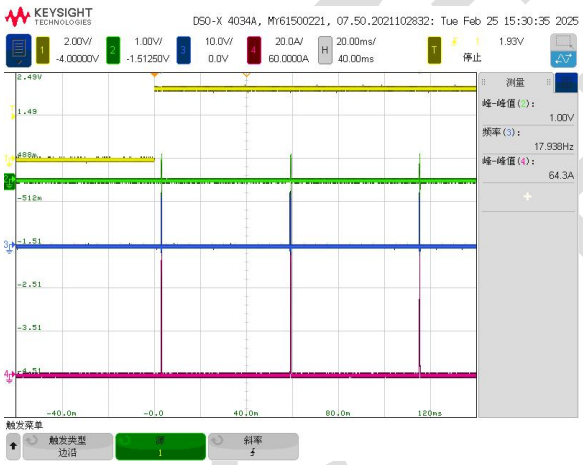
ZOOM IN



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

High-side Short-Circuit Protection

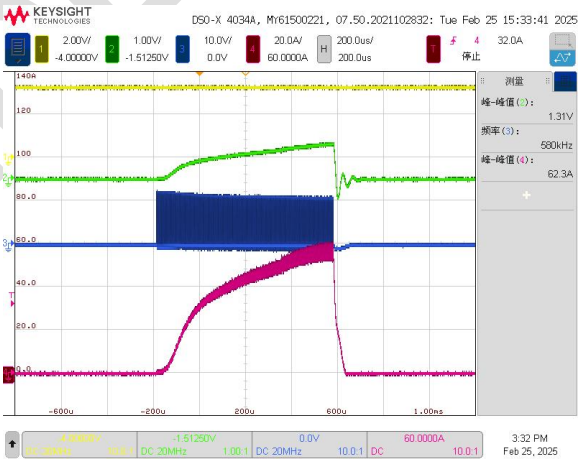
HMOS_ILIM=50A, LMOS_LIM=74A



CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

High-side Short-Circuit Protection

ZOOM IN



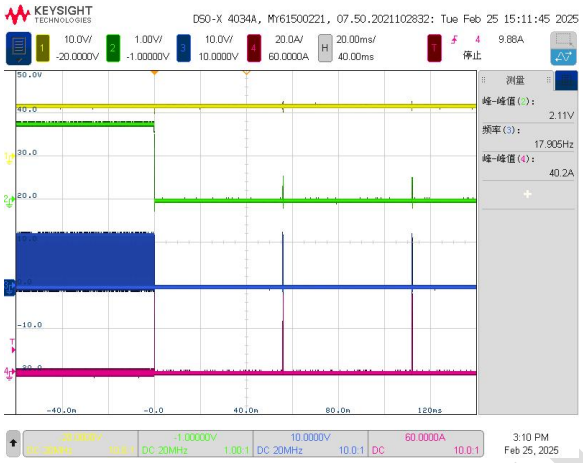
CH1-V_{EN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

2.10.2 Hot Short

Test conditions: V_{IN}=12V, V_{EN}=V_{IN}, short V_{OUT} to GND during steady state.

