Company Profile

Leshan Radio company Ltd.

Agenda

01 Basic Information

02 Factory View

03 Automotive Business

04 Products & Quality

01 Basic Information

Vision Mission Milestone

Manufacture world-class quality semiconductor products with competitive price to meet worldwide customers' demand.

LRC established at 1971, is a world-class comprehensive electronic enterprise with wafer design, semiconductor components manufacturing and sales

1971

Establishment of LRC

1984·1986

Introduced Glass Sealed and Plastic Sealed Diodes product line with 50Mpcs/yr

1990-1993

Had been worked with HKG & Taiwan to build a JV wth production capacity of 1Bpcs/yr. At 1993 LRC is the biggest discrete manufacturing base in China and being the first Diodes Brand in China.

1995.3

Cooperate with Motorola to Established a JV LESHAN Pheonix Semiconductor (LPS). It is now JV with ON-Semi

Since 2001

Being 7 times ranking the China Top 100 Electronics Enterprises

2009

Chengdu Advanced Power Semiconductor (APS) Established

2021

LRC is continuously increasing the capacity and achieved 70Bpcs/Yr

LRC Group

LRC
LRC Power Semiconductor
LRC hold 100%

ROHS · IATF16949 · Halogen Free · ISO140001 · ISO9001

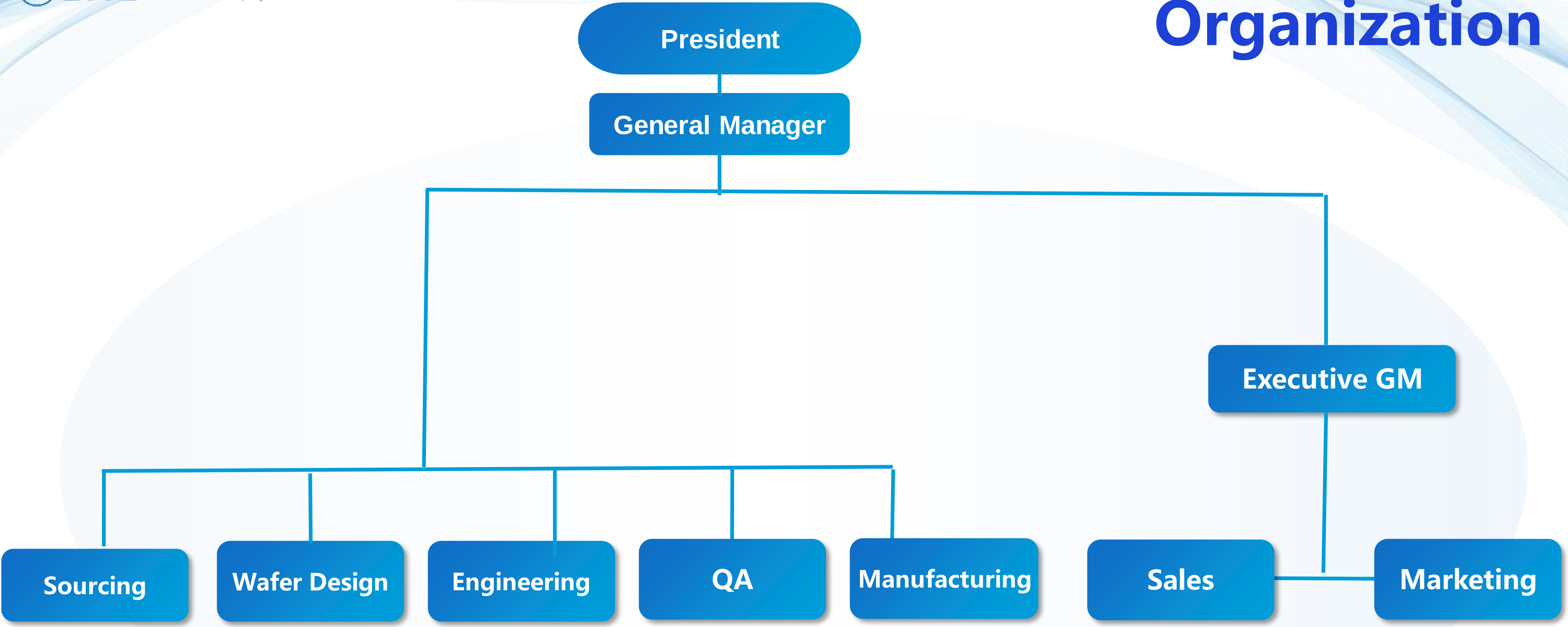
APS
Chengdu Advanced Power Semiconductors
LRC hold 100%

