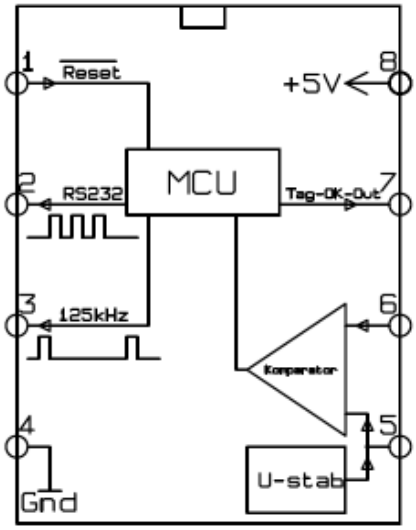
The special function chip SF6107 is a RFID receiver, which is able to decode RFID tags after EM-4102 standard (125khz reading frequency with 40 bit data).
With a pull up or pull down on pin two it is possible to connect the device to a PC or MC. Also the device is able to use it as:

- Stand-alone application (door opener for one master and up to 20 tags)
- RS232 PC connection to transfer the tag id to a PC
- connection of the device to a MC (micro controller)

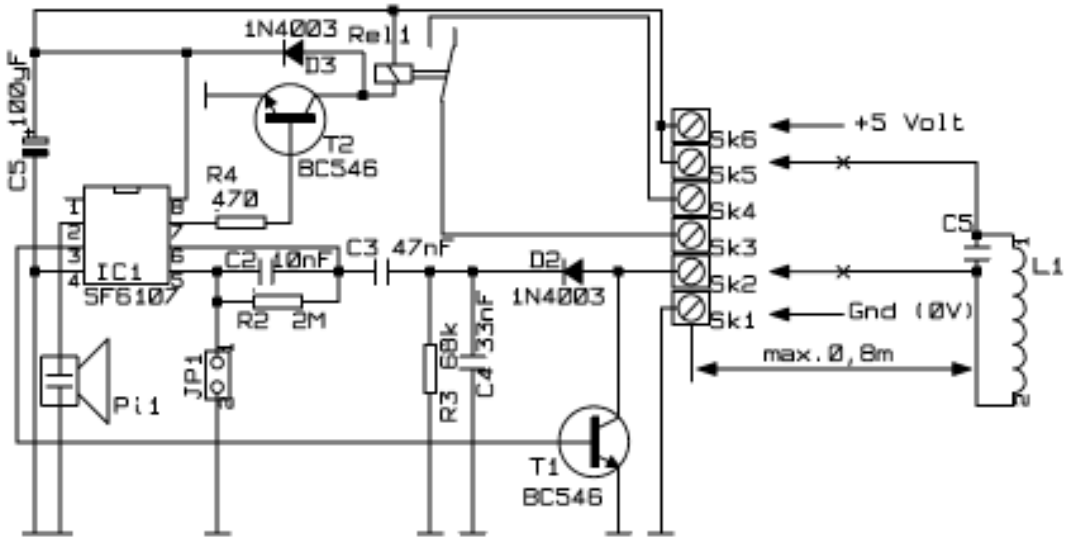


Basic data

- Easy 5 volt supply voltage (on current = 20 mA)
- Only some other electronic parts around the chip
- on PC connection power supply from RS232 or USB
- Internal memory for the master and up to 20 self programmable tags
- Reading distance up to 3 cm
- Setup help for finding resonance frequency of L1/C5
- Maximum wire length between device and circuit up to 0,8m
- Monitor function on pin 2 with a piezoelectric speaker-disk (at tag recognize)
- Output of the Tag-ID with 9600 baud (8N1) to a PC or MC
- On reset output of the number of the programmed tags in memory
- Output of every tag (even if it is programmed in the chip memory or not)

Using of ST6107 in a stand-alone application

picture 2: door opener



Picture 2 shows the circuit with the SF6107 when it works as a door opener. If the chip has recognized a tag, in every case the id will output on pin two to a PC or MC. When this tag was any time before programmed in it's memory (up to 20 are possible), also pin seven is going to a high level.

