全漢企業股份有限公司

電氣規格書

料號 :

9PA7006200 ,TRIAL RUN(B OK+P-REPORT OK),G.P,FSP700-80UEPB,IPC,EPS1U(80+ PLATINUM),ErP,700W,BALL,W/IO,WO/SS,FSP,W/PFC(A),WEEE,FULL RANGE,RAZ02,

版次 : 4

文件編號 : ESD13068055

附件版本 : 1.0

研發部門 : RAZ02

作者 : evachen/陳志禎

Model No/Type :

機密 : N

發行日期 : 2015/4/16-9:47:34

備註 :

升版理由 : 1. 增加FW資料 2. B-TEST修改(2014.10.09) 3. 修改INPUT LINE CURRENT(原為12A-6A，改為10A-5A)(2015.4.15記)

單位	姓名	單位	姓名	單位	姓名
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EEProm Specification

項次	名稱	數值	單位	說明
1	Manufacturer Name	FSP GROUP		
2	Product Name	IPC POWER		
3	Product Part/Model Number	9PA7006200		Product Part
4	Product Version	10		客戶版本
5	Product Serial Number	S1234567890		VV: FSP 成品版本 MM: 無錫全漢(外銷): MM=P3 輝力(外銷): MM=P4 福永眾漢(內銷): MM=P5 SSSSS:16 進位的流水號(依週期歸零，從 00001 開始) WW: 生產週期（40 週=40) Y: 生產年（2006 年=6)
6	Asset Tag	2011/01/21		生產日期(yyyy/mm/dd)
7	FRU File ID	1M.0001.0013.001		韌體 ID(Firmware ID)
8	PSU Address	B0		

9	EEPROM Address	A0		
10	Protocol	PMBus		
11	Last Ouput	N		是否為最後一筆 Output
12	Overall capacity(watts)	700	W	0-4096 watts
13	Peak VA	0	W	若無請空白
14	Inrush current	0	A	若無請空白
15	Inrush interval in ms	1	ms	若無請空白
16	Low end Input voltage range 1	9000	10mV	ex: 9V 請填 900
17	High end Input voltage range 1	26400	10mV	
18	Low end Input voltage range 2	0	10mV	110V range ,若無 Autoswitch support 才需填寫
19	High end Input voltage range 2	0	10mV	220V range ,若無 Autoswitch support 才需填寫
20	Low end Input frequency range	47	Hz	
21	High end Input frequency range	63	Hz	
22	A/C dropout tolerance in ms	16	ms	
23	Peak Wattage-Hold up time in seconds	0	s	0-15 s

24	Last Ouput	N		是否為最後一筆 Output
25	Standby Output	N		
26	Output 1 Nominal Voltage in 10mV	330	10 mV	ex: 3.3V 請填 330
27	Output 1 Maximum negative voltage deviation in 10mV	3135	10 mV	
28	Output 1 Maximum positive voltage deviation in 10mV	3465	10 mV	
29	Output 1 Ripple and Noise Pk-Pk 10Hz to 20MHz in mV	50	mV	
30	Output 1 Minimum current draw in mA	100	mA	
31	Output 1 Maximum current draw in mA	25000	mA	若超過 65.535A 單位請改以 10mA 表示
32	Last Ouput	N		是否為最後一筆 Output
33	Standby Output	N		
34	Output 2 Nominal Voltage in 10mV	500	10 mV	ex: 3.3V 請填 330
35	Output 2 Maximum negative voltage deviation in 10mV	475	10 mV	
36	Output 2 Maximum positive voltage deviation in 10mV	525	10 mV	
37	Output 2 Ripple and Noise Pk-Pk 10Hz to 20MHz in mV	50	mV	
38	Output 2 Minimum current draw in mA	1000	mA	

39	Output 2 Maximum current draw in mA	30000	mA	若超過 65.535A 單位請改以 10mA 表示
40	Last Ouput	N		是否為最後一筆 Output
41	Standby Output	N		
42	Output 3 Nominal Voltage in 10mV	1200	10 mV	ex: 3.3V 請填 330
43	Output 3 Maximum negative voltage deviation in 10mV	1140	10 mV	
44	Output 3 Maximum positive voltage deviation in 10mV	1260	10 mV	
45	Output 3 Ripple and Noise Pk-Pk 10Hz to 20MHz in mV	120	mV	
46	Output 3 Minimum current draw in mA	1000	mA	
47	Output 3 Maximum current draw in mA	16000	mA	若超過 65.535A 單位請改以 10mA 表示
48	Last Ouput	N		是否為最後一筆 Output
49	Standby Output	N		
50	Output 4 Nominal Voltage in 10mV	1200	10 mV	ex: 3.3V 請填 330
51	Output 4 Maximum negative voltage deviation in 10mV	1140	10 mV	
52	Output 4 Maximum positive voltage deviation in 10mV	1260	10 mV	
53	Output 4 Ripple and Noise Pk-Pk 10Hz to 20MHz in	120	mV	

	mV			
54	Output 4 Minimum current draw in mA	1000	mA	
55	Output 4 Maximum current draw in mA	16000	mA	若超過 65.535A 單位請改以 10mA 表示
56	Last Ouput	N		是否為最後一筆 Output
57	Standby Output	N		
58	Output 5 Nominal Voltage in 10mV	1200	10 mV	ex: 3.3V 請填 330
59	Output 5 Maximum negative voltage deviation in 10mV	1140	10 mV	
60	Output 5 Maximum positive voltage deviation in 10mV	1260	10 mV	
61	Output 5 Ripple and Noise Pk-Pk 10Hz to 20MHz in mV	120	mV	
62	Output 5 Minimum current draw in mA	1000	mA	
63	Output 5 Maximum current draw in mA	16000	mA	若超過 65.535A 單位請改以 10mA 表示
64	Last Ouput	N		是否為最後一筆 Output
65	Standby Output	N		
66	Output 6 Nominal Voltage in 10mV	1200	10 mV	ex: 3.3V 請填 330
67	Output 6 Maximum negative voltage deviation in 10mV	1140	10 mV	

