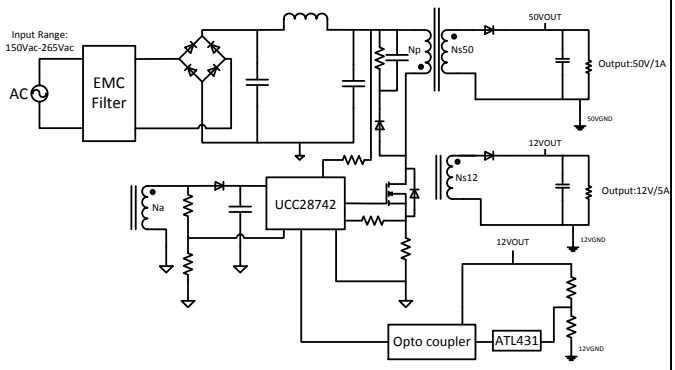
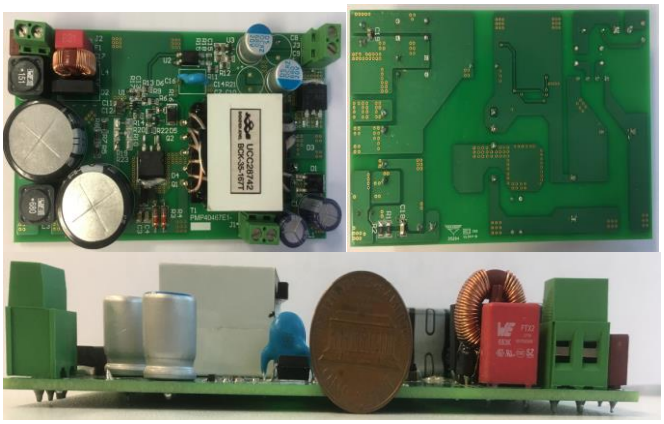
Test Report: PMP40467

AC input, 12-V/5-A and 50-V/1-A dual-output flyback reference design

Description

The PMP40467 is 12-V/5-A and 50-V/1-A dual-output flyback auxiliary power supply with secondary-side regulation UCC28742. The design features high efficiency and various fault protections (input low line, output over-voltage, over-current, short-circuit). When standby, the converter can consume less power.





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1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1. Voltage and Current Requirements

PARAMETER	SPECIFICATIONS
Input	AC Source: 150V AC_{RMS} to 265V AC_{RMS} AC line frequency range: 47Hz to 63Hz
Output	12V/5A; 50V/1A

1.2 Required Equipment

- AC Source: Chroma 61503
- E-Load: Chroma 63101 module
- Multi-meter (voltage): Fluke 287C
- Multi-meter (current): Fluke 287C
- DPO 3054 Digital Phosphor Oscilloscope
- Fluke Thermal Imager
- P5205A 100MHz, High Voltage Differential Probe

