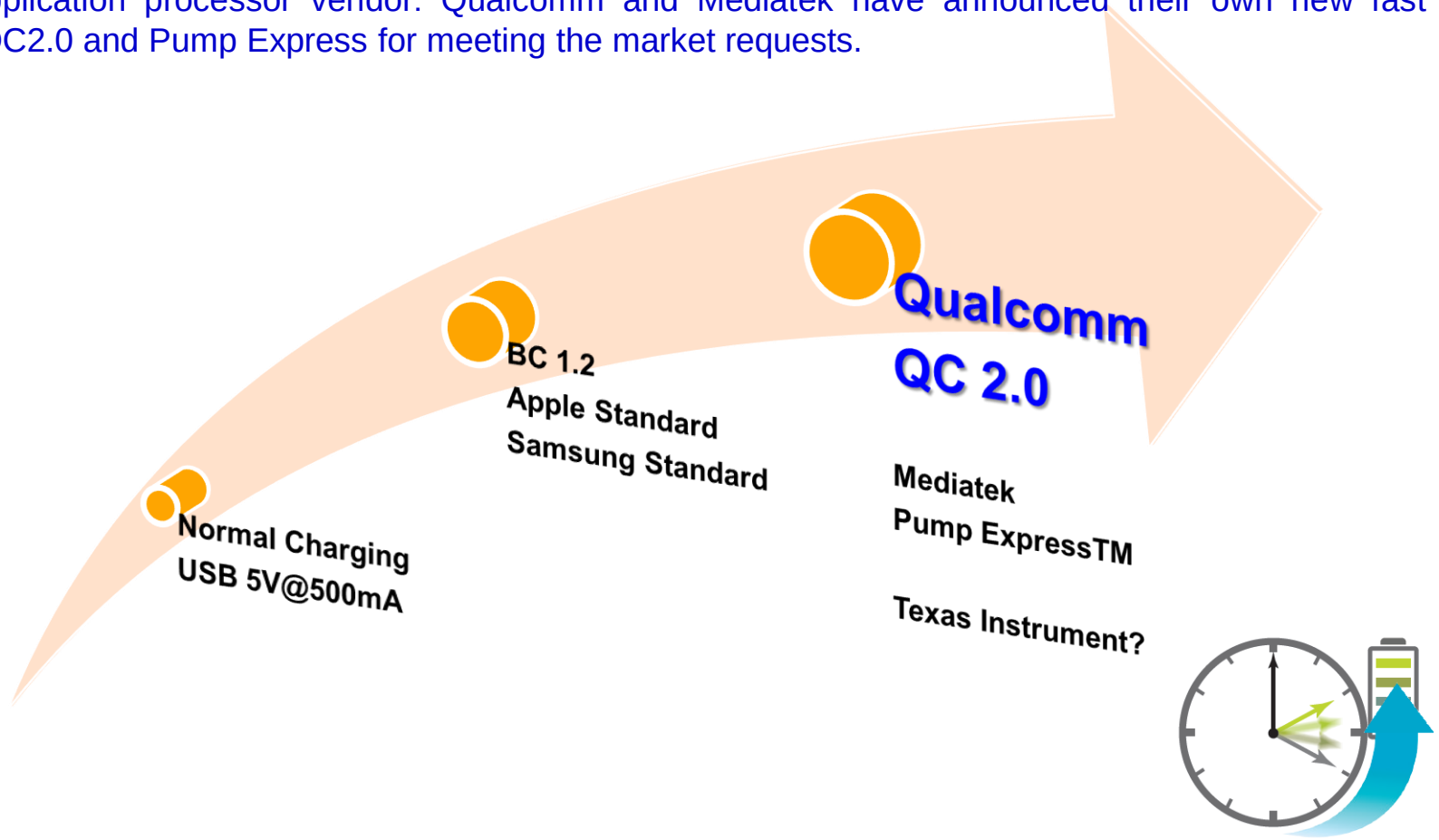
Quick Charge 2.0 Solution

Marketing Department
2015-Q2

Fast Charging Developing Trend

- With the booming needs of long time use and less charging time for mobile devices (smart phones and tablets), Charging technology has the trend from normal USB/ adaptor charging to the appearance of BC1.2 and Apple/ Samsung's own fast charging standard. The next generation's fight has begun. 2 main leading application processor vendor: Qualcomm and Mediatek have announced their own new fast charging QC2.0 and Pump Express for meeting the market requests.



Fast Charging Comparison: QC 2.0 V.S. Pump Express

Item	Quick Charge 2.0	BC1.2
Company	QUALCOMM	HI-SPEED CERTIFIED USB
Performance	Charging speed 75%faster	Normal speed
Additional Accessories	High cost(integration of hard/software) Phone side: Same cost, through USB PHY Charger side: Add new IC for communication	High cost(integration of hard/software) Phone side: Same cost, through USB PHY Charger side: Add new IC for communication
Output Voltage	Type A: 5V, 9V, 12V Type B: 5V, 9V, 12V, 20V	1A@5V
Technology	Base on the D+/D- through USB Charger needs to provide high output voltage and power to the cell phone	Base on the D+/D- through USB Charger needs to provide high output voltage and power to the cell phone

Quick Charge 2.0 Fast Charging Devices

Sony Xperia Z4 Tablet
Snapdragon 810 processor

Droid Turbo by Motorola
Snapdragon 805 processor

Nexus 6 from Google
Snapdragon 805 processor

Samsung GALAXY Note Edge
Snapdragon 805 processor

Samsung GALAXY Note 4
Snapdragon 805 processor

HTC Desire Eye
Snapdragon 801 processor

New Moto X by Motorola
Snapdragon 801 processor

Sony Xperia Z3 Tablet Compact
Snapdragon 801 processor

Sony Xperia Z3 Compact
Snapdragon 801 processor

Sony Xperia Z3
Snapdragon 801 processor

HTC One (M8)
Snapdragon 801 processor

Sony Xperia Z2 Tablet
Snapdragon 801 processor

Quick Charge 2.0 Spec

Qualcomm Quick Charge 2.0:

- Communication between mobile phone and adaptor/ power bank through D+ and D- ports
- Class A: 5V/ 9V/ 12V
- Class B: 5V/ 9V/ 12V/ 20V

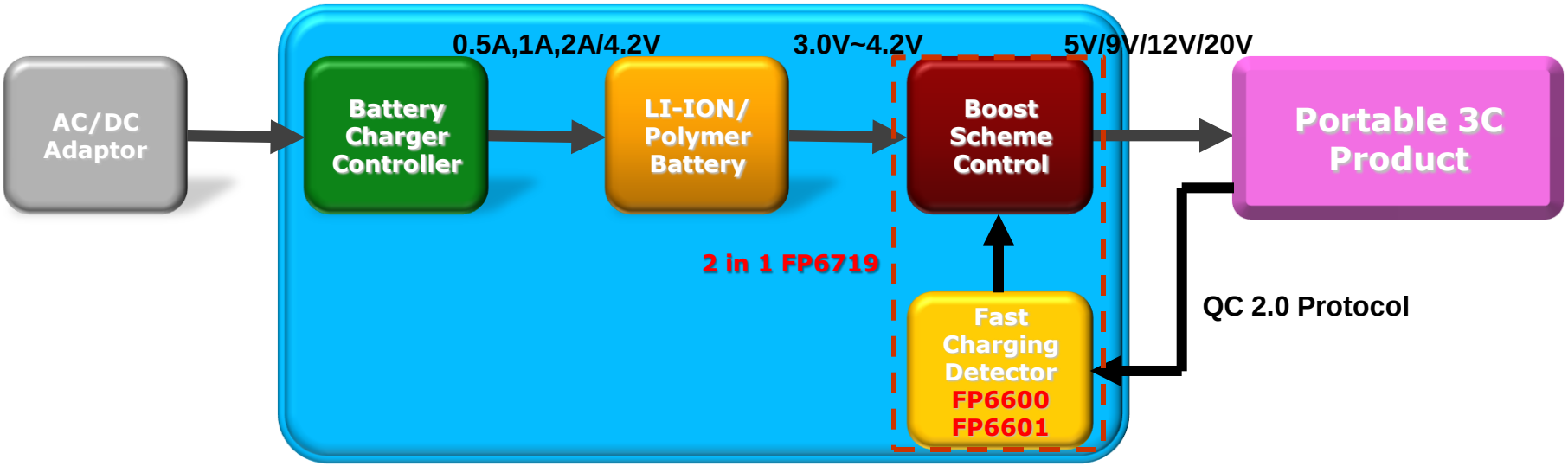
Power bank

Adaptor

D+	D-	Output Voltage
3.3V	3.3V	20V
0.6V	0.6V	12V
3.3V	0.6V	9V
0.6V	GND	5V (Default)

