WESTCODE
An IXYS Company

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Application note for device mounting instructions

Introduction

This document outlines the minimum mounting conditions for Westcode high power press-pack diodes, thyristors, GTO's and IGBT's.

Recommendations for interface properties

The interfaces to the device pole faces (either heatsink or busbar) must conduct both thermal and electrical energy from the device. It is important that these interfaces maintain a stable contact throughout the lifetime of the equipment to ensure reliable operation of the device. Both the surface geometry and finish are important factors to consider.

Surface roughness

The surface roughness is a measure of the microstructure of the surface and is expressed as a R_a value as per BS EN ISO 4287:1998+A1 2009. Prior to heatsink preparation a surface roughness, $R_a \leq 1.6\mu m$ for all contact surfaces is recommended.

Surface flatness

Flatness is a measure of the net variation of a surface defined by two parallel planes. A flatness of 30µm is required for thyristors, diodes and GTO's and 10µm for IGBT's for all interface surfaces within the clamping structure and clamp force range specified in the device data sheet.

Note 1: The flatness of an IGBT greater than that specified in the clamped condition may be seen prior to the device being clamped. This is due to differential thermal expansion of the housing components post manufacture and in no way reflects or impacts the device flatness once it is clamped to the nominal force.

Note 2: The stack components must only deflect elastically. A flatness greater than the maximum specified may result if plastic deformation of the contact surfaces (such as cooler collapse) occurs under loading.

Westcode recommends the use of Fuji Prescale film; see www.fujifilm-prescale.eu or a similar film product to confirm the pressure uniformity of the mechanical design of the assembly. The film is manufactured in a number of different pressure ranges and should be inserted between the device contact face and the cooler or heatsink. A good pressure distribution and a non-uniform pressure distribution are shown in figures 1 and 2 respectively.

Figure 1: Example of good pressure distribution

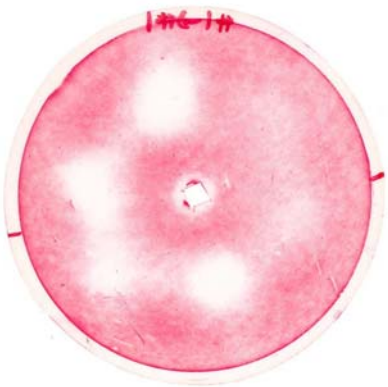


Figure 2: Example of poor pressure distribution

Surface finish

In order to maintain a good electrical connection and avoid corrosion over time, Westcode recommends that all non-aluminium contact surfaces be nickel-plated. Chemical plating is preferable to electroplating in high reliability applications. Plating depth should be 4-6µm in accordance with that applied to the device.

Surface preparation prior to assembly

All contact surfaces should be clean and dry prior to assembly. If necessary all non-plated contact surfaces should be lightly abraded to remove oxide films with a rotary wire brush using a suitable contact grease to form a slurry or alternatively polished using 3M Scotchbright™ or a similar product. Note that the slurry produced by the abrasion should be left on the contact surface until the device is ready to be mounted (to prevent re-oxidation). The contact surfaces should then be cleaned using ethanol or similar solvent and a lint free cloth. Lint free gloves should be worn when handling prepared parts. A very thin film of suitable mounting grease, such as Jetlube SCX13 (Westcode part number XSGSCX13) should be applied to the device. When the device has been clamped to full load a small bead approximately 0.1mm in diameter should be squeezed out from between the contact surfaces.

Pictures of the surface preparation process are shown in appendix 1.

Mounting Force, F_M

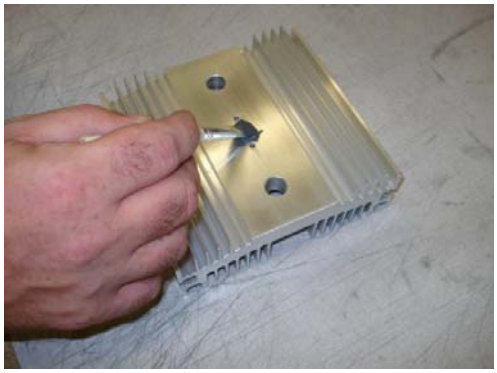
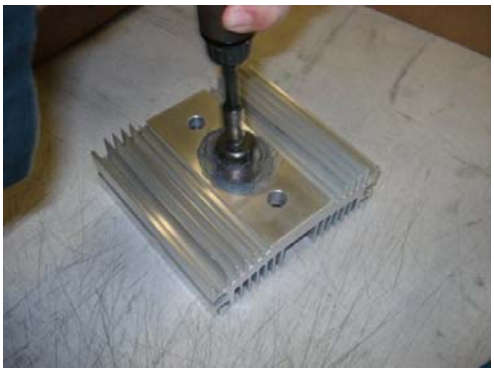
The mounting force, F_M is the recommended force to be applied for optimal device performance. The data sheet ratings are not guaranteed if the mounting force is lower than that specified in the data sheet. The thermal impedance and the on-state voltage drop will increase, and the short circuit current rating will decrease when the force is reduced below the rated value.

