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AND9481/D

Power Bank Application Note using the LC709501F

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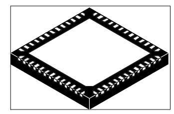
APPLICATION NOTE



QFN52 6x6, 0.4P

Overview

LC709501F is a Lithium ion switching charger controller for Power Bank. This device has all functions to control Power Bank application. It can control Type−C port control IC and includes Quick Charge 3.0 HVDCP. The built−in switching controller can output from 5 V up to 12 V for Quick Charge. The high power output for USB Type−C and Quick Charge is possible with appropriate external MOSFETs.

Function

- Easy power scaling with external MOSFETs
- Buck charge / Boost charge
- Supports Quick Charge 3.0 HVDCP Class A. 5 V up to 12 V
- Supports USB type−C DRP with Port control IC
- Reference software supports various combination of USB port
- Supports USB BC 1.2
- Controls an external Boost−IC for 2nd USB output
- Battery level gauging
- Status & Battery level display with 4 LEDs
- Boost auto start−up
- Thermistor sensing function
- Over voltage/Over current detection
- JEITA compliance Battery management
- Safety timer
- Low quiescent current: 15 μA at Low power mode

Applications

- Power Bank
- USB−related charging application

The content specified herein is subject to change for improvement without notice.
The content specified herein is for the purpose of introducing products, if you wish to use any such products, please be sure to refer the datasheet, which can be obtained upon request.

July, 2019 − Rev. 4

Publication Order Number:
AND9481D

EVALUATION BOARD

LC709501F−FW02 Evaluation Board : LC709501A02GEVB

Table 1. PORT FUNCTION

	USB1	USB2	USB3
USB Port Type	Micro−B (input), 5 V / 2.4 A	Type−A (output), 5−12 V / 27 W	Type−A (output), 5 V / 2 A
Function	BC 1.2 and divided mode detection, source capacity detection (Note 1)	QC3.0 up to 12 V Boost auto start−up (Note 2)	Boost auto start−up (Note 2) BC1.2 (DCP) or divided mode (Note 3)

1. This device sets maximum input current with D+/− Detection and VBUS voltage drop.
2. When a device is connected, boost is started automatically without pushing the switch. Refer to the section “Boost auto start−up”.
3. This function is provided by NT6003.

Table 2. MAIN COMPONENTS

Item	Manufacturer	Part Number	Function
Controller	ON Semiconductor	LC709501F−FW02	Buck charge, 1st
FETs	ON Semiconductor	ECH8310 x 5 NTTFS4H05N x 2	For DD converter and Gate switch (Note 4)
Lib protection	ON Semiconductor	LC06111TMT x 2	
Inductor	Panasonic	ETQP6F4R6HFA	4.6 μH, for Buck charge & 1st Boost
2nd Boost IC	Silergy	SY7065A	2nd Boost IC for USB3 port (Note 5)
Protocol IC	EOSMEM	NT6003	DCP or divided output for USB3 port

4. PWM frequency: 150 kHz.
5. During insertion detection of USB3, this IC ports which connect to VBUS must be Hi−Z. Refer to the section “Boost auto start−up”.

Other functions

- 4 LEDs, Fuel gauge, Thermistor sensing, One push switch, On board programmer interface

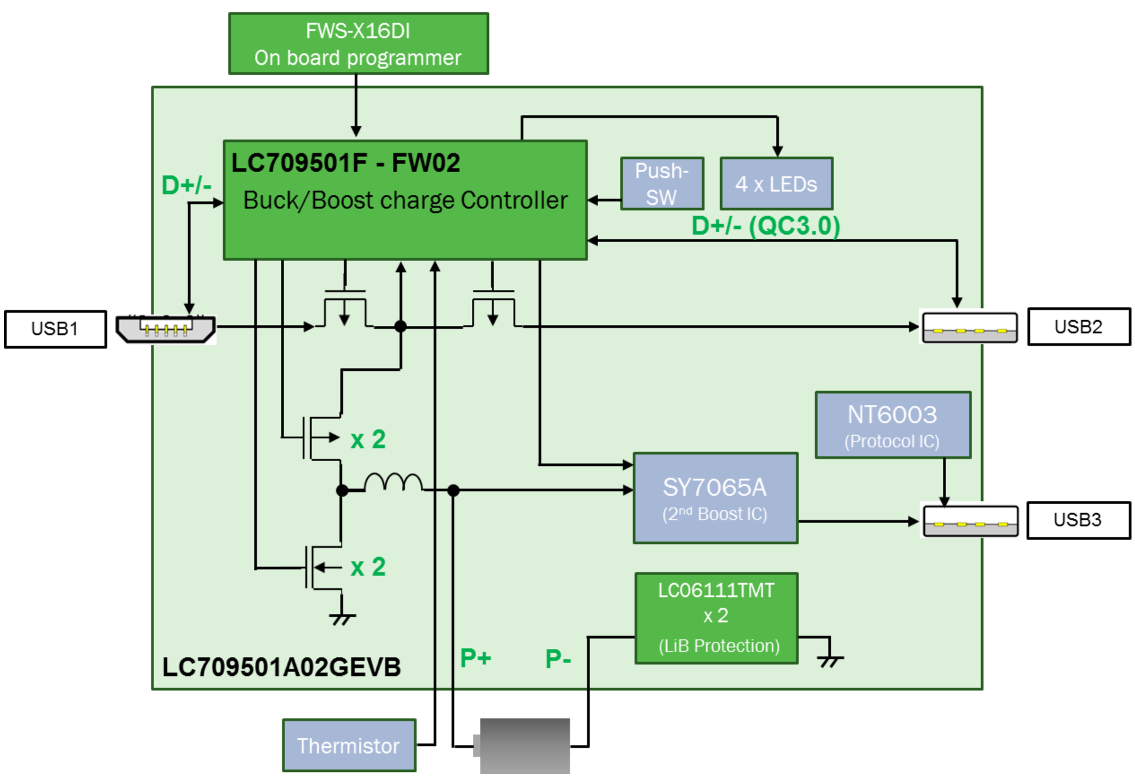


Figure 1. LC709501A02GEVB Block Diagram

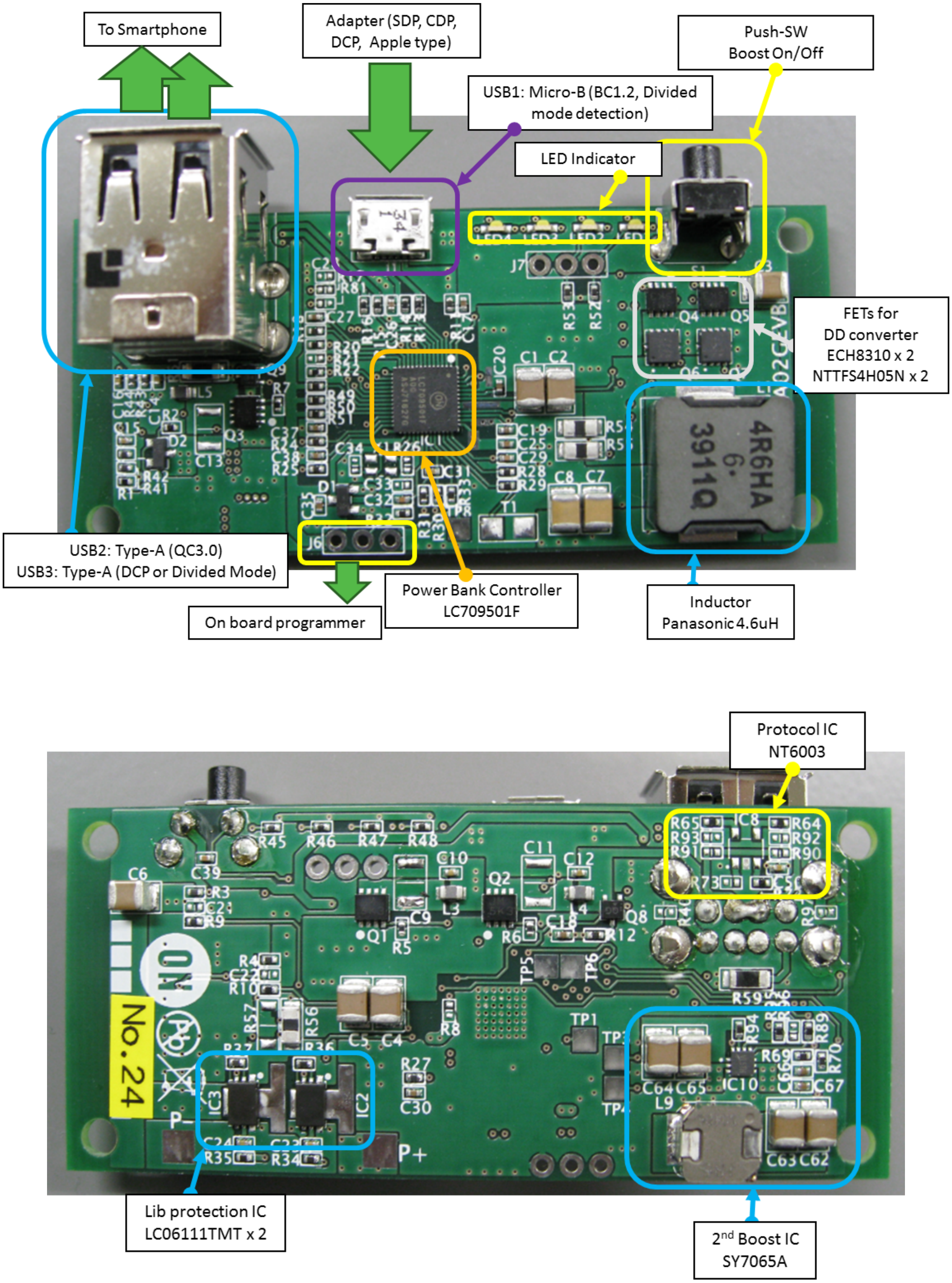


Figure 2. LC709501A02GEVB Photos

LC709501F−FW05 Evaluation Board : LC709501A05GEVB

Table 3. PORT FUNCTION

	USB1	USB2	USB3
USB Port Type	Type−C (Input and Output)	−	Type−A (output), 5 V / 2 A
Function	Role detection (Input or Output) Input: BC 1.2 and Divided mode detection, Source capacity detection (Note 6) Output: QC 3.0 up to 12 V	−	Boost auto start−up (Note 7) BC1.2 (DCP) or Divided mode (Note 8)

6. This device sets maximum input current with D± Detection and VBUS voltage drop.
7. When a device is connected, boost is started automatically without pushing the switch. Refer to the section “Boost auto start−up”.
8. This function is provided by NT6003.

Table 4. MAIN COMPONENTS

Item	Manufacturer	Part Number	Function
Controller	ON Semiconductor	LC709501F−FW05	Buck charge, 1st Boost for USB2 port
FETs	ON Semiconductor	ECH8310 x 4 NTTFS4H05N x 2	For DD converter and Gate switch (Note 9)
Lib protection	ON Semiconductor	LC06111TMT x 2	
Port Control IC	ON Semiconductor	FUSB302B	For Communication channels of USB1
Inductor	Panasonic	ETQP6F4R6HFA	4.6 μH, for Buck charge & 1st Boost
2nd Boost IC	Silergy	SY7065A	2nd Boost IC for USB3 port (Note 10)
Protocol IC	EOSMEM	NT6003	DCP or divided output for USB3 port

9. PWM frequency: 150 kHz.
10. During insertion detection of USB3, this IC ports which connect to VBUS must be Hi−Z. Refer to the section “Boost auto start−up”.

Other functions

- 4 LEDs, Fuel gauge, Thermistor sensing, One push switch, On board programmer interface

