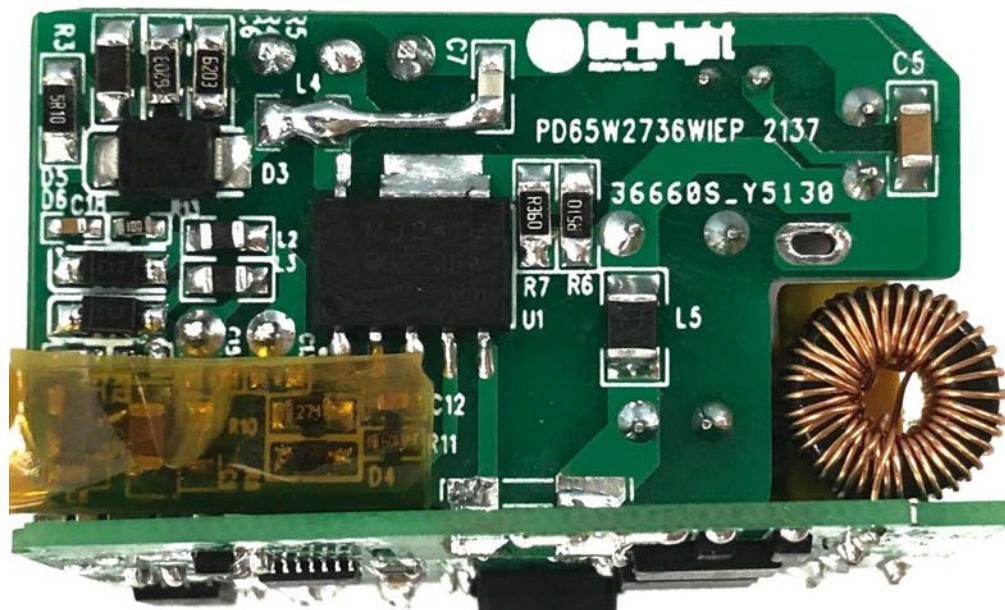


Subject

**OB2736W+OB2613N Demo Board Manual**

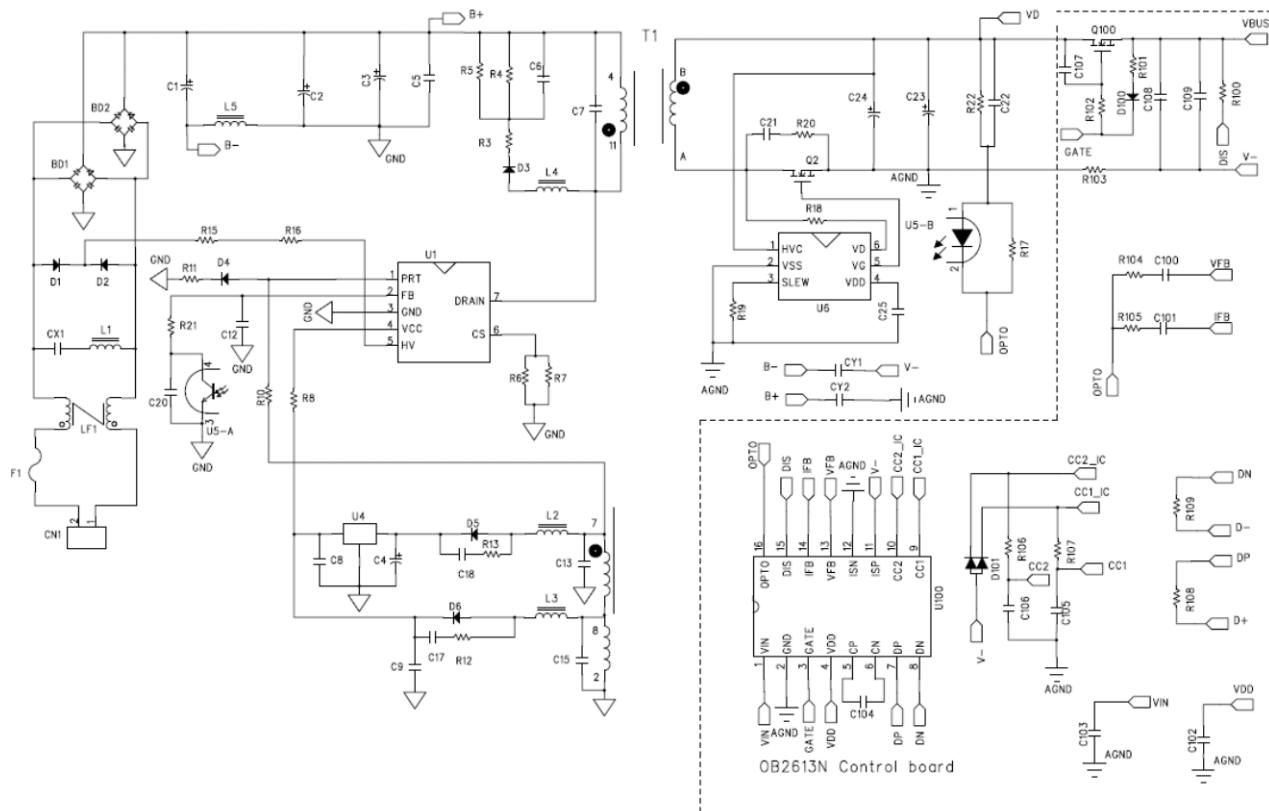
Board Model: PD20V3.25A OB2736WIEP+2613

Doc. No.: OB\_DOC\_DBM\_2736W+2613N00

**Key features:**

- Support Power Delivery 3.0 Protocol@ Include PPS
- Output voltage: 5V/9V/12V/15V/20V
- Output current: 3A/3A/3A/3A/3.25A
- Standby power less than 75mW
- Average efficiency meet COC V tier2
- Comprehensive protection coverage such as SCP、OCP、OLP、OVP、OTP
- High precision OCP performance
- Programmable cable drop compensation
