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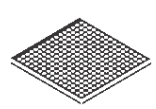
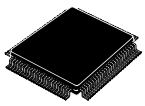
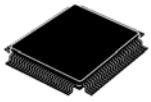
SPC564Bxx
SPC56ECxx

32-bit MCU family built on the Power Architecture® for automotive body electronics applications

Datasheet - production data


LBGA256
(17 x 17 x 1.7 mm)


LQFP208
(28 x 28 x 1.4 mm)


LQFP176
(24 x 24 x 1.4 mm)

Features

- e200z4d, 32-bit Power Architecture®
  - Up to 120 MHz and 200 MIPs operation
- e200z0h, 32-bit Power Architecture
  - Up to 80 MHz and 75 MIPs operation
- Memory
  - Up to 3 MByte on-chip Flash with ECC
  - Up to 256 KByte on-chip SRAM with ECC
  - 64KByte on-chip Data Flash with ECC
  - 16-entry memory protection unit (MPU)
  - User selectable Memory BIST
- Interrupts
  - 255 interrupt sources with 16 priority levels
  - Up to 54 ext. IRQ including 30 wake-up
- GPIOs: from 147 (LQFP176) to 199 (LBGA256)
- System timer units
  - 8-ch. 32-bit periodic interrupt timer (PIT)
  - 4-channel 32-bit system timer (STM)
  - Safety System Watchdog Timer (SWT)
  - Real-time clock timer (RTC/API)
- eMIOS, 16-bit counter timed I/O units
  - Up to 64 channels with PWM/MC/IC/OC
- Two ADC (10-bit and 12-bit)
  - Up to 62 channels extendable to 90 ch.
  - Multiple Analog Watchdog
- Dedicated diagnostic features for lighting
  - Advanced shiffted PWM generation
  - ADC conversion synchronized on PWM
- Communication interfaces
  - Up to 6 FlexCAN with 64 buffers each
  - Up to 10 LINFlex/UART channels
  - Up to 8 buffered DSPI channels
  - I²C interface
  - One FleyRay (dual-ch.) with 128 buffers
  - Fast Ethernet Controller
- Cryptographic Services Engine (CSE)
  - AES-128 en/decryption, CMAC auth.
  - Secured device boot mode
- 32-ch. eDMA with multiple request sources
- Clock generation
  - 4 to 40 MHz main oscillator
  - 16 MHz internal RC oscillator
  - Software-controlled FMPLL
  - 128 kHz internal RC oscillator
  - 32 kHz auxiliary oscillator
  - Clock Monitoring Unit (CMU)
- Low power capabilities
  - Ultra low power STANDBY
  - CAN Sampler to store CAN ID in STBY
  - Fast wake-up and exectute from RAM
- Exhaustive debugging capability
  - Nexus 3+ interface on LBGA256 only
  - Nexus 1 on all devices
- Voltage supply
  - Single 5 V or 3.3 V supply
  - On-chip Vreg with external ballast transitor
- Operating temperature range -40 to 125 °C

Table 1. Device summary

Package	Part number		
	1.5 MByte	2 MByte	3 MByte
LQFP176	SPC564B64L7 SPC56EC64L7	SPC564B70L7 SPC56EC70L7	SPC564B74L7 SPC56EC74L7
LQFP208	SPC564B64L8 SPC56EC64L8	SPC564B70L8 SPC56EC70L8	SPC564B74L8 SPC56EC74L8
LBGA256	SPC56EC64B3	SPC56EC70B3	SPC56EC74B3

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1 Introduction

1.1 Document Overview

This document describes the features of the family and options available within the family members, and highlights important electrical and physical characteristics of the SPC564Bxx and SPC56ECxx device. To ensure a complete understanding of the device functionality, refer also to the SPC564Bxx and SPC56ECxx Reference Manual.

1.2 Description

The SPC564Bxx and SPC56ECxx is a new family of next generation microcontrollers built on the Power Architecture embedded category. This document describes the features of the family and options available within the family members, and highlights important electrical and physical characteristics of the device.

The SPC564Bxx and SPC56ECxx family expands the range of the SPC560B microcontroller family. It provides the scalability needed to implement platform approaches and delivers the performance required by increasingly sophisticated software architectures. The advanced and cost-efficient host processor core of the SPC564Bxx and SPC56ECxx automotive controller family complies with the Power Architecture embedded category, which is 100 percent user-mode compatible with the original Power Architecture user instruction set architecture (UISA). It operates at speeds of up to 120 MHz and offers high performance processing optimized for low power consumption. It also capitalizes on the available development infrastructure of current Power Architecture devices and is supported with software drivers, operating systems and configuration code to assist with users implementations.

Table 2. SPC564Bxx and SPC56ECxx family comparison[1]

Feature		SPC564B64		SPC56EC64			SPC564B70		SPC56EC70			SPC564B74		SPC56EC74		
Package		LQFP 176	LQFP 208	LQFP 176	LQFP 208	LBGA 256	LQFP 176	LQFP 208	LQFP 176	LQFP 208	LBGA 256	LQFP 176	LQFP 208	LQFP 176	LQFP 208	LBGA 256
CPU		e200z4d		e200z4d + e200z0h			e200z4d		e200z4d + e200z0h			e200z4d		e200z4d + e200z0h		
Execution speed[2]		Up to 120 MHz (e200z4d)		Up to 120 MHz (e200z4d) Up to 80 MHz (e200z0h)[3]			Up to 120 MHz (e200z4d)		Up to 120 MHz (e200z4d) Up to 80 MHz (e200z0h)[3]			Up to 120 MHz (e200z4d)		Up to 120 MHz (e200z4d) Up to 80 MHz (e200z0h)[3]		
Code flash memory		1.5 MB					2 MB					3 MB				
Data flash memory		4 x16 KB														
SRAM		128 KB		192 KB			160 KB		256 KB			192 KB		256 KB		
MPU		16-entry														
eDMA[4]		32 ch														
10-bit ADC																
	dedicated[5], [6]	27 ch	33 ch	27 ch	33 ch		27 ch	33 ch	27 ch	33 ch		27 ch	33 ch	27 ch	33 ch	
	shared with 12-bit ADC[7]	19 ch														
12-bit ADC																
	dedicated[8]	5 ch	10 ch	5 ch	10 ch		5 ch	10 ch	5 ch	10 ch		5 ch	10 ch	5 ch	10 ch	
	shared with 10-bit ADC[7]	19 ch														
CTU		64 ch														
Total timer I/O[9] eMIOS		64 ch, 16-bit														
SCI (LINFlexD)		10														
SPI (DSPI)		8														
CAN (FlexCAN)[10]		6														

