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What is "[Embedded - Microcontrollers](#)"?

"[Embedded - Microcontrollers](#)" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "[Embedded - Microcontrollers](#)"

Details

Product Status	Active
Core Processor	ARM® Cortex®-M4
Core Size	32-Bit Single-Core
Speed	100MHz
Connectivity	CANbus, EBI/EMI, I ² C, IrDA, SD, SPI, UART/USART
Peripherals	DMA, I ² S, LVD, POR, PWM, WDT
Number of I/O	104
Program Memory Size	128KB (128K x 8)
Program Memory Type	FLASH
EEPROM Size	4K x 8
RAM Size	32K x 8
Voltage - Supply (Vcc/Vdd)	1.71V ~ 3.6V
Data Converters	A/D 46x16b; D/A 2x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	144-LBGA
Supplier Device Package	144-MAPBGA (13x13)
Purchase URL	https://www.e-xfl.com/product-detail/nxp-semiconductors/mk10dx128vmd10

3.4 Definition: Rating

A *rating* is a minimum or maximum value of a technical characteristic that, if exceeded, may cause permanent chip failure:

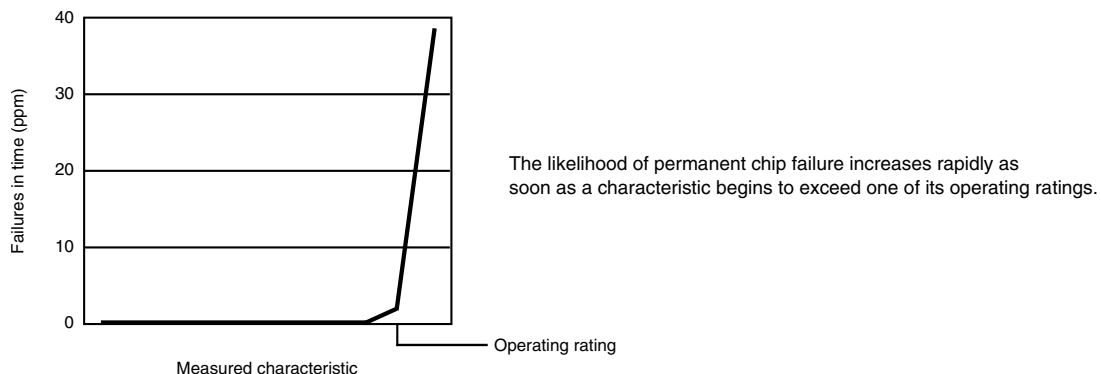
- *Operating ratings* apply during operation of the chip.
- *Handling ratings* apply when the chip is not powered.

3.4.1 Example

This is an example of an operating rating:

Symbol	Description	Min.	Max.	Unit
V _{DD}	1.0 V core supply voltage	−0.3	1.2	V

3.5 Result of exceeding a rating



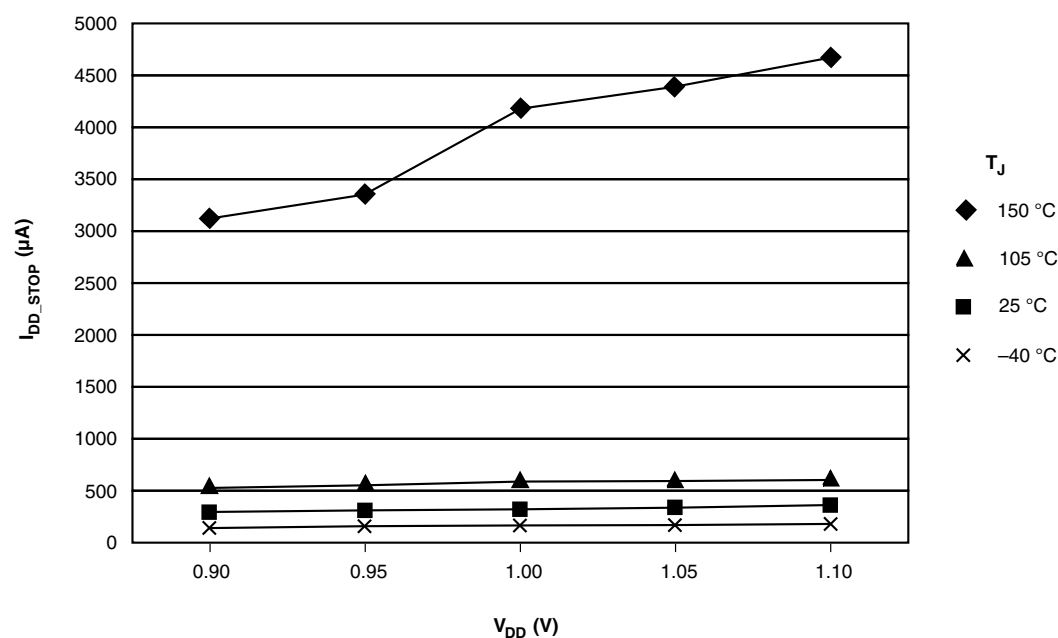
3.8.1 Example 1

This is an example of an operating behavior that includes a typical value:

Symbol	Description	Min.	Typ.	Max.	Unit
I_{WP}	Digital I/O weak pullup/pulldown current	10	70	130	μA

3.8.2 Example 2

This is an example of a chart that shows typical values for various voltage and temperature conditions:



3.9 Typical value conditions

Typical values assume you meet the following conditions (or other conditions as specified):

Symbol	Description	Value	Unit
T_A	Ambient temperature	25	°C
V_{DD}	3.3 V supply voltage	3.3	V

3. Specified according to Annex D of IEC Standard 61967-2, *Measurement of Radiated Emissions—TEM Cell and Wideband TEM Cell Method*

5.2.7 Designing with radiated emissions in mind

To find application notes that provide guidance on designing your system to minimize interference from radiated emissions:

1. Go to www.freescale.com.
2. Perform a keyword search for “EMC design.”

5.2.8 Capacitance attributes

Table 8. Capacitance attributes

Symbol	Description	Min.	Max.	Unit
C _{IN_A}	Input capacitance: analog pins	—	7	pF
C _{IN_D}	Input capacitance: digital pins	—	7	pF

5.3 Switching specifications

5.3.1 Device clock specifications

Table 9. Device clock specifications

Symbol	Description	Min.	Max.	Unit	Notes
Normal run mode					
f _{SYS}	System and core clock	—	100	MHz	
f _{BUS}	Bus clock	—	50	MHz	
FB_CLK	FlexBus clock	—	50	MHz	
f _{FLASH}	Flash clock	—	25	MHz	
f _{LPTMR}	LPTMR clock	—	25	MHz	
VLPR mode ¹					
f _{SYS}	System and core clock	—	4	MHz	
f _{BUS}	Bus clock	—	4	MHz	
FB_CLK	FlexBus clock	—	4	MHz	
f _{FLASH}	Flash clock	—	0.5	MHz	
f _{ERCLK}	External reference clock	—	16	MHz	
f _{LPTMR_pin}	LPTMR clock	—	25	MHz	
f _{LPTMR_ERCLK}	LPTMR external reference clock	—	16	MHz	

Table continues on the next page...

Table 9. Device clock specifications (continued)

Symbol	Description	Min.	Max.	Unit	Notes
$f_{\text{FlexCAN_ERCLK}}$	FlexCAN external reference clock	—	8	MHz	
$f_{\text{I2S_MCLK}}$	I2S master clock	—	12.5	MHz	
$f_{\text{I2S_BCLK}}$	I2S bit clock	—	4	MHz	

1. The frequency limitations in VLPR mode here override any frequency specification listed in the timing specification for any other module.

