STEP TECHNICA CO.,LTD.

CUnet Family

MKY44-DA16B

DATA SHEET

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MKY44 Series CUnet-Compliant Intelligent Slave ICs

key words : 4ch 16 bits D/A

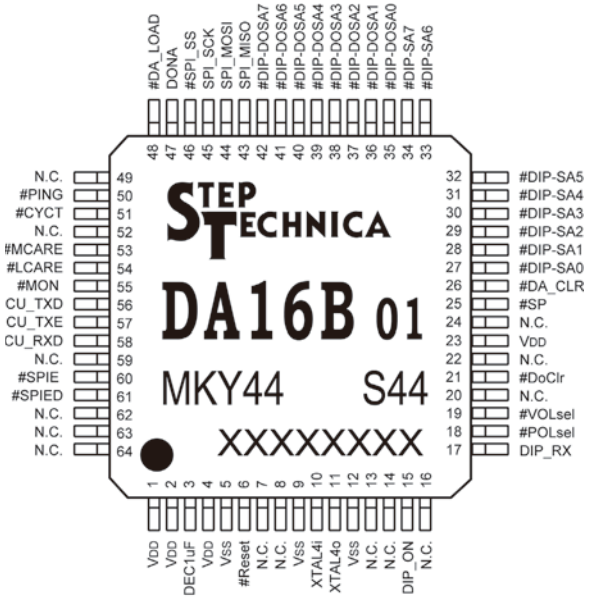
CUnet

■ MKY44-DA16B Specifications

- ● Model : MKY44-DA16B
- ● ADC : AD5754 external with SPI connection
- ● Number of channels : 4-channel
- ● Power voltage : 3.3 V
- ● Power consumption : 20 mA
- ● Temperature range : -40 to +85 °C
- ● Package : 64-pin TQFP (0.5 mm pitch 10 mm × 10 mm)
- ● ST44SW : Not required

Specifications of Analog Devices DA Converter AD5754

- ● Built-in output amplifier
- ● Analog output range : +5 V, +10 V, ±5 V, ±10 V
- ● D/A conversion resolution : 16 bits
- ● Integral non-linearity error : Max. ±16 LSB
- ● DNL error : Max. ±1 LSB
- ● Number of channels : 4-channel



Note: N. C. pin is not connected. Pins prefixed with "#" are negative logic (active Low).

■ Applications

Industrial devices
Medical devices
Measurement devices
Power wire monitoring
Process control

■ Overview

The MKY44-DA16B is a CUnet station IC with analog output function. With an MKY44-DA16B, analog output control can be achieved on one chip without using the CPU, by connecting an AD5754 (Analog Devices DA converter) by SPI. DA output speed depends on the speed of the CUnet network. Because a CUnet network allows multiple-master configurations, to output DA, the IC must specify the CUnet IC to be its master. The MKY44-DA16B's DOSA (Data Output Station Address) pin is used to specify the network address of the IC to be its master. When this is done, the MKY44-DA16B outputs the control data written to the memory of the specified master. This control data is automatically copied to all CUnet ICs through CUnet communication (memory sharing).
Existing users of CUnet can get analog output control just by adding this product to their networks. New users have the opportunity to reduce D/A control wiring that used to use parallel connections and to achieve easy, networked analog control.

■ DOSA Setting and Output Target Data

The MKY44-DA16B treats as the output target the MB (Memory Block) data corresponding to the specified DOSA value. Bits 15 to 0 are the analog output data of ch0. Bits 31 to 16 are the analog output data of ch1. Bits 47 to 32 are the analog output data of ch2. Bits 63 to 48 are the analog output data of ch3. Since the data is in little-endian format, the LSB is in the smallest address. D/A conversion is performed with CC (CUnetCycle) and the analog output voltage is updated in the data in this area. The analog output value is echoed back to the EAO (Echo back Analog Out) area of the MB specified by the SA setting.

Address	0x07	0x06	0x05	0x04	0x03	0x02	0x01	0x00
bit	63 to 48		47 to 32		31 to 16		15 to 0	
	Analog Out ch3		Analog Out ch2		Analog Out ch1		Analog Out ch0	

■ Data Placement of the Occupied Memory Block

The MKY44-DA16B occupies one MB (memory block) corresponding to the specified SA value. The MB occupied by the MKY44-DA16B is 8 bytes (64 bits). The data configuration within the 8 bytes is as follows.

Address	0x07	0x06	0x05	0x04	0x03	0x02	0x01	0x00
bit	63 to 48		47 to 32		31 to 16		15 to 0	
	Echo back Analog Out ch3		Echo back Analog Out ch2		Echo back Analog Out ch1		Echo back Analog Out ch0	

■ Setting of Pins #POLsel, #VOLsel, #DoClr, and #SP

The MKY44-DA16B has pins #POLsel, #VOLsel, #DoClr, and #SP to set the functions. The MKY44-DA16B obtains the status of these setting pins when returning from a hardware reset. Activate the MKY44-DA16B after setting these pins to fit the user application.

