

If ‘wait for power key’ (W4PK) is chosen, the module will wait for a PWR_IO press before entering in ON state when power is applied.

ON/RUN mode

In this mode, the PMIC is running at full power so all voltage regulators are generating the nominal voltage for this mode. The CPU reset line is de-asserted and the processor is running at normal speed, performing DVFS if the system was configured to do so. In this state, the SCU_PMIC_ON_REQ line is asserted high, indicating that the module is ON.

Note that the specific state of the regulators (on/off) and the voltage in this mode are controlled by the firmware running on the i.MX 8X processor. The PMIC starts with the default settings configured on the OTP area, but once the software takes control it applies the specific configuration implemented in the firmware.

SUSPEND mode

The suspend mode (also known as suspend-to-RAM mode) is the low-power mode that allows the module to preserve RAM content. When the module enters SUSPEND, the following actions take place:

- The processor goes into low power, disabling as much functionality as possible and keeping active only the peripherals configured to wake the system from SUSPEND.
- The DDR memory is set to self-refresh mode to preserve its contents while reducing power consumption.
- The PMIC goes into standby mode, configuring the regulators for this specific mode.
- The MCA goes into sleep mode, keeping active the peripherals that always run in low power modes (like the RTC) and those configured to wake up the system (such as IRQs and power IO). MCA GPIOs configured as outputs also keep their value.

OFF mode

The module enters OFF mode after a power-off event. In this mode:

- The PMIC is set to the OFF state and all the voltage regulators, except VSNVS, are switched off.
- The SCU_PMIC_ON_REQ line is asserted low, indicating that the module is in OFF state.
- The MCA goes into sleep mode, keeping active the peripherals that always run in low-power modes (like the RTC) and those configured to wake up the system (such as IRQs and power IO).

COIN-CELL mode

In COIN-CELL mode, only the MCA is powered from the coin-cell battery, leaving the rest of the module power inputs switched off. In this mode, the MCA remains in sleep mode, updating the RTC and monitoring the following events:

- Tamper events that would be registered in the NVRAM memory of the MCA and would assert the Tamper output if enabled.
- Power in MCA_VIN_DET, which indicates that power is reconnected to the system and it can be powered-on.

Power IO signal/Power button

The MCA provides a signal (PWR_IO) to detect external events that trigger a transition between the different power modes described in [Power modes](#). The pin has wake-up interrupt/event capabilities, it is active low, and it does not provide an internal pull-up. (The pull-up resistor, typically a 100K resistor to VCC_MCA, must be added externally.) This signal is ideal for connecting a power button or the output of a peripheral that controls the power state of the module and its transitions. The firmware

provides a configurable debounce filter to improve noise immunity and filter rebounds on push buttons. When the PWR_IO signal is asserted low, one of the following events occurs:

- If the duration of the assertion is short (time configurable by the user) the system will trigger an interrupt that, commonly, indicates the host processor that the system should enter suspend state. When the system is in a low-power mode, the effect of a short assertion of this line is the following:
 - While in suspend state, it will wake the system.
 - While in OFF state, it will boot the system.
- If the low-pulse duration is long enough (again, time-configurable by the user) the system triggers the power off interrupt, to tell the host processor to start a transition to OFF state.
- If the system does not enter OFF state before a configurable guard timer expires, the MCA will automatically set the OFF state unless the user explicitly cancels it by writing to the **mca_cancel_pwroff** entry in the sysfilesystem.

MCA_VIN_DET signal

The on-module MCA is powered from a dedicated external power rail, VCC_MCA. As recommended in the reference designs (see [System-on-module power rails distribution](#)), this power supply is provided by an external 3.3V regulator. If the system requires system time to be kept when there is no power, you must use a coin-cell battery to power the MCA while it keeps the RTC up to date in low-power mode. The MCA uses the MCA_VIN_DET input to monitor the input voltage of the whole system and automatically switch to RTC mode when it is disconnected, to keep the system time and save power.

MCA_VIN_DET is a digital line, not analog. This means that the transition time between high and low values is crucial to optimize the time the system takes to switch to RTC mode. Digi recommends you ensure a fast discharge of this signal to allow a quick fall time.

MCA firmware update

The i.MX 8X processor can update the firmware of the MCA. See the [MCA software documentation](#) for additional information about the MCA firmware update process.

IOMUX

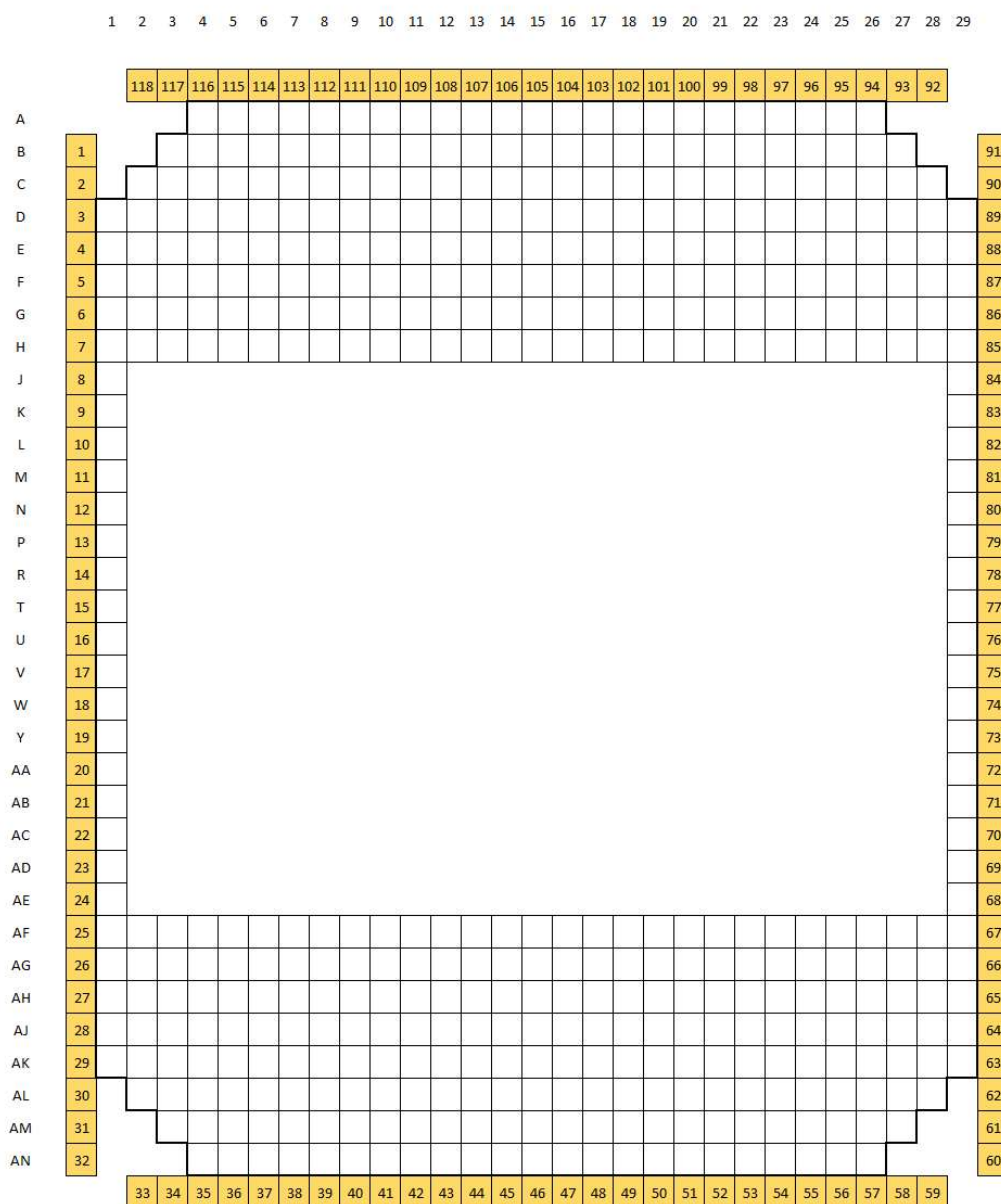
The following sections describe the pin multiplexing (IOMUX) of the ConnectCore 8X

Note The Digi ConnectCore Smart IOMUX tool can dramatically simplify pin configuration and resolution. You can enter the list of interfaces required by your project and use the Smart IOMUX graphical interface to mock up configuration options, resulting in full pin assignment and device tree snippets that match your desired functionality. See the [Smart IOMUX User Guide](#) for more information and download instructions.

Module pinout	42
IOMUX table	43
Extended LGA version	61

Module pinout

The ConnectCore 8X System-on-module has a mixed pad structure. It provides 474 LGA pads and 118 peripheral castellated pads. The general layout can be found on the following diagram:



Note This diagram represents the module as seen from the top side with antennas on top.

IOMUX table

The following table lists the I/O multiplexing (IOMUX) of the ConnectCore 8X System-on-module. Most of the castellated pads are associated with (connected to) an LGA pad; this relationship is highlighted in the "Associated LGA Pad name" column.

The microprocessor used on this module, like all CMOS devices, can be driven into a latch-up condition if any I/O pin is driven outside of its associated power rail. Care must be taken to:

- Never drive an I/O pin beyond its positive rail or below ground.
- Never drive an I/O pin from an external power source during the power-on or reset sequences.
- Never hot-swap the module or interrupt its ground connection to external circuitry.



Latch-up is a condition that can cause excessive current draw and result in excessive heating of the microprocessor or its power supplies. This excessive heating can permanently damage the microprocessor and/or its supporting components.