Mobile Phone

Mobile Power Bank Block Diagram

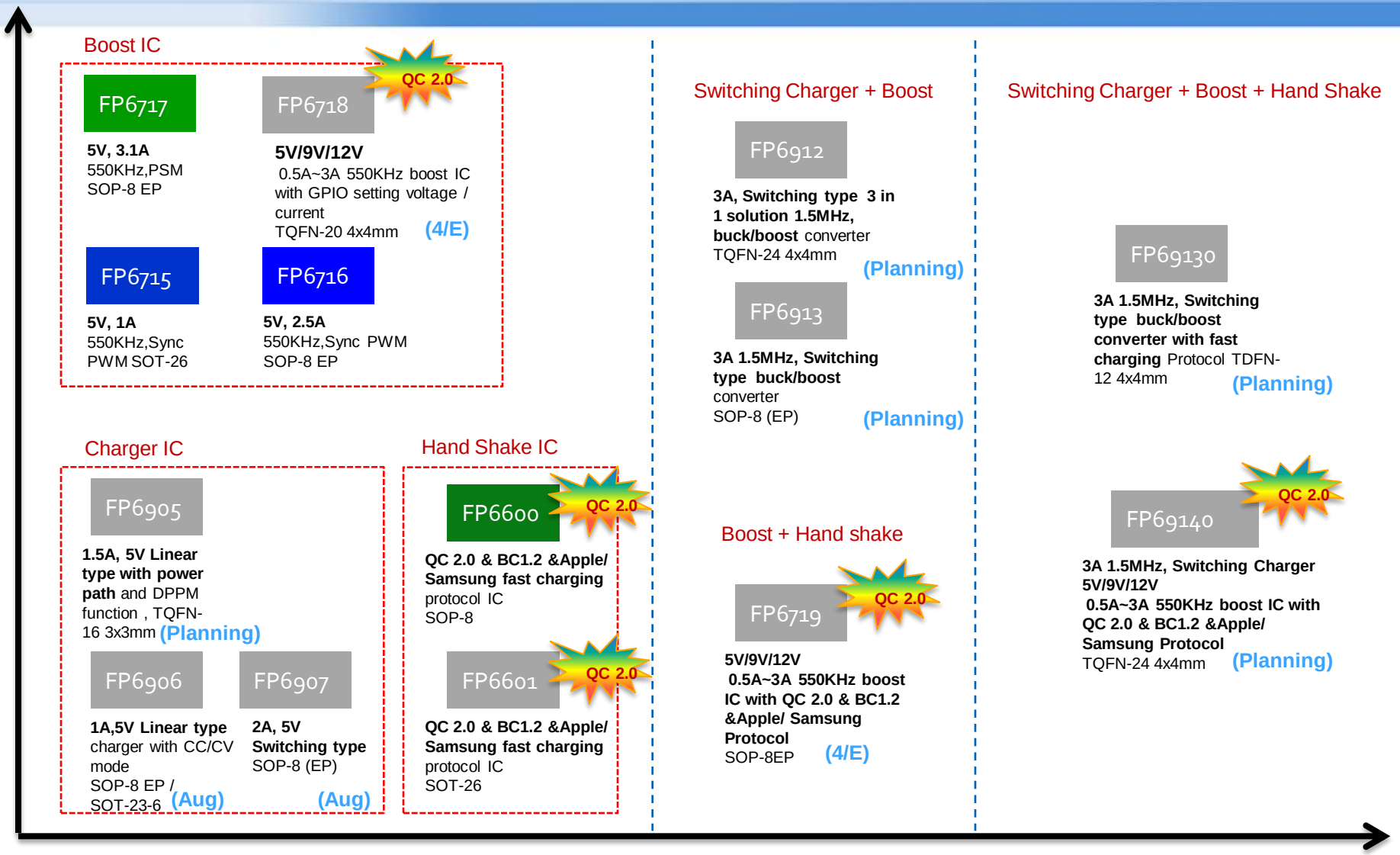


Fitipower promotion solution:

- Charge IC part No.: FP6906 (Linear 1A), FP6907 (Switching 2A)
- Boost IC: 5V_FP6715 (1A), FP6716 (2.1A), FP6717 (3.1A)
  5V/9V/12V_FP6718 (w/ Detection IC: GL889Q)
- **QC2.0 Fast Charging Detector: FP6600 (Class A/B), FP6601 (Class A)**
- **Boost + QC2.0 Fast Charging Detector (2 in 1): FP6719**

2015 Roadmap_Power Bank

MP
Sample
Developing/Planning



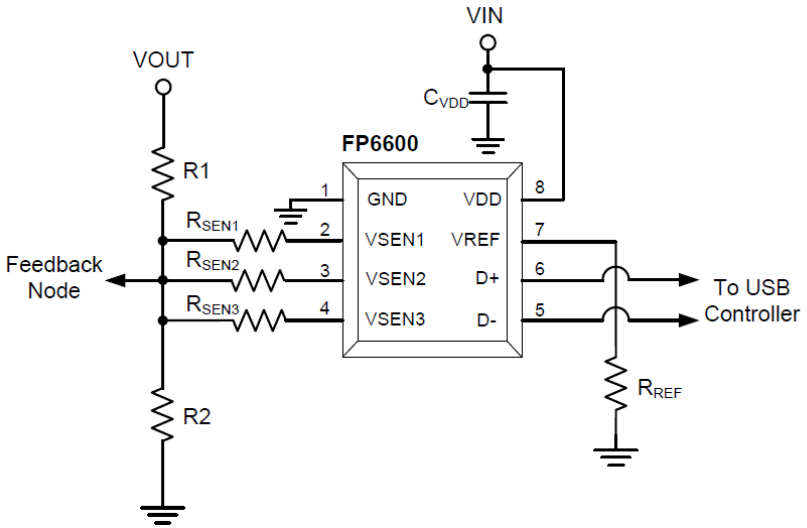
QC2.0 Hand Shake IC Solution

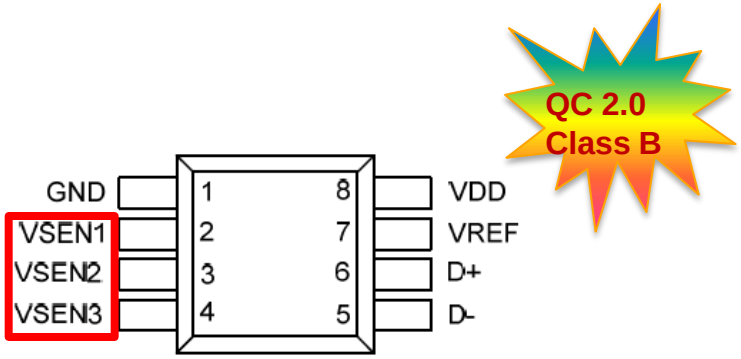
FP6600 QC 2.0 & BC1.2 &Apple/ Samsung fast charging protocol IC

ES

Features

- Fully supports Quick Charge 2.0 specification
  Class A: 5 V, 9 V, and 12 V output voltage
  Class B: 5 V, 9 V, 12 V, and 20 V output voltage
- USB battery charging specification revision 1.2 compatible Automatic USB DCP shorting D+ to D- line
  Default 5 V mode operation
- Very low power consumption Below 1 mW at 5 V output
- Fail safe operation Adjacent pin-to-pin short-circuit fault
  Open circuit pin fault





SOP8

P2P CHY100

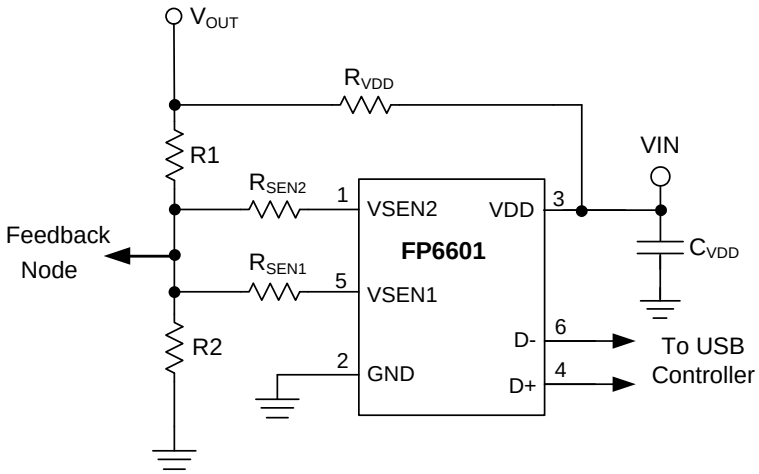
Fully Support: QC2.0/ BC1.2/ Apple/ Samsung

FP6601 QC 2.0 & BC1.2 &Apple/ Samsung fast charging protocol IC

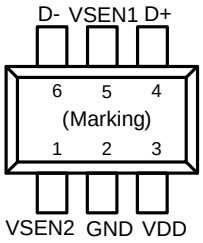
Developing

Features

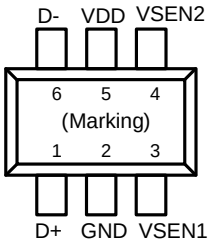
- Fully supports Quick Charge 2.0 specification
  Class A: 5 V, 9 V, and 12 V output voltage
- USB battery charging specification revision 1.2
  compatible Automatic USB DCP shorting D+ to D- line
  Default 5 V mode operation
- Very low power consumption Below 1 mW at 5 V output
- Fail safe operation Adjacent pin-to-pin short-circuit fault
  Open circuit pin fault



