

# Device Modeling Report

COMPONENTS: CAPACITOR/CERAMIC  
PART NUMBER: DE1E3KX102MA5B  
MANUFACTURER: MURATA  
REMARK: TA=60C



**Bee Technologies Inc.**

## Theory: Auto Balancing Bridge Method

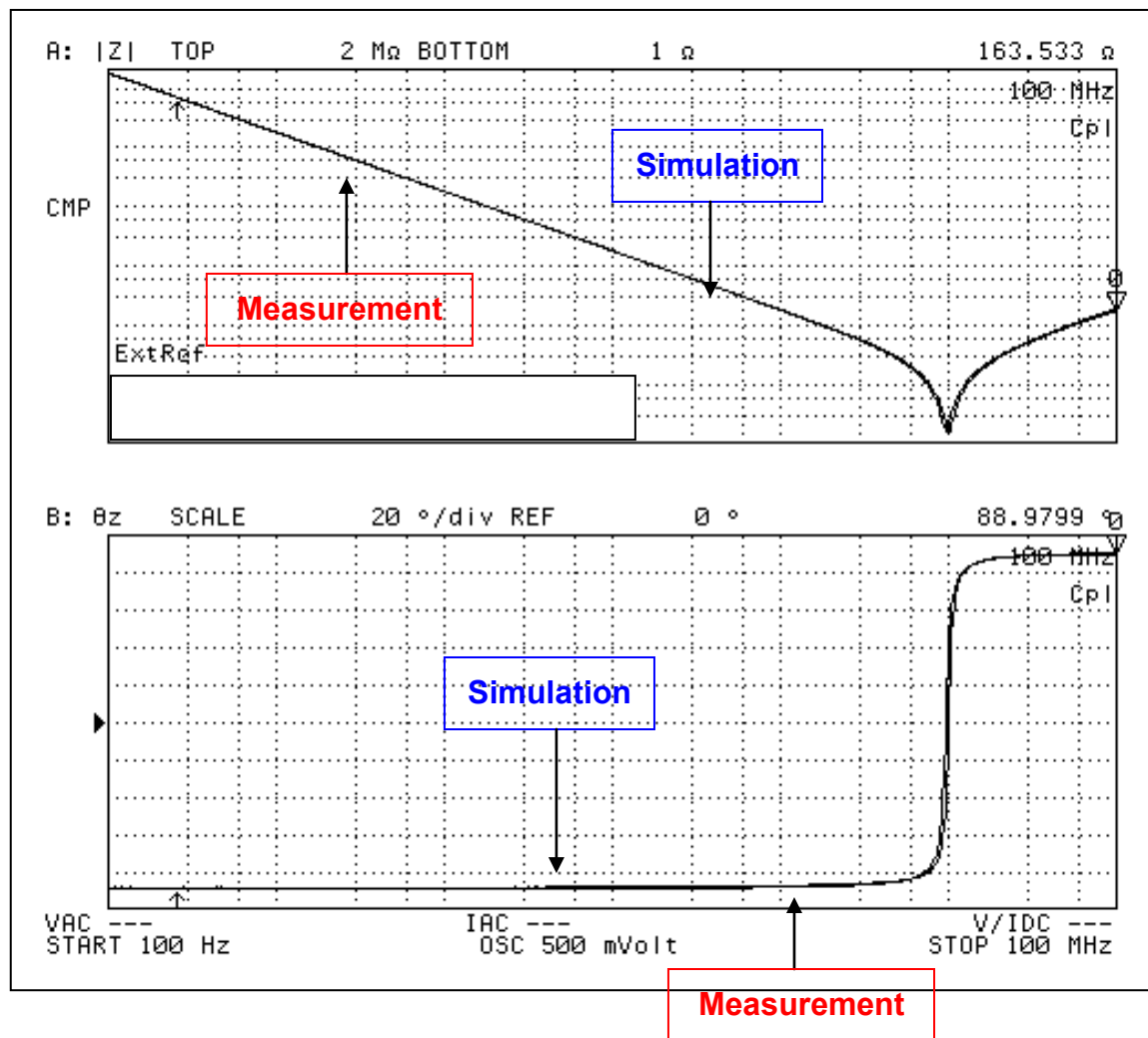
### Optimization of Simulation

Range of adjustment Frequency: 100Hz to 100M(Hz)

Frequency vs.  $|Z|$  and Frequency vs.  $\theta_z$  Characteristic

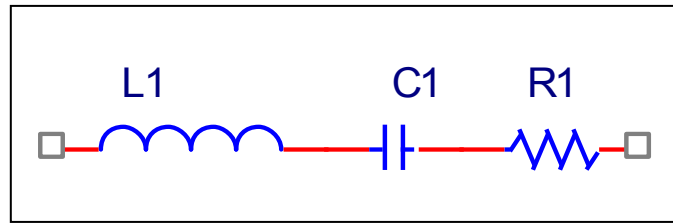
Attention)

