

MODEL LIST: ADP-160FR AAA/AAB/AAC/AAD/AA/AB/ABA/ASA/ASB

1. Scope

This specification applies to the switching regulator used for Class II type products.

2. Specification

Refer to the following

3. Appearance

Other way indicate

4. Safety specifications

USA, Canada : UL60950-1+C-UL (R/C 認證) 2nd Edition

EU : IEC/EN 60950-1 (CB) 1st Edition/2nd Edition

KC mark

5. EMC

EMC	Item	Specifications and Test Conditions
EMI	Conduction (雜音端子電壓)	VCCI-B, FCC Part15 B IT: EN55022, EN55024, CISPR22, CISPR24 AV: EN55013, EN55020, CISPR13, CISPR20
	Radiation (不要輻射)	VCCI-B, FCC Part15 B IT: EN55022, EN55024, CISPR22, CISPR24 AV: EN55013, EN55020, CISPR13, CISPR20
	Harmonic (電源高調波)	IT: EN61000-3-2 AV: EN61000-3-2
	Flicker (電源閃爍)	IT: EN61000-3-3 AV: EN61000-3-3
EMS	Electrostatic Discharge (靜電氣放電)	IEC61000-4-2 Test Probe: 150pF / 330 ohm Air : ~ +/- 8kV Contact : ~ +/-6kV No function error, no latch off, no damage.



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DELTA ELECTRONICS, INC.

DESCRIPTION :
電氣規格 (Electrical Specification)

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MODEL NO. :
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RS (放射無線周波數磁界)	IEC61000-4-3 3V/m AM modulation 1kHz 80% 80~10000MHz Sweep rate: 1.5x10-3 decade/s No function error, no latch off, no damage.
EFT/B (快速暫態雜訊)	IEC61000-4-4 1KV No function error, no latch off, no damage.
Surge (雷擊)	IEC61000-4-5 Common : +/-4KV Normal : +/-2KV Phase + : 0°C, 90°C Phase - : 180°C, 270°C No function error, no latch off, no damage.
CS (傳導性妨害)	EC61000-4-6 3V AM modulation 1kHz 80% 0.15~80MHz Sweep rate:1.5x10-3 decade/s No function error, no latch off, no damage.
Immunity (電源周波數磁界)	IEC61000-4-8 1A/m x,y,z direction No function error, no latch off, no damage.



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	AC dip (電源電壓變動)	IEC61000-4-11	
		Above 95%, reduction, 0.5 cycle (240Vac→12Vac) & (100Vac→5Vac)	No function error, no latch off, no damage. (Performance Criterion B)
		30% reduction, 25 cycle (240Vac → 168Vac) & (100Vac→ 70Vac)	After the test, AC OFF then ON , then unit should be able to start again and no function error, no latch, no damage. (Performance Criterion C)
		Above 95%, reduction, 250 cycle (240Vac→ 12Vac)&(100Vac→5Vac)	After the test, AC OFF then ON , then unit should be able to start again and no function error, no latch off, no damage.(Performance Criterion C).

6. Input characteristics

	Item	Condition	Specification
1	Rated input voltage	-	100 ~ 240 Vac
2	Input voltage range	-	85 ~ 276 Vac
3	Input current	5VSB/1.5A, 12V/13A @ 100Vac	<2.5A
4	Rated input frequency	-	50Hz / 60Hz
5	Input frequency	-	47 ~ 63 Hz
6	Input inrush current	85 ~ 276 Vac Rated load (Test with 3KV AC source).	Ta= 25°C Cold start Less than 140A
			Ta= 40°C Repeat AC ON<=>OFF (5VSB: 120mA load, 12V OFF) Less than 180A/2msec 以下

7. Output characteristics

7-1. Output System:

Control signal (input): 12V on/off by ACDC_STBY

Control signal (output): ACIN_DET indicate the AC in or not, and inform about the status of abnormal condition.



