



AN1498: EFR32xG27 WLCSP39 – Support for +6 dBm 125 °C Operation

This application note presents pre-compliance radiated TX tests of the EFR32xG27 WLCSP39 Wireless MCU that allow extending the output power range from +4 dBm to +6 dBm without facing any issues regarding the radiated harmonic limits of FCC 15.247. This document can also be used as a reference for using the SoC up to 125 °C temperature.

KEY FEATURES

- Pre-compliance radiated harmonic tests
- 125 °C support

Note: The RF validation of the WLCSP39 package was performed up to +4 dBm output power of the high power PA. However, +6 dBm capability has been thoroughly tested and deemed applicable up to 125 °C and will be referred to as the highest power level in this application note.

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1. Elevating the Output Power and Temperature Range Restrictions

The original restrictions of +4 dBm and 85 °C for the CSP package were determined considering the technological differences compared to the QFN package (e.g., detuning of the RF matching network at higher power) and to avoid the increased temperature dependent TX current draw that could potentially exceed the capabilities of the DC-DC boost converter.

As a result of recent investigations, Silicon Labs has elevated these limitations and allows the use of the xG27 WLCSP package at +6 dBm up to 125 °C temperature.

The recommended hardware reference designs continue to be BRD4110B and BRD4111B without any changes needed.

2. FCC Pre-Compliance Radiated Harmonic Tests

While Silicon Labs recommends using an RF shield to avoid harmonics of the fundamental power to exceed the -41 dBm FCC limit (or E field strength of 54 dBuV/m at 3m from DUT), the xG27 WLCSP39 package has been tested up to the 5th harmonic and found to be compliant to the limits with great margins, even without an RF shield. The table below summarizes the measurements.

Table 2.1. Radiated TX Harmonic Emissions with a CW TX Signal at the Center and Edge Channels (BRD4111B)

Radiated Emissions		Measured Maximums in EIRP [dBm]	FCC_15.247 Limit in EIRP [dBm]	Margin [dB]
2402 MHz	Fund.	8.9	30	21.1
	H2	-56.9	-41.2	15.7
	H3	-56.1	-11.1	45
	H4	-60.2	-11.1	49.1
	H5	-53.1	-41.2	11.8
2450 MHz	Fund.	9.1	30	20.9
	H2	-58	-41.2	16.8
	H3	-55.8	-11.1	14.6
	H4	-59.4	-11.1	48.5
	H5	-53.9	-41.2	12.7
2480 MHz	Fund.	8.5	30	21.5
	H2	-56.9	-41.2	15.6
	H3	-55.3	-11.1	14.1
	H4	-59.2	-11.1	47.7
	H5	-55.2	-41.2	13.9

A raw power setting of 74 was used which was determined on a Spectrum Analyzer in a conducted measurement setting to output +6 dBm power. The onboard Inverted-F (IFA) of BRD4111B was used, which has a peak gain of 3.1 dBi, which explains the 9.1 dBm output power reading in the maximum direction.

The device was measured in all three XYZ planes. The values in the table represent the orientations where the harmonic level were found to be the worst. The measurements confirm FCC compliant +6 dBm operation.

See [AN930.2](#) for conducted TX harmonic emissions and TX current consumption measurements.

Note:

1. Silicon Labs SoCs – as opposed to Modules – are not officially certified for any RF standard (FCC 15.247, ETSI, etc.). The presented results only showcase that the device is capable of excellent RF performance if the RF design guidelines of [AN930.2](#) and [AN928.2](#) are followed. Consequently, the customer must do the full RF certification on their end-product with an accredited test house.

3. 125 °C Support

The verification tests were performed on multiple corner parts¹ of multiple die revisions. The devices were tested in a temperature chamber for 30 minutes at 6 dBm output power in CW transmit mode, and no anomalies were observed.

Note:

1. Specifically selected parts that perform below average across multiple RF metrics.

4. Revision History

Revision 0.1

October, 2024

Initial version.

Simplicity Studio

One-click access to MCU and wireless tools, documentation, software, source code libraries & more. Available for Windows, Mac and Linux!



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