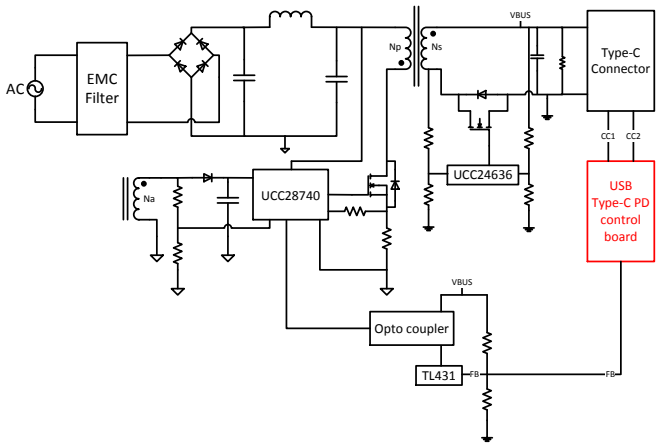
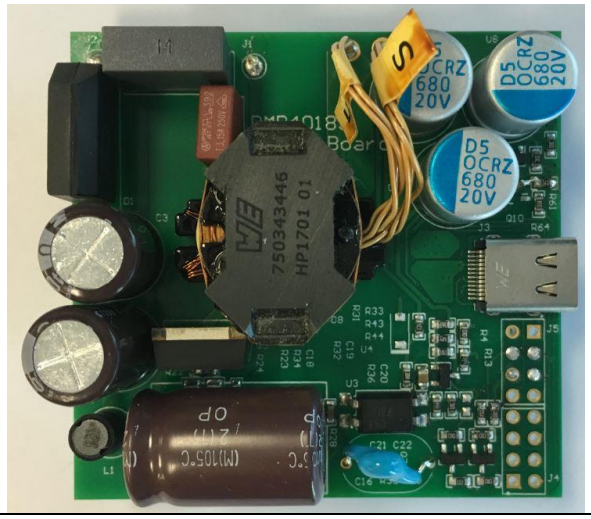
Test Report: PMP40183
45W USB Type-C™ PD DFP Adapter Reference Design for Fast Charge Applications

Description

The PMP40183 is a fast charger solution with secondary-side regulation using UCC28740DR which provides Constant-Voltage Constant-Current. The design supports maximum 15V/3A PD 3.0 standard and also 6.2V-11V/4A output power level. This output performance will enable fast charge between the PMP40183 power board reference design and the USB Type-C™ PD control board reference design with TIDA-01582 serving as a smart phone that is being charged. The secondary synchronous rectifier UCC24636 enables high efficiency with maximum SR conduction time.





1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1. Voltage and Current Requirements

PARAMETER	SPECIFICATIONS
Input	AC Source: 85V AC_{RMS} to 265V AC_{RMS} AC line frequency range: 47Hz to 63Hz
Output	PD 3.0: 5V/3A; 9V/3A; 15V/3A PPS: 6.2V-11V/4A

1.2 Required Equipment

- AC Source: Chroma 61503
- E-Load: Chroma 63101 module
- Multi-meter (voltage): Fluke 287C
- Multi-meter (current): Fluke 287C

