

## BlueFan BT680F/E/T BLE5 Module

### Features

- Standalone or used with a host MCU by UART interface/HCI Commands
- Hybrid Castellated/LGA pins, easier prototyping, easier production
- Toshiba SOC, built-in Cortex M0 processor
- Masked-ROM:
  - Boot program
  - HCI/Extended HCI command
  - Control API for GATT/SM layer
  - API for hardware control
- RAM: retention, 144 KB (user area RAM, 76 KB).
- Flash:128 KB
- Bluetooth RF analog core, baseband digital core and integrated antenna
- Transmitter power +8 dBm;
- Receiver sensitivity at 1Mbps: -95 dBm.
- Receiver sensitivity at 125 Kbps: -105 dBm.
- Bluetooth Low Energy (BLE) V5 GATT profile with OTA (Over The Air) support.
- Bluetooth SIG certified BLE 5 stacks embedded in mask-ROM.
- Up to18 General Purpose IOs to be configured by firmware:
  - SPI interface,
  - I<sup>2</sup>C interface
  - UART interface, 9600bps to 921.6 Kbps
  - Up to 2 wake up interfaces
  - Up to 5 ADC channels (1 for internal monitoring of VDD).
  - Up to 4 PWM channels
- On board 32 MHz main clock
- External 32.768 kHz sleep clock
- Operation voltage: 1.9V-3.6V
- Peak current consumption, 11.5 mA (+8 dBm TX, 2 Mbps PHY)
- Deep sleep mode, <0.1uA
- Operation Temperature: -40°C to +85°C
- Sizes: 15x20.8x1.9mm;
- Hybrid pins: 16 castellated and 24 LGA pins
- Integrated shield to resist EMI

### Applications:

- Access Points
- Industrial Control
- Medical
- Scanners
- iOS and Android devices
- Wireless sensors
- Cable replacement
- Instrumentation
- Automobile
- Sports
- Proximity

### Ordering Information:

module	BT680F	BT680T	BT680E
SoC	TC35680FSG-002	TC35681FSG-002	TC35680FSG-002



## BlueFan BT680F/E/T BLE5 Module

RAM	144KB	144KB	144KB
Flash	128KB	0	128KB
antenna	PCB trace	PCB trace	u.FL
Antenna Gain	<i>1.32dBi</i>	<i>1.32dBi</i>	<i>6dBi</i>
Line of sight range	3000 meters at 125 Kbps	3000 meters at 125 Kbps	
Sizes, mm	15x20.8x1.9	15x20.8x1.9	15x20.8x1.9
Evaluation board	EV-BT680F	EV-BT680T	EV-BT680E
FCC ID	X8WBT680	X8WBT680	X8WBT680
Industrial Canada ID	4100A-BT680	4100A-BT680	4100A-BT680
Availability	Sample	Sample	Sample

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# BlueFan BT680F/E/T BLE5 Module

## 1. Introduction

BlueFan modules are Bluetooth Smart module using Toshiba SoC. Toshiba SoC provides Bluetooth™ HCI (Host Control Interface) function specified in Bluetooth™ Core Specifications. The HCI function allows BlueFan to be connected to an external host processor for Bluetooth applications.

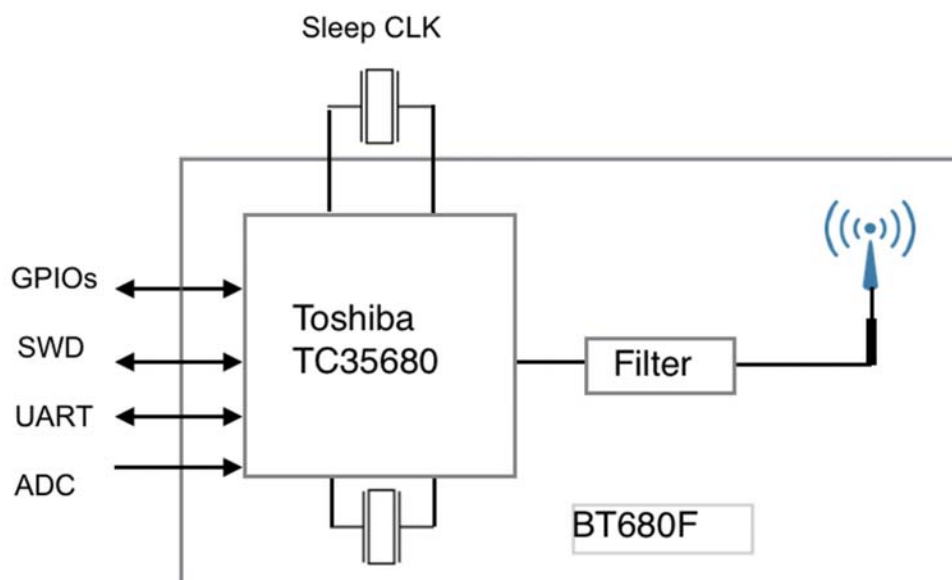
Bluetooth stacks and GATT 5 profiles are embedded with OTA support.

BT680F modules work in standalone alone mode without a host processor. An SWD (Serial Wire Debug) 2-wire interface is available for firmware development.

## 2. Product Features

### BT680F with PCB trace antenna

The following is a block diagram of BT680F. It operates in standalone mode or with a host processor. A 32MHz main clock crystal is on board. A 32.768 KHz crystal can be added on the main board to provide precise sleep clock in sleep mode. This module can be wake up by an external



signal. Printed antenna is integrated. Co-existence connection with WiFi is provided.

