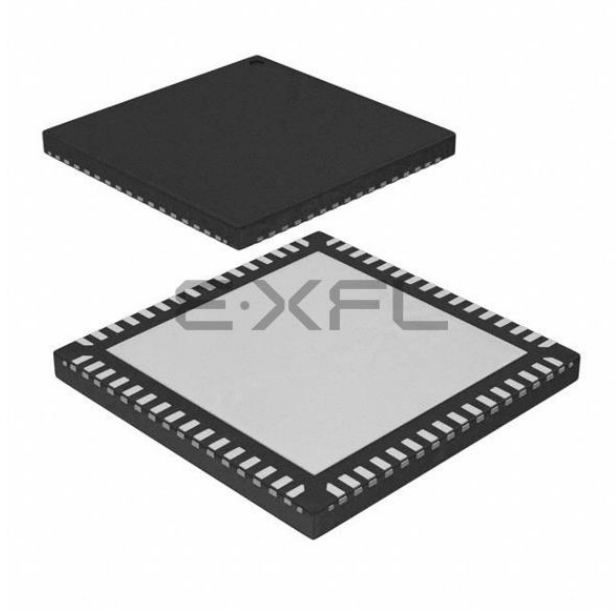


Welcome to E-XFL.COM

What is "Embedded - Microcontrollers"?

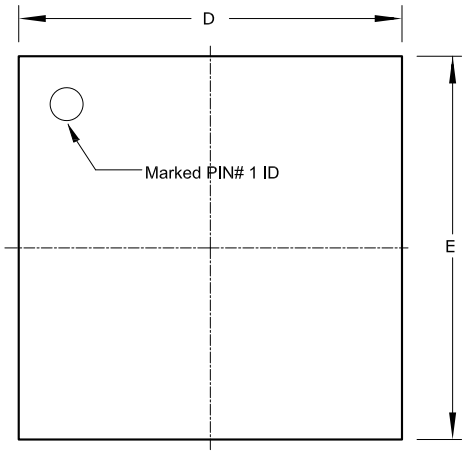
"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" 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"

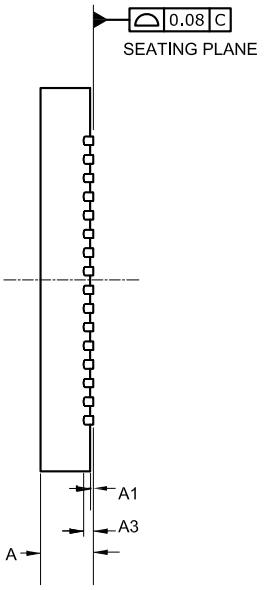
Details	
Product Status	Active
Core Processor	AVR
Core Size	8/16-Bit
Speed	32MHz
Connectivity	I²C, IrDA, SPI, UART/USART, USB
Peripherals	Brown-out Detect/Reset, DMA, POR, PWM, WDT
Number of I/O	50
Program Memory Size	64KB (32K x 16)
Program Memory Type	FLASH
EEPROM Size	2K x 8
RAM Size	4K x 8
Voltage - Supply (Vcc/Vdd)	1.6V ~ 3.6V
Data Converters	A/D 16x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	64-VFQFN Exposed Pad
Supplier Device Package	64-QFN (9x9)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/atxmega64c3-mhr

32.2 64M

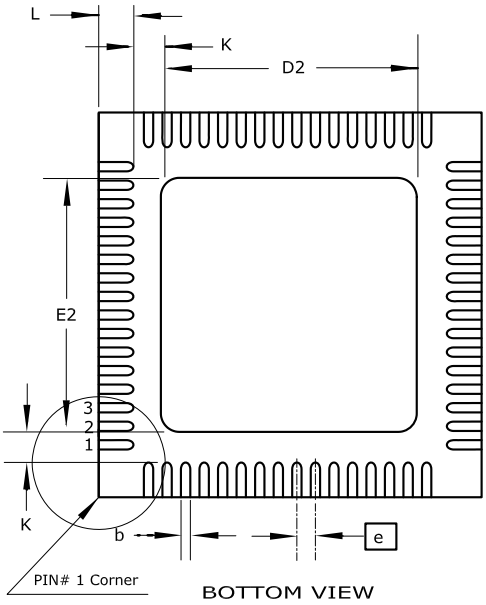
DRAWINGS NOT SCALED



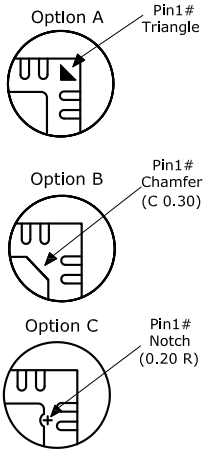
TOP VIEW



SIDE VIEW



BOTTOM VIEW



COMMON DIMENSIONS

(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	----	----	1.00	
A1	----	0.02	0.05	
A3		0.20 REF		
D/E	8.90	9.00	9.10	
D2/E2	7.50	7.65	7.80	
L	0.35	0.40	0.45	
K	0.20	0.27	0.40	
b	0.18	----	0.30	2
e		0.50 BSC		
n		64		

Notes : 1. This drawing is for general information only. Refer to JEDEC Drawing MO-220, Variation VMMD for proper dimensions, tolerances, datums, etc.
2. Dimension b applies to metallized terminal and is measured between 0.15mm and 0.30mm from the terminal tip.
If the terminal has the optical radius on the other end of the terminal, the dimension should not be measured in that radius area.

12/18/2012

	TITLE	GPC	DRAWING NO.	REV.
Package Drawing Contact: **packagedrawings@atmel.com**	PP, 64 Lds - 0.50mm Pitch, 9x9x1mm Body size Very Thin Quad Flat Package (VQFN) Sawn	ZFF	PP	A

33.4.8 Bandgap and Internal 1.0V Reference Characteristics

Table 33-100.Bandgap and Internal 1.0V Reference Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
	Startup time	As reference for ADC		1 Clk_{PER} + 2.5µs		µs
		As input voltage to ADC and AC		1.5		
	Bandgap voltage			1.1		V
INT1V	Internal 1.00V reference	T= 85°C, after calibration	0.99	1.0	1.01	
	Variation over voltage and temperature	Calibrated at T= 85°C		1		%

33.4.9 Brownout Detection Characteristics

Table 33-101.Brownout Detection Characteristics(1)

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{BOT}	BOD level 0 falling V_{CC}		1.40	1.60	1.70	V
	BOD level 1 falling V_{CC}			1.8		
	BOD level 2 falling V_{CC}			2.0		
	BOD level 3 falling V_{CC}			2.2		
	BOD level 4 falling V_{CC}			2.4		
	BOD level 5 falling V_{CC}			2.6		
	BOD level 6 falling V_{CC}			2.8		
	BOD level 7 falling V_{CC}			3.0		
t_{BOD}	Detection time	Continuous mode		0.4		µs
		Sampled mode		1000		
V_{HYST}	Hysteresis			1.0		%

Note: 1. BOD is calibrated at 85°C within BOD level 0 values, and BOD level 0 is the default level.

33.4.10 External Reset Characteristics

Table 33-102.External Reset Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
t_{EXT}	Minimum reset pulse width		1000	90		ns
V_{RST}	Reset threshold voltage	V_{CC} = 2.7 - 3.6V		0.45*V_{CC}		V
		V_{CC} = 1.6 - 2.7V		0.45*V_{CC}		
R_{RST}	Reset pin Pull-up Resistor			25		kΩ

33.4.11 Power-on Reset Characteristics

Table 33-103. Power-on Reset Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{POT-} (1)	POR threshold voltage falling V_{CC}	V_{CC} falls faster than 1V/ms	0.4	1.0		V
		V_{CC} falls at 1V/ms or slower	0.8	1.3		
V_{POT+}	POR threshold voltage rising V_{CC}			1.3	1.59	

Note: 1. V_{POT-} values are only valid when BOD is disabled. When BOD is enabled $V_{POT-} = V_{POT+}$.

33.4.12 Flash and EEPROM Memory Characteristics

Table 33-104. Endurance and Data Retention

Symbol	Parameter	Condition		Min.	Typ.	Max.	Units
	Flash	Write/Erase cycles	25°C	10K			Cycle
			85°C	10K			
			105°C	2K			
		Data retention	25°C	100			Year
			85°C	25			
			105°C	10			
	EEPROM	Write/Erase cycles	25°C	100K			Cycle
			85°C	100K			
			105°C	30K			
		Data retention	25°C	100			Year
			85°C	25			
			105°C	10			

Table 33-105. Programming Time

Symbol	Parameter	Condition	Min.	Typ. (1)	Max.	Units
	Chip erase(2)	192KB Flash, EEPROM		90		ms
	Application erase	Section erase		6		
	Flash	Page erase		4		
		Page write		4		
		Atomic page erase and write		8		
	EEPROM	Page erase		4		
		Page write		4		
		Atomic page erase and write		8		

Notes: 1. Programming is timed from the 2MHz internal oscillator.
2. EEPROM is not erased if the EESAVE fuse is programmed.