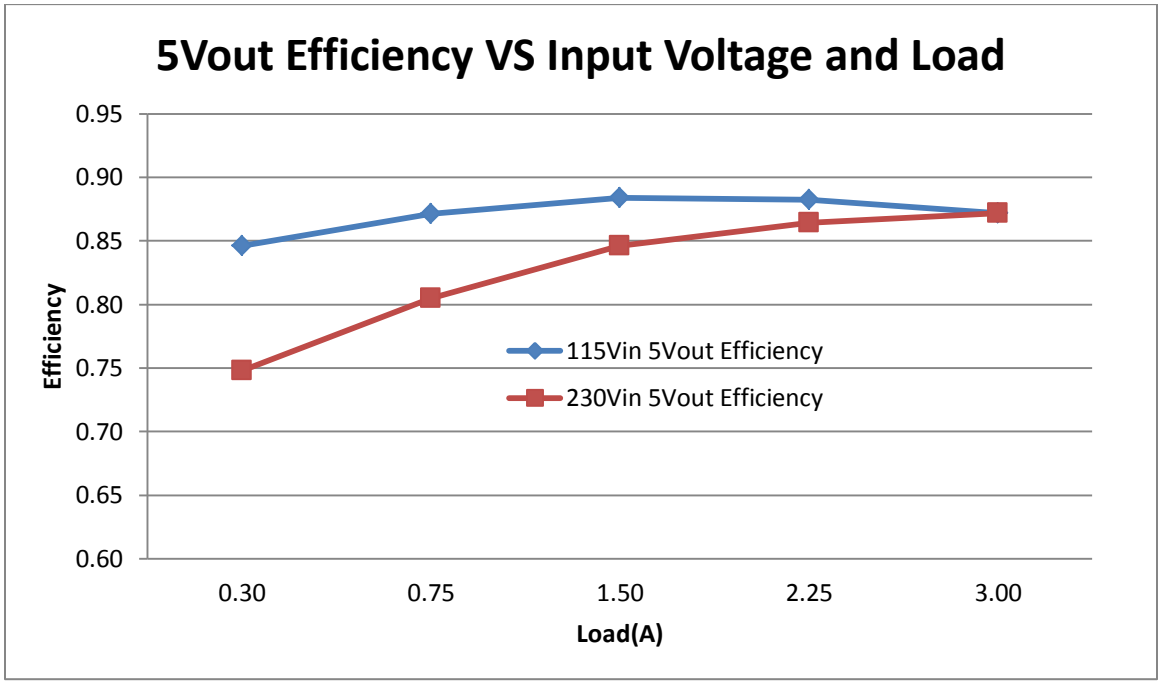
1.3 Considerations

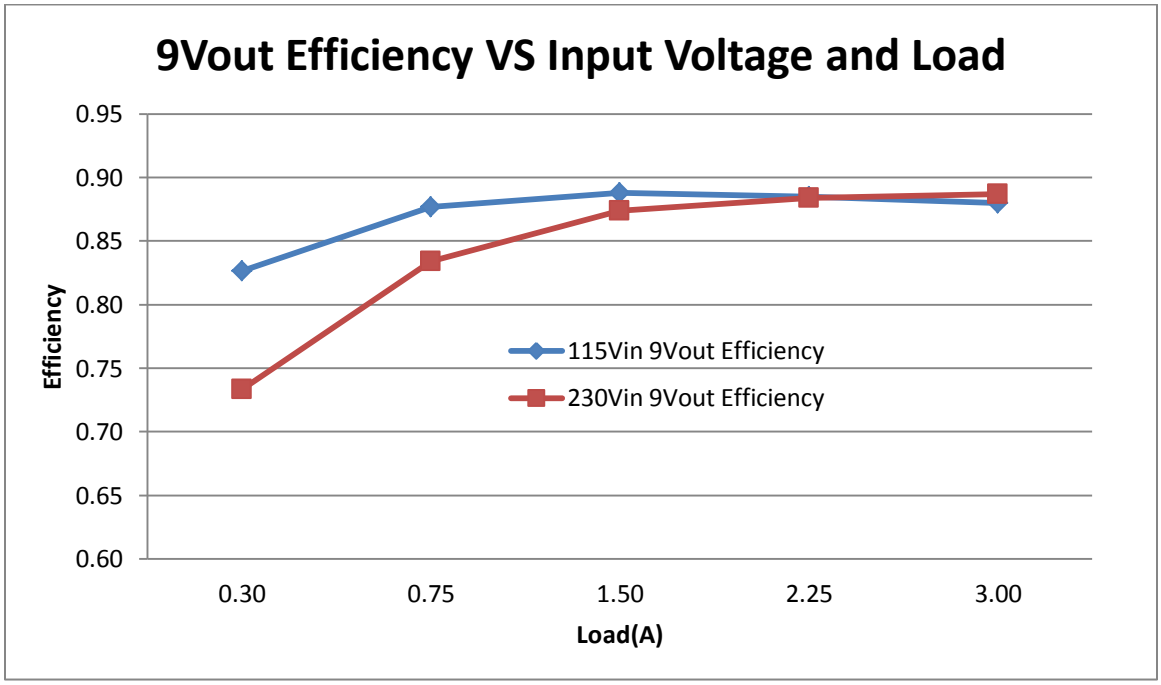
When test PD3.0 DFP function, it is tested with PMP20413PCB Rev C(USB Type-C™ PD sink board).

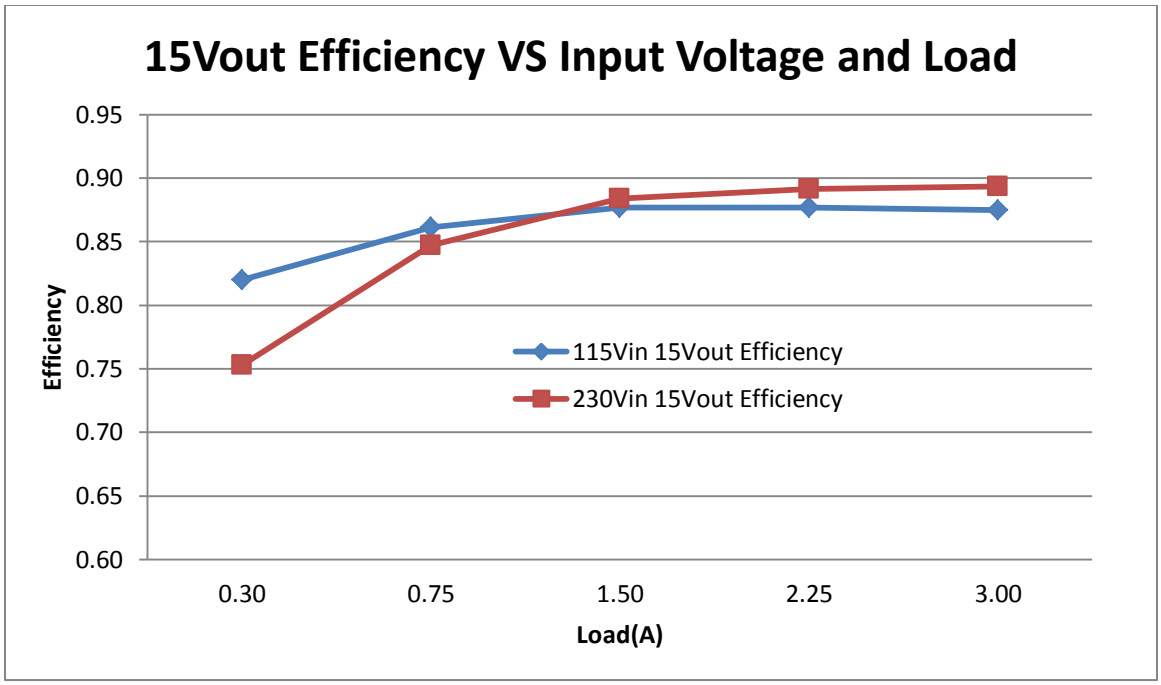
When test PD PPS function, it is tested with TIDA-01582(USB Type-C™ PD UFP).

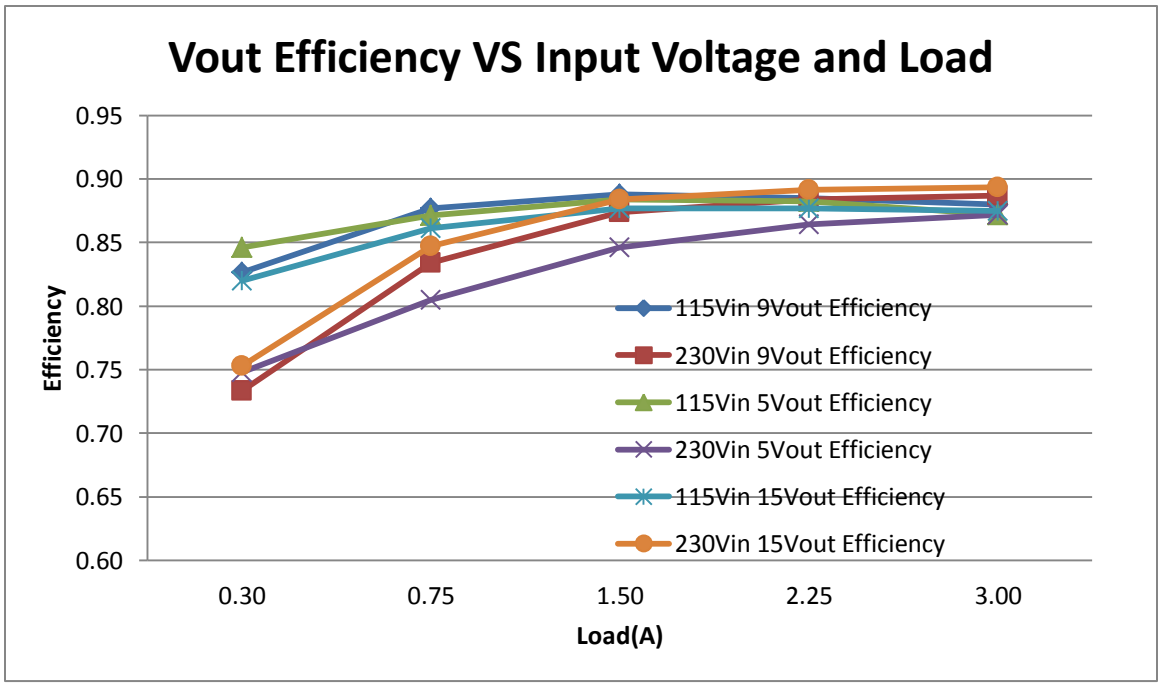
2 Testing and Results

2.1 Efficiency Graphs









2.2 Efficiency Data*

Input Voltage(V)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Efficiency	Average Efficiency
115	0.023	5.1788	0			
	1.813	5.1788	0.2963	1.53	0.8464	87.75
	4.439	5.1763	0.7472	3.87	0.8713	
	8.760	5.1750	1.4963	7.74	0.8839	
	13.170	5.1738	2.2463	11.62	0.8825	
	17.760	5.1725	2.9944	15.49	0.8721	