5.3.2 General switching specifications

These general purpose specifications apply to all signals configured for GPIO, UART, CAN, CMT, and I²C signals.

Table 10. General switching specifications

Symbol	Description	Min.	Max.	Unit	Notes
	GPIO pin interrupt pulse width (digital glitch filter disabled) — Synchronous path	1.5	—	Bus clock cycles	1, 2
	GPIO pin interrupt pulse width (digital glitch filter disabled, analog filter enabled) — Asynchronous path	100	—	ns	3
	GPIO pin interrupt pulse width (digital glitch filter disabled, analog filter disabled) — Asynchronous path	16	—	ns	3
	External reset pulse width (digital glitch filter disabled)	100	—	ns	3
	Mode select (EZP_CS) hold time after reset deassertion	2	—	Bus clock cycles	
	Port rise and fall time (high drive strength) - Slew disabled $1.71 \leq V_{\text{DD}} \leq 2.7\text{V}$ $2.7 \leq V_{\text{DD}} \leq 3.6\text{V}$ - Slew enabled $1.71 \leq V_{\text{DD}} \leq 2.7\text{V}$ $2.7 \leq V_{\text{DD}} \leq 3.6\text{V}$	— — — —	12 6 36 24	ns ns ns ns	4
	Port rise and fall time (low drive strength) - Slew disabled $1.71 \leq V_{\text{DD}} \leq 2.7\text{V}$ $2.7 \leq V_{\text{DD}} \leq 3.6\text{V}$ - Slew enabled $1.71 \leq V_{\text{DD}} \leq 2.7\text{V}$ $2.7 \leq V_{\text{DD}} \leq 3.6\text{V}$	— — — —	12 6 36 24	ns ns ns ns	5

6.4.1.2 Flash timing specifications — commands**Table 21. Flash command timing specifications**

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
t _{rd1blk256k}	Read 1s Block execution time 256 KB program/data flash	—	—	1.7	ms	
t _{rd1sec2k}	Read 1s Section execution time (flash sector)	—	—	60	μs	1
t _{pgmchk}	Program Check execution time	—	—	45	μs	1
t _{rdsrc}	Read Resource execution time	—	—	30	μs	1
t _{pgm4}	Program Longword execution time	—	65	145	μs	
t _{ersblk256k}	Erase Flash Block execution time 256 KB program/data flash	—	122	985	ms	2
t _{ersscr}	Erase Flash Sector execution time	—	14	114	ms	2
t _{pgmsec512}	Program Section execution time 512 B flash	—	2.4	—	ms	
t _{pgmsec1k}	1 KB flash	—	4.7	—	ms	
t _{pgmsec2k}	2 KB flash	—	9.3	—	ms	
t _{rd1all}	Read 1s All Blocks execution time	—	—	1.8	ms	
t _{rdonce}	Read Once execution time	—	—	25	μs	1
t _{pgmonce}	Program Once execution time	—	65	—	μs	
t _{ersall}	Erase All Blocks execution time	—	250	2000	ms	2
t _{vfykey}	Verify Backdoor Access Key execution time	—	—	30	μs	1
t _{swapx01}	Swap Control execution time control code 0x01	—	200	—	μs	
t _{swapx02}	control code 0x02	—	70	150	μs	
t _{swapx04}	control code 0x04	—	70	150	μs	
t _{swapx08}	control code 0x08	—	—	30	μs	
t _{pgmpart64k}	Program Partition for EEPROM execution time 64 KB FlexNVM	—	138	—	ms	
t _{pgmpart256k}	256 KB FlexNVM	—	145	—	ms	
t _{setramff}	Set FlexRAM Function execution time: Control Code 0xFF	—	70	—	μs	
t _{setram32k}	32 KB EEPROM backup	—	0.8	1.2	ms	
t _{setram64k}	64 KB EEPROM backup	—	1.3	1.9	ms	
t _{setram256k}	256 KB EEPROM backup	—	4.5	5.5	ms	
Byte-write to FlexRAM for EEPROM operation						
t _{eewr8bers}	Byte-write to erased FlexRAM location execution time	—	175	260	μs	3

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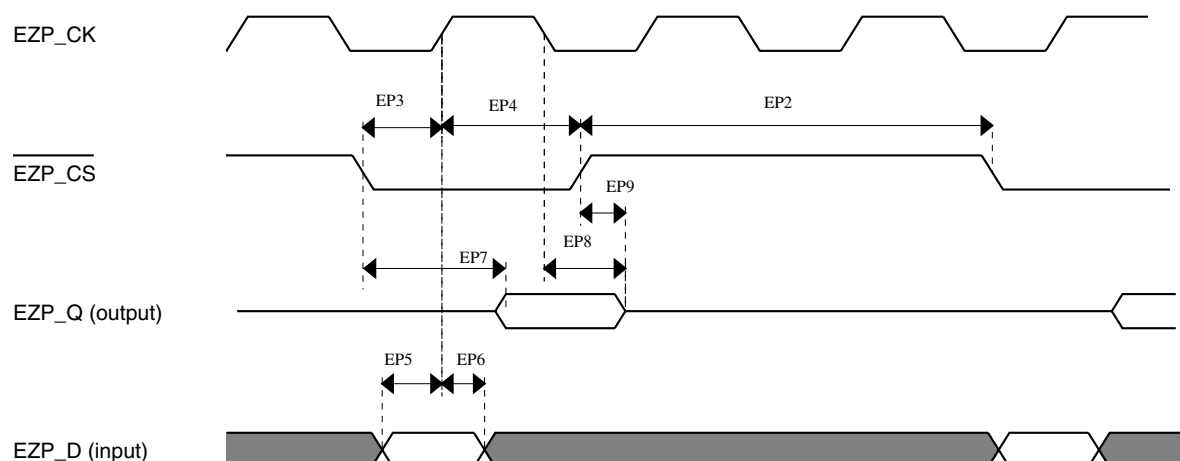


Figure 10. EzPort Timing Diagram

6.4.3 Flexbus Switching Specifications

All processor bus timings are synchronous; input setup/hold and output delay are given in respect to the rising edge of a reference clock, FB_CLK. The FB_CLK frequency may be the same as the internal system bus frequency or an integer divider of that frequency.

The following timing numbers indicate when data is latched or driven onto the external bus, relative to the Flexbus output clock (FB_CLK). All other timing relationships can be derived from these values.

Table 25. Flexbus limited voltage range switching specifications

Num	Description	Min.	Max.	Unit	Notes
	Operating voltage	2.7	3.6	V	
	Frequency of operation	—	FB_CLK	MHz	
FB1	Clock period	20	—	ns	
FB2	Address, data, and control output valid	—	11.5	ns	1
FB3	Address, data, and control output hold	0.5	—	ns	1
FB4	Data and $\overline{\text{FB_TA}}$ input setup	8.5	—	ns	2
FB5	Data and $\overline{\text{FB_TA}}$ input hold	0.5	—	ns	2

1. Specification is valid for all FB_AD[31:0], $\overline{\text{FB_BE/BWEn}}$, $\overline{\text{FB_CSn}}$, $\overline{\text{FB_OE}}$, FB_R/W, $\overline{\text{FB_TBST}}$, FB_TSI[1:0], FB_ALE, and $\overline{\text{FB_TS}}$.

