NGX

N80 BLE 5.0 Module User's Guide Rev 1.0

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Introduction

This document describes a detailed information about NGX N80 BLE 5.0 module. The N80 module enables the user to evaluate and demonstrate the functionalities of the Toshiba TC35680FSG Bluetooth® chip.

TC35680FSG is compliant with 2.4 GHz wireless communication Bluetooth® Low Energy Ver.5.0 specification. Each device has an MCU based on Arm® Cortex-M0® processor and integrates RF analog circuit and baseband digital circuits. The following functions in the Bluetooth® core specifications are supported; the LE Long-Range feature, LE 2-Mbps feature, HCI (Host Control Interface) feature, Low Energy GATT Profile feature, and others. Flash memory is included to store user application program.

Features

- Compliant with Bluetooth® Low Energy Ver.5.0 specification.
- HCI commands/Extended HCI commands
- Control API in GATT/SM layer (TCU commands: Toshiba Command Unit)
- Auto-advertising feature
- Output power setting feature
- Built-in Arm® Cortex®-M0 processor (Maximum operating frequency is 32 MHz)
- Bluetooth® protocol stack
- Bootloader
- General-purpose I/O(GPIO) (18 pins)
- General-purpose serial interfaces
  - UART interface (2 channels. Shared with the GPIO pins)
    - HCI mode: One channel is used as a host interface (9600 bps to 921.6 kbps)
    - User-App mode: 600 to 2000 kbps
  - SPI interface (2 channels. Shared with the GPIO pins)
  - I2C interface (2 channels. Shared with the GPIO pins)
- PWM interface (4 channels)
- AD converter (5 ADC Channels)
- SWD Interface for Emulator debug control
- Interface for RTC.
- Small and compact surface mount module
- Supports Bluetooth Low Energy data packet length extension
- Ideal for portable battery-operated devices
- Integral PCB antenna or provision for external antenna.
- Transparent UART mode for seamless serial data over UART interface

RF/Analog

- Maximum output power: +8.5dBm ±2 dB (conducted)
- Maximum RX sensitivity: -105.0 dBm
- RSSI accuracy: ±2 dB

Data Throughput

- Data Throughput up to 1Mbps

Memory

- Built-in retention SRAM (User area is 76 KB out of total 144 KB)
- Memory capacity: 128 KB
- Sector size: 4 KB

MAC/Baseband/Higher Layer

- Secure AES128 encryption
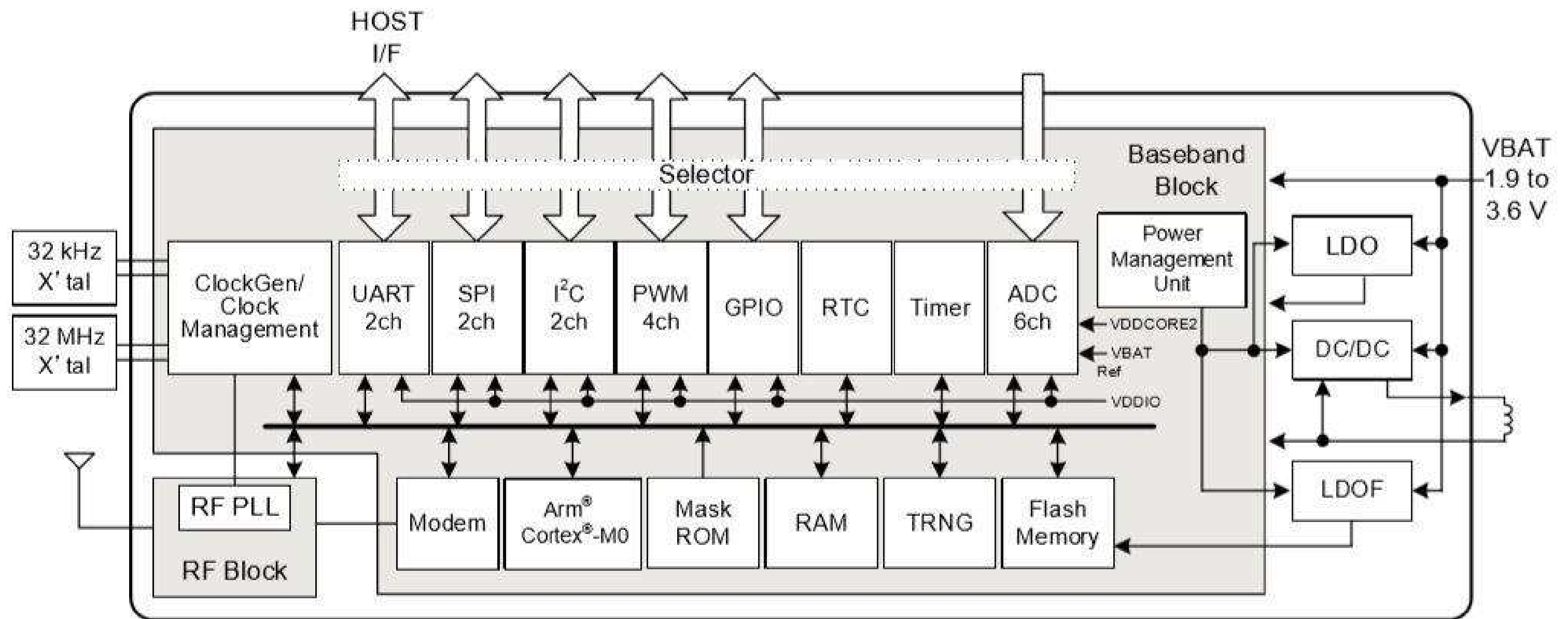- Bluetooth profiles: GAP, GATT, ATT, SMP, and L2CAP

