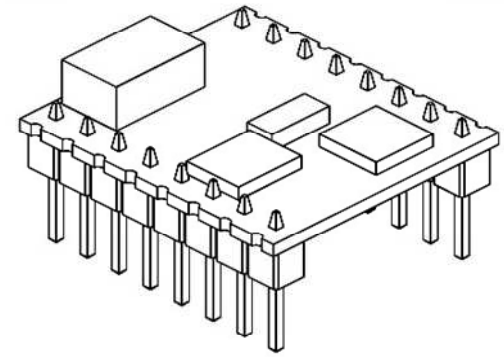
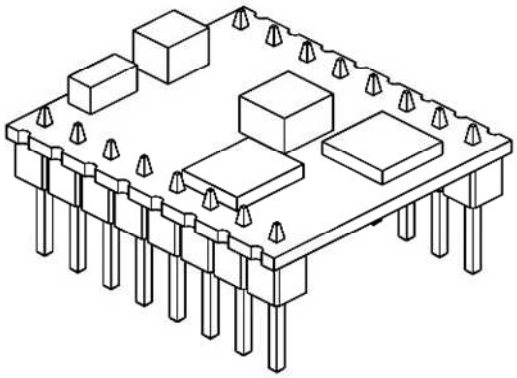
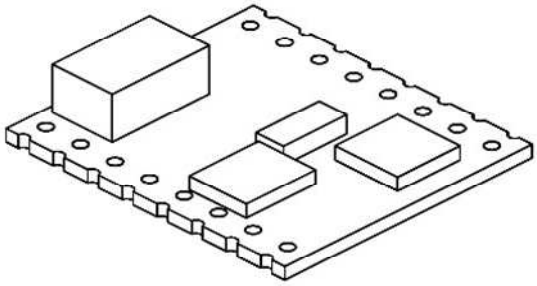
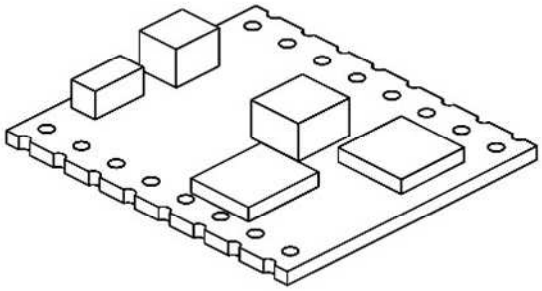
RF-10/20 Series









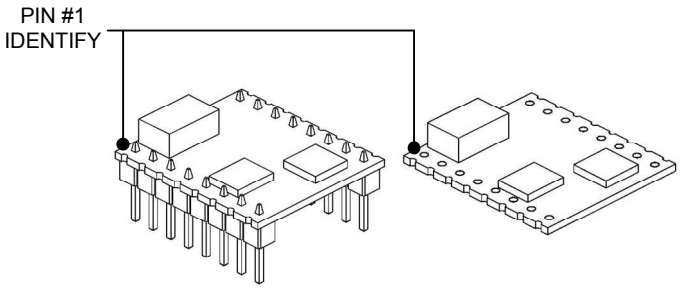
125 KHZ/134.2KHZ/13.56 MHZ Proximity Reader Module User's Manual

GIGA-TMS
PROMAG

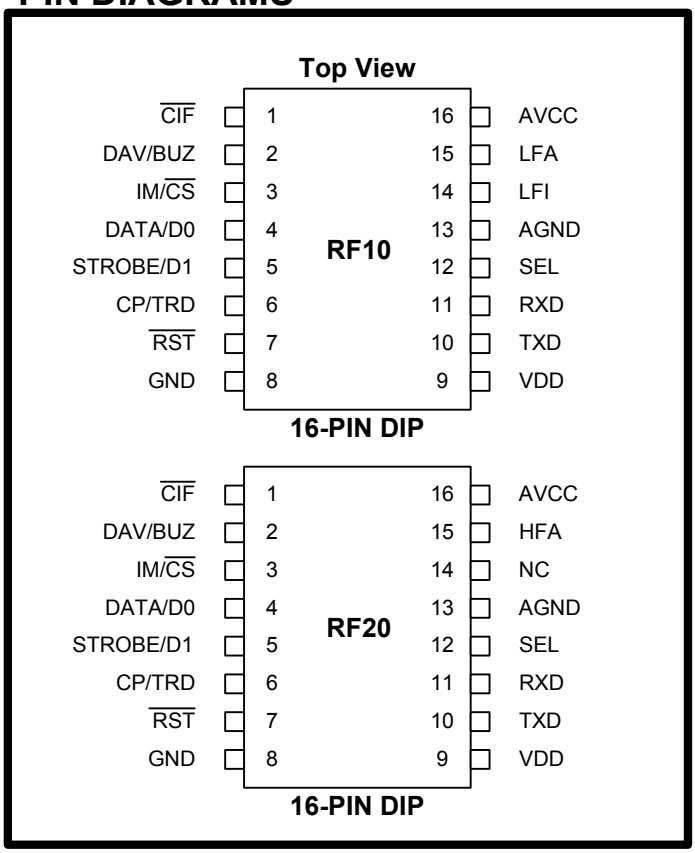
RF10/20
125KHZ/134.2KHZ/13.56MHZ Proximity Reader Module

