MANUFACTURE TEST REQUIREMENT

MODELNAME : PS-2251-3S

CUSTOMER : CISCO

DATE : Mar. 24 , 2020

REV : A

PREPARED BY : Pippen Huang

Ellen Liao

CHECKED BY :

APPROVED BY :

Modification History

Revision	Date	Description	Sections Affected	Originator
X01	8/6/2019	Initial	All	Pippen Huang
X02	10/17/2019	1. Change Accuracy 30% load Pin SPEC	1.2.1	Pippen Huang
	11/01/2019	2. Delete ripple noise 100MHz test condition Add AC_OK, SCL and SDA signal ripple SPEC	3	Pippen Huang
		3. Change 12V overshoot SPEC	4	Pippen Huang
		4. Change 12V dynamic load SPEC	5	Pippen Huang
		5. Change surge, ESD and EFT SPEC	22, 23, 24	Pippen Huang
	11/05/2019	6. Calibration change: Vout Setpoint formula	1.1.3	Ellen Liao
X03	11/18/2019	1. Change 12V overshoot SPEC	4	Pippen Huang
		2. Change FW version from D5h to EBh	1.2.2	Ellen Liao
X04	12/02/2019	1. update Vout Setpoint/Droop Calibration	1.1.3	Ellen Liao
A	03/24/2020	1. Change Accuracy 30% load Iin, Iout and Pout	1.2.1	Pippen Huang

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1. Initial Test (Pre-Check)

1.1 Trimming and Calibration

1.1.1 Background

Factory Mode Enable Command
S + ADDRw + 0xD1 + 0x4C + 0x69 + 0x6F + 0x6E + P
Calibration Clear Command
S + ADDRw + 0xBD + 0x01 + 0x02 + P
Calibration Write Command
S + ADDRw + 0xBD + 0x08 + 0x00 + Index + $Slope_0$ + $Slope_1$ + $Offset_0$ + $Offset_1$+ $Offset_2$ + $Offset_3$ + P
Calibration Read Command
S + ADDRw + 0xBD + 0x02 + 0x01 + Index + RS + ADDRr + 0x06 + $Slope_0$ + $Slope_1$ + $Offset_0$ + $Offset_1$+ $Offset_2$ + $Offset_3$ + P
Enable the Calibration Save Command
S + ADDRw + 0xEA + 0x9A + P
Disable the Calibration Save Command
S + ADDRw + 0xEA + 0x56 + P

1.1.2 Calibration Setup

- PSON Low, 12V/1A
- Power up UUT with 115VAC
- I2C Address 0xB4 or 0xB6
- Enable factory mode by Factory Mode Enable Command.
- Clear all calibration data by Calibration Clear Command.
- Calibration Write Command is used to write trim data.
- Related Pmbus commands as below.

Command	Code	Format
Input Voltage	0x88	Linear Format (N = -1)
Input Current	0x89	Linear Format (N = -7)
Input Power	0x97	Linear Format (N = 0)
Output Voltage	0x8B	Linear Format (direct with one decimal place)
Output Current	0x8C	Linear Format (direct with one decimal place)
Output Power	0x96	Linear Format (N = 0)

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- Calibration Data Index as below.

Item	Index
Vin Reporting	0x00
Reserved	0x01
Reserved	0x02
Iin Reporting Low#1	0x03
Iin Reporting Low#2	0x04
Reserved	0x05
Iin Reporting High#1	0x06
Iin Reporting High#2	0x07
Reserved	0x08
Pin Reporting Low#1	0x09
Pin Reporting Low#2	0x0A
Reserved	0x0B
Pin Reporting High#1	0x0C
Pin Reporting High#2	0x0D
Reserved	0x0E
Reserved	0x0F
Vout Setpoint	0x10
Vout Reporting	0x11
Reserved	0x12
Iout Reporting#1	0x13
Iout Reporting#2	0x14
Reserved	0x15
DroopRef	0x16
Reserved	0x17
Reserved	0x18
Reserved	0x19

