

# SPM<sup>®</sup> MODULE DESIGN GUIDE

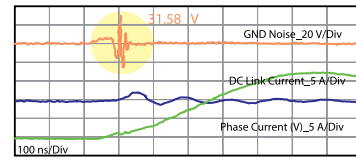
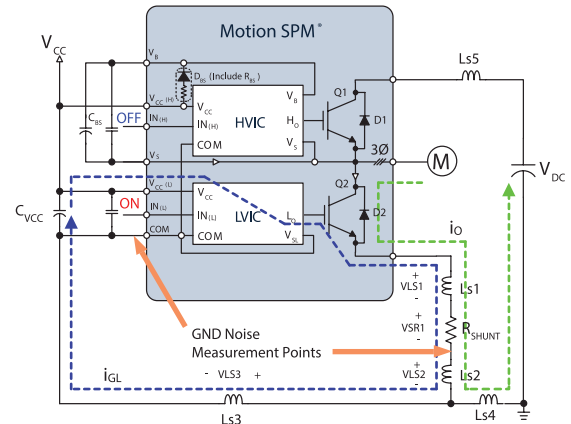
Fairchild Semiconductor has the integrated and discrete devices for your consumer and industrial motor control applications.

Our solutions deliver high integration, power efficiency, system reliability and functionality while reducing engineering development time.

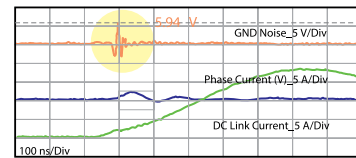
## Achieve High Efficiency and System Reliability with These Design Guidelines

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

- Minimized stray inductance ( $Ls1 + Ls2 + Ls4$ ) 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



Surge Voltage @  $Ls1 + Ls2 + Ls4 = 120 \text{ nH}$



Surge Voltage @  $Ls1 + Ls2 + Ls4 = 35 \text{ nH}$

Connect signal GND and power GND at only one point. Don't make a loop in GND pattern.

Connect  $C_{sc}$  filters's capacitor to signal GND (not to power GND).

The  $V_{in}$  RC filters need to be placed close to SPM.

Capacitors between  $V_{cc}$  and signal GND should be placed close to SPM.

The  $V_{in}$  RC filters should be placed close to SPM.

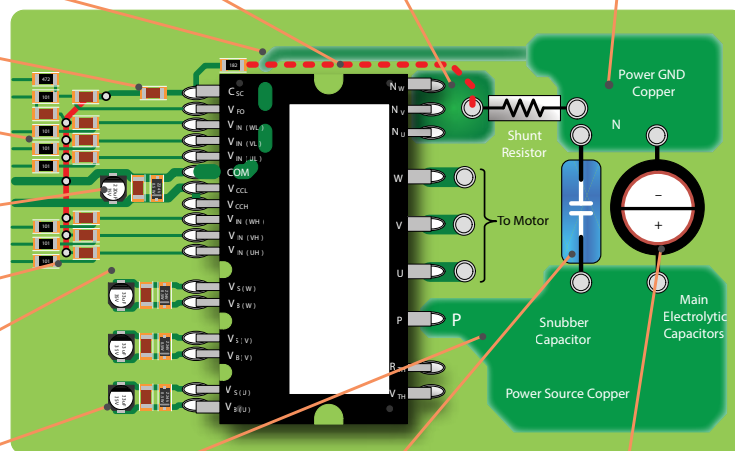
Isolation distance is required among different voltage potentials

Capacitor and Zener diode should be located closely to terminals.

$C_{sc}$  wiring should be short and begin from the shunt resistor.

Wiring between  $N_U$ ,  $N_V$ ,  $N_W$ , and the shunt resistor should be as short as possible.

Use a plane to minimize the impedance between the shunt resistor and DC bus capacitors.



Use a plane to minimize the impedance between the shunt resistor and DC bus capacitors.

Place a snubber capacitor between P and N terminals and very close to SPM.

The main electrolytic capacitors should be placed very close to SPM.

# MOTION SPM<sup>®</sup> MODULE PACKAGE REFERENCE

Dimensions (mm xmm)	Features	Packages 1:1 Ratio		
<b>SPM 5 Series</b> (29 x 12 x 3.1) Substrate: Full-pack Lead Options: Different lead options available	<ul style="list-style-type: none"><li>• 500 V/250 V</li><li>• UVLO, BSD, TSU</li><li>• MOSFETs solution</li></ul>			
<b>SPM 45 Series</b> (39 x 23 x 4.5) Substrate: Ceramic Lead Options: Different lead options available	<ul style="list-style-type: none"><li>• 600 V, 5-20 A</li><li>• NTC, UVLO, OCP, BSD</li><li>• IGBTs solution</li><li>• PFC SPM solution is also available in SPM 45 package</li></ul>			
<b>SPM 3 Series</b> (44 x 26.8 x 5.5) Substrate: DBC, full-pack	<ul style="list-style-type: none"><li>• 600 V, 5-30 A</li><li>• UVLO, OCP, BSD, TSD</li><li>• IGBTs solution is also available in SPM 3 package</li></ul>			
<b>SPM 2 Series</b> (60 x 31 x 7.2) Substrate: DBC	<ul style="list-style-type: none"><li>• 600 V, ~75 A</li><li>• NTC, UVLO, OCP</li><li>• Current sensing with sensing IGBTs</li><li>• IGBTs solution</li><li>• PFC SPM solution is also available in SPM 2 package</li></ul>			
<b>SPM 1 Series</b> (96 x 55 x 7.2) Substrate: DBC	<ul style="list-style-type: none"><li>• 600 V, ~75 A</li><li>• NTC, UVLO, OCP</li><li>• IGBTs solution</li><li>• PFC and inverter merged solution is also available in SPM 1 package</li></ul>			

Description of Integrated Functions in SPM Solution - BSD: Boot Strap Diode, OCP: Over Current Protection, BSD: Thermal Shut Down. TSU: Thermal Sensing Unit. NTC: Negative Temperature Coefficient Thermistor

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