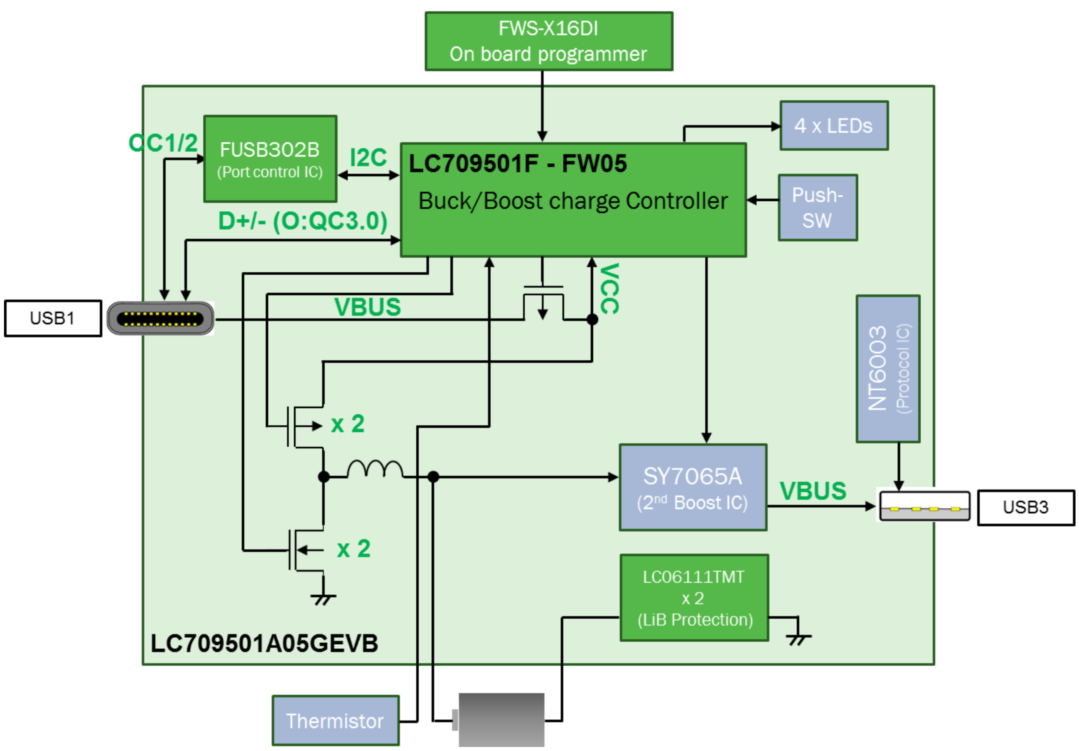
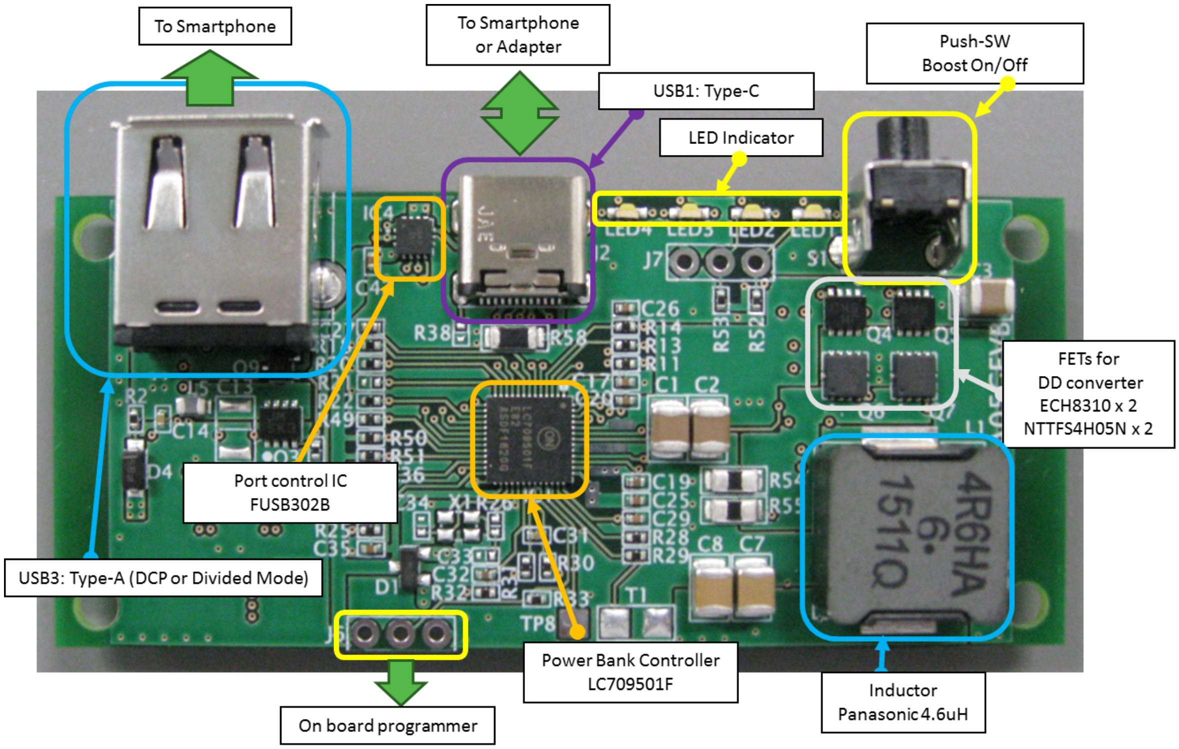


Figure 3. LC709501A05GEVB Block Diagram



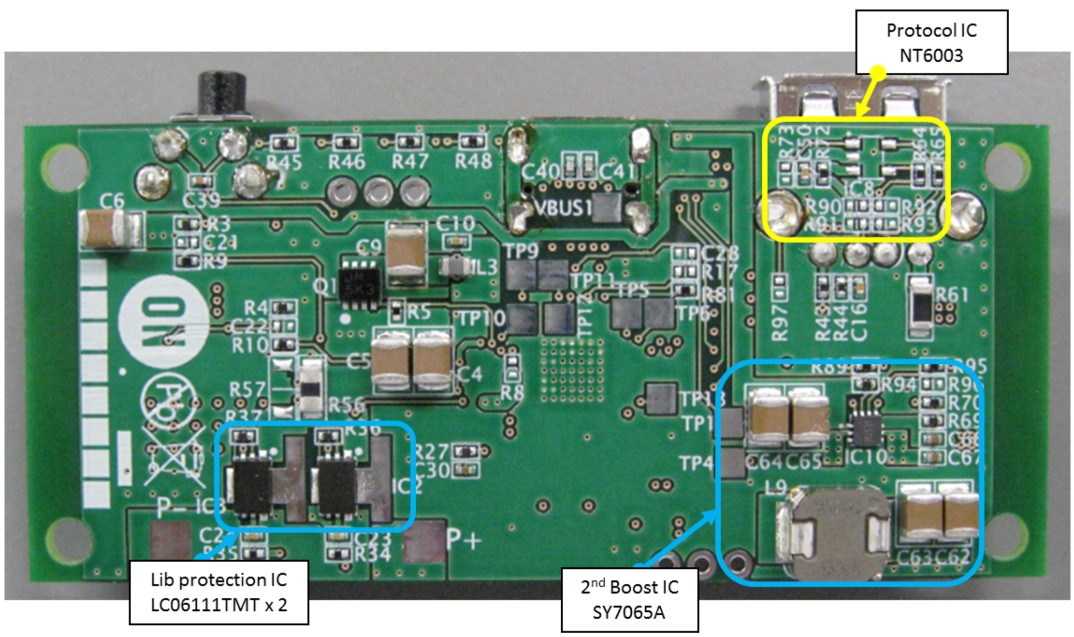


Figure 4. LC709501A05GEVB

LC709501F−FW06 Evaluation Board : LC709501A06GEVB

Table 5. PORT FUNCTION

	USB1	USB2	USB3
USB Port Type	USB PD (5 V−12 V) / QC3.0 Output USB PD (5 V−12 V) Input	–	Type−A (output), 5 V / 2 A
Function	Role detection (Input or Output) USB PD up to 12 V Input: BC 1.2 and Divided mode detection, Source capacity detection (Note 11) Output: QC 3.0 up to 12 V (Note 14)	–	Boost auto start−up (Note 12) BC1.2 (DCP) or Divided mode (Note 13)

11. This device sets maximum input current with D± Detection and VBUS voltage drop.
12. When a device is connected, boost is started automatically without pushing the switch. Refer to the section "Boost auto start−up".
13. This function is provided by NT6003.
14. For none−PD device

Table 6. MAIN COMPONENTS

Item	Manufacturer	Part Number	Function
Controller	ON Semiconductor	LC709501F−FW05	Buck charge, 1st Boost for USB2 port
FETs	ON Semiconductor	ECH8310 x 4 NTTFS4H05N x 2	For DD converter and Gate switch (Note 15)
Lib protection	ON Semiconductor	LC06111TMT x 2	
Port Control IC	ON Semiconductor	FUSB302B	For Communication channels of USB1
Inductor	CoilCraft	XAL1010−472MEB	4.7 μH, for Buck charge & 1st Boost
2nd Boost IC	Silergy	SY7065A	2nd Boost IC for USB3 port (Note 16)
Protocol IC	EOSMEM	NT6003	DCP or divided output for USB3 port

15. PWM frequency: 150 kHz.
16. During insertion detection of USB3, this IC ports which connect to VBUS must be Hi−Z. Refer to the section "Boost auto start−up".

Other functions

- 4 LEDs, Fuel gauge, Thermistor sensing, One push switch, On board programmer interface

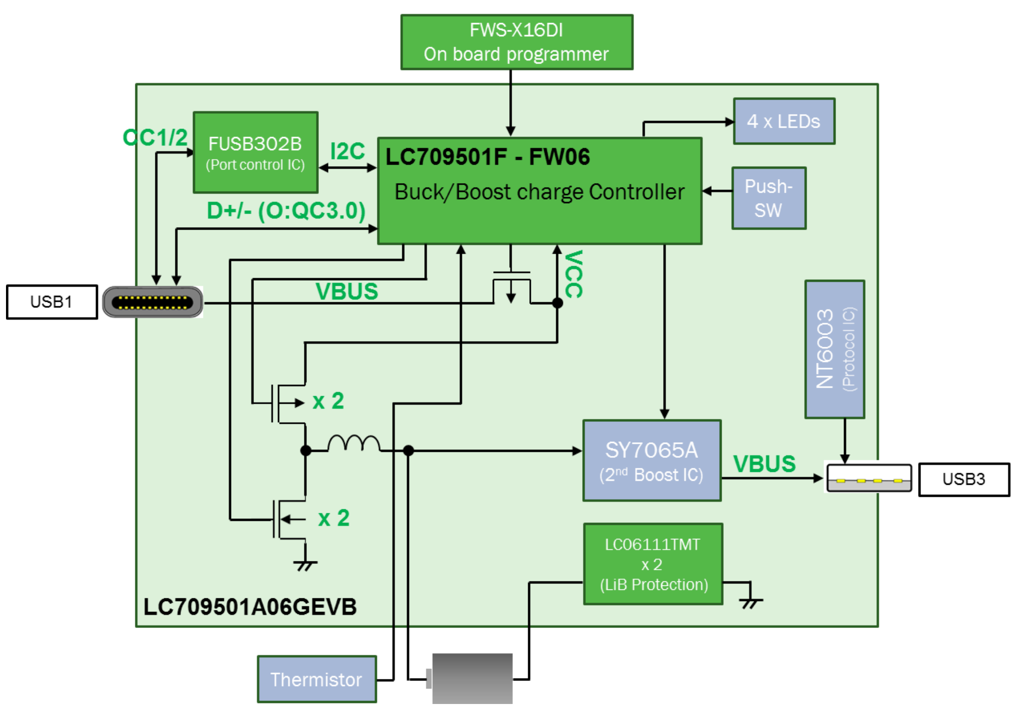


Figure 5. LC709501A06GEVB Block Diagram

CIRCUITS AND COMPONENTS AROUND CONVERTER

Up and Down Convert Current Path

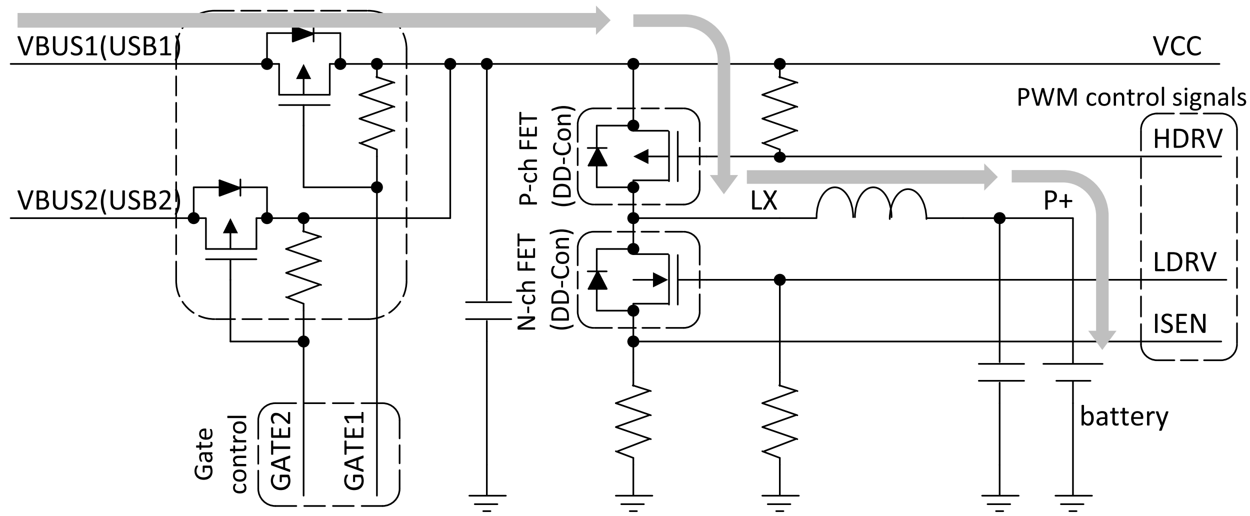


Figure 6. Down Convert (Buck Charge : VBUS1 → Battery)

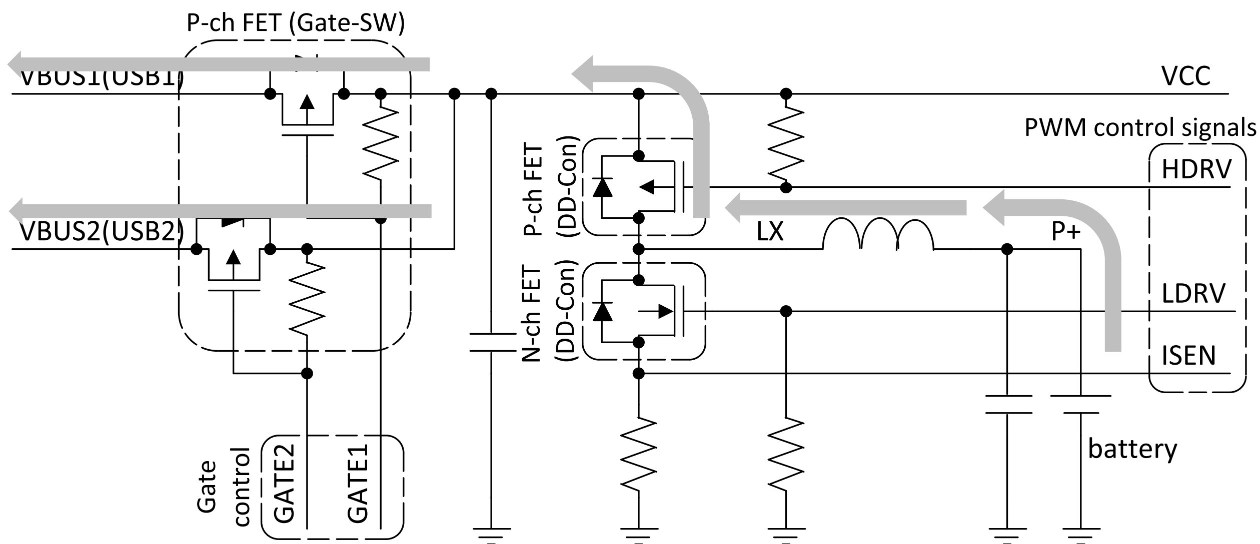


Figure 7. Up Convert (Boost Charge: Battery → VBUS1 or VBUS2)

FET Selection

- DD Converter
  N−ch High−Speed, Low−Rds−ON, Vt < 3 V
  P−ch High−Speed, Low−Rds−ON, 1 V < Vt < 3 V
- Gate Switch
  Low−Speed, Low−Rds−ON, Vt < 4 V

Table 7. N−ch FET (DD CONVERTER)

Parameter	NTTFS4H05N
VDss	25
Vas	+/−20
Vt	(1.65)
Vt−Min/Max	1.2 / 2.1
Ciss	1205
Rds ON (4.5 V)	3.8
Rds ON (10 V)	2.5
Qg (4.5 V)	8.7
Tdon	8.9
Tr	32
Tdoff	14.6
Tf	3

Table 8. P−ch FET (DD CONVERTER, GATE SWITCH)

Parameter	NTTFS4H05N
VDss	−30
Vas	+/−20
Vt	(−1.9)
Vt−Min/Max	−1.2 / −2.6
Ciss	1400
Rds ON (4.5 V)	13
Rds ON (10 V)	–
Qg (4.5 V)	28 (10)
Tdon	10 (10)
Tr	45 (10)
Tdoff	134 (10)
Tf	87 (10)

Inductor Selection

2.2 μH, 4.6 μH or 4.7 μH inductor can be applied for this device. Following inductors are recommended examples. Low DC resistance is desirable to prevent heat and improve efficiency.

