

DATA SHEET

TDA5051

Home automation modem

Product specification
Supersedes data of 1997 Mar 11
File under Integrated Circuits, IC11

1997 Sep 19

Home automation modem

TDA5051

FEATURES

- Full digital carrier generation and shaping
- Modulation/demodulation frequency set by clock adjustment, from microcontroller or on-chip oscillator
- High clock rate of 6 bits D/A (Digital-to-Analog) converter for rejection of aliasing components
- Fully integrated output power stage with overload protection
- Automatic gain control at receiver input
- 8-bit A/D and narrow digital filtering
- Digital demodulation delivering baseband data
- Easy compliance with EN50065-1 with simple coupling network
- Few external components for low cost applications
- SO16 plastic package.

APPLICATIONS

- Home appliance control (air conditioning, shutters, lighting, alarms and so on)
- Energy/heating control
- ASK (Amplitude Shift Keying) data transmission using the home power network.

GENERAL DESCRIPTION

The TDA5051 is a modem IC, specifically dedicated to ASK transmission by means of the home power supply network, at 600 or 1200 baud data rate. It operates from a single 5 V supply.

QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|---|----------------------|------|-------|-------|------------|
| V_{DD} | supply voltage | | 4.75 | 5.0 | 5.25 | V |
| $I_{DD(tot)}$ | total supply current | $f_{osc} = 8.48$ MHz | | | | |
| | reception mode | | – | 28 | 38 | mA |
| | transmission mode ($\overline{DATA}_{IN} = 0$) | $Z_L = 30 \Omega$ | – | 47 | 68 | mA |
| | power down mode | | – | 19 | 25 | mA |
| T_{amb} | operating ambient temperature | | 0 | – | 70 | °C |
| f_{cr} | carrier frequency | note 1 | 95 | 132.5 | 148.5 | kHz |
| f_{osc} | oscillator frequency | | 6.08 | 8.48 | 9.504 | MHz |
| $V_{o(rms)}$ | output carrier signal on CISPR16 load (RMS value) | | 120 | – | 122 | dB μ V |
| $V_{i(rms)}$ | input signal (RMS value) | | 66 | – | 122 | dB μ V |
| THD | total harmonic distortion on CISPR16 load with coupling network | | – | –55 | – | dB |
| Z_L | load impedance | | 1 | 30 | – | Ω |
| BR | baud rate | | – | 600 | 1200 | bits/s |

Note

1. Frequency range corresponding to the EN50065-1 band. However the modem can operate at any lower oscillator frequency.

ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | |
|-------------|---------|--|----------|
| | NAME | DESCRIPTION | VERSION |
| TDA5051T | SO16 | plastic small outline package: 16 leads; body width 7.5 mm | SOT162-1 |

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BLOCK DIAGRAM

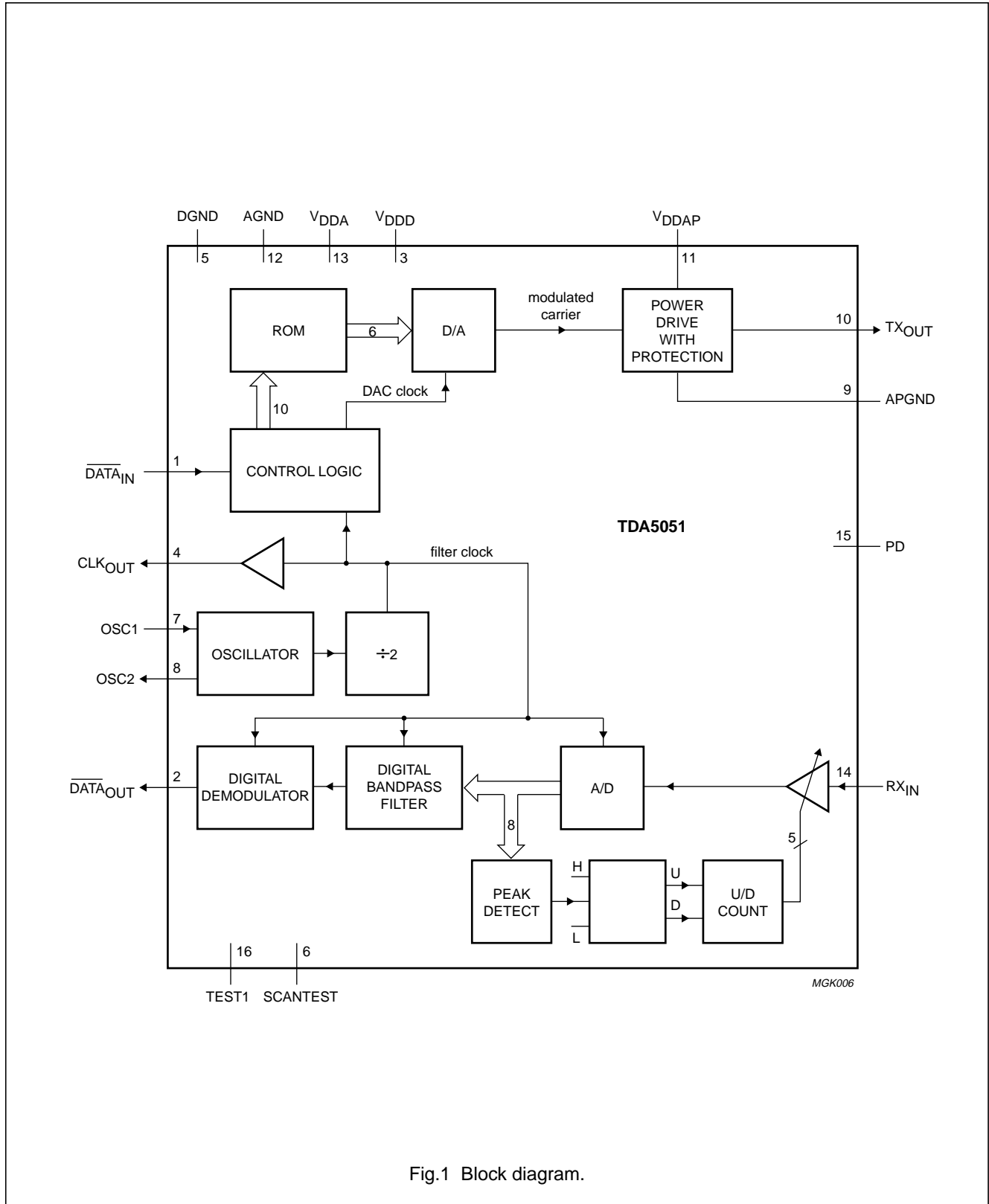


Fig.1 Block diagram.

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PINNING

| SYMBOL | PIN | DESCRIPTION |
|---------------------------------------|-----|---|
| $\overline{\text{DATA}}_{\text{IN}}$ | 1 | digital data input (active LOW) |
| $\overline{\text{DATA}}_{\text{OUT}}$ | 2 | digital data output (active LOW) |
| V_{DDD} | 3 | digital supply voltage |
| CLK_{OUT} | 4 | clock output |
| DGND | 5 | digital ground |
| SCANTEST | 6 | test input (LOW in application) |
| OSC1 | 7 | oscillator input |
| OSC2 | 8 | oscillator output |
| APGND | 9 | analog ground for power amplifier |
| TX_{OUT} | 10 | analog signal output |
| V_{DDAP} | 11 | analog supply voltage for power amplifier |
| AGND | 12 | analog ground |
| V_{DDA} | 13 | analog supply voltage |
| RX_{IN} | 14 | analog signal input |
| PD | 15 | power-down input (active HIGH) |
| TEST1 | 16 | test input (HIGH in application) |

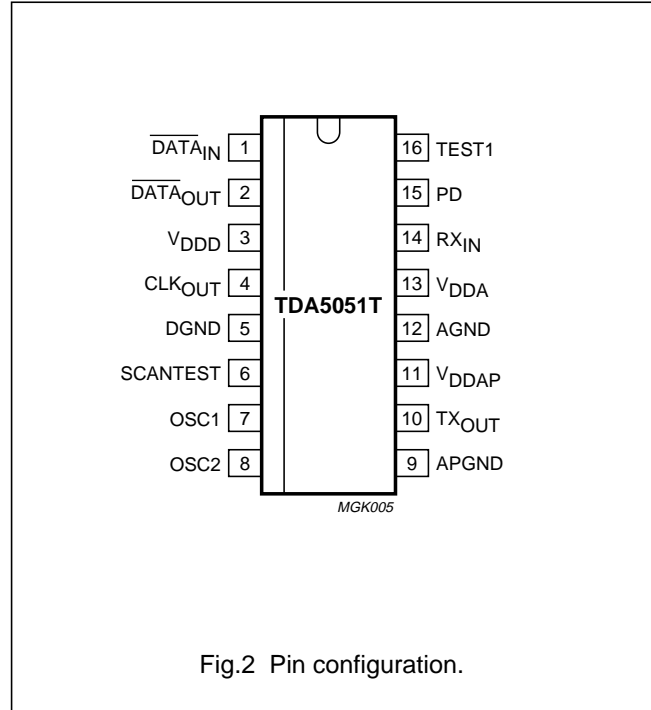


Fig.2 Pin configuration.

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FUNCTIONAL DESCRIPTION

Both transmission and reception stages are controlled either by the master clock of the microcontroller, or by the on-chip reference oscillator connected to a crystal. This holds for the accuracy of the transmission carrier and the exact trimming of the digital filter, thus making the performance totally independent of application disturbances such as component spread, temperature, supply drift and so on.

The interface with the power network is made by means of a LC network (see Fig.18). The device includes a power output stage able to feed a 120 dB μ V (RMS) signal on a typical 30 Ω load.

To reduce power consumption, the IC is disabled by a power-down input (pin PD): in this mode, the on-chip oscillator remains active and the clock continues to be supplied at pin CLK_{OUT}. For low-power operation in reception mode, this pin can be dynamically controlled by the microcontroller (see Section "Power-down mode").

