

WHEN ENHANCED PERFORMANCE  
IS REQUIRED



**FARADFLEX®**



**OAK-MITSUBISHI TECHNOLOGIES**  
MITSUBISHI KINZOKU CORPORATE GROUP



The drive to **increase the speeds** and **functionality of electronic systems** is putting pressure on interconnect designers to supply enough capacitance within the available printed circuit board (PCB) or chip package real estate. They must also **reduce impedance, power buss noise and EMI.**

One way that leading edge designers are accomplishing this is to **embed capacitor layers inside the PCB or chip package.**



Buried Capacitance™ utilizes the technology of putting a capacitor plane inside the PCB to reduce the overall impedance of the power distribution system, as well as free up surface real estate (by eliminating some discrete capacitors).

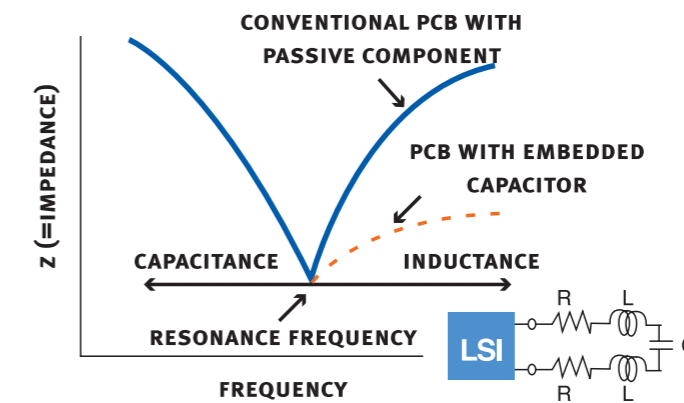
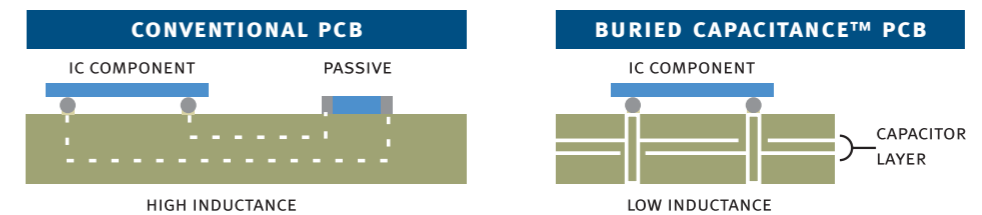
It is the reduced inductance that is a key performance factor in reducing impedance as system frequencies increase.

Fiberglass reinforced epoxy material has been the standard product used to embed these layers in PCBs. These types of substrates have improved the performance of many systems. However, as switching speeds increase, there is a need for even lower impedance power/ground planes.

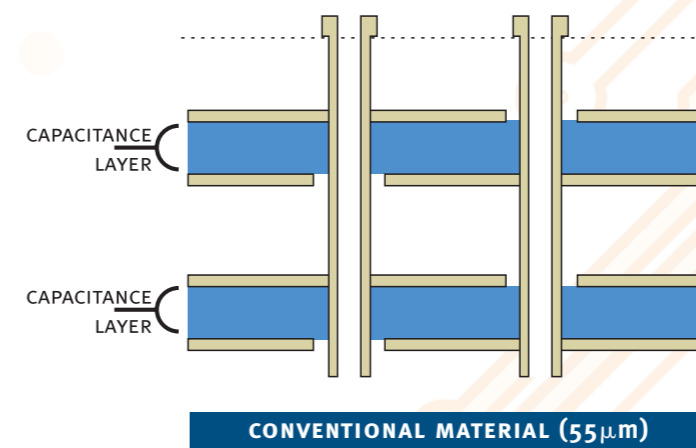
To meet this need, Oak-Mitsui Technologies has developed the FaradFlex® family of novel thin substrates, that is the next generation of Buried Capacitance™ licensed material.

FaradFlex® is the *premier licensed* polymer film based substrate that can be used when enhanced performance is required over traditional materials. FaradFlex® provides higher capacitance values and ultra-thin dielectric layer, allowing for significantly lower power/ground plane impedance.