ISO9001 · QC080000 · OHSAS18001 · IATF16949 · ROHS · ISO14001
Halogen Free

LPS
Leshan-Pheonix Semiconductor
LRC 20% & ON 80%

ISO9001 · ROHS · IATF16949 · Halogen Free · ISO14001

Organization



President

General Manager

Executive GM

Sourcing

Wafer Design

Engineering

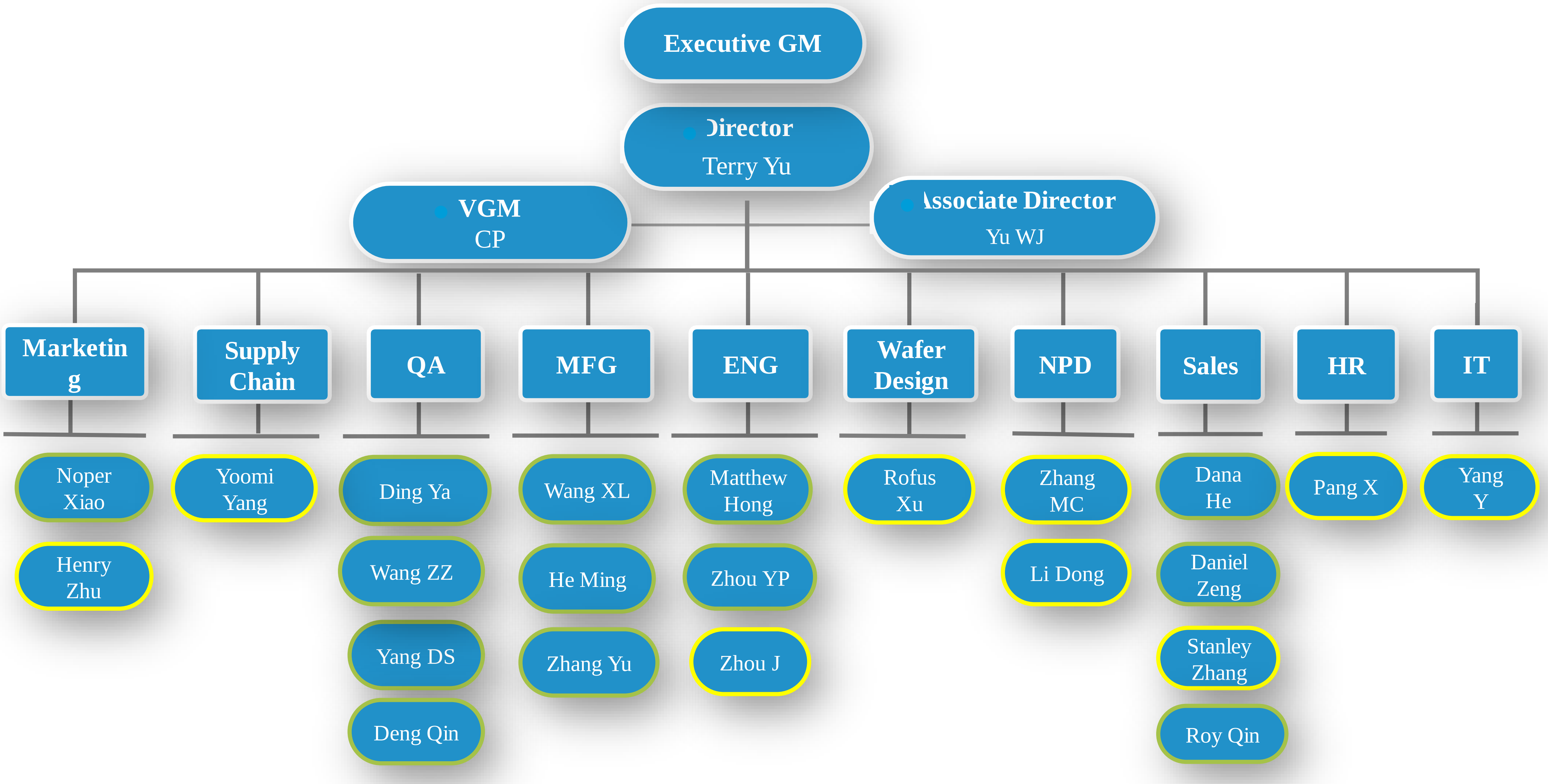
QA

Manufacturing

Sales

Marketing

Automotive Team Organization



Executive GM

Director
Terry Yu

VGM
CP

Associate Director
Yu WJ

Marketing
- Noper Xiao
- Henry Zhu

Supply Chain
- Yoomi Yang

QA
- Ding Ya
- Wang ZZ
- Yang DS
- Deng Qin

MFG
- Wang XL
- He Ming
- Zhang Yu

ENG
- Matthew Hong
- Zhou YP
- Zhou J

Wafer Design
- Rofus Xu

NPD
- Zhang MC
- Li Dong

Sales
- Dana He
- Daniel Zeng
- Stanley Zhang
- Roy Qin

HR
- Pang X

IT
- Yang Y

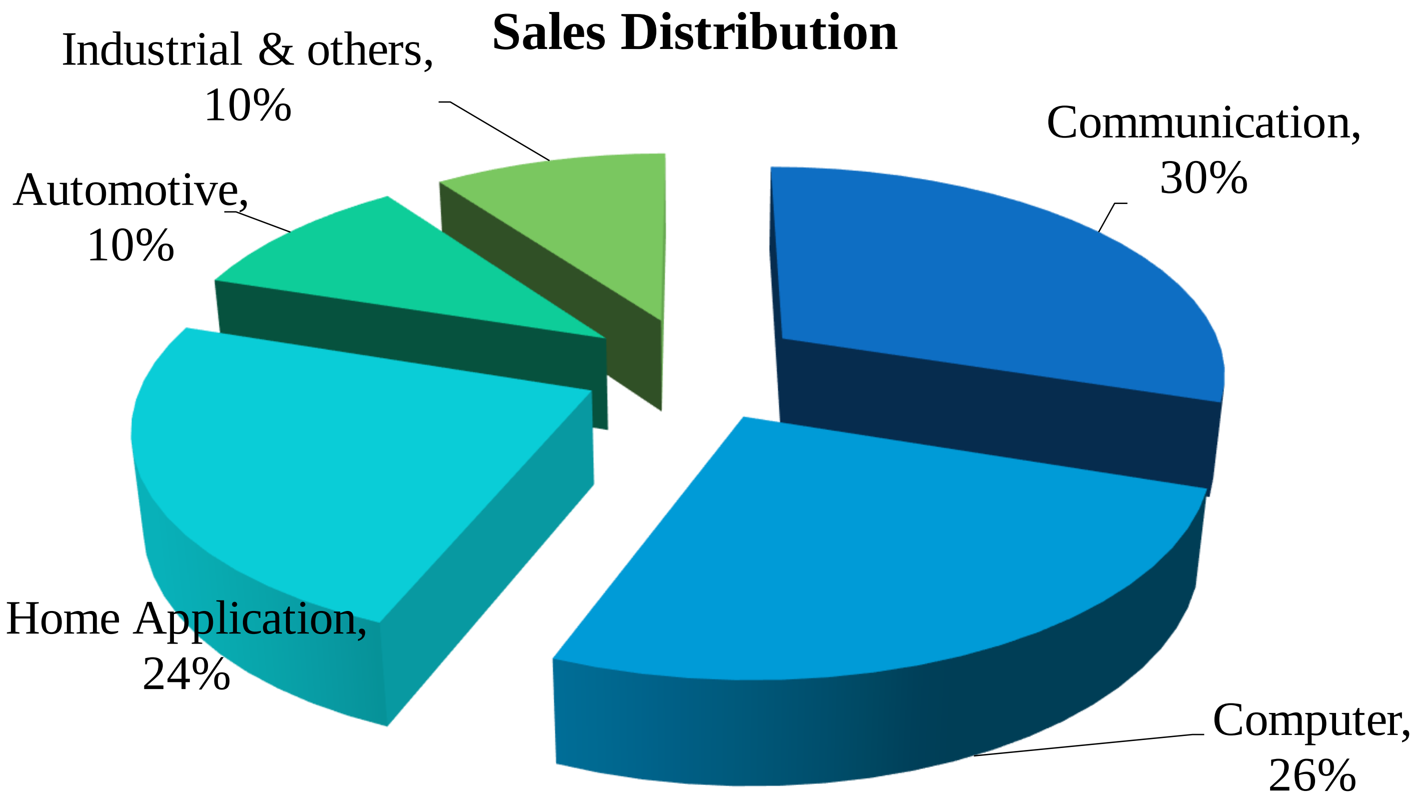
Company Overview

LRC Group

Is the biggest Discrete components manufacturer in China

Company Update

History	Employers
50Yr	+4290
Capacity	**Sales Revenue**
70Bpcs	USD535M

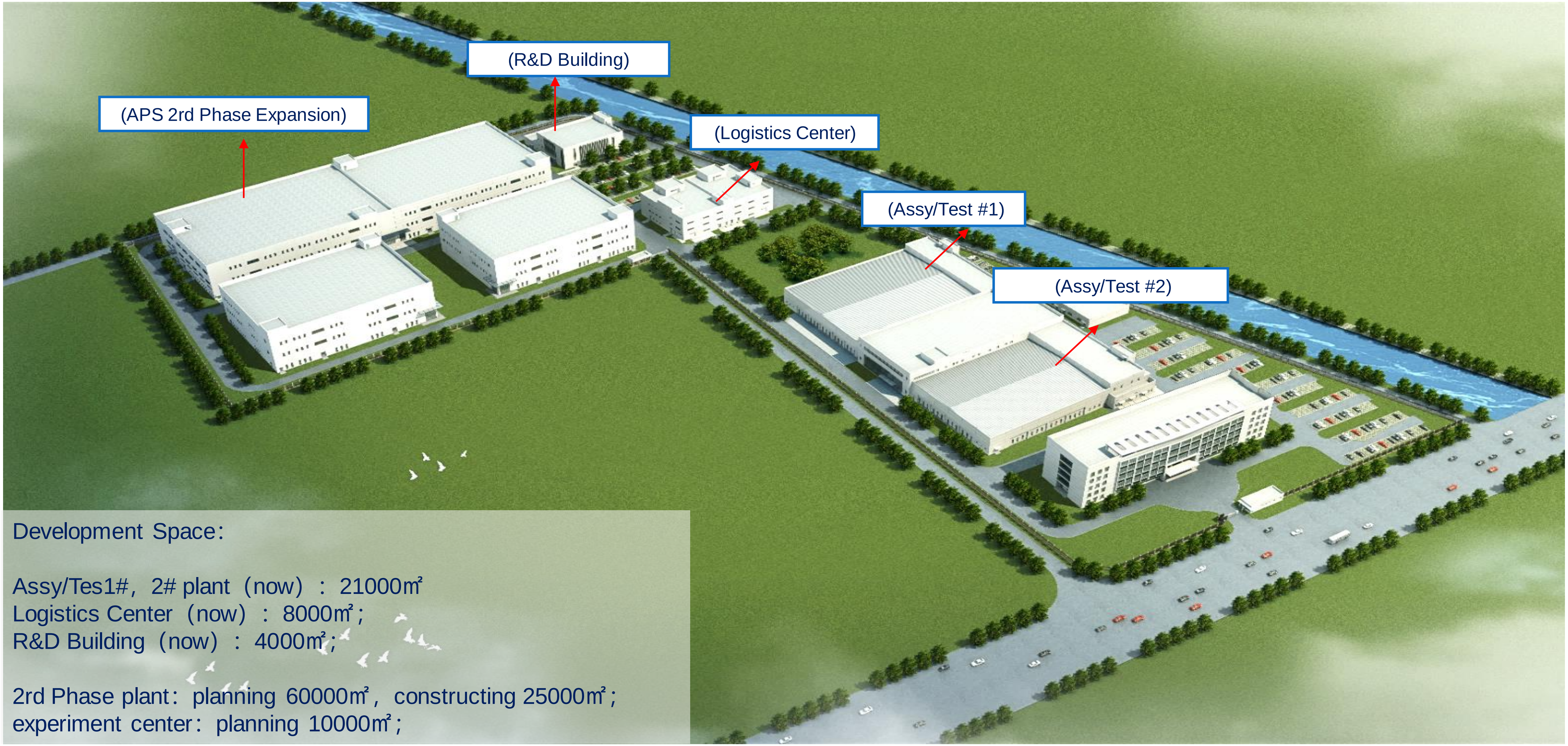


Our products are serving **5000+ Customers**, with the Vision of

Building a World-class Comprehensive Electronic Enterprise.

