

STK5MFU3C1AGEVB

STK5MFU3C1A-E Evaluation Board User's Manual



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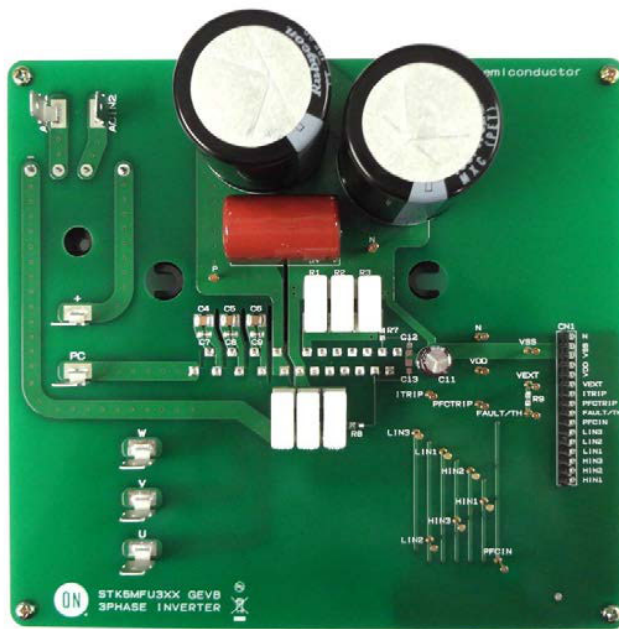
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Introduction

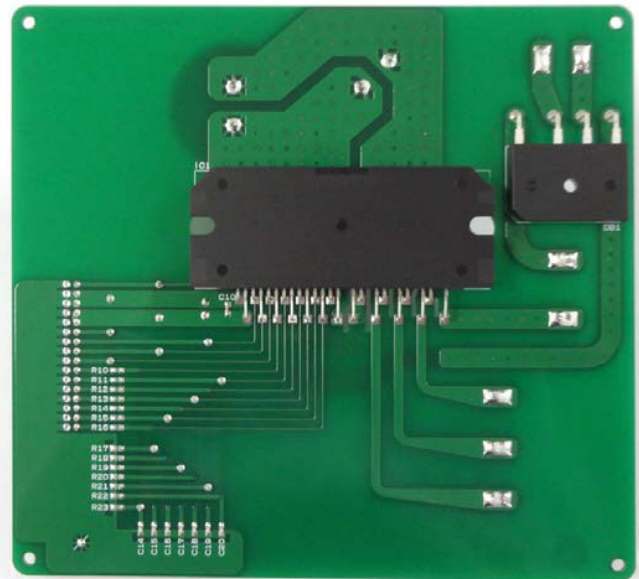
STK5MFU3C1AGEVB includes the basic external components needed for the operation of STK5MFU3C1A-E (SIP28 78x31.1 / 2in1 PFC and Inverter / 1shunt) and enables to evaluate this model.

