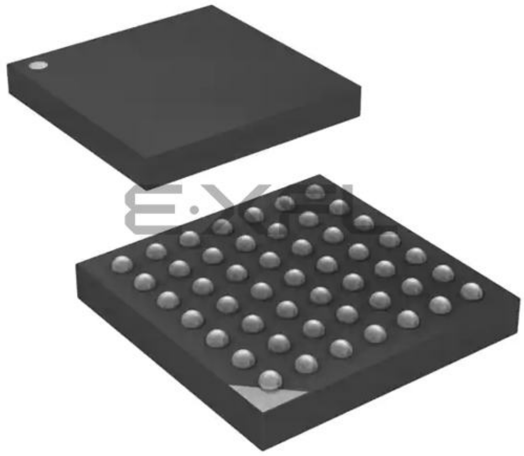


Welcome to E-XFL.COM

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
Peripherals	Brown-out Detect/Reset, POR, PWM, WDT
Number of I/O	34
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 12x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	49-VFBGA
Supplier Device Package	49-VFBGA (5x5)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/atxmega64d4-cu

Table 7-3. Number of Bytes and Pages in the EEPROM

Devices	EEPROM	Page Size	E2BYTE	E2PAGE	No of Pages
	Size	**bytes**			
ATxmega16D4	1K	32	ADDR[4:0]	ADDR[10:5]	32
ATxmega32D4	1K	32	ADDR[4:0]	ADDR[10:5]	32
ATxmega64D4	2K	32	ADDR[4:0]	ADDR[10:5]	64
ATxmega128D4	2K	32	ADDR[4:0]	ADDR[10:5]	64

23. IRCOM – IR Communication Module

23.1 Features

- Pulse modulation/demodulation for infrared communication
- IrDA compatible for baud rates up to 115.2kbps
- Selectable pulse modulation scheme
  - 3/16 of the baud rate period
  - Fixed pulse period, 8-bit programmable
  - Pulse modulation disabled
- Built-in filtering
- Can be connected to and used by any USART

23.2 Overview

Atmel AVR XMEGA devices contain an infrared communication module (IRCOM) that is IrDA compatible for baud rates up to 115.2Kbps. It can be connected to any USART to enable infrared pulse encoding/decoding for that USART.

25. ADC – 12-bit Analog to Digital Converter

25.1 Features

- One Analog to Digital Converters (ADC)
- 12-bit resolution
- Up to 200 thousand samples per second
  - Down to 3.6µs conversion time with 8-bit resolution
  - Down to 5.0µs conversion time with 12-bit resolution
- Differential and single-ended input
  - Up to 12 single-ended inputs
  - 12x4 differential inputs without gain
  - 12x4 differential input with gain
- Built-in differential gain stage
  - 1/2x, 1x, 2x, 4x, 8x, 16x, 32x, and 64x gain options
- Single, continuous and scan conversion options
- Three internal inputs
  - Internal temperature sensor
  - AV_{CC} voltage divided by 10
  - 1.1V bandgap voltage
- Internal and external reference options
- Compare function for accurate monitoring of user defined thresholds
- Optional event triggered conversion for accurate timing
- Optional interrupt/event on compare result

25.2 Overview

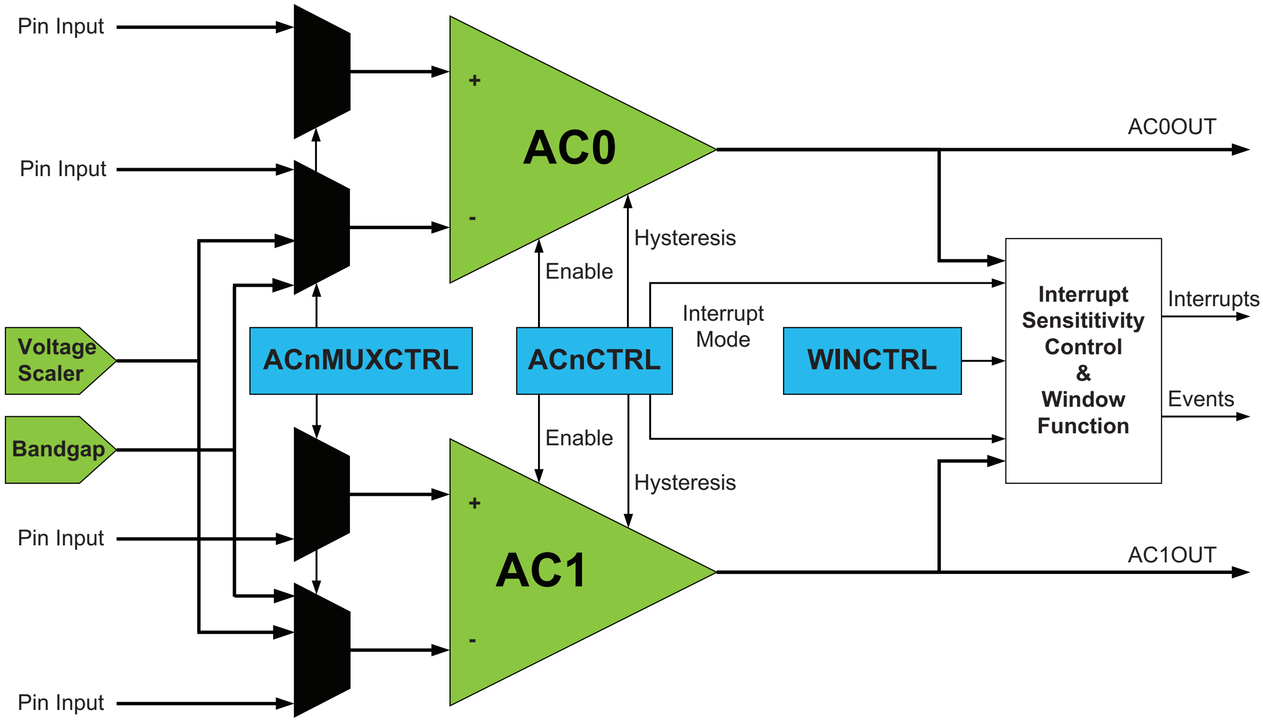
The ADC converts analog signals to digital values. The ADC has 12-bit resolution and is capable of converting up to 200 thousand samples per second (ksps). The input selection is flexible, and both single-ended and differential measurements can be done. For differential measurements, an optional gain stage is available to increase the dynamic range. In addition, several internal signal inputs are available. The ADC can provide both signed and unsigned results.

The ADC measurements can either be started by application software or an incoming event from another peripheral in the device. The ADC measurements can be started with predictable timing, and without software intervention.

Both internal and external reference voltages can be used. An integrated temperature sensor is available for use with the ADC. The AV_{CC}/10 and the bandgap voltage can also be measured by the ADC.

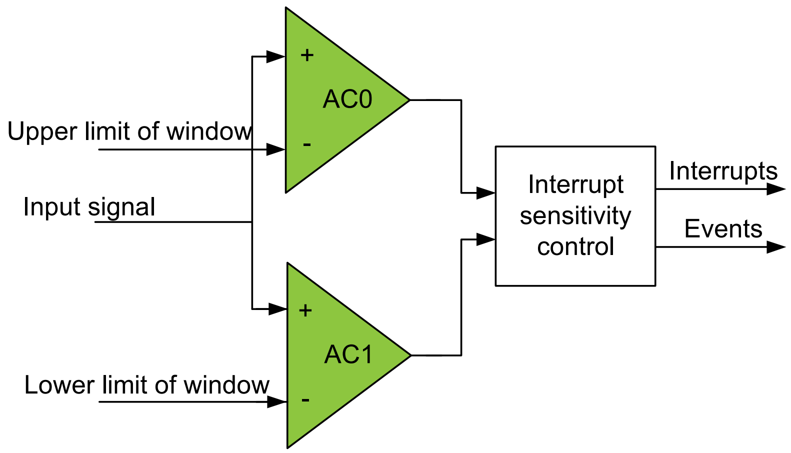
The ADC has a compare function for accurate monitoring of user defined thresholds with minimum software intervention required.

