

Errata

AWR2243 Device Errata

Silicon Revisions 1.0 and 1.1



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1 Introduction

This document describes the known exceptions to the functional and performance specifications to TI CMOS Radar Devices (AWR2243, AWR2243P).

Unless, otherwise noted, "AWR2243", when referenced, refers to both the AWR2243 and AWR2243P devices.

2 Device Nomenclature

To designate the stages in the product development cycle, TI assigns prefixes to the part numbers of Radar / milli-meter Wave sensor devices. Each of the Radar devices has one of the two prefixes: XAx or AWR2x (for example: **AWR2243**APBGABLRQ1). These prefixes represent evolutionary stages of product development from engineering prototypes (XAx) through fully qualified production devices (AWR2x).

Device development evolutionary flow:

- XAx** — Experimental device that is not necessarily representative of the final device's electrical specifications and may not use production assembly flow.
- AWR2x** — Production version of the silicon die that is fully qualified.

XAx devices are shipped with the following disclaimer:

"Developmental product is intended for internal evaluation purposes."

Texas Instruments recommends that these devices not to be used in any production system as their expected end-use failure rate is still undefined.

3 Device Markings

Figure 3-1 shows an example of the AWR2243 Radar Device's package symbolization.

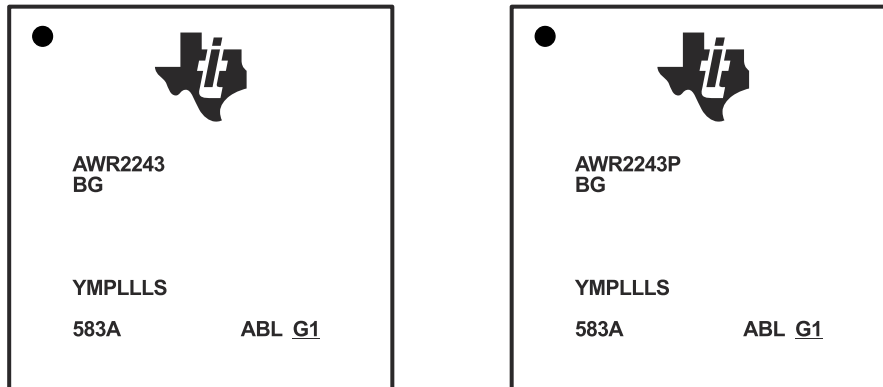


Figure 3-1. Example of Device Part Markings

This identifying number contains the following information:

- **Line 1:** Device Number
- **Line 2:** Safety Level and Security Grade
- **Line 3:** Lot Trace Code
 - YM = Year/Month Code
 - P L L L = Assembly Lot
 - S = Assembly Site Code
- **Line 4:**
 - 583 = AWR2243 Identifier
 - BLANK = ES1.0, A = ES1.1
 - ABL = Package Identifier
 - G1 = "Green" Package Build (must be underlined)

4 Advisory to Silicon Variant / Revision Map

Table 4-1. Advisory to Silicon Variant / Revision Map

ADVISORY NUMBER	ADVISORY TITLE	AWR2243	
		ES1.0	ES1.1
MASTER SUBSYSTEM			
MSS#37	DCC Module Frequency Comparison can Report Erroneous Results	X	X
ANALOG / MILLIMETER WAVE			
ANA#08A	Doppler Spur Observed at Certain RF Frequencies	X	X
ANA#11	TX, RX Calibrations Sensitive to Large External Interference	X	X
ANA#12	Second Harmonic (HD2) is Present in the Receiver	X	X
ANA#13	TX1 to TX3 Phase Mismatch Variation over Temperature is Double that of TX2/TX1 and TX3/TX2 Combinations	X	X
ANA#18A	Spurs Caused due to Digital Activity Coupling to XTAL	X	X
ANA#21	Out of Band Radiated Spectral Emission	X	X
ANA#22A	Overshoot and Undershoot During Inter-Chirp Idle Time	X	X
ANA#23	MIPI CSI2 HS Data TX Differential Voltage Mismatch (Pulse) Marginality	X	X
ANA#24	40-MHz OSC CLKOUT Causing Spurs in 2D FFT Spectrum	X	X
ANA#25	High-Speed Data System Coupling to the Clock System	X	X
ANA#27	Digital Temperature Sensor Having Higher Error	X	X
ANA#28	20GHz FM_CW_SYNCOUT/CLKOUT to FM_CW_SYNCIN Coupling in Cascade Use Case	X	X

5 Known Design Exceptions to Functional Specifications

MSS#37***DCC Module Frequency Comparison can Report Erroneous Results***

**Revision(s)
Affected:**

AWR2243 ES1.0, ES1.1

Description:

The Dual-clock Comparator module, which is used to monitor a clock frequency while comparing with a known clock reference, could stop earlier than expected, and, thus, indicating the measured clock frequency to be lower. This is due to a clock domain crossing issue causing the error detection logic to get triggered. This incorrect reporting, can cause a rare failure in the DCC monitor used to monitor internal clock frequencies.

Workaround(s):

Multiple measurements can be taken for the same clock pairs, and the median of the frequencies reported can be used for detecting failure.

