WSTS 2020 5G IOT

500 2020 5200

5G 2020 5G

1

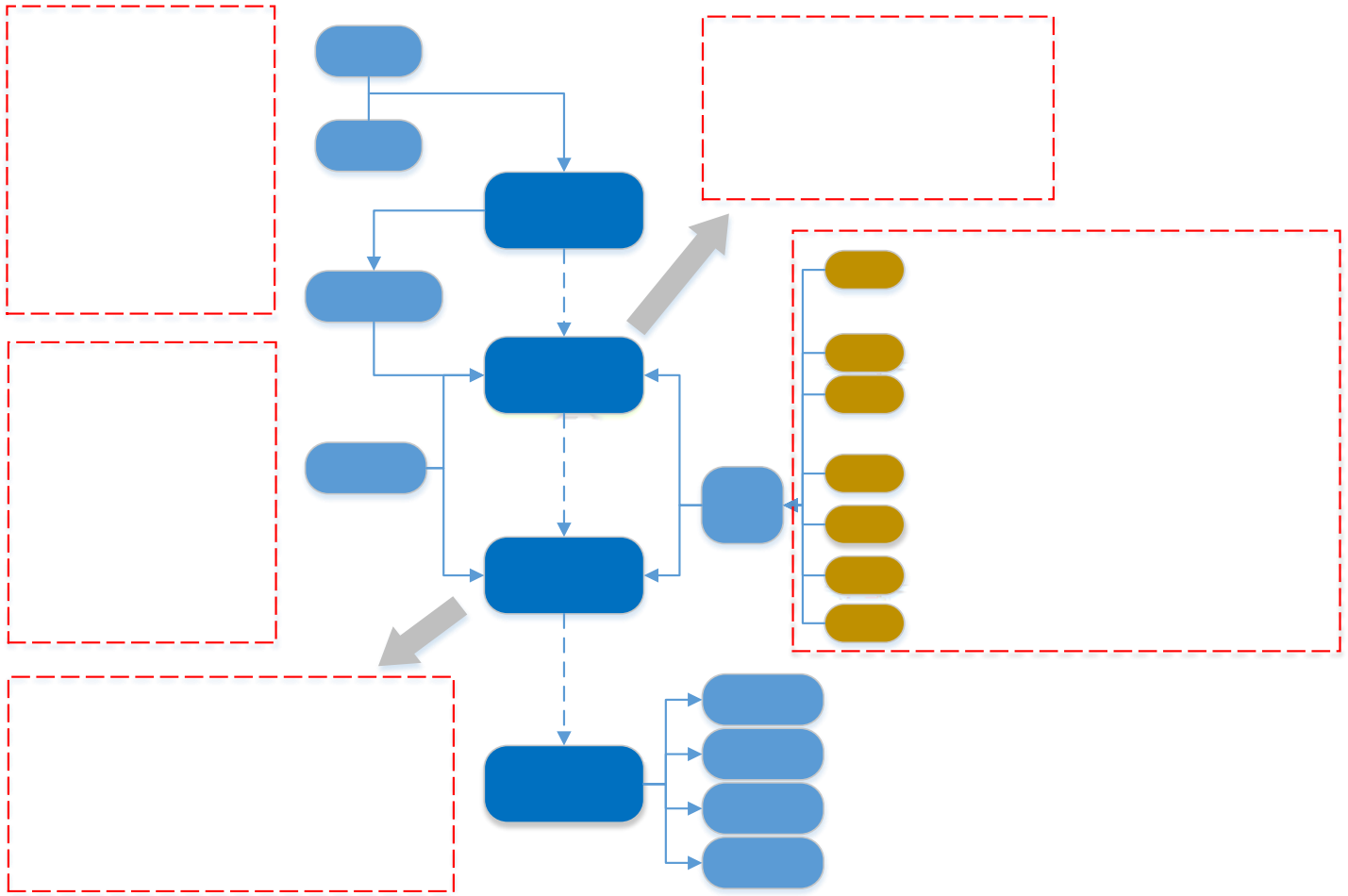
			2019E	2020E	2021E	2019E	2020E	2021E	
300661.SZ		258.10	1.71	2.32	2.97	150.94	111.25	86.90	
603986.SH		200.00	1.90	2.58	3.24	105.26	77.52	61.73	
603501.SH		147.60	0.98	2.60	3.58	150.61	56.77	41.23	
300782.SZ		415.80	4.85	7.31	9.92	85.73	56.88	41.92	
002938.SZ		44.01	1.26	1.56	1.78	34.93	28.21	24.72	
002475.SZ		35.38	0.77	1.01	1.22	45.95	35.03	29.00	
000725.SZ	A	4.64	0.07	0.11	0.18	66.29	42.18	25.78	
002371.SZ		95.00	0.33	0.47	0.64	287.88	202.13	148.44	
688012.SH		73.39	0.65	0.80	0.96	112.91	91.74	76.45	
688008.SH		168.59	1.85	2.54	3.48	91.13	66.37	48.45	
688018.SH		26.06	0.72	0.95	1.17	36.19	27.43	22.27	
300623.SZ		88.81	0.79	1.14	1.55	112.42	77.90	57.30	
601138.SH		17.51	0.89	1.03	1.20	19.61	16.96	14.64	
600745.SH		91.18	0.79	1.96	2.53	115.42	46.52	36.04	
603160.SH		198.00	4.86	5.68	6.61	40.74	34.86	29.95	
002241.SZ		20.14	0.39	0.57	0.73	51.30	35.26	27.55	
000100.SZ	TCL	4.52	0.28	0.31	0.36	16.17	14.51	12.41	
002876.SZ		50.70	0.60	1.83	2.73	84.01	27.65	18.55	

wind

5G

LCD

1



ITT BANK

1

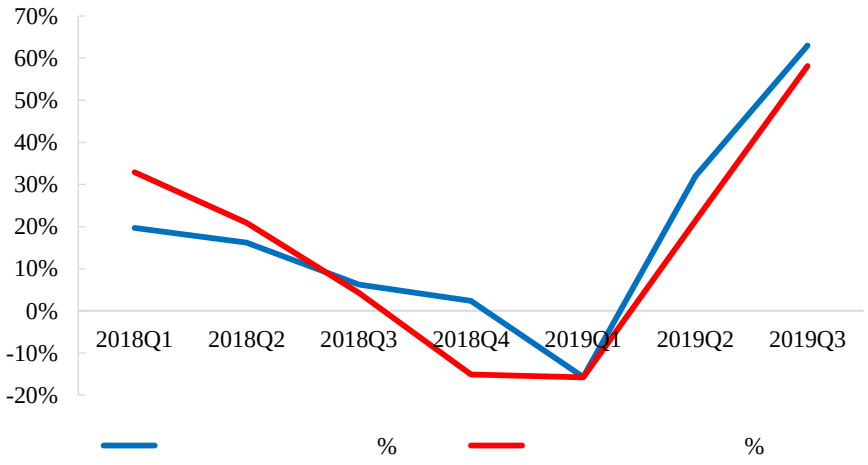
0

18% 22%

2

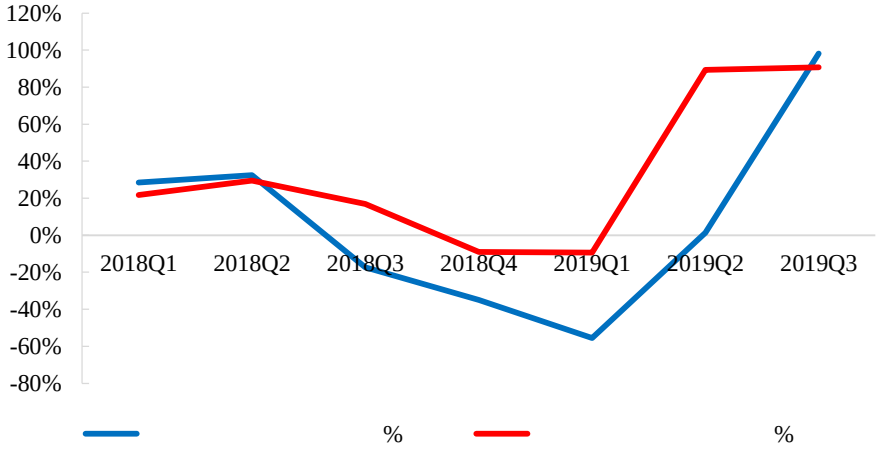
		MPU	0%
		MPU	0%
		MCU	2%
		FPGA/EPLD	0%
		DSP	0%
		Application processor	18%
		Communication processor	22%
		Embeded MPU	0%
		Embeded DSP	0%
		DRAM	0%
		NAND FLASH	0%
		NOR FLASH	5%
		Image Processor	5%
	/	Display processor	5%
		Display driver	0%

3


70%
60%
50%
40%
30%
20%
10%
0%
-10%
-20%
2018Q1
2018Q2
2018Q3
2018Q4
2019Q1
2019Q2
2019Q3
%
%

wind

4


120%
100%
80%
60%
40%
20%
0%
-20%
-40%
-60%
-80%
2018Q1
2018Q2
2018Q3
2018Q4
2019Q1
2019Q2
2019Q3
%
%

wind

Mate 30 Pro 5G

Mate 30 Pro 5G

RAM ROM

Mate 30 Pro 5G **2.6%** **9.5%** 2081
88.4% 31.6% 194 8.2%
183.1 41.7% 62 2.6%
9.5% 2 0.1% 14% 3
9.68

3 Mate 30 Pro 5G

4 Mate 30 Pro 5G

	62	2.6%	41.82	9.5%
	2081	88.4%	138.88	31.6%
	194	8.2%	183.1	41.7%
	2	0.1%	61.65	14.0%
	3	0.1%	9.68	2.2%
	13	0.6%	4.08	0.9%
	2355	100.0%	439.21	100.0%

IC Fabless IDM fabless IDM

DIGITIMES Research 2018 10 IC (Fabless) 217.54 164.50 75.73 2018 34.2% IC 2018 IC

IC IC 2018 IC 2519.30 IC

5 IC

IC		
DRAM		1%
NAND Flash		0%
NOR Flash	Cypress	11%
CPU	AMD	1%
GPU	AMD	0%
SOC		12%
FPGA	Intel Lattice Microsemi	1%
MCU	ST NXP Microchip ADI c	6%

