# EV2663-C-00A

## Evaluation Board of 500mA Linear Charger with PPM for Single Cell Li-ion Battery

## DESCRIPTION

The EV2663-C-00A is an evaluation board for the MP2663, a highly-integrated single-cell Li-Ion/Li-Polymer battery charger with system power path management, targeted at space limited portable applications. It takes input power from either an AC adapter or a USB port to supply the system load and charge the battery independently. The charger section features pre-charge, constant current (CC) and constant voltage (CV) regulation, charge termination and charge status.

EV2663 ensures the continuous power to the system by automatically selecting the input, the battery or both to power the system.

EV2663 provides system short circuit protection to prevent the Li-Ion battery from being damaged due to excessive high current.

EV2663 cuts off the path between battery and system when battery UVLO to prevent the Li-Ion battery from being overly discharged.

Through the I2C connector on EV2663, the customer can program the charging parameters, such as: input current limit, input voltage regulation limit, charging current, battery regulation voltage, and battery UVLO.
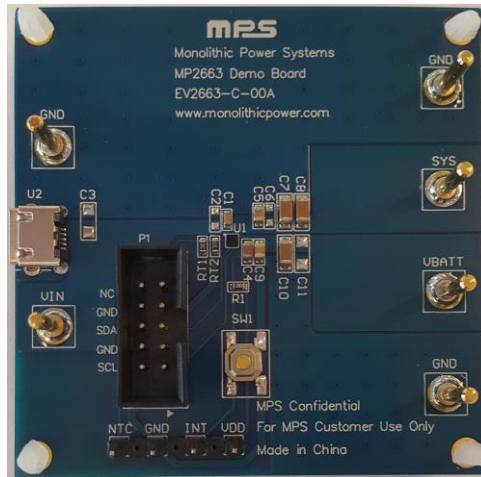
## FEATURES

- Fully Autonomous Charger for Single-Cell Li-Ion/Polymer Batteries
- Current Limit for USB Port
- Complete Power Path Management for Simultaneously Powering the System and Charging the Battery
- 0.5% Charging Voltage Accuracy
- 13V Maximum Voltage for the Input Source
- I2C Interface for Setting charging Parameters and Status Reporting
- Robust Charging Protection Including Battery Temperature Monitor and Programmable Timer
- Battery Disconnection Function

## APPLICATIONS

- Wearable devices
- Smart Handheld Devices
- Fitness Accessories
- Smart Watches

## ELECTRICAL SPECIFICATION

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Input Voltage | $V_{IN}$ | 4.35 - 5.5 | V |
| Battery Voltage | $V_{BATT}$ | 3.60 - 4.545 | V |
| Input Current Limit | $I_{IN\_LIM}$ | 85 - 455 | mA |
| Charge Current | $I_{CC}$ | 8 - 535 | mA |
| Discharge Current | $I_{DSCHG}$ | 400 - 3200 | mA |

# EV2663-C-00A EVALUATION BOARD



**(L x W x H) 2.5" x2.5"x 0.063"**
**(6.35cm x 6.35cm x 0.16cm)**

| Board Number | MPS IC Number |
|---|---|
| EV2663-C-00A | MP2663GC-xxxx* |

*: "xxxx" is the register setting option. The factory default is "0000". This content can be viewed in I²C register map. For customer options, please contact an MPS FAE to obtain an "XXXX" value.

