PAN1761 Series
NPI Presentation

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PAN1761 Series (P/N ENW89848A1KF)

Bluetooth low energy functionality

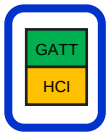
TOSHIBA

Series	PAN1761
Status	Pre-Production
Part Number*	ENW89848A1KF
RF Category	***Bluetooth*® low energy functionality *Bluetooth* v4.1 + NFC Tag Type 3**
Software/Profile	Embedded Profiles
Used ICs	TC35670-006
Size [mm] w/ antenna	15.6 x 8.7 x 1.8 (NFC antenna pin)
Rx Sensitivity [dBm]	-90
Tx Power (max.) [dBm]	+0
Power Supply [V]	1.8 to 3.6
Current Consumption (max.)	Tx: 5.5mA (tbc) Rx: 5.5mA (tbc) Sleep Mode: <0.1µA (tbc)
Interfaces	GPIO, UART, I²C, NFC Wake-Up, etc.
Microcontroller and Memory	ARM 7 32KB on chip RAM + 512kb EEPROM + 1.5kb EEPROM NFC memory
Specialty	Compatible to Toshiba Bluetooth SDK for BLE-GATT
Compatibility	All TC365xx based modules are footprint- and pin-compatible
Operating Temperature [°C]	-40 to +85
Evaluation Kit*	ENW89848AVKF (EMK)

[Features]

- Bluetooth low energy functionality Module v4.1 + NFC Tag Type 3 combo
- Operation possible as Host-less, Stand-alone Module
- BLE Profiles Including “SPP over BLE” Available
- In the production: Pre-programmed Bluetooth/MAC Address

PAN1761



[Benefits]

- Bluetooth wake-up function via NFC
- Out-of-band (OoB) pairing functionality via NFC
- Read/Write data through NFC Tag
- Start mobile Apps automatically
- Ecosystem with PAN1026 + PAN1760 + PAN1761 Series:
  Compatible to Toshiba Bluetooth SDK for BLE-GATT
  Same Form Factor, Same Footprint

[Possible Application]

- Data Transfer to Smartphone/Tablet: General Industry, Wireless Health Monitoring, Smart Home
- Application where power consumption is crucial
- Security critical application
- Portable Application without host MCU

Design and Specifications are subject to change without notice. Ask the factory for technical specifications before purchase and/or use.

[website] + [Toshiba Extranet]

PAN1761 Series (P/N ENW89848A1KF)

[Features]

[Discovery Questions]

[Availability]

- Bluetooth low energy functionality Module v4.1 + NFC Tag Type 3 combo
  - Bluetooth wake-up function via NFC
  - Out-of-Band (OoB) pairing functionality via NFC
  - Read/Write data through NFC Tag
  - Support of Scatternet
  - Over the Air Update (OTA)
- Operation possible as Host-less, Stand-alone Module with the integrated 32KB on-chip RAM and 512KB EEPROM for application code storage and execution and additional 1.5KB EEPROM NFC
- BLE Profiles Including “SPP over BLE” Available
- Supports Central and Peripheral Mode
- In the production: Pre-programmed Bluetooth/MAC Address
- Bluetooth Ecosystem with PAN1026 Series, PAN1760 Series and PAN1761 Series:
  - Same Size
  - Same Footprint
  - Compatible to Toshiba Bluetooth SDK for BLE-GATT (Toshiba Extranet)
- Custom Flashing Service for Qualified Projects

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PAN1760 Series (P/N ENW89847A1KF)

[Features]

[Discovery Questions]

[Availability]

Question	Answer
Is power consumption a critical topic in your application?	For maintenance Bluetooth connection is shut off in standby (0,0 mA) and not “listening” for connection requests. Smartphone can be used to “wake-up” Bluetooth. Example application: water pump (battery), quarterly maintenance check
Is security important to your application?	Bluetooth keys can be allowed to be transferred with NFC only. For Bluetooth pairing user needs to be very close to end product at least once (man-in-the-middle scenario). Example application: electricity meter in building
Does your product need to reduce cost with less/no buttons or a less costly/no display?	Adding Bluetooth low energy and NFC combo can enable a very rich interface with your product by controlling it with a smartphone/tablet. NFC can be used to establish connection/launch smartphone app by proximity. No other user input/interaction is needed. Example application: medical devices, sensors
Do you wish to use a unique identification?	NFC allows unique identification of end products (proximity). No different Bluetooth Device Name is needed. Example application: price tag/product information in shops