EVAL BOARD USER'S MANUAL

ONPN of EVAL Board	ONPN of IPM	Io
STK5MFU3C1AGEVB	STK5MFU3C1A-E	30 A



Top View



Bottom View

Figure 1. Evaluation Board Photos

STK5MFU3C1AGEVB

CIRCUIT DIAGRAM

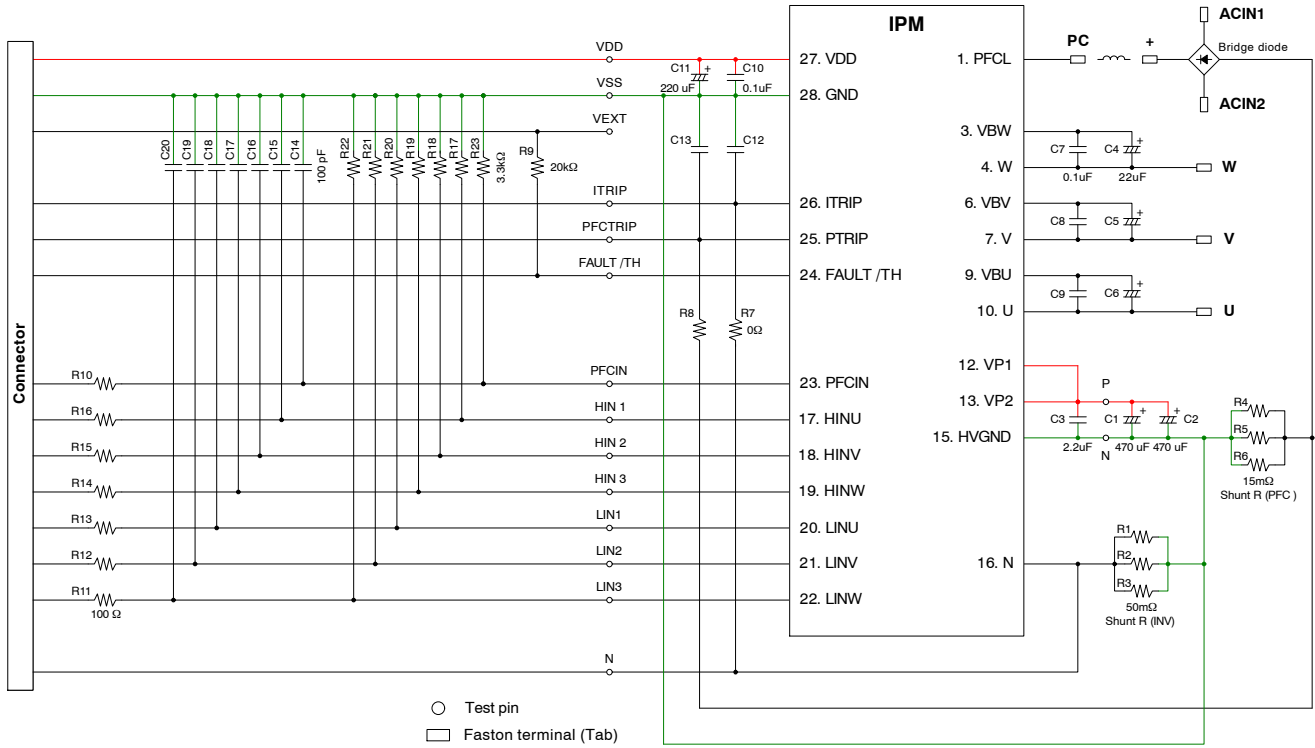


Figure 2. Evaluation Board Schematic

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PIN DESCRIPTION

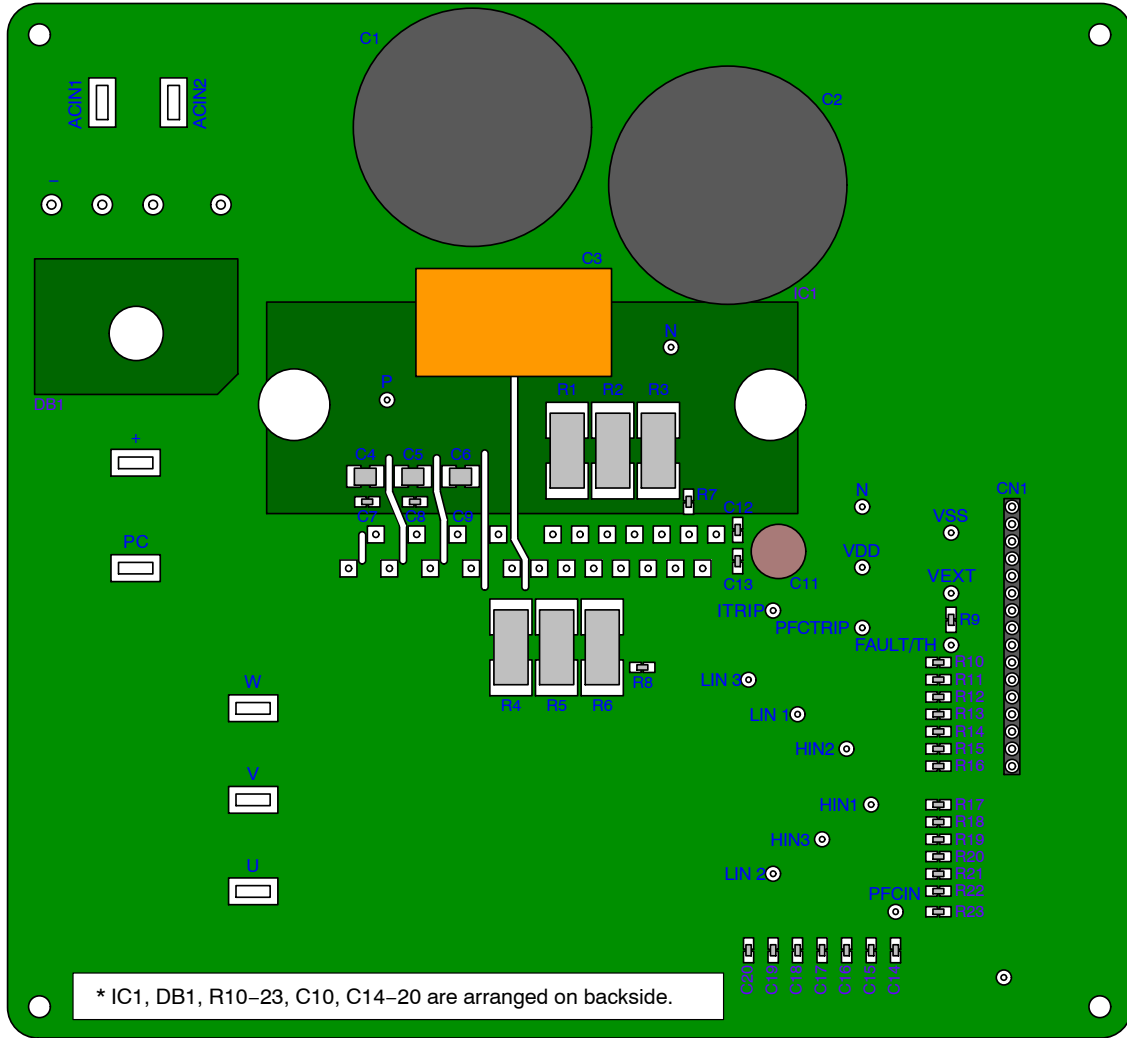


Figure 3. Transparent View from Top Side

U, V, W : 3 phase inverter output

VDD : Control power supply

VSS : Signal GND

PC : Rectified AC Voltage input

HINx, LINx, PFCIN : Control signal input

ITRIP : Over-current protection for Inverter

PFCTRIP : Over-current protection for PFC

VEXT : FAULT/TH pull-up

Apply the logic I/O voltage

FAULT/TH : Fault output, Thermistor

ACIN1, ACIN2 : Bridge diode AC voltage input

+, - : Bridge diode output

R1-6 : Shunt resistor, 3 parallel connection

R7 (, C12) : RC filter for ITRIP

R8 (, C13) : RC filter for PFCTRIP

R10-16, C14-20 : Low pass filter for signal input

Prevention malfunction by noise

R17-23 : Pull-down to VSS for signal input

Prevention malfunction by external wiring

C4-6 : Boot strap capacitor

Blue : Arranged on top side

Purple : Arranged on back side

* C10 is arranged on back position of C12 and C13.