Figure 26-1. Analog Comparator Overview

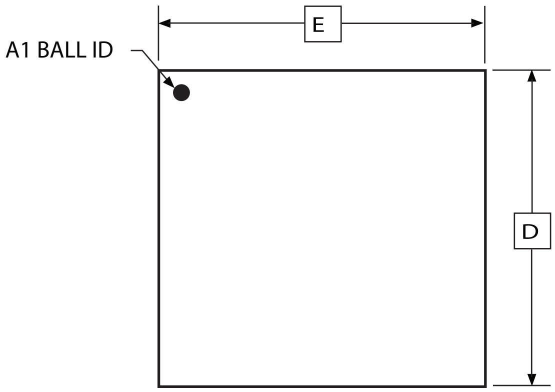


The window function is realized by connecting the external inputs of the two analog comparators in a pair as shown in Figure 26-2.

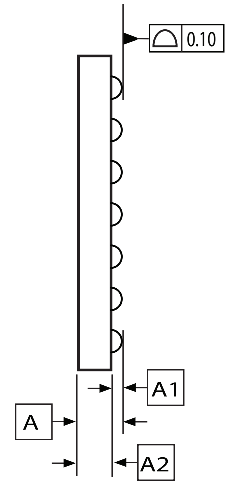
Figure 26-2. Analog Comparator Window Function



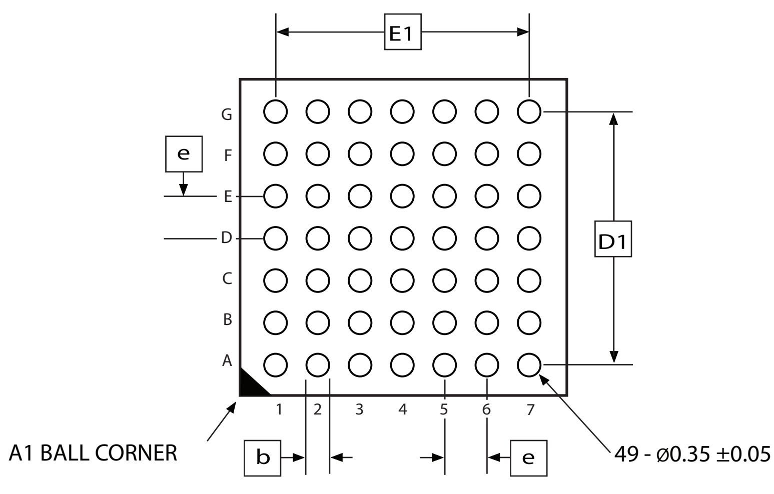
31.3 49C2



TOP VIEW



SIDE VIEW



BOTTOM VIEW

COMMON DIMENSIONS
(Unit of Measure = mm)

SYMBOL	MIN	NOM	MAX	NOTE
A	–	–	1.00	
A1	0.20	–	–	
A2	0.65	–	–	
D	4.90	5.00	5.10	
D1	3.90 BSC			
E4.90	5.00	5.10		
E1	3.90 BSC			
b	0.30	0.35	0.40	
e	0.65 BSC			

3/14/08

Atmel Package Drawing Contact: packagedrawings@atmel.com	TITLE 49C2, 49-ball (7 x 7 array), 0.65mm pitch, 5.0 x 5.0 x 1.0mm, very thin, fine-pitch ball grid array package (VFBGA)	GPC	DRAWING NO.	REV.
		CBD	49C2	A

32.2.8 Bandgap and Internal 1.0V Reference Characteristics

Table 32-41. 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	0.98	1	1.02	
	Variation over voltage and temperature	Calibrated at T= 85°C, V_{CC} = 3.0V		±1.0		%

32.2.9 Brownout Detection Characteristics

Table 32-42. Brownout Detection Characteristics[(1)]

Symbol	Parameter	Condition	Min.	Typ.	Max.	Units
V_{BOT}	BOD level 0 falling V_{CC}		1.50	1.62	1.75	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			1.2		%

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

32.2.10 External Reset Characteristics

Table 32-43. 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_{IH})	V_{CC} = 2.7 - 3.6V	0.6*V_{CC}			V
		V_{CC} = 1.6 - 2.7V	0.6*V_{CC}			
	Reset threshold voltage (V_{IL})	V_{CC} = 2.7 - 3.6V			0.5*V_{CC}	
		V_{CC} = 1.6 - 2.7V			0.4*V_{CC}	
R_{RST}	Reset pin pull-up resistor			25		kΩ

