芯高科技
HIGH TECH
TECHNOLOGY LIMITED

HT6020

Characterization Report

Version 01

Car Charger_HT6020 (20W + 20W) 演示板測試

雙輸出車載充電器 (DB02)

測試單元: 20030601

2020/12/17

報告大綱

芯高科技 HIGH TECH TECHNOLOGY LIMITED

1. 摘要
2. 演示板介紹
3. 測試規格
4. 負載調節
5. 效率
6. 雙通道輸出性能
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1. 摘要

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操作模式:	單通道	雙通道
輸入電壓範圍	12V to 24V	
主要支持的快速充電協議	QC 3.0**	
輸出電壓和電流範圍 (最大輸出功率是 20W + 20W)	(5V 3A), (9V 2A), (12V 1.5A), (20V – 1A)	雙通道的最大總輸出電流為 5A
沒有快充協議時的輸出電壓和電流範圍	5V 3A	雙通道的最大總輸出電流為 5A
尺寸	64mm(長) X 37mm(闊) X 14mm(高)	
最大輸出功率	20W	40W
負載調節(Load Regulation)準確度	輸出電壓在不同負載下準確度達 99% (Vin=24V)	
最大功率轉換效率	96%	97%
短路(Short Circuit)測試	✓	

** QC3.0: Based on QUALCOMM webpage: Charge up to 4 times faster than conventional 5W chargers.
(https://www.qualcomm.com/news/onq/2015/09/14/introducing-quick-charge-30-next-generation-fast-charging-technology)

2. 演示板介紹

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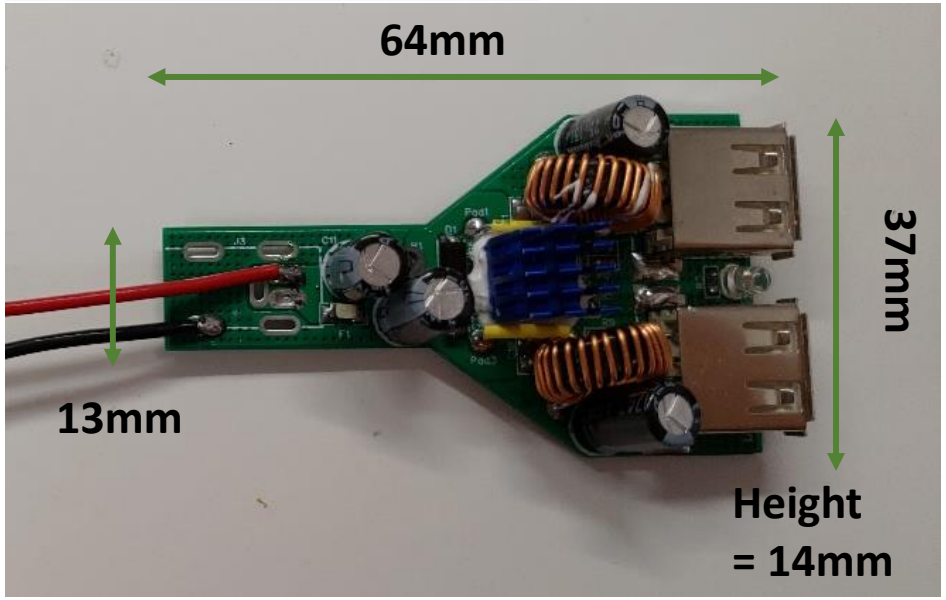
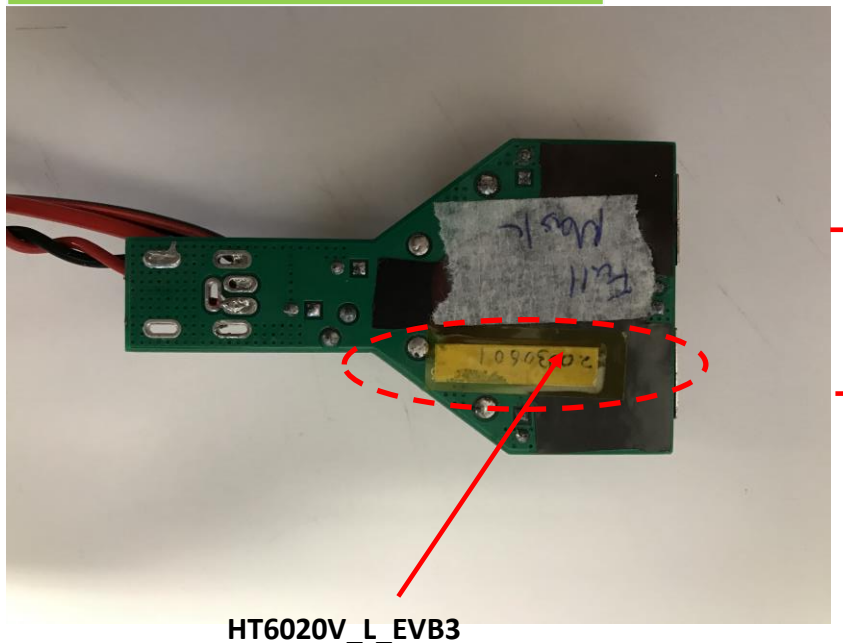
- 演示板 (測試單元: 20062202)
- 尺寸: 64mm(長) x 37mm(闊) x 14mm(高)

演示板 (頂視圖)



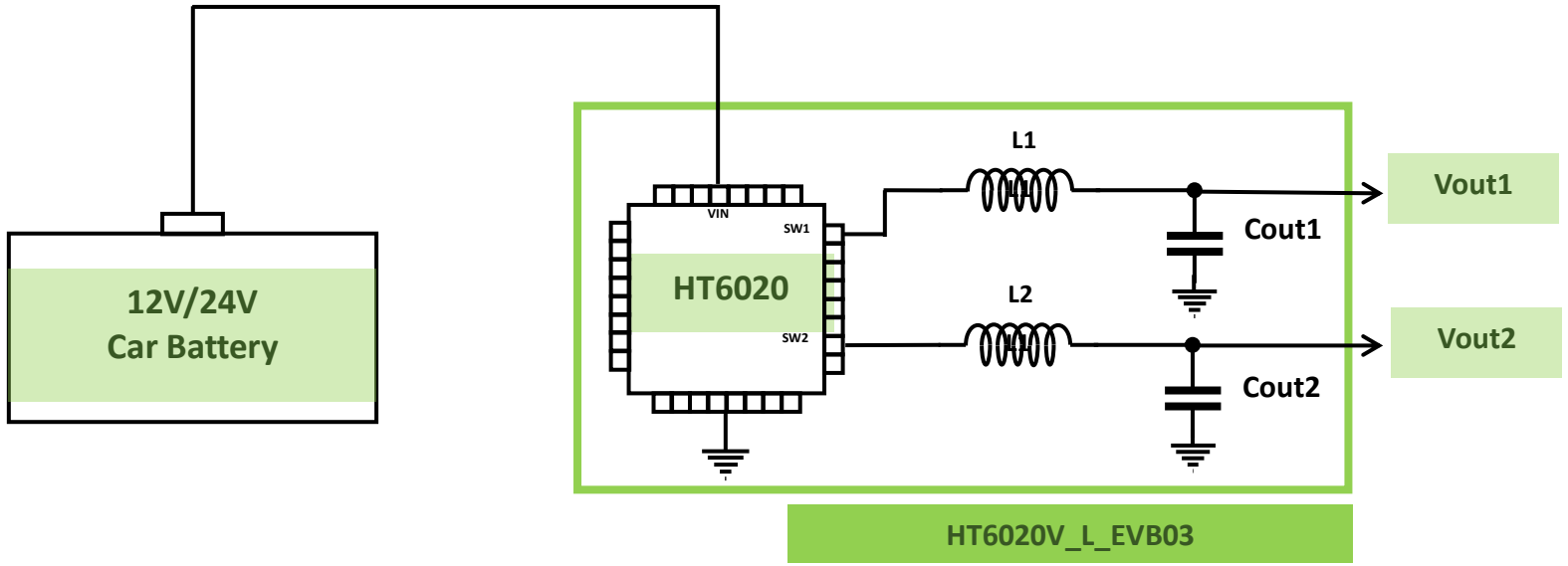
演示板 (底視圖)



