

STK57FU394AGGEVB

STK57FU394AG-E Evaluation Board User's Manual



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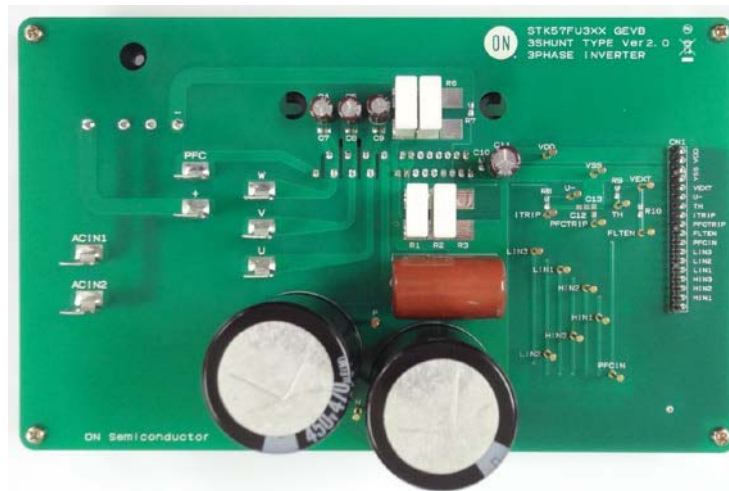
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Introduction

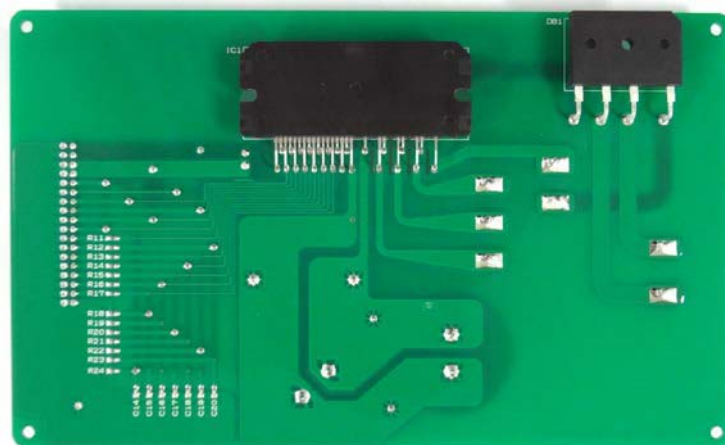
By using this board, STK57FU394AG-E (SIP2A / 2in1 / 3shunt) can be evaluated.

