

# Cyntec Power Module Solution

Cyntec Co., Ltd.

2018/Q4R



# Outline

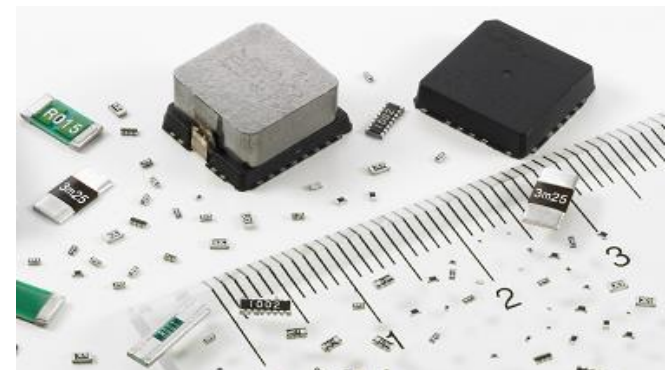
1. Cyntec the Company
2. Core Technology and Platform
3. Benefit of Using Power Module
4. Product Solution
5. QC and Reliability

# Cyntec Vision

## Making Things Smaller and Smarter

Dedicated to continuously develop new materials, processing, and integration technologies to provide products and solutions which contribute to

- ✓ Space-Saving
- ✓ Better Performing
- ✓ Environmentally-Friendly



# Company Profile



Date Established: October 28, 1991

Paid in Capital: US\$ 450M (NT\$ 14,813M)

Space: Taiwan and Mainland China

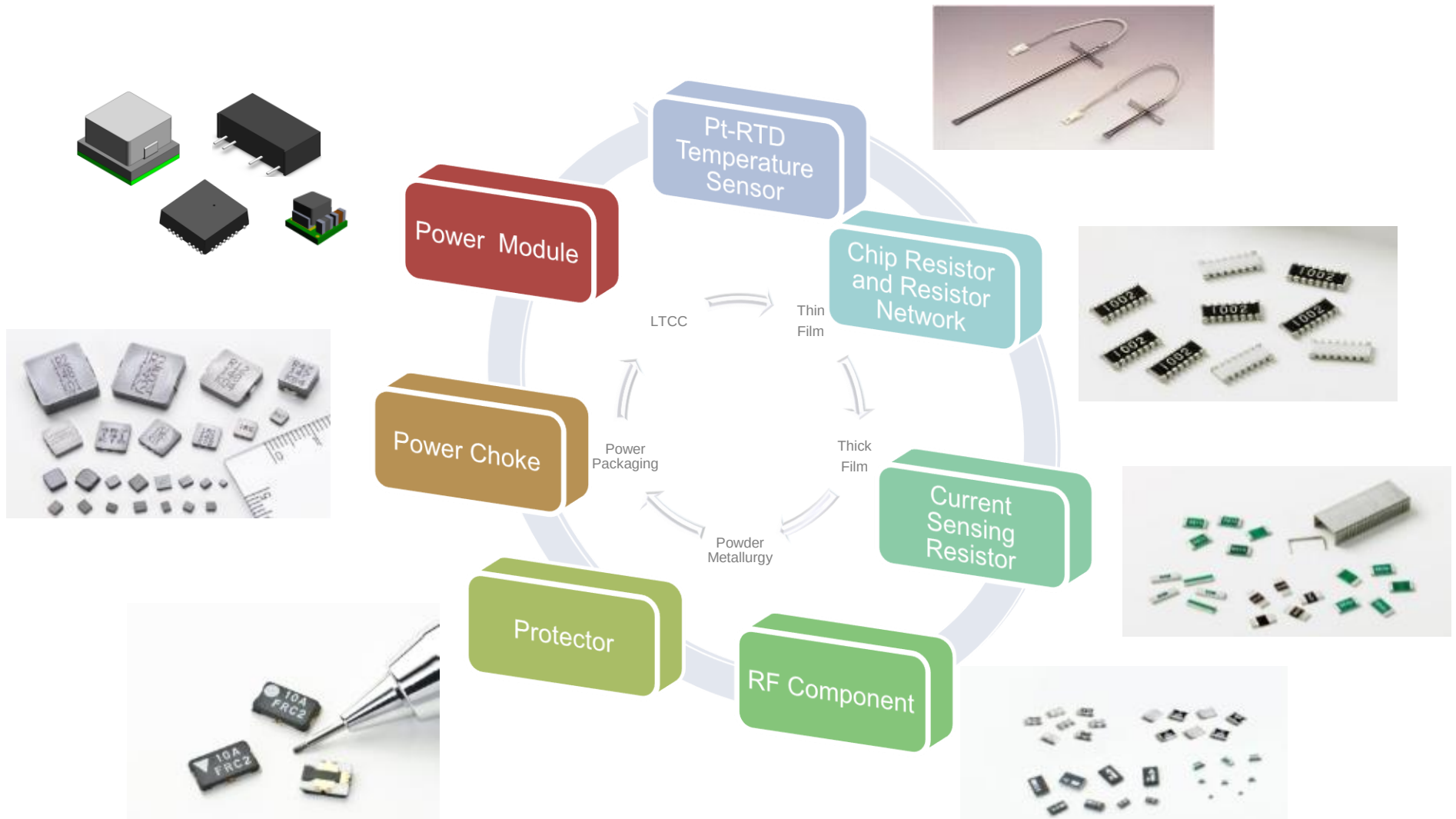
Taiwan- 360,000 ft<sup>2</sup>(32,400 m<sup>2</sup>)

SuZhou1- Cyntec Co.,Ltd 308,022 ft<sup>2</sup> (28,600 m<sup>2</sup>)

SuZhou2- Cyntec Electronics Co.,Ltd 1,112,526 ft<sup>2</sup> (103,410 m<sup>2</sup>)



# Cyntec Product Portfolio

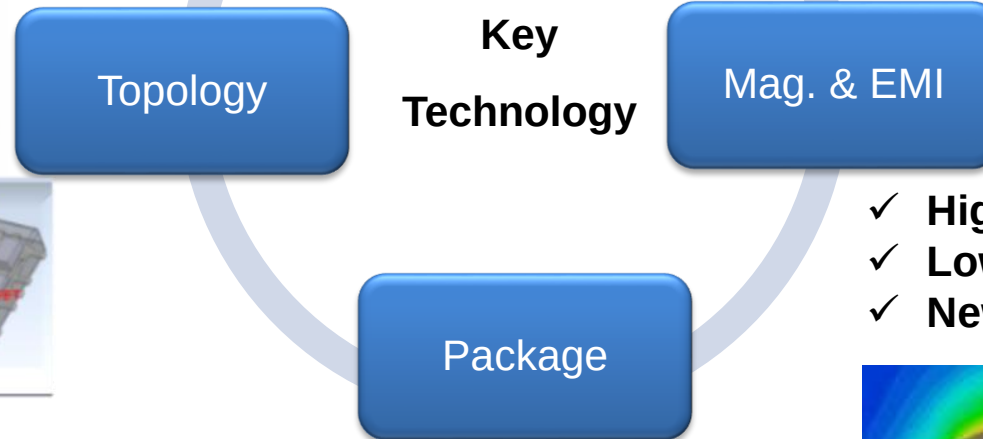
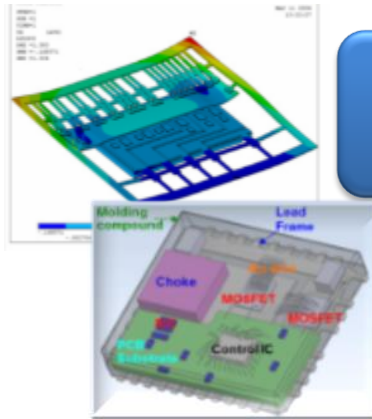