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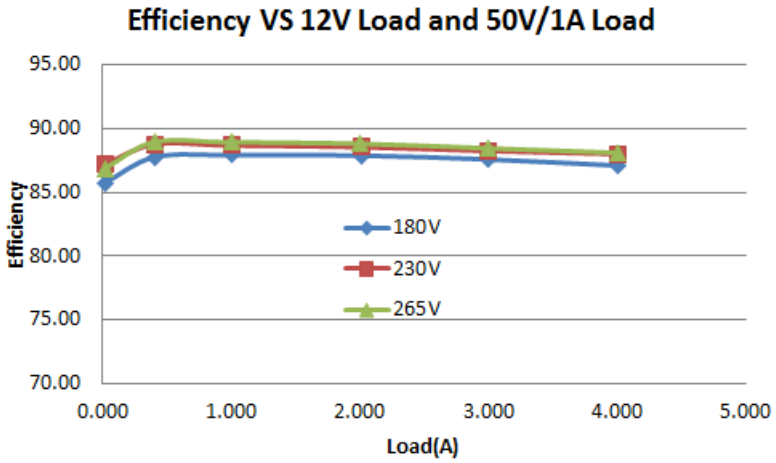
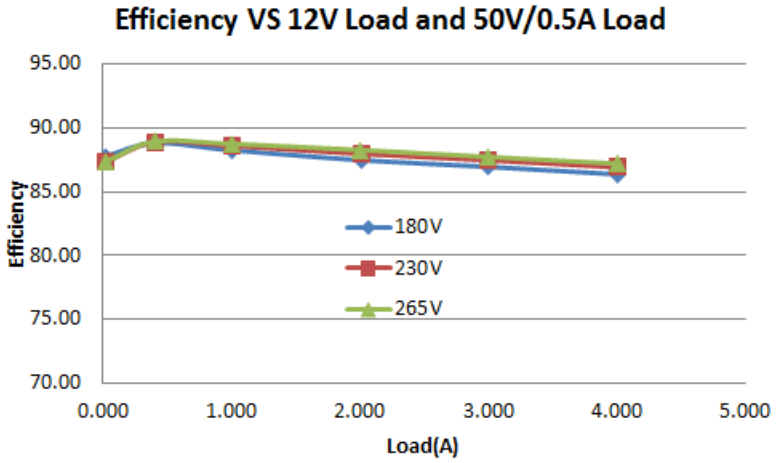
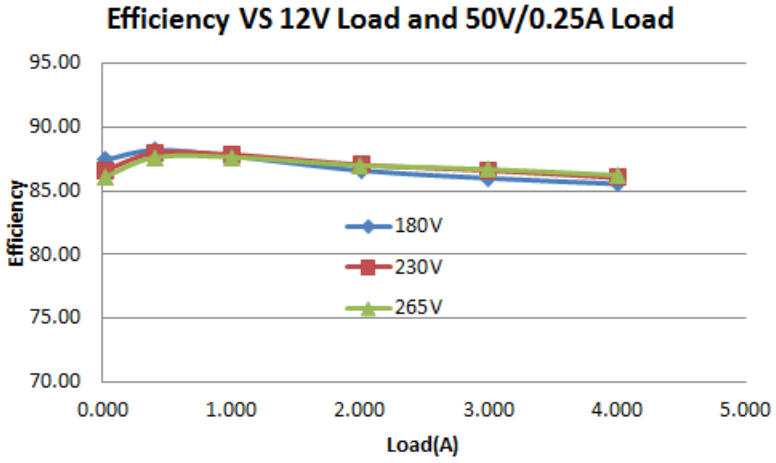
2 Testing and Results

2.1 Efficiency Graphs







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2.2 Efficiency Data*

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
180	32.47	12.042	0.015	27.664	1.000	85.75
	59.46	12.042	0.406	47.316	1.000	87.78
	70.18	12.042	1.000	49.681	1.000	87.94
	85.27	12.041	2.010	50.760	1.000	87.90
	99.85	12.040	3.001	51.338	1.000	87.60
	114.58	12.040	4.006	51.595	1.000	87.11

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
180	20.41	12.047	0.015	35.466	0.500	87.78
	33.18	12.047	0.406	49.167	0.500	88.83
	42.32	12.046	1.000	50.621	0.500	88.28
	57.28	12.045	2.010	51.812	0.500	87.49
	71.87	12.043	3.002	52.703	0.500	86.96
	86.78	12.041	4.001	53.576	0.500	86.38

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
180	12.00	12.047	0.015	40.747	0.253	87.43
	19.92	12.046	0.401	50.349	0.253	88.20
	28.70	12.045	1.000	51.916	0.253	87.74
	43.56	12.044	2.002	53.808	0.253	86.61
	58.33	12.043	3.001	55.420	0.253	86.01
	73.10	12.042	4.001	56.770	0.253	85.56

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
230	33.05	12.048	0.015	28.648	1.000	87.22
	58.83	12.048	0.406	47.353	1.000	88.79
	69.37	12.047	1.000	49.487	1.000	88.69
	84.41	12.046	2.010	50.553	1.000	88.56
	98.88	12.045	3.001	51.134	1.000	88.26
	113.44	12.043	4.006	51.615	1.000	88.02

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
230	20.31	12.047	0.015	35.104	0.500	87.32
	33.16	12.047	0.406	49.185	0.500	88.91
	42.22	12.046	1.000	50.729	0.500	88.61
	57.04	12.045	2.010	51.955	0.500	87.99
	71.52	12.044	3.002	52.831	0.500	87.48
	86.26	12.043	4.001	53.612	0.500	86.93

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Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
230	12.13	12.048	0.015	40.791	0.253	86.59
	19.93	12.048	0.401	50.210	0.253	87.99
	28.60	12.047	1.000	51.700	0.253	87.87
	43.26	12.046	2.002	53.550	0.253	87.06
	57.84	12.045	3.001	55.100	0.253	86.60
	72.65	12.043	4.001	56.630	0.253	86.04

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
265	32.57	12.046	0.015	28.120	1.000	86.88
	58.99	12.045	0.406	47.598	1.000	88.96
	69.52	12.045	1.000	49.797	1.000	88.94
	84.50	12.044	2.010	50.862	1.000	88.83
	98.92	12.043	3.001	51.379	1.000	88.47
	113.58	12.042	4.006	51.854	1.000	88.12

