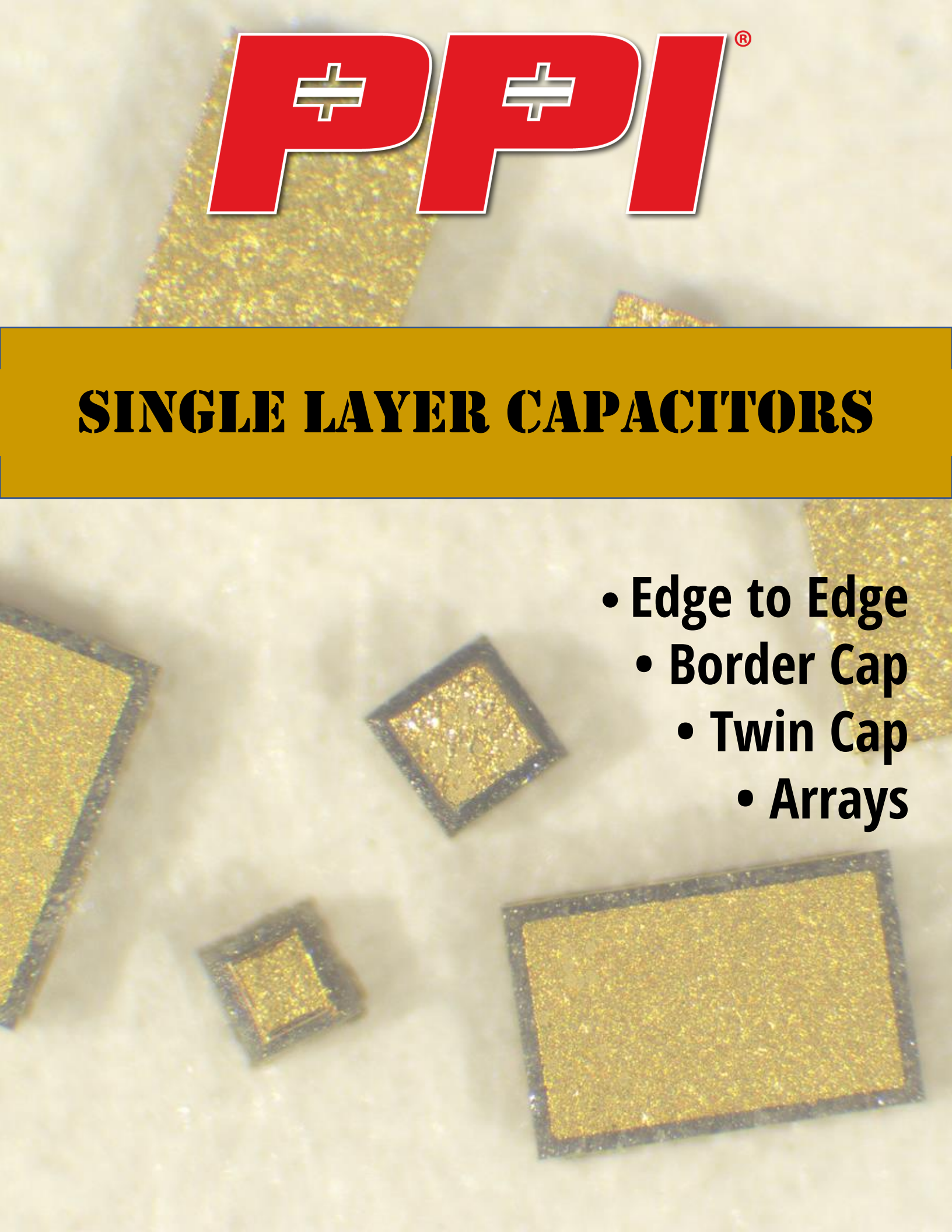
PPI®

SINGLE LAYER CAPACITORS

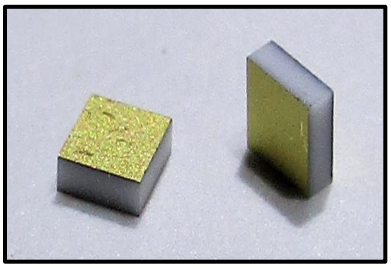
- Edge to Edge
- Border Cap
- Twin Cap
- Arrays



Single Layer Capacitors

Standard Edge to Edge

Product Features



PPI offers Standard Edge to Edge SLC with tight tolerances to the required size, shape and value. Thicknesses of up to 25+ mils are available utilizing temperature-stable low-loss materials and special terminations to improve the all solder process. Chip size, shape and electrical properties may be determined from the dielectric material.

- Capacitance: 0.04 to 10,000pF
- Square or rectangle, length or width .005" and up

Part Numbering

PP S – AS7 – 10X10 X6 – D4 – 1R0 – K – 3 W

RoHS

PP = Passive Plus	Cap Style	Dielectric Code *See Table*	Length & Width (mils)	Thickness (mils)	Metallization *See Table*	Capacitance Value *See Table*	Tolerance *See Table*	Voltage *See Table*	Packaging W = Waffle Pack (Standard)

Substrates

Substrates can be supplied as follows:

- **Bare**

• **Metallized:**	• Gold over Platinum, Palladium, or Nickel • Silver over Platinum • Custom schemes and patterns to Customer specifications
Thickness Range	3 mils +
Length and Width	Up to 4" depending on material

Standard Electrode Metallizations

Gold (D4) This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.

Silver (S7) This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Single Layer Capacitors

Standard Edge to Edge

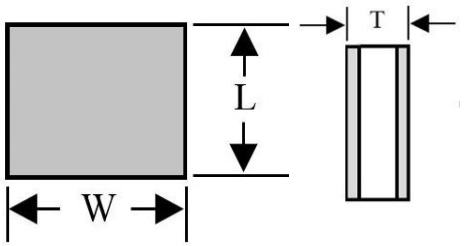
Metallization Codes

Code	Description
D4	Ti/Pt/Au Titanium/Platinum/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF



Capacitance Tolerance & Dimensional Tolerances Codes

Class I Dielectrics: AS1 - KS2			
Tolerance	**Code**	**Tolerance**	**Code**
± .50pF	D	± 20%	M
± .25pF	C	± 15%	L
±.10pF	B	± 10%	K
± .05pF	A	± 5%	J
± .01pF	P	± 3%	H
		± 2%	G

Material	L or W Dimension	Tolerance
AS1 - ZS1	< 20 mils	±15%
	≥ 20 mils	±10%

Class II Dielectrics: MS1 - ZS4			
Tolerance	**Code**	**Tolerance**	**Code**
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV	± 5%	J

Material	L or W Dimension	Tolerance
ZS4 - ZS6	≤ 15 mils	± 2 mils
	> 15 mils; ≤ 30 mils	± 3 mils
	> 30 mils	± 5 mils

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	4 mils
3	100V	6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard).
Other packaging options may be available.
Please contact PPI.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min @ 25°C	Temperature Coefficient (-25 to 125°C)	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
AS1	10^{12}	Negligible	0.0001	3.8	Quartz
AS2	10^{12}	Negligible	0.0001	3.9	Si
AS3	10^{12}	Negligible	0.0001	6.6	BeO
AS6	10^{12}	P120 ± 25ppm	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50ppm	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50ppm	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 ± 30ppm	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30ppm	0.001	20	Titanate
ES1	10^{12}	0 ± 30ppm	0.002	40	Titanate
FS1	10^{12}	0 ± 30ppm	0.005	50	Titanate
IS1	10^{15}	0 ± 30ppm	0.005	84	Titanate
KS3	10^{6}	N1500 ± 500ppm	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material, but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR (MEG-OHMs) 100VDC @ 25°C	Temperature Coefficient (-55 to 125°C)	Dissipation Factor (@ 1 MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^5	5 to -10	0.010	2.0	300
PS1	10^4	± 10%	0.025	3.0	700
SS3	10^5	3 to -10	0.015	3.5	2,200
US1	10^5	0 to -35	0.020	3.0	4,000
US3	10^5	3.0	0.025	3.0	5,000
RS2	10^4	± 10%	0.025	3.0	1250
ZS1	10^5	0 to -80	0.025	3.0	11,000
ZS4	*Contact PPI*	15 to -15	0.035	3.0	25,000
ZS6	*Contact PPI*	15 to -15	0.035	3.0	35,000
US3	10^5	± 15%	0.030	3.0	4500

