Replacing AT84AS003/004 ADC with EV10AS003B/004B ADC

Application Note

1. Introduction

This application note aims at providing you with a comparison and recommendations to migrate from the existing AT84AS003/004 to the EV10AS003B/004B.

It first compares the two versions including:

- Power supplies
- Analog and digital controls

It also describes board modifications to migrate from the existing version to the B version.

This new B series ADC is designed to ensure minimum board level design modifications and equal electrical performance.

This document applies to the following devices:

- AT84AS003CTP
- AT84AS003VTP
- AT84AS004CTP
- AT84AS004VTP

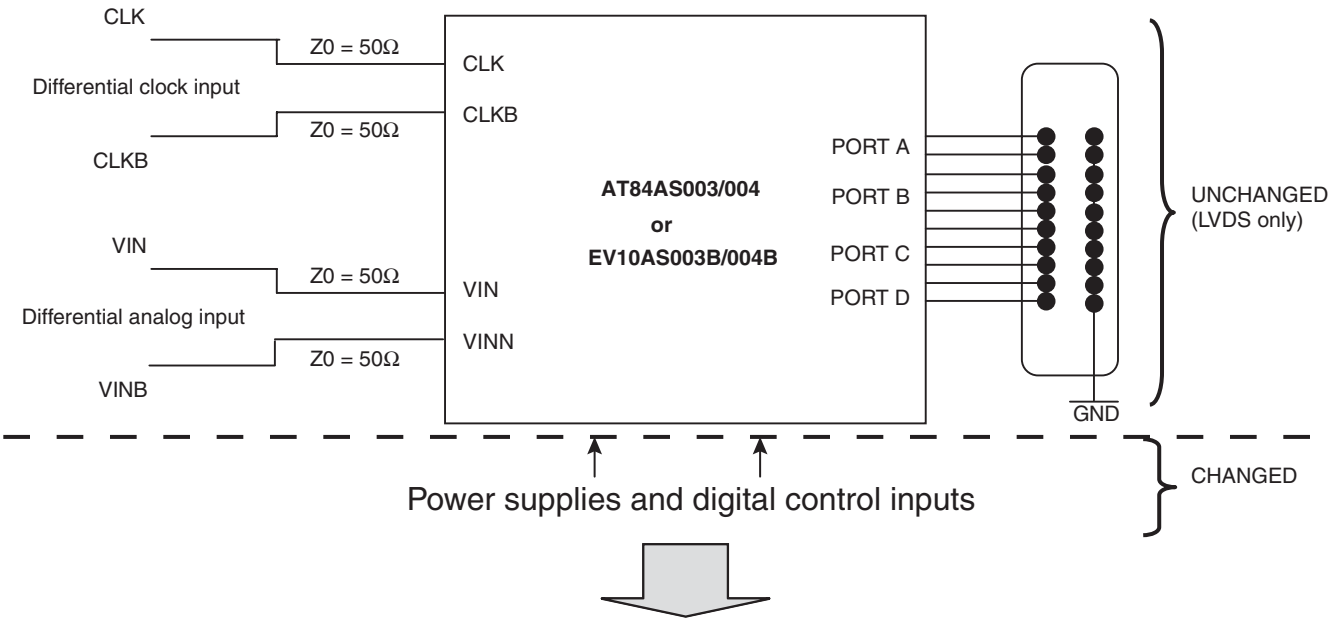
2. Comparing AT84AS003/004 and EV10AS003B/004B 10-bit 1.5/2 Gsps ADC Devices

The EV10AS003B/004B is delivered in the same package as the AT84AS003/004, with same footprint, same mechanical and thermal characteristics.

The EV10AS003B/004B has been designed in order to feature the same timing characteristics as the AT84AS003/004 with ascending electrical performance compatibility.

The following section discusses the similarities and differences between the AT84AS003/004 and the EV10AS003B/004B.