## EVALUATION BOARD SCHEMATIC
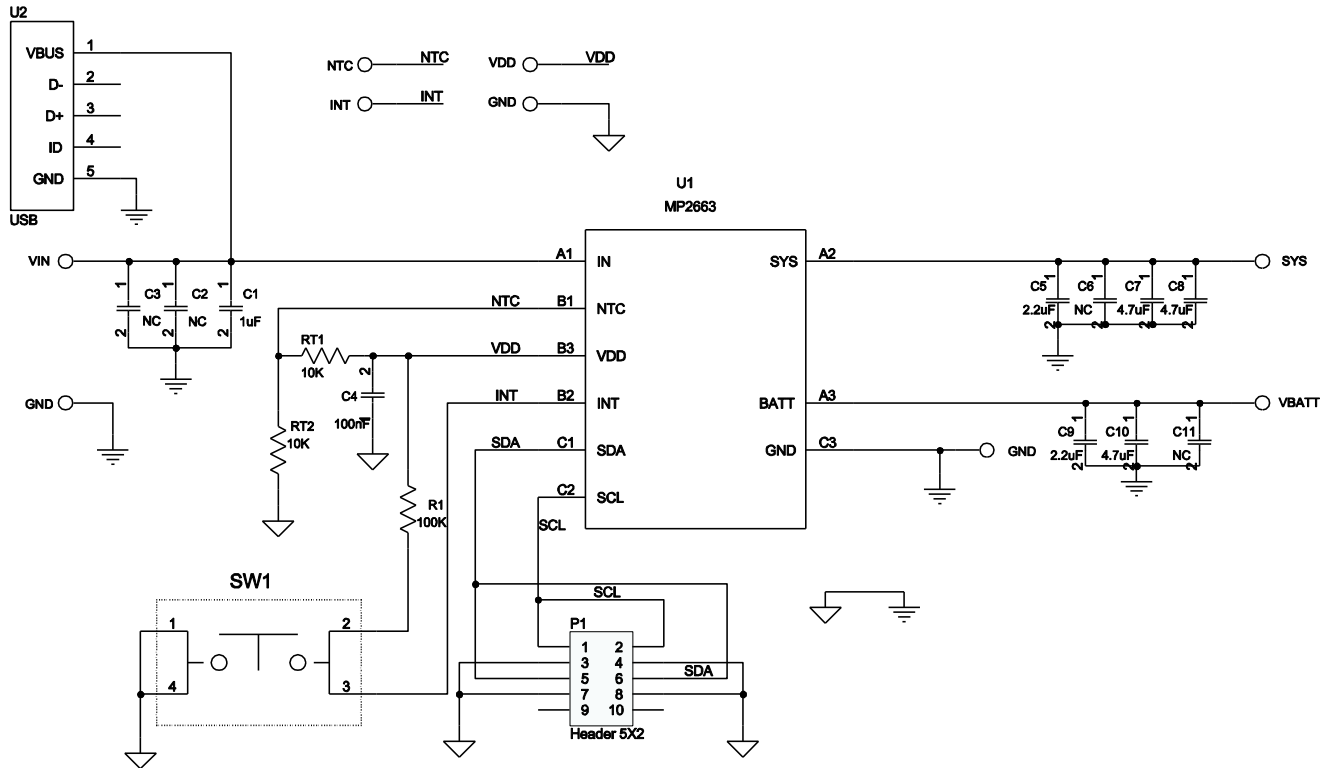


## EV2663-C-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Part Number |
|---|---|---|---|---|---|---|
| 1 | C1 | 1μF | Ceramic Cap;25V; X7R;0603; | 0603 | muRata | GRM188R71E105KA12D |
| 2 | C5, C9 | 2.2μF | Ceramic Cap;25V; X7R;0805; | 0805 | muRata | GRM21BR71E225KA73L |
| 1 | C2 | NC | Ceramic Cap;25V; X7R;0805; | 0805 | muRata | GRM21BR71E225KA73L |
| 3 | C7, C8, C10 | 4.7μF | Ceramic Cap;25V; X7R;1206 | 1206 | muRata | GRM31CR71E475KA88L |
| 1 | C4 | 100nF | Ceramic Cap;25V; X7R;0805; | 0805 | HHEC | C0805X104K025T |
| 1 | C6 | NC | Ceramic Cap;25V; X7R;0805; | 0805 | muRata | GRM21BR71E225KA73L |
| 2 | C3, C11 | NC | Ceramic Cap;25V; X7R;1206 | 1206 | muRata | GRM31CR71E475KA88L |
| 1 | P1 | | Header, 5-Pin, Dual row | | | |
| 1 | R1 | 100k | Film Resistor;1%; | 0603 | Yageo | RC0603FR-07100KL |
| 2 | RT1, RT2 | 10k | Film Resistor;1%; | 0603 | Yageo | RC0603FR-0710KL |
| 1 | U2 | | Micro-B USB connector; | | | |
| 1 | U1 | IC | MP2663GC-0000 | WCSP 1.55mm* 1.55mm | MPS | MP2663GC-0000 |

