REV.	Description	Date
S0	RELEASE S/M	01/15/2015
S1	Add FRU SPEC	01/20/2015
S2	Update item2.5 “The turn on and turn off Hysteresis voltage can meet Greater than or equal to 4V.”	04/07/2015
S3	Update item 3.9&3.10& item 6.3	05/12/2015
S4	Update item 2.5.2	06/15/2015
S5	Update item 6.3	07/28/2015
S6	Update item 2.1	08/05/2015
S7	Update item 2.1	08/18/2015
S8	Update Item 3.2	01/26/2016

台達電子工業股份有限公司 DELTA ELECTRONICS, INC.				DESCRIPTION : 電氣規格(Electrical Specification)	
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Date	Drawn	Design (EE)	Design (ME)	DOCUMENT NAME. : **ES-550AB-11 D**	REV. **S8**
01/26/2016	何英	何海濱	鄧合龍		

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1. SCOPE

This requirement defines the key characteristics for the power supply specification. The specification that PS supplier provides shall include but not limited the characteristics in this requirement.

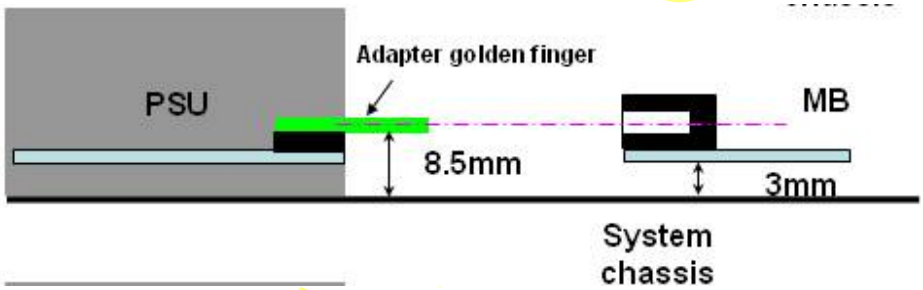
1.1 General

TABLE 1 VENDOR PART NUMBER REFERENCE

P/N	SUPPLIER P/N	DESCRIPTION
XXXXXXX	DPS-550AB-11 D	550W 1+1 REDUNDANT POWER SUPPLY module

1.2 Mechanical requirement

1）Outline dimension
Width: 73.5mm
Thickness:39/40mm
Length: 185mm excluding golden finger
The height of adapter golden finger to 8.5mm



If the height of adapter golden finger need to be changed by Customer, Supplier should meet this change.

2）Gold finger pin assignment as below:

Pin	Name	Pin	Name
A1	GND	B1	GND
A2	GND	B2	GND
A3	GND	B3	GND
A4	GND	B4	GND
A5	GND	B5	GND
A6	GND	B6	GND
A7	GND	B7	GND
A8	GND	B8	GND
A9	GND	B9	GND
A10	+12V	B10	+12V
A11	+12V	B11	+12V
A12	+12V	B12	+12V
A13	+12V	B13	+12V
A14	+12V	B14	+12V
A15	+12V	B15	+12V
A16	+12V	B16	+12V
A17	+12V	B17	+12V
A18	+12V	B18	+12V
A19	SDA	B19	A0
A20	SCL	B20	A1
A21	PSON	B21	12VSB
A22	SMB-ALERT	B22	CR_ 1
A23	RETURN_S	B23	12LS
A24	+12VRS	B24	N_C
A25	PWOK	B25	N_C

3) Bug proof cover and insulator film between all PWB and metal case is necessary.

1.3 Label

The label shall be located at the location that it's easer to see when the system chassis is opened. The marking is legible and preserved permanently. The marking contents shall not be deteriorated due to heating or chemical influence.

A. Model name and PS revision: REV:00, start from the first mass production
B. Vendor's name and Logo: Vendor's S/N .S/N shall be digital and MES BAR, the information from MES BAR shall be same as the digital. S/N defines the code year, the code week and the code number from production line.
C. Input voltage range/nominal input current /input frequency range/nominal output power/nominal output voltages and the max current.
D. Customer P/N. The distance between the P/N position and S/N shall be Min5mm in vertical direction.
E. ROHS mark， WEEE mark.
F. 80 Plus platinum mark.
G. All character shall be English and Simple Chinese.
H. For all of labels, The character or word on the label can not upend

The label picture shall be subject to Customer approval before the PSU sample approval.

2. AC/DC INPUT DATA

2.1 Voltage /current /frequency

The power supply shall operate within all specified limits over the following input voltage range. Harmonic distortion of up to 10% THD shall not cause the power supply to go out of specified limits. The power supply shall be capable of start-up (power-on) with minimum load and full rated power load, at line input as low as 90 VAC whatever AC line is pure sine wave or 10% THD ,or 180Vdc.

Table 2 AC Input Rating

PARAMETER	MIN	RATED	MAX	PEAK
Voltage220Vrms	90Vrms	200-240V_{rms}	264V_{rms}	300V_{rms}
Voltage110Vrms		100-127V_{rms}		
DC input	180Vdc	240Vdc	300Vdc	
Current		<7.1A@100-127VAC <3.4A @200V-240VAC <4A @240Vdc		
Frequency	47HZ	50/60	63 Hz	
Inlet	1 per module,IEC320C-14，10A/250VAC			
VTHD	< 10% THD			
iTHD	<5%@50% Load,3.5%@100% load			
Range	Universal range			

Note: 1. Funtion test at the AC voltage 137V
2. iTHD: Test condition :110V/60Hz and 220V/50Hz

2.2 AC Inrush Current

When input power is applied to the power supply and any initial inrush current surge or spike of 1ms or less shall not exceed 40A peak per module. Any additional inrush current surges or spikes in the form of AC cycles or multiple AC cycles greater than 5ms shall not exceed 60A peak per module.

Inrush current difference between line and neutral is under 0.1A per half cycle of input current and/or the phase difference between line and neutral is less than +/- 20 degrees during each AC input voltage half-cycle. The test should use three current probe to detect the current of line/neutral/PE while test input current.

The PS shall meet inrush requirements for any rated AC voltage, during turn on at any phase of AC voltage, during any AC dropout condition, and during AC power cycling. The AC power cycling test condition is defined as cycling the AC power off and back on after the power supply has been operating at maximum load and has reached thermal stability. The period between the AC power cycles could be anywhere between 20 ms to 10 seconds. The inrush shall be less than the ratings of the critical components. Any inrush current of the AC line shall not cause damage to the power supply.

For Vdc input HVDC, Input current shall be less 30A.

2.3 Hold up time（For AC AND HVDC）

An AC line loss is the condition when AC/HVDC input drops to 0Vac at any phase of the AC line for defined length of time. During an AC/HVDC loss of defined time or less the power supply shall meet dynamic voltage regulation (Table 7) in the rated load at all AC/HVDC input voltages.

1) Hold up time Vout>=13mS for full load. Vout>=17mS for half load(90V~264VAC/180V-300vdc)
2) Hold up time PG>=12mS for full load. PG>=16mS for half load(90V~264VAC/180V-300vdc)
3) Hold up time +12VSB>=25mS for full load.(90V~264VAC/180V-300vdc)

To meet the smart function requirement in the NOD management 2.0, the holdup time of power supply module with low output power must be longer than the high output power's. The lower the output power is, the longer the holdup time shall be.
Any exceptions must be subject customer to approval.

2.4 AC/HVDC line dropout

AC line dropout is the condition when AC or HVDC input drops to 0VAC at any phase of the AC line for any length of time. During an AC or HVDC dropout of 12mS or less the power supply shall meet dynamic voltage regulation (Table 7) in the rated load and half load at all AC or HVDC input voltages. An AC or HVDC line dropout of 12mS or less shall not cause malfunction of control signals or protection circuit trip. If the AC or HVDC dropout lasts longer than 12mS the power supply shall recover and meet all turn on requirements.
During an AC or HVDC dropout of 16mS or less the power supply shall meet dynamic voltage regulation (Table 7) in the half load at rated AC or HVDC input voltages. An AC or HVDC line dropout of 16mS or less shall not cause malfunction of control signals or protection circuit trip. If the AC or HVDC dropout lasts longer than 16mS the power supply shall recover and meet all turn on requirements.
The power supply shall meet the AC or HVDC dropout requirement over rated AC or HVDC input voltages, frequencies, and output loading conditions. Any dropout of the AC or HVDC line shall not cause damage to the power supply

2.5 Brownout

Power supply shall contain protection circuitry such that the application of an input voltage below the minimum specified in table 2 shall not cause damage to the power supply unit nor cause failure of the input fuse and overstress to any other component. In the event of shutdown due to extended brownout, the power supply shall automatically restart after the AC /HVDC input is within specified limits. The voltage level between shutdown and recovery shall have a minimum of 5 VAC/HVDC of voltage hysteresis, so that the power supply will not oscillate on and off due to voltage change condition. The power supply shall meet dynamic voltage regulations (Table 4) and all turn on requirements or turn off requirements while shutdown or recovery. The turn on and

turn off Hysteresis voltage can meet Greater than or equal to 4V.

2.5.1 AC/HVDC Turn off Requirements

Power supply shall go to power off state after a slow brownout condition. The brownout condition shall be tested with all valid redundant power system configurations using the system. While the power system is operating at full rated DC load, the AC/HVDC line voltage shall be reduced from 90VAC/60Hz to 0VAC(180Vdc to 0Vdc) at a constant rate over a period of 30 minutes.
Power supply shall shutdown at the AC voltage 73±5V.
For HVDC, Power supply shall shutdown at the DC voltage 165V±5Vdc
No ouput voltage and signal (PWOK and other signals) oscillate while AC turn off .

