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from EMC Standards

5 - EMC techniques for heatsinks - Updated Jan 2021

emc14f v2.8

Helping you solve your EMC problems

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Module 5: EMC techniques for heatsinks

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Change Record: v2.6 – v2.8, Jan 2021

- **Safety note applied to all slides, with some reformatting**
- **Slide 5.4.2 – text improved a little**
- **Slide 5.10.2 – text improved**
- **Slide 5.10.8 – new supplier added**
- ***New slide 5.11.9 added***
  'A different proprietary method of combining BLS with cooling'

emc14f v2.8 **All relevant safety requirements must be applied**, not necessarily covered in these slides CCC

Good Electromagnetic (EM) Engineering…

- **is cost-effective SI, PI and EMC engineering: well-proven to save time & money in all lifecycle stages, helping to increase profits & reduce financial risks…**
- **for PCBs, modules, sub-assemblies, devices, products, equipment, vehicles, sub-systems, systems, installations, etc., etc.; of any size, in all applications**
  see Module 1 especially 1.15 (also in Webinar 1c) and 1.16 (also in Webinar 1d)

- **This Module contains many EM Engineering guidelines that should *also* be used as an initial design checklist:** ***any that can't or won't be followed identify a project risk!***
  see Module 1, section 1.16 (also in Webinar 1d)
  - **to adapt any λ-based design guidelines to different EMC standards, *see Module 1, section 1.18*** *also in Webinar 1d*

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emc14f v2.8 **All relevant safety requirements must be applied**, not necessarily covered in these slides CCC

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For safety requirements, see our training courses on design for safety compliance

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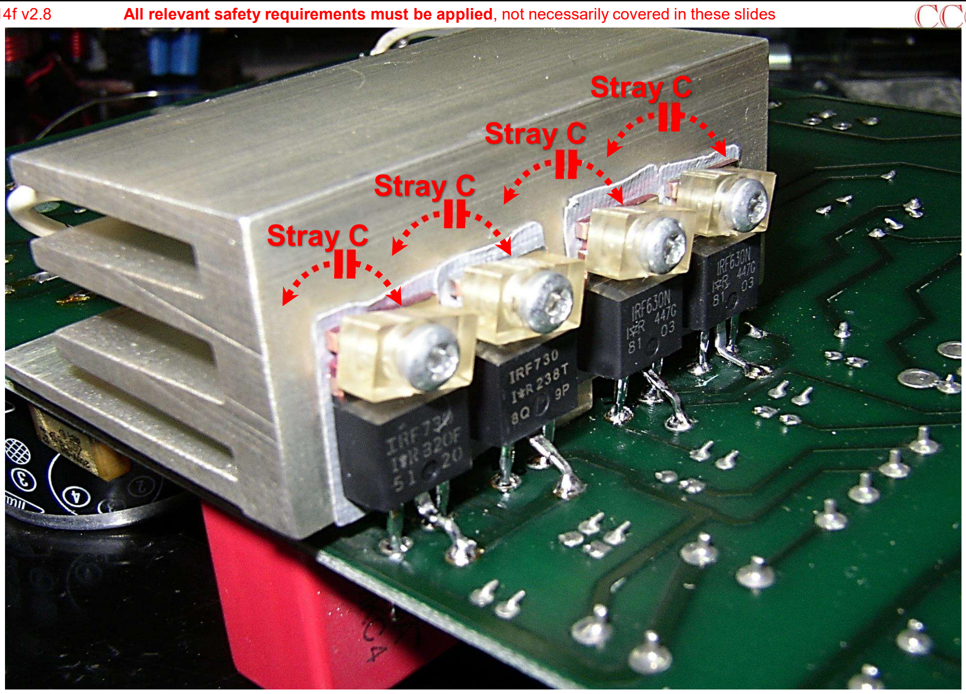
5. EMC techniques for heatsinks

5.1

Importance of controlling stray heatsink currents

Controlling stray heatsink currents

- **An IC or transistor fitted with a heatsink has a significant stray capacitance to that heatsink…**
  - **because its thermal interface washer is thin, and has a high value of dielectric constant (ε_r)...**
    - **and sometimes devices are bonded directly to a heatsink**
  - **when the voltages of the IC or power transistor fluctuate, this stray capacitance injects stray currents into *conductive* heatsinks…**
  - **returning these stray currents to their sources, – the power supply for the IC or transistor, – is *very important indeed* for controlling EMC emissions**



5. EMC techniques for heatsinks

5.2

Ceramic and plastic heatsinks have no stray currents

Ceramic or plastic heatsinks

- **....have no stray currents, because they are not conductive (e.g. "CeramCool", "CoolPoly")...**
  - **and they do not need thermal insulating washers so can sometimes have better heat dissipation than metal...**
    - **as well as having no EMC emissions...**
  - **and some can have metallised/etched surfaces, like a single-layer PCB, allowing direct bonding of devices...**
    - **especially good for power LED arrays**
- **But device heatsink 'tabs' will still emit...**
  - **so some of the following techniques may still be required**

Examples of thermally-conductive plastic heatsinks

For ICs
(glued in place with thermally-conductive epoxy)

For LED lamp housings