Peripheral operating requirements and behaviors

2. Specification is valid for all FB_AD[31:0] and $\overline{\text{FB_TA}}$.

Table 26. Flexbus full voltage range switching specifications

Num	Description	Min.	Max.	Unit	Notes
	Operating voltage	1.71	3.6	V	
	Frequency of operation	—	FB_CLK	MHz	
FB1	Clock period	1/FB_CLK	—	ns	
FB2	Address, data, and control output valid	—	13.5	ns	1
FB3	Address, data, and control output hold	0	—	ns	1
FB4	Data and $\overline{\text{FB_TA}}$ input setup	13.7	—	ns	2
FB5	Data and $\overline{\text{FB_TA}}$ input hold	0.5	—	ns	2

1. Specification is valid for all FB_AD[31:0], $\overline{\text{FB_BE/BWEn}}$, $\overline{\text{FB_CSn}}$, $\overline{\text{FB_OE}}$, FB_R/W, $\overline{\text{FB_TBST}}$, FB_TSIz[1:0], FB_ALE, and $\overline{\text{FB_TS}}$.
2. Specification is valid for all FB_AD[31:0] and $\overline{\text{FB_TA}}$.

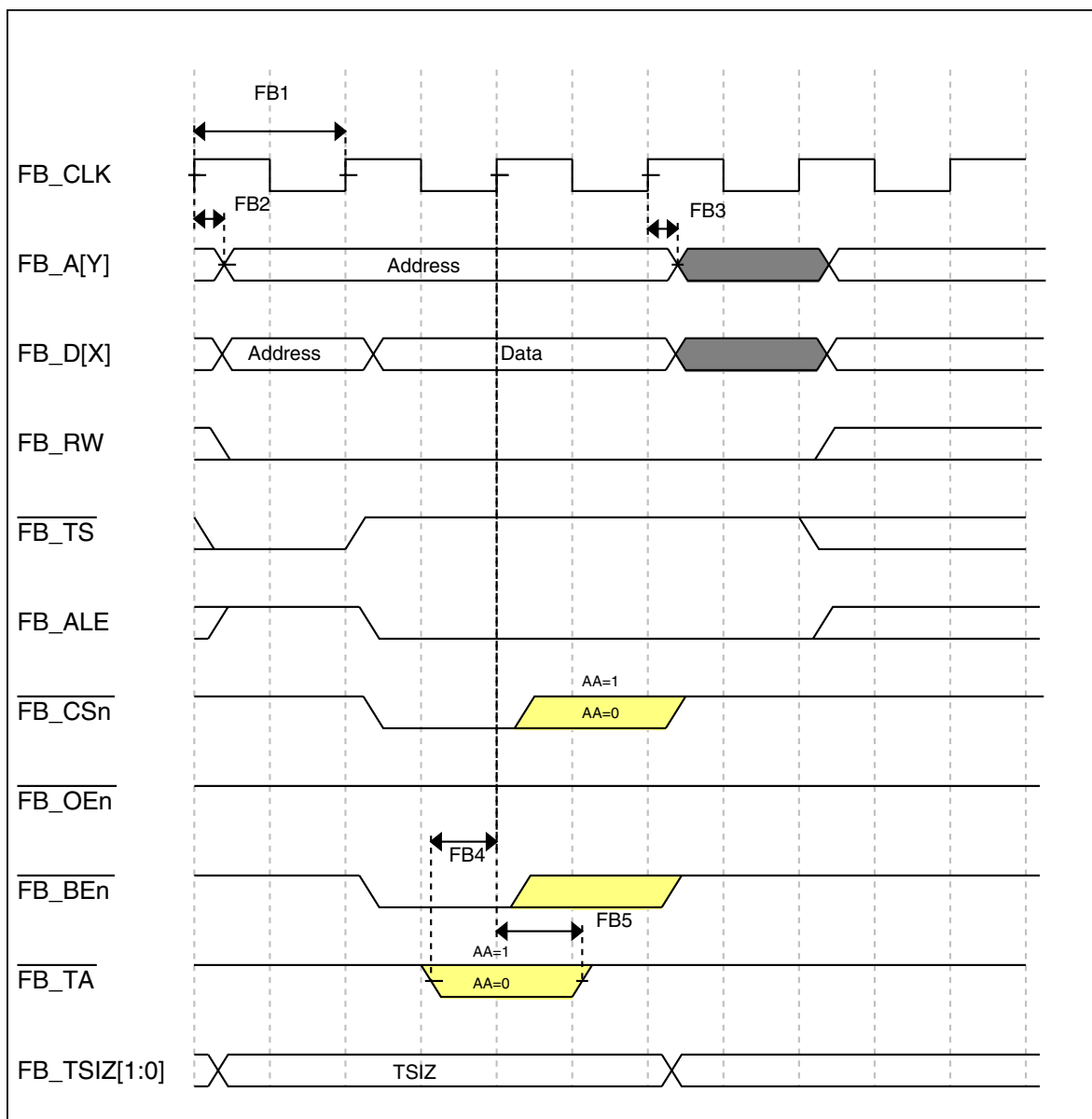


Figure 12. FlexBus write timing diagram

6.5 Security and integrity modules

There are no specifications necessary for the device's security and integrity modules.

