Test Specifications and Results of ADC components

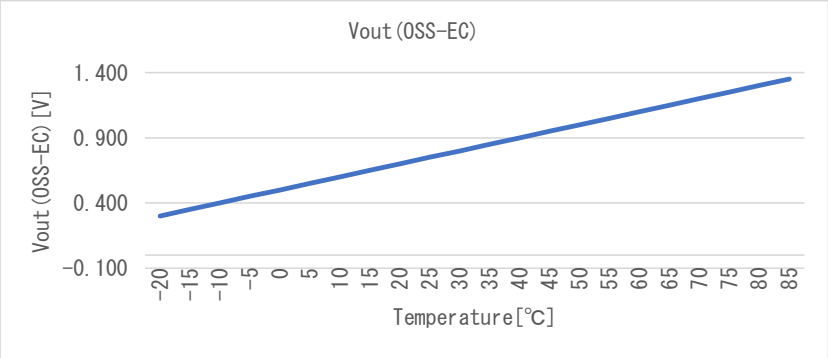
Spec-00000057.pdf

Date	17-Oct-22
Verifier	Red Dragon

vi = (ai × 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 × k) + (phy_{n-1} × (1 - k))
WMA calculation method phy = ((yn × n) + (yn-1 × (n-1)) + … + (y1 × 1)) / (n + (n-1) +…+ 1)
Non-MA calculation method phy = y

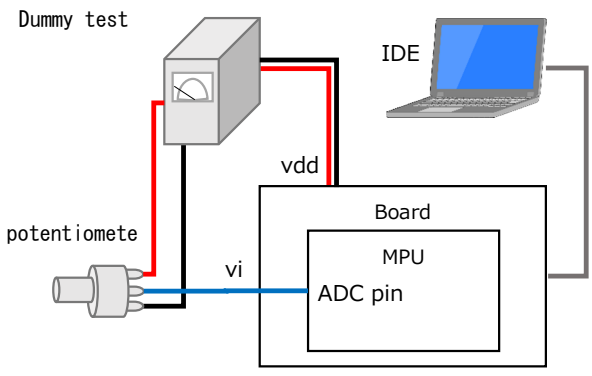
Spec-MAX6607IXK_MAX6608IUK.pdf

component data		
x_offset	0.5000	[V]
gain	0.01	[V/℃]
y_offset	0.0	[℃]
max	85.0	[℃]
min	-20.0	[℃]



Coefficient		
SMA	n	4
EMA	k	0.75
WMA	m	3

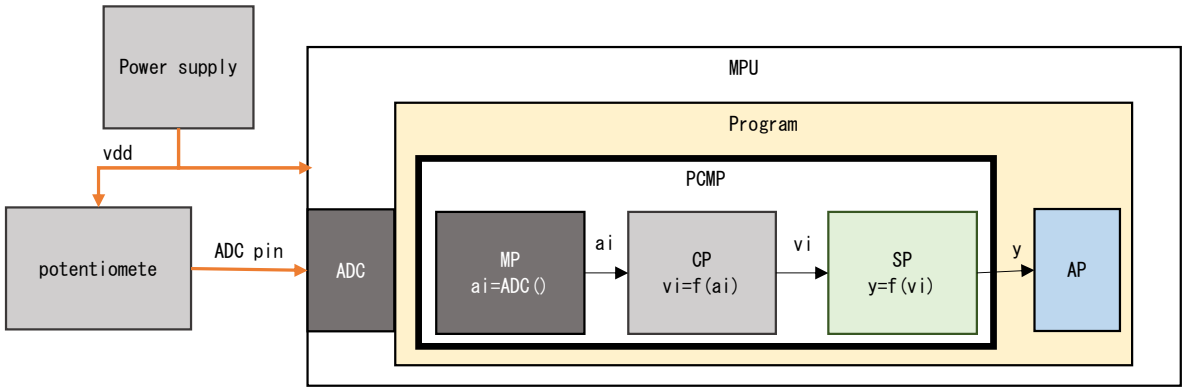
Test environment	
Board	Arduino Pro Mini(3.3V versions)
MPU	ATmega328P
ComplierVer	Arm Compiler 6.16
IDE	Mbed Studio 1.4.4
Vdd	3.3 [V]
ADC bit	10 [bit]
ADC pin	A0 -
Component	Dummy



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:

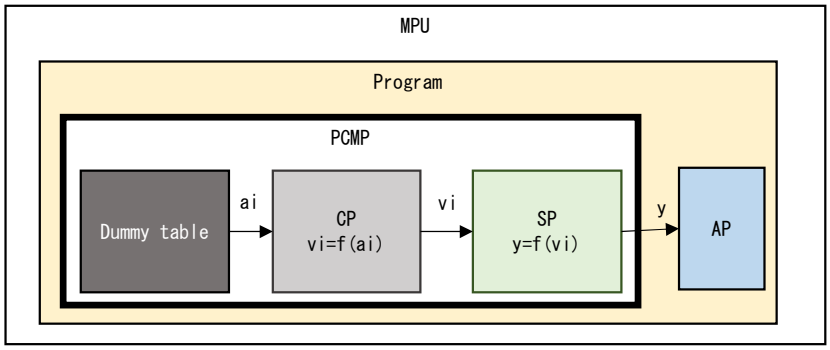


No.		ADC pin	ai	vi	p	res.phy	res.sts	Judgment
1	Expected	0.000	0	0.000	-50.000	-20.000	4,002	OK
	Measured		0	0.000	-50.000	-20.000	4,002	
	Difference		0	0.000	0.000	0.000	0	
2	Expected	1.250	388	1.250	75.039	75.039	4,000	OK
	Measured		388	1.250	75.039	75.039	4,000	
	Difference		0	0.000	0.000	0.000	0	
3	Expected	1.300	403	1.299	79.873	79.873	4,000	OK
	Measured		403	1.299	79.873	79.873	4,000	
	Difference		0	0.000	0.000	0.000	0	
4	Expected	3.300	1,024	3.300	280.000	85.000	4,001	OK
	Measured		1,023	3.297	279.678	85.000	4,001	
	Difference		1	0.003	0.322	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	95	0.306	-19.385	-19.385	4,000	OK
	Measured	95	0.306	-19.385	-19.385	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	94	0.303	-19.707	-19.707	4,000	OK
	Measured	94	0.303	-19.707	-19.707	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	93	0.300	-20.029	-20.000	4,002	OK
	Measured	93	0.300	-20.029	-20.000	4,002	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	94	0.303	-19.707	-19.707	4,000	OK
	Measured	94	0.303	-19.707	-19.707	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	418	1.347	84.707	84.707	4,000	OK
	Measured	418	1.347	84.707	84.707	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	419	1.350	85.029	85.000	4,001	OK
	Measured	419	1.350	85.029	85.000	4,001	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	418	1.347	84.707	84.707	4,000	OK
	Measured	418	1.347	84.707	84.707	4,000	
	Difference	0	0.000	0.000	0.000	0	

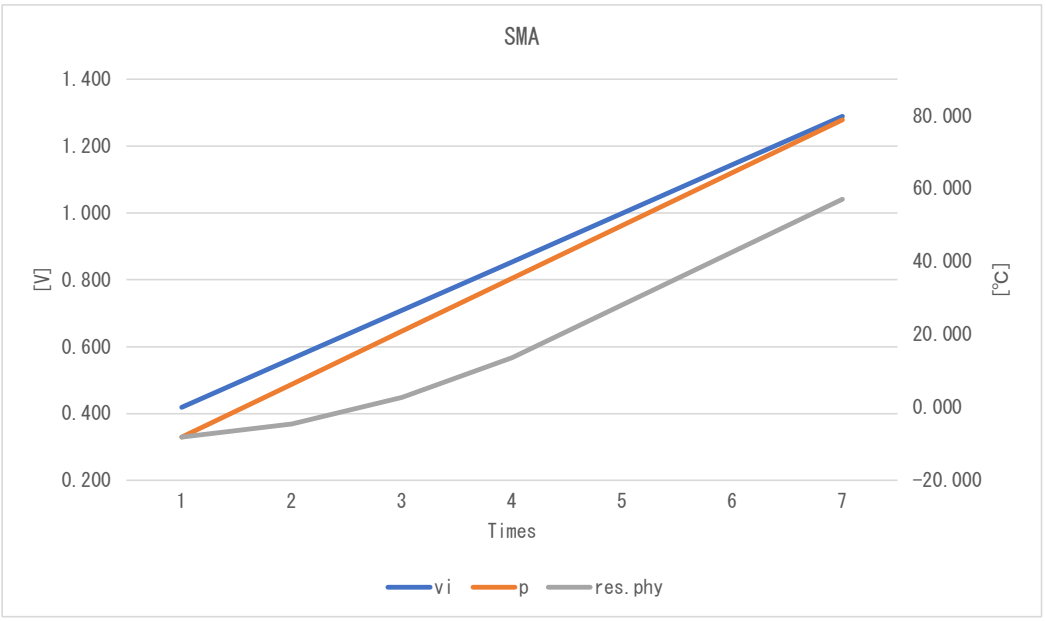
res.sts	4000	Normal
	4001	Max Limiter NG
	4002	Min Limiter NG

