Through-Hole ChiP™ Package Soldering Guidelines

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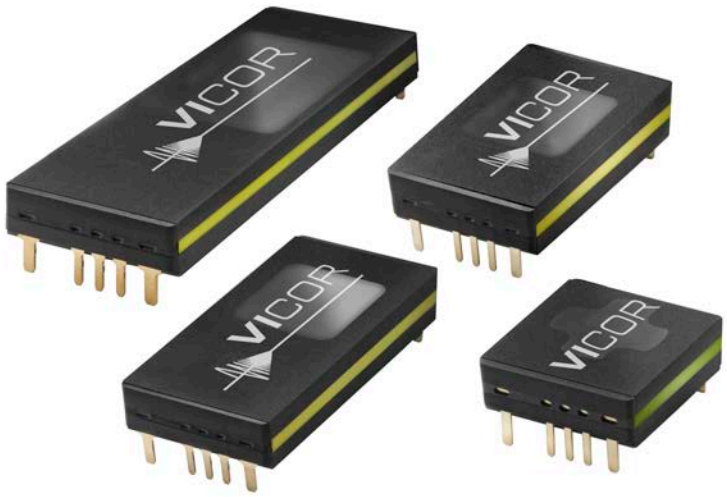


Representative Applicable Packages

Introduction

This document is intended to provide guidance to users of the Vicor Converter housed in Package (ChiP) Technology to physically integrate ChiPs having through-hole leads into higher-level assemblies.

ChiPs having through-hole leads should be assembled onto printed circuit boards via wave or selective soldering. Manual soldering is not recommended.

Note: Solder and related soldering equipment may be hazardous. Industry-standard health and safety precautions must be observed in the design and operation of soldering processes.

Disclaimer

This document provides general guidelines, as well as preferred examples which have proven to yield defect-free, reliable results.

A carefully designed and controlled process is necessary to ensure defect-free, reliable results. Given the range of printed circuit boards and components in customers' higher-level assembly designs, as well as the variety of soldering equipment which may be used, significant developmental efforts are likely to be necessary in order to optimize the soldering process for each application/process context. ChiP mechanical samples having through-hole leads are available to enable optimization of the soldering process.

Please contact Vicor Applications Engineering for further assistance or inquiries regarding the soldering of through-hole ChiPs not covered in this document.

Handling

Attribute	Symbol	Conditions / Notes	Min	Max	Unit
Storage Temperature	T_{ST}	T-Grade	-40	125	°C
		M-Grade	-65		
ESD rating	HBM	ESDA/JEDEC JDS-001-2012	CLASS 1C		
	CDM	ESD22-C101E	CLASS 2		

ChiPs™ should remain in original, sealed packaging until time of use. Once opened, exposure to humidity should be minimized.

