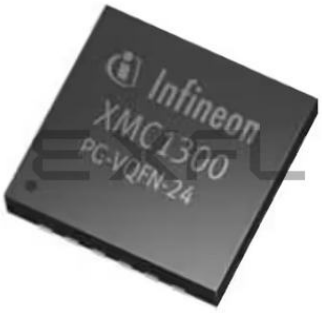

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Obsolete
Core Processor	ARM® Cortex®-M4
Core Size	32-Bit Single-Core
Speed	120MHz
Connectivity	CANbus, EBI/EMI, Ethernet, I²C, LINbus, SPI, UART, USB
Peripherals	DMA, I²S, LED, POR, PWM, WDT
Number of I/O	91
Program Memory Size	1MB (1M x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	160K x 8
Voltage - Supply (Vcc/Vdd)	3.13V ~ 3.63V
Data Converters	A/D 32x12b; D/A 2x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	144-LFBGA
Supplier Device Package	PG-LFBGA-144-10
Purchase URL	https://www.e-xfl.com/product-detail/infineon-technologies/xmc4500e144f1024abxqsa1

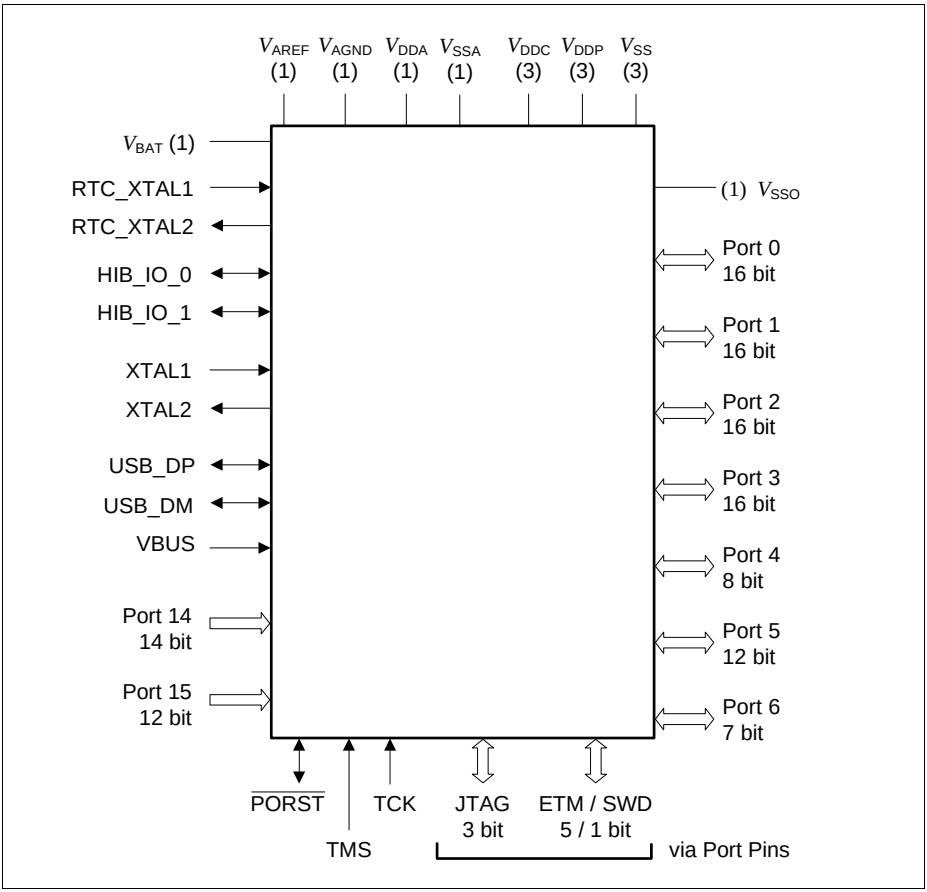

Figure 3 XMC4500 Logic Symbol PG-LFBGA-144

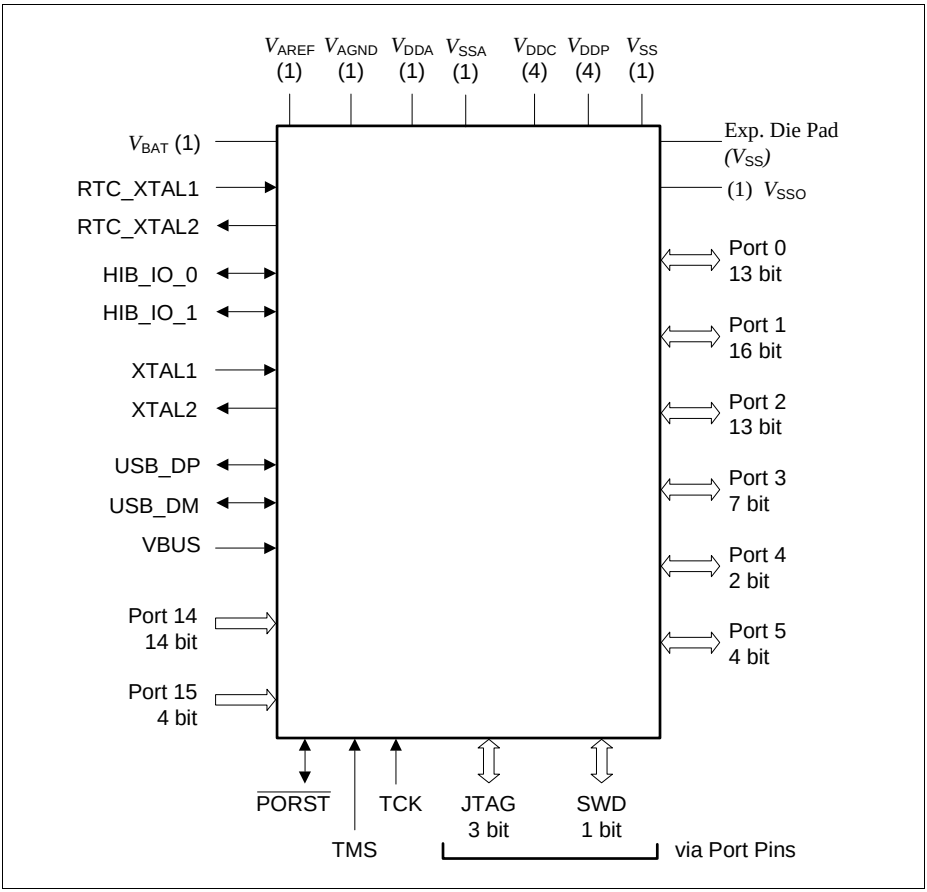

Figure 4 XMC4500 Logic Symbol PG-LQFP-100

	1	2	3	4	5	6	7	8	9	10	11	12	
A	VSS	VDDC	P0.2	P0.3	P0.5	P0.6	P3.6	P0.8	P4.1	P1.8	VDDP	VSS	A
