

14 mm x 14 mm antenna reference board for the M24LR04E-R dual interface EEPROM

Introduction

The ANT7-T-M24LR04E is a ready-to-use demonstration board intended to evaluate the M24LR04E-R dual interface Electrically Erasable Programmable Memory (EEPROM), a device featuring an I2C interface that can be operated from an external power supply. The M24LR04E-R is a contactless memory, powered by the received carrier electromagnetic field, organized as 512 bytes in the I2C mode and as 128 × 32 bits in RF mode.

The board (see [Figure 1](#)) features:

- M24LR04E-R dual interface EEPROM
- 14 mm x 14 mm, 13.56MHz dual layer etched antenna
- I2C test points
- Configurable general digital output (RF) toggling during either RF Write in Progress or RF Busy mode
- Energy harvesting analog output pin (EH) available on test point

Figure 1. ANT7-T-M24LR04E board



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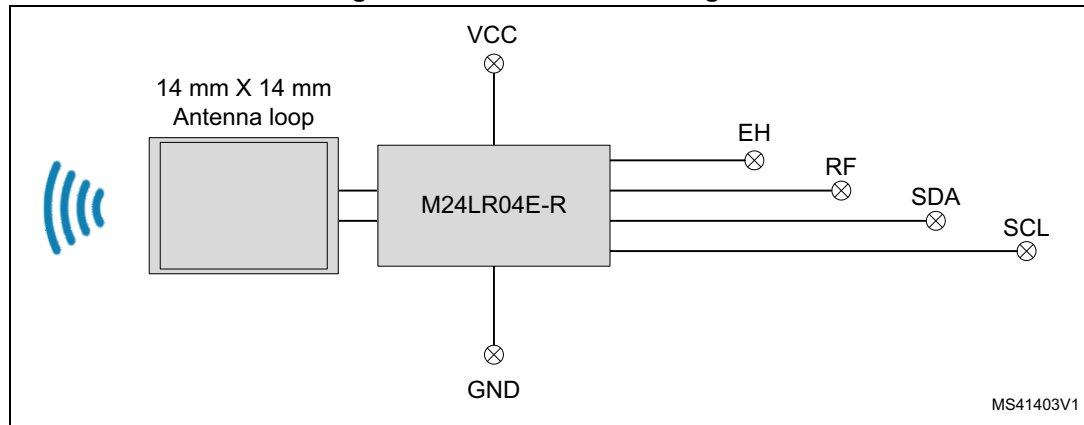
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1 Hardware description

The ANT7-T-M24LR04E (see [Figure 2](#)) contains the M24LR04E-R EEPROM device and a 14 mm x 14 mm, 13.56 MHz dual layer etched antenna.

Figure 2. Functional block diagram



The M24LR04E-R is a dynamic NFC Forum Type 5 Tag – ISO/IEC 15693 with 25 pF internal tuning capacitance. Memory size is 4 Kbits with NDEF support, it can be accessed either by I2C interface or by 13.56MHz air interface.

The tag features a user configurable digital output (RF), toggling during either RF Write in Progress or RF Busy mode.

The M24LR04E-R also provides an Energy Harvesting mode. When activated, the M24LR04E-R delivers the energy in excess coming from the RF field on the Vout analog pin. In case the RF field strength is insufficient or when Energy Harvesting mode is disabled, the Vout pin goes into high-Z state and Energy Harvesting mode is automatically stopped.

1.1 Startup

The ANT7-T-M24LR04E is already programmed with an URI that will automatically redirect to the associated ST webpage.

User has to:

- Enable NFC on the phone (Settings → Wireless and Networks → NFC) and make sure it is also connected to the Internet
- Bring the phone close to the ANT7-T-M24LR04E antenna to be redirected to ST25 webpage.

Various uses of the ANT7-T-M24LR04E with a smartphone are allowed with ST25 NFC Demo application for Android.

To download the application and for more use cases details user should visit the dedicated pages on <https://play.google.com> and www.st.com.

It is also possible to access the M24LR04E-R memory with CR95HF demonstration board and associated PC software, available on www.st.com.

1.2 Using Energy Harvesting pin

The M24LR04E-R provides an Energy Harvesting mode. When activated, the M24LR04E-R delivers the energy in excess coming from the RF field on the Vout analog pin. In case the RF field strength is insufficient or when Energy Harvesting mode is disabled, the Vout pin goes into high-Z state and Energy Harvesting mode is automatically stopped. This output can be used to power devices of an application. It is advised to add a 10 nF capacitor between Vout and GND.

