STK5MFU3C1AGEVB

STK5MFU3C1A-E Evaluation Board User's Manual

ON Semiconductor®

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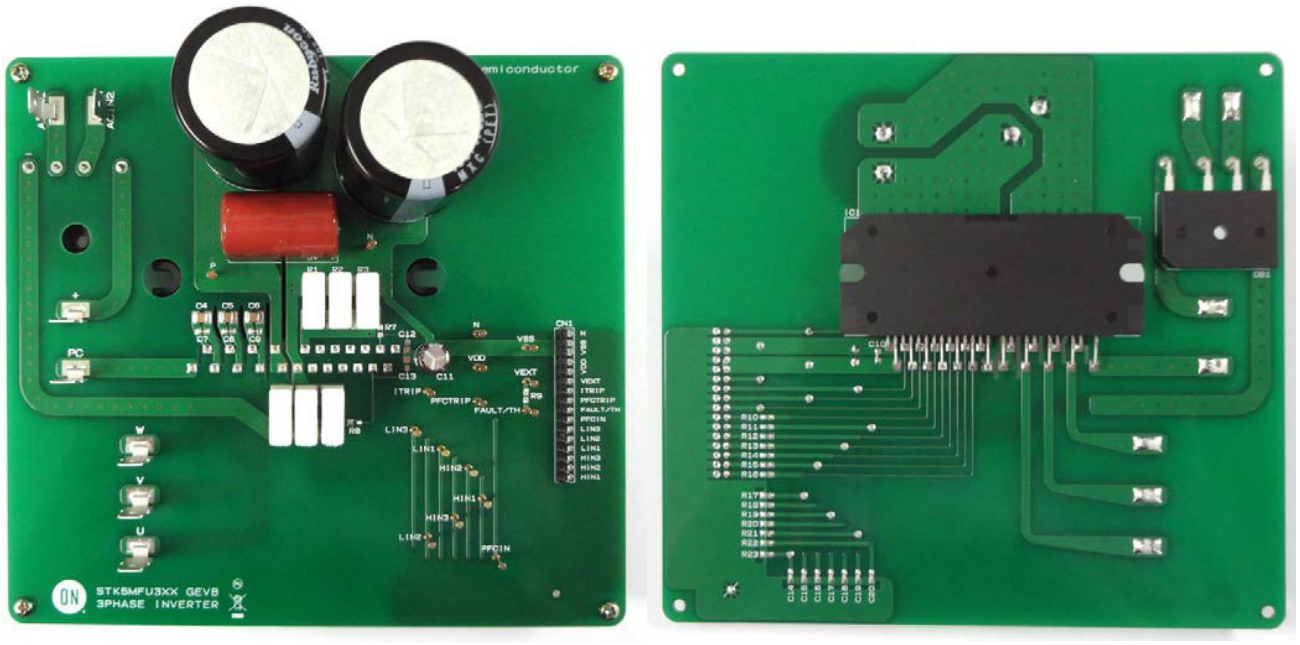
EVAL BOARD USER'S MANUAL

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.

