

SGM41518 Demo Board Test Report

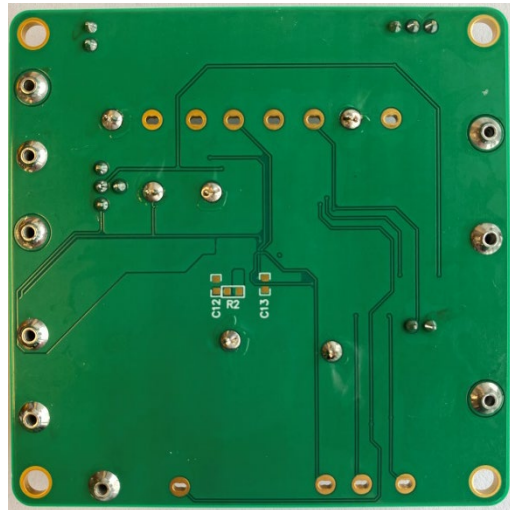
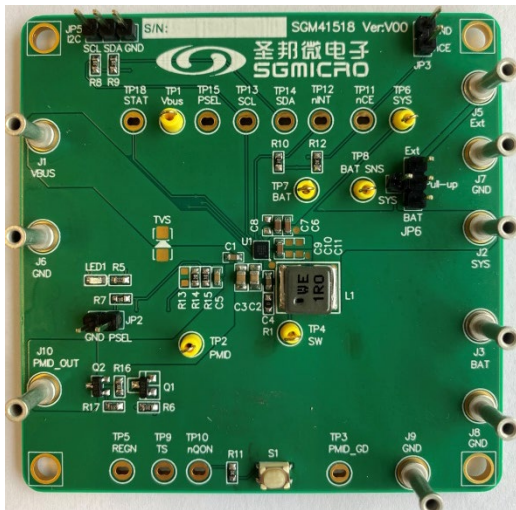


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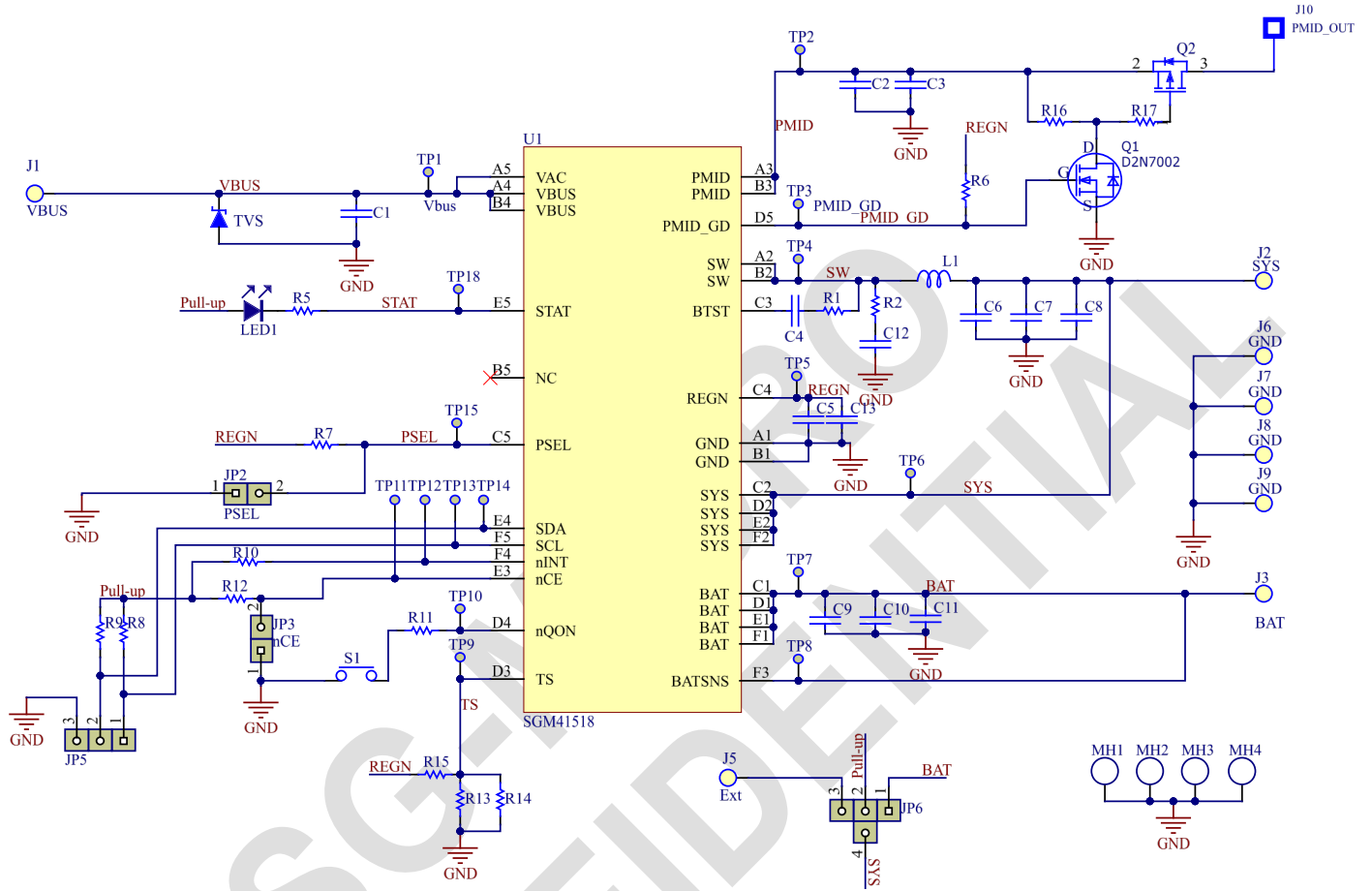
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1. Schematic and BOM List



Item	Designator	QTY	Description	Manufactory
1	C1	1	1uF,25V,X5R,0603	
2	C2,C3	2	10uF,25V,X5R,0805	
3	C4	1	47nF,10V,X5R,0603	
4	C5	1	4.7uF,10V,X5R,0603	
5	C6,C7,C9	3	10uF,10V,X5R,0603	
6	C8,C10,C11,C12,C13	0	NP	
7	L1	1	1uH, I _{SAT} =27.5A, I _{RMS} =12A, DCR=5.5mΩ, Size 6030, 74439344010	Würth
8	LED1	1	LED, 0603, Blue	
9	Q1	1	N-MOSFET, 60V/115mA, Ron=1.2Ω, 2N7002	
10	Q2	1	P-MOSFET, 30V/4.2A, Ron=50mΩ, AO3401A	
11	R1	1	0Ω, ±5%, SMD res.,0603	
12	R5	1	2.2KΩ, ±5%, SMD res.,0603	
13	R6	1	100KΩ, ±5%, SMD res.,0603	
14	R7,R8,R9,R10,R11,R12	6	10KΩ, ±5%, SMD res.,0603	
15	R14,R15	2	10KΩ, ±1%, SMD res.,0603	
16	R16	1	20KΩ, ±5%, SMD res.,0603	
17	R17	1	5.1KΩ, ±5%, SMD res.,0603	
18	R2,R13	0	NP	
19	S1	1	Tact Switch, SKRSPACE010, SMD	
20	TVS	0	NP	
21	U1	1	Charger IC, WLCSP-2.0×2.4-30B, SGM41518	SG-Micro
Conclusion: Total 27 components				

2. Test item

2.1 Short charge current and Pre-charge current

Setup and conditions:

- Set VBUS to 5V/9V/12V/others voltage respectively.
- Set the pre-charge setting to 260mA, and measure the short charging current and pre-charging current under different battery voltage (Emulated battery: power supply||4A E-load, keep the connect wire short).

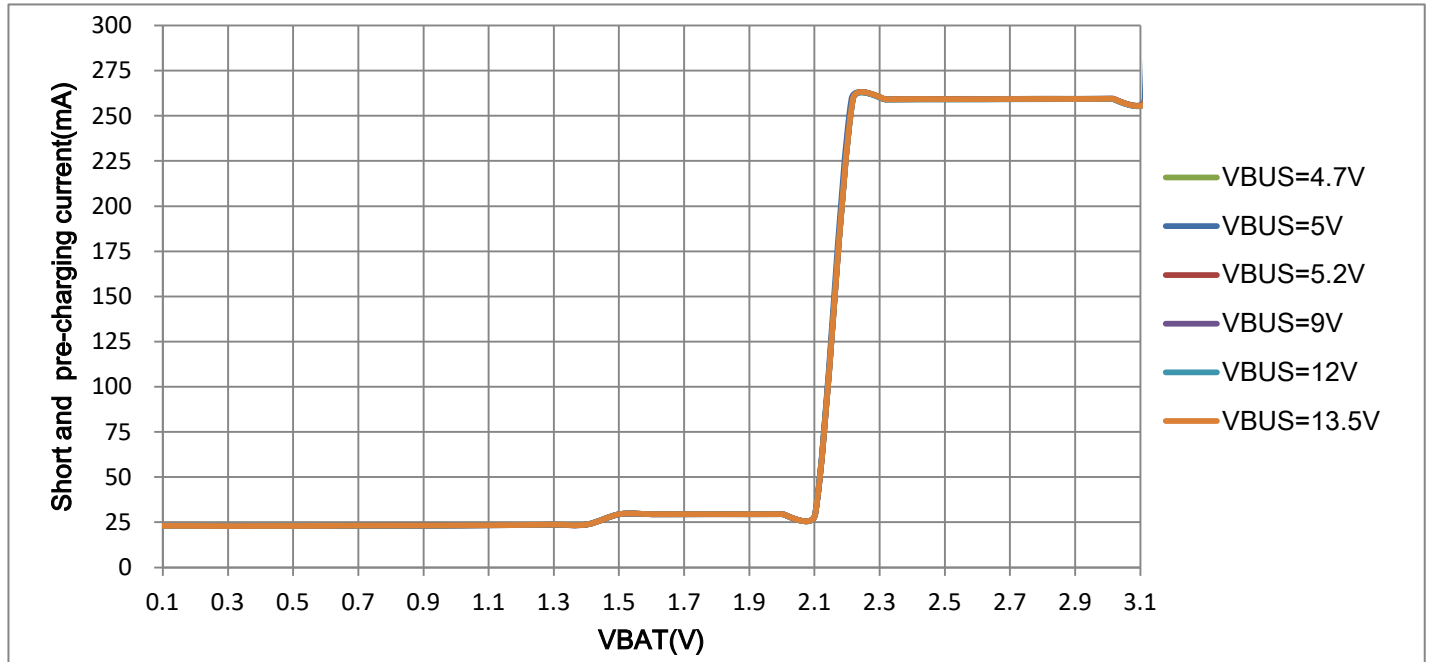


Chart1 Short charging current and 260mA pre-charging current

2.2 Fast-charge current

Setup and conditions:

- Set VBUS to 5V/9V/12V/others voltage respectively.
- Set the charge current to 240mA, 1260mA respectively, and measure the fast charging current under different battery voltage.

