



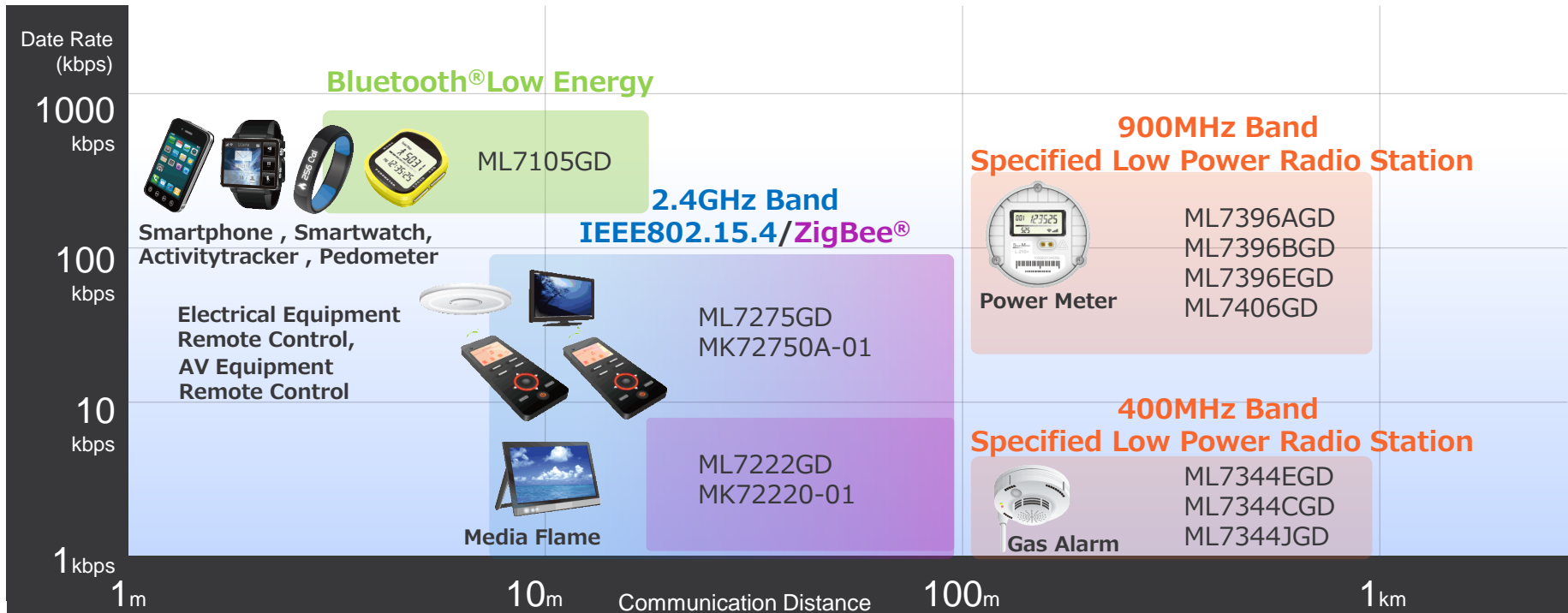
Bluetooth[®] Low Energy Product introduction

LAPIS Semiconductor Co., Ltd.



