Test Specifications and Results of ADC components

Spec-00000058.pdf

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

$y = (vi - x\_offset) / gain + y\_offset$ 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 $phy = ((yn \times n) + (yn-1 \times (n-1)) + \cdots + (y1 \times 1)) / (n + (n-1) + \cdots + 1)$

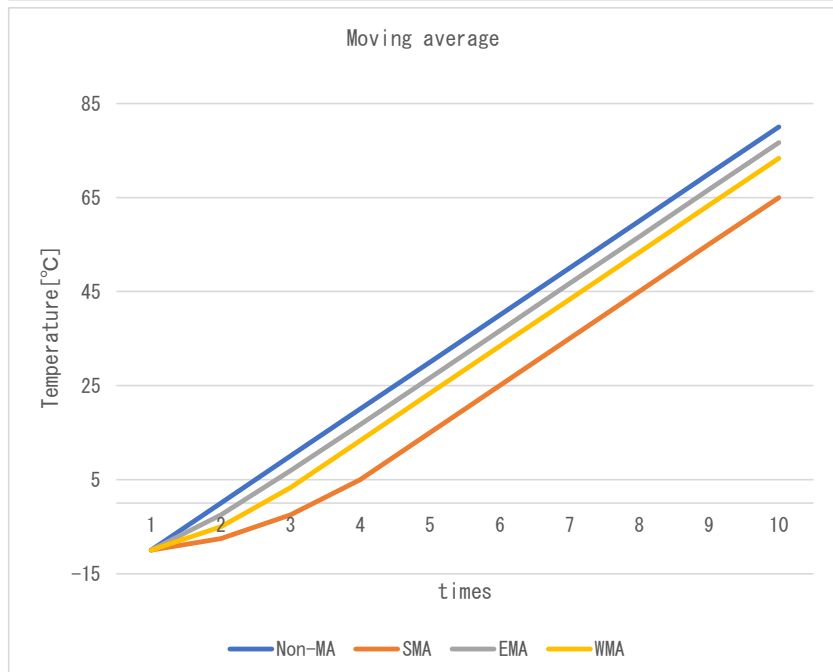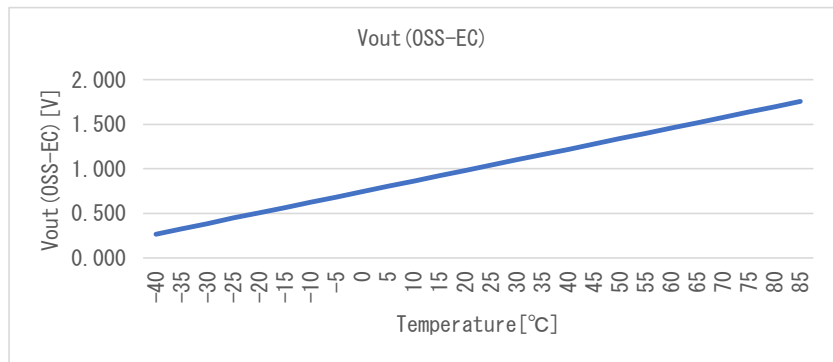Non-MA calculation method $phy = y$

Spec-MAX6605MXKV.pdf

component data		
x_offset	0.7440	[V]
gain	0.0119	[V/℃]
y_offset	0.0	[℃]
max	85.0	[℃]
min	-40.0	[℃]

Coefficient		
SMA	n	4
EMA	k	0.75
WMA	m	3

Vout (OSS-EC)

Moving average

Test environment	
Board	NUCLEO-F401RE
MPU	STM32F401RE
ComplierVer	Arm Compiler 6.16
IDE	Mbed Studio 1.4.4
Vdd	3.3 [V]
ADC bit	16 [bit]
ADC pin	A0 -
Component	Dummy
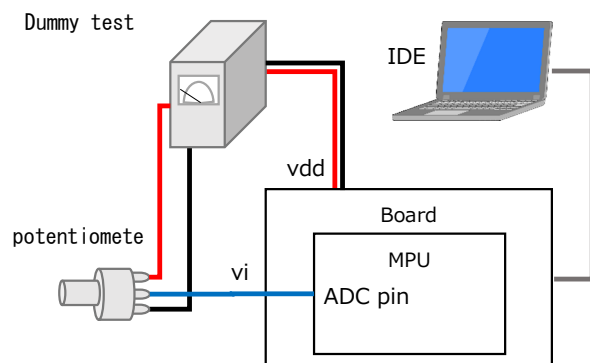
Test Method