PAN1760 Series (P/N ENW89847A1KF)

[Features]

[Discovery Questions]

[Availability]

Question	Answer
Will your end customers need to update your product's firmware or need to easily gain access to product info/manuals easily?	Just ask the end customer to download a smartphone/tablet app to update your product without the use of a PC or USB.
In your application will you need an easy, low-power way to read sensors/monitor the real world and potentially report them to the cloud (IoT)?	Off a coin cell battery you can easily read & report the real world around for IoT applications or local with a smartphone.
Shall the Bluetooth module work stand-alone / autonomously?	PAN1761 Series can work autonomously in using the integrated EEPROM for applications, up to 32KB on-chip RAM and 512KB are available for stand-alone operation, no host MCU is needed.
Do you want a module with integrated profile?	If no, PAN1761 Series is the perfect fit. GATT/GAP API is integrated. On top of this standard interface you can realise all BLE profiles.

Why use Bluetooth low energy?

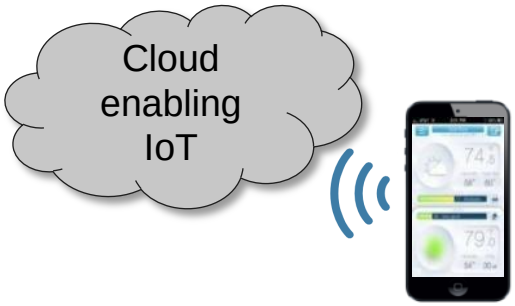
Multiyear on Coin Cell

- Low peak currents reduce stress/strain on battery
- Small solution form factor
- Ultra low sleep currents
- Small protocol overhead
- Small payloads

Remote Display and Personalization

- Smartphone instead of local display → more info, historical data etc.
- Over the air upgrades from phone to end equipment
- More intuitive set-up and configuration
- Personal operator/user setup and configuration

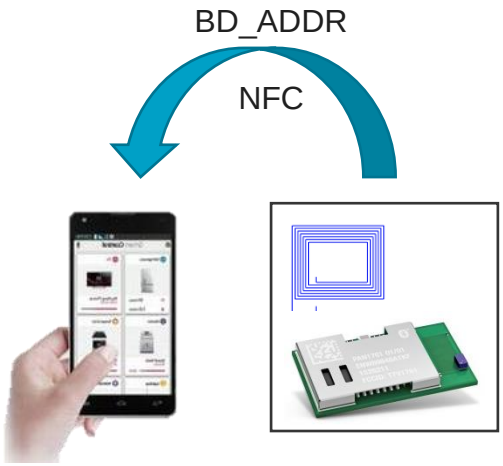
Hub to Internet (IoT)



- Smartphone interoperability
- Access your devices from anywhere (through Cloud)
- Enables real time aggregated data
- Existing ecosystem of Cloud services
- Push firmware updates

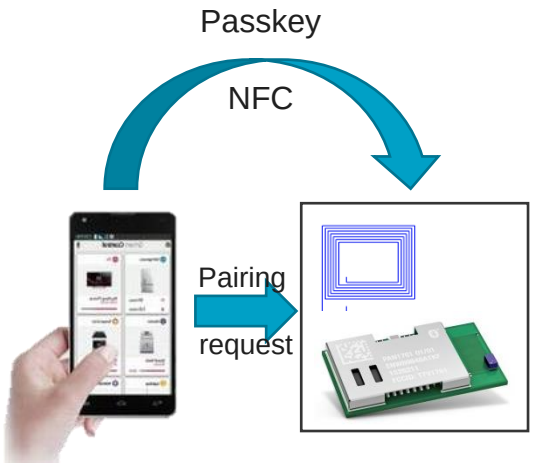
How to use NFC for Bluetooth pairing?

