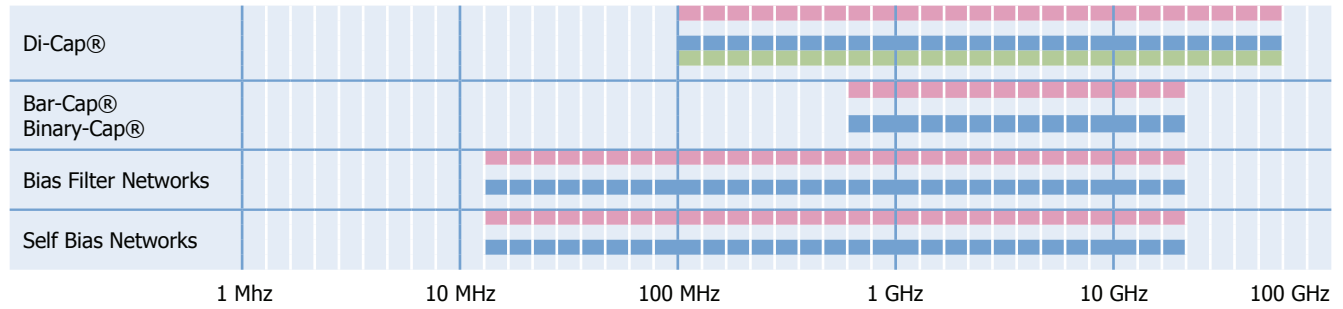
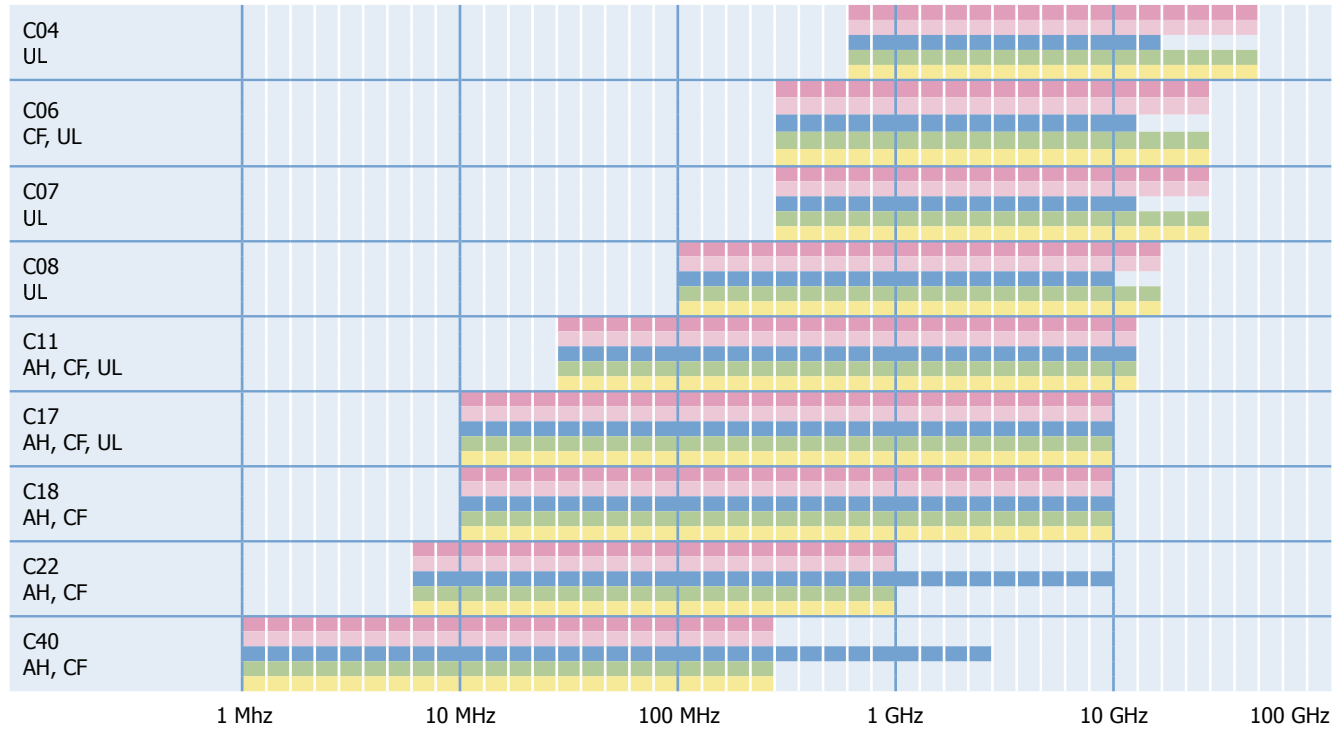


