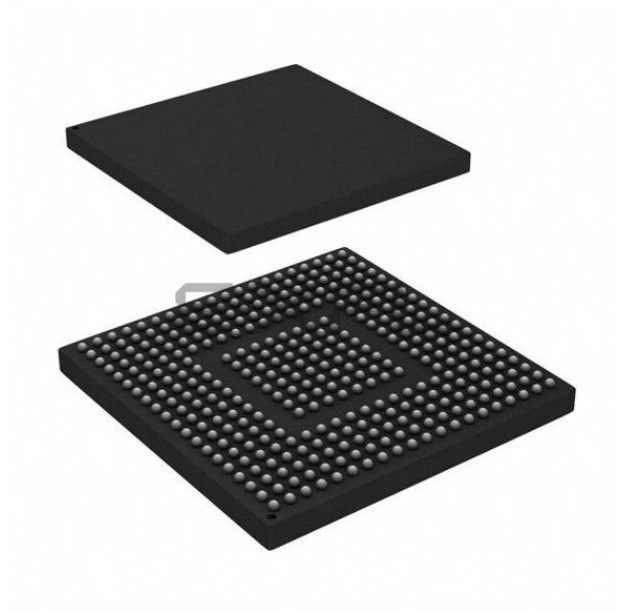

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Understanding Embedded - Microprocessors

Embedded microprocessors are specialized computing chips designed to perform specific tasks within an embedded system. Unlike general-purpose microprocessors found in personal computers, embedded microprocessors are tailored for dedicated functions within larger systems, offering optimized performance, efficiency, and reliability. These microprocessors are integral to the operation of countless electronic devices, providing the computational power necessary for controlling processes, handling data, and managing communications.

Applications of Embedded - Microprocessors

Embedded microprocessors are utilized across a broad spectrum of applications, making them indispensable in

Details	
Product Status	Active
Core Processor	ARM® Cortex®-A5 + Cortex®-M4
Number of Cores/Bus Width	2 Core, 32-Bit
Speed	400MHz, 133MHz
Co-Processors/DSP	Multimedia; NEON™ MPE
RAM Controllers	LPDDR2, DDR3, DRAM
Graphics Acceleration	Yes
Display & Interface Controllers	DCU, GPU, LCD, VideoADC, VIU
Ethernet	10/100Mbps (2)
SATA	-
USB	USB 2.0 OTG + PHY (1)
Voltage - I/O	3.3V
Operating Temperature	-40°C ~ 85°C (TA)
Security Features	ARM TZ, Hashing, RNG, RTC, RTIC, Secure JTAG, SNVS, TZ ASC, TZ WDOG
Package / Case	364-LFBGA
Supplier Device Package	364-LFBGA (17x17)
Purchase URL	https://www.e-xfl.com/product-detail/nxp-semiconductors/svf532r3k1cmk4

5 Operating Requirements

5.1 Thermal operating requirements

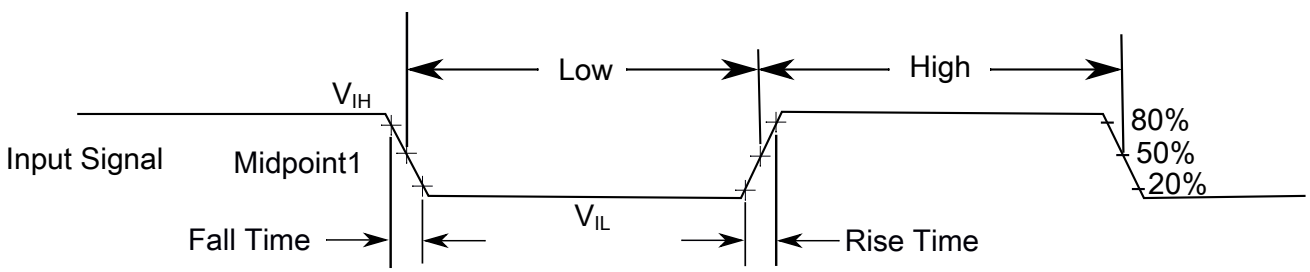
Table 1. Thermal operating requirements

Symbol	Description	Min.	Max.	Unit
T_A	Ambient temperature	–40	85	°C
T_J	Junction temperature		105	°C

6 General

6.1 AC electrical characteristics

Unless otherwise specified, propagation delays are measured from the 50% to the 50% point, and rise and fall times are measured at the 20% and 80% points, as shown in the following figure.



The midpoint is $V_{IL} + (V_{IH} - V_{IL}) / 2$

Figure 2. Input signal measurement reference

6.2.3 LDO electrical specifications

6.2.3.1 LDO_1P1

Table 12. LDO_1P1 parameters

Specification	Min	Typ	Max	Unit	Comments
VDDIO	3	3.3	3.6	V	IO supply
VDD1P1_OUT	0.9	1.1	1.2	V	Regulator output
I_out	-		150	mA	>= 300mV drop out
Regulator output programming range	0.8	1.1	1.4	V	Programmable in 25mV steps
Brownout Voltage	0.85	0.94		V	
Brownout offset step	0	-	175	mV	Programmable in 25mV steps
Minimum external decoupling capacitor	1	-	-	µF	low ESR

For additional information, see the device reference manual.

6.2.3.2 LDO_2P5

Table 13. LDO_2P5 parameters

Specification	Min	Typ	Max	Unit	Comments
VDDIO	3	3.3	3.6	V	IO supply
VDD2P5_OUT	2.3	2.5	2.6	V	Regulator output
I_out	-		350	mA	@500mV drop out
Regulator output programming range	2.0	2.5	2.75	V	Programmable in 25mV steps
[P:][C:] Brownout Voltage	2.25	2.33		V	
Brownout offset step	0	-	175	mV	Programmable in 25mV steps
Minimum external decoupling capacitor	1	-	-	µF	low ESR

For additional information, see the reference manual.

Table 28. Power sequencing (continued)

Power Supply (PKG Level)	Board Level Power Nets	Parameters	Power Order	Comment
VDD33_LDOIN	VDD33	LDO input supply (LDO1P1, LDO2P5, LDO1P1_RTC)	1	VDD33_LDOIN,VDDREG and VDD33 should come from a common supply source (represented as 3.3V SMPS in the Figure 4)
VDDREG	VDD33	Device PMU regulator and External ballast supply	1	
VDD33	VDD33	GPIO 3.3V IO supply, LCD Supply	1	
SDRAMC_VDD1P5	SDRAMC_VDD1P5	1.2/1.5 DDR Main IO supply	NA	In case the Ballast transistor's collector is connected to the 1.5V DRAM supply (instead of the 3.3V supply), turn this 1.5V supply on before turning on the 3.3V.
VDDA33_ADC	VDDA33_ADC	3.3V supply for ADC, DAC and IO segment	1	
VREFH_ADC	VREFH_ADC	High Reference of ADC, DAC	1	
VDDA33_AFE	VDDA33_AFE	3.3V supply of AFE (Video ADC)	1	
VDD12_AFE	VDD	1.2V supply for AFE (Video ADC)	2	
FA_VDD	VDD	Shorted with VDD at Board Level in 364BGA (Test pin only)	NA	
VDD	VDD	1.2V core supply from External ballast	2	
USB0_VBUS	USB_VBUS	VBUS supply for USB	NA	
USB1_VBUS	USB_VBUS	VBUS supply for USB	NA	

NOTE

NA stands for no sequencing needs, for example, the supply can come in any order.

