

TX37

KARO
e l e c t r o n i c s

System On Module

- Processor Freescale i.MX37, 532 MHz
- RAM 128MB mobile DDR-SDRAM
- ROM 128MB NAND Flash
- RTC DS1339 Real Time Clock
- Power supply Single 3.0V to 5.5V
- Size 26mm SO-DIMM
- Temp.-Range -20°C..70°C

Key Features

- 10/100Mbps Ethernet
- High Speed USB 2.0 OTG
- True color LCD controller, 24bpp
- Multimedia:
 - PAL/NTSC TV-Out
 - Multi Standard HW Video Decoder
 - H.264 HP, MP, BP
 - VC-1 SP, MP, AP
 - MPEG4 SP, ASP, DivX
 - MPEG2 MP @ ML
 - Image Processing Unit
 - Display Processor
 - CSC, video/graphics combining
- Vector Floating Point Unit

OS Support

- Windows Embedded CE
- RedBoot Bootloader

Development System

- Starter-Kit V

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532 MHz
ARM11

 **freescale**[™]
semiconductor

Board highlights:

- standard TX-DIMM pinout
- low power consumption
- as small as possible - only 26mm

The TX37 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, and the standard PCMCIA interface permits simple extension and integration into a target system. The TX37 is specifically targeted at embedded multimedia applications where size, high cpu-performance and low power consumption are critical factors.

i.MX37

- ARM1176JZF-S Processor (with TrustZone)
- 16 KB L1 Instruction Cache
- 16 KB L1 Data Cache
- 128 KB L2 cache
- Vector Floating Point Unit (VFP11)
- Maximum frequency of the core (including VFP11), L1 and L2 caches is:
 - 532 MHz at 1.0V nominal
 - 400 MHz at 0.9V nominal
 - 600 MHz and above at 1.0V nominal
- VPUv3D – Video Processing Unit
- IPUv3D – Image Processing Unit, version 3D

Standard TX-DIMM interface

Universal 1.8V Interfaces:

- 4-wire UART (x2)
- up to 24-bit LCD Interface
- I2C
- SSI/AC97/I2S
- 4-wire SDIO (x2)
- Keypad 3x4

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

- 10/100 Mbps Ethernet
- High Speed USB 2.0 OTG

Power Supply

The TX37 accepts an input voltage from various sources:

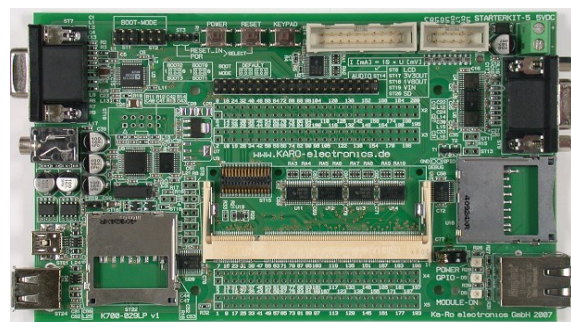
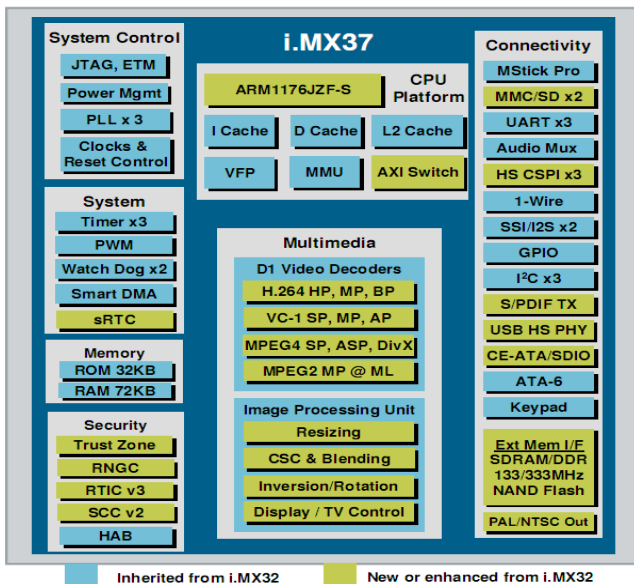
- 1-cell Li-Ion/Polymer (3.0V to 4.2V)
- 5.0V USB supply or AC wall adapter
- 3.3V

Up to 1A output current 1.8V and 3.3V power supply outputs of the TX37 can also be used on the baseboard.

