N channel high side FET drive by charge pump

MM3746 Series

Outline

MM3746 series are protection ICs with charger pump and drive high side N channel FET for Lithium-ion and Lithium-polymer secondary battery. This IC is most suitable for the intelligent battery pack with which I communicate data between the battery pack and the system.

And MM3746 series has a temperature detection by using a NTC Thermistor, protects the battery pack and system from over temperature.

Features
(Unless otherwise specified, Ta=25°C)

(1) Range and accuracy of detection/release voltage
- Overcharge detection voltage............................ Vdet1 .... 4.2V to 4.6V, 5mV steps.............Accuracy±15mV
- Overdischarge detection voltage .... Vdet2 .... 2.0V to 3.0V, 50mV steps...........Accuracy±40mV
- Discharging overcurrent detection voltage .... Vdet3 .... 10mV to 150mV, 1mV steps.........Accuracy±3.0mV *1
- Charging overcurrent detection voltage .... Vdet4 .... −150mV to −10mV, 1mV steps .....Accuracy±3.0mV *1
- Short detection voltage..................................... Vshort .... 40mV to 300mV, 50mV steps....... Accuracy±5.0mV
- 0V battery charge inhibition battery voltage ...... Vst .... ±1.3V fixed .... Accuracy±150mV
- Temperature detection .... Tdet .... 55 to 85°C.................................. Accuracy±5.0°C

  *1 Accuracy of overcurrent detection voltage (Ta=25°C)
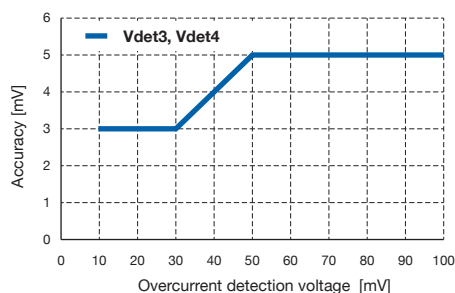
(2) Temperature detection function.............................Selectable "Enable" or "Disable"

(3) 0V battery charge function ....Selection from "Permission" or "Inhibition"

(4) Current consumption (Not include NTC bias current)
- Normal mode ....Typ. 6.0µA, Max. 10.0µA
- Stand-by mode ....Max. 0.1µA (Overdischarge latch function Enable)
  Max. 1.2µA (Overdischarge latch function Disable)

Pin assignment

■ WLCSP-10A

(Top view)

| Pin no.	Symbol	Function
A1	VSS	Negative power supply voltage input terminal
A2	VDD	Positive power supply voltage input terminal
A3	COUT	Charge FET control terminal
B1	TH(TEST)	Temperature level detect terminal (Test terminal)
B3	CS	Current level detect terminal
C1	CN	Flying capacitor connecting terminal
C3	DOUT	Discharge FET control terminal
D1	CP	Flying capacitor connecting terminal
D2	VOUT	Charge pump output terminal
D3	V+	Charger positive voltage input terminal

LINE UP

Product name	Package	Overcharge detection	Overdischarge detection	Discharging overcurrent detection	Charging overcurrent detection	Short detection	Temperature detection resistance	Overcharge detection latch function	Overcharge hysteresis cancel	Overdischarge detection latch function	Overdischarge hysteresis cancel	0V battery charge function	Temperature detection function	Delay time *1
		Vdet1	Vdet2	Vdet3	Vdet4	Vshort	RdetTH							
		V	V	mV	mV	mV	---							
MM3746BB1LBE	WLCSP-10A	4.270	2.300	13.0	-10.0	40.0	---	Disable	Enable	Enable	Disable	Inhibition	Disable	A
MM3746BC1LBE	WLCSP-10A	4.490	2.900	33.0	-17.0	140.0	---	Disable	Enable	Enable	Disable	Inhibition	Disable	B

*1 Delay time

	tVdet1	tVdet2	tVdet3	tVdet4	tshort1	tVtdet
	ms	ms	ms	ms	µs	---
A	1020	128	16.0	8.0	250	---
B	1020	16	16.0	8.0	250	---

Please inquire to us, if you request a rank other than the above.