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
1	E4	USDHC1_RESET_B	USDHC1_RESET_B	ALT0: USDHC1_RESET_B ALT1: NAND_RE_N ALT2: SPI2_SCK ALT3: ALT4: GPIO4_IO19	VDD_USDHC1	
2	E3	USDHC1_VSELECT	USDHC1_VSELECT	ALT0: USDHC1_VSELECT ALT1: NAND_RE_P ALT2: SPI2_SDO ALT3: NAND_RE_B ALT4: GPIO4_IO20	VDD_USDHC1	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
3	F3	USDHC1_WP	USDHC1_WP	ALT0: USDHC1_WP ALT1: NAND_DQS_N ALT2: SPI2_SDI ALT3: ALT4: GPIO4_I021	VDD_USDHC1	
4	G2	USDHC1_CD_B	USDHC1_CD_B	ALT0: USDHC1_CD_B ALT1: NAND_DQS_P ALT2: SPI2_CS0 ALT3: NAND_DQS ALT4: GPIO4_I022	VDD_USDHC1	
5	F1	USDHC1_CMD	USDHC1_CMD	ALT0: USDHC1_CMD ALT1: NAND_CE0_B ALT2: MQS_R ALT3: ALT4: GPIO4_I024	VDD_USDHC1	
6	G1	USDHC1_DATA0	USDHC1_DATA0	ALT0: USDHC1_DATA0 ALT1: NAND_CE1_B ALT2: MQS_L ALT3: ALT4: GPIO4_I025	VDD_USDHC1	
7	H1	USDHC1_DATA1	USDHC1_DATA1	ALT0: USDHC1_DATA1 ALT1: NAND_RE_B ALT2: UART3_TX ALT3: ALT4: GPIO4_I026	VDD_USDHC1	
8	J1	USDHC1_DATA2	USDHC1_DATA2	ALT0: USDHC1_DATA2 ALT1: NAND_WE_B ALT2: UART3_CTS_B ALT3: ALT4: GPIO4_I027	VDD_USDHC1	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
9	K1	USDHC1_DATA3	USDHC1_DATA3	ALT0: USDHC1_DATA3 ALT1: NAND_ALE ALT2: UART3_RTS_B ALT3: ALT4: GPIO4_IO28	VDD_USDHC1	
10	L1	USDHC1_CLK	USDHC1_CLK	ALT0: USDHC1_CLK ALT1: ALT2: UART3_RX ALT3: ALT4: GPIO4_IO23	VDD_USDHC1	
11	M1	GND	-	-	-	
12	N1	VDD_USDHC1	-	-	VDD_USDHC1	
13	P1	UART0_TX	UART0_TX	ALT0: UART0_TX ALT1: MQS_L ALT2: FLEXCAN0_TX ALT3: ALT4: GPIO1_IO22	3V3	
14	R1	UART0_RX	UART0_RX	ALT0: UART0_RX ALT1: MQS_R ALT2: FLEXCAN0_RX ALT3: ALT4: GPIO1_IO21	3V3	
15	T1	GND	-	-	-	
16	U1	VDD_MIPI_DSI_DIG	-	-	VDD_MIPI_DSI_DIG	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
17	V1	MIPI_DSIO_I2C0_SCL	MIPI_DSIO_I2C0_SCL	ALT0: MIPI_DSIO_I2C0_SCL ALT1: MIPI_DSIO1_GPIO0_IO02 ALT2: ALT3: ALT4: GPIO1_IO25	VDD_MIPI_DSI_DIG	
18	W1	MIPI_DSIO_I2C0_SDA	MIPI_DSIO_I2C0_SDA	ALT0: MIPI_DSIO_I2C0_SDA ALT1: MIPI_DSIO1_GPIO0_IO03 ALT2: ALT3: ALT4: GPIO1_IO26	VDD_MIPI_DSI_DIG	
19	Y1	MIPI_DSIO_GPIO0_00	MIPI_DSIO_GPIO0_00	ALT0: MIPI_DSIO_GPIO0_IO00 ALT1: I2C1_SCL ALT2: MIPI_DSIO_PWM0_OUT ALT3: ALT4: GPIO1_IO27	VDD_MIPI_DSI_DIG	
20	AA1	MIPI_DSIO_GPIO0_01	MIPI_DSIO_GPIO0_01	ALT0: MIPI_DSIO_GPIO0_IO01 ALT1: I2C1_SDA ALT2: ALT3: ALT4: GPIO1_IO28	VDD_MIPI_DSI_DIG	
21	AB1	MIPI_DSIO_I2C0_SCL	MIPI_DSIO_I2C0_SCL	ALT0: MIPI_DSIO_I2C0_SCL ALT1: MIPI_DSIO_GPIO0_IO02 ALT2: ALT3: ALT4: GPIO1_IO29	VDD_MIPI_DSI_DIG	
22	AC1	MIPI_DSIO_I2C0_SDA	MIPI_DSIO_I2C0_SDA	ALT0: MIPI_DSIO_I2C0_SDA ALT1: MIPI_DSIO_GPIO0_IO03 ALT2: ALT3: ALT4: GPIO1_IO30	VDD_MIPI_DSI_DIG	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
23	AD1	MIPI_DSI1_GPI00_00	MIPI_DSI1_GPI00_00	ALT0: MIPI_DSI1_GPI00_IO00 ALT1: I2C2_SCL ALT2: MIPI_DSI1_PWM0_OUT ALT3: ALT4: GPIO1_IO31	VDD_MIPI_DSI_DIG	
24	AE1	MIPI_DSI1_GPI00_01	MIPI_DSI1_GPI00_01	ALT0: MIPI_DSI1_GPI00_IO01 ALT1: I2C2_SDA ALT2: ALT3: ALT4: GPIO2_IO00	VDD_MIPI_DSI_DIG	
25	AF1	QSPI0A_SS1_B	QSPI0A_SS1_B	ALT0: QSPI0A_SS1_B ALT1: ALT2: ALT3: ALT4: GPIO3_IO15	3V3	
26	AG1	QSPI0A_SCLK	QSPI0A_SCLK	ALT0: QSPI0A_SCLK ALT1: ALT2: ALT3: ALT4: GPIO3_IO16	3V3	
27	AH1	1V8	-	-	1V8	
28	AJ1	GND	-	-	-	
29	AK1	3V3	-	-	3V3	
30	-	GND	-	-	-	
31	-	VSYS2	-	-	VSYS2	
32	-	VSYS2	-	-	VSYS2	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
33	-	VSYS	-	-	VSYS	
34	-	GND	-	-	-	
35	AN4	QSPI0A_DQS	QSPI0A_DQS	ALT0: QSPI0A_DQS ALT1: ALT2: ALT3: ALT4: GPIO3_IO13	3V3	
36	AN5	QSPI0A_SS0_B	QSPI0A_SS0_B	ALT0: QSPI0A_SS0_B ALT1: ALT2: ALT3: ALT4: GPIO3_IO14	3V3	
37	AN6	MIPI_DSIO_CLK_N	MIPI_DSIO_CLK_N	-	NVCC_MIPI_CSI_DSI	
38	AN7	MIPI_DSIO_CLK_P	MIPI_DSIO_CLK_P	-	NVCC_MIPI_CSI_DSI	
39	AN8	GND	-	-	-	
40	AN9	MIPI_DSIO_DATA0_N	MIPI_DSIO_DATA0_N	-	NVCC_MIPI_CSI_DSI	
41	AN10	MIPI_DSIO_DATA0_P	MIPI_DSIO_DATA0_P	-	NVCC_MIPI_CSI_DSI	
42	AN11	GND	-	-	-	
43	AN12	MIPI_DSIO_DATA1_N	MIPI_DSIO_DATA1_N	-	NVCC_MIPI_CSI_DSI	
44	AN13	MIPI_DSIO_DATA1_P	MIPI_DSIO_DATA1_P	-	NVCC_MIPI_CSI_DSI	
45	AN14	GND	-	-	-	
46	AN15	MIPI_DSIO_DATA2_N	MIPI_DSIO_DATA2_N	-	NVCC_MIPI_CSI_DSI	
47	AN16	MIPI_DSIO_DATA2_P	MIPI_DSIO_DATA2_P	-	NVCC_MIPI_CSI_DSI	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
48	AN17	GND	-	-	-	
49	AN18	MIPI_DSIO_DATA3_N	MIPI_DSIO_DATA3_N	-	NVCC_MIPI_CSI_DSI	
50	AN19	MIPI_DSIO_DATA3_P	MIPI_DSIO_DATA3_P	-	NVCC_MIPI_CSI_DSI	
51	AN20	GND	-	-	-	
52	AN21	MCA_IO1	-	ALT0: ADC0_DP1/ADC0_SE1 ALT1: PTE16 ALT2: SPI0_PCS0 ALT3: UART2_TX ALT4: TPM_CLKIN0 ALT5: ALT6: FXIO0_D0 ALT7:	VCC_MCA	
53	AN22	MCA_IO2	-	ALT0: ADC0_DM1/ADC0_SE5a ALT1: PTE17 ALT2: SPI0_SCK ALT3: UART2_RX ALT4: TPM_CLKIN1 ALT5: LPTMR0_ALT3 ALT6: FXIO0_D1 ALT7:	VCC_MCA	
54	AN23	MCA_IO3	-	ALT0: ADC0_DP2/ADC0_SE2 ALT1: PTE18 ALT2: SPI0_MOSI ALT3: ALT4: I2C0_SDA ALT5: SPI0_MISO ALT6: FXIO0_D2 ALT7:	VCC_MCA	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
55	AN24	SWD_CLK/PWR_IO	-	ALT0: ALT1: PTA0 ALT2: ALT3: TPM0_CH5 ALT4: ALT5: ALT6: ALT7: SWD_CLK	VCC_MCA	Input power ON/OFF line of the module (active low).
56	AN25	SYS_RESET	-	-	VCC_MCA	Input reset line of the module (active low).
57	AN26	SWD_DIO/MCA_I00	-	ALT0: ALT1: PTA3 ALT2: I2C1_SCL ALT3: TPM0_CH0 ALT4: ALT5: ALT6: ALT7: SWD_DIO	VCC_MCA	
58	AM27	MCA_VIN_DET	-	-	VCC_MCA	
59	-	VCC_MCA	-	-	VCC_MCA	
60	-	GND	-	-	-	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
61	AL27	MCA_IO4	-	ALT0: ADC0_DM2/ADC0_SE6a ALT1: PTE19 ALT2: SPI0_MISO ALT3: ALT4: I2C0_SCL ALT5: SPI0_MOSI ALT6: FXIO0_D3 ALT7:	VCC_MCA	
62	AL28	MCA_IO5	-	ALT0: ADC0_DP0/ADC0_SE0 ALT1: PTE20 ALT2: ALT3: TPM1_CH0 ALT4: LPUART0_TX ALT5: ALT6: FXIO0_D4 ALT7:	VCC_MCA	
