

RAP-SA01 + IMX6S

Design Verification Report

Initiated by	Jeffery Chen	Job Title	Engineer	Originate Date	2014/1/13
Reviewed by	Max Chen	Job Title	Supervisor	Revision	QQ4-037 Rev.A7
Approved by	Simon Lin	Job Title	Manager	DMR Task Number 版本	

Test Unit Information		
Model	RAP-SA01	
Description	ODM SMARC Carrier Board	
PCB version	A01	
OS	Ubuntu 12.04 (LTS)	
Kernel version	3.0.35	
Product phase	DVT Reversion, Supporting	
Produced by	Jeffery	
CPU	Freescale iMX6S 800MHz	
PM IC	Wolfson WM8326	
LAN chipset	Broadcom BCM54610	Connector location CNx
Touch	N/A	
LCD Panel Model	CHI MEI G121X1 -L03 C1	
Storage Size	Micron eMMC 4GB	
Internal Memory Size	Micron DDR3 1066 1GB	

Product image



Item		Descriptions	Result
Product Spec Verification		Specification Check	
LED check		LED indicator check (Power / HDD / LED / Others)	Pass
Basic Function		WiFi / USB / COM / Audio Function Test & Check	Pass
Performance		LAN	Pass
Power Consumption		Full load / Idle / Erp mode test	Pass
Power interruption test		100/200/500/1000ms	Pass
Room temperature Power on/off test		Room temperature / 4000times for system level	Pass
High Temperature Test		85°C/24hrs IEC 60068-2-2 Test:Bb	Pass
Low Temperature Test		-40°C/24hrs IEC 60068-2-1 Test:Ab	Pass
Temperature cycle test		-40°C~85°C RH95% 8 cycles IEC 60068-2-14 Test:N	Pass
Power on cycle test		-40°C / 1000times IEC 60068-2-1 Test:Ab	Pass
		85°C / 1000times for system level IEC 60068-2-2 Test:Bb	Pass
Storage test		-40°C 24hrs 85°C/ RH95% 24hrs IEC 60068-2-3 Test:Ca	Pass
Random Vibration Operation		1. PSD: 0.00454G²/Hz , 1.5 Grms 2. operation mode 3. Test Frequency : 5-500Hz 4. Test Axis : X,Y and Z axis 5. 30 minutes per each axis 6. IEC 60068-2-64 Test:Fh 7. Storage : CF or SSD	Pass

Random vibration test (Non-operation)	1 PSD: 0.01818G ² /Hz , 3.0 Grms 2 Non-Operation mode 3 Test Frequency : 5-500Hz 4 Test Axis : X,Y and Z axis 5 30 min. per each axis 6 IEC 60068-2-64 Test:Fh	Pass
Thermal	1 Max. Loading at Room Temperature & 85°C 2 Capacitor life time calculation 3 IEC 60068-2-2 Test:Bb	Pass

** Notes: Test items and test contents depend on spec.

Title	RAP-SA01	Verification																																																																
	ODM SMARC Carrier Board	check																																																																
Features	Form Factor 107.95x69.85mm	✓																																																																
	Accept Avalue and others SMARC compatible CPU Modules	✓																																																																
	LVDS signal on Milli-Grid™ connector	✓																																																																
	Optional Bluetooth module & Digi XTend RF module	N/A																																																																
	2x UART(configable with RS232/485 mode)	✓																																																																
Specifications																																																																		
System	SMARC CPU Module socket: Supports Avalue SA-IMX6 and future new SMARC modules																																																																	
Bluetooth®	USB Bluetooth® Module (Install by customer)	N/A																																																																
Digi XTend®	XTend™ RF Module Built-in RPSMA RF Connector (install by customer) 902 - 928 MHz Frequency Band 3V CMOS UART Interface 2x10, 2mm Connector	N/A																																																																
I/O																																																																		
Network	One Ethernet Port RJ45 with Indicator LEDs	✓																																																																
USB	SMSC USB Hub USB2514 onboard 2x USB ports (USB Type A vertical type) 1x USB OTG port (mini-USB vertical type)	✓																																																																
Serial Port	2x RS-232/RS-485 <ul style="list-style-type: none">• Software Selectable• 8 pin 3.81mm STL(Z) 1550 Vertical Terminal Block <table><tr><th>Pin #↴</th><th>RS232↴</th><th>RS485↴</th></tr><tr><td>1↴</td><td>RXD1↴</td><td>TR1+↴</td></tr><tr><td>2↴</td><td>TXD1↴</td><td>TR1-↴</td></tr><tr><td>3↴</td><td>GND↴</td><td>GND↴</td></tr><tr><td>4↴</td><td>RXD2↴</td><td>TR2+↴</td></tr><tr><td>5↴</td><td>TXD2↴</td><td>TR2-↴</td></tr><tr><td>6↴</td><td>GND↴</td><td>GND↴</td></tr><tr><td>7↴</td><td>DCIN↴</td><td>DCIN↴</td></tr><tr><td>8↴</td><td>GND↴</td><td>GND↴</td></tr></table>	Pin #↴	RS232↴	RS485↴	1↴	RXD1↴	TR1+↴	2↴	TXD1↴	TR1-↴	3↴	GND↴	GND↴	4↴	RXD2↴	TR2+↴	5↴	TXD2↴	TR2-↴	6↴	GND↴	GND↴	7↴	DCIN↴	DCIN↴	8↴	GND↴	GND↴	✓																																					
Pin #↴	RS232↴	RS485↴																																																																
1↴	RXD1↴	TR1+↴																																																																
2↴	TXD1↴	TR1-↴																																																																
3↴	GND↴	GND↴																																																																
4↴	RXD2↴	TR2+↴																																																																
5↴	TXD2↴	TR2-↴																																																																
6↴	GND↴	GND↴																																																																
7↴	DCIN↴	DCIN↴																																																																
8↴	GND↴	GND↴																																																																
Battery	LI Battery (CR2032) for RTC(Optional function)	✓																																																																
Display Port	2x 15pin Molex Milli-Grid™ connector <ul style="list-style-type: none">• LVDS Interface• I2C and I2S Interface for LCD panel & 4-wire resistive touch control on monitor side• 5V Power for LCD and Backlight• Power Management Control <table><tr><th>Pin#↴</th><th>Signal Name↴</th><th>Pin#↴</th><th>Signal Name↴</th></tr><tr><td>1↴</td><td>LCD 5V↴</td><td>2↴</td><td>LCD 5V↴</td></tr><tr><td>3↴</td><td>LCD 3.3V↴</td><td>4↴</td><td>LCD 3.3V↴</td></tr><tr><td>5↴</td><td>GND↴</td><td>6↴</td><td>GND↴</td></tr><tr><td>7↴</td><td>EDID_CLK↴</td><td>8↴</td><td>EDID_DATA↴</td></tr><tr><td>9↴</td><td>LVDS_DATA0+↴</td><td>10↴</td><td>LVDS_DATA0+↴</td></tr><tr><td>11↴</td><td>GND↴</td><td>12↴</td><td>LVDS_DATA1+↴</td></tr><tr><td>13↴</td><td>LVDS_DATA1+↴</td><td>14↴</td><td>GND↴</td></tr><tr><td>15↴</td><td>LVDS_DATA2+↴</td><td>16↴</td><td>LVDS_DATA2+↴</td></tr><tr><td>17↴</td><td>GND↴</td><td>18↴</td><td>LVDS_DATA3+↴</td></tr><tr><td>19↴</td><td>LVDS_DATA3+↴</td><td>20↴</td><td>GND↴</td></tr><tr><td>21↴</td><td>LVDS_CLK+↴</td><td>22↴</td><td>LVDS_CLK+↴</td></tr><tr><td>23↴</td><td>I2C CLK- (for Touch)↴</td><td>24↴</td><td>I2C DATA+ (for Touch)↴</td></tr><tr><td>25↴</td><td>GND↴</td><td>26↴</td><td>BKL_PWM ↴</td></tr><tr><td>27↴</td><td>BKL_EN↴</td><td>28↴</td><td>GND↴</td></tr><tr><td>29↴</td><td>BKL_PWR (5V/VIN)↴</td><td>30↴</td><td>BKL_PWR (5V/VIN)↴</td></tr></table>	Pin#↴	Signal Name↴	Pin#↴	Signal Name↴	1↴	LCD 5V↴	2↴	LCD 5V↴	3↴	LCD 3.3V↴	4↴	LCD 3.3V↴	5↴	GND↴	6↴	GND↴	7↴	EDID_CLK↴	8↴	EDID_DATA↴	9↴	LVDS_DATA0+↴	10↴	LVDS_DATA0+↴	11↴	GND↴	12↴	LVDS_DATA1+↴	13↴	LVDS_DATA1+↴	14↴	GND↴	15↴	LVDS_DATA2+↴	16↴	LVDS_DATA2+↴	17↴	GND↴	18↴	LVDS_DATA3+↴	19↴	LVDS_DATA3+↴	20↴	GND↴	21↴	LVDS_CLK+↴	22↴	LVDS_CLK+↴	23↴	I2C CLK- (for Touch)↴	24↴	I2C DATA+ (for Touch)↴	25↴	GND↴	26↴	BKL_PWM ↴	27↴	BKL_EN↴	28↴	GND↴	29↴	BKL_PWR (5V/VIN)↴	30↴	BKL_PWR (5V/VIN)↴	✓
Pin#↴	Signal Name↴	Pin#↴	Signal Name↴																																																															
1↴	LCD 5V↴	2↴	LCD 5V↴																																																															
3↴	LCD 3.3V↴	4↴	LCD 3.3V↴																																																															
5↴	GND↴	6↴	GND↴																																																															
7↴	EDID_CLK↴	8↴	EDID_DATA↴																																																															
9↴	LVDS_DATA0+↴	10↴	LVDS_DATA0+↴																																																															
11↴	GND↴	12↴	LVDS_DATA1+↴																																																															
13↴	LVDS_DATA1+↴	14↴	GND↴																																																															
15↴	LVDS_DATA2+↴	16↴	LVDS_DATA2+↴																																																															
17↴	GND↴	18↴	LVDS_DATA3+↴																																																															
19↴	LVDS_DATA3+↴	20↴	GND↴																																																															
21↴	LVDS_CLK+↴	22↴	LVDS_CLK+↴																																																															
23↴	I2C CLK- (for Touch)↴	24↴	I2C DATA+ (for Touch)↴																																																															
25↴	GND↴	26↴	BKL_PWM ↴																																																															
27↴	BKL_EN↴	28↴	GND↴																																																															
29↴	BKL_PWR (5V/VIN)↴	30↴	BKL_PWR (5V/VIN)↴																																																															
LED & Switch																																																																		
LED Indicators	2x Bi-Color LED Controlled by GPIO & Signal from WM8326 <ul style="list-style-type: none">• Green / Red• Green / Yellow	✓																																																																

Switch	1x Reset Switch (180 degree)	✓
Mechanical & Environmental		
Power Input	9~30VDC Input Input power monitoring (solar panel battery)	✓
Cooling Method	Passive Cooling, Chassis Vents	✓
Operating Temp	-40oC to 85oC	✓
Storage Temp	-40oC to 85oC	✓
Dimensions	107.95x69.85mm	✓
Weight	TBD	N/A
Mounting	DIN Rail Mount Direct Wall Mount	✓

	OS		Note
<input type="checkbox"/>			
<input checked="" type="checkbox"/>	Ubuntu 12.04		
<input type="checkbox"/>			

7.8.1 Colours of indicator lights

The colours of indicator lights and their meanings shall comply with Table 2.