Figure 2-1. Block Diagram



2.1 EV10AS003B/004B versus AT84AS003/004

Highlights of the differences between the two devices:

- Two power supply assignments (lower voltage):
  - Analog power supply: V_{EE}
  - ADC Negative digital power supply: V_{MINUSD}
- Three-digital control input pins active-level change (default mode is unchanged)

Table 2-1. Main Differences Between AT84AS003/004 and EV10AS003B/004B Devices

Function	Symbol	AT84AS003/004	EV10AS003B/004B
Analog power supplies	V_{EE}	–5V	–2.2V
Digital power supplies	V_{MINUSD}	–2.2V	0V (DGND)
Digital control inputs	DRRB	CMOS 3.3V/LVCMOS	CMOS 3.3V/LVCMOS
	B/GB, PGEB, SDAEN	0/ –5V	CMOS 3.3V/LVCMOS
Output buffers	LVDS	Yes	Yes

2.2 Pinout Differences Summary

Table 2-2 is a description of the pin differences between AT84AS003/004 and AT84AD003/004B. Table 2-2 includes recommendations for forward compatibility. For more details, please refer to "EV10AS003B/004B Pinout (Bottom View, Balls Side)" on page 5.

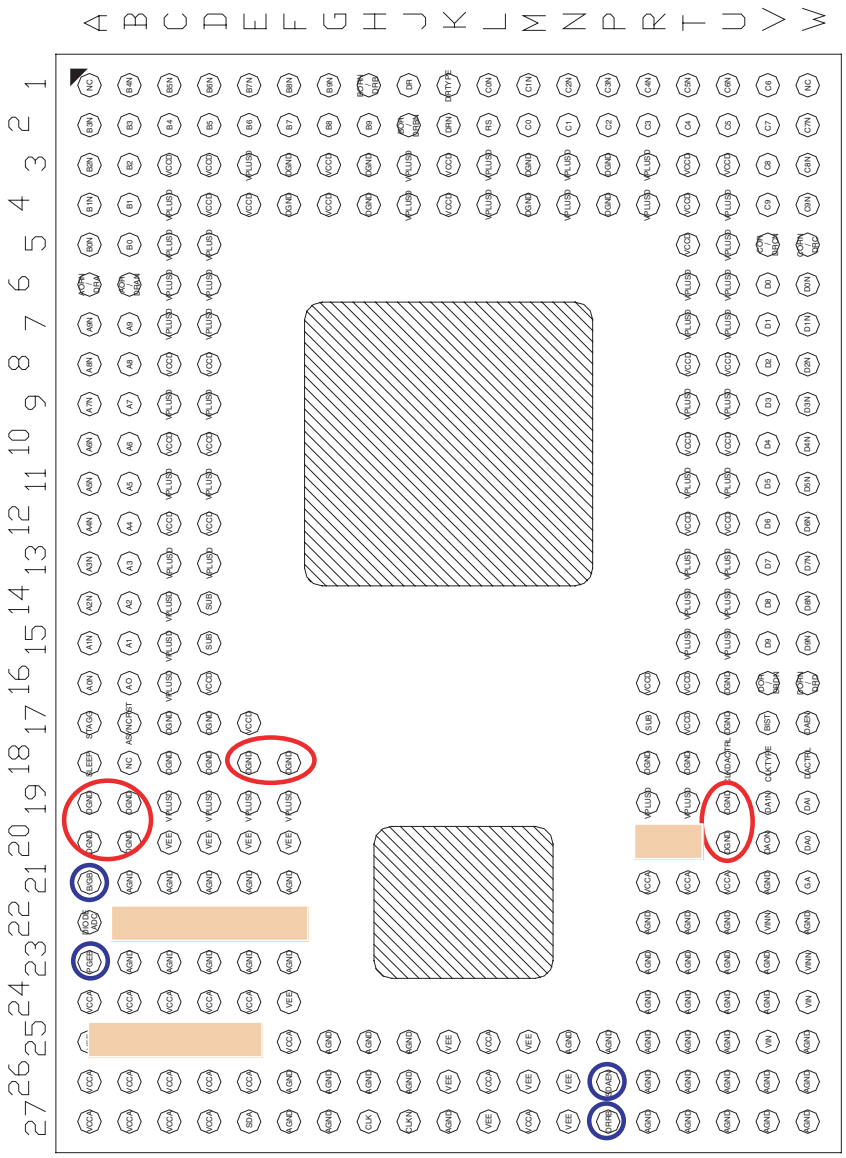
Table 2-2. Pin Differences

Pin	AT84AS003/004	Modification on EV10AS003B/004B
A24, A26, A27, B24, B26, B27, C24, C26, C27, D24, D26, D27, E24, E26, F25, L25, L26, M27, R21, T21, U21	V_{CCA}	Unchanged
B21, B23, C21, C23, D21, D23, E21, E23, F21, F23, F26, F27, G25, G26, G27, H25, H26, J25, J26, K27, N25, P25, R22, R23, R24, R25, R26, R27, T22, T23, T24, T25, T26, T27, U22, U23, U24, U25, U26, U27, V21, V23, V24, V26, V27, W22, W25, W26, W27	AGND	Unchanged
C17, C18, D17, D18, F3, F4, H3, H4, M3, M4, P3, P4, R18, T18, U16, U17	DGND	Unchanged
A25, B22, B25, C20, C22, C25, D20, D22, D25, E20; E22, E25, F20, F22, F24, K25, K26, L27, M25, M26, N26, N27, R20, T20	V_{EE}	Pin label compatible Voltage change from –5V to –2.2V
D14, D15, R17	SUB	Unchanged (connect to VEE = –2.2V)
C4, C5, C6, C7, C9, C11, C13, C14, C15, C16, C19, D5, D6, D7, D9, D11, D13, D19, E3, E19, F19, J3, J4, L3, L4, N3, N4, R3, R4, R19, T6, T7, T9, T11, T13, T14, T15, T19, U4, U5, U6, U7, U9, U11, U13, U14, U15	V_{PLUSD}	Unchanged
