

## Power SOC+ with 5V/2.1A Output and 1A linear Charger

### DESCRIPTION

ETA9687 belong to a series of ETA Solutions pioneered Power SOC+. It is capable of delivering 2.1A at the 5V output and can charge at its input with up to 1A charging current. A highly integrated synchronous boost converter that can provide efficiency as high as 97% and a simple linear charge that provides fast charge current up to 1A are both integrated in ETA9687. Simple MCU functions are also included in ETA9687, such as, push-button, USB charging emulation, no load detection. All of these highly integrated features of ETA's Power SOC+ technology make ETA9687 an ideal solution for Power bank or applications alike.

ETA9687 is available in ESDP-8 package.

### FEATURES

- ◆ Up to 97% Energy Converting Efficiency
- ◆ Up to 2.1A output current at 5V output, 3.3V input
- ◆ Dedicated Charging Port (DCP) emulator
- ◆ True Shut off during shutdown and output short-circuit protection
- ◆ Thermal Shutdown
- ◆ ESDP-8

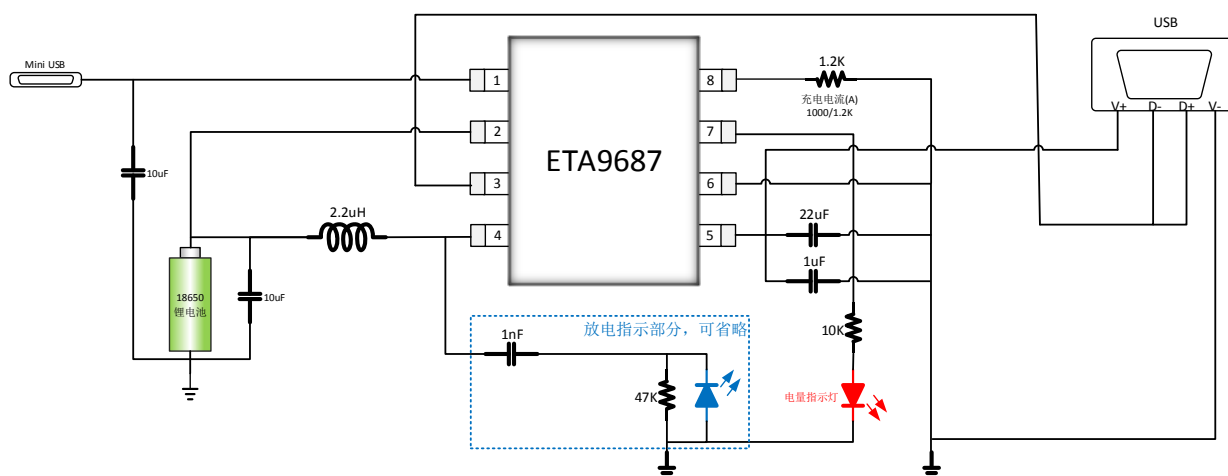
### APPLICATIONS

- ◆ Power Bank
- ◆ Tablet PC, MID

### ORDERING INFORMATION

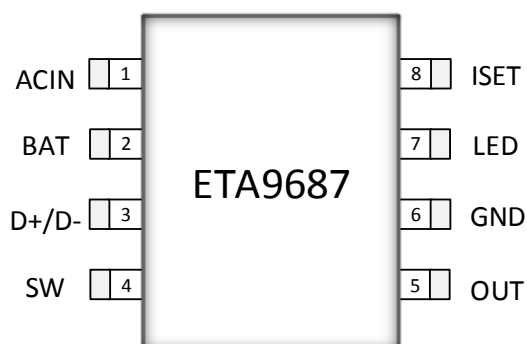
| PART ID    | PACKAGE | TOP MARK         |
|------------|---------|------------------|
| ETA9687E8A | ESDP8   | ETA9687<br>YWW2L |

### TYPICAL APPLICATION



Typical application circuit of ETA9687

## PIN CONFIGURATION



## ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

|                                      |                |               |      |
|--------------------------------------|----------------|---------------|------|
| All Pins Voltage                     | -0.3V to 5.5V  |               |      |
| Operating Temperature Range          | -40°C to 85°C  |               |      |
| Storage Temperature Range            | -55°C to 150°C |               |      |
| Thermal Resistance                   | $\theta_{JC}$  | $\theta_{JA}$ |      |
| ESOP8                                | 10             | 58            | °C/W |
| Lead Temperature (Soldering, 10ssec) | 260°C          |               |      |
| ESD HBM (Human Body Mode)            | 2KV            |               |      |
| ESD MM (Machine Mode)                | 200V           |               |      |

ESOP-8

## ELECTRICAL CHARACTERISTICS

( $V_{BAT}=3.6V$ ,  $V_{ACIN}=5V$ , unless otherwise specified. Typical values are at  $T_A=25^\circ C$ .)

