APEC

APEC SEMINAR 2021

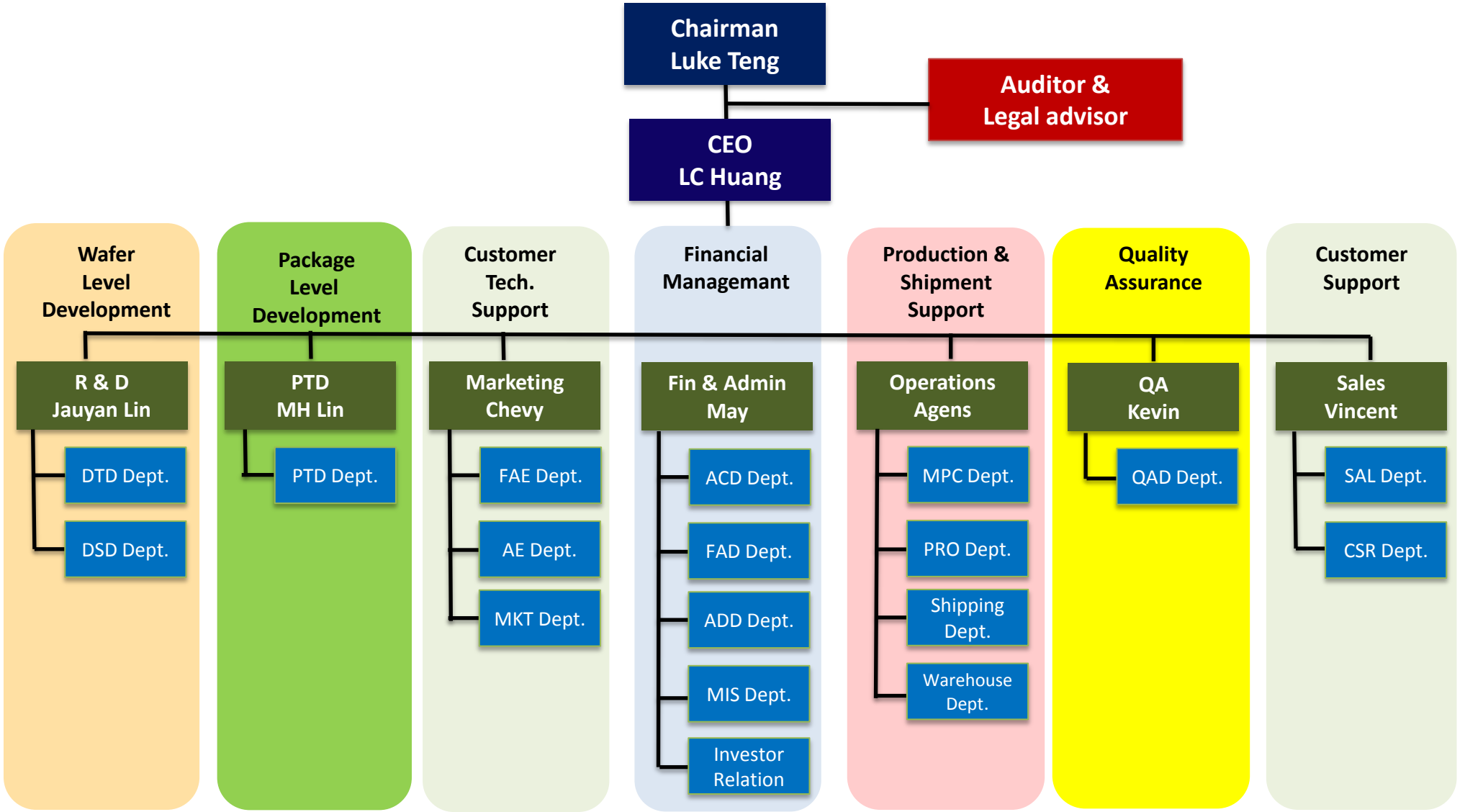
About APEC

Milestone

- Established in 1998.
- The first company successfully integrated DMOS and IGBT process in TW.
- ISO9001 certificated since 1999.
- Providing solutions for new power requirements in MOSFETs, IGBTs and Power ICs.
- Products are broadly used in the computing, SMPS, display, communications and industrial segments.
- Listed on Taiwan Stock Exchange (Stock Code: 8261).
- Total Shipments of MOSFET reaches 32 Billion pcs till 2020/E.

