TIDC-CC2650-CC2592-EMK

This report provides the procedure to control CC2592 range extender device from CC2650 and key test data measured on TIDA-CC2650-CC2592-EM board.

CC2592 Range Extender Control

To setup CC2592 range extender control from CC2650, any DIO pins can be used.
On CC2650, general purpose signals from the RFCORE can be assigned to GPIO using the IOC:IOCFG<n>.PORTID fields. The settings to be programmed are 0x2F, 0x30, 0x31, 0x32 to get RFC_GPO0, RFC_GPO1, RFC_GPO2, RFC_GPO3 respectively. By default, RF Core Data Out 0 is configured to be high when the LNA is enabled and low otherwise. RF Core Data Out 1 is configured to be high when the PA is active and low otherwise. For further information on programming the IO control registers, please refer to the technical reference manual for CC2650.

In TIDC-CC2650-CC2592-EMK design, DIO7 and DIO13 on CC2650 are used for PA enable and LNA enable respectively for CC2592 range extender device. RFCore Data Out 0 signal is mapped to DIO13 and RF Core Data Out 1 is mapped to DIO7. DIO14 is initialized and programmed as a GPIO to provide HGM input for CC2592. Registers configuration needed is as follows:
IOCFG7 = 0x30
IOCFG13 = 0x2F

This can be programmed using IOCPortConfigureSet function as follows:

```
#include "ioc.h"
// Map RFC_GPO0 to DIO13
IOCPortConfigureSet(IOID_13, IOC_PORT_RFC_GPO0,
                IOC_IOMODE_NORMAL);
// Map RFC_GPO1 to DIO7
IOCPortConfigureSet(IOID_7, IOC_PORT_RFC_GPO1,
                IOC_IOMODE_NORMAL);
```

Test Results and Performance curves

Test data in this report has been measured on TIDC-CC2650-CC2592-EMK under typical conditions defined in this document as temperature = 25°C, supply = 3.0 V, frequency = 2440 MHz and internal DC-DC converter enabled on CC2650, if nothing else is stated. The PCB layout on this design will greatly influence the RF performance. When using CC2650 and CC2592 on a design, it is highly recommended to follow TI reference design for layout, stack-up and schematic as close as possible to obtain optimum performance.

Current Consumption

Parameter	Condition	Typical	Unit
Receive Current	-100 dBm input level	10.2	mA
Transmit Current	TXPOWER = 0x3F TXPOWER = 0x1C TXPOWER = 0x12 TXPOWER = 0x0E TXPOWER = 0x0B TXPOWER = 0x53 TXPOWER = 0x51	179.8 155.3 134.4 119.9 105.1 96.0 88.3	mA mA mA mA mA mA mA

Table 1. Current Consumption

Receive Parameters

Parameter	Condition	Typical	Unit
Receive Sensitivity	IEEE 802.15.4 (Offset Q-PSK DSSS, 250 kbps)	-100.2	dBm
Receive Sensitivity	1-Mbps GFSK (Bluetooth Low Energy)	-98.7	dBm
Interferer Rejection	Wanted signal 3 dB above the sensitivity level, IEEE 802.15.4 modulated interferer at IEEE 802.15.4 channels ±5 MHz from wanted signal, IEEE 802.15.4 ±10 MHz from wanted signal, IEEE 802.15.4 ±20 MHz from wanted signal. Wanted signal at -82dBm	 30.2 40.6 57.9	 dB dB dB

Table 2. Receive Parameters

Transmit Parameters

Parameter	Condition	Typical	Unit
Emission* with TXPOWER = 0x28	Conducted 2·RF (FCC restricted band) Conducted 3·RF (FCC restricted band)	-44.5 -53.2	dBm dBm
Max Error Vector Magnitude (EVM)	Measured as defined by IEEE 802.15.4 TXPOWER = 0x28	3.2	%

Table 3. Transmit Parameters

*This design has been tested to be compliant with FCC specification at 2*Fc and 3*Fc on radiated tests as well with RF shield. At high power levels, RF shield is required to be complaint with FCC harmonic emission regulations.

