



Telink

# Datasheet for Multi-protocol Wireless Connectivity Module with Integrated Energy Harvester TLSR8273-M-EH

DS-TLSR8273-M-EH-E1

Ver 0.5.0

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## Keyword

Bluetooth LE; Bluetooth Mesh; RF4CE; 2.4 GHz; Integrated Energy Harvester

## Brief

This datasheet is dedicated for Multi-protocol Wireless Connectivity Module with Integrated Energy Harvester TLSR8273-M-EH.

In this datasheet, key features and application of the TLSR8273-M-EH are introduced.

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## Revision History

Version	Change Description
0.5.0	Initial release

# Table of Contents

1 Overview.....	6
1.1 Block Diagram.....	6
1.2 Key Features .....	7
1.2.1 General Features .....	7
1.2.2 RF Features.....	7
1.2.3 Features of Power Management Module.....	8
1.2.4 Energy Harvesting .....	8
1.3 Applications.....	9
1.4 Pin Layout.....	9

# List of Figures

Figure 1-1 Module Render .....	6
Figure 1-2 Block Diagram of the System .....	6
Figure 1-3 Pin Assignments for TLSR8273-M-EH .....	9

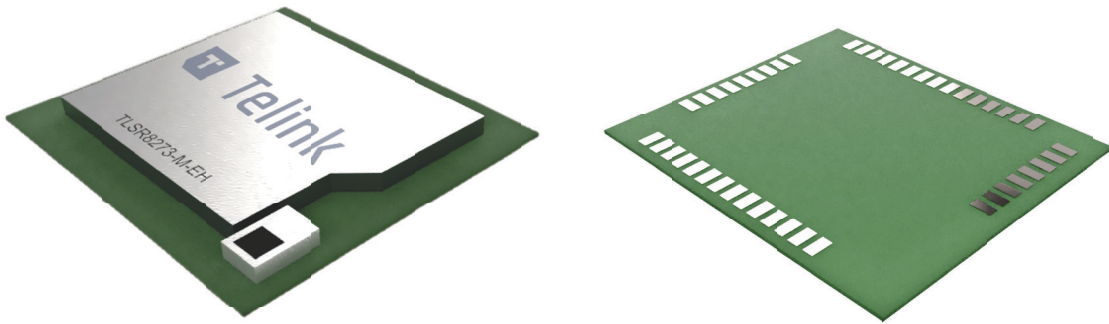
# List of Tables

Table 1-1 Pin Function of TLSR8273-M-EH .....	10
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# 1 Overview

By integrating wireless connectivity and energy harvesting on a compact footprint, this module makes battery-less operation possible for a wide range of power sensitive IoT applications. With a multi-protocol radio, a 32-bit MCU, and embedded memory, it supports various standards in the 2.4GHz ISM band, including Bluetooth® LE, Bluetooth Mesh, RF4CE, and custom protocols. It offers 32 GPIOs, a 14bit ADC with PGA, one quadrature decoder, 6-channel PWM, and other rich interfaces. It also supports high-performance voice processing with AMIC and DMIC interfaces, and stereo audio codec. The module supports multiple battery supply schemes, including alkaline battery, rechargeable battery charged from either USB or integrated Energy Harvester. Moreover, this Energy Harvester supports the use of super capacitors, making the end device battery-less.