- Regional offices: China / Korea /Japan
- Distributors: China / Taiwan/ Korea /Japan/ Singapore/ Germany

Organization



Core Value

Customer trust

Customer first, treating customers enthusiastically and sincerely.

Quality first

Quality is always our top priority. We keep enhancing the quality in all process; from design to production.

Superior service

Offering technical support to customers including alternative part check, design review and failure analysis.

Excellent technology

Providing customers the best-in-class products with advanced process technology.

Product Overview

LV & MV MOSFETs

- LV: 12V ~ 45V ; MV: 50V ~ 250V
- Trench & Double Gate
- MB / NB / VGA / E-Tool / Server / SMPS / BMS / DC to DC

HV MOSFETs

- 400V ~ 900V
- Planar & Super Junction
- SMPS / Motion / Server / Charger

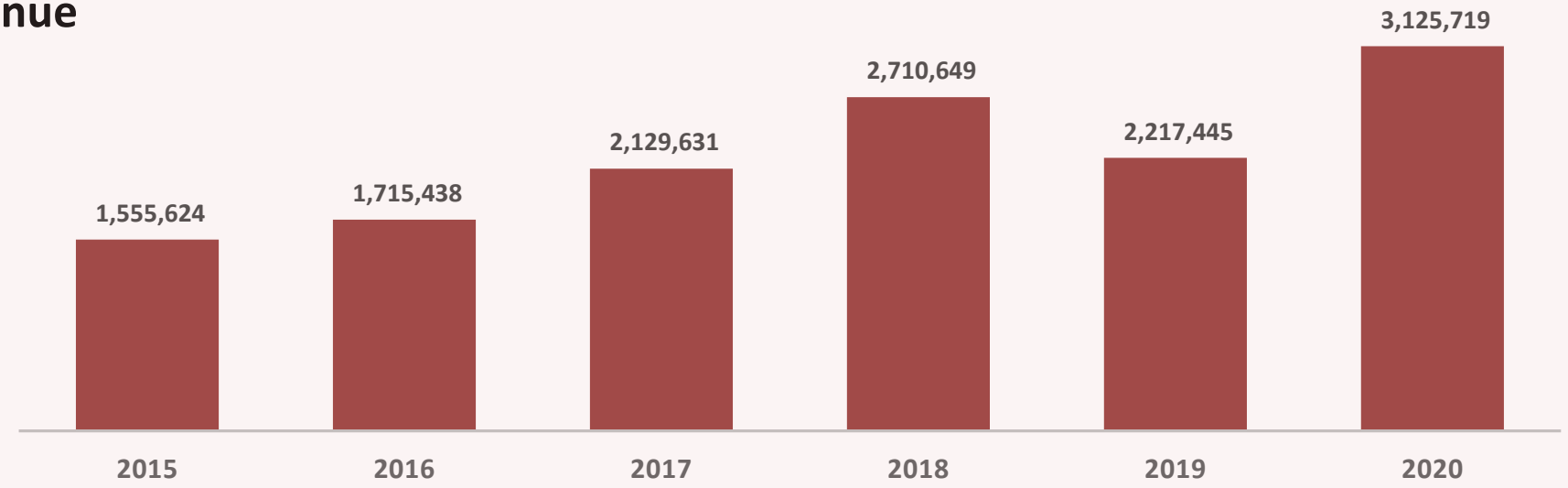
IGBT

- 400V ~ 1300V
- NPT & Field Stop
- UPS / Welding / IH Cook / White Goods / Flash