MKY44-DA16B		Description	Function	
Pin	Name		Lo-input	Hi-input (open pin)
18	#POLsel	Analog output type selection	Bipolar: ±n V input	Unipolar: 0 V to +n V input
19	#VOLsel	Analog output voltage selection	10 V	5 V
21	#DoClr	Clear output when in DONA	Clear output when in DONA	Do not clear output when in DONA
25	#SP	Read the data for hardware setting	Parallel	Serial

When the MKY44-DA16B returns from hardware reset, the setting conditions read out from pins #POLsel, #VOLsel, #DoClr and #SP are shown in the status byte in the basic format of mail by “1” for Low-level and “0” for High-level.

■ DIP-SW Settings for SA/DOSA

MKY44-DA16B reads out the 16 bits of hardware setting data when returning from hardware reset. To read out the data, set pin #SP to select whether to read in parallel from the pins or read as serial data from the ST44SW, a dedicated LSI.

When pin #SP is Low-level: The MKY44-DA16B will read out as the data for hardware setting the status of the 16 bits from pin #DIP-SA0 to pin #DIP-SA7 and from pin #DIP-DOSA0 to pin #DIP-DOSA7. It is recommended to connect two 8-bit type DIP-SWs to these pins. These pins are pulled up internally when reading from a DIP-SW and recognize the ON state (Lo level) as "1".

When pin #SP is High-level or open: When returning from a reset, the MKY44-DA16B will read out 16 bits of data for hardware setting as serial data from the ST44SW, a dedicated LSI. It is recommended to connect two 8-bit DIP-SWs to an ST44SW specified for hexadecimal. The pins to connect a DIP-SW to the ST44SW are pulled up internally when reading from the DIP-SW. These bits recognize the ON state (Lo level) as "1".

MKY44-DA16B	
#SP pin = Low-level	
Pin	Name
42	#DIP-DOSA7
41	#DIP-DOSA6
40	#DIP-DOSA5
39	#DIP-DOSA4
38	#DIP-DOSA3
37	#DIP-DOSA2
36	#DIP-DOSA1
35	#DIP-DOSA0
34	#DIP-SA7
33	#DIP-SA6
32	#DIP-SA5
31	#DIP-SA4
30	#DIP-SA3
29	#DIP-SA2
28	#DIP-SA1
27	#DIP-SA0

ST44SW	
#SP pin = High-level or open	
Pin	Name
1	#P17
32	#P16
31	#P15
30	#P14
29	#P13
28	#P12
27	#P11
26	#P10
21	#P07
20	#P06
19	#P05
18	#P04
17	#P03
16	#P02
15	#P01
14	#P00

DIP-SW	No.	Signal		Function/Description
DIP•SW•DOSA	8	RESERVED		Reserved bit. Turn it off when in use.
	7	RESERVED		
	6	DOSA	DOSA5	Set DOSA value in hexadecimal, treating the ON state as "1"
	5		DOSA4	
	4		DOSA3	
	3		DOSA2	
	2		DOSA1	
	1		DOSA0	
DIP•SW•SA	8	BPS	BPS1	Set the transfer rate of CUnet. BPS1, BPS0 = OFF, OFF 12 Mbps BPS1, BPS0 = OFF, ON 6 Mbps BPS1, BPS0 = ON, OFF 3 Mbps BPS1, BPS0 = ON, ON (This setting is disabled.)
	7		BPS0	
	6	SA	SA5	Set SA value in hexadecimal, treating the ON state as "1"
	5		SA4	
	4		SA3	
	3		SA2	
	2		SA1	
	1		SA0	

The ST44SW has a function that can set SA and DOSA in decimal. For details on setting in decimal, refer to the User's Manual of ST44SW.

■ Monitor pins of CUnet

Pin	Function
#PING	This pin normally maintains High-level. It transitions to Low-level when the PING instruction is received from another CUnet station, and later it transitions to High-level when a packet with no PING instruction to MKY44-DA16B is not placed is received from another CUnet station.
#CYCT	This pin normally maintains High-level and outputs Low pulse for "2 × Tbps" time at the lead timing of the CUnet cycle. Tbps is 83.33 ns at 12 Mbps, 166.67 ns at 6 Mbps, and 333.33 ns at 3 Mbps.
#MON	This pin outputs the MON signal, which is a standard function of CUnet. This pin retains Low-level while a link has been established with another CUnet device for at least 3 consecutive cycles.
#LCARE	This pin outputs the LCARE signal, which is a standard function of CUnet. This pin outputs the Low-level for 50 ms when the LCARE signal is generated and upon return from hardware reset. As a unique function of the MKY44-DA16B, the Low-level output of this pin is also used to display hardware errors including setting errors.
#MCARE	This pin outputs the MCARE signal, which is a standard function of CUnet. This pin outputs the Low-level for 50 ms when the MCARE signal is generated and upon return from hardware reset. As a unique function of the MKY44-DA16B, the Low-level output of this pin is also used to display hardware errors including setting errors.
DONA	This pin outputs the Low-level when it can confirm the presence of another party issuing operation commands to the MKY44-DA16B. When it has not confirmed the presence of another party in the past 16 consecutive cycles, it outputs the High-level.

