

724-52

MIFARE® Secure OEM Reader Module

Data Sheet

General Description

The 724-52 MIFARE® Secure OEM Reader Module is a fully encapsulated device containing all the electronics required to perform a secure read from a Mifare® Std 1k or 4k card with just the addition of an external antenna. Where user feedback is required external LEDs and a beeper can be connected to form a complete interactive reader.

The reader module is configurable to read data from a designated sector using a designated key. As this data cannot be copied from the Mifare card it provides a secure card read.

Card reader modules are supplied in a factory reset state and are programmed using a configuration card.

The configuration card is prepared using the Secure Card software and the 719-52 Mifare Card programmer. The configuration card specifies the sector number or MAD address and the relevant key of the sector that contains the application data. It also specifies the reader output format and LED and beeper control.

A reader module can be reconfigured at a future date to have a different sector / key but only if the customer's reconfiguration key is known. This prevents malevolent reconfiguration of the reader module.

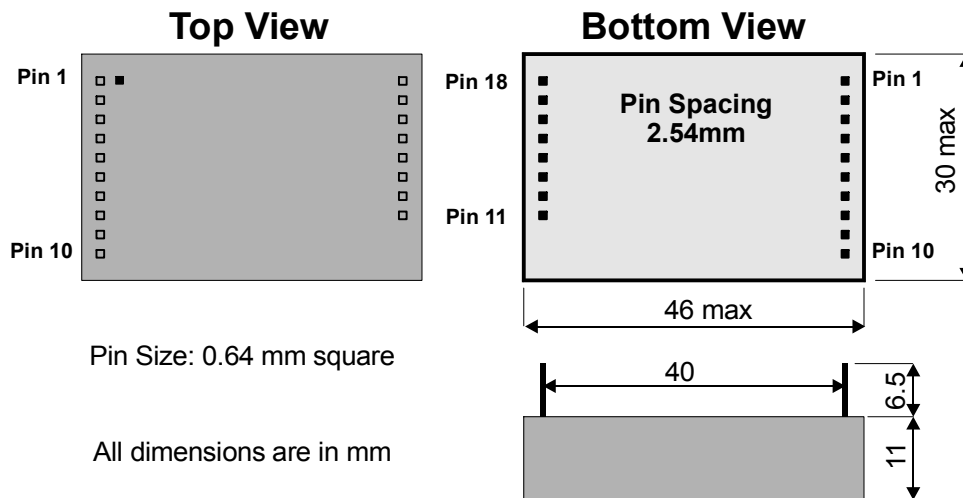
User cards may be created using the 719-52 card programming software.

The reader module has Wiegand, Mag-stripe and RS232 (TTL) outputs and supports a number of formats.

Features

- 5V to 12V operating voltage, current consumption typically 100mA
- Matched for 50 ohm 13.56MHz external antenna
- Supports MIFARE® Std 1k and 4k cards
- Contactless interface to specification ISO/IEC 14443A
- Reads data from 1 block up to 64 blocks (1k card) or 256 blocks (4k card)
- Output formats supported, Wiegand (up to 128 bits), Mag Stripe (up to 20 chars), RS232 TTL levels (baud rates 2400 to 57600)
- Output MIFARE® UID (only RS232 output formats)
- Red, Yellow and Green LED drivers and control
- 4kHz beeper driver and control
- Output may be a single transmission or continuous (whilst card is in the field)
- Read range 20 to 100 mm dependant on external antenna and card type
- Compact size 30 x 46 x 11 mm, weight 30g
- Operating temperature range -20°C to +60°C
- Uses a Philips MIFARE® reader IC