NOTE IEC 60601-1-8 contains specific requirement for the colour, flashing frequency and DUTY CYCLE of alarm indicator lights.

Dot-matrix and other alphanumeric displays are not considered to be indicator lights.

**Table 2 – Colours of indicator lights and their meaning
for ME EQUIPMENT**

Colour	Meaning
Red	Warning – immediate response by the OPERATOR is required
Yellow	Caution – prompt response by the OPERATOR is required
Green	Ready for use
Any other colour	Meaning other than that of red, yellow or green

Subject	Test Item	Pass	Fail	Note
Power LED indicator (LED indicator must be in the darkroom confirmation)	Power on LED color check	✓		
	Power LED Dark for system off	✓		Can't have Micro-Light lamp
	Power LED Light for system turn on	✓		
	Power LED Flash for standby with ATX power	N/A		
HDD LED indicator (LED indicator must be in the darkroom confirmation)	HDD LED Flash for HDD active Read / Write	N/A		
	HDD LED Dark for HDD no active	N/A		Can't have Micro-Light lamp
Ethernet LED indicator	Data Rate , Off => 10Mbps/sec	✓		
	Data Rate , Green => 100Mbps/sec	✓		
	Data Rate , Orange => 1000Mbps/sec	✓		
	Link / ACT , Off => not established	✓		
	Link / ACT , Yellow Off => established	✓		
	Link / ACT , Yellow Blinking => activity	✓		
Others LED indicator (LED indicator must be in the darkroom confirmation)	Power on LED color check	N/A		
	LED Dark for system off	N/A		Can't have Micro-Light lamp
	LED Light for system turn on	N/A		

Basic Function



DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date :	2014/1/3	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

Subject	Test Item	Pass	Fail	Note
Video Function	*.WMA	✓		
	*.H.264	✓		
	*.MP4	✓		
Audio Function	*.MP3	N/A		
	Microphone	N/A		
	Speaker adjust volume	N/A		
	Alarm Colock volume	N/A		
LAN Function	Turn On/Off	✓		
	Network notification	✓		
	Download file from internet	✓		
	Disconnect policy	✓		
Transmission	Read / Write Test(Upload/Download/Copy 10GB files)	✓		
Connection	Download file from internet	✓		
Miss Operation	Power off suddenly while OS is booting up.	✓		
	Reset system while OS is booting up.	✓		
USB Port 1	Auto detect (for all channels)	✓		
	Hot plug function is normal (for all channels)	✓		
	System information is correct	✓		
	Read/Write test (Copy 10GB file(s))	✓		
	USB 2.0 Removable Devices	✓		
	Remove & Increase USB Device	✓		
	USB Keyboard / USB Mouse / USB HDD	✓		
USB Port 2	Auto detect (for all channels)	✓		
	Hot plug function is normal (for all channels)	✓		
	System information is correct	✓		
	Read/Write test (Copy 10GB file(s))	✓		
	USB 2.0 Removable Devices	✓		
	Remove & Increase USB Device	✓		
	USB Keyboard / USB Mouse / USB HDD	✓		
COM Port 1	Loopback test	✓		Only support RX/TX/GND
	Modem test	N/A		
COM Port 2	Loopback test	✓		Only support RX/TX/GND
	Modem test	N/A		

Test Engineer	Jeffery	Date :	2014/1/14	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				
Application	Test Item		Bandwidth(Mbits/Sec)	Note	
Iperf Test 1. Type command -w 100m -i 1 -t 30 and record the result if LAN speed is Giga 2. Type command -w 10m -i 1 -t 30 and record the result if LAN speed is Mega	Giga LAN		419		

Power Consumption



DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date :	2014/1/2	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

Testing Software (MAX. load) 1 Runing H.264 1080P video + COM loopback

****If LAN is on board function, all LAN ports have to connect to a switch HUB through CAT5e LAN cable,**

but don't need to do data transfer, or through a cross over cable connect two LAN ports is acceptable

Condition:

Power on - Boot sequency: Measure the maximum current value of between system power on and boot-up to O.S.

Idle mode: Measure the current value when without running any program

Max. load: Measure the maximum current value which system under maximum load (CPU: Top speed ,RAM & Graphic: Full loading)

Condition	Power Consumption (A)						Test Software	Note / Issue ID
	Power on - Boot procedure	Idle mode	Supend Mode	S5 Mode	Max Load			
+9V	1.31	1.16	N/A	N/A	1.17	1		
Total (Watt)	11.79	10.44	N/A	N/A	10.53			
+12V	1.29	0.85	N/A	N/A	0.92	1		
Total (Watt)	15.48	10.2	N/A	N/A	11.04			
+19V	0.91	0.83	N/A	N/A	0.88	1		
Total (Watt)	17.29	15.77	N/A	N/A	16.72			
+24V	0.67	0.44	N/A	N/A	0.48	1		
Total (Watt)	16.08	10.56	N/A	N/A	11.52			
+30V	0.61	0.58	N/A	N/A	0.61	1		
Total (Watt)	18.3	17.4	N/A	N/A	18.3			

Condition	USB Power measurement (mA)						Result	Note / Issue ID
	Voltage (4.75v~5.00v)	Current	Power On					
USB1	4.89	510mA	5.06				Pass	
USB2	4.88	510mA	5.06				Pass	

Condition		ERP Test (off mode < 0.50W)				Note / Issue ID
		Voltage Condition	Current (A)	Watt (W)		
Main power off	<input checked="" type="checkbox"/>	12V	0	0		

Power interruption Test

DMR Task Number 0

版本 0

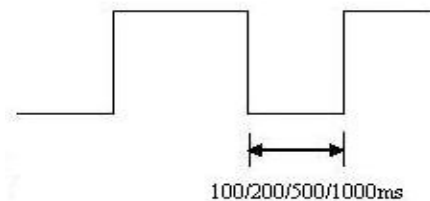
Test Engineer	Jeffery	Date	2014/1/2	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

Power interruption test

Test Condition : Environment : $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ambient Humidity : $50 \pm 10\%$ RH

Test time : 10 times
Interval time 100ms/200ms/500ms/1000ms

Procedure :
1 Input the AC voltage
2 system boot up
3 Apply switching main power switch with the specified conditions.
(In case of the products equipped with the voltage-switch unit, installed them)



Judgment Criteria :
1 There must be no danger or fire.
2 It must not catch fire or produce smoke.
3 There should be no abnormal phenomenon (ex. auto-boot up)
4. There should be no abnormalities affecting the product's functions and performance

Power interruption Test

Item	Adapter	interval time	Mode	Test Stage	Result	Note/Issue ID
Power interruption Test	FSP FSP060-DBAE1	100ms	AT	DVT	Pass	
		200ms	AT	DVT	Pass	
		500ms	AT	DVT	Pass	
		1000ms	AT	DVT	Pass	

Room Temp Power On/Off Test



DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date	2013/12/13~2013/12/16	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

Test Condition :

Condition

1 Test temperature : Room temperature

2 Number of test : 4000 times

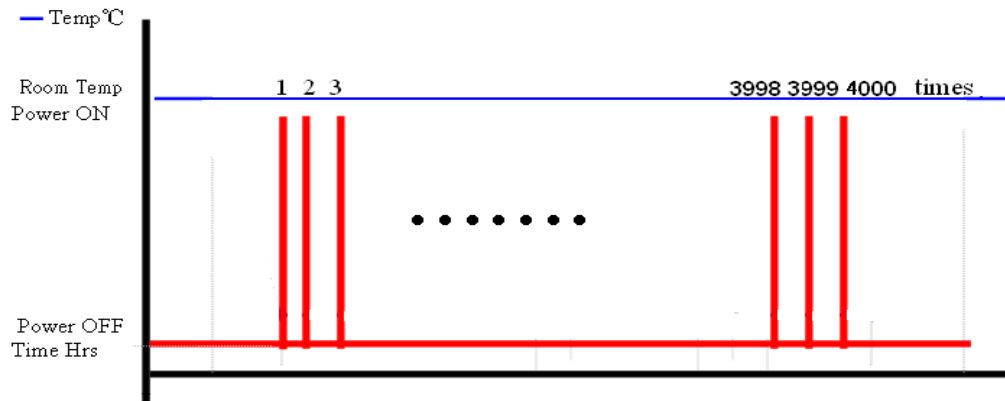
3 Test software : Ubuntu

4 Step : A) System power on, record the count number then system power off

B) After 1 minutes, system power on again.

C) Recycle step A and B for 4000 times.

5 Test environment curve :



Test result :

- 1 All system functions must be checked with appropriate testing programs and should pass the inspection.
- 2 There should be no abnormalities, which couldn't affect the product specified functions and performances.