Table 2. SPC564Bxx and SPC56ECxx family comparison[1] (continued)

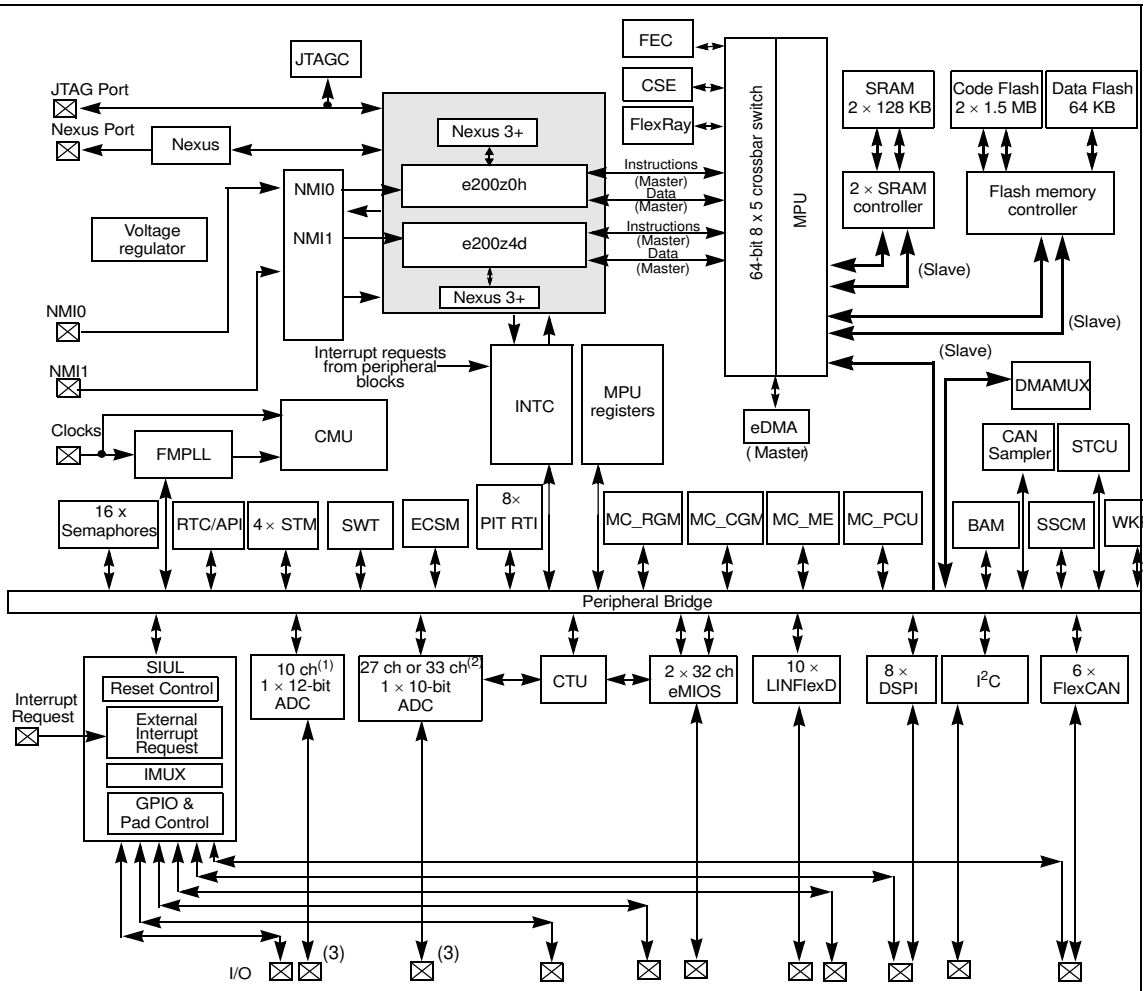
Feature	SPC564B64		SPC56EC64			SPC564B70		SPC56EC70			SPC564B74		SPC56EC74		
Package	LQFP 176	LQFP 208	LQFP 176	LQFP 208	LBGA 256	LQFP 176	LQFP 208	LQFP 176	LQFP 208	LBGA 256	LQFP 176	LQFP 208	LQFP 176	LQFP 208	LBGA 256
FlexRay	Yes														
STCU[11]	Yes														
Ethernet	No		Yes			No		Yes			No		Yes		
I^2C	1														
32 kHz oscillator (SXOSC)	Yes														
GPIO[12]	147	177	147	177	199	147	177	147	177	199	147	177	147	177	199
Debug	JTAG				Nexus 3+	JTAG				Nexus 3+	JTAG				Nexus 3+
Cryptographic Services Engine (CSE)	Optional														

1. Feature set dependent on selected peripheral multiplexing; table shows example.
2. Based on 125 °C ambient operating temperature and subject to full device characterization.
3. The e200z0h can run at speeds up to 80 MHz. However, if system frequency is >80 MHz (e.g., e200z4d running at 120 MHz) the e200z0h needs to run at 1/2 system frequency. There is a configurable e200z0 system clock divider for this purpose.
4. DMAMUX also included that allows for software selection of 32 out of a possible 57 sources.
5. Not shared with 12-bit ADC, but possibly shared with other alternate functions.
6. There are 23 dedicated ANS plus 4 dedicated ANX channels on LQPF176. For higher pin count packages, there are 29 dedicated ANS plus 4 dedicated ANX channels.
7. 16x precision channels (ANP) and 3x standard (ANS).
8. Not shared with 10-bit ADC, but possibly shared with other alternate functions.
9. As a minimum, all timer channels can function as PWM or Input Capture and Output Control. Refer to the eMIOS section of the device reference manual for information on the channel configuration and functions.
10. CAN Sampler also included that allows ID of CAN message to be captured when in low power mode.
11. STCU controls MBIST activation and reporting.
12. Estimated I/O count for proposed packages based on multiplexing with peripherals.

