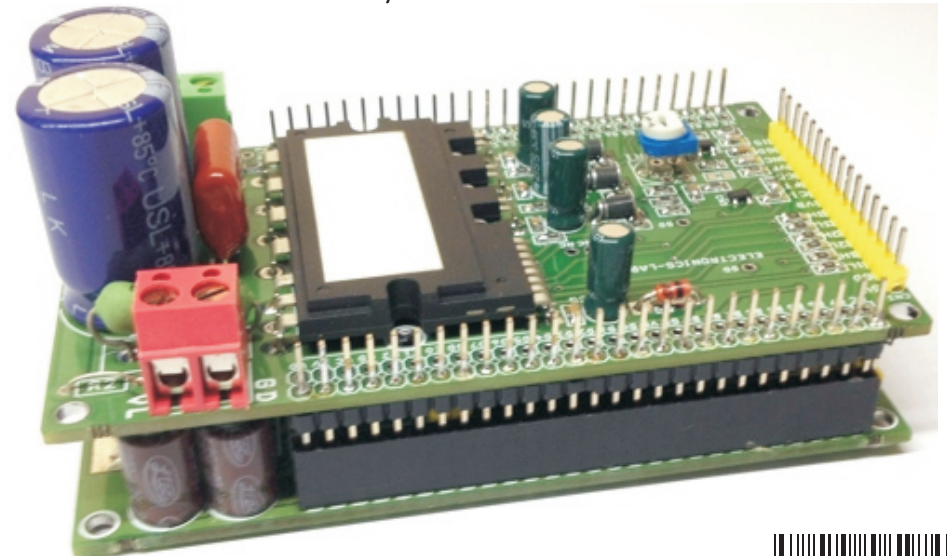


Intelligent Power Module (IPM) Board for Brushless Motors

Intelligent Power Module (IPM) board has been designed using FSBS5CH60 IC from Fairchild, which provides a fully-featured, high-performance inverter output stage for AC Induction, BLDC, and PMSM motors. These modules integrate optimized gate drive of the built-in IGBTs to minimize EMI and losses, while also providing multiple on-module protection features including under-voltage lockouts, over-current shutdown, and fault reporting. 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 module's internal IGBTs. Separate negative IGBT terminals are connected to shunt resistor to provide the current feedback to the micro-controller. This IPM module helps to develop lots of power applications and also can be used as H-Bridge for brushed DC motor. The module is mainly helps to drive Hall sensor based or encoder based motors, it doesn't support FOC algorithm, FOC based IPM board is under development and will be published soon.

This board is designed to evaluate Fairchild Semiconductor's FSBS5CH60. The motion SPM is installed as the motor power module on the board to drive a three-phase AC Induction Motor (ACIM), Brushless DC (BLDC) motor, Brushless AC (BLAC) motor, or Permanent-Magnet Synchronous Motor (PMSM). The board has bulk capacitors and microcontroller (MCU) interface circuitry. As this board is designed for a wide variety of motor types, not all included circuitry is required for all types of motors. Some motor types may require some additional circuitry be added, depending on the control algorithms being implemented.

The board is designed to connect DC power sources feeding current to the motor. The three-phase motor output terminals (U-M1, V-M2, W-M3) from the screw terminal should be connected to the motor windings. Three bootstrap power supply circuits are designed into the board, one per phase. A bootstrap capacitor, charge resistor for charging the capacitor, and the blocking diode for high-voltage isolation make up each bootstrap supply. The microcontroller (MCU) or motion-controller development board connects to this IPM board via the provided 16 Pin header connector. Six low-pass filters are used between the signal input connector and the gate input signal pins of the IC. Short-circuit current protection is provided by a single shunt resistor, op amp, and low-pass filter. Additional resistor divider circuitry is included to monitor bus voltage, inverter phase current, and module temperature.



This board is made for low voltage motor up to 90V DC load up to 5Amps, however it can be used for higher voltage motor up to 400V DC by changing bulk capacitor, refer note for more details. Two 4mm holes provided to mount heat-sink on top of the IC. Board also has 28-40 Pin PIC Micro-Controller and DSpic shield which helps easy interface with many PIC micro-controllers and Motor DSpics. 16 PIN header connector can be hookup to any port pin of PIC/DSpic development board using female to female wire harness.

Safety precautions Warning

The board operates at lethal voltages and has bulk capacitors that store significant charge. Accidental contact can lead to lab equipment damage, personnel injury, and may be fatal. Please be exceptionally careful when probing and handling this board. Always observe normal laboratory precautions.

Note 1: This board support Motor supply up to 90V DC (High Supply Input possible refer Note 2)

Note 2: For higher supply input Change bulk capacitor C6, C7 voltages as per higher supply requirement, extra safety precaution needed to handle the board for higher dc voltage supply input.

Note 3: PR1 Trimmer potentiometer provided to set the over current output, over current detector circuitry is built using comparator.