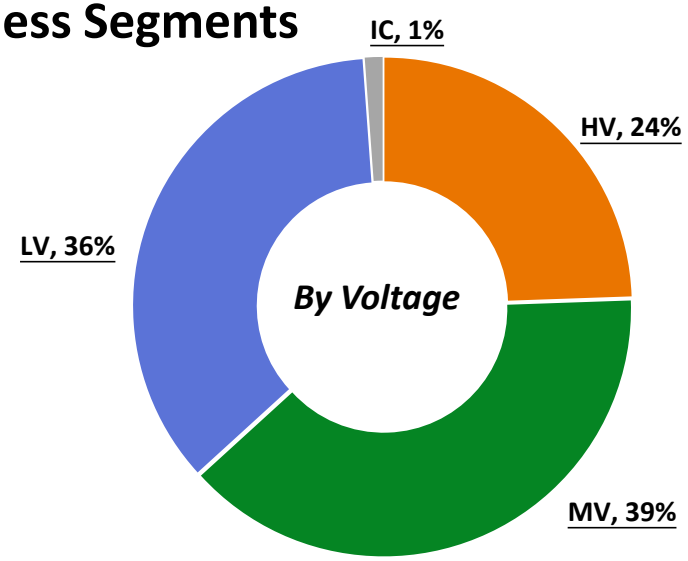
2020 Revenue and Business Segments

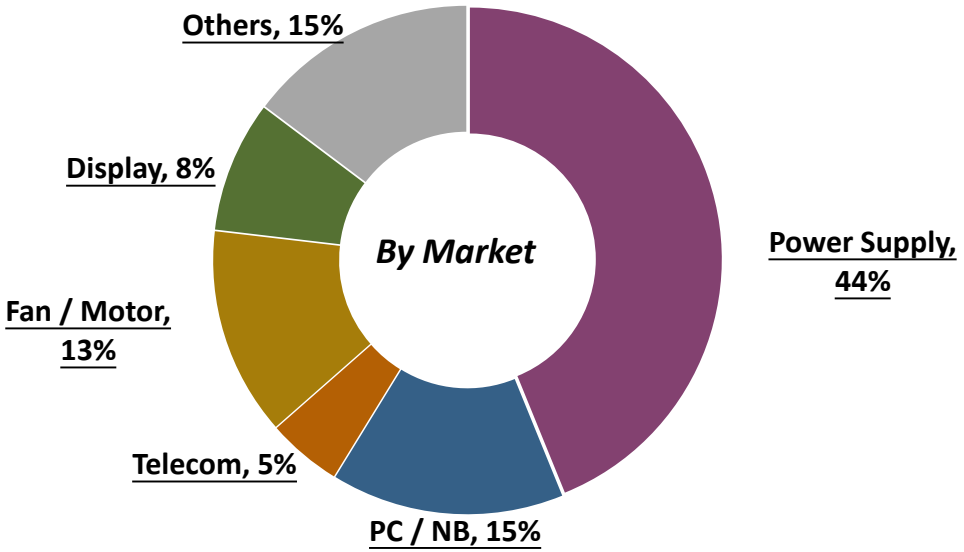
Revenue

(NTD K)

