



芯高科技
HIGH TECH
TECHNOLOGY LIMITED

HT6328 (200W, 100W + 100W) 演示板測試

雙輸出充電器 (HT6328_DB03)
測試單元: 21030301

2021/3/3 | 機密文件



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
7. 過流保護
8. 附錄

1. 摘要



| 操作模式: | Ch1 | Ch2 |
|------------------------------------|---|---|
| 輸入電壓範圍 | 12V to 24V | |
| 輸出電壓和電流範圍 (最大輸出功率是 100W + 100W) | (5V 3A), (9V 3A), (12V 3A) *, (15V 3A) *, (20V 5A) *, (11V 5A) *, (3.3V 5A) * | (5V 3A), (9V 3A), (12V 3A) *, (15V 3A) *, (20V 5A) *, (11V 5A) *, (3.3V 5A) * |
| 主要支持的快速充電協議 | PD 3.0, QC3.0 | PD 3.0, QC3.0 |
| 尺寸 | 57mm(長) X 55mm(闊) X 22mm(高) | |
| 最大輸出功率 | 100W | 100W |
| 負載調節(Load Regulation)準確度 | 輸出電壓在不同負載下準確度達 94%# | |
| 最大功率轉換效率 | 97% | 97% |
| 短路(Short Circuit)測試 | ✓ | |

* For 24 Vin

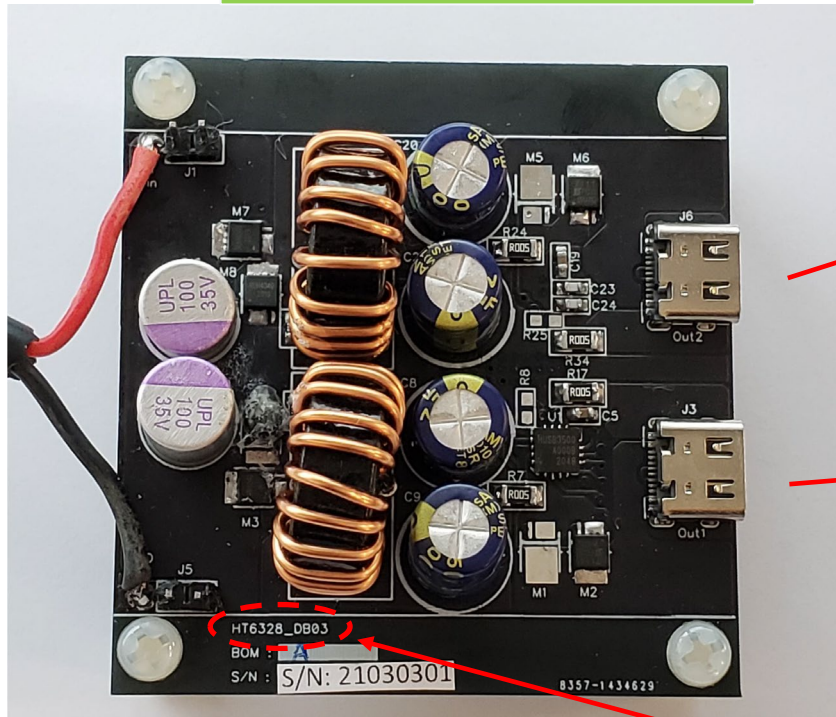
** QC3.0: Based on QUALCOMM webpage: Charge up to 4 times faster than conventional 5W chargers.
(<https://www.qualcomm.com/news/onq/2015/09/14/introducing-quick-charge-30-next-generation-fast-charging-technology>)