2. 演示板介紹

芯高科技 HIGH TECH TECHNOLOGY LIMITED

設計簡約*



* 有關完整的電路圖，請參見附錄I。

3. 測試規格

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輸入電壓

12 V, 13 V, 24 V

輸出電壓和電流

- 5 V, 0 – 3A (15 W)
- 9 V, 0 – 2 A (18 W)
- 12 V, 0 – 1.5 A (18 W)
- 20 V, 0 – 1 A (20 W) (只適用於Vin = 24V)

雙路輸出的總輸出電流及功率

- 最大總輸出電流為 5 A
- 總功率最高為40 W {20W (20V, 1A) + 20W (20V, 1A)}

4. 負載調節 Load Regulation (V_{in} = 12V)

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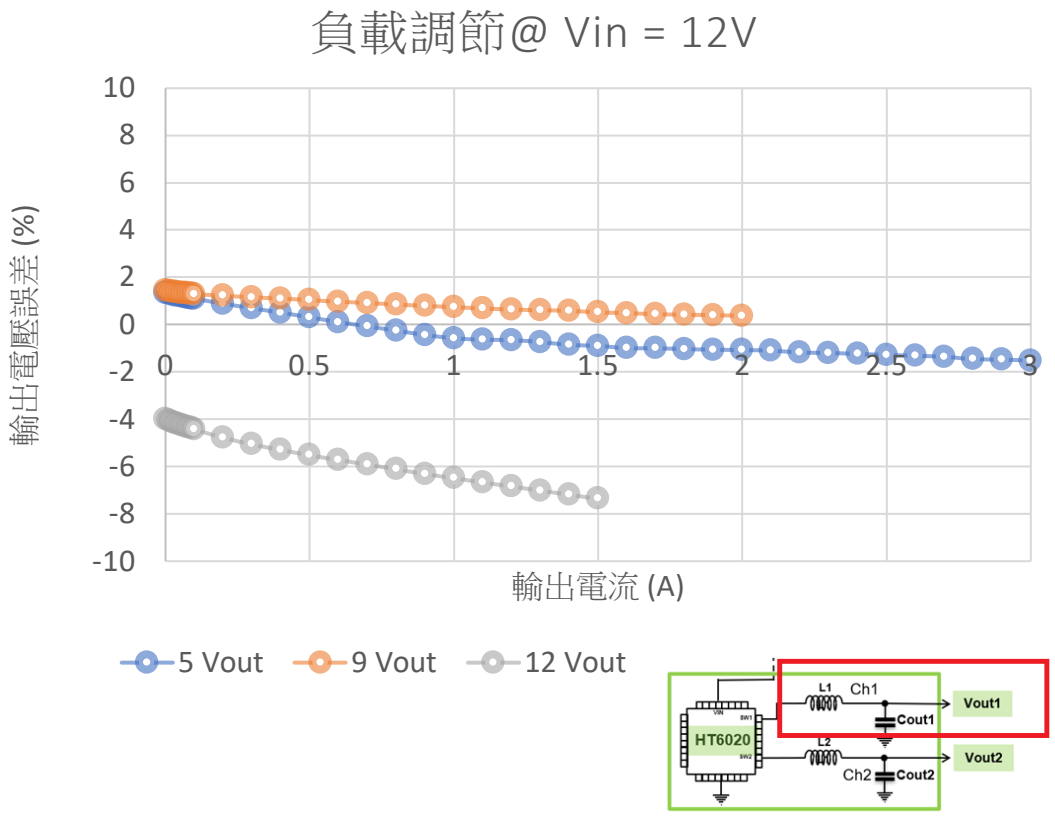
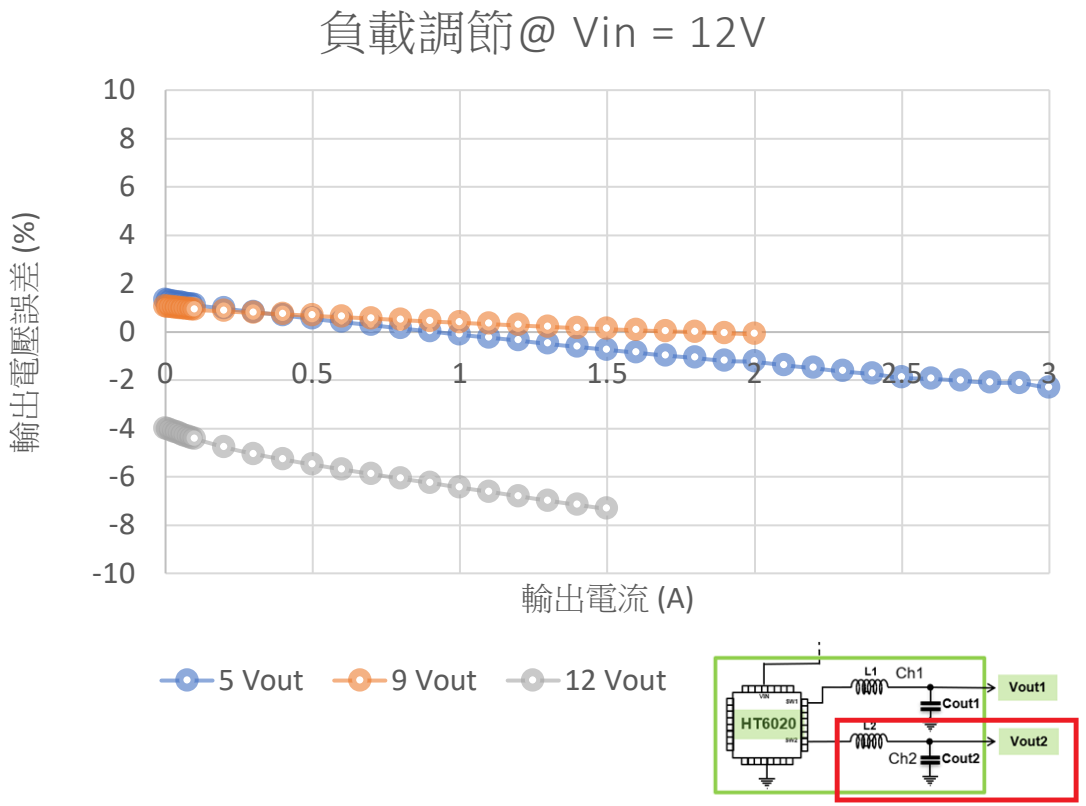
輸出電壓準確度 >98%, V_{out} = 5 – 9V @I_{out} = 0 – 3A

輸出電壓準確度 >91%, V_{out} = 12V @I_{out} = 0 – 3A

Ch1 (通道1), (Ch 2 No Load)



Ch2 (通道2), (Ch1 No Load)



4. 負載調節 (V_{in} = 13V)

