TDK SPICE Netlist Library

~models for multilayer ceramic capacitors~

TDK-EPC Corporation
Technical Service Center

July, 2014

Type of models

3 types of SPICE models are provided for multilayer ceramic capacitors

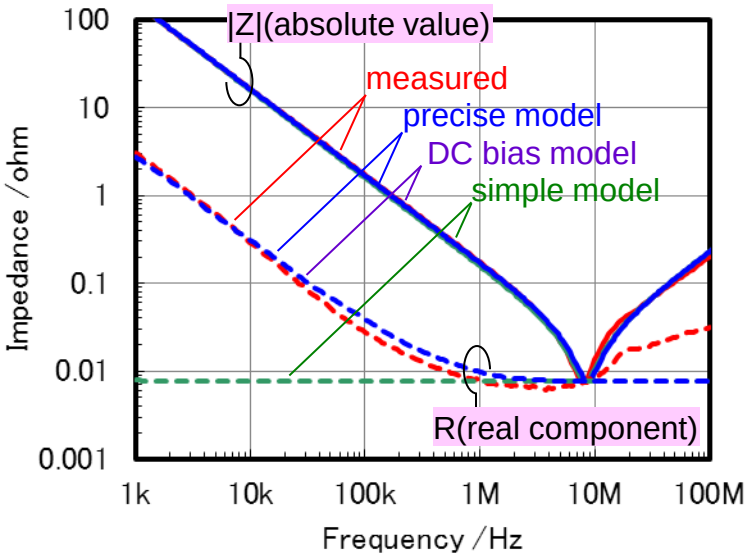
Type of Model	Simple Model	Precise Model	DC Bias Model
Contents of Model	Simple equivalent circuit that models only capacitance, self resonance frequency and equivalent series resistance of an capacitor.	Equivalent circuit model that models the frequency dependence of impedance property of an capacitor.	Equivalent circuit model that can simulate DC bias property of multilayered ceramic capacitors. The frequency dependence of impedance property is modeled, too.
Scope of Products	・temperature compensating type (class1) ・high dielectric type(class2)	・temperature compensating type (class1) ・high dielectric type(class2)	・high dielectric type(class2)

The compared results among those models are shown in the following pages.
Please use an appropriate model according to the purpose of the simulation.

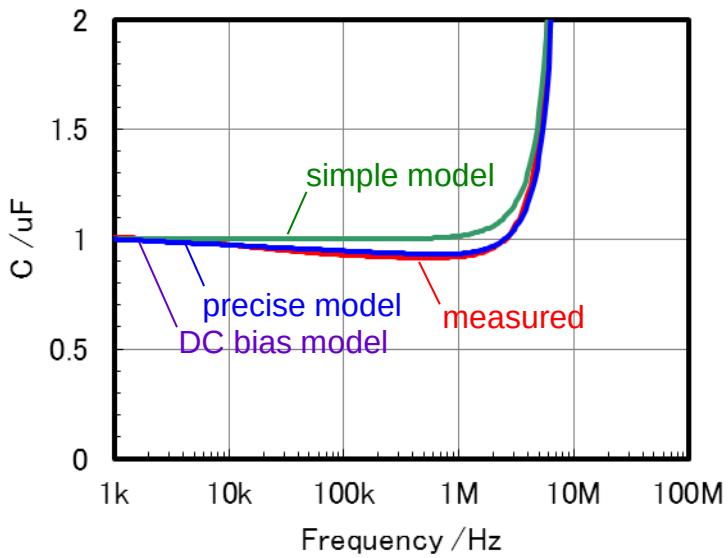
measurement vs. model ~ceramic capacitor~