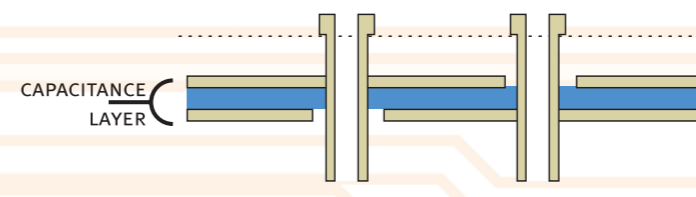
FaradFlex is a registered trademark of Oak-Mitsui, Inc.  
Buried Capacitance is a trademark of HSCI.



## THE NEXT GENERATION OF BURIED CAPACITANCE™ MATERIAL

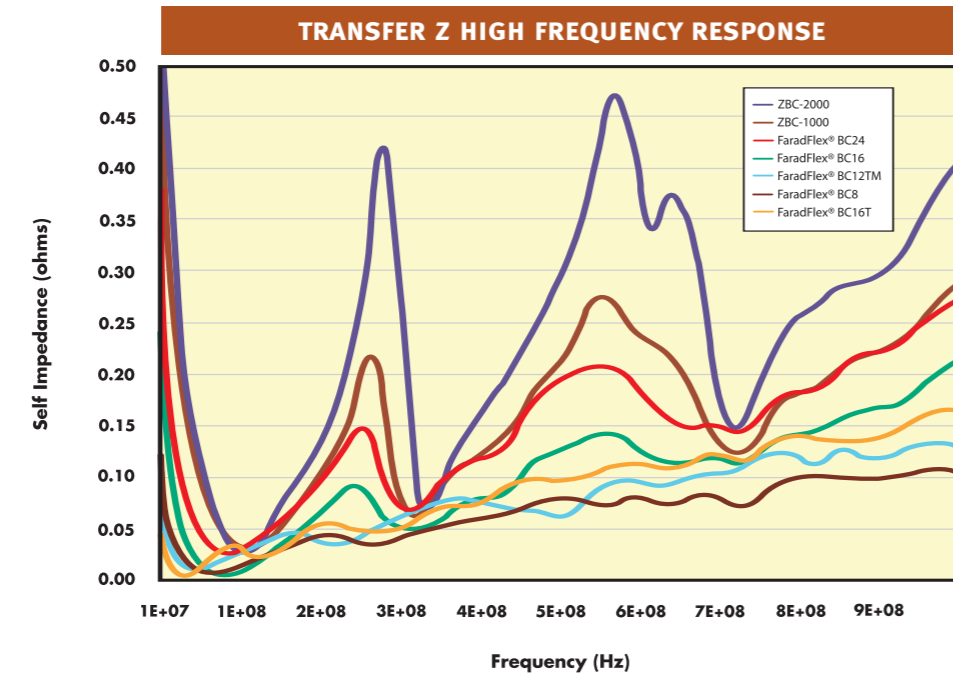
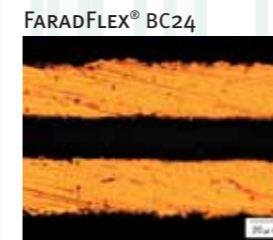
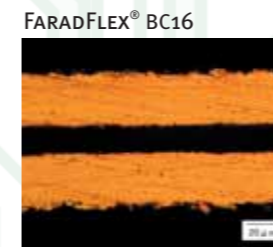
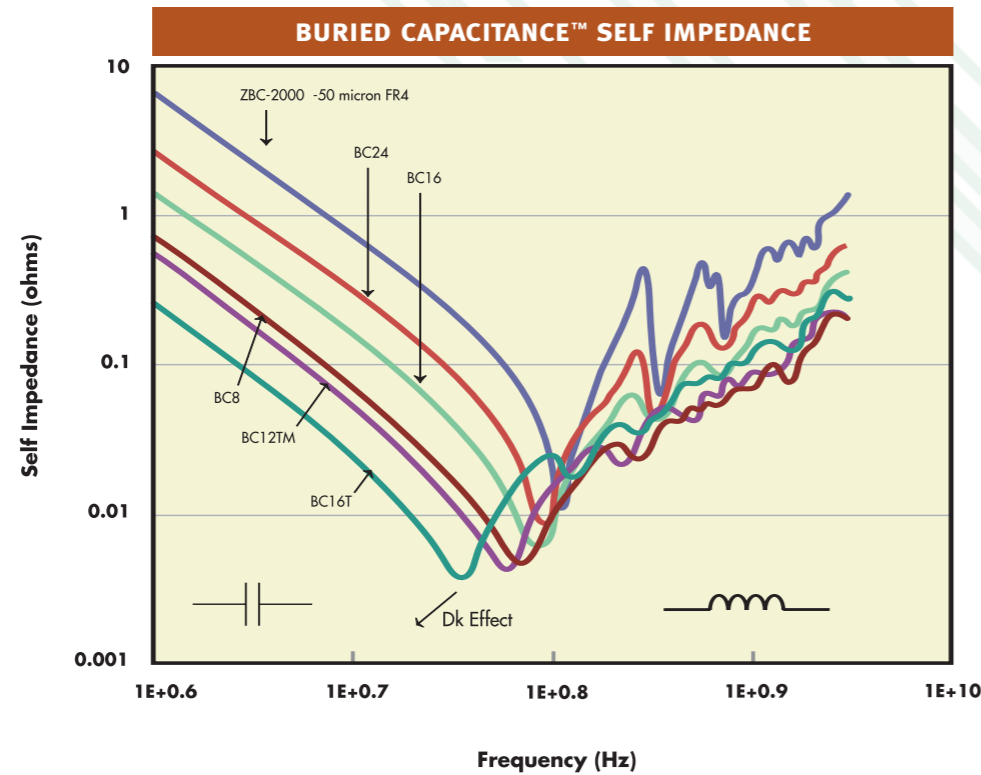