Single Layer Capacitors

Standard Edge to Edge

Capacitance, Case Size & Dielectric Availability - Class I Dielectrics

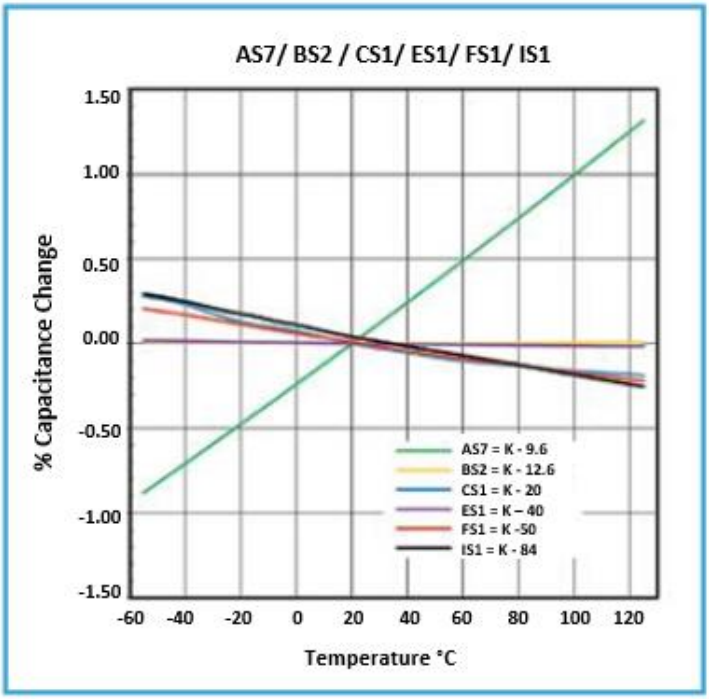
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
0.04	AS7	5	AS7	6	AS7	10												
0.06	AS7	4	AS7	5	AS7	8	AS2	5	AS2	10								
0.08	ES1	10	AS7	4	AS7	6	AS7	10	AS2	7	AS2	9						
0.1	ES1	8	ES1	11	AS7	5	AS7	9	AS2	5	AS2	7	AS2	10				
0.2	ES1	5	ES1	7	ES1	10	AS7	4	AS7	7	AS7	10	AS2	5	AS2	7	AS2	10
0.3	IS1	6	ES1	4	ES1	6	ES1	11	AS7	4	AS7	7	AS7	9	AS2	5	AS2	7
0.4	IS1	5	IS1	7	ES1	5	ES1	9	ES1	15	AS7	5	AS7	7	AS7	9	AS2	5
0.5	IS1	4	IS1	5	ES1	4	ES1	7	ES1	11	AS7	5	AS7	5	AS7	7	AS2	4
0.6	KS2	6	IS1	5	IS1	7	ES1	6	ES1	10	ES1	15	AS7	4	AS7	6	AS7	9
0.8	MS1	8	KS2	6	IS1	5	ES1	5	ES1	7	ES1	10	ES1	15	AS7	4	AS7	7
1.0	MS1	7	KS2	5	IS1	4	IS1	7	ES1	6	ES1	8	ES1	10	AS7	4	AS7	5
1.2	MS1	6	KS2	4	IS1	4	IS1	6	ES1	5	ES1	7	ES1	9	AS7	3	AS7	5
1.5	MS1	5	MS1	7	KS2	5	IS1	5	ES1	4	ES1	6	ES1	7	ES1	10	AS7	4
1.8	MS1	4	MS1	5	KS2	4	IS1	4	IS1	6	ES1	5	ES1	6	ES1	8	ES1	11
2.0	MS1	4	MS1	5	KS2	4	KS2	7	IS1	6	ES1	4	ES1	5	ES1	7	ES1	11
2.2	RS1	4	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	5	ES1	7	ES1	10
2.7	RS1	8	MS1	4	MS1	6	KS2	5	IS1	4	IS1	6	ES1	4	ES1	5	ES1	8
3.3	RS1	7	RS1	10	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	4	ES1	7
3.9	RS1	6	RS1	9	MS1	4	MS1	7	KS2	5	IS1	4	IS1	6	IS1	8	ES1	6
4.7	RS1	5	RS1	7	RS1	11	MS1	6	KS2	4	KS2	6	IS1	5	IS1	6	ES1	5
5.6	RS1	4	RS1	6	RS1	10	MS1	5	MS1	7	KS2	5	IS1	4	IS1	5	ES1	4
6.8	RS1	4	RS1	5	RS1	8	MS1	4	MS1	6	KS2	5	KS2	6	IS1	4	IS1	7
8.2	SS3	6	RS1	4	RS1	7	MS1	4	MS1	5	KS2	4	KS2	5	KS2	7	KS2	10
10	SS3	5	RS1	4	RS1	5	RS1	9	MS1	4	MS1	6	KS2	4	KS2	5	KS2	8
12	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	5	MS1	7	KS2	4	KS2	7
15	US1	6	SS3	5	RS1	4	RS1	6	RS1	10	MS1	4	MS1	6	MS1	7	KS2	6
18	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	6	KS2	5
20	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	5	KS2	4
22	US1	4	US1	6	SS3	5	RS1	4	RS1	7	RS1	9	MS1	4	MS1	5	KS2	4

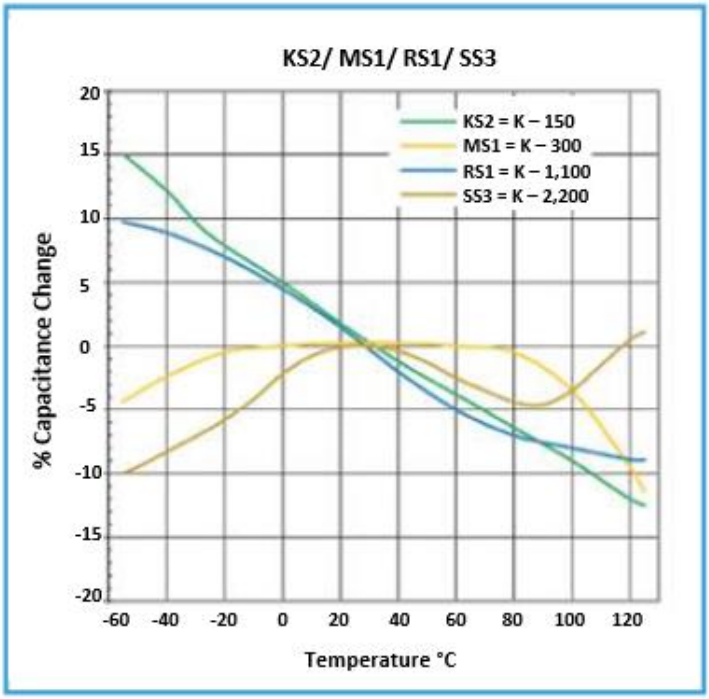
Shaded cells indicate Class II Dielectrics

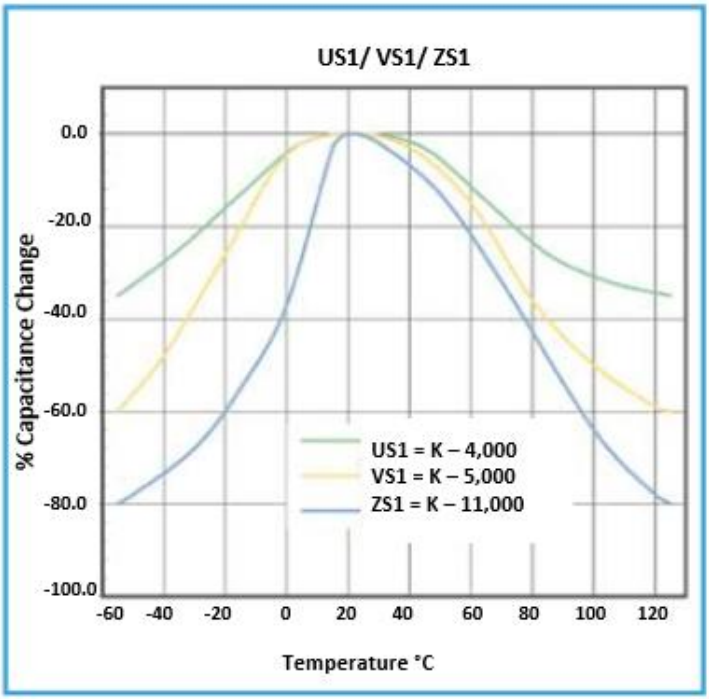
Capacitance, Case Size & Dielectric Availability – Class II Dielectrics