■ Connection of LEDs and Display Status

LED connection is recommended for the #MON, #LCARE, #MCARE, DONA pins of MKY44-DA16B. It is recommended to connect green color LED part indicating a stable operation to #MON pin and DONA pin. To #LCARE pin, it is recommended to connect orange color LED part indicating a gentle warning. To #MCARE pin, it is recommended to connect red color LED part indicating a definite warning. These pins have ±2mA current drive capability. Connect them in such a way that the LEDs will light up at Low-level.
The LEDs display the status of MKY44-DA16B. The state in which MON and DONA are lit is when normal operation is possible.
Note: The following table does not cover the pin name "#" that shows negative logic, since it is based on signal names.

DONA	MON	LCARE	MCARE	State
---	---	---	---	Indicates the state of power off, the state when the #Reset pin is active, or the state when no CUnet devices is linked after returning from hardware reset.
---	●	---	---	Although a link is successfully established with at least one CUnet device, the station address device (the other party that writes the data to the MKY44-DA16B) set by DOSA is missing.
●	●	---	---	The connection of the CUnet network is normal.
---	---	---	●	The setting values of SA and DOSA of DIP-SW are inappropriate.
---	---	□	---	When it becomes clear that at least one CUnet link is not established, the LED flashes for approximately 50 ms.
---	---	---	□	When it becomes clear that at least one CUnet link has not been established during the last 3 consecutive scans, the LED flashes for approximately 50 ms.
---	---	□	□	When it becomes clear that at least one CUnet link has been disconnected during the last 3 consecutive scans, and when hardware reset is executed, the LED flashes for approximately 50 ms.
---	---	▲	▲	The following internal hardware of MKY44-DA16B is abnormal. Blink alternately every second ⇒ DIP-SW read hardware including ST44SW Blink alternately every two seconds ⇒ MKY44-DA16B internal hardware Please perform maintenance such as replacement.

●: Continuous lighting □: Flash lighting for about 50 ms ▲: Alternating lit and unlit every few seconds

Unique to MKY44-DA16B display, the status in which only MCARE stays lit means that the settings of SA and DOSA of DIP-SW are inappropriately identical or overlapping values. If LCARE and MCARE keep blinking every few seconds, it means a failure caused by a crash in MKY44-DA16B.
The other signal transitions of MON, LCARE, and MCARE are standard CUnet operation. For more information about these signals, refer to the section ***"Quality Control and Indication of Network"*** and others in the User's Manual of the CUnet-dedicated LSI that is installed in the device to refer to the MKY44-DA16B data.

■ Support for CUnet mail

The MKY44-DA16B supports the “product inquiry” function of CUnet mail.

● Product Inquiry Using the Mail Function

Upon receiving a message in product inquiry format using the “CUnet ?” character string, the MKY44-DA16B replies to the sender using the basic format of the MKY44-DA16B (see below). You can make a product inquiry from any node.

◆ Product Inquiry Format

Address	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
Ascii	**C**	**U**	**n**	**e**	**t**	**[sp]**	**?**	**[¥r]**
Hex	0x43	0x55	0x6E	0x65	0x74	0x20	0x3F	0x0D

◆ Basic Format of the MKY44-DA16B

Address	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
Ascii	**D**	**A**	**1**	**6**	**B**	**[sp]**	***VN**	***Vn** ⇒
Hex	0x44	0x41	0x31	0x36	0x42	0x20	✻	✻

Address	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
Ascii	**M**	✻	✻	✻	✻	✻	✻	✻
⇒ Hex	0x4D	0x00	SA	DOSA	Status	0x00	0x00	0x00