68	Output 6 Maximum positive voltage deviation in 10mV	1260	10 mV	
69	Output 6 Ripple and Noise Pk-Pk 10Hz to 20MHz in mV	120	mV	
70	Output 6 Minimum current draw in mA	1000	mA	
71	Output 6 Maximum current draw in mA	16000	mA	若超過 65.535A 單位請改以 10mA 表示
72	Last Ouput	N		是否為最後一筆 Output
73	Standby Output	N		
74	Output 7 Nominal Voltage in 10mV	-1200	10 mV	ex: 3.3V 請填 330
75	Output 7 Maximum negative voltage deviation in 10mV	-1080	10 mV	
76	Output 7 Maximum positive voltage deviation in 10mV	-1320	10 mV	
77	Output 7 Ripple and Noise Pk-Pk 10Hz to 20MHz in mV	200	mV	
78	Output 7 Minimum current draw in mA	0	mA	
79	Output 7 Maximum current draw in mA	500	mA	若超過 65.535A 單位請改以 10mA 表示
80	Last Ouput	Y		是否為最後一筆 Output
81	Standby Output	Y		
82	Output 8 Nominal Voltage in 10mV	500	10 mV	ex: 3.3V 請填 330

83	Output 8 Maximum negative voltage deviation in 10mV	475	10 mV	
84	Output 8 Maximum positive voltage deviation in 10mV	525	10 mV	
85	Output 8 Ripple and Noise Pk-Pk 10Hz to 20MHz in mV	50	mV	
86	Output 8 Minimum current draw in mA	0	mA	
87	Output 8 Maximum current draw in mA	4000	mA	若超過 65.535A 單位請改以 10mA 表示

Binary Flags		說明
Tachometer pulses per rotation (Bit 4)	1	Tachometer predictive fail signal: 0 - One pulse per rotation 1- Two pulse per rotation Pass/fail predictive fail signal: 0 – The signal asserted (1) indicates failure 1 – The signal de-asserted (0) indicates failure.
Hot Swap capability (Bit 3)	1	0=No, 1=Yes
Autoswitch support (Bit 2)	1	0=No, 1=Yes
Power Factor correction support (Bit 1)	1	0=No, 1=Yes
Predictive fail pin support (SMBAlert/PS_Alert) (Bit 0)	1	0=No, 1=Yes
Combined Wattage	Y	Combined Wattage: Y- Output1 V and Output2 V have a combined wattage of Total Combined Wattage N- No combined voltages for the power supply
Output 1 in V	5V	
Output 2 in V	3.3V	
Total Combined Wattage	150	

		ex:5V and 3.3V have a combined wattage of 120 watts
Predictive fail Tachometer(Rotations per second)	16	1.Please fill RPS, between 0 and 255. 2.between 60 and 15300 RPMs

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SPECIFICATION

FSP700-80UEPB

Main Feature:
Active PFC Circuit
Full Range Input

Sep,9,2013
REV:1.0

全漢企業股份有限公司
FSP TECHNOLOGY INC.

MODEL: FSP700-80UEPB

Revision History

Rev	Description	Date	Author
1.0		2013.09.09	Kathy
1.1	B-TEST 修改:5.3 & 5.4	2014.10.09	Kathy
1.2	4.3.4. INPUT LINE CURRENT 原爲 12-6A，RD 更正爲 10-5A	2015.01.14	Eva

1. GENERAL DESCRIPTION AND SCOPE

This is the specification of Model FSP700-80UEPB AC-line powered switching power supply with active PFC (Power Factor Correction) circuit, meet EN61000-3-2 and with Full Range Input features. Designed and manufactured by FSP GROUP.

All outputs and shall communicate to external devices through Inter-Integrated (I^2C) Circuit protocol. The power supply will have an EEPROM for storing powers supply FRU information, and meet PMBus Revision 1.2 requirement.(It is define in PMBus specification)

The specification below is intended to describe as detailedly as possible the functions and performance of the subject power supply. Any comment or additional requirements to this specification from our customers will be highly appreciated and treated as a new target for us to approach.

2. REFERENCE DOCUMENTS

The subject power supply will meet the EMI requirements and obtain main safety approvals as following:

2.1 EMI REGULATORY

- FCC Part 15 Subpart J, Class 'B' 115 Vac operation.
- CISPR 22 Class 'B' 230 Vac operation.

3. PHYSICAL REQUIREMENTS

3.1 MECHANICAL SPECIFICATIONS

The mechanical drawing of the subject power supply, which indicate the form factor, location of the mounting holes, location, the length of the connectors, and other physical specifications of the subject power supply. Please refer to the attachment drawing.

3.2 CONNECTOR SPECIFICATIONS

The power supply connectors are:

AC Inlet : Standard inlet socket 10A/250V, UL/CSA/VDE approved.

