



3- 5 cells Li-ion/polymer battery protection IC

MM3474 series

Outline

MM3474 series is an overcharge, overdischarge and overcurrent protection IC for a lithium-ion / lithium-polymer secondary battery. This supports 3 to 5 serial cells, and the number of cells can be switched over by inputting high / low signal to SEL terminal. MM3474 series can protect Lithium ion battery pack of 6-plus serial cells by connecting in cascade. This also provides the control terminals of output overdischarge detection (SDC) and output overcharge detection (SOC), which allows configuring an application with fewer external parts for 6 or more cells connected in series.

Features

(Unless otherwise specified, Ta=25°C)

1) Range and accuracy of detection/release voltage

• Overcharge detection voltage	3.6V to 4.5V, 5mV steps	Accuracy±25mV (Ta=0~50°C)
• Overcharge release voltage	3.4V to 4.5V, 50mV steps	Accuracy±50mV
• Overdischarge detection voltage	2.0V to 3.0V, 50mV steps	Accuracy±80mV
• Overdischarge release voltage	2.0V to 3.4V, 50mV steps	Accuracy±100mV
• Overcurrent detect voltage	+50mV to +300mV, 5mV steps	Accuracy±15mV
• Short detection voltage	0.2V to 1.0V, 50mV steps	Accuracy±100mV

2) Range of detection delay time

• Overcharge detection dead time	Setting by capacitor of COV pin
• Overdischarge detection dead time	Setting by capacitor of CDC pin
• Overcurrent detection dead time	Setting by capacitor of COL1 pin
• Short detection dead time	300us fixed

3) 0V battery charge function

Selection from "Prohibition" or "Permission"

4) The setting for three cell , for four cell , and for five cell protection can be set with the SEL1 pin and the SEL2 pin

5) The charge and discharge of the battery can be controlled with SDC pin and SOC pin

6) Low current consumption

• Consumption current1 (VDD), Vcell=4.4V	Typ. 10.0uA Max. 20.0uA
• Consumption current2 (VDD), Vcell=3.5V	Typ. 5.0uA Max. 10.0uA
• Consumption current3 (VDD), Vcell=1.8V	Typ. 1.5uA, Max. 3.0uA

7) Package type

• TSOP-20D	6.50 × 6.40 × 1.10 [mm]
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Pin explanations

TSOP-20D	Pin No.	Symbol	Function
<p>TOP VIEW</p>	1	OV	Charge control output terminal. Output type is Pch open drain.
	2	V-	Input terminal connected to charger negative voltage.
	3	CS	Input of overcurrent detection.
	4	DCHG	Discharge control output terminal. Output type is CMOS.
	5	COV	This pin is dead time setting of overcharge detection and release.
	6	CDC	This pin is dead time setting of overdischarge detection and release.
	7	COL1	This pin is dead time setting of overcurrent detection.
	8	COL2	This pin is dead time setting of overcurrent release.
	9	VSS1	The input terminal of the negative voltage of V1 cell.
	10	VSS2	The input terminal of the ground of IC.
	11	SEL1	This pin is for changing function for 3cell in series or 4cell in series , 5cell in series. SEL1 = H , SEL2 = H → 5Cell protection SEL1 = H , SEL2 = L → 4Cell protection SEL1 = L , SEL2 = H → 3Cell protection (SEL1=SEL2=L setting is prohibited.)
	12	SEL2	
	13	V1	The input terminal of the positive voltage of V1 cell, and the negative voltage of V2 cell .
	14	V2	The input terminal of the positive voltage of V2 cell, and the negative voltage of V3 cell .
	15	V3	The input terminal of the positive voltage of V3 cell, and the negative voltage of V4 cell .
	16	V4	The input terminal of the positive voltage of V4 cell, and the negative voltage of V5 cell .
	17	V5	The input terminal of the positive voltage of V5 cell .
	18	VDD	The input terminal of the power supply of IC.
	19	SDC	The control terminal of output overdischarge detection.
	20	SOC	The control terminal of output overcharge detection.



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
VDD pin supply voltage	V_{VDDMAX}	VSS2-0.3	VSS2+30.0	V
Voltage between the input terminals of voltage of battery	$V_{cellMAX}$	-0.3	10.0	V
V- pin supply voltage	V_{V-MAX}	VDD-30	VDD+0.3	V
OV pin supply voltage	V_{OVMAX}	VDD-30	VDD+0.3	V
DCHG pin supply voltage	$V_{DCHGMAX}$	VSS-0.3	VDD+0.3	V
Storage temperature	Tstg	-55	125	°C