- Meet EN55022 Class B EMI

## Schematic



## Performance Evaluation

### Test Equipments

Item	Vender	Module
AC Source:	WEST	WEW1010
Digital Power Meter	YOKOGAWA	WT210
Electrical Load	Prodigit	3315C
Oscilloscope	LeCroy	WS424
Multimeter	VICTORY	VC9807A
Thermal	FLUKE	HS 2

## 1. Input Characteristics

### 1.1 Input current and Standby power

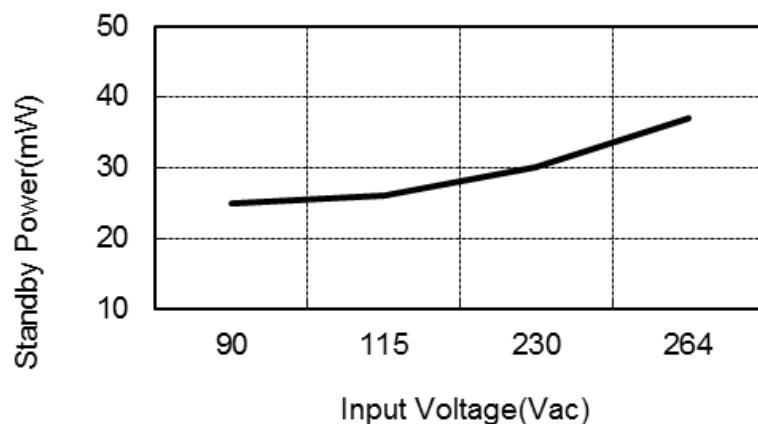
The module was tested at different input voltages (from 90Vac to 264Vac)

Table 1 Input current at full load

Input Voltage	90V/60Hz	115V/60Hz	230V/50Hz	264V/50Hz
Input Current(A)	1.34	1.10	0.78	0.71

