

ATC5CPL004 User Manual

Description

- Model : ATC5CPL004
- WLAN : 802.11 a/b/g/n/ac
- Frequency Range : 2400MHz ~ 5845MHz

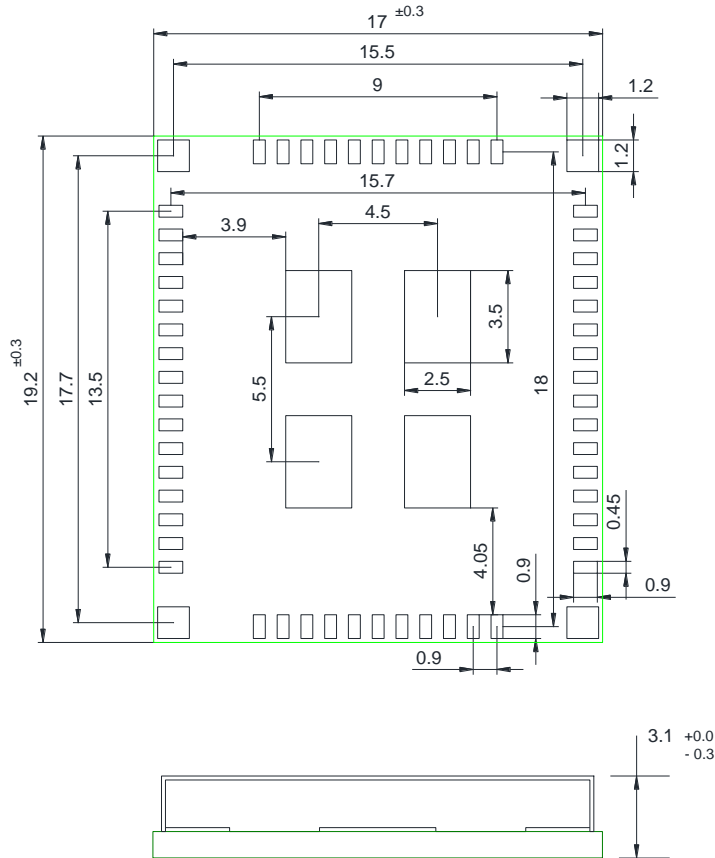
Features

- Dimension : 22.5mm x 20.0mm x 2.9mm
- Temperature Range : -40°C ~ +85°C
- Supply Voltage : VBAT 3.2V to 3.6V
- Output Power
 - WLAN : 12.0dBm(11b 11Mbps), 12dBm(11g 54Mbps, 11n 2.4G MCS7), 8dBm(11a 54Mbps), 8dBm(11n 5G MCS7), 8dBm(11ac MCS9)
- Interface : PCIe(WLAN)

Application

- Automotive (Outdoor Device)

Dimensions



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Operating condition

1) Recommended operation conditions

Parameter	Min	Max	Unit
Operating Temperature Range	-40	+85	°C
Supply Voltage : VBATT (3.3V)	3.0 ¹⁾	3.6	V
Supply Voltage : VIO (1.8V to 3.3V)	1.62	3.6	V