1.3 Block diagram

Figure 1 shows the detailed block diagram of the SPC564Bxx and SPC56ECxx.

Figure 1. SPC564Bxx and SPC56ECxx block diagram



Legend:

ADC	Analog-to-Digital Converter	JTAGC	JTAG controller
BAM	Boot Assist Module	LINFlexD	Local Interconnect Network Flexible with DMA sup
CSE	Cryptographic Services Engine	MC_ME	Mode Entry Module
CAN	Controller Area Network (FlexCAN)	MC_CGM	Clock Generation Module
CMU	Clock Monitor Unit	MC_PCU	Power Control Unit
CTU	Cross Triggering Unit	MC_RGM	Reset Generation Module
DMAMUX	DMA Channel Multiplexer	MPU	Memory Protection Unit
DSPI	Deserial Serial Peripheral Interface	Nexus	Nexus Development Interface
eDMA	enhanced Direct Memory Access	NMI	Non-Maskable Interrupt
FlexCAN	Controller Area Network controller modules	PIT_RTI	Periodic Interrupt Timer with Real-Time Interrupt
FEC	Fast Ethernet Controller	RTC/API	Real-Time Clock/ Autonomous Periodic Interrupt
eMIOS	Enhanced Modular Input Output System	SIUL	System Integration Unit Lite
ECSM	Error Correction Status Module	SRAM	Static Random-Access Memory
FMPLL	Frequency-Modulated Phase-Locked Loop	SSCM	System Status Configuration Module
FlexRay	FlexRay Communication Controller	STM	System Timer Module
I2C	Inter-integrated Circuit Bus	SWT	Software Watchdog Timer
IMUX	Internal Multiplexer	STCU	Self Test Control Unit
INTC	Interrupt Controller	WKPU	Wakeup Unit

Notes:
1) 10 dedicated channels plus up to 19 shared channels. See the device-comparison table.
2) Package dependent. 27 or 33 dedicated channels plus up to 19 shared channels. See the device-comparison table.
3) 16 x precision channels (ANP) are mapped on input only I/O cells.

Table 3 summarizes the functions of the blocks present on the SPC564Bxx and SPC56ECxx.

Table 3. SPC564Bxx and SPC56ECxx series block summary

Block	Function
Analog-to-digital converter (ADC)	Converts analog voltages to digital values
Boot assist module (BAM)	A block of read-only memory containing VLE code which is executed according to the boot mode of the device
Clock monitor unit (CMU)	Monitors clock source (internal and external) integrity
Cross triggering unit (CTU)	Enables synchronization of ADC conversions with a timer event from the eMIOS or from the PIT
Cryptographic Security Engine (CSE)	Supports the encoding and decoding of any kind of data
Crossbar (XBAR) switch	Supports simultaneous connections between two master ports and three slave ports. The crossbar supports a 32-bit address bus width and a 64-bit data bus width
DMA Channel Multiplexer (DMAMUX)	Allows to route DMA sources (called slots) to DMA channels
Deserial serial peripheral interface (DSPI)	Provides a synchronous serial interface for communication with external devices
Error Correction Status Module (ECSM)	Provides a myriad of miscellaneous control functions for the device including program-visible information about configuration and revision levels, a reset status register, wakeup control for exiting sleep modes, and optional features such as information on memory errors reported by error-correcting codes
Enhanced Direct Memory Access (eDMA)	Performs complex data transfers with minimal intervention from a host processor via “n” programmable channels.
Enhanced modular input output system (eMIOS)	Provides the functionality to generate or measure events
Flash memory	Provides non-volatile storage for program code, constants and variables
FlexCAN (controller area network)	Supports the standard CAN communications protocol
FMPLL (frequency-modulated phase-locked loop)	Generates high-speed system clocks and supports programmable frequency modulation
FlexRay (FlexRay communication controller)	Provides high-speed distributed control for advanced automotive applications
Fast Ethernet Controller (FEC)	Ethernet Media Access Controller (MAC) designed to support both 10 and 100 Mbps Ethernet/IEEE 802.3 networks
Internal multiplexer (IMUX) SIUL subblock	Allows flexible mapping of peripheral interface on the different pins of the device
Inter-integrated circuit (I^2C™) bus	A two wire bidirectional serial bus that provides a simple and efficient method of data exchange between devices
Interrupt controller (INTC)	Provides priority-based preemptive scheduling of interrupt requests for both e200z0h and e200z4d cores
JTAG controller	Provides the means to test chip functionality and connectivity while remaining transparent to system logic when not in test mode

