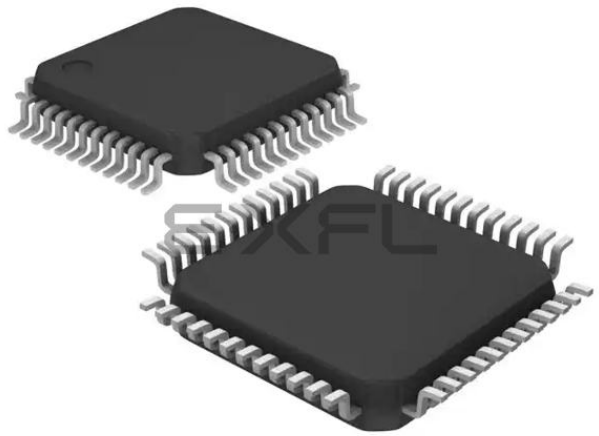

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	ARM® Cortex®-M0+
Core Size	32-Bit Single-Core
Speed	75MHz
Connectivity	CANbus, I²C, SPI, UART/USART
Peripherals	DMA, LVD, POR, WDT
Number of I/O	40
Program Memory Size	128KB (128K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	16K x 8
Voltage - Supply (Vcc/Vdd)	1.71V ~ 3.6V
Data Converters	A/D 2x16b; D/A 1x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 105°C (TA)
Mounting Type	Surface Mount
Package / Case	48-LQFP
Supplier Device Package	48-LQFP (7x7)
Purchase URL	https://www.e-xfl.com/product-detail/nxp-semiconductors/mkv11z128vlf7

Table of Contents

1 Ratings

1.1 Thermal handling ratings

Symbol	Description	Min.	Max.	Unit	Notes
T_{STG}	Storage temperature	–55	150	°C	1
T_{SDR}	Solder temperature, lead-free	—	260	°C	2

1. Determined according to JEDEC Standard JESD22-A103, *High Temperature Storage Life*.
2. Determined according to IPC/JEDEC Standard J-STD-020, *Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices*.

1.2 Moisture handling ratings

Symbol	Description	Min.	Max.	Unit	Notes
MSL	Moisture sensitivity level	—	3	—	1

1. Determined according to IPC/JEDEC Standard J-STD-020, *Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices*.

1.3 ESD handling ratings

Symbol	Description	Min.	Max.	Unit	Notes
V_{HBM}	Electrostatic discharge voltage, human-body model	-2000	+2000	V	1
V_{CDM}	Electrostatic discharge voltage, charged-device model	-500	+500	V	2
I_{LAT}	Latch-up current at ambient temperature of 105 °C	-100	+100	mA	

1. Determined according to JEDEC Standard JESD22-A114, *Electrostatic Discharge (ESD) Sensitivity Testing Human Body Model (HBM)*.
2. Determined according to JEDEC Standard JESD22-C101, *Field-Induced Charged-Device Model Test Method for Electrostatic-Discharge-Withstand Thresholds of Microelectronic Components*.