1.1.3 Vout Setpoint/Droop Calibration

Item	Offset1		
Setup	PSON# Low		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/10.5A	Meter
A' = 12.0V			Spec
Write Command Line			
S + ADDRw + 0xBD + 0x08 + 0x00 + 0x10 + 0x00 + 0x00 + 0xF4 + 0x01 + 0x00 + 0x00 + P			
Parameter	Input Voltage	Output Load	Source
D	115VAC	12V/10.5A	Meter
K1 = 500			
Equation	$R = \frac{(A - D) \times 1000}{K1}$		

Item	Slope1 + Offset1		
Equation	$O1 = \frac{(A - A') \times 1000}{R}$		
Slope1 = M	M = 0xFFFF		
Offset1 = O1			
Index = 0x10			
Write Calibration Data			
- Represent *Slope2* to **A 2 Byte Hex value**. (*Slope₁* + *Slope₀*) - Represent *Offset2* to **A 4 Byte Hex value**. (*Offset₃* + *Offset₂* + *Offset₁* + *Offset₀*) - Write calibration data by Calibration Write Command, Index 0x10			
Design Requirement			
- 12V/10.5A = 12.00V ± **0.01Vdc**			

1.1.4 Vout Reporting Calibration

Item	Slope		
Setup	PSON# Low		
Equation	$X = \frac{B}{A} \times N$		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/10.5A	Cmd 0x8B
B = 12V			Spec
N = 1024			
Slope = X			
Index = 0x11			
Write Calibration Data			
- Represent *Slope* to **A 2 Byte Hex value**. (*Slope₁* + *Slope₀*) - Represent *0x00000000* to **A 4 Byte Hex value**. (*Offset₃* + *Offset₂* + *Offset₁* + *Offset₀*) - Write calibration data by Calibration Write Command, Index 0x11			
Design Requirement			
- Cmd 0x8B/10.5A = 12V ± 5%			

1.1.5 Iout Reporting Calibration

Item	Slope1 + Offset1		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B \right) \right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/1A	Meter
B			Cmd 0x8C
A’		12V/4A	Meter
B’			Cmd 0x8C
M = 1024			
N = 65536			
Slope1 = X			
Offset1 = Y			
Index = 0x13			
Item	Slope2 + Offset2		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B \right) \right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/4A	Meter
B			Cmd 0x8C
A’		12V/20A	Meter
B’			Cmd 0x8C
M = 1024			
N = 65536			

Slope2 = X			
Offset2 = Y			
Index = 0x14			
Write Calibration Data			
- Represent *Slope1* to **A 2 Byte Hex value**. ($Slope_1$ + $Slope_0$) - Represent *Offset1* to **A 4 Byte Hex value**. ($Offset_3$ + $Offset_2$ + $Offset_1$ + $Offset_0$) - Write calibration data by Calibration Write Command, Index 0x13 - Represent *Slope2* to **A 2 Byte Hex value**. ($Slope_1$ + $Slope_0$) - Represent *Offset2* to **A 4 Byte Hex value**. ($Offset_3$ + $Offset_2$ + $Offset_1$ + $Offset_0$) - Write calibration data by Calibration Write Command, Index 0x14			
Design Requirement			
- See 1.2.1			

1.1.6 Iin Reporting Calibration

1.1.6.1 Low Line

Item	Slope1 + Offset1		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B\right)\right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/1A	Meter
B			Cmd 0x89
A’	115VAC	12V/4A	Meter
B’			Cmd 0x89
M = 1024			
N = 262144			
Slope1 = X			
Offset1 = Y			
Index = 0x03			
Item	Slope2 + Offset2		
Setup	PSON# Low		

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Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B \right) \right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/4A	Meter
B			Cmd 0x89
A’	115VAC	12V/20A	Meter
B’			Cmd 0x89
M = 1024			
N = 262144			
Slope2 = X			
Offset2 = Y			
Index = 0x04			

Write Calibration Data

- Represent *Slope1* to **A 2 Byte Hex value**. (*Slope*$_1$ + *Slope*$_0$)
- Represent *Offset1* to **A 4 Byte Hex value**. (*Offset*$_3$ + *Offset*$_2$ + *Offset*$_1$ + *Offset*$_0$)
- Write calibration data by Calibration Write Command, Index 0x03
- Represent *Slope2* to **A 2 Byte Hex value**. (*Slope*$_1$ + *Slope*$_0$)
- Represent *Offset2* to **A 4 Byte Hex value**. (*Offset*$_3$ + *Offset*$_2$ + *Offset*$_1$ + *Offset*$_0$)
- Write calibration data by Calibration Write Command, Index 0x04