2.5.2 AC/HVDC Turn on Requirements

Power supply shall return to normal power up state after a slow recovery condition. The recovery shall be tested in all valid redundant power system configurations. With the test loads configured for maximum system DC output in resistive mode, the AC line voltage shall be increased from 0VAC to 90VAC/60Hz(HVDC: 0Vdc to 180Vdc) at a constant rate over a period of 30 minutes.
Power supply shall turn up at the AC voltage 80V±5V
For HVDC, Power supply shall turn up at the DC voltage 170V±7Vdc

2.5.3 AC/HVDC input identify Requirements

Power supply can identify the current input is AC or DC .System side can get this information via send PMBUS READ Command STATUS_MFR_SPECIFIC (0x80h).

The STATUS_MFR_SPECIFIC command returns one data byte with contents as follows:

Bit Number	Meaning
7(NA)	
6 (NA)	
5(NA)	
4 (NA)	
3(NA)	
2(NA)	
1	DC Input
0	AC Input

STATUS_MFR_SPECIFIC Data Byte Contents

Bit	No Input	AC Input	DC Input	UNUSED
Bit 1 Value	0	0	1	1
Bit 0 Value	0	1	0	1

PMBus STATUS_MFR_SPECIFIC: AC or DC Input

2.6 AC line transient

2.6.1 Compliable with EMC standard

Power supply shall operate within specifications under the following conditions:

a) Transients as defined in IEC 61000-4-4, Electrical Fast Transients standard, up to 1KV at AC line. Applied to six combinations of input AC/DC power (L1, L1-L2, L1-PE, L1-L2-PE, L2, L2-PE).

b) Transients as defined in IEC 61000-4-5, Electrical Surge standard. Up to and including ±2 kV limits and phases 0 degrees, 90 degrees, 180 degrees, 270 degrees.

Surge should meet the criteria in following table as well.

Table 3

	Unidirectional	Ring Wave
AC Leads	2.0 kV	2.0 kV
I/O Leads	1.0 kV	1.0 kV
DC Leads	0.5 kV	0.5 kV

c) Power supply shall comply with IEC 61000-4-3, Electrostatic Discharge standard, up to 8KV and with contact, 15KV with air mode.
d) Power supply must meet all the transient requirements for the CE mark designation.

2.6.2 Line Surge or Sag

Table4 Surge and Sag

Duration	Surge/sag	Operating AC Voltage	Line Frequency	Performance Criteria
500ms	10%	220/110VAC 240VDC	50/60Hz	No loss of function or performance
0 to 1/2 AC cycle	30%	220/110VAC 240VDC	50/60Hz	No loss of function or performance
=1/2 AC cycles	30%	220/110VAC 240VDC	50/60Hz	No loss of function or performance
>1/2 AC cycles	30%/>30%	220/110VAC 240VDC	50/60Hz	Loss of function acceptable, Power supply can starts up automatically

2.7 Efficiency

1) 80 Plus Platinum level standard is necessary. Exceptions should be subject to Customer approval.
Module:
90%,94%,91% (20%;50%;100% load) 230VAC/50Hz
Power supply must meet climate saver platinum level standard, the certification is necessary.
2) Energy star for computer server 2.0 is necessary:
Without Fan

Table5 Efficiency

% of full load(550W) \ Output voltage		+12V(A)	+12VSB(A)	Efficiency(%)
Light load condition	20%	8.594	0.572	230V:>90%
Half load condition	50%	21.485	1.43	230V:>94%
Full load condition	100%	42.97	2.86	230V:>91%

3) 12VSB current is 0.05A in standby mode at 230Vac/50Hz;Input power< 5.0 W, Fan run at a minimum RPM Any exceptions must be subjected to customer approval

2.8 Power factor

Energy star for computer sever 2.0 is necessary.

Output power	10% load	20% load	50% load	100% load
Power factor	> 0.65	> 0.80	> 0.95	> 0.95

Power factor test must meet the test conditions specified in Energy start for computer server 2.0. Test condition,115V/60Hz and 230V/50Hz ,Load condition please reference the above table5 output power.

2.9 Harmonic current

The power supply shall meet the requirements of IEC 61000-3-2 Class A and the Guidelines for the Suppression of Harmonics in Appliances and General Use Equipment Class A for harmonic line current content at all conditions of output power.

2.10 Voltage fluctuations flicks requirements

The power supply shall comply with the applicable limits for voltage fluctuations flickers IEC 61000-3-3.

3. DC OUTPUT DATA

3.1 Power/Currents Rating

The following table define the power and current ratings. The combined output power of all outputs shall not exceed the rated output power. Load ranges are provided for each output level. The power supply shall meet both static, dynamic voltage regulation and timing requirements for the minimum/maximum/cross loading conditions.

Table 6, power and current

Signal	Min(A)	MAX(A)	PEAK(A)
12V	1A	45.0A	51A
12VSB	0A	3.0A	10A
Total(W)		550W	

Footnotes:

1) Maximum continuous power shall not exceed 550W.
2) Peak load on the combined 12V output shall not exceed 51A . The keep time of peak load shall be 12S.
3) 12Vsb should be able to withstand 10A inrush current when power cord is inserted into power supply. But the test way have use capacitive loading to analog system loading.

3.2 Voltage Regulation

The power supply output voltages must stay within the following voltage limits shown in Table 7 when operating at steady state, dynamic loading conditions. And the overshoot at turn on conditions shall also meet the voltage limits. All outputs are measured with reference to the return remote sense (ReturnS) signal. The 12V and 12VSB outputs are measured at the power supply connectors referenced to ReturnS.

Table 7, voltage regulation limits

Static outputs	Min	Max	units	tolerance
+12V	+11.8	+12.4	Vdc	-1.67%, +3.33%
12VSB	+11.4	+12.6	Vdc	- 5%,+5%
Dynamic outputs	Min	Max	units	tolerance
+12V	+11.52	+12.6	Vdc	-4%, +5%
12VSB	+11.4	+12.6	Vdc	- 5%,+5%

Minimum, nominal and maximum output voltage set point shall be suitable to make sure output voltage on the PDB is within the limit in table 7 for all outputs load conditions. The measurement of the output voltage accuracy on this module should be at the PWB mounting pins of output mating connector on the PDB.

3.3 Ripple noise

Table8 Ripple and Noise

VOLTAGE	Ripple/Noise pk-pk
+12V	120 mV
12VSB	120 mV

Footnotes:

1）This is measured over a bandwidth of 20Hz to 20MHz at the output connector.
A 10μF tantalum capacitor in parallel with a 0.1μF ceramic capacitor are placed at the point of measurement.

2) Common noise: 350mV, 10Hz~20MHz, which test will be connected to customer system When test this function, It will add one resistor 100ohm between output and GND.

3) Ripple noise test must be at least in 5us/1ms/10ms sweep and peak detect mode.

3.4 Dynamic Loading

The load transient repetition rate shall be tested between 50Hz to 10 KHz at duty cycles rang from10%-90%.The test shall be at least in 50 Hz/1KHz/10KHz condition. The load transient repetition rate is only a test specification.
The output voltages shall remain within limits specified in table 7 for the step loading, Slew rate, and capacitive loading in the table 9.

Table9 Transient Load Requirements

Output	Transient Step (A) XX % of rated current	A/us	Frequency Hz	Cap(uF)
+12V	65%	0.5	50HZ— 10KHZ	2200
12VSB	65%	0.5		20

3.5 Capacitive Loading

The power supply shall be stable and meet all requirements with the following capacitive loading ranges.

Table10 Output Capacitive loading

outputs	12V	12VSB
Cap load (uF)	1000-22000	1--11000

3.6 No load

The power supply turn on in no load condition shall not cause damage to the power supply. The power supply shall be able to turn up in no load condition.

3.7 Residual Voltage in Standby mode

Residual voltage at the power supply outputs for no load condition shall not exceed 100mV when AC voltage is applied and the PSON# signal is de-asserted.

3.8 Redundant and hot swap

Hot swapping a power supply is the process of inserting and extracting a power supply module from an operating power system both stead and dynamic conditions with power cord as well as without power cord. In general, a failed (off by internal latch or external control) supply module may be removed, and replaced with a good power supply module. However, hot swap needs to work with operational as well as failed power supply module.
The power supply shall meet following requirements while hot remove or insert the module to the cage：

a) The output voltage shall stay within the limits shown in Table 7.
b) DC signal, such as PG, PS-ON, present and other signals shall not oscillate or change,
c) Current Sharing bus shall not oscillate,
d) LED color shall not change,
e) Power supply shall not be overload and other protection,
f) The newly inserted power supply may get turned on by plugging AC into the external and meet the turn on requirements, including the voltage shown in table 7 and timing shown in table 11.
g) The two modules shall be synchronous while the power supply turn on, turn off, dropout and brownout. Any oscillation of voltage waveform due to the non-synchronous is not acceptable.

3.9 Forced Load Sharing

+12V output current from each power supply shall be within (+10%, -10%) of Iload / (no. of PS) when supplying total output load current of 0.2I max. < I load < I max. where, I max. = 10A for 2 power supplies connected in parallel. The error shall be calculated by：（M1-M2）/M1，or（M1-M2）/M2. For example M1=10A，M2= 9.1-11A

I- bus Characteristic

Item	Description	Min	Nominal	Max	Units
V_{share}; I_{out}= 45A	Voltage of load monitor bus.	7.90	8.00	8.10	V
V_{share}; I_{out}= 22.5A	Voltage of load monitor bus.	3.90	4.00	4.10	V
V_{share}; I_{out}= 9A	Voltage of load monitor bus.	1.50	1.60	1.70	V

3.10 Smart on

Power supply shall meet Smart on redundant requirement. The slave module shall be in the Smart Standby state when the system load is less than 40% full load, and recovery to normal redundant state when the system load is more than 70% full load. The detailed transfer current point must be verified and subject customer approval.