FEATURES

- Low cost, ultra small outline 21x18x6.8 mm
- Plug-in fitting for 125K/134.2K/13.56Mhz
- Wide operate voltage range (3.3 V ~ 5 V)
- Ultra-Low power consumption 1.5mA @ 3.3V RF10, 2.5mA @3.3V RF20 at intermittent mode.
- Independent RF transmit voltage support up to 12 V for long read range.
- 125KHZ- EM(RF10),134.2KHZ-ISO11784/ISO11785 HDX/FDX(RF10),13.56MHZ-MIFARE UID R/O(RF20) and R/W (RF30)
- Externally programmable RS-232 , ABA TK2 , WIEGAND interface. Programmable SPI*1,I2C*1 interface and other parameter by
- Software.
  Support In-System Programmable and Self Firmware Update
- Provides StartKit (RFxxSK) for Application



PIN DIAGRAMS



APPLICATIONS

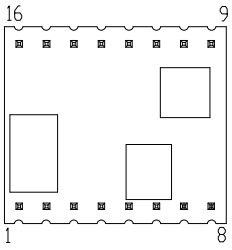
- Access Control System
- Security System
- Time Attendance
- Automatic Equipment
- Point of Sale
- Patrol System
- Portable Battery Device

DESCRIPTION

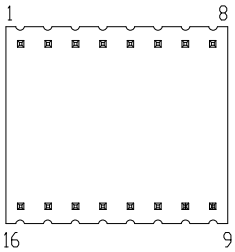
The RFxx is a low cost high performance proximity reader module featuring ultra-low power,very samll dimensions and long range that has been designed specifically for OEM applications. The RFxx feature good read range at 5 volts making it ideally suited to a wide variety of applications, particularly access control. The same basic unit can be configured to output most of the common formats, including RS-232, Wiegand and Magstripe making it easy to upgrade existing installation.The reader generates a 125KHZ/13.56MHz inductive field that extends some way beyond the reader module. When a transponder is placed within the vicinity of the reader module, it draws power from this field and providing the field is of sufficient strength the internal microcircuits contained in the transponder begin to function. Data is transferred from the transponder by means of amplitude modulation in such a manner that the transponder varies the rate at which it draws power from the field in a way that corresponds to the internal identity code programmed in this internal memory. These changes in field power can be detected by the reader and converted back into a copy of the original data.

Note: 1. * SPI and I2C Reserved function

PIN FUNCTIONS



Top View



Bottom View

PIN	PIN NAME	I/O	FUNCTION DESCRIPTION				
			ABA TK2	WIEGAND	UART	SPI	I2C
1	/CIF	O	Card in the field, Active LO				
2	DAV/BUZ	O	--			DAV	--
3	IM/SS	I	Intermittent Mode			SS	--
4	DATA	O	Data	Data 0	--	MOSI	SDA
5	STROBE	O	Strobe	Data 1	--	MISO	--
6	CP/TRD	O	Card Present		TRD	SCK	SCL
7	/RST	I	Reset				
8	GND	P	Power Ground				
9	VDD	P	Digital Power supply				
10	TXD	O	UART output				
11	RXD	I	UART input				
12	SEL	O	Connect GND	Connect VDD	No Connection	Reserved	
13	LFG	P	Antenna Coil Ground				
14	LFI	A	Antenna coil receive input				
15	LFA	A	Antenna Coil Output				
16	VCC	P	RF transmit power supply				

[Note 1] **I** : Input , **O** : Output , **I/O** : Input or Output , **P** : Power , **A** : Antenna Coil
[Note 2] SPI and I2C Reserved function

/CIF (PIN1) :
The Pin is LO, when the card entered in readable distance of reader . Otherwise It is HI.

DAV/BUZ (PIN2) : SPI interface /Buzzer output
The DAV signal is the data available output for the device.This signal is normally low.
2.6kHz signal output from the device (Mark = LO)

IM/SS (PIN3) :
IM connect to VDD is Intermittent mode. Connect to GND is Normal Mode at Wiegand/ABA TK2/UART .The /SS signal is the chip select input for the device at SPI

DATA (PIN4) :
This pin is DATA output pin at ABA TK2 interface. It's DATA0 output pin at Wiegand interface.

CLK (PIN5) :
This pin is STROBE output pin at ABA TK2 interface. It is DATA1 output pin at Wiegand interface.

CP (PIN6) :
This pin is Card Present pin for ABA TK2, WIEGAND, and Transmit / Receive Control Output for UART interface.

/RST (PIN7) :
Reset Pin. Active is LO. internal pull-up provided

GND (PIN8) :
Power Ground

VDD (PIN9) :
Digital power input +3.3V to +5VDC regulated

TXD (PIN10) :
UART output from the device (Mark = HI)

RXD (PIN11) :
UART input to the device (Mark = HI), pulled up internally

SEL (PIN12) :
Programming Pin for output interface.No connection for UART interface output.Connect to Ground for ABA TK2 output. Connect to VDD for Wiegand output.