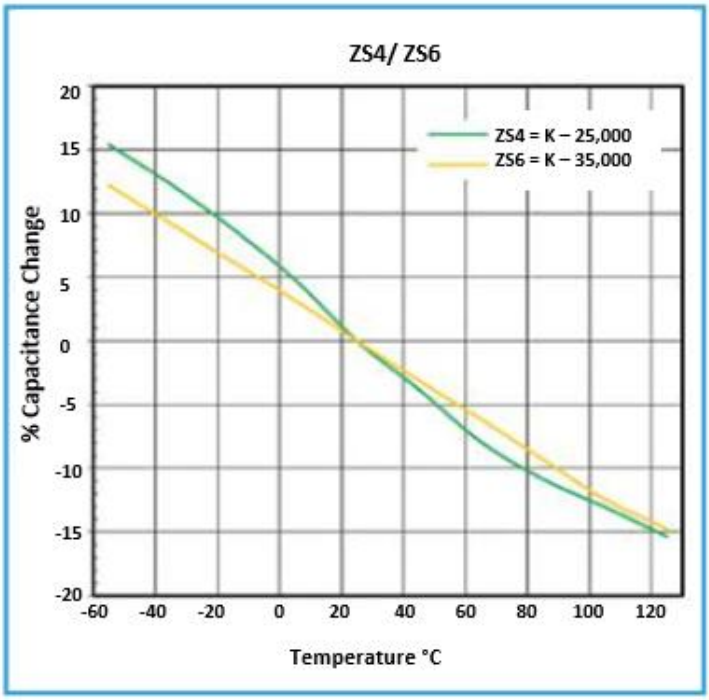
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
27	US1	4	US1	5	SS3	4	RS1	4	RS1	6	RS1	8	MS1	3	MS1	4	MS1	6
33	VS1	4	US1	4	US1	6	SS3	6	RS1	5	RS1	6	RS1	11	MS1	4	MS1	5
39	ZS1	6	US1	4	US1	5	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10	MS1	4
47	ZS1	5	ZS1	7	US1	5	SS3	4	SS3	6	RS1	5	RS1	6	RS1	8	MS1	4
56	ZS1	4	ZS1	6	VS1	5	US1	7	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10
68	ZS1	4	ZS1	5	VS1	4	US1	6	SS3	5	SS3	6	RS1	4	RS1	6	RS1	9
82	ZS4	7	ZS1	4	ZS1	7	VS1	6	SS3	4	SS3	5	SS3	7	SS3	10	RS1	7
100	ZS4	6	ZS4	8	ZS1	6	VS1	5	US1	6	SS3	5	SS3	6	SS3	8	RS1	6
120	ZS4	5	ZS4	7	ZS1	5	ZS1	8	VS1	6	SS3	4	SS3	5	SS3	7	RS1	5
150	ZS4	4	ZS4	5	ZS1	4	ZS1	7	VS1	5	VS1	7	SS3	4	SS3	5	RS1	4
180	ZS6	4	ZS4	5	ZS4	7	ZS1	6	VS1	4	VS1	6	VS1	8	US1	8	SS3	7
200	ZS6	4	ZS4	4	ZS4	6	ZS1	5	ZS1	8	VS1	5	VS1	7	US1	7	SS3	6
220	ZS6	4	ZS6	5	ZS4	6	ZS1	4	ZS1	7	VS1	5	VS1	6	US1	6	SS3	6
270			ZS6	4	ZS4	5	ZS4	8	ZS1	6	VS1	4	VS1	5	US1	5	SS3	5
330					ZS4	4	ZS4	7	ZS1	5	ZS1	7	VS1	4	US1	4	US1	7
390					ZS6	4	ZS4	6	ZS1	4	ZS1	6	ZS1	7	ZS1	10	US1	6
470					ZS6	4	ZS4	5	ZS4	7	ZS1	5	ZS1	6	ZS1	8	US1	5
560							ZS4	4	ZS4	6	ZS1	4	ZS1	5	ZS1	7	US1	4
680							ZS6	5	ZS4	5	ZS4	8	ZS1	5	ZS1	6	VS1	4
820							ZS6	4	ZS6	6	ZS4	6	ZS1	4	ZS1	5	ZS1	7
1000									ZS6	5	ZS4	5	ZS4	7	ZS1	4	ZS1	6
1200									ZS6	4	ZS4	4	ZS4	6	ZS4	7	ZS1	5
1500											ZS6	5	ZS4	5	ZS4	6	ZS1	4
1800											ZS6	4	ZS6	6	ZS4	5	ZS4	8
2200													ZS6	5	ZS4	4	ZS4	6
2700													ZS6	4	ZS6	5	ZS4	5
3300																	ZS6	6

Typical Temperature Characteristics









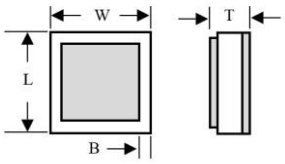
Single Layer Capacitors

Border Cap

Product Features

Border Caps have the topside electrode withdrawn from the edges in order to increase the distance between electrodes and dramatically decrease the possibilities of shorting when epoxy die-mounting. This style is also widely used for optical recognition-based assembly.

Increased margin sizes and special terminations are available for high power LC filter applications. Border Caps can be customized to any sized square or rectangle. Contact PPI for more information.



Part Numbering

PP B – FS1 – 29×19 × 6 – D4 – 1R0 – K – 3 W

- PP = Passive Plus
- Capacitor Style *B = Border*
- Dielectric Code *See Table*
- Length & Width (mils)
- Thickness (mils)
- Metallization *See Table*
- Capacitance Value *See Table*
- Tolerance *See Table*
- Voltage *See Table*
- Packaging W = Waffle Pack (Standard)

Thicknesses (mils)

Length & Width	L or W Tolerance	Margin Nominal	Thickness
≤ .010	± .002	0.001	± .0015
.011 - .029	± .002	0.002	
≥ .030	± .003	0.002	

All dimensions given are inches

Metallization Codes

Code	Description
D4	Ti/Pt/Au Titanium/Platinum/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Single Layer Capacitors

Border Cap

Substrates

Substrates can be supplied as follows:

• **Bare**	
• **Metallized:**	• Gold over Platinum, Palladium, or Nickel • Silver over Platinum • Custom schemes and patterns to Customer specifications
Thickness Range	3 mils +
Length and Width	Up to 4” depending on material

Standard Electrode Metallizations

Gold (D4)	This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.
Silver (S7)	This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Capacitance Tolerance Codes

Class I Dielectrics: AS1 - KS2			
Tolerance	**Code**	**Tolerance**	**Code**
± .50pF	D	± 20%	M
± .25pF	C	± 15%	L
±.10pF	B	± 10%	K
± .05pF	A	± 5%	J
± .01pF	P	± 3%	H
		± 2%	G

Class II Dielectrics: MS1 – ZS6			
Tolerance	**Code**	**Tolerance**	**Code**
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV	± 5%	J

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	4 mils
3	100V	6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard).
Other packaging options may be available.
Please contact PPI.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min @ 25°C	Temperature Coefficient (-25 to 125°C)	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
AS1	10^{12}	Negligible	0.0001	3.8	Quartz
AS2	10^{12}	Negligible	0.0001	3.9	Si
AS3	10^{12}	Negligible	0.0001	6.6	BeO
AS6	10^{12}	P120 ± 25ppm	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50ppm	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50ppm	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 ± 30ppm	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30ppm	0.001	20	Titanate
ES1	10^{12}	0 ± 30ppm	0.002	40	Titanate
FS1	10^{12}	0 ± 30ppm	0.005	50	Titanate
IS1	10^{15}	0 ± 30ppm	0.005	84	Titanate
KS3	10^{6}	N1500 ± 500ppm	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR (MEG-OHMs) 100VDC @ 25°C	Temperature Coefficient (-55 to 125°C)	Dissipation Factor (@ 1 MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^5	5 to -10	0.010	2.0	300
PS1	10^4	± 10%	0.025	3.0	700
SS3	10^5	3 to -10	0.015	3.5	2,200
US1	10^5	0 to -35	0.020	3.0	4,000
US3	10^5	3.0	0.025	3.0	5,000
RS2	10^4	± 10%	0.025	3.0	1250
ZS1	10^5	0 to -80	0.025	3.0	11,000
ZS4	*Contact PPI*	15 to -15	0.035	3.0	25,000
ZS6	*Contact PPI*	15 to -15	0.035	3.0	35,000
US3	10^5	± 15%	0.030	3.0	4500