B	VDDP	P3.1	P3.2	P0.10	P0.4	P3.5	P0.7	P4.0	P1.6	P1.7	P1.9	VDDC	B
C	P3.0	P3.13	P0.1	P0.0	P0.13	P0.15	P4.4	P4.6	P4.7	P1.4	P1.2	P1.3	C
D	USB_DM	P3.12	P3.11	P0.9	P0.12	P3.14	P3.15	P4.5	P1.0	P1.5	P1.11	P1.10	D
E	USB_DP	VBUS	P3.8	P3.7	P0.11	P0.14	P3.4	P4.2	P1.1	P1.14	P1.12	P1.13	E
F	RTC_XTAL2	RTC_XTAL1	HIB_IO_1	HIB_IO_0	P3.9	P3.10	P3.3	P4.3	P6.1	P6.4	P6.5	P6.6	F
G	VBAT	P15.3	P15.5	P15.4	P15.6	P15.7	TMS	TCK	P6.3	P6.0	$\overline{\text{PORST}}$	P1.15	G
H	P15.2	P14.15	P14.14	P14.13	P5.10	P5.8	P5.2	P5.1	P5.0	P6.2	XTAL1	XTAL2	H
J	P14.12	P14.7	P14.6	P14.3	P5.11	P2.15	P5.7	P5.5	P2.6	P5.3	P2.0	VSSO	J
K	P14.4	P14.5	P14.2	P15.15	P15.12	P5.9	P2.14	P5.6	P2.7	P5.4	P2.2	P2.1	K
L	VDDA	P14.1	P14.0	P15.14	P14.9	P15.9	P2.12	P2.10	P2.8	P2.4	P2.3	VDDP	L
M	VSSA	VAGND	VAREF	P15.13	P14.8	P15.8	P2.13	P2.11	P2.9	P2.5	VDDC	VSS	M
	1	2	3	4	5	6	7	8	9	10	11	12	

XMC4500- (top view)

Figure 6 XMC4500 PG-LFBGA-144 Pin Configuration (top view)

Table 11 Port I/O Functions (cont'd)

Function	Outputs						Inputs									
	ALT1	ALT2	ALT3	ALT4	HWO0	HWO1	HWI0	HWI1	Input	Input	Input	Input	Input	Input	Input	Input
P2.12	ETH0. TXD2		CCU81. OUT33	ETH0. TXD0	DB. ETM_TRACEDA TA1	EBU. AD30		EBU. D30					CCU43. IN3C			
P2.13	ETH0. TXD3			ETH0. TXD1	DB. ETM_TRACEDA TA0	EBU. AD31		EBU. D31					CCU43. IN2C			
P2.14	VADC. EMUX11	U1C0. DOUT0	CCU80. OUT21		DB. ETM_TRACECLK	$\overline{\text{EBU.}}$ BC0				U1C0. DX0D			CCU43. IN0B	CCU43. IN1B	CCU43. IN2B	CCU43. IN3B
P2.15	VADC. EMUX12		CCU80. OUT11	LEDTS0. LINE6	LEDTS0. EXTENDED6	$\overline{\text{EBU.}}$ BC1	LEDTS0. TSIN6A		ETH0. COLA	U1C0. DX0C			CCU42. IN0B	CCU42. IN1B	CCU42. IN2B	CCU42. IN3B
P3.0	U2C1. SELO0	U0C1. SCLKOUT	CCU42. OUT0			$\overline{\text{EBU.}}$ $\overline{\text{RD}}$			U0C1. DX1B				CCU80. IN2C	CCU81. IN0C		
P3.1		U0C1. SELO0				$\overline{\text{EBU.}}$ $\overline{\text{RD_WR}}$			U0C1. DX2B		ERU0. 0B1		CCU80. IN1C			
P3.2	USB. DRIVEVBUS	CAN. N0_TXD		LEDTS0. COLA		$\overline{\text{EBU.}}$ $\overline{\text{CS0}}$					ERU0. 0A1		CCU80. IN0C			
P3.3		U1C1. SELO1	CCU42. OUT3		SDMMC. LED			$\overline{\text{EBU.}}$ $\overline{\text{WAIT}}$		DSD. DIN3B			CCU42. IN3A	CCU80. IN3B		
P3.4	U2C1. MCLKOUT	U1C1. SELO2	CCU42. OUT2	DSD. MCLK3	SDMMC. BUS_POWER			$\overline{\text{EBU.}}$ $\overline{\text{HOLD}}$	U2C1. DX0B	DSD. MCLK3B			CCU42. IN2A	CCU80. IN0B		
P3.5	U2C1. DOUT0	U1C1. SELO3	CCU42. OUT1	U0C1. DOUT0	SDMMC. CMD_OUT	EBU. AD4	SDMMC. CMD_IN	EBU. D4	U2C1. DX0A		ERU0. 3B1		CCU42. IN1A			