32.3.14 SPI Characteristics

Figure 32-19.SPI Timing Requirements in Master Mode

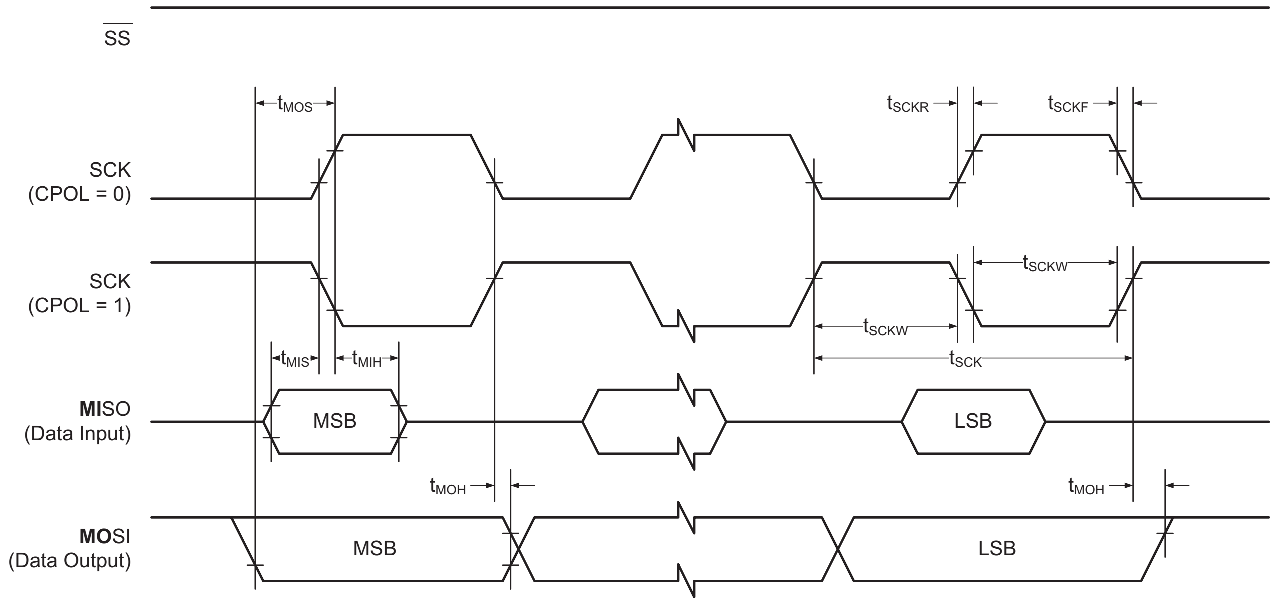


Figure 32-20.SPI Timing Requirements in Slave Mode

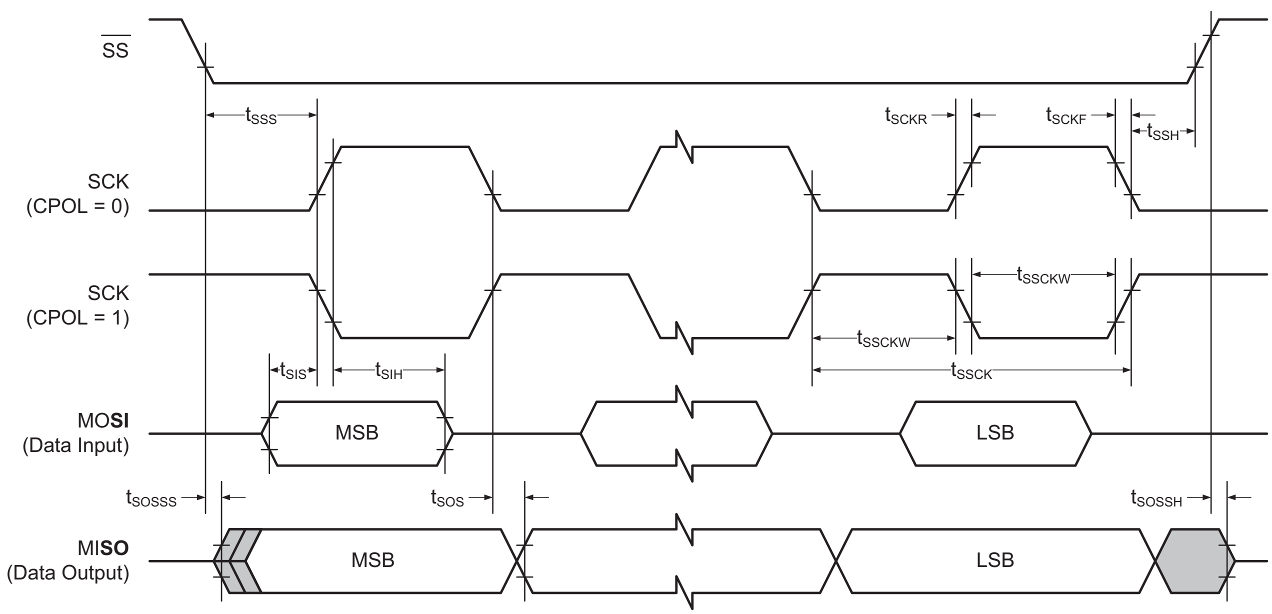


Figure 33-27. I/O Pin Output Voltage vs. Source Current

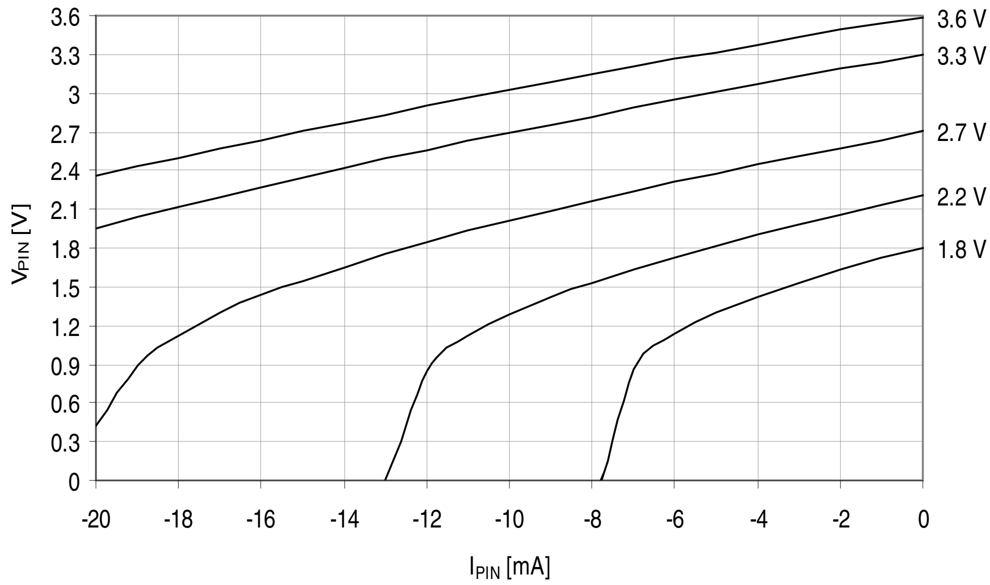


Figure 33-28. I/O Pin Output Voltage vs. Sink Current

V_{CC} = 1.8V

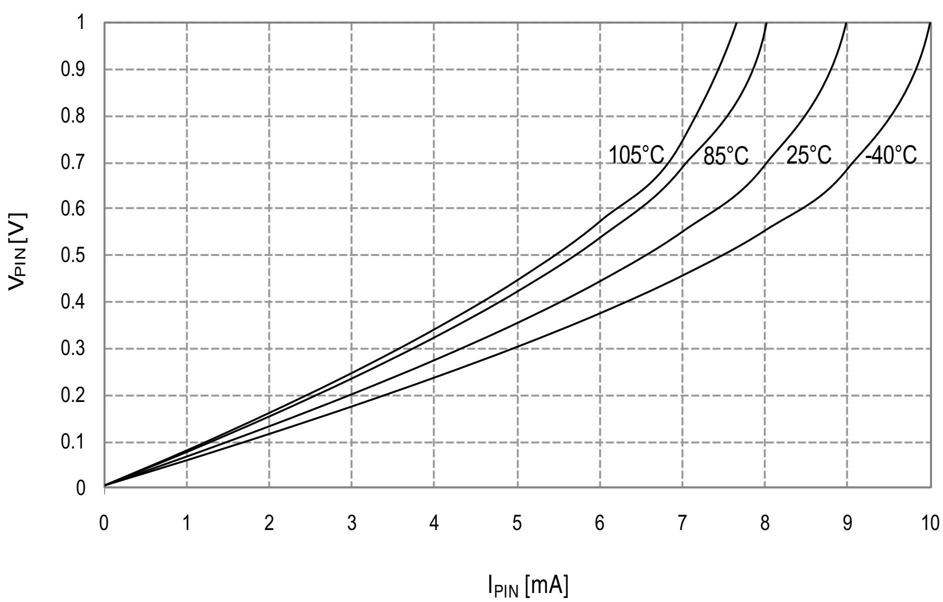
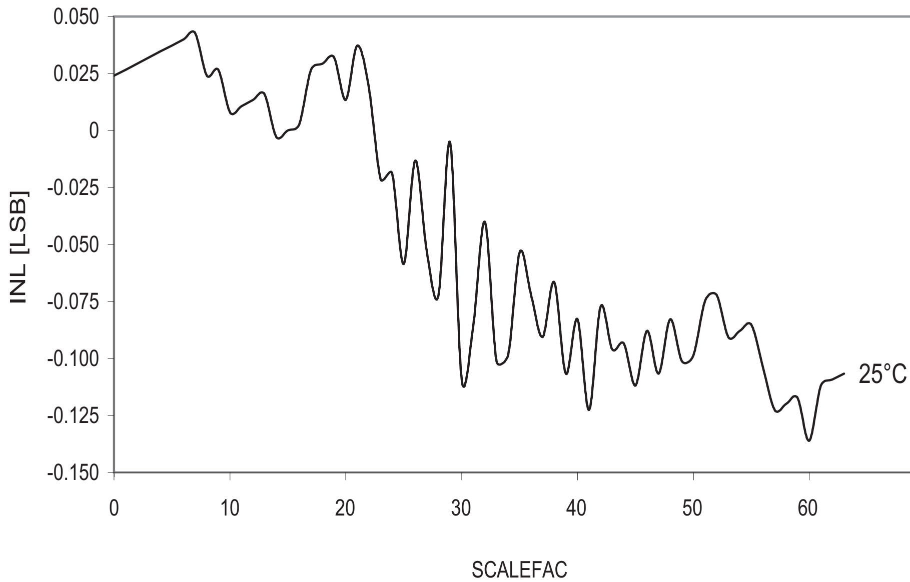