- Standalone or used with a host MCU by UART interface/HCI Commands
- Hybrid Castellated/LGA pins, easier prototyping, easier production
- Toshiba SOC, built-in Cortex M0 processor
- Masked-ROM:
  - Boot program
  - HCI/Extended HCI command
  - Control API for GATT/SM layer
  - API for hardware control
- RAM: retention, 144 KB (user area RAM, 76 KB).
- Flash:128 KB

## BlueFan BT680F/E/T BLE5 Module

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- Transmitter power +8 dBm;
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- Bluetooth SIG certified BLE 5 stacks embedded in mask-ROM.
- Up to 18 General Purpose IOs to be configured by firmware:
  - SPI interface,
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- Operation Temperature: -40°C to +85°C
- Sizes: 15x20.8x1.9mm;
- Hybrid pins: 16 castellated and 24 LGA pins
- Integrated shield to resist EMI

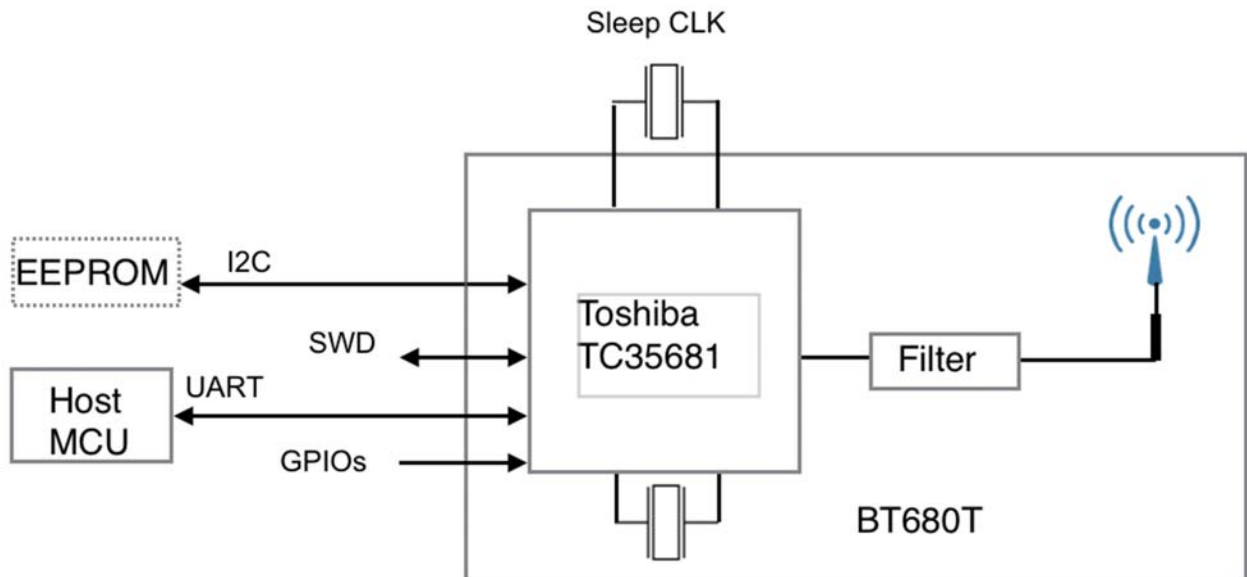
### **BT680E with an u.FL Connector for External Antenna**

BT680E has the same specifications as BT680F except the integrated PCB trace antenna is replaced with an u.FL connector for external antenna.

### **BT680T Communicating with a Host MCU Using HCI Commands**

## BlueFan BT680F/E/T BLE5 Module

BT680T specifications are the same as that of BT680F except flash memory size. A host MCU sends HCI commands to manage operation of BT680T. BT680T can work in standalone mode by adding an

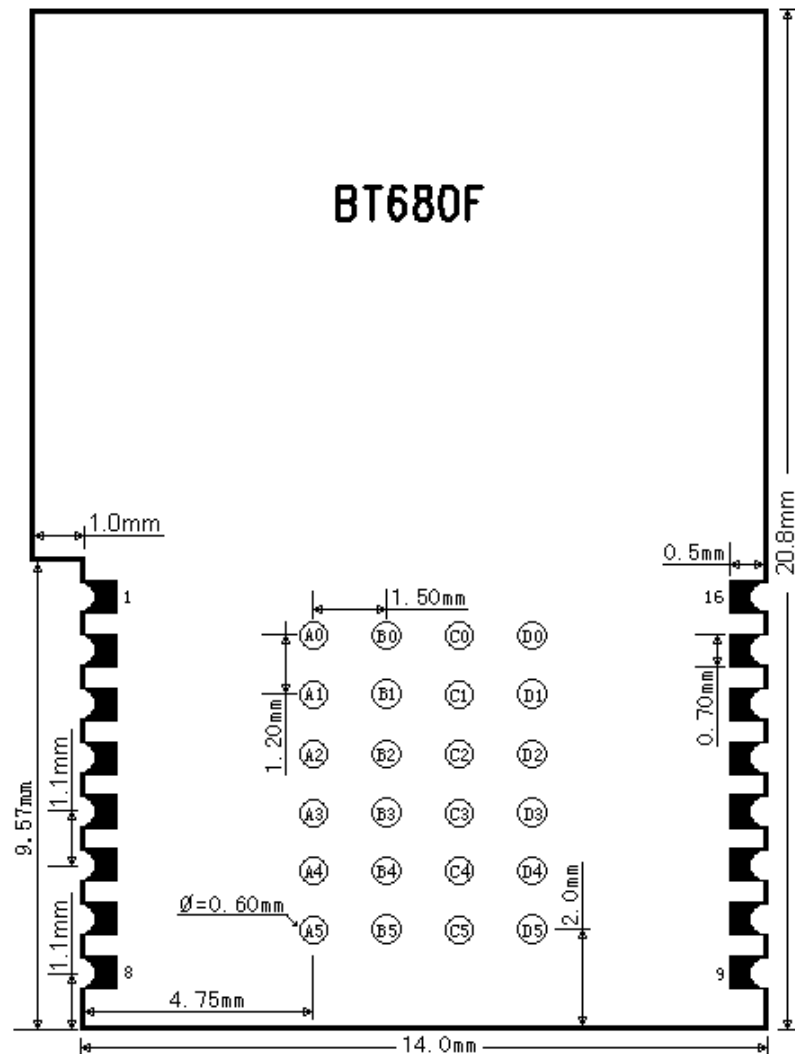


external serial EEPROM.

