Engineering Test Report

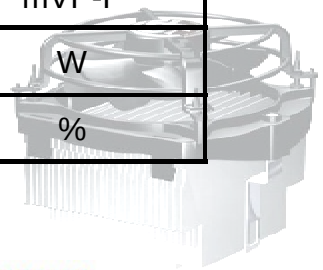
Design of 5V@1.5A ; 9V@1.5A ; 12V1.1A Quick Charge Charger with ACT4455 and FT-150 (Quick Charge 2.0 Interface IC)

Features:

- **ACT4455 Duty ratio:0% to 100% PWM control**
- **With 100% Duty, Output equal Input voltage.**
- **40V Input Voltage Surge**
- **QualComm Quick Charge QC2.0 Compliance;**
- **Programmable Cable Compensation**
- **Complete System and Output Protections (SCP, OCP, OVP, OTP).**

1. Power Supply Specification

Description	Symbol	Min	Typ	Max	Units
INPUT					
Voltage	VIN	12		36	VAC
Output					
Output Voltage (5V)	VOUT	4.75	5.2	5.25	V
Output Current (5V)	IOUT	2			A
Output Ripple Voltage (5V)	VRIPPLE			100	mVP-P
Output Voltage (9V)	VOUT	8.55	9	9.45	V
Output Current (9V)	IOUT	1.5			A
Output Ripple Voltage (9V)	VRIPPLE			100	mVP-P
Output Voltage (12V)	VOUT	11.4	12	12.6	V
Output Current (12V)	IOUT	1.1			A
Output Ripple Voltage (12V)	VRIPPLE			100	mVP-P
Continuous Output Power	POUT		13.5		W
Average Efficiency	η		90		%



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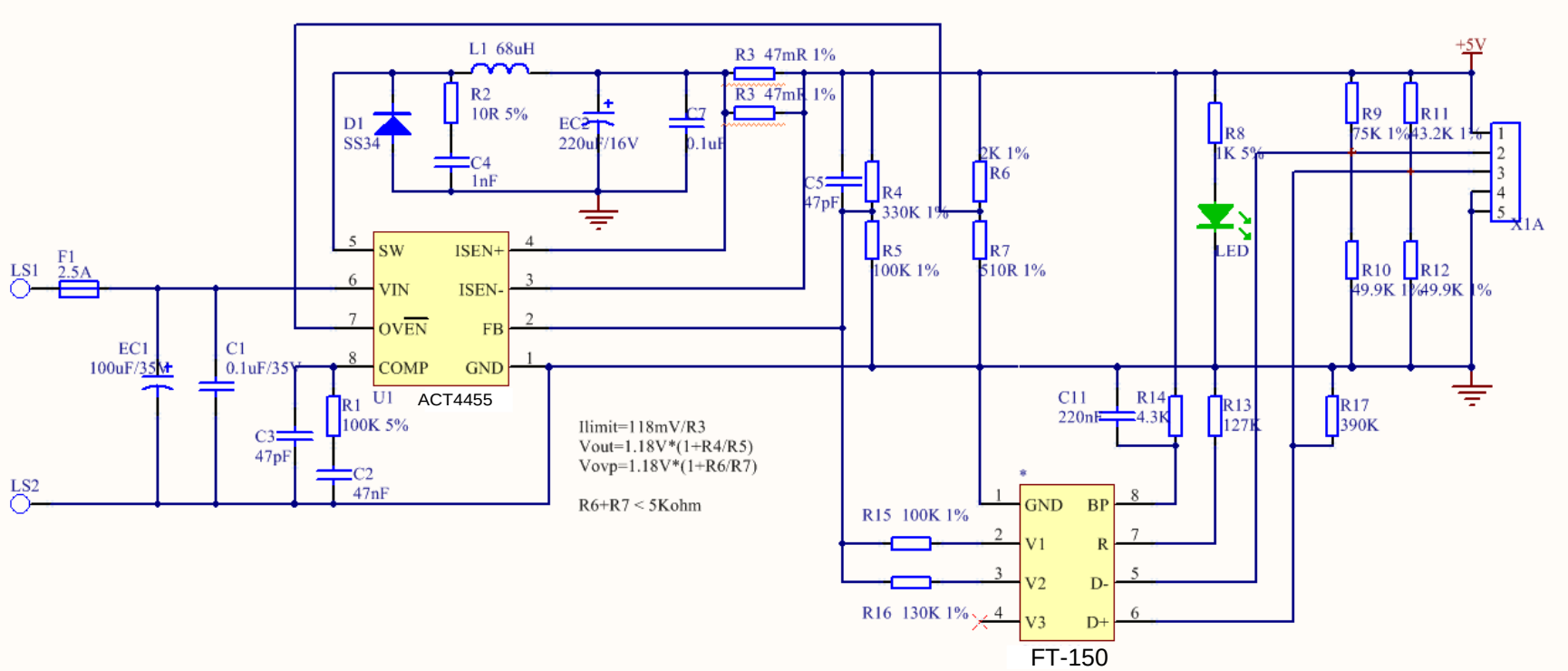
2. Schematic