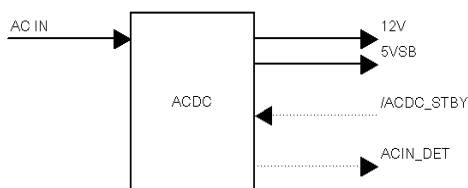
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7-2 Output Characteristics:

Below output capacitance (smallest capacity) should be satisfied

12V : 22uF (Ceramic capacitor)

5VSB : 10uF (Ceramic capacitor)

Output	Output Voltage		Output Current			Ripple & Nioise (at rated load)
	Rated	Tolerance	Peak	Rated	Min.	
5VSB	4.8V	+/- 4%	3A	1.5A	0A	Ta= -5~40°C 50mVp-p,max
12V	12V	+ 5%, - 4%	19.5A/30msec	13A	0A	150mVp-p,max

Output	OCP	OVP
5VSB	3 ~ 3.75A	6V,max
12V	19.5 ~ 24.375A	15.6V,max

7-3 Other characteristics:

	Item	Condition and Specification	
1	No load operating	Input range: 85 ~ 276 Vac No function error, no damage, and output voltage should be within regulation.	
2	Over / Undershoot	Input range: 85 ~ 276 Vac Output voltage should be within 10% of rated output voltage.	
3	Start with capacitive load	Input range: 85 ~ 276 Vac Output should be in parallel with below capacitor : 12V : 4700uF 5VSB : 100uF The unit should be able to start stably.	
4	Protective function	OCP	Once the 5VSB has been detected abnormal (5VSB OC/OV), all output should be shut down
		OVP	Once the 12V has been detected abnormal (12V OC/OV/OT/UV), 12V output should be shut down immediately, and pull ACIN_DET to low.
		OTP	



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		Protection functional operation (Signal and power output)		
5	Recovery from protection	Remove latch function after the AC OFF and within 3 minutes.		
6	Transient response	5VSB	Input range: 85 ~ 276 Vac [5VSB load change] Change range : 100%~60%, 90%~50%, 80%~40% Change frequency : 10Hz & 1kHz. Change rate : 0.01A/usec 12V load : 0A and 13A	Output voltage should be regulated within 4.8V +/-4%.
		12V	Input range: 85 ~ 276 Vac [12V load change] Change range : 100%~80%, 90%~70%, 80%~60% Change frequency : 10Hz & 1kHz. Change rate : 0.3A/use 5V load : 0A and 1.5A	Output voltage should be regulated within 12V +5% -4%.

8. Control terminal characteristics

ACDC_STBY	<p>Signal polarity</p> <table><tr><td></td><td colspan="2">ACDC_STBY</td></tr><tr><td></td><td>Hi</td><td>Low</td></tr><tr><td>5VSB</td><td>ON</td><td>ON</td></tr><tr><td>12V</td><td>ON</td><td>OFF</td></tr></table> <p>【 ACDC_STBY signal level 】</p> <p>Vin_max : 3.465V Vih : Min 2.2V Vil : Max 0.6V Iin_max : 0.15mA</p>		ACDC_STBY			Hi	Low	5VSB	ON	ON	12V	ON	OFF
	ACDC_STBY												
	Hi	Low											
5VSB	ON	ON											
12V	ON	OFF											
ACIN_DET	<p>【 ACIN_DET signal level 】</p> <p>With the signal output which fills up below-mentioned Spec, on ACDC side the P-D resistant internal of 100kΩ.</p> <p>[AC ON] ACIN_DET : Voh: Min=4.5V, Max=5.1V</p> <p>[AC OFF] ACIN_DET : Vol: Min=0V, Max=0.3V</p>												



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9. Power ON/OFF (Sequential control & Timing)

