SENSITRON
SEMICONDUCTOR

ASSEMBLY AND SOLDERING INFORMATION FOR *SHD SERIES* SURFACE MOUNT DEVICES

SCOPE:

This document contains recommended procedures and pad sizes for soldering surface mountable SHD-1, 1B, SHD-2, 2B, SHD-3, 3A, 3B, SHD-4, 4A, 4B, SHD-5, 5A, 5B, and SHD 6 packages to printed circuit boards.

MOUNTING:

All of Sensitron's ***SHD Series*** surface mount devices can be attached to common PCB or thermally enhanced boards using conventional surface mount attachment methods.

Because of the superior power handling capabilities of the ***SHD Series*** devices, the user will have to take care of designing the boards in such a manner to utilize the full capacity of our product. Increased trace thickness and trace widths for current and thermal conductivity interfaces will have to be considered in the design of the boards.

ATTACHMENT TO PC BOARDS AND SUBSTRATES:

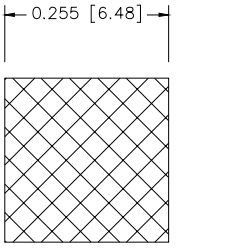
The circuit designer will have to choose a PCB material that will be rated for the system temperature-operating envelope. If the system is strictly a commercial product that operates in the -20°C to +85°C range, the use of the ***SHD Series*** with a typical FR4 type board is sufficient. The usage even up to +115°C have been use successful.

The use of the product in the industrial temperature range of -40°C to +125°C range, then care should be taken as to choose a board material with a lower coefficient of thermal expansion to increase long term reliability.

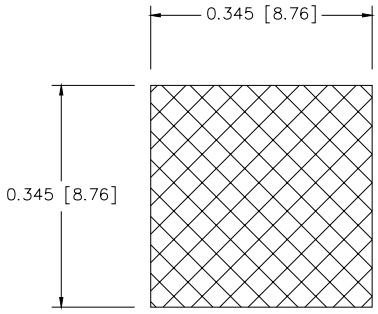
Of course the use of the product where the temperature extremes are –55°C to +150°C (Aerospace/Military) is what the ***SHD Series*** was designed for. In these cases a ceramic insert section such as DBC Alumina can be used. This is one example and is not intended to exhaust all the possible attachment materials. Other techniques of controlling the thermal expansion of the board material have also been utilized over the many years the SHD line has been in production.

CIRCUIT BOARD LAYOUT RECOMMENDATIONS:

The metallized "pad" or "land area" on the end user's circuitry must be properly designed. Improper dimensioning or spacing of the land areas may result in poor solder fillets or "tombstoning" The following drawings illustrate the recommended pad dimensions for the SHD product line. Good land design will depend on the end user's application.



EXPOSED
LAND PATTERN RECOMMENDATION
SHD 1



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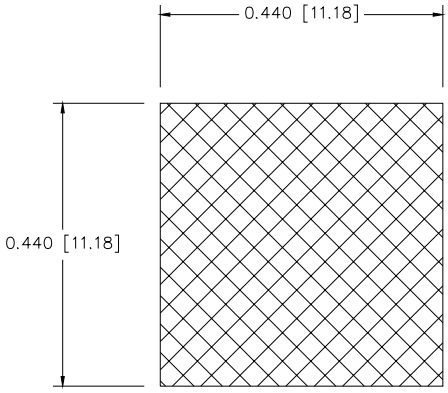
SHD 2



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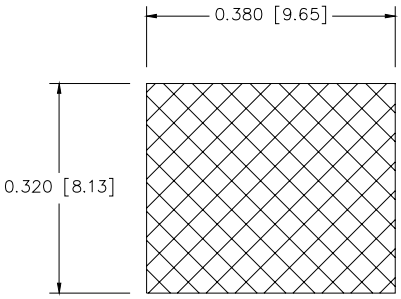
SHD 3