# Power Module

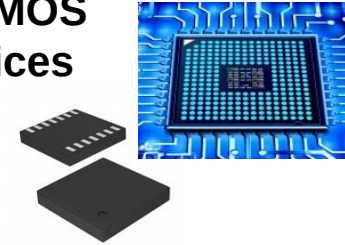
Core Technology  
Product Platform

# Core Competence

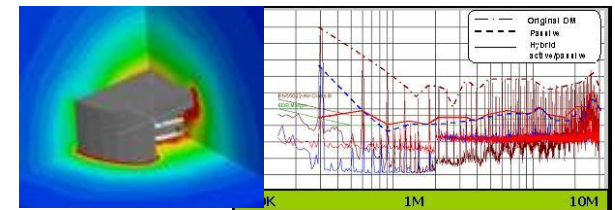
- ✓ High efficiency topology
- ✓ High frequency low loss component
- ✓ Low loss connection



- ✓ Customized PWM IC
- ✓ Low FOM Si-MOS
- ✓ GaN/SiC Devices

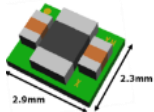
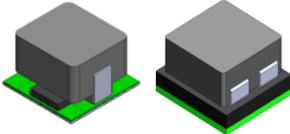
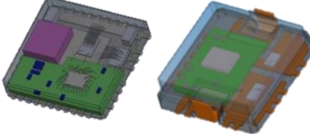
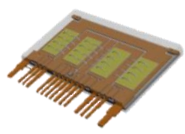


- ✓ High Frequency Core
- ✓ Low AC copper loss
- ✓ New material and process



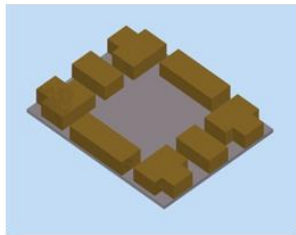
- ✓ Molding/Stack power platform
- ✓ Open frame power platform
- ✓ SIP embedded technology

# Module Platform and Application

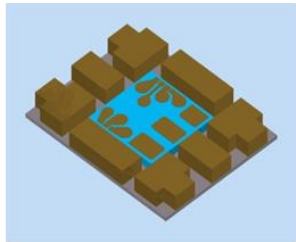
|                       | <b>μPOL</b><br> | <b>Stack 3D</b><br> | <b>Two Carrier</b><br> | <b>High Power</b><br> |
|-----------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
|                       | 12/5V uPOL                                                                                       | 12/5V POL                                                                                             | 12/5V POL & Stack                                                                                         | PFC; D2D; IPM                                                                                            |
| Client-SSD            | O                                                                                                |                                                                                                       |                                                                                                           |                                                                                                          |
| Client-Drone          | O                                                                                                |                                                                                                       |                                                                                                           |                                                                                                          |
| Client Smart Phone    | O                                                                                                |                                                                                                       |                                                                                                           |                                                                                                          |
| Client IoT            | O                                                                                                |                                                                                                       |                                                                                                           |                                                                                                          |
| Cloud Server          | O                                                                                                | O                                                                                                     | O                                                                                                         | O                                                                                                        |
| Cloud Telecom         | O                                                                                                | O                                                                                                     | O                                                                                                         | O                                                                                                        |
| Cloud Networking      | O                                                                                                | O                                                                                                     | O                                                                                                         | O                                                                                                        |
| Automotive            | O                                                                                                | O                                                                                                     | O                                                                                                         |                                                                                                          |
| Industrial            | O                                                                                                | O                                                                                                     | O                                                                                                         |                                                                                                          |
| Package size(typical) | 2.5x2.0x0.8mm<br>2.9x2.3x1.1mm<br> <br>6.0x6.0x3.5mm                                             | 6.0x6.0x3.5mm<br> <br>15.0x15.0x8.0mm                                                                 | 12.0x12.0x6.05mm(10A)<br>14.5x14.5x7.45mm(20A)<br>15.0x15.0x3.7mm(10A)                                    | 43.3x30.7x3.6mm                                                                                          |
| Output Current        | <6A                                                                                              | 3A~60A                                                                                                | 10A~20A                                                                                                   | 20A~50A                                                                                                  |



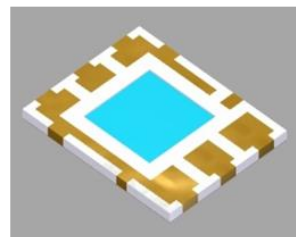
# u-POL Embedded Structure and Process



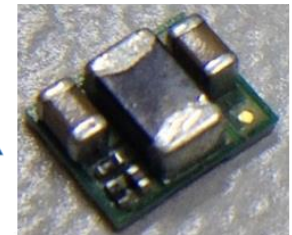
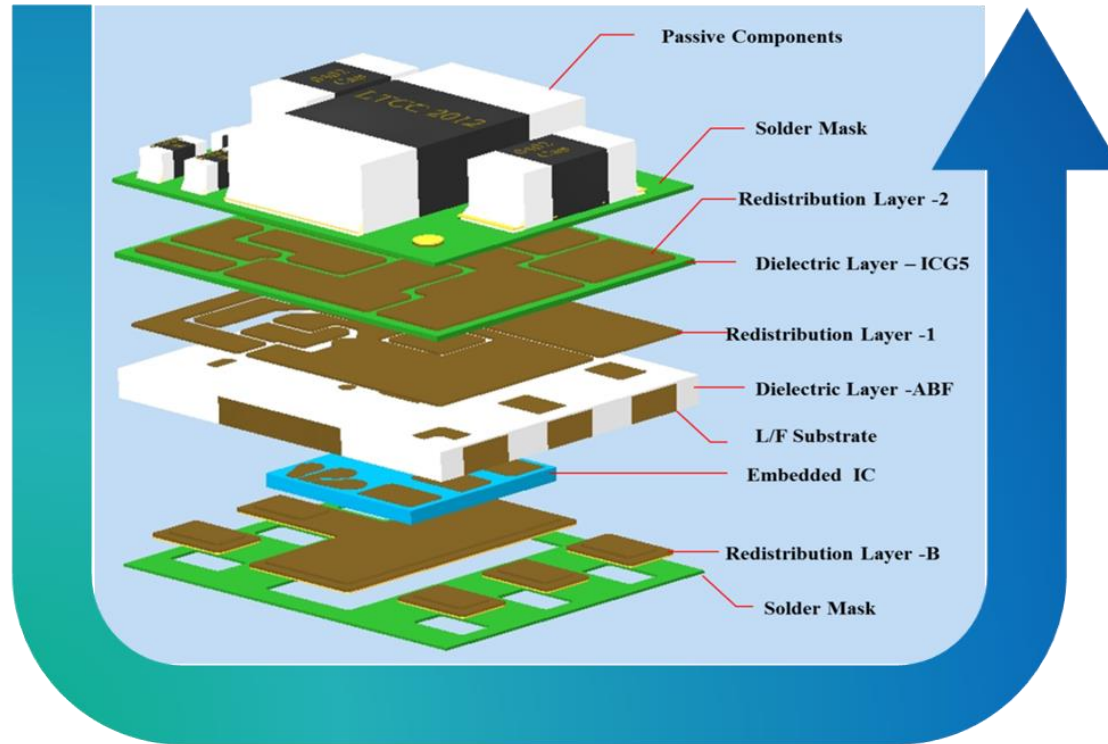
Lead frame