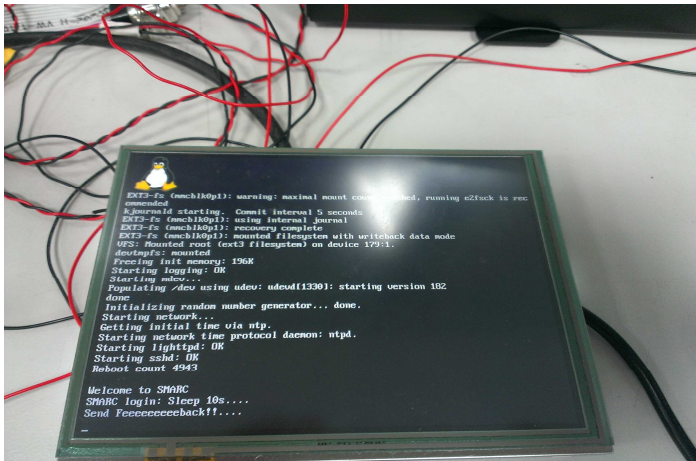
There is no damage in electronic and mechanical functions.

Degradation has no been found.

Performance is maintained with no incurable physical damage or degradation.

Temperature	Power mode	
Room temperature	AT	ATX
Result	Pass	N/A

Test picture :



High Temperature Operation Test

DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date	2013/12/27~2013/12/28	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

Test Standard : Reference IEC60068-2-2 Testing procedures

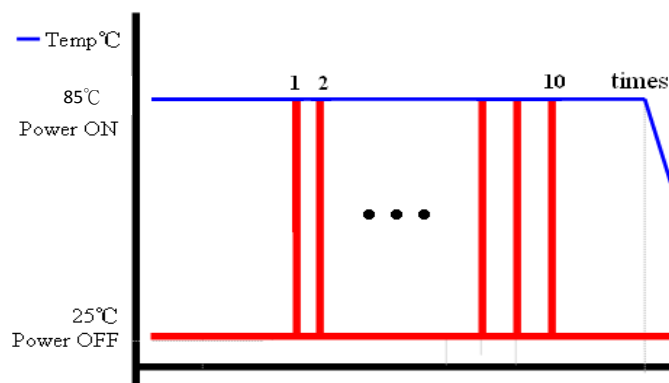
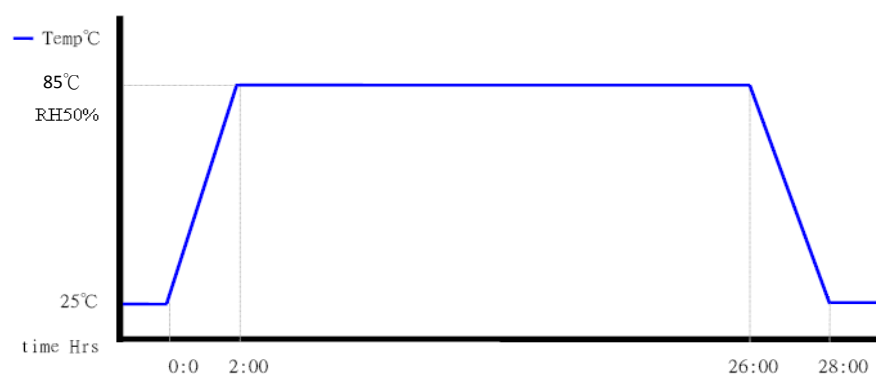
Test Bb : Dry Heat Test

Test Condition : 1 Test Temperature : 85°C for board level

2 Test Time : 24 hours

3 Test software : H.264 video + Ping IP + Com loopback

4 Executing on/off test 10 times after running burn in test 24 hours



Test equipment :

Programmable temperature & humidity chamber

use chamber		V		
Model:	Ten Billion FX1004	THS-D4T-150	THS-D4T-150+LN2	KSON THS-A4T-100
Date of calibration :	2013/12/20	2013/6/13	2013/6/13	2013/12/20

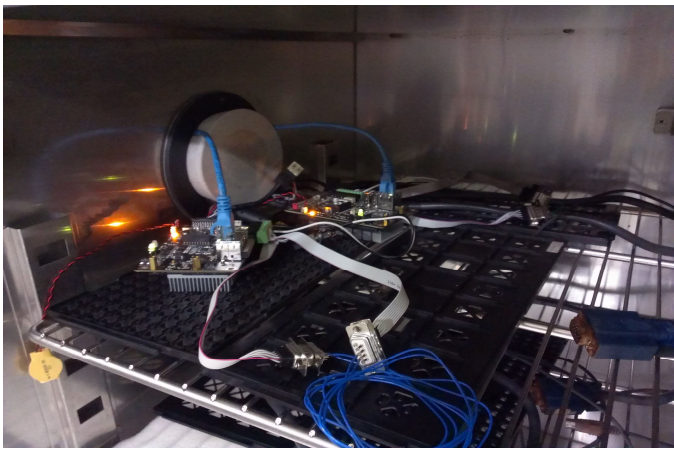
Performance criteria :

- 1 All system functions must be checked with appropriate testing programs and should pass the inspection.
- 2 There should be no abnormalities, which couldn't affect the product specified functions and performances.

Test result :

There is no damage in electronic and mechanical functions.
Degradation has no been found.
Performance is maintained with no incurable physical damage or degradation.

Test picture :



Low Temperature Operation Test

DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date	2013/12/26~2013/12/27	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

Test Standard : Reference IEC60068-2-1 Testing procedures

Test Ab : Cold Test

Test Condition : 1 Test Temperature : -40°C

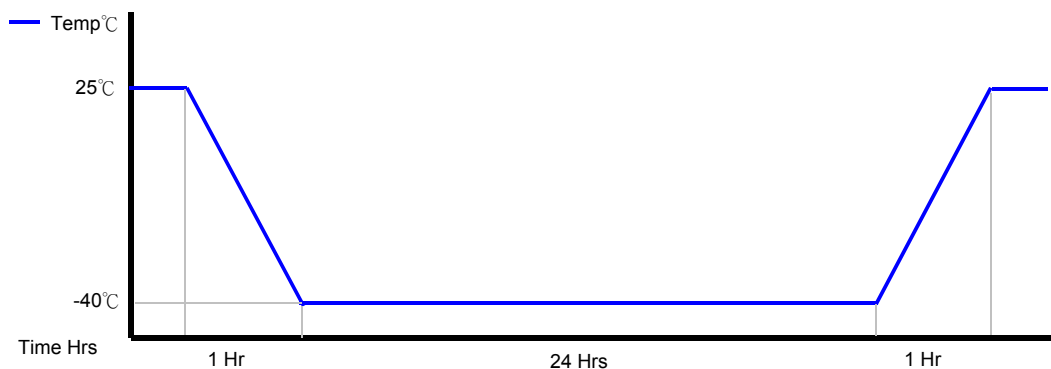
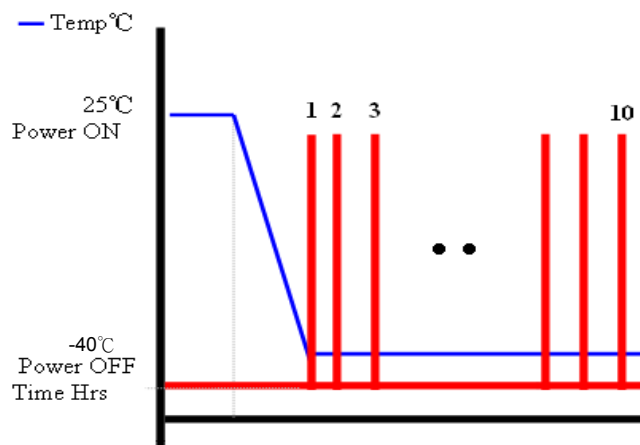
2 Test Time : 24 hours

3 Test software : H.264 video + Ping IP + Com loopback

Test procedure : 1 Power on at -40°C into OS by manually and check device manager list, there are should be no " ! " or " ? " mark display

2 Peripheral check : 10 times

3 After peripheral chek is finish, keep lower chamber temperature at -40°C and running test program.



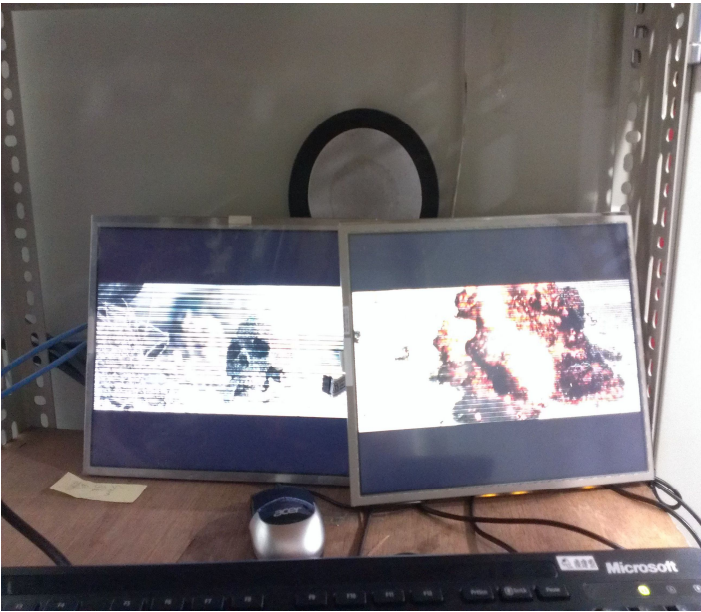
Test equipment : Programmable temperature & humidity chamber

use chamber				V
Model:	Ten Billion FX1004	THS-D4T-150	THS-D4T-150+LN2	KSON THS-A4T-100
Date of calibration :	2013/12/20	2013/6/13	2013/6/13	2013/12/20

Performance criteria :
1 All system functions must be checked with appropriate testing programs and should pass the inspection.
2 There should be no abnormalities, which couldn't affect the product specified functions and performances.

Test result :
There are should be no " !" or " ? " mark display at device manager
There is no damage in electronic and mechanical functions.
Degradation has no been found.
Performance is maintained with no incurable physical damage or degradation.