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



Top View Bottom View

Figure 1. Evaluation Board Photos

CIRCUIT DIAGRAM

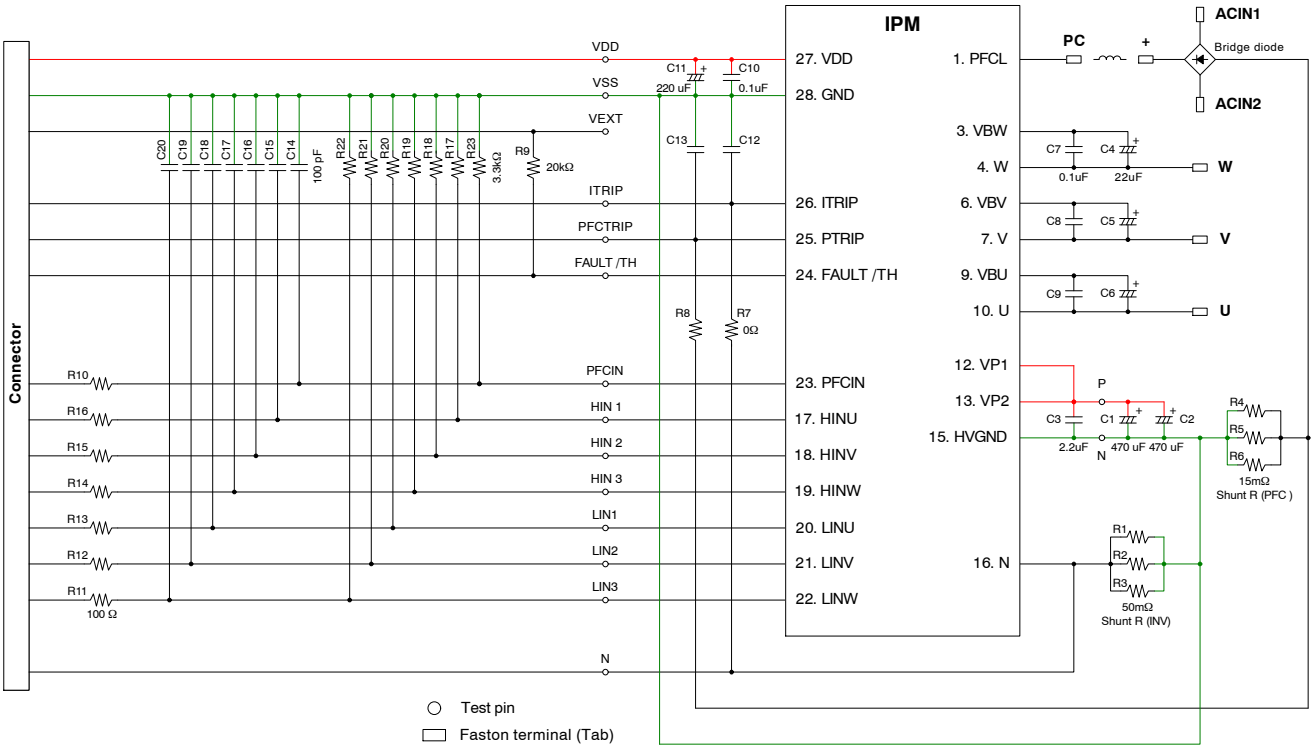