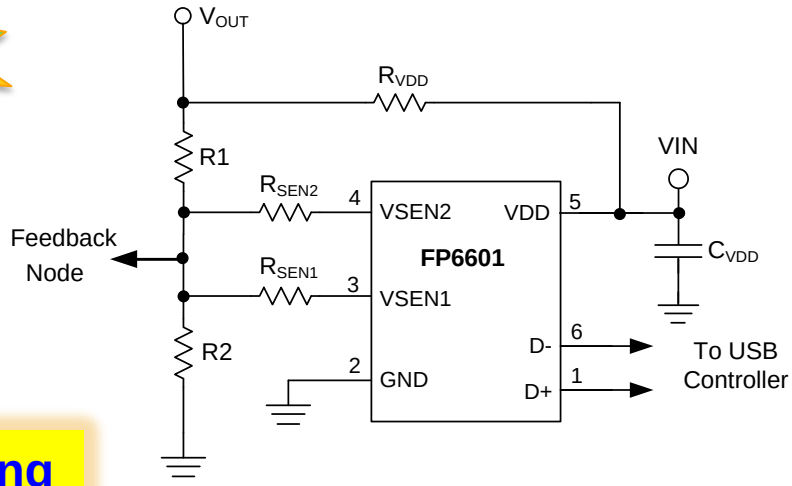
SOT23-6 Package A



SOT23-6 Package B



QC 2.0 Class A



Fully Support: QC2.0/ BC1.2/ Apple/ Samsung

BC1.2 Test Performance

Unit: A

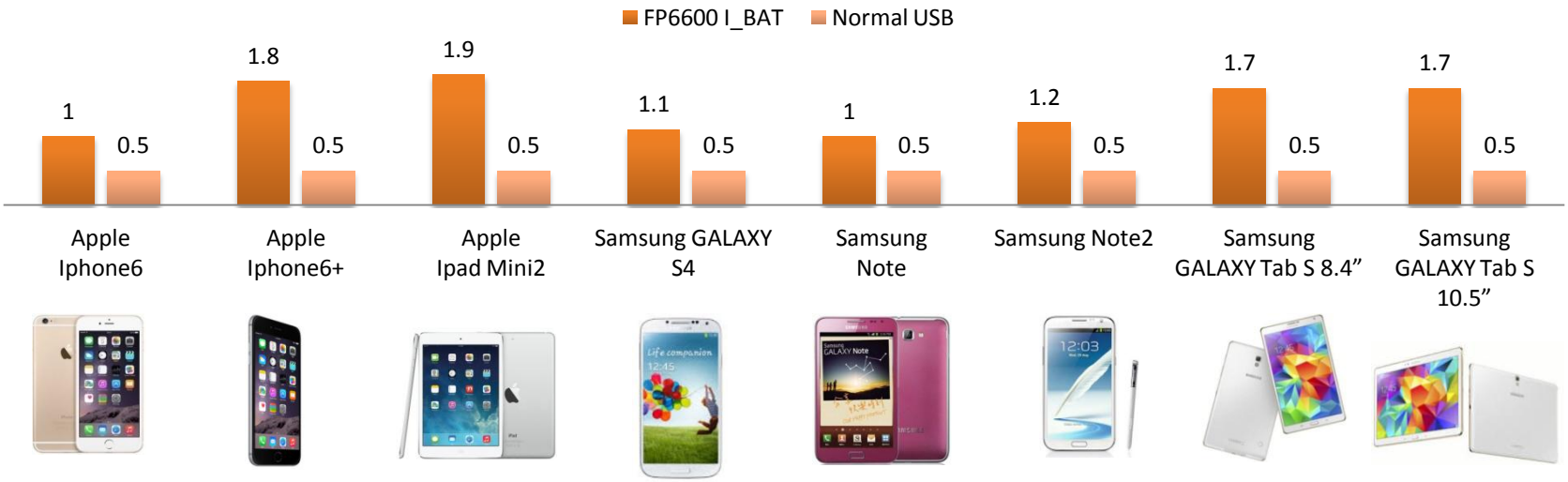
Power Device	Huawei Honor H30-L01	小米 紅米note	Sony Z1	HTC Desire 820	ASUS Padphone Infinity	ASUS Zenfone 5
BAT Status	69%	58%	80%	66%	80%	85%

1. 支援快充: 支持BC1.2快充
2. 兼容性佳: 華為, 小米, Sony, HTC, 華碩etc. 皆可兼容

Apple & Samsung Test Performance

Apple & Samsung Power Device

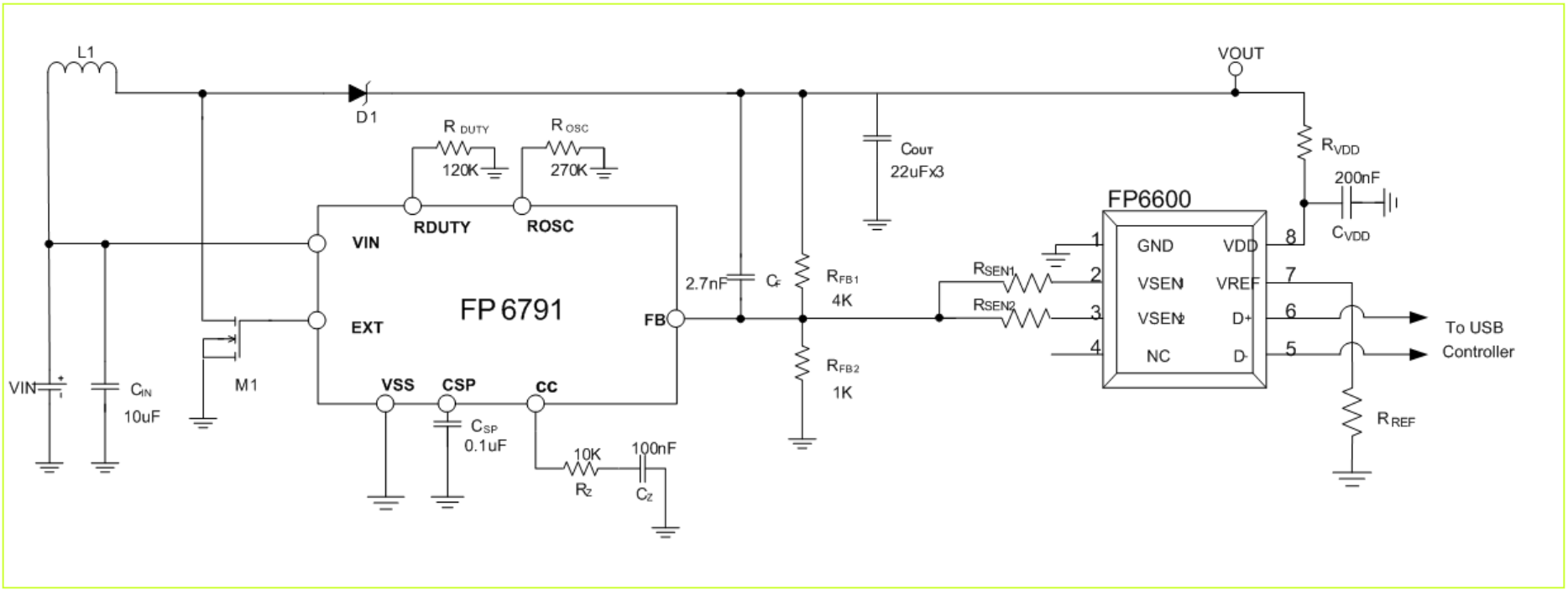
Unit: A



Power Device	Apple Iphone6	Apple Iphone6+	Apple Ipad Mini2	Samsung GALAXY S4	Samsung Note	Samsung Note2	Samsung GALAXY Tab S 8.4”	Samsung GALAXY Tab S 10.5”
BAT Status	75%	70%	29%	49%	79%	86%	59%	69%

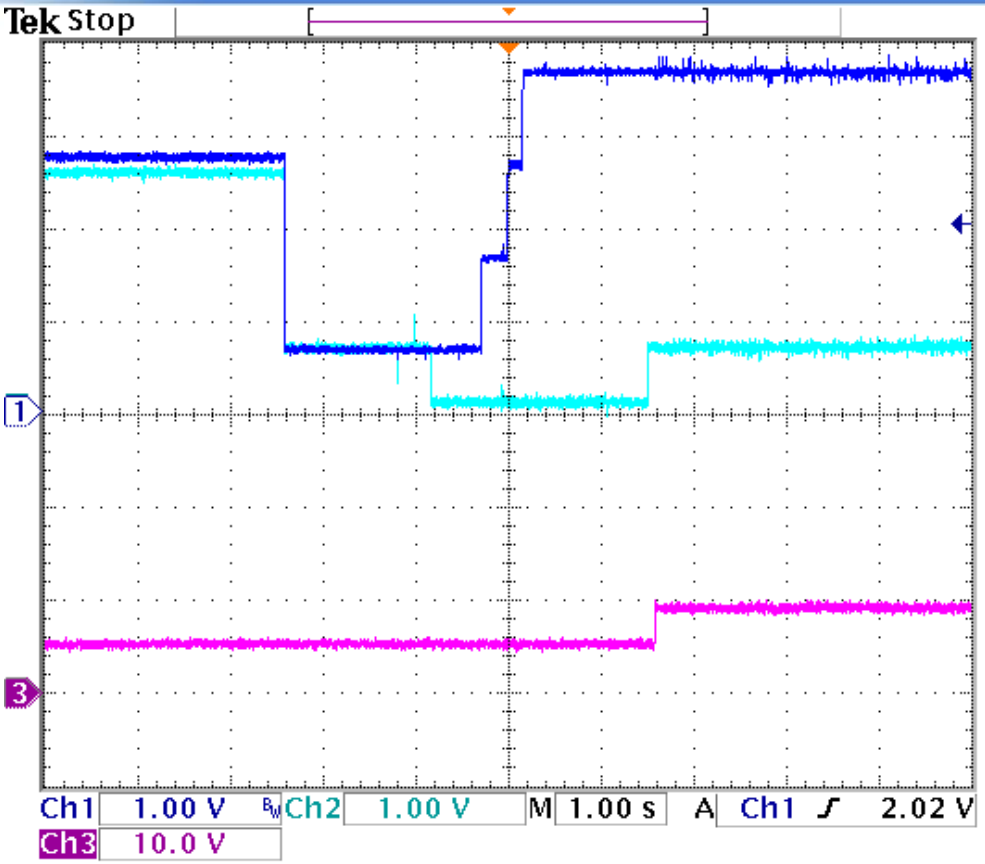
1. 支援快充: 支持Apple/ Samsung大電流快充
2. 兼容性佳: 蘋果, 三星皆可兼容