Memory

RAM FIFO

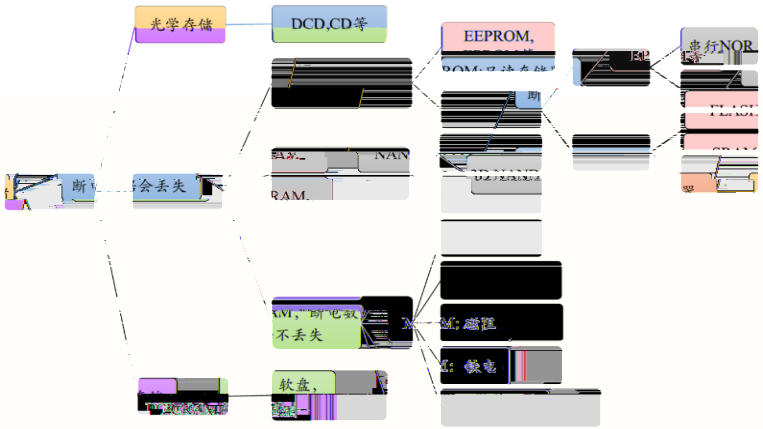
TF

DVD/VCD

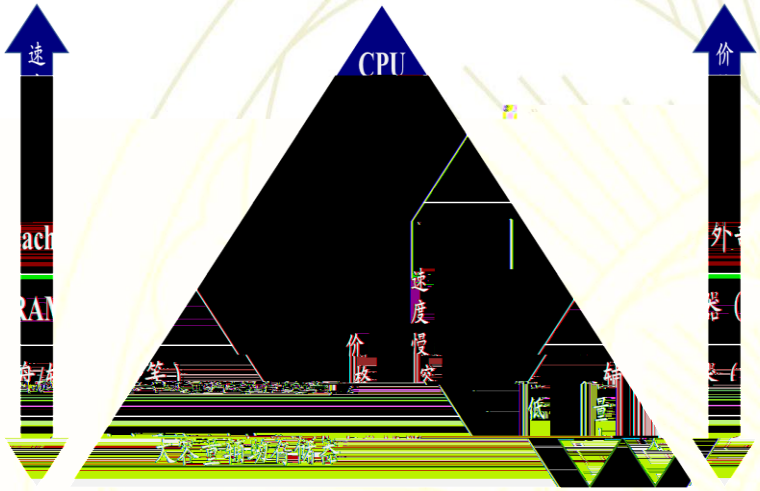
VM NVM

CPU RAM ROM

5



6



NOR NOR Flash

Strategy Analytics 2019

3.75 2020 3.68

AMOLED TDDI AMOLED

AMOLED 5.8 6.92 TDDI-COF

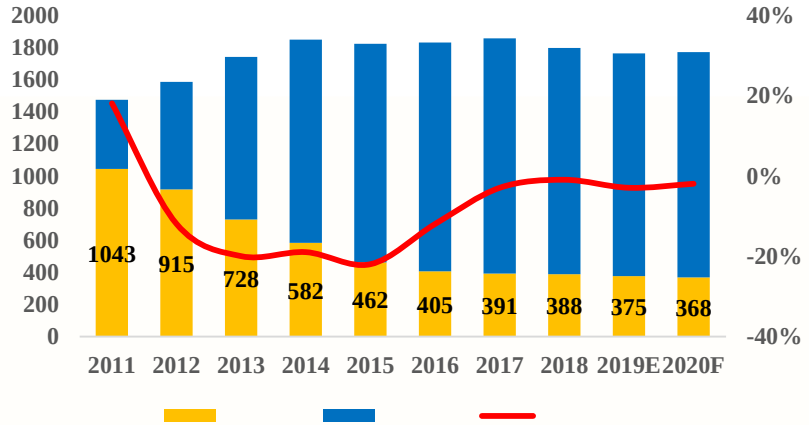
6.1 7

TWS TWS 150% 1.1

IDC 1.5 5G TWS

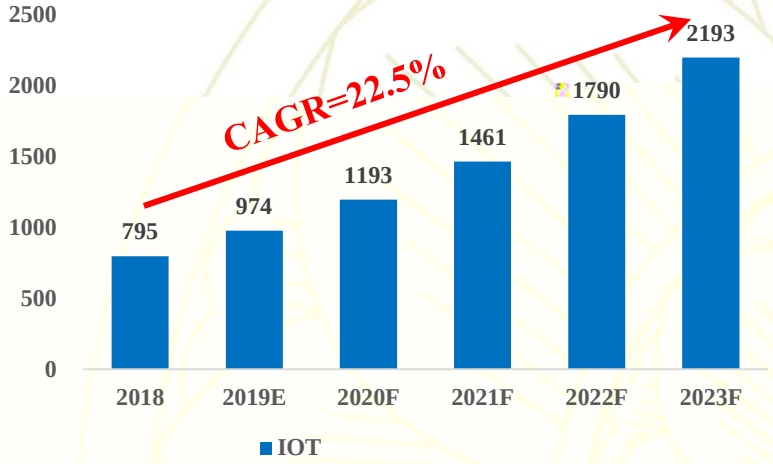
NOR Flash

7



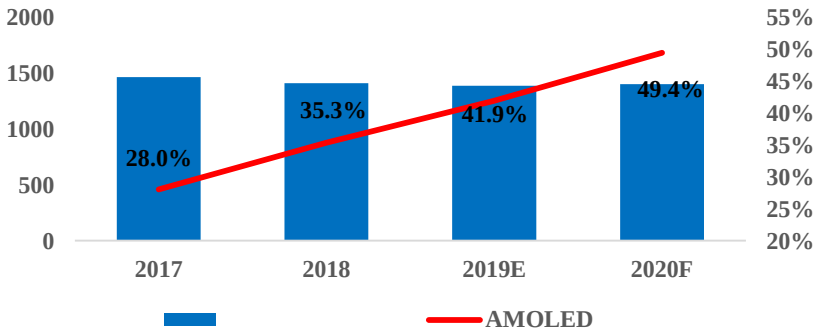
IDC

8 **IoT**



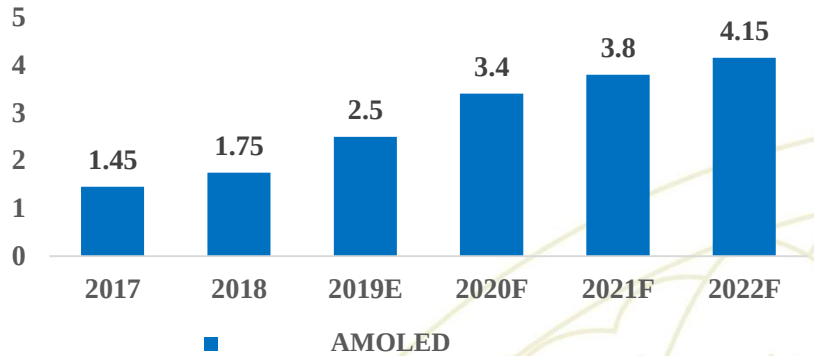
MarketsandMarkets

9 AMOLED



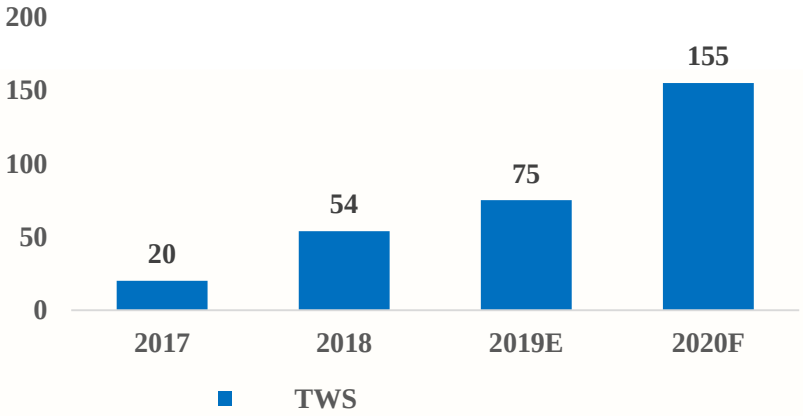
IDC WitsView

10 AMOLED



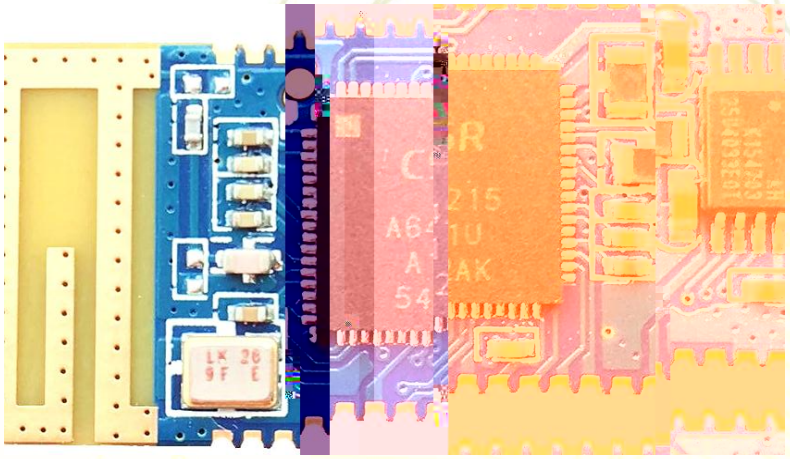
IHS

11 2016-2020F TWS



GFK

12 NOR Flash TWS



IC 5G NAND Flash

SSD **NAND Flash** DRAMexchange 2019 -Ñ NAND Flash

461 27.1% DRAMeXchang 550

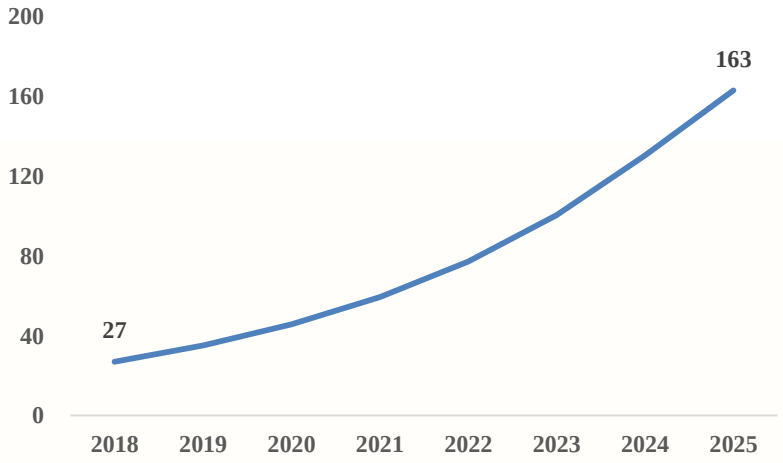
IC 5G NAND Flash

5G

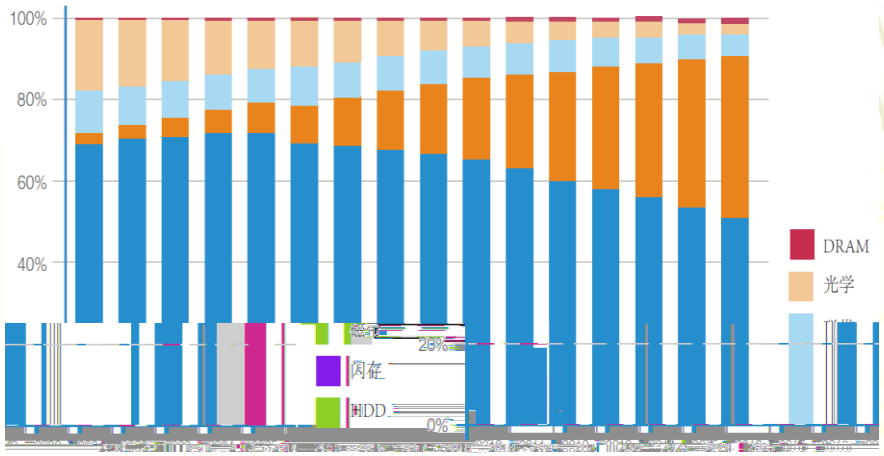
1600 5G

IDC 2025 163ZB (1ZB 1 GB) 2018 2019 35ZB 58% HDD 30% NAND Flash NAND Flash

14



15



IC

DRAM

5G

20%

14

40.9%

5G

9%

PC/NB

10%

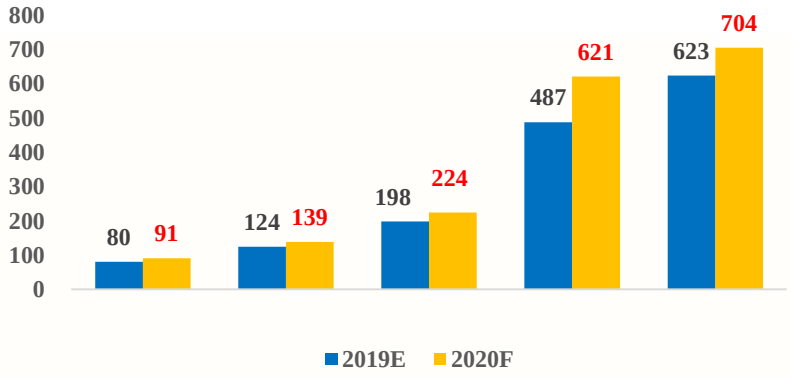
7%

PC/NB

7%

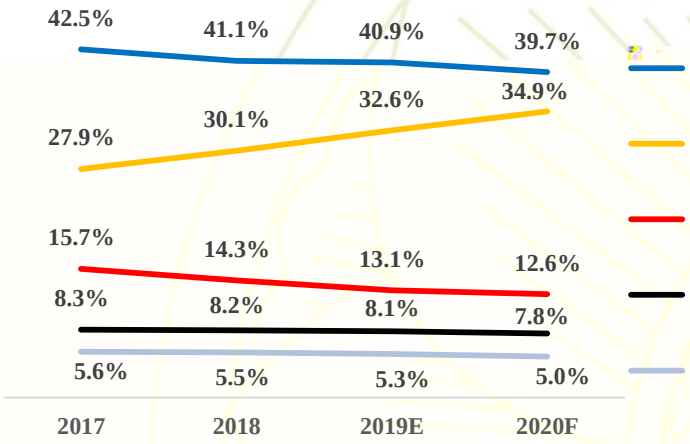
8%

16 DRAM bit **17.5%**



DRAMexchange

17



IC Insights

IC

18

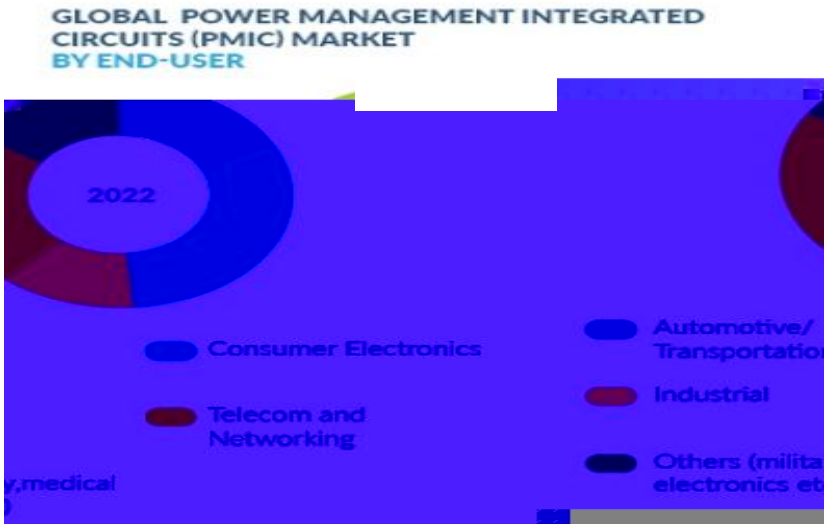
连接虚拟与现实的桥梁
Real World Entry
Real World Action
系统电源管理IC：电源转换芯片、电池充放电管理芯片、μP电源监控芯片等
放大器
模数转
中央处理单元及存
数模转
输出
连续的模拟信号处理通路：采集、放大、滤波等
离散的数字信号处理及存储等（通常为“0”和“1”组成的二进制码）
连续的模拟信号输出通路：放大、驱动输出等

