Texas Instruments

PMP11536 Test Report

Asia Power Design Service

1 General

1.1 PURPOSE

Provide the detailed data for evaluating and verifying the PMP11536.
PMP11536 is a power bank reference design within one Micro B port supporting fast charger input and two output ports. One is a USB type C port supporting 5V/3A output and another one is a USB type A port supporting 5V/2A output.

The valid input voltage can be up to 12V according to the charging protocol. The output voltage of type C port is fixed at 5.1V, as well as the type A port. The rated charging current is 3A and the rated output current for type C port and type A port are 3A and 2A respectively.

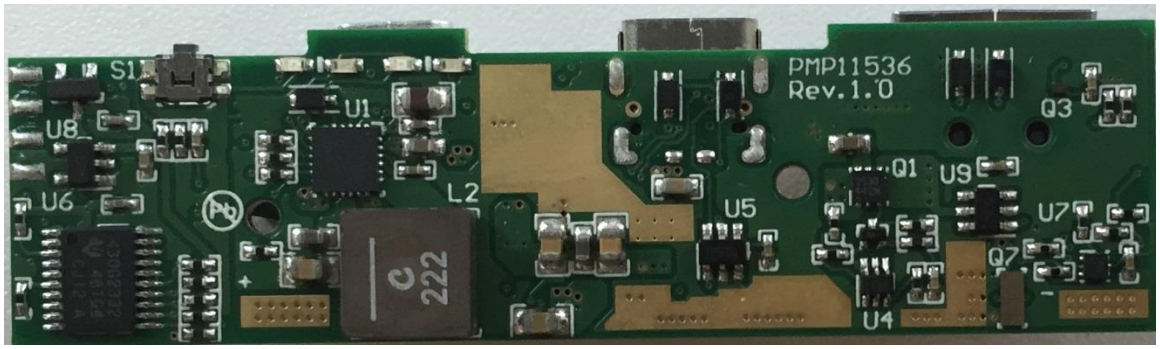
1.2 REFERENCE DOCUMENTATION

PMP11536_Schematic.pdf
PMP11536_Layout.zip
PMP11536_BOM.pdf

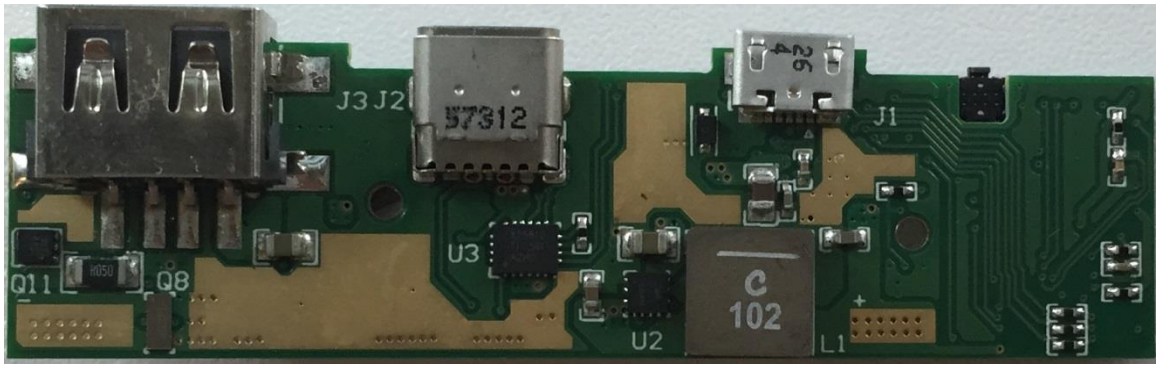
1.3 TEST EQUIPMENTS

Multi-meter: FLUKE 17B
DC Source: Chroma 62024P-100-50
Electronic Load: Chroma 63103A
Oscillation: Tektronix DPO3054
Infrared Thermometer: FLUKE Ti9

1.4 PHOTOS



Top View



Bottom View

2 INPUT AND OUTPUT CHARACTERISTICS

2.1 STANDBY CURRENT

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
I_{STD}	Standby current	VBAT=3.5V, All ports unattached		790		uA

2.2 EFFICIENCY

12Vin Charging & VBAT=3.2V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
12.096	0.0427	3.194	0.0656	40.57%
12.083	0.1763	3.2009	0.4453	66.91%
12.065	0.3436	3.2098	0.9525	73.75%
12.044	0.5143	3.2189	1.4719	76.49%
12.024	0.6863	3.2278	1.9791	77.41%
12.008	0.86	3.2369	2.4872	77.96%
11.99	1.0164	3.2447	2.9241	77.85%