THIN CAPACITOR MATERIAL FARADFLEX®





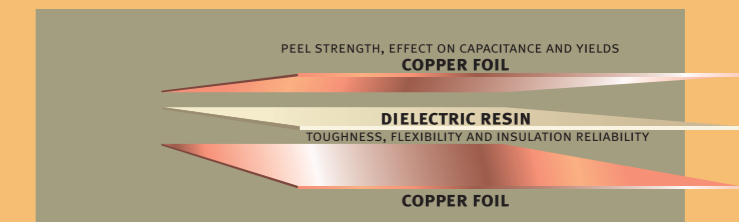
THE THIN FARADFLEX® LAYERS GREATLY REDUCE THE POWER DISTRIBUTION IMPEDANCE AND DAMPENS THE RESONANCE PEAKS.



Optimization of the dielectric and proprietary copper foil has resulted in an extremely thin material that not only has excellent electrical properties, but is rugged enough to process through typical PCB inner layer processing. To insure high yields during processing, every core is pre-tested at 500 volts (High Potential)\*.

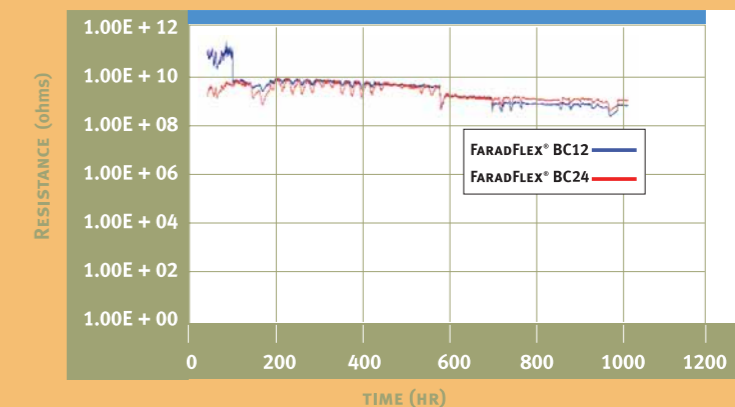
\*BC16T is tested at a lower Hi-Pot voltage

Optimized Material Properties



In addition, FaradFlex® has been engineered to withstand over 1000 hours during Electro-migration testing.

TEST CONDITION: 85°C/85% 35V



I N N O V A T I V E



Printed Circuits Boards made with FaradFlex® layers have demonstrated that no manufacturing process changes are necessary\*. The material processes through typical inner layer lines (with the usual procedures for handling thin laminates) and is compatible with standard drilling and plating.