Table 9. RECOMMENDED INDUCTORS

Manufacturer	L (typ)	DCR (typ)	IMAX (40°C rise)	Size (mm)	Part Number
TDK	2.2 μH	17.3 mΩ	8.2 A	7.1 x 6.5 x 3.0	SPM6530T−2R2M
Coilcraft	2.2 μH	5.73 mΩ	17.8 A	7.5 x 7.3 x 6.3	XAL7070−222MEC
Panasonic	4.6 μH	6.48 mΩ	9.3 A	12.5 x 12.5 x 5.7	ETQP6F4R6HFA
CoilCraft	4.7 μH	5.20 mΩ	25.4 A	11.3 x 10.0 x 10.0	XAL1010−472MEB

Circuit Examples around Converter

Select circuit configuration around converter according to the requests for target output power, efficiency, temperature and PCB layout size. Following circuits are the example under the use of the inductors which is mentioned in Inductor selection.

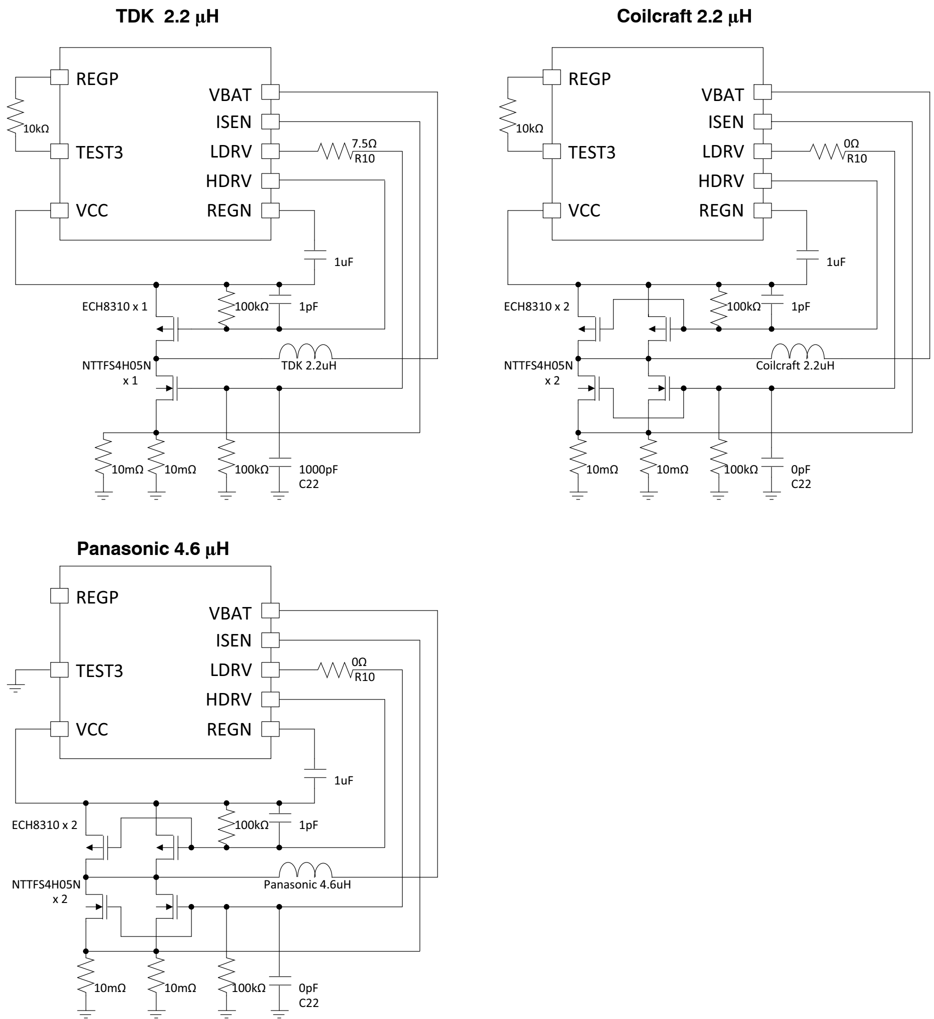


Figure 8.

Table 10. CIRCUIT EXAMPLES AROUND CONVERTER

Inductor	L	PWM freq.	Switching FET	C22	R10
TDK	2.2 μH	300 kHz	ECH8310 x 1 NTTFS4H05N x 1	1000 pF	7.5 Ω
Coilcraft	2.2 μH	300 kHz	ECH8310 x 2 NTTFS4H05N x 2	0 pF	0
Panasonic	4.6 μH	150 kHz	ECH8310 x 2 NTTFS4H05N x 2	0 pF	0
CoilCraft	4.7 μH	150 kHz	ECH8310 x 2 NTTFS4H05N x 2	0 pF	0

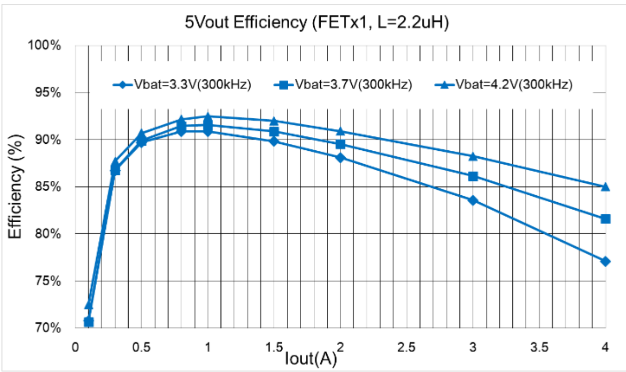
- This device can choose PWM frequency of either 150 kHz or 300 kHz. 150 kHz is chosen when TEST3 input is low, and 300 kHz is chosen when the input is high
- Make the switching FETs a parallel array to suppress the heat generation at high power output
- Place indicated C and R on LDRV line when FETs array is single

TEST RESULT

Boost and Buck charge test result using LC709501A02GEVB Evaluation board. Each following results support the three circuitry example around converter in section Citcuit examples around conventer.

TDK 2.2 μH, 300 kHz, FET x1

VBUS2 Boost Efficiency



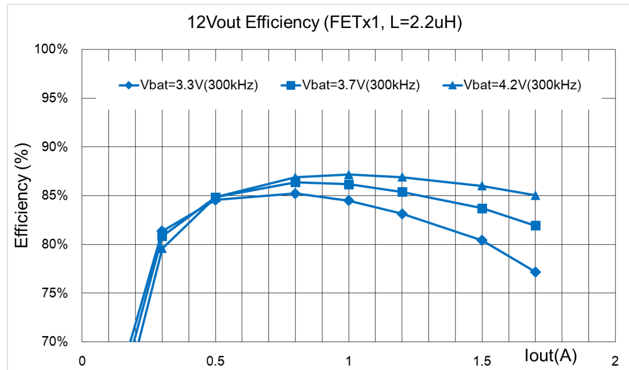
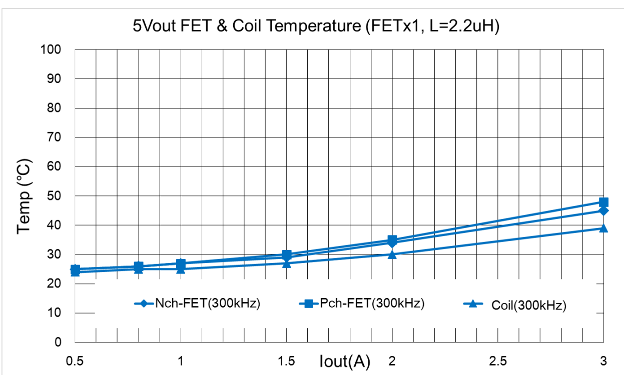


Figure 9.

VBUS2 Boost Temperature



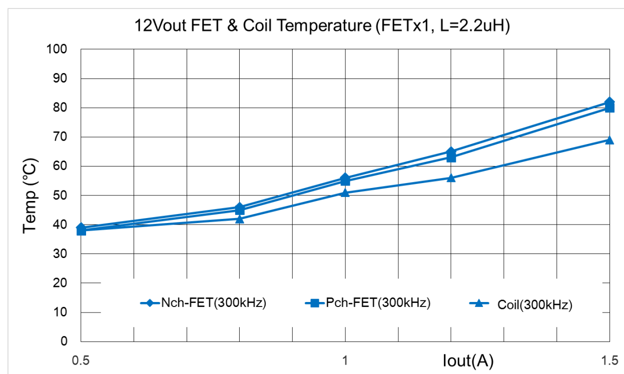


Figure 10.

VBUS2 Boost Switching Ripple

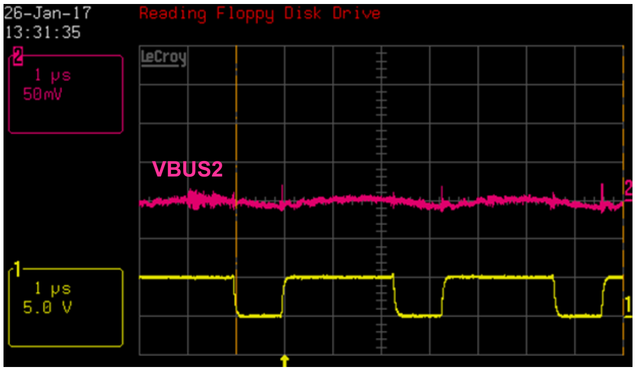


Figure 11. VBUS2 = 5 V/1 A, VBAT = 3.7 V

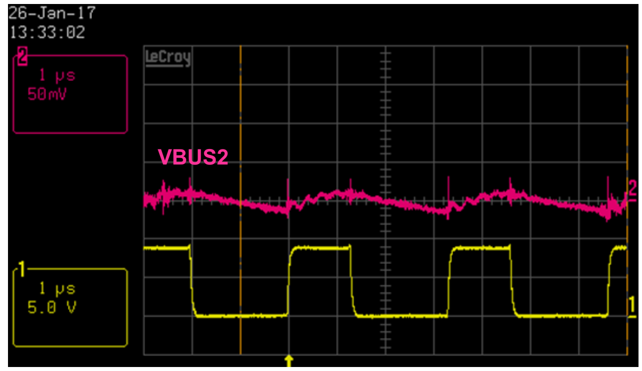


Figure 12. VBUS2 = 9 V/1 A, VBAT = 3.7 V

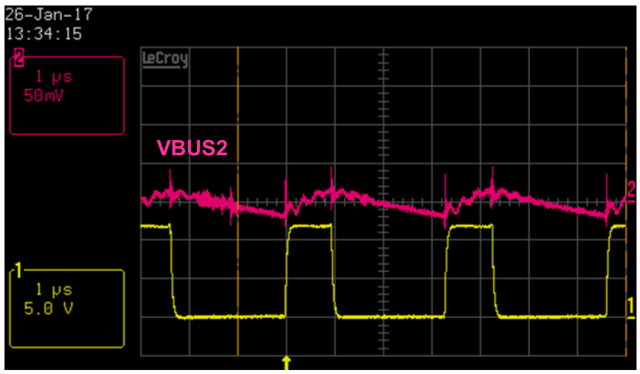


Figure 13. VBUS2 = 12 V/1 A, VBAT = 3.7 V

VBAT Buck Charge Switching Ripple

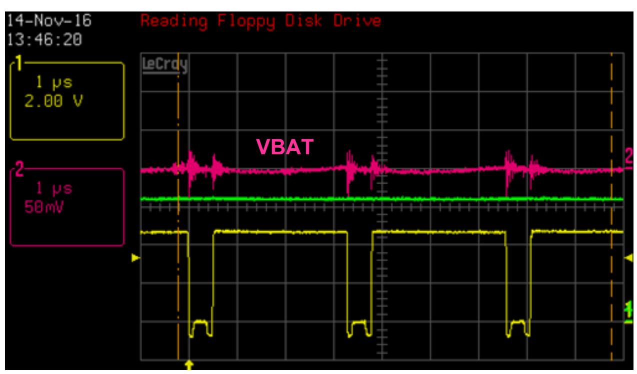


Figure 14. VBUS2 = 5 V, VBAT = 3.7 V

VBUS2 Boost Load Transit (1 A → 2 A)

