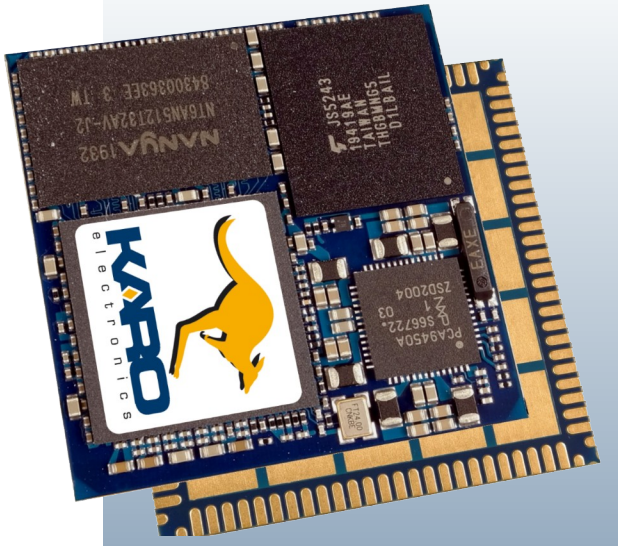
QSXM

KARO electronics

QFN Style Solder-Down System-on-Module

- QSX – extended 2nd generation QS module series
- QS pin-compatible
- Solder-down version
- 29mm square
- 2.6mm total height
- QFN type lead style
  - 1mm pitch
  - 108 pads
  - Thermal pad
- Visual solder joint inspection possible after soldering
- Single-sided assembly
- 3.3V-5V power supply (-5%/+10%)



Key Features

- NXP i.MX 8M Mini — Quad Cortex-A53 up to 1.6 GHz, Cortex-M4 up to 400 MHz
- RAM — 2 GB LPDDR4
- ROM — 4 GB eMMC
- Grade — Industrial
- Temperature — -25°C to 85°C
- Display support
  - MIPI DSI (4-lane)
  - GC328 2D GPU
  - GCNanoUltra 3D GPU
  - 1080p60 video de-/encode
- Connectivity
  - 2x USB 2.0
  - 1x Gb Ethernet, RGMII
  - 1x eMMC/SD
  - 1x PCIe® Gen 2, 1-lane
  - 4x UART, 3x I²C, 2x SPI, 4x PWM, SAI
  - Up to 60x 3.3V General Purpose I/O
  - MIPI-CSI (4-lane)

