Cyntec Power Module Solution

Cyntec Co., Ltd.

2020/Q4R
Outline

1. Cyntec the Company
2. Core Technology and Platform
3. Benefit of Using Power Module
4. Product Solution
   - 5Vin & 12Vin PoL
   - Automotive grade power module
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
✓ Short Time-to-Market
Cyntec Product Portfolio
Power Module
Core Competency
Packaging Platform
What is a Power Module?

Power module is DC/DC converter that integrates controller, MOSFETs, inductor into a single package.

Total foot-print: up-to **38mm²**

Up to 70% Size Reduction

**12.25mm²**
Core Competence

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

Semiconductor

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

Topology

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

Key Technology

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

Mag. & EMI

- Core Competence
# Module Platform and Application

<table>
<thead>
<tr>
<th></th>
<th>μPOL</th>
<th>Stack 3D</th>
<th>Two Carrier</th>
<th>High Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client-SSD</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client-Drone</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client Smart Phone</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client IoT</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cloud Server</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cloud Telecom</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cloud Networking</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Automotive</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Industrial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### Package size (typical)
- 2.5x2.0x0.8mm
- 2.9x2.3x1.1mm
- 6.0x6.0x3.5mm
- 6.0x6.0x3.5mm
- 12.0x12.0x6.05mm (10A)
- 14.5x14.5x7.45mm (20A)
- 15.0x15.0x3.7mm (10A)
- 43.3x30.7x3.6mm

### Output Current
- <6A
- 3A~120A
- 10A~20A
- 20A~50A
u-POL Embedded Structure and Process

- Lead frame
- Chip Mounting
- Lamination
- Laser Drill Via
- Tape-ratio: 0.69
- IC
- ABF
- Via Plating
- RDL Plating
- Dicing Saw
- SMT Passive
- Solder Mask
SiP Packaging Platform and Process

Panel PCB
Component Mounting
Panel Molding
Dispensing glue/Solder
SMT Choke
Solder Ball mounting
Dicing Saw
Two-carrier Structure and Process

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 μPOL and POL
2. High reliability performance
3. Up to 96% efficiency performance (μPOL)
4. Application: wearable/portable device, mobile phone, SSD, FPGA, data center (server, switch and storage), etc.
Benefit of Power Module Adoption

**Smaller Body and Lighter weight**
- Active and Passive components integrated by advanced 3D packaging

**Better Electrical Performance**
- Reduced parasitic L/C improving power loss and minimizing signal distortions

**Optimized Thermal Performance**
- Proprietary internal and external thermal spreading technology allowing high power operation within a small footprint

**Fast Time-to-Market**
- Pre-qualified DC-DC solutions for easy deployment with complete I/O and EMI guides
Products Solution

- 5Vin & 12Vin PoL
## Cyntec Power Module Portfolio

<table>
<thead>
<tr>
<th>lout</th>
<th>Vin</th>
<th>5V</th>
<th>12V</th>
<th>24V</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.6A</td>
<td>MUN3C1XR6-SB</td>
<td>2.5X2.0X1.1mm</td>
<td>Vin: 2.7V-5.5V</td>
<td>Vout: 1.2-1.8V</td>
</tr>
<tr>
<td></td>
<td>MUN3CAD01-SB</td>
<td>2.5X2X1.1mm</td>
<td>Vin: 2.7-5.5V</td>
<td>Vout: 0.6-1.8V</td>
</tr>
<tr>
<td>1A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>lout</td>
<td>Vin</td>
<td>5V</td>
<td>12V</td>
<td>24V</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>---------------------</td>
<td>----------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>6A</td>
<td></td>
<td>MUN12AD06-SM</td>
<td>6.0X6.0X3.5mm</td>
<td>Vin: 7.0-24.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Vout: 0.6-6.0V</td>
</tr>
<tr>
<td>10A</td>
<td></td>
<td>HM10107A</td>
<td>15.0X15.0X3.7mm</td>
<td>Vin: 1.0-15.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Vout: 0.6-5.5V</td>
</tr>
<tr>
<td>12A</td>
<td></td>
<td>MSN12AD12-MP</td>
<td>8.6X7.5X6.5mm</td>
<td>Vin: 4.5-16.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Vout: 0.6-5.5V</td>
</tr>
<tr>
<td>20A</td>
<td></td>
<td>MSN12AD20-MQ</td>
<td>10.0X9.0X6.5mm</td>
<td>Vin: 4.5-15.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Vout: 0.6-5.5V</td>
</tr>
<tr>
<td>30A</td>
<td></td>
<td>MSN12VD30-FR</td>
<td>14.2X7.8X6.35mm</td>
<td>Vin: 4.5V~ 14.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Vout: 0.25V ~ 2.5V</td>
</tr>
</tbody>
</table>
**New product introduction--- MUN12AD03-SEC**