Operating Conditions

- Operating voltage range: 3.3V to 4.2V
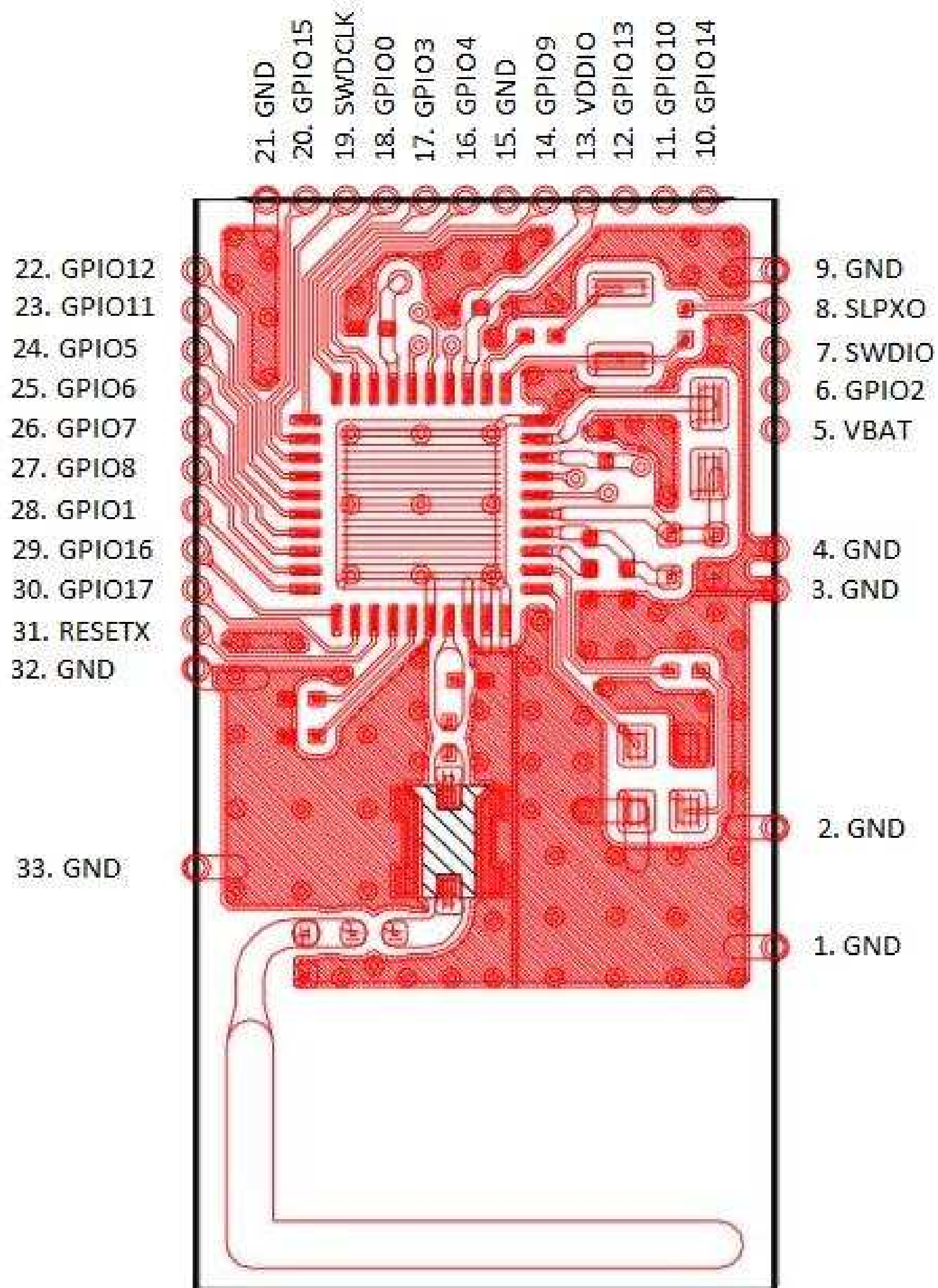- Operating temperature: -20ºC to +70ºC

