

GaN

Si C

GaN

5G

Si C

GaN

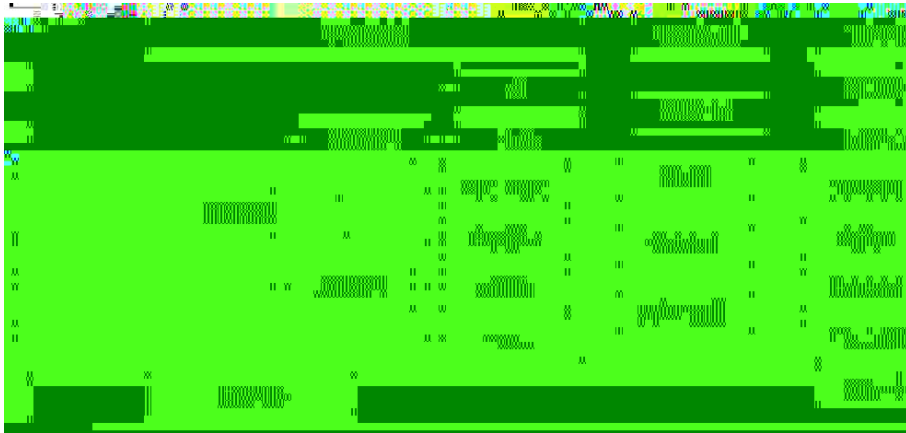
5G

Si C

"

"

“ ”



1: 业

Si

Ge

20

50

Si

CPU GPU

SoC

I GBT

-

MOSFET

I GBT

20 90 GaAs InP
 GaAs Si
 4G GPS
 GaN Si C
 ZnO
 2. 2eV
 1: 、 、

	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
WcmK	1.49	1.3	4.0
MW/cm	0.3	3.3	3.3
	175	800	600

HEMT
 0.5-1W/mm
 5-8W/mm
 MOS

Si Ge GaAs InP GaN

Si C

5G

2: 三

	Si Ge		Si 99% 95% Si Ge
	GaAs InP	Si GaAs InP InP	GPS
	GaN Si C		

5G

MOSFET IGBT SBD

1 10

2

3

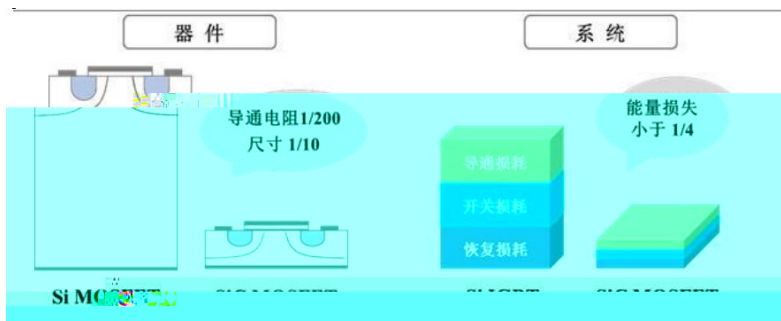
1/10

4

2

1/100

3



2: SiC

Si

MOSFET

MOSFET

1/200

1/10

MOSFET

I GBT I GBT I GBT 1/4
 I GBT MOSFET EPA MOSFET
 I GBT 77% EPA MOSFET
 I GBT I GBT 85% I GBT
 5-10% MOSFET

GaN GaN HEMT(5G)
 I GBT GaN GaN Si Si C MOSFET

2 4

3

, 5G

;