1.4 Voltage and current operating ratings

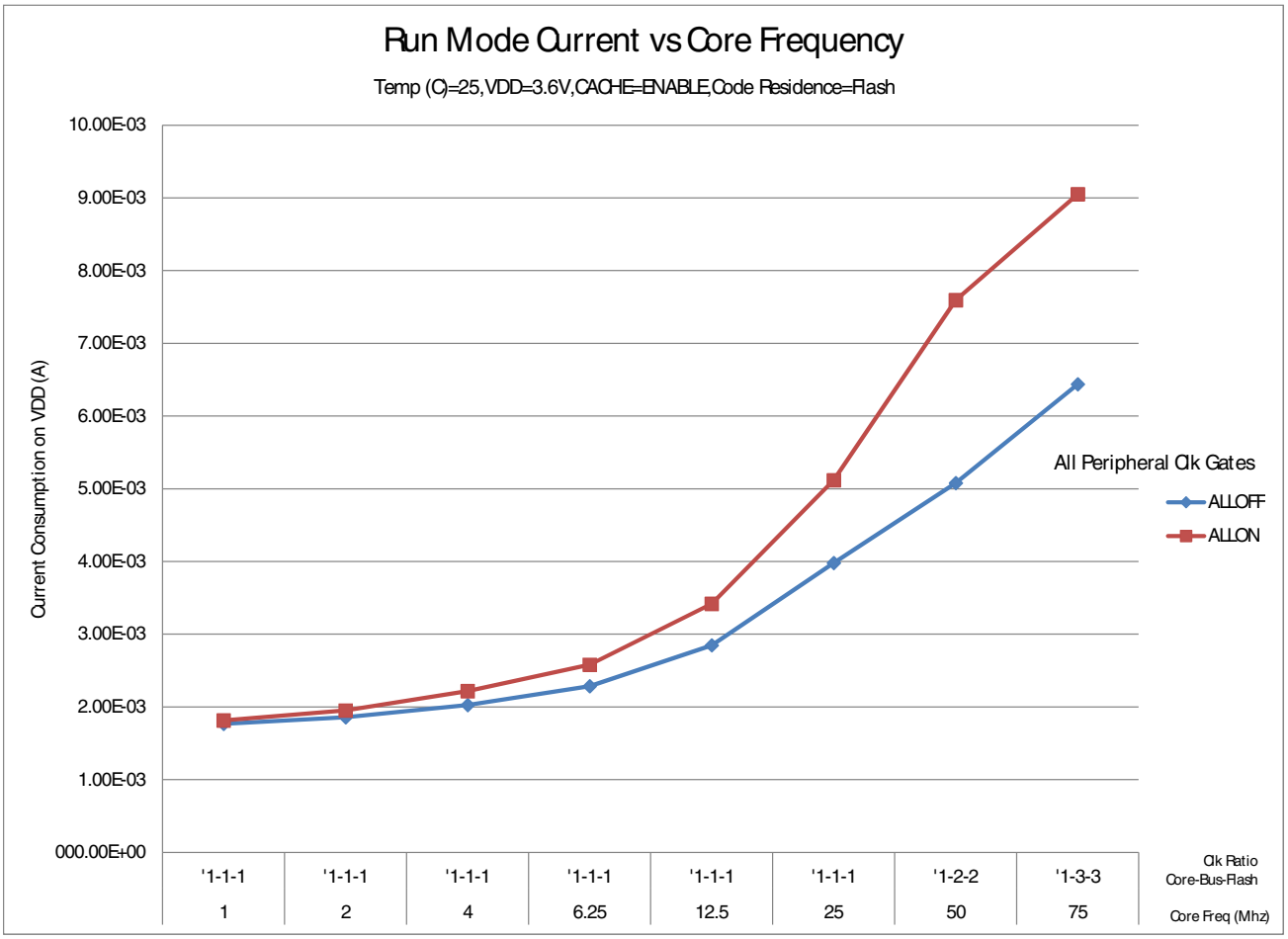

Figure 3. Run mode supply current vs. core frequency

2.4 Thermal specifications

2.4.1 Thermal operating requirements

Table 11. Thermal operating requirements

Symbol	Description	Min.	Max.	Unit
T_J	Die junction temperature	–40	125	°C
T_A	Ambient temperature [1]	–40	105	°C

1. Maximum T_A can be exceeded only if the user ensures that T_J does not exceed maximum T_J. The simplest method to determine T_J is:

   $T_J = T_A + R_{\theta JA}$ x chip power dissipation

2.4.2 Thermal attributes

Table 12. Thermal attributes

Board type	Symbol	Description	64 LQFP	48 LQFP	32 LQFP	32 QFN	Unit	Notes
Single-layer (1S)	$R_{\theta JA}$	Thermal resistance, junction to ambient (natural convection)	64	81	85	98	°C/W	1
Four-layer (2s2p)	$R_{\theta JA}$	Thermal resistance, junction to ambient (natural convection)	46	57	57	34	°C/W	
Single-layer (1S)	$R_{\theta JMA}$	Thermal resistance, junction to ambient (200 ft./min. air speed)	52	68	72	82	°C/W	
Four-layer (2s2p)	$R_{\theta JMA}$	Thermal resistance, junction to ambient (200 ft./min. air speed)	39	51	50	28	°C/W	
—	$R_{\theta JB}$	Thermal resistance, junction to board	28	35	33	14	°C/W	2
—	$R_{\theta JC}$	Thermal resistance, junction to case	15	25	25	2.5	°C/W	3
—	Ψ_{JT}	Thermal characterization parameter, junction to package top outside center (natural convection)	2	7	7	8	°C/W	4

1. Determined according to JEDEC Standard JESD51-2, *Integrated Circuits Thermal Test Method Environmental Conditions—Natural Convection (Still Air)*, or EIA/JEDEC Standard JESD51-6, *Integrated Circuit Thermal Test Method Environmental Conditions—Forced Convection (Moving Air)*.

2. Determined according to JEDEC Standard JESD51-8, *Integrated Circuit Thermal Test Method Environmental Conditions—Junction-to-Board*.
3. Determined according to Method 1012.1 of MIL-STD 883, *Test Method Standard, Microcircuits*, with the cold plate temperature used for the case temperature. The value includes the thermal resistance of the interface material between the top of the package and the cold plate.
4. Determined according to JEDEC Standard JESD51-2, *Integrated Circuits Thermal Test Method Environmental Conditions—Natural Convection (Still Air)*.

3 Peripheral operating requirements and behaviors

3.1 Core modules

3.1.1 SWD Electricals

Table 13. SWD full voltage range electricals

Symbol	Description	Min.	Max.	Unit
	Operating voltage	1.71	3.6	V
J1	SWD_CLK frequency of operation • Serial wire debug	 0	 25	 MHz
J2	SWD_CLK cycle period	1/J1	—	ns
J3	SWD_CLK clock pulse width • Serial wire debug	 20	 —	 ns
J4	SWD_CLK rise and fall times	—	3	ns
J9	SWD_DIO input data setup time to SWD_CLK rise	10	—	ns
J10	SWD_DIO input data hold time after SWD_CLK rise	0	—	ns
J11	SWD_CLK high to SWD_DIO data valid	—	32	ns
J12	SWD_CLK high to SWD_DIO high-Z	5	—	ns

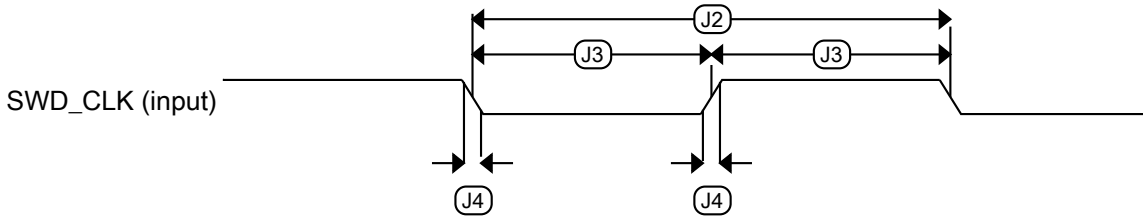

Figure 5. Serial wire clock input timing

4. The resulting system clock frequencies must not exceed their maximum specified values. The DCO frequency deviation (Δf_{dco_t}) over voltage and temperature must be considered.
5. These typical values listed are with the slow internal reference clock (FEI) using factory trim and DMX32 = 1.
6. The resulting clock frequency must not exceed the maximum specified clock frequency of the device.
7. This specification is based on standard deviation (RMS) of period or frequency.
8. This specification applies to any time the FLL reference source or reference divider is changed, trim value is changed, DMX32 bit is changed, DRS bits are changed, or there is a change from FLL disabled (BLPE, BLPI) to FLL enabled (FEI, FEE, FBE, FBI). If a crystal/resonator is being used as the reference, this specification assumes it is already running.