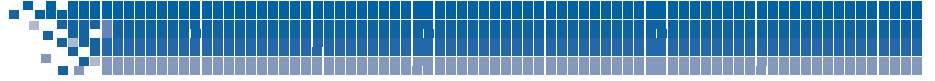
Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating ambient temperature	TOPR	-40	85	°C
Operating voltage	VOPR	VSS+3.5	VSS+22.5	V

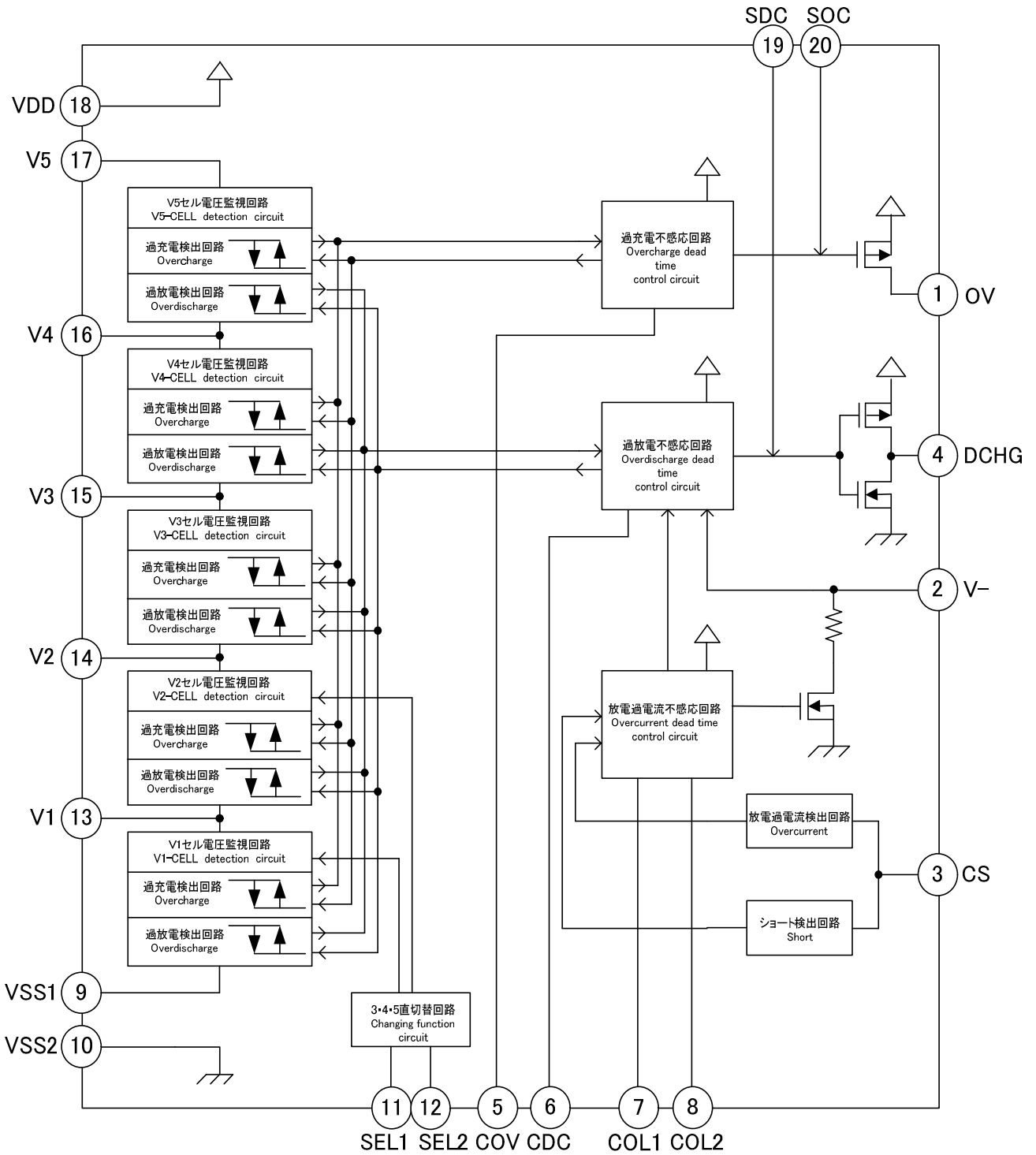
Electrical characteristics

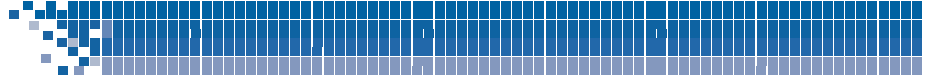
(特記なき場合、 $T_a=25^\circ\text{C}$)