# Simplified Frequency & Product Application Chart

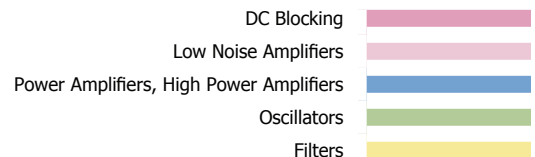
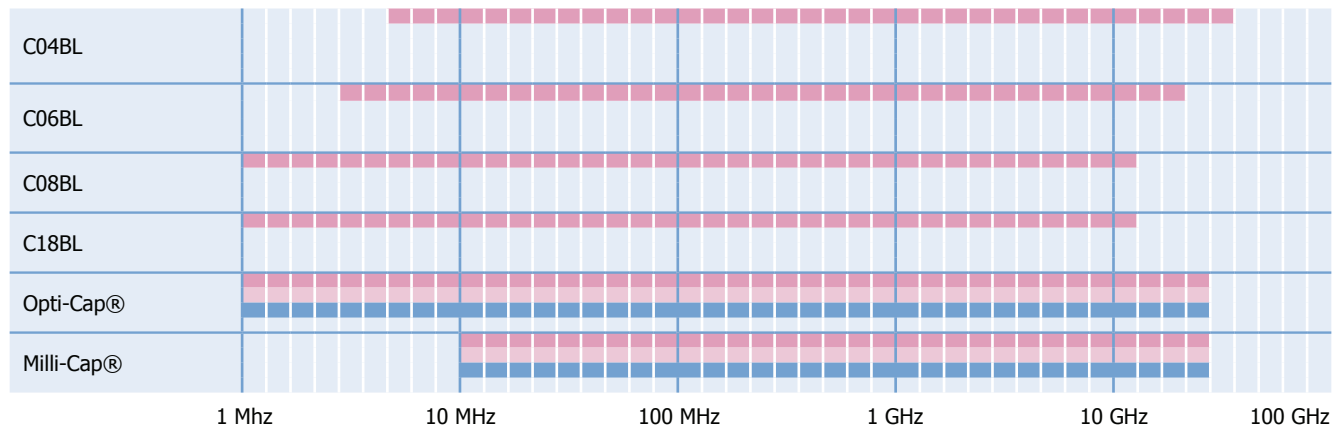
## SLC and Thin Film



## High Q Capacitors



## Broadband and DC Blocks

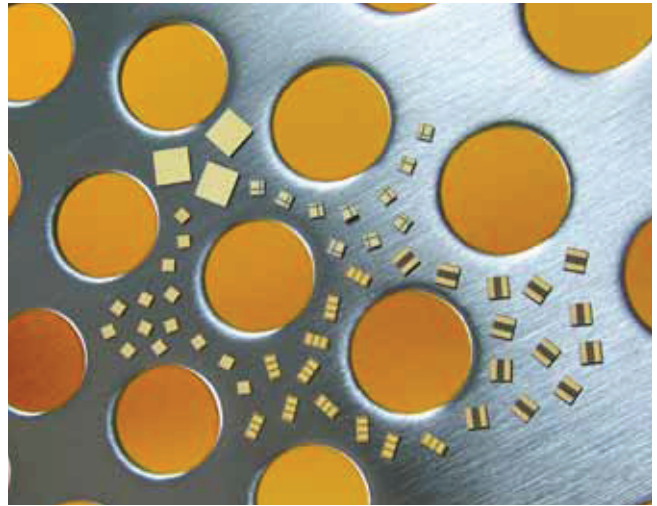


# SLC - Dielectric Information

Single Layer Capacitors are available with any of our proprietary dielectric materials in the following configurations:

- Border Cap<sup>®</sup>
- Di-Cap<sup>®</sup>
- Bar Cap<sup>®</sup>
- Bi-Cap<sup>®</sup>
- Gap Cap<sup>®</sup>
- T-Cap<sup>®</sup>

Please consult the following pages for part number identification.



