(688396)

( ) ( )

021-38676820 021-38677388

wangcong@gtjas.com zhangtianwen@gtjas.com

S0880517010002 S0880118090094

6 **SiC**

SiC **GaN**

2020.11.09

(688396)

87.41

81.07

50.20

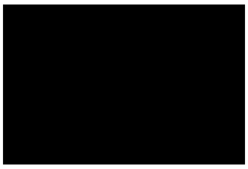
www.crmicro.com

	2018A	2019A	2020E	2021E	2022E
	6,271	**5,743**	**6,719**	**8,197**	**10,083**
	4,690	4,431	4,752	5,574	6,639
	85	66	77	94	116
	126	112	131	172	219
	374	377	336	410	504
EBIT	**546**	**274**	**926**	**1,209**	**1,646**
	0	0	0	0	0
	11	0	0	0	0
	0	31	47	-52	-78
	586	**478**	**1,120**	**1,564**	**2,106**
	53	-6	116	160	215
	108	112	104	144	193
	429	**401**	**940**	**1,299**	**1,738**
于					
事 于	1,538	2,438	7,500	8,639	10,176
于	27	44	44	44	44
	0	82	82	82	82
于可	3,898	3,816	3,806	3,796	3,746
于	571	557	557	557	557
于可	**9,992**	**10,095**	**15,600**	**17,446**	**19,834**
	4,654	1,979	2,127	2,480	2,936
	318	1,726	1,726	1,726	1,726
未	5,020	6,391	11,748	13,241	15,173
(IC)	**7,471**	**7,897**	**13,254**	**14,747**	**16,679**
NOPLAT	497	277	833	1,088	1,482
承	953	709	510	410	350
	133	-1,192	105	115	144
	-533	-611	-658	-607	-557
	1,050	**-816**	**791**	**1,006**	**1,419**
	1,482	576	1,497	1,802	2,200
	-575	-41	-658	-607	-557
	-627	-180	4,223	-56	-105
	281	**356**	**5,062**	**1,139**	**1,538**
	6.7%	-8.4%	17.0%	22.0%	23.0%
EBIT	8150.3%	-49.9%	238.0%	30.6%	36.2%
	511.0%	-6.7%	134.5%	38.3%	33.8%
	25.2%	22.8%	29.3%	32.0%	34.2%
EBIT	8.7%	4.8%	13.8%	14.7%	16.3%
	6.8%	7.0%	14.0%	15.9%	17.2%
于 (ROE)	10.4%	7.4%	8.8%	10.8%	12.6%
于 (ROA)	5.4%	5.1%	6.7%	8.3%	9.7%
(ROIC)	6.7%	3.5%	6.3%	7.4%	8.9%
	91.9	86.9	86.9	86.9	86.9
	35.0	51.8	51.8	51.8	51.8
于	581.6	641.6	847.5	776.8	718.0
	3.5	1.4	1.6	1.4	1.3
/	8.5%	10.6%	9.8%	7.4%	5.5%
于	49.8%	36.7%	24.7%	24.1%	23.5%
	99.1%	58.0%	32.8%	31.8%	30.7%
PE	142.14	152.31	64.95	46.97	35.11
PB	11.69	8.44	5.72	5.08	4.44
EV/EBITDA	0.61		36.97	33.61	26.49
P/S	6.64	7.25	8.72	7.45	6.05
	0.0%	0.1%	0.3%	0.4%	0.6%

%

52 32.38-63.51

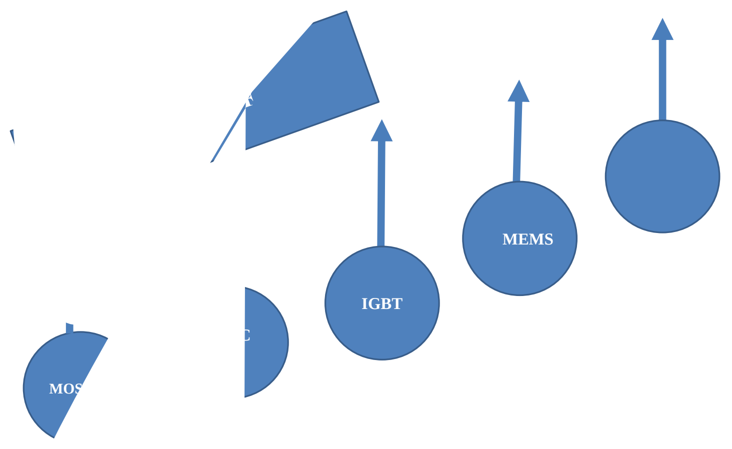
61,039



1.

