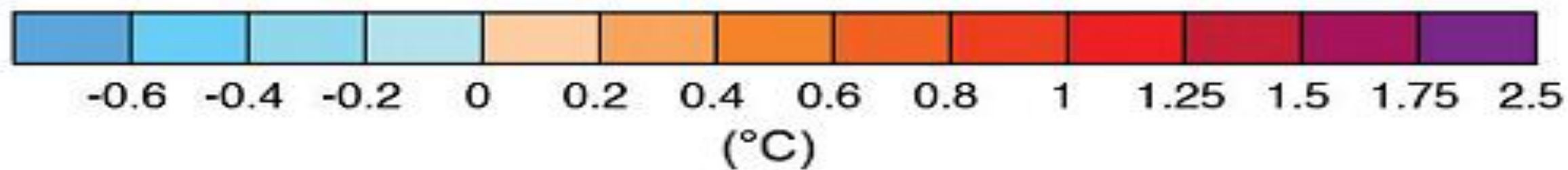
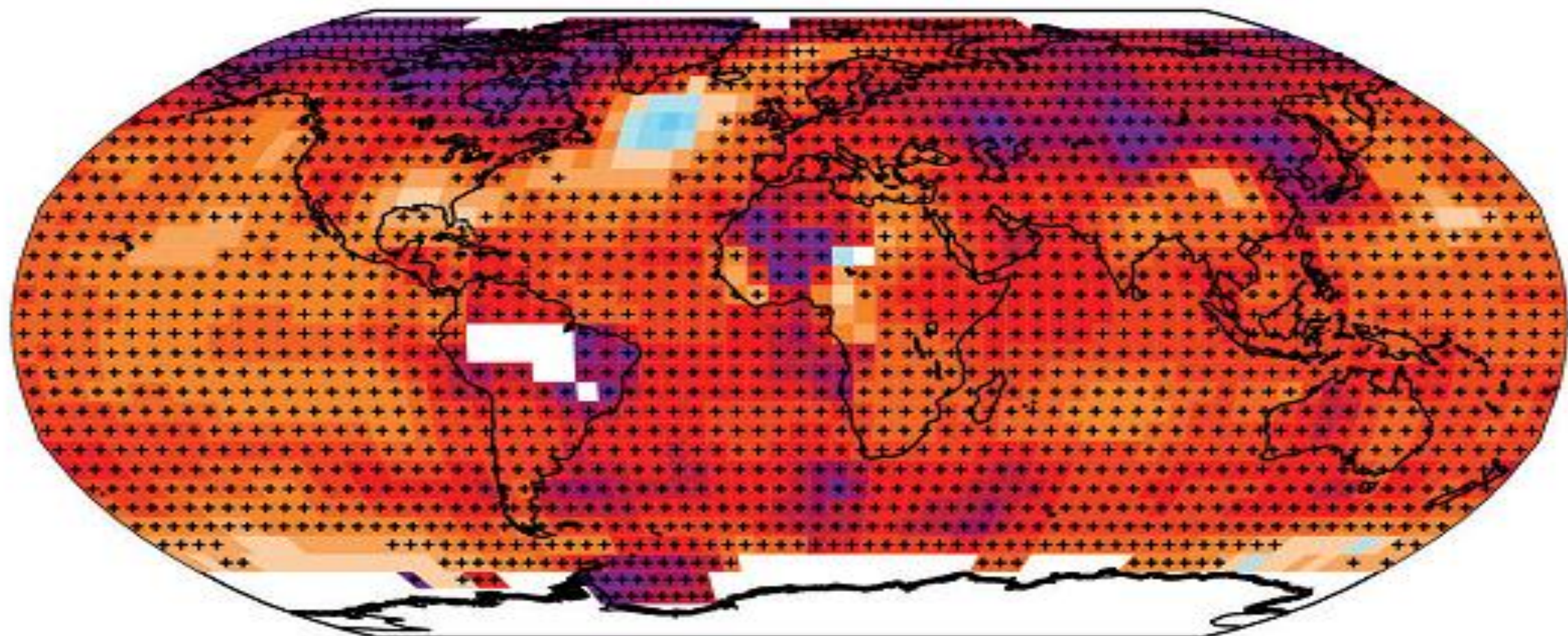


# Power Discrete Market & Supply Chain

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# 1901-2012年期間表面溫度的改變

Observed change in surface temperature 1901–2012



# Paris Climate Agreement



(a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

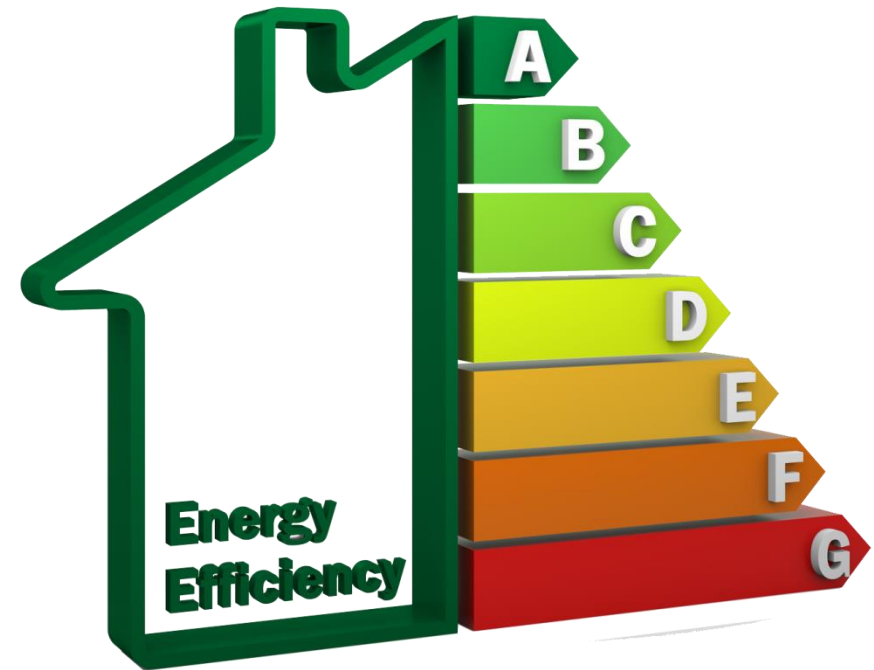
(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production;