## BlueFan BT680F/E/T BLE5 Module

### 3. Hardware Description

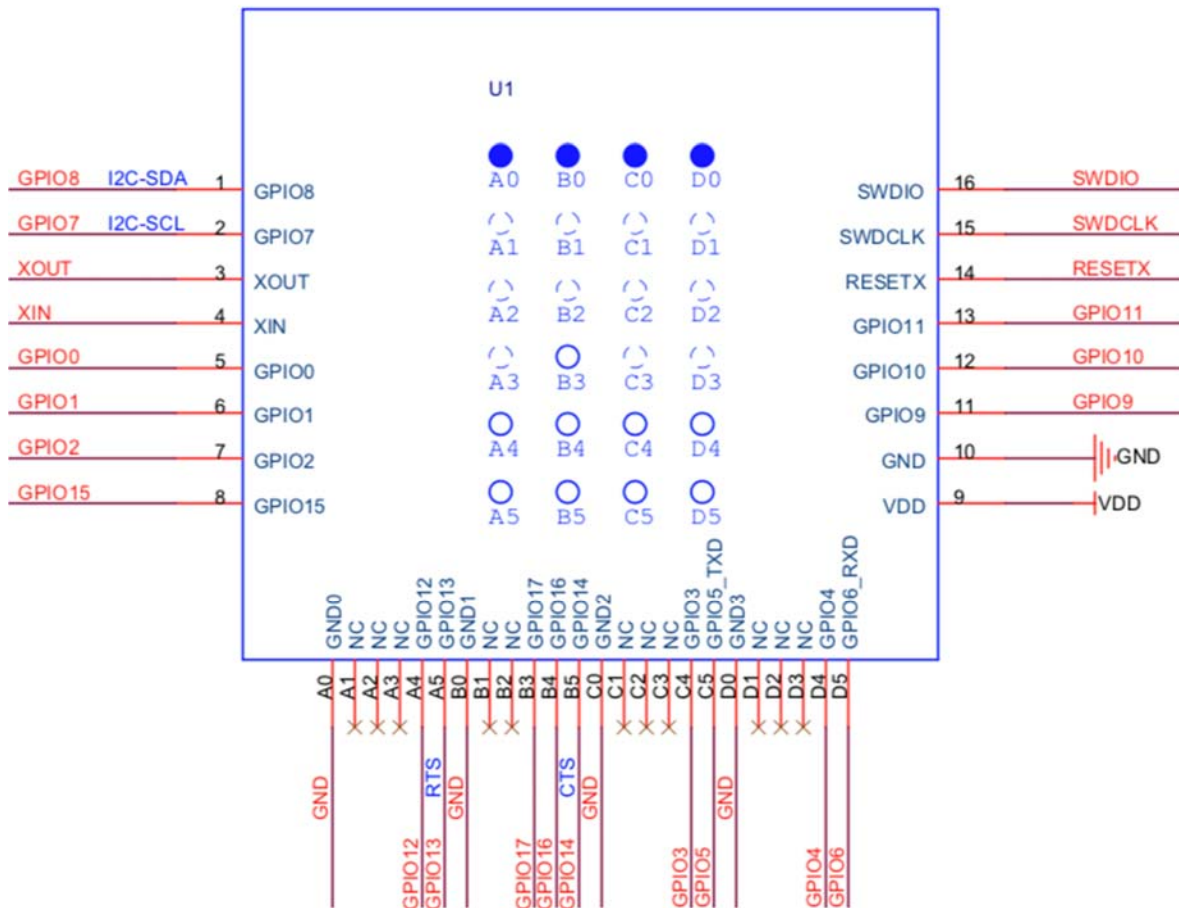
#### Module Footprint Drawing



A mechanical drawing is shown below.

# BlueFan BT680F/E/T BLE5 Module

## BT680F Pin Assignments



## BlueFan BT680F/E/T BLE5 Module

### Pin Functions

BT680F module has 16 castellated pins for product needing limited GPIOs and additional 24 Land Grid Array (LGA) pins.

All Toshiba TC35680-FSG GPIO pins are accessible. GPIO pins can be configured by firmware as UART, SPI, I<sup>2</sup>C, ADC, or PWM pins. The followings are configurable examples. For additional examples of configuration, please refer to Toshiba data sheets.

Pin	pin name	Descriptions
1	GPIO8	GPIO8, configured as I2C-SDA on evaluation board.
2	GPIO7	GPIO7, configured as I2C-SCL on evaluation board
3	XOUT	Connection for external 32.768 kHz sleep clock
4	XIN	Connection for external 32.768 kHz sleep clock
5	GPIO0	GPIO 0
6	GPIO1	GPIO 1
7	GPIO2	GPIO 2 or PWM 1
8	GPIO15	GPIO 15
9	VDD	VDD, 1.9 to 3.6V DC power supply
10	GND	Ground
11	GPIO9	GPIO 9 or ADC 3
12	GPIO10	GPIO 10 or ADC 4
13	GPIO11	GPIO 11 or SPI-DOUT 2 or I2C-SCL 2.
14	RESETX	Hardware reset input, low to reset.
15	SWDCLK	Serial Wire Debug clock pin
16	SWDIO	Serial Wire Debug data pin
A0	GND0	Ground
A1	NC	
A2	NC	
A3	NC	
A4	GPIO12	GPIO 12 or SPI-DIN 2 or I2C-SCL 2
A5	GPIO13	GPIO 13 or SPI-SCS 2 or UART 1 RTSX
B0	GND1	Ground

## BlueFan BT680F/E/T BLE5 Module

Pin	pin name	Descriptions
B1	NC	
B2	NC	
B3	GPIO17	GPIO 17 or UART 2 RX
B4	GPIO16	GPIO 16 or UART 2 TX
B5	GPIO14	GPIO 14 or SPI-SCLK 2 or UART 1 CTSX
C0	GND2	Ground
C1	NC	
C2	NC	
C3	NC	
C4	GPIO3	GPIO or PWM 2
C5	GPIO5-TXD	GPIO 5 or UART 1 TX
D0	GND3	Ground
D1	NC	
D2	NC	
D3	NC	
D4	GPIO4	GPIO 4 or PWM 3
D5	GPIO6-RXD	GPIO 6 or UART 1 RX

## BlueFan BT680F/E/T BLE5 Module

### Example of GPIO Functions

The following shows examples of possible GPIO. For details about combination of settings, refer to Toshiba software application notes.