Low-side Short-Circuit Protection

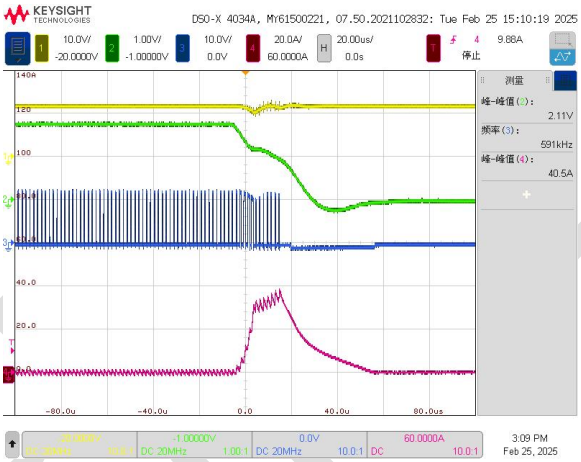
HMOS_ILIM=203A, LMOS_LIM=37A



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

Low-side Short-Circuit Protection

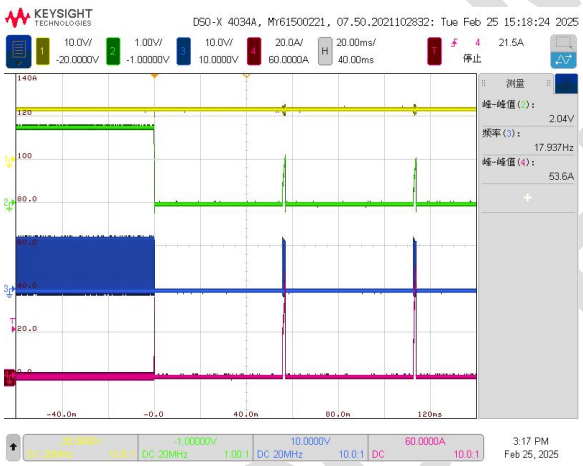
ZOOM IN



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

High-side Short-Circuit Protection

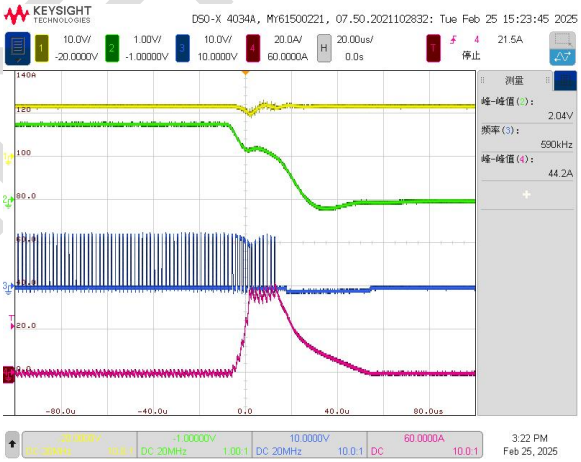
HMOS_ILIM=50A, LMOS_LIM=74A



CH1-V_{IN} CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

High-side Short-Circuit Protection

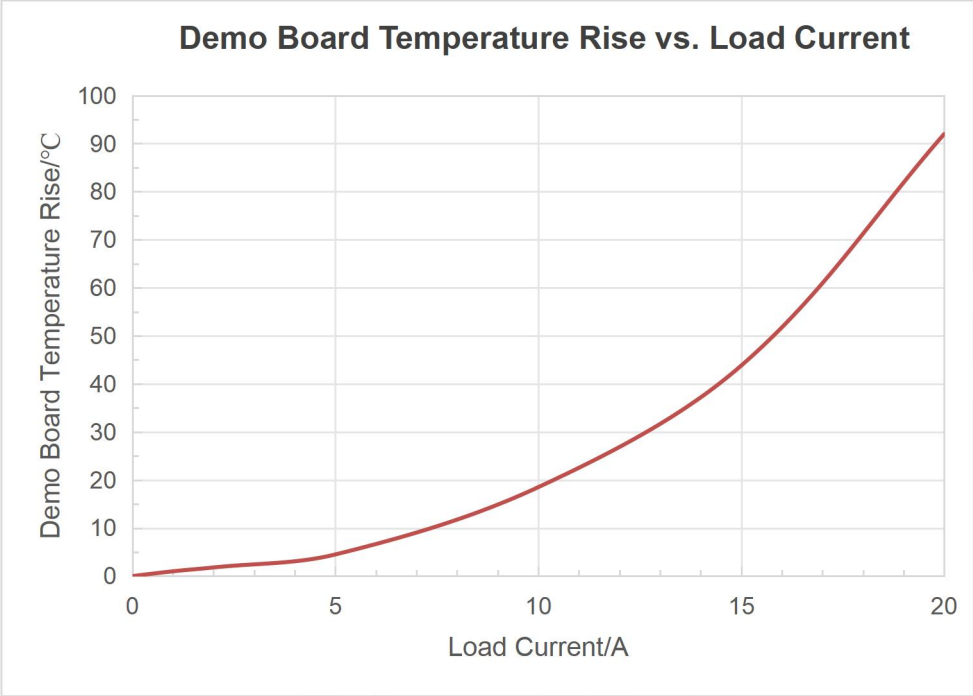
ZOOM IN



CH1-V_{IN}CH2-V_{OUT} CH3-V_{SW} CH4-I_{IN}

2.11 Thermal Test

Test conditions: SGM64104A,V_{IN}=12V, V_{OUT}=1.8V, V_{EN}=V_{IN}.



Note: Since SGM64104 is a buck controller, the maximum temperature on the demo board typically occurs near power paths such as N-MOS or inductor. Therefore, the temperature rise curve in the following figure primarily represents the situation on the demo board rather than the chip package. This is influenced by factors like N-MOS, inductor selection and PCB layout, so the figure is provided as a reference only.