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
- UCB1400 audio codec & 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
- Operating Voltage: 5VDC
- Power Supply by USB-OTG or screw header.
- 100mm x 160mm
- Schematics of the base board are included for reference.



Ordering Information

Order Number	i.MX37	SDRAM	Flash	Temp.
TX37/532/128S/128F	532MHz	128MB	128MB	-20°C..70°C

PINOUT

PIN	Type	TX-STANDARD	i.MX37 Pad Name	i.MX37 Alternate	GPIO	Description
POWER SUPPLY & RESET						
1-4	power	VIN	-			Module power supply input (3.0V-5.5V)
5-8	power	1V8_OUT	-			1.8V buck regulator output, up to 1A
9-12	power	3V3_OUT	-			3.3V buck regulator output, up to 1A
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	2.8V to 5.5V	PMIC_PWR_ON	-		PB24 47K-PD	This is an active high push button input which can be used to signal PWR_ON and PWR_OFF events to the CPU by controlling the PMIC ext_wakup signal and select contents of PMIC register 8H'88. Connected to a GPIO.
15	1V8	#RESET_OUT	#RESET_OUT			Reset Output - active low output: can be caused by all reset source: power on reset, system reset (RESET_IN), and watchdog reset.
16	2V8	#PMIC_RESET_IN	-		~14K-PU	Power On Reset—Active low input signal. Typically a push button reset or driven by an open collector output. This signal is also driven low by BATT_FLT. Please refer to the PMIC datasheet for details. Leave unconnected, if not used.
17	1V8	#RESET_IN	#RESET_IN			Master Reset—External active low Schmitt trigger input signal. When this signal goes active, all modules (except the reset module, SDRAMC module, and the clock control module) are reset.

Ethernet

19	analog	ETN_TXN	-			Transmit Data Negative: 100Base-TX or 10Base-T differential transmit output to magnetics.
20	3V3	#ETN_LINKLED	-			Active low LINK ON indication: Active indicates that the link is on.
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_RXP	-			Receive Data Positive: 100Base-TX or 10Base-T differential receive input from magnetics.
24	3V3	#ETN_ACTLED	-			Active low ACTIVITY indication: Active indicates that there is Carrier sense (CRS) from the active PMD.
25	analog	ETN_RXN	-			Receive Data Negative: 100Base-TX or 10Base-T differential receive input from magnetics.
26	GND	GND	-			

USB-HOST

27	NC	USBH_VBUSEN				not connected
28	NC	#USBH_OC				not connected
29	NC	USBH_DM				not connected
30	NC	USBH_VBUS				not connected
31	NC	USBH_DP				not connected
32	GND	GND				

USB-OTG

33	analog	USBOTG_ID	USBOTG_ID			ID pin of the USB cable. For an A-Device ID is grounded. For a B-Device ID is floated.
34	3V3	USBOTG_VBUSEN	GPIO2_11	EMI_NANDF_CS3 PATA_CS_1 ESDHC3_CMD CSPI3_MOSI I2C2_SDA FEC_TDATA[0] SJC_DONE	GPIO2_11	Active high external 5V supply enable. This pin is used to enable the external VBUS power supply.
35	analog	USBOTG_DM	USBOTG_DM			D- pin of the USB cable

PIN	Type	TX-STANDARD	i.MX37 Pad Name	i.MX37 Alternate	GPIO	Description
36	3V3	#USBOTG_OC	GPIO1_6	USB_USB_OC CCM_CLKO IIM_ICWE WDOG2_WDOG_B EMI_EIM_D[6] ESDHC1_LCTL CCM_PLL2_BYP	GPIO1_6	Active low over-current indicator input connected to a GPIO. 47kΩ pull-up resistor.
37	analog	USBOTG_DP	USBOTG_DP			D+ pin of the USB cable
38	analog	USBOTG_VBUS	USBOTG_VBUS			VBUS pin of the USB cable. This pin is used for the VBUS comparator inputs.
39	GND	GND	-			