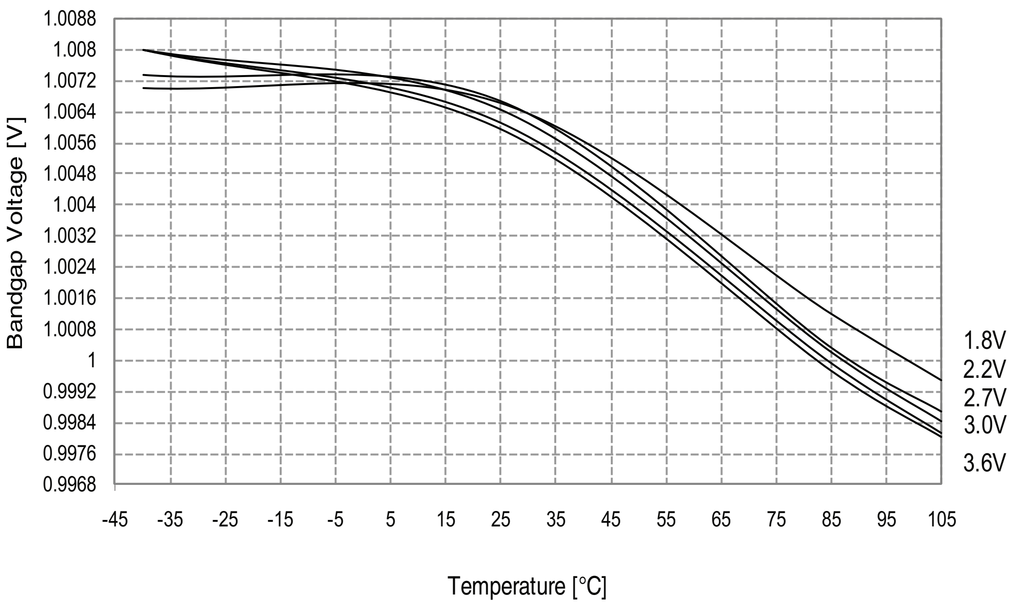
Figure 33-53. Voltage Scaler INL vs. SCALEFAC

T = 25°C, V_{CC} = 3.0V



33.1.5 Internal 1.0V Reference Characteristics

Figure 33-54. ADC Internal 1.0V Reference vs. Temperature



33.1.7 External Reset Characteristics

Figure 33-57. Minimum Reset Pin Pulse Width vs. V_{CC}

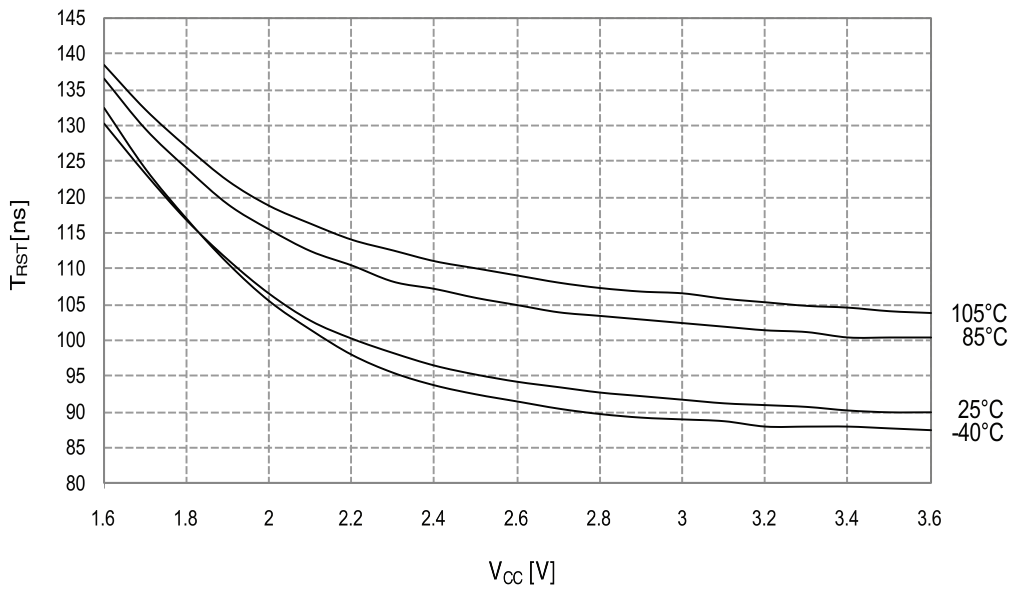
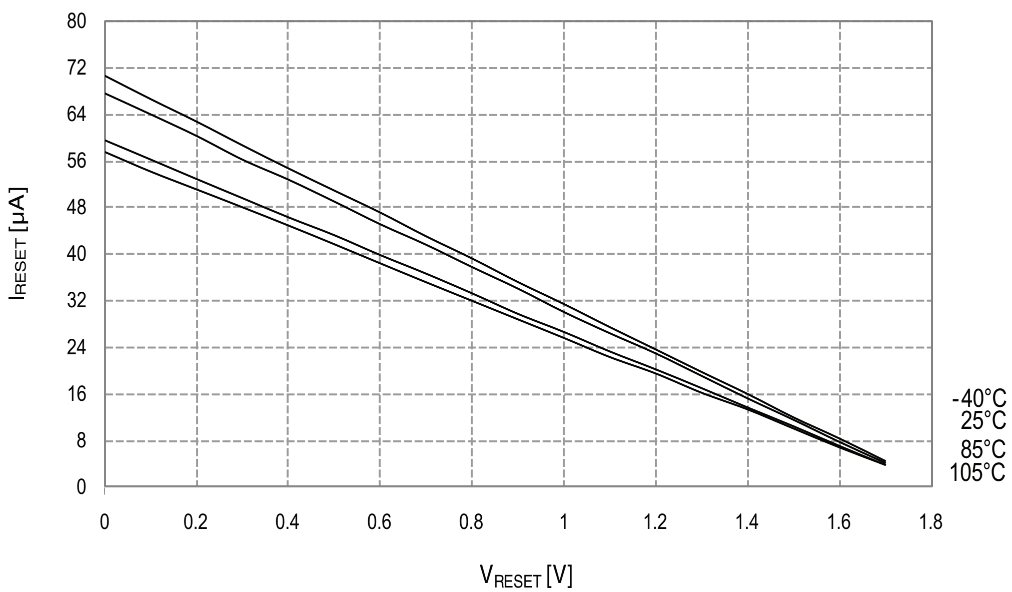