In this example, the piezoelectric speaker-disk Pi1 is used on pin 2 for a monitoring function. This is ever possible, even a PC or MC is connected on pin 2 or not.

How you can reset the tag memory of the SF6107:

- Switch power off
- Set JP1 (set pin 5 of SF6107 to ground level)
- Switch power on, wait 10 seconds
- Remove jumper JP1 (normal level on pin 5)

How you can program the master tag into the memory:

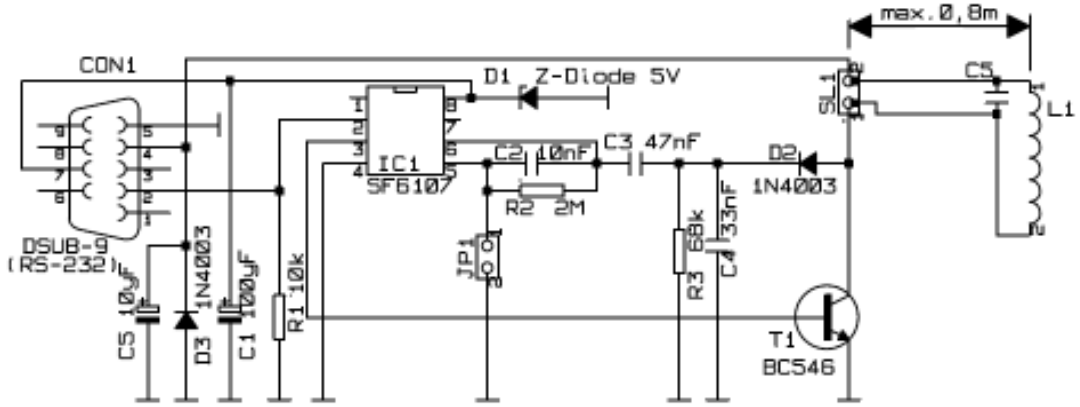
- Tag memory must be clear. If necessary, clear the tag memory (JP1, procedure see at reset of tag memory above)
- The first tag, the chip has recognized, is the master tag

How you can register a new tag into the memory (up to 20 possible):

- Hold the master tag near the coil
- Pin 7 goes to high level
- Hold the master tag for at least 60 seconds near the coil
- Remove master tag
- Now within 20 seconds it is possible to register one or more new tags into the chip memory
- This procedure every time is possible to add new tags

Connecting the ST6107 on a PC (RS 232 or USB)

Picture 3: circuit for using with a PC interface



In the circuit in picture 3 you can see when the SF6107 is connected directly to the RS232 interface of a PC. If the PC or notebook is without a RS232 interface, it is possible to use an adaptor (USB-RS232). The price of it should be less than 15 euro (20$). This adaptor has a dsub-9 connector with the same functionality. After installation of this adaptor on a PC, the delivered driver creates a virtual com port.
The power supply of the unit will deliver from the PC interface. In each case pin 4 and pin 7 of RS232 delivers a current of approximately 10 ma. This was tested at numerous PC's and Notebooks. Also all tested adaptors (USB-RS232) produced enough current.

After the reset the SF6107 is sending immediately on pin 2 with 9600 baud, 8 data bits, no parity, 1 stop bit (an example):

```
#T4
#R00:CC00154423
#R01:CC00154424
#R02:CC00154433
#R03:CC00154434
```

#T4: 4 tags are registered in the SF6107 (1 master, 3 normal tags)
#R00: ID of tag 0 (=master)
….
#R03: ID of tag 3 (no. 3 of 3 normal tags)

After the reset output procedure the SF6107 is in stand-by and waiting for a tag. It scans its entrance constantly and tries to decode a tag. Only if all check bits right and a second read procedure has identified the same tag id, the SF6107 is sending out the recognized id as a hex string on it's pin 2 with 9600 baud (8N1), an example:

CC00154434

The output of the string is repeating until the tag is removed from the coil:

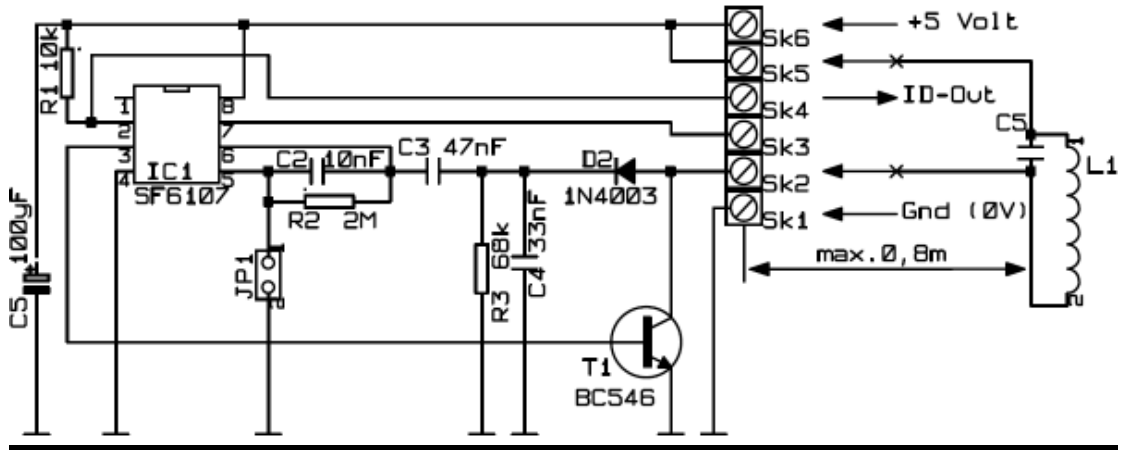
CC00154434
CC00154434
CC00154434
CC00154434
CC00154434

If the recognized tag is a registered one (the tag-id is in the tag memory of the chip), the SF6107 sets its pin 7 to high level until the tag is removed.
The string of the tag-id contents 10 characters (0..9, A..F) and it is terminated with CR/LF (ASCII codes 13/13).
The difference to other information outputs on pin 2 is a '#' (ASCII code 35) at the begin of a new line:

#T4	;in the SF6107 are stored 4 tags (master + 3 tags)
#S7D	;setup is activated (ready to register new tags)
#N09	;tag no. 9 was just registered
#R02xxxxxxxxx	;the just registered tag-id of tag no. 2 is xxxxxxxxx

Connecting the ST6107 on a micro controller

picture 4: circuit for a MC interface (TTL-RS232)



In the circuit in picture 4 the SF6107 is connected to a micro controller. The reset procedure of the SF6107 is scanning pin 2. If high level on pin 2 was found, all RS232 outputs on pin 2 are inverted (TTL-RS232).

Table 1 Absolute maximum ratings

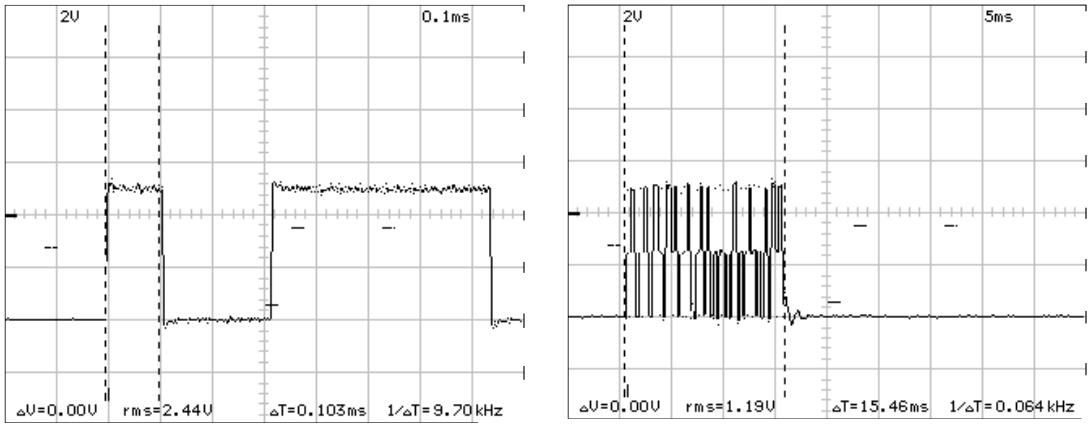
	min	typical	max
Maximum operating voltage (pin 8)	0 V		6 V
operating voltage (pin 8)	4,5V		5,5V
Storage temperature	-65 ℃		150 ℃
Operating temperature	0 ℃		45 ℃
DC current (pins 2, 3, 7)	0		40 mA
P. s. current (without pins 2 and 7)	11 mA	16 mA	18 mA
Power supply current	11 mA	16 mA	27 mA