02 Factory View

➢ APS Whole plant aerial view



Development Space:

Assy/Tes1#, 2# plant（now） : 21000㎡
Logistics Center（now） : 8000㎡;
R&D Building（now） : 4000㎡;

2rd Phase plant: planning 60000㎡, constructing 25000㎡;
experiment center: planning 10000㎡;

Smart Factory-Automation Equipment

01 Wafer Sawing

02 Die Bond & Wire Bond

03 Molding

04 Plating

Smart Factory-Automation

05 Trim & Form

06 IR-Reflow

07 Label & Marking

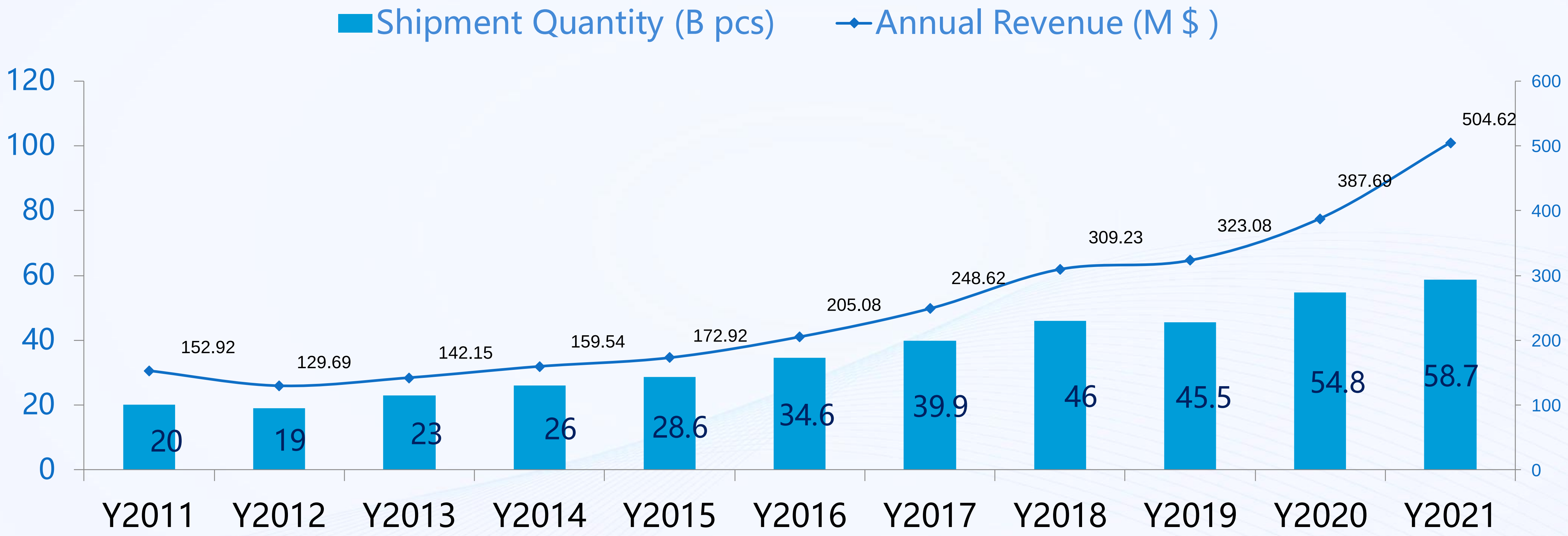
08 Laboratory

The equipments are purchased from Japan, Singapore and other countries.

03 Automotive Business

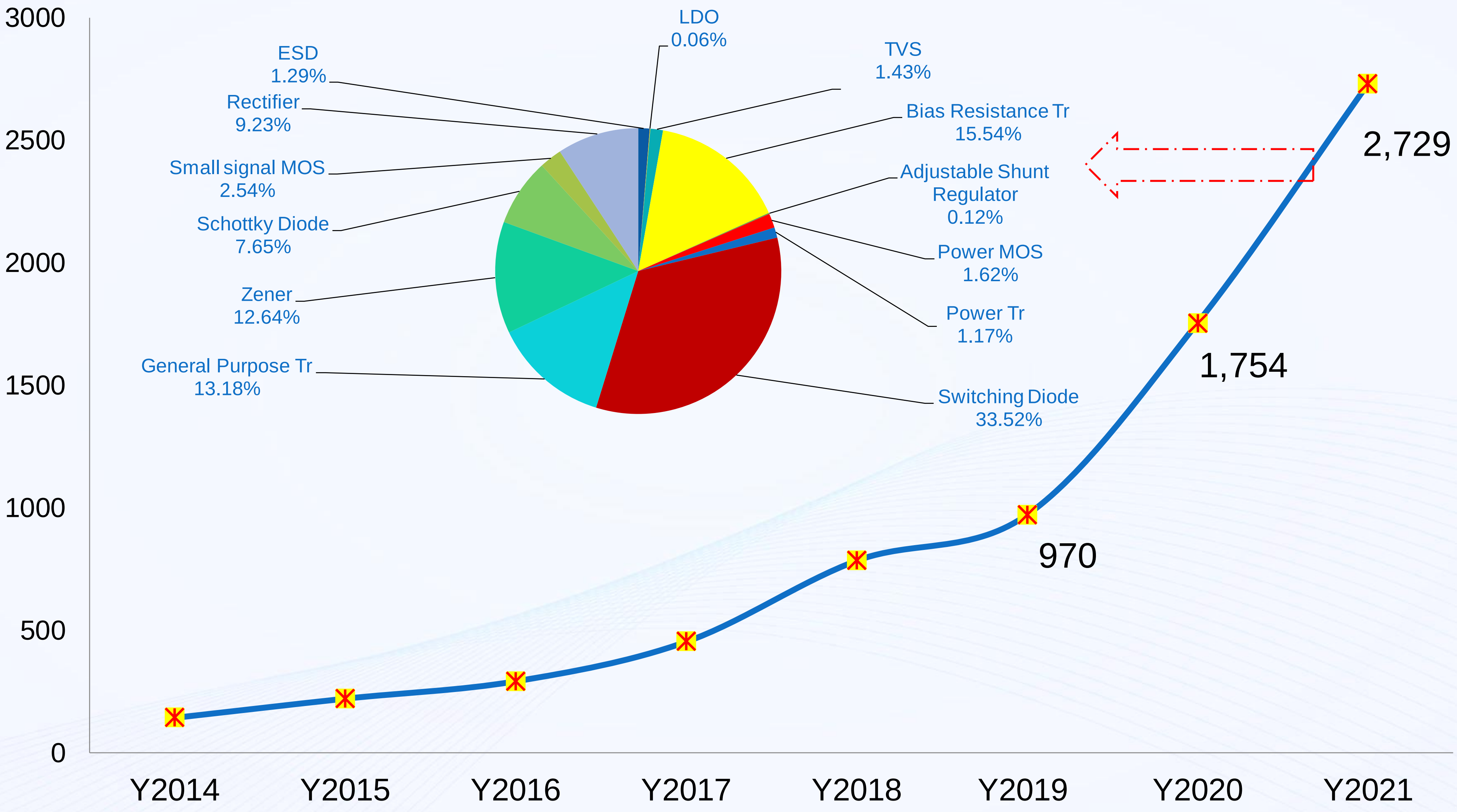
Sales Revenue and Production Capacity

Employees： 4000+ Annual Capacity： 70 Billion pcs.



※ 2019 Global Discrete semiconductor shipping quantity is 470 billion pcs. As per IC Insights

Automotive Product Shipment（Mil pcs）



Sales Distribution

Communication	Computer	Consumer	Industrial& Others	Automotive
30%	26%	24%	10%	10%

2021

Automotive
20%

2025

Comment:
Promote Automotive business from 10% of total revenue to 20%.