4. ELECTRICAL REQUIREMENTS

4.1 OUTPUT ELECTRICAL REQUIREMENTS

The subject power supply will meet all electrical specifications below, over the full operation temperature range and dynamic load regulation.

4.1.1. OUTPUT RATING

Output	Nominal	Regulation	Ripple/Noise	Min	Max	peak
1	+3.3V	3.3V ±5%	50mV	0.1A	25.0 A	
2	+5V	+5V ±5%	50mV	1A	30.0 A	
3	+12V1	12V ±5%	120mV	1A	16.0 A	
4	+12V2	12V ±5%	120mV	1A	16.0 A	
5	+12V3	12V ±5%	120mV	1A	16.0 A	
6	+12V4	12V ±5%	120mV	1A	16.0 A	
7	-12V	-12V ±10%	120mV	0 A	0.5 A	
8	+5VSB	+5Vsb ±5%	50mV	0 A	4A	

(1) Maximum continuous total DC output power should not exceed 700W.

(2) Maximum combined current for the 12V outputs shall be 56A.

(3) Combined 3.3V and 5V power shall not exceed 170W.

(4) Ripple and noise measurements shall be made under all specified load conditions through a single pole low pass filter with 20MHz cutoff frequency. Outputs shall bypassed at the connector with a 0.1uF ceramic disk capacitor and a 10uF electrolytic capacitor to simulate system loading

4.1.2. LOAD CAPACITY SPECIFICATIONS

The cross regulation defined as follows, the voltage regulation limits DC include DC Output ripple & noise.

LOAD	STM.	+3.3V	+5V	+12V1	+12V2	+12V3	+12V4	-12V	5VSB
ALL NORMAL	HHHHHHHH	14.36A	17.94A	11.29A	11.29A	11.29A	11.29A	0.4A	3.23A
+3.3V MAX others MIN	HLLLLLLL	25.0 A	1.0 A	1A	1A	1A	1A	0.0A	0.1A
+5V MAX others MIN	LHLLLLLL	1.5 A	30.0 A	2A	2A	2A	2A	0.0A	0.1A
+12V1 MAX others MIN	LLHLLLLL	1.5 A	1.0A	16.0A	1A	1A	0.5A	0.0A	0.1A
+12V2 MAX others MIN	LLLHLLLL	1.5 A	1.0 A	1A	16.0A	1A	0.5A	0.0A	0.1A
+12V3 MAX others MIN	LLLLHLLL	1.5 A	1.0 A	1A	1A	16.0A	0.5A	0.0A	0.1A
+12V4 MAX others MIN	LLLLLHLL	1.5 A	1.0A	1A	1A	1A	16.0A	0.0A	0.1A
ALL MIN	LLLLLLLL	1.5A	1.0 A	1A	1A	1A	1A	0.0A	0.1A

4.1.3. HOLD-UP TIME (FULL LOAD)

115V / 60Hz : 16 mSec. Minimum.
230V / 50Hz : 16 mSec. Minimum.

The output voltage will remain within specification, in the event that the input power is removed or interrupted, for the duration of one cycle of the input frequency. The interruption may occur at any

point in the AC voltage cycle. The power good signal shall remain high during this test.

4.1.4.OUTPUT RISE TIME

(10% TO 90% OF FINAL OUTPUT VALUE, @FULL LOAD)

115V-rms or 230V-rms + 5Vdc : 20ms Maximum

4.1.5.OVER VOLTAGE PROTECTION

Voltage Source	Protection Point
+ 3.3 V_{dc}	3.5V-4.5V
+5V_{dc}	5.5V-6.82V
+12V_{1dc},+12V_{2dc} , +12V_{3dc},+12V_{4dc}	13.4V-15.6V

4.1.6.SHORT CIRCUIT PROTECTION

Output short circuit is defined to be a short circuit load of less than 0.1 ohm.

In the event of an output short circuit condition on +3.3V, +5V or +12V output, the power supply will shutdown and latch off without damage to the power supply. The power supply shall return to normal operation after the short circuit has been removed and the power switch has been turned off for no more than 2 seconds.

In the event of an output short circuit condition on –12V output, the power supply will not be damaged. The power supply shall return to normal operation as soon as the short circuit has been removed. and the power switch has been turned off for no more than 2 seconds.