Table 2 Standby power at no load

Input voltage	Pin(mW)	Vo(V)	Specification	Test result
90Vac/60HZ	25	4.971	<75mW	Pass
115Vac/60HZ	26	4.972		
230Vac/50HZ	30	4.975		
264Vac/50HZ	37	4.984		



## 1.2 Efficiency

*Table 3 Efficiency @PCB End*

5V3A								
	100%	75%	50%	25%	AVE	CoC Req	10%	CoC Req
115Vac	91.57%	91.62%	91.47%	90.56%	91.30%	81.84%	82.29%	72.48%
230Vac	89.25%	88.86%	88.15%	85.24%	87.87%		76.85%	

9V3A								
	100%	75%	50%	25%	AVE	CoC Req	10%	CoC Req
115Vac	93.27%	93.35%	92.88%	92.21%	92.93%	87.30%	88.29%	77.30%
230Vac	91.1%	90.39%	89.05%	88.61%	89.79%		82.37%	

12V3A								
	100%	75%	50%	25%	AVE	CoC Req	10%	CoC Req
115Vac	93.46%	93.74%	93.38%	92.8%	93.35%	88.30%	88.95%	78.30%
230Vac	92.03%	91.01%	90.1%	90.22%	90.84%		84.76%	

15V3A								
	100%	75%	50%	25%	AVE	CoC Req	10%	CoC Req
115Vac	93.57%	93.81%	93.68%	92.84%	93.48%	88.85%	89.5%	78.85%
230Vac	93.01%	92.34%	91.53%	90.85%	91.93%		86.13%	

20V3.25A								
	100%	75%	50%	25%	AVE	CoC Req	10%	CoC Req
115Vac	93.18%	93.78%	93.69%	92.47%	93.28%	88.85%	90.3%	79%
230Vac	93.42%	92.91%	92.03%	90.98%	92.34%		87.35%	

## 2. Output Characteristics

### 2.1 Line Regulation & Load Regulation

All data was measurement at @100mR CABLE end

*Table 4 Line Regulation & Load Regulation*

<b>Input voltage</b>	<b>No load</b>	<b>Half load</b>	<b>Full load</b>	<b>Specification</b>	<b>Output Voltage</b>
90Vac/60HZ	4.975	4.934	4.906		5V
115Vac/60HZ	4.985	4.943	4.915		
230Vac/50HZ	4.976	4.936	4.91		
264Vac/50HZ	4.982	4.951	4.912		
Line Regulation	0.2%			<2%	
Load Regulation	1.4%			<5%	

<b>Input voltage</b>	<b>No load</b>	<b>Half load</b>	<b>Full load</b>	<b>Specification</b>	<b>Output Voltage</b>
90Vac/60HZ	8.98	8.942	8.916		9V
115Vac/60HZ	9.01	8.969	8.937		
230Vac/50HZ	9.001	8.964	8.935		
264Vac/50HZ	9.014	8.976	8.948		
Line Regulation	0.38%			<2%	
Load Regulation	0.81%			<5%	

<b>Input voltage</b>	<b>No load</b>	<b>Half load</b>	<b>Full load</b>	<b>Specification</b>	<b>Output Voltage</b>
90Vac/60HZ	11.953	11.85	11.77		12V
115Vac/60HZ	11.987	11.881	11.777		
230Vac/50HZ	11.985	11.88	11.778		
264Vac/50HZ	12.003	11.898	11.791		
Line Regulation	0.42%			<2%	
Load Regulation	1.77%			<5%	

<b>Input voltage</b>	<b>No load</b>	<b>Half load</b>	<b>Full load</b>	<b>Specification</b>	<b>Output Voltage</b>
90Vac/60HZ	14.979	14.874	14.781		15V
115Vac/60HZ	14.984	14.875	14.777		
230Vac/50HZ	14.976	14.873	14.777		
264Vac/50HZ	15.01	14.886	14.779		
Line Regulation	0.23%			<2%	
Load Regulation	1.54%			<5%	