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:
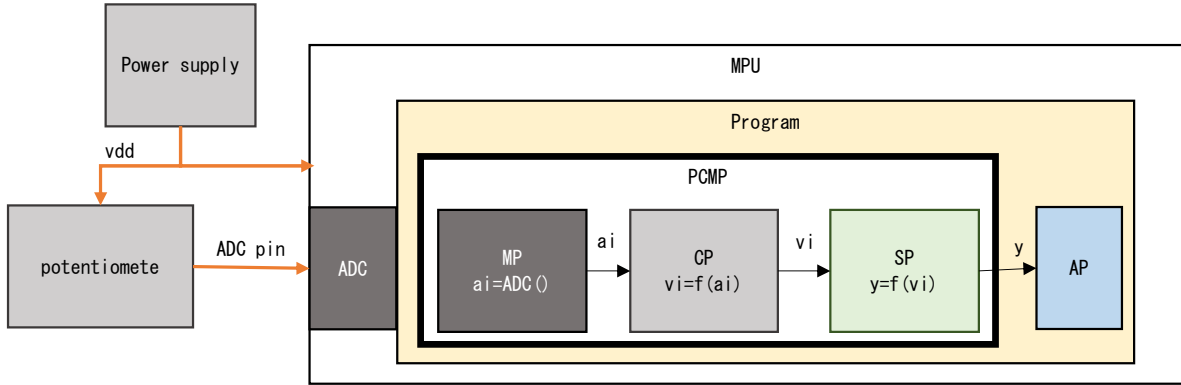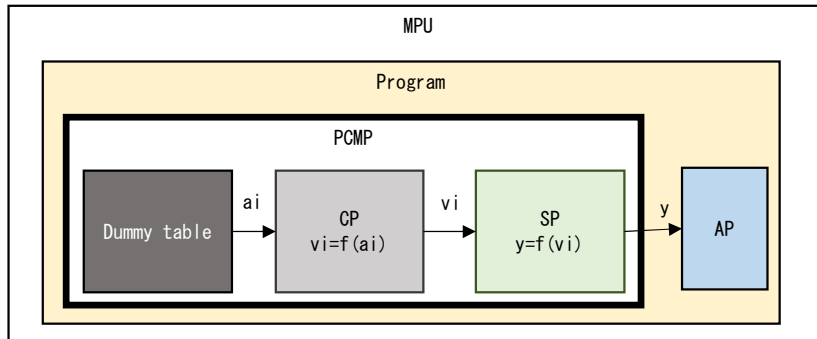

	No.	ADC pin	ai	vi	p	res.phy	res.sts	Judgment
1	Expected		32	0.002	-62.386	-40.000	4,002	
	Measured	0.002	32	0.002	-62.386	-40.000	4,002	OK
	Difference		0	0.000	0.000	0.000	0	
2	Expected		29,799	1.500	63.571	63.571	4,000	
	Measured	1.501	29,767	1.499	63.436	63.436	4,000	OK
	Difference		32	0.002	0.135	0.135	0	
3	Expected		33,815	1.703	80.565	80.565	4,000	
	Measured	1.703	33,848	1.704	80.704	80.704	4,000	OK
	Difference		-33	-0.002	-0.140	-0.140	0	
4	Expected		65,536	3.300	214.790	85.000	4,001	
	Measured	3.300	65,535	3.300	21.479	85.000	4,001	OK
	Difference		1	0.000	193.311	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.