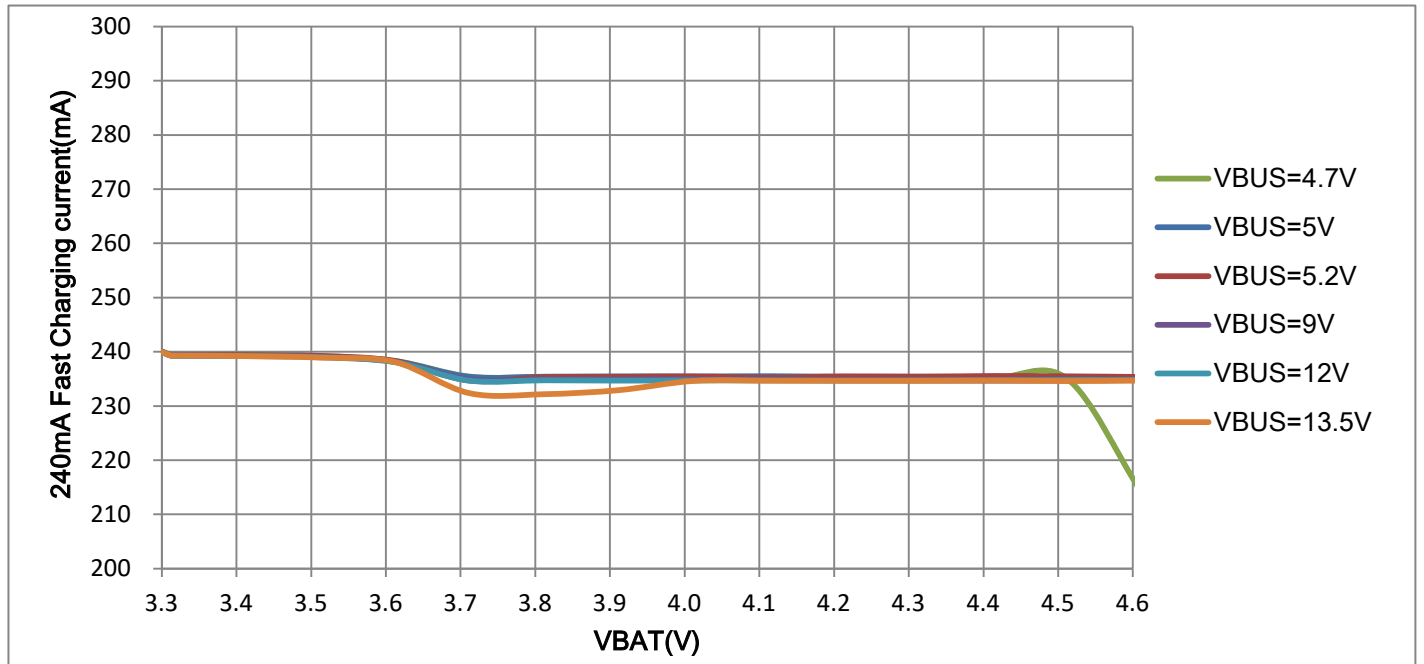


Chart2 240mA fast-charging current

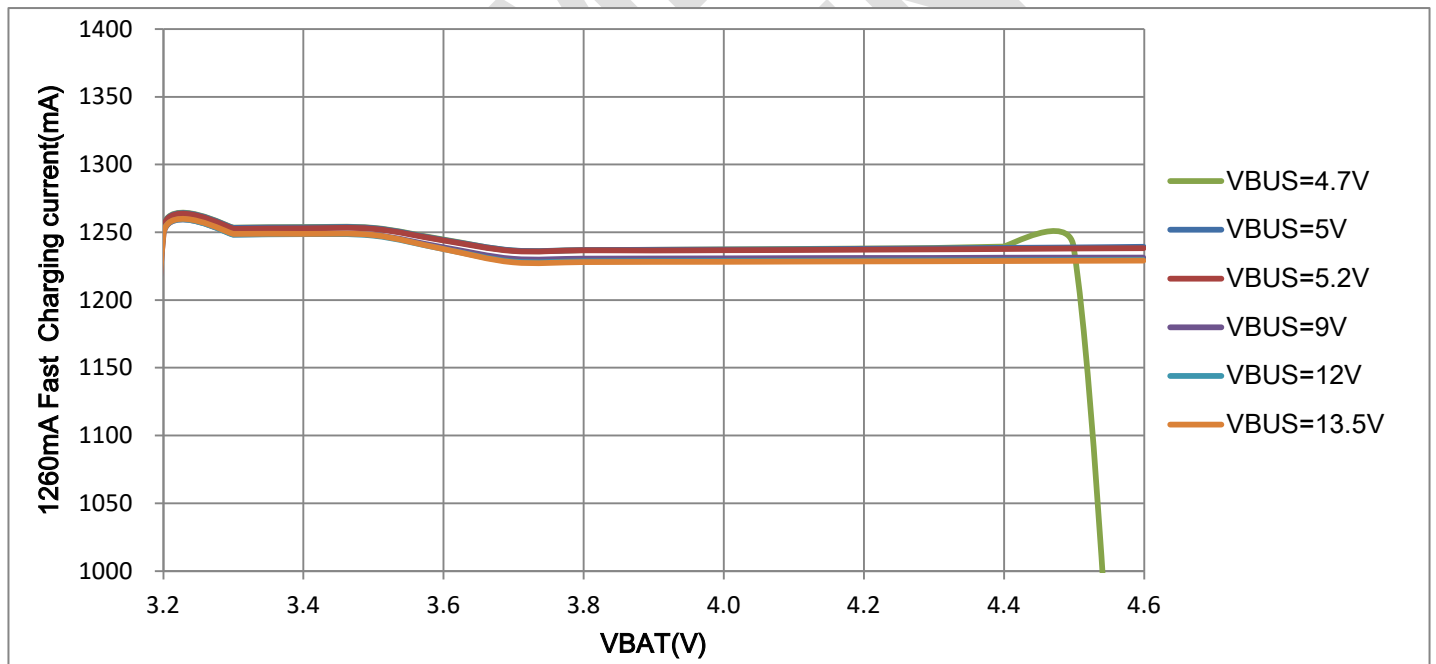


Chart3 1260mA fast-charging current

2.3 CV Accuracy

Setup and conditions:

- Set VBUS to 5V/12V respectively.
- Set the ICHG to 1260mA and VREG to 3856mV, 4208mV, 4352mV, 4400mV, 4624mV, 4200mV, 4344mV respectively, and measure the battery voltage under different charging current in CV mode.

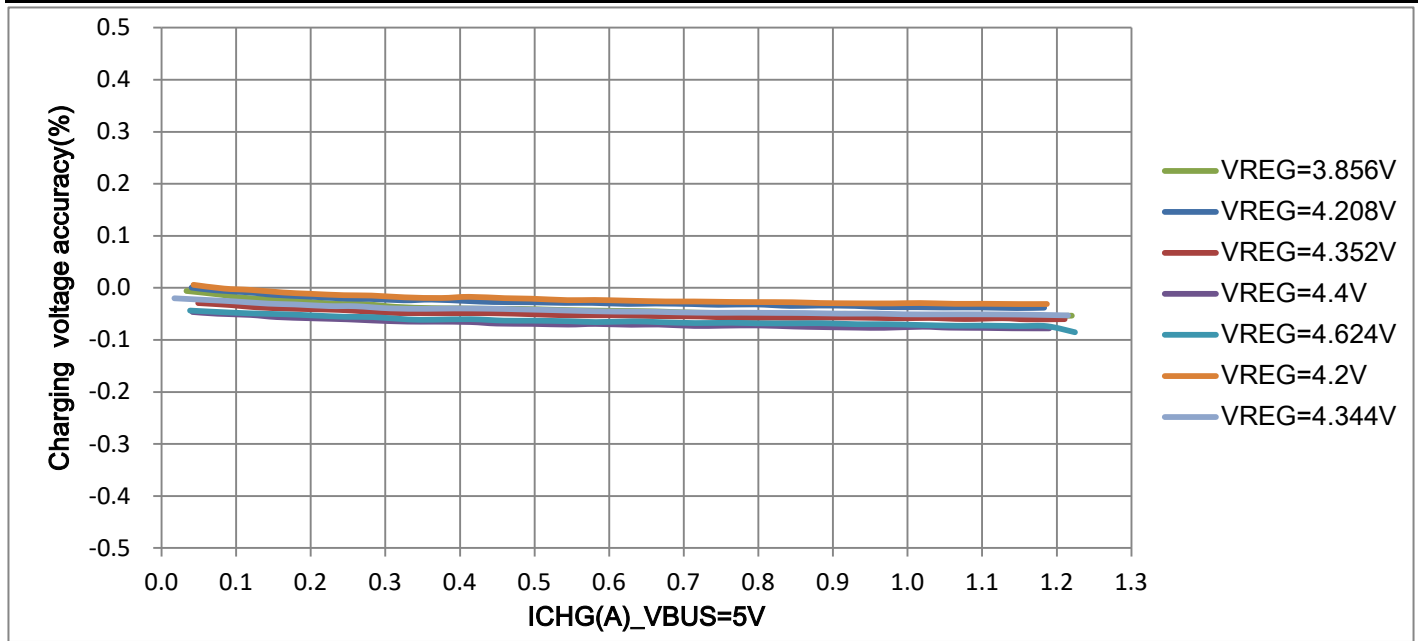


Chart4 Charging voltage accuracy at VBUS=5V

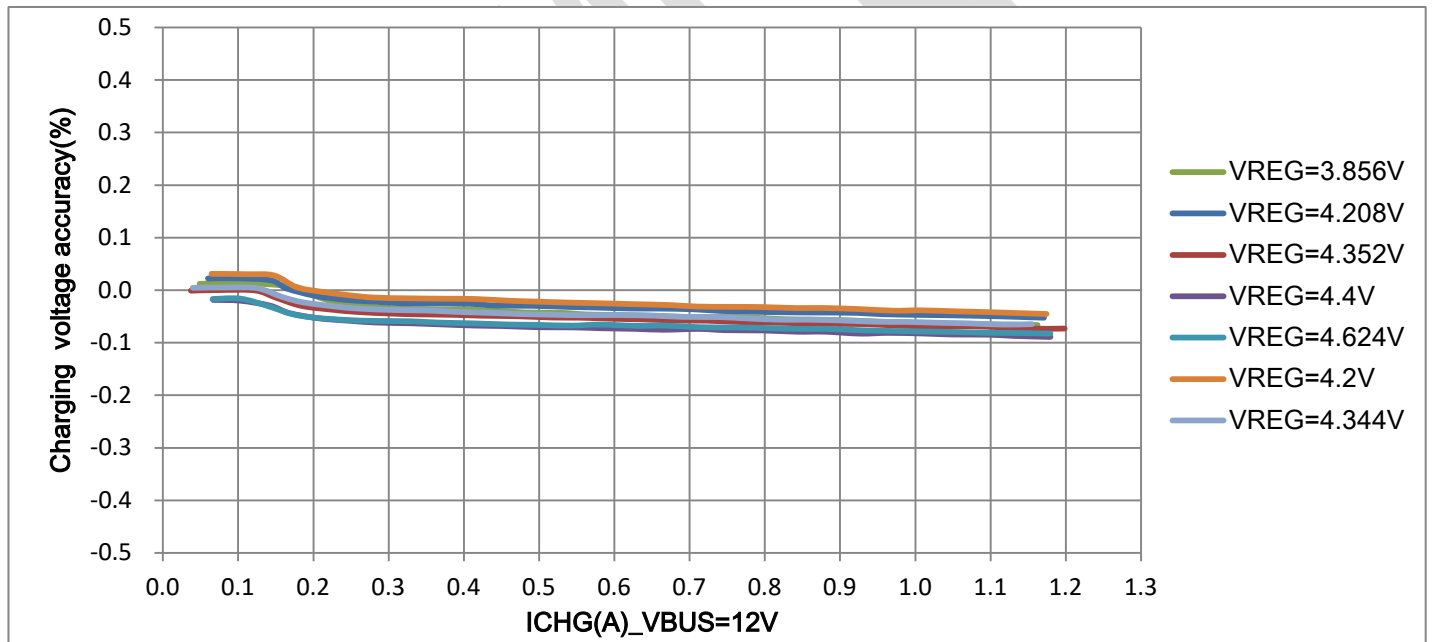


Chart5 Charging voltage accuracy at VBUS=12V

2.4 IINDPM

Setup and conditions:

- Set VBUS to 5V/12V respectively.
- Set the VBAT to 3.7V, IINDPM to 500mA, 1500mA, and increase the system load gradually until chip enter deep discharging state, and measure the input current and charging current.