EVAL BOARD USER'S MANUAL

ONPN of EVAL Board	ONPN of IPM	Io
STK57FU394AGGEVB	STK57FU394AG-E	15 A



Top View



Bottom View

Figure 1. Evaluation Board Photos

STK57FU394AGGEVB

CIRCUIT DIAGRAM

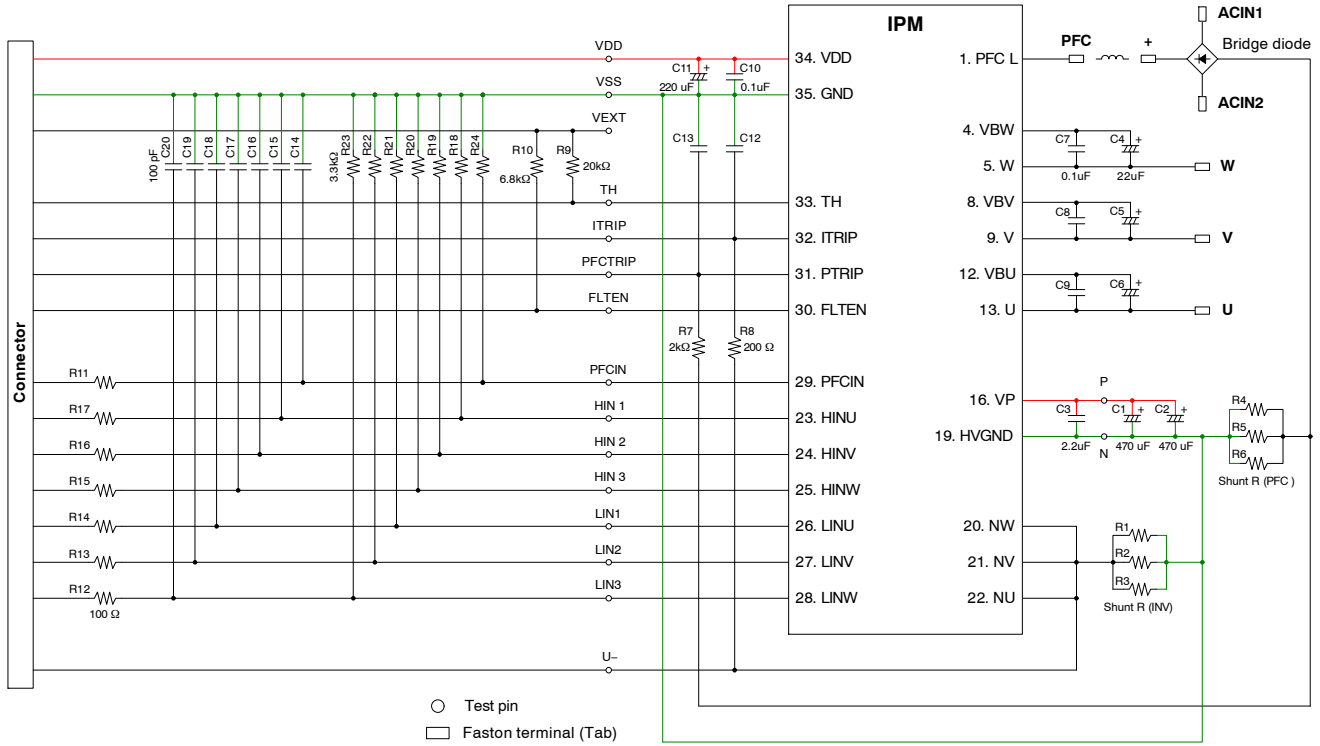


Figure 2. Evaluation Board Schematic

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PIN DESCRIPTION

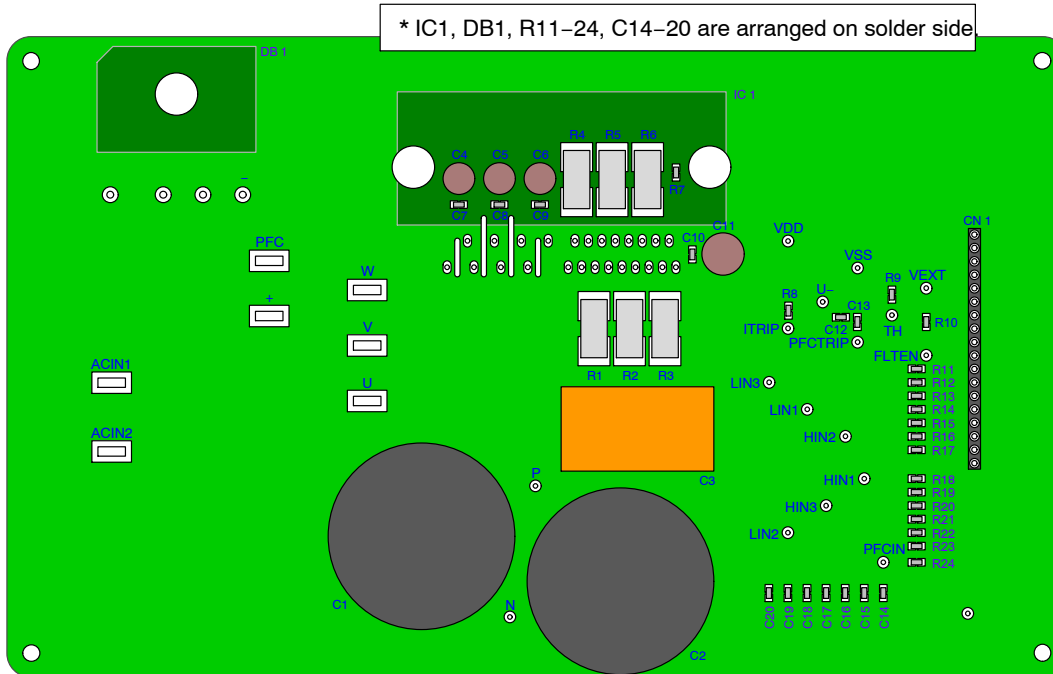


Figure 3. Transparent View from Top Side

U, V, W : 3 phase inverter output

VDD : Control power supply (DC 15 V)

VSS : Signal GND

PFC : Rectified AC Voltage input

HINx, LINx, PFCIN : Control signal input

ITRIP : Over-current protection for Inverter

PFCTRIP : Over-current protection for PFC

VEXT : FLTEN, TH pull-up

Apply the logic I/O voltage

FLTEN : Enable input and Fault output

TH : Internal termistor

ACIN1, ACIN2 : Bridge diode AC voltage input

+, - : Bridge diode output

R1-6 : Shunt resistor, 3 parallel connection

R8 (, C12) : RC filter for ITRIP

R7 (, C13) : RC filter for PTRIP

R9 : Pull-up to VEXT (TH)

R10 : Pull-up to VEXT (FLTEN)

