MM3721 series

概要 / OUTLINE

MM3721シリーズは電流検出抵抗Rsnsを用いることで充電/放電電流異常を高精度に検出可能なLiイオン/Liポリマー2次電池保護ICです。2段階の放電過電流検出機能を持ち、通常放電状態と大電流放電状態それぞれでシステムを適切に保護することができます。

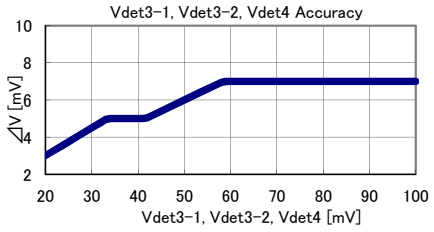
MM3721 series are Li-ion battery protection IC and detect charge current / discharge current with high precision by current sensing resistor (Rsns). MM3721 have two step discharge overcurrent detection. And system is protected appropriately in the next 2 state, Normal discharge mode and large current discharge mode.

特徴 / FEATURES

1, 検出電圧選択範囲と精度 / Range and accuracy of detection voltage　　（特記なき場合、Ta=+25℃）

項目/Item	記号/SYMBOL	設定範囲/Range	精度/Accuracy
・過充電検出電圧 Overcharge detection voltage	Vdet1	3.6V to 5.0V 5mV step	±20mV ±25mV（Ta=-20 to +60℃）
・過充電復帰電圧 Overcharge release voltage	Vrel1	Vdet1-0.2V to Vdet1 5mV step	±30mV
・過放電検出電圧 Overdischarge detection voltage	Vdet2	2.0V to 3.0V 50mV step	±35mV
・過放電復帰電圧 Overdischarge release voltage	Vrel2	2.0V to 3.0V 50mV step	+65 / -35mV (In case Vdet2=Vrel2) +90 / -65mV (In case Vdet2≠Vrel2)
・放電過電流検出電圧1 Discharging overcurrent detection voltage 1	Vdet3-1	20mV to 150mV 1mV step	±⊿V *1
・放電過電流検出電圧2 Discharging overcurrent detection voltage 2	Vdet3-2	Vdet3-1 + 10mV to 200mV 1mV step	±⊿V *1
・充電過電流検出電圧 Charging overcurrent detection voltage	Vdet4	-20mV to -150mV 1mV step	±⊿V *1
・短絡検出電圧 Short detection voltage	Vshort	0.4V to 0.9V 0.05V step	±100mV
・0V充電禁止電池電圧 0V battery charge inhibition battery voltage	Vst	1.3V to 1.8V / 0.1V step 0.9V	±100mV ±300mV

*1 過電流検出精度 / Current detection voltage Accuracy



2, 遅延時間の設定 / Delay time setting

	記号/SYMBOL	設定範囲/Range
・過充電検出遅延時間 Overcharge detection delay time	tVdet1	256ms to 4.6s
・過放電検出遅延時間 Overdischarge detection delay time	tVdet2	8ms to 256ms
・放電過電流1検出遅延時間 Discharging overcurrent 1 detection delay time	tVdet3-1	8ms to 256ms
・放電過電流2検出遅延時間 Discharging overcurrent 2 detection delay time	tVdet3-2	6ms to 64ms *tVdet3-2 < tVdet3-1
・充電過電流検出遅延時間 Charging overcurrent detection delay time	tVdet4	6ms to 64ms
・短絡検出遅延時間 Short detection delay time	tVshort	250us to 400us

3, 消費電流 / Current consumption

・通常動作モード時 / Normal mode	Typ. 3.0uA, Max. 6.0uA
・スタンバイモード時 / Stand-by mode	Max. 0.1uA (過放電ラッチ機能ありの場合 / In case Overdischarge latch function Enable.) Max 0.6uA (過放電ラッチ機能なしの場合 / In case Overdischarge latch function Disable.)

