

第三代半导体 业

研究报告

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一、 业概况

GaN

Si C

GaN

5G

Si C

GaN

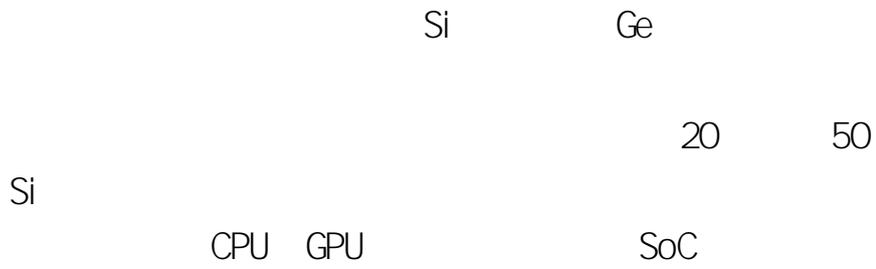
5G

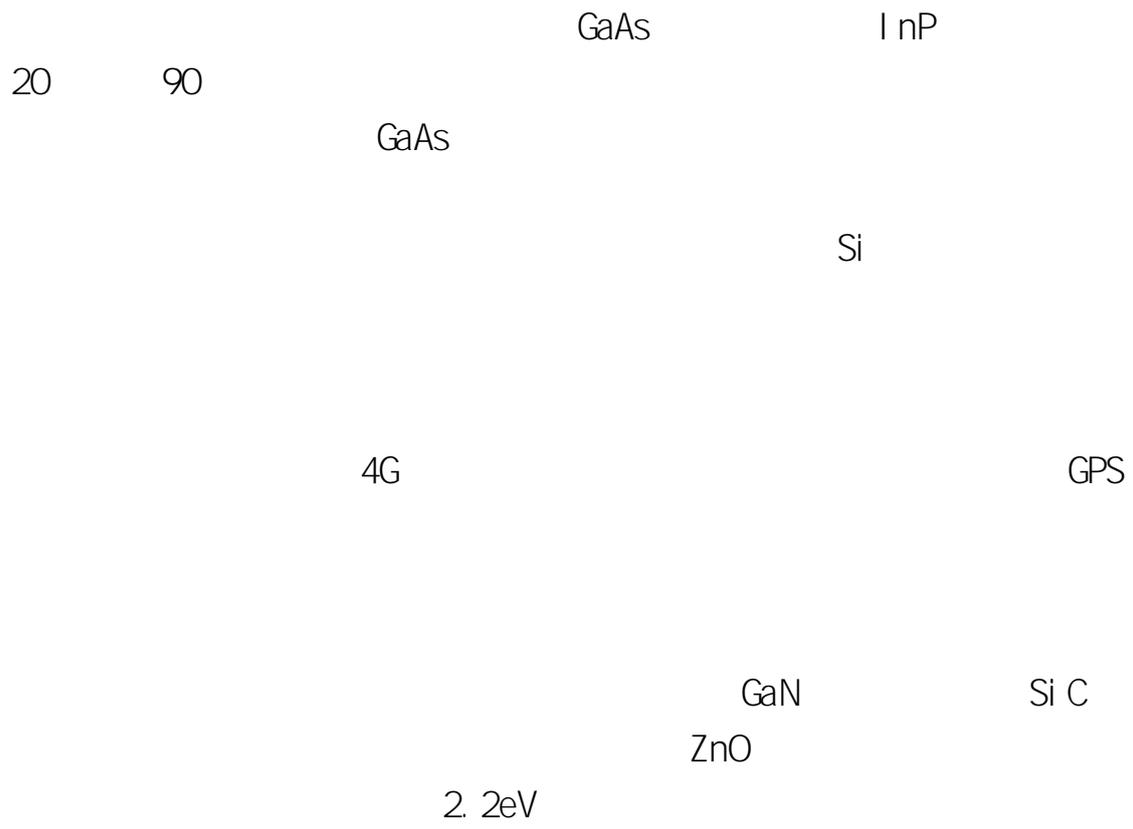
Si C

"

"