# PRINTED CIRCUIT BOARD LAYOUT
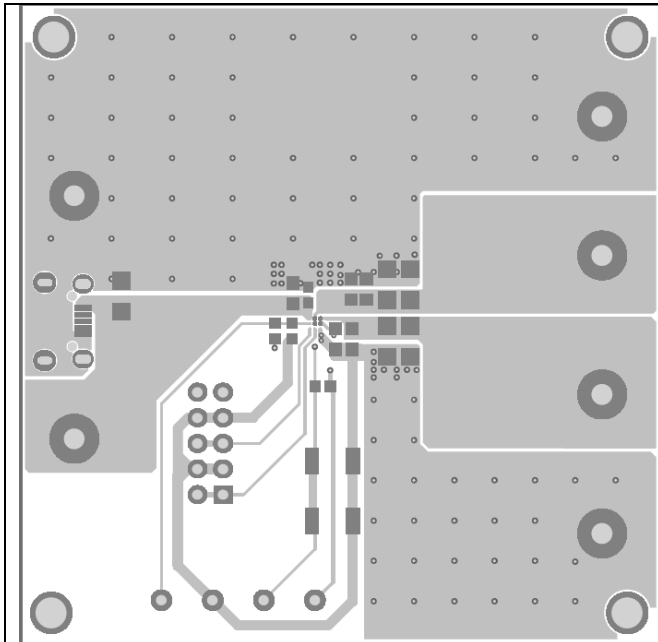

Figure 1: Top Layer
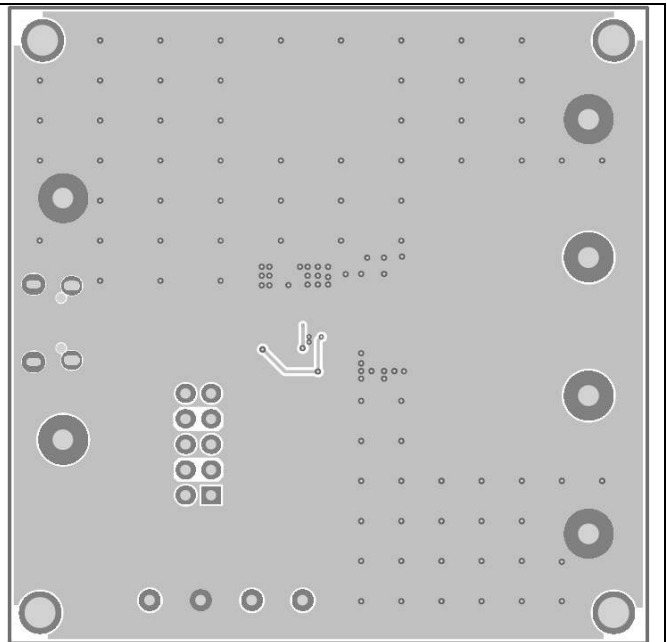

Figure 2: Bottom Layer


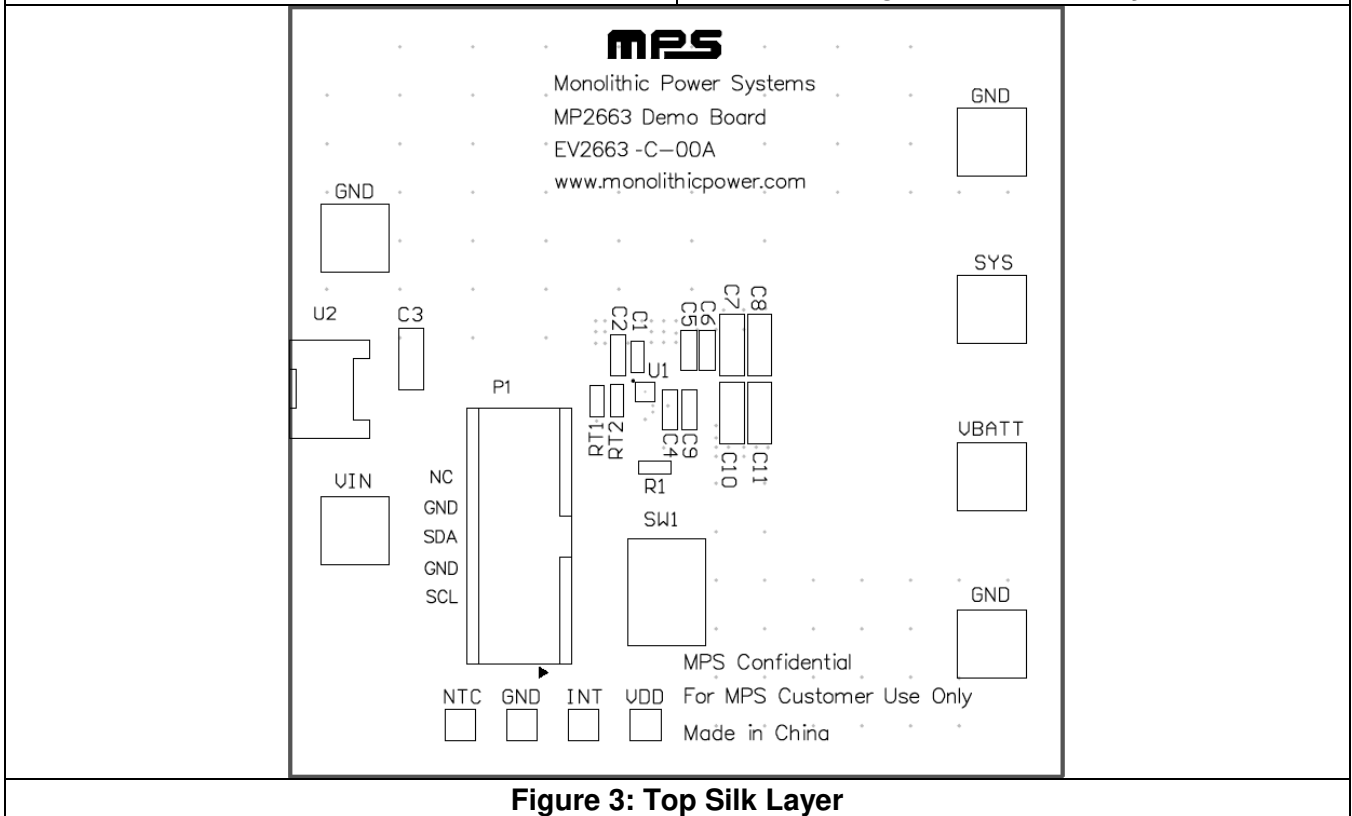Figure 3: Top Silk Layer

# QUICK START GUIDE

This board is designed for MP2663 which is a highly-integrated single-cell Li-Ion/Li-Polymer battery charger with system power path management function. And layout accommodates most commonly used capacitors. The default