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## EMI Suppression for DC Motors using X2Y Integrated Passive Components

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6. Housing Design



### 1. Introduction

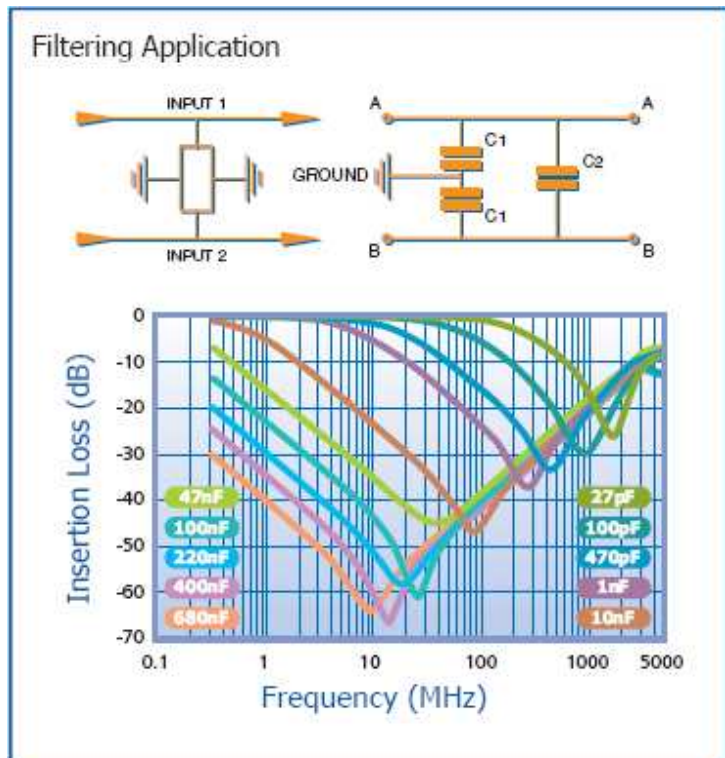
X2Y products are integrated passive components which are manufactured by Syfer Technology Ltd under license from X2Y Attenuators LLC. For unbalanced applications they provide ultra low ESL (equivalent series inductance) and are capable of replacing two or more conventional devices. In order to achieve the ultimate filtering performance the guidelines laid out below should be considered. Syfer's X2Y range can be found at [http://www.syfer.com/category\\_docs/filtsmx2y.pdf](http://www.syfer.com/category_docs/filtsmx2y.pdf)

### 2. Product Selection

When selecting an X2Y component for use in a DC motor the first thing to consider is the filtering frequency requirement. Generally for motors the higher capacitance values are most suitable.

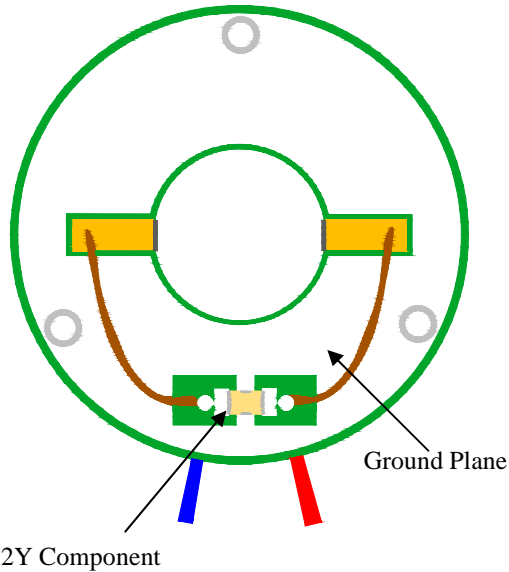
The graph to the right shows the insertion loss characteristics for X2Y product, one consideration is the frequency at which the maximum performance is required.

MLCCs are susceptible to mechanical cracking generally as a result of poor processing during the PCB assembly process. Bending of the PCB post population is the most common cause. Because of this issue Flexicap™ Termination is recommended for capacitors used in motor applications. Flexicap™ is a polymer based termination material which is flexible and absorbs some of the mechanical stress which may otherwise be exerted on the ceramic component of the capacitor. Good process control is still required to completely prevent the occurrence of mechanical cracking.



### 3. Grounding

The grounding of the X2Y component is very important to the functionality; both ground terminations must be soldered and the ground should be continuous, as large as possible and connected to the motor housing at multiple points.



### 4. Placement

The ideal placement for the component is between and near to the power lines, and as close to the exit point of the casing as possible. This reduces the incidence of radiated noise being coupled back on to the lines and carried out of the casing.

### 5. Lead Lengths

Lead lengths both to the brushes and to the X2Y component should be kept as short as possible. This will reduce the impedance of the path to ground for the noise and will also reduce the incidence of radiated noise being coupled back on to the lines and carried out of the casing. The track to the solder tabs should also be as short and as wide as is practical.

### 6. Housing Design

- The motor housing and end cap should ideally be constructed from metal as they act as a Faraday cage. In the event that this is not possible then maximum metallization should be used.
- The ventilation slots should be round in shape, not rectangular, and be positioned away from the vicinity of the brushes; this restricts the radiation of noise from the brushes.
- The power leads should exit the motor housing in close proximity to each other.