Step 1



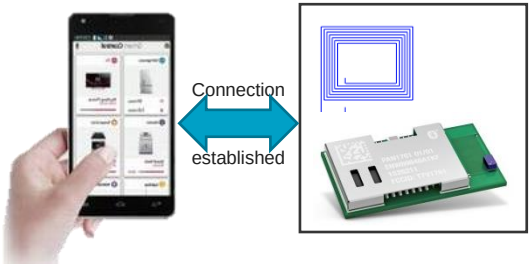
- Touch and hold Smartphone to NFC antenna connected to PAN1761 module
- Via NFC Bluetooth address (BR_ADDR) will be exchanged to Smartphone

Step 2



- Using provided Bluetooth address smartphone can directly initiate pairing
- Smartphone sends Passkey via NFC to PAN1761 module

Step 3



- Pairing completed
- Bluetooth connection established

PAN1761 Series (P/N ENW89848A1KF)

[Features]

[Discovery Questions]

[Availability]

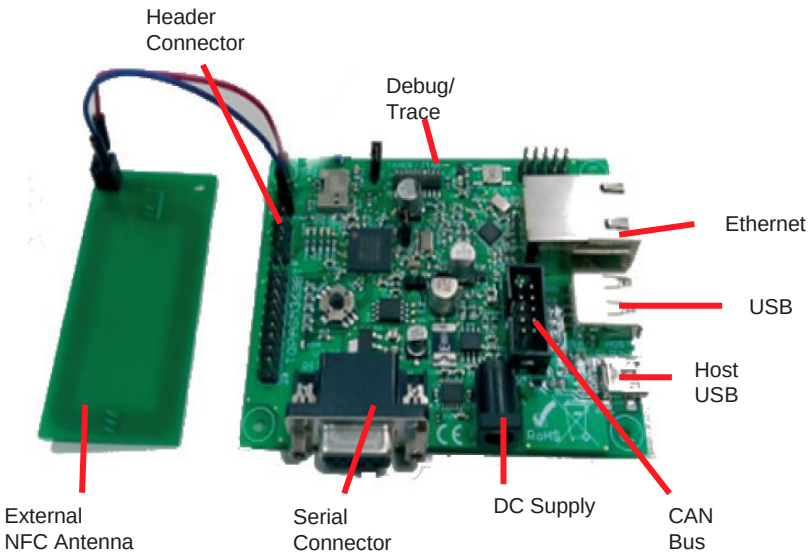
- **Module**
  (P/N ENW89848A1KF)
  [Pre-Production] NOW
  [Mass Production] estimated Q1 CY2017

- **Development Tool**
  [Experimenter Kit] NOW
  (P/N PAN1761-EMK)
  - Toshiba Starter Kit with mounted PAN1761 Module (P/N ENW89848AVKF) (QTY 1)

- **Documentation**
  https://eu.industrial.panasonic.com/products/wireless-connectivity/bluetooth/bluetooth-smart-low-energy/series/pan1761/CS2375?reset=1

PAN1761 Series – Concept to Production

PAN1761 Series Experimenter Kit (Toshiba Starter Kit)



[P/N]	ENW89848AVKF
[Purpose]	▪ Compatible to Toshiba Bluetooth SDK for BLE-GATT and NFC Tag ▪ Software Development ▪ Independent of Platform and RTOS
[Description]	▪ PAN1761 is connected with UART ▪ Embedded Toshiba Cortex M3 MCU TMPM369 with 512KB flash available for download of software projects ▪ External NFC antenna included ▪ Peripherals: Ethernet, CAN, USB, GPIO, Serial, UART
[PC Utilities]	IAR Workbench J-Link JTAG debugger interface included, compatible to Toshiba Bluetooth SDK for BLE-GATT