Input Voltage(V)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Efficiency	Average Efficiency
230	0.055		0			
	2.050	5.1763	0.2963	1.53	0.7482	84.69
	4.800	5.1763	0.7463	3.86	0.8048	
	9.150	5.1750	1.4963	7.74	0.8463	
	13.450	5.1750	2.2463	11.62	0.8643	
	17.760	5.1725	2.9944	15.49	0.8721	

Input Voltage(V)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Efficiency	Average Efficiency
115	0.126	9.0090	0			
	3.230	9.0088	0.2963	2.67	0.8264	88.24
	7.820	9.0088	0.7613	6.86	0.8770	
	15.320	9.0063	1.5103	13.60	0.8879	
	22.840	9.0050	2.2444	20.21	0.8849	
	30.790	9.0013	3.0094	27.09	0.8798	

Input Voltage(V)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Efficiency	Average Efficiency
230	0.167	9.0100	0			
	3.640	9.0100	0.2963	2.67	0.7334	86.99
	8.060	9.0088	0.7463	6.72	0.8342	
	15.410	9.0075	1.4953	13.47	0.8740	
	22.860	9.0050	2.2444	20.21	0.8841	
	30.540	9.0025	3.0094	27.09	0.8871	

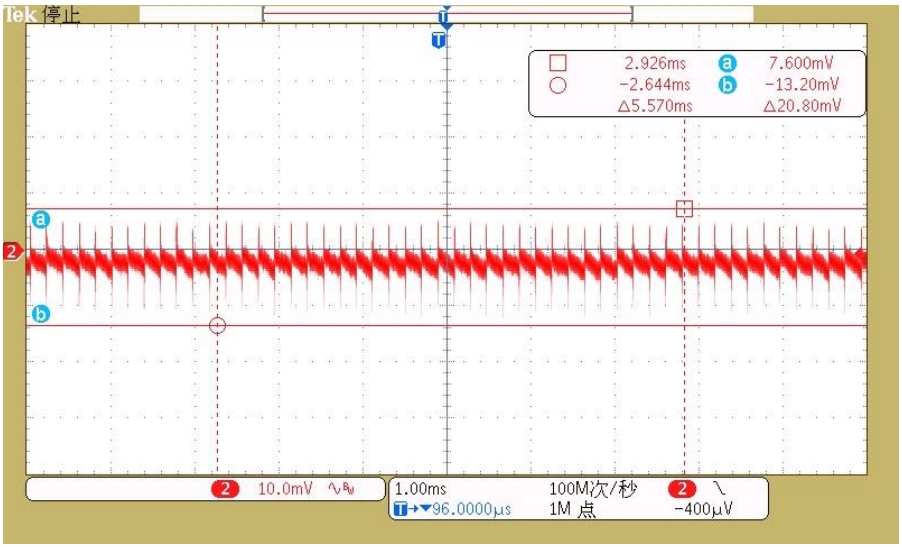
Input Voltage(V)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Efficiency	Average Efficiency
115	0.482	14.9940	0			
	5.408	14.9710	0.2963	4.44	0.8202	0.87
	12.930	14.9260	0.7463	11.14	0.8615	
	25.410	14.9040	1.4953	22.29	0.8771	
	38.120	14.8950	2.2444	33.43	0.8770	
	50.890	14.8750	2.9934	44.53	0.8750	

Input Voltage(V)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Efficiency	Average Efficiency
230	0.563	14.9950	0			
	5.870	14.9700	0.2953	4.42	0.7531	0.88
	13.160	14.9410	0.7463	11.15	0.8473	
	25.240	14.9180	1.4953	22.31	0.8838	
	37.510	14.8960	2.2444	33.43	0.8913	
	49.840	14.8750	2.9934	44.53	0.8934	