QS XM

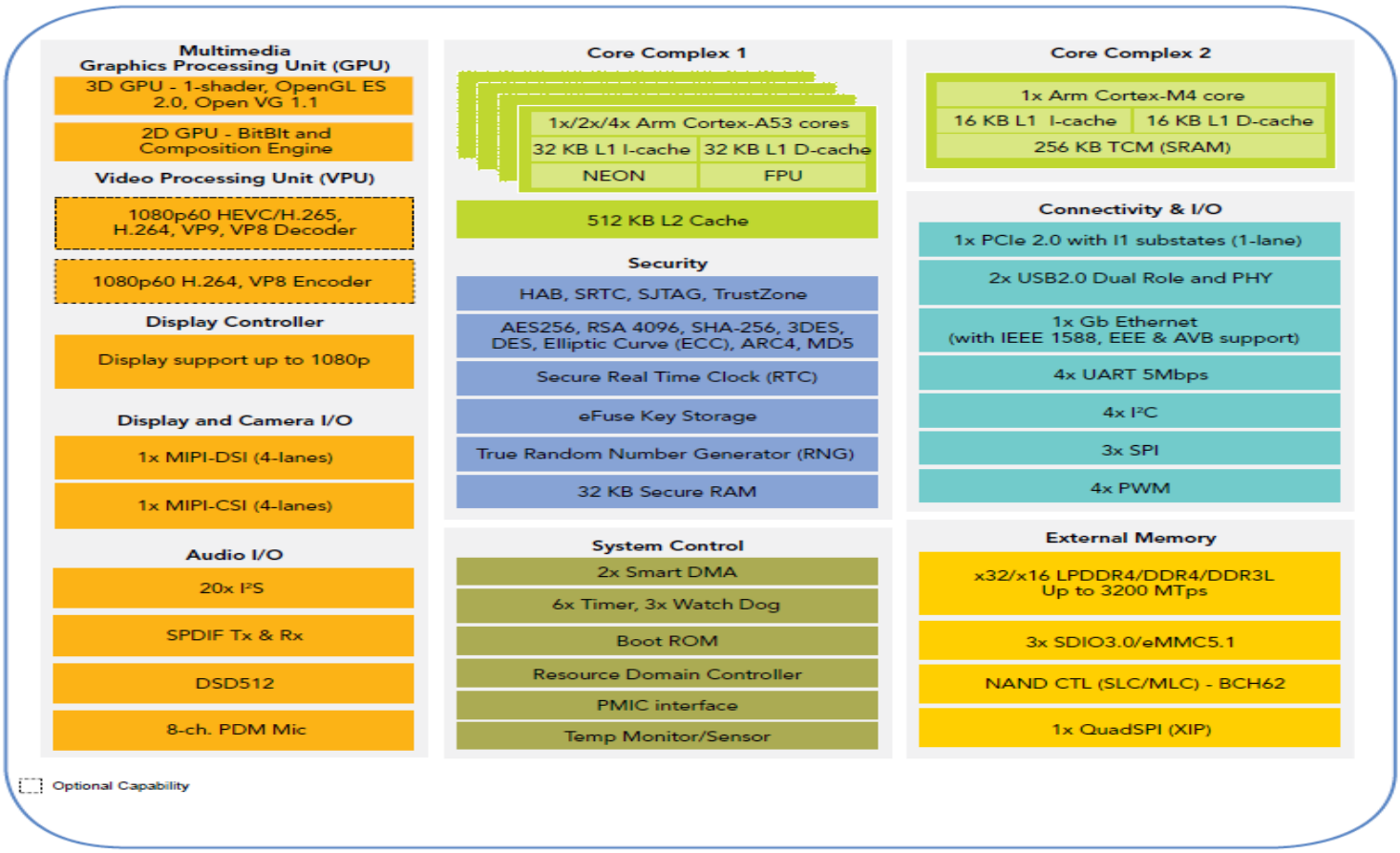
i.MX8M Mini

OS Support

- Linux
- Windows 10 IoT

NXP

i.MX 8M MINI FAMILY BLOCK DIAGRAM



QS8M – QSXM – QSXP – Differentiated Features and Ordering Information

	QS8M - i.MX 8M Mini	**QSXM** - i.MX 8M Mini	**QSXP** - i.MX 8M Plus
Primary Arm® Core	4x Cortex®-A53 1.6 GHz		
Secondary Arm® Core	Cortex-M4 400 MHz		Cortex-M7 800 MHz
RAM	1 GB DDR3L x16	2 GB LPDDR4 x32	
ROM	4 GB eMMC		8 GB eMMC
3D GPU	GCNanoUltra (1 shader, OpenGL ES 2.0)		GC7000UL (2 shaders, OpenGL ES 2.0/3.0/3.1 OpenCL 1.2, Vulkan)
2D GPU	GC520L		
AI/ML/DSP	-		NN Accel 2.3 TOPS Hi-Fi4 DSP 800 MHz
Video De-/Encode	1080p60 H.264		1080p60 H.264, H.265
Connectivity	2x USB 2.0	2x USB 2.0, PCIe	USB 2.0, USB 3.0, PCIe
QS Size	100 pins 27mm square	108 pins 29mm square	
Grade / Temperature	Industrial -25°C to 85°C		Industrial -30°C to 85°C
Ordering Information	QS8M/MQ/1GS/4GF/E85	QSXM/MM6C/2GS/4GF/E85	QSXP/ML8/2GS/4GF/E85

2021-03-17

DIRECTinsight
directinsight.co.uk

Direct Insight Ltd., The Hayloft, Greatworth Hall,
Greatworth, Oxfordshire, OX17 2DH, UK
Phone: +44 1295 768800 Email: support@directinsight.co.uk