/

75%

50%

25%

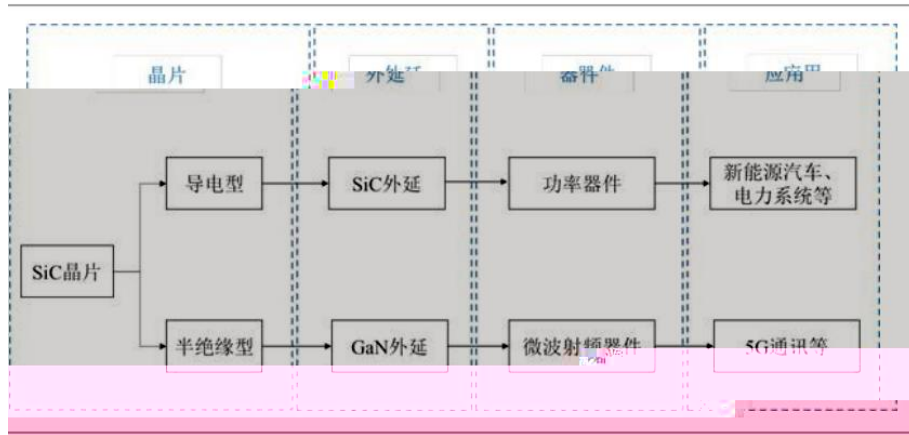
Si C

"

"

"

"



3: SiC 业

Si C

Si C

Si C

50%

Si C

Si C

PVT

2000

C

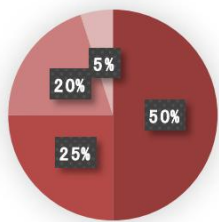
Si

Si

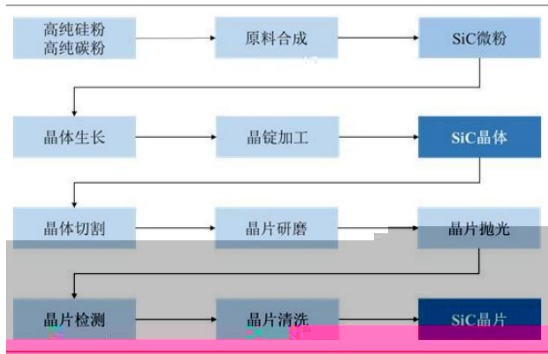
Si₂C

Si C₂

PVT SiC 4H SiC 4H-SiC SiC
 SiC 105 cm 15-30m cm SiC
 MOSFET IGBT SiC
 GaN-on-SiC SiC GaN HEMT
 5G 5G
 9 / 20 / 18 / 2020 2030 40 /



■ SiC衬底
 ■ 外延
 ■ 前段
 ■ 封测



4: SiC 业

5: SiC

SiC

1000V

SiC

Si

5G

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

3: 不

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

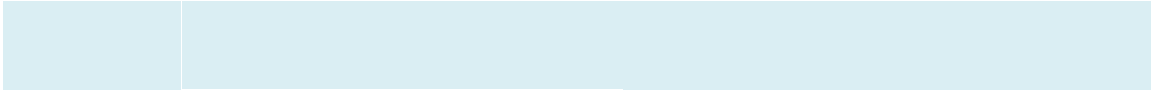
3: 三

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

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

4: 三

	Cree
	Cree Aixtron
	/ Meyer Burger NTC



Ai xtron
LPE
TEL
Nufl are

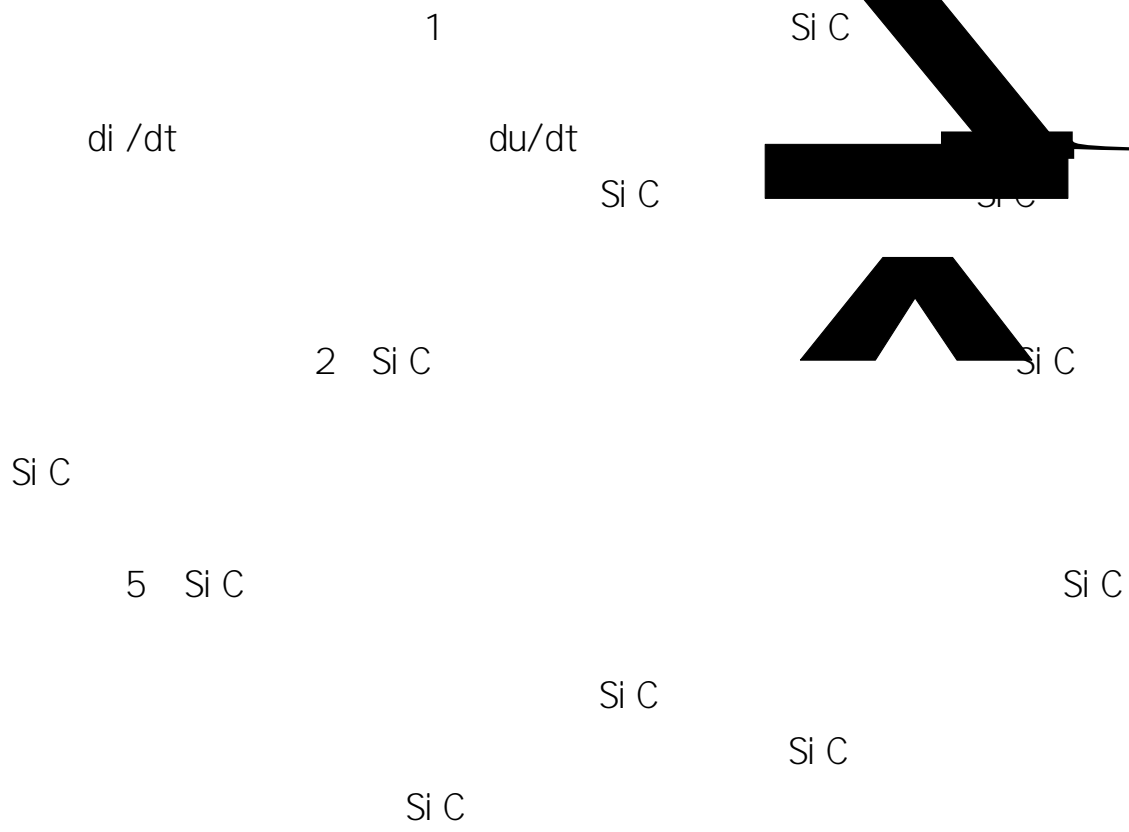
			/	/
			Di sco	

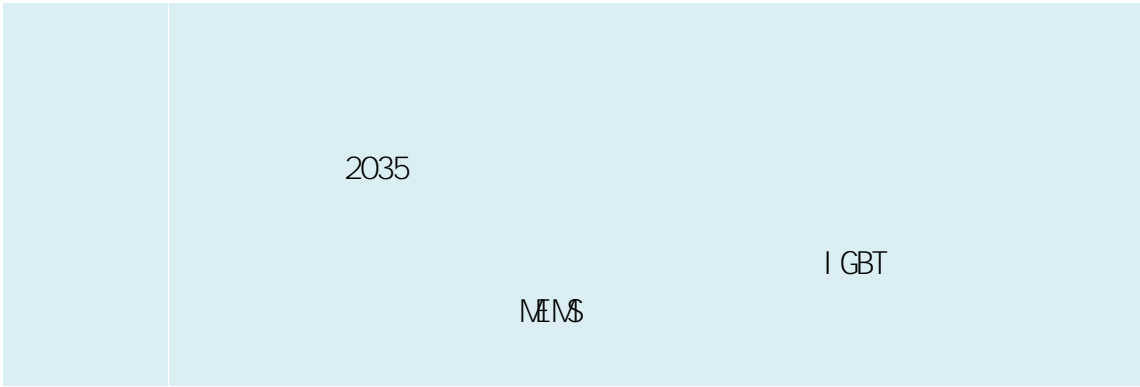
5: 三

5: 三				
Si C		%		
Si C	Si C	JBS	SBD	Si C Pi N
SBD,°		250V	SBD	Si C
				Si CSBD

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



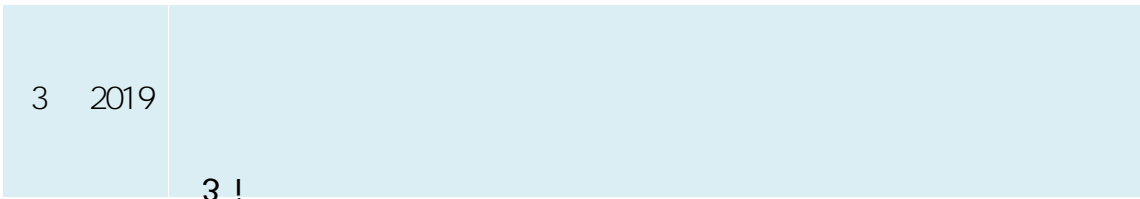




2 2020

10%

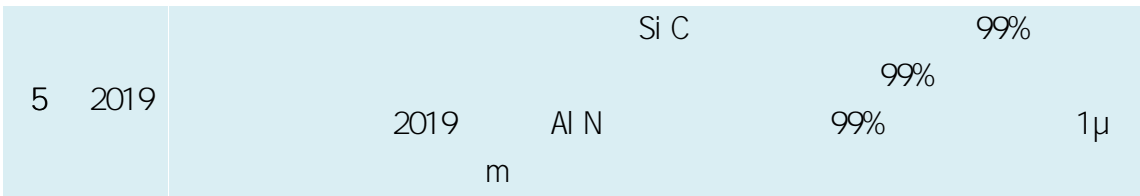
2 3



4 2019

2018 12 31

25%



GaN

6 2019

2019

a

?

K

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

GaN 3 1 Si C 2 III
ZnO

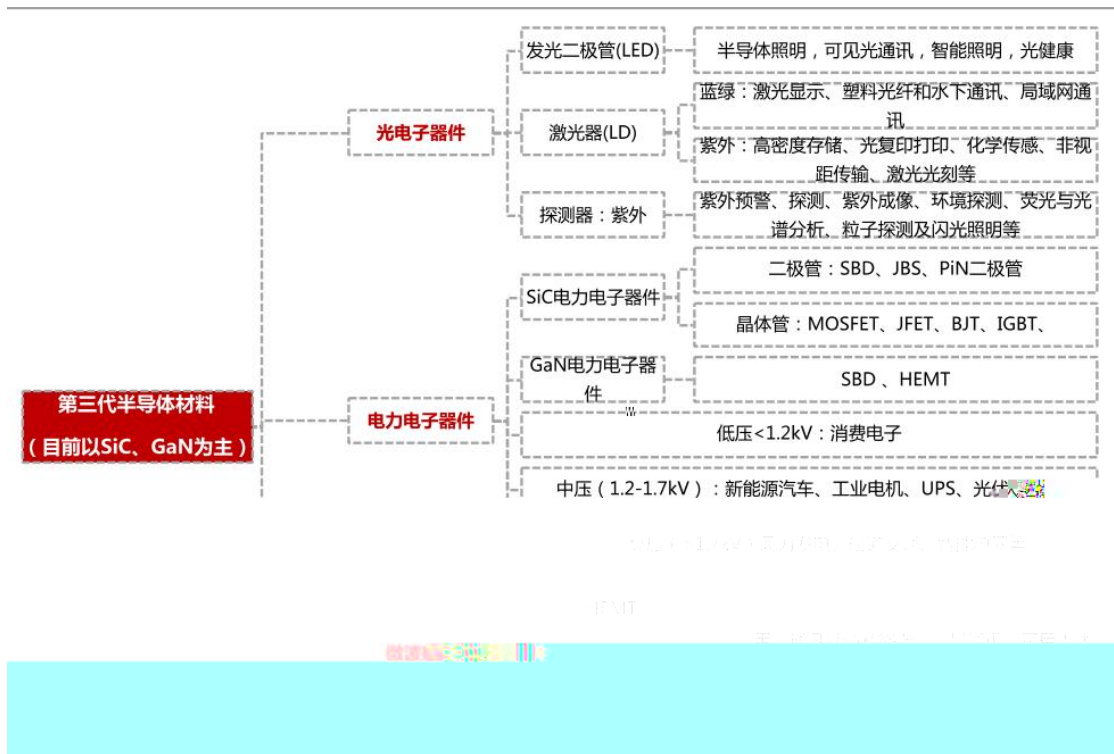
Si C GaN

5G

1

2

3



6: 三 下

CASA

2020	2020				7100
2019	7.1%		7013		100
	69.5%	Si C	GaN		44.7
	54%	GaN		60.8	
80.3%					LED
					20
				LED	
2020	Si C	GaN			90%
2020	PD				
GaN				GaN	