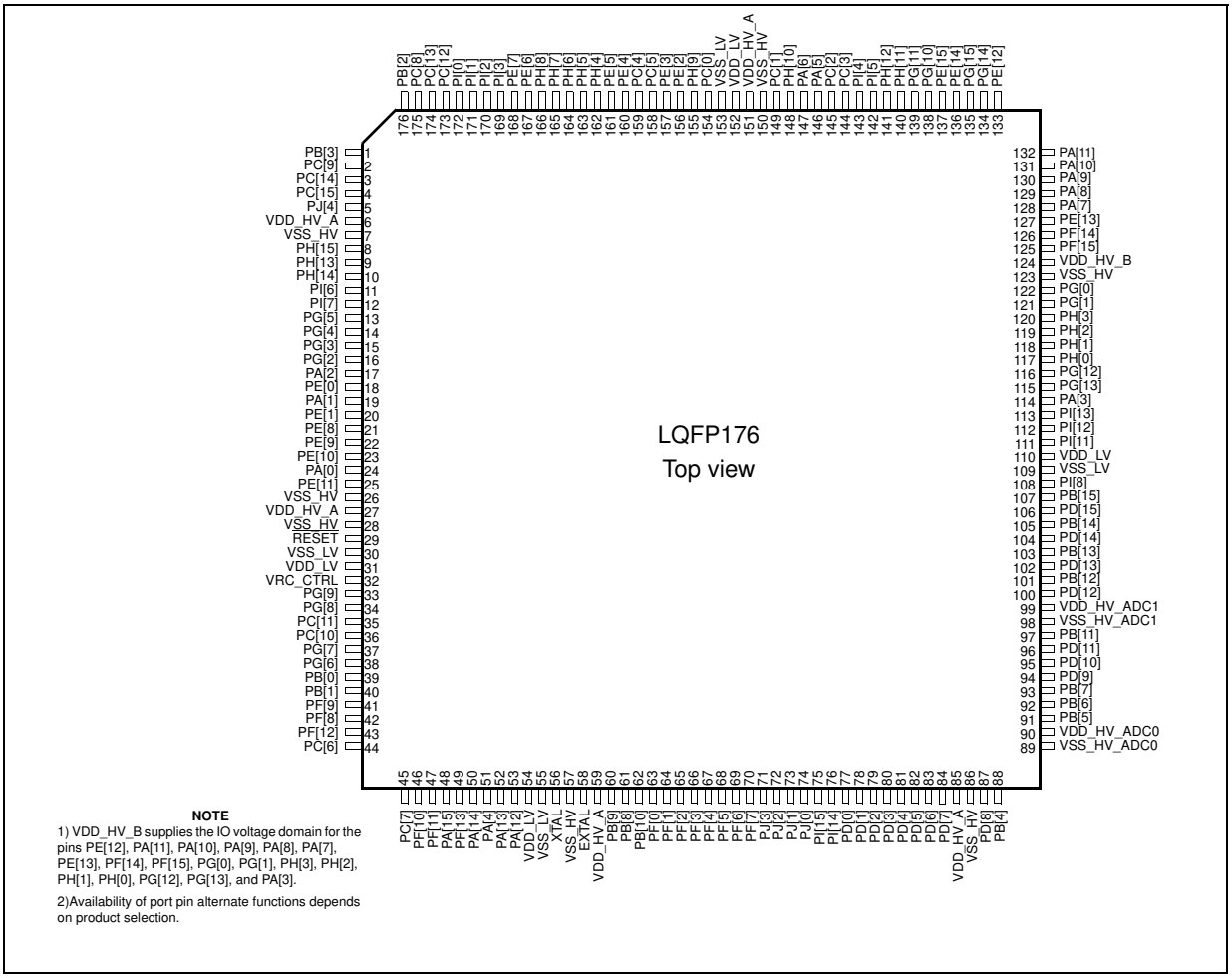
Table 3. SPC564Bxx and SPC56ECxx series block summary (continued)

Block	Function
LinFlexD (Local Interconnect Network Flexible with DMA support)	Manages a high number of LIN (Local Interconnect Network protocol) messages efficiently with a minimum of CPU load
Memory protection unit (MPU)	Provides hardware access control for all memory references generated in a device
Clock generation module (MC_CGM)	Provides logic and control required for the generation of system and peripheral clocks
Power control unit (MC_PCU)	Reduces the overall power consumption by disconnecting parts of the device from the power supply via a power switching device; device components are grouped into sections called “power domains” which are controlled by the PCU
Reset generation module (MC_RGM)	Centralizes reset sources and manages the device reset sequence of the device
Mode entry module (MC_ME)	Provides a mechanism for controlling the device operational mode and mode transition sequences in all functional states; also manages the power control unit, reset generation module and clock generation module, and holds the configuration, control and status registers accessible for applications
Non-Maskable Interrupt (NMI)	Handles external events that must produce an immediate response, such as power down detection
Nexus Development Interface (NDI)	Provides real-time development capabilities for e200z0h and e200z4d core processor
Periodic interrupt timer/ Real Time Interrupt Timer (PIT_RTI)	Produces periodic interrupts and triggers
Real-time counter (RTC/API)	A free running counter used for time keeping applications, the RTC can be configured to generate an interrupt at a predefined interval independent of the mode of operation (run mode or low-power mode). Supports autonomous periodic interrupt (API) function to generate a periodic wakeup request to exit a low power mode or an interrupt request
Static random-access memory (SRAM)	Provides storage for program code, constants, and variables
System integration unit lite (SIUL)	Provides control over all the electrical pad controls and up 32 ports with 16 bits of bidirectional, general-purpose input and output signals and supports up to 32 external interrupts with trigger event configuration
System status and configuration module (SSCM)	Provides system configuration and status data (such as memory size and status, device mode and security status), device identification data, debug status port enable and selection, and bus and peripheral abort enable/disable
System timer module (STM)	Provides a set of output compare events to support AutoSAR and operating system tasks
Semaphores	Provides the hardware support needed in multi-core systems for sharing resources and provides a simple mechanism to achieve lock/unlock operations via a single write access.
Wake Unit (WKPU)	Supports external sources that can generate interrupts or wakeup events, of which can cause non-maskable interrupt requests or wakeup events.

2 Package pinouts and signal descriptions

The available LQFP pinouts and the LBGA ballmaps are provided in the following figures. For functional port pin description, see *Table 6*.