◆ Description of the Basic Format

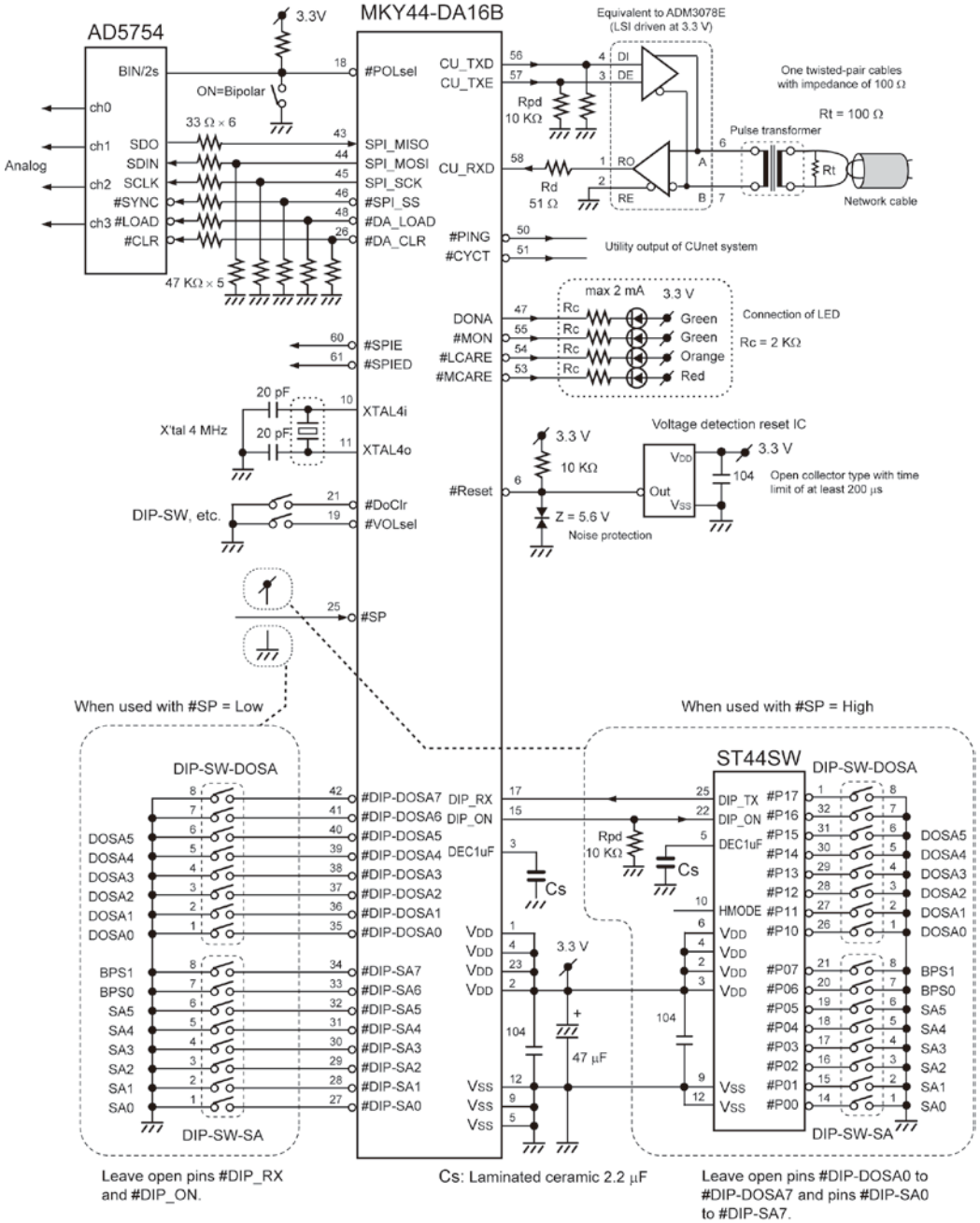
Symbol	Name	Description	Valid range
*VN *Vn	Version Number	Shows the version number of the MKY44-DA16B in two ASCII characters. The version numbers start from “01.” *VN represents the tens place and *Vn represents the ones place.	01 to 99 (in ASCII)
SA	DIP-SW-SA	Shows the DIP-SW-SA data shown in the section ***“DIP-SW Settings for SA/DOSA”*** as one hexadecimal byte.	0x00 to 0xFF
DOSA	DIP-SW-DOSA	Shows the DIP-SW-DOSA data shown in the section ***“DIP-SW Settings for SA/DOSA”*** as one hexadecimal byte.	0x00 to 0xFF
Status	bit5 to 7	”0”	0x00 to 0x1F
	bit4	SPIED: Detect SPI connection error	
	bit3	POLsel: Select the analog output type	
	bit2	VOLsel: Select the analog output voltage	
	bit1	DoClr: Clear the output when in DONA	
	bit0	SP: Read the data for hardware setting	

If the MKY44-DA16B receives a message in a format different from a “CUnet ?” character string, it will return a message in NAK format, in which byte 0x08 of the basic format is “N”. In this case, the NAK reason of “0xE0” or “0xE1” will be shown in byte 0x09.

Byte 0x09	Definition
0x03	The received byte 0x09 (MC: Message Code) is not “0x00.”
0xE0	The first 8 bytes are irregular.
0xE1	The format is irregular.
0xE2	The mail data size is irregular.