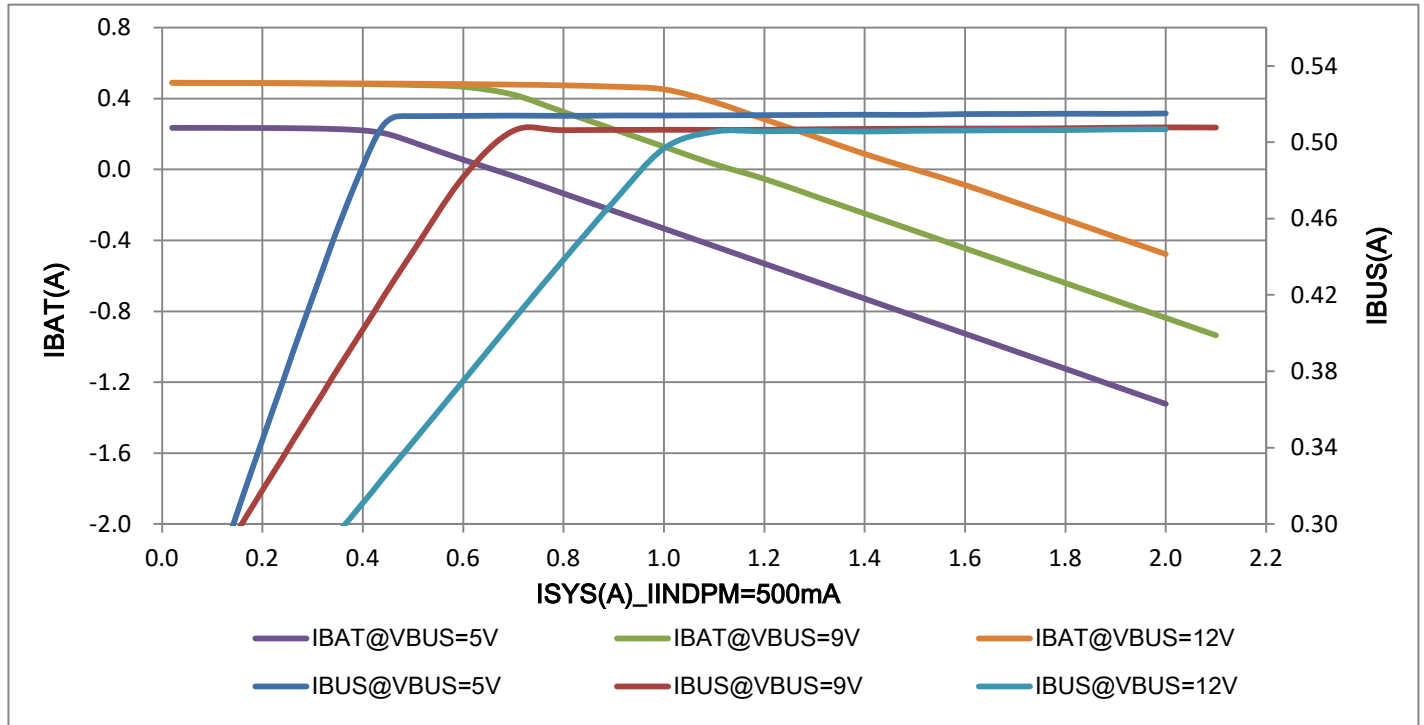


Chart6 Input current DPM at VBUS=5V

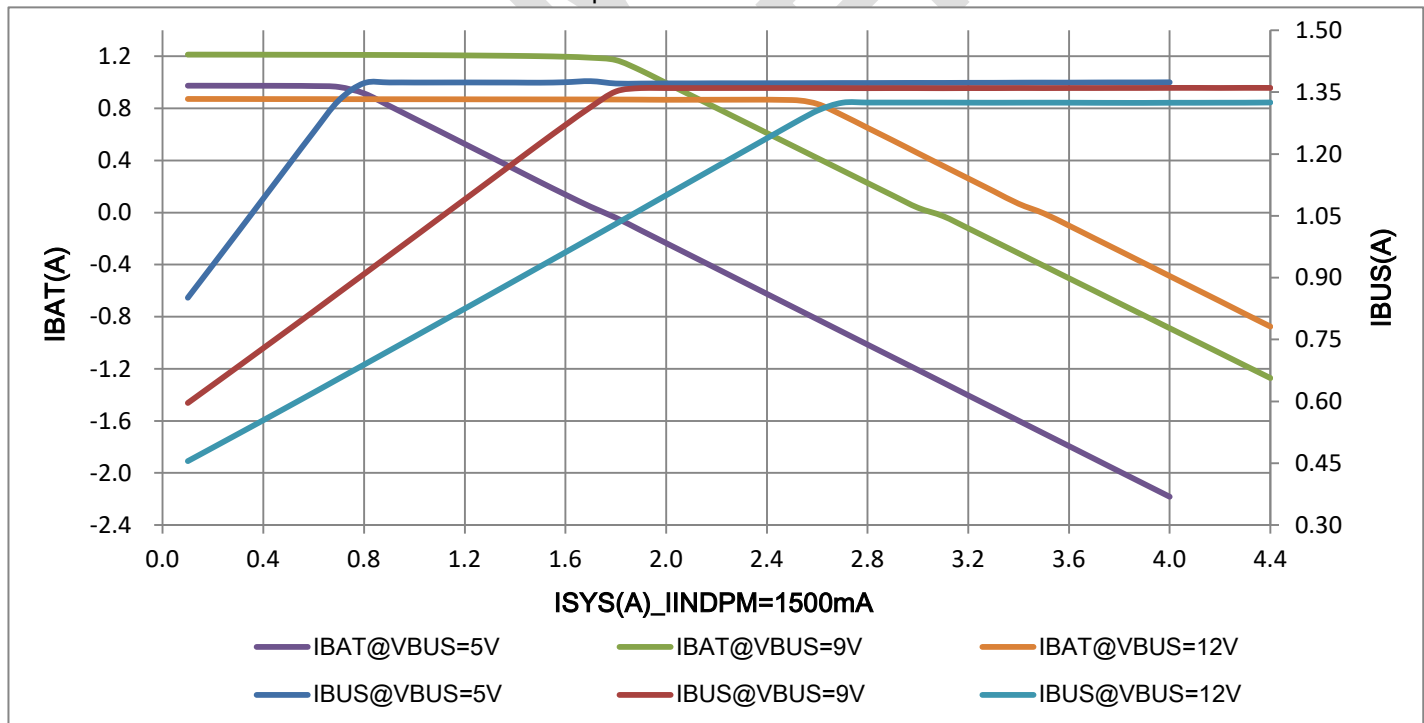


Chart7 Input current DPM at VBUS=12V

2.5 VINDPM and VDPM_BAT_TRACK function

Setup and conditions:

- Set VBUS to 5V/7V/9.5V/12.5V (900mA current limit) respectively.

- Set the VBAT to 3.7V, VINDPM to 3.9V, 4.4V, 6.4V, 8V, 11V, and increase the system load gradually until chip enter deep discharging state, and measure the input voltage.
- Set the VBAT to 4V, VINDPM to 3.9V and VDPM_BAT_TRACK to 200mV, 250mV, 300mV, and increase the system load gradually until chip enter deep discharging state, and measure the input voltage.

