

## General Description

The TH71081 antenna board is designed to optimally match the differential power amplifier output to a loop antenna. The TH71081 board is populated for ASK transmission.

The evaluation board contains a differential-drive loop antenna printed on the PCB (Printed Circuit Board). The size of the loop antenna is matched to the resonant frequency..

Board layout data in Gerber format is available on request.

## Features

- ☐ Fully integrated, PLL-stabilized VCO
- ☐ Flexible frequency range from 850 MHz to 930 MHz
- ☐ ASK achieved by on/off keying of internal power amplifier
- ☐ Wide power supply range from 2.2 V to 5.5 V
- ☐ High over-all frequency accuracy
- ☐ Very low standby current
- ☐ Adjustable equivalent radiated power (ERP) range from -20 dBm to -6 dBm
- ☐ Adjustable current consumption from 6.2 mA to 12.5 mA
- ☐ Differential output well-suited for loop antenna
- ☐ Conforms to EN 300 220 standard

## Ordering Information

### Part No.

EVB71081-868

EVB71081-915

## Applications

- ☐ Keyless car and central locking
- ☐ Low-power telemetry
- ☐ Alarm and security systems
- ☐ General digital data transmission
- ☐ General analog audio signal transmission

### Theory of Operation

#### General

As depicted in Fig.1, the TH71081 transmitter consists of a fully integrated voltage-controlled oscillator (VCO), a divide-by-32 divider (div32), a phase-frequency detector (PFD) and a charge pump. An external loop filter at pin LF determines the dynamic behaviour of the PLL and suppresses reference spurious signals.

The VCO's output signal feeds the power amplifier (PA). RF signal power  $P_o$  can be adjusted in six steps from  $P_o = -15$  dBm to  $+1$  dBm either by changing the value of resistor  $R_1$  or by varying the voltage  $V_{PS}$  at pin PS/DATA. The open-collector differential output (OUT1, OUT2) can be used to either directly drive a loop antenna or to be converted to a single-ended impedance by means of a balanced-to-unbalanced (balun) transformer. For maximum available output power, the differential output should be matched to a load of approx. 1 k $\Omega$ .

Bandgap biasing ensures stable operation of the IC at a power supply range of 2.2 V to 5.5 V.

#### ASK Modulation

The TH71081 can be ASK-modulated by applying data directly at pin PS. This turns the PA on and off and therefore leads to an ASK signal at the output

#### LO Source

Many applications require a stable RF source. For this purpose, the TH71081 can be used without modulation as an easy-to-use, PLL-stabilized, continuous wave (CW) generator.

#### Mode Control Logic

The mode control logic allows two different modes of operation as listed in the following table. The mode control pin ENTX is pulled-down internally. This guarantees that the whole circuit is shut down if this pin is left floating.

ENTX	Mode	Description
0	TX disabled	whole circuit in standby
1	TX enable	TX active

Table 1: Modes of operation

#### Output Power Selection

typical values at  $T_a = 23$  °C and  $V_{cc} = 3$  V:

R1 / k $\Omega$	0	7.5	11	15	24	43
R2 / k $\Omega$	$\infty$	4.7	4.7	4.7	4.7	4.7
$V_{PS}$ / V	$\geq 2$	1.1	0.9	0.7	0.5	0.3
$I_{cc}$ / mA	12.5	9.5	8.5	7.8	7.0	6.2
$P_o$ / dBm	1	-2	-5	-8	-12	-15
$P_{harm}$ / dBm	$\leq -40$	$\leq -40$	$\leq -40$	$\leq -45$	$\leq -45$	$\leq -50$

Table 2: Output Power Selection

If the transmitter is operated at any supply voltage  $V_{cc}$ , the values for  $R_1$  and  $R_2$  can be calculated as follows:

$$R_1 = R_2 \cdot \left( \frac{V_{cc}}{V_{PS}} - 1 \right)$$

For more detailed information, please refer to the latest TH71081 data sheet revision.