Figure 2. Evaluation Board Schematic

PIN DESCRIPTION

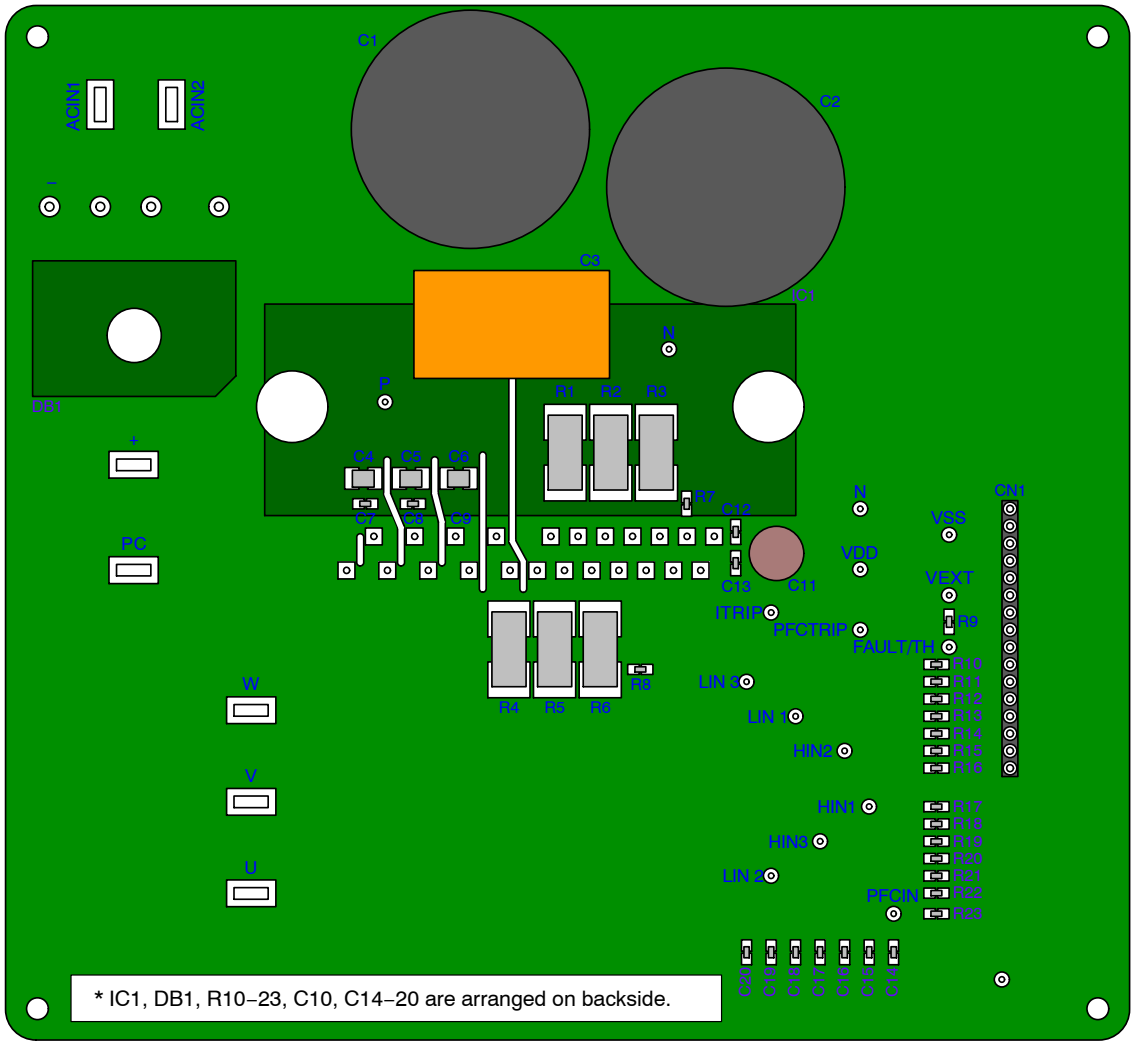


Figure 3. Transparent View from Top Side

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.