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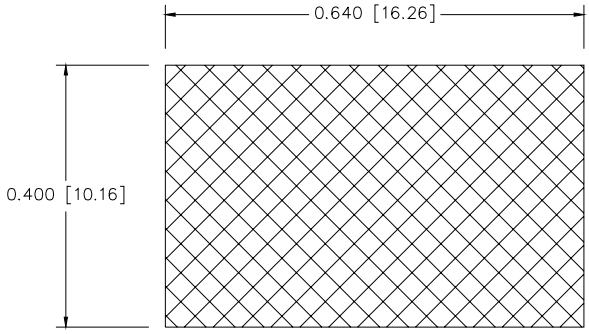
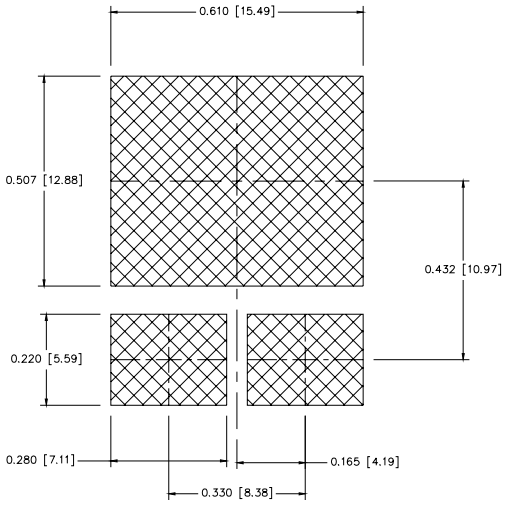
SHD 4



EXPOSED
LAND PATTERN RECOMMENDATION
SHD 5

SHD Series

SHD 1
SHD 2
SHD 3
SHD 4
SHD 5
SHD 6



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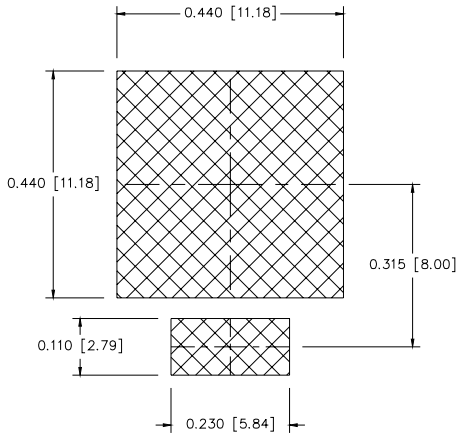
SHD 6



EXPOSED
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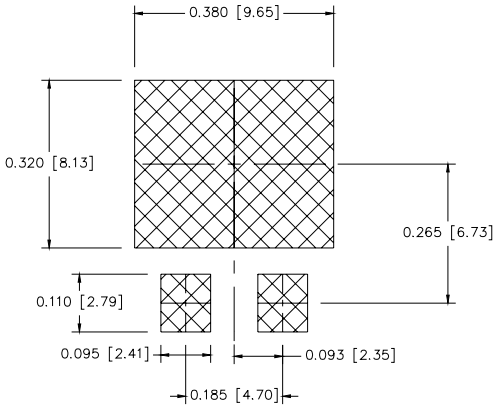
SHD 3A

SHD Series

SHD 3A
SHD 4A
SHD 5A



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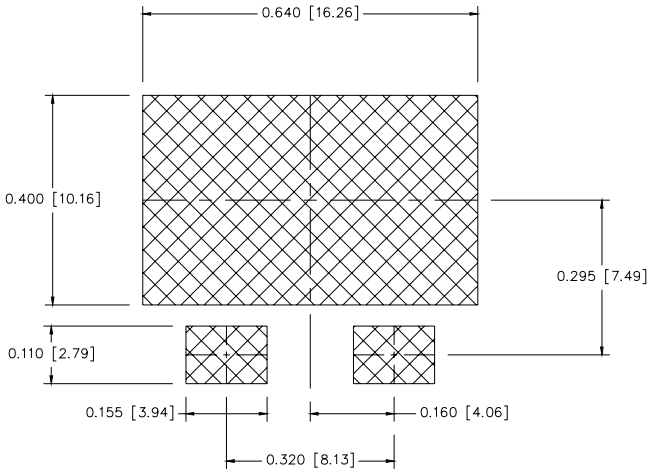
SHD 4A



