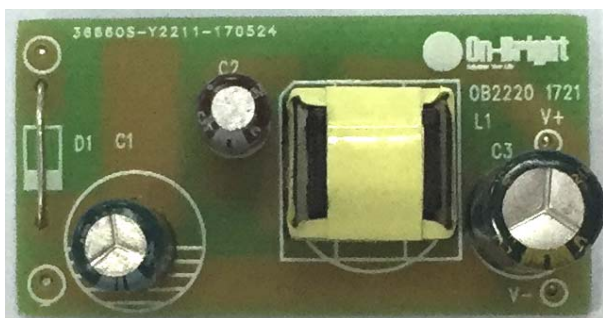


Subject
OB2220P Demo Board Manual

Board Model: AD12V0.3A2220P.00

Doc. No.: OB_DOC_DBM_2220P00



Key features:

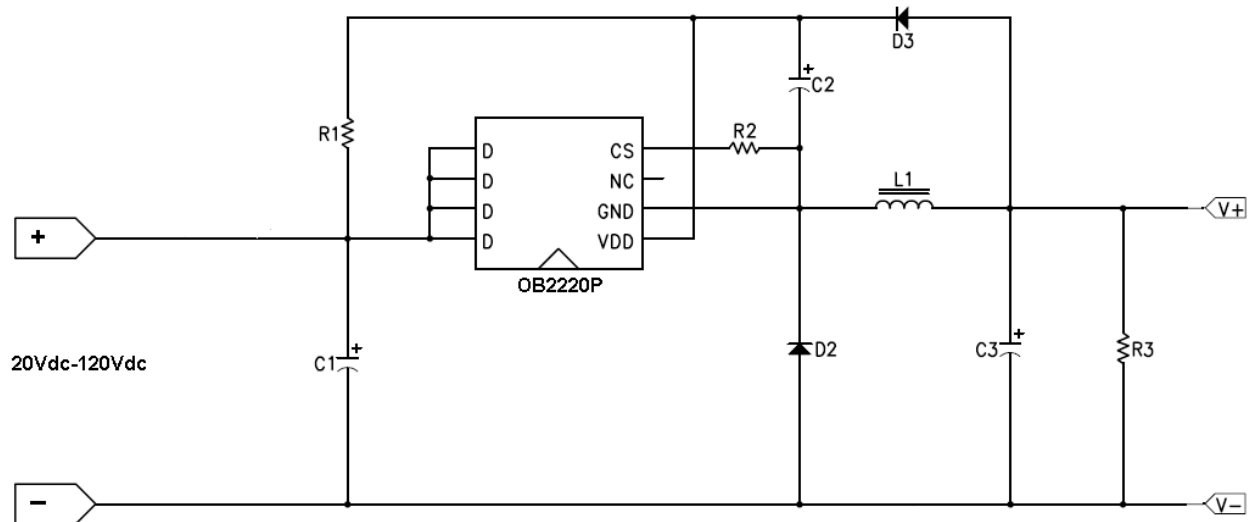
- Lowest possible component count
- Efficiency measured >75% at full load
- Good dynamic response
- Comprehensive protection including output short protection, OLP, etc.