QC 2.0 Application Circuit w/ Boost IC for Power Bank



FP6791 (Boost) + FP6600 (QC2.0 Detection)

QC 2.0_9V Test

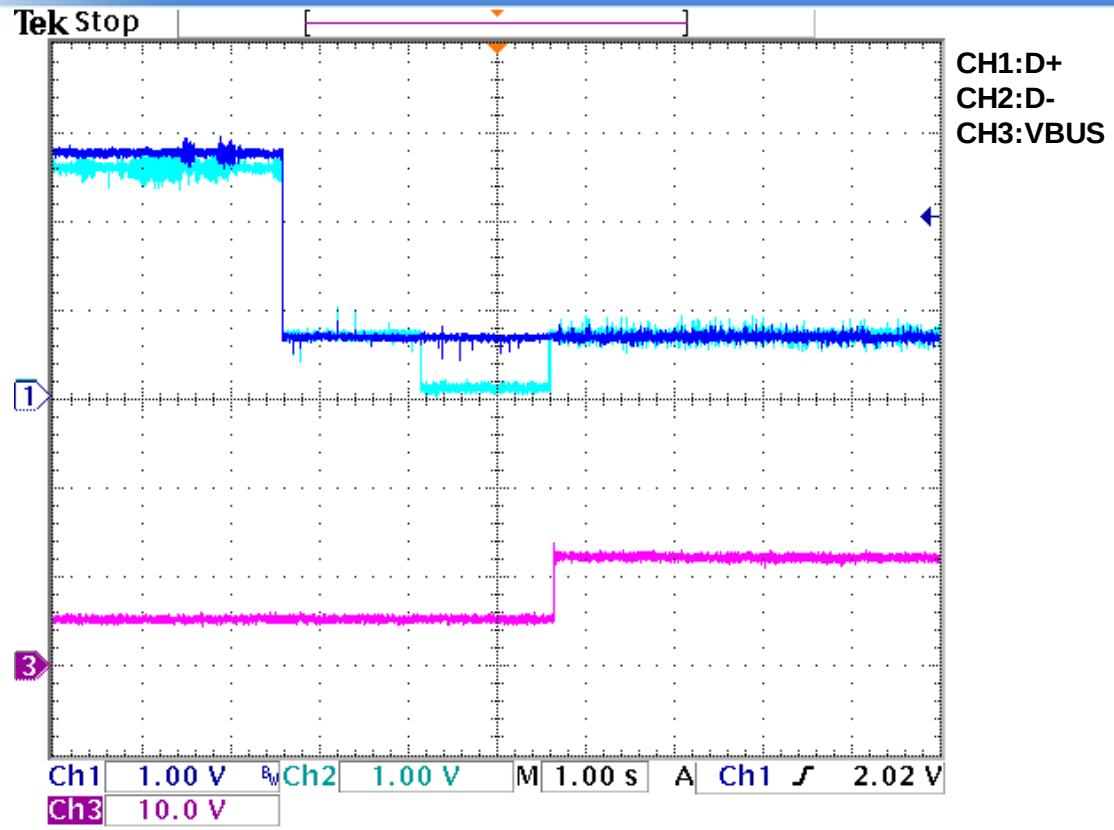


CH1:D+
CH2:D-
CH3:VBUS

D+>0.325V and keep 1.25S, SW4: ON, 進入QC2.0 Mode.
D+=3.3V, D-=0.6V, SW1:ON, VOUT=9V.

支援快充: 完全支持 QC2.0規範

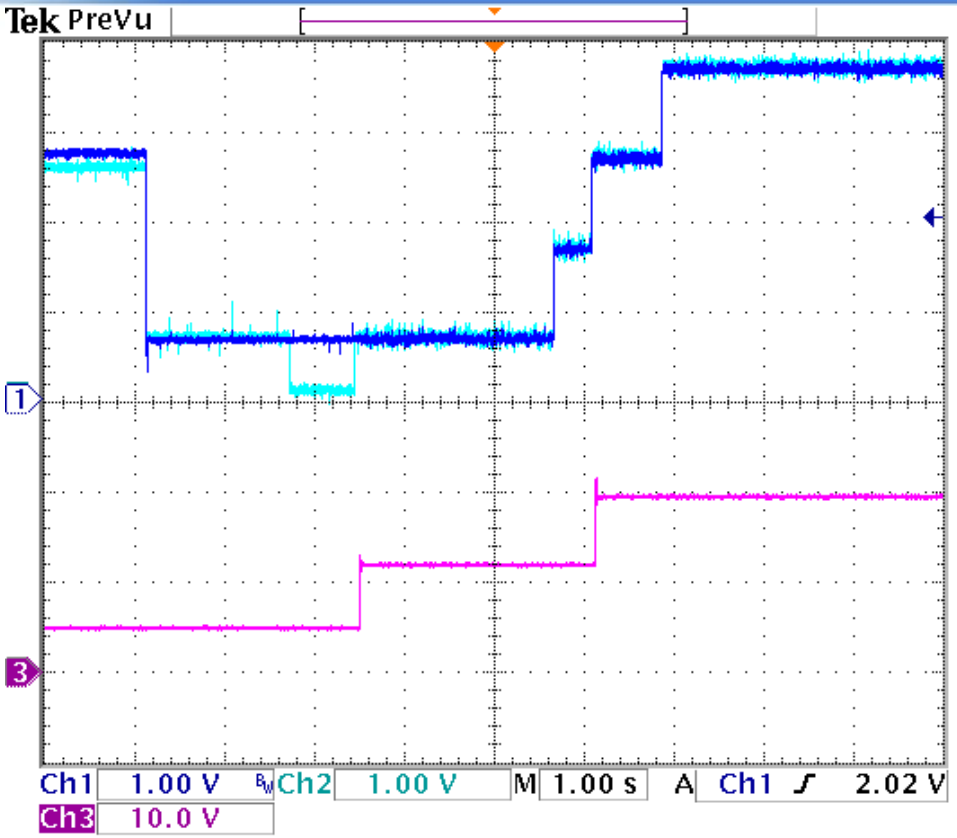
QC 2.0_12V Test



D+>0.325V and keep 1.25S, SW4: ON, 進入QC2.0 Mode.
D+=0.6V, D-=0.6V, SW1,SW2:ON, VOUT=12V.

支援快充: 完全支持 **QC2.0規範**

QC 2.0_20V Test

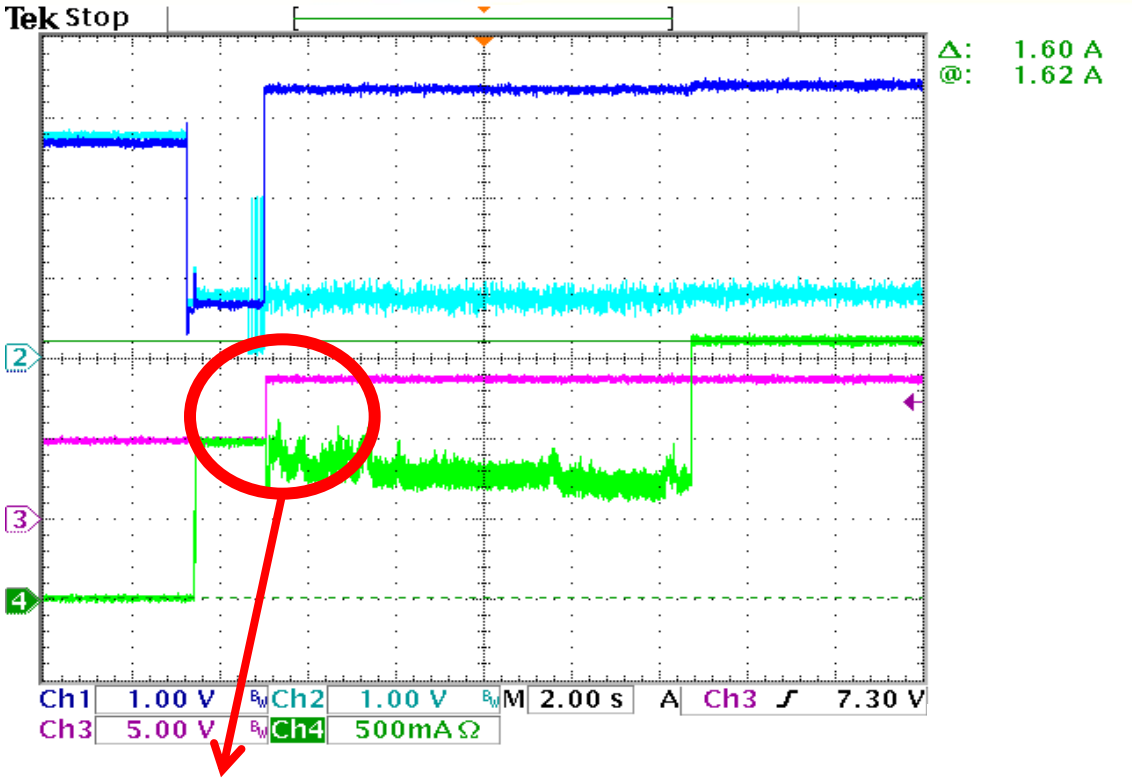


CH1:D+
CH2:D-
CH3:VBUS

D+>0.325V and keep 1.25S, SW4: ON, 進入QC2.0 Mode.
D+=3.6V, D-=3.6V, SW1,SW2,SW3:ON, VOUT=20V.