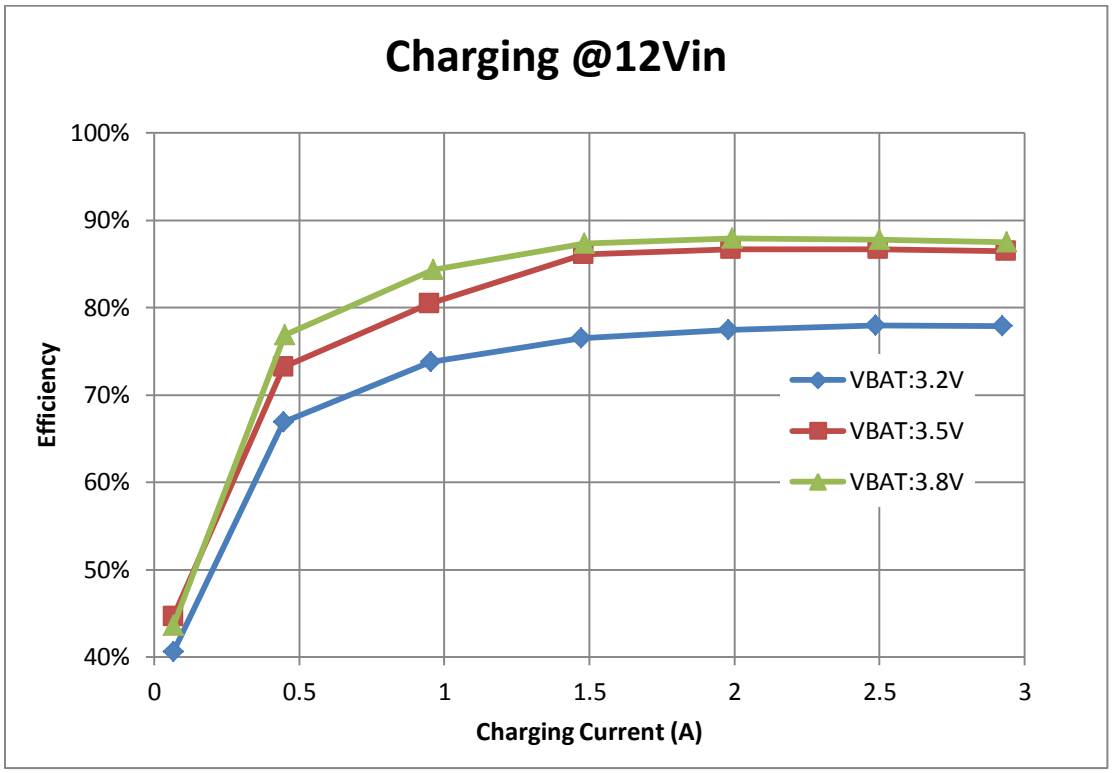
12Vin Charging & VBAT=3.5V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
12.097	0.0424	3.4876	0.0656	44.61%
12.083	0.176	3.4944	0.4453	73.17%
12.063	0.3424	3.5034	0.9488	80.48%
12.045	0.5017	3.5127	1.4813	86.11%
12.03	0.6715	3.5216	1.9875	86.64%
12.009	0.8463	3.5307	2.4956	86.70%
11.992	1.0024	3.5385	2.9363	86.43%

12Vin Charging & VBAT=3.8V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
12.098	0.0473	3.8005	0.0656	43.57%
12.086	0.1845	3.8075	0.45	76.84%

12.07	0.3608	3.8165	0.9619	84.30%
12.053	0.539	3.8257	1.4831	87.34%
12.037	0.722	3.8347	1.9922	87.90%
12.021	0.9013	3.8043	2.4994	87.76%
12.005	1.0667	3.8121	2.9381	87.46%



9Vin Charging & VBAT=3.2V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
9.095	0.0454	3.194	0.0666	51.52%
9.072	0.219	3.2008	0.4453	71.74%
9.044	0.4377	3.2097	0.9534	77.30%
9.014	0.6645	3.2188	1.4728	79.15%
8.981	0.893	3.2278	1.9809	79.72%
8.929	1.1303	3.2368	2.4853	79.71%
8.874	1.3413	3.2445	2.9269	79.78%