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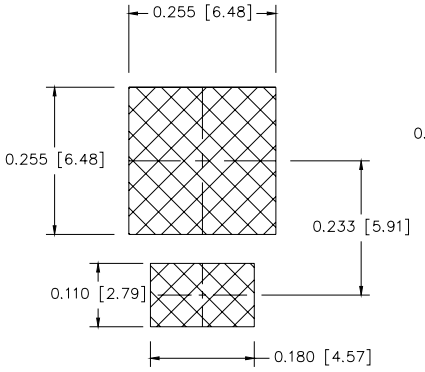
SHD 5A



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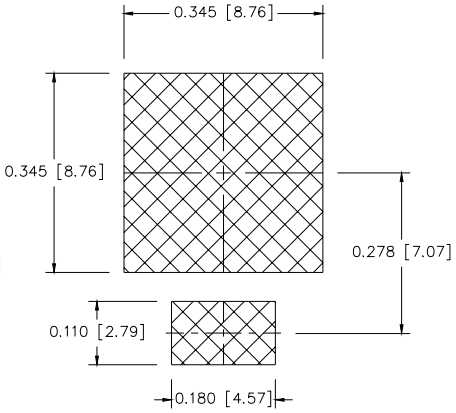
SHD 1B



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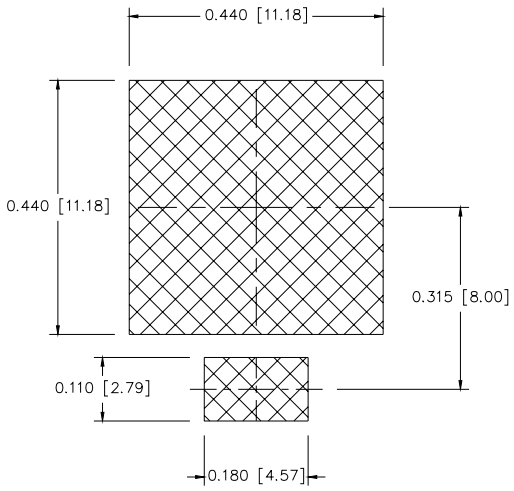
SHD 2B



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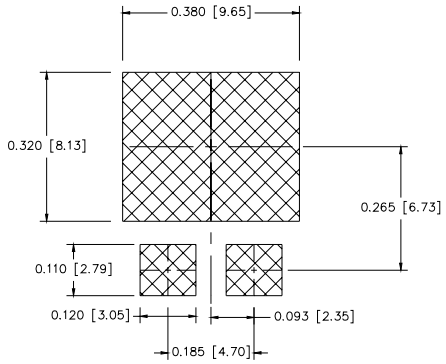
SHD 3B



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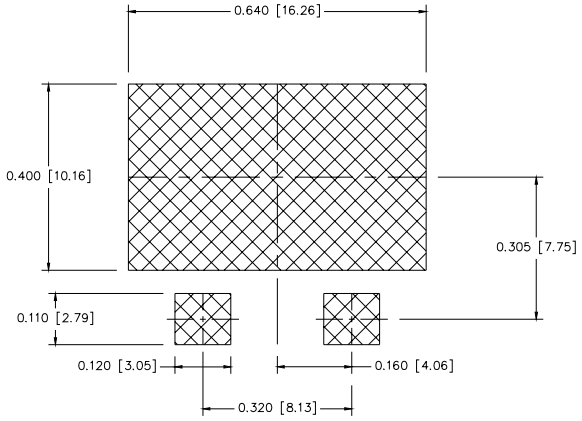
SHD 4B



EXPOSED
LAND PATTERN RECOMMENDATION
SHD 5B

SHD Series

SHD 1B
SHD 2B
SHD 3B
SHD 4B
SHD 5B

SHD AND PCB/SUBSTRATE PREPARATION:

It is recommended that both SHD and substrate be pre-tinned by some means prior to reflow attachment. Standard SHD devices are pre-tinned as a normal process. Consult factory for other finishes.

