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1 Summary of Features

The XMCXXXXSC devices are members of the XMC1000 Family of microcontrollers based on the ARM Cortex-M0 processor core. The XMCXXXXSC series addresses the real-time control needs of wireless power systems.

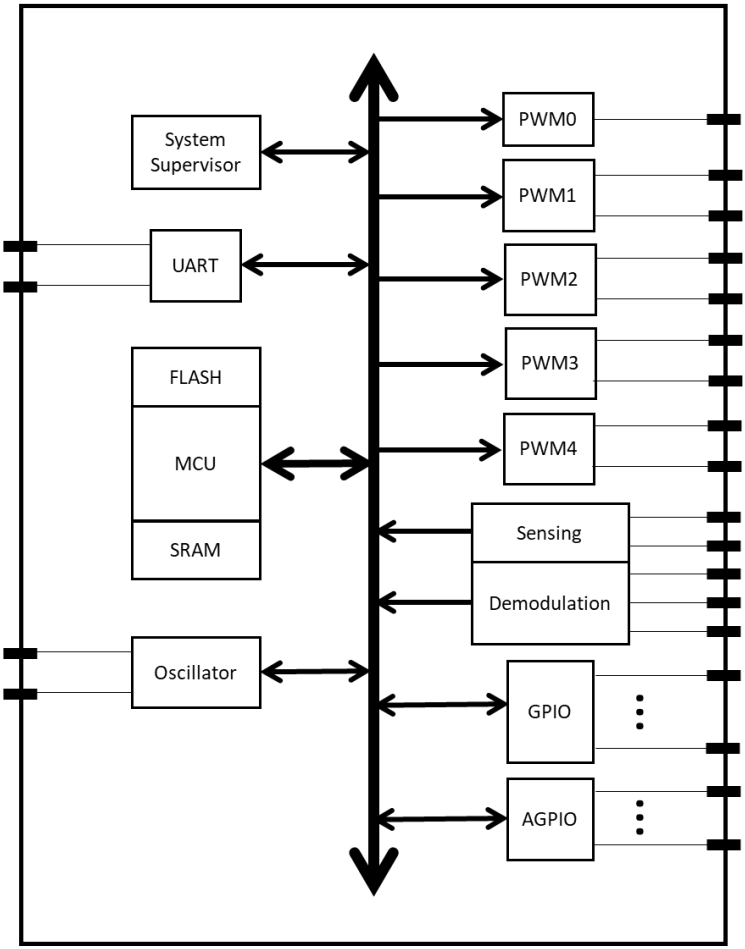

Figure 1 Block Diagram

Features

CPU subsystem

- 32-bit ARM Cortex-M0 CPU Core
- MATH coprocessor

On-Chip Memories

- SRAM (with parity)
- Flash (with ECC)

Supply, Reset and Clock

- 3.3 V or 5 V supply with power on reset and brownout detector
- On-chip clock monitor
- External crystal oscillator support (8 to 20 MHz)

System Control

- Window watchdog
- Real time clock module
- Pseudo random number generator

Communication Peripherals

- Four USIC channels, usable as
  - UART (115.2 kb/s)
  - IIC (up to 400 kb/s)

Analog Frontend Peripherals

- A/D converters for voltage and current sensing
- Temperature Sensor

Industrial Control Peripherals

- 2 PWM channels for full bridge coil driver
- 1 PWM channel for step-up or step-down bridge supply control

Up to 13 Input/Output Ports

- 3.3 V or 5 V capable

Programming Support

- Secure bootloader

Packages

- VQFN-40 (5×5 mm^2)

Tools

- Easy to use GUI for programming and debugging

1.1 Device Overview

The following table lists the available features per device type for the XMCXXXXSC series.

