TX28

System On Module

- Processor — Freescale i.MX287, 454 MHz
- RAM — 128MB DDR2-400 SDRAM
- ROM — 128MB NAND Flash
- RTC — DS1339 Real Time Clock
- Power supply — Single 3.1V to 5.5V
- Size — 26mm SO-DIMM
- Temp.-Range — -40°C..85°C

454 MHz ARM9

Key Features

- Two 10/100Mbps Ethernet ports with IEEE1588 support
- Two High-Speed USB 2.0 ports
- True colour LCD controller
- Two CAN interfaces
- 4/5 wire Touchscreen interface
- Several peripheral interfaces:
  UART, SD-CARD, I2C, PWM, Serial Audio, SPI
- Power management optimized for long battery life
- 3.3V I/O

OS Support

- Windows Embedded CE
- Linux

Development System

- Starter-Kit V

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Board highlights:

- Lowest cost 454MHz ARM9
- Industrial temperature range
- Standard TX-DIMM pinout
- as small as possible - only 26mm

The TX28 is a member of a module series, specially designed for Freescales i.MX multimedia processors. TX modules are complete computers, implemented on a board smaller than a credit card, and ready to be designed into your embedded system. TX modules includes a Freescale® i.MX processor, SDRAM and Flash memory. The integrated LCD-controller enables direct connection of an LCD screen. The TX28 is specifically targeted at embedded applications where size, high cpu-performance and cost are critical factors.

System on module

- Freescale® i.MX28, 454 MHz
- 128 MByte DDR2-400 SDRAM (16bit)
- 128 MByte NAND Flash memory
- DIMM200-module (67,6mm x 26 mm x 3,6mm)
- Operating temperature range -40..85°C

i.MX28 for Industrial Applications
The i.MX28 family of multimedia applications processors is the latest extension of Freescales ARM9 product portfolio. The i.MX28 family integrates display, power management, and connectivity features unmatched in ARM9-based devices, reducing system cost and complexity for cost sensitive applications. And easy-to-use tools and software help you design differentiated industrial and consumer products in less time.

With optimized performance and power consumption, the i.MX28 is an ideal fit for fanless systems or for portable equipment that need to be battery operated. Numerous connectivity options including dual 10/100 Ethernet (IEEE® 1588 capable) with L2 switch address specific needs for industrial applications. Additionally, the LCD controller with touch screen capability makes it possible to design creative and intuitive user interfaces that are required by many applications.

The i.MX28 family of multimedia applications processors integrates display, power management, CAN, USB, and Ethernet connectivity. The combination of advanced connectivity peripherals with a 454Mhz ARM9 processor core creates a platform for gateway products that bridge multiple networks. With attention to overall system cost, i.MX28 integrates physical USB interfaces (PHY), 10/100 Ethernet , power management, and a resistive touch screen display controller.

Standard TX-DIMM pinout:

- 4-wire UARTs (x3)
- LCD
- I2C / PWM
- Serial Audio Interfaces (x2)
- 4-wire SD-Card/SDIO