Test picture :



Temperature cycle test

Test Engineer	Jeffery	Date	2013/12/30~2014/01/01	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

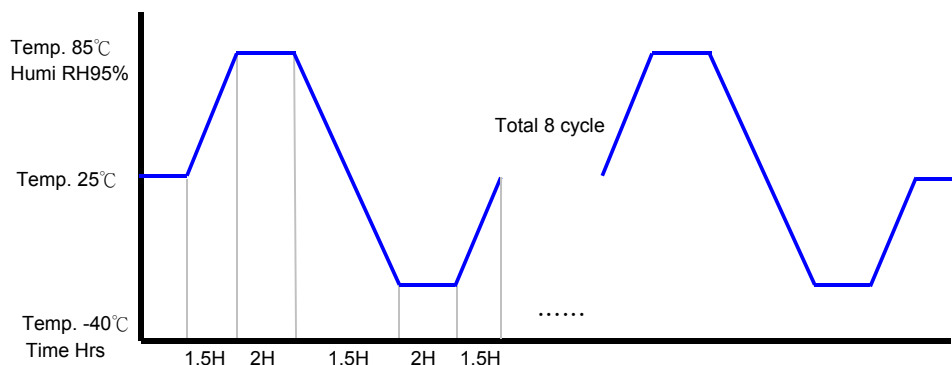
Temperature cycle test

Test Standard : Reference IEC60068-2-14 Testing procedures

Test N : Change of temperature test

Test Condition :

- 1 Test Temperature : High temperature 85°C RH95% / Low temperature -40°C
- 2 Test dwell Time : 2 hours
- 3 Temperature slope : heating 1.5 hour, cooling 1.5 hour
- 4 Test cycle : 8 cycles
- 5 Test software : H.264 video + Ping IP + Com loopback
- 6 Test environment curve



Test equipment : Programmable temperature & humidity chamber

use chamber				V
Model:	Ten Billion FX1004	THS-D4T-150	THS-D4T-150+LN2	KSON THS-A4T-100
Date of calibration :	2013/12/20	2013/6/13	2013/6/13	2013/12/20

Performance criteria :

- 1 All system functions must be checked with appropriate testing programs and should pass the inspection.
- 2 There should be no abnormalities, which couldn't affect the product specified functions and performances.

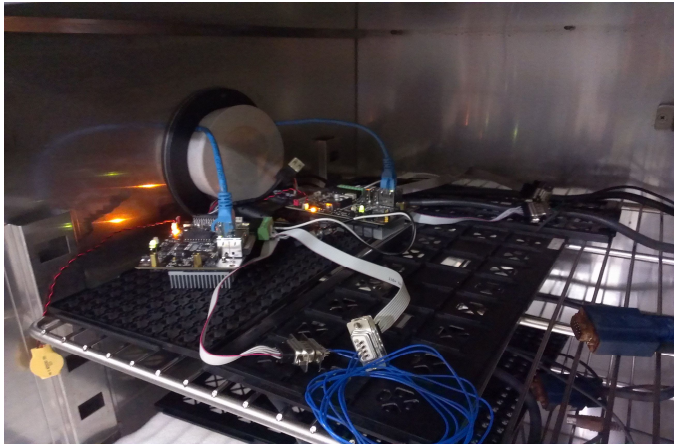
Test result :

There is no damage in electronic and mechanical functions.

Degradation has no been found.

Performance is maintained with no incurable physical damage or degradation.

Test picture :



Power on cycle test

DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date	2013/12/17~2013/12/18	-40℃ Result	Pass
Test Configuration				85℃ Result	Pass
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP FSP060-DBAB1 12V 5A 60W				

Power On/Off Test

Test Standard : Reference IEC60068-2-2 Testing procedures Test Bb : Dry Heat test

Reference IEC60068-2-1 Testing procedures Test Ab : Cold test

Test Condition : Condition

1 Test temperature : -40℃

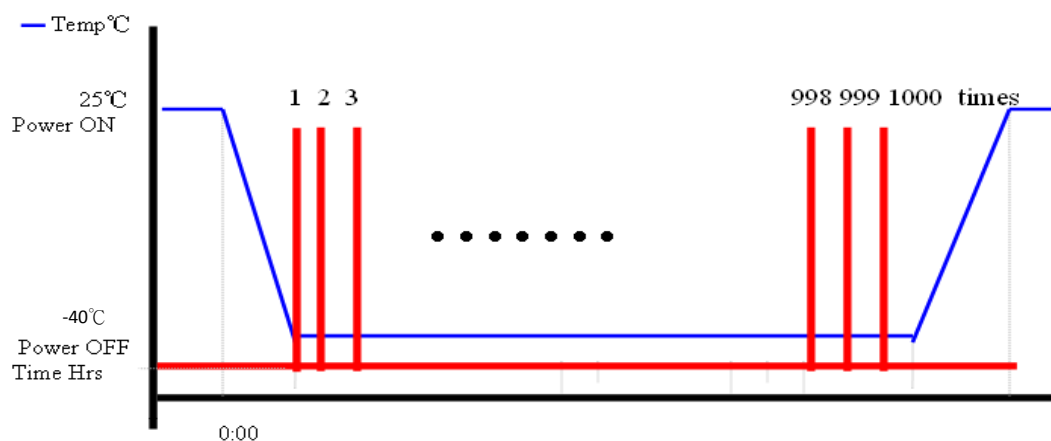
2 Number of test : 1000 times

3 Test software : Ubuntu

4 Step : A) System power on, record the count number then system power off

B) After 1 minutes, system power on again.

C) Recycle step A and B for 1000 times.



2 Number of test : 1000 times

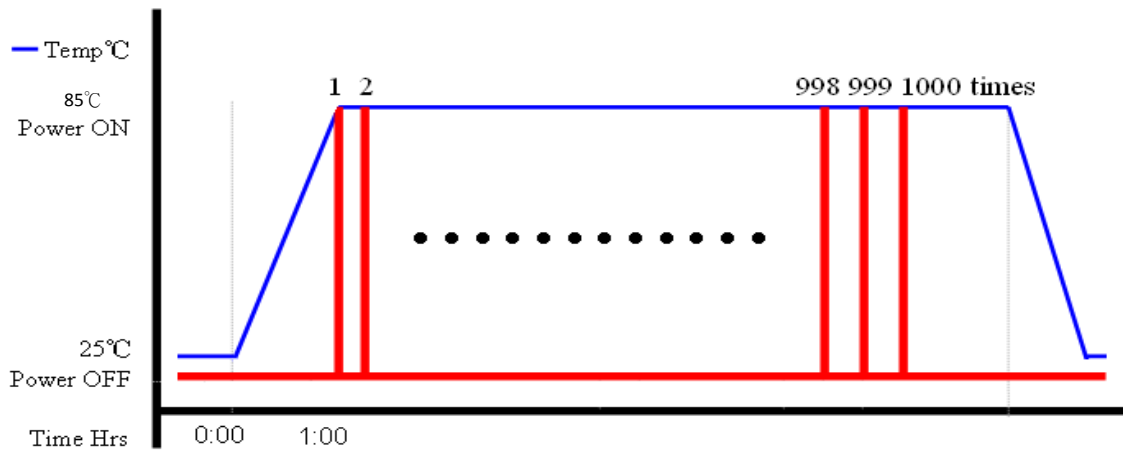
3 Test software : Ubuntu

4 Step : A) System power on, record the count number then system power off

B) After 1 minute, system power on again.

C) Recycle step A and B for 1000 times.

5 Test environment curve :



Test equipment :

use chamber				V
Model:	Ten Billion FX1004	THS-D4T-150	THS-D4T-150+LN2	KSON THS-A4T-100
Date of calibration :	2013/12/20	2013/6/13	2013/6/13	2013/12/20

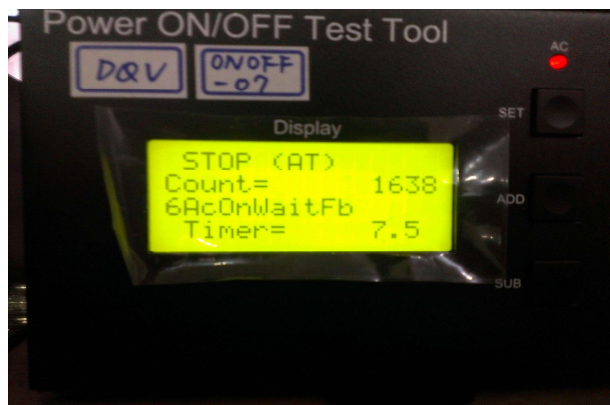
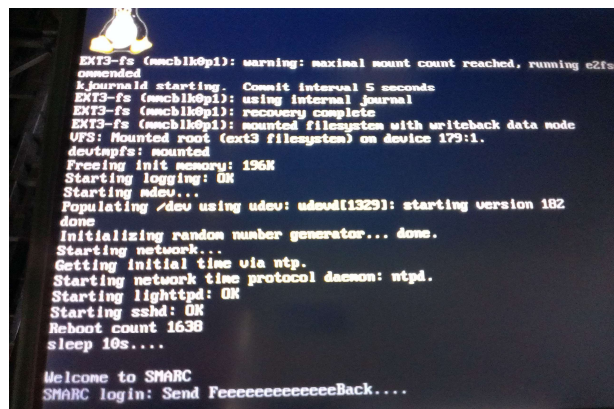
Performance criteria :

- 1 All system functions must be checked with appropriate testing programs and should pass the inspection.
- 2 There should be no abnormalities, which couldn't affect the product specified functions and performances.

Test result :

There is no damage in electronic and mechanical functions.
 Degradation has no been found.
 Performance is maintained with no incurable physical damage or degradation.

