

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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RENESAS TECHNICAL UPDATE

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Product Category	MPU&MCU	Document No.	TN-380-A064A/E	Rev.	1.00
Title	Adding A/D Conversion Specification to 3826A Group and 3826 Group		Information Category	Technical Notification	
Applicable Product	3826A Group M38268MCA-XXXFP, M38268MCA-XXXGP, M3826AMFA-XXXFP, M3826AMFA-XXXGP 3826 Group M38268AEFFP, M3826AEFGP, M3826AEFFS	Lot No. -	Reference Document	3826 Group (A version) Datasheet 3826 Group Datasheet	

Though only 8-bit resolution was available in the A/D converter of 3826A group and 3826 group in the past, the specification is added to correspond to also the 10-bit resolution newly.
Corresponding to more precise resolution by corresponding to 10-bit A/D conversion mode becomes possible.
Figure 1 is a block diagram of the A/D converter corresponding to 10-bit A/D conversion mode.
Low-order 2 bits of the A/D conversion result are stored in an unused address 0014₁₆ in the past.
High-order 8 bits of the A/D conversion result are stored in the existing A/D conversion register (address 0035₁₆).

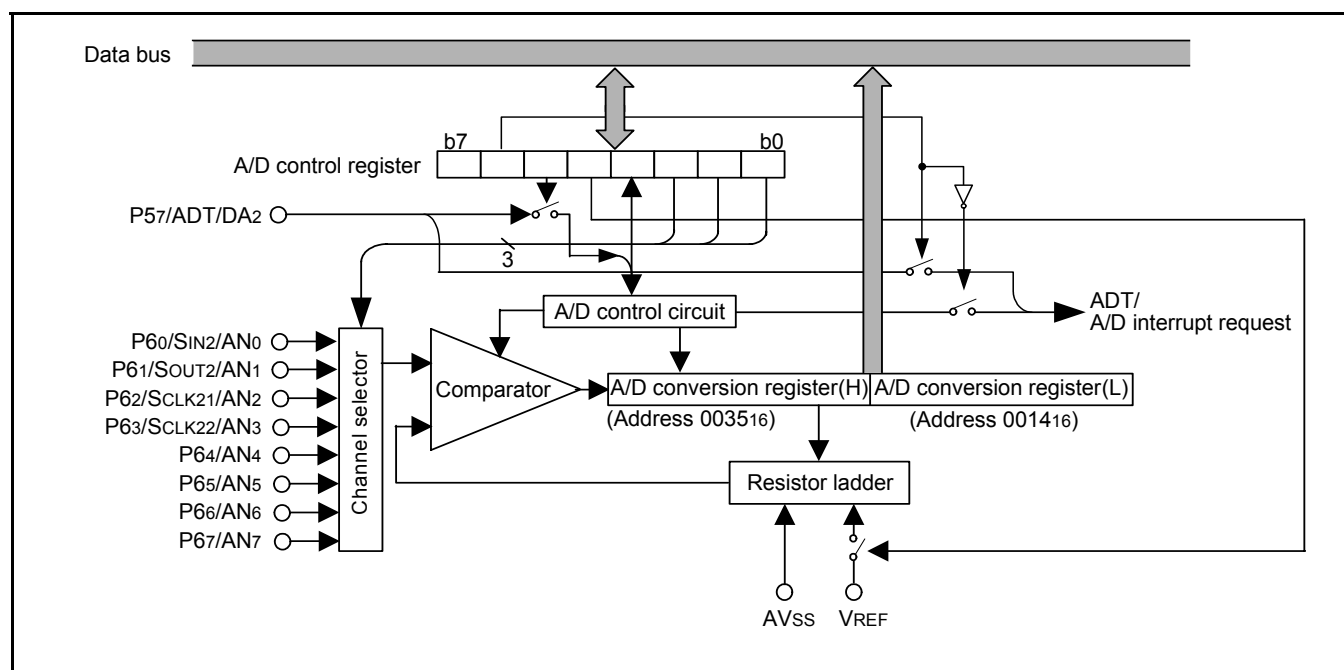


Fig.1 A/D converter block diagram of 3826A Group and 3826 Group

- Switching A/D conversion mode

10-bit conversion mode is set when the bit 0 of A/D conversion register L (address 0014₁₆) is set to "0".

8-bit conversion mode is set when "1" is written. Since "1" is set to the bit 0 in address 0014₁₆ immediately after the power supply turning on, the 8-bit conversion mode is set.

Switch the A/D conversion mode when the A/D converter ends.

There is no restriction at waiting time such as until the A/D conversion beginning after switching the A/D conversion mode.