function of this board is preset for charger mode and the charge full voltage is preset to 4.095V for 1 cell Li-Ion battery.

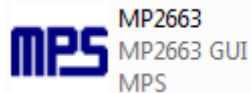Evaluation Platform Preparation:
1) USB-to-I$^2$C Communication Kit
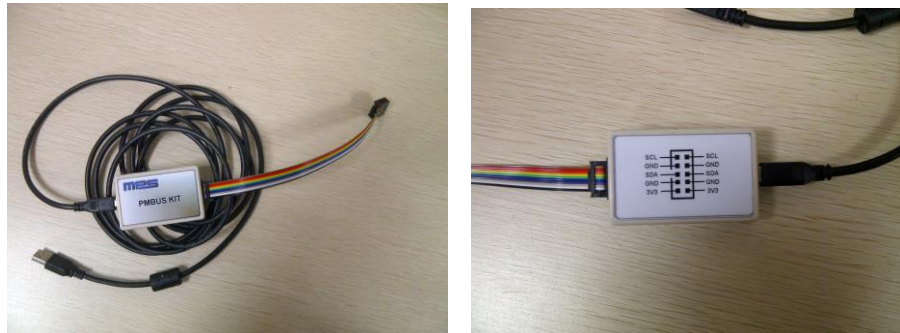


**Figure 4: USB-to-I$^2$C Communication Kit**

2) Software – double-click on the MP2663 Evaluation Kit EXE file and open the software. The software supports the Windows operating systems.