63	AK29	MCA_IO6	-	ALT0: ADC0_DM0/ADC0_SE4a ALT1: PTE21 ALT2: ALT3: PTM1_CH1 ALT4: LPUART0_RX ALT5: ALT6: FXIO0_D5 ALT7:	VCC_MCA	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
64	AJ29	MCA_I07	-	ALT0: ADC0_DP3/ADC0_SE3 ALT1: PTE22 ALT2: ALT3: TPM2_CH0 ALT4: UART2_TX ALT5: ALT6: FXIO0_D6 ALT7:	VCC_MCA	
65	AH29	MCA_I08	-	ALT0: ADC0_DM3/ADC0_SE7a ALT1: PTE23 ALT2: ALT3: TPM2_CH1 ALT4: UART2_RX ALT5: ALT6: FXIO0_D7 ALT7:	VCC_MCA	
66	AG29	MCA_I09	-	ALT0: ALT1: PTA1 ALT2: LPUART0_RX ALT3: TPM2_CH0 ALT4: ALT5: ALT6: ALT7:	VCC_MCA	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
67	AF29	MCA_IO10	-	ALT0: ALT1: PTA2 ALT2: LPUART0_TX ALT3: TPM2_CH1 ALT4: ALT5: ALT6: ALT7:	VCC_MCA	
68	AE29	SCU_BOOT_MODE0	SCU_BOOT_MODE0	-	VCC_SCU_1V8	
69	AD29	SCU_BOOT_MODE1	SCU_BOOT_MODE1	-	VCC_SCU_1V8	
70	AC29	SCU_GPIO0_00	SCU_GPIO0_00	ALT0: SCU_GPIO0_IO00 ALT1: SCU_UART0_RX ALT2: M40_UART0_RX ALT3: UART3_RX ALT4: GPIO2_IO03	VCC_SCU_1V8	
71	AB29	SCU_GPIO0_01	SCU_GPIO0_01	ALT0: SCU_GPIO0_IO01 ALT1: SCU_UART0_TX ALT2: M40_UART0_TX ALT3: UART3_TX ALT4: SCU_WDOG0_WDOG_OUT	VCC_SCU_1V8	
72	AA29	VCC_SCU_1V8	-	-	VCC_SCU_1V8	Do not use this power rail unless otherwise noted.
73	Y29	GND	-	-	-	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
74	W29	UART2_TX	UART2_TX	ALT0: UART2_TX ALT1: FTM_CH1 ALT2: FLEXCAN1_TX ALT3: ALT4: GPIO1_IO23	3V3	
75	V29	UART2_RX	UART2_RX	ALT0: UART2_RX ALT1: FTM_CH0 ALT2: FLEXCAN1_RX ALT3: ALT4: GPIO1_IO24	3V3	
76	U29	FLEXCAN2_RX	FLEXCAN2_RX	ALT0: FLEXCAN2_RX ALT1: SAI3_RXD ALT2: UART3_RX ALT3: SAI1_RXFS ALT4: GPIO1_IO19	3V3	
77	T29	FLEXCAN2_TX	FLEXCAN2_TX	ALT0: FLEXCAN2_TX ALT1: SAI3_RXFS ALT2: UART3_TX ALT3: SAI1_RXC ALT4: GPIO1_IO20	3V3	
78	R29	FLEXCAN1_RX	FLEXCAN1_RX	ALT0: FLEXCAN1_RX ALT1: SAI2_RXFS ALT2: FTM_CH2 ALT3: SAI1_TXD ALT4: GPIO1_IO17	3V3	
79	P29	FLEXCAN1_TX	FLEXCAN1_TX	ALT0: FLEXCAN1_TX ALT1: SAI3_RXC ALT2: DMA0_REQ_IN0 ALT3: SAI1_RXD ALT4: GPIO1_IO18	3V3	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
80	N29	FLEXCAN0_RX	FLEXCAN0_RX	ALT0: FLEXCAN0_RX ALT1: SAI2_RXC ALT2: UART0_RTS_B ALT3: SAI1_TXC ALT4: GPIO1_IO15	3V3	
81	M29	FLEXCAN0_TX	FLEXCAN0_TX	ALT0: FLEXCAN0_TX ALT1: SAI2_RXD ALT2: UART0_CTS_B ALT3: SAI1_TXFS ALT4: GPIO1_IO16	3V3	
82	L29	ADC_IN1	ADC_IN1	ALT0: ADC_IN1 ALT1: M40_I2C0_SDA ALT2: M40_GPIO0_IO01 ALT3: ALT4: GPIO1_IO09	1V8	
83	K29	ADC_IN0	ADC_IN0	ALT0: ADC_IN0 ALT1: M40_I2C0_SCL ALT2: M40_GPIO0_IO00 ALT3: ALT4: GPIO1_IO10	1V8	
84	J29	ADC_VREFH	-	-	-	
85	H29	GND	-	-	-	
86	G29	MCLK_OUT0	MCLK_OUT0	ALT0: MCLK_OUT0 ALT1: ESAI0_TX_HF_CLK ALT2: LCDIF_CLK ALT3: SPI2_SDO ALT4: GPIO0_IO20	3V3	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
87	F29	MCLK_IN0	MCLK_IN0	ALT0: MCLK_IN0 ALT1: ESAI0_RX_HF_CLK ALT2: LCDIF_VSYNC ALT3: SPI2_SDI ALT4: GPIO0_IO19	3V3	
88	E29	MCLK_IN1	MCLK_IN1	ALT0: MCLK_IN1 ALT1: I2C3_SDA ALT2: LCDIF_EN ALT3: SPI2_SCK ALT4: LCDIF_D17	3V3	
89	F28	SPI3_CS1	SPI3_CS1	ALT0: SPI3_CS1 ALT1: I2C3_SCL ALT2: LCDIF_RESET ALT3: SPI2_CS0 ALT4: LCDIF_D16	3V3	
90	E28	SPI3_SCK	SPI3_SCK	ALT0: SPI3_SCK ALT1: ALT2: LCDIF_D13 ALT3: ALT4: GPIO0_IO13	3V3	
91	E27	SPI3_SDO	SPI3_SDO	ALT0: SPI3_SDO ALT1: ALT2: LCDIF_D14 ALT3: ALT4: GPIO0_IO14	3V3	
92	C24	SPI3_SDI	SPI3_SDI	ALT0: SPI3_SDI ALT1: ALT2: LCDIF_D15 ALT3: ALT4: GPIO0_IO15	3V3	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
93	B24	SPI3_CS0	SPI3_CS0	ALT0: SPI3_CS0 ALT1: MCLK_OUT1 ALT2: LCDIF_HSYNC ALT3: ALT4: GPIO0_IO16	3V3	
94	-	GND	-	-	-	
95	-	VDD_ENET0	-	-	VDD_ENET0	
96	A24	ENET0_RGMII_TXC	ENET0_RGMII_TXC	ALT0: ENET0_RGMII_TXC ALT1: ENET0_RCLK50M_OUT ALT2: ENET0_RCLK50M_IN ALT3: NAND_CE1_B ALT4: GPIO4_IO29	VDD_ENET0	
97	A23	ENET0_RGMII_TX_CTL	ENET0_RGMII_TX_CTL	ALT0: ENET0_RGMII_TX_CTL ALT1: ALT2: ALT3: USDHCI1_RESET_B ALT4: GPIO4_IO30	VDD_ENET0	
98	A22	ENET0_RGMII_TXD0	ENET0_RGMII_TXD0	ALT0: ENET0_RGMII_TXD0 ALT1: ALT2: ALT3: USDHCI1_VSELECT ALT4: GPIO4_IO31	VDD_ENET0	
99	A21	ENET0_RGMII_TXD1	ENET0_RGMII_TXD1	ALT0: ENET0_RGMII_TXD1 ALT1: ALT2: ALT3: USDHCI1_WP ALT4: GPIO5_IO00	VDD_ENET0	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
100	A20	ENET0_RGMII_TXD2	ENET0_RGMII_TXD2	ALT0: ENET0_RGMII_TXD2 ALT1: MLB_CLK ALT2: NAND_CE0_B ALT3: USDMHC1_CD_B ALT4: GPIO5_IO01	VDD_ENET0	
101	A19	ENET0_RGMII_TXD3	ENET0_RGMII_TXD3	ALT0: ENET0_RGMII_TXD3 ALT1: MLB_SIG ALT2: NAND_RE_B ALT3: ALT4: GPIO5_IO02	VDD_ENET0	
102	A18	ENET0_RGMII_RXC	ENET0_RGMII_RXC	ALT0: ENET0_RGMII_RXC ALT1: MLB_DATA ALT2: NAND_WE_B ALT3: USDMHC1_CLK ALT4: GPIO5_IO03	VDD_ENET0	
103	A17	ENET0_RGMII_RX_CTL	ENET0_RGMII_RX_CTL	ALT0: ENET0_RGMII_RX_CTL ALT1: ALT2: ALT3: USDMHC1_CMD ALT4: GPIO5_IO04	VDD_ENET0	
104	A16	ENET0_RGMII_RXD0	ENET0_RGMII_RXD0	ALT0: ENET0_RGMII_RXD0 ALT1: ALT2: ALT3: USDMHC1_DATA0 ALT4: GPIO5_IO05	VDD_ENET0	
105	A15	ENET0_RGMII_RXD1	ENET0_RGMII_RXD1	ALT0: ENET0_RGMII_RXD1 ALT1: ALT2: ALT3: USDMHC1_DATA1 ALT4: GPIO5_IO06	VDD_ENET0	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
106	A14	ENET0_RGMII_RXD2	ENET0_RGMII_RXD2	ALT0: ENET0_RGMII_RXD2 ALT1: ENET0_RMII_RX_ER ALT2: USDHC1_DATA2 ALT4: GPIO5_IO07	VDD_ENET0	
107	A13	ENET0_RGMII_RXD3	ENET0_RGMII_RXD3	ALT0: ENET0_RGMII_RXD3 ALT1: NAND_ALE ALT2: USDHC1_DATA3 ALT4: GPIO5_IO08	VDD_ENET0	
108	A12	ENET0_REFCLK_125M_25M	ENET0_REFCLK_125M_25M	ALT0: ENET0_REFCLK_125M_25M ALT1: ENET0_PPS ALT2: ENET1_PPS ALT3: GPIO5_IO09 ALT4: GPIO5_IO09	VDD_ENET0	
109	A11	ENET0_MDIO	ENET0_MDIO	ALT0: ENET0_MDIO ALT1: I2C3_SDA ALT2: ENET1_MDIO ALT3: GPIO5_IO10 ALT4: GPIO5_IO10	VDD_ENET0	
110	A10	ENET0_MDC	ENET0_MDC	ALT0: ENET0_MDC ALT1: I2C3_SCL ALT2: ENET1_MDC ALT3: GPIO5_IO11 ALT4: GPIO5_IO11	VDD_ENET0	
111	A9	USB_OTG2_P	USB_OTG2_DP	-	3V3	
112	A8	USB_OTG2_N	USB_OTG2_DN	-	3V3	
113	A7	USB_OTG1_P	USB_OTG1_DP	-	3V3	