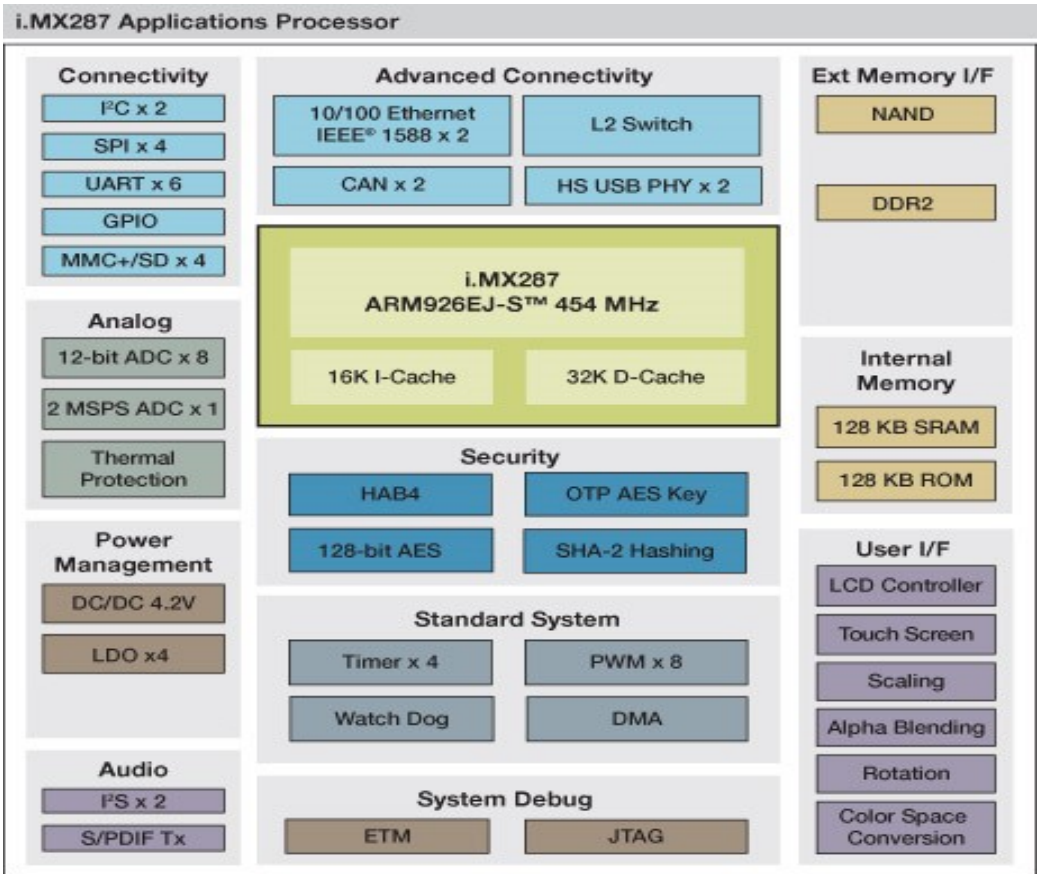
High-Speed communication interfaces incl. onboard Ethernet PHY / on-chip USB PHY allows direct use of connectors/magnetics on the baseboard without the need for additional logic:

- 10/100 Mbps Ethernet
- 480 Mbps USB OTG
- 480 Mbps USB Host

Additional interfaces like CAN, 4/5-wire resistive touch-screen, 2 UARTs and external memory interface are available on TX28 specific pins. Some interfaces are multiplexed with other functions.

Power Supply
The TX28 accepts an input voltage from various sources:

- 1-cell Li-Ion/Polymer (3.1V to 4.2V)
- 5.0V USB supply or AC wall adapter
- 3.3V



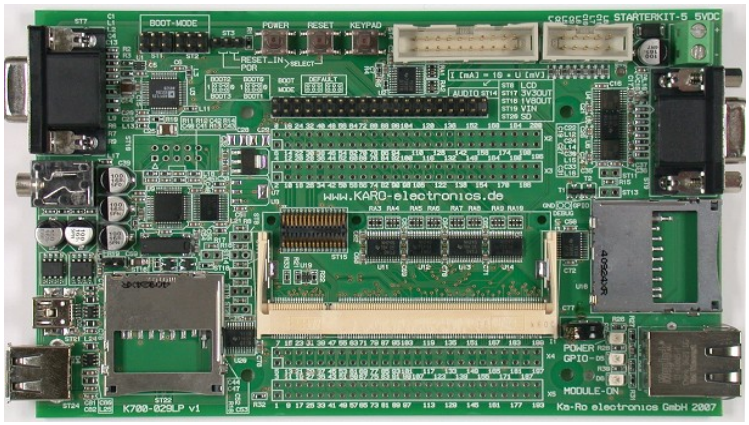
Ordering Information

Order Number	CPU	SDRAM	Flash	Temp.
TX28/454/128S/128F/I	454MHz i.MX287	128MB	128MB	-40°C..85°C

2011-01-20

STARTER-KIT V

The Starter-Kit V is a ready-to-use development system for building applications based on the TX embedded processor boards.



- DIMM200 TX socket
- Two SD-card sockets
- USB 2.0 OTG and USB 2.0 Host connector
- D-SUB 15 VGA connector
- 40pin LCD flat cable header
- 3.5mm headphone connector
- JTAG interface
- SGTL5000 audio codec
- TSC2007 touchscreen controller
- RS232 on 10pin flat cable and SUB-D header
- All pins of the TX socket are connected to daughter board slot for easy application design-in
- 10/100 Mbit/s Ethernet
- 5VDC Power Supply by USB-OTG or power jack.
-
- 100mm x 160mm
- Schematics of the base board are included for reference.

