

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 Ω .

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 Ω | 0 | 7.5 | 11 | 15 | 24 | 43 |
|------------------|------------|------------|------------|------------|------------|------------|
| R2 / k Ω | ∞ | 4.7 | 4.7 | 4.7 | 4.7 | 4.7 |
| V_{PS} / V | ≥ 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 | ≤ -40 | ≤ -40 | ≤ -40 | ≤ -45 | ≤ -45 | ≤ -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

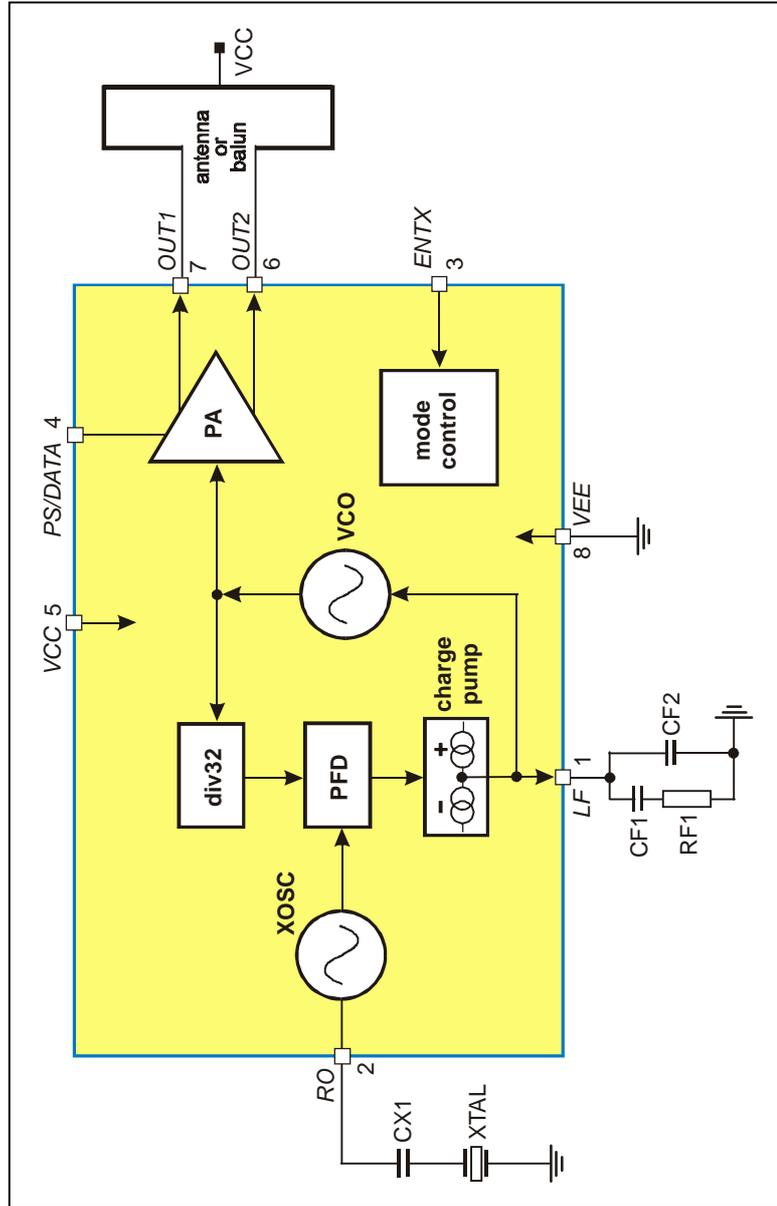
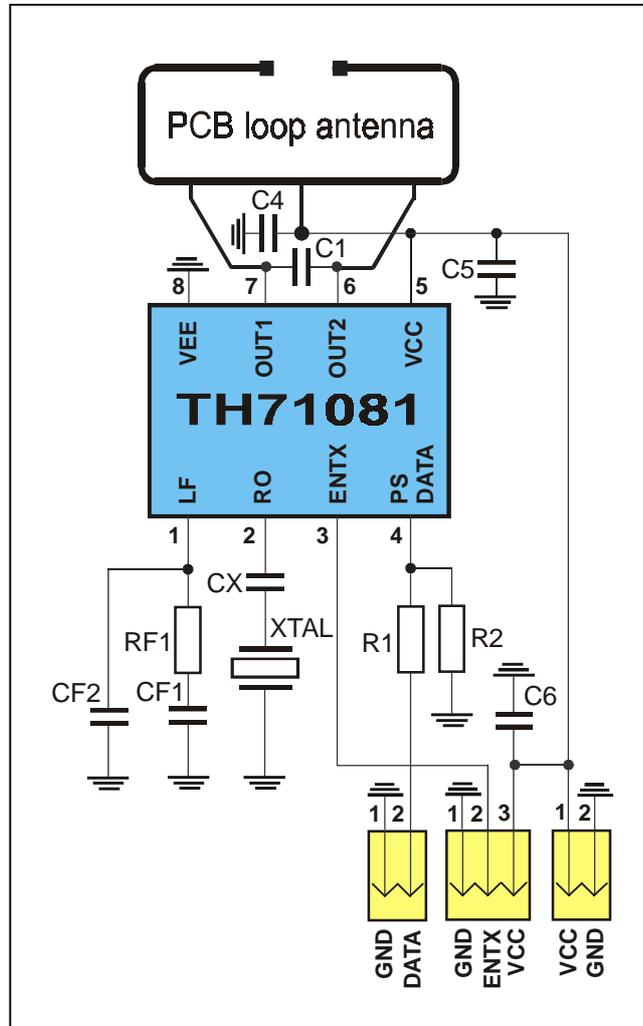
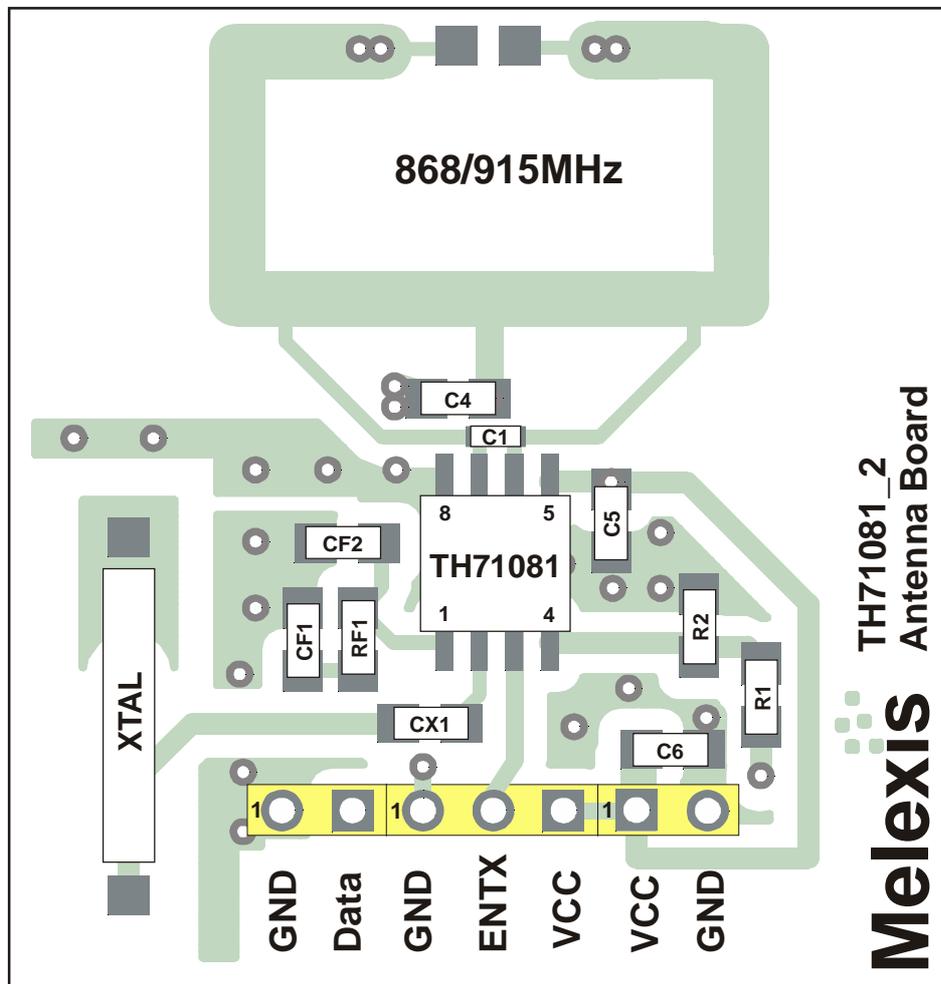


