

32001269 / 32001270 - 3V DUAL MODE TRANSCEIVERS

The 32001269 and 32001270 transceivers can operate in two modes:

- Normal Mode whose operation is already described in the datasheet
- Extended Mode , user programmable, covered in this document

1. PROGRAMMING MODE

For the setup of the device a **serial interface** is provided, by means of the same I/O lines that are used for normal operation. These lines are EN, CH_SEL, TX/RX, and must be connected to an external microcontroller.

- Entering programming mode: to enable the programming mode it is necessary to:
 - set the device in power down state (by setting pin 5, EN = 0), and then:
 - generate a high pulse t_1 with a duration within 80 μ s and 120 μ s on EN line (see Figure 1).
- From that point on, the transceiver is in **UART programming mode** on CH_SEL pin (pin 8).
- The serial port is configured for reception only, with the following parameters:
 - Baud rate: 9600 $\pm$ 300 baud
 - Parity: no
 - Stop bit: 1
 - Data bit: 8
- The time t_2 between the end of the pulse on EN line and start of data transmission on CH_SEL must be at least 1 ms (see Figure 1).

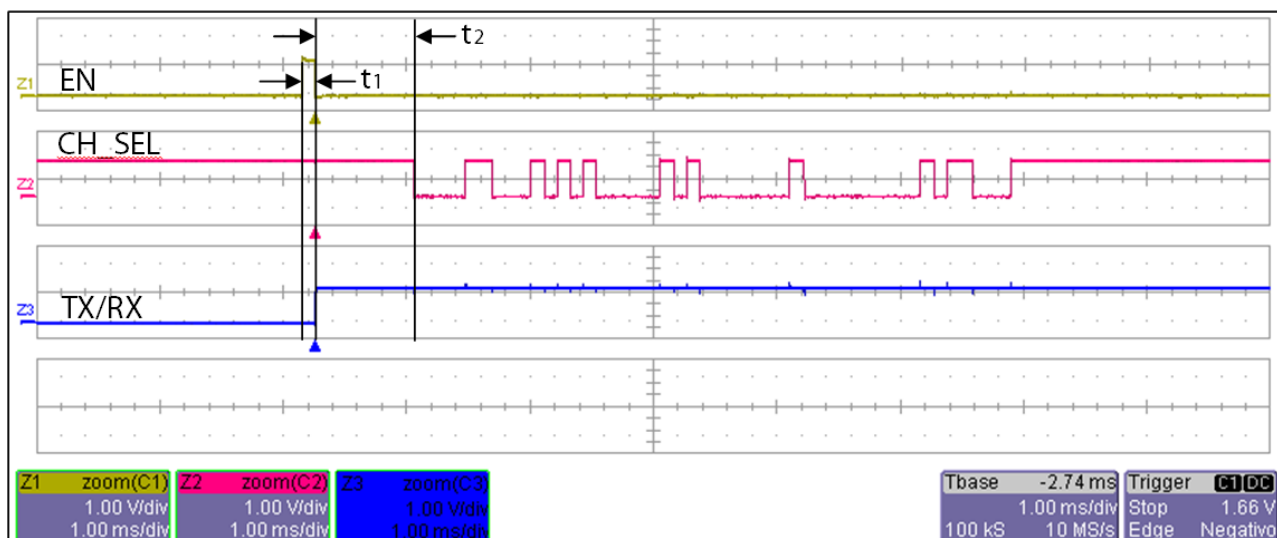


Figure 1: timings. $80 \mu s < t_1 < 120 \mu s$; $t_2 > 1 ms$

- **Feedback on the state of programming:** the transceiver is capable of returning a feedback in case of successful programming (ACK). To this purpose it is necessary to set the TX / RX line (pin 6) as input on the external microcontroller during the programming operation, with pull-up enabled. The line must be set this way within the end of the pulse t_1 on EN and the beginning of the transmission of serial data (end of t_2), and kept in pull-up for all the duration of programming phase. The ACK occurs as a negative pulse t_3 on the TX / RX line and has a duration of 1 ms (typical) (see Figure 2).

