

Produkte

Products 14029292 001 Seite 1 von 15 Prüfbericht - Nr.: Page 1 of 15 Test Report No.: ThinkGeek Inc. Auftraggeber: 11216 Waples Mill Road Client: Suite 100, Fairfax VA 22030 USA Gegenstand der Prüfung: Bluetooth Keyboard with Case for iPad / iPad2 Test Item: Bezeichnung: JT-2901913C Serien-Nr.: Engineering sample Identification: JT-2901933C Serial No.: Wareneingangs-Nr.: 00120309101-001 Eingangsdatum: 09.03.2012 Receipt No .: Date of Receipt: TÜV Rheinland Hong Kong Ltd. Prüfort: 8/F., First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong Testing Location: Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong FCC Part 15 Subpart C Prüfgrundlage: Test Specification: ANSI C63.4-2003 CISPR 22:1997 Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben Prüfergebnis: genannter Prüfgrundlage. Test Results: The above mentioned product was tested and passed. TÜV Rheinland Hong Kong Ltd. Prüflaboratorium: 8-10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong Testing Laboratory: geprüft/ tested by: kontrolliert/ reviewed by: Mika Chan Sharon Li 11.04.2012 11.04.2012 Senior Project Engineer Assistant Manager Datum Name/Stellung Unterschrift Datum Name/Stellung Unterschrift Date Name/Position Name/Position Signature Date Signature FCCID: V77JT2901913C

Sonstiges:

Other Aspects

Abkürzungen: P(ass) entspricht Prüfgrundlage Abbreviations: P(ass) passed entspricht nicht Prüfgrundlage F(ail) F(ail) failed N/A nicht anwendbar not applicable nicht getestet

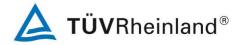
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Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	FHSS modulation
Number of channels	79
Channel separation	1 MHz
Type of antenna	PCB Antenna
Antenna gain (dBi)	0.8
Power level	fix
Type of equipment	stand alone, plug-in radio device
Connection to public utility power line	No
Nominal voltage	V _{nor} : 3.7 V
Independent Operation Modes	Page scan
	Inquiry scan
	Connection state - HID Link

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Product function and intended use

The test item is a Bluetooth Wireless Keyboard based on the Bluetooth technology. Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

The Bluetooth uses GFSK (Gaussian Frequency Shift Keying) modulation where a binary one is represented by a positive frequency deviation and a binary zero by a negative frequency deviation. Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, 79 RF channels spaced 1 MHz apart are defined.

The channel is represented by a pseudo-random hopping sequence through the 79 channels. The channel is divided into time slots, with a nominal slot length of 625 μ s, where each slot corresponds to different RF hop frequencies. The nominal hop rate is 1600 hops/s. The symbol rate on the channel is 1 Ms/s. The USB connector is for charging only, no data exchange supported.

Submitted documents

Circuit Diagram Block Diagram Bill of material User manual

Remark

FCC ID: V77JT2901913C

Model	Product description
JT-2901913C	Bluetooth Keyboard with Case for iPad2
JT-2901933C	Bluetooth Keyboard with Case for iPad

The Bluetooth keyboard for both model listed above are the universal keyboard compatible with iPad2 and iPad, what makes these two models different is just the leather case.

Special accessories and auxiliary equipment

The product has been tested together with the following additional accessory:

Laptop computer

Brand: Lenovo Model: T61

S/N: L3-X9333 08/05

AC adaptor Brand: Lenovo Model: 92P1103

Input rating: 100-240V ~ 1.7A-0.9A, 50/60Hz

Output rating: 20V, 4.5A

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List of Test and Measurement Instruments

Hong Kong Productivity Council (Registration number: 90656)

Equipment used	Manufacturer	Model No.	S/N	Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	25-May-12
Test Receiver	R&S	ESU40	100190	26-May-12
Bi-conical Antenna	R&S	HK116	100241	05-May-13
Log Periodic Antenna	R&S	HL223	841516/020	06-May-13
Coaxial cable 50ohm	Rosenberger	RTK081-05S-	LA2-001-	15-Nov-13
		05S-10m	10M / 001	
Microwave amplifer 0.5-	HP	83017A	3950M00241	03-Oct-13
26.5GHz, 25dB gain				
High Pass Filter (cutoff	Trilithic	23042	9829213	28-Oct-13
freq. =1000MHz)				
Horn Antenna	EMCO	3115	9002-3351	11-May-13
Active Loop Antenna	EMCO	6502	9107-2651	19-Apr-12

TÜV Rheinland Hong Kong Ltd.