Castellated pad #	Associated LGA Pad name	ConnectCore 8X signal name	i.MX 8X pin name*	Multiplexing	Power group	Comments
114	A6	USB_OTG1_N	USB_OTG1_DN	-	3V3	
115	-	GND	-	-	-	
116	B6	USB_OTG1_VBUS	-	-	-	
117	D4	GND	-	-	-	
118	C6	USB_OTG1_ID	USB_OTG1_ID	-	3V3	

Extended LGA version

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
A4	GND	-	-	-	
A5	GND	-	-	-	
A25	GND	-	-	-	
A26	RESERVED	-	-	-	
B3	GND	-	-	-	
B4	GND	-	-	-	
B5	GND	-	-	-	
B7	RESERVED	-	-	-	
B8	GND	-	-	-	
B9	USB_SS3_TX_N	USB_SS3_TX_N	-	1V8	
B10	USB_SS3_TX_P	USB_SS3_TXP	-	1V8	
B11	GND	-	-	-	
B12	USB_SS3_RX_N	USB_SS3_RX_N	-	1V8	
B13	USB_SS3_RX_P	USB_SS3_RX_P	-	1V8	
B14	GND	-	-	-	
B15	GND	-	-	-	
B16	WLAN_RF_KILL#	-	-	3V3_RF	
B17	BT_RF_KILL#	-	-	3V3_RF	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
B18	GND	-	-	-	
B19	ESAI0_SCKR	ESAI0_SCKR	ALT0: ESAI0_SCKR ALT1: ALT2: LCDIF_D02 ALT3: ENET1_RGMII_TX_CTL ALT4: GPIO0_IO02	VDD_ESAI_SPDIF	
B20	ESAI0_FSR	ESAI0_FSR	ALT0: ESAI0_FSR ALT1: ENET1_RCLK50M_OUT ALT2: LCDIF_D00 ALT3: ENET1_RGMII_TXC ALT4: ENET1_RCLK50M_IN	VDD_ESAI_SPDIF	
B21	ESAI0_SCKT	ESAI0_SCKT	ALT0: ESAI0_SCKT ALT1: MLB_SIG ALT2: LCDIF_D03 ALT3: ENET1_RGMII_TXD3 ALT4: GPIO0_IO03	VDD_ESAI_SPDIF	
B22	ESAI0_TX1	ESAI0_TX1	ALT0: ESAI0_TX1 ALT1: ALT2: LCDIF_D05 ALT3: ENET1_RGMII_RXD3 ALT4: GPIO0_IO05	VDD_ESAI_SPDIF	
B23	RESERVED	-	-	-	
B25	GND	-	-	-	
B26	GND	-	-	-	
B27	GND	-	-	-	
C2	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
C3	RF_ANT2_INT	-	-	-	Internal secondary antenna pad.
C4	GND	-	-	-	
C5	GND	-	-	-	
C7	USB_SS3_TC1	USB_SS3_TC1	ALT0: I2C1_SCL ALT1: USB_OTG2_PWR ALT2: ALT3: ALT4: GPIO4_IO04	3V3	
C8	USB_SS3_TC0	USB_SS3_TC0	ALT0: I2C1_SCL ALT1: USB_OTG1_PWR ALT2: USB_OTG2_PWR ALT3: ALT4: GPIO4_IO03	3V3	
C9	USB_SS3_TC2	USB_SS3_TC2	ALT0: I2C1_SDA ALT1: USB_OTG1_OC ALT2: USB_OTG2_OC ALT3: ALT4: GPIO4_IO05	3V3	
C10	USB_OTG2_ID	USB_OTG2_ID	-	3V3	
C11	USB_SS3_TC3	USB_SS3_TC3	ALT0: I2C1_SDA ALT1: USB_OTG2_OC ALT2: ALT3: ALT4: GPIO4_IO06	3V3	
C12	GND	-	-	-	
C13	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
C14	GND	-	-	-	
C15	GND	-	-	-	
C16	GND	-	-	-	
C17	SPI2_CS0	SPI2_CS0	ALT0: SPI2_CS0 ALT1: ALT2: ALT3: ALT4: GPIO1_IO00	VDD_SPI_SAI	
C18	SPI2_SDI	SPI2_SDI	ALT0: SPI2_SDI ALT1: ALT2: ALT3: ALT4: GPIO1_IO02	VDD_SPI_SAI	
C19	SAI0_TXFS	SAI0_TXFS	ALT0: SAI0_TXFS ALT1: SPI2_CS1 ALT2: SPI1_SCK ALT3: ALT4: GPIO0_IO28	VDD_SPI_SAI	
C20	ESAI0_TX2_RX3	ESAI0_TX2_RX3	ALT0: ESAI0_TX2_RX3 ALT1: ENET1_RMII_RX_ER ALT2: LCDIF_D06 ALT3: ENET1_RGMII_RXD2 ALT4: GPIO0_IO06	VDD_ESAI_SPDIF	
C21	ESAI0_FST	ESAI0_FST	ALT0: ESAI0_FST ALT1: MLB_CLK ALT2: LCDIF_D01 ALT3: ENET1_RGMII_TXD2 ALT4: GPIO0_IO01	VDD_ESAI_SPDIF	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
C22	ESAI0_TX4_RX1	ESAI0_TX4_RX1	ALT0: ESAI0_TX4_RX1 ALT1: ALT2: LCDIF_D08 ALT3: ENET1_RGMII_TXD0 ALT4: GPIO0_IO08	VDD_ESAI_SPDIF	
C23	SPDIF0_TX	SPDIF0_TX	ALT0: SPDIF0_TX ALT1: MQS_L ALT2: LCDIF_D11 ALT3: ENET1_RGMII_RX_CTL ALT4: GPIO0_IO11	VDD_ESAI_SPDIF	
C25	GND	-	-	-	
C26	GND	-	-	-	
C27	RF_ANT1_INT	-	-	-	Internal primary antenna pad.
C28	GND	-	-	-	
D1	RESERVED	-	-	-	
D2	GND	-	-	-	
D3	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
D5	WLAN_SD1_D3	-	-	3V3_RF	This SDIO interface is connected to the Wireless chip on the chip on the wireless variants of the SOM. By default, the QCA chip carried by the SOM will use the internal PCIe interface, not the SDIO.
D6	WLAN_SD1_D2	-	-	3V3_RF	
D7	WLAN_SD1_D7	-	-	3V3_RF	
D8	WLAN_SD1_D1	-	-	3V3_RF	
D9	WLAN_SD1_D0	-	-	3V3_RF	
D10	WLAN_SD1_D6	-	-	3V3_RF	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
D11	WLAN_SD1_CMD	-	-	3V3_RF	
D12	WLAN_SD1_CLK	-	-	3V3_RF	
D13	WLAN_SD1_D5	-	-	3V3_RF	
D14	WLAN_SD1_D4	-	-	3V3_RF	
D15	VDD_ENET0	-	-	VDD_ENET0	
D16	GND	-	-	-	
D17	SPI0_SCK	SPI0_SCK	ALT0: SPI0_SCK ALT1: SAI0_TXC ALT2: M40_I2C0_SCL ALT3: M40_GPIO0_IO00 ALT4: GPIO1_IO04	VDD_SPI_SAI	
D18	SPI2_SDO	SPI2_SDO	ALT0: SPI2_SDO ALT1: ALT2: ALT3: ALT4: GPIO1_IO01	VDD_SPI_SAI	
D19	SAI1_RXD	SAI1_RXD	ALT0: SAI1_RXD ALT1: SAI0_RXFS ALT2: SPI1_CS1 ALT3: LCDIF_D21 ALT4: GPIO0_IO29	VDD_SPI_SAI	
D20	ESAI0_TX5_RX0	ESAI0_TX5_RX0	ALT0: ESAI0_TX5_RX0 ALT1: ALT2: LCDIF_D09 ALT3: ENET1_RGMII_TXD1 ALT4: GPIO0_IO09	VDD_ESAI_SPDIF	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
D21	SPDIF0_RX	SPDIF0_RX	ALT0: SPDIF0_RX ALT1: MQS_R ALT2: LCDIF_D10 ALT3: ENET1_RGMII_RXD0 ALT4: GPIO0_IO10	VDD_ESAI_SPDIF	
D22	ESAI0_TX0	ESAI0_TX0	ALT0: ESAI0_TX0 ALT1: MLB_DATA ALT2: LCDIF_D04 ALT3: ENET1_RGMII_RXC ALT4: GPIO0_IO04	VDD_ESAI_SPDIF	
D23	ESAI0_TX3_RX2	ESAI0_TX3_RX2	ALT0: ESAI0_TX3_RX2 ALT1: LCDIF_D07 ALT3: ENET1_RGMII_RXD1 ALT4: GPIO0_IO07	VDD_ESAI_SPDIF	
D24	GND	-	-	-	
D25	SPDIF0_EXT_CLK	SPDIF0_EXT_CLK	ALT0: SPDIF0_EXT_CLK ALT1: LCDIF_D12 ALT3: ENET1_REFCLK_125M_25M ALT4: GPIO0_IO12	VDD_ESAI_SPDIF	
D26	GND	-	-	-	
D27	GND	-	-	-	
D28	GND	-	-	-	
D29	GND	-	-	-	
E1	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
E2	GND	-	-	-	
E5	VDD_EMMC0	-	-	VDD_EMMC0	Do not use this power rail unless otherwise noted.
E6	GND	-	-	-	
E7	RESERVED	-	-	-	
E8	GND	-	-	-	
E9	GPS_COEX	-	-	3V3_RF	
E10	LTE_PRI	-	-	3V3_RF	
E11	LTE_SYNC	-	-	3V3_RF	
E12	BT_UART1_RX	UART1_RX	ALT0: UART1_RX ALT1: PWM1_OUT ALT2: GPT0_COMPARE ALT3: GPT1_CLK ALT4: GPIO0_IO22	3V3/3V3_RF	Internal UART line used by the Bluetooth. This signal is externally available only in non-wireless variants.