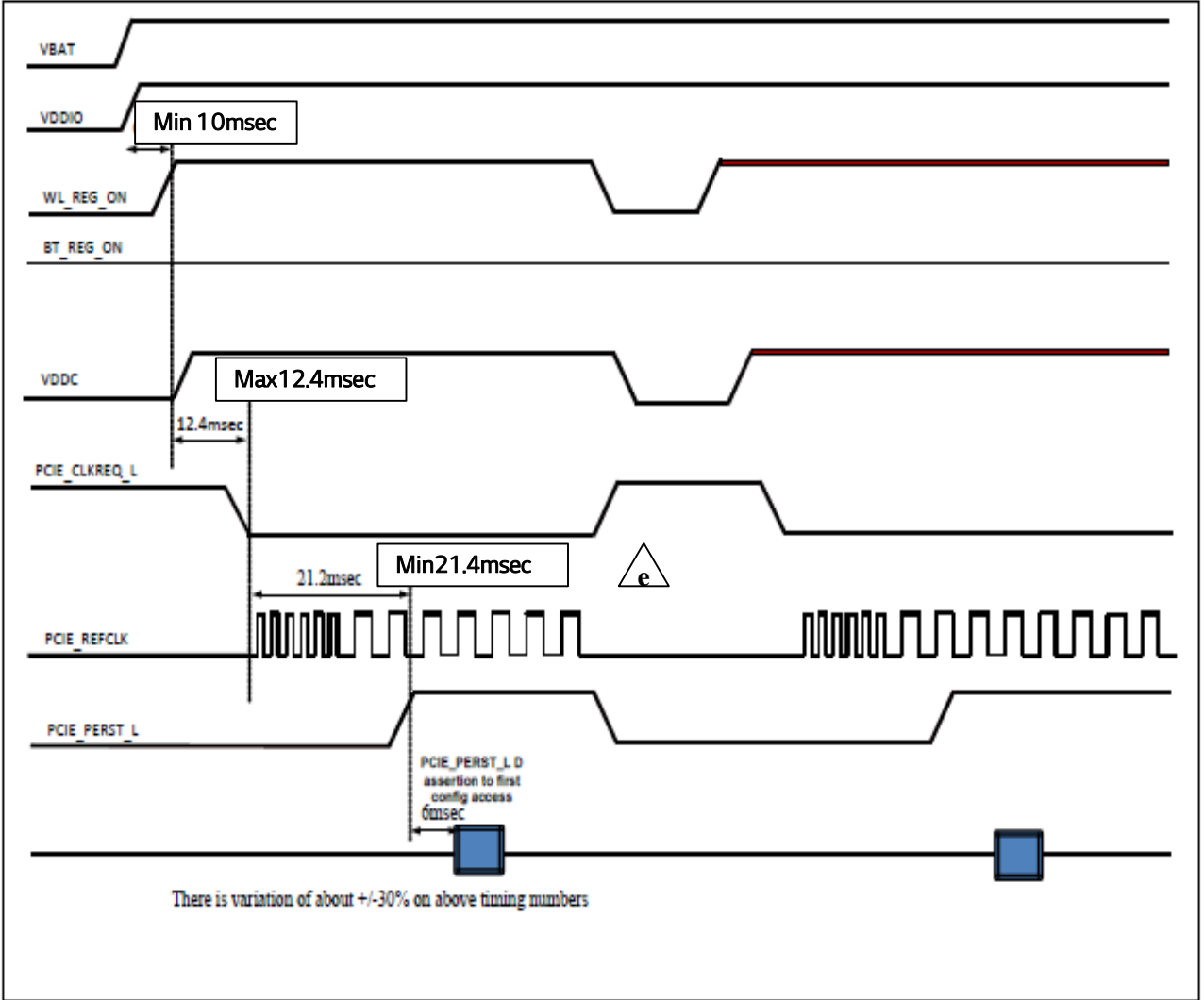
2) Current consumption

Parameter	Average	Unit
Stand-by (BT & WLAN)	10	mA
WLAN Continuous Rx	180	mA
WLAN Continuous Tx ²⁾	790	mA
Bluetooth Connection	20	mA

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Boot up sequence

Figure 47. WLAN Power-Up Sequence for PCIe Host



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General Features

BT(V5.1) + 2.4GHz/5GHz Wi-Fi 5(802.11a/b/g/n/ac) 2.4G SISO / 5G 2x2 MIMO Module

1) Features

- Operation Voltage is 3.3V/1.8V Dual Power Rail
- Up to 866 Mbps data rate(802.11ac wave2 compliant)
- Automotive Module
 - All components are AEC-Q 100/200 qualified
- Support 2 Antenna port
 - ANT0: Bluetooth/WLAN 5GHz, ANT1: WLAN WLAN2.4&5GHz
- Integrated WLAN PA, LNA (CYW88459) and RF Switch
- RoHS Compliant
- Size : 19.2 x 17.0 x 3.1mm
- Support bandwidth : HT20 / HT40 / VHT80
- Interface: PCIe(WLAN), UART, PCM/I2S(BT)
- Package type : SMD type(LGA)