Table 33-112.External Clock with Prescaler (1) for System Clock

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
$1/t_{CK}$	Clock Frequency (2)	V_{CC} = 1.6 - 1.8V	0		90	MHz
		V_{CC} = 2.7 - 3.6V	0		142	
t_{CK}	Clock Period	V_{CC} = 1.6 - 1.8V	11			ns
		V_{CC} = 2.7 - 3.6V	7			
t_{CH}	Clock High Time	V_{CC} = 1.6 - 1.8V	4.5			
		V_{CC} = 2.7 - 3.6V	2.4			
t_{CL}	Clock Low Time	V_{CC} = 1.6 - 1.8V	4.5			
		V_{CC} = 2.7 - 3.6V	2.4			
t_{CR}	Rise Time (for maximum frequency)	V_{CC} = 1.6 - 1.8V			1.5	
		V_{CC} = 2.7 - 3.6V			1.0	
t_{CF}	Fall Time (for maximum frequency)	V_{CC} = 1.6 - 1.8V			1.5	
		V_{CC} = 2.7 - 3.6V			1.0	
Δt_{CK}	Change in period from one clock cycle to the next				10	%

Notes: 1. System Clock Prescalers must be set so that maximum CPU clock frequency for device is not exceeded.
2. The maximum frequency vs. supply voltage is linear between 1.6V and 2.7V, and the same applies for all other parameters with supply voltage conditions.

33.4.13.7 External 16MHz Crystal Oscillator and XOSC Characteristics

Table 33-113. External 16MHz Crystal Oscillator and XOSC Characteristics

Symbol	Parameter	Condition		Min.	Typ.	Max.	Units
	Cycle to cycle jitter	XOSCPWR=0	FRQRANGE=0		0		ns
			FRQRANGE=1, 2, or 3		0		
		XOSCPWR=1			0		
	Long term jitter	XOSCPWR=0	FRQRANGE=0		0		
			FRQRANGE=1, 2, or 3		0		
		XOSCPWR=1			0		
	Frequency error	XOSCPWR=0	FRQRANGE=0		0.03		%
			FRQRANGE=1		0.03		
			FRQRANGE=2 or 3		0.03		
		XOSCPWR=1			0.003		
	Duty cycle	XOSCPWR=0	FRQRANGE=0		50		
			FRQRANGE=1		50		
			FRQRANGE=2 or 3		50		
		XOSCPWR=1			50		

33.5.13.5 Internal Phase Locked Loop (PLL) Characteristics

Table 33-139.Internal PLL Characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
f_{IN}	Input frequency	Output frequency must be within f_{OUT}	0.4		64	MHz
f_{OUT}	Output frequency(1)	V_{CC}= 1.6 - 1.8V	20		48	
		V_{CC}= 2.7 - 3.6V	20		128	
	Start-up time			25		µs
	Re-lock time			25		

Note: 1. The maximum output frequency vs. supply voltage is linear between 1.8V and 2.7V, and can never be higher than four times the maximum CPU frequency.

33.5.13.6 External Clock Characteristics

Figure 33-31.External Clock Drive Waveform

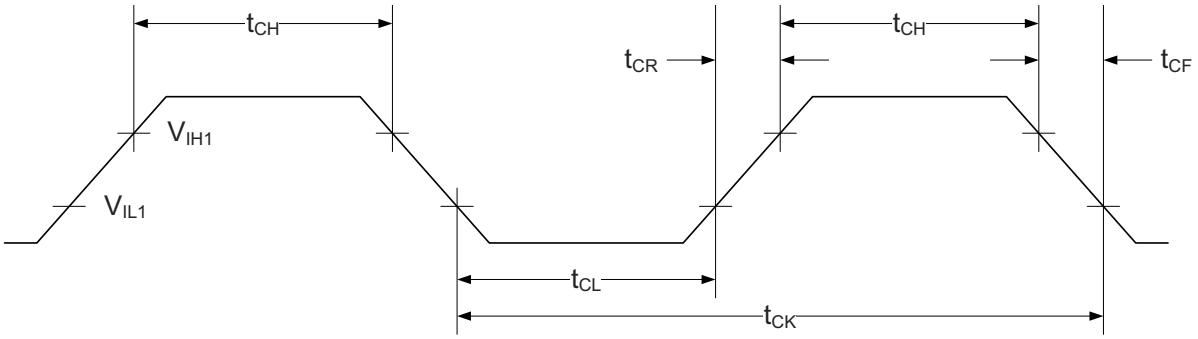


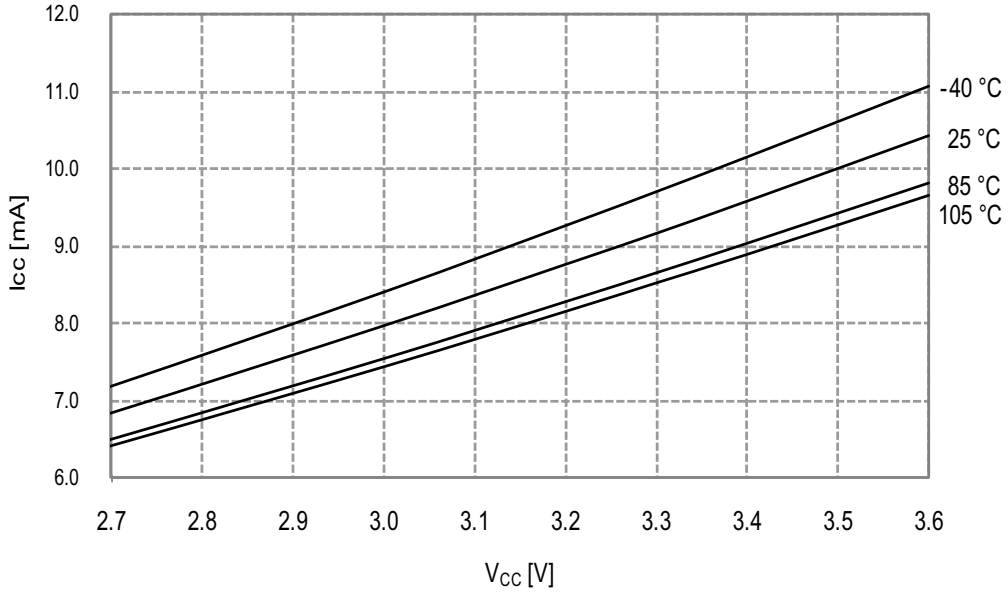
Table 33-140.External Clock used as System Clock without Prescaling

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
$1/t_{CK}$	Clock Frequency (1)	V_{CC} = 1.6 - 1.8V	0		12	MHz
		V_{CC} = 2.7 - 3.6V	0		32	
t_{CK}	Clock Period	V_{CC} = 1.6 - 1.8V	83.3			ns
		V_{CC} = 2.7 - 3.6V	31.5			
t_{CH}	Clock High Time	V_{CC} = 1.6 - 1.8V	30.0			
		V_{CC} = 2.7 - 3.6V	12.5			
t_{CL}	Clock Low Time	V_{CC} = 1.6 - 1.8V	30.0			
		V_{CC} = 2.7 - 3.6V	12.5			
t_{CR}	Rise Time (for maximum frequency)	V_{CC} = 1.6 - 1.8V			10	
		V_{CC} = 2.7 - 3.6V			3	
t_{CF}	Fall Time (for maximum frequency)	V_{CC} = 1.6 - 1.8V			10	
		V_{CC} = 2.7 - 3.6V			3	
Δt_{CK}	Change in period from one clock cycle to the next				10	%

Note: 1. The maximum frequency vs. supply voltage is linear between 1.6V and 2.7V, and the same applies for all other parameters with supply voltage conditions.