Design Requirement

- See 1.2.1

1.1.6.2 High Line

Item	Slope1 + Offset1		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B\right)\right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	230VAC	12V/1A	Meter
B			Cmd 0x89
A’	230VAC	12V/4A	Meter
B’			Cmd 0x89
M = 1024			
N = 262144			
Slope1 = X			
Offset1 = Y			
Index = 0x06			
Item	Slope2 + Offset2		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B\right)\right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	230VAC	12V/4A	Meter
B			Cmd 0x89
A’		12V/20A	Meter
B’			Cmd 0x89
M = 1024			
N = 262144			
Slope2 = X			
Offset2 = Y			
Index = 0x07			
Write Calibration Data			

- Represent *Slope1* to **A 2 Byte Hex value**. (*Slope*$_1$ + *Slope*$_0$)
- Represent *Offset1* to **A 4 Byte Hex value**. (*Offset*$_3$ + *Offset*$_2$ + *Offset*$_1$ + *Offset*$_0$)
- Write calibration data by Calibration Write Command, Index 0x06
- Represent *Slope2* to **A 2 Byte Hex value**. (*Slope*$_1$ + *Slope*$_0$)
- Represent *Offset2* to **A 4 Byte Hex value**. (*Offset*$_3$ + *Offset*$_2$ + *Offset*$_1$ + *Offset*$_0$)
- Write calibration data by Calibration Write Command, Index 0x07

Design Requirement

- See 1.2.1

1.1.7 Pin Reporting Calibration

1.1.7.1 Low Line

Item	Slope1 + Offset1		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B \right) \right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/1A	Meter
B			Cmd 0x97
A’	115VAC	12V/4A	Meter
B’			Cmd 0x97
M = 1024			
N = 1024			
Slope1 = X			
Offset1 = Y			
Index = 0x09			
Item	Slope2 + Offset2		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B \right) \right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	115VAC	12V/4A	Meter
B			Cmd 0x97
A’		12V/20A	Meter
B’			Cmd 0x97
M = 1024			

N = 1024			
Slope2 = X			
Offset2 = Y			
Index = 0x0A			
Write Calibration Data			
- Represent *Slope1* to **A 2 Byte Hex value**. (*Slope₁* + *Slope₀*) - Represent *Offset1* to **A 4 Byte Hex value**. (*Offset₃* + *Offset₂* + *Offset₁* + *Offset₀*) - Write calibration data by Calibration Write Command, Index 0x09 - Represent *Slope2* to **A 2 Byte Hex value**. (*Slope₁* + *Slope₀*) - Represent *Offset2* to **A 4 Byte Hex value**. (*Offset₃* + *Offset₂* + *Offset₁* + *Offset₀*) - Write calibration data by Calibration Write Command, Index 0x0A			
Design Requirement			
- See 1.2.1			

1.1.7.2 High Line

Item	Slope1 + Offset1		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B\right)\right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	230VAC	12V/1A	Meter
B			Cmd 0x97
A’		12V/4A	Meter
B’			Cmd 0x97
M = 1024			
N = 1024			
Slope1 = X			
Offset1 = Y			

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Index = 0x0C			
Item	Slope2 + Offset2		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B \right) \right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	230VAC	12V/4A	Meter
B			Cmd 0x97
A’		12V/20A	Meter
B’			Cmd 0x97
M = 1024			
N = 1024			
Slope2 = X			
Offset2 = Y			
Index = 0x0D			

Write Calibration Data

- Represent *Slope1* to **A 2 Byte Hex value**. (*Slope*$_1$ + *Slope*$_0$)
- Represent *Offset1* to **A 4 Byte Hex value**. (*Offset*$_3$ + *Offset*$_2$ + *Offset*$_1$ + *Offset*$_0$)
- Write calibration data by Calibration Write Command, Index 0x0C
- Represent *Slope2* to **A 2 Byte Hex value**. (*Slope*$_1$ + *Slope*$_0$)
- Represent *Offset2* to **A 4 Byte Hex value**. (*Offset*$_3$ + *Offset*$_2$ + *Offset*$_1$ + *Offset*$_0$)
- Write calibration data by Calibration Write Command, Index 0x0D

