EV2662-C-01A

Evaluation Board of 500mA Linear Charger with Power Path Management, 1mA Termination and <1µA Battery Leakage for Single-Cell Li-Ion Battery

DESCRIPTION

The EV2662-C-01A is an evaluation board for the MP2662, 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 constant current pre charge (PRE.C), constant current fast charge (CC) and constant voltage (CV) regulation, charge termination and auto-recharge.

EV2662 ensures the continuous power to the system by automatically selecting the input, the battery or both to power the system.

EV2662 provides system short circuit protection to prevent the Li-Ion battery from being damaged due to excessive high current.

EV2662 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 EV2662, the customer can program the charging parameters, such as: input current limit, input minimum voltage regulation, 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
- 21V Maximum Voltage for the Input Source
- I^{2}C 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}	50 - 500	mA
Input Minimum Voltage	V_{IN_MIN}	3.88 - 5.08	V
Fast Charge Current	I_{CC}	8 - 456	mA
Discharge Current	I_{DSCHG}	400 - 3200	mA

EV2662-C-01A 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
EV2662-C-01A	MP2662GC-xxxx*

*: "xxxx" is the register setting option. The factory default is "0000". This content can be viewed in I^{2}C register map. For customer options, please contact an MPS FAE to obtain an "xxxx" value.

QUICK START GUIDE

This board is designed for MP2662 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 4.200V for 1 cell Li-Ion battery.

Evaluation Platform Preparation:
1) A computer with at least one USB port and a USB cable. The MP2662 evaluation software must be properly installed.
2) USB-to-I²C Communication Kit (EVKT-USBI2C-02).

Figure 1: USB-to-I²C Communication Kit

3) Software - Double-click on the "MP2662 Evaluation Kit" EXE file to run the MP2662 evaluation software. The software supports the Windows XP and Windows 7 operating systems.
The MP2662 Evaluation Kit EXE file can be downloaded from *MPS website* by searching for "MP2662".
4) Original Test Setup for MP2662 in Figure2.
Attach the input voltage (V$_{IN}$=5V) and the input ground to the VIN and GND pins, respectively.
Attach the positive and negative ends of the load to the SYS and GND pins, respectively.
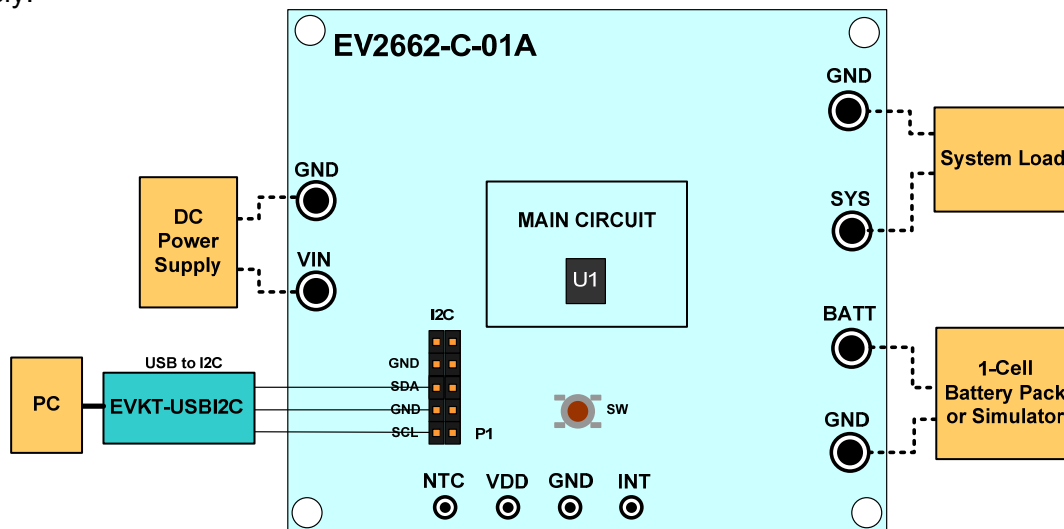Attach the positive and negative ends of the battery (V$_{BATT}$=3 - 4.2V) to the BATT and GND pins, respectively.