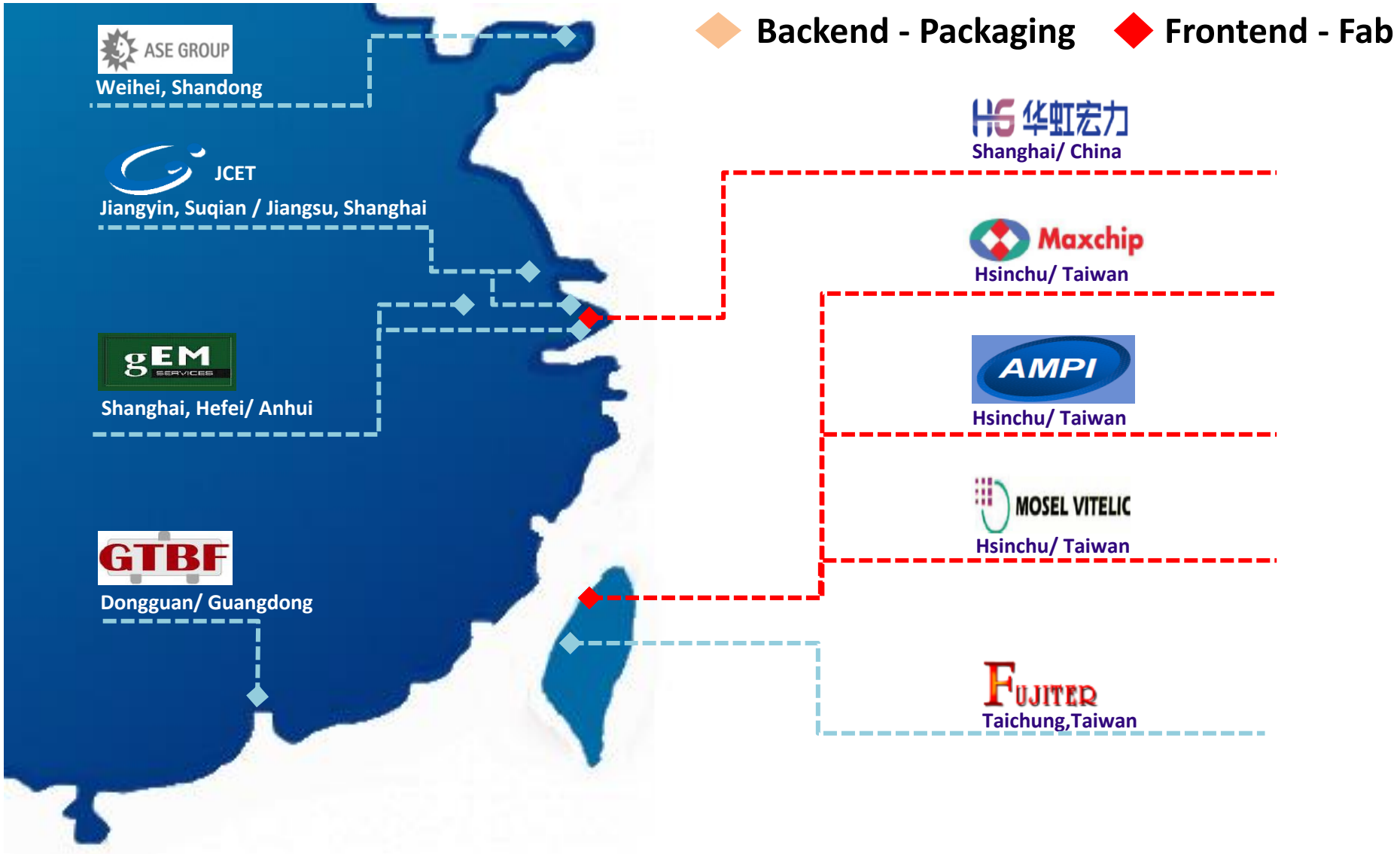


Business Segments





Supply Chain



Customer Base

Computing Brand

Professional EMS

Power Supply

TV Displays

Customer Base

Communication

Accton 智邦科技 | ALPHA Networks | cisco | Gemtek | HUAWEI

Motion Control

AVC | BOSCH | DELTA | Dirt Devil | dji | greenworks

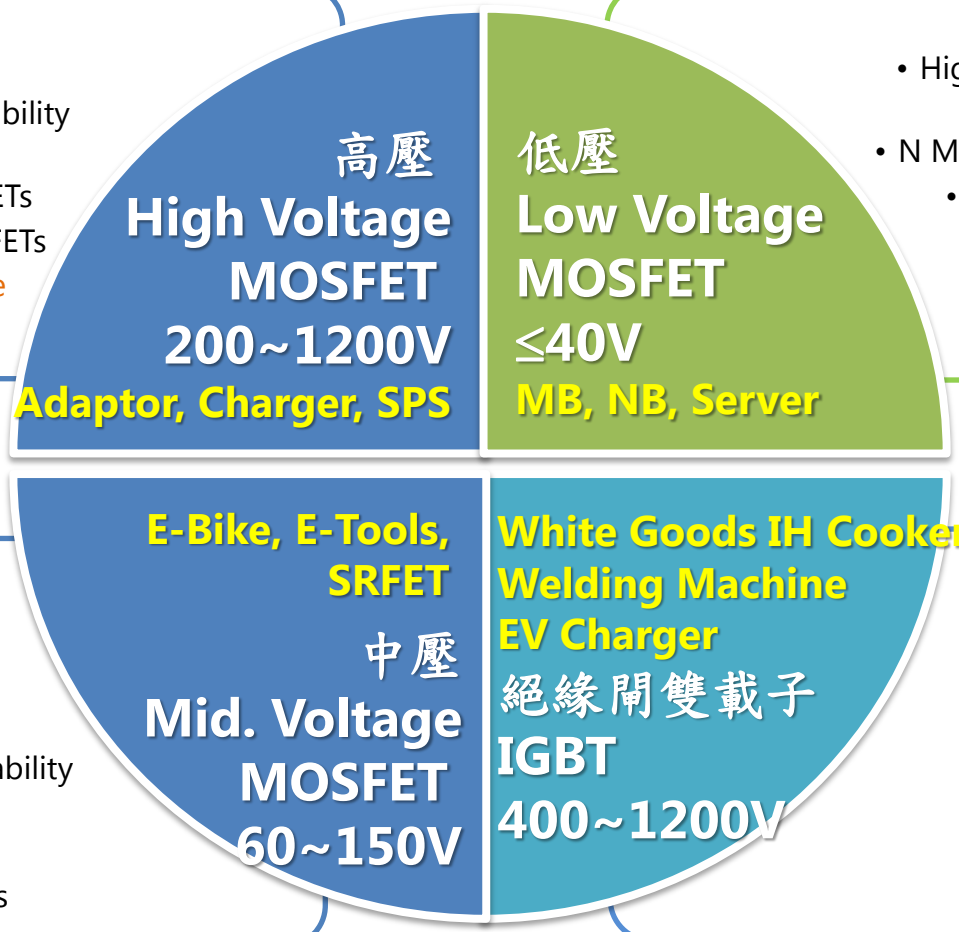
HOBBYWING | Nidec All for dreams | RYOBI Power tools that won't quit. | StanleyBlack&Decker | SUNON