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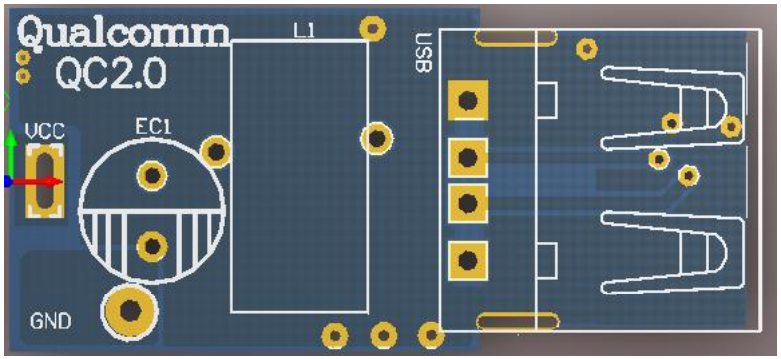
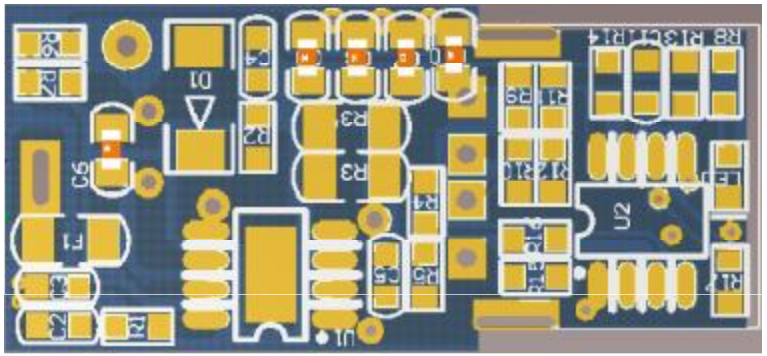
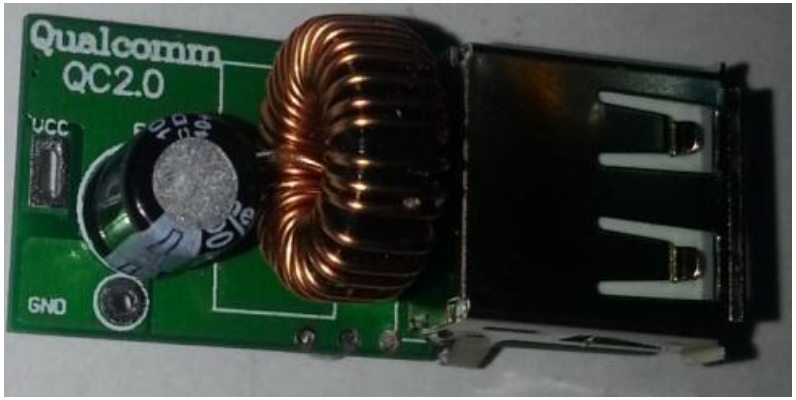
3. EV Board







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4. Cable compsation, Ripple % Efficiency Measurement

OUTPUT_5V

V_{IN} (VDC)	VIN (V)	IIN (mA)	V_{OUT} (V)	I_{OUT} (mA)	V_{RIPPLE} (mV)	P_{OUT} (W)	η (%)
12	12.73	<1	5.08	0	8.9	0.00	
	12.73	214	5.12	500	20	2.56	93.97%
	12.67	440	5.16	1000	21.4	5.16	92.56%
	12.4	930	5.23	2000	23.6	10.46	90.70%
	12.31	1149	5.28	2400	25.8	12.67	89.59%
24	24.38	<1	5.08	0	10.5	0.00	
	24.25	117	5.13	500	23.6	2.57	90.40%
	24.18	235	5.17	1000	24.8	5.17	90.98%
	23.87	488	5.25	2000	30	10.50	90.14%
	24.01	597	5.28	2400	33.2	12.67	88.41%
30	30.45	<1	5.08	0	10.8	0.00	
	30.37	95	5.14	500	24.8	2.57	89.08%
	30.22	191	5.18	1000	26	5.18	89.74%
	30.13	394	5.26	2000	31.6	10.52	88.62%
	30.08	480	5.29	2400	34.3	12.70	87.93%

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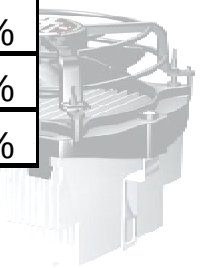


4. Cable compsation, Ripple % Efficiency Measurement

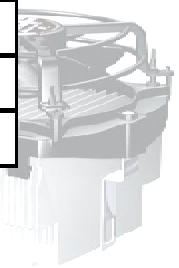
OUTPUT_9V

VIN (VDC)	VIN (V)	IIN (mA)	VOUT (V)	IOUT (mA)	VRIPPLE (mV)	POUT (W)	η (%)
12	12.93	<1	8.98	0	10.4	0.00	
	12.56	368	9	500	22.4	4.50	97.36%
	12.36	757	9.05	1000	25.6	9.05	96.72%
	12.12	1175	9.09	1500	24.8	13.64	95.74%
	11.92	1616	9.14	2000	26.4	18.28	94.90%
24	24.65	<1	8.97	0	12.8	0.00	
	24.42	196	9.02	500	36.8	4.51	94.23%
	24.31	394	9.06	1000	46.8	9.06	94.59%
	24.17	600	9.08	1500	48.1	13.62	93.92%
	24.01	811	9.13	2000	56.8	18.26	93.78%
30	30.67	<1	8.98	0	14.4	0.00	
	30.38	159	9.03	500	38.4	4.52	93.47%
	30.37	319	9.08	1000	46.4	9.08	93.72%
	30.25	484	9.11	1500	48.8	13.67	93.33%
	30.12	654	9.14	2000	60	18.28	92.80%