■ Configuration Example of the CUnet Analog Input Terminal with the MKY44-DA16B

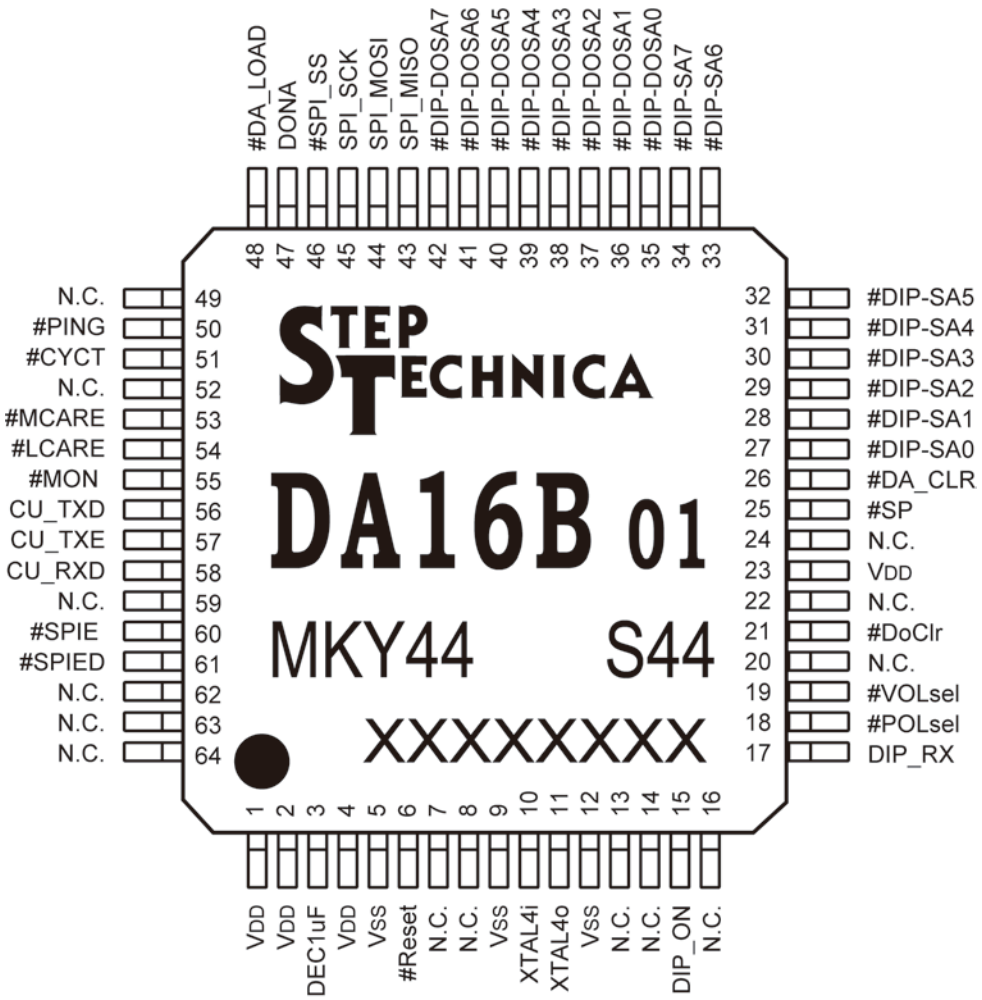
As shown in the configuration diagram of the CUnet analog input terminal with the MKY44-DA16B, the signal of the MKY44-DA16B network interface (pins CU_TXE, CU_TXD, CU_RXD) signal of the MKY44-DA16B is connected to CUnet through the recommended transceiver and pulse transformer. It connects the MKY44-DA16B and the Analog Devices AD5754.
If a current conversion or voltage amplification circuit is required before the analog output of the AD5754, please prepare a circuit that fits the application.
If the voltage output from the AD5754 is ± nV (Bipolar), set the Low-level to pin #POLsel of the MKY44-DA16B.
With this setting, write D/A conversion data representing -32768 to 0 to 32767 (0x8000 to 0x0000 to 0x7FFF) in the shared memory of CUnet when the sender of the analog value sets the value. If the voltage output from the AD5754 is 0V to + nV (Unipolar), set the High-level to pin #POLsel of the MKY44-DA16B. In this setting, write D/A conversion data representing 0 to 65535 (0x0000 to 0xFFFF) in the shared memory of CUnet when the sender of the analog value sets the value.
In a hardware reset, the MKY44-DA16B reads its station address, the transfer rate, the general-purpose output, and the output data controller's station address to start operation. The MKY44-DA16B has an SPI connection monitor. When SPI connection is normal, the High-level is output to pin #SPIE (SPI Error). When it is abnormal, the Low-level is output to pin #SPIE. The output to this #SPIE pin is updated when the analog value is sampled. The MKY44-DA16B normally outputs the High-level to pin #SPIED (SPI Error Detect). However, after detecting an SPI connection error, it will continue outputting the Low-level to pin #SPIED until the next hardware reset. For applications in which SPI connection errors are detected, it is recommended to perform maintenance to enhance the quality and stability of the device peripheral environment and hardware.