However, the Smart Standby module should immediately turn up and output all of system power once the operating module predicts failure. The power supply module must meet the output regulation in table5 and timing requirement in table 8.

The defaults of Smart Standby point and recovery point must be saved in a EEPROM of u-processor, Supplier must provide a command to customer to change these two point value.

In the cold redundant mode,the power supply 12V&12Vsb voltage regulation can exceed 13.2V.

3.11 Mix two different modules into one PDB.

Mix two different modules into one PDB shall be necessary if the two sources may be used. However, the system ODM/OEM manufacture should verify this function and be subject to customer approval.

3.12 Remote sense

Remote sense is necessary at 12V and return sense. The remote sense should be able to regulate out voltage drop of 300mV minimum on 12V rail as well as return. There are the values of resistor connecting between the remote sense and the out voltages internal to power supply.

3.13 Output connector requirement

Gold finger
Supplier must ensure the pinout and dimension of gold finger is same between 550W and 800W power supply module for a common motherboard.

3.14 Return

All DC Returns (GND) are internally connected to frame ground.

3.15 Output isolation

The power supply shall have the isolate device to isolate the power supply output from the PDB during the hot swap or power supply failure. This isolate device may be O'ring Mosfet or equivalent functional circuits.

4. TIMING & SEQUENCE

4.1 General timing

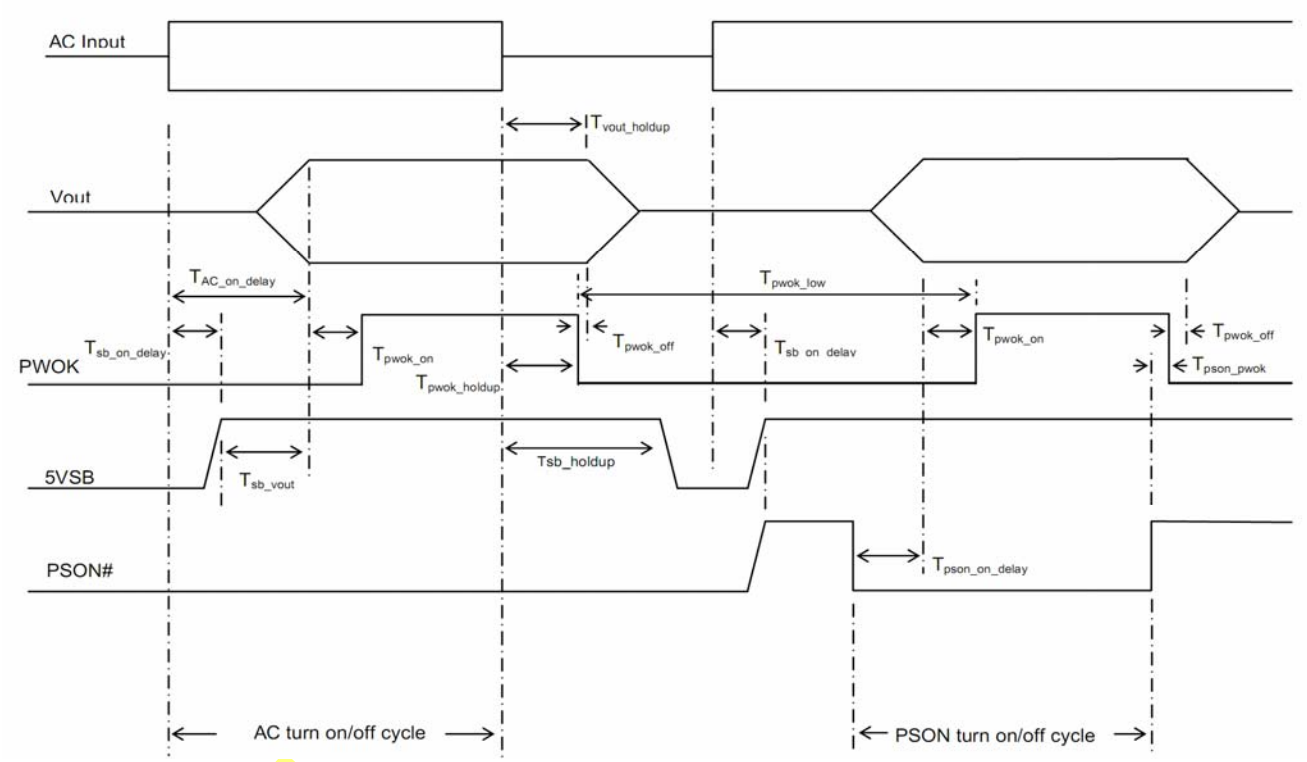
These are the timing requirements for power supply operation including alone module outputs and multi model outputs. All outputs shall rise and fall monotonically.
12VSB rise waveform shall soft-start from the time when 12VSB (or another input voltage for DC to DC converter) goes to regulation limit.
However, PS timing must meet the requirement of mother board. PS supplier must evaluate and verify the timing characteristics when in design stage and system test stage.
The criteria in below table is recommended, any exceptions must be subject to Customer approval.

Table11 Turn On/Turn Off Timing

ITEM	DESCRIPTION	MIN	MAX	UNIS
T_{vout_rise}	Output voltage rise time from each main output. /For 12VSB.	1 1	50 50	msec
$T_{sb\_on\_delay}$	Delay from AC being applied to 12VSB being within regulation.		1500	msec
$T_{ac\_on\_delay}$	Delay from AC being applied to all output voltages being within regulation.		2500	msec
T_{vout_holdup}	Time all output voltages stay within regulation after loss of AC.	13		msec
T_{vout_holdup}	Time all output voltages stay within regulation after loss of AC for half load	17		msec
T_{pwok_holdup}	Delay from loss of AC to deassertion of PWOK	12		msec
T_{pwok_holdup}	Delay from loss of AC to deassertion of PWOK for half load	16		msec

$T_{pson\_on\_delay}$	Delay from PSON# active to output voltages within regulation limits.	5	400	msec
T_{pson_pwok}	Delay from PSON# deactive to PWOK being deasserted.		50	msec
T_{pwok_on}	Delay from output voltages within regulation limits to PWOK asserted at turn on.	200	500	msec
T_{pwok_off}	Delay from PWOK deasserted to output voltages dropping out of regulation limits.	1		msec
T_{pwok_low}	Duration of PWOK being in the deasserted state during an off/on cycle using AC or the PSON signal.	100		msec
T_{sb_vout}	Delay from 12VSB being in regulation to O/Ps being in regulation at AC turn on.	10	1500	msec

Figure 1 Timing diagram



台達電子工業股份有限公司 DELTA ELECTRONICS, INC.				DESCRIPTION : 電氣規格 (Electrical Specification)	
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF DELTA ELECTRONICS, INC. AND SHALL NOT BE REPRODUCED OR USED AS THE BASIS FOR THE MANUFACTURE OR SELL OF APPARATUSES OR DEVICES WITHOUT PERMISSION.				MODEL NO. **DPS-550AB-11 D**	
Date	Drawn	Design (EE)	Design (ME)	DOCUMENT NO. : **ES-550AB-11 D**	REV. **S8**
01/26/2016	何英	何海濱	鄧合龍		

5. CONTROL SIGNAL AND OTHER DC SIGNALS

5.1 PG signal (PWOK)

The power supply PDB shall provide TTL compatible PWOK signal to the system. The combined PWOK signal from two power supply modules shall use logic “OR”;
The low pass filter (104 capacitor is recommended) shall be added into the PWOK signal to suppress the high frequency noise to keep the high level absolutely. However, this low pass filter shall be used in PSU or motherboard PWOK circuit. Therefore, supplier must be subject to add this low pass filter in the PWOK input circuit of motherboard if it can not be added in PSU circuit due to the re-layout difficulty.

Table12 PWOK TTL Characteristics

Signal type	+3.3VDC, TTL compatible
Logical low voltage	∠0.4V
Logical high voltage	2.4VDC—3.47VDC,2mA source current
Sink current, PWOK= low	<=4mA
Source current, PWOK= high	≤2mA
PWOK rise and fall time	≤ 100us
High-state output impedance	A pull up resistor is between PWOK output and 3.3Vsb

5.2 PS-ON signal

PSON# signal is required to remotely turn on/off the power supply module / PDB Combo. PSON# is an active low signal that turns on the +12V power rail and other DC to DC converters on the PDB. When this signal is not pulled low by the system, or left open, all the outputs (except for 12VSB) shall be turned off. This signal is pulled to a 3.3Vsb voltage by a pull-up resistor internal to the PDB. Refer to Figure 1 On/Off Timing for timing diagram.