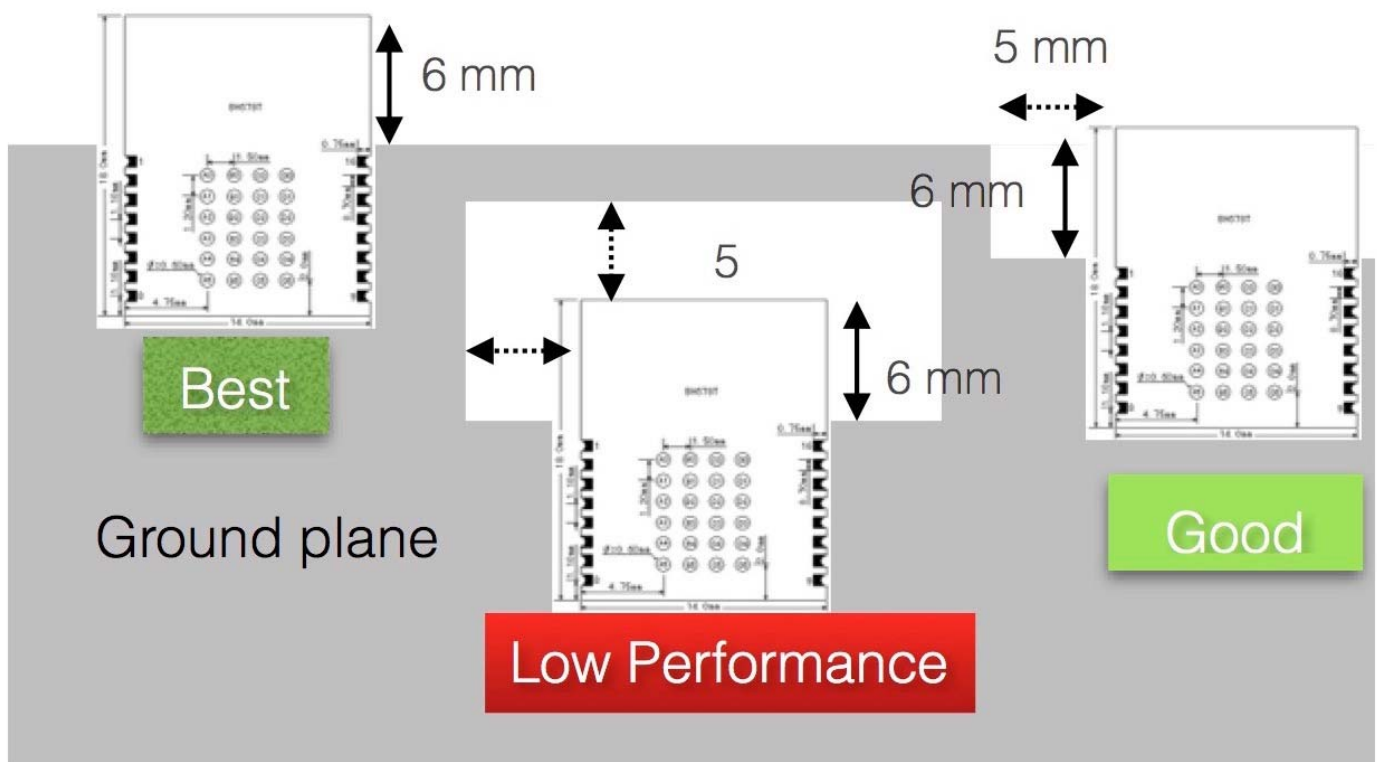
	Example 1	Example 2	Example 3	Example 4	Example 5
GPIO0	GPIO0	GPIO0	GPIO0	GPIO0	GPIO0
GPIO1	GPIO 1	GPIO 1	GPIO 1	GPIO 1	GPIO 1
GPIO2	PWM 1	PWM 1	PWM 1	GPIO 2	GPIO 2
GPIO3	PWM2	PWM2	PWM2	SPI-DOUT1	GPIO3
GPIO4	PWM3	PWM3	PWM3	SPI-DOUT2	GPIO4
GPIO5	UART1-TX	UART1-TX	UART1-TX	UART1-TX	UART1-TX
GPIO6	UART1-RX	UART1-RX	UART1-RX	UART1-RX	UART1-RX
GPIO7	UART1-RTSX	UART1-RTSX	I2C-SCL1	SPI-SCS1	I2C-SCL1
GPIO8	UART1-CTSX	UART1-CTSX	I2C-SDA1	SPI-SCLK1	I2C-SDA1
GPIO9	ADC3	ADC3	ADC3	ADC3	GPIO 9
GPIO10	ADC4	ADC4	ADC4	ADC4	GPIO 10
GPIO11	SPI-DOUT2	I2C-SCL2	GPIO 11	I2C-SCL 2	GPIO 11
GPIO12	SPI-DIN2	I2C-SDA2	GPIO 12	I2C-SDA2	GPIO12
GPIO13	SPI-SCS2	GPIO13	UART1-RTSX	UART1-RTSX	GPIO13
GPIO14	SPI-SCLK2	GPIO14	UART1-CTSX	UART1-CTSX	GPIO14
GPIO15	GPIO15	GPIO15	GPIO15	GPIO15	GPIO15
GPIO16	UART2-TX	GPIO16	GPIO16	GPIO16	GPIO16
GPIO17	UART2-RX	GPIO17	GPIO17	GPIO17	GPIO17

## BlueFan BT680F/E/T BLE5 Module

### Mounting BT680F on the Host PCB

The following figure shows recommended mounting of BT680F module on the host PCB.

- For the best Bluetooth range performance, the antenna area of module shall extend 6 mm outside the edge of host PCB board, or 6 mm outside the edge of a ground plane.
- The next choice is to place module on a corner of host PCB, the antenna area shall extend 6mm from the edge of ground plane. Ground plane shall be at least 5 mm from the edge of the antenna area of module.



1. Module extends 6 mm from edge or ground plane of the host PCB board.

2. No ground plane on all layers for at least 5mm from edge of module. Longer distance for longer Bluetooth range.

- Bluetooth range performance is degraded if a module is placed in the middle of the host PCB.

For the best Bluetooth range performance, keep all external metal at least 30mm from the antenna area.

## BlueFan BT680F/E/T BLE5 Module

### 4. Hardware Interfaces

#### Bluetooth Interfaces

BT680 Series with an integrated PCB trace antenna or u. FL connector for an external antenna; RF analog, baseband hardware, embedded firmware in ROM of TC35680, provide complete supports of Bluetooth Low Energy (BLE) interfaces.

Bluetooth Core Specification features supported and not supported by BT680F Series are in the table below.