DISPLAY OPTION

The optional display comes with an FFC cable and a small adapter PCB which can be plugged directly onto the Starter-Kit 40pin LCD header.

- 5,7 inch TFT display
- 640 x 480 dots
- White LED backlight
- Touchsceen

PINOUT			Marked yellow: Not connected			
PIN	**Type**	**Function**	**i.MX28 Pad Name**	**Alternate functions**	**GPIO**	**Description (refer to i.MX28 manuals for details)**
POWER SUPPLY & RESET						
1-4	power	VIN				Module power supply input (3.0V-5.5V)
5-7, 9-12	power	VOUT				3.3V power supply output (up to 0.2A)
8	3V3	BOOTMODE				Boot mode select H: Boot from NAND / L: Boot from UART/USB
13	power	VBACKUP	-			DS1339 RTC backup power supply. Supply voltage must be held between 1.3V and 3.7V for proper RTC operation. This pin can be connected to a primary cell such as a lithium button cell. Additionally, this pin can be connected to a rechargeable cell or a super cap when used with the trickle charge feature.
14	special		PSWITCH			Used for chip power on or recovery. PSWITCH is at MID LEVEL & STARTUP by default. A 10kΩ resistor to VDDXTAL is applied onboard and a 10kΩ resistor in series is used. => i.MX28 Reference manual chap 11.4 "PSWITCH Pin Functions"
15	3V3	FEC_RESET_B	ENET0_RX_CLK	ENET0_RX_ER ENET0_1588_EVENT2_IN	GPIO4_13	Ethernet PHY reset – active low output signal. This pin is hard wired to the onboard Ethernet PHY and provides a fixed function.
16	VIN	#POR				Power On Reset - active low input signal. Typically a push button reset. Leave unconnected if not used. The i.MX28 is a PMU and an SoC, power-on reset is generated internally. If low the power supply connected to the i.MX28 is turned off.
17	3V3	#RESETIN	RESETN			This pin resets the chip if it is low. This pin is pulled up to VDDIO33 with an internal resistor. No external pull up resistors are needed
18	GND	GND				
Ethernet						
19	analog	ETN_TXN				Transmit Data Negative: 100Base-TX or 10Base-T differential transmit output to magnetics.
20	3V3	#ETN_LED2				Active low - output is driven active when the operating speed is 100Mbps. This LED will go inactive when the operating speed is 10Mbps or during line isolation.
21	analog	ETN_TXP				Transmit Data Positive: 100Base-TX or 10Base-T differential transmit output to magnetics.
22	power	ETN_3V3				+3.3V analog power supply output to magnetics
23	analog	ETN_RXN				Receive Data Negative: 100Base-TX or 10Base-T differential receive input from magnetics.
24	3V3	#ETN_LED1				Active low - output is driven active whenever the device detects a valid link, and blinks indicating activity.
25	analog	ETN_RXP				Receive Data Positive: 100Base-TX or 10Base-T differential receive input from magnetics.
26	GND	GND				
USB-HOST						
27	3V3	USBH_VBUSEN	SPDIF	ENET1_RX_ER	**GPIO3_27**	Active high external 5V supply enable. This pin is used to enable the external VBUS power supply.
28	3V3	#USBH_OC	JTAG_RTCK		**GPIO4_20**	Active low over-current indicator input connected to a GPIO.
29	analog	USBH_DM	**USB1DM**			D- pin of the USB cable
30	NC					not connected
31	analog	USBH_DP	**USB1DP**			D+ pin of the USB cable
32	GND	GND				
USB-OTG / 2nd CAN						
33	3V3	USBOTG_ID	**USB0ID**	PWM2 USB1_OVERCURRENT	GPIO3_18	ID pin of the USB cable. For an A-Device ID is grounded. For a B-Device ID is floated.
34	3V3	USBOTG_VBUSEN	GPMI_CE2N	CAN1_TX ENET0_RX_ER	**GPIO0_18**	Active high external 5V supply enable. This pin is used to enable the external VBUS power supply.
35	analog	USBOTG_DM	**USB0DM**			D- pin of the USB cable
36	3V3	#USBOTG_OC	GPMI_CE3N	CAN1_RX SAIF1_MCLK	**GPIO0_19**	Active low over-current indicator input connected to a GPIO. 10kΩ pull-up resistor.
37	analog	USBOTG_DP	**USB0DP**			D+ pin of the USB cable
38	power	USBOTG_VBUS	**VDD5V**			
39	GND	GND				
I2C						
40	3V3	I2C_DATA	**I2C0_SDA**	TIMROT_ROTARYB DUART_TX	GPIO3_25	I2C Data
41	3V3	I2C_CLK	**I2C0_SCL**	TIMROT_ROTARYA DUART_RX	GPIO3_24	I2C Clock