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
E13	BT_UART1_TX	UART1_TX	ALT0: UART1_TX ALT1: PWM0_OUT ALT2: GPT0_CAPTURE ALT3: ALT4: GPIO0_IO21	3V3/3V3_RF	Internal UART line used by the Bluetooth. This signal is externally available only in non-wireless variants.
E14	VDD_ESAI_SPDIF	-	-	VDD_ESAI_SPDIF	
E15	GND	-	-	-	
E16	VDD_SPI_SAI	-	-	VDD_SPI_SAI	
E17	SPI2_SCK	SPI2_SCK	ALT0: SPI2_SCK ALT1: ALT2: ALT3: ALT4: GPIO1_IO03	VDD_SPI_SAI	
E18	SPI0_SDO	SPI0_SDO	ALT0: SPI0_SDO ALT1: SAI0_TXFS ALT2: M40_I2C0_SDA ALT3: M40_GPIO0_IO01 ALT4: GPIO1_IO06	VDD_SPI_SAI	
E19	SPI0_CS0	SPI0_CS0	ALT0: SPI0_CS0 ALT1: SAI0_RXD ALT2: M40_TPM0_CH1 ALT3: M40_GPIO0_IO03 ALT4: GPIO1_IO08	VDD_SPI_SAI	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
E20	SAI0_TXD	SAI0_TXD	ALT0: SAI0_TXD ALT1: SAI1_RXC ALT2: SPI1_SDO ALT3: LCDIF_D18 ALT4: GPIO0_IO25	VDD_SPI_SAI	
E21	SAI0_RXD	SAI0_RXD	ALT0: SAI0_RXD ALT1: SAI1_RXFS ALT2: SPI1_CS0 ALT3: LCDIF_D20 ALT4: GPIO0_IO27	VDD_SPI_SAI	
E22	SPI0_SDI	SPI0_SDI	ALT0: SPI0_SDI ALT1: SAI0_TXD ALT2: M40_TPM0_CH0 ALT3: M40_GPIO0_IO02 ALT4: GPIO1_IO05	VDD_SPI_SAI	
E23	SAI0_TXC	SAI0_TXC	ALT0: SAI0_TXC ALT1: SAI1_TXD ALT2: SPI1_SDI ALT3: LCDIF_D19 ALT4: GPIO0_IO26	VDD_SPI_SAI	
E24	SAI1_RXC	SAI1_RXC	ALT0: SAI1_RXC ALT1: SAI1_TXC ALT2: LCDIF_D22 ALT4: GPIO0_IO30	VDD_SPI_SAI	
E25	SAI1_RXFS	SAI1_RXFS	ALT0: SAI1_RXFS ALT1: SAI1_TXFS ALT2: LCDIF_D23 ALT4: GPIO0_IO31	VDD_SPI_SAI	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
E26	SPI0_CS1	SPI0_CS1	ALT0: SPI0_CS1 ALT1: SAIO_RXC ALT2: SAI1_TXD ALT3: LCDIF_PWM0 ALT4: GPIO1_IO07	VDD_SPI_SAI	
F2	VDD_PCIE_DIG	-	-	VDD_PCIE_DGI/3V3_RF	
F4	PCIE_LGA_OUT_CTRL0_WAKE_B	-	ALT0: PCIE_CTRL0_WAKE_B ALT4: GPIO4_IO02	VDD_PCIE_DIG	Internal PCIe line used by the wireless. This signal is externally available only in non-wireless variants.
F5	PCIE_LGA_OUT_CTRL0_CLKREQ_B	-	ALT0: PCIE_CTRL0_CLKREQ_B ALT4: GPIO4_IO01	VDD_PCIE_DIG	Internal PCIe line used by the wireless. This signal is externally available only in non-wireless variants.

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
F6	PCIE_LGA_OUT_CTRL0_PERST_B	-	ALT0: PCIE_CTRL0_PERST_B ALT4: GPIO4_IO00	VDD_PCIE_DIG	Internal PCIe line used by the wireless. This signal is externally available only in non-wireless variants.
F7	PCIE_LGA_IN_CTRL0_WAKE_B	-	-	VDD_PCIE_DIG	Leave this pin floating unless otherwise noted.
F8	PCIE_LGA_IN_CTRL0_CLKREQ_B	-	-	VDD_PCIE_DIG	Leave this pin floating unless otherwise noted.
F9	PCIE_LGA_IN_CTRL0_PERST_B	-	-	VDD_PCIE_DIG	Leave this pin floating unless otherwise noted.

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
F10	3V3_RF_EN	QSPI0A_DATA3	ALT0: QSPI0A_DATA3 ALT4: GPIO3_IO12	3V3	In Wireless variants of the SOM this is a reserved output line. Do not drive this signal externally.
F11	BT_UART1_RTS#	UART1_RTS_B	ALT0: UART1_RTS_B ALT1: PWM2_OUT ALT2: LCDIF_D16 ALT3: GPT1_CAPTURE ALT4: GPT0_CLK	3V3/3V3_RF	Internal UART line used by the Bluetooth. This signal is externally available only in non-wireless variants.
F12	BT_UART1_CTS#	UART1_CTS_B	ALT0: UART1_CTS_B ALT1: PWM3_OUT ALT2: LCDIF_D17 ALT3: GPT1_COMPARE ALT4: GPIO0_IO24	3V3/3V3_RF	Internal UART line used by the Bluetooth. This signal is externally available only in non-wireless variants.
F13	PCM_OUT	-	-	3V3_RF	
F14	PCM_SYNC	-	-	3V3_RF	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
F15	GND	-	-	-	
F16	GND	-	-	-	
F17	3V3_RF	-	-	3V3_RF	
F18	3V3_RF	-	-	3V3_RF	
F19	RESERVED	-	-	-	
F20	RESERVED	-	-	-	
F21	GND	-	-	-	
F22	GND	-	-	-	
F23	QOW	-	-	3V3_RF	
F24	WLAN_LED	-	-	3V3_RF	Functionality not supported.
F25	BT_LED	-	-	3V3_RF	Functionality not supported.
F26	BT_EN	QSPI0A_DATA1	ALT0: QSPI0A_DATA1 ALT4: GPIO3_IO10	3V3_RF	In wireless variants of the SOM, this is a reserved output line. Do not drive this signal externally.

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
F27	WL_EN	QSPI0A_DATA2	ALT0: QSPI0A_DATA2 ALT4: GPIO3_IO11	3V3_RF	In wireless variants of the SOM, this is a reserved output line. Do not drive this signal externally.
G3	PCIE0_LGA_IN_REFCLK_N	-	-	1V	
G4	PCIE0_LGA_IN_REFCLK_P	-	-	1V8	
G5	GND	-	-	-	
G6	PCIE0_LGA_OUT_RX0_N	-	-	1V8	Internal PCIe line used by the Wireless. This signal is externally available only in non-wireless variants.

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
G7	PCIE0_LGA_OUT_RX0_P	-	-	1V8	Internal PCIe line used by the Wireless. This signal is externally available only in non-wireless variants.
G8	GND	-	-	-	
G9	PCIE0_LGA_OUT_TX0_N	-	-	1V8	Internal PCIe line used by the Wireless. This signal is externally available only in non-wireless variants.
G10	PCIE0_LGA_OUT_TX0_P	-	-	1V8	Internal PCIe line used by the Wireless. This signal is externally available only in non-wireless variants.

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
G11	GND	-	-	-	
G12	BT_WAKEUP_SLAVE	-	-	3V3_RF	
G13	PCM_CLK	-	-	3V3_RF	
G14	PCM_IN	-	-	3V3_RF	
G15	LTE_ACTIVE	-	-	3V3_RF	
G16	GND	-	-	-	
G17	BT_WAKEUP_HOST	-	-	3V3_RF	
G18	WLAN_SDIO_INT_L	-	-	3V3_RF	
G19	GND	-	-	-	
G20	PCIE0_LGA_IN_TX0_P	-	-	1V8	Leave this pin floating unless otherwise noted.
G21	PCIE0_LGA_IN_TX0_N	-	-	1V8	Leave this pin floating unless otherwise noted.
G22	GND	-	-	-	
G23	PCIE0_LGA_IN_RX0_P	-	-	1V8	Leave this pin floating unless otherwise noted.

