



BL-M8723DP2

802.11n 150Mbps WLAN + BT v4.2

PCI Express Mini Card Specification

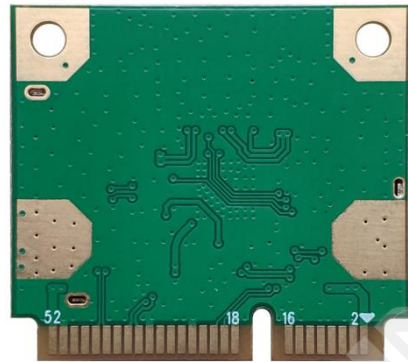
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(Top View)



(Bottom View)

Module Name: BL-M8723DP2	
Module Type: 802.11b/g/n 150Mbps WLAN + Bluetooth v4.2 PCI Express Mini Card	
Revision: V1.0	
Customer Approval:	
Company:	
Title:	
Signature:	Date:
Approval:	
Title:	
Signature:	Date:

Revision History

Revision	Summary	Release Date	Revised By
0.1	Initial release	2024-01-18	Fnz
1.0	Official release	2024-01-18	Fnz

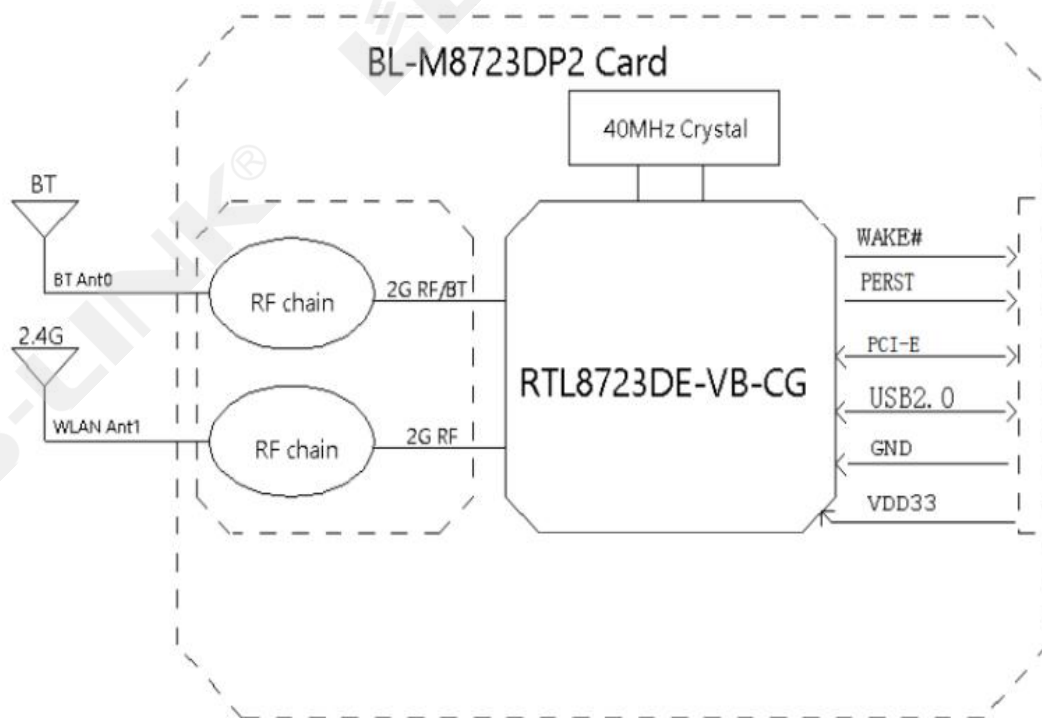
1. Introduction

BL-M8723DP2 is a highly integrated WLAN+Bluetooth Combo PCI Express Mini Card, it contains a WLAN subsystem with PCI Express interface controller and a Bluetooth subsystem with USB interface controller. This card compatible IEEE802.11b/g/n standard and provides the maximum PHY rate up to 150Mbps, it supports Bluetooth dual mode with BT v4.2 compliant, offering feature-rich wireless connectivity and reliable throughput from an extended distance.