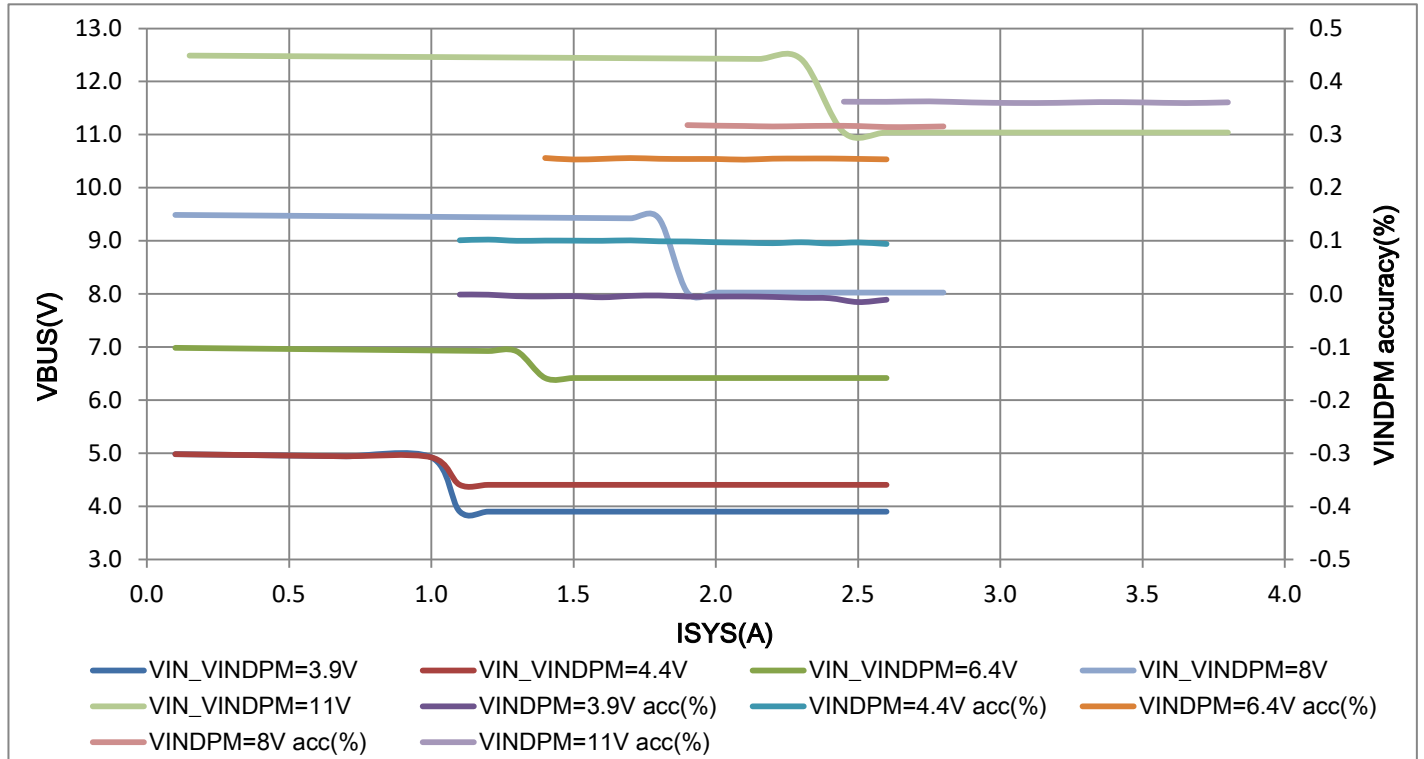


Chart8 VINDPM

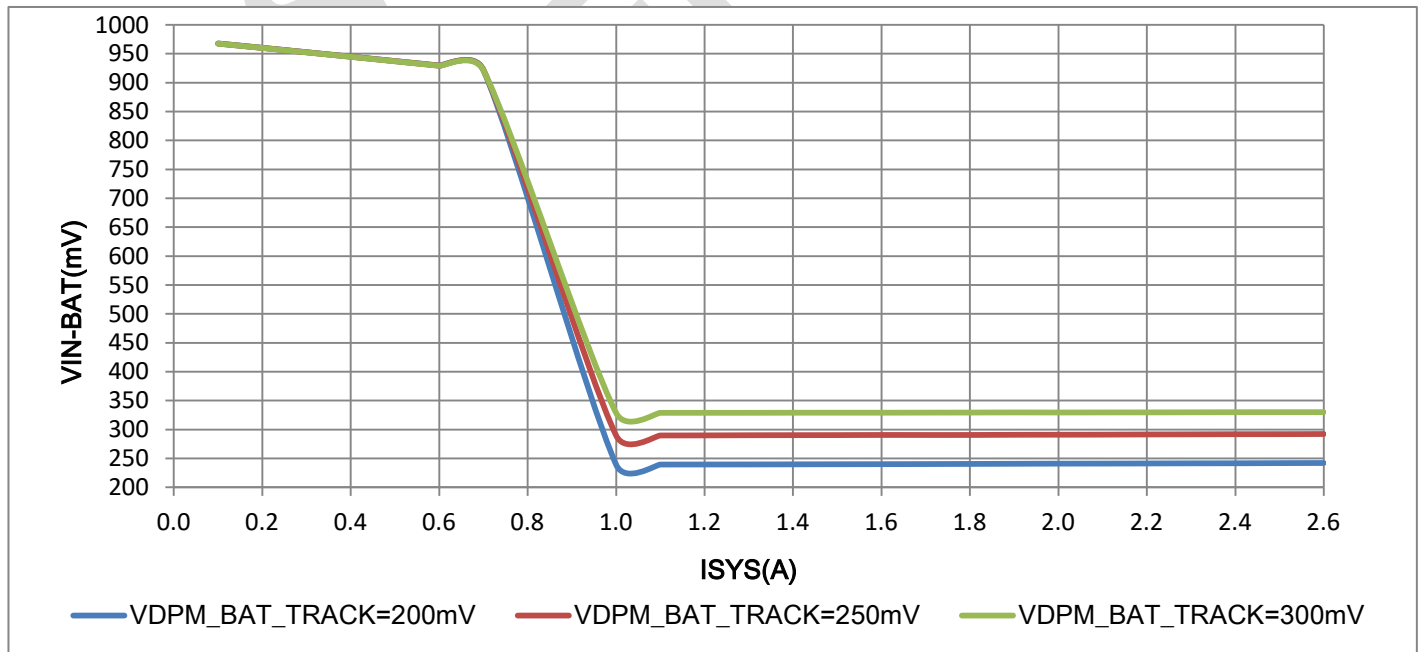


Chart9 VDPM_BAT_TRACK

2.6 Charging efficiency

Setup and conditions:

- Set the VBUS to 5V/9V/12V respectively.
- Measure the efficiency at 4V battery under different charging current.

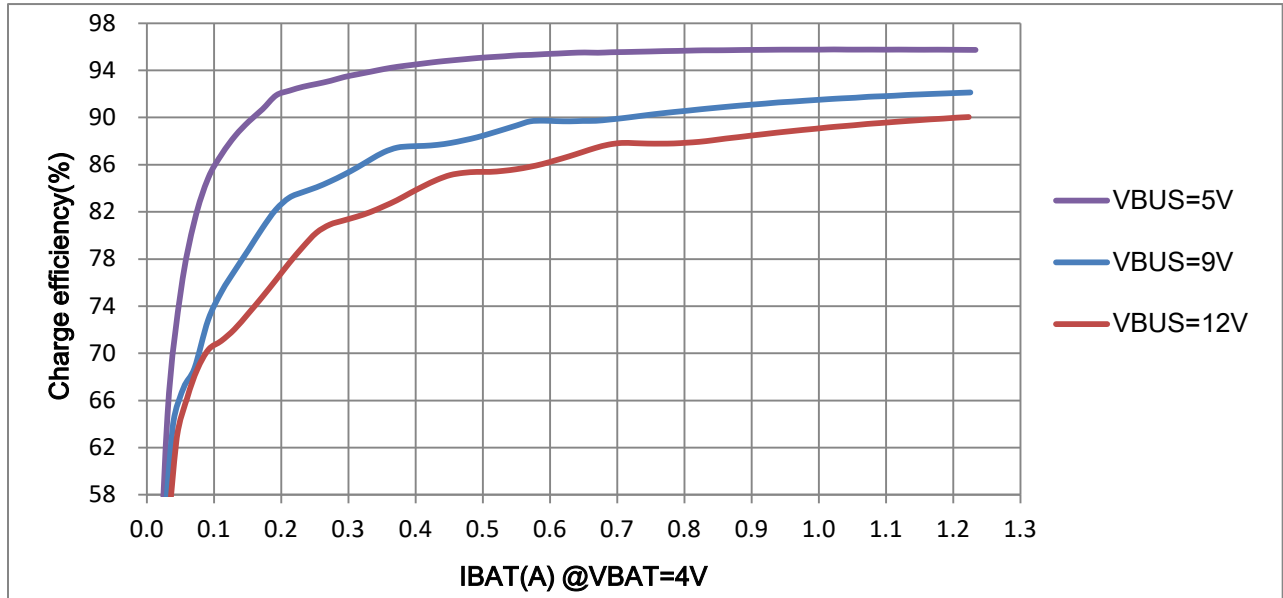


Chart10 Charging efficiency at VBAT=4V

2.7 OTG efficiency

Setup and conditions:

- Set the VBAT to 3.2V/3.8V/4.2V respectively.
- Measure the OTG efficiency for 5V PMID output.

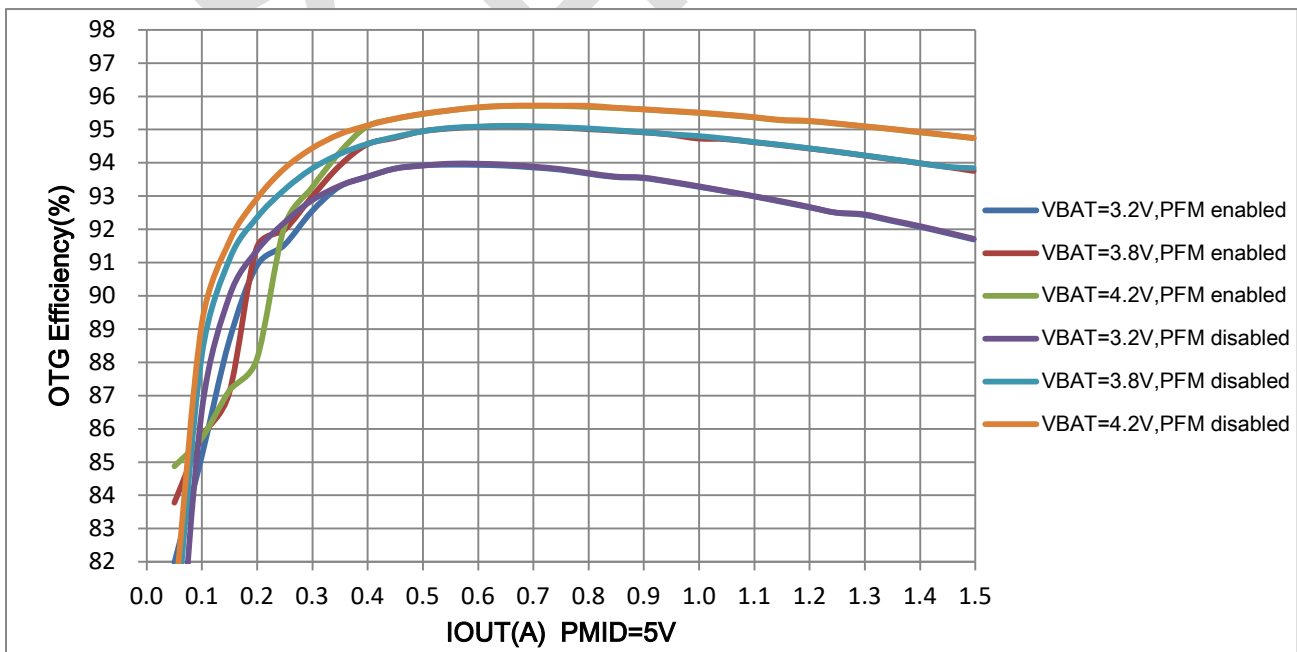


Chart11 OTG at PMID=5V

2.8 Steady state operation

2.8.1 Short charge & pre-charge

Setup and conditions:

- Set the VBUS to 5V/12V respectively.
- Sweep VBAT=0.1V->2.4V->0.1V with 10mV step, CV=4.624V, Ipre-charge & ICHG =260mA & 1260mA.

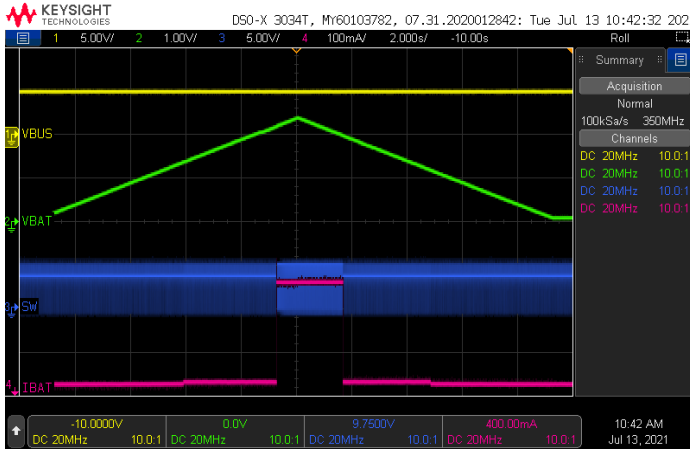


Figure1 VBUS=5V, Ipre-charge=260mA

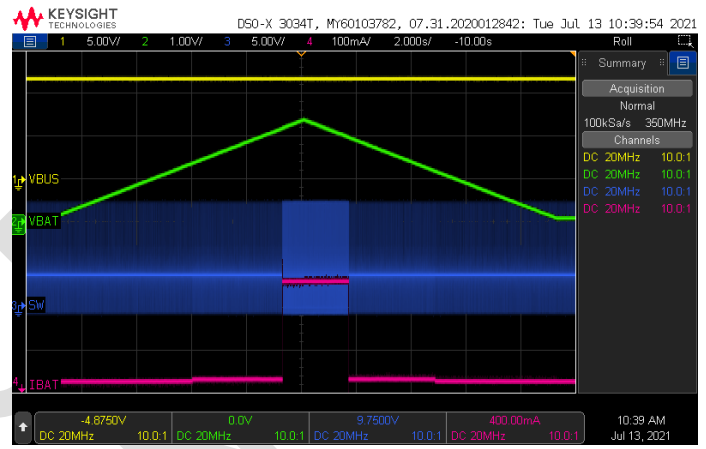


Figure2 VBUS=12V, Ipre-charge=260mA

2.8.2 Pre-charge & fast charge

Setup and conditions:

- Set the VBUS to 5V/12V respectively.
- Sweep VBAT=2.4V->4.55V->2.4V with 10mV step, CV=4.624V, Ipre-charge & ICHG = 260mA & 1260mA.