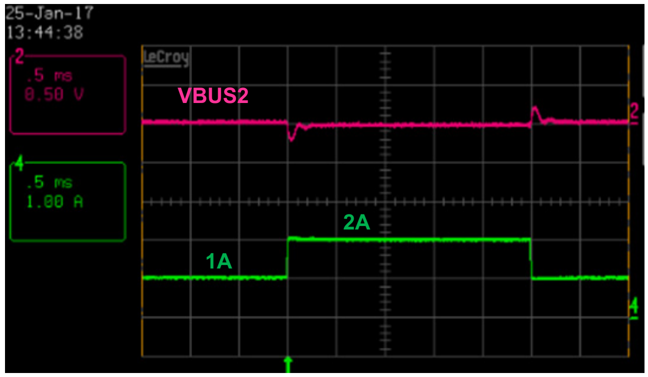


Figure 15. VBUS2 = 5 V, VBAT = 3.7 V

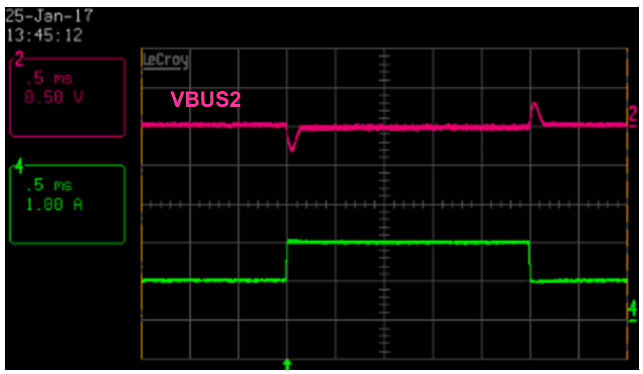


Figure 17. VBUS2 = 9 V, VBAT = 3.7 V

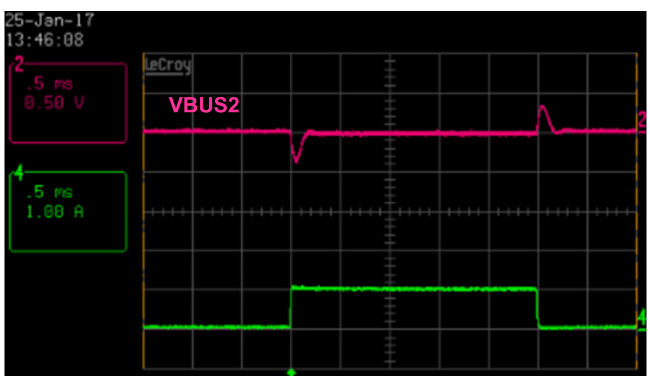


Figure 16. VBUS2 = 12 V, VBA = 3.7 V

Coilcraft 2.2 μH, 300 kHz, FET x 2

VBUS2 Boost Efficiency

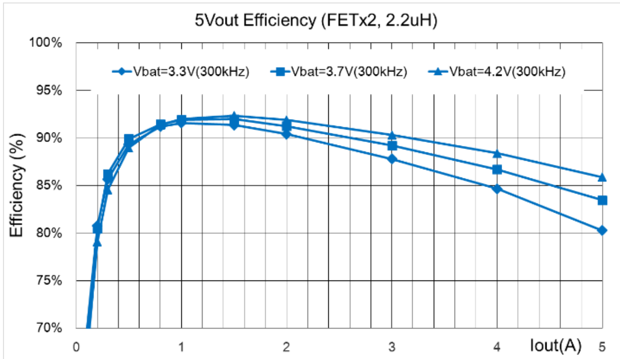


Figure 18. 5Vout Efficiency (FET x 2, 2.2 μH)

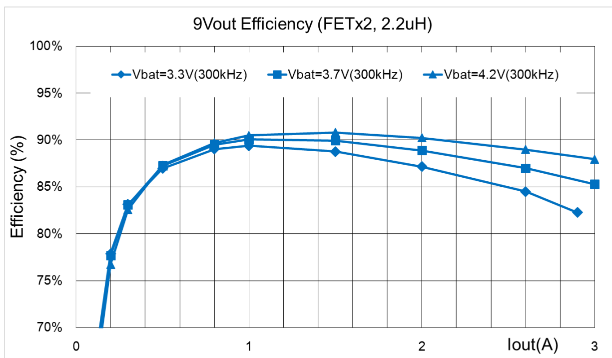


Figure 19. 9Vout Efficiency (FET x 2, 2.2 μH)

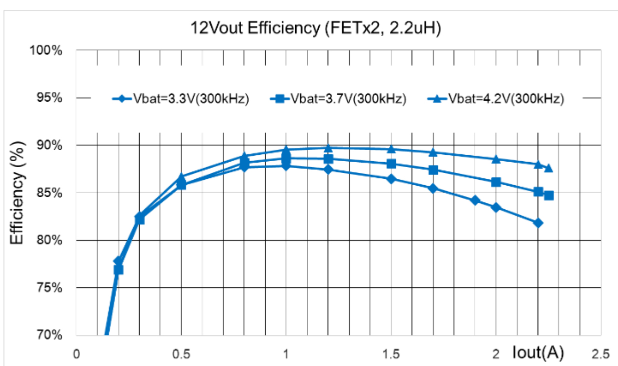


Figure 20. 12Vout Efficiency (FET x 2, 2.2 μH)

VBUS2 Boost Temperature

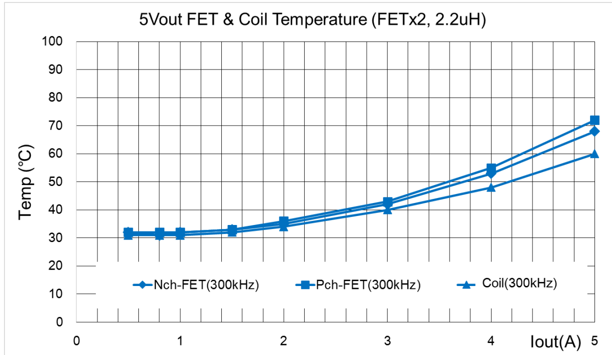


Figure 21. 5Vout FET & Coil Temperature (FET x 2, 2.2 μH)

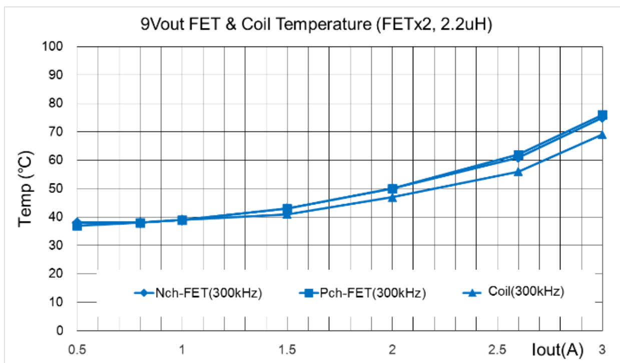


Figure 22. 9Vout FET & Coil Temperature (FET x 2, 2.2 μH)

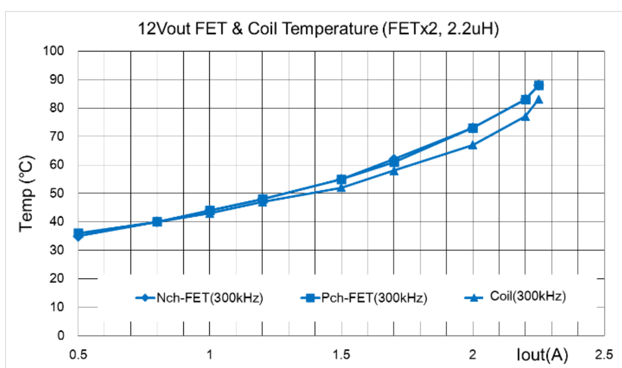


Figure 23. 12Vout FET & Coil Temperature (FET x 2, 2.2 μH)

VBUS2 Boost Switching Ripple

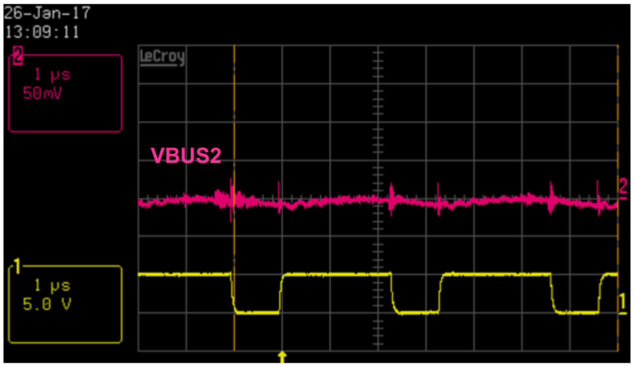


Figure 24. VBUS2 = 5 V/1 A, VBAT = 3.7 V

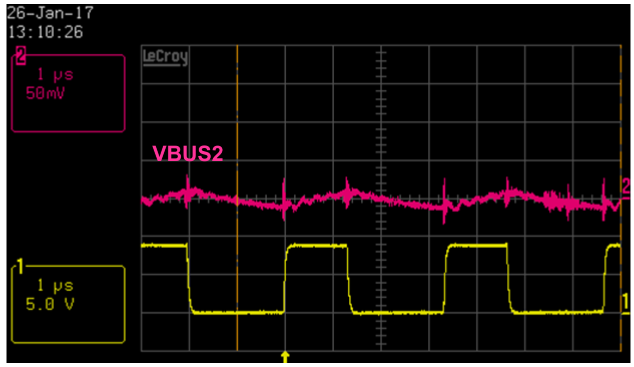


Figure 25. VBUS2 = 9 V/1 A, VBAT = 3.7 V

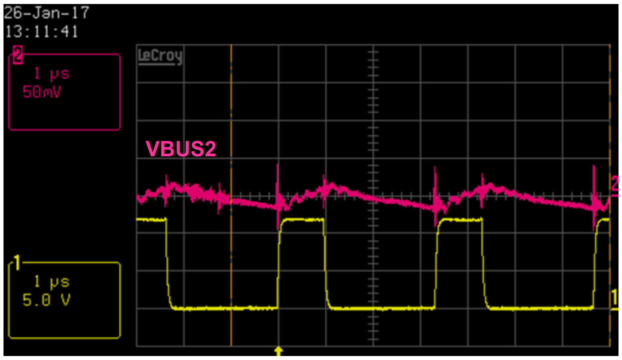


Figure 26. VBUS2 = 12 V/1 A, VBAT = 3.7 V

VBAT Buck Charge Switching Ripple

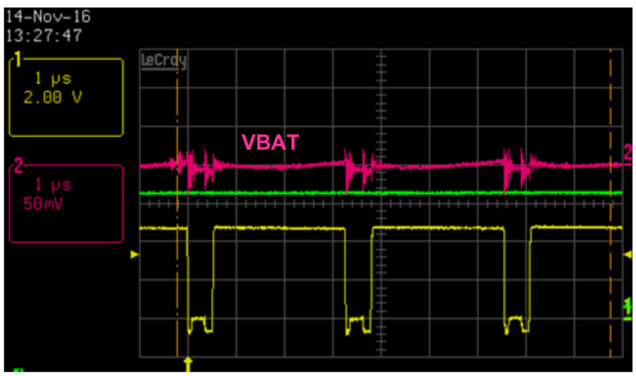


Figure 27. VBUS2 = 5 V, VBAT = 3.7 V

VBUS2 Boost Load Transit (1 A → 2 A)

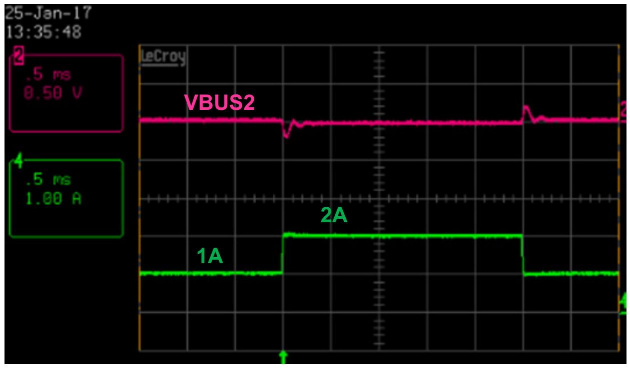


Figure 28. VBUS2 = 5 V

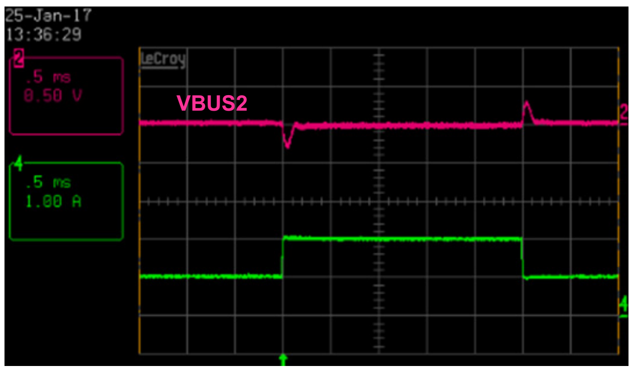


Figure 29. VBUS2 = 9 V

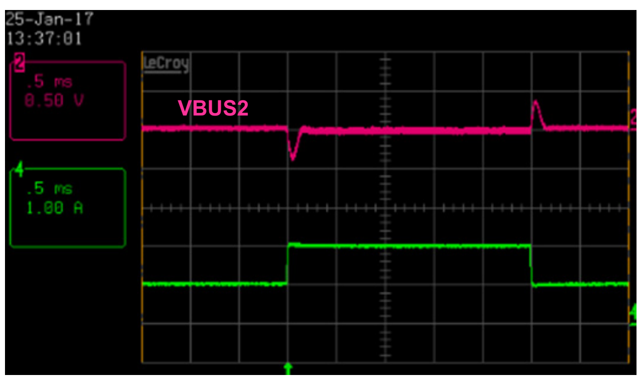


Figure 30. VBUS2 = 12 V

Panasonic 4.6 μH 150 kHz, FET x 2

VBUS2 Boost Efficiency

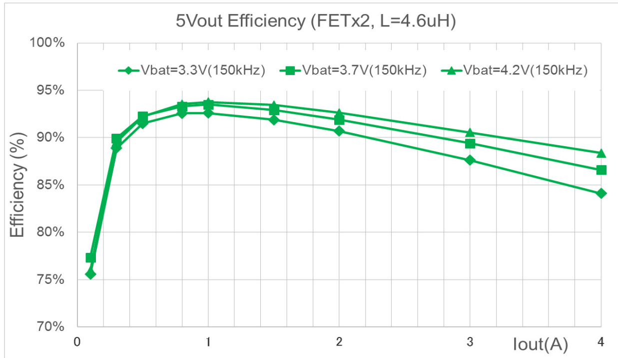


Figure 31. 5Vout Efficiency (FET x 2, L = 4.6 μH)