NOTE

All supplies grouped together e.g. 1,2, others. These have no power sequencing restriction in between them.

NOTE

If none of the SDRAMC pins are connected on the board, the SDRAMC supply could be left floating.

NOTE

At power up, 1.2V supply will follow 3.3V supply. At power down, it should be checked that 1.2V falls before 3.3V.

NOTE

The standby current on USBx_VBUS is 300 - 500 uA. This is well below the 2.5 mA limit set by the USB 2.0 specification. This supply will be ON for applications that need to monitor the

9.1.1.2 12-bit ADC characteristics

Table 32. 12-bit ADC Characteristics (V_{REFH} = V_{DDAD}, V_{REFL} = V_{SSAD})

Characteristic	Conditions	Symb	Min	Typ	Max	Unit	Comment
Supply Current	ADLPC=1, ADHSC=0	I_{DDAD}		250		µA	ADLSMP=0 ADSTS=10 ADCO=1
	ADLPC=0, ADHSC=0			350			
	ADLPC=0, ADHSC=1			400			
Supply Current	Stop, Reset, Module Off	I_{DDAD}		0.01	0.8	µA	
ADC Asynchronous Clock Source	ADHSC=0	f_{ADACK}		10		MHz	$t_{ADACK} = 1/f_{ADACK}$
	ADHSC=1			20			
Sample Cycles	ADLSMP=0, ADSTS=00	Csamp		2		cycles	
	ADLSMP=0, ADSTS=01			4			
	ADLSMP=0, ADSTS=10			6			
	ADLSMP=0, ADSTS=11			8			
	ADLSMP=1, ADSTS=00			12			
	ADLSMP=1, ADSTS=01			16			
	ADLSMP=1, ADSTS=10			20			
	ADLSMP=1, ADSTS=11			24			
Conversion Cycles	ADLSMP=0 ADSTS=00	Cconv		28		cycles	
	ADLSMP=0 ADSTS=01			30			
	ADLSMP=0 ADSTS=10			32			
	ADLSMP=0 ADSTS=11			34			
	ADLSMP=1 ADSTS=00			38			
	ADLSMP=1 ADSTS=01			42			
	ADLSMP=1 ADSTS=10			46			
	ADLSMP=1, ADSTS=11			50			
Conversion Time	ADLSMP=0 ADSTS=00	Tconv		0.7		µs	Fadc=40 MHz
	ADLSMP=0 ADSTS=01			0.75			

Table continues on the next page...

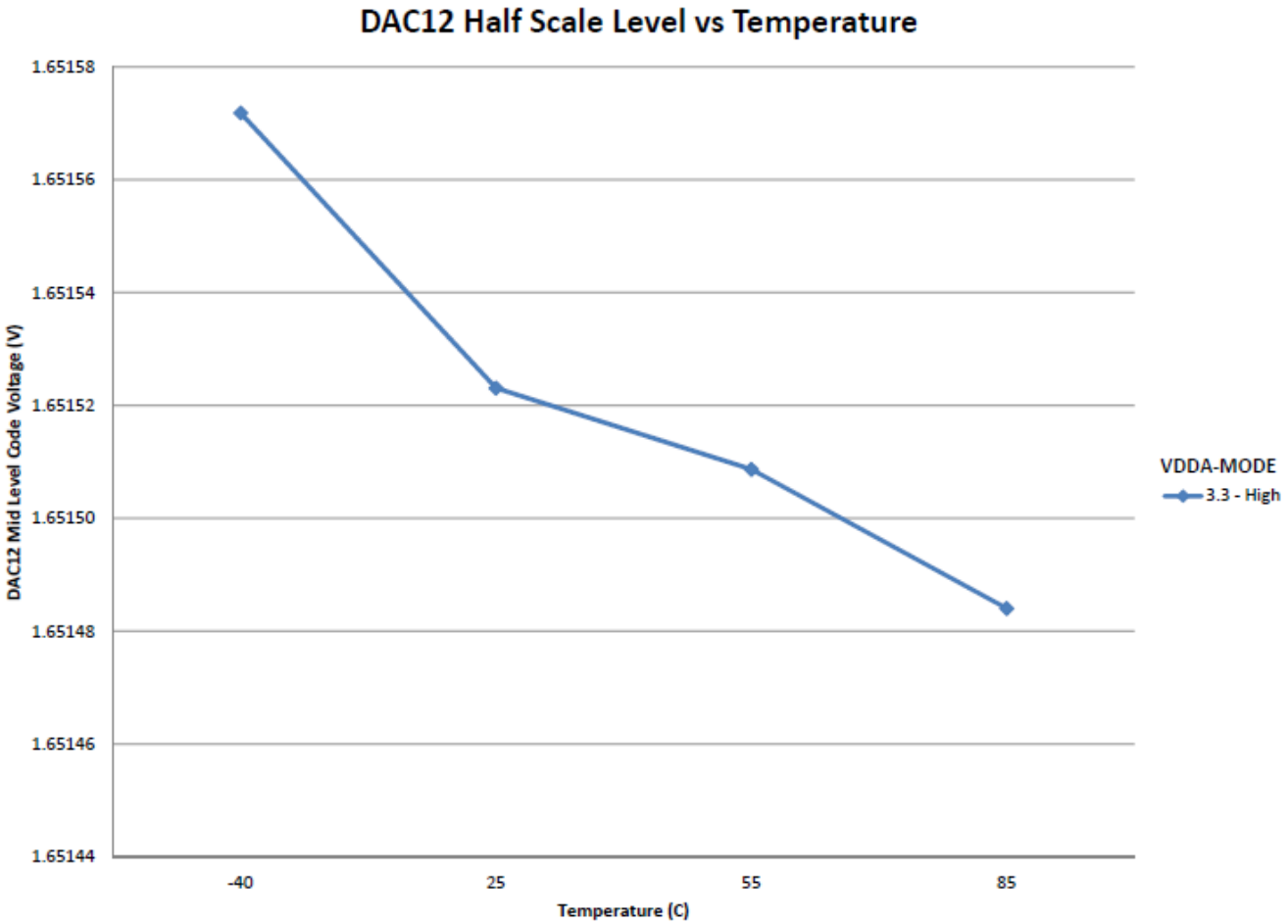


Figure 11. Offset at half scale vs. temperature

9.1.3 VideoADC Specifications

This section describes the electrical specification and characteristics of the VideoADC Analog Front End.

Table 35. VideoADC Specifications

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
VDDA33_AFE	Supply voltage	3.0	3.3	3.6	V	—
	Supply current	—	—	41	mA	—
VDDA12_AFE	Supply voltage	1.1	1.2	1.26	V	—
	Supply current	—	—	14	mA	—
V_{in}	Input signal voltage range	0	0.5	1.4	V	—
	External AC coupling	10	47		nF	The external AC coupling capacitance cannot be too large.

Table continues on the next page...

