

### > TC35667FTG SINGLE CHIP CONTROLLER FOR BLUETOOTH LE

The TC35667FTG is a highly integrated RFCMOS Bluetooth device which supports the new BT Low Energy (LE) 4.0 standard. TC35667FTG is suitable for ultra low power portable products. The device comes with embedded BLE stack and GATT profile. Toshiba has tested the Bluetooth interoperability extensively and performed Bluetooth Qualification Body (BQB) qualification.

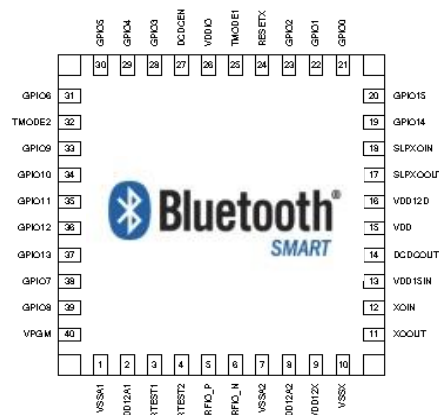


#### > KEY BENEFITS

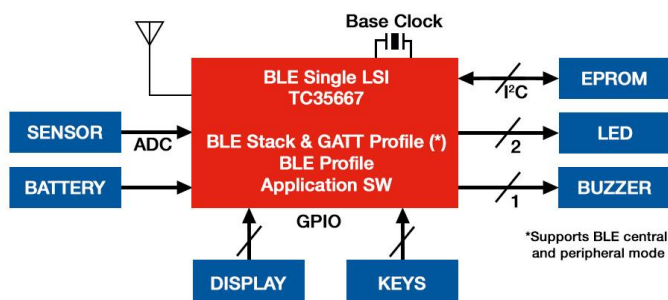
- Bluetooth Low Energy (LE) 4.0 for power sensitive applications
- Flexible system architectures through:
  - HCI model over UART
  - Embedded profile model (API over UART)
  - Stand alone model (no additional host MCU)
- Bluetooth qualified embedded BLE stack and GATT profile for easy BQB EPL
- On-chip RAM for slow to medium size applications
- Ultra low bill of materials due to very few external components
- System integration by multiple on-chip peripherals (3 channels)
- Flexible single power supply (1.8V-3.6V)
- Various sleep modes and clock options to optimize power consumption
- Small and cheap system design with QFN40 package: 6mm x 6mm

#### > TC35667FTG FEATURES

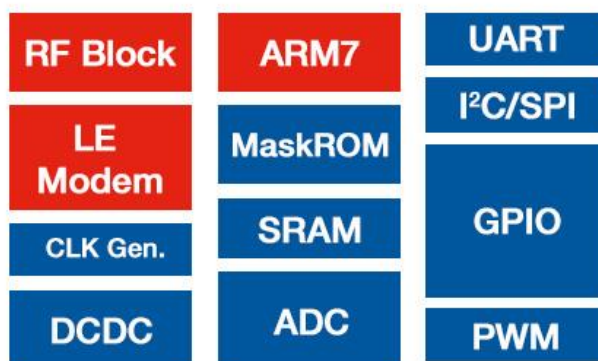
- BLE 4.0 compliant
- Supports BLE central and peripheral mode
- RX Sensitivity -87dBm (typ.)
- On-chip 32KB RAM for application code and patches
- On-chip balun, antenna switch, LNA, DC-DC converter
- Interfaces: UART, SPI & I2C interface, PWM output (3channels) , ADC (3 channels), 16 programmable IO
- Operational Voltage: 1.8V to 3.6V
- Deep sleep mode 0.7uA; sleep mode 5uA
- Peak current in operation mode 0.9-8.7mA (depends on selected clocking scheme and data mode)
- Package: 40pin QFN 6mm x 6mm x 0.9mm