4.1.7.OVER CURRENT PROTECTION

3.3V	30A-42A
5V	35A-42A
12V1	18A-22A
12V2	18A-22A
12V3	18A-22A
12V4	18A-22A

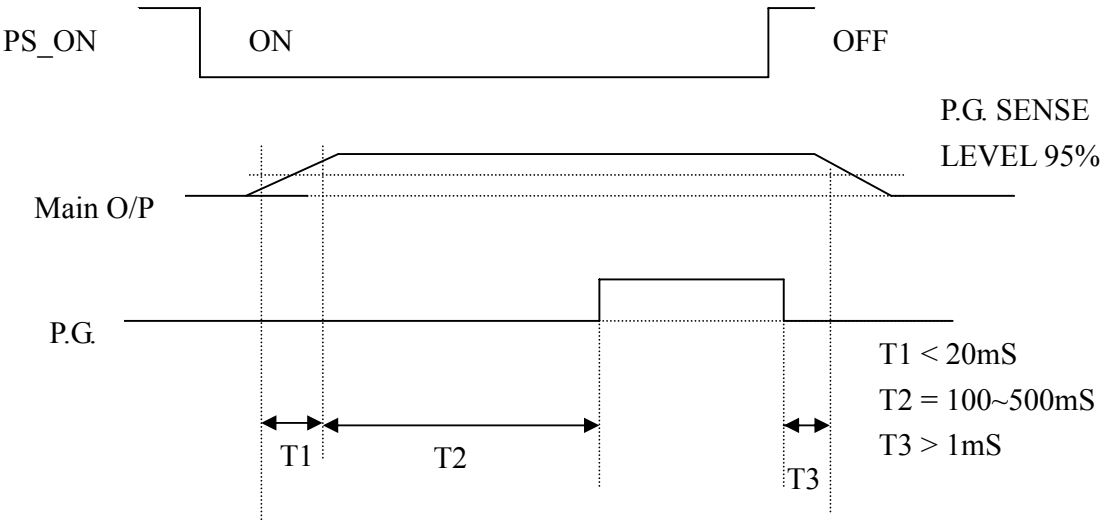
4.1.8.POWER GOOD SIGNAL

The power good signal is a TTL compatible signal for the purpose of initiating an orderly star-up procedure under normal input operating conditions. This signal is asserted (low) until +5Vdc has reached 4.75 volts during power up. Characteristics:

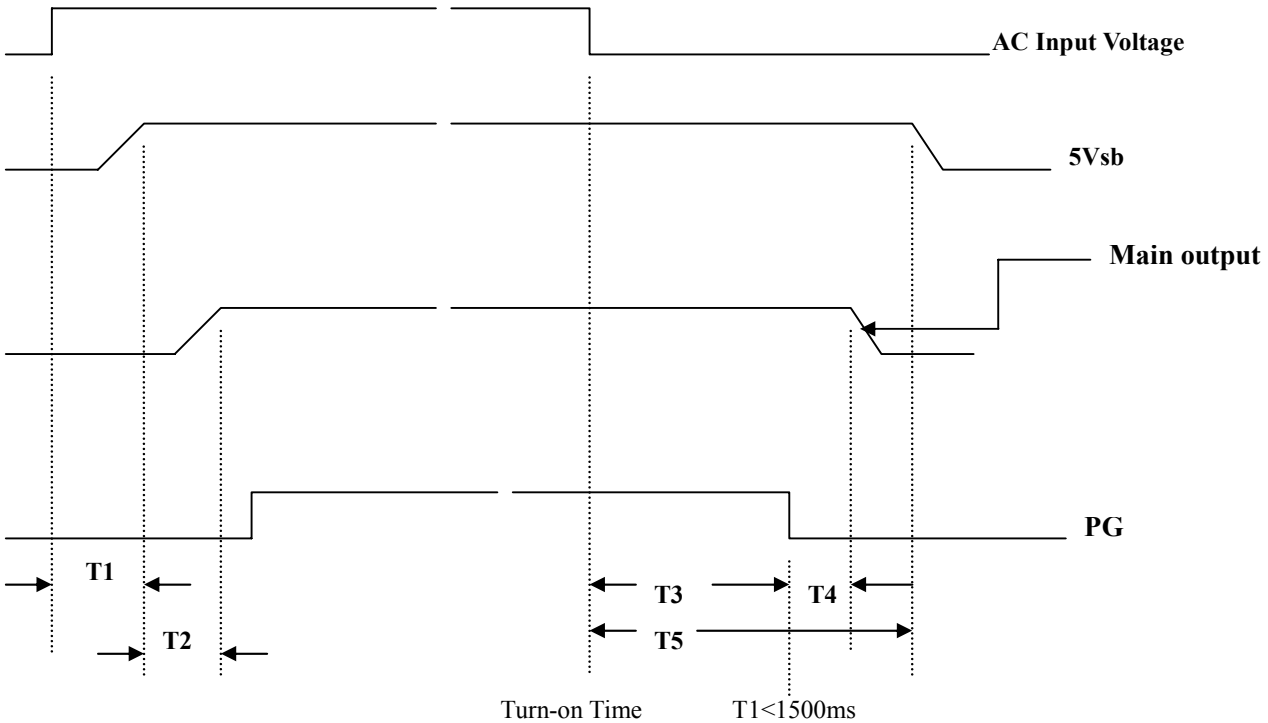
TTL signal asserted (low state) : less than 0.5V while sinking 10mA.
TTL signal asserted (high state): greater than 4.75V while sourcing 500uA.
High state output impedance: less or equal to 1Kohm from output to common.

POWER GOOD @ 115/230V,FULL LOAD	100 –500mSec.
POWER FAIL @115/230V,FULL LOAD	1 mSec. minimum

(A) Remote ON-OFF Timing:



(B) AC ON / OFF Timing :



Turn-on Time	T1<1500ms
VAUX-on Delay	T2>1ms
RIDE-Through	T3>16ms
Hold-up	T4>1ms
VAUX Ride Through	T5>70ms

4.2. OUTPUT TRANSIENT LOAD RESPONSE

The output voltages shall remain within the limits specified in 4.1.1 output rating table in page 6 for the step loading and within the limits specified in Table 1 for the capacitive loading. The load transient repetition rate shall be tested between 50Hz and 5 kHz at duty cycles ranging from 10%-90%. The load transient repetition rate is only a test specification. The step load may occur anywhere within the MIN load to the MAX load shown in Table 1.

