



Solutions for Minimizing EMI/RFI Interference in Connected Appliances

BY KATE GLUCK

Nowadays, appliances do it all. They've become centerpieces for kitchens, function as entertainment centers and even connect to virtual assistants. Yet, the sensitive electronic components that power the interconnected and improved user experience of these devices are also increasingly susceptible to the challenges associated with Electromagnetic interference (EMI) and radio frequency interference (RFI).

Without proper shielding and grounding, EMI and RFI can compromise performance by distorting and delaying data. Left unchecked, the interference will cause EMI noise and crosstalk, leading to a low signal-to-noise ratio, poor signals, higher error rates, and slower communication

speeds. Higher frequencies, electronic components in closer proximity, and increasingly complex products compound the challenge. The good news is that in many cases all of this can be addressed with a piece of custom die-cut specialty tape.

Trends Driving EMI/RFI

Before diving into the solutions, it is important to highlight why they are needed in the first place.

Key among the trends driving the need for increased shielding and grounding is the proliferation of 4G and 5G networks and Human Machine Interface (HMI). Data speeds are increasing and components must be able to operate at higher frequencies and with lower operating voltages. Also, as Internet of Things (IoT)

technology is being integrated into new energy-consuming devices, more devices are creating interference and affecting nearby electronics.

All of this has created a myriad of benefits for consumers and a wealth of design challenges for engineers. EMI/RFI applications often have unknown issues that come up in the prototyping phase that can derail product launch timelines if a full electrical redesign is needed. Electrical designs have to meet Electromagnetic Compatibility (EMC) to ensure they don't interfere with nearby electronics.

Solutions to Minimize Interference

Rather than embark on a full electrical system overhaul, many engineers are turning to die-cut 3M tapes. A far cry from the average tape,

3M electrically conductive tapes, films, and adhesives are formulated to minimize EMI noise and crosstalk and help provide EMI protection from a wide range of frequencies. JBC Technologies can convert these tapes to the specific size, shape, and configuration that you need to solve your unique challenge.

Technical applications for die-cut 3M Electrically Conductive Tapes & Films include:

- Electrostatic discharge (ESD)
- Shield-can lid
- Bond line gap shielding
- PCB/flex/chassis grounding
- EMI shield and gasket attachment
- Electrical connectivity to medium pitch flexible circuits and PCBs
- Flex circuit to flex circuit interconnection
- Passive intermodulation (PIM) management

Factors to Consider

All EMI/RFI problems have a source, a path and a receiver. The culprits (sources) are the high frequency digital electronics that appliance consumers know and love. The victims (receivers) are the sensitive analog circuits and sensors. The path is all the space in between.

The job of the tape is to block the path, so that both source and receiver can function as intended. This starts at the bond line. Even if it's microscopic, if there is a gap between the two materials at the bond line, EMI energy can escape. This is where the conductive filler type comes into play.

Particle density is also of significant

importance. Because electromagnetic interference can be attributed to radio waves and microwaves, not all devices function at the same frequency, nor do they need to shield from the same frequency. 3M™ Electrically Conductive Tapes are available with varying levels of conductive particle density to accommodate different frequency requirements. A helpful rule of thumb is that the higher the density of conductive particles the harder it is for high frequencies (shorter wavelengths) to get through the spaces between particles.

Selecting The Right 3M EMI Tape

Due to the complexities involved, selecting the right tape usually requires the help of an expert. Below, we list 10 basic questions to help you narrow down which die-cut 3M Electrically Conductive Tapes & Films will work best for your application

1. Are you trying to provide EMI shielding, grounding, or both?
2. What is your contact/ electrical resistance (R) target?
3. What are the substrates you'll be applying the tape to?
4. What is the bond line gap thickness?
5. What is the primary frequency of interest? / What level of shielding performance (db) do you need?
6. Does your application require a Z or XYZ conductivity path?
7. What operating temperature range, environmental conditions, and chemicals will your product be subject to?
8. What is the grounding area size?
9. What is your desired adhesion level?
10. Where and how will the tape be applied?

Converting Rolls of Tape Into Finished Parts

As effective as the 3M tapes and films are, they are even more effective when cut to the size and shape needed for your particular application. A 3M Preferred Converter, JBC Technologies has over 30 years of experience converting flexible materials. We use techniques like high-speed slitting, laminating, and rotary and flat-bed die-cutting to transform electrically conductive tapes and other materials into custom parts that solve our customers' unique challenges. We strive to add value at every stage, from materials selection and product design support to value analysis/ value engineering.

Examples of part presentations we can provide for EMI/RFI shielding tapes include: Slit to custom widths, kiss cut to a liner, island placed on a liner, pull tabs for ease of assembly through cut, and even adhered to customer supplied parts. ●



Kate Gluck is the Vice President of Business Development for JBC Technologies. Prior to this Kate was JBC's Director of Sales and Marketing and was responsible for all of the company's sales and marketing operations, including end-to-end management of JBC's online presence and advertising, estimating and sales activities, and service and support in all markets. Kate's current mission is to partner with industry experts and leading suppliers to uncover new opportunities for profitable, sustainable growth for JBC's custom and branded products.



Courtesy of 3M