3.3.2 Oscillator electrical specifications

3.3.2.1 Oscillator DC electrical specifications

Table 15. Oscillator DC electrical specifications

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
V_{DD}	Supply voltage	1.71	—	3.6	V	
I_{DDOSC}	Supply current — low-power mode (HGO=0)					1
	• 32 kHz	—	500	—	nA	
	• 4 MHz	—	200	—	µA	
	• 8 MHz	—	300	—	µA	
	• 16 MHz	—	950	—	µA	
	• 24 MHz	—	1.2	—	mA	
	• 32 MHz	—	1.5	—	mA	
I_{DDOSC}	Supply current — high gain mode (HGO=1)					1
	• 4 MHz	—	500	—	µA	
	• 8 MHz	—	600	—	µA	
	• 16 MHz	—	2.5	—	mA	
	• 24 MHz	—	3	—	mA	
	• 32 MHz	—	4	—	mA	
C_x	EXTAL load capacitance	—	—	—		2, 3
C_y	XTAL load capacitance	—	—	—		2, 3
R_F	Feedback resistor — low-frequency, low-power mode (HGO=0)	—	—	—	MΩ	2, 4
	Feedback resistor — low-frequency, high-gain mode (HGO=1)	—	10	—	MΩ	
	Feedback resistor — high-frequency, low-power mode (HGO=0)	—	—	—	MΩ	
	Feedback resistor — high-frequency, high-gain mode (HGO=1)	—	1	—	MΩ	

Table continues on the next page...

Table 15. Oscillator DC electrical specifications (continued)

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
R_S	Series resistor — low-frequency, low-power mode (HGO=0)	—	—	—	kΩ	
	Series resistor — low-frequency, high-gain mode (HGO=1)	—	200	—	kΩ	
	Series resistor — high-frequency, low-power mode (HGO=0)	—	—	—	kΩ	
	Series resistor — high-frequency, high-gain mode (HGO=1)	—	0	—	kΩ	
V_{pp}[5]	Peak-to-peak amplitude of oscillation (oscillator mode) — low-frequency, low-power mode (HGO=0)	—	0.6	—	V	
	Peak-to-peak amplitude of oscillation (oscillator mode) — low-frequency, high-gain mode (HGO=1)	—	V_{DD}	—	V	
	Peak-to-peak amplitude of oscillation (oscillator mode) — high-frequency, low-power mode (HGO=0)	—	0.6	—	V	
	Peak-to-peak amplitude of oscillation (oscillator mode) — high-frequency, high-gain mode (HGO=1)	—	V_{DD}	—	V	

1. V_{DD}=3.3 V, Temperature =25 °C
2. See crystal or resonator manufacturer's recommendation
3. C_x,C_y can be provided by using the integrated capacitors when the low frequency oscillator (RANGE = 00) is used. For all other cases external capacitors must be used.
4. When low power mode is selected, R_F is integrated and must not be attached externally.
5. The EXTAL and XTAL pins should only be connected to required oscillator components and must not be connected to any other devices.

3.3.2.2 Oscillator frequency specifications

Table 16. Oscillator frequency specifications

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
f_{osc_lo}	Oscillator crystal or resonator frequency — low-frequency mode (MCG_C2[RANGE]=00)	32	—	40	kHz	
$f_{osc\_hi\_1}$	Oscillator crystal or resonator frequency — high-frequency mode (low range) (MCG_C2[RANGE]=01)	3	—	8	MHz	
$f_{osc\_hi\_2}$	Oscillator crystal or resonator frequency — high frequency mode (high range) (MCG_C2[RANGE]=1x)	8	—	32	MHz	
f_{ec_extal}	Input clock frequency (external clock mode)	—	—	50 48	MHz	1, 2

Table continues on the next page...

Table 16. Oscillator frequency specifications (continued)

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
t_{dc_extal}	Input clock duty cycle (external clock mode)	40	50	60	%	
t_{cst}	Crystal startup time — 32 kHz low-frequency, low-power mode (HGO=0)	—	1000	—	ms	3, 4
	Crystal startup time — 32 kHz low-frequency, high-gain mode (HGO=1)	—	500	—	ms	
	Crystal startup time — 8 MHz high-frequency (MCG_C2[RANGE]=01), low-power mode (HGO=0)	—	0.6	—	ms	
	Crystal startup time — 8 MHz high-frequency (MCG_C2[RANGE]=01), high-gain mode (HGO=1)	—	1	—	ms	

1. Other frequency limits may apply when external clock is being used as a reference for the FLL or PLL.
2. When transitioning from FEI or FBI to FBE mode, restrict the frequency of the input clock so that, when it is divided by FRDIV, it remains within the limits of the DCO input clock frequency.
3. Proper PC board layout procedures must be followed to achieve specifications.
4. Crystal startup time is defined as the time between the oscillator being enabled and the OSCINIT bit in the MCG_S register being set.

NOTE

The 32 kHz oscillator works in low power mode by default and cannot be moved into high power/gain mode.

3.4 Memories and memory interfaces

3.4.1 Flash electrical specifications

This section describes the electrical characteristics of the flash memory module.

3.4.1.1 Flash timing specifications — program and erase

The following specifications represent the amount of time the internal charge pumps are active and do not include command overhead.

Table 17. NVM program/erase timing specifications

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
t_{hvpgm4}	Longword Program high-voltage time	—	7.5	18	µs	—
$t_{hversscr}$	Sector Erase high-voltage time	—	13	113	ms	1
$t_{hversall}$	Erase All high-voltage time	—	52	452	ms	1