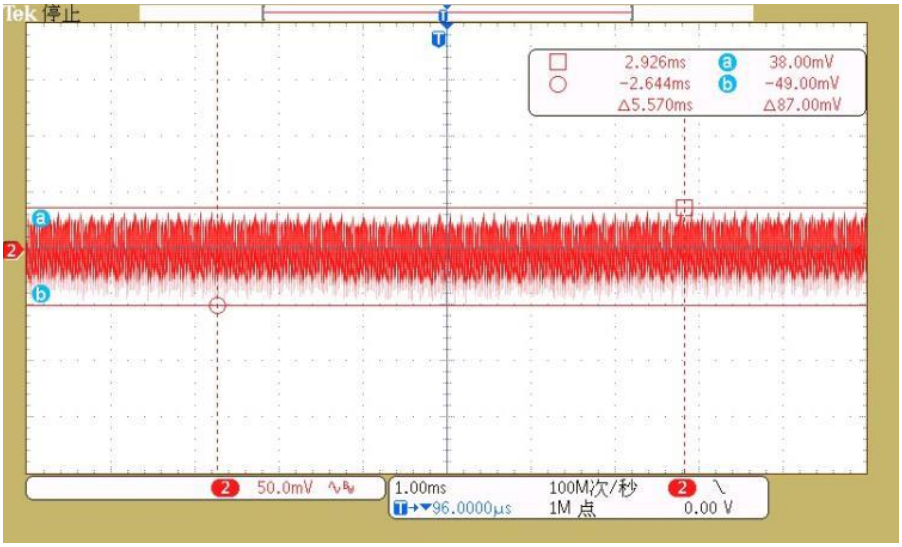
3 Waveforms

*3.1 Output Voltage Ripple**

115Vin 15Vout No Load



115Vin 15Vout Full Load



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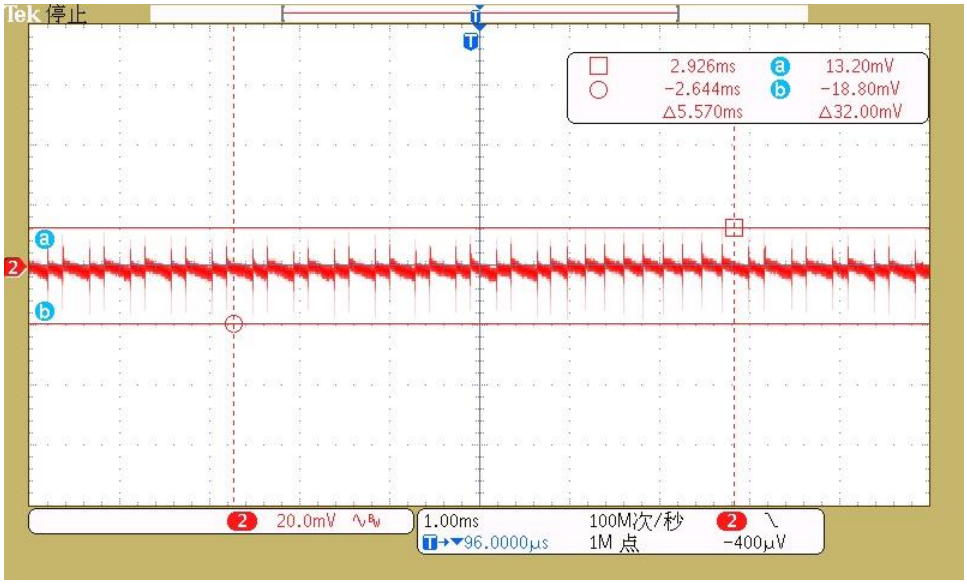
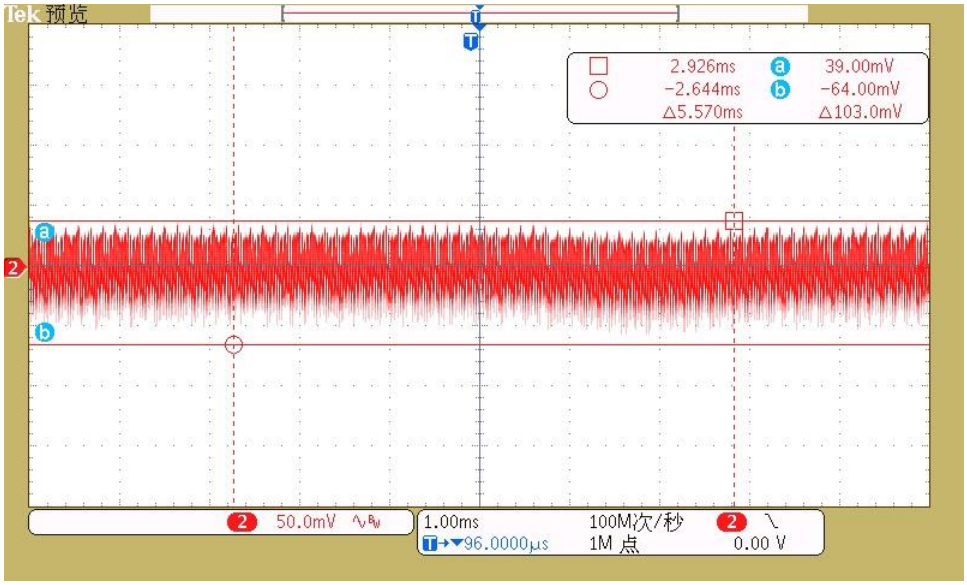
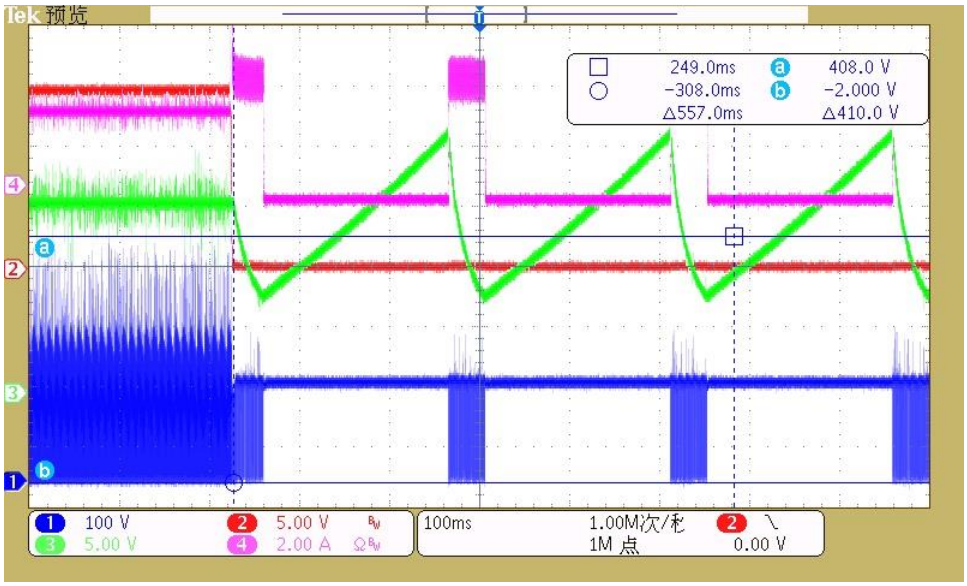