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
265	20.49	12.048	0.015	35.426	0.500	87.34
	33.16	12.048	0.406	49.209	0.500	88.95
	42.10	12.047	1.000	50.642	0.500	88.77
	56.79	12.046	2.010	51.849	0.500	88.28
	71.28	12.044	3.002	52.787	0.500	87.75
	86.03	12.043	4.001	53.696	0.500	87.22

Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
265	12.29	12.048	0.015	41.096	0.253	86.09
	20.05	12.048	0.401	50.337	0.253	87.62
	28.73	12.047	1.000	51.922	0.253	87.66
	43.36	12.045	2.002	53.822	0.253	87.02
	57.89	12.045	3.001	55.500	0.253	86.70
	72.57	12.044	4.001	56.910	0.253	86.24

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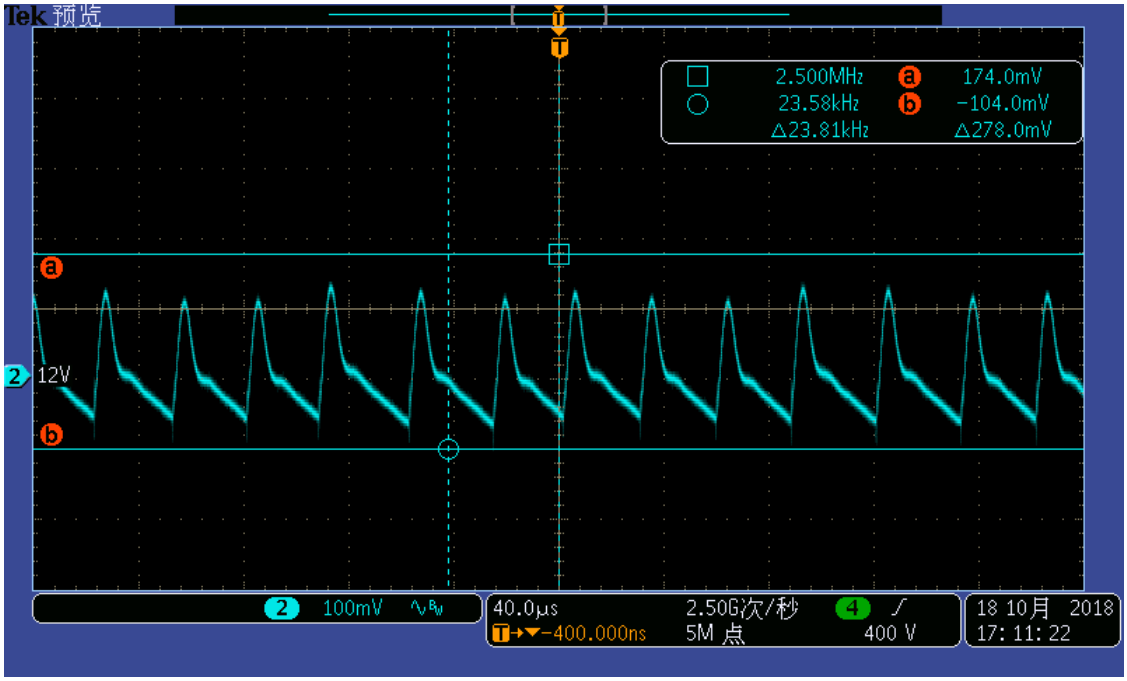
X-CAP=0.068uF+0.3uF						
Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
230.00	0.487	12.052	0.017	54.809	0.00	42.07
230.00	0.293	12.052	0.006	53.050	0.00	24.68
230.00	0.170	12.052	0.000	54.328	0.00	0.00

X-CAP0.068uF+0.3uF parallel 3Mohm						
Vin(V)	Pin(W)	12Vmain(V)	Imain(A)	50Vaux(V)	Iaux(A)	Efficiency(%)
230.00	0.506	12.052	0.017	54.789	0.00	40.49
230.00	0.294	12.052	0.005	52.676	0.00	20.50
230.00	0.190	12.052	0.000	50.593	0.00	0.00