| PARAMETER                            | CONDITIONS   | MIN  | TYP  | MAX  | UNITS      |
|--------------------------------------|--|------|------|------|------------|
| <b>SYNCHRONOUS BOOST</b>             |  |      |      |      |            |
| Quiescent current                    | $V_{BAT}=3.6V$ , $V_{OUT}=5.5V$ , Device not switching |      | 120  | 150  | $\mu A$    |
| Shutdown Supply Current at $V_{BAT}$ | $V_{BAT}=3.6V$ , $V_{EN}=GND$                          |      | 6    | 10   | $\mu A$    |
| $V_{BAT}$ UVLO at Rising             |  |      | 3.1  |      | V          |
| $V_{BAT}$ UVLO at Falling            |  |      | 2.6  |      | V          |
| $V_{OUT}$                            | Output Voltage   | 4.90 | 5.03 | 5.15 | V          |
| Low Side Main FET $R_{DS(on)}$       | $V_{OUT}=5V$   |      | 90   |      | m $\Omega$ |
| Synchronous FET $R_{DS(on)}$         | $V_{OUT}=5V$   |      | 50   |      | m $\Omega$ |
| Switch Frequency                     |  |      | 1    |      | MHZ        |
| Main FET Current Limit               |  |      | 4.2  |      | A          |
| SW Leakage Current                   | $V_{out}=5V$ , $V_{sw}=0$ or $5V$ , $V_{EN}=GND$       | -1   | 0    | 1    | $\mu A$    |
| Thermal Shutdown                     | Rising, Hysteresis=20°C                                |      | 150  |      | °C         |
| <b>LINEAR CHARGER</b>                |  |      |      |      |            |
| BAT CV Voltage                       |  | 4.16 | 4.20 | 4.24 | V          |
| Charger Restart Threshold            | From Done to FastCharge                                | 150  |      | 220  | mV         |
| BAT Pre-condition Voltage            |  | 2.65 | 2.87 | 3.1  | V          |
| Pre-condition Charger Current        |  | 50   | 80   | 110  | mA         |
| ACIN fast Charge Current             | $R_{ISET}=1K$  |      | 1000 |      | mA         |

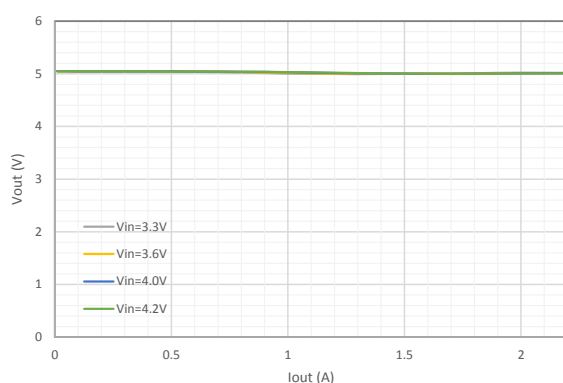
## PIN DESCRIPTION

| PIN # | NAME  | DESCRIPTION  |
|-------|-------|--|
| 1     | ACIN  | Charger input pin. Connect to an AC adaptor or a USB charger output.   |
| 2     | BAT   | Battery input pin. Bypass BAT to GND with a 10uF or greater ceramic capacitor.   |
| 3     | D+/D- | Connect to the D+ and D- line of USB connect, provide the correct voltage with attached portable equipment for USB Dedicated Charging Port (DCP) Emulator.         |
| 4     | SW    | Switching node of the Switching Regulator. Connect a 1uH to 2.2uH inductor between IN and SW pin.  |
| 5     | OUT   | Output pin. Bypass with a 22uFx2 or larger ceramic capacitor closely between this pin and ground.  |
| 6     | GND   | Ground.  |
| 7     | LED   | Battery level display  |
| 8     | ISSET | Charge Current set pin for AC input. Connecting a Resistor (Rset) between ISET to GND. This sets the fast charge current value as $I_{charge} = 1000/R_{set}$ (mA) |

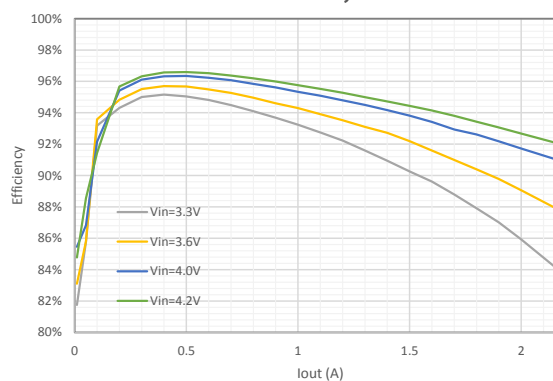
## TYPICAL CHARACTERISTICS

(Typical values are at  $T_A = 25^\circ\text{C}$  unless otherwise specified.)

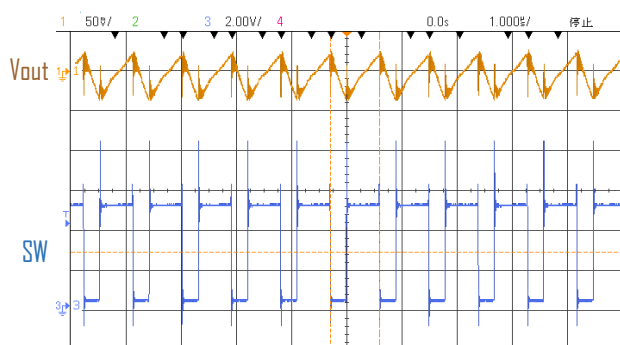
ETA9687 Vout Vs. Iout



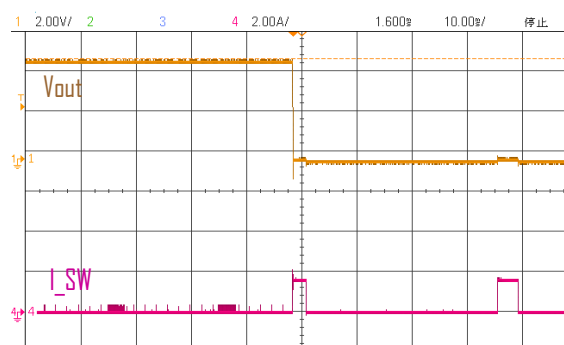
ETA9687 Efficiency Vs. Iout



Switching Waveforms:  $V_{BAT}=3.6\text{V}$ ,  $I_{out}=2.1\text{A}$

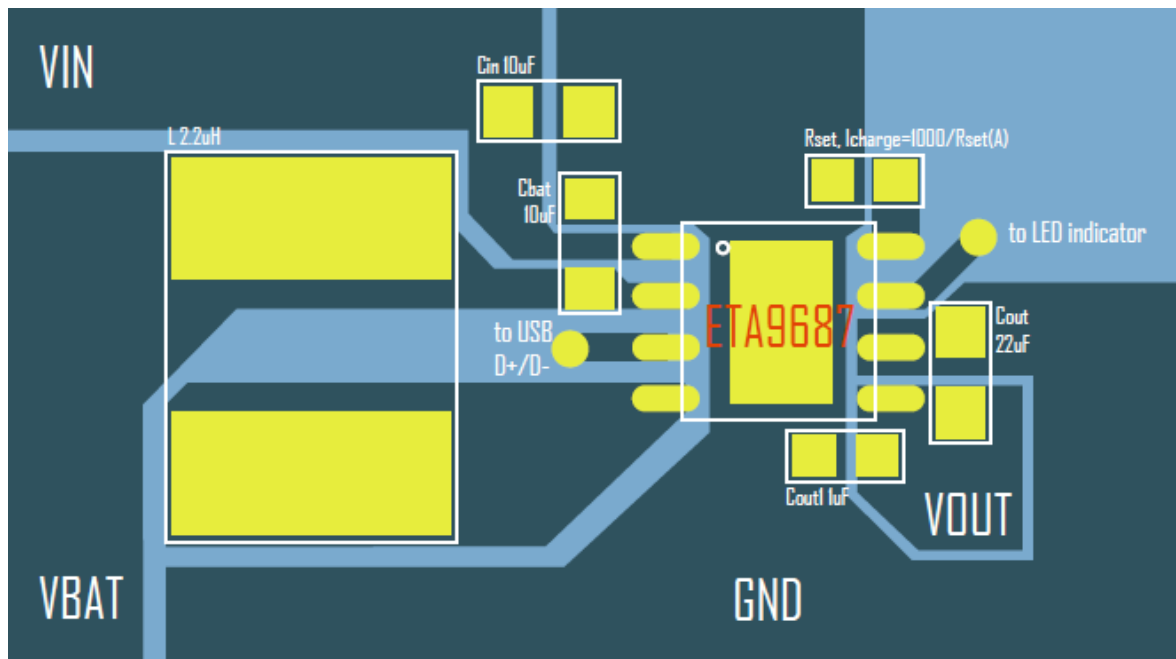


Output Short Circuit Protection:  $V_{BAT}=4.2\text{V}$



## PCB GUIDELINES

A well designed PCB is very important to obtain the best performance of ETA9687. A typical illustration of PCB guide is shown below:



Please always place the output capacitor (Cout) as close to the chip (ETA9687) as possible.

## THERMAL CONSIDERATIONS

As the ETA9687 has a power MOSFET with internal current limit up to 5A, heat dissipation is always needed to be considered when designing the PCB for such high-power step-up converter. ETA9687 employs a package of ESOP8 with only 10 °C/W thermal resistance from chip to its thermal pad. So it is crucial for one to lay a large area of copper (in most case, it is the large ground plane), directly contacting the thermal pad of the chip through more than 2 large vias from bottom, to spread the heat away to the ambient environment as fast as possible.

A thicker copper foil is always recommended to help the heat dissipation, so a PCB with 2oz copper thickness is a much better choice than that of 1oz copper.

## PACKAGE OUTLINE

Package: ESOP8

