BENEFITS OF USING CAPACITOR ARRAYS

AVX capacitor arrays offer designers the opportunity to lower placement costs, increase assembly line output through lower component count per board and to reduce real estate requirements.

Reduced Costs

Placement costs are greatly reduced by effectively placing one device instead of four or two. This results in increased throughput and translates into savings on machine time. Inventory levels are lowered and further savings are made on solder materials, etc.

Space Saving

Space savings can be quite dramatic when compared to the use of discrete chip capacitors. As an example, the 0508 4-element array offers a space reduction of >40% vs. 4 x 0402 discrete capacitors and of >70% vs. 4 x 0603 discrete capacitors. (This calculation is dependent on the spacing of the discrete components.)

Increased Throughput

Assuming that there are 220 passive components placed in a mobile phone:

A reduction in the passive count to 200 (by replacing discrete components with arrays) results in an increase in throughput of approximately 9%.

A reduction of 40 placements increases throughput by 18%.

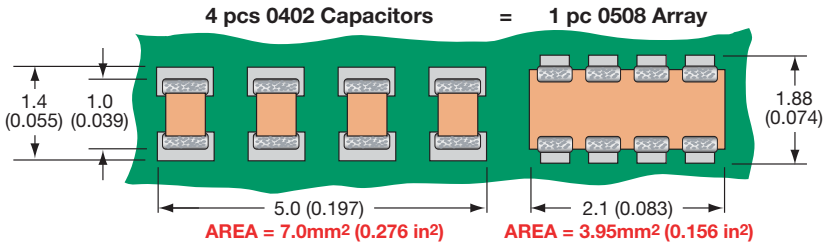
For high volume users of cap arrays using the very latest placement equipment capable of placing 10 components per second, the increase in throughput can be very significant and can have the overall effect of reducing the number of placement machines required to mount components:

If 120 million 2-element arrays or 40 million 4-element arrays were placed in a year, the requirement for placement equipment would be reduced by one machine.

During a 20Hr operational day a machine places 720K components. Over a working year of 167 days the machine can place approximately 120 million. If 2-element arrays are mounted instead of discrete components, then the number of placements is reduced by a factor of two and in the scenario where 120 million 2-element arrays are placed there is a saving of one pick and place machine.

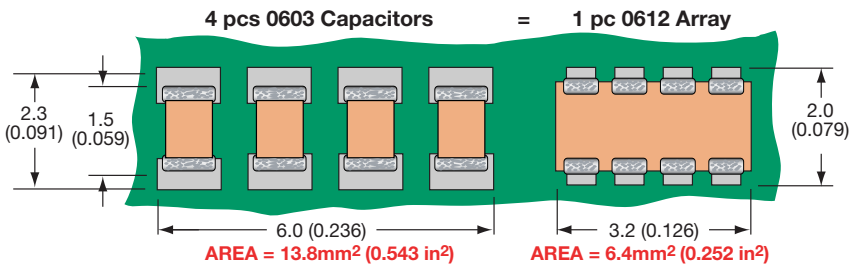
Smaller volume users can also benefit from replacing discrete components with arrays. The total number of placements is reduced thus creating spare capacity on placement machines. This in turn generates the opportunity to increase overall production output without further investment in new equipment.

W2A (0508) Capacitor Arrays



The 0508 4-element capacitor array gives a PCB space saving of over 40% vs four 0402 discretes and over 70% vs four 0603 discrete capacitors.

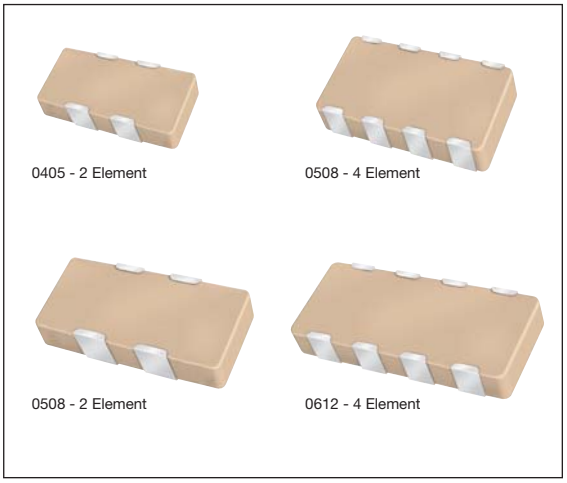
W3A (0612) Capacitor Arrays



The 0612 4-element capacitor array gives a PCB space saving of over 50% vs four 0603 discretes and over 70% vs four 0805 discrete capacitors.