Table 1: Transient Load Reguirements

Output	Step Load Size	Load Slew Rate	Capacitive Load
+3.3V	30% of max load	0.5A/us	4700uF
+5V	30% of max load	0.5A/us	4700uF
+12V1,+12V2,+12V3,+12V4	65% of max load	1.0A/us	2200uF
+5Vsb	25% of max load	0.5A/us	100uF

4.3. INPUT ELECTRICAL SPECIFICATIONS

4.3.1. VOLTAGE RANGE

PARAMETER		UNITS
V-in Range	90 - 264	V-rms

4.3.2. INPUT FREQUENCY

INPUT FREQUENCY	47–63Hz

4.3.3. INRUSH CURRENT

(Cold start – 25 deg. C)

115V	40A
230V	80A

(No damage)

4.3.4. INPUT LINE CURRENT

115V	10Amps – rms maximum
230V	5 Amps – rms maximum

4.4. EFFICIENCY

	Full load (100%)	Typical load (50%)	Light load (20%)
115VAC	89%	92%	90%
230VAC	89%	92%	90%

(loading shown in Amps)

Loading	+12V1	+12V2	+12V3	+12V4	+5V	+3.3V	-12V	+5Vsb
Full (100%)	11.29	11.29	11.29	11.29	17.69	14.74	0.40	3.23
Typical (50%)	5.65	5.65	5.65	5.65	8.84	7.37	0.2	1.61
Light (20%)	2.26	2.26	2.26	2.26	3.54	2.95	0.08	0.65

4.5LED Indicator

A green/amber double color Light Emitting Diode (LED) shall be mounted as indicated in mechanical drawing and shall indicate the status of the DC GOOD signal with green color. The LED shall continue to glow under normal operation of the power supply. If this LED is blinking or not lit or in amber color, the power supply is not operating properly.

4.6. PS_ ON#

PS_ON# is an active-low, TTL-compatible signal that allows a motherboard to remotely control the power supply in conjunction with features such as soft on/off, Wake on LAN+, or wake-on-modem. When PS_ON# is pulled to TTL low, the power supply should turn on the five main DC output rails: +12VDC,+5VDC,+3.3VDC,and –12VDC. When PS_ON# is pulled to TTL high or open-circuited, the DC output rails should not deliver current and should be held at zero potential with respect to ground. PS_ON# has no effect on the +5VSB output, which is always enabled whenever the AC power is present. Table 15 lists PS_ON# signal characteristics.

The power supply shall provide an internal pull-up to TTL high. The power supply shall also provide debounce circuitry on PS_ON# to prevent it from oscillating on/off at startup when activated by a mechanical switch. The DC output enable circuitry must be SELV-compliant.

Table 15. PS_ON# Signal Characteristics

	Min.	Max.
VIL, Input Low Voltage	0.0V	0.8V
IIL, Input Low Current (Vin = 0.4V)		-1.6mA
VIH, Input High Voltage (lin = -200 μ A)	2.0V	
VIH OPEN circuit, lin = 0		5.25V

5. ENVIRONMENTAL REQUIREMENTS

The power supply will be compliant with each item in this specification for the following Environmental conditions.

5.1. TEMPERATURE RANGE

Operating	0 to +50 deg. C
Storage	-20 to +80 deg. C

5.2. HUMIDITY

Operating	85% RH, Non-condensing
Storage	95% RH, Non-condensing

5.3. VIBRATION

The subject power supply will withstand the following imposed conditions without experiencing non-recoverable failure or deviation from specified output characteristics.

Vibration Operation, 0.01g²/Hz at 5 Hz sloping to 0.02g²/Hz at 20 Hz, and maintaining 0.02g²/Hz from 20Hz to 500 Hz. The area under the PSD curve is 3.13gRMS. The duration shall be 20 minutes per axis for all three axes on all samples

5.4. SHOCK

The subject power supply will withstand the following imposed conditions without experiencing non-recoverable failure or deviation from specified output characteristics.

Storage –40G, 9 mSec. half-sine wave pulse in both directions on three mutually perpendicular axes.

Operating -10G, 11mSec. half-sine wave pulse in both directions on three mutually Perpendicular axes.

6. SAFETY

6.1. LEAKAGE CURRENT

The leakage current from AC to safety ground will not exceed 3.5 mA-rms at 264Vac, 50 Hz.

7. ELECTORMAGNETIC COMPATIBILITY

7.1 LINE CONDUCTED EMI

The subject power supply will meet FCC and VFG class B requirements under full load conditions.

7.2. RADIATED EMI

The subject power suppy will meet FCC and CISPR 22 requirements under normal load conditions.

8. LABELLING

Label marking will be permanent, legible and complied with all agency requirements.

8.1. MODEL NUMBER LABEL

Labels will be affixed to the sides of the power supply showing the following:

- Manufacturer's name and logo.
- Model no., serial no., revision level, location of manufacturer.
- The total power output and the maximum load for each output.
- AC input rating.

8.2 DC OUTPUT IDENTIFICATION
Each output connector will be labeled.

9. RELIABILITY

9.1. MTBF

The power supply have a minimum predicted MTBF(MIL-HDBK-217) of 100,000 hours of continuous operation at 25℃, 100% -output load, and nominal AC input voltage.