Figure 34-7. Active Mode Supply Current vs. V_{CC}

f_{SYS} = 32MHz internal oscillator



34.1.1.2 Idle Mode Supply Current

Figure 34-8. Idle Mode Supply Current vs. Frequency

f_{SYS} = 0 - 1MHz external clock, T = 25°C

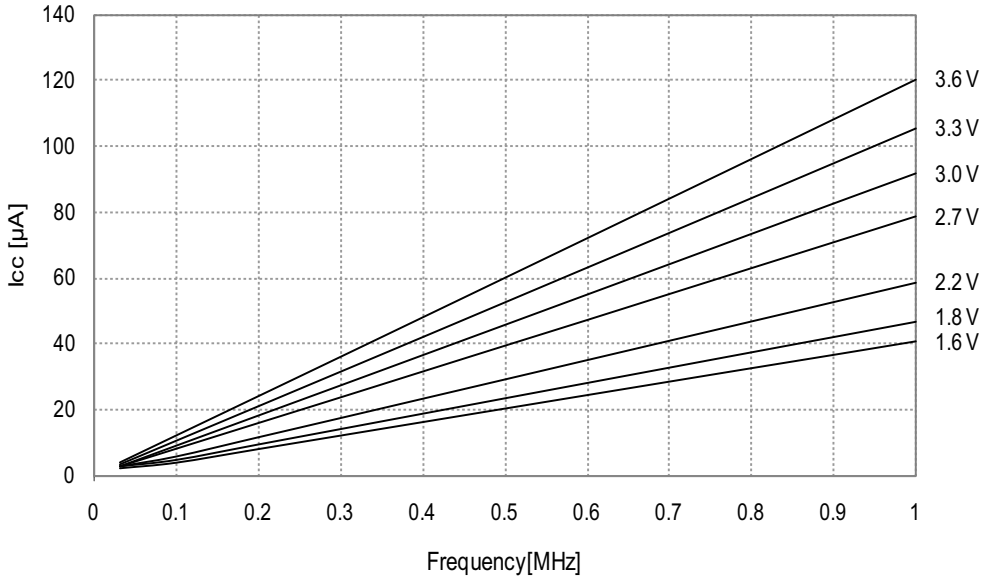


Figure 34-61. 32MHz Internal Oscillator Frequency vs. Temperature

DFLL enabled, from the 32.768kHz internal oscillator

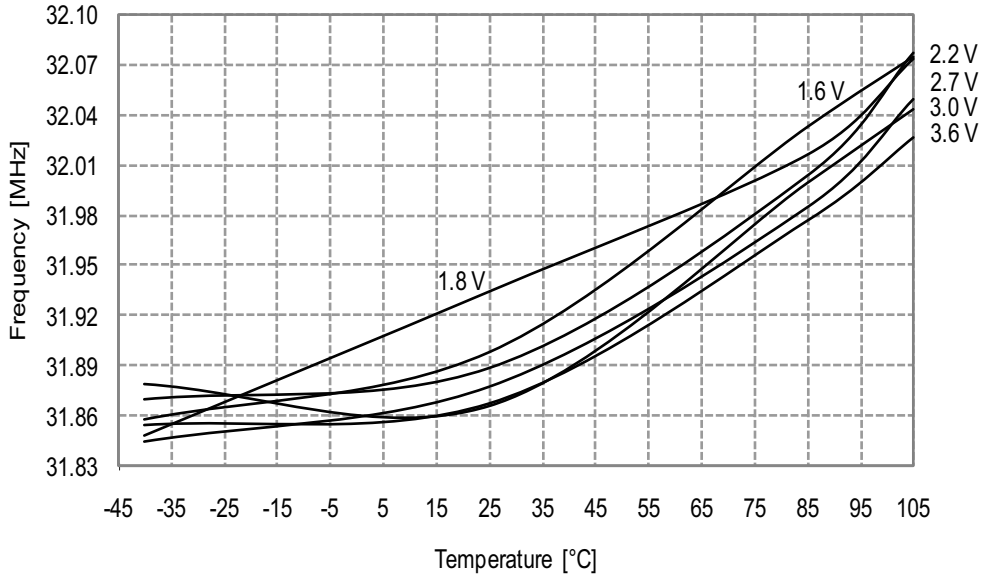
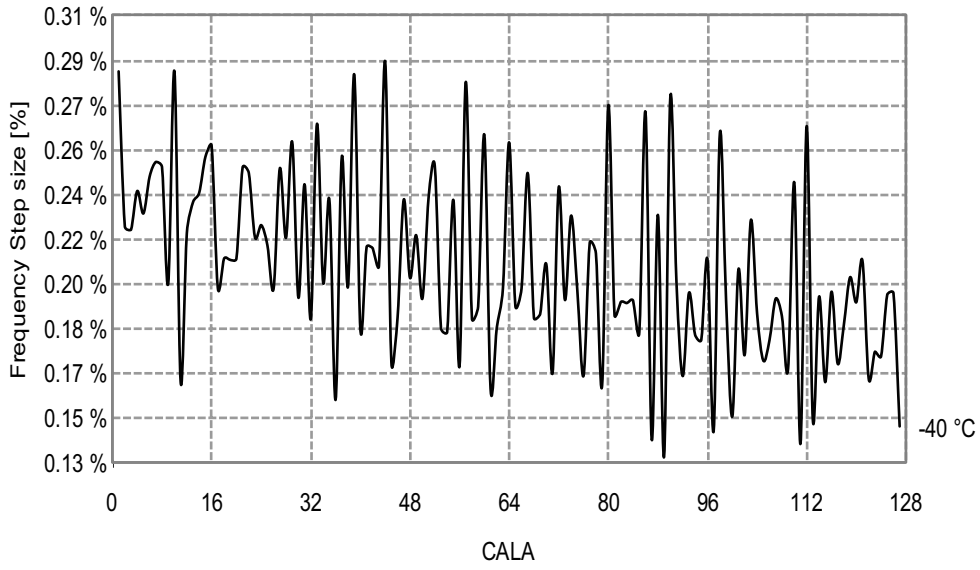


Figure 34-62. 32MHz Internal Oscillator CALA Calibration Step Size

T = -40°C, V_{CC} = 3.0V



34.1.8.5 32MHz Internal Oscillator Calibrated to 48MHz

Figure 34-67. 48MHz Internal Oscillator Frequency vs. Temperature
DFLL disabled

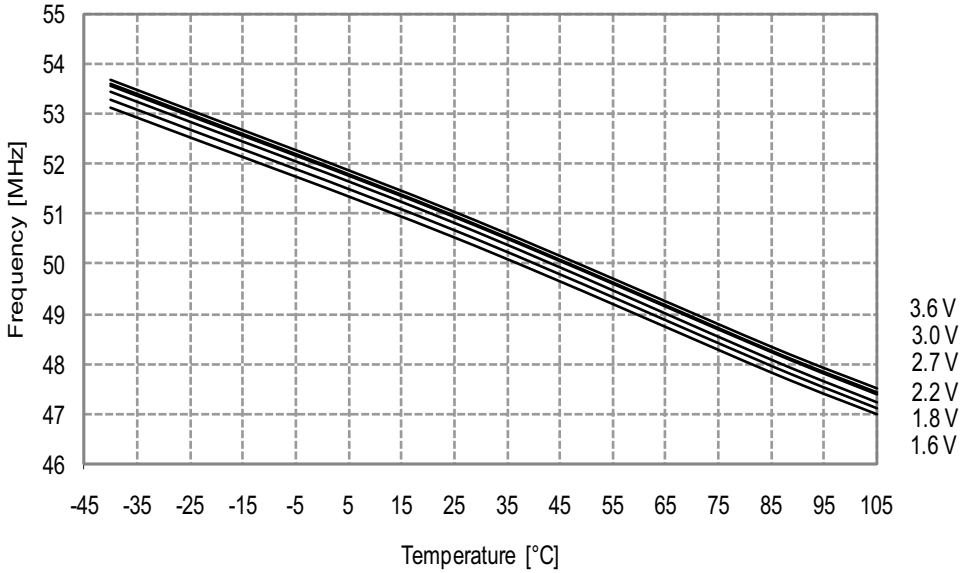


Figure 34-68. 48MHz Internal Oscillator Frequency vs. Temperature
DFLL enabled, from the 32.768kHz internal oscillator

