EZRadio and EZRadio Pro Family Rev C2A/A2A Device Errata

This document describes the errata for the following EZRadio® and EZRadioPRO® Rev C2A/A2A devices:

EZRadio:

- Si4055-C2A
- Si4355-C2A
- Si4455-C2A

EZRadioPRO:

- Si4060-C2A
- Si4460-C2A
- Si4461-C2A
- Si4063-C2A
- Si4463-C2A
- Si4362-C2A
- Si4438-C2A
- Si4467-A2A
- Si4468-A2A

To verify the revision of a chip, the ROMID replay field of the PART_INFO API command can be used. Rev C2A and A2A correspond to ROMID = 6.

A firmware patch is available to address most of these issues. To use the patch, it has to be downloaded after powering up the device*. For details about where to get and how to apply the patch, see section 9.6 of AN633 application note. For a detailed description of the APIs referenced in this document, see the EZRadio or EZRadioPRO API Documentation available on the Silicon Labs website.

Note: *Applying the patch increases the time to power-up the chip (from ~15 ms to ~26 ms, typical). The patch size is 512 bytes.

1. Errata Summary

A firmware patch is available to address most of these issues. We recommend that customers download the patch after powering up the device.

Note: Applying the patch increases the time to power-up the chip (from ~15 ms to ~26 ms, typical). The patch size is 500 bytes.

Table 1.1. Errata Status Summary

Errata #	Title/Problem	Workaround without patch	Si4055-C2A Si4355-C2A Si4455-C2A	Si4x60-C2A Si4461-C2A Si4x63-C2A Si4362-C2A Si4438-C2A	Si4467-A2A Si4468-A2A
1	Latched RSSI feature may not work properly	No	—	0x4668	—
2	Increased harmonics and lower fundamental power in TX mode when using a Direct Tie match	No	0x4668	0x4668	—
3	LDC mode duty cycling may stop after first packet reception	Yes	—	0x4668	—
4	RX automatic frequency hop may stop hopping	No	—	0x4668	—
5	TX to TX transition timing may vary	No	0x4668	0x4668	—
6	RX state lock-up may occur when DSA is enabled	No	0x4668	0x4668	—
7	Sync word detection timeout for non-standard preamble may not work	No	—	0x4668	—
8	Worse sensitivity than expected in LP mode	No	0x4668	0x4668	—
9	Manual RX hop takes 20 µs longer than in rev B devices	No	—	0x4668	0xD046
10	PSM gets stuck in IDLE state after a while	No	0x4668	0x4668	0xD046
11	Invalid Sync Word interrupt prematurely fires when antenna diversity is enabled	Yes	—	+	+
12	The falling edge of the Digital PA Ramp function is not working properly	Yes	—	+	+
13	If the Wake Up Timer is enabled, transitioning from XO clock to boot clock may cause CTS failure	No	0x4668	0x4668	0xD046

Legend: — not affected; + affected; 0xXXXX ID of patch that fixes the issue.

2. Detailed Errata Descriptions

2.1 Latched RSSI Feature may not Work Properly

Description of Errata
The RSSI value can be latched at: 1. Preamble detection 2. Sync word detection 3. 'x' Tbit periods after entering RX state/hopping to a new frequency band 4. 'x' Tsample periods after entering RX state/hopping to a new frequency band, where Tsample is the RX data oversampling clock period **Note:** The Latched RSSI may not be captured properly if the latching instant is based on Tbit/Tsample. In other words, when `MODEM_RSSI_CONTROL: Latch = RX_STATE1-RX_STATE5`, or `MODEM_RSSI_CONTROL: AVERAGE = Sample1` the returned Latched RSSI may be invalid.
Affected Conditions / Impacts
Invalid Latched RSSI value may be returned. Only EZRadioPRO parts are affected (the EZRadio parts always capture the Latched RSSI at sync word detection, and are therefore not affected).
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.2 Increased Harmonics and Lower Fundamental Power in TX Mode when using a Direct Tie Match

Description of Errata
In TX mode, LNA protection diodes will not be enabled.
Affected Conditions / Impacts
Harmonic content may be excessive and fundamental RF power reduced when using a direct-tie match. Increase of the 3rd harmonic can be as high as 20 dB. No impact when operating in RX state or when using a split TX / RX match or a match with an RF switch and single antenna. Both EZRadio and EZRadioPRO parts are affected.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.3 LDC Mode Duty Cycling may Stop after First Packet Reception

Description of Errata
When Low Duty Cycling (LDC) mode is enabled, the radio may stop receiving packets after the first successfully received packet, depending on what the next state is after reading the RX FIFO. For example, if it is commanded to go to SPI active after reading the FIFO, it may stop duty cycling from that point on.
Affected Conditions / Impacts
The chip may stop entering RX state autonomously. Only EZRadioPRO parts are affected.
Workaround
There are two workarounds available. 1. After reading the RX FIFO, enter Sleep state, or 2. Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.4 Auto RX Frequency may Stop Hopping

Description of Errata
Without any signal present, the radio may stop hopping after a while, and stay in receive mode at a seemingly random channel.
Affected Conditions / Impacts
Automatic frequency hopping may stop working. The device is still functional and will respond to subsequent commands from the host. Only EZRadioPRO parts are affected.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.5 TX to TX Transition Timing may Vary