Figure 2. 176-pin LQFP configuration

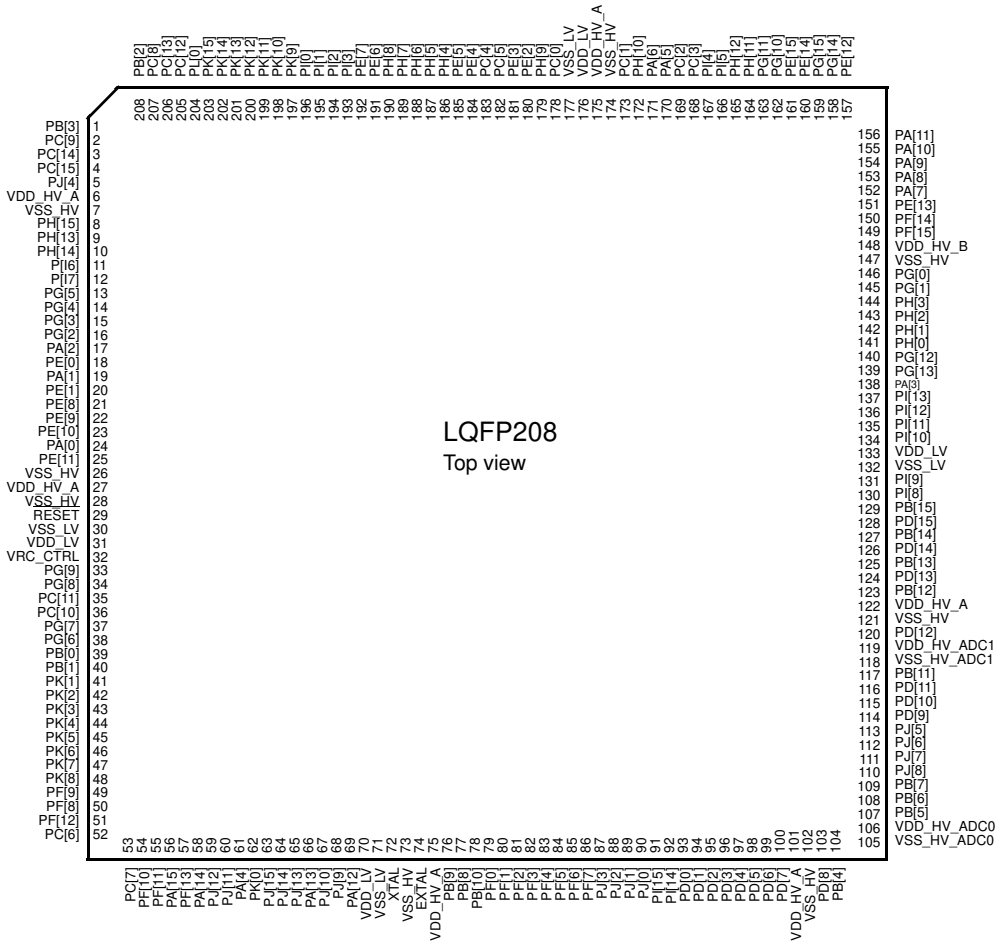


NOTE

1) VDD_HV_B supplies the IO voltage domain for the pins PE[12], PA[11], PA[10], PA[9], PA[8], PA[7], PE[13], PF[14], PF[15], PG[0], PG[1], PH[3], PH[2], PH[1], PH[0], PG[12], PG[13], and PA[3].

2)Availability of port pin alternate functions depends on product selection.

Figure 3. 208-pin LQFP configuration



NOTE
1) VDD_HV_B supplies the IO voltage domain for the pins PE[12], PA[11], PA[10], PA[9], PA[8], PA[7], PE[13], PF[14], PF[15], PG[0], PG[1], PH[3], PH[2], PH[1], PH[0], PG[12], PG[13], and PA[3].
2) Availability of port pin alternate functions depends on product selection.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
A	PC[15]	PB[2]	PC[13]	PI[1]	PE[7]	PH[8]	PE[2]	PE[4]	PC[4]	PE[3]	PH[9]	PI[4]	PH[11]	PE[14]	PA[10]	PG[11]	A
B	PH[13]	PC[14]	PC[8]	PC[12]	PI[3]	PE[6]	PH[5]	PE[5]	PC[5]	PC[0]	PC[2]	PH[12]	PG[10]	PA[11]	PA[9]	PA[8]	B
C	PH[14]	VDD_HV_A	PC[9]	PL[0]	PI[0]	PH[7]	PH[6]	VSS_LV	VDD_HV_A	PA[5]	PC[3]	PE[15]	PG[14]	PE[12]	PA[7]	PE[13]	C
D	PG[5]	PI[6]	PJ[4]	PB[3]	PK[15]	PI[2]	PH[4]	VDD_LV	PC[1]	PH[10]	PA[6]	PI[5]	PG[15]	PF[14]	PF[15]	PH[2]	D
E	PG[3]	PI[7]	PH[15]	PG[2]	VDD_LV	VSS_LV	PK[10]	PK[9]	PM[1]	PM[0]	PL[15]	PL[14]	PG[0]	PG[1]	PH[0]	VDD_HV_A	E
F	PA[2]	PG[4]	PA[1]	PE[1]	PL[2]	PM[6]	PL[1]	PK[11]	PM[5]	PL[13]	PL[12]	PM[2]	PH[1]	PH[3]	PG[12]	PG[13]	F
G	PE[8]	PE[0]	PE[10]	PA[0]	PL[3]	VSS_HV	VSS_HV	VSS_HV	VSS_HV	VSS_HV	VSS_HV	PK[12]	VDD_HV_B	PI[13]	PI[12]	PA[3]	G
H	PE[9]	VDD_HV_A	PE[11]	PK[1]	PL[4]	VSS_LV	VSS_LV	VSS_HV	VSS_HV	VSS_HV	VSS_HV	PK[13]	VDD_HV_A	VDD_LV	VSS_LV	PI[11]	H
J	VSS_HV	VRC_CTRL	VDD_LV	PG[9]	PL[5]	VSS_LV	VSS_LV	VSS_LV	VSS_HV	VSS_HV	VSS_HV	PK[14]	PD[15]	PI[8]	PI[9]	PI[10]	J
K	RESET	VSS_LV	PG[8]	PC[11]	PL[6]	VSS_LV	VSS_LV	VSS_LV	VSS_LV	VDD_LV	VDD_LV	PM[3]	PD[14]	PD[13]	PB[14]	PB[15]	K
L	PC[10]	PG[7]	PB[0]	PK[2]	PL[7]	VSS_LV	VSS_LV	VSS_LV	VSS_LV	VDD_LV	VDD_LV	PM[4]	PD[12]	PB[12]	PB[13]	VDD_HV_ADC1	L
M	PG[6]	PB[1]	PK[4]	PF[9]	PK[5]	PK[6]	PK[7]	PK[8]	PL[8]	PL[9]	PL[10]	PL[11]	PB[11]	PD[10]	PD[11]	VSS_HV_ADC1	M
N	PK[3]	PF[8]	PC[6]	PC[7]	PJ[13]	VDD_HV_A	PB[10]	PF[6]	VDD_HV_A	PJ[1]	PD[2]	PJ[5]	PB[5]	PB[6]	PJ[6]	PD[9]	N
P	PF[12]	PF[10]	PF[13]	PA[14]	PJ[9]	PA[12]	PF[0]	PF[5]	PF[7]	PJ[3]	PI[15]	PD[4]	PD[7]	PD[8]	PJ[8]	PJ[7]	P
R	PF[11]	PA[15]	PJ[11]	PJ[15]	PA[13]	PF[2]	PF[3]	PF[4]	VDD_LV	PJ[2]	PJ[0]	PD[0]	PD[3]	PD[6]	VDD_HV_ADC0	PB[7]	R
T	PJ[12]	PA[4]	PK[0]	PJ[14]	PJ[10]	PF[1]	XTAL	EXTAL	VSS_LV	PB[9]	PB[8]	PI[14]	PD[1]	PD[5]	VSS_HV_ADC0	PB[4]	T
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	