CROSS SECTIONAL OF BOARD MADE WITH FARADFLEX®



CROSS SECTIONAL AFTER PLATED — FARADFLEX® BC12

The FaradFlex® line of products allows PCB and chip packaging designers to cost effectively improve system performance while saving on expensive board area. Improvements in reliability can also be realized due to the reduced number of solder joints (by removing the discrete capacitors).

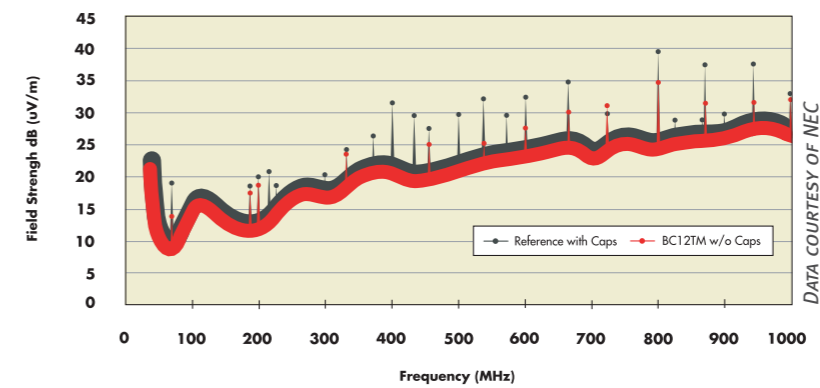
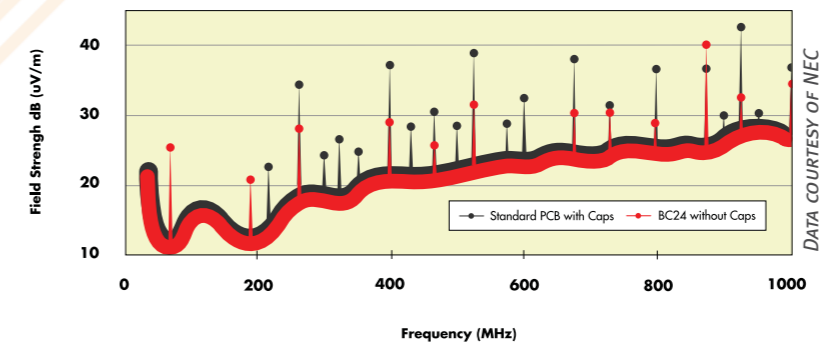
\*BC16T may require sequential processing since it is not self supporting.

THIS CHART PROVIDES THE TYPICAL CHARACTERISTICS FOR THE DIFFERENT PRODUCTS IN THE FARADFLEX® LINE OF CAPACITOR MATERIAL.

PROPERTIES	METHOD	BC24	BC16	BC12	BC8	BC12TM	BC16T
	IPC OR OTHERS						
DIELECTRIC THICKNESS, μ	REFERENCE	24	16	12	8	12	16
Cp@ 1MHz / 1GHz (pF/cm²)	IPC TM-650 2.5.5.3	180/160	250/225	300/270	480/430	700/600	1700/1450
Dk@ 1MHz / 1GHz	IPC TM-650 2.5.5.3	4.4/4.0	4.4/4.0	4.4/4.0	4.4/4.0	10/8.5	30/26
LOSS TANGENT @ 1MHz / 1GHz	IPC TM-650 2.5.5.3	0.015 / 0.02	0.015 / 0.02	0.015 / 0.02	0.016 / 0.21	0.019	0.019/0.035
PEEL STRENGTH, LBS/IN	IPC TM-650 2.4.9	>8	>8	>8	>8	>4	>6
DIELECTRIC STRENGTH, kV/MIL	IPC TM-650 2.5.6.3	7.0+	7.0+	7.0+	7.0+	5.8	2.8
TENSILE STRENGTH, MPA (KPSI)	ASTM D-882A	152 (22.0)	164 (23.8)	194 (28.2)	126 (18.3)	110 (16.0)	NA
ELONGATION, %	ASTM D-882A	18.5	16.5	11.5	8.5	6.0	NA
DECOMPOSITION TEMP. 5% WEIGHT LOSS IN N <sub>2</sub> /O <sub>2</sub>	TGA	390/350	385/345	385/345	380/340	390/345	390/350
BOIL TEST, 2HRS BOIL IN WATER 20 SEC DIP @ 260C SOLDER (10SPEC)	—	PASS	PASS	PASS	PASS	PASS	PASS
THERMAL STRESS (20 SEC FLOAT @ 288C), TIMES	—	>10	>10	>10	>10	>10	>10
MIGRATION, 85C/85%RH/DC 35V	—	>1000	>1000	>1000	>1000	>1000	>1000
FLAMMABILITY/TEMP RATING	UL-94/UL746	VO 130°C	VO 130°C	VO 130°C	VO 125°C	VO 130°C	VO 130°C
PWB PROCESSING	—	BOTH SIDE ETCHING	BOTH SIDE ETCHING	BOTH SIDE ETCHING	BOTH SIDE ETCHING	BOTH SIDE ETCHING	SEQUENTIAL LAMINATION

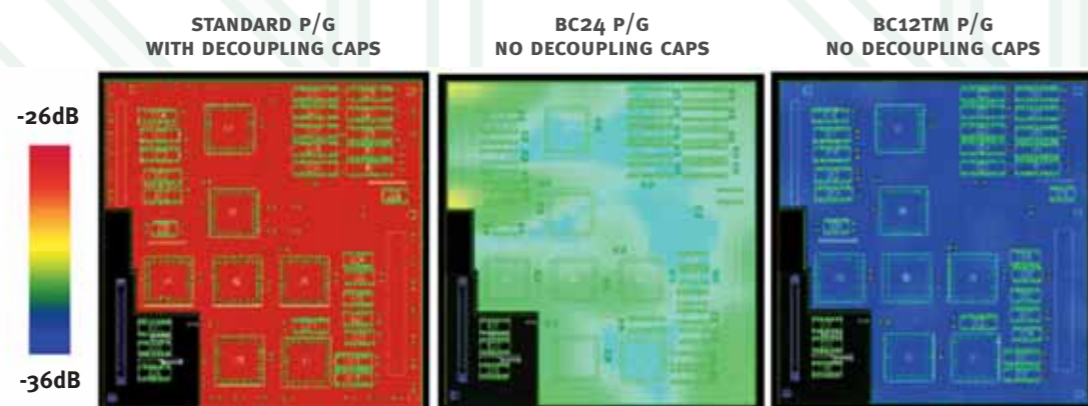
NA = Not Applicable

FARADFLEX® IS ALSO HIGHLY EFFECTIVE AT REDUCING EMI





FARADFLEX® GREATLY REDUCES POWER BUSS NOISE  
AND ELIMINATES THE NEED FOR MANY DECOUPLING CAPACITORS.



DEVELOPED BY NEC  
SIMULATION PROVIDED BY TECHDREAM, INC.

## SUMMARY OF FEATURES AND BENEFITS

### BENEFITS OF BURIED CAPACITANCE™

- » Improved Power Distribution System
- » Reduction in Discrete Capacitors and Associated Assembly Costs
- » Reduced PCB size and/or increased functionality
- » Reduced Board thickness
- » Reduced Shielding Requirements (due to lower EMI)
- » Improved Reliability (due to less solder welds)
- » Simplified Routing due to reduction in traces and vias

### FEATURES OF FARADFLEX®

- » Highest Capacitance Density and Thinnest Products Available
- » Robust Product that is Compatible with Standard PCB Processes
- » 100% High Potential (Hi-Pot) Tested
- » Compatible with Lead-Free Assembly
- » Largest Variety of Products to Suit Your Applications
- » Tight Tolerance on Capacitor Density with X7R or better TCC
- » Available in Multiple Sizes with Various Copper Weights

To start enjoying the benefits  
of Buried Capacitance™ technology using the  
FaradFlex® line of products, contact Oak-Mitsui Technologies.

[www.oakmitsui.com](http://www.oakmitsui.com) (518) 686-4961 [FaradFlex.Sales@oakmitsui.com](mailto:FaradFlex.Sales@oakmitsui.com)

#### REMARKS

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**OAK-MITSUI TECHNOLOGIES**  
MITSUI KINZOKU CORPORATE GROUP



80 1ST STREET HOOSICK FALLS, NY 12090

[www.oakmitsui.com](http://www.oakmitsui.com) (518) 686-4961 [FaradFlex.Sales@oakmitsui.com](mailto:FaradFlex.Sales@oakmitsui.com)