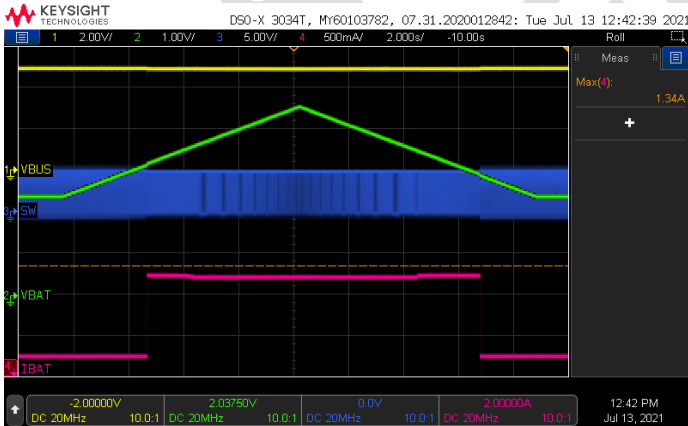


Figure3 VBUS=5V, Ipre-charge=260mA, ICHG=1260mA

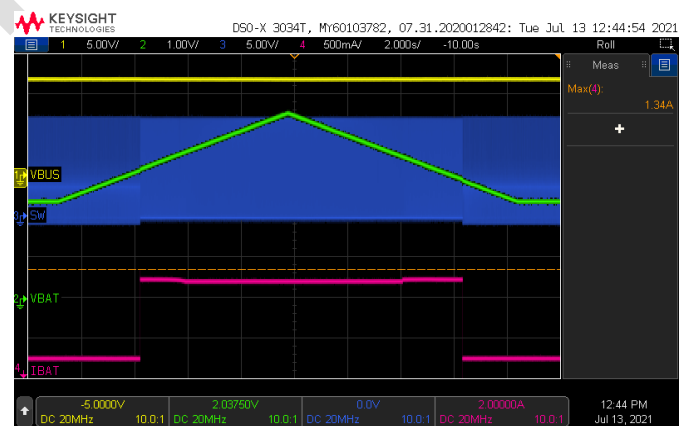


Figure4 VBUS=12V, Ipre-charge=260mA, ICHG=1260mA

2.8.3 CV mode

Setup and conditions:

- Set the VBUS to 5V/12V respectively.
- Sweep VBAT=4.1V->4.24V->4.1V, 4.2V->4.55V->4.2V, with 1mV step, CV=4.208V/4.496V, Ipre-charge & ICHG =20mA & 1260mA, Iterm=20mA.

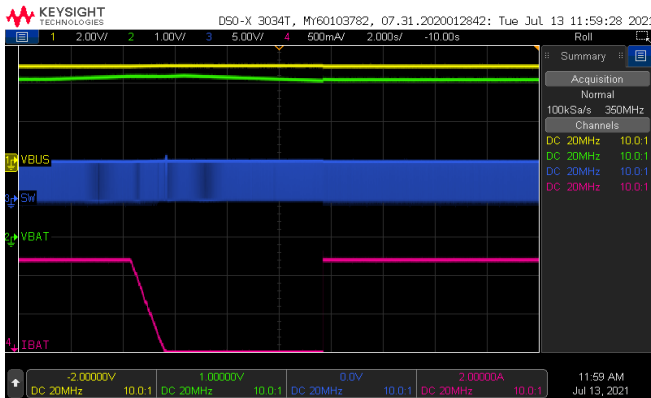


Figure5 VBUS=5V, CV=4.208V

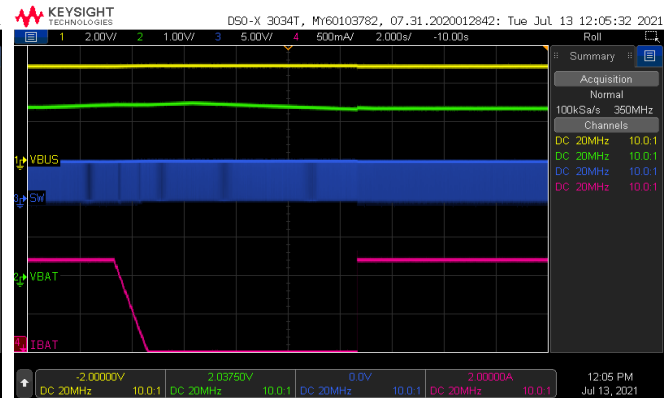


Figure6 VBUS=5V, CV=4.496V

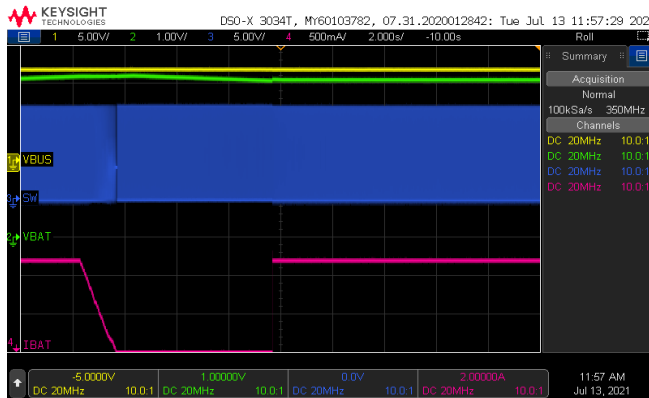


Figure7 VBUS=12V, CV=4.208V

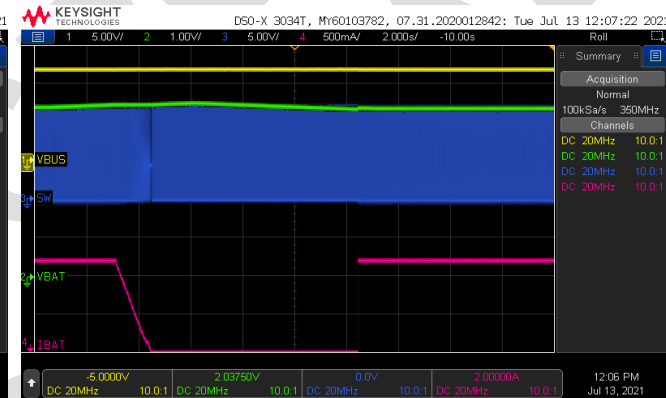


Figure8 VBUS=12V, CV=4.496V

2.8.4 IINDPM

Setup and conditions:

- Set the VBUS to 5V/12V respectively.
- Set VBAT=3.8V, SYS_MIN=3.5V, CV=4.208V, ICHG =1260mA, IINDPM to 100mA/500mA, capture the related waveforms.

VBUS=5V

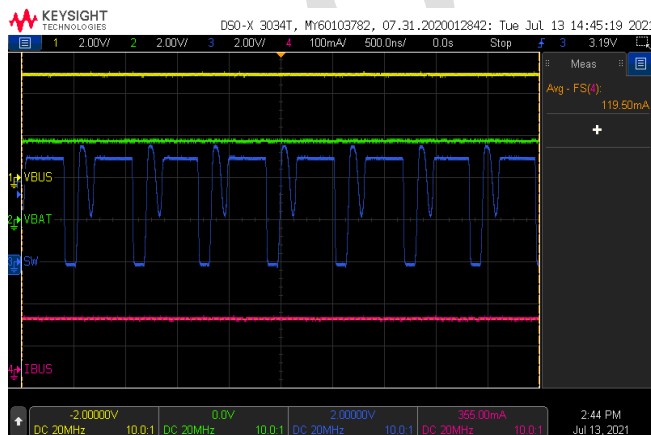


Figure9 IINDPM=100mA, VBAT=3.8V

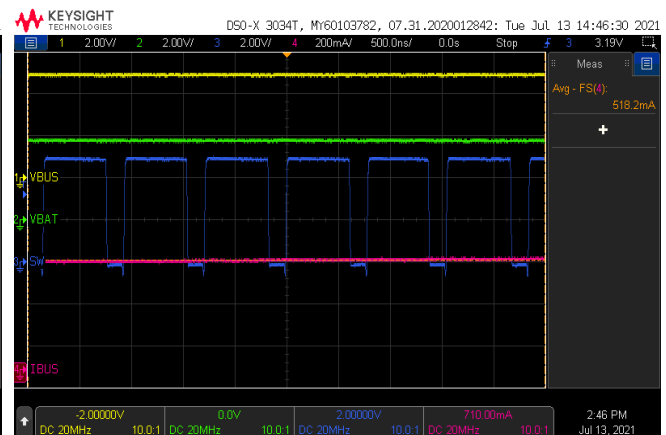


Figure10 IINDPM=500mA, VBAT=3.8V

VBUS=12V

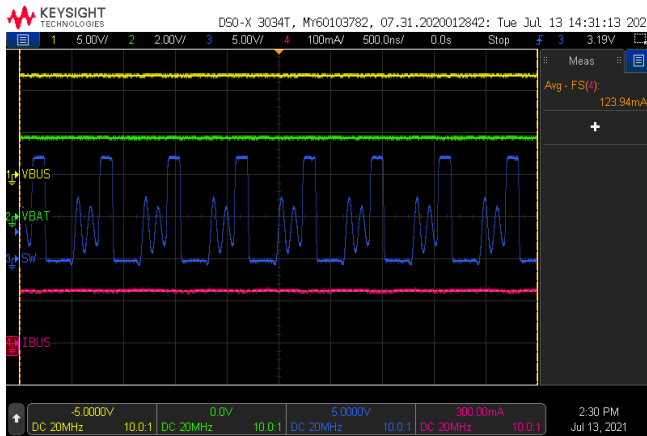


Figure11 IINDPM=100mA,VBAT=3.8V

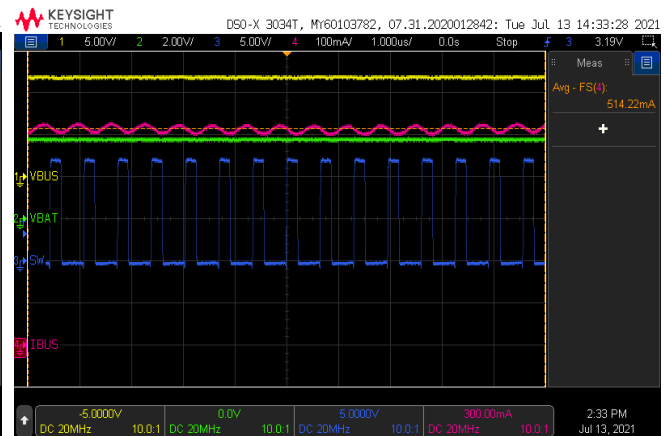


Figure12 IINDPM=500mA,VBAT=3.8V

2.8.5 VINDPM

Setup and conditions:

- Set the VBUS to 5V-500mA/12V-500mA.
- Set VBAT=3.8V, SYS_MIN=3.5V, CV=4.208V, ICHG =1260mA, IINDPM to 3200mA, VINDPM=4.4V/11V, capture the related waveforms.
- Set the VBUS to 5V-500mA.
- Set VBAT=3.9V, SYS_MIN=3.5V, CV=4.208V, ICHG =1260mA, IINDPM to 3200mA, VINDPM=3.9V, VTRACK to 200mV/300mV respectively, capture the related waveforms.

