Lithium-ion battery charge control IC
Monolithic IC MM8013

Outline

The MM8013 is a high accuracy fuel gauge IC for 1-cell Li-ion battery or Li-polymer battery.
The MM8013 measures temperature, voltage and current by high-precision delta-sigma AD converter and executes current integration both at discharging and charging using specific battery characteristics parameter and the measurement values.
The MM8013 offers excellent management ability for battery power.
The MM8013 achieves safety and security by following functions: battery degradation detection using capacitance change, anomaly detection.

Features

(1) High accuracy battery power management
- Battery power is based on current integration value which is measured periodically and is controlled to minimize its error by correction using open voltage (OCV) and battery characteristics parameter.

(2) High precision voltage measurement
- Electric current and voltage value are measured by high accuracy 16bit delta-sigma AD converter.
- The current resolution is 1mA and the voltage resolution is 1mV.

(3) Battery degradation detection
- Total capacity of battery is measured periodically and capacitance change status is monitored. Degradation detection is done using the depth of capacitance change.

(4) Low Current Consumption
- Current consumption 60μA (operation)
- Current consumption 20μA (Low Power Active)
- Current consumption 1μA (Shutdown mode)

(5) Correspondence interface I^2C interface

(6) Traceability
- Battery ID and manufacture / shipment information are stored in nonvolatile memory and are accessible.

(7) Operating Ambient temperature –20°C to +85°C

(8) Operating voltage 2.5V to 5.5V

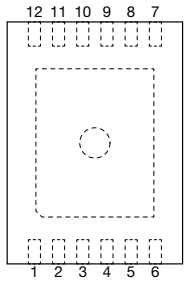
Package

PLP-12A

Applications

1. Smart phone/ Tablet
2. Digital camera
3. Wearable device
4. Mobile devices

Pin Assignment

Top view PLP-12A	Pin No.	Symbol	Function
	1	SE	General purpose output pin
	2	TREG	Not Supported
	3	VDD	Power supply pin
	4	VBAT	Voltage sensor input pin
	5	VREG	Regulator output pin
	6	VSS	Power supply pin
	7	VRSM	Current sensor input pin
	8	VRSP	Current sensor input pin
	9	THM	Thermistor input
	10	SDA	I^2C data input/output
	11	SCL	I^2C clock input
	12	HDG	General purpose output pin

Electrical Characteristics (Except where noted otherwise VDD=3.6V, Ta=25°C)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Active mode current consumption	Iact			60.0		µA
		Topr=–20~+85°C			90.0	
Low power active mode current consumption	Ilpa	Measurement interval 20s		22.0		µA
		Measurement interval 20s Topr=–20~+85°C			32.0	
		Measurement interval 60s		20.0		
		Measurement interval 60s Topr=–20~+85°C			30.0	
Standby mode current consumption	Istby			5.4		µA
		Topr=–20~+85°C			8.5	
Shutdown mode current consumption	Isdn			0.1		µA
		Topr=–20~+85°C			1.0	
Supplied voltage	VDD		2.5		5.5	V
Data I/O pin voltage range (SCL, SDA, HDQ)	VIO		–0.3		+5.5	V
Oscillation frequency 1	fosc1	Ta=–20~+85°C		614.4		kHz
Oscillation frequency 2	fosc2	Ta=–20~+85°C		38.4		kHz
Current sensor input range	Irng		–24.0		+24.0	mV
Battery voltage sensor input range	Vrng		1300		5000	mV
Temperature sensor input range	Trng		–20		+85	°C
Regulator voltage	Vreg	VDD=3.6V @25°C	1.76	1.8	1.84	V
VBAT input impedance	Pcell	VBAT=3.6V	6.0	8.0		MΩ
SCL, SDA pulldown current	Ipd	VPIN=0.4V		0.1		µA

Application Circuit

Example of the battery pack side loading