Capacitor Array

Capacitor Array (IPC)



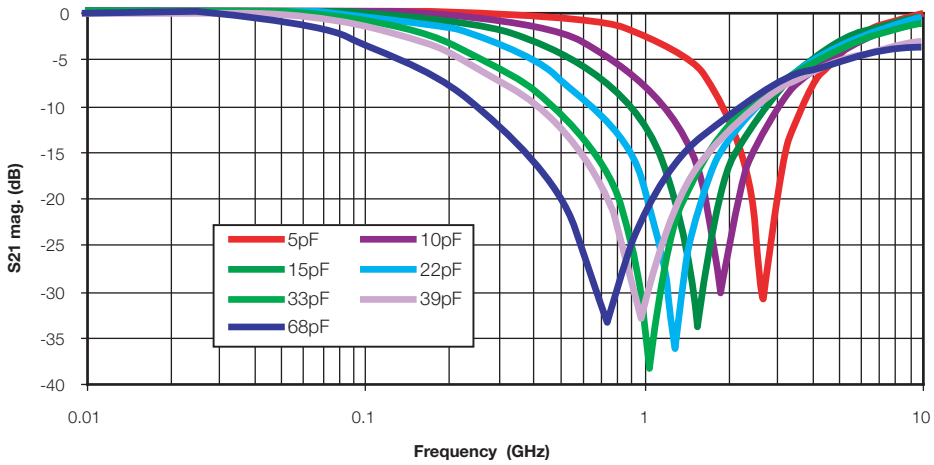
GENERAL DESCRIPTION

AVX is the market leader in the development and manufacture of capacitor arrays. The smallest array option available from AVX, the 0405 2-element device, has been an enormous success in the Telecommunications market. The array family of products also includes the 0612 4-element device as well as 0508 2-element and 4-element series, all of which have received widespread acceptance in the marketplace.

AVX capacitor arrays are available in X5R, X7R and NP0 (C0G) ceramic dielectrics to cover a broad range of capacitance values. Voltage ratings from 6.3 Volts up to 100 Volts are offered. AVX also now offers a range of automotive capacitor arrays qualified to AEC-Q200 (see separate table).

Key markets for capacitor arrays are Mobile and Cordless Phones, Digital Set Top Boxes, Computer Motherboards and Peripherals as well as Automotive applications, RF Modems, Networking Products, etc.

AVX Capacitor Array - W2A41A*K**
S21 Magnitude



HOW TO ORDER

W	2	A	4	3	C	103	M	A	T	2A
Style W = RoHS L = SnPb	**Case Size** 1 = 0405 2 = 0508 3 = 0612	**Array**	**Number of Caps**	**Voltage** Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	**Dielectric** A = NP0 C = X7R D = X5R	**Capacitance Code** 2 Sig Digits + Number of Zeros	**Capacitance Tolerance** J = ±5% K = ±10% M = ±20%	**Failure Rate** A = Commercial 4 = Automotive	**Termination Code** T = Plated Ni and Sn** Z = FLEXITERM®** B = 5% min lead X = FLEXITERM® with 5% min lead	**Packaging & Quantity Code** 2A = 7" Reel (4000) 4A = 13" Reel (10000) 2F = 7" Reel (1000)

**RoHS compliant

NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.