Design Requirement

- See 1.2.1

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1.1.8 Vin Reporting Calibration

Item	Slope + Offset		
Setup	PSON# Low		
Equation	$X = \frac{A'-A}{B'-B} \times M$ $Y = \left(A - \left(\frac{X}{M} \times B \right) \right) \times N$		
Parameter	Input Voltage	Output Load	Source
A	90VAC	12V/1A	Meter
B			Cmd 0x88
A’	264VAC		Meter
B’			Cmd 0x88
M = 1024			
N = 65536			
Slope1 = X			
Offset1 = Y			
Index = 0x00			
Write Calibration Data			
- Represent *Slope* to **A 2 Byte Hex value**. (*Slope*$_1$ + *Slope*$_0$) - Represent *Offset* to **A 4 Byte Hex value**. (*Offset*$_3$ + *Offset*$_2$ + *Offset*$_1$ + *Offset*$_0$) - Write calibration data by Calibration Write Command, Index 0x00			
Design Requirement			
- See 1.2.1			

※ <Note>

After finishing the calibration steps, we need to disable calibration save key. (Write the disable calibration save key 0x56 to PMbus command 0xEA.)

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1.1.9 Note

- All of the calculate results shall be **Rounded Off**.
- The actual 12V Output Voltage should be measured by 6-1/2 digital multi-meter (Agilent-34401A or equal).
- The actual Output Current should be sensed from electronic load.
- **All the data measured and read from power meter, multimeter, electric load should have 1% accuracy to prevent calibration fail.**

1.2 Reporting and Accuracy

1.2.1 Accuracy

Vin	Load	+12V	+12Vsb	Line Voltage Accuracy	Input line Current Accuracy	Input Power Accuracy	Output Voltage Accuracy	Output Current Accuracy	Output Power Accuracy
Vac/Hz	%	(A)	(A)						
	100	21	0.5						
	90	18.9	0.45						
	80	16.8	0.4						
115V/60Hz	70	14.7	0.35		**+/-5%**	**+/-5%**		**+/-5%**	**+/-5%**
208V/60Hz	60	12.6	0.3	**+/-5%**			**+/-5%**		
230V/50Hz	50	10.5	0.25						
	40	8.4	0.2						
	30	6.3	0.15		**+/-10%**	**+/-10%**		**+/-10%**	**+/-10%**
	20	4.2	0.1						

Note:

- Vin (ac), Iin (ac), Pin (ac) real data must using power analyzer to measurement.

Test input voltage: 115VAC/60Hz, 208VAC/60Hz, 230VAC/50Hz

- Minimum settling time for readings is 5 sec.

1.2.2 Reporting

Command	Code	Test Condition	Design Requirement
Read_FAN_SPEED_1	0x90	Any	> 1000 rpm < 20000 rpm
Inlet Temperature	0x8D	Any	125℃＞Temp＞ -30℃

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Internal Temperature (Primary hot-spot)	0x8E	Any	125℃＞Temp＞ -30℃
Internal Temperature (Secondary hot-spot)	0x8F	Any	125℃＞Temp＞ -30℃
Firmware Revision (Under Factory Mode)	0xEB	Read 2 bytes (01XX)	Refer to the most recent firmware control list/DN

Note:

- The actual 12V Output Voltage should be measured by 6-1/2 digital multi-meter (Agilent-34401A or equal).
- The actual Output Current should be sensed from electronic load.
- **All the data measured and read from power meter, multi-meter, electric load should have 1% accuracy to prevent calibration fail.**

1.3 I2C Address Pin

- I2C Address Pin is pulled up internally inside UUT.
- I2C Address Pin has to be pulled up/down externally on test fixture to decide which I2C address is going to be recognized by UUT.
- While I2C Address Pin is pulled up externally, the I2C address of UUT is 0xB6.
- While I2C Address Pin is pulled down externally, the I2C address of UUT is 0xB4.
- The resistance of Pull up/down resister is 1Kohm.
- See below table for electrical requirement.