4, 0V電池への充電機能 / 0V battery Charge function　　"許可"/"禁止"選択可能
Selectable "Permission" or "inhibition"

5, 絶対最大定格 / Absolute maximum ratings

・VDD端子 / VDD pin	VSS-0.3V to 12V
・COUT端子、V−端子 / COUT pin and V- pin	VDD-28V to VDD+0.3V
・DOUT端子、CS端子 / DOUT pin and CS pin	VSS-0.3V to VDD+0.3V
・保存温度 / Storage temperature	-55 to +125℃
・動作周囲温度 / Operation temperature	-40 to +85℃

6, パッケージラインナップ/ PKG Line up

SSON-6J	1.40 × 1.40 × 0.55 [mm]
SON-6C	1.60 × 2.00 × 0.55 [mm]

＊ 上記以外の仕様をご希望の場合は、弊社までお問い合わせください
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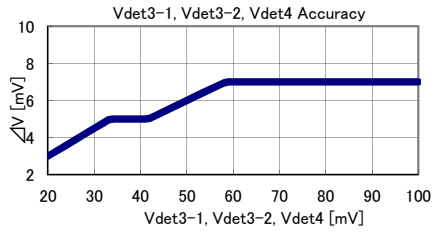
電気的特性 / ELECTRICAL CHARACTERISTICS

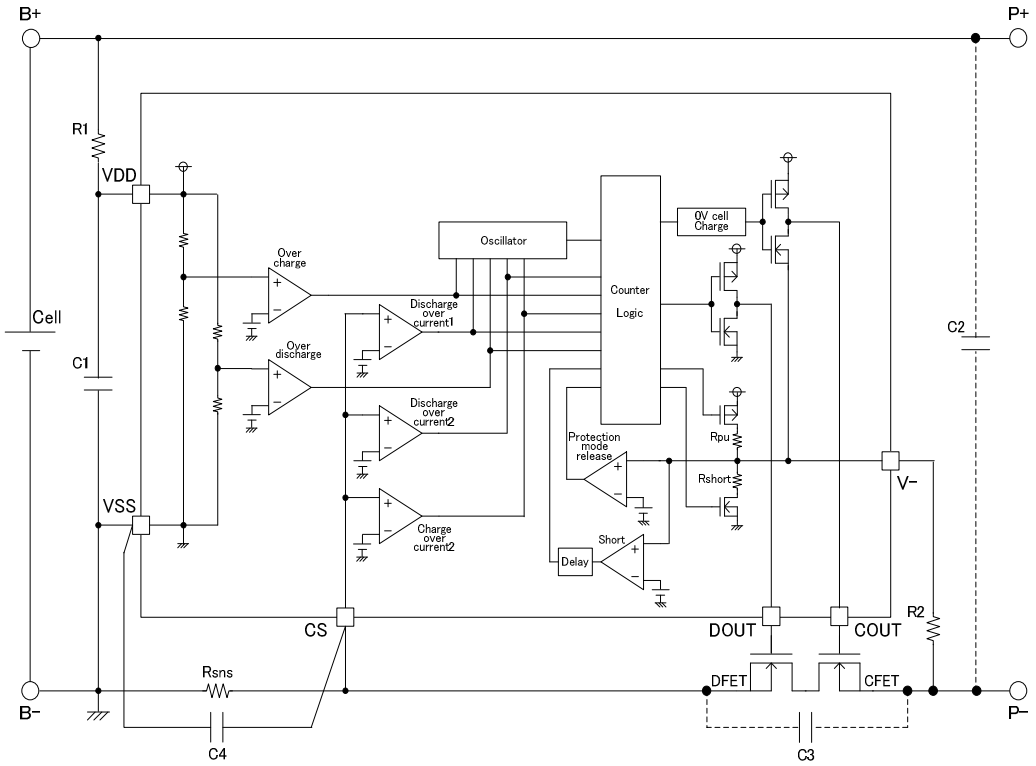
特記なき場合 Ta=25℃ / Ta=25℃, unless otherwise specified