Capacitor Array

Capacitance Range – NP0/C0G

SIZE		0405			0508				0508				0612			
# Elements		2			2				4				4			
Soldering		Reflow Only			Reflow/Wave				Reflow/Wave				Reflow/Wave			
Packaging		All Paper			All Paper				Paper/Embossed				Paper/Embossed			
Length	mm (in.)	1.00 ± 0.15 (0.039 ± 0.006)			1.30 ± 0.15 (0.051 ± 0.006)				1.30 ± 0.15 (0.051 ± 0.006)				1.60 ± 0.150 (0.063 ± 0.006)			
Width	mm (in.)	1.37 ± 0.15 (0.054 ± 0.006)			2.10 ± 0.15 (0.083 ± 0.006)				2.10 ± 0.15 (0.083 ± 0.006)				3.20 ± 0.20 (0.126 ± 0.008)			
Max. Thickness	mm (in.)	0.66 (0.026)			0.94 (0.037)				0.94 (0.037)				1.35 (0.053)			
WVDC		16	25	50	16	25	50	100	16	25	50	100	16	25	50	100
1R0 1R2 1R5	Cap (pF) 1.0 1.2 1.5	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
1R8 2R2 2R7	1.8 2.2 2.7	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
3R3 3R9 4R7	3.3 3.9 4.7	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5R6 6R8 8R2	5.6 6.8 8.2	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
100 120 150	10 12 15	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
180 220 270	18 22 27	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
330 390 470	33 39 47	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
560 680 820	56 68 82	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
101 121 151	100 120 150	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
181 221 271	180 220 270				■	■	■	■	■	■	■	■	■	■	■	■
331 391 471	330 390 470				■	■	■	■					■	■	■	■
561 681 821	560 680 820															
102 122 152	1000 1200 1500															
182 222 272	1800 2200 2700															
332 392 472	3300 3900 4700															
562 682 822	5600 6800 8200															

Capacitor Array

Capacitance Range – X7R/X5R

SIZE		0306				0405					0508						0508						0612					
# Elements		4				2					2						4						4					
Soldering		Reflow Only				Reflow Only					Reflow/Wave						Reflow/Wave						Reflow/Wave					
Packaging		All Paper				All Paper					All Paper						Paper/Embossed						Paper/Embossed					
Length	mm (in.)	1.60 ± 0.15 (0.063 ± 0.006)				1.00 ± 0.15 (0.039 ± 0.006)					1.30 ± 0.15 (0.051 ± 0.006)						1.30 ± 0.15 (0.051 ± 0.006)						1.60 ± 0.150 (0.063 ± 0.006)					
Width	mm (in.)	0.81 ± 0.15 (0.032 ± 0.006)				1.37 ± 0.15 (0.054 ± 0.006)					2.10 ± 0.15 (0.083 ± 0.006)						2.10 ± 0.15 (0.083 ± 0.006)						3.20 ± 0.20 (0.126 ± 0.008)					
Max. Thickness	mm (in.)	0.50 (0.020)				0.66 (0.026)					0.94 (0.037)						0.94 (0.037)						1.35 (0.053)					
WVDC		6	10	16	25	6	10	16	25	50	6	10	16	25	50	100	6	10	16	25	50	100	6	10	16	25	50	100
101	100																											
121 Cap (µF)	120																											
151	150																											
181	180																											
221	220																											
271	270																											
331	330																											
391	390																											
471	470																											
561	560																											
681	680																											
821	820																											
102	1000																											
122	1200																											
152	1500																											
182	1800																											
222	2200																											
272	2700																											
332	3300																											
392	3900																											
472	4700																											
562	5600																											
682	6800																											
822	8200																											
103	0.010																											
123 Cap (µF)	0.012																											
153	0.015																											
183	0.018																											
223	0.022																											
273	0.027																											
333	0.033																											
393	0.039																											
473	0.047																											
563	0.056																											
683	0.068																											
823	0.082																											
104	0.10																											
124	0.12																											
154	0.15																											
184	0.18																											
224	0.22																											
274	0.27																											
334	0.33																											
474	0.47																											
564	0.56																											
684	0.68																											
824	0.82																											
105	1.0																											
125	1.2																											
155	1.5																											
185	1.8																											
225	2.2																											
335	3.3																											
475	4.7																											
106	10																											
226	22																											
476	47																											
107	100																											

= Currently available X7R

= Currently available X5R

= Under development X7R, contact factory for advance samples

= Under development X5R, contact factory for advance samples

Automotive Capacitor Array (IPC)

0508 - 4 Element

0612 - 4 Element

As the market leader in the development and manufacture of capacitor arrays AVX is pleased to offer a range of AEC-Q200 qualified arrays to compliment our product offering to the Automotive industry. Both the AVX 0612 and 0508 4-element capacitor array styles are qualified to the AEC-Q200 automotive specifications.