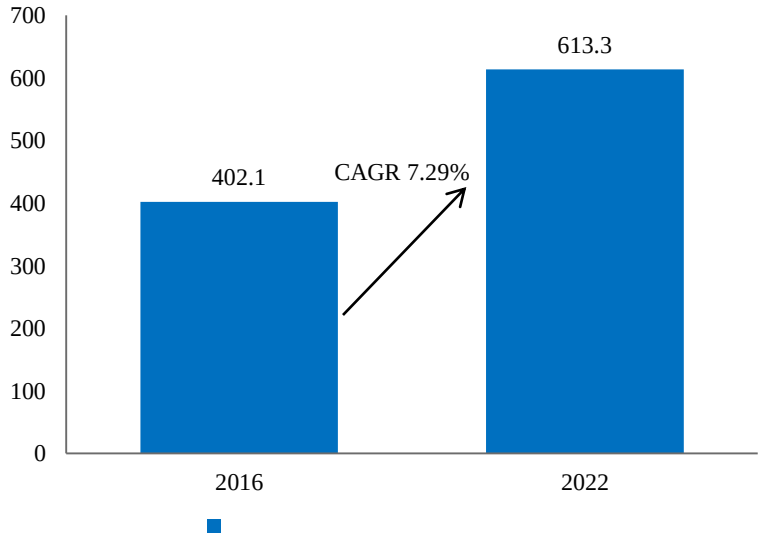
IC

Esticast Research 2016

402.1 2023 613.3 7.29%

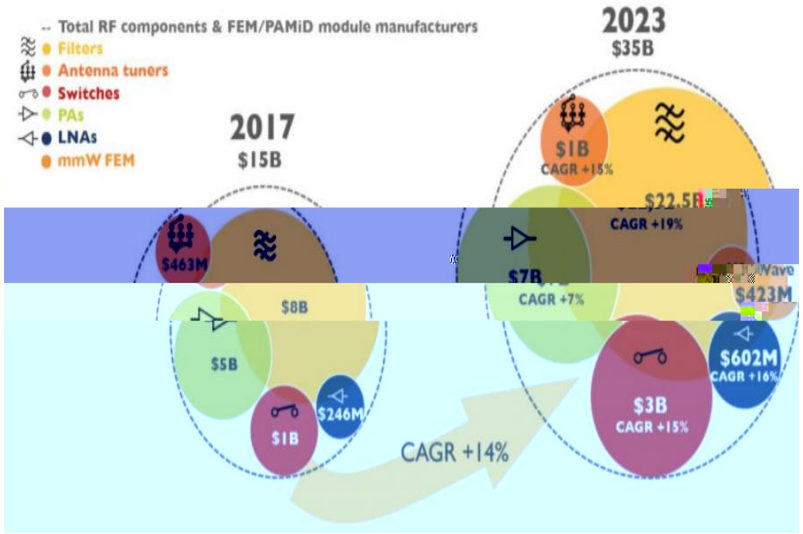
4.0

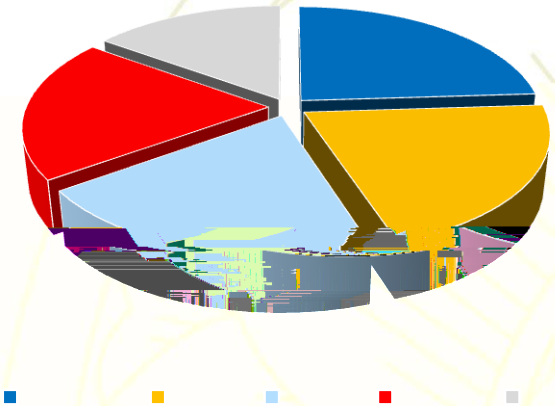




IC

Yole Developement 2017 150
2023 350 15%
Qorvo 85%
Avago Qorvo
5G





IC

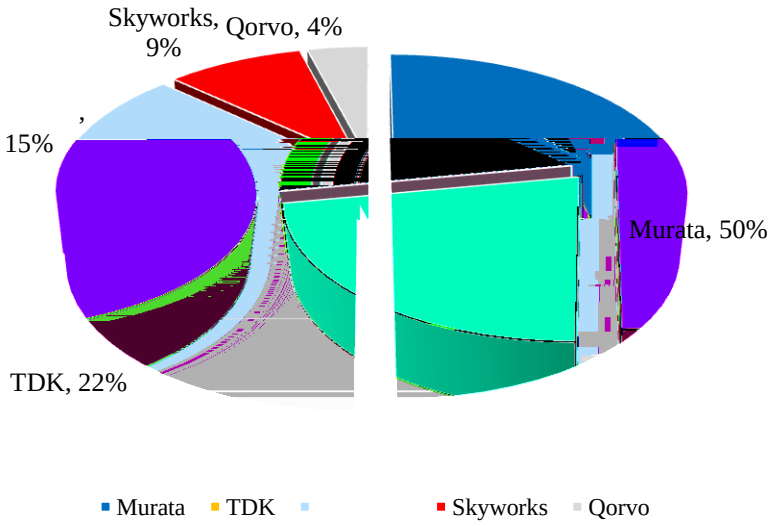
23

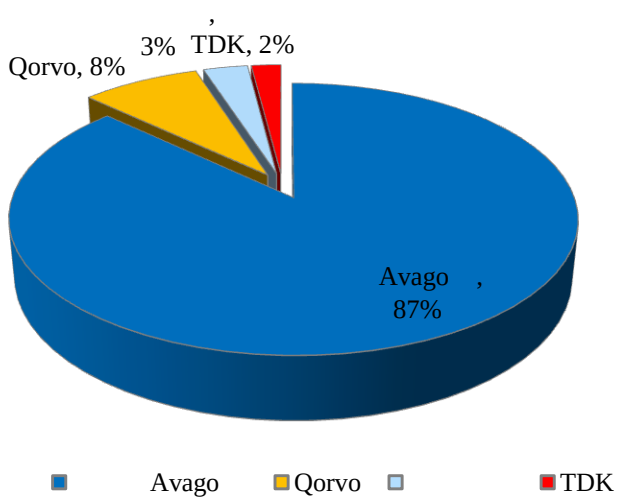
IC

SAW BAW

BAW Avago Qorvo

SAW Murata TDK





IC

2G 3G 4G

WiFi FM GPS

4G

2\3G

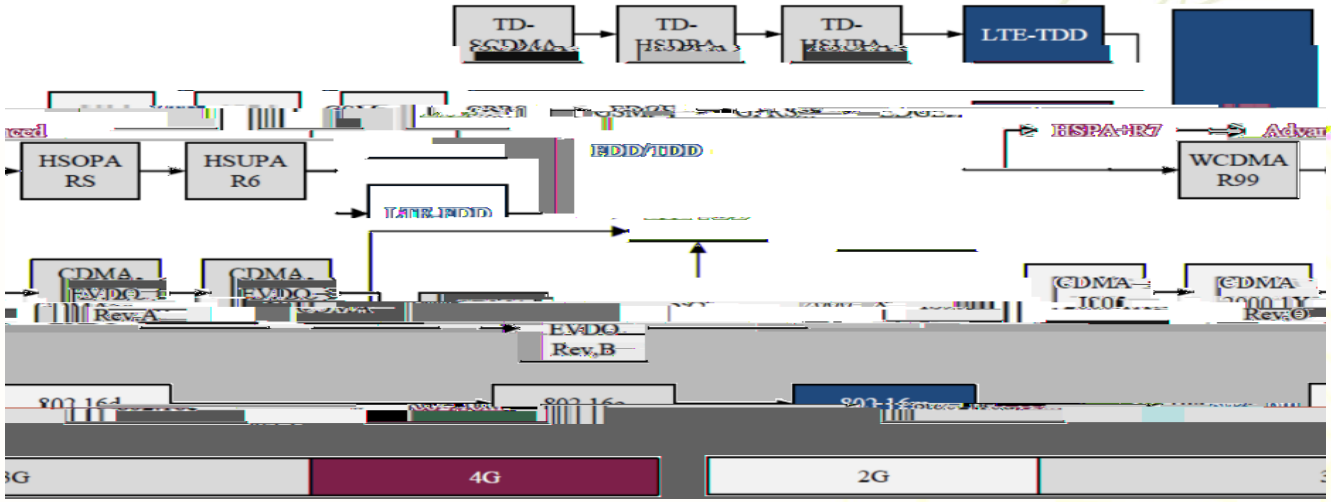
Yole Development 2G 1

3G 3.4 4G

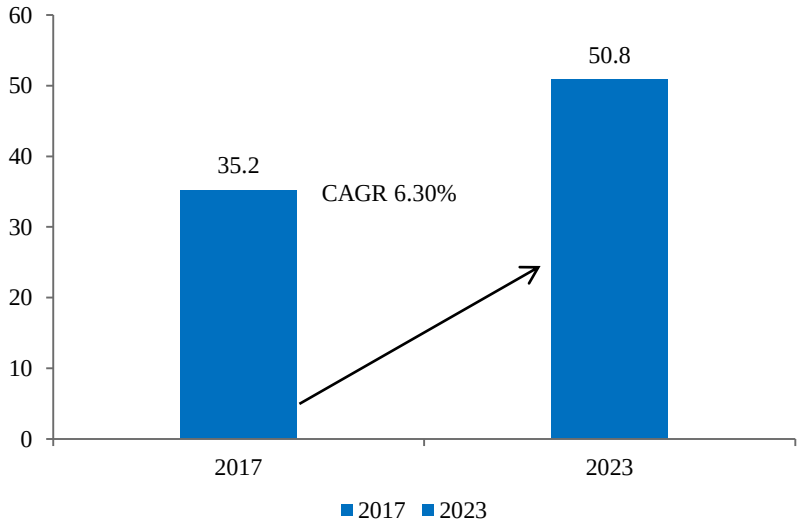
6 LTE 15.3

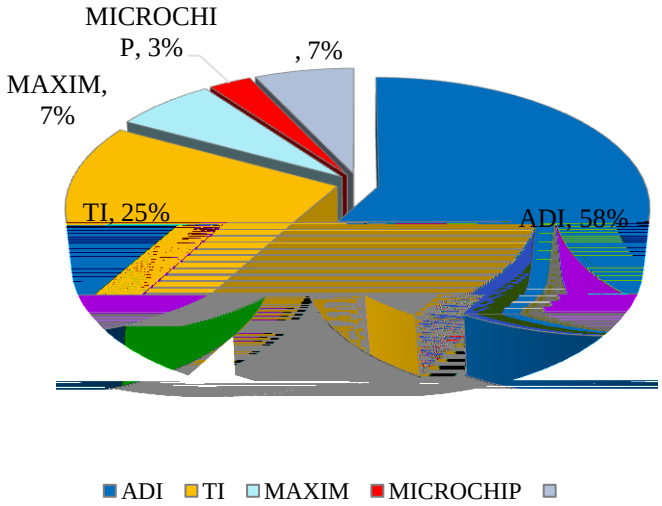
5G

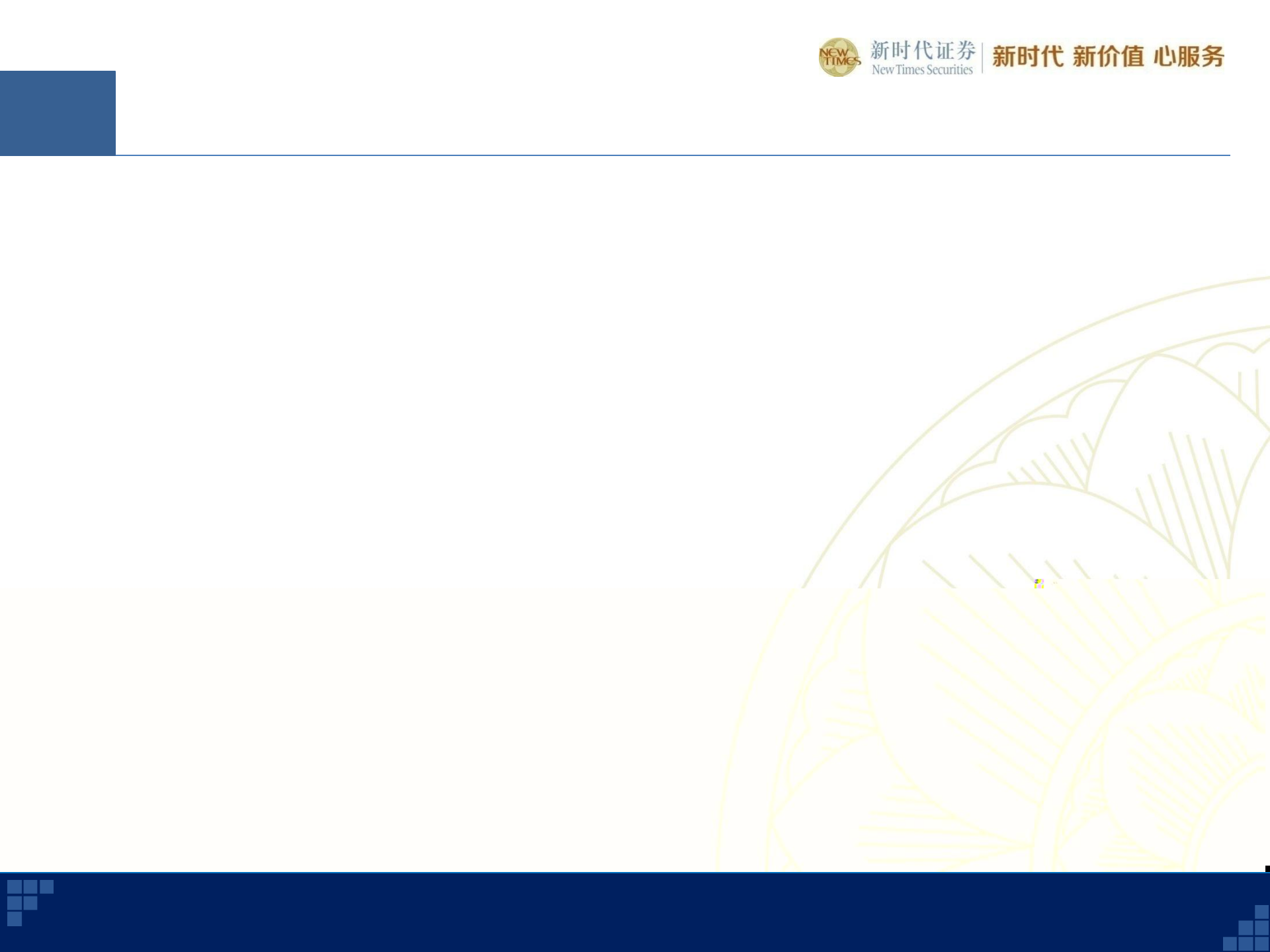
27

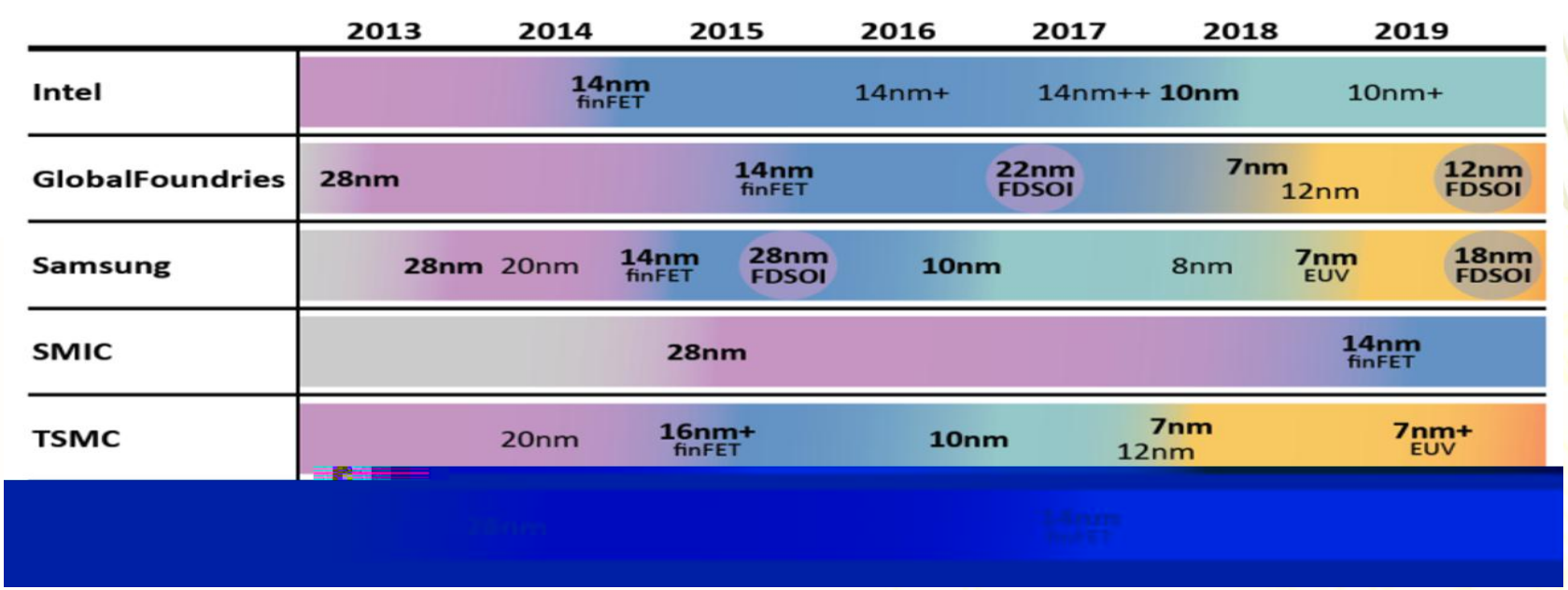


IC


60
50
40
30
20
10
0
35.2
CAGR 6.30%
50.8
2017
2023
2017
2023


MICROCHIP, 3%
, 7%
MAXIM, 7%
TI, 25%
ADI, 58%
ADI
TI
MAXIM
MICROCHIP




2013
2014
2015
2016
2017
2018
2019
Intel
14nm finFET
14nm+
14nm++
10nm
10nm+
GlobalFoundries
28nm
14nm finFET
22nm FDSOI
7nm
12nm
12nm FDSOI
Samsung
28nm
20nm
14nm finFET
28nm FDSOI
10nm
8nm
7nm EUV
18nm FDSOI
SMIC
28nm
14nm finFET
TSMC
20nm
16nm+ finFET
10nm
7nm
12nm
7nm+ EUV

SEMI

IC **IDM** IDM

2019 81% IDM 19%

DIGITIMES 2018

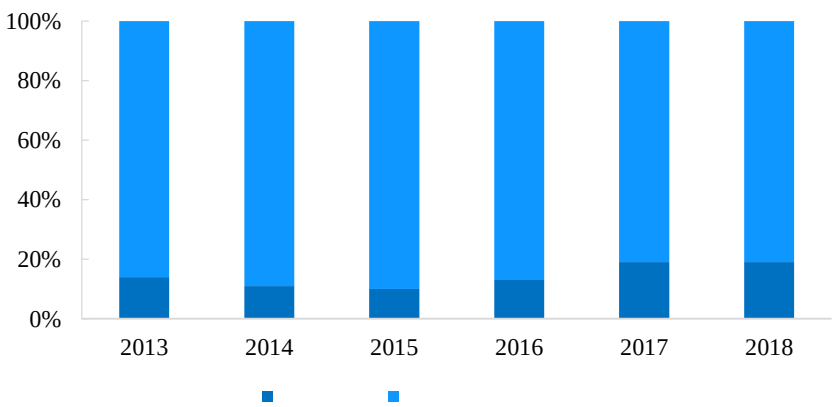
607.2 3 7.87% 2019

2019 Q1 Q2 16% 8%

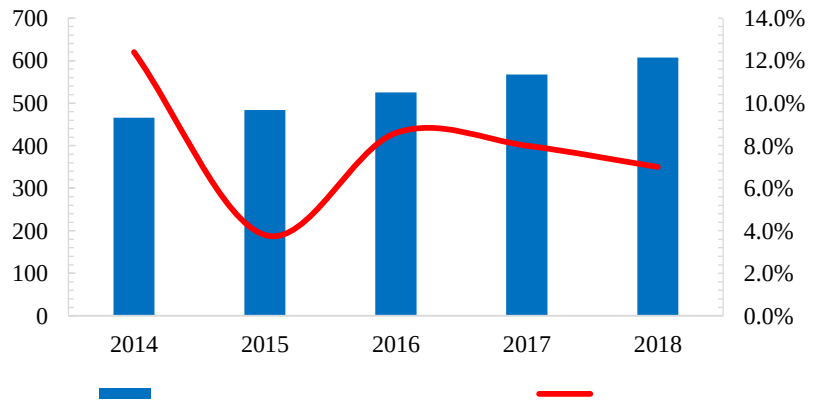
2019 Q1 Q2 13%

2019Q4 6%

32 **80%**



33



DIGITIMES

IC IC

IC

2017 20%

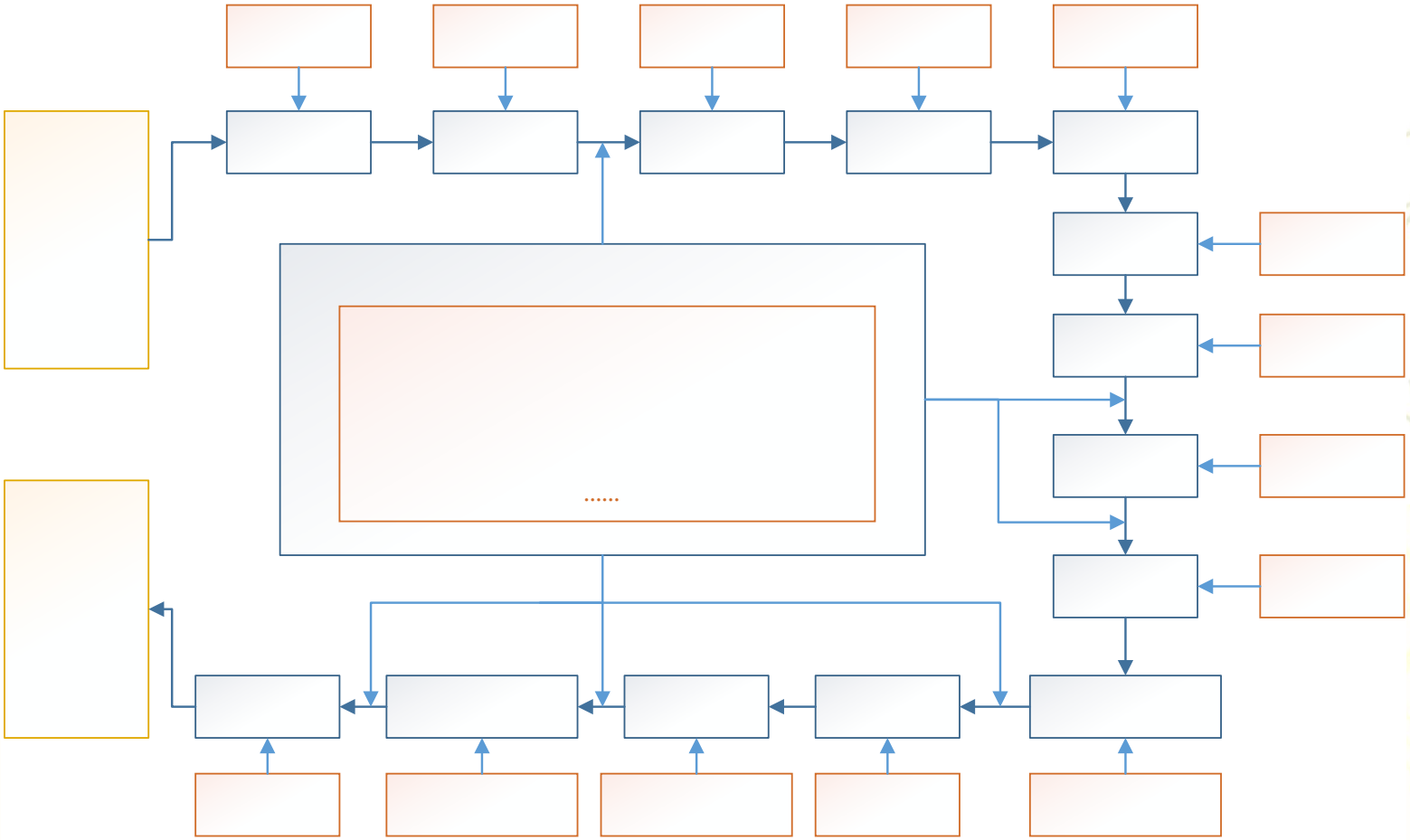
IC 2019

20.1%

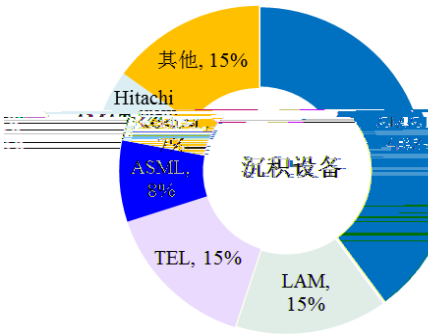
9 2019 IC

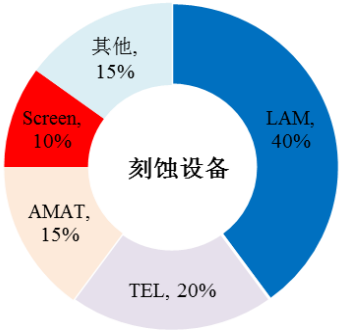
		2019		2019
1	/ 3 [Ö	38046	6.6%	20.0%
2		27846	-6.2%	