#### > STAND ALONE APPLICATION EXAMPLE



#### > BLOCK DIAGRAM



## > TC35661SBG

### SINGLE CHIP CONTROLLER FOR BLUETOOTH CLASSIC (3.0+EDR) AND BLUETOOTH LE (4.0)

The TC35661SBG is a highly integrated RFCMOS Bluetooth device which supports Bluetooth Classic (3.0+EDR) and the new BT Low Energy (LE) 4.0 standard. TC35661SBG supports the standard Bluetooth HCI interface and offers integration of stack and selected BT profiles on-chip. Through its WIFI coexistence interface it supports the BT3.0-HS function. The device realises an easy way to integrate Bluetooth for various industrial, medical and automotive applications. Toshiba has tested the Bluetooth interoperability extensively. All Toshiba Bluetooth devices and software are Bluetooth Qualification Body (BQB) qualified.

#### > KEY BENEFITS

- Dual Mode core for classic and new Bluetooth 4.0 standard
- BQB qualified hardware and software for easy Bluetooth EPL
- Flexible system architectures through:
  - HCI model
  - Embedded profile model
  - Stand alone model
- Embedded on-chip Bluetooth stack and selected profiles for easy Bluetooth system design
- Stand alone operation for small applications is feasible without a host MCU
- Ultra low bill of materials due to very few external components
- Multiple programmable IO options
- On-chip voltage controller and low power modes
- Consumer and automotive qualification (AEC-Q100)

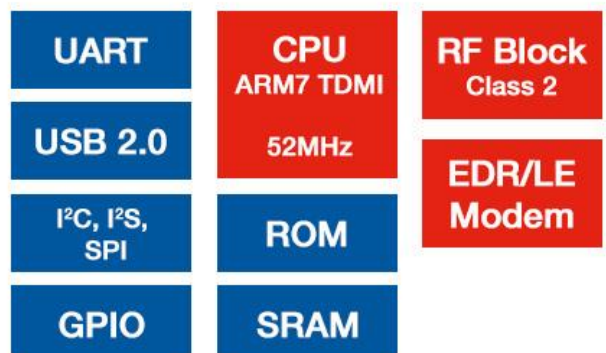


#### > TC35661 FEATURES

- Bluetooth Core Spec 3.0 and 4.0, EDR and LE support
- TC35661-0XX: HCI type
- TC35661-XXX: embedded profile type
- BT Class 2 support
- RX Sensitivity -91dBm (typ.)
- Baseband with ARM7TDMI - 13 to 52 MHz
- On-chip ROM, RAM, including Patch-RAM
- ROMless version available
- On-chip balun, antenna switch, LNA, LDO
- Interfaces: UART, SPI, USB2.0(FS), I2C, I2S/PCM, GPIO
- IEEE802.15.2. 2/3/4 coexistence interface
- Data transfer up to 2 Mbps (DH5 packets) net
- Package: 64ball BGA (ROM version), 0.5/0.8mm pitch, 1.2/1.4mm height
- Operational voltage: 1.8V or 3.3V (typ.)
- Low power sleep mode 30uA (max)
- Operation mode well below 30mA (depends on packet-type and selected operational mode)
- AEC-Q100 automotive qualification (0.8mm pitch)

System	System Configuration	Product ID(*)
BT 4.0 HCI standard	HCI	TC35661-007
BT 4.0 HCI standard & WB speech	HCI	TC35661-008
BT 4.0 Embedded Profile	SPP	TC35661-203
	HID	TC35661-100
	SPP+BLE GATT	TC35661-501
	HID+BLE GATT	TC35661-600
	SPP+HSP	TC35661-800
BT 4.0 Stand Alone With Profile	SPP Stand Alone	TC35661-700
	HID Stand Alone	TC35661-104