Single Layer Capacitors

Border Cap

Capacitance, Case Size & Dielectric Availability - Class I Dielectrics

Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
0.04	AS7	4	AS7	4	AS7	5	AS1	5										
0.06	ES1	10	AS7	4	AS7	6	AS1	5	AS1	8	AS1	10						
0.08	ES1	7	ES1	10	AS7	5	AS7	10	AS1	6	AS1	8	AS1	11				
0.1	ES1	6	ES1	9	AS7	4	AS7	7	AS1	5	AS1	7	AS1	10				
0.2	IS1	4	ES1	4	ES1	5	AS7	4	AS7	5	AS7	7	AS1	4	AS1	5	AS1	10
0.3	KS2	6	IS1	5	ES1	4	ES1	8	AS7	4	AS7	5	AS7	7	AS1	4	AS1	6
0.4	KS2	4	IS1	4	IS1	6	ES1	6	ES1	10	AS7	4	AS7	5	AS7	7	AS1	5
0.5	MS1	5	KS2	4	IS1	5	ES1	4	ES1	7	ES1	10	AS7	4	AS7	6	AS7	10
0.6	MS1	5	KS2	5	IS1	4	ES1	4	ES1	6	ES1	10	AS7	4	AS7	5	AS7	7
0.8	MS1	5	MS1	5	KS2	5	IS1	6	ES1	5	ES1	7	ES1	10	AS7	4	AS7	6
1.0	MS1	4	MS1	5	KS2	4	IS1	5	ES1	4	ES1	6	ES1	8	ES1	10	AS7	5
1.2	RS1	6	MS1	5	MS1	7	IS1	4	IS1	7	ES1	5	ES1	7	ES1	10	AS7	4
1.5	RS1	7	MS1	4	MS1	6	KS2	6	IS1	6	IS1	8	ES1	6	ES1	7	ES1	15
1.8	RS1	6	MS1	4	MS1	5	KS2	5	IS1	5	IS1	7	ES1	5	ES1	7	ES1	10
2.0	RS1	6	RS1	8	MS1	4	KS2	5	IS1	5	IS1	6	ES1	4	ES1	6	ES1	10
2.2	RS1	5	RS1	7	MS1	4	MS1	7	KS2	7	IS1	6	ES1	4	ES1	5	ES1	10
2.7	RS1	5	RS1	6	MS1	4	MS1	6	KS2	6	IS1	6	IS1	8	ES1	5	ES1	8
3.3	SS3	6	RS1	6	RS1	8	MS1	5	KS2	5	IS1	4	IS1	6	IS1	7	ES1	6
3.9	SS3	5	RS1	5	RS1	7	MS1	4	KS2	4	KS2	6	IS1	5	IS1	6	ES1	5
4.7	SS3	5	RS1	5	RS1	7	MS1	4	MS1	6	KS2	5	IS1	4	IS1	5	IS1	8
5.6	SS3	5	SS3	6	RS1	5	MS1	4	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7
6.8	US1	5	SS3	6	RS1	5	RS1	8	MS1	5	MS1	7	KS2	5	KS2	7	IS1	6
8.2	US1	4	SS3	5	RS1	4	RS1	7	MS1	4	MS1	6	KS2	4	KS2	5	IS1	5
10	US1	5	SS3	4	SS3	6	RS1	6	MS1	4	MS1	5	MS1	6	KS2	5	IS1	4
12	US1	5	US1	6	SS3	5	RS1	5	RS1	8	MS1	4	MS1	6	KS2	4	KS2	6
15	US1	4	US1	5	SS3	5	RS1	5	RS1	7	MS1	4	MS1	5	MS1	6	KS2	5
18	VS1	4	VS1	6	US1	7	SS3	7	RS1	5	RS1	9	MS1	4	MS1	5	KS2	4
20	ZS1	5	VS1	5	US1	6	SS3	6	RS1	5	RS1	8	MS1	4	MS1	5	KS2	4

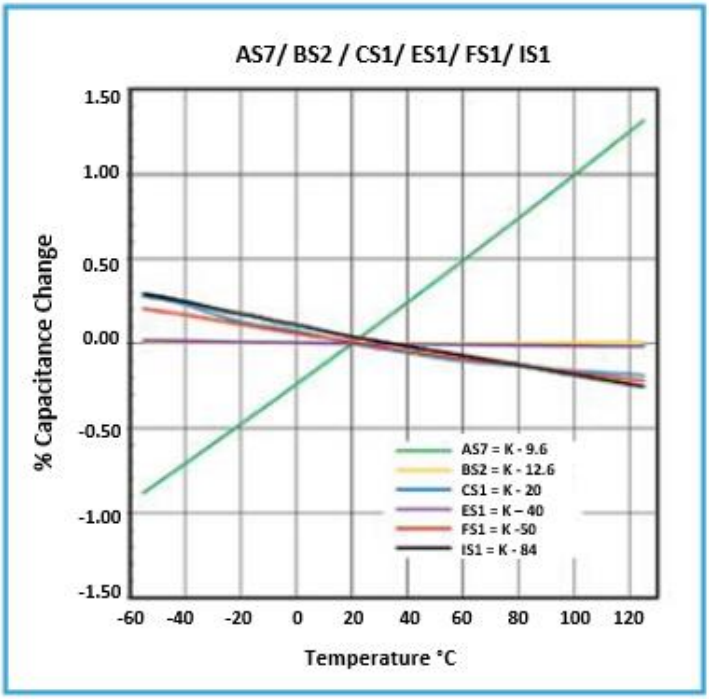
Class I Dielectrics

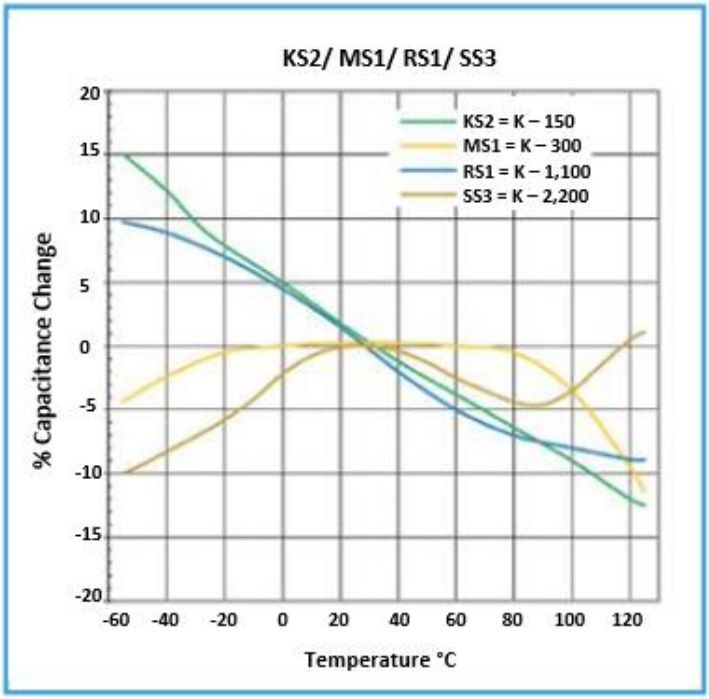
Shaded cells indicate Class II Dielectrics

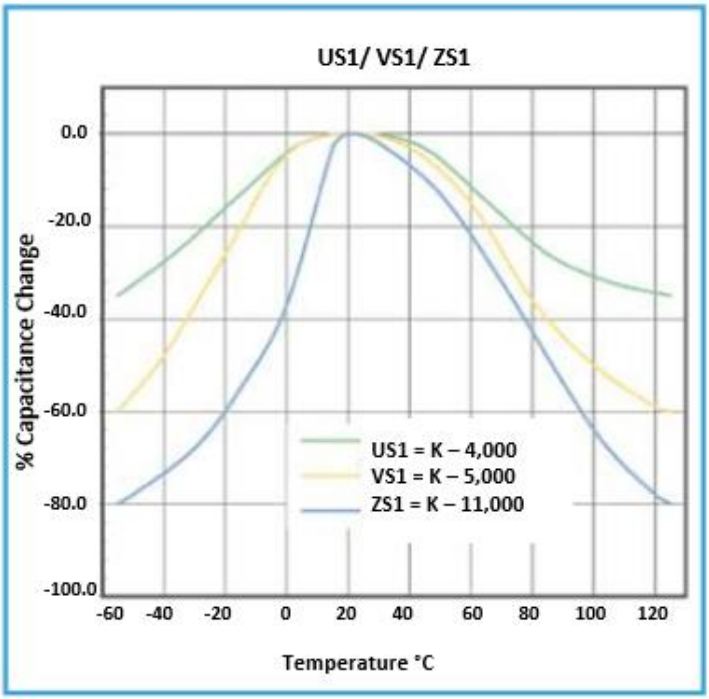
Capacitance, Case Size & Dielectric Availability – Class II Dielectrics