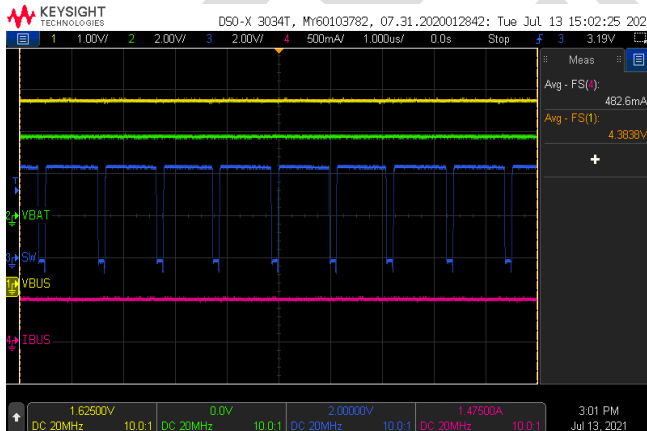


Figure13 VINDPM=4.4V,VBAT=3.8V

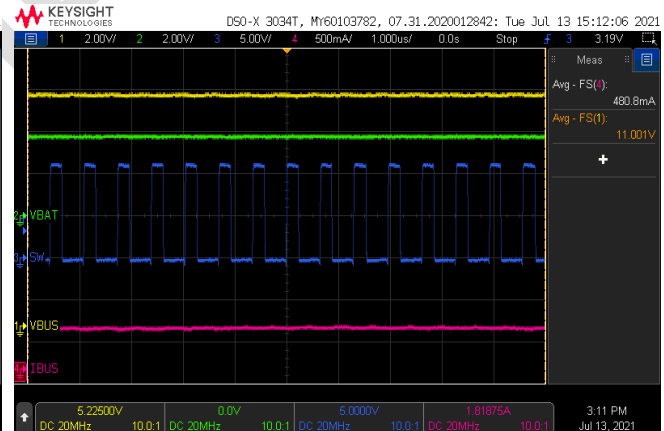


Figure14 VINDPM=11V,VBAT=3.8V,ISYS=1A

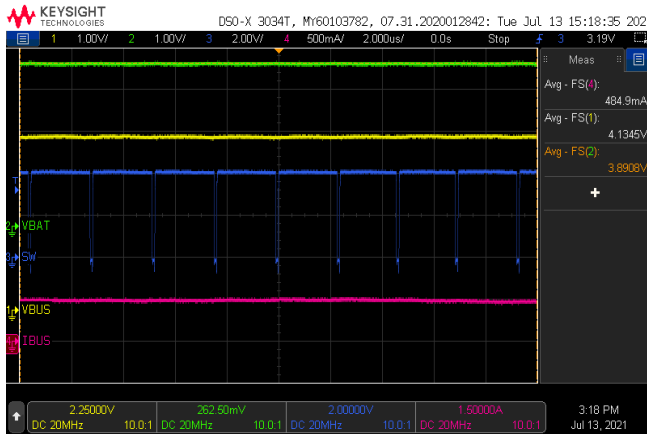


Figure15 VTRACK=200mV

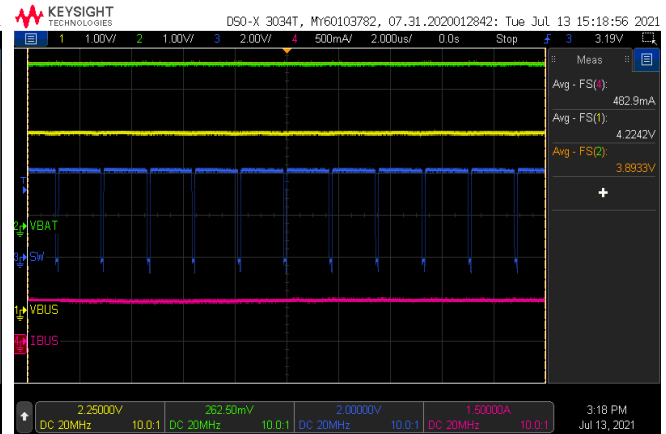


Figure16 VTRACK=300mV

2.8.6 OTG

Setup and conditions:

- Set the VBAT to 4.2V.
- Set MIN_BAT_SEL bit=1, BST_CONFIG bit=1, PMID out to 4.85V/5.3V respectively, IOUT (PMID) =0A/1.5A.
- Capture the related waveforms.

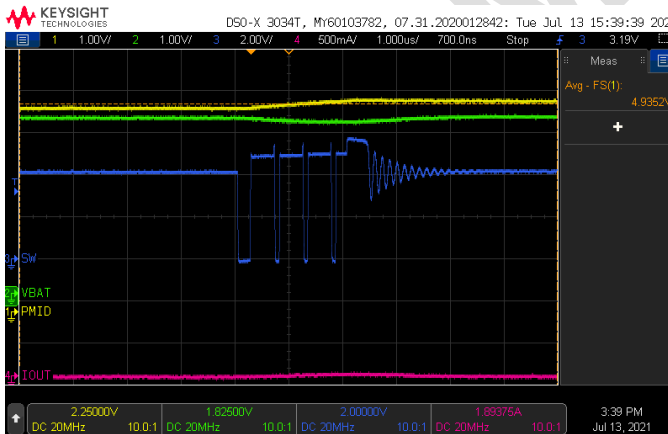


Figure17 VBAT=4.2V, PMID=4.85V, no load
PFM enabled

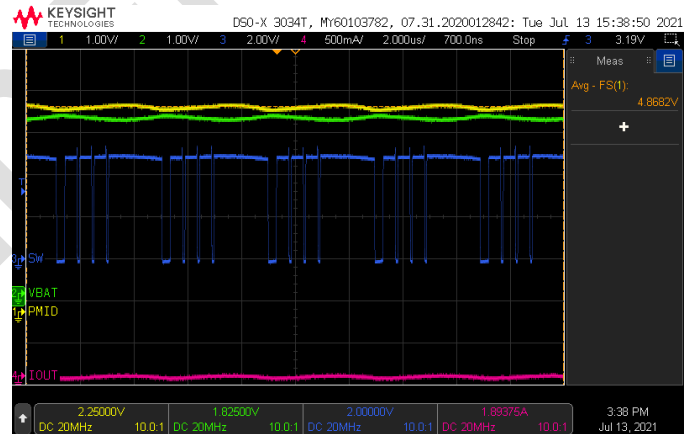


Figure18 VBAT=4.2V, PMID=4.85V, no load
PFM disabled

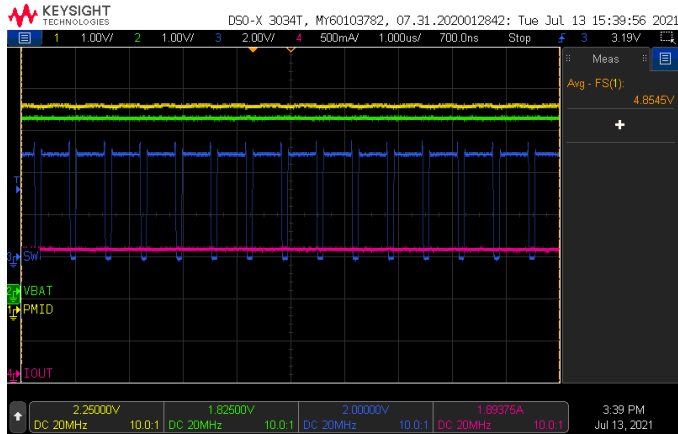


Figure19 VBAT=4.2V,PMID=4.85V, 1.5A load
PFM enabled

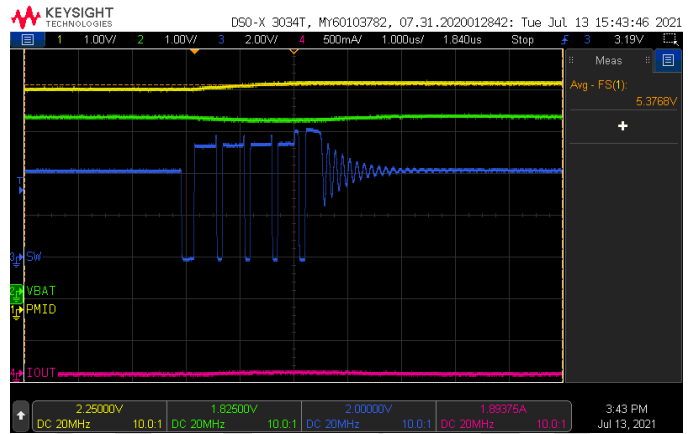


Figure20 VBAT=4.2V,PMID=5.3V, no load
PFM enabled

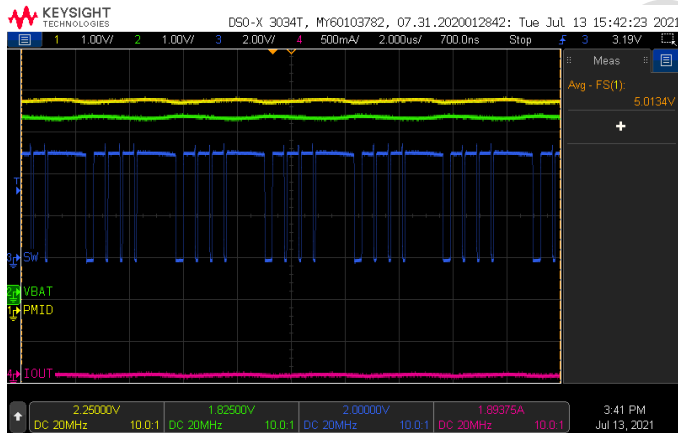


Figure21 VBAT=4.2V,PMID=5.3V, no load
PFM disabled

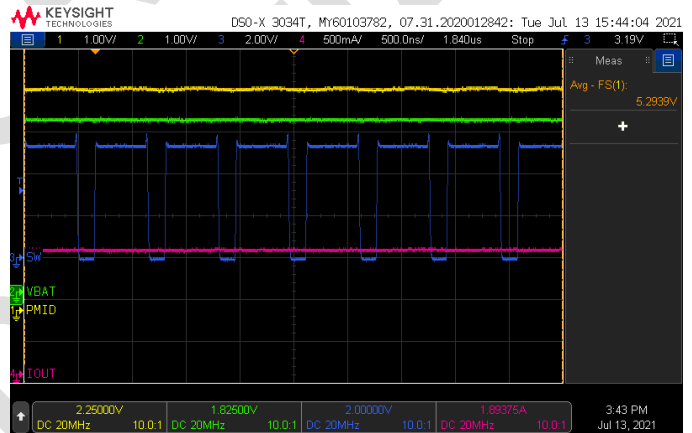


Figure22 VBAT=4.2V,PMID=5.3V, 1.5A load
PFM enabled

2.8.7 OTG start-up and dynamic load

A. OTG start-up

Setup and conditions:

- Set VBAT=3V, PMID=5V, MIN_BAT_SEL bit=1, load for PMID: 0A/1A.
- Set BST_CONFIG bit=1 to capture the start-up waveforms

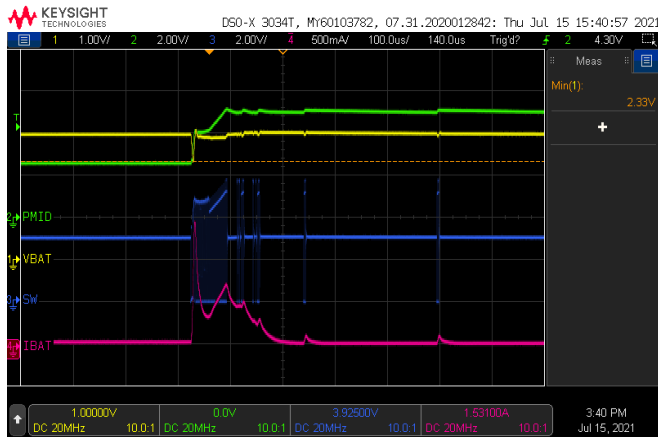


Figure23 PMID=5V,VBAT=3V, PFM enabled

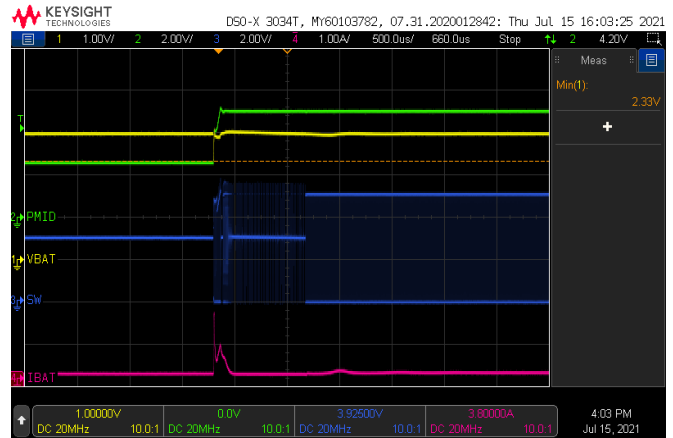


Figure24 PMID=5V,VBAT=3V, PFM disabled

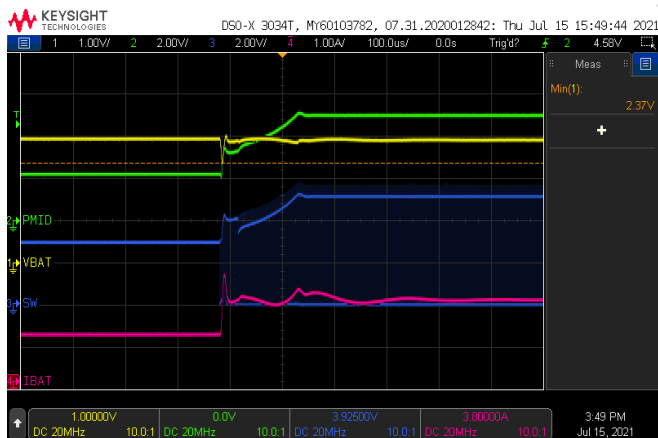


Figure25 PMID=5V,VBAT=3V, load for PMID:1A

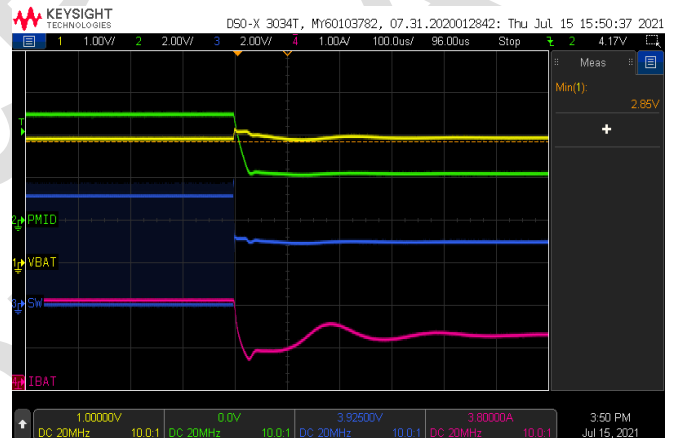


Figure26 PMID=5V,VBAT=3V, shutdown

B. Dynamic load

- Set VBAT=4.2V, MIN_BAT_SEL bit=1, load for PMID: 0A/1A.
- In OTG mode, set PMID=5V, load for PMID:0->1.5A->0(TH=TL=5ms, SR=10A/us),

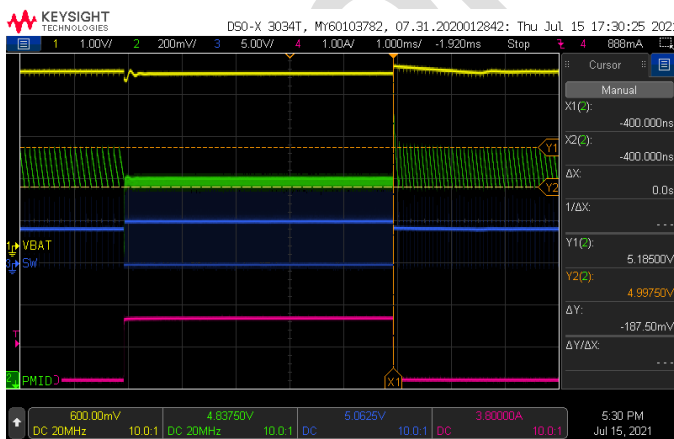


Figure27 PMID=5V,VBAT=4.2V, PFM enabled

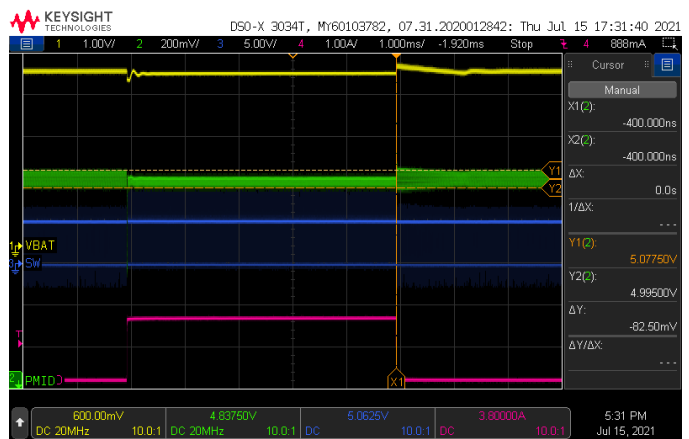


Figure28 PMID=5V,VBAT=4.2V, PFM disabled

2.8.8 System dynamic load with battery

Setup and conditions:

- Set VBAT=3.7V, VBUS to 5V.
- Set different IINDPM and charging current, dynamic system load: 0TH=TL=5ms, SR=10A/us.