When the circuit is connected to an external clock generator (see Fig.6), the clock signal must be applied at pin OSC1 (pin 7); OSC2 (pin 8) must be left open. Use of the on-chip clock circuitry is shown in Fig.7.

All logic inputs and outputs are compatible with TTL/CMOS levels, providing an easy connection to a standard microcontroller I/O port.

The digital part of the IC is fully scan-testable. Two digital inputs, SCANTEST and TEST1, are used for production test: these pins must be left open in functional mode (correct levels are internally defined by pull-up/down resistors).

Transmission mode

The carrier frequency is generated by the scanning of a ROM memory under the control of the microcontroller clock or the reference frequency provided by the on-chip oscillator, thus providing strict stability with respect to environmental conditions. High frequency clocking rejects the aliasing components to such an extent that they are filtered by the coupling LC network and do not cause any significant disturbance. The data modulation is applied through pin DATA_{IN} and smoothly applied by specific digital circuitry to the carrier (shaping). Harmonic components are limited in this process, thus avoiding unacceptable disturbance of the transmission channel (according to CISPR16 and EN50065-1 recommendations). A -55 dB total harmonic distortion is reached when using the typical LC coupling network (or an equivalent filter).

The D/A converter and the power stage are set in order to provide a maximum signal level of 122 dB μ V (RMS) at the output.

The output of the power stage (TX_{OUT}) **always** has to be connected to a decoupling capacitor, because of a DC level of 0.5V_{DD} at this pin, present even when the device is not transmitting. This pin also has to be **protected against overvoltage and negative transient signals**. The DC level of TX_{OUT} can be used to bias an unipolar transient suppressor, as shown in the application diagram (see Fig.18).

Direct connection to the mains is done through a LC network for low-cost applications. However, a HF signal transformer could be used when power-line insulation has to be performed.

CAUTION

In transmission mode, the receiving part of the circuit is **not disabled** and the detection of the transmitted signal is normally performed. In this mode, the gain chosen before the beginning of the transmission is stored, and the **AGC is internally set to -6 dB** as long as DATA_{IN} is LOW. Then, the old gain setting is **automatically restored**.

Receiving mode

The input signal received by the modem is applied to a wide range input amplifier with Automatic Gain Control (AGC) (-6 to +30 dB). This is basically for noise performance improvement and signal level adjustment that ensures a maximum sensitivity of the A/D converter. Then an 8 bit A/D conversion is performed, followed by digital bandpass filtering, in order to meet the CISPR normalization and to comply with some additional limitations encountered in current applications. After digital demodulation, the baseband data signal is made available after pulse shaping.

The signal pin (RX_{IN}) is a high-impedance input, which has to be protected and DC decoupled for the same reasons as with pin TX_{OUT}. The high sensitivity (66 dB μ V) of this input requires an efficient 50 Hz rejection filter (realized by the LC coupling network) also used as an anti-aliasing filter for the internal digital processing (see Fig.18).

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Data format**TRANSMISSION MODE**

The data input ($\overline{\text{DATA}}_{\text{IN}}$) is active LOW: this means that a burst is generated on the line (pin TX_{OUT}) when pin $\overline{\text{DATA}}_{\text{IN}}$ is LOW.

Pin TX_{OUT} is in high-impedance state as long as the device is not transmitting. Successive logic 1s are treated in a NRZ mode (see pulse shape description in Figs 8 and 9).

RECEIVING MODE

The data output (pin $\overline{\text{DATA}}_{\text{OUT}}$) is active LOW; this means that the data output is LOW when a burst is received. Pin $\overline{\text{DATA}}_{\text{OUT}}$ remains LOW as long as a burst is received.

Power-down mode

Power-down input (pin PD) is active HIGH; this means that the power consumption is minimal when pin PD is HIGH. All functions, except clock generation, are disabled then.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|------------------|-------------------------------|------|------|------|
| V_{DD} | supply voltage | 4.5 | 5.5 | V |
| f_{osc} | oscillator frequency | – | 12 | MHz |
| T_{stg} | storage temperature | –50 | +150 | °C |
| T_{amb} | operating ambient temperature | –10 | +80 | °C |
| T_{j} | junction temperature | – | 125 | °C |

HANDLING

Inputs and outputs are protected against electrostatic discharge in normal handling. However, to be totally safe, it is desirable to take normal precautions appropriate to handling MOS devices.

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CHARACTERISTICS

$V_{DD} = V_{DDA} = 5\text{ V} \pm 5\%$; $T_{\text{amb}} = 0\text{ to }70\text{ }^{\circ}\text{C}$; V_{DD} connected to V_{DDA} ; $DGND$ connected to $AGND$.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--|---|--|-------------------|------|-------------------|------|
| Supply | | | | | | |
| V_{DD} | supply voltage | | 4.75 | 5 | 5.25 | V |
| $I_{DD(RX/TX)(\text{tot})}$ | total analog + digital supply current; TX or RX mode | $V_{DD} = 5\text{ V} \pm 5\%$ | – | 28 | 38 | mA |
| $I_{DD(PD)(\text{tot})}$ | total analog + digital supply current; power-down mode | $V_{DD} = 5\text{ V} \pm 5\%$; PD = HIGH | – | 19 | 25 | mA |
| $I_{DD(PAMP)}$ | power amplifier supply current in transmission mode | $V_{DD} = 5\text{ V} \pm 5\%$; $Z_L = 30\ \Omega$; $\overline{DATA}_{IN} = \text{LOW}$ | – | 19 | 30 | mA |
| $I_{DD(PAMP)(\text{max})}$ | maximum power amplifier supply current in transmission mode | $V_{DD} = 5\text{ V} \pm 5\%$; $Z_L = 1\ \Omega$; $\overline{DATA}_{IN} = \text{LOW}$ | – | 76 | – | mA |
| \overline{DATA}_{IN} input, PD input: \overline{DATA}_{OUT} output, CLK_{OUT} output | | | | | | |
| V_{IH} | HIGH-level input voltage | | $0.2V_{DD} + 0.9$ | – | $V_{DD} + 0.5$ | V |
| V_{IL} | LOW-level input voltage | | –0.5 | – | $0.2V_{DD} - 0.1$ | V |
| V_{OH} | HIGH-level output voltage | $I_{OH} = -1.6\text{ mA}$ | 2.4 | – | – | V |
| V_{OL} | LOW-level output voltage | $I_{OL} = 1.6\text{ mA}$ | – | – | 0.45 | V |
| OSC1 input and OSC2 output (OSC2 only used for driving external quartz crystal; must be left open when using an external clock generator) | | | | | | |
| V_{IH} | HIGH-level input voltage | | $0.7V_{DD}$ | – | $V_{DD} + 0.5$ | V |
| V_{IL} | LOW-level input voltage | | –0.5 | – | $0.2V_{DD} - 0.1$ | V |
| V_{OH} | HIGH-level output voltage | $I_{OH} = -1.6\text{ mA}$ | 2.4 | – | – | V |
| V_{OL} | LOW-level output voltage | $I_{OL} = 1.6\text{ mA}$ | – | – | 0.45 | V |
| Clock | | | | | | |
| f_{osc} | oscillator frequency | | 6.080 | – | 9.504 | MHz |
| $\frac{f_{\text{osc}}}{f_{\text{cr}}}$ | ratio between oscillator and carrier frequency | | – | 64 | – | |
| $\frac{f_{\text{osc}}}{f_{\text{CLKOUT}}}$ | ratio between oscillator and clock output frequency | | – | 2 | – | |

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| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------------------|---|--|------|-------|------|------------------------|
| Transmission mode | | | | | | |
| f_{cr} | carrier frequency | $f_{osc} = 8.48 \text{ MHz}$ | – | 132.5 | – | kHz |
| t_{su} | set-up time of the shaped burst | $f_{osc} = 8.48 \text{ MHz}$; see Fig.8 | – | 170 | – | μs |
| t_h | hold time of the shaped burst | $f_{osc} = 8.48 \text{ MHz}$; see Fig.8 | – | 170 | – | μs |
| $t_{W(DI)(min)}$ | minimum pulse width of $\overline{\text{DATA}}_{IN}$ signal | $f_{osc} = 8.48 \text{ MHz}$; see Fig.8 | – | 190 | – | μs |
| $V_{o(rms)}$ | output carrier signal (RMS value) | $Z_L = \text{CISPR16}$ $\overline{\text{DATA}}_{IN} = \text{LOW}$ | 120 | – | 122 | $\text{dB}\mu\text{V}$ |
| $I_{o(max)}$ | power amplifier maximum output current (peak value) | $Z_L = 1 \Omega$; $\overline{\text{DATA}}_{IN} = \text{LOW}$ | – | 160 | – | mA |
| Z_o | output impedance of the power amplifier | | – | 5 | – | Ω |
| V_o | output DC level at TX_{OUT} | | – | 2.5 | – | V |
| THD | total harmonic distortion on CISPR16 load with the coupling network (measured on the first ten harmonics) | $V_{o(rms)} = 121 \text{ dB}\mu\text{V}$ on CISPR16 load; $f_{osc} = 8.48 \text{ MHz}$; $\overline{\text{DATA}}_{IN} = \text{LOW}$ (no modulation); see Figs 3 and 16 | – | –55 | – | dB |
| B_{-20dB} | bandwidth of the shaped output signal (at –20 dB) on CISPR16 load with the coupling network | $V_{o(rms)} = 121 \text{ dB}\mu\text{V}$ on CISPR16 load; $f_{osc} = 8.48 \text{ MHz}$; $\overline{\text{DATA}}_{IN} = 300 \text{ Hz}$; duty factor = 50%; see Fig.4 | – | 3000 | – | Hz |
| Reception mode | | | | | | |
| $V_{i(rms)}$ | analog input signal (RMS value) | | 68 | – | 122 | $\text{dB}\mu\text{V}$ |
| V_I | DC level at pin RX_{IN} | | – | 2.5 | – | V |
| Z_i | RX_{IN} input impedance | | – | 50 | – | $\text{k}\Omega$ |
| R_{AGC} | automatic gain control range | | – | 36 | – | dB |
| $t_{c(AGC)}$ | automatic gain control time constant | $f_{osc} = 8.48 \text{ MHz}$; see Fig.5 | – | 296 | – | μs |
| $t_{d(dem)(su)}$ | demodulation delay set-up time | $f_{osc} = 8.48 \text{ MHz}$; see Fig.15 | – | 410 | 460 | μs |
| $t_{d(dem)(h)}$ | demodulation delay hold time | $f_{osc} = 8.48 \text{ MHz}$; see Fig.15 | – | 330 | 380 | μs |
| B_{det} | detection bandwidth | $f_{osc} = 8.48 \text{ MHz}$ | – | 3 | – | kHz |