6.6 Analog

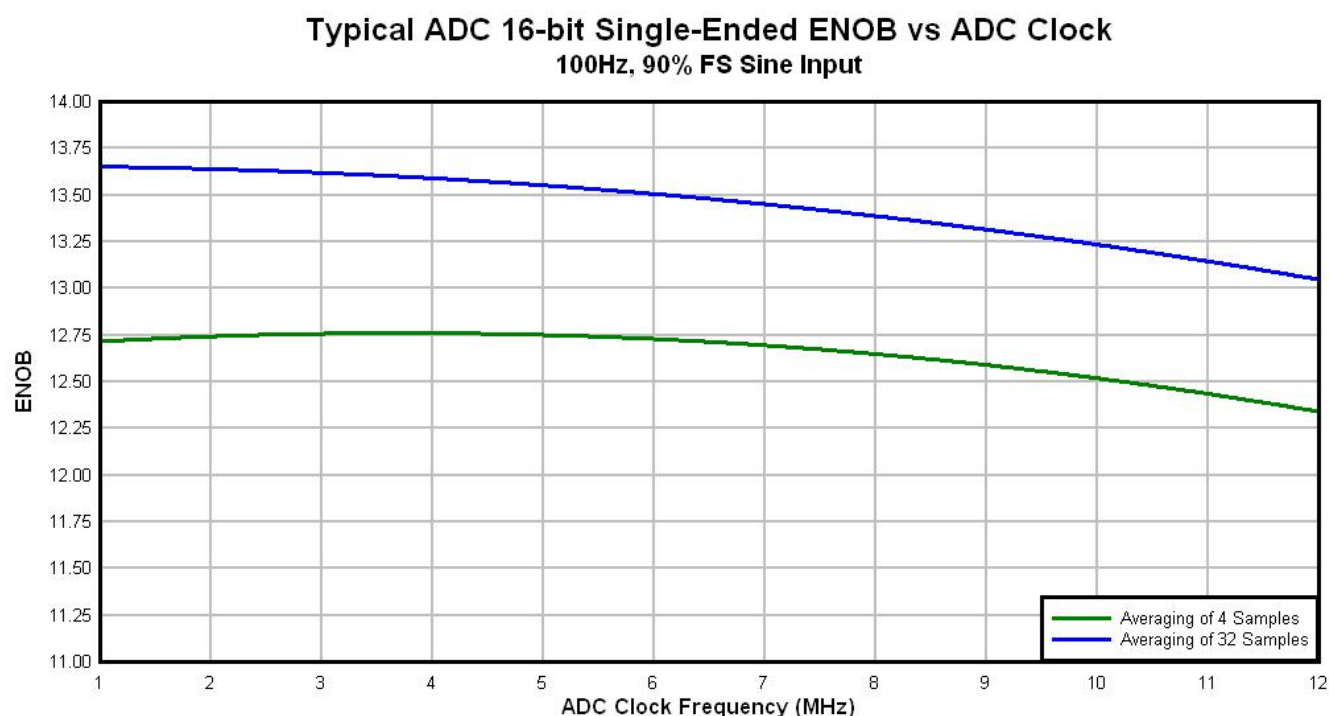


Figure 15. Typical ENOB vs. ADC_CLK for 16-bit single-ended mode

6.6.1.3 16-bit ADC with PGA operating conditions

Table 29. 16-bit ADC with PGA operating conditions

Symbol	Description	Conditions	Min.	Typ. ¹	Max.	Unit	Notes
V _{DDA}	Supply voltage	Absolute	1.71	—	3.6	V	
V _{REFPGA}	PGA ref voltage		V _{REF_OU} T	V _{REF_OU} T	V _{REF_OU} T	V	2, 3
V _{ADIN}	Input voltage		V _{SSA}	—	V _{DDA}	V	
V _{CM}	Input Common Mode range		V _{SSA}	—	V _{DDA}	V	
R _{PGAD}	Differential input impedance	Gain = 1, 2, 4, 8 Gain = 16, 32 Gain = 64	— — —	128 64 32	— — —	kΩ	IN+ to IN- ⁴
R _{AS}	Analog source resistance		—	100	—	Ω	5
T _S	ADC sampling time		1.25	—	—	μs	6

Table continues on the next page...

Table 29. 16-bit ADC with PGA operating conditions (continued)

Symbol	Description	Conditions	Min.	Typ. ¹	Max.	Unit	Notes
C _{rate}	ADC conversion rate	≤ 13 bit modes No ADC hardware averaging Continuous conversions enabled Peripheral clock = 50 MHz	18.484	—	450	Ksps	7
		16 bit modes No ADC hardware averaging Continuous conversions enabled Peripheral clock = 50 MHz	37.037	—	250	Ksps	8

1. Typical values assume V_{DDA} = 3.0 V, Temp = 25°C, f_{ADCK} = 6 MHz unless otherwise stated. Typical values are for reference only and are not tested in production.
2. ADC must be configured to use the internal voltage reference (VREF_OUT)
3. PGA reference is internally connected to the VREF_OUT pin. If the user wishes to drive VREF_OUT with a voltage other than the output of the VREF module, the VREF module must be disabled.
4. For single ended configurations the input impedance of the driven input is R_{PGAD}/2
5. The analog source resistance (R_{AS}), external to MCU, should be kept as minimum as possible. Increased R_{AS} causes drop in PGA gain without affecting other performances. This is not dependent on ADC clock frequency.
6. The minimum sampling time is dependent on input signal frequency and ADC mode of operation. A minimum of 1.25μs time should be allowed for F_{in}=4 kHz at 16-bit differential mode. Recommended ADC setting is: ADLSMP=1, ADLSTS=2 at 8 MHz ADC clock.
7. ADC clock = 18 MHz, ADLSMP = 1, ADLST = 00, ADHSC = 1
8. ADC clock = 12 MHz, ADLSMP = 1, ADLST = 01, ADHSC = 1

6.6.1.4 16-bit ADC with PGA characteristics with Chop enabled (ADC_PGA[PGACHPb] =0)

Table 30. 16-bit ADC with PGA characteristics

Symbol	Description	Conditions	Min.	Typ. ¹	Max.	Unit	Notes
I _{DDA_PGA}	Supply current	Low power (ADC_PGA[PGALPb]=0)	—	420	644	μA	2
I _{DC_PGA}	Input DC current		$\frac{2}{R_{PGAD}} \left(\frac{(V_{REFPGA} \times 0.583) - V_{CM}}{(Gain+1)} \right)$			A	3
		Gain =1, V _{REFPGA} =1.2V, V _{CM} =0.5V	—	1.54	—	μA	
		Gain =64, V _{REFPGA} =1.2V, V _{CM} =0.1V	—	0.57	—	μA	

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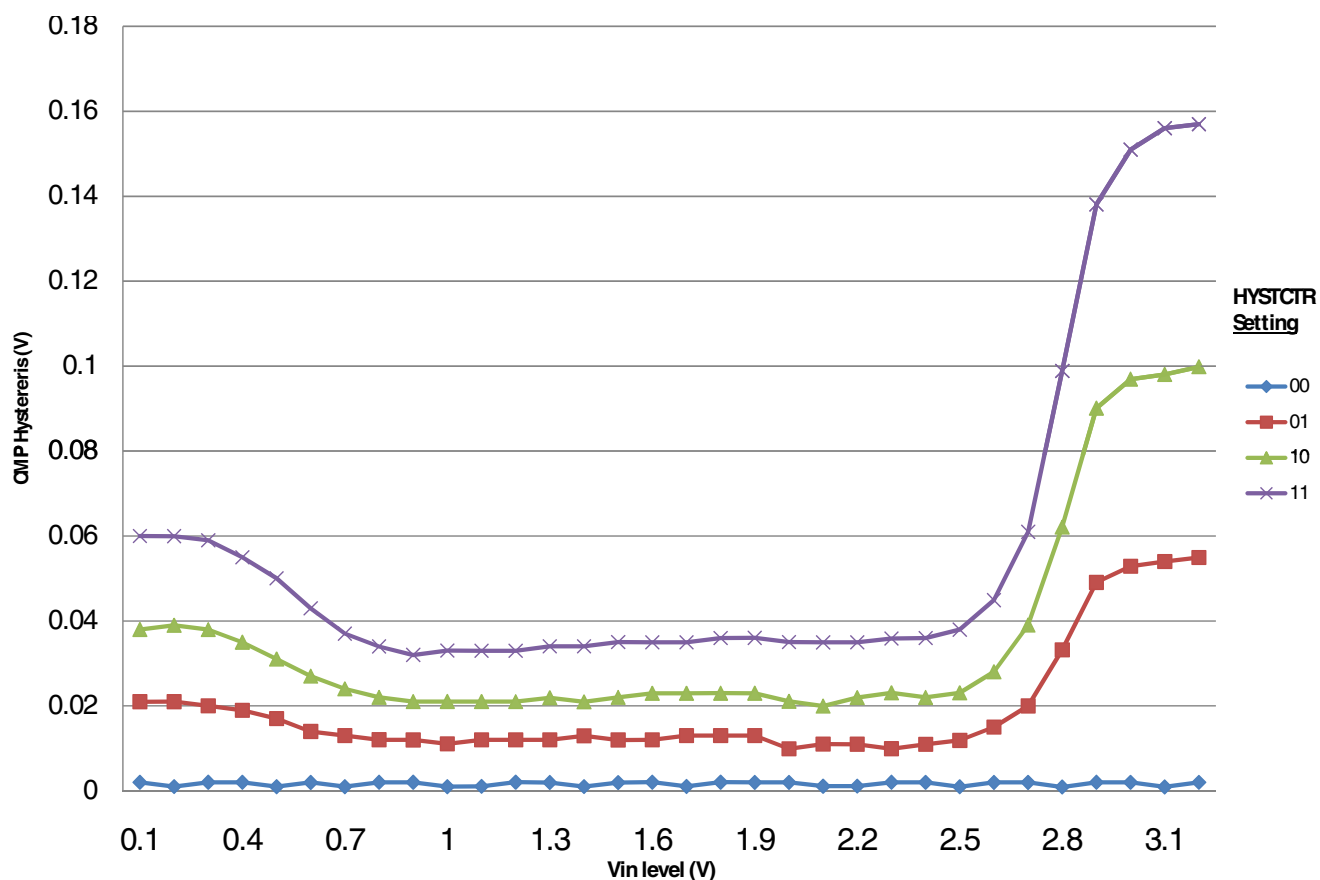