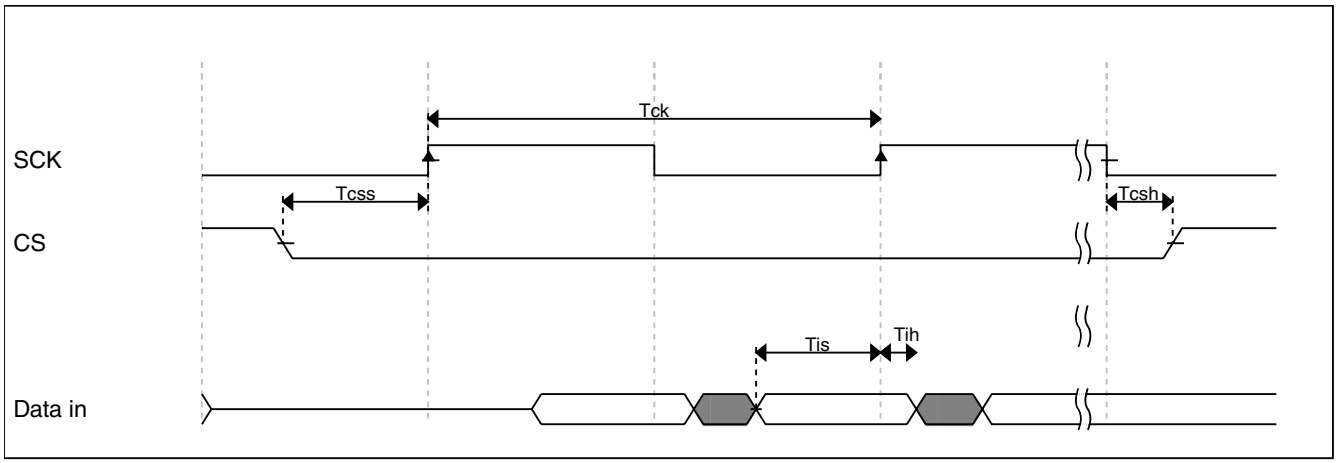


Figure 32. QuadSPI Input/Read timing (DDR mode)

NOTE

- The numbers are for a setting of 0x1 in regiater QuadSPI_SMPR[DDRSMP]
- Read frequency calculations should be: SCK/2 > (flash access time) + Setup (Tis) - (QuadSPI_SMPR[DDRSMP])x SCK/4
- Frequency calculator guideline (Max read frequency): SCK/2 > (Flash access time)max + (Tis)max - (QuadSPI_SMPR[DDRSMP]) xSCK/4
- Hold timing: flash_access (min) + flash_data_valid (min) > SCK/2 + HOLD(Tih) + (QuadSPI_SMPR[DDRSMP])SCK/4
- A negative time indicates the actual capture edge inside the device is earlier than clock appearing at pad.

Table 50. QuadSPI Input/Read timing (DDR mode)

Symbol	Parameter	Value		Unit
		Min	Max	
T_{is}	Setup time for incoming data	6.4	—	ns
T_{ih}	Hold time requirement for incoming data	-3.0	—	ns

NOTE

9.5.4 DDR controller specifications

9.5.4.1 DDR3 Timing Parameters

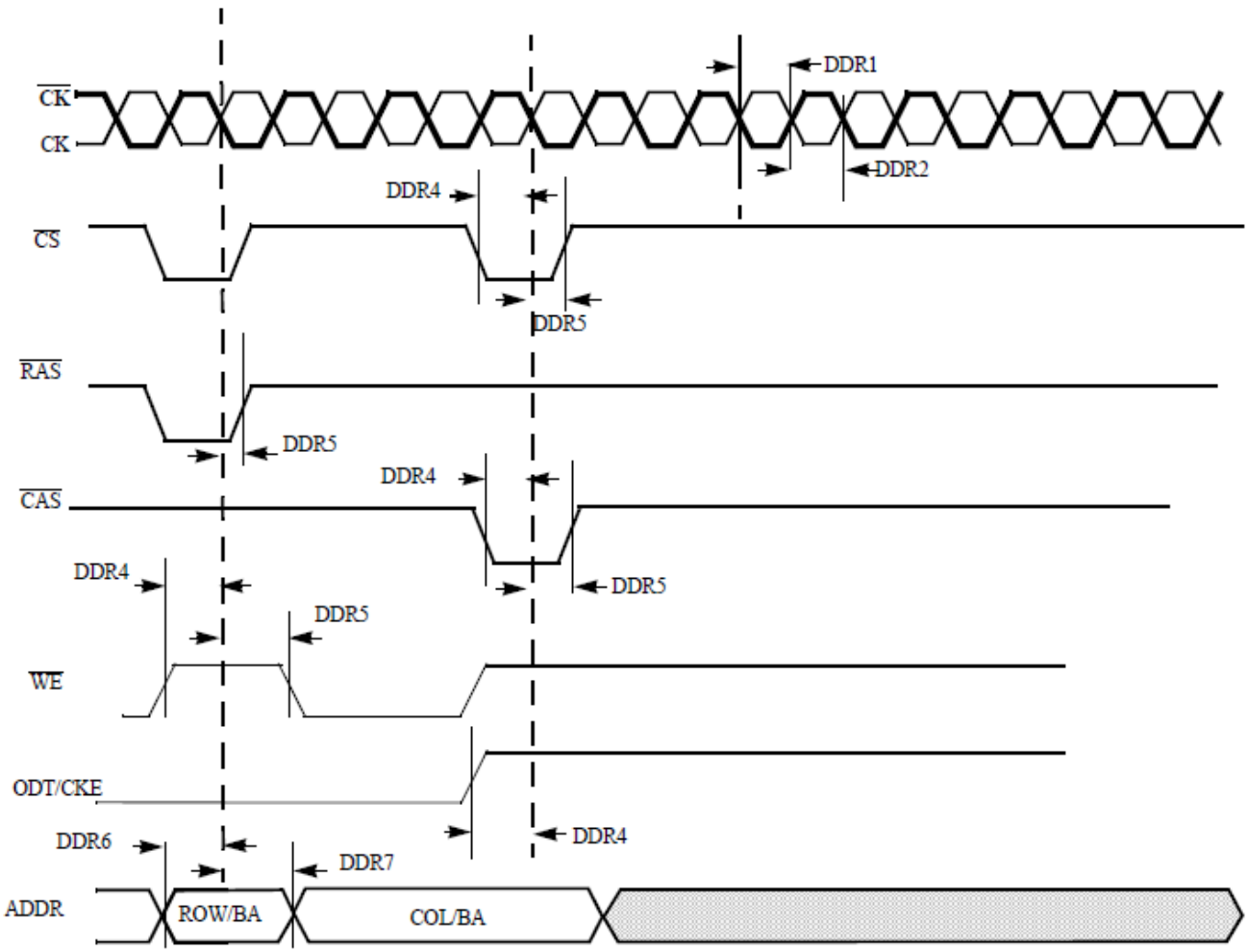


Figure 41. DDR3 Command and Address Timing Parameters

NOTE

RESET pin has a external weak pull DOWN requirement if DDR3 memory is NOT required to support content retention in the device low power modes where core voltage is off but DRAM voltage is on.