PIN	Type	Function	i.MX28 Pad Name	Alternate functions	GPIO	Description (refer to i.MX28 manuals for details)
PWM						
42	3V3	PWM	**PWM0**	I2C1_SCL DUART_RX	GPIO3_16	PWM Output
1-WIRE						
43	3V3	OWDAT	SSP0_DATA7	SSP2_SCK	**GPIO2_7**	The i.MX28 has no 1-Wire controller – a GPIO is used here instead. 1-Wire bus. Requires an external pull-up resistor. The recommended resistor is specified by the generic 1-Wire device used in a given system.
CSPI – Configurable Serial Peripheral Interface						
44	3V3	CSPI_SS	AUART2_RX	SSP3_D1 **SSP3_D4**	GPIO3_8	SSP3 SPI Mode SSn1 Slave Select (Selectable polarity) signal
45	3V3	CSPI_SS	AUART2_TX	SSP3_D2 **SSP3_D5**	GPIO3_9	SSP3 SPI Mode SSn2 Slave Select (Selectable polarity) signal
46	3V3	CSPI_MOSI	**SSP3_MOSI**	AUART4_RX ENET1_1588_EVENT0_IN	GPIO2_25	Master Out/Slave In signal
47	3V3	CSPI_MISO	**SSP3_MISO**	AUART4_RTS ENET1_1588_EVENT1_O	GPIO2_26	Master In/Slave Out signal
48	3V3	CSPI_SCLK	**SSP3_SCK**	AUART4_TX ENET1_1588_EVENT0_O	GPIO2_24	Serial Clock signal
49	3V3		**SSP3_SS0**	AUART4_CTS ENET1_1588_EVENT1_IN	GPIO2_27	
50	GND	GND				
SD – Secure Digital Interface 1						
51	3V3	SD1_CD	**SSP0_DETECT**		GPIO2_9	SD Card Detect – connected to a GPIO
52	3V3	SD1_D[0]	**SSP0_DATA0**		GPIO2_0	SD Data bidirectional signals—If the system designer does not want to make use of the internal pull-up, via the Pull-up enable register, a 50 K–69 K external pull up resistor must be added.
53	3V3	SD1_D[1]	**SSP0_DATA1**		GPIO2_1	
54	3V3	SD1_D[2]	**SSP0_DATA2**		GPIO2_2	
55	3V3	SD1_D[3]	**SSP0_DATA3**		GPIO2_3	
56	3V3	SD1_CMD	**SSP0_CMD**		GPIO2_8	SD Command bidirectional signal
57	3V3	SD1_CLK	**SSP0_SCK**		GPIO2_10	SD Output Clock.
58	GND	GND				
1st UART						
59	3V3	TXD	AUART0_RTS	AUART4_TX **DUART_TX**	GPIO3_3	Debug UART Transmit Data output signal
60	3V3	RXD	AUART0_CTS	AUART4_RX **DUART_RX**	GPIO3_2	Debug UART Receive Data input signal
61	3V3	RTS	AUART0_TX	I2C0_SDA **DUART_RTS**	GPIO3_1	Debug UART Request to Send input signal
62	3V3	CTS	AUART0_RX	I2C0_SCL **DUART_CTS**	GPIO3_0	Debug UART Clear to Send output signal
2nd UART						
63	3V3	TXD	**AUART1_TX**	SSP3_CARD_DETECT PWM_1	GPIO3_5	Application UART 1 Transmit Data output signal
64	3V3	RXD	**AUART1_RX**	SSP2_CARD_DETECT PWM_0	GPIO3_4	Application UART 1 Receive Data input signal
65	3V3	RTS	**AUART1_RTS**	USB0_ID TIMROT_ROTARYB	GPIO3_7	Application UART 1 Request to Send input signal
66	3V3	CTS	**AUART1_CTS**	USB0_OVERCURRENTTIM ROT_ROTARYA	GPIO3_6	Application UART 1 Clear to Send output signal
3rd UART						
67	3V3	TXD	**AUART3_TX**	CAN0_RX ENET0_1588_EVENT0_IN	GPIO3_13	Application UART 3 Transmit Data output signal
68	3V3	RXD	**AUART3_RX**	CAN0_TX ENET0_1588_EVENT0_O	GPIO3_12	Application UART 3 Receive Data input signal
69	3V3	RTS	**AUART3_RTS**	CAN1_RX ENET0_1588_EVENT1_IN	GPIO3_15	Application UART 3 Request to Send input signal
70	3V3	CTS	**AUART3_CTS**	CAN1_TX ENET0_1588_EVENT1_O	GPIO3_14	Application UART 3 Clear to Send output signal
71	GND	GND				