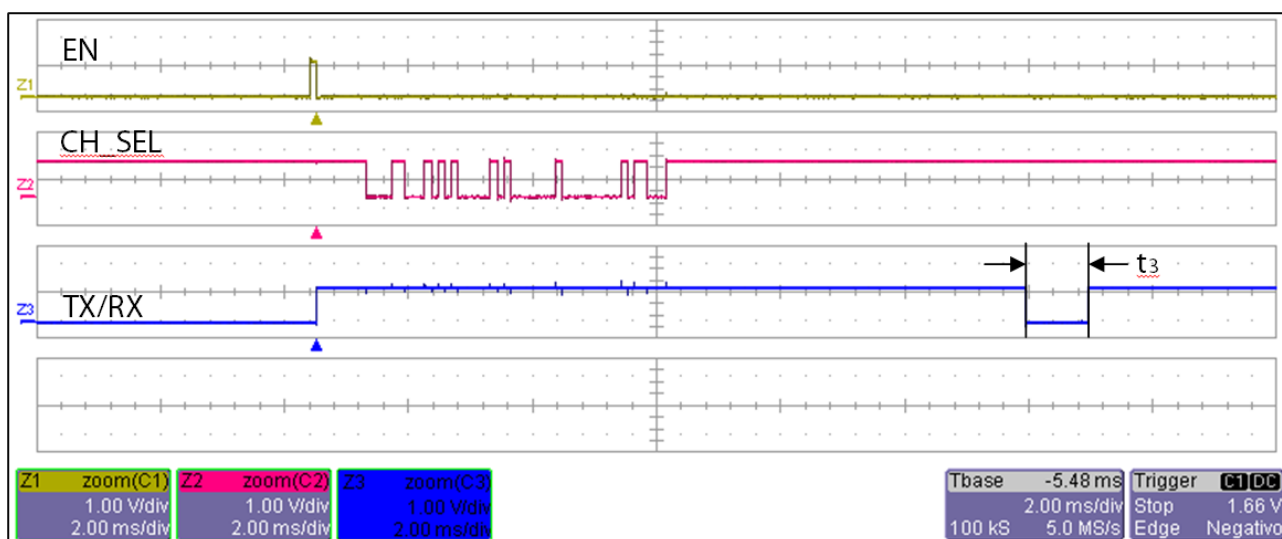


Figure 2: timings. $t_3 = 1 ms$ typ.

If programming is not successful, the line remains in tri-state.

- When programming ends, disable the pull-up on the external microcontroller pin on TX/RX line and restore the functionality of this line (input for the transceiver).
- The transceiver exits the programming mode after a timeout of **100 ms**. For this reason, the time **t4** elapsed between the end of the pulse on EN and the end of a valid command sent on CH_SEL must be less than **90 ms**.
- After programming a single parameter, the user can program other parameters consecutively; the 100 ms time-out is reset at the end of each ACK pulse on the TX / RX line, for each programmed parameter. To avoid errors during the writing of consecutive parameters it is mandatory that during this phase there are no pulses on EN line, and there are no other than programming data on CH_SEL line (see figure 4).
- After a valid command, before starting the transmission of new data you must wait for the ACK on the TX / RX line, or if the TX / RX line is not used, a delay of at least **15 ms** for the writing of *single parameters* and of at least **40 ms** to set the *default parameters* (0x0A).
- Typical time **t5** between command reception and ACK valid for the writing of *single parameters*: **7 ms** (see Figure 3).
- Typical time **t5** between command reception and ACK valid only for setting the *default parameters*: **25 ms** (see Figure 3).