Revision History

Revise Date	Version	Reason/Issue
2018/2/8	00	First issue

1. Board Information

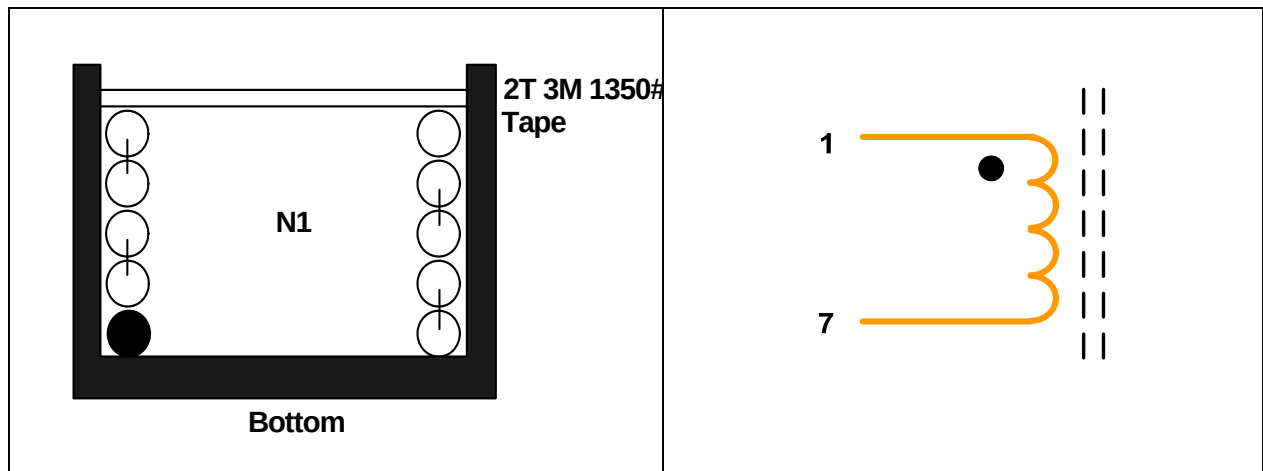
1.1. Board schematic



1.2. Component list

No.	Position	Description	Quantity
1	D1	Jumper	1
2	D2	Diode ES1G	1
3	D3	Diode M7	1
4	C1	E.C. 4.7uF /200V	1
5	C2	E.C. 3.3uF /50V	1
6	C3	E.C. 330uF /25V	1
7	R1	SMD RES 360K /5% /1206	1
8	R2	SMD RES 0R82 /1% /1206	1
9	R3	SMD RES 2K /5% /1206	1
10	U1	OB2220P SOP8	1
11	L1	Inductor 500uH /EE10	1
	Total		11