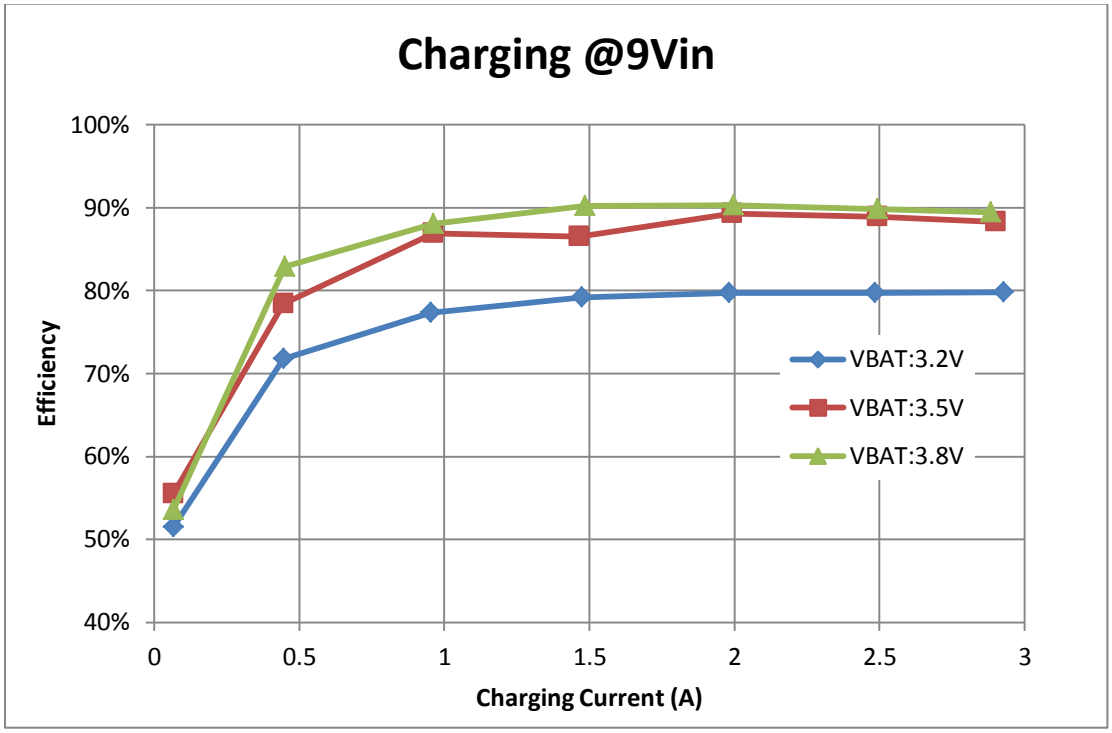
9Vin Charging & VBAT=3.5V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
9.095	0.0453	3.4875	0.0656	55.53%
9.072	0.2187	3.4944	0.4453	78.43%
9.045	0.429	3.5035	0.9628	86.93%

8.994	0.661	3.5124	1.4644	86.52%
8.973	0.875	3.5215	1.9913	89.31%
8.935	1.108	3.5304	2.4928	88.89%
8.871	1.31	3.5377	2.9006	88.30%

9Vin Charging & VBAT=3.8V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
9.097	0.05	3.8004	0.0666	55.65%
9.081	0.2276	3.8074	0.45	82.90%
9.06	0.4604	3.8165	0.9628	88.09%
9.038	0.697	3.8258	1.485	90.19%
9.016	0.9401	3.8347	1.9959	90.30%
8.994	1.1855	3.8436	2.4928	89.86%
8.976	1.3832	3.8505	2.8838	89.44%