Table13 PS_ON TTL CHARACTERISTICS

Signal type	+3.3VDC, TTL compatible
Logical low voltage （Vi_L）	0.0—1.0V
Logical high voltage（Vi_H；Iin=-200uA）	≥2V
Ii_L(Vin=0.4V 时)	≤-4mA
Open status（Iin=0）	≤ 3.47V
Power-on status	PS_ON= 0
Power-off status	PS_ON= 1 or open state
Rise & Fall time	0us---100us

5.3 SMBAlert# Signal

To meet the Nod manager 2.0,SMB Alert shall drop to 0v in below conditions, and must be recovery by system by PMBUS command:

A, AC line loss(lower than 20vac) more than 2ms
B, Hotspot OT warning occurs
C, OP warning occurs,

Table14 SMBALERT# SIGNAL CHARACTERISTICS

Signal Type (Active Low)	+3.3VDC, TTL compatible	
Alert# = High	OK	
Alert# = Low	Alert to system	
	MIN	MAX
Logic level low voltage, Isink=4 mA	0 V	0.4 V
Logic level high voltage, Isource=50 µA	2.4V	3.47 V
Sink current, Alert# = low		4 mA
Source current, Alert# = high		50 µA
Alert# rise and fall time		100 µs

5.4 Power supply LED indicator

One indicator LED in power supply module next to the inlet socket.
This LED shall have 5 kind of status as below:
A. Standby /CR state or PDB fault/ protection ---green blinking at 1Hz
B. Normal work---green color
C. Module fault/protection ----red continuously

D. Warning----red blinking at 1Hz(psu can operate normally but high temperature without protection, fan speed slow down , input voltage lower than 90Vac (not warning above 90v condition, must be warning state below 85V condition);high power, high current etc.)

E. Power cord unplugged, red continuously

Table15 LED INDICATOR STATES

Power Supply Condition	LED State
Normal work	GREEN
No AC power to all power supplies	OFF
AC present / Only 12VSB on (PS off) or PS in CR state.	1Hz Blink GREEN
AC cord unplugged; with a second power supply in parallel still with AC input power.	RED
Power supply warning events where the power supply continues to operate; high temp, high power, high current, slow fan, input voltage lower than 90Vac (not warning above 90v condition, must be warning state below 85V condition);	1Hz Blink RED
Power supply critical event causing a shutdown; failure, OCP, OVP, Fan Fail	RED

6. PROTECTION

6.1 Power supply Turn on after protection

Power supply shall shut down and latch-off by fault or protection. Protection circuits inside the power supply shall only cause the power supply's main outputs to shut down. When this fault or protection is removed, Power supply must be able to turn up through toggling PS ON/OFF or AC ON/OFF re-cycle. The toggling time is <=1S by PSON turn on mode, and <=15S by AC on mode. The 12VSB protection mode is auto restart once the fault or protection is removed. Any exceptions should be subject to Customer approval.

The power supply output voltages shall not be greater than the max limits shown in Table 7 when OCP or short protection circuit is triggered.

6.2 OVP

For redundant PS, once one power supply module (not PDB) is in OVP state due to the internal OVP trip point detected, another power supply module which not detects the OVP trip point shall be normally running.

Table16 Over voltage protection

Voltage	Min(V)	Max(V)
+12V	+13.5	+15
12VSB	+13.5	+15

Footnotes:

1) OVP state on Main outputs shall shutdown and latch off，12VSB OVP shall be Auto Restart when OVP condition is removed.
2) OVP at 12V output shall be designed to have module OVP circuit and PDB OVP circuit.

6.3 OCP/OC WARNING/OP WARNING

Table17 Over current protection

Output	Minimum	Maximum
+12V	Peak current 51.0A	67.5A (150% of rated output current)
12VSB	5.0A	10.0A

Footnotes:

1) OCP state on Main outputs shall shut down and latch off, and shall be cleared by toggling the PSON# signal or by an AC input re-cycle，12Vsb OCP shall be Auto Restart when OCP condition is removed.
2) Over current limit level shall be maintained for a period of 50ms current over the OCP level in the main outputs, and a period of 100 msec minimum to 500 msec maximum in SB output. Therefore, a suitable capacitor should be added to the input of OCP comparator to reduce the peak level.
3) OC warning set points must higher than max load and lower than OCP set point. OC warning level should keep (boucing) for 800ms+/-200ms before the warning flag set to logic 1.
4)when the peak current is 63 A,the PSU just only meet equal to 33.75 A or more than 33.75 A jump to 63 A, A 2200uF electrolytic capacitor should be placed at the point of measurement and the keep time of peak current 63A should be less than 12ms.

6.4 Short circuit protection

The power supply shall shut down and latch off when any output is short circuit(impedance less than 0.1ohm) with any other outputs, whatever the outputs is shorten when power supply is running as well as before turn on.

1) The power supply shall be no physical damage when +12V,12VSB output is shorted to its DC return or other outputs.
2) 12VSB shall be Auto Restart when short condition is removed.

3) Short maintain time shall be less than 500us whatever short occurs before PS turn up or after PS turn up. Short resistor should be less than 0.1ohm.Min short current should be greater than 200% of max rated current.

6.5 OPP

TBD
OPP shall be defined by supplier.
OP warning shall be Sum of Iout*Vout,
OP warning set point should be high than 110% output power and higher than peak load. OP warning level should keep(boucing) for 800ms+/-200ms before the warning flag set to logic 1

6.6 Over temperature protection

The power supply shall be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature, which could cause internal part/s failures. In an over temperature condition the PS shall shutdown. The Standby output shall not shutdown during an OTP condition. When the temperature drops to within safe operating limit for internal parts, the power supply shall restore power automatically. The OTP circuit shall incorporate built in hysteretic(>5°C) such that the power supply does not oscillate on and off due to temperature recovering condition.
OT sense should contain 3 points: 2 hotspot points and ambient sense.The hotspot points shall be the two worst case location at primary side and 2rd side..

6.7 Immunity voltage from system at main output rail

The Power supply shall be immune to any residual voltage placed on its outputs (Typically a leakage voltage through the system from standby output) up to 2V. There shall be no additional heat generated, stress of any internal components, nor protection circuit trip during turn on with this voltage applied to any individual output, and all outputs simultaneously.

6.8 Immunity voltage at 12VSB rail

Add 2V voltage at 12Vsb output rail when AC is not applied, then apply AC to PSU, PSU shall be able to turn up, and meet all turn on requirements.

7. TEMPERATURE

7.1 Operating temperature

+0°C Min.， +55°C Max for module
(Full load and all input voltage range, temperature change rate 5°C/min~10°C/h is accepted))
None operating temperature(storage):-40°C Min.， +70°C Max

7.2 Cold start

The power supple shall be able to turn up at 0 degree centigrade. Supplier must provide the report on cold start

8. ACOUSTIC AND FAN SPEED CONTROL

8.1 Acoustic (measured according to ECMA 74)

a) <=TBD.the distance which from power to measure point is 1m.
Test condition: 100% load, Surrounding temperature >45°C
b) <=TBD.the distance which from power to measure point is 1m.
Test condition: 60% load, Surrounding temperature >40°C
c) <=TBD.the distance which from power to measure point is 1m.
Test condition:40% load, Surrounding temperature >35°C

Abnormal audible noise from power supply shall be unacceptable, such as low frequency noise and so on.

8.2 Fan speed control

The power supply shall contain fan speed circuits to vary the fan speed to ensure that the critical component do not exceed the safe operating levels.
The power supply design shall employ the PWM control to vary the fan speed.
The fan speed shall have 50% margin above the lowest duty of rated specification of fan.

8.3 In standby mode

Fan voltage is powered from 12v and 12VSB. The fan will run by the 12V voltage while power supply turn on, and it shall run in low speed by 12VSB voltage in standby mode.

8.4 Airflow requirement

The power supply shall meet the system airflow impedance. Therefore supplier must provide the airflow requirement to Customer for the chassis design.

9. RESTRICTED SUBSTANCES

9.1 Rohs

Power supply must meet be Rohs6 compliant including the component, PCB, soldering material, case, wire, process.

9.2 Restricted substances

EMS	Requirements
Recycled Plastics:	Post-consumer recycled content plastics to constitute a minimum of 4% of total supplier plastic purchases.
Packaging	Minimum 50% total recycled content, including 30% post-consumer recycled content for corrugated materials. Corrugated – min. 50% total recycled content, min. 30% post consumer content. Minimum 50% total recycled content by weight across all new systems for cushions. Post-consumer content should be marked if available.

10. HUMIDITY

operating (non-condensing): 5% to 90%
Make sure to thoroughly test the higher values (50 degrees and 90% humidity)
Non-operating (non-condensing): 5% to 95%

11. ALTITUDE

5000m

12. PMBUS

12.1 Electrical Layer

The PMBus electrical driving levels shall comply with high power DC specifications given in Section 3.1.3. of SMBus Specification version 2.0.

12.2 FRU Data Format

For identification of the power supply an internal 256x8 bit EEPROM with PMBus interface is used. The information in the EEPROM follows the IPMI (Platform Management FRU Information

Storage Definition) guidelines Document Revision 1.1 from November 15, 1999 and Siemens Norm SN77250.

The PSU's FRU Data is specified as the contents attached in the end.

12.3 FRU Signals

Four pins will be allocated for the FRU information on the Power Supply connector. One pin is the serial clock (SCL). The second pin is used for serial data (SDA). Two pins are for address lines A0 to indicate to the power supply's EEPROM which position the power supply is located in the system. The SCL and SDA signals are pulled up by system, the A0 address line through a 10K ohmresistor pulled up to 3.3V

.

Table18 FRU Signals

A0	EEPROM	μP	PSU
0	A0	B0	1
1	A2	B2	2

12.4 PMBus Command Set

Via the PMBus the computer system can communicate with the power supply to access currents, voltages, fan control and speed and temperatures. The communication follows the Power System Management Protocol Specification. As soon as AC Power is connected to the PSU the PMBus functionality must be available.

Following Table shows mandatory PMBus commands to be supported by the PSU.