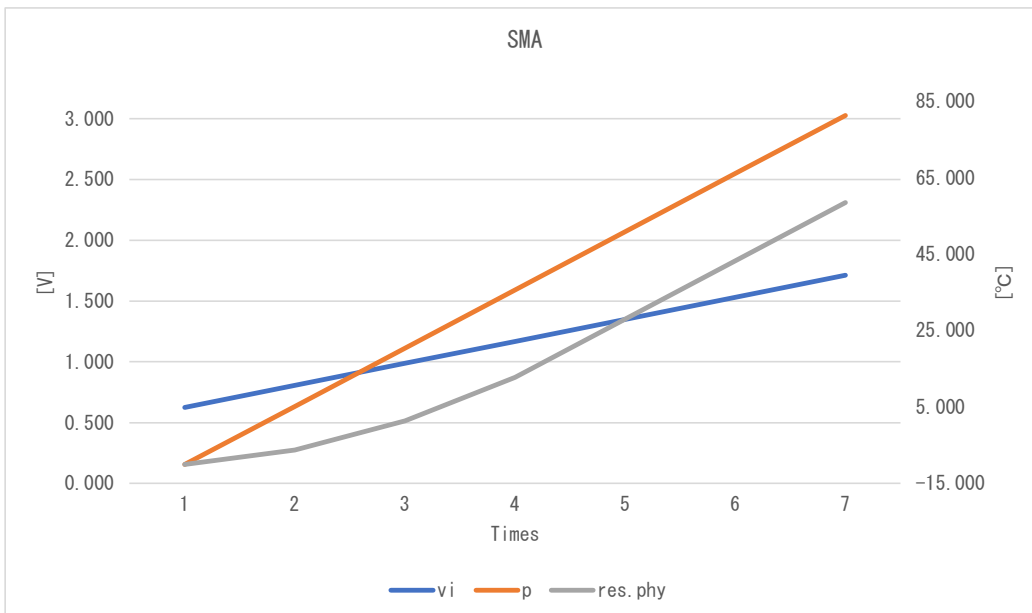|	No.	Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	5,324	0.268	−39.993	−39.993	4,000	
	Measured	5,324	0.268	−39.993	−39.993	4,000	OK
	Difference	0	0.000	0.000	0.000	0	
2	Expected	5,323	0.268	−39.997	−39.997	4,000	
	Measured	5,323	0.268	−39.997	−39.997	4,000	OK
	Difference	0	0.000	0.000	0.000	0	
3	Expected	5,322	0.268	−40.001	−40.000	4,002	
	Measured	5,322	0.268	−40.001	−40.000	4,002	OK
	Difference	0	0.000	0.000	0.000	0	
4	Expected	5,323	0.268	−39.997	−39.997	4,000	
	Measured	5,323	0.268	−39.997	−39.997	4,000	OK
	Difference	1,778	0.000	0.000	0.000	0	
5	Expected	34,863	1.755	84.999	84.999	4,000	
	Measured	34,863	1.755	84.999	84.999	4,000	OK
	Difference	0	0.000	0.000	0.000	0	
6	Expected	34,864	1.756	85.004	85.000	4,001	
	Measured	34,864	1.756	85.004	85.000	4,001	OK
	Difference	0	0.000	0.000	0.000	0	
7	Expected	34,863	1.755	84.999	84.999	4,000	
	Measured	34,863	1.755	84.999	84.999	4,000	OK
	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.
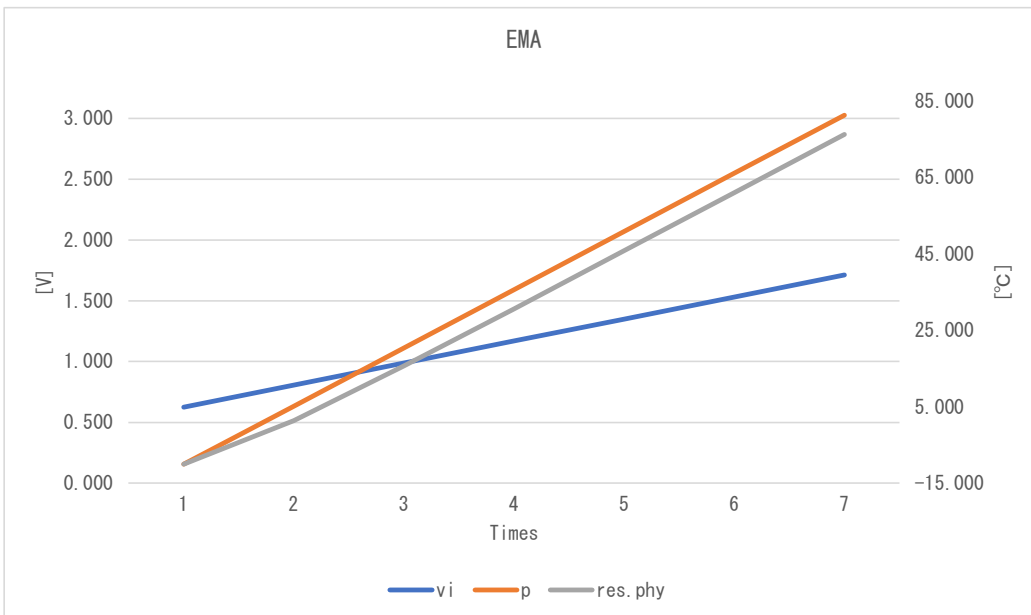
SMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	12,400	0.624	-10.051	-10.051	4,000	OK
	Measured	12,400	0.624	-10.051	-10.051	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	16,000	0.806	5.182	-6.243	4,000	OK
	Measured	16,000	0.806	5.182	-6.243	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	19,600	0.987	20.415	1.374	4,000	OK
	Measured	19,600	0.987	20.415	1.374	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	23,200	1.168	35.648	12.798	4,000	OK
	Measured	23,200	1.168	35.648	12.798	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	26,800	1.349	50.881	28.032	4,000	OK
	Measured	26,800	1.349	50.881	28.032	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	30,400	1.531	66.114	43.265	4,000	OK
	Measured	30,400	1.531	66.114	43.265	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	34,000	1.712	81.348	58.498	4,000	OK
	Measured	34,000	1.712	81.348	58.498	4,000	
	Difference	0	0.000	0.000	0.000	0	