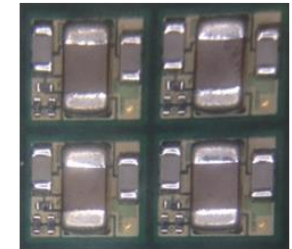
Chip Mounting



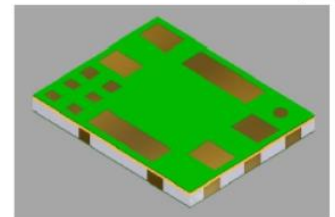
Lamination



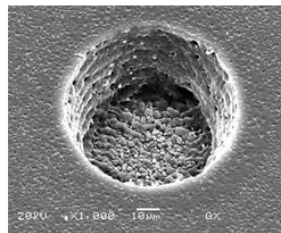
Dicing Saw



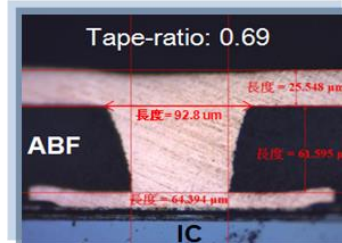
SMT Passive



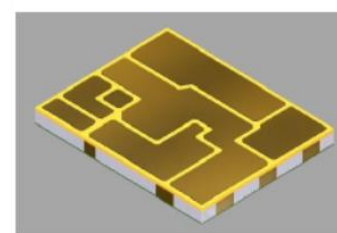
Solder Mask



Laser Drill Via



Via Plating



RDL Plating

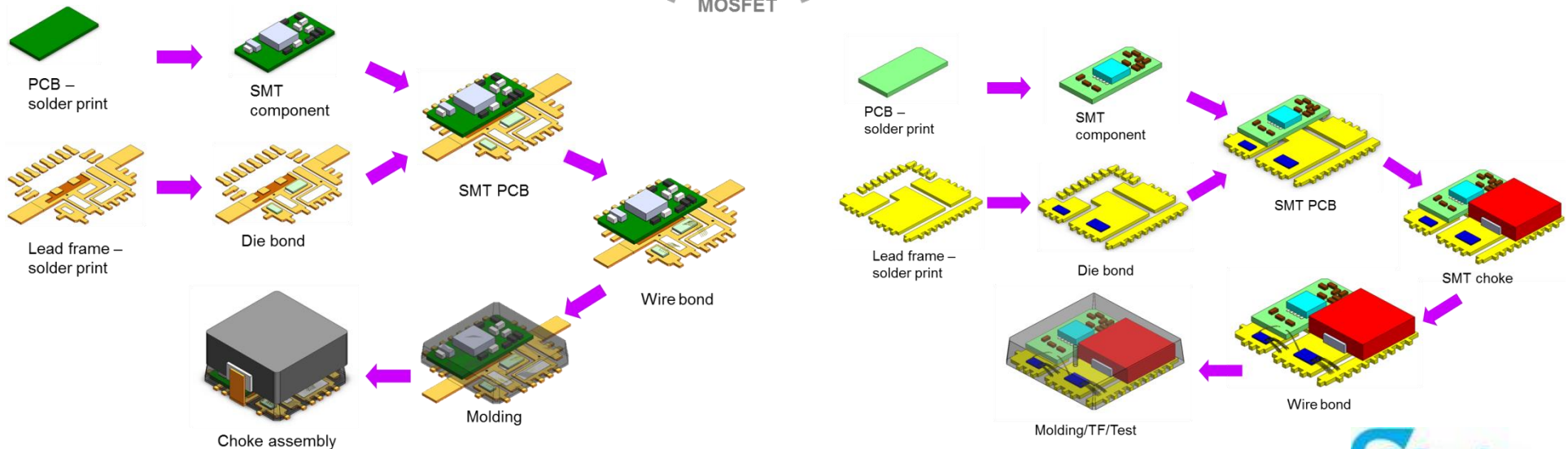
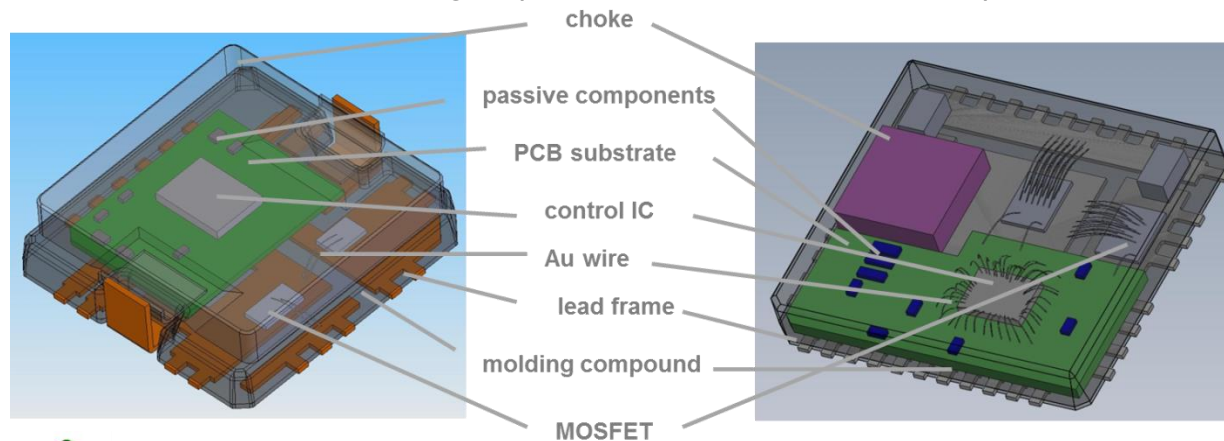
# Two-carrier Structure

## Modular concept with 2-carrier-solution:

- Lead frame for power-parts (MOSFET, diode, power choke)
- PCB for application specific logic (IC, passive components)

■ RoHS compliant

■ Pb-free 



# Benefit of Using Power Module

Space Saving

Performance(High-frequency)

Time-to-Market

Total Cost Saving(Design and Sourcing)

# Benefit of Space Saving

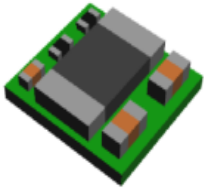
(uPOL as an Example)



## Benefits:

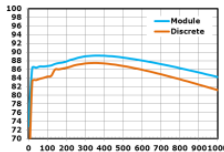
1. High density integration power module, upto 50% for  $\mu$ POL and POL
2. High reliability performance
3. Up to 96% efficiency performance( $\mu$ POL)
4. Application: wearable/portable device, mobile phone, SSD, FPGA, data center(server, switch and storage), etc.