*Please use SPICE MODEL within the range from 100Hz to 100M(Hz)*



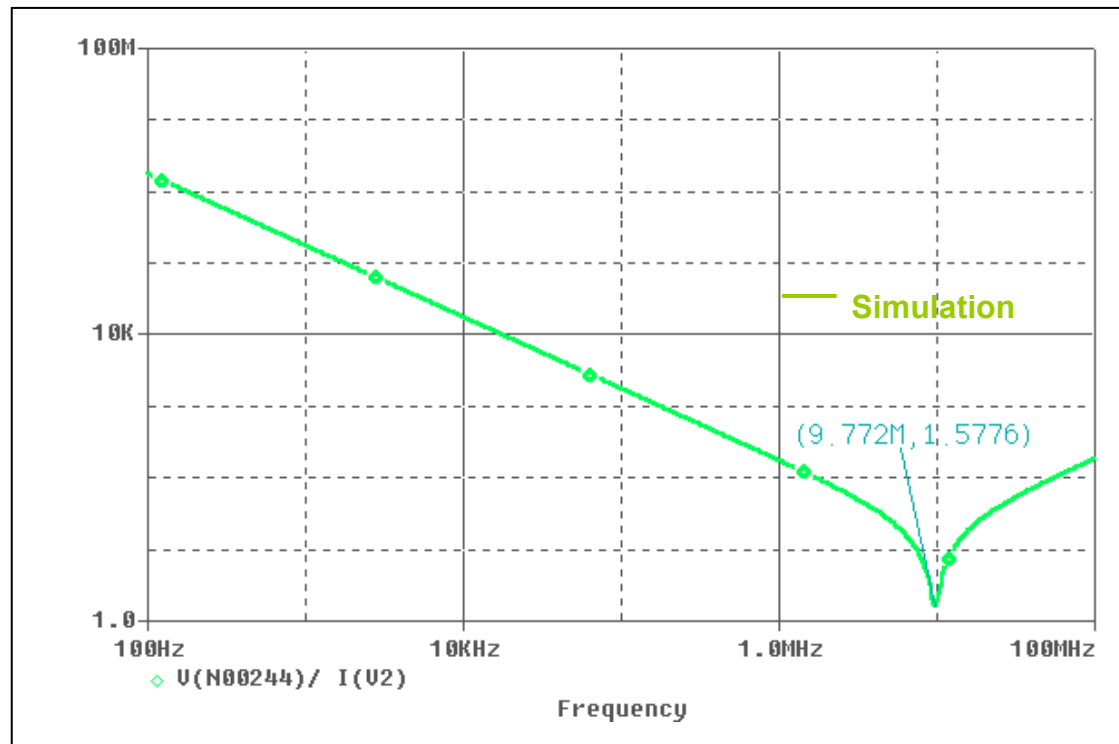
|    |  |
|----|--|
| L1 |  |
| C1 |  |
| R1 |  |

Equivalent circuit

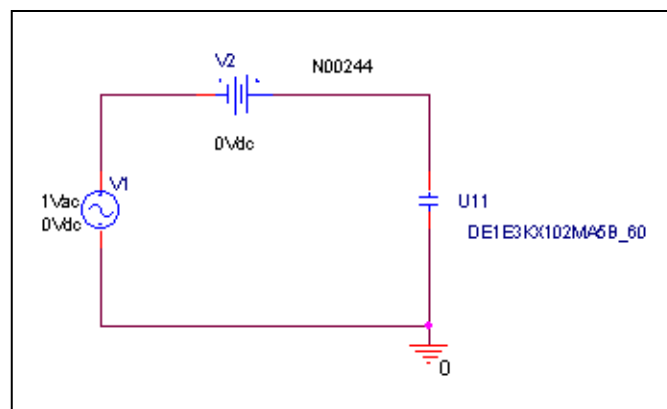


## Frequency vs. |Z| Characteristic

### Circuit Simulation result



### Evaluation Circuit



**Simulation result**

| <b>Frequency<br/>(Hz)</b> | <b>IZI (ohm)<br/>:Measurement</b> | <b>IZI (ohm)<br/>:Simulation</b> | <b>% Error</b> |
|---------------------------|-----------------------------------|----------------------------------|----------------|
| 100                       | 1.72456M                          | 1.7677M                          | 2.5015         |
| 1K                        | 173.345K                          | 176.769K                         | 1.9753         |
| 10K                       | 17.4308K                          | 17.677K                          | 1.4124         |
| 100K                      | 1.76312K                          | 1.7675K                          | 0.2484         |
| 1M                        | 177.486                           | 174.927                          | 1.4418         |
| 10M                       | 1.61573                           | 1.7946                           | 11.0705        |
| 100M                      | 163.562                           | 183.173                          | 11.9899        |

|                  | <b>Measurement</b> | <b>Simulation</b> | <b>%Error</b> |
|------------------|--------------------|-------------------|---------------|
| <b>FSRF(Hz)</b>  | 10.2329M           | 9.772M            | 4.5041        |
| <b>IZI (ohm)</b> | 1.53882            | 1.57600           | -2.4161       |