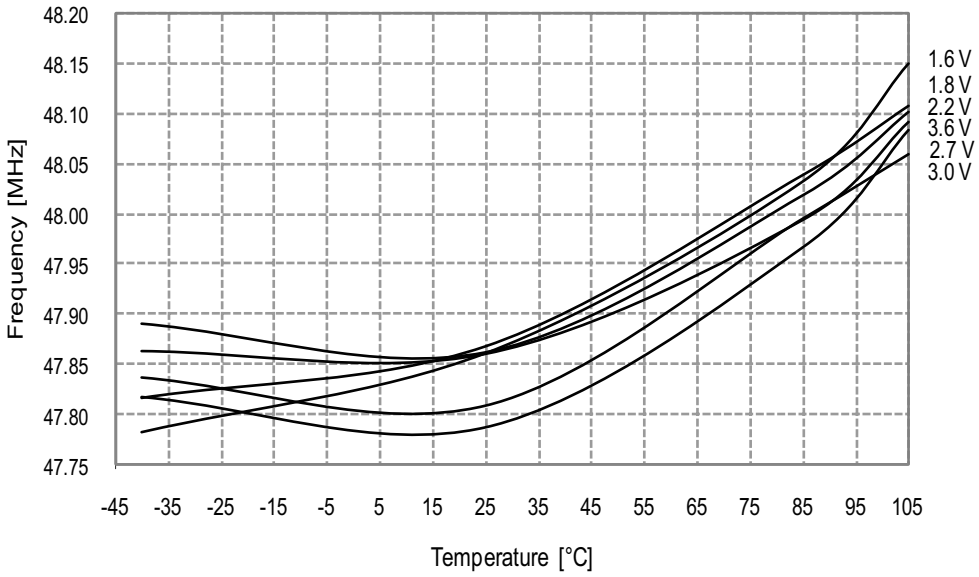
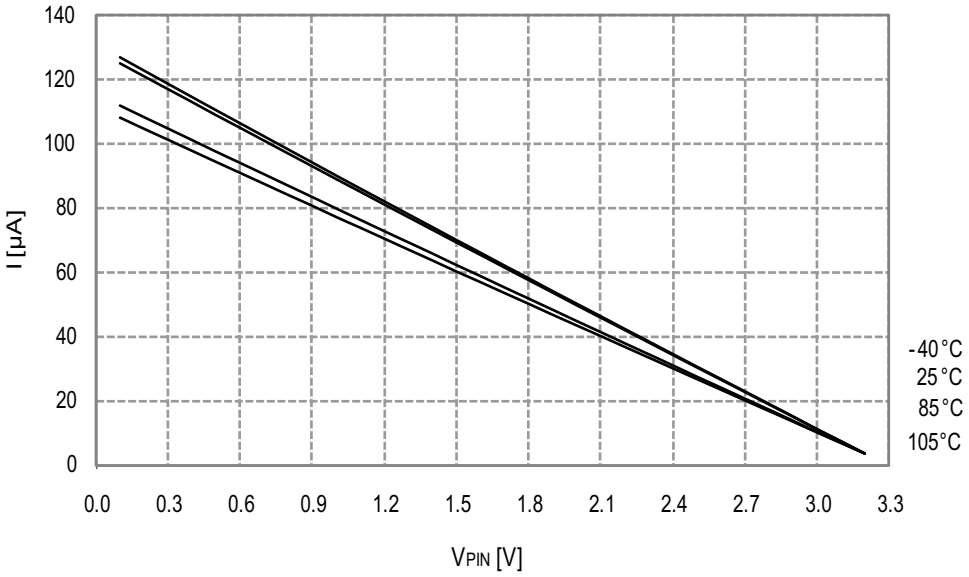


Figure 34-92. I/O Pin Pull-up Resistor Current vs. Input Voltage

V_{CC} = 3.3V



34.2.2.2 Output Voltage vs. Sink/Source Current

Figure 34-93. I/O Pin Output Voltage vs. Source Current

V_{CC} = 1.8V

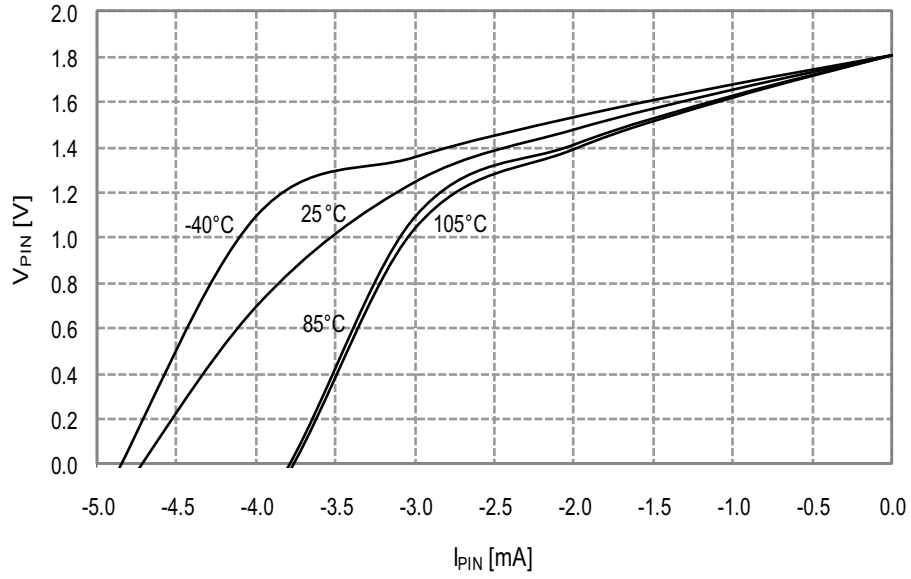


Figure 34-114. Analog Comparator Hysteresis vs. V_{CC}

Large hysteresis

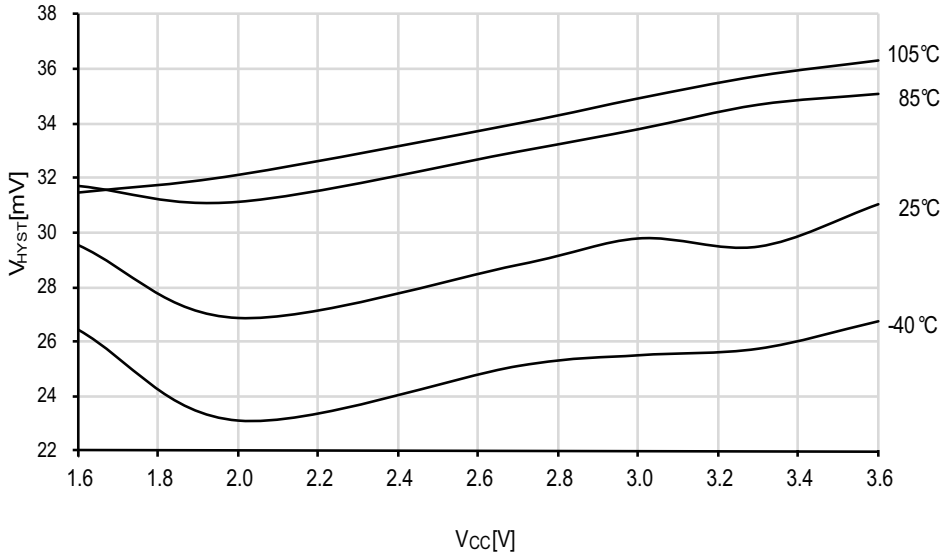
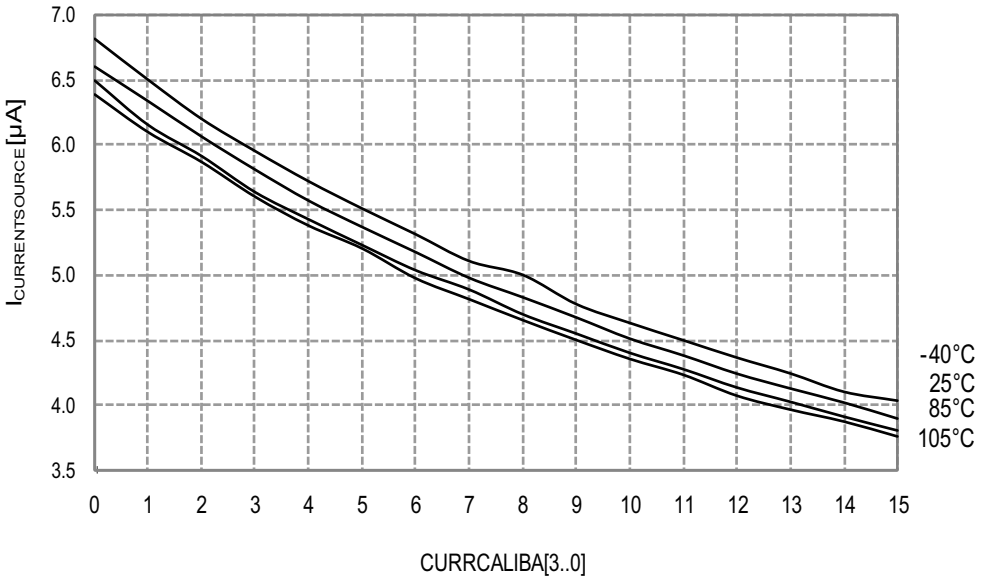