Placement

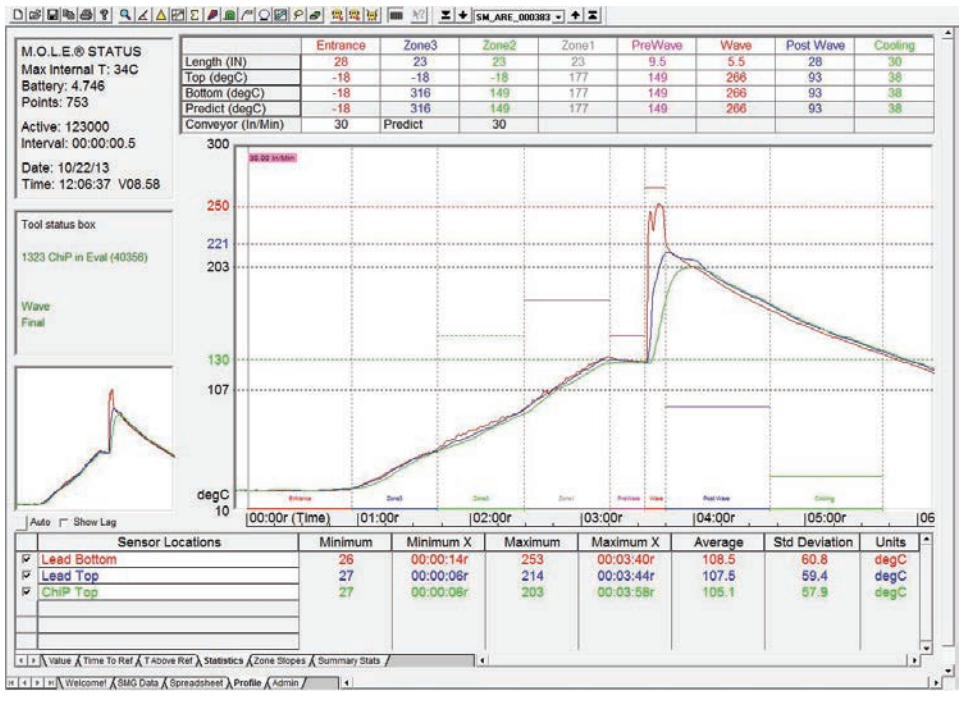
Use the recommended hole pattern as illustrated on the datasheet to support proper seating of the ChiP leads within the PCB. The ChiP should be placed such that each lead rests in its appropriate hole without distortion.

Soldering Process

The following description of a wave soldering process is based upon the use of preferred SAC305, high-temperature, lead-free solder with a preferred solder temperature of 265°C.

In general, a selective soldering process does not incorporate a conveyor, but uses other mechanisms to control the progression of the assembly through the process stages. The temperatures, times and rates described below should also be applicable to a selective soldering process.

Figure 1
Preferred Soldering Process Profile



The maximum temperature at any point on the ChiP™ body must not exceed 205°C during the soldering process. The maximum temperature at the lead-to-ChiP interface must not exceed 215°C. In practice, this may be achieved in a typical wave soldering process by limiting the peak temperature at the top center of the ChiP body to 135°C during preheating.

Fluxing

ChiPs are compatible with no-clean and water-washable fluxes. Alpha EF-2202 is preferred for use in wave soldering ChiPs having through-hole leads. Ultrasonic spray is the preferred method to apply flux to the bottom or solder side of the board. Precise control of flux quantity is necessary, as too much or too little flux will result in defective solder joints or other problems.

Preheating

The preheating stage prior to wave immersion must be carefully managed to ensure that flux activation is effective, and that PCB and lead temperatures are adequate immediately prior to wave immersion to support proper solder joint formation. The proper balance of pre-heating energy and preferred conveyor speed of 12.7mm/s should heat the top surface of the PCB at a preferred rate of 1°C/s to a preferred temperature of 130°C immediately prior to wave immersion.

Wave Immersion

The proper balance of conveyor angle, immersion depth and conveyor speed are critical to proper solder joint formation. The preferred wave immersion contact time is nine seconds.

Post-Wave Cleaning

If no-clean flux is used, no cleaning is required, although residues will remain on the assembly. The preferred ALPHA EF-2202 is a no-clean flux and the residues are designed to be left on the board. If desired, flux residues can be removed with Petroferm Bioact EC Ultra Semi-aqueous cleaner or with other commercially available solvent cleaners. ChiPs are generally compatible with commercially available solvents used to remove flux residues.

If water-soluble flux is used, the ChiP-on-board assembly should be washed using deionized water or water mixed with a commercially available saponifier. ChiPs are generally compatible with these mixtures.

Inspection

Refer to IPC-A-610, “Acceptability of Electronic Assemblies” for relevant inspection methodology and criteria.

Removal

Should it become necessary to remove a ChiP having through-hole leads from a PCB, it is preferred and generally most effective to mechanically sever the leads as close as possible to the top of the PCB. Alternatively, a selective soldering or re-work system may be used to de-solder the unit, but this may result in detachment of the lead structures from the body of the ChiP.

Once removed, the ChiP site may be reworked to restore the original condition of the PCB, and a new ChiP assembled as described above.

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