



# Motion SPM<sup>®</sup> Module Portfolio

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## Increase Reliability and Reduce Design Time

Fairchild's Motion SPM<sup>®</sup> Smart Power Modules integrate motor drive and protection circuitry into a single package to simplify and accelerate your system design and help optimize efficiency for motor control and industrial inverter applications.

SPM modules range from 40V to 1200V and support from 20W to 10 kW to provide design scalability with a wide variety of packaging options. Integrated SPM modules cover motor drive applications from small fan motors, pumps, power tools, and home appliances to high-power air conditioning units and industrial drives.

## Innovative Motor Control Solutions

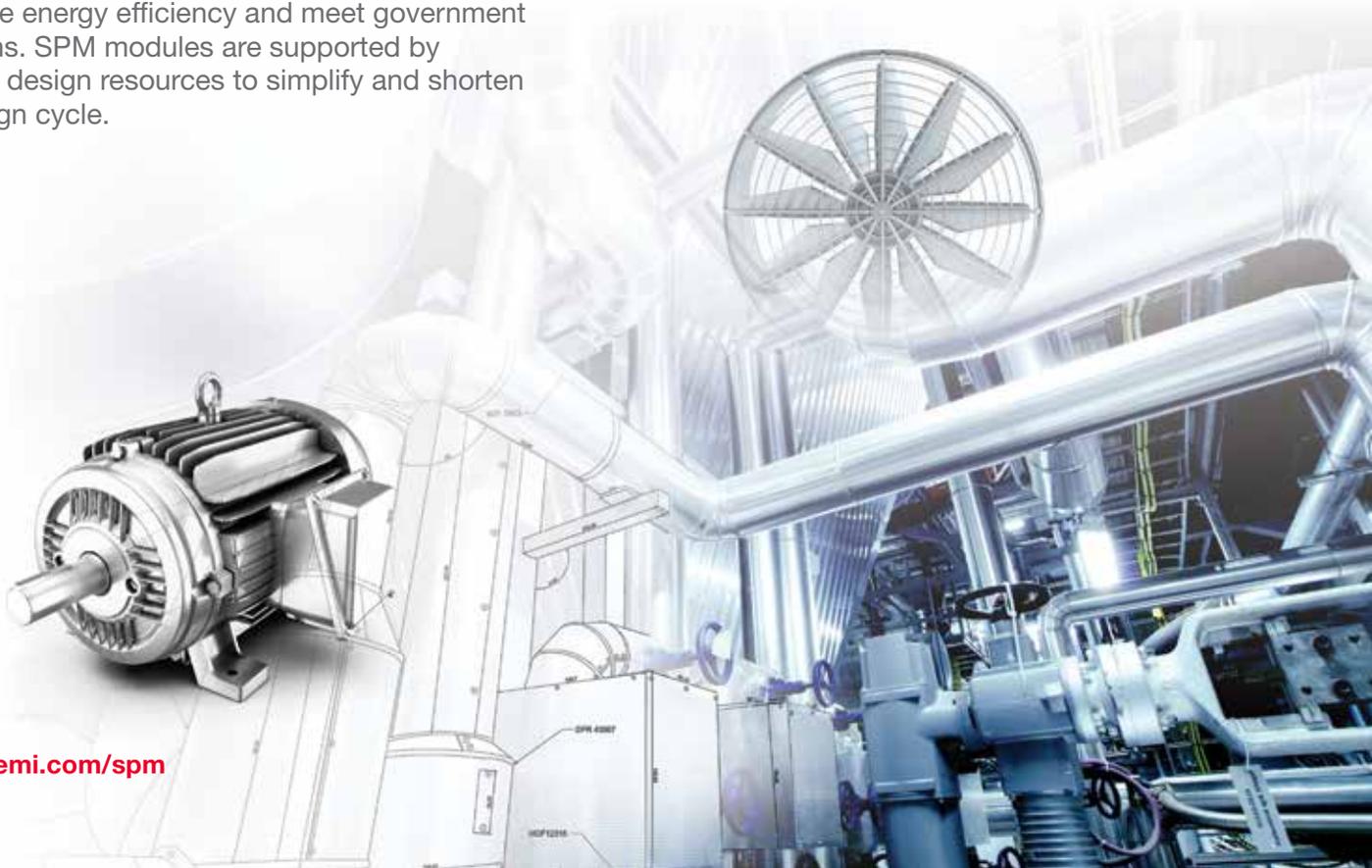
Our expanding product portfolio—combined with manufacturing process enhancements, innovative topologies, and systems expertise—allows circuit designers to develop the most advanced solutions to improve energy efficiency and meet government regulations. SPM modules are supported by extensive design resources to simplify and shorten your design cycle.