Definition: (Actual Vout / Target Vout) %

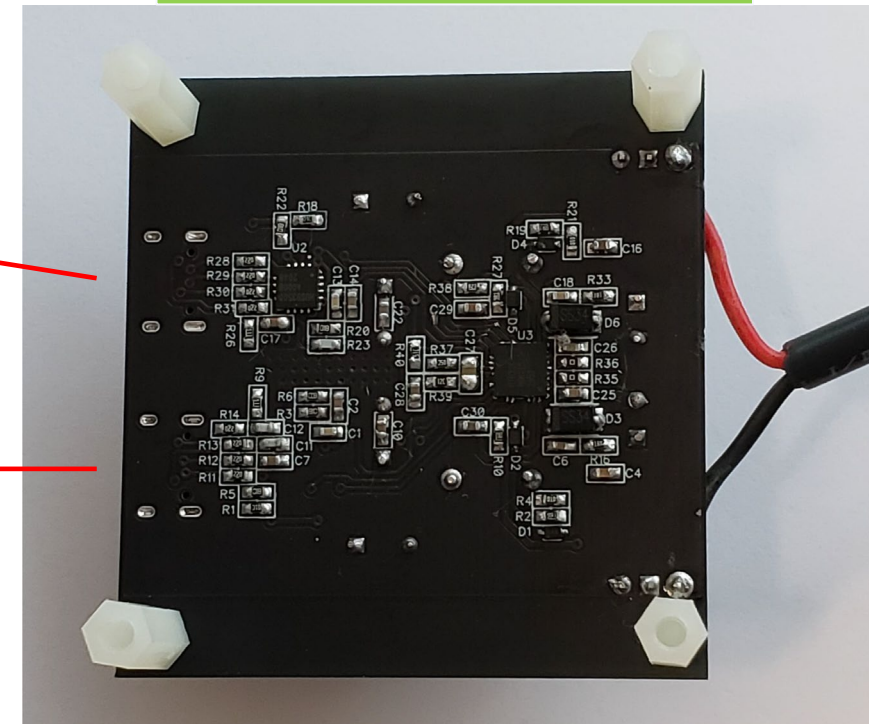
2. 演示板介紹

- 演示板 (測試單元:21030301)
- 尺寸: 57mm(長) x 55mm(闊) x 22mm(高)

演示板 (頂視圖)



演示板 (底視圖)