1.3. Inductor design



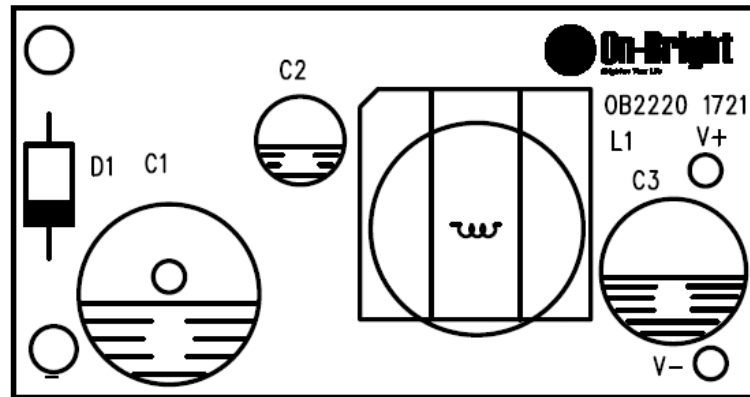
1. Bobbin: EE10

2. Core: TDK PC40.

3. L1-7= 500uH (at:10KHz, 1V)

Material	Turns	Inductance & Tolerance
$\Phi 0.27 * 1$ 2UEW	106	500uH $\pm 7\%$

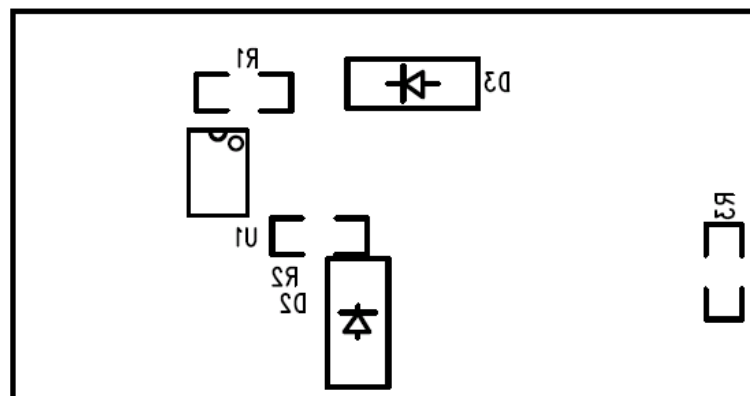
1.4.PCB Gerber File



Top

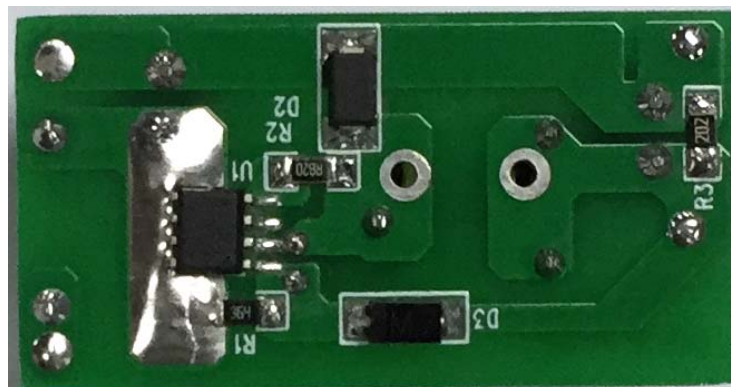
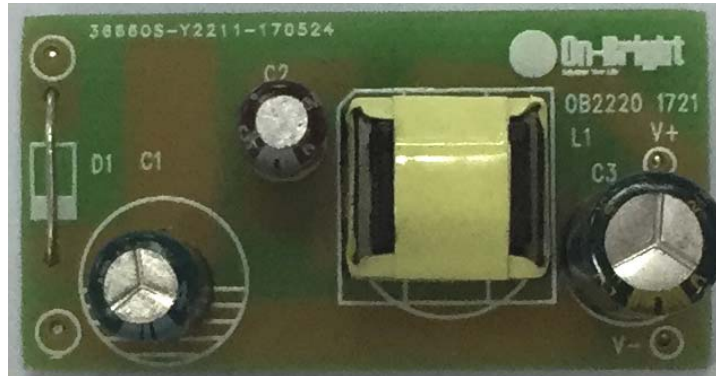


Bottom



Silkscreen Bottom

1.5. Snapshot



2. Converter Specification

2.1. Input Characteristics

- DC input voltage range 20Vdc - 120Vdc

2.2. Output Characteristics

- Output voltage V_{OUT} 12V
- Output current I_{OUT} 300mA
- Operating frequency 50KHz
- Output power 3.6W

2.3. Performance Function

- Efficiency >75%
- Ripple & Noise <100mV

2.4. Protection Function

- Short Circuit Protection Output shut down with auto-restart
- Over Load Protection Output shut down with auto-restart

3. Performance Evaluation

3.1. Efficiency

Input voltage	load 300mA	Spec	Remark
20Vdc	81.76	>75%	Pass
40Vdc	84.36		Pass
60Vdc	84.79		Pass
80Vdc	85.05		Pass
100Vdc	84.55		Pass
120Vdc	85.33		Pass

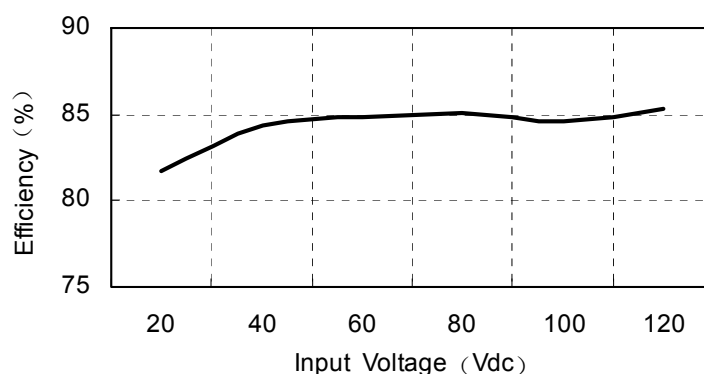


Figure 1. Efficiency @300mA load

3.2. Output Voltage

Input voltage	0mA	100mA	200mA	300mA	Spec	Remark
20Vdc	12.56	12.29	12.22	12.16	10~14V	Pass
40Vdc	12.53	12.25	12.16	12.08		Pass
60Vdc	12.51	12.23	12.13	12.05		Pass
80Vdc	12.50	12.22	12.11	12.03		Pass
100Vdc	12.49	12.21	12.11	12.02		Pass
120Vdc	12.48	12.20	12.10	12.02		Pass