R11-17, C14-20 : Low pass filter for signal input

Prevention malfunction by noise

C4 -6 : Boot strap capacitor

R18-24 : Pull-down to VSS for signal input

Prevention malfunction by external wiring

IC1 : IPM

DB1 : Bridge diode

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OPERATION PROCEDURE

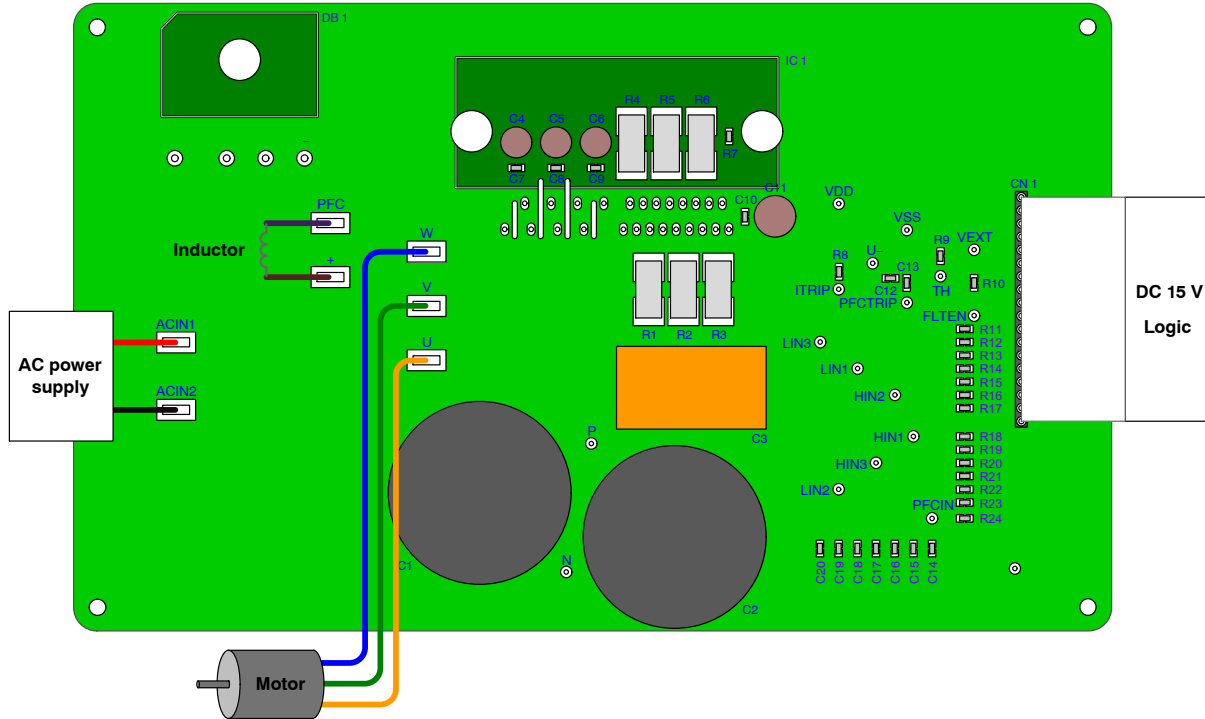


Figure 4. Connection Example

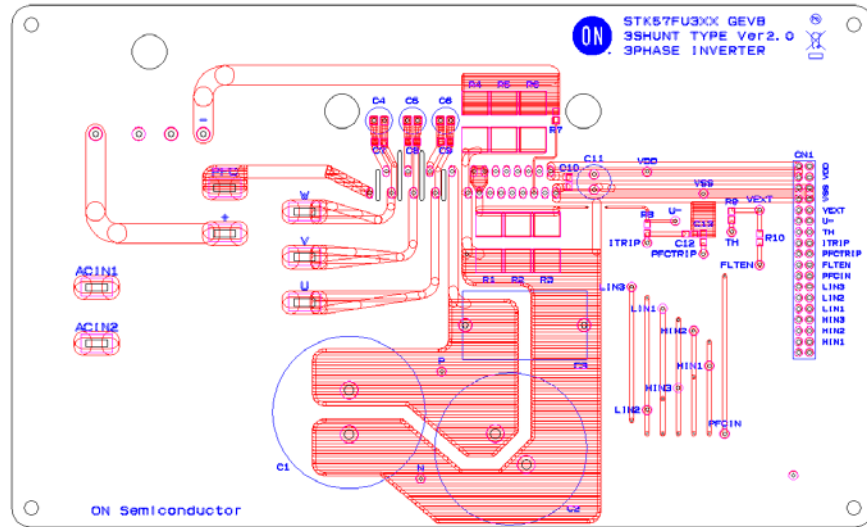
- Step 1. Connect IPM, the three power supplies, logic parts, inductor and the motor to the evaluation board, and confirm that each power supply is OFF at this time.
- Step 2. Apply DC 15 V to VDD and the logic I/O voltage to VEXT.
- Step 3. Perform a voltage setup according to specifications, and apply 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.

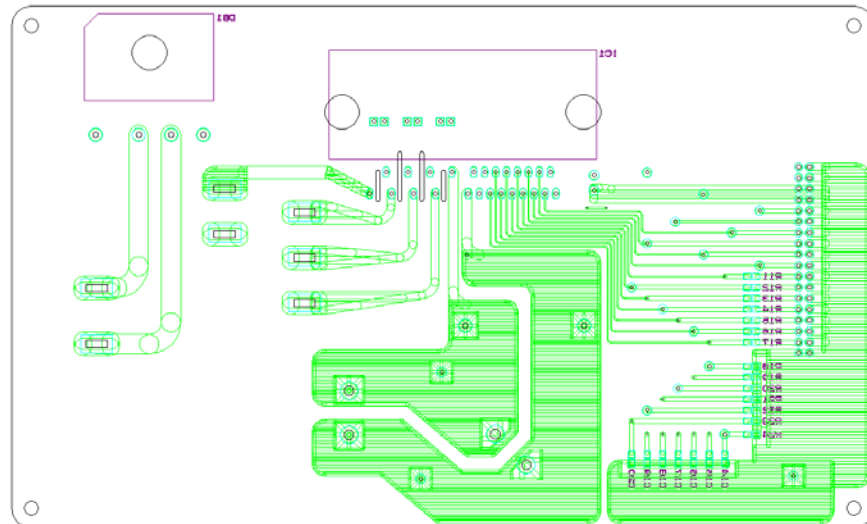
NOTE: When turning off the power supply part and the logic part, please carry out in the reverse order to above steps.

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LAYOUT



Top Side



Back Side

Figure 5. Evaluation Board Layout (Top View)

Length: 121 mm
Side: 200 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	Footprint	Manufacturer	Manufacturer Part Number	Substitution Allowed
R1, R2	2	Metal plate resistor	50 mΩ / 5 W	±10%		KOA	BPR58C50LK	Yes
R4, R5	2	Metal plate resistor	20 mΩ / 5 W	±10%		KOA	BPR58C20LK	Yes
R7	1		2 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JT2D2001F	Yes
R8	1		200 Ω / 0.1 W	±1%	SMD 1608	KOA	RK73H1JT2D2000F	Yes
R9	1		20 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JT2D2002F	Yes
R10	1		6.8 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JT2D6801F	Yes
R11 – R17	7		100 Ω / 0.1 W	±1%	SMD 1608	KOA	RK73H1JT2D1000F	Yes
R18 – R24	7		3.3 kΩ / 0.1 W	±1%	SMD 1608	KOA	RK73H1JT2D3301F	Yes
C1, C2	2	Aluminum electrolytic capacitor	470 μF / 450 V	±20%	Through-hole	Rubycon	450MXC470MEFCN35X50	Yes
C3	1	Film capacitor	2.2 μF / 630 V	±5%	Through-hole	PANASONIC	ECQE6225JT	Yes
C4 – C6	3		47 μF / 50 V	±20%	Through-hole	Nippon Chemi-Con	EKMG500ELL470MF11D	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		optional		SMD 1608			Yes
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	18 pin / 2.54 pitch		Through-hole	Hirose	A2-18PA-2.54DSA(71)	Yes
VSS, VDD, VEXT, U-, TH, ITRIP, PFCTRIP, FLTEN, PFCIN, HIN1-3, LIN1-3, P, N	17	Test Pin			Through-hole	Mac8	ST-1-3	Yes
U, V, W, +, PFC, ACIN1, ACIN2	7	Faston terminal (Tab)			Through-hole			Yes
IC1	1	3 Phase Inverter IPM			Through-hole	ON Semiconductor	STK57FU394AG-E	No

NOTE All components are lead free.

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HEAT SINK MOUNTING

Table 2. MOUNTING CONDITION

Item	Recommended Condition
Pitch	56.0 ± 0.1 mm (Please refer to Package Outline Diagram)
Screw	Diameter: M3 Screw head types: pan head, truss head, binding head
Washer	Plane washer The size is D = 7 mm, d = 3.2 mm and t = 0.5 mm JIS B 1256
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: 0.6 to 0.9 Nm on first screw Final tightening: 0.6 to 0.9 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.

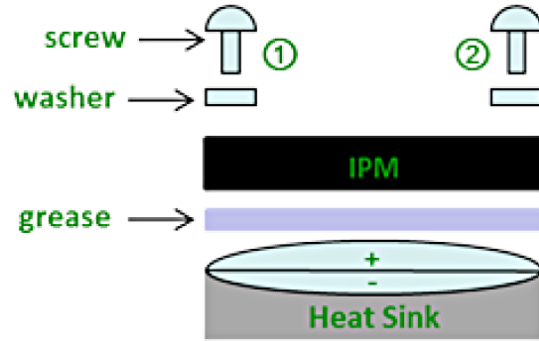


Figure 6. Mounting Composition

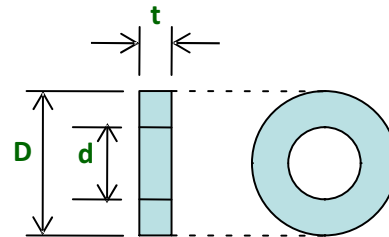


Figure 7. Size of Washer

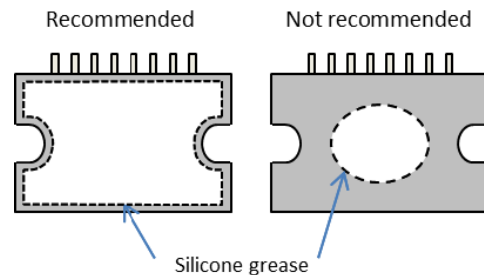



Figure 8. Uniform Application of Grease Recommended

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