Others

BROADCOM | Google | intel | KONICA MINOLTA | RICOH imagine. change.

Product Introduction

Product Overview



- Std. N MOSFETs
- Std. -200V P MOSFETs
- High ESD Protection Capability HV MOSFETs
- Ultra Low Ron HV MOSFETs
- Fast Recovering HV MOSFETs
- SiC Schottky Barrier Diode

- Std. N & P MOSFETs
- High ESD Protection Capability MOSFETs (ESD > 8KV)
- N MOSFETs with Schottky Diode
- Ultra Low Qgd N MOSFETs

- Std. N & P MOSFETs
- High ESD Protection Capability MOSFETs
- Ultra Low Qgd MOSFETs
- Ultra Low Ron N MOSFETs

- 400V Strobe Flash IGBT
- 600V FS IGBT
- 1200V FS IGBT
- 600V FS IGBT + FRD
- 1200V FS IGBT + FRD
- 600V/1200V FS RC-IGBT

New Product Planning & Introduction

Product Roadmap Overview

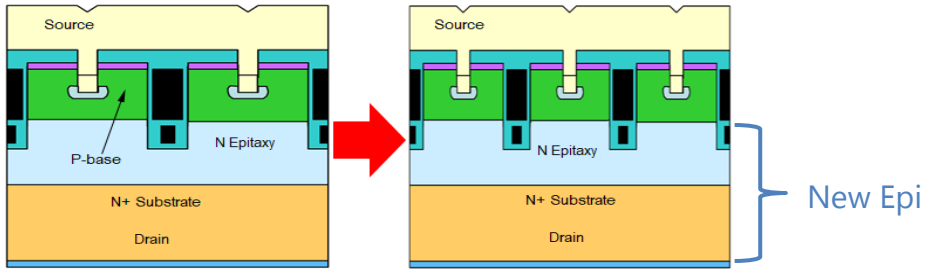
Year	2020	2021	2022
30V~100V	30V/40V SGT NA Series 60V/80V SGT NA Series	100V/-100V SGT NA Series	30V/40V SGT NC Series 60V/80V SGT NC Series
120V~250V	120V/150V SGT Gen 2 NA Series	200V SGT Gen 2 NA Series	
HV ML SJ	600V/650V Gen 2 MA Series	600V/650V Gen 3 MC Series	
HV DT SJ	600V/650V Gen 3 SC Series	200V SC Series 700V Gen 3 SC Series	600V/650V Gen 4 SD Series
IGBT	Gen 2 600V/1200V FS IGBT Integrate FRD		
SiC Devices	600V SiC SBD	600V SiC MOSFET	

Product Roadmap (LV & MV)

Year	2020	2021	2022
30V ~ 100V	30V/40V SGT NA Series 60V/80V SGT NA Series	100V SGT NA Series -100V SGT New Platform	30V/40V SGT NC Series 60V/80V SGT NC Series
120V ~ 250V	120V/150V SGT Gen 2 NA Series	200V SGT Gen 2 NA Series	