9.5.4.3 DDR3 Write cycle

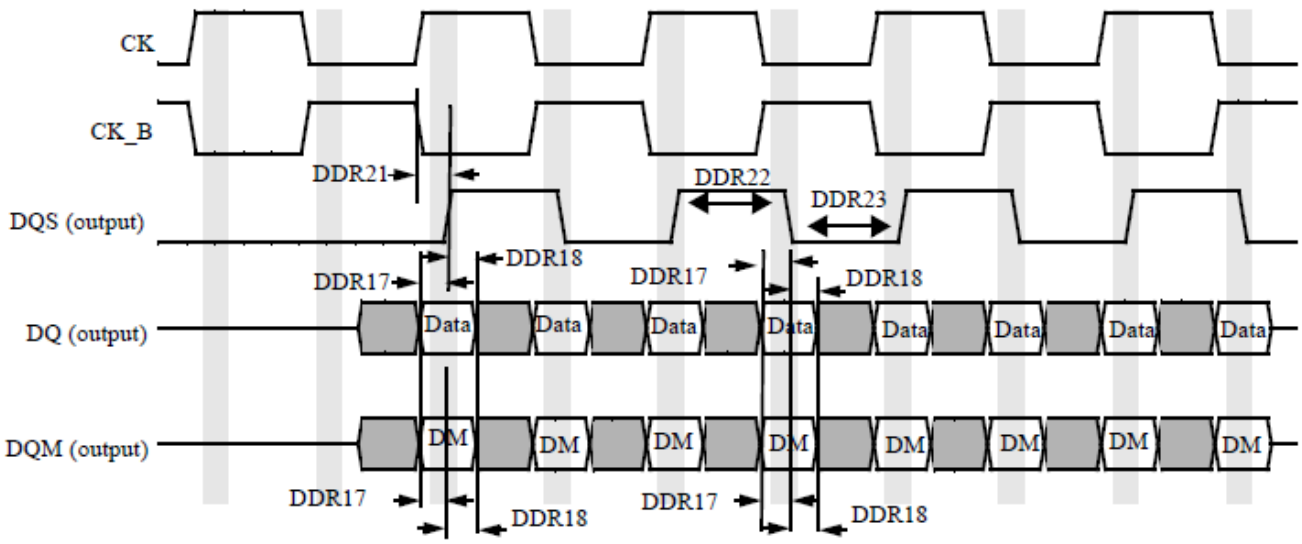


Figure 43. DDR3 Write cycle

Table 56. DDR3 Write cycle

ID	Parameter	Symbol	CK = 400 MHz		Unit
			Min	Max	
DDR17	DQ and DQM setup time to DQS (differential strobe)	tDS	240	—	ps
DDR18	DQ and DQM hold time to DQS (differential strobe)	tDH	215	—	ps
DDR21	DQS latching rising transitions to associated clock edges	tDQSS	-0.25	+0.25	tCK
DDR22	DQS high level width	tDQSH	0.45	0.55	tCK
DDR22	DQS low level width	tDQSL	0.45	0.55	tCK

NOTE

To receive the reported setup and hold values, write calibration should be performed in order to locate the DQS in the middle of DQ window.

NOTE

All measurements are in reference to Vref level.

NOTE

Measurements were done using balanced load and 25 ohms resistor from outputs to VDD_REF.

9.6.5 SDHC specifications

The following timing specs are defined at the chip I/O pin and must be translated appropriately to arrive at timing specs/constraints for the physical interface. A load of 50 pF is assumed.

Table 66. SDHC switching specifications

Num	Symbol	Description	Min.	Max.	Unit
		Operating voltage	1.71	3.6	V
	Card input clock				
SD1	fpp	Clock frequency (low speed)	0	400	kHz
	fpp	Clock frequency (SD\SDIO full speed\high speed)	0	25\50	MHz
	fpp	Clock frequency (MMC full speed\high speed)	0	20\50	MHz
	f_{OD}	Clock frequency (identification mode)	0	400	kHz
SD2	t_{WL}	Clock low time	7	—	ns
SD3	t_{WH}	Clock high time	7	—	ns
SD4	t_{TLH}	Clock rise time	—	3	ns
SD5	t_{THL}	Clock fall time	—	3	ns
	SDHC output / card inputs SDHC_CMD, SDHC_DAT (reference to SDHC_CLK)				
SD6	t_{OD}	SDHC output delay (output valid)	-5	4	ns
	SDHC input / card inputs SDHC_CMD, SDHC_DAT (reference to SDHC_CLK)				
SD7	t_{ISU}	SDHC input setup time	5	—	ns
SD8	t_{IH}	SDHC input hold time	0	—	ns

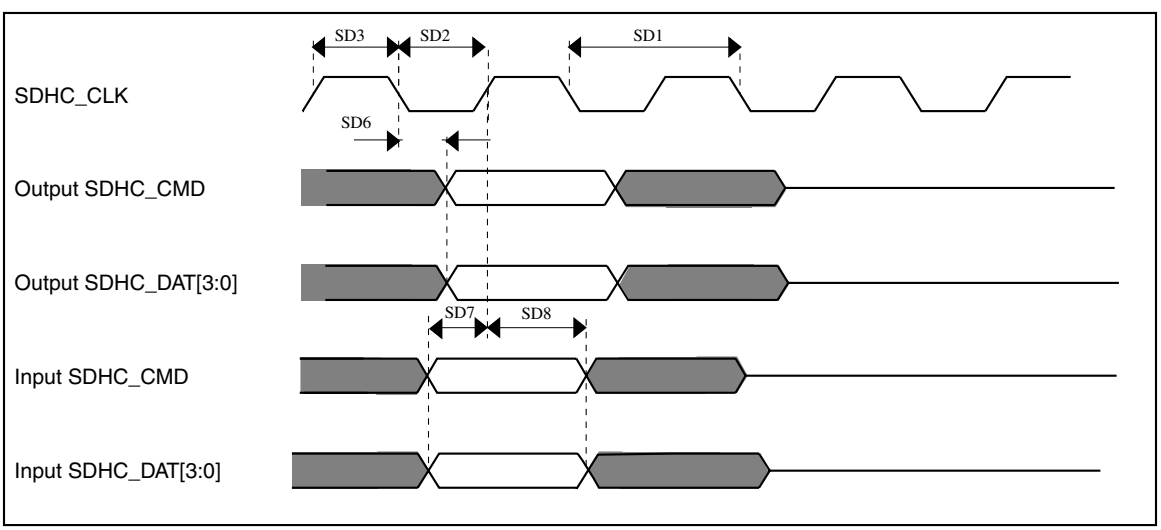


Figure 53. SDHC timing

Table 67. 24MHz external oscillator electrical characteristics (continued)

Symbol	Parameter	Condition	Value			Unit
			Min	Typ	Max	
C_{IN}	Input Capacitance	EXTAL and XTAL pins	—	9	—	pF
VIH	XTAL pin input high voltage	—	0.8 x Vdd[1]	—	Vdd +0.3	V
VIL	XTAL pin input low voltage	—	Vss -0.3	—	0.2 x Vdd	V

1. V_{DD} =1.1 V ± 10%, TA = -40 to +85 °C, unless otherwise specified.

9.7.2 32 KHz Oscillator Specifications

This block implements an amplifier that when combined with a suitable quartz crystal and external load capacitors implements a low power oscillator. It also implements a power mux such that it can be powered from either a ~3 V backup battery or VDDIO such as the oscillator consumes power from VDDIO when that supply is available and transitions to the back up battery when VDDIO is lost.