Figure 2: Test Setup for MP2662

5) Turn on the computer. Launch the MP2662 evaluation software. The main window of the software is shown in Figure 3.
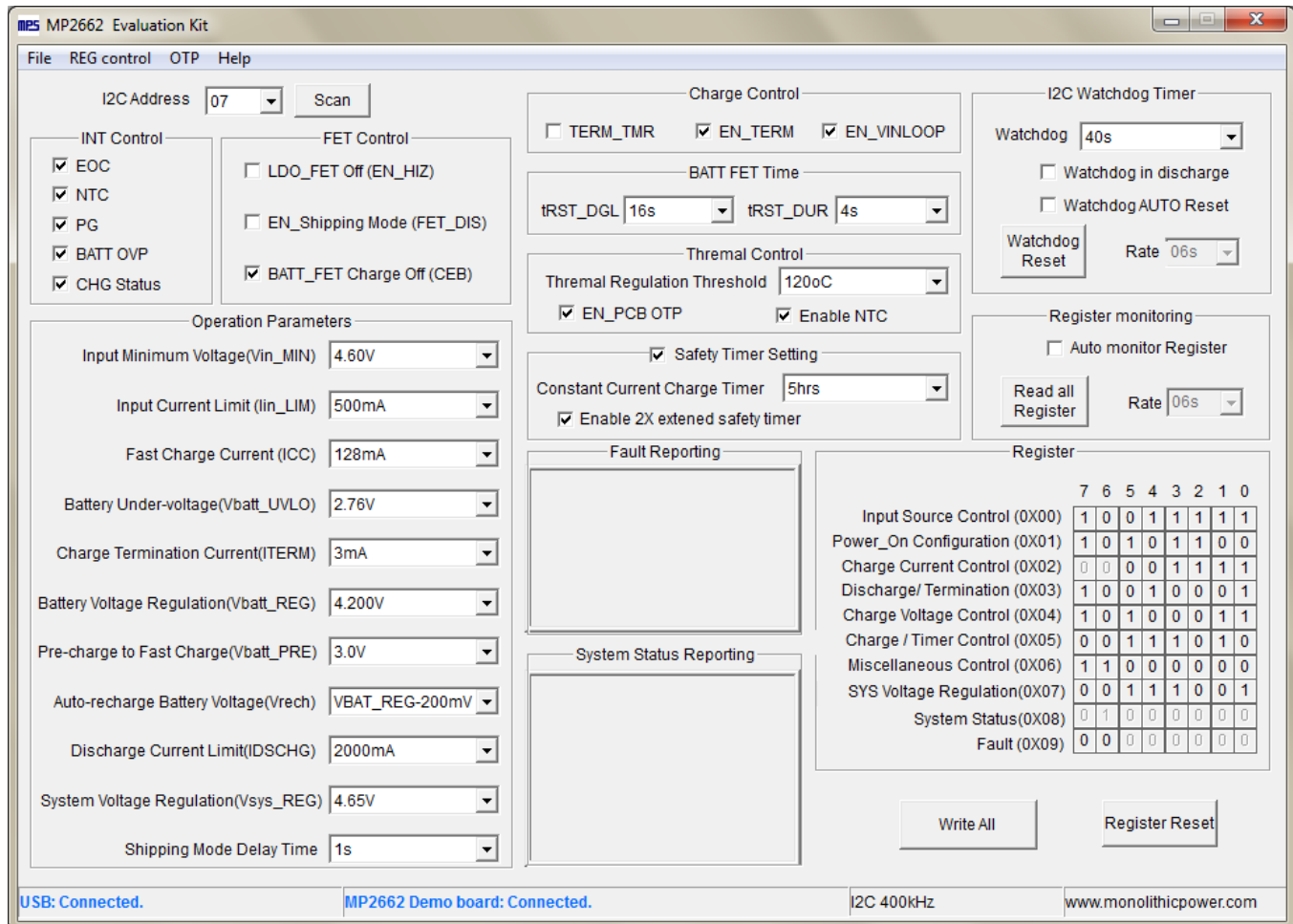

Figure 3: MP2662 evaluation interface

Procedure
Make sure all the connections are normal - both the USB-to-I2C Communication Kit and the EV2662-C-01A are connected correctly. It is ready to run the program!

