Test Specifications and Results of ADC components

Spec-00000057.pdf

Date	20-Oct-22
Verifier	Red Dragon

$vi = (ai \times ADC\_vdd) / 2^{ADC\_bit}$

$y = (vi - x\_offset) / gain + y\_offset$ range min to max

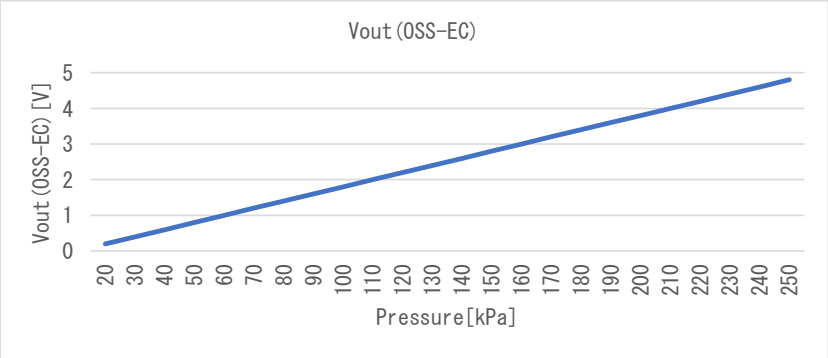
SMA calculation method $phy = (y_n + y_{n-1} + y_{n-2}) / n$

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

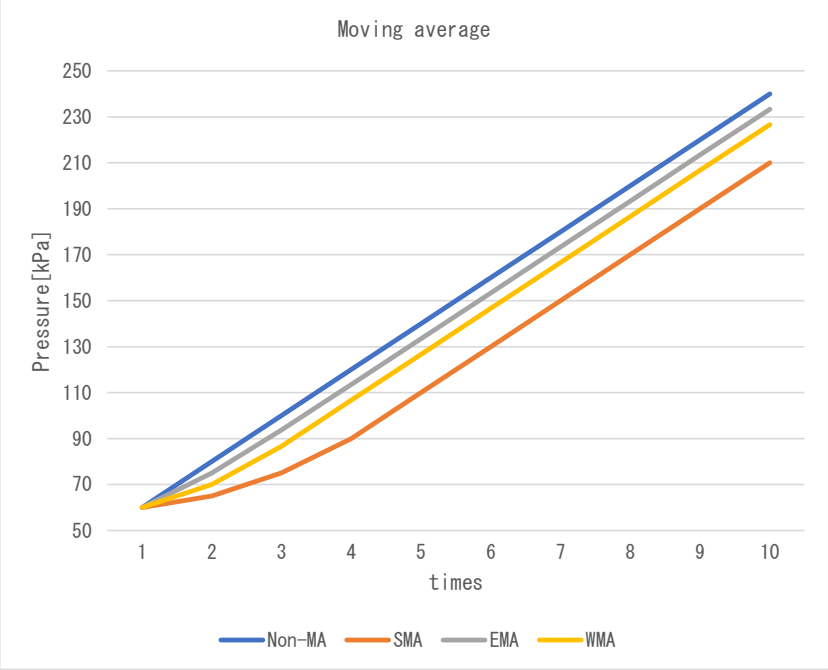
WMA calculation method $phy = ((yn \times n) + (yn-1 \times (n-1)) + \cdots + (y1 \times 1)) / (n + (n-1) + \cdots + 1)$

Non-MA calculation method $phy = y$

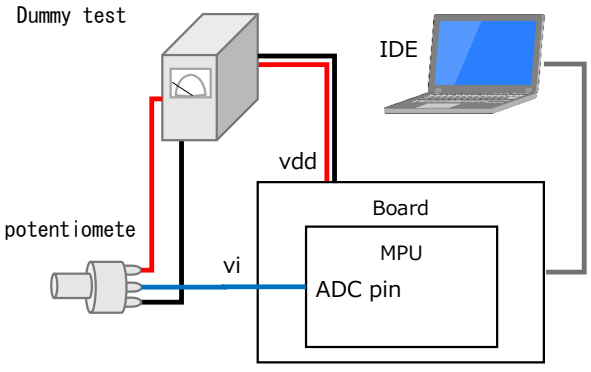
Spec-MPXHZ6250A.pdf		
component data		
x_offset	-0.2000	[V]
gain	0.02	[V/kPa]
y_offset	0.0	[kPa]
max	250.0	[kPa]
min	20.0	[kPa]