4. Cable compsation, Ripple % Efficiency Measurement

OUTPUT_12V

VIN (VDC)	VIN (V)	IIN (mA)	VOUT (V)	IOUT (mA)	VRIPPLE (mV)	POUT (W)	η (%)
12	12.73	2	11.96	0	14.4	0.00	
	12.7	481	12	500	36.8	6.00	98.2%
	12.55	977	12.04	1000	24.8	12.04	98.2%
	12.63	1071	12.05	1100	38.2	13.26	98.0%
	12.86	1930	12.13	2000	45.6	24.26	97.7%
24	25	1	11.98	0	10.4	0.00	
	24.7	255	12.01	503	48.8	6.04	95.9%
	24.56	513	12.05	1000	51.2	12.05	95.6%
	24.52	564	12.06	1100	56	13.27	95.9%
	24.27	1052	12.12	2000	67.2	24.24	94.9%
30	30.66	1	12	0	12.3	0.00	
	30.38	209	12.03	500	57.8	6.02	94.7%
	30.29	418	12.06	1000	65.4	12.06	95.3%
	30.22	462	12.07	1100	66.4	13.28	95.1%
	30.01	855	12.13	2000	81.6	24.26	94.5%



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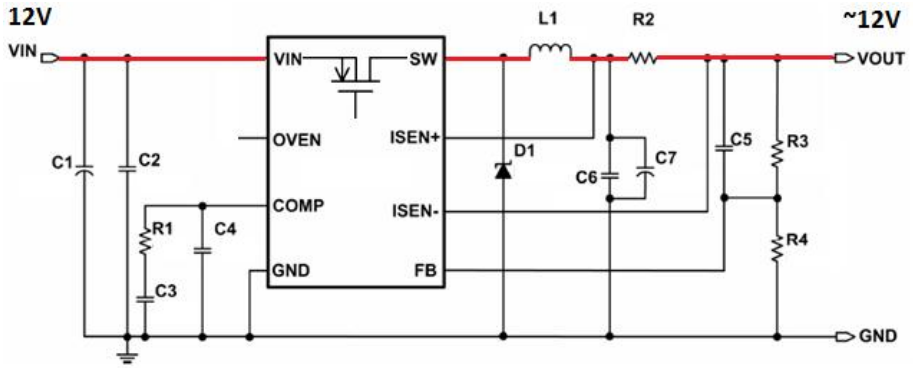
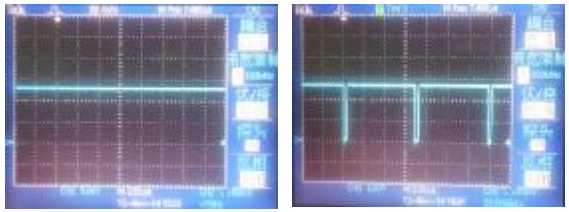
4. 12V Output Dropout 150mV@ 1A

Dropout 测试值:

Vin(V)	Vout(V)	Loading(A)	Dropout(mV)
11.98	11.96	0	10mV
11.97	11.82	1	150mV
11.96	11.66	2	300mV





ACT4455
100%Duty

Competitor
90% Duty

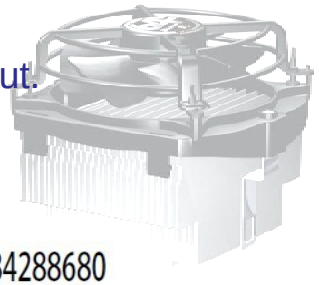
备注:

1.电压12V输入时可12V电压输出.

2.因 ACT4455在100% Duty时, IC内MOS处于一直导通状态, Vin输入会直通到Vout.

3.满载输出时, 只通路中PMOS / 电感L1 / 限流电阻R2及PCB走线等阻抗的压降, 总阻抗<150mΩ.

4.目前竞争者产品无法直通.