1.1 Features

- Form Factor: PCI Express Half-Mini Card with bottom-side keep outs
- Operating Frequency: 2.4~2.4835GHz
- IEEE Standards: IEEE 802.11b/g/n
- Wireless PHY rate can reach up to 150Mbps
- Support BT Classic / BT Low Energy dual mode
- Connect to external antenna through IPEX connectors

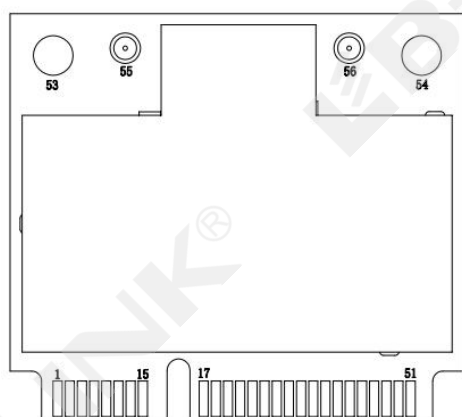
1.2 Block Diagram



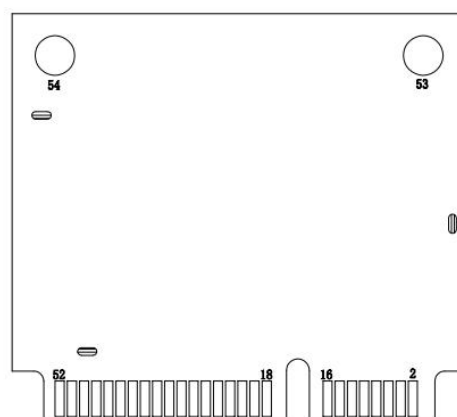
1.3 General Specifications

Card Name	BL-M8723DP2
Chipset	RTL8723DE-VB-CG
WLAN Standards	IEEE802.11b/g/n
BT Specification	Bluetooth Core Specification v4.2/2.1
Host Interface	PCIE for WLAN & USB for BT
Antenna	Connect to the external antenna through IPEX connectors
Dimension	30.0*26.8*3.1mm (L*W*H)
Power Supply	DC 3.3V±0.2V @ 500 mA (Max)
Operation Temperature	-20°C to +70°C
Operation Humidity	10% to 95% RH (Non-Condensing)

2. Pin Assignments



(Top View)



(Bottom View)

2.1 Pin Definition

No.	Pin Name	Type	Level	Card Pin Description
1	WAKE#	O/D	3.3V	Power Management Event active low open drain output. Used to reactivate the PCI Express bus main power rails and

				reference clock. This WAKE# can be shared with BT wake up host function via sideband signals
3	NC	--		No connection(floating)
5	NC	--		No connection(floating)
7	CLKREQ#	I/O/D	3.3V	Reference Clock Request open drain output, it used to request for the reference clock.
9	GND	P		Ground connections
11	REFCLK-	AI		PCI Express 100MHz differential reference clock input
13	REFCLK+	AI		PCI Express 100MHz differential reference clock input
15	GND	P		Ground connections
17	NC	--		No connection(floating)
19	NC	--		No connection(floating)
21	GND	P		Ground connections
23	PERn0	AO		PERp0 and PERn0 differential pair from the PCI Express transmitter on this card, and output to the PCI Express receiver on the system board (AC coupling capacitors are integrated in the Card)
25	PERp0	AO		PERp0 and PERn0 differential pair from the PCI Express transmitter on this card, and output to the PCI Express receiver on the system board (AC coupling capacitors are integrated in the Card)
27	GND	P		Ground connections
29	GND	P		Ground connections
31	PETn0	AI		PETp0 and PETn0 differential pair from the PCI Express transmitter on the system board, and connected to the PCI Express receiver on this card
33	PETp0	AI		PETp0 and PETn0 differential pair from the PCI Express transmitter on the system board, and connected to the PCI Express receiver on this card
35	GND	P		Ground connections
37	GND	P		Ground connections
39	NC	--		No connection(floating)
41	NC	--		No connection(floating)
43	GND	P		Ground connections
45	NC	--		No connection(floating)
47	NC	--		No connection(floating)
49	NC	--		No connection(floating)
51	NC	--		No connection(floating)