# Benefit of Performance Enhancement



## Smaller Body and Lighter Weight

- Components embedded inside substrate enable 3D packaging
- Contacting or SMT can be done from both side



## Better Electrical Performance to Support Longer Running Hour

- Reduced parasitic L/C improving power loss and minimize signal distortions



## Anti-vibration and Environmental Ability

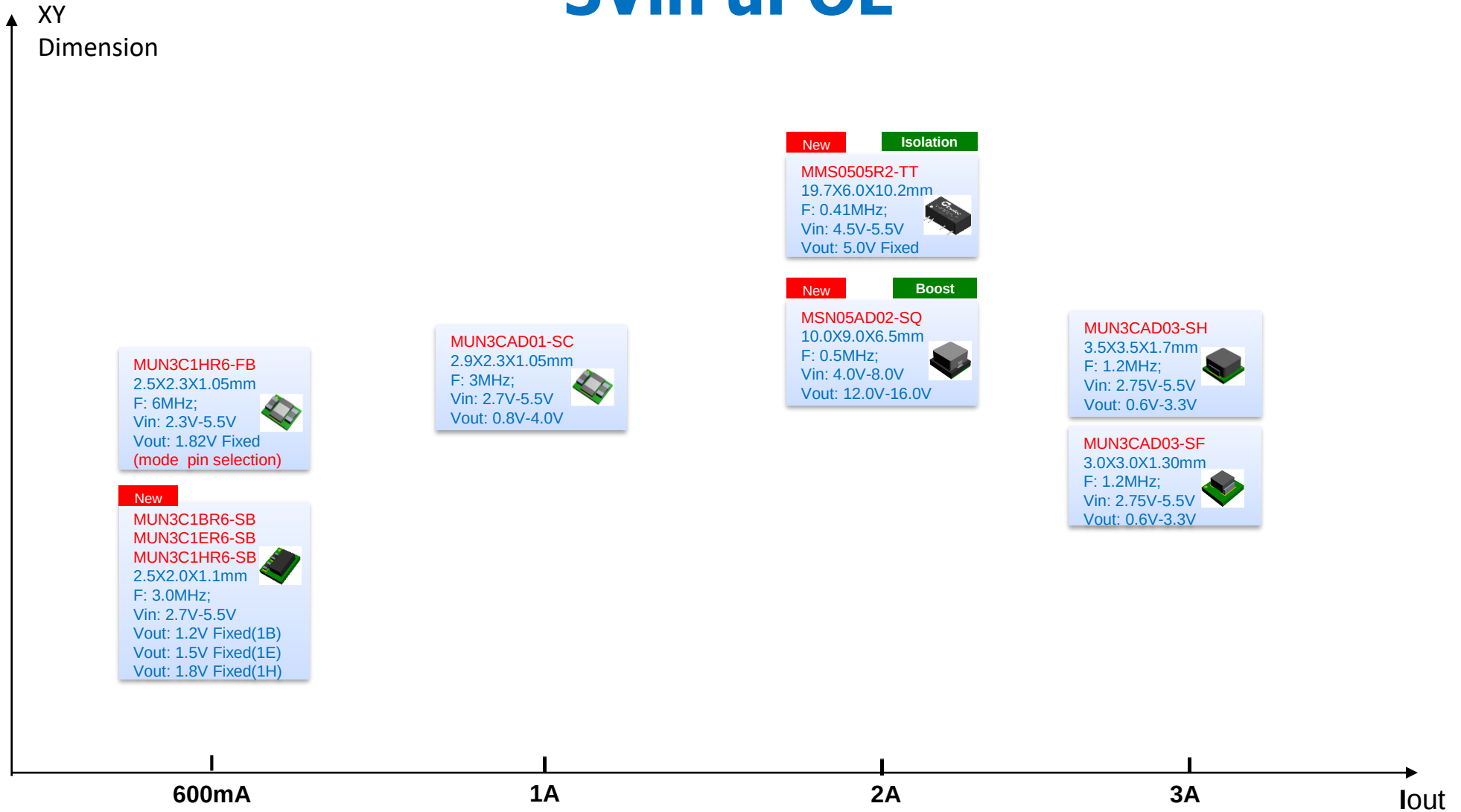
- Copper Substrate based thick copper core suitable for Vibration Condition
- Well-packed structure for environmental challenge