Lapis Semiconductor Product Map

1



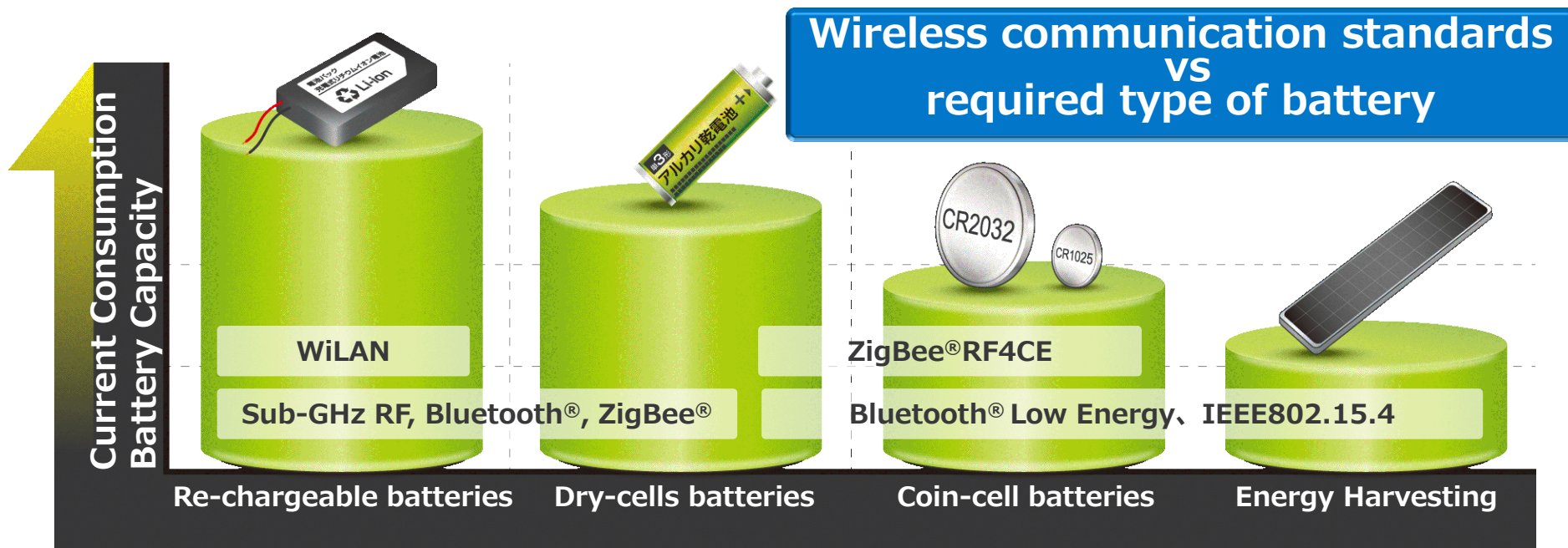
	Specified Low Power Radio Station		IEEE802.15.4	Bluetooth® LE	W i F i (IEEE802.11g)
	Narrow Band	Wide Band			
Frequency Band	426/429MHz	900MHz	2.4GHz	2.4GHz	2.4GHz
Communication Distance	Several 100m	Several 100m	Several 10m	Around 10m	Several 10m
Communication Speed (Air)	≤9600bps	50kbps≤	250kbps	1Mbps	11Mbps
Target Applications	Telemetry, Security equipment	Smart meters	Measurement, control	Potable equipment	Wireless LAN
Market	The frequency band differ based on region		Worldwide	Worldwide	Worldwide

“Low Power” is our key-word

2

All Wireless communication products from Lapis Semiconductor is “Low Power”