Si C GaN

2019

CESI

2018

230.91

70

5% 2019-2023

39% 2030

1100

500

40-50%

Si C GaN

100

55-60%

GAN

500

50%

Si C GaN

30%

Si C MOSFET

Si C

Yol e Onli a

2020

8.54

Si C GaN

7.03

Si C

1.51

2025

Si C

30

Si C

6.8

Si C

Si

Si C GaN

Si MOSFET IGBT GTO

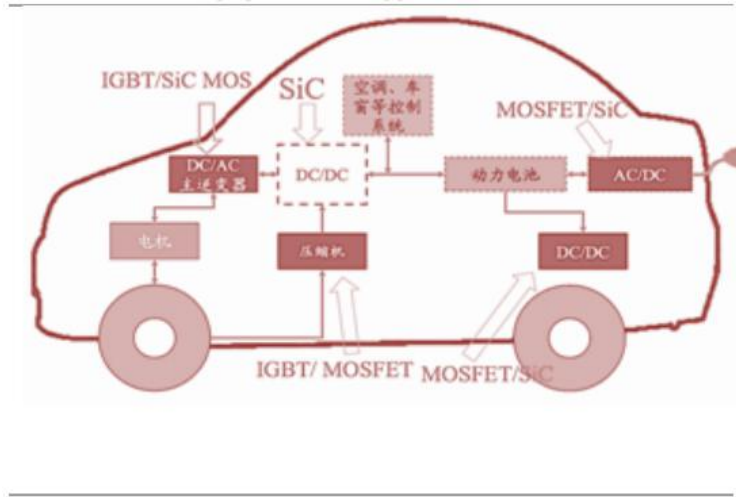
Si C

600 V

600 V

/

GaN



7:

1

" "

DC-DC

Si C

Si C

Strategy Analytics

MCU

23%

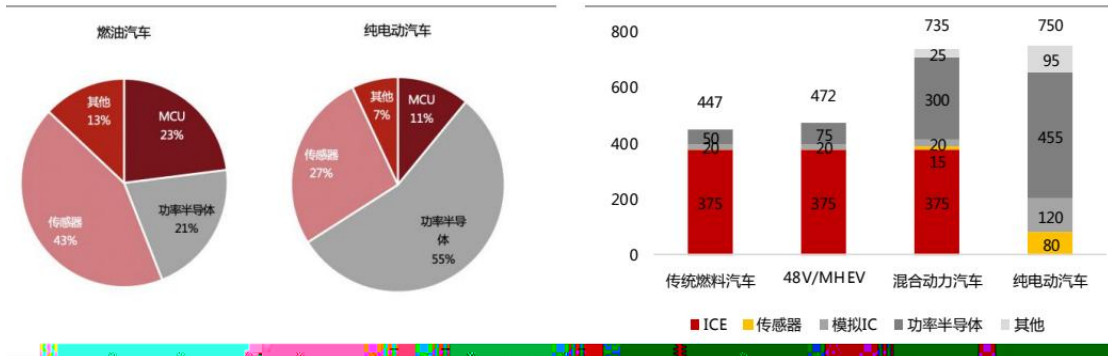
55%

/

300/455

/

50/75



8:

不 不

9:

()

Si C GaN

DC/DC 2015 OBC / Model 3

Si C MOSFET 2016

Si C 10%

Formula E Si C

I GBT 43% 6kg 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 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