MOSFET IGBT

1



1 2

9 25 (688396)

MOSFET IGBT 4
IGBT
IGBT

SiC **SiC MOSFET**
GaN

2.

SiC GaN
SiC 2030
500 5G
SiC GaN

2.1. SiC GaN

/
/

(GaAs) (InP) (GaN) (SiC)

/ **(Ge)** **(Si)** **(Se)** **(B)**
50

60

(GaAs) **(InP)**

(InSb) **(GaN)** **(SiC)** **(CdS)** 20 90

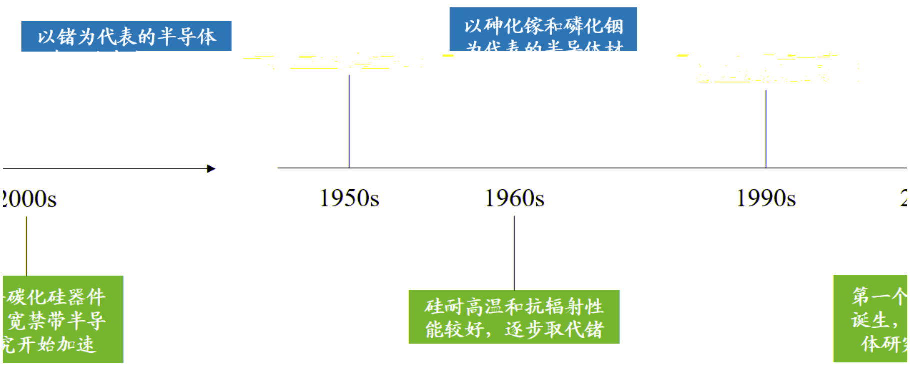
(GaAs) (InP)

1

2

(LED) (LD)

2



Yole

SiC GaN

(Eg) 2.3 (eV)

3 **SiC** **GaN**

(SiC) (GaN)

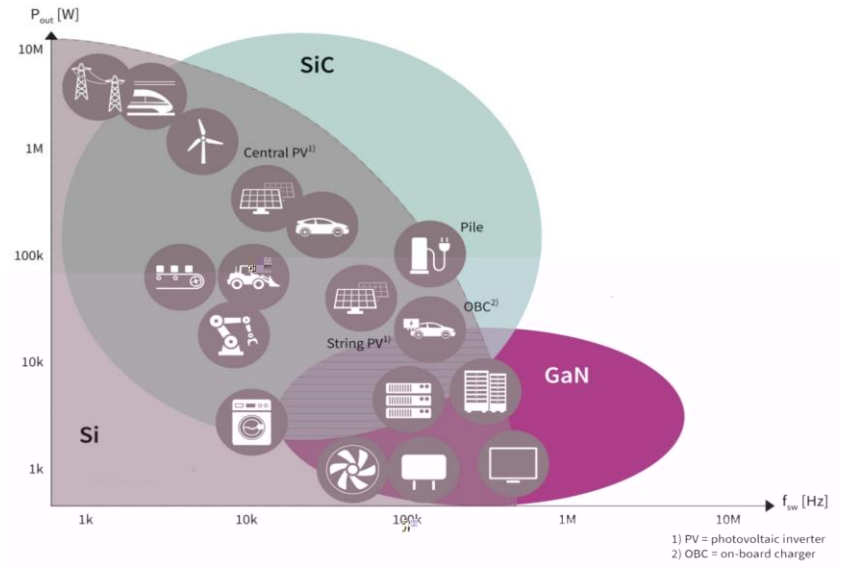
1:

	Si	GaAs	GaN
eV	1.1	1.4	3.4
10^{-7}cm/s	1.0	2.1	2.7
W/c K	1.3	0.6	2.0
M/cm	0.3	0.4	5.0
cm^2/ V s	1350	8500	900

/

[redacted]

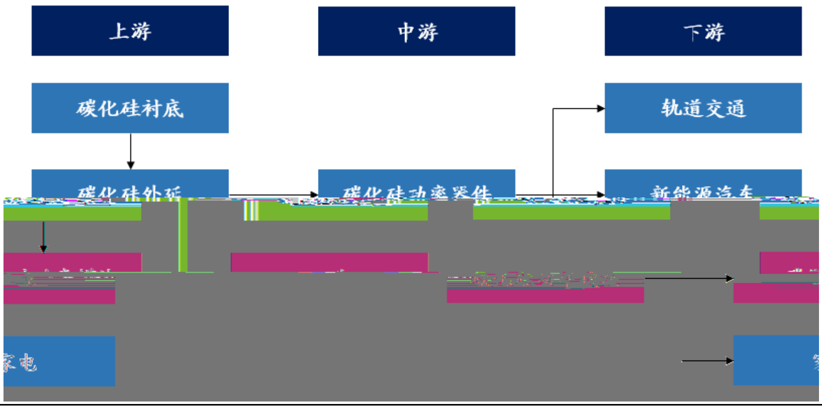
4



2.2. SiC

4H SiC(4H-SiC)

5 SiC



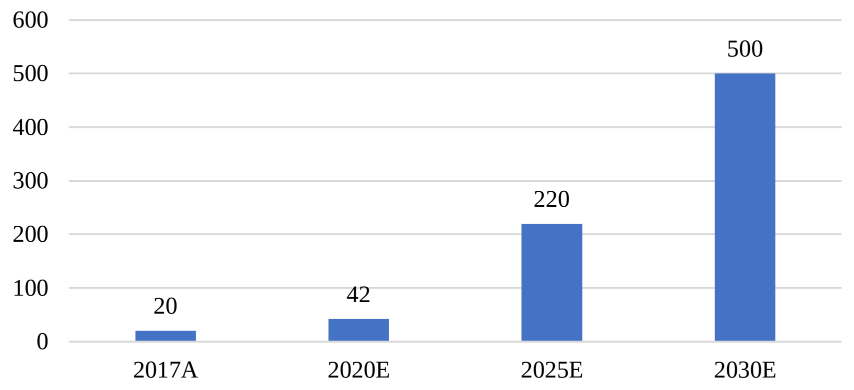
1 /

2010 Cree 6
2015 2015 Cree II-VI
8

6 **2030** **6** **SiC**
40 Yole 2017 4
10 6 1.5 2020 4
10 6
8 2020 TD[2i826 0 0 Tm EMC /P <<MCID 84/Lang(en-US)>>BDC

SiC	SBD
	PiN PiN
	JBS
	PiN MPS
SiC	MOSFET
	BJT
	JFET
	IGBT

21 **SiC** **JBS** **(** **)** **MOSFET** 2001 (Infineon) Cree



Yole

1

2

3

4

99 %

50 %

5
2001 600 V

SiC MOSFET JBS
SiC MOSFET
SiC JBS

7 4 SiC
SiC
5G 2020 5G
SiC
SiC

10 SiC

11 SiC

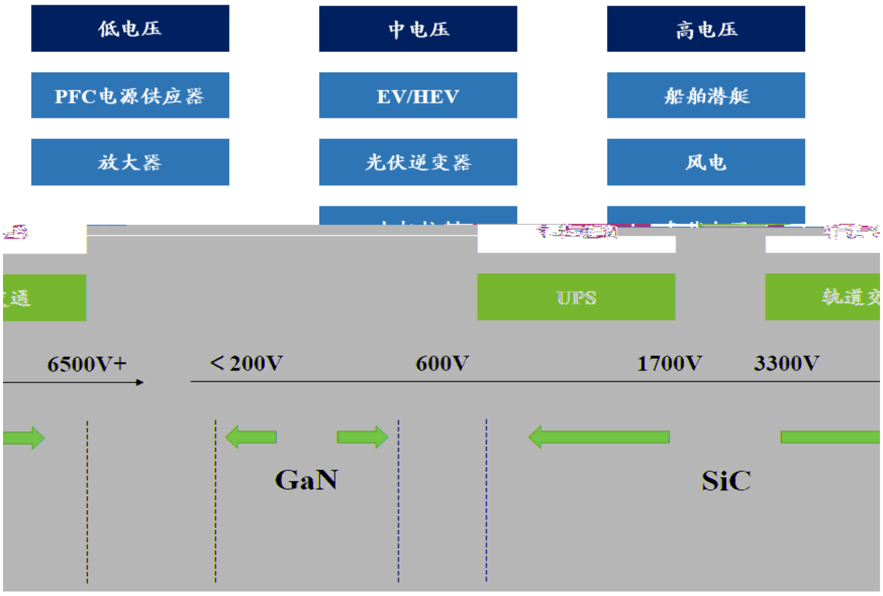
行业	新基建投资金额
5G✔	2020年投资规模近3000亿元
特高压	2020年投资规模超600亿元
轨道交通	2020年投资规模在5000亿元左右
充电桩✔	2020年投资规模约100亿元
数据中心✔	2020年投资规模约1000亿元
人工智能	2020年投资规模约350亿元
投资规模或达百亿级别	工业互联网 2020年

