Voltage and temperature monitoring IC with BIF
MM3757 Series

Outline

The MM3757 is a voltage and temperature monitoring IC. For a solution including a charge circuit, the MM3757 on the battery pack realizes accurate measurement of the battery voltage.
This solution can maximize the CC (constant current) charge mode of the charge circuit, and reduce the charge. As a communication interface, MIPI® BIF, which is a battery interface developed by MIPI® Alliance (an international organization), is used.

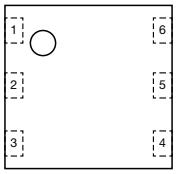
Features

(1) Highly accurate measurement of battery voltage and temperature.
(2) Communication method. MIPI® BIF compliant

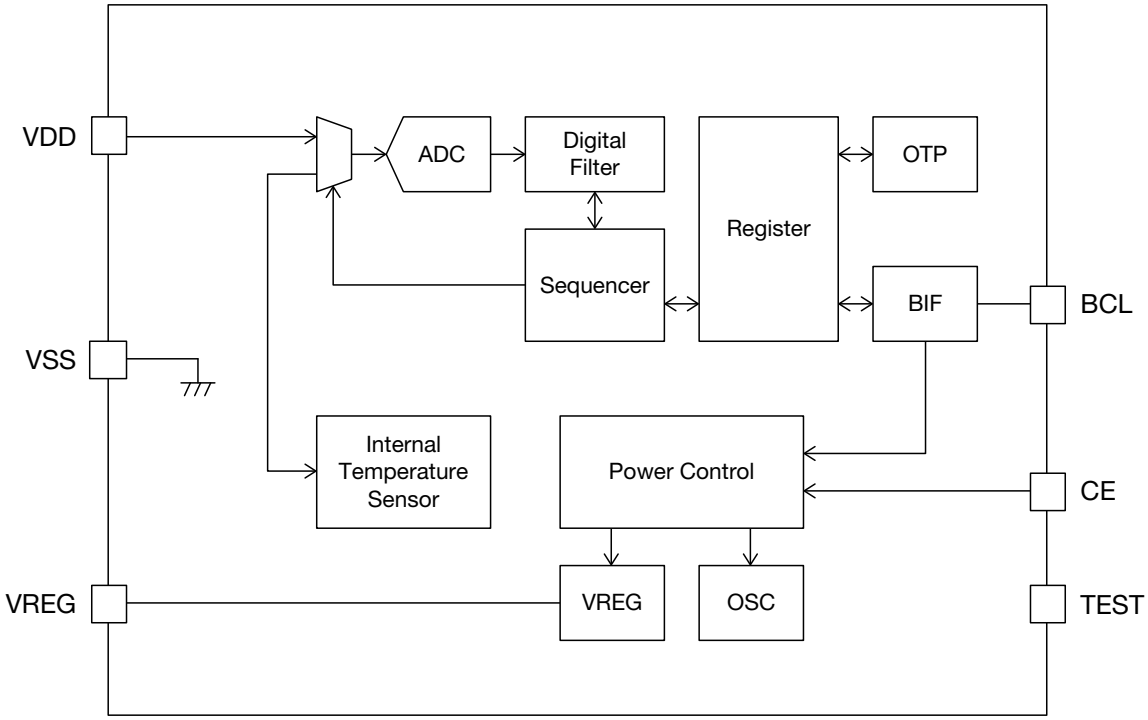
Applications

Voltage monitoring

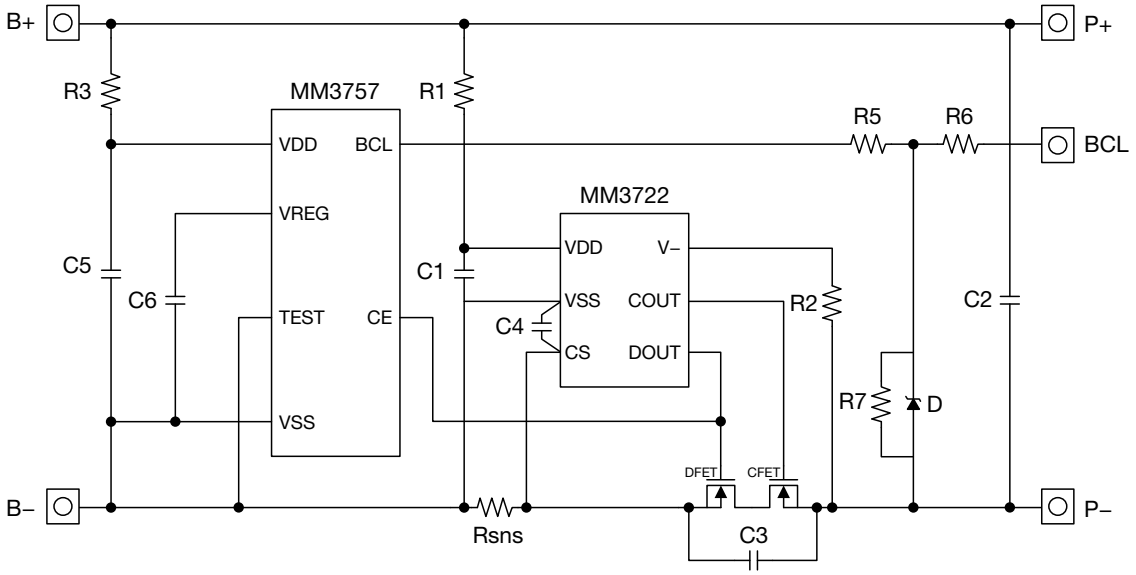
Pin Assignment

Top view PLP-6H	Pin No.	Symbol	IN/OUT	Function
	1	VDD	IN	VDD terminal
	2	VREG	OUT	Regulator output terminal
	3	VSS		VSS terminal. Connected to ground
	4	CE	IN	Chip enable terminal
	5	BCL	IN/OUT	MIPI® BIF BCL terminal
	6	TEST		Test terminal

Block Diagram



Application Circuit



Symbol	Part	Min.	Typ.	Max.	Purpose
R1	Resistor		100Ω	1KΩ	For voltage fluctuation, For ESD
C1	Capacitor	0.01μF	0.1μF	1.0μF	For voltage fluctuation
R2	Resistor		1.0kΩ	1.0kΩ	Current limit for charger reverse connection
C2	Capacitor		0.1μF		For exogenous noise
C3	Capacitor		0.1μF		For exogenous noise
Rsns	Resistor		4mΩ		Current detection resistance
C4	Capacitor		0.1μF		For exogenous noise
DFET CFET	Nch MOS FET				Charge and discharge control
R3	Resistor		10Ω		For voltage fluctuation, For ESD
C5	Capacitor		1.0μF		For voltage fluctuation
C6	Capacitor		0.1μF		For internal voltage regulator fluctuation
R5	Resistor		100Ω	100Ω	For ESD
R6	Resistor		100Ω	100Ω	For ESD
R7	Resistor		1MΩ	1MΩ	For ESD
DZ	Zener Diode		6.8V		ESD protection diode

This typical application circuit and constant value do not guarantee proper operation.
Please evaluate thoroughly by actual application to set up constants.

Precautions for safe handling

· R1 and C1 stabilize supply voltage fluctuations. However, the detection voltage of protection IC rises by the current consumption of protection IC when R1 is too large. Therefore, R1 should be 1kohm or less. Please use 0.01μF or more for C1 to stabilize the operation.