# Products Solution

## By Vin/Structure

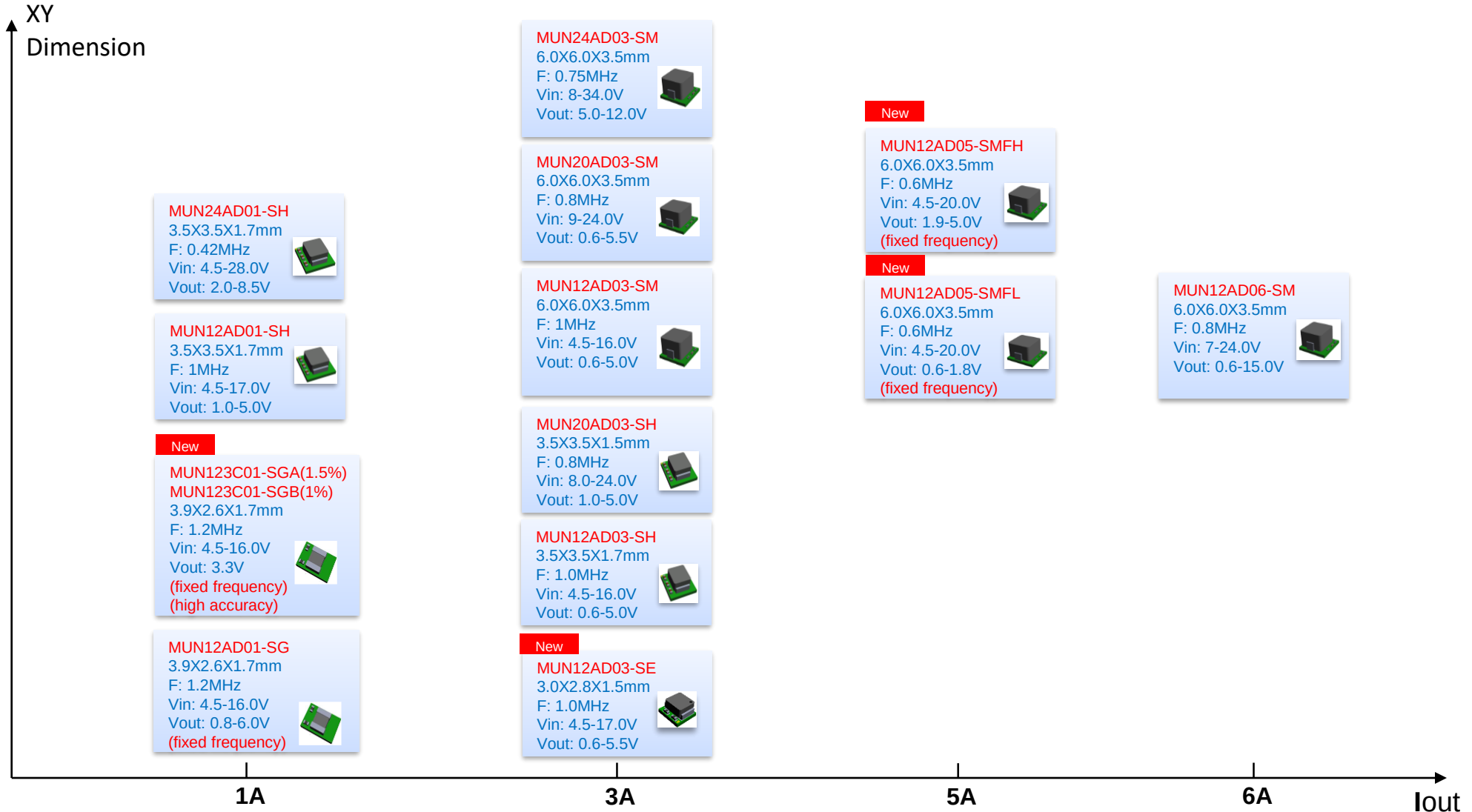


# 5Vin uPOL



# 12Vin uPOL

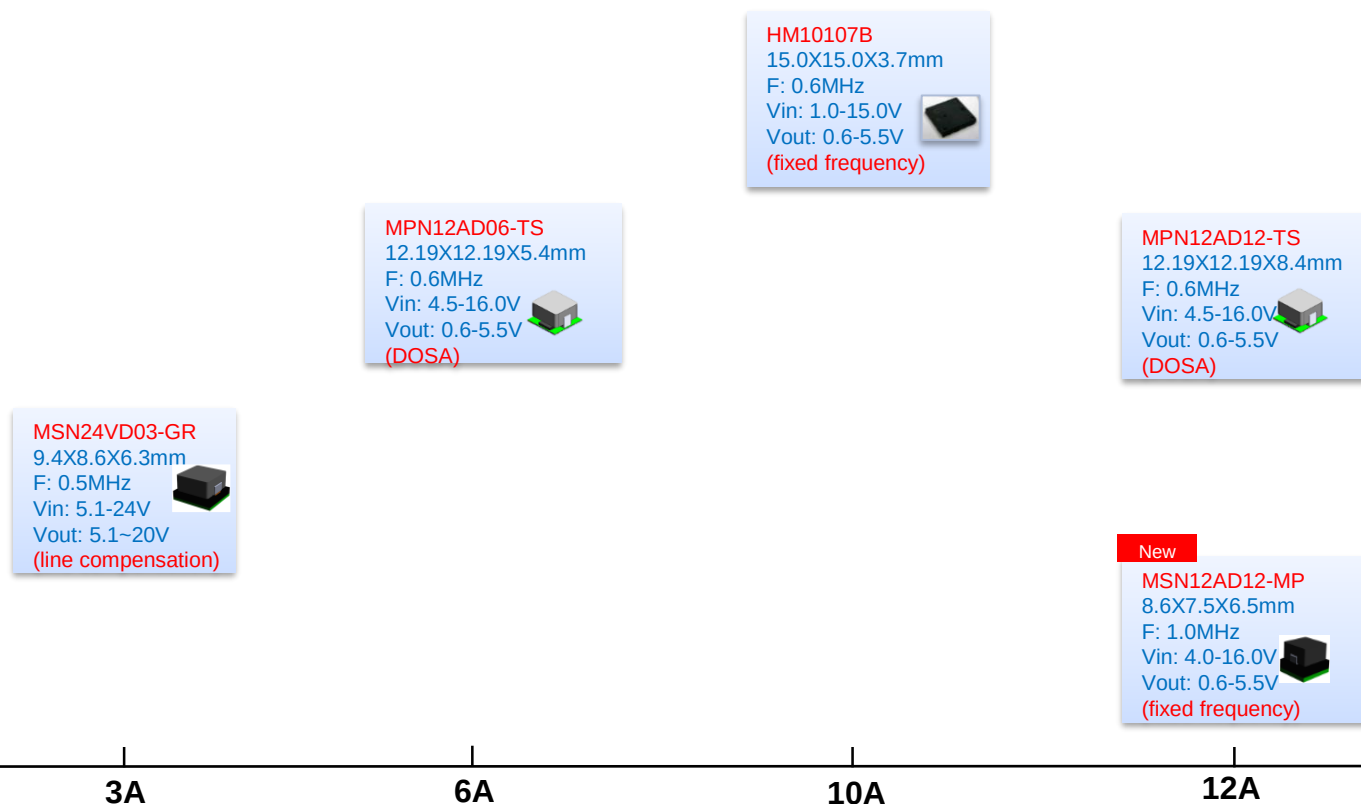
**New** : Under Development  
(Engineering sample available)