Figure 34-115. Analog Comparator Current Source vs. Calibration Value

V_{CC} = 3.0V



34.2.8.3 2MHz Internal Oscillator

Figure 34-128. 2MHz Internal Oscillator Frequency vs. Temperature

DFLL disabled

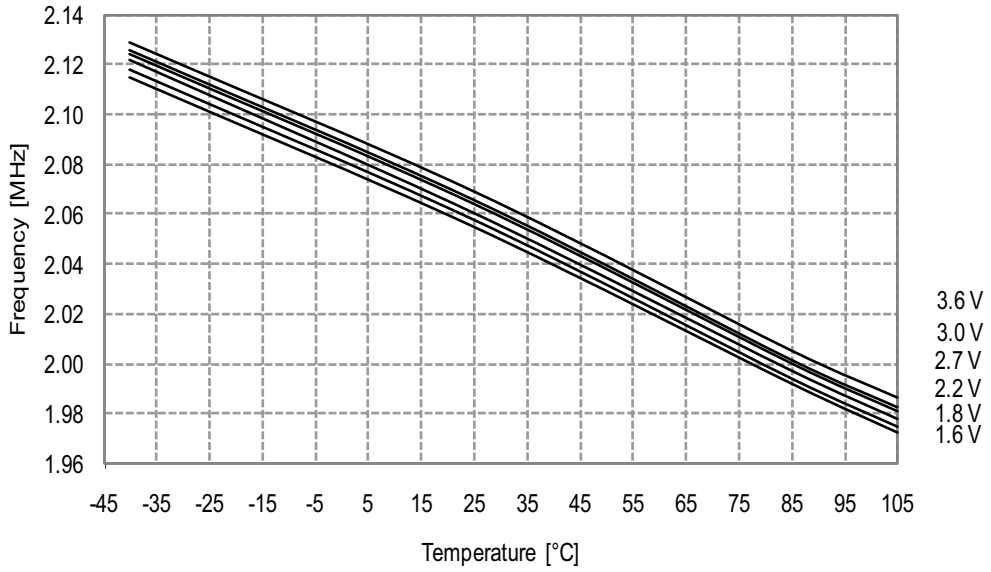


Figure 34-129. 2MHz Internal Oscillator Frequency vs. Temperature

DFLL enabled, from the 32.768kHz internal oscillator

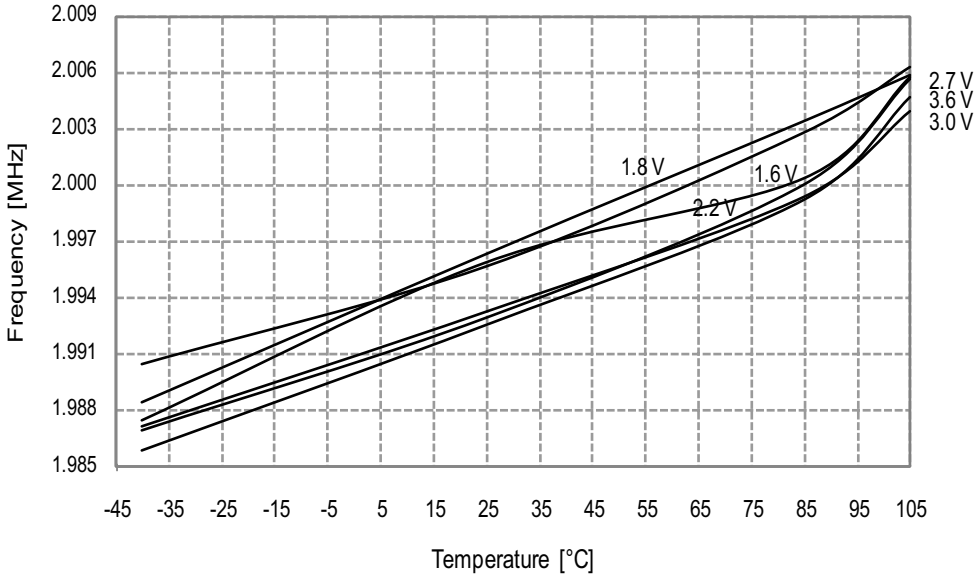


Figure 34-132. 32MHz Internal Oscillator Frequency vs. Temperature

DFLL enabled, from the 32.768kHz internal oscillator

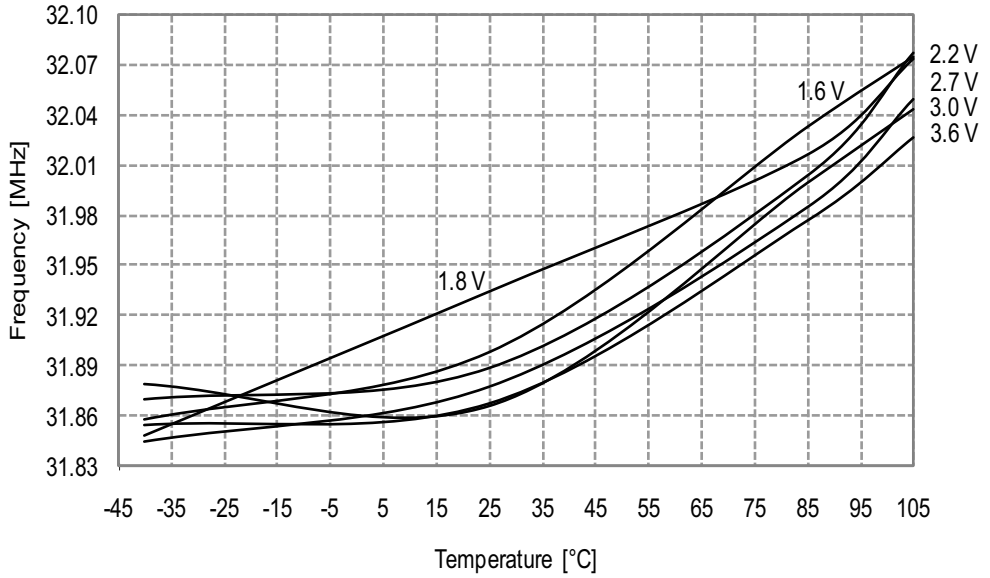
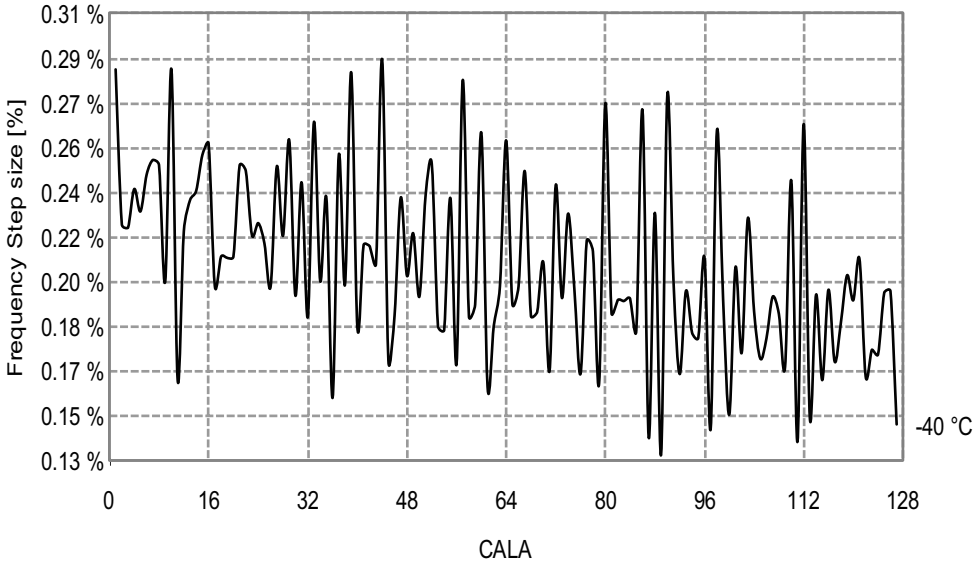