項目/Item	単位/Unit	記号/Symbol	備考/Note	Min	Typ	Max
動作電圧 Operating voltage	V	Vop		1.5	-	5.5
動作周囲温度 Operating Ambient temperature	℃	Ta		-40	-	85
過電流復帰抵抗 Discharge overcurrent release resistance	kohms	Rshort	VDD=3.6V, CS=0V, V-=2.0V	Rshort*0.6	Rshort	Rshort*2.0
V-端子プルアップ抵抗 V- terminal pull-up resistances	kohms	Rpu	VDD=2.0V, CS=V-=0V	Rpu*0.5	Rpu	Rpu*2.0
COUT Lレベル出力電圧 COUT L level output voltage	V	VcoL	Icout=30uA, VDD=4.5V	-	0.1	0.5
COUT Hレベル出力電圧 COUT H level output voltage	V	VcoH	Icout=-30uA, VDD=4.0V	VDD-0.5	VDD-0.1	-
DOUT Lレベル出力電圧 DOUT L level output voltage	V	VdoL	Idout=30uA, VDD=2.0V	-	0.1	0.5
DOUT Hレベル出力電圧 DOUT H level output voltage	V	VdoH	Idout=-30uA, VDD=4.0V	VDD-0.5	VDD-0.1	-
消費電流 Current consumption	uA	Idd	VDD=4.0V, V-=CS=0V	-	3.0	6.0
スタンバイ電流 Current consumption at stand-by	uA	Is	VDD=2.0V, CS=0V *3	-	-	0.1
			VDD=2.0V, CS=0V *4	-	0.3	0.6
0V充電許可充電器電圧 0V battery charge permission charger voltage	V	Vst	Vst=VDD-V-, VDD=CS=0V *1	-	-	1.2
0V充電禁止電池電圧 0V battery charge inhibition battery voltage	V		Vst=VDD-VSS, V-=CS=0V *2	Vst-0.1	Vst	Vst+0.1
過充電検出電圧 Overcharge detection voltage	V	Vdet1	Ta=25℃ V-=CS=0V	Vdet1-0.020	Vdet1	Vde1+0.020
			Ta=-20 to 60℃ V-=CS=0V	Vdet1-0.025		Vde1+0.025
過充電復帰電圧 Overcharge release voltage	V	Vrel1	*5	Vrel1-0.030	Vrel1	Vrel1+0.030
過放電検出電圧 Overdischarge detection voltage	V	Vdet2	V-=CS=0V	Vdet1-0.035	Vdet2	Vde1+0.035
過放電復帰電圧 Overdischarge release voltage	V	Vrel2	In case Vdet2=Vrel2 *3 *5	Vrel2-0.035	Vrel2	Vrel2+0.065
			In case Vdet2≠Vrel2 *4 *5	Vdet1-0.065		Vdet1+0.090
放電過電流検出電圧1 Discharging overcurrent detection voltage 1	V	Vdet3-1	VDD=3.6V, V-=0V *6	Vdet3-⊿V	Vdet3-1	Vdet3+⊿V
放電過電流検出電圧2 Discharging overcurrent detection voltage 2	V	Vdet3-1	VDD=3.6V, V-=0V *6	Vdet3-⊿V	Vdet3-2	Vdet3+⊿V
充電過電流検出電圧 Charging overcurrent detection voltage	V	Vdet4	VDD=3.6V, V-=0V *6	Vdet4-⊿V	Vdet4	Vdet4+⊿V
短絡検出電圧 Short detection voltage	V	Vshort	VDD=3.6V, CS=VSS	Vshort-0.100	Vshort	Vshort+0.100
過充電検出遅延時間 Overcharge detection delay time	ms	tVdet1		tVdet1*0.8	tVdet1	tVdet1*1.2
過放電検出遅延時間 Overdischarge detection delay time	ms	tVdet2		tVdet2*0.8	tVdet2	tVdet2*1.2
放電過電流検出遅延時間 Discharging overcurrent detection delay time	ms	tVdet3		tVdet3*0.8	tVdet3	tVdet3*1.2
充電過電流検出遅延時間 Charging overcurrent detection delay time	ms	tVdet4		tVdet4*0.8	tVdet4	tVdet4*1.2
短絡検出遅延時間 Short detection delay time	us	tVshort		tVshort*0.8	tVshort	tVshort*1.2

*1 0V電池への充電機能"許可"の場合/In case 0V battery charge function "Permission".
*2 0V電池への充電機能"禁止"の場合/In case 0V battery charge function "inhibition".
*3 過放電ラッチ機能"あり"の場合/Overdischarge mode latch function "Enable".
*4 過放電ラッチ機能"なし"の場合/Overdischarge mode latch function "Disable".
*5 復帰条件は各ランクの仕様書を参照ください./Please refer to each specifications for release condition.
*6 過電流検出精度/Current detection voltage Accuracy



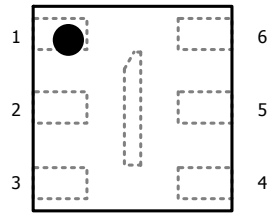
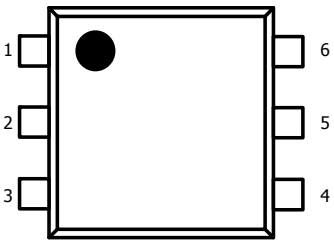
応用回路例 / Typical application circuit