# 12Vin POL

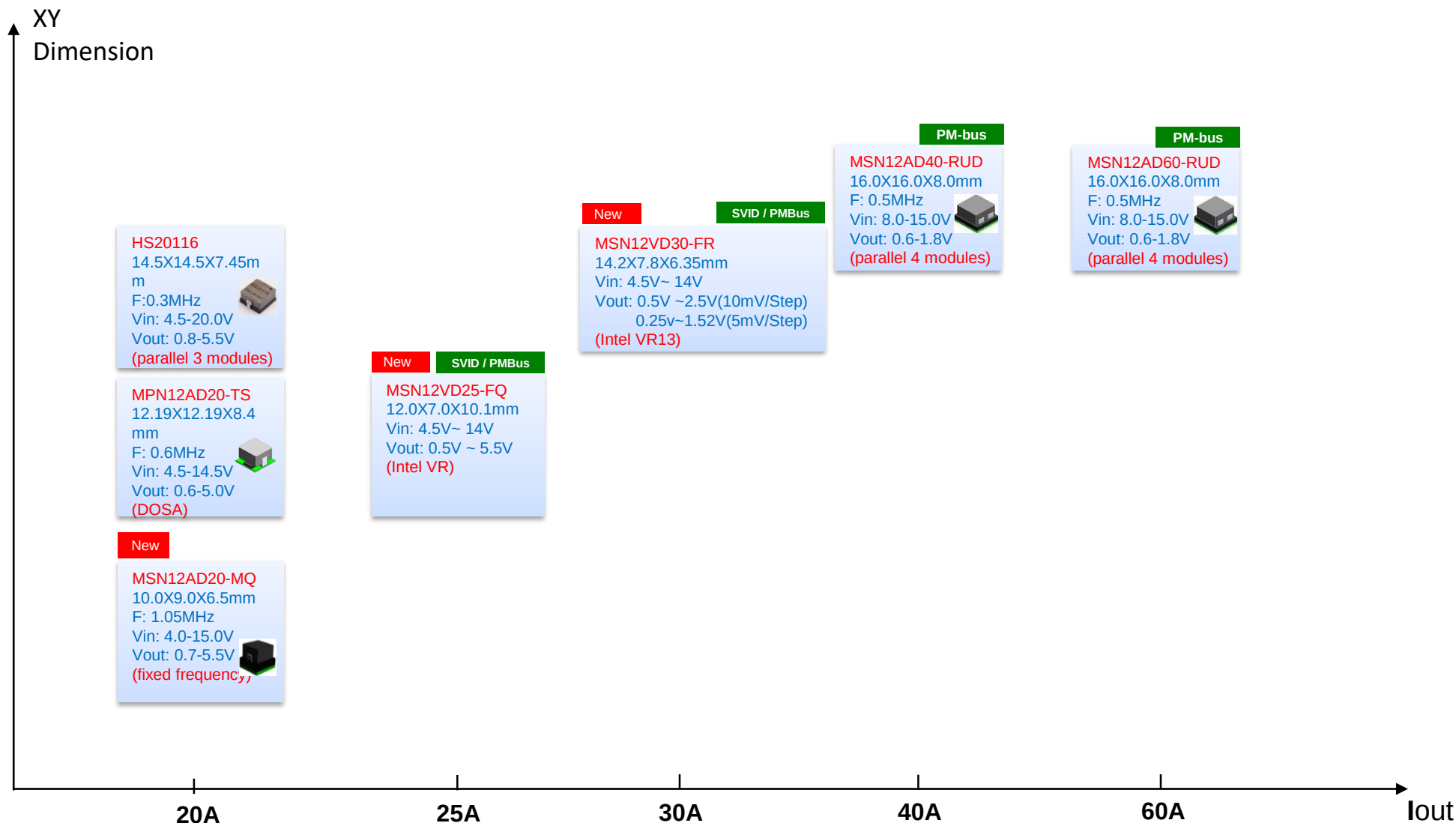
**New** : Under Development  
(Engineering sample available)