Pinout Description & Dimensions



Pin #	Pin name	Function
1	DETECT ⁷	Idles high and goes low whilst card data is being output. Simulates the 'PRESENT' output for Magstripe output formats.
2	CLOCK/DATA0 ⁷	Outputs card data in selected format (except RS232).
3	DATA/DATA1 ⁷	Outputs card data in selected format (except RS232).
4	RESERVED	Reserved - do not connect.
5	INVERT ^{5,6}	Connect this pin to 0V to invert output on pins 1,2,3.
6	TTL TX ^{1,7}	RS232 (TTL) data output.
7	RED LED ³	RED LED drive, connect to anode and ground cathode.
8	YELLOW LED ³	YELLOW LED drive, connect to anode and ground cathode.
9	GREEN LED ³	GREEN LED drive, connect to anode and ground cathode.
10	RESERVED	Reserved - do not connect.
11	ANT GND ²	External antenna GND connection.
12	ANT TX	External antenna connection.
13	ANT GND ²	External antenna GND connection.
14	RESERVED	Reserved - do not connect.
15	BEEPER	Open collector output for connection to an external beeper.
16	NC	No Connect
17	VCC ⁴	Connect +5V to +12V from power supply.
18	0V	Connect 0V from power supply.

Note 1: TTL TX connects to the internal microprocessor UART and the output is 5V TTL levels suitable for connecting to the application microprocessor UART, if EIA compliant RS232 outputs are required then connect this to a 232 driver IC.

Note 2: These antenna GND's are internally connected, one or both may be connected to the external antenna GND.

Note 3: Includes internal current limiting resistor so no external resistor is required.

Note 4: For voltages less than 5.5V the internal regulator drops out of regulation and any ripple on the external supply is passed through to the module, in these cases it is recommended that the supply ripple be less than 20mVpp.

Note 5: Leave unconnected if INVERT function is not required.

Note 6: Input pin, no protection, take same precautions as for microprocessor GPIO.

Note 7: Output pin, not current limited, max current < 20mA and total for all outputs < 50mA.

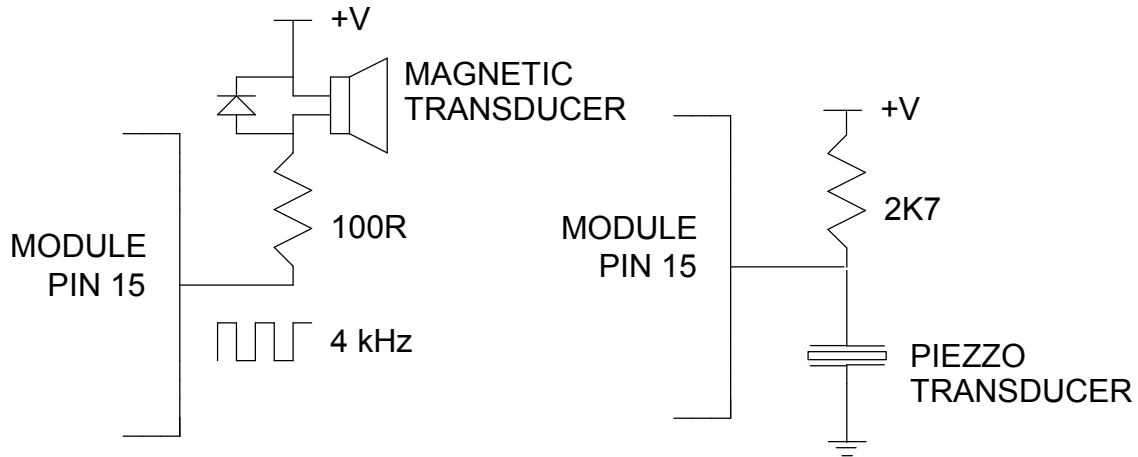
Power Connections

The module can be powered from +5V to +12V. **Do not exceed +12V on this pin.** With voltages below 5.5V the internal voltage regulator drops out of regulation and any ripple on the external supply gets passed through to the module, in these cases it is recommended that the supply ripple be less than 20mVpp.

External Beeper Connection

The module pin 15 (BEEPER) is an open collector output. It outputs a frequency of 4 kHz under beeper control.