AEC-Q200 is the Automotive Industry qualification standard and a detailed qualification package is available on request.

All AVX automotive capacitor array production facilities are certified to ISO/TS 16949:2002.

HOW TO ORDER

W	3	A	4	Y	C	104	K	4	T	2A
Style W = RoHS L = SnPb	**Case Size** 1 = 0405 2 = 0508 3 = 0612	**Array**	**Number of Caps**	**Voltage** 6 = 6.3V Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	**Dielectric** A = NP0 C = X7R F = X8R	**Capacitance Code (In pF)** Significant Digits + Number of Zeros e.g. 10µF=106	**Capacitance Tolerance** *J = ±5% *K = ±10% M = ±20%	**Failure Rate** 4 = Automotive	**Terminations** T = Plated Ni and Sn** Z = FLEXITERM®** B = 5% min lead X = FLEXITERM® with 5% min lead	**Packaging & Quantity Code** 2A = 7" Reel (4000) 4A = 13" Reel (10000) 2F = 7" Reel (1000)

**RoHS compliant

*Contact factory for availability by part number for K = ±10% and J = ±5% tolerance.

NP0/C0G

SIZE		0405	0508	0508				0612			
No. of Elements		2	2	4				4			
	WVDC	50	50	16	25	50	100	16	25	50	100
1R0 1R2 1R5	Cap 1.0 (pF) 1.2 1.5										
1R8 2R2 2R7	1.8 2.2 2.7										
3R3 3R9 4R7	3.3 3.9 4.7										
5R6 6R8 8R2	5.6 6.8 8.2										
100 120 150	10 12 15										
180 220 270	18 22 27										
330 390 470	33 39 47										
560 680 820	56 68 82										
101 121 151	100 120 150										
181 221 271	180 220 270										
331 391 471	330 390 470										
561 681 821	560 680 820										
102 122 152	1000 1200 1500										
182 222 272	1800 2200 2700										
332 392 472	3300 3900 4700										
562 682 822	5600 6800 8200										

= Under development

X7R / X8R

SIZE		0508					0508					0612					0405
No. of Elements		2					4					4					2
	WVDC	10	16	25	50	100	16	25	50	100	10	16	25	50	100	16
101 121 151	Cap 100 (pF) 120 150															
181 221 271	180 220 270															
331 391 471	330 390 470															
561 681 821	560 680 820															
102 122 152	1000 1200 1500															
182 222 272	1800 2200 2700															
332 392 472	3300 3900 4700															
562 682 822	5600 6800 8200															
103 123 153	Cap 0.010 (µF) 0.012 0.015															
183 223 273	0.018 0.022 0.027															
333 393 473	0.033 0.039 0.047															
563 683 823	0.056 0.068 0.082															
104 124 154	0.10 0.12 0.15															
224	0.22															

= X7R

= X8R

= Under development

RoHS COMPLIANT

Capacitor Array

Multi-Value Capacitor Array (IPC)

GENERAL DESCRIPTION

A recent addition to the array product range is the Multi-Value Capacitor Array. These devices combine two different capacitance values in standard 'Cap Array' packages and are available with a maximum ratio between the two capacitance values of 100:1. The multi-value array is currently available in the 0405 and 0508 2-element styles and also in the 0612 4-element style.

Whereas to date AVX capacitor arrays have been suited to applications where multiple capacitors of the same value are used, the multi-value array introduces a new flexibility to the range. The multi-value array can replace discrete capacitors of different values and can be used for broadband decoupling applications. The 0508 x 2 element multi-value array would be particularly recommended in this application. Another application is filtering the 900/1800 or 1900MHz noise in mobile phones. The 0405 2-element, low capacitance value NP0, (C0G) device would be suited to this application, in view of the space saving requirements of mobile phone manufacturers.