3) A computer with at least one USB port and a USB cable. The MP2663 evaluation software must be properly installed.
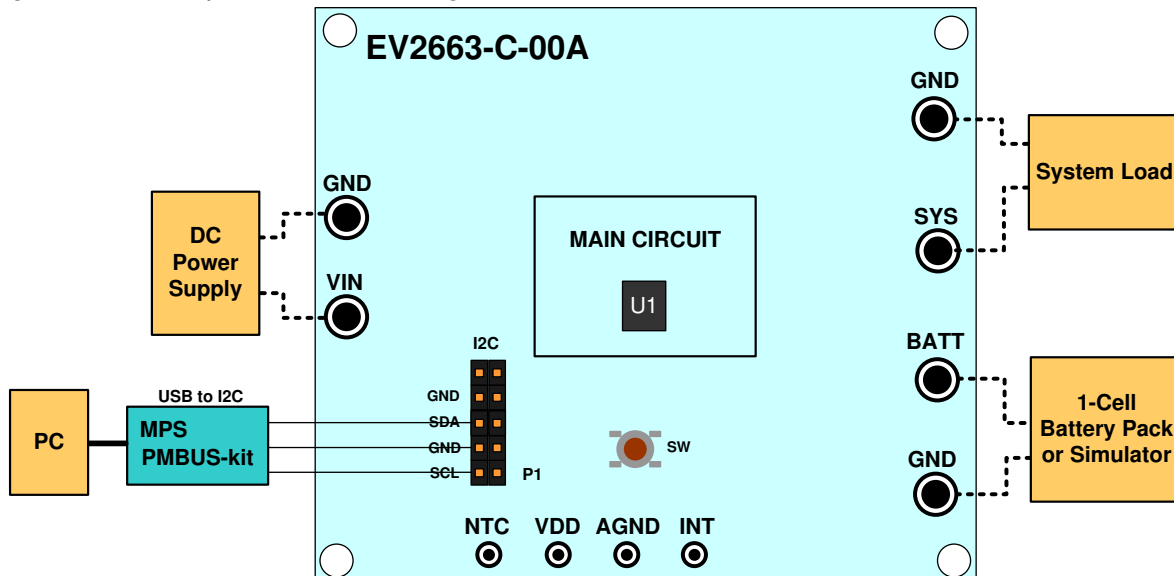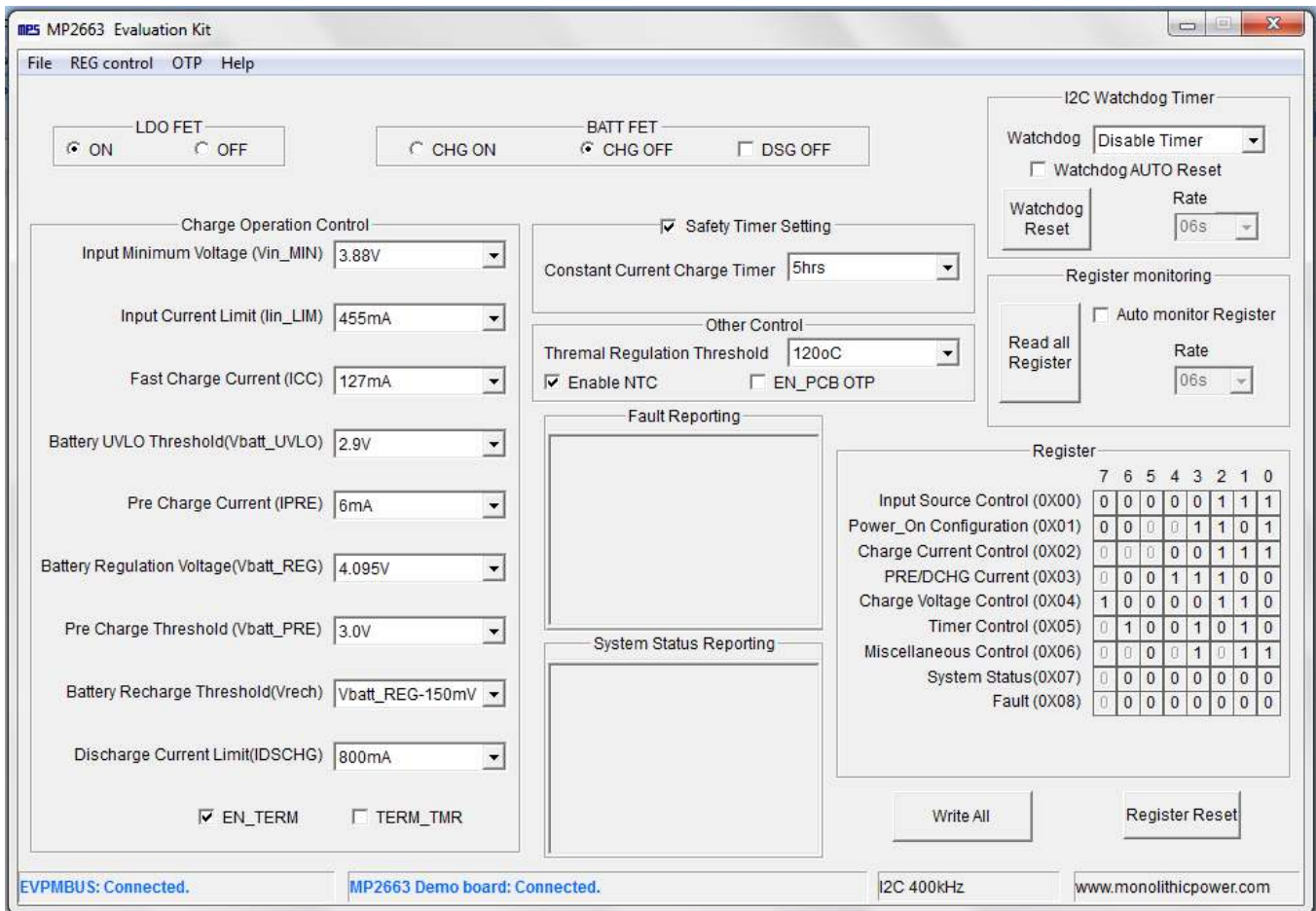4) Original Test Setup for MP2663 in Figure5