3 Waveforms

*3.1 Output Voltage Ripple**

115Vin 12Vout 4A and 50V 0.25A



CH1=12Vout

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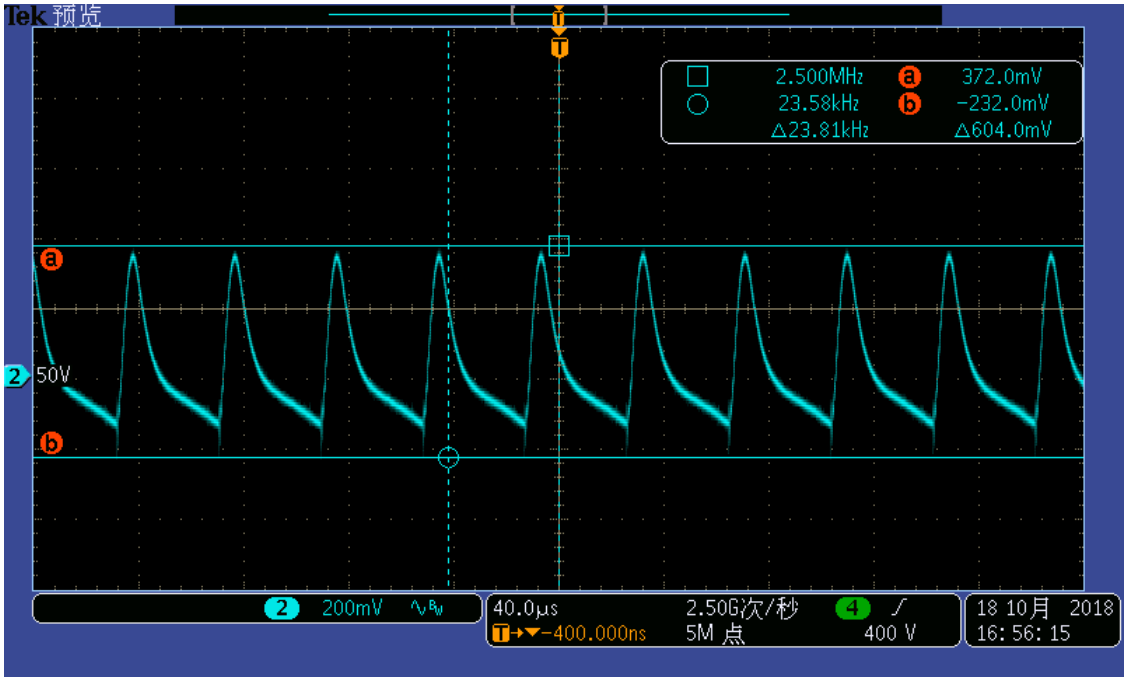
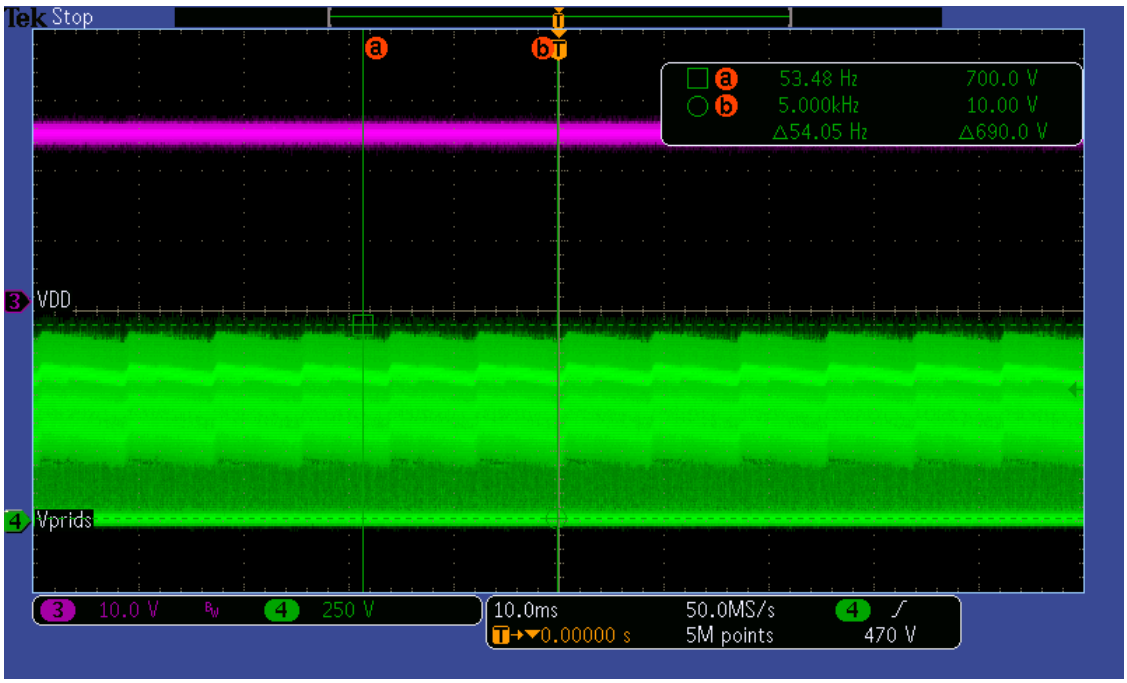
180Vin 50Vout 1A and 12Vout 0.2A