P3.6	U2C1. SCLKOUT	U1C1. SELO4	CCU42. OUT0	U0C1. SCLKOUT	SDMMC. CLK_OUT	EBU. AD5	SDMMC. CLK_IN	EBU. D5	U2C1. DX1B		ERU0. 3A1		CCU42. IN0A			
P3.7		CAN. N2_TXD	CCU41. OUT3	LEDTS0. LINE0					U2C0. DX0C							
P3.8	U2C0. DOUT0	U0C1. SELO3	CCU41. OUT2	LEDTS0. LINE1					CAN. N2_RXDB				POSIF1. IN2B			
P3.9	U2C0. SCLKOUT	CAN. N1_TXD	CCU41. OUT1	LEDTS0. LINE2									POSIF1. IN1B			
P3.10	U2C0. SELO0	CAN. N0_TXD	CCU41. OUT0	LEDTS0. LINE3	U0C1. DOUT3		U0C1. HWIN3						POSIF1. IN0B			
P3.11	U2C1. DOUT0	U0C1. SELO2	CCU42. OUT3	LEDTS0. LINE4	U0C1. DOUT2		U0C1. HWIN2		CAN. N1_RXDB					CCU81. IN3C		
P3.12		U0C1. SELO1	CCU42. OUT2	LEDTS0. LINE5	U0C1. DOUT1		U0C1. HWIN1		CAN. N0_RXDC	U2C1. DX0D				CCU81. IN2C		
P3.13	U2C1. SCLKOUT	U0C1. DOUT0	CCU42. OUT1	LEDTS0. LINE6	U0C1. DOUT0		U0C1. HWIN0		U0C1. DX0D				CCU80. IN3C	CCU81. IN1C		
P3.14		U1C0. SELO3			U1C1. DOUT1		U1C1. HWIN1			U1C1. DX0B			CCU42. IN1C			
P3.15		U1C1. DOUT0			U1C1. DOUT0		U1C1. HWIN0			U1C1. DX0A			CCU42. IN0C			
P4.0			DSD. MCLK1		SDMMC. DATA0_OUT	EBU. AD8	SDMMC. DATA0_IN	EBU. D8	U1C1. DX1C	DSD. MCLK1B	U0C1. DX0E	U2C1. DX0C				
P4.1	U2C1. SELO0		DSD. MCLK0	U0C1. SELO0	SDMMC. DATA3_OUT	EBU. AD9	SDMMC. DATA3_IN	EBU. D9	U2C1. DX2B	DSD. MCLK0B		U2C1. DX2A				
P4.2	U2C1. SELO1	U1C1. DOUT0		U2C1. SCLKOUT					U1C1. DX0C			U2C1. DX1A	CCU43. IN1C			

Table 11 Port I/O Functions (cont'd)