## DLI Class I Dielectric Materials

Dielectric Code	Relative $\epsilon_r$ @ 1 MHz	Temperature Coefficient -55°C to 125°C (ppm/°C Max)	1 MHz Dissipation Factor (% Maximum)	25°C Insulation Resistance (M $\Omega$ )	125°C Insulation Resistance (M $\Omega$ )
PI	9.9	P105 $\pm$ 20	0.15	>106	>105
PG	13	P22 $\pm$ 30	0.15	>106	>105
AH	20	P90 $\pm$ 20	0.15	>106	>105
CF	24	0 $\pm$ 15	0.60	>106	>105
NA	22	N30 $\pm$ 15	0.15	>106	>105
CD	37	N20 $\pm$ 15	0.15	>106	>105
NG	43	N220 $\pm$ 60	0.25	>106	>105
CG	70	0 $\pm$ 30	0.70	>106	>105
DB	72	N50 $\pm$ 30	0.15	>106	>105
NP	85	N750 $\pm$ 200	0.50	>104	>103
NR	160	N1500 $\pm$ 500	0.25	>106	>105
NS	300	N2400 $\pm$ 500	0.70	>106	>105
NU	600	N3700 $\pm$ 1000	1.50	>106	>105
NV	900	N4700 $\pm$ 1000	1.20	>106	>105

## DLI Class II Dielectric Materials

Dielectric Code	Relative $\epsilon_r$ @ 1 MHz	Temperature Coefficient -55°C to 125°C (ppm/°C Max)		1 MHz Dissipation Factor (% Maximum)	25°C Insulation Resistance (M $\Omega$ )	125°C Insulation Resistance (M $\Omega$ )
		No Bias, Pre Voltage Conditioning	No Bias, Post Voltage Conditioning			
BF*	445	$\pm$ 7.5	$\pm$ 10	2.5	>104	>102
BD	700	$\pm$ 10	$\pm$ 15	2.5	>104	>103
BG*	900	$\pm$ 10	$\pm$ 15	2.5	>104	>103
BC	1300	$\pm$ 10	$\pm$ 15	2.5	>104	>103
BE	1250	$\pm$ 10	$\pm$ 15	2.5	>104	>103
BL	2000	$\pm$ 15	$\pm$ 25	2.5	>105	>104
BJ	3300	$\pm$ 10	$\pm$ 15	3.0	>105	>104
BN	4500	$\pm$ 15	$\pm$ 25	3.0	>105	>104