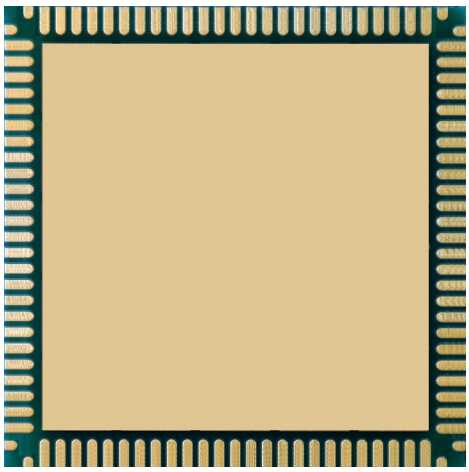
QFN Style Computer On Module Advantages

Defined Return Path

The reason PCB layout becomes more and more important is because of the trend to faster, higher integrated, smaller formfactors, and lower power electronic circuits. The higher the switching frequencies are, the more radiation may occur on a PCB. With good layout, many EMI problems can be minimized to meet the required specifications.

When a module or component is used in a design, the supplier specifies the basis for such a layout. It's not only the pinout which should lead to an easy wiring without the need for crossings. He also has to provide a proper solution for the signal path back to the module. If this return path, mostly the ground plane, cannot be connected near the signal pin, the return current has to take another way and this may result in a loop area. The larger the area, the more radiation and EMI problems may occur.

Ka-Ro QSCOM modules uses a large ground pad on the bottom side. With this a defined ground plane connection is available for all signals. In addition to have a good return path for all signals this large ground pad can be used for cooling.



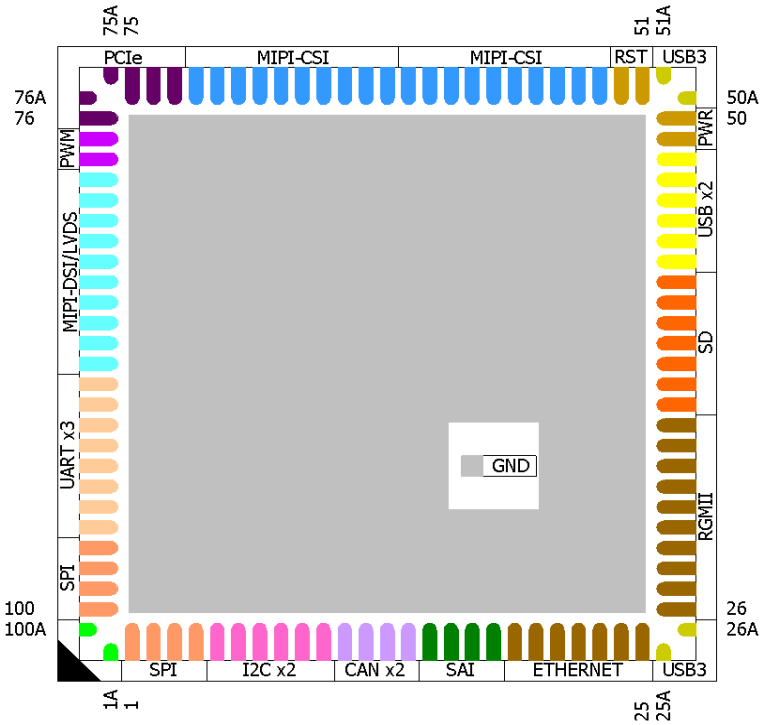
Easy Wiring - Even 2-layer printed circuit boards can be used.

With a solid ground plane on the bottom layer, high speed signals can be routed on the top layer at a defined impedance. However, this is only possible if a peripheral or plug can be connected directly without crossing other routes.

