



Application Note:

**Lead Trimming and Hand Soldering
Guidelines for VPT DC-DC Converters**

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INTRODUCTION

VPT's DV Series hybrid thick-film DC-DC Converters and EMI Filters (hereafter referred to as "product(s)") are hermetically sealed to keep moisture and/or contaminants from entering the package cavity. Products of this type use a solder seal, projection weld, or seam weld process to create the hermetic seal between the lid and the package body. Depending on lead (pin) diameter/length and package configuration, products of this type will use either a compression glass or brazed ceramic disc to create a hermetic seal between the lead and package body. This glass or ceramic seal also serves the dual purpose of electrically isolating the lead from the package body.

VPT's products use uniform lead lengths across all standard product families. Customers may request a specific lead length as a paid custom modification. However, it is often more efficient to save cost and time by ordering a standard product and trimming the leads in-house.

VPT's products can be mounted and connected in customer's systems in many different configurations with various processes. The most popular and well controlled soldering methods for PCB attachment is wave soldering. In many systems, however, this is not a viable option because of limiting configurations, resources, or hard wiring. This

usually leaves hand soldering using a soldering iron, hot air system, or other method as the best option.

This document details the proper processes for trimming leads and hand soldering products into systems and applications while ensuring product safety and maintaining functional integrity.

LEAD TRIMMING

The lead trimming process, if not performed correctly, can either bend the leads at unacceptable angles or damage the glass or ceramic seals. Seal damage can cause chip-out or micro-cracking, which can result in a loss of hermeticity. VPT performs 100% external visual inspection and leak testing after trimming leads for purchase order requirements to verify that the leads and seals have not been damaged as part of the trimming process. It is strongly suggested that customers do the same when performing these operations in-house. Micro-cracks are undetectable by the naked eye and require a visual test under high magnification. MIL-STD-883, Test Method 2009 specifies the proper visual inspection criteria to be used when determining acceptable bent lead angles or cracking, crazing, or chip-out of the glass or ceramic seals after trimming. Leads trimmed by the customer should always be trimmed to length before insertion, attachment, or soldering into the application.

VPT recommends the following process when trimming leads:

1. **Create a trimming fixture.** One trimming block should be created for each type of VPT product used. It should be the same thickness as the desired final length of the lead and should be manufactured from aluminum or other similarly rigid, inexpensive, easily drilled and machined material. Holes should be drilled in the block in the locations for all pins of the product to be trimmed. These holes should be slightly larger than the pin diameter (approximately 0.010 to 0.020 inches) to guard against the scraping or bending of the leads during insertion and removal. The lead dimensions and locations are detailed in the product's corresponding datasheet located at www.vpt-inc.com/datasheets.

2. **Insertion into the trimming fixture.** The product should be inserted straight down over the pins until it sits flat on the trimming fixture, ensuring only the lead length to be trimmed, or waste area, is visible from the other side. See Figure 1.

3. **Position correctly.** The trimming block and product should be placed upside down, with pins up, on a firm, ESD-safe surface that will keep the product and fixture from sliding. High quality flush cutters should be used to trim the leads even with the surface of the trimming block. See Figure 2.

4. **Test for success.** After lead trimming is completed, VPT recommends that customers measure the final lead lengths with calipers. VPT also recommends a visual inspection and leak test to verify that the product remains undamaged after the trimming process.

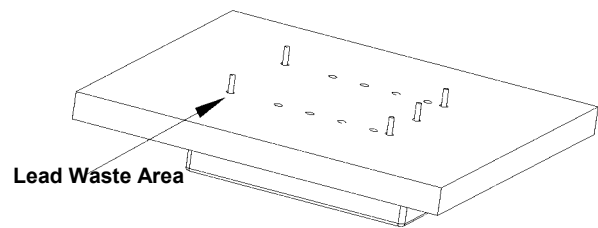


Figure 2

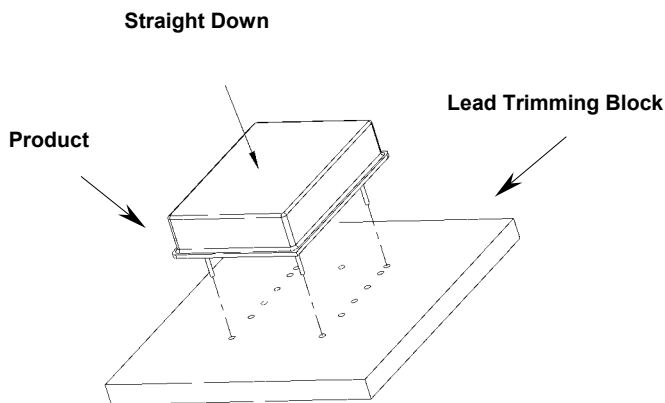


Figure 1

HAND SOLDERING

At **no time** during soldering operations should any VPT product or pin be exposed to 270°C or higher for more than 10 seconds. This can melt solder inside of the unit, causing internal solder joint and attachment failures. VPT performs 100% external visual inspection and electrical verification testing after hand soldering operations to verify that the leads and internal components have not been damaged as part of the process. It is strongly suggested that customers do the same when performing any hand soldering process.

VPT recommends customers follow these steps when hand soldering products into application PCBs and systems:

1. **Careful insertion.** Insert the unit into the application PCB. Be sure to place the product straight into the mounting holes to prevent bent leads or seal damage.
2. **Pre-heating.** Heat the area around the lead to be soldered (PCB pad, plane, relief, etc.) with a high quality, heat-controlled soldering iron. Ensure that no contact is made with the lead itself. Wire solder (electronic grade with a non-corrosive - RMA, no-clean, etc. - flux core) should be held to the area (not the tip of the soldering iron) until it starts to melt and can be moved over the pad with the soldering iron. It is helpful to pre-tin the solder pads before the product is installed to help with solder transfer.
3. **Applying solder to the leads.** As soon as the solder starts to melt, move the soldering iron into contact with the lead (while maintaining contact with the solder pad), add enough solder to complete the joint, and remove.
4. **Troubleshooting.** If the soldering iron must stay in contact with the PCB solder pad for more than 5-7 seconds to ensure melting, the board may be too thick, have solder pads that are too large, or simply need more heat for soldering. In this case the board may need to be pre-heated before soldering to ensure that the soldering iron can achieve solder melt temperature quickly enough.
5. **Test for success.** After soldering is completed, VPT recommends that customers perform a visual inspection to verify solder joint acceptability and attachment to the PCB. Remaining flux from the soldering operation should be cleaned per the customer's normal process. VPT's products are resistant to cleaning solvents.

CONCLUSION

VPT's DV Series hybrid thick-film DC-DC converters and EMI filters are reliable and robust products which perform well under system level electrical and mechanical stresses when handled and installed correctly. Proper testing after customer lead trimming or soldering will ensure that the products have not been damaged during these operations.

ADDITIONAL INFORMATION

For additional information on lead trimming and hand soldering, or to learn about VPT's products and services, contact VPT at 425.487.4850 or sales@vpt.com. Or, visit VPT at www.vpt-inc.com.