Test picture :





Stability Test



Test Engineer	Jeffery	Date	2014/1/6	Result	Pass
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

Power On/Off and Boot Test

Item	Comment	details	Test Stage	Result	Note/Issue ID
Timer	Time		≤ 2 sec/day	DVT	Pass
	RTC timer		≤ 2 sec/day	DVT	Pass
Clock measured (Room temperature)	32.768KHz	Range 32767.34464 ~32768.65536	32768 +/- 20 ppm	DVT	Pass
	14.318MHz	Range 14.3186095454~ 14.3177504546	14.31818 +/- 30 ppm	DVT	N/A
	25.0000MHz	Range 25.00075~24.99925	25.0000 +/- 30 ppm	DVT	N/A
Power On/Off test (AT mode)	With CMOS battery		booting rate =100%	DVT	Pass
H/W Reset test (by reset button)	H/W reset		booting rate =100%	DVT	Pass

Power margin Test (only for single DC voltage input products)

LAN Port Stress Test

LAN Port	Testing condition	Test Time(Hours)	Test Stage	Result	Note/Issue ID
LAN 1	High_Performance_Through (lperf test)	12	DVT	Pass	

COM Port Stress Test

System configuration					
COM Port	Testing condition	Test Time(Hours)	Test Stage	Result	Note/Issue ID
COM1	1. Baud Rate: 115200	12	DVT	Pass	
	2. Data Bits: 8				
COM2	3. Parity: None		DVT	Pass	
	4. Stop Bits: 1				

Storage test

Test Engineer	Jeffery	Date	2014/1/3~2014/1/6	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

Storage Test

Test Standard : Reference IEC60068-2-3 High temperature & Humidity storage test Test : Ca

Reference IEC60068-2-1 Cold test Test : Ab

Test Condition : Condition

Low temperature setup

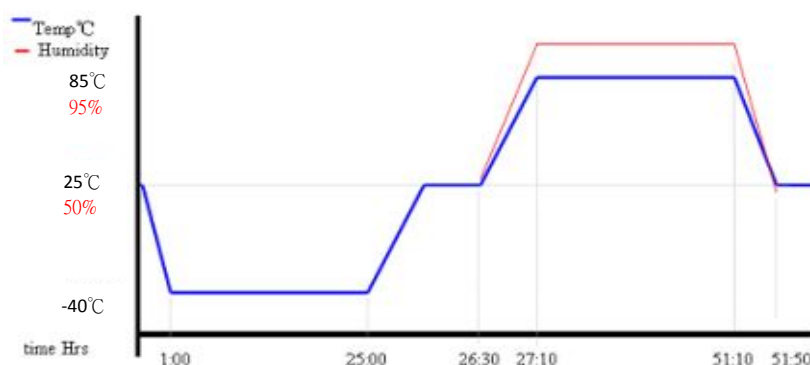
1 Test temperature : -40°C (if system has LCD panel,storage temperature depend on panel spec.)

2 Test time : 24 hours

3 Temperature gradient 1°C/minute

High temperature setup

4 Temperature gradient 1°C/minute



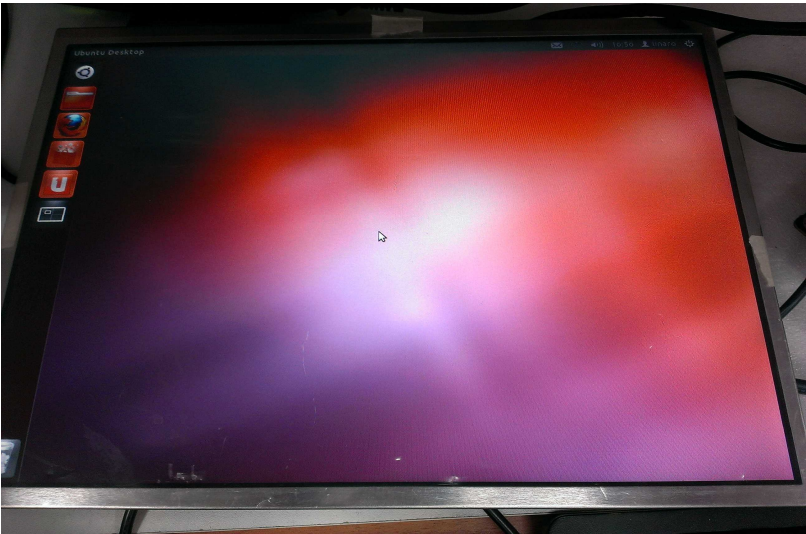
Test equipment : Programmable temperature & humidity chamber

use chamber				V
Model:	Ten Billion FX1004	THS-D4T-150	THS-D4T-150+LN2	KSON THS-A4T-100
Date of calibration :	2013/12/20	2013/6/13	2013/6/13	2013/12/20

Performance criteria :
 1 All system functions must be checked with appropriate testing programs and should pass the inspection.
 2 There should be no abnormalities, which couldn't affect the product specified functions and performances.

Test result :
 There is no damage in electronic and mechanical functions.
 Degradation has no been found.
 Performance is maintained with no incurable physical damage or degradation.

Test picture :



Random Vibration Operation

DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date	2014/1/3	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

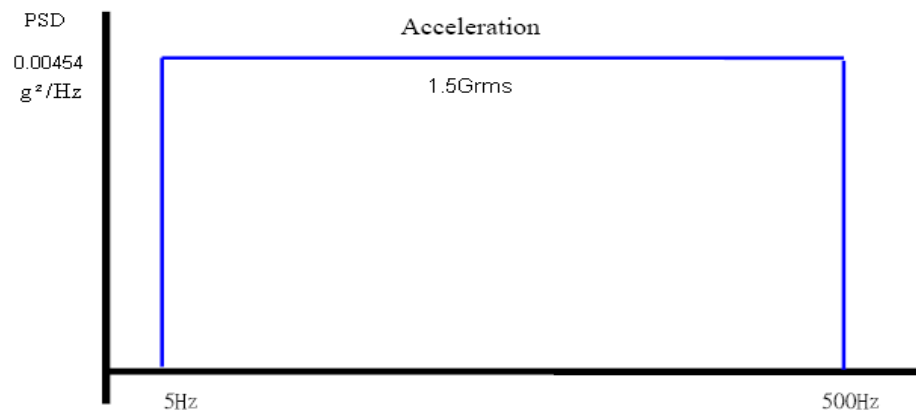
Random Vibration Operation

Test Standard : Reference IEC60068-2-64 Testing procedures

Test Fh : Vibration boardband random Test

Test Condition :

- 1 Test PSD : 0.00454G²/Hz , 1.5 Grms
- 2 Test frequency : 5~500 Hz
- 3 Test axis : X,Y and Z axis
- 4 Test time : 30 minutes each axis
- 5 System condition : operation mode
- 6 Test curve



Test equipment : Vibration simulator system

Model : VS-300VH

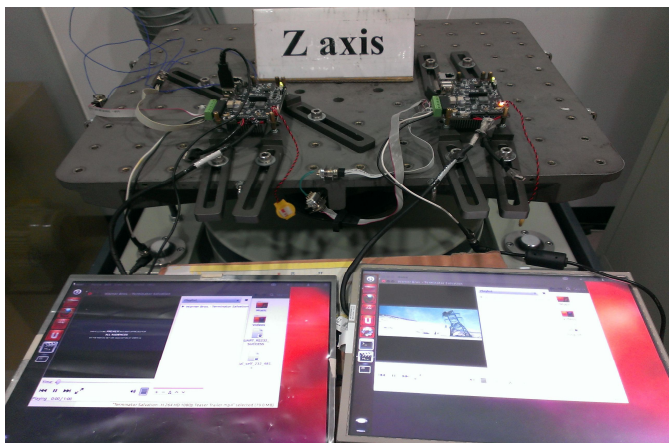
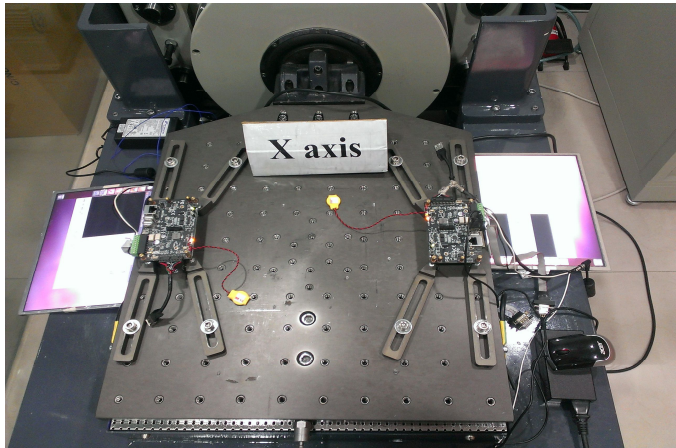
Date of calibration : 8/23/2013

Performance criteria :

- 1 All system functions must be checked with appropriate testing programs and should pass the inspection
- 2 There should be no abnormalities, which couldn't affect the product specified functions and performances
- 3 The cover and connectors should work properly without any interference
- 4 All screws should be tightened up appropriately
- 5 All gaps on the surface are appropriately
- 6 The assembling / disassembling of the system enclosure must be smooth and no deformed parts should be found

Test result : There is no damage in electronic and mechanical functions.
 Degradation has no been found.
 Performance is maintained with no incurable physical damage or degradation.

