

Evaluation Board for IGBT Module

1. Introduction

The Evaluation Board FA5650N_7MBR100VP060 was developed to support customers during their first steps designing applications with the High voltage driver IC FA5650N and IGBT module. This Board realizes driving 3-phase motor by easy wiring because built-in Rectifier Diode Bridge, Inverter circuit and IGBT gate drive circuit.

3. IGBT module type which can be tested

- 7MBR50VP060-50
- 7MBR75VP060-50
- 7MBR100VP060-50
- 600V Power Integrated Module only.

2. Features

- Input voltage: AC170~264V, 50/60Hz
- Rated output power: up to 7.5kW motor
- Control signals 3.3V Logic compatible
- Single control power supply of DC+15V
- Built-in high and low side Gate Driver IC
- Built-in Bootstrap circuit
- Built-in Current sensor of DC-bus line

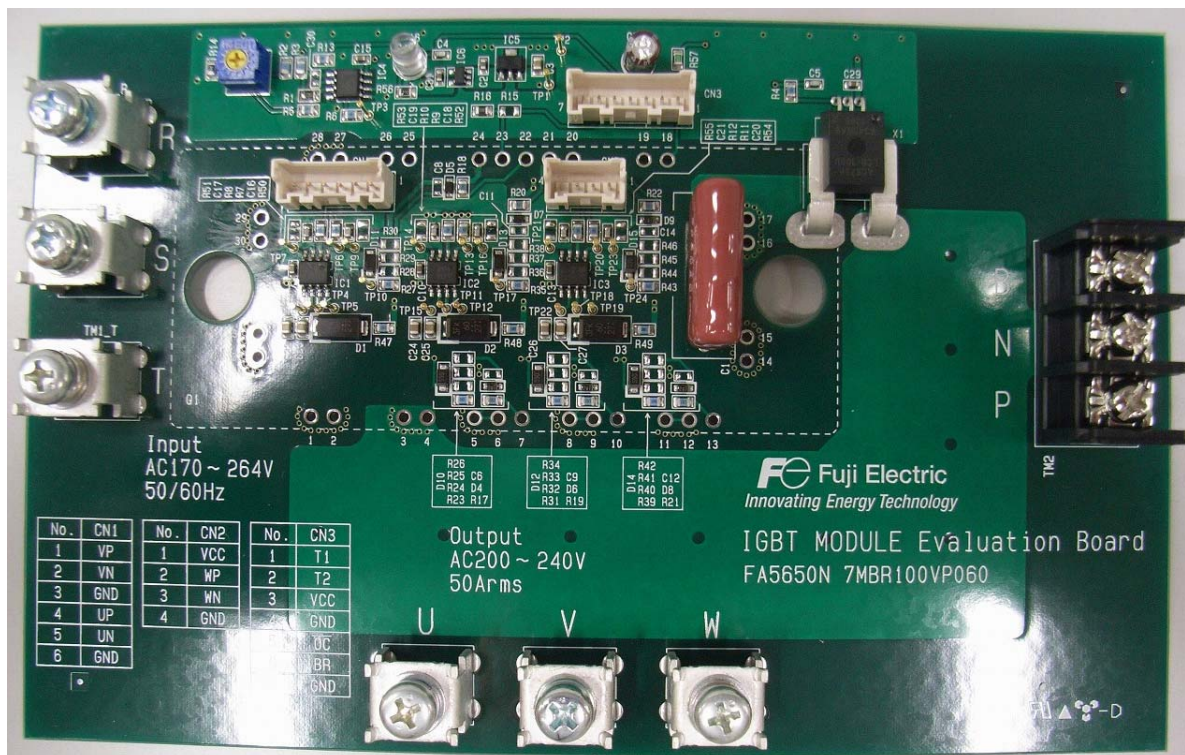


Figure 1 Evaluation Board FA5650N_7MBR100VP060