### SPM Advantages:

- Widest breadth of packaging for motor control applications
- Optimized packaging for thermal performance, high-power density, and robust assembly
- Wide range of guaranteed junction temperature -40°C to +150°C
- Better ruggedness, optimized conduction and switching losses increase reliability and reduce design time

### Discrete Component Integration:

- Optimized system cost
  - Higher manufacturability
  - Saves board/PCB space
  - Reduced development time
- Reduced failure rate in manufacturing
- Protection feature set includes UVLO, OTP, OCP, and cross-conduction
- Lower RFI/EMI noise



# Motion SPM® Module Series

## SPM 7 Series

Advanced SPM 7 modules provide fully-featured, high-performance three-phase inverter output stage for AC Induction, BLDC, and PMSM motors. The built-in HVIC translates incoming logic-level gate inputs to the high-voltage, high-current drive signals required to properly drive the module's internal MOSFETs. Separate open-source MOSFET terminals are available for each phase to support the widest variety of control algorithms. PQFN package offers up to 50% board space savings while minimizing EMI and losses.

**Applications:** Small pumps, pedestal and ceiling fans, and residential A/C <100W.



## SPM 5 Series

250V, 500V, and 600V SPM 5 module series provides optimized gate drive to minimize EMI and losses for less than 200W, three-phase motor drive applications. Modules are offered in three package options – DIP, double DIP, and SMD. Separate open-source MOSFET terminals are available for each phase to support the widest variety of control algorithms.

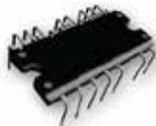


**Applications:** Dishwashers, ceiling fans, pumps, and residential A/C.

## SPM 8 Series

Targets lower power, compact motor control applications. The SPM 8 series integrates 600V Field Stop trench IGBTs with extended short circuit withstand time, stealth diodes, and three (3) half-bridge gate driver IC's. Separate open emitter IGBT terminals are available for each phase to support the widest variety of control algorithms.

**Applications:** Industrial fans, pumps, washing machines, and refrigerators.



### Features:

- UL Certified No. E209204 (UL1557)
- FRFET MOSFET three-phase inverter
- Cost-competitive PQFN package
- Extremely low  $R_{\theta J-CB}$  0.8°C/W (heat dissipation by PCB pattern)
- Enhanced protection functions with UVLO, OCP, Interlock, TSU
- Better reliability with higher noise and surge immunity

See the portfolio at [fairchildsemi.com/spm7](http://fairchildsemi.com/spm7)

### Features:

- UL Certified No. E209204 (UL1557)
- FRFET MOSFET three-phase inverter with gate drivers and protection
- Standard package options – DIP, double DIP, SMD
- Better ruggedness with superior SCWT >30  $\mu$ sec in worst conditions
- Enhanced functions with built-in bootstrap diode and TSU function
- Better reliability with higher noise and surge immunity

See the portfolio at [fairchildsemi.com/spm5](http://fairchildsemi.com/spm5)

### Features:

- UL certified No. E209204 (UL1557)
- Low-loss, short circuit-rated Field-Stop trench IGBTs
- Separate open-emitter pins from low-side IGBTs for three-phase current sensing
- Active-high interface, works with 3.3 / 5V logic, Schmitt-trigger input
- HVIC for gate drive, under-voltage, over current and short-circuit current protection
- Fault Output for under-voltage, over current and short-circuit current protection
- Inter-lock function for short-circuit prevention

See the portfolio at [fairchildsemi.com/spm8](http://fairchildsemi.com/spm8)

## SPM 55 Series

600V SPM 55 modules provide a fully-featured, high-performance inverter output stage for lower power AC Induction, BLDC, and PMSM motors, up to 1 kW. The built-in, high-speed HVIC requires only a single supply voltage and translates the incoming logic-level gate inputs to the high-voltage, high-current drive signals required to properly drive the modules' robust short-circuit-rated IGBTs. Separate negative IGBT terminals are available for each phase to support the widest variety of control algorithms.