230Vin 15Vout Full Load



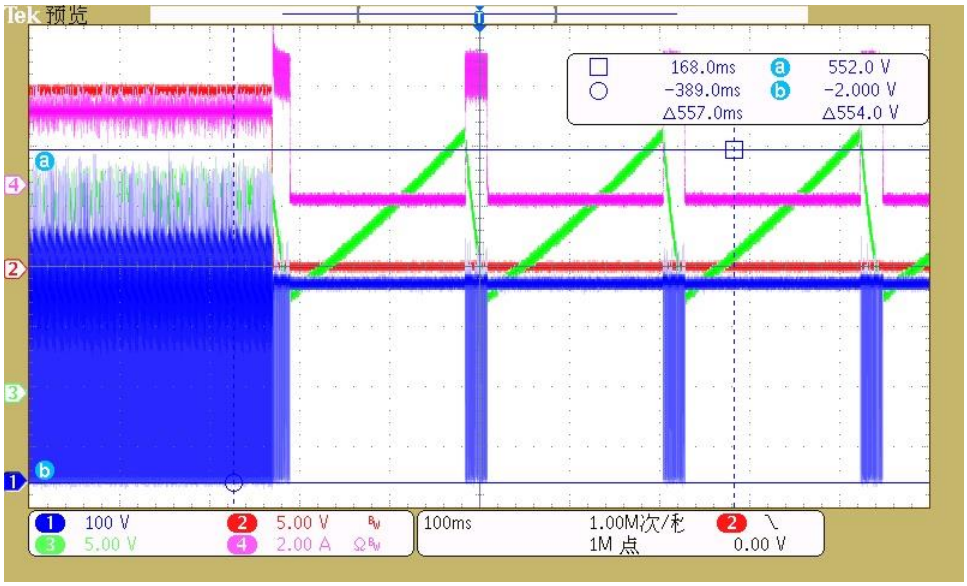
*3.2 Short Circuit Recovery**

115V 15Vout Short Circuit Recovery



CH1=Vprids; CH2=Vout; CH3=VDD; CH4=Iout

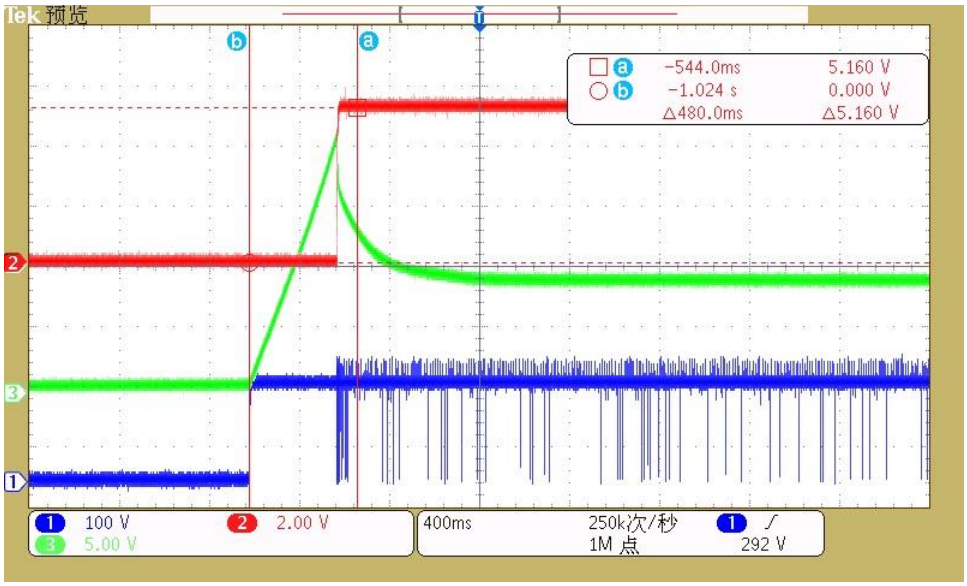
230V 15Vout Short Circuit Recovery



CH1=Vprids; CH2=Vout; CH3=VDD; CH4=Iout

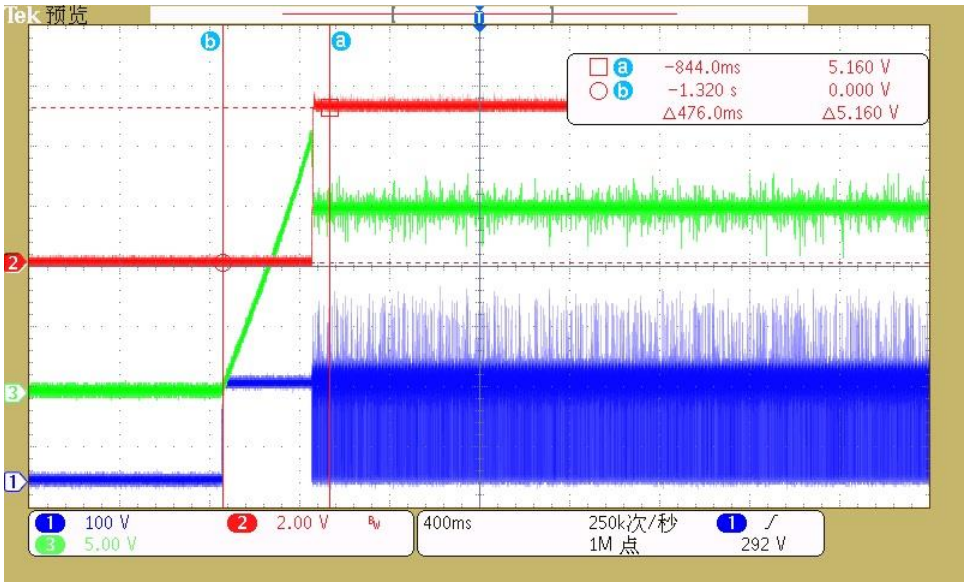
*3.3 Start-up Sequence**

115Vin No Load Start-up