**Figure 5: Test Setup for MP2663**

5) Turn on the computer. Launch the MP2663 evaluation software. The main window of the software is shown in Figure 6.



**Figure 6: MP2663 evaluation software**

**Procedure**
**Make sure all the connections are normal -- the EVPMBUS connected and EV2663-C-00A connected. It is ready to run the program!**

**Charger Function**



1. Set Input Minimum Voltage at 3.88 V (the range is 3.88 - 5.08V)

2. Set Input Current Limit to 455mA (the range is 85 – 455mA)

| Input Current Limit (Iin_LIM) | 455mA ▼ |
|---|---|
| | 130mA ▲ |
| | 175mA |
| | 220mA |
| | 265mA |
| | 310mA |
| | 355mA |
| | **455mA** ▼ |

3. Set Constant Charge Current, ICC to 127mA (the range is 8 – 535mA)

| Fast Charge Current (ICC) | 127mA ▼ |
|---|---|
| | **127mA** ▲ |
| | 144mA |
| | 161mA |
| | 178mA |
| | 195mA |
| | 212mA |
| | 229mA |
| | 246mA |
| | 263mA |
| | 280mA |
| | 297mA ▼ |

4. Set BATT UVLO threshold to 2.9V (the range is 2.4 – 3.1V)

| Battery UVLO Threshold(Vbatt_UVLO) | 2.9V ▼ |
|---|---|
| | 2.7V ▲ |
| | 2.8V |
| | **2.9V** |
| | 3.0V |
| | 3.1V ▼ |

5. Set Pre Current to 6mA (the range is 6 – 27mA)

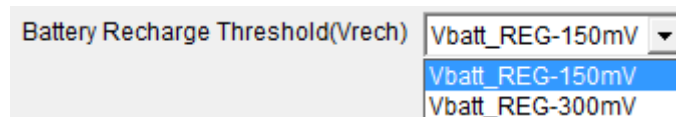| Pre Charge Current (IPRE) | 6mA ▼ |
|---|---|
| | **6mA** |
| | 13mA |
| | 20mA |
| | 27mA |

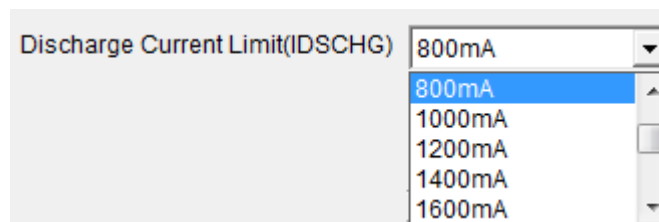6. Set Battery Regulation Voltage to 4.095 V (the range is 3.6 - 4.545V)
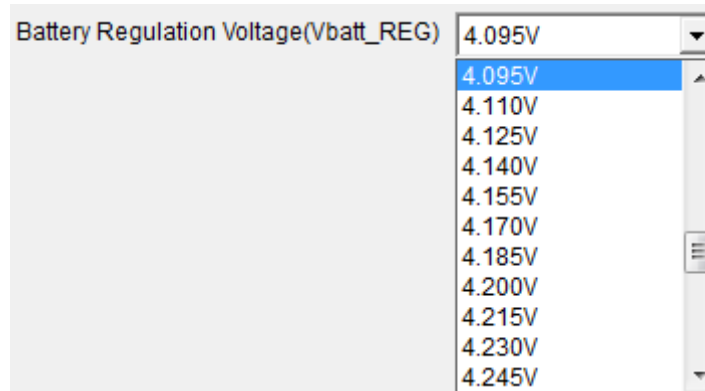