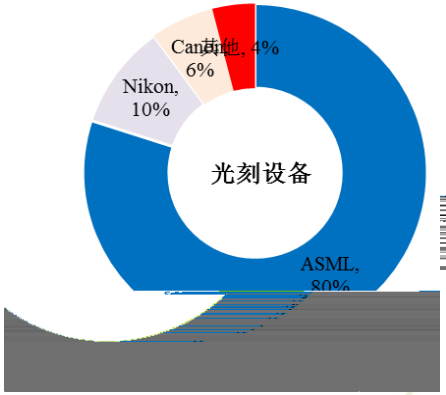
34

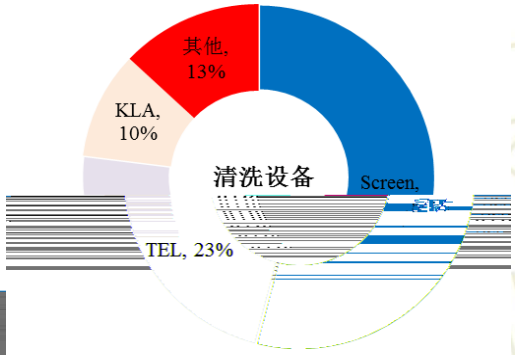


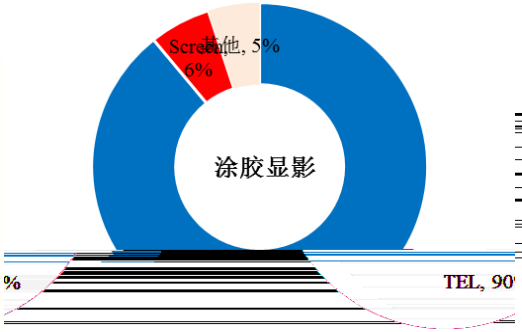
35

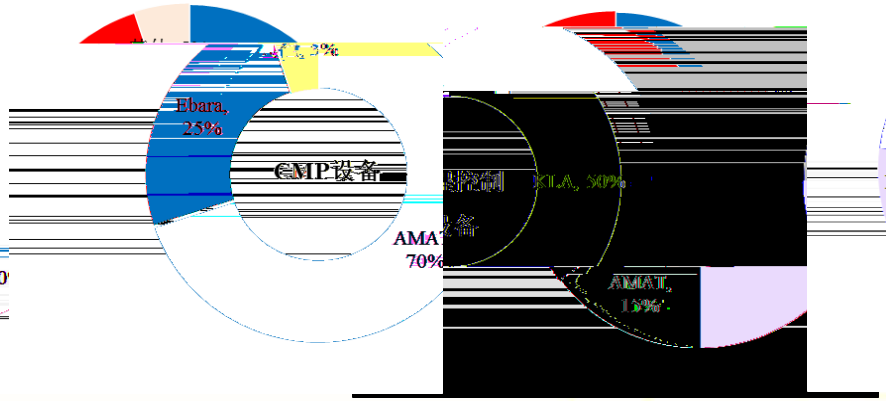


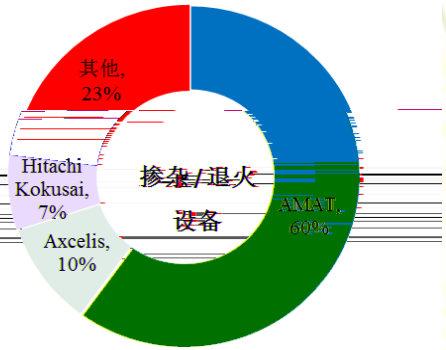












Gartner2017

2019 12 SEMI

644 2019 576 2020 2021

2020 **10**

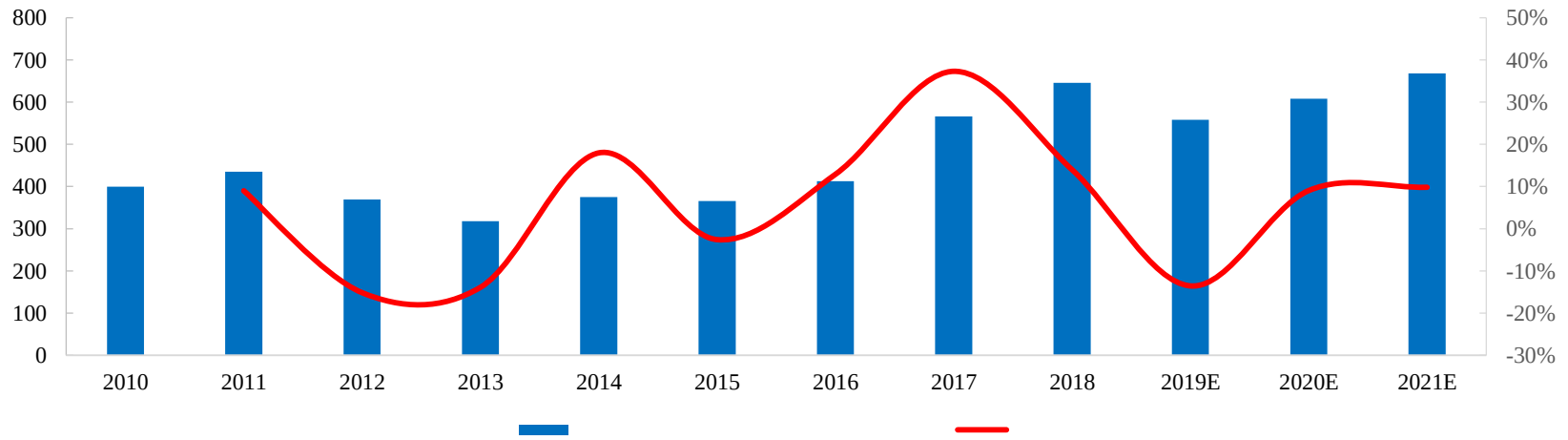
foundry 2020

7nm

110 140-150 7nm

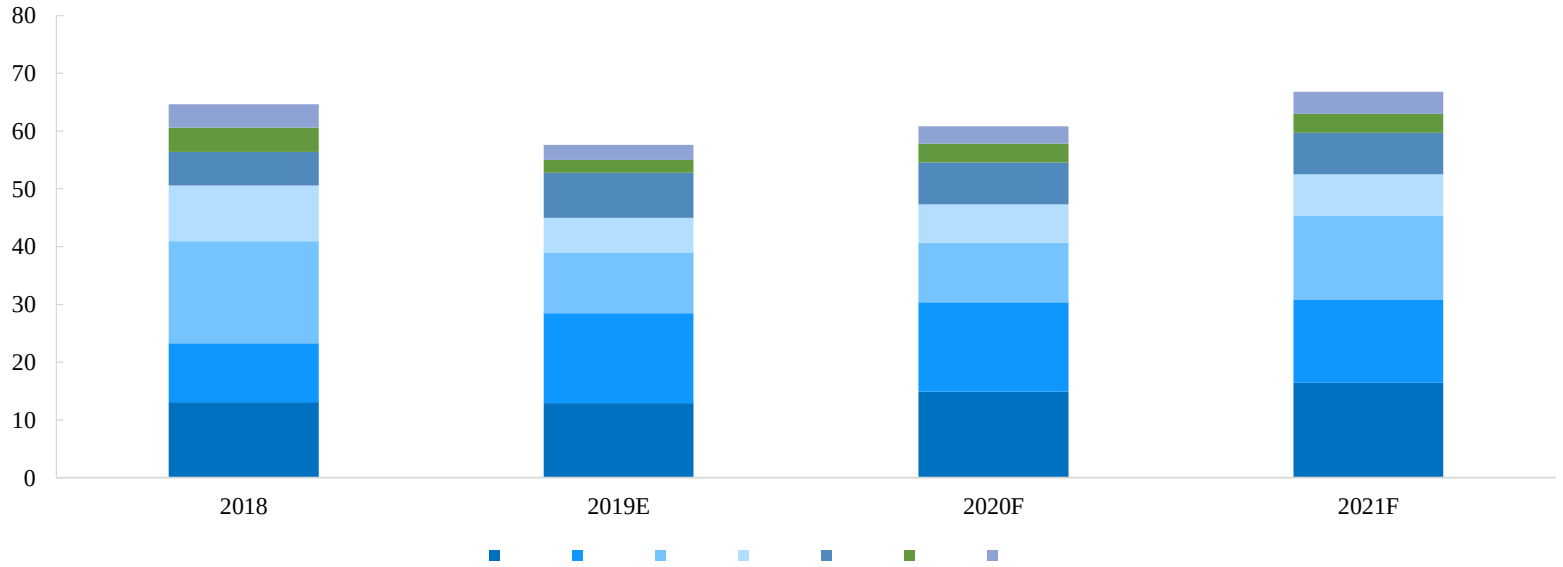
15 5nm 25

36 SEMI 2020



SEMI

37



SEMI

10 **900**

1			35	12	102.4	2018Q1	2019Q3	
2			NA	8	58.8	2018Q2	2020Q1	
3			30	8	39.9	2019Q1	2021	
4			40	12	25	2018Q1	2019H2	
5			80	12	70	2018Q1	2020Q1	NAND
6			40	12	70	2017Q4	2019Q3	
7			50	12	359	2018Q3	NA	
8			60	8	TBD	2018Q3	NA	
9			NA	6	TBD	NA	NA	
10			10	12	43	2016Q3	2019Q3	
11			20	12	TBD	2017Q1	NA	
12			30	8	TBD	2018H2	2019Q3	
13			100	8	67.9	2018H2	NA	
14			30	8	50	2019Q1	NA	
15			NA	12	TBD	NA	NA	
16			40	12	180	NA	NA	
17			20	12	10	NA	NA	
18			NA	8	TBD	NA	NA	
19			300	40-20nm	240	2016Q1	NA	3D NAND
20			125	25-20nm	494	2016Q4	NA	DRAM
21			300	12	240	2018Q3	2020Q4	3D NAND

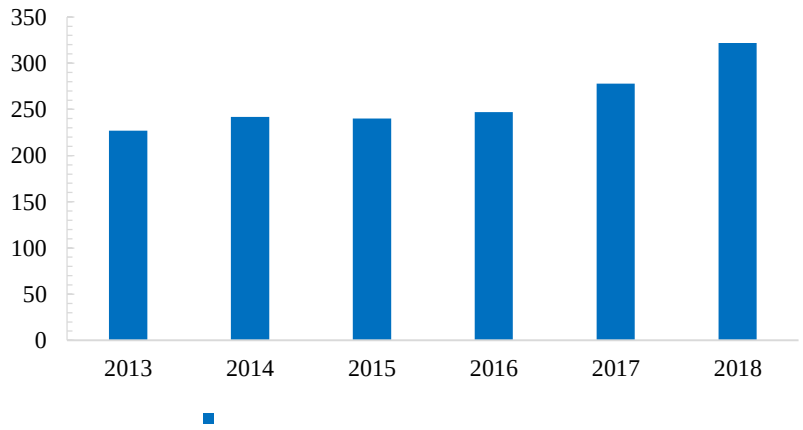
CSIA

Semi 2018 322

7.24% 37%

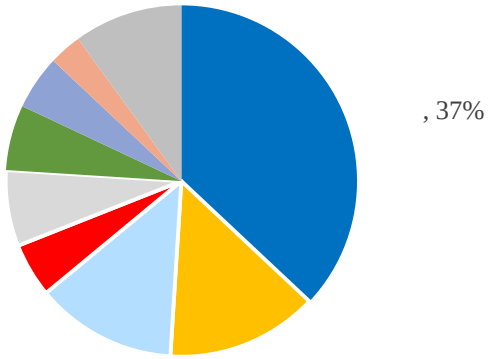
14% 13%

38



SEMI

39



SEMI

11

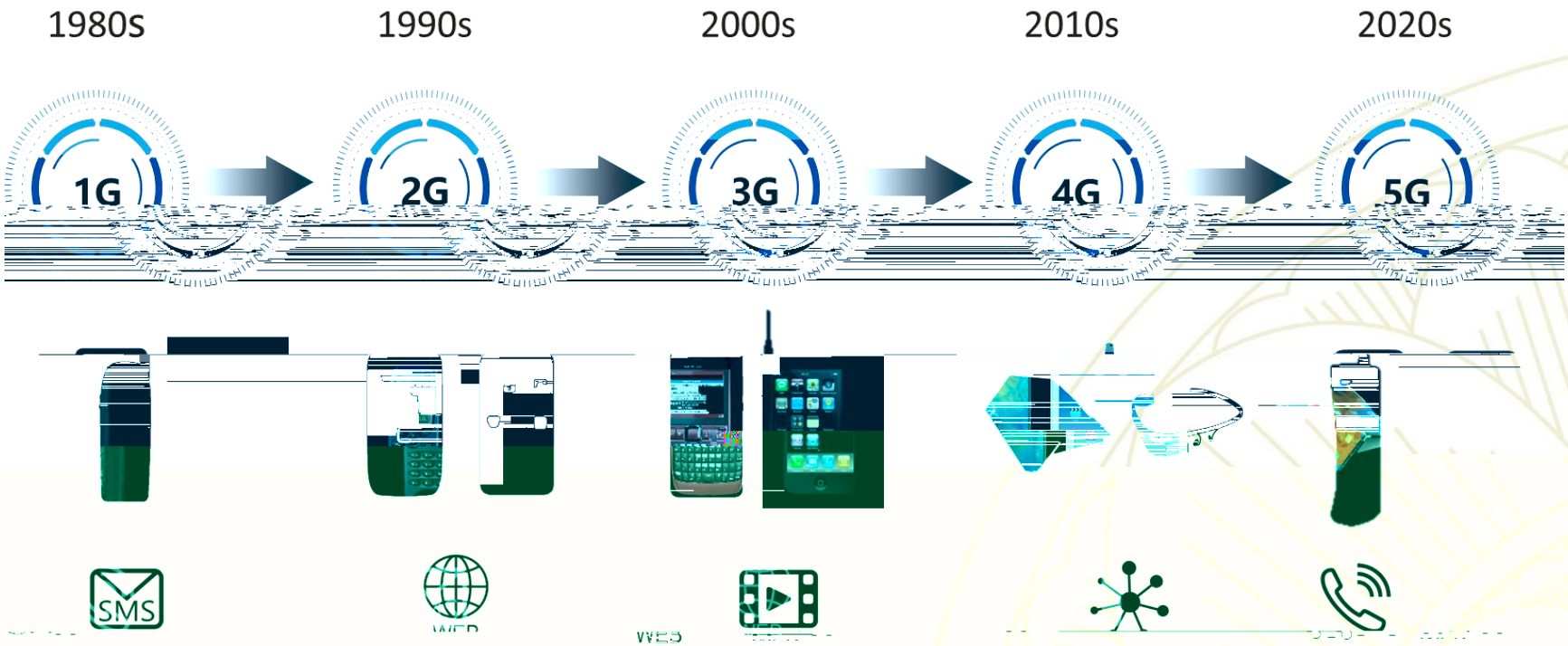
	2019/12/27						
		2019E	2020E	2021E	2019E	2020E	2021E
603986.SH	200.00	1.9	2.58	3.24	105.26	77.52	61.73
688008.SH	73.39	0.65	0.8	0.96	112.91	91.74	76.45
688018.SH	168.59	1.85	2.54	3.48	91.13	66.37	48.45
002049.SZ	51.69	0.77	0.98	1.19	67.13	52.74	43.44
603501.SH	147.60	0.98	2.6	3.58	150.61	56.77	41.23
300782.SZ	415.80	4.85	7.31	9.92	85.73		