1. Maximum time based on expectations at cycling end-of-life.

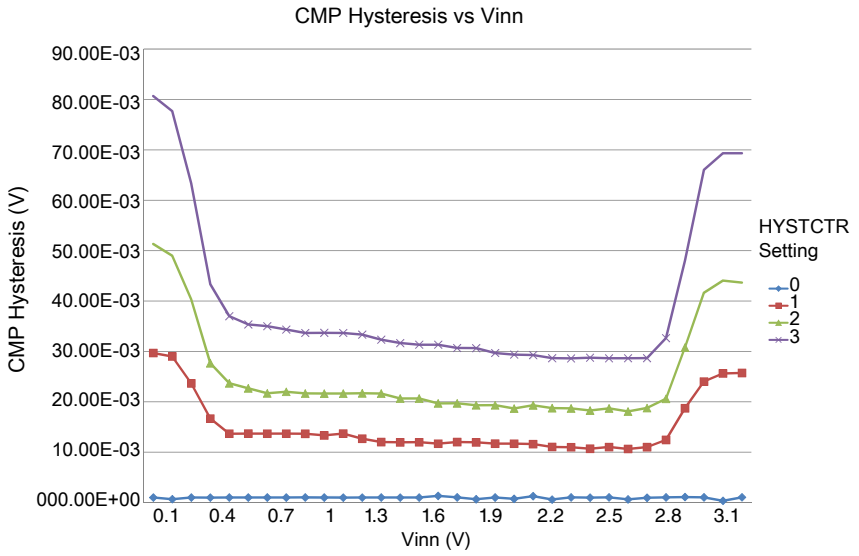

Figure 10. Typical hysteresis vs. Vin level (V_{DD} = 3.3 V, PMODE = 0)

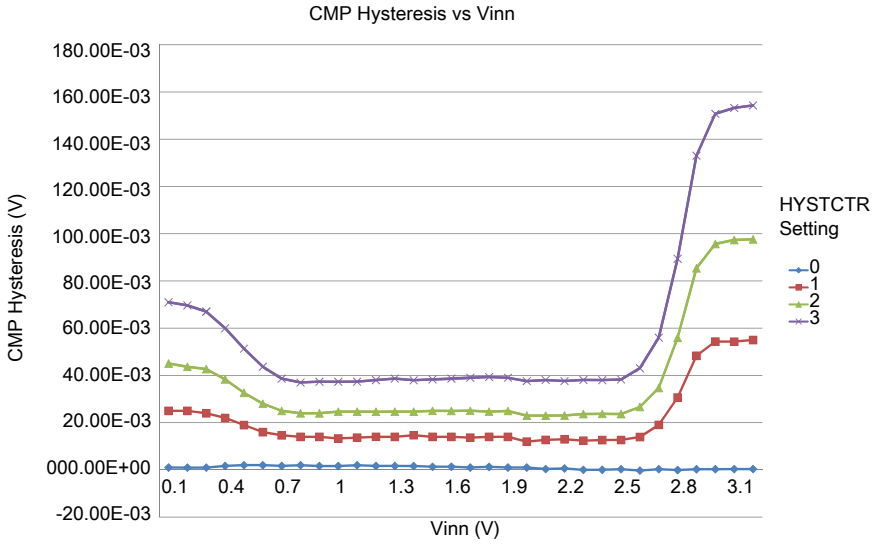

Figure 11. Typical hysteresis vs. Vin level (V_{DD} = 3.3 V, PMODE = 1)

3.6.3 12-bit DAC electrical characteristics

3.6.3.1 12-bit DAC operating requirements

Table 24. 12-bit DAC operating requirements

Symbol	Desciption	Min.	Max.	Unit	Notes
V_{DDA}	Supply voltage	1.71	3.6	V	
V_{DACR}	Reference voltage	1.13	3.6	V	1
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 V_{REFH}.
2. A small load capacitance (47 pF) can improve the bandwidth performance of the DAC.

3.6.3.2 12-bit DAC operating behaviors

Table 25. 12-bit DAC operating behaviors

Symbol	Description	Min.	Typ.	Max.	Unit	Notes
I_{DDA_DACLP}	Supply current — low-power mode	—	—	150	µA	
I_{DDA_DACHP}	Supply current — high-speed mode	—	—	700	µA	
t_{DACLP}	Full-scale settling time (0x080 to 0xF7F) — low-power mode	—	100	200	µs	1
t_{DACHP}	Full-scale settling time (0x080 to 0xF7F) — high-power mode	—	15	30	µs	1
$t_{CCDACLP}$	Code-to-code settling time (0xBF8 to 0xC08)—high-speed mode	—	1	—	µs	1
	—low-power mode	—	—	5	µs	1
$V_{dacoutl}$	DAC output voltage range low — high-speed mode, no load, DAC set to 0x000	—	—	100	mV	
$V_{dacouth}$	DAC output voltage range high — high-speed mode, no load, DAC set to 0xFFF	V_{DACR} −100	—	V_{DACR}	mV	
INL	Integral non-linearity error — high speed mode	—	—	±8	LSB	2
DNL	Differential non-linearity error — V_{DACR} > 2 V	—	—	±1	LSB	3
DNL	Differential non-linearity error — V_{DACR} = VREF_OUT	—	—	±1	LSB	4
V_{OFFSET}	Offset error	—	±0.4	±0.8	%FSR	5
E_G	Gain error	—	±0.1	±0.6	%FSR	5
PSRR	Power supply rejection ratio, V_{DDA} ≥ 2.4 V	60	—	90	dB	
T_{CO}	Temperature coefficient offset voltage	—	3.7	—	µV/C	6
T_{GE}	Temperature coefficient gain error	—	0.000421	—	%FSR/C	
Rop	Output resistance (load = 3 kΩ)	—	—	250	Ω	
SR	Slew rate -80h→ F7Fh→ 80h				V/µs	