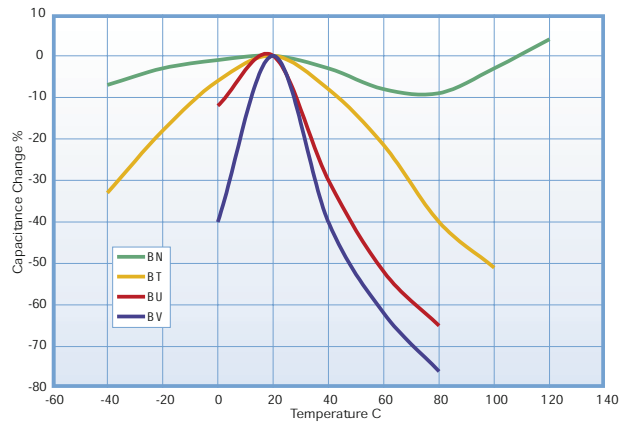
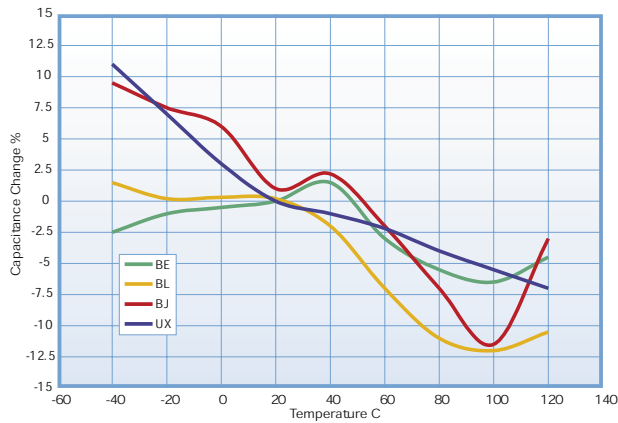
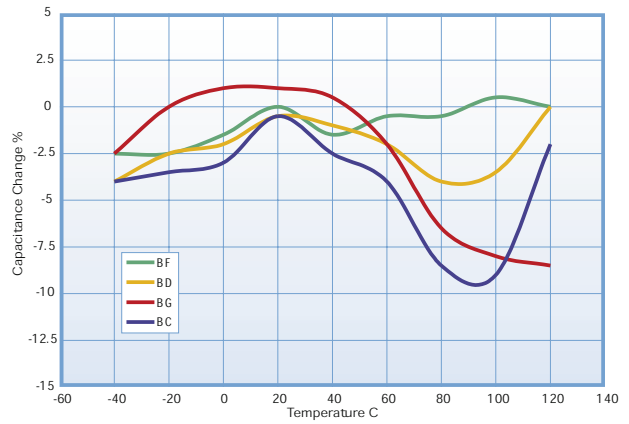
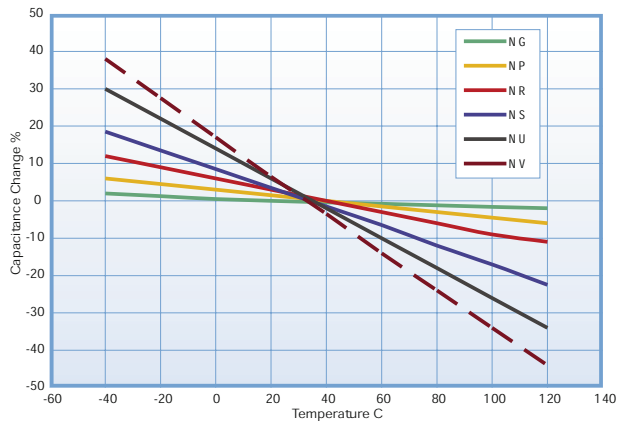
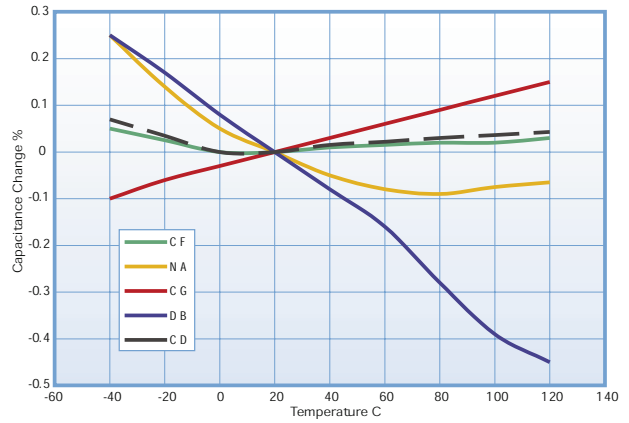
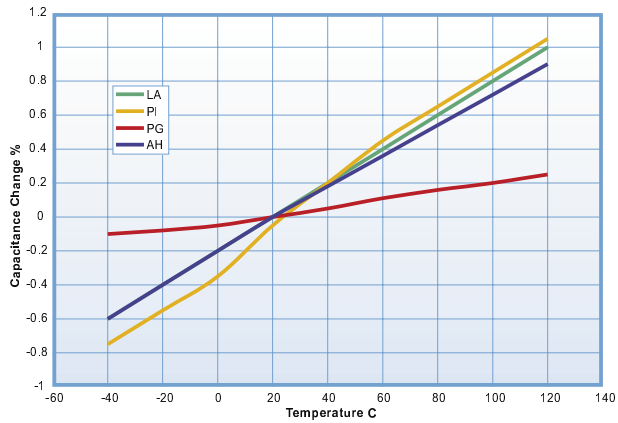
## DLI Class III Dielectric Materials