I2C

40	1V8	I2C_DATA	GPIO1_1	SDMA_EXT_EVENT1 I2C2_SDA IPU_DI1_PIN17 IPU_DIO_PIN1 EMI_EIM_D[1] ESDHC3_LCTL FEC_MDIO	GPIO1_1	I2C Data
41	1V8	I2C_CLK	GPIO1_0	SDMA_EXT_EVENT0 I2C2_SCL IPU_SER_DISPO_CS EMI_EIM_D[0] ESDHC2_LCTL WDOG_RST_B_DEB	GPIO1_0	I2C Clock

PWM

42	NC	PWM				not connected
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1-WIRE

43	3V3	OWIRE	OWIRE_LINE	EMI_DSTROBE CCM_PLL3_BYP WDOG2_RST_B_DEB ARM1176_PLATFORM _128K_PMU_IRQ_B SDMA_DEBUG_PC13	GPIO1_31	
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TV

44	analog	CSPI_SS0	TVDAC_IOB_BACK			Cable detection channel #2 (blue) input
45	analog	CSPI_SS1	TVDAC_IOB			TVDAC channel #2 (blue) output
46	analog	CSPI_MOSI	TVDAC_I0G_BACK			Cable detection channel #0 (green) input
47	analog	CSPI_MISO	TVDAC_I0G			TVDAC channel #0 (green) output
48	analog	CSPI_SCLK	TVDAC_I0R_BACK			Cable detection channel #1 (red) input
49	analog	CSPI_RDY	TVDAC_I0R			TVDAC channel #1 (red) output
50	GND	TVGND				

SD – Secure Digital Interface 1

51	1V8	SD1_CD	AUD5_WB_RXD	SPDIF_OUT2 EMI_EIM_D[14] UART1_TXD_MUX FEC_RX_DV	GPIO2_21	SD Card Detect – connected to a GPIO
52	1V8	SD1_D[0]	SD1_DATA0	CSPI3_MISO FEC_RX_CLK	GPIO1_18	SD Data bidirectional signals
53	1V8	SD1_D[1]	SD1_DATA1	CSU_ALARM_AUT[2] FEC_RX_DV	GPIO1_19	
54	1V8	SD1_D[2]	SD1_DATA2	FEC_TX_CLK	GPIO1_20	
55	1V8	SD1_D[3]	SD1_DATA3	CSPI3_SS0	GPIO1_21	
56	1V8	SD1_CMD	SD1_CMD	CSPI3_MOSI FEC_TX_EN	GPIO1_16	SD Command bidirectional signal
57	1V8	SD1_CLK	SD1_CLK	CSPI3_SCLK FEC_COL	GPIO1_17	SD Output Clock.
58	GND	GND				

