# 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-lon 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.

#### Parameter Symbol Value Units Input Voltage Vin 4.35 - 5.5 V 3.60 -**Battery Voltage** V VBATT 4.545 Input Current Limit 50 - 500 IN LIM mΑ Input Minimum V $V_{\text{IN}_{\text{MIN}}}$ 3.88 - 5.08 Voltage Fast Charge Current 8 - 456 Icc mΑ **Discharge Current** IDSCHG 400 - 3200 mΑ

## **ELECTRICAL SPECIFICATION**

## **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<sup>2</sup>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

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## **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<sup>2</sup>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-I<sup>2</sup>C Communication Kit (EVKT-USBI2C-02).



Figure 1: USB-to-I<sup>2</sup>C 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 <u>MPS website</u> by searching for "MP2662". 4) Original Test Setup for MP2662 in Figure2.

Attach the input voltage (VIN=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.

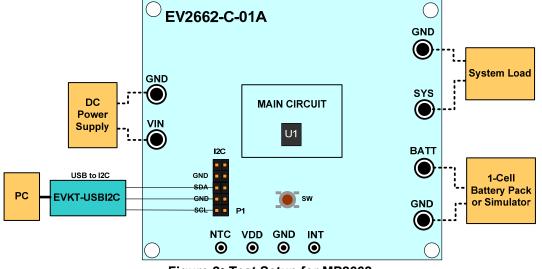


Figure 2: Test Setup for MP2662



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

MP2662 Evaluation Kit					
File REG control OTP Help					
I2C Address 07 💌 S	can	Charge Control		I2C Wat	tchdog Timer
INT Control	FET Control	TERM_TMR	EN_VINLOOP	Watchdog 40	s 🔻
	ET Off (EN_HIZ)	BATT FET Time		🗌 Watch	ndog in discharge
I I I NTC I I I PG I I EN_Shi	pping Mode (FET_DIS)	tRST_DGL 16s • tRST_DUF	R 4s 💌	Watch	hdog AUTO Reset
I BATT OVP	ET Charge Off (CEB)	Thremal Control Thremal Regulation Threshold 1200	c 🚽	Watchdog Reset	Rate 06s 👻
Operation Parame	ters		able NTC	Registe	er monitoring
Input Minimum Voltage(Vin_MIN)	4.60V 💌	Safety Timer Setting		Auto	monitor Register
Input Current Limit (lin_LIM)	500mA 💌	Constant Current Charge Timer 5hrs ↓ Enable 2X extened safety timer	•	Read all Register	Rate 06s 💌
Fast Charge Current (ICC)	128mA 💌	Fault Reporting		Register	
	2.76V <b>•</b>		Input Source Co Power_On Configu	ontrol (0X00) 1	6 5 4 3 2 1 0 0 0 1 1 1 1 1 0 1 0 1 1 0 0
Charge Termination Current(ITERM)	3mA 💌		Charge Current Co	ontrol (0X02)	0 0 0 1 1 1 1
Battery Voltage Regulation(Vbatt_REG)	4.200V <b>•</b>		Discharge/ Termin Charge Voltage Co		0 0 1 0 0 0 1 0 1 0 0 0 1 1
Pre-charge to Fast Charge(Vbatt_PRE)	3.0V 💌	System Status Reporting	Charge / Timer Co Miscellaneous Co		0 1 1 1 0 1 0 1 0 0 0 0 0 0
Auto-recharge Battery Voltage(Vrech)	VBAT_REG-200mV		SYS Voltage Regi System	ulation(0X07) 0	<b>0 1 1 1 0 0 1</b> 1 0 0 0 0 0 0
Discharge Current Limit(IDSCHG)	2000mA 💌		-	Fault (0X09)	0000000
System Voltage Regulation(Vsys_REG)	4.65V 💌		Write	All	Register Reset
Shipping Mode Delay Time	1s 💌				
USB: Connected.	MP2662 Demo board: Co	onnected.	I2C 400kHz	www.	monolithicpower.com

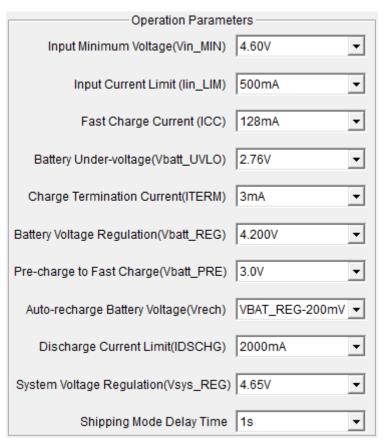
Figure 3: MP2662 evaluation interface

#### 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**



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 - 5	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