Fig. 1: TH71081 block diagram with external components

Circuit Diagram



PCB Top View



Board size is 34mm x 36mm

Board Connection

| | | | |
|-------------|-------------------------------|-------------|--------------------------------|
| VCC | Power supply (2.2 V to 5.5 V) | ENTX | Mode control pin (see table 1) |
| DATA | Input for ASK data (CMOS) | GND | 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 Ω | 1.5 k Ω | ±10% | loop filter resistor |
| R1 | 0805 | 11 k Ω see table 2 | 0 Ω see table 2 | ±10% | ASK power-select resistor, not requirement at CW mode |
| R2 | 0805 | 4.7 k Ω 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, $R_{m, max} = 40$ Ω |
| 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

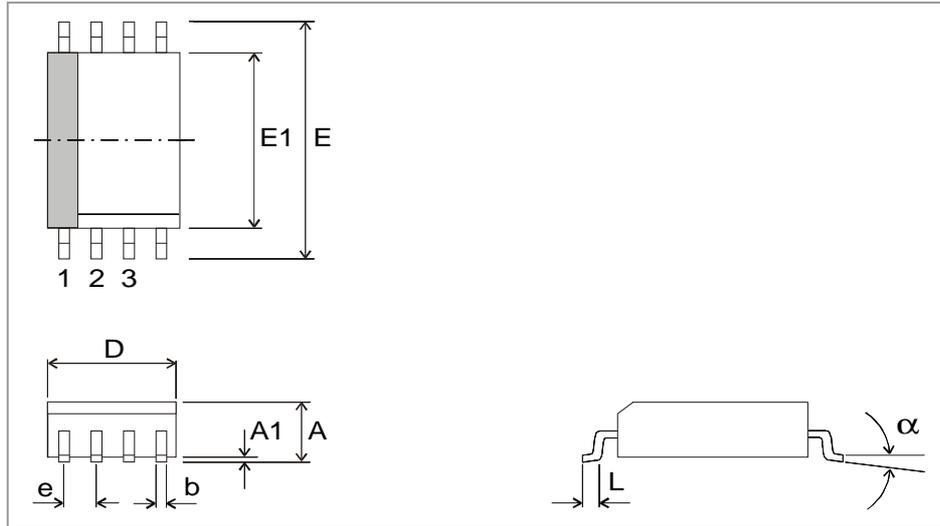


Fig. 2: SOIC8

| all Dimension in mm, coplanarity < 0.1mm | | | | | | | | | |
|---|-------|-------|--------|-------|--------|------|-------|-------|----------|
| | D | E1 | E | A | A1 | e | b | L | α |
| 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° |

Disclaimer

Devices sold by Melexis are covered by the warranty and patent indemnification provisions appearing in its Term of Sale. Melexis makes no warranty, express, statutory, implied, or by description regarding the information set forth herein or regarding the freedom of the described devices from patent infringement. Melexis reserves the right to change specifications and prices at any time and without notice. Therefore, prior to designing this product into a system, it is necessary to check with Melexis for current information. This product is intended for use in normal commercial applications. Applications requiring extended temperature range, unusual environmental requirements, or high reliability applications, such as military, medical life-support or life-sustaining equipment are specifically not recommended without additional processing by Melexis for each application.

The information furnished by Melexis is believed to be correct and accurate. However, Melexis shall not be liable to recipient or any third party for any damages, including but not limited to personal injury, property damage, loss of profits, loss of use, interrupt of business or indirect, special incidental or consequential damages, of any kind, in connection with or arising out of the furnishing, performance or use of the technical data herein. No obligation or liability to recipient or any third party shall arise or flow out of Melexis' rendering of technical or other services.

© 2002 Melexis NV. All rights reserved.

For the latest version of this document. Go to our website at
www.melexis.com

Or for additional information contact Melexis Direct:

Europe and Japan:
Phone: +32 1367 0495
E-mail: sales_europe@melexis.com

All other locations:
Phone: +1 603 223 2362
E-mail: sales_usa@melexis.com

QS9000, VDA6.1 and ISO14001 Certified