Li-ion Battery 2nd Protection

Reported：台北工程部

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Agenda

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- 鋰電池二次保護IC架構介紹
- RICOH鋰電池二次保護IC產品線
- 重點功能

鋰電池二次保護IC架構介紹

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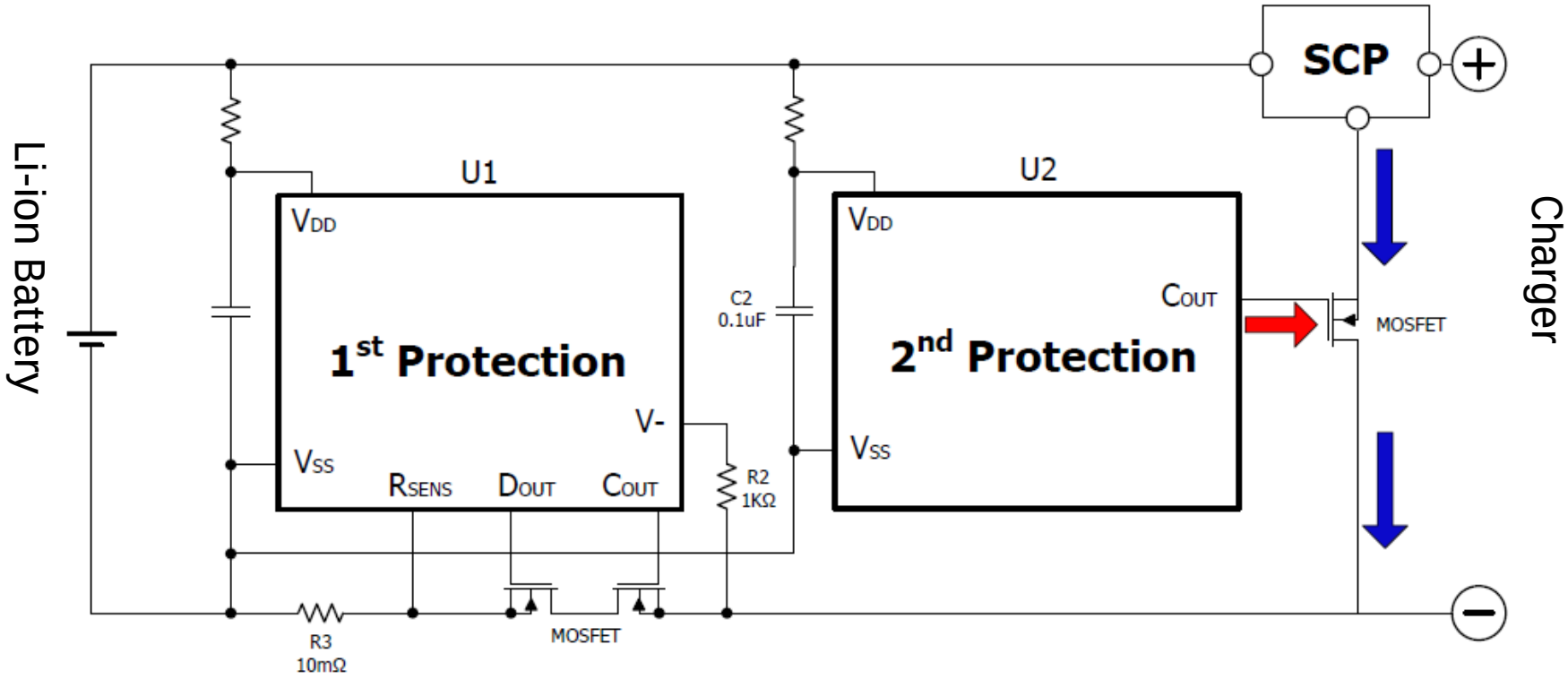

當U1 OVP失效，U2 OVP形成二次保險的作用，COUT輸出H(如上圖紅色箭頭)，MOSFET導通將SCP燒毀，達成永久斷開充放電路徑的狀態(如上圖藍色箭頭)。