## Block Diagram

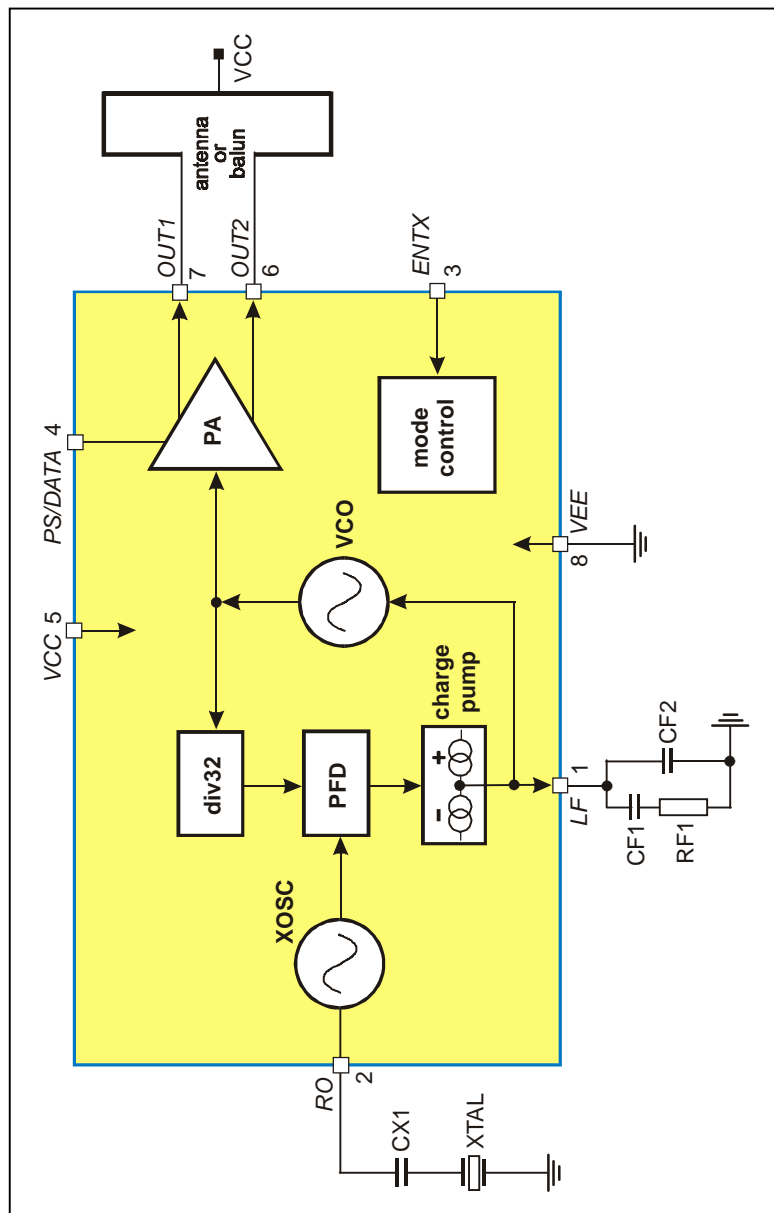