Item	Condition	Specification
5VSB turn on time (t_5vsb_on)	ACDC_STBY: Low	5VSB output voltage should be regulated to 4.8V+/-4% within 300mS.
ACIN_DET turn on delay time (t_acin_det_delay)	AC input: OFF to ON	ACIN_DET: Low to Hi Turn on after 5VSB output has stabilized.
ACIN_DET turn on delay time 2 (t_acin_det_delay2)	AC input: ON to OFF then ON again.	Once ACIN_DET from Hi to Low, and if turn Hi again, it should be wait for 10ms or more.
ACIN_DET turn off delay time (t_ac_off)	5VSB : no load ACDC_STBY: Low	more than 40msec
	ACDC_STBY: Hi	ACIN_DET should be turn low while 12V output drop between 12V to 0V.
12V turn on time (t_main_on)	ACDC_STBY on to 12V rise time.	12V output voltage can be regulated to 12V+/-5% within 400mS.
12V turn on rise time (t_main_on_2)	10V to 12V rise time.	12V output voltage from 10V rise to 12V within 150msec.
12V turn on rise time (t_main_on_3)	0V to 12V rise time	12V output voltage from 0V rise to 12V within 2~20msec.
12V turn off time (t_main_off)	5VSB: rated load 12V : 8A load ACDC_STBY: Hi to Low	12V output voltage from 100%(avg voltage before change state) drop to 10% within 250mS.
Line cycle dropout (t_dur1)	Refer to item 10-7.	
Hold up time(t_dur2)		



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10. Common specifications

	Item	Condition	Specification
1	Switching frequency	100Vac input. Rated load.	-
2	Power factor	-	IEC61000-3-2.
3	Life	Rated input voltage. Ambient temperature, constant humidity.	70,000Hr or more with thermal test BOX. => 20,000Hr, 12V/5VSB rated load (FAN cooling). => 50,000Hr, 12V OFF/5VSB rated load (air convection).
4	Efficiency	5VSB (12V OFF)	Rated input voltage, load (0.03A)
			55.5%
			Rated input voltage, load (0.05A)
			63.0%
			Rated input voltage, load (0.06A)
			66.5%
			Rated input voltage, load (0.1A)
			71.5%
			Rated input voltage, load (0.3A)
			78%
		12V (5VSB: 0A)	Rated input voltage, load (0.37A)
			78%
			Rated input voltage, load (0.6A).
			79.5%
			Rated input voltage, load (0.75A).
			80.0%
			Rated input voltage, load (1A)
			80.5%
			Rated input voltage, load (1.5A)
			80%
			Rated input voltage, load (0.2A).
			52%
			Rated input voltage, load (0.3A).
			60.0%
			Rated input voltage, load (1A).
			75.0%
			Rated input voltage, load (2A).
			84.0%
			Rated input voltage, load (3A).
			87.5%
			Rated input voltage, load (4A).
			89.0%
			Rated input voltage, load (5A).
			89.5%
			Rated input voltage, load (6A).
			90.0%
			Rated input voltage, load (7A).
			90.5%
			Rated input voltage, load (8A).
			90.0%



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			Rated input voltage, load (9A).	90.0%
			Rated input voltage, load (11A).	89.5%
			Rated input voltage, load (13A).	89.0%
5	Idle power consumption		Rated input voltage 12V OFF 5VSB: 0A load	0.085W(max)
			Rated input voltage 12V 0A load 5VSB: 0A load	0.9~1.7W
6	Internal components temperature rise		Rated input voltage. Thermal test BOX. Ta=40°C	There is enough de-rating of temperature for all component. No component over derating before OTP trigger.
7	Line cycle dropout (瞬停保証時間)	t_dur1	Rated input voltage 1. 12V: 6.5A (5VSB 0A)	50Hz 2 cycle(=40ms). Output voltage shall be satisfy electric characteristic.
		t_dur2	Input voltage range 1. 5VSB: 1.5A load 2. 12V: OFF & ON	5VSB shall be low after ACIN_DET low
8	入力片切 test		AC ON→ Line OPEN→Line SHORT. AC ON→Neutral OPEN→Neutral SHORT.	Same as AC ON→ AC OFF→ AC ON Same as AC ON→ AC OFF→ AC ON
9	Leakage current		Rated input voltage.	100uArms or less.
10	AC input discharge time		Input 121V or less, from AC power OFF to 37% rated.	1 sec or less.
			Input 122V or more, from AC power OFF to 45V.	1 sec or less.
11	400V input protection		400Vac input / 2sec.	No safety hazard.
12	Dielectric strength		Input between primary and secondary.	IEC60950-1 item 5.2
			QA (sampling) : 3.0kVac 50/60Hz 60sec Production line (all): 3.1kVac 50/60Hz 3sec	Sense current : 10mA or less. Without damage to parts.
13	Insulation resistance		500 Vdc input between primary and secondary.	10 Mohm or more.
14	Insulation distance		-	Should be met the safety requirement and add external 0.5mm for SIE request.