Table 1 Features of XMCXXXXSC Device Types

Features	
Operating temperature (ambient)	-40 to 105 °C
Operating voltage	3.3 V or 5.5 V
GPIOs	27
GPIs	8
Packages	VQFN-40

1.2 Ordering Information

The ordering code for an Infineon microcontroller provides an exact reference to a specific product. The code “XMC<DDDD>SC-<Z><PPP><T>” identifies:

- <DDDD> the derivatives function set
- <Z> the package variant
  – Q: VQFN
- <PPP> package pin count
- <T> the temperature range:
  – X: -40°C to 105°C

For ordering codes for the XMCXXXXSC please contact your sales representative or local distributor.

This document describes several derivatives of the XMCXXXXSC series, some descriptions may not apply to a specific product. Please see **Table 2**.

For simplicity the term **XMCXXXXSC** is used for all derivatives throughout this document.

1.3 Device Types

These device types are available and can be ordered through Infineon's direct and/or distribution channels.

Table 2 Synopsis of XMCXXXXSC Device Types

Derivative	Description
XMC0001SC-Q040X	Evaluation device to be programmed by the customer
XMC6521SC-Q040X	Qi single coil 15W inductive MP-A11 desktop transmitter
XMC6511SC-Q040X	Qi single coil 10W sub-surface infrastructure transmitter
XMC7501SC-Q040X	Single coil low power inductive transmitter
XMC7531SC-Q040X	Single coil 30W Telecom and Security transmitter
XMC7541SC-Q040X	Single coil 80W high power inductive transmitter
XMC8511SC-Q040X	Low power resonant multi-device transmitter
XMC8531SC-Q040X	30W resonant transmitter

2 General Device Information

This section summarizes the package pin configurations with a detailed list of the functional I/O mapping.

2.1 Pin Configuration and Definition

The following figures summarize all pins, showing their locations.

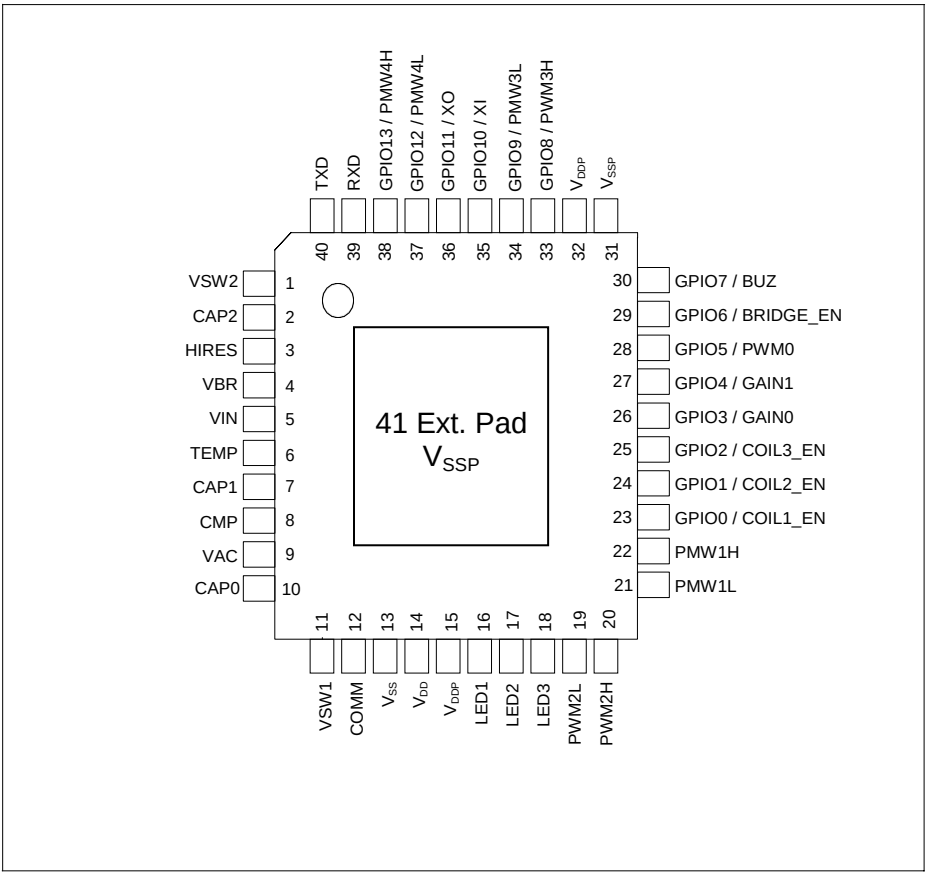

Figure 7 XMCXXXXSC PG-VQFN-40-17 Pin Configuration (top view)