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

# Reducing $CO_2$ Improve energy efficiency



新能源 再生能源

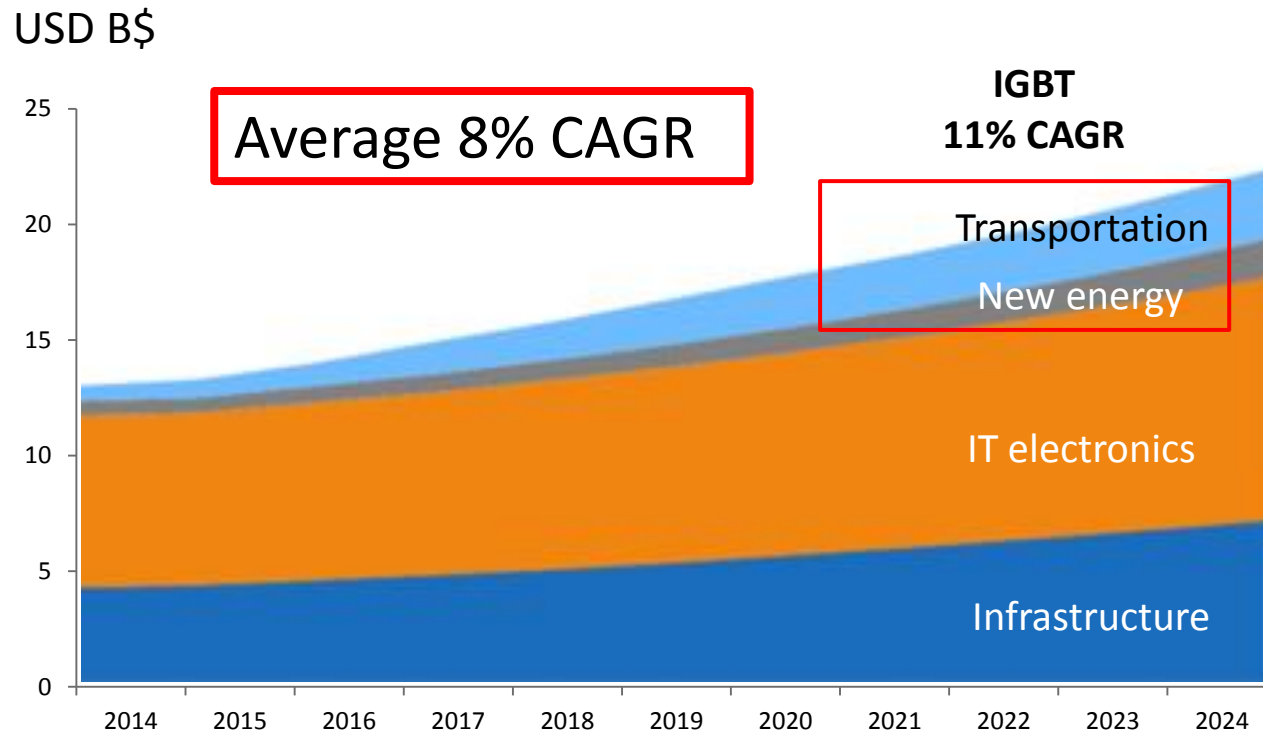


使用效率 轉化效率

# Power Discrete Market

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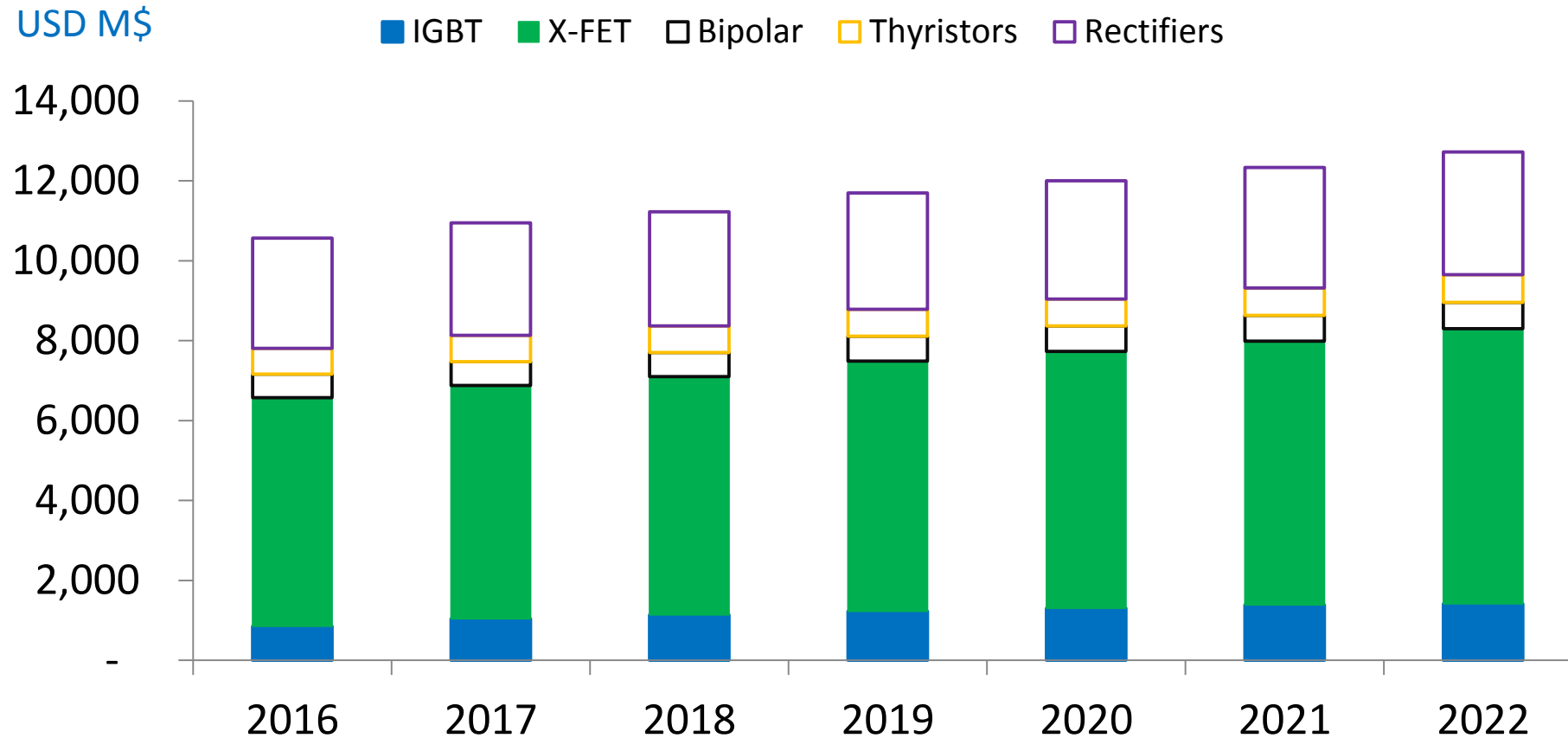
# Continue Growing