Applications

- Home and security
- Health and fitness
- Secure payment
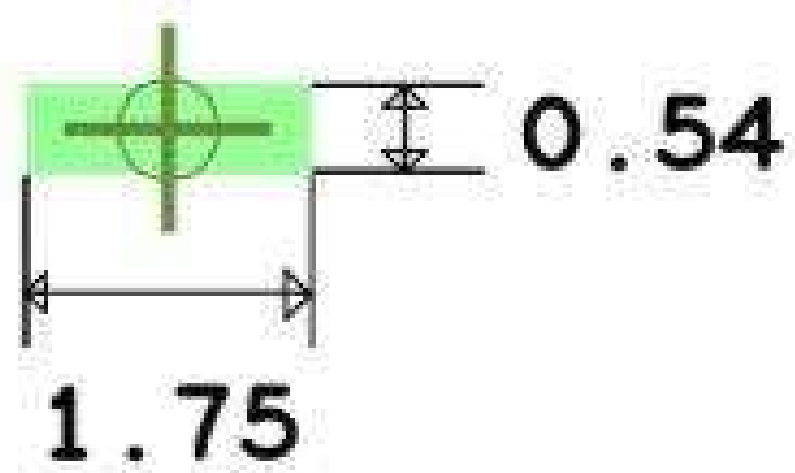- Internet of Things (IoT)
- Industrial and data logger

Block Diagram

Pin Assignment

22. GPIO12	9. GND
23. GPIO11	8. SLPXO
24. GPIO5	7. SWDIO
25. GPIO6	6. GPIO2
26. GPIO7	5. VBAT
27. GPIO8	
28. GPIO1	4. GND
29. GPIO16	3. GND
30. GPIO17	
31. RESETX	
32. GND	
	2. GND
33. GND	
	1. GND

Top pins: 21. GND, 20. GPIO15, 19. SWDCLK, 18. GPIO0, 17. GPIO3, 16. GPIO4, 15. GND, 14. GPIO9, 13. VDDIO, 12. GPIO13, 11. GPIO10, 10. GPIO14