Figure 17. Typical hysteresis vs. Vin level (VDD=3.3V, PMODE=1)

6.6.3 12-bit DAC electrical characteristics

6.6.3.1 12-bit DAC operating requirements

Table 32. 12-bit DAC operating requirements

Symbol	Description	Min.	Max.	Unit	Notes
V_{DDA}	Supply voltage	1.71	3.6	V	
V_{DACR}	Reference voltage	1.13	3.6	V	1
T_A	Temperature	Operating temperature range of the device		°C	
C_L	Output load capacitance	—	100	pF	2
I_L	Output load current	—	1	mA	

1. The DAC reference can be selected to be V_{DDA} or the voltage output of the VREF module (VREF_OUT)
2. A small load capacitance (47 pF) can improve the bandwidth performance of the DAC

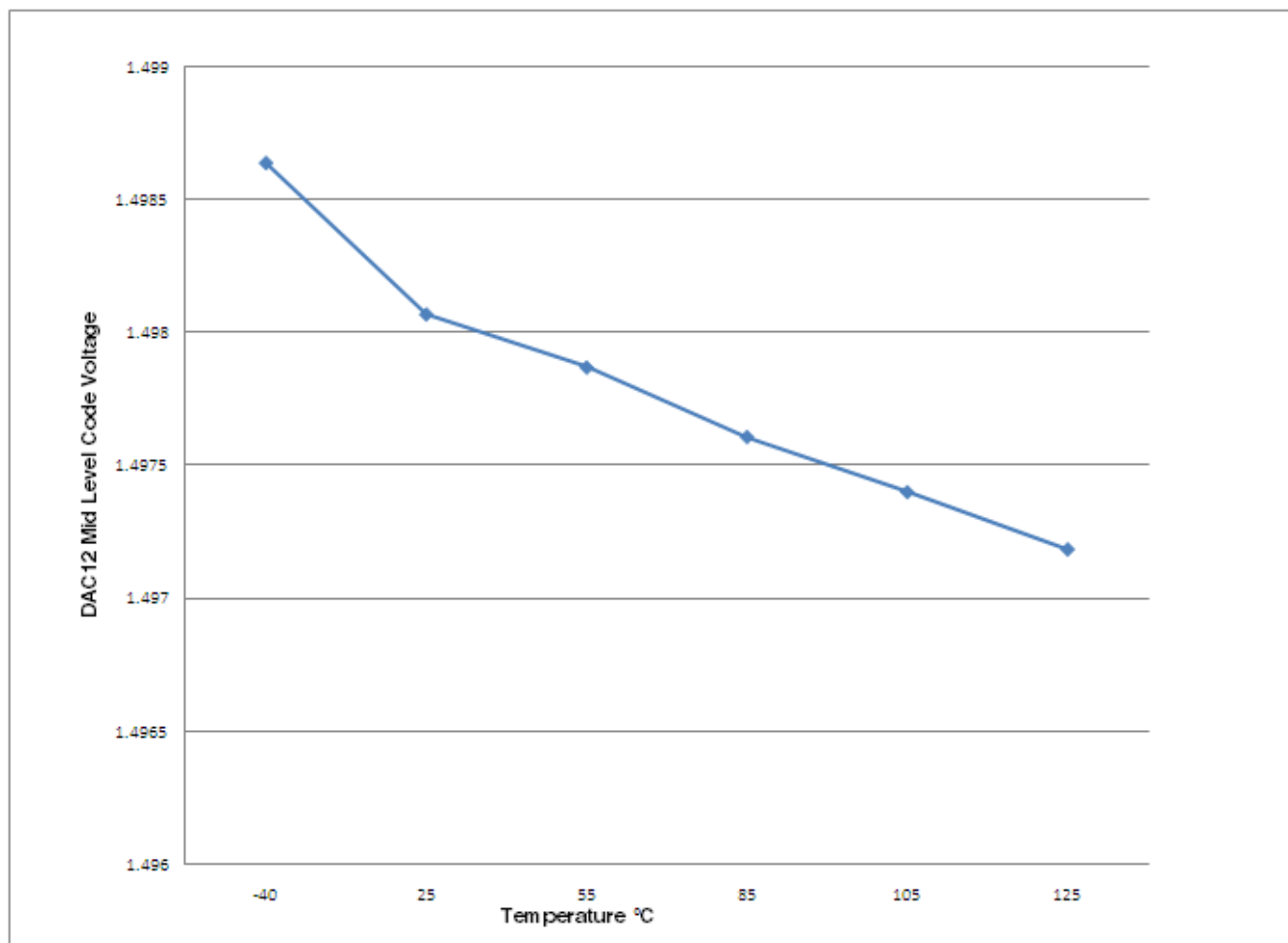


Figure 19. Offset at half scale vs. temperature

6.6.4 Voltage reference electrical specifications

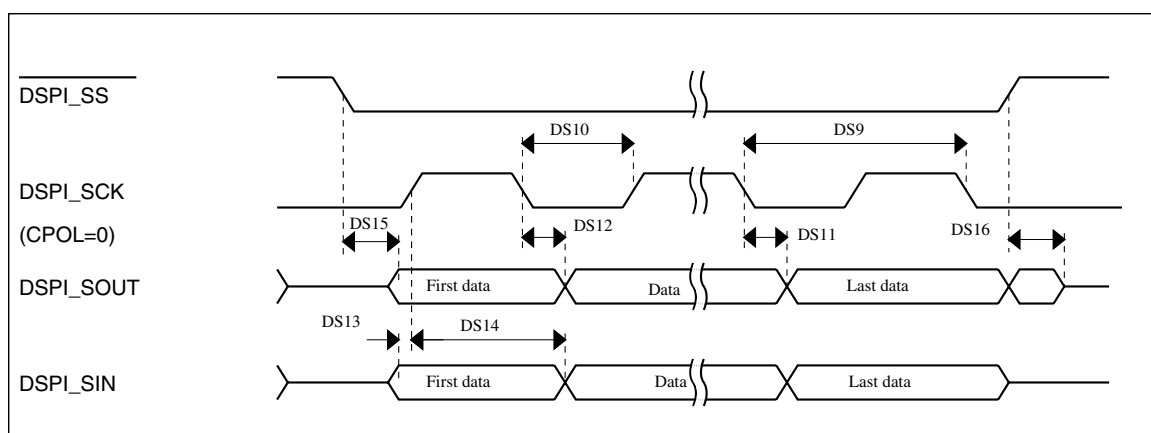
Table 34. VREF full-range operating requirements

Symbol	Description	Min.	Max.	Unit	Notes
V _{DDA}	Supply voltage	1.71	3.6	V	
T _A	Temperature	Operating temperature range of the device		°C	
C _L	Output load capacitance	100		nF	1, 2

1. C_L must be connected to VREF_OUT if the VREF_OUT functionality is being used for either an internal or external reference.
2. The load capacitance should not exceed +/-25% of the nominal specified C_L value over the operating temperature range of the device.