C3, C8, C10, C12, D3, D4, D8, D10, D12, D16, E4, E17, G3, G4, K3, K4, R16, T3, T4, T5, T8, T10, T12, T16, T17, U3, U8, U10, U12	V_{CCD}	Unchanged
A19, A20, B19, B20, E18, F18, U19, U20	DGND	To be connected to digital ground plane (0V)
V25, W24	VIN	Unchanged
V22, W23	VINN	Unchanged
H27	CLK	Unchanged
J27	CLKN	Unchanged
B16, B15, B14, B13, B12, B11, B10, B9, B8, B7	A0...A9	Unchanged
A16, A15, A14, A13, A12, A11, A10, A9, A8, A7	A0N…A9N	Unchanged
B6, A6	AOR/DRAN, AORN/DRA	Unchanged
B5, B4, B3, B2, C2, D2, E2, F2, G2, H2	B0…B9	Unchanged
B5, B4, B3, B2, C2, D2, E2, F2, G2, H2	B0N…B9N	Unchanged
J2, H1	BOR/DRBN, BORN/DRB	Unchanged
M2, N2, P2, R2, T2, U2, V1, V2, V3, V4	C0…C9	Unchanged
L1, M1, N1, P1, R1, T1, U1, W2, W3, W4	C0N…C9N	Unchanged
V5, W5	COR/DRCN, CORN/DRC	Unchanged
V6, V7, V8, V9, V10, V11, V12, V13, V14, V15	D0…D9	Unchanged
W6, W7, W8, W9, W10, W11, W12, W13, W14, W15	D0N…D9N	Unchanged

Table 2-2. Pin Differences (Continued)

Pin	AT84AS003/004	Modification on EV10AS003B/004B
V16, W16	DOR/DRDN, DORN/DRD	Unchanged
J1, K2	DR, DRN	Unchanged
B17	ASYNCRST	Unchanged
V18	CLKTYPE	Unchanged
A18	SLEEP	Unchanged
A17	STAGG	Unchanged
K1	DRTYPE	Unchanged
L2	RS	Unchanged
V17	BIST	Unchanged
U18	CLKDACTRL	Unchanged
W18	DACTRL	Unchanged
W17	DAEN	Unchanged
W19, V19	DAI, DAIN	Unchanged
A21	B/GB	Binary mode: low level (GND) Gray mode: high level (V_{CC} instead of V_{EE})
A22	Diode/DECb	Unchanged
A23	PGEB	Inactive at low level (GND) and *active at high level (V_{CC} instead of V_{EE})*
P27	DRRB	Active low (GND) Unchanged
W21	GA	Unchanged
E27	SDA	Unchanged
P26	SDAEN	Inactive at low level (GND) and active at high level (V_{CC} instead of V_{EE})
A1, B18	NC	Full compatible

Figure 2-2. EV10AS003B/004B Pinout (Bottom View, Balls Side)



Analog power supplies:

V_{EE} plane: –5V= –2.2V

Digital power supplies (LVDS output buffers):

V_{MINUSD} (–5V) pin of the AT84AS003/004 becomes DGND (0V = digital ground plane) on the EV10AS003B/004B. DGND is an independent ground plane dedicated the output buffers.