Test picture :



Random Vibration test (Non-operation)

Test Engineer	Jeffery	Date	2014/1/3	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	Ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

Random Vibration Operation

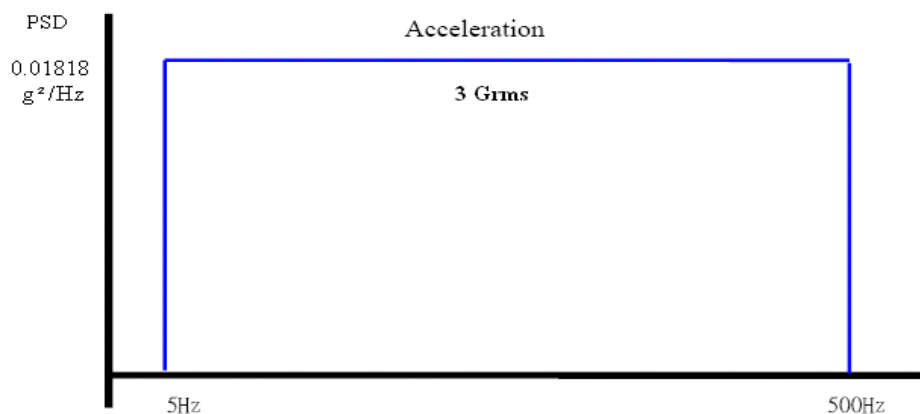
Test Standard : Reference IEC60068-2-64 Testing procedures

Test Fh : Vibration boardband random Test

Test Condition :

- 1 Test PSD : 0.01818G²/Hz 3 Grms
- 2 Test frequency : 5~500 Hz
- 3 Test axis : X,Y and Z axis
- 4 Test time : 30 min. each axis
- 5 System condition : Non-Operation mode

Test curve :



Test equipment : Vibration simulator system
Model : VS-300VH
Date of calibration : 8/23/2013

Performance criteria :

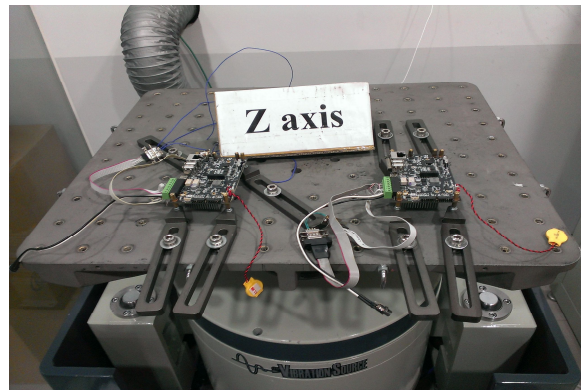
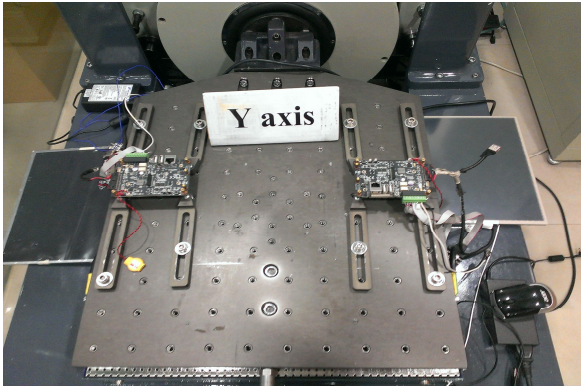
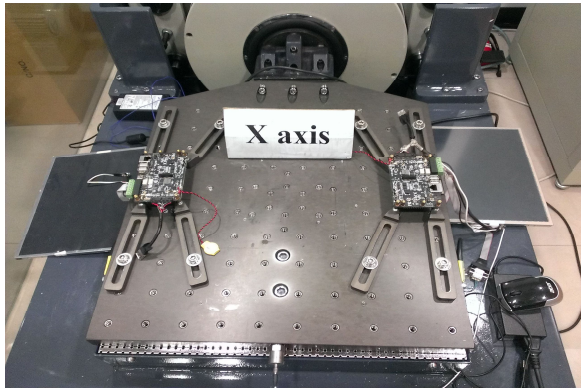
- 1 All system functions must be checked with appropriate testing programs and should pass the inspection
- 2 There should be no abnormalities, which couldn't affect the product specified functions and performances
- 3 The cover and connectors should work properly without any interference
- 4 All screws should be tightened up appropriately
- 5 All gaps on the surface are appropriately
- 6 The assembling / disassembling of the system enclosure must be smooth and no deformed parts should be found

Test result : There is no damage in electronic and mechanical functions.

Degradation has no been found.

Performance is maintained with no incurable physical damage or degradation.

Test picture :



Test Engineer	Jeffery	Date	2014/1/6	Result	Pass
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

Purpose: To evaluate whether the functions are maintained in a stable condition after the product is implement misuse test.

Conditions: Perform all types of misuses including the following which could take place in operation.

1) Simultaneous operation

2) Opposite operation

3) Halfway operation

4) Incomplete operation

5) Procedure omission

6) Wrong procedure

1-1 Turn on the system and press any two keys simultaneous until system into OS.

1-2 Turn on the system and press mouse right and left keys simultaneous until system into OS.

1-3 Turn on the system and press touch panel simultaneous until system into OS.

2 Opposite operation

2-1 PS/2 keyboard connector connect with PS/2 mouse then power on and boot into the OS.

2-2 PS/2 mouse connector connect with PS/2 keyboard then power on and boot into the OS.

2-3 Audio line out connector connect with MIC then turn on system and play music file.

2-4 Cash drawer cable RJ11 connect to RJ45 connector then power on and boot into the OS.

3 Halfway

3-1 Directly turn off power at system starting boot up into OS.

3-2 Insert devices at system starting boot up.

3-3 Removed devices at system executing closing.

4 Incomplete operation

4-1 Insert power cord to power supply socket incompletely then perform the on/off test.

4-2 Insert devices to specified connector incompletely then power on and boot into OS.

5 Procedure omission

5-1 Directly power off without OS shutdown rule.

5-2 Adapter with DC output then directly plug to system DC jack and boot up system ten times.

6 Wrong procedure

6-1 System mode is S5 then press and hold push button until system stop operation.

6-2 System mode is S0 then press and hold push button until system stop operation.

Judgment Criteria:

The product shall operate normally and no any damage after the test.

Item	sub-Item	Device	Manufacture /PN	Test stage	Result	Note/Issue ID
Simultaneous operation	1-1	Keyboard		DVT	Pass	
	1-2	Mouse		DVT	Pass	
	1-3	Touch		DVT	NA	
Opposite operation	2-1	Mouse		DVT	NA	
	2-2	Keyboard		DVT	NA	
	2-3	Audio		DVT	NA	
	2-4	RJ11	RJ11 cable	DVT	NA	
Halfway	3-1			DVT	Pass	
	3-2	USB Key/Mous		DVT	Pass	
	3-3	USB Key/Mous		DVT	Pass	
Incomplete operation	4-1			DVT	Pass	
	4-2	USB Key/Mous		DVT	Pass	
Procedure omission	5-1			DVT	Pass	
	5-2	12V		DVT	Pass	
		19V		DVT	NA	
		24V		DVT	NA	
Wrong procedure	6-1			DVT	NA	
	6-2			DVT	NA	

Test Engineer	Jeffery	Date	2014/1/6	Result	Pass
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6S 800 MHz				
OS	ubuntu 12.04				
Kernel Version	3.0.35				
Memory	Micron DDR3 1066 1GB				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

Purpose: To check that there is no risk of fire or electric shock in abnormal situations caused by the failure of an internal component of the product.

Conditions: Environment : 25°C± 2°C ambient Humidity : 60 ± 10% RH

Test Procedure:

- 1 Adjust the serial port DC output to +5V by jumper cap.
- 2 Turn on the test item and startup into the OS
- 3 Perform the short test +5V to GND
- 4 Adjust the serial port DC output to +12V by jumper cap, then repeat step 2 and 3.
- 5 Turn on the test item and startup into the OS
- 9 Turn on the test item and startup into the OS
- 10 Turn on the test item and startup into the OS
- 11 Perform the DC IN short test. (DC IN power supply only)

Judgment Criteria:

- 1 There must be no danger of fire.
- 2 It must not catch fire.
- 3 It must not produce smoke. (If the product is equipped with a protective device, smoke is allowed in an amount not exceeding that produced by the burning end of a cigarette for 10 seconds.)
- 4 Solder must not have been melted by heating of components.
- 5 The case must not deform from the generated heat.
- 6 The product must not present a danger of electric shock.

Test item	Number	Result statement	Test stage	Result	Note/Issue ID
Serial port	COM1		DVT	N/A	
	COM2		DVT	N/A	
USB port	USB1	USB malfunction	DVT	Pass	
	USB2	USB malfunction	DVT	Pass	
DC IN	12V	System shutdown	DVT	Pass	

Thermal and Capacitor Life time Calculation

Test Engineer	Jeffery	Date	2013/1/6	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A01				
CPU Type	Freescale iMX6 Solo 800MHz				
OS	Ubuntu 10.04 (LTS)				
Kernel Version	3.0.35				
Memory	Micron DDR3L 512+512Mb				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

$$L_x = L_o \times 2^{(T_o - T_x)/10} \times 2^{(\Delta T_o - \Delta T_x)/5}$$

$$= L_o \times 2^{(105 - T_x)/10} \times 2^{(5 - \Delta T_x)/5}$$

Where: Lx = Lifetime (hours) of the capacitor to be estimated
 Lo = Base lifetime (hours) of the capacitor described in the specification sheet
 To = Maximum rated operating temperature
 Tx = Actual ambient temperature (°C) of the capacitor within device
 (This is not the environment temperature of the device, but the environment temperature of the capacitor that has been placed within the device.)
 ΔTo = Rise (°C) in core temperature of the capacitor due to rated (permissible) maximum ripple current.