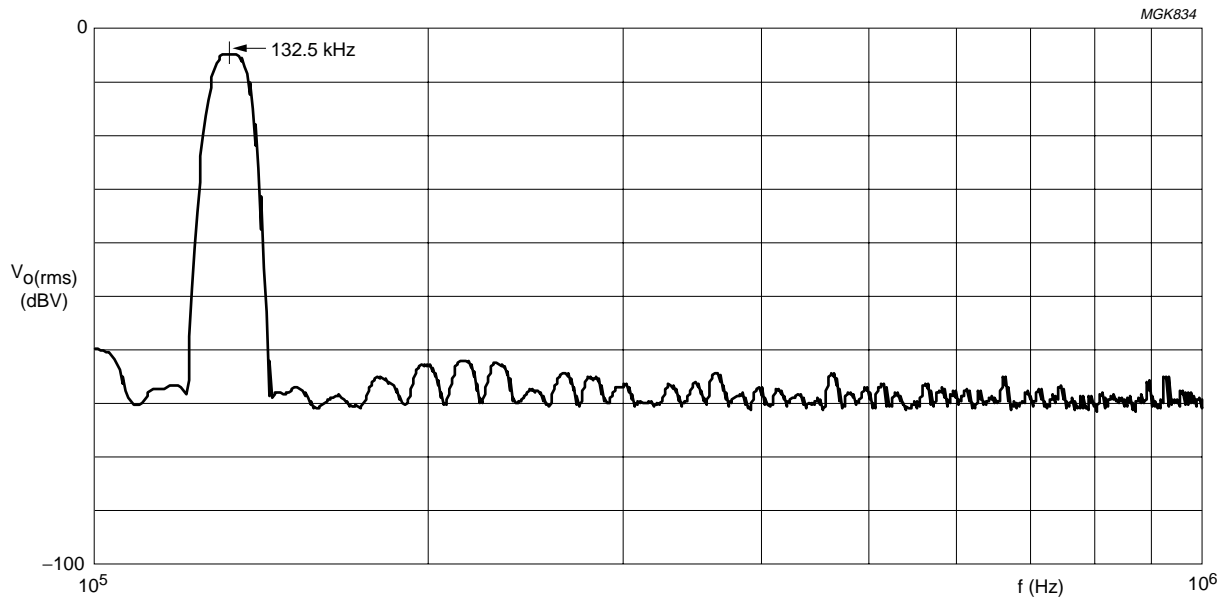
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| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------------------|--|---|------|------|------|--------------------|
| BER | bit error rate | $f_{osc} = 8.48$ MHz; 600 baud; S/N = 35 dB; signal 76 dB μ V; see Fig.17 | – | 1 | – | 1×10^{-4} |
| Power-up timing | | | | | | |
| $t_{d(pu)(TX)}$ | delay between power-up and \overline{DATA}_{IN} in transmission mode | XTAL = 8.48 MHz; C1 = C2 = 27 pF; $R_p = 2.2$ M Ω ; see Fig.10 | – | 1 | – | μ s |
| $t_{d(pu)(RX)}$ | delay between power-up and \overline{DATA}_{OUT} in reception mode | XTAL = 8.48 MHz; C1 = C2 = 27pF; $R_p = 2.2$ M Ω ; $f_{RXIN} = 132.5$ kHz; 120 dB μ V sinewave; see Fig.11 | – | 1 | – | μ s |
| Power-down timing | | | | | | |
| $t_{d(pd)(TX)}$ | delay between PD = 0 and \overline{DATA}_{IN} in transmission mode | $f_{osc} = 8.48$ MHz; see Fig.12 | – | 10 | – | μ s |
| $t_{d(pd)(RX)}$ | delay between PD = 0 and \overline{DATA}_{OUT} in reception mode | $f_{osc} = 8.48$ MHz; $f_{RXIN} = 132.5$ kHz; 120 dB μ V sinewave; see Fig.13 | – | 500 | – | μ s |
| $t_{active(min)}$ | minimum active time with T = 10 ms power-down period in reception mode | $f_{osc} = 8.48$ MHz; $f_{RXIN} = 132.5$ kHz; 120 dB μ V sinewave; see Fig.14 | – | 1 | – | μ s |

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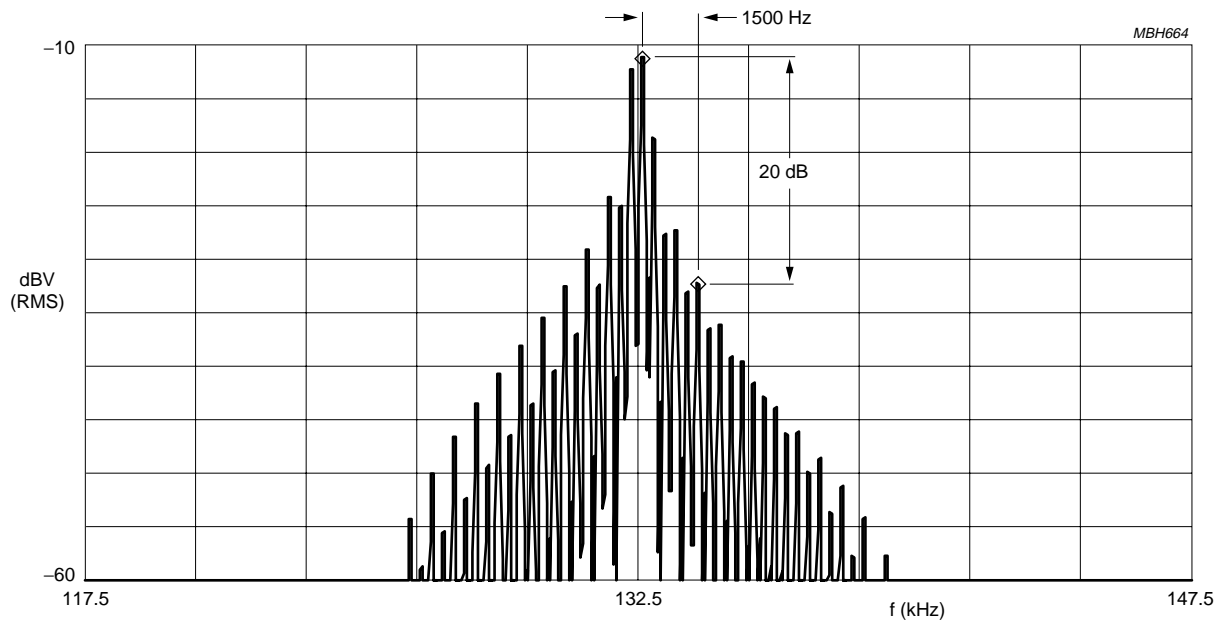


Resolution bandwidth = 9 kHz; top: 0 dBV (RMS) = 120 dB μ V (RMS); marker at -5 dBV (RMS) = 115 dB μ V (RMS); the CISPR16 network provides an attenuation of 6 dB, so the signal amplitude is 121 dB μ V (RMS).

Fig.3 Carrier spectrum.

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Resolution bandwidth = 100 Hz; $B_{-20dB} = 3000 \text{ Hz} (2 \times 1500 \text{ Hz})$.

Fig.4 Shaped signal spectrum.

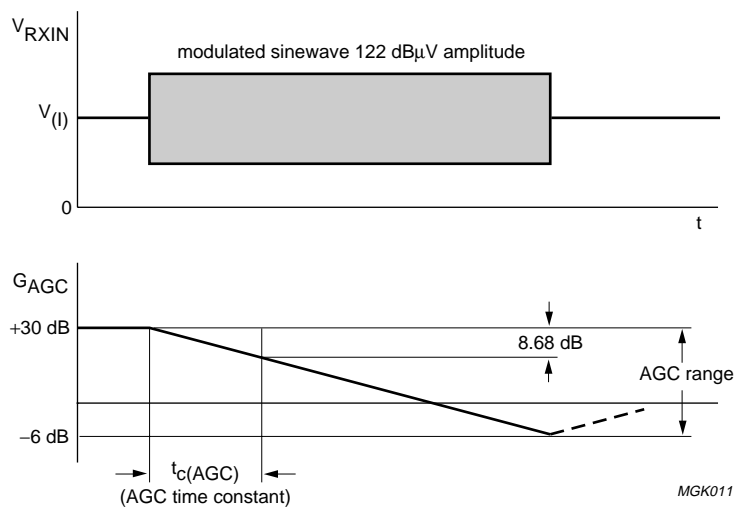


Fig.5 AGC time constant definition (not to scale).