Digital control input pins:

On the EV10AS003B/004B the B/GB, PGEB, SDAEN, digital input control pins are activated at logic high (V_{CC} = +3.3V, +1.3V threshold) instead of logic low (V_{CC} = –5V, –1.3V threshold). The inactive level remains at GND = 0V.

2.3 Getting Started with the EV10AS003B/004B Using the Existing AT84AS003/004 Evaluation Board

1. Connect all three power supplies (V_{EE}, V_{CC}, V_{PLUSD}) and all ground accesses, as follows:
   – V_{CC} : +3.3V
   – V_{EE}: –2.2V
   – V_{PLUSD}: +2.5V
2. Configure the digital control inputs in default mode (1).
   – B/GB floating or GND (binary mode)
   – PGEB floating or GND (disabled)
   – SDA floating or GND (disabled)
   – DRRB connected to V_{CC} = 3.3V (free running)
3. Connect the analog signal as formerly (same full-scale and common mode).
4. Connect the clock signal as formerly (same level and common mode).
5. Connect the high-speed acquisition system probes to the board data outputs (LVDS compatible).
6. Switch on the power supplies.
7. Apply the clock and analog signals.

Note: Apply adequate settings if activation is requested as described in Section 2. on page 1.

Example: PGEB threshold becomes +1.3V instead of –1.3V.

3. AT84AS003/004 to EV10AS003B/004B: Application Information

This section discusses the board implementation of the previous changes.

3.1 Analog and Digital Power Supplies

Table 3-1. Power Supplies

Power Supplies		AT84AS003/004	EV10AS003B/004B	Recommendations
Analog power supplies	V_{EE}	–5V	–2.2V	Change regulator
Digital power supplies	Output buffers VMINUSD	–2.2V	0V	To be connected to digital ground plane

3.2 Digital Control Inputs Implementation (SDAEN, B/GB, PGEB)

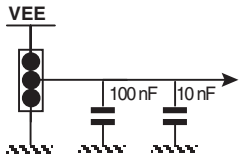
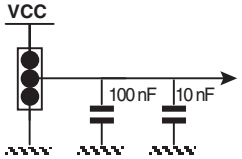
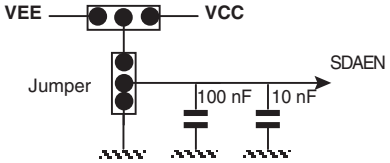
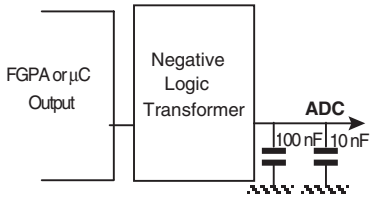
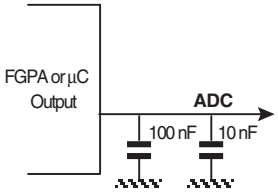
Advantage: Since the input signals are CMOS compatible, the ADC can be connected directly to FPGA or microcontroller devices. The default level remains unchanged at GND.

Summary: The main differences between the AT8AS003/004 and the EV10AS003B/004B are the control levels.

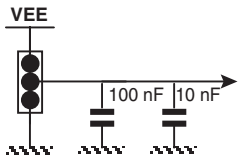
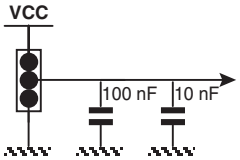
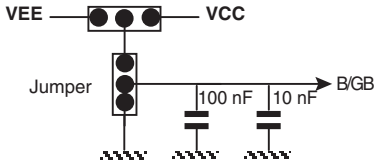
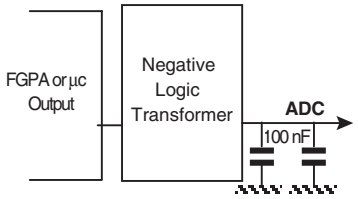
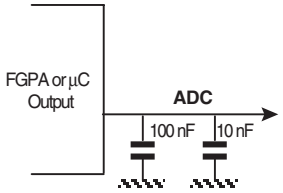
- The active threshold becomes +1.3V instead of –1.3V
- The activated level becomes +3.3V instead of –5V

The following tables outline examples of configurations used for the existing AT84AS003/004 and replacement part EV10AS003B/004B. The implementation describes either pin re-assignments, removal of negative logic transformer or description of forward compatibility for V_{EE} and V_{CC} selection.

