

# CC2400

## Reliability Report

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### CONCLUSION

The CC2400 meets the Chipcon product reliability qualification standards based on the procedures and tests documented in the following.

### Design phase

Design is made for robustness using extensive corner simulations for:

- Process variations
- Minimum/maximum operating temperature
- Minimum/maximum operating voltage
- Minimum/maximum process limitations

### Process

The CC2400 is based on the Chipcon SmartRF<sup>®</sup>-03 platform. It is designed in an industry standard 0.18µm mixed signal CMOS process with 1 poly layer and 4 metal layers.

### Package reliability (QFN-48 RoHS compatible)

Moisture Sensitivity Level	JEDEC Level 3
Temp Cycling	-65/150°C, 1000 cycles
Thermal shock Test	-65/150°C, 500 cycles
HAST	130°C / 85% r.h. 168 hrs
Autoclave	121°C / 15 psi / saturated steam, 168 hrs

### ESD and Latch-Up

Latch-up testing according to JEDEC 17.

Minimum immunity level: ± 100mA at all pins. VDD abs. max. rating + 20% at all supply pins.

ESD test according to Mil. Std. 883E 3015 Human Body Model.

Minimum immunity level RF pin groups: 0.5kV, except:

DI to DGUARD	0.1kV	AVDD_RF1 to DGUARD	0.25kV
RF_IO to AVDD_PRE	0.25kV	TXRX_SWITCH to DGUARD	0.25kV
RF_IO to DVDD_ADC	0.25kV	AVDD_SW to DGUARD	0.25kV
RF_IO to DVDD3.3	0.25kV	AVDD_RF2 to DGUARD	0.25kV
RF_IO to DVDD1.8	0.25kV	AVDD_IF2 to DGUARD	0.25kV
RF_IO to AVDD_CHP	0.25kV	DVDD_ADC to DGND_GUARD	0.25kV
RF_IO to GND	0.1kV	DGUARD to DVDD3.3	0.1kV
RF_IO to DGND_GUARD	0.1kV	DGUARD to DVDD1.8	0.1kV
DIO to DGUARD	0.1kV	DGUARD to AVDD_XOSC	0.25kV
AIO to DGUARD	0.25kV	DGUARD to AVDD_CHP	0.25kV
AO&AI to DGUARD	0.1kV	DGUARD to GND	0.1kV
AO&AI to GND	0.1kV	DGUARD to DGND	0.1kV
AO&AI to DGND_GUARD	0.25kV	DGUARD to DSUB_PADS	0.1kV
VCO_GUARD to DGUARD	0.25kV	DGUARD to DSUB_CORE	0.1kV
AVDD_VCC to DGUARD	0.25kV	DGUARD to GND_PT	0.25kV
AVDD_PRE to DGUARD	0.25kV	RF_IO to RF_IO	0.25kV

Minimum immunity level non-RF pin groups: 1kV, except:

DI to AVDD_VCC	0.5kV	AO&AI to DSUB_CORE	0.75kV
DI to AVDD_PRE	0.75kV	AO&AI to GND_PT	0.5kV
DI to AVDD_RF2	0.5kV	VCO_GUARD to DVDD1.8	0.5kV
DI to AVDD_IF2	0.75kV	VCO_GUARD to DSUB_CORE	0.75kV
DI to AVDD_ADC	0.75kV	AVDD_VCC to DVDD1.8	0.25kV
DI to DVDD_ADC	0.75kV	AVDD_VCC to DGND	0.5kV
DI to AVDD_XOSC	0.75kV	AVDD_VCC to DSUB_PADS	0.75kV
DI to AVDD_CHP	0.25kV	AVDD_VCC to DSUB_CORE	0.75kV
DIO to VCO_GUARD	0.5kV	AVDD_PRE to DVDD3.3	0.75kV
DIO to AVDD_VCC	0.5kV	AVDD_PRE to DVDD1.8	0.75kV
DIO to AVDD_PRE	0.5kV	AVDD_PRE to DSUB_CORE	0.75kV
DIO to AVDD_RF1	0.75kV	AVDD_RF1 to DVDD1.8	0.5kV
DIO to AVDD_RF2	0.5kV	TXRX_SWITCH to DVDD1.8	0.5kV
DIO to AVDD_IF2	0.75kV	TXRX_SWITCH to DSUB_CORE	0.75kV
DIO to AVDD_ADC	0.75kV	AVDD_SW to DVDD1.8	0.5kV
DIO to DVDD_ADC	0.5kV	AVDD_SW to AVDD_CHP	0.75kV
DIO to AVDD_CHP	0.5kV	AVDD_SW to DSUB_CORE	0.75kV
DIO to GND_PT	0.75kV	AVDD_RF2 to DVDD1.8	0.5kV
AIO to DVDD1.8	0.25kV	AVDD_RF2 to DSUB_PADS	0.75kV
AO&AI to VCO_GUARD	0.25kV	AVDD_RF2 to DSUB_CORE	0.5kV
AO&AI to AVDD_VCC	0.5kV	AVDD_IF2 to DVDD1.8	0.5kV
AO&AI to AVDD_PRE	0.25kV	AVDD_ADC to DVDD1.8	0.5kV
AO&AI to AVDD_RF1	0.25kV	DVDD_ADC to DVDD1.8	0.5kV
AO&AI to TXRX_SWITCH	0.5kV	DVDD3.3 to AVDD_CHP	0.75kV
AO&AI to AVDD_SW	0.25kV	DVDD1.8 to AVDD_XOSC	0.75kV
AO&AI to AVDD_RF2	0.25kV	DVDD1.8 to AVDD_IF1	0.5kV
AO&AI to AVDD_IF2	0.25kV	DVDD1.8 to AVDD_CHP	0.5kV
AO&AI to AVDD_ADC	0.5kV	DVDD1.8 to GND_PT	0.5kV
AO&AI to DVDD_ADC	0.25kV	AVDD_XOSC to AVDD_IF1	0.75kV
AO&AI to DVDD3.3	0.75kV	AVDD_XOSC to AVDD_CHP	0.75kV
AO&AI to DVDD1.8	0.5kV	AVDD_CHP to DGND	0.75kV
AO&AI to AVDD_XOSC	0.5kV	AVDD_CHP to DSUB_CORE	0.5kV
AO&AI to AVDD_IF1	0.5kV	AO&AI to AO&AI	0.5kV
AO&AI to AVDD_CHP	0.5kV		

## Transfer to Production

First Article Inspection (testing at  $-40/+25/+85^{\circ}\text{C}$ )

Production test limits extraction based on statistical methods.

Accelerated lifetime test. Minimum expected lifetime (\*): 10 years at  $58^{\circ}\text{C}$ ,

1.4 years at  $85^{\circ}\text{C}$ , FIT of approx. 60 (at room temp) with 60% confidence level.

(\* based on test of 9 devices at  $125^{\circ}\text{C}$  and 1 at  $25^{\circ}\text{C}$  for 1040hrs, 0 failures. Devices from lot 0447XAB - WAC.

## Production test

Final test  $+25^{\circ}\text{C}$

Sampling test ( $-40/+25/+85^{\circ}\text{C}$ )

## Tape & Reel specification

Package: QFN 48 - RoHS compatible

Tape Width: 16,0mm

Component Pitch: 12,0mm

Hole Pitch: 4,0mm

13inch tape with 4000 pcs.

Carrier tape and reel is in accordance with EIA specification 481.

### **Solderability**

Recommended soldering profile is according to IPC/JEDEC J-STD-020C July 2004

### **Summary**

The above data show that CC2400 meets the Chipcon product reliability qualification standards and has an acceptable level of reliability.

### **Revision history**

1.0 Initial Version

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