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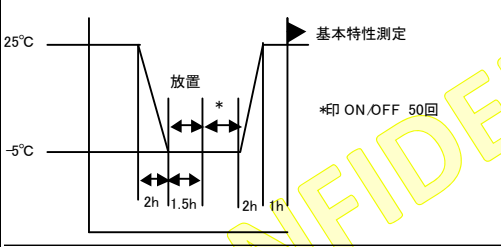
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11. Environmental

	Item	Condition & Specification
1	Operation guarantee temperature range	-5 ~ +40°C (humidity 20~90% Rh)
2	Storage guarantee temperature range	-35 ~ +80°C (humidity 10~90% Rh)
3	High temperature / high humidity operation	+40°C/90% Rh 1000Hr operation. Electric characteristic shall be satisfied.
4	High temperature / high humidity storage	After put the unit with max. storage temperature & humidity in storage 96Hr, then change the condition to ambient temperature & humidity 1Hr, and then test it. Electric characteristic shall be satisfied.
5	Low temperature storage	After put the unit with min. storage temperature in storage 96Hr, then change the condition to ambient temperature 1Hr, and then test it. Electric characteristic shall be satisfied.
6	Low temperature operation	After put the unit with min. operation temperature in storage 5Hr, then test it. Electric characteristic shall be satisfied.
7	Low temperature starting	Rated input voltage \pm 10%. Rated load. Electric characteristic shall be satisfied. Testing follow below temperature curve: 
8	Damp heat	Temperature: 40 \pm 2°C Humidity 90~95% Store: 48 hour It wipes the water-drop, 30 minutes leaves in normal temperature normal moisture, dielectric strength and Insulation resistance shall be satisfied.
9	Thermal shock	-20°C: 4 hours 80°C: 4 hours -20°C~80°C: 10°C/minute It designates this as 1 cycles and 5 cycles leaves, electric characteristic shall be satisfied and without distinct damage in appearance.



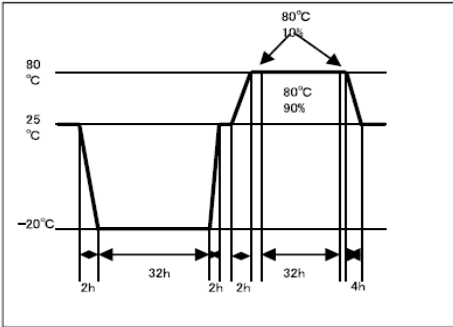
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10	Heat cycle	<p>Put the unit with temperature / humidity (follow below temperature / humidity curve) in storage, and then test it with rated input voltage / rated load. Electric characteristic shall be satisfied and without distinct damage in appearance.</p> 
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12. Other

	Item	Condition & Specification
1	Appearance	There is no adhesion of the foreign material and the dirty fingerprint. In addition, when producing it depends on the oil and the like which is used, there is no stench of the product.
2	Adhesive	Chloroprene is designated as the main component, do not use the adhesive.
3	Weight	NA
4	Noise	-