Charger Function

Operation Parameters

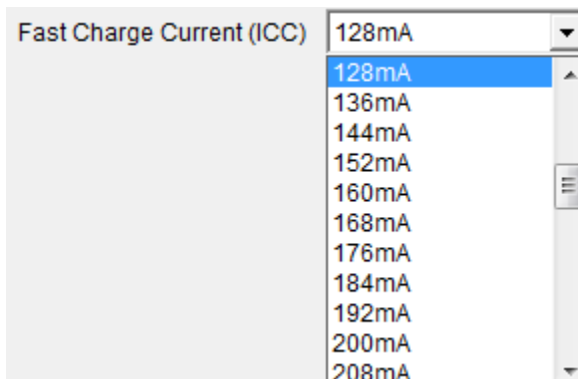|	
Input Minimum Voltage(Vin_MIN)	4.60V
Input Current Limit (Iin_LIM)	500mA
Fast Charge Current (ICC)	128mA
Battery Under-voltage(Vbatt_UVLO)	2.76V
Charge Termination Current(ITERM)	3mA
Battery Voltage Regulation(Vbatt_REG)	4.200V
Pre-charge to Fast Charge(Vbatt_PRE)	3.0V
Auto-recharge Battery Voltage(Vrech)	VBAT_REG-200mV
Discharge Current Limit(IDSCHG)	2000mA
System Voltage Regulation(Vsys_REG)	4.65V
Shipping Mode Delay Time	1s

1. Set Input Minimum Voltage at 4.60V (the range is 3.88 - 5.08V):

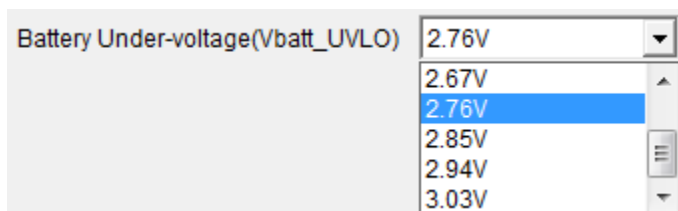|	
Input Minimum Voltage(Vin_MIN)	4.60V

4.60V
4.68V
4.76V
4.84V
4.92V
5.00V
5.08V

2. Set Input Current Limit to 500mA (the range is 50 - 500mA):

Input Current Limit (Iin_LIM)	500mA

320mA
350mA
380mA
410mA
440mA
470mA
500mA

3. Set Fast Charge Current to 128mA (the range is 8 - 456mA):

Fast Charge Current (ICC)	128mA
	128mA
	136mA
	144mA
	152mA
	160mA
	168mA
	176mA
	184mA
	192mA
	200mA
	208mA

4. Set BATT UVLO threshold to 2.76V (the range is 2.4 - 3.03V):

Battery Under-voltage(Vbatt_UVLO)	2.76V
	2.67V
	2.76V
	2.85V
	2.94V
	3.03V

5. Set Charge Termination Current to 3mA (the range is 1 - 31mA):

Charge Termination Current(ITERM)	3mA
	3mA
	5mA
	7mA
	9mA
	11mA
	13mA
	15mA
	17mA
	19mA
	21mA
	23mA
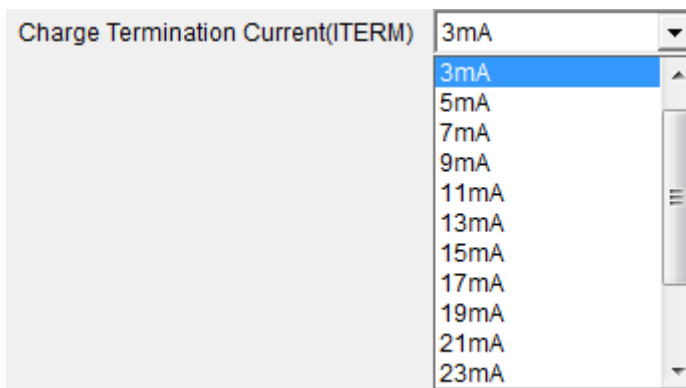
6. Set Battery Voltage Regulation to 4.200V (the range is 3.6 - 4.545V):