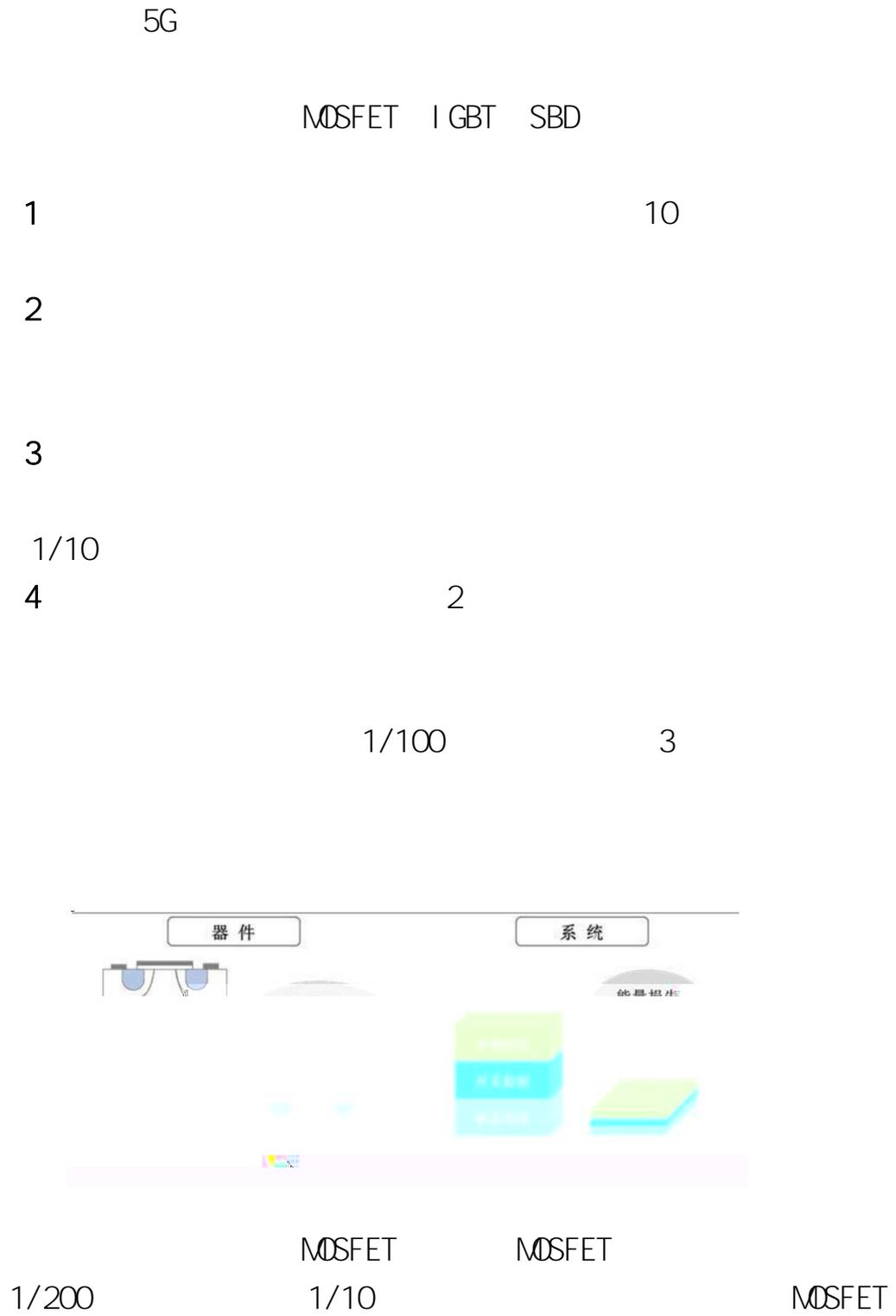
二、第三代半导体简介





	Si	GaN	Si C
eV	1.1	3.4	3.3
10cm/Vs	1350	2000	1000
10cm/s	1	2.7	2.2
	11.9	8.9	9.7
W/cmK	1.49	1.3	4.0
MW/cm	0.3	3.3	3.3
	175	800	600