輸出 1

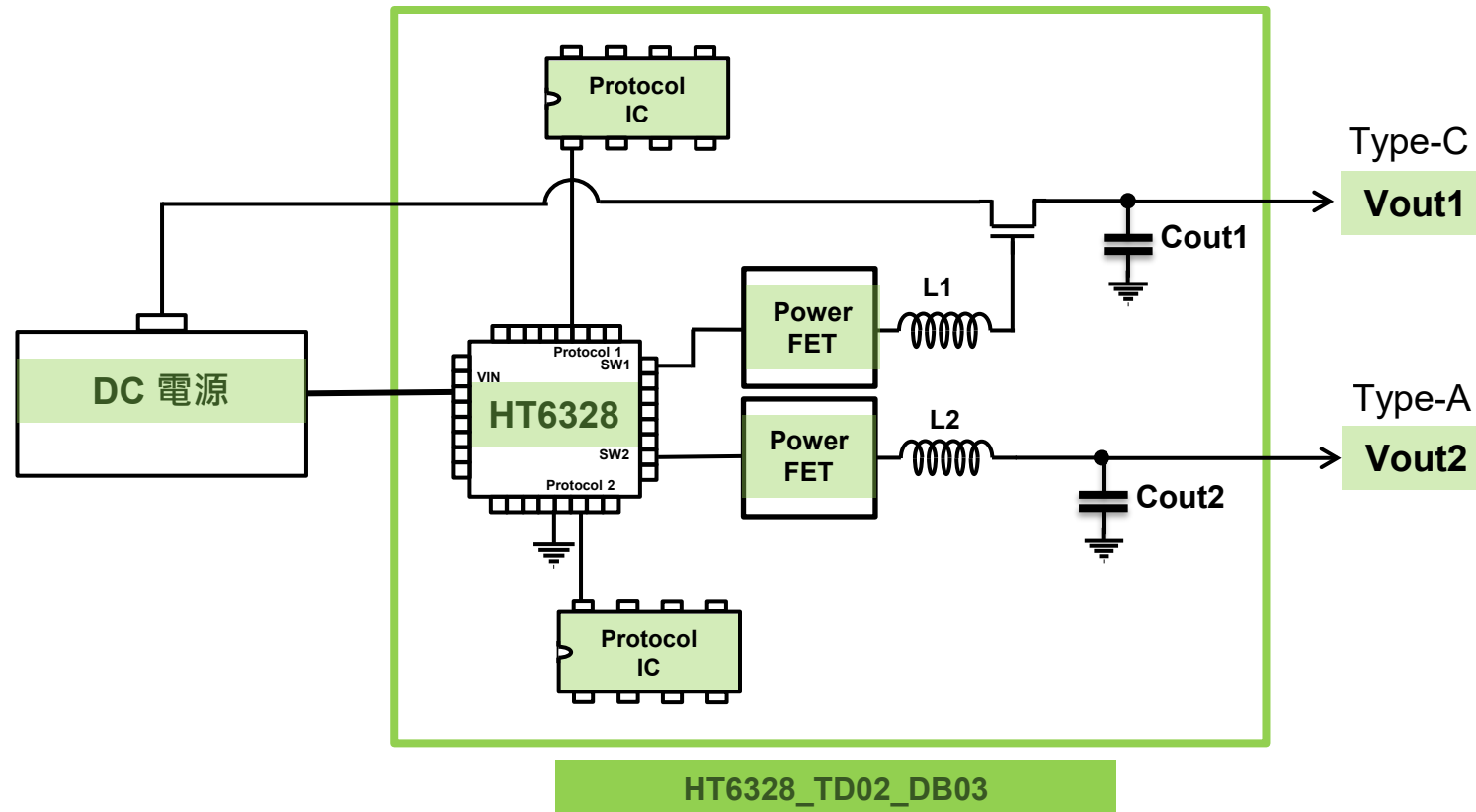
輸出 2

HT6328_DB03



2. 演示板介紹

設計簡約*



* 有關完整的電路圖，請參見附錄I。



3. 測試規格

輸入電壓

24 V

輸出電壓和電流

- CH1
 - 5 V, 0 – 3 A (15 W)
 - 9 V, 0 – 3 A (27 W)
 - 12 V, 0 – 3 A (36 W)
 - 15 V, 0 – 3 A (65 W)
 - 20 V, 0 – 5 A (100 W)
 - 11 V, 0 – 5 A (55 W) (PPS Mode)
 - 3.3 V, 0 – 5 A (16.5 W) (PPS Mode)
- CH2
 - 5 V, 0 – 3 A (15 W)
 - 9 V, 0 – 3 A (27 W)
 - 12 V, 0 – 3 A (36 W)
 - 15 V, 0 – 3 A (65 W)
 - 20 V, 0 – 5 A (100 W)
 - 11 V, 0 – 5 A (55 W) (PPS Mode)
 - 3.3 V, 0 – 5 A (16.5 W) (PPS Mode)

雙路輸出的總輸出電流及功率

- 最大總輸出電流為 10 A
- 總功率最高為200 W (100W + 100W)