Table 39. Slave mode DSPI timing (limited voltage range)

Num	Description	Min.	Max.	Unit
	Operating voltage	2.7	3.6	V
	Frequency of operation		12.5	MHz
DS9	DSPI_SCK input cycle time	$4 \times t_{BUS}$	—	ns
DS10	DSPI_SCK input high/low time	$(t_{SCK}/2) - 2$	$(t_{SCK}/2) + 2$	ns
DS11	DSPI_SCK to DSPI_SOUT valid	—	20	ns
DS12	DSPI_SCK to DSPI_SOUT invalid	0	—	ns
DS13	DSPI_SIN to DSPI_SCK input setup	2	—	ns
DS14	DSPI_SCK to DSPI_SIN input hold	7	—	ns
DS15	DSPI_SS active to DSPI_SOUT driven	—	14	ns </td
DS16	DSPI_SS inactive to DSPI_SOUT not driven	—	14	ns

**Figure 21. DSPI classic SPI timing — slave mode**

6.8.3 DSPI switching specifications (full voltage range)

The DMA Serial Peripheral Interface (DSPI) provides a synchronous serial bus with master and slave operations. Many of the transfer attributes are programmable. The tables below provides DSPI timing characteristics for classic SPI timing modes. Refer to the DSPI chapter of the Reference Manual for information on the modified transfer formats used for communicating with slower peripheral devices.

Table 40. Master mode DSPI timing (full voltage range)

Num	Description	Min.	Max.	Unit	Notes
	Operating voltage	1.71	3.6	V	1
	Frequency of operation	—	12.5	MHz	
DS1	DSPI_SCK output cycle time	$4 \times t_{BUS}$	—	ns	

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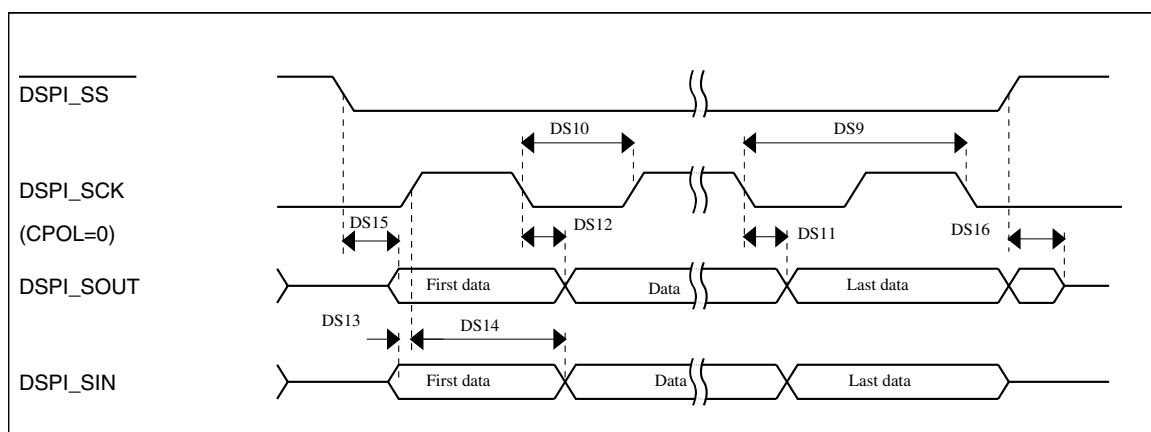


Figure 23. DSPI classic SPI timing — slave mode

6.8.4 I²C switching specifications

See [General switching specifications](#).

6.8.5 UART switching specifications

See [General switching specifications](#).

6.8.6 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.

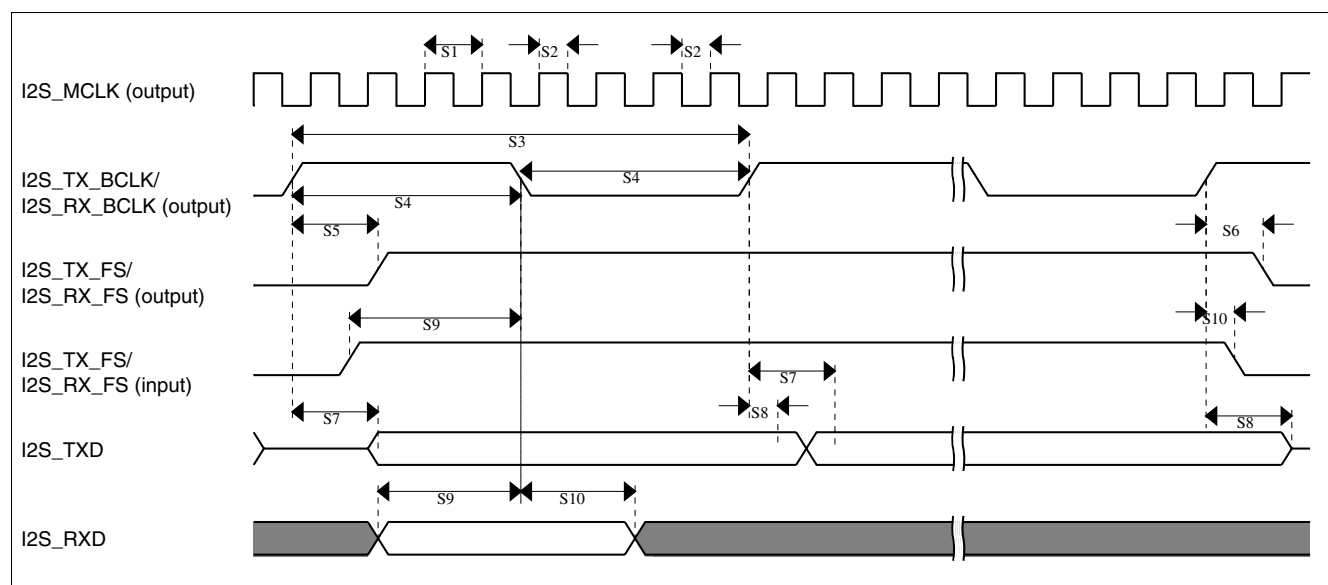
Table 42. SDHC switching specifications

Num	Symbol	Description	Min.	Max.	Unit
Card input clock					
SD1	fpp	Clock frequency (low speed)	0	400	kHz
	fpp	Clock frequency (SD\SDIO full speed)	0	25	MHz
	fpp	Clock frequency (MMC full speed)	0	20	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)					

Table continues on the next page...

Table 43. I2S/SAI master mode timing in Normal Run, Wait and Stop modes (limited voltage range)

Num.	Characteristic	Min.	Max.	Unit
	Operating voltage	2.7	3.6	V
S1	I2S_MCLK cycle time	40	—	ns
S2	I2S_MCLK pulse width high/low	45%	55%	MCLK period
S3	I2S_TX_BCLK/I2S_RX_BCLK cycle time (output)	80	—	ns
S4	I2S_TX_BCLK/I2S_RX_BCLK pulse width high/low	45%	55%	BCLK period
S5	I2S_TX_BCLK/I2S_RX_BCLK to I2S_TX_FS/ I2S_RX_FS output valid	—	15	ns
S6	I2S_TX_BCLK/I2S_RX_BCLK to I2S_TX_FS/ I2S_RX_FS output invalid	0	—	ns
S7	I2S_TX_BCLK to I2S_TXD valid	—	15	ns
S8	I2S_TX_BCLK to I2S_TXD invalid	0	—	ns
S9	I2S_RXD/I2S_RX_FS input setup before I2S_RX_BCLK	15	—	ns
S10	I2S_RXD/I2S_RX_FS input hold after I2S_RX_BCLK	0	—	ns