Table 19 Supported PMBus Command Set

Command Code	Command Name	Read/Write	Number of Data Bytes	Comment
00h	PAGE	R	1	00
03h	Clear_Fault	Send Byte	0	
20h	VOUT_MODE	R/W	1	17h (n=-9)
3Ah	FAN_CONFIG_1_2	R/W	1	
3Bh	FAN_COMMAND_1	R/W	2	
4Ah	IOUT_OC_WARN_LIMIT	R/W	2	
51h	OT_WARN_LIMIT	R/W	2	
5Dh	IIN_OC_WARN_LIMIT	R/W	2	Low line / High line
6Ah	POUT_OP_WARN_LIMIT	R/W	2	
6Bh	PIN_OP_WARN_LIMIT	R/W	2	Low line / High line
79H	STATUS_WORD	R/W	2	
(Low)6	OFF			
5	VOUT_OV_FAULT			
4	IOUT_OC			
3	VIN_UV			
2	TEMPERATURE			
0	NON OF THE ABOVE			
(High)7	VOUT			
6	IOUT/POUT			
5	INPUT			
3	POWER_GOOD#			
2	FANS			
7Ah	STATUS_VOUT	R/W	1	
7	VOUT_OV_FAULT			
4	VOUT_UV_FAULT			
7Bh	STATUS_IOUT	R/W	1	
7	Iout OC fault			
5	Iout OC warning			
1	Pout OP fault			
0	Pout OP warning			
7Ch	STATUS_INPUT	R/W	1	
5	Vin UV warning			
4	Vin UV fault			
3	Unit off for insufficient input			
7Dh	STATUS_TEMPERATURE	R/W	1	
7	OT fault			
6	OT warning			
7Eh	STATUS_CML	R/W	1	
7	command_fault		1	
6	data_fault		1	
5	PEC_fault		1	
81h	STATUS_FANS_1_2	R/W	1	

7	Fan 1 fault			
5	Fan1 warning			
86h	READ_EIN	R	6	
87h	READ_EOUT	R	6	
88h	READ_VIN	R	2	
89h	READ_IIN	R	2	
8Bh	READ_VOUT	R	2	
8Ch	READ_IOUT	R	2	
8Dh	READ_TEMPERATURE_1	R	2	Ambient
8Eh	READ_TEMPERATURE_2	R	2	Hotspot
90h	READ_FAN_SPEED_1	R	2	In rpm
96h	READ_POUT	R	2	
97h	READ_PIN	R	2	
98h	PMBUS_REVISION	R	1	
99h	MFR_ID	R/W	14	
9Ah	MFR_MODEL	R/W	14	
9Bh	MFR_REVISION	R/W	5	
9Eh	MFR_SERIAL	R/W	14	
A0h	MFR_VIN_MIN	R	2	
A1h	MFR_VIN_MAX	R	2	
A2h	MFR_IIN_MAX	R	2	Low line / High line
A3h	MFR_PIN_MAX	R	2	Low line / High line
A4h	MFR_VOUT_MIN	R	2	
A5h	MFR_VOUT_MAX	R	2	
A6h	MFR_IOUT_MAX	R	2	
A7h	MFR_POUT_MAX	R	2	
A8h	MFR_TAMBIENT_MAX	R	2	
AAh	MFR_EFFICIENCY_LL	R/W	14	At 20%/50%/100% load
ABh	MFR_EFFICIENCY_HL	R/W	14	At 20%/50%/100% load
E0h	SMART_ON_CONFIG	R/W	1	

Note : Command 99h ,9Ah and 9Eh : if the real data length not meet the 14bytes , the rest of section need to add symbol “#”.

12.5 PMBus Temperature Read Commands

The following temperature read commands as documented by the PMBus specification Part II version 1.2 should be supported.

READ_TEMPERATURE_1, should provide the PSU inlet temperature.

READ_TEMPERATURE_2, should provide the temperature of the assumed hottest point in the PSU.

More details about the sensor placement TBD.

12.6 PMBus Commands Preciseness and Data Format

The sensor commands shall meet the following accuracy requirements. The accuracies shall be met over the specified ambient temperature and the full range of rated input voltage.

	Required Accuracy (+/-x% of reading)(Vin range=(100Vac~127Vac) or (200Vac~240Vac)or(180Vdc~300Vdc)		
Output Loading condition	<10%	10%~20%	>20%~100%
READ_VIN(88h)	+/-5%	+/-5%	+/-5%
READ_IIN(89h)	No spec	+/-5% or +/-0.3A	+/-5% or +/-0.3A
READ_PIN(97h)	No spec	+/-5% or +/-5W	+/-5% or +/-5W
READ_VOUT(8Bh)	+/-5%	+/-5%	+/-5%
READ_IOUT(8Ch)	No spec	+/-10%	+/-5%
READ_POUT(96h)	No spec	+/-10%	+/-5%
READ_TEMPERATURE_1(8Dh) READ_TEMPERATURE_2(8Eh)	+/-3 ºC	+/-3 ºC	+/-3 ºC

Preferred data format is the “Linear Data Format” as specified by PMBus specification Part II version 1.2.

12.7 COMMAND FOR COLD REDUNDANCY

Power supply shall meet Intel Cold Red on redundant requirement. The slave module shall be capable of being in the Cold Red state when the system load is less than 40%(recommended) full load, and recovery to normal redundant state when the system load is more than 70%(recommended) full load.

Cold Red standby PSU should immediately turn on within 100us and output all of system power once the operating module predicts failure.

When one PSU's E0h configure to 0x01(Active), the other configure to 0x02(Standby), this mode called Offline mode. The Active PSU will provide 100% current to system. The Standby PSU will wake up (Provide 50% load) once the total load is more than 107% of maximum load. And if load decrease to 100% of maximum load, the Standby PSU will not provide load again.

When one PSU's E0h configure to 0x03(Active), the other configure to 0x04(Standby), this mode called Cold Redundant mode. The Active PSU will provide 100% current to system. The Standby PSU will wake up (Provide 50% load) once the total load is more than 70% of maximum load. And if load decrease to 40% of maximum load, the Standby PSU will not provide load again.

Command code	Command Name	Read/Write	Number of Data Bytes	Note
E0	PSU Mode	R/W	1	0x00 : Normal Mode (Default) 0x01 : Active Mode (off line) 0x02 : Standby Mode (off line) 0x03 : Master Mode (Cold Redundant) 0x04 : Slave Mode (Cold Redundant)

13. SR MODE

When system configure the two redundant power supplies into Smart Redundant mode, the Smart standby power supplies shall power ON or OFF depending upon loading state. Once fault event occur in the Smart Active Power supply, then the Smart Standby power supply shall power on quickly to maintain full redundancy in the system.

14. MECHANICAL

<table>
<tr><td>Shock</td><td>Operating :Half-sine 5 G, 11 ms pulse ,3 times in each direction.
None operating: Half-sine 140 G, 2 ms pulse,3times in each direction</td></tr>
<tr><td>Shock packaged</td><td>Test height is based on the weight of the package (see below table).
Test requirement: 6 face,3 drops per face;2 corner(the weakest corner and the weakest corner's corresponding diagonal corner),1drops;the related 3 edge to the weakest corner, 1 drop per edge.
<table>
<tr><th>Product Weight（kg）</th><th>Non-palletized Free Fall Height(m)</th><th>Palletized (Single product) Free Fall Height(m)</th></tr>
<tr><td>0-5</td><td>1.1</td><td>N/A</td></tr>
<tr><td>5-15</td><td>1</td><td>N/A</td></tr>
<tr><td>15-30</td><td>0.8</td><td>N/A</td></tr>
<tr><td>30-50</td><td>0.65</td><td>0.46</td></tr>
<tr><td>50-120</td><td>0.5</td><td>0.3</td></tr>
</table></td></tr>
</table>

Random Vibration

Non-operating

Sine sweep:

5Hz to 500Hz @ 0.5g RMS at 0.5 octaves per minute; dwell 15 min at each of 3 resonant points;

Random profile:

5Hz @ 0.01g²/Hz to 20Hz @ 0.02g²/Hz (slope up); 20Hz to 500Hz @ 0.02g²/Hz (flat);
Input acceleration = 3.13gRMS; 10 min. per axis for 3 axis on all samples

15. PACKAGE

Power supply module package shall be the Anti-ESD bag to avoid power supply damage in shipment.

16. RELIABILITY

16.1 Stress/Component De-rating

The following component de-rating requirements shall be followed:

(1) The semiconductor junction temperature at all load condition, all input voltage range , and ambient of 55°C shall not exceed 110°C for 150°C component and 130°C for 175°C component, and the thermal rating must be less than 80% rated specification.
If it's power SMD, the thermal rating must be less than 60% whatever is at max current or max voltage.

(2)Capacitor:

Ripple Current: 80% of rated specification at frequency and temperature.

Voltage: 90% of the rated specification.

Bulk cap voltage de-rating <=100% of the rated specification ;

Temperature:. 80% of rated 105°C specification at ambient of 55°C Not accept 85°C specification.

(3)Resistor:

The power of resistor's de-rating<=65% of the rated specification whatever is ambient or high 55°C condition and all of input voltage range.,

Temperature: 80% of rated specification at ambient of 55°C

(4) Static voltage/power/current de-rating of all components :<=80% of the rated specification. The OCP current must be considered the output component de-rating.

Vr/Ipeak/If of diode shall meet 80% of spec rating.

The voltage and current rating for Dynamic/output short/input on off of all components:<=90% of the rated specification.

+12Vsb primary switch MOSFET voltage de-rating <=80% of the rated specification at steady status, <=90% of the rated specification at transient status;

(5)Transformer and Inductor core and coil temperature shall not exceed 110°C and 80% of rated temperature ambient of 55°C

The core/junction temperature of all other components at all load condition, all input voltage range, and ambient of 55°C shall not exceed 110°C for 150°C component and 130°C for 175°C component, and the thermal rating must be less than 80% rated specification

The component thermal shall not reach its max specification rating while the power supply OTP/OCP trips due to the excessive heat in the all load/input voltage condition.