Bluetooth(BT5.1 + EDR compliant)

1) Bluetooth Key Features

- Support for Bluetooth 5.1 features
 - GATT Caching
 - Angle of Arrival (AoA) and Angle of Departure (AoD)
 - Advertising Channel Index Randomization
 - Selective parts of Minor Feature Enhancements batch1
- Fully supports Bluetooth 5.0 features:
 - LE 2 Mbits/s
 - LE Long Range, S2/S8 coding
 - LE Higher Output Power
 - LE Advertising Extensions
 - LE Channel Selection Algorithm #2
 - LE High Duty Cycle Non-Connectable Advertising
 - Slot Availability Mask (SAM)
- Fully supports Bluetooth 4.2 features
 - LE Data Packet Length Extension
 - LE Secure Connections
 - Link Layer privacy
 - Link Layer Extended Scanner Filter policies

General Features

Bluetooth(BT5.1 + EDR compliant)

- Fully supports Bluetooth 4.1 features
 - BR/EDR secure connections
 - eSCO reserved slots clarification
 - Train nudging
 - Generalized interlaced scan
 - Connectionless Slave broadcast
 - Unencrypted unicast connectionless data support
 - Low duty cycle directed advertising
 - 32-bit UUID support in LE
 - LE dual mode topology
 - Piconet clock adjustment
 - LE L2CAP connection oriented channel support
 - LE privacy v1.1
 - LE Link Layer topology
 - LE ping
 - Fast advertising interval
- HCI UART baud rates up to 4 Mbits/s supporting maximum Bluetooth data rates
- Multipoint operation with up to seven active slaves
 - Maximum of seven simultaneous active ACL links
 - Maximum of three simultaneous active SCO and eSCO connections with scatternet support
- Narrowband and wideband packet loss concealment
- Scatternet operation with up to four active piconets with background scan and support for scatter mode
- High-speed HCI UART transport support with low-power out-of-band BT_DEV_WAKE and BT_HOST_WAKE signaling
- Channel quality driven data rate and packet type selection
- Standard Bluetooth test modes
- Extended radio and production test mode features
- Full support for power savings modes
 - Bluetooth clock request
 - Bluetooth standard sniff
 - Deep-sleep modes and software regulator shutdown

General Features

WLAN

1) WLAN RF band & modulation Features

- Dual-band 2.4GHz and 5GHz 802.11 a/b/g/n/ac(802.11ac compliant)
- Dual-stream up to 866Mbps data rate
- Supports 20, 40 and 80MHz channels with optional SGI(256 QAM modulation)
- Tx and Rx low-density parity check(LDPC)
- Supports IEEE 802.11ac/n beamforming
- Supports two antennas with one dedicated to Bluetooth and WLAN and one to WLAN.
- PCIe mode complies with PCI Express base specification revision 3.0 for x1 lane and power management running at Gen1 speeds
- WPA and WPA2(Personal) support for powerful encryption and authentication
- AES and TKIP in hardware for faster data encryption and IEEE 802.11i compatibility
- Reference WLAN subsystem provides Wi-Fi protected Setup(WPS)

2) WLAN MAC features

- Enhanced MAC for supporting IEEE 802.11ac features
- Transmission and reception of aggregated MPDUs(A-MPDU) for high throughput(HT)
- Support for power management schemes, including WMM power-save multi-poll(PSMP) and multiphase PSMP operation
- Support for immediate ACK and block-ACK policies
- Inter-frame space timing support, including RIFS
- Back-off counters in hardware for supporting multiple priorities as specified in the WMM specification
- Timing synchronization function(TSF), network allocation vector(NAV) maintenance, and target beacon transmission time(TBTT) generation in hardware
- Hardware offload for AES-CCMP, legacy WPA TKIP, legacy WEP ciphers, WAPI, and support for key management
- WPA, WAPI STA, and WPA2/WPA3 support for powerful encryption and authentication
- Programmable independent basic service set(IBSS) or infrastructure basic service set functionality