2.1.1 Package Pin Summary

The following columns list the package pin number to which the respective function is mapped in that package.

The “Pad Type” indicates the employed pad type:

- STD_INOUT (standard bi-directional pads)
- STD_INOUT/AN (standard bi-directional pads with analog input)
- STD_INOUT/clock (standard bi-directional pads with oscillator function)
- High Current (high current bi-directional pads)
- STD_IN/AN (standard input pads with analog input)
- Power (power supply)

Details about the pad properties are defined in the Electrical Parameter chapter.

Table 5 Package Pin Mapping

Function	VQFN 40	Pad Type	Notes
GPIO0	23	STD_INOUT	GPIO0 or COIL1_EN (coil #1 enable)
GPIO1	24	STD_INOUT	GPIO1 or COIL2_EN (coil #2 enable)
GPIO2	25	STD_INOUT	GPIO2 or COIL3_EN (coil #3 enable)
GPIO3	26	STD_INOUT	GPIO3 or GAIN0 (measurement gain control)
GPIO4	27	STD_INOUT	GPIO4 or GAIN1 (measurement gain control)
GPIO5	28	STD_INOUT	GPIO5 or PWM0 (bridge supply PWM)
GPIO6	29	STD_INOUT	GPIO6 or BRIDGE_EN (bridge enable)
GPIO7	30	STD_INOUT	GPIO7 or BUZ (buzzer)
GPIO8	33	STD_INOUT	GPIO8 or PWM3H (PWM channel #3)
GPIO9	34	STD_INOUT	GPIO9 or PWM3L (PWM channel #3)
GPIO10	35	STD_INOUT /clock_IN	GPIO10 or XI (crystal input)
GPIO11	36	STD_INOUT /clock_O	GPIO11 or XO (crystal output)
GPIO12	37	STD_INOUT	GPIO12 or PWM4L (PWM channel #4)
GPIO13	38	STD_INOUT	GPIO13 or PWM4H (PWM channel #4)

Table 5 Package Pin Mapping (cont'd)

Function	VQFN 40	Pad Type	Notes
RXD	39	STD_INOUT	UART receive
TXD	40	STD_INOUT	UART transmit
PWM1H	22	High Current	PWM channel #1
PWM1L	21	High Current	PWM channel #1
PWM2H	20	High Current	PWM channel #2
PWM2L	19	High Current	PWM channel #2
LED3	18	High Current	LED control
LED2	17	High Current	LED control
LED1	16	High Current	LED control
VSW2	1	STD_INOUT /AN	PWM channel #2 switch node voltage
CAP2	2	STD_INOUT /AN	High Resolution PWM capacitor
HIRES	3	STD_IN/AN	High Resolution PWM input
VBR	4	STD_IN/AN	Bridge voltage measurement
VIN	5	STD_IN/AN	Input voltage measurement
TEMP	6	STD_IN/AN	Coil thermistor (optional)
CAP1	7	STD_IN/AN	BIAS/Peak Capacitor
CMP	8	STD_IN/AN	Current sense/Peak detector

Table 5 Package Pin Mapping (cont'd)

