

**OEM-DES-M900/M901/M902**  
**13.56 MHz OEM RFID Module**  
**Hardware Description**

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## 1 Installation

### 1.1 Reference Documents

Command Protocol and API Description: OEM-DES devices Communication Protocol\_x.yy\_EN.pdf  
Manual of Test/Demo Software: OEM-DES devices Test Software Manual\_x.y\_EN.pdf

### 1.2 Key Features

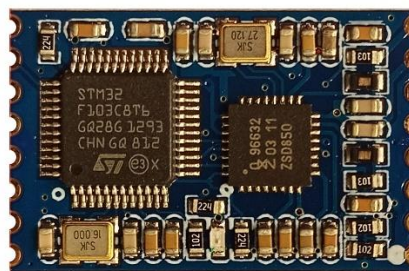
- Adopts ARM MCU solution
- Tiny size, single-face laying components with stamp-holes
- Compliant with ISO14443A/B, ISO15693, ISO18092 Standard
- 3.3 V power supply
- TTL, USB or PC/SC interface

### 1.3 MCU Versions, Core Module Identification

Due to procurement problems on the world market, there are 3 versions of MCU used:

- STM32F103C6T8 (ST Microelectronics), order code OEM-DES-M900-TTL
- APM32F103CBT6 (Geehy Semiconductor), order code OEM-DES-M901-TTL
- GD32F350CBT6 (GigaDevice), order code OEM-DES-M902-TTL

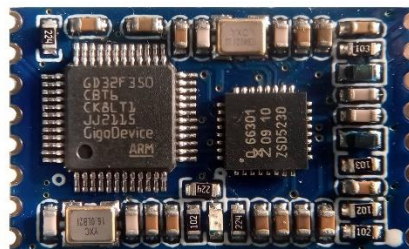
OEM-DES-M900-TTL  
MCU: STM32F103C6T8



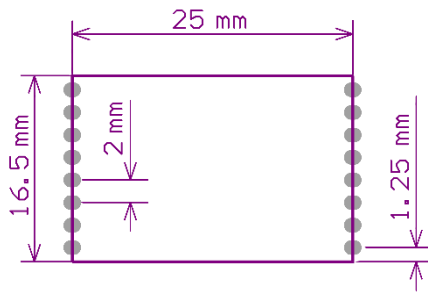
OEM-DES-M901-TTL  
MCU: APM32F103CBT6



OEM-DES-M902-TTL  
MCU: GD32F350CBT6

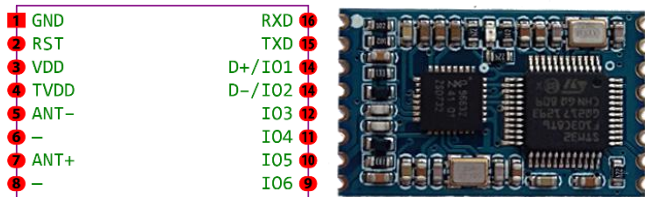


## 2 Dimensions



### 3 Pinouts

#### 3.1 Pinout TTL Version



Pin	Signal	IO Type	Description	μC Pin
1	GND	GND	GND, use this ground pin for power supply	GND
2	RST	Input	Low level reset, connect 10 kOhm pull-up resistor to VDD	RST
3	VDD	PWR	Power supply +3.3 Vdc for μC	VCC
4	TVDD	PWR	Power supply +3.3...5 Vdc for RF IC	—
5	ANT–	Output	RX out, antenna, use this pin and pin 7 for antenna connection	—
6	RFU		RFU, do not connect	—
7	ANT+	Output	RX out, antenna, use this pin and pin 5 for antenna connection	—
8	RFU		RFU, do not connect	—
9	IO6	Output	External LED, active low, open collector	37, PA14
10	IO5	Output	External LED, active low, open collector	29, PA8
11	IO4	Output	A group of IOs used for control full colour RGB LED, active low, open collector	30, PA9
12	IO3	Output		31, PA10
13	IO2	Output		32, PA11
14	IO1	Output	External Buzzer, active high	33, PA12
15	TxD	Output	UART TxD	12, PA2
16	RxD	Input	UART RxD	13, PA3

#### 3.2 Pinout USB or PC/SC Version

Pin	Signal	IO Type	Description	μC Pin
1	GND	GND	GND, use this ground pin for power supply	GND
2	RST	Input	Low level reset, connect 10 kOhm pull-up resistor to VDD	RST
3	VDD	PWR	Power supply +3.3 Vdc for μC	VCC
4	TVDD	PWR	Power supply +3.3...5 Vdc for RF IC	—
5	ANT–	Output	RX out, antenna, use this pin and pin 7 for antenna connection	—
6	RFU		RFU, do not connect	—
7	ANT+	Output	RX out, antenna, use this pin and pin 5 for antenna connection	—
8	RFU		RFU, do not connect	—
9	IO6	Output	External LED, active low, open collector	37, PA14
10	IO5	Output	External LED, active low, open collector	29, PA8
11	IO4	Output		30, PA9
12	IO3	Output		31, PA10
13	USB D–	Data–	USB Interface	32, PA11
14	USB D+	Data+	USB Interface	33, PA12
15	TxD	Output	UART TxD	12, PA2
16	RxD	Input	UART RxD	13, PA3

## 4 EMC Notes

### 4.1 RF Connection

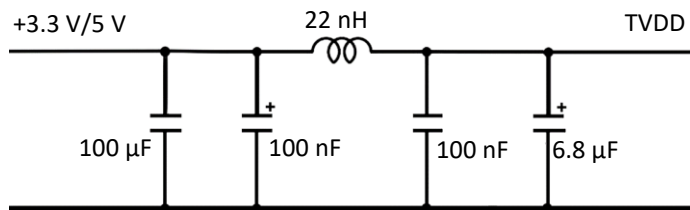
Keep the traces to an RF connection as short as possible.