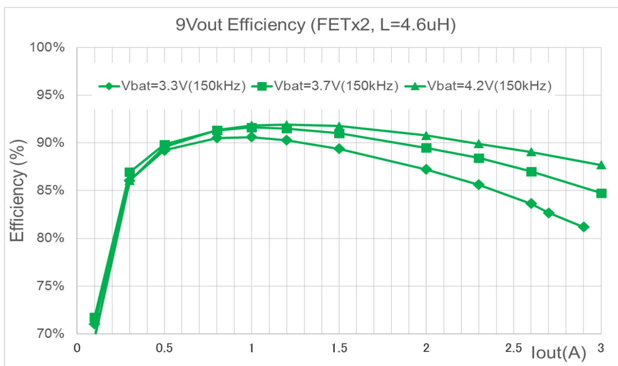


Figure 32. 9Vout Efficiency (FET x 2, L = 4.6 μH)

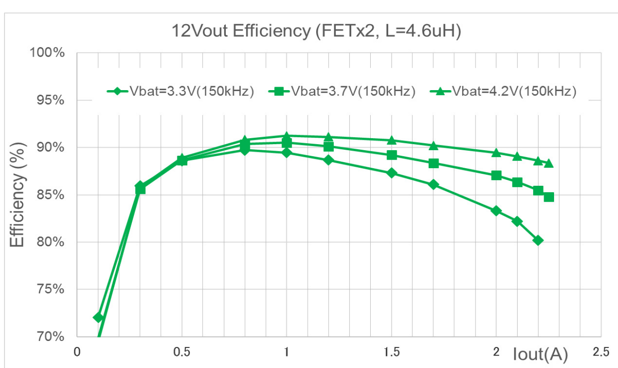


Figure 33. 12Vout Efficiency (FET x 2, L = 4.6 μH)

VBUS2 Boost Temperature

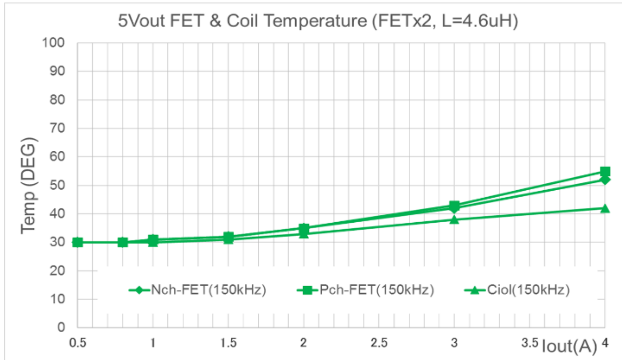


Figure 34. 5Vout FET & Coil Temperature (FET x 2, L = 4.6 μH)

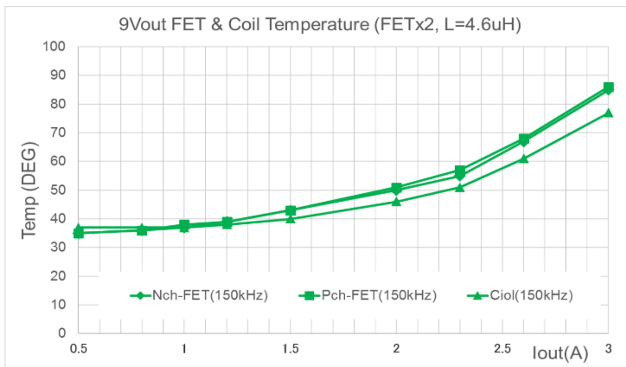


Figure 35. 9Vout FET & Coil Temperature (FET x 2, L = 4.6 μH)

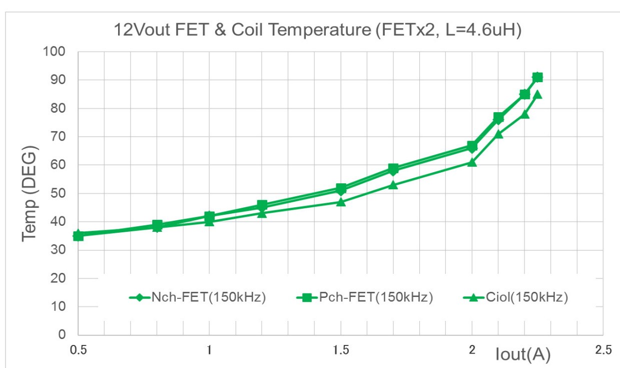


Figure 36. 12Vout FET & Coil Temperature (FET x 2, L = 4.6 μH)

VBUS2 Boost Switching Ripple

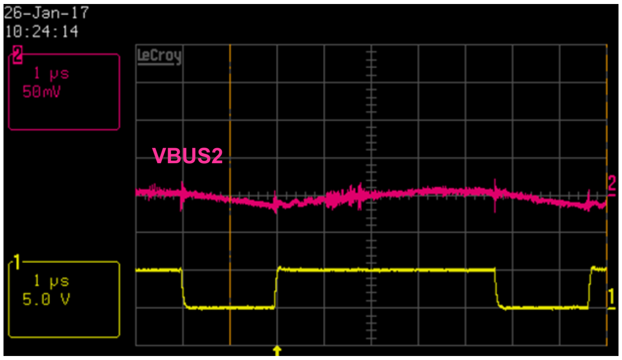


Figure 37. VBUS2 = 5 V / 1 A, VBAT = 3.7 V

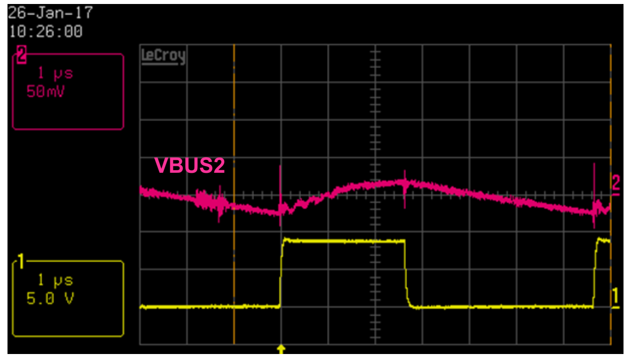


Figure 38. VBUS2 = 9 V / 1 A, VBAT = 3.7 V

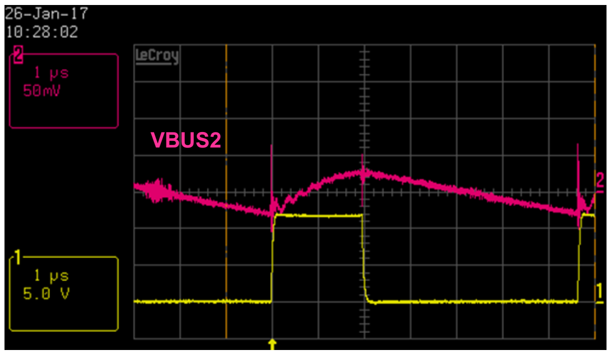


Figure 39. VBUS2 = 12 V / 1 A, VBAT = 3.7 V

VBAT Buck Charge Switching Ripple

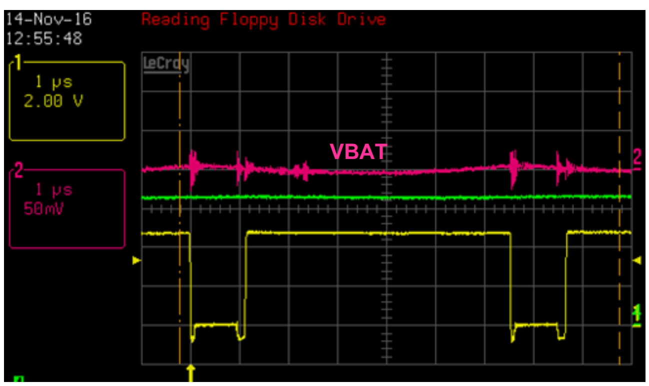


Figure 40. VBUS1 = 5 V, VBAT = 3.7 V

VBUS2 Boost Load Transit (1 A → 2 A)

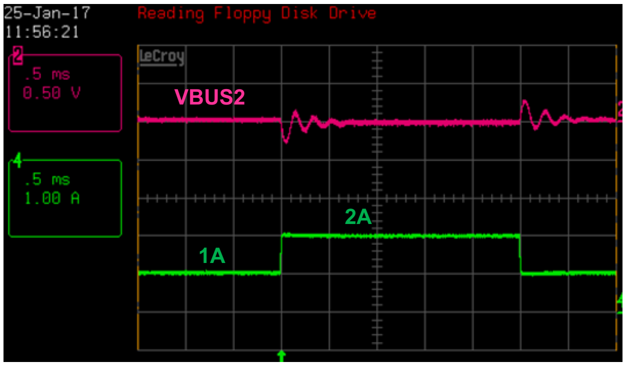


Figure 41. VBUS2 = 5 V

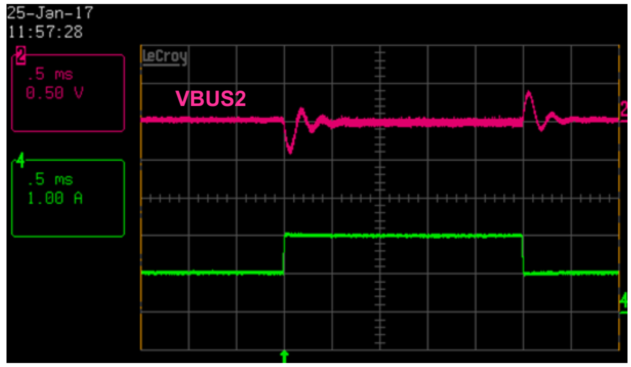


Figure 42. VBUS2 = 9 V

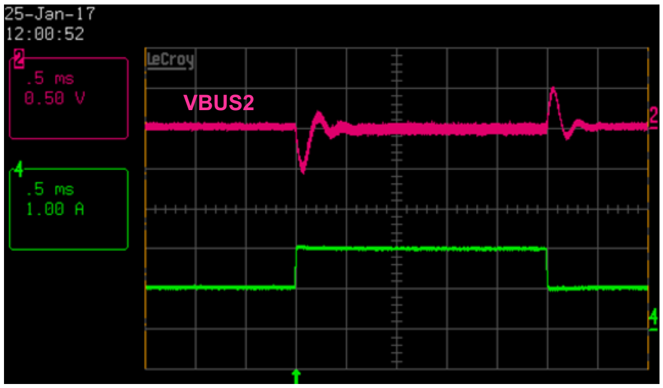


Figure 43. VBUS2 = 12 V

FUEL GAUGE

Features

Simple setting for various battery

- Set only three battery parameters for fuel gauging
  - Design capacity
  - Charging voltage 4.2 V or 4.35 V
- Unique algorithm to realize accurate battery monitoring in few parameters
- Set the parameters by Port configuration or Software configuration

Table 11.

Parameter	Port	Range	Resistance
Design Capacity	FGADJ	2400 mAh – 24400 mAH	4.7 k Ω – 390 k Ω
Battery Profile	(Note 17)	4.2 V or 4.35 V	Software configuration

17. Default battery profile is 4.2 V. 4.35 V can be selected by Software configuration.

Battery level result

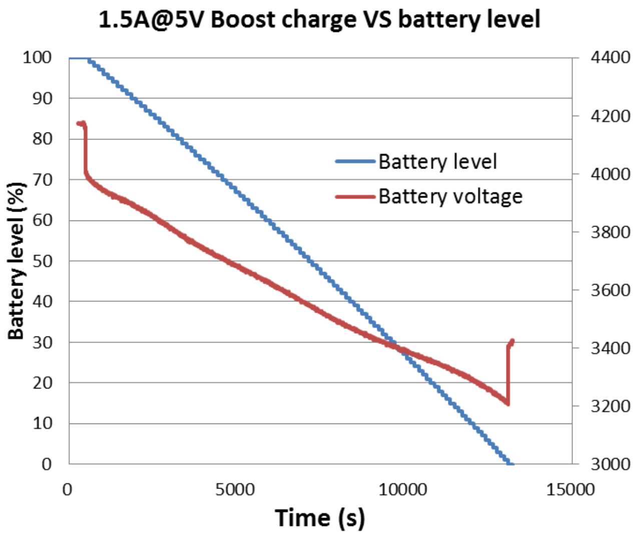


Figure 44.