In addition, if the clock monitor determines that the OSC32K is not present, then the source of the 32 K will automatically switch to the 128kHz internal RC clock divided by 4.

The OSC32k runs from vdd_rtc supply, generated inside OSC32k itself from VDDIO/ VBAT. The target battery is a ~3 V coin cell. Proper choice of coin cell type is necessary for chosen VDDIO range. Appropriate series resistor (Rs) must be used when connecting the coin cell. Rs depends on the charge current limit that depends on the chosen coin cell.

For example:

- Average Discharge Voltage is 2.5 V
- Maximum Charge Current is 0.6 mA

For a charge voltage of 3.2 V, Rs = (3.2-2.5)/0.6 m = 1.17 k

Table 68. OSC32K Main Characteristics

	Notes	Min	Typ	Max
F_{OSC}	This frequency is nominal and determined mainly by the crystal selected. 32.0 K would work as well.		32.768 KHz	
Current consumption	The 4 µA is the consumption of the oscillator alone (OSC32k). Total supply consumption will depend on what the digital portion of the RTC consumes. The ring oscillator consumes 1 µA when ring oscillator is inactive, 20 µA when the ring		4 µA	

Table continues on the next page...

9.7.7 PLL5 (Ethernet PLL) Electrical Parameters

Table 73. PLL5 Electrical Parameters

Parameter	Value
Clock output range	500 MHz
Reference clock	24 MHz
Lock time	<7500 reference cycles
Cycle to cycle jitter (p2p)[1]	<400ps @ 50 MHz
Duty Cycle	45%~55%

1. Jitter numbers are measured at divided PLL clock because high frequency cannot be brought-out IO pad.

9.7.8 PLL4 (Audio PLL) Electrical Parameters

Table 74. PLL4 Electrical Parameters

Parameter	Value
Clock output range	650 MHz ~1.3 GHz
Reference clock	24 MHz
Lock time	<7500 reference cycles
Long term jitter(RMS)	<42ps @1128MHz
Period jitter(p2p)[1]	<115ps@1128MHz
Duty Cycle	43%~57%

1. Jitter numbers are measured at divided PLL clock because high frequency cannot be brought-out on IO pad.

9.7.9 PLL6 (Video PLL) Electrical Parameters

Table 75. PLL6 Electrical Parameters

Parameter	Value
Clock output range	650 MHz ~1.3 GHz
Reference clock	24 MHz
Lock time	<7500 reference cycles
Long term jitter(RMS)[1]	<42ps @ 1128 MHz
Period jitter(p2p)	<130ps @960MHz
Duty Cycle	43%~57%

1. Jitter numbers are measured at divided PLL clock because high frequency cannot be brought-out on IO pad & at use case frequency.