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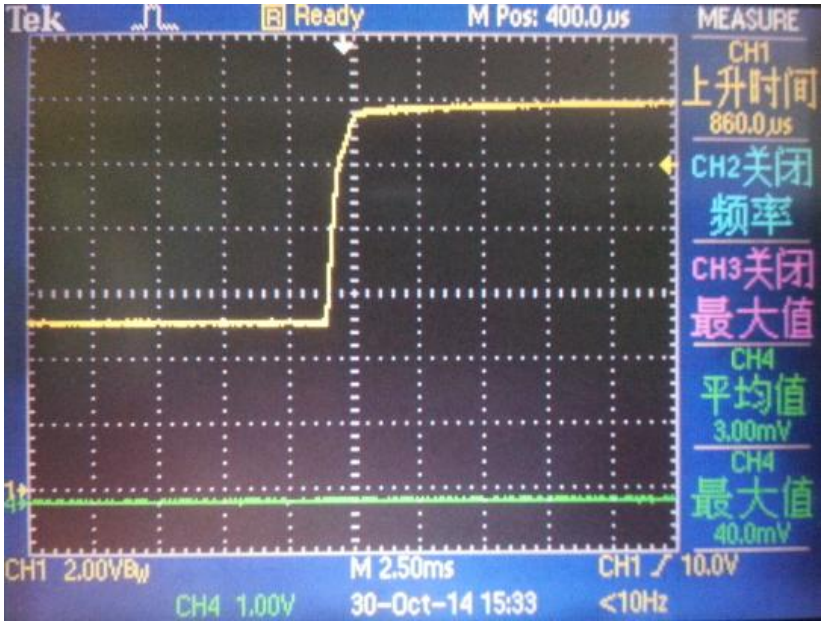
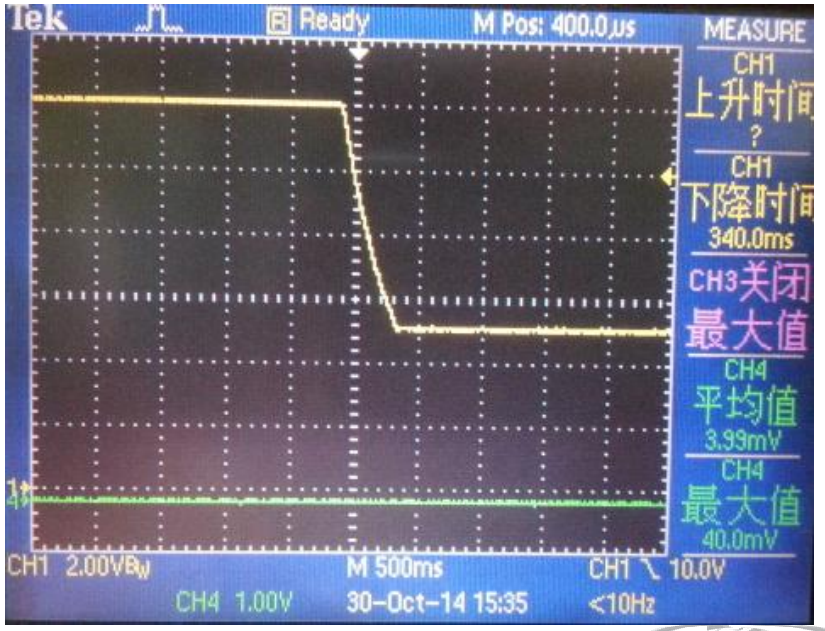
5. Voltage Transition-A

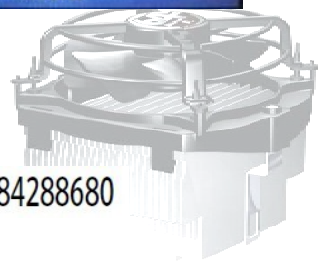
Test conditions:

- Output at No_Load
- Output voltage selected by QC2.0 Interface IC via D+ & D- signals





Output: 5V à 12V no load



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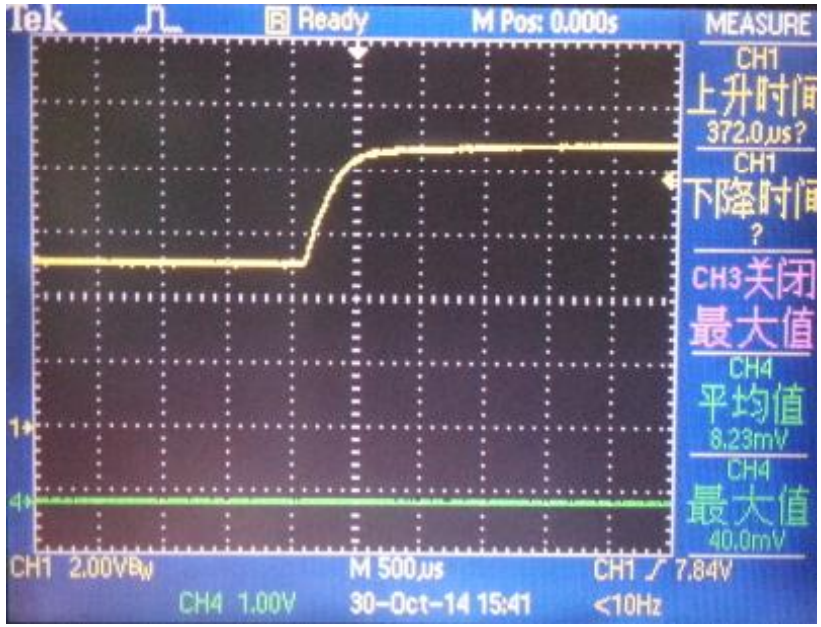
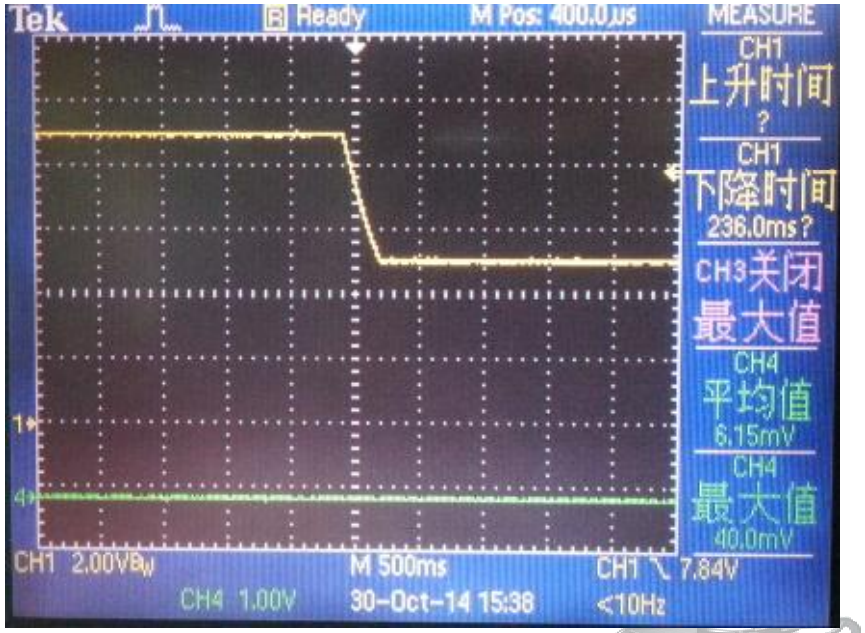
5. Voltage Transition-B

