AI03 MIC&VR&LED Specification

1 Description

The leaf is equiped MEMS microphone, potentiometer and LEDs. A MEMS microphone and a potentiometer are connected to Analog Input pins and LEDs are connected to Digital Output pins.

All power supply pins can be turned on/off by the Load SW with controlling an IO expander.

2 Leaf specification

2.1 Block diagram

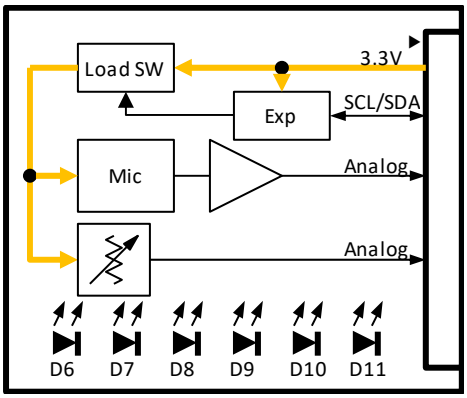


Figure 2.1 Block diagram

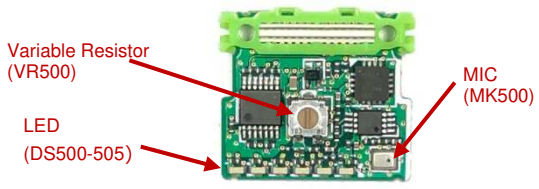
2.2 Power supply specification

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Power Supply Voltage	-	2.7V	3.3V	3.6V
Idd	Operating current	Active	-	6.1mA	-
		Sleep	-	0.6uA	-

2.3 Main parts

Reference No.	Part name	Part number	Vendor name	note
MK500	MIC	SPW2430HR5H-B	Knowles	—
VR500	Potentiometer	ST-4ETA10kΩ	Nidec Copal Electronics	—
DS500-505	LED	SML-A12Y8TT86	ROHM	—
IC502	I2C Expander	PCA9557RGVR	Texas Instruments	—
IC503	Load Switch	XC8102AA01NR-G	TOREX	—

2.4 Appearance

Top Side	Back Side
	

2.5 Pin assignment

Name	Function
A2	Analog MIC Input (The pin assign can be set to A3 by changing the chip resistance.)
A3	Potentiometer Input (The pin assign can be set to A0 by changing the chip resistance.)
D6	LED1
D7	LED2
D8	LED3
D9	LED4
D10	LED5
D11	LED6
SCL	I2C SCL Clock
SDA	I2C SDA Data
3V3	3.3V
GND	GND

3 Microphone (SPW2430HR5H-B) Specifications

3.1 Description

Item	Description
Type	MEMS
Direction	Omnidirectional
Frequency Range	100Hz ～ 10kHz
Gain	0dB
Interfaces	Analog

3.2 Electrical characteristics

3.2.1 Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +100℃
Maximum Operation Voltage	5.0V

3.2.2 Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	supply voltage	Internal Oscillator	1.5V	-	3.6V
Idd	Supply Current	Vdd=3.6V	-	75uA	110uA
S	Sensitivity	94 dB @1 kHz	-45 dBV/Pa	-42 dBV/Pa	-39dBV/Pa
SNR	Signal to Noise Ratio	94 dB @1 kHz, A-weighted	-	59dB(A)	-
THD	Total Harmonic Distortion	94 dB SPL @1kHz, S=Typ, Rload>2k	-	0.1%	0.2%
-	DC Output	Vdd=1.5V	-	0.66V	-
Zout	Output Impedance	@ 1 kHz	-	-	450Ω

3.3 Link destination of data sheet

https://www.knowles.com/subdepartment/dpt-microphones/subdpt-sisonic-surface-mount-memsPotentiometer (ST-4ETA10kΩ) Specifications

3.4 Description

Parameter	Value
Nominal resistance	10kΩ
Resistance law	Linear law (B)
Effective electrical angle	210° (1 turn)

3.5 Electrical characteristics

Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-55℃ to +125℃
Power ratings	0.25W (70℃) 0W (125℃)
Maximum Operation Voltage	200V or power rating, whichever is smaller

3.6 Link destination of data sheet

https://www.nidec-copal-electronics.com/j/product/detail/00000171/

4 LED(SML-A12Y8TT86) Specifications

4.1 Description

Parameter	Value
Package Type	Side-view
Emitting color	Yellow

4.2 Electrical characteristics

4.2.1 Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Power Dissipation	54mW
Forward Current	20mA
Peak Forward Current	100mA (1/10,1kHz)
Reverse Voltage	5V