ANA#08A *Doppler Spur Observed at Certain RF Frequencies*

**Revision(s)
Affected:** AWR2243 ES1.0, ES1.1

Description: When the instantaneous FMCW Ramp frequency nears certain specific RF frequencies, there can be coupling between the synthesizer's reference and its output, and manifest as frequency glitches or spurs in TX output spectrum.

Implication: In FMCW radar 2D signal processing, this can lead to spurs in a fixed Doppler bin at all range bins. This situation can occur with narrow band chirps, if the FMCW ramp includes or nears 76.8-, 77.4-, 78-, 79.2-, 80.4-, 81-GHz RF frequencies. The affected Doppler bin is a function of chirp timing and RF frequency properties.

Workaround(s): Use the device's dithering features to vary idle time, RF frequency and ramp end times to spread the spurs significantly in Doppler dimension so that it does not get detected as spurious targets. Using larger chirp band widths also reduces the spur level.

ANA#11 *TX, RX Calibrations Sensitive to Large External Interference*

**Revision(s)
Affected:** AWR2243 ES1.0, ES1.1

Description: External interference present on the RX or TX pins, during the period of the device calibration at RfInit, can lead to degraded accuracy or errors in the calibration results. If the interference changes its level while these calibrations are actively running, the calibration algorithm may interpret this as a change in signal power, leading to incorrect convergence. This applies to boot-time PD, Rx IQ mismatch calibration, Rx gain calibration, Tx power calibration, and phase-shifter calibration. It also impacts run-time Tx output power calibration in CLPC mode.

Workaround(s): **Workaround #1:**
The incident power detector in the TX output power detector, along with the absolute level of the PA loopback used during the PA loopback monitors, are insensitive to this, and they can be used to check that the calibrations converged correctly. Calibration can be re-run if large interference was observed.

Workaround #2:

Another workaround is to save the boot time calibrations at production (done in a clean environment without interference) and during operation, the calibrations can be restored. For the runtime Tx output power calibrations, OLPC mode can be used instead of the CLPC mode.

ANA#12	<i>Second Harmonic (HD2) Present in the Receiver</i>
Revision(s) Affected:	AWR2243 ES1.0, ES1.1
Description:	There is a finite isolation between the RF pins/package and the FMCW synthesizer. This can create spurious tones at the synthesizer output and lead to appearance of 2nd order harmonics and inter-modulations of expected IF frequencies at RX ADC output. The amplitude of the 2nd harmonic could as high as -55 dBc , referenced to the power level of the intended tone at the LNA input.
Workaround(s):	No workaround available at this time. However, in many typical radar usecases the HD2 does not affect the system performance due to two reasons: <ol style="list-style-type: none"> 1. Since the HD2 comes from a coupling to the LO signal, there is an inherent suppression of the HD2 level due to the self-mixing effect (that is, phase noise and phase spur suppression effect at the mixer). 2. In real-life scenarios there is often a double-bounce effect of the radar signal reflected from the target, which leads to a ghost object at twice the distance of the actual object. This effect is often indistinguishable from the effect of HD2 itself.
ANA#13	<i>TX1 to TX3 Phase Mismatch Variation over Temperature is Double that of TX2/TX1 and TX3/TX2 Combinations</i>
Revision(s) Affected:	AWR2243 ES1.0, ES1.1
Description:	TX3/TX1 combination exhibits a phase mismatch variation of ± 6 degrees across the complete recommended operating temperature range per the data manual whereas, TX2/TX1 and TX3/TX2 combinations exhibit a lower variation of ± 3 degrees over the same temperature range.
Workaround(s):	In applications requiring high phase accuracy across TX channels, a background angle calibration can be used to control phase variation over temperature.

ANA#18A***Spurs Caused due to Digital Activity Coupling to XTAL***

**Revision(s)
Affected:**

AWR2243 ES1.0, ES1.1

Description:

Digital filtering activity can potentially couple to XTAL pins and lead to spurs in the RX ADC output. The spur frequencies depend on the sampling rate (F_s) and DFE modes. The strongest of these spurs have been observed when F_s is close to 10-, 12.5-, 20-, 25-Msps within ± 1.5 MHz. In these ranges, an IF spur can appear at about $2F_s-40$ MHz, $4F_s-40$ MHz, $4F_s-100$ MHz, and $8F_s-100$ MHz.

Workaround(s):**Workaround #1:**

Avoid sampling rates close to these numbers (10-, 12.5-, 20-, 25-Msps) or use exactly these numbers (spur is at 0 Hz in the latter case).

Workaround #2:

Using external TCXO, instead of XTAL, can avoid these spurs.