Pin Description

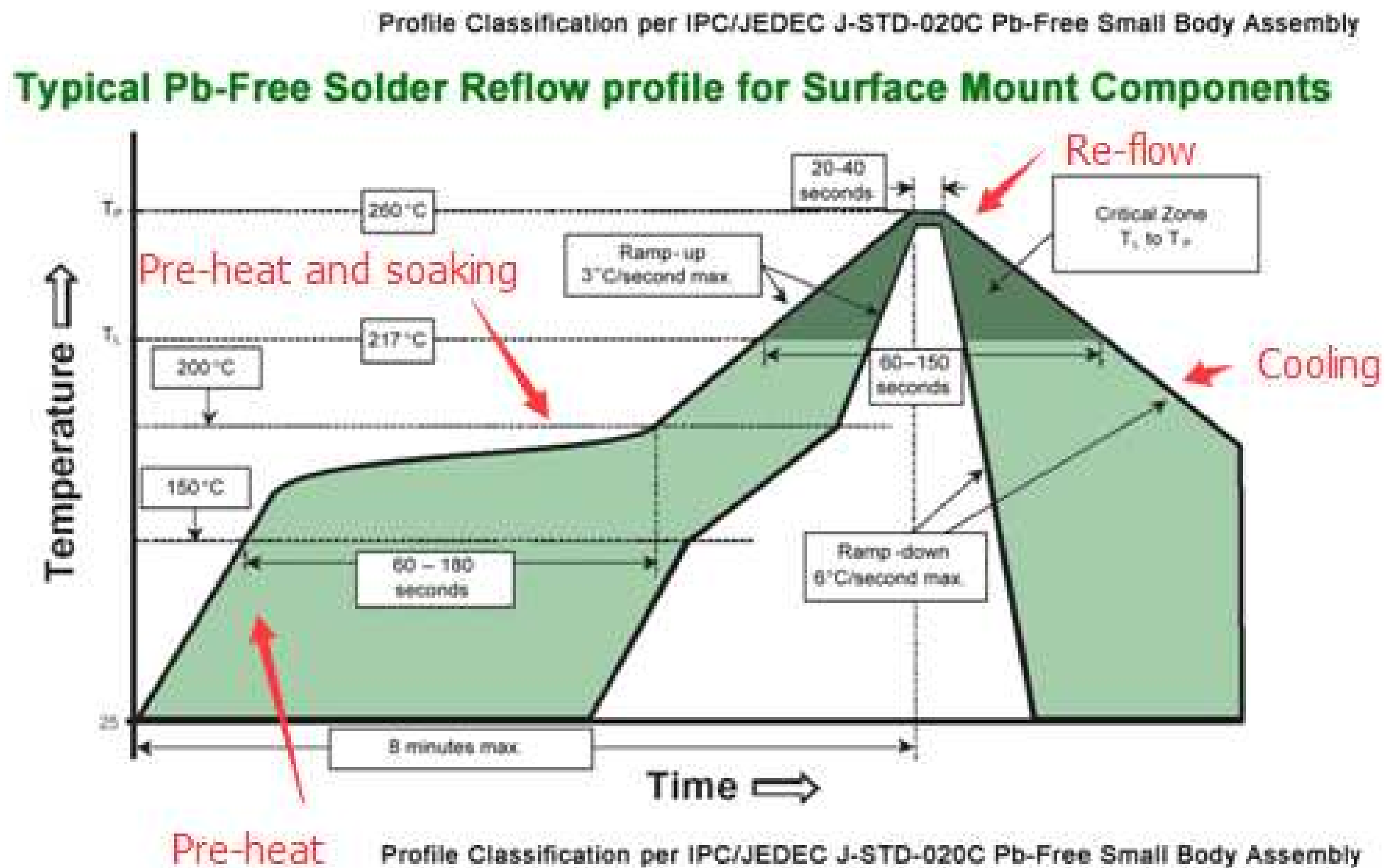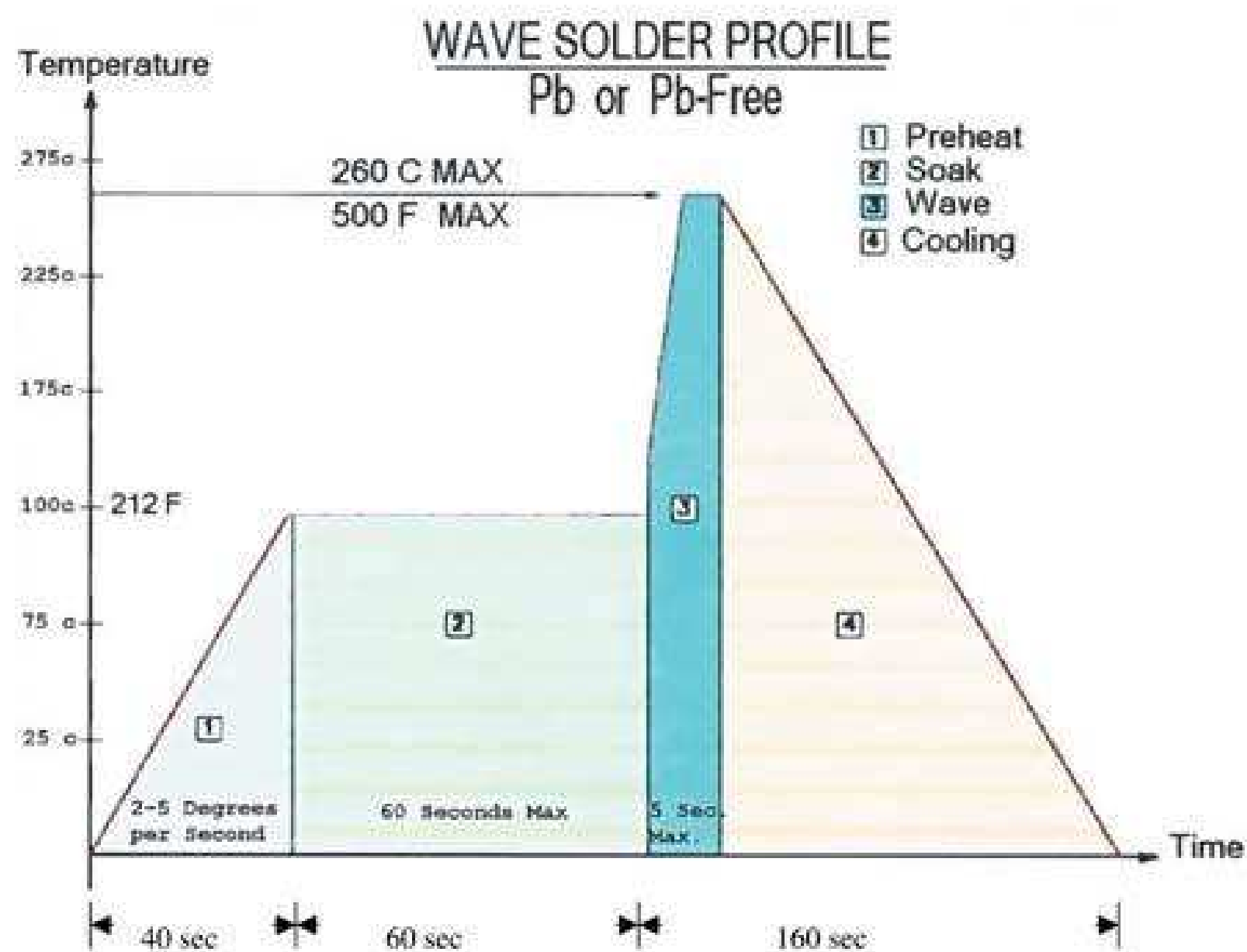| Pin Name	Pin no.	Description
RESETX	31	Hardware reset input pin. Low level asserts the reset.
GPIO0	18	General-purpose I/O pins. Following functions can be set by software; ● Switch as input or output. ● Connection or disconnection of a pull-up and a pull-down resistors. ● Selection of output drivability. ● Setting of an interrupt.
GPIO15	20	The interrupt can also be used to wake up from the Deep Sleep mode to the Active mode.
GPIO1	28	General-purpose I/O pins. Following functions can be set by software; ● Switch as input or output. ● Connection or disconnection of a pull-up and a pull-down resistors. ● Selection of output drivability. ● Setting of an interrupt.
GPIO2	6	
GPIO5	24	
GPIO6	25	
GPIO7	26	
GPIO8	27	
GPIO11	23	
GPIO12	22	
GPIO13	12	
GPIO16	29	
GPIO17	30	
GPIO3	17	ADC input and general-purpose I/O pins. Following functions can be set by software; ● Switch of input or output. ● Connection or disconnection of a pull-up and a pull-down resistors. ● Selection of output drivability. ● Setting of an interrupt. ● ADC input.
GPIO4	16	
GPIO9	14	
GPIO10	11	
GPIO14	10	
SLPXO	8	Input pin for the sleep clock oscillation by a crystal resonator. A 32.768-kHz crystal is connected internally on the module. When an external clock is used, the clock should be input to this pin.
SWDCLK	19	SWD clock pin. Input pin of the Serial Wire Debug clock. When the function is not used, this pin should be open.
SWDIO	7	SWD data pin or Operating mode switching pin. Input or output data pin for the Serial Wire Debug. When the functions of this pin are not used, this pin should be open. This pin is also used to switch an operating mode. For the details of switching the operation mode, refer to Section 3.4.
VBAT	5	Power supply pin for DC/DC converter/LDO regulator and the sleep circuit. An external power supply should be connected to this pin to operate the built-in DC/DC converter and LDO regulator