Typical application circuit
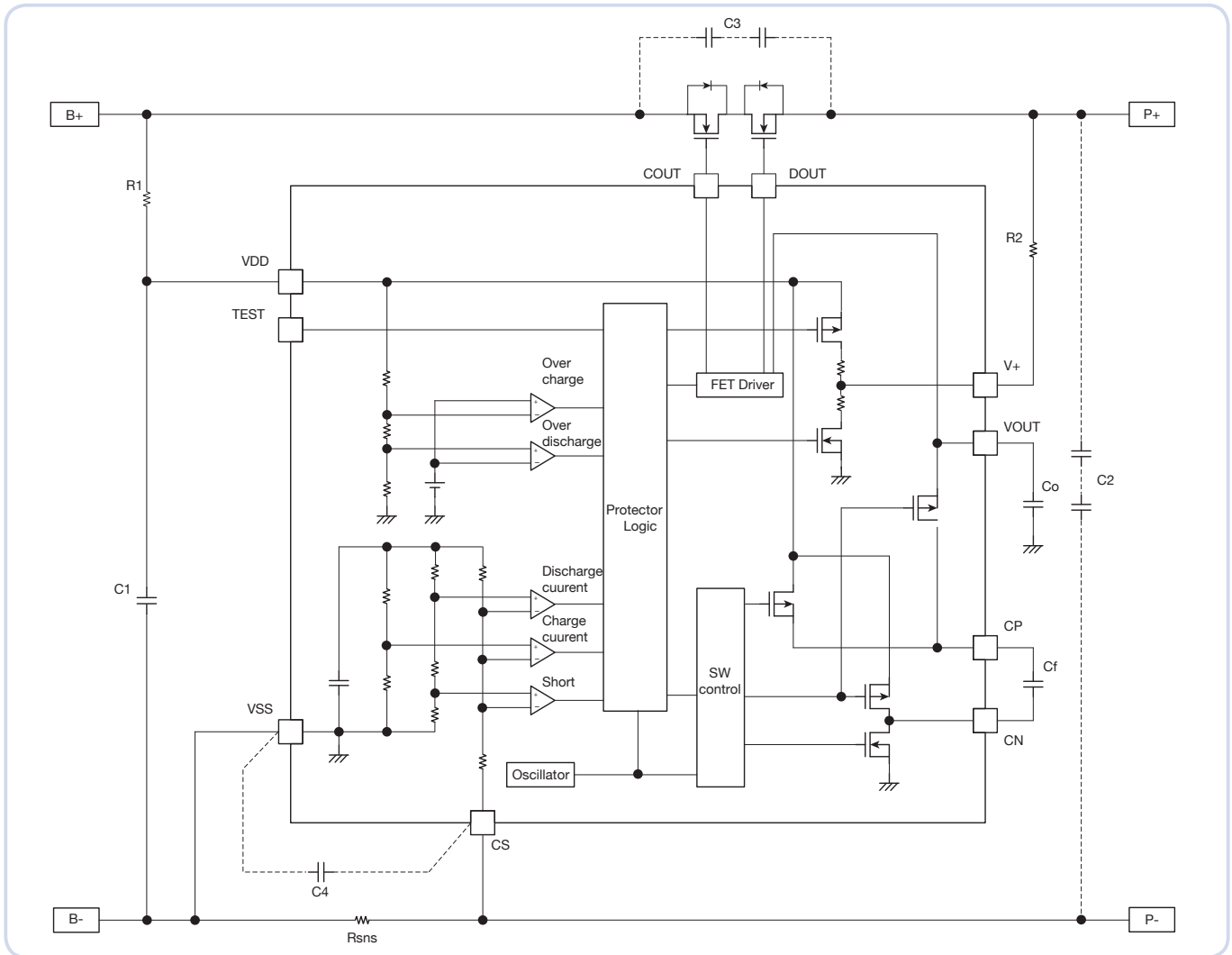
● The characteristics of the charge pump (ripple voltage, output current ability, etc.) are decided by the capacitor (C1, Cf, Co). Please select ceramic capacitor with a small ESR(Equivalent Series Resistance). Please arrange Cf near the CN and CP terminal.

● R1 and C1 help to stabilize a supply voltage fluctuation. 0.1μF or more is recommended for C1 to secure stable operation. The value of Cf and Co affects the output current drivability and the output voltage ripple respectively. The recommend value of Cf and Co is 0.047μF to drive CFET and DFET with no fail.

● The detection voltage rises by the current consumption (IDD) of IC when R1 is too large. 300Ω or less is recommended for R1. The variation of overcharge detection voltage (ΔVdet1) is expressed in the following equation.

$$\Delta Vdet1 = R1 * IDD$$

● R1 and R2 are useful for the current limiting resistance if a charger is connected reversely or a high-voltage charger that exceeds the absolute maximum rating is connected. If total value of "R1+R2" is too small, it may exceed allowed power dissipation of IC. Please have total value of "R1 and R2" should be more than 300ohm. If R2 is too large, CFET may not be able to turn off, therefore please use 10kohm or less.

● C2, C3 and C4 are useful to improve the system stability against the voltage ripple and exogenous noise. Please consider whether or not capacitors should be placed, the area should be placed, and capacitance value in consideration of the system characteristic. Especially C4 prevents false discharge overcurrent detection.

● Current threshold of discharging overcurrent detection and short detection (Idoc, Icoc, Ishort) are expressed in the following equations.

$$Idoc = Vdet3 / Rsns$$
$$Icoc = Vdet4 / Rsns$$
$$Ishort = Vshort / Rsns$$

MITSUMI ELECTRIC CO., LTD.