Test conditions:

- Output at No_Load
- Output voltage selected by QC2.0 Interface IC via D+ & D- signals





Output: 5V à 9V no load

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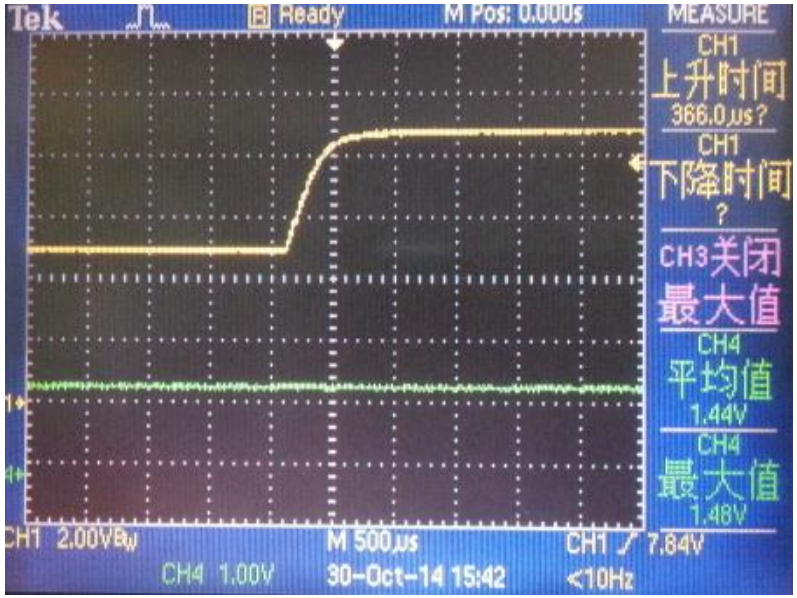
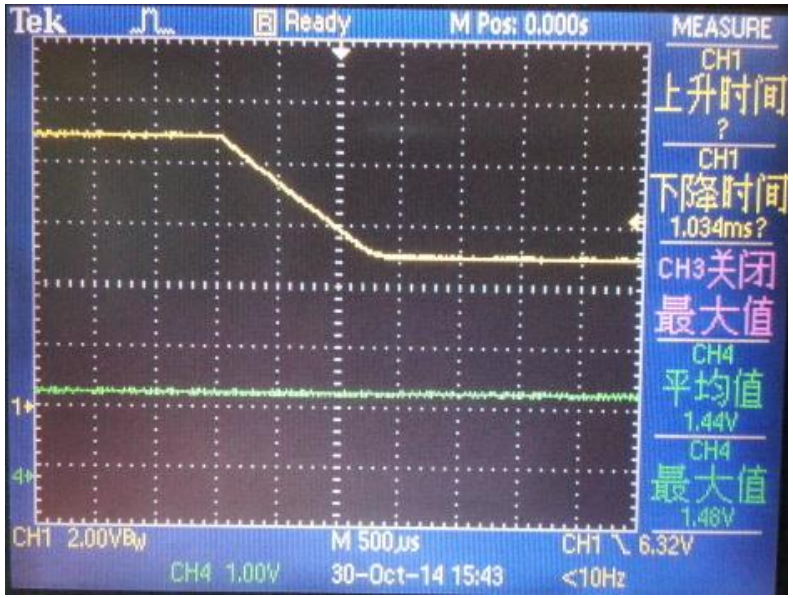
5. Voltage Transition-C

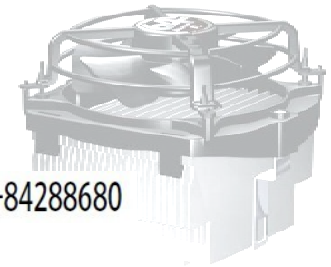
Test conditions:

- Output at 1.5A (9V Full Load)
- Output voltage selected by QC2.0 Interface IC via D+ & D- signals





Output: 5V **à** 9V 1.5A Full load



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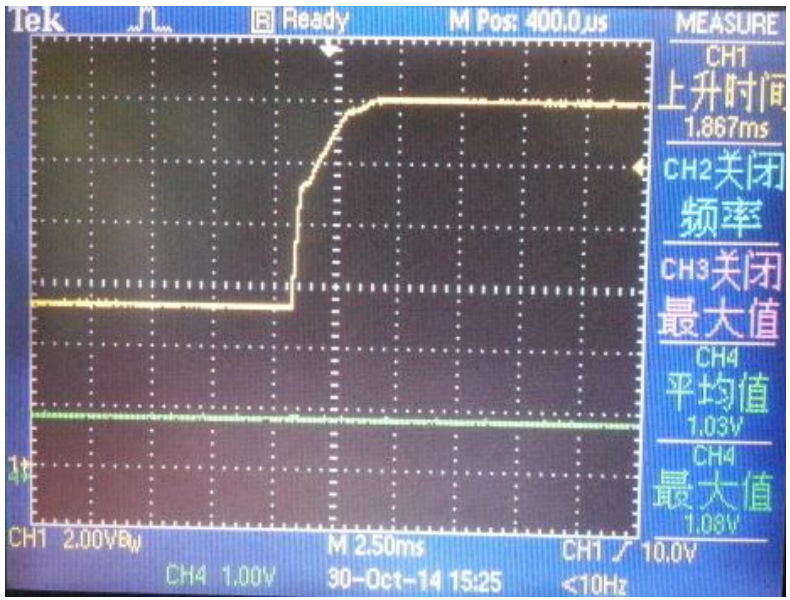
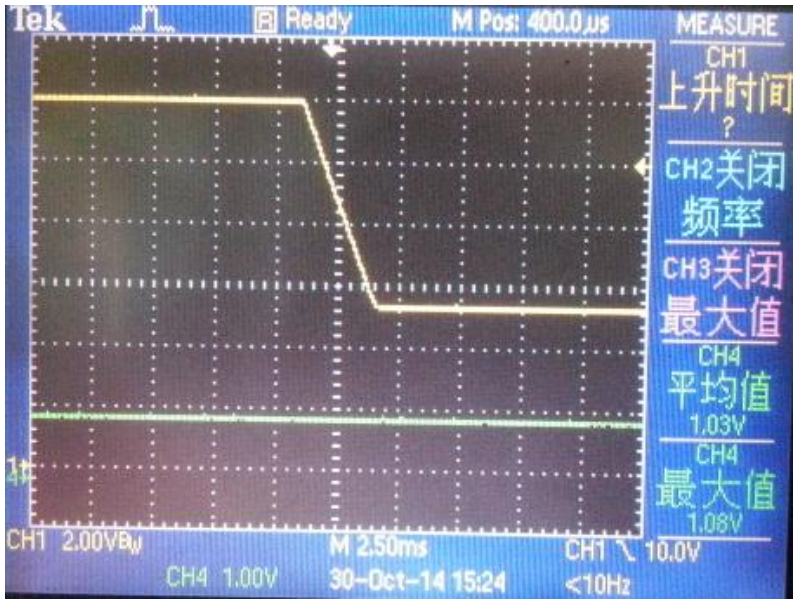
5. Voltage Transition-D

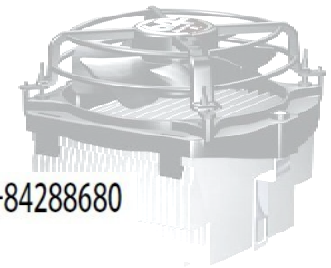
Test conditions:

- Output at 1.1A (12V Full Load)
- Output voltage selected by QC2.0 Interface IC via D+ & D- signals