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Toshiba Extranet

[Registration] https://apps.toshiba.de/web/SDKRegistration/

[Login] https://apps.toshiba.de/extranet

Developer Zone

- Getting Started
- Software
- Android/iOS
- Downloads
- Tools
- Hardware
- Product Qualification
- FAQ

Download Zone

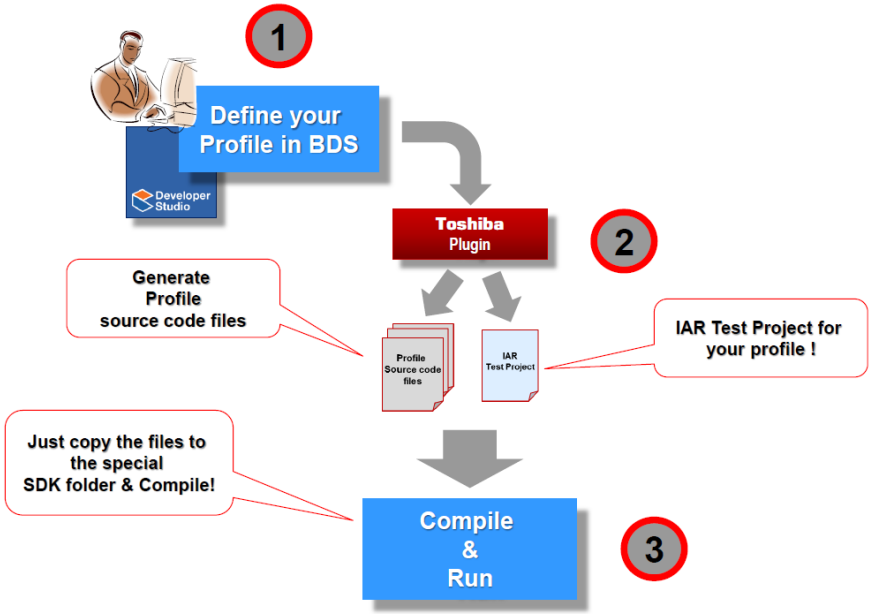
- Development Tools
- Software Development Kit (SDK)

Plug-in for Bluetooth Developer Studio (BDS)

Bluetooth Developer Studio

- GUI tool for rapid BLE profile design
- free-of-charge
- Plug-in generates all you need to run the profile:
  - C- source code of a BLE Profile
  - IAR Project files
- Generated BLE profile code is:
  - Compliant to Toshiba SDK v2.0.5 BLE profile architecture
  - Based on SDK API for BLE
  - Ready-to-Run
- Generated project can be immediately used with Toshiba Bluetooth SDK to compile and run the profile

BDS Development Flow



- Watch the video for information on BDS
- You can download BDS here
- Plug-in is officially published on Toshiba's Bluetooth Developer Zone

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Q&A

Question	Answer
I made my design on PAN1026 and want to change to PAN1761. What do I have to consider?	PAN1026 Series and PAN1761 Series share the same size and footprint. Therefore Bluetooth low energy applications and profiles developed using PAN1026 can almost be transferred 1:1 to PAN1761. Only changes need to be made for NFC antenna and NFC software part.
How much memory offers PAN1761?	PAN1761 Series has integrated 512KB EEPROM and 32Kb of RAM for application code storage and execution and additional 1.5KB EEPROM NFC memory.
Is it possible to upgrade the firmware Over The Air?	Yes, Over the Air Update is possible.
Which purpose has the SPI Interface?	You can add external non-volatile memory to the module via SPI.
How long should I plan for from start of development to final, certified, solution?	Depending on your knowledge and complexity of the product. Our customers have their final product into production in 6-12 months time.
What data rate will your application require?	Our BLE stack supports >16KB per second. Note that the throughput is dependent on the smartphone / tablet too.
Would you need a officially adopted profile, or would you make your own?	Toshiba supports most officially adopted profiles in addition to proprietary profiles in their SDK. Toshiba offers as well plug-ins for Bluetooth Developer Studio.