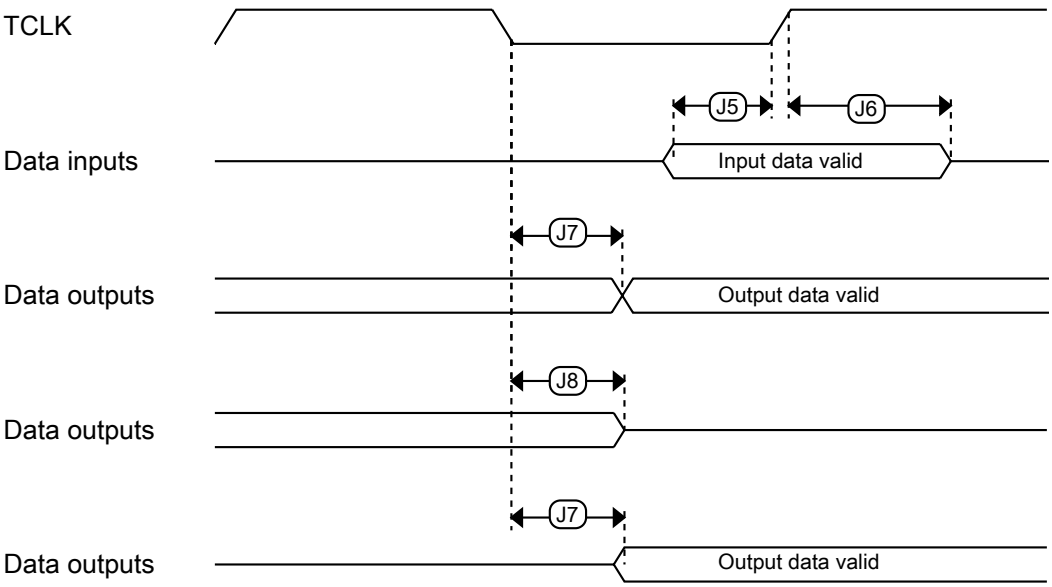


Figure 55. Boundary scan (JTAG) timing

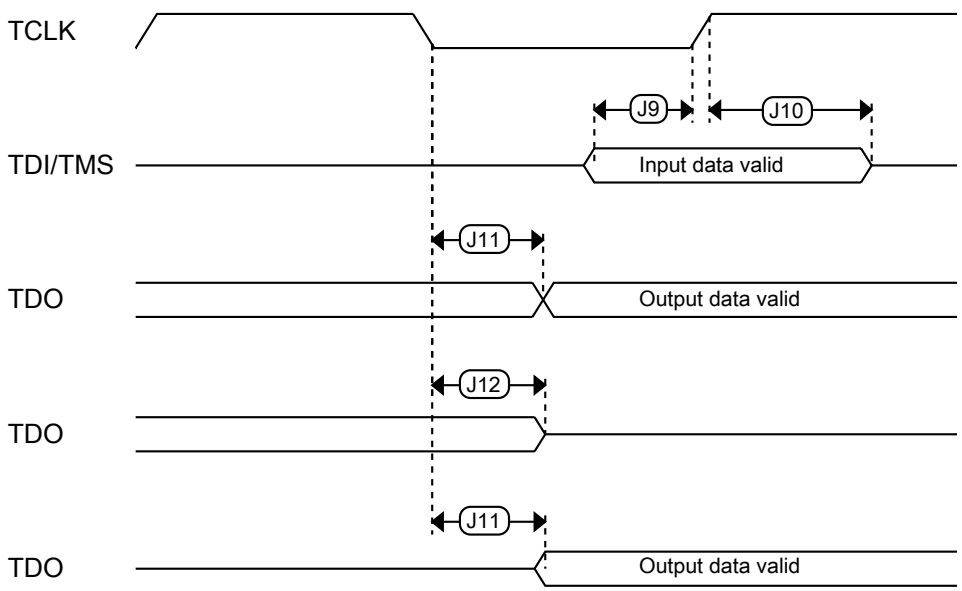


Figure 56. Test Access Port timing

364 MAP BGA	176 LQFP	Pin Name	Default	ALT0	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6	ALT7	EzPort
C17	148	PTA23		PTA23	TRACED7				SAI2_RX_SYNC	I2C2_SDA	DCU1_DE/DCU1_TCON3	
R16	—	PTA24		PTA24	TRACED8	USB1_VBUS_EN			SDHC1_CLK	DCU1_TCON4		
R17	—	PTA25		PTA25	TRACED9	USB1_VBUS_OC			SDHC1_CMD	DCU1_TCON5		
R19	—	PTA26		PTA26	TRACED10	SAI3_TX_BCLK			SDHC1_DAT0	DCU1_TCON6		
R20	—	PTA27		PTA27	TRACED11	SAI3_RX_BCLK			SDHC1_DAT1	DCU1_TCON7		
P20	—	PTA28		PTA28	TRACED12	SAI3_RX_DATA	ENET1_1588_TMR0	SCI4_TX	SDHC1_DAT2	DCU1_TCON8		
P18	—	PTA29		PTA29	TRACED13	SAI3_TX_DATA	ENET1_1588_TMR1	SCI4_RX	SDHC1_DAT3	DCU1_TCON9		
P17	—	PTA30		PTA30	TRACED14	SAI3_RX_SYNC	ENET1_1588_TMR2	SCI4_RTS	I2C3_SCL		SCI3_TX	
P16	—	PTA31		PTA31	TRACED15	SAI3_TX_SYNC	ENET1_1588_TMR3	SCI4_CTS	I2C3_SDA		SCI3_RX	
T6	49	PTB0		PTB0	FTM0_CH0	ADC0_SE2	TRACECTL	LCD34	SAI2_RX_BCLK	VIU_DATA18	QSPI1_A_CS0	
T7	50	PTB1	RCON30	PTB1	FTM0_CH1	ADC0_SE3	RCON30	LCD35	SAI2_RX_DATA	VIU_DATA19	QSPI1_A_DATA3	
V7	51	PTB2	RCON31	PTB2	FTM0_CH2	ADC1_SE2	RCON31	LCD36	SAI2_RX_SYNC	VIU_DATA20	QSPI1_A_DATA2	
W7	53	PTB3		PTB3	FTM0_CH3	ADC1_SE3	EXTRIG	LCD37		VIU_DATA21	QSPI1_A_DATA1	
Y7	54	PTB4		PTB4	FTM0_CH4	SCI1_TX	ADC0_SE4	LCD38	VIU_FID	VIU_DATA22	QSPI1_A_DATA0	
Y8	55	PTB5		PTB5	FTM0_CH5	SCI1_RX	ADC1_SE4	LCD39	VIU_DE	VIU_DATA23	QSPI1_A_DQS	
W8	56	PTB6		PTB6	FTM0_CH6	SCI1_RTS	QSPI0_A_CS1	LCD40	FB_CLKOUT	VIU_HSYNC	SCI2_TX	
D13	166	PTB7		PTB7	FTM0_CH7	SCI1_CTS	QSPI0_B_CS1	LCD41		VIU_VSYNC	SCI2_RX	
J16	121	PTB8		PTB8	FTM1CH0		FTM1_QD_PHA		VIU_DE		DCU1_R6	
J19	123	PTB9		PTB9	FTM1CH1		FTM1_QD_PHB				DCU1_R7	
B15	159	PTB10		PTB10	SCI0_TX			DCU0_TCON4	VIU_DE	CKO1	ENET_TS_CLKIN	
D14	164	PTB11		PTB11	SCI0_RX			DCU0_TCON5	SNVS_ALARM_OUT_B	CKO2	ENET0_1588_TMR0	
E13	165	PTB12	NMI	PTB12	SCI0_RTS		SPI0_PCS5	DCU0_TCON6	FB_AD1	NMI	ENET0_1588_TMR1	
D15	156	PTB13		PTB13	SCI0_CTS		SPI0_PCS4	DCU0_TCON7	FB_AD0	TRACECTL		

364 MAP BGA	176 LQFP	Pin Name	Default	ALT0	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6	ALT7	EzPort
B14	162	PTB14		PTB14	CAN0_RX	I2C0_SCL		DCU0_ TCON8			DCU1_PCLK	
A14	161	PTB15		PTB15	CAN0_TX	I2C0_SDA		DCU0_ TCON9			VIU_PIX_ CLK	
C14	163	PTB16		PTB16	CAN1_RX	I2C1_SCL		DCU0_ TCON10				
A15	160	PTB17		PTB17	CAN1_TX	I2C1_SDA		DCU0_ TCON11				
B12	171	PTB18		PTB18	SPI0_PCS1	EXT_AUDIO_ MCLK				VIU_DATA9	CCM_OBS0	
C13	167	PTB19		PTB19	SPI0_PCS0					VIU_DATA10	CCM_OBS1	
A13	169	PTB20		PTB20	SPI0_SIN			LCD42		VIU_DATA11	CCM_OBS2	
E12	173	PTB21		PTB21	SPI0_SOUT			LCD43		VIU_DATA12	DCU1_PCLK	
D12	172	PTB22		PTB22	SPI0_SCK				VIU_FID			
V10	61	USB0_GND			USB0_GND							
T10	63	USB0_DP			USB0_DP							
T9	62	USB0_DM			USB0_DM							
W11	60	USB0_VBUS			USB0_VBUS							
Y10	59	USB_DCAP			USB_DCAP							
Y11	64	USB0_ VBUS_ DETECT			USB0_ VBUS_ DETECT							
Y9	—	USB1_GND			USB1_GND							
W9	—	USB1_DP			USB1_DP							
V9	—	USB1_DM			USB1_DM							
W10	—	USB1_VBUS			USB1_VBUS							
U9	—	USB1_ VBUS_ DETECT			USB1_ VBUS_ DETECT							
L4	8	PTC0		PTC0	RMII0_MDC/ MII0_MDC	FTM1CH0	SPI0_PCS3	ESAI_SCKT	SDHC0_CLK	VIU_DATA0	RCON18	
L5	9	PTC1		PTC1	RMII0_MDIO/ MII0_MDC	FTM1CH1	SPI0_PCS2	ESAI_FST	SDHC0_CMD	VIU_DATA1	RCON19	
M5	11	PTC2		PTC2	RMII0_CRS_ DV	SCI1_TX		ESAI_SDO0	SDHC0_ DAT0	VIU_DATA2	RCON20	
M3	12	PTC3		PTC3	RMII0_RXD1/ MII0_RXD[1]	SCI1_RX		ESAI_SDO1	SDHC0_ DAT1	VIU_DATA3	DCU0_R0	
L2	14	PTC4		PTC4	RMII0_RXD0/ MII0_RXD[0]	SCI1_RTS	SPI1_PCS1	ESAI_SDO2/ ESAI_SDI3	SDHC0_ DAT2	VIU_DATA4	DCU0_R1	
M1	15	PTC5		PTC5	RMII0_RXER/ MII0_RXER	SCI1_CTS	SPI1_PCS0	ESAI_SDO3/ ESAI_SDI2	SDHC0_ DAT3	VIU_DATA5	DCU0_G0	
N1	16	PTC6		PTC6	RMII0_TXD1/ MII0_TXD[1]		SPI1_SIN	ESAI_SDO5/ ESAI_SDI0	SDHC0_WP	VIU_DATA6	DCU0_G1	
N2	17	PTC7		PTC7	RMII0_TXD0/ MII0_TXD[0]		SPI1_SOUT	ESAI_SDO4/ ESAI_SDI1		VIU_DATA7	DCU0_B0	