SiC

2.3. GaN

GaN **600V** GaN
1700
GaN GaN
0~300V
Si 600V SiC 300V~600V GaN

12 GaN 600V



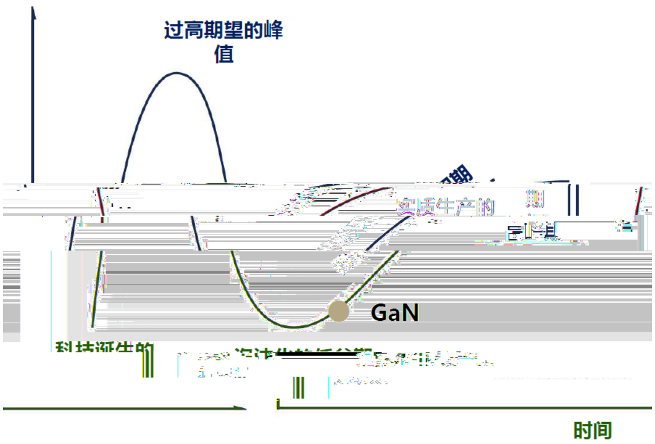
SiC GaN

GaN
GaN
Si SiC
GaN-on-Si GaN-on-SiC
GaN-on-SiC GaN SiC
GaN SiC
GaN

GaN-on-Si GaN-on-SiC
Macom GaN-on-Si
GaN-on-SiC GaN-
on-Si SiC
GaN-on-Si

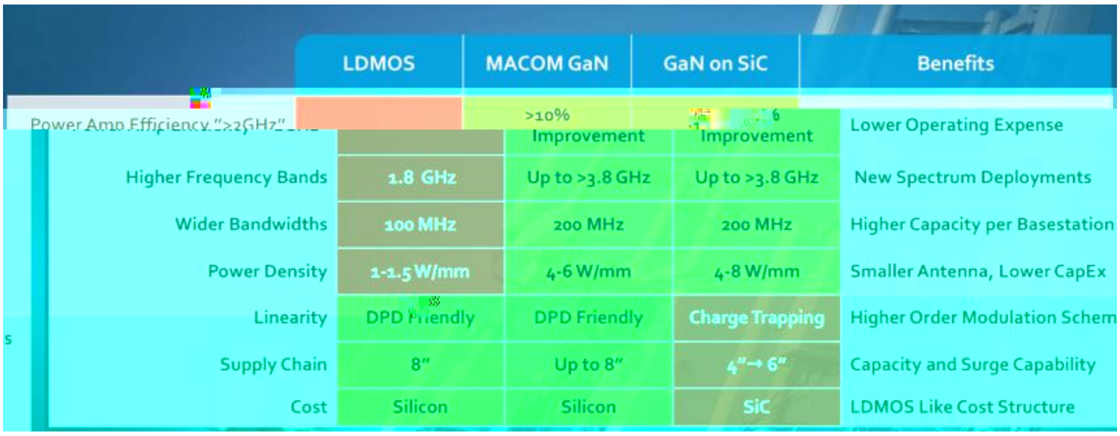
13 CoolGaN

14 GaN



Gartner

15 GaN-on-Si



	LDMOS	MACOM GaN	GaN on SiC	Benefits
Power Amp Efficiency ">2GHz"		>10% Improvement	Improvement	Lower Operating Expense
Higher Frequency Bands	1.8 GHz	Up to >3.8 GHz	Up to >3.8 GHz	New Spectrum Deployments
Wider Bandwidths	100 MHz	200 MHz	200 MHz	Higher Capacity per Basestation
Power Density	1-1.5 W/mm	4-6 W/mm	4-8 W/mm	Smaller Antenna, Lower CapEx
Linearity	DPD Friendly	DPD Friendly	Charge Trapping	Higher Order Modulation Schem
Supply Chain	8"	Up to 8"	4"→6"	Capacity and Surge Capability
Cost	Silicon	Silicon	SiC	LDMOS Like Cost Structure

GaN

GaN (SBD) (FET) GaN (PA) (LNA) **GaN** **GaN** 2018 GaN 2020 CES GaN 66 18W 30W 65W 100W 2020 2 13 10 65W

Yole 2017 GaN 1000 2023 4.3 2017-2023 CAGR 87%

16 10 65W

3. 6 SiC

SiC 2020 7 SiC
6 SiC
SiC JBS GaN
SiC

3.1. 6 SiC GaN

2020

1 2020 2

2020 2

IDM
650V GaN SiC JBS
SiC MOSFET

2 2020 7
7 SiC 6 SiC
2020 7
4 SiC
1200V 650V SiC
6 SiC GaN

3 2020 8
SiC JBS GaN
2020 6 650V 1200V SiC JBS
SiC JBS
650V
MOCVD

4 2020 9
6 SiC

2020 8 2020 9
6 SiC 1000

SiC

18 SiC SiC

1200V					650V	
电流等级（A）	T0220 R2L	T0247 Dual Die	TO247 R2L	DPAK R2L	电流等级（A）	T0220 R2L
2A	CRXI02D120G1			CRXL02D120G1	4A	CRXI04D065G1
		CRXL05D120G1	6A	CRXI06D065G1	5A	CRXI05D120G1
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
RXI15D120G1		CRXU20D120G1		10A	CRXI10D065G1	15A C[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
CRXI16D065G1	30A		CRXQ30D120G1			16A
	40A		CRXQ40D120G1			

SiC

SiC GaN

IDM

3.2. SiC

-

3.24%

SiC

1

2011 2012 3 4 SiC 2014 6 SiC 2011 3

Aixtron

2012 3 9

3 4

2014 4 6

6

2

32.64%

JIANHUI ZHAO 1988

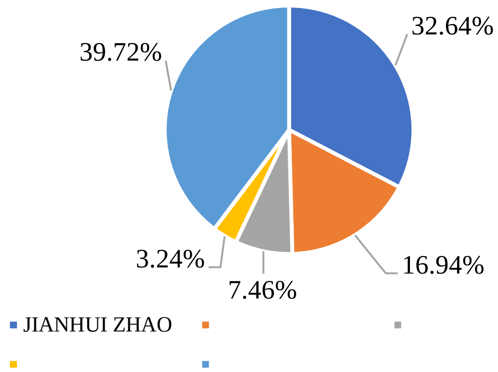
16.94%

7.46% 5.14%

3.24%

19

20 **3.24%**



3

2020 10 10

41 2013 9

2019 12

3: **2020** **10** **10**

	CN201911405142.5	CN111167780A	2019/12/30
	CN201911400025.X	CN111088522A	2019/12/30
T	CN201911400028.3	CN111058091A	2019/12/30
	CN201911400042.3	CN111101196A	2019/12/30
	CN201721375888.2	CN207439989U	2017/10/24
	CN201711000158.9	CN107829135A	2017/10/24
	CN201721078400.X	CN207130366U	2017/08/25
	CN201721073570.9	CN207130365U	2017/08/25
	CN201610377959.6	CN106087039A	2016/05/31
	CN201610351566.8	CN106057694B	2016/05/24

SiC

4.

2020-2022

9.75% 17.31% 10.70% 9.75% 13.46%

9.80% IDM 2020-2022

28.20% 27.08% 35.30% 28.20% 22.92%

34.20%

2020/2021/2022 17%/22%/23%

2020/2021/2022 29.28%/32.00% /34.15%

2020-2022 9.40 12.99 17.38

135% 38% 34% EPS 0.77 1.07 1.43

0.68 0.91 1.23

4

		2017	2018	2019	2020E	2021E	2022E
		3519.76	3571.91	3183.52	3493.91	4098.62	4537.17
	%	59.90%	56.96%	55.44%	52.00%	50.00%	45.00%
	%		1.48%	-10.87%	9.75%	17.31%	10.70%
	%	16.33%	18.57%	17.76%	24.00%	27.00%	27.00%
		2339.06	2683.49	2515.66	3225.15	4098.62	5545.44
	%	39.81%	[illegible]	[illegible]	[illegible]	[illegible]	55.00%
	%		14.73%				

IDM

IGBT **15%**

PB 2021 PB 6.98 2021
8.03 PB 87.41

PS 2021 PS 11.55 2021 13.28
PS 89.55

87.41

5 2020 11 5

			P/S				**PB**		
			2021E)	2020E	2021E	2022E	2020E	2021E	2022E
300623.SZ		41.58	16.86	4.81	5.26	5.83	8.64	7.90	7.13
300373.SZ		41.69	6.23	6.04	6.89	7.93	6.90	6.05	5.26
			11.55		-		7.77	6.98	6.19
688396.SH		49.92	7.45	8.78	9.89	11.32	5.69	5.05	4.41

wind wind

6.

且

且 强 可
安

京 安
强 安 京 取 京

取
京 强 取 取
取
取 强

且 更 取 可 安 安 且

且 公

公 取
取 且 未 未事 取
于咨 更 取 取

取
司

未京 取
公 士

事 且 司 安
安 公

公
公
且

公
且

且 且