



**MATERIALS THAT MATTER**

# **SiC-Based Materials and Devices Enabling Electrification and Mobility at Scale**

May 29, 2020

# II-VI Incorporated Q3 FY2020 Overview

**\$627M**

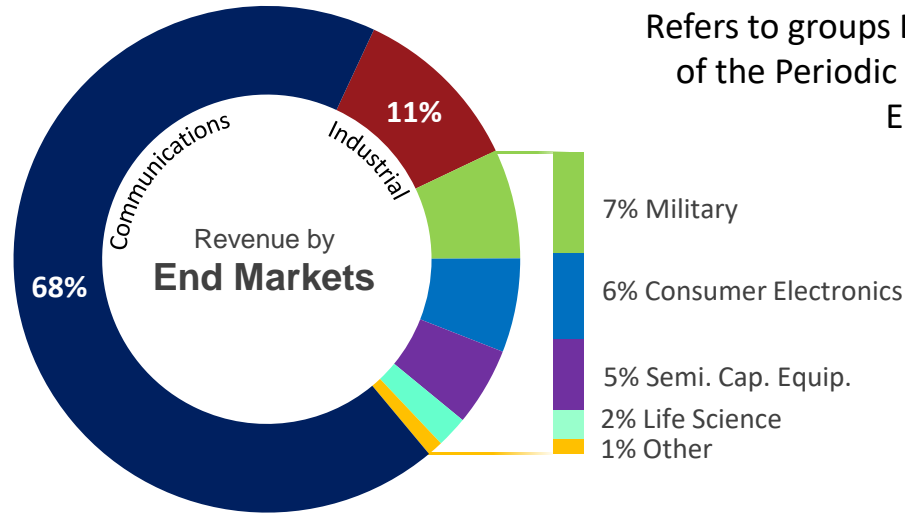
Revenue

**\$388M**

Cash and Equivalents

**\$120M YTD**

Cash Flow from Operations



**“TWO SIX”**

Refers to groups II and VI of the Periodic Table of Elements

	IIIA	IVA	VA	VIA
	B Boron	C Carbon	N Nitrogen	O Oxygen
	Al Aluminum	Si Silicon	P Phosphorus	S Sulfur
IIIB	Zn Zinc	Ga Gallium	Ge Germanium	As Arsenic
	Cd Cadmium	In Indium	Sb Antimony	Te Tellurium
	Hg Mercury	Tl Thallium	Pb Lead	Bi Bismuth
				Po Polonium

**Core Competency:**  
**ENGINEERED MATERIALS**



**22,000+**

Employees



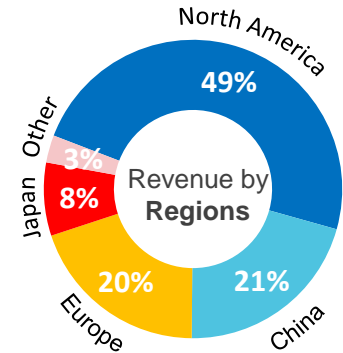
**69**

Locations



**18**

Countries



# Core Strategy

## Core Competency

- **A Leader** in engineered materials and **optoelectronic devices**
- **Differentiated** lasers, optics, and **integrated circuits**
- **Enabling** the convergence of **communications, computing, and sensing**

## Innovation Strategy

Markets



Diversified per Platform

Infrastructure



Capital Intensive

Performance



Valued By Customers

Products



Process Intensive

Differentiation



Engineered Materials

# Addressing Multiple Strong and Growing Markets



**Optical Communications**

GaAs | InP | LCoS

For terrestrial, undersea, wireless optical infrastructure and datacenters


**CY25  
Market**

**\$22B**

**CY20-25  
CAGR**

**14%**

Source: Ovum, LightCounting, Cignal AI, Internal Estimates



**3D Sensing & LiDAR**

GaAs | InP

For 3D sensing in consumer electronics & LiDAR in automotive

**\$7.5B**

**24%**

Source: Morgan Stanley, Forbes, Yole, IDC



**RF and Power Electronics**

SiC | GaN/SiC | Diamond

For electric vehicles, smart power grids and 4G/5G RF antennas

**\$6.2B**

**24%**

Source: Yole, Strategy Analytics, LightCounting (includes devices)



**Aerospace & Defense**

GaAs | Sapphire

For F35, contested space, directed energy and hypersonics

**\$2.6B**

**15%**

Source: Internal estimates

Updated on 4/9/2020

# Strategic Compound Semiconductor Platforms: SiC and GaN

## ■ Champaign, IL, USA

GaN and SiC EpiWafers

- GaN/SiC RF
- SiC/SiC Power
- Ongoing Expansion



## ■ Easton, PA, USA

SiC Substrates (RF and Power)

- Crystal growth
- Ongoing Expansion
- > 250K sq.ft. space



## ■ Pine Brook, NJ, USA

SiC Substrates (RF and Power)

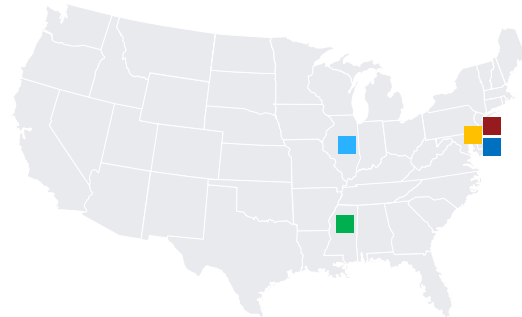
- R&D
- Crystal growth
- Slicing



## ■ Starkville, MS, USA

Back End SiC Wafer Processing

- Polish
- Clean
- Characterize
- Ship
- RF & Power Market



## ■ Warren, NJ, USA

RF GaN/SiC Devices

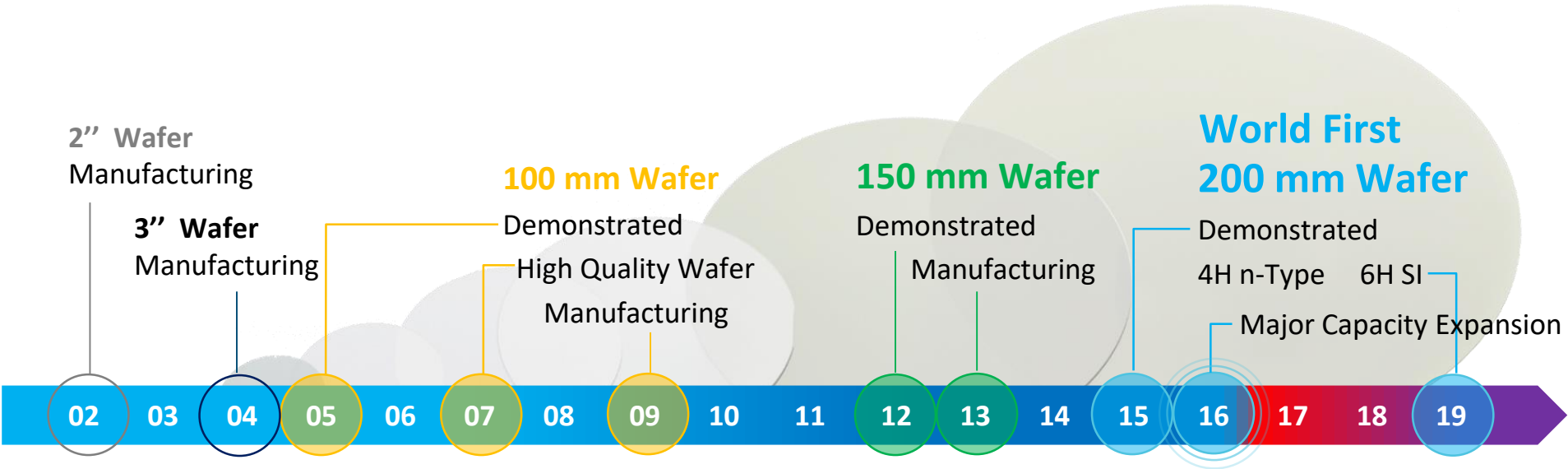
- GaN/SiC RF HEMT's



**II-VI will be a key enabler of SiC and GaN compound semiconductor technology nodes**

- Leading technology, vertical integration, scalable 150mm platform, supply chain security
- 5G wireless, green energy, EV/HEV

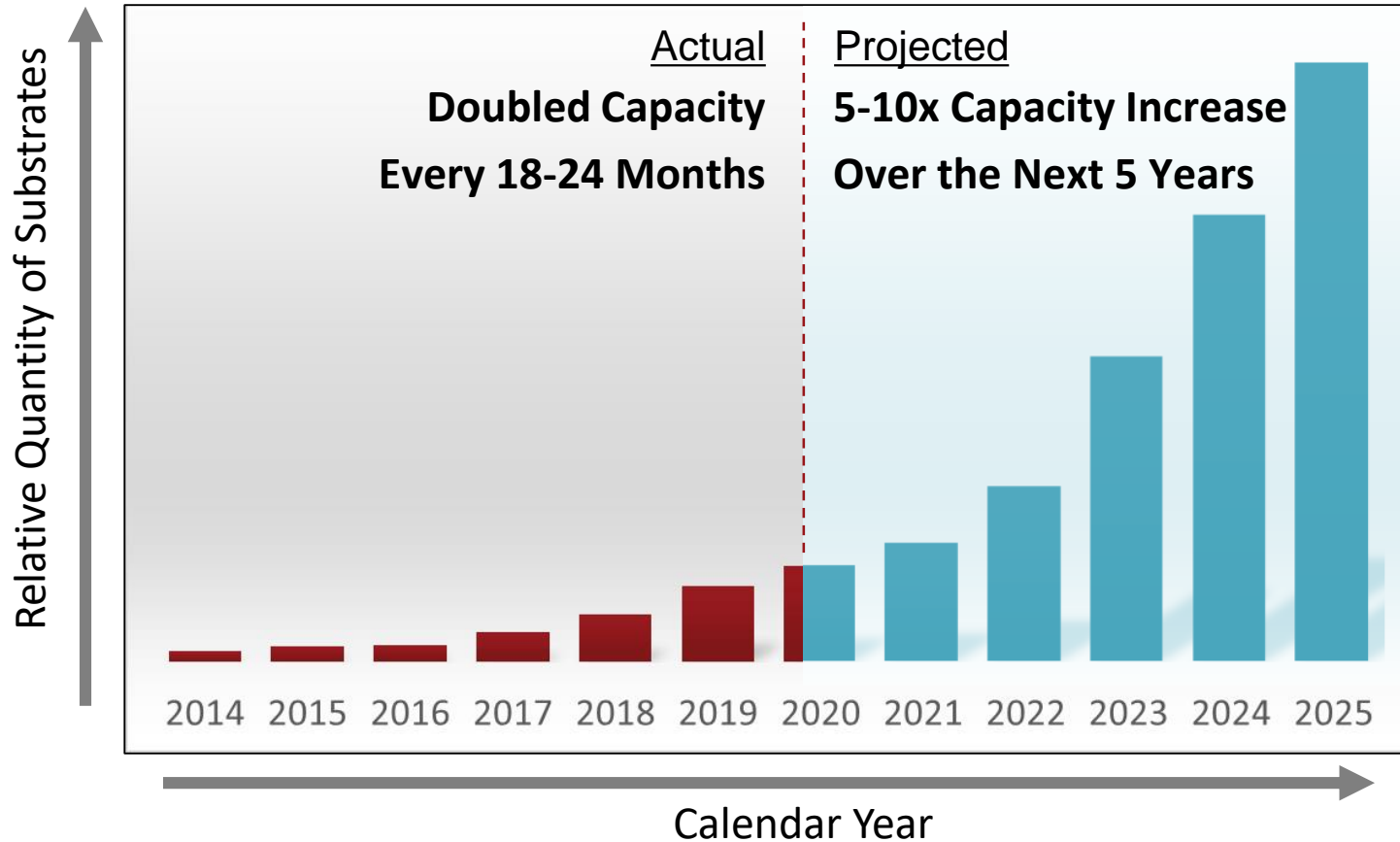
# II-VI SiC Diameter Expansion Timeline



## Advantages of Large Diameter Substrates

- Large diameter substrate fabrication cost (per unit area) is reduced significantly
- Large diameter wafer availability has helped move SiC-based devices from niche to mainstream
- Existing 200 mm silicon wafer fab lines can be used for SiC devices manufacturing

# SiC Manufacturing Capacity Expansion



# Enabling Electrification & Mobility



Ramping silicon carbide substrate capacity 5-10x over the next 5 years

## POWER ELECTRONICS FOR ELECTRIC VEHICLES

- 100, 150 mm diameter **conductive** substrates
- 2015: World's first 200 mm conductive substrates
- For SiC MOSFETs power devices
- About 10% more driving distance on the same charge

## RF ELECTRONICS FOR WIRELESS BASE STATIONS

- 100, 150 mm diameter **semi-insulating** substrates
- 2019: World's first 200 mm semi-insulating substrates
- For SiC-based GaN HEMT devices
- GaN/SiC enables high-bandwidth 5G bands





**IMI**

**MATERIALS THAT MATTER**