BT*	4200	+22, -56% (-55°C to 105°C)	+22, -56% (-55°C to 105°C)	3.0	>105	>102
BU	8500	+22, -82% (10°C to 85°C)	+22, -82% (10°C to 85°C)	3.0	>105	>104
BV	13,500	+22, -82% (10°C to 85°C)	+22, -82% (10°C to 85°C)	3.0	>105	>104
UX	25,000	$\pm$ 15%	$\pm$ 25%	2.5	>103	>102

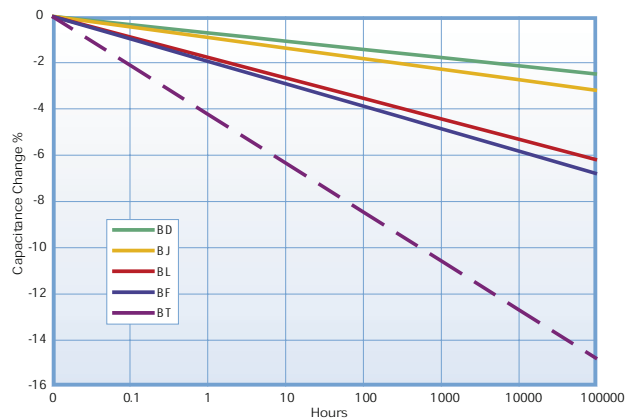
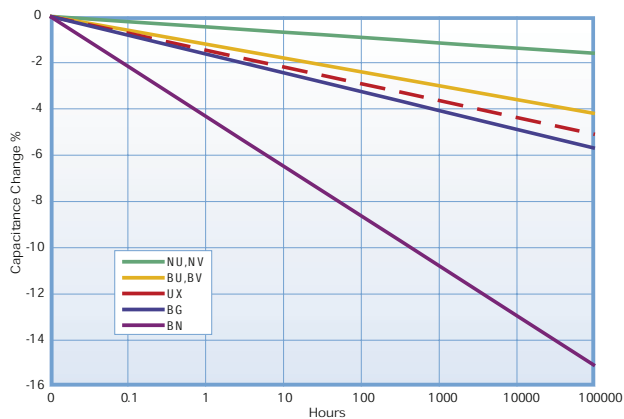
\* Recommended for commercial use only. Please contact an inside sales representative for additional information.

# SLC - Dielectric Information

## Dielectric Temperature Characteristics

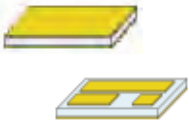
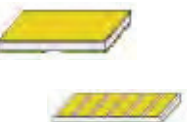

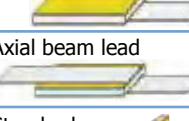
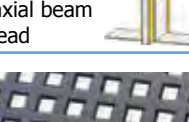


## Dielectric Aging Characteristics



# SLC - Specifications

## Termination Codes

	Code	Description (Layers in order from dielectric material to outermost)		Capacitor Types
	P	S1 (Sputter Plated) 1. 300 Angstroms Titanium-Tungsten 2. 50µ Inches min. Nickel-Vanadium 3. 100µ Inches min. Gold		Di-Cap®, T-Cap®, Bar Cap®, Binary Cap®, and Gap Cap
		AU-100 (Wet Plated) 1. 75µ Inches min. Nickel 2. 100µ Inches min. Gold		
	T	S2 1. 300 Angstroms Titanium-Tungsten 2. 50µ Inches min. Nickel-Vanadium 3. 300µ Inches min. Gold-Tin		Di-Cap®, T-Cap®
	M	S5 1. 300 Angstroms Titanium-Tungsten 2. 100µ Inches min. Gold		Di-Cap®, T-Cap®, Bar Cap®, Binary Cap®, and Gap Cap
	B	S1	AU-100	Single Border Cap
	E	S1	AU-100	Double Border Cap
Single beam lead	L	Standard lead material is silver (Ag) .002" thick. Optional Gold (Au)		Di-Cap®
Axial beam lead	A	Standard lead material is Silver (Ag) .002" thick. Optional Gold (Au)		Di-Cap®
	Z	Standard lead material is Tin-Copper (Sn,Cu) .002" thick. Optional Gold (Au)		
Standard axial beam lead	S	Standard lead material is silver (Ag) .002" thick. Optional Gold (Au)		Di-Cap®