ANA#21	<i>Out of Band Radiated Spectral Emission</i>
Revision(s) Affected:	AWR2243 ES1.0, ES1.1
Description:	14.4-GHz and 28.8-GHz frequency components on the radiated spectrum emissions, are out of band.
Workaround(s):	To help in reducing the spur, shield around the device (<i>excluding Antenna region</i>). Microwave absorbers are available and can be attached to the top of the device.
ANA#22A	<i>Overshoot and Undershoot During Inter-Chirp Idle Time</i>
Revision(s) Affected:	AWR2243 ES1.0, ES1.1
Description:	At the end of the chirp , when the synthesizer starts to go back to the start frequency of the next chirp, there is some overshoot and undershoot. The undershoot/overshoot is proportional to the chirp bandwidth. Negative slope chirps have a worse undershoot than positive slope chirps.
Workaround(s):	To ensure the TX power amplifier is OFF during chirp idle time and not causing "on-air" emissions during the undershoot/overshoot period, keep the inter-chirp power savings ON.
ANA#23	<i>MIPI CSI2 HS Data TX Differential Voltage Mismatch (Pulse) Marginality</i>
Revision(s) Affected:	AWR2243 ES1.0, ES1.1
Description:	Some devices could fail the MIPI CSI2 HS TX Differential Voltage Mismatch spec [$\Delta VOD = VOD1 - VOD0 $] by a few mV on the CSI data lanes at higher temperatures. The MIPI spec for this parameter is 14 mV.
Workaround(s):	None. This failure should typically not impact the data integrity/reception.

ANA#24	<i>40-MHz OSC CLKOUT Causing Spurs in 2D-FFT Spectrum</i>
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Revision(s) Affected:	AWR2243 ES1.0, ES1.1
Description:	Harmonics of 40 MHz from osc-clkout can be coupled onto the synthesizer and can cause low amplitude spurs in the 2D-FFT spectrum. These spurs are at fixed doppler bin, across all range bins.
Workaround(s):	<p>Workaround #1</p> <p>For single chip usecases, where OSC CLKOUT is not used , OSC CLKOUT output can be disabled.</p> <p>Workaround #2</p> <p>For cascade usecase or where OSC clkout is needed in the system, use the chirp dithering capability (idle time, RF start frequency, ADC start time) across the frame to spread the spur across all the Doppler bins and hence avoid false detection.</p>
ANA#25	<i>High-Speed Data System Coupling to the Clock System</i>
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Revision(s) Affected:	AWR2243 ES1.0, ES1.1
Description:	Data transfer over LVDS and CSI interface with repeatable patterns could interfere with the clock system and cause low-level spurs in the Rx spectrum and show up in the 2D-FFT. In case of CSI interface, the mode transitions (LP-to-HS or HS-to-LP) could also cause interference in the clock system.
Workaround(s):	The firmware allows applying random dither to the CSI data transfer start time. This can be controlled using the "AWR_DEV_CSI2_DELAY_DUMMY_CFG_SET_SB" API. With the dithering the glitch on the synthesizer frequency error gets spread out in time, across the chirps of a frame, reducing the impact in the 2D-FFT.

ANA#27***Digital Temperature Sensor Having Higher Error***

**Revision(s)
Affected:**

AWR2243 ES1.0, ES1.1

Description:

Due to the single-ended nature of the digital temperature sensors, as compared to the differential design of analog temperature sensors (that is, TX, RX, and PM), it is vulnerable to noise and can have higher error than the analog temperature sensors.

Workaround(s):

Use only the analog temperature sensor values (TX and RX) in the algorithm. The digital temperature sensor value can be ignored.

ANA#28**20GHz FM_CW_SYNCOUT/CLKOUT to FM_CW_SYNCIN Coupling in Cascade Use Case**

**Revision(s)
Affected:**

AWR2243 ES1.0, ES1.1

Description:

There is ~18dB on chip isolation between the 20GHz FM_CW_SYNCOUT/CLKOUT and FM_CW_SYNCIN signals of the master device in cascade configuration. Apart from the stronger FM_CW_SYNCIN signal that is looped back to the master device, there is also a weaker signal coupled from SYNCOUT/CLKOUT directly to SYNCIN. Between the two signals, there is a delay due to PCB routing. This signal delay, caused by PCB routing, could lead to slight smearing of the object peak in the range dimension. The extent of smearing depends on the PCB routing delays of the 20GHz signals.

Workaround(s):

Keep the PCB routing delay of the 20GHz sync signals lower, to reduce the extent of smearing of the peak.

Trademarks

All other trademarks are the property of their respective owners.

Revision History

Changes from January 11, 2020 to August 15, 2020 (from Revision * (January 2020) to Revision A (August 2020))

	Page
• Global: Added Silicon Revision 1.1 device-specific information.....	2
• Global: Updated the numbering format for tables, figures, and cross-references throughout the document.....	2
• Global: Added AWR2243P device-specific information.....	2
• Section 2 (Device Nomenclature): Updated/Changed the example part number to reflect the RTM'd device...	2
• Section 3 (Device Markings): Updated/Changed Figure 3-1 to show a AWR2243P example of device part markings.....	3
• Table 4-1 (Advisory to Silicon Variant / Revision Map): Updated/Changed MSS#37, ANA#11, ANA#12, and ANA#13 advisories, all silicon revisions.....	4
• Table 4-1 : Added ANA#08A, ANA#18A, ANA#21, ANA#22A, and ANA#23 through ANA#25, ANA#27 and ANA#28 advisories, all silicon revisions.....	4

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