**Applications:** Appliance inverters (such as residential A/C), washing machines, and refrigerators.



### Features:

- UL Certified No. E209204 (UL1557)
- Advanced Field-Stop trench IGBTs with low power loss
- Diversified switching speed options (normal/fast/ultra-fast)
- Integrated bootstrap diode
- Enhanced protection functions with interlock, TSU and TSD, shutdown
- Better reliability with higher noise and surge immunity

See the portfolio at [fairchildsemi.com/spm55](https://www.fairchildsemi.com/spm55)

## SPM 45 Series

600V SPM 45 module series provides compact and high-performance inverter solutions for AC motor drives in lower power applications, up to 2 kW. The series targets cost-sensitive applications below 30A in ceramic substrate packaging with built-in bootstrap diodes. System reliability is further enhanced by built-in NTC for temperature monitoring, integrated under-voltage lock-out function and over-current protection input. Three separate open-emitter pins for low-side IGBTs enable three leg current sensing and built-in bootstrap diodes and dedicated Vs pins make PCB layout easy.

**Applications:** Appliance inverters (such as residential A/C), washing machines, refrigerators, pumps, industrial fans, and compact inverters.



### Features:

- UL Certified No. E209204 (UL1557)
- NPT and ES planar and advanced Field-Stop trench IGBTs with low power loss
- Short circuit-rated
- Enhanced functions with built-in bootstrap diode and NTC thermistor
- Better reliability with higher noise and surge immunity
- Better thermal performance down to 1.9°C/W (max)
- Expanded current rating up to 30A

See the portfolio at [fairchildsemi.com/spm45](https://www.fairchildsemi.com/spm45)

### SPM 3 Series

600V and 1200V SPM 3 module series covers a wide range of power applications up to 3 kW. Separate open emitter terminals are available for each phase to support the widest variety of control algorithms. SPM 3 modules are offered in very low thermal resistance packaging DBC, and full Pak options.

**Applications:** HVAC, commercial air conditioner, compact industrial level inverter, servo-driver, and pumps.



#### Features:

- UL Certified No. E209204 (UL1557)
- NPT planar and Field-Stop trench IGBTs with low power loss
- Short circuit-rated
- Enhanced functions with built-in bootstrap diode and thermal sensing unit (TSU)
- Better reliability with higher noise and surge immunity
- Better thermal performance with DBC substrate 1.1°C/W (max)
- Expanded current rating up to 50A for 600V, 20A for 1200V

See the portfolio at [fairchildsemi.com/spm3](http://fairchildsemi.com/spm3)

### SPM 2 Series

600V and 1200V SPM 2 module series covers up to 10 kW three-phase inverterized motor drive applications. Reliability reinforced using NPT and Field-Stop trench IGBTs with DBC package technologies that achieve 10% reduction in module losses with longer short-circuit rating capabilities and embedded protection circuits. Design conveniences include simple heat sink attachment and component reductions.

**Applications:** HVAC, industrial inverter/servo motors, pumps, and fan motors.



#### Features:

- UL Certified No. E209204 (UL1557)
- NPT trench IGBTs with low power loss
- Adjustable over-current protection
- Enhanced functions with built-in bootstrap diode and NTC thermistor
- Better reliability with higher noise and surge immunity
- Better thermal performance with DBC substrate 0.8°C/W (max)
- Design conveniences: full circle screw hole, no side dummy

