

Test Specifications and Results of ADC components

Spec-0000057. pdf

$$v_i = (a_i \times \text{ADC_vdd}) / 2^{\text{ADC_bit}}$$

$$y = (v_i - x_{\text{offset}}) / \text{gain} + y_{\text{offset}} \quad \text{range min to max}$$

$$\text{SMA calculation method} \quad \text{phy} = (y_n + y_{n-1} + y_{n-2}) / n$$

$$\text{EMA calculation method} \quad \text{phy} = (y \times k) + (\text{phy}_{n-1} \times (1 - k))$$

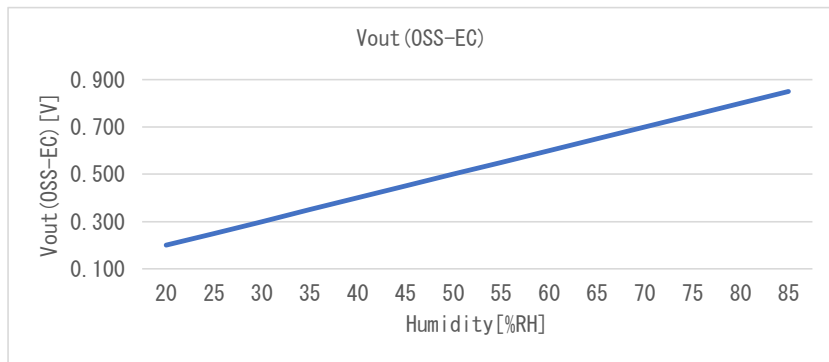
$$\text{WMA calculation method} \quad \text{phy} = (y_n \times n) + (y_{n-1} \times (n-1)) + \dots + (y_1 \times 1) / (n + (n-1) + \dots + 1)$$

$$\text{Non-MA calculation method} \quad \text{phy} = y$$

Date	28-Oct-22
Verifier	Red Dragon

Spec-CHS-MSS. pdf

component data	
x_offset	0.0000 [V]
gain	0.01 [V/%RH]
y_offset	0.0 [%RH]
max	85.0 [%RH]
min	20.0 [%RH]

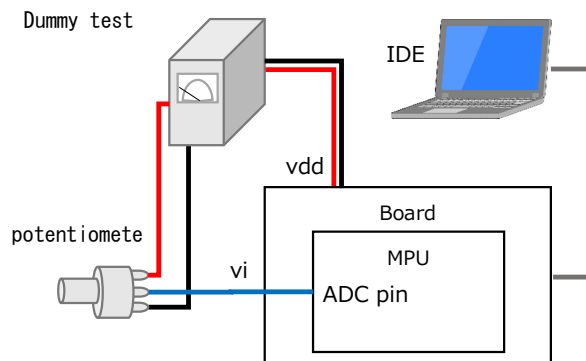


Coefficient		
SMA	n	4
EMA	k	0.75
WMA	m	3



Test environment

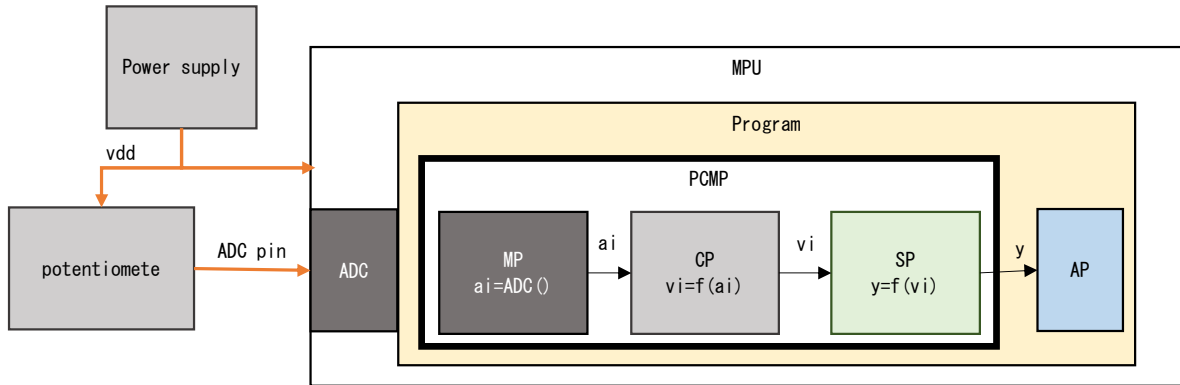
Board	Mega 2560 Rev3
MPU	ATmega2560
CompilerVer	avr-gcc 7.3.0
IDE	Arduino IDE 1.8.19
Vdd	5.0 [V]
ADC bit	10 [bit]
ADC pin	A0 -
Component	Dummy