CH2=50Vout

3.2 MOSFET Voltage Stress

Vin=265Vin 50Vout 1A and 12Vout 4.0A



CH3=VDD; CH4=Vprids with full bandwidth

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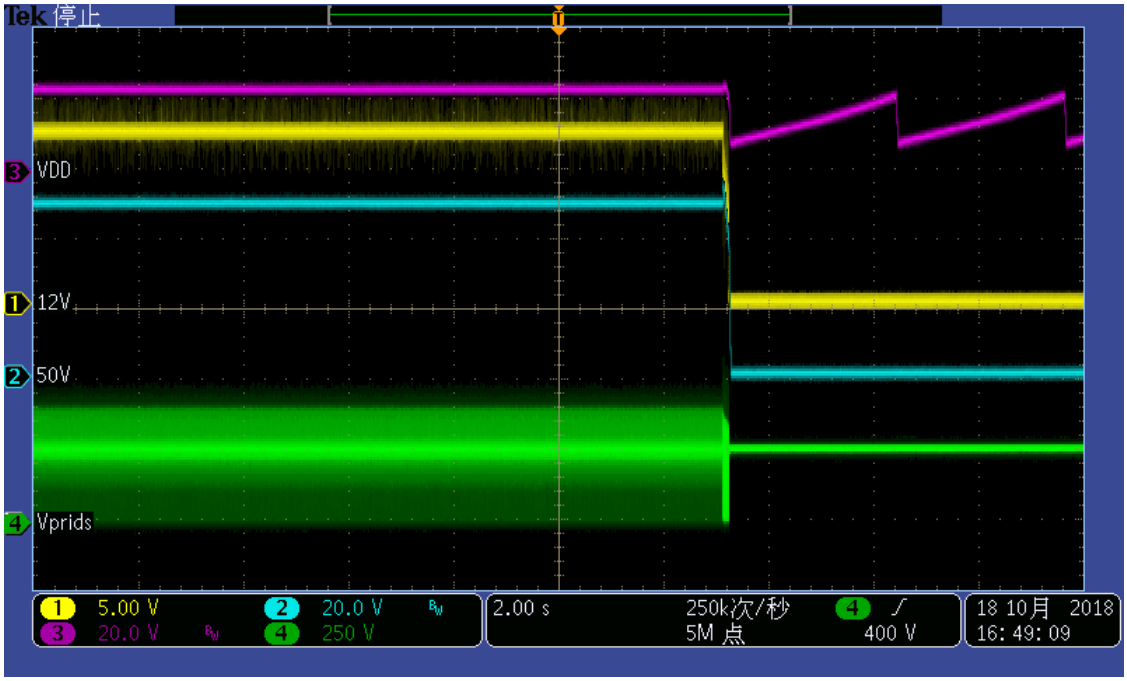
CH3=VDD; CH4=Vprids with full bandwidth

3.3 Short Circuit Recovery

180V 12Vout Short Circuit Protection



CH1=12Vout; CH1=50Vout; CH3=VDD; CH4=Vprids;