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TIMING

Configurations for clock

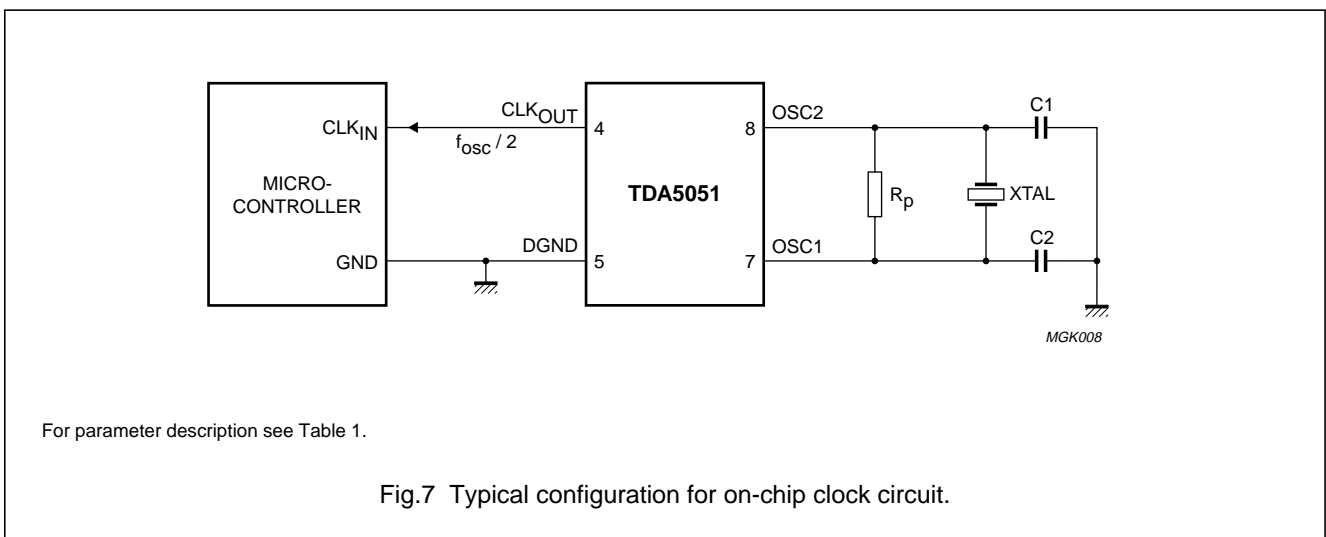
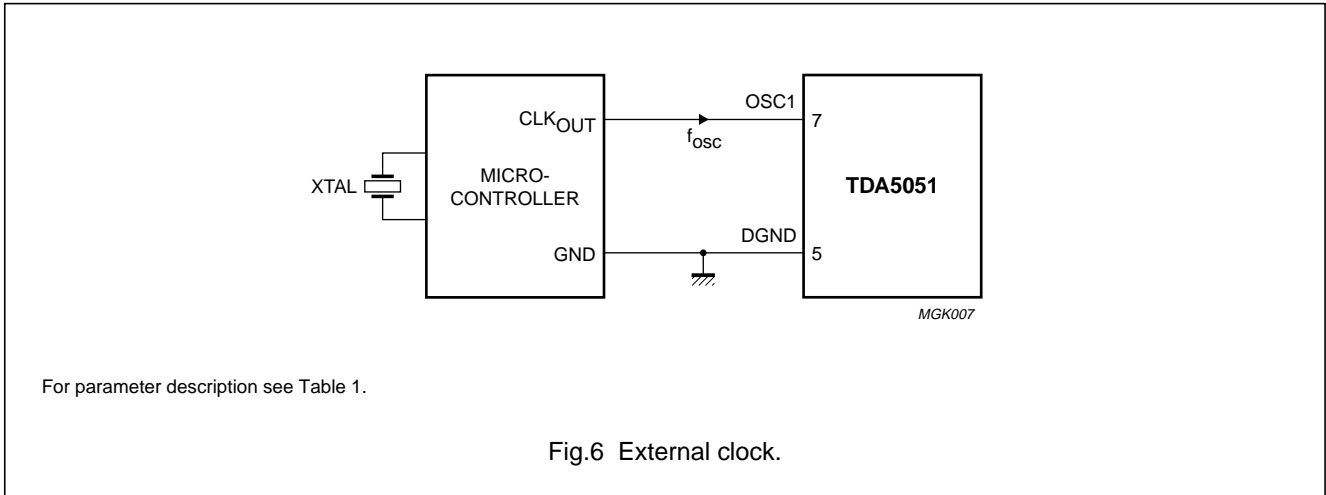


Table 1 Clock oscillator parameters

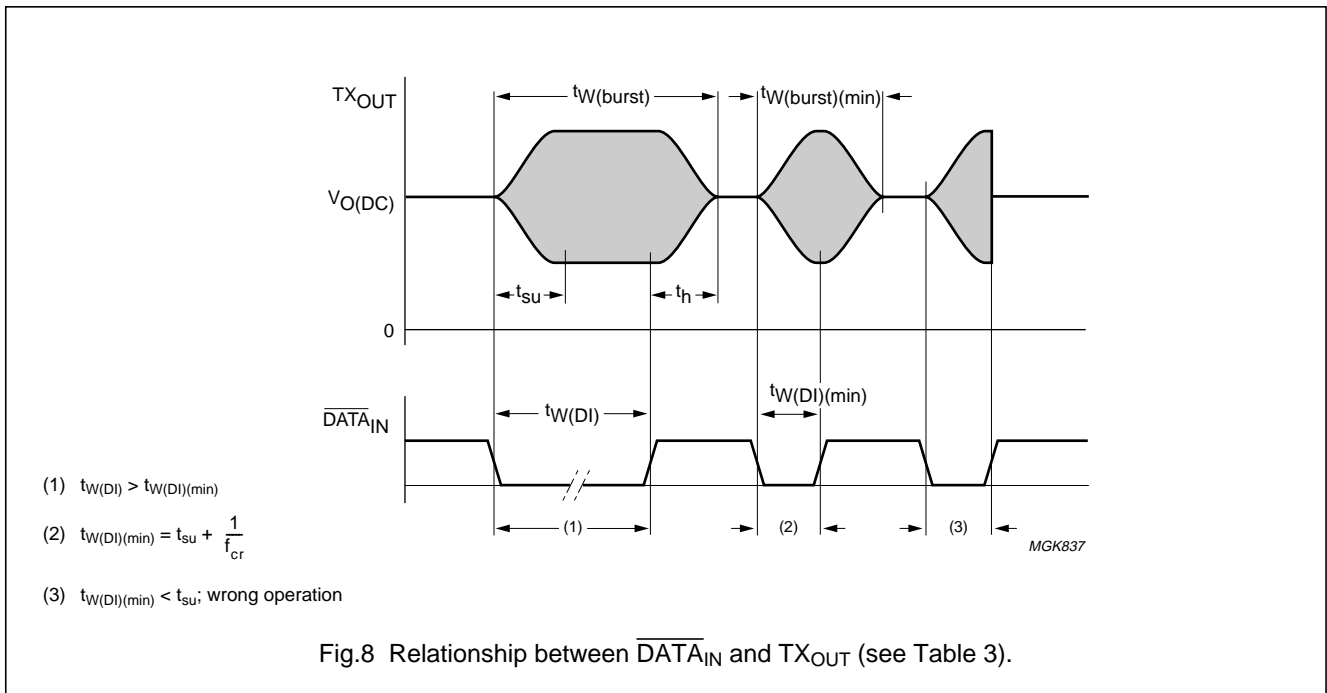
| f_{osc} OSCILLATOR FREQUENCY | f_{cr} CARRIER FREQUENCY | $\frac{1}{2}f_{osc}$ CLOCK OUTPUT FREQUENCY | EXTERNAL COMPONENTS |
|--------------------------------------|----------------------------------|---|--|
| 6.080 to 9.504 MHz | 95 to 148.5 kHz | 3.040 to 4.752 MHz | C1 = C2 = 27 to 47 pF; R _p = 2.2 to 4.7 MΩ; XTAL = standard quartz crystal |

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Table 2 Calculation of parameters depending of the clock frequency

| SYMBOL | PARAMETER | CONDITIONS | UNIT |
|---------------------|--|--|------|
| f_{osc} | oscillator frequency | with on-chip oscillator: frequency of the crystal quartz; with external clock: frequency of the signal applied at OSC1 | Hz |
| f_{CLKOUT} | clock output frequency | $\frac{1}{2}f_{osc}$ | Hz |
| f_{cr} | carrier frequency/digital filter tuning frequency | $\frac{1}{64}f_{osc}$ | Hz |
| t_{su} | set-up time of the shaped burst | $\frac{23}{f_{cr}}$ or $\frac{1472}{f_{osc}}$ | s |
| t_h | hold time of the shaped burst | $\frac{23}{f_{cr}}$ or $\frac{1472}{f_{osc}}$ | s |
| $t_{W(DI)(min)}$ | minimum pulse width of \overline{DATA}_{IN} signal | $t_{su} + \frac{1}{f_{cr}}$ | s |
| $t_{W(burst)(min)}$ | minimum burst time of $V_{O(DC)}$ signal | $t_{W(DI)(min)} + t_h$ | s |
| $t_{c(AGC)}$ | AGC time constant | $\frac{2514}{f_{osc}}$ | s |
| $t_{su(demod)}$ | demodulation set-up time | $\frac{3700}{f_{osc}}$ (\approx max.) | s |
| $t_h(demod)$ | demodulation hold time | $\frac{3050}{f_{osc}}$ (\approx max.) | s |



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Table 3 Relationship between $\overline{\text{DATA}}_{\text{IN}}$ and TX_{OUT}

| PD | $\overline{\text{DATA}}_{\text{IN}}$ | TX_{OUT} |
|----|--------------------------------------|-------------------------------|
| 1 | X ⁽¹⁾ | high impedance |
| 0 | 1 | high impedance (after t_h) |
| 0 | 0 | active with DC offset |