Notes:
1) VDD_HV_B supplies the IO voltage domain for the pins PE[12], PA[11], PA[10], PA[9], PA[8], PA[7], PE[13], PF[14], PF[15], PG[0], PG[1], PH[3], PH[2], PH[1], PH[0], PG[12], PG[13], PA[3], PM[3], and PM[4].
2)Availability of port pin alternate functions depends on product selection.

Figure 4. 256-pin BGA configuration

2.1 Pad types

In the device the following types of pads are available for system pins and functional port pins:

S = Slow[a]

M = Medium[a],[b]

F = Fast[a],[b]

I = Input only with analog feature[a]

A = Analog

2.2 System pins

The system pins are listed in *Table 4*.

Table 4. System pin descriptions

Port pin	Function	I/O direction	Pad type	RESET config.	Pin number		
					LQFP 176	LQFP 208	LBGA 256
RESET	Bidirectional reset with Schmitt-Trigger characteristics and noise filter.	I/O	M	Input, weak pull-up only after PHASE2	29	29	K1
EXTAL	Analog input of the oscillator amplifier circuit. Needs to be grounded if oscillator bypass mode is used.	I	A[1]	—	58	74	T8
XTAL	Analog output of the oscillator amplifier circuit, when the oscillator is not in bypass mode. Analog input for the clock generator when the oscillator is in bypass mode.	I/O	A[1]	—	56	72	T7

1. For analog pads, it is not recommended to enable IBE if APC is enabled to avoid extra current in middle range voltage.

a. See the I/O pad electrical characteristics in the device datasheet for details.

b. All medium and fast pads are in slow configuration by default at reset and can be configured as fast or medium. For example, Fast/Medium pad will be Medium by default at reset. Similarly, Slow/Medium pad will be Slow by default. Only exception is PC[1] which is in medium configuration by default (refer to PCR.SRC in the reference manual, Pad Configuration Registers (PCR0—PCR198)).

2.3 Functional ports

The functional port pins are listed in *Table 5*.

Table 5. Functional port pin descriptions

Port pin	PCR	Alternate function[1]	Function	Peripheral	I/O direction[2]	Pad type	RESET config.	Pin number		
								LQFP 176	LQFP 208	LBGA256
PA[0]	PCR[0]	AF0 AF1 AF2 AF3 — —	GPIO[0] E0UC[0] CLKOUT E0UC[13] WKPU[19] CAN1RX	SIUL eMIOS_0 MC_CGM eMIOS_0 WKPU FlexCAN_1	I/O I/O O I/O I I	M/S	Tristate	24	24	G4
PA[1]	PCR[1]	AF0 AF1 AF2 AF3 — — —	GPIO[1] E0UC[1] — — WKPU[2] CAN3RX NMI[0][3]	SIUL eMIOS_0 — — WKPU FlexCAN_3 WKPU	I/O I/O — — I I I	S	Tristate	19	19	F3
PA[2]	PCR[2]	AF0 AF1 AF2 AF3 — —	GPIO[2] E0UC[2] — MA[2] WKPU[3] NMI[1][3]	SIUL eMIOS_0 — ADC_0 WKPU WKPU	I/O I/O — O I I	S	Tristate	17	17	F1
PA[3]	PCR[3]	AF0 AF1 AF2 AF3 — — —	GPIO[3] E0UC[3] LIN5TX CS4_1 RX_ER_CLK EIRQ[0] ADC1_S[0]	SIUL eMIOS_0 LINFlexD_5 DSPI_1 FEC SIUL ADC_1	I/O I/O O O I I I	M/S	Tristate	114	138	G16
PA[4]	PCR[4]	AF0 AF1 AF2 AF3 — —	GPIO[4] E0UC[4] — CS0_1 LIN5RX WKPU[9]	SIUL eMIOS_0 — DSPI_1 LINFlexD_5 WKPU	I/O I/O — I/O I I	S	Tristate	51	61	T2

