

# The heat is on...

From consumer gadgets to industrial electronics, overheating is a problem which affects manufacturers and end users alike.

In the age of ultra-thin electronics, the need to cram increasingly powerful components into ever-smaller spaces has inevitably led to performance and reliability issues, with many engineers having to make compromises on either the overall cost, or the schedules of their projects.

The result? Thermal issues that reduce performance, impact reliability and make devices too hot to handle. These issues could one day burn a hole in manufacturers' pockets – quite literally!

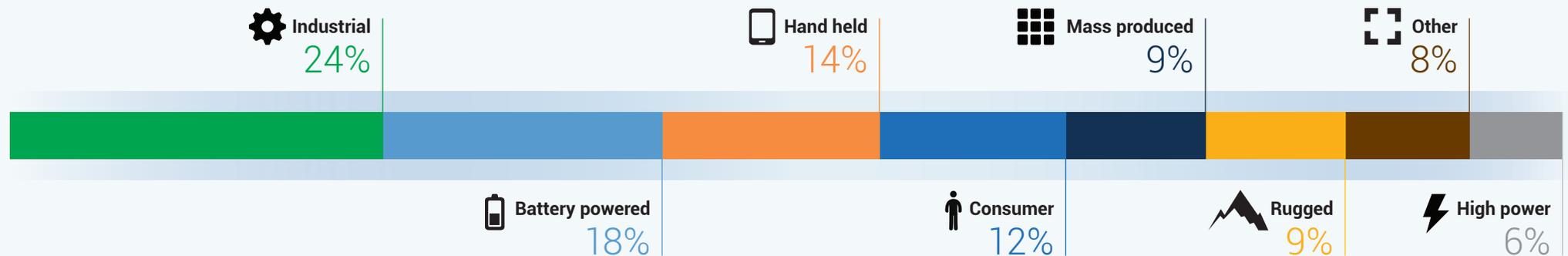
So what are design engineers doing to solve such problems? And how important is thermal design in modern electronics?

These are the questions that 6SigmaET set out to explore in its latest research project.

**Through an independent study of over 350 professional electronics engineers\*, 6SigmaET's The Heat Is On examines how modern design considerations have evolved and how engineers can benefit by placing thermal simulation at the heart of their electronic designs.**

\*Based on the Electronics Weekly engineering database

## Survey respondents by product / device



# What's the priority?

## What are engineers prioritising when it comes to electronics design?

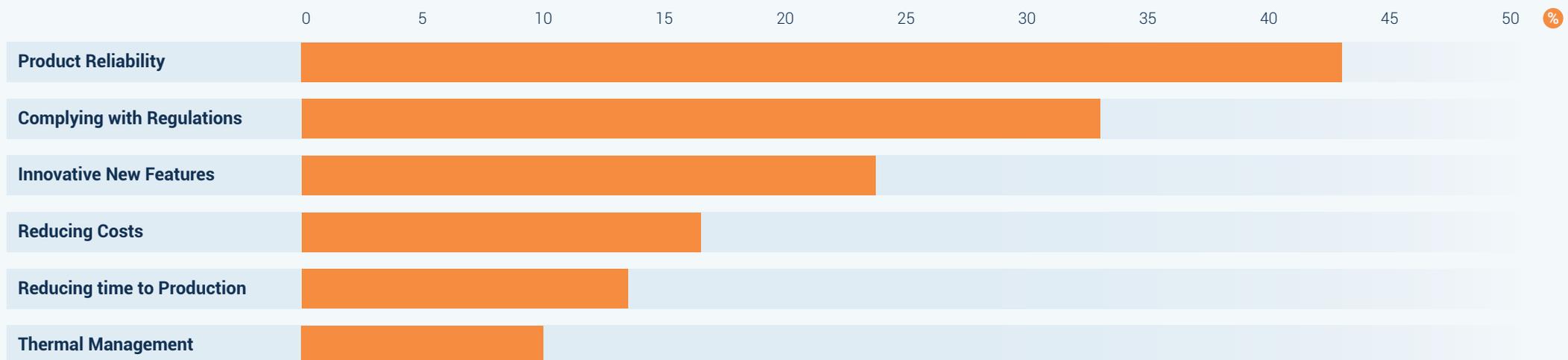
Despite the often-discussed time and cost pressures placed on engineers, less than 1 in 5 consider cost to be their top priority, while only 14% believe that reducing time to production should be the #1 concern.

Instead, most feel that the need to produce innovative, compliant and – most importantly - reliable products is a significantly higher priority than rushing a project or attempting to cut down the BOM.

In fact, almost half (43%) of design engineers consider product reliability to be their number one concern, while a further 20% consider it to be their second highest priority.

**Thermal management, on the other hand, remains the least important, with 40% of engineers marking it as a 'low priority' for their designs.**

### Design priorities for engineers



# If you can't stand the heat...

## The role of thermal management in electronic design

The inherent contradiction in not prioritising thermal management is that designers and engineers are setting themselves up for failure in the long term.

As it stands, 99.5% of engineers have had a product derailed by late stage complications, while one in twenty have had every single project delayed. A further one in five also specifically identify thermal issues as a common cause of their delays.

While it's easy to dismiss thermal design as 'low priority', the truth is that considering thermal issues early on in the design process is essential for ensuring a product is right first time.

While it's unlikely that a device will burst into flames, an overheating component will result in the device not functioning, or failing at a later date.

**Worse still, late-stage thermal issues typically involve going back to the drawing board on a design. This means investing yet more time - and money - into developing a brand new prototype.**



**14%** think that thermal considerations do not matter when planning their designs



**13%** of engineers don't test the thermal performance of their designs **at all**

## At the back of the queue

### Thermal management after the fact

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As it stands, thermal analysis is either left until the last minute or is simply not included, with 13% of engineers not testing the thermal performance of their designs **at all**.

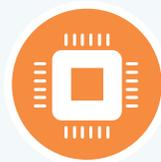
This is not because engineers don't care about thermal issues: many simply believe that their designs are too low power for it to be worth considering. However, this is a common misconception. Even small, low power devices such as the Google Chromecast can require significant planning when it comes to thermal design.

Our research highlights that designers are far more likely to try to overengineer products instead, giving themselves a 'thermal margin' by adding sometimes unnecessary components such as heat sink and fans rather than identifying the underlying cause.

### When do engineers test the thermal operation of their designs?



25%  
Early in  
the design



56%  
After the first  
prototype



27%  
After a design  
is complete

## A change in direction

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It sounds obvious, but the best way to ensure your electronics design isn't plagued by late stage complications is to consider thermal design earlier in the process.

By catching such issues early on – even before a physical prototype has been produced - engineers can cut back on production costs and time to market, and ultimately boost the reliability of their designs. All things that engineers list as their top priorities!

Given these benefits, one in three engineers agree that they should be devoting more time to thermal management. And yet, more than half (55%) can't see how they could bring thermal considerations any further forward in their design processes.

**The solution? Simulation.**

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1 in 3

designers think they should be spending more time on thermal management

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27%

of engineers wait until after a design has been completed before they consider testing for thermal issues

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"Tools that enable design checking should be deployed at the earliest stage: each remake can cost thousands, but even if the cost of remaking is minimised to a few hundred pounds the biggest issue is the time lost."

**Rod Piwowarski**, CEO Lascar Electronics

# Stop, simulate and listen

## Building simulation into your thermal design

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By using simulation, engineers can experiment with different design options, identifying where their devices are likely to overheat and addressing those issues without overengineering their designs.

Through the use of the latest simulation tools, designers are even able to run multiple variations of their designs over the cloud; this allows them to test different design layouts without producing costly physical prototypes.

As it stands, 40% of engineers are already using simulation as a way to reduce the number of prototypes they need to develop, with the vast majority benefiting from a combined physical/simulation prototyping approach.

While the adoption of thermal simulation is on the rise, one in every ten engineers still relies purely on physical prototypes. This represents a massive opportunity for engineers to streamline their production process, both in terms of time and costs.

# Three steps to keep thermal at the heart of your design

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1

## Bring thermal to the forefront:

Considering potential thermal issues from the outset not only saves designers time and budget, it is also the best way to maximise the efficiency of their designs. By waiting until a project is almost complete to test the thermal implications of a particular layout or design, engineers risk sending their entire projects back to the drawing board at the last minute. Rather than weighing down designs with heatsinks and or reducing the devices performance, isn't it better to take a right-first-time approach? This is not only a better use of time, but will ultimately lead to better design solutions and better end products for users.

2

## Take a combined design verification approach:

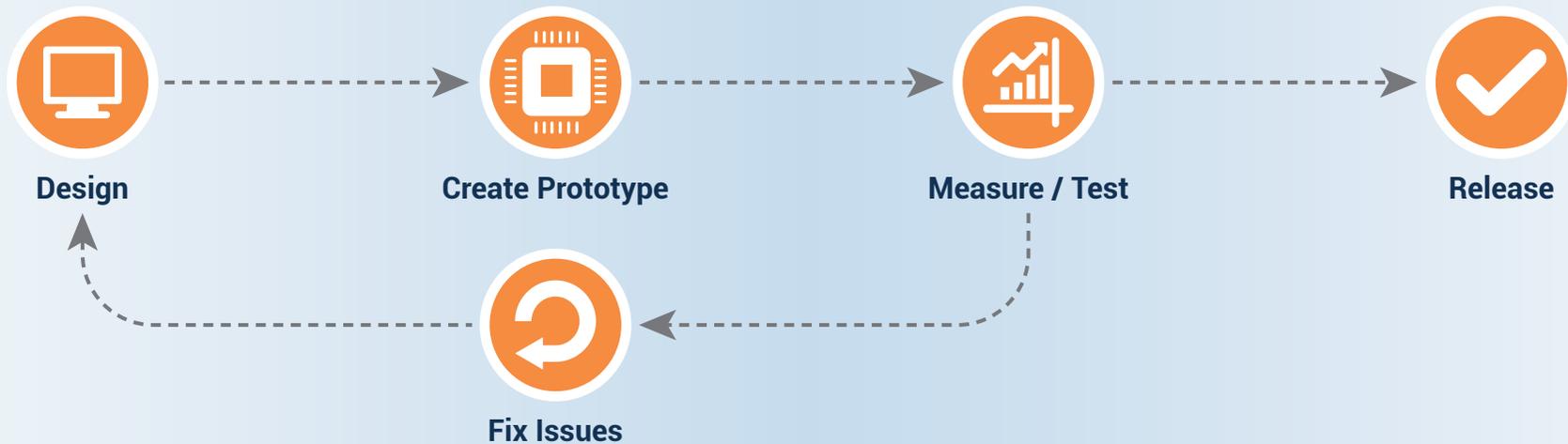
By combing early-stage simulation with late-stage prototypes, electronic engineers can achieve a best-of-both-worlds approach. Software simulation can help to identify potential flaws and unexpected thermal interactions prior to manufacture, reducing the need for costly rounds of prototyping while minimising the risk of failure in the field. Physical prototyping can then be used as a final-stage check, to ensure the design is ready for mass production.

3

## Thermal is about more than just overheating:

Always remember that thermal management is about more than whether a component overheats. Effective thermal design is an issue which affects everything: product reliability, energy efficiency, device weight, and even whether a device is too noisy. As such, it's worth remembering that even devices with low power dissipation still require thermal consideration in order to maximise the performance and reliability of an end design.

## How it's done



## How it should be done



To find out more about how thermal issues could be damaging your designs, contact the 6SigmaET team at **[www.6sigmaET.com](http://www.6sigmaET.com)**

To arrange a free trial of the 6SigmaET thermal simulation suite, visit **<http://www.6sigmaet.info/trialrequest.php>**