Note

1. X = don't care.

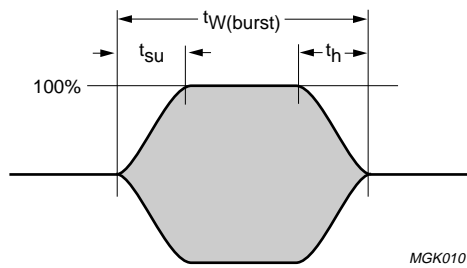
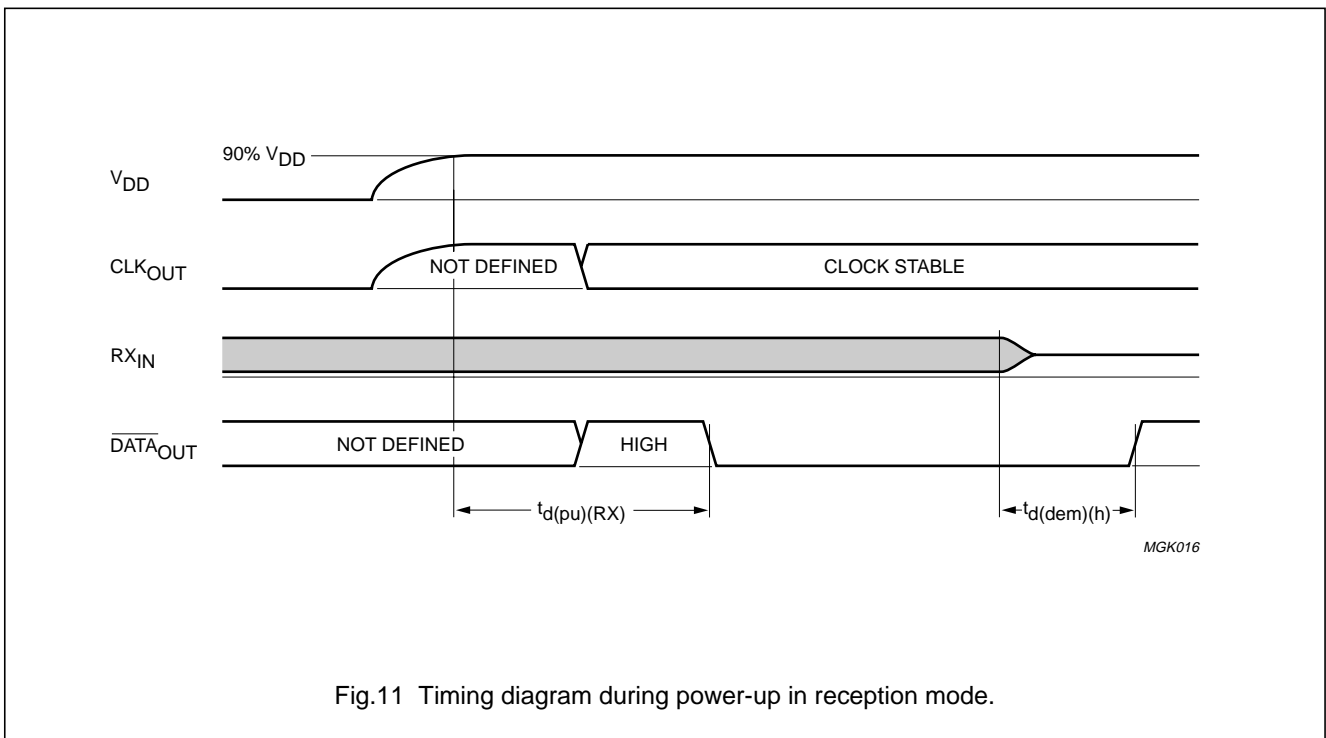
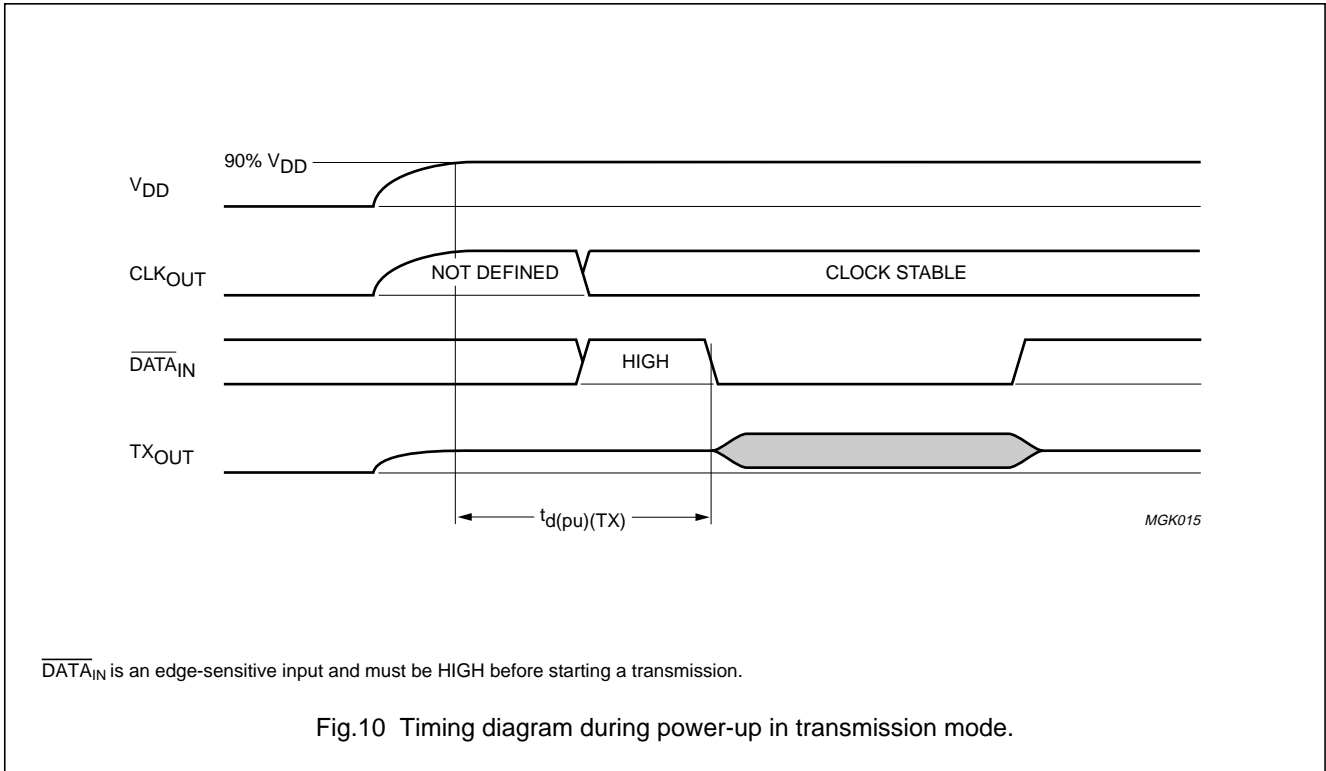


Fig.9 Pulse shape characteristics.

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Timing diagrams



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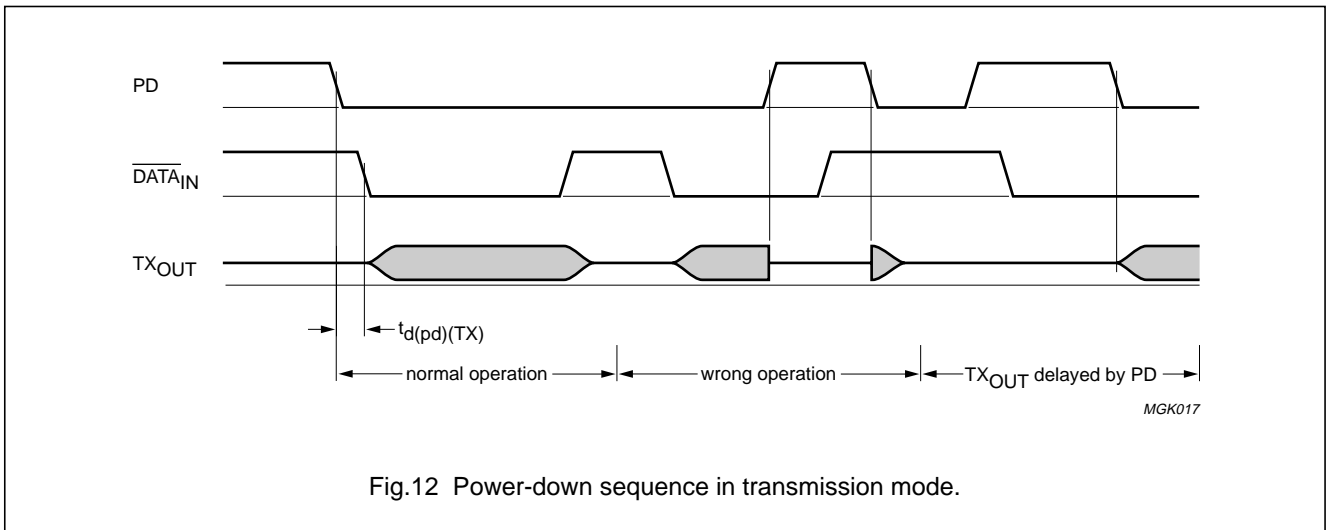


Fig.12 Power-down sequence in transmission mode.