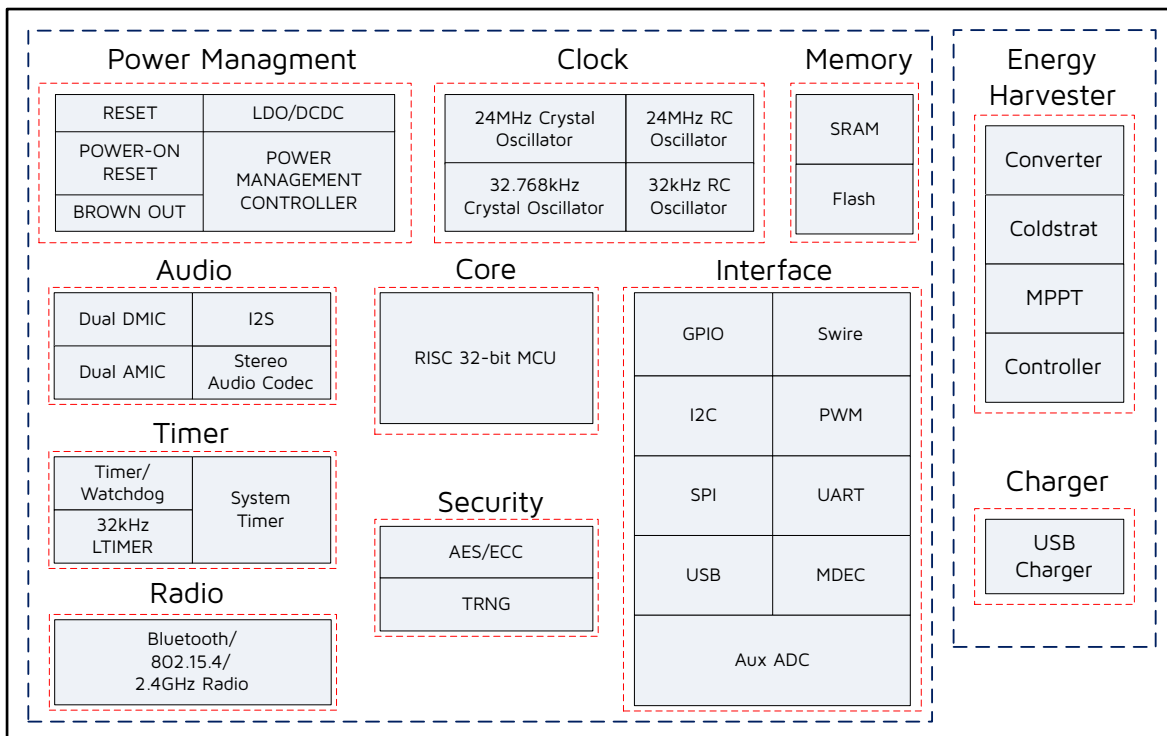
**Figure 1-1 Module Render**



## 1.1 Block Diagram

The system's block diagram is as shown in [Figure 1-2](#).

**Figure 1-2 Block Diagram of the System**



## 1.2 Key Features

### 1.2.1 General Features

General features are as follows:

1. Embedded 32-bit RISC microcontroller
  - Maximum 48 MHz operation frequency
  - CoreMark 1.25/MHz
2. Memory
  - Program memory: 512 KB flash
  - Data memory: 64 KB SRAM with 32 KB retention
3. Rich Set of Interfaces:
  - Up to 32 GPIOs
  - SPI
  - I2C
  - USB 2.0
  - Swire
  - UART with hardware flow control and 7816 protocol support
  - Up to 6 channels of differential PWM
  - IR transmitter with DMA
  - Embedded low power comparator
  - PTA for Wi-Fi coexistence
4. Voice Features:
  - I2S and USB input
  - Dual-channel DMIC
  - Single-channel AMIC
  - Stereo audio output
5. Security:
  - Embedded hardware AES and software AES-CCM
  - Embedded hardware acceleration for Elliptical Curve Cryptography (ECC)
  - Embedded TRNG (True Random Number Generator)
6. Size: 23 mm x 21 mm
7. Operating temperature range: -40°C ~ +85°C
8. Certification:
  - FCC
  - CE
  - BQB

### 1.2.2 RF Features

RF features include:



1. Bluetooth 5.1 compliant
2. Bluetooth LE 1 Mbps, 2 Mbps, Coded PHY, AOA/AOD
3. Bluetooth Mesh
4. IEEE 802.15.4: Zigbee/Rf4CE/6LoWPAN/Thread
5. 2.4GHz proprietary protocols
6. Multi-boot switch and concurrent mode\*
7. OTA upgradable
8. RX sensitivity: -96 dBm @ 1 Mbps mode, -99.5 dBm @ 250 kbps mode
9. TX output power: Up to +10 dBm

### 1.2.3 Features of Power Management Module

Features of power management module include:

1. Supply Voltage:
  - 2.2V-4.5V: Working Mode
  - 0V-2.2V: Cold start mode
2. Supply Source:
  - Primary battery
  - Rechargeable battery: USB or Energy Harvesting
  - Super capacitor: Energy Harvesting plus Cold Start
3. USB Charging:
  - Max current: 200mA
  - Over voltage protection: 2.7V, 3.1V, 3.5V, 4.1V
  - Under voltage protection: 2.2V, 2.5V, 3.4V
4. Current Consumption (25°C):
  - Rx mode: 6.32 mA
  - Tx mode @ 0dBm: 6.73 mA
  - Deep Sleep with 32 KB SRAM retention: 2.5 uA
  - Deep Sleep with 32 KB SRAM retention, with 32K RC oscillator on: 3 uA