Figure 34-133. 32MHz Internal Oscillator CALA Calibration Step Size

T = -40°C, V_{CC} = 3.0V



34.3 Atmel ATxmega128C3

34.3.1 Current Consumption

34.3.1.1 Active Mode Supply Current

Figure 34-143. Active Supply Current vs. Frequency

f_{SYS} = 0 - 1MHz external clock, T = 25°C

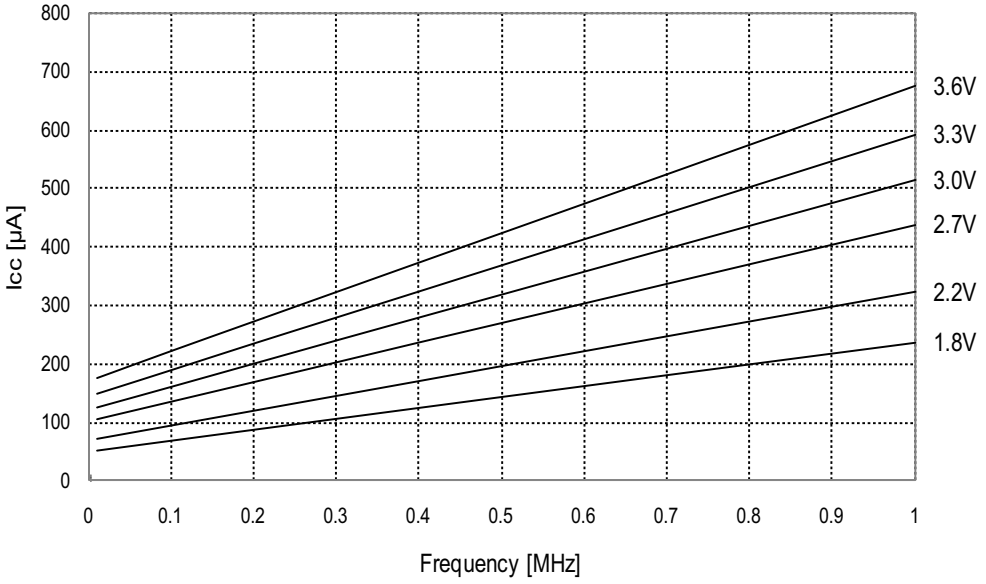


Figure 34-144. Active Supply Current vs. Frequency

f_{SYS} = 1 - 32MHz external clock, T = 25°C

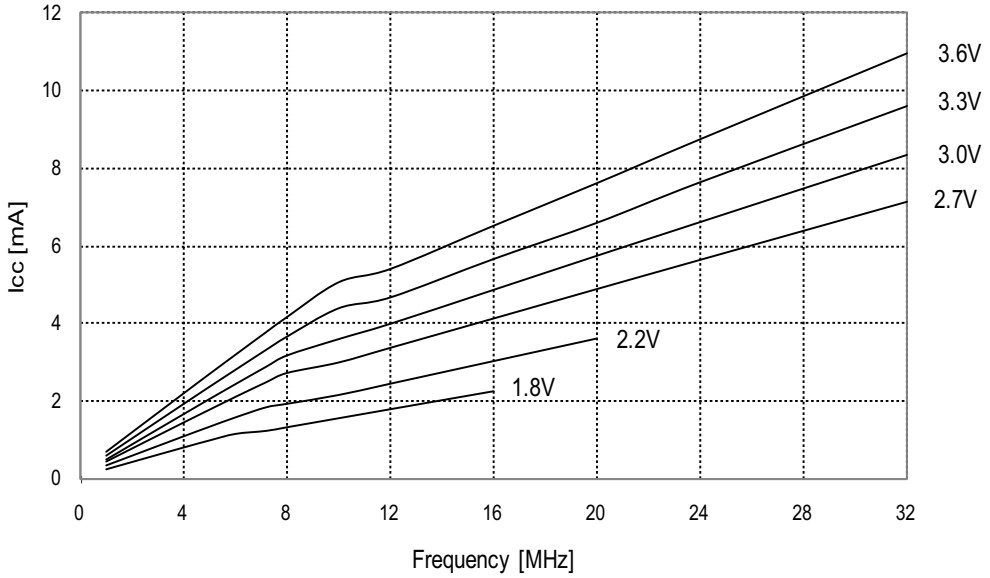


Figure 34-199. 2MHz Internal Oscillator Frequency vs. Temperature

DFLL enabled, from the 32.768kHz internal oscillator

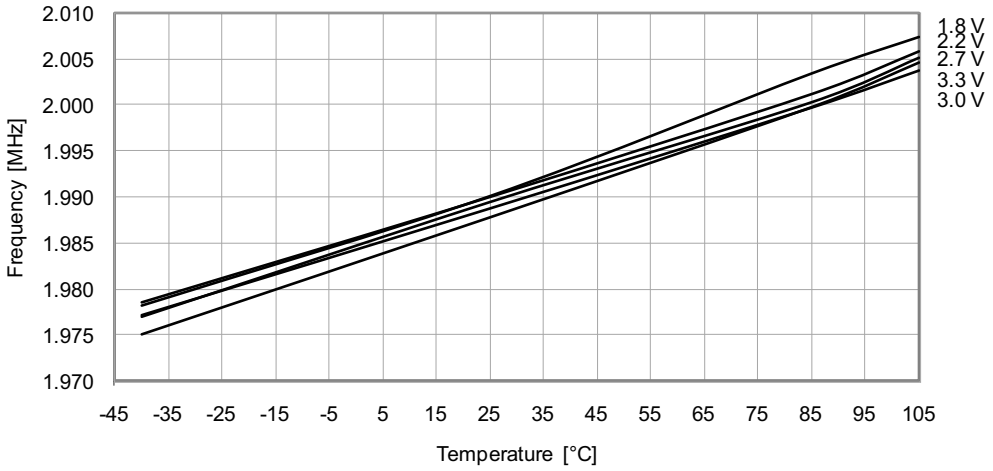
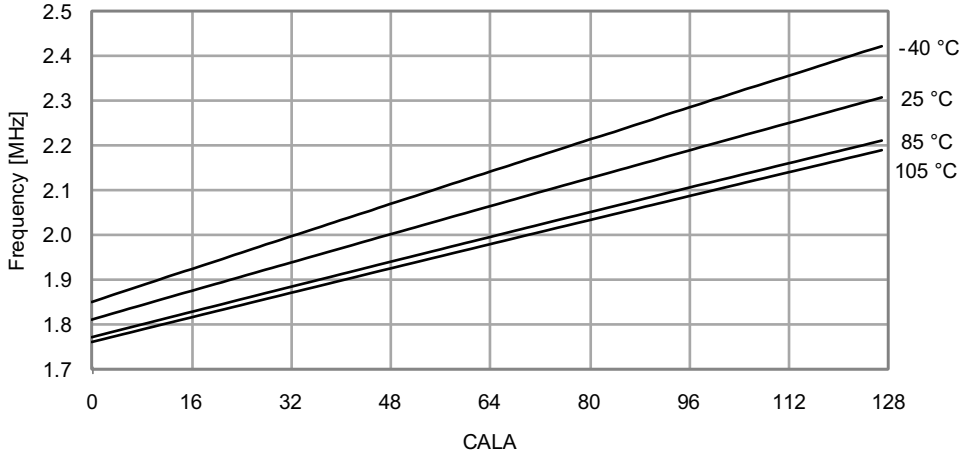


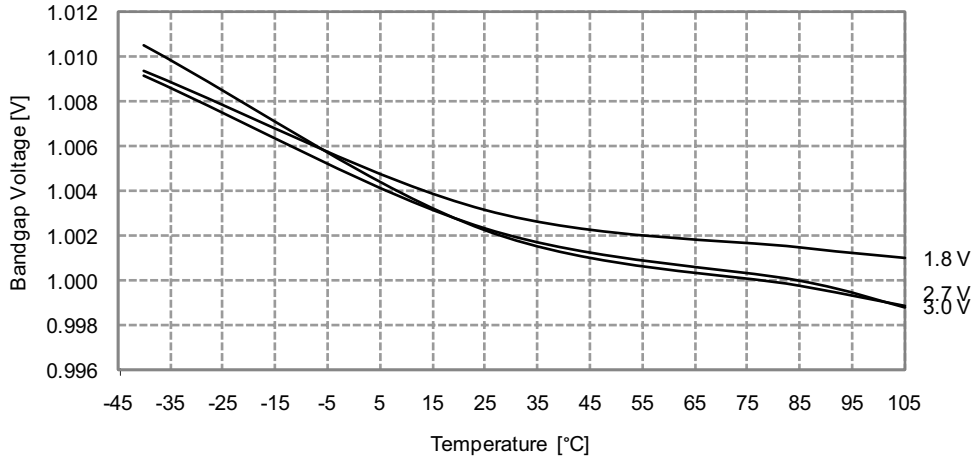
Figure 34-200. 2MHz Internal Oscillator Frequency vs. CALA Calibration Value

V_{CC} = 3V.