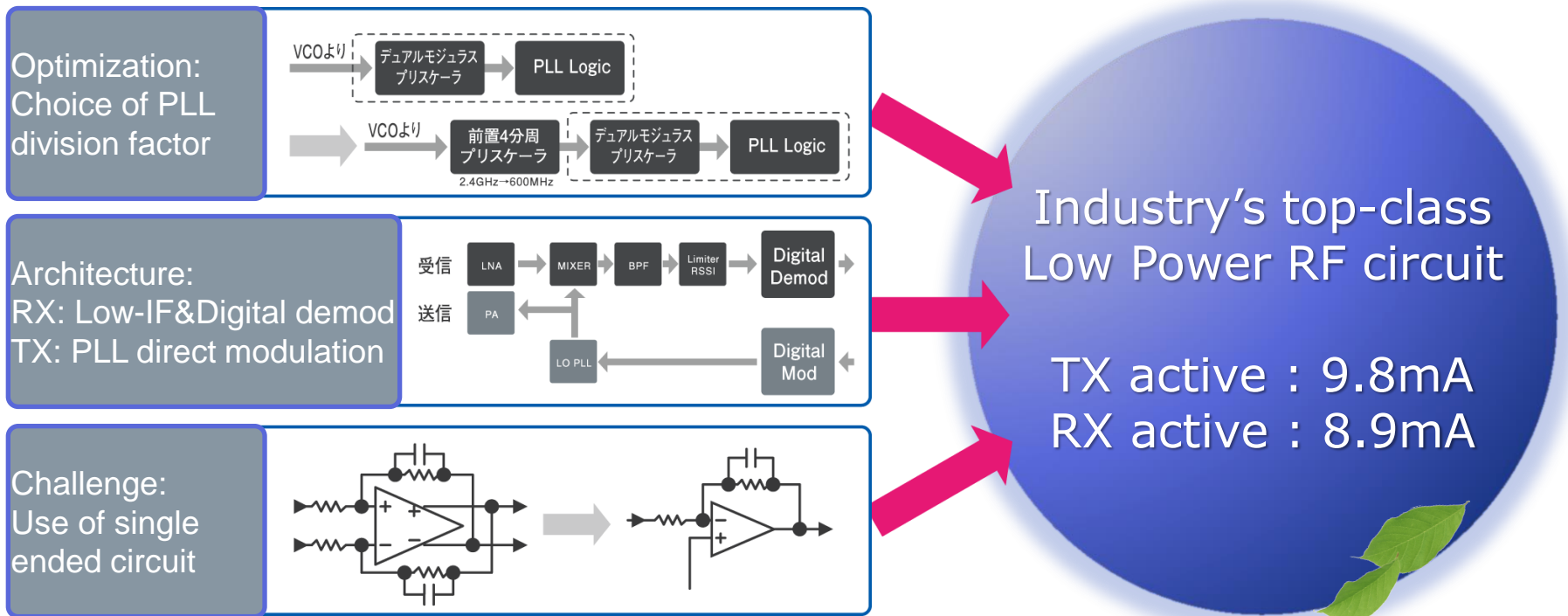
- Low Power Radio extend battery lifetime , smaller battery enable smaller form factor
- Accumulated know-how thanks to in-house design RF circuit blocks
- System level design partitioning enables effective average current