3.3.Dynamic (Figure 2&3)

Input voltage	V _{OUT-min} (V)	V _{OUT-max} (V)	Spec	Remark
20Vdc	11.87	12.43	10~14V	Pass
40Vdc	11.60	12.43		Pass
60Vdc	11.52	12.42		Pass
80Vdc	11.50	12.42		Pass
100Vdc	11.45	12.40		Pass
120Vdc	11.54	12.41		Pass

Note: A dynamic loading with low load set at 0mA lasting for 20ms and high set at 300mA lasting for 20ms is added to output. The ramp is set at 0.25A/us at transient.

3.4.Over Current Protection & Recovery

Input voltage	OCP (mA)	Recovery (mA)	Spec	Remark
20Vdc	487	472	$\geq 1.1 \cdot I_{OUT}$	Pass
40Vdc	454	451		Pass
60Vdc	433	431		Pass
80Vdc	425	423		Pass
100Vdc	422	420		Pass
120Vdc	423	421		Pass

3.5.Ripple & Noise (Figure 4-7)

Input voltage	No load (mV)	Full load (mV)	Spec	Remark
20Vdc	38	55	<100mV	Pass
40Vdc	40	58		Pass
60Vdc	40	56		Pass
80Vdc	43	57		Pass
100Vdc	42	60		Pass
120Vdc	46	63		Pass