Life Time Estimation Formula on PX/PXA/PS/PSA series Capacitors

$$L_x = L_o \times 10^{(T_o - T_x)/20}$$

$$= 2000 \times 10^{(105 - T_x)/20}$$

Where: Lx = Lifetime (hours) of the capacitor to be estimated
 Lo = Base lifetime (hours) of the capacitor described in the specification sheet ;
 2000hours for PX/PXA/PS/PSA series
 To = Maximum rated operating temperature ; 105°C for PX/PXA/PS/PSA series
 Tx = Actual ambient temperature (°C) of the capacitor within device
 (This is not the environment temperature of the device, but the environment temperature of the capacitor that has been placed within the device.)

$$\Delta T_x = (T_s - T_x) \times K_c$$

Where: Ts = Surface temperature (°C) of the case
 Tx = Actual ambient temperature (°C) of the capacitor
 Kc = Coefficient standing for the ratio of the ΔTx to the (Ts - Tx)
 For the Kc's, refer to the table below:

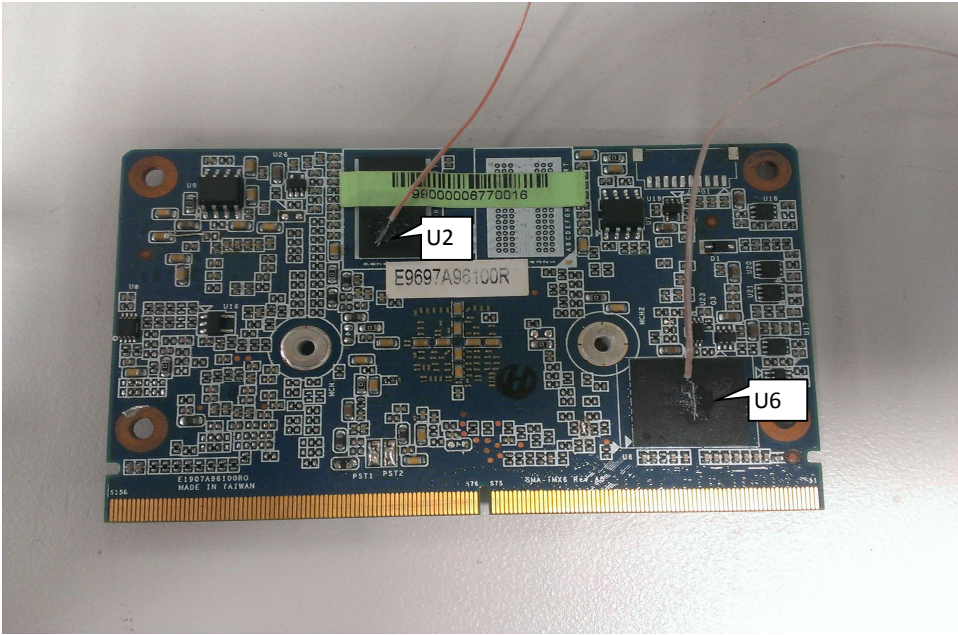
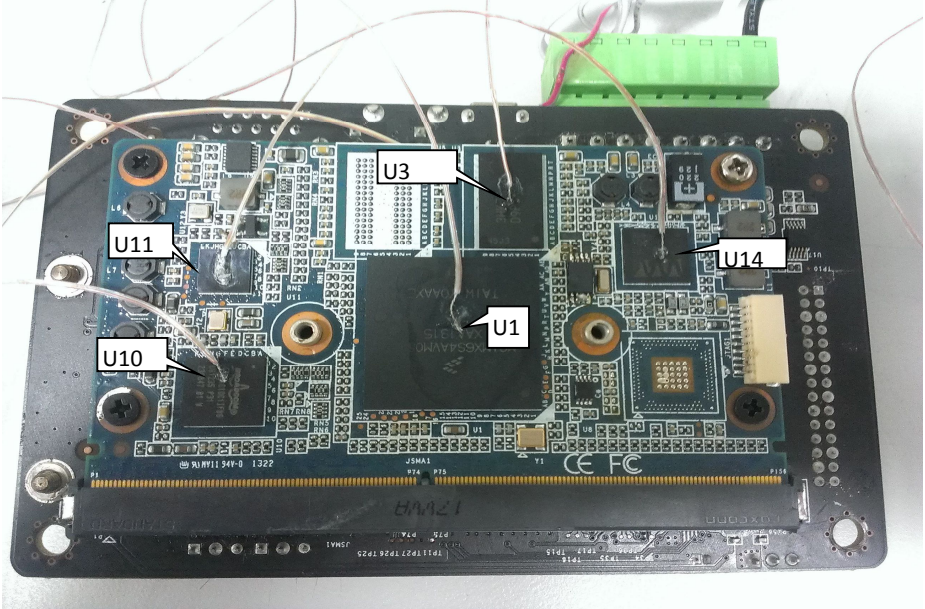
Kc :	Capacitor diameter (mm)	φ5- φ8	φ10	φ12.5	φ16	φ18
	Kc	1.10	1.15	1.20	1.25	1.30

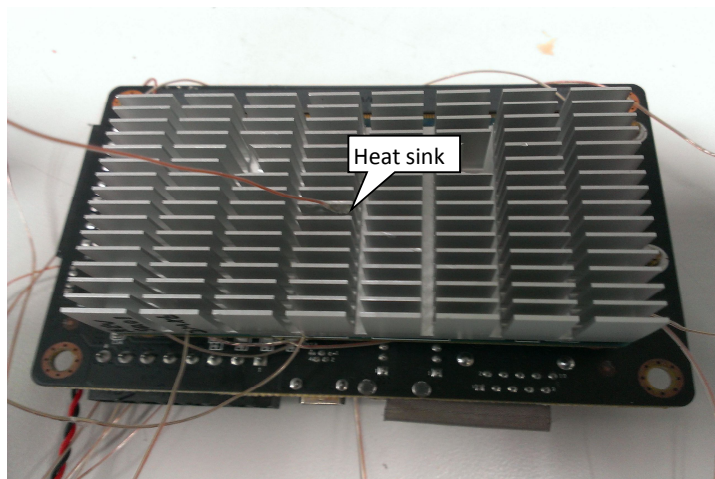
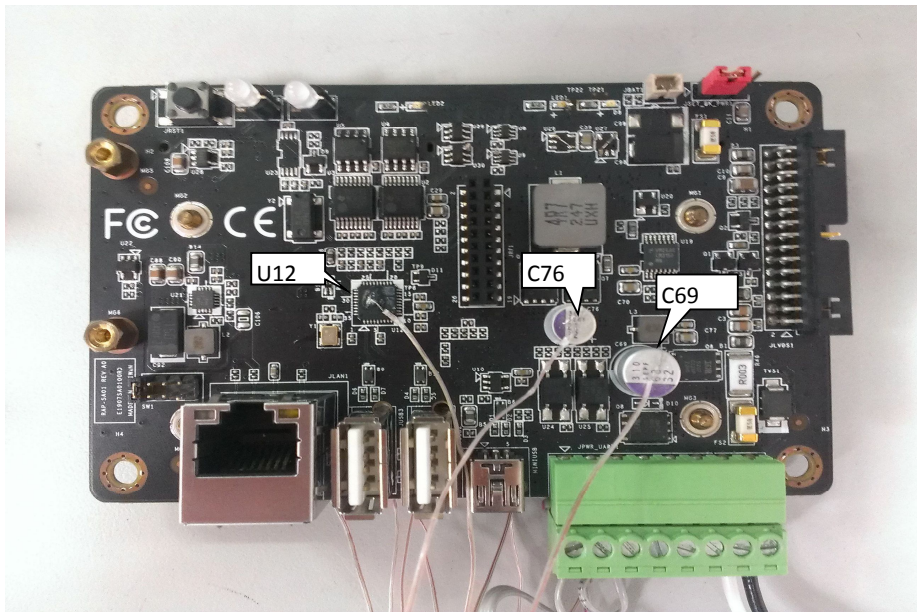
Test procedure : 1. Room Temperature Thermal and Capacitor Life time Calculation & battery , Panel , Inverter or Converter

Chamber	aluminum	aluminum
25°C	C76	C69
Ts(°C)	29.60	28.30
Tx(°C)		
Lo(hours)	5000	5000
Kc		
ΔTx(°C)		
Lx(hours)	29442183	34195582
Life(years)	3360.98	3903.61
Result	Pass	Pass

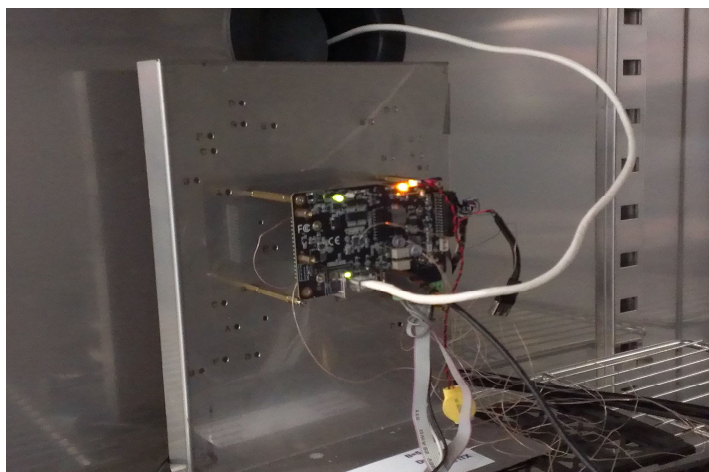
Chamber	Micron DDR3	Micron DDR3
25°C	U2	U3
SPEC(Tc)	95.00	95.00
Ts	31.70	31.70
SPEC - Ts	63.30	63.30
Result	Pass	Pass

Chamber	CPU	SMSC USB2514Bi	Broadcom BCM54610 C	Micron emmc 4G	WM8326GE FL00E	CPLD	Heat sink		
25°C	U1	U12	U10	U6	U14	U11			
SPEC(Ta)	85.00	85.00	85.00	85.00	85.00	85.00			
Ts	30.30	30.50	32.10	33.80	32.10	29.80	29.60		





Thermal Pad $K=6$
 $T=0.5$



Wind Speed: 0.3 m/s

Thermal and Capacitor Life time Calculation



DMR Task Number 0

版本 0

Test Engineer	Jeffery	Date	2013/1/6	Result	Pass
Test Configuration					
Model name	RAP-SA01				
PCB version	A0				
CPU Type	Freescale iMX6 Solo 800MHz				
OS	Ubuntu 10.04 (LTS)				
Kernel Version	3.0.35				
Memory	Micron DDR3L 512+512Mb				
Storage	Micron eMMC 4GB				
Adapter	FSP060-DBAB1 12V 5A 60W				

$$L_x = L_o \times 2^{(T_o - T_x)/10} \times 2^{(\Delta T_o - \Delta T_x)/5}$$

$$= L_o \times 2^{(105 - T_x)/10} \times 2^{(5 - \Delta T_x)/5}$$

Where: Lx = Lifetime (hours) of the capacitor to be estimated
 Lo = Base lifetime (hours) of the capacitor described in the specification sheet
 To = Maximum rated operating temperature
 Tx = Actual ambient temperature (°C) of the capacitor within device
 (This is not the environment temperature of the device, but the environment temperature of the capacitor that has been placed within the device.)
 ΔTo = Rise (°C) in core temperature of the capacitor due to rated (permissible) maximum ripple current.