Ultra Low Power Design I –RF circuit-

3

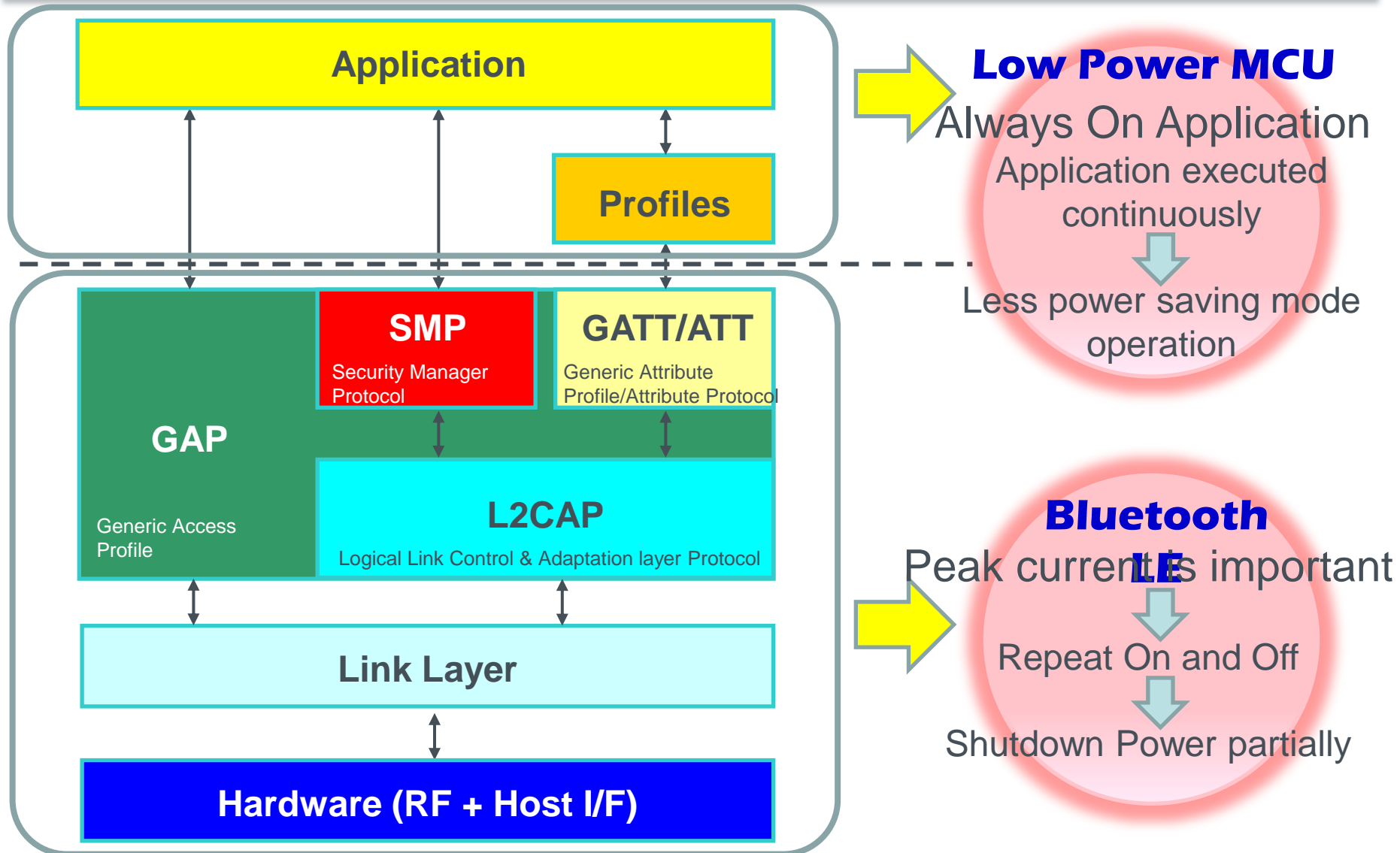
- Industry's top-class Ultra Low Power RF design
 - Accumulated Design Know-How over 10yrs experiences in wireless design