General Features

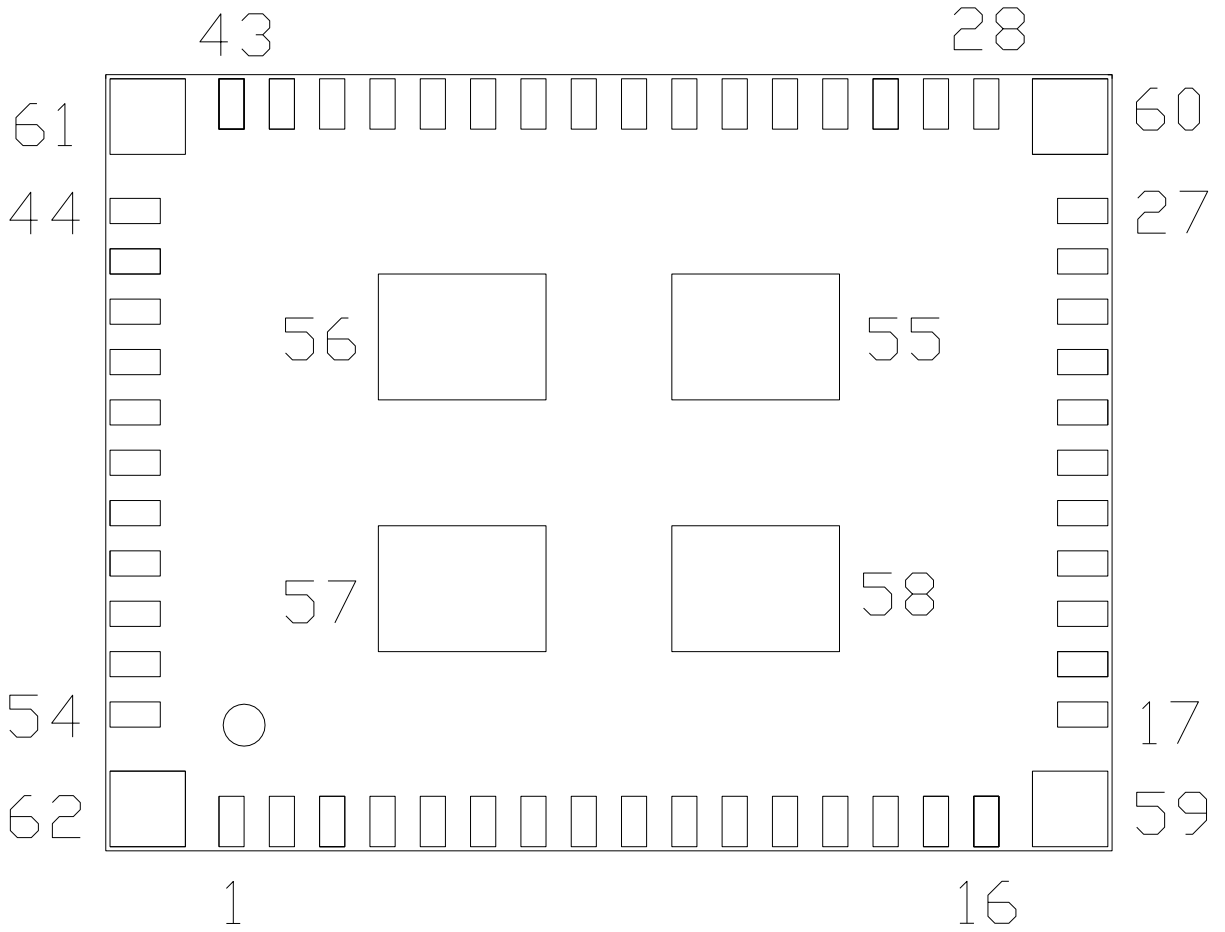
WLAN

3) WLAN PHY features

- Programmable data rates from MCS0-9 in 20MHz, 40MHz, and 80MHz channels, as specified in IEEE 802.11ac
- Improved performance with 2x2 channel smoothing and spur canceller support
- Supports Optional short GI and Green field modes in Tx and Rx
- Tx and Rx LDPC for improved range and power efficiency
- Beamforming support
- Supports IEEE 802.11h/k for worldwide operation
- Advanced algorithms for low power, enhanced sensitivity, range, and reliability
- IEEE 802.11a, 11b, 11g, 11n, 11ac single stream PHY standards
- Designed to meet FCC and other worldwide regulatory requirements

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Pin Configuration



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Pin Configuration

No	Pin Name	I/O	Description
1	BT_UART_RXD	I/O	Bluetooth UART signal input
2	BT_UART_TXD	I/O	Bluetooth UART signal output
3	BT_PCM_SYNC	I/O	PCM sync signal, can be master (output) or slave (input)
4	BT_PCM_CLK	I/O	PCM clock, can be master (output) or slave (input)
5	BT_PCM_IN	I	PCM data input
6	BT_PCM_OUT	O	PCM data output
7	GND	-	Ground
8	PCIE_PERST_N	I	PCIE system reset.
9	PCIE_PME_L	O	PCIE power management event output
10	PCIE_CLKREQ_N	O	PCIE clock request signal
11	PCIE_CLK_N	I	PCIE differential clock input negative
12	PCIE_CLK_P	I	PCIE differential clock input positive
13	PCIE_TD_N	O	PCIE Transmitter differential negative
14	PCIE_TD_P	O	PCIE Transmitter differential positive
15	PCIE_RD_N	I	PCIE Receiver differential negative
16	PCIE_RD_P	I	PCIE Receiver differential positive