Parameter	Symbol	Note	Min	Typ	Max	Unit
Current consumption						
Current consumption1 (VDD)	I_{DD1}	Vcell=4.4V	-	10.0	20.0	uA
Current consumption2 (VDD)	I_{DD2}	Vcell=3.6V	-	5.0	10.0	uA
Current consumption3 (VDD)	I_{DD3}	Vcell=1.8V	-	1.5	3.0	uA
Detection / Release voltage						
Maximum forbidden voltage for 0V charging	V_{CELL0V}	「禁止」ファンクション	0.3	0.6	0.9	V
Overcharge detection voltage	V_{CELLU}	$T_a=0\sim 50^\circ\text{C}$	Typ-0.025	V_{DET1}	Typ+0.025	V
Overcharge release voltage	V_{CELLO}		Typ-0.050	V_{REL1}	Typ+0.050	V
Overdischarge detection voltage	V_{CELLS}		Typ-0.080	V_{DET2}	Typ+0.080	V
Overdischarge release voltage	V_{CELLD}		Typ-0.100	V_{REL2}	Typ+0.100	V
overcurrent detection voltage	V_{OC}		Typ-15%	V_{DET3-1}	Typ+15%	V
Short detection voltage	V_{SHORT}		Typ-30%	V_{SHORT}	Typ+30%	V
Detection voltage delay time						
Overcharge detection dead time	t_{OV1}		Typ-50%	t_{VDET1}	Typ+50%	s
Overdischarge detection dead time	t_{DC1}		Typ-50%	t_{VDET2}	Typ+50%	s
Overcurrent detection dead time	t_{OC1}		Typ-50%	$t_{VDET3-1}$	Typ+50%	ms
Short detection dead time	t_{SHORT}		100	300	600	us