XY  
Dimension

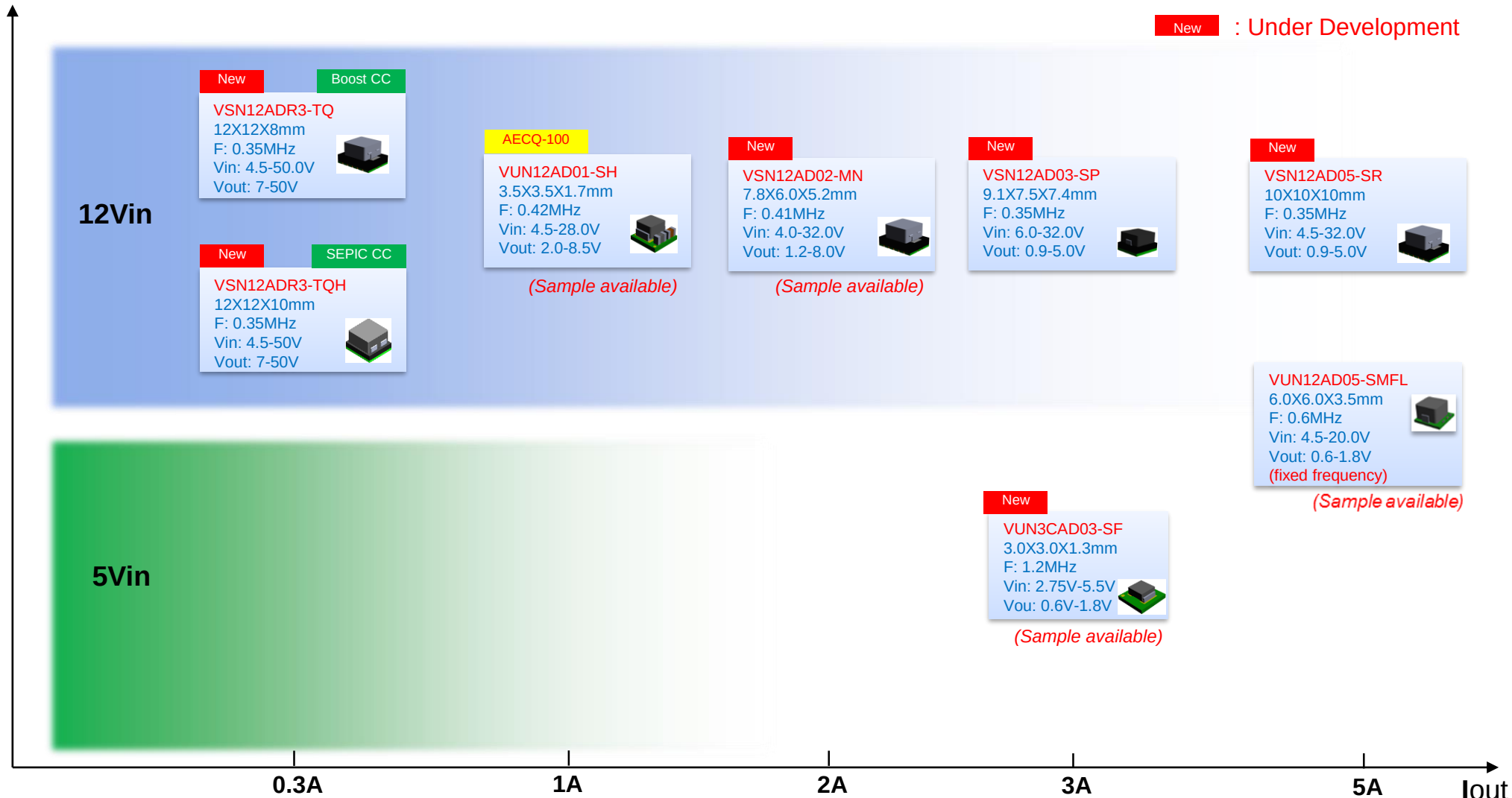


# 12Vin POL

**New** : Under Development  
(Engineering sample available)



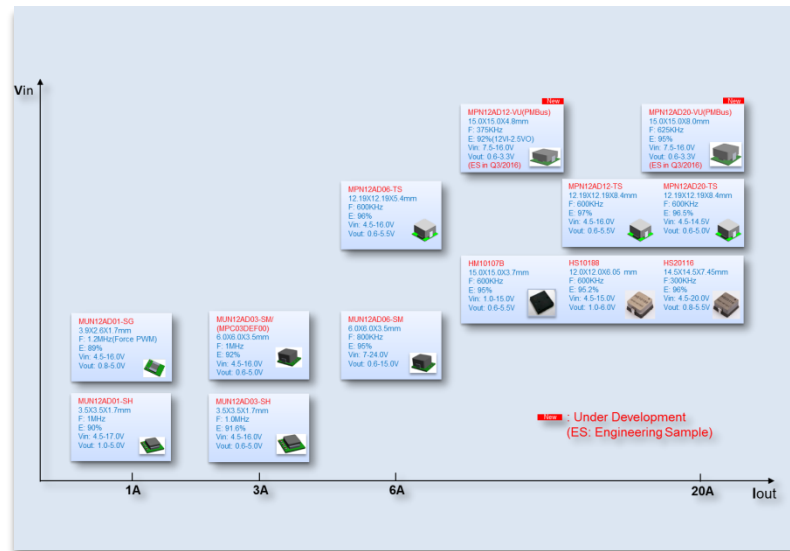
# Automotive-grade Power Modules



# Customized Packaging

## Providing Packaging According to Customer's Spec/IC

### Standard Product Solution

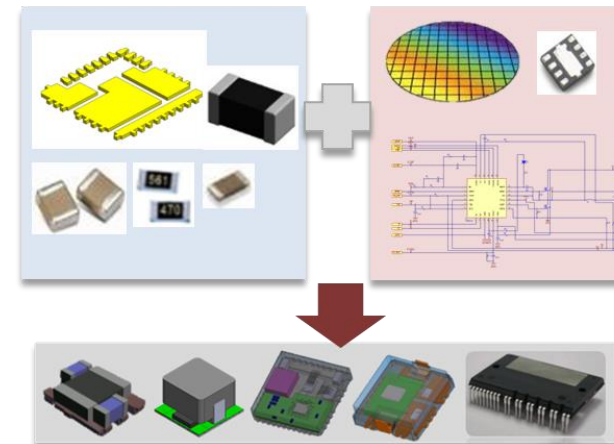


Cyntec provides standard products to meet up customer demand, and help customer from function confirmation, layout, testing, and application issue solving.

### Customized Packaging

Cyntec provides passive components, packaging platform, and testing/packing.

Customer provides IC, XYZ dimension target, pin-out, and testing requirement, etc.





# On-Line Support

To get data sheet, EVB guide and Gerber file, please visit:  
<http://www.cyntec.com/productDetail.aspx?id=75>



To get SGS report and QE Report and more support, please contact sales in your region, or directly to Cyntec HQs:

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Phone: +886-3-579-9829 EXT: 1766

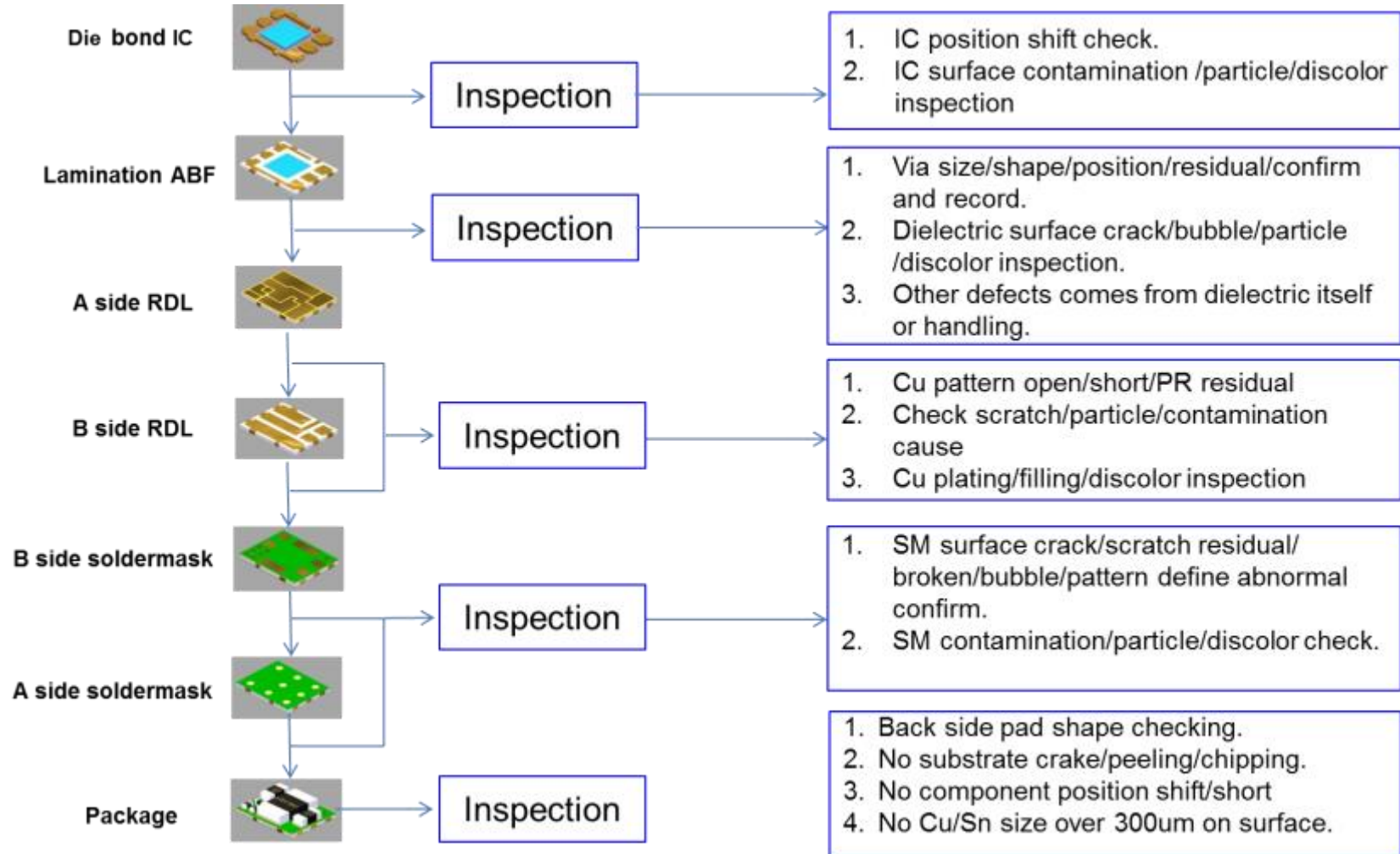
2, R&D 2<sup>nd</sup> Road, Science-based Industrial Park,  
HsinChu 30076, Taiwan

# Performance, Reliability and Safety

# Performance, Reliability and Safety Plan

|             | Standards       | uPOL/Molding        |                    |            |                    | Sip/Dip             |                    |                    |
|-------------|-----------------|---------------------|--------------------|------------|--------------------|---------------------|--------------------|--------------------|
|             |                 | Consumer Commercial | Telecom Networking | Automotive | Industrial Medical | Consumer Commercial | Telecom Networking | Industrial Medical |
| Performance | IPC-9592        | O                   | O                  | O          | O                  | O                   | O                  | O                  |
|             | EL- 6(level 6)  | O                   | O                  |            |                    |                     |                    |                    |
| Reliability | JESD22          | O                   | O                  |            | O                  | O                   | O                  | O                  |
|             | JIS C 5201-1    | O                   | O                  |            | O                  | O                   | O                  | O                  |
|             | IPC-9592        | O                   | O                  |            | O                  | O                   | O                  | O                  |
|             | MIL-STD-883     | O                   | O                  |            | O                  | O                   | O                  | O                  |
|             | AEC Q-100/(104) |                     |                    | O          |                    |                     |                    |                    |
| Safety      | CISPR11(EMI)    |                     |                    |            | O                  |                     |                    | O                  |
|             | CISPR22(EMI)    | O                   | O                  |            |                    | O                   | O                  |                    |
|             | CISPR25(EMC)    |                     |                    | O          |                    |                     |                    |                    |
|             | IEC60950-1      |                     |                    |            |                    | O                   |                    |                    |
|             | IEC60601        |                     |                    |            |                    |                     |                    | O                  |
|             | UL60950-1       |                     |                    |            |                    | O                   |                    |                    |
|             | UL60601         |                     |                    |            |                    |                     |                    | O                  |
|             | EN55011(EMI)    |                     |                    |            | O                  |                     |                    | O                  |
|             | EN55022(EMI)    | O                   | O                  |            |                    | O                   | O                  |                    |
|             | TL81000(EMC)    |                     |                    | O          |                    |                     |                    |                    |