Output: 5V **à** 12V 1.1A Full load



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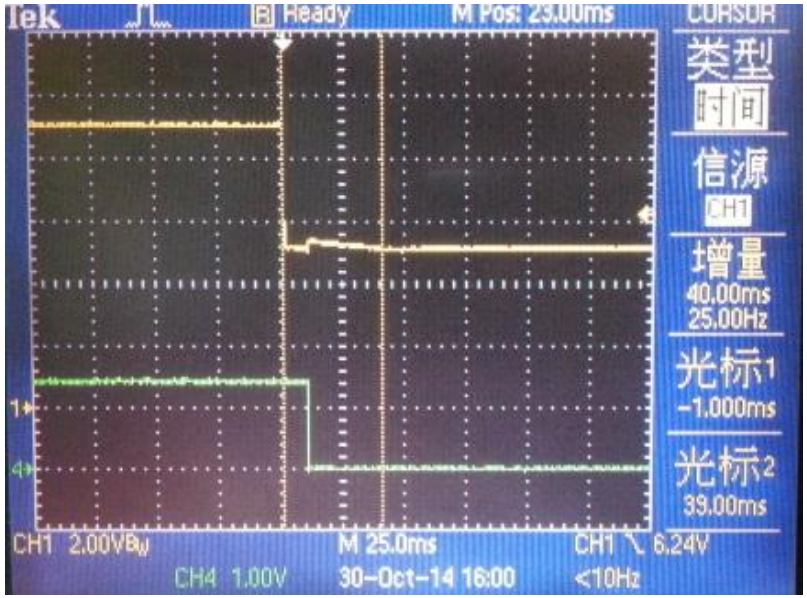
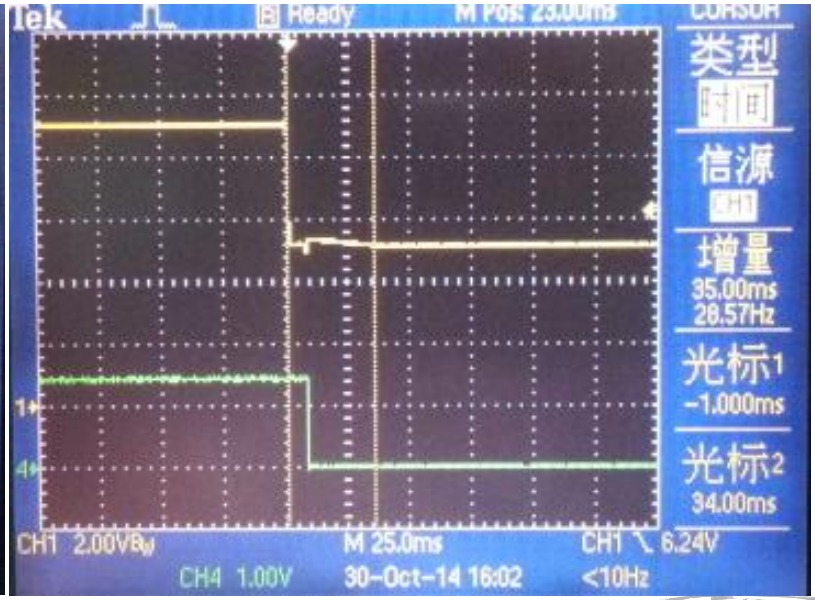
6. Output Settling to 5V

Test conditions:

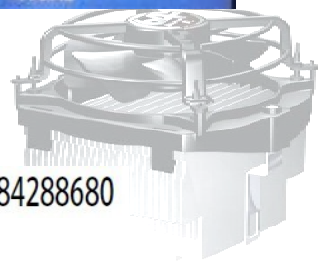
- Output at 9V@ 1.5A and Switch to 5V@ 0A
- Output voltage selected by QC2.0 Interface IC via D+ & D- signals, then unplug the USB
- Total Output capacitance is 100uF



Vin:12V



Vin:24V



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6. Output Settling to 5V

Test conditions:

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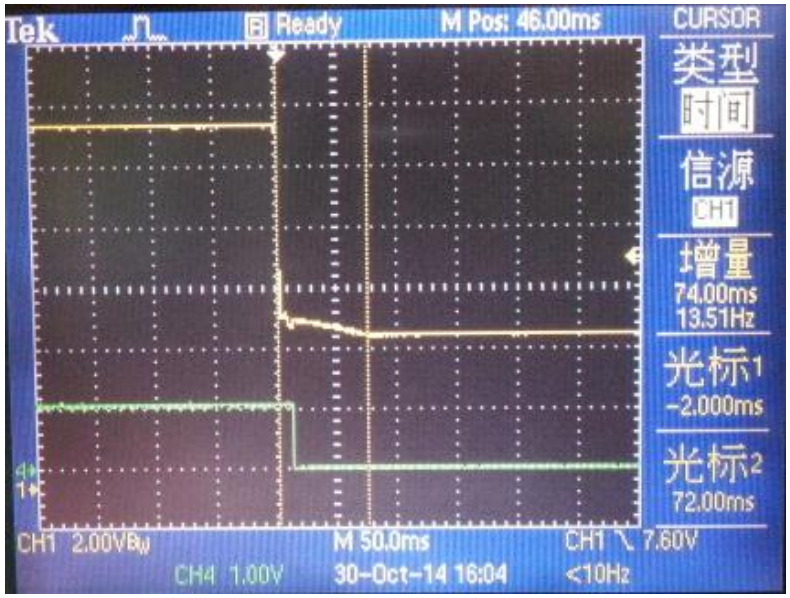
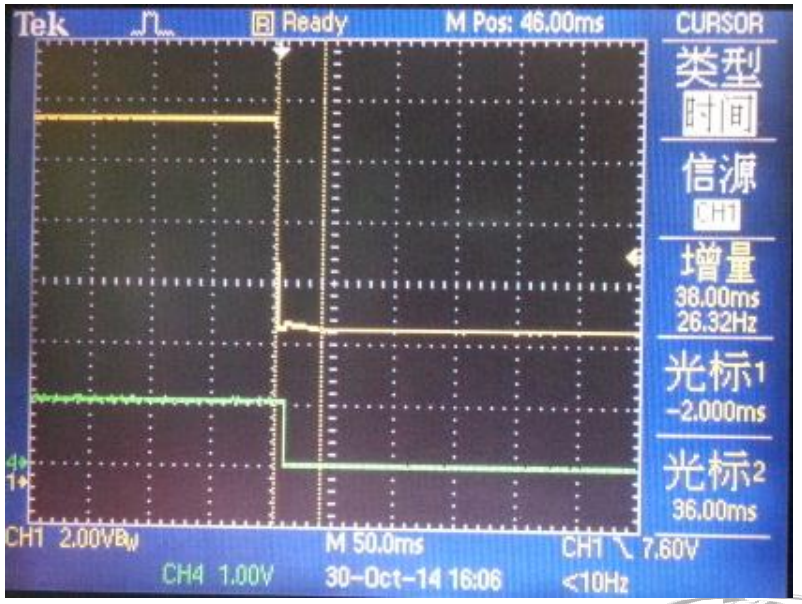
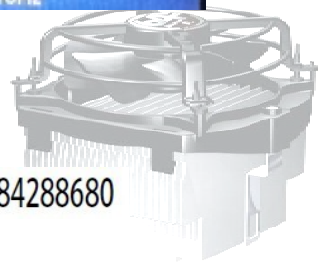