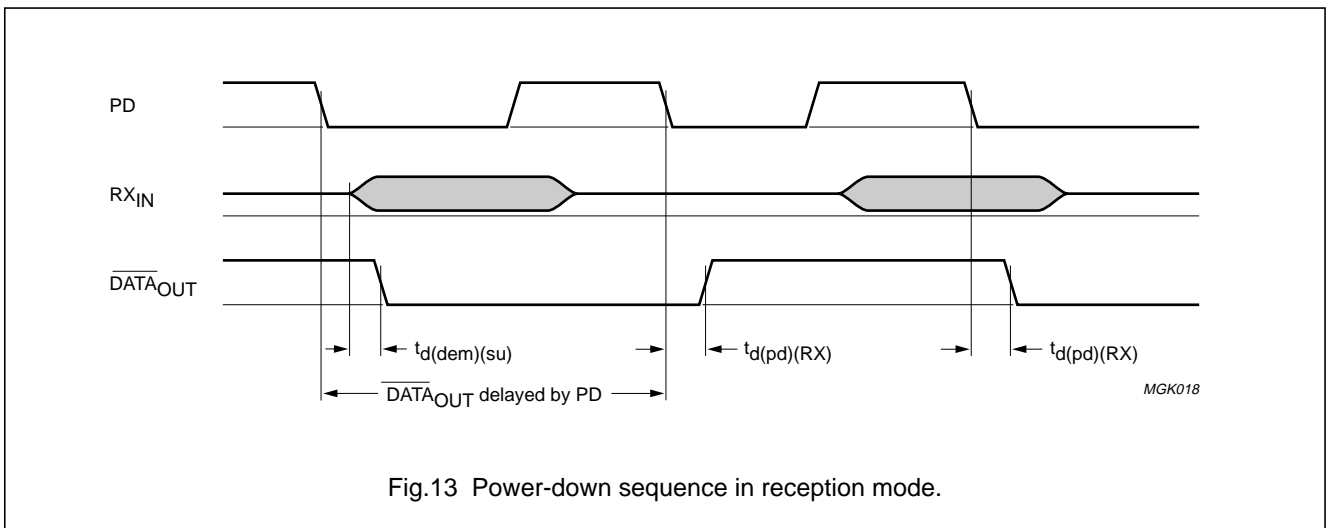


Fig.13 Power-down sequence in reception mode.

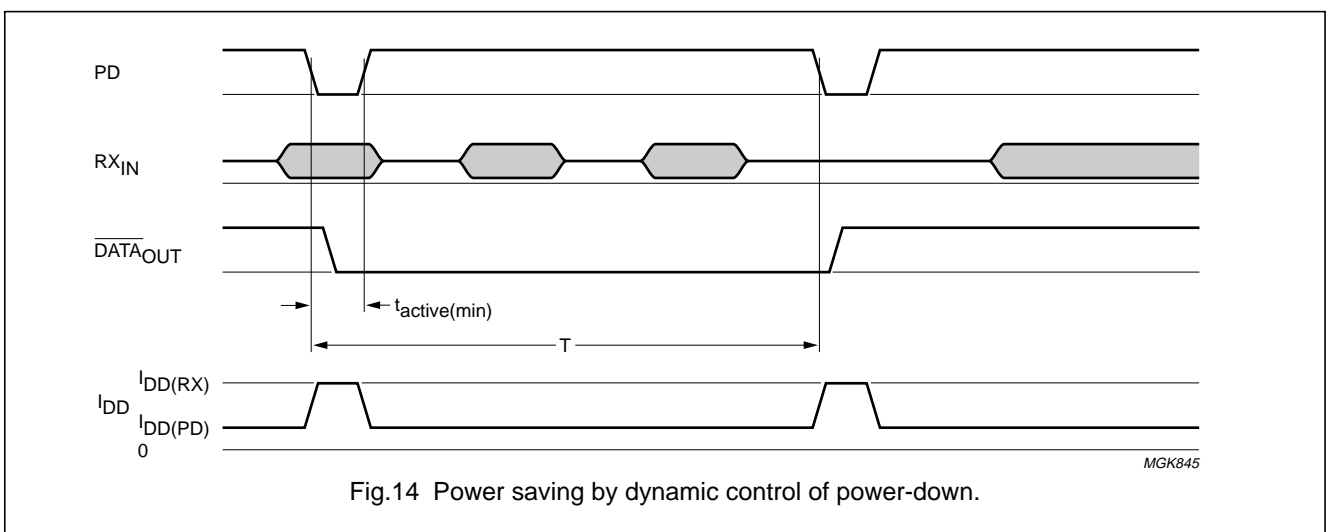


Fig.14 Power saving by dynamic control of power-down.

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TEST INFORMATION

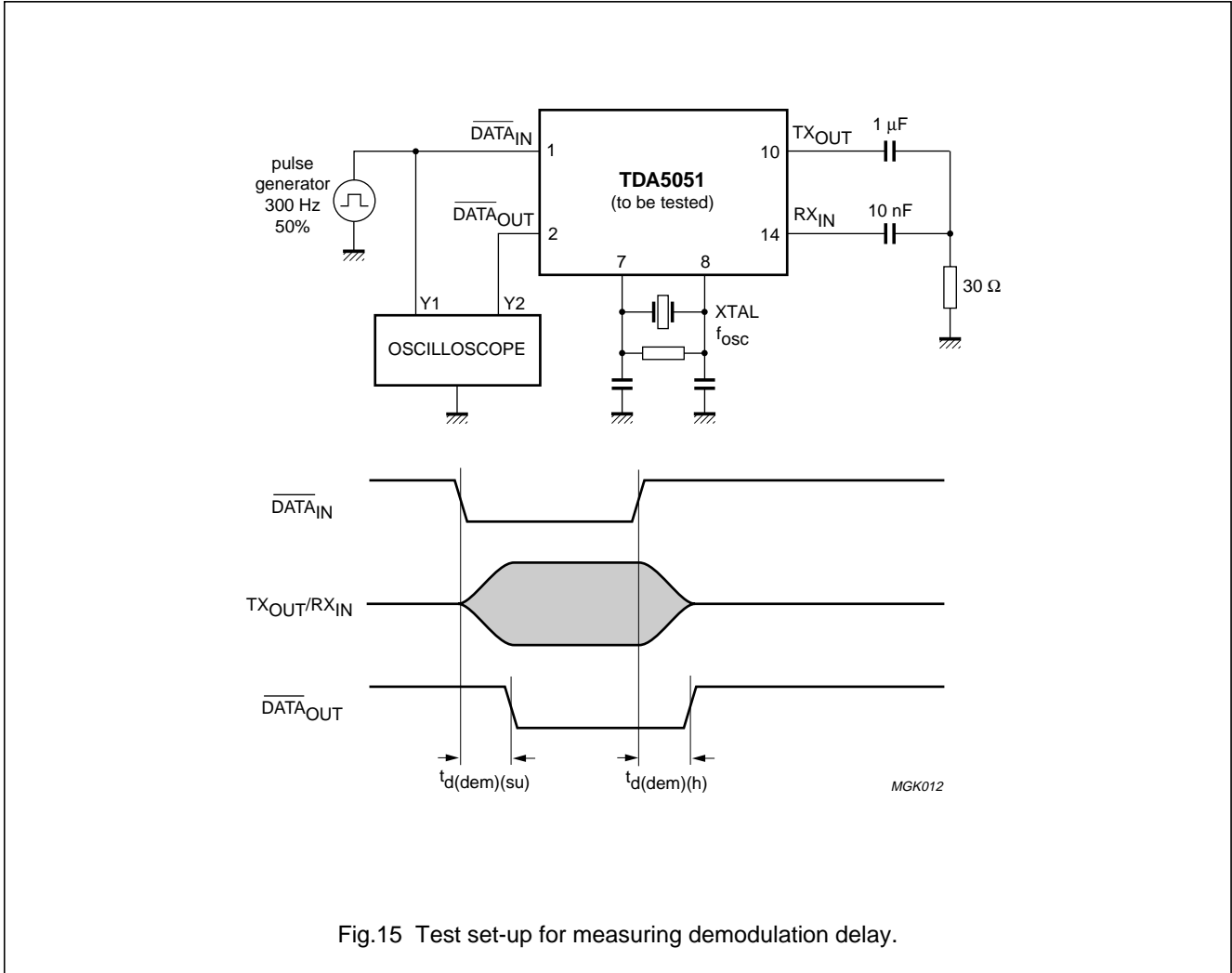
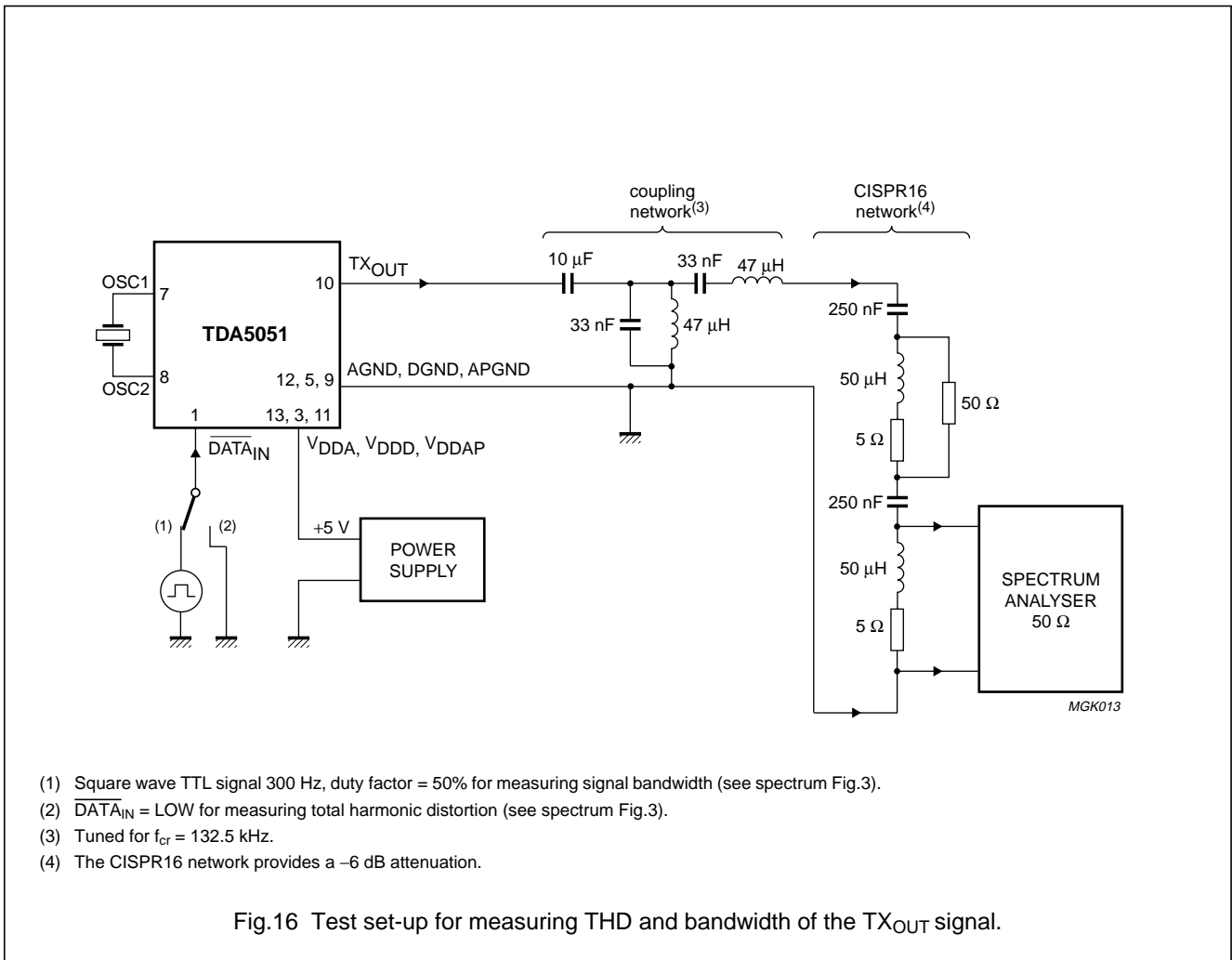


Fig.15 Test set-up for measuring demodulation delay.