2	VDD33	P		DC3.3V power supply
4	GND	P		Ground connections
6	NC	--		No connection(floating)
8	NC	--		No connection(floating)
10	NC	--		No connection(floating)
12	NC	--		No connection(floating)
14	NC	--		No connection(floating)
16	NC	--		No connection(floating)
18	GND	P		Ground connections
20	W_DIS#	I	3.3V	W_DIS# can be defined as the WLAN Radio-off function with host interface remaining connected. When this pin is pulled low, WLAN function will be Radio-off. When this function is not required,external pull high is not required. Shared with GPIO9
22	PERST#	I	3.3V	PCI Express Reset active low input. When the PERST# is asserted at power-on state, the card returns to a pre-defined reset state and is ready for initialization and configuration after the de-assertion of the PERST#
24	NC	--		No connection(floating)
26	GND	P		Ground connections
28	NC	--		No connection(floating)
30	NC	--		No connection(floating)
32	NC	--		No connection(floating)
34	GND	P		Ground connections
36	USB_D-	A I/O		USB 2.0 Full Speed Interface differential pair for BT
38	USB_D+	A I/O		USB 2.0 Full Speed Interface differential pair for BT
40	NC	--		No connection(floating)
42	BT_LED	I/O	3.3V	LED Pin (Active Low)
44	WALN_LED	I/O	3.3V	LED Pin (Active Low)
46	NC	--		No connection(floating)
48	NC	--		No connection(floating)
50	GND	P		Ground connections
52	VDD33	P		DC3.3V power supply
55	ANT1	RF		IPEX connector for 2.4G WLAN ANT1
56	ANT0	RF		IPEX connector for 2.4G BT ANT0

P: Power or Ground; I/O: In/Output; I: Input; A I/O: Analog In/Output; AI: Analog Input; AO: Analog Output; RF: Analog RF Port or RF Ground; O/D:Open Drain Output;

3. Electrical and Thermal Specifications

3.1 Recommended Operating Conditions

Parameters		Min	Typ	Max	Units
Ambient Operating Temperature		-20	25	70	°C
External Antenna VSWR			1.7	2	/
Supply Voltage	VDD33	3.1	3.3	3.5	V

3.2 Current Consumption

Conditions : VDD33=3.3V ; Ta:25°C			
Use Case	VDD33 Current		
	Typ (I _{RMS})	Max (I _{Peak})	Units
2.4G WLAN throughput TX 98Mbps(Linux Drive, BT disable)	290	368	mA
2.4G WLAN throughput RX 107Mbps(Linux Drive, BT disable)	145	358	mA
2.4G 11b@1Mbps TX@17dBm (RF test)	353	378	mA
2.4G 11b@11Mbps TX@17dBm (RF test)	345	374	mA
2.4G 11g@6Mbps TX@17dBm (RF test)	351	374	mA
2.4G 11g@54Mbps TX@14dBm (RF test)	230	340	mA
2.4G 11n@HT20 MCS0 TX@17dBm (RF test)	342	368	mA
2.4G 11n@HT20 MCS7 TX@14dBm (RF test)	228	342	mA
2.4G 11n@HT20 MCS0 TX@17dBm (RF test)	333	368	mA
2.4G 11n@HT20 MCS7 TX@14dBm (RF test)	206	342	mA
2.4G 11b@1M RX (RF test)	144	156	mA
2.4G 11n@HT40 MCS0 RX (RF test)	154	168	mA
2.4G 11n@HT40 MCS7 RX (RF test)	156	170	mA
BT			
BT BR_1M TX@5dBm((BT RF test)	205	225	mA
BT EDR_3M TX@5dBm((BT RF test)	208	227	mA
BT EDR_3M TX@5dBm((BT RF test)	215	232	mA
BT LE_1M TX@5dBm ((BT RF test)	197	220	mA
BT LE_1M RX Active ((BT RF test)	181	193	mA

