



Passive Component Reliability Workshop

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Course Summary

The Passive Component Reliability Workshop course will be presented in three sessions covering capacitors, inductors and resistors.

Tantalum & Electrolytic Capacitors (**Dr. Yuri Freeman, Kemet**), MLCC & EMI filters (**John Marshall, AVX**) and SuperCapacitors, Film & Thin film capacitors (**Chris Reynolds, AVX**). Students will gain an understanding of capacitor construction and how performance characteristics are affected by time, temperature, voltage and frequency. End applications are discussed along with reliability expectations, common failure modes and de-rating methods for increased lifetime performance. Processing guidelines are presented and the availability and use of simulation models is shown.

The Inductor performance, reliability and selection session will be taught by (**Scott Harris, Vanguard Electronics**). This course will outline the basics of magnetics from an RF and power inductor and transformers point of view. Material performance, core types and properties along with wire types, winding techniques and patterns are shown relative to their impact upon performance. Reliability predictions and levels are discussed along with a preview of emerging technologies and device simulation techniques.

Resistor theory, performance & reliability will be taught by (**Bryan Yarborough, Vishay**). Resistor types and materials will be discussed relative to component performance. Device characteristics and performance relative to time, temperature, frequency and power are discussed. Heat transfer means and noise characteristics outlined. Reliability expectations and recommended applications are given.



Instructor Bios



Dr. Yuri Freeman is the Director of Advanced Research in the Tantalum (Ta) business unit and a member of the Advanced Technology Group at KEMET Electronics. Dr. Freeman received his PhD in Solid State Physics from Kharkov Technical University in Ukraine. Prior to KEMET, he worked as a principal scientist at Elitan, the largest producer in the Soviet Union of Ta and Niobium (Nb) capacitors, and at Vishay Sprague in the USA. He has published more than 30 papers and received 26 patents in the field of physics and technology of Ta and Nb-based capacitors. He is also the winner of the Anders Gustaf Ekeberg Tantalum Prize, awarded

annually for outstanding contribution to the advancement of the knowledge and understanding of the metallic element tantalum (Ta), for his 2018 book 'Tantalum and Niobium-Based Capacitors'.



John Marshall has been employed by AVX Ltd since April 1983 and based in the Coleraine manufacturing facility in N. Ireland. He has had various responsibilities in the Process Engineering, Production and Quality areas and several years as Manufacturing and Operations manager. He is experienced in all processes for Ceramic capacitor production and engineering from materials to packaging. He spent several periods of secondment in the Asia region between 2002 through to 2018 giving quality and technical support to the AVX Ceramic

Manufacturing operations in Malaysia and China and developing the AVX customer base with particular emphasis on Power supply, Telecommunications and the Automotive industries. From 2011 to 2018, he was responsible for achieving qualification for the Space High Reliability BME technology products with the ESCC, NASA and the D.L.A. (Mil) approvals. Also, through 2017 to 2018, he was directly involved with AVX Penang with responsibility for qualifying the High "CV" technology and bringing it to full production status. He is the ongoing technical liaison on the Space Ceramic Capacitor Development, Materials, Design and process engineering (including manufacture, test and reliability programs) with the various AVX manufacturing plants and planning teams. Mr. Marshall provided customer technical support and design for projects utilizing ceramic BME capacitor products within the U.S.A (and Asia regions) with particular emphasis on the high reliability requirements for the Space and Aerospace market and the ongoing range extension programs with the Automotive customer base. He has published papers and articles in various electronic magazines, and presentations at the ESA conference, USA CMSE sessions and CARTS.



Chris Reynolds is a Technical Manager at AVX Corporation, based in Fountain Inn SC, with over 35 years' experience across many passive component technologies. This has spanned medical and space level R&D designs to automotive and industrial applications, involving embedded, SMT, Through-Hole and Bolt-In capacitor technologies. Chris holds a BSc in Physics from Birmingham University, UK.



Scott Harris is the Director of Sales and Marketing for Vanguard Electronics, a world renown supplier of hi-reliability magnetics. He has extensive experience in magnetics designs as well as material development used in the space and avionics markets. Prior to joining Vanguard, he worked as an Application Engineer and Product Manager for the AVX Hi-Reliability Capacitor group. Scott holds a BSEE from NC State University, is the author of several papers, and currently holds two patents.



Bryan Yarborough is a Product Marketing Engineer for Vishay Dale Electronics. Bryan was a Nuclear Operator in the US Navy for 6 years where he studied electrical and mechanical Engineering topics. After the Navy he received his Bachelors in Computer Science & Mathematics and later an MBA. Bryan worked 6 years in manufacturing and product development for lithium batteries with Saft America and 7 years with IRC as Applications Engineer with their current sense products. Bryan has been with Vishay Dale Electronics for over 4 years where he is responsible for technical customer engagement and Marketing for

Power Metal Strip® current sense resistors.