Vin:12V



Vin:24V



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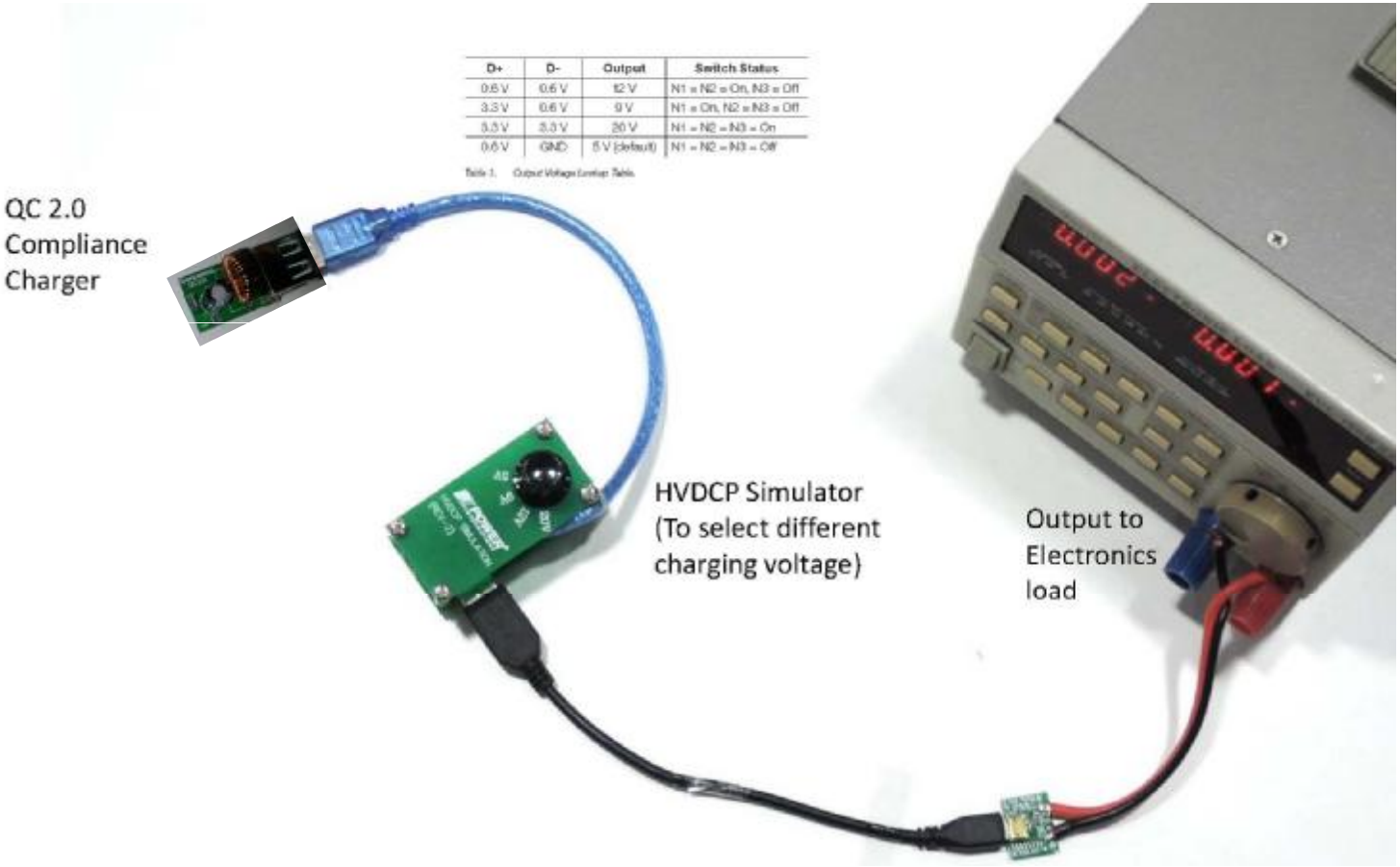
8. QC 2.0 Test Setup (HVDCP Simulator with E-Load)



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