PIN	Type	TX-STANDARD	i.MX37 Pad Name	i.MX37 Alternate	GPIO	Description
UART1						
59	1V8	UART1_TXD	UART1_TXD	DISPB1_SER_DIO USBOTG_DATA[1] CSPI2_SS2 IPU_DIO_PIN8 IPU_DISP1_DAT[1]	GPIO2_25	Transmit Data output signal
60	1V8	UART1_RXD	UART1_RXD	DISPB1_SER_DIN USBOTG_DATA[0] CSPI1_SS2 IPU_DIO_PIN1 IPU_DISP1_DAT[0]	GPIO2_24	Receive Data input signal
61	1V8	UART1_RTS	UART1_RTS	DISPB1_SER_CLK USBOTG_DATA[2] CSPI1_RDY IPU_DIO_PIN7 IPU_DISP1_DAT[2]	GPIO2_26	Request to Send input signal
62	1V8	UART1_CTS	UART1_CTS	DISPB1_SER_RS USBOTG_DATA[3] CSPI2_RDY IPU_DIO_PIN6 IPU_DISP1_DAT[3]	GPIO2_27	Clear to Send output signal
UART2						
63	1V8	UART2_TXD	DI1_PIN12	ESDHC3_CD UART2_TXD_MUX	GPIO3_11	Transmit Data output signal
64	1V8	UART2_RXD	DI1_PIN11	ESDHC2_CD UART2_RXD_MUX IPU_DI1_WAIT	GPIO3_10	Receive Data input signal
65	1V8	UART2_RTS	DI1_PIN13	ESDHC2_WP UART2_RTS	GPIO3_12	Request to Send input signal
66	1V8	UART2_CTS	DI1_D0_CS	ESDHC3_WP UART2_CTS EPIT2_EPITO	GPIO3_13	Clear to Send output signal
UART3						
67	NC	UART3_TXD				not connected
68	NC	UART3_RXD				not connected
69	NC	UART3_RTS				not connected
70	NC	UART3_CTS				not connected
71	GND	GND				
KEYPAD						
72	1V8	KP_COL[0]	GPIO1_4	CCM_SSI_EXT1_CLK KPP_COL[0] CCM_CCM_OUT_1 ESDHC1_WP	GPIO1_4	Keypad Column selection signals.
73	1V8	KP_COL[1]	GPIO1_3	CCM_SSI_EXT2_CLK KPP_COL[1] CCM_CCM_OUT_0	GPIO1_3	
74	1V8	KP_COL[2]	GPIO1_2	KPP_COL[2] EPIT1_EPITO CCM_DI_CLK CSU_TD	GPIO1_2	
75	NC	KP_COL[3]				not connected
76	NC	KP_COL[4]				not connected
77	1V8	KP_ROW[0]	UART1_DSR	UART1_DSR KPP_ROW[1] USBOTG_DATA[5] UART2_RTS IPU_DIO_PIN4 IPU_DISP1_DAT[5]	GPIO2_29	Keypad Row selection signals.
78	1V8	KP_ROW[1]	UART1_DTR	UART1_DTR KPP_ROW[2] USBOTG_DATA[4] UART2_CTS IPU_DIO_PIN5 IPU_DISP1_DAT[4]	GPIO2_28	
79	1V8	KP_ROW[2]	AUD5_WB_CK	AUD5_TXC KPP_ROW[3] UART1_RTS FEC_TX_CLK	GPIO2_22	

PIN	Type	TX-STANDARD	i.MX37 Pad Name	i.MX37 Alternate	GPIO	Description
80	1V8	KP_ROW[3]	AUD5_RXFS	AUD5_RXFS KPP_ROW[4] CCM_STOP IPU_DI0_PIN16 FEC_TX_EN	GPIO2_18	
81	NC	KP_ROW[4]				not connected
82	GND	GND				

SSI - Serial Audio Port (Configurable to I2S Protocol and AC97)

83	1V8	SSI3_INT	GPIO1_5	USB_PWR IPU_DI1_D1_CS CCM_CCM_OUT_2 WDOG1_WDOG_B ESDHC1_CD CCM_PLL1_BYP	GPIO1_5	GPIO
84	1V8	SSI3_RXD	AUD3_BB_RXD	SPDIF_OUT2 USBOTG_DIR UART3_TXD_MUX IPU_DI1_PIN3	GPIO2_15	Receive serial data
85	1V8	SSI3_TXD	AUD3_BB_TXD	SPDIF_OUT1 USBOTG_CLK UART3_RXD_MUX IPU_DI1_PIN2	GPIO2_14	Transmit serial data
86	1V8	SSI3_CLK	AUD3_BB_CLK	AUD3_TXC KPP_ROW[5] USBOTG_STP UART3_RTS IPU_DI1_DISP_CLK	GPIO2_16	Serial clock
87	1V8	SSI3_FS	AUD3_BB_FS	AUD3_TXFS KPP_COL[5] USBOTG_NXT UART3_CTS IPU_DI1_PIN15	GPIO2_17	Frame Sync
88	GND	GND				

SSI - Serial Audio Port (Configurable to I2S Protocol and AC97)

89	NC	SSI4_INT				not connected
90	NC	SSI4_RXD				not connected
91	NC	SSI4_TXD				not connected
92	NC	SSI4_CLK				not connected
93	NC	SSI4_FS				not connected
94	GND	GND				