OPERATION PROCEDURE

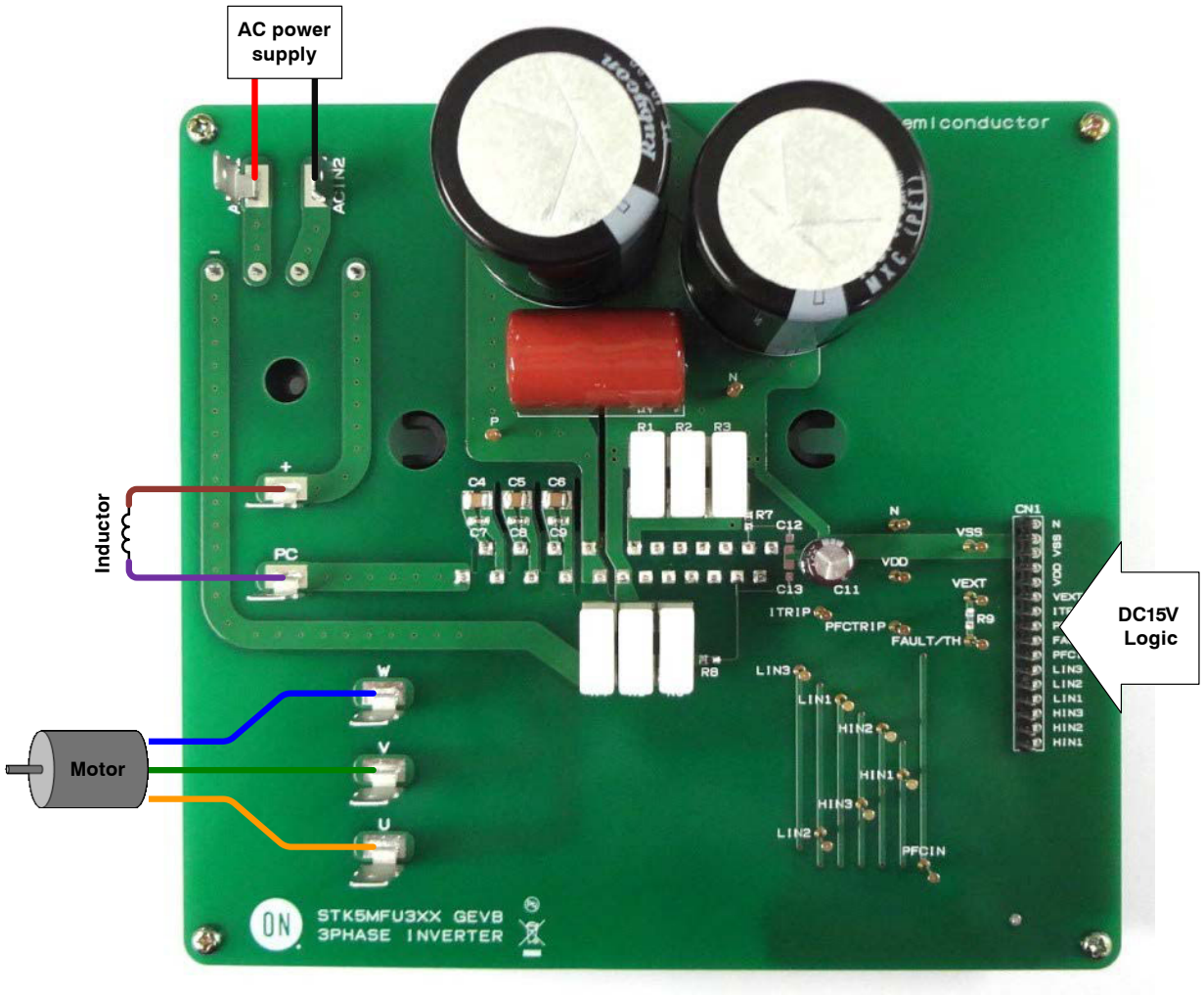


Figure 4. Connection Example

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.

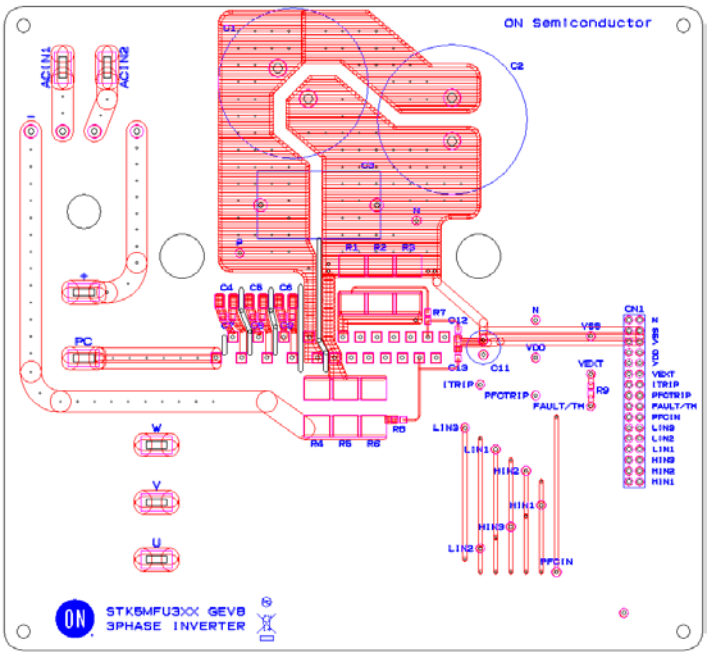
Step 2. Apply DC15V to VDD and the logic I/O voltage to VEXT.