Main Customers

Communication

- ZTE中兴
- tp-link
- oppo
- TRANSSION
- mi 小米
- HQ HUAQIN 华勤通讯
- vivo
- LONGCHEER
- WINGTECH
- JEZETEK 九联

Consumers

- Whirlpool
- SAMSUNG
- Electrolux
- PHILIPS
- Panasonic
- DIEHL
- Bitron
- GREE 格力
- 美的 Midea
- TCL
- Canon

Power

- DELTA
- EATON
- ARTESYN
- Salcomp
- Hansol
- OSRAM
- LITEON
- signify
- PHIHONG
- DONG YANG E.P
- LG Innotek

Others

- FOXCONN
- JABIL
- flex
- TPV 冠捷科技集团
- Nintendo
- MITSUMI
- INOVANCE
- dji
- makita
- HiKOKI
- TTI
- BOSCH
- HIKVISION
- alhua
- DESAY 德赛
- mindray 迈瑞
- Longhorn

Computers

- Lenovo
- DELL
- hp
- ASUS
- Quanta Computer
- Inventec
- wistron
- logitech
- GIGABYTE
- msi

Automotive

- KOSTAL
- BYD
- TE
- LS Automotive
- UAES
- DENSO
- DRÄXLMAIER
- HARMAN
- TESLA
- 长江汽车电子
- JECO

Panel

- BOE
- SAMSUNG
- AUO
- TIANMA
- TRULY 信利
- .film
- TES
- INNOLUX 群创光电
- CSOT 华星光电

Key Automotive Customers & Applications

KOSTAL

BYD

UAES

DESAY SV

SAIC 上汽集团 SAIC MOTOR

TESLA

BTL

YR YURA

Hanon SYSTEMS

国轩高科 GOTION HIGH-TECH

DENSO

HARMAN

TE

BOE

[illegible]

DRÄXLMAIER

TIANMA

LS Automotive

HYUNDAI MOBIS

HSAE 航盛

长江汽车电子 CAEA Changjiang Automobile Electronic

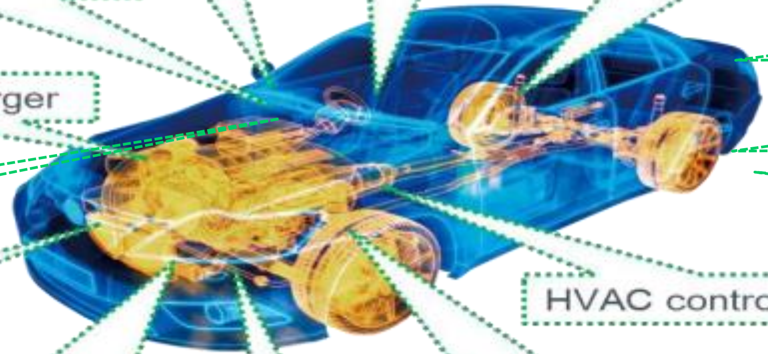
ECARX

MIND 曼德

VMAX

EVTECH

SUNWODA 欣旺达



WCBS，ADAS，EPB
ABS，ESC

Vehicle Control Unit

DC-to-DC converter

Electric Power Steering

Battery management system

Electric Super charger

CDU/OBC/OCC

In-Vehicle Infotainment

Tire pressure monitoring

Engine ECU

HVAC control system

Automatic transmission

Body control module

Head Lamp

Under Qualification

BOSCH

APTIV

Valeo
法雷奥

HELLA

ZF

MAGNETI MARELLI

SL

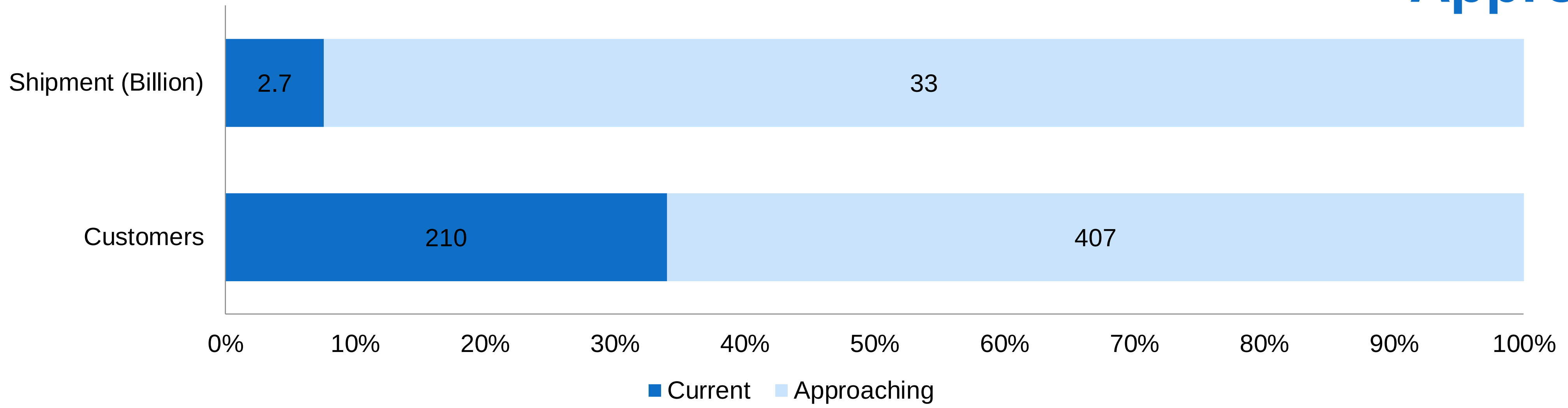
均胜电子
JOYSON ELECTRONICS

CATL 宁德时代

faurecia

ALPSALPINE
Perfecting the Art of Electronics

Customers Approach



Comment

Currently 1) 210 automotive customers.

2) 2.7 Billion pcs shipment.

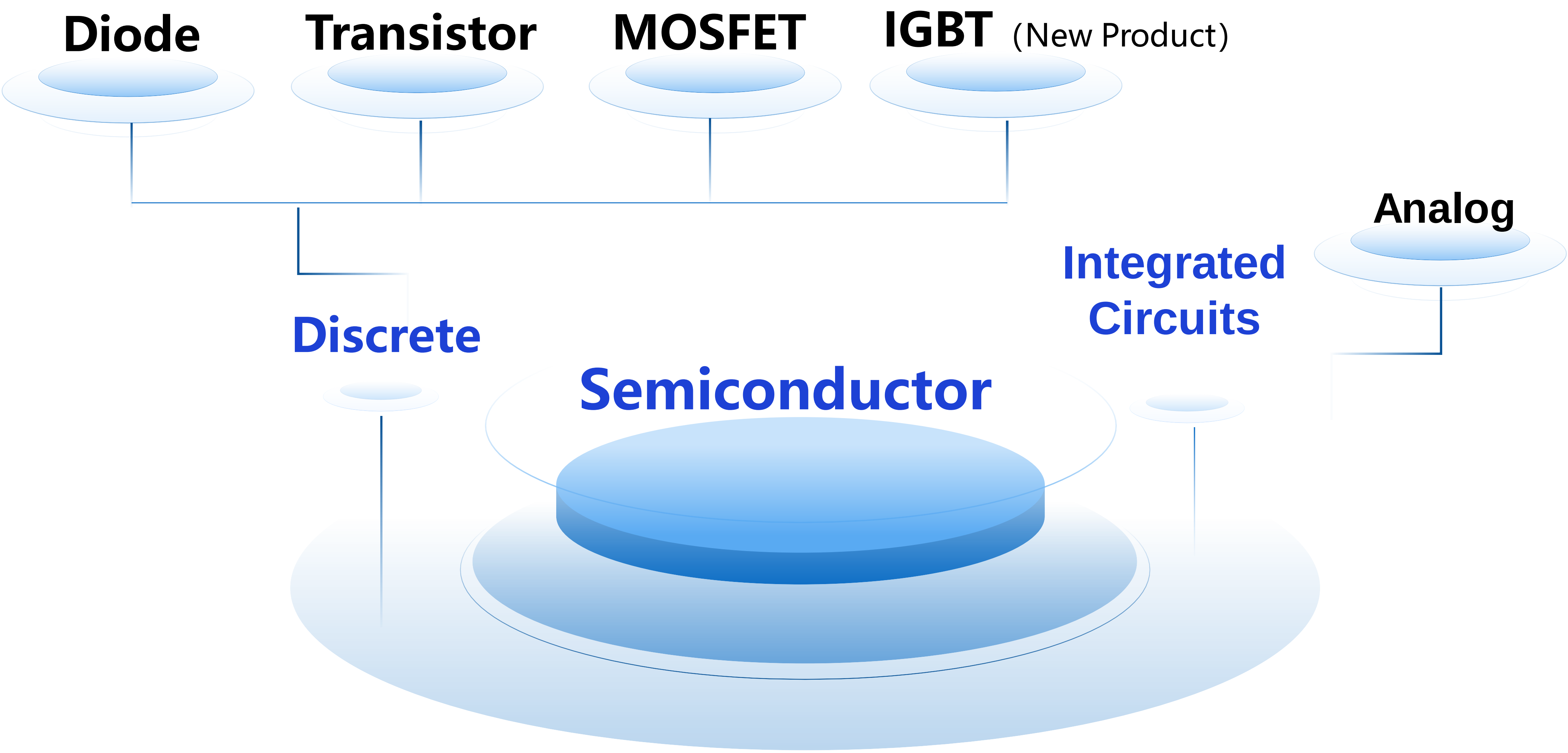
Potentially 1) 407 more customers are being approached.

2) 7 Billion pcs potential business in demand of current 210 customers.

3) 26 Billion pcs potential business in demand of 407 more customers.