Panasonic

Bluetooth Ecosystem on Toshiba Semiconductors

INFORMATION SECURITY MANAGEMENT SYSTEM
ISO/IEC 27001
DNV

Bluetooth Ecosystem on Toshiba Semiconductors

Series	PAN1026	PAN1760	PAN1761
Status	Mass Production	Mass Production	Pre-Production
Part Number*	ENW89837A3KF	ENW89847A1KF	ENW89848A1KF
RF Category	***Bluetooth® dual mode functionality Bluetooth* v4.0 class 2**	***Bluetooth®* low energy functionality *Bluetooth* v4.1**	***Bluetooth®* low energy functionality *Bluetooth* v4.1 + NFC Tag class 3**
Software/Profile	SPP and GATT	Embedded Profiles	Embedded Profiles
Used ICs	TC35661-501	TC35667-006	TC35670-006
Size [mm] w/ antenna	15.6 x 8.7 x 1.8	15.6 x 8.7 x 1.8	15.6 x 8.7 x 1.8 (NFC antenna pin)
Rx Sensitivity [dBm]	-88 @ BER 10^{-3}	-91	-90
Tx Power (max.) [dBm]	+4	+0	+0
Power Supply [V]	1.8 or 3.3	1.8 to 3.6	1.8 to 3.6
Current Consumption (max.)	ACL, DH1: 46mA Sleep Mode: <100µA	Tx 5.4mA Rx: 5.4mA Sleep Mode: <1µA	Tx: 5.5mA (tbc) Rx: 5.5mA (tbc) Sleep Mode: <0.1µA (tbc)
Interfaces	GPIO, UART	GPIO, UART, SPI, I²C, ADC	GPIO, UART, I²C, NFC Wake-Up, etc.
Microcontroller and Memory	ARM 7	ARM 7, 32KB on-chip RAM, 512KB EEPROM	ARM 7, 32KB on-chip RAM, 512KB EEPROM, 1.5KB EEPROM NFC memory
Specialty	Compatible to Toshiba Bluetooth SDK for BLE-GATT		
Compatibility	All TC365xx based modules are footprint- and pin-compatible		
Operating Temperature [°C]	-40 to +85	-40 to +85	-40 to +85
Evaluation Kit*	ENW89837AVKF (EMK)	ENW89847AVKF (EMK) or ENW89847AUKF (Morpheus Board)	ENW89848AVKF (EMK)

[Compatibility]

- Size
- Footprint
- Toshiba Bluetooth SDK for BLE-GATT (Toshiba Extranet)

[Outlook]

Panasonic and Toshiba plan to strengthen their cooperation with more modules to come in 2017.

PAN1026 Series (P/N ENW89837A3KF)

Bluetooth®
dual mode
functionality

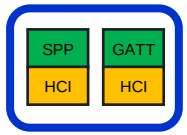
TOSHIBA

Series	PAN1026 Series
Status	Mass Production
Part Number*	ENW89837A3KF
RF Category	***Bluetooth*® dual mode functionality *Bluetooth* v4.0 class 2**
Software/Profile	SPP and GATT
Used ICs	TC35661-501
Size [mm] w/ antenna	15.6 x 8.7 x 1.8
Rx Sensitivity [dBm]	-88 @ BER 10^{-3}
Tx Power (max.) [dBm]	+4
Power Supply [V]	1.8 or 3.3
Current Consumption	ACL, DH1: 46mA Sleep Mode: <100µA
Interfaces	GPIO, UART
Specialty	Compatible to Toshiba Bluetooth SDK for BLE-GATT
Compatibility	All TC365xx based modules are footprint- and pin-compatible
Operating Temperature [°C]	-40 to +85
Evaluation Kit*	ENW89837AVKF (EMK)

[Features]

- Bluetooth Embedded dual mode functionality Module (Place & Play)
- Bluetooth v2.1 Embedded SPP, High Level API Commands
- Bluetooth v4.0 (LE) Embedded GATT
- BLE Profiles Including “SPP over BLE” Available
- Pre-programmed Bluetooth/MAC Address

PAN1026



[Benefits]