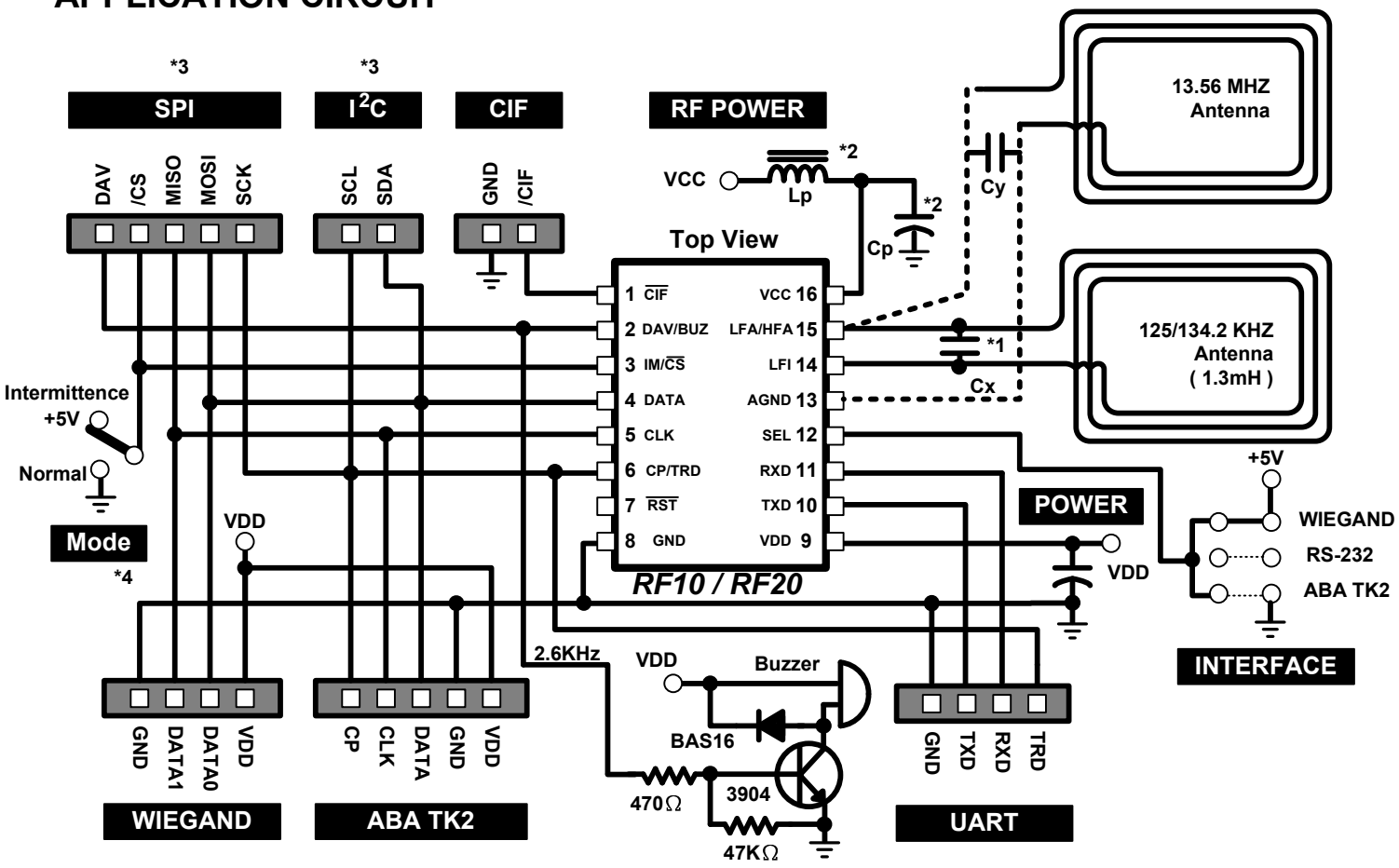
LFG (PIN13) :
RF transmit power ground

LFI (PIN14) :
To tuning capacitor with antenna coil input

LFA (PIN15) :
Antenna coil output

VCC (PIN16) :
RF transmit power input +3.3V to +12VDC regulated

APPLICATION CIRCUIT

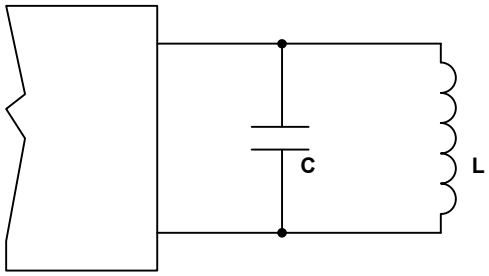


**1 No need Cx for standard version and only using 1.3 mH coil antenna.*
**2 No need Lp , Cp for clear power.*
**3 SPI and I2C Reserved function*
**4 Mode select function only for Wiegand/ABA TK2/UART interface.*