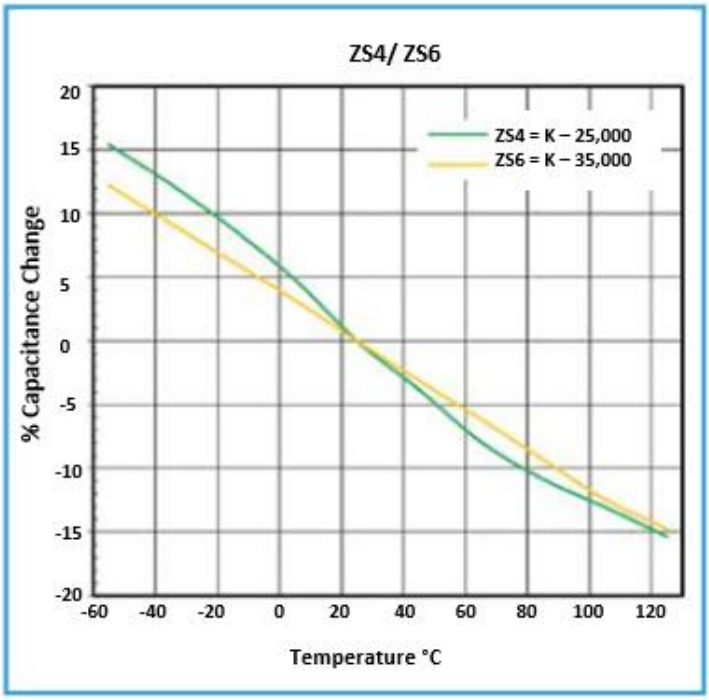
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
22	ZS1	7	VS1	4	US1	5	SS3	6	RS1	5	RS1	7	RS1	10	MS1	4	MS1	6
27	ZS1	6	VS1	4	VS1	5	SS3	5	RS1	4	RS1	6	RS1	8	MS1	4	MS1	5
33	ZS1	5	ZS1	6	VS1	4	SS3	4	SS3	6	RS1	5	RS1	7	RS1	9	MS1	5
39	ZS1	4	ZS1	5	VS1	4	US1	6	SS3	6	RS1	4	RS1	6	RS1	8	MS1	4
47	ZS4	8	ZS1	5	ZS1	6	US1	5	SS3	5	SS3	7	RS1	5	RS1	7	RS1	11
56	ZS4	6	ZS1	4	ZS1	5	VS1	5	SS3	4	SS3	6	RS1	4	RS1	6	RS1	9
68	ZS4	5	ZS4	8	ZS1	5	VS1	4	US1	6	SS3	5	RS1	4	RS1	5	RS1	7
82	ZS6	6	ZS4	6	ZS1	4	VS1	4	US1	5	SS3	4	SS3	6	RS1	4	RS1	6
100	ZS6	5	ZS4	6	ZS1	4	ZS1	6	VS1	5	US1	6	SS3	5	SS3	7	RS1	5
120			ZS4	5	ZS4	6	ZS1	5	VS1	4	VS1	6	SS3	4	SS3	5	RS1	4
150			ZS4	6	ZS4	6	ZS1	4	ZS1	7	VS1	5	VS1	7	SS3	4	SS3	7
180			ZS6	5	ZS4	5	ZS1	4	ZS1	6	VS1	4	VS1	6	SS3	4	SS3	6
200					ZS6	5	ZS1	4	ZS1	6	VS1	4	VS1	5	US1	6	SS3	5
220					ZS6	5	ZS4	8	ZS1	5	VS1	4	VS1	5	US1	5	SS3	5
270					ZS6	5	ZS4	6	ZS1	4	ZS1	7	VS1	4	VS1	6	SS3	4
330							ZS4	5	ZS1	4	ZS1	5	ZS1	7	VS1	5	US1	6
390							ZS4	5	ZS4	6	ZS1	5	ZS1	6	VS1	4	US1	5
470							ZS4	4	ZS4	6	ZS1	4	ZS1	5	ZS1	7	VS1	5
560							ZS6	5	ZS6	6	ZS1	4	ZS1	5	ZS1	6	VS1	4
680									ZS6	6	ZS4	6	ZS1	4	ZS1	5	ZS1	8
820									ZS6	5	ZS4	5	ZS4	8	ZS1	4	ZS1	7
1000											ZS6	6	ZS4	6	ZS4	8	ZS1	6
1200											ZS6	5	ZS4	5	ZS4	7	ZS1	5
1500													ZS6	6	ZS4	5	ZS1	4
1800													ZS6	5	ZS6	6	ZS4	7
2200															ZS6	5	ZS4	6
2700															ZS6	5	ZS4	5
3300																	ZS6	5

Typical Temperature Characteristics

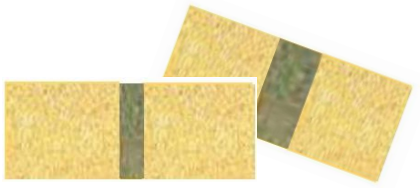








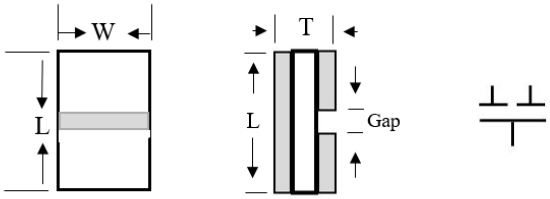
Product Features



A single full electrode is provided on one side of the capacitor and split electrodes on the other side. This is a three-terminal capacitor which can be used as a two capacitor with a common electrode or as serially connected capacitors so that connections may be made on one side of the chip only (surface mount). This design is often used in microstrip coupling to eliminate lead inductance and raise the self resonant frequency.

Product Characteristics

Capacitance:	0.06 picofarads and up
Chip shape:	Twin pads with gap
Gap widths:	5, 10, 15, 20 mil or custom



Standard dimensional tolerance for length and width is ±15% up to 20 mils. For dimensions greater than 20 mils, standard tolerance is ±10%. In cases where dimension cannot be exceeded, insert "M" to signify a maximum dimension. The thickness tolerance is ± 1.5 mils.

Part Numbering

PP T – US3 – 20×10 × 4 – D4 – 100 – K – 2 W

- PP = Passive Plus
- Capacitor Style *T = Twin*
- Dielectric Code *See Table*
- Length & Width (mils)
- Thickness (mils)
- Metallization *See Table*
- Capacitance Value *See Table*
- Tolerance *See Table*
- Voltage *See Table*
- Packaging W = Waffle Pack (Standard)

Substrates

Substrates can be supplied as follows:

- **Bare**
- **Metallized:**
  - Gold over Platinum, Palladium, or Nickel
  - Silver over Platinum
  - Custom schemes and patterns to Customer specifications

Thickness Range	3 mils +

Standard Electrode Metallizations

Gold (D4) This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.

Silver (S7) This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Capacitance Tolerance Codes

Class I Dielectrics: AS1 - KS2	
Tolerance	**Code**
± 20%	M
± 15%	L
± 10%	K
± 5%	J

Class II Dielectrics: MS1 – ZS6			
Tolerance	**Code**	**Tolerance**	**Code**
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV		

Metallization Codes

Code	Description
D4	Ti/Pt/Au Titanium/Platinum/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	4 mils
3	100V	6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard). Other packaging options may be available. Please contact PPI.

Twin Caps are available in a wide range of size configurations, dielectric and termination materials to fit your application. Please contact PPI for designs not listed in this catalog.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min @ 25°C	Temperature Coefficient (-25 to 125°C)	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
AS1	10^{12}	Negligible	0.0001	3.8	Quartz
AS2	10^{12}	Negligible	0.0001	3.9	Si
AS3	10^{12}	Negligible	0.0001	6.6	BeO
AS6	10^{12}	P120 ± 25ppm	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50ppm	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50ppm	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 ± 30ppm	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30ppm	0.001	20	Titanate
ES1	10^{12}	0 ± 30ppm	0.002	40	Titanate
FS1	10^{12}	0 ± 30ppm	0.005	50	Titanate
IS1	10^{15}	0 ± 30ppm	0.005	84	Titanate
KS3	10^{6}	N1500 ± 500ppm	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR (MEG-OHMs) 100VDC @ 25°C	Temperature Coefficient (-55 to 125°C)	Dissipation Factor (@ 1 MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^5	5 to -10	0.010	2.0	300
PS1	10^4	± 10%	0.025	3.0	700
SS3	10^5	3 to -10	0.015	3.5	2,200
US1	10^5	0 to -35	0.020	3.0	4,000
US3	10^5	3.0	0.025	3.0	5,000
RS2	10^4	± 10%	0.025	3.0	1250
ZS1	10^5	0 to -80	0.025	3.0	11,000
ZS4	*Contact PPI*	15 to -15	0.035	3.0	25,000
ZS6	*Contact PPI*	15 to -15	0.035	3.0	35,000
US3	10^5	± 15%	0.030	3.0	4500

Capacitance, Case Size & Dielectric Availability

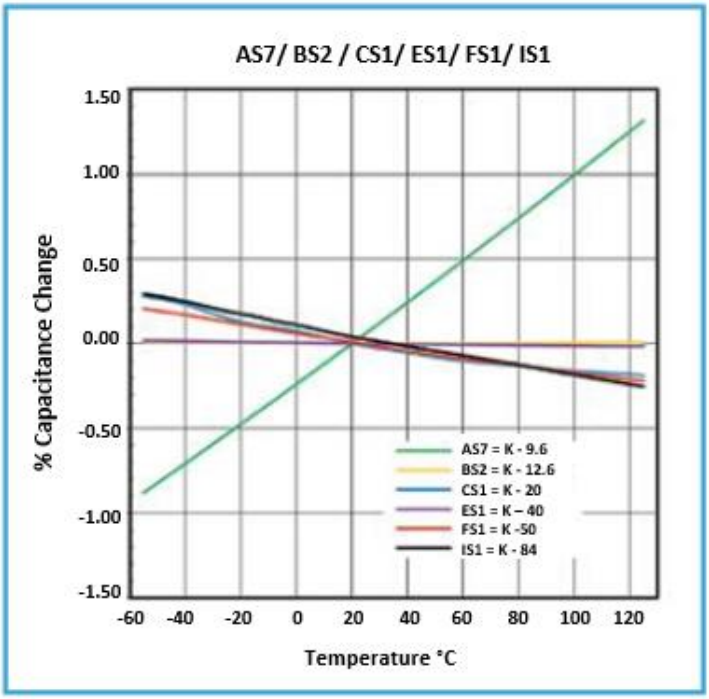
Capacitance (pF)	Case Size *Mils* *(mm)*							
	20x10		40x20		60x30		80x40	
	(.508 x .254)		(1.016 x .508)		(1.524 x .762)		(2.032 x 1.016)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
	Class I Dielectrics							
0.06	ES1	6	AS7	6	AS1	6	AS1	8
0.08	ES1	4	AS7	4	AS1	4	AS1	7
0.1	IS1	7	ES1	15	AS7	8	AS1	5
0.2	KS3	6	ES1	7	AS7	4	AS7	7
0.3	MS1	8	ES1	5	ES1	10	AS7	4
0.4	MS1	6	IS1	7	ES1	8	ES1	15
0.5	MS1	5	IS1	6	ES1	7	ES1	10
0.6	MS1	4	IS1	5	ES1	6	ES1	9
0.8	PS1	11	KS3	6	IS1	4	ES1	7
1	PS1	9	KS3	5	IS1	7	ES1	6
1.2	PS1	7	KS3	4	IS1	6	ES1	5
1.5	PS1	6	MS1	7	IS1	5	IS1	8
1.8	PS1	5	MS1	6	IS1	4	IS1	6
2	PS1	4	MS1	5	IS1	4	IS1	6
2.2	PS1	4	MS1	5	KS3	6	IS1	5
2.7	SS3	7	MS1	4	KS3	5	IS1	4
3.3	SS3	6	PS1	11	KS3	4	KS3	6
3.9	SS3	5	PS1	9	MS1	7	KS3	5
4.7	SS3	4	PS1	8	MS1	5	KS3	4
5.6	US1	6	PS1	6	MS1	5	MS1	7
6.8	US1	5	PS1	5	MS1	4	MS1	6
8.2	US3	5	PS1	4	PS1	11	MS1	5
10	US3	4	SS3	7	PS1	9	MS1	4
12	ZS1	8	SS3	6	PS1	7	PS1	11