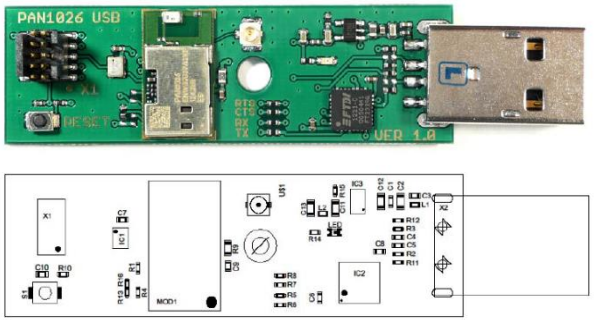
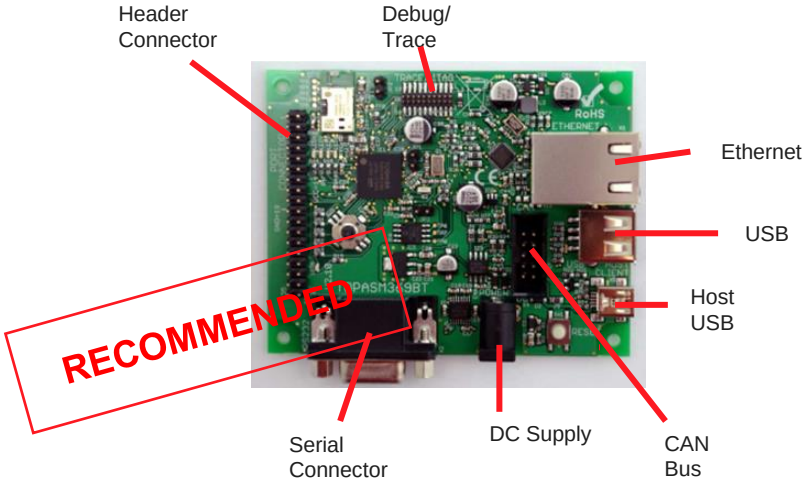
- Lower Software Development Efforts: Profile with High Level API Commands, 8-bit MCU Sufficient
- Ecosystem with PAN1026 + PAN1760 + PAN1761 Series: Compatible to Toshiba Bluetooth SDK for BLE-GATT Same Form Factor, Same Footprint
- Compared to Competition: Small Size with All Components Needed for stand-alone Bluetooth Transmission

[Possible Application]

- Data Transfer to Smartphone/Tablet: General Industry, Wireless Health Monitoring, Smart Home
- Non-Battery Driven Application

[website] + [Toshiba Extranet]

PAN1026 Series – Concept to Production

	PAN1026 USB Starter Kit	PAN1026 Series Experimenter Kit (Toshiba Starter Kit)
		
[P/N]	ENW89837AYKF	ENW89837AVKF
[Purpose]	▪ Testing and First Evaluation ▪ Reference Design ▪ Easy Prototyping (UART Pins) ▪ Easy Connection to Smartphones/Tablets with Bluetooth® Low Energy Technology	▪ Platform for embedded Chiron LSI Bluetooth control- and application software ▪ Software Development ▪ Independent of Platform and RTOS
[Description]	▪ USB Stick with FTDI for PC connectivity ▪ Access to module pins ▪ Two USB sticks for Bluetooth link tests	▪ PAN1026 is connected with UART ▪ Embedded Toshiba Cortex M3 MCU TMPM396 with 512kb flash available for download of software projects ▪ Peripherals: Ethernet, CAN, USB, Serial, UART
[PC Utilities]	EasySPP and EasyBLE for Easy Rx and Tx measurement, Basic TCU commands, Stream and Command Mode	IAR Workbench J-Link JTAG debugger interface included, compatible to standard tool chain (e.g. IAR, Keil, Attolic)
[API]	Low Level	High Level

PAN1760 Series (P/N ENW89847A1KF)