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
G24	PCIE0_LGA_IN_RX0_N	-	-	1V8	Leave this pin floating unless otherwise noted.
G25	GND	-	-	-	
G26	GND	-	-	-	
G27	GND	-	-	-	
G28	GND	-	-	-	
H2	GND	-	-	-	
H3	GND	-	-	-	
H4	GND	-	-	-	
H5	GND	-	-	-	
H6	GND	-	-	-	
H7	GND	-	-	-	
H8	GND	-	-	-	
H9	GND	-	-	-	
H10	GND	-	-	-	
H11	GND	-	-	-	
H12	GND	-	-	-	
H13	GND	-	-	-	
H14	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
H15	GND	-	-	-	
H16	GND	-	-	-	
H17	GND	-	-	-	
H18	GND	-	-	-	
H19	GND	-	-	-	
H20	GND	-	-	-	
H21	GND	-	-	-	
H22	GND	-	-	-	
H23	GND	-	-	-	
H24	GND	-	-	-	
H25	GND	-	-	-	
H26	GND	-	-	-	
H27	GND	-	-	-	
H28	GND	-	-	-	
AF2	GND	-	-	-	
AF3	GND	-	-	-	
AF4	GND	-	-	-	
AF5	GND	-	-	-	
AF6	GND	-	-	-	
AF7	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AF8	GND	-	-	-	
AF9	GND	-	-	-	
AF10	GND	-	-	-	
AF11	GND	-	-	-	
AF12	GND	-	-	-	
AF13	GND	-	-	-	
AF14	GND	-	-	-	
AF15	GND	-	-	-	
AF16	GND	-	-	-	
AF17	GND	-	-	-	
AF18	GND	-	-	-	
AF19	GND	-	-	-	
AF20	GND	-	-	-	
AF21	GND	-	-	-	
AF22	GND	-	-	-	
AF23	GND	-	-	-	
AF24	GND	-	-	-	
AF25	GND	-	-	-	
AF26	GND	-	-	-	
AF27	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AF28	GND	-	-	-	
AG2	GND	-	-	-	
AG3	GND	-	-	-	
AG4	GND	-	-	-	
AG5	GND	-	-	-	
AG6	GND	-	-	-	
AG7	GND	-	-	-	
AG8	QSPI0B_DATA3	QSPI0B_DATA3	ALT0: QSPI0B_DATA3 ALT1: QSPI1A_DATA3 ALT2: KPP0_ROW0 ALT3: ALT4: GPIO3_IO21	VDD_QSPI0B	
AG9	QSPI0B_DATA1	QSPI0B_DATA1	ALT0: QSPI0B_DATA1 ALT1: QSPI1A_DATA1 ALT2: KPP0_COL2 ALT3: ALT4: GPIO3_IO19	VDD_QSPI0B	
AG10	QSPI0B_SS1_B	QSPI0B_SS1_B	ALT0: QSPI0B_SS1_B ALT1: QSPI1A_SS1_B ALT2: KPP0_ROW3 ALT3: ALT4: GPIO3_IO24	VDD_QSPI0B	
AG11	QSPI0B_DATA0	QSPI0B_DATA0	ALT0: QSPI0B_DATA0 ALT1: QSPI1A_DATA0 ALT2: KPP0_COL1 ALT3: ALT4: GPIO3_IO18	VDD_QSPI0B	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AG12	QSPI0B_DQS	QSPI0B_DQS	ALT0: QSPI0B_DQS ALT1: QSPI1A_DQS ALT2: KPP0_ROW1 ALT3: ALT4: GPIO3_IO22	VDD_QSPI0B	
AG13	QSPI0B_SS0_B	QSPI0B_SS0_B	ALT0: QSPI0B_SS0_B ALT1: QSPI1A_SS0_B ALT2: KPP0_ROW2 ALT3: ALT4: GPIO3_IO23	VDD_QSPI0B	
AG14	QSPI0B_DATA2	QSPI0B_DATA2	ALT0: QSPI0B_DATA2 ALT1: QSPI1A_DATA2 ALT2: KPP0_COL3 ALT3: ALT4: GPIO3_IO20	VDD_QSPI0B	
AG15	QSPI0B_SCLK	QSPI0B_SCLK	ALT0: QSPI0B_SCLK ALT1: QSPI1A_SCLK ALT2: KPP0_COL0 ALT3: ALT4: GPIO3_IO17	VDD_QSPI0B	
AG16	GND	-	-	-	
AG17	VDD_QSPI0B	-	-	VDD_QSPI0B	
AG18	IMX8_ON_OFF	ON_OFF_BUTTON	-	VCC_SNV5_LDO_1V8	ON/OFF signal from the CPU. Digi recommends leaving this pin floating.
AG19	JTAG_TRST_GPIO	JTAG_TRST_B	-	VCC_SCU_1V8	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AG20	JTAG_TCK	JTAG_TCK	-	VCC_SCU_1V8	
AG21	JTAG_TDO	JTAG_TDO	-	VCC_SCU_1V8	
AG22	VDD_CSI	-	-	VDD_CSI	
AG23	GND	-	-	-	
AG24	VDD_ADC_1V8	-	-	VDD_ADC_1V8	
AG25	ADC_IN4	ADC_IN4	ALT0: ADC_IN4 ALT1: M40_TPM_CH0 ALT2: M40_GPIO0_IO04 ALT3: ALT4: GPIO1_IO14	1V8	
AG26	ADC_IN3	ADC_IN3	ALT0: ADC_IN3 ALT1: M40_UART0_TX ALT2: M40_GPIO0_IO03 ALT3: MCLK_OUT0 ALT4: GPIO1_IO11	1V8	
AG27	ADC_IN2	ADC_IN2	ALT0: ADC_IN2 ALT1: M40_UART0_RX ALT2: M40_GPIO0_IO02 ALT3: MCLK_IN0 ALT4: GPIO1_IO12	1V8	
AG28	ADC_IN5	ADC_IN5	ALT0: ADC_IN5 ALT1: TPM0_CH1 ALT2: M40_GPIO0_IO05 ALT3: ALT4: GPIO1_IO13	1V8	
AH2	1V8	-	-	1V8	
AH3	1V8	-	-	1V8	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AH4	GND	-	-	-	
AH5	GND	-	-	-	
AH6	PMIC_FSOB	-	-		
AH7	LDO4	-	-	LDO4	
AH8	GND	-	-	-	
AH9	LDO4IN	-	-	-	
AH10	POR_B	-	-	VCC_SCU_1V8	Reset signal of the CPU. Digi recommends leaving this pin floating. 10K pull-up inside the module connected to VCC_SCU_1V8.
AH11	PMIC_EWARN	-	-		
AH12	PMIC_WDI	-	-		
AH13	VLDO2_VSELECT	-	-		
AH14	GND	-	-	-	
AH15	MIPI_DSI1_DATA2_P	MIPI_DSI1_DATA2_P	-	NVCC_MIPI_CSI_DSI	
AH16	MIPI_DSI1_DATA2_N	MIPI_DSI1_DATA2_N	-	NVCC_MIPI_CSI_DSI	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AH17	GND	-	-	-	
AH18	NVCC_MIPI_CSI_DSI	-	-	NVCC_MIPI_CSI_DSI	
AH19	GND	-	-	-	
AH20	CSI_D06	CSI_D06	ALT0: CSI_D08 ALT1: ALT2: SAI3_RXC ALT3: TAMPER_IN1 ALT4:	VDD_CSI	
AH21	GND	-	-	-	
AH22	CSI_PCLK	CSI_PCLK	ALT0: CSI_PCLK ALT1: MIPI_CSI0_I2C0_SCL ALT2: ALT3: SPI1_SCK ALT4: GPIO3_IO00	VDD_CSI	
AH23	CSI_VSYNC	CSI_VSYNC	ALT0: CSI_VSYNC ALT1: CSI_D01 ALT2: ALT3: TAMPER_IN4 ALT4:	VDD_CSI	
AH24	CSI_D03	CSI_D03	ALT0: CSI_D05 ALT1: ALT2: SAI2_RXC ALT3: TAMPER_OUT3 ALT4:	VDD_CSI	
AH25	CSI_D00	CSI_D00	ALT0: CSI_D02 ALT1: ALT2: SAI0_RXC ALT3: TAMPER_OUT0 ALT4:	VDD_CSI	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AH26	CSI_D01	CSI_D01	ALT0: CSI_D03 ALT1: ALT2: SAI0_RXD ALT3: TAMPER_OUT1 ALT4:	VDD_CSI	
AH27	JTAG_TDI	JTAG_TDI	-	VCC_SCU_1V8	
AH28	JTAG_TMS	JTAG_TMS	-	VCC_SCU_1V8	
AJ2	VSYS2	-	-	VSYS2	
AJ3	VSYS2	-	-	VSYS2	
AJ4	VSYS2	-	-	VSYS2	
AJ5	GND	-	-	-	
AJ6	GND	-	-	-	
AJ7	GND	-	-	-	
AJ8	LDO3IN	-	-		
AJ9	GND	-	-	-	
AJ10	LDO3	-	-	LDO3	
AJ11	SCU_PMIC_STANDBY	-	-		

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AJ12	PWR_ON	-	-		Power on/off signal of the SOM: ■ ON: high level. ■ OFF: low level. 2.2M pull-up on module connected to VCC_MCA.
AJ13	VCC_SNVLS_LDO_1V8	-	-	VCC_SNVLS_LDO_1V8	Do not use this cell unless otherwise noted.
AJ14	GND	-	-	-	
AJ15	MIPI_DSI1_DATA0_N	MIPI_DSI1_DATA0_N	-	NVCC_MIPI_CSI_DSI	
AJ16	MIPI_DSI1_DATA0_P	MIPI_DSI1_DATA0_P	-	NVCC_MIPI_CSI_DSI	
AJ17	GND	-	-	-	
AJ18	MIPI_DSI1_CLK_P	MIPI_DSI1_CLK_P	-	NVCC_MIPI_CSI_DSI	
AJ19	MIPI_DSI1_CLK_N	MIPI_DSI1_CLK_N	-	NVCC_MIPI_CSI_DSI	
AJ20	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AJ21	CSI_MCLK	CSI_MCLK	ALT0: CSI_MCLK ALT1: MIPI_CSI0_I2C0_SDA ALT2: ALT3: SPI1_SDO ALT4: GPIO3_IO01	VDD_CSI	
AJ22	CSI_D07	CSI_D07	ALT0: CSI_D09 ALT1: ALT2: SAI3_RXD ALT3: TAMPER_IN2 ALT4:	VDD_CSI	
AJ23	CSI_D04	CSI_D04	ALT0: CSI_D06 ALT1: ALT2: SAI2_RXD ALT3: TAMPER_OUT4 ALT4:	VDD_CSI	
AJ24	CSI_D05	CSI_D05	ALT0: CSI_D07 ALT1: ALT2: SAI2_RXFS ALT3: TAMPER_IN0 ALT4:	VDD_CSI	
AJ25	CSI_D02	CSI_D02	ALT0: CSI_D04 ALT1: ALT2: SAI0_RXFS ALT3: TAMPER_OUT2 ALT4:	VDD_CSI	
AJ26	GND	-	-	-	
AJ27	SCU_BOOT_MODE3	SCU_BOOT_MODE3	-	VCC_SCU_1V8	
AJ28	SCU_BOOT_MODE2	SCU_BOOT_MODE2	-	VCC_SCU_1V8	
AK2	VSY52	-	-	VSY52	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AK3	VSYS2	-	-	VSYS2	
AK4	VSYS2	-	-	VSYS2	
AK5	GND	-	-	-	
AK6	GND	-	-	-	
AK7	GND	-	-	-	
AK8	GND	-	-	-	
AK9	GND	-	-	-	
AK10	GND	-	-	-	
AK11	GND	-	-	-	
AK12	GND	-	-	-	
AK13	GND	-	-	-	
AK14	GND	-	-	-	
AK15	MIPI_DSI1_DATA1_N	MIPI_DSI1_DATA1_N	-	NVCC_MIPI_CSI_DSI	
AK16	MIPI_DSI1_DATA1_P	MIPI_DSI1_DATA1_P	-	NVCC_MIPI_CSI_DSI	
AK17	GND	-	-	-	
AK18	MIPI_DSI1_DATA3_P	MIPI_DSI1_DATA3_P	-	NVCC_MIPI_CSI_DSI	
AK19	MIPI_DSI1_DATA3_N	MIPI_DSI1_DATA3_N	-	NVCC_MIPI_CSI_DSI	
AK20	GND	-	-	-	
AK21	MIPI_CSI0_DATA3_P	MIPI_CSI0_DATA3_P	-	NVCC_MIPI_CSI_DSI	
AK22	MIPI_CSI0_DATA3_N	MIPI_CSI0_DATA3_N	-	NVCC_MIPI_CSI_DSI	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AK23	GND	-	-	-	
AK24	MIPI_CSI0_I2C0_SDA	MIPI_CSI0_I2C0_SDA	ALT0: MIPI_CSI0_I2C0_SDA ALT1: MIPI_CSI0_GPIO0_IO03 ALT2: ALT3: ALT4: GPIO3_IO06	1V8	
AK25	MIPI_CSI0_I2C0_SCL	MIPI_CSI0_I2C0_SCL	ALT0: MIPI_CSI0_I2C0_SCL ALT1: MIPI_CSI0_GPIO0_IO02 ALT2: ALT3: ALT4: GPIO3_IO05	1V8	
AK26	CSI_RESET	CSI_RESET	ALT0: CSI_RESET ALT1: CSI_I2C_SDA ALT2: I2C3_SDA ALT3: SPI1_CS0 ALT4: GPIO3_IO03	VDD_CSI	
AK27	CSI_EN	CSI_EN	ALT0: CSI_EN ALT1: CSI_I2C_SCL ALT2: I2C3_SCL ALT3: SPI1_SDI ALT4: GPIO3_IO02	VDD_CSI	
AK28	CSI_HSYNC	CSI_HSYNC	ALT0: CSI_HSYNC ALT1: CSI_D00 ALT2: SAI3_RXFS ALT3: TAMPER_IN3 ALT4:	VDD_CSI	
AL2	3V3	-	-	3V3	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AL3	3V3	-	-	3V3	
AL4	GND	-	-	-	
AL5	GND	-	-	-	
AL6	VSYS	-	-	VSYS	
AL7	VSYS	-	-	VSYS	
AL8	VSYS	-	-	VSYS	
AL9	GND	-	-	-	
AL10	GND	-	-	-	
AL11	GND	-	-	-	
AL12	MIPI_CSIO_DATA1_P	MIPI_CSIO_DATA1_P	-	NVCC_MIPI_CSI_DSI	
AL13	MIPI_CSIO_DATA1_N	MIPI_CSIO_DATA1_N	-	NVCC_MIPI_CSI_DSI	
AL14	GND	-	-	-	
AL15	MIPI_CSIO_DATA0_P	MIPI_CSIO_DATA0_P	-	NVCC_MIPI_CSI_DSI	
AL16	MIPI_CSIO_DATA0_N	MIPI_CSIO_DATA0_N	-	NVCC_MIPI_CSI_DSI	
AL17	GND	-	-	-	
AL18	MIPI_CSIO_MCLK_OUT	MIPI_CSIO_MCLK_OUT	ALT0: MIPI_CSIO_MCLK_OUT ALT1: ALT2: ALT3: ALT4: GPIO3_IO04	1V8	
AL19	RESERVED	-	-	-	
AL20	RESERVED	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AL21	MCA_CLKOUT32K	-	ALT0: PTE0/CLKOUT32K ALT1: SPI1_MISO ALT2: LPUART1_TX ALT3: RTC_CLKOUT ALT4: CMP0_OUT ALT5: I2C1_SDA ALT6: I2C1_SCL ALT7:	VCC_MCA	
AL22	MCA_IO13	-	ALT0: PTD7 ALT1: SPI1_MISO ALT2: LPUART0_TX ALT3: I2C1_SCL ALT4: SPI1_MOSI ALT5: FXIO0_D7 ALT6:	VCC_MCA	
AL23	MCA_IO17	-	ALT0: PTD4/LLWU_P14 ALT1: SPI1_PCS0 ALT2: UART2_RX ALT3: TPM0_CH4 ALT4:	VCC_MCA	
AL24	MCA_IO16	-	ALT0: PTC4/LLWU_P8 ALT1: SPI0_PCS0 ALT2: LPUART1_TX ALT3: TPM0_CH3 ALT4: SPI1_PCS0 ALT5:	VCC_MCA	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AL25	MCA_IO15	-	ALT0: ALT1: PTC3 ALT2: SPI1_SCK ALT3: LPUART1_RX ALT4: TPM0_CH2 ALT5: CLKOUT ALT6: ALT7:	VCC_MCA	
AL26	MCA_IO14	-	ALT0: ADC0_SE11 ALT1: PTC2 ALT2: I2C1_SDA ALT3: ALT4: TPM0_CH1 ALT5: ALT6: ALT7:	VCC_MCA	
AM3	3V3	-	-	3V3	
AM4	3V3	-	-	3V3	
AM5	GND	-	-	-	
AM6	GND	-	-	-	
AM7	PMIC_PGOOD	-	-		
AM8	VCC_LICELL	-	-	VCC_LICELL	
AM9	PMIC_AMUX	-	-		
AM10	RESERVED	-	-	-	
AM11	RESERVED	-	-	-	
AM12	GND	-	-	-	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AM13	MIPI_CSI0_CLK_P	MIPI_CSI0_CLK_P	-	NVCC_MIPI_CSI_DSI	
AM14	MIPI_CSI0_CLK_N	MIPI_CSI0_CLK_N	-	NVCC_MIPI_CSI_DSI	
AM15	GND	-	-	-	
AM16	MIPI_CSI0_DATA2_P	MIPI_CSI0_DATA2_P	-	NVCC_MIPI_CSI_DSI	
AM17	MIPI_CSI0_DATA2_N	MIPI_CSI0_DATA2_N	-	NVCC_MIPI_CSI_DSI	
AM18	GND	-	-	-	
AM19	RESERVED	-	-	-	
AM20	GND	-	-	-	
AM21	VCC_MCA	-	-	VCC_MCA	
AM22	RESERVED	-	-	-	
AM23	MCA_IO18	-	ALT0: ADC0_SE7b ALT1: PTD6/LLWU_P15 ALT2: SPI1_MOSI ALT3: LPUART0_RX ALT4: I2C1_SDA ALT5: SPI1_MISO ALT6: FXIO0_D6 ALT7:	VCC_MCA	
AM24	MCA_VREF_OUT	-		VCC_MCA	