支援快充: 完全支持 QC2.0規範

QC 2.0 Test Performance w/ 紅米 Note

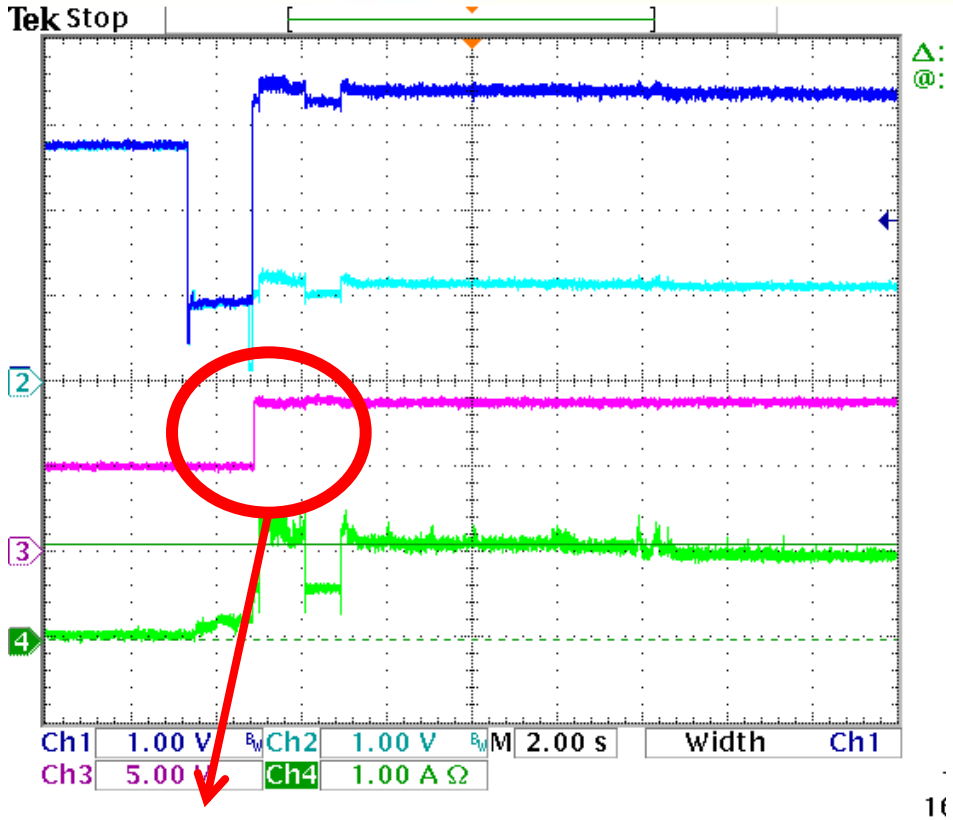


CH1:D+
CH2:D-
CH3:VBUS
CH4: Charge current

Through D+/ D- communication, after receiving *紅米Note* 9V request, FP6600 controls internal MOS for changing Boost IC's Vfb to change Vbus from 5V to 9V and enter QC2.0 9V mode

兼容性佳: 兼容小米QC2.0

QC 2.0 Test Performance w/ Samsung Note4



CH1:D+
CH2:D-
CH3:VBUS
CH4: Charge current

Through D+/ D- communication, after receiving *Samsung Note4* 9V request, FP6600 controls internal MOS for changing Boost IC's Vfb to change Vbus from 5V to 9V and enter QC2.0 9V mode

兼容性佳:兼容三星QC2.0

FITIPOWER 天鈺科技股份有限公司 fitipower integrated technology Inc.

Fitipower Integrated Technology Inc.

FP6600 & FP6601 Comparison with Competitors

Item	FP6600	FP6601	CHY100
QC2.0 Class B (5V/ 9V/ 12V/ 20V)	V		V
QC2.0 Class A (5V/ 9V/ 12V)	V	V	V
Apple (1A, 2.1A/ 2.4A@5V)	V	V	
Samsung (1A, 2.4A@5V)	V	V	V
BC1.2 (1A@5V)	V	V	V
Package	SOP8-EP	SOT23-6	SOP8-EP

1. ***支援快充:*** 支持市面所有快充 **(BC1.2, Apple/ Samsung, QC2.0)**
2. ***兼容性佳:*** 蘋果, 三星, 華為, 小米, **Sony, HTC, 華碩etc.** 皆可兼容
3. ***物超所值:*** 除**QC2.0 , BC1.2, Samsung,** 還比**CHY100** 多支援**Apple** 快充規範

QC2.0 Boost + Hand Shake IC Solution

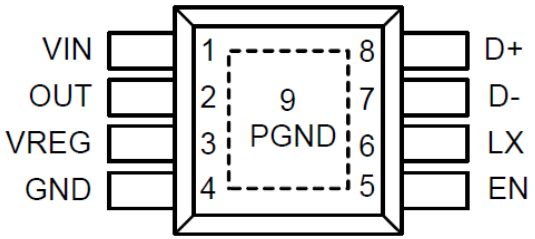
FP6719 High Efficiency, Synchronous Boost Converter with Fast Charging Protocol

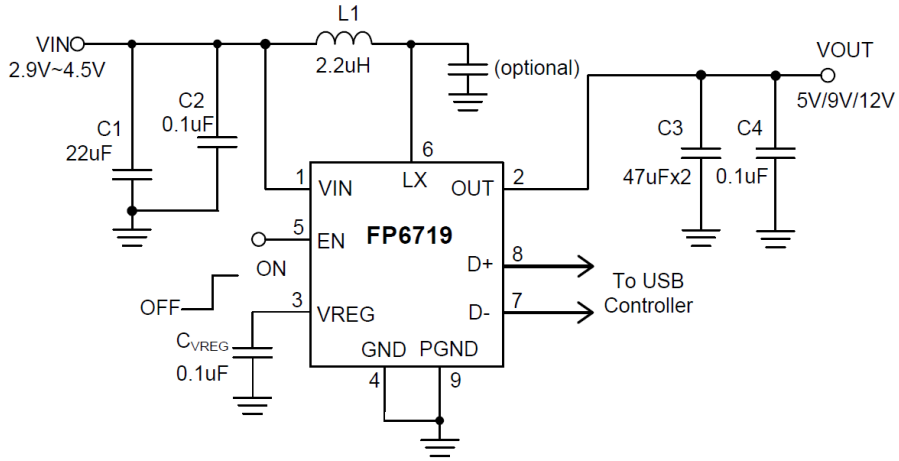
Developing

Features

- Input Voltage Range from 2.9V to 5.5V.
- Output Voltage Can be Set to 5V/9V/12V.
- Built-in Low RDS(ON) Integrated Power MOSFET
- NMOS 39m/PMOS 42m
- Up to 3.0A Programmable Output Current
- Fixed Switching Frequency 500KHz .
- 0.5% Voltage Accuracy
- Power-Save Mode for Light-Load Efficiency.
- Short Circuit Current Fold-back Protection.
- Built-in Soft Start, Output Overvoltage Protection and Thermal Protection
- Supports USB DCP Shorting D+ Line to D- Line BC1.2
- Meets Chinese Telecommunication Industrial Standard YD/T 1591-2009
- Complaint with Apple® and Samsung devices
- SOP-8 (Exposed Pad) Pb-Free Package

QC2.0 Class A Boost
+ Detection 2 in 1 in SOP8EP





Thanks!