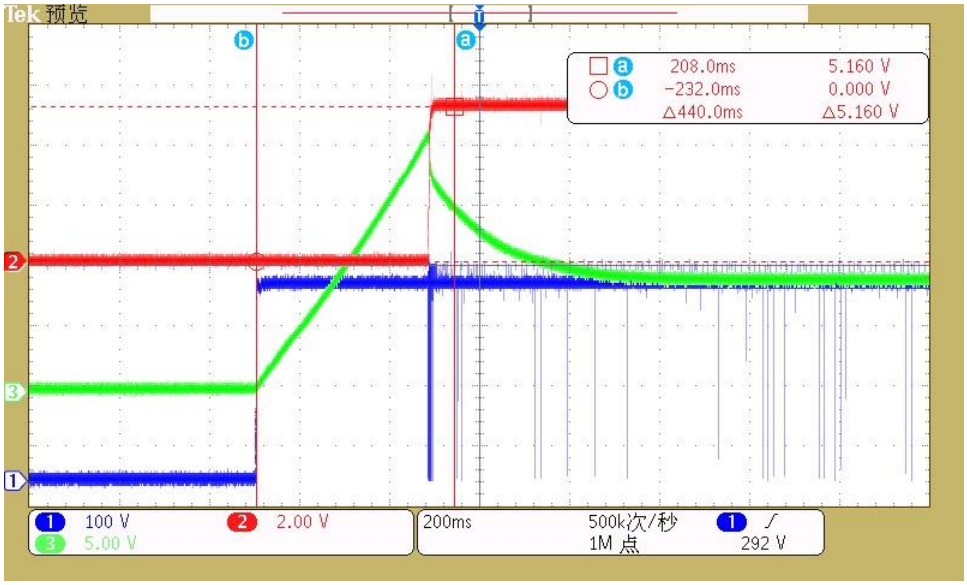
CH1=Vprids; CH2=Vout; CH3=VDD

115Vin 3A Load Start-up



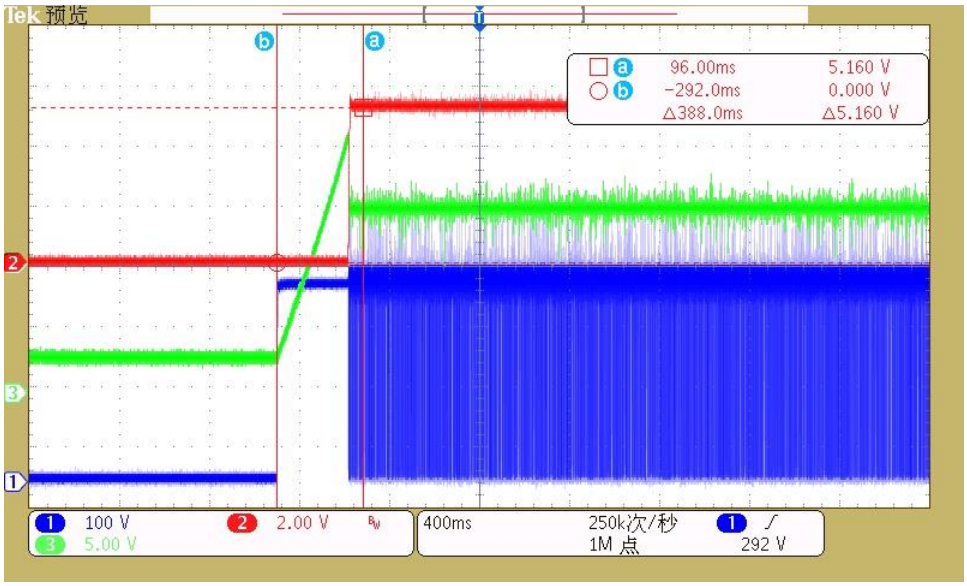
CH1=Vprids; CH2=Vout; CH3=VDD

230Vin No Load Start-up



CH1=Vprids; CH2=Vout; CH3=VDD

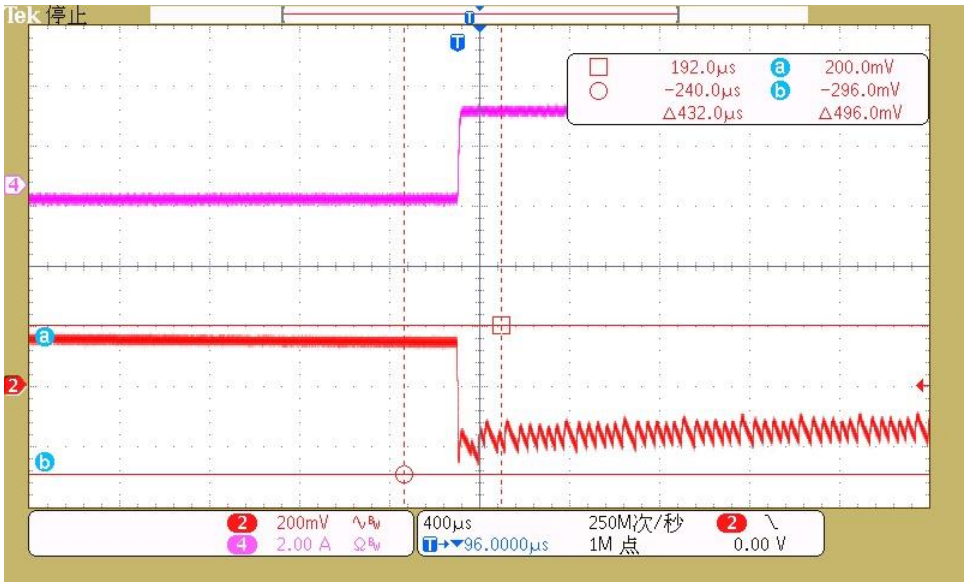
230Vin 3A Load Start-up



CH1=Vprids; CH2=Vout; CH3=VDD

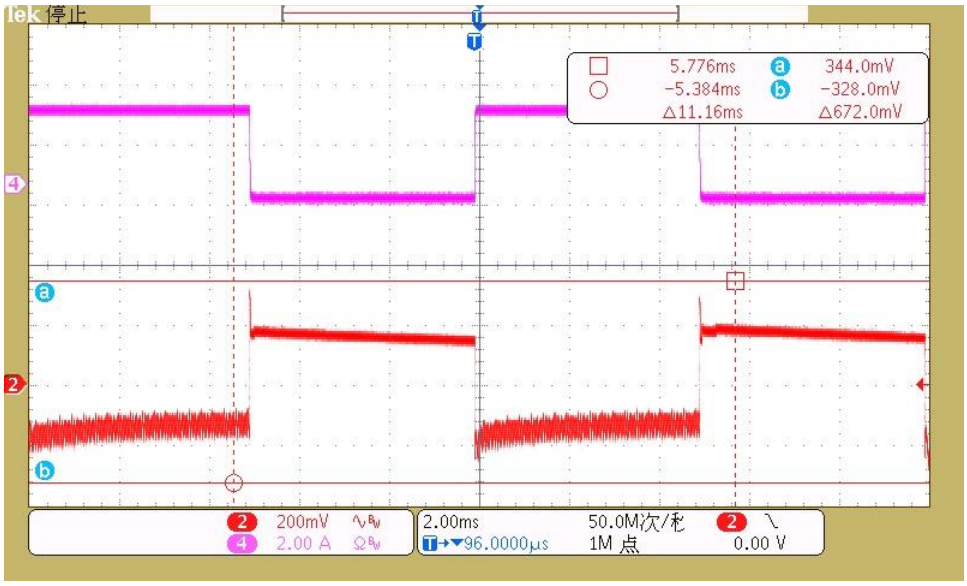
*3.4 Dynamic Response**