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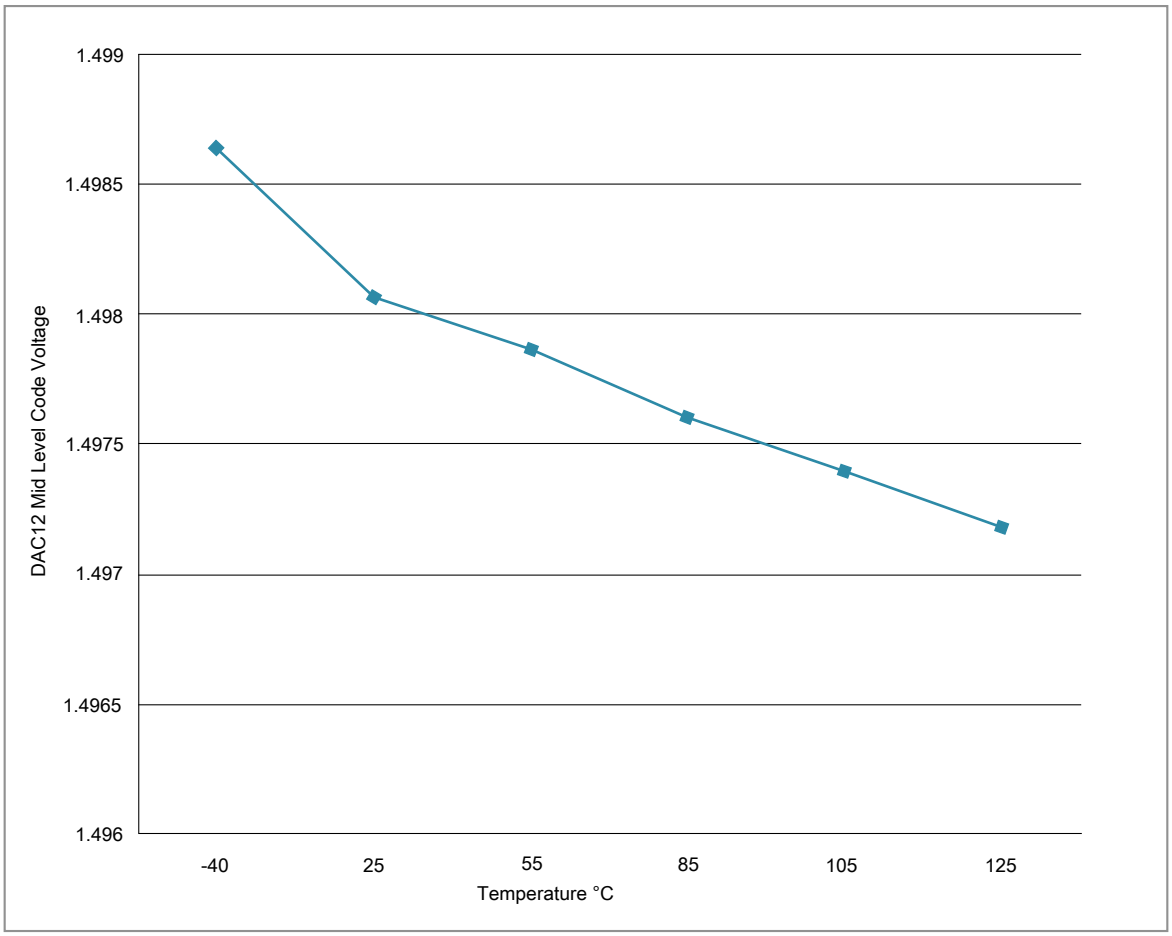

Figure 13. Offset at half scale vs. temperature

3.7 Timers

See General switching specifications.

3.8 Communication interfaces

3.8.2 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 28. Master mode DSPI timing (full voltage range)

Symbol	Description	Min.	Max.	Unit	Notes
	Operating voltage	1.7	3.6	V	1
	Frequency of operation	–	**18.75**	**MHz**	2
DS1	DSPI_SCK output cycle time	2 x t_{BUS}	–	ns	3
DS2	DSPI_SCK output high/low time	(t_{SCK}/2) – 4	(t_{SCK}/2) + 4	ns	
DS3	DSPI_PCS*n* valid to DSPI_SCK delay	(t_{SCK}/2) – 4	–	ns	4
DS4	DSPI_SCK to DSPI_PCS*n* invalid delay	(t_{SCK}/2) – 4	–	ns	5
DS5	DSPI_SCK to DSPI_SOUT valid	–	10		
DS6	DSPI_SCK to DSPI_SOUT invalid	–7.8	–	ns	
DS7	DSPI_SIN to DSPI_SCK input setup	24	–	ns	
DS8	DSPI_SCK to DSPI_SIN input hold	0	–	ns	
	Frequency of operation	–	**18.75**	**MHz**	6
DS1	DSPI_SCK output cycle time	2 x t_{BUS}	–	ns	3
DS2	DSPI_SCK output high/low time	(t_{SCK}/2) – 4	(t_{SCK}/2) + 4	ns	
DS3	DSPI_PCS*n* valid to DSPI_SCK delay	(t_{SCK}/2) – 4	–	ns	4
DS4	DSPI_SCK to DSPI_PCS*n* invalid delay	(t_{SCK}/2) – 4	–	ns	5
DS5	DSPI_SCK to DSPI_SOUT valid	–	26		
DS6	DSPI_SCK to DSPI_SOUT invalid	–7.8	–	ns	
DS7	DSPI_SIN to DSPI_SCK input setup	24	–	ns	
DS8	DSPI_SCK to DSPI_SIN input hold	0	–	ns	

Table continues on the next page...

Table 28. Master mode DSPI timing (full voltage range) (continued)

Symbol	Description	Min.	Max.	Unit	Notes
	Frequency of operation	–	**25**	**MHz**	7
DS1	DSPI_SCK output cycle time	2 x t_{BUS}	–	ns	3
DS2	DSPI_SCK output high/low time	(t_{SCK}/2) – 4	(t_{SCK}/2) + 4	ns	
DS3	DSPI_PCS*n* valid to DSPI_SCK delay	(t_{SCK}/2) – 4	–	ns	4
DS4	DSPI_SCK to DSPI_PCS*n* invalid delay	(t_{SCK}/2) – 4	–	ns	5
DS5	DSPI_SCK to DSPI_SOUT valid	–	10		
DS6	DSPI_SCK to DSPI_SOUT invalid	–7.8	–	ns	
DS7	DSPI_SIN to DSPI_SCK input setup	17	–	ns	
DS8	DSPI_SCK to DSPI_SIN input hold	0	–	ns	

1. The DSPI module can operate across the entire operating voltage for the processor, but to run across the full voltage range the maximum frequency of operation is reduced.
2. Normal pads
3. The SPI module is clocked by the system clock
4. The delay is programmable in SPIx_CTARn[PSSCK] and SPIx_CTARn[CSSCK].
5. The delay is programmable in SPIx_CTARn[PASC] and SPIx_CTARn[ASC]
6. Open Drain pads: SIN: PTC7, SOUT:PTC6
7. Fast pads: SIN: PTD7, SOUT:PTD6, SCK: PTD5, PCS:PTD4