BT Core Spec.	Description	Notes
v4.0 features	Central	Supported
	Peripheral	Supported
	Multi Profile/point	Supported
	Connection Updates	Supported
	Random Address	Supported
	WhiteList	Supported
	Security Property (Just Works)	Supported
	Security Property (PassKey Entry)	Supported
	Security Property (OBB)	Supported
	Security Property (Numeric Comparison)	Supported
	GATT-Client	Supported
	GATT-Server	Supported
	Broadcaster	Supported
	Observer	Supported
v4.1 features	Low Duty Cycle Directed Advertising	Supported
	32-bit UUID support in LE	Supported
	LE L2CAP Connection Oriented Channel Support	Not Supported
	LE Privacy v1.1	Supported
	Connection Parameter Request Procedure	Supported
	Extended Reject Indication	Supported
	Slave-initiated Features Exchange	Supported
	LE Ping	Supported
	Act as LE Master and LE Slave at the same time	Supported
	Act as LE Slave to more than one LE Master at the same time	Supported

## BlueFan BT680F/E/T BLE5 Module

BT Core Spec.	Description	Notes
v4.2 features	LE Data Packet Length Extension	Supported
	LE Secure Connections	Supported
	Link Layer Privacy	Not Supported
	Link Layer Extended Scanner Filter Policies	Supported
v5 features	2Msym/s OHY for LE	Supported
	High Duty Cycle Non-Connectable Advertising	Supported
	LE Advertising Extensions	Supported
	Channel Selection Algorithm #2	Supported

Bluetooth transmission power is selectable from +8, +7, +6, 0,-6, and -20 dBm.

The RSSI of reception block has an accuracy of +/- 2 dB (typical) for an input signal between -90 and -10 dBm.

### Reset

A RC circuit is on board to reset Toshiba processor on powering up. A host processor can reset module by setting RESETX pin low.

### UART Features

Depending on firmware setting, BT680F supports with 2 channels of UART. Channel 1 has flow control (TX1, RX1, CTS1, RTS1). Channel 2 doesn't have flow control.

- Default baud rate 115.2Kbps; programmable baud rate:9600 bps to 921.6 Kbps.
- Full duplex start-stop synchronization data transfer (RX, TX).
- Data format:
  - LSB first
  - 1 start bit
  - 8 data bit
  - 1 stop bit
  - No parity bit
- Error detection:
  - Receiver timeout error
  - Receiver overrun error
  - Receiver frame error
- The interval of transmit to transmit, insert the duration of 12 characters or more. Interval can be changed by the command.
- Host wake-up function.

## BlueFan BT680F/E/T BLE5 Module

In host mode, BlueFan module communicates commands, status, and data with a host CPU through UART interfaces. The UART interfaces are shared with GPIO pins, and during boot process after a reset, module firmware assigns UART functions to the GPIOs.

### Flow Control Function

BlueFan module UART interface uses flow control function by hardware signal, Transmit flow control (CTS<sub>X</sub>) and receive flow control (RTS<sub>X</sub>). Above Figure shows signals input and output direction .

CTS<sub>X</sub> input signal is used for UART transmitting. Low input indicates close of the preparation of the other party to receive data and module executes UART transmitting data if there is data for transmission. In case of input high level, module stops transmitting by UART frame.

RTS<sub>X</sub> input signal is used for UART receiving. Low output indicates request data transmission to UART transmitside device of the other party. module outputs Low level from RTS<sub>X</sub> when being able to receive data and prepares to receive data. Response time of UART transmitting and receiving for flow control signal depends on baud rate and internal process status of frame. It is from 1 frame to 4 frames.

Response time of UART transmitting and receiving for flow control signal depends on baud rate and internal process status of frame. It is from 1 frame to 4 frame.

### Error Detect Function

Module UART interface has 3 kinds of error functions.

- Receiver timeout error
- Receiver over run error
- Receiver frame error

Receiver timeout error reports as an error if the receiver frame interval counted by internal timer is equal to or greater than a predetermined time

Receiver over run error is reported if UART internal receive frame buffer is overflowed.

Receiver frame error is reported if it fails to recognize the unit frame.

### SPI Interface

Features SPI interface.

- Utilize VDDIO power supply
- SPI interface:
  - Chip select: 2 channels
  - Chip select polarity: High-active, Low-active
  - Serial clock master operation: Polarity and phase are adjustable
  - Serial clock frequency: 8 kHz to 16 MHz
  - Serial data transfer mode: MSB-first or LSB first

### I<sup>2</sup>C interface

Features of I<sup>2</sup>C interface

- Utilize VDDIO power supply

## BlueFan BT680F/E/T BLE5 Module

- Operation mode: I<sup>2</sup>C bus master
- Serial clock frequency: standard mode(100 kHz maximum), fast mode (100 to 400 kHz).
- Output mode: Open drain, CMOS output
- Device address format: 7 bit address, 10 bit address is not supported.

### Pulse Width Modulation Interface

Features of PWM interface.

- Utilize VDDIO power supply
- Pulse generation function
- Selectable source clock, 16 MHz or 32.768 kHz
- 12 bit clock division setting, divider up to 1/4096: 8Hz to 16.384kHz for 32.768 kHz clock;
- Divider up to 1/16777216, 0.954 Hz to 8MHz for 16 MHz clock.
- It can mask the pulse output with 1 second period, 50 ms unit width (rhythm function).
- The interrupt can be generated in synchronization with the cycle of 1 second rhythm pattern.
- It can switch the pulse output to Low/High active
- Duty of pulse output is adjustable.
- Each PWM output can be synchronized by the pulse output synchronization function.

### Analog to Digital Converter

BT680F has 6 channels of 12 bit ADC for battery monitoring and analog inputs from external sensors.

- Utilize VDDIO power supply
- 1 internal input channel (ADC 0) for VBAT voltage monitoring.
- 5 channels for analog inputs, shared with GPIOs
- Maximum conversion rate is 1 MS/s
- 10-bit by default, 12-bit selectable

The ADC has up to 12-bit conversion accuracy and can work for input voltage from 0V to 3.6V (VDD). ADC channel 0 is connected to the VDDCORE2, whose voltage level is 1.2V, an IC internal voltage. When a battery is used as power source, the reference voltage can slide over time because the battery is connected as reference voltage.

AD converted data can be calculated by CPU into voltage values because the channel 0 is supplied with 1.2V to its input.