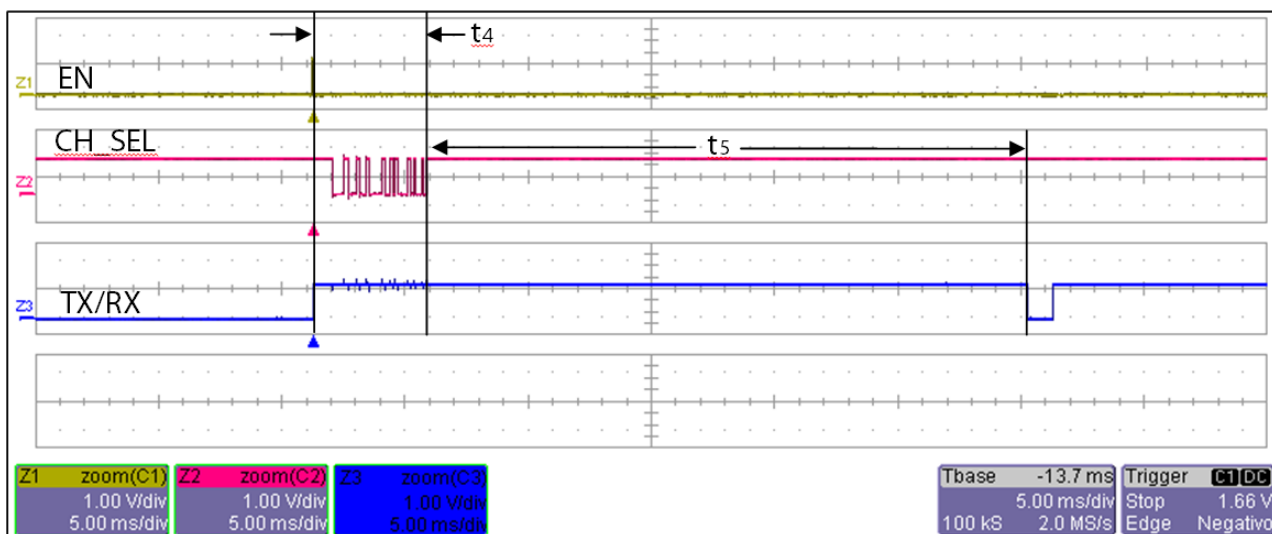


Figure 3: timings. $t_4 < 90$ ms; $t_5 = 7$ ms typ. for the setting of single parameters; $t_5 = 25$ ms typ. for the setting of default parameters.

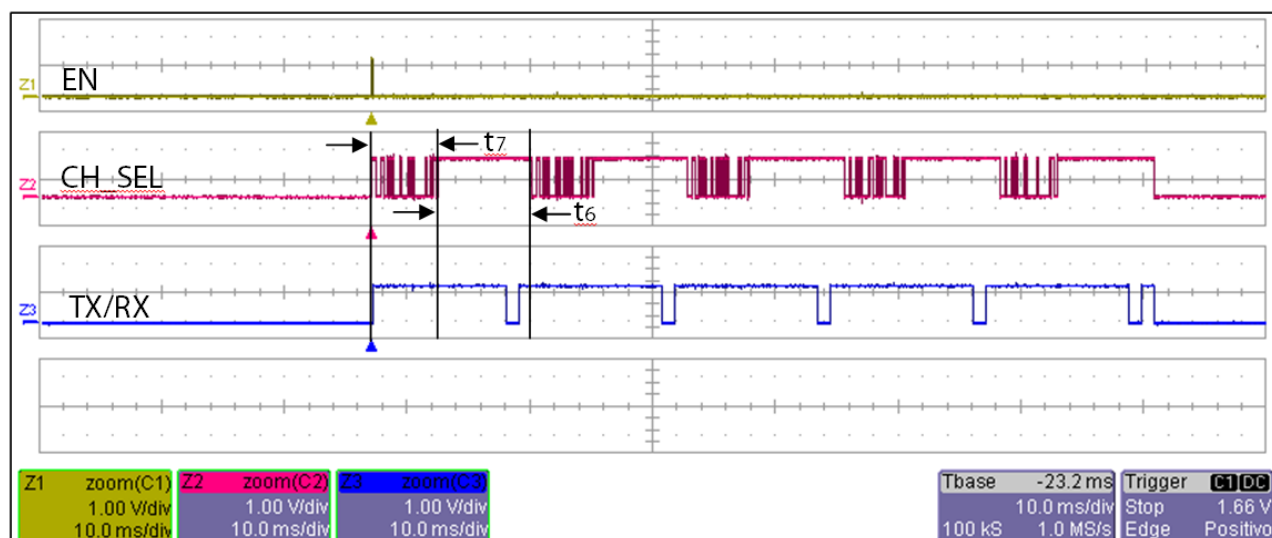


Figure 4: no other data must be present on CH_SEL line during period t_6 elapsed between a frame related to a command (t_7) and the following.