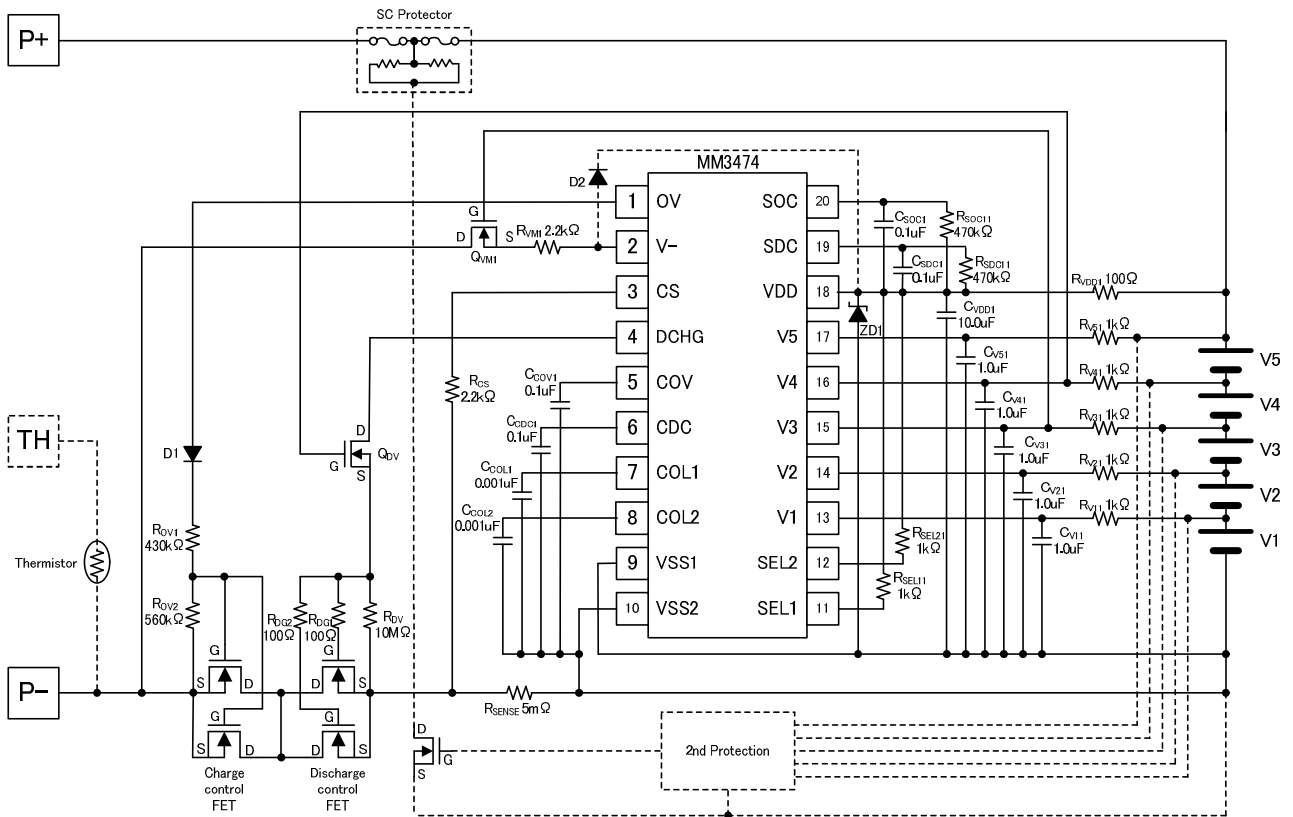
Block diagram



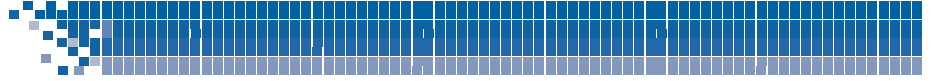


Typical application circuit

- 5 cells protection circuit

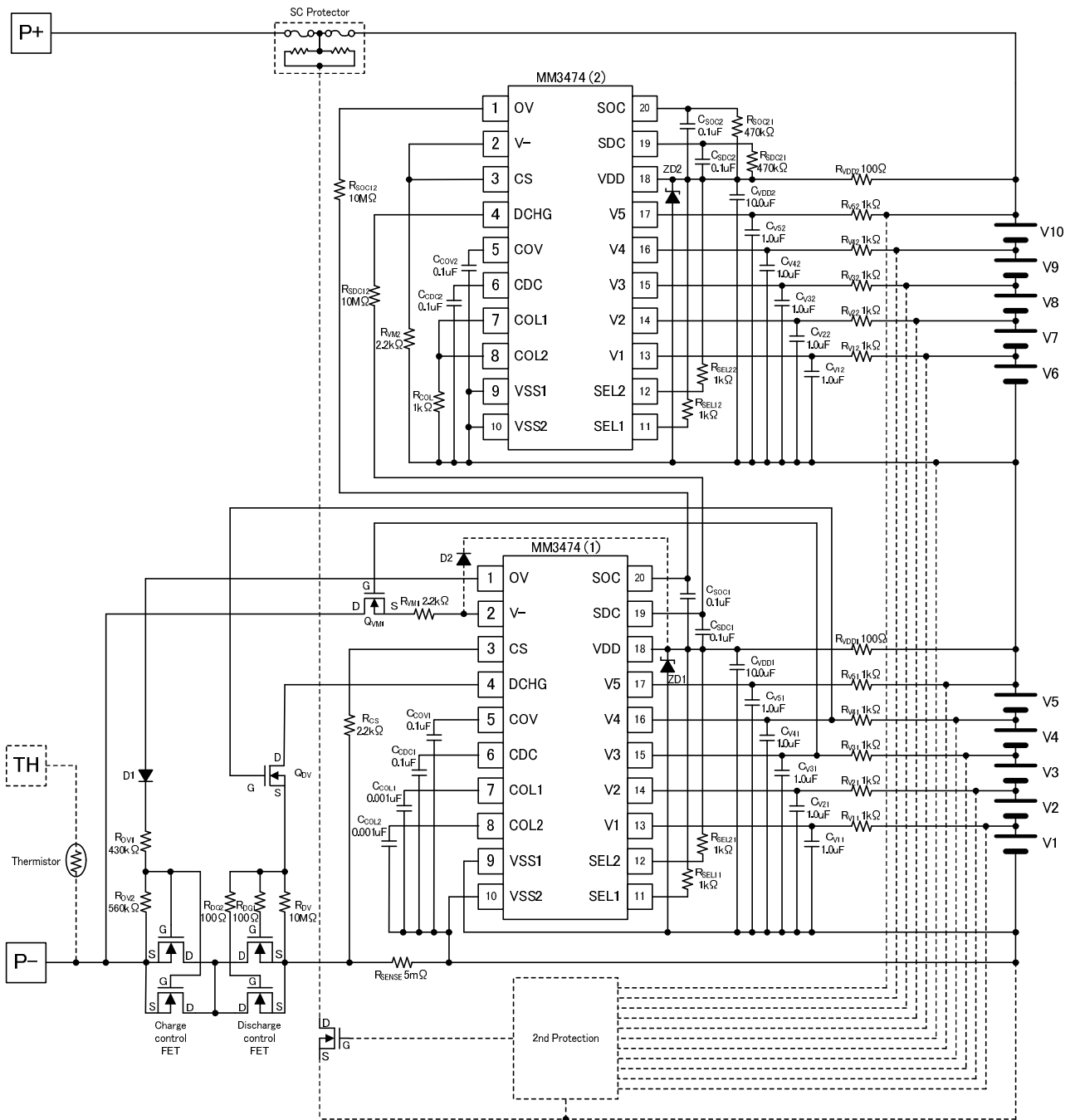


※ This circuit is shown as an example of typical application for reference. According to the conditions which are actually used, the maximum rating (voltage, power dissipation, ESD tolerance, etc.) of each parts should be verified enough.



Typical application circuit

- 10 cells protection circuit



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