04 Products & Quality

Product Portfolio



Diode

Transistor

MOSFET

IGBT (New Product)

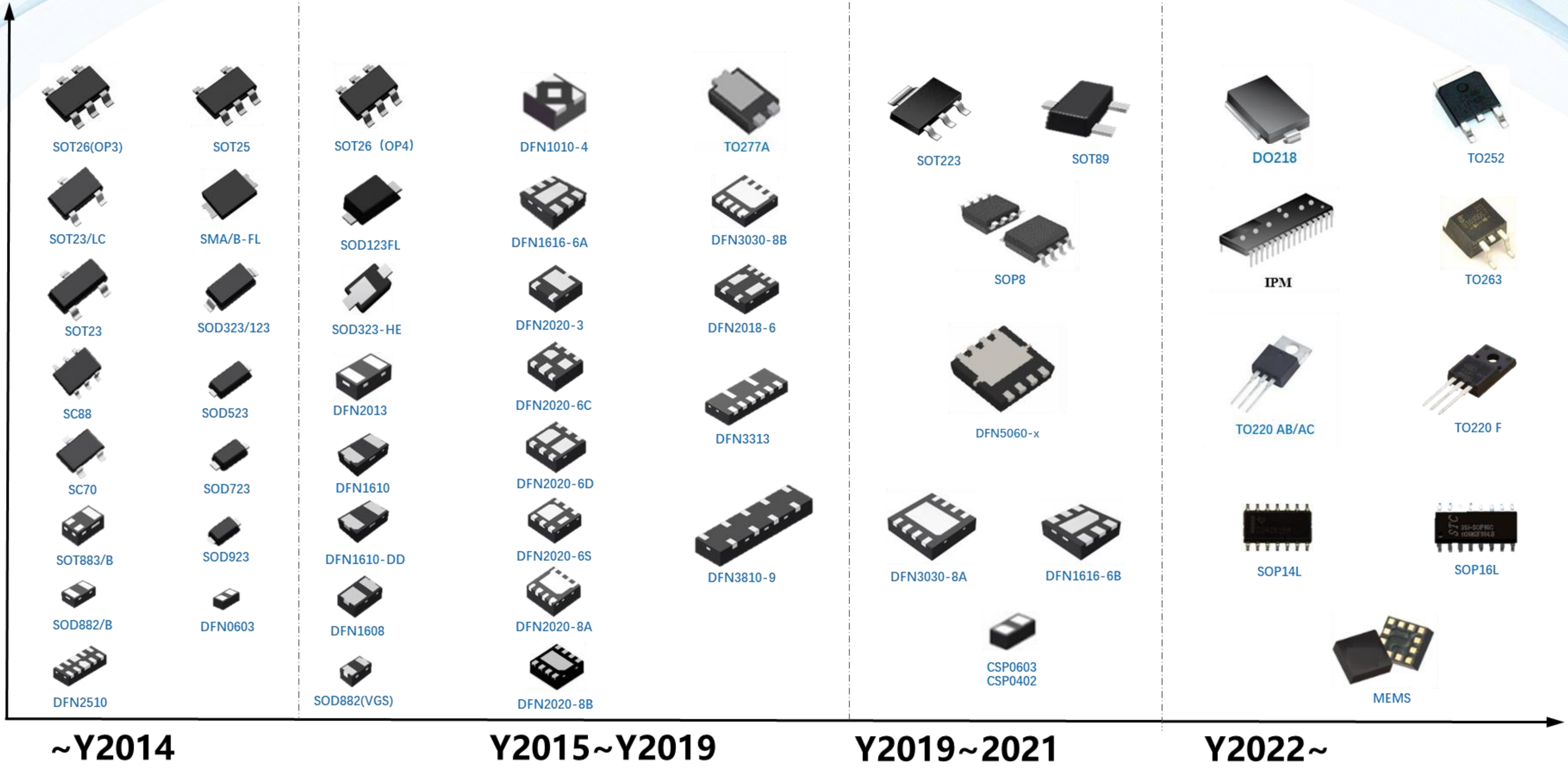
Discrete

Semiconductor

Integrated Circuits

Analog

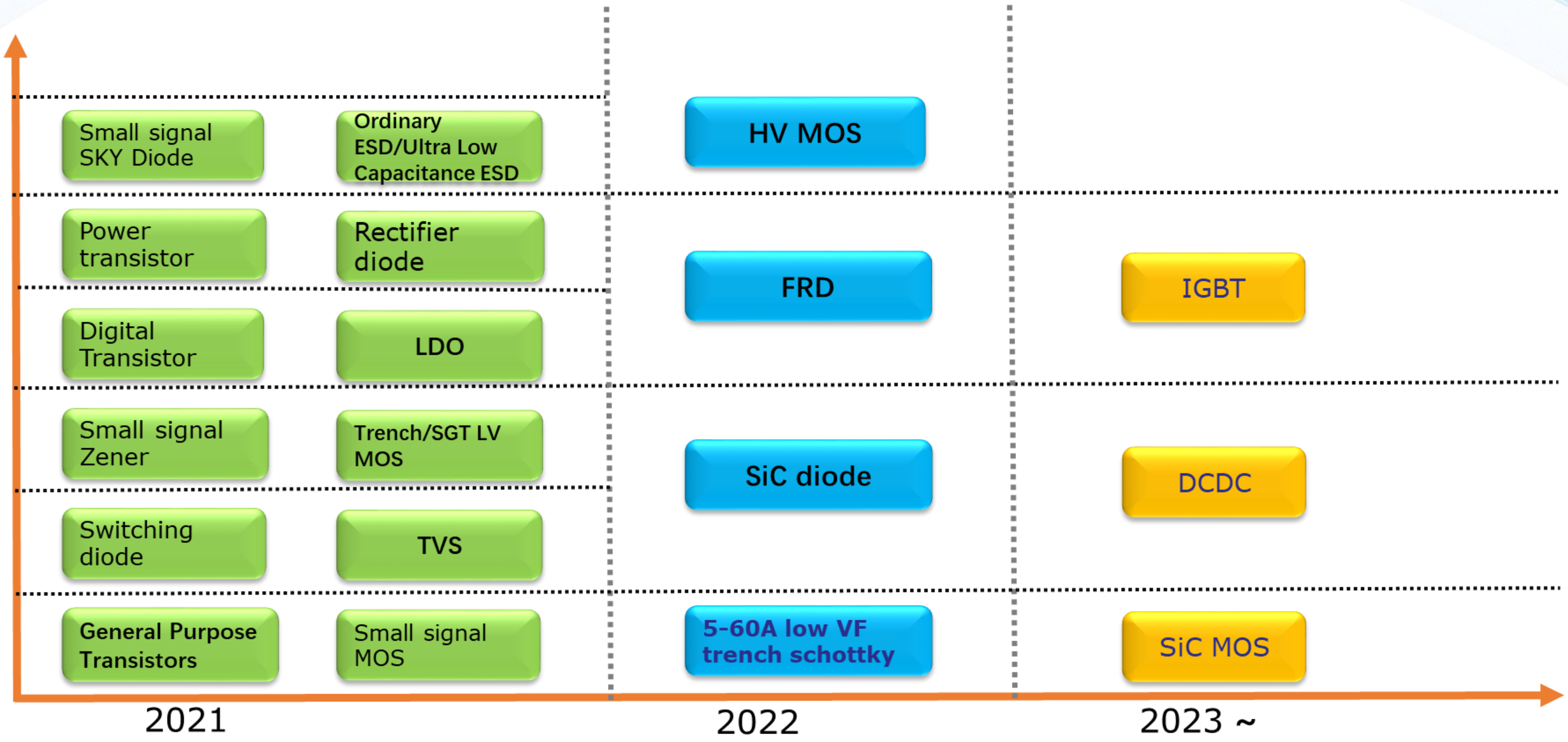
Roadmap by Package



1. Package Dimension:

Small size>>>Medium size>>>Large size

Roadmap by Category



Small signal SKY Diode

Ordinary ESD/Ultra Low Capacitance ESD

HV MOS

Power transistor

Rectifier diode

Digital Transistor

LDO

FRD

IGBT

Small signal Zener

Trench/SGT LV MOS

Switching diode

TVS

SiC diode

DCDC

General Purpose Transistors

Small signal MOS

5-60A low VF trench schottky

SiC MOS

2021

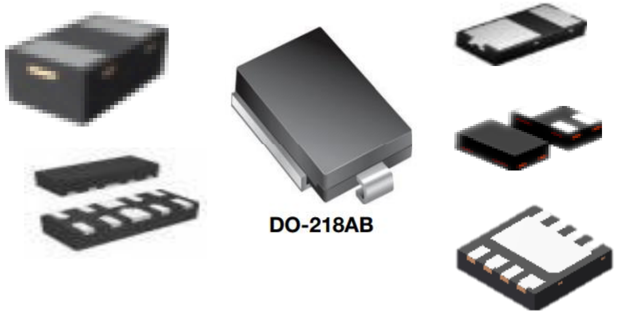
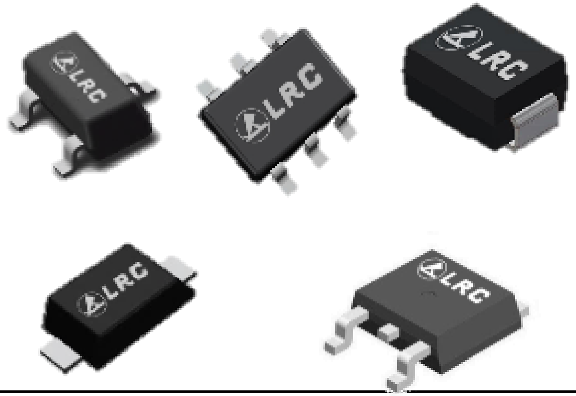
2022