Appendix

Charger IC Section

FP6905 1.5A USB-Friendly Li-Ion Battery Linear Charger IC with Input OVP Protection

Developing

Features

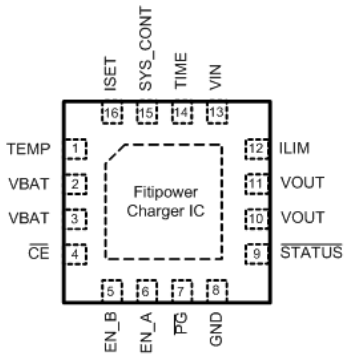
- **Input Voltage Rating up to 10V**.
- **Built-in Power Path MOSFET** and Current Sensor
- **Fully Compliant USB Charger**
- **Selectable 1000mA and 500mA Maximum Input Current**
- 1% Voltage Accuracy
- Very Low Thermal Dissipation
- Programmable Current Limit up to 1.5A
- Charge Current Thermal Regulation
- Battery Disconnect Detection.
- Built-in Reverse Current, Short-Circuit and Thermal Protection
- NTC Thermistor Interface.
- LED Charge State Indicate and Power Good
- **Input OVP Protection**
- Thermally-Enhanced thin **TQFN-16 3x3mm** Package

Applications

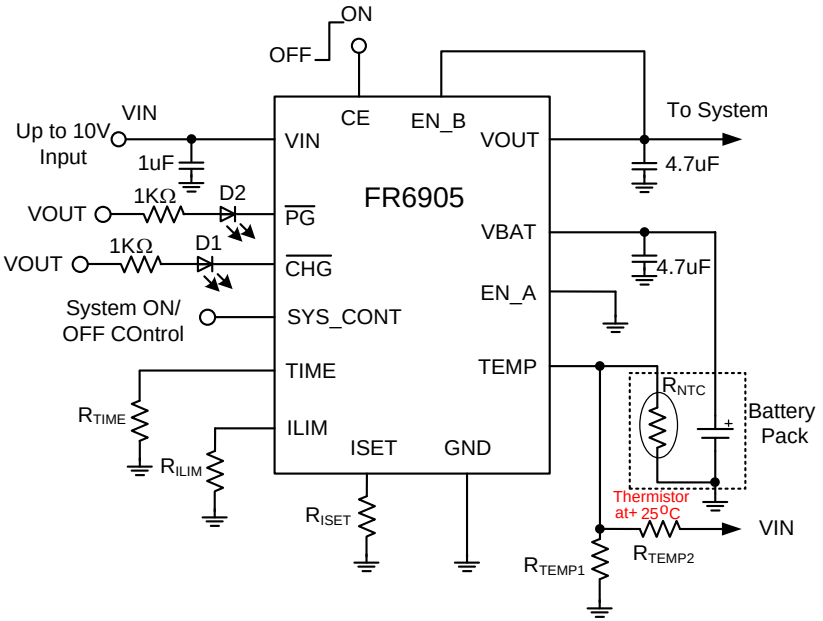
- Smart Phones
- GPS
- Li-ion Battery Power Devices
- Digital Still Cameras
- Wireless Application

Pin Assignment

WD Package TDFN-16 (3x3mm)



Typical Application Circuit



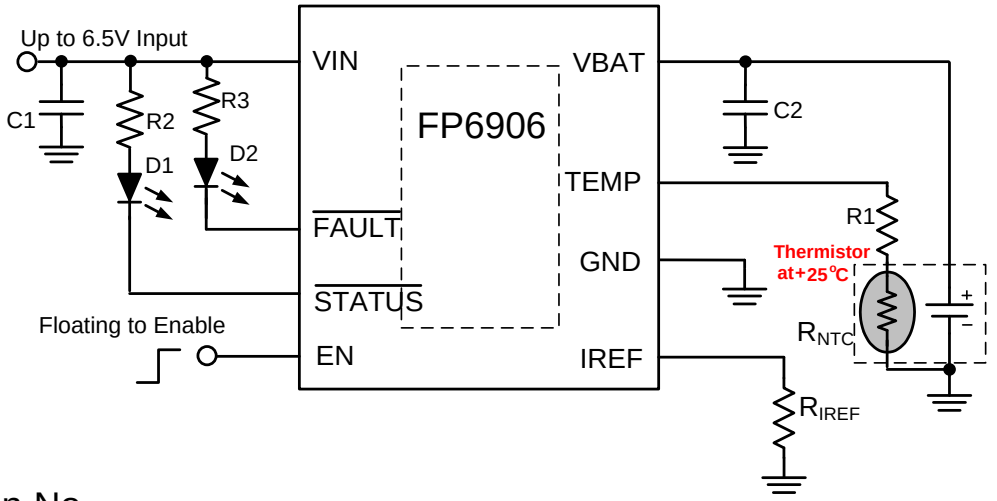
FP6906 1.0A USB-Friendly Li-Ion Battery Linear Charger IC with Input OVP Protection

Developing

Features

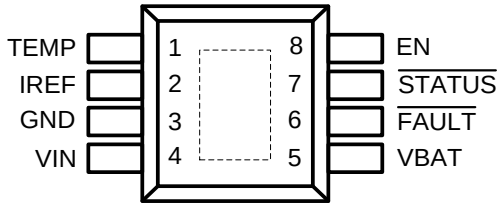
- **Input Voltage Rating up to 10V**.
- Integrated Pass Element and Current Sensor
- No External Blocking Diode Required
- Complete Charger for Single-Cell Li-ion Batteries
- 1% Voltage Accuracy
- Input Over-Voltage Protection
- Programmable Current Limit up to 1.0A
- Charge Current Thermal Fold-back
- Accepts Multiple Types of Adapters
- Can Operate at 2.65V After Start Up
- Ambient Temperature Range: -20˚C to 85˚C
- NTC Interface
- Less than 3μA Leakage Current off the Battery when No Input Power Attached or Charger Disabled
- Thermally-Enhanced with SOP-8 EP/SOT-26 Package

Typical Application Circuit

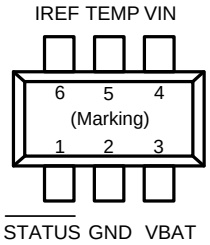


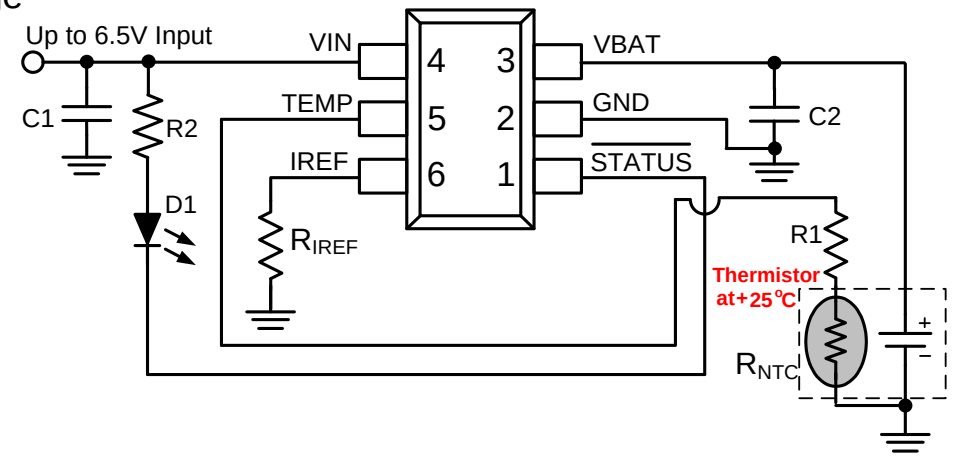
Pin Assignment

SP Package (SOP-8 Exposed Pad)



S6 Package (SOT-23-6)





FP6907 2A USB-Friendly Li-Ion Battery Switching Charger IC with Input OVP Protection

Switching

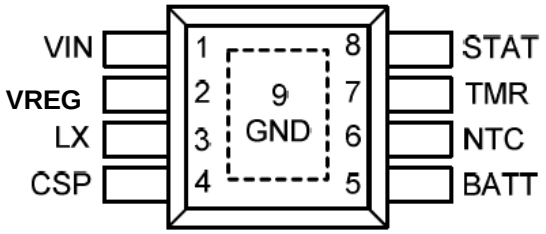
Developing

Features

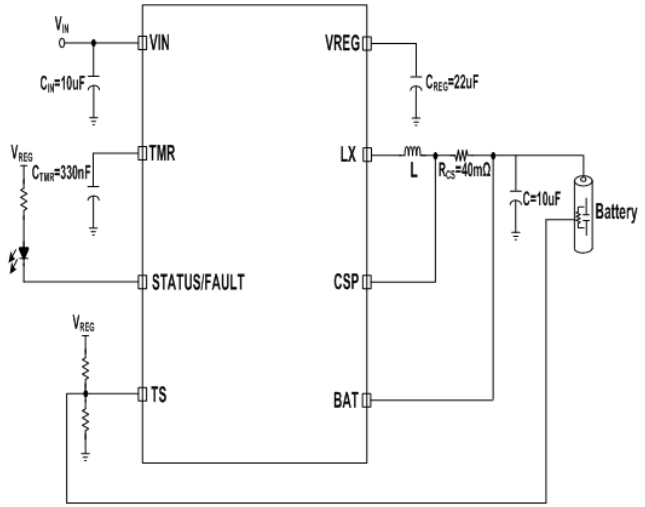
- High Efficiency up to 96%
- Low RDS(ON) Integrated Power MOSFET
- Wide Input Voltage Range: 4.0V to 18V
- 1% Voltage Accuracy
- Fixed 4.35V/ 4.2V for cell voltage
- Programmable Charging Current up to 2.0A with External Resistance.
- Fixed 800KHz Switching Frequency
- NTC Thermistor Interface
- Less than 3μA Leakage Current off the Battery when No Input Power Attached or Charger Disabled
- Battery Disconnect Detection
- Input Under Voltage Lockout
- Over-Temperature Protection with Auto Recovery
- LED Charge State Indicate and Power Good
- SOP-8 Exposed Pad Package
- RoHS Compliant

Pin Assignments

SP Package (SOP-8 Exposed Pad)