3.6. Waveforms

Figure 2: 20Vdc, 0-300mA load

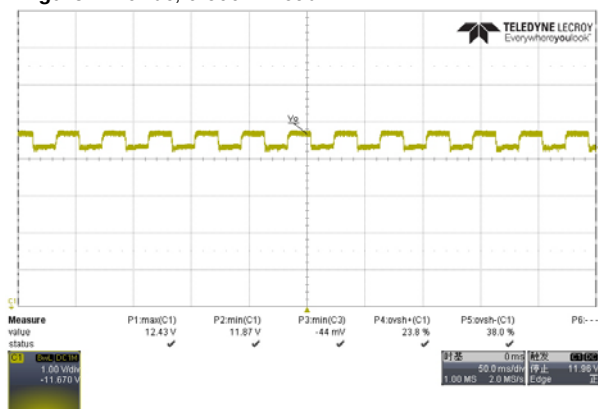


Figure 3: 120Vdc, 0-300mA load

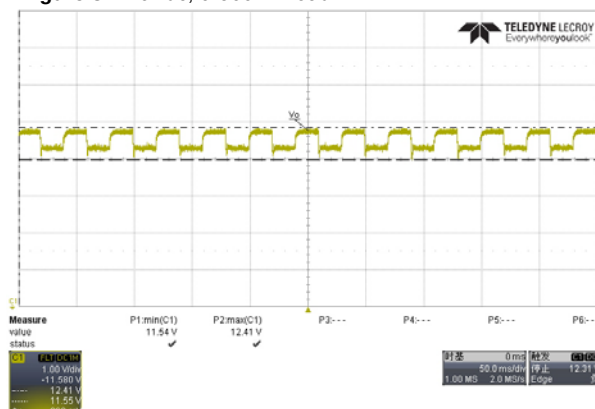


Figure 4: 20Vdc, no- load

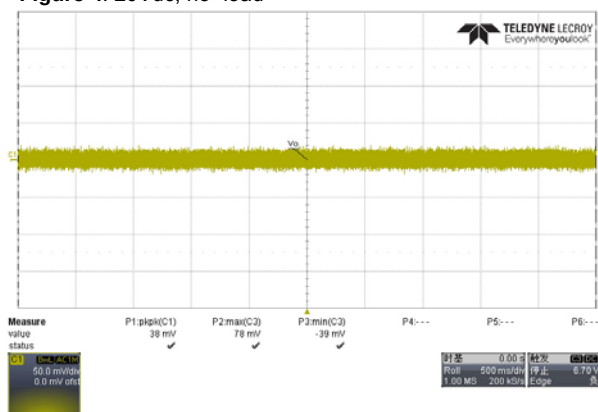


Figure 5: 20Vdc, full load

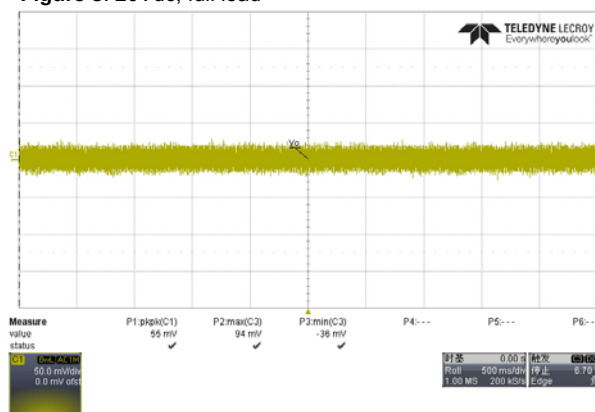


Figure 6: 120Vdc, no- load

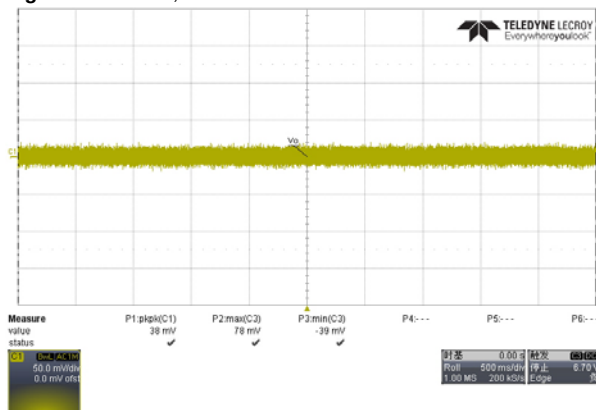


Figure 7: 120Vdc, full load

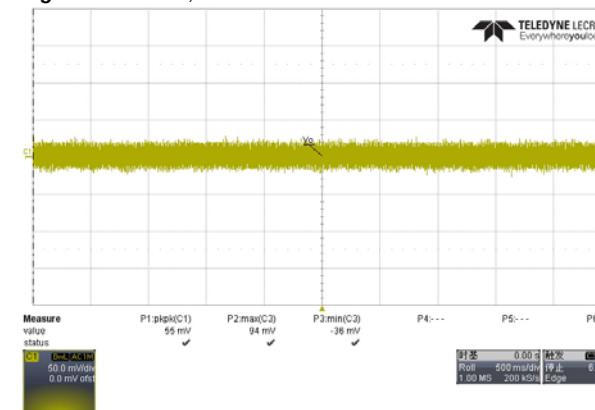
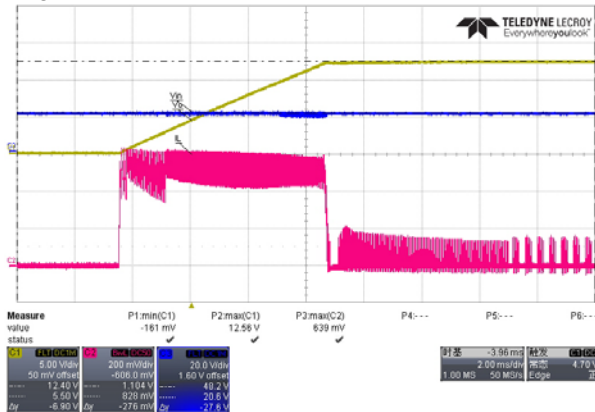
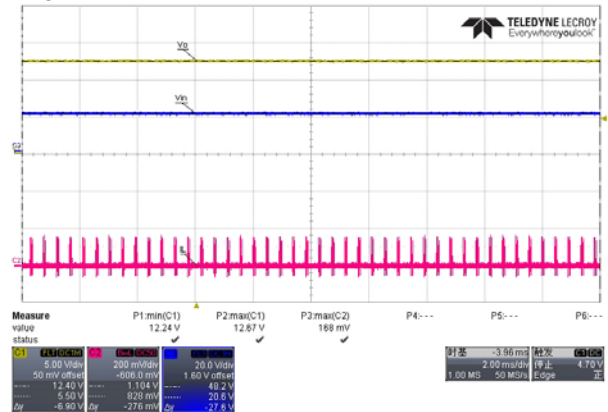