2023 ~

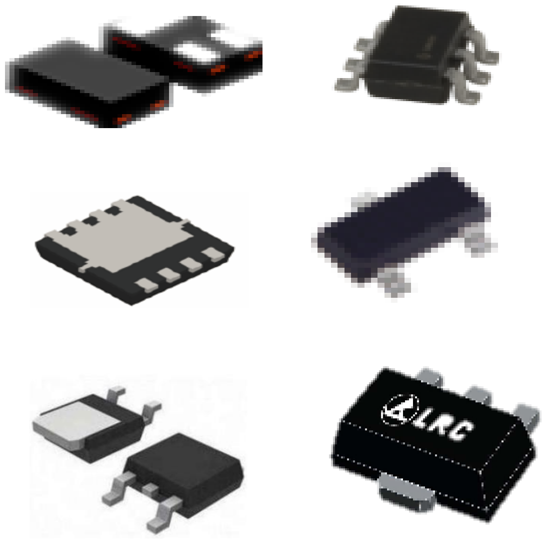
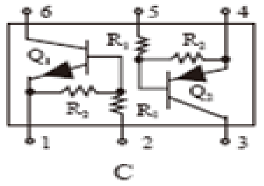
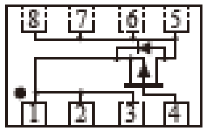
2. Technology:

- So far, ~1700 devices are available for automotive application.
- LRC is focusing on BEV/HEV to develop more devices, such as SiC diode & MOSFET.

Automotive Products—Diode

Product	Key Parameter	Package	Package Outline
ESD/TVS	V_{rwm}: 3.3~250V I_{pp} : 1~300A P_{pp} : 3~6600W	DFN SC88/88A/SMA/B/C SOD123~SOD923 DO218	**DFN**: SOD882 / SOT883 / DFN1608 / DFN2510 / DFN2020  SOT23 / SC88 / SC88A / SMA / SMAFL / SMBFL / SODXXX / TO277 
Zener	V_z : 2.2V ~75V P_d : 200~5000mW	SOD123~SOD923 SMA/SMAFL/SMB/SMC SOT23/SC88	
Schottky	V_r : 20~200V I_f : 0.2~15A V_f : < 0.5V	DFN SMAFL/SMBFL/SMB/SMC/TO277 SOT23/SC88/SC70 SOD123~SOD923	
Rectifier	V_{pk} : 50~1200V I_o : 1~3A T_{rr} : 20、25、35、75、250、500、2100ns	SMA/SMAFL/SMB/SMC SOD123FL	
Switching	V_r : 35~350V I_f : 100~300mA T_{rr} : low to 4ns	DFN SMAFL/SMB/SMC TO277 SOT23/SC88/SC70 SOD123~SOD923	

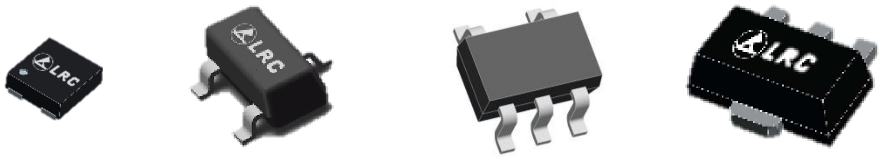
Automotive Products—Transistor

Product	Key Parameter	Package	Package Outline
General Purpose Transistors	BV_{CEO} : 20~400V I_C : 0.1~8A H_{FE} : 30~800 Low V_{ces} : <0.1V	SC70/SC88/SC89 SOT23/SOT89/SOT223 SOT883 TO252	SOT23/SC88/SC88A/SC70/ SOT883/SOT223/SOT89/D FNXXX   
Switching Transistors	BV_{CEO} : 40~60V I_C : 200~600mA H_{FE} : >80 T_{on}/T_{off} :< 70ns/300ns	SC70 SC88 SOT23 SOT883	
Digital Transistors	BV_{CEO} : >50V I_C : 0.2~0.5A R1 : 1~100Kohm R1/R2 : 1~50 H_{FE} : 30~160	SC70 SC88 SOT23 SOT883	
MOSFETS	BV_{DSS} : 20~150V I_D : 0.1~50A R_{ds} : <10ohm;low to 2mohm V_{th} : 0.5~2.5V	SC70 SC88 SOT23 SOT883 DFNXXX	

Automotive products-LDO

Product introduction:

- DFN1010-4、SOT23-3、SOT23-5、SOT89
- Low Dropout Voltage,
- Low Quiescent Current,
- Low Output Noise Level,
- High PSRR (Power Supply Rejection Ratio)



Device	Package	Vin（V）	IQ（uA）	Vout（V）	Iout（mA）
S-LR6230A33M	SOT23-3	2.0~7.0	5	1.2~5.0	300
S-LR6230B18F	DFN1010-4A(T0.37)	2.0~7.0	5	1.2~5.0	300
S-LR6230B18M	SOT25	2.0~7.0	5	1.2~5.0	300
S-LR6230B28F	DFN1010-4A(T0.37)	2.0~7.0	5	1.2~5.0	300
S-LR6230B33F	DFN1010-4A(T0.37)	2.0~7.0	5	1.2~5.0	300
S-LR6230B33M	SOT25	2.0~7.0	5	1.2~5.0	300
S-LR6302A33M	SOT23-3	2.5~18	2	1.2~5	300
S-LR6302B33M	SOT25	2.5~18	2	1.2~5	300
S-LR6302B36M	SOT25	2.5~18	2	1.2~5	300
S-LR6302B50M	SOT25	2.5~18	2	1.2~5	300
S-LR6375A33MF	SOT25	2.5~36	3	2.1~5	250
S-LR6375A50MF	SOT25	2.5~36	3	2.1~5	250
S-LR6375A50PT	SOT89	2.5~36	3	2.1~5	250

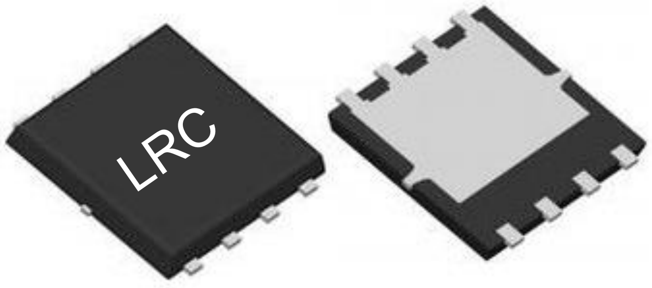
Product introduction:

- SOT23
- Low Dynamic output impedance 0.1Ω (Typ)
- Adjustable output voltage 2.5-36V
- Sink current capa bility of 1mA to 100mA
- Operating Junction Temperature is up to 150°C
- Fast turn-on response

Device	I_{KMAX} (mA)	V_{REF} (V)	V_O (V)	$\Delta V_O/V_O$ (±%)	T_A (°C)	Ikmin（mA）	Package
S-LR431AKLT1G	150	2.5	2.5~36	0.5	-40~125	0.3	SOT23
S-LR431APKLT1G	150	2.495	2.5~36	0.5	-40~125	0.3	SOT23
S-LTL431AKLT1G	150	2.5	2.5~36	0.5	-40~125	0.3	SOT23
S-LTL431APKLT1G	150	2.495	2.5~36	0.5	-40~125	0.3	SOT23
S-LR431ACLT1G	150	2.5	2.5~36	0.5	-40~125	0.085	SOT23
S-LR431APCLT1G	150	2.495	2.5~36	0.5	-40~125	0.085	SOT23
S-LTL431ACLT1G	150	2.5	2.5~36	0.5	-40~125	0.085	SOT23
S-LTL431APCLT1G	150	2.495	2.5~36	0.5	-40~125	0.085	SOT23

Automotive Products—Power MOS

- Package SOT23, DFN2*2,DFN3*3,DFN5*6
- Lower Rds < 100mohm, and Id up to 50A, BVDSS ~ 100V
- SGT + Trench technology, Tj ~ 175℃
- Apply to VI、T-BOX、lighting、ETC、Vehicle electronics；