Note 4: Refer data sheet of FSBS5CH60 IC for more information about input signals and rest features.

Note 5: For bus voltage feed, Choose R5, R6 Resistors as per application requirement.

Features

Supply Up To 90V DC 5Amps

Load 90V DC Up to 5Amps

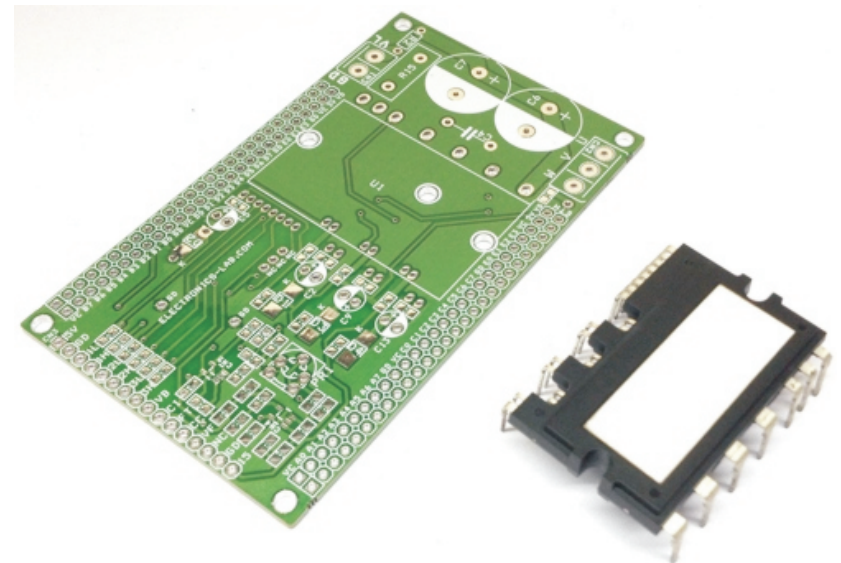
Logic Supply 5V DC (For Op-Amps)

Gate Driver Supply 15V DC

Current Feedback Output 200mV/1Amp

Fault Output Normally High, Goes low at Over Current set point

Trimmer Potentiometer PR1 to set the over current output





Inputs/Outputs 16 Pin Header Connector

Pin 1 5V DC In for Op-amp and Comparator

Pin 2 GND (Ground)

Pin 3 M1 Low-In (U)

Pin 4 M1 High-In (U)

Pin 5 M2 Low-In (V)

Pin 6 M2 High-In (V)

Pin 7 M3 Low-in (W)

Pin 8 M3 High-In (W)

Pin 9 Bus Voltage Feedback Output to Micro-controller

Pin 10 CSI Current Sense Voltage Output 200mV/1amp

Pin 11 over Current/Fault Output To Micro-Controller Normally High Goes Low at Over Current (Comparator)

Pin 12 Short Circuit Current Detection

Pin 13 Fault Out IPM IC

Pin 14 Not In Use

PIN 15 GND

Pin 16 15V DC Supply Input for Gate Drivers

BOM			
SR.	QNTY	REF	DESC
1	1	CN1	2 PIN SCREW TERMINAL
2	1	CN2	4 PIN SCREW TERMINAL
3	1	CN3	16 PIN HEADER CONNECTOR
4	1	CN4	LMV7235 SMD
5	1	CN5	MCP6021 SMD
6	6	C1,C3,C8,C12,C15,C20	0.1uF SMD 0805
7	3	C2,C9,C13	33uF35V
8	1	C4	0.1uF/630V
9	1	C5	33uF/35V
10	2	C6,C7	470uF/100V
11	2	C10,C14	33KPF SMD 0805
12	1	C11	1KPF/50V SMD 0805
13	1	C16	47KPF SMD 0805
14	2	C17,C19	33PF SMD 0805
15	2	C18,C27	OMIT
16	6	C21,C22,C23,C24,C25,C26	1KPF SMD 0805
17	3	D1,D3,D4	1N4007 SMD 4007
18	1	D2	15V/1W ZENER
19	1	PR1	5K TRIMMER POTENTIOMETER
20	7	R1,R3,R4,R7,R9,R12,R13	2.2E SMD 0805
21	4	R2,R11,R19,R26	0E SMD 0805
22	1	R5	220K SMD 0805
23	3	R6,R20,R25	1K SMD 0805
24	1	R8	10K SMD 0805
25	2	R10,R16	2.00E+02
26	1	R14	62E SMD 0805
27	1	R15	0.01/3W
28	1	R17	2K4 SMD 0805
29	1	R18	1M SMD 0805
30	1	R21	20K SMD 0805
31	3	R22,R23,R24	330E SMD 0805
32	6	R27,R28,R29,R30,R31,R32	100E SMD 0805
33	1	U1	FSBS5CH60 FAIRCHILD