Part No.: C1005X5R0J105K050BB

frequency dependence of impedance without DC bias voltage



frequency dependence of capacitance without DC bias voltage

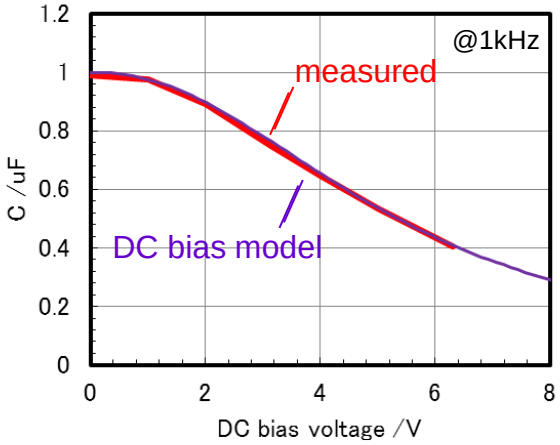


- Regarding |Z|, three models fit with the measured result.
- The **precise model** and the **DC bias model** correspond to the measured R at the frequencies below the self resonant frequency. (In these graphs, the results of the **precise model** is completely the same as that of the **DC bias model**.)
- The **simple model** models R only at the self resonant frequency.
- Use the **precise model** or the **DC bias model** if loss is evaluated.
- The DC bias property is not modeled in the **simple model** and the **precise model**.

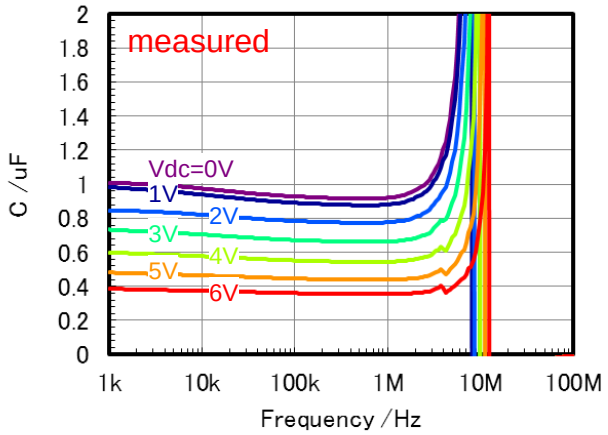
measurement vs. model ~ceramic capacitor~

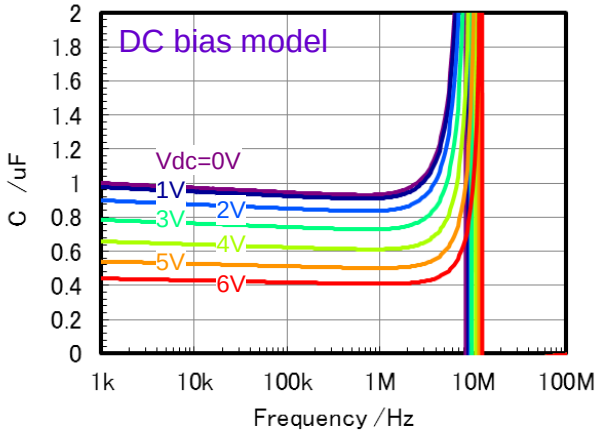
Part No.: C1005X5R0J105K050BB

capacitance vs. DC bias voltage



frequency dependence of capacitance for various values of DC bias voltage





- The change of capacitance by DC bias voltage can be simulated in the **DC bias model**.
- In the **DC bias model**, the frequency dependence of impedance is also modeled.
- Please use the **DC bias model** if the effect of DC bias voltage is considered.

Caution

< Applicable condition >

The parameters in this library are obtained under the condition of 25ºC, no DC bias (excepting the DC superimposition model), and small signal operation. Proper result might not be obtained if your condition is different from the above one.

< Terms and conditions regarding TDK Simulation Models >

(1) This simulation model is being provided solely for informational purposes. Please refer to the specifications of the products in terms of detailed characteristics of such products.

(2) In no event shall TDK Corporation of any of its subsidiaries be liable for any loss or damage arising, directly or indirectly, from any information contained in this simulation model, including, but not limited to loss or damages arising from any inaccuracies, omissions or errors in connection with such information.

(3) Any and all copyrights on this simulation model are owned by TDK-EPC Corporation. Duplication or redistribution of this simulation model without prior written permission from TDK-EPC Corporation is prohibited.

(4) This simulation model is subject to any modification or change without any prior notice.

(5) Neither TDK Corporation nor any of its subsidiaries shall make any warranty, express or implied, including but not limited to the correctness, implied warranties of merchantability and fitness for a particular purpose with respect to this simulation models.

(6) The use of this simulation model shall be deemed to have consented to the terms and conditions hereof.


TDK