ADVANTAGES OF THE MULTI-VALUE CAPACITOR ARRAYS

Enhanced Performance Due to Reduced Parasitic Inductance

When connected in parallel, not only do discrete capacitors of different values give the desired self-resonance, but an additional unwanted parallel resonance also results. This parallel resonance is induced between each capacitor's self-resonant frequencies and produces a peak in impedance response. For decoupling and bypassing applications this peak will result in a frequency band of reduced decoupling and in filtering applications reduced attenuation.

The multi-value capacitor array, combining capacitors in one unit, virtually eliminates the problematic parallel resonance, by minimizing parasitic inductance between the capacitors, thus enhancing the broadband decoupling/filtering performance of the part.

Reduced ESR

An advantage of connecting two capacitors in parallel is a significant reduction in ESR. However, as stated above, using discrete components brings with it the unwanted side effect of parallel resonance. The multi-value cap array is an excellent alternative as not only does it perform the same function as parallel capacitors but also it reduces the uncertainty of the frequency response.

HOW TO ORDER (Multi-Value Capacitor Array - IPC)

W	2	A	2	Y	C	102M	104M	A	T	2A
Style	Case Size 1 = 0405 2 = 0508 3 = 0612	Array	Number of Caps	Voltage Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	Dielectric A = NP0 C = X7R D = X5R	1st Value: Capacitance Code (In pF) 2 Sig. Digits + No. of Zeros	2nd Value: Capacitance Tolerance K = ±10% M = ±20%	Failure Rate	Terminations T = Plated Ni and Sn** Z = FLEXITERM®** B = 5% min lead X = FLEXITERM® with 5% min lead	Packaging & Quantity Code 2A = 7" Reel (4000) 4A = 13" Reel (10000) 2F = 7" Reel (1000)

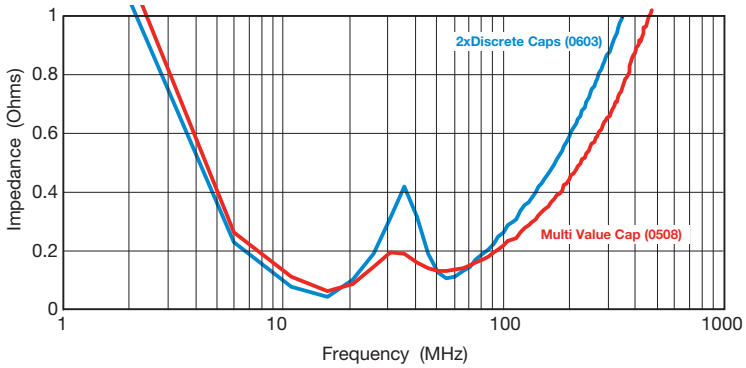
NOTE: Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers.

**RoHS compliant

	Cap (Min/Max)	
	NP0	X5R/X7R
0612 4-element	100/471	221/104
0508 2-element	100/471	221/104
0405 2-element	100/101	101/103

- Max. ratio between the two cap values is 1:100.
- The voltage of the higher capacitance value dictates the voltage of the multi-value part.
- Only combinations of values within a specific dielectric range are possible.

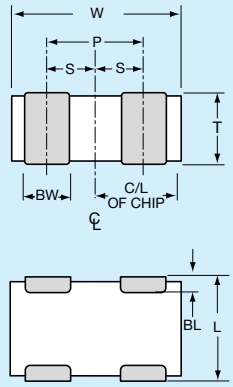
IMPEDANCE VS FREQUENCY



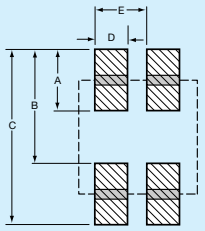
PART & PAD LAYOUT DIMENSIONS

millimeters (inches)