REFLOW ATTACHMENT :

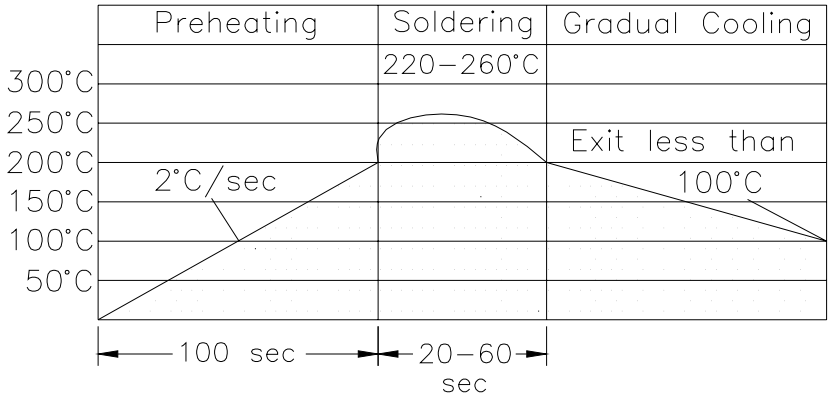
Sensitron recommends three methods of reflow attachment: IR, Vapor Phase reflow and Hot air convection reflow.

Ideal profiles for any of these methods will exhibit a ramp-up of about 2°C/second. The user is advised never to exceed a rise-rate of 4°C/second. In all three approaches, Sensitron strongly recommends that the SHD user employ a pre-heat prior to soldering. The user's board or substrate should be pre-heated for a minimum of one minute. Careful attention should be paid to ramp down, as well. After exiting from a soldering operation, boards or substrates should be allowed to cool at their own natural rate, without heat sinking. The user is advised to cool well below 60°C before attempting any cleaning operations.

IR REFLOW:

Infrared radiation is a popular method for solder reflow. The IR energy is provided by lamps or specially muffled panel-type heat sources. Both the board top and bottom sides can be heated, sometimes with different temperature profiles. Most of the IR furnaces commonly used are of the unfocused source type with a broadened spectrum of wavelengths. This tends to protect heat sensitive parts from overheating, yet at the same time improves uniformity of heating. The rate of heating tends to be a function of the emissivity of the materials and their inherent thermal conductivity. Solder paste absorbs IR radiation and heat quicker than the SHD. To heat solder paste, it must be exposed to the radiation on the pads beyond the SHD's surface. If it is shadowed, the reflow action is not as good. This means that some attention must be paid to pad dimensions and part placement. Other reflow techniques using smaller pads may accommodate higher density chip-mounting requirements. A typical IR reflow profile is shown below:

TYPICAL IR PROFILE

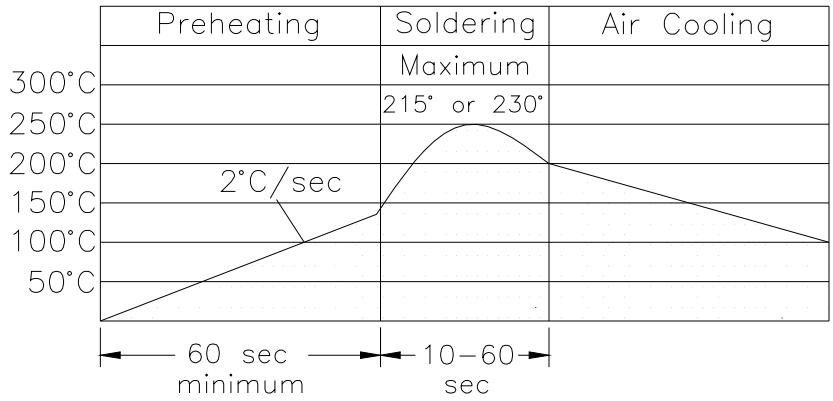


VAPOR PHASE REFLOW:

Heating is accomplished by the condensation of perfluorinated solvent vapors. Heating rates of all exposed surfaces is very uniform and repeatable from assembly to assembly.