13. 耐久性能

	Item	Condition & Specification
1	Load open / short	<p>5VSB Rated input voltage. After output short 1sec, AC off (disable latch mode) then re-start as 1cycle, this 100 cycles after doing electric characteristic shall be satisfied. (將輸出端子 Short 一秒後, AC OFF (Latch 解除) 再切入 AC 以此為 1cycle, 實行 100 cycle 後, 滿足電器特性。)</p>



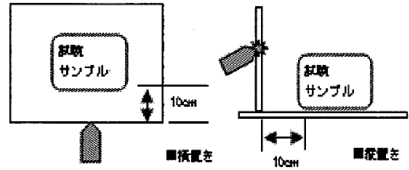
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		12V Rated input voltage. After output short 1sec, AC off (disable latch mode) then re-start as 1cycle, this 100 cycles after doing electric characteristic shall be satisfied. (將輸出端子 Short 一秒後, AC OFF (Latch 解除) 再切入 AC 以此為 1cycle, 實行 100 cycle 後, 滿足電器特性。)	
2	Power ON/OFF (Primary)	Rated input voltage +/-10%. 12V: OFF 5VSB: rated load (resistor load) Air convection	The primary power supply ON/OFF shall be done 100,000 times. (5sec/ON, 5sec/OFF) Electric characteristic shall be satisfied.
	Power ON/OFF (Secondary)	Rated input voltage +/-10%. 5VSB: Rated load (resistor load) 12V: Rated load (resistor) Inside thermal test BOX,FAN cooling	The secondary ACDC_STBY control the ON/OFF shall be done 100,000 times. (5sec/ON, 5sec/OFF) Electric characteristic shall be satisfied.
3	O/S test	Input voltage : 90V & 264V Output load : Rated load. Open & Short parts: Transistor and IC: Combination between all terminals Diode: Between A-K Transformer & chock: Coil Capacitance: Between terminals When AC input turn on state, to do components open/short test.	No ignition or smoke or damage.
4	Electrostatic Discharge	IEC61000-4-2 Rated input voltage. Rated load. Test probe: 150pF / 330 ohm. Each 5 times.	Air : +/- 12KV: no function error. +/- 14KV: no latch off, no damage. +/- 15KV: no quality accident.
		Discharge location: [Air] : Any surface hand can touch except the air intake vent. [Indirect]	Indirect : +/- 8KV: no function error, no latch off, no damage. +/- 15KV: no quality accident.
		 <p>[Contact] : Any metal hand can touch. power & signal (input/output).</p>	Contact : +/- 12KV: no function error, no latch off, no damage. +/- 15KV: no quality accident.



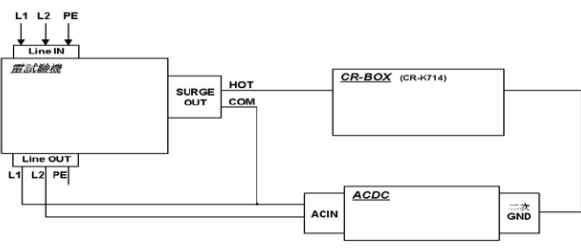
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5	AC Transient	Rated input voltage, rated load. Charge capacitor: 2000pF. Surge voltage: 7~15kV. 3 times/each.	+/-10kV: no function error. +/-15kV: no latch off, no damage.
6	AC noise	Rated input voltage, rated load. Pulse width: 100ns/1000ns. Noise voltage: +/-1kV.	No function error, no latch off, no damage.
7	Surge 雷擊	Rated input voltage, rated load. IEC1000-4-5 with CR box (13 ohm + 9uF) Phase +: 0°, 90°. Phase -: 180°, 270°. Each 5 times. 	L-N/N-L +/- 6k: no function error, no latch off, no damage. +/- 8V: cam damage, no quality accident. L-G/N-G +/- 6k: no function error, no latch off, no damage. +/- 8V: cam damage, no quality accident.
8	Vibration	Frequency (7~30~7Hz / 5 minutes), Acceleration 23.5 m/s ² X,Y,Z each 20 minutes (Non-operating/Random). Electric characteristic shall be satisfied. There shall be no blistering damage to the construction.	
9	Shock	1.Non-operating/half-sine Three axis (X,Y,Z direction) shall be applied in both directions of mutually perpendicular axis 1 times (a total of 6 times) for table a. Sample : 2pcs	