Source: Lux Research Inc.

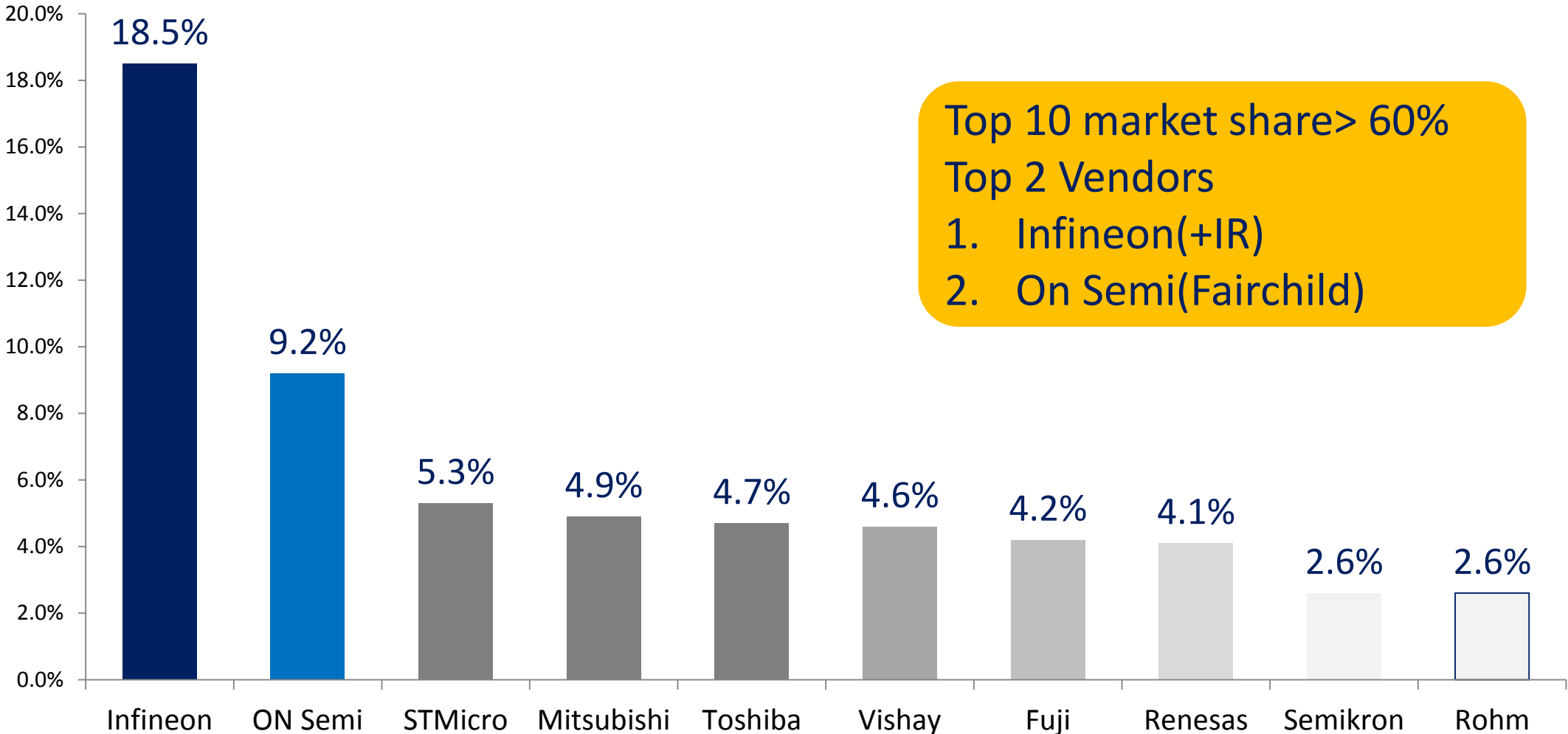
- 2016-2022 12.3B\$ to 19.5B\$ <Chlue Research>
- Market share 2016 APAC hold 39.8%, China is the fast growing
- Driven by Automotive, Industry 4.0, New energy