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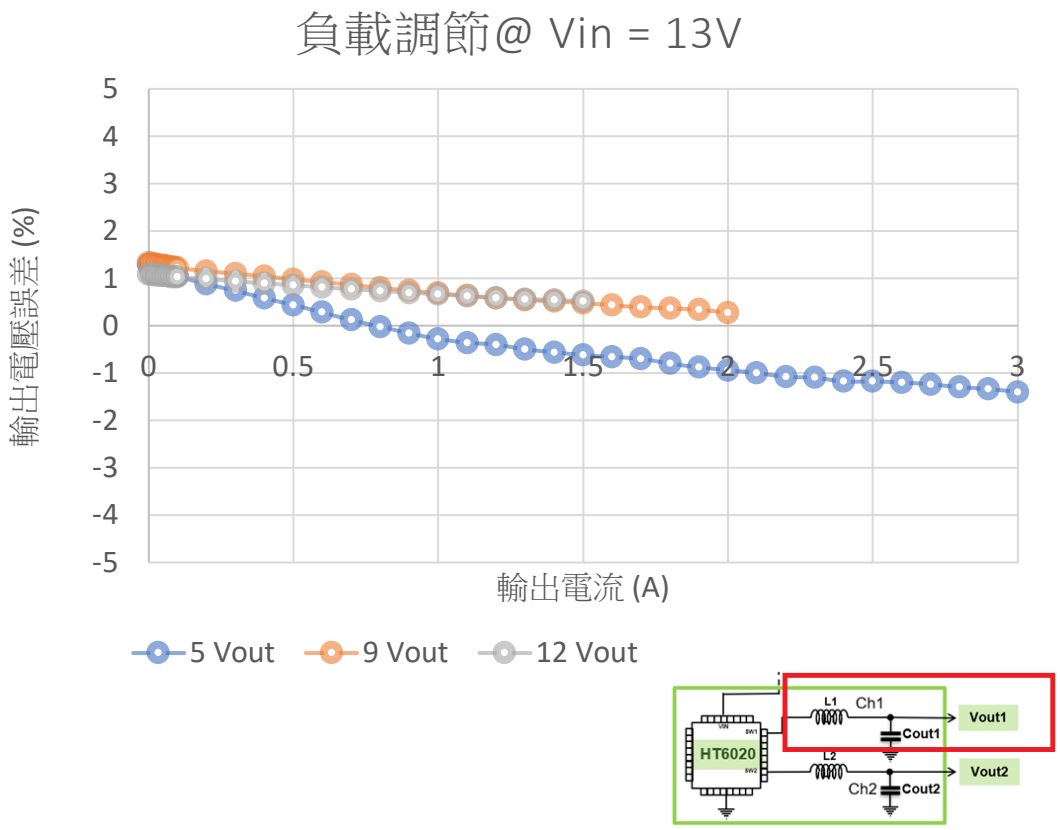
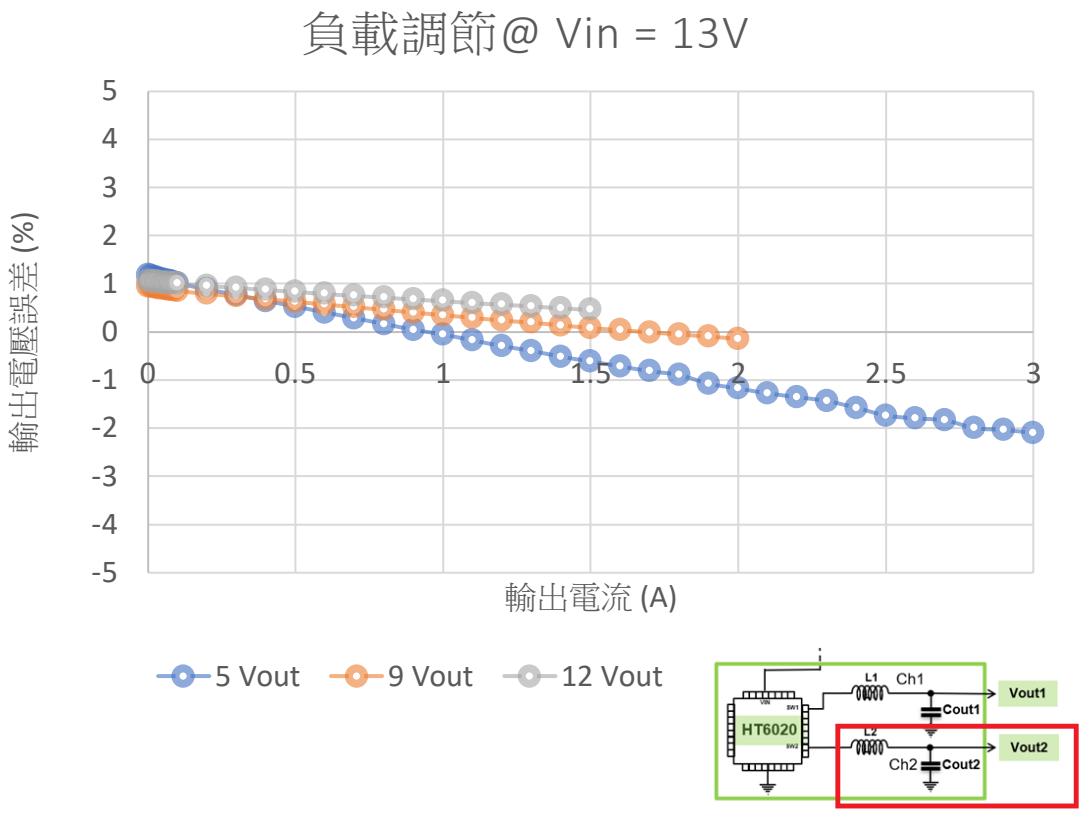
輸出電壓準確度 >98%, V_{out} = 5 – 12V @I_{out} = 0 – 3A

Ch1, (Ch2 No Load)



Ch2, (Ch1 No Load)



4. 負載調節 (V_{in} = 24V)

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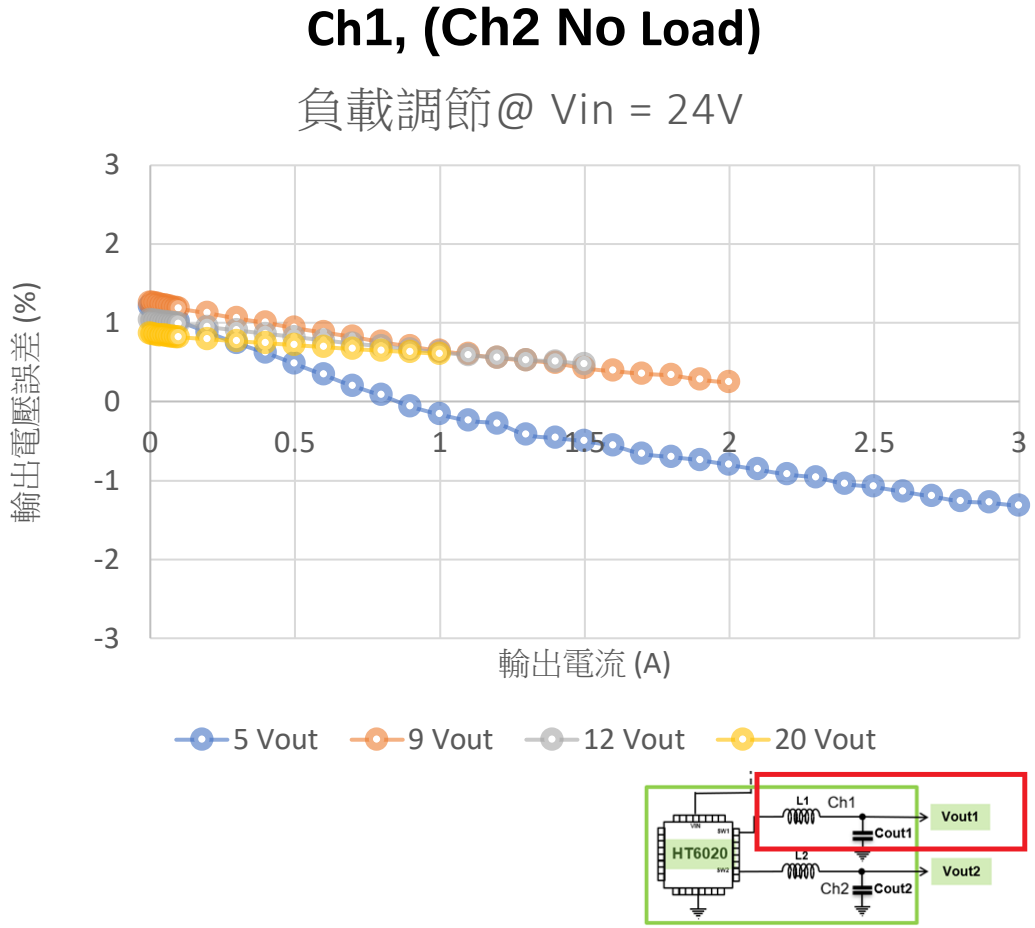
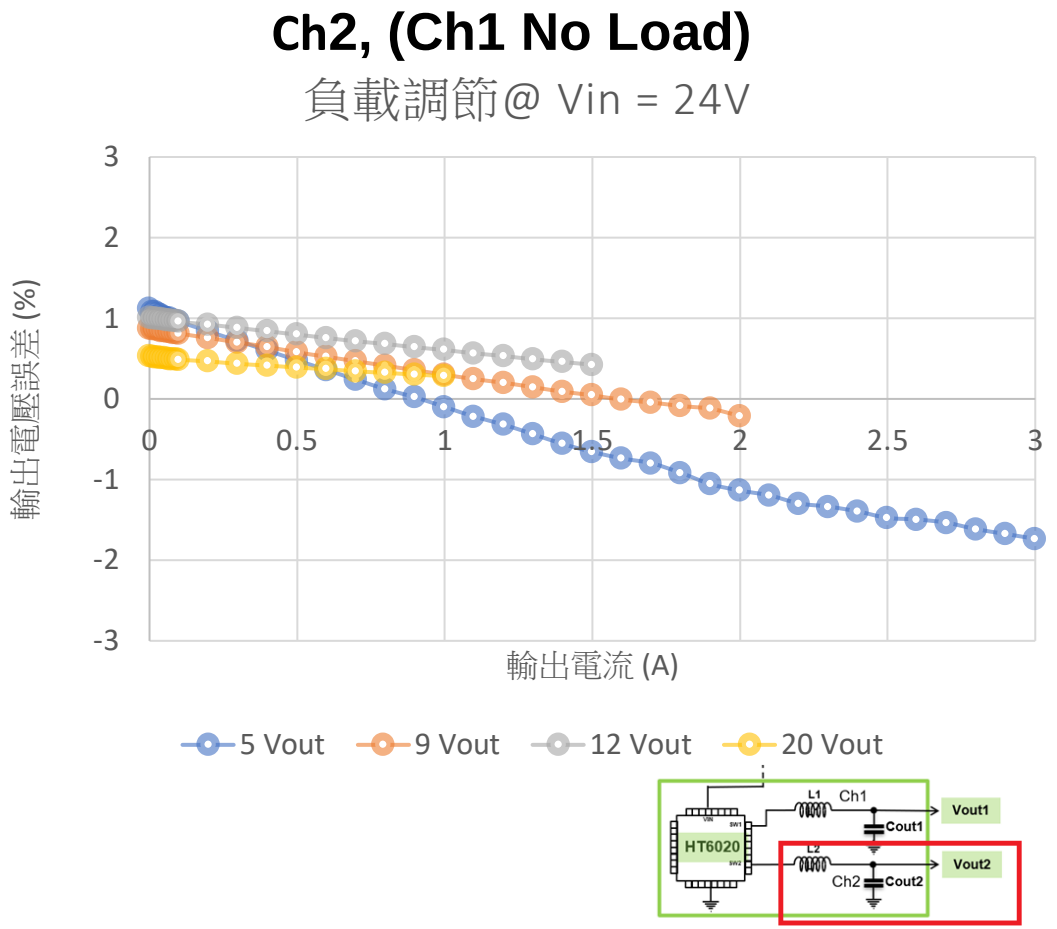
輸出電壓準確度 >98%, V_{out} = 5 – 20V @I_{out} = 0 – 3A