FSP module
PIC24 Firmware
and
PMBus 1.2 Protocol specification

Document History

Version	Editor	Date	Description
001	YCC	2013/05/20	Original
002	YCC	2013/08/08	Update T2 OTP restart.60℃
003	YCC	2013/09/02	Update Fan Temperature Control Level Value.
004	YCC	2013/09/04	Update Fan Temperature Control Table.
005	YCC	2013/09/05	Update Fan Temperature Control Table.
006	YCC	2013/09/16	Update OP Fan Control Duty
007	YCC	2013/09/24	Create Fan2 Protect.
008	YCC	2013/10/21	Update Fan 2 Protect.

1 Device Address

Power supply PMBus address	0xB0
Power supply EEPROM address	0xA0

2 PMBus Data Format

The Linear Data Format is a two byte value with:
An 11 bit, two's complement mantissa and
A 5 bit, two's complement exponent (scaling factor).
The format of the two data bytes is illustrated in Figure 4.

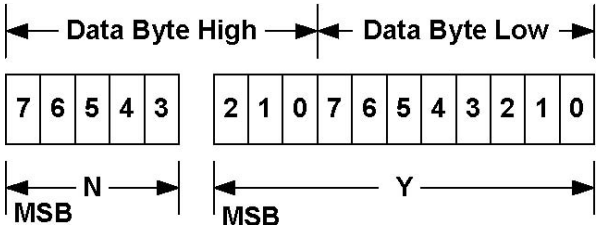


Figure 4. Linear Data Format Data Bytes

The relation between Y, N and the "real world" value is:

$X = Y \cdot 2^{N}$

Where, as described above:
X is the "real world" value being communicated
Y is an 11 bit, two's complement integer; and
N is a 5 bit, two's complement integer.
Devices that use the Linear format must accept and be able to process any value of N.

3 PAGE Command (00h)

Page member :

READ_IOUT

READ_VOUT

STATUS_IOUT

STATUS_VOUT

IOUT_OC_WARN_LIMIT

Page list :

PAGE	OUTPUT	Description
00h	12v1	Supported, Default for single 12v output
01h	12v2	Supported
02h	12v3	Supported
03h	12v4	
04h	12v5	
05h	12v6	
06h-0fh	Reserved	
10h	5v	Supported
11h	3.3v	Supported
12h-1fh	Reserved	
20h	5vsb	
21h	3.3vsb	
22h	-12v	
23h-2fh	Reserved	
30h	48v	
31h	24v	
32h-3fh	Reserved	

4 Operation Command (01h)

Operation Notice：

This function is only supported for module operation only without PDB.

If utilized while inserted in a PDB without function support, utilization of this function might cause Unexpected side effects.

Operation command Default Value is 0x80h.

Bits [7:6]	Bits [5:4]	Bits [3:2]	Bits [1:0]	Unit On Or Off	Margin State	Description	Supported
00	XX	XX	XX	Immediate Off (No Sequencing)	N/A	Immediate turn-off	Ok
01	XX	XX	XX	Soft Off (With Sequencing)	N/A	turn-off delay and fall time	-
10	00	XX	XX	On (turn-on)	Off	Immediate turn-on	Ok
10	01	01	XX	On	Margin Low (Ignore Fault)	Margin Low (Ignore Fault)	-
10	01	10	XX	On	Margin Low (Act On Fault)	Margin Low (Act On Fault)	-
10	10	01	XX	On	Margin High (Ignore Fault)	Margin High (Ignore Fault)	-
10	10	10	XX	On	Margin High (Act On Fault)	Margin High (Act On Fault)	-

5 ON_OFF_CONFIG Command (02h)

Operation Notice：

This function is only supported for module operation only without PDB.

If utilized while inserted in a PDB without function support, utilization of this function might cause Unexpected side effects.

ONOFF_CONFIG command Default value is 0x15h.

Bit	Purpose	Bit Value	Meaning	Default value	Supported
7:5	Reserved	Reserved	Reserved	Reserved	Reserved
4	Sets the default to either operate any time power is present or for the on/off to be controlled by CONTROL pin and serial bus commands	0	Unit powers up any time power is present regardless of state of the CONTROL pin	1	Ok
		1	Unit does not power up until commanded by the CONTROL pin and OPERATION command (as programmed in bits [3:0]).		
3	Controls how the unit responds to commands received via the serial bus	0	Unit ignores the on/off portion of the OPERATION command from serial bus	0	Ok
		1	To start, the unit requires that that the on/off portion of the OPERATION command is instructing the unit to run. Depending on bit [2], the unit may also require the CONTROL pin to be asserted for the unit to start and energize the output.		
2	Controls how the unit responds to the CONTROL pin	0	Unit ignores the CONTROL pin (on/off controlled only the OPERATION command)	1	Ok
		1	Unit requires the CONTROL pin to be asserted to start the unit. Depending on bit [3], the OPERATION command may also be required to instruct the device to start before the output is energized.		
1	Polarity of the CONTROL pin	0	Active low (Pull pin low to start the unit)	0	-
		1	Active high (Pull high to start the unit)		
0	CONTROL pin action when commanding the unit to turn off	0	Use the programmed turn off delay (Section 16.5) and fall time (Section 16.6)	1	-
		1	Turn off the output and stop transferring energy to the output as fast as possible. The device's product literature shall specify whether or not the device sinks current to decrease the output voltage fall time.		