RICOH鋰電池二次保護IC產品線

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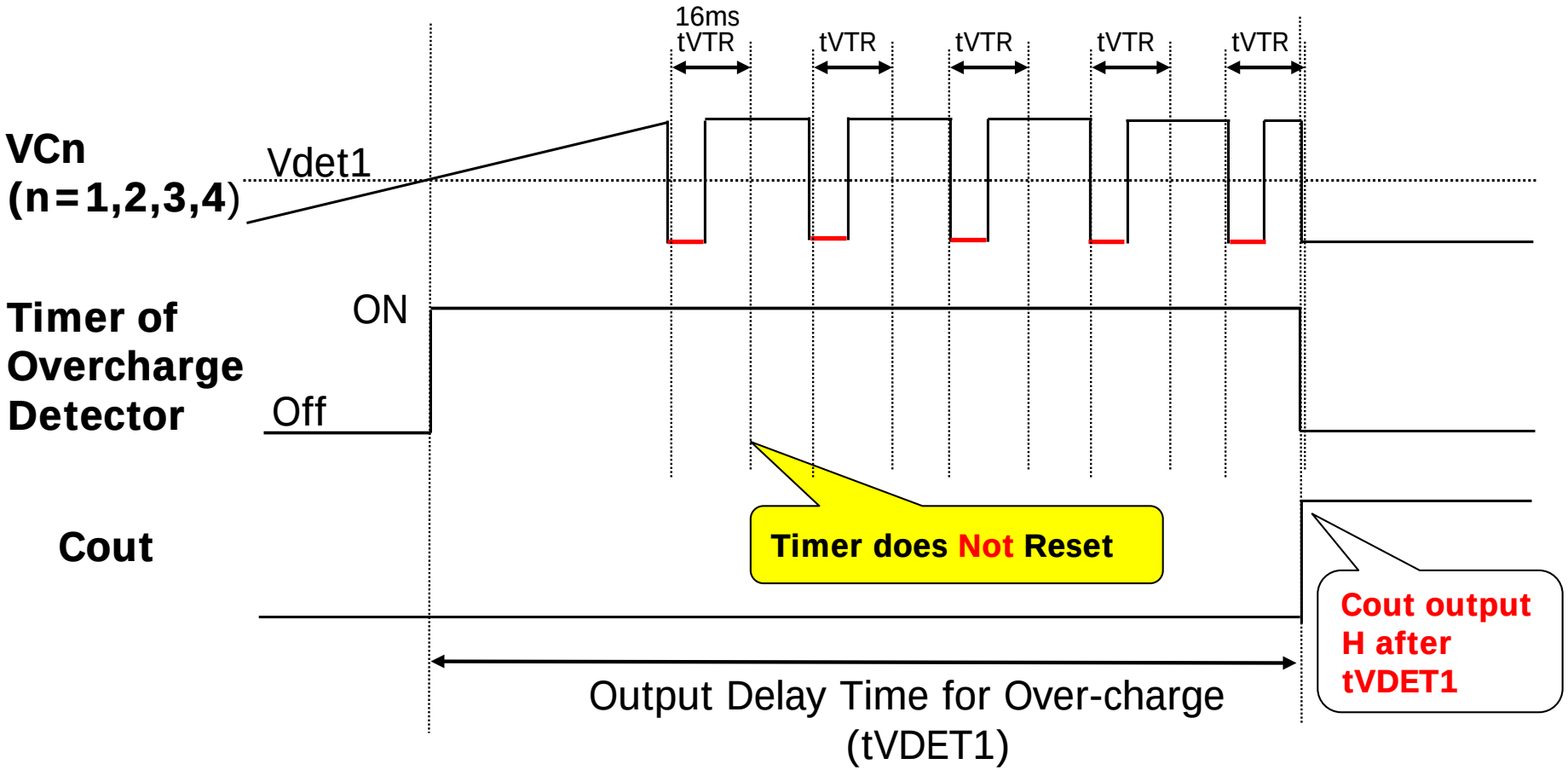
	R5434D	R5435N/K	R5437/38L	R5439K NEW!
Cell Numbers	2/3/4/5	2/3	1/2/3	2/3/4
Maximum Voltage	30V	30V	26V	32V
Supply Current	3.0uA (Typ)	3.0uA (Typ)	0.85uA (Typ)	4.0uA (Typ)
Shutdown Current	—	0.1uA (Max)	0.1uA (Max)	Shutdown1: 2.5uA(Typ) Shutdown2: 0.2uA(Typ)
Over-charge Detection	3.6V – 4.6V (Auto Release)	4.1V – 4.55V (Auto Release)	4.1V – 4.6V (Auto Release)	4.2V – 4.6V (Auto Release)
Accuracy of Over-charge	+/-25mV(25℃) +/-30mV(0℃ – 60℃)	+/-20mV(25℃) +/-25mV(0℃ – 60℃)	+/-20mV(25℃) +/-25mV(0℃ – 60℃)	+/-20mV(25℃) +/-25mV(0℃ – 60℃)
Over-charge Delay Time	1.5 sec	2/4/6 sec	2/4/6 sec	2/4/6 sec
Timer Reset Delay	Yes	Yes	No	Selectable
External Interruption	Yes (CTLC pin)	No	No	No
Regulator Output	No	No	No	3.3V (±2%) For RTC Iout (Max) = 2mA
Output Type	CMOS	CMOS	CMOS	CMOS
“H” level of Output	3.7V (Typ)	4.7V (Typ)	4.7V (Typ)	4.7V (Typ)
Main Application	Power tool, e-bike, cleaner	Laptop PC	Laptop PC	Laptop PC
Customer / Region	World Wide	World Wide	World Wide	World Wide
Package	SON-8 (2.9×3.0×0.9)	TSOT23-6 (2.9×2.8×0.85) DFN1616-6B (1.6×1.6×0.6)	DFN1814-6 (1.4x1.8x0.4)	DFN2020-8 (2.0x2.0.x0.6)