Figure 33-58. Reset Pin Pull-up Resistor Current vs. Reset Pin Voltage

V_{CC} = 1.8V



33.3.1.5 Standby Mode Supply Current

Figure 33-177. Standby Supply Current vs. V_{CC}

Standby, f_{SYS} = 1MHz

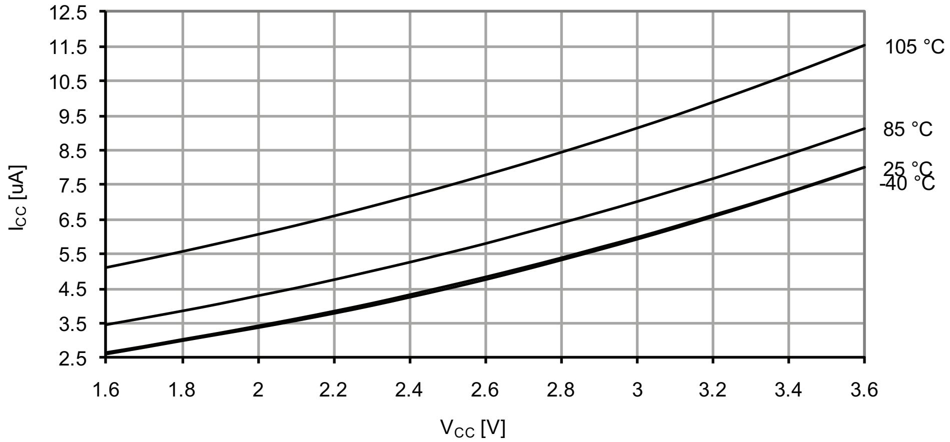


Figure 33-178. Standby Supply Current vs. V_{CC}

25°C, running from different crystal oscillators

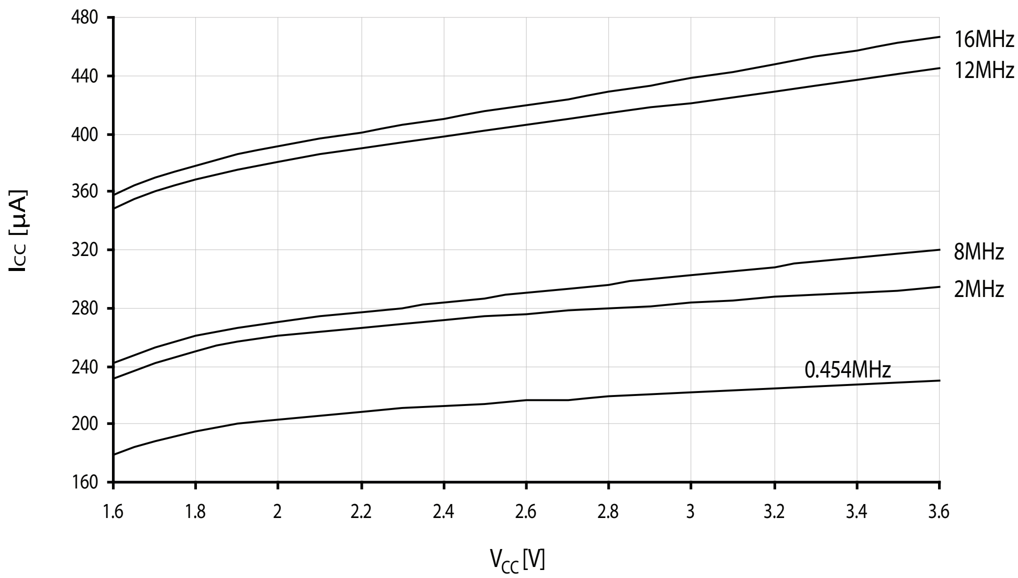


Figure 33-201. Gain Error vs. V_{CC}

T = 25°C, V_{REF} = external 1.0V, ADC sampling speed = 500ksps

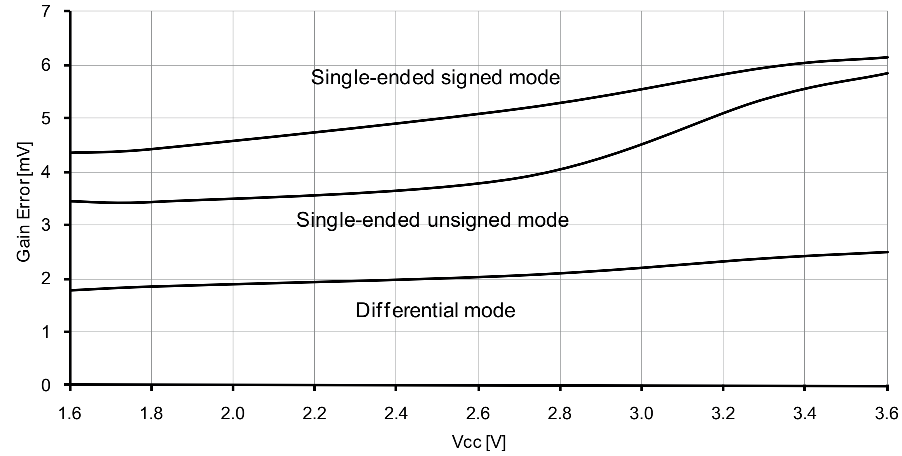


Figure 33-202. Offset Error vs. V_{REF}

T = 25°C, V_{CC} = 3.6V, ADC sampling speed = 500ksps

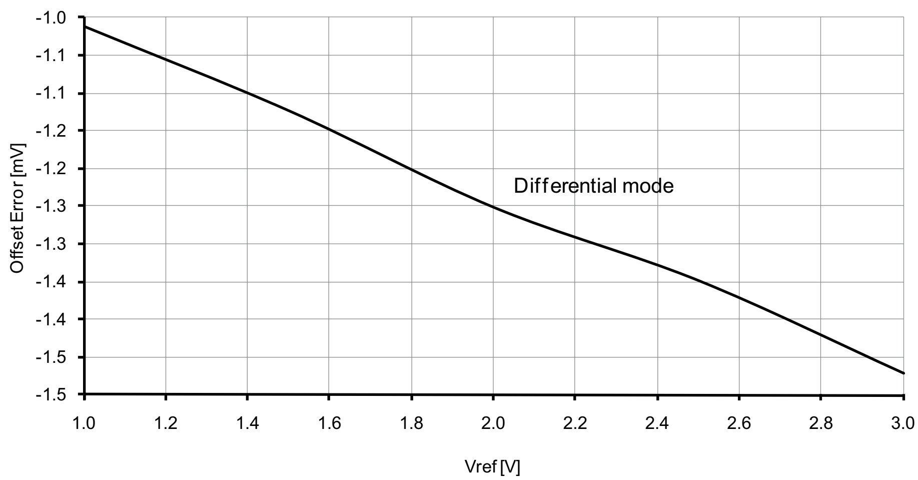
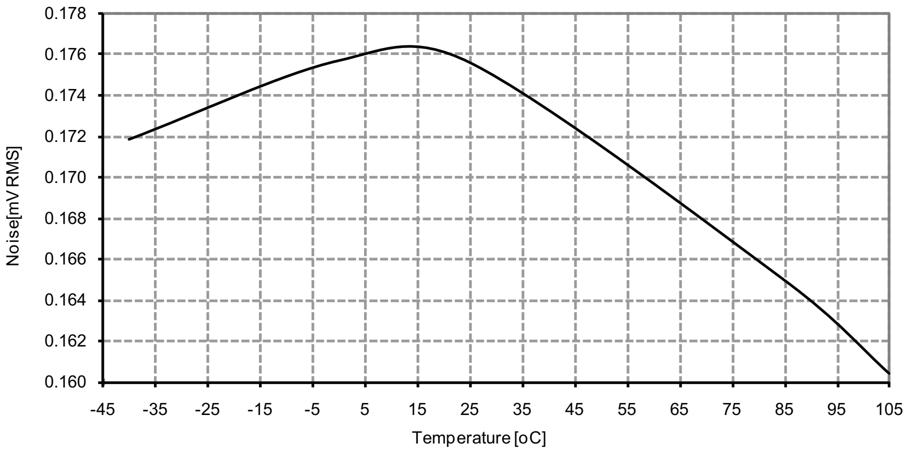