5Vin Charging & VBAT=3.2V

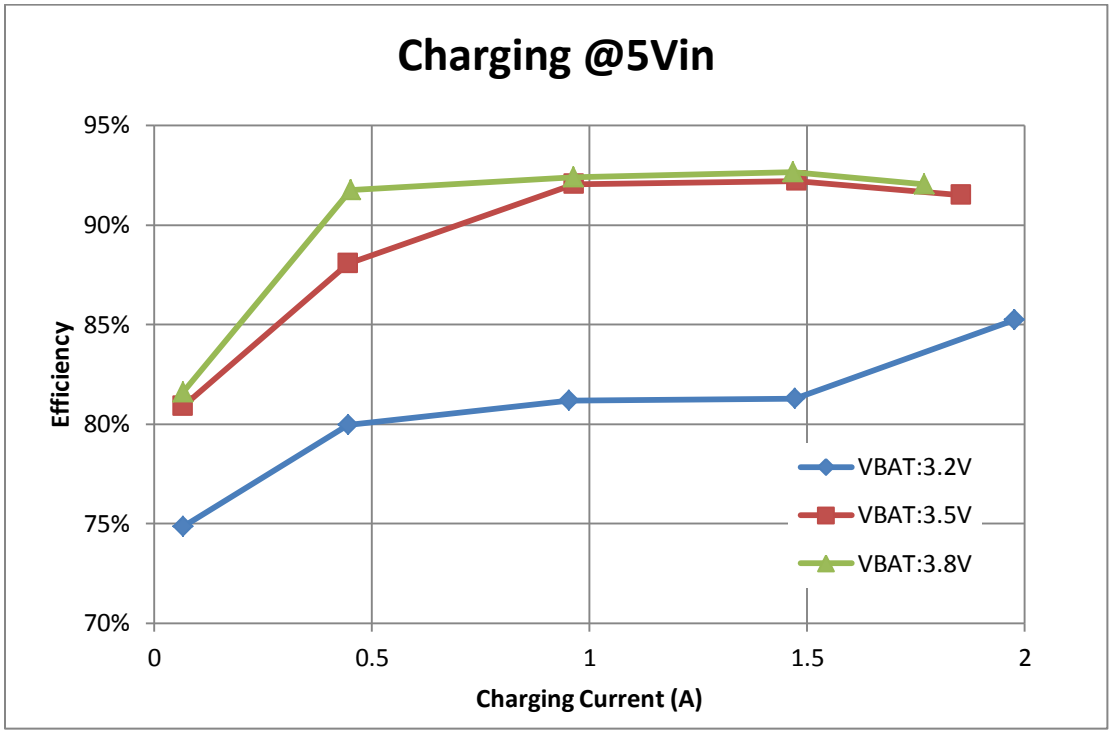
V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
5.0864	0.0547	3.1743	0.0656	74.84%
5.0477	0.351	3.1811	0.4453	79.95%
4.9956	0.75	3.19	0.9534	81.17%
4.9395	1.1730	3.1992	1.4719	81.27%
4.894	1.5206	3.208	1.9772	85.23%

5Vin Charging & VBAT=3.5V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
5.0868	0.0556	3.4876	0.0656	80.89%
5.0481	0.35	3.4944	0.4453	88.07%
4.9984	0.7347	3.5035	0.9647	92.04%
4.9448	1.1374	3.5125	1.4765	92.21%
4.9017	1.4556	3.5191	1.8553	91.51%

5Vin Charging & VBAT=3.8V

V_{in}(V)	I_{in}(A)	V_{BAT}(V)	I_{BAT}(A)	EFF.(%)
5.0859	0.061	3.8007	0.0666	81.59%
5.0455	0.367	3.7682	0.4509	91.76%
4.9902	0.7895	3.7772	0.9638	92.40%
4.933	1.2153	3.786	1.4672	92.66%
4.896	1.4891	3.7913	1.77	92.04%