(6) Component select requirements:

For PFC booster: Vds>=600V

For main switching MOSFET Vds>=600V; (full/half bridge or double forward topology)

For 12Vsb Vds>=800V for single forward or flyback topology),and the Mosfet must separate from switching controller, so the TOP switch or Tiny switch shall be prohibited.

Bulk cap:

The max voltage of >=450V.

Temperature 105°C

Basic life Lo of bulk capacitor must be 3000Hrs or above to meet 5years life time, Less than 3000Hrs can not be acceptable, Otherwise supplier must provide the evidence to ensure the life time shall be able to meet 5 years by the calculating formula which is acceptable by capacitor manufacture

(7)MOV/spark gap voltage must be up to 300Vrms if the MOV or spark gap is used. The voltage of other primary side components must also suffer up to 300Vrms.

(8) Design and Fabrication of PCBs: The board material shall be rated 130°C minimum. And the surface temperature shall not exceed 100°C.

(9) Gold thickness of gold finger shall be more than 30 u inches.

* Component derating must test in cross condition with high/low voltage/max load/min load/output short after turn on/turn on after output short.If the 12V/12VSB can't be the max load simultaneous, the load condition should separate into 12Vmax load ,12VSB max load. The worst case is required .Component derating should be tested in turn on mode as well as 12VSB mode.
Thermal derating for all components must be at ambient of 55°C as well as other ambient temperature.
Supplier must provide the stress/component de-rating report to customer approval. Component de-rating report must contain second source and third source.

16.2 Component source rules

All of component source must meet class A/B in customer ECSL as well as below rules. Class C/ D shall be prohibited. In general, class C /D or other components not limited on class A/B shall be prohibited as well.

(1) Fan shall be double ball type, the sleeve type is not acceptable. NMB/Nidec/Delta/AVC will be preference. Any exceptions must be subjected to customer approval.

(2) Capacitor rules:
A. Electrolytic capacitor supplier shall be the manufacture from Japan, NCC/Rubycon/Nichicon will be preference.
B. No quaternary salt electrolytic capacitor shall be used.
Any exceptions must be subjected to customer approval.
C. Film cap:
PE capacitor shall be prohibited. PP capacitor should be instead of PE capacitor.
D. Okaya/carli/Arco/ shall be preference for X capacitor
TDK/Murata shall be preference for Y capacitor.
Any exceptions must be subjected to customer approval

(3) Resistor rules:
Cement resistor shall be prohibited in the inrush current control circuit.

16.3 Mean Time Between Failure (MTBF）

The power supply shall have a minimum MTBF at continuous operation of 250,000 hours at 100% load,115/230vac/ 240Vdc and 55°C ambient by Bellcore RPP, and 500,000 hours demonstrated at 100% load ,115/230VAC/240Vdc,and 55°C ambient.

DMTBF should be evaluated in Arrehnius And Coffin Manson Models. The test process can't interrupt during the test. The Ea should be less than 0.6eV.

DMTBF report must contain first source, second source and third source.

16.4 Halt test

Supplier shall perform a HALT test on the product and provide test results to final approval.
The POS method of HASA test shall be used for halt test.50 cycles ,it shall be necessary.
Halt report must contain the failure mechanism and root cause.

Halt report must contain first source, second source and third source

16.5 Power cycles

5000 full AC cycles, 10000 cycles remote on/off.

16.6 Life time:(E-Capacitor/Fan/photo coupler)

The life time analysis condition is as below:
Life time:>44000 power on hours.
Ambient temperature:55°C
Load: 100% load
AC voltage:100Vac/60HZ, and 240Vac/50HZ,
HVDC voltage:180VDC,300VDC
If the Outputs can't be the max load simultaneous, the load condition should separate into 12Vmax load ,12Vsb max load, The worst case is required.
Supplier must provide the component lifetime report to customer approval. Component lifetime report must contain second source and third source.

16.7 Quality criteria

Supplier must make sure Failure Rate:< 500DPPM per 1000 hours.

16.8 Safety Consideration

(1) No smoke and no fire may occur if one single component in the power supply fails. So a fuse on the input of dc-dc converter or an equivalent circuit shall be needed to anti smoke or failure enlargement while a single component failed.The fuse shall trip if power component short to power ground or PE.

(2) Creepage and Clearance distance on PCB must meet IEC 60950-1 CI.2.10

(3) Catastrophic Failure Protection

The power supply design and choice of its components shall be such, that if any component failure should occur, the power supply whatever is the power supply(module/PDB/none redundant power supply) shall not exhibit any of the following:

- Flame
- Charred PCB
- Fused (burnt) PCB conductor
- Startling noise

(4) Hi-pot

One hundred percent (100%) of the Power Supply Module shall comply with the minimum Production Line Hipot (High Potential) Test as noted below. The test shall be applied between the PRIMARY (AC LINE and NEUTRAL) and EARTH GROUND ,PRIMARY AND SECOND.

Withstand voltage: Meet safety requirement, at least 1.9KAC or 2550VDC.

Dwell time: dwell time:2S minimum/1.9KAC.

(5) Input leakage current:

<1mA at 240V RMS, and <0.5mA at 120VRMS

17. CERTIFICATION OVERVIEW

1) The safety , EMC/EMI and deviations certification must ensure the PSU product can sell to below countries, So the power supply must get any specific certification of these countries.

USA
Canada
UK
France
Germany
Italy
China

2) All of certifications shall be latest version in the early 2011'.

17.1 Safety Certification

UL60950-1 /CSA 60950(USA / Canada)
EN60950-1 (Europe)
IEC60950-1 (International)
TUV via CB Report, IEC60950 (report to include all country national deviations)
CCC- CNCA Certification (China) GB4943.1-2011
CE-low voltage directive 2006/95/EC(Europe)
Power Supply Supplier requires providing copy of each certification and CB report.
GS Geprufte Sicherheit
KC –Korea
FCC
80 Plus Platinum Certificate

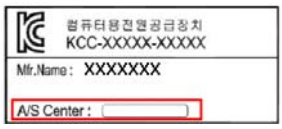
17.2 EMI

FCC /ICES-003 - Emissions (USA/Canada) Verification Class A-6dB
CISPR 22 – Emissions (International) Class A-6dB
EN55022 - Emissions (Europe) Class A-6dB
GB 9254-98 class A -6dB.
VCCI class A -6dB
KCC class A -6dB

17.3 Regulatory Marks on Power Supplies

The below marks are necessary. Supplier must get all the certifications for below marks.
Other safety mark is issued by notified body in item 17.1-item 17.3 should also be required, such as TUV, or other body customer approved.





17.4 EMC Compliance

EN55024 - Immunity (Europe)
a) IEC61000-4-2 Electrostatic Discharge
b) IEC61000-4-3 Radiated RFI Immunity
c) IEC61000-4-4 Electrical Fast Transients
d) IEC61000-4-5 Electrical Surge
e) IEC61000-4-6 RF Conducted

f) IEC61000-4-8 Power Frequency Magnetic Fields
g) IEC61000-4-11 Voltage Dips and Interruptions
* EN61000-3-2 - Harmonics (Europe)
* EN61000-3-3 - Voltage Flicker (Europe)

CE – EMC Directive 2004/108/EC (Europe)
GB 9254 – (EMC) Certification (China)
GB 17625.1 - (Harmonics) CNCA Certification (China)
GB/T17618-1998
KCC EFMC certification

17.5 Other certification

Supplier should get below certifications,:
EPEAT GOLD standard
Energy start for computer server 2.0
80 plus platinum–Certification is necessary
China Environment Labeling 10 years cycle(need mark)
Climate saver gold level –or platinum--certification is necessary

17.6 Component Regulation Requirements

1. All Fans shall have the minimum certifications: UL and TUV or VDE
2. All current limiting devices shall have UL and TUV or VDE certifications and shall be suitable rated for the application where the device in its application complies with IEC60950.
3. All printed wiring boards shall be rated UL94V-0 and be sourced from a UL approved printed wiring board manufacturer
4. All connectors shall be UL recognized and have a UL flame rating of UL94V-0
5. All wiring harnesses shall be sourced from a UL approved wiring harness manufacturer. SELV Cable to be rated minimum 80V, 130C
6. Product safety label must be printed on UL approved label stock and printer ribbon. Alternatively labels can be purchased from a UL approved label manufacturer.
7. The product must be marked with the correct regulatory markings to support the certifications that are specified in this document.

18. POWER SUPPLY MONITOR AND CONTROL

1) PMbus1.2 specification shall be used for the communication with system.
2) The power supply shall comply with Intel Node manager2.0 specification. Any exceptions should be subjected to customer approval.

3) PMbus must sense input and output current/voltage/power,and temperature
4) Protection: OVP/OCP/OTP status and which output is in protection mode.
5) Warning: Power supply work normally, PMbus can detect input/output high current, input/output high power, high temperature at hotspot, input voltage lower than 90Vac/180Vdc < not warning above 90Vac/180Vdc condition, must be warning state below 85Vac/175Vdc condition > and which output is in warning status, fan slows down etc.
6) Power supply module present or not. For this function, Vcc of second side MCU must be from 12VSB bus.
7) Power supply has fan speed control by PMbus. If power supply does not connect to PMbus, power supply should control fan speed based on internal temperature limit. However, Fan speed control based on internal temperature limit at some critical component shall be first preference.
8) EEPROM: can save power supply model name and revision, power supply module location manufacture name.
FRU need to use Product Info Area Format.
9) Power supply can turn on/off by PM bus by different address,
A) Power supply should turn on or off by front button on system panel or PMbus control. One turn on/off mode can't prohibit another mode.
B) Power supply module A may be in ON state, and module B may be in OFF state during a week. But it turns module B in ON state, and module A in OFF state during next week. This function can be changed to itemC) in system software by PM bus. It turns on/off each other between two modules once every week. This duration can be changed in system software by PMbus.
C) Two modules can turn on/off simultaneously by PM bus control. This function can be change to itemB) in system software by PM bus.
10) Measure tolerance: Voltage /current/power less than +/-5%. Temperature less than +/-3°C.
11)Firmware revision on power supply, firmware date etc shall refer to PMBUS command list.
12)Current/power tolerance: shall meet Energy start for server 2.0.
Pin 10% load to 100% load: +/-5% or +/-5W
Iin 10% load to 100% load: +/-5% or +/-0.3A

Output current/power tolerance:
+/-10% tolerance @10%—20% load
+/-5%@ 20% load to 100% load.