Battery Voltage Regulation(Vbatt_REG)	4.200V ▼

4.200V
4.215V
4.230V
4.245V
4.260V
4.275V
4.290V
4.305V
4.320V
4.335V
4.350V

7. Set Pre - Charge to Fast Charge Threshold Voltage to 3.0 V (the range is 2.8 - 3.0V):

Pre-charge to Fast Charge(Vbatt_PRE)	3.0V ▼

2.8V
3.0V

8. Set Battery Auto-recharge Voltage to VBAT_REG - 200mV (the range is 100mV or 200mV):

Auto-recharge Battery Voltage(Vrech)	VBAT_REG-200mV ▼

VBAT_REG-100mV
VBAT_REG-200mV

9. Set Battery Discharge Current Limit to 2000mA (the range is 400mA to 3200mA):

Discharge Current Limit(IDSCHG)	2000mA ▼

2000mA
2200mA
2400mA
2600mA
2800mA

Others

1. INT Control Setting:

2. FET Control:

EN_HIZ only controls the on/off of the LDO FET.

CEB only control the on/off of the Battery FET in charge mode.

FET_DIS selected could turn off the Battery FET at both charge and discharge mode.
FET_DIS unselected could not turn on Battery FET; pull INT to low by push button or plug in the input adapter for 2s could turn on Battery FET when it's turned off by FET_DIS.

3. 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

4. VINLOOP Control:

.

5. BATT FET Time Setting:

```
┌─────────── BATT FET Time ───────────┐
│ tRST_DGL │16s    ▼│  tRST_DUR │4s    ▼│
└──────────────────────────────────────┘
```

6. Thermal Control:

```
┌─────────────── Thremal Control ───────────────┐
│ Thremal Regulation Threshold │120oC        ▼│  │
│      ☑ EN_PCB OTP        ☑ Enable NTC          │
└────────────────────────────────────────────────┘
```

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

7. Safety Timer Setting:

```
┌──────── ☑ Safety Timer Setting ────────┐
│ Constant Current Charge Timer │5hrs   ▼│ │
│ ☑ Enable 2X extened safety timer         │
└──────────────────────────────────────────┘
```

8. I²C Watchdog Timer:

```
┌─────────── I2C Watchdog Timer ───────────┐
│ Watchdog │40s        ▼│                    │
│        ☐ Watchdog in discharge             │
│        ☐ Watchdog AUTO Reset               │
│ ┌──────────┐                               │
│ │ Watchdog │   Rate │06s  ▼│               │
│ │  Reset   │                               │
│ └──────────┘                               │
└────────────────────────────────────────────┘
```

9. Resister Auto Monitor:

Register monitoring

☐ Auto monitor Register

Read all Register   Rate 06s
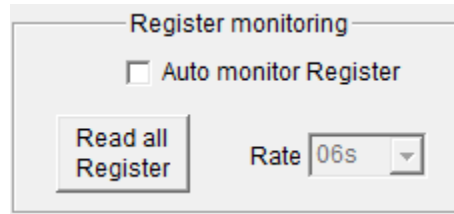
10. Content of the Registers:

Register	7	6	5	4	3	2	1	0
Input Source Control (0X00)	1	0	0	1	1	1	1	1
Power_On Configuration (0X01)	1	0	1	0	1	1	0	0
Charge Current Control (0X02)	0	0	0	0	1	1	1	1
Discharge/ Termination (0X03)	1	0	0	1	0	0	0	1
Charge Voltage Control (0X04)	1	0	1	0	0	0	1	1
Charge / Timer Control (0X05)	0	0	1	1	1	0	1	0
Miscellaneous Control (0X06)	1	1	0	0	0	0	0	0
SYS Voltage Regulation(0X07)	0	0	1	1	1	0	0	1
System Status(0X08)	0	1	0	0	0	0	0	0
Fault (0X09)	0	0	0	0	0	0	0	0