Programming bytes sequence:

- START: 0x18
- LEN: number of bytes from START to CHK
- CMD: command to be executed
- D1: first data (if any)
- CHK: checksum (0xFF – (XOR from START to CHK))

If you try to set a parameter with a value other than those permitted, the configuration will remain unchanged.

The settings are valid by the end of the time-out.

Valid parameters are stored in non-volatile memory, and are preserved even if module power is switched off.

2. COMMAND LIST COD. 32001269 (434 MHz version):

Parameter	Description	Byte CMD	Byte LEN	Parameter value
Channel 1	Channel frequency selection byte	0x50	5	0x00: 433.42 MHz (default) 0x01: 433.92 MHz 0x02: 434.42 MHz
Channel 2	Channel 2 frequency selection byte	0x51	5	0x00: 433.42 MHz 0x01: 433.92 MHz 0x02: 434.42 MHz (default)
Modulation	Modulation selection byte	0x52	5	0x00: OOK (default) 0x01: 2FSK
Sync	Synchronizer enabled / disabled selection byte (*)	0x53	5	0x00: sync disabled, normal mode, data transparent (default) 0x01: sync disabled, "slow" mode 0x02: sync enabled, baud rate 1200 0x03: sync enabled, baud rate 2400 0x04: sync enabled, baud rate 4800 0x05: sync enabled, baud rate 9600 0x06: sync enabled, baud rate 19200 0x07: sync enabled baud rate 38400
Power	RF output power selection byte	0x01	5	0x00: +10 dBm (default) 0x01: +7 dBm 0x02: +4 dBm 0x03: +1 dBm 0x04: -2 dBm 0x05: -5 dBm
Default setting	Default parameters setting	0x0A	4	

3. COMMAND LIST COD. 32001270 (868 MHz version):

Parameter	Description	Byte CMD	Byte LEN	Parameter value
Channel 1	Channel frequency selection byte	0x50	5	0x00: 868.15 MHz (default) 0x01: 868.3 MHz 0x02: 868.45 MHz 0x03: 868.825 MHz 0x04: 868.95 MHz 0x05: 869.075 MHz 0x06: 869.85 MHz
Channel 2	Channel 2 frequency selection byte	0x51	5	0x00: 868.15 MHz 0x01: 868.3 MHz 0x02: 868.45 MHz (default) 0x03: 868.825 MHz 0x04: 868.95 MHz 0x05: 869.075 MHz 0x06: 869.85 MHz
Modulation	Modulation selection byte	0x52	5	0x00: OOK 0x01: 2FSK (default)
Sync	Synchronizer enabled / disabled selection byte (*)	0x53	5	0x00: sync disabled, normal mode, data transparent (default) 0x01: sync disabled, "slow" mode 0x02: sync enabled, baud rate 1200 0x03: sync enabled, baud rate 2400 0x04: sync enabled, baud rate 4800 0x05: sync enabled, baud rate 9600 0x06: sync enabled, baud rate 19200 0x07: sync enabled baud rate 38400
Power	RF output power selection byte	0x01	5	0x00: +10 dBm (default) 0x01: +7 dBm 0x02: +4 dBm 0x03: +1 dBm 0x04: -2 dBm 0x05: -5 dBm
Default setting	Default parameters setting	0x0A	4	

(*) **Note:** for the management of synchronous and asynchronous modes, see the following paragraph:

4. SYNCHRONOUS AND ASYNCHRONOUS MODES

The default factory setting for the transceiver is in “**normal mode**” (0x00), which means that the operation is independent from the baud rate; the module can operate with any baud rate between 1200 and 4800 baud.