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OPERATION PROCEDURE

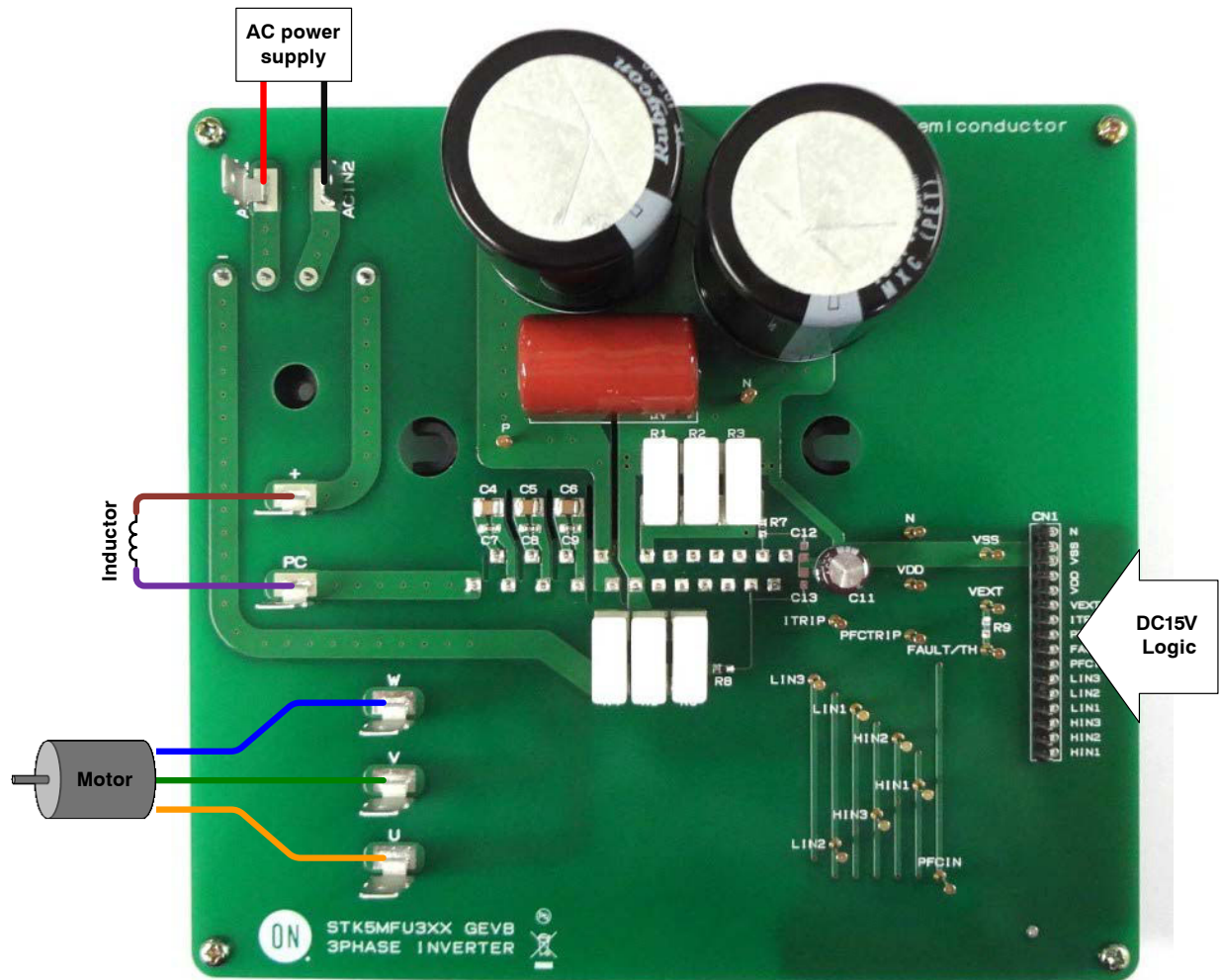


Figure 4. Connection Example

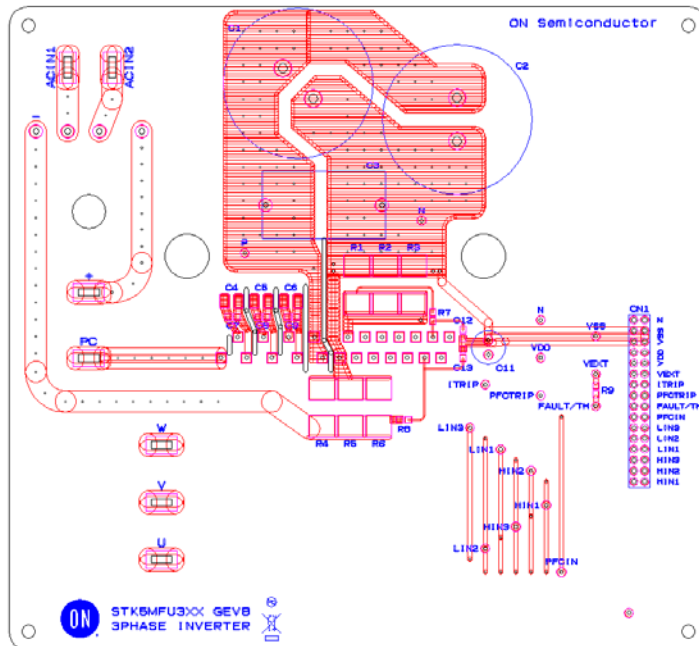
- Step 1. Connect IPM, the three power supplies, logic parts, inductor and the motor to the evaluation board, and confirm that each power supply is OFF at this time.
- Step 2. Apply DC15V to VDD and the logic I/O voltage to VEXT.
- Step 3. Perform a voltage setup according to specifications, and apply AC power supply between ACIN1 and ACIN2.