## Test Level Codes

Code	Description
<b>Industrial / Commercial Options</b>	
Y	• 1% AQL 2 Side Visual Screening
X	• 100% 4 Side Visual Screening • 1% AQL for the electrical parameters Capacitance, Dissipation Factor, Insulation Resistance, and Dielectric Withstanding Voltage
<b>High Reliability Options</b>	
A	MIL-PRF-49464 Group A • 100% Thermal Shock • 100%, 100 +/-4 Hours Voltage Conditioning • 100% Electrical Screening • 100% 6 Side Visual Screening • Bond Strength • Die Shear Strength • Temperature Coefficient Limits
B	MIL-PRF-49464 Group B • MIL-PRF-49464, Group A • Immersion • Low Voltage Humidity • Life
D	Special agreed upon testing to customers' formal specification. Customer Drawing Required! (May include, but is not limited to, one or more of the following common requests.) • MIL-PRF-38534 Class H Element Evaluation. • MIL-PRF-38534 Class K Element Evaluation. • 10(0) Destructive Bond Pull per MIL-STD-883, Method 2011. • 10(0) Die Shear per MIL-STD-883, Method 2019. Consult Factory for other alternatives or assistance in specifying custom testing.
E	6 Side Visual Screening per MIL-STD-883, Method 2032.

All Single Layer Capacitors are Lead Free and RoHS compliant.

## Capacitance Tolerance Table

Tolerance Code	Tolerance
A	±.05pF
B	±.10pF
C	±.25pF
D	±.50pF
E	±.5%
F	±1%
G	±2%
H	±3%
I	±4%
J	±5%
K	±10%
L	±15%
M	±20%
X	GMV
V	+100%, -0%
Z	+80% , -20%
S	Special

## Environmental & Physical Testing Procedures

Parameter	Method	MIL-STD-202
		Condition
Thermal Shock	107	A, (modified), -55°C to +125°C.
Immersion	104	B
Moisture Resistance	106	-
Resistance to Solder Heat	210	C, 260°C for 20 seconds.
Life	108	A, 96 Hours @ +125°C.
Barometric Pressure	105	B
Shock, (Specified Pulse)	213	I, 100g's, 6ms.
Vibration, High Frequency	204	G, 30g's peak, 10Hz to 2kHz.

Parameter	Method	MIL-STD-883
		Condition
Bond Strength	2011	D, 3 grams minimum with .001" dia wire
Die Shear Strength	2019	Limit per MIL-STD-883, Figure 2019-4.
Temperature Cycling	1010	C
Mechanical Shock	2002	B,Y1,
Constant Acceleration	2001	3,000g's, Y1 direction

# SLC - Packaging

## SLC Waffle Packaging

DLI offers a wide variety of standard design waffle packs in various materials depending on the application. Typical material offerings are antistatic and gel pack, which can contain up to 400 pieces depending on component dimension. Custom waffle packs are available; please consult the factory for details.

## SLC Tape and Reel

DLI offers tape and reel packaging solutions for a variety of our single layer capacitor case sizes. Utilizing the latest technology and equipment to provide our customers the highest quality products, our standard SMD tape and reel packaging meets or exceeds EIA standards. Custom tape and reel packaging available; consult the factory for options.

## SLC on Tape Ring

DLI offers single layer capacitors re-populated on blue membrane tape and photon ring assembly to maximize efficiency and minimize product cost. Used in high volume applications, the re-populated capacitors provide for more efficient component placement and fewer "pick and place" machine change outs. The re-populated capacitors meet GMV capacitance value, are 100% visually acceptable, and can be re-populated in custom shapes and sizes on a 6 inch photon tape ring.