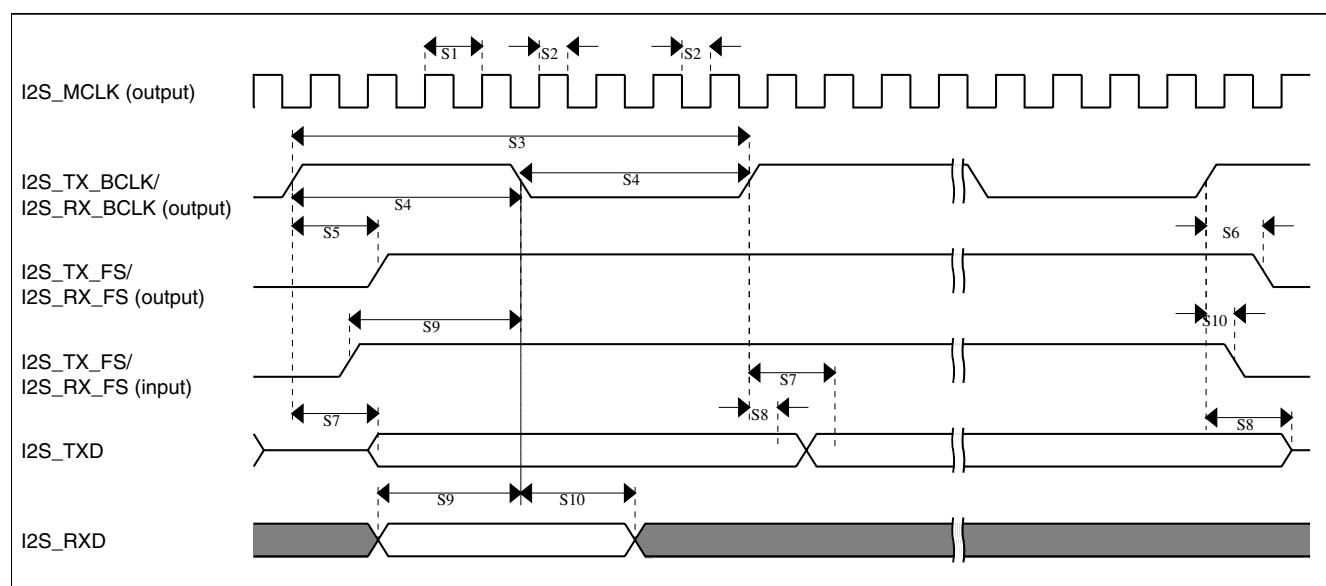
**Figure 25. I2S/SAI timing — master modes****Table 44. I2S/SAI slave mode timing in Normal Run, Wait and Stop modes (limited voltage range)**

Num.	Characteristic	Min.	Max.	Unit
	Operating voltage	2.7	3.6	V
S11	I2S_TX_BCLK/I2S_RX_BCLK cycle time (input)	80	—	ns
S12	I2S_TX_BCLK/I2S_RX_BCLK pulse width high/low (input)	45%	55%	MCLK period

Table continues on the next page...

Table 45. I2S/SAI master mode timing in Normal Run, Wait and Stop modes (full voltage range) (continued)

Num.	Characteristic	Min.	Max.	Unit
S1	I2S_MCLK cycle time	40	—	ns
S2	I2S_MCLK pulse width high/low	45%	55%	MCLK period
S3	I2S_TX_BCLK/I2S_RX_BCLK cycle time (output)	80	—	ns
S4	I2S_TX_BCLK/I2S_RX_BCLK pulse width high/low	45%	55%	BCLK period
S5	I2S_TX_BCLK/I2S_RX_BCLK to I2S_TX_FS/ I2S_RX_FS output valid	—	15	ns
S6	I2S_TX_BCLK/I2S_RX_BCLK to I2S_TX_FS/ I2S_RX_FS output invalid	-1.0	—	ns
S7	I2S_TX_BCLK to I2S_TXD valid	—	15	ns
S8	I2S_TX_BCLK to I2S_TXD invalid	0	—	ns
S9	I2S_RXD/I2S_RX_FS input setup before I2S_RX_BCLK	20.5	—	ns
S10	I2S_RXD/I2S_RX_FS input hold after I2S_RX_BCLK	0	—	ns

**Figure 27. I2S/SAI timing — master modes****Table 46. I2S/SAI slave mode timing in Normal Run, Wait and Stop modes (full voltage range)**

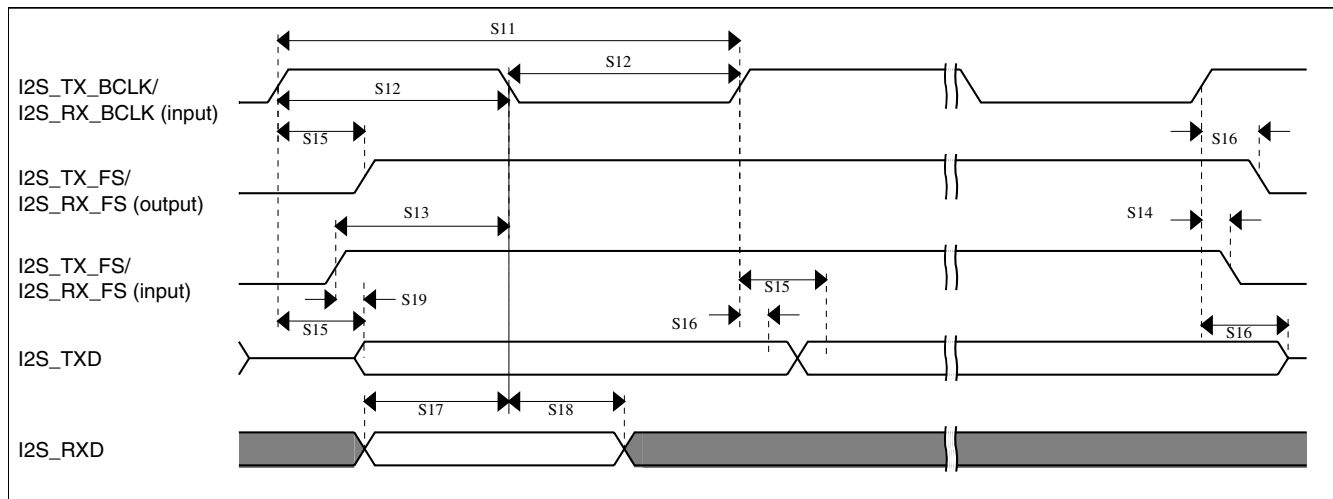
Num.	Characteristic	Min.	Max.	Unit
	Operating voltage	1.71	3.6	V
S11	I2S_TX_BCLK/I2S_RX_BCLK cycle time (input)	80	—	ns
S12	I2S_TX_BCLK/I2S_RX_BCLK pulse width high/low (input)	45%	55%	MCLK period

Table continues on the next page...

Table 48. I2S/SAI slave mode timing in VLPR, VLPW, and VLPS modes (full voltage range) (continued)

Num.	Characteristic	Min.	Max.	Unit
S13	I2S_TX_FS/I2S_RX_FS input setup before I2S_TX_BCLK/I2S_RX_BCLK	30	—	ns
S14	I2S_TX_FS/I2S_RX_FS input hold after I2S_TX_BCLK/I2S_RX_BCLK	3	—	ns
S15	I2S_TX_BCLK to I2S_TXD/I2S_TX_FS output valid	—	63	ns
S16	I2S_TX_BCLK to I2S_TXD/I2S_TX_FS output invalid	0	—	ns
S17	I2S_RXD setup before I2S_RX_BCLK	30	—	ns
S18	I2S_RXD hold after I2S_RX_BCLK	2	—	ns
S19	I2S_TX_FS input assertion to I2S_TXD output valid ¹	—	72	ns

1. Applies to first bit in each frame and only if the TCR4[FSE] bit is clear

**Figure 30. I2S/SAI timing — slave modes**

6.9 Human-machine interfaces (HMI)

6.9.1 TSI electrical specifications

Table 49. TSI electrical specifications

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
V _{DDTSI}	Operating voltage	1.71	—	3.6	V	
C _{ELE}	Target electrode capacitance range	1	20	500	pF	1
f _{REFmax}	Reference oscillator frequency	—	8	15	MHz	2, 3
f _{ELEmax}	Electrode oscillator frequency	—	1	1.8	MHz	2, 4

Table continues on the next page...