Features:
- Lower Rdson
- Lower miller capacitance

Improvement:
- Lower Rdson
- Better FOM



Optimum:
1. Higher cell density.
2. Epi. wafer change.
3. Oxide process improved.
   - Better Vth control
   - 4.5V Ron Optimized

Ultra low Rdson in PMPAK33 & 56 package

Voltage (V)	Package	Rdson.max (mohm)	Package	Rdson.max (mohm)
30	PMPAK 3x3	1.7	PMPAK 5x6	0.68
40	PMPAK 3x3	2.5	PMPAK 5x6	0.85
60	PMPAK 3x3	3.5	PMPAK 5x6	1.4
80	PMPAK 3x3	5.2	PMPAK 5x6	2.6
100	PMPAK 3x3	9.2	PMPAK 5x6	3.5

Product Plan of LV/MV MOSFET

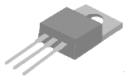
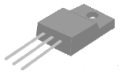
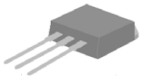
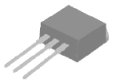
Planning
New Available
Under Developing

LV / MV SGT MOSFET

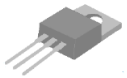
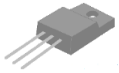
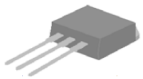
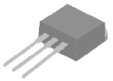
30V	30V/0.68mΩ PMPAK5x6 2021/Q1	30V/2mΩ PMPAK5x6 2021/Q1	30V/3mΩ PMPAK5x6 30V/3.3mΩ PMPAK3x3 2021/Q1	30V/4mΩ PMPAK5x6 AP4054CMT	30V/5.5mΩ PMPAK5x6 2021/Q1	30V/7mR PMPAK5x6 AP4052CMT
40V/45V	40V/0.85mΩ PMPAK5x6 2021/Q1	45V/0.95mΩ PMPAK5x6 AP4NAR95CMT-A	40V/1.1mΩ PMPAK5x6 AP4NA1R1CMT	45V/1.4mΩ PMPAK5x6 AP4NA1R4CMT-A	40V/2.4mΩ SPPAK5x6 AP4NA2R4CST	
60V	60V/1.2mΩ PMPAK5x6 AP6NA1R2LXT	60V/1.4mΩ PMPAK5x6 AP6NA1R4CXT	60V/1.7mΩ PMPAK5x6 AP6NA1R7CMT	60V/3.2mΩ SSPAK5x6 AP6NA3R2CST	60V/3.3mΩ TO220F AP6NA3R3LI	60V/8.0mΩ SSPAK5x6 AP6NA8R0CST
80V	80V/1.2mΩ TOLL AP8NA1R2TL	80V/2.6mΩ PMPAK5x6 AP8NA2R6CXT	80V/3.2mΩ PMPAK5x6 2021/Q2			
100V	100V/1.5mΩ TOLL AP10NA1R5TL	100V/3.5mΩ PMPAK5x6 AP10N3R5XT	100V/6.5mΩ PMPAK5x6 2021/Q3	100V/8.2mΩ PMPAK5x6 AP10N8R2LMT	100V/9.5mΩ PMPAK5x6 AP10N9R5MT	100V/11mΩ PMPAK5x6 2021/Q1

LV/MV Product (BY PACKAGE)