## SLC "Black Dotted" on Tape Ring

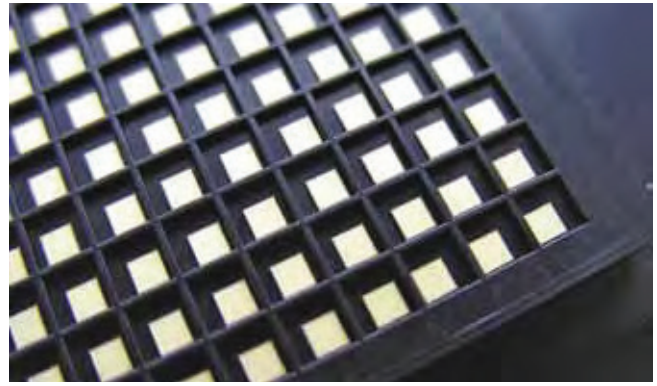
DLI offers "black dotted" capacitors on membrane tape and photon ring assembly. For high volume applications utilizing visual recognition, a less expensive alternative is the use of "black dotted" capacitors provided on saw dice membrane tape. The non- "black dotted" capacitors meet GMV capacitance value and a minimum of 75% visually acceptable product is guaranteed.

## Storage

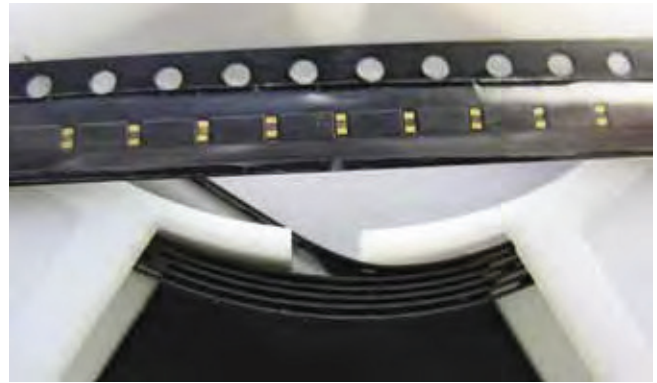
Single layer capacitors with applicable terminations will be solderable for a minimum of 1 year from date of shipment if properly stored in their original packaging. For extended periods, storage in a dry nitrogen environment is recommended. Product supplied on membrane tape and photon ring should be stored in the original container and in an environmentally controlled area where temperature and humidity are maintained. It is recommended not to store the product in direct light as this can negatively impact the adhesion properties of the tape.

## Handling

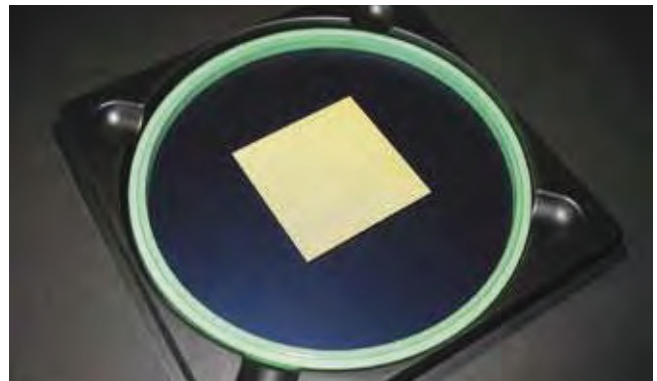
Single layer ceramic capacitors should be handled carefully during component transfer or placement, preventing damage to the gold and ceramic surfaces. The capacitors should be handled with precision stainless steel tweezers or a vacuum wand. Contacting the capacitor with bare hands should be avoided as resulting contaminants will affect the performance of the component.