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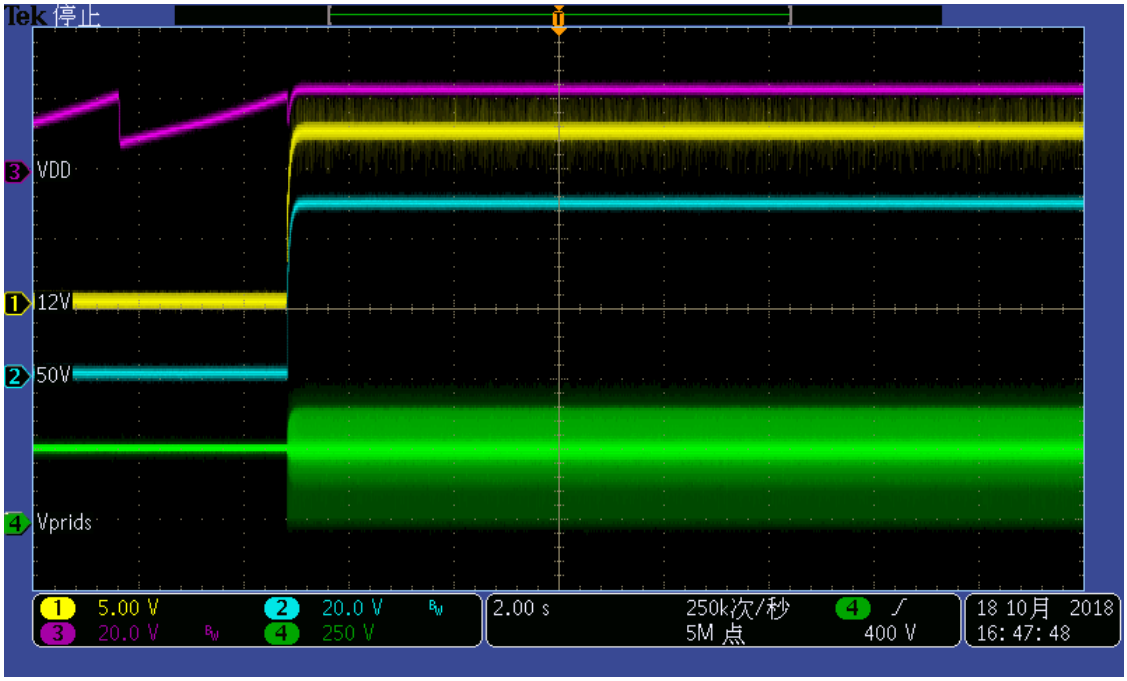
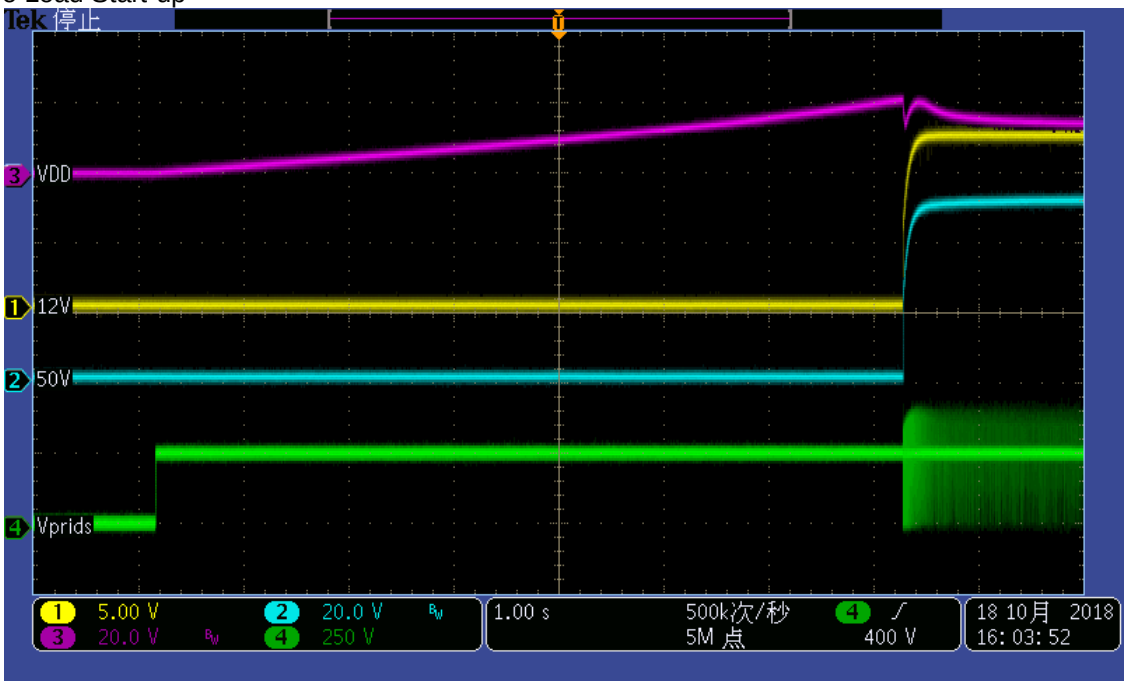
180V 12Vout Short Circuit Protection Recovery



CH1=12Vout; CH1=50Vout; CH3=VDD; CH4=Vprids;