Figure 8: 20Vdc, start at no-load



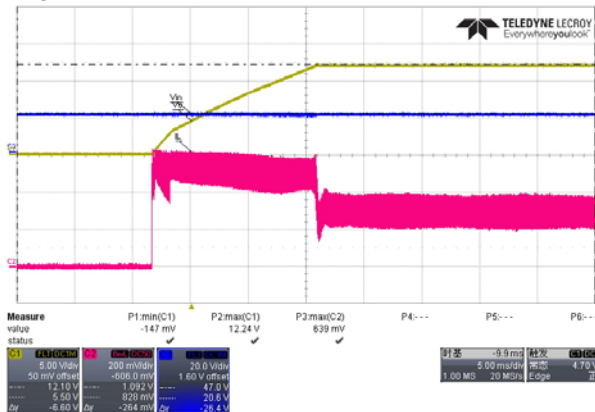
CH1: V_{out} CH2: $I_{Inductor}$ CH3: V_{in}
 20V 直流输入，空载启动波形

Figure 9: 20Vdc, no-load



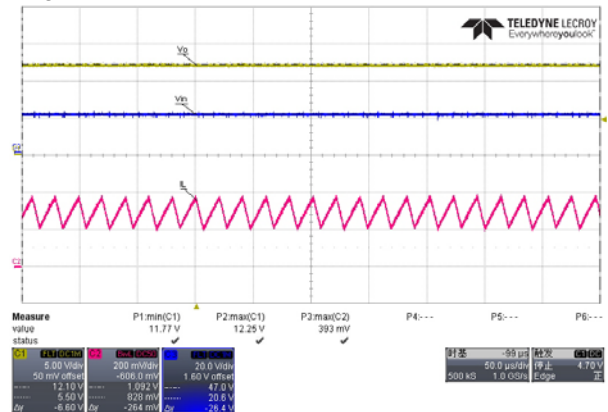
CH1: V_{out} CH2: $I_{Inductor}$ CH3: V_{in}
 20V 直流输入，空载正常工作波形

Figure 10: 20Vdc, start at full load



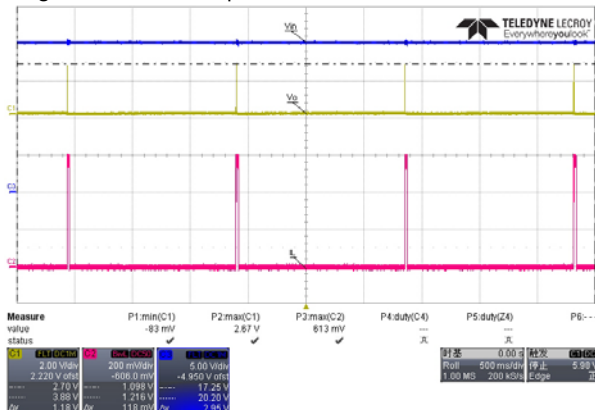
CH1: V_{out} CH2: $I_{Inductor}$ CH3: V_{in}
 20V 直流输入，满载启动波形

Figure 11: 20Vdc, full load



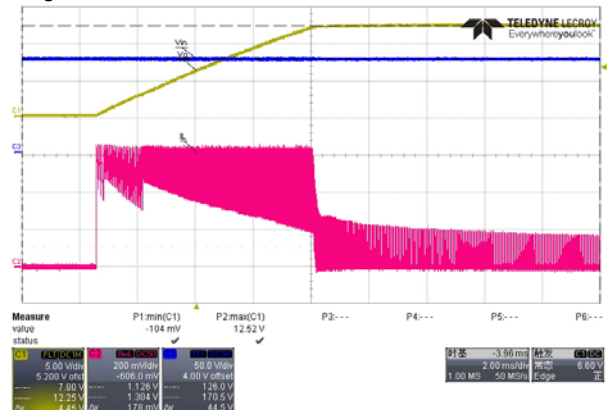
CH1: V_{out} CH2: $I_{Inductor}$ CH3: V_{in}
 20V 直流输入，满载正常工作波形