5.1 ON_OFF_CONFIG command operation note

Setting type	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Data value	Description[1]	Supported
1	0	X	X	X	0	0x00	If AC ok, turn-on power + DLY	-
2	0	X	X	X	1	0x01	If AC ok, turn-on power	OK
3	1	0	0	x	x	0x10	null	-
4	1	0	1	0	0	0x14	HW + LO + DLY	-
5	1	0	1	0	1	0x15	HW + LO	OK
6	1	0	1	1	0	0x16	HW + HI + DLY	-
7	1	0	1	1	1	0x17	HW + HI	-
8	1	1	0	X	0	0x18	SW + DLY	-
9	1	1	0	X	1	0x19	SW	OK
10	1	1	1	0	0	0x1C	HW + LO + SW + DLY	-
11	1	1	1	0	1	0x1D	HW + LO + SW	OK
12	1	1	1	1	0	0x1E	HW + HI + SW + DLY	-
13	1	1	1	1	1	0x1F	HW + HI + SW	-

[1] :

X = don’t care

HW = turn-on/off by control pin

HI = control pin active high turn-on power

LO = control pin active low turn-on power

SW = turn-on/off by operation command

DLY = turn-off delay

6 CLEAR_FAULTS Command (03h)

Operation Notice：

Null.

6.1 Power clear faults methods

The Power have four methods can be clear PMBus faults.

Method	Description
1	PMBus clear faults command
2	PMBus operation RESET[1]
3	PS RESET[1]
4	AC RESET[1]

[1] : RESET mean is Turn-OFF → Turn-ON

7 STATUS_WORD Command (79h)

Byte	Bit Number	Status Bit Name	Meaning	Supported
Low	7	BUSY	A fault was declared because the device was busy and unable to respond.	-
	6	OFF	This bit is asserted if the unit is not providing power to the output, regardless of the reason, including simply not being enabled.	Ok
	5	VOUT_OV	An output overvoltage fault has occurred	Ok
	4	IOUT_OC	An output overcurrent fault has occurred	Ok
	3	VIN_UV	An input under voltage fault has occurred	Ok
	2	TEMPER-ATURE	A temperature fault or warning has occurred	Ok
	1	CML	A communications, memory or logic fault has occurred	-
	0	NONE OF THE ABOVE	A fault or warning not listed in bits [7:1] of this byte has occurred	-
High	7	VOUT	An output voltage fault or warning has occurred	Ok
	6	IOUT/POUT	An output current or output power fault or warning has occurred	Ok
	5	INPUT	An input voltage, input current, or input power fault or warning has occurred	Ok
	4	MFR	A manufacturer specific fault or warning has occurred	-
	3	POWER_ GOOD#	The POWER_GOOD signal, if present, is negated	Ok
	2	FANS	A fan or airflow fault or warning has occurred	Ok
	1	OTHER	A bit in STATUS_OTHER is set	-
	0	UNKNOWN	A fault type not given in bits [15:1] of the SATUS_WORD has been detected	-

8 STATUS_VOUT Command (7Ah)

Bit	Meaning	Supported
7	VOUT Overvoltage Fault	Ok
6	VOUT Overvoltage Warning	-
5	VOUT Under voltage Warning	-
4	VOUT Under voltage Fault	Ok
3	VOUT_MAX Warning (An attempt has been made to set the output voltage to value higher than allowed by the VOUT_MAX command	-
2	TON_MAX_FAULT	-
1	TOFF_MAX Warning	-
0	VOUT Tracking Error	-

9 STATUS_IOUT Command (7Bh)

Bit	Meaning	Supported
7	IOUT Overcurrent Fault	Ok
6	IOUT Overcurrent And Low Voltage Shutdown Fault	Ok
5	IOUT Overcurrent Warning	Ok
4	IOUT Undercurrent Fault	-
3	Current Share Fault	-
2	Power Limiting	-
1	POUT Overpower Fault	OK
0	POUT Overpower Warning	OK

10 STATUS_INPUT Command (7Ch)

Bit	Meaning	Supported
7	VIN Overvoltage Fault	-
6	VIN Overvoltage Warning	OK
5	VIN Under voltage Warning	OK
4	VIN Under voltage Fault	OK
3	Unit Is Off For Insufficient Input Voltage	-
2	IIN Overcurrent Fault	OK
1	IIN Overcurrent Warning	OK
0	PIN Overpower Warning	OK

11 STATUS_TEMPERATURE Command (7Dh)

Bit	Meaning	Supported
7	Over temperature Fault	Ok
6	Over temperature Warning	Ok
5	Under temperature Warning	-
4	Under temperature Fault	-
3	Reserved	
2	Reserved	
1	Reserved	
0	Reserved	

12 STATUS_CML Command (7Eh)

Bit	Meaning	Supported
7	Invalid Or Unsupported Command Received	-
6	Invalid Or Unsupported Data Received	-
5	Packet Error Check Failed	-
4	Memory Fault Detected	-
3	Processor Fault Detected	-
2	Reserved	-
1	A communication fault other than the ones listed in this table has occurred	-
0	Other Memory Or Logic Fault has occurred.	-

13 STATUS_FAN_1_2 Command (81h)

Bit	Meaning	Supported
7	Fan 1 Fault	Ok
6	Fan 2 Fault	-
5	Fan 1 Warning	Ok
4	Fan 2 Warning	-
3	Fan 1 Speed Overridden	Ok
2	Fan 2 Speed Overridden	-
1	Airflow Fault	-
0	Airflow Warning	OK