Device	**Package**	**Polarity**
S-LNB2306ELT1G	SOT-23-LC	N-Channel（with ESD)
S-LPB3407LT1G	SOT-23-LC	P-Channel
S-LN2312LT1G	SOT-23	N-Channel
S-LN2306ELT1G	SOT-23	N-Channel(with ESD)
S-LN4812LT1G	SOT-23	N-Channel
S-LN2308LT1G	SOT-23	N-Channel
S-LN2292LT1G	SOT-23	N-Channel
S-LP2305DSLT1G	SOT-23	P-Channel
S-LP3415ELT1G	SOT-23	P-Channel （with ESD)
S-LP2301LT1G	SOT-23	N-Channel
S-LP3443LT1G	SOT-23	N-Channel
S-LP3407LT1G	SOT-23	P-Channel
S-LP2408LT1G	SOT-23	P-Channel
S-LP2309LT1G	SOT-23	P-Channel
S-LP2371LT1G	SOT-23	P-Channel
S-LDP3407T1G	SOT-26	Dual-P
S-LN06N060TZHG	SOT-223	N-Channel

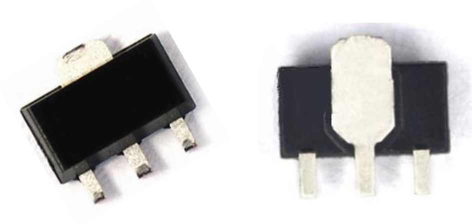
Device	**Package**	**Polarity**
S-LN2328EDT2AG	DFN2020-6S	N-Channel（with ESD)
S-LP2615DT2AG	DFN2020-6S	P-Channel
S-LDP3415EDT2AG	DFN2020-6D	Dual-P（with ESD）
S-LN8340DT1AG	DFN3030-8B	N-Channel
S-LNB8340DT0AG	DFN3333-8A	N-Channel
S-LNB8342DT0AG	DFN3333-8A	N-Channel
S-LNB8408DT0AG	DFN3333-8A	N-Channel
S-LNB8512DT0AG	DFN3333-8A	N-Channel
S-LNB8266DT0AG	DFN3333-8A	N-Channel
S-LPB8413DT0AG	DFN3333-8A	P-Channel
S-LPB8619DT0AG	DFN3333-8A	P-Channel
S-LPB85260DT0AG	DFN3333-8A	P-Channel
S-LN7406DT1WG	DFN5×6-8B	N-Channel
S-LN7418DT1WG	DFN5×6-8B	N-Channel
S-LN7266DT1WG	DFN5×6-8B	N-Channel
S-LP7337DT1WG	DFN5×6-8B	P-Channel （with ESD)
S-LP7413DT1WG	DFN5×6-8B	P-Channel

Device	**Package**	**Polarity**	技术特点
S-LN7408DT1WG	DFN5×6	N-Channel	SGT
S-LN7403DT1WG	DFN5×6	N-Channel	SGT
S-LN7401DT1WG	DFN5×6	N-Channel	SGT/Clip
S-LDN7407DT1WG	DFN5×6	Dual-N	SGT
S-LDN7412DT1WG	DFN5×6	Dual-N	SGT
S-LN7266DT1WG	DFN5×6	N-Channel	Trench
S-LN7508DT1WG	DFN5×6	N-Channel	SGT
S-LN7514DT1WG	DFN5×6	N-Channel	SGT
S-LDN7514DT1WG	DFN5×6	Dual-N	SGT
S-LDN7626DT1AG	DFN5×6	Dual-N	SGT

Automotive products-Power transistor

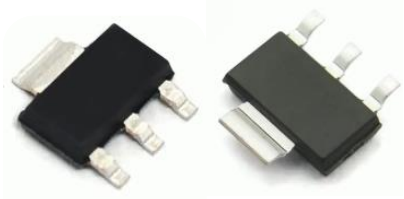
Product Introduction:

- Package: SOT89 PD>0.55W; SOT223 PD > 1W; TO252 PD > 1.4W
- Up to 5A for SOT89; 6A for SOT223;8A for TO252
- BVCEO: 40~100V
- Lower VCES ~0.25V
- Apply to Lighting ,OBC, BCM,T-BOX, ESP,and so on



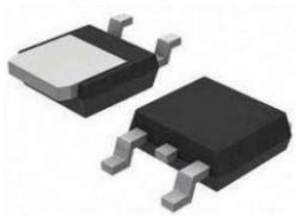
SOT89

Part No.	Parameter
S-LBSS4350SY3T1G	3A,50V,NPN
S-LBSS5350SY3T1G	3A,50V,PNP
S-LBTN180Y3T1G	1A,80V,NPN
S-LBTP180Y3T1G	1A,80V,PNP
S-LBTN4100Y3T1G	4.5A,100V,NPN
S-LBSS4250Y3T1G	2A,50V,NPN
S-LBSS5250Y3T1G	2A,50V,PNP
S-LBTP3100Y3T1G	3A,100V,PNP
S-LBTN1100Y3T1G	1A,100V,NPN
S-LBTN560Y3T1G	5A,60V,NPN
S-LBTP560Y3T1G	5A,60V,PNP



SOT223

Part No.	Parameter
S-LBTP180Z4TZHG	-1A,-80V,PNP
S-LBTN180Z4TZHG	1A,80V,NPN
S-LBTP3100Z4TZHG	-3A,-100V,PNP
S-LBTN560Z4TZHG	5.2A,60V,NPN
S-LBTP460Z4TZHG	-4.5A,-60V,PNP
S-LBTP2907AZ4TZHG	-0.6A,-60V,PNP
S-LBTN2222AZ4TZHG	0.6A,40V,NPN
S-LBTN660Z4TZHG	6A,60V,NPN
S-LBTP660Z4TZHG	-6A,-60V,PNP
S-LBTN1100Z4TZHG	1A,100V,NPN
S-LBSS5350SZ4TZHG	-3A,-50V,PNP
S-LBSS4350SZ4TZHG	3A,50V,PNP



TO252

Part No.	Parameter
S-LBTN880DPTUG	8A,80V,NPN
S-LBTP880DPTUG	8A,80V,PNP
S-LBTN6100DPTUG	6A,100V,NPN
S-LBTP6100DPTUG	6A,100V,PNP
S-LBTP3100DPTUG	3A,100V,PNP
S-LBTN3100DPTUG	3A,100V,NPN
S-LBTN360DPTUG	3A,60V,NPN
S-LBTN1150DPTUG	1A,150V,NPN
S-LBTN4100DPTUG	4A,100V,NPN

Automotive Products—New Products

Product Introduction:

- DO-218AB package
- 22V~40V/3.6KW/4.6KW/6.6KW,high power unidirectional & dual-directional TVS.
- Comply with ISO7637-2 and automotive electronics application requirements.
- Excellent clamping capability, super fast response time.
- Apply to air condition, OBC,DC-DC, and so on

DO-218AB

Device	VRWM(V)	PPM (KW)	IFSM(A)
S-SM8SXXA/CA	10-43	6.6	700
S-SM6SXXA/CA	10-43	4.6	600
S-SM5SXXA/CA	10-43	3.6	500

Product Introduction:

- SMA/SMB/SMC/TO277
- 10ns+ Ultra fast Rectifier Diodes
- Trr is 10ns+
- High temperature characteristics to Tj 175℃, Low Leakage performance;
- Multi-packaging & Multi-current matching various circuit requirements;
- Apply to lights, engine control and other high temperature applications.

SMA/B/C

TO277

Current	**Device**	**trr**	**VF**	**IR**
		trr max	VFmax	Type@165℃
1A	S-1UFMA102H	<20ns	0.85	5uA
	S-1UFMA102HL	<20ns	0.82	7uA
2A	S-1UFMA202H	<20ns	0.85	8uA
	S-1UFMB202H	<20ns		8uA
	S-1UFMB202HL	**<20ns**		**9uA**
3A	S-1UFMB302H	<20ns	0.85	11uA
	S-1UFMC302H	<20ns		11uA
	S-1UFMB302HL	<20ns	0.82	20uA
	S-1UFMAC302HL	<20ns		20uA
5A	S-1UFMC502H	<25ns	0.85	26uA
	S-LFR051U10SA7	**<25ns**		**26uA**
	S-1UFMC502HL	<25ns	0.82	30uA
8A	S-1UFMC802H	<25ns	0.85	50uA

Automotive Product Qualification

1，LRC conducts reliability tests as Per JEDEC, AEC-Q101, AEC-Q100 standard.

2，Able to conduct all tests including TC, PCT，HAST, HTRB, HTHH, H3TRB，IOL, SSOP, Solder ability etc..