VBUS=5V

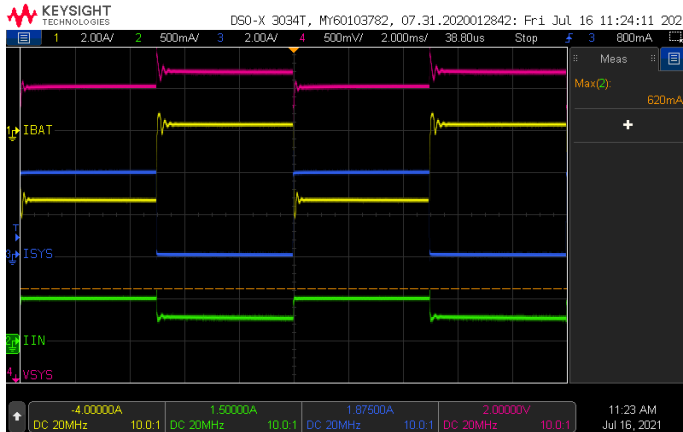


Figure29 VBAT=3.7V

IINDPM=500mA, ICHG=340mA, ISYS:0A->4A->0A

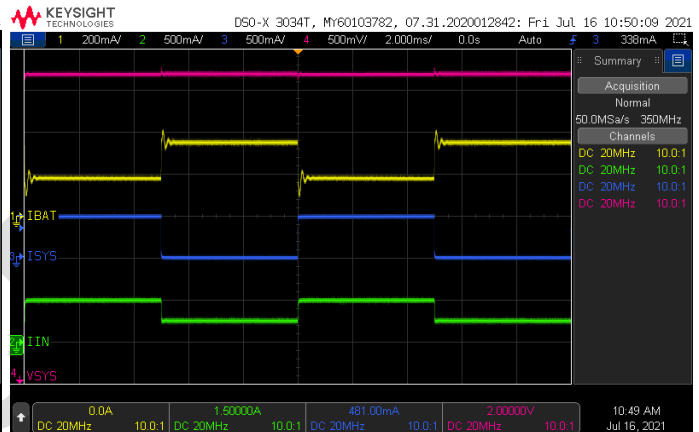


Figure30 VBAT=3.7V

IINDPM=500mA, ICHG=340mA, ISYS:0A->500mA->0A

2.9 Reliability test

2.9.1 Short test

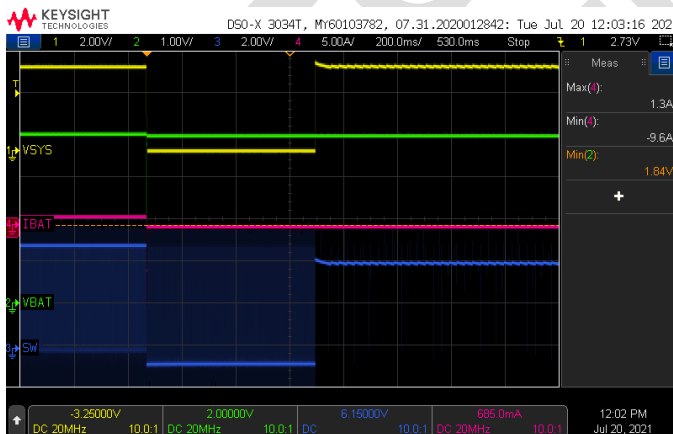


Figure31 Short the VSYS, VBUS=5V, IINDPM=3.2A, ICHG=1.26A, VBAT=4V

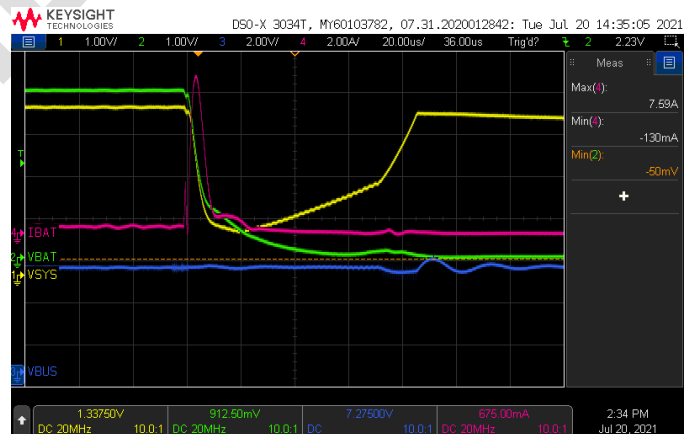


Figure32 Short the battery, VBUS=5V, VBAT=4V, ICHG=1260mA, IINDPM=3.2A

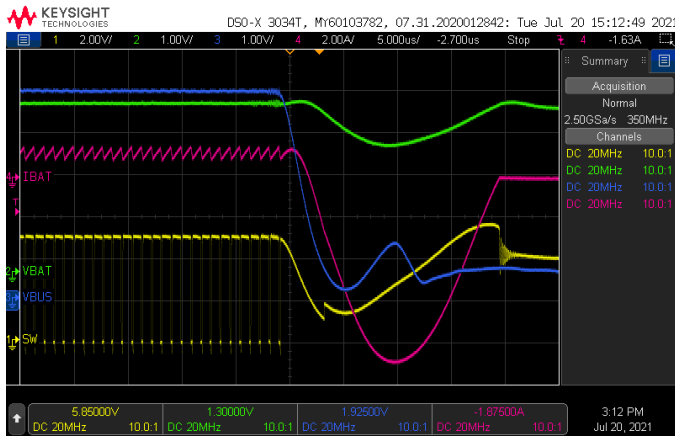


Figure33 Short VBUS, VBUS=5V, ICHG=1260mA,VBAT=4V

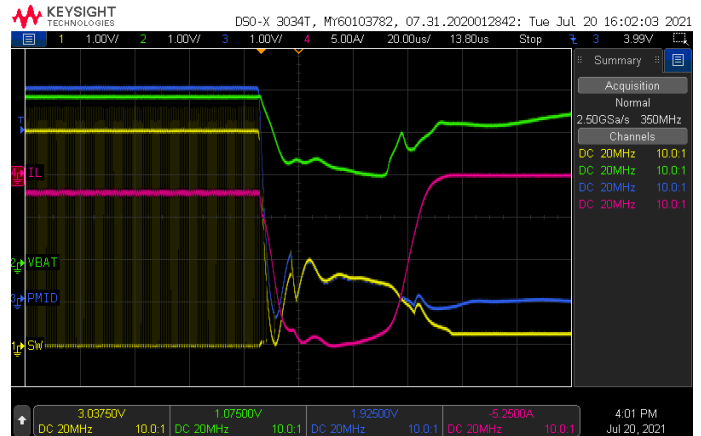


Figure34 Short PMID, VBAT=4V, OTG, PMID load=1.5A

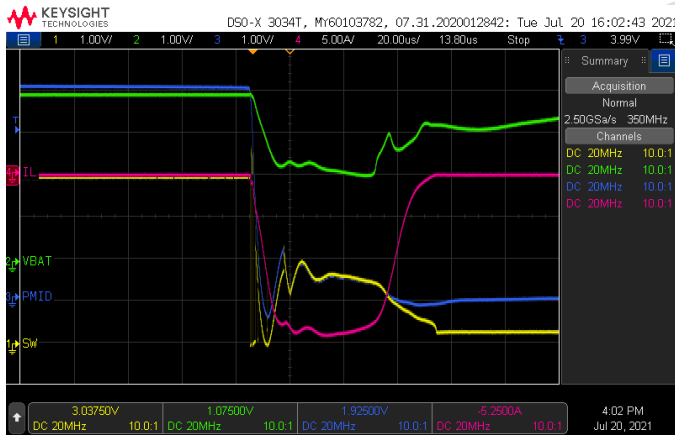


Figure35 Short PMID, VBAT=4V, OTG, PMID load=0A

2.9.2 OVP

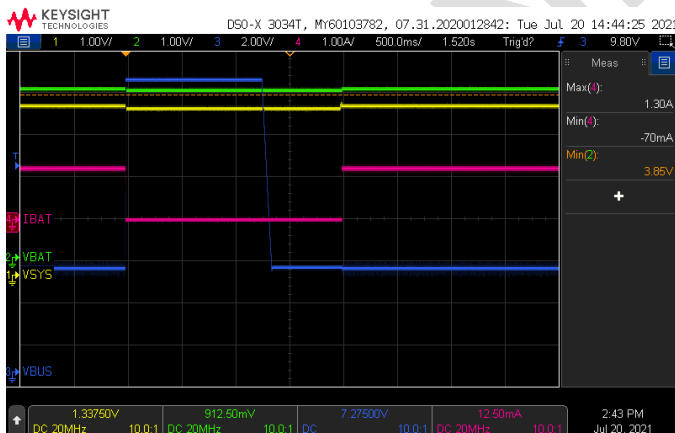


Figure36 VBUS OVP, VBUS OVP=5.5V VBUS:5V->12V

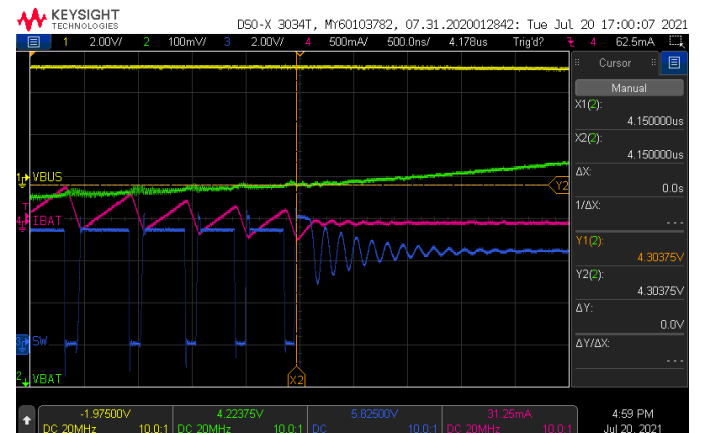


Figure37 VBAT OVP, VBUS=5V, ICHG=1260mA, VBAT: 4V->4.5V, CH4-IL

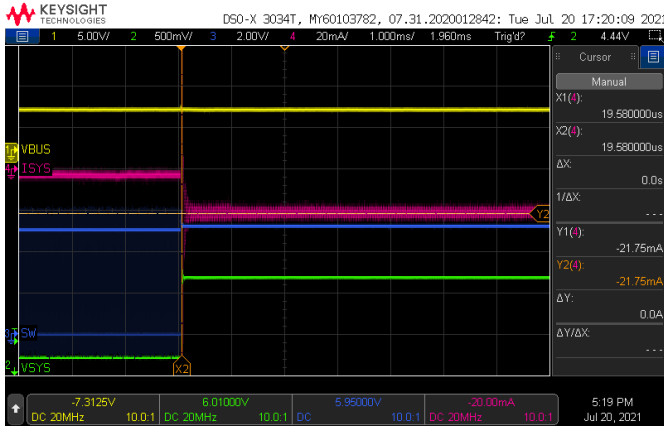


Figure38 VSYS OVP, VBUS=5V, charge disabled, VSYS: 4V->5V

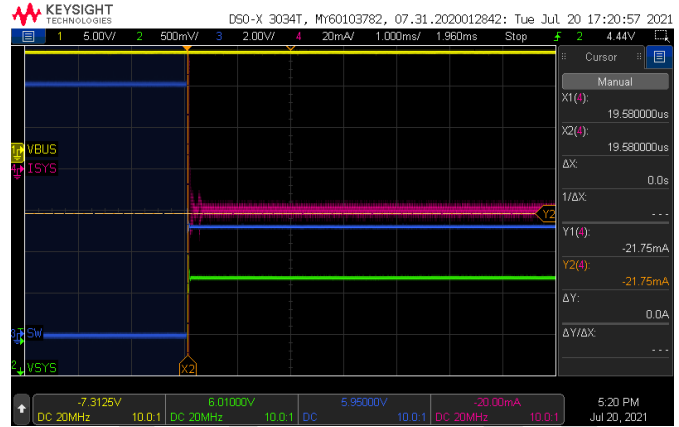


Figure39 VSYS OVP, VBUS=12V, charge disabled, VSYS: 4V->5V

2.9.3 System OCP

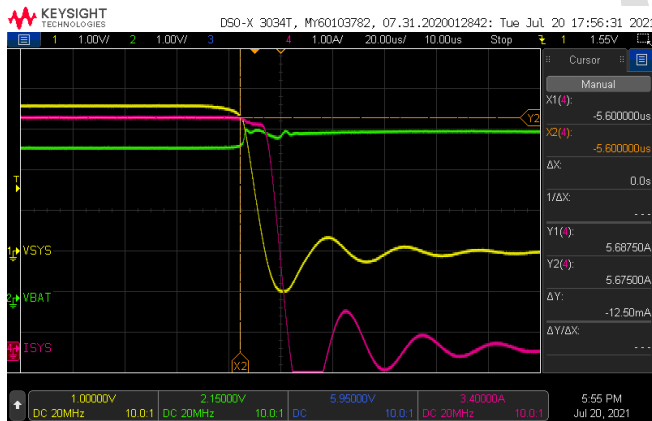


Figure40 system OCP, VBAT=4V, no VBUS, increase the ISYS slowly to capture the OCP point.

2.9.4 Thermal shutdown

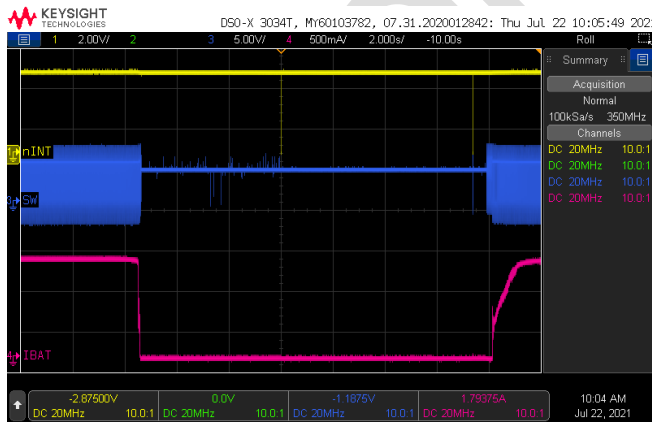


Figure41 Thermal shutdown, VBAT=4V, IINDPM=3.2A, VBUS=5V, ICHG=1260mA, heat the chip

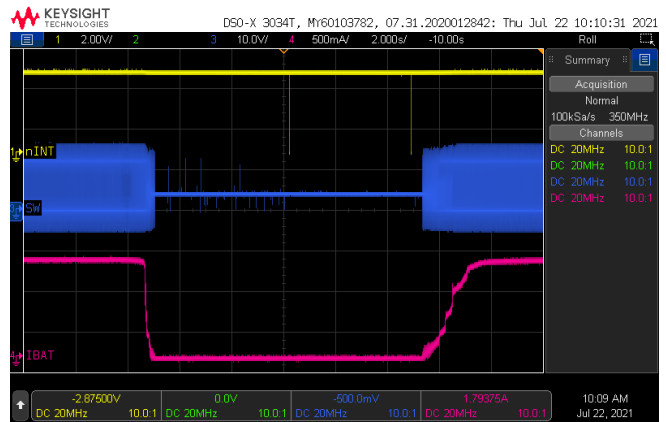


Figure42 Thermal shutdown, VBAT=4V, IINDPM=3.2A, VBUS=12V, ICHG=1260mA, heat the chip