Table 5. Functional port pin descriptions (continued)

Port pin	PCR	Alternate function[1]	Function	Peripheral	I/O direction[2]	Pad type	RESET config.	Pin number		
								LQFP 176	LQFP 208	LBGA256
PA[5]	PCR[5]	AF0 AF1 AF2	GPIO[5] E0UC[5] LIN4TX	SIUL eMIOS_0 LINFlexD_4	I/O I/O O	M/S	Tristate	146	170	C10
PA[6]	PCR[6]	AF0 AF1 AF2 AF3 — —	GPIO[6] E0UC[6] — CS1_1 LIN4RX EIRQ[1]	SIUL eMIOS_0 — DSPI_1 LINFlexD_4 SIUL	I/O I/O — O I I	S	Tristate	147	171	D11
PA[7]	PCR[7]	AF0 AF1 AF2 AF3 — — —	GPIO[7] E0UC[7] LIN3TX — RXD[2] EIRQ[2] ADC1_S[1]	SIUL eMIOS_0 LINFlexD_3 — FEC SIUL ADC_1	I/O I/O O — I I I	M/S	Tristate	128	152	C15
PA[8]	PCR[8]	AF0 AF1 AF2 AF3 — — — —	GPIO[8] E0UC[8] E0UC[14] — RXD[1] EIRQ[3] ABS[0] LIN3RX	SIUL eMIOS_0 eMIOS_0 — FEC SIUL MC_RGM LINFlexD_3	I/O I/O I/O — I I I I	M/S	Input, weak pull-up	129	153	B16
PA[9]	PCR[9]	AF0 AF1 AF2 AF3 — —	GPIO[9] E0UC[9] — CS2_1 RXD[0] FAB	SIUL eMIOS_0 — DSPI1 FEC MC_RGM	I/O I/O — O I I	M/S	Pull-down	130	154	B15

Table 5. Functional port pin descriptions (continued)

Port pin	PCR	Alternate function[1]	Function	Peripheral	I/O direction[2]	Pad type	RESET config.	Pin number		
								LQFP 176	LQFP 208	LBGA256
PA[10]	PCR[10]	AF0 AF1 AF2 AF3 — — —	GPIO[10] E0UC[10] SDA LIN2TX COL ADC1_S[2] SIN_1	SIUL eMIOS_0 I^2C LINFlexD_2 FEC ADC_1 DSPI_1	I/O I/O I/O O I I I	M/S	Tristate	131	155	A15
PA[11]	PCR[11]	AF0 AF1 AF2 AF3 — — — —	GPIO[11] E0UC[11] SCL — RX_ER EIRQ[16] LIN2RX ADC1_S[3]	SIUL eMIOS_0 I^2C — FEC SIUL LINFlexD_2 ADC_1	I/O I/O I/O — I I I I	M/S	Tristate	132	156	B14
PA[12]	PCR[12]	AF0 AF1 AF2 AF3 — —	GPIO[12] — E0UC[28] CS3_1 EIRQ[17] SIN_0	SIUL — eMIOS_0 DSPI1 SIUL DSPI_0	I/O — I/O O I I	S	Tristate	53	69	P6
PA[13]	PCR[13]	AF0 AF1 AF2 AF3	GPIO[13] SOUT_0 E0UC[29] —	SIUL DSPI_0 eMIOS_0 —	I/O O I/O —	M/S	Tristate	52	66	R5
PA[14]	PCR[14]	AF0 AF1 AF2 AF3 —	GPIO[14] SCK_0 CS0_0 E0UC[0] EIRQ[4]	SIUL DSPI_0 DSPI_0 eMIOS_0 SIUL	I/O I/O I/O I/O I	M/S	Tristate	50	58	P4
PA[15]	PCR[15]	AF0 AF1 AF2 AF3 —	GPIO[15] CS0_0 SCK_0 E0UC[1] WKPU[10]	SIUL DSPI_0 DSPI_0 eMIOS_0 WKPU	I/O I/O I/O I/O I	M/S	Tristate	48	56	R2

Table 5. Functional port pin descriptions (continued)

Port pin	PCR	Alternate function[1]	Function	Peripheral	I/O direction[2]	Pad type	RESET config.	Pin number		
								LQFP 176	LQFP 208	LBGA256
PB[0]	PCR[16]	AF0 AF1 AF2 AF3	GPIO[16] CAN0TX E0UC[30] LIN0TX	SIUL FlexCAN_0 eMIOS_0 LINFlexD_0	I/O O I/O I	M/S	Tristate	39	39	L3
PB[1]	PCR[17]	AF0 AF1 AF2 — — —	GPIO[17] — E0UC[31] LIN0RX WKPU[4] CAN0RX	SIUL — eMIOS_0 LINFlexD_0 WKPU FlexCAN_0	I/O — I/O I I I	S	Tristate	40	40	M2
PB[2]	PCR[18]	AF0 AF1 AF2 AF3	GPIO[18] LIN0TX SDA E0UC[30]	SIUL LINFlexD_0 I^2C eMIOS_0	I/O O I/O I/O	M/S	Tristate	176	208	A2
PB[3]	PCR[19]	AF0 AF1 AF2 AF3 — —	GPIO[19] E0UC[31] SCL — WKPU[11] LIN0RX	SIUL eMIOS_0 I^2C — WKPU LINFlexD_0	I/O I/O I/O — I I	S	Tristate	1	1	D4
PB[4]	PCR[20]	AF0 AF1 AF2 AF3 — —	GPI[20] — — — ADC0_P[0] ADC1_P[0]	SIUL — — — ADC_0 ADC_1	I — — — I I	I	Tristate	88	104	T16
PB[5]	PCR[21]	AF0 AF1 AF2 AF3 — —	GPI[21] — — — ADC0_P[1] ADC1_P[1]	SIUL — — — ADC_0 ADC_1	I — — — I I	I	Tristate	91	107	N13