4. WLAN & Bluetooth RF Specifications

4.1 2.4G WLAN RF Specification

Conditions : VDD33=3.3V ; Ta:25℃			
Features	Description		
WLAN Standard	IEEE 802.11b/g/n		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Ch1~Ch13 (For 20MHz Channels)		
Modulation	802.11b (DSSS): CCK, DQPSK, DBPSK; 802.11g (OFDM): BPSK, QPSK, QAM16, QAM64; 802.11n (OFDM): BPSK, QPSK, QAM16, QAM64;		
Data Rate	802.11b: 1, 2, 5.5, 11Mbps; 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps; 802.11n (HT20): MCS0~MCS7(1T1R_SISO) 6.5~72.2Mbps; 802.11n (HT40): MCS0~MCS7(1T1R_SISO) 13.5~150Mbps;		
Frequency Tolerance	≤±20ppm		
2.4G Transmitter Specifications (TX power of some rates is calibrated, customers can define the target TX power of other rates by modifying configuration file of the driver software. Customers must define the TX power same or lower than recommended Target TX Power as below)			
TX Rate	TX Power (dBm)	TX Power Tolerance (dBm)	EVM (dB)
802.11b@1Mbps	Recommended Target TX Power:17	±1.5	≤-10
802.11b@11Mbps	Calibrated TX Power:17	±1.5	≤-10
802.11g@6Mbps	Recommended Target TX Power:16	±1.5	≤-10
802.11g@54Mbps	Calibrated TX Power:14	±1.5	≤-25
802.11n@HT20_MCS0	Recommended Target TX Power:16	±1.5	≤-10
802.11n@HT20_MCS7	Calibrated TX Power:14	±1.5	≤-28
802.11n@HT40_MCS0	Recommended Target TX Power:16	±1.5	≤-10
802.11n@HT40_MCS7	Calibrated TX Power:14	±1.5	≤-28
2.4G Receiver Specifications			
RX Rate	Min Input Level (dBm)	Max Input Level (dBm)	PER
802.11b@1Mbps	-93	0	< 8%
802.11b@11Mbps	-86	0	< 8%
802.11g@6Mbps	-89	0	< 10%

802.11g@54Mbps	-70	0	< 10%
802.11n@HT20_MCS0	-88	0	< 10%
802.11n@HT20_MCS7	-68	0	< 10%
802.11n@HT40_MCS0	-87	0	< 10%
802.11n@HT40_MCS7	-66	0	< 10%

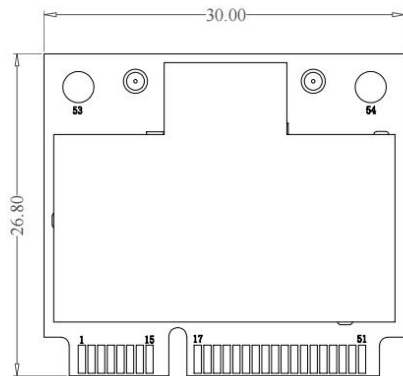
4.2 Bluetooth RF Specification

Conditions: VDD33=3.3V; Ta:25°C			
Features	Description		
Bluetooth Specification	Bluetooth Core Specification v4.2/2.1		
Frequency Range	2.4~2.4835GHz (2.4GHz ISM Band)		
Channels	Bluetooth Classic: Ch0~Ch78 (For 1MHz Channels); Bluetooth Low Energy: Ch0~Ch39 (For 2MHz Channels);		
Power Classes	Bluetooth Classic: Class1; Bluetooth Low Energy: Class1.5;		
Data Rate & Modulation	BR_1Mbps: GFSK; EDR_2Mbps: $\pi/4$ -DQPSK; EDR_3Mbps: 8DPSK; LE_1Mbps: GFSK (Uncoded);		
Bluetooth Transmitter Specifications			
Items	Min (dBm)	Typ (dBm)	Max (dBm)
TX Power			
BR_1M	2	5	8
EDR_2/3M	2	5	8
LE_1M	2	5	8
Items	Min	Typ	Max
BR_1M (DH1) Modulation Characteristics			
Δf_{1avg}	140KHz	165.2KHz	175KHz
Δf_{2avg}	115KHz	153KHz	175KHz
Δf_{2max}	115KHz	161.3KHz	/
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.926	/

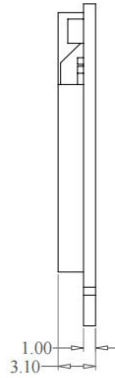
Items	Min	Typ	Max	
EDR_3M(3DH5) EDR Carrier Frequency Stability and Modulation Accuracy				
ω_i	-75KHz	16.6KHz	+75KHz	
$\omega_i+\omega_o$	-75KHz	16.51KHz	+75KHz	
ω_o	-10KHz	0.34KHz	+10KHz	
8DPSK RMS DEVM	/	0.037	0.13	
8DPSK Peak DEVM	/	0.082	0.25	
Items	Min	Typ	Max	
LE_1M Modulation Characteristics				
Δf_{1avg}	225KHz	252.28KHz	275KHz	
Δf_{2avg}	185KHz	231.54KHz	275KHz	
Δf_{2max}	185KHz	224.60KHz	/	
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.918	/	
Items	Min	Typ	Max	
LE_2M Modulation Characteristics				
Δf_{1avg}	450KHz	499.73KHz	550KHz	
Δf_{2avg}	370KHz	495.79KHz	550KHz	
Δf_{2max}	370KHz	477.9KHz	/	
$\Delta f_{2avg}/\Delta f_{1avg}$	0.8	0.992	/	
Bluetooth Receiver Specifications				
Items	Sensitivity		Maximum Input Level	
	Input Level (Typ. dBm)	BER	Input Level (Typ. dBm)	BER
BR_1M (DH1)	-87	$\leq 0.1\%$	-10	$\leq 0.1\%$
EDR_2M(DH1)	-85	$\leq 0.01\%$	-10	$\leq 0.1\%$
EDR_3M (3DH5)	-80	$\leq 0.01\%$	-10	$\leq 0.1\%$
	Input Level (Typ. dBm)	PER	Input Level (Typ. dBm)	PER
LE_1M	-89	$\leq 5\%$	-10	$\leq 5\%$