Figure 33-209. DAC Noise vs. Temperature

V_{CC} = 2.7V, V_{REF} = 1.0V



33.3.5 Analog Comparator Characteristics

Figure 33-210. Analog Comparator Hysteresis vs. V_{CC}

High-speed, small hysteresis

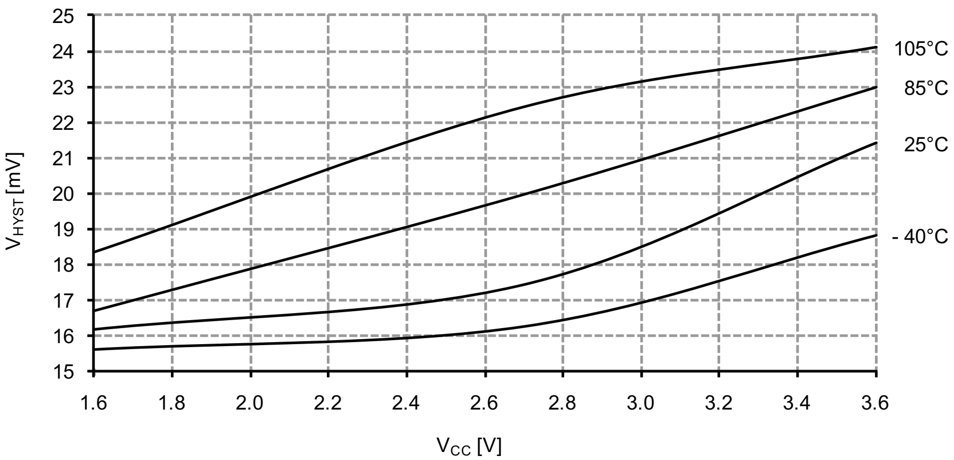


Figure 33-211. Analog Comparator Hysteresis vs. V_{CC}

Low power, small hysteresis

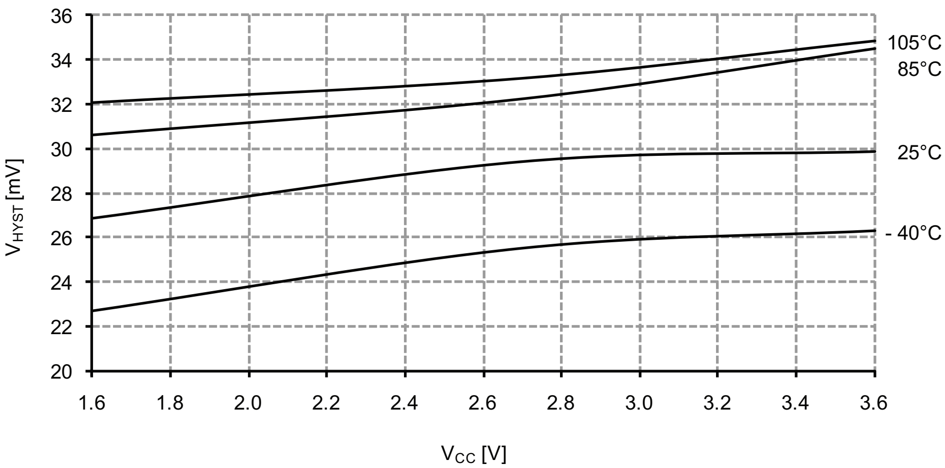


Figure 33-212. Analog Comparator Hysteresis vs. V_{CC}

High-speed mode, large hysteresis

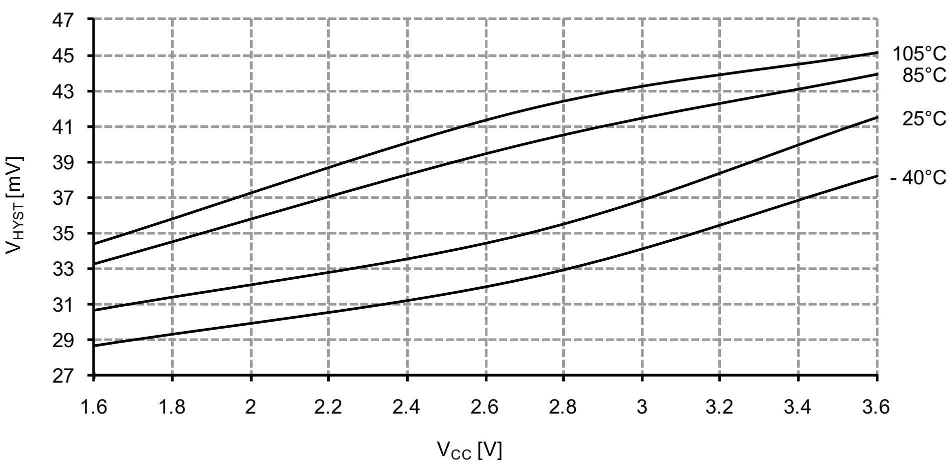
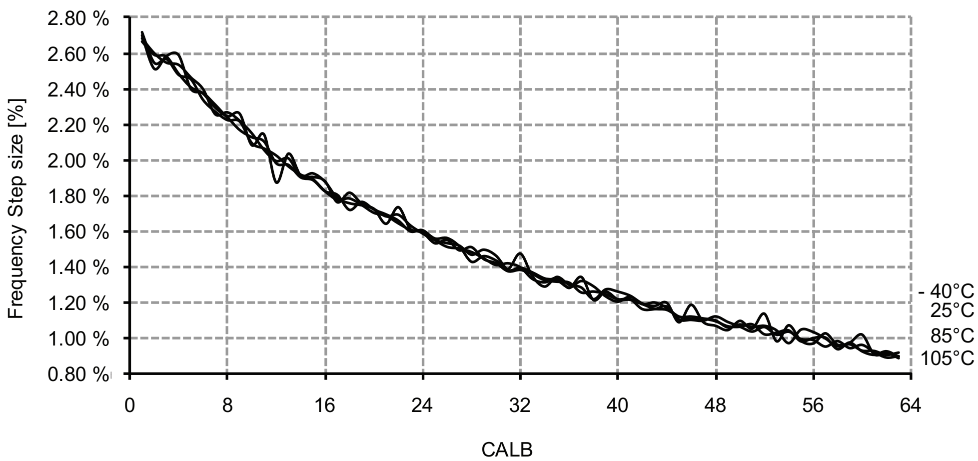