I2C Address Pin	Min.	Max.	Unit
Pull up	3.0	3.4	V
Pull down	0	0.8	V

1.4 FRU

- Refer to the most recent DN for FRU spec.
- FRU data should be flashed into an EEPROM device inside UUT through I2C address 0xA0/0xA2/0xA4/0xA6 (depending on I2C Address Pin).
- FRU Write should be enabled through Pmbus command 0xEA followed by a data byte with designated key before flashing FRU data into EEPROM.
- FRU Write should be disabled through Pmbus command 0xEA followed by a data byte with designated key after FRU data flashing completed.
- S + ADDRw + 0xEA + KEY + P

KEY	Description
0x56	Write access to the EEPROM is disabled
0x9A	Write access to the EEPROM is enabled

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1. Initial output voltage confirm for ATE

Input Voltage	Output Current	Output Voltage
230Vac/50Hz	+12V/10.5A +12Vsb /0A	+12Vsb : 11.4~12.6V +12V : 11.94~12.06V

2. Regulation(Load 變動率請參照 Dynamic test 勿超出 50% , AC input voltage 變動率勿超過 120V)

Test Condition	Output Current	Design Requirement
85Vac/47Hz 115Vac/60Hz 230Vac/50Hz 264Vac/63Hz	+12V/1A, +12Vsb/0A +12V/1A, +12Vsb/0.5A +12V/10.5A, +12Vsb/0.25A +12V/21A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	+12V : 11.4V~12.6V +12Vsb : 11.4V~12.6V

3. Ripple noise

Test Condition	Output Current	Design requirement
85Vac/47Hz 115Vac/60Hz 230Vac/50Hz 264Vac/63Hz	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	+12V < 240mVpp +12Vsb < 240mVpp (20M bandwidth)
With 10.1uf + 500uf on +12V **With 10.1uf + 20uf on +12VSB** **With 0.01uf on Signals**		AC_OK Signals ≤ 300mVpp PW_OK Signals ≤ 300mVpp SCL & SDA Signals ≤ 200mVpp (20M bandwidth)

4. Overshoot / Undershoot

Test Condition	Output Current	Design requirement
85Vac/47Hz 115Vac/60Hz 230Vac/50Hz 264Vac/63Hz	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	+12V Max load <= +-10% (12.87V) +12V Min load <= +-10% (13.5V) +12Vsb <= +-10%(13.2V)
With 500uf on +12V and 20uf on +12VSB **With 11000uf on +12V and 1000uf on +12VSB**		

5. Dynamic Load Response

Test Condition	Output Current				Design Requirement
85Vac/47Hz 264Vac/63Hz	Case	+12V Dynamic (A)		+12V SB	Case1&2 +12V : 11.64V~12.67V Case3&4 +12V : 11.115V~12.915V +12Vsb : 11.40V~12.60V
	1	1	12	0	
With 500uf on +12V	2	1	12	0.5	
With 20uf on +12VSB	3	1	21	0	
	4	1	21	0.5	
With 1A/us on +12V	Case	+12Vsb Dynamic (A)		+12V	
With 1A/us on +12VSB	5	0	0.5	1	
1. 10ms (50%~50% DUTY) **2. 50ms (50%~50% DUTY)**	6	0	0.5	21	

6. AC Sweep

Test Condition	Output Current	Design Requirement
85Vac to 264Vac for 5s then back	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	+12V : 11.40~12.60 +12Vsb : 11.40~12.60

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7. AC Line Sag/Surge Transient

Test Condition	Output Current	Design Requirement
	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	

Duration	Sag	Operating AC Voltage	Line Frequency	Performance Criteria
Continuous	10%	115Vac 230Vac	50/60 Hz	No loss of function or performance
0 to 1 AC cycle	100%	115Vac 230Vac	50/60 Hz	No loss of function or performance preferred. If unit shuts down due to hold up time limit, unit shall recover into full performance after the sag.
> 1 AC cycle	>10%	115Vac 230Vac	50/60 Hz	Loss of function acceptable, self-recoverable
Duration	**Surge**	**Operating AC Voltage**	**Line Frequency**	**Performance Criteria**
Continuous	10%	115Vac 230Vac	50/60 Hz	No loss of function or performance
0 to ½ AC cycle	30%	115Vac 230Vac	50/60 Hz	No loss of function or performance
100ms	300Vac	264Vac	50/60 Hz	No loss of function or performance