Coefficient		
SMA	n	4
EMA	k	0.75
WMA	m	3



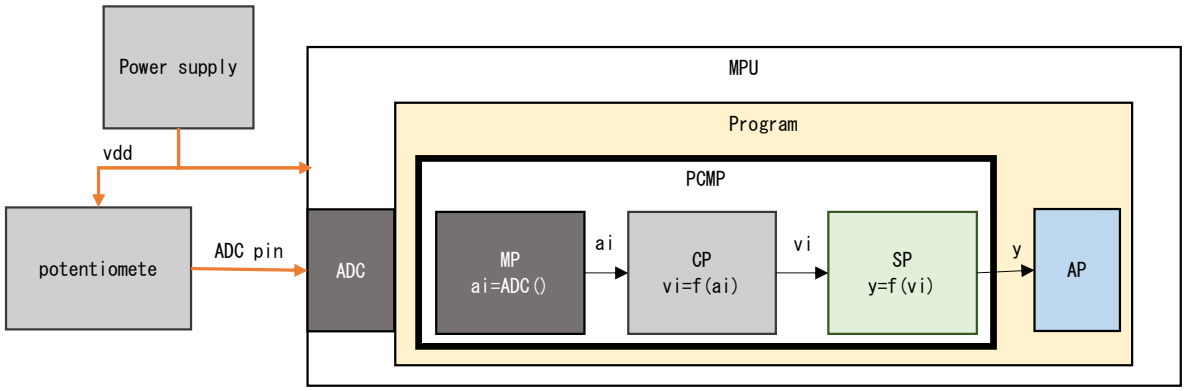
Test environment		
Board	Mega 2560 Rev3	
MPU	ATmega2560	
ComplierVer	avr-gcc 7.3.0	
IDE	Arduino IDE 1.8.19	
Vdd	5.0	[V]
ADC bit	10	[bit]
ADC pin	A0	-
Component	Dummy	



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:

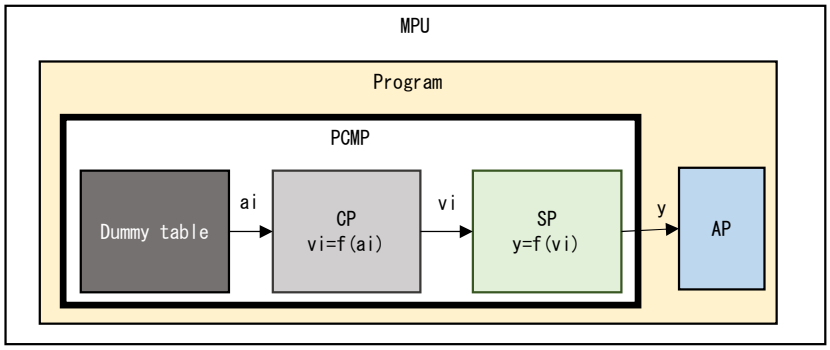


No.		ADC pin	ai	vi	p	res.phy	res.sts	Judgment
1	Expected	0.000	0	0.000	10.000	20.000	4,002	OK
	Measured		0	0.000	10.000	20.000	4,002	
	Difference		0	0.000	0.000	0.000	0	
2	Expected	1.500	307	1.499	84.951	84.951	4,000	OK
	Measured		307	1.499	84.951	84.951	4,000	
	Difference		0	0.000	0.000	0.000	0	
3	Expected	2.000	410	2.002	110.098	110.098	4,000	OK
	Measured		410	2.002	110.098	110.098	4,000	
	Difference		0	0.000	0.000	0.000	0	
4	Expected	5.000	1,024	5.000	260.000	250.000	4,001	OK
	Measured		1,023	4.995	259.756	250.000	4,001	
	Difference		1	0.005	0.244	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 ai according to Dummy table as shown in the table below, and check Max/Min limiters and diagnostic results. Non-MA mode.