Table 2 Characteristics

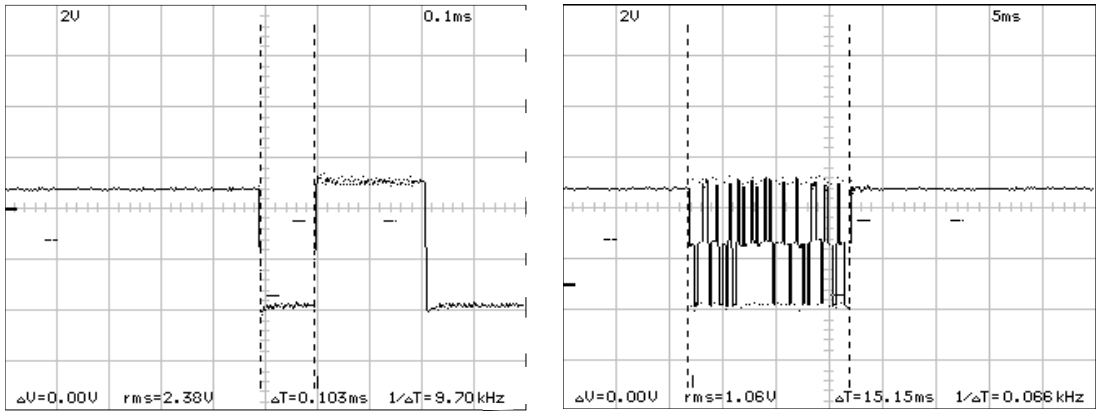
	min	typical	max
DC resonance voltage (on R3/C4)	8 V	10	17 V
Noise level (AC, on C3, f=125kHz)		50 mV	140 mV
AC level (on C3, f<5kHz)	50 mV	200 mV	1,5 V
Capacity of C5	2,2 nF	16 nF	80 nF
Inductance of L1	20 μH	100 μH	737 μH

Waveforms

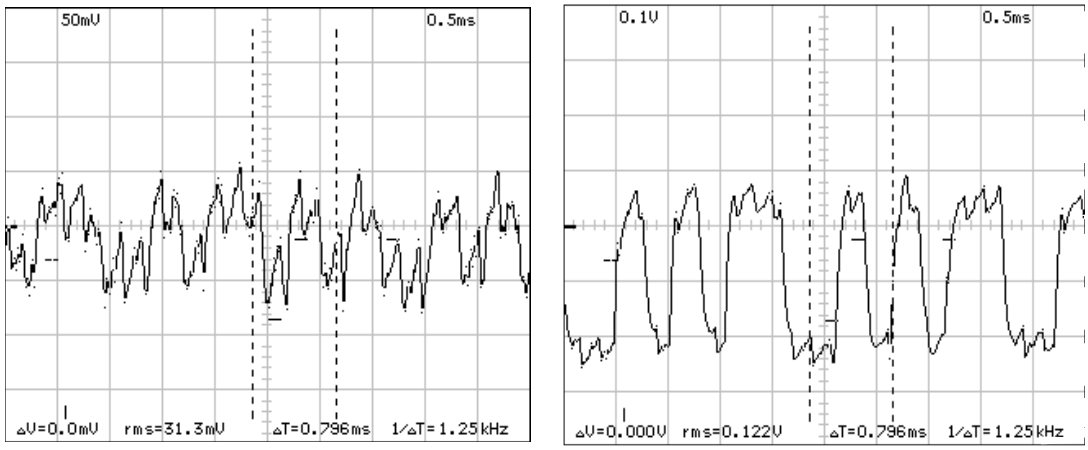
Bild 5: output on pin 2 (PC-RS232)