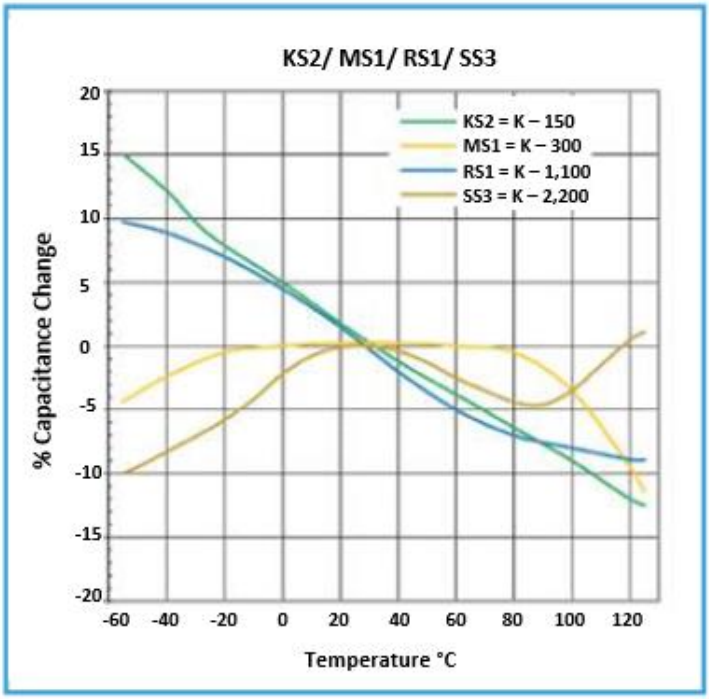
Capacitance, Case Size & Dielectic Availabity chart continues on the next page.

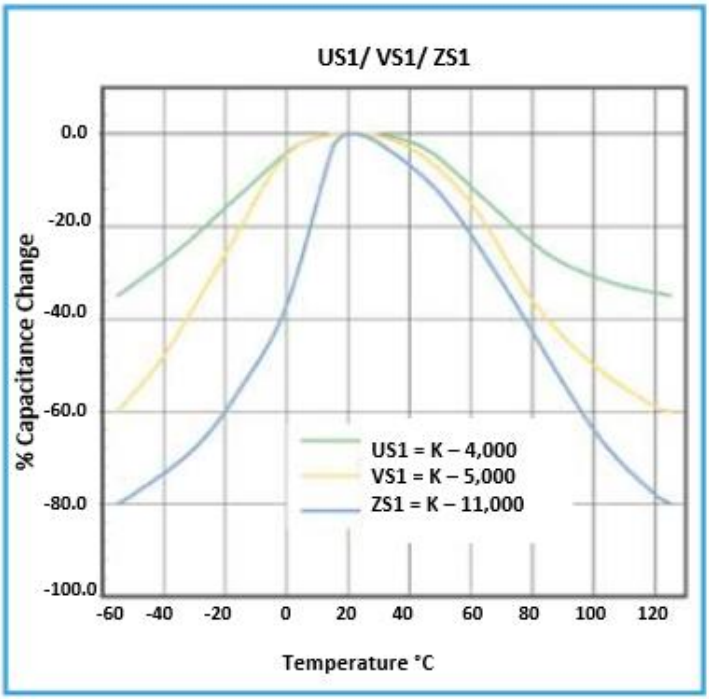
Capacitance, Case Size & Dielectric Availability - continued

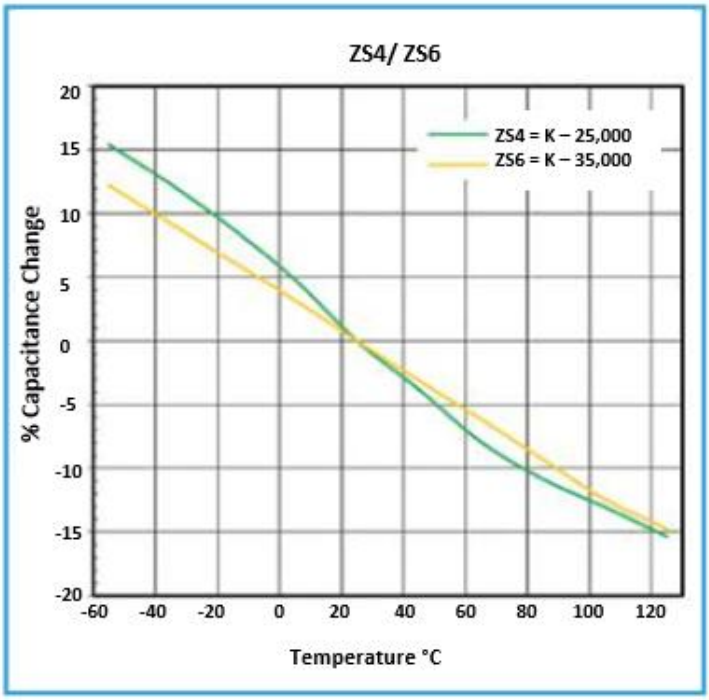
15	ZS1	6	SS3	5	PS1	6	PS1	9
18	ZS1	5	SS3	4	PS1	5	PS1	8
20	ZS1	5	US1	7	PS1	4	PS1	7
22	ZS1	4	US1	6	PS1	4	PS1	6
27	ZS4	8	US1	5	SS3	7	PS1	5
33	ZS4	6	US3	5	SS3	6	SS3	9
39	ZS4	5	US3	4	SS3	5	SS3	8
47	US3	6	ZS1	8	SS3	4	SS3	6
56	US3	5	ZS1	7	US1	6	SS3	5
68	US3	4	ZS1	5	US1	5	US1	8
82			ZS1	4	US3	5	US3	8
100			ZS4	8	US3	4	US3	7
120			ZS4	7	ZS1	8	US3	6
150			ZS4	5	ZS1	6	US3	5
180			ZS4	5	ZS1	5	ZS1	8
200			ZS6	6	ZS1	5	ZS1	7
220			ZS6	5	ZS4	9	ZS1	7
270			ZS6	4	ZS4	8	ZS1	6
330					ZS4	6	ZS1	5
390					ZS4	5	ZS4	9
470					ZS6	6	ZS4	7
560					ZS6	5	ZS4	6
680					ZS6	4	ZS4	5
820							ZS6	6
1000							ZS6	5
1200							ZS6	4
	Class II Dielectrics							

Typical Temperature Characteristics









Single Layer Capacitors

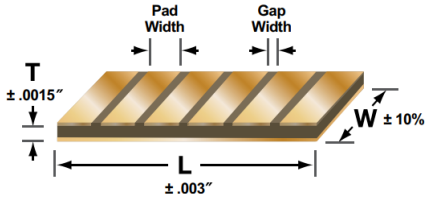
Array Cap

Product Features

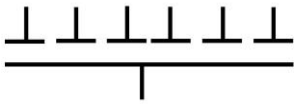
Array Caps are used where arrays of capacitors are needed, usually for decoupling or bypass of GaAs integrated circuits. Standard arrays can contain up to 10 capacitors starting at 0.04pF. Typical overall dimensions range start at 20x10 mils. Array Caps can be fully customized to meet Customer's application requirements.

Array Caps are available with (B) or without borders (A) surrounding the edges to help prevent epoxy shorts and aid optical recognition systems.

Dimensions and Electrode Configuration



Standard border is 2 mils and the gap is between 4 – 6 mills depending on the capacitance required.



Part Numbering

PP A B – FS1 – 4 – 105×25 × 4 D4 – 101 – K – 2 – W

PP = Passive Plus	Array	Style Code *A = No Border; B = Border*	Dielectric Code *See Table*	Number of Capacitors	Length & Width (mils)	Thickness (mils)	Metallization *See Table*	Capacitance Value *See Table*	Tolerance *See Table*	Voltage *See Table*	Packaging W = Waffle Pack (Standard)

Substrates

Substrates can be supplied as follows:

- **Bare**

• **Metallized:**	• Gold over Platinum, Palladium, or Nickel • Silver over Platinum • Custom schemes and patterns to Customer specifications
Thickness Range	3 mils +

Standard Electrode Metallizations

Gold (D4) This metallization consists of a minimum of 70 micro-inches of Gold over Platinum or Nickel which is ideal for all wirebonding methodologies.