HAST


HTRB


Temperature Cycle


IOL


AC


H3TRB


Oven


SSOP


PTC


Solder Pot


Low-temp Cabinet


Reflow Oven

Improvement & Problem Solving

FA capability and Techniques

1，LRC conducts all DC/AC parameter tests.

2，Able to conduct both package and wafer level analysis.


SAT


Chemical Decap S.


Probe Station

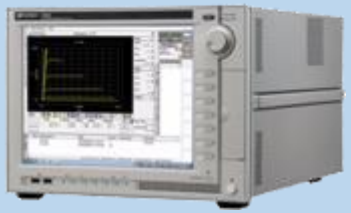

Cross Section


Microscope


X-ray


DC Tester


SEM

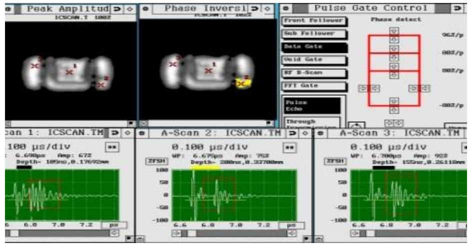

Curve tracer


Laser Decap.

Failure Analysis capability and Techniques

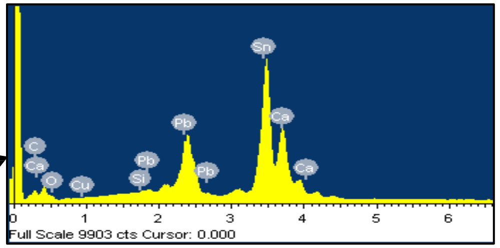
Failure Analysis Technology

SAM



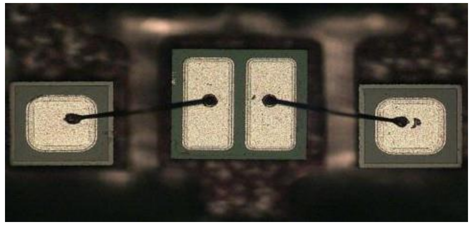
SONIX UHR2000

EDX



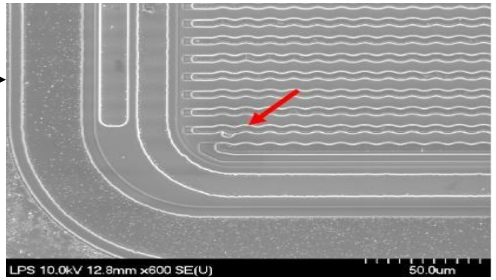
HORIBA EX_220

Visual Inspection

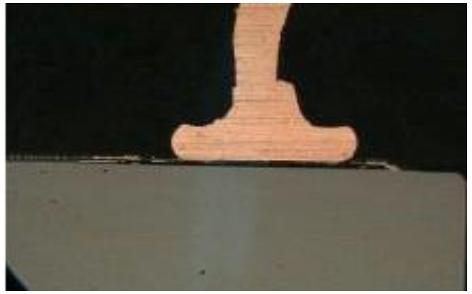


NIKON SMZ1500/L150

SEM

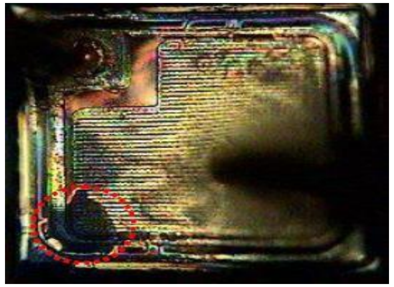


Cross Section



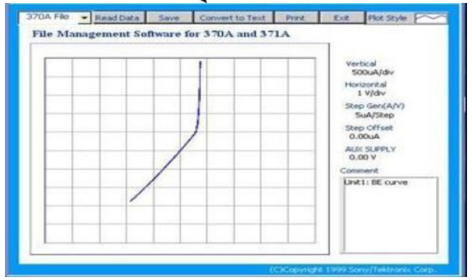
BUELHLER ECOMET 3

Liquid crystals



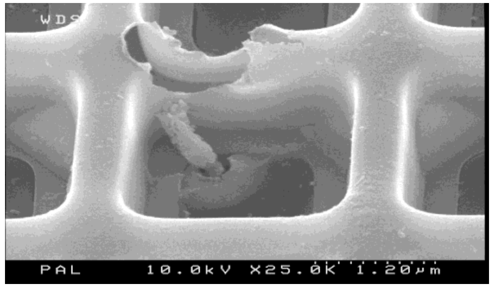
KARL SUSS _ PM5

Electrical Test



TEKTRONIX 370A

Deprocess



HITACHI S4700

Improvement & Problem Solving

TPM CI activity has been started since 2011, and Six sigma project since 2017

Continual Improvement (6-Sigma)

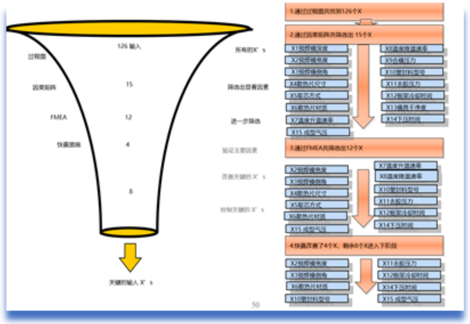
Example 10#

Top N Issue

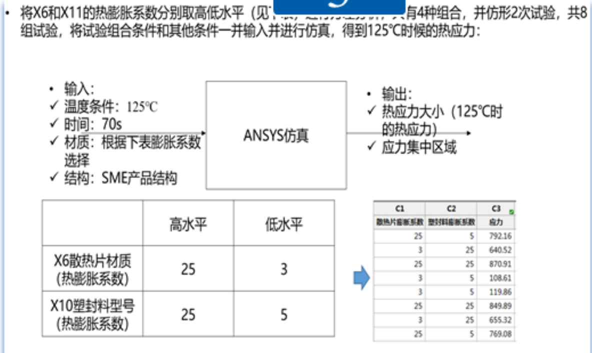
Project Selection

Define 1

Measure 2



Analyze 3



- 将X6和X11的热膨胀系数分别取高低水平（见 有4种组合，并仿形2次试验，共8组试验，将试验组合条件和其他条件一并输入并进行仿真，得到125℃时候的热应力：

- 输入：
  - ✓ 温度条件：125℃
  - ✓ 时间：70s
  - ✓ 材质：根据下表膨胀系数选择
  - ✓ 结构：SME产品结构

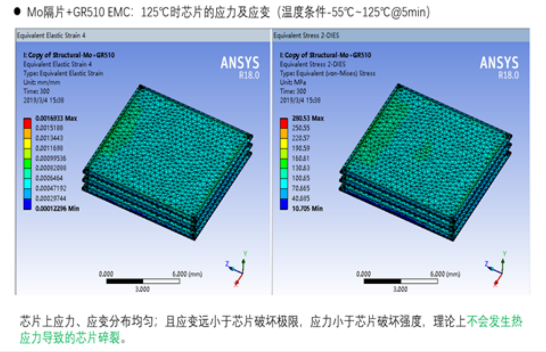
ANSYS仿真

- 输出：
  - ✓ 热应力大小（125℃时的热应力）
  - ✓ 应力集中区域

	高水平	低水平
X6散热片材质 (热膨胀系数)	25	3
X10塑封料型号 (热膨胀系数)	25	5

C1 散热片膨胀系数	C2 塑封料膨胀系数	C3 应力
25	5	792.16
3	25	640.52
25	25	870.91
3	5	108.61
3	5	119.86
25	25	849.89
3	25	655.32
25	5	769.08

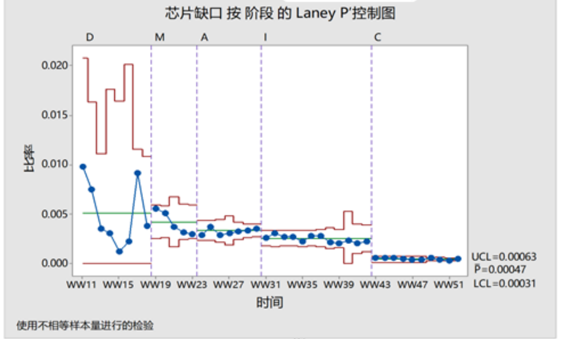
Improve 4



- Mo隔片+GR510 EMC：125℃时芯片的应力及应变（温度条件-55℃~125℃@5min）

芯片上应力、应变分布均匀；且应变远小于芯片破坏极限，应力小于芯片破坏强度，理论上不会发生热应力导致的芯片碎裂。

Control 5



Select others

Large professional electronic group dedicating to the manufacturing of semiconductors products

Leshan Radio Company Ltd.

THANKS

World Class
Comprehensive Electronic
Enterprise