三、第三代半导体主 材料



四、第三代半导体产业

/

75%

50%

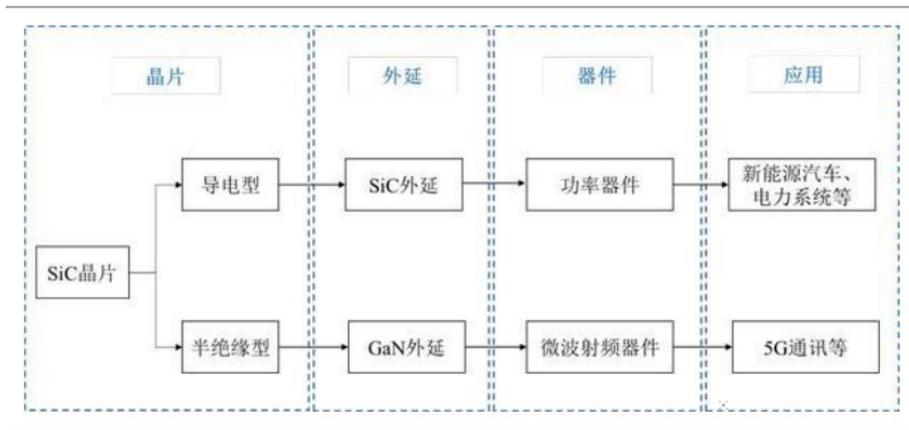
25%

Si C

"

"

"



Si C

50%

Si C

Si C

Si C

Si C

PVT

2000

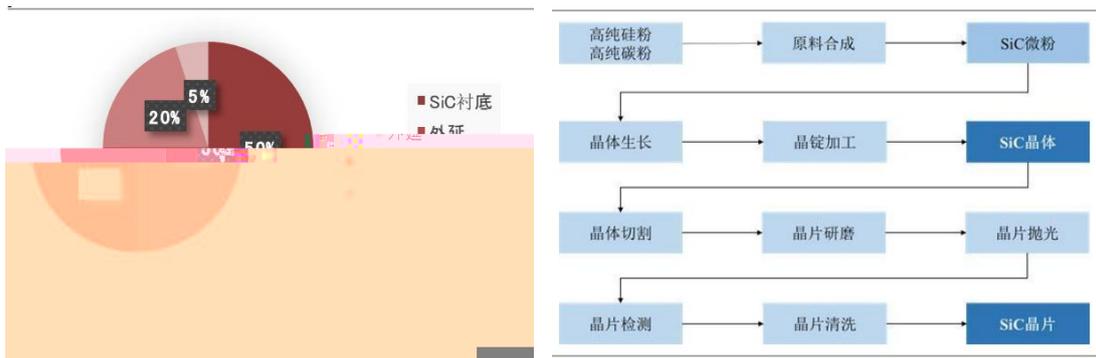
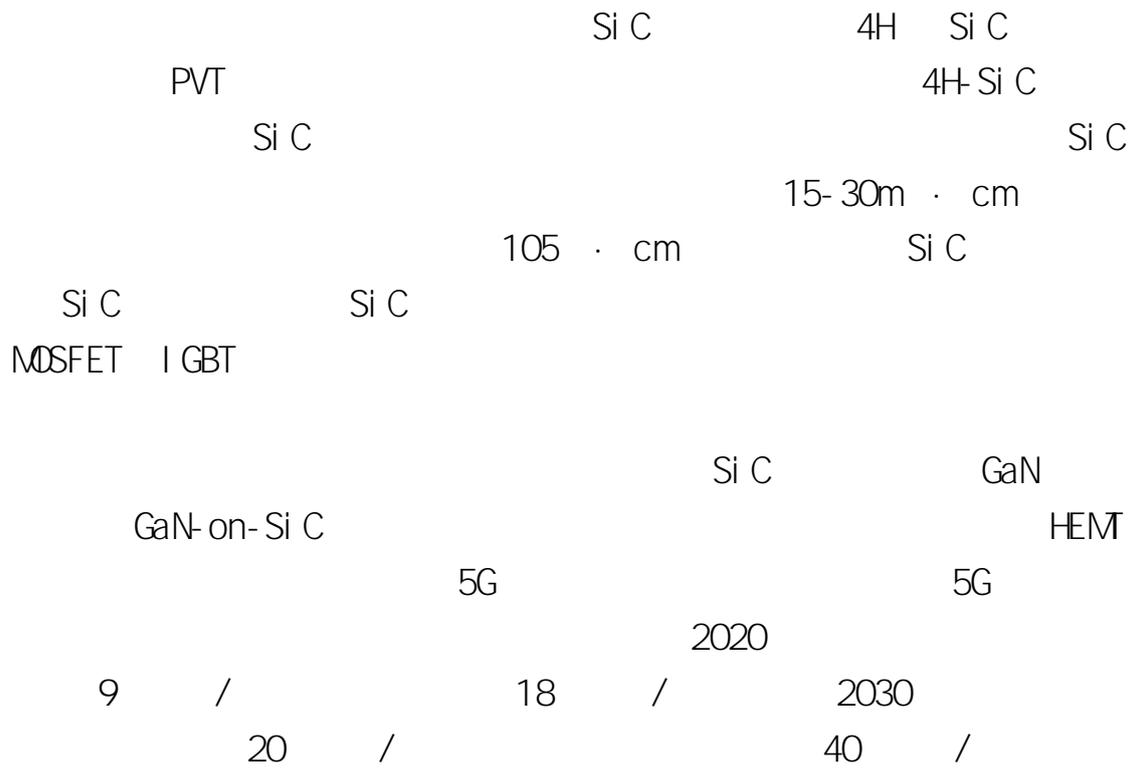
C

