

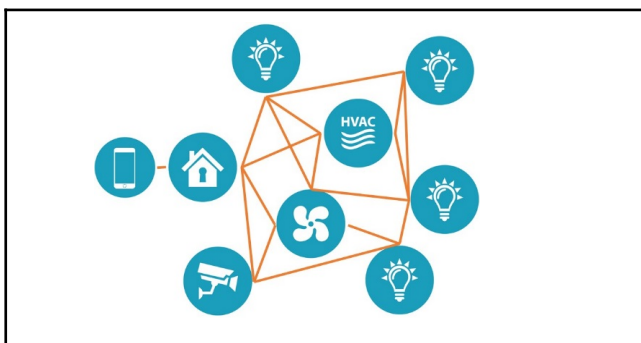
MANY-TO-MANY NETWORK

TOSHIBA BLUETOOTH® MESH

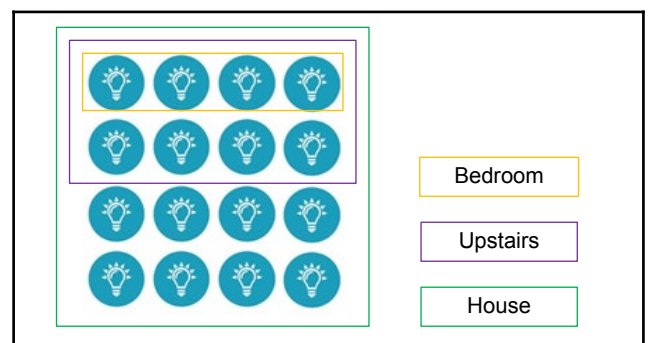
Nowadays Bluetooth technology is available in billions of smartphones, tablets, many new cars and in thousands of different products ranging from wearables to medical devices. On a world-wide basis, 92% of all consumers are aware of the Bluetooth brand. Bluetooth mesh adds an important new dimension to the world's most widely-adopted wireless standard through its introduction of a "many-to-many" topology. By supporting the Bluetooth mesh 1.0 standard, Toshiba Bluetooth devices can interact in an interoperable, reliable, scalable and secure mesh network.



| | |
|-----------------------|--|
| Many-to-Many topology | In addition to point to point connections (e.g., between cell phone and smart watch), multiple devices can interact with each other in a mesh network and thus unlocking new use cases. |
| Interoperability | A full stack solution offered by Bluetooth mesh that consists of physical layer, networking layer and application layer enables world-wide interoperability across multiple vendor devices. Immutable data models assure backward compatibility. |
| Reliability | Multiple, dynamic pathways from the sender to the receiver and self-healing capability leads to highly reliable network communication. Furthermore there is no bridge or router required between smartphone and mesh network which presents a single point of failure. |
| Scalability | Up to 30K nodes can be added to a mesh network. In practice mesh networks with over 1000 nodes are in commercial use. Messages can be relayed up to 127 times in order to travel longer distances and cover greater physical areas. |
| Security | As one of the latest published low power mesh standards, Bluetooth mesh offers protection against all known threats. All messages are encrypted and authenticated using AES-CCM with 128bit keys. Due to multi-layer encryption and multiple application keys, each application may use their own key and hence makes sure that e.g. a light bulb can not access messages to a door lock. When adding a new node to a mesh network, key material can be securely transferred over an unsecured channel to the new node by using Elliptic-curve Diffie–Hellman (ECDH) protocol. |



Mesh interconnected devices in a smart home network enable synergy effects e.g. by combining sensors such as light and temperature sensors with controllers for shutter, air conditioning, lighting and heating.



Due to the publish and subscribe paradigm, each luminaire can be subscribed to various groups. For example a luminaire may be subscribed to the groups "bedroom", "upstairs" and "house".

TOSHIBA BLUETOOTH MESH EVALUATION PLATFORM

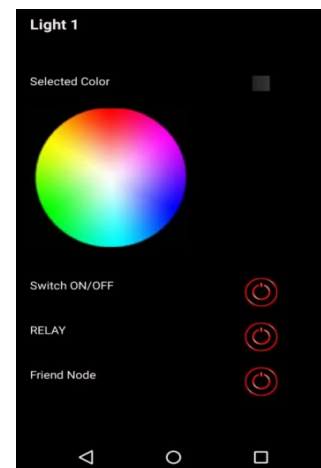
Control multiple boards (one board shown) via an Android™ application.

HARDWARE

- Toshiba TC35678 Bluetooth Low Energy module
- Micro USB connection for power and UART
- USB or battery powered
- JTAG
- Multi-color LED

QUALIFICATIONS

- Bluetooth mesh 1.0
 - Advertising bearer
 - Relay feature
- Bluetooth mesh model 1.0
 - Light HSL Server



DELIVERABLES

- Hardware schematics
- Hardware Bill-Of-Material (BOM) list
- Bluetooth mesh firmware binary code*1
- Bluetooth mesh model sample source code
- Sample Android app
- Documentation

| | TC35678 | TC35679 | TC35680 | TC35681 |
|------------------------------|--|-------------------|---|------------------|
| Bluetooth version | Bluetooth Low Energy 4.2 | | Bluetooth Low Energy 5 | |
| Bluetooth mesh 1.0 | Qualified | Under development | | |
| Peak current RX / TX @ 1Mbps | 3.3 mA (RX) / 3.3 mA @ 0dBm (TX) | | 5.1 mA (RX) / 11.0 mA @ +8dBm (TX) | |
| Peak current RX / TX @ 2Mbps | Not available | | 5.5 mA (RX) / 11.5 mA @ +8dBm (TX) | |
| Link budget | 93.5 dBm @ 1Mbps | | 113 dBm @ 125Kbps | |
| External components | 7 | | 11 | |
| Deep sleep current | 50 nA | | | |
| Internal SRAM | 192 KB | | 144KB | |
| NVM storage | 256 KB | None | 128KB | None |
| Supported optional features | LE Data Packet Length Extension LE Secure Connections Link Layer Privacy Link Layer Extended Scanner Filter Policies | | LE 2M PHY LE Coded PHY (500Kbps, 125Kbps) LE Advertising Extensions High Duty Cycle Non-Connectable Advertising LE Channel Selection Algorithm #2 | |
| Temperature range | -40 °C to 85 °C | -40 °C to 105 °C | -40 °C to 85 °C | -40 °C to 125 °C |
| Automotive grade | No | Yes | No | Yes |
| Package | QFN40 / QFN60 | QFN40 | QFN40 | QFN40 / WCSP |

(*1) Note: Will be ready for mass production from March 2019

For more information please, visit toshiba.semicon-storage.com or contact your local Toshiba sales office.



The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc.
ARM and Cortex are registered trademarks of ARM Limited (or its subsidiaries) in the United States and/or other countries.
Android is a trademark of Google, Inc.
Copyright 2018 TOSHIBA Electronic Devices & Storage Corporation
Product specifications are all subject to change without notice. Product design specifications and colours are subject to change without notice and may vary from those shown. Errors and omissions excepted.