<b>Input voltage</b>	<b>No load</b>	<b>Half load</b>	<b>Full load</b>	<b>Specification</b>	<b>Output Voltage</b>
90Vac/60HZ	19.98	19.88	19.80		20V
115Vac/60HZ	20.01	19.87	19.80		
230Vac/50HZ	20.02	19.89	19.78		
264Vac/50HZ	20.01	19.88	19.78		
Line Regulation	0.2%			<2%	
Load Regulation	1.2%			<5%	

## 2.2 Ripple & Noise

All data was measurement at @100mR CABLE end

*Table 5 Ripple & Noise*

Input voltage	5V R&N (mV)		
	No load	Full load	Remark
90Vac/60HZ	40.3	72.3	
264Vac/50HZ	44.2	77.4	

Input voltage	9V R&N (mV)		
	No load	Full load	Remark
90Vac/60HZ	52.5	89	
264Vac/50HZ	54.4	81	

Input voltage	12V R&N (mV)		
	No load	Full load	Remark
90Vac/60HZ	50.6	109	
264Vac/50HZ	55.7	86	

Input voltage	15V R&N (mV)		
	No load	Full load	Remark
90Vac/60HZ	54.4	142	
264Vac/50HZ	62.7	114	

Input voltage	20V R&N (mV)		
	No load	Full load	Remark
90Vac/60HZ	74	187	
264Vac/50HZ	73	134	

Note: Ripple& noise was measured at line (100mR) end without probe cap of 10uf+100nf and ground clip. Measurement bandwidth was limited to 20MHZ.

## Dynamic Test

A dynamic loading with low set at 10% full load lasting for 10mS and high set at 90% full load lasting for 10mS is added to output. The ramp is set at 0.25A/uS at transient.  
 All data was measurement at @100mR CABLE end.

Table 6 Output voltage under dynamic test

Input voltage	5V Output voltage (mV)	Waveform
90V/60HZ	±328	Fig.15-16
264V/50HZ	±304	

Input voltage	9V Output voltage (mV)	Waveform
90V/60HZ	±344	
264V/50HZ	±336	

Input voltage	12V Output voltage (mV)	Waveform
90V/60HZ	±368	
264V/50HZ	±368	

Input voltage	15V Output voltage (mV)	Waveform
90V/60HZ	±384	
264V/50HZ	±368	

Input voltage	20V Output voltage (mV)	Waveform
90V/60HZ	±416	Fig.17-18
264V/50HZ	±384	

