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Control integrated Power System (CiPoS™)

Mounting and handling recommendations

AN-Cipos-3

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http://www.infineon.com/cipos

Power Management & Drives

Never stop thinking.

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1 Short Description

This application note describes recommendation for the assembly and mounting of CiPoS modules. Please refer also the Infineon notes on processing for general recommendations of handling and processing of packaged electronic devices.

http://www.infineon.com/upload/Document/documents/processing.pdf

The datasheet of the respective CiPoS(tm) module is the valid reference in case that there are different values of parameters given in this application note compared to the datasheet.

2 Mounting a CiPoS™ module onto a heat sink

2.1 General Guidelines

An adequate heat sinking capability of the CiPoS™ module is only achievable, if it is suitably mounted. This is the fundamental requirement in order to keep the electrical and thermal performance of the module. The following general points should be observed when mounting CiPoS™ on a heat sink. Verify the following points related to the heat sink:

a)There must be no burrs on aluminum or copper heat sinks.

b)Screw holes must be countersunk.

c)There must be no unevenness or scratches in the heat sink

d)The surface of the module must be completely in contact with the module.

e)There must be no oxidation nor stain or burls on the heat sink surface

To improve the thermal conductivity, apply silicone grease to the contact surface between the CiPoS™ module and heat sink. Spread a homogenous layer of silicone grease with a thickness of 100 µm over the CiPoS™ module substrate surface. Non-planar surfaces of the heat sink may require a thicker layer of thermal grease. Please refer here to the specifications of the heat sink manufacturer. It is important to note here, that the heat sink covers the complete backside of the module. There may be different functional behaviour, if there is a portion of the backside of the module, which is not in contact with the heat sink.

To prevent a loss of heat dissipation effect due to warping of the substrate, tighten down the mounting screws gradually and sequentially while maintaining a left/right balance in pressure applied.

It must be assured by design of the application PCB, that the plane of the back side of the module and the plane of the heat sink are parallel in order to achieve minimal tensions of the package and an optimal contact of the module with the heat sink. Please refer to the mechanical specifications of the module given in the datasheets.

2.2 Recommended tightening torque

The tightening torque of M3 screws is specified for typically M_S = 0.5 Nm and maximum M_S = 0.6 Nm. The screw holes must be centred to the screw openings of the mould compound, so that the screws do not contact the mould compound.

If an insulating sheet is used, use a sheet larger than the CiPoS™ module, and it should be aligned accurately when attached. It is important to ensure, that no air is enclosed by the insulating sheet. Generally speaking, insulating sheets are used in the following cases:

-When the ability to withstand primary and secondary voltages is required to achieve required safety standard.

-When CiPoS™ module must be insulated from the heat sink.

-When measures to reduce noise or other problems are required.

2.3 Screw Tightening to Heat sink

The tightening of the screws is the main process of attaching the module to the heat sink. It is assumed, that an interface pad is attached to the heat sink face, which extends to the edge of the module and is located for the fixing holes. It is recommended, that M3 fixing screws are used in conjunction with a spring washer and a flat, rectangular washer. The spring washer must be assembled between the rectangular washer and the screw head. The screw torque must be monitored by the fixing tool.

Tightening Process:

- Align module with the fixing holes.
- Insert screw A with washers to touch only position (finger tight).
- Insert screw B with washers to 0.2 Nm.
- Tighten screw A to final torque.
- Tighten screw B to final torque.

2.4 Mounting with springs or clips

The application of clips or springs on the front side of the module is recommended in the area of the DCB. This ensures, that the power chips are optimally pressed to the heat sink. The DCB always has the highest peaks of the back side surface, so that no tilting can occur, if the spring or clip is pressed onto the module in the DCB area. A large contact area will lead to a homogenous distribution or the pressing force, so that the DCB contacts the heat sink equally.