Type C DFP@ VBAT=3.2V

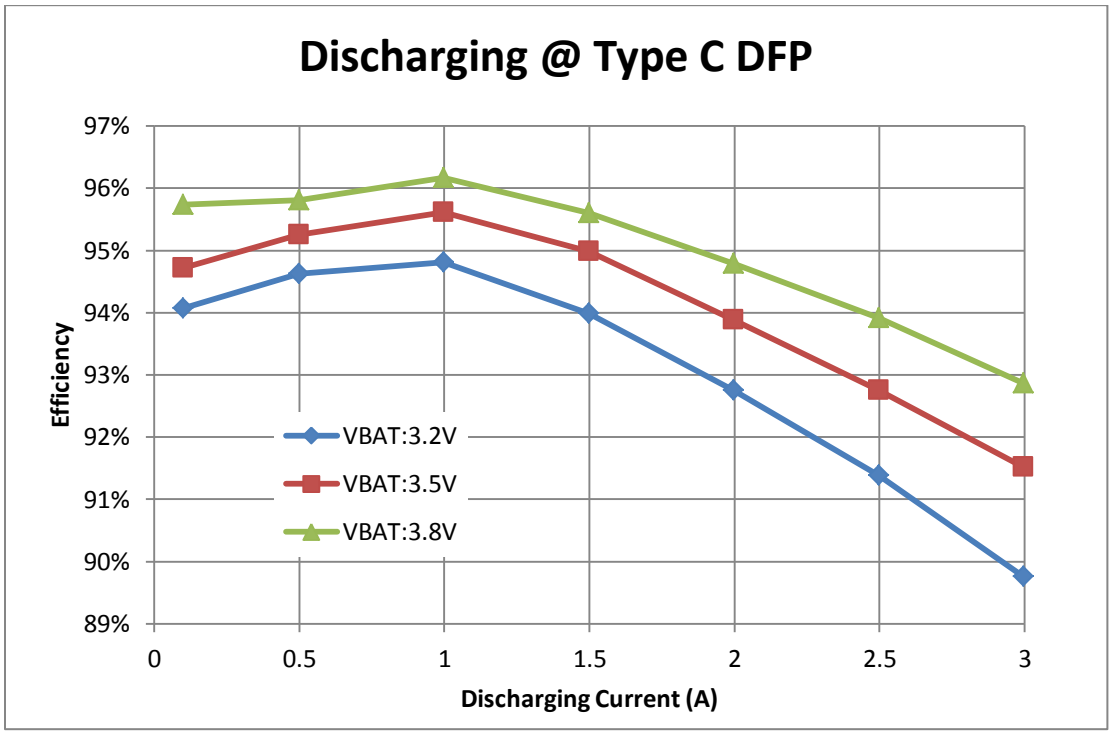
V_{BAT}(V)	I_{BAT}(A)	V_o(V)	I_o(A)	EFF.(%)
3.2055	0.1686	5.1875	0.098	94.07%
3.2057	0.845	5.1461	0.4981	94.63%
3.2045	1.6837	5.127	0.9977	94.81%
3.2038	2.5407	5.1079	1.4977	93.98%
3.2005	3.4223	5.0881	1.9967	92.75%
3.2072	4.3165	5.0672	2.4967	91.39%
3.2005	5.2616	5.0442	2.9966	89.76%

Type C DFP@ VBAT=3.5V

V_{BAT}(V)	I_{BAT}(A)	V_o(V)	I_o(A)	EFF.(%)
3.5062	0.1532	5.1915	0.098	94.72%
3.5087	0.7674	5.147	0.4983	95.25%
3.5046	1.527	5.1282	0.9978	95.62%
3.5077	2.2967	5.1093	1.4977	94.99%
3.5015	3.0917	5.0897	1.9968	93.88%
3.5016	3.897	5.069	2.497	92.76%
3.5028	4.7181	5.0474	2.9966	91.52%

Type C DFP@ VBAT=3.8V

V_{BAT}(V)	I_{BAT}(A)	V_o(V)	I_o(A)	EFF.(%)
3.7978	0.14	5.1943	0.098	95.74%
3.8033	0.704	5.1479	0.4983	95.80%
3.8013	1.4	5.1295	0.9977	96.16%
3.8006	2.1066	5.1108	1.4977	95.60%
3.8065	2.8178	5.0917	1.9969	94.79%
3.8039	3.545	5.0718	2.497	93.92%
3.8086	4.279	5.0507	2.9966	92.87%



Type A Discharging @5Vo & VBAT=3.2V

V_{BAT}(V)	I_{BAT}(A)	V_o(V)	I_o(A)	EFF.(%)