Ch1, (Ch2 No Load)



Ch2, (Ch1 No Load)



5. 電源效率, η_{single} @ Vin=12V

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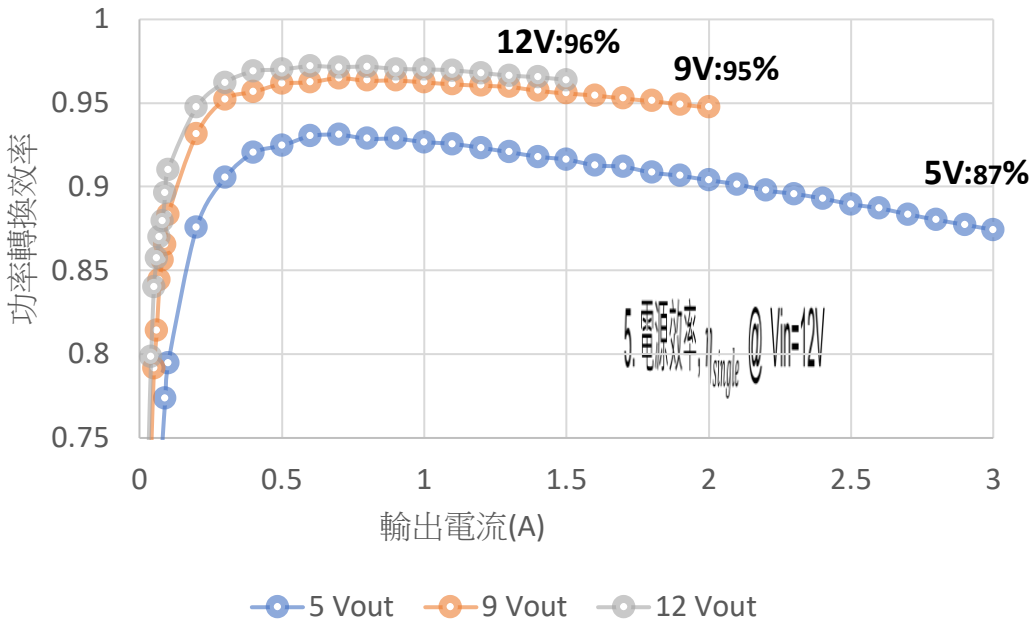
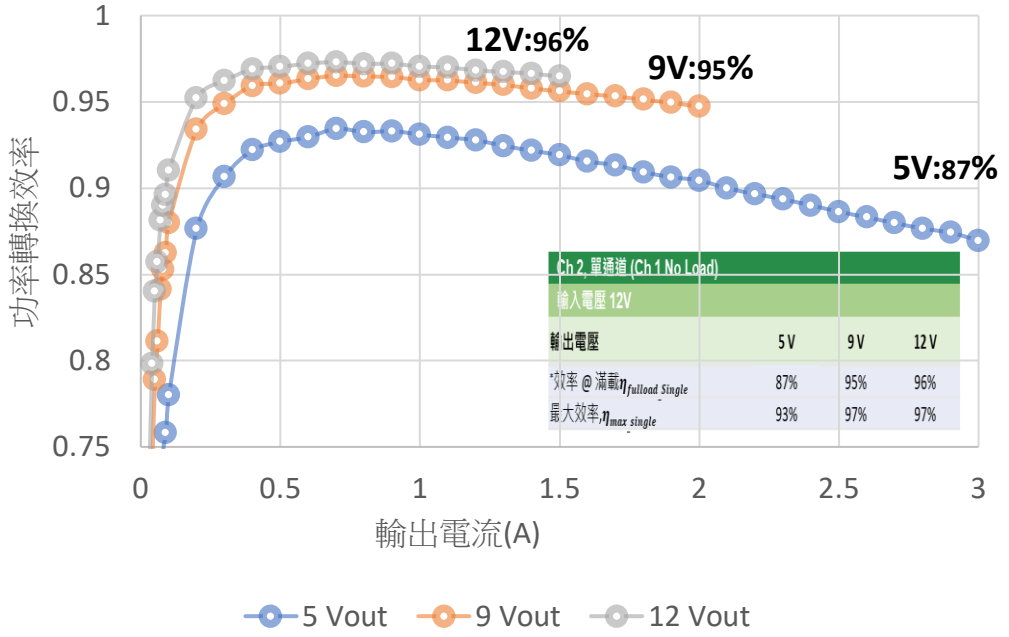
Ch1 功率轉換效率@ Vin = 12V



Ch 1, 單通道 (Ch 2 No Load)			
輸入電壓 12V			
輸出電壓	5 V	9 V	12 V
*效率 @ 滿載$\eta_{fulload_Single}$	87%	95%	96%
最大效率,η_{max_single}	93%	96%	97%

Ch2 功率轉換效率@ Vin = 12V



Ch 2, 單通道 (Ch 1 No Load)			
輸入電壓 12V			
輸出電壓	5 V	9 V	12 V
*效率 @ 滿載$\eta_{fulload_Single}$	87%	95%	96%
最大效率,η_{max_single}	93%	97%	97%

* 滿載 Full load conditions (5V, 3A), (9V,2A), (12V,1.5A)