Figure 33-237. 32MHz Internal Oscillator CALB Calibration Step Size

V_{CC} = 3.0V



33.3.10.5 32MHz Internal Oscillator Calibrated to 48MHz

Figure 33-238. 48MHz Internal Oscillator Frequency vs. Temperature

DFLL disabled

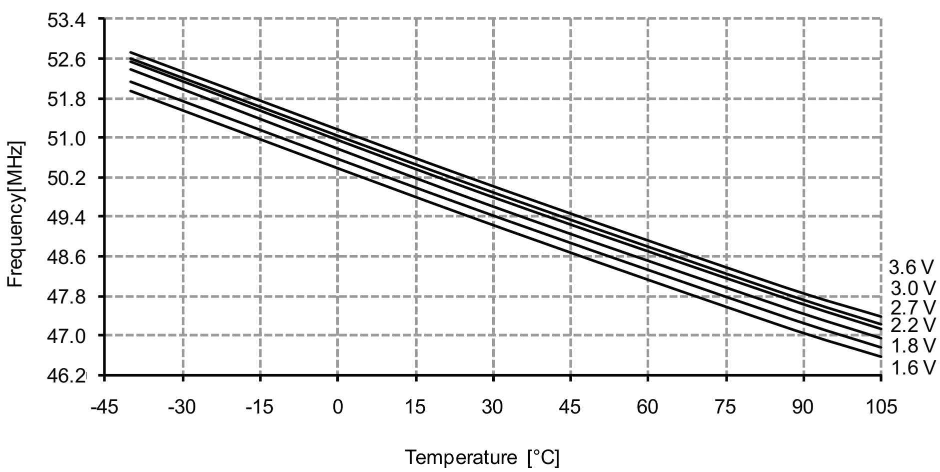


Figure 33-295. Analog Comparator Hysteresis vs. V_{CC}

Low power, small hysteresis

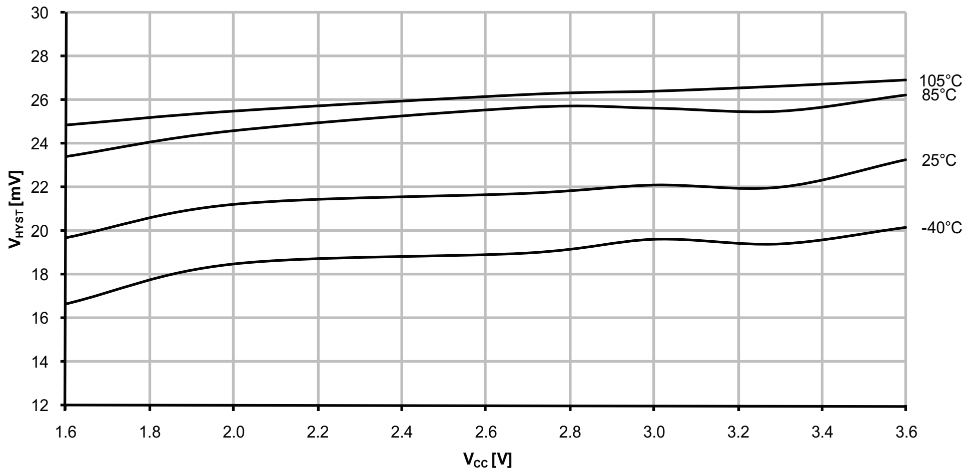


Figure 33-296. Analog Comparator Hysteresis vs. V_{CC}

High-speed mode, large hysteresis

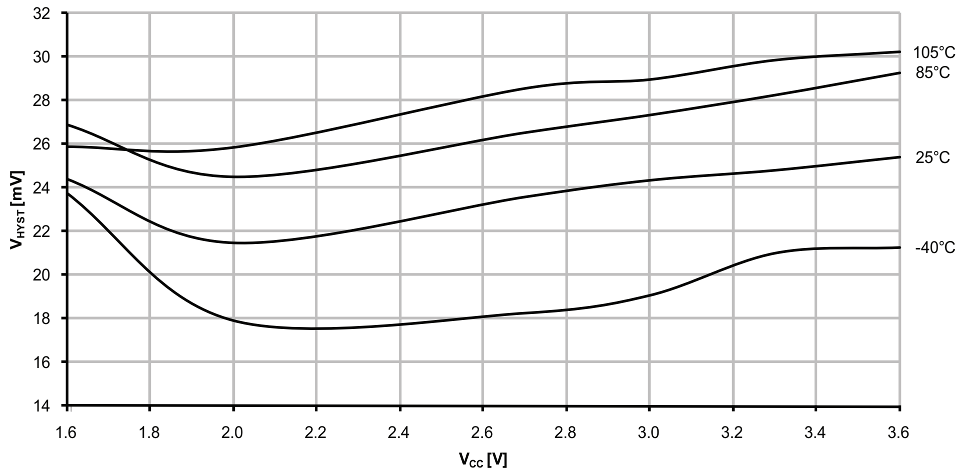


Figure 33-297. Analog Comparator Hysteresis vs. V_{CC}

Low power, large hysteresis

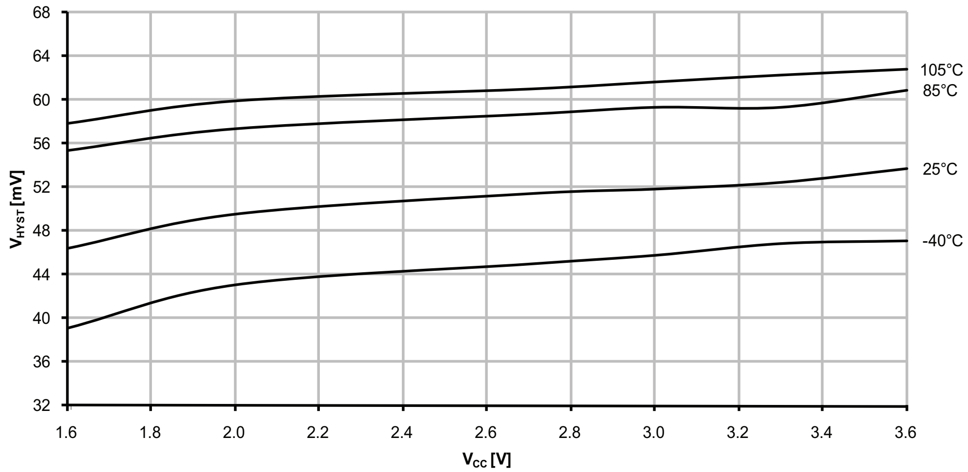
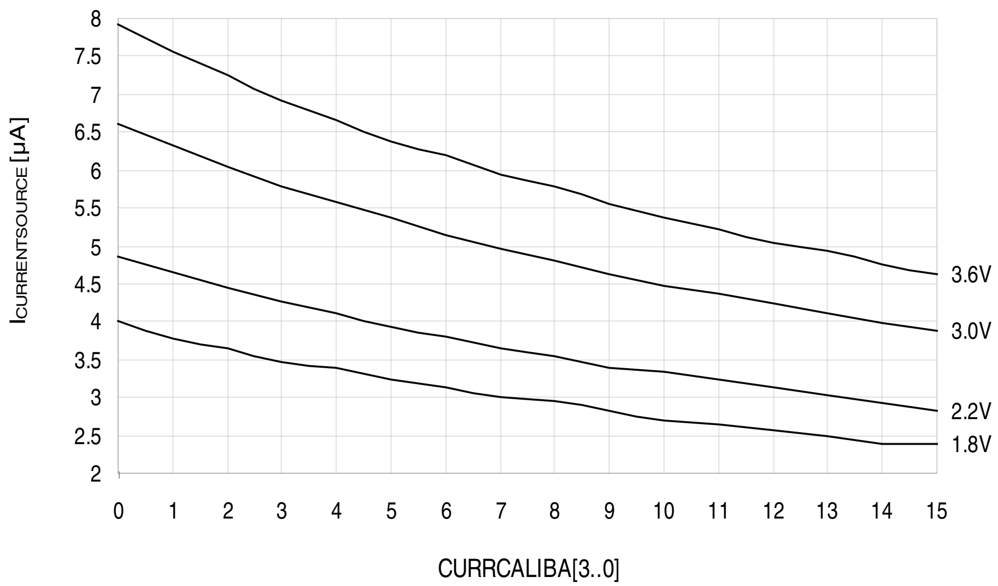