Keep enough margin in RF performances

Ultra Low Power Design II –System partitioning-

4



Roadmap for Bluetooth Low Energy LSI products

5

Core Spec
v4.2 (v5.0?)

Integrate user application
into flash memory
Shanghai features

- LE 2.0Mbps
- LE Long Range
- LE security enhancement

ML7135

LE 2Mbps, Long range
2.4GHzRF+LL+HOST
Active current : below 3mA

QF
N

WCS
P

Core Spec
v4.1

HCI chip
Budapest release v4.1
features

- 32bit UUID
- Low duty cycle Directed Advertising
- Link Layer Topology
- LE ping

ML7115

Bluetooth LE HCI chip
2.4GHzRF+LL
Active current : below 5mA

WCS
P

ML7125

Bluetooth LE complete SoC
2.4GHzRF+LL+HOST
Active current : below 5mA

QF
N

WCS
P

Core Spec
v4.0

ML7105-00X

Bluetooth LE SoC
2.4GHzRF+LL+HOST
Active current : below 9mA

QF
N

Integrate custom profile
Budapest release v4.1 features

- 32bit UUID
- Low duty cycle Directed Advertising
- Link Layer Topology
- LE L2CAP connection oriented channel
- LE ping

CY2013

CY2014

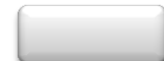
CY2015



: Mass production



: Development



: Planning

ML7105C - Bluetooth Low Energy LSI

6

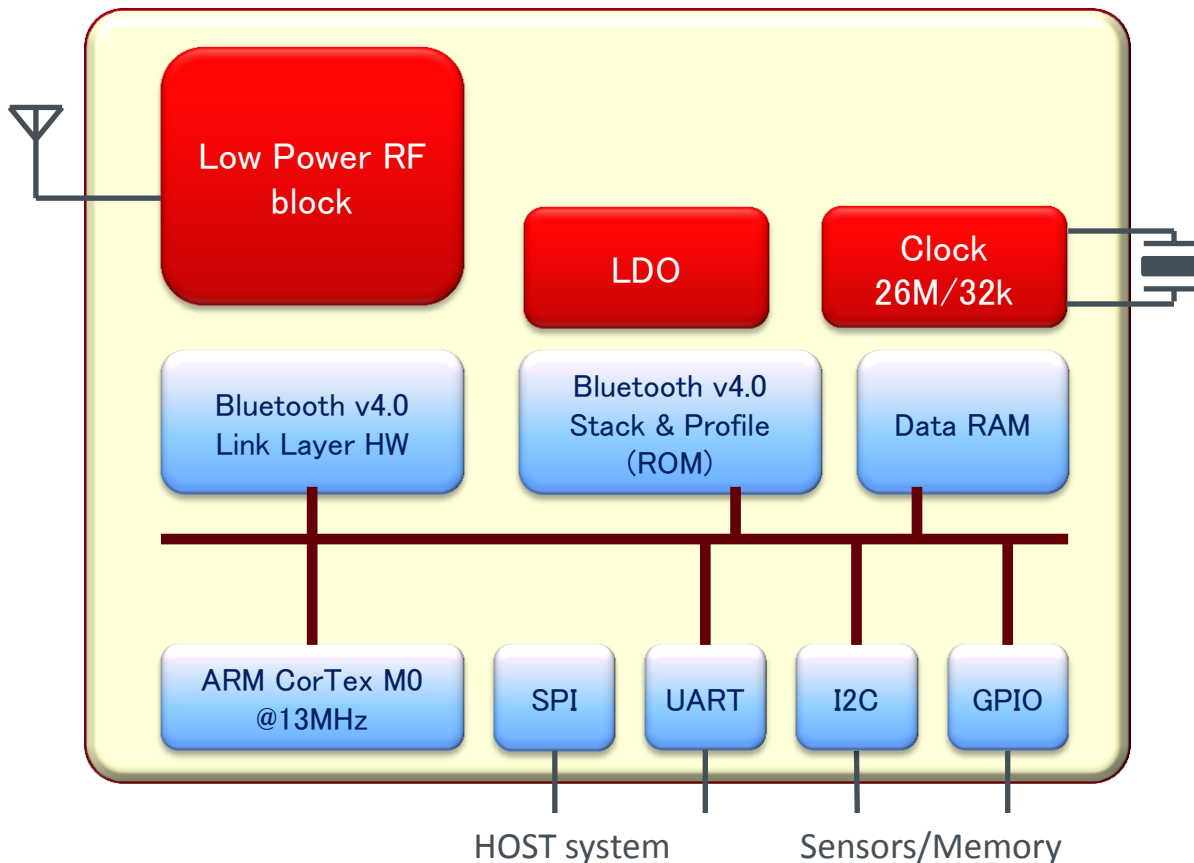
■ Compliant with Bluetooth low energy single mode(master/slave role)

- Dedicated timer in Low Power Logic block reduce system level power consumption during Deep Sleep Mode.

■ Lowest power consumption

- RF circuit is single ended and uses direct modulation.

MP



ML7105C Specification.

- Operating voltage : 1.6 to 3.6V
- Operating Temp. : -20 to 70deg.C
- Low Power consumption
 - TX active 9.8mA (typ.)
 - RX active 8.9mA (typ.)
 - Sleep below 0.7uA
- Supported layer
 - ATT, GATT, SMP, GAP, L2CAP
- Host I/F
 - SPI or UART
- Package
 - 32pin WQFN 5.0 x 5.0 x 0.8mm
- Schedule
 - MP Now

ML7125 supports Bluetooth core spec v4.1

7

**Under
developme
nt**

■ Built-in Bluetooth v4.1 SoC stack and controller

- Down load user's application code into system RAM
- Multi connection engine enable parallel connection (up to 2 devices)

■ Ultra Lowest Power consumption

- Significant improvement in Peak (active) and Sleep current

ML7125 Target spec.