### Dynamic waveform

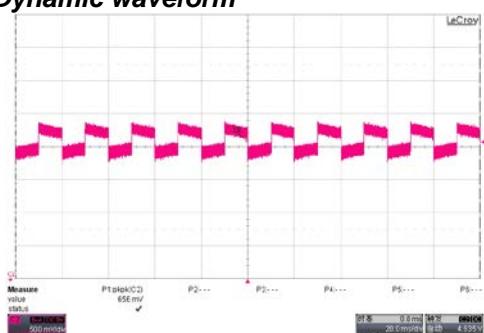


Fig. 1 Dynamic waveform@90Vac input

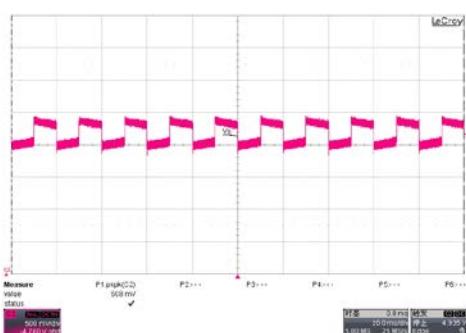


Fig. 2 Dynamic waveform@264Vac input

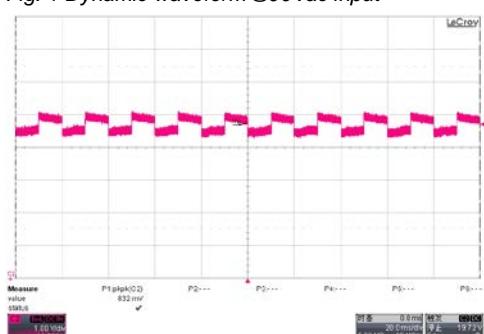


Fig. 3 Dynamic waveform@90Vac input

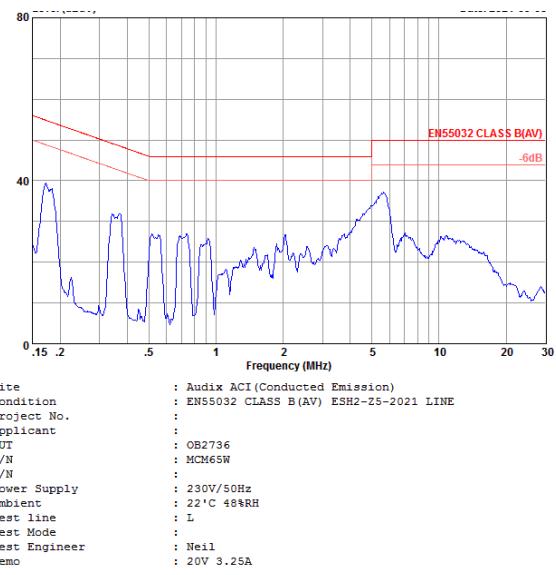
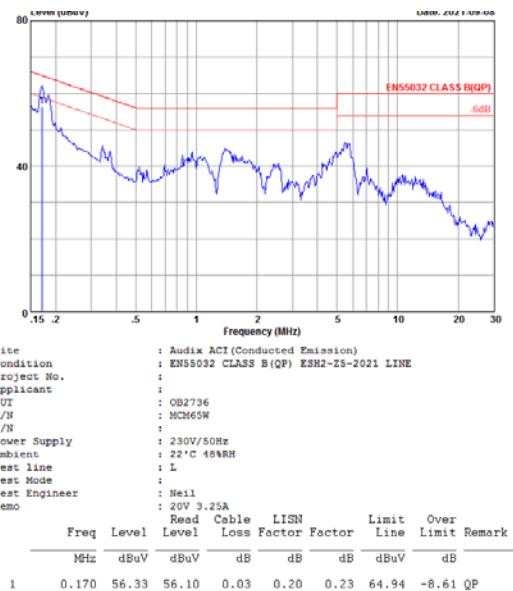


Fig. 4 Dynamic waveform@264Vac input

### 3. EMI Test

The Power supply passed EN55022 Class B & FCC class B EMI requirement with more than 6dB margin tested with shield.

#### 3.1 Conducted EMI Test



#### 3.2 Radiation EMI Test



## 4. PD Specification Test

### 4.1 Vbus Change Test

Vbus changing test between 5V/9V/12V/15V/20V under No load/Full load conditions

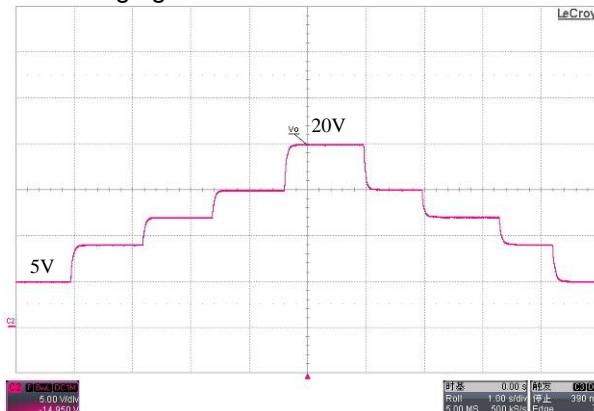


Fig. 5 Vbus Changing Test @no load



Fig. 6 Vbus Changing Test @full load

### 4.2 Negative Voltage Transitions

Vbus changing test from 20V to 5V @No load/Full load. The transition time is 166ms (spec: <275ms)