Function	VQFN 40	Pad Type	Notes
VAC	9	STD_IN/AN	Coil AC measurement
CAP0	10	STD_IN/AN	Communication demodulator input B
VSW1	11	STD_INOUT /AN	PWM channel #1 switch node voltage
COMM	12	STD_INOUT /AN	Communication demodulator input
VSS	13	Power	Supply GND, ADC reference GND
VDD	14	Power	Supply VDD, ADC reference voltage/ ORC reference voltage
VDDP	15	Power	When VDD is supplied, VDDP has to be supplied with the same voltage.
VDDP	32	Power	I/O port supply
VSSP	31	Power	I/O port ground
VSSP	Exp. Pad	Power	**Exposed Die Pad** The exposed die pad is connected internally to VSSP. For proper operation, it is mandatory to connect the exposed pad to the board ground. For thermal aspects, please refer to the Package and Reliability chapter.

3 Electrical Parameter

This section provides the electrical parameter which are implementation-specific for the XMCXXXXSC.

3.1 General Parameters

3.1.1 Parameter Interpretation

The parameters listed in this section represent partly the characteristics of the XMCXXXXSC and partly its requirements on the system. To aid interpreting the parameters easily when evaluating them for a design, they are indicated by the abbreviations in the “Symbol” column:

- **CC**
  Such parameters indicate **C**ontroller **C**haracteristics, which are distinctive feature of the XMCXXXXSC and must be regarded for a system design.
- **SR**
  Such parameters indicate **S**ystem **R**equirements, which must be provided by the application system in which the XMCXXXXSC is designed in.

3.1.2 Absolute Maximum Ratings

Stresses above the values listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions may affect device reliability.

Table 11 Absolute Maximum Rating Parameters

Parameter	Symbol		Values			Unit	Note / Test Condition
			Min.	Typ.	Max.		
Junction temperature	T_J	SR	-40	–	115	°C	–
Storage temperature	T_{ST}	SR	-40	–	125	°C	–
Voltage on power supply pin with respect to V_{SSP}	V_{DDP}	SR	-0.3	–	6	V	–
Voltage on digital pins with respect to V_{SSP} [1]	V_{IN}	SR	-0.5	–	V_{DDP} + 0.5 or max. 6	V	whichever is lower
Voltage on analog input pins with respect to V_{SSP} [2]	V_{INP2}	SR	-0.3	–	V_{DDP} + 0.3	V	–
Voltage on analog input pins with respect to V_{SSP}	V_{AIN} V_{AREF}	SR	-0.5	–	V_{DDP} + 0.5 or max. 6	V	whichever is lower
Input current on any pin during overload condition	I_{IN}	SR	-10	–	10	mA	–
Absolute maximum sum of all input currents during overload condition	ΣI_{IN}	SR	-50	–	+50	mA	–

1) Excluding pins CAP2, HIRES, CAP1, CMP, VAC, CAP0, COMM.

1) Applicable to pins CAP2, HIRES, CAP1, CMP, VAC, CAP0, COMM.

3.1.3 Pin Reliability in Overload

When receiving signals from higher voltage devices, low-voltage devices experience overload currents and voltages that go beyond their own IO power supplies specification.

Table 12 defines overload conditions that will not cause any negative reliability impact if all the following conditions are met:

- full operation life-time is not exceeded
- **Operating Conditions** are met for
  - pad supply levels (V_{DDP})
  - temperature

If a pin current is outside of the **Operating Conditions** but within the overload conditions, then the parameters of this pin as stated in the Operating Conditions can no longer be guaranteed. Operation is still possible in most cases but with relaxed parameters.

Note: An overload condition on one or more pins does not require a reset.

Note: A series resistor at the pin to limit the current to the maximum permitted overload current is sufficient to handle failure situations like short to battery.

Table 12 Overload Parameters

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input current on any port pin during overload condition	I_{OV} SR	-5	–	5	mA	
Absolute sum of all input circuit currents during overload condition	I_{OVS} SR	–	–	25	mA	

Figure 11 shows the path of the input currents during overload via the ESD protection structures. The diodes against V_{DDP} and ground are a simplified representation of these ESD protection structures.

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