- Ultra low power RF
 - Cortex M0+ @ 13MHz
 - Bluetooth v4.1 stack and controller
 - RAM 28kB scalable memory retention
 - ROM 96kB for stack and profiles
 - Low Power logic for deep sleep mode
 - WCSP 0.4mm pitch 67pins (ball-less)

■ Current consumption

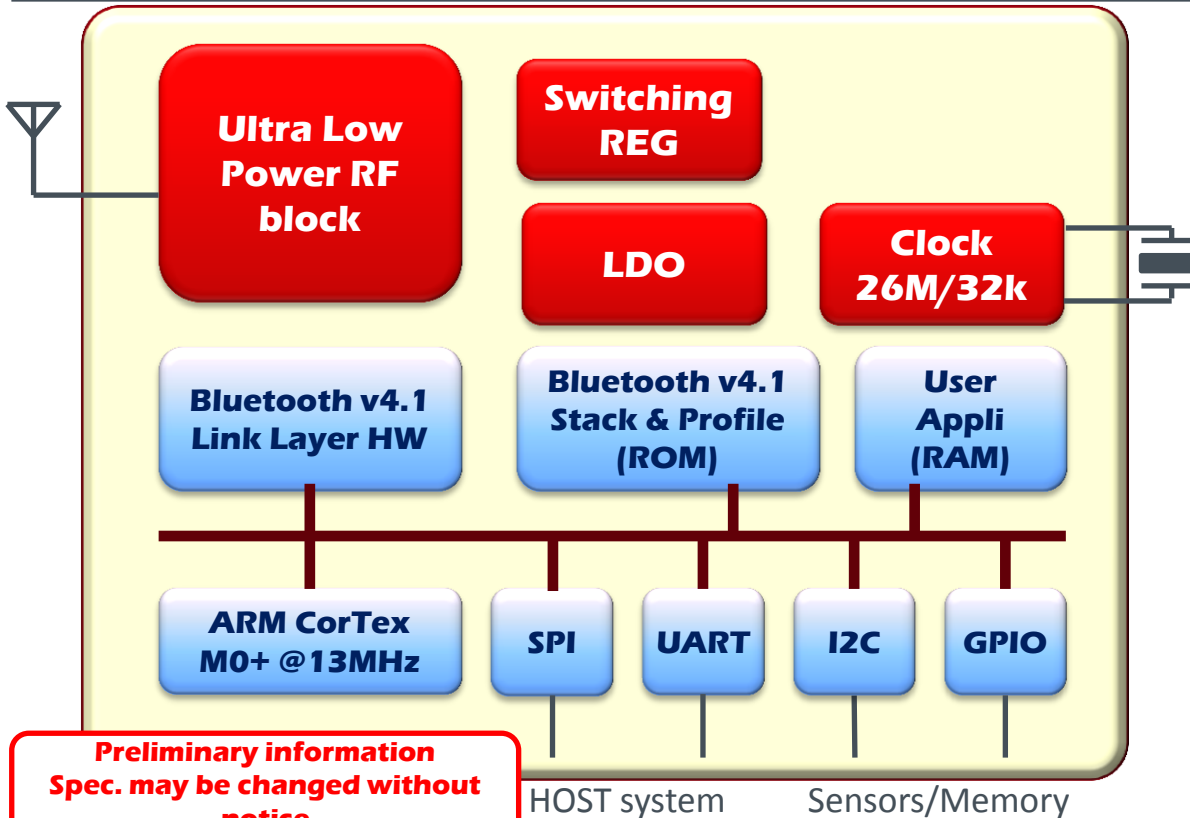
- 5mA TX/RX (3.0V with DCDC)
- 2mA App at 13MHz
- 3uA Deep sleep mode (memory 28kB retention)
- 0.3uA Deep sleep mode (memory 8kB retention)

■ Schedule

ES 4/E/2015

CS 5/E/2015

MP 8/E/2015



**Preliminary information
Spec. may be changed without
notice**

Link Layer topology feature

ML7105C



ML7125



ML7125



ML7125



Max 2 slaves at a time

Max 2 devices can be connected at same time . Support 3 Pico-nets.

ML7105C Development kit overview

9

ML7105C Development kit includes USB dongle , Wireless sensor node , GUI software , Sample application and Documentation.