Too high a mounting force could reduce the load cycling capability. The mounting force must be uniformly applied across the whole area of the pole face, this is particularly important for press-pack IGBT's. Variations in contact pressure of more than 10% across the pole face are not permitted.

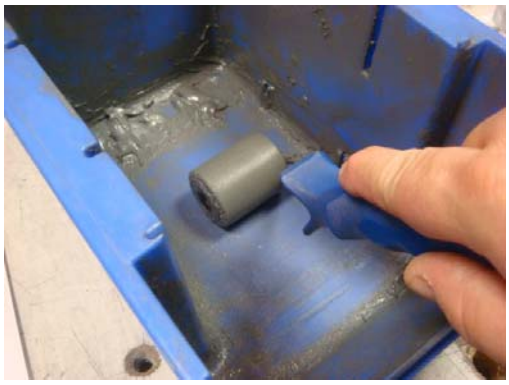
Application support

A full range of clamps, coolers and other assembly parts are available from Westcode. Please contact your local distributor, Area Sales Manager or the factory direct for more information.

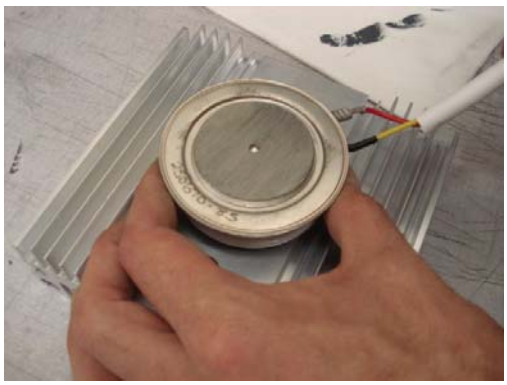
Appendix 1

Load the brush with a small amount of Jetlube SCX 13.	
Apply the grease to the heatsink close to the spirol pin as shown.	
An air operated rotary wire brush is used to abrade the paste onto the heatsink.	
Note that the rotary wire brush must be replaced when the bristles are too short.	

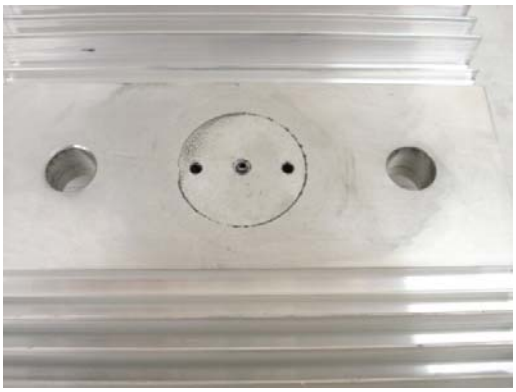
Appendix 1 (continued)

These bristles are of an acceptable length.	
Leave the heatsink slurried with the thermal grease until the device is ready to be mounted. When ready to mount the devices remove the paste with a lint free tissue as shown.	
The heatsink mounting surface should appear lightly abraded as shown.	
Apply a small amount of thermal grease to a roller as shown.	

Appendix 1 (continued)

Apply a small amount of thermal grease to the device anode and cathode contact surfaces. Ensure that no debris or hairs are left on the contact surface.	
The contact surface should have a thin film of grease applied to the surface as shown.	
Place the device onto the heatsink.	
Note that a small amount of grease should be squeezed out of the device/ heatsink joint when the clamp is tightened. Excessive grease will cause a high volt drop across the joint and affect heat transfer. The bead of grease should be no more than 0.1mm.	

Appendix 1 (continued)

Heatsink after the device was removed to show the bead of thermal grease that has been squeezed out of the contact area when the pressure was applied.	
Close up of the device mounting area after the device was removed. The bead of grease is no more than 0.1mm in diameter.