記号 Symboll	部品 Part	最小値 Min.	 Typ.	最大値 Max.	目的 Purpose
R1	Resistor	-	100	1KΩ	電源電圧変動対策、ESD対策 For voltage fluctuation, For ESD
C1	Capacitor	0.01uF	0.1uF	1.0uF	電源電圧変動対策 For voltage fluctuation
R2	Resistor	-	1.0kΩ	10kΩ	充電器逆接電流制限 Current limit for charger reverse connection
C2	Capacitor	-	0.1uF	-	ノイズ対策 For exogenous noise
C3	Capacitor	-	0.1uF	-	ノイズ対策 For exogenous noise
Rsns	Resistor	-	-	20mΩ	電流検出抵抗 Current detection resistance
C4	Capacitor	-	0.1uF	-	ノイズ対策 For exogenous noise
DFET CFET	Nch MOS FET	-	-	-	充放電制御 Charge and discharge control

＊ 本回路例および定数は、動作を保証するものではありません。実際のアプリケーションで十分な評価を実施の上、定数を設定してください。
This typical application circuit and constant value do not guarantee proper operation. Please evaluate thoroughly by actual application to set up constants.

パッケージ、ピン配置 / PKG, Pin configuration

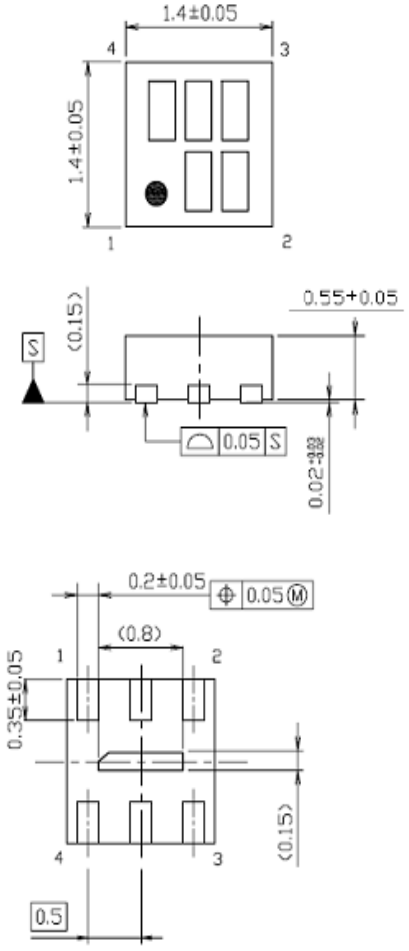
SSON-6J	SON-6C
	

端子 Pin No	名称 SYMBOL	機能 Function
1	V-	充電器マイナス電位入力端子 Charger negative voltage input terminal
2	COUT	充電FET制御端子 Charge FET control terminal
3	DOUT	放電FET制御端子 Discharge FET control terminal
4	VSS	負側電源入力端子 Negative power supply voltage input terminal
5	VDD	正側電源入力端子 Positive power supply voltage input terminal
6	CS	過電流検出端子 Current detection terminal

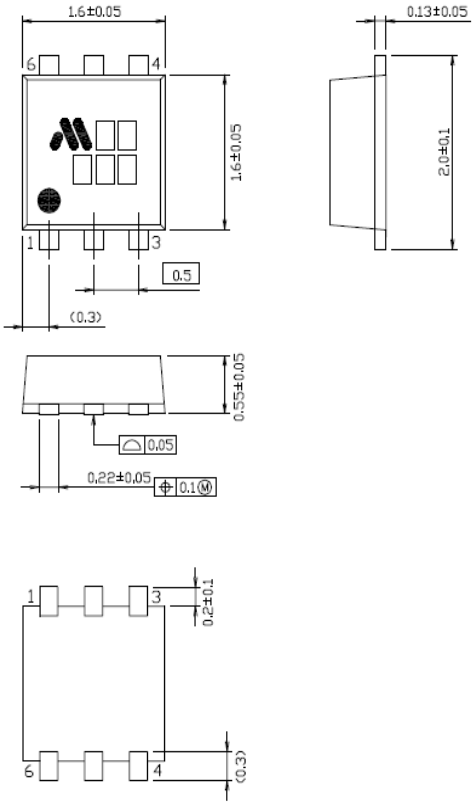
パッケージ外形図 / PACKAGE DIMENSIONS

UNIT: mm

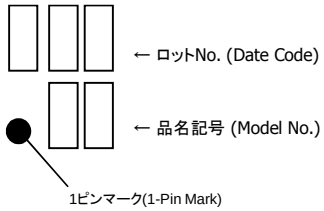
SSON-6J
表面(Top View)