GUI software

[BlueLite Commander]

Central [USB dongle]

ML7105C
wireless module

USB Conversion
Board

Peripheral
[Wireless Sensor Node]

Sensor Node

ML7105C
wireless module

Temperature

Proximity

Accelerometer

Roadmap for Bluetooth Low Energy Module products

10

Combination module

ML7125 MP start

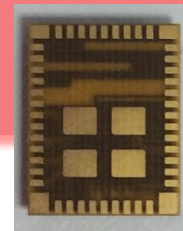
MK71252-01
Combination module for
IoT/O2O application
BLE+NFC
Size TBD

MK71251-01
Combination module for
Wearable device
BLE+ACC (Kionix inc.)
Size TBD

Baseline

MK71250-01
Bluetooth Smart module
Type of module TBD
Size TBD

MK71050-03
Bluetooth Smart module
SMT type w/Metal shield case
10.7 x 13.6 x 1.78



CY2014

CY2015

CY2016

CY2016~

: Mass production

: Development

: Planning

```
COM3:38400baud - Tera Term VT
File Edit Setup Control Window Resize Help
1: BLE Device Ver. & BD_ADDR
2: Update BD_ADDR
3: Read EEPROM
4: Write EEPROM
5: (Reserved)
6: (Reserved)
7: Change Peer ID
8: Delete Pairing Information (only Current ID)
9: Factory Default (VSP)
0: Cancel

Msg: VSP Factory Default Setting Complete
Msg: Reboot

Bluetooth Low Energy "VSP Software" Version 0.09
Copyright (C) 2013 LAPIS Semiconductor Co., Ltd.

Msg: Initial Setting (Role: Peripheral, Peer Device ID: 0)
Msg: Start Advertising
Msg: Start Connection
Msg: Pairing Request (Passkey "056149")
Msg: Pairing Success
Msg: Start Encryption
Msg: Connection Complete
Msg: Connection Update Complete
skjfdkjsfdkjhkhjvnd
dkjfdkfdkj
VSP peer to peer communication
```

Design Resources <Documentations>

- Datasheet
- User's manual
- Design Guideline

<Evaluation Kit>

- Manuals (HW,SW,App.)
 - Test Tools
 - Sample app code
- Available in web site

```
COM4:38400baud - Tera Term VT
File Edit Setup Control Window Resize Help

Bluetooth Low Energy "VSP Software" Version 0.09
Copyright (C) 2013 LAPIS Semiconductor Co., Ltd.

Msg: Initial Setting (Role: Central, Peer Device ID: 1)
Msg: Pairing Information Unknown
Enter 'S' for Scan

Msg: Start Scanning
Msg: Stop Scanning
Msg: BLE Device was found
Msg: Start Scanning for Connection
Msg: Start Connection
Msg: Pairing Request
Passkey Entry (6-digit number):000000
Msg: Pairing Success
Msg: Start Encryption
Msg: Connection Complete
Msg: Connection Update Complete

skjidsjksd
jfdkjhkhkh
Reverse operation can be done
Msg: Connection Update Complete
```



Peer-to-peer Communication is possible by using Terminal software such as Teraterm.
Emulating Comm-Port application.(Virtual Comport app.)



BPP: Blood Pressure monitor



HRP: Heart Rate Monitor



HTP: Thermometer



WSP: Weight Scale
(under development)



GLP: Glucose meter

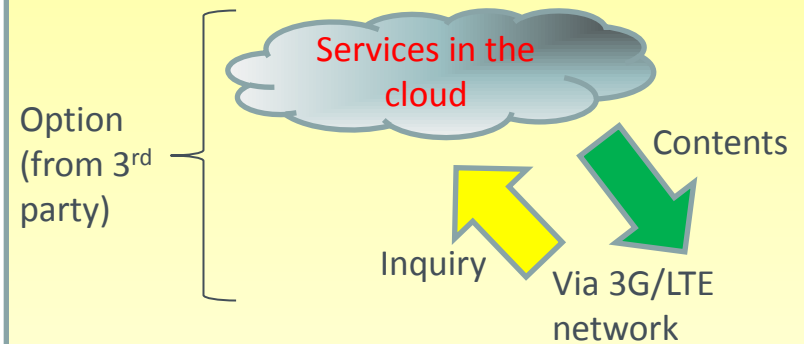
ROHM GROUP

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VSP: Vender Specific Profile

Beacon Development Kit

(Under development)



Broadcast indormation such as ID, URL from beacon device

ROHM GROUP
LAPIS
SEMICONDUCTOR

Contact: support-ble@adm.lapis-semi.com