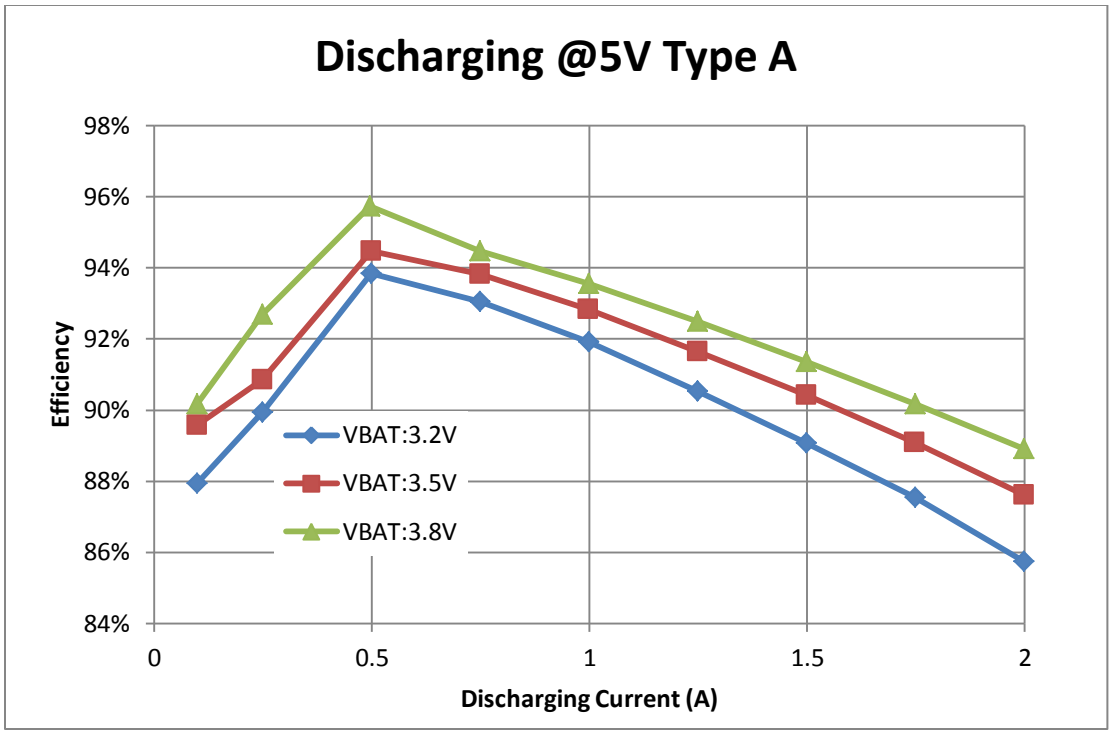
3.2055	0.1783	5.1083	0.0984	87.95%
3.2017	0.4383	5.0813	0.2484	89.94%
3.2078	0.8415	5.0782	0.4988	93.84%
3.2019	1.2698	5.0509	0.7491	93.06%
3.207	1.7008	5.0236	0.998	91.92%
3.2015	2.1514	4.9956	1.2483	90.54%
3.2053	2.6074	4.967	1.4988	89.08%
3.2082	3.0735	4.9377	1.7482	87.54%
3.1983	3.5761	4.9071	1.9985	85.74%

Type A Discharging @5Vo & VBAT=3.5V

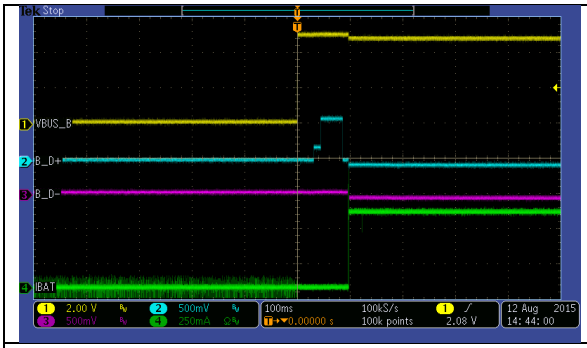
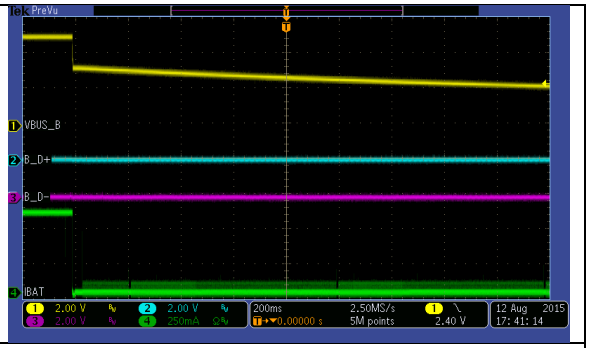
V_{BAT}(V)	I_{BAT}(A)	V_o(V)	I_o(A)	EFF.(%)
3.506	0.16	5.1064	0.0984	89.57%
3.5018	0.397	5.0853	0.2484	90.86%
3.5012	0.7658	5.0781	0.4988	94.47%
3.4992	1.1525	5.0509	0.7491	93.82%
3.5068	1.54	5.0238	0.9979	92.83%
3.5025	1.9428	4.9959	1.2482	91.64%
3.5094	2.3464	4.9676	1.4989	90.42%
3.506	2.764	4.9387	1.7481	89.09%
3.5014	3.1976	4.9085	1.9986	87.62%