LGA pad name	ConnectCore 8X signal name	i.MX 8X pad name*	Multiplexing	Power Group	Comments
AM25	MCA_IO12	-	ALT0: ADC0_SE9 ALT1: PTB1 ALT2: I2C0_SDA ALT3: TPM1_CH1 ALT4: SPI1_MISO ALT5: SPI1_MOSI ALT6: ALT7:	VCC_MCA	
AM26	MCA_IO11	-	ALT0: ADC0_SE8 ALT1: PTB0/LLWU_P5 ALT2: I2C0_SCL ALT3: TPM1_CH0 ALT4: SPI1_MOSI ALT5: SPI1_MISO ALT6: ALT7:	VCC_MCA	



CAUTION! All WLAN_SD1 pads must remain unconnected unless you have a variant carrying a wireless MAC that uses an SDIO interface.

Module specifications

The following sections describe the specifications for the ConnectCore 8X System-on-module.

Power consumption98

Environmental specifications100

Power consumption

This section contains information about the power consumption of the ConnectCore 8X System-on-module. All measurements were performed on the ConnectCore 8X SBC platform running Digi Embedded Yocto.

All presented results were measured at ambient temperature (25°C).

Note These power consumption numbers should be considered guidelines only, never as fixed or absolute values. Actual values will depend entirely upon individual setup and system application.

Power consumption use cases

The power consumption of the ConnectCore 8X System-on-module was evaluated in the following use cases:

KS0 - Power off mode

Long-term power off state. In this mode, the power-on key can be asserted to start the device. Resumption is done via a full reboot.

You can enter this mode by issuing the following command:

```
~# poweroff
```

KS1 - Standby mode

Low power mode state that allows system restart without a full reboot. The logic state of the system is stored in RAM, which stays in self-refresh state. Resumption is done via a wake-up event, which causes the system to perform a warm boot.

You can enter this mode by issuing the following command:

```
~# standby
```

KS2 - System idle

System stays in Idle mode:

- Linux is alive but idle, waiting for an event. CPU is halted waiting for interrupt.
- Only one CPU core is enabled.
- The GPU is not working.
- Screens are off so no significant I/O to DDR is occurring.

KS3 - User Idle mode

Fully loaded and running OS, with an active display waiting for a command on the UI with the following conditions:

- Linux is operating.
- GPU and CPU complexes are powered but in IDLE state
- 10" display is on.

Complex power consumption use cases

The following use cases define real scenarios where CPU and GPU are stressed:

CoreMark & Dhrystone

CoreMark and Dhrystone are benchmark tools that measure the performance of central processing units (CPU) in embedded systems.

GLMARK2

Glmak2 is a benchmark tool that measures many aspects of OpenGL (ES) 2.0 performance.

Dual Video Play

The Dual Video Play benchmark tool measures the performance of the system when displaying video through both LVDS.

Results

ConnectCore 8X - 2GB RAM- 16GB eMMC

State	SOM consumption ¹ (mW)	Full SBC consumption ² (mW)	Benchmark result
KS0	1.1	16.5	-
KS1	35	40	-
KS2	1100	1850	-
KS3	2085	5750	-
CoreMark	1600	2600	13972.985561 iter/sec
GLMARK2	*	9000	743
Dual Video Play	*	12000	-

¹ Measured at R1 on the SBC (input of VSYS+VSYS2)

² Measured at the 5V input barrel connector. Note that the power consumption measurements on the SBC include all the interfaces available on this platform. It also includes the power consumption of the lvds displays, when used.

* Due to hardware requirements, this consumption cannot be obtained for the SOM alone.

Environmental specifications

- Operating temperature: -40 to 85 C.



CAUTION! Your final product may require additional thermal management such as passive (heatsink/spreader) or active (airflow) cooling to achieve the maximum operating temperature without exceeding the processor junction temp limit.

- The ConnectCore 8X module shall be built in an enclosure so the shield is not accessible to the end user.

Assembly instructions

Moisture sensitivity and shelf life	102
Mounting	102
Coplanarity	102
Solder paste print	102
Stencil	102
SMT pick and place	103
SMT process parameter reference	103
Reflow profile	103

Moisture sensitivity and shelf life

The ConnectCore 8X system-on-module module is classified as a Level 3 Moisture Sensitive Device in accordance with IPC/JEDEC J-STD-020.

1. Calculated shelf life in sealed packaging: 12 months at <40°C and <90% relative humidity (RH).
2. Environmental condition during production: 30°C / 60% RH according to IPC/JEDEC J-STD-033C paragraph 5.
3. After module is removed from sealed packaging, modules that will be subjected to reflow solder temperatures are required to be:
 - a. Mounted within 168 hours
 - b. Stored per J-STD-033
4. Baking is required, before mounting if:
 - a. the packaging humidity indicator indicates 10% RH or higher.
 - b. either 3a or 3b are not met
5. If baking is required, bake modules in trays for 4-6 hours at 125°C; maximum stacking height is 10 trays.

Mounting

The ConnectCore 8X system-on-module module has been designed with easy integration into existing SMT processes in mind. This section contains guidance for mounting the module on your carrier board.

Modules are not sealed and therefore they should not be subjected to a wash cycle or similar treatment where condensation could occur. Contact Digi International for guidance to discuss conformal coating approaches and options, if needed.

Coplanarity

The coplanarity measured is <0.003" bow and twist (98% confidence interval). It is important that the carrier board is also coplanar. It is recommended that the assembly be supported during the reflow process with a fixture to minimize the potential bow of the carrier card.

Solder paste print

The following solder paste type has been approved for mounting the module on a carrier board:

- SAC305 No-Clean solder paste (Lead-free: Alpha OM-340 Type 4 or equivalent)

The following solder paste printing parameters are recommended:

- Stencil thickness: 0.125 mm/5 mil
- Stencil diameter: One to one of pad diameter (to +20% of pad)
- Paste alignment: 20% off the pad max (offset <20% pad diameter)

Stencil

The recommendation is to use a laser cut and/or electro-formed stencil. Based on the actual coplanarity characteristics of your carrier board, adjustments may be required to determine the optimal solder paste volume.

SMT pick and place

- Placement nozzle: Largest available on the machine
- Nozzle pick surface: Center of shield
- Placement speed: Slowest speed for the machine
- Placement alignment: 10% of pad diameter (compensating for module weight and supporting alignment). The module should be placed last as part of the assembly/mounting process to eliminate unexpected shifting.