Do not intermix the supply GND with RF GND. Use the GND connector #5 from the OEM Module.

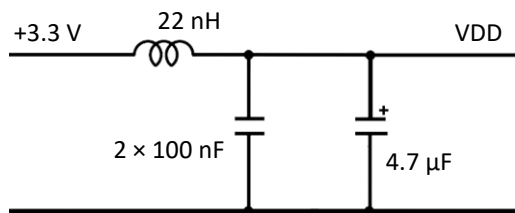
In case you have to fulfil strict EMC regulations, try these filters:

### 4.2 Power Supply

In addition to the capacitors on the core module, you can filter the VDD and TVDD power supply lines with separate C-L-C filters and apply a separate supply voltage (up to 5 Vdc to TVDD, 3.3 Vdc to VDD).

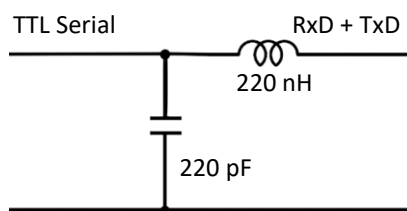


Values taken from the Application Note AN11022.pdf from NXP



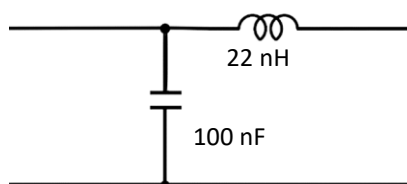
Values taken from the  $\mu$ C Data Sheed from ST Microelectronics

### 4.3 Serial Interfaces



-3 dB point @ 7 MHz

### 4.4 Other IOs (LED, Buzzer, Reset, etc.)



-3 dB Point @ 4.4 MHz

## 5 Different Firmware Behaviour

There are firmware versions available with different behaviour regarding these functions:

Function affected	Behaviour 1	Behaviour 2
Status after power-on	Active, power consumption 18...20 mS	Goes into sleep mode after initialisation, power consumption app 0.11 mA Any state change (rising or falling edge) on RxD or an open RxD pin wakes up the RFID module.
Storage of auto-list card operation mode	Non-Volatile, auto-list card mode setting is stored in Flash memory, cannot be changed too often	Volatile, auto-list card mode setting is stored in RAM, can be changed indefinitely

## 6 Technical Data

### Electrical Specifications

Power Supply	3.3 Vdc for the MCU on Pin VDD 3.3...5 Vdc for the RX IC on Pin TVDD
Power Consumption	< 100 mA, standby current < 1 mA (low power mode)
Operating Frequency	13.56 MHz
Baudrate	9600...115200 bit/s
Antenna	External
Reader IC	NXP CLRC 663
RF TX Speed	up to 848 kBd
Interfaces	TTL, 3.3 V output levels, the input is not 5 V tolerant! USB: PC/SC, HID, VCP
Maximum Output Current	Max. 25 mA on each single output, max 80 mA in total.

### Mechanical Specifications

Dimensions	25 × 16.5 × 2.8 mm
Weight	3 g
Material	FR4, blue

### Environmental Conditions

Operating Temperature	-20 °C ... +80 °C
Storage Temperature	-40 °C ... +85 °C
Humidity	up to 95 %, non-condensing
MTBF	200'000 h

### Supported Standards / Tags

ISO 14443 A and compatible	Read/write: MIFARE® Classic Mini / 1K /4K, MIFARE Ultralight®, MIFARE Ultralight® C, MIFARE® DESFire®EV1, MIFARE® Smart MX, MIFARE® Plus S / X, MIFARE® Pro X, NTAG 21x Read UID only of all other ISO14443A RFID tags
ISO 14443 B and compatible	SRI4K, SRIX4K, AT88RF020, 66CL160S, SR176
ISO 15693 and compatible	EM4135, EM4043, EM4x33, EM4x35, I-Code SLI / SLIX, M24LR16/64, TI Tag-it HF-I, SRF55Vxx (my-d vicinity)
ISO 18000-3 mode 3	I-Code ILT-m

### Applicable Standards

EMC	EN 301489-1:2019-11 (v2.2.3) EN 301489-17:2020-09 (v3.2.4)
Radio Regulation	EN 300330:2017-02 (v2.1.1)
Safety & Health	EN 50581:2012 (valid until 2024-07-07) EN 62368-1:2017-07 EN 62479:2011-09
RoHS 2	EC Guideline 2011/65/EU and amendment 2015/863
REACH	EU Guideline 1907/2006, updated by 2018/2005/EU
Certificates	FCC, CE

SDK Information	
Supported OS	Windows XP, Vista, 7, 8, 8.1, 10
Supported Languages	Binary command protocol, VS2005 C++
Demo Software	Windows

Other functions and details to be continued and upgraded.