SMA

EMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	12,400	0.624	−10.051	−10.051	4,000	OK
	Measured	12,400	0.624	−10.051	−10.051	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	16,000	0.806	5.182	1.374	4,000	OK
	Measured	16,000	0.806	5.182	1.374	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	19,600	0.987	20.415	15.655	4,000	OK
	Measured	19,600	0.987	20.415	15.655	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	23,200	1.168	35.648	30.650	4,000	OK
	Measured	23,200	1.168	35.648	30.650	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	26,800	1.349	50.881	45.823	4,000	OK
	Measured	26,800	1.349	50.881	45.823	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	30,400	1.531	66.114	61.042	4,000	OK
	Measured	30,400	1.531	66.114	61.042	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	34,000	1.712	81.348	76.271	4,000	OK
	Measured	34,000	1.712	81.348	76.271	4,000	
	Difference	0	0.000	0.000	0.000	0	

EMA

WMA

No.		Dummy ai	vi	p	res.phy	res.sts	Judgment
1	Expected	12,400	0.624	−10.051	−10.051	4,000	OK
	Measured	12,400	0.624	−10.051	−10.051	4,000	
	Difference	0	0.000	0.000	0.000	0	
2	Expected	16,000	0.806	5.182	−2.435	4,000	OK
	Measured	16,000	0.806	5.182	−2.435	4,000	
	Difference	0	0.000	0.000	0.000	0	
3	Expected	19,600	0.987	20.415	10.260	4,000	OK
	Measured	19,600	0.987	20.415	10.260	4,000	
	Difference	0	0.000	0.000	0.000	0	
4	Expected	23,200	1.168	35.648	25.493	4,000	OK
	Measured	23,200	1.168	35.648	25.493	4,000	
	Difference	0	0.000	0.000	0.000	0	
5	Expected	26,800	1.349	50.881	40.726	4,000	OK
	Measured	26,800	1.349	50.881	40.726	4,000	
	Difference	0	0.000	0.000	0.000	0	
6	Expected	30,400	1.531	66.114	55.959	4,000	OK
	Measured	30,400	1.531	66.114	55.959	4,000	
	Difference	0	0.000	0.000	0.000	0	
7	Expected	34,000	1.712	81.348	71.192	4,000	OK
	Measured	34,000	1.712	81.348	71.192	4,000	
	Difference	0	0.000	0.000	0.000	0	

WMA