PIN	Type	Function	i.MX28 Pad Name	Alternate functions	GPIO	Description (refer to i.MX28 manuals for details)
KEYPAD / 1st CAN						
72	3V3	KP_COL[0]				I2C-bus I/O port / PCA9554 - IO0
73	3V3	KP_COL[1]	-			I2C-bus I/O port / PCA9554 - IO1
74	3V3	KP_COL[2]	-			I2C-bus I/O port / PCA9554 - IO2
75	3V3	KP_COL[3]	-			I2C-bus I/O port / PCA9554 - IO3
76	3V3	TXCAN	GPMI_RDY2	**CAN0_TX** ENET0_TX_ER	GPIO0_22	
77	3V3	KP_ROW[0]	-			I2C-bus I/O port / PCA9554 - IO4
78	3V3	KP_ROW[1]	-			I2C-bus I/O port / PCA9554 - IO5
79	3V3	KP_ROW[2]	-			I2C-bus I/O port / PCA9554 - IO6
80	3V3	KP_ROW[3]	-			I2C-bus I/O port / PCA9554 - IO7
81	3V3	RXCAN	GPMI_RDY3	**CAN0_RX** HSADC_TRIGGER	GPIO0_23	
82	GND	GND				
SSI 1 - Serial Audio Port 1 (Configurable to I2S Protocol and AC97)						
83	3V3	SSI1_INT	SAIF0_MCLK	PWM_3 AUART4_CTS	**GPIO3_20**	GPIO
84	3V3	SSI1_RXD	SAIF1_SDATA0	PWM_7 **SAIF0_SDATA1**	GPIO3_26	Serial Audio Interface 0 serial data line 1
85	3V3	SSI1_TXD	**SAIF0_SDATA0**	PWM_6 AUART4_TX	GPIO3_23	Serial Audio Interface 0 serial data line 0
86	3V3	SSI1_CLK	**SAIF0_BITCLK**	PWM_5 AUART4_RX	GPIO3_22	Serial Audio Interface 0 serial bit clock
87	3V3	SSI1_FS	**SAIF0_LRCLK**	PWM_4 AUART4_RTS	GPIO3_21	Serial Audio Interface 0 left/right clock
88	GND	GND				
SSI 2 - Serial Audio Port 2 (Configurable to I2S Protocol and AC97)						
89	3V3	SSI2_INT	LCD_DOTCLK	SAIF1_MCLK ETM_TCLK	**GPIO1_30**	GPIO
90	3V3	SSI2_RXD	LCD_HSYNC	**SAIF1_SDATA1** ETM_TCTL	GPIO1_29	Serial Audio Interface 1 serial data line 1
91	3V3	SSI2_TXD	LCD_VSYNC	**SAIF1_SDATA0**	GPIO1_28	Serial Audio Interface 1 serial data line 0
92	3V3	SSI2_CLK	AUART2_CTS	I2C1_SCL **SAIF1_BITCLK**	GPIO3_10	Serial Audio Interface 1 serial bit clock
93	3V3	SSI2_FS	AUART2_RTS	I2C1_SDA **SAIF1_LRCLK**	GPIO3_11	Serial Audio Interface 1 left/right clock
94	GND	GND				
Secure Digital Interface 2						
95	NC					not connected
96	NC					not connected
97	NC					not connected
98	NC					not connected
99	NC					not connected
100	NC					not connected
101	3V3		ENET_CLK			Fixed function clock output to Ethernet PHY
102	GND	GND				