Function	Outputs						Inputs										
	ALT1	ALT2	ALT3	ALT4	HWO0	HWO1	HWI0	HWI1	Input	Input	Input	Input	Input	Input	Input	Input	
P6.6			DSD. MCLK3		DB. ETM_TRACEDATA0	$\overline{\text{EBU.}}$ BC3			DSD. MCLK3A	ETH0. CLK_TXB							
P14.0									VADC. G0CH0								
P14.1									VADC. G0CH1								
P14.2									VADC. G0CH2	VADC. G1CH2							
P14.3									VADC. G0CH3	VADC. G1CH3			CAN. N0_RXDB				
P14.4									VADC. G0CH4		VADC. G2CH0						
P14.5									VADC. G0CH5		VADC. G2CH1		POSIF0. IN2B				
P14.6									VADC. G0CH6				POSIF0. IN1B		G0ORC6		
P14.7									VADC. G0CH7				POSIF0. IN0B		G0ORC7		
P14.8					DAC. OUT_0					VADC. G1CH0		VADC. G3CH2	ETH0. RXD0C				
P14.9					DAC. OUT_1					VADC. G1CH1		VADC. G3CH3	ETH0. RXD1C				
P14.12										VADC. G1CH4							
P14.13										VADC. G1CH5							
P14.14										VADC. G1CH6					G1ORC6		
P14.15										VADC. G1CH7					G1ORC7		
P15.2											VADC. G2CH2						
P15.3											VADC. G2CH3						
P15.4											VADC. G2CH4						
P15.5											VADC. G2CH5						
P15.6											VADC. G2CH6						
P15.7											VADC. G2CH7						
P15.8												VADC. G3CH0	ETH0. CLK_RMIIC			ETH0. CLKRXC	
P15.9												VADC. G3CH1	ETH0. CRS_DVC			ETH0. RXDVC	

3.1.4 Pad Driver and Pad Classes Summary

Figure 17 DAC Conversion Examples

4 Package and Reliability

The XMC4500 is a member of the XMC4000 Family of microcontrollers. It is also compatible to a certain extent with members of similar families or subfamilies.

Each package is optimized for the device it houses. Therefore, there may be slight differences between packages of the same pin-count but for different device types. In particular, the size of the Exposed Die Pad may vary.

If different device types are considered or planned for an application, it must be ensured that the board layout fits all packages under consideration.

4.1 Package Parameters

Table 64 provides the thermal characteristics of the packages used in XMC4500.

Table 64 Thermal Characteristics of the Packages

Parameter	Symbol	Limit Values		Unit	Package Types
		Min.	Max.		
Exposed Die Pad Dimensions (including U-Groove where applicable)	Ex uEy CC	-	6.5 u6.5	mm	PG-LQFP-144-18
		-	6.5 u6.5	mm	PG-LQFP-144-24
		-	7.0 u7.0	mm	PG-LQFP-100-11
		-	7.0 u7.0	mm	PG-LQFP-100-25
Thermal resistance Junction-Ambient T_J d150 °C	R_{4JA} CC	-	40.5	K/W	PG-LFBGA-144-10
		-	22.4	K/W	PG-LQFP-144-18[1)]
		-	19.5	K/W	PG-LQFP-144-24[1)]
		-	23.0	K/W	PG-LQFP-100-11[1)]
		-	21.0	K/W	PG-LQFP-100-25[1)]

1) Device mounted on a 4-layer JEDEC board (JESD 51-7) with thermal vias; exposed pad soldered.

Note: For electrical reasons, it is required to connect the exposed pad to the board ground V_{SS}, independent of EMC and thermal requirements.

4.1.1 Thermal Considerations

When operating the XMC4500 in a system, the total heat generated in the chip must be dissipated to the ambient environment to prevent overheating and the resulting thermal damage.

The maximum heat that can be dissipated depends on the package and its integration into the target board. The “Thermal resistance R_{4JA}” quantifies these parameters. The

Table 66 Differences PG-LQFP-100-11 to PG-LQFP-100-24

Change	PG-LQFP-100-11	PG-LQFP-100-25
Thermal Resistance Junction Ambient (R_{4JA})	23.0 K/W	19.5 K/W
Lead Width	$0.22^{\pm 0.05}$ mm	$0.2^{+0.07}_{-0.03}$ mm
Lead Thickness	$0.15^{+0.05}_{-0.06}$ mm	$0.127^{+0.073}_{-0.037}$ mm
Exposed Die Pad outer dimensions	7.0 mm u7.0 mm	7.0 mm u7.0 mm
Exposed Die Pad U-Groove inner dimensions	n.a.	6.2 mm u6.2 mm

Figure 57 PG-LQFP-100-11 (Plastic Green Low Profile Quad Flat Package)

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