5. 電源效率, η_{single} @ Vin=13V

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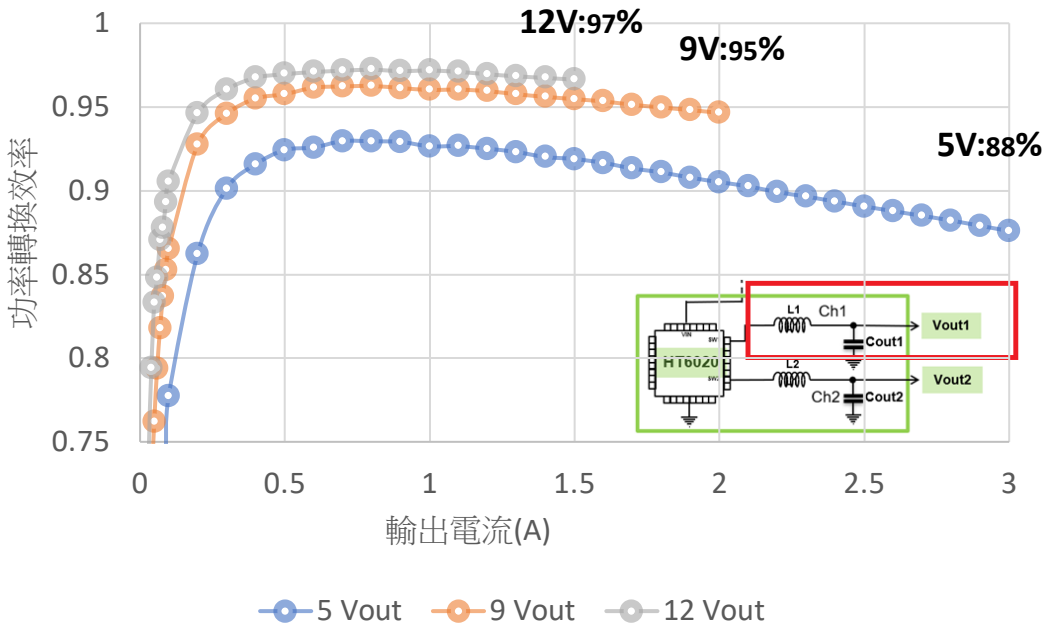
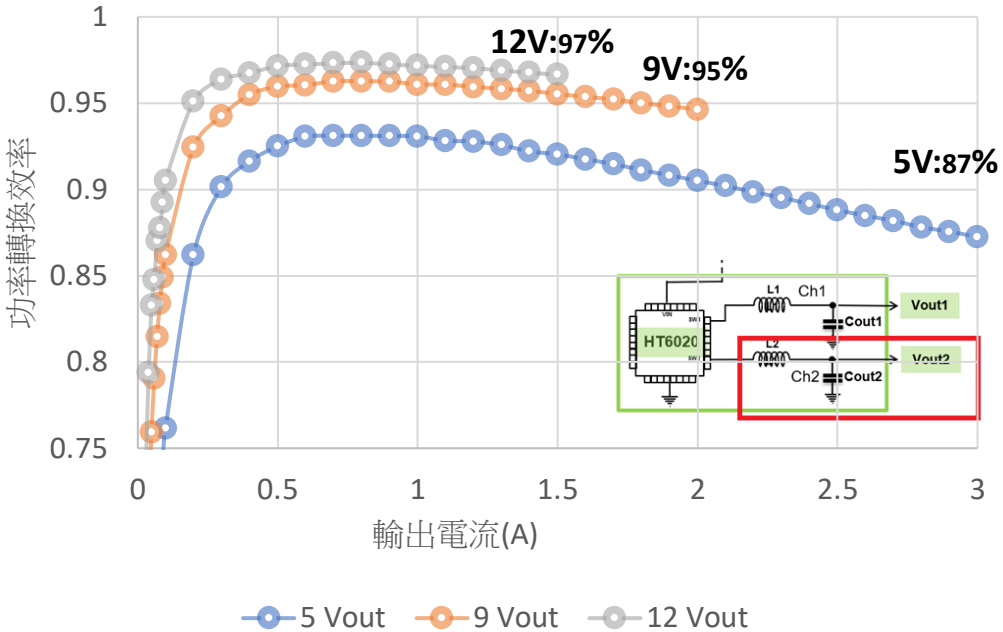
Ch1 功率轉換效率@ Vin = 13V



Ch 1, 單通道 (Ch 2 No Load)			
輸入電壓 13 V			
輸出電壓	**5 V**	**9 V**	**12 V**
*效率 @ 滿載$\eta_{fulload_Single}$	88%	95%	97%
最大效率,η_{max_single}	93%	96%	97%

Ch2 功率轉換效率@ Vin = 13V



Ch 2, 單通道 (Ch 1 No Load)			
輸入電壓 13 V			
輸出電壓	**5 V**	**9 V**	**12 V**
*效率 @ 滿載$\eta_{fulload_Single}$	87%	95%	97%
最大效率,η_{max_single}	93%	96%	97%

* 滿載 Full load conditions (5V, 3A), (9V,2A), (12V,1.5A)

5. 電源效率, η_{single} @ Vin=24V

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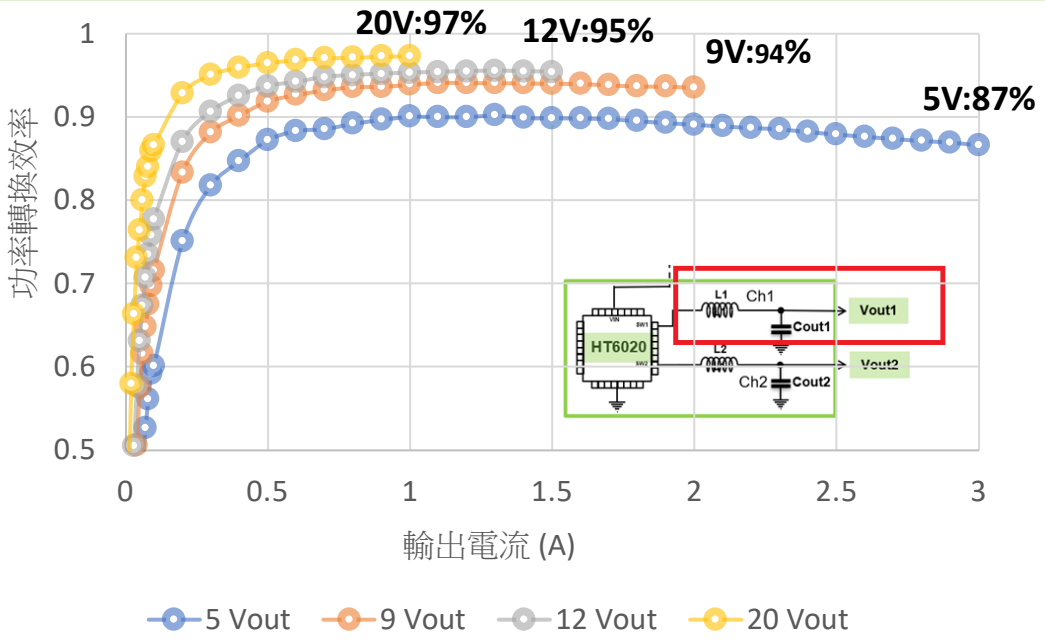
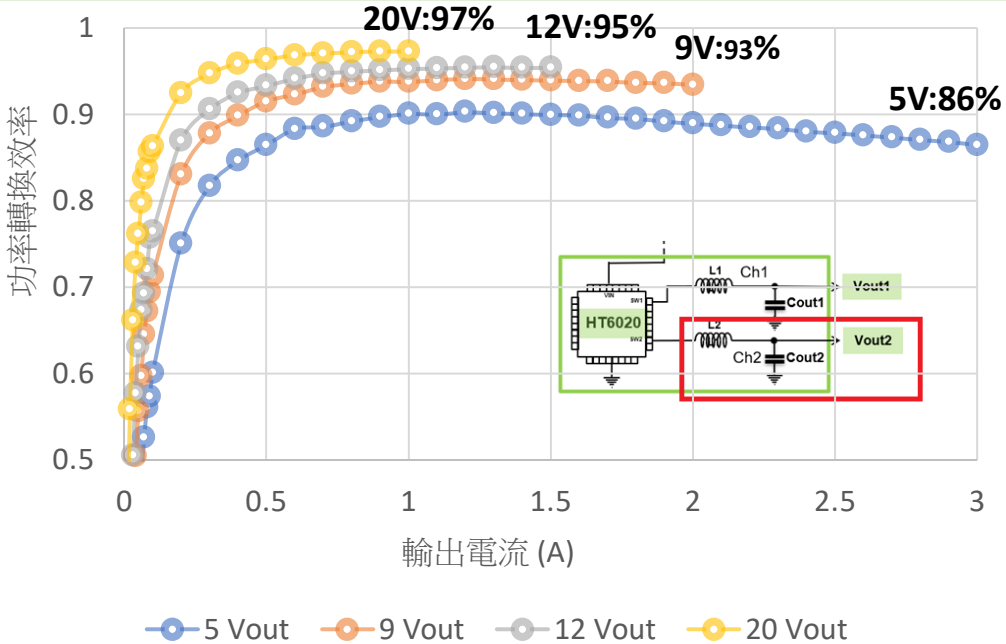
Ch1 功率轉換效率@ Vin = 24V