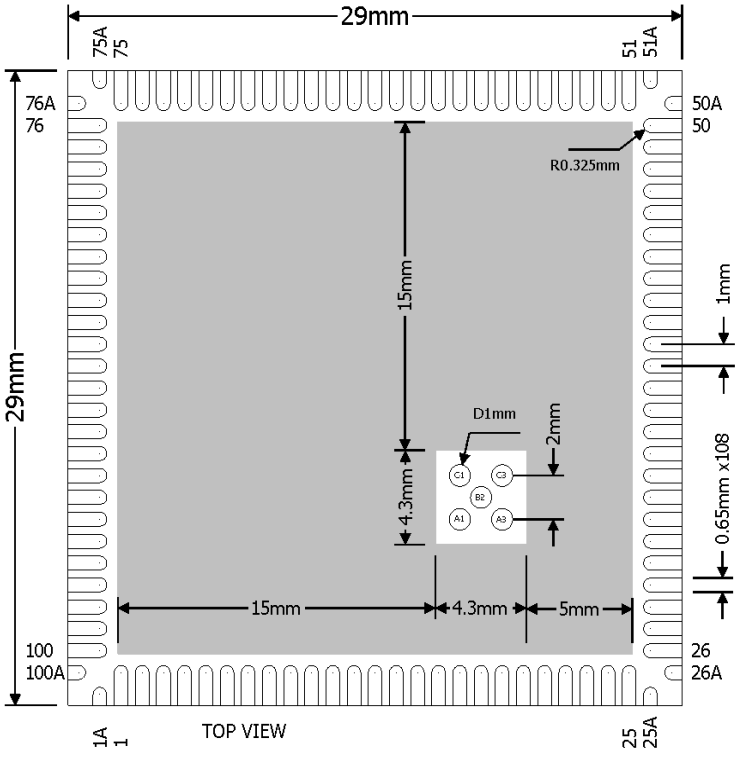
Advanced Soldering

Using a large solder pad underneath the component has not only electrical and thermal advantages. It is also used to hold the component at a defined height during soldering, without the solder being compressed by the weight of the components, which could result in short circuits.