**Features**
- High Density uPOL Module
- 3A Output Current
- 91% Peak Efficiency at 12VIN
- Input Voltage Range from 4.5V to 17V
- Output Voltage Range from 0.8V to 5.5V
- Enable / PGOOD Function
- Automatic Power Saving/PWM Mode
- Protections (OCP: Non-latching, OTP)
- Adjustable Soft Start Function
- Compact Size: 3.0mm*2.8mm*1.5mm
- Pb-free for RoHS compliant
- MSL 2, 260°C Reflow
- Point of Load Conversion
- LDOs Replacement
- Set Top Box / DSL Modem / AP Router
- Industrial Personal Computer

**Applications**
- Point of Load Conversion
- LDOs Replacement
- Set Top Box / DSL Modem / AP Router
- Industrial Personal Computer

**Package**
- 1.5mm<br>3.0mm<br>2.8mm

**Efficiency**

![Efficiency Graph](image-url)
Products Solution

- Automotive grade power module
Feature for automotive application

Simple EMI
• Much shorter current path in integrated modules
• Simple EMI solution (spread spectrum, no CMC)

High Temperature Operation
• Heat reduction by high conversion efficiency
• Full power operation at 125°C ambient

Small and Easy
• Up to 70% footprint saving by advanced packaging
• Minimum DC-DC design effort

Automotive Quality
• Automotive qualified factory and products (AECQ)
• Mass production for automotive since 2018

1A Buck
3A Buck (2.1MHz)
Cyntec Automotive Power Modules

<table>
<thead>
<tr>
<th>Product Platform</th>
<th>Part Number</th>
<th>Topology</th>
<th>Regulation</th>
<th>Input Voltage</th>
<th>Output Voltage</th>
<th>Max. Output Current</th>
<th>Dimensions</th>
<th>PGood</th>
<th>Softstart</th>
<th>Auto PFM/ Force PWM</th>
<th>Frequency</th>
<th>MSL</th>
<th>Packing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive</td>
<td>VUN12AD01-SHC</td>
<td>Buck</td>
<td>Constant Voltage</td>
<td>4.50 - 28.00</td>
<td>0.80 - 8.50</td>
<td>1.00 - 3.50</td>
<td>3.50 - 12.25</td>
<td>1.70</td>
<td>N</td>
<td>Internal</td>
<td>Auto PFM</td>
<td>0.42 MHz</td>
<td>2 Tape Reel</td>
</tr>
<tr>
<td>Automotive</td>
<td>VUN12AD01-SH</td>
<td>Buck</td>
<td>Constant Voltage</td>
<td>4.50 - 28.00</td>
<td>3.00 - 8.50</td>
<td>1.00 - 3.50</td>
<td>3.50 - 12.25</td>
<td>1.70</td>
<td>N</td>
<td>Internal</td>
<td>Auto PFM</td>
<td>0.42 MHz</td>
<td>2 Tape Reel</td>
</tr>
<tr>
<td>Automotive</td>
<td>VPN12ADTE-FU</td>
<td>Boost</td>
<td>Constant Voltage</td>
<td>5.50 - 36.00</td>
<td>20.00 - 45.00</td>
<td>1.50 - 15.00</td>
<td>15.00 - 225.00</td>
<td>8.00</td>
<td>N</td>
<td>Internal</td>
<td>Force PWM</td>
<td>0.35 MHz</td>
<td>3 Tape Reel</td>
</tr>
<tr>
<td>Automotive</td>
<td>VPN12AD02-FU</td>
<td>Buck-Boost</td>
<td>Constant Voltage/Current</td>
<td>5.50 - 36.00</td>
<td>3.00 - 40.00</td>
<td>2.00 - 15.00</td>
<td>15.00 - 225.00</td>
<td>8.20</td>
<td>Y</td>
<td>External</td>
<td>Force PWM</td>
<td>0.35 MHz</td>
<td>3 Tape Reel</td>
</tr>
<tr>
<td>Automotive</td>
<td>VUN12AD02-KM</td>
<td>Buck</td>
<td>Constant Voltage</td>
<td>4.00 - 36.00</td>
<td>0.90 - 8.00</td>
<td>2.00 - 6.00</td>
<td>6.00 - 36.00</td>
<td>3.50</td>
<td>Y</td>
<td>External</td>
<td>Mode Select</td>
<td>0.43 MHz</td>
<td>2 Tape Reel</td>
</tr>
<tr>
<td>Automotive</td>
<td>VUN12AD02-KMH</td>
<td>Buck</td>
<td>Constant Voltage</td>
<td>8.00 - 36.00</td>
<td>0.90 - 8.00</td>
<td>2.00 - 6.00</td>
<td>6.00 - 36.00</td>
<td>2.50</td>
<td>Y</td>
<td>External</td>
<td>Force PWM</td>
<td>2.10 MHz</td>
<td>2 Tape Reel</td>
</tr>
<tr>
<td>Automotive</td>
<td>VUN12AD03-KM</td>
<td>Buck</td>
<td>Constant Voltage</td>
<td>4.00 - 36.00</td>
<td>0.90 - 5.00</td>
<td>3.00 - 6.00</td>
<td>6.00 - 36.00</td>
<td>3.50</td>
<td>Y</td>
<td>External</td>
<td>Mode Select</td>
<td>0.43 MHz</td>
<td>2 Tape Reel</td>
</tr>
<tr>
<td>Automotive</td>
<td>VUN12AD03-KMH</td>
<td>Buck</td>
<td>Constant Voltage</td>
<td>8.00 - 36.00</td>
<td>0.90 - 8.00</td>
<td>2.00 - 6.00</td>
<td>6.00 - 36.00</td>
<td>2.50</td>
<td>Y</td>
<td>External</td>
<td>Force PWM</td>
<td>2.10 MHz</td>
<td>2 Tape Reel</td>
</tr>
</tbody>
</table>