Step 3. Perform a voltage setup according to specifications, and apply AC power supply between ACIN1 and ACIN2.

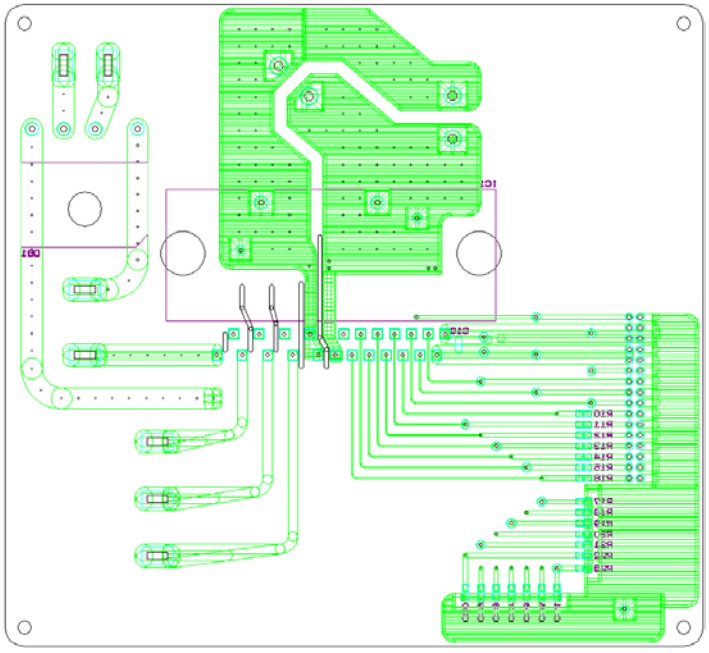
Step 4. The IPM will start when signals are applied. The low−side inputs must be switched on first to charge up the bootstrap capacitors.

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

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

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	RK73Z1JTTD	YES
R9	1		20 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JTTD2002F	YES
R10 – R16	7		100 Ω / 0.1W	±1%	SMD 1608	KOA	RK73H1JTTD1000F	YES
R17 – R23	7		3.3 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JTTD3301F	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, PFCTRIP, 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.

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.

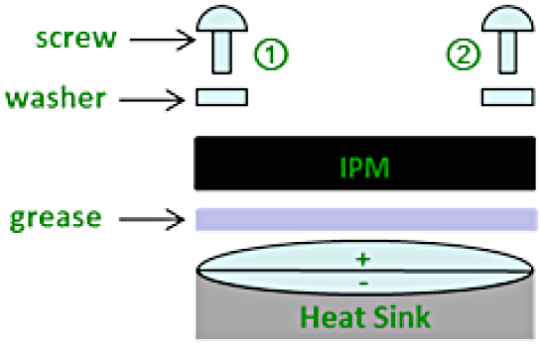


Figure 6. Mounting Composition

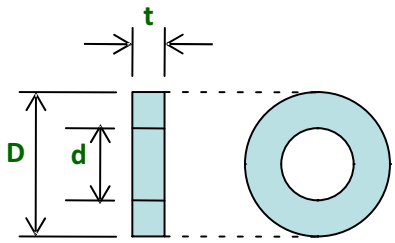


Figure 7. Size of Washer

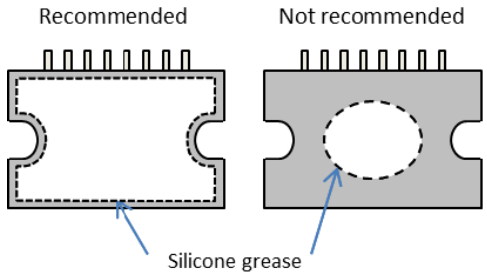


Figure 8. Uniform Application of Thermal Grease

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