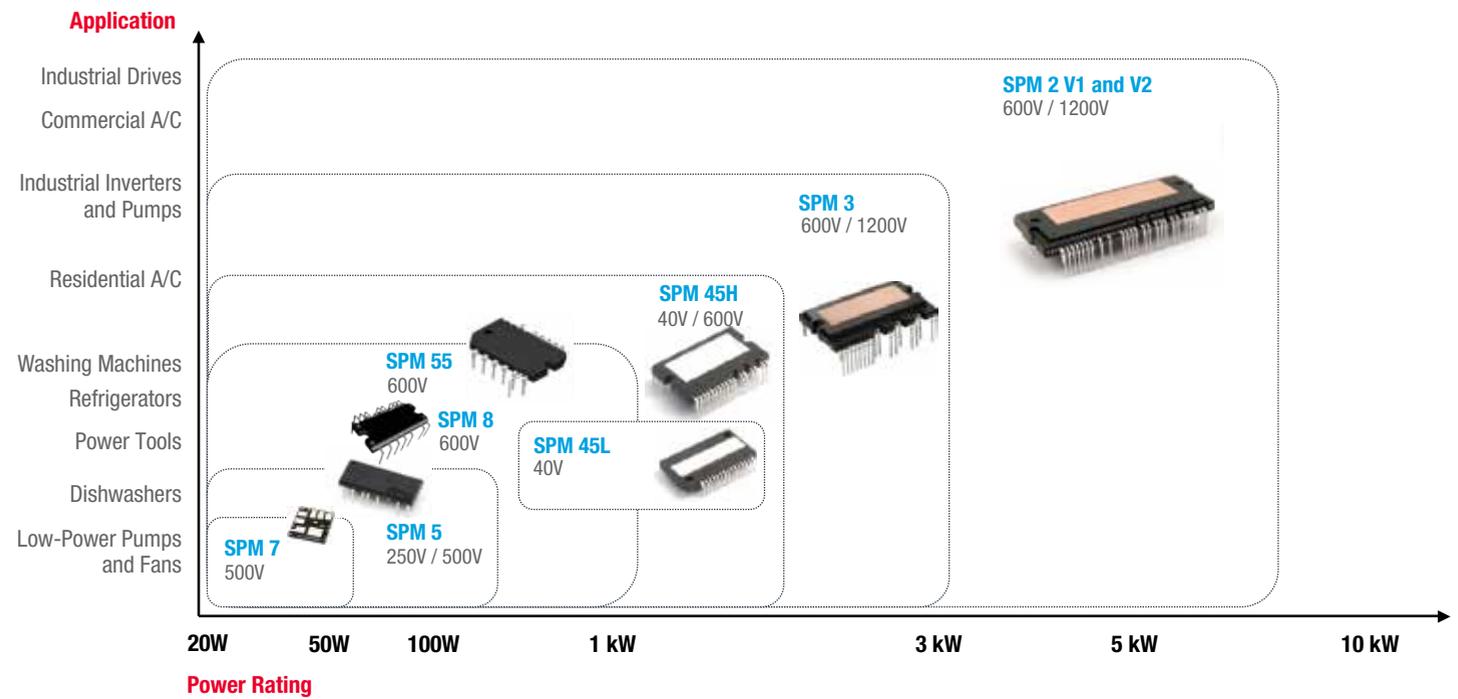
See the portfolio at [fairchildsemi.com/spm2](http://fairchildsemi.com/spm2)

# Motion SPM® Module Portfolio

## SPM Modules — Integrated Motor Drive + Protection

- IGBTs, Super Junction MOSFETs, HVICs, LVICs, and peripherals combined
- Multiple power ratings with a breadth of packages
- Rugged, high efficiency, saves space, cost and development time