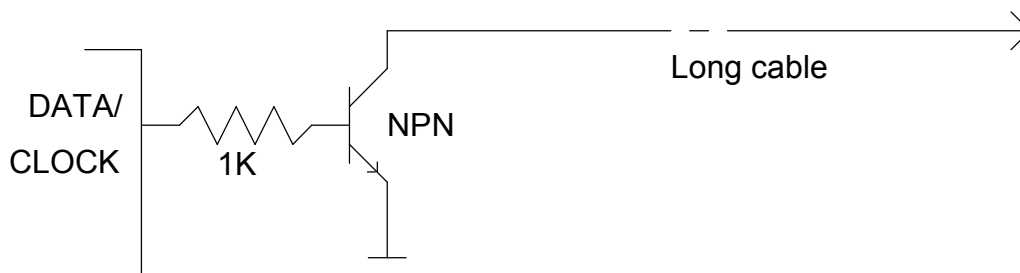
Two suitable beeper circuits are:



INVERT pin

The polarity of DETECT (pin1), CLOCK/DATA0 (pin2) and DATA/DATA1 (pin3) may be inverted by connecting INVERT (pin 5) to 0V.

In most modes the idle level of the signal pins 1,2 and 3 is high. This is acceptable when connecting the module directly to the receiving equipment over a short cable (<15m). However when a long cable exists between module and receiving equipment it is desirable to include an open collector transistor stage between the module and the long cable as shown below:



To ensure that the idle state of the transistor is off, the idle level from the module signal pins must be low. To achieve this connect INVERT to 0V.

Antenna

The module requires an external H field antenna resonant at 13.56MHz and matched to 50 ohms. This usually takes the form of a multiturn (typically 3 turns) inductive loop with parallel resonant capacitor and an 'L' match to 50 ohms. See the application note 'Designing an antenna for the Mifare module' for more information or contact the supplier to supply an antenna to your specification.

RS232 (TTL) output modes

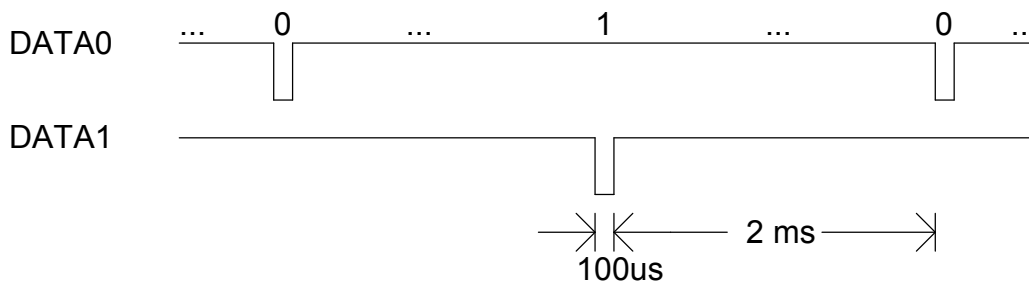
If this output format is configured then the data, exactly as read from the Mifare card in bytes, is output on pin 6 (TTL TX). This output is suitable to connect directly to the UART of a microprocessor. The idle level is high. The baud rate is configurable.

To achieve true RS232 levels the module output should be connected to a level shifter IC (e.g. MAX232).

Wiegand Output Modes

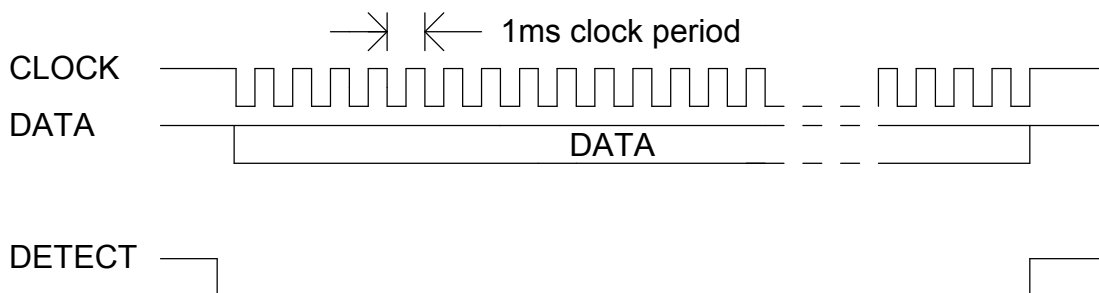
If this output format is configured then the data, exactly as read from the Mifare card, is output on DATA0 (pin 2) and DATA1 (pin 3). Both are normally high.