Input voltage of ADC 1 to ADC 5 = (conversion result of ADC<sub>n</sub>/conversion result of ADC<sub>0</sub>) x1.2V



## BlueFan BT680F/E/T BLE5 Module

### 5. BlueFan Module Specifications

#### Absolute Maximum Ratings

	Symbol	Minimun	Maximum
Power supply	VBAT, VDDIO	-0.3V	+3.9V
IO pin input voltage	VIN	-0.3V	VDDIO+0.3V, <3.9V
IO pin input current	IIN	-10mA	+10mA
Storage temperature	Tstg	-40°C	+125 °C
Input power	RFIO		+10 dBm

# BlueFan BT680F/E/T BLE5 Module

## Recommended Operating Conditions

		Min	Typ	Max	
1	Power supply voltage (BT680F)	1.9	3.0	3.6	V
2	Power supply voltage (BT680T)	1.8	3.0	3.6	V
3	Maximum ambient operating temperature (BT680F)	-40	25	85	°C
4	Maximum ambient operating temperature (BT680T)	-40	25	125	°C

## Current Consumption

Parameters	Condition	Min	Typ	Max	mA
Digital operation			0.8		mA
Flash read			2.4		mA
Flash write			15.6		mA
Receiving data	1 Mbps		5.1		mA
Receiving data	2 Mbps		5.5		mA
Transmitting data	Output power = 0 dBm, 1 Mbps		6.0		mA
Transmitting data	Output power = 0 dBm, 2 Mbps		6.5		mA
Transmitting data	Output power = 0 dBm, 1 Mbps		11.0		mA
Transmitting data	Output power = +8 dBm, 2 Mbps		11.5		mA
Low power, with connection	32 MHz disabled, 32.768KHz enabled (sleep mode)		2.5		uA
Low power, no connection	32 MHz disabled, 32.768KHz enabled (back up mode)		2.4		uA
Low power, no connection	32 MHz disabled, 32.768KHz disabled (deep sleep mode)		0.05		uA

## BlueFan BT680F/E/T BLE5 Module

### 6. System Operation

Two operation options on starting up.

- Control module by an external MCU, or HCI (Host Control Interface) mode.
- Control module by user application program in module, or standalone mode.

#### Setting Operation Mode

Operation Mode	GPIO 1	SWDIO	Purpose
User-App mode	H	L	Execute user program, including AT command mode
HCI Mode	L	H	Control module by a host MCU
Test Mode	L	L	Inhibit

#### Standalone Mode

When user-app mode or standalone mode is selected, user program in internal flash is loaded to internal RAM during boot-up sequence. Then, the applications are executed. To build a standalone system, both the wireless protocol and the user application can be handled by the embedded Cortex M0. The masked-ROM has Bluetooth low energy protocol stack and API for hardware control. They can be used by the user program.

Application programs are developed and compiled in a Windows PC and downloaded into flash ROM of module.

#### HCI Mode

On HCI mode, module receives control commands from the host MCU by the UART interface. Default baud rate of UART is 115200. Program codes are stored in masked-ROM. No firmware development or programming of flash memory is required for BT680F operating in HCI mode.

HCI command evaluation software are available for Windows PC and MAC. Sample scripts for setting up communication to an iOS or Android device is available. HCI command control flow can be developed on Windows PC or MAC before porting onto the target MCU.

## BlueFan BT680F/E/T BLE5 Module

### 7. Module Evaluation Board

A development/evaluation board is available for each module. A quick and easy way to evaluate a module, e.g., BT680F is to use a Windows PC or a MAC as the host processor. Connect the evaluation board to a PC or a MAC with a USB cable.

#### Evaluation Software for Windows PC

Evaluation software for Windows PC can be download from the following link.

<https://dl.dropboxusercontent.com/u/54939426/BlueFanHClwin.rar>

After unzipping, it becomes an executable file. You need to OPEN from a MENU for the first time. Then, you can double click the icon to open.

#### Evaluation Software for MAC

Evaluation software for MAC can be download from the following link.

<https://dl.dropboxusercontent.com/u/54939426/BlueFanHClmac.zip>

After unzipping, it becomes an executable file. You need to OPEN from a MENU for the first time. Then, you can double click the icon to open

#### Android OS App

Android OS apps to evaluate communication via SPP and BLE can be downloaded from Google Play Store by searching for [BlueFan](#). This is a basic app for proving communication between a PC/MAC, a BlueFan module, and an Android device.

Source codes for this Android app is available for user of BlueFan evaluation board. Please contact Fanstel.