Typical Application Circuit



Boost IC Section

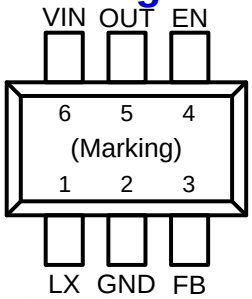
FP6715 High Efficiency Low Ripple 5V 1A, Sync Step-up Converter

MP

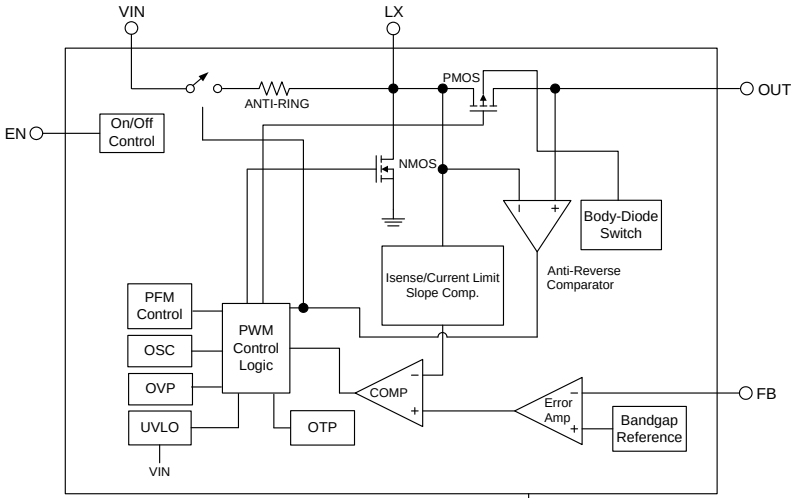
Features

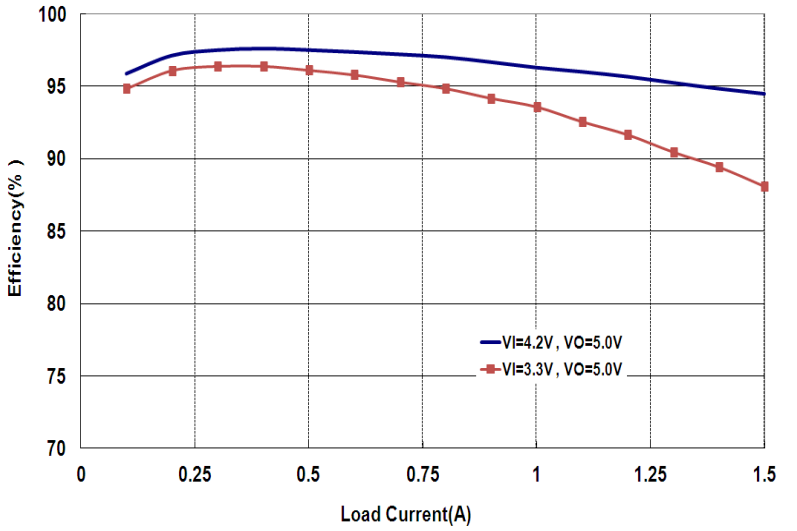
- Up to 93% Efficiency.
- 1.9V to 5.25V DC Input Range.
- Low Rds(on) Integrated Power MOSFET.
- NMOS 80mΩ / PMOS 85mΩ
- Fixed 550KHz Oscillator Frequency.
- Low-Power Mode for Light Load Conditions.
- ±2.0% Voltage Reference Accuracy.
- Cycle by Cycle Current Limit.
- PMOS Current limit for Short Circuit Protection.
- Low Quiescent Current.
- Input Under Voltage Lockout
- Fast Transient Response
- Built-in Soft Start function
- Over-Temperature Protection With Auto Recovery
- OVP Protection
- Space-Saving SOT-23-6 Pb-Free Package.

Pin Assignments



Block Diagram

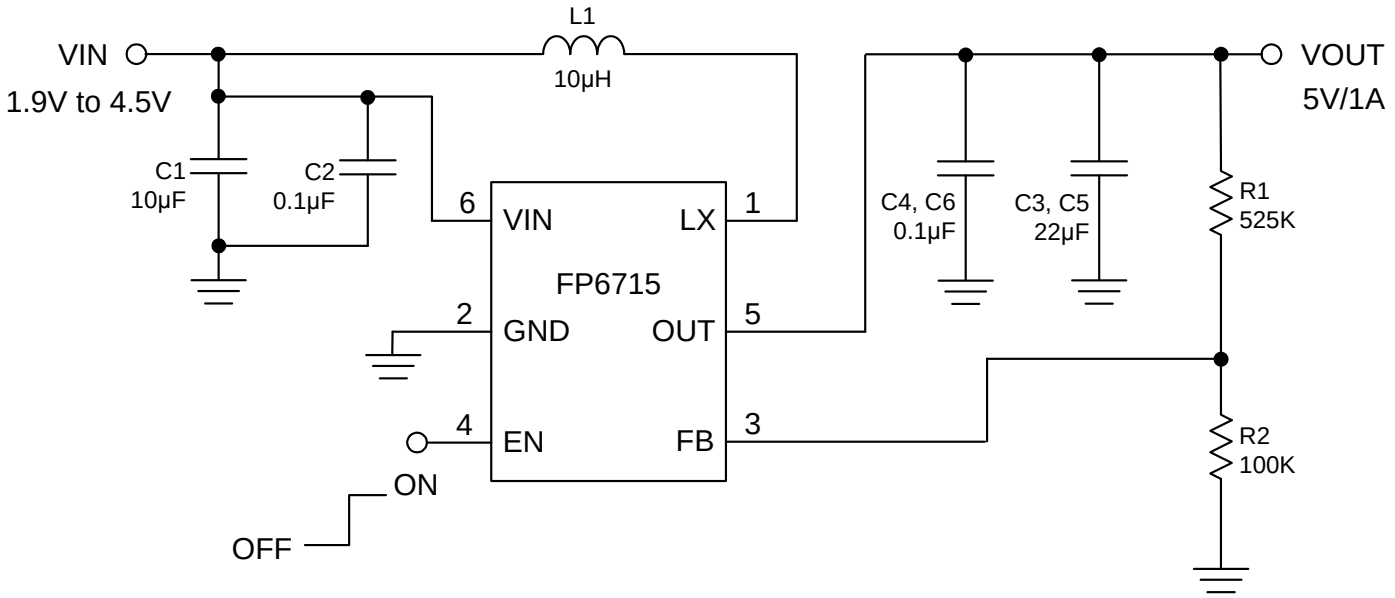




FITIPOWER 天鈺科技股份有限公司 fitipower integrated technology Inc.

Fitipower Integrated Technology Inc.

5V/1A Typical Application Circuit



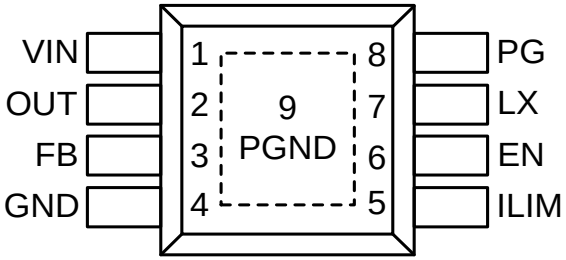
FP6716 High Efficiency Low Ripple 5V 2.5A, Sync Step-up Converter