*3.4 Start-up Sequence**

180Vin No Load Start-up



CH1=12Vout; CH3=19Vout; CH4=5Vout

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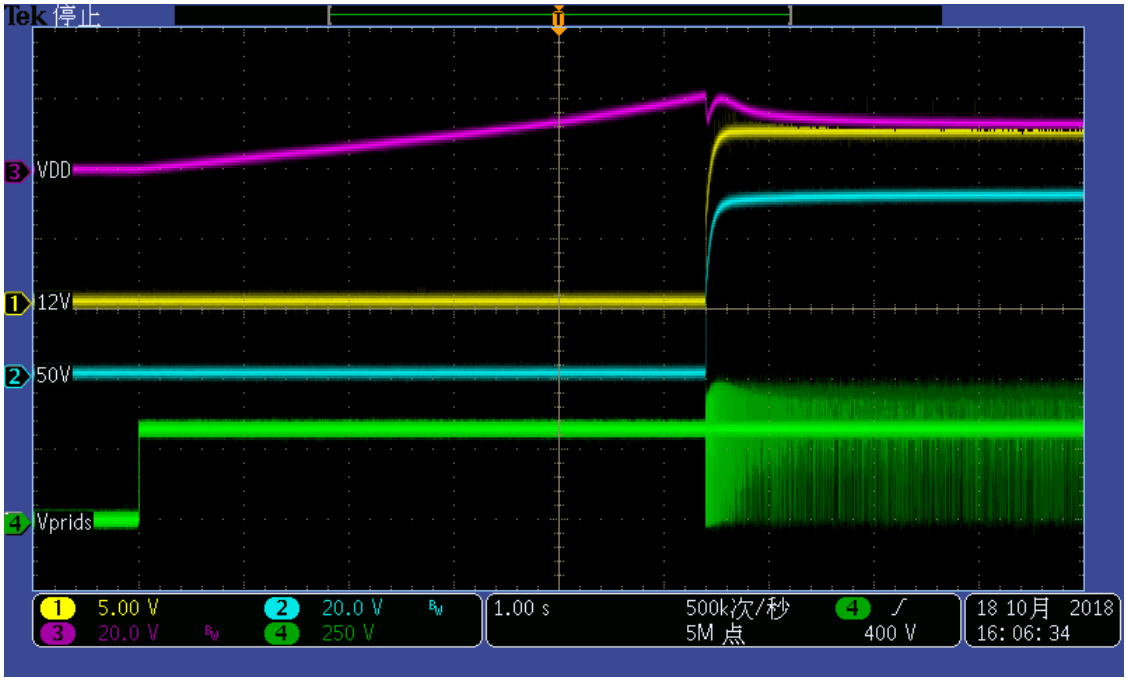
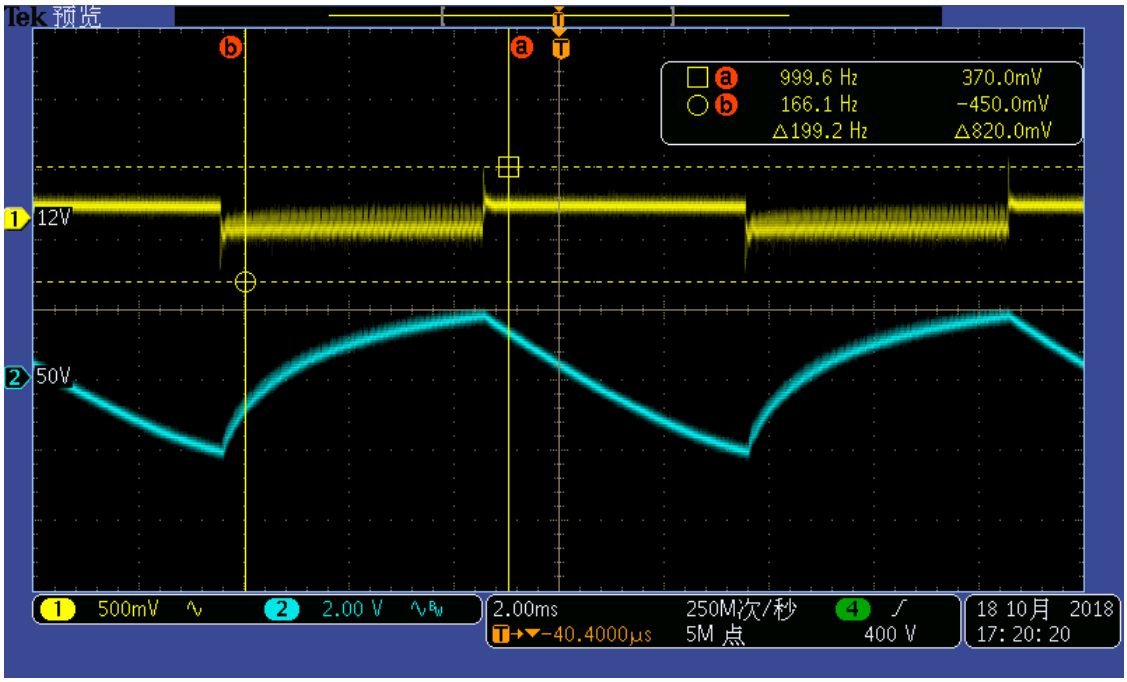
230Vin Full Load Start-up



CH1=12Vout; CH3=19Vout; CH4=5Vout

3.5 Dynamic Response

180V 12Vout Dynamic Response
12V Load from 0.4A to 3A, 100Hz, 400mA/us. 50V 0.25A