Figure 12: 20Vdc, output short to GND



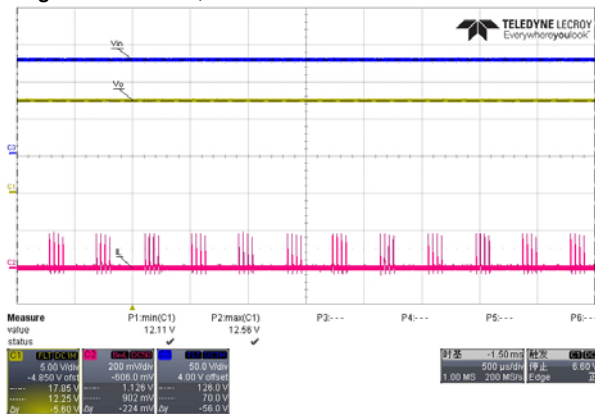
CH1: V_{out} CH2: $I_{Inductor}$ CH3: V_{in}
 8120V 直流输入，输出短路

Figure 13: 120Vdc, start at no-load



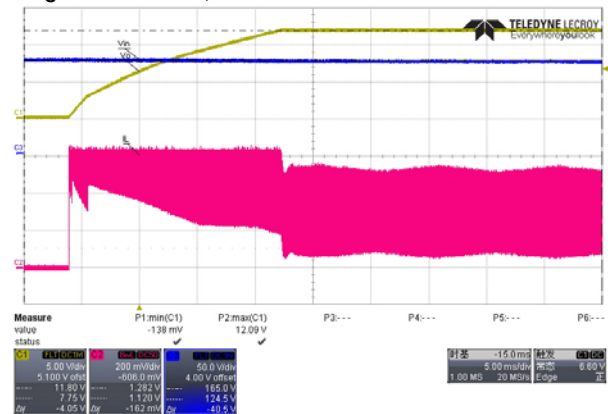
CH1: V_{out} CH2: $I_{Inductor}$ CH3: V_{in}
 80V 直流输入，空载启动波形

Figure 14: 120Vdc, no-load



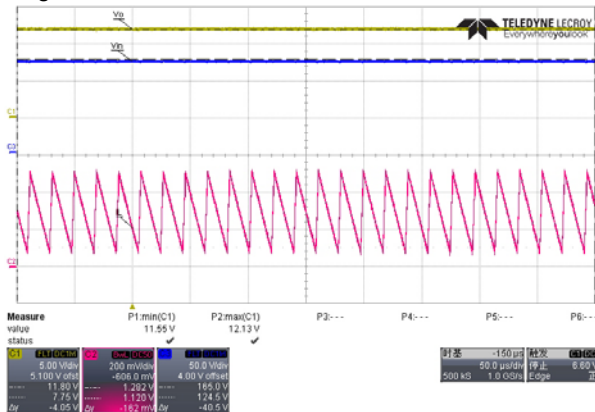
CH1: V_{out} CH2: I_{Inductor} CH3: V_{in}
 70V 直流输入，空载正常工作波形

Figure 15: 120Vdc, start at full load



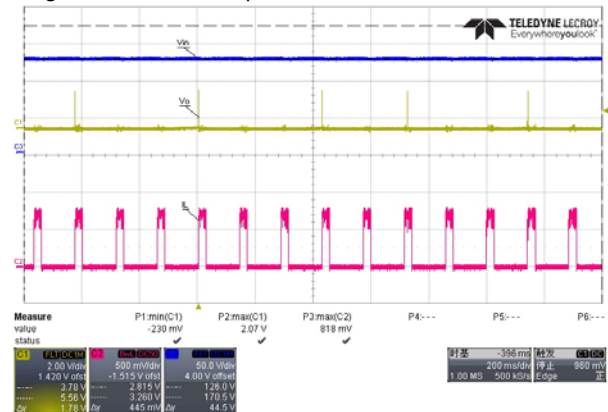
CH1: V_{out} CH2: I_{Inductor} CH3: V_{in}
 120V 直流输入，满载启动波形