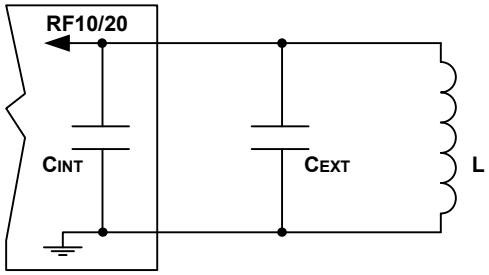
ANTENNA DESIGN FOR PCB

Formula

$$F = \frac{1}{2\pi\sqrt{L\,C}}$$



$$F = \frac{1}{2\pi\sqrt{L\,(C_{INT}+C_{EXT})}}$$

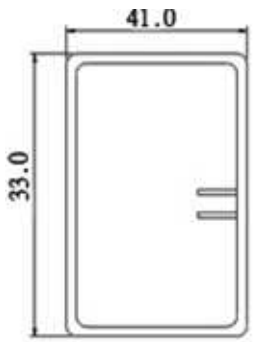


F = 125KHz/134.2KHz/13.56 MHz
CINT : Capacitor at inside of the RFxx
CEXT: Capacitor at outside of the RFxx

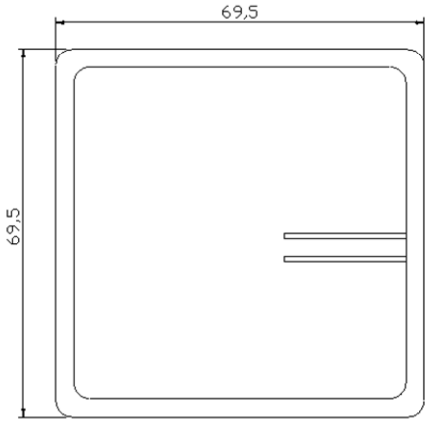
PS: No need CEXT for RF10 standard version and only using 1.3 mH coil antenna.

ANTENNA

ELC-L1-T027

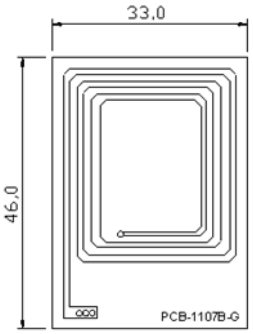


B

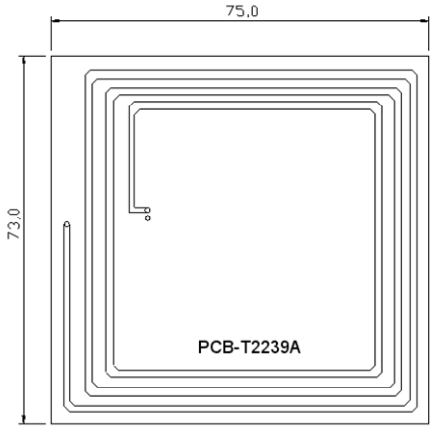


	ANT measure	track width	number of turns	inductance	Q
ELC-L1-T027	33 mm X 41 mm	0.18 mm	133	1.3 mH	50
ANT-T0005	69.5 mm X 69.5 mm	0.4 mm	91	1.3 mH	30

PCB-1107B-G



PCB-T2239A



	ANT measure	track width	track gap	number of turns	inductance	Q
PCB-1107B-G	33 mm X 46 mm	1 mm	0.5 mm	5	0.9 uH	3.5
PCB-T2239A	75 mm X 73 mm	1.5 mm	0.5 mm	3	1.3 uH	6

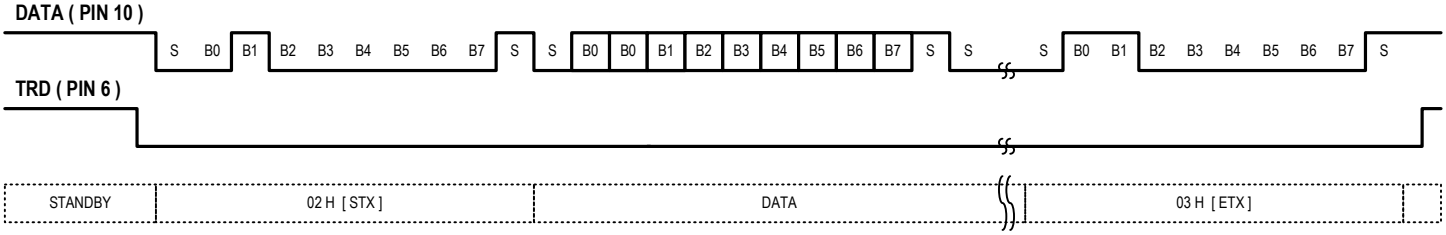
CAPACITOR

Note that the best read ranges are found when the inductance is made slightly more than that required for resonance. Polypropylene, Polycarbonate or Polyphenylene-Sulphide capactitors are recommended. Ensure the tuning capacitors are capable of working continuously at 13.56MHz at the measured AC voltage present on the coil depending on coil Q. Use only low loss capacitors.

Example:
Vendors and part. no. for suitable MLCC ,100pF , 250V capacitors.