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Table a		
落下面	G sensor data	Duration
+X	150	8
-X	80	9
+Y	80	9
-Y	150	8
+Z	150	8
-Z	150	8

2.Non-operating/half-sine
A directions for a sample,
G & Duration value follow table b
Total sample : 12pcs

Table b		
落下面	G sensor data	Duration
+X	600	2.5
-X	500	2.5
+Y	150	4
-Y	500	2.5
+Z	600	2.5
-Z	900	1.5



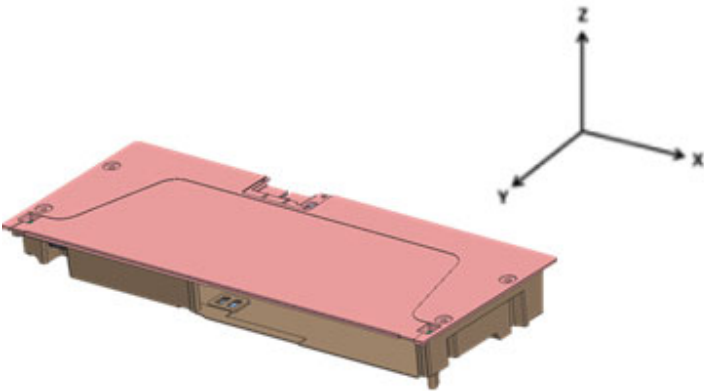

台達電子工業股份有限公司
DELTA ELECTRONICS, INC.

DESCRIPTION :
電氣規格 (Electrical Specification)

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MODEL NO. :
ADP-160FR SERIES

Date	Drawn	Design (EE)	Design (ME)	DOCUMENT NAME. :	REV.
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10	CMZE	<p>Follow test program by customer provide.</p> <p>Vin:100Vac/50Hz, 230Vac/50Hz</p> <p>Vo:5VSB/0A,12V/6.3A & 5VSB/0A,12V/0.2A</p> <p>Spec:<-6dBm@100kHz~500kHz</p>

14. MECHANICAL

Item	Judgement	Condition
1	Vibration	<p>Electric characteristic shall be satisfied. And no remarkable abnormal occurrence on the appearance and construction. Parts and assembly with customer system must also be satisfied.</p> <p>Non-operating/Random:</p> <p>The entire frequency range from 7Hz(0.822 g² /Hz) to 30Hz(0.192 g² /Hz) and return to 7Hz(0.822 g² /Hz) shall be a transverse in 5 min. Three axis (X,Y,Z direction) shall be applied 20minutes acceleration: 23.5 m/s² (2.85Grms)</p>



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2	Shock	Electric characteristic shall be satisfied. And no remarkable abnormal occurrence on the appearance and construction. Parts and assembly with customer system must also be satisfied.	<div>1.Non-operating/half-sine Three axis (X,Y,Z direction) shall be applied in both directions of mutually perpendicular axis 1 times (a total of 6 times) for table a. Sample : 2pcs</div> <table><tr><th colspan="3">Table a</th></tr><tr><th>落下面</th><th>G sensor data</th><th>Duration</th></tr><tr><td>+X</td><td>150</td><td>8</td></tr><tr><td>-X</td><td>80</td><td>9</td></tr><tr><td>+Y</td><td>80</td><td>9</td></tr><tr><td>-Y</td><td>150</td><td>8</td></tr><tr><td>+Z</td><td>150</td><td>8</td></tr><tr><td>-Z</td><td>150</td><td>8</td></tr></table> <div>2.Non-operating/half-sine A directions for a sample, G & Duration value follow table b Total sample : 12pcs</div> <table><tr><th colspan="3">Table b</th></tr><tr><th>落下面</th><th>G sensor data</th><th>Duration</th></tr><tr><td>+X</td><td>600</td><td>2.5</td></tr><tr><td>-X</td><td>500</td><td>2.5</td></tr><tr><td>+Y</td><td>150</td><td>4</td></tr><tr><td>-Y</td><td>500</td><td>2.5</td></tr><tr><td>+Z</td><td>600</td><td>2.5</td></tr><tr><td>-Z</td><td>900</td><td>1.5</td></tr></table>	Table a			落下面	G sensor data	Duration	+X	150	8	-X	80	9	+Y	80	9	-Y	150	8	+Z	150	8	-Z	150	8	Table b			落下面	G sensor data	Duration	+X	600	2.5	-X	500	2.5	+Y	150	4	-Y	500	2.5	+Z	600	2.5	-Z	900	1.5
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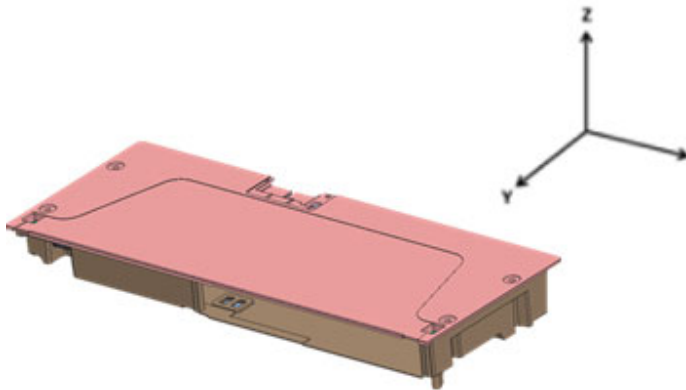

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3	Drop I	1. No component broken.. 2. No PWB copper pad peeling and broken 3. Hi-pot test pass with specific condition. (AC 3300V/1min) 4. No soldering crack. 6. ATS function Pass.	測試前,Case 請用螺絲鎖附在系統配合孔固定 case 1.Drop TIMES: 5 times for every surface (six side),total 30 times 2. Test surface material : The concrete 3.Drop height: 10cm.
4	Drop II	1. No component broken.. 2. No PWB copper pad peeling and broken 3. Hi-pot test pass with specific condition. (AC 3300V/1min) 4. No soldering crack. 5. ATS function Pass.	測試前,Case 請用螺絲鎖附在系統配合孔固定 case 1.Drop TIMES: 1 times for every surface (six side),total 6 times 2. Test surface material : The concrete 3.Drop height: 45cm.



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5. Packing test :

5.1 Drop test condition:

<1>.Drop height:**80.0CM**

<2>.Impact surface: concrete floor

<3>.Drop times: **1 side (Bottom side),total 10 times**

Criteria:

The sample has no electric characteristic issue and without distinct damage in appearance.

5.2 Vibration test condition:

<1>.Wave: Random

<2>.Acceleration: 1.146Grms

<3>.Frequency: 5-200Hz

<4>.Duration:30min/side

<5>.Orientations: each axis total 3 times

Criteria:

The sample has no electric characteristic issue and without distinct damage in appearance.