19. REQUIREMENT FROM MOTHERBOARD

TBD, as an attached file once the motherboard provides the requirements.

20. DOCUMENTATIONS

Supplier must provide the documentations as below:

1) Schematics & BOM & PCB artwork for every revision.
2) Mechanical drawing
3) Label drawing
4) Bench report for every revision.
5) Component stress/derating report at 55°C ambient for every revision
6) Life time report for every revision
7) Cold start report at 0°C ambient
8) Power cycle report
9) Halt report
10) Environment test report
11) Safety certification, CB report
12)Smokeless report
13) EPEAT/80plus Pt gold+/climate saver platinum +/Energy star2.0/CEL certification.
14) Principle design calculation

Mfg Date & Time:
2015/01/15 04:14:00 PM

DPS-550AB-11 D FRU MEMORY MAP SXXE00

ITEM	ADDRESS	BYTE VALUE (DEC)	BYTE VALUE (hex)	DESCRIPTION	BLOCK TITLE
1	0000H	1	01	FORMAT VERSION NUMBER	COMMON HEADER
2	0001H	0	00	INTERNAL USE AREA OFFSET	
3	0002H	0	00	CHASSIS INFO AREA OFFSET	
4	0003H	0	00	BOARD AREA OFFSET	
5	0004H	1	01	PRODUCT INFO AREA OFFSET	
6	0005H	10	0A	MULTI RECORD AREA OFFSET	
7	0006H	0	00	PAD (ALWAYS ZERO)	
8	0007H	244	F4	ZERO CHECK SUM (100H-(TOTAL BYTES))	
1	0008H	1	01	BOARD AREA FORMAT VERSION	PRODUCT INFORMATION AREA
2	0009H	9	09	BOARD AREA LENGTH (#BYTES / 8)	
3	000AH	25	19	LANGUAGE (ENGLISH)	
4	000BH	197	C5	BOARD MANUFACTURER NAME LENGTH / byte	
5	000CH	68	44	D	
6	000DH	69	45	E	
7	000EH	76	4C	L	
8	000FH	84	54	T	
9	0010H	65	41	A	
10	0011H	206	CE	BOARD PRODUCT NAME LENGTH	
11	0012H	68	44	D	
12	0013H	80	50	P	
13	0014H	83	53	S	
14	0015H	45	2D	-	
15	0016H	53	35	5	
16	0017H	53	35	5	
17	0018H	48	30	0	
18	0019H	65	41	A	
19	001AH	66	42	B	
20	001BH	45	2D	-	
21	001CH	49	31	1	
22	001DH	49	31	1	
23	001EH	32	20		
24	001FH	68	44	D	
25	0020H	212	D4	BOARD PART / MODEL NO. LENGTH	Part NO.
26	0021H	88	58	X	
27	0022H	88	58	X	
28	0023H	88	58	X	
29	0024H	88	58	X	
30	0025H	88	58	X	
31	0026H	88	58	X	
32	0027H	88	58	X	
33	0028H	88	58	X	
34	0029H	88	58	X	
35	002AH	88	58	X	
36	002BH	88	58	X	
37	002CH	88	58	X	
38	002DH	88	58	X	
39	002EH	88	58	X	
40	002FH	88	58	X	
41	0030H	88	58	X	
42	0031H	88	58	X	
43	0032H	88	58	X	
44	0033H	88	58	X	
45	0034H	88	58	X	
46	0035H	195	C3	BORAD VERSION type/length	
47	0036H	88	58	X	To be updated
48	0037H	88	58	X	To be updated
49	0038H	70	46	F	To be updated
50	0039H	206	CE	PRODUCT SERIAL NO. LENGTH	
51	003AH	88	58	X	To be updated
52	003BH	88	58	X	To be updated
53	003CH	88	58	X	To be updated
54	003DH	88	58	X : D = DELTA CHINA , C = DELTA TAIWAN , T = THAILAND ,	To be updated
55	003EH	88	58	X YEAR (MAX 99) ;(DATE CODE)	To be updated
56	003FH	88	58	X	To be updated
57	0040H	88	58	X WEEK (MAX 52)	To be updated

58	0041H	88	58	X	To be updated
59	0042H	88	58	X (P / S SERIAL NUMBER MAX : 999999)	To be updated
60	0043H	88	58	X	To be updated
61	0044H	88	58	X	To be updated
62	0045H	88	58	X	To be updated
63	0046H	88	58	X	To be updated
64	0047H	88	58	X	To be updated
65	0048H	192	C0	ASSET TAG type/length byte	
66	0049H	192	C0	FRU File ID type/length byte	
67	004AH	193	C1	NO MORE FIELDS MARKER	
68	004BH	0	00	PAD (ALWAYS ZERO)	
69	004CH	0	00	PAD (ALWAYS ZERO)	
70	004DH	0	00	PAD (ALWAYS ZERO)	
71	004EH	0	00	PAD (ALWAYS ZERO)	
72	004FH	112	70	CHECKSUM (100H - (LOWER BYTE (SUM OF BYTES))	To be updated
1	0050H	0	00	RECORD TYPE ID 0X00 = POWER SUPPLY INFORMATION	MULTIRECORD
2	0051H	2	02	7 : 7 END OF LIST , 6 : 4 =000B , 3 : 0 RECORD FORMAT VERSION = 2	HEADER
3	0052H	24	18	RECORD LENGTH OF MULTIRECORD	
4	0053H	128	80	RECORD CHECKSUM	
5	0054H	102	66	HEADER CHECKSUM	
6	0055H	38	26	15-12 : RESERVED , WRITE AS 0000B	550W
7	0056H	2	02	11-0 : OVERALL CAPACITY (WATTS)	550W
8	0057H	32	20	PEAK VALUE	800W
9	0058H	3	03	LSB FIRST	800W
10	0059H	60	3C	INRUSH CURRENT FFH IF NOT SPECIFIED	60A
11	005AH	5	05	SET TO 0 IF NO INRUSH CURRENT SPECIFIED	5mS
12	005BH	16	10	LOW END INPUT VOLTAGE RANGE 1 100V = 2328H	100V
13	005CH	39	27		100V
14	005DH	156	9C	HIGH END INPUT VOLTAGE RANGE 1 140 = 36B0H	127V
15	005EH	49	31		127V
16	005FH	32	20	LOW END INPUT VOLTAGE RANGE 2 180V = 4650H	200V
17	0060H	78	4E		200V
18	0061H	192	C0	HIGH END INPUT VOLTAGE RANGE 2 264 = 6720H	240V
19	0062H	93	5D		240V
20	0063H	47	2F	LOW END INPUT FREQUENCY RANGE 47HZ = 2FH	47Hz
21	0064H	63	3F	HIGH END INPUT FREQUENCY RANGE 63HZ = 3FH	63Hz
22	0065H	12	0C	A / C DROPOUT TOLERANCE IN mS 12mS = 0CH	12mS
23	0066H	26	1A	7-5 : RESERVED , WRITE AS 000B	
				4 : TACHOMETER PULSES PER ROTATION / PREDICTIVE FALL POLARITY YES = 1	
				(FAIL = 1 , PASS = 0)	
				3 : HOT SWAP / REDUNDANCY SUPPORT YES = 1	
				2 : AUTOSWITCH YES = 1	
				1 : POWER FACTOR CORRECTION YES = 1	
				0 : PREDICTIVE FALL SUPPLY YES = 1	
24	0067H	138	8A	PEAK WATTAGE 15-12 : HOLD UP TIME IN SECONDS 1S = 1H	650W
25	0068H	194	C2	11-0 PEAK CAPACITY (WATTS) (LSB FIRST) 575W = 01C2H	12S
26	0069H	0	00	COMMBINED WATTAGE 7-4 : VOLTAGE 1 , 3-0 : VOLTAGE 2 =00 H	
27	006AH	0	00	BYTE 2 : 3 TOTAL COMBINED WATTAGE (LSB FIRST) W =0000H	0
28	006BH	0	00		
29	006CH	133	85	PREDICTIVE FAIL TACHOMETER LOWER THRESHOLD (RPM / 60) 2000/60 --> 21h	
1	006DH	1	01	RECORD TYPE ID 0X01 = DC OUTPUT Record	MULTIRECORD
2	006EH	2	02	7 : 7 END OF LIST , 6 : 4 =000B , 3 : 0 RECORD FORMAT VERSION = 2	HEADER
3	006FH	13	0D	RECORD LENGTH OF MULTIRECORD	
4	0070H	11	0B	RECORD CHECKSUM	
5	0071H	229	E5	HEADER CHECKSUM	
6	0072H	1	01	+12V 7 : STANDBY = 0 , 6-4 : RESERVED 000B , 3-0 : OUTPUT NUMBER = 0001B	+12V
7	0073H	176	B0	NOMINAL VOLTAGE (10mV) 1200 = 04B0H	12.0V
8	0074H	4	04		12.0V
9	0075H	128	80	MAXIMUM NEGATIVE VOLTAGE DEVIATION (10mV)	11.52V
10	0076H	4	04		11.52V
11	0077H	212	D4	MAXIMUM POSITIVE VOLTAGE DEVIATION (10mV)	12.36V
12	0078H	4	04		12.36V
13	0079H	120	78	RIPPLE AND NOISE PK-PK 10Hz TO 20MHz (mV) 120mV = 0078H	120mV
14	007AH	0	00		120mV
15	007BH	244	F4	MINIMUM CURRENT DRAW(mA)	0.5A
16	007CH	1	01		0.5A
17	007DH	200	C8	MAXIMUM CURRENT DRAW(mA)	45A
18	007EH	175	AF		45A
1	007FH	1	01	RECORD TYPE ID 0X01 = DC OUTPUT Record	MULTIRECORD
2	0080H	130	82	7 : 7 END OF LIST , 6 : 4 =000B , 3 : 0 RECORD FORMAT VERSION = 2	HEADER
3	0081H	13	0D	RECORD LENGTH OF MULTIRECORD	
4	0082H	245	F5	RECORD CHECKSUM	