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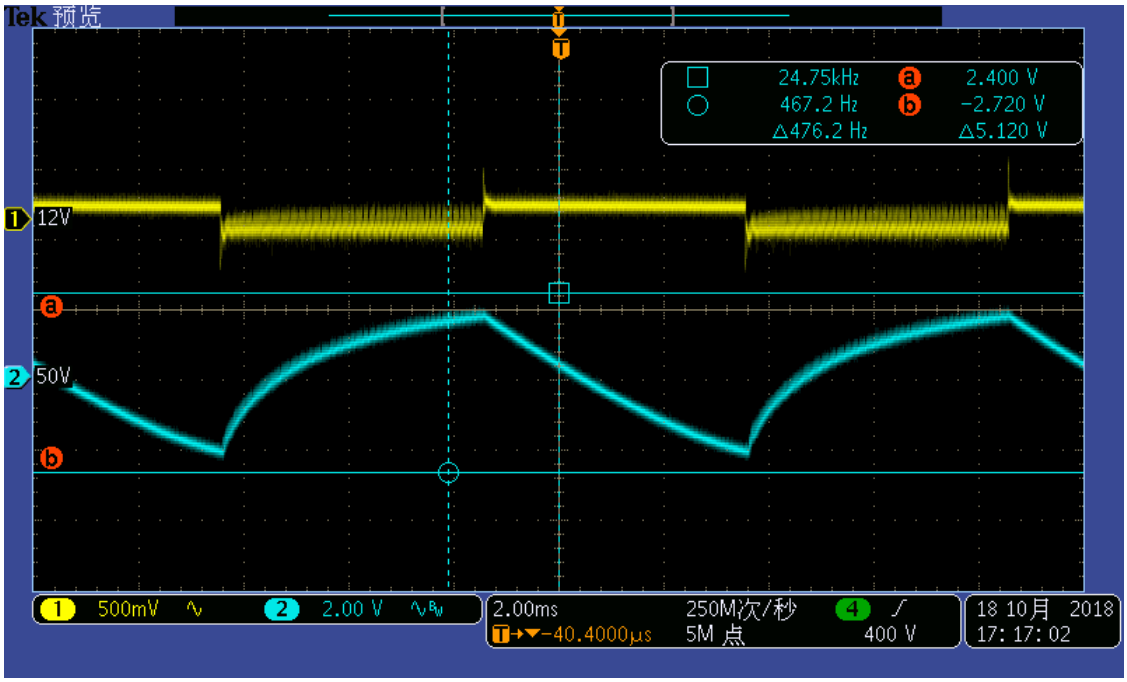
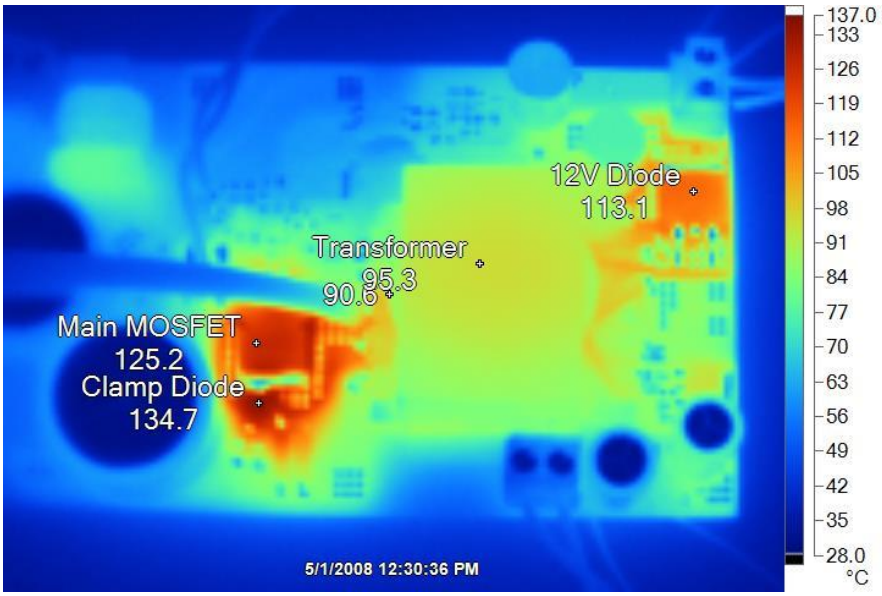
180V 50Vout Dynamic Response based on 12V dynamic load
12V Load from 0.4A to 3A, 100Hz, 400mA/us. 50V 0.25A



3.6 Thermal Performance

Vin=230Vin 50Vout 1A and 12Vout 4.0A
The converter runs 30mins at ambient temperature 25°C



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