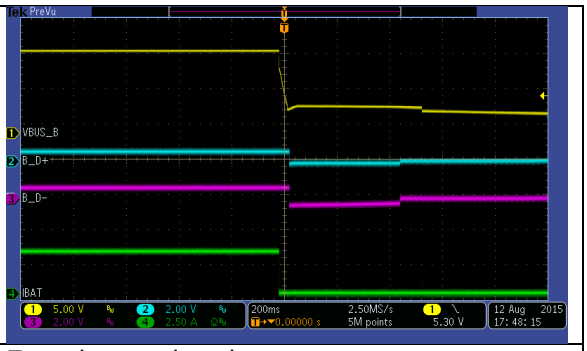
Type A Discharging @5Vo & VBAT=3.8V

V_{BAT}(V)	I_{BAT}(A)	V_o(V)	I_o(A)	EFF.(%)
3.807	0.1472	5.13	0.0985	90.17%
3.7947	0.3588	5.0806	0.2484	92.69%
3.8047	0.6903	5.0798	0.495	95.74%
3.805	1.0526	5.0509	0.7491	94.47%
3.8037	1.4088	5.0237	0.998	93.56%
3.8034	1.7725	4.9957	1.2483	92.50%
3.8027	2.143	4.9675	1.4989	91.37%
3.7998	2.5198	4.9387	1.7482	90.17%
3.8075	2.898	4.9088	1.9986	88.91%



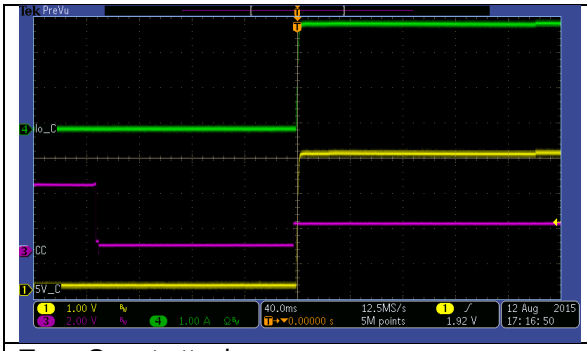
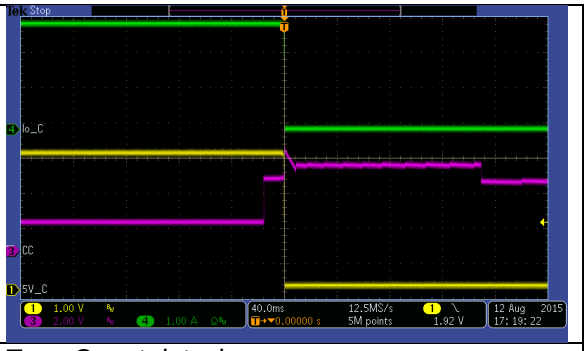
2.3 INPUT DETECTION

	
Default USB2.0 port attach CH1: VBUS Voltage of Micro B 2V/Div CH2: D+ of Micro B 0.5V/Div CH3: D- of Micro B 0.5V/Div CH4: Battery Current 0.25A/Div	Default USB2.0 port detach CH1: VBUS Voltage of Micro B 2V/Div CH2: D+ of Micro B 0.5V/Div CH3: D- of Micro B 0.5V/Div CH4: Battery Current 0.25A/Div

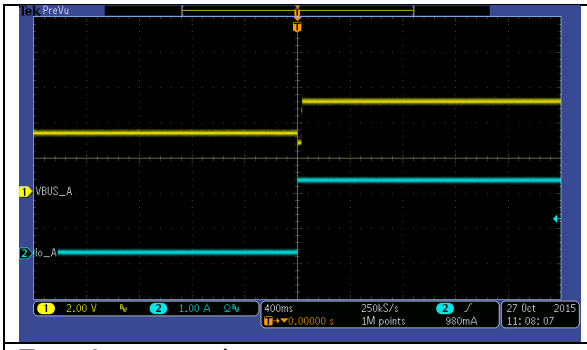
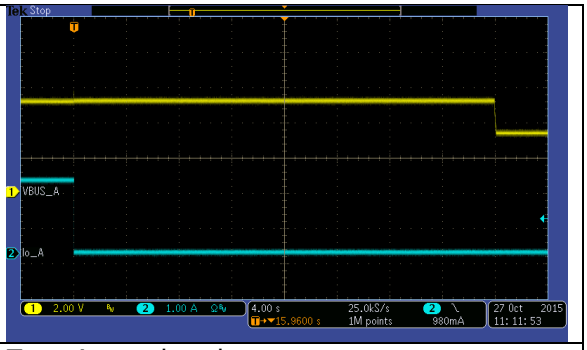
	
Fast charger attach CH1: VBUS Voltage of Micro B 5V/Div CH2: D+ of Micro B 2V/Div CH3: D- of Micro B 2V/Div CH4: Battery Current 2.5A/Div	Fast charger detach CH1: VBUS Voltage of Micro B 5V/Div CH2: D+ of Micro B 2V/Div CH3: D- of Micro B 2V/Div CH4: Battery Current 2.5A/Div