17	PCIE_EN	I	PCIE_ENABLE : Low : PCIE Disabled, High : PCIE Enabled
18	WL_DEV_WAKE	I	WLAN device wake from host
19	BT_DEV_WAKE	I	Bluetooth device wake from host
20	SDIO_DIS	I	SDIO_DISABLE : For use of PCIe → High
21	SDIO_DATA3	I/O	SDIO data line 3
22	SDIO_DATA2	I/O	SDIO data line 2
23	SDIO_CLK	I	SDIO clock
24	SDIO_PAD	I	SDIO_PADVDDIO : For use of PCIe → High
25	SDIO_DATA1	I/O	SDIO data line 1
26	SDIO_DATA0	I/O	SDIO data line 0
27	SDIO_CMD	I/O	SDIO command line
28	GND	-	Ground
29	CO_EX_OUT1	O	3-Wire Co-Existence Out1
30	CO_EX_OUT0	O	3-Wire Co-Existence Out0

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Pin Configuration

No	Pin Name	I/O	Description
31	CO_EX_IN	I	3-Wire Co-Existence In
32	BT_RST_N	I	Bluetooth Reset - Active-low reset input
33	GND	-	Ground
34	VBAT	I	Positive supply - Supply voltage : Typical 3.3V.
35	GND	-	Ground
36	Version Pin	-	Ground
37	VIO	I	BT, WLAN VDDIO supply voltage.(3.3V or 1.8V) - BT and WLAN should be same power rail
38	GND	-	Ground
39	NC	-	Floating
40	GND	-	Ground
41	WL_REG_ON	I	WLAN Power on reset - Internal 200K Ω pull-down
42	BT_REG_ON	I	BT Power on Reset
43	LPO	I	Low power clock input (32.768KHz, 200~1800mV P-P)
44	WL_HOST_WAKE	O	WLAN host wake from device
45	BT_HOST_WAKE	O	Bluetooth host wake from device
46	GND	-	Ground
47	GND	-	Ground
48	ANT_CORE0	I/O	WLAN 5G RF with Bluetooth RF ANT
49	GND	-	Ground
50	ANT_CORE1	I/O	WLAN 2.4G, 5G RF ANT
51	GND	-	Ground
52	GND	-	Ground
53	BT_UART_CTS_N	I/O	Bluetooth UART clear to send
54	BT_UART_RTS_N	I/O	Bluetooth UART request to send
55	GND	-	Ground
56	GND	-	Ground
57	GND	-	Ground
58	GND	-	Ground
59	GND	-	Ground
60	GND	-	Ground
61	GND	-	Ground
62	GND	-	Ground