Silver (S7) This metallization consists of 20 micro-inches of Silver over Platinum which is ideal for all solder applications whenever the use of Gold is unacceptable.

Metallization Codes

Code	Description
D4	Ti/Pt/Au Titanium/Platinum/Gold **(70 µin Gold)**
S7	Ti/Pt/Ag Titanium/Platinum/Silver **(20 µin Silver)**
K2	Ta/Pd/Au Tantalum/Palladium/Gold **(75 µin Gold)**
L3	Ta/Pd/Au Tantalum/Palladium/Gold **(100 µin Gold)**

Contact PPI for available metallizations.

Capacitance Tolerance Codes

Class I Dielectrics: AS1 - KS2	
Tolerance	**Code**
± 20%	M
± 15%	L
± 10%	K

Class II Dielectrics: MS1 - ZS4			
Tolerance	**Code**	**Tolerance**	**Code**
-10% thru +40%	Y	± 20%	M
-20% thru +80%	Z	± 15%	L
0% thru +100%	V	± 10%	K
Guaranteed Min. Value	GMV		

Capacitance Codes

Value	Code
<10pF	1R0 = 1.0pF
>10pF	101 = 100pF

Rated Voltage Codes

Code	Voltage	Dielectric Thickness
2	50V	4 mils
3	100V	6 mils

Packaging

PPI SLCs are available in Waffle Packs (Standard).
Other packaging options may be available.
Please contact PPI.

Dielectric Materials – Class I

Dielectrics below consist of material exhibiting very low losses, extremely low or closely controlled temperature coefficients, negligible voltage and frequency coefficients, negligible aging effects and high insultation and dielectric breakdown.

Type	IR Min @ 25°C	Temperature Coefficient (-25 to 125°C)	Dissipation Factor (@ 10GHz)	Dielectric Constant (K)	Material
AS1	10^{12}	Negligible	0.0001	3.8	Quartz
AS2	10^{12}	Negligible	0.0001	3.9	Si
AS3	10^{12}	Negligible	0.0001	6.6	BeO
AS6	10^{12}	P120 ± 25ppm	0.0001	8.7	AlN
AS7	10^{12}	P180 ± 50ppm	0.0006	9.6	Alumina 96
AS8	10^{12}	P180 ± 50ppm	0.0006	9.8	Alumina 99.6
BS2	10^{12}	NP0 ± 30ppm	0.0001	12.6	Titanate
CS1	10^{12}	0 ± 30ppm	0.001	20	Titanate
ES1	10^{12}	0 ± 30ppm	0.002	40	Titanate
FS1	10^{12}	0 ± 30ppm	0.005	50	Titanate
IS1	10^{15}	0 ± 30ppm	0.005	84	Titanate
KS3	10^{6}	N1500 ± 500ppm	0.0025	160	Titanate

Dielectric Materials – Class II

Dielectrics below are characterized by high dielectric constants, increased losses and higher temperature coefficients. These properties are inherent with this class of material, but the high dielectric constants permit the use of smaller size to achieve low series inductance and meet dimensional requirements. Capacitors made with these materials are often used for coupling of microstrip line circuits where a small chip is necessary. Used as a bypass capacitor, the small size provides low series inductance and dielectric losses are typically of little concern.

Type	IR (MEG-OHMs) 100VDC @ 25°C	Temperature Coefficient (-55 to 125°C)	Dissipation Factor (@ 1 MHz)	Aging (%) HR/Decade	Dielectric Constant (K)
MS1	10^5	5 to -10	0.010	2.0	300
PS1	10^4	± 10%	0.025	3.0	700
SS3	10^5	3 to -10	0.015	3.5	2,200
US1	10^5	0 to -35	0.020	3.0	4,000
US3	10^5	3.0	0.025	3.0	5,000
RS2	10^4	± 10%	0.025	3.0	1250
ZS1	10^5	0 to -80	0.025	3.0	11,000
ZS4	*Contact PPI*	15 to -15	0.035	3.0	25,000
ZS6	*Contact PPI*	15 to -15	0.035	3.0	35,000
US3	10^5	± 15%	0.030	3.0	4500

Capacitance, Case Size & Dielectric Availability - Class I Dielectrics

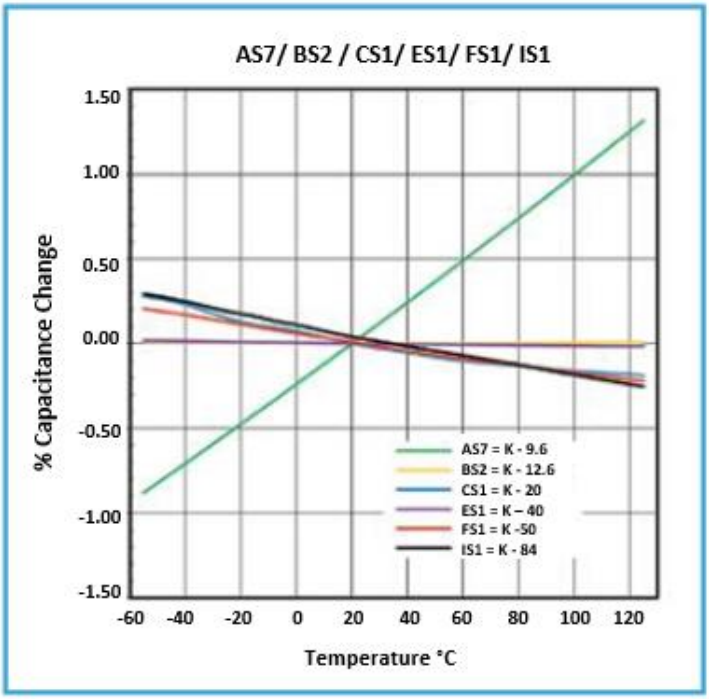
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
0.04	AS7	5	AS7	6	AS7	10												
0.06	AS7	4	AS7	5	AS7	8	AS2	5	AS2	10								
0.08	ES1	10	AS7	4	AS7	6	AS7	10	AS2	7	AS2	9						
0.1	ES1	8	ES1	11	AS7	5	AS7	9	AS2	5	AS2	7	AS2	10				
0.2	ES1	5	ES1	7	ES1	10	AS7	4	AS7	7	AS7	10	AS2	5	AS2	7	AS2	10
0.3	IS1	6	ES1	4	ES1	6	ES1	11	AS7	4	AS7	7	AS7	9	AS2	5	AS2	7
0.4	IS1	5	IS1	7	ES1	5	ES1	9	ES1	15	AS7	5	AS7	7	AS7	9	AS2	5
0.5	IS1	4	IS1	5	ES1	4	ES1	7	ES1	11	AS7	5	AS7	5	AS7	7	AS2	4
0.6	KS2	6	IS1	5	IS1	7	ES1	6	ES1	10	ES1	15	AS7	4	AS7	6	AS7	9
0.8	MS1	8	KS2	6	IS1	5	ES1	5	ES1	7	ES1	10	ES1	15	AS7	4	AS7	7
1.0	MS1	7	KS2	5	IS1	4	IS1	7	ES1	6	ES1	8	ES1	10	AS7	4	AS7	5
1.2	MS1	6	KS2	4	IS1	4	IS1	6	ES1	5	ES1	7	ES1	9	AS7	3	AS7	5
1.5	MS1	5	MS1	7	KS2	5	IS1	5	ES1	4	ES1	6	ES1	7	ES1	10	AS7	4
1.8	MS1	4	MS1	5	KS2	4	IS1	4	IS1	6	ES1	5	ES1	6	ES1	8	ES1	11
2.0	MS1	4	MS1	5	KS2	4	KS2	7	IS1	6	ES1	4	ES1	5	ES1	7	ES1	11
2.2	RS1	4	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	5	ES1	7	ES1	10
2.7	RS1	8	MS1	4	MS1	6	KS2	5	IS1	4	IS1	6	ES1	4	ES1	5	ES1	8
3.3	RS1	7	RS1	10	MS1	5	KS2	4	KS2	6	IS1	5	IS1	7	ES1	4	ES1	7
3.9	RS1	6	RS1	9	MS1	4	MS1	7	KS2	5	IS1	4	IS1	6	IS1	8	ES1	6
4.7	RS1	5	RS1	7	RS1	11	MS1	6	KS2	4	KS2	6	IS1	5	IS1	6	ES1	5
5.6	RS1	4	RS1	6	RS1	10	MS1	5	MS1	7	KS2	5	IS1	4	IS1	5	ES1	4
6.8	RS1	4	RS1	5	RS1	8	MS1	4	MS1	6	KS2	5	KS2	6	IS1	4	IS1	7
8.2	SS3	6	RS1	4	RS1	7	MS1	4	MS1	5	KS2	4	KS2	5	KS2	7	KS2	10
10	SS3	5	RS1	4	RS1	5	RS1	9	MS1	4	MS1	6	KS2	4	KS2	5	KS2	8
12	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	5	MS1	7	KS2	4	KS2	7
15	US1	6	SS3	5	RS1	4	RS1	6	RS1	10	MS1	4	MS1	6	MS1	7	KS2	6
18	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	6	KS2	5
20	US1	5	SS3	4	SS3	6	RS1	5	RS1	8	RS1	11	MS1	4	MS1	5	KS2	4
22	US1	4	US1	6	SS3	5	RS1	4	RS1	7	RS1	9	MS1	4	MS1	5	KS2	4