190 x 120 mm

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4. Block Diagram

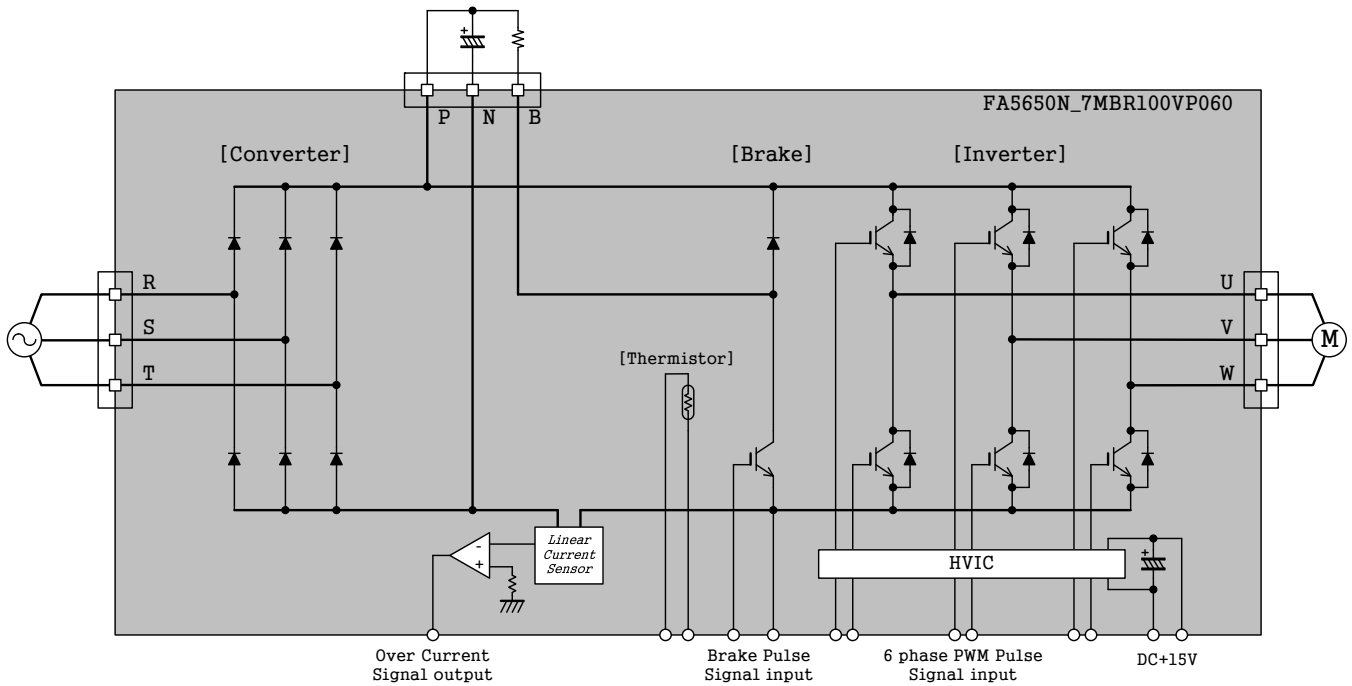


Figure 2 Evaluation Board Block Diagram

5. Preparations for use

- Soldering of the IGBT module to this evaluation board.
- Apply a thermal compound to a copper base side of the IGBT module.
- Screw fastening of the IGBT module is carried out to a cooling fin by rated torque.
- Connect AC power supply to the R,S,T terminals of this evaluation board in screw.
- Connect the electrolytic capacitors to the P,N terminals of this evaluation board in screw.
- Connect the motor cables to the U,V,W terminals of this evaluation board in screw.
- Connect the DC+15V power supply to the VCC pins and GND pins of CN1, CN2 and CN3 by connectors.
- Connect the PWM Pulses input wires to the UP/UN pins, VP/VN pins and WP/WN pins by connectors.