Description of Errata
TX_DELAY specified in the START_TX command will not always be honored, so the amount of time the TX to TX state transition takes may not be consistent.
Affected Conditions / Impacts
TX to TX state transition time may vary. Both EZRadio and EZRadioPRO parts are affected. This does not affect the manual TX_HOP timing.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.6 RX Lock-up may Occur when DSA or PSM is Enabled

Description of Errata
Digital Signal Arrival detector (DSA) can be used to detect preamble in a very short period of time. It is used for Preamble Sense Mode (PSM) amongst other features, where the chip duty cycles between RX Idle and RX state while searching for a preamble. When the DSA is enabled, an RX lock-up may occur.
Affected Conditions / Impacts
RX lock-up may occur. The device is still functional and will respond to subsequent commands from the host. EZRadio and EZRadio-PRO parts are affected.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.7 Sync Word Detection Timeout for Non-standard Preamble may not Work

Description of Errata
It is possible to configure the device for non-standard preamble (i.e., other than a 1010, or a 0101 pattern), in which case the sync word timeout is controlled by the packet handler. When this feature is enabled, the sync word detection timeout may not work correctly.
Affected Conditions / Impacts
Without a sync word timeout, the chip may continue searching for a sync word instead of going back to searching for non-standard preamble. No impact if standard preamble is used. Only EZRadioPRO parts are affected.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.8 Worse Sensitivity than Expected in LP Mode

Description of Errata
Si4455 and Si446x show 3 dB loss of sensitivity between HP and LP modes and not give the same sensitivity/current tradeoff performance as rev B.
Affected Conditions / Impacts
EZRadio and EZRadioPRO parts are affected.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2. It will increase sensitivity and supply current in LP mode.

2.9 Manual RX Hop takes 20 µs Longer than on Rev B Devices

Description of Errata
When using the RX_HOP command, the RX to RX state transition takes about 20 µs longer than on rev B devices.
Affected Conditions / Impacts
Time critical applications may not work after transition from rev B1B to rev C2A/A2A. Only EZRadioPRO parts are affected.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.10 PSM gets Stuck in IDLE State after a While

Description of Errata
When the receiver is started in PSM mode it can get stuck in IDLE state (i.e., stops duty cycling) after some non-predictable time. It only happens when there are packets transmitted to the receiver, typically after a number of successfully received packets.
Affected Conditions / Impacts
PSM mode cannot be used. EZRadio and EZRadioPRO parts are affected.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

2.11 Invalid Sync Word Interrupt Prematurely Fires when Antenna Diversity is Enabled

Description of Errata
Antenna diversity is a feature where the signal strength on two, spatially-separated antennas is evaluated and the stronger antenna is selected for the remainder of the packet. The antenna diversity algorithm toggles between the antennas until `PREAMBLE_VALID` signal is detected on one of the antennas. Once detected, it searches for Sync Word on the stronger antenna, and generates either a Sync Word detected, or an Invalid Sync Word signal. If Invalid Sync Word hardware interrupt is enabled, it may fire right after `PREAMBLE_VALID` signal without receiving enough number of bits to determine whether there is a Sync Word pattern match, or not. Apart from generating this incorrect Invalid Sync Word signal, the chip still operates as expected. It keeps looking for a Sync Word pattern, and depending on what it finds, it either receives the complete packet, or goes back to preamble search mode.
Affected Conditions / Impacts
Invalid Sync Word detect NIRQ hardware interrupt cannot be used when Antenna Diversity is enabled. Only EZRadioPRO parts are affected.
Workaround
Disable Invalid Sync Word detect NIRQ hardware interrupt when Antenna Diversity is enabled.

2.12 The Falling Edge of the Digital PA Ramp Function is not Working Properly

Description of Errata
Si446x revC2A and Si4467/68 revA2A has a digital power ramping feature that sequentially steps through PA_POWER_LVL values, from min to max with a configurable step size and with a configurable dwell time on each of these steps. While the rising edge ramps correctly, according to the specified ramp time, the falling edge is an abrupt square edge.
Affected Conditions / Impacts
Only EZRadioPRO parts are affected.
Workaround
After POWER_UP: 1. Do the following SPI write: 0xF1474B00. Wait for CTS. 2. Make a transition to SLEEP state. 3. Make a transition back to READY state.

2.13 If the Wake Up Timer is Enabled, Transitioning from XO Clock to Boot Clock May Cause CTS Failure

Description of Errata
If the chip is in READY, RX or TX state, and is transitioning to SLEEP or SPI_ACTIVE state, it switches from XO clock to boot clock. Glitchless transition from XO clock to boot clock is guaranteed only if the boot clock is enabled and switched to that clock source at the same time. If the wake up timer (WUT) is enabled, it will generate a WUT event whenever it expires. Anytime the WUT event fires, the boot clock would incorrectly start running. If the clock transition happens after this, it may cause a clock glitch that may cause incorrect chip behavior, typically ending up in CTS failure.
Affected Conditions / Impacts
If the chip is transitioning from READY, RX or TX state to SLEEP or SPI_ACTIVE state while the WUT is running, it may cause CTS failure. Without a CTS response, the host MCU will be unable to send further commands to the transceiver.
Workaround
Apply the patch that is referenced in Table 1.1 Errata Status Summary on page 2.

3. Revision History

Revision 0.1

January, 2020

- Initial release.

Revision 0.2

February, 2021

- Added 2.13 If the Wake Up Timer is Enabled, Transitioning from XO Clock to Boot Clock May Cause CTS Failure.

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