wind

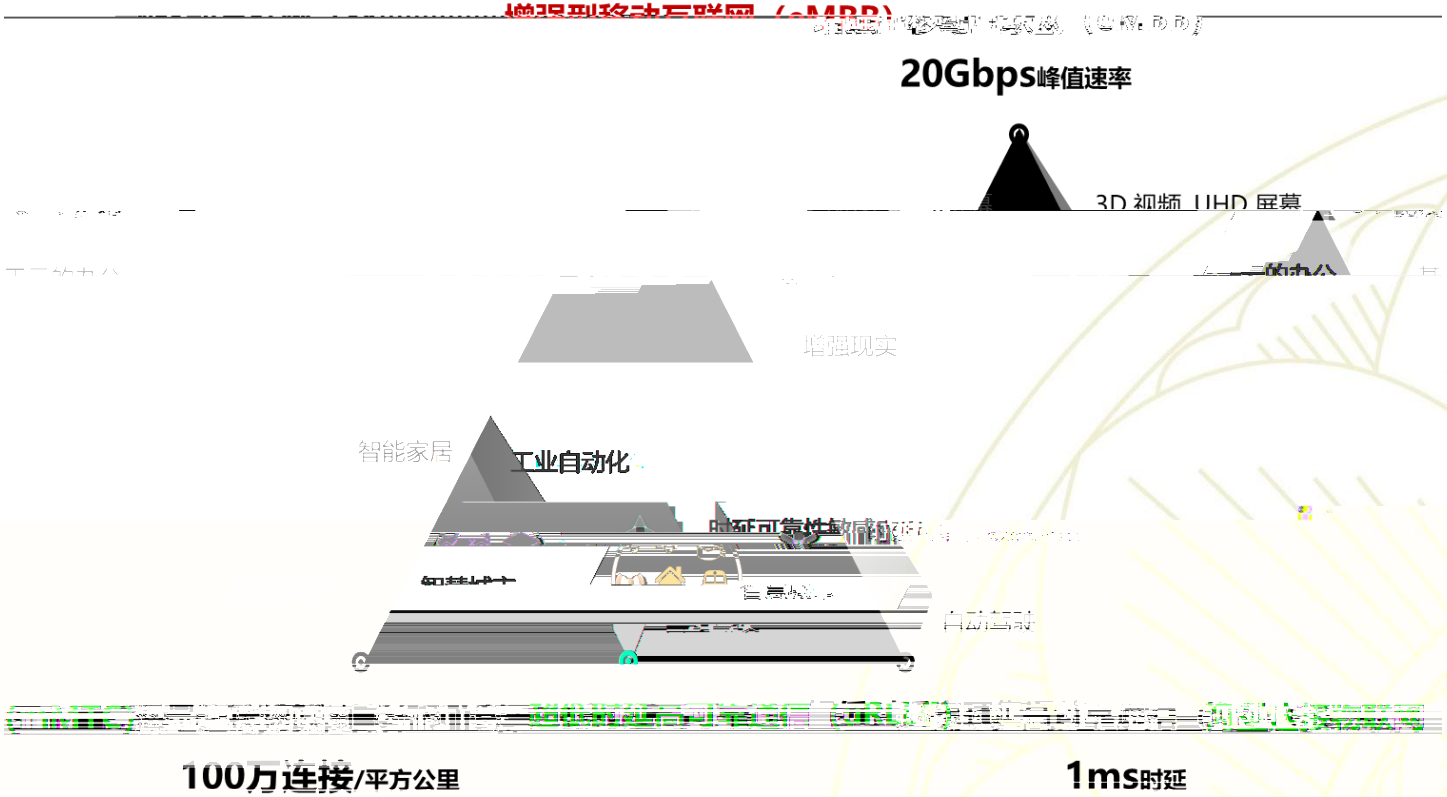
5G

LCD

40 5G


1980s
1990s
2000s
2010s
2020s
1G
2G
3G
4G
5G
SMS
音
短信
上网
视频
万物互联的智能时代
语

41 5G eMBB mMTC uRLLC



IDC

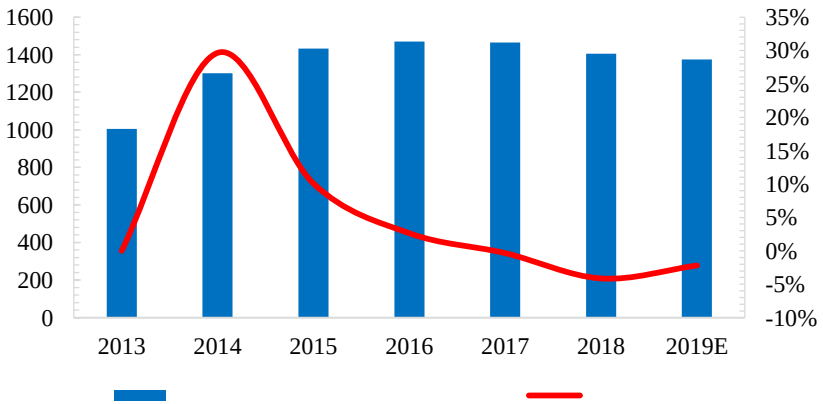
2018 4.1% 2019

2.2%

2018

4.1% 19.4%

42

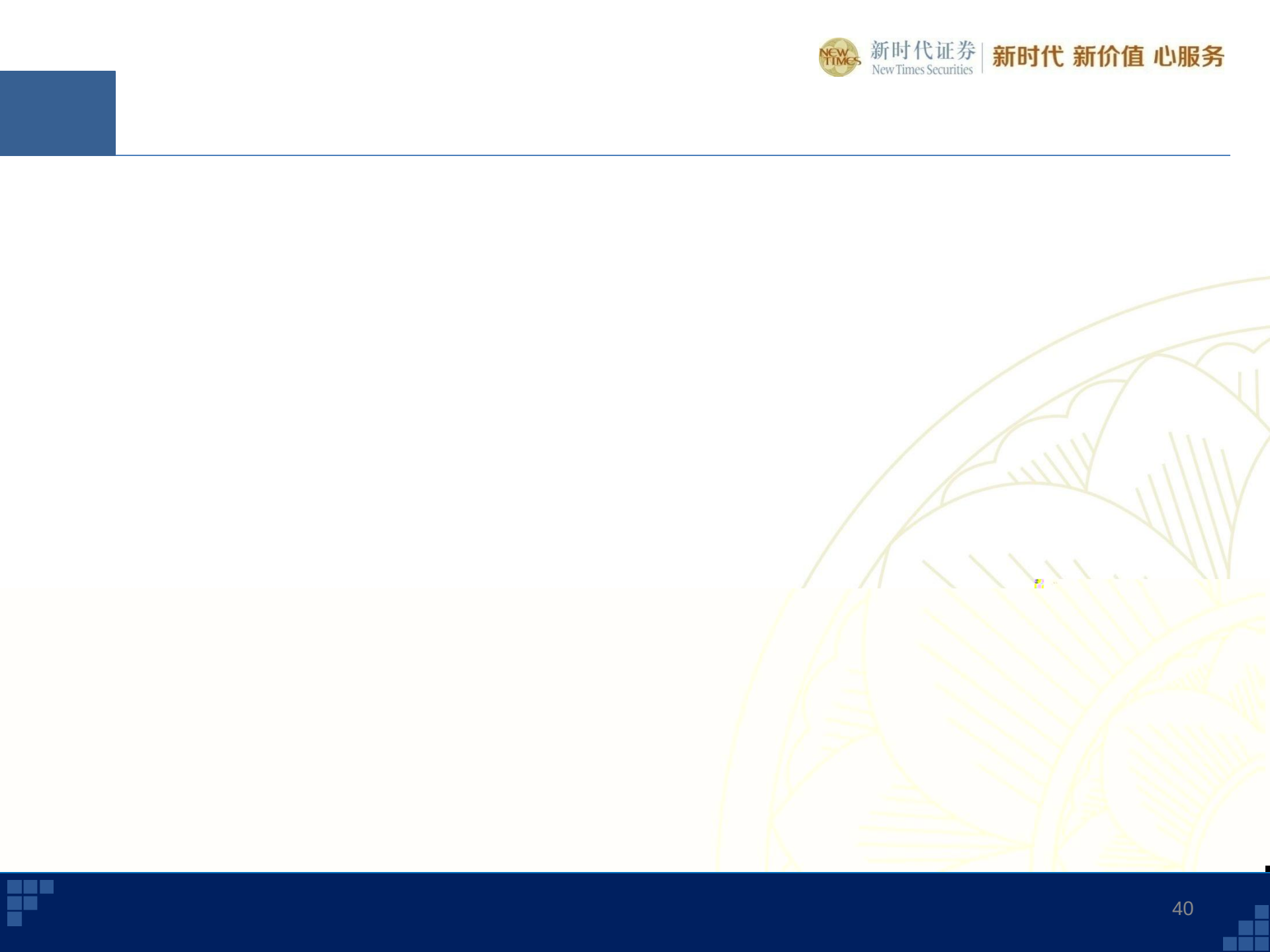


IDC

12

	2018	2018	2017	2017	
	292.3	20.80%	317.7	21.70%	-8%
	208.8	14.90%	215.8	14.70%	-3.20%
	206	14.70%	154.2	10.50%	33.60%
	122.6	8.70%	92.7	6.30%	32.20%
OPPO	113.1	8.10%	111.7	7.60%	1.30%
	462	32.90%	573.4	39.10%	-19.40%
	1404.9	100%	1465.5	100%	-4.10%

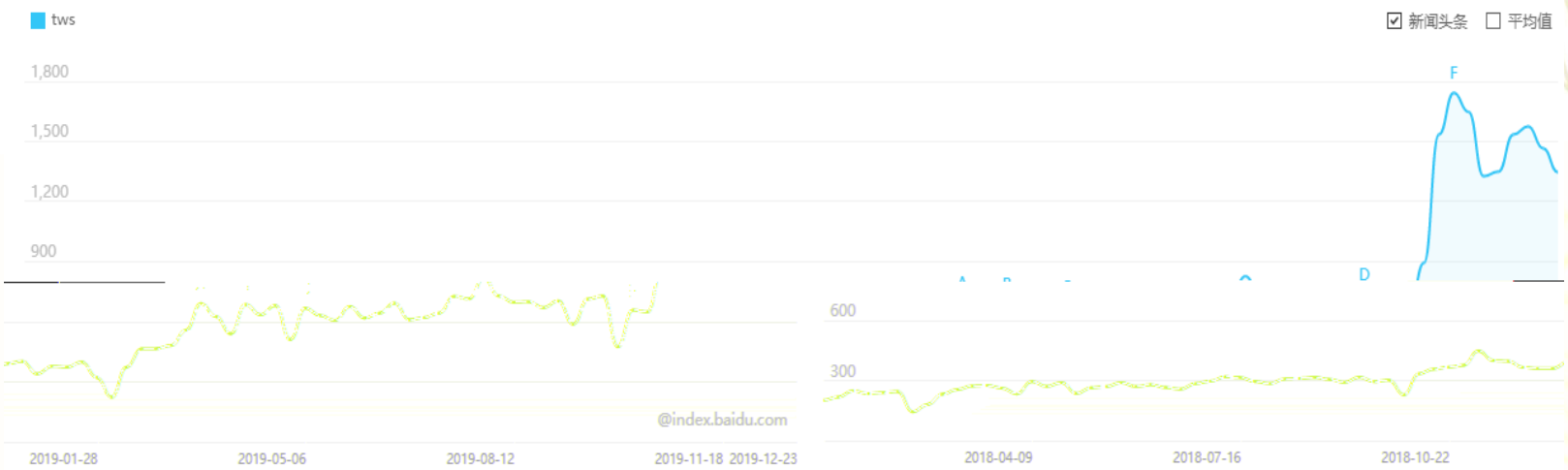
Gartner



TWS AirPods
TWS

AirPods **TWS** AirPods
TWS
TWS

44 AirPods ,TWS



Counterpoints IDC

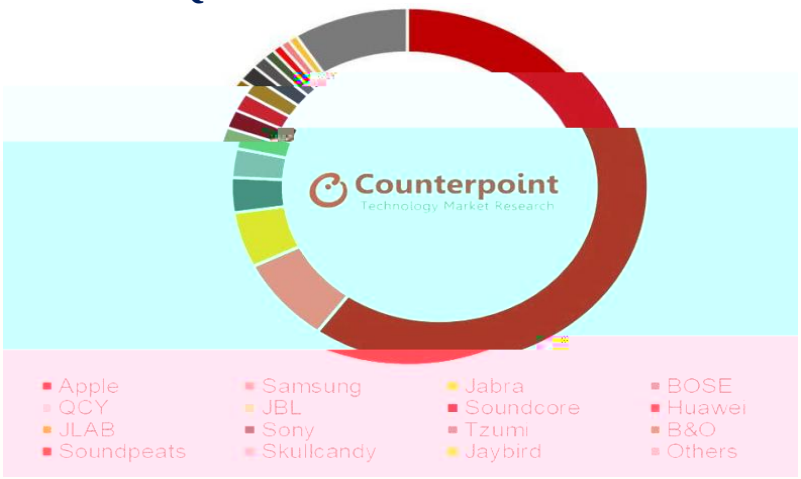
AirPods Counterpoint

AirPods

TWS IDC 2018 2020

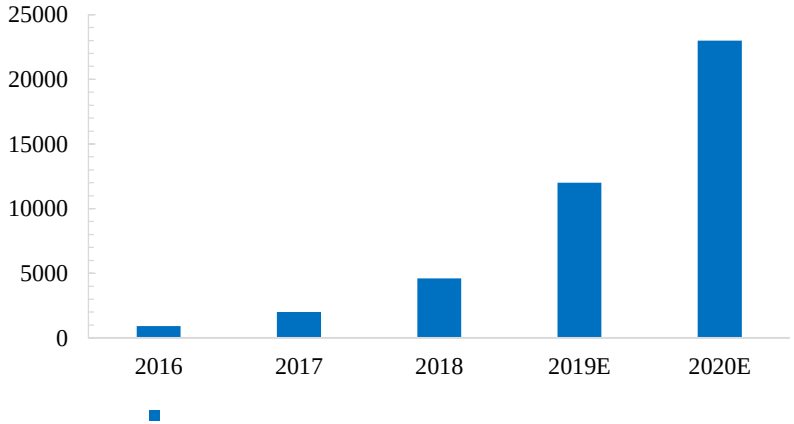
6,500 1 1.5 51%

45 2019Q1



Counterpoints

46 TWS



IDC

TWS ODM

TWS

TWS

47 AirPods

Ifixit

14 TWS

TWS	
SIP	
FPC	

Ifixit

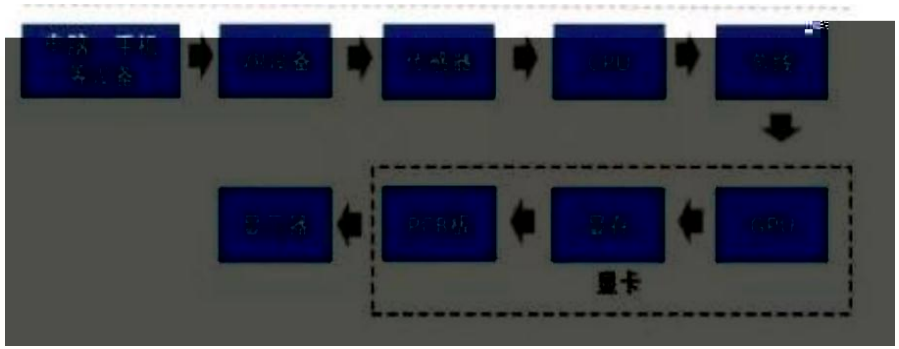
VR 3D

VR

VR

VR

48 VR



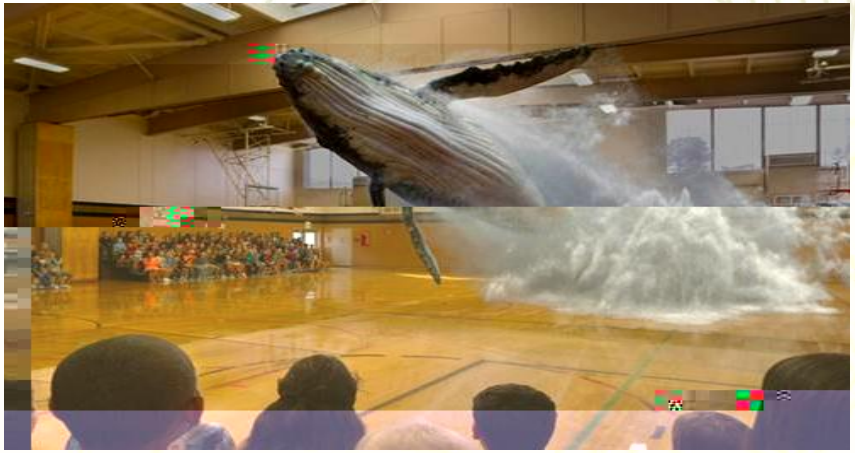
49 VR

AR

50 AR

图像输入设备
计算与存储设备
系统显示技术
增强现实系统设计最基本的问题就是实现虚拟信息和物理世界的融合。
跟踪定位技术
实时检测观察者的位置、视域方向、运动的情况，帮助系统决定显示何种虚拟对象。
虚实融合技术
对虚实环境进行准确的配准，实现遮挡、阴影和光照一致性，同时支持自然的交互。