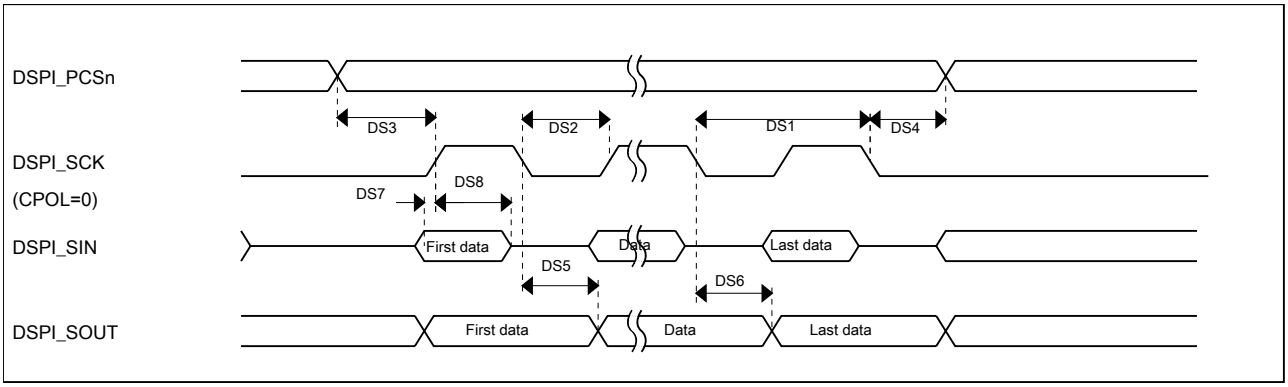

Figure 16. DSPI classic SPI timing — master mode

Table 29. Slave mode DSPI timing (full voltage range)

Symbol	Description	Min.	Max.	Unit	Notes
	Operating voltage	1.7	3.6	V	
	Frequency of operation	–	**9.375**	**MHz**	1

Table continues on the next page...

Table 29. Slave mode DSPI timing (full voltage range) (continued)

Symbol	Description	Min.	Max.	Unit	Notes
DS9	DSPI_SCK input cycle time	4 x t_{BUS}	—	ns	2
DS10	DSPI_SCK input high/low time	(t_{SCK}/2) – 4	(t_{SCK}/2) + 4	ns	
DS11	DSPI_SCK to DSPI_SOUT valid	–	27.8	ns	
DS12	DSPI_SCK to DSPI_SOUT invalid	0	–	ns	
DS13	DSPI_SIN to DSPI_SCK input setup	2.7	–	ns	
DS14	DSPI_SCK to DSPI_SIN input hold	7	–	ns	
DS15	$\overline{\text{DSPI\_SS}}$ active to DSPI_SOUT driven	–	22	ns	
DS16	$\overline{\text{DSPI\_SS}}$ inactive to DSPI_SOUT not driven	–	22	ns	
	Frequency of operation	–	**9.375**	**MHz**	3
DS9	DSPI_SCK input cycle time	4 x t_{BUS}	—	ns	2
DS10	DSPI_SCK input high/low time	(t_{SCK}/2) – 4	(t_{SCK}/2) + 4	ns	
DS11	DSPI_SCK to DSPI_SOUT valid	–	43.8	ns	
DS12	DSPI_SCK to DSPI_SOUT invalid	0	–	ns	
DS13	DSPI_SIN to DSPI_SCK input setup	2.7	–	ns	
DS14	DSPI_SCK to DSPI_SIN input hold	7	–	ns	
DS15	$\overline{\text{DSPI\_SS}}$ active to DSPI_SOUT driven	–	22	ns	
DS16	$\overline{\text{DSPI\_SS}}$ inactive to DSPI_SOUT not driven	–	38	ns	
	Frequency of operation		**12.5**	**MHz**	4
DS9	DSPI_SCK input cycle time	4 x t_{BUS}	—	ns	2
DS10	DSPI_SCK input high/low time	(t_{SCK}/2) – 4	(t_{SCK}/2) + 4	ns	
DS11	DSPI_SCK to DSPI_SOUT valid	–	20.8	ns	
DS12	DSPI_SCK to DSPI_SOUT invalid	0	–	ns	
DS13	DSPI_SIN to DSPI_SCK input setup	2.7	–	ns	
DS14	DSPI_SCK to DSPI_SIN input hold	7	–	ns	
DS15	$\overline{\text{DSPI\_SS}}$ active to DSPI_SOUT driven	–	22	ns	
DS16	$\overline{\text{DSPI\_SS}}$ inactive to DSPI_SOUT not driven	–	15	ns	

1. Normal pads
2. The SPI module is clocked by the system clock
3. Open Drain pads: SIN: PTC7, SOUT:PTC6
4. Fast pads: SIN: PTD7, SOUT:PTD6, SCK: PTD5, PCS:PTD4

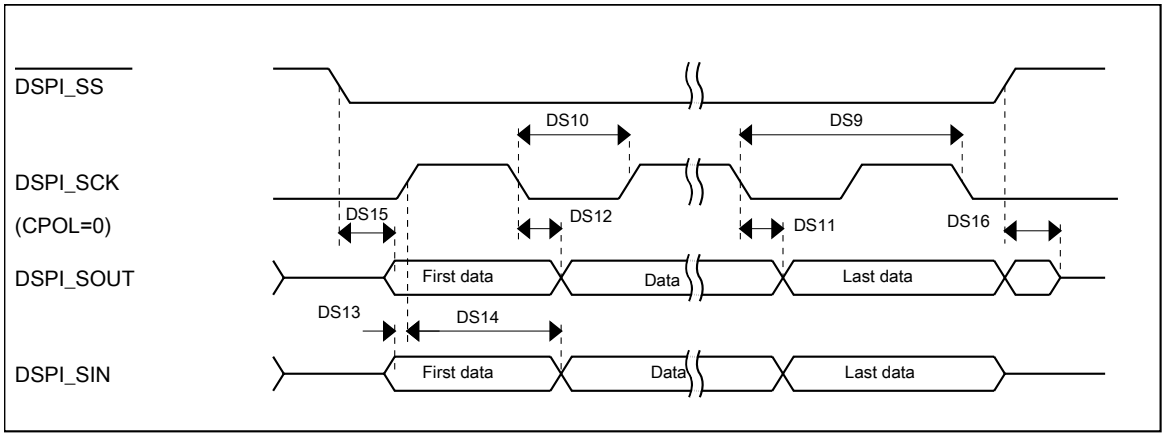

Figure 17. DSPI classic SPI timing — slave mode

3.8.3 I²C

See General switching specifications.