■ Pin Functions of the MKY44-DA16B

Pin name	Pin No.	Logic	I/O	Function
DEC1UF	3	--	--	Connect a capacitor whose effective capacitance is at least 1 μF and a 0.1 μF ceramic capacitor for high frequency bypass in parallel between this pin and Vss. Or connect a laminated ceramic capacitor of around 2.2 μF with the property that capacitance reduction is about 20% even in DC bias.
#Reset	6	Negative	I/O	The hardware reset input pin of MKY44-DA16B. Right after power is turned on or when the user intentionally resets the hardware, Low should be retained for at least 200 μs.
XTAL4i XTAL4o	10, 11	--	--	Pins to connect a crystal resonator. Connect a 4 MHz crystal resonator between these pins. Connect 20 pF ceramic capacitors between these pins and Vss. The layouts must be respectively near the pins. When connecting oscillator, input the clock signal to XTAL4i as shown below and leave XTAL4o to be opened. Clock frequency : 4 MHz ±500 ppm Jitter : Within 500 ps Rise / Fall time : Within 20 ns (VDD 20% - 80% threshold)
DIP_ON	15	Positive	O	Connect this pin with pin DIP_ON of the ST44SW. For more information about the ST44SW, refer to the ST44SW User's Manual.
DIP_RX	17	Positive	I	Connect this pin with pin DIP_TX of the ST44SW. For more information about the ST44SW, refer to the ST44SW User's Manual.
#POLsel	18	Negative	I	Pin to set whether the analog output type should be treated as Bipolar (±n V) or Unipolar (0 V to +n V).
#VOLsel	19	Negative	I	Pin to select the voltage of analog output.
#DoClr	21	Negative	I	Setting pin to clear output when in DONA.
#SP	25	Negative	I	To read hardware setting data in parallel from the pins, set the Low-level to this pin. To read hardware setting data serially from the ST44SW, set the High-level to this pin or leave it open.
#DA_CLR	26	Negative	O	Function pin to force D/A output to be "0x0000". Connect it to pin #CLR of the AD5754.
#DIP-SA7 to #DIP-SA0	27 to 34	Positive	I	When setting the Low-level to pin #SP, a DIP-SW is connected to this pin to set the SA and BPS values. Set the SA value in hexadecimal, treating the ON state as "1". When the High-level is set to pin #SP or it is left open, leave this pin open.
#DIP-DOSA7 to #DIP-DOSA0	35 to 42	Positive	O	When fs setting the Low-level to pin #SP, a DIP-SW is connected to this pin to set the DOSA value. Set the DOSA value in hexadecimal, treating the ON state as "1". When the High-level is set to pin #SP or it is left open, leave this pin open.
SPI_MISO	43	Positive	I	MISO function pin of SSPI. Connect it to pin SDO of the AD5754.
SPI_MOSI	44	Positive	O	MOSI function pin of SSPI. Connect it to pin SDIN of the AD5754.
SPI_SCK	45	Positive	O	SCK function pin of SPI. Connect it to pin SCLK of the AD5754.
#SPI_SS	46	Negative	O	#SS function pin of SPI. Connect it to pin #SYNC of the AD5754.
DONA	47	Positive	O	This pin retains the High-level during the DONA (DO Not Arrival) state. It is at Low-level at other times.
#DA_LOAD	48	Negative	O	Control pin to batch update D/A output. Connect it to pin #LOAD of the AD5754.
#PING	50	Negative	O	A pin to output the PING signal, which is a standard function of CUnet. When the PING signal occurs, this pin transitions to Low-level.
#CYCT	51	Negative	O	A pin to output the CYCT signal, which is a standard function of CUnet. When the CYCT signal occurs, this pin transitions to Low-level.
#MCARE	53	Negative	O	A pin to output the MCARE signal, which is a standard function of CUnet. This pin outputs the Low-level for about 50 ms, when the MCARE signal occurs and when it returns from hardware reset. It is recommended to connect red color LED indicating a definite warning to this pin.
#LCARE	54	Negative	O	A pin to output the LCARE signal, which is a standard function of CUnet. This pin outputs the Low-level for about 50 ms, when the LCARE signal occurs and when it returns from hardware reset. It is recommended to connect orange color LED indicating a gentle warning to this pin.
#MON	55	Negative	O	A pin to output the MON signal, which is a standard function of CUnet. This pin retains Low-level while a link has been established with another CUnet devices for at least 3 consecutive cycles. It is recommended to connect green color LED indicating a stable operation to this pin.
CU_TXD	56	Positive	O	Output pin to send CUnet packets. Connect this pin to a drive input pin such as of a driver.
CU_TXE	57	Positive	O	A pin to output the High-level while CUnet packets are output. Connect this pin to the enable input pin of the driver.
CU_RXD	58	Positive	I	A pin to input CUnet packets. Connect this pin to the output pin of the receiver.
#SPIE	60	Negative	O	Pin monitoring the SPI connection state. This pin outputs the Low-level when an SPI error is active. The output of this pin is updated when the analog value is sampled.
#SPIED	61	Negative	O	This pin normally outputs the High-level, but outputs the Low-level from when an SPI connection error is detected until hardware reset.
Vdd	1, 2, 4, 23			Power pin. Supply 3.3 V.
Vss	5, 9, 12			Power pin. Connected to 0 V.
N.C.	7, 8, 13, 14, 16, 20, 22, 24, 49, 52, 59, 62, 63, 64			Do not connect to other signals; keep them open.