8. AC Line Distortion (VTHD 10%)

Test Condition	Output Current	Design Requirement
115Vac/60Hz 230Vac/50Hz V-THD (10%)	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	Outputs turn on monotonically. +12V : 11.4V~12.6V +12Vsb : 11.4V~12.6V

9. Efficiency

Test condition	Output Current	Design requirement
115Vac/60Hz	+12V/21A, +12Vsb/0.5A	>=85%
	+12V/10.5A, +12Vsb/0.25A	>=88% , PF>0.90
	+12V/ 4.2A, +12Vsb/0.1A	>=85%
230Vac/50Hz	+12V/21A, +12Vsb/0.5A	>=85%
	+12V/10.5A, +12Vsb/0.25A	>=89% , PF>0.90
	+12V/ 4.2A, +12Vsb/0.1A	>=85%

Notes :
1. Fan loading is included for efficiency measurement

10. Inrush current (測試值不包含 X 電容充電流，由 DQE 拔除 X 電容驗證測試)

Test Condition	Output Current	Design Requirement
115Vac/60Hz 230Vac/50Hz	+12V/21A, +12Vsb/0.5A	Cold start <30A Cold start <60A

11. Input Current

Test Condition	Output Current	Design Requirement
115Vac/60Hz 230Vac/50Hz	+12V/21A, +12Vsb/0.5A	<2.7A <1.4A

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12. Harmonic Current

Test Condition	Output Current	Design Requirement
115Vac/60Hz 230Vac/50Hz	+12V/21A, +12Vsb/0.5A Input 75W	Class A

13. Signal outputs test

Signal Name	PS I/O	Description
AC_OK	Output Open-Collector	High = AC Present (The AC Present Range is 88Vac~275Vac.) Low = AC Not Present (The AC Range is out of the 88Vac~275Vac.) (PS internal pull-up = 4.7K 3.3V, MB pull-up 10K)
PS_OK	Output Open-Collector	Indicates that the 12v Main and Standby output voltages are operational. High = 12VDC main output is greater than (>) 10.9V and less than (<) 13.2V, AND when 12VSB output is > 10.9V and < 13.2V. If any of the outputs fail due to over current protection, over voltage protection, output under voltage, or over temperature protection, then this output will be driven LOW". (PS internal pull-up = 4.7K 3.3v, MB pull-up 10K)

Test Condition	Output Current	Design requirement	
85Vac/47Hz 115Vac/60Hz 230Vac/50Hz 264Vac/63Hz	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	Reference table	
		Parameter	Voltage Level
		Output High	2.4V (2.4~3.5)
		Output Low	0.4V (0~0.4)
		Input High	2.1V (2.1~3.2)
		Input Low	0.7V(0~0.7)

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14. LED Indicators

Function		Green	Amber
OCP	12V Warning (optional)	Off	Blinking
OCP	12V Protection	Off	Solid On
OVP	12V	Off	Solid On
SCP	12V	Off	Solid On
UVP	12V	Off	Solid On
FAN Fault	Lock (before OTP)	Off	Blinking
FAN Fault	Lock (after OTP)	Off	Solid On
OTP	Warning	Off	Blinking
OTP	Protection	Off	Solid On
12V Main On		Solid on	Off
12V Main Off (Standby mode)		Blinking	Off
No AC Power input (all present supplies)		Off	Off
No AC Power input Other 2nd supply functioning		Off	Solid On
12V Main On (CR Slave PSU is in Sleep mode)		Blinking	Off
12V Main and 12V Standby Outputs Off (PSKILL High or NC)		Blinking	Off

15. Dropout

Test Condition	Output Current	Design requirement
85Vac/47Hz 264Vac/63Hz Case 1: drop to 0V for 5ms Case 2 drop to 0V for 20ms Case 3: drop to 0V for 50ms Case 4: drop to 0V for 100ms Case 5: drop to 0V for 500ms	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	Case 1: Outputs and PS_OK keep in regulation (11.4V~12.6V)(2.4V~3.5V) Case 2: Outputs keep in regulation and PS_OK turn on monotonically Case 3: Outputs and PS_OK turn on monotonically

16. Brown-in and Brown-out

Test Condition	Output Current	Design requirement
85Vac to 0Vac then back **With 500uf on +12V and 20uf on +12VSB**	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	Output no oscillation Brown In: 80 ~ 85Vac Brown Out: 70 ~ 82Vac