Test Method

1. Coupling test with variable resistors

As shown in the figure below, the voltage is varied by a variable resistor to check if the temperature calculation results match the specifications. Non-MA mode:

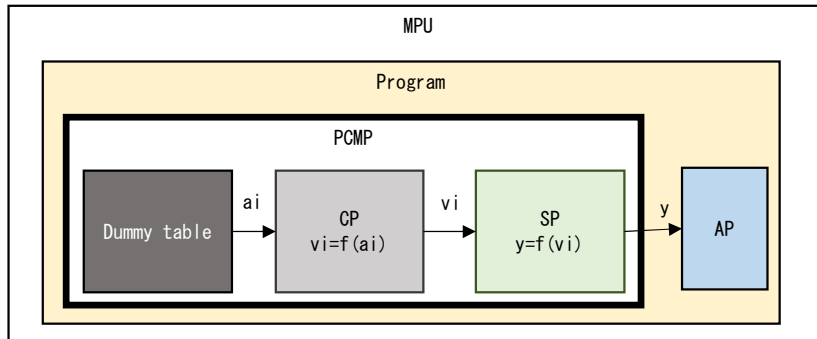


No.		ADC pin	ai	vi	p	res. phy	res. sts	Judgment
1	Expected	0.000	0	0.000	0.000	20.000	4,002	OK
	Measured		0	0.000	0.000	20.000	4,002	
	Difference		0	0.000	0.000	0.000	0	
2	Expected	1.500	307	1.499	149.902	85.000	4,001	OK
	Measured		307	1.499	149.902	85.000	4,001	
	Difference		0	0.000	0.000	0.000	0	
3	Expected	2.000	410	2.002	200.195	85.000	4,001	OK
	Measured		410	2.002	200.195	85.000	4,001	
	Difference		0	0.000	0.000	0.000	0	
4	Expected	5.000	1,024	5.000	500.000	85.000	4,001	OK
	Measured		1,023	4.995	499.512	85.000	4,001	
	Difference		1	0.005	0.488	0.000	0	

res. sts 4,000 Normal
 4,001 Max Limiter NG
 4,002 Min Limiter NG

2. Detail of replacing ADC value test

As shown in the figure below, change the MP layer to the value read from the Dummy table as shown in the test, and perform the following detailed test.



2-1. Max/Min range test

Vary a_i according to Dummy table as shown in the table below, and check Max/Min limiters and diagnostic results. Non-MA mode.

No.	Dummy a_i	v_i	p	res. phy	res. sts	Judgment
1	Expected	42	0.205	20.508	4,000	OK
	Measured	42	0.205	20.508	4,000	
	Difference	0	0.000	0.000	0	
2	Expected	41	0.200	20.020	4,000	OK
	Measured	41	0.200	20.020	4,000	
	Difference	0	0.000	0.000	0	
3	Expected	40	0.195	19.531	4,002	OK
	Measured	40	0.195	19.531	4,002	
	Difference	0	0.000	0.000	0	
4	Expected	41	0.200	20.020	4,000	OK
	Measured	41	0.200	20.020	4,000	
	Difference	0	0.000	0.000	0	
5	Expected	174	0.850	84.961	4,000	OK
	Measured	174	0.850	84.961	4,000	
	Difference	0	0.000	0.000	0	
6	Expected	175	0.854	85.449	4,001	OK
	Measured	175	0.855	85.449	4,001	
	Difference	0	0.000	0.000	0	
7	Expected	174	0.850	84.961	4,000	OK
	Measured	174	0.850	84.961	4,000	
	Difference	0	0.000	0.000	0	