Vendors	WWW address	Part. no.
TDK	http://www.component.tdk.com	MLCC C1608C0G2E101J
Walsin	Http://www.passivecomponent.com	MLCC 0805N101J251LT

UART OUTPUT TIMING



*** 19200 Baudrate , No Parity , One stop bit , 8 data bits**

UART DATA STRUCTURE (ASCII)

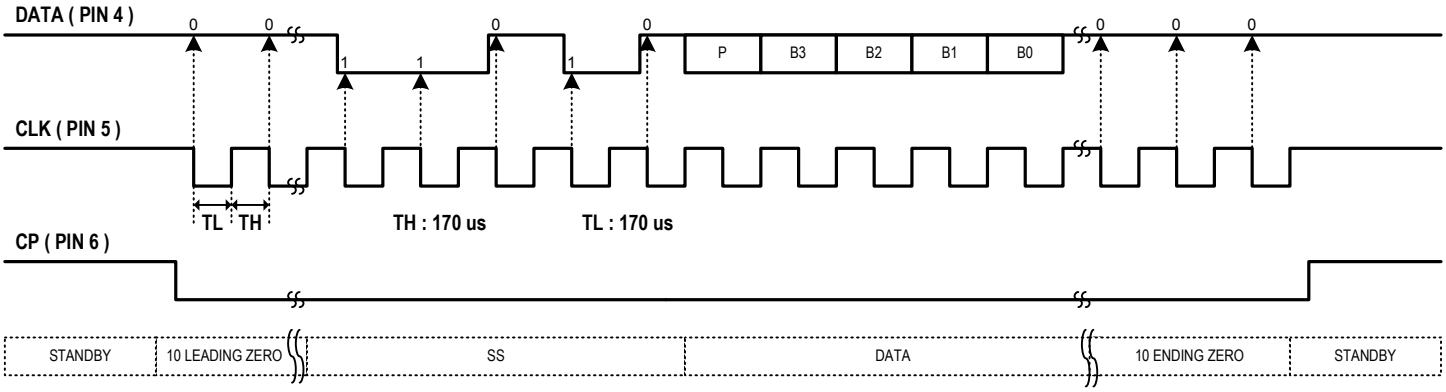
STX (02H)	DATA (ASCII)	CR	LF	ETX (03H)

The start character is factory defined as an "STX" (02H). The CR\LF characters serve to bring the received screen text back to the left hand side and on the line below after the data bytes have been sent. The "ETX" (03H) character denotes the end of current transmission.

DATA DIGITAL FORMAT

Type	Digits	Example
✓ HEX	10	046100058E (ASCII)
DEC	14	$4*16^8+ \ 6*16^7+ \ 1*16^6+ \ 5*16^2+ \ 8*16^1+ \ 14*16^0$ = 00018807260558 (ASCII)

ABA TK2 OUTPUT TIMING



ABA TK2 DATA STRUCTURE

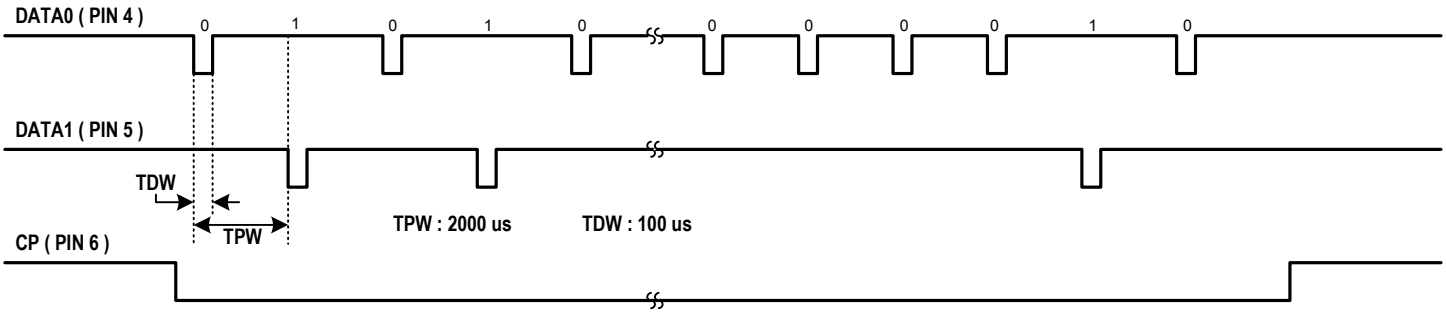
10 leading zeros	SS	DATA	ES	LRC	10 ending zeros

The leading zeros prepare the receiving unit to accept the data. SS is the start sequence consisting of 11010. ES is the end sequence consisting of 11111. LRC is the Longitudinal Redundancy Check character. Lastly there follows trailing zeros.