11. Monitor the MP2662 Operation Status and Fault Report:

System Status Reporting
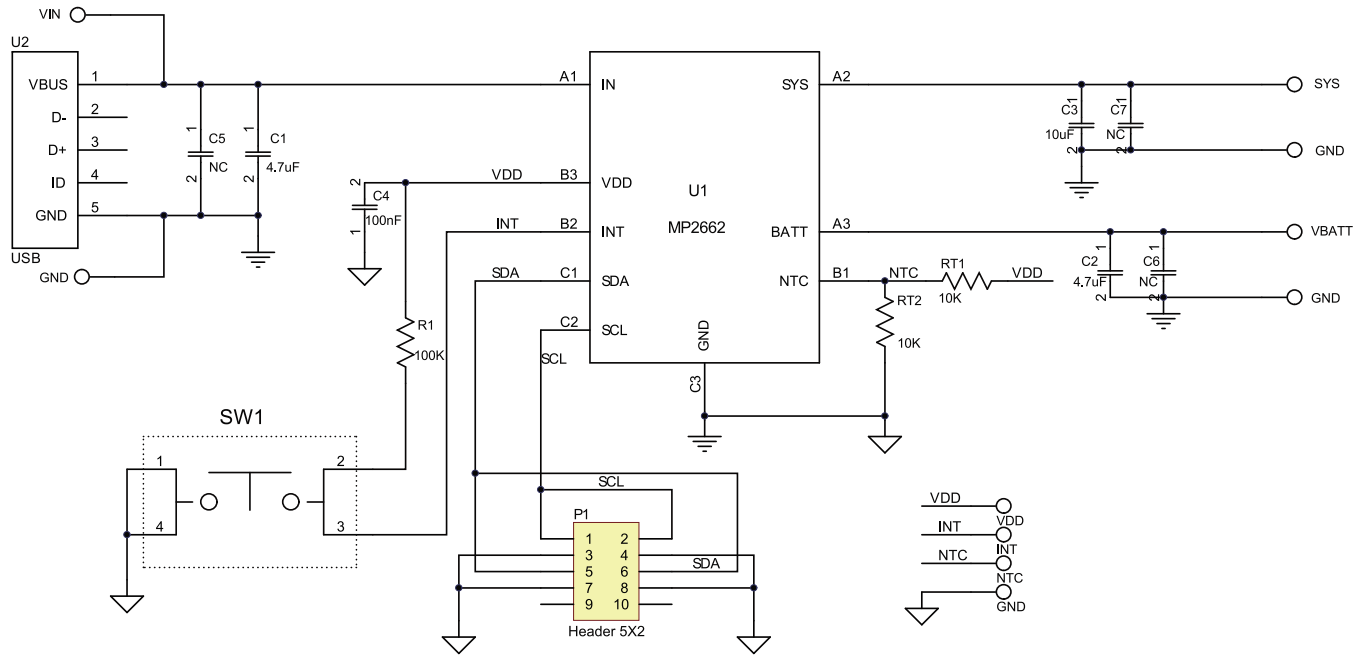
Fault Reporting
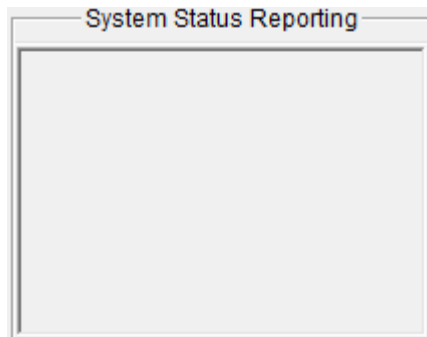
❖**Notes**❖

Please contact local FAE to apply:

1. **The latest datasheet to get the other detailed description on the operation of this part;**

2. **The "MP2662 Evaluation Kit" EXE file.**

EVALUATION BOARD SCHEMATIC

EV2662-C-01A BILL OF MATERIALS

Qty	Ref	Value	Description	Package	Manufacture	Manufacture_PN
2	C1, C2	4.7µF	Ceramic Capacitor;25V;X5R;0603;	0603	muRata	GRM188R61E475KE11D
1	C3	10µF	Capacitor;16V;X5R;	0603	muRata	GRM188R61C106KAALD
1	C4	100nF	Ceramic Capacitor;25V;X7R;0603;	0603	muRata	GRM188R71E104KA01D
1	C5	NC	Capacitor;50V;X5R;	0805	muRata	GRM21BR61H475KE51
2	C6, C7	NC	Capacitor;16V;X5R;	0805	muRata	GRM21BR61C106KE15L
1	P1		Header, 5-Pin, Dual row;			
1	R1	100kΩ	Film Resistor;1%;	0603	Yageo	RC0603FR-07100KL
2	RT1, RT2	10kΩ	Film Resistor;1%;	0603	Yageo	RC0603FR-0710KL
1	U2		Micro-B USB connector;			
1	U1		IC;1.75mm*1.75mm	WLCSP-9	MPS	MP2662GC-0000