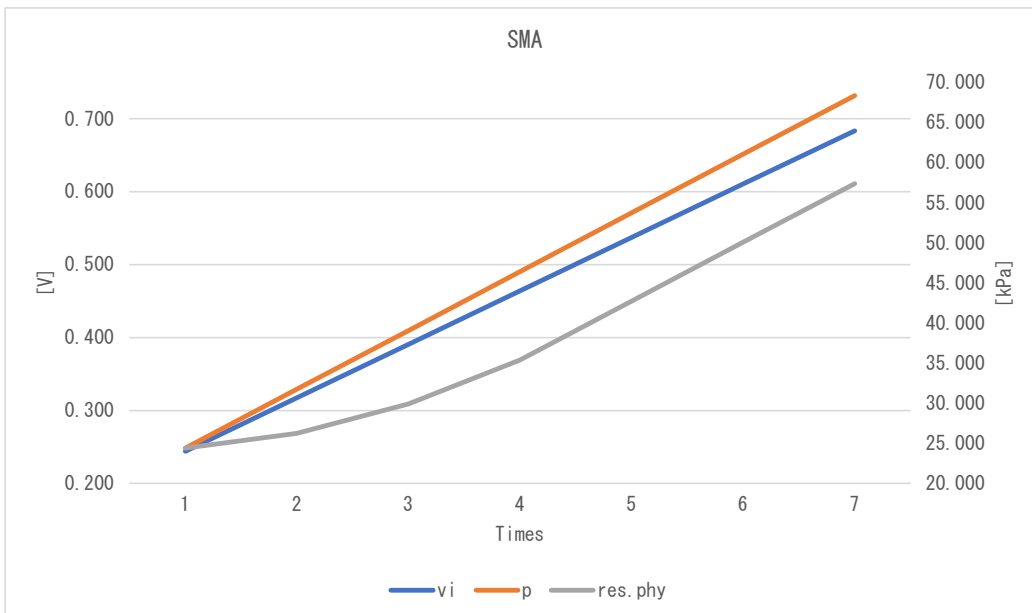
res. sts 4000 Normal
 4001 Max Limiter NG
 4002 Min Limiter NG

2-2. Moving average test

Check each Filter by changing ai according to the Dummy table as shown in the table below.