Bluetooth low energy functionality

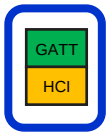
TOSHIBA

Series	PAN1760
Status	Engineering Sample
Part Number*	ENW89847A1KF
RF Category	***Bluetooth®* low energy functionality *Bluetooth* v4.1**
Software/Profile	Embedded Profiles
Used ICs	TC35667-006
Size [mm] w/ antenna	15.6 x 8.7 x 1.8
Rx Sensitivity [dBm]	-91
Tx Power (max.) [dBm]	+0
Power Supply [V]	1.8 to 3.6
Current Consumption	Tx 5.4mA Rx: 5.4mA Sleep Mode: <1µA
Interfaces	GPIO, UART, SPI, I²C, ADC
Microcontroller and Memory	ARM 7 32kB on-chip RAM 512kb EEPROM
Specialty	Compatible to Toshiba Bluetooth SDK for BLE-GATT
Compatibility	All TC365xx based modules are footprint- and pin-compatible
Operating Temperature [°C]	-40 to +85
Evaluation Kit*	ENW89847AVKF (EMK) or ENW89847AUKF (Morpheus Board)

[Features]

- Bluetooth low energy functionality Module v4.1
- Operation possible as Host-less, Stand-alone Module
- BLE Profiles Including “SPP over BLE” Available
- Supports Central and Peripheral Mode
- In the production: Pre-programmed Bluetooth/MAC Address

PAN1760



[Benefits]

- Ecosystem with PAN1026 + PAN1760 + PAN1761 Series:
  Compatible to Toshiba Bluetooth SDK for BLE-GATT
  Same Form Factor, Same Footprint
- Compared to Competition: Small Size with All Components Needed for Bluetooth Transmission

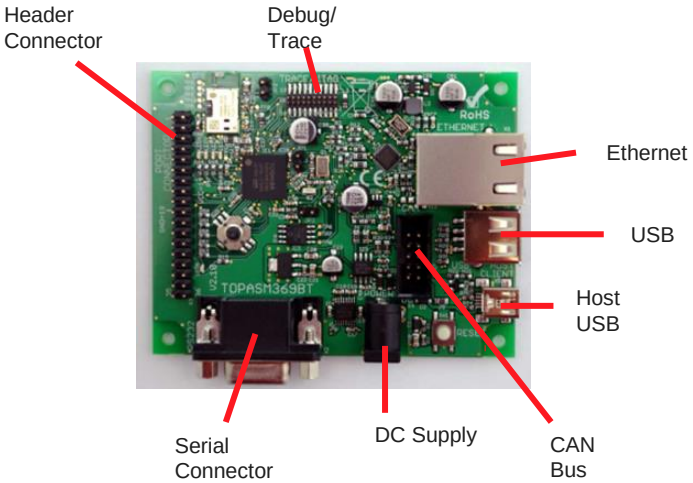
[Possible Application]

- Data Transfer to Smartphone/Tablet: General Industry, Wireless Health Monitoring, Smart Home
- Application where Power Consumption is Crucial
- Portable Application without host MCU

[website] + [Toshiba Extranet]

PAN1760 Series – Concept to Production

PAN1760 Series Experimenter Kit (Toshiba Starter Kit)



"Morpheus Board"
Toshiba Bluetooth Smart Standalone Development Kit

[P/N]	ENW89847AVKF	ENW89847AUKF
[Purpose]	▪ Platform for embedded Chiron LSI Bluetooth control- and application software ▪ Software Development ▪ Independent of Platform and RTOS	▪ Platform for standalone development of PAN1760 Series ▪ Standalone Software Development
[Description]	▪ PAN1760 is connected with UART ▪ Embedded Toshiba Cortex M3 MCU TMPM369 with 512kb flash available for download of software projects ▪ Peripherals: Ethernet, CAN, USB, GPIO, Serial, UART	▪ TC35667 included ▪ Coin Cell operation possible ▪ Peripherals: USB, GPIO, Serial, UART
[PC Utilities]	IAR Workbench J-Link JTAG debugger interface included, compatible to Toshiba Bluetooth SDK for BLE-GATT	IAR Workbench J-Link JTAG debugger interface included, compatible to standard tool chain (e.g. IAR, Keil, Attolic)

DANKESCHÖN
THANK YOU

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