5. Mechanical Specifications

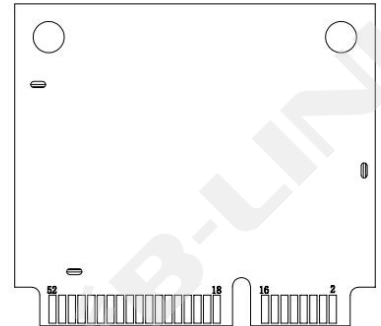
5.1 Module Outline Drawing



(Top View)



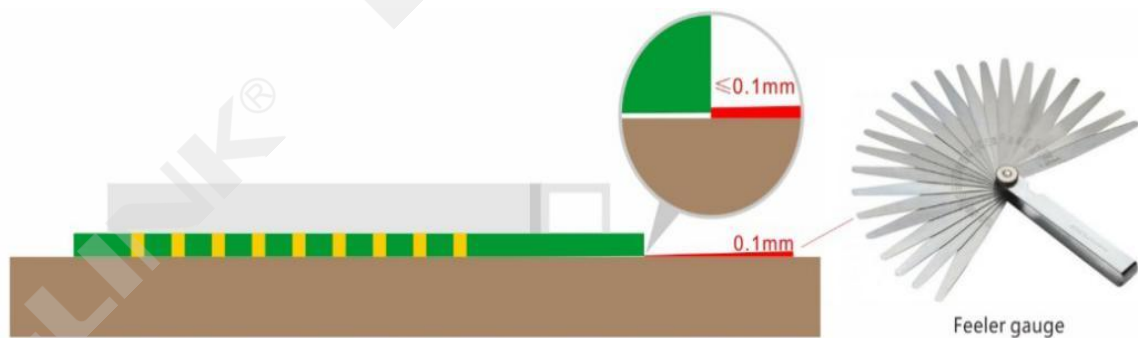
(Side View)



(Bottom View)

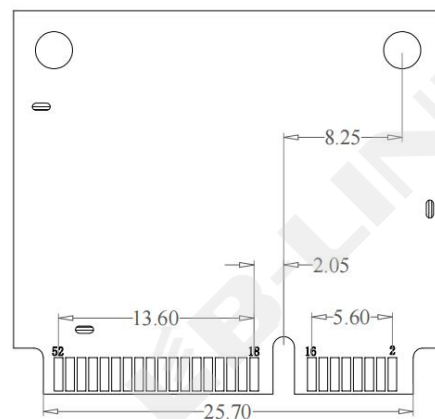
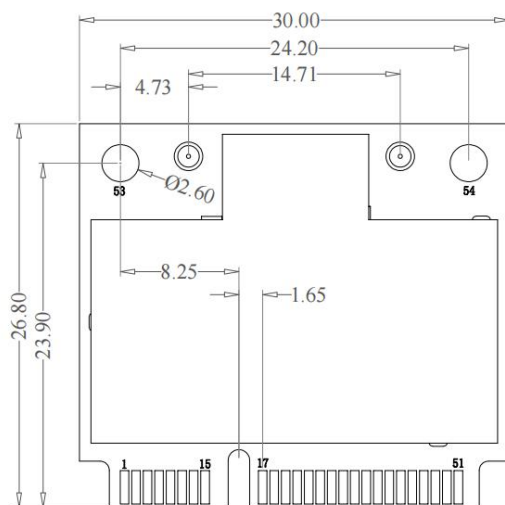
Card dimension: 30.0*26.8*3.1mm (L*W*H; Tolerance: $\pm 0.3\text{mm}_L/W$, $\pm 0.2\text{mm}_H$)