34.4.5 Internal 1.0V Reference Characteristics

Figure 34-257. ADC Internal 1.0V Reference vs. Temperature



34.4.6 BOD Characteristics

Figure 34-258. BOD Thresholds vs. Temperature

BOD level = 1.6V

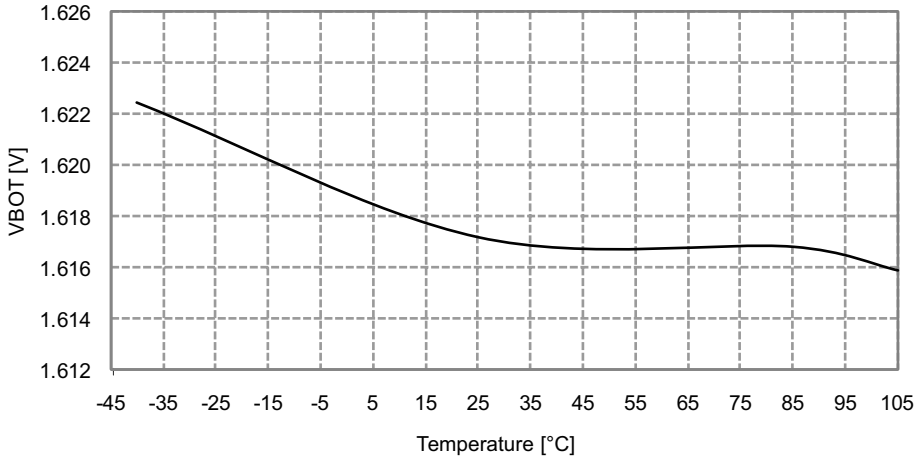


Figure 34-269. 2MHz Internal Oscillator Frequency vs. Temperature

DFLL enabled, from the 32.768kHz internal oscillator

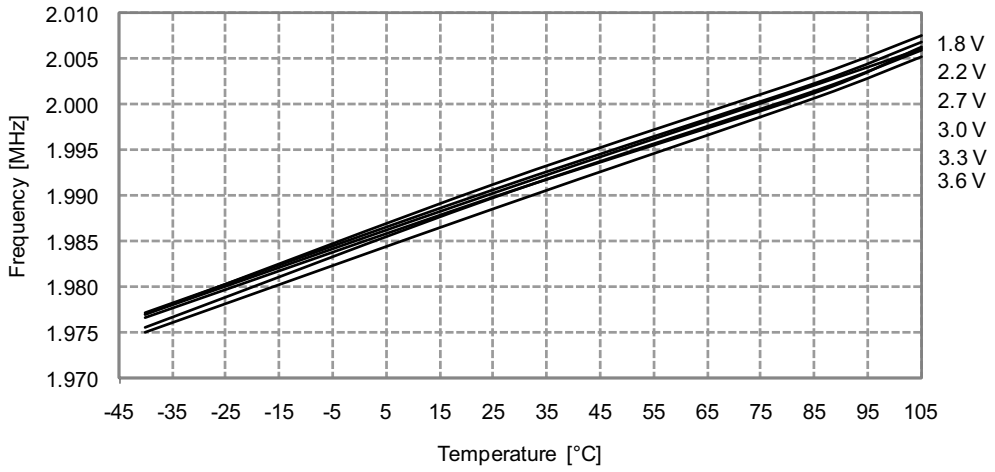
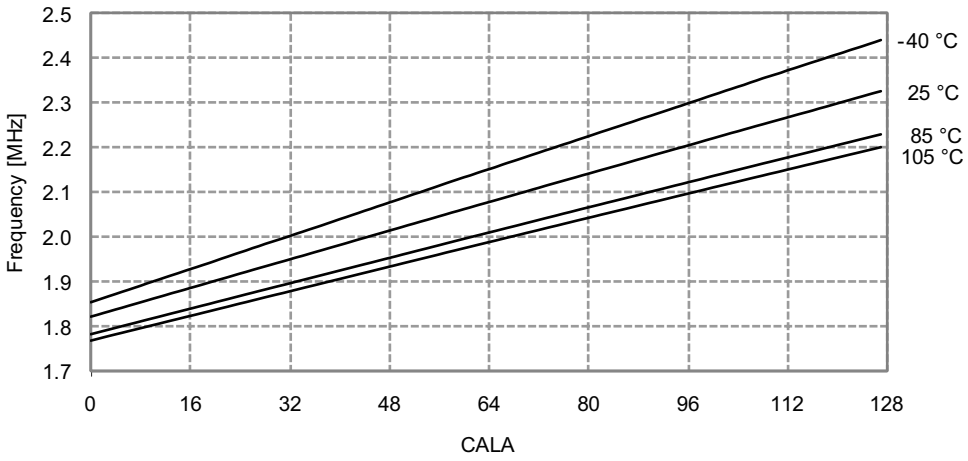