### 1.2.4 Energy Harvesting

1. Battery voltage: 0V-4.5V
2. Supports all DC harvesters
3. Support multiple types of batteries & super caps
4. Cold Start active from 0V to 2.2V
5. Cold Start min. voltage: 280mV
6. Cold Start min. power: 15uW
7. Voltage boosting factor: 2x, 4x, 8x, 16x (auto)
8. MPPT (Maximum Power Point Tracking) with superior performance
9. MPPT refresh rate: 1s, 8s
10. User configurable parameters (through HW)

## 1.3 Applications

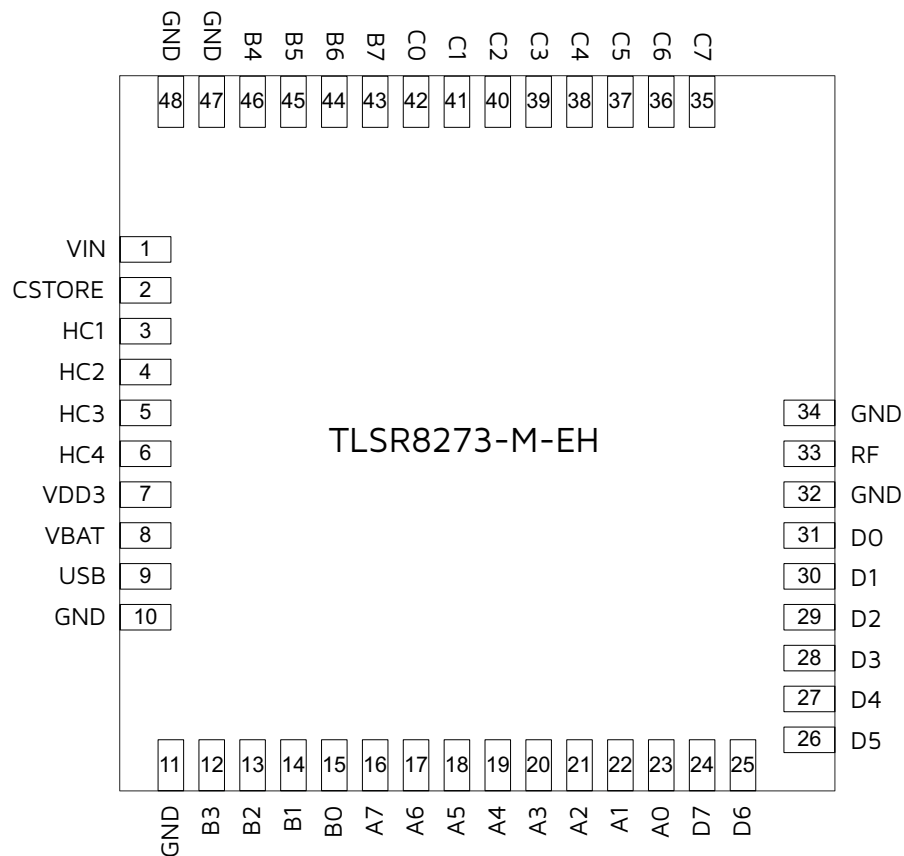
Its typical applications include:

- Remote Control Units - Bluetooth LE, RF4CE, IR, Voice over Cloud
- Wearables - Bluetooth LE
- Electronic Shelf Labels - Proprietary Protocols
- HID - Proprietary Protocols, Bluetooth LE
- Smart Home - Bluetooth LE, Bluetooth Mesh, Zigbee
- Data Transfer - Bluetooth LE
- Health & Wellness - Bluetooth LE, Bluetooth Mesh
- Location Services - RSSI, AOA/AOD

## 1.4 Pin Layout

Pin assignment of TLSR8273-M-EH is shown blow.

**Figure 1-3 Pin Assignments for TLSR8273-M-EH**



Functions of 48 pins for TLSR8273-M-EH are described in [Table 1-1](#).