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	42	0.205	20.254	20.254	4,000	OK
	Measured	42	0.205	20.254	20.254	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	41	0.200	20.010	20.010	4,000	OK
	Measured	41	0.200	20.010	20.010	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	40	0.195	19.766	20.000	4,002	OK
	Measured	40	0.195	19.766	20.000	4,002	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	41	0.200	20.010	20.010	4,000	OK
	Measured	41	0.200	20.010	20.010	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	983	4.800	249.990	249.990	4,000	OK
	Measured	983	4.800	249.990	249.990	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	984	4.805	250.234	250.000	4,001	OK
	Measured	984	4.805	250.234	250.000	4,001	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	983	4.800	249.990	249.990	4,000	OK
	Measured	983	4.800	249.990	249.990	4,000	
	Difference	0	0.000	0.000	0.000	0	

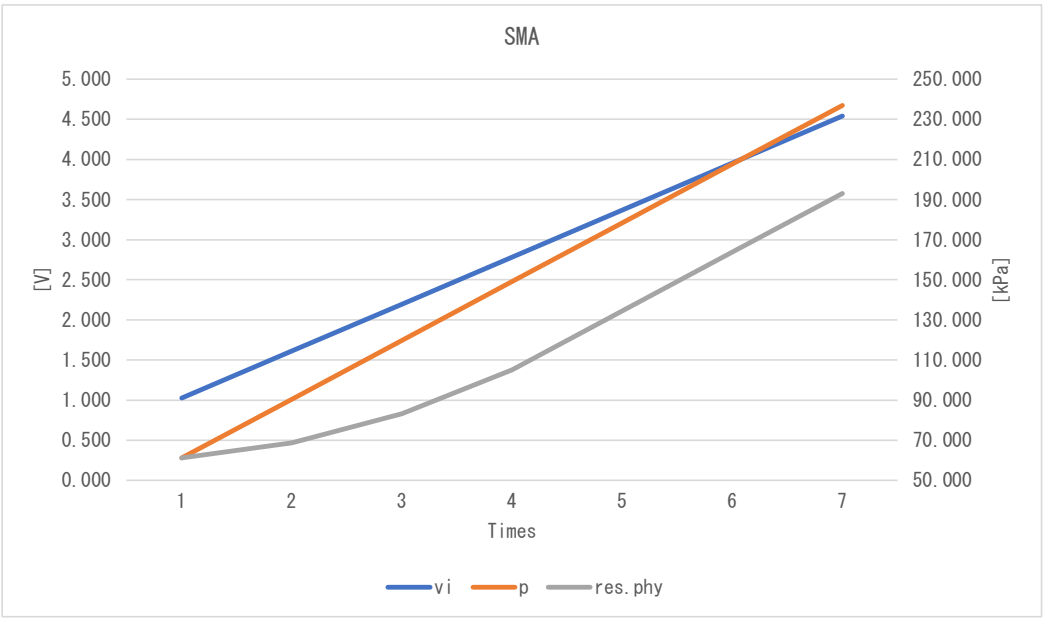
res.sts 4000 Normal
4001 Max Limiter NG
4002 Min Limiter NG