Si

Si

Si₂C

Si C₂



SiC
 1000V
 Si
 SiC
 5G

GaN / - -
 GaN
 GaN GaN
 LED Si MOCVD GaN Si C
 GaN
 1 2000 2014 LED
 LED 2 Si C 3
 Si
 2020 GaN

	GaN	Si C	Si
GaN		/	/
Si C	/		/
Si	/	/	
	/LED	/	/

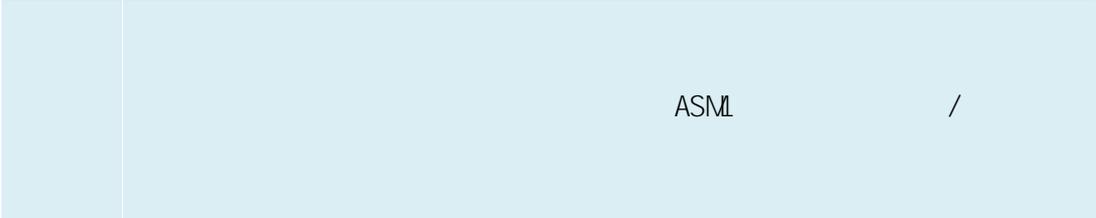
Si C		PVT
------	--	-----

		Si C
		Si C
		Si C Si C
GaN	GaN	HVPE
	GaN	MOCVD

			Cree	
			Cree Aixtron	
		/	Meyer Burger NTC	
	Si	Si C	STRASBAUGH Logi tech	
			Logi tech AMAT	

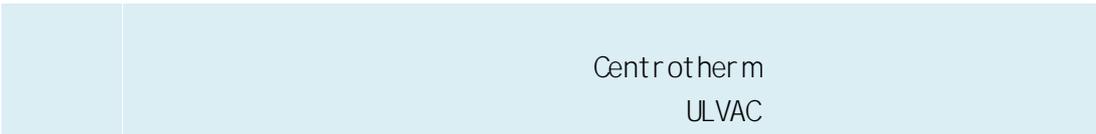


Ai xtron
LPE
TEL
NufI are
Epi gress

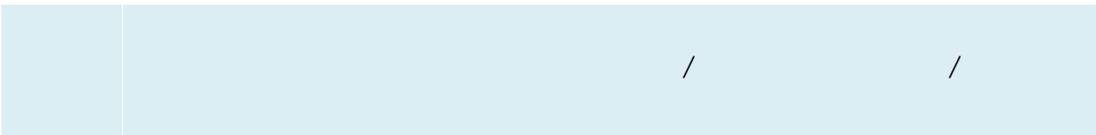


ASML /

/ /



Centrotherm
ULVAC
ULVAC
NI SSI N
AMAT



/ /

SENTECH
TOXFORD
Cori al



PECVD

Meyer
Burger
Appl i ed
Materi al s

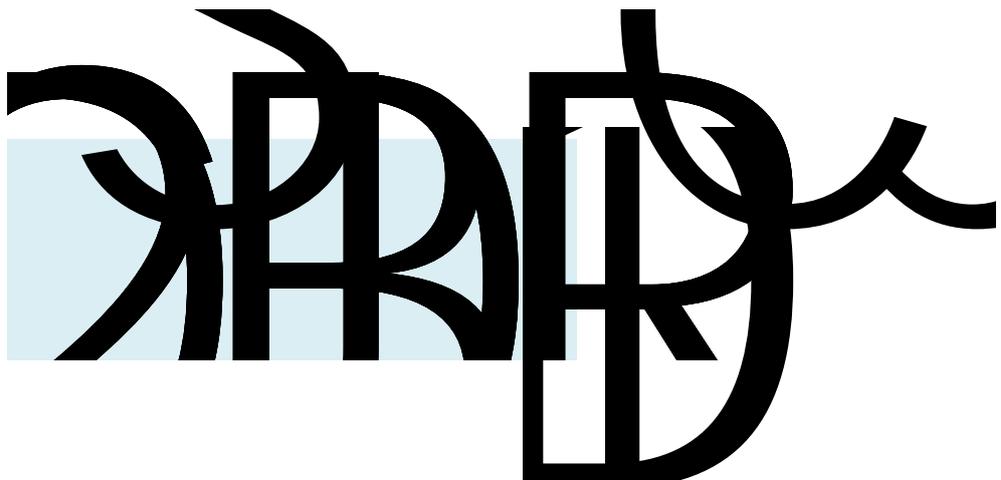
MOCVD

Ai xtron
Veeco



			/	/
			Di sco	

	Si C				
Si C		Si C	SBD	Si C Pi N	Si C
	SBD	JBS	. SBD		Si CSBD
		250V			



GaN HEMT	GaN	HEMT		
	100GHz	GaN HEMT Ka	300	1-
GaN	GaN GaN	GaN PN	GaN 3	PN

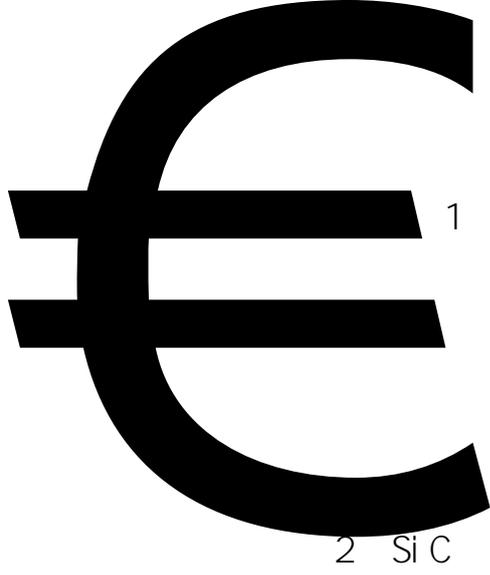
1 Si C Si C
4 6 8

Si C

Si C

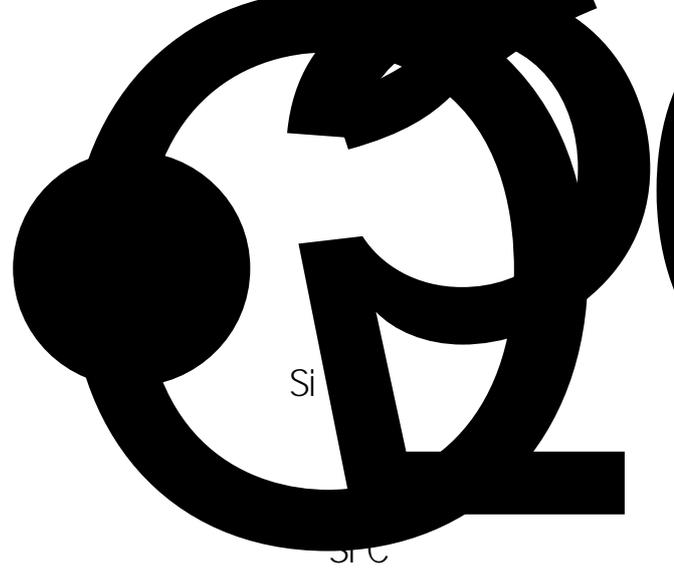
Si C

r



du/dt

Si C



Si

Si C

Si C

5 Si C

Si C

Si C

Si C

Si C

五、第三代半导体产

,

8	2016		" "	2030 2030	"	"		
9	2015		2025	2025 80%	5G 50%			
10	2021		2021- 2025	Si C	6	8 5G	GaAs	GaN

六、第三代半导体下游应用市场

GaN 3 1 Si C 2 III
ZnO

Si C GaN

5G

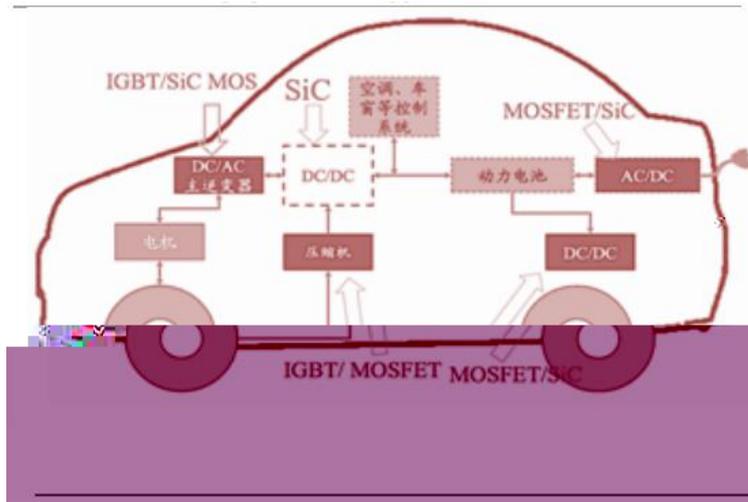
1

2

3



Year	Material	Percentage	Value
2020	第三代半导体材料	7.1%	7100
2019	第三代半导体材料	69.5%	100
2020	SiC	54%	44.7
2020	GaN	60.8%	60.8
2020	LED	80.3%	20
2020	LED	90%	90%



1

" "

DC-DC

Si C

Si C

Strategy Analytics

MCU

23%

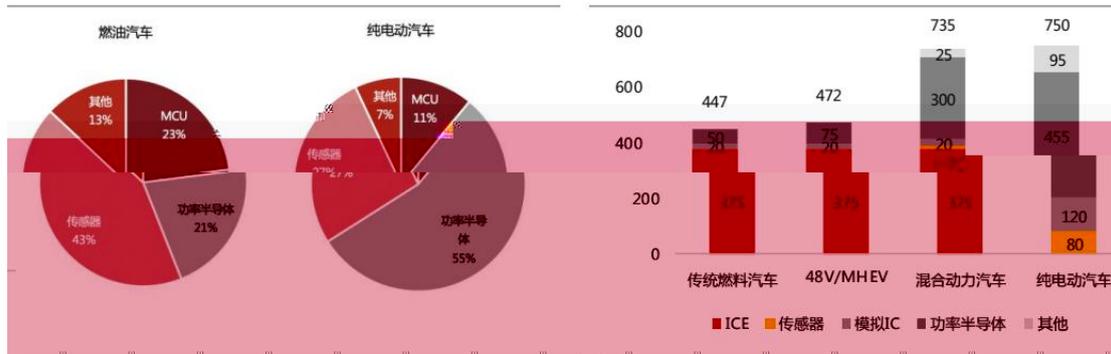
55%

/

300/455

/

50/75



Si C GaN

DC/DC 2015 OBC / Model 3

Si C MOSFET 2016

Si C 10%

Formula E Si C

I GBT 43% 6kg Si C 2018

Model 3 Si C

Si C 600 VDC

120kW Si C 2020 7

EV Si C-MOSFET 30kW/L

2020 11 300-600kW Si C MOSFET

TRATON

3% 6% 40kW/L

AEC-Q101 GaN HEMT

2 GaN GaN

GaN MOSFET

GaN

GaN GaN GaN

2019 9 OPPO GaN SuperVOOC2.0

65W

2020 2 65 W GaN

48

GaN

GaN

3

5G

Si

1

Si C

2

FACTS

PET

3

Si C
85%

Si IGBT
Si C

Si C

Si C

4

Si C

N700S

5

Si C

Si C

Si

3-5

Si

1/2

10% 20%

Si C

Si

GaN

1700

25GHz

1800W

5G

GaN

GaN

GaAs

(CATV)

LDMOS

GaAs

PA

GaAs

GaN

Si

LDMOS

GaAs

50W

GaN

LDMOS

LDMOS

4G

4G

1. 88GHz - 2. 635GHz

5G

Sub- 6GHz

0. 45GHz - 6GHz

24. 25GHz - 52. 6GHz

LDMOS

3GHz

5G

GaN

40Hz

5G

GaN

5

12%

Yol e

2025

GaN RF3

20

2019- 2025

GaNRF

12%

3. 42

11. 10

22%

15%
 3. 18
 7. 31
 1 5G
 5G
 GaN
 GaN
 GaN
 5G
 2020
 70
 80 5G
 5 5G
 Yol e 2022 4G/5G
 2023 GaN
 16
 5. 21 85% GaN
 LDMS
 2
 AESA
 GaN
 Yol e 2025 11
 GaN
 GaN
 22% CAGR

七、第三代半导体主 企业

Si C
 Si C
 Si C
 70% 80%
 2020
 2020
 45%
 Si l troni c
 I OE
 Si C
 Si C
 Si Crystal 20% II - VI 13%
 CREE

2019 3% 2020 5.3%
2.6%



Cree Rohm Si C - -
- Infineon
Si C
Cree II-VI Rohm Si Crystal
Si C 90% Cree Rohm
ST 70%
Si C Cree Rohm
Si C
2-6 Si C
2-6 Si C
IDM Si C
Si C Si C

GaN

/IDM

Corvo Cree
GaN

GaN
90%

6

2

4

Epi GaN

ICE

GaN

NTT-AT

2014

8

2018

12

8

GaN GaN-on-Si

GaN

EPC

MACOM

Transphom

Navi tas

Di al og

Ampl eon

GaN

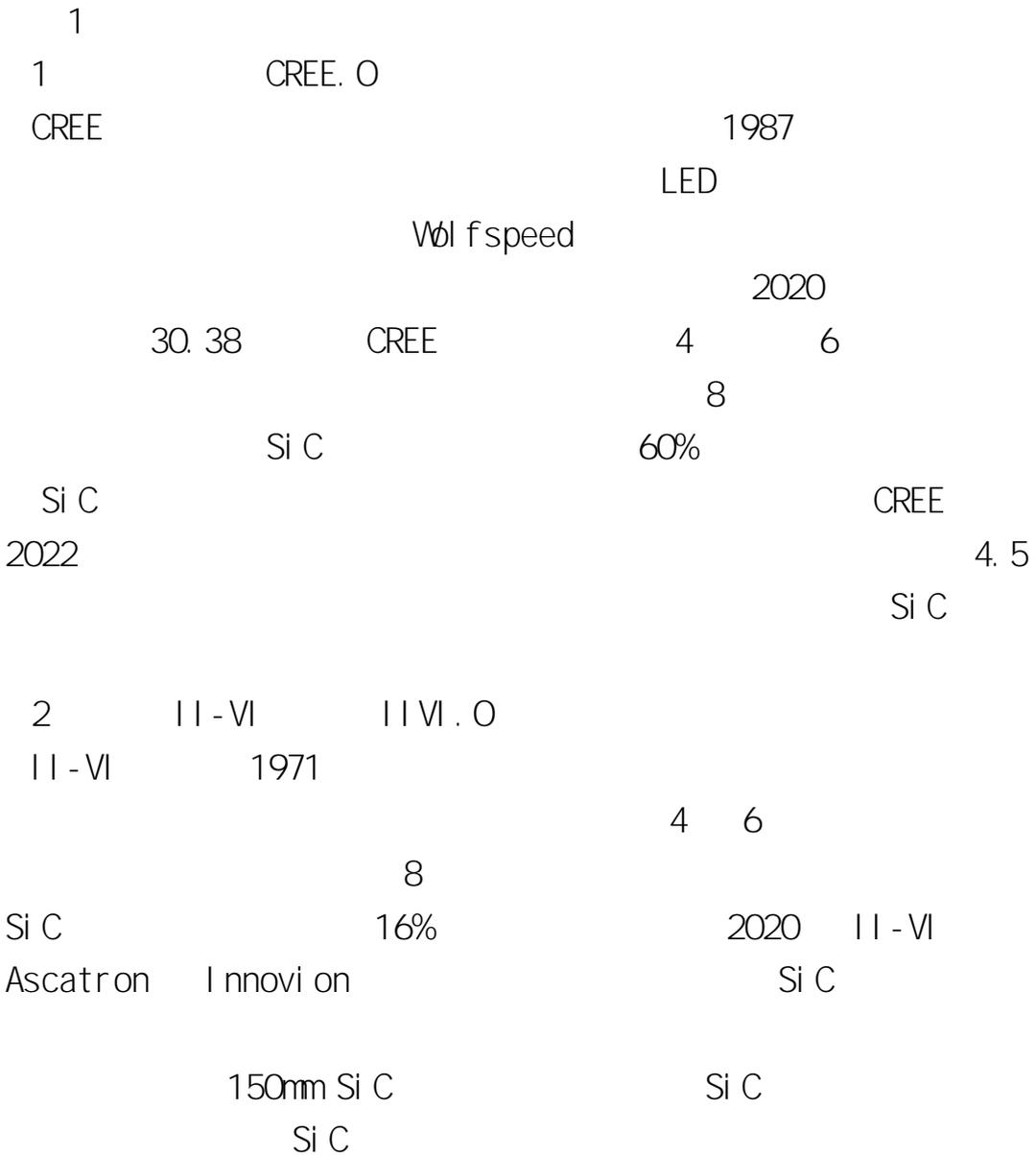
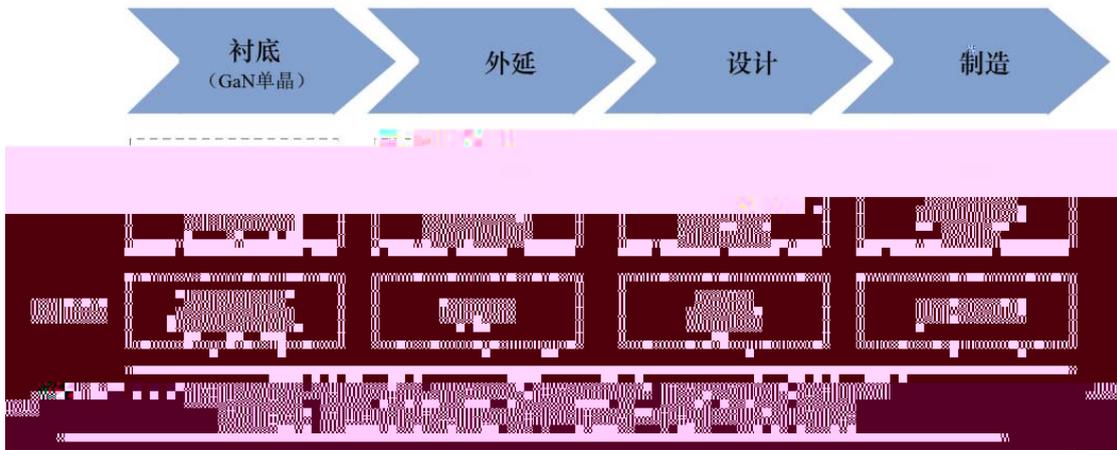
IDM