- Reading A/D conversion result

When reading the conversion result in the 10-bit A/D conversion mode, read the A/D conversion register H (address 0035₁₆) in first, and the A/D conversion register L (address 0014₁₆) in next.

Correct conversion result cannot be obtained when reading from A/D conversion register L (address 0014₁₆) first.

When reading the conversion result in the 8-bit A/D conversion mode, read the A/D conversion register H (address 0035₁₆) only.

When A/D conversion register L (address 0014₁₆) is read first, the result is undefined.

- Conversion time

When 8-bit A/D conversion mode is selected, the conversion time is 12.5 μ s * as before.

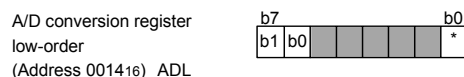
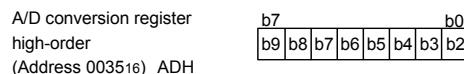
When 10-bit A/D conversion mode is selected, it is 15.5 μ s*.

The conversion time is not shortened even when only the high-order 8-bit conversion result is necessary when the 10-bit A/D conversion mode is selected.

* f(X_{IN}) =8MHz

- 10-bit reading

(Read address 0035₁₆ in first, and address 0014₁₆ in next.)



Note : The low-order 6 bits of address 0014₁₆ become "0" at reading.

- 8-bit reading

(Read only address 0035₁₆)

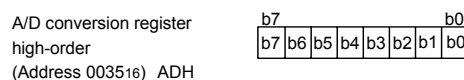


Fig.2 Structure of A/D conversion regsiter

- Special note

This function addition is a change in the specification (The function of the 10-bit A/D conversion mode had been already built). There is no change of the hardware of the microcomputer.

Therefore, there is no influence on the electric characteristics and reliability at all, excluding the A/D converter characteristics. As for the A/D converter, refer to the following table.

Also, There is no need to change software for the customer who has used the program of 8-bit A/D converter specification at all by this specification addition.

Table 1 A/D converter characteristics

(V_{CC} = 2.7 to 5.5 V, V_{SS} = AV_{SS} = 0 V, Ta = -20 to 85°C, f(X_{IN}) = 500 kHz to 8 MHz (Note 1), in middle/high-speed mode unless otherwise noted)

8-bit A-D mode (when conversion mode selection bit (bit 0 of address 0014₁₆) is "1")

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
–	Resolution				8	bit
–	Absolute accuracy (excluding quantization error)	V _{CC} = V _{REF} = 2.7 to 5.5 V			±2	LSB
t _{CONV}	Conversion time	f(X _{IN}) = 8 MHz			12.5 (Note 2)	μs
RLADDER	Ladder resistor		12	35	100	kΩ
I _{VREF}	Reference power source input current	V _{REF} = 5.0 V	50	150	200	μA
I _{IA}	Analog port input current				5.0	μA

Notes 1: f(X_{IN}) = 500 kHz to 8 MHz at 3826 Group and f(X_{IN}) = 500 kHz to 10 MHz at 3826A Group.

2: When the internal trigger is used in the middle-speed mode, the max. value of t_{CONV} is 14 μs.

Table 2 A/D converter characteristics

(V_{CC} = 2.7 to 5.5 V, V_{SS} = AV_{SS} = 0 V, Ta = -20 to 85°C, f(X_{IN}) = 500 kHz to 8 MHz (Note 1), in middle/high-speed mode unless otherwise noted)

10-bit A-D mode (when conversion mode selection bit (bit 0 of address 0014₁₆) is "0")

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
–	Resolution				10	bit
–	Absolute accuracy (excluding quantization error)	V _{CC} = V _{REF} = 2.7 to 5.5 V			±4	LSB
t _{CONV}	Conversion time	f(X _{IN}) = 8 MHz			15.5 (Note 2)	μs
RLADDER	Ladder resistor		12	35	100	kΩ
I _{VREF}	Reference power source input current	V _{REF} = 5.0 V	50	150	200	μA
I _{IA}	Analog port input current				5.0	μA

Notes 1: f(X_{IN}) = 500 kHz to 8 MHz at 3826 Group and f(X_{IN}) = 500 kHz to 10 MHz at 3826A Group.

2: When the internal trigger is used in the middle-speed mode, the max. value of t_{CONV} is 17 μs.

- Emulator MCU

The 10-bit A/D conversion function is not built-in the M38267RLFS.

Use the M37560RLFS for the development of software using 10-bit A/D conversion.

The DTMF function and the CTCSS function are built-in the M37560RLFS.

- Implementation date

After March 1, 2006, the shipment inspection that adds 10-bit A/D conversion mode is done for the shipment.