3.8.4 UART

See General switching specifications.

4 Dimensions

4.1 Obtaining package dimensions

Package dimensions are provided in package drawings.

To find a package drawing, go to www.freescale.com and perform a keyword search for the drawing's document number:

If you want the drawing for this package	Then use this document number
32-pin QFN	98ASA00473D
32-pin LQFP [1]	98ASH70029A
48-pin LQFP	98ASH00962A
64-pin LQFP	98ASS23234W

1. The 32-pin LQFP package for this product is not yet available, however it is included in a Package Your Way program for Kinetis MCUs. Please visit http://www.freescale.com/KPYW for more details.

5 Pinout

5.1 KV11 Signal Multiplexing and Pin Assignments

The following table shows the signals available on each pin and the locations of these pins on the devices supported by this document. The Port Control Module is responsible for selecting which ALT functionality is available on each pin.

NOTE

- PTB0, PTB1, PTC3, PTC4, PTD4, PTD5, PTD6, PTD7 are high current pins.
- PTC6 and PTC7 have open drain outputs

64 LQFP	48 QFP	32 QFN	32 LQFP	Pin Name	DEFAULT	ALT0	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6	ALT7
—	—	7	7	VDDA/ VREFH	VDDA/ VREFH	VDDA/ VREFH							
—	—	8	8	VREFL/ VSSA	VREFL/ VSSA	VREFL/ VSSA							
1	—	—	—	PTE0	ADC1_SE12	ADC1_SE12	PTE0		UART1_TX				
2	—	—	—	PTE1/ LLWU_P0	ADC1_SE13	ADC1_SE13	PTE1/ LLWU_P0		UART1_RX				
3	1	1	1	VDD	VDD	VDD							
4	2	2	2	VSS	VSS	VSS							
5	3	3	3	PTE16	ADC0_SE1/ ADC0_DP1/ ADC1_SE0	ADC0_SE1/ ADC0_DP1/ ADC1_SE0	PTE16	SPI0_PCS0	UART1_TX	FTM_ CLKIN0		FTM0_FLT3	
6	4	4	4	PTE17/ LLWU_P19	ADC0_DM1/ ADC0_SE5/ ADC1_SE5	ADC0_DM1/ ADC0_SE5/ ADC1_SE5	PTE17/ LLWU_P19	SPI0_SCK	UART1_RX	FTM_ CLKIN1		LPTMR0_ ALT3	
7	5	5	5	PTE18/ LLWU_P20	ADC0_SE6/ ADC1_SE1/ ADC1_DP1	ADC0_SE6/ ADC1_SE1/ ADC1_DP1	PTE18/ LLWU_P20	SPI0_SOUT	UART1_ CTS_b	I2C0_SDA		SPI0_SIN	
8	6	6	6	PTE19	ADC0_SE7/ ADC1_SE7/ ADC1_DM1	ADC0_SE7/ ADC1_SE7/ ADC1_DM1	PTE19	SPI0_SIN	UART1_ RTS_b	I2C0_SCL		SPI0_SOUT	
9	7	—	—	PTE20	ADC0_SE0/ ADC0_DP0	ADC0_SE0/ ADC0_DP0	PTE20		FTM1_CH0	UART0_TX			
10	8	—	—	PTE21	ADC0_SE4/ ADC0_DM0	ADC0_SE4/ ADC0_DM0	PTE21		FTM1_CH1	UART0_RX			
11	—	—	—	PTE22	ADC0_SE12	ADC0_SE12	PTE22						
12	—	—	—	PTE23	ADC0_SE13	ADC0_SE13	PTE23						
13	9	—	—	VDDA	VDDA	VDDA							

5.2 KV11 Pinouts

The following figure shows the pinout diagram for the devices supported by this document. Many signals may be multiplexed onto a single pin. To determine what signals can be used on which pin, see the previous section.