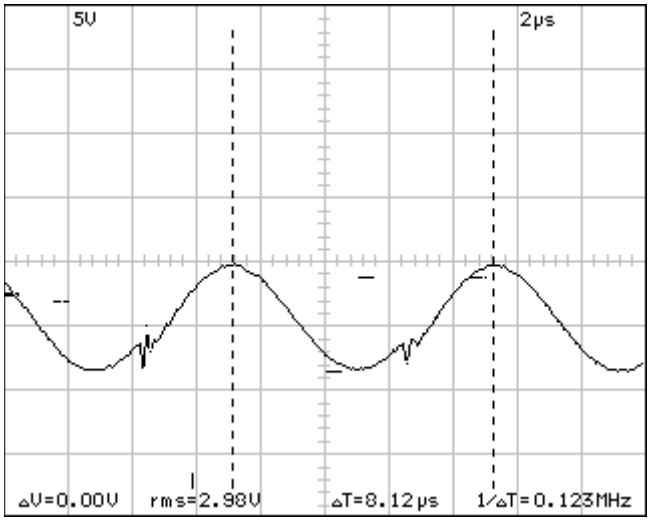
picture 6: output pin 2 (TTL-RS232)



picture 7: Pin 6, distance coil-tag, left 3cm, right 0,5 cm



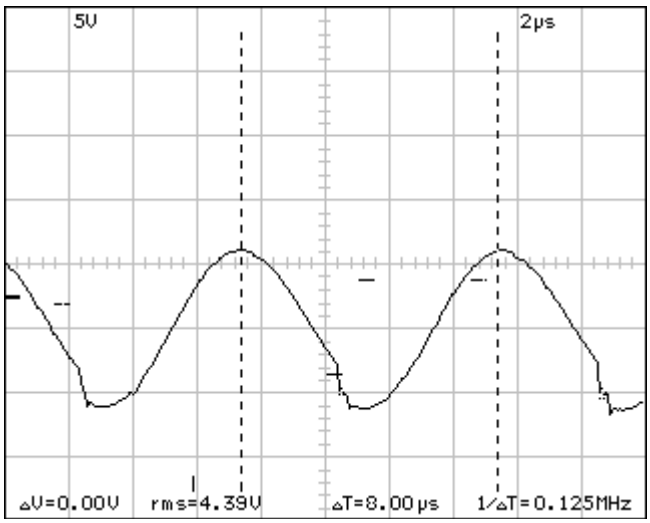
picture 8: collector T1, C5=68 NF, L1=10 windings, diameter 10 cm



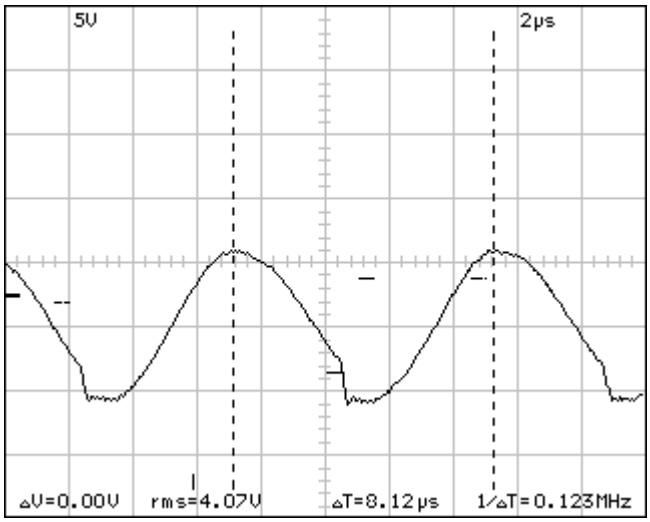
The construction of the resonant circuit (C5/L1) is important for a good reading distance. The proportion between C5 and L1 should be in the right range (see table 2). With 68nF (C5) and 10 windings (L1) the AC-voltage (Vpp) is approximately 8 volt (125kHz). Only a high quality of the resonant circuit (C5/L1) gives a high modulation voltage on C4 when a tag is moved near the coil. The small peek is generated by T1.