14 Command Summary supported

Command Code	Name	Type	Data Bytes	Conditions
00h	PAGE	R/W Byte	1	
01h	OPERATION	R/W Byte		
02h	ON_OFF_CONFIG	R/W Byte		
03h	CLEAR_FAULTS	Send Byte	0	
05h	PAGE_PLUS_WRITE	Write Byte		
06h	PAGE_PLUSE_READ	R/W Byte		
19h	CAPABILITY	Read Byte	1	Value is 90h
1Ah	QUERY	Block Write-Block Read Process Call	See PMBUS SPEC	
1Bh	SMBALERT_MASK	R/W Byte		
3Ah	FAN_CONFIG_1_2	Read Byte	1	
3Bh	FAN_COMMAND_1	R/W Word	2	
4Ah	IOUT_OC_WARN_LIMIT	Read Word	2	Page member
79h	STATUS_WORD	Read Word	2	
7Ah	STATUS_VOUT	Read Byte	1	Page member
7Bh	STATUS_IOUT	Read Byte	1	Page member
7Ch	STATUS_INPUT	Read Byte	1	
7Dh	STATUS_TEMPERATURE	Read Byte	1	
81h	STATUS_FANS_1_2	R/W Byte	1	
86h	READ_EIN	Read	6	
87h	READ_EOUT	Read	6	
88h	READ_VIN	Read Word	2	
89h	READ_IIN	Read Word	2	
8Bh	READ_VOUT	Read Word	2	Page member
8Ch	READ_IOUT	Read Word	2	Page member
8Dh	READ_TEMPERATURE_1	Read Word	2	
8Eh	READ_TEMPERATURE_2	Read Word	2	
90h	READ_FAN_SPEED_1	Read Word	2	
95h	READ_FREQUENCY	Read Word	2	
96h	READ_POUT	Read Word	2	
97h	READ_PIN	Read Word	2	
98h	PMBUS_REVISION	Read Byte	1	

ADh	IC_DEVICE_ID	Read Block		
D1h	MFR_FW_ID	Read Block	Variable	1M.0001.0013.001
D4h	MFR_FW_DATE	Read Block	Variable	
D7h	MFR_CAL_INPUT	R/W		

15 Firmware control rules

15.1 Auto fan control rule

➢ **1. Temperature control Fan duty cycle**

Control conditions Temperature (℃)	Fan duty cycle (%)
TEMP >0 & TEMP <= 50	**10**
TEMP >50 & TEMP <=60	**10 ~ 50**
TEMP >60 & TEMP <=80	**50 ~ 70**
TEMP >80 & TEMP <=90	**70 ~ 100**
TEMP >90	**100**

➢ **2. PMBus control Fan duty cycle**

Control conditions PMBus fan control command (%)	Fan duty cycle (%)
Command value	**Command value**

Both two methods can control fan duty cycle at the same time, max duty cycle is final output value.

➢ **3. Other rule control Fan duty cycle**

rule	Fan duty cycle (%)
Environmental temperature > Power heat sink temperature & Environmental temperature > 40℃	**70**
Output power > 595W & Power heat sink temperature < 60℃	**50**

15.2 LED control rules

Event	Green led	Amber led
No AC power plug in.	OFF	OFF
AC ok + power turn-off.	Every sec blink once.	OFF
AC ok + power turn-on, no failure event.	Green led turn-on.	OFF
AC ok + power turn-on, failure event.	OFF	ON
AC ok + power turn-on, warning event.	Green and amber led on every sec exchange of blink.	Green and amber led on every sec exchange of blink.

16 Firmware Protection

- 1.Hardware SCP
- 2.Hardware OVP
- 3.Vout Over Voltage

	Protect threshold
12V	13.8 V
5V	6.1 V
3.3V	3.9 V

- 4.Vout Under Voltage

	Protect threshold
12V	10.5V
5V	4.5V
3.3V	2.9V

- 5.Iout Over Current

	Warning threshold	Protect threshold
12V	19A	19.5A
5V	33A	36A
3.3V	33A	36A

- 6.Over Temperature

Temperature1：Environmental temperature

Temperature2：Power heat sink temperature

	Warning threshold	Protect threshold
Temperature 1	70℃	75℃
Temperature 2	95℃	100℃

- 7.Over Temperature Re-start

	Re-start temperature	
Temperature 1	65℃	
Temperature 2 (Temperature 2 >25℃)	60℃	

- 8.AC Input Under Voltage

	Vin UV Warning threshold	Vin UV Protect threshold(hold 4sec)
AC Vin	82V	76V

- 9.AC Input Over Voltage

	Vin OV Warning threshold	Vin OV Protect threshold(hold 4sec)
AC Vin	270V	280V

- 10.AC Iin Over Current

	Iin OC Warning threshold	Iin OC Protect threshold
AC Iin	11A	11.5A

- 11.AC Pin Over Power

	Over Power Warning threshold(hold 5sec turn-off PSU)
AC Input Power	1kW

- 12.Pout Over Power

	Pout Over Power Warning threshold	Pout Over Power Protect threshold(hold 4sec)
Output Power	800W	860W

- 13.Fan Protection

	Warning threshold	Protect threshold	Life Protect threshold (when duty>75%)	Life Protect threshold (when duty>50%)
Fan 1	1200rpm	1000rpm	4000rpm	2000rpm
Fan2	300rpm	100rpm	4000rpm	2000rpm