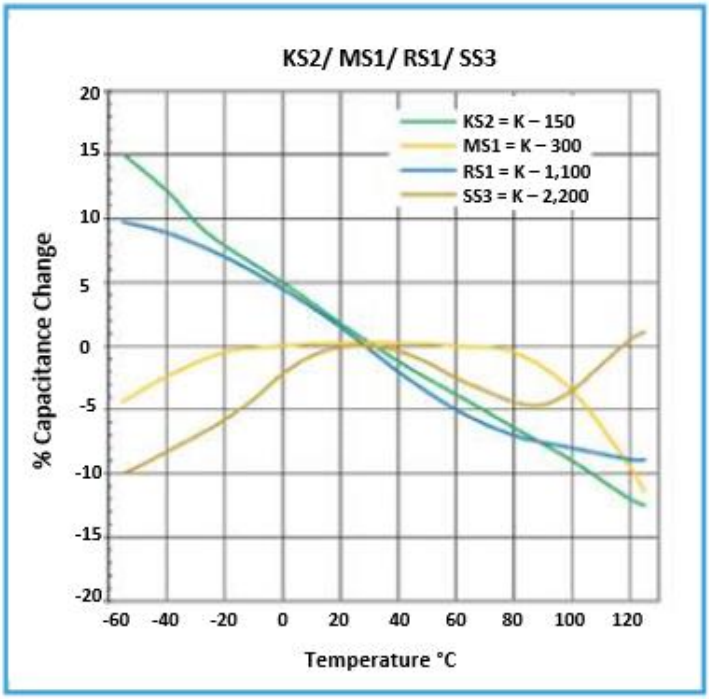
Shaded cells indicate Class II Dielectrics

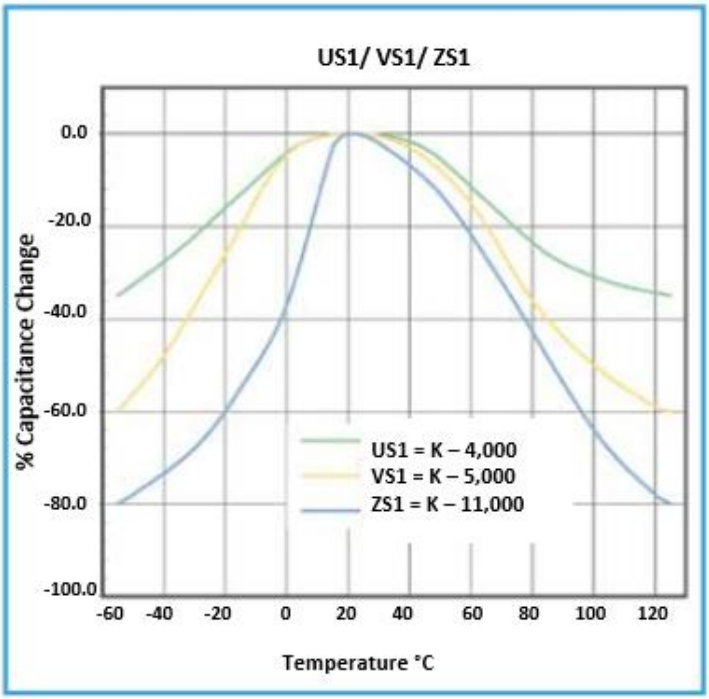
Capacitance, Case Size & Dielectric Availability – Class II Dielectrics

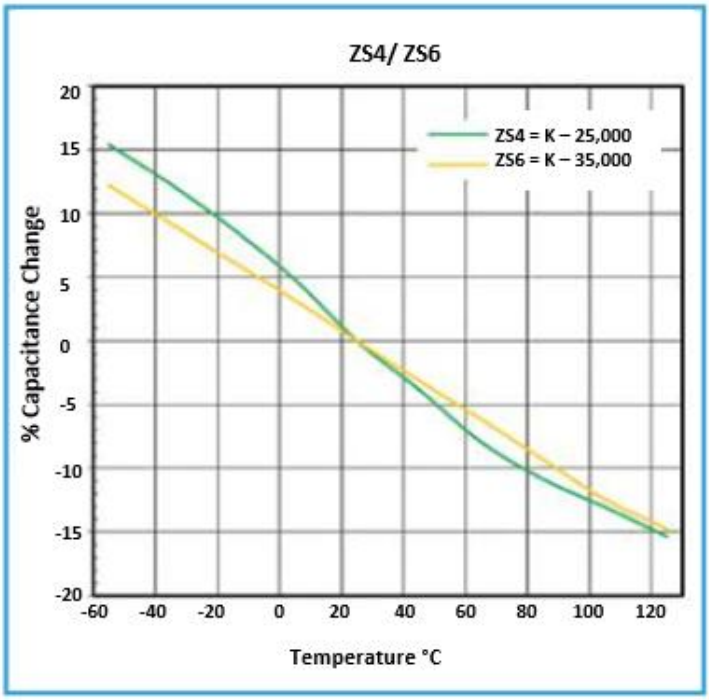
Cap (pF)	Size mils (mm)																	
	10x10 (.254 x .254)		12x12 (.305 x .305)		15x15 (.381 x .381)		20x20 (.508 x .508)		25x25 (.635 x .635)		30x30 (.762 x .762)		35x35 (.889 x .889)		40x40 (1.016 x 1.016)		50x50 (1.270 x 1.270)	
	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness	Dielectric	Thickness
27	US1	4	US1	5	SS3	4	RS1	4	RS1	6	RS1	8	MS1	3	MS1	4	MS1	6
33	VS1	4	US1	4	US1	6	SS3	6	RS1	5	RS1	6	RS1	11	MS1	4	MS1	5
39	ZS1	6	US1	4	US1	5	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10	MS1	4
47	ZS1	5	ZS1	7	US1	5	SS3	4	SS3	6	RS1	5	RS1	6	RS1	8	MS1	4
56	ZS1	4	ZS1	6	VS1	5	US1	7	SS3	5	RS1	4	RS1	5	RS1	7	RS1	10
68	ZS1	4	ZS1	5	VS1	4	US1	6	SS3	5	SS3	6	RS1	4	RS1	6	RS1	9
82	ZS4	7	ZS1	4	ZS1	7	VS1	6	SS3	4	SS3	5	SS3	7	SS3	10	RS1	7
100	ZS4	6	ZS4	8	ZS1	6	VS1	5	US1	6	SS3	5	SS3	6	SS3	8	RS1	6
120	ZS4	5	ZS4	7	ZS1	5	ZS1	8	VS1	6	SS3	4	SS3	5	SS3	7	RS1	5
150	ZS4	4	ZS4	5	ZS1	4	ZS1	7	VS1	5	VS1	7	SS3	4	SS3	5	RS1	4
180	ZS6	4	ZS4	5	ZS4	7	ZS1	6	VS1	4	VS1	6	VS1	8	US1	8	SS3	7
200	ZS6	4	ZS4	4	ZS4	6	ZS1	5	ZS1	8	VS1	5	VS1	7	US1	7	SS3	6
220	ZS6	4	ZS6	5	ZS4	6	ZS1	4	ZS1	7	VS1	5	VS1	6	US1	6	SS3	6
270			ZS6	4	ZS4	5	ZS4	8	ZS1	6	VS1	4	VS1	5	US1	5	SS3	5
330					ZS4	4	ZS4	7	ZS1	5	ZS1	7	VS1	4	US1	4	US1	7
390					ZS6	4	ZS4	6	ZS1	4	ZS1	6	ZS1	7	ZS1	10	US1	6
470					ZS6	4	ZS4	5	ZS4	7	ZS1	5	ZS1	6	ZS1	8	US1	5
560							ZS4	4	ZS4	6	ZS1	4	ZS1	5	ZS1	7	US1	4
680							ZS6	5	ZS4	5	ZS4	8	ZS1	5	ZS1	6	VS1	4
820							ZS6	4	ZS6	6	ZS4	6	ZS1	4	ZS1	5	ZS1	7
1000									ZS6	5	ZS4	5	ZS4	7	ZS1	4	ZS1	6
1200									ZS6	4	ZS4	4	ZS4	6	ZS4	7	ZS1	5
1500											ZS6	5	ZS4	5	ZS4	6	ZS1	4
1800											ZS6	4	ZS6	6	ZS4	5	ZS4	8
2200													ZS6	5	ZS4	4	ZS4	6
2700													ZS6	4	ZS6	5	ZS4	5
3300																	ZS6	6

Typical Temperature Characteristics









PPI Passive Plus Inc.®
RF & Microwave Components

Headquarters: New York, USA