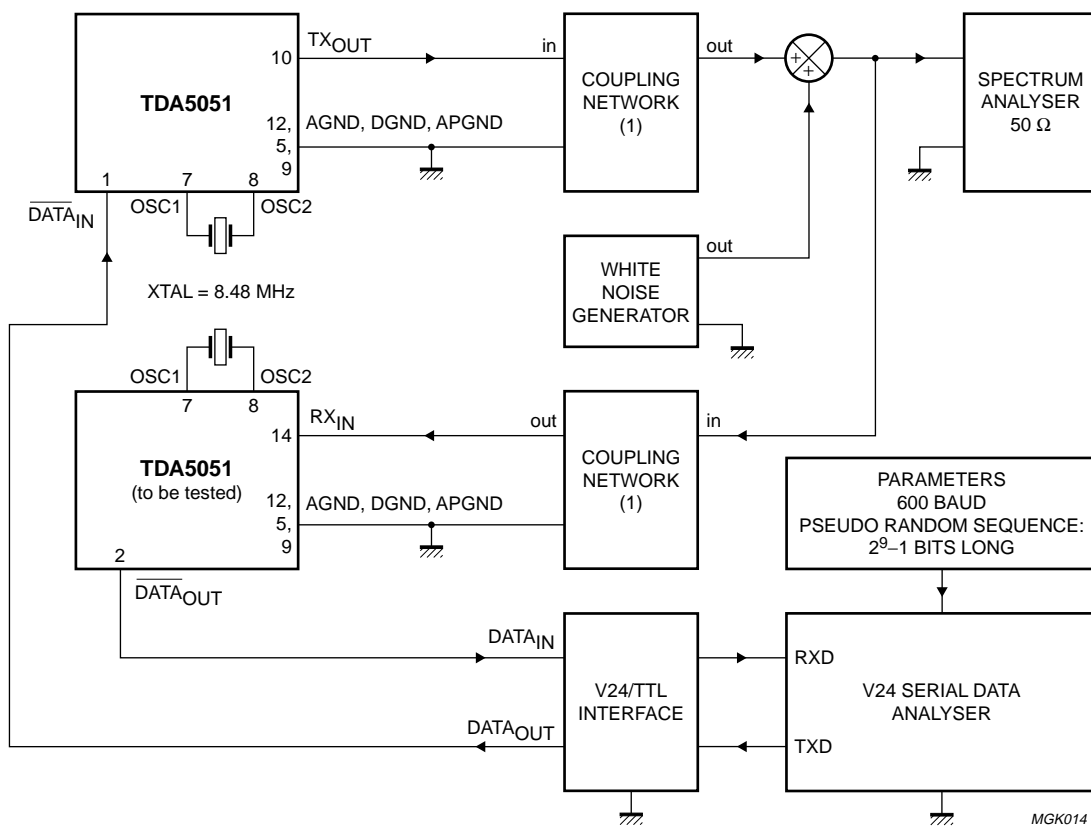
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(1) See Fig.16.

Fig.17 Test set-up for measuring bit error rate (BER).

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APPLICATION INFORMATION

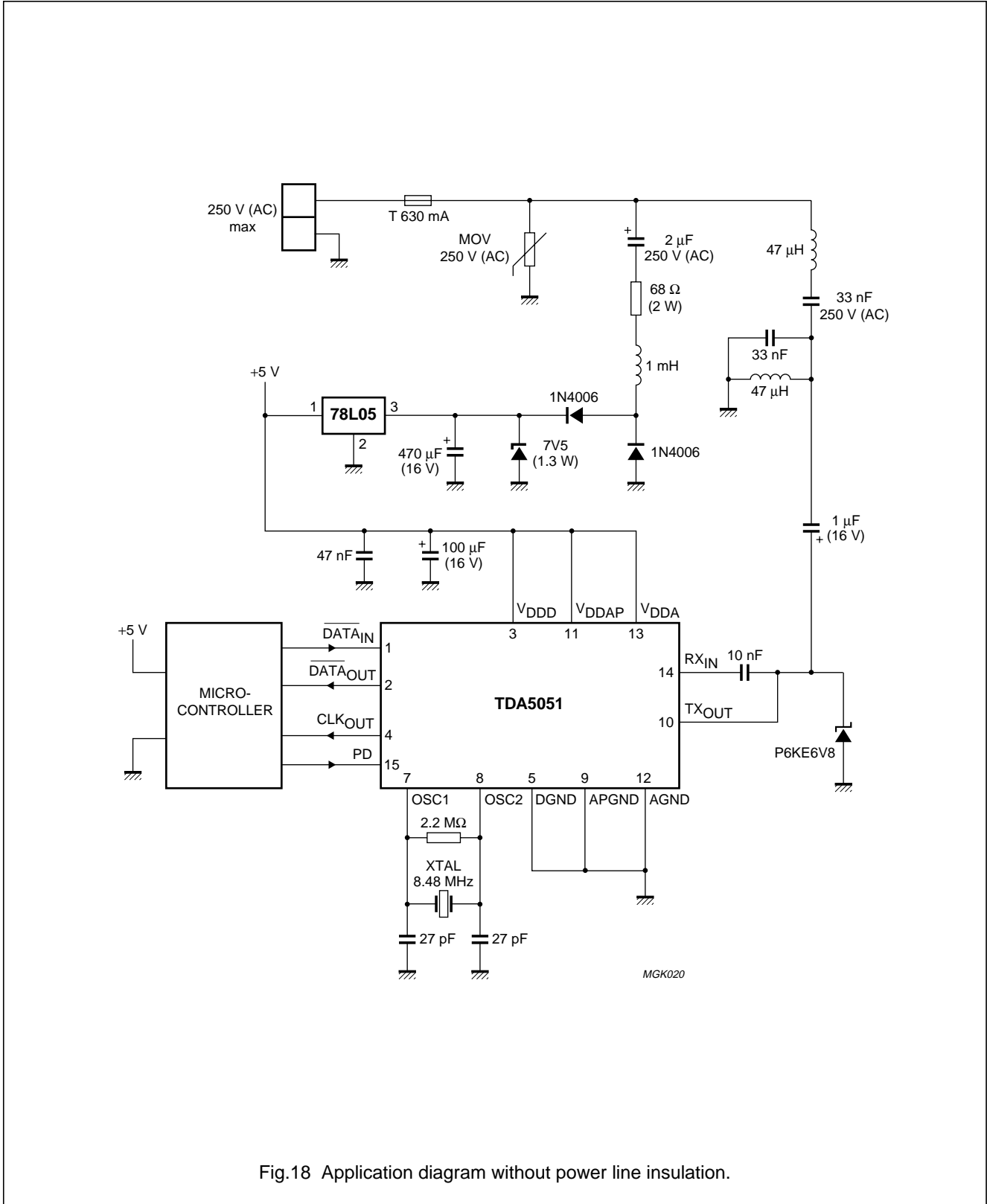
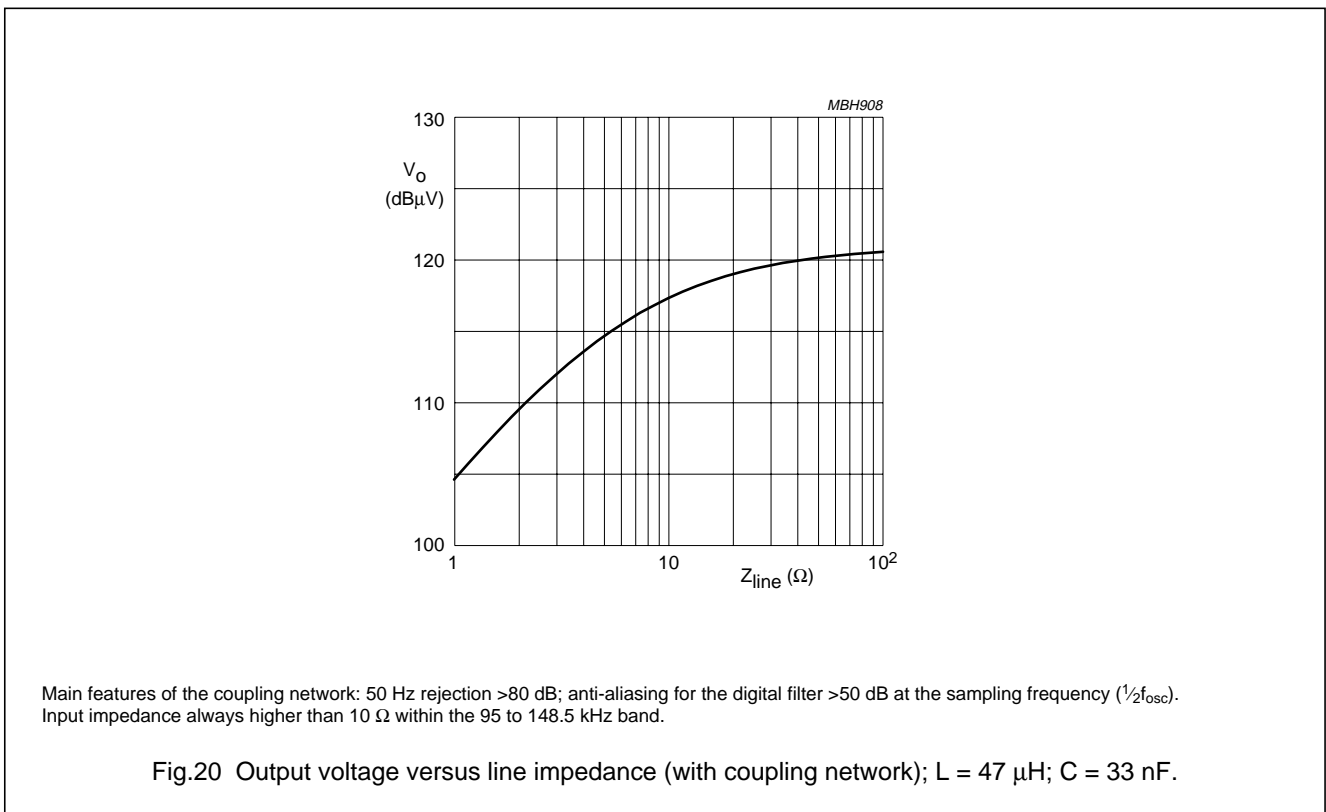
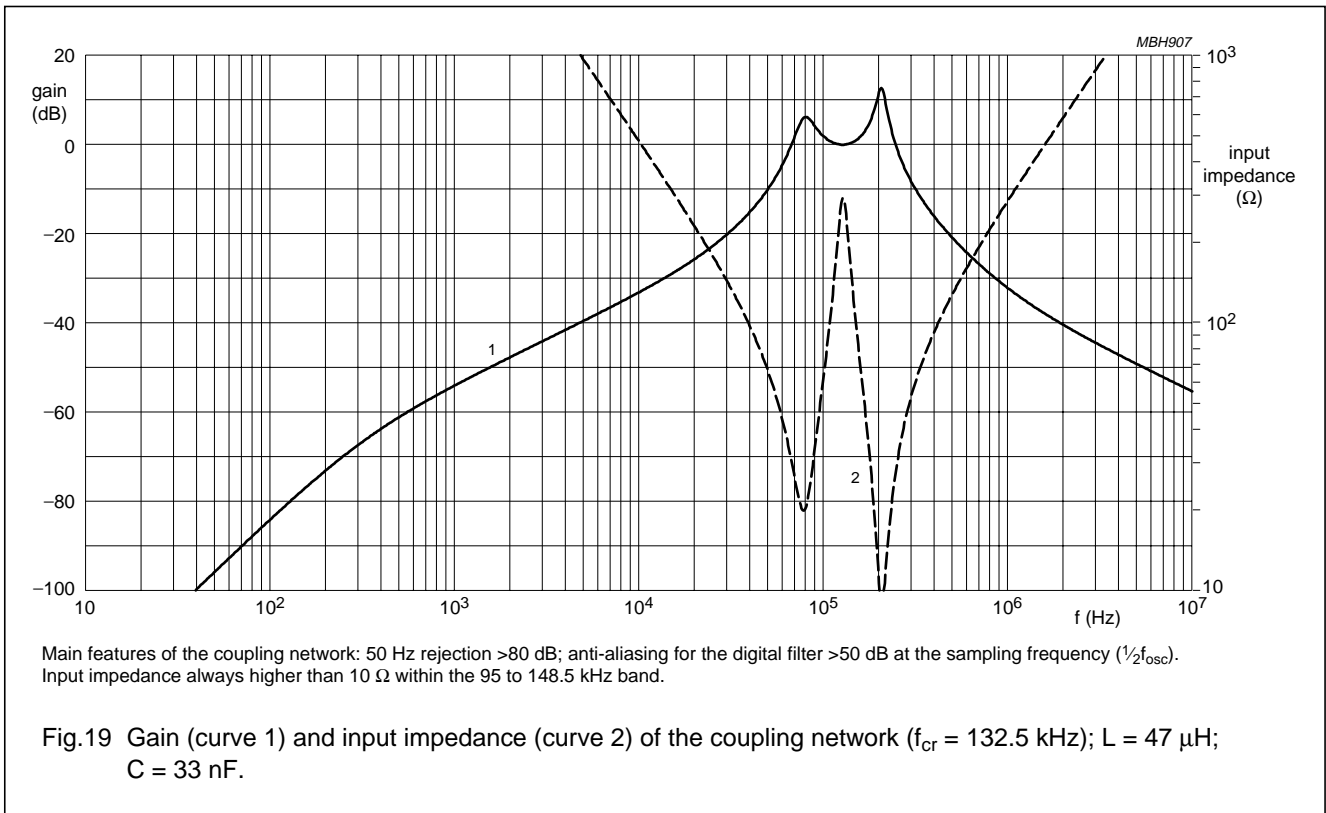