■ Pin Assignment



Note: N. C. pin is not connected. Pins prefixed with "#" are negative logic (active Low).

■ Electrical Ratings

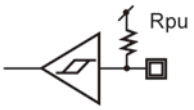
(T_A = 25°C V_{SS} = 0 V)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Storage temperature	Tstg	---	-55	---	125	°C
Operating temperature	Topr	---	-40	---	85	°C
Pin voltage (absolute maximum rating)	V_I	---	-0.3	---	V_{DD}+0.3	V
Operating power supply voltage	V_{DD}	---	3.0	3.3	3.6	V
Mean operating current	$V_{DD}A$	Vi = V_{DD} or V_{SS}, output open XTAL = 4 MHz	---	10	20	mA
I/O pin capacitance	Ci/o	V_{DD} = Vi = 0 V Ta = 25°C	---	10	---	pF
Rise/fall time of input signal	T_{ICLK}	When inputting generated clock of XTAL4i pin	---	---	5	ns
Rise/fall time of input signal	T_{IRF}	Schmitt trigger input	---	---	100	ms

■ Pin Ratings

No	I/O	Name	Type	No	I/O	Name	Type	No	I/O	Name	Type	No	I/O	Name	Type
1	--	V_{DD}	--	17	I	DIP_RX	A	33	I	#DIP-SA6	A	49	--	N.C.	--
2	--	V_{DD}	--	18	I	#POLsel	A	34	I	#DIP-SA7	A	50	O	#PING	B
3	--	DEC1uF	--	19	I	#VOLsel	A	35	O	#DIP-DOSA0	A	51	O	#CYCT	B
4	--	V_{DD}	--	20	--	N.C.	--	36	O	#DIP-DOSA1	A	52	--	N.C.	--
5	--	V_{SS}	--	21	I	#DoClr	A	37	O	#DIP-DOSA2	A	53	O	#MCARE	B
6	I/O	#Reset	C	22	--	N.C.	--	38	O	#DIP-DOSA3	A	54	O	#LCARE	B
7	--	N.C.	--	23	--	V_{DD}	--	39	O	#DIP-DOSA4	A	55	O	#MON	B
8	--	N.C.	--	24	--	N.C.	--	40	O	#DIP-DOSA5	A	56	O	CU_TXD	B
9	--	V_{SS}	--	25	--	#SP	--	41	O	#DIP-DOSA6	A	57	O	CU_TXE	B
10	--	XTAL4i	--	26	O	#DA_CLR	B	42	O	#DIP-DOSA7	A	58	I	CU_RXD	A
11	--	XTAL4o	--	27	I	#DIP-SA0	A	43	I	SPI_MISO	A	59	--	N.C.	--
12	--	V_{SS}	--	28	I	#DIP-SA1	A	44	O	SPI_MOSI	B	60	O	#SPIE	B
13	--	N.C.	--	29	I	#DIP-SA2	A	45	O	SPI_SCK	B	61	O	#SPIED	B
14	--	N.C.	--	30	I	#DIP-SA3	A	46	O	#SPI_SS	B	62	--	N.C.	--
15	O	DIP_ON	B	31	I	#DIP-SA4	A	47	O	DONA	B	63	--	N.C.	--
16	--	N.C.	--	32	I	#DIP-SA5	A	48	O	#DA_LOAD	B	64	--	N.C.	--

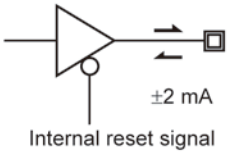
Type-A Pull-up register Schmitt input



V_{t+} max = 0.8 × V_{DD}
V_{t-} min = 0.2 × V_{DD}
ΔV_t min = 0.6V

Rpu (Pull-up register) Typ: 100 KΩ (30 KΩ to 300 KΩ: V_{DD} = 3.0 V, V_I = Vss)

Type-B Push-pull output

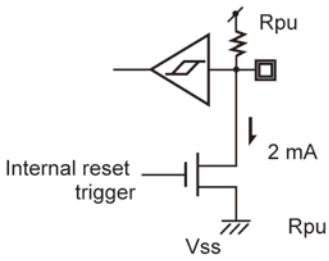


V_{OH} min = 2.4 V (V_{DD} = 3.0 V, I_{OH} = -2 mA)
V_{OL} max = 0.4 V (V_{DD} = 3.0 V, I_{OL} = 2 mA)

I_{OH} max = -2 mA
I_{OL} max = 2 mA

The Type B output pin is in a high impedance state during hardware reset.
For user application devices for which this state is inappropriate, connect to the pin either pull-down resistance or pull-up resistance that can ensure initial levels suitable for the user application.