picture 9: collector T1, C5=17 nF, L1=30 windings, diameter 6 cm

A better proportion of C5/L1 shows picture 9, with it we get a AC-voltage of more than 11 volt (VPP).



picture 10: collector T1, C5=2,7 nF, L1=100 windings, diameter 6cm



With C5=2,7 nF we get near the same AC-voltage

Tuning of the resonant circuit (C5/L1)

Bild 11

Without any tuning of C5/L1 a recognizing of a tag should be possible. But then we have a very small reading distance. Of course, the resonance should ever be in a range of 75-140 kHz.
If the value of the coil is not unknown, we can compute the value of C5. With such a circuit we will have a good recognizing .

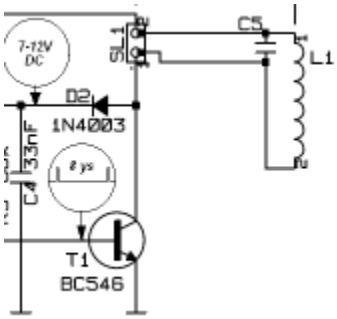


Table 3: possible values of C5/L1

1. Coil L1	2. C5	3. Res. freq..	4. DC on C4
20 W, 0,5mm wire, 6,5 cm	47 nF	123 kHz	9,4 V
30 W, 0,5mm wire, 5,5 cm	17 nF	118 kHz	9,3 V
10 W, 0,5mm wire, 9,5 cm	78 nF	117 kHz	8,4 V
100 W, 0,5mm wire, 3,5 cm	3,4 nF	114 kHz	9,2 V

1. coil (L1): number of windings, diameter of wire, inside diameter of coil
2. Capacity of C5
3. Resonance frequency
4. DC voltage at the measure point D2/R3/C4

If the value of the coil is unknown, it is possible to tune the resonance of the circuit with an easy dc voltage meter . Therefore we are measuring the DC voltage on D2/C4. We can get the resonance point together with the maximum DC voltage (see table 4):

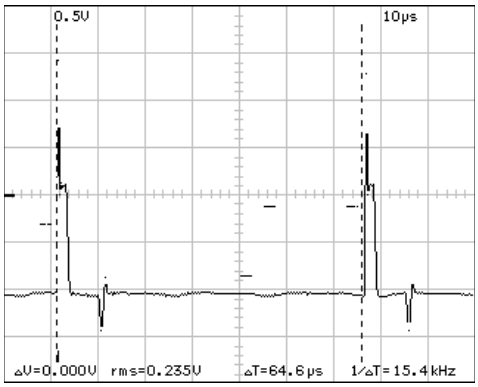
Table 4: DC voltages on D2/C4, coil 30 windings, ∅55mm

C5 (nF)	**F (khz)**	**L1 (µH)**	**DC on C4 (V)**	**tag is recognized**
5	220	100	8,8	no
10	155	100	9,3	no
14	133	100	11,2	yes
15	125	100	11,5	yes
16,5	120	100	9,5	yes
19	116	100	9	yes
23	100	100	7,5	yes
28	92	100	6,3	yes
36	83	100	5,6	yes
47	71	100	5,1	yes
61	62	100	5,0	no

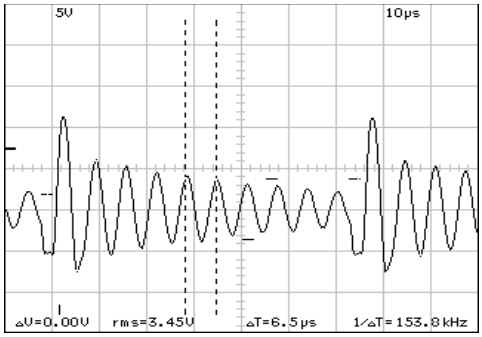
Tuning with an oscilloscope

If an oscilloscope is on-hand, it is possible to switch the SF6107 into a special mode for a better tuning. Therefore jumper JP1 must be set (pin 5 must have low level). After a reset we have an other distance of the pulses on pin 3 of the SF6107 (base of T1), see picture 12. The distance of the pulses is now 64 micro seconds (normal 8).

picture 12



picture 13



Now we can control directly the self oscillation of the resonance circuit. The example in picture 13 shows a frequency of 153,8 kHz.

