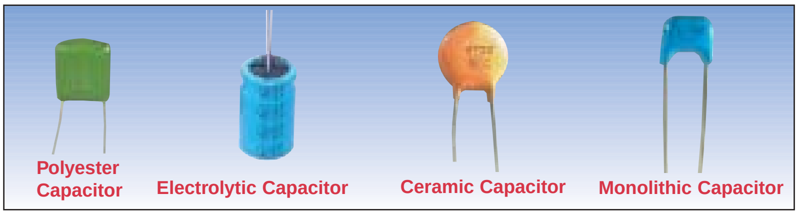
ALTRONICS DATASHEET

CAPACITORS



A capacitor works on the principal of having two conductive plates which are very close and are parallel to each other. When a charge is applied to one plate of the capacitor, the electrons will generate an approximately equal, but opposite charge on the other plate of the capacitor. Capacitors will pass AC current, but will block DC current. A capacitor can also be used to smooth out voltage ripple, as in DC power supplies. Capacitance is measured in Farads (F).

Capacitor Parameters
Capacitors have five parameters. Capacitance (Farads), Tolerance (%), Maximum Working Voltage (Volts), Surge Voltage (Volts) and leakage. Because a Farad is a very large unit, most capacitors are normally measured in the ranges of pico, nano and micro farads.

Working Voltage
This refers to the maximum voltage that should be placed across the capacitor under normal operating conditions.

Surge Voltages
The maximum **instantaneous** voltage a capacitor can withstand. If the surge voltage is exceeded over too long a period there is a very good chance that the capacitor will be destroyed by the voltage 'punching' through the insulating material inside the casing of the capacitor. If a circuit has a surging characteristic, choose a capacitor with a high rated surge voltage.

Leakage
Refers to the amount of charge that is lost when the capacitor has a voltage across its terminals. If a capacitor has a low leakage it means that very little power is lost. Generally leakage is very small and is not normally a consideration for general purpose circuits.

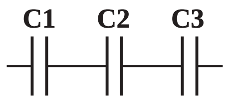
Tolerance
As with resistors, tolerance indicates how close the capacitor is to its noted value. These are normally written on the larger capacitors and encoded on the small ones.

Code	Tolerance	Code	Tolerance
C	±0.25pF	D	±0.5pF
E	±1pF	G	±2%
J	± 5%	K	±10%
L	±15%	M	±20%
N	±30%		

Capacitor Markings
There are a two methods for marking capacitor values. One is to write the information numerically directly onto the capacitor itself. The second is to use the EIA coding system.

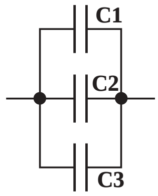
EIA Coding
The EIA code works on a very similar principle to the resistor colour code. The first two digits refer to the value with the third being the multiplier. The fourth character represents the tolerance.
When the EIA code is used, the value will always be in Pico-Farads (see Decimal Multipliers).
Example 1: 103K
This expands to:
1 = 1
0 = 0
3 = x 1,000
K = 10% (see Capacitor Tolerance for listings)
Then we combine these numbers together:
1 0 x1,000 = 10,000pF = 0.01µF,
at ±10% tolerance.
Example 2. : 335K
This expands to:
3 = 3; 3 = 3; 5 = x 100,000; K = ±10%
Then we combine these numbers together:
3 3 x100,000 = 3,300,000pF = 3,300nF = 3.3µF, at 10% tolerance.

Capacitors in Series
Capacitors in series can be calculated by: Note:- The new value will always be lower.



$$C_{Total} = \frac{1}{\left(\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \text{etc .....}\right)}$$

Capacitors in Parallel
When capacitors are placed in parallel they can be simply added together.



CTotal = C1 + C2 + C3 + etc....
Note :- The new capacitance value will be higher.

READING & CONVERTING CAPACITOR VALUES

1,000,000pF	=	1µF	=	1,000nF
100,000pF	=	0.1µF	=	100nF
10,000pF	=	0.01µF	=	10nF
1,000pF	=	0.001µF	=	1nF
100pF	=	0.0001µF	=	0.1nF
10pF	=	0.00001µF	=	0.01nF
1pF	=	0.000001µF	=	0.001nF

OR ...

µF	nF	pF	EIA Code
0.001µF	1.0nF	1000pF	102
0.0012µF	1.2nF	1200pF	122
0.0015µF	1.5nF	1500pF	152
0.0018µF	1.8nF	1800pF	182
0.0022µF	2.2nF	2200pF	222
0.0027µF	2.7nF	2700pF	272
0.0033µF	3.3nF	3300pF	332
0.0039µF	3.9nF	3900pF	392
0.0047µF	4.7nF	4700pF	472
0.0056µF	5.6nF	5600pF	562
0.0068µF	6.8nF	6800pF	682
0.0082µF	8.2nF	8200pF	822
0.01µF	10nF	1.00 x10^4 pF	103
0.012µF	12nF	1.20 x10^4 pF	123
0.015µF	15nF	1.50 x10^4pF	153
0.018µF	18nF	1.80 x10^4pF	183
0.022µF	22nF	2.20 x10^4pF	223
0.027µF	27nF	2.70 x10^4pF	273
0.033µF	33nF	3.30 x10^4pF	333
0.039µF	39nF	3.90 x10^4pF	393
0.047µF	47nF	4.70 x10^4pF	473
0.056µF	56nF	5.60 x10^4pF	563
0.068µF	68nF	6.80 x10^4pF	683
0.082µF	82nF	8.20 x10^4pF	823
0.1µF	100nF	1.00 x10^5pF	104
0.12µF	120nF	1.20 x10^5pF	124
0.15µF	150nF	1.50 x10^5pF	154
0.18µF	180nF	1.80 x10^5pF	184
0.22µF	220nF	2.20 x10^5pF	224
0.27µF	270nF	2.70 x10^5pF	274
0.33µF	330nF	3.30 x10^5pF	334
0.39µF	390nF	3.90 x10^5pF	394
0.47µF	470nF	4.70 x10^5pF	474
0.56µF	560nF	5.60 x10^5pF	564
0.68µF	680nF	6.80 x10^5pF	684
0.82µF	820nF	8.20 x10^5pF	824
1µF	1000nF	1.00 x10^6pF	105
1.2µF	1200nF	1.20 x10^6pF	125
1.5µF	1500nF	1.50 x10^6pF	155
1.8µF	1800nF	1.80 x10^6pF	185
2.2µF	2200nF	2.20 x10^6pF	225
2.7µF	2700nF	2.70 x10^6pF	275
3.3µF	3300nF	3.30 x10^6pF	335
3.9µF	3900nF	3.90 x10^6pF	395
4.7µF	4700nF	4.70 x10^6pF	475
5.6µF	5600nF	5.60 x10^6pF	565
6.8µF	6800nF	6.80 x10^6pF	685
8.2µF	8200nF	8.20 x10^6pF	825
10µF	10000nF	1.00 x10^7pF	106

Altronics 174 Roe St, Perth, WA 6000
ABN: 84 177 396 871
Phone: 1300 797 007
Fax: 1300 789 777
Internet: www.altronics.com.au