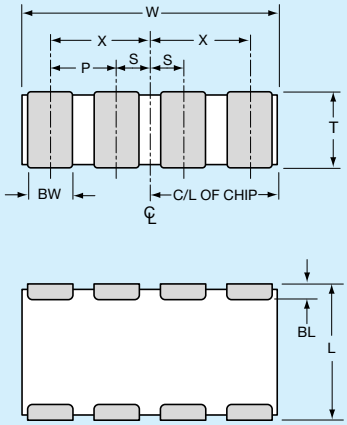
0405 - 2 Element



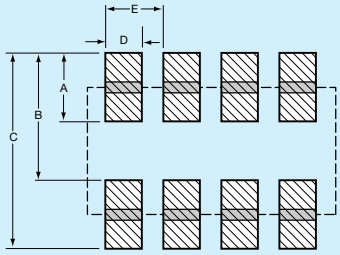
PAD LAYOUT



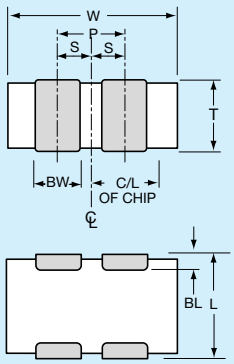
0612 - 4 Element



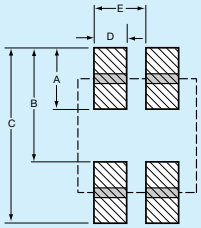
PAD LAYOUT



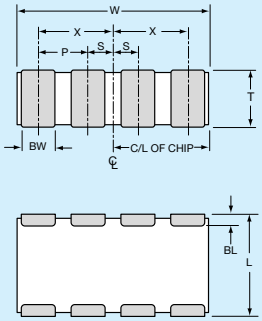
0508 - 2 Element



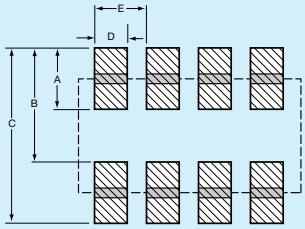
PAD LAYOUT



0508 - 4 Element



PAD LAYOUT



PART DIMENSIONS

0405 - 2 Element

L	W	T	BW	BL	P	S
1.00 ± 0.15 (0.039 ± 0.006)	1.37 ± 0.15 (0.054 ± 0.006)	0.66 MAX (0.026 MAX)	0.36 ± 0.10 (0.014 ± 0.004)	0.20 ± 0.10 (0.008 ± 0.004)	0.64 REF (0.025 REF)	0.32 ± 0.10 (0.013 ± 0.004)

0508 - 2 Element

L	W	T	BW	BL	P	S
1.30 ± 0.15 (0.051 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	0.94 MAX (0.037 MAX)	0.43 ± 0.10 (0.017 ± 0.004)	0.33 ± 0.08 (0.013 ± 0.003)	1.00 REF (0.039 REF)	0.50 ± 0.10 (0.020 ± 0.004)

0508 - 4 Element

L	W	T	BW	BL	P	X	S
1.30 ± 0.15 (0.051 ± 0.006)	2.10 ± 0.15 (0.083 ± 0.006)	0.94 MAX (0.037 MAX)	0.25 ± 0.06 (0.010 ± 0.003)	0.20 ± 0.08 (0.008 ± 0.003)	0.50 REF (0.020 REF)	0.75 ± 0.10 (0.030 ± 0.004)	0.25 ± 0.10 (0.010 ± 0.004)

0612 - 4 Element

L	W	T	BW	BL	P	X	S
1.60 ± 0.20 (0.063 ± 0.008)	3.20 ± 0.20 (0.126 ± 0.008)	1.35 MAX (0.053 MAX)	0.41 ± 0.10 (0.016 ± 0.004)	$0.18^{+0.25}_{-0.08}$ ($0.007^{+0.010}_{-0.003}$)	0.76 REF (0.030 REF)	1.14 ± 0.10 (0.045 ± 0.004)	0.38 ± 0.10 (0.015 ± 0.004)

PAD LAYOUT DIMENSIONS

0405 - 2 Element

A	B	C	D	E
0.46 (0.018)	0.74 (0.029)	1.20 (0.047)	0.30 (0.012)	0.64 (0.025)

0508 - 2 Element

A	B	C	D	E
0.68 (0.027)	1.32 (0.052)	2.00 (0.079)	0.46 (0.018)	1.00 (0.039)

0508 - 4 Element

A	B	C	D	E
0.56 (0.022)	1.32 (0.052)	1.88 (0.074)	0.30 (0.012)	0.50 (0.020)

0612 - 4 Element

A	B	C	D	E
0.89 (0.035)	1.65 (0.065)	2.54 (0.100)	0.46 (0.018)	0.76 (0.030)