Cree

30%

Corvo

MACOM



3 Si Crystal
Si Crystal Si C

2009

2019
Si Crystal Si C

Si C

4

2019
Norstel Si C Si C 4H
Norstel 150mm 6 Si C

Si C

150mm 200mm 8
n

5

1999
IDM IC

2020 4
Cypress

2
1

2010 11

Si C

2018-2020 2020 4.25
2018 8.5% 2020 34.9%

		4				4.81
/	Yol e	2019	2020			
			2020			
	30%	2021	9		I PO	
2						
		2006	9			"
	—	—	—	—	—	"
					6	
	2	6				
Si C			"			
				"		
Devel opment		2018				Yol e
1.7%						4
		6		2020	1	8
		2020	10			
2021	3				54	
3					603290. SH	
		2005	4		700	I GBT
		I GBT				
		I GBT				95%
		I GBT				
		I GBT			Si C	
					I XYS Semi conductor	
2020			9.63		23.55%	
1.81			33.6%			
3				688396. SH		
		2003	1	900		I DM

MOSFET

MCU

6

Si C

650V

Si C

8

133

/

1

1200V

F&AHs

R ±0 P5

— — — —

120 3 6

6 300316. SZ

2006 12 950

LED

8 12 6

12 12 2021 12

Si C Si C GaN Si C GaN Si C

Si 2 4-8

36-46%

CASA

Si C —— Si C

5

200mm 8

2019 600V-650V Si C SBD

Si 2.4 1200V Si C SBD Si

5 2019 Si C GaN

Si

Si C

八、我国第三代半导体产业发展 势