VDDIO	13	Power supply pin for I/O. The power of the proper voltage for the GPIO circuits should be supplied. The voltage should not exceed the VBAT value.
GND	1,2,3,4,9,15,21,32,33	Ground pin.

Footprint Description

All Dimensions are in mm

Reflow Profile

According to the recommendation by the IPC association, the generic Pb-free solder reflow profile is shown below.

Typical Pb-Free Solder Reflow profile for Surface Mount Components

Profile Classification per IPC/JEDEC J-STD-020C Pb-Free Small Body Assembly

Wave Solder Profile

FCC Caution

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.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

If the FCC ID 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: 2AUP7-N80".
The module is intended for Host product manufacturer only. Please see the full grant of equipment document for restrictions. The module cannot be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures.

The module is only FCC authorized for the FCC part 15.247 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.
The Host product manufacturer should make test on the product with module to confirm that the host product meets the FCC part 15.247 rules. This investigation of the final product can be done by spot checking emissions from the device while paired with another Bluetooth companion one as per the normal intended use (For example, data transfer, music playing, etc.), to check the fundamental-frequency and spurious emissions for compliance.
To satisfy FCC RF exposure requirements, a separation distance of 20 cm or more should be maintained between antenna radiating structures of host product and persons during device operation.
The Host product manufacturer should add such caution in the user manual of the device into which the module is installed.
This device should be only used by Host product manufacturer, without RF power increasement nor antennas type modification.
(Antenna applied: PCB, 2.42dBi max.)