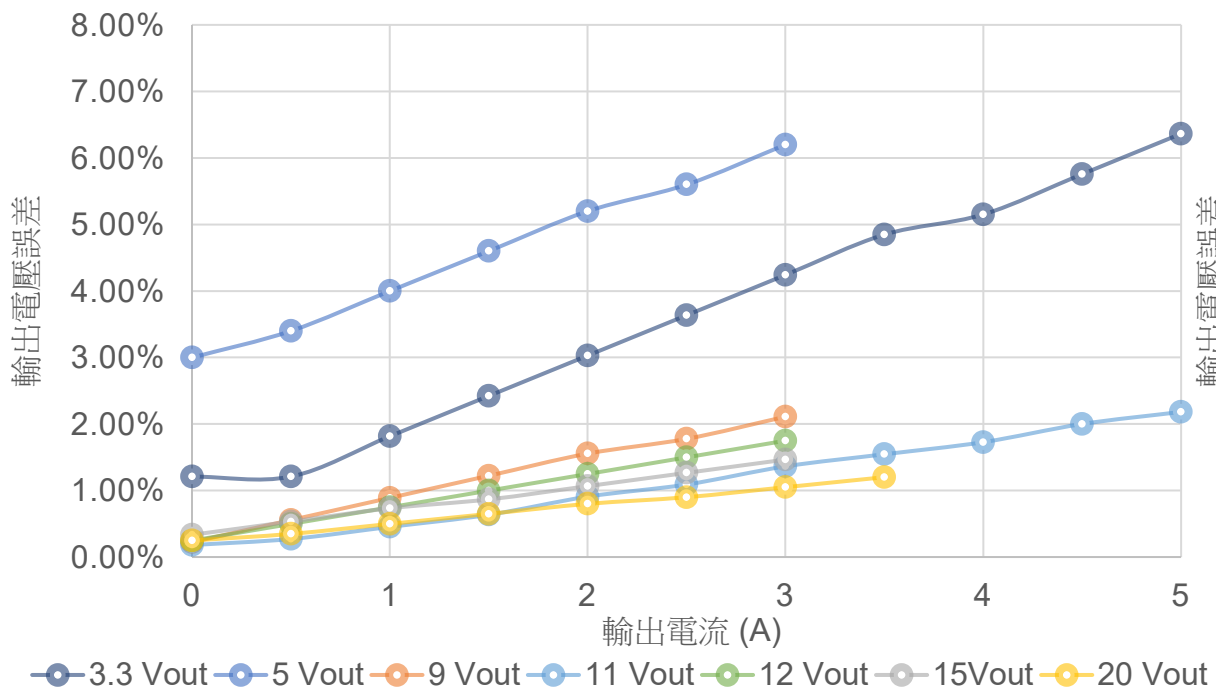
4. 負載調節 ($V_{in} = 24V$)



輸出電壓準確度 >94%, $V_{out} = 5 - 20V @ I_{out} = 0 - 5A$

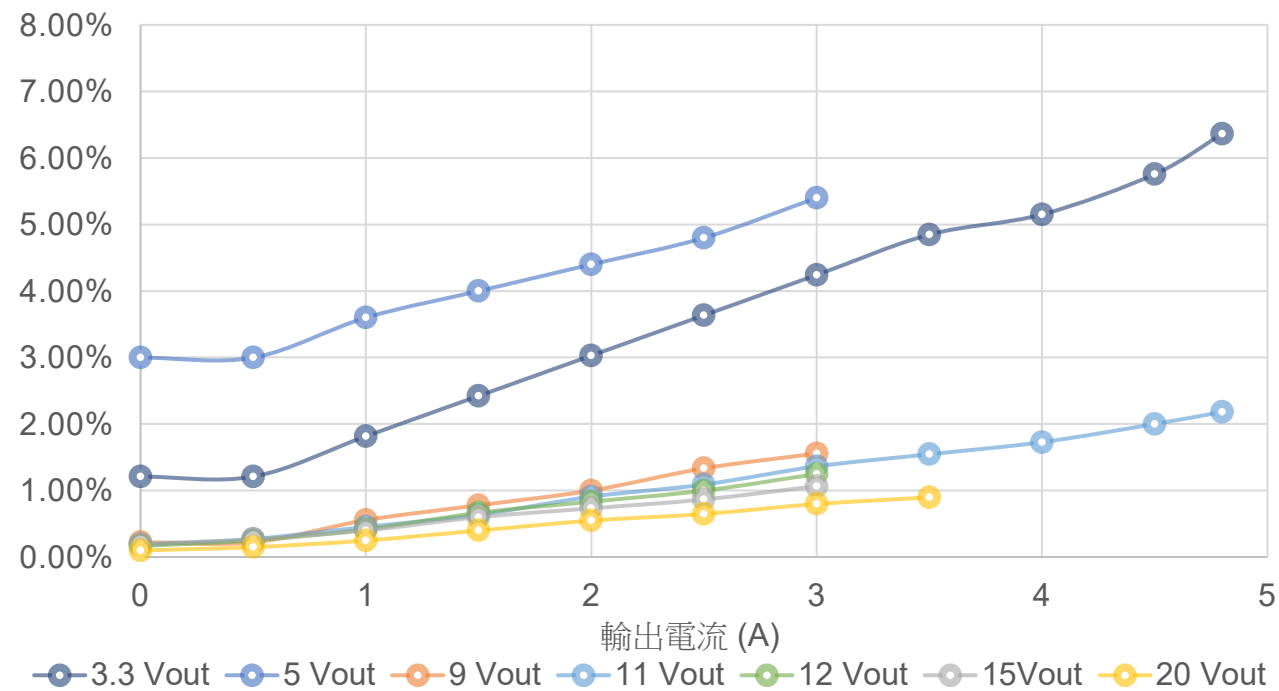
Ch1, (Ch2 No Load)