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6. Circuit

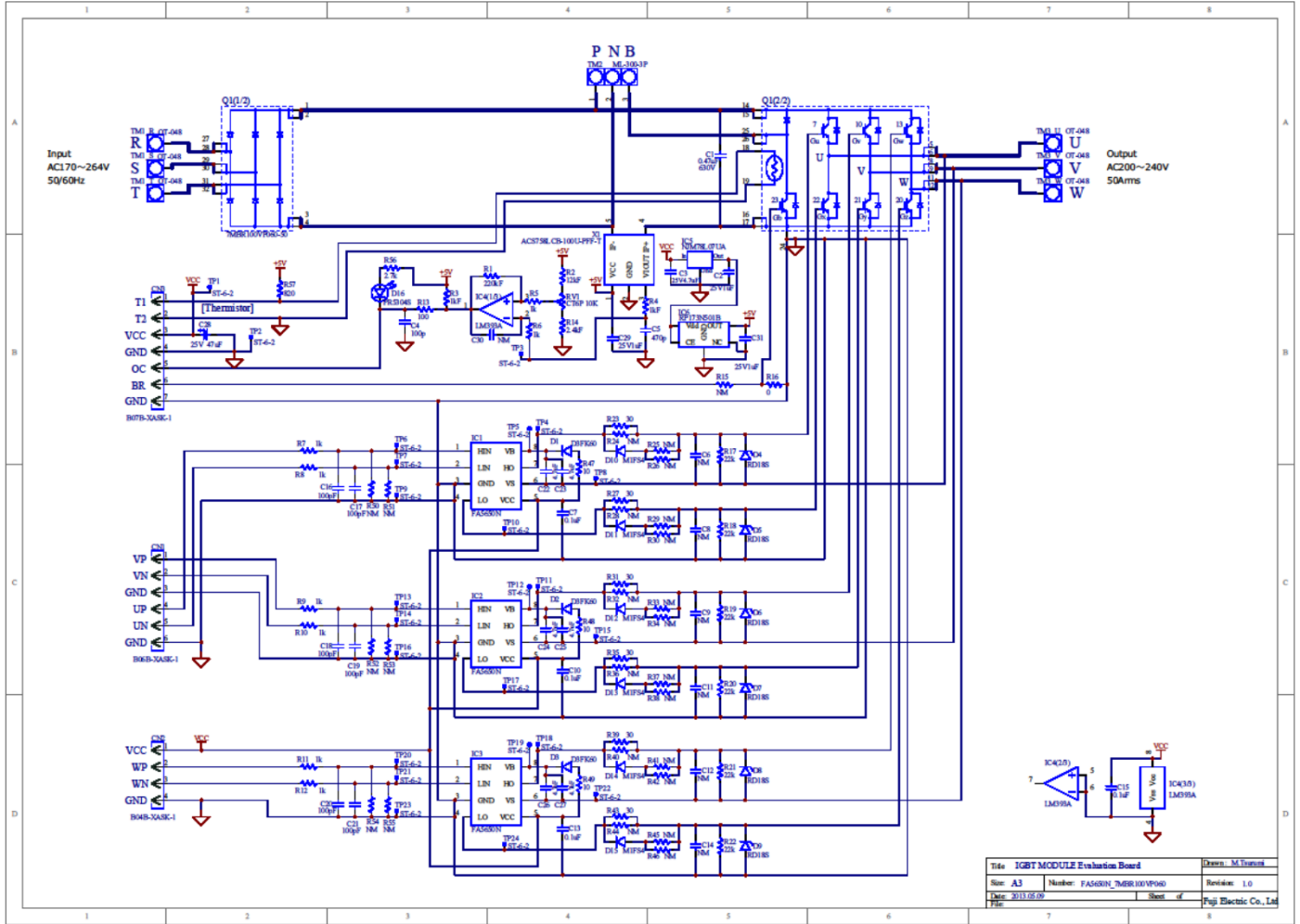


Figure 3 Evaluation Board Block Circuit

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7. Pin assignment

Table 1. Main terminals

TM1	
Symbol	Function
R	AC power supply input R-phase
S	AC power supply input S-phase
T	AC power supply input T-phase
TM2	
Symbol	Function
P	DC-bus line +
N	DC-bus line -
B	Collector terminal of Brake IGBT
TM3	
Symbol	Function
U	Inverter output terminal U-phase
V	Inverter output terminal V-phase
W	Inverter output terminal W-phase

Table 2. Control terminals

CN1		
No.	Symbol	Function
1	VP	PWM pulse input for High-side of V-phase
2	VN	PWM pulse input for Low-side of V-phase
3	GND	Ground terminal for control power supply
4	UP	PWM pulse input for High-side of U-phase
5	UN	PWM pulse input for Low-side of U-phase
6	VCC	Control power supply
CN2		
No.	Symbol	Function
1	VCC	Control power supply
2	WP	PWM pulse input for High-side of W-phase
3	WN	PWM pulse input for Low-side of W-phase
4	GND	Ground terminal for control power supply
CN3		
No.	Symbol	Function
1	T1	Thermistor output terminal
2	T2	Thermistor output terminal
3	VCC	Control power supply
4	GND	Ground terminal for control power supply
5	OC	Logic signal output of over current
6	BR	Gate signal input for Brake IGBT
7	GND	Ground terminal for control power supply

CN1: Housing Model No. XAP-06V-1, 2.5mm pitch

CN2: Housing Model No. XAP-04V-1, 2.5mm pitch

CN3: