ENGINEERING EVALUATION

REPORT NUMBER: 100110740MID
ORIGINAL ISSUE DATE: June 23rd, 2011
REVISION AND DATE: Original

EVALUATION CENTER
Intertek Testing Services NA Ltd.
8431 Murphy Drive
Middleton, WI 53562

RENDERED TO

B&W GROUP LIMITED
DALE ROAD
WORTHING
WEST SUSSEX BN11 2BH
ATTN: MR. PAUL MILLS
EMAIL: pmills@bwgroup.com

PRODUCT EVALUATED: BB6W Wall-Mounted Speaker Enclosure
EVALUATION PROPERTY: Fire Resistance

Engineering Evaluation of BB6W Wall-Mounted Speaker Enclosure for compliance with the applicable requirements of the following criteria: ASTM E814-10 *Standard Test Method for Fire Tests of Penetration Firestop Systems*

1 Table of Contents

2 Introduction

Intertek is conducting an engineering evaluation for B&W Group Limited on BB6W Wall-Mounted Speaker Enclosure to evaluate fire resistance. The evaluation is being conducted to determine if requiring a cover or speaker be installed within the enclosure opening will maintain compliance with ASTM E814-10 *Standard Test Method for Fire Tests of Penetration Firestop Systems*.

3 Product and Assembly Description

3.1. Product and/or Assembly Description:

Tested samples consisted of a steel enclosure box containing 1" thick Superwool applied inside the well of the box. Four samples were installed into a wood stud wall made of nominal 2" x 4" wood studs with one layer of 5/8" Type X gypsum wallboard attached to either side. Two of the enclosures were installed with a steel and plastic template for the wall cut outs.

3.2. Product and/or Assembly Traceability:

The test samples were sent directly to Intertek in Middleton, WI from Sound Sources Technology, Inc in Torrance, CA, a supplier for B&W Group and were compared to drawings and previously tested enclosures.

3.3. Product and/or Assembly Certification:

The BB6W speaker enclosure is not currently certified by Intertek.

Authorities Having Jurisdiction (AHJ) should be consulted in all cases as to the particular requirements covering the installation and use of Intertek certified products, equipment, systems, devices and materials. The AHJ should be consulted before construction. Fire resistance assemblies and products are developed by the design submitter and have been investigated by Intertek for compliance with specific requirements. The published information (product and design listings) cannot always address every construction nuance encountered in the field. When field issues arise, it is recommended the first contact for assistance be the technical service staff provided by the product manufacturer noted for the design. Users of fire resistance assemblies are advised to consult the test standard referenced for each Intertek certified product. The test standard includes specifics concerning alternate materials and alternate methods of construction. Only products which bear Intertek's Mark are considered as certified. The appearance of a company's name or product in Intertek Directory of Listed Building Products does not in itself assure that products so identified have been manufactured under Intertek's Follow-Up Service. Only those products bearing the Intertek Mark should be considered to be Listed and covered under Intertek's Follow-Up Service. Always verify the Mark on the product before using it.

4 Reference Documents

As part of this evaluation, Intertek has directly or indirectly used the following referenced documents:

Intertek Reports:

- 100110740SAT-003 (7/29/2010)
- 100110740MID-003 (6/21/2011)

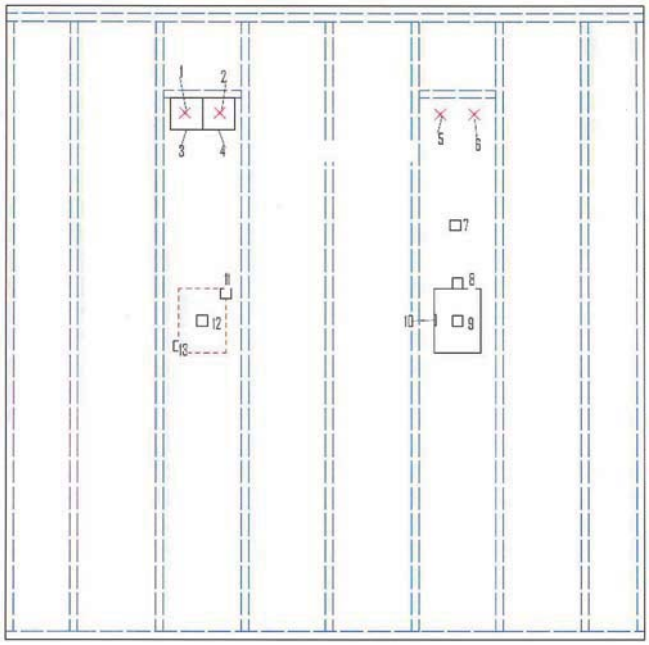
Standards

- ASTM E814-10 *Standard Test Method for Fire Tests of Penetration Firestop Systems*

5 Evaluation Method

This evaluation is being conducted solely for the above italicized referenced project or use or both. Due to the variables that exist from project to project and the fact that each evaluation requires review of the most current existing data and information, this evaluation is not to be used as justification for any other opinion nor used for any other project, without the express written consent of Intertek. This report should serve as Intertek's opinion regarding the use of the certified product in the conditions described herein. The materials used on the project, which are applied in compliance with Intertek Design Listings, must bear the Intertek listing mark. All certified products must be installed in accordance with the details contained in Intertek's *Directory of Listed Building Products*.

A version of the BB6W wall-mounted speaker enclosure was tested by Intertek at the fire testing lab in Elmendorf, TX on July 23rd, 2010. Two boxes were mounted into a nominal 2"x 4" wood stud wall with one layer of 5/8" thick, Type X gypsum wallboard on each side. The studs were spaced 16" o.c. One of the enclosures was installed so that the opening in the wallboard was in the direction of the assembly facing into the furnace while the second enclosure opening was on the side of the wall assembly facing out of the furnace. The stud cavities were filled with R-13, un-faced, fiberglass insulation. This version of the speaker box contained ½" thick Superwool applied to the bottom of the box and 1" thick Rockwool applied around the sides of the box opening. A foam gasket was also applied to the flanges of the box between the box and the wallboard. The assembly was then tested for a 1 hour fire duration and subjected to a hose stream test immediately following the fire test. Thermocouples were placed on the unexposed side of the wall as per the following drawing:



ASTM E814 gives the conditions of acceptance for a penetration in section 10. They are as follows:

- No single thermocouple on the unexposed surfaces of the assembly may rise more than 325º F above the ambient temperature recorded prior to the beginning of the test
- The material must remain within the opening during the fire test and hose stream test
- The material must prevent the passage of flame through openings in the element on the unexposed side of the wall assembly
- The material sealing the opening in the wall shall not develop any gap that allows a projection of water beyond the unexposed side of the assembly during the hose stream test.

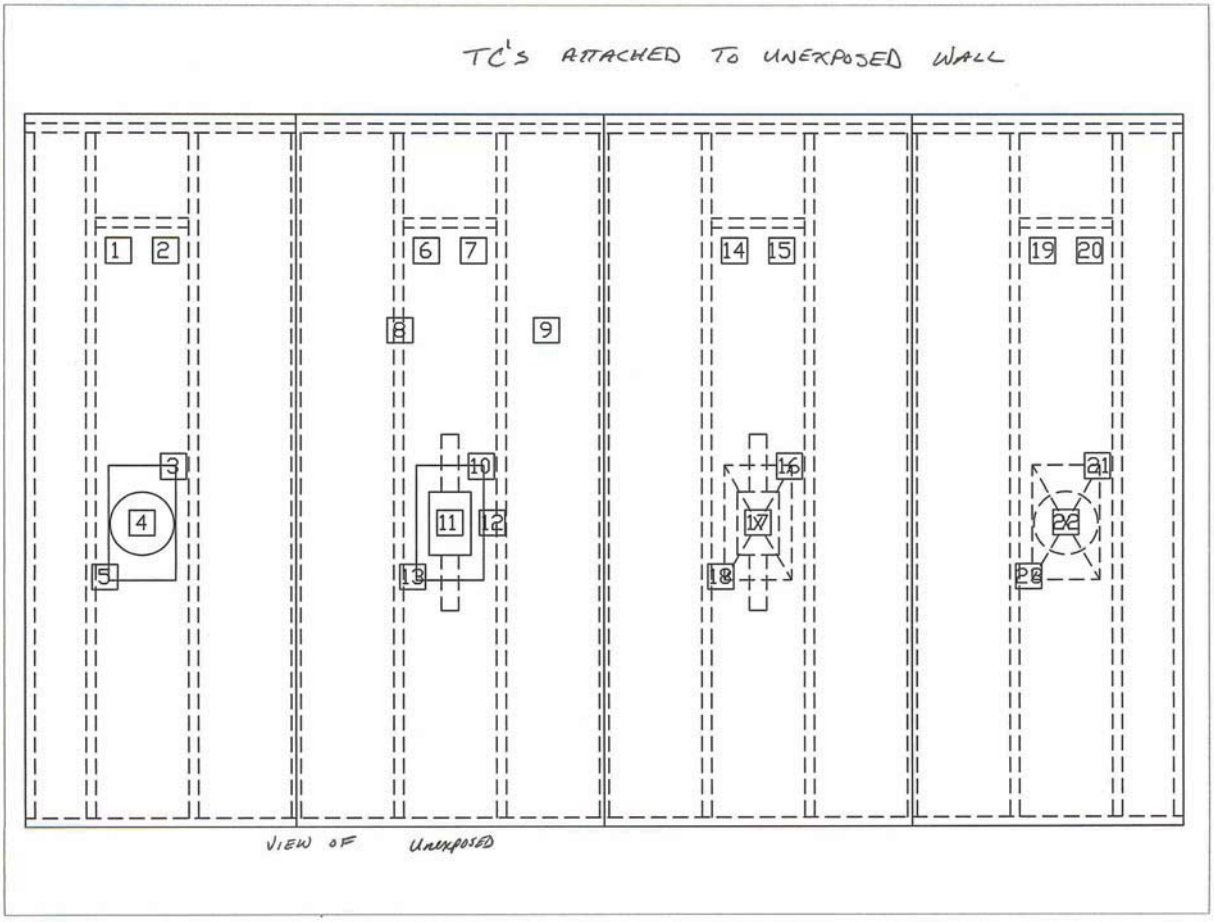
Per test report 100110740SAT-003, ambient temperature at the beginning of the test was between 85-86º F at the start of the test, allowing for a maximum temperature at any unexposed thermocouple of 411º F. The thermocouple located at location #9 above reached a temperature above this point, 420º F, at 27 minutes into the test. In addition, thermocouple #12 reached a temperature of 413º F at 47 minutes, #10 reached 421º F at 49 minutes, and #13 reached 444º F at 58 minutes. This resulted in the boxes not passing the temperature rise requirement for either installation direction.

Due to failing this test, B&W Group made the following changes to the product for a second test:

- Replaced ½" thick Superwool installed in the back of the box with 1" thick Superwool.
- Replaced 1" thick Rockwool installed around the edges of the box opening with 1" thick Superwool.
- Replaced plastic chord grip with steel chord grip.
- Added tabs to hold the insulation into the enclosure.
- Removed foam gasket from mounting holes on the top and bottom flanges of the box.

In addition to the changes made to the enclosures, 3M Fire Barrier CP 25WB+ intumescent caulk was applied to the opening in the top of the box for cables as well as in place of the foam gasket around the flanges between the enclosure and the wallboard.

The wall assembly was constructed the same as the previous test and was subjected to a 1 hour fire resistance test on June 15th, 2011 at the Intertek fire resistance lab in Middleton, WI, followed immediately by the hose stream test. Four enclosures were installed into the wall, with two having openings facing into the furnace and two facing out of the furnace. The two enclosures installed in the middle of the wall had the PMK W6 insert installed to the face of the enclosure. This insert is used as a template for cutting the opening through the wallboard. The following thermocouple locations were recorded during the fire resistance test:



Per test report 100110740MID-003, the ambient temperature at the beginning of the test was 70º F. This allows the maximum temperature of any unexposed thermocouple to be 395º F. Thermocouple #11 reached a temperature of 407.5º F at 41 minutes into the fire resistance test. Thermocouple #4, located inside the box behind the plane of the drywall, reached a temperature of 399.6º F at 43 minutes and had a maximum temperature reading of 519º F at 60 minutes. Thermocouple #22, located behind the box without the PMKW6 on the unexposed drywall face, reached a temperature of 261.8º F. However, thermocouple #17, located on the unexposed face of the drywall behind the box with the PMKW6 installed, reached a temperature of 432.9º F at 55 minutes and therefore cannot be approved without further testing as the wall behind the box failed. The rest of the unexposed thermocouples remained below the maximum 395º F, including thermocouples #3 and #5, located on the unexposed surface of the drywall at the corners of the box flanges of a box with a circular cutout and PMKW6 not installed, which reached temperatures of 215º F and 207º F respectively. The exposed surface was well below the maximum 395º F allowed by the standard. Based on these readings, the enclosure installed with the opening on the exposed side of the assembly and without the PMK W6 insert passed the fire resistance portion of the test while the other three variations did not. In addition, thermocouples #3 and #5, located on the wallboard directly adjacent to the enclosure opening, passed the requirements of ASTM E814 for temperature rise with a maximum reading of 215º F and 207º F respectively. This shows that the temperature near the surface of the enclosure opening was significantly cooler than the temperature inside the enclosure cavity.

In order to be approved for a 1 hour fire rating, the BB6W speaker enclosure would be required to be installed with a speaker in the opening and cannot be left empty. The use of the PMK W6 insert is not approved for use with a fire rated enclosure. Adding a speaker to the box when installed will provide additional material between the thermocouple installed on the face of the unexposed installation and the heat source, moving a thermocouple on the unexposed side further away from the heat source and slowing the amount of heat transfer due to additional thermal mass to the thermocouple allowing for additional time before it would reach the maximum temperature rise allowed by the standard to allow for a 1 hour fire rating per ASTM E814-10. The material installed in the enclosure cavity would be required to have an ignition temperature that is a minimum 525º F. This temperature rise rating is required because the inside temperature of the box reached a maximum of 519º F. Any material installed in the cavity would need to have an ignition temperature above 525º F so that it would not flame during a 60 minute fire resistance test.

In addition to the fire resistance rating, the enclosures must also pass the hose stream test without developing any openings that would allow the passage of water to the unexposed side. As can be seen in the picture below, the wall assembly did not pass the hose stream test due to through openings:

However, the wallboard surrounding the outer two enclosures, which were installed without the PMK W6 insert, was in tact, with no through openings. Because this test was evaluating the enclosures and not the wall assembly, which is already rated for 1 hour, the area around the enclosures should be evaluated. Based on this, the enclosures did not allow gaps around the installation that allowed water to pass through to the unexposed side and can thus be considered to have passed the hose stream requirements of ASTM E814-10.

6 Conclusion

Intertek is conducting an engineering evaluation for B&W Group Limited on BB6W Wall-Mounted Speaker Enclosure to evaluate fire resistance. The evaluation is being conducted to determine if requiring a cover or speaker be installed within the enclosure opening will maintain compliance with ASTM E814-10 *Standard Test Method for Fire Tests of Penetration Firestop Systems*.

Based on the information contained and referenced herein, it is Intertek's professional judgment based on sound engineering principles that the following is true:

B&W Group's BB6W wall-mounted speaker enclosures may be approved for a 1-hour fire rating per ASTM E814-10 provided they are installed with a material filling the box cavity that has a minimum temperature rise of 525° F.

INTERTEK

Reported by:

Jesse Peterson
Engineer, BP-Safety

Reviewed by:

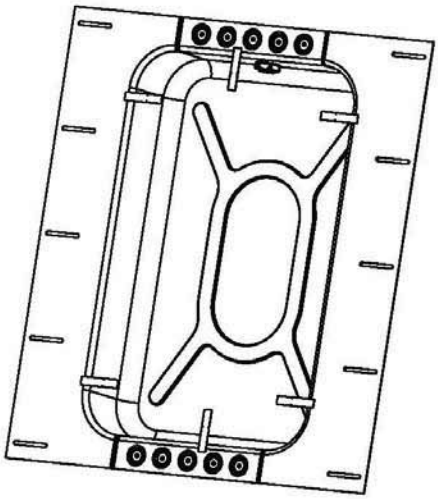
Kent Kelsey
Fire Resistance Team Leader

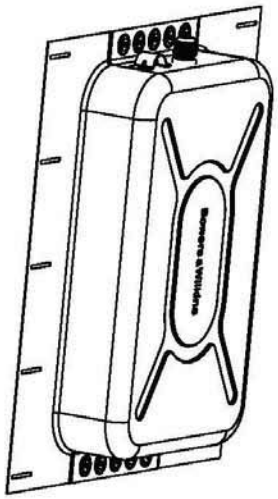
7 APPENDIX

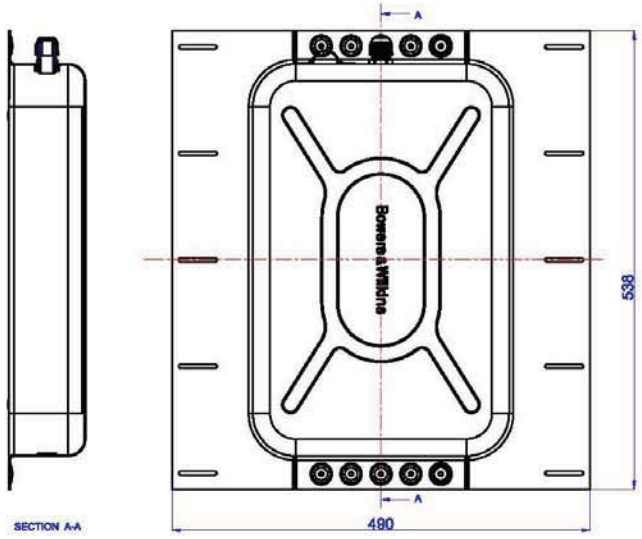
BB6W Drawings

該部品符合歐洲
環保ROHS標准
All components are
based on Eu.Rohs STD

CHANGE NOTICE:	SYM	Description of change	Date	Draw	Approve
	1	變更依據			







SECTION A-A

注：標*號的尺寸為必檢尺寸
Have not indicated the size tolerated.
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Material :								Draw	蔣潔純	2011-05-10	巨翼電子(深圳)有限公司
								Check	鐘利艷	2011-05-10	JU YI ELECTRONICS (SHEN ZHEN) CO., LTD.
								Approve			Name - 後桶組裝外觀圖
Tolerance		0 ~ 14.99	15 ~ 49.99	50 ~ 249.99	250 ~ 499.99	500 ~ 750		Unit	mm		
A	±	0.05	0.1	0.2	0.3	0.4		Scale	1:7 (A4)		Model BB6W
B	±	0.1	0.2	0.3	0.5	0.7		Part No/Dwg No	JYC-1105039D	Sheet: 1 of 1	Rev 2
C	±	0.2	0.5	1.0	1.5	2.0					
D	±	0.5	1.0	1.5	2.0	2.5					

Rev	History of change
2	JY-
1	JYC-1102014D

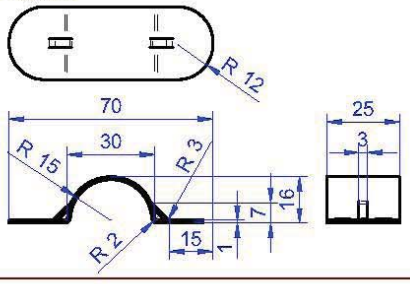
該部品符合歐洲
環保 ROHS 標準
All components are
based on Eu. Rohs STD

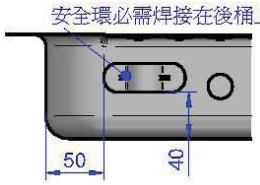
CHANGE NOTICE :

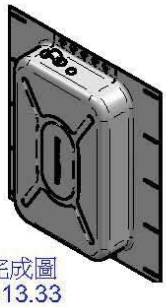
SYM	Description of change	Date	Draw	Approve
1				

3

1. 安全環



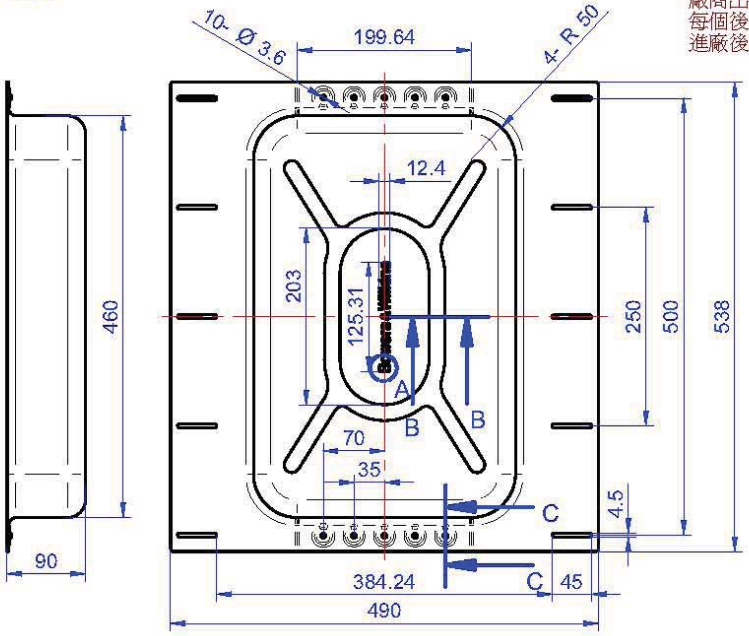




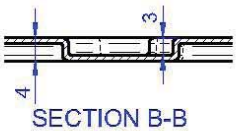
完成圖
1:13.33

2. 後桶

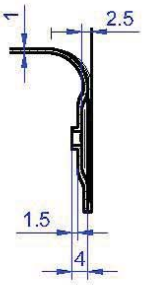
廠商出貨到巨翼時必需確保運送過程中
每個後桶不會刮傷，
進廠後裝上電線夾+吸音綿再包裝出貨。



DETAIL A
1:2



SECTION B-B
1:1



SECTION C-C
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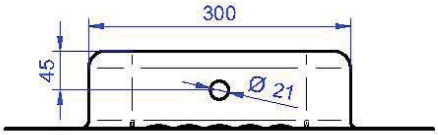


Have not indicated the size tolerated.
Please use C range.

備註：Logo 要用沖壓(Press)的方式製作

Material	鐵 T=1.0mm 液體烤漆 / 黑色		
Draw	鄭玉玲	2010-05-07	巨翼電子(深圳)有限公司 JU YI ELECTRONICS (SHEN ZHEN) CO., LTD
Check	鐘利艷	2010-05-07	
Approve	林柏洋	2010-05-07	
Unit	m.m		Name: BACK BOX 後筒
Scale A4	1:6.67		Model: BB 6W / Rev: A
Part No / Dwg No	025G-BB6W	Sheet : 1 of 1	

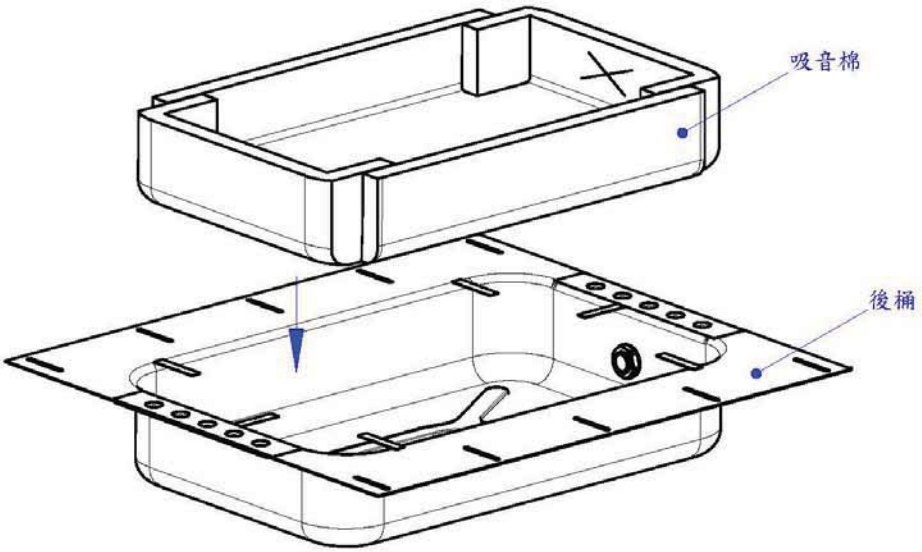
Tolerance		0 ~ 14.99	15 ~ 49.99	50 ~ 249.99	250 ~ 499.99	500 ~ 750
A	⊔	0.05	0.1	0.2	0.3	0.4
B	⊔	0.1	0.2	0.3	0.5	0.7
C	⊔	0.2	0.5	1.0	1.5	2.0
D	⊔	0.5	1.0	1.5	2.0	2.5

Rev	History of change
1	JY-1002047D

該部品符合歐洲
環保ROHS標準
All components are
based on Eu. Rohs STD

CHANGE NOTICE :

SYM	Description of change	Date	Draw	Approve
1	變更依據			



Have not indicated the size tolerated.
Please use B range.

Material		Draw	蔣潔純	2011-05-10
		Check	鐘利艷	2011-05-10
		Approve		

巨翼電子(深圳)有限公司
JU YI ELECTRONICS (SHEN ZHEN) CO.,LTD.

Tolerance		0 ~ 14.99	15 ~ 49.99	50 ~ 249.99	250 ~ 499.99	500 ~ 750
A	±	0.05	0.1	0.2	0.3	0.4
B	±	0.1	0.2	0.3	0.5	0.7
C	±	0.2	0.5	1.0	1.5	2.0
D	±	0.5	1.0	1.5	2.0	2.5

Unit m.m
Scale A4 1:1
Part No / Dwg No JYC-1105039D
Sheet 1 of 1

Name
-
後桶外觀組裝圖
Model BB6W
Rev 2

Rev	History of change
2	JY-
1	JY-

8 LAST PAGE & REVISION SUMMARY

DATE	SUMMARY
June 23rd, 2011	Original