Ch1 負載調節 @ $V_{in} = 24V$



Ch2, (Ch1 No Load)

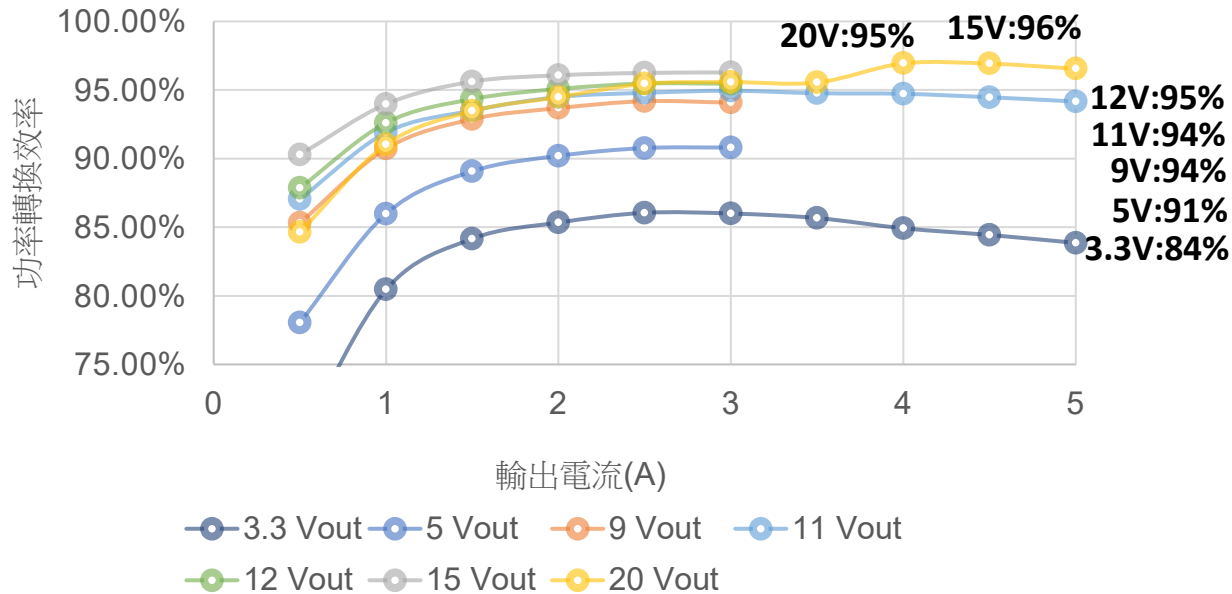
Ch2 負載調節 @ $V_{in} = 24V$



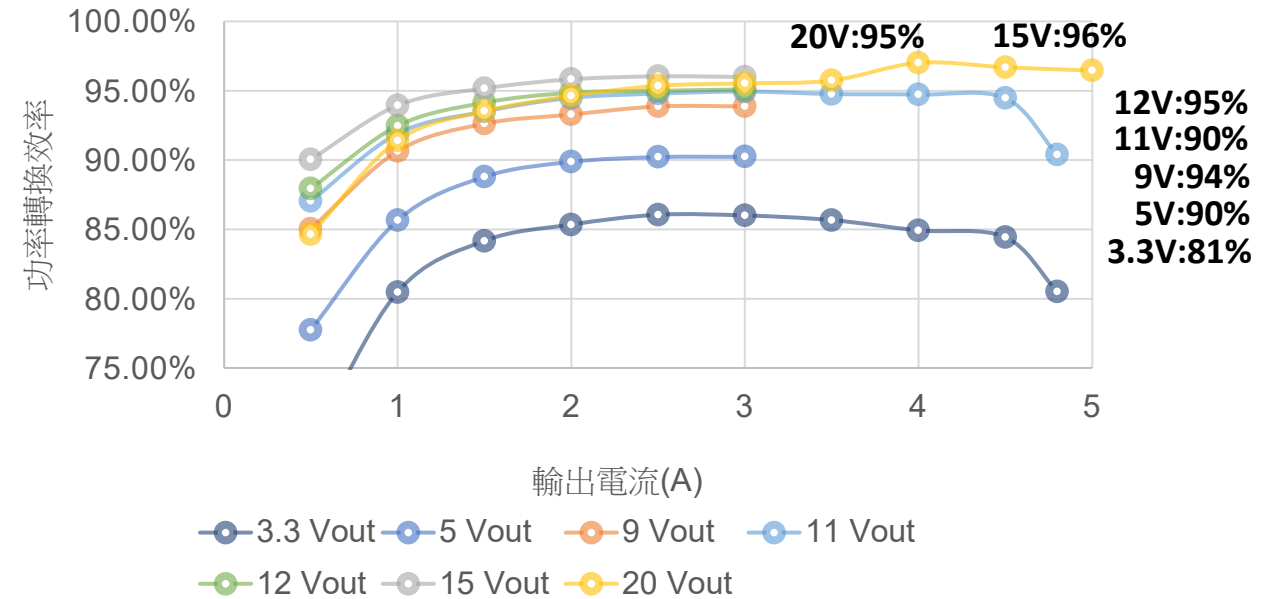
5. 電源效率, η_{single} ($V_{in} = 24V$)



Ch1 功率轉換效率@ $V_{in} = 24V$



Ch2 功率轉換效率@ $V_{in} = 24V$



| Ch 1, 單通道 (Ch 2 No Load) | | | | | | | |
|------------------------------------|-----|-----|------|------|------|-----------|----------|
| 輸入電壓 24V | | | | | | | |
| 輸出電壓 | 5 V | 9 V | 12 V | 15 V | 20 V | 3.3V(PPS) | 11V(PPS) |
| *效率 @ 滿載 $\eta_{fullload_Single}$ | 91% | 94% | 95% | 96% | 97% | 84% | 94% |
| 最大效率, η_{max_single} | 91% | 94% | 95% | 96% | 97% | 86% | 95% |

| Ch 2, 單通道 (Ch 1 No Load) | | | | | | | |
|------------------------------------|-----|-----|------|------|------|-----------|----------|
| 輸入電壓 24V | | | | | | | |
| 輸出電壓 | 5 V | 9 V | 12 V | 15 V | 20 V | 3.3V(PPS) | 11V(PPS) |
| *效率 @ 滿載 $\eta_{fullload_Single}$ | 90% | 94% | 95% | 96% | 96% | 81% | 90% |
| 最大效率, η_{max_single} | 90% | 94% | 95% | 96% | 97% | 86% | 95% |

* 滿載 Full load conditions (5V, 3A), (9V, 3A), (12V, 3A),(15V, 3A),(20V, 5A), PPS(3.3V, 5A), PPS(11V, 5A)



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

- 總結

Vin 24V

滿載效率範圍*, $\eta_{fulload_Dual}$ (Vout = 5V-12V)

90% - 97%

*In various combination of full load conditions: (5V, 3A), (9V,3A), (12V,3A), (15V,3A), (20V, 5A),
PPS(3.3V, 5A), PPS(11V, 5A)



6. 雙通道輸出性能 (24 Vin)

最大功率下的效能

| Output Power | Ch1 (PD) | | Ch2 (QC) | | Efficiency |
|--------------|----------|----------|----------|----------|------------|
| | Vout (V) | Iout (A) | Vout (V) | Iout (A) | |
| 200 | 20.05 | 5 | 20.06 | 5 | 95% |