Timer Reset

Timing Chart 1 (Case : Off Pulse is short)

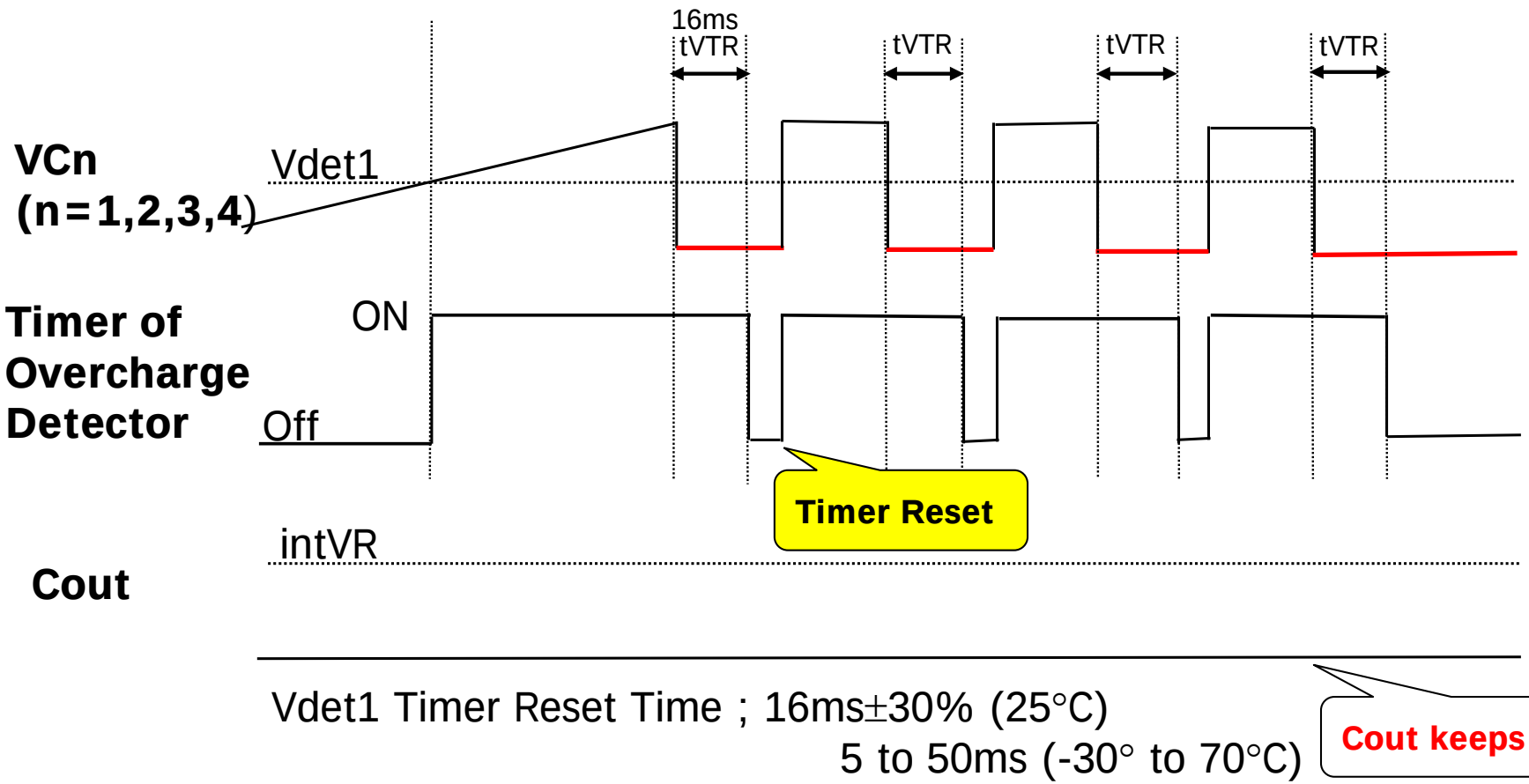


Vdet1 Timer Reset Time ; 16ms±30% (25°C)

5 to 50ms (-30° to 70°C)

Timer Reset

Timing Chart 2 (Case：Off Pulse is long enough)



R5439K Shutdown1 Mode

進入Shutdown1條件:

VCn < VSHT1n (3.8V)

進入Shutdown1後:

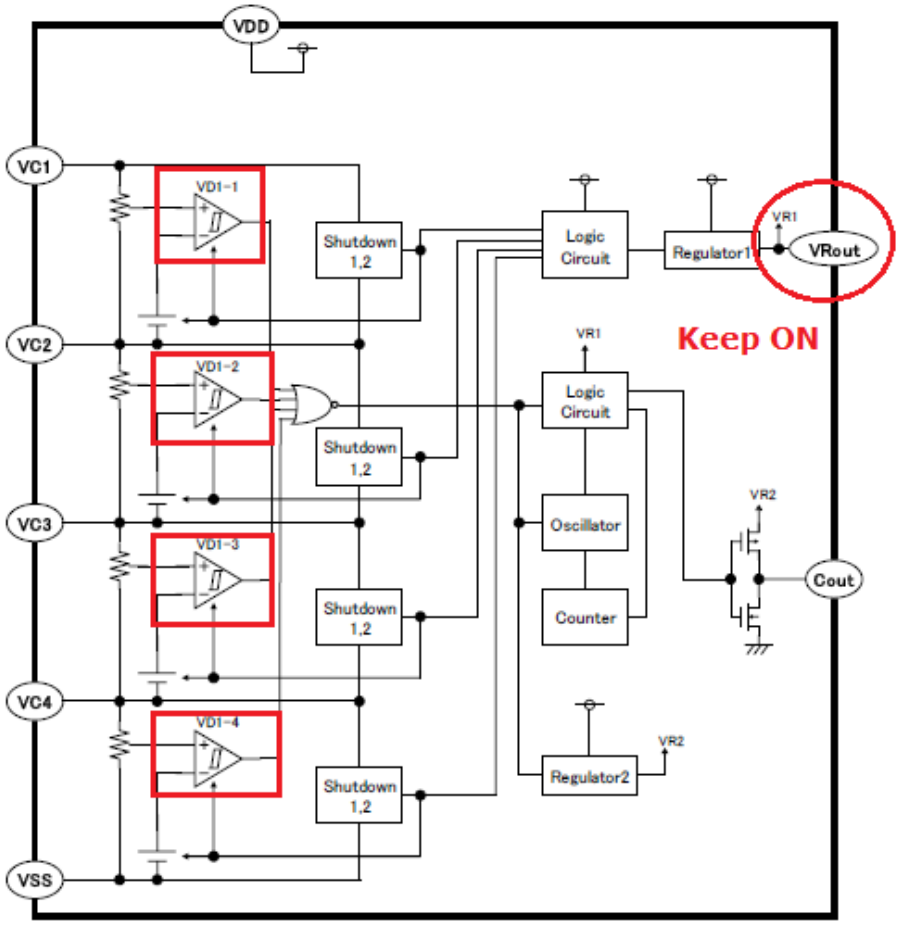
1. 該串OVP停止偵測
   (進入省電模式)
2. VROUT (3.3V LDO)持續輸出

離開 Shutdown1條件:

VCn > VSHT1n (3.8V)

離開Shutdown1後:

該串OVP開始偵測



R5439K Shutdown2 Mode

進入Shutdown2條件:

1. All VCn < VSHT1n (3.8V)
2. Any VCn < VSHT2n (2.5V)

進入Shutdown2後:

1. VROUT (3.3V LDO)停止輸出
2. Supply current只有0.2uA

離開 Shutdown2條件:

All VCn > VREL2n 或 Any VCn > VSHT1n

離開Shutdown2後:

VROUT (3.3V LDO)開始輸出

R5439K Shutdown2 Mode (example)

假設VSHT1=3.8V、VSHT2=2.4V
當 VC1=2.3V (已低於VSHT2)
VC2=2.3V (已低於VSHT2)
VC3=2.5V (已低於VSHT1)
VC4=3.7V (已低於VSHT1)
此時IC已進入Shutdown2 mode

VREL2=VSHT2+0.2V=2.6V
如需離開Shutdown2 mode有兩種方式:
1. VC1、VC2、VC3需大於2.6V
2. 任一cell電壓大於3.8V

R5439K VROUT和IOUT的輸出能力

VROUT=3.3V (fixed in data sheet)
VROUT=2.9V-3.75V (By laser trimming)

IOUT=2mA (25 ℃)
1.5mA (-40~85 ℃)

預知詳情請洽...

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FAE team

蕭翔文 (Alvin)	alvin@aeneas.com.tw	(02)8797-4259 #628
葉昇晏 (Allen)	allen.ye@aeneas.com.tw	(02)8797-4259 #635
許哲維 (Leon)	leon@aeneas.com.tw	(02)8797-4259 #636
王立文 (Leo)	leo@aeneas.com.tw	(02)8797-4259 #720
李柏翰 (Jesper)	jesper@aeneas.com.tw	(02)8797-4259 #639

Thank You!