GaN Systems

RETHINKING 'WHAT'S SMART'

# Next Generation Smart Home That's Available to Everyone

GANSYSTEMS.COM/SMART-HOME-5G

Too often, the fact that a technology merely exists drives the direction of a specific implementation, rather than focusing on *developing technologies in response to real and important human needs.*

This has often been the case of the 'smart home' in its various stages of automation and intelligence.

What would a 'smarter home' look like if we more closely consider the inter-related nature of the technologies it requires versus looking at each in isolation?

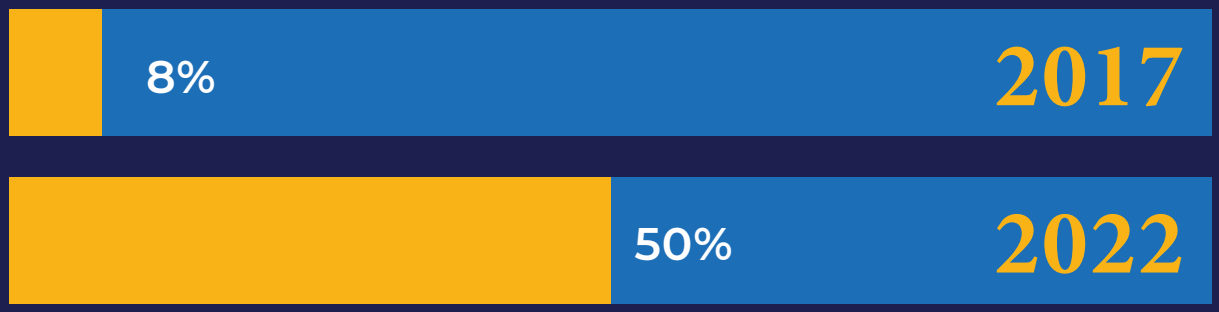
And which of those technologies rises to the level of greatest importance when we look through the lenses of some of the most important social, economic, and environmental needs of our time?

# The Smart Home of the Past and Today

Some of the earliest visions of the smart home of the future are found in the stories and experiences of the 1950s Whirlpool Miracle Kitchen and House of the Future at Disneyland, 'The Jetsons' cartoon of the 1960s, and various corporate vision initiatives in the decades since then. What they share is a blend of whimsy, proof of concept, and a knack for self-promotion of 'not yet ready for prime time' technology that was perhaps not fully aligned with what people actually needed, at least not just for the 1%.

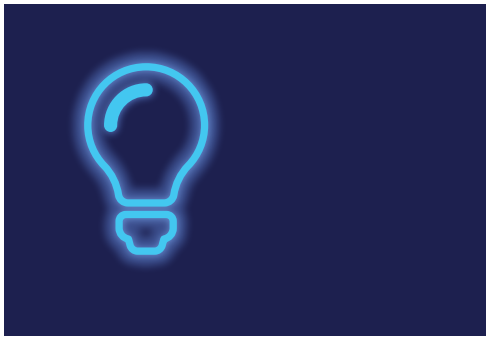
Various research and analyst groups have published estimations and predictions around the number of 'smart homes' – each with a different definition depending on the technologies they follow. The Swedish research firm Berg Insight estimates that nearly 16% of North American households (the most advanced global market) were considered smart at some level in 2017 – with an estimate of this reaching nearly 50% of all homes (63 million) by 2022. Other research groups, however, cite current numbers as low as 8%. It becomes even murkier when looking at data around the current and predicted number of connected devices in homes (of all types) – ranging from 223M devices in 2019 to predictions of more than 740M in 2023.

## Smart Homes



# What really defines a smart *(or smarter)* home?

Is it a single technology like voice-enabled speakers (120M of these in US homes) or 'more fully integrated systems' that control lighting, indoor climate, energy management, entertainment, communications, security, and health systems? What needs and populations do those systems actually serve?



All of these numbers are intriguing and indicate a direction, even if they lack in agreement to specifics. What is important is that the numbers indicate that most people still are not seeing and experiencing the value, relevance, and accessibility of the fully integrated smart home promise in their daily lives. This may be the result of an industry conversation lacking enough focus on what a broader more inclusive segment of the population actually wants and needs - as opposed to the new tricks that the technology can do for a small and privileged minority.

# Social, Environmental, and Economic Trends Should Inform the Discussion of the Smart Home as Much as Technology

It's important to look at the definition of a smart home – or really a 'smarter' home within smarter environments (neighbors, communities, and cities) – as a place that is available for all or certainly many more than it is today. It's time to leave behind the definition as a place of privilege, and replace it with one of accessibility and possibility.

***Smart homes should be about accessibility and possibility.***

**Some of the important trends and considerations that impact the way that those in the technology industry should think about the 'smarter home' include:**

- Disruptions to our traditional means of employment impacting where we live and how a home is used.
- Changes in the housing market around affordability and availability effecting where people can live (versus where they work), as well as growing interest in more flexible versus fixed places of residence and work.
- Concerns about the current healthcare system accompanied by interest and need for greater self-monitoring and less reliance on institutional solutions.
- The energy ecosystem impacts resulting from climate change and an increasingly 'electrified' world.
- The continuing existence of Internet deserts and the digital divide even in what we think of as our most wired urban centers

## Everyone has a different concept of what 'home' should mean and different people have varying levels of capacity, flexibility, or opportunity to define this.

Here are some key focus areas of what 'home' - and the technologies we bring into it - should now be about:

- Relevance to daily tasks: the productivity automation path.
- Life enhancing: self-improvement along the lines of personal health and mental well-being.
- Simultaneously address personal level as well as systemic issues: optimizing decisions (sustainability for example) for both inside the home and across the community.

Given these larger trends and a different perspectives on defining 'home,' what then are the technologies of importance for a smarter home?

## The Relevant Technologies of Change for a Smarter Home

Three important categories of technology are deeply interconnected in creating the 'smarter home' of the near future possible, and are equally connected to the important social trends.

- Connectivity
- Increasingly invisible and intelligent technology
- Energy access and efficiency

# 5G

## Connectivity
## *The Rise of 5G*

Connectivity is the basic building block of the smarter home. It is what enables the home to essentially become like an invisible and always adapting computer linked to an increasingly valuable and data (and energy) hungry ecosystem of smart devices. Reliable data connections are important inside the home, and to the outside world. But not all communities have been treated equitably in the connectivity story to date. Some gaps result from infrastructure inefficiency that can be addressed by new technologies such as 5G, while other parts of it originate in policies and attitudes. Internet deserts, data divides, and data congestion are real limitations to a future of equality and opportunity in smarter cities, communities, and homes.

In the past, there's been significant hype around 5G technology. But 2020 is a year of significant progress in the realization of a global rollout. 5G can be a transformative technology for the 'smarter home' as it delivers fast bandwidth and reduced latency in a cable and wire-free setting, while consuming less power than current mobile networks.

*"Where there are broadband access deficiencies, changing policies and attitudes must be part of the path to get us to a smarter future. Technology can play a significant role as a partner to more thoughtful policies in the form of 5G, which provides a new path to access."*

**One of the important technologies that must accompany the installation and growth of 5G wireless data networks is through-wall wireless power that removes the time, cost, and location barriers of wired approaches.**

With wireless power, power can be transferred from inside a building to devices outside without drilling holes and routing power cords. To solve the last 100 feet challenge of bandwidth distribution in a 5G world without wires, outside access units or 5G base stations can be deployed on utility poles or building rooftops in close proximity to the passing fiber backhaul, so that an area can be covered by a high-density, high-capacity wireless network. Individual homes then use 5G customer premises equipment (called CPE which is similar to a cable modem) on a wall to instantly get online. Making these hardware devices as energy efficient as possible is also important. By being wireless in terms of both power and data, 5G avoids the cost and time of installing physical fiber lines in both rural and urban environments.

# GaN Technology and Wireless Charging for 5G Networks

As 5G pushes ahead, the power factor is one of the most critical issues and where there are opportunities for real improvement. 5G networks are expected to consume 2-3 times the amount of energy as today's networks since they will require both new cell sites and more power to run existing sites. Additionally, getting the high bandwidth data transmitted the "last hundred feet" to user residences also requires a paradigm shift approach. The answer is wireless power transfer via through-wall, removing the time, costs, location barriers of legacy wired approaches.

Optimizing 5G performance to address these needs necessitates the new technologies and approaches in power supplies and wireless power applications that GaN technology makes possible.

With wireless power and data transmission made possible through walls and windows, 5G receivers can be placed outside a building.  And they deliver three times the performance of a receiver inside a building.

*"Through-wall wireless power is an important complimentary technology to the 5G rollout.*

*It removes the time, cost, and location barriers of wired approaches."*

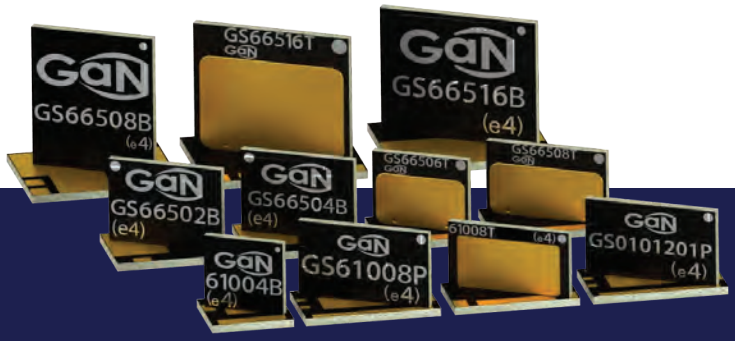
# The Case for the Smarter Home of the Near Future

Smarter homes and communities are being driven by both technology advances in hardware and AI, as well as by the significant environmental and economic changes present at both individual and systemic levels. Social and legal contracts around potential technology invasiveness and privacy will still need to be identified and proactively addressed. 5G networks, more intelligent and invisible devices, and new technologies of energy generation and efficiency will then all need to work together to make this a future that is possible and accessible for all.

## About GaN Systems

GaN Systems is the global leader in GaN power semiconductors with the largest portfolio of transistors that uniquely address the needs of today's most demanding industries including data center servers, renewable energy systems, automotive, industrial motors and consumer electronics.

As a market-leading innovator, GaN Systems makes possible the design of smaller, lower cost, more efficient power systems. The company's award-winning products provide system design opportunities free from the limitations of yesterday's silicon. By changing the rules of transistor performance, GaN Systems is enabling power conversion companies to revolutionize their industries and transform the world.




**1-613-686-1996**

**experts@gansystems.com**

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