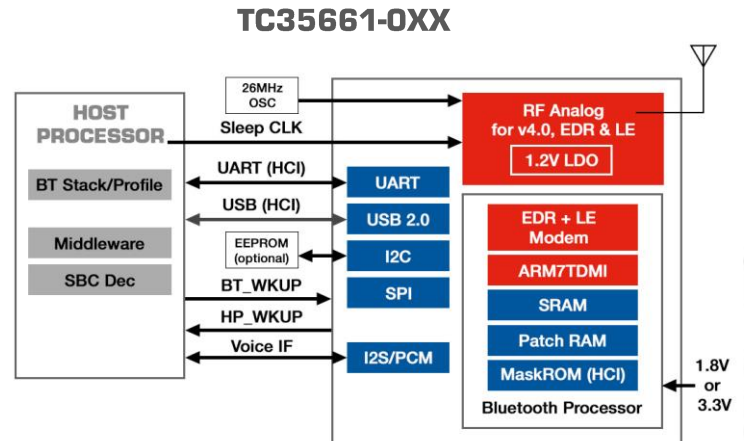
#### > TC35661SBG (FBGA64)



(\*) Subject to firmware updates. Subject to change without notice

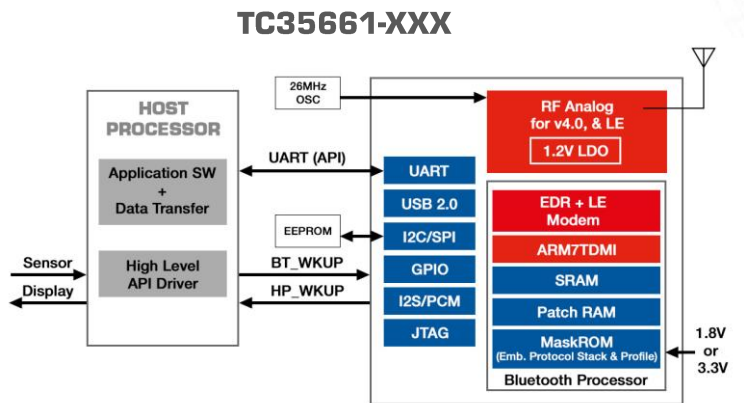
## ➤ HCI SYSTEM CONCEPT

The Bluetooth HCI (host controller interface) model: the low layer stack (RF, LC, LM) runs on the TC35661SBG device. Through a UART or USB it is connected to an external host processor, which executes the upper Bluetooth stack (L2CAP, RFCOMM) and profiles. Beyond the upper stack the host processor runs the application software. This application processor may also run additional tasks such as middleware and multimedia functions. This concept is suitable for voice and data. It can be combined with 3<sup>rd</sup> party Bluetooth protocol stacks over the standardized HCI software interface.



## ➤ EMBEDDED PROFILE SYSTEM CONCEPT

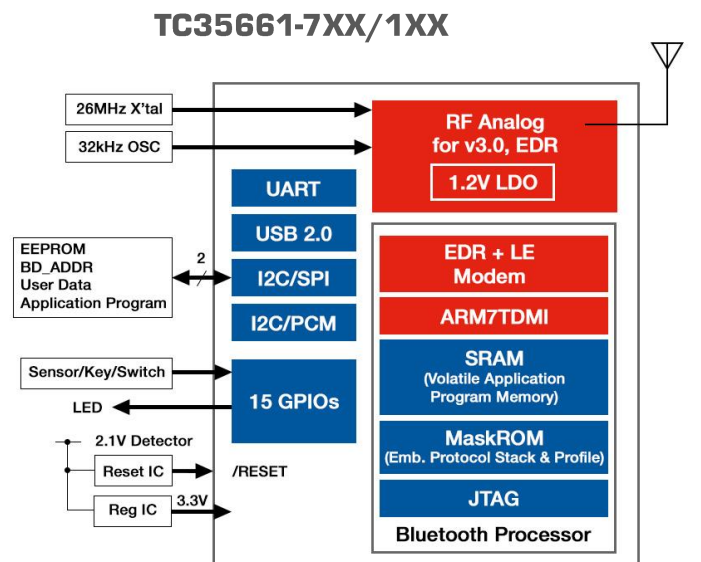
The embedded profile model integrates both the lower and upper stack as well as some selected profiles in the TC35661SBG. The UART interface carries control and payload data to/from the embedded API. The whole Bluetooth functionality is managed by the Bluetooth LSI. The host processor only handles the application data and some basic system control. Depending on the complexity of the application the host CPU performance requirement will be very minor. This concept is for data only. The embedded profile models for BT4.0 feature Smart Ready (dual mode) or Smart (BLE single mode) Bluetooth marking. Toshiba offers source code for an optional high level host driver fitting to the embedded API in order to simplify design to realize fast time to market.