364 MAP BGA	176 LQFP	Pin Name	Default	ALT0	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6	ALT7	EzPort
W15	76	PTE14		PTE14	DCU0_G1			LCD14				
L18	115	PTE15	RCON6	PTE15	DCU0_G2		RCON6	LCD15				
L20	116	PTE16	RCON7	PTE16	DCU0_G3		RCON7	LCD16				
K20	117	PTE17	RCON8	PTE17	DCU0_G4		RCON8	LCD17				
K19	118	PTE18	RCON9	PTE18	DCU0_G5		RCON9	LCD18				
K18	119	PTE19	RCON10	PTE19	DCU0_G6		RCON10	LCD19	I2C0_SCL			
A12	170	PTE20	RCON11	PTE20	DCU0_G7		RCON11	LCD20	I2C0_SDA		EWM_in	
V16	79	PTE21		PTE21	DCU0_B0			LCD21				
W17	84	PTE22		PTE22	DCU0_B1			LCD22				
J17	122	PTE23	RCON12	PTE23	DCU0_B2		RCON12	LCD23				
D19	134	PTE24	RCON13	PTE24	DCU0_B3		RCON13	LCD24				
C19	135	PTE25	RCON14	PTE25	DCU0_B4		RCON14	LCD25				
C20	137	PTE26	RCON15	PTE26	DCU0_B5		RCON15	LCD26				
B20	138	PTE27	RCON16	PTE27	DCU0_B6		RCON16	LCD27	I2C1_SCL			
K16	120	PTE28	RCON17	PTE28	DCU0_B7		RCON17	LCD28	I2C1_SDA		EWM_out	
V15	75	PTA7		PTA7	VIU_PIX_CLK							
T14	—	EXT_TAMPER0			EXT_TAMPER0							
U14	—	EXT_TAMPER1			EXT_TAMPER1							
T13	—	EXT_TAMPER2/EXT_WM0_TAMPER_IN			EXT_TAMPER2/EXT_WM0_TAMPER_IN							
U13	—	EXT_TAMPER3/EXT_WM0_TAMPER_OUT			EXT_TAMPER3/EXT_WM0_TAMPER_OUT							
U12	—	EXT_TAMPER4/EXT_WM1_TAMPER_IN			EXT_TAMPER4/EXT_WM1_TAMPER_IN							
U10	—	EXT_TAMPER5/EXT_WM1_TAMPER_OUT			EXT_TAMPER5/EXT_WM1_TAMPER_OUT							
G7	2	VDD			VDD							
J7	22	VDD			VDD							
L7	48	VDD			VDD							
H8	—	VDD			VDD							
K8	85	VDD			VDD							
M8	102	VDD			VDD							

364 MAP BGA	176 LQFP	Pin Name	Default	ALT0	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6	ALT7	EzPort
M18	—	VSS			VSS							
R2	—	VSS			VSS							
R18	—	VSS			VSS							
U7	—	VSS			VSS							
U19	—	VSS			VSS							
V13	—	VSS			VSS							
W6	—	VSS			VSS							
V17	—	VSS			VSS							
Y1	—	VSS			VSS							
Y20	—	VSS			VSS							
H19	—	VSS			VSS							
L19	—	VSS			VSS							
P19	—	VSS			VSS							
J5	—	SDRAMC_ VDD2P5			SDRAMC_ VDD2P5							
E6	—	SDRAMC_ VDD2P5			SDRAMC_ VDD2P5							
E10	—	SDRAMC_ VDD2P5			SDRAMC_ VDD2P5							
E4	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
D5	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
F5	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
H5	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
K5	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
E7	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
E9	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
D11	—	SDRAMC_ VDD1P5			SDRAMC_ VDD1P5							
K3	10	VDD33			VDD33							
N3	21	VDD33			VDD33							
V8	52	VDD33			VDD33							
C12	—	VDD33			VDD33							
C15	83	VDD33			VDD33							
U16	95	VDD33			VDD33							
K17	108	VDD33			VDD33							
N17	127	VDD33			VDD33							

Table 78. RGPIO versus Pins (continued)

RGPIO	In GPIO module	Corresponding Pin on the chip	IOMUX register name	IOMUX register address
RGPIO[1]	PORT0[1]	PTA8	IOMUXC_PTA8	40048004
RGPIO[2]	PORT0[2]	PTA9	IOMUXC_PTA9	40048008
RGPIO[3]	PORT0[3]	PTA10	IOMUXC_PTA10	4004800C
RGPIO[4]	PORT0[4]	PTA11	IOMUXC_PTA11	40048010
RGPIO[5]	PORT0[5]	PTA12	IOMUXC_PTA12	40048014
RGPIO[6]	PORT0[6]	PTA16	IOMUXC_PTA16	40048018
RGPIO[7]	PORT0[7]	PTA17	IOMUXC_PTA17	4004801C
RGPIO[8]	PORT0[8]	PTA18	IOMUXC_PTA18	40048020
RGPIO[9]	PORT0[9]	PTA19	IOMUXC_PTA19	40048024
RGPIO[10]	PORT0[10]	PTA20	IOMUXC_PTA20	40048028
RGPIO[11]	PORT0[11]	PTA21	IOMUXC_PTA21	4004802C
RGPIO[12]	PORT0[12]	PTA22	IOMUXC_PTA22	40048030
RGPIO[13]	PORT0[13]	PTA23	IOMUXC_PTA23	40048034
RGPIO[14]	PORT0[14]	PTA24	IOMUXC_PTA24	40048038
RGPIO[15]	PORT0[15]	PTA25	IOMUXC_PTA25	4004803C
RGPIO[16]	PORT0[16]	PTA26	IOMUXC_PTA26	40048040
RGPIO[17]	PORT0[17]	PTA27	IOMUXC_PTA27	40048044
RGPIO[18]	PORT0[18]	PTA28	IOMUXC_PTA28	40048048
RGPIO[19]	PORT0[19]	PTA29	IOMUXC_PTA29	4004804C
RGPIO[20]	PORT0[20]	PTA30	IOMUXC_PTA30	40048050
RGPIO[21]	PORT0[21]	PTA31	IOMUXC_PTA31	40048054
RGPIO[22]	PORT0[22]	PTB0	IOMUXC_PTB0	40048058
RGPIO[23]	PORT0[23]	PTB1	IOMUXC_PTB1	4004805C
RGPIO[24]	PORT0[24]	PTB2	IOMUXC_PTB2	40048060
RGPIO[25]	PORT0[25]	PTB3	IOMUXC_PTB3	40048064
RGPIO[26]	PORT0[26]	PTB4	IOMUXC_PTB4	40048068
RGPIO[27]	PORT0[27]	PTB5	IOMUXC_PTB5	4004806C
RGPIO[28]	PORT0[28]	PTB6	IOMUXC_PTB6	40048070
RGPIO[29]	PORT0[29]	PTB7	IOMUXC_PTB7	40048074
RGPIO[30]	PORT0[30]	PTB8	IOMUXC_PTB8	40048078
RGPIO[31]	PORT0[31]	PTB9	IOMUXC_PTB9	4004807C
RGPIO[32]	PORT1[0]	PTB10	IOMUXC_PTB10	40048080
RGPIO[33]	PORT1[1]	PTB11	IOMUXC_PTB11	40048084
RGPIO[34]	PORT1[2]	PTB12	IOMUXC_PTB12	40048088
RGPIO[35]	PORT1[3]	PTB13	IOMUXC_PTB13	4004808C
RGPIO[36]	PORT1[4]	PTB14	IOMUXC_PTB14	40048090
RGPIO[37]	PORT1[5]	PTB15	IOMUXC_PTB15	40048094
RGPIO[38]	PORT1[6]	PTB16	IOMUXC_PTB16	40048098
RGPIO[39]	PORT1[7]	PTB17	IOMUXC_PTB17	4004809C

Table continues on the next page...