Standard Contact Assignments



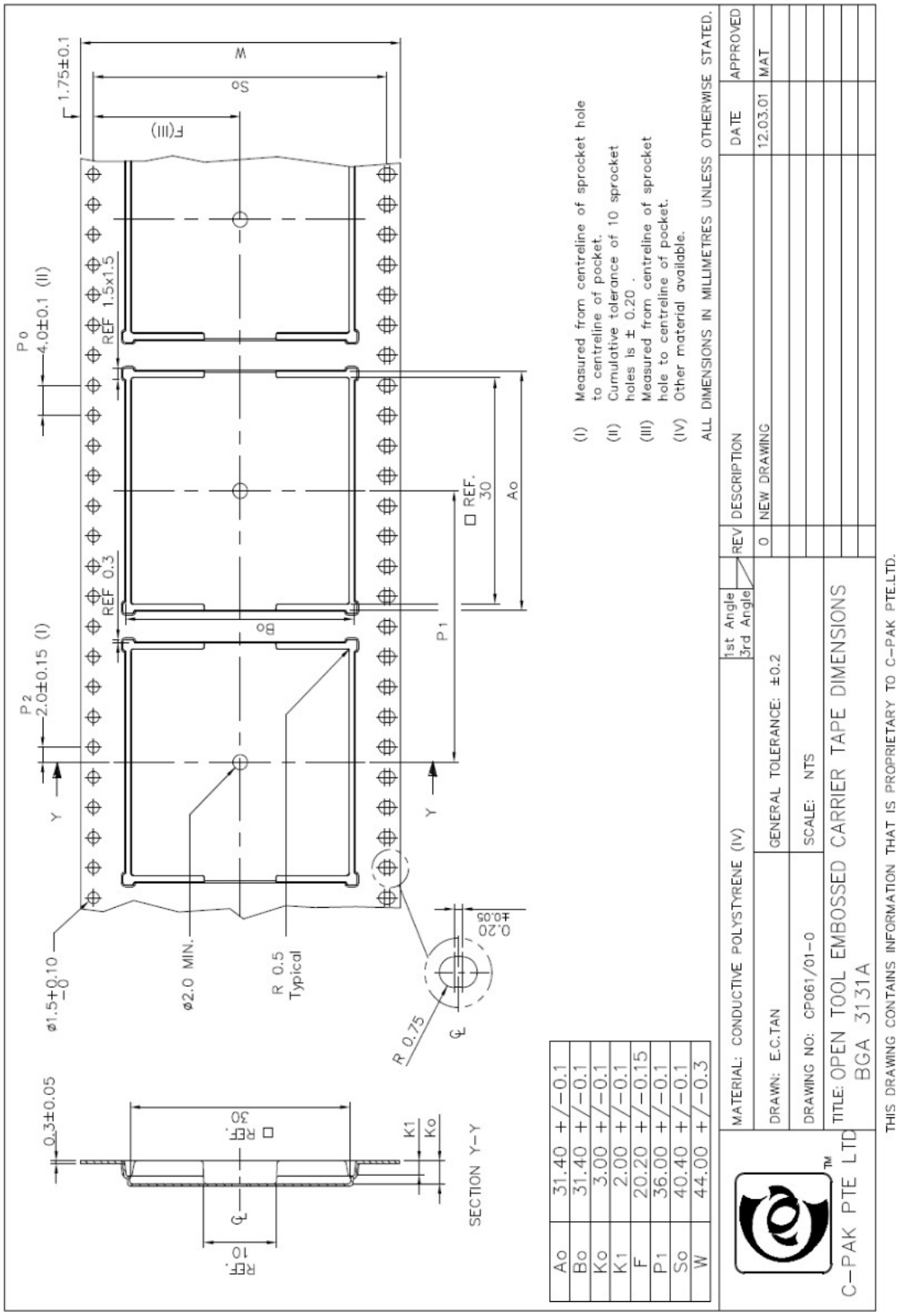
Package Information



DIRECTinsight
directinsight.co.uk

Direct Insight Ltd., The Hayloft, Greatworth Hall,
Greatworth, Oxfordshire, OX17 2DH, UK
Phone: +44 1295 768800 Email: support@directinsight.co.uk

Packaging


W
So
F(III)
1.75±0.1
Po
4.0±0.1 (II)
REF 1.5x1.5
P2
2.0±0.15 (I)
REF 0.3
Bo
Ao
P1
□ REF. 30
Y
ø1.5+0.10 -0
ø2.0 MIN.
R 0.5 Typical
R 0.75
ø0.20 +0.05
0.3±0.05
□ REF. 30
REF. 10
K1
Ko
SECTION Y-Y
(I) Measured from centreline of sprocket hole to centreline of pocket.
(II) Cumulative tolerance of 10 sprocket holes is ± 0.20 .
(III) Measured from centreline of sprocket hole to centreline of pocket.
(IV) Other material available.
ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.
REV DESCRIPTION DATE APPROVED
0 NEW DRAWING 12.03.01 MAT
1st Angle 3rd Angle
MATERIAL: CONDUCTIVE POLYSTYRENE (IV)
DRAWN: E.C.TAN
GENERAL TOLERANCE: ±0.2
DRAWING NO: CP061/01-0
SCALE: NTS
TITLE: OPEN TOOL EMBOSSED CARRIER TAPE DIMENSIONS BGA 3131A
C-PAK PTE LTD
THIS DRAWING CONTAINS INFORMATION THAT IS PROPRIETARY TO C-PAK PTE.LTD.
Ao 31.40 +/-0.1
Bo 31.40 +/-0.1
Ko 3.00 +/-0.1
K1 2.00 +/-0.1
F 20.20 +/-0.15
P1 36.00 +/-0.1
So 40.40 +/-0.1
W 44.00 +/-0.3

