

Upgrade from CC1100 to CC1101

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Keywords

- *RF Transceiver*
- *CC1101*
- *CC1100*

1 Introduction

This document explains the similarities and differences between the CC1100 and the CC1101 RF transceivers. The CC1101 is an upgrade of the existing CC1100 transceiver, and all performance parameters are equal or better on the CC1101. For most customers the CC1101 can be a drop-in replacement of the

CC1100 transceiver, and this can be determined by reading the design note.

TI will continue to produce both the CC1100 and the CC1101 in the future. Customers using the CC1100 do not need to change if they do not want to upgrade.

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2 Abbreviations

ADC	Analog to Digital Converter
dB	decibel
EM	Evaluation Module
GFSK	Gaussian shaped Frequency Shift Keying
kbps	kilo bits per second
PCB	Printed Circuit Board

3 Digital Interface Upgrade

3.1 Code Compatibility

The digital block is identical on both the CC1100 and the CC1101, so the CC1101 has 100% code compatibility with the CC1100. All features on the CC1100 also work on the CC1101. Several customers have already replaced the CC1100 with the CC1101 in their designs without any issues.

3.2 New Bit Setting for Close-in Reception

The CC1101 includes two previously unused bits which attenuate the incoming signal. This is useful in scenarios where the RX and TX devices are situated very close and the TX device is using high output power.

The ability to attenuate an incoming signal is controlled by bit 4 and bit 5 in the `FIFOTHR` register. Setting bit 4 to “1” gives 6 dB attenuation of the incoming signal and setting bit 5 gives 12 dB attenuation. Setting both gives 18 dB attenuation. See summary in Table 1.

Description	<code>FIFOTHR.CLOSE_IN_RX[1]</code>	<code>FIFOTHR.CLOSE_IN_RX[0]</code>
No attenuation (same as CC1100)	0	0
6 dB Attenuation	0	1
12 dB Attenuation	1	0
18 dB Attenuation	1	1

Table 1. `FIFOTHR.CLOSE_IN_RX` Settings

Bits 5:4 of the `FIFOTHR` register are marked as “reserved” in the CC1100 data sheet and the meaning of these bits have now been changed for the CC1101 as described.

Example:

Without attenuation: register `FIFOTHR` = 0x07 (default setting from SmartRF Studio)

With 18 dB attenuation: register `FIFOTHR` = 0x37

For more information, please see the CC1101 data sheet [1] and DN010 Close-in Reception with CC1101 [2].

3.3 Retention on ADC Data Rate Settings

The CC1101 can wake up with the ADC configured for optimal sensitivity at low data rates without writing to any registers upon wakeup. With the CC1100, the `TEST` registers had to be written after wakeup in order to accomplish this.

By setting bit 6 of the `FIFOTHR` register, the CC1101 wakes up with optimum settings for low data rate (≤ 100 kbps). Further writing to the `TEST` registers should be avoided because the chip configures these registers automatically.

Description	<code>FIFOTHR.ADC_RETENTION</code>
CC1101 will wake up with optimal ADC settings for low data rate (≤ 100 kbps)	1
CC1101 will wake up with optimal ADC settings for high data rate (> 100 kbps)	0

Table 2. `FIFOTHR.ADC_RETENTION` Settings

If SmartRF Studio is used to generate register values for CC1101, these settings are incorporated already.

3.4 New Electronic Revision Number

CC1100 can be replaced by CC1101 without changing register settings. Still it is necessary to take the version register in account if the firmware checks for this. The chip version is found in register 0x31 `VERSION`, and the CC1101 has electronic revision number 0x04, while the CC1100 has electronic revision number 0x03.

4 Analog Front-End Upgrade

4.1 RF Output Spectrum

The frequency synthesizer of the CC1101 is an optimization of the CC1100 frequency synthesizer.

Characterization has shown that the output spectrum is the same or better compared to CC1100 using the same register settings. In general, the phase noise is improved by 4 - 5 dB on the CC1101 compared to the CC1100.

CC1101 has improved RF performance in the European 863 to 870 frequency band. We recommend using GFSK modulation for best utilization of the channels in addition to the latest CC1101EM Reference Design available on the web ([4] and [5]). Old PCB layouts done for CC1100 will still perform the same or better with the CC1101. Differential load impedance is the same for CC1100 and CC1101.

4.2 Frequency Band of Operation

CC1101 has expanded the frequency range. In addition to the bands supported by the CC1100, the CC1101 can operate in the 387 - 400 MHz and 779 - 800 MHz frequency bands. This gives the frequency coverage shown in Table 3.

Parameter	Min	Max	Unit
Frequency Range	300	348	MHz
	387	464	MHz
	779	928	MHz

Table 3. Frequency Coverage

5 References

- [1] CC1101 Single-Chip Low Cost Low Power RF-Transceiver, Data sheet (cc1101.pdf)
- [2] DN010 Close-in Reception with CC1101 (swra147.pdf)
- [3] SmartRF Studio (swrc046.zip)
- [4] CC1101EM 315 and 433MHz Reference Design (swrr046.zip)
- [5] CC1101EM 868 and 915MHz Reference Design (swrr045.zip)

6 General Information

6.1 Document History

Revision	Date	Description/Changes
SWRA145A	2009.07.14	Removed logo from header. Cosmetic changes. Added table numbers and cross references. Added references. Added and removed keywords
SWRA145	2007.07.16	Initial release.

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