Ch2 功率轉換效率@ Vin = 24V



Ch 1, 單通道 (Ch 2 No Load)				
輸入電壓 24 V				
輸出電壓	**5 V**	**9 V**	**12 V**	**20 V**
*效率 @ 滿載$\eta_{fulload_Single}$	87%	94%	95%	97%
最大效率,η_{max_single}	90%	94%	96%	97%

Ch 2, 單通道 (Ch 1 No Load)				
輸入電壓 24 V				
輸出電壓	**5 V**	**9 V**	**12 V**	**20 V**
*效率 @ 滿載$\eta_{fulload_Single}$	86%	93%	95%	97%
最大效率,η_{max_single}	90%	94%	95%	97%

* 滿載 Full load conditions (5V, 3A), (9V,2A), (12V,1.5A) & (20V,1A)

5. 功率轉換效率 (雙通道), $\eta_{fulload\_Dual}$

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- 總結

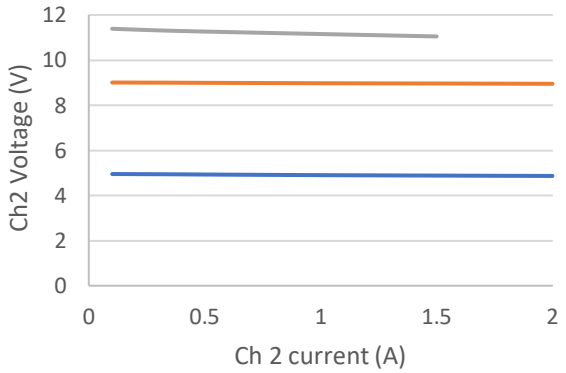
Vin 12V, 13V & 24V	
滿載效率範圍*, $\eta_{fulload\_Dual}$	86% - 97%

*In various combination of full load conditions: (5V, 3A), (9V,2A), (12V,1.5A) & (20V,1A)

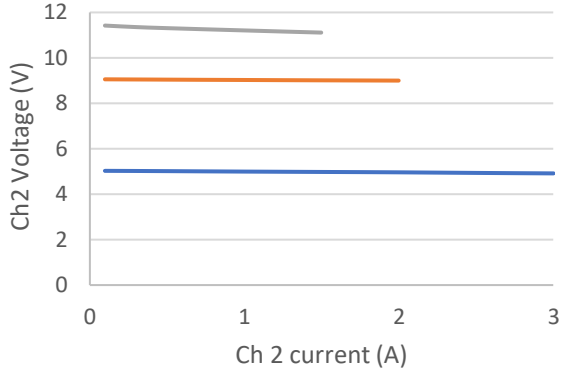
6. 雙通道輸出性能

Ch2 在不同Ch1設定下的情況 @ V_{IN}=12V

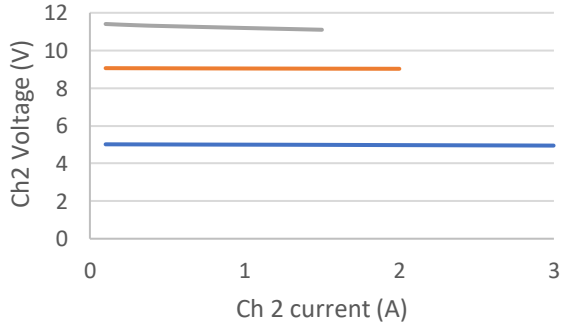
- **Ch1 : 運作於 5 V, 3A**
- **Ch2 : Vo vs Io @ Vin = 12V**

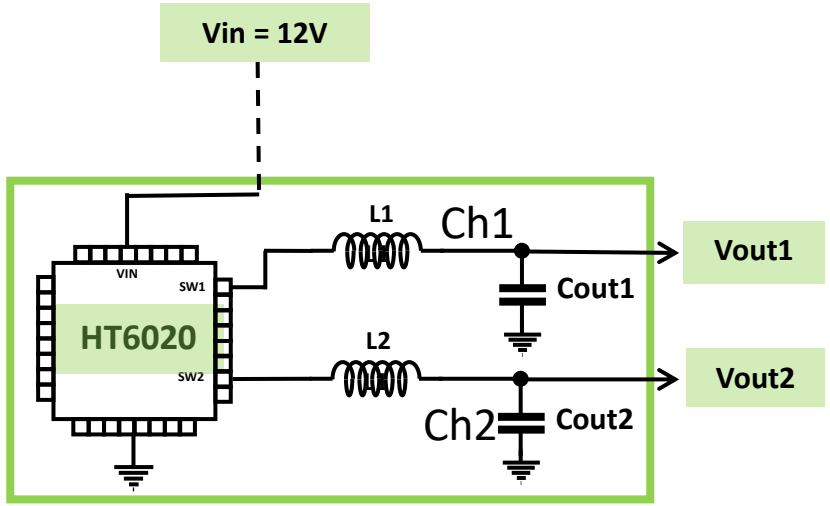


- **Ch1 : 運作於 9 V, 2A**
- **Ch2 : Vo vs Io @ Vin = 12V**



- **Ch1 : 運作於 12 V, 1.5A**
- **Ch2 : Vo vs Io @ Vin = 12V**





摘要

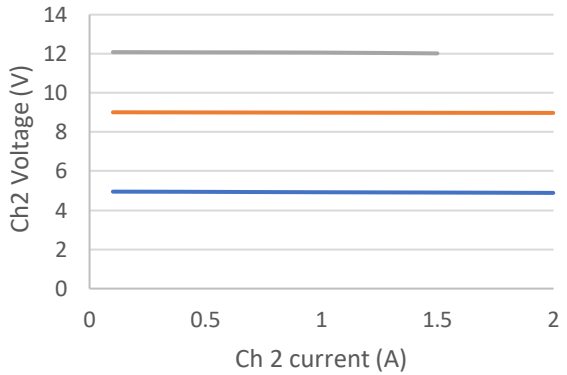
- 當Vout1固定時，Vout2 在5V及9V輸出電壓下準確度達96%；在12V輸出電壓下準確度達91% 。
- 當兩個通道同時運作時，最大輸出電流為5A。
- 最大輸出功率是 40W (20 W + 20 W)

5 V　9 V　12 V

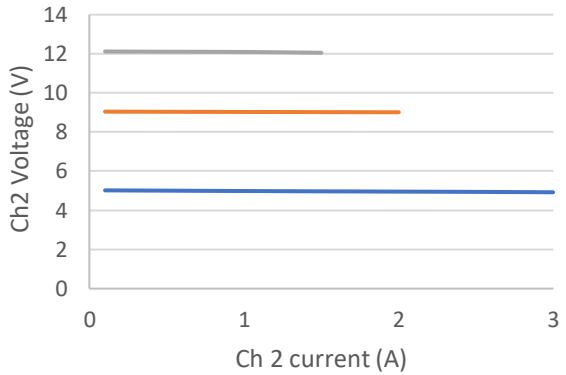
6. 雙通道輸出性能

Ch2 在不同Ch1設定下的情況 @ V_{IN}=13V

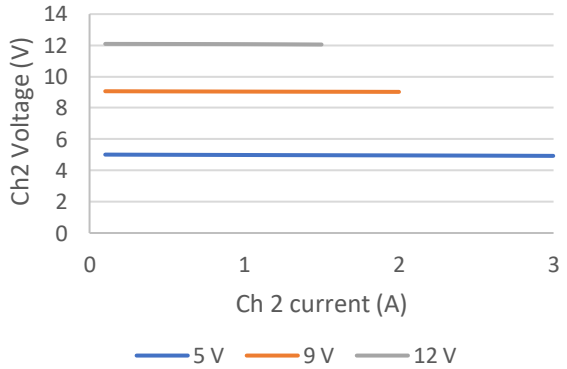
- **Ch1 : 運作於 5 V, 3A**
- **Ch2 : Vo vs Io @ Vin = 13V**