Output Power Programming

The RF output power of the CC2650 - CC2592 EM is controlled by txPower parameter on CC2650 radio setup operation. Table 4 shows the typical output power and current consumption for the recommended power settings. The value specified in the table refers to the combined value of txPower.IB and txPower.GC.

TXPOWER	Power [dBm]	Current [mA]
0x3F	22.0	179.8
0x1C	20.9	155.3
0x12	19.5	134.4
0x0E	18.4	119.9
0x0B	16.9	105.1
0x53	15.9	96.0
0x51	14.9	88.3

Table 4. Power Table

Note that the recommended power settings given in Table 4 are a subset of all the possible TXPOWER register settings. However, using other settings than those recommended might result in suboptimal performance in areas like current consumption, EVM, and spurious emission.

Typical Performance Curves

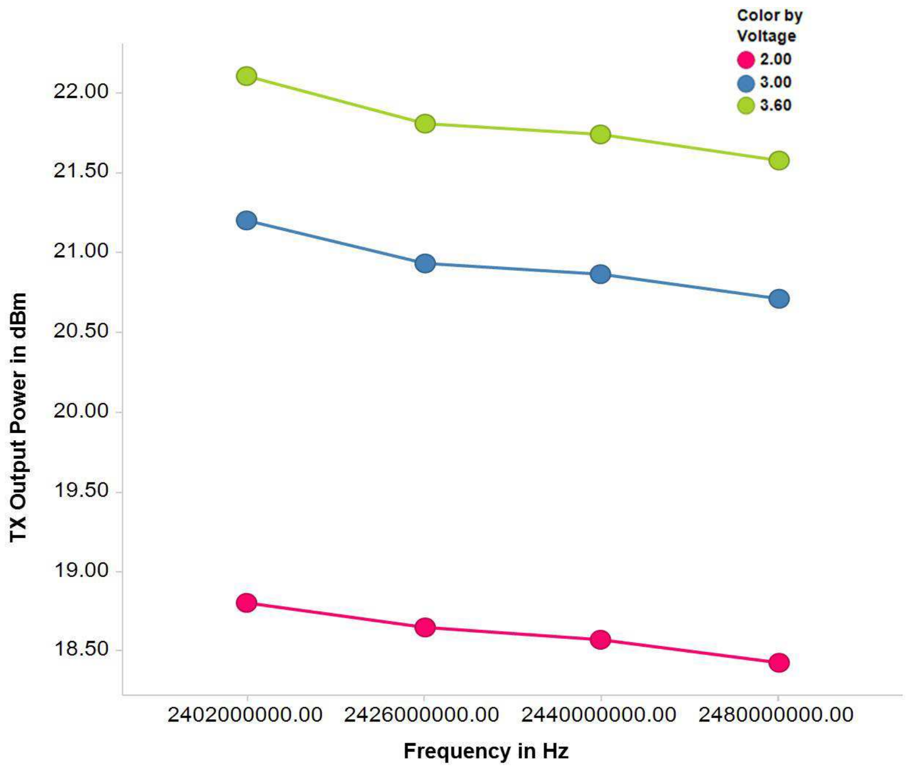

Figure 1. Output Power vs. Frequency and Power Supply Voltage, TXPOWER = 0X28

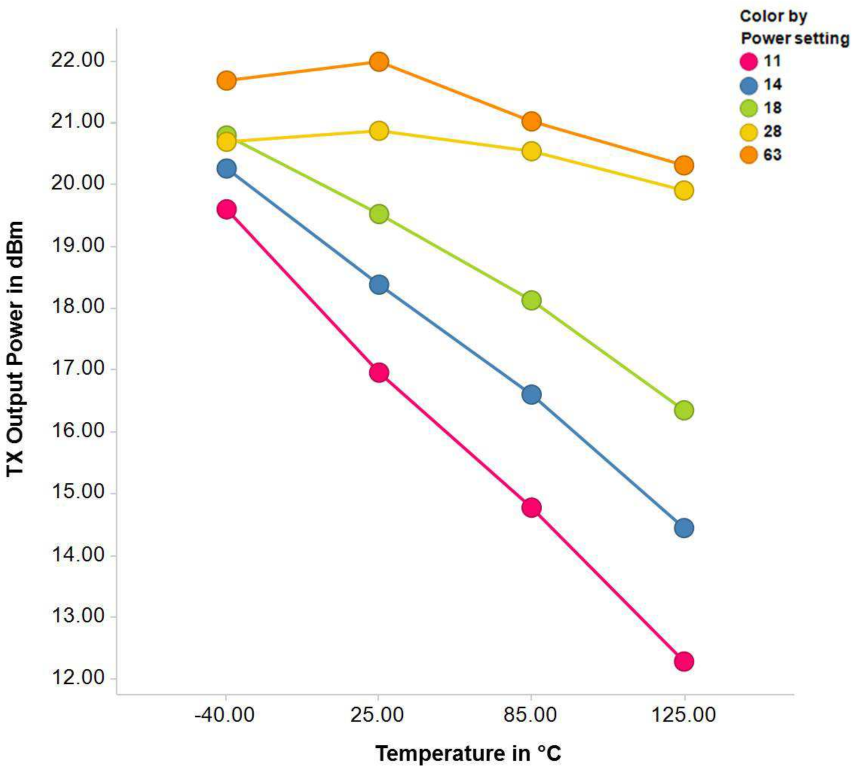

Figure 2. Output Power vs. Temperature at various TXPOWER settings

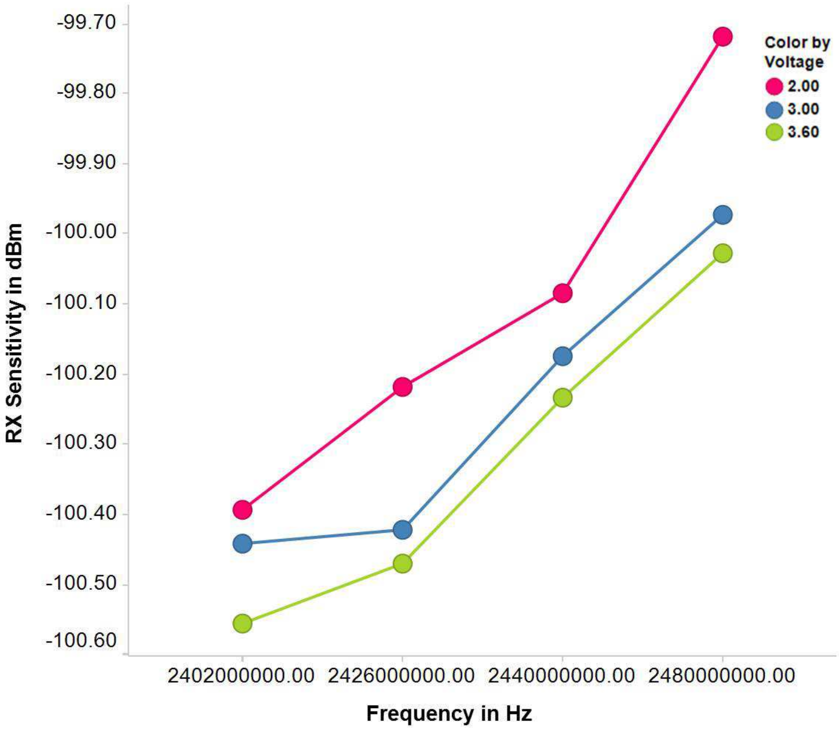

Figure 3. Sensitivity vs. Frequency and Power Supply Voltage for IEEE 802.15.4 PHY mode