51 AR



15 2018-2019 VR

	2018-2019 VR			
	HTC Vive Pro	Oculus Go	Oculus Quest	Huawei VR Glass
	HTC & Valve	Facebook	Facebook	Huawei
	2018 1	2018 5	2019 5	2019 12
( )	6488	1393	2793	2999
	2 3.5 3K AMOLED	LCD	LCD	FAST LCD
	2880x1600	1280×1440	1600*1440	1600*1600
	90Hz	60Hz/72Hz	72Hz	70Hz/90Hz
( )	110	90	100	90
	Vive 78%, ,		, 360 ,	

Huawei VR Glass

Huawei VR Glass VR 3200*1600 pc 90Hz , FAST LCD

Huawei VR Glass

166g

52 Huawei VR Glass

53 Huawei VR Glass

A AR/VR

Lumus Lumus

OLED

A LCOS

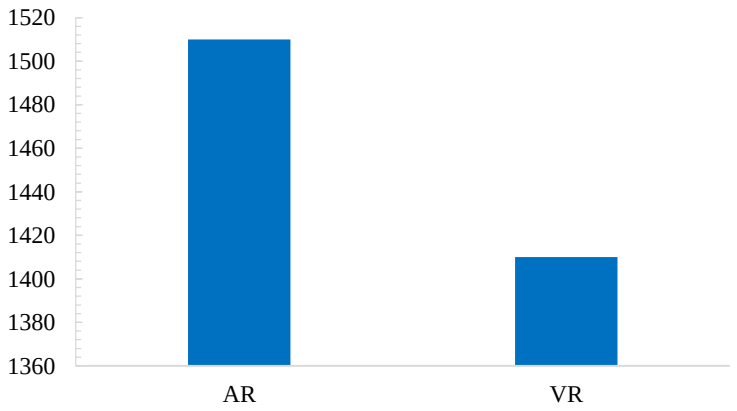
AR/VR AR/VR

ABI research 2025 VR/AR 1510/1410

16 AR/VR

		AR/VR
		ODM Oculus Sony
		Lumus Lumus
	A	OLED
		LCOS

54 2025 VR/AR 1510/1410



ABIresearch

17

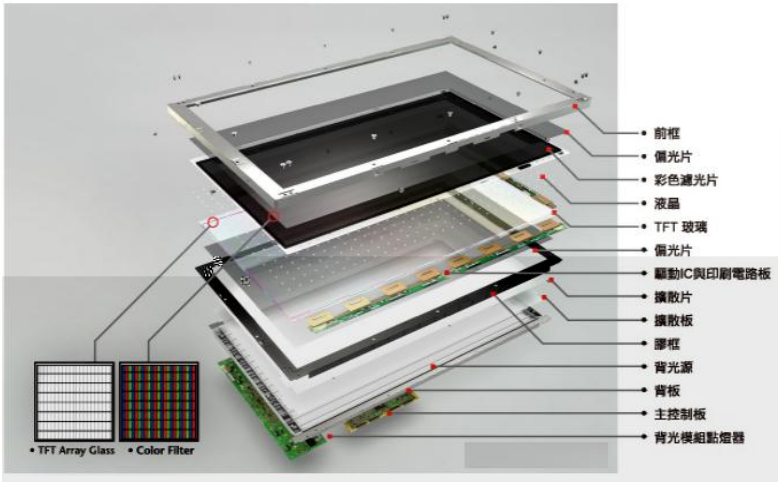
		2019/12/27	EPS			PE			
			2019E	2020E	2021E	2019E	2020E	2021E	
002475.SZ		35.38	0.77	1.01	1.22	45.95	35.03	29.00	
002938.SZ		44.01	1.26	1.56	1.78	34.93	28.21	24.72	
601138.SH		17.51	0.89	1.03	1.20	19.61	16.96	14.64	
300679.SZ		38.14	0.79	1.14	1.68	48.36	33.46	22.64	
002241.SZ		20.14	0.39	0.57	0.73	51.30	35.26	27.55	
300115.SZ		17.97	0.46	0.68	0.83	38.83	26.44	21.59	
002008.SZ		38.52	0.80	1.49	1.75	48.12	25.94	22.06	
002600.SZ		10.98	0.34	0.40	0.48	31.97	27.24	22.75	
300735.SZ		25.72	0.91	1.22	1.62	28.19	21.08	15.84	
601231.SH		19.50	0.62	0.80	1.01	31.28	24.35	19.23	
300433.SZ		13.64	0.41	0.59	0.73	32.95	23.11	18.61	

wind

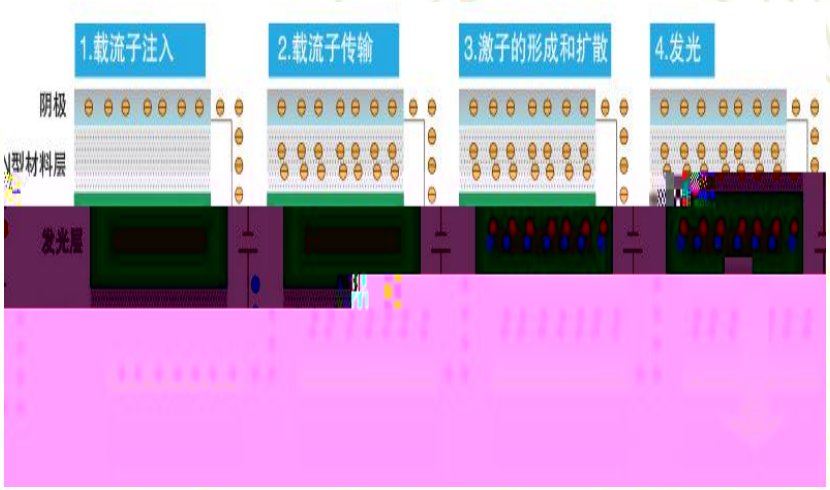
5G

LCD

55 LCD



56 OLED



LCD:TV

57

2020-2022 LCD

TV

1

TV 1.0
2020/2021/2022 6.2%/6.19%/6.19%

TV 1.3
2020/2021/2022 7.10%/7.03%/6.96%

TV 1.5
2020/2021/2022 7.71%/7.58%/7.47%

18

		2016	2017	2018	2019E	2020E	2021E	2022E
悲观假设（1寸）	全球面板需求面积（亿平方米）	1.88	2.00	2.17	2.26	2.40	2.55	2.71
	全球面板需求面积成长率（%）	6.00%	6.50%	9.00%	4.10%	6.20%	6.19%	6.19%
中性假设（1.3寸）	全球面板需求面积（亿平方米）	1.88	2.00	2.17	2.28	2.45	2.62	2.80
	全球面板需求面积成长率（%）	6.00%	6.50%	9.00%	5.06%	7.10%	7.03%	6.96%
乐观假设（1.5寸）	全球面板需求面积（亿平方米）	1.88	2.00	2.17	2.30	2.48	2.66	2.86
	全球面板需求面积成长率（%）	6.00%	6.50%	9.00%	5.70%	7.71%	7.58%	7.47%