Figure 34-270. 2MHz Internal Oscillator Frequency vs. CALA Calibration Value

V_{CC} = 3V



34.4.8.4 32MHz Internal Oscillator

Figure 34-271. 32MHz Internal Oscillator Frequency vs. Temperature

DFLL disabled

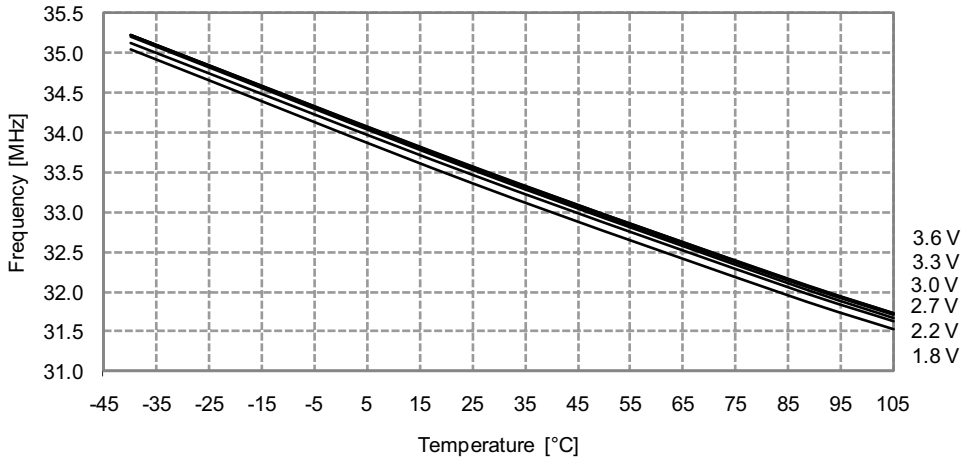


Figure 34-272. 32MHz Internal Oscillator Frequency vs. Temperature

DFLL enabled, from the 32.768kHz internal oscillator

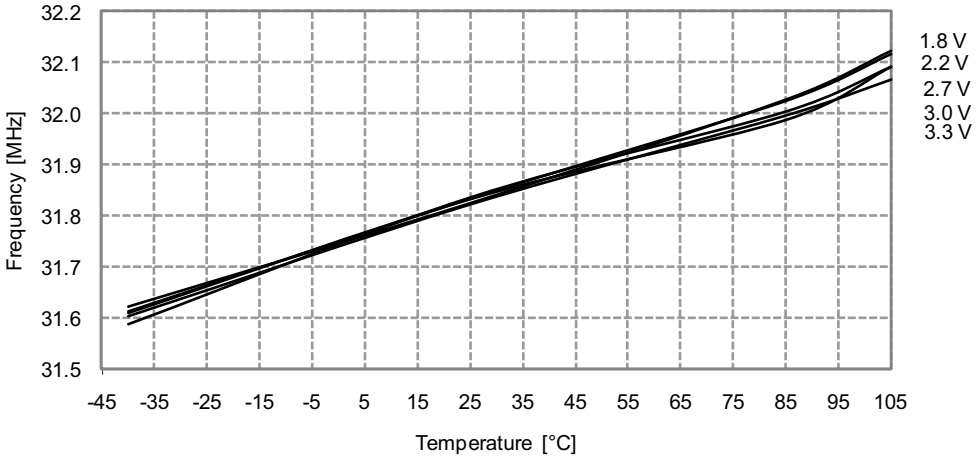


Figure 34-315. DNL Error vs. External V_{REF}

T = 25°C, V_{CC} = 3.6V, external reference

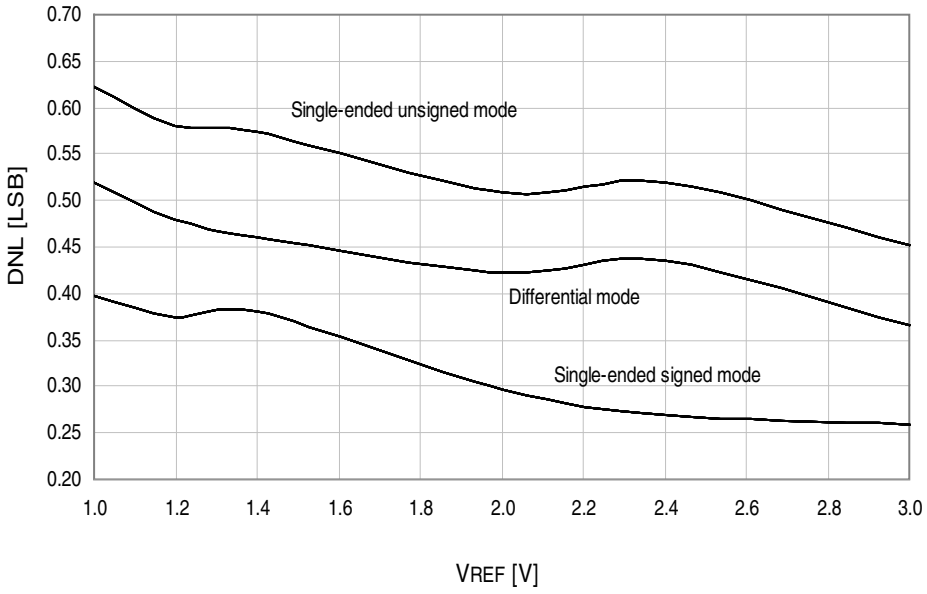
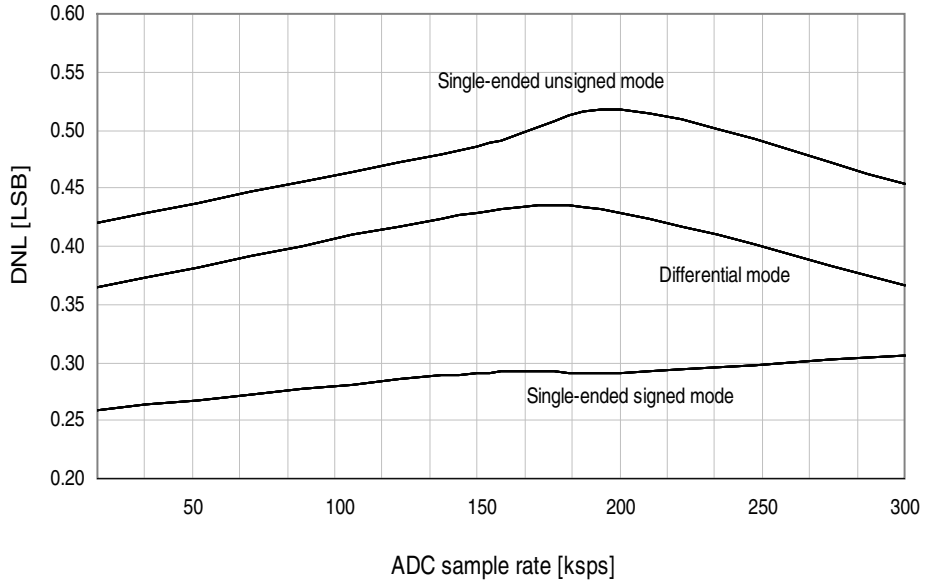


Figure 34-316. DNL Error vs. Sample Rate

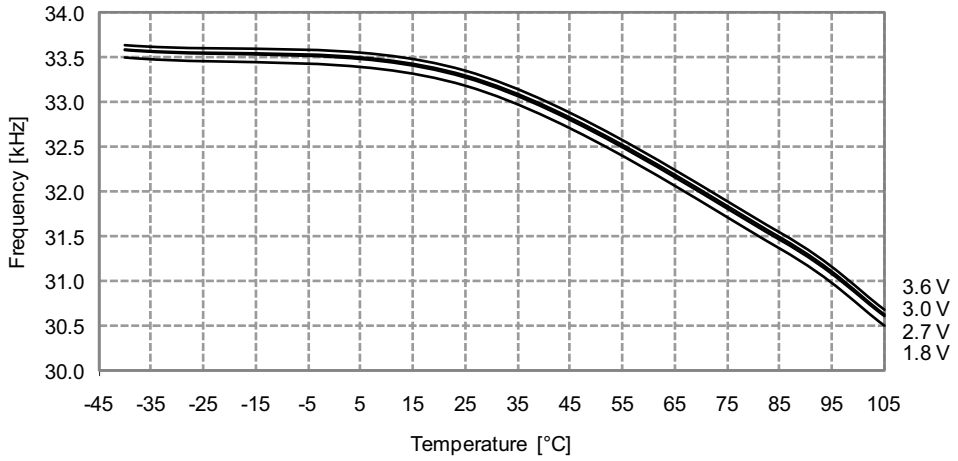
T = 25°C, V_{CC} = 3.6V, V_{REF} = 3.0V external



34.5.8 Oscillator Characteristics

34.5.8.1 Ultra Low-Power Internal Oscillator

Figure 34-335. Ultra Low-Power Internal Oscillator Frequency vs. Temperature



34.5.8.2 32.768kHz Internal Oscillator

Figure 34-336. 32.768kHz Internal Oscillator Frequency vs. Temperature

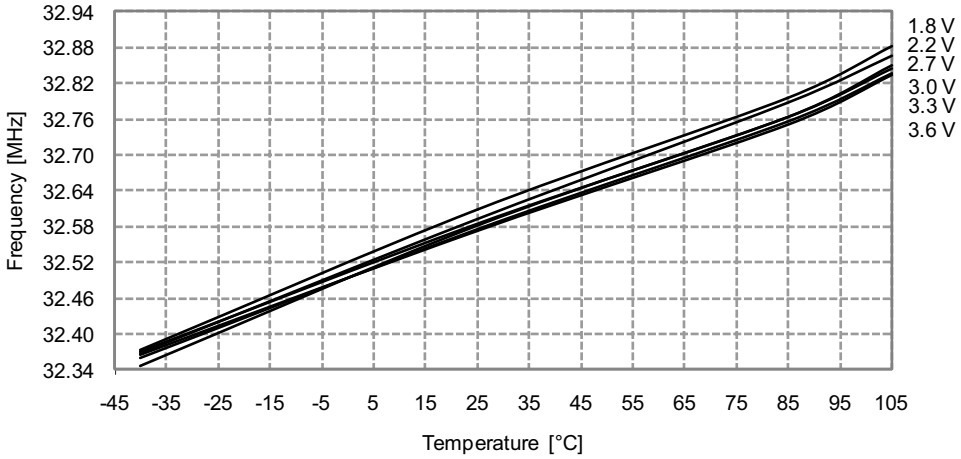


Figure 34-345. 32MHz Internal Oscillator CALA Calibration Step Size

T = 85°C, V_{CC} = 3.0V

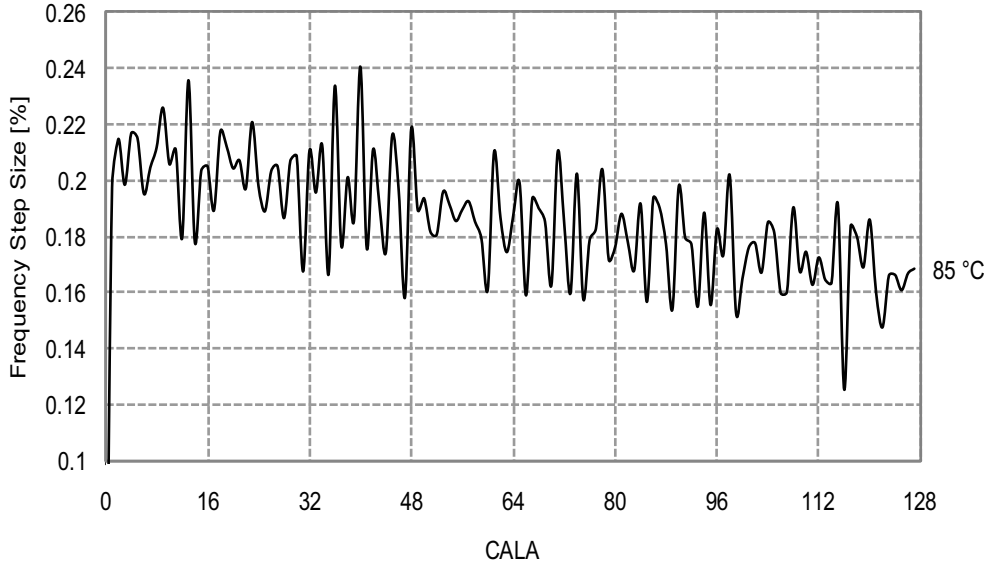


Figure 34-346. 32MHz Internal Oscillator CALA Calibration Step Size

T = 105°C, V_{CC} = 3.0V