7. 過流保護 Over-Current Protection

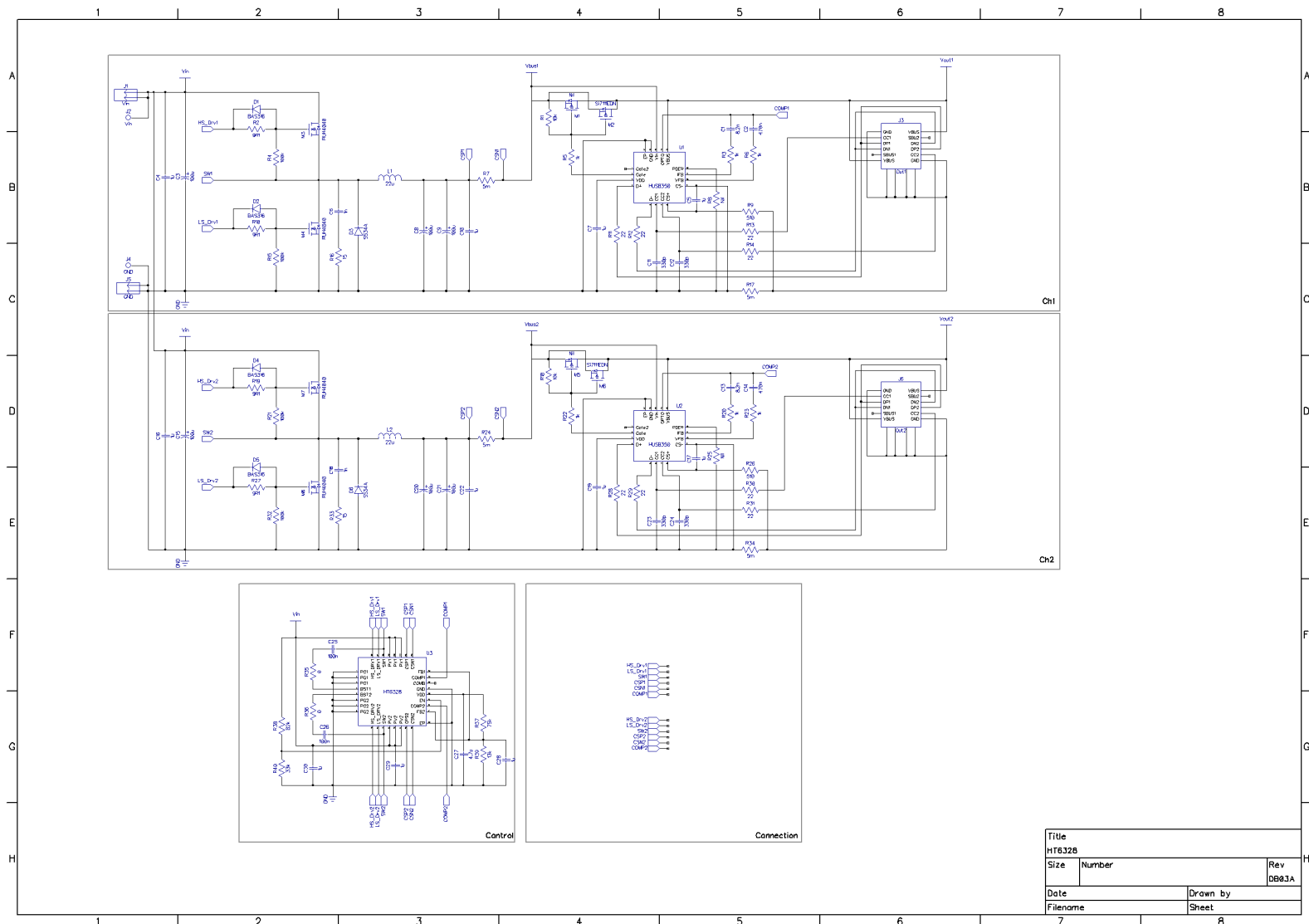


| Channel | Over Current Protection/ Short Circuit Protection level |
|--------------------------|--|
| Ch1 (Other than 20 Vout) | 3.8 A |
| Ch2 (Other than 20 Vout) | 3.8 A |
| Ch1 (20 Vout) | 6.2A |
| Ch2 (20 Vout) | 6.1A |