115V 5Vout Dynamic Response



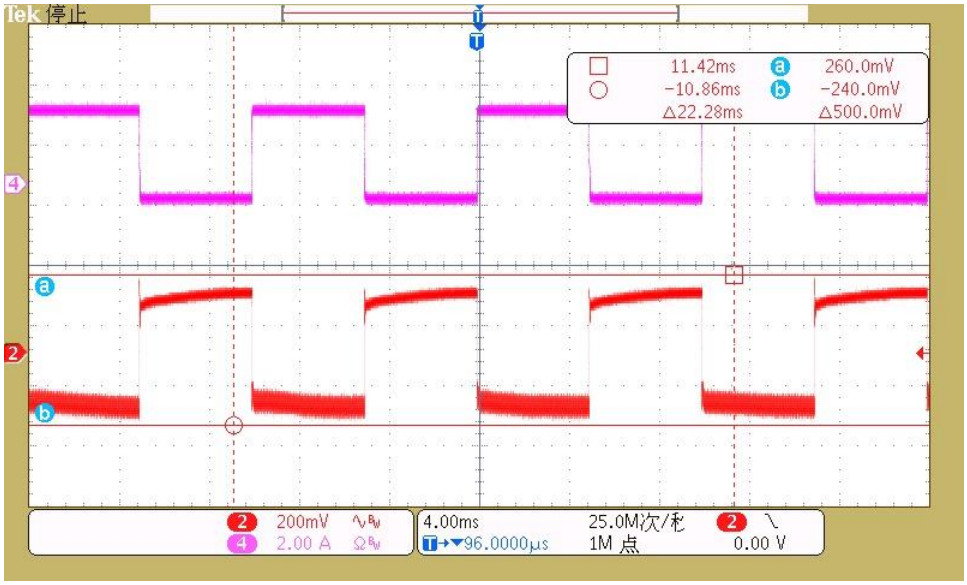
CH2=Vout; CH4=Iout

230V 5Vout Dynamic Response



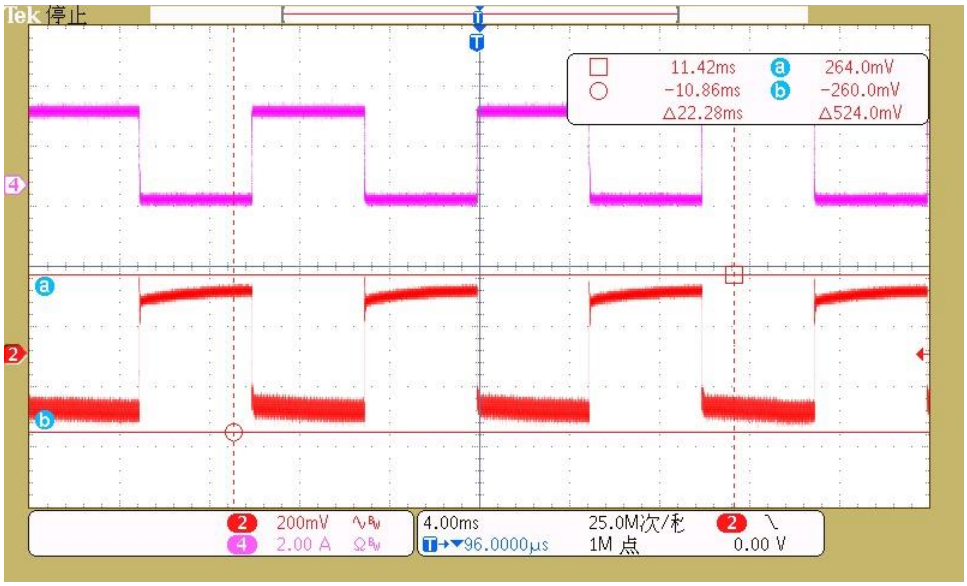
CH2=Vout; CH4=Iout

115V 15Vout Dynamic Response



CH2=Vout; CH4=Iout

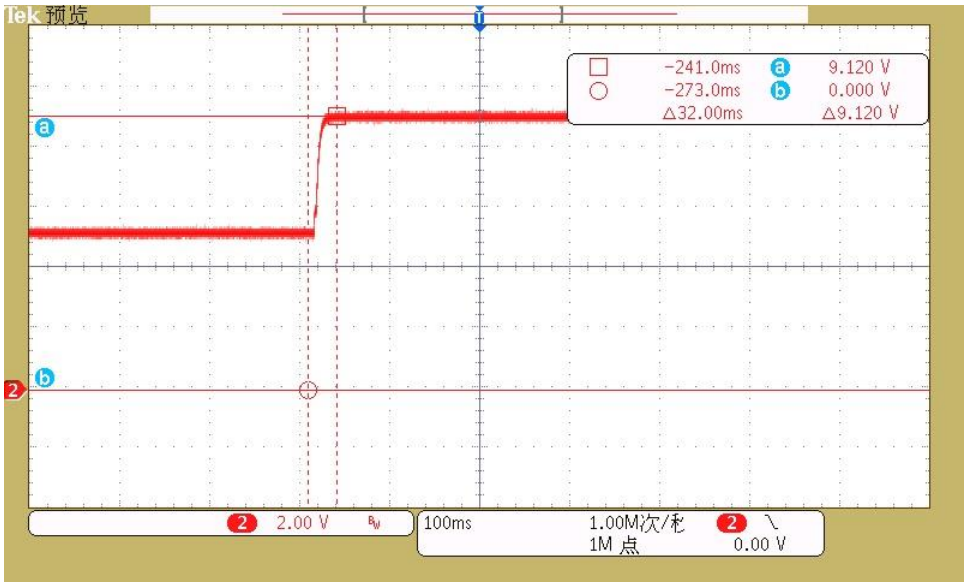
230V 15Vout Dynamic Response



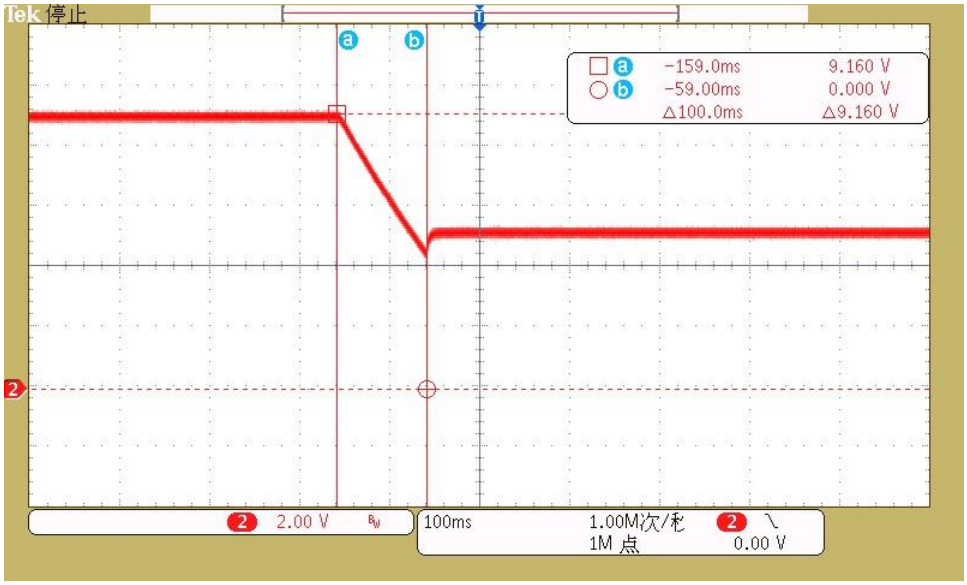
CH2=Vout; CH4=Iout