1800W GaN 1700 25GHz

GaN 5G

GaN GaAs

(CATV) LDMOS

GaN 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

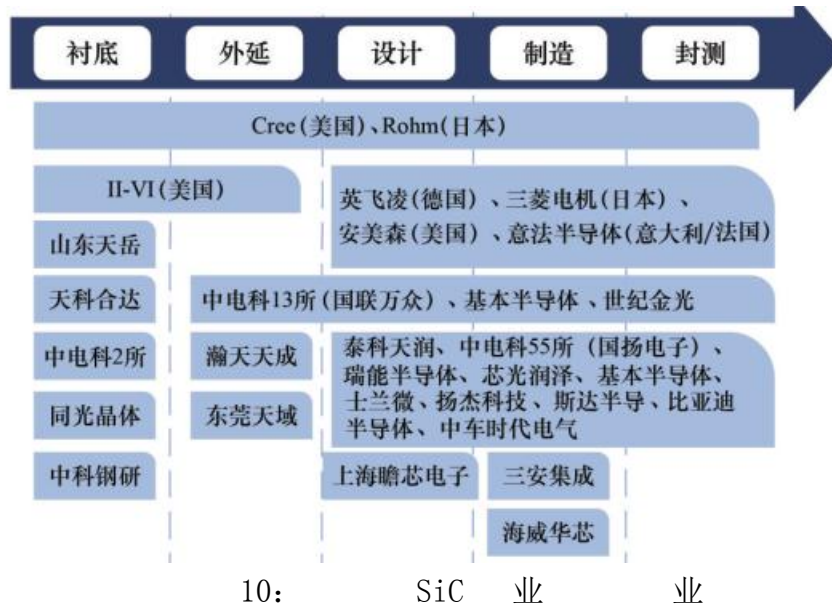
2025 GaN RF3 20 2019- 2025

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 GaAs
 GaN
 AESA
 GaN
 Yol e 2025 GaN 11
 22% CAGR
 Si C
 Si C
 Si C
 Si C
 Si C
 70% 80%
 2020
 2020
 45%
 Si I troni c
 Si C
 I OE
 Si Crystal
 20% II - VI 13%
 CREE

2019 3% 2020 5.3%
2.6%



10: SiC 业 业

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

Si C Si C

4 6

Si C Si C

4 Si C

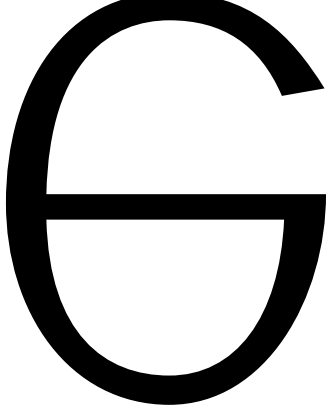
6 Si C GaN

7: 三

		Si C 4 Si C 6 8 GaN 2 4 6	Si C 4 6 6 8 GaN 4/6
		Si C 4 6 Si C GaN 6 Si GaN GaN 5μ m 600V	Si C 6 70-80% GaN Si C GaN 4 6 8
		40-50%	70-80%
		15	33

8:

	Cree	II - VI	Si Crystal		
4					
6	2012			2019	2014
8	2019	2015 2019			2020



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

Navitas

Dialog

Amplion

GaN

IDM

Cree

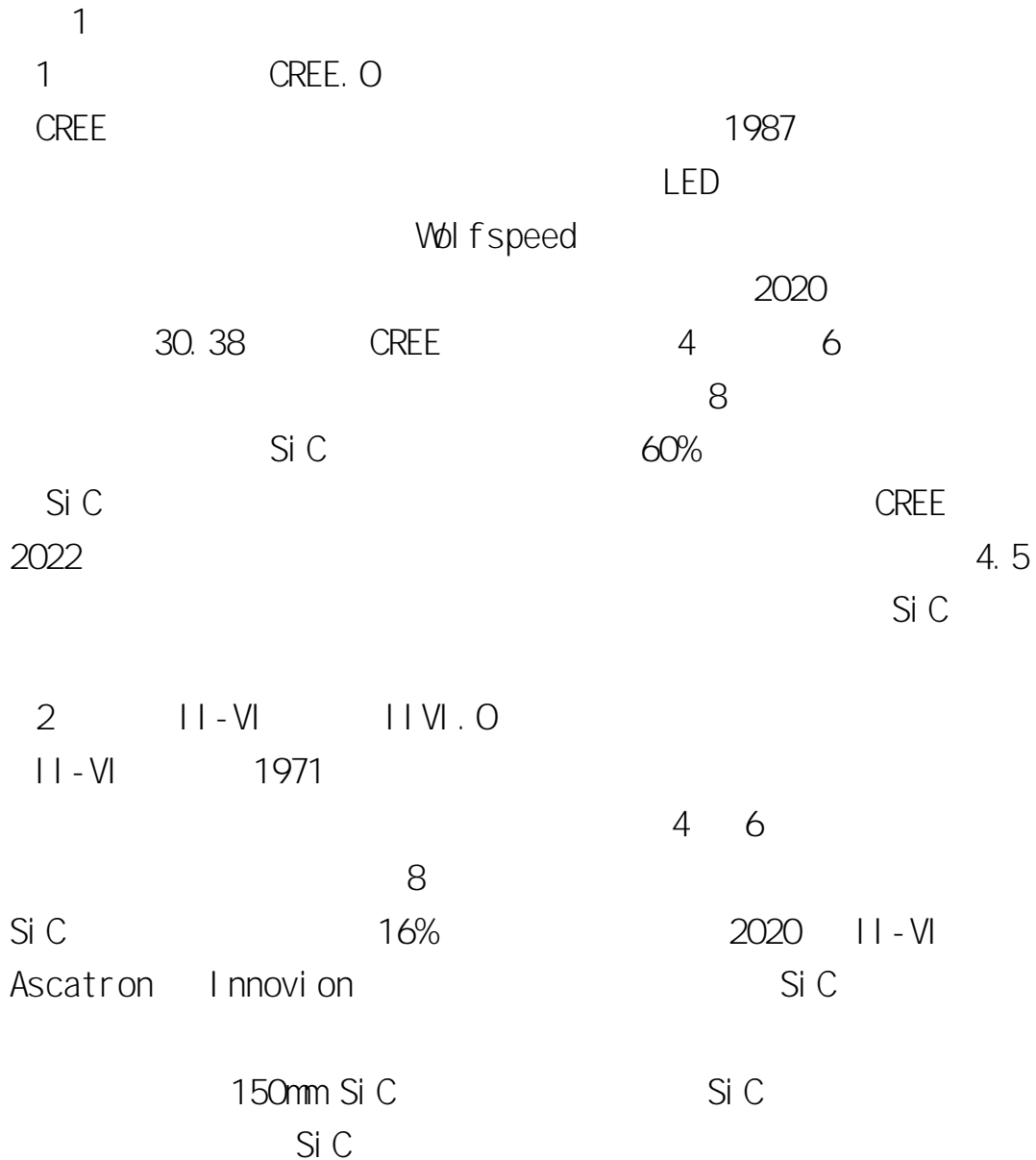
30%

Corvo

MACOM



11: GaN 业 业



3 Si Crystal
Si Crystal Si C

2009

2019
Si Crystal Si C

Si C

4

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

Si C

150mm 200mm 8
n

5

1999
IDM IC

2020 4
Cypress

2
1

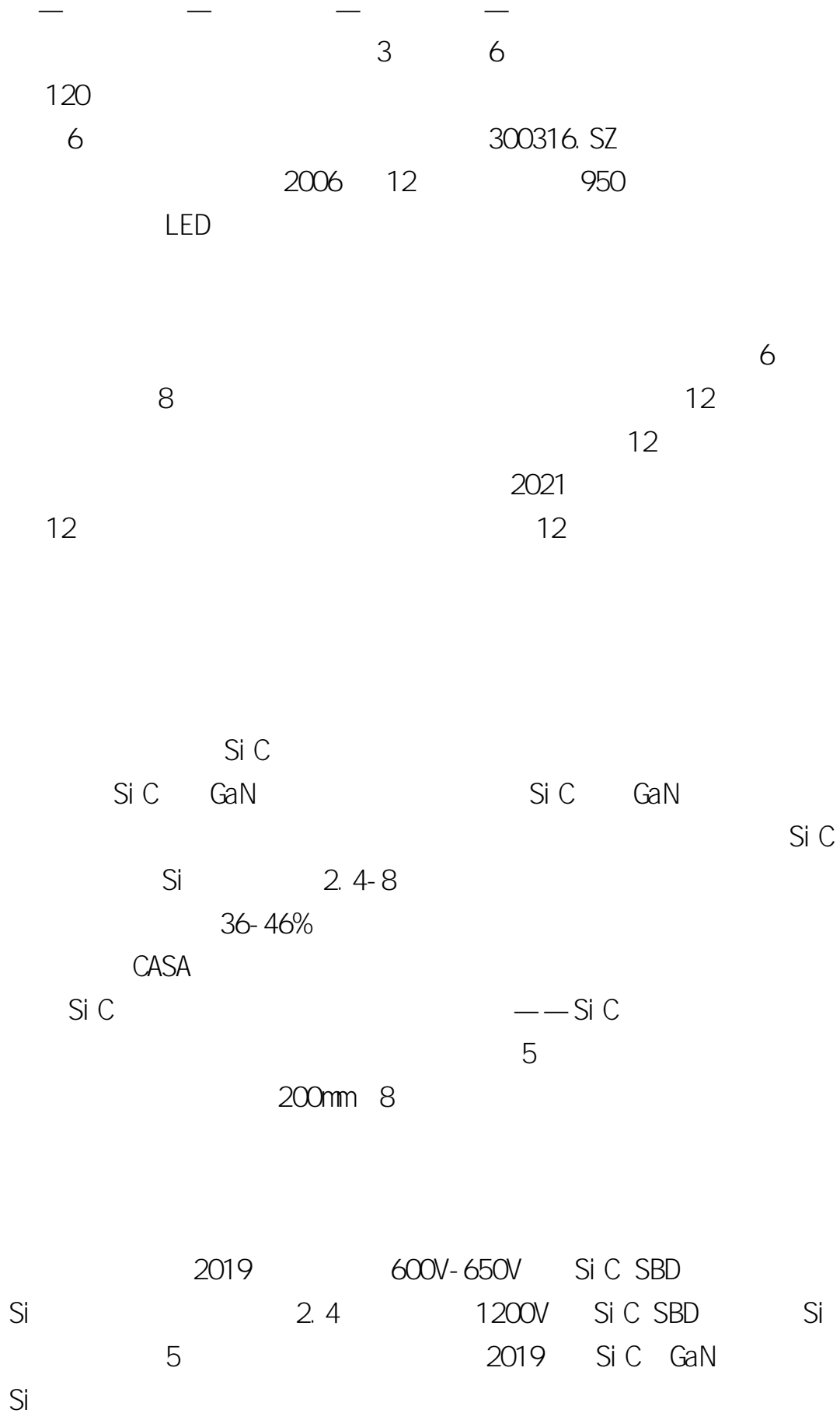
2010 11

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			"				
				"			Yol e
Devel opment		2018					
1.7%							

	MOSFET		I C	MCU			
		6		Si C			1200V
650V	Si C						1000 /
		8			133	/	12



Si C

2020 " "

" 5G " 5G

40 5G

2020- 2026

35%

940. 8 5G

EV Sales 2019 116

54%

1 AC- AC 220V 12-

36V 2 AC- DC 3 DC- DC 4

DC- AC 12V

Si C MOSFET

I GBT+Si FRD

Si C 3% 5% Si C

2021

Cree Si C 5- 10%

	2018 / 2024	600	Si C	2020	15
	2018			16	15
Infi neon	8	GaN-on-Si 3500	6	Si C	Si C Sil tectra 90%
II-VI	2018	Si C	4	5-10	
	2020	6	Si C		
	2020	6	Si C		
	Si C Corporation	GaN-on-Si C		Ascatron AB	INNOVION

Si C

Si C