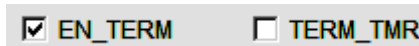7. Set Pre Charge to CC Charge Threshold Voltage to 3.0 V (the range is 2.8 or 3.0V)
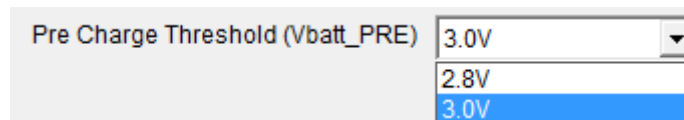


8. Set Battery auto recharge Voltage to Vbatt_REG – 150mV (the range is 150mV or 300mV)



9. Set battery discharge current limit to 800mA (the range is 400mA to 2600mA):



10. Termination Function Select



**Table 1: Termination Function Selection Table**

| EN_TERM | TERM_TMR | After $I_{BATT}$ hit $I_{TERM}$ in CV mode | |
|---|---|---|---|
| | | Operation | Charge Status |
| ☐ | x | Keep CV Charge | Charge |
| ☑ | ☐ | Charge Done | Charge Done |
| ☑ | ☑ | Keep CV Charge | Charge Done |

**Others**

1. LDO FET Control:



This bit only controls the on/off of the LDO FET.

2. BATT FET Control:



CHG ON and CHG OFF only control the on/off of the Battery FET in charge mode.
DSG OFF selected could turn off the Battery FET at both charge and discharge mode.
DSG OFF unselected could not turn on Battery FET; pull INT to low by push button could turn on Battery FET when it's turned off by DSG OFF.

3. Other Control.



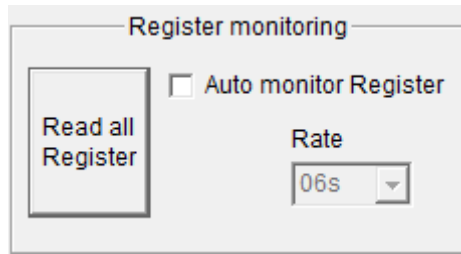Above setting enables PCB OTP; for other application, please refer to the table below.

**Table 2 NTC Function Selection Table**

| Enable NTC | EN_PCB OTP | Function |
|:---:|:---:|:---:|
| ☐ | x | Disable |
| ☑ | ☐ | NTC |
| ☑ | ☑ | PCB OTP |

4. Safety Timer Setting



5. I$^2$C Watchdog Timer

## 6. Resister Auto Monitor

**Register monitoring**

Read all Register

☐ Auto monitor Register

Rate

06s ▾

## 7. Content of the Registers:

**Register**

|  | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| Input Source Control (0X00) | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Power_On Configuration (0X01) | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 |
| Charge Current Control (0X02) | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| PRE/DCHG Current (0X03) | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 |
| Charge Voltage Control (0X04) | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 |
| Timer Control (0X05) | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 |
| Miscellaneous Control (0X06) | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 |
| System Status(0X07) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Fault (0X08) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

## 8. Monitor the MP2663 operation status and Fault report

**Fault Reporting**

**System Satus Reporting**
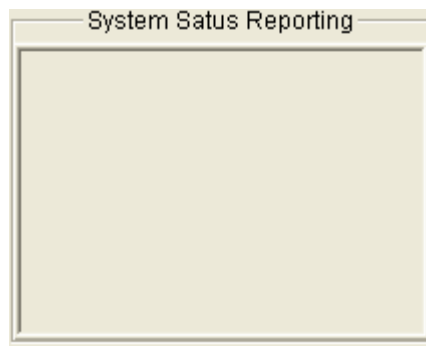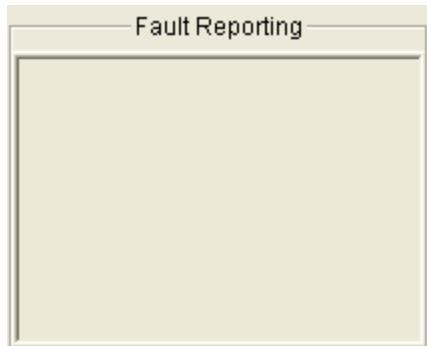
❖**Notes**❖

1. **For the other detailed description on the operation of this part, please contact local FAE to apply the latest datasheet**