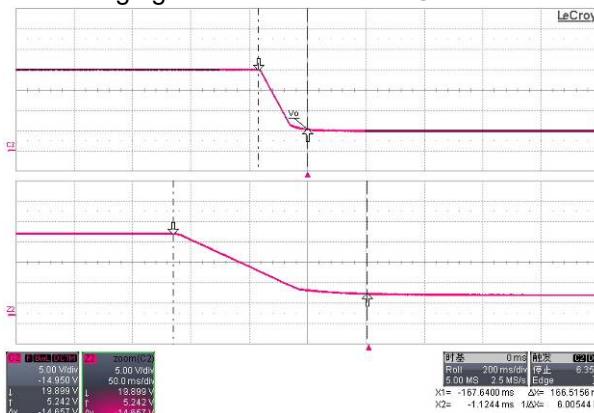


Fig. 7 Vbus Change From 20V to 5V @no load

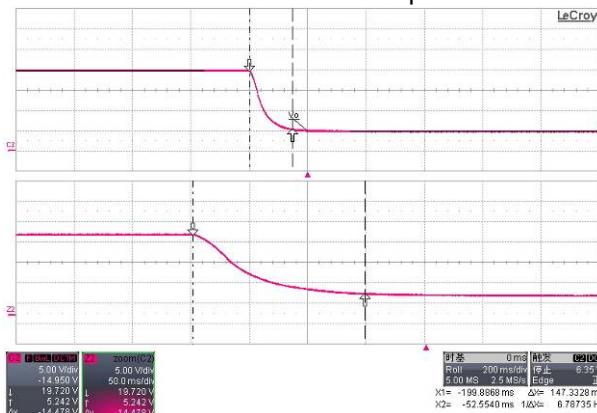


Fig. 8 Vbus Change From 20V to 5V @full load

### 4.3 Positive Voltage Transitions

Vbus changing test from 5V to 20V @No load/Full load. The transition time is 132ms (spec: <275ms)