1.3 Using WIP/BUSY pin general purpose output (RF)

The M24LR04E-R features a configurable open drain output RF WIP/BUSY pin (RF) used to provide RF activity information to an external device. It toggles either when RF is busy or when write operation (initiated by RF) is occurring. The WIP/BUSY pin is an open drain output, it then requires a pull-up resistor (20 k Ω) to VCC pin.

1.4 Using I2C pins

The memory is accessible through I2C when it is powered by the VCC pin. I2C clock and data signals are respectively available on SCL and SDA test points. Since I2C is an open drain interface, pull up resistors have to be connected from both lines to VCC.

2 Component description

2.1 M24LR04E-R

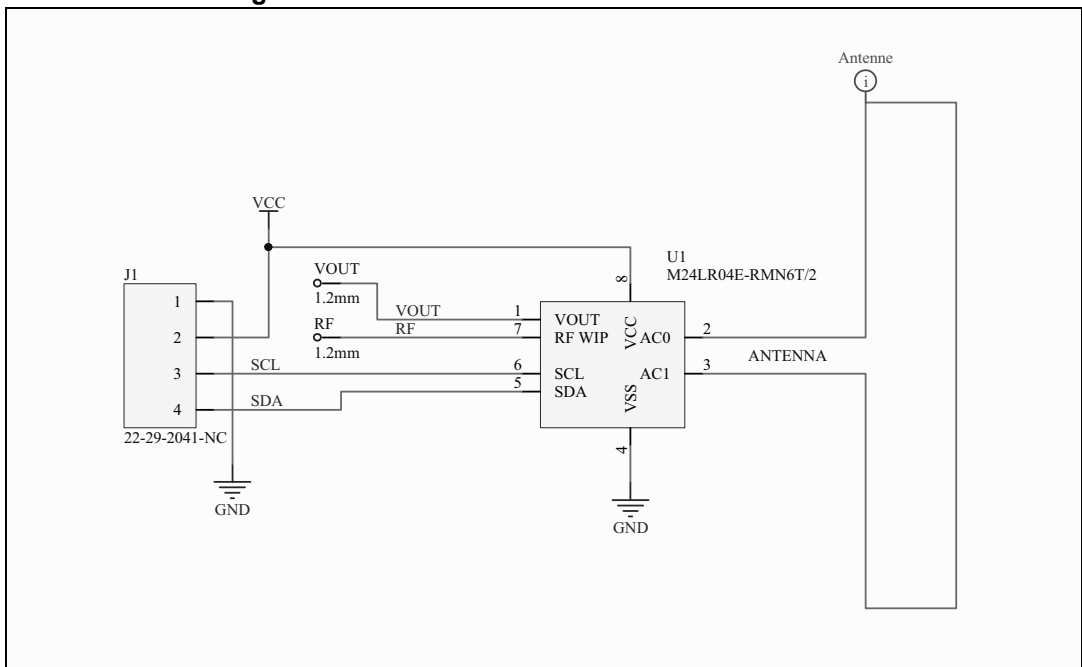
The M24LR04E-R device is a dynamic NFC/RFID tag IC with a dual-interface electrically erasable programmable memory (EEPROM). It features an I2C interface and can be operated from a V_{CC} power supply. The M24LR04E-R features one digital output pad to indicate RF or I2C activity, and an analog output for energy harvesting.

Table 1. M24LR04E-R

Feature	Description
Sales type	M24LR04E-RMN6
Package	SO8N
Operating voltage	2.7 to 5.5 Volts

3 Schematics

Figure 3. ANT7-T-M24LR04E hardware schematics



4 Federal Communications Commission (FCC) and Industry Canada (IC) compliance statements

4.1 FCC Compliance Statement

4.1.1 Part 15.19

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

4.1.2 Part 15.105

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

4.1.3 Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user's authority to operate this equipment

4.2 Formal notices required by the Industry Canada ("IC")

4.2.1 Compliance Statement

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation.

4.2.2 Declaration de Conformité

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

5 Revision history

Table 2. Document revision history

Date	Revision	Changes
28-Apr-2016	1	Initial release.

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