Based on specific user requirements related to particular frame structures and data rate, other operating settings could be managed through the SYNC command.

Using the SYNC command it is possible to:

- set the module in “**slow mode**” (0x01): this setting could be used with codings that have **long pauses** in their frame and/or have **very slow data rates** (e.g. **slow HT12** coding).
- set the module in “**synchronous modes**” (0x02 – 0x07): with this option it is possible to enhance the receiver sensitivity, but the user must observe the set baud rate with a tolerance of $\pm 5\%$. This mode is recommended for advanced users, in order to take advantage of maximum performance of the module, as long as the radio frame is implemented in accordance with the suggestions given in Mipot’s application note **AN001**.

The following tables show the sensitivity values (BER = 10E-2) in the various operating modes for the cod. **32001269 (434 MHz)**:

1. OOK modulation:

Baud rate	Sync off, Normal Mode (0x00)	Sync on 1200 (0x02)	Sync on 2400 (0x03)	Sync on 4800 (0x04)	Sync on 9600 (0x05)	Sync on 19200 (0x06)	Sync on 38400 (0x07)
1200	-100	-116	-	-	-	-	-
2400	-110	-	-116	-	-	-	-
4800	-112	-	-	-115	-	-	-
9600	-	-	-	-	-113	-	-
19200	-	-	-	-	-	-110	-
38400	-	-	-	-	-	-	-107

2. 2FSK modulation:

Baud rate	Sync off, Normal Mode (0x00)	Sync on 1200 (0x02)	Sync on 2400 (0x03)	Sync on 4800 (0x04)	Sync on 9600 (0x05)	Sync on 19200 (0x06)	Sync on 38400 (0x07)
1200	-106	-117	-	-	-	-	-
2400	-107	-	-116	-	-	-	-
4800	-107	-	-	-114	-	-	-
9600	-	-	-	-	-111	-	-
19200	-	-	-	-	-	-106	-
38400	-	-	-	-	-	-	-105

The following tables show the sensitivity values (BER = 10E-2) in the various operating modes for the cod. 32001270 (868 MHz):

3. OOK modulation:

Baud rate	Sync off, Normal Mode (0x00)	Sync on 1200 (0x02)	Sync on 2400 (0x03)	Sync on 4800 (0x04)	Sync on 9600 (0x05)	Sync on 19200 (0x06)	Sync on 38400 (0x07)
1200	-103	-115	-	-	-	-	-
2400	-111	-	-115	-	-	-	-
4800	-112	-	-	-115	-	-	-
9600	-	-	-	-	-112	-	-
19200	-	-	-	-	-	-111	-
38400	-	-	-	-	-	-	-109

4. 2FSK modulation:

Baud rate	Sync off, Normal Mode (0x00)	Sync on 1200 (0x02)	Sync on 2400 (0x03)	Sync on 4800 (0x04)	Sync on 9600 (0x05)	Sync on 19200 (0x06)	Sync on 38400 (0x07)
1200	-102	-116	-	-	-	-	-
2400	-102	-	-115	-	-	-	-
4800	-104	-	-	-113	-	-	-
9600	-	-	-	-	-106	-	-
19200	-	-	-	-	-	-105	-
38400	-	-	-	-	-	-	-103

Example: To set the 32001269 TRX in 2FSK and channel 1 on 433.92 MHz, you must send the 100 μ s pulse on the EN line and then send the following two commands on the CH_SEL line:

- Select the channel frequency 433.92 MHz: 0x18 0x05 0x50 0x01 0xB3
- Select the modulation 2FSK: 0x18 0x05 0x52 0x01 0xB1

Example: To set the 32001270 TRX in OOK and channel 1 on 868.3 MHz, you must send the 100 μ s pulse on the EN line and then send the following two commands on the CH_SEL line:

- Select the channel frequency 868.3 MHz: 0x18 0x05 0x50 0x01 0xB3
- Select the modulation OOK: 0x18 0x05 0x52 0x00 0xB0