Conducted Emission

Equipment	Manufacturer	Type	S/N	Due Date
Test Receiver	Rohde & Schwarz	ESCS30	100201	11 Jan 13
LISN	Rohde & Schwarz	ESH3-Z5	100230	11 Jan 13

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Results FCC Part 15 - Subpart C

Subclause 15.203 – Antenna Information

Pass

Requirement: No antenna other than that furnished by the responsible party shall be used with the

device

Results: Permanent attached antenna

Verdict: Pass

Subclause 15.204 - Antenna Information

Pass

Requirement: Provide information for every antenna proposed for the use with the EUT

Results: a) Antenna type: PCB Antenna

b) Manufacturer and model no: N.A. c) Gain with reference to an isotropic radiator: 0.8 dBi

Verdict: Pass

Subclause 15.207 - Disturbance Voltage on AC Mains

Pass

Test Port: AC mains input port of the laptop computer

Applied voltage: 120VAC

Applicable only to equipment designed to be connected to the public utiliy power line.

Adaptor Model: 92P1103

1) Mode of operation: Charging and operating mode

Live measurement

Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBμV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 - 0,5	0.150	59.1	41.0	66 - 56	56 - 46	Pass
> 0,5 - 5	1.302	35.3	34.9	56	46	Pass
> 5 - 30	7.608	40.2	39.4	60	50	Pass

Neutral measurement

Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBμV	Average dBμV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 - 0,5	0.150	61.7	41.9	66 - 56	56 - 46	Pass
0,15 - 0,5	0.978	34.2	33.4	66 - 56	56 - 46	Pass
> 0,5 - 5	-	-	•	56	46	Pass
> 5 - 30	14.898	37.8	31.6	60	50	Pass

Results: The radio frequency voltage that is conducted back onto the AC power line on any

frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits.

For test Results plots refer to Appendix 1, page 2-3.

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Subclause 15.247 (a)(1) – Carrier Frequency Separation

Pass

Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated

by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is

greater.

Test Specification: FCC Part 15 Subpart A - Subclause 15.31

Mode of operation: Tx mode (hopping on), GFSK Port of testing: Temporary antenna port

Detector : Peak

RBW/VBW : 100 kHz / 300 kHz

Supply voltage : 3.7VDC from DC power supply

Temperature : 23°C Humidity : 50%

Results: The centre frequencies of the hopping channels are separated by more than the

2/3*20dB bandwidth. For test Results plots refer to Appendix 1, page 4.

Verdict: Pass

Subclause 15.247 (a)(1)(iii) - Number of hopping channels

Pass

Requirement: Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 75

channels or 15 channels if power is below 125mW.

Test Specification: FCC Part 15 Subpart A - Subclause 15.31

Mode of operation: Tx mode (hopping on), GFSK Port of testing: Temporary antenna port

Detector : Peak

RBW/VBW : 1 MHz / 3 MHz

Supply voltage : 3.7VDC from DC power supply

Temperature : 23°C Humidity : 50%

Results: The total number of hopping frequencies is more than 15. For test Results plots refer to

Appendix 1, page 5.

Verdict: Pass

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Subclause 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time)

Pass

Requirement: Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15

channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels

employed.

Test Specification: FCC Part 15 Subpart A - Subclause 15.31

Mode of operation: Tx mode (hopping on), DH5 packet

Port of testing : Temporary antenna port

Detector : Peak

RBW/VBW : 1 MHz / 3 MHz

Supply voltage : 3.7VDC from DC power supply

Temperature : 23°C Humidity : 50%

Results: Time period calculation = $0.4 \times 79 = 31.6 \text{s}$

Dwell time = $88 \times 2.896 \times 10^{-3} = 254.85 \times 10^{-3}$

 $<= 400 \times 10^{-3} \text{ s}$

For test protocols please refer to Appendix 1, page 6.