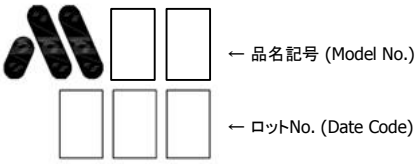
SON-6C
表面(Top View)



マーク内容(Marking Contents)/SSON-6J



マーク内容(Marking Contents)/S0N-6C



製品ラインナップ / LINE UP

機種名 MODEL	パッケージ PKG	0V充電 / 0V charge	保護状態ラッチファンクション Protection mode latch function			ヒスキャンセル Hys-Cancel		放電過電流復帰範囲拡大機能 Discharging overcurrent release range extended function.	過充電検出電圧 Overcharge detection voltage	過充電復帰電圧 Overcharge release voltage	過放電検出電圧 Overdischarge detection voltage	過放電復帰電圧 Overdischarge release voltage	放電過電流検出電圧1 Discharging overcurrent detection voltage	放電過電流検出電圧2 Discharging overcurrent detection voltage	充電過電流検出電圧 Charging overcurrent detection voltage	短絡検出電圧 Short detection voltage	遅延時間/ Delay time *1	開発状況/Development state
			過充電 Overcharge	過放電 Overdischarge	放電過電流 Discharge overcurrent	過充電 Overcharge	過放電 Overdischarge		Vdet1 [V]	Vrel1 [V]	Vdet2 [V]	Vrel2 [V]	Vdet3-1 [V]	Vdet3-2 [V]	Vdet4 [V]	Vshort [V]	-	
MM3721EF1RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.425	4.425	2.400	2.400	0.040	0.072	-0.022	0.600	A	MP
MM3721EF2RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.420	4.420	2.300	2.300	0.030	0.040	-0.020	0.400	B	MP
MM3721EF5RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.420	4.420	2.300	2.300	0.032	0.047	-0.028	0.400	B	MP
MM3721EF6RRE	SSON-6J	0.9	Enable	Enable	Disable	-	-	Yes(1.0V)	4.470	4.470	2.300	2.300	0.037	0.054	-0.021	0.400	B	MP
MM3721FF1RRE	SSON-6J	1.6	Disable	Disable	Disable	Disable	Enable	Yes(1.0V)	4.440	4.240	2.300	2.600	0.040	0.063	-0.020	0.800	C	ES
MM3721FF2YRE	SON-6C	1.6	Disable	Disable	Disable	Disable	Enable	Yes(1.0V)	4.440	4.240	2.300	2.600	0.064	0.095	-0.022	0.800	D	ES
MM3721HF1RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.440	4.240	2.300	2.300	0.025	0.038	-0.020	0.400	E	MP
MM3721HF2RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.440	4.240	2.300	2.300	0.025	0.034	-0.020	0.400	E	MP
MM3721HF4RRE	SSON-6J	0.9	Disable	Enable	Disable	Disable	-	Yes(1.0V)	4.485	4.285	2.300	2.300	0.025	0.034	-0.020	0.400	E	ES

*1 遅延時間/Delay time

	tVdet1 [s]	tVrel1 [ms]	tVdet2 [ms]	tVrel2 [ms]	tVdet3-1 [ms]	tVrel3-1 [ms]	tVdet3-2 [ms]	tVrel3-2 [ms]	tVdet4 [ms]	tVrel4 [ms]	tshort [us]
A	1.02	16.00	125.00	1.00	3072.00	1.00	10.00	1.00	8.00	1.00	300
B	1.02	16.00	125.00	1.00	5120.00	1.00	8.00	1.00	8.00	1.00	300
C	4.60	16.00	96.00	1.00	160.00	1.00	16.00	1.00	8.00	1.00	300
D	4.60	16.00	96.00	1.00	160.00	1.00	16.00	1.00	8.00	1.00	400
E	4.60	16.00	96.00	1.00	448.00	1.00	24.00	1.00	8.00	1.00	300

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