* Under Developing

Package Draw										
VDS (V)	$R_{DS(ON)}$ @VGS=10V (mΩ)	PMPAK-3X3 (YT)	PMPAK-5X6 (MT/CMT/CST/XT)	SO-8 (M)	TO-220 (P)	TO-220CFM (I)	TO-251 (J/JB/JV)	TO-252 (H)	TO-262 (R)	TO-263 (S)
30	0.68		AP3NAR68CXT							
	1.7		AP3N1R7CMT							
	2.1		AP3N2R1CMT							
	4		AP4054CMT							
	6.2		AP3N6R2MT							
	7		AP4052CMT							
40	0.85		AP4NAR85CMT							
	1.1		AP4NA1R1CMT							
	2.4		AP4N2R4CMT AP4NA2R4CST			AP4NA2R4I		AP4NA2R4H		
	3.6				AP4N3R6P					
45	0.95		AP4NAR95CMT-A							
	1.4		AP4NA1R4CMT-A							
	1.8		AP4N1R8CMT-A							
60	1.2		AP6NA1R2LCXT							
	1.4		AP6NA1R4CXT							
	1.7		AP6NA1R7CMT							
	2				AP6N2R0P	AP6N2R0I				
	2.5					AP6NA2R5LI				
	3.2		AP6N3R0LMT AP6NA3R2LMT			AP6N3R2ALI AP6NA3R3LI		AP6N3R1LH		
	3.5				AP6N3R5P	AP6N3R5I AP6NA3R5I				AP6N3R5S
	3.8		AP6N3R8LMT-L			AP6N3R8ALI		AP6N3R8H AP6NA3R8H-D		
	5.8		AP6NA5R8LMT-L							
	6		AP6NA6R0CST		AP6N6R0P					
	6.5		AP6N6R5MT AP6NA6R5LMT-L			AP6N6R5I		AP6N6R5H		
	6.8			AP6N6R8ALM			AP6N6R8ALJV	AP6N6R8ALH		
	8.0		AP6NA8R0CST							
	8.2						AP6NA8R2JV			

LV/MV Product (BY PACKAGE)

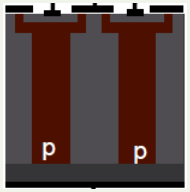
Package Draw										
VDS (V)	$R_{DS(ON)}$ @VGS=10V (mΩ)	PMPAK-3X3 (YT)	PMPAK-5X6 (MT/CMT/CST/XT)	SO-8 (M)	TO-220 (P)	TO-220CFM (I)	TO-251 (J/JB/JV)	TO-252 (H)	TO-262 (R)	TO-263 (S)
80	2.6		AP8NA2R6CXT							
	3.5		AP8N3R5CMT							
	4.2		AP8N4R2MT							
	8.8		AP8N8R0MT	AP8N010LM	AP8N8R0P	AP8N8R0I	AP8N8R0J	AP8N8R0H AP8N8R0LH		
100	3				AP10TN003P	AP10TN003I			AP10TN003R	AP10TN003S
	3.5		AP10N3R5XT		AP10N3R8P					AP10N3R8S
	4		AP10TN004CMT AP10TN004LCMT							
	5.5		AP10TN5R5MT AP10TN5R5LMT							
	7.9				AP10N7R9P	AP10N7R9I	AP10N7R5J	AP10N7R5H	AP10N7R9R	
	8.2		AP10NA8R2LMT		AP10NA8R2LP	AP10NA8R2LIT		AP10NA8R2LH		
	8.8		AP10TN008CMT		AP10N8R8P	AP10N8R8I		AP10N8R8LH	AP10N8R8R	
	9.5		AP10N9R5MT				AP10N9R5J AP10N9R5LJ	AP10N9R5H		
	10		AP10TN010CMT							
	12		AP10N012MT		AP10N012P	AP10N012I	AP10N012J	AP10N012H		
	28	AP10TN028YT	AP10TN028MT	AP10TN030M				AP10N024H		
120	7.6				AP12N7R5P	AP12N7R5I			AP12N7R5R	
	8.4		AP12N8R4CMT							
	14					AP12N014I				
150	16.5		AP1502ACMT							
	52		AP15NA052MT							

HV MOSFET Development Roadmap

Technology Roadmap (HV)

Year	2020	2021	2022

Deep Trench



600V/650V Gen 3 SC Series

700V Gen 3 SC Series

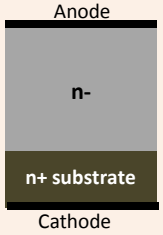
200V SC Series

600V/650V Gen 4 SD Series

Features:
- Lower Rdson
- Lower switching loss
- Optimized Rg

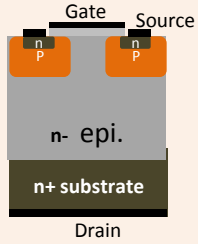
Improvement:
- Lower RDS(ON)
- higher di/dt
- faster Trr