#### iOS App

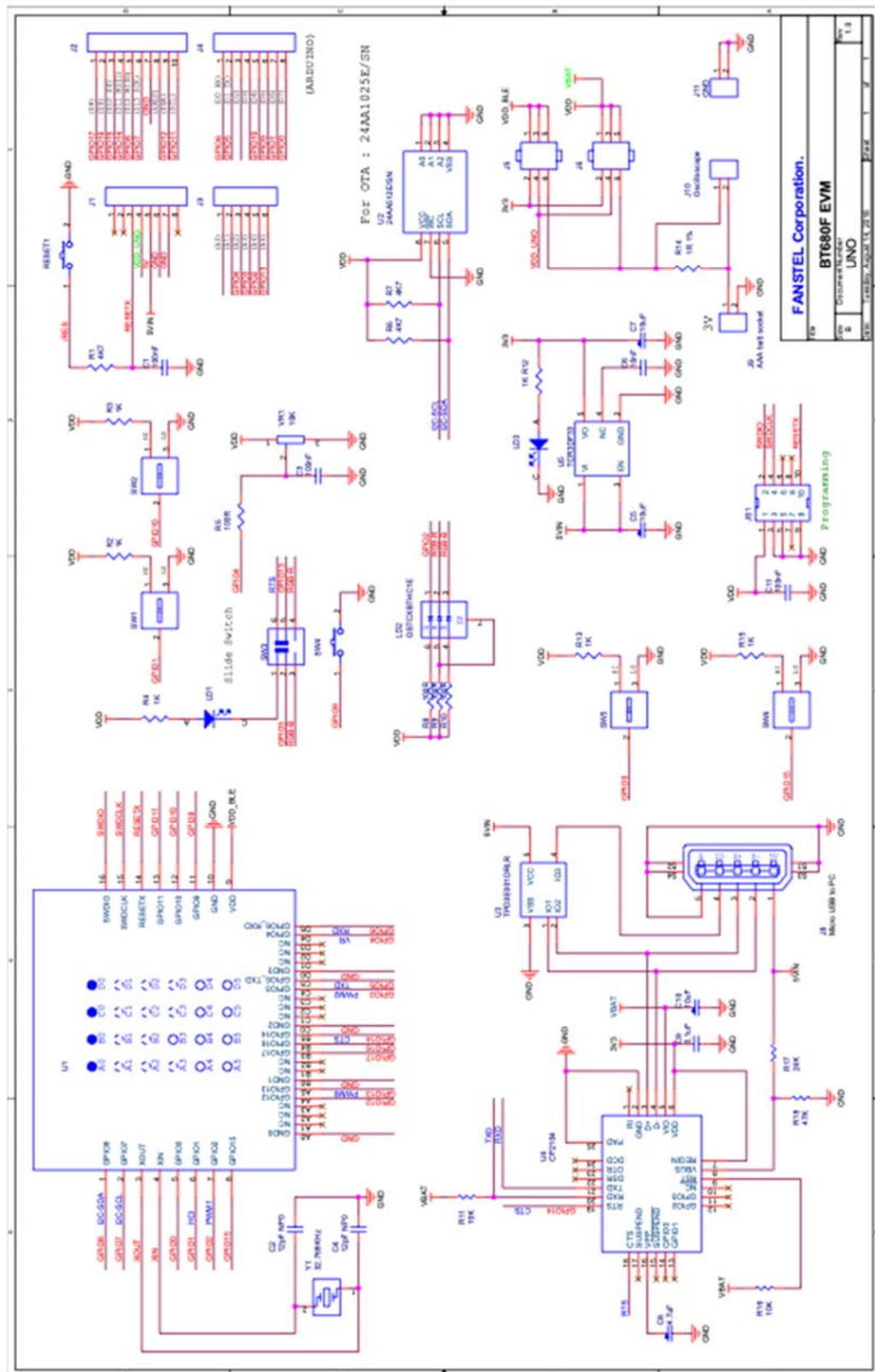
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## BlueFan BT680F/E/T BLE5 Module

## Evaluation Board Schematics



## BlueFan BT680F/E/T BLE5 Module

### Battery Powered Products

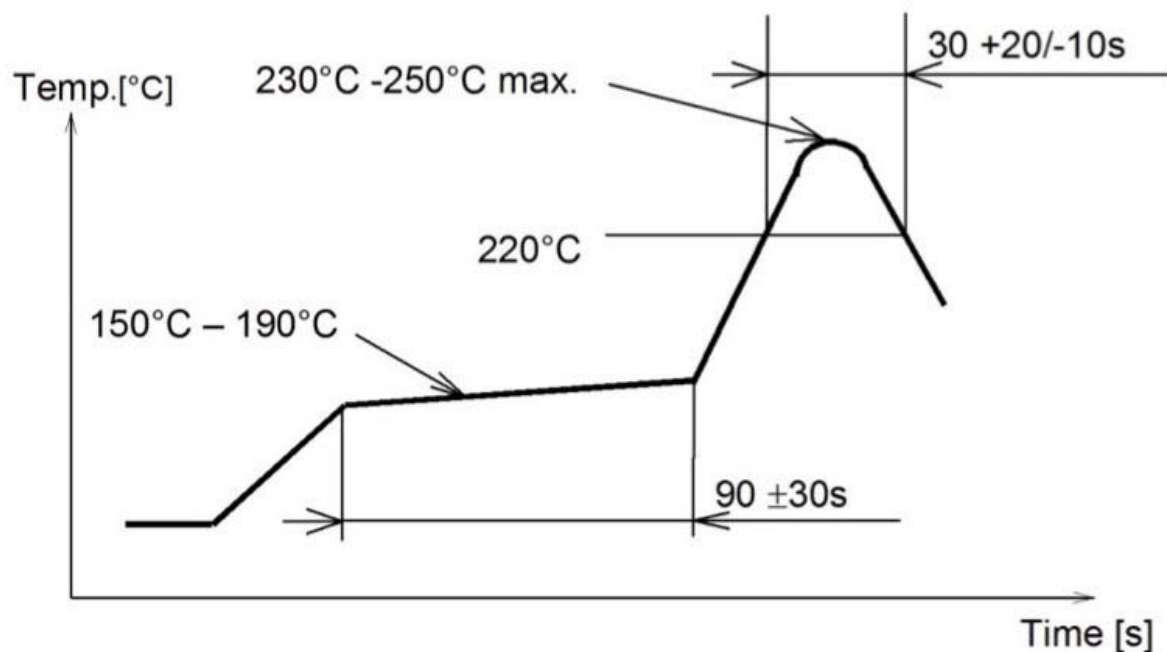
Current consumption is important for battery-powered product. If a 32.768 kHz crystal is installed, main clock can be disabled in sleep mode to reduce power consumption. If you need to reduce sleep mode power consumption, add a crystal and two capacitors to the SLPXOIN and SLPXOOUT pins.

### 8. FCC

(1) the module should not installed and operated simultaneously with other radios except additional RF exposure was evaluated and meeting FCC requirement for simultaneously transmission.

(2) Antenna used should be limited to (Dipole) type with equal or lesser antenna gain.

### 9. Soldering Temperature-Time Profile for Re-Flow Soldering



Maximum number of cycles for re-flow is 2. No opposite side re-flow is allowed due to module weight.

### 10. Cautions and Packaging

#### Cautions

Failure to follow the guidelines set forth in this document may result in degrading of the product's functions and damage to the product.

#### Design Notes

(1) Follow the conditions written in this specification, especially the control signals of this module.

(2) The supply voltage has to be free of AC ripple voltage (for example from a battery or a low noise regulator output). For noisy supply voltages, provide a decoupling circuit (for example a ferrite in series connection and a bypass capacitor to ground of at least 47uF directly at the module).

## BlueFan BT680F/E/T BLE5 Module

- (3) This product should not be mechanically stressed when installed.
- (4) Keep this product away from heat. Heat is the major cause of decreasing the life of these products.
- (5) Avoid assembly and use of the target equipment in conditions where the products' temperature may exceed the maximum tolerance.
- (6) The supply voltage should not be exceedingly high or reversed. It should not carry noise and/or spikes.
- (7) this product away from other high frequency circuits.