Pinout

PIN	QSCOM STANDARD	i.MX8MM Pad Name	Alternate functions	GPIO	Description (refer to i.MX8MM manuals for details)
1st SPI					
1	SPIA_NSS	ECSPI2_SS0	UART4_RTS_B	GPIO5[13]	
2	SPIA_MISO	ECSPI2_MISO	UART4_CTS_B	GPIO5[12]	
3	SPIA_MOSI	ECSPI2_MOSI	UART4_TX	GPIO5[11]	
4	SPIA_SCK	ECSPI2_SCLK	UART4_RX	GPIO5[10]	
I2C					
5	I2CA_SCL	I2C2_SCL	ENET1_1588_EVENT1_IN USDHC3_CD_B	GPIO5[16]	
6	I2CA_SDA	I2C2_SDA	ENET1_1588_EVENT1_OUT USDHC3_WP	GPIO5[17]	
7	INTA	I2C4_SCL	PWM2_OUT PCIE1_CLKREQ_B	GPIO5[20]	
8	I2CA_SCL	I2C3_SCL	PWM4_OUT GPT2_CLK	GPIO5[18]	
9	I2CA_SDA	I2C3_SDA	PWM3_OUT GPT3_CLK	GPIO5[19]	
10	INTA	I2C4_SDA	PWM1_OUT	GPIO5[21]	
SPDIF					
11	CANA_RX	SPDIF_TX	SPDIF1_OUT PWM3_OUT	GPIO5[03]	
12	CANA_TX	SPDIF_RX	SPDIF1_IN PWM2_OUT	GPIO5[04]	
13	CANA_RX	SPDIF_EXT_CLK	PWM1_OUT	GPIO5[05]	
14	CANA_TX	SAI2_MCLK	SAI5_MCLK	GPIO4[27]	
SAI					
15	SAI_TX	SAI2_TXD0	SAI2_TX_DATA0 SAI5_TX_DATA3	GPIO4[26]	
16	SAI_RX	SAI2_RXD0	SAI2_RX_DATA0 SAI5_TX_DATA0 UART1_RTS_B	GPIO4[23]	
17	SAI_SCK	SAI2_TXC	SAI2_TX_BCLK SAI5_TX_DATA2	GPIO4[25]	
18	SAI_FS	SAI2_TXFS	SAI2_TX_SYNC SAI5_TX_DATA1 SAI2_TX_DATA1 UART1_CTS_B	GPIO4[24]	
ETHERNET					
19	ENET_RST	SAI2_RXC	SAI2_RX_BCLK SAI5_TX_BCLK UART1_RX	GPIO4[22]	
20	ENET_CK125	GPIO1_IO00	CCM_ENET_PHY_REF_CLK_ROOT XTALOSC_REF_CLK_32K CCM_EXT_CLK1	GPIO1[00]	
21	ENET_INT	GPIO1_IO10	USB1_OTG_ID	GPIO1[10]	
22	ENET_MDIO	ENET_MDIO	ENET1_MDIO IOMUXC_ENET1_MDIO_	GPIO1[17]	
23	ENET_MDC	ENET_MDC	ENET1_MDC	GPIO1[16]	
24	ENET_RXC	ENET_RXC	ENET1_RGMII_RXC ENET1_RX_ER	GPIO1[25]	For RMII—ENET_RXC works as RMII.RX_ERR For RGMII—ENET_RXC works as RGMII.RX_CLK
25	ENET_RX_CTL	ENET_RX_CTL	ENET1_RGMII_RX_CTL	GPIO1[24]	RMII.RX_EN (CRS_DV); RGMII.RC_CTL
26	ENET_RXD0	ENET_RD0	ENET1_RGMII_RD0	GPIO1[26]	RMII and RGMII.RD0
27	ENET_RXD1	ENET_RD1	ENET1_RGMII_RD1	GPIO1[27]	RMII and RGMII.RD1
28	ENET_RXD2	ENET_RD2	ENET1_RGMII_RD2	GPIO1[28]	Only used for RGMII
29	ENET_RXD3	ENET_RD3	ENET1_RGMII_RD3	GPIO1[29]	Only used for RGMII
30	ENET_TX_CTL	ENET_TX_CTL	ENET1_RGMII_TX_CTL	GPIO1[22]	RMII.TX_EN; RGMII.TX_CTL
31	ENET_TXC	ENET_TXC	ENET1_RGMII_TXC ENET1_TX_ER	GPIO1[23]	For RMII—ENET_TXC works as RMII.TX_ERR For RGMII—ENET_TXC works as RGMII.TX_CLK
32	ENET_TXD3	ENET_TD3	ENET1_RGMII_TD3	GPIO1[18]	Only used for RGMII