# Power Discrete Market Size by Segment



Source: YOLE

# IDM主導市場



Source: Infineon



# 功率元件種類 演進

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# Power Discrete Types

## Power Semiconductor

### Power Discrete

Thyristor  
閘流體

Rectifier  
整流器

Diode  
二極體

Transistor  
電晶體  
(MOSFET,  
IGBT, BJT)

### Power IC

Power Management IC  
(Regulator, Switch IC,  
Driver IC, PMIC,  
Supervisor/Smart IC)

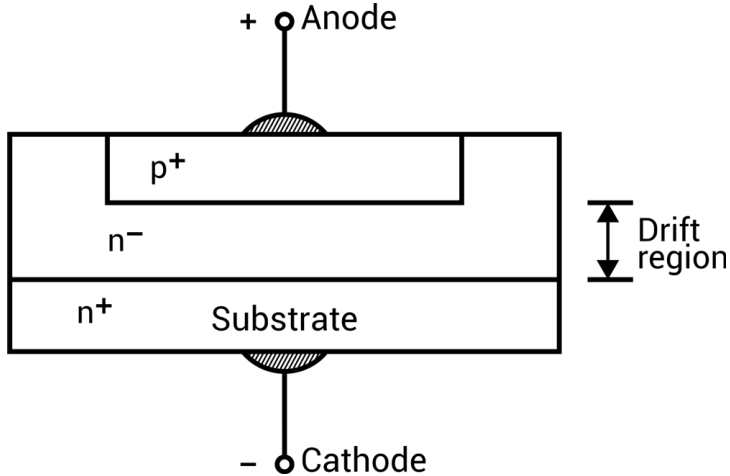
Motion  
Control IC

### Power Module

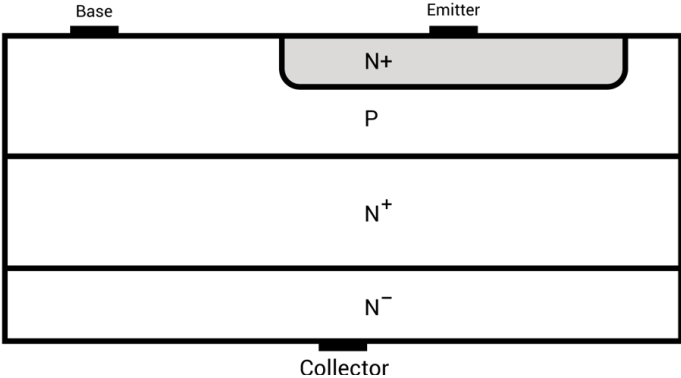
Automobile  
applications with  
Integrated passive  
components

# Structure of Various Power Discrete

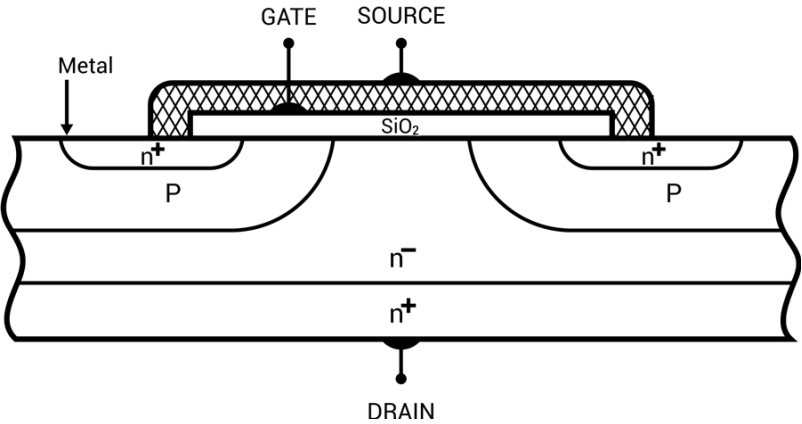
**Diode**



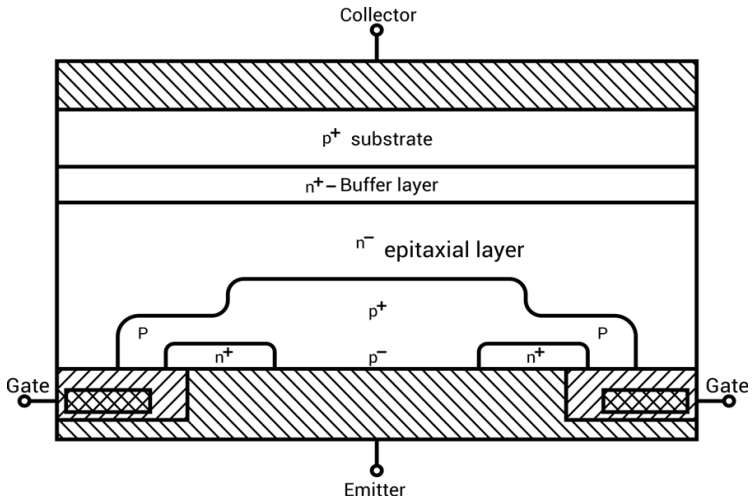
**Bipolar Junction Transistor (BJT)**



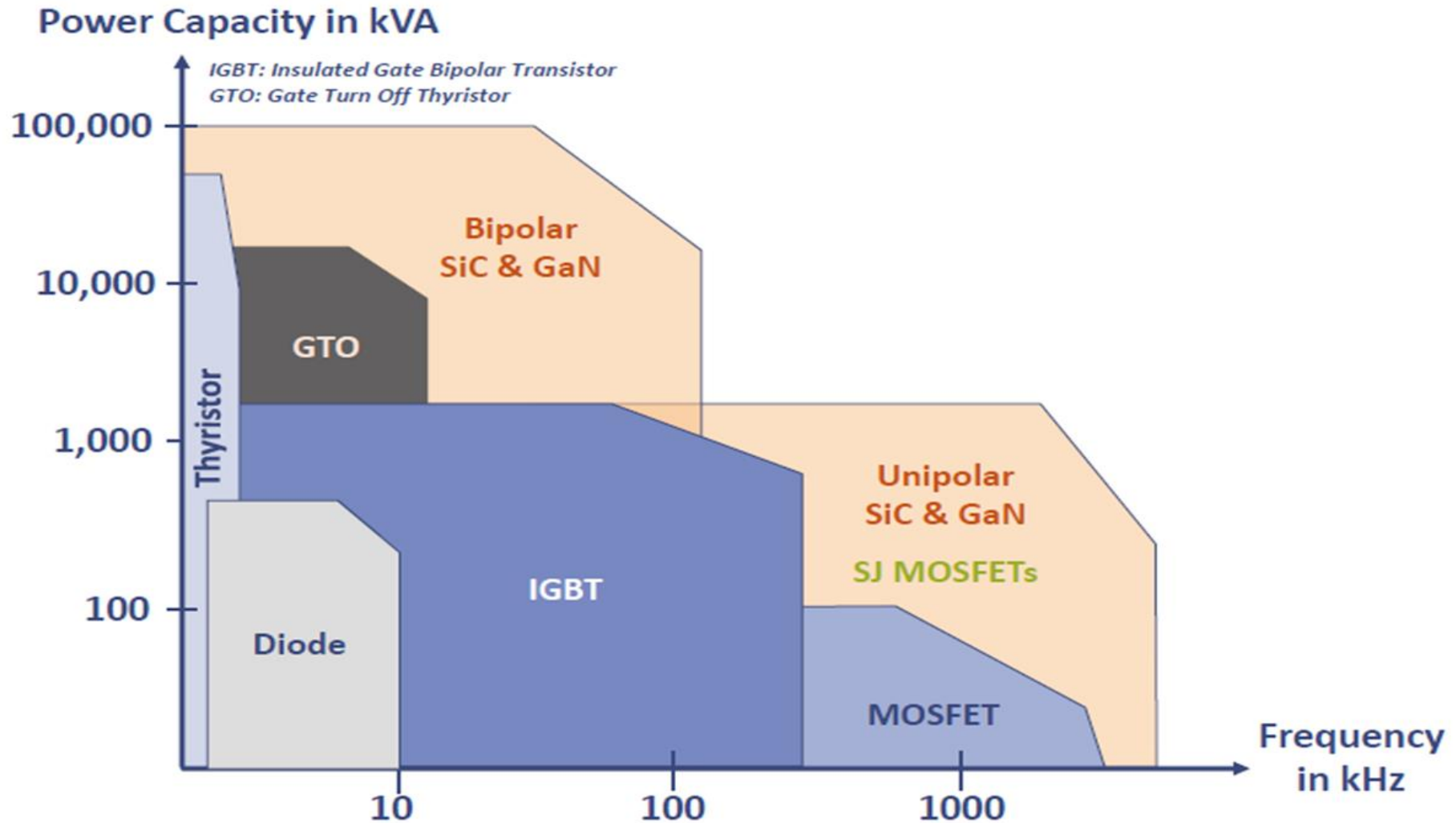
**MOSFET**



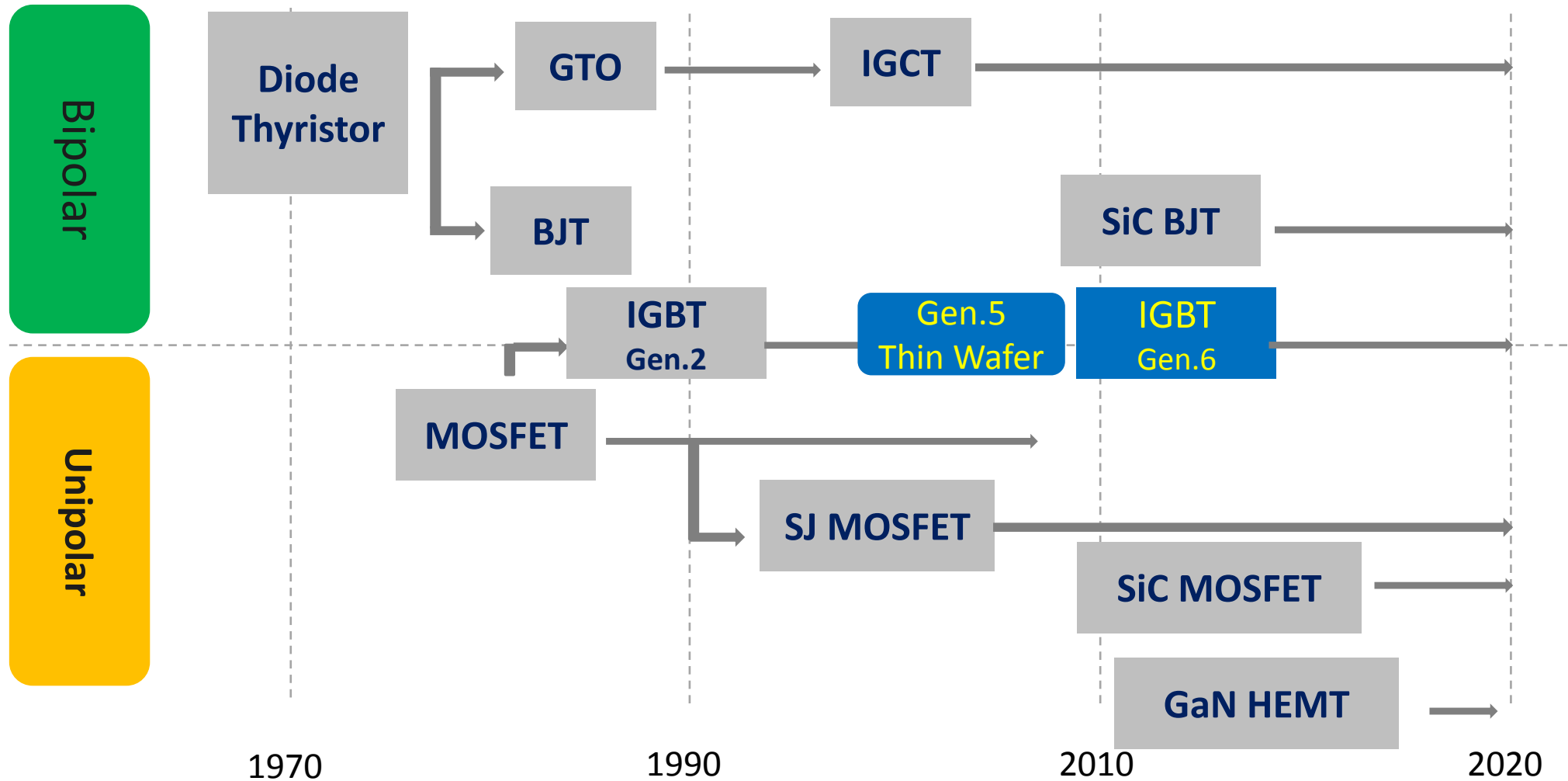
**IGBT**



# Comparison of Power Discretes



# Evolution of Power Discrete



# Process challenge

## Middle End

Thinning Wafer Process 、 Stress 、  
High Dose Implantation (IGBT) 、  
Laser Anneal (IGBT)

## Back End

Heat Dissipation 、  
Thermal and Mechanical  
Stress Control

# Technique Evolution -ROHM



Global - English

Products Technical Support Applications Sales Buy or Sample

ROHM

## New 650V IGBTs Deliver Class-Leading Efficiency with Soft Switching

ROHM has announced the availability of 2 new types of 650V IGBTs that combine class-leading low conduction loss with high-speed switching characteristics. This makes them ideal for power conversion in general-purpose inverters and converters for consumer appliances, such as ACs and IH (Induction Heaters), as well as industrial equipment, including power conditioners, welding machines, and UPS (Uninterrupted Power Supplies). A total of 21 models are offered, consisting of the RGTV series, which features short-circuit tolerance, and the RGW series that delivers fast switching speed.

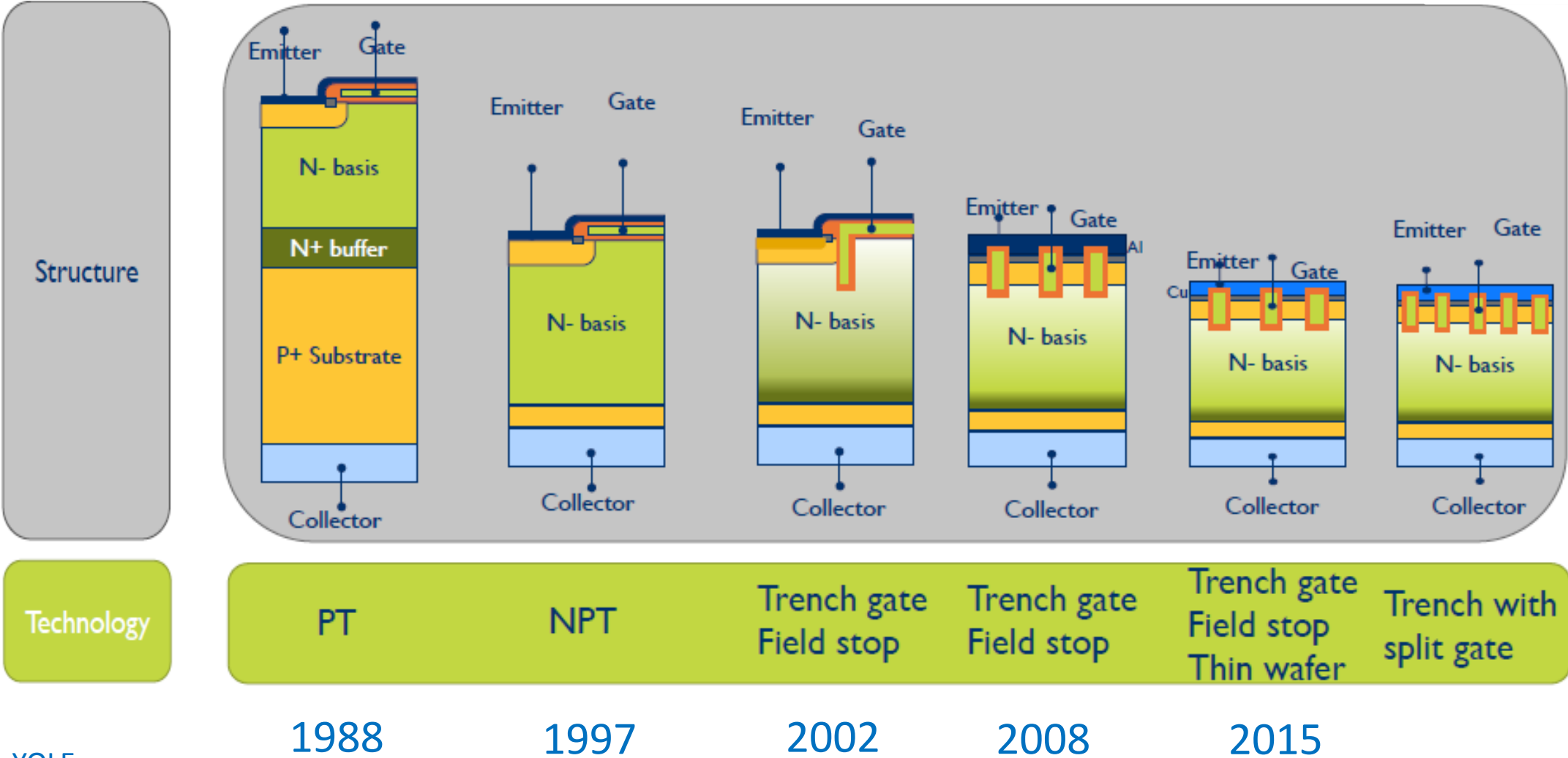
In recent years, the emergence of IoT has caused an exponential growth in the volume of data generated, bringing about a need to improve the functionality and capacity of data centers. However, as the number of servers and UPS essential to ensuring stable operation of the main power supply continues to rise, it becomes increasingly difficult to reduce power consumption. In addition, in high-power applications that utilize IGBTs there is a need to maintain reliability by simplifying measures against overshoot during switching, which can lead to device failure or malfunction.