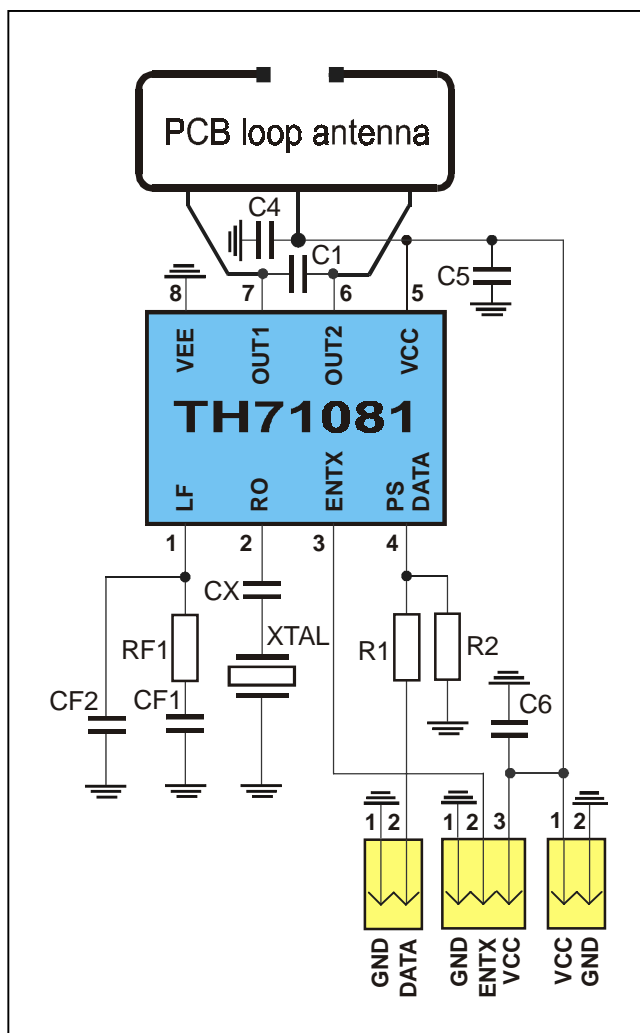
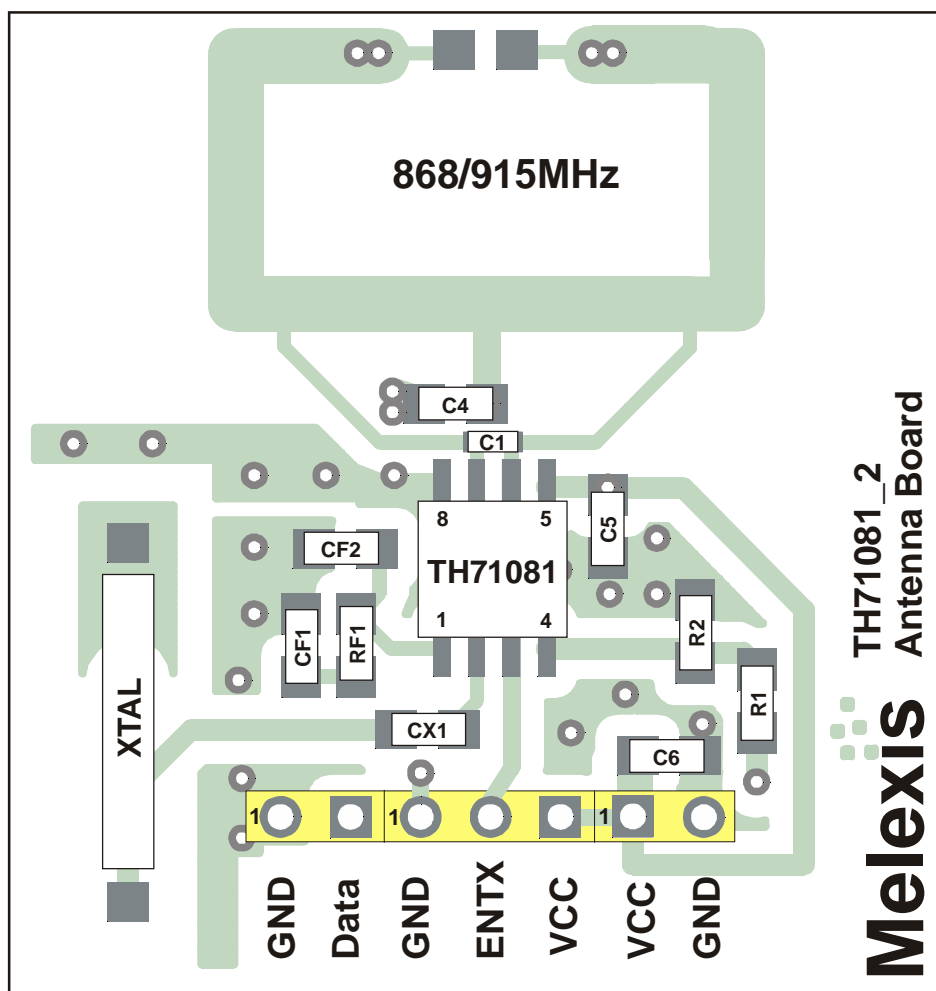