PIN	QSCOM STANDARD	i.MX8MM Pad Name	Alternate functions	GPIO	Description (refer to i.MX8MM manuals for details)
33	ENET_TXD2	ENET_TD2	ENET1_RGMII_TD2 INPUT=ENET1_TX_CLK OUTPUT=CCM_ENET_REF_CLK_ROOT	GPIO1[19]	Used as RMII clock and RGMII data, there are two RGMII clock schemes. • MAC generate output 50M reference clock for PHY, and MAC also use this 50M clock. • MAC use external 50M clock.
34	ENET_TXD1	ENET_TD1	ENET1_RGMII_TD1	GPIO1[20]	RMII and RGMII.TD1
35	ENET_TXD0	ENET_TD0	ENET1_RGMII_TD0	GPIO1[21]	RMII and RGMII.TD0
SD					
36	SD_CD	SD2_CD_B	USDHC2_CD_B	GPIO2[12]	
37	SD_D1	SD2_DATA1	USDHC2_DATA1	GPIO2[16]	
38	SD_D0	SD2_DATA0	USDHC2_DATA0	GPIO2[15]	
39	SD_CLK	SD2_CLK	USDHC2_CLK	GPIO2[13]	
40	SD_CMD	SD2_CMD	USDHC2_CMD	GPIO2[14]	
41	SD_D3	SD2_DATA3	USDHC2_DATA3	GPIO2[18]	
42	SD_D2	SD2_DATA2	USDHC2_DATA2	GPIO2[17]	
USB					
43	USBH_VBUS	USB2_VBUS			
44	USBH_DN	USB2_DN			
45	USBH_DP	USB2_DP			
46	USBOTG_VBUS	USB1_VBUS			
47	USBOTG_DN	USB1_DN			
48	USBOTG_DP	USB1_DP			
POWER SUPPLY & RESET					
49 50	VIN				3.3V Module power supply input.
51	#POR		POR_B	10K-PU to 1V8	Power On Reset — 1.8V active low input / open drain output signal. Also connected to PMIC RESETO. Leave unconnected, if not used.
52	BOOT_MODE				Boot mode select L: Boot from eMMC / H: Boot from UART/USB
MIPI-CSI					
53	CSI_D3P_A	MIPI_CSI_DATA3_P			
54	CSI_D3N_A	MIPI_CSI_DATA3_N			
55	CSI_D2P_A	MIPI_CSI_DATA2_P			
56	CSI_D2N_A	MIPI_CSI_DATA2_N			
57	CSI_D1P_A	MIPI_CSI_DATA1_P			
58	CSI_D1N_A	MIPI_CSI_DATA1_N			
59	CSI_D0P_A	MIPI_CSI_DATA0_P			
60	CSI_D0N_A	MIPI_CSI_DATA0_N			
61	CSI_CLKP_A	MIPI_CSI_CLK_P			
62	CSI_CLKN_A	MIPI_CSI_CLK_N			