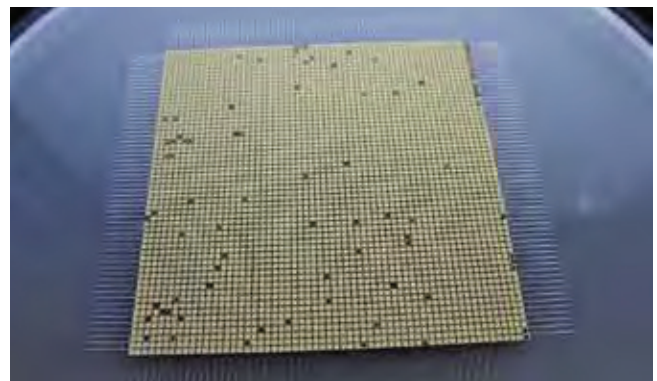
SLC Waffle Packaging



SLC Tape and Reel



SLC on Tape Ring

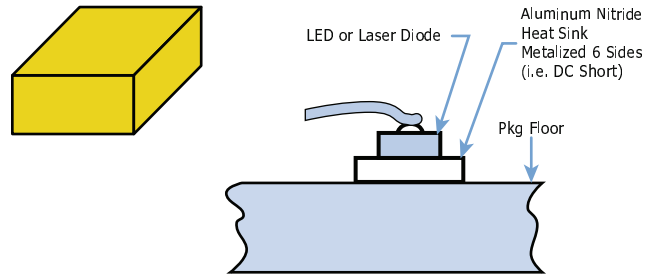


SLC "Black Dotted" on Tape Ring

# SLC - Heatsinks, Standoffs & Submounts

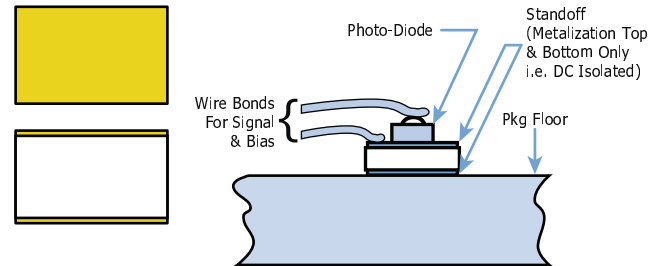
## Heatsinks

- Heatsinks are fully metallized on all sides and are used to dissipate and absorb heat
- Heatsinks allow for high thermal conductivity and are electrically conductive (DC short)
- Typically used with LED's or laser diodes



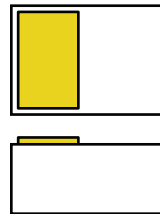
## Standoffs

- A Standoff is much like a Heatsink however it is typically metallized on only the top and bottom surfaces
- Each device is custom tailored to the customer's specifications and is typically used with LED's or Photo Diodes (works as a photo detector, light is allowed in through fibers)



## Submounts

- Submounts are ceramic LED package bases which minimize thermal resistance between LED junctions and adjacent components
- By reducing junction temperatures, an LED will produce increased efficiency, brightness, color and reliability
- Each device is custom tailored to the customer's specifications



## Material Specifications

Material Code	Relative $\epsilon_r^*$ @ 5 GHz	TCC†Loss ppm/°C	Coefficient of Tangent* % Max	Thermal Thermal Expansion ppm/°K	Conductivity W/m-°K
AG	8.85 ± 0.35 (@ 1MHz)	Aluminum Nitride	0.10	4.6	140-180
PI	9.9 ± 0.15 (@ 1MHz)	Alumina 99.6%	0.01	6.5 - 7.5	27

\*Unless otherwise specified K dielectric measurement at approximately 5 GHz. †For the temperature range -55 to 125°C. \*\*Material only provided metallized.

## Surface Finish

Code	Roughness $R_a$	Material Process
X	>50 $\mu$ in.	As-Fired
Y	20 $\mu$ in.	Machined
Z	<5 $\mu$ in.	Polished
S	Special	Drawing required

## Metallization

Code	Description
M	300 Angstroms TiW, 100 $\mu$ in. min. Au
P	75 $\mu$ in. min. Nickel, 100 $\mu$ in. min. Au
E	Metallized and etched per Customer drawing
T	300 Angstroms min. TiW, 50 $\mu$ in. min. NiV, 300 $\mu$ in. min. Au-Sn
D	SPECIAL, DLI Design per Customer Requirements