3.5 PD 3.0 Voltage Transition*

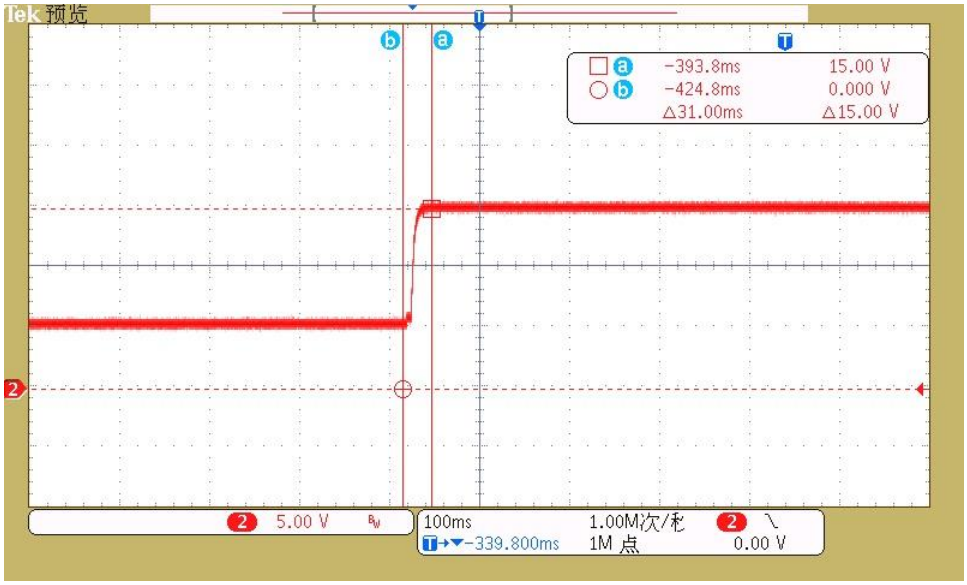
5V to 9V



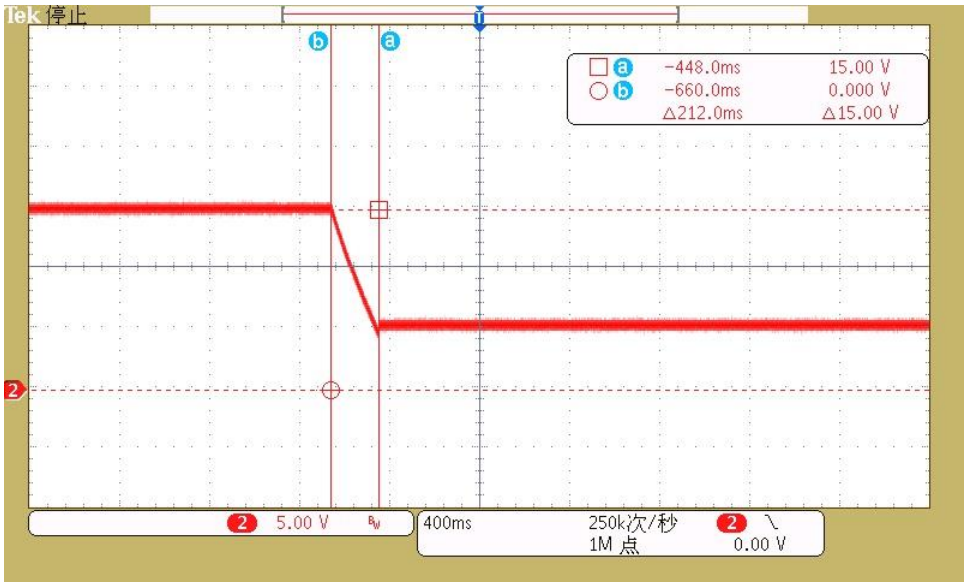
9V to 5V



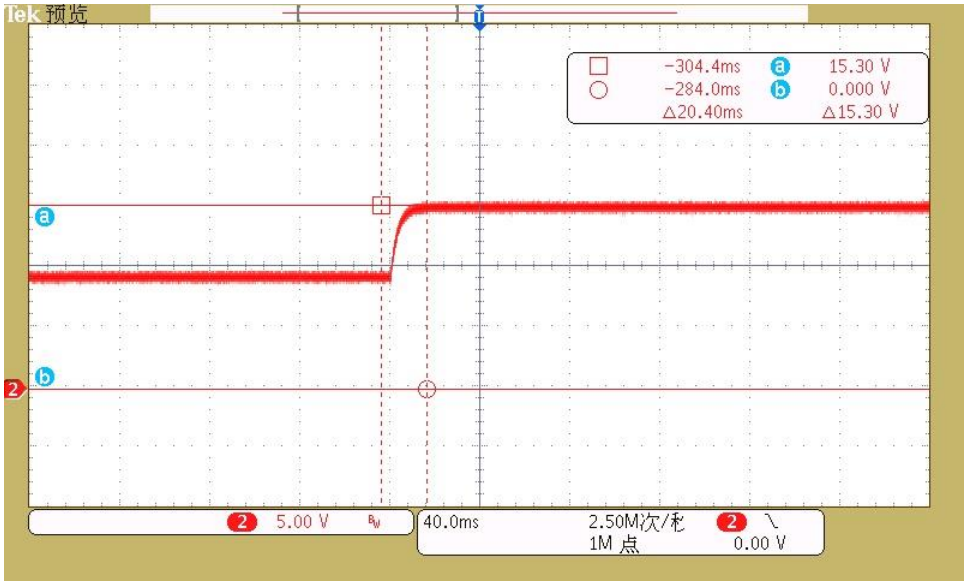
5V to 15V



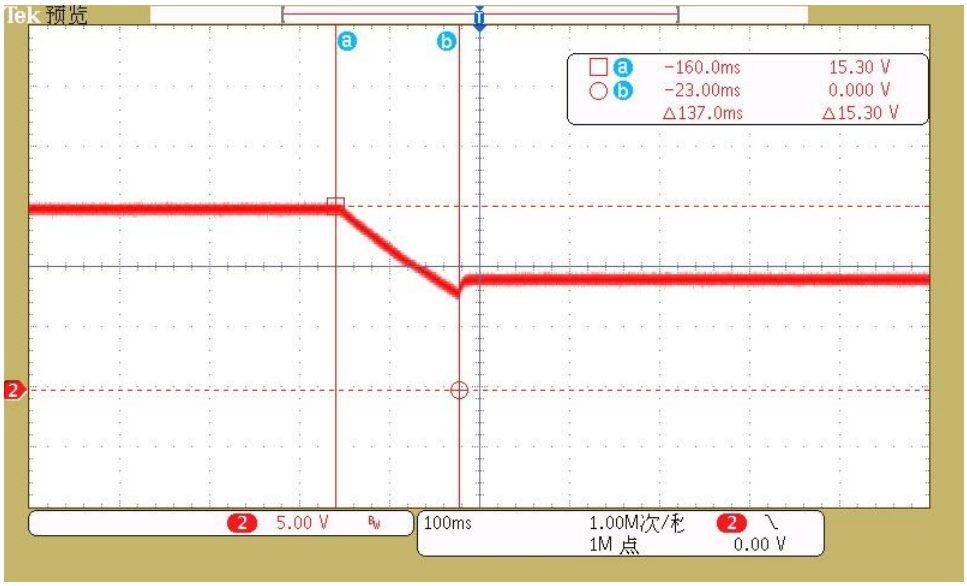
15V to 5V



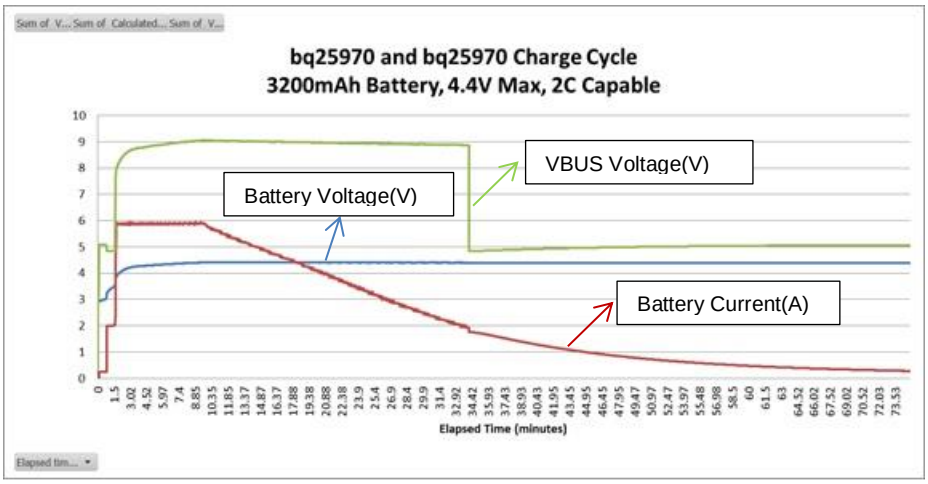
9V to 15V



15V to 9V



3.6 PD PPS Voltage Transition



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