PIN	QSCOM STANDARD	i.MX8MM Pad Name	Alternate functions	GPIO	Description (refer to i.MX8MM manuals for details)
GPIO					
63		GPIO1_IO02	WDOG1_WDOG_B WDOG1_WDOG_ANY SJC_DE_B	GPIO1[02]	PMIC Watchdog – connected to PMIC WDOG_B
64		GPIO1_IO04	USDHC2_VSELECT SDMA1_EXT_EVENT1	GPIO1[04]	
65		GPIO1_IO05	M4_NMI CCM_PMIC_READY	GPIO1[05]	
66		GPIO1_IO06	ENET1_MDC USDHC1_CD_B CCM_EXT_CLK3	GPIO1[06]	
67		GPIO1_IO07	ENET1_MDIO USDHC1_WP CCM_EXT_CLK4	GPIO1[07]	
68		GPIO1_IO08	ENET1_1588_EVENT0_IN USDHC2_RESET_B	GPIO1[08]	
69		GPIO1_IO09	ENET1_1588_EVENT0_OUT USDHC3_RESET_B SDMA2_EXT_EVENT0	GPIO1[09]	
70		GPIO1_IO11	USB2_OTG_ID USDHC3_VSELECT CCM_PMIC_READY	GPIO1[11]	
71		GPIO1_IO12	USB1_OTG_PWR SDMA2_EXT_EVENT1	GPIO1[12]	
72		GPIO1_IO13	USB1_OTG_OC PWM2_OUT	GPIO1[13]	
73		GPIO1_IO14	USB2_OTG_PWR USDHC3_CD_B PWM3_OUT CCM_CLKO1	GPIO1[14]	
74		PCIE_CLK_P			
75		PCIE_CLK_N			
76		SD2_WP	USDHC2_WP	GPIO2[20]	
Display Control					
77	**DISP_EN**	SAI2_RXFS	SAI2_RX_SYNC SAI5_TX_SYNC SAI5_TX_DATA1 SAI2_RX_DATA1 UART1_TX	GPIO4[21]	
78	**DISP_BL**	GPIO1_IO01	**PWM1_OUT** XTALOSC_REF_CLK_24M CCM_EXT_CLK2	GPIO1[01]	
MIPI-DSI					
79	DSI_D3P	MIPI_DSI_DATA3_P			
80	DSI_D3N	MIPI_DSI_DATA3_N			
81	DSI_D2P	MIPI_DSI_DATA2_P			
82	DSI_D2N	MIPI_DSI_DATA2_N			
83	DSI_D1P	MIPI_DSI_DATA1_P			
84	DSI_D1N	MIPI_DSI_DATA1_N			
85	DSI_D0P	MIPI_DSI_DATA0_P			
86	DSI_D0N	MIPI_DSI_DATA0_N			
87	DSI_CLKP	MIPI_DSI_CLK_P			
88	DSI_CLKN	MIPI_DSI_CLK_N			
UART					

PIN	QSCOM STANDARD	i.MX8MM Pad Name	Alternate functions	GPIO	Description (refer to i.MX8MM manuals for details)
89	UARTA_RXD	**UART1_RXD**	UART1_RX ECSPI3_SCLK		
90	UARTA_TXD	**UART1_TXD**	UART1_TX ECSPI3_MOSI		
91	UARTB_RXD	**UART3_RXD**	UART3_RX UART1_CTS_B USDHC3_RESET_B		
92	UARTB_TXD	**UART3_TXD**	UART3_TX UART1_RTS_B USDHC3_VSELECT		
93	UARTC_RXD	**UART2_RXD**	UART2_RX ECSPI3_MISO	GPIO5[24]	
94	UARTC_TXD	**UART2_TXD**	UART2_TX ECSPI3_SS0	GPIO5[25]	
95	UARTC_RTS	UART4_TXD	UART4_TX **UART2_RTS_B**	GPIO5[29]	NXP: Request to Send **input** signal
96	UARTC_CTS	UART4_RXD	UART4_RX **UART2_CTS_B** PCIE1_CLKREQ_B	GPIO5[28]	NXP: Clear to Send **output** signal
2nd SPI					
97	SPIB_NSS	ECSPI1_SS0	UART3_RTS_B	GPIO5[09]	
98	SPIB_MISO	ECSPI1_MISO	UART3_CTS_B	GPIO5[08]	
99	SPIB_MOSI	ECSPI1_MOSI	UART3_TX	GPIO5[07]	
100	SPIB_SCK	ECSPI1_SCLK	UART3_RX	GPIO5[06]	
USB3					
25A	not connected				
26A	not connected				
50A	not connected				
51A	not connected				
PCIe					
75A		PCIE_TXN_P			
76A		PCIE_TXN_M			
100A		PCIE_RXN_P			
1A		PCIE_RXN_M			

Pins used for manufacturing and debugging – leave unconnected

PIN		PIN		PIN	
C1	JTAG_TDI			C3	JTAG_TCK
		B2	JTAG_TDO		
A1	JTAG_BSCAN			A3	JTAG_TMS