Verdict: Pass

Subclause 15.247 (a) - 20 dB Bandwidth

Pass

Requirement: Frequency hopping systems shall have hopping channel carrier frequencies separated

by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is

greater.

Test Specification: FCC Part 15 Subpart A - Subclause 15.31

Mode of operation: Tx mode (2402MHz, 2441MHz, 2480MHz), (GFSK)

Port of testing : Temporary antenna port

Detector : Peak

RBW/VBW : 30 kHz / 100 kHz

Supply voltage : 3.7VDC from DC power supply

Temperature : 23°C Humidity : 50%

Results: For test protocols refer to Appendix 1, page 7-8.

Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.546	0.492	1.038
2441	0.492	0.480	0.972
2480	0.480	0.492	0.972

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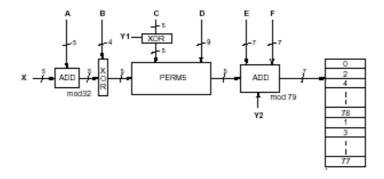
Subclause 15.247 (a) - Hopping Sequence

Pass

Requirement: The hopping sequence is generated and provided with an example.

Hopping sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies.



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Example d	ata:							
Hop sequen			NECTIO	ON STA	TE:			
CLK start: 0:								
ULAP: 0x00			10000	10000	11010	14440	11016	110101
#ticks:	00 02	04 06	00 0a	10006	10 12	14 16	10 1a	1c 1e
0x0000010:	08 66	10 70	12 19	14 23	16 01	18 05	20 33	22 37
0x0000030:								
0x0000050:	40 74	42 78	44 27	46 31	48 09	50 13	52 41	54 45
0x0000070:	56 11	58 15	60 43	62 47	32 17	36 19	34 49	38 51
0x0000090:	40 21	44 23	42 53	46 55	48 33	52 35	50 65	54 67
0x00000b0:	56 37	60 39	58 69	62 71	64 25	68 27	66 57	70 59
0x0000d0:	72 29	76 31	74 61	78 63	01 41	05 43	03 73	07 75
0x00000f0:	09 45	13 47	11 77	15 00	64 49	66 53	68 02	70 06
0x0000110:								
0x0000130:								
0x0000150:								
0x0000170:								
0x0000190:								
0x00001b0:			•	•	•			
0x00001d0:								
0x00001f0:								
0x0000210:								
0x0000230:								
0x0000250:								
0x0000270: 0x0000290:								
0x0000290.								
0x00002d0:			•	•	•			
0x00002d0.								
0x0000210.								
0x0000310:								
0x0000350:								
0x0000370:								
0x0000390:								
0x00003b0:								
0x00003d0:	21 57	25 73	37 10	41 26	27 61	31 77	43 14	47 30
								25 24 İ

Subclause 15.247 (a) - Equal Hopping Frequency Use

Pass

Requirement: Each of the transmitter's hopping channels is used equally on average.

Equal hopping frequency use

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause 15.247 (a) - Receiver Input Bandwidth

Pass

Requirement: The associated receiver(s) complies with the requirement that its input bandwidth matches

the bandwidth of the transmitted signal.

Receiver input bandwidth

The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.

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Subclause 15.247 (a) - Receiver Hopping Capability

Pass

Requirement: The associated receiver has the ability to shift frequencies in synchronisation with the

transmitted signals.

Receiver hopping Capability

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause 15.247 (b)(1) – Peak Output Power

Pass

Test Specification: FCC Part 15 Subpart A – Subclause 15.31 Mode of operation: Tx mode (2402MHz, 2441MHz, 2480MHz)

Port of testing : Temporary antenna port

Detector : Peak

RBW/VBW : 3 MHz / 10 MHz

Supply voltage : 3.7VDC from DC power supply

Temperature : 23°C Humidity : 50%

Requirement: For frequency hopping systems operating in the 2400-2483.5 MHz band employing at

least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 Watt. For all other frequency hopping systems in the 2400 –

2483.5 MHz band: 0.125 Watts.

Results: For test protocols please refer to Appendix 1, page 9-10.