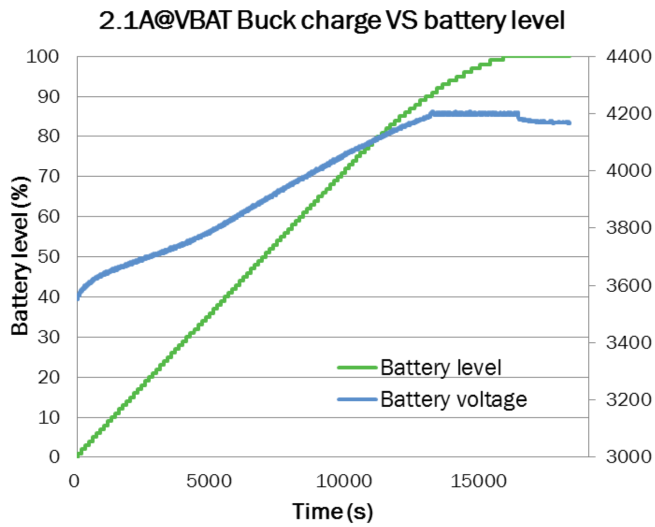


Figure 45.

- Design capacity of measured battery is 9600 mAh
- 1% step battery level is reported via USBdD 2.0 Full Speed interface

Thermistor

- T1 Thermistor is NTC thermistor to measure battery temperature, and it must be placed near the battery
- Match R36 resistance with a used thermistor resistance at 25 deg
- The default B constant of NTC thermistor is 3300 K. Use Software configuration to change it. Then 2600 K to 4700 K is selectable

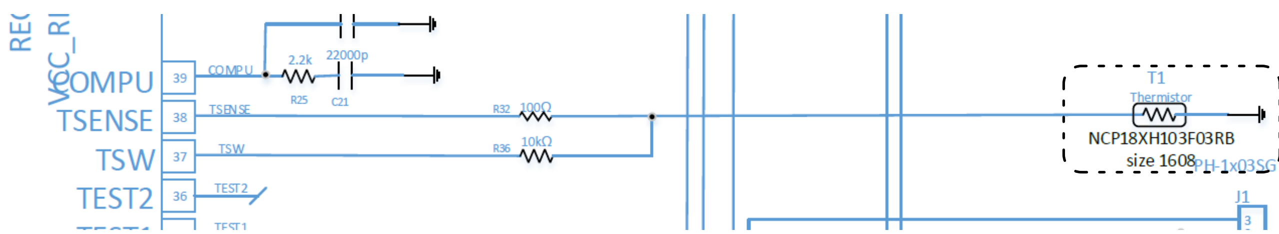


Figure 46.

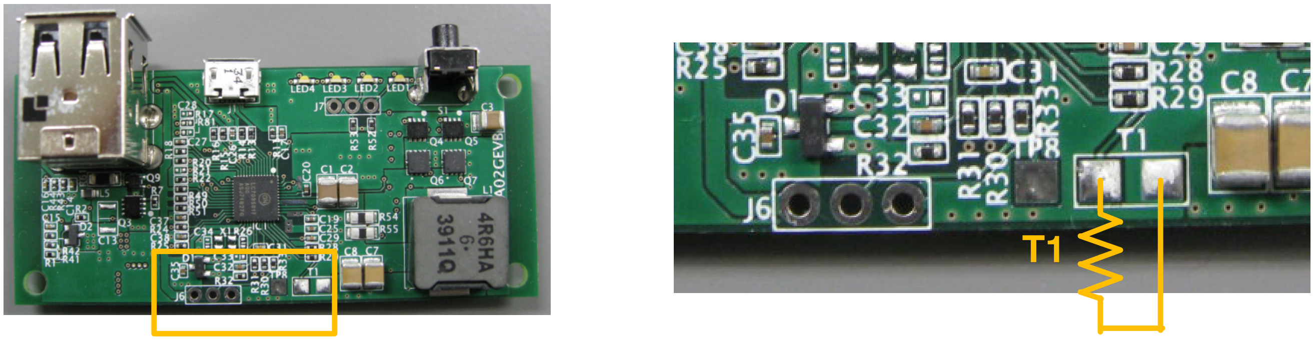
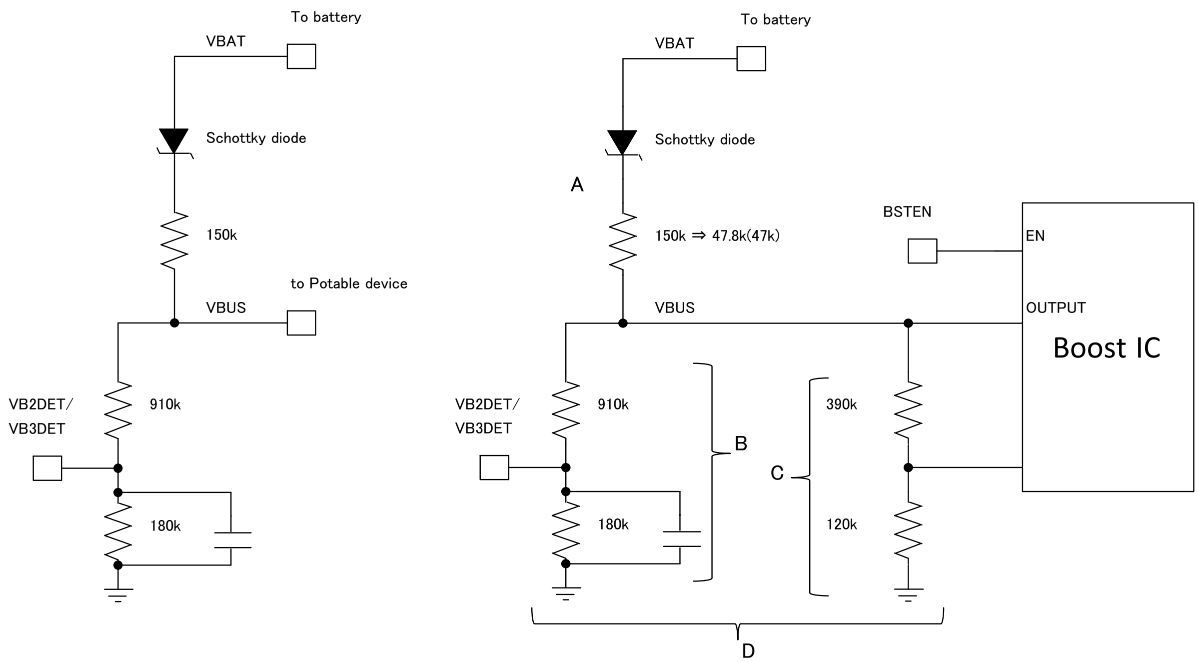


Figure 47. Thermistor terminals on LC709501A02GEVB Evaluation board

BOOST AUTO START–UP

LC709501F can detect one or two Type–A USB plug insertion automatically. If it detects, starts Boost charge to connected port. Boost auto start–up needs next circuits per each port.



Case without the other pull–down

Case with divided resistor for Boost IC

Figure 48.

If the other pull–down resistor (Ex. Divided resistor for Boost IC) is connected to VBUS, the pull–up resistance must be adjusted. Right side figure shows the case that 390 kΩ + 120 kΩ resistor for Boost IC is connected to VBUS. In this figure A is pull–up resistor, B is original pull–down resistor, and C is added pull–down resistor. D is the resistance that added B and C. The pull–up resistance must be adjusted as the ratio of A and B is equal to the ratio of A’ and D.

$$A : B = 150k\Omega : (910k\Omega + 180kOMEGA) = A' : \{(910k\Omega + 180kOMEGA) \parallel (390k\Omega + 120kOMEGA)\}$$

$$A' = 47.8k\Omega$$

In addition care the Boost IC ports which connect to VBUS during the insertion detection. When the Boost IC is disable (BSTEN = L), the ports must be Hi–Z. See the port status in the datasheet of Boost IC.

BATTERY LEAK CURRENT IN STANBY

The board will minimize the battery leak current when no plug is inserted and it waits plug insertion. Main leak source at the time is shown next.

- ICs standby
  LC709501F (Low power mode) / Lib protection IC / Port control IC
- Boost auto start−up circuits x The number of Type−A plug

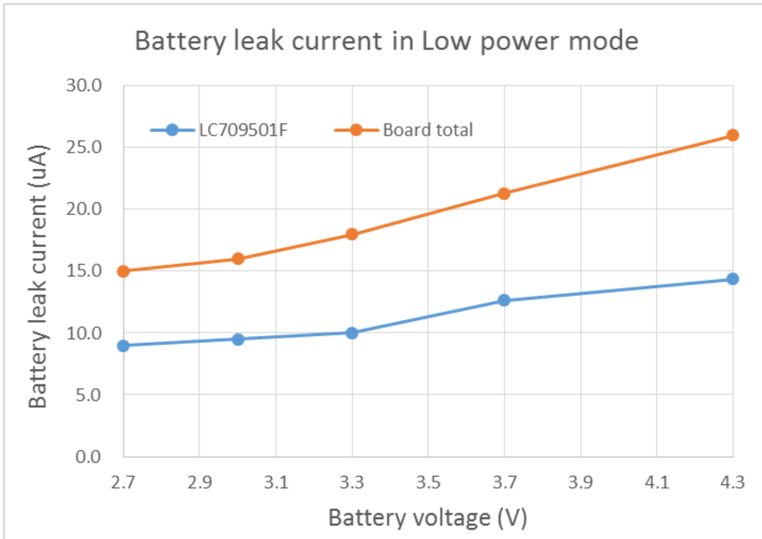


Figure 49. The current of LC709501A02GEVB at Low power mode

PCB LAYOUT GUIDE

Converter Schematic

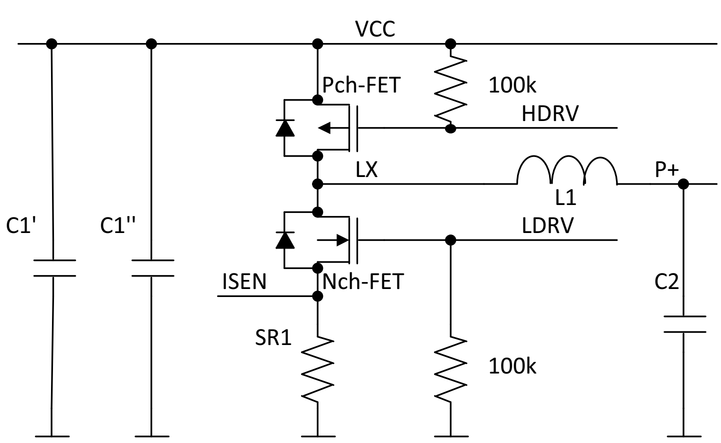


Figure 50.

Power Bank Application Layout

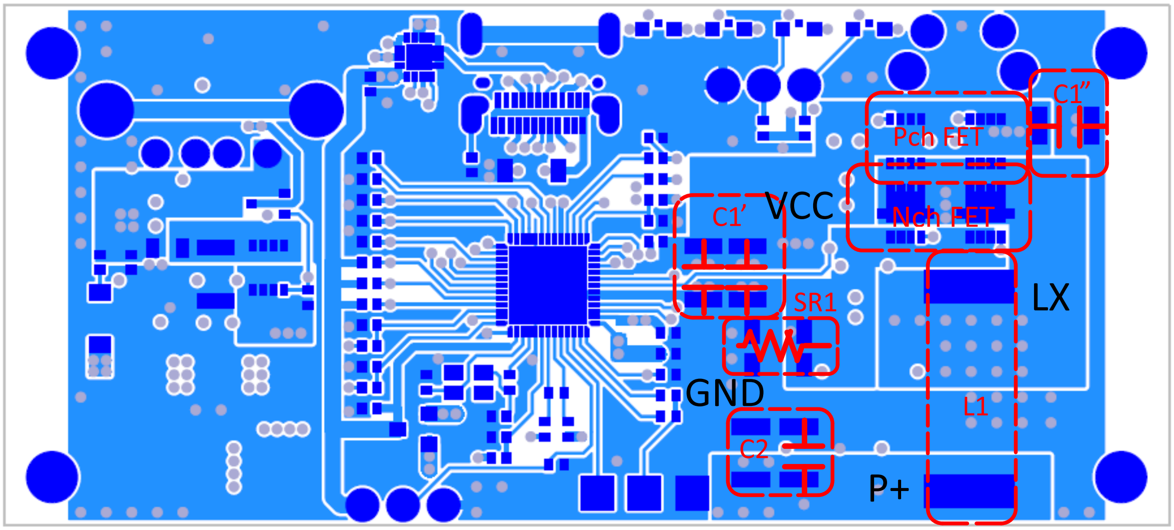


Figure 51. Top Layer

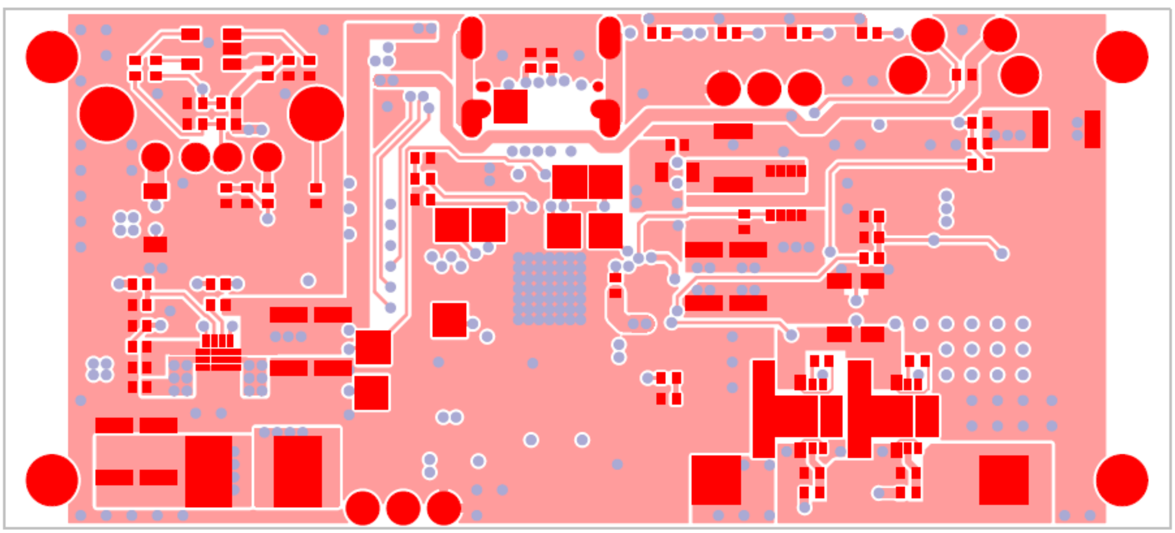


Figure 52. Bottom Layer

- Separate VCC capacitor at the following approximate capacity ratios in C1' and C1''
  C1' : C1'' = 2 : 1
- Place input capacitor C1' as close as possible to VCC pin and GND pins (AVSSS, AVSSP)
- Place input capacitor C1'' as close as possible to Pch FET
- Place coil as close as possible to the external transistor. Make the trace wide enough to carry the charging current
  Do not use multiple layers in parallel for this connection.
- Place output capacitor C2 as close as possible to coil, external power transistor, and IC
- It is critical for the external power transistor to have sufficient discharge performance
- Use via holes to secure sufficient current path