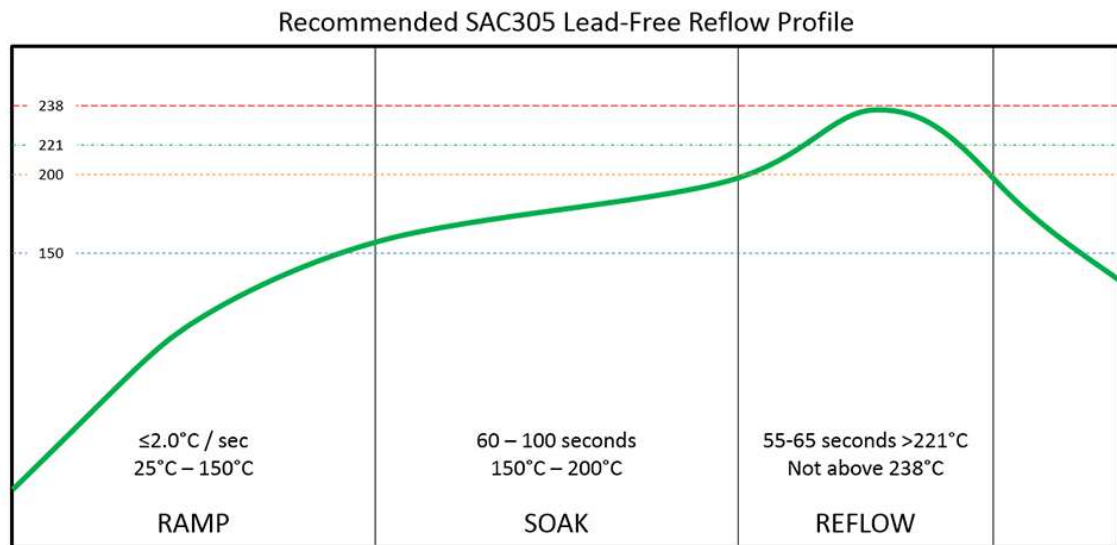
SMT process parameter reference

Process	SMT process	Specification recommendations
Screen print	Solder paste	SAC305 No-Clean (Alpha OM-340 or equivalent)
	Stencil thickness	0.15 mm / 5 mil
	Stencil diameter	1.47 mm / 58mil
	Paste alignment	20% maximum off center of the pad
PnP	Placement nozzle	Largest available on machine
	Nozzle pick surface	Shield center
	Speed	Slowest possible with PnP machine
	Placement sequence	Last, if possible
	Placement alignment	10% maximum off center of pad
Reflow	See the Reflow profile	

Reflow profile

Digi recommends the following:

- SoM temperature below 238°C during reflow cycle.
- Time Above Liquidus (TAL) between 55 and 65 seconds.
- Use of 40AWG K-type thermal couple and M.O.L.E. or equivalent thermal profiler.



Recommended reflow profile only - 10 heating zone convection reflow oven
Modifications to profile may be required to fit specific equipment, application, process or design

Digi recommends you use two (2) thermocouple locations to achieve proper attachment of SoM:

- Attach thermocouple to bottom of SoM located in the center of the cutout with the thermocouple touching the SoM.
- Drill hole through bottom of carrier PCB near corner of SoM deep enough to reach SoM.
- Insert thermocouple into hole touching SoM and secure.

Digi recommends X-ray analysis after reflow to confirm proper mounting and solder reflow.

The ConnectCore 8X system-on-module is approved to withstand a total of four (4) reflow cycles. Two (2) reflow cycles are required for manufacturing the module. Two (2) reflow cycles are remaining for mounting the module on the carrier board. Digi strongly recommends soldering the module during the last reflow cycles of the carrier board manufacturing process.

Regulatory information and certifications

Note The ConnectCore 8X module complies with Part 15 of the United States FCC rules and regulations. Other certifications are currently pending.

United States FCC	106
Europe	110
Canada (IC)	112
Japan	113

United States FCC

The ConnectCore 8X module complies with Part 15 of the FCC rules and regulations. Compliance with the labeling requirements, FCC notices and antenna usage guidelines is required. To fulfill FCC Certification, the OEM must comply with the following regulations:

The system integrator must ensure that the text on top side of the module is placed on the outside of the final product.

ConnectCore 8X module may only be used with antennas approved (see [Approved antennas](#)).

Labeling requirements



WARNING! The Original Equipment Manufacturer (OEM) must ensure that FCC labeling requirements are met. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown below. Required FCC Label for OEM products containing the ConnectCore 8X module.

Contains FCC ID: 2ACG6-CCIMX8

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Maximum power and frequency specifications (FCC)

RF band	Peak antenna gain	Technology	Frequencies
2.4 GHz	2.5 dBi	BT + EDR	[BW 1 MHz] x 79 non-overlapping channels, # (center freq. MHz): * [2400 - 2483.5 MHz]: 0 (2402) to 78 (2480)
		Bluetooth LE	[BW 2 MHz] x 40 non-overlapping channels, # (center freq. MHz): * [2400 - 2483.5 MHz]: 0 (2402) to 39 (2480)

RF band	Peak antenna gain	Technology	Frequencies
2.4 GHz	4.6 dBi	WLAN	[BW 20 MHz] x 11 overlapping channels, # (center freq. MHz): * [2400 - 2473 MHz]: 1 (2412), 2 (2417), 3 (2422), 4 (2427), 5 (2432), 6 (2437), 7 (2442), 8 (2447), 9 (2452), 10 (2457), 11 (2462)
			[BW 40 MHz] x 7 overlapping channels, # (center freq. MHz): * [2400 - 2473 MHz]: 3 (2422), 4 (2427), 5 (2432), 6 (2437), 7 (2442), 8 (2447), 9 (2452)
			[BW 20 MHz] x 24 non-overlapping channels, # (center freq. MHz): * [5150 - 5250 MHz]: 36 (5180), 40 (5200), 44 (5220), 48 (5240) * [5250 - 5350 MHz]: 52 (5260), 56 (5280), 60 (5300), 64 (5320) * [5470 - 5725 MHz]: 100 (5500), 104 (5520), 108 (5540), 112 (5560), 116 (5580), 120 (5600), 124 (5620), 128 (5640), 132 (5660), 136 (5680), 140 (5700) * [5725 - 5850 MHz]: 149 (5745), 153 (5765), 157 (5785), 161 (5805), 165 (5825)
			[BW 40 MHz] x 11 non-overlapping channels, # (center freq. MHz): * [5150 - 5250 MHz]: 38 (5190), 46 (5230) * [5250 - 5350 MHz]: 54 (5270), 62 (5310) * [5470 - 5725 MHz]: 102 (5510), 110 (5550), 118 (5590), 126 (5630), 134 (5670) * [5725 - 5850 MHz]: 151 (5755), 159 (5795)
			[BW 80 MHz] x 5 non-overlapping channels, # (center freq. MHz): * [5150 - 5250 MHz]: 42 (5210) * [5250 - 5350 MHz]: 58 (5290) * [5470 - 5725 MHz]: 106 (5530), 122 (5610) * [5725 - 5850 MHz]: 155 (5775)

Note A table containing transmit power values will be added in a subsequent revision of this manual.

FCC notices

IMPORTANT: The ConnectCore 8X module has been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Modifications not expressly approved by Digi could void the user's authority to operate the equipment.

IMPORTANT: OEMs must test final product to comply with unintentional radiators (FCC section 15.107 & 15.109) before declaring compliance of their final product to Part 15 of the FCC Rules.

IMPORTANT: The ConnectCore 8X module has been certified for remote and base radio applications. If the module will be used for portable applications, the device must undergo SAR testing. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Re-orient or relocate the receiving antenna, Increase the separation between the equipment and receiver, Connect equipment and receiver to outlets on different circuits, or Consult the dealer or an experienced radio/TV technician for help.

IMPORTANT: This module has been tested and found to comply with the following requirements for Modular Approval.

Part 15.247 - Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

Part 15.407 - General technical requirements.

FCC-approved antennas

The ConnectCore 8X can be installed utilizing antennas and cables constructed with non-standard connectors (RPSMA, RPTNC, and so on).

The modules are FCC approved for fixed base station and mobile applications for the channels indicated in the tables below. If the antenna is mounted at least 20 cm (8 in) from nearby persons, the application is considered a mobile application. Antennas not listed in the table must be tested to comply with FCC Section 15.203 (Unique Antenna Connectors) and Section 15.247 (Emissions).

The following table shows the antenna that was used to certify the ConnectCore 8X wireless module. This antenna can be replaced by others, however further certification testing is required. The number of tests to be carried out can be decreased by using an antenna of the same type, i.e. dualband omnidirectional dipole, showing lower peak gain. In such case, only a spot check may be required by the certification laboratories to keep current certifications valid according to FCC regulations. If replacing by an antenna with higher gain, complete radiated tests according to FCC regulations are required by the certification laboratories.

Antenna used to certify the ConnectCore 8X wireless module

Antenna type	Supplier	Antenna part no.	Freq. (MHz)	Peak antenna gain (dBi)	Directional gain (dBi)
PCB	YAGEO	ANTX100P001B24553	2402~2480	4.6	7.61
			5150~5250	4.9	7.91
			5250~5350	3.9	6.91
			5470~5725	5.1	8.11
			5725~5850	5.1	8.11
PCB	TAOGLAS	FXP830.07.0100C	2402~2480	3.32	6.33
			5150~5250	6.11	9.12
			5250~5350	6.11	9.12
			5470~5725	6.11	9.12
			5725~5850	6.11	9.12
Dipole	TAOGLAS	GW.48.A151	2402~2480	3.42	6.43
			5150~5250	4.56	7.57
			5250~5350	4.56	7.57
			5470~5725	4.56	7.57
			5725~5850	4.56	7.57

Antenna type	Supplier	Antenna part no.	Freq. (MHz)	Peak antenna gain (dBi)	Directional gain (dBi)
PCB	TAOGLAS	FXP522.A.07.A.001	2402~2480	3.78 (Port 1) 3.15 (Port 2)	6.79
			5150~5250	4.63 (Port 1) 4.61 (Port 2)	7.64
			5250~5350	4.63 (Port 1) 4.61 (Port 2)	7.64
			5470~5725	4.63 (Port 1) 4.61 (Port 2)	7.64
			5725~5850	4.63 (Port 1) 4.61 (Port 2)	7.64
Dipole	Linx	ANT-DB1-RAF-RPS	2402~2480	2.5	5.51
			5150~5250	4.6	7.61
			5250~5350	4.6	7.61
			5470~5725	4.6	7.61
			5725~5850	4.6	7.61
PCB	Ethertronic	1001932	2402~2480	2.5	5.51
			5150~5250	5	8.01
			5250~5350	5	8.01
			5470~5725	5	8.01
			5725~5850	5	8.01
PCB	TAOGLAS	FXP831.07.0100C	2402~2480	3	6.01
			5150~5250	5.5	8.51
			5250~5350	5.5	8.51
			5470~5725	5.5	8.51
			5725~5850	5.5	8.51

Note If using the RF module in a portable application (for example - if the module is used in a hand-held device and the antenna is less than 20 cm (8 in) from the human body when the device is in operation): The integrator is responsible for passing additional SAR (Specific Absorption Rate) testing based on FCC rules 2.1091 and FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, OET Bulletin and Supplement C. The testing results will be submitted to the FCC for approval prior to selling the integrated unit. The required SAR testing measures emissions from the module and how they affect the person.