NOTE: Support of embedded hardware features depend on firmware specification

## ➤ STAND ALONE SYSTEM CONCEPT

TC35661 can be run without an additional host MCU for small applications. The application code gets stored into the attached EEPROM. After RESET the code is boot loaded into the embedded SRAM of TC35661-7xx/1xx and executed by the Bluetooth processor itself. Toshiba uses commercial debugger software to allow evaluation of the application code.



NOTE: Support of embedded hardware features depend on firmware specification



## > TC35661 EMBEDDED PROFILE SOFTWARE MODEL EXAMPLES

TC35661-2XX	
Profile API	
SDP GAP	SPP
	RFCOMM
	L2CAP
LC/LMP (v4.0)	
RF Driver	
with Serial Port Profile (SPP) for wireless cable replacement	

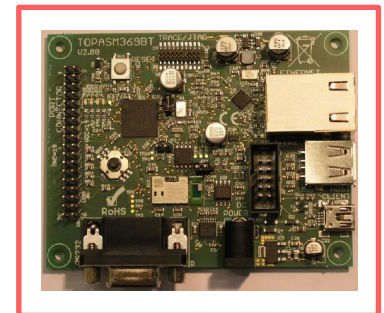
TC35661-5XX			
SPP-API		GATT-API	
SDP GAP	SPP	GATT	SMP
	RFCOMM	Attribute Profile	
	L2CAP		L2CAP
LC/LMP (v4.0)			
RF Driver			
with GATT and SPP profile for BT 4.0 dual mode enabled accessory products			

## > BLUETOOTH STARTER KIT

The BMSKTOPASM369BT(kc) starter kit makes it possible to quickly and easily evaluate Toshiba's Bluetooth Dual Mode LSI TC35661-501 in combination with Toshiba's CortexM3 MCU as a host MCU. It is made to execute the Toshiba Bluetooth driver software and debug user application code via an embedded J-Link debugger interface. The TMPM369DFG Microcontroller offers embedded Ethernet, CAN, USB host, USB device and RS-232 connectivity.

Starter Kit Content:

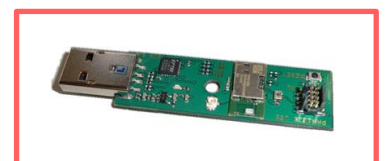
- Toshiba TOPAS369BT board
- Segger J-Link JTAG/SWD emulator with USB interface
- J-Link 19-pin Cortex-M adapter
- USB cable
- Rapid start-up guide



## > BLUETOOTH EVALUATION USB STICK

Quickly and easily evaluate designs with the USB evaluation stick for TC35661SBG. The stick has a USB to UART converter and allows hardware access to the module pins. Two USB sticks for Bluetooth link tests are available as a kit which includes:

- Easy Rx and Tx measurement
- Basic API commands
- Stream and command mode



Evaluation software is necessary to operate the USB stick and you can download it from Panasonic Industrial Devices Europe. The USB evaluation stick with SMD Module PAN1026 is manufactured by Panasonic Industrial Devices Europe. For ordering and product details please contact Panasonic Industrial Devices Europe.