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Module Integration Guide

1. Applicable FCC Rules
- CFR 47 Part 15.247

2. Operational Condition

The module is limited to OEM installation ONLY. The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

3. Limited Module Procedure

ATC5CPL004 is limited Module. The module doesn't have its own power supply regulation. Therefore, the host product manufacturer must design the host product so that a constant voltage of 3.3V is applied to the module.

4. Trace antenna designs : N/A

5. RF Exposure consideration (CFR 47 Part 1, 1.1307(b), 1.1310)

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with minimum 20 cm between the radiator and human body.

6. Antenna

This modular has PCB pattern antenna. Any changes of antenna designs might require additional assessment. The Host antenna type shall be same type and antenna gain shall be less or equal to below information.

Item	Contents	
Antenna Type	PCB Pattern Antenna	
Antenna peak gain	Ant 1	2 400 MHz ~ 2 483.5 MHz: 2.28 dBi
		5 150 MHz ~ 5 250 MHz: 1.68 dBi
		5 250 MHz ~ 5 350 MHz: 1.68 dBi
		5 470 MHz ~ 5 725 MHz: 2.38 dBi
		5 725 MHz ~ 5 850 MHz: 3.04 dBi
	Ant 2	2 400 MHz ~ 2 483.5 MHz: 1.84 dBi
		5 150 MHz ~ 5 250 MHz: 1.90 dBi
		5 250 MHz ~ 5 350 MHz: 2.92 dBi
		5 470 MHz ~ 5 725 MHz: 3.55 dBi
		5 725 MHz ~ 5 850 MHz: 3.32 dBi

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7. Label and compliance information

The end user manual shall include all required regulatory information/warnings as shown in this manual. If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module.

This exterior label can use wording such as the following:

“Contains FCC ID : YZP-ATC5CPL004” any similar wording that expresses the same meaning may be used.

8. Information on test modes and additional testing requirements

This modular was tested in standalone configuration. Integration of this modular into a host equipment would require additional testing.

9. Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Module Integration Guide

10. ISED Statement

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s).

Operation is subject to the following two conditions:

- (1) This device may not cause interference.
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes : (1) L'appareil ne doit pas produire de brouillage, et (2) L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Please notice that if the IC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC : 7414C-ATC5CPL004" any similar wording that expresses the same meaning may be used.

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit : Contient IC :7414C-ATC5CPL004 est le numéro d'homologation du module

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm (7.8 inches) between the antenna and your body.

NOTE: THE MANUFACTURER IS NOT RESPONSIBLE FOR ANY RADIO OR TV INTERFERENCE CAUSED BY UNAUTHORIZED MODIFICATIONS TO THIS EQUIPMENT. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

Cet équipement est conforme aux limites d'exposition aux rayonnements IC définies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm (7,8 pouces) entre l'antenne et votre corps.

REMARQUE: LE FABRICANT NE PEUT ÊTRE TENU RESPONSABLE DES INTERFÉRENCES RADIO OU TÉLÉVISÉES CAUSÉES PAR DES MODIFICATIONS NON AUTORISÉES DE CET APPAREIL. CES MODIFICATIONS PEUVENT ANNULER L'AUTORITE DE L'UTILISATEUR A FAIRE FONCTIONNER L'APPAREIL.