Figure 33-298. Analog Comparator Current Source vs. Calibration Value

Temperature = 25°C



33.4.10.5 32MHz Internal Oscillator Calibrated to 48MHz

Figure 33-321. 48MHz Internal Oscillator Frequency vs. Temperature

DFLL disabled

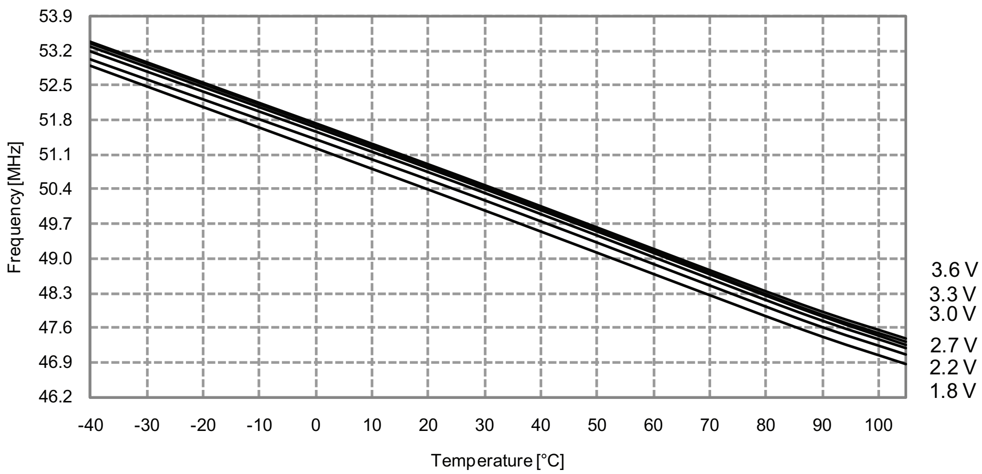


Figure 33-322. 48MHz Internal Oscillator Frequency vs. Temperature

DFLL enabled, from the 32.768kHz internal oscillator

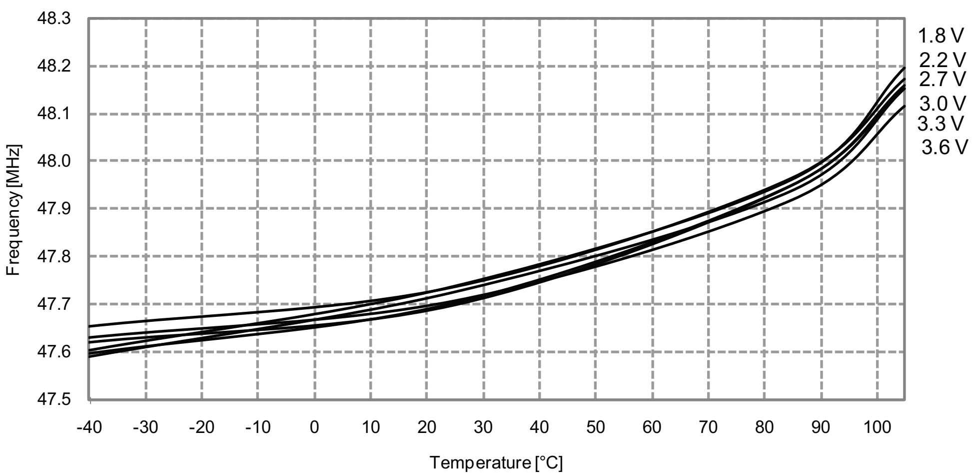
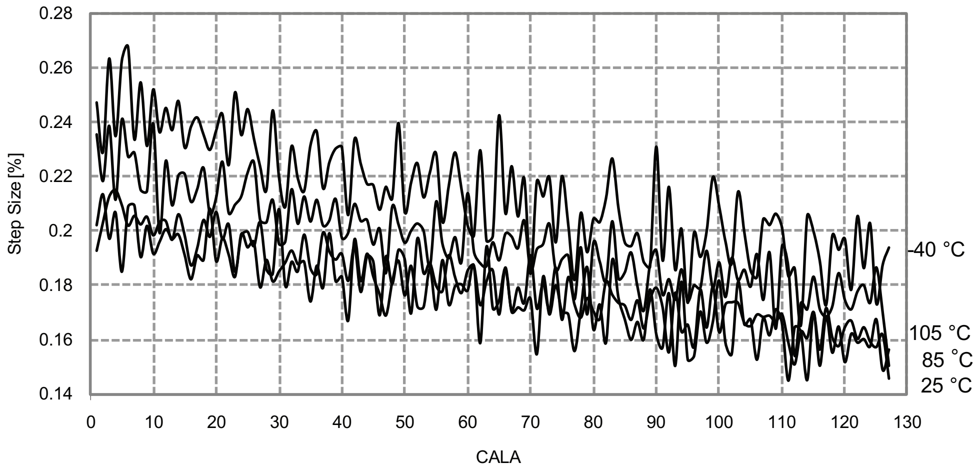


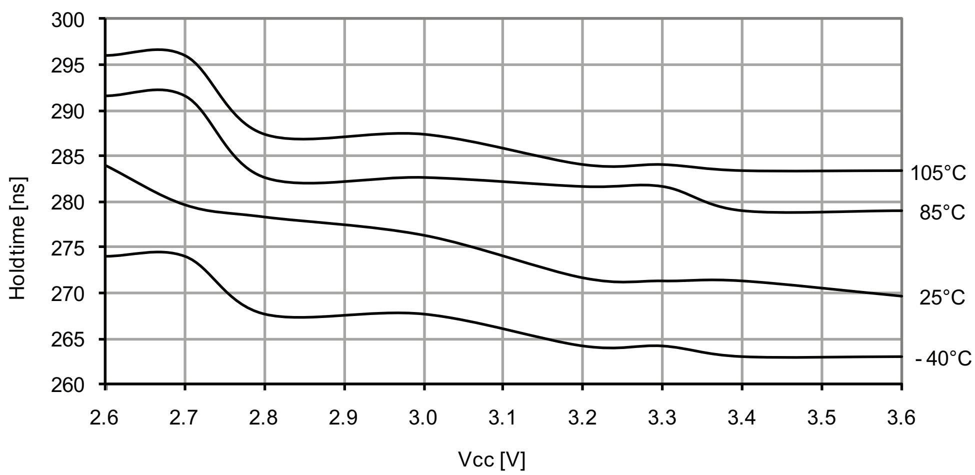
Figure 33-323. 48MHz Internal Oscillator CALA Calibration Step Size

$V_{CC} = 3V$



33.4.11 Two-Wire Interface Characteristics

Figure 33-324. SDA Hold Time vs. Supply Voltage



35.19 8135A – 03/09

1. Initial revision.