Secure Digital Interface 2

95	1V8	SD2_CD	AUD5_WB_RXD	SPDIF_OUT2 UART1_TXD_MUX FEC_RX_DV	GPIO2_21	
96	1V8	SD2_D[0]	SD2_DATA0	I2C1_SDA CSPI3_MISO ESDHC1_DAT4	GPIO1_24	
97	1V8	SD2_D[1]	SD2_DATA1	PATA_DA_2 CSU_ALARM_AUT[0] ESDHC1_DAT5	GPIO1_25	
98	1V8	SD2_D[2]	SD2_DATA2	PATA_DA_1 CSU_ALARM_AUT[1] ESDHC1_DAT6	GPIO1_26	
99	1V8	SD2_D[3]	SD2_DATA3	PATA_DA_0 CSPI3_SS1 ESDHC1_DAT7	GPIO1_27	
100	1V8	SD2_CMD	SD2_CMD	CSPI3_MOSI KPP_ROW[7]	GPIO1_22	
101	1V8	SD2_CLK	SD2_CLK	I2C1_SCL CSPI3_SCLK KPP_COL[7]	GPIO1_23	
102	GND	GND				

PIN	Type	TX-STANDARD	i.MX37 Pad Name	i.MX37 Alternate	GPIO	Description
CMOS Sensor Interface						
103	NC	CSL_D0				not connected
104	NC	CSL_D1				not connected
105	NC	CSL_D2				not connected
106	NC	CSL_D3				not connected
107	NC	CSL_D4				not connected
108	NC	CSL_D5				not connected
109	NC	CSL_D6				not connected
110	NC	CSL_D7				not connected
111	GND	GND				
112	NC	CSL_HSYNC				not connected
113	NC	CSL_VSYNC				not connected
114	NC	CSL_PIXCLK				not connected
115	NC	CSL_MCLK				not connected
116	GND	GND				
LCD Controller and Smart LCD Controller						
117	1V8	LD [0]	DISP1_DAT0	IPU_DISP0_DAT[0]		LCD Data Bus
118	1V8	LD [1]	DISP1_DAT1	IPU_DISP0_DAT[1]		LCD Data Bus
119	1V8	LD [2]	DISP1_DAT2	IPU_DISP0_DAT[2]		LCD Data Bus
120	1V8	LD [3]	DISP1_DAT3	IPU_DISP0_DAT[3]		LCD Data Bus
121	1V8	LD [4]	DISP1_DAT4	IPU_DISP0_DAT[4]		LCD Data Bus
122	1V8	LD [5]	DISP1_DAT5	IPU_DISP0_DAT[5]		LCD Data Bus
123	1V8	LD [6]	DISP1_DAT6	IPU_DISP0_DAT[6]		LCD Data Bus
124	1V8	LD [7]	DISP1_DAT7	IPU_DISP0_DAT[7]		LCD Data Bus
125	1V8	LD [8]	DISP1_DAT8	IPU_DISP0_DAT[8] BT_SPARE_FUSE		LCD Data Bus
126	1V8	LD [9]	DISP1_DAT9	IPU_DISP0_DAT[9] BT_SPI_TYPE		LCD Data Bus
127	1V8	LD [10]	DISP1_DAT10	IPU_DISP0_DAT[10] BT_WEIM_MUXED		LCD Data Bus
128	1V8	LD [11]	DISP1_DAT11	IPU_DISP0_DAT[11] BT_EEPROM_CONFIG		LCD Data Bus
129	GND	GND				
130	1V8	LD [12]	DISP1_DAT12	IPU_DISP0_DAT[12] BT_SDMMC_SRC		LCD Data Bus
131	1V8	LD [13]	DISP1_DAT13	IPU_DISP0_DAT[13] BT_SPARE_SIZE[0]		LCD Data Bus
132	1V8	LD [14]	DISP1_DAT14	IPU_DISP0_DAT[14] BT_SPARE_SIZE[1]		LCD Data Bus
133	1V8	LD [15]	DISP1_DAT15	IPU_DISP0_DAT[15] BT_USB_SRC		LCD Data Bus
134	1V8	LD [16]	DISP1_DAT16	IPU_DISP0_DAT[16] CTI1_CTI_IN[4] BT_MLC_SEL	GPIO1_28	LCD Data Bus
135	1V8	LD [17]	DISP1_DAT17	IPU_DISP0_DAT[17] CTI1_CTI_IN[5] BT_MEM_CTL[0]	GPIO1_29	LCD Data Bus
136	1V8	LD [18]	DISP1_DAT18	IPU_DISP0_DAT[18] IPU_DIO_PIN5 IPU_DI1_PIN11 AUDMUX_AUD4_RXFS BT_MEM_CTL[1]	GPIO3_14	LCD Data Bus