## SPM Motor Control Module Portfolio



## Module Packaging Options by Series

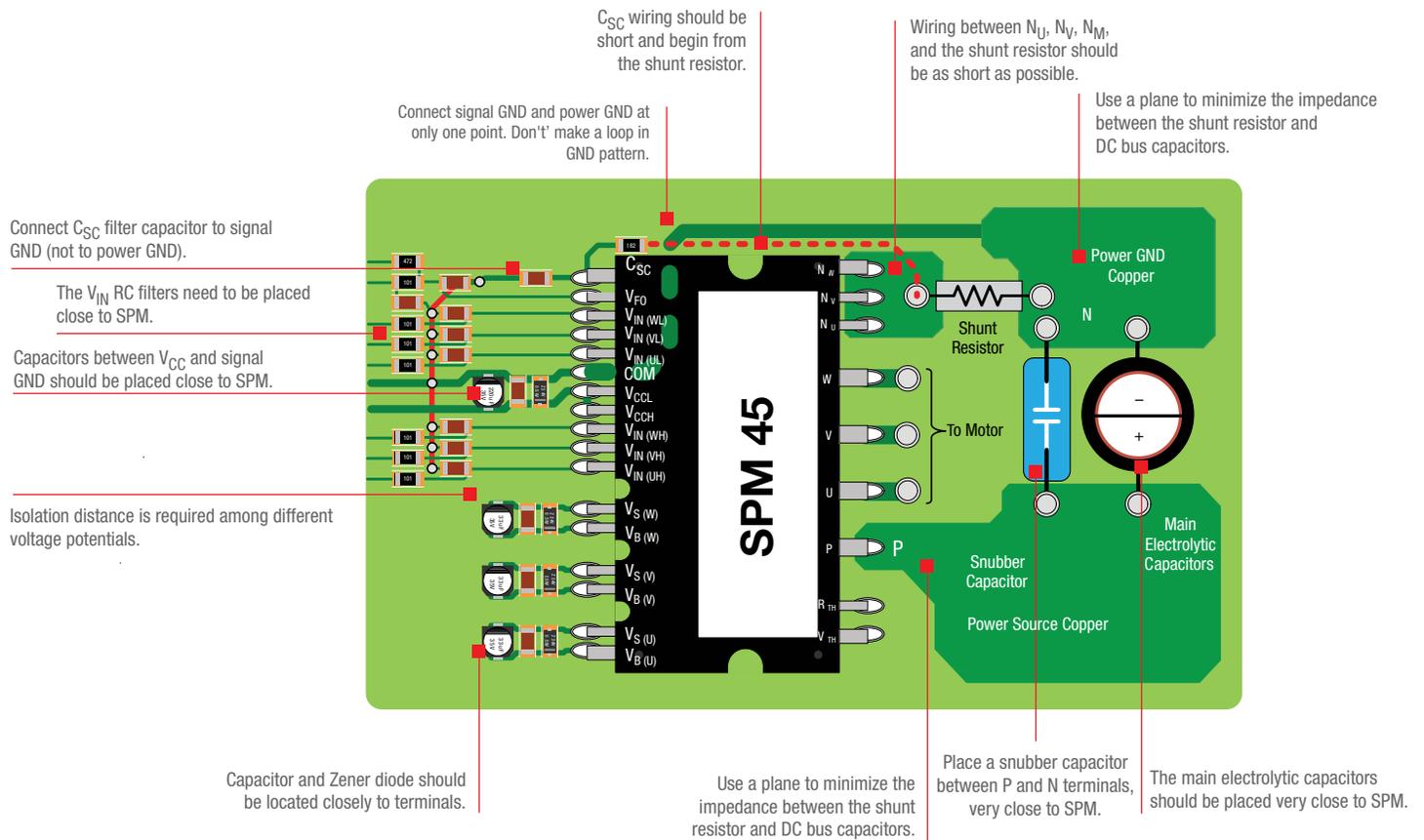


# SPM® Module Design Guidelines

## Achieve High Efficiency and System Reliability with These Design Guidelines

Recommendations for better board design provide significant reduction in electrical over-stress (EOS) to achieve improved system reliability without sacrificing efficiency.

- Minimized stray inductance ( $L_{s1} + L_{s2} + L_{s4}$ ) can reduce ground noise (surge voltage)
- Non-inductive resistor should be used for shunt resistor
- Connect the power ground terminal with the signal ground at a single point, using non-loop ground pattern



For design resources and detailed information on all of the SPM modules, visit [fairchildsemi.com/spm](http://fairchildsemi.com/spm)

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