DATA DIGITAL FORMAT

Type	Digits	Example
HEX	10	046100058E
✓ DEC	14	$4*16^8+ \ 6*16^7+ \ 1*16^6+ \ 5*16^2+ \ 8*16^1+ \ 14*16^0$ = 00018807260558

WIEGAND OUTPUT TIMING



STANDBY	EVEN	bit 23	bit 22	bit 21	.....	bit 4	bit 3	bit 2	bit 1	bit 0	ODD	STANDBY

WIEGAND DATA STRUCTURE

1. 26 Bits Wiegand -

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
P	S	S	S	S	S	S	S	S	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	**P**
P	E	E	E	E	E	E	E	E	E	E	E	E	O	O	O	O	O	O	O	O	O	O	O	O	**P**
SUMMED FOR EVEN PARITY (E)													**SUMMED FOR ODD PARITY (O)**												

P	Parity (Even or Odd) Start Bit and Stop Bit
S	Site Bits from Card or Reader
C	Card Number Bits from Card
SYRDSSW1-W26	Site bits from Card (24bits Card Data)
MSB	Normal 01
LSB	Normal 24

EXAMPLE

0	1	0	1	1	0	0	0	1	0	1	0	1	0	1	1	0	0	0	1	0	0	1	0	0	1

DATA DIGITAL FORMAT

Type	Digits	Example
✓ BIN	- -	1011 0001 0101 0110 0010 0100
HEX	6	B15624
DEC	6	$2^{23}+2^{21}+2^{20}+2^{16}+2^{14}+2^{12}+2^{10}+2^{9}+2^{5}+2^{2}$ = 11621924

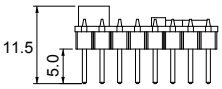
SPECIFICATIONS

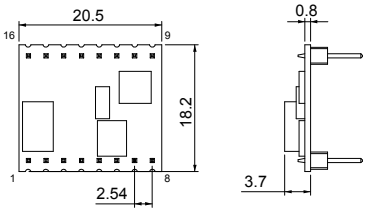
POWER REQUIREMENTS	3.3V - 5 V regulated for Operate Voltage . A linear regulator is recommended. 3.3V - 12 V regulated for RF Power . A linear regulator is recommended.
CURRENT REQUIREMENTS	RF10 : 6 mA AVG @ 3.3V (Normal Mode) 1.5 mA AVG @3.3V (Intermittence Mode) RF20 : 20 mA AVG @ 3.3V / 31mA AVG @ 5.0V (Normal Mode) 2.5 mA AVG @ 3.3V / 4.5 mA AVG @ 5.0V (Intermittence Mode)
INTERFACE	Wiegand ,Magstripe, 19200 Baud Serial ASCII (UART) ,SPI ,I2C or special to customer specifications.
FREQUENCY	125KHz (RF10), 134.2KHz (RF10), 13.56MHz (RF20) standard.
TRANSPONDER	Read Only.
CONFIGURE INTERFACE	UART , 19200 bps 8N1
DIMENSIONS	21 x 18 x 6.8 mm
WEIGHT	< 10 gm
ENVIRONMENT	Operating Temp : -0℃ ~ +60℃ Humidity : 10 ~ 90 % relative

PACKAGE DESCRIPTION

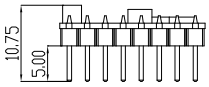
16-lead, 0.600" Wide Dual Inline Package
Dimensions in Millimeters

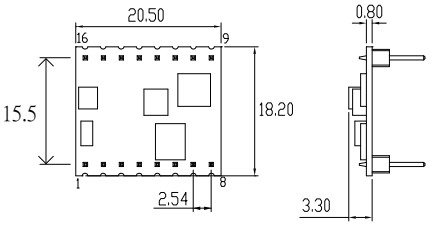
RF10



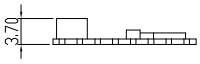


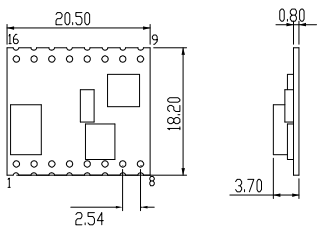
RF20



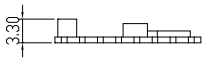


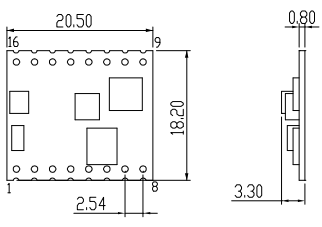
RF10(SMD)