Step 4. The IPM will start when signals are applied. The low-side inputs must be switched on first to charge up the bootstrap capacitors.

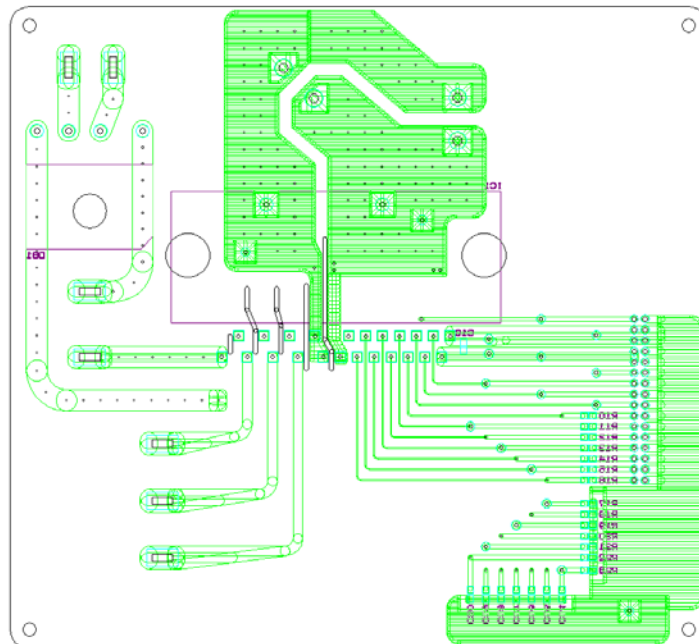
NOTE: When turning off the power supply part and the logic part, please carry out in the reverse order to above steps.

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LAYOUT



Top Side



Back Side

Figure 5. Evaluation Board Layout (Top View)

Length: 152 mm

Side: 165 mm

Thickness: 1.6 mm

Rigid double-sided substrate (Material: FR-4)