Fig.18 Application diagram without power line insulation.

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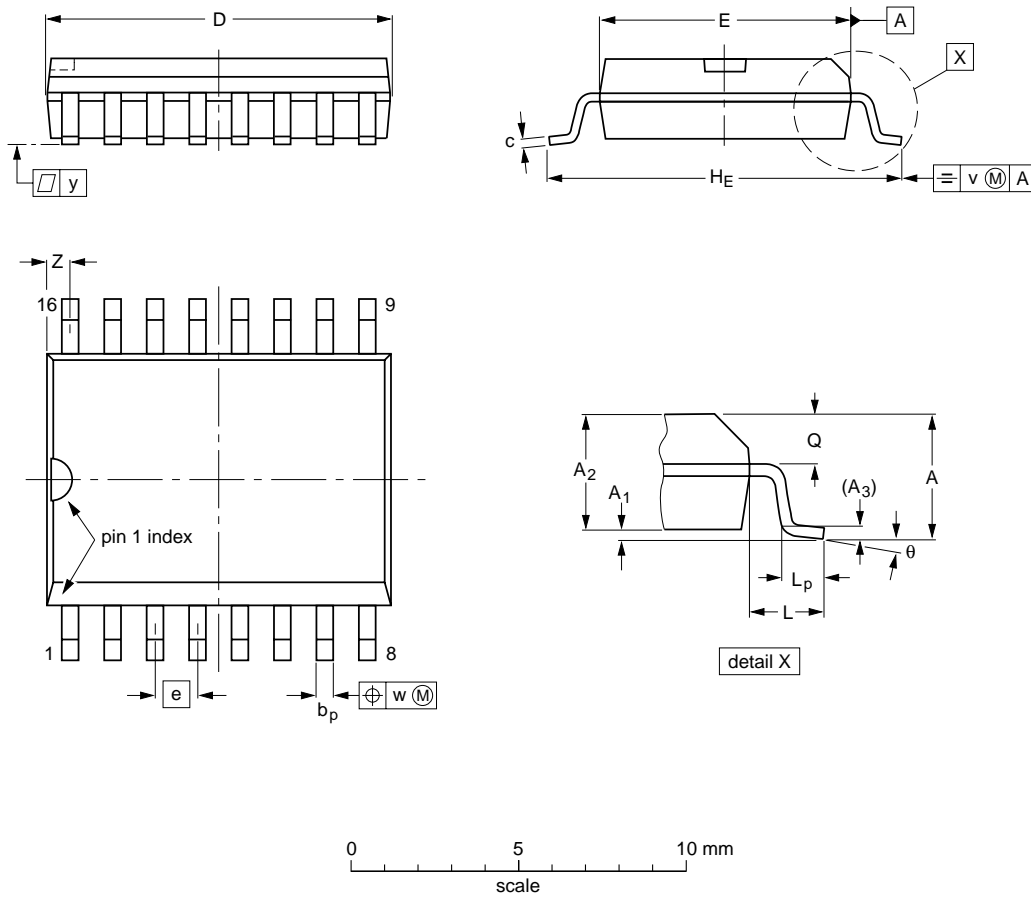
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PACKAGE OUTLINE

SO16: plastic small outline package; 16 leads; body width 7.5 mm

SOT162-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT | A max. | A ₁ | A ₂ | A ₃ | b _p | c | D ⁽¹⁾ | E ⁽¹⁾ | e | H _E | L | L _p | Q | v | w | y | z ⁽¹⁾ | θ |
|--------|--------|----------------|----------------|----------------|----------------|----------------|------------------|------------------|-------|----------------|-------|----------------|----------------|------|------|-------|------------------|----------|
| mm | 2.65 | 0.30 0.10 | 2.45 2.25 | 0.25 | 0.49 0.36 | 0.32 0.23 | 10.5 10.1 | 7.6 7.4 | 1.27 | 10.65 10.00 | 1.4 | 1.1 0.4 | 1.1 1.0 | 0.25 | 0.25 | 0.1 | 0.9 0.4 | 8° 0° |
| inches | 0.10 | 0.012 0.004 | 0.096 0.089 | 0.01 | 0.019 0.014 | 0.013 0.009 | 0.41 0.40 | 0.30 0.29 | 0.050 | 0.419 0.394 | 0.055 | 0.043 0.016 | 0.043 0.039 | 0.01 | 0.01 | 0.004 | 0.035 0.016 | |

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
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Home automation modem

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SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our "*IC Package Databook*" (order code 9398 652 90011).

Reflow soldering

Reflow soldering techniques are suitable for all SO packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

Wave soldering

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Repairing soldered joints

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

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DEFINITIONS

| | |
|---|---|
| Data sheet status | |
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| Limiting values | |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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NOTES

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