$$\Delta T_x = (T_s - T_x) \times K_c$$

Where: Ts = Surface temperature (°C) of the case
 Tx = Actual ambient temperature (°C) of the capacitor
 Kc = Coefficient standing for the ratio of the ΔTx to the (Ts - Tx)
 For the Kc's, refer to the table below:

Capacitor diameter (mm)	φ5-φ8	φ10	φ12.5	φ16	φ18
Kc	1.10	1.15	1.20	1.25	1.30

Life Time Estimation Formula on PX/PXA/PS/PSA series Capacitors

$$L_x = L_o \times 10^{(T_o - T_x)/20}$$

$$= 2000 \times 10^{(105 - T_x)/20}$$

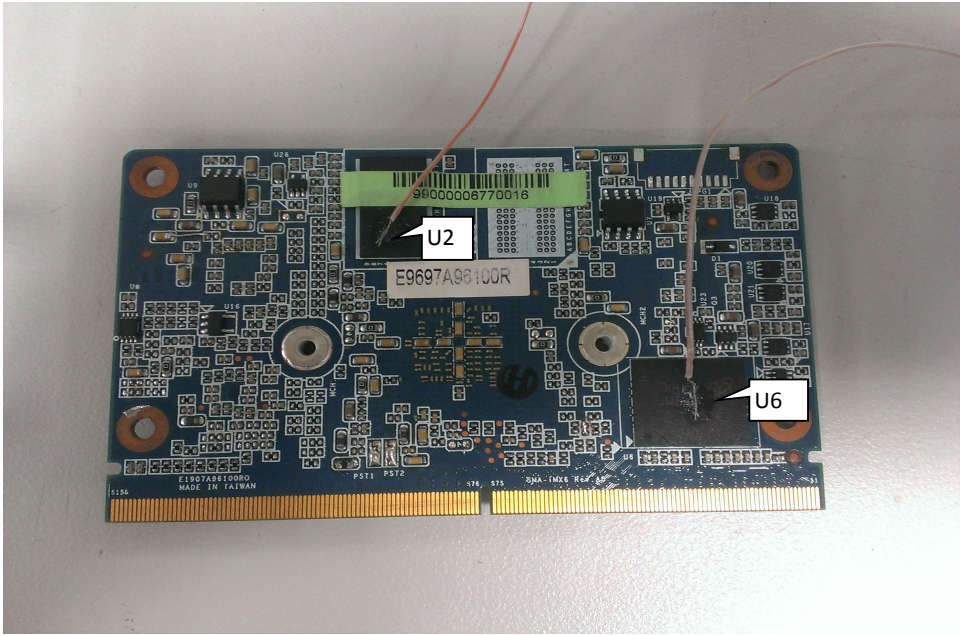
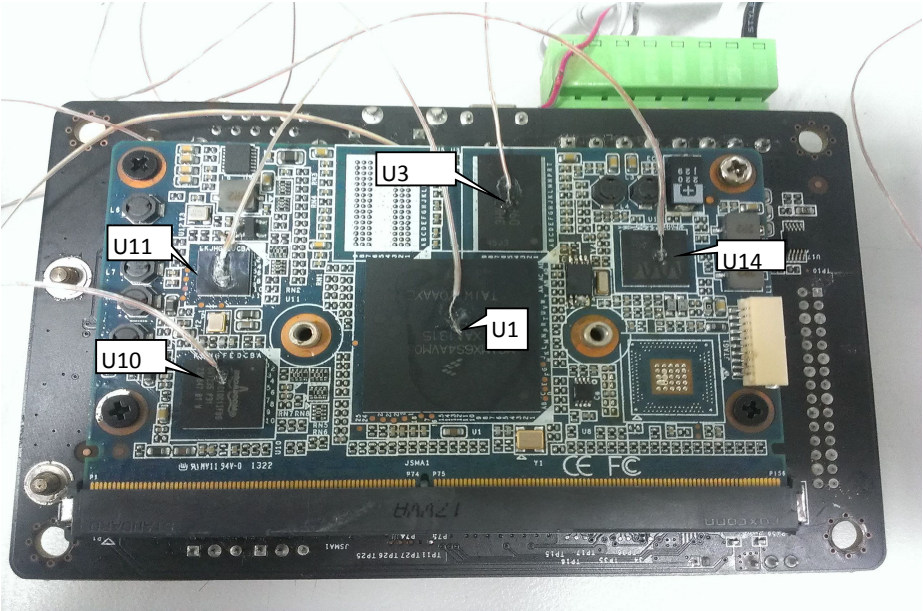
Where: Lx = Lifetime (hours) of the capacitor to be estimated
 Lo = Base lifetime (hours) of the capacitor described in the specification sheet ;
 2000hours for PX/PXA/PS/PSA series
 To = Maximum rated operating temperature ; 105°C for PX/PXA/PS/PSA series
 Tx = Actual ambient temperature (°C) of the capacitor within device
 (This is not the environment temperature of the device, but the environment temperature of the capacitor that has been placed within the device.)

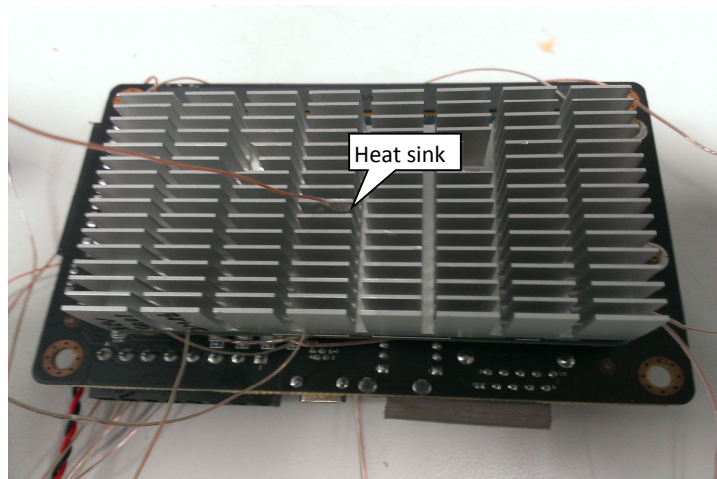
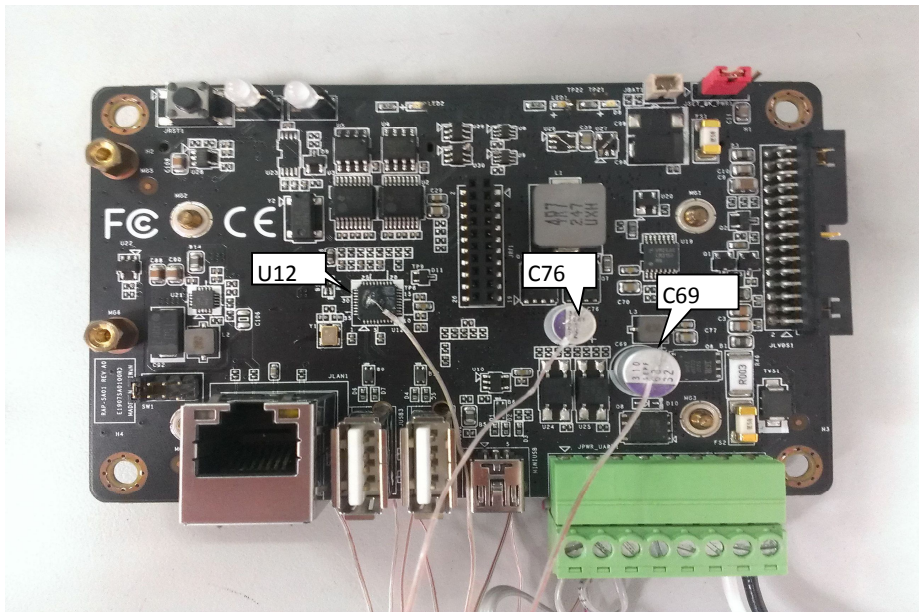
Test procedure : 1. Room Temperature Thermal and Capacitor Life time Calculation & battery , Panel , Inverter or Converter

Chamber	aluminum	aluminum
85°C	C76	C69
Ts(°C)	90.40	89.30
Tx(°C)		
Lo(hours)	5000	5000
Kc		
ΔTx(°C)		
Lx(hours)	26852	30477
Life(years)	3.07	3.48
Result	Pass	Pass

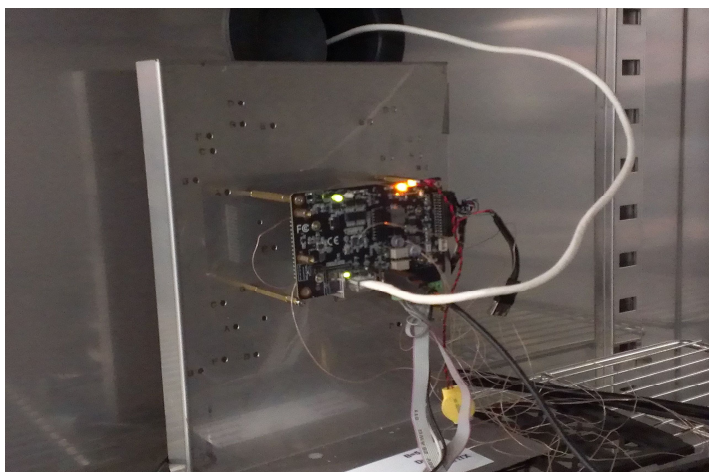
Chamber	Micron DDR3	Micron DDR3
85°C	U2	U3
SPEC(Tc)	95.00	95.00
Ts	93.30	93.70
SPEC - Ts	1.70	1.30
Result	Pass	Pass

Chamber	CPU	SMSC USB2514Bi	Broadcom BCM54610 C	Micron emmc 4G	WM8326GE FL00E	CPLD	Heat sink		
85°C	U1	U12	U10	U6	U14	U11			
SPEC(Ta)	85.00	85.00	85.00	85.00	85.00	85.00			
Ts	91.90	91.10	93.30	94.80	93.60	90.80	90.80		





Thermal Pad $K=6$
 $T=0.5$



Wind Speed: 0.3 m/s