IPEX / MHF-1 connector dimension: 3.0*2.6*1.2mm (L*W*H, $\varnothing 2.0\text{mm}$)



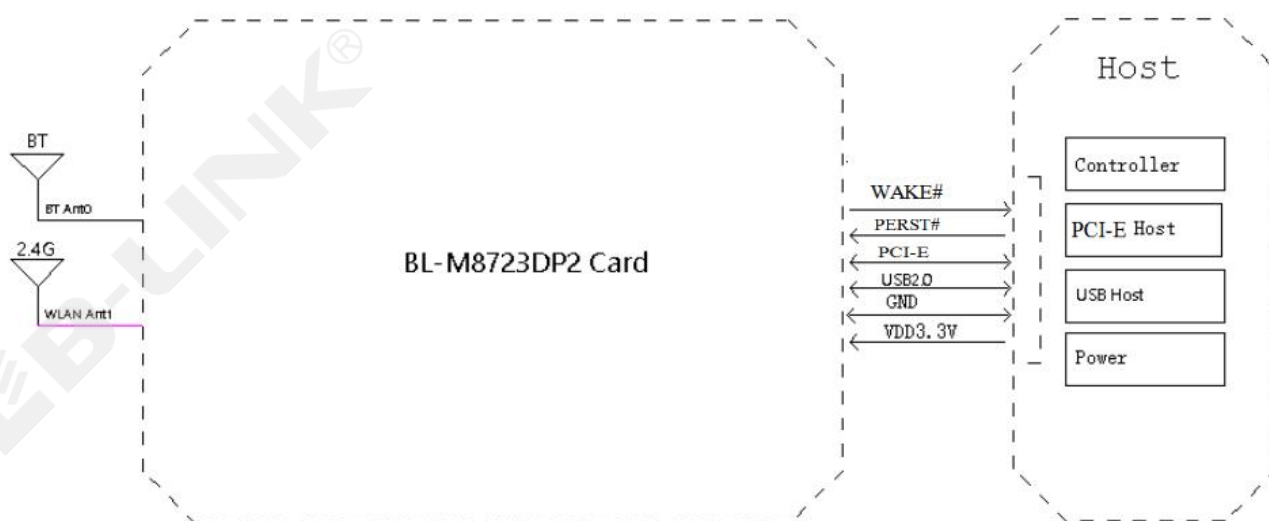
Module Bow and Twist: $\leq 0.1\text{mm}$

5.2 Mechanical Dimensions



6. Application Information

6.1 Typical Application Circuit



7. Key Components Of Module

No.	Parts	Specification	Manufacturer	Note
1	Chipset	RTL8723DE-VB-CG	Realtek CO., LTD	
2	PCB	BL-M8723DP2	Shenzhen Tie Fa Technology CO. LTD	
			Guangdong KINGSHINE ELECTRONICS CO., LTD	
			Quzhou Sunlord Electronics CO., LTD	
3	Crystal	40MHz-3225	JinHua East Crystal Electronic CO.,LTD	
			Chengde oscillator Electronic Technology CO.,LTD	
			Lucki Electronics Co., Ltd	

8. Package and Storage Information

8.1 Package Dimensions



Package specification:

1. 45 modules per blister plate and 900 modules per box.
2. The blister is bound with wire membrane and put into anti-static vacuum bag.
3. Put 1 bag of dry beads (20g) and 1 humidity card in each anti-static vacuum bag.
4. The outer box size is 35.2*21.5*15.5cm.

8.2 Storage Conditions

Absolute Maximum Ratings:

Storage temperature: -40°C to +85°C,
Storage humidity: 10% to 95 (Non-Condensing)

Recommended Storage Conditions:

Storage temperature: 5°C to +40°C,
Storage humidity: 20% to 90% RH

Please use this Module within 12month after vacuum-packaged.
The Module shall be stored without opening the packing.
After the packing opened, the Module shall be used within 72hours.
When the color of the humidity indicator in the packing changed,
The Module shall be baked before soldering.
Baking condition: 60°C, 24hours, 1time.

ESD Sensitivity:

ESD Protection: 2KV (HBM, Maximum rating)
The Card is a static-sensitive electronic device.
Do not operate or store near strong electrostatic fields.
Take proper ESD precautions!



ESD CAUTION