# uPOL QC Flow Chart



# uPOL Reliability Test(Without Bias)

| Item                                                          | Condition                                                                                                                                                                                                                                                                               | Sample Size                    | Standard     |
|---------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------|
| Moisture Sensitivity Level 2<br>(MSL2)                        | Baking 125°C, 24hrs<br>Ta = 85°C, RH = 60%, 168 hrs<br>Reflow = 3x                                                                                                                                                                                                                      | 540 pcs<br>(3 shift lots)      | J-STD-020    |
| Temperature Cycle<br>(with MSL2 Pre-condition)                | Ta = -55°C to 125°C<br>Duration = 30 mins/cycles (-55c/15mins,+125/15mins)<br>(C0, C200, C500, C1000 cycles)                                                                                                                                                                            | 77X3=231 pcs<br>(3 shift lots) | JESD22-A104C |
| Press Cooker Test<br>(with MSL2 Pre-condition)                | Ta=121°C, RH=100%, 2ATM<br>(96hrs)                                                                                                                                                                                                                                                      | 77X3=231 pcs<br>(3 shift lots) | JESD22-A102C |
| High Temperature<br>Storage Life<br>(with MSL2 Pre-condition) | Ta = 125°C<br>(T0, T500 , T1000hrs)                                                                                                                                                                                                                                                     | 77X3=231 pcs<br>(3 shift lots) | JESD22-A103C |
| Low Temperature<br>Storage Life<br>(with MSL2 Pre-condition)  | Ta = - 40°C<br>(T0, T500, T1000 hrs)                                                                                                                                                                                                                                                    | 77X3=231 pcs<br>(3 shift lots) | JESD22- A119 |
| Vibration<br>Variable Frequency                               | 1. Vibration frequency/Displacement: 20 ~ 80 Hz / 1.52 mm<br>2.Vibration frequency/Acceleration: 80 ~ 2000 Hz / 20 g<br>3. Cycle time : 4 minutes<br>4. Number of cycles : 4 cycles for each axis<br>5. Vibration axes : X, Y and Z<br>(Rotating each axis on vertical vibration table) | 30X3=90 pcs<br>(3 shift lots)  | JESD22-B103B |

# uPOL Reliability Test(Without Bias)

| Item                                | Condition                                                                                                                                                                                                                           | Sample Size                   | Standard          |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------|
| Vibration Test<br>Random            | Vibration frequency : 5~200 Hz<br>Test Grms : 6.27 Grms<br>Duration of test : 30 minutes for each axis<br>Vibration axes : X, Y and Z<br>(Rotating each axis on vertical vibration table)                                           | 30X3=60 pcs<br>(3 shift lots) | JESD22- B103B     |
| Drop Test On Board                  | 150cm height<br>Drop each face (6 drops) for 1 cycle<br>Drop 5 cycles                                                                                                                                                               | 10X3=30 pcs<br>(3 shift lots) | JESD22- B103B     |
| Bending Test                        | 6mm / Holding 60 sec / 1.0mm PCB                                                                                                                                                                                                    | 10pcs                         | JIS C 5201-1 4.33 |
| Solderability Test                  | SA 4 hrs / 245c dipping 5 sec 2 times.                                                                                                                                                                                              | 10X3=30 pcs<br>(3 shift lots) | MIL-STD-883       |
| Solderability<br>Soldering Strength | 1. 10N pushing force and increase the force until the electrode pads are peeled off.<br>2. The maximum force shall be reached within 5 s.<br>3. The pushing force is applied in the longitudinal direction.                         | 10X3=30 pcs<br>(3 shift lots) | IEC 60068-2-21    |
| Mechanical Shock                    | 1. Pulse shape : Half-sine waveform<br>2. Impact acceleration : 1500 g<br>3. Pulse duration : 0.5 ms<br>4. Number of shocks : 30 shocks (5 shocks for each face)<br>5. Orientation : Bottom, top, left, right, front and rear faces | 30X3=90 pcs<br>(3 shift lots) | JESD22-B104C      |

# uPOL Reliability Test(With Bias)

| Item                                                            | Condition                                                                                                           | Sample Size                    | Standard     |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------|
| High Temp Operating Life<br>(HTOL)<br>(with MSL2 Pre-condition) | Ta = 85°C,<br>Vin = Vin max, Vout = Vout max, Iout = Imax<br>(T0, T168, T500, T1000 hrs)                            | 77X3=231 pcs<br>(3 shift lots) | JESD22-A108C |
| Temp Humidity Bias<br>(THB)<br>(with MSL2 Pre-condition)        | Ta = 85°C, RH = 85%,<br>Vin = Vin max, Vout = Vout max<br>(T0, T168, T500, T1000 hrs)                               | 77X3=231 pcs<br>(3 shift lots) | JESD22-A101B |
| Power Cycle<br>(with MSL2 Pre-condition)                        | Ta = 85°C,<br>Vin = Vin max, Vout = Vout max, Iout = Imax<br>Ton = 3mins, Toff = 1 mins<br>(C0, C200, C1000 Cycles) | 77X3=231 pcs<br>(3 shift lots) | JESD22- A122 |



# POL Reliability Test

## (Additional Items Than uPOL)

| Item                                                  | Condition                                                          | Sample Size                   | Standard           |
|-------------------------------------------------------|--------------------------------------------------------------------|-------------------------------|--------------------|
| Moisture Sensitivity Level 3<br>(MSL3 for Molding)    | Baking 125°C, 24hrs<br>Ta = 30°C, RH = 60%, 196 hrs<br>Reflow = 3x | 540 pcs<br>(3 shift lots)     | JEDEC<br>J-STD-020 |
| On board drop test<br>(STACK and open Frame POL only) | 76 cm height<br>6 faces drop as 1 cycles<br>Drop 5 cycles          | 15X3=45 pcs<br>(3 shift lots) | Cyntec QE          |
| Solderability Test<br>(for Molding and SiP/DiP)       | SA 4 hrs / 245c dipping 7 sec.                                     | 10X3=30 pcs<br>(3 shift lots) | MIL-STD-883        |

# Smarter. Greener. Together.

To learn more about Delta, please visit [www.deltaww.com](http://www.deltaww.com).