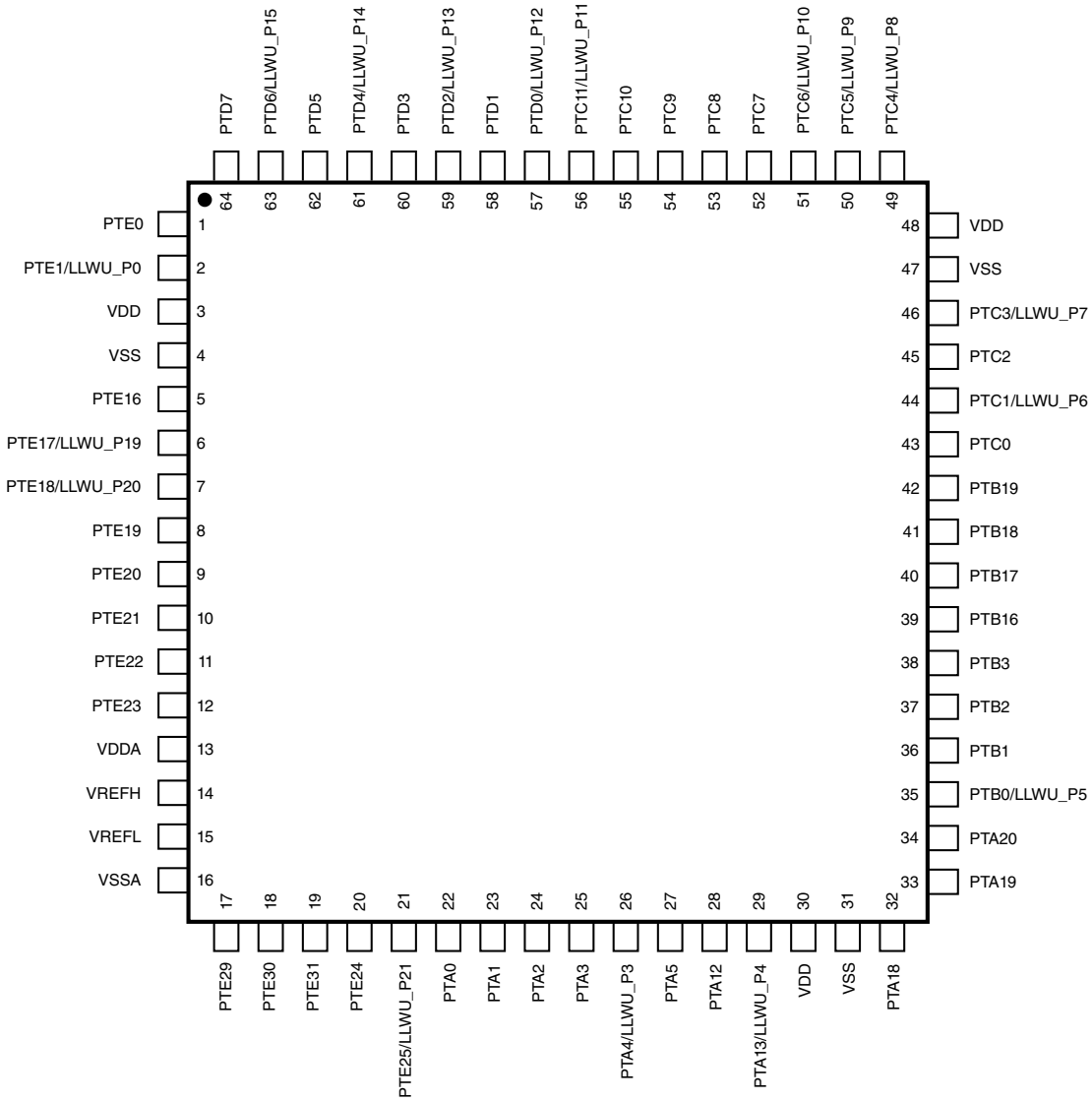

Figure 18. 64 LQFP Pinout Diagram

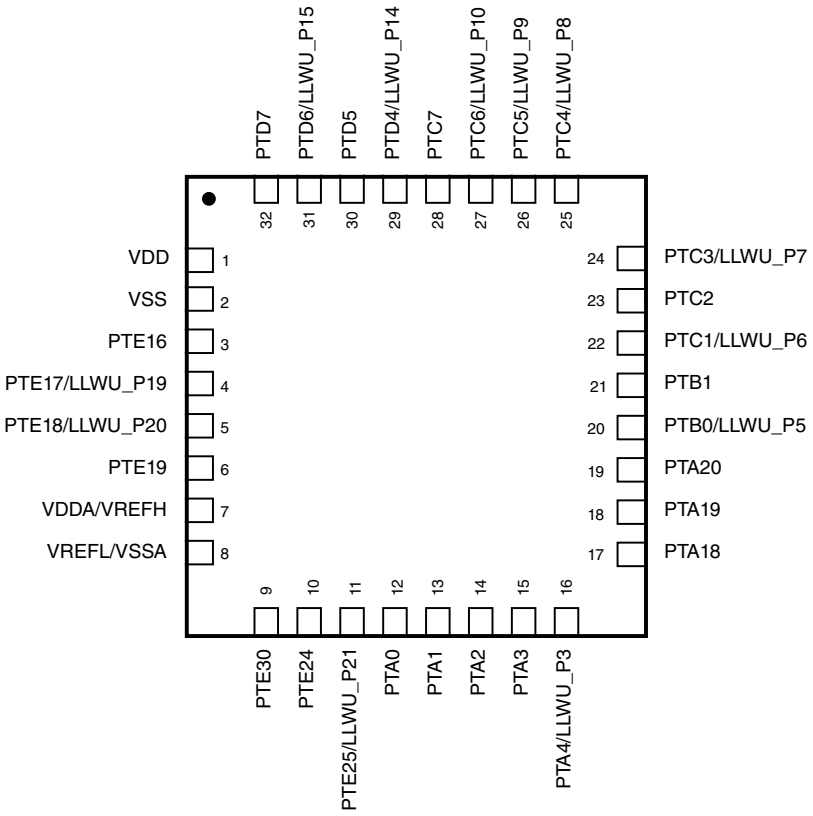

Figure 21. 32 QFN Pinout Diagram

6 Ordering parts

6.1 Determining valid orderable parts

Valid orderable part numbers are provided on the web. To determine the orderable part numbers for this device, go to www.freescale.com and perform a part number search for the MKV11 device numbers.

7 Part identification

8 Terminology and guidelines

8.1 Definition: Operating requirement

An *operating requirement* is a specified value or range of values for a technical characteristic that you must guarantee during operation to avoid incorrect operation and possibly decreasing the useful life of the chip.

8.1.1 Example

This is an example of an operating requirement:

Symbol	Description	Min.	Max.	Unit
V_{DD}	1.0 V core supply voltage	0.9	1.1	V

8.2 Definition: Operating behavior

Unless otherwise specified, an *operating behavior* is a specified value or range of values for a technical characteristic that are guaranteed during operation if you meet the operating requirements and any other specified conditions.

8.2.1 Example

This is an example of an operating behavior:

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

Table 30. Revision history (continued)

Rev. No.	Date	Substantial Changes
2	04/2015	Updated the following sections: • Power mode transition operating behaviors • Power consumption operating behaviors • 16-bit ADC operating conditions • Fields • Updated the table "16-bit ADC electrical characteristics" with a footnote • Added the figure "Run mode supply current vs. core frequency" to the section "Diagram: Typical IDD_RUN operating behavior"
3	06/2015	• Added a footnote to the ambient temperature entry in the table "Thermal operating requirements"