Table 80. Power Supply Pins (continued)

Supply Rail Name	364 MAP BGA	176 LQFP (R-series ONLY)	Comment
VSS	A1, A20, B3, B5, B8, B11, B13, B16, B19, C2, D17, E5, E8, E11, E14, E19, F2, G8, G10, G12, G14, G17, H4, H7, H9, H11, H13, H19, J2, J8, J9, J10, J11, J12, J14, J18, K7, K9, K10, K11, K12, K13, L8, L9, L10, L11, L12, L14, L19, M2, M4, M7, M9, M10, M11, M12, M13, M18, N8, N10, N12, N14, P7, P9, P11, P13, P19, R2, R18, U7, U19, V11, V13, V17, W6, Y1, Y20	1, 13, 20, 25, 45, 67, 74, 82, 96, 107, 139, 144, 157, 175, 176, FLG	Ground. Connect "Flag pad (FLG)" to the internal GND plane with numerous vias—for both electrical and thermal purposes.
VSSA33_ADC	V2	32	ATD Ground
VSS12_AFE	R5	38	Video ADC Ground
VSSA33_AFE	V4	39	Video ADC Ground
VSS_KEL0	U11	66	Ground (VSS and VSS_KEL0 are NOT connected internally)

14 Functional Assignment Pins

14.1 Functional Assignment Pins

Table 81. Functional Assignment Pins

Signal Name	364 MAP BGA	176 LQFP (R-series ONLY)	Power Group	Pad Type	Default Mode (Reset)	Default Function	Input/ Output	Value
ADC0SE8	Y2	—	VDDA33_ADC	Analog	—	ADC0SE8	—	—
ADC0SE9	W2	—	VDDA33_ADC	Analog	—	ADC0SE9	—	—
ADC1SE8	W3	—	VDDA33_ADC	Analog	—	ADC1SE8	—	—
ADC1SE9	Y3	—	VDDA33_ADC	Analog	—	ADC1SE9	—	—
BCTRL	T2	26	VDDREG	Analog	—	BCTRL	—	—
DACO0	U1	29	VDDA33_ADC	Analog	—	DACO0	—	—
DACO1	U2	30	VDDA33_ADC	Analog	—	DACO1	—	—
DDR_A[0]	C7	—	SDRAMC_VDD2P5	DDR	—	DDR_A[0]	—	—

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Table 81. Functional Assignment Pins (continued)

Signal Name	364 MAP BGA	176 LQFP (R-series ONLY)	Power Group	Pad Type	Default Mode (Reset)	Default Function	Input/ Output	Value
PTD26	G16	—	VDD33	GPIO	ALT0	GPIO	Disabled	
PTD27	H16	—	VDD33	GPIO	ALT0	GPIO	Disabled	
PTD28	H17	—	VDD33	GPIO	ALT0	GPIO	Disabled	
PTD29	H18	—	VDD33	GPIO	ALT0	GPIO	Disabled	
PTD30	H20	—	VDD33	GPIO	ALT0	GPIO	Disabled	
PTD31	J20	—	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE0	N16	103	VDD33	GPIO	ALT2	BMODE1	Input	Disabled
PTE1	N18	104	VDD33	GPIO	ALT2	BMODE0	Input	Disabled
PTE2	N19	105	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE3	Y15	77	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE4	N20	106	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE5	T16	80	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE6	W16	81	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE7	M20	109	VDD33	GPIO	ALT3	RCON0	Input	Disabled
PTE8	M19	110	VDD33	GPIO	ALT3	RCON1	Input	Disabled
PTE9	M17	111	VDD33	GPIO	ALT3	RCON2	Input	Disabled
PTE10	M16	112	VDD33	GPIO	ALT3	RCON3	Input	Disabled
PTE11	L16	113	VDD33	GPIO	ALT3	RCON4	Input	Disabled
PTE12	L17	114	VDD33	GPIO	ALT3	RCON5	Input	Disabled
PTE13	Y16	78	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE14	W15	76	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE15	L18	115	VDD33	GPIO	ALT3	RCON6	Input	Disabled
PTE16	L20	116	VDD33	GPIO	ALT3	RCON7	Input	Disabled
PTE17	K20	117	VDD33	GPIO	ALT3	RCON8	Input	Disabled
PTE18	K19	118	VDD33	GPIO	ALT3	RCON9	Input	Disabled
PTE19	K18	119	VDD33	GPIO	ALT3	RCON10	Input	Disabled
PTE20	A12	170	VDD33	GPIO	ALT3	RCON11	Input	Disabled
PTE21	V16	79	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE22	W17	84	VDD33	GPIO	ALT0	GPIO	Disabled	
PTE23	J17	122	VDD33	GPIO	ALT3	RCON12	Input	Disabled
PTE24	D19	134	VDD33	GPIO	ALT3	RCON13	Input	Disabled
PTE25	C19	135	VDD33	GPIO	ALT3	RCON14	Input	Disabled
PTE26	C20	137	VDD33	GPIO	ALT3	RCON15	Input	Disabled
PTE27	B20	138	VDD33	GPIO	ALT3	RCON16	Input	Disabled
PTE28	K16	120	VDD33	GPIO	ALT3	RCON17	Input	Disabled
RESETB/ RESET_OUT	T4	28	VDD33	GPIO	—	RESETB/ RESET_OUT	—	—

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Table 82. Revision History (continued)

Rev. No.	Date	Substantial Changes
		Rewritten the EMC radiated emissions operating behaviors table In the GPIO DC Electrical characteristics table: • Vhys test condition changed • Added R_Keeper row In the DDR operating conditions, changed the Vddi Min and Max values In the Power sequencing table, rremoved some rows In the Power Supply section, removed LVDS and removed the note In the Recommended operating conditions table, updated min and max of VDD12_AFE and FA_VDD. Updated Min, Max, and Typ for VDD Added the Recommended Connections for Unused Analog Interfaces table In the 12-bit ADC Characteristics table, updated the typ and max values of TUE, DNL. INL, ZSE, FSE Added Receive and Transmit signal timing specifications for MII interfaces In the DSPI table, clarified the TBDs In PLL 4, PLL 5, PLL 6 electrical characteristics tables, added footnotes In the JTAG electrical table, clarified the TBDs In the pinouts section, added Special Signal table Added Power Supply pins section Added Functional Assignment section
Rev 6	Jan 2014	• Added QuadSPI electricals • Changed VBB references to VBAT • In the feature list, clarified that ECC supported for 8-bit mode only, not 16-bit. • Revised the part number format • Revised the field table • Added Absolute Maximum Rating table, which was madde non_cust in the previous version • In the Power Consumption Operating Behavior table, Revised min and max value of IDD_LPS3 and IDD_LPS2. Removed IDD_LPS1 row

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