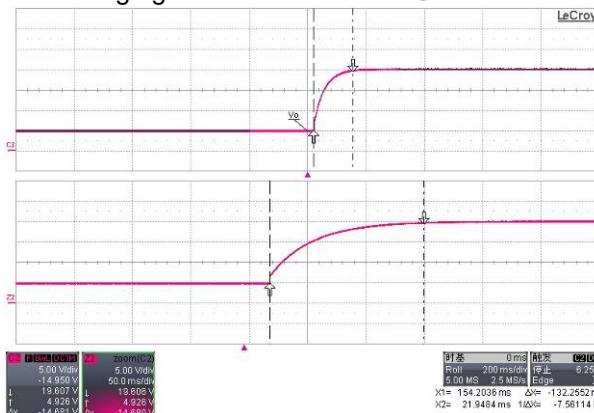


Fig. 9 Vbus Change From 5V to 20V @no load

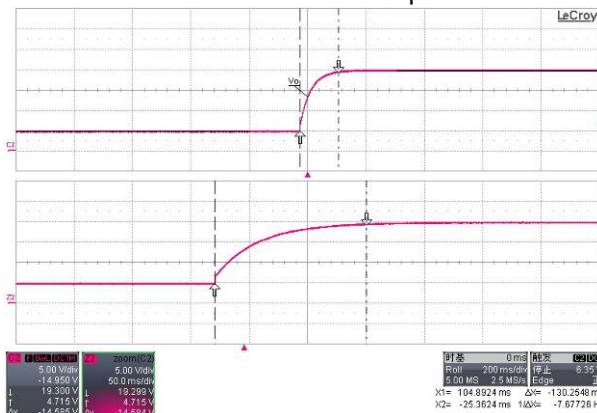
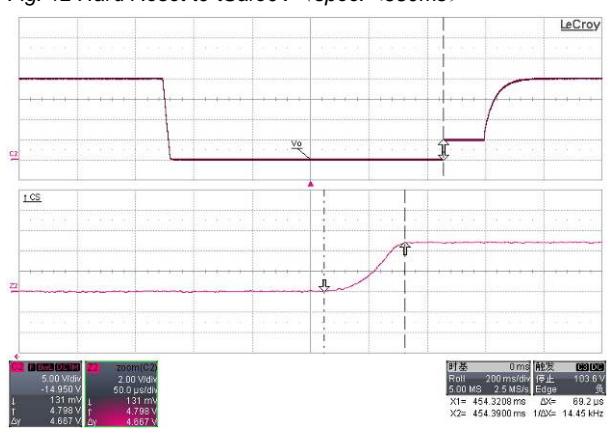
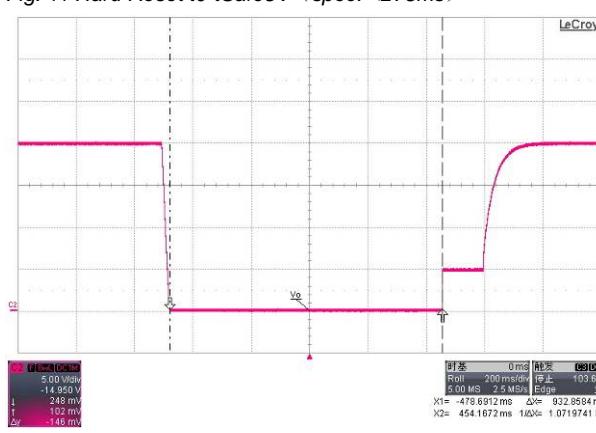
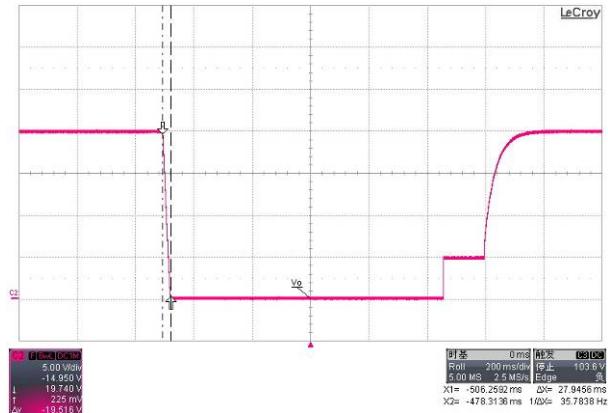
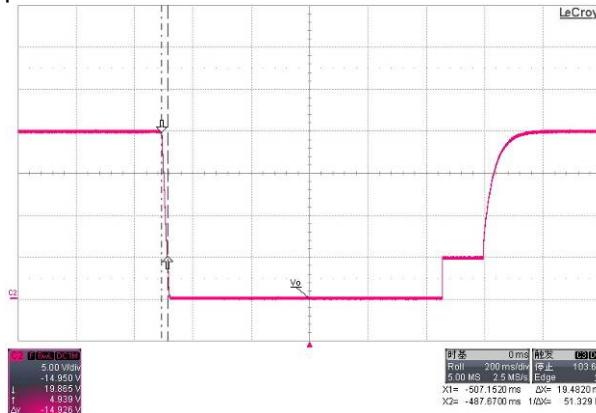


Fig. 10 Vbus Change From 5V to 20V @full load

#### 4.4 Response to Hard Resets

When responding to hard reset, the time of tSafe5V/tSafe0V/tSrcRecover/tSrcTurnon are strict following PD spec.





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