**VPN12AD02-FU**
15X15X8.2mm
F: 0.35MHz
Vin: 5.5-36V
Vout: 3-40V
(Buck-boost CC/CV)

**VUN12AD03-KM**
6.0X6.0X3.5mm
F: 0.43MHz
Vin: 4.0-36.0V
Vout: 0.9-5.0V
(Spread spectrum)

**VUN12AD03-KMH**
6.0X6.0X2.6mm
F: 2.1MHz
Vin: 8.0-36.0V
Vout: 0.9-5.0V
(Spread spectrum)
Product Highlight

2.1MHz 3A Buck Module for ripple sensitive applications
VUN12AD03-KMH

**features:**
- High Density Fully Integration Module
- Maximum Output Current: 2A
- Input Voltage Range from 4V to 36V
- Output Voltage Range from 0.9V to 8V
- VIN Maximum Rating 42V
- Switching Frequency 2.1MHz
- Approaching 100% duty cycle
- Force PWM Mode
- Enable Function
- Protections (UVLO, OTP, OCP: non-latching)
- Power Good Indicator
- Selectable Spread Spectrum Frequency
- Wettable Flank Packaging
- Compact Size: 6mm*6mm*2.6mm
- Pb-free for RoHS compliant
- MSL 2, 260C Reflow
- AECQ-100 certificate

**Graphs:**
- Efficiency >90% Peak @12Vin/5Vout
- Ripple <4mVpp
**Product Highlight**

**125°C 3A Buck Module for high temperature applications**

**VUN12AD03-KM**

**Features:**
- High Density Fully Integration Module
- Max Output Current: 3A
- Input Voltage Range from 4V to 36V
- Output Voltage Range from 0.9V to 8V
- VIN Maximum Rating 42V
- Switching Frequency 430kHz
- Approaching 100% duty cycle
- Selectable PSM/FPWM at Light Load
- Enable Function
- Protections (UVLO, OTP, OCP: non-latching)
- Power Good Indicator
- Selectable Spread Spectrum Frequency
- Wettable Flank Packaging
- Compact Size: 6mm*6mm*3.5mm
- Pb-free for RoHS compliant
- MSL 2, 260°C Reflow
- AEC-Q-100 certificate

*Efficiency >96% Peak @12Vin/8Vout*

*Full 3A loading up to 95°C*
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.
Date Established: October 28, 1991
Paid in Capital: US$ 450M (NT$ 14,813M)
Space: Taiwan and Mainland China
  Taiwan- 360,000 ft² (32,400 m²)
  SuZhou1- Cyntec Co., Ltd 308,022 ft² (28,600 m²)
  SuZhou2- Cyntec Electronics Co., Ltd 1,112,526 ft² (103,410 m²)
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:

Rosemei Lee
ROSEMEI.HM.LEE@CYNTEC.COM
Phone: +886-3-579-9829 EXT: 1766

2, R&D 2nd Road, Science-based Industrial Park, HsinChu 30076, Taiwan