PIN	Type	Function	i.MX28 Pad Name	Alternate functions	GPIO	Description (refer to i.MX28 manuals for details)
Synchronous Serial Port 2 instead of the standard CMOS Sensor Interface						
103	3V3		SSP0_DATA4	**SSP2_D0**	GPIO2_4	
104	3V3		SSP1_SCK	**SSP2_D1** ENET0_1588_EVENT2_O	GPIO2_12	
105	3V3		SSP1_CMD	**SSP2_D2** ENET0_1588_EVENT2_IN	GPIO2_13	
106	3V3		**SSP2_SS0**	AUART3_TX SAIF1_SDATA2	GPIO2_19	
107	3V3		**SSP2_SS1**	SSP2_D1 USB1_OVERCURRENT	GPIO2_20	
108	3V3		**SSP2_SS2**	SSP2_D2 USB0_OVERCURRENT	GPIO2_21	
109	3V3		SSP1_DATA0	**SSP2_D6** ENET0_1588_EVENT3_O	GPIO2_14	
110	3V3		SSP1_DATA3	**SSP2_D7** ENET0_1588_EVENT3_IN	GPIO2_15	
111	GND	GND				
112	3V3		**SSP2_MISO**	AUART3_RX SAIF1_SDATA1	GPIO2_18	
113	3V3		**SSP2_MOSI**	AUART2_TX SAIF0_SDATA2	GPIO2_17	
114	3V3		**SSP2_SCK**	AUART2_RX SAIF0_SDATA1	GPIO2_16	
115	3V3		**PWM1**	I2C1_SDA DUART_TX	GPIO3_17	
116	GND	GND				
LCD Controller and Smart LCD Controller						
117	3V3	LD0	**LCD_D00**	ETM_DA0	GPIO1_0	LCD Data Bus
118	3V3	LD1	**LCD_D01**	ETM_DA1	GPIO1_1	LCD Data Bus
119	3V3	LD2	**LCD_D02**	ETM_DA2	GPIO1_2	LCD Data Bus
120	3V3	LD3	**LCD_D03**	ETM_DA3 ETM_DA8	GPIO1_3	LCD Data Bus
121	3V3	LD4	**LCD_D04**	ETM_DA4 ETM_DA9	GPIO1_4	LCD Data Bus
122	3V3	LD5	**LCD_D05**	ETM_DA5	GPIO1_5	LCD Data Bus
123	3V3	LD6	**LCD_D06**	ETM_DA6	GPIO1_6	LCD Data Bus
124	3V3	LD7	**LCD_D07**	ETM_DA7	GPIO1_7	LCD Data Bus
125	3V3	LD8	**LCD_D08**	ETM_DA8 ETM_DA3	GPIO1_8	LCD Data Bus
126	3V3	LD9	**LCD_D09**	ETM_DA9 ETM_DA4	GPIO1_9	LCD Data Bus
127	3V3	LD10	**LCD_D10**	ETM_DA10	GPIO1_10	LCD Data Bus
128	3V3	LD11	**LCD_D11**	ETM_DA11	GPIO1_11	LCD Data Bus
129	GND	GND				
130	3V3	LD12	**LCD_D12**	ETM_DA12	GPIO1_12	LCD Data Bus
131	3V3	LD13	**LCD_D13**	ETM_DA13	GPIO1_13	LCD Data Bus
132	3V3	LD14	**LCD_D14**	ETM_DA14	GPIO1_14	LCD Data Bus
133	3V3	LD15	**LCD_D15**	ETM_DA15	GPIO1_15	LCD Data Bus
134	3V3	LD16	**LCD_D16**	ETM_DA7	GPIO1_16	LCD Data Bus
135	3V3	LD17	**LCD_D17**	ETM_DA6	GPIO1_17	LCD Data Bus
136	3V3	LD18	**LCD_D18**	ETM_DA5	GPIO1_18	LCD Data Bus
137	3V3	LD19	**LCD_D19**	ETM_DA4	GPIO1_19	LCD Data Bus
138	3V3	LD20	**LCD_D20**	ENET1_1588_EVENT2_O ETM_DA3	GPIO1_20	LCD Data Bus
139	3V3	LD21	**LCD_D21**	ENET1_1588_EVENT2_IN ETM_DA2	GPIO1_21	LCD Data Bus