4.2.2 Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vf	Forward Voltage	If=20mA	-	2.2V	-
Ir	Reverse Current	Vr=5V	-	-	10uA
λd	Dominant Wavelength	If=20mA	586nm	590nm	594nm
Iv	Luminous Intensity	If=20mA	25mcd	63mcd	-

4.3 Link destination of data sheet

https://www.rohm.co.jp/products/led/chip-leds-mono-color-type/standard/sml-a12y8t-product

5 I2C Expander (PCA9557RGVR) Specifications

5.1 Description

Parameter	Item
Type	Parallel Port Expander
GIO Port	8Port
IO	5V Tolerant
Interfaces	I2C

5.2 Electrical characteristics

5.2.1 Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Maximum Operation Voltage	6.0V

5.2.2 Specifications

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply Voltage	Internal Oscillator	2.3V	-	5.5V
Idd	Operating mode	3.6V 100kHz	-	1uA	4uA
	Standby mode	3.6V Vi=Vcc or GND, Io=0	-	0.25uA	0.9uA

5.3 Link destination of data sheet

http://www.tij.co.jp/product/jp/PCA9557/

5.4 Register

Name	D7	D6	D5	D4	D3	D2	D1	D0
Control Register	0	0	0	0	0	0	B1	B0

Control Register Field Descriptions

B1	B0	REGISTER
0	0	Input Port
0	1	Output Port
1	0	Polarity Inversion
1	1	Configuration

Name	Control	D7	D6	D5	D4	D3	D2	D1	D0
Input Port	00h	I7	I6	I5	I4	I3	I2	I1	I0

Input Port Register Field Descriptions

Field	Description
I[7:0]	The input port register (register 0) reflects the incoming logic levels of the pins, regardless of whether the pin is defined as an input or an output by the configuration register. It only acts on read operation. Writes to these registers have no effect. The default value, X, is determined by the externally applied logic level. Before a read operation, a write transmission is sent with the command byte to signal the I2C device that the input port register will be accessed next.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Output Port	01h	O7	O6	O5	O4	O3	O2	O1	O0

Output Port Register Field Descriptions

Field	Description
O[7:0]	The output port register (register 1) shows the outgoing logic levels of the pins defined as outputs by the configuration register. Bit values in this register have no effect on pins defined as inputs. In turn, reads from this register reflect the value that is in the flip-flop controlling the output selection, not the actual pin value.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Polarity Inversion	02h	N7	N6	N5	N4	N3	N2	N1	N0

Polarity Inversion Register Field Descriptions

Field	Description
N[3:0]	The polarity inversion register (register 2) allows polarity inversion of pins defined as inputs by the configuration register. If a bit in this register is set (written with 1), the corresponding port pin's polarity is inverted. If a bit in this register is cleared (written with a 0), the corresponding port pin's original polarity is retained.

Name	Pointer	D7	D6	D5	D4	D3	D2	D1	D0
Configuration	03h	C7	C6	C5	C4	C3	C2	C1	C0

Configuration Register Field Descriptions

Field	Description
C[7:0]	The configuration register (register 3) configures the directions of the I/O pins. If a bit in this register is set to 1, the corresponding port pin is enabled as an input with high impedance output driver. If a bit in this register is cleared to 0, the corresponding port pin is enabled as an output.

6 Load Switch(XC8102AA01NR-G) Specifications

6.1 Description

Item	Description
Protection Circuits	Fold-back Protection Circuit equiped

6.2 Electrical characteristics

6.2.1 Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Maximum Operation Voltage	6.5V

6.2.2 Rating

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply voltage	Internal Oscillator	1.2V	-	6.0V
Ron	ON resistance	2.9V	-	0.35Ω	0.475Ω
Ilim	Current limit	VIN≧2.9V, VOUT = VIN - 0.8V	400mA	480mA	-
Ishort	Short-circuit current	VCE=VIN, VOUT=0V	-	30mA	75mA
Idd	Operating mode	4.0V	-	3.8uA	6.5uA
	Standby mode	6V	-	0.01uA	0.10uA

6.3 Link destination of data sheet

https://www.torex.co.jp/products/load-switches/series/?name=xc8102

6.4 Power saving control

All power supply for a MIC, a VR and LEDs are possible to be turned off by Load SW with controlling I2C expander.

7 Revision history

Rev A1.0: First edition, August 2019