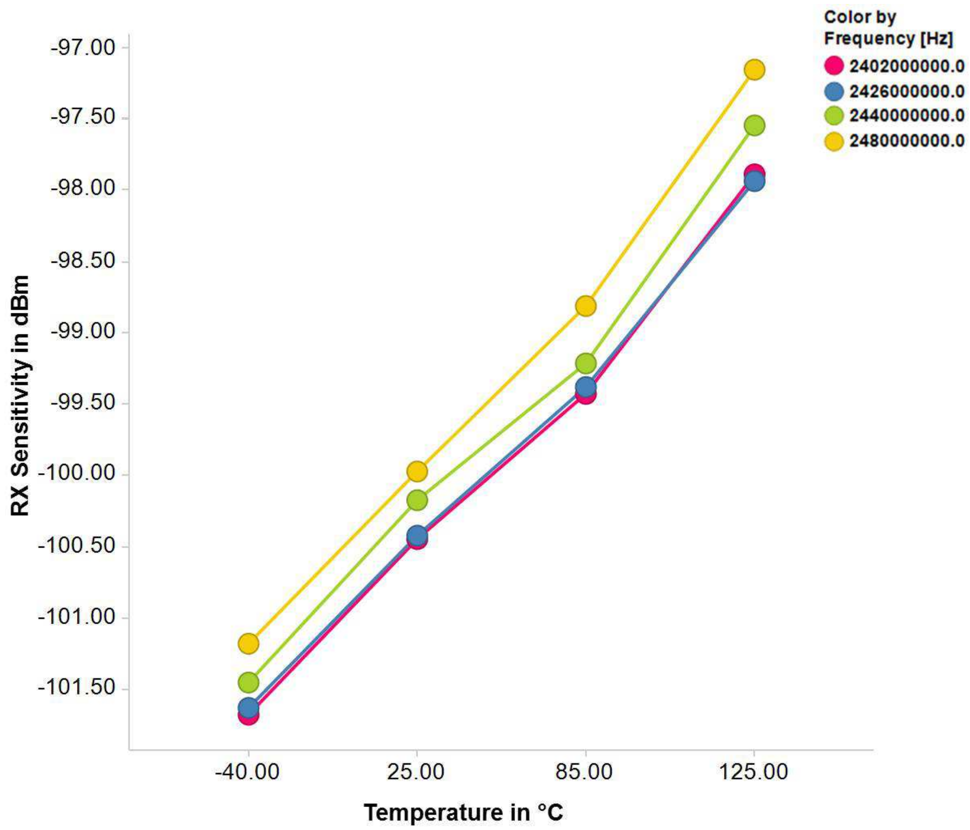

Figure 4. Sensitivity vs. Temperature and Power Supply Voltage IEEE 802.15.4 PHY mode

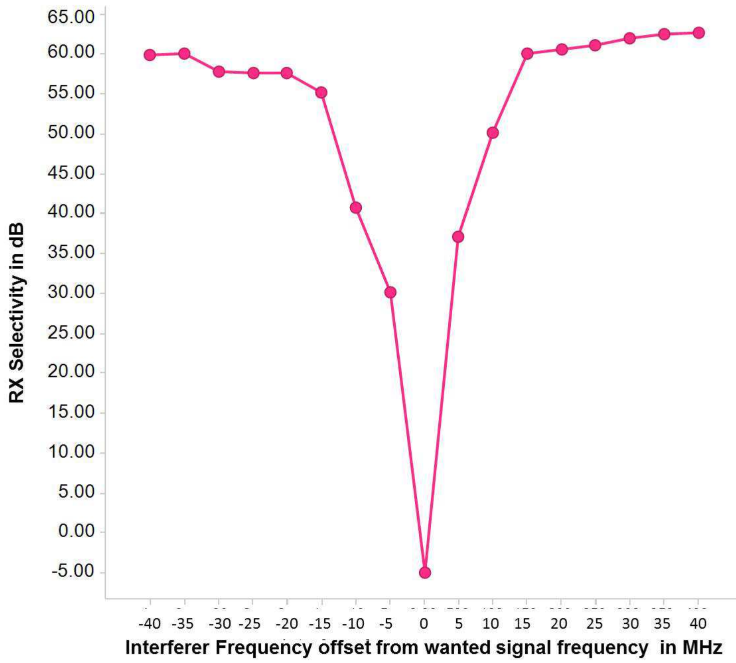

Figure 5. Selectivity measured with wanted signal at 2440MHz

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