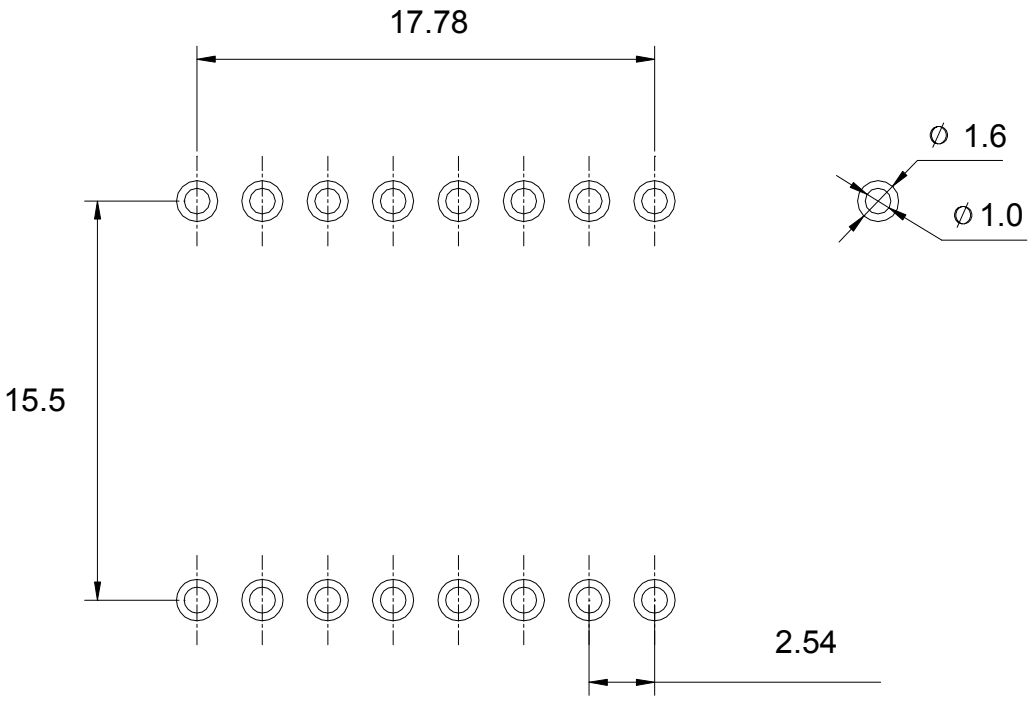
RF20(SMD)