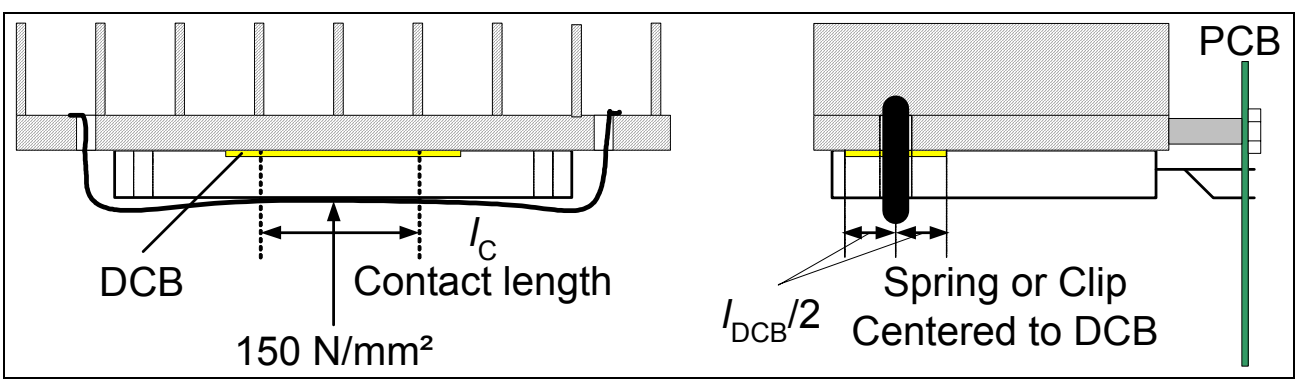

Figure 1 Mounting with springs

The applied pressure must not exceed 150 N/mm² according to Figure 1. Higher pressures may provoke cracks or failures of the module. It is recommended, that the contact length lC of the spring or clip is at least half of the DCB width.

Tilting of the module may occur, if the spring or clip does not contact the module in the area of the DCB. This can result is gaps between the module and the heat sink. This can require the usage of gap filling material or a thicker layer of thermal grease.

2.5 Mounting with bars

The same conditions and aspects are valid for mounting a CiPoS™ module onto a heat sink with a metal bar as described in the previous sections.

2.6 Solder process

The CiPoS™ module is specified for wave soldering processes only. The solder point must keep a distance of 1.6 mm from the mould compound and must not exceed a temperature of 260°C according to the datasheet.

All soldering equipment must be grounded properly.

The thermal contact to the heat sink may be reduced, if the CiPoS™ module tilts during the soldering process.

2.7 General handling and processing precautions

All equipment, which is used to handle or mount CiPoS™ modules must comply with the according standards in respect of ESD. This includes e.g. the transportation, storage and assembly. The module itself is an ESD sensitive device. It may therefore harm, in case of ESD shocks.

Please refer also to the general mounting instructions of Infineon in respect of bending and cutting of the pins.

http://www.infineon.com/upload/Document/documents/processing.pdf

3 Summary of Used Nomenclature

Physics:

General identifiers:

A .....cross area
b, *B* .....magnetic inductance
d, *D* .....duty cycle
f.....frequency
i, *I*.....current
N.....number of turns
p, *P* .....power
t, *T*.....time, time-intervals
v, *V*.....voltage
W .....energy
h.....efficiency

Special identifiers:

A_L ..... inductance factor
$V_{(BR)CES}$ .. collector-emitter breakdown voltage of IGBT
V_F..... forward voltage of diodes
V_{rrm} ..... maximum reverse voltage of diodes

capital letters:constant values and time intervals
small letters: time variant values

Components:

C .....capacitance
D .....diode
IC .....integrated circuit
L ..... inductance
R..... resistor
TR..... transformer

Indices:

AC.....alternating current value
DC.....direct current value
BE.....basis-emitter value
C .....Collector value
CS.....current sense value
E .....Emitter value
G.....Gate value
OPTO..optocoupler value
P .....primary side value
Pk.....peak value
R..... reflected from secondary to primary side
S .....secondary side value
Sh .....shunt value
UVLO..undervoltage lockout value
Z.....zener value

fmin..... value at minimum pulse frequency
i .....running variable
in .....input value
max .....maximum value
min .....minimum value
off .....turn-off value
on .....turn-on value
out .....output value
p .....pulsed
rip .....ripple value

1, 2, 3 .....on-going designator

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