Improvement:
- Best Cost-Performance
- Robust di/dt
- Better EMI



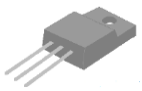
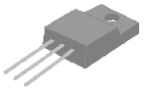
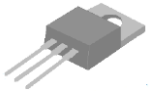
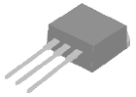
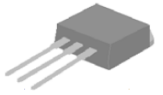
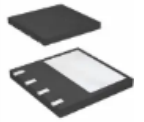
600V SiC SBD

600V SiC MOSFET



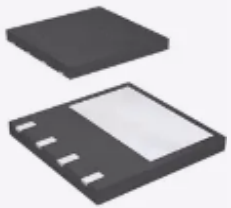
HV MOSFET Product (BY PACKAGE)

SA/SL/SC Series

Package Draw										
VDS (V)	$R_{DS(ON)}$ @VGS=10V (mΩ)	TO-220F (I)	TO-220F-NL (IN/IT)	TO-220 (P)	TO-252 (H)	TO-262 (R)	TO-263 (S)	TO-247 (W)	TO-251S (JB)	PDFN8x8_HV (DT8)
600	85									AP60SC085DDT8 AP60SC099DDT8
	115/130	AP60SA115DI		AP60SA115DP		AP60SA115DR				AP60SA125DDT8
	160	AP60SL160DI	AP60SL160DIN	AP60SL160DP			AP60SL160DS			
	190	AP60SA180DI	AP60SA180DIN AP60SC180DIT	AP60SA180DP	AP60SC200DH	AP60SA180DR				AP60SA190DDT8 AP60SC200UDDT8
	280	AP60SA290DI	AP60SA290DIN AP60SC280DIT	AP60SA290DP	AP60SA290DH AP60SC280DH		AP60SA290DS	AP60SA290DWL		
	380	AP60SA380DI	AP60SA380DIN AP60SC360DIT		AP60SA380DH AP60SC360DH					
	600		AP60SC600DIT		AP60SC600DH					
650	70							AP65SA074FWL		
	130	AP65SA130DI		AP65SA130DP		AP65SA130DR				AP65SA145DDT8
	190	AP65SA190DI	AP65SA190DIN	AP65SA190DP		AP65SA190DR				AP65SA210DDT8
	280		AP65SA280DIN		AP65SA320DH					
	380	AP65SA420DI	AP65SA420DIN		AP65SA420DH	AP65SA420DR				
	600		AP65SA600DIN		AP65SA600DH					
700	380	AP70SL380AI			AP70SL380AH		AP70SL380AS		AP70SL380AJ	
	950	AP70SL950AI			AP70SL950AH				AP70SL950AJB	
	1400	AP70SL1K4AI			AP70SL1K4AH AP70SL1K4BH				AP70SL1K4AJB AP70SL1K4BJB	
800	450	AP80SA400DI								

* Under Developing

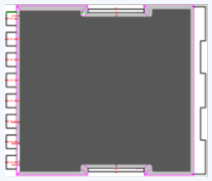
Package Development Roadmap



PDFN 8x8 HV Package
- High voltage
- Ultra Low On-resistance
- Thinner Package

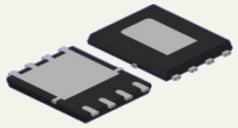
Product Plan
- **AP60SA125DDT8 (600V/125mR)**
- **AP60SA190DDT8 (600V/190mR)**
- **AP65SA145DDT8 (650V/145mR)**
- **AP65SA210DDT8 (650V/210mR)**

Production



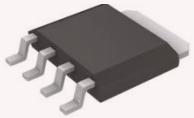
Toll 10x12 Package
- Higher current capability
- Smaller footprint
- Very low package & thermal resistance
- Lower package inductance

Product Plan
- **AP8NA1R2TL (80V/1.2mR)**
- **AP10NA1R5TL (100V/1.5mR)**



Dual Side Heat-sink 5X6 Package
- Double side cooling package
- Very Low thermal resistance
- High efficiency Server power solution

Product Plan
- AP8NA2R6DCMT (80V/2.6mR)*



SPPAK 5X6 Package (LFPAK)
- Lower package inductance
- Very Low thermal resistance
- Improved mechanical characteristics

Product Plan
- **AP4NA2R4CST (40V/2.4mR)**
- **AP6NA8R0CST (60V/8mR)**
- **AP6NA3R2CST (60V/3.2mR)**

* Under Development

Thank You.