IHS Markit

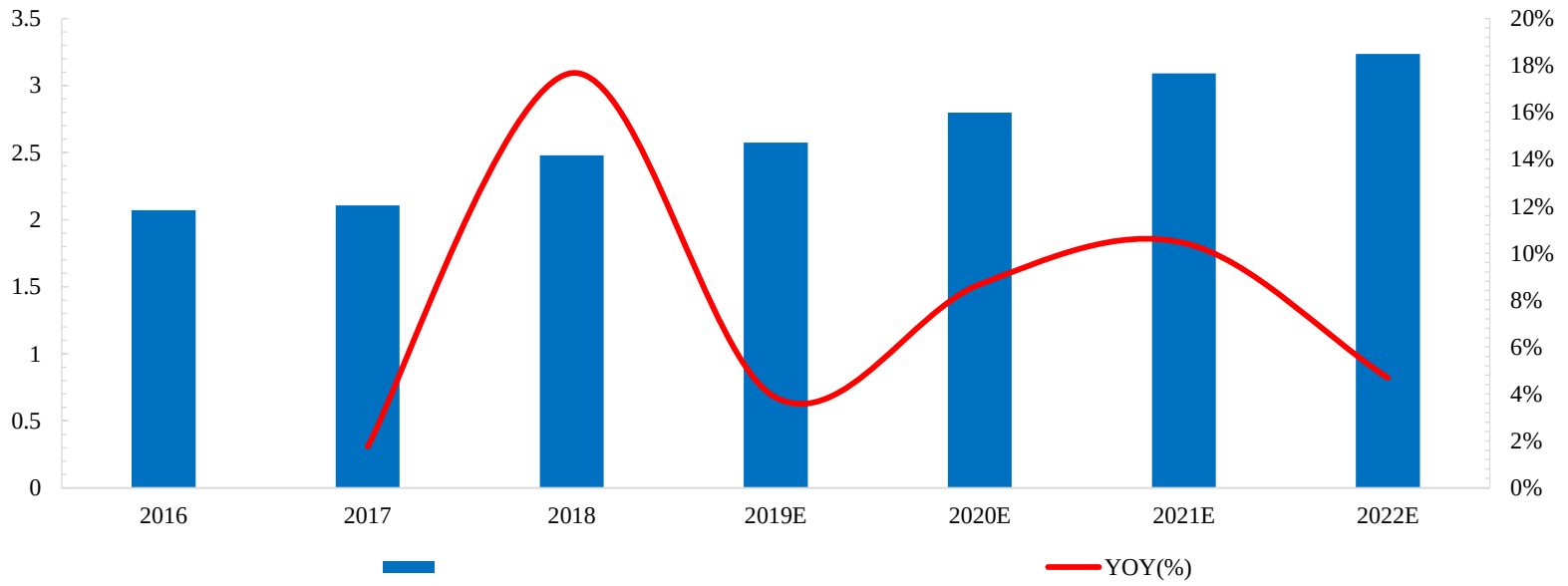
LCD

1

10.5 2020/2021/2022

8.7%/10.4%/4.7%

58 1



WitsView

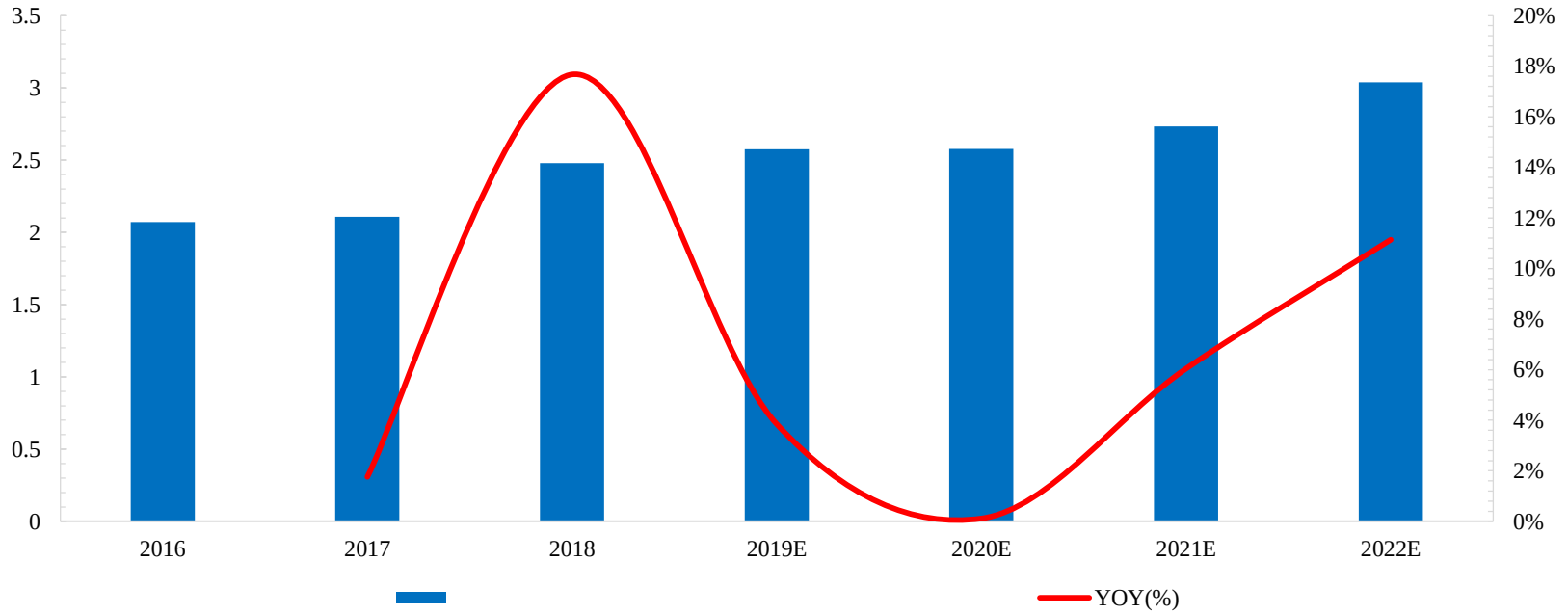
LCD

3 2

LG LCD OLED

2020/2021/2022 0.1%/6.0%/11.1%

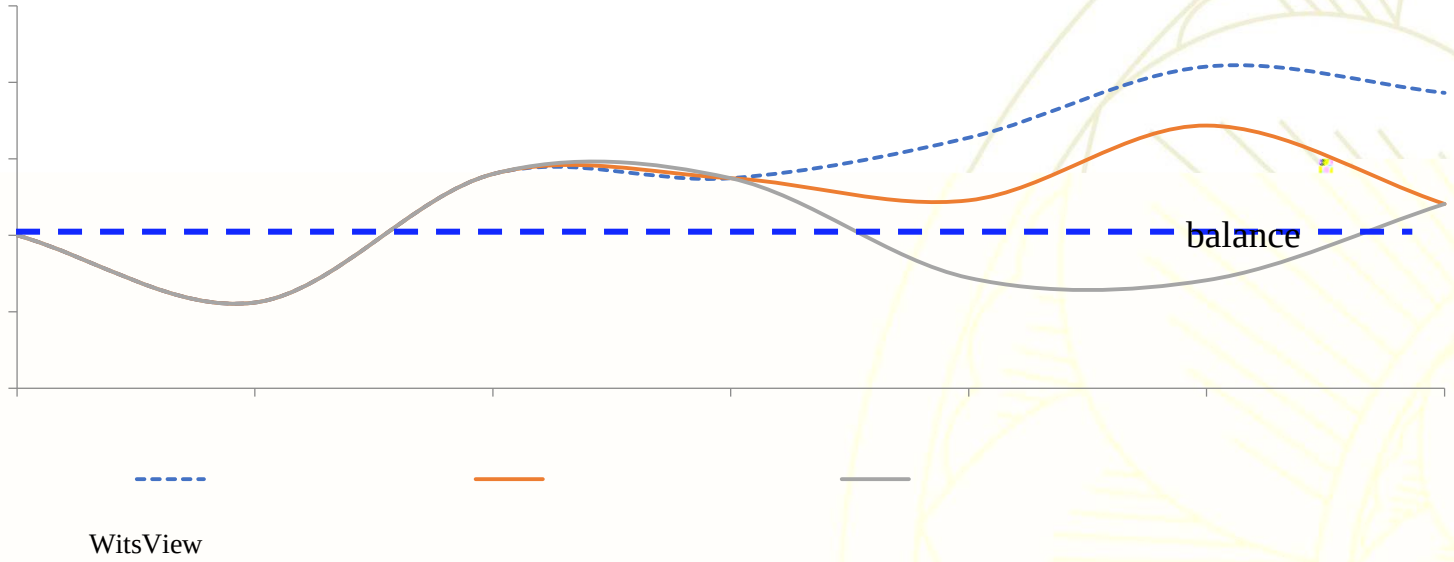
60 3



WitsView

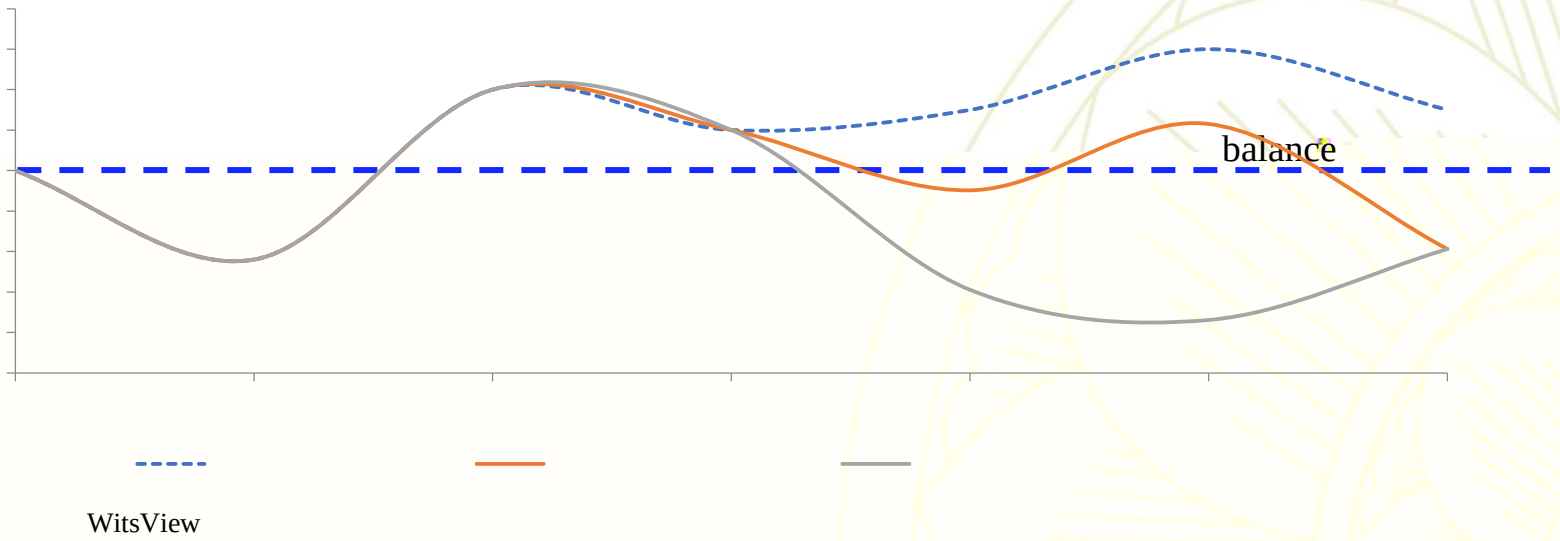
LCD:

61 TV 1 Glut



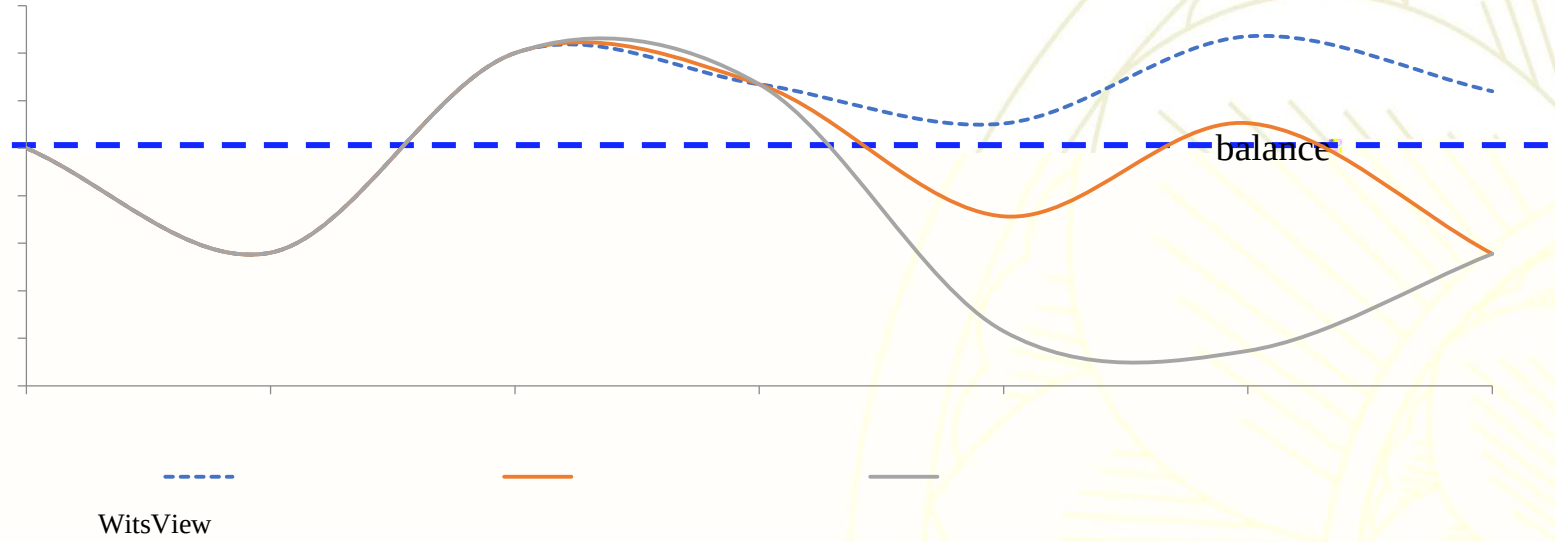
LCD

62 TV 1.3 Glut



LCD

63 TV 1.5 Glut



LCD

LCD

19

IHS

OLED OLED

OLED AMOLED OLED

AMOLED

AMOLED LCD

OLED OLED 2019 82%

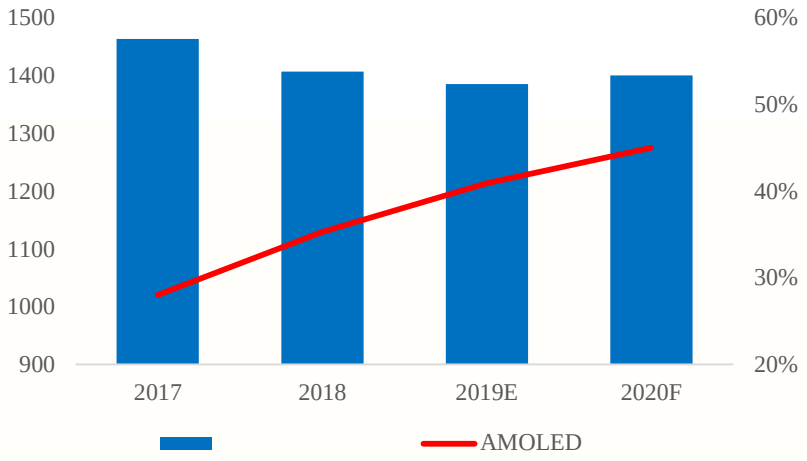
287

AMOLED 2017 28%

2019 41% Counterpoint 2020 AMOLED

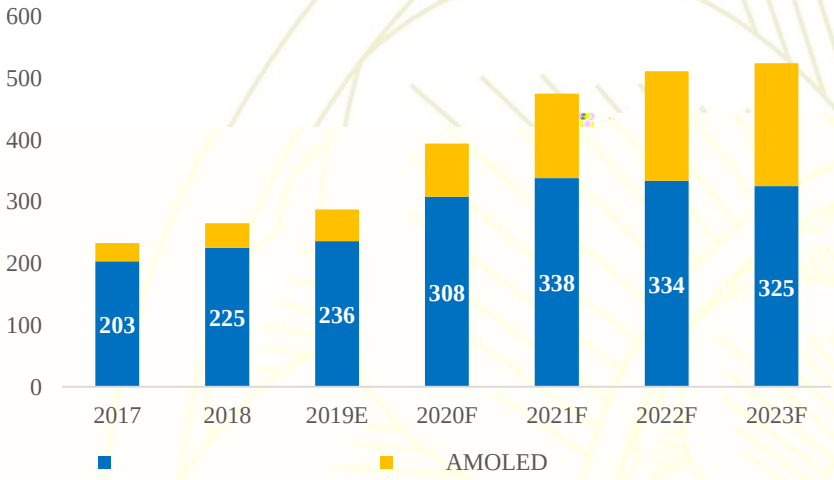
6

65 OLED



IDC Counterpoint

66 OLED



DSCC

OLED OLED

AMOLED

Edge

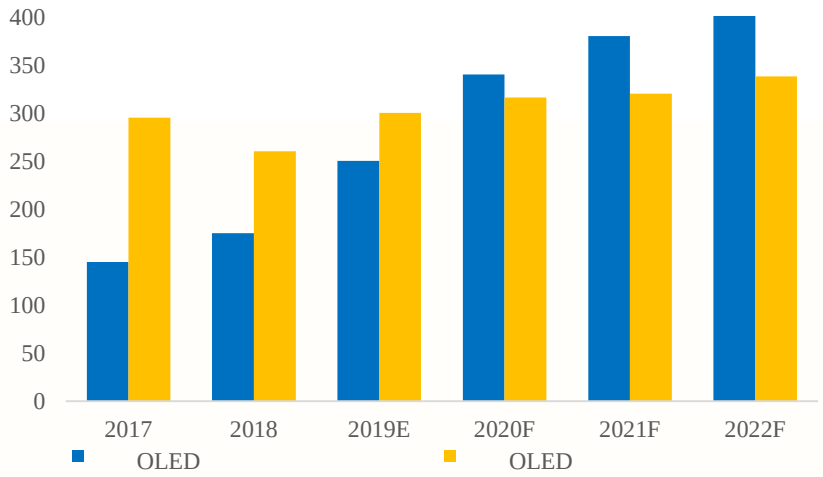
IHS Markit AMOLED 2020 3.357

AMOLED 3.159 2018 38.9% 52%

OLED 2019 110

WitsView 2022 3.4%

67 AMOLED



IHS

20

FlexPal	7.8	8999	2018Q4
Galaxy Fold	7.3	15999	2019Q2
Mate X	8	29999	2019Q4
W2	7.2	22999	2019Q4

OPPO 2020

OLED TV OLED

AMOLED OLED

OLED LG OLED

2018 OLED 290 66%

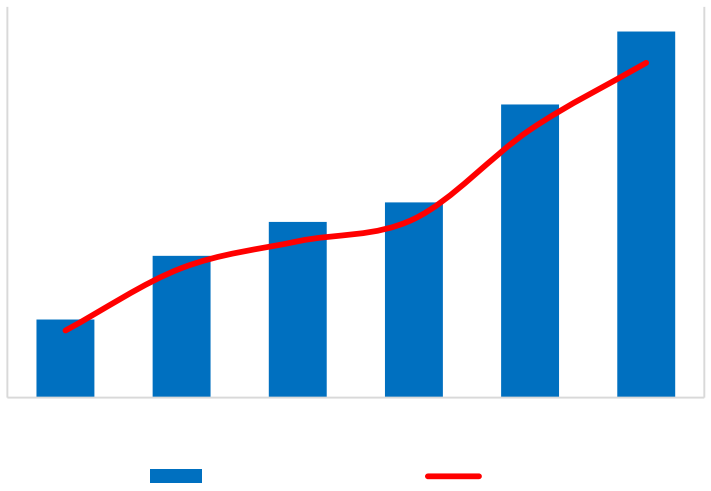
2019 OLED 360 28%

LG G8.5 2020 OLED 400

3% 2023 OLED 105 2018-2023

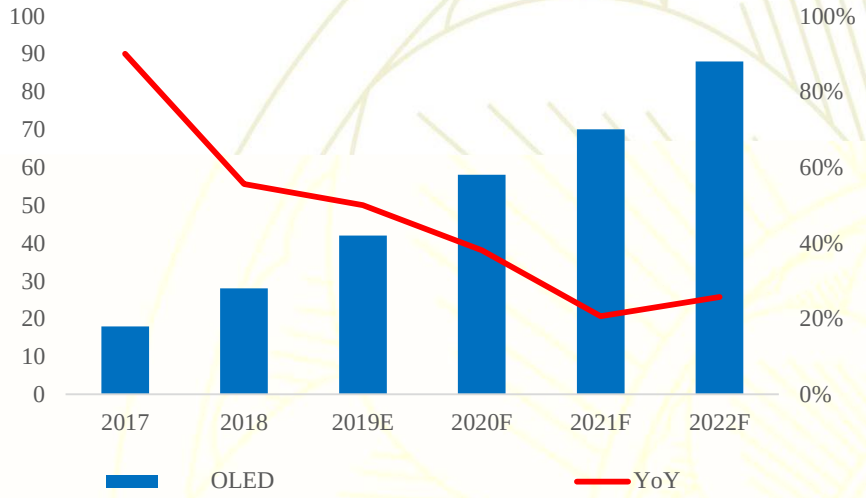
31%

68 OLED



DSCC

69 OLED



DSCC

VR/AR

6263 IDC 2022 20% VR/AR 890 54.1% IDC 2023 6860 66.7% VR FOV

OLED OLED OLED

OLED OLED

OLED

LG OLED
AMOLED 90%
OLED LGD OLED
LGD
LG 11 A5
18 27 LGD OLED
2017

21 OLED

					/
	A2	5.5	/		48K
	A3	6			135K
	A4	6		2018	135K
LGD	E2	4.5	/		22K
	E5	6			15K
	E6-E9	6		2018	45K
	P10	10.5		2019	45K
		8.5		2020	60K 2021 90K

OLED OLED

OLED

LCD OLED

2018

2019 8 OLED JOLED

OLED

2 /

22 OLED

					/
JDI		6	/	2018	15K
		6	/	2017	15K
		6		2018	10K
		4.5			4K
		6		2019	30K
		4.5	/		8K
		6	/	2018	8K
JOLED		5.5		2020	20K
		4.5		2017	10K
		6	/	2018	4K
		6	/	2018	40K
		6	/	2019	30K

OLED OLED

OLED

OLED 2018 2019
2019 10 OLED 4000
OLED 80% IHS 2020
OLED 28%

23 OLED

			/
	6		48K
	6	2019	48K
	6	2021	48K
	6	2020	48K
	6	2021	30K
	6	2018	30K
	5.5	/ 2016	21K
	6	2018	30K
	6	/	30K
	6	2021	37.5K
	6	2018	15K
	6	2020	30K
	6	2019	45K
	6	2021	30K

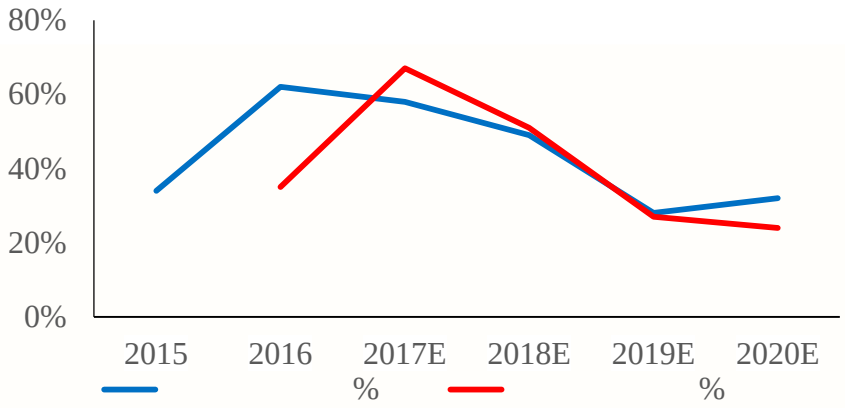
OLED

2017 2018 AMOLED

2019 OLED

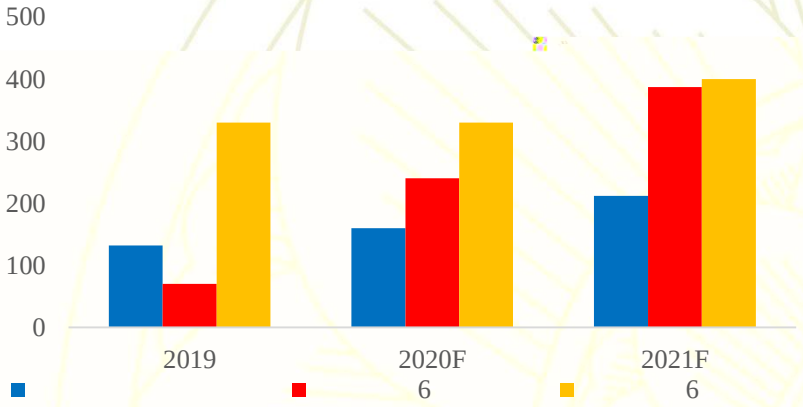
240 85%

72 OLED



WitsView

73 OLED



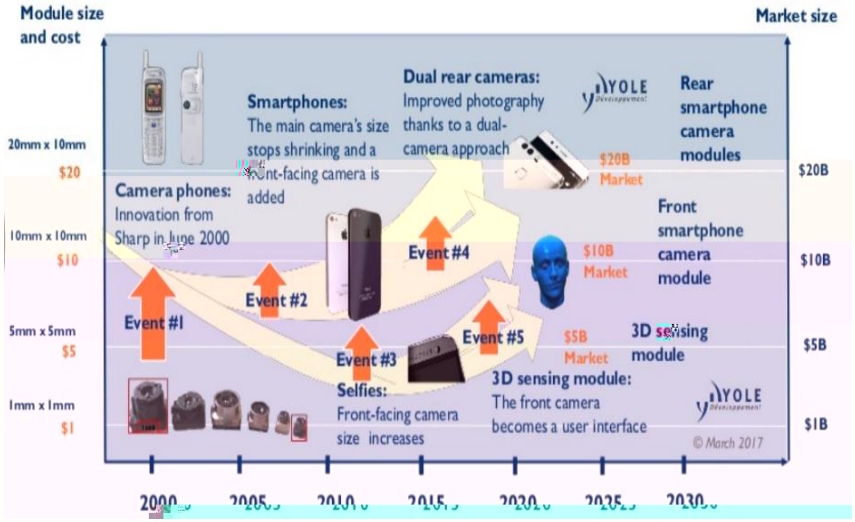
		2019/12/27	EPS			PE		
			2019E	2020E	2021E	2019E	2020E	2021E
000725.SZ	A	4.64	0.07	0.11	0.18	66.29	42.18	25.78
300567.SZ		55.90	2.54	3.48	4.53	22.01	16.06	12.34
000050.SZ	A	16.35	0.61	0.75	0.80	26.87	21.69	20.34
000100.SZ	TCL	4.52	0.28	0.31	0.36	16.17	14.51	12.41
002387.SZ		15.80	0.25	-0.10	-0.26	62.62	-151.05	-59.69
002876.SZ		50.70	0.60	1.83	2.73	84.01	27.65	18.55

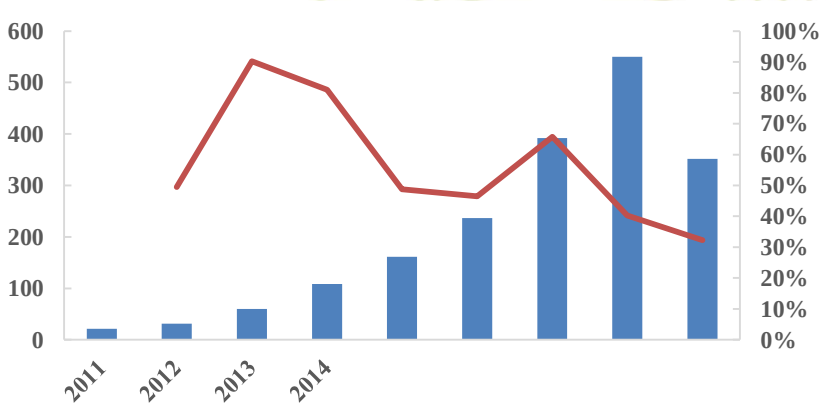
wind

5G

LCD

74


Module size and cost
Market size
20mm x 10mm
$20
10mm x 10mm
$10
5mm x 5mm
$5
1mm x 1mm
$1
Smartphones:
The main camera's size stops shrinking and a front-facing camera is added
Dual rear cameras:
Improved photography thanks to a dual-camera approach
Rear smartphone camera modules
$20B Market
$20B
Camera phones:
Innovation from Sharp in June 2000
Front smartphone camera module
$10B Market
$10B
Event #1
Event #2
Event #3
Event #4
Event #5
$5B Market
3D sensing module
$5B
Selfies:
Front-facing camera size increases
3D sensing module:
The front camera becomes a user interface
$1B
YOLE
© March 2017
2000
2005
2010
2015
2020
2025
2030

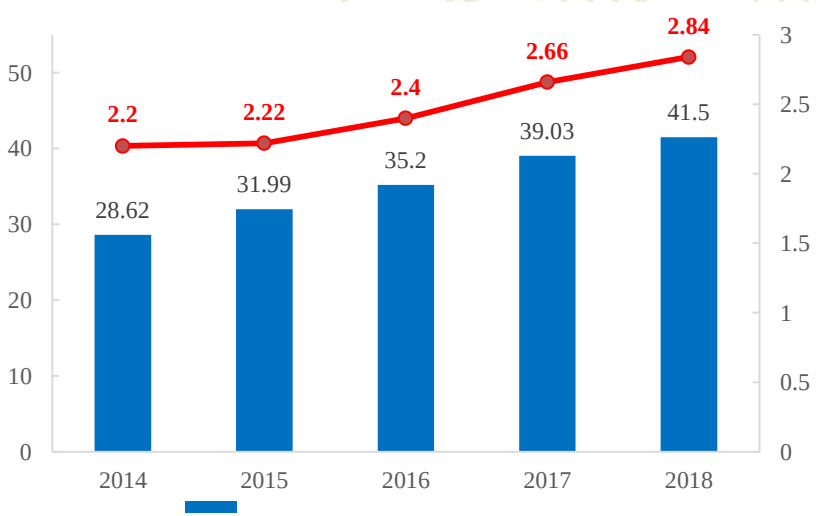

600
500
400
300
200
100
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2011
2012
2013
2014

wind

76

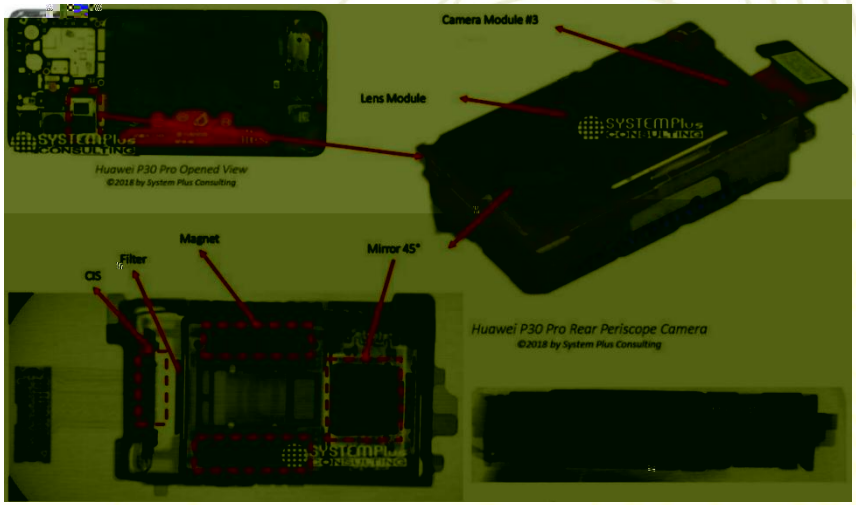
Yole

77 2014-2018



Yole

78



Counter

System Plus

CMOS

CMOS CMOS
sony

LD

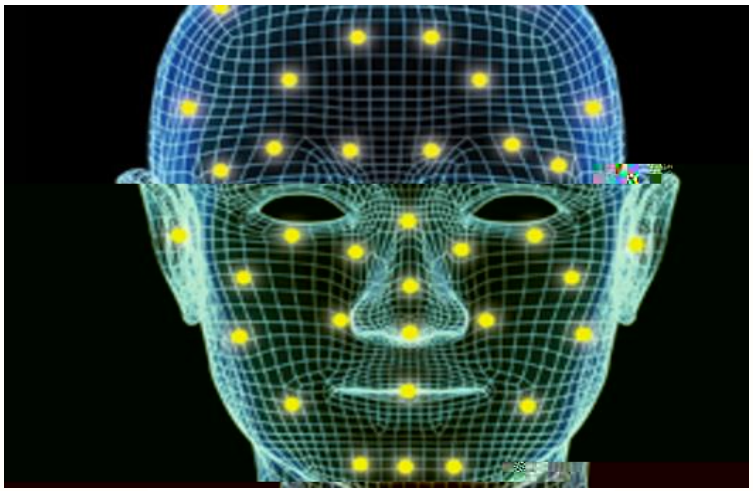
25: CCM

Yole

yole 2024 CCM
457 9.1%
Camera 2018 85

3D 3D Sensing
3D AR/VR
3D Sensing AR/VR 3D Sensing
AR/VR Presence
3D

82 3D Sensing



AMS

83 3D Sensing

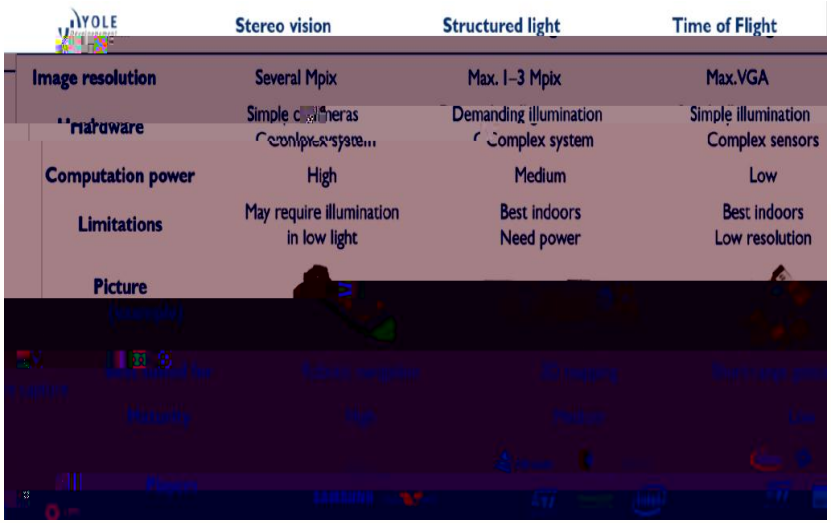
Infineon

3D TOF

TOF

RGB

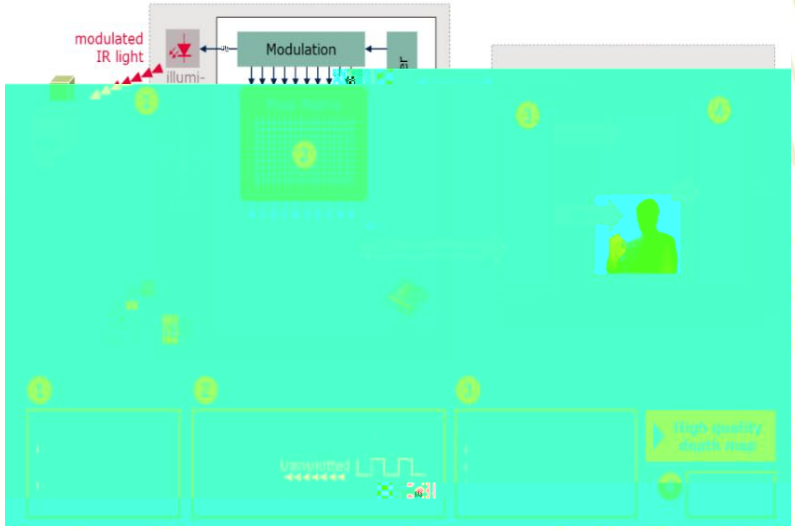
84



	Stereo vision	Structured light	Time of Flight
Image resolution	Several Mpix	Max. 1-3 Mpix	Max.VGA
Hardware	Simple cameras Complex system	Demanding illumination Complex system	Simple illumination Complex sensors
Computation power	High	Medium	Low
Limitations	May require illumination in low light	Best indoors Need power	Best indoors Low resolution
Picture			

Yole

85



Infineon

3D Sensing CMOS

VCSEL DOE

VCSEL

lumentum Finsar

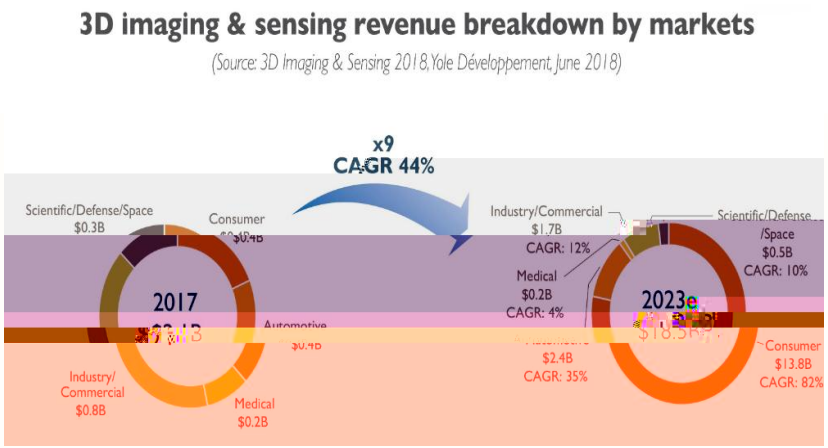
WLO Heptagon AMS

DOE

26 3D Sensing

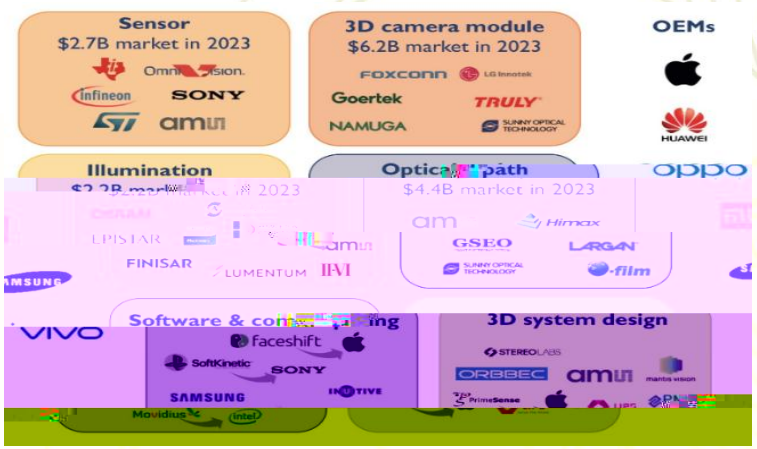
3D Sensing Yole 2017
3D sensing 21 2023 185
44% 2017
4 2023 138 82%
CMOS 2023 23 Sony
2023 62
VIAVI

86 3D Sensing



Yole

87 3D Sensing



Yole

		2019/12/27		EPS			PE		
			2019E	2020E	2021E	2019E	2020E	2021E	
603501.SH		147.60	0.98	2.6	3.58	150.61	56.77	41.23	
1478.HK		11.77	0.38	0.51	0.62	30.97	23.08	18.98	
002273.SZ		15.96	0.42	0.54	0.68	38.00	29.56	23.47	
2382.HK		122.55	3.17	4.43	5.58	38.66	27.66	21.96	
002962.SZ		37.75	0.82	1.11	1.39	46.04	34.01	27.16	
002456.SZ		15.60	0.21	0.59	0.8	74.29	26.44	19.50	

wind

5G

LCD

3-5

CIS

WIFi MCU

2020 5G 5G

5G 4G

PCB

LCD

OLED OLED

A TCL

5

CIS

2020 PCB

PCB

5G

LCD

5G

致谢