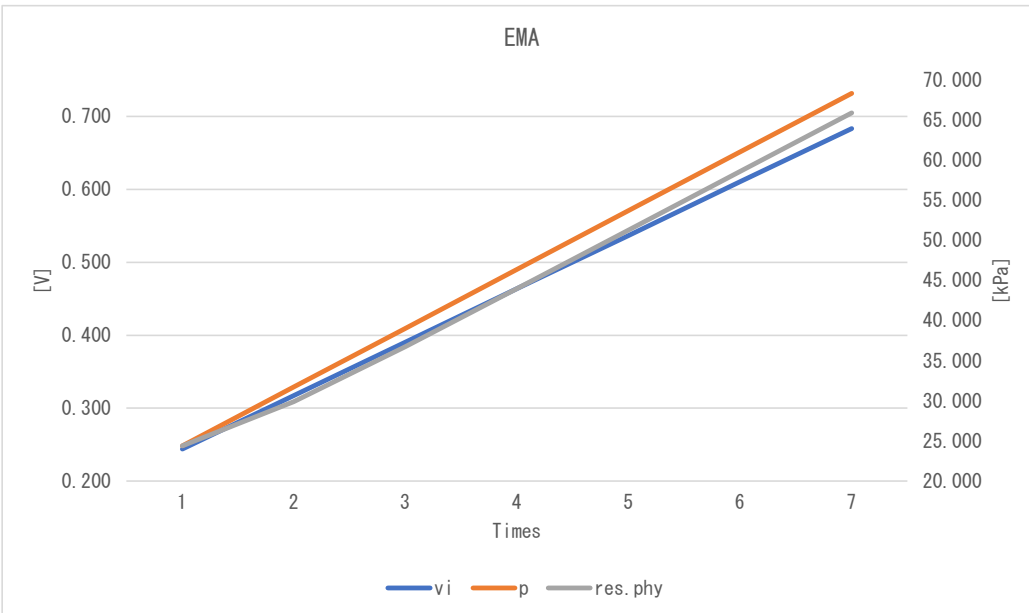
SMA

No.	Dummy ai	vi	p	res. phy	res. sts	Judgment
1	Expected	50	0.244	24.414	24.414	4,000
	Measured	50	0.244	24.414	24.414	4,000
	Difference	0	0.000	0.000	0.000	0
2	Expected	65	0.317	31.738	26.245	4,000
	Measured	65	0.317	31.738	26.245	4,000
	Difference	0	0.000	0.000	0.000	0
3	Expected	80	0.391	39.063	29.907	4,000
	Measured	80	0.391	39.063	29.907	4,000
	Difference	0	0.000	0.000	0.000	0
4	Expected	95	0.464	46.387	35.400	4,000
	Measured	95	0.464	46.387	35.400	4,000
	Difference	0	0.000	0.000	0.000	0
5	Expected	110	0.537	53.711	42.725	4,000
	Measured	110	0.537	53.711	42.725	4,000
	Difference	0	0.000	0.000	0.000	0
6	Expected	125	0.610	61.035	50.049	4,000
	Measured	125	0.610	61.035	50.049	4,000
	Difference	0	0.000	0.000	0.000	0
7	Expected	140	0.684	68.359	57.373	4,000
	Measured	140	0.684	68.359	57.373	4,000
	Difference	0	0.000	0.000	0.000	0



EMA

	No.	Dummy ai	vi	p	res. phy	res. sts	Judgment
1	Expected	50	0.244	24.414	24.414	4.000	OK
	Measured	50	0.244	24.414	24.414	4.000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	65	0.317	31.738	29.907	4.000	OK
	Measured	65	0.317	31.738	29.907	4.000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	80	0.391	39.063	36.774	4.000	OK
	Measured	80	0.391	39.063	36.774	4.000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	95	0.464	46.387	43.983	4.000	OK
	Measured	95	0.464	46.387	43.984	4.000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	110	0.537	53.711	51.279	4.000	OK
	Measured	110	0.537	53.711	51.279	4.000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	125	0.610	61.035	58.596	4.000	OK
	Measured	125	0.610	61.035	58.596	4.000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	140	0.684	68.359	65.919	4.000	OK
	Measured	140	0.684	68.359	65.919	4.000	
	Difference	0	0.000	0.000	0.000	0	



WMA

No.		Dummy ai	vi	p	res. phy	res. sts	Judgment
1	Expected	50	0.244	24.414	24.414	4,000	OK
	Measured	50	0.244	24.414	24.414	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	65	0.317	31.738	28.076	4,000	OK
	Measured	65	0.317	31.738	28.076	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	80	0.391	39.063	34.180	4,000	OK
	Measured	80	0.391	39.063	34.180	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	95	0.464	46.387	41.504	4,000	OK
	Measured	95	0.464	46.387	41.504	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	110	0.537	53.711	48.828	4,000	OK
	Measured	110	0.537	53.711	48.828	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	125	0.610	61.035	56.152	4,000	OK
	Measured	125	0.610	61.035	56.152	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	140	0.684	68.359	63.477	4,000	OK
	Measured	140	0.684	68.359	63.477	4,000	
	Difference	0	0.000	0.000	0.000	0	