GFSK Modulation

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	-3.59	0	-3.590	0.125 / 21.0	Pass
2441	-4.05	0	-4.050	0.125 / 21.0	Pass
2480	-4.69	0	-4.690	0.125 / 21.0	Pass

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Subclause 15.247	(d) – Band edge compliance of conducted emissions Pass
Mode of operation Port of testing Detector	: FCC Part 15 Subpart A – Subclause 15.31 : Tx mode (2402MHz, 2480MHz), GFSK : Temporary antenna port : Peak : 100 kHz / 300 kHz : 3.7VDC from DC power supply : 23°C : 50%
Requirement:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Results:	Pre-scan has been conduced to determine the worst-case mode from all possible combinations between available modulations and packet types. There is no peak found outside any 100 kHz bandwidth of the operating frequency band. For test protocols refer to Appendix 1, page 11-12.

Subclause 15.205	5 – Band edge compliance of radiated emissions Pass
	: FCC Part 15 Subpart A – Subclause 15.31 : Tx mode (2402MHz, 2480MHz), GFSK : Temporary antenna port : Peak : 1 MHz / 3 MHz : 3.7VDC from DC power supply : 23°C : 50%
Requirement:	Radiated emissions which fall in the restricted bans, as defined in 15.205 (a), must also comply with the radiated emission limits specified in 15.209(a).
Results:	There is no peak found in the restricted bands. For test protocols refer to Appendix 1, page 13-20.

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Subclause 15.247 (d) - Spurious Conducted Emissions

Pass

Test Specification: FCC Part 15 Subpart A – Subclause 15.31

Mode of operation: Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK

Port of testing : Temporary antenna port

Detector : Peak

RBW/VBW : 100 kHz / 300 kHz

Supply voltage : 3.7VDC from DC power supply

Temperature : 23 °C Humidity : 50 %

Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or

digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on

either an RF conducted or a radiated measurement.

Results: There is no peak found outside any 100kHz bandwidth of the operating frequency band

in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(d). For test protocols refer to Appendix 1, page 21-22.

Operating **Spurious Spurious Level** Reference value Delta Verdict frequency frequency (dBm) (dBm) (dB) (MHz) (MHz) Pass 2402 no peak found 2441 Pass no peak found 2480 no peak found Pass

Subclause 15.247 (c) - Spurious Radiated Emissions

Pass

Test Specification: ANSI C63.4 – 2003

Mode of operation: Tx mode (2402MHz, 2441MHz, 2480MHz), GFSK

Port of testing : Enclosure Detector : Peak

RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz

1 MHz / 3 MHz for f > 1 GHz

Supply voltage : internal batteries has been activated

Temperature : 23°C Humidity : 50%

Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest

level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section15.205(a), must also comply with the radiated emission

limits specified in section 15.205(c).

Results: All three transmit frequency modes comply with the field strength within the restricted

bands. There is no spurious found below 30MHz.

Tx frequency 2402MHz Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
336.002	22.60	46.0 / QP
4803.919	48.19	74.0 / P

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4804.032	36.24	54.0 / A
Tx frequency 2402MHz	Horizontal Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
336.002	35.20	46.0 / QP
1601.516	44.99	74.0 / P
1601.467	40.62	54.0 / A
4804.208	48.81	74.0 / P
4804.016	39.27	54.0 / A
Tx frequency 2441MHz	Vertical Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
336.002	22.50	46.0 / QP
4881.971	48.05	74.0 / P
4882.051	36.28	54.0 / A
Tx frequency 2441MHz	Horizontal Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
336.002	35.50	46.0 / QP
1627.403	44.92	74.0 / P
1627.339	39.29	54.0 / A
4881.647	48.87	74.0 / P
4882.016	40.04	54.0 / A

Tx frequency 2480MHz	Vertical Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
336.002	22.5	46.0 / QP
4959.695	49.84	74.0 / P
4960.001	40.04	54.0 / A
Tx frequency 2480MHz	Horizontal Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
336.002	35.3	46.0 / QP
1653.381	45.04	74.0 / P
1653.349	38.89	54.0 / A
4960.025	48.80	74.0 / P
4960.112	35.80	54.0 / A

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