4.200V	•
4.200V	*
4.215V	
4.230V	
4.245V	
4.260V	
4.275V	
4.290V	 _
4.305V	
4.320V	
4.335V	
4.350V	Ŧ

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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	-

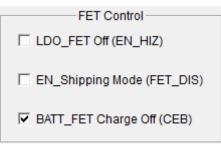


#### Others

1. INT Control Setting:

INT Control	
EOC	
✓ NTC	
PG	
BATT OVP	
CHG Status	

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:

TERM_TMR	EN_TERM
----------	---------

	TERM TMR	After IBATT hit ITE	After IBATT hit ITERM in CV mode		
EN_TERM TERM_TMR		Operation	Charge Status		
	х	Keep CV Charge	Charge		
		Charge Done	Charge Done		
<	2	Keep CV Charge	Charge		

#### Table 1 Termination Function Selection Table

4. VINLOOP Control:

EN\_VINLOOP



#### 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:

Enable NTC	EN_PCB OTP	Function			
	х	Disable			
•		NTC			
2	2	PCB OTP			

**Table 2 NTC Function Selection Table** 

#### 7. Safety Timer Setting:

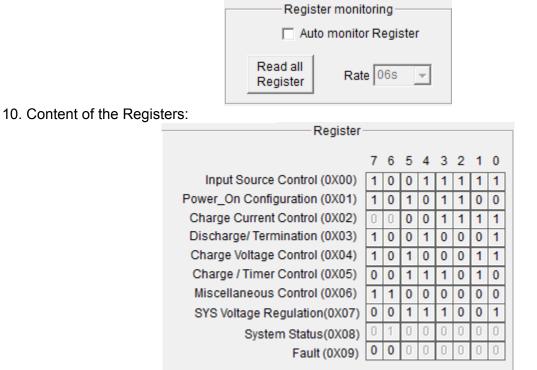
Safety Timer Setting						
Constant Current Charge Timer 5hrs	-					
Enable 2X extened safety timer						

### 8. I<sup>2</sup>C Watchdog Timer:

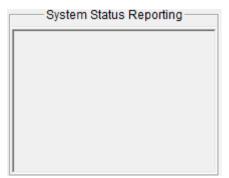
I2C Watchdog Timer					
Watchdog 40s 💌					
🔲 Watchdog in discharge					
Watchdog AUTO Reset					
Watchdog Reset	Rate 06s 💌				



9. Resister Auto Monitor:



11. Monitor the MP2662 Operation Status and Fault Report:



	Fault	Repor	ting —	
				_

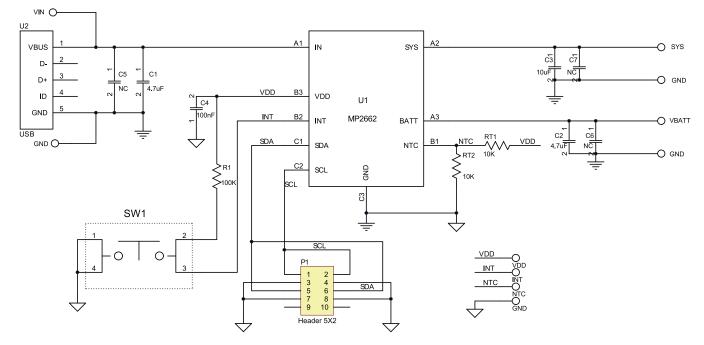
#### **♦Notes**

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



## PRINTED CIRCUIT BOARD LAYOUT

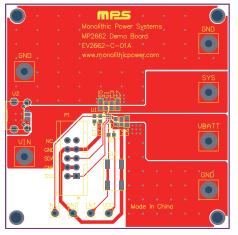


Figure 4: Top Layer

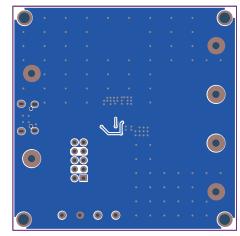


Figure 5: Bottom Layer

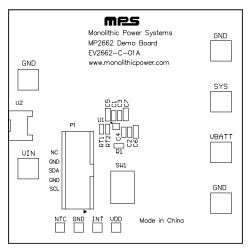


Figure 6: Top Silk Layer

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