A binary 1 is represented by a 100 us pulse low on DATA1. A binary 0 is represented by a 100 us pulse low on DATA0. There is a 2 ms inter bit delay.



Clock/Data Mode

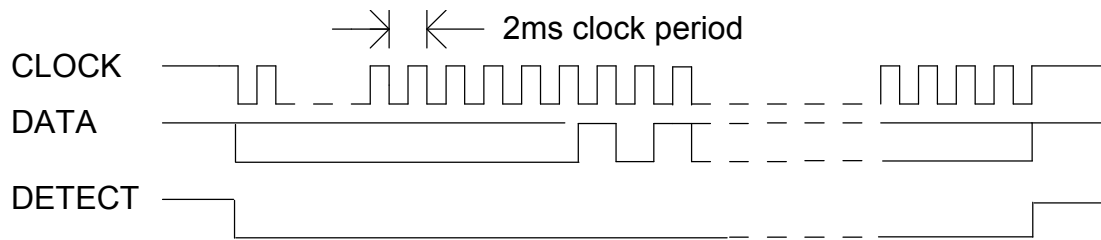
If this output format is configured then the data, exactly as read from the Mifare card, is clocked out on the CLOCK and DATA pins.



Data is set up on the falling edge of the clock and is stable on the rising edge of the clock.

Mag Stripe Modes

In this mode the data, exactly as read from the Mifare card, is clocked out on the CLOCK and DATA pins at 100 characters per second.



Operation

Once configured, the reader will read data stored in a block (or blocks) from a MIFARE card and output this data in a chosen format.

The choice of which sector and block to read, which authentication KEY to use, and which output format to use, is decided by the user. Using the 719-52 Mifare card programmer, a configuration card may be made using the parameters the user has chosen. This card must be presented to the 724-52 reader when it is in the factory reset state. Presenting this card to the reader module will load these settings into the reader module and the reader module is now configured. The Configuration Card may be used on as many reader modules as required. Following is a full list of configurable reader options:

- Sector Number or Mifare Application ID (when card is configured for MAD).
- Block Number within the sector
- Single or multiple blocks (multiple blocks only possible with RS232 outputs)
- Sector Key (must match Key A in the sector trailer for successful authentication)
- Output format (wiegand, magstripe, RS232)
- Continuous or single transmission mode.
- Number of bits to read off the card.
- First bit position
- Red LED flash - none, on good read, on failed read, on both.
- Green LED flash - none, on good read, on failed read, on both.
- Beeper sound - none, on good read, on failed read, on both.
- UID output - none, on good read, on failed read, on both. (Only available In RS232 mode.)
- Allow reconfiguration
- Re-configuration key.

Factory Reset State

A new reader will start in the factory reset state and has the following functionality:

LED Controls

The external red and green LEDs will flash alternatively ON and OFF with a period of 1 second. The LEDs will not respond to any card reading.

Card in Field

The reader will poll a MIFARE card in the field for its UID and if received will attempt to read 'Configuration' data. If the card contains valid configuration data the card's configuration settings will be loaded into the reader which will reset and resume operation in a configured state. Note that all LEDs will be off in the configured state.

Beeper Control

The external beeper will respond with a single 500ms beep if a valid configuration card was read and the settings were accepted.

Configuration Card

Configuration cards can be programmed using the 719-52 Mifare card programmer. A MIFARE Std 1k card is used as a configuration card. The reader uses a factory defined KEY to read the configuration card. To prevent unauthorised re-configuring of readers in the future, the user can do one of two things:

1. Disallow future re-configuration of the reader.
2. Choose a new key to be used for re-configuring the reader.

If you disallow future re-configuration, the reader configuration can only be set back to the factory reset state by reloading the reader firmware.