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17. TIMING

Item	Description	MIN	MAX	UNITS
Tvout_rise	Output voltage rise time (each output)	1.5	300	msec
Tsb_on_delay	Delay from AC being applied to 12VSB being within regulation.		2000	msec
Tac_on_delay	Delay from AC being applied to all output voltages being within regulation.		2000	msec
Tvout_holdup	Time all output voltages, including 12VSB, stay within regulation after loss of AC.	20		msec
Tpw_ok_holdup	Delay from loss of AC to de-assertion of PW_OK	20		msec
Tps_on_l_delay	Delay from PS_ON active to output voltages within regulation limits.	5	3000	msec
Tps_on_l_pw_ok	Delay from PS_ON deactive to PW_OK being deasserted.		20	msec
Tac_ok_on	Delay from AC input turn on to assertion of AC_OK.	100	1000	msec
Tac_ok_off	Delay from loss of AC input to deassertion of AC_OK		20	msec
Tpw_ok_on	Delay from output voltages within regulation limits to PW_OK asserted at turn on.	100	1000	msec
Tpw_ok_off	Delay from PW_OK deasserted to 12VDC dropping out of regulation limits.	1	700	msec
Tpw_ok_low	Duration of PW_OK being in the deasserted state during an off/on cycle using AC or the PS_ON signal.	100		msec
Tsb_vout	Delay from 12VSB being in regulation to 12VDC being in regulation at AC turn on.	50	1500	msec

Test Condition	Output Current	Design Requirement
85Vac/47Hz 264Vac/63Hz	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	Reference graph and table

18. SCP.

Test Condition	Output Current	Design Requirement
85Vac/47Hz 264Vac/63Hz	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	Short on +12V: +12V: Hiccup +12Vsb: Remain Short on +12Vsb: Hiccup

19. OCP

Test Condition	Output Current	Design Requirement
85Vac/47Hz 264Vac/63Hz	+12V/21A, +12Vsb/0.5A	OCP +12V: 24~28A +12V: Hiccup +12Vsb: Remain OCP +12VSB: 0.8A~1.3A +12Vsb: Hiccup

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20. OVP

Test Condition	Output Current	Design Requirement
85Vac/47Hz 264Vac/63Hz	+12V/1A, +12Vsb/0A +12V/21A, +12Vsb/0.5A	OVP on +12V: 13.0.~15V +12V latch off, +12Vsb: Remain OVP on +12VSB: 13.0~15V +12V latch off, +12Vsb: Hiccup

21. Hi-POT TEST

Test Condition	Output Current	Design Requirement
2121 V_{DC}	Input/Case Input/Output	No error and No damage

22. Lightning Surge

Test Condition		Design Requirement
BI Wave 110Vac/60Hz 220Vac/50Hz	2KV Differential mode(Criteria A) 4KV Common mode(Criteria A)	No error and No damage

23. ESD

Test Condition		Design Requirement
EN61000-4-2 110Vac/60Hz 220Vac/50Hz	+/- 15KV air discharge +/- 8KV contact discharge	No error and No damage

24. EFT

Test Condition		Design Requirement
EN 61000-4-4 110Vac/60Hz 220Vac/50Hz	0.5KV min (Criteria A)	No error and No damage

25. LEAKAGE CURRENT

Test Condition		Design Requirement
240Vac/50Hz	L / N	< 1.0mA
264Vac/60Hz	L / N	< 3.5mA

26. IR

Test Condition		Design Requirement
500Vdc, 60s		> 2M ohm

27. EMI

Test Condition		Design Requirement
EN55022 115Vac/60Hz 230Vac/50Hz	Class A	Under 6dB

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28. Oring-FET Test

Test Condition		Design Requirement
115Vac/60Hz 230Vac/50Hz	+12V/1A, +12Vsb/0.1A	External supply OVP (13.0V~16.0V) Detect PG signal Failed if PG drops

29. IR/GROUNDING

Each unit(100% of production) must pass a production ground continuity test at 25A for at least 2s with less than 0.1 ohm from the safety ground(third wire) input pin to the power supply chassis. Each unit must be marked to indicate it passed the test. Reference Standard EN50116