Type-C Pull-up register Schmitt input
Open drain output

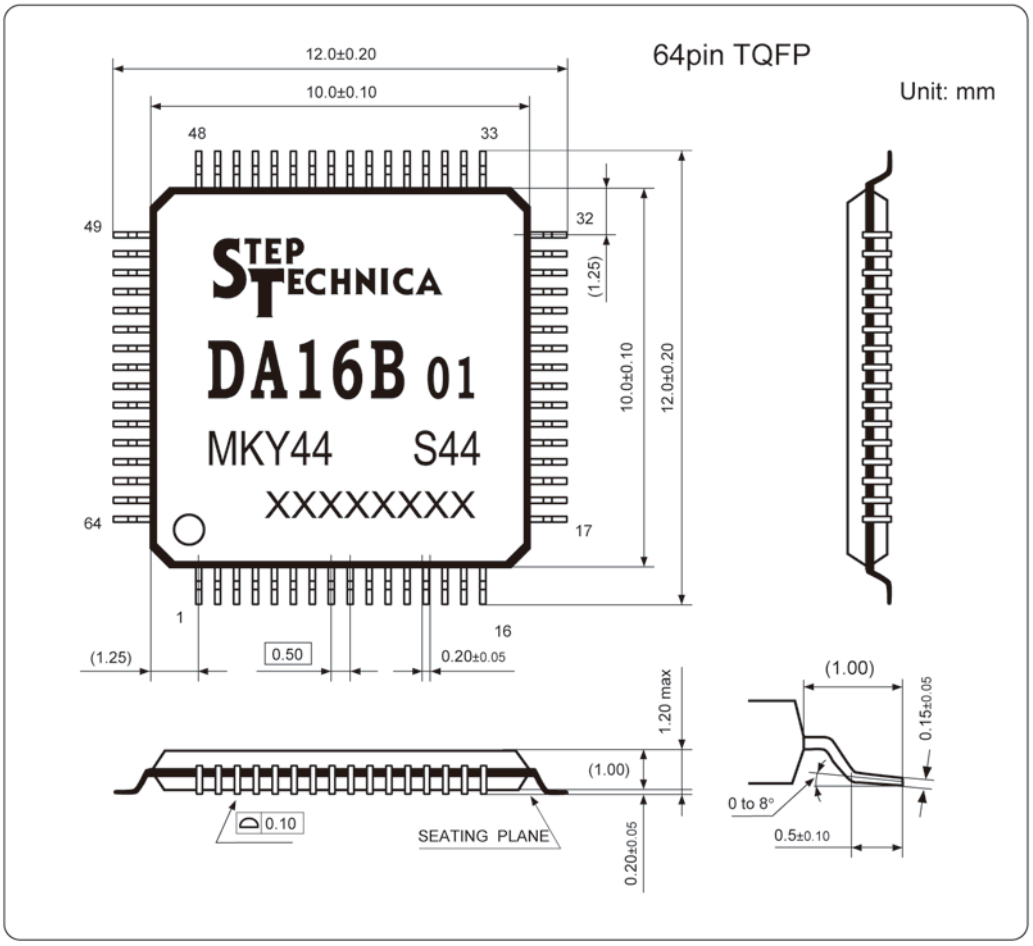


V_{t+} max = 0.8 × V_{DD}
V_{t-} min = 0.2 × V_{DD}
ΔV_t min = 0.6V

V_{OL} max = 0.4 V (V_{DD} = 3.0 V, I_{OL} = 2 mA)
I_{OL} max = 2 mA

Rpu (Pull-up register) Typ: 100 KΩ (30 KΩ to 300 KΩ: V_{DD} = 3.0 V, V_I = V_{SS})

■ Package Dimensions



Revision History

Version	Data	Page	Contents
1.1E	NOV 2013		Issued the first edition
1.2E	AUG 2018	P7	Corrected #Reset signal I/O type
		P9	Corrected the rated values of Type-A and Type-C
		ALL	Corrected typos of entire document
1.3E	OCT 2020	P7	Added the functional description for XTAL4i and XTAL4o
1.4E	JAN 2024	P11	Change of address

Document No.: DS_MKY44DA16B_V1.4E
Issued: January, 2024

Related Manuals:

CUnet Introduction Guide		**STD_CUSTU_Vx.xE**
CUnet Technical Guide		**STD_CUTGN_Vx.xE**
CUnet IC	**MKY43 User's Manual**	**STD_CU43_Vx.xE**
CUnet I/O- IC	**MKY46 User's Manual**	**STD_CU46_Vx.xE**
CUnet HUB- IC	**MKY02 User's Manual**	**STD_CUH02_Vx.xE**

StepTechnica Co., Ltd. 1-1-15, Tateno, Higashiyamato-shi, Tokyo 207-0021 TEL: +81-42-569-8577 **https:// www.steptechnica.com/en/**

Note

1. The information in this data sheet is subject to change without prior notice. Before using this product, please confirm that this is the latest version of this document.
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