Fig. 1: TH71081 block diagram with external components

*Circuit Diagram*



*PCB Top View*



Board size is 34mm x 36mm

**Board Connection**

<b>VCC</b>	Power supply (2.2 V to 5.5 V)	<b>ENTX</b>	Mode control pin (see table 1)
<b>DATA</b>	Input for ASK data (CMOS)	<b>GND</b>	Several ground pins

### Board Component Values

Part	Size	Value 868.3 MHz	Value 915 MHz	Tolerance	Description
CF1	0805	4.7 nF	10 nF	±10%	loop filter capacitor
CF2	0805	56 pF	56 pF	±10%	loop filter capacitor
CX	0805	82 pF	82 pF	±5%	XOSC capacitor for ASK, trimmed to $f_c$
C1	0603	0.82 - 1.2 pF	0.82 - 1.2 pF	±2%	antenna tuning capacitor
C4	0805	330 pF	150 pF	±10%	blocking capacitor
C5	0805	330 pF	150 pF	±10%	blocking capacitor
C6	0805	220 nF	33 nF	±10%	blocking capacitor
RF1	0805	1.5 k $\Omega$	1.5 k $\Omega$	±10%	loop filter resistor
R1	0805	11 k $\Omega$ see table 2	0 $\Omega$ see table 2	±10%	ASK power-select resistor, not requirement at CW mode
R2	0805	4.7 k $\Omega$ see table 2	NIP see table 2	±10%	ASK or CW mode power-select resistor
XTAL	HC49/S	27.1344 MHz fundamental wave	28.5938 MHz fundamental wave	±30ppm calibration ±30ppm temp.	crystal, $C_{load} = 12$ pF to 15 pF, $C_{0, max} = 7$ pF, $R_{m, max} = 40$ $\Omega$
PCB loop antenna	long side length	20 mm	20 mm		on FR4 PCB material side length including length of C1
PCB loop antenna	small side length	11 mm	11 mm		on FR4 PCB material
PCB loop antenna	Line width	2 mm	2 mm		on FR4 PCB material

NIP – not in place, may be used optionally

The listed component values are default values. All values might be changed to fit to any specific application.

Pads for C1 are for population of a fixed-value capacitor with size 0805 or a to use trimming capacitor either.

## Package Information

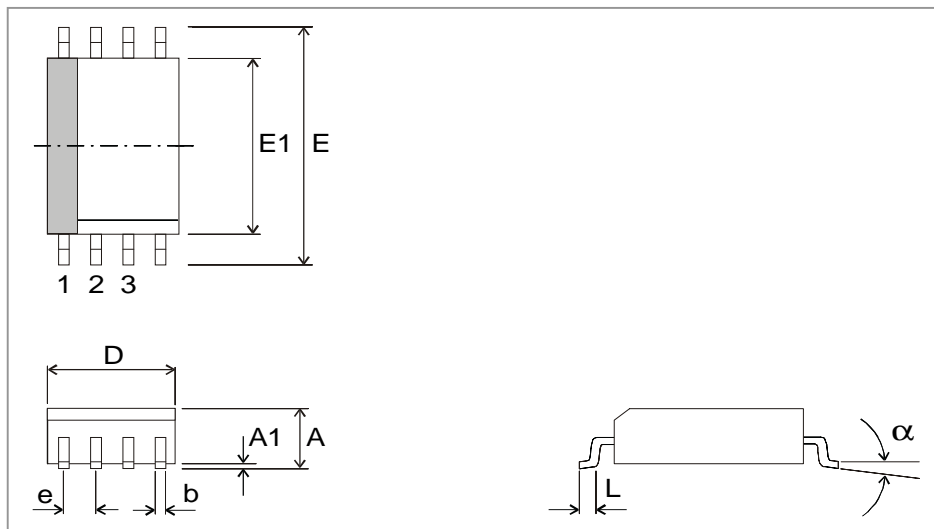


Fig. 2: SOIC8

all Dimension in mm, coplanarity < 0.1mm									
	D	E1	E	A	A1	e	b	L	$\alpha$
min	4.80	3.81	5.80	1.32	0.10	1.27	0.36	0.41	0°
max	4.98	3.99	6.20	1.72	0.25		0.46	1.27	8°
all Dimension in inch, coplanarity < 0.004"									
min	0.189	0.150	0.2284	0.060	0.0040	0.05	0.014	0.016	0°
max	0.196	0.157	0.2440	0.068	0.0098		0.018	0.050	8°

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