· R1 and R2 resistors are current limit resistance if a charger is connected reversely or a high-voltage charger that exceeds the absolute maximum rating is connected. If "R1+R2" is too small, the power consumption have potential exceeding the allowed power dissipation of IC, and "R1 and R2" should be more than 1kohm. R2 should be 1kohm as well.

· In the overdischarge mode, V- terminal is pulled up to VDD by Rpu.
If a charger is connected, P- terminal is dropped to about -0.7V by parasitical Di of DFET. And Iv- flows from P+ to P- terminal and the voltage drop (⊿VR1)arises in R1.Therefore, the cell voltage (Vrel2') at overdischarge release is expressed in the following equation.

$$\begin{aligned} Vrel2' &= Vdet2 + \Delta VR1 \\ &= Vrel2 + R1 * Iv- \\ &= Vrel2 + R1 * (Vdet2 + 0.7) / (R1 + Rpu + R2) \end{aligned}$$

· C2 and C3 have effect of stabilizing the system by improving the capacity for voltage ripples and exogenous noises. Please decide the necessity of insertion, position, and capacitance value in consideration of the system characteristic.

· If Rsns is too large, the power loss increases. Moreover, the power consumption might exceed the allowable power dissipation of resistance by the overcurrent. Please select Rsns according to the cell and system spec.

· C4 capacitors will improve the tolerated capacity for exogenous noise and prevent false discharge overcurrent detection. Please arrange C4 near the CS and VSS terminal.

· Current thresholds of discharging overcurrent detection and short detection (Idoc, Ishort) are expressed in the following equations.

$$Idoc = Vdet3 / Rsns$$
$$Ishort1 = Vshort1 / Rsns$$
$$Ishort2 = Vshort2 / (Rsns + 2Ron)$$

*Ron : ON resistance of CFET and DFET

· Current threshold of charging overcurrent detection (Icoc) is expressed in the following equation.

$$Icoc = –Vdet4 / Rsns$$

· R3 and C5 stabilize supply voltage fluctuation.

· C6 is a capacitance to stabilize the operation of the MM3757 internal regulator.

· R5, R6, R7, and DZ are devices protecting communication terminal from ESD.