### Notes on Antenna and PCB Layout

- (1) Don't use a module with internal antenna inside a metal case.
- (2) Use a module with external antenna inside a metal case. Antenna must be outside of a metal case.
- (3) For PCB layout:
  - Avoid running any signal line below module whenever possible,
  - No ground plane below antenna,
  - If possible, cut-off the portion of main board PCB below antenna.

### Installation Notes

- (1) Reflow soldering is possible twice based on the time-temperature profile in this data sheets. Set up the temperature at the soldering portion of this product according to this reflow profile.
- (2) Carefully position the products so that their heat will not burn into printed circuitboards or affect the other components that are susceptible to heat.
- (3) Carefully locate these products so that their temperatures will not increase due to the effects of heat generated by neighboring components.
- (4) If a vinyl-covered wire comes into contact with the products, then the cover will melt and generate toxic gas, damaging the insulation. Never allow contact between the cover and these products to occur.
- (5) This product should not be mechanically stressed or vibrated when reflowed.
- (6) If you want to repair your board by hand soldering, please keep the conditions of this chapter.
- (7) Do not wash this product.
- (8) Refer to the recommended pattern when designing a board.
- (9) Pressing on parts of the metal cover or fastening objects to the metal will cause damage to the unit.
- (10) For more details on LGA (Land Grid Array) soldering processes refer to the application note.

## BlueFan BT680F/E/T BLE5 Module

### Usage Condition Notes

- (1) Take measures to protect the unit against static electricity. If pulses or other transient loads (a large load applied in a short time) are applied to the products, check and evaluate their operation before assembly on the final products.
- (2) Do not use dropped products.
- (3) Do not touch, damage or soil the pins.
- (4) Follow the recommended condition ratings about the power supply applied to this product.
- (5) Electrode peeling strength: Do not add pressure of more than 4.9N when soldered on PCB
- (6) Pressing on parts of the metal cover or fastening objects to the metal cover will cause damage.
- (7) These products are intended for general purpose and standard use in general electronic equipment, such as home appliances, office equipment, information and communication equipment.

### Storage Notes

- (1) The module should not be stressed mechanically during storage.
- (2) Do not store these products in the following conditions or the performance characteristics of the product, such as RF performance will be adversely affected:
  - Storage in salty air or in an environment with a high concentration of corrosive gas.
  - Storage in direct sunlight
  - Storage in an environment where the temperature may be outside the range specified.
  - Storage of the products for more than one year after the date of delivery storage period.
- (3) Keep this product away from water, poisonous gas and corrosive gas.
- (4) This product should not be stressed or shocked when transported.
- (5) Follow the specification when stacking packed crates (max. 10).

### Safety Conditions

These specifications are intended to preserve the quality assurance of products and individual components. Before use, check and evaluate the operation when mounted on your products. Abide by these specifications, without deviation when using the products. These products may short-circuit. If electrical shocks, smoke, fire, and/or accidents involving human life are anticipated when a short circuit occurs, then provide the following failsafe functions, as a minimum.

- (1) Ensure the safety of the whole system by installing a protection circuit and a protection device.
- (2) Ensure the safety of the whole system by installing a redundant circuit or another system to prevent a dual fault causing an unsafe status.



## BlueFan BT680F/E/T BLE5 Module

### Other Cautions

- (1) This specification sheet is copyrighted. Reproduction of this data sheet is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices.
- (2) Do not use the products for other purposes than those listed.
- (3) Be sure to provide an appropriate failsafe function on your product to prevent an additional damage that may be caused by the abnormal function or the failure of the product.
- (4) This product has been manufactured without any ozone chemical controlled under the Montreal Protocol.
- (5) These products are not intended for other uses, other than under the special conditions shown below. Before using these products under such special conditions, check their performance and reliability under the said special conditions carefully to determine whether or not they can be used in such a manner.
  - In liquid, such as water, salt water, oil, alkali, or organic solvent, or in places where liquid may splash.
  - In direct sunlight, outdoors, or in a dusty environment
  - In an environment where condensation occurs.
  - In an environment with a high concentration of harmful gas.
- (6) If an abnormal voltage is applied due to a problem occurring in other components or circuits, replace these products with new products because they may not be able to provide normal performance even if their electronic characteristics and appearances appear satisfactory.
- (7) When you have any question or uncertainty, contact Fanstel.

### Packaging

Production modules are delivered in reel, 1000 modules in each reel.



## BlueFan BT680F/E/T BLE5 Module

### Revision History

- May 2018, Ver. 0.90: Initial draft release



## BlueFan BT680F/E/T BLE5 Module

### 11. CONTACT US

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### Federal Communications Commission (FCC) Statement

#### 15.21

You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

#### 15.105(b)



## BlueFan BT680F/E/T BLE5 Module

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- 1) this device may not cause harmful interference, and
- 2) this device must accept any interference received, including interference that may cause undesired operation of the device.

### **FCC RF Radiation Exposure Statement**

- 1) This Transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- 2) This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note: The end product shall have the words "Contains Transmitter Module FCC ID: X8WBT680"



## BlueFan BT680F/E/T BLE5 Module

### Canada, Industry Canada (IC)

This Class B digital apparatus complies with Canadian ICES-003  
Cet appareil numérique de classe B est conforme à la norme NMB-003.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the

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.

### Canada, avis d'Industrie Canada (IC)

“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.”

Déclaration d'exposition aux radiations:

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

### (Modular approval) End Product Labeling:

The final end product must be labeled in a visible area with the following: “Contains IC: **4100A-BT680**”.

### Caution: Exposure to Radio Frequency Radiation.

To comply with RSS 102 RF exposure compliance requirements

#### OEM statement

The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labeled with its own FCC ID number. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown below. If the FCC ID is not visible when the equipment is installed inside another device, then the outside of the device into which the equipment is installed must also display a label referring to the enclosed equipment

The end product with this module may subject to perform FCC part 15 unintentional emission test requirement and be properly authorized.

This device is intended for OEM integrator only

This radio transmitter (192170139/AA/00) has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed Below, with the maximum permissible gain indicated. Antenna types not included in this list that Have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

BT680F & BT680T: PCB Antenna, 1.32dBi

BT680E: Dipole Antenna, 6dBi