8. 附錄 I



- 演示板原理圖
(物料清單詳見附錄II)
- Sch ver: HT6328_DB03
- PCB ver: HT6328_DB03
- BOM ver: A



8. 附錄 II



- 演示板物料

| RefDes | Name | Type | Value | Part Number | Package | Quantity |
|--|----------------------|-----------|--------|-------------|---------------|----------|
| Capcitor | | | | | | |
| C11, C12, C23, C24 | CAP_0603 | Cap | 330p | | 0603 | 4 |
| C6, C18 | CAP_0603 | Cap | 1n | | 0603 | 2 |
| C1, C13 | CAP_0603 | Cap | 8.2n | | 0603 | 2 |
| C25, C26 | CAP_0603 | Cap | 100n | | 0603 | 2 |
| C2, C14 | CAP_0603 | Cap | 470n | | 0603 | 2 |
| C4, C5, C7, C10, C16, C17, C19, C22, C28, C29, C30 | CAP_0603 | Cap | 1u | | 0603 | 11 |
| C27 | CAP_0805 | Cap | 4.7u | | 0805 | 1 |
| C3, C15 | 100uF 35V 3.5/8.5h12 | Ecap | 100u | | | 2 |
| C8, C9, C20, C21 | 330uF 35V 5/10x13 | Ecap | 100u | | | 4 |
| Diode | | | | | | |
| D1, D2, D4, D5 | BAS316 | Diode | BAS316 | | SOD-323 | 4 |
| D3, D6 | SMA | Diode | SS34A | | | 2 |
| Connector | | | | | | |
| J1 | P2/2.54 | Connector | Vin | | HDR-1x2T/2.54 | 1 |
| J3 | Type-C-16p | Connector | Out1 | | Type-C-16p | 1 |
| J5 | P2/2.54 | Connector | GND | | HDR-1x2T/2.54 | 1 |
| J6 | Type-C-16p | Connector | Out2 | | Type-C-16p | 1 |
| Inductor | | | | | | |
| L1, L2 | 17mm_H | Inductor | 22u | | 17mm_H | 2 |

8. 附錄 II



- 演示板物料

| RefDes | Name | Type | Value | Part Number | Package | Quantity |
|--|---------------|-------|-----------|-------------|------------|----------|
| FET | | | | | | |
| M1, M5 | PMOS_PDFN3333 | P-MOS | Nil | | PDFN3333 | 2 |
| M2, M6 | PMOS_PDFN3333 | P-MOS | Si7111EDN | | PDFN3333 | 2 |
| M3, M4, M7, M8 | NMOS_PDFN3333 | N-MOS | RUH4040 | | PDFN3333 | 4 |
| Resistor | | | | | | |
| R35, R36 | RES_0603 | Res | | 0 | 0603 | 2 |
| R2, R10, R19, R27 | RES_0603 | Res | 9R1 | | 0603 | 4 |
| R16, R33 | RES_0603 | Res | | 15 | 0603 | 2 |
| R11, R12, R13, R14, R28, R29, R30, R31 | RES_0603 | Res | | 22 | 0603 | 8 |
| R9, R26 | RES_0603 | Res | | 510 | 0603 | 2 |
| R3, R5, R6, R20, R22, R23 | RES_0603 | Res | 1k | | 0603 | 6 |
| R1, R18 | RES_0603 | Res | 10k | | 0603 | 2 |
| R39 | RES_0603 | Res | 13k | | 0603 | 1 |
| R40 | RES_0603 | Res | 33k | | 0603 | 1 |
| R37 | RES_0603 | Res | 75k | | 0603 | 1 |
| R38 | RES_0603 | Res | 82k | | 0603 | 1 |
| R4, R15, R21, R32 | RES_0603 | Res | 100k | | 0603 | 4 |
| R8, R25 | RES_0603 | Res | Nil | | 0603 | 2 |
| R7, R17, R24, R34 | RES_1206 | Res | 5m | | 1206 | 4 |
| IC | | | | | | |
| U1, U2 | HUSB339 | | | HUSB350 | QFN-16/4x4 | 2 |
| U3 | HT6328 | IC | | HT6328 | QFN32 | 1 |

8. 附錄 III



1. 附件 – 印刷線路板圖(Gerber)
2. 附件 – 原理圖(Schematic)