MP

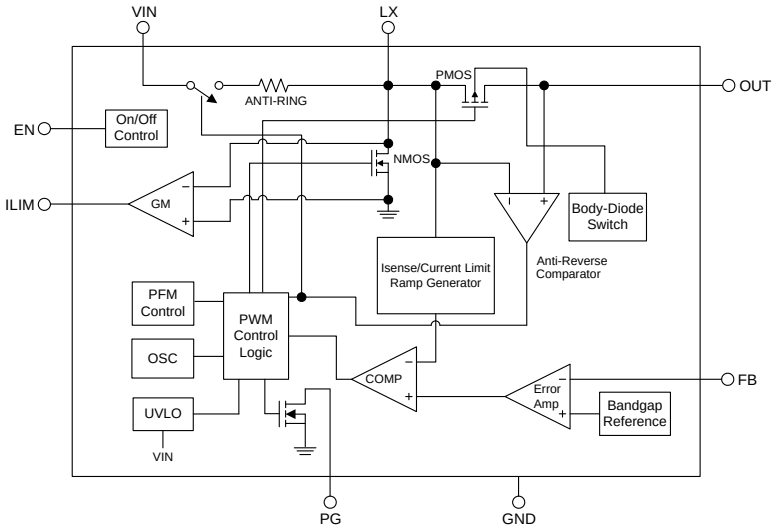
Features

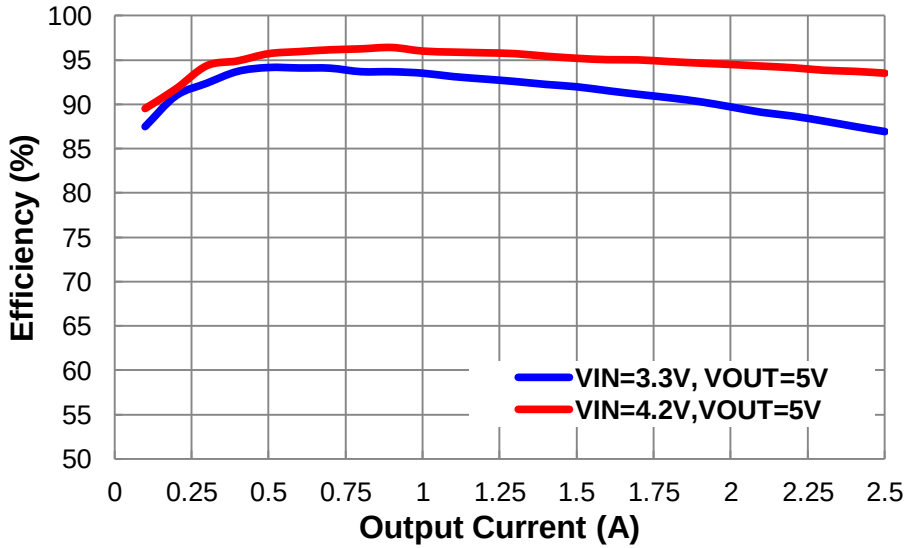
- Up to 95% Efficiency.
- 2.5V to 5.5V DC Input Range.
- Low Rds(on) Integrated Power MOSFET.
- NMOS 50mΩ / PMOS80mΩ
- Fixed 550KHz Oscillator Frequency.
- Low-Power Mode for Light Load Conditions.
- ±2.0% Voltage Reference Accuracy.
- Adjustable Current Limit.
- PMOS Current limit for Short Circuit Protection.
- Low Quiescent Current.
- Input Under Voltage Lockout
- Internal Compensation Function
- Built-in Soft Start function
- Over-Temperature Protection With Auto Recovery
- OVP Protection
- SOP-8 (EP) Pb-Free Package.

Pin Assignments

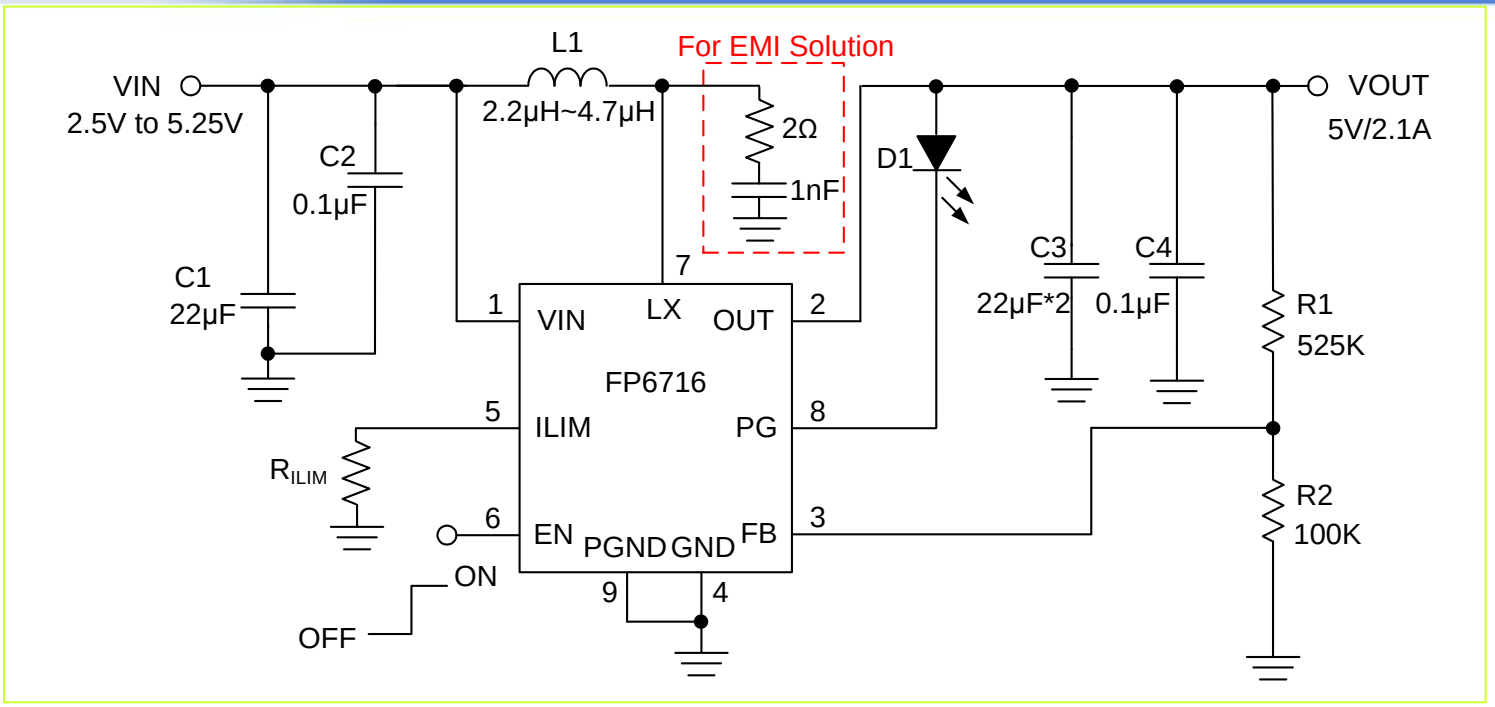


Block Diagram





5V/2.1A Typical Application Circuit



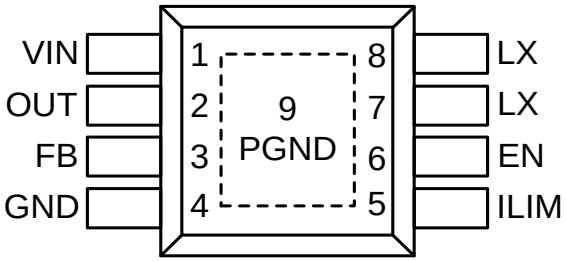
FP6717 High Efficiency Low Ripple 5V 3.1A, Sync Step-up IC

MP

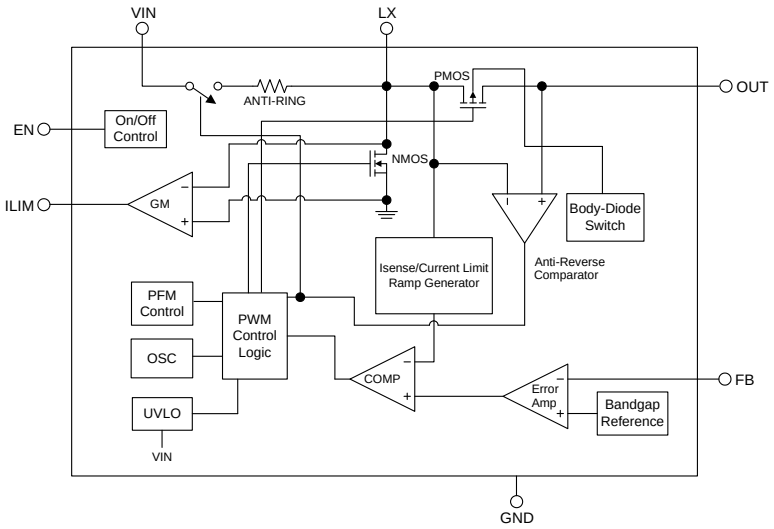
Features

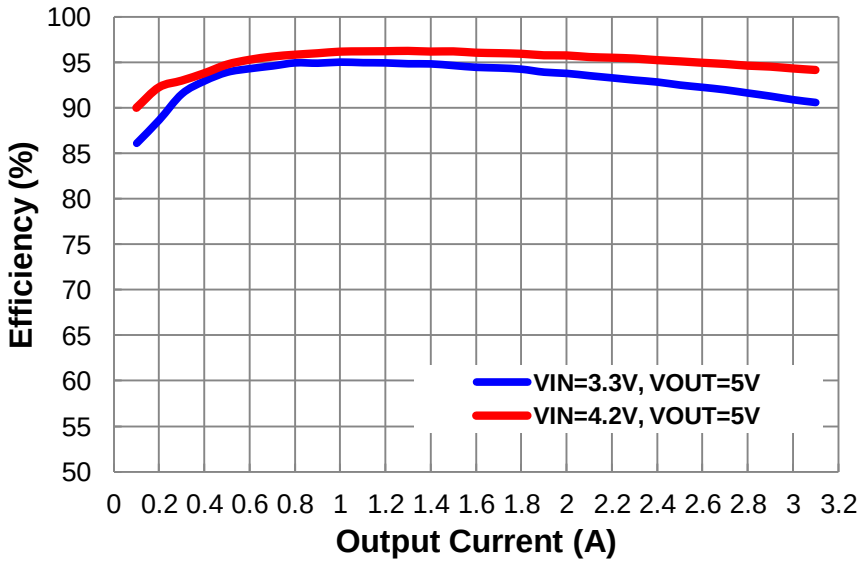
- Up to 95% Efficiency.
- 2.5V to 5.5V DC Input Range.
- Low Rds(on) Integrated Power MOSFET.
- NMOS 39mΩ / PMOS 42mΩ
- Fixed 550KHz Oscillator Frequency.
- Low-Power Mode for Light Load Conditions.
- ±2.0% Voltage Reference Accuracy.
- Adjustable Current Limit.
- PMOS Current limit for Short Circuit Protection.
- Low Quiescent Current.
- Input Under Voltage Lockout
- Internal Compensation Function
- Built-in Soft Start function
- Over-Temperature Protection With Auto Recovery
- OVP Protection
- SOP-8 (EP) Pb-Free Package.

Pin Assignments



Block Diagram





5V/3.1A Typical Application Circuit