Table 5. Functional port pin descriptions (continued)

Port pin	PCR	Alternate function[1]	Function	Peripheral	I/O direction[2]	Pad type	RESET config.	Pin number		
								LQFP 176	LQFP 208	LBGA256
PB[6]	PCR[22]	AF0 AF1 AF2 AF3 — —	GPI[22] — — — ADC0_P[2] ADC1_P[2]	SIUL — — — ADC_0 ADC_1	I — — — I I	I	Tristate	92	108	N14
PB[7]	PCR[23]	AF0 AF1 AF2 AF3 — —	GPI[23] — — — ADC0_P[3] ADC1_P[3]	SIUL — — — ADC_0 ADC_1	I — — — I I	I	Tristate	93	109	R16
PB[8]	PCR[24]	AF0 AF1 AF2 AF3 — — — —	GPI[24] — — — ADC0_S[0] ADC1_S[4] WKPU[25] OSC32k_XTAL[4]	SIUL — — — ADC_0 ADC_1 WKPU SXOSC	I — — — I I I I	I	—	61	77	T11
PB[9][5]	PCR[25]	AF0 AF1 AF2 AF3 — — — —	GPI[25] — — — ADC0_S[1] ADC1_S[5] WKPU[26] OSC32k_EXTAL[4]	SIUL — — — ADC_0 ADC_1 WKPU SXOSC	I — — — I I I I	I	—	60	76	T10
PB[10]	PCR[26]	AF0 AF1 AF2 AF3 — — —	GPIO[26] SOUT_1 CAN3TX — ADC0_S[2] ADC1_S[6] WKPU[8]	SIUL DSPI_1 FlexCAN_3 — ADC_0 ADC_1 WKPU	I/O O — — I I I	S	Tristate	62	78	N7

Table 5. Functional port pin descriptions (continued)

Port pin	PCR	Alternate function[1]	Function	Peripheral	I/O direction[2]	Pad type	RESET config.	Pin number		
								LQFP 176	LQFP 208	LBGA256
PB[11]	PCR[27]	AF0 AF1 AF2 AF3 —	GPIO[27] E0UC[3] — CS0_0 ADC0_S[3]	SIUL eMIOS_0 — DSPI_0 ADC_0	I/O I/O — I/O I	S	Tristate	97	117	M13
PB[12]	PCR[28]	AF0 AF1 AF2 AF3 —	GPIO[28] E0UC[4] — CS1_0 ADC0_X[0]	SIUL eMIOS_0 — DSPI_0 ADC_0	I/O I/O — O I	S	Tristate	101	123	L14
PB[13]	PCR[29]	AF0 AF1 AF2 AF3 —	GPIO[29] E0UC[5] — CS2_0 ADC0_X[1]	SIUL eMIOS_0 — DSPI_0 ADC_0	I/O I/O — O I	S	Tristate	103	125	L15
PB[14]	PCR[30]	AF0 AF1 AF2 AF3 —	GPIO[30] E0UC[6] — CS3_0 ADC0_X[2]	SIUL eMIOS_0 — DSPI_0 ADC_0	I/O I/O — O I	S	Tristate	105	127	K15
PB[15]	PCR[31]	AF0 AF1 AF2 AF3 —	GPIO[31] E0UC[7] — CS4_0 ADC0_X[3]	SIUL eMIOS_0 — DSPI_0 ADC_0	I/O I/O — O I	S	Tristate	107	129	K16
PC[0][6]	PCR[32]	AF0 AF1 AF2 AF3	GPIO[32] — TDI —	SIUL — JTAGC —	I/O — I —	M/S	Input, weak pull-up	154	178	B10
PC[1][6]	PCR[33]	AF0 AF1 AF2 AF3	GPIO[33] — TDO —	SIUL — JTAGC —	I/O — O —	F/M	Tristate	149	173	D9

Table 5. Functional port pin descriptions (continued)

Port pin	PCR	Alternate function[1]	Function	Peripheral	I/O direction[2]	Pad type	RESET config.	Pin number		
								LQFP 176	LQFP 208	LBGA256
PC[2]	PCR[34]	AF0 AF1 AF2 AF3 —	GPIO[34] SCK_1 CAN4TX — EIRQ[5]	SIUL DSPI_1 FlexCAN_4 — SIUL	I/O I/O O — I	M/S	Tristate	145	169	B11
PC[3]	PCR[35]	AF0 AF1 AF2 AF3 — — —	GPIO[35] CS0_1 MA[0] — CAN1RX CAN4RX EIRQ[6]	SIUL DSPI_1 ADC_0 — FlexCAN_1 FlexCAN_4 SIUL	I/O I/O O I I I	S	Tristate	144	168	C11
PC[4]	PCR[36]	AF0 AF1 AF2 AF3 ALT4 — — —	GPIO[36] E1UC[31] — FR_B_TX_EN SIN_1 CAN3RX EIRQ[18]	SIUL eMIOS_1 — Flexray DSPI_1 FlexCAN_3 SIUL	I/O I/O — O I I I	M/S	Tristate	159	183	A9
PC[5]	PCR[37]	AF0 AF1 AF2 AF3 ALT4 —	GPIO[37] SOUT_1 CAN3TX — FR_A_TX EIRQ[7]	SIUL DSPI_1 FlexCAN_3 — Flexray SIUL	I/O O O — O I	M/S	Tristate	158	182	B9
PC[6]	PCR[38]	AF0 AF1 AF2 AF3	GPIO[38] LIN1TX E1UC[28] —	SIUL LINFlexD_1 eMIOS_1 —	I/O O I/O —	S	Tristate	44	52	N3
PC[7]	PCR[39]	AF0 AF1 AF2 AF3 — —	GPIO[39] — E1UC[29] — LIN1RX WKPU[12]	SIUL — eMIOS_1 — LINFlexD_1 WKPU	I/O — I/O — I I	S	Tristate	45	53	N4