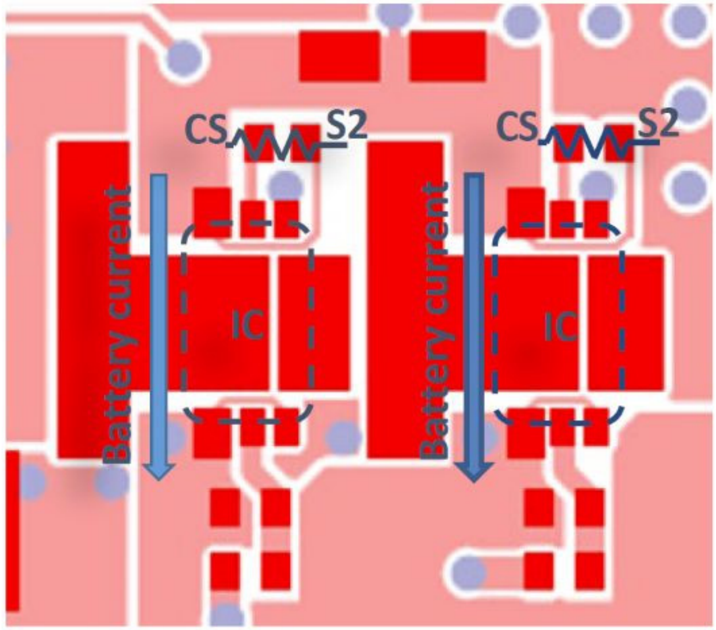


Figure 53. Bottom Layer around Lib−Protection IC

- Connect the resistances between S2 & CS of Lib−Protection IC without Battery current path.

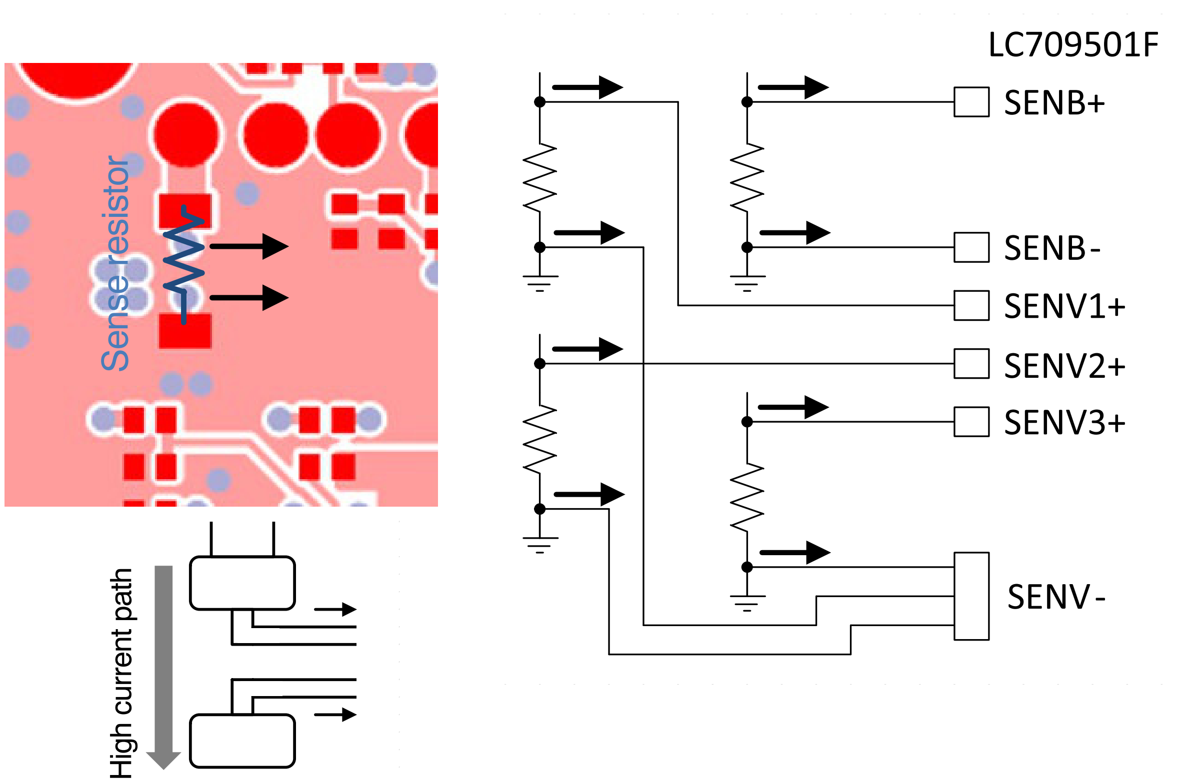


Figure 54. Bottom Layer around Sense resistor

- Extract SENV and SENB signals from the inner side of the sense resistance to remove influence of wire resistance
- Extract Ground side signals of SENV sense resistors with independent lines. Then short their lines near SENV−port of this IC

Down Convert (Buck charge) Current Path vs Layout

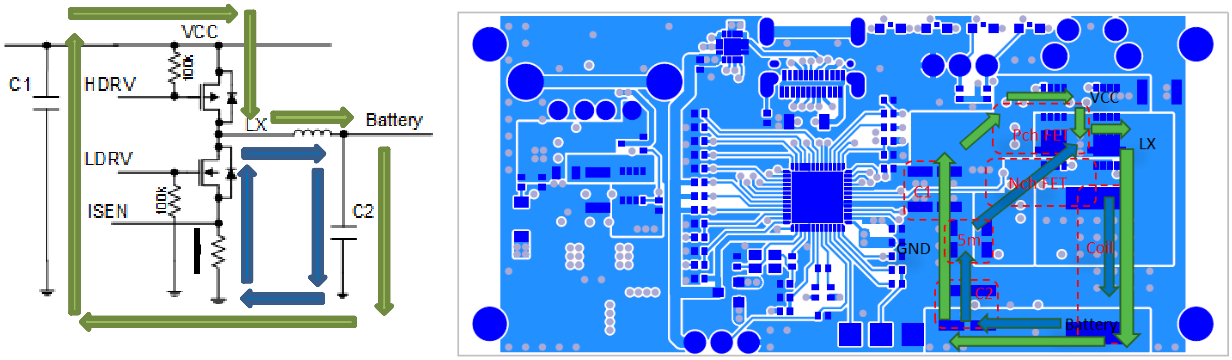


Figure 55.

In DC−DC down conversion, it is desirable to have short and wide enough line for large current to flow to the same direction.

Up Convert (Boost charge) Current Path vs Layout

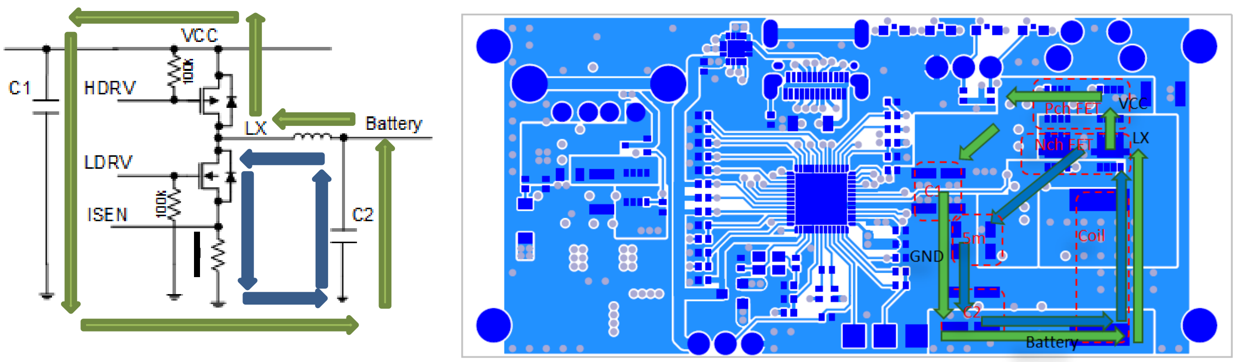


Figure 56.

In DC−DC up conversion, it is desirable to have short and wide enough line for large current to flow to the same direction.

ON−BOARD PROGRAMMING

LC7095xx is prepared 2type programmer.

FWS-X16DI: Production, for Factory
LC88DEBUGGEVB: Evaluation, for Engineer

On−board Programming Tool: FWS−X16DI (Ordering Information: FWSX16DITYPE2MDT)

FWS−X16DI is the on board programmer for Production Factory which ON Semiconductor provides. Built−in ROM of LC709501F on board can be programmed by the programmer. When programming, the device and programmer is connected by only 1 port and DVDD and GND. FWS−X16DI supports the operation with PC and Stand−alone. Download the manual and Application on ON Semiconductor HP.

Search "FWS−X16DI" on ON Semiconducter HP, and download the files.

Figure 57.

Connection FWS−X16DI

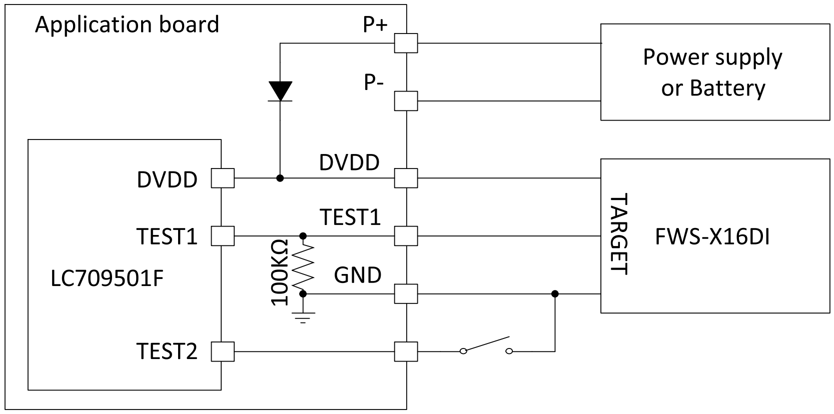


Figure 58.

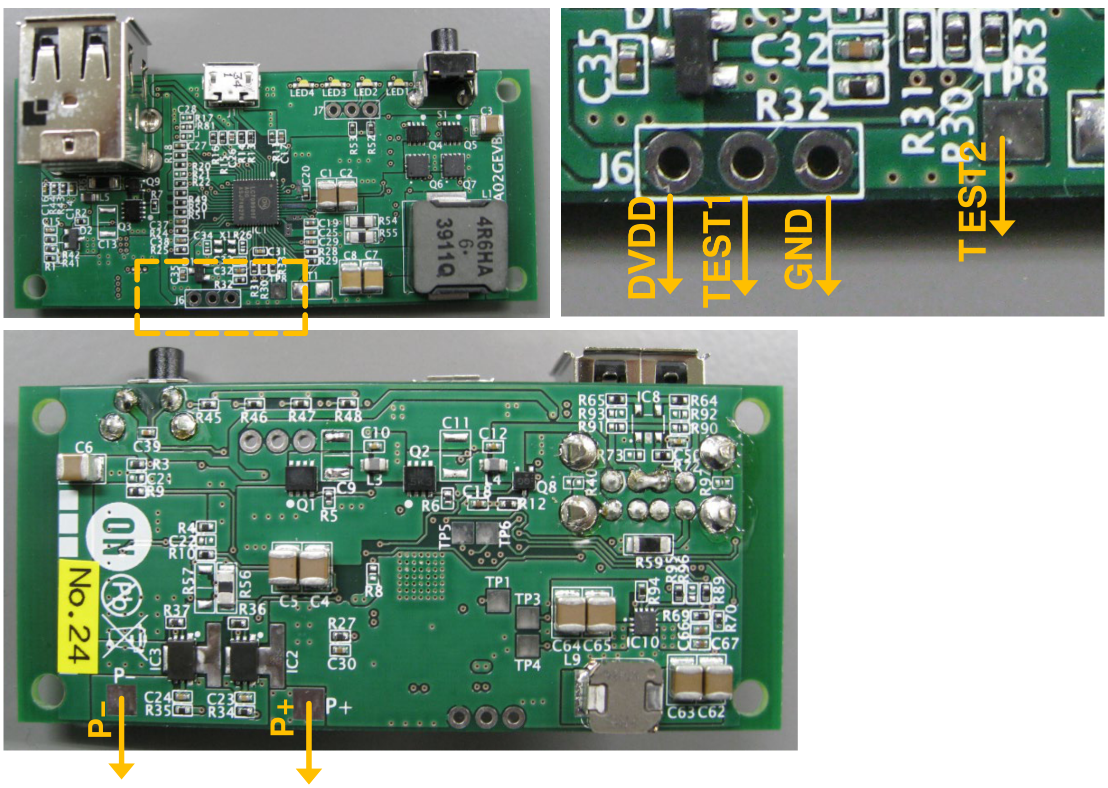


Figure 59. On Board Programming Terminals on LC709501A02GEVB Evaluation Board

Application Software FWS−X16DI

1. Execute “SscFWS” application software on PC
2. Select LC709501F from pull−down list of devices
3. Open target file
4. Programming + Verify
5. Check Success or Error