Higher temperature perfluorinated liquids are also available. The latest vapor phase reflow equipment are in-line systems, using a conveyer belt. Batch systems are also in use. The immersion time required for reflow varies from about ten seconds to approximately one minute. The time depends on the mass of the largest devices to be soldered. Vapor phase soldering has the reputation of being the best approach for mounting of IC chip carriers on boards using small, high density mounting pads and interconnections. A typical Vapor Phase reflow profile is shown below

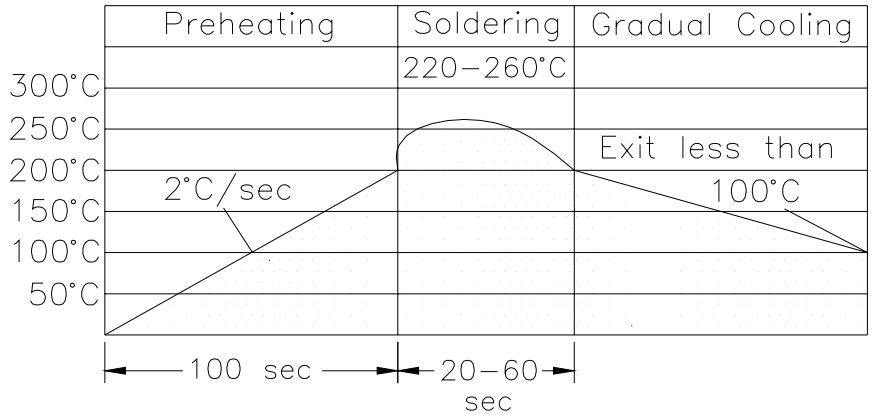
TYPICAL VAPOR PHASE PROFILE



HOT AIR CONVECTION REFLOW:

This reflow technique is also used to solder SHD devices. A conveyer belt transports the boards through a tunnel oven with several controlled heating zones. The process is very stable with repeatable results. Various circuit board materials will behave differently during heating. Materials that withstand the process without damage such as scorching or lifting must be selected. The time for temperature excursion above the solder's melting temperature should be restricted to a maximum of 60 seconds. A maximum not to exceed temperature of 260°C is recommended. A typical convection reflow profile is shown below.

TYPICAL HOT AIR CONVECTION REFLOW PROFILE



CLEANING:

Most contaminants generated after soldering operations can be removed by solvent or aqueous cleaning. Cleaning is most often performed in ultrasonic tanks, vapor degreasers or ultrasonic degreasers. Typical cleaning cycles may employ more than one step in order to effectively remove both non-polar and polar contaminants.

SENSITRON HERMETIC DEVICE STANDARD PACKAGING

- Surface Mount Technology
- State of the Art Design
- Fast Switching – no magnetic elements
- Single chip / Multi chip capabilities
- Axial, MELF or MOLY Tab
- Packaged for easy mounting using vapor solder reflow or a belt furnace

CAPABILITIES:

- Voltage: 50V To 1200V (Single Chip)
- Voltage: 1500V To 6000V (Multi Chip)
- Trr: 25ns To 3000ns

QUALITY:

- QPL To JANTX, JANTXV
- Screen To JANTX, JANTXV, JANS
- ISO 9000 Certified facility
- Ultra Fast Diodes With Small Temperature Dependence
- Soft Recovery
- 100% Temperature Cycling

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To speak with a salesperson, please, contact the factory or your local sales representative. For information on our other product offering, please visit our web site at: http://www.sensitron.com. For application/design assistance, please e-mail us at – sales@sensitron.com.