Pinout

144 LQFP	144 MAP BGA	Pin Name	Default	ALT0	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6	ALT7	EzPort
36	J3	ADC0_SE16/ CMP1_IN2/ ADC0_SE21	ADC0_SE16/ CMP1_IN2/ ADC0_SE21	ADC0_SE16/ CMP1_IN2/ ADC0_SE21								
37	M3	VREF_OUT/ CMP1_IN5/ CMP0_IN5/ ADC1_SE18	VREF_OUT/ CMP1_IN5/ CMP0_IN5/ ADC1_SE18	VREF_OUT/ CMP1_IN5/ CMP0_IN5/ ADC1_SE18								
38	L3	DAC0_OUT/ CMP1_IN3/ ADC0_SE23	DAC0_OUT/ CMP1_IN3/ ADC0_SE23	DAC0_OUT/ CMP1_IN3/ ADC0_SE23								
39	L4	DAC1_OUT/ CMP0_IN4/ CMP2_IN3/ ADC1_SE23	DAC1_OUT/ CMP0_IN4/ CMP2_IN3/ ADC1_SE23	DAC1_OUT/ CMP0_IN4/ CMP2_IN3/ ADC1_SE23								
40	M7	XTAL32	XTAL32	XTAL32								
41	M6	EXTAL32	EXTAL32	EXTAL32								
42	L6	VBAT	VBAT	VBAT								
43	—	VDD	VDD	VDD								
44	—	VSS	VSS	VSS								
45	M4	PTE24	ADC0_SE17	ADC0_SE17	PTE24	CAN1_TX	UART4_TX			EWM_OUT_b		
46	K5	PTE25	ADC0_SE18	ADC0_SE18	PTE25	CAN1_RX	UART4_RX			EWM_IN		
47	K4	PTE26	DISABLED		PTE26		UART4_CTS_b			RTC_CLKOUT		
48	J4	PTE27	DISABLED		PTE27		UART4_RTS_b					
49	H4	PTE28	DISABLED		PTE28							
50	J5	PTA0	JTAG_TCLK/ SWD_CLK/ EZP_CLK	TSIO_CH1	PTA0	UART0_CTS_b/ UART0_COL_b	FTM0_CH5				JTAG_TCLK/ SWD_CLK	EZP_CLK
51	J6	PTA1	JTAG_TDI/ EZP_DI	TSIO_CH2	PTA1	UART0_RX	FTM0_CH6				JTAG_TDI	EZP_DI
52	K6	PTA2	JTAG_TDO/ TRACE_SWO/ EZP_DO	TSIO_CH3	PTA2	UART0_TX	FTM0_CH7				JTAG_TDO/ TRACE_SWO	EZP_DO
53	K7	PTA3	JTAG_TMS/ SWD_DIO	TSIO_CH4	PTA3	UART0_RTS_b	FTM0_CH0				JTAG_TMS/ SWD_DIO	
54	L7	PTA4/ LLWU_P3	NMI_b/ EZP_CS_b	TSIO_CH5	PTA4/ LLWU_P3		FTM0_CH1				NMI_b	EZP_CS_b
55	M8	PTA5	DISABLED		PTA5		FTM0_CH2		CMP2_OUT	I2S0_TX_BCLK	JTAG_TRST_b	
56	E7	VDD	VDD	VDD								
57	G7	VSS	VSS	VSS								
58	J7	PTA6	DISABLED		PTA6		FTM0_CH3				TRACE_CLKOUT	
59	J8	PTA7	ADC0_SE10	ADC0_SE10	PTA7		FTM0_CH4				TRACE_D3	

Revision History

	1	2	3	4	5	6	7	8	9	10	11	12	
A	PTD7	PTD6/ LLWU_P15	PTD5	PTD4/ LLWU_P14	PTD0/ LLWU_P12	PTC16	PTC12	PTC8	PTC4/ LLWU_P8	NC	PTC3/ LLWU_P7	PTC2	A
B	PTD12	PTD11	PTD10	PTD3	PTC19	PTC15	PTC11/ LLWU_P11	PTC7	PTD9	NC	PTC1/ LLWU_P6	PTC0	B
C	PTD15	PTD14	PTD13	PTD2/ LLWU_P13	PTC18	PTC14	PTC10	PTC6/ LLWU_P10	PTD8	NC	PTB23	PTB22	C
D	PTE2/ LLWU_P1	PTE1/ LLWU_P0	PTE0	PTD1	PTC17	PTC13	PTC9	PTC5/ LLWU_P9	PTB21	PTB20	PTB19	PTB18	D
E	PTE6	PTE5	PTE4/ LLWU_P2	PTE3	VDD	VDD	VDD	VDD	PTB17	PTB16	PTB11	PTB10	E
F	PTE10	PTE9	PTE8	PTE7	VDD	VSS	VSS	VDD	PTB9	PTB8	PTB7	PTB6	F
G	PTE18	PTE19	PTE12	PTE11	VREFH	VREFL	VSS	VSS	PTB5	PTB4	PTB3	PTB2	G
H	PTE16	PTE17	VSS	PTE28	VDDA	VSSA	VSS	VSS	PTB1	PTB0/ LLWU_P5	PTA29	PTA28	H
J	ADC0_DP1	ADC0_DM1	ADC0_SE16/ CMP1_IN2/ ADC0_SE21	PTE27	PTA0	PTA1	PTA6	PTA7	PTA13/ LLWU_P4	PTA27	PTA26	PTA25	J
K	ADC1_DP1	ADC1_DM1	ADC1_SE16/ CMP2_IN2/ ADC0_SE22	PTE26	PTE25	PTA2	PTA3	PTA8	PTA12	PTA16	PTA17	PTA24	K
L	PGA0_DP/ ADC0_DP0/ ADC1_DP3	PGA0_DM/ ADC0_DM0/ ADC1_DM3	DAC0_OUT/ CMP1_IN3/ ADC0_SE23	DAC1_OUT/ CMP0_IN4/ CMP2_IN3/ ADC1_SE23	RTC _WAKEUP_B	VBAT	PTA4/ LLWU_P3	PTA9	PTA11	PTA14	PTA15	RESET_b	L
M	PGA1_DP/ ADC1_DP0/ ADC0_DP3	PGA1_DM/ ADC1_DM0/ ADC0_DM3	VREF_OUT/ CMP1_IN5/ CMP0_IN5/ ADC1_SE18	PTE24	NC	EXTAL32	XTAL32	PTA5	PTA10	VSS	PTA19	PTA18	M
	1	2	3	4	5	6	7	8	9	10	11	12	

Figure 32. K10 144 MAPBGA Pinout Diagram

9 Revision History

The following table provides a revision history for this document.

Table 50. Revision History

Rev. No.	Date	Substantial Changes
1	6/2012	Initial public revision
2	12/2012	Replaced TBDs throughout.

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