5	0083H	123	7B	HEADER CHECKSUM	
6	0084H	130	82	+12VSB 7 : STANDBY = 0 , 6-4 : RESERVED 000B , 3-0 : OUTPUT NUMBER = 0010B	+12VSB
7	0085H	176	B0	NOMINAL VOLTAGE(10mV)	12V
8	0086H	4	04		12V
9	0087H	116	74	MAXIMUM NEGATIVE VOLTAGE DEVIATION(10mV)	11.4V
10	0088H	4	04		11.4V
11	0089H	236	EC	MAXIMUM POSITIVE VOLTAGE DEVIATION(10mV)	12.6V
12	008AH	4	04		12.6V
13	008BH	120	78	RIPPLE AND NOISE PK - PK 10Hz TO 20MHz(mV) 50mV = 0032H	120mV
14	008CH	0	00		120mV
15	008DH	50	32	MINIMUM CURRENT DRAW(mA) 0mA = 0000H	0.05A
16	008EH	0	00		0.05A
17	008FH	184	B8	MAXIMUM CURRENT DRAW(mA)	3A
18	0090H	11	0B		3A
1	0091H	0	00	Unused Area	
2	0092H	0	00	Unused Area	
3	0093H	0	00	Unused Area	
4	0094H	0	00	Unused Area	
5	0095H	0	00	Unused Area	
6	0096H	0	00	Unused Area	
7	0097H	0	00	Unused Area	
8	0098H	0	00	Unused Area	
9	0099H	0	00	Unused Area	
10	009AH	0	00	Unused Area	
11	009BH	0	00	Unused Area	
12	009CH	0	00	Unused Area	
13	009DH	0	00	Unused Area	
14	009EH	0	00	Unused Area	
15	009FH	0	00	Unused Area	
16	00A0H	0	00	Unused Area	
17	00A1H	0	00	Unused Area	
18	00A2H	0	00	Unused Area	
19	00A3H	0	00	Unused Area	
20	00A4H	0	00	Unused Area	
21	00A5H	0	00	Unused Area	
22	00A6H	0	00	Unused Area	
23	00A7H	0	00	Unused Area	
24	00A8H	0	00	Unused Area	
25	00A9H	0	00	Unused Area	
26	00AAH	0	00	Unused Area	
27	00ABH	0	00	Unused Area	
28	00ACH	0	00	Unused Area	
29	00ADH	0	00	Unused Area	
30	00AEH	0	00	Unused Area	
31	00AFH	0	00	Unused Area	
32	00B0H	0	00	Unused Area	
33	00B1H	0	00	Unused Area	
34	00B2H	0	00	Unused Area	
35	00B3H	0	00	Unused Area	
36	00B4H	0	00	Unused Area	
37	00B5H	0	00	Unused Area	
38	00B6H	0	00	Unused Area	
39	00B7H	0	00	Unused Area	
40	00B8H	0	00	Unused Area	
41	00B9H	0	00	Unused Area	
42	00BAH	0	00	Unused Area	
43	00BBH	0	00	Unused Area	
44	00BCH	0	00	Unused Area	
45	00BDH	0	00	Unused Area	
46	00BEH	0	00	Unused Area	
47	00BFH	0	00	Unused Area	
48	00C0H	0	00	Unused Area	
49	00C1H	0	00	Unused Area	
50	00C2H	0	00	Unused Area	
51	00C3H	0	00	Unused Area	
52	00C4H	0	00	Unused Area	
53	00C5H	0	00	Unused Area	
54	00C6H	0	00	Unused Area	
55	00C7H	0	00	Unused Area	
56	00C8H	0	00	Unused Area	
57	00C9H	0	00	Unused Area	
58	00CAH	0	00	Unused Area	

59	00CBH	0	00	Unused Area	
60	00CCH	0	00	Unused Area	
61	00CDH	0	00	Unused Area	
62	00CEH	0	00	Unused Area	
63	00CFH	0	00	Unused Area	
64	00D0H	0	00	Unused Area	
65	00D1H	0	00	Unused Area	
66	00D2H	0	00	Unused Area	
67	00D3H	0	00	Unused Area	
68	00D4H	0	00	Unused Area	
69	00D5H	0	00	Unused Area	
70	00D6H	0	00	Unused Area	
71	00D7H	0	00	Unused Area	
72	00D8H	0	00	Unused Area	
73	00D9H	0	00	Unused Area	
74	00DAH	0	00	Unused Area	
75	00DBH	0	00	Unused Area	
76	00DCH	0	00	Unused Area	
77	00DDH	0	00	Unused Area	
78	00DEH	0	00	Unused Area	
79	00DFH	0	00	Unused Area	
80	00E0H	0	00	Unused Area	
81	00E1H	0	00	Unused Area	
82	00E2H	0	00	Unused Area	
83	00E3H	0	00	Unused Area	
84	00E4H	0	00	Unused Area	
85	00E5H	0	00	Unused Area	
86	00E6H	0	00	Unused Area	
87	00E7H	0	00	Unused Area	
88	00E8H	0	00	Unused Area	
89	00E9H	0	00	Unused Area	
90	00EAH	0	00	Unused Area	
91	00EBH	0	00	Unused Area	
92	00ECH	0	00	Unused Area	
93	00EDH	0	00	Unused Area	
94	00EEH	0	00	Unused Area	
95	00EFH	0	00	Unused Area	
96	00F0H	0	00	Unused Area	
97	00F1H	0	00	Unused Area	
98	00F2H	0	00	Unused Area	
99	00F3H	0	00	Unused Area	
100	00F4H	0	00	Unused Area	
101	00F5H	0	00	Unused Area	
102	00F6H	0	00	Unused Area	
103	00F7H	0	00	Unused Area	
104	00F8H	0	00	Unused Area	
105	00F9H	0	00	Unused Area	
106	00FAH	0	00	Unused Area	
107	00FBH	0	00	Unused Area	
108	00FCH	0	00	Unused Area	
109	00FDH	0	00	Unused Area	
110	00FEH	0	00	Unused Area	
111	00FFH	0	00	Unused Area	

FRU DATA FOLLOW WITH SPEC LABEL, SPEC LABEL SHOULD BE CONFIRMED BY M.E.

Table showing DPS-550AB-11 D HEX Information: 2015/01/15 Rev: SXXE00

Addr	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0000	01	00	00	00	01	0A	00	F4	01	09	19	C5	44	45	4C	54
0010	41	CE	44	50	53	2D	35	35	30	41	42	2D	31	31	20	44
0020	D4	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
0030	58	58	58	58	58	C3	58	58	46	CE	58	58	58	58	58	58
0040	58	58	58	58	58	58	58	58	C0	C0	C1	00	00	00	00	70
0050	00	02	18	80	66	26	02	20	03	3C	05	10	27	9C	31	20
0060	4E	C0	5D	2F	3F	0C	1A	8A	C2	00	00	00	85	01	02	0D
0070	0B	E5	01	B0	04	80	04	D4	04	78	00	F4	01	C8	AF	01
0080	82	0D	F5	7B	82	B0	04	74	04	EC	04	78	00	32	00	B8
0090	0B	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00A0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00B0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00C0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00D0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00E0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
00F0	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

CHECK LIST **All data written to EEPROM should be ASCII code in hexidecimal format**

Note: All of the Check Sum are Calculated by Zero Check Sum

NO.	Item	Address	Byte	Description	Value
1	Checksum1	07H	1	100H - (Low Byte Sum(00H~06H))	F4
2	Checksum2	4FH	1	100H - (Low Byte Sum(08H~4EH))	70
3	Checksum3	53H	1	100H - (Low Byte Sum(55H~6CH))	80
4	Checksum4	54H	1	100H - (Low Byte Sum(50H~53H))	66
5	Checksum6	70H	1	100H - (Low Byte Sum(72H~7EH))	0B
6	Checksum7	71H	1	100H - (Low Byte Sum(6DH~70H))	E5
7	Checksum8	82H	1	100H - (Low Byte Sum(84H~90H))	F5
8	Checksum9	83H	1	100H - (Low Byte Sum(7FH~82H))	7B
9	Manufacturer Name	0CH~10H	5	Use the ASCII Code	"DELTA"
10	Product Name	12H~1FH	14	Use the ASCII Code	"DPS-550AB-11 D"
11	Product Version NO	36H~38H	3	Use the ASCII Code*(the value must to accord with #1)	Updated
12	Product Serial No.	3AH~47H	14	Use the ASCII Code*(the value must to accord with #3)	Updated
13	Unused Area	91H~FFH			00