These two new series adopt thin wafer technology that reduces wafer thickness by 15% over conventional products and an original structure featuring a refined cell design to provide the industry's lowest conduction loss ( $V_{CE(sat)}=1.5V$ ) with fast switching characteristics ( $t_f=30$  to  $40ns$ ).

Source: Rohm, [LINK](#)

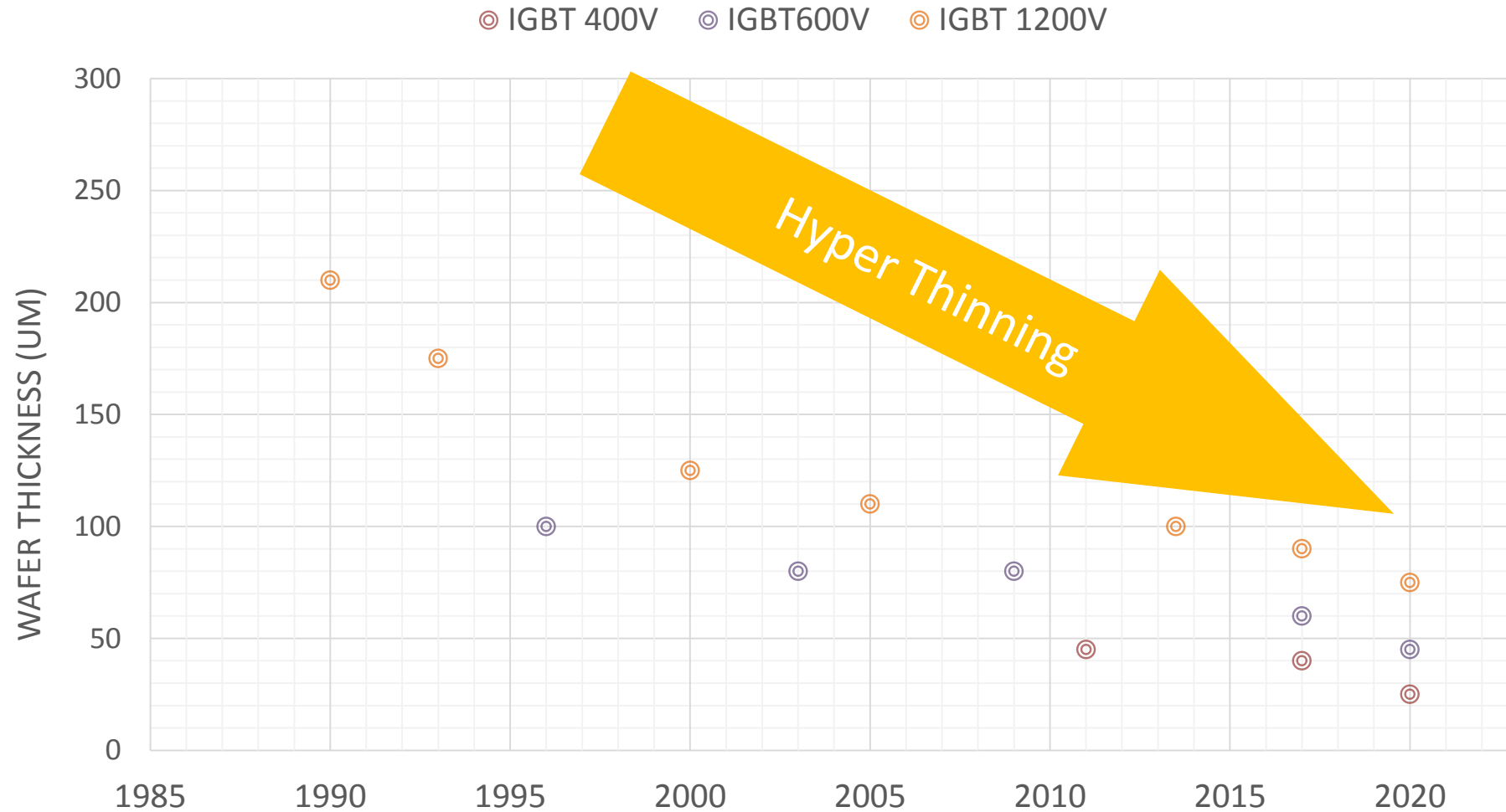
# Technique Evolution -First Tier IDM



Source: YOLE



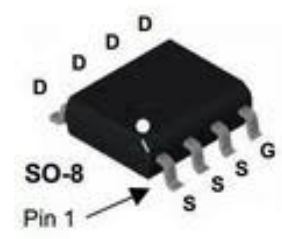
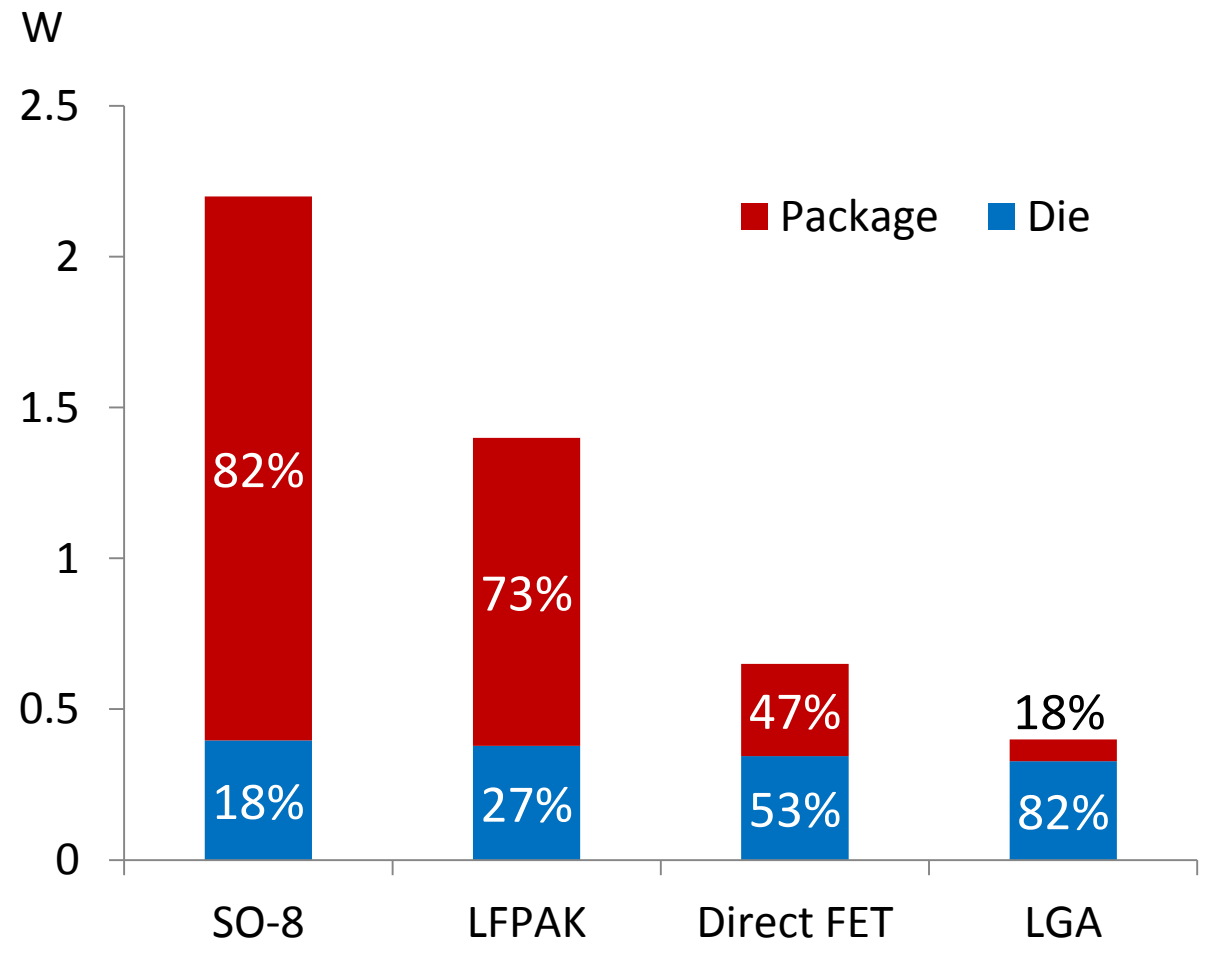
# IGBT Thinning Roadmap



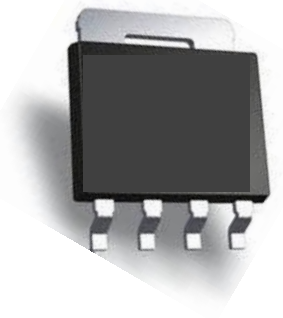
Source: Infineon



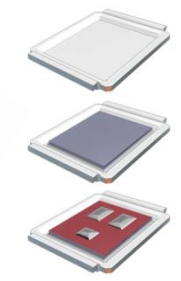
# Power Loss Impact by Package



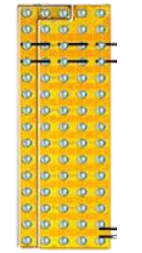
SO-8



LFPAK



Direct FET



LGA eGaN FET

Source: <https://epc-co.com/epc/DesignSupport/Chip-ScalePackaging.aspx>

# Power Discrete Supply Chain

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# Criteria of Supply Chain

**Reliability**

Stable 、 High Yield Rate

**Verifiable**

Long term MP Experience

# Process Services Vender

## FEOL

tsmc 、 VIA 、  
UMC 、 Maxchip etc..

## 中段

PSI 、 XinTech 、  
Chipbond 、 mmec etc..

## BEOL

GEM 、 LingSen etc

# Outsourcing Flow

Differentiation/ Profit 2X2 Matrix

	前段	中段	後段
1	Outsourcing	In-house	In-house
2	Outsourcing	In-house	Outsourcing
3	Outsourcing	Outsourcing	Outsourcing
4	Outsourcing	In-house	In-house
5	Outsourcing	In-house	Outsourcing
6	Outsourcing	Outsourcing	Outsourcing
7	Outsourcing	Outsourcing	In-house
8	Outsourcing	Outsourcing	In-house

Outsourcing In-house

# Division VS Integration





Q & A

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