Both sides resist coating

Copper foil thickness: 70 μm

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BILL OF MATERIALS

Table 1. BILL OF MATERIALS

Designator	Qty	Description	Value	Tolerance	Foot-print	Manufacturer	Manufacturer Part number	Substitution Allowed
R1 – R3	3	Metal plate resistor	50 mΩ / 5 W	±10%		KOA	BPR58C50LK	YES
R4 – R6	3	Metal plate resistor	15 mΩ / 5 W	±10%		KOA	BPR58C15LK	YES
R7, R8	2		0 Ω		SMD 1608	KOA	RK73Z1JTDD	YES
R9	1		20 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JTDD2002F	YES
R10 – R16	7		100 Ω / 0.1W	±1%	SMD 1608	KOA	RK73H1JTDD1000F	YES
R17 – R23	7		3.3 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JTDD3301F	YES
C1, C2	2	Aluminum electrolytic capacitor	470 μF / 450 V	±20%	Through-hole	Rubycon	450MXC470MEFCSN35X50	YES
C3	1	Film capacitor	2.2 μF / 630 V	±5%	Through-hole	PANASONIC	ECQE6225JT	YES
C4 – C6	3		22 μF / 25 V	±20%	SMD 3225	MURATA	GRM32ER71E226ME15L	YES
C7 – C10	4		0.1 μF / 50 V	±10%	SMD 1608	MURATA	GRM188B31H104K	YES
C11	1	Aluminum electrolytic capacitor	220 μF / 35 V	±20%	Through-hole	Nippon Chemi-Con	EKMG350ELL221MHB5D	YES
C12, C13	2					NC		
C14 – C20	7		100 pF / 50 V	±5%	SMD 1608	MURATA	GRM1882C1H101J	YES
DB1	1	Bridge diode	25 A / 800 V		Through-hole	Shindengen	D25XB80	YES
CN1	1	Connector	16 pin / 2.54 pitch		Through-hole	Hirose	A2-16PA-2.54DSA(71)	YES
VSS, VDD, VEXT, N, ITRIP, PFCT RIP, FAULT/TH, PFCIN, HIN1-3, LIN1-3, P, N	16	Test pin			Through-hole	Mac8	ST-1-3	YES
U, V, W, +, PC, ACIN1, ACIN2	7	Faston terminal (Tab)			Through-hole			YES
IC1	1	Boost PFC + 3 Phase Inverter IPM			Through-hole	ON Semiconductor	STK5MFU3C1A-E	NO

NOTE: All components are lead free.

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HEAT SINK MOUNTING

Table 2. MOUNTING CONDITION

Item	Recommended Condition
Pitch	70.0 ± 0.1 mm (Please refer to Package Outline Diagram)
Screw	Diameter: M4 Bind machine screw, Truss machine screw, Pan machine screw
Washer	Plane washer The size is D = 9.0 mm, d = 4.3 mm and t = 0.8 mm JIS B 1256 (Figure 7.)
Heat Sink	Material: Aluminum or Copper Warpage (the surface that contacts IPM): -50 to 100 μm Screw holes must be countersunk. No contamination on the heat sink surface that contacts IPM.
Torque	Temporary tightening: 20 to 30% of final tightening on first screw Temporary tightening: 20 to 30% of final tightening on second screw Final tightening: 0.79 to 1.17 Nm on first screw Final tightening: 0.79 to 1.17 Nm on second screw
Grease	Silicone grease Thickness: 100 to 200 μm Uniformly apply silicone grease to whole back. Thermal foils are only recommended after careful evaluation. Thickness, stiffness and compressibility parameters have a strong influence on performance.

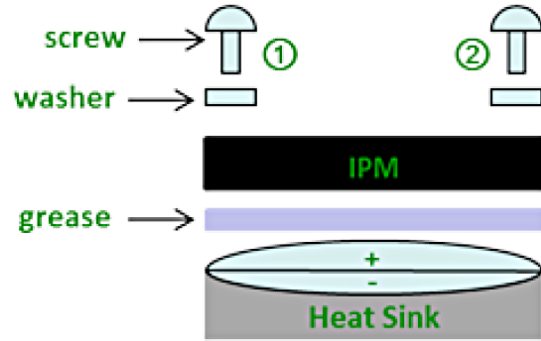


Figure 6. Mounting Composition

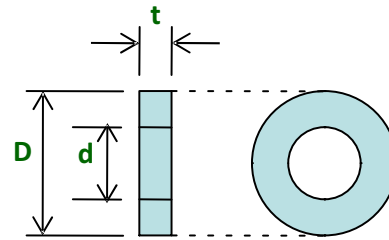


Figure 7. Size of Washer

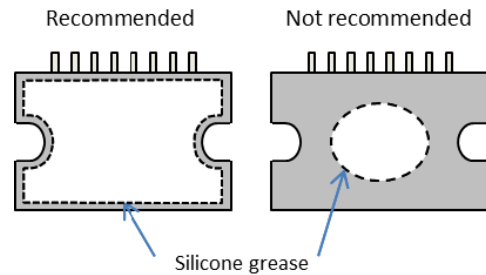


Figure 8. Uniform Application of Thermal Grease

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