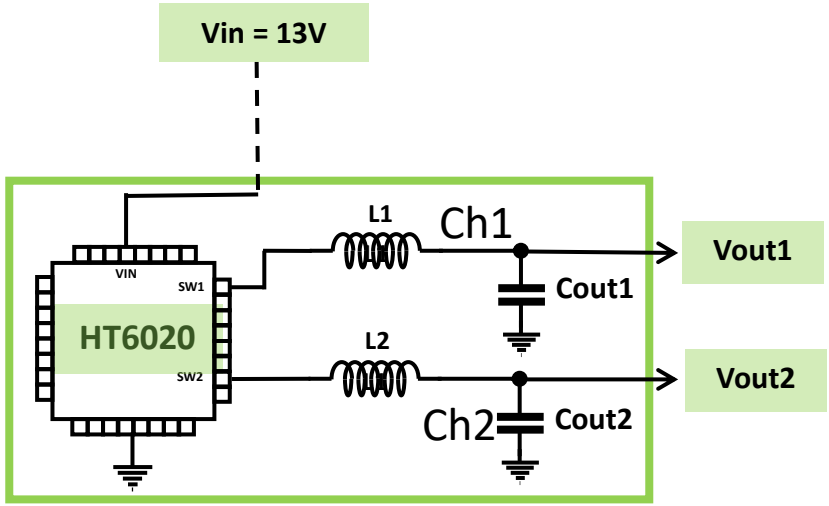


- **Ch1 : 運作於 9 V, 2A**
- **Ch2 : Vo vs Io @ Vin = 13V**



- **Ch1 : 運作於 12 V, 1.5A**
- **Ch2 : Vo vs Io @ Vin = 13V**





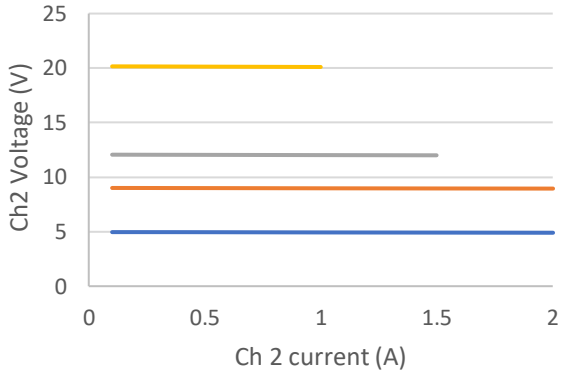
摘要

- 當Vout1固定時，Vout2 在不同的輸出電壓下準確度達97%。
- 當兩個通道同時運作時，最大輸出電流為5A。
- 最大輸出功率是 40W (20 W + 20 W)

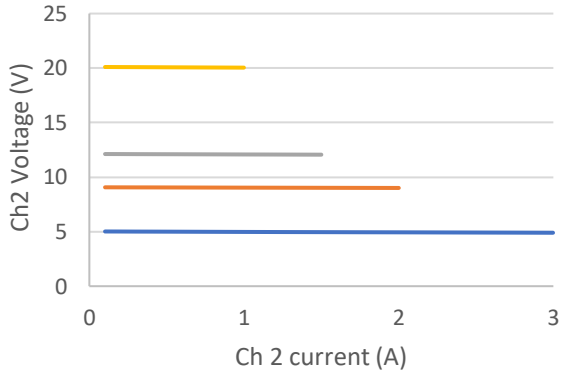
6. 雙通道輸出性能

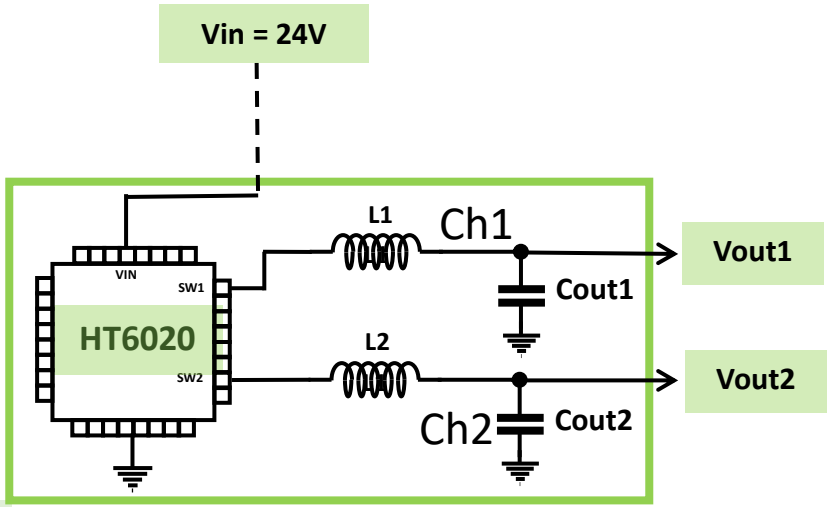
Ch2 在不同Ch1設定下的情況 @ V_{IN}=24V

- **Ch1 : 運作於 5 V, 3A**
- **Ch2 : Vo vs Io @ Vin = 24V**

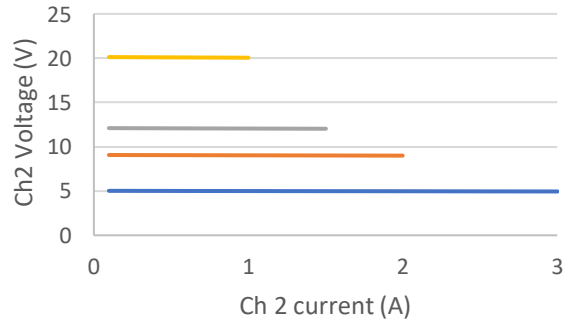


- **Ch1 : 運作於 9 V, 2A**
- **Ch2 : Vo vs Io @ Vin = 24V**

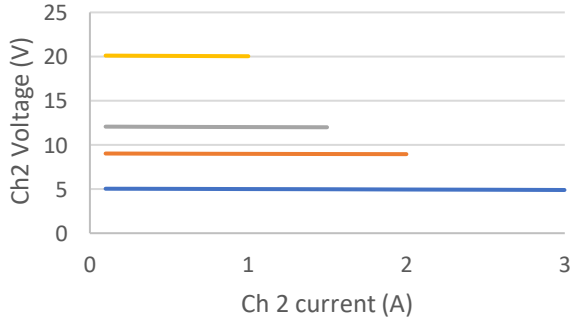




- **Ch1 : 運作於 12 V, 1.5A**
- **Ch2 : Vo vs Io @ Vin = 24V**



- **Ch1 : 運作於 20 V, 1A**
- **Ch2 : Vo vs Io @ Vin = 24V**



摘要

- 當Vout1固定時，Vout2 在不同的輸出電壓下準確度達97%。
- 當兩個通道同時運作時，最大輸出電流為5A。
- 最大輸出功率是 40W (20 W + 20 W)