Figure 16: 120Vdc, full load



CH1: V_{out} CH2: I_{Inductor} CH3: V_{in}
 120V 直流输入，满载正常工作波形

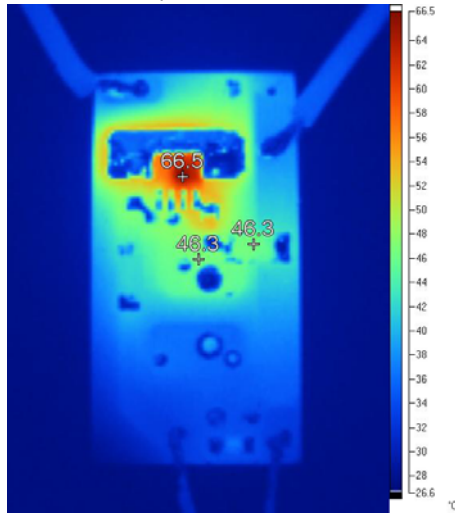
Figure 17: 120Vdc, output short to GND



CH1: V_{out} CH2: I_{Inductor} CH3: V_{in}
 120V 直流输入，输出短路

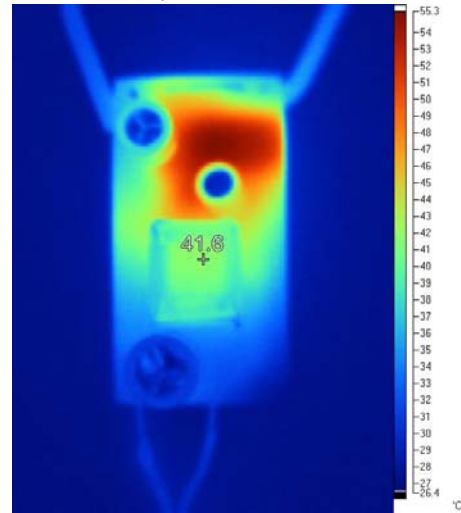
3.7. Thermal Test

Figure 18: 20Vdc input, 300mA load



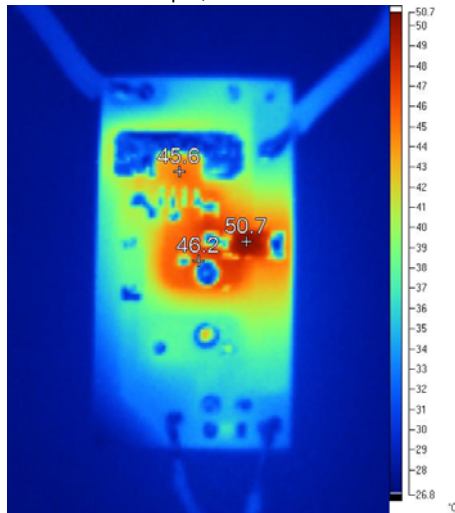
Thermal test result under ambient 25°C
U1:66.5°C, D2:46.3°C

Figure 19: 20Vdc input, 300mA load



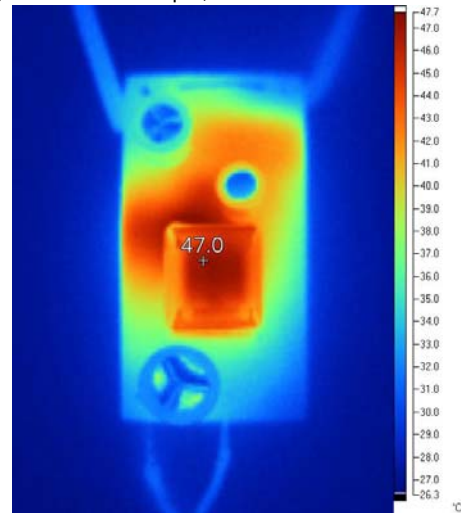
Thermal test result under ambient 25°C
L1:41.6°C

Figure 20: 120Vdc input, 300mA load



Thermal test result under ambient 25°C
U1:45.6°C, D2:50.7°C

Figure 21: 120Vdc input, 300mA load



Thermal test result under ambient 25°C
L1:47°C

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