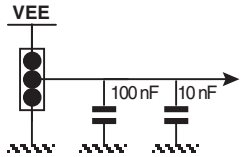
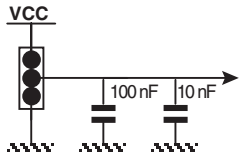
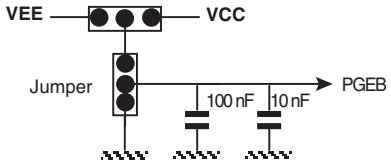
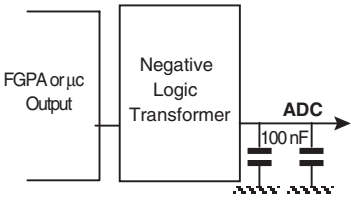
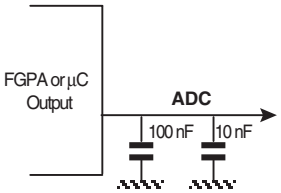
3.2.1 SDAEN (Sampling Delay Adjust Enable)

	AT84AS003/004 SDAEN	EV10AS003B/004B SDAEN Implementation
Disable	GND (or floating) Default mode	GND (or floating) Default mode
Enable	V_{EE} (–5V) Threshold (–1.3V)	V_{CC} (+3.3V) Threshold (+1.3V)
Electrical schematic for evaluation test		
Electrical schematic for evaluation test AT84AS003/004 or EV10AS003B/004B Compatible board design		
Electrical schematic for embedded application with microcontroller or FPGA		 Note: FPGA connection -Standard LVTTL I/O (programmable 3.3V bank) -LVDS I/O

3.2.2 B/GB (Binary or Gray Output Coding)

	AT84AS003/004 B/GB	EV10AS003B/004B B/GB Implementation
Binary mode	GND (or floating) Default mode	GND (or floating) Default mode
Gray mode	V_{EE} (–5V) Threshold (–1.3V)	V_{CC} (+3.3V) Threshold (+1.3V)
Electrical schematic for evaluation test		
Electrical schematic for evaluation test: AT84AS003/004 or EV10AS003B/004B Compatible board design		
Electrical schematic for embedded application with microcontroller or FPGA		 Note: FPGA connection -Standard LVTTL I/O (programmable 3.3V bank) -LVDS I/O

3.2.3 PGEB (Pattern Generator Enable)

	AT84AS003/004 PGEB	EV10AS003B/004B PGEB Implementation
Disable	GND (or floating) Default mode	GND (or floating) Default mode
Enable	V_{EE} (–5V) Threshold (–1.3V)	V_{CC} (+3.3V) Threshold (+1.3V)
Electrical schematic for evaluation test		
Electrical schematic for evaluation test: AT84AS003/004 or EV10AS003B/004B Compatible board design		
Electrical Schematic for embedded application with microcontroller or FPGA		 Note: FPGA connection -Standard LVTTL I/O (programmable 3.3V bank) -LVDS I/O

How to reach us

Home page: www.e2v.com

Sales Office:

Northern Europe

e2v ltd

106 Waterhouse Lane

Chelmsford

Essex CM1 2QU

England

Tel: +44 (0)1245 493493

Fax: +44 (0)1245 492492

E-Mail: enquiries@e2v.com

Southern Europe

e2v sas

16 Burospace

F-91572 Bièvres

Cedex

France

Tel: +33 (0) 1 60 19 55 00

Fax:+33 (0) 1 60 19 55 29

E-Mail: enquiries-fr@e2v.com

Germany and Austria

e2v gmbh

Industriestraße 29

82194 Gröbenzell

Germany

Tel: +49 (0) 842 410 570

Fax:: +49 (0) 842 284 547

E-Mail: enquiries-de@e2v.com

Americas

e2v inc.

4 Westchester Plaza

Elmsford

NY 10523-1482

USA

Tel: +1 (914) 592 6050

Fax:: +1 (914) 592-5148

E-Mail: enquiries-na@e2v.com

Asia Pacific

e2v ltd

11/F,

Onfem Tower,

29 Wyndham Street,Central,

Hong Kong

Tel: +852 3679 364 8/9

Fax: +852 3583 1084

E-Mail: enquiries-ap@e2v.com

Product Contact:

e2v

Avenue de Rochepleine

BP 123 - 38521 Saint-Egrève Cedex

France

Tel: +33 (0)4 76 58 30 00

Hotline:

hotline-bdc@e2v.com