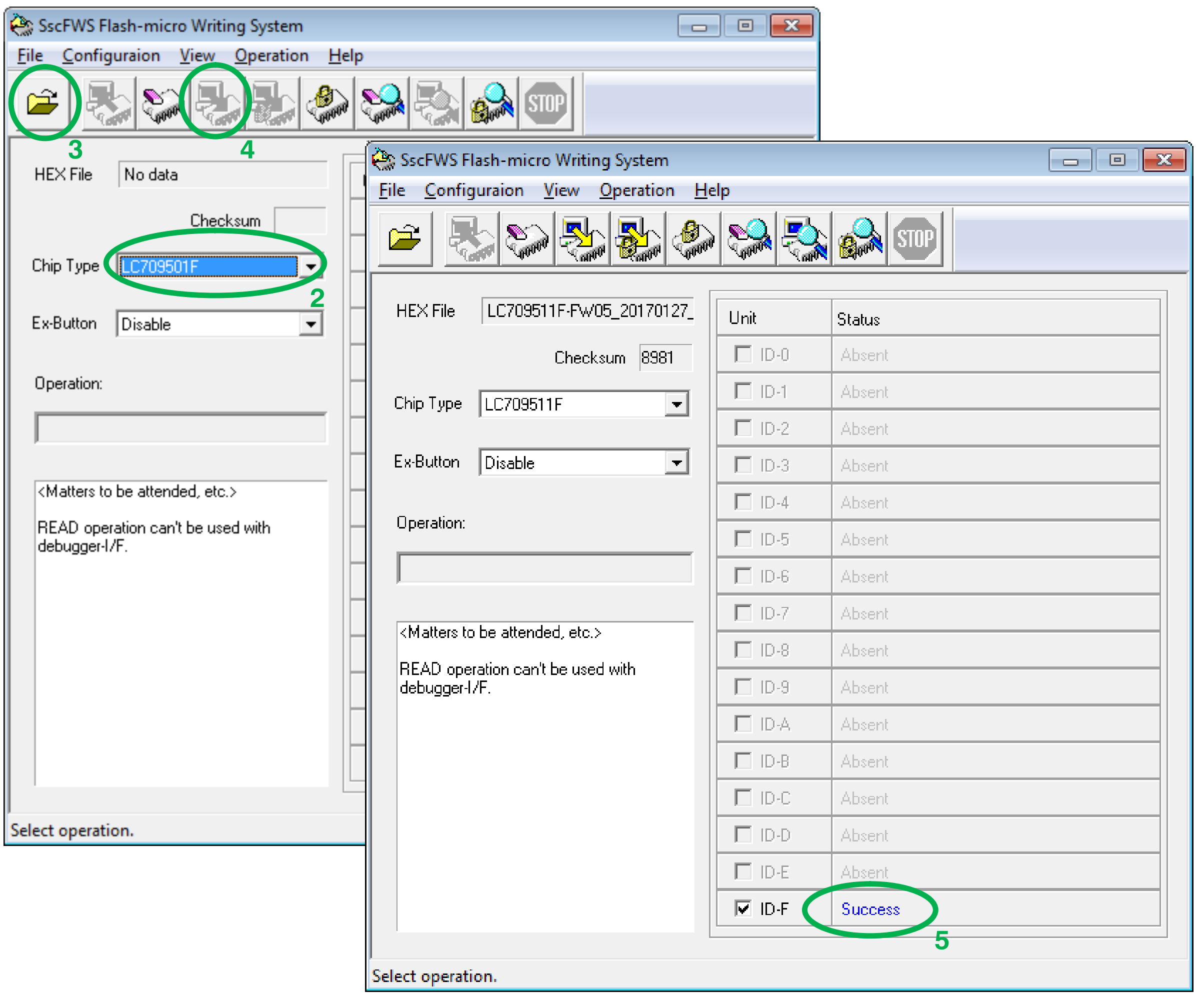


Figure 60.

Electrical Characteristic for Programming

Table 12. ELECTRICAL CHARACTERISTICS (Ta = +10°C to +55°C)

Parameter	Symbol	Pin	Min	Max	Unit
Operating P+ supply	VPPW	P+	3.3	4.5	V
Operating DVDD voltage	VVDDW	DVDD	3.0	4.5	V
Cycle number of Re−Writing	Wcyc	–	–	100	Cycle

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

NOTES: Do not program more than above cycle number.
Satisfy above condition during Programming.

Initialization after Programming

Initialization of this device is necessary for correct operation after programming. It is done automatically by falling and rising of DVDD supply voltage which is showed below.

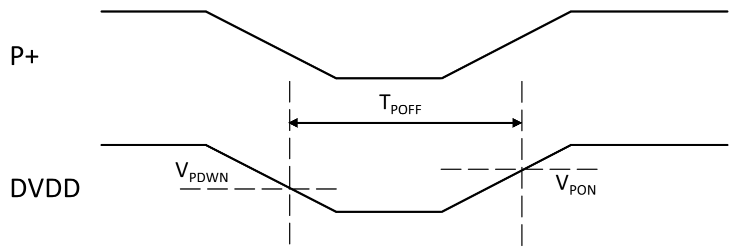


Figure 61.

Table 13.

Parameter	Symbol	Pin	Min	Max	Unit
Power Down Voltage	V_{PDWN}	DVDD	–	1.5	V
Power on Voltage	V_{PON}	DVDD	2.7	–	V
DVDD Low Pulse Width for Initialization	T_{POFF}	–	100	–	ms

If fixed battery makes supply stop difficult, initialize using TEST2 pin. The initialization is done during GND level is input to TEST2. After it, make TEST 2 pin open.

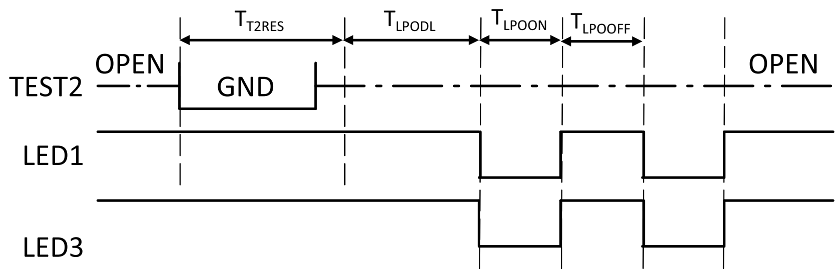


Figure 62.

Table 14.

Parameter	Symbol	Min	Typ	Max	Unit
TEST2 Initial Pulse Width	T_{T2INTZ}	50	–	–	ms
Delay from Finish of Initialization to Lighting	T_{T2LDL}	200	–	–	ms
Lighting Time During Flashing	T_{FLS_L}	–	250	–	ms
Lights Out Time During Flashing	T_{FLS_H}	–	250	–	ms

NOTE: TEST2 pin is pulled−up to DVDD with 100 kΩ resistor in this device.
After finish of Initialization, LED1 and LED3 flash twice to make known that the initialization has been done..

On−board Debugging & Programming Tool: LC88FDEBUGGEVB (Ordering Information: LC88FDEBUGGEVB)

LC88FDEBUGGEVB is the on board debug and programmer for evaluation which ON Semiconductor provides. Built−in ROM of LC709501F on board can be programmed by the programmer. When programming, the device and programmer is connected by only 1 port and VDD and GND. LC88FDEBUGGEVB supports the operation with PC. Download the manual and Application on ON Semiconductor HP.

Search "Xstormy 16" on ON Semiconducter HP, and download the files.

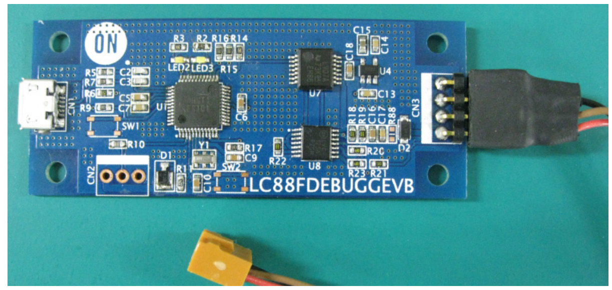


Figure 63.

Connection LC88DEBUGGEVB

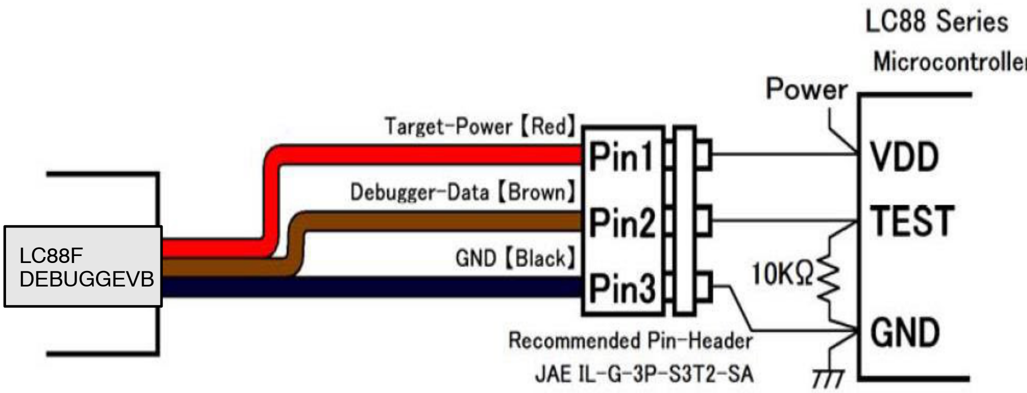


Figure 64.

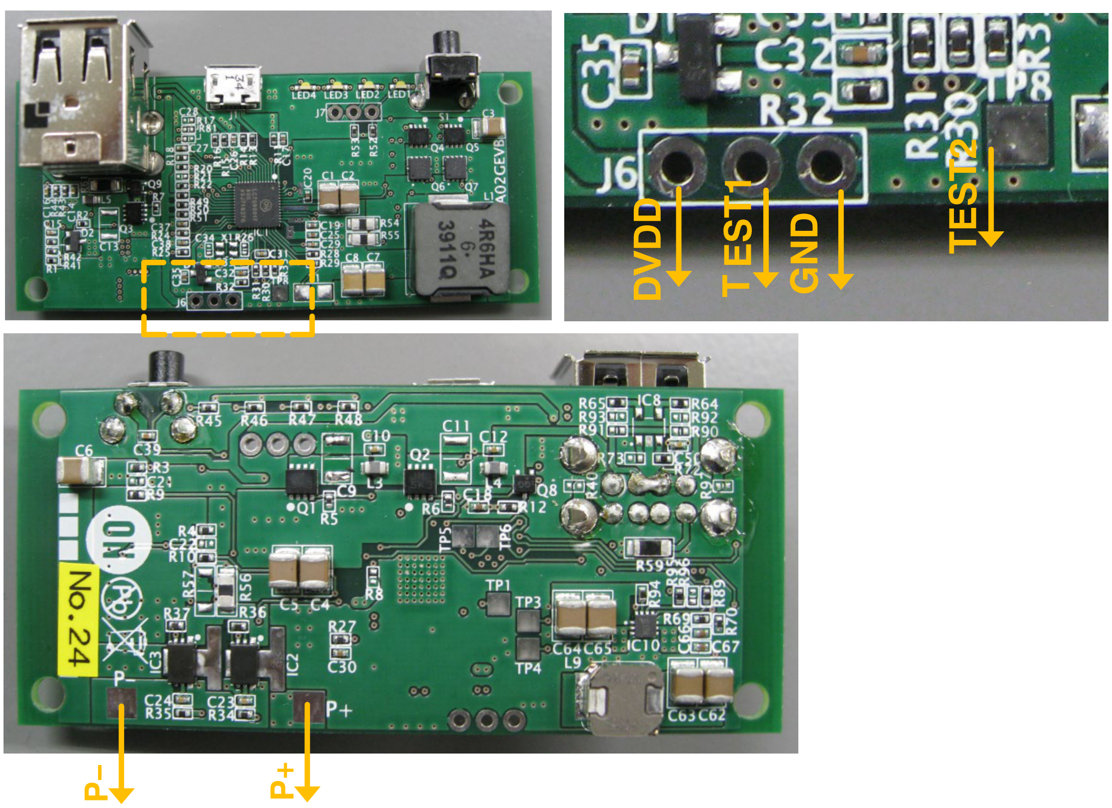


Figure 65. On Board Programming Terminals on LC709501A02GEVB Evaluation Board

Application software LC88FDEBUGGEVB

1. Download reference software from ON Semiconductor HP: https://www.onsemi.com/
   Search “Target IC”   Target IC: LC7095xx –> [Software] –> “Target Software”
   Configurable_Software : Users are able to modify the software
   “Board_name”_software : Pre−installed software (NOT modify)
2. Execute “IDE” application software on PC.
   [Start] –> [All programs] –> [Xstormy16 Series Development Tool]–>[IDE]
3. When use configurable software
   Open Project: [File] –> [Open Project] Project File Path: LC709501F−RFxx\PRJ−RFxx\xxxx.epx
   When use Pre−installed software → Jump (5)
4. Modify the file   Documentation Folder: DOC\
   Config.c   : Parameter (Battery data, Safety function, temperature, etc)
   GpioControl.c: GPIO
   LedControl.c : LED
5. [Build] → [Build] or [Rebuild]
6. [Tool] → [Debugger] → [Target IC]
7. [File] → [Open Hex file]   File Path: LC709501F−RFxx\PRJ−RFxx\Release\RE9999.hex
8. [Debug] [Reset], [Debug] → [Execute]

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