2-2. Moving average test

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

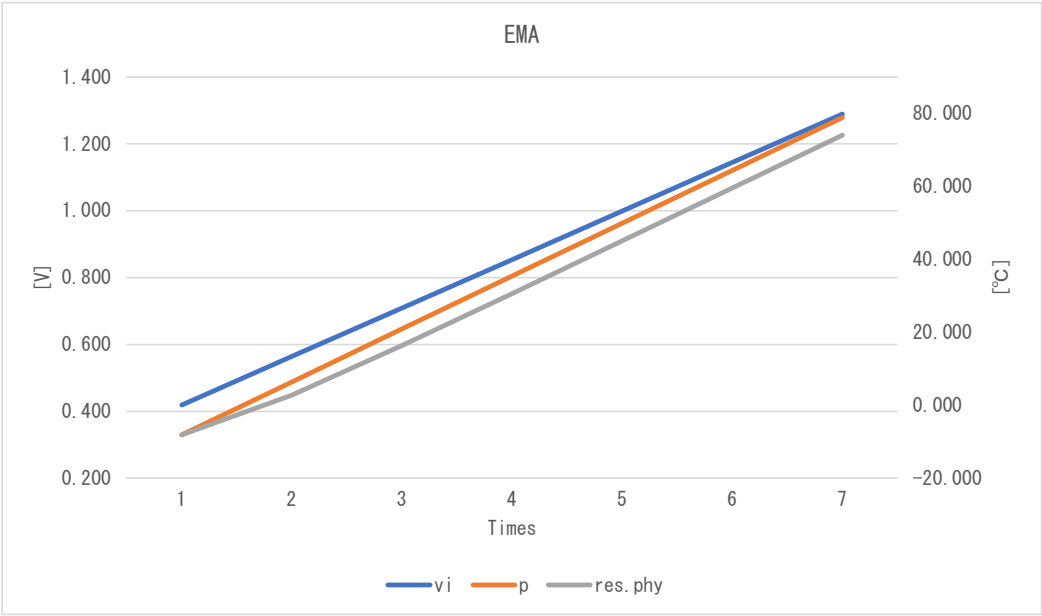
SMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	130	0.419	-8.105	-8.105	4,000	OK
	Measured	130	0.419	-8.106	-8.106	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	175	0.564	6.396	-4.480	4,000	OK
	Measured	175	0.564	6.397	-4.480	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	220	0.709	20.898	2.771	4,000	OK
	Measured	220	0.709	20.898	2.771	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	265	0.854	35.400	13.647	4,000	OK
	Measured	265	0.854	35.400	13.648	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	310	0.999	49.902	28.149	4,000	OK
	Measured	310	0.999	49.902	28.149	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	355	1.144	64.404	42.651	4,000	OK
	Measured	355	1.144	64.404	42.651	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	400	1.289	78.906	57.153	4,000	OK
	Measured	400	1.289	78.906	57.153	4,000	
	Difference	0	0.000	0.000	0.000	0	



EMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	130	0.419	-8.105	-8.105	4,000	OK
	Measured	130	0.419	-8.106	-8.106	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	175	0.564	6.396	2.771	4,000	OK
	Measured	175	0.564	6.397	2.771	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	220	0.709	20.898	16.367	4,000	OK
	Measured	220	0.709	20.898	16.367	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	265	0.854	35.400	30.642	4,000	OK
	Measured	265	0.854	35.400	30.642	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	310	0.999	49.902	45.087	4,000	OK
	Measured	310	0.999	49.902	45.087	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	355	1.144	64.404	59.575	4,000	OK
	Measured	355	1.144	64.404	59.575	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	400	1.289	78.906	74.073	4,000	OK
	Measured	400	1.289	78.906	74.074	4,000	
	Difference	0	0.000	0.000	0.000	0	



WMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	130	0.419	-8.105	-8.105	4,000	OK
	Measured	130	0.419	-8.106	-8.106	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	175	0.564	6.396	-0.854	4,000	OK
	Measured	175	0.564	6.397	-0.855	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	220	0.709	20.898	11.230	4,000	OK
	Measured	220	0.709	20.898	11.231	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	265	0.854	35.400	25.732	4,000	OK
	Measured	265	0.854	35.400	25.732	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	310	0.999	49.902	40.234	4,000	OK
	Measured	310	0.999	49.902	40.234	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	355	1.144	64.404	54.736	4,000	OK
	Measured	355	1.144	64.404	54.736	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	400	1.289	78.906	69.238	4,000	OK
	Measured	400	1.289	78.906	69.238		
	Difference	0	0.000	0.000	0.000	4,000