PIN	Type	Function	i.MX28 Pad Name	Alternate functions	GPIO	Description (refer to i.MX28 manuals for details)
140	3V3	LD22	**LCD_D22**	ENET1_1588_EVENT3_O ETM_DA1	GPIO1_22	LCD Data Bus
141	3V3	LD23	**LCD_D23**	ENET1_1588_EVENT3_IN ETM_DA0	GPIO1_23	LCD Data Bus
142	GND	GND				
143	3V3	HSYNC	LCD_WR_RWN	**LCD_HSYNC** ETM_TCLK	GPIO1_25	
144	3V3	VSYNC	LCD_RD_E	**LCD_VSYNC** ETM_TCTL	GPIO1_24	
145	3V3	OE_ACD	LCD_CS	**LCD_ENABLE**	GPIO1_27	
146	3V3	LSCLK	LCD_RS	**LCD_DOTCLK**	GPIO1_26	
147	GND	GND				
Module Specific Signals						
148	3V3	GPIO	SSP0_DATA5	SSP2_D3	**GPIO2_5**	
149	3V3	GPIO	SSP0_DATA6	SSP2_CMD	**GPIO2_6**	
150	3V3	GPIO	LCD_RESET	LCD_VSYNC	**GPIO3_30**	
151	3V3	GPIO	LCD_ENABLE		**GPIO1_31**	
152	3V3	GPIO	ENET0_RXD2	ENET1_RXD0 ENET0_1588_EVENT0_O	**GPIO4_9**	
153	3V3	GPIO	ENET0_RXD3	ENET1_RXD1 ENET0_1588_EVENT0_IN	**GPIO4_10**	
154	3V3	GPIO	ENET0_TXD2	ENET1_TXD0 ENET0_1588_EVENT1_O	**GPIO4_11**	
155	3V3	GPIO	ENET0_TXD3	ENET1_TXD1 ENET0_1588_EVENT1_IN	**GPIO4_12**	
156	3V3	GPIO	ENET0_COL	ENET1_TX_EN ENET0_1588_EVENT3_O	**GPIO4_14**	
157	3V3	GPIO	ENET0_CRS	ENET1_RX_EN ENET0_1588_EVENT3_IN	**GPIO4_15**	
158	3V3	GPIO	GPMI_CE1N	SSP3_D3	**GPIO0_17**	
159	3V3	GPIO	GPMI_RDY1	SSP1_CMD	**GPIO0_21**	
160	GND	GND				
161	3V3	D[0]	**GPMI_D00**			Fixed function used for NAND flash
162	3V3	D[1]	**GPMI_D01**			Fixed function used for NAND flash
163	3V3	D[2]	**GPMI_D02**			Fixed function used for NAND flash
164	3V3	D[3]	**GPMI_D03**			Fixed function used for NAND flash
165	3V3	D[4]	**GPMI_D04**			Fixed function used for NAND flash
166	3V3	D[5]	**GPMI_D05**			Fixed function used for NAND flash
167	3V3	D[6]	**GPMI_D06**			Fixed function used for NAND flash
168	3V3	D[7]	**GPMI_D07**			Fixed function used for NAND flash
169	NC					not connected
170	NC					not connected
171	GND	GND				
172	NC					not connected
173	NC					not connected
174	NC					not connected
175	NC					not connected
176	NC					not connected
177	NC					not connected

PIN	Type	Function	i.MX28 Pad Name	Alternate functions	GPIO	Description (refer to i.MX28 manuals for details)
178	NC					not connected
179	3V3		**GPMI_CLE**			Fixed function GPMI_CLE used for NAND flash
180	3V3		**GPMI_ALE**			Fixed function GPMI_ALE used for NAND flash
181	3V3		**GPMI_WRN**			Fixed function GPMI_WRN used for NAND flash
182	3V3		**GPMI_RDN**			Fixed function GPMI_RDN used for NAND flash
183	GND	GND				
184	NC					not connected
185	analog	XN	**LRADC4**			Touscreen ADC input channels
186	analog	XP	**LRADC2**			
187	analog	YN	**LRADC5**			
188	analog	YP	**LRADC3**			
189	analog	WIPER	**LRADC6**			
190	analog		**LRADC0**			General purpose measurements channels
191	analog		**LRADC1**			
192	analog		**HSADC0**			
193	NC					not connected
194	NC					not connected
195	NC					not connected
196	NC					not connected
198	3V3		**ENET0_TX_CLK**		GPIO4_5	Fixed function input used for Ethernet PHY Interrupt
198	3V3		**ENET_MDC**			Fixed function ENET_MDC used for Ethernet PHY
199	3V3		**ENET0_MDIO**			Fixed function ENET0_MDIO used for Ethernet PHY
200	GND	GND	GND			