2-2. Moving average test

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

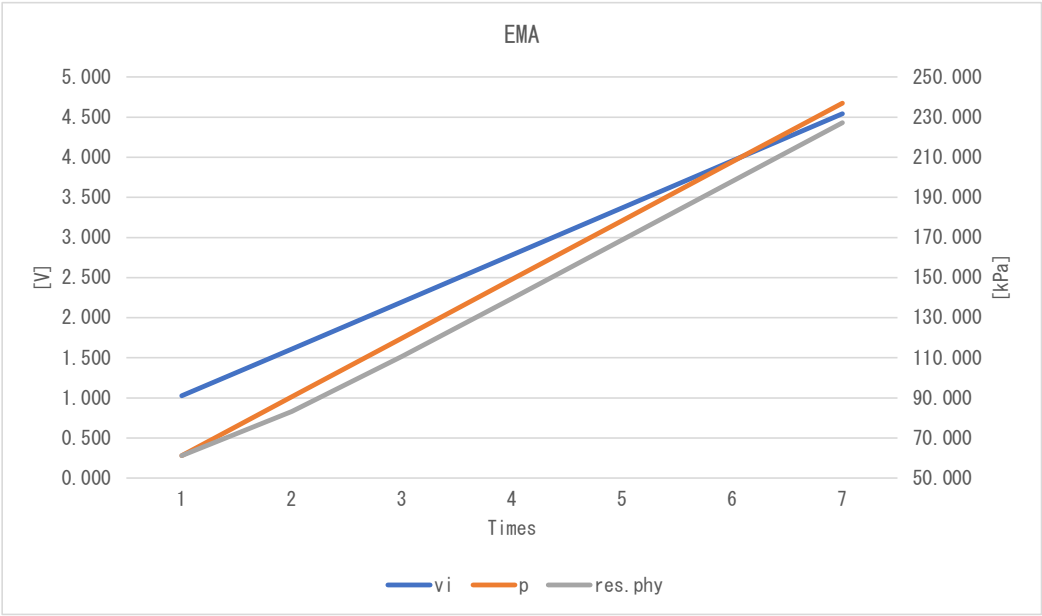
SMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	210	1.025	61.270	61.270	4,000	OK
	Measured	210	1.025	61.270	61.270	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	330	1.611	90.566	68.594	4,000	OK
	Measured	330	1.611	90.566	68.594	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	450	2.197	119.863	83.242	4,000	OK
	Measured	450	2.197	119.863	83.242	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	570	2.783	149.160	105.215	4,000	OK
	Measured	570	2.783	149.160	105.215	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	690	3.369	178.457	134.512	4,000	OK
	Measured	690	3.369	178.457	134.512	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	810	3.955	207.754	163.809	4,000	OK
	Measured	810	3.955	207.754	163.809	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	930	4.541	237.051	193.105	4,000	OK
	Measured	930	4.541	237.051	193.105	4,000	
	Difference	0	0.000	0.000	0.000	0	



EMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	210	1.025	61.270	61.270	4,000	OK
	Measured	210	1.025	61.270	61.270	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	330	1.611	90.566	83.242	4,000	OK
	Measured	330	1.611	90.566	83.242	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	450	2.197	119.863	110.708	4,000	OK
	Measured	450	2.197	119.863	110.708	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	570	2.783	149.160	139.547	4,000	OK
	Measured	570	2.783	149.160	139.547	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	690	3.369	178.457	168.730	4,000	OK
	Measured	690	3.369	178.457	168.730	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	810	3.955	207.754	197.998	4,000	OK
	Measured	810	3.955	207.754	197.998	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	930	4.541	237.051	227.288	4,000	OK
	Measured	930	4.541	237.051	227.288	4,000	
	Difference	0	0.000	0.000	0.000	0	



WMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	210	1.025	61.270	61.270	4,000	OK
	Measured	210	1.025	61.270	61.270	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	330	1.611	90.566	75.918	4,000	OK
	Measured	330	1.611	90.566	75.918	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	450	2.197	119.863	100.332	4,000	OK
	Measured	450	2.197	119.863	100.332	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	570	2.783	149.160	129.629	4,000	OK
	Measured	570	2.783	149.160	129.629	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	690	3.369	178.457	158.926	4,000	OK
	Measured	690	3.369	178.457	158.926	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	810	3.955	207.754	188.223	4,000	OK
	Measured	810	3.955	207.754	188.223	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	930	4.541	237.051	217.520	4,000	OK
	Measured	930	4.541	237.051	217.520	4,000	
	Difference	0	0.000	0.000	0.000	0