7. 過流保護 Over-Current Protection

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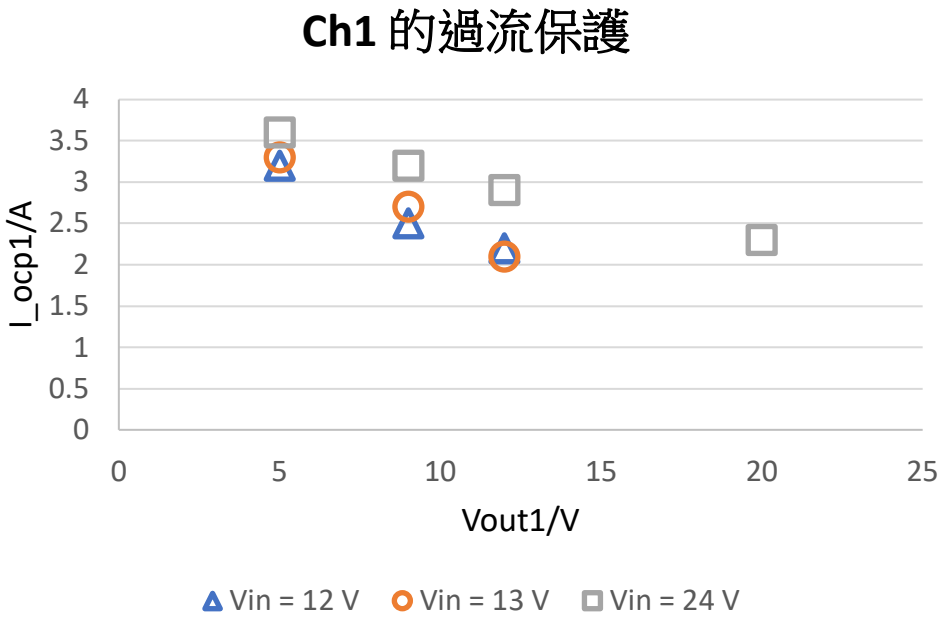
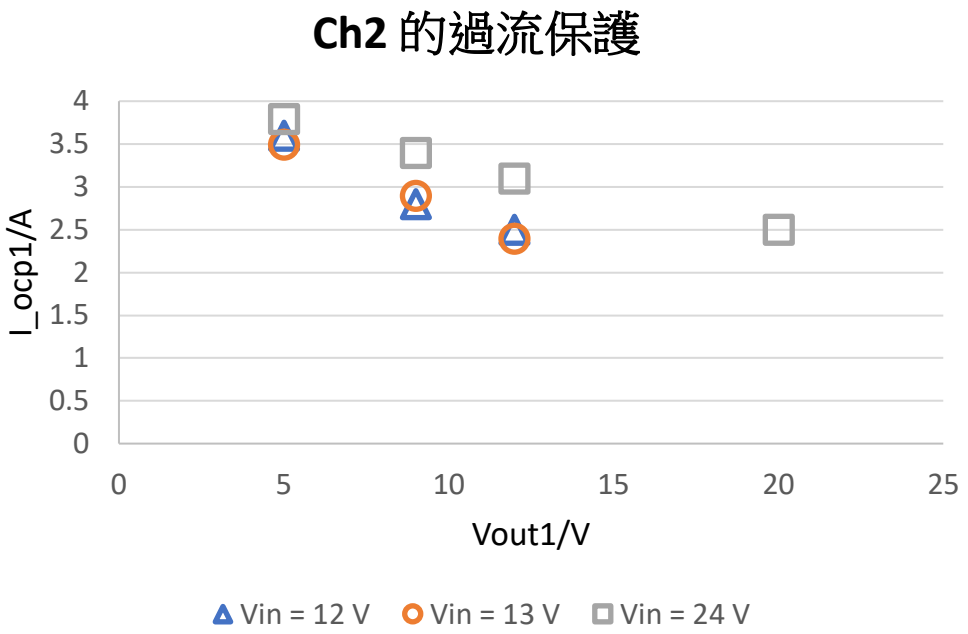
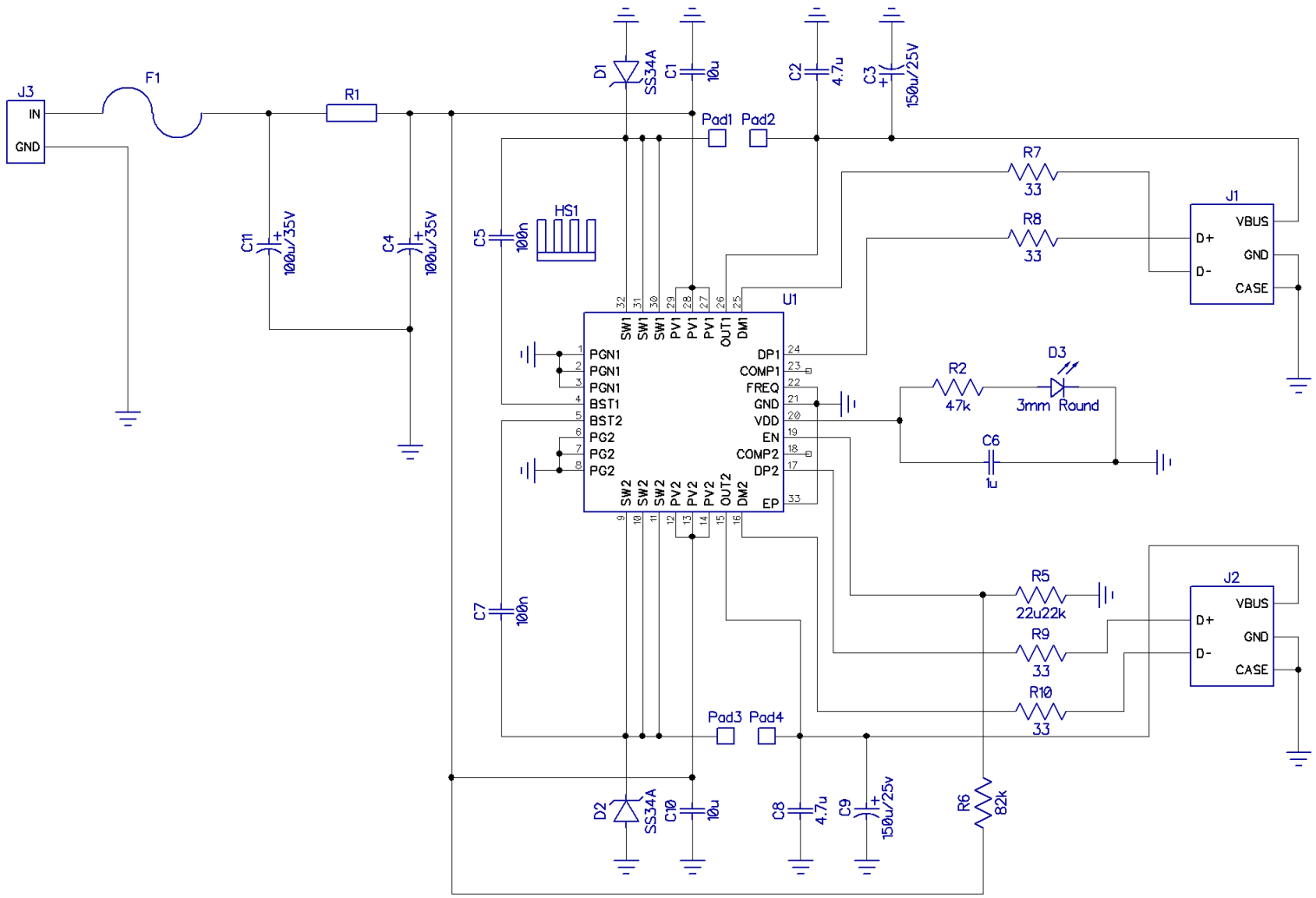




8. 附錄 I

- 演示板原理圖
(物料清單詳見附錄II)



8. 附錄 II

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- 演示板物料

RefDes	NAME	VALUE
C1	CAP_1206	10u
C2	CAP_0805	4.7u
C3	E-Cap 2.5/6.3	150u/25V
C4	E-Cap 2.5/6.3	100u/35V
C5	CAP_0603	100n
C6	CAP_0603	1u
C7	CAP_0603	100n
C8	CAP_0805	4.7u
C9	E-Cap 2.5/6.3	150u/25v
C10	CAP_1206	10u
C11	E-Cap 2.5/6.3	100u/35V
D1	SMA	SS34A
D2	SMA	SS34A
D3	LED-3R_Red	3mm Round
F1	FUSE	7A 1206
HS1	HS_9*9*10	Heat Sink

RefDes	NAME	VALUE
J1	USB_F	Connector
J2	USB_F	Connector
J3	Car_Charger_H	Connector/Wire
Pad1	Pad_2.5/1.6	Inductor 47uH,9mm
Pad2	Pad_2.5/1.6	Inductor 47uH,9mm
Pad3	Pad_2.5/1.6	Inductor 47uH,9mm
Pad4	Pad_2.5/1.6	Inductor 47uH,9mm
R1	Ferrite Bead	
R2	RES_0603	47k
R5	RES_0603	22k
R6	RES_0603	82k
R7	RES_0603	33
R8	RES_0603	33
R9	RES_0603	33
R10	RES_0603	33
U1	HT6020V-LRC	

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