15. For safety

15.1 Atiltude : 2000m

15.2 Thermal test setup

fan 1= 12V ,

fan 2= 12V,

fan 3= 8V

Thermal test ambient : 40deg C

Setup method



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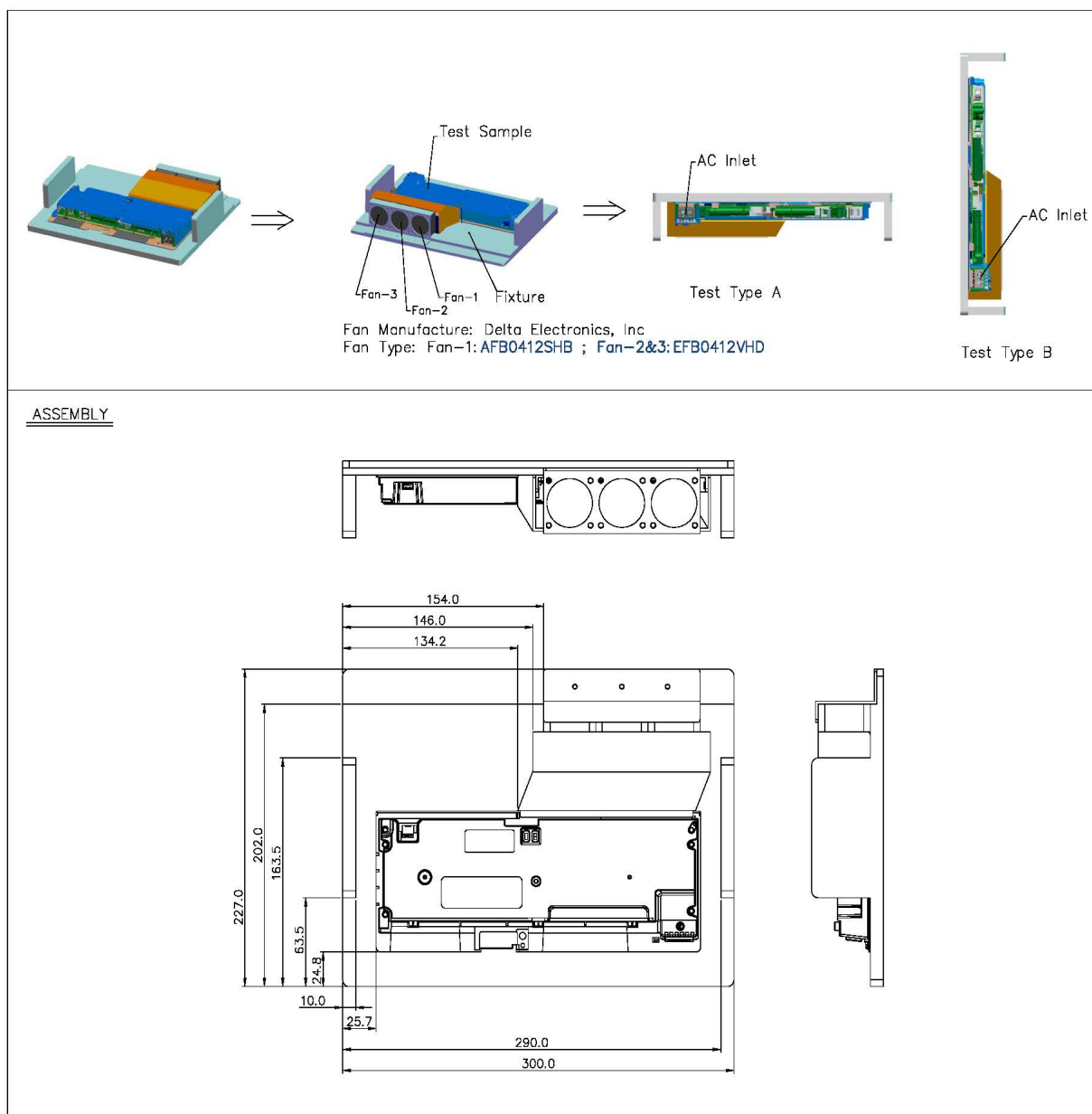
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16. 噪音測試量測 (帶 case 測試), 麥克風距離case 出風口 5cm, 依照客戶指定負載如下,

(1) 5VSB:量測 0.03A, 0.33A, 12V OFF.

12V:量測 0.33A, 5V 0A.

(2) 此機種 case 有開孔, 定義為 open frame 機種:

階段	EVT	DVT&PVT	M/P FQC	M/P QE
測試距離	5cm	5cm	5cm	5cm
輸入電壓	100V & 230V	100V & 230V	100V & 230V	100V & 230V
標準	40 dB max.			

17. Product Ingress protection(IP) rating: Not requirement

Product Application: Game Consoles

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