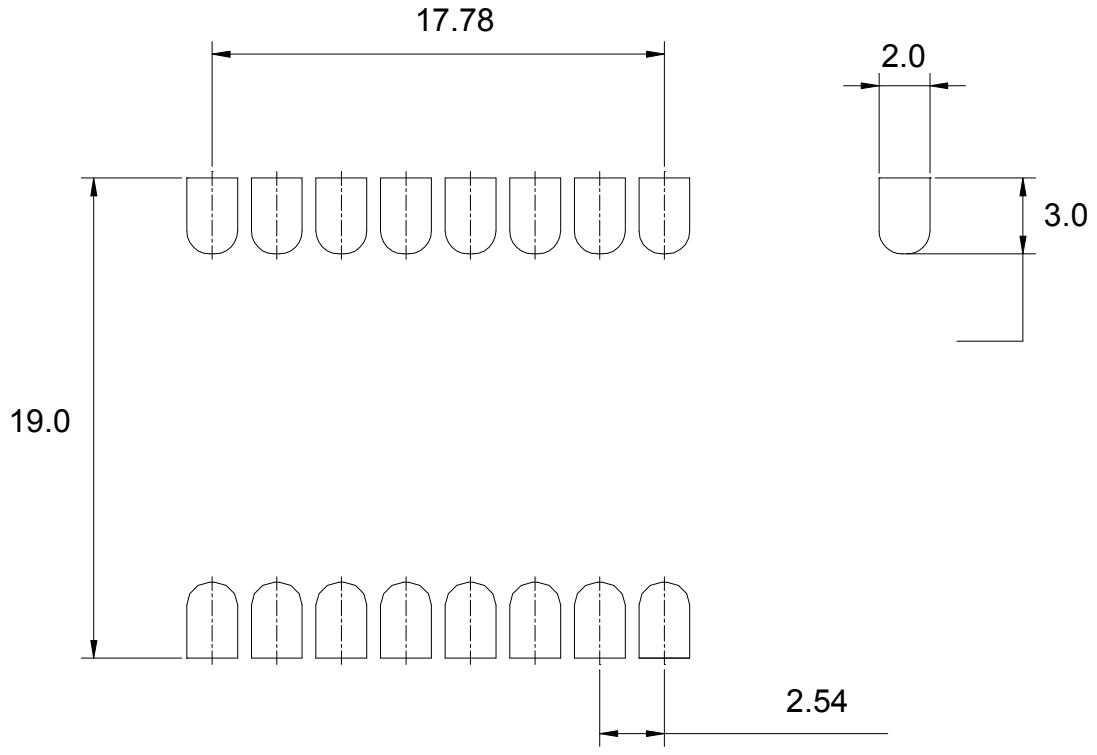
Example Board Layout

DIP

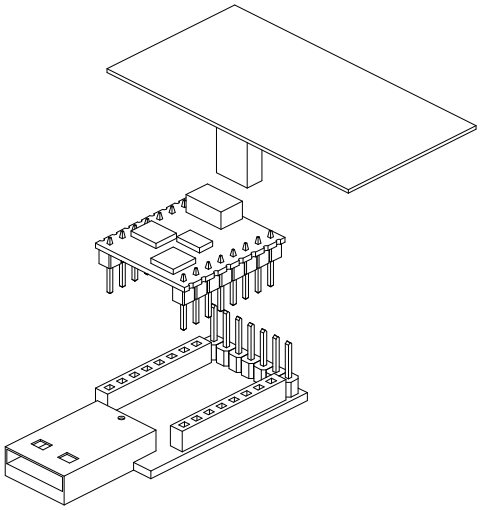


UNIT	TOLERANCE
mm	±0.15mm

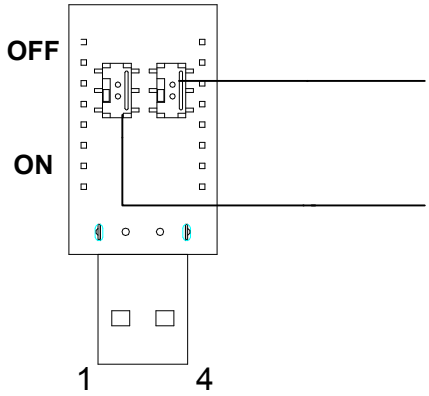
SMT



RF10/20 START KIT



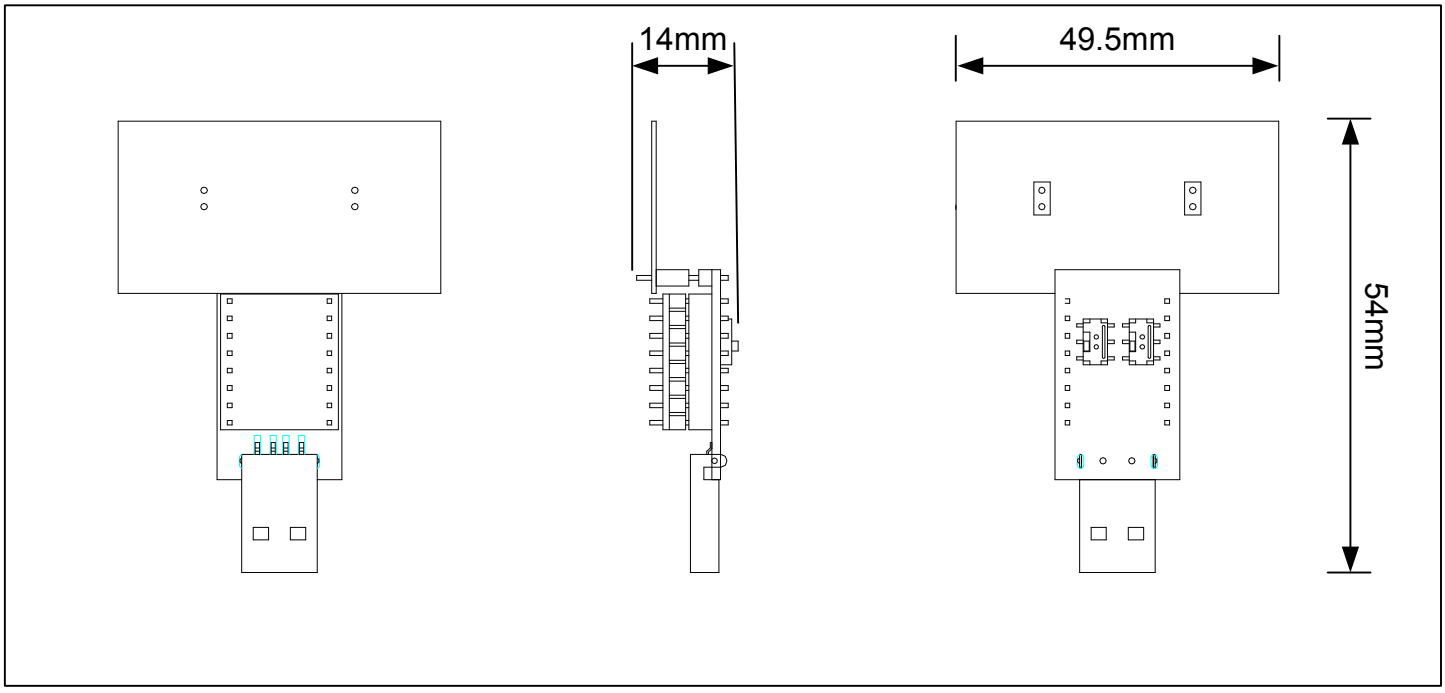
Supply Voltage **Power Consumption**	USB DC 5.0V RF10/20SK-00: 550 mA (Max.) 500 mA (Stand by)
Typical Maximum Read	Range up to 7 cm (Interal Anttena)
Interface **In ideal Conditions**	USB HID(Human Interface Device) 125KHz EM Format for RF10SK-00 13.56MHz Mifare Format for RF20SK-00
Audio/Visual Indication	Internal LED (D1: Read indicator D2: Power indicator)
Dimensions **Weight**	L54x W49.5x H14mm Approx. RF10SK-00: 8.85g Approx. RF20SK-00: 12.55g
Environment	Operating Temp : -10 ~ + 60 Deg.c Storage Temp : -20 ~ + 65 Deg.c Humidity : 10 ~ 90 relative



SW1: POWER SAVE MODE
OFF: NORMAL
ON: INTERMITTENCE

SW2: RF POWER
OFF: EXTERNAL
ON: INTERNAL

1.VDD 2.D- 3.D+ 4.GND



Preliminary