PIN	Type	TX-STANDARD	i.MX37 Pad Name	i.MX37 Alternate	GPIO	Description
137	1V8	LD [19]	DISP1_DAT19	IPU_DISP0_DAT[19] IPU_DIO_PIN6 IPU_DI1_PIN12 AUDMUX_AUD4_RXC BUS_WIDTH	GPIO3_15	LCD Data Bus
138	1V8	LD [20]	DISP1_DAT20	IPU_DISP0_DAT[20] IPU_DIO_PIN7 IPU_DI1_PIN13 AUDMUX_AUD4_TXD NF_PAGE_SZ[0]	GPIO3_16	LCD Data Bus
139	1V8	LD [21]	DISP1_DAT21	IPU_DISP0_DAT[21] IPU_DIO_PIN8 IPU_DI1_PIN14 AUDMUX_AUD4_RXD NF_PAGE_SZ[1]	GPIO3_17	LCD Data Bus
140	1V8	LD [22]	DISP1_DAT22	IPU_DISP0_DAT[22] EMI_EIM_CS2 IPU_DI1_D0_CS AUDMUX_AUD4_TXC BT_MEM_TYPE[0]	GPIO3_18	LCD Data Bus
141	1V8	LD [23]	DISP1_DAT23	IPU_DISP0_DAT[23] EMI_EIM_CS3 IPU_DI1_D1_CS AUDMUX_AUD4_TXFS BT_MEM_TYPE[1]	GPIO3_19	LCD Data Bus
142	GND	GND				
143	1V8	HSYNC	DI1_PIN2	IPU_DIO_PIN2	GPIO3_31	
144	1V8	VSYSN	DI1_PIN3	IPU_DIO_PIN3	GPIO3_29	
145	1V8	OE_ACD	DI1_PIN15	IPU_DIO_PIN15	GPIO1_30	
146	1V8	LSCLK	DI1_DISP_CLK	IPU_DIO_DISP_CLK	GPIO3_30	Shift Clock
147	GND	GND				

External Bus/Chip Select (EMI)

148	NC	PC_PWRON				not connected
149	NC	PC_CD1_B				not connected
150	NC	PC_BVD1				not connected
151	NC	PC_BVD2				not connected
152	NC	PC_VS1				not connected
153	1V8	PC_VS2	AUD5_RXC	KPP_COL[4] CCM_WAIT IPU_DIO_PIN14 FEC_COL	GPIO2_19	
154	NC	IOIS16				not connected
155	NC	PC_RW_B				not connected
156	NC	PC_RST				not connected
157	NC	PC_WAIT_B				not connected
158	NC	PC_READY				not connected
159	NC	PC_POE				not connected
160	GND	GND				
161	NC	CS [0]				not connected
162	NC	CS [1]				not connected
163	NC	CS [4]				not connected
164	NC	ECB				not connected

PIN	Type	TX-STANDARD	i.MX37 Pad Name	i.MX37 Alternate	GPIO	Description
External Bus/Chip Select (EMI)						
165	NC	EB0				not connected
166	NC	EB1				not connected
167	NC	OE				not connected
168	NC	LBA				not connected
169	NC	RW				not connected
170	NC	BCLK				not connected
171	GND	GND				
172	NC	A [0]				not connected
173	NC	A [1]				not connected
174	NC	A [2]				not connected
175	NC	A [3]				not connected
176	NC	A [4]				not connected
177	NC	A [5]				not connected
178	NC	A [6]				not connected
179	NC	A [7]				not connected
180	NC	A [8]				not connected
181	NC	A [9]				not connected
182	NC	A [10]				not connected
183	GND	GND				
184	NC	D[0]				not connected
185	NC	D[1]				not connected
186	NC	D[2]				not connected
187	NC	D[3]				not connected
188	NC	D[4]				not connected
189	NC	D[5]				not connected
190	NC	D[7]				not connected
191	NC	D[6]				not connected
192	NC	D[8]				not connected
193	NC	D[9]				not connected
194	NC	D[10]				not connected
195	NC	D[11]				not connected
196	NC	D[12]				not connected
197	NC	D[13]				not connected
198	NC	D[14]				not connected
199	NC	D[15]				not connected
200	GND	GND	GND			