X2Y as an EMI filter for brushed DC motor

1) Introduction

The X2Y component is a very effective way to reduce the noise generated by a brushed-DC motor. However, EMC is a vast subject and this two-page document does obviously not represent an EMC solution. It is just an example of implementation of EMI filter on power leads of a brushed-DC motor.

2) Guidelines (diagrams in the next page)

- The X2Y component should be chosen so that its voltage rating is higher than the maximum voltage between each power lead and reference, which may be significantly higher than the DC motor power supply (due to back EMF). On the other hand, the DC current will not affect the X2Y component because it is in shunt.

- The capacitance value of the X2Y should be high enough to obtain the desired rejections at low frequencies, but low enough so that the PWM signal is not attenuated by the X2Y. Please feel free to contact us about this.

- If possible, the X2Y component should be placed right in-between the two power leads, at the entry point of the motor housing.

- The contact between the 'ground plane' of the PCB and the motor housing should be as good as possible to allow the best connection (with the least amount of resistance). A Copper tape or equivalent should be soldered to PCB reference plane PCB and to motor housing (chassis), so that the radiated emissions are confined within the motor and PCB assembly.

- There should be a continuous (unbroken) trace going underneath the component from G1 to G2. A one-layer or two-layer PCB may be used (the example in the next paragraph shows a two-layer PCB).

- The terminals A and B (end-terminations) should be attached to their respective via with short and wide traces to minimize inductance.

- Power leads should go through vias that are connected to A and B so all transients have to propagate through the X2Y component.

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3) Diagrams (not to scale)