**Table 1-1 Pin Function of TLSR8273-M-EH**

No	Pin Name	Type	Description
1	VIN	Power	PV CELL
2	CSTORE	CIO	PMU configuration level (high)
3	HC1	CIO	PMU configuration IO
4	HC2	CIO	PMU configuration IO
5	HC3	CIO	PMU configuration IO
6	HC4	CIO	PMU configuration IO
7	VDD3	Power	PMU LDO output voltage
8	VBAT	Power	Module power supply input (rechargeable battery or super capacitor)
9	USB	Power	5V input for internal charger unit
10	GND	Power	Common ground
11	GND	Power	Common ground
12	B3	GPIO	General purpose I/O pins, supporting TX_CYC2PA , UART_RTS , PWM0_N as optional functions
13	B2	GPIO	General purpose I/O pins, supporting RX_CYC2LNA , UART_CTS , PWM5 as optional functions
14	B1	GPIO	General purpose I/O pins, supporting ATSEL2 , UART_TX , PWM4 as optional functions
15	B0	GPIO	General purpose I/O pins, supporting ATSEL1 , UART_RX , PWM3 as optional functions
16	A7	SWS	General purpose I/O pins, supporting UART_RTS , SWS as optional functions
17	A6	GPIO	General purpose I/O pins, supporting DP (SWS) as optional functions
18	A5	GPIO	General purpose I/O pins, supporting DM as optional functions
19	A4	GPIO	General purpose I/O pins, supporting PWM2 , UART_RTS , CK/SCL as optional functions
20	A3	GPIO	General purpose I/O pins, supporting PWM1 , UART_CTS , DI/SDA as optional functions
21	A2	GPIO	General purpose I/O pins, supporting PWM0 , UART_TX , DO as optional functions
22	A1	GPIO	General purpose I/O pins, supporting I2S_CLK ,7816_CLK ,DMIC_CLK as optional functions

No	Pin Name	Type	Description
23	A0	GPIO	General purpose I/O pins, supporting UART_RX, PWM0_N, DMIC_DI as optional functions
24	D7	GPIO	General purpose I/O pins, supporting 7816_TRX/UART_TX, I2S_BCK , SPI_CK/SCL as optional functions
25	D6	GPIO	General purpose I/O pins, supporting ATSELO , UART_RX , CN as optional functions
26	D5	GPIO	General purpose I/O pins, supporting PWM0_N , PWM0 as optional functions
27	D4	GPIO	General purpose I/O pins, supporting PWM2_N , I2S_SDO , SWM as optional functions
28	D3	GPIO	General purpose I/O pins, supporting 7816_TRX/UART_TX, I2S_SDI , PWM1_N as optional functions
29	D2	GPIO	General purpose I/O pins, supporting PWM3 , I2S_LR , SPI_CN as optional functions
30	D1	GPIO	General purpose I/O pins, supporting UART_CTS , TX_CYC2PA as optional functions
31	D0	GPIO	General purpose I/O pins, supporting 7816_TRX, UART_TX, RX_CYC2LNA as optional functions
32	GND	Power	Common ground
33	RF	RF	2.4G RF port, connect the antenna
34	GND	Power	Common ground
35	C7	GPIO	General purpose I/O pins, supporting PWM5_N , ATSEL2 , TX_CYC2PA as optional functions
36	C6	GPIO	General purpose I/O pins, supporting PWM4_N , ATSEL1 , RX_CYC2LNA as optional functions
37	C5	GPIO	General purpose I/O pins, supporting ATSELO , UART_RX , PWM3_N as optional functions
38	C4	GPIO	General purpose I/O pins, supporting PWM0 , UART_CTS , PWM2 as optional functions
39	C3	GPIO	General purpose I/O pins, supporting I2C_SCK , UART_RX , PWM1 as optional functions
40	C2	GPIO	General purpose I/O pins, supporting I2C_SDA, 7816_TRX/UART_TX, PWM0 as optional functions
41	C1	GPIO	General purpose I/O pins, supporting PWM0 , PWM1_N , I2C_SCK as optional functions

No	Pin Name	Type	Description
42	C0	GPIO	General purpose I/O pins, supporting UART_RTS , PWM4_N , I2C_SDA as optional functions
43	B7	GPIO	General purpose I/O pins, supporting UART_RX , SPI_DO , SDM_N1as optional functions
44	B6	GPIO	General purpose I/O pins, supporting UART_RTS , SPI_DI/SDA , SDM_P1 as optional functions
45	B5	GPIO	General purpose I/O pins, supporting PWM5 , SDM_NO as optional functions
46	B4	GPIO	General purpose I/O pins, supporting PWM4 , SDM_PO as optional functions
47	GND	Power	Common ground
48	GND	Power	Common ground