Computing of L1/C5:

$$L\ (\mu H) = \frac{25}{F\ (MHz)^2 \times C\ (nF)}$$

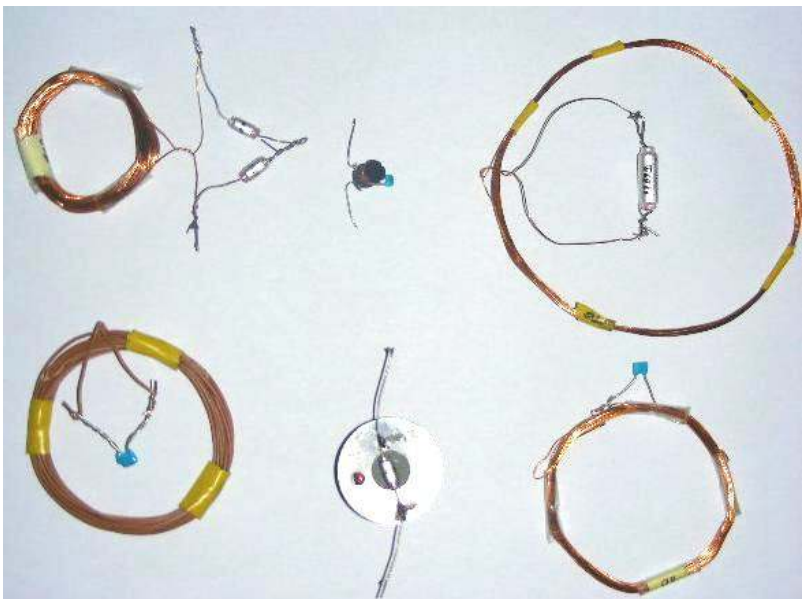
$$C\ (nF) = \frac{25}{F\ (MHz)^2 \times L\ (\mu H)}$$

Possible values of L1 / C5

Table 5: values of C5 and L1 for resonance frequency 125 kHz

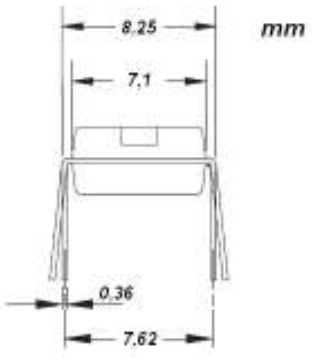
C5 (NF)	L1 in μH
80	20
68	24
47	35
33	50
22	74
16	100
10	160
8	200
6,8	240
4,7	345
2,7	600

Examples of L1/C5

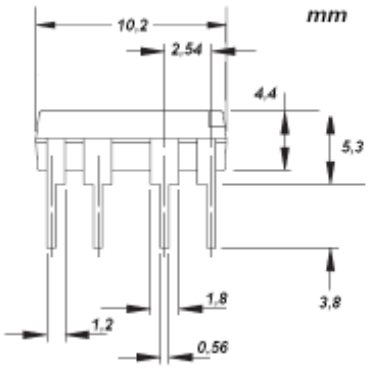


Packaging dimensions SF6107-PDIP)

picture 14

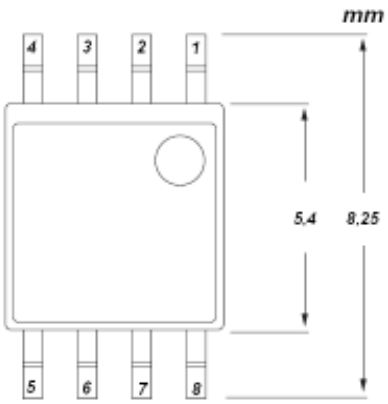


picture 15



Packaging dimensions SF6107-SOIC

picture 16



picture 17