2.4 OUTPUT DETECTION

TYPE C

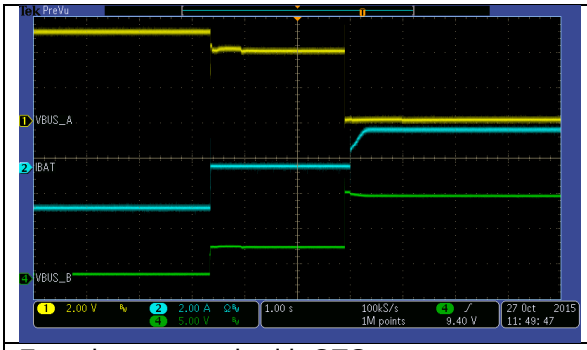
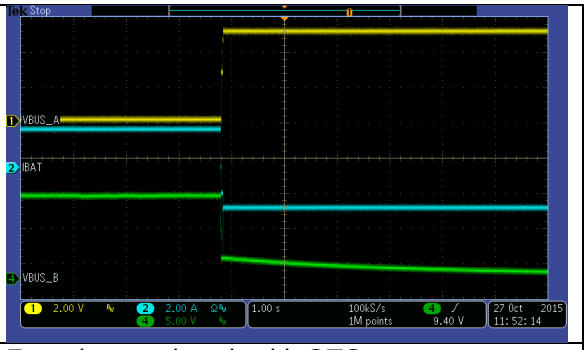
	
Type C port attach CH1: VBUS Voltage of Type C 1V/Div CH3: CC of Type C 2V/Div CH4: Output Current of Type C 1A/Div	Type C port detach CH1: VBUS Voltage of Type C 1V/Div CH3: CC of Type C 2V/Div CH4: Output Current of Type C 1A/Div

TYPE A

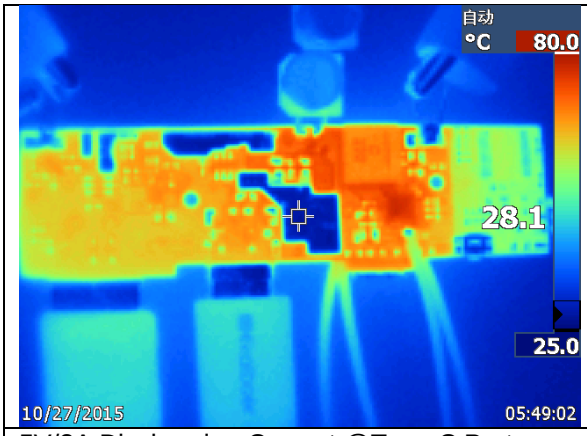
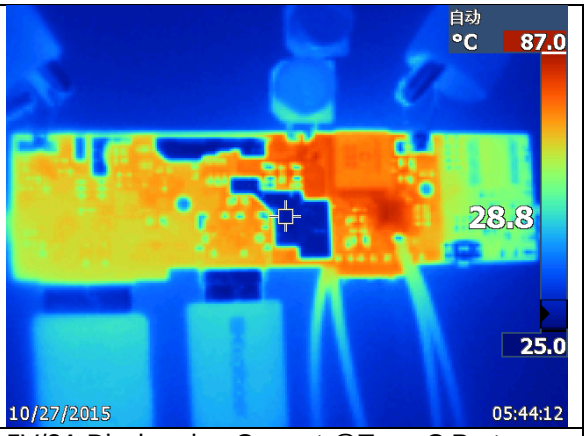
	
Type A port attach CH1: VBUS Voltage of Type A 2V/Div	Type A port detach CH1: VBUS Voltage of Type A 2V/Div

CH2: Output Current of Type A 1A/Div	CH4: Output Current of Type A 1A/Div

2.5 OTG OVP

	
Fast charger attach with OTG output CH1: VBUS Voltage of Type A 2V/Div CH2: Battery Current 2A/Div CH4: VBUS Voltage of Micro B 5V/Div	Fast charger detach with OTG output CH1: VBUS Voltage of Type A 2V/Div CH2: Battery Current 2A/Div CH4: VBUS Voltage of Micro B 5V/Div

3 THERMAL

	
5V/3A Discharging Current @Type C Port 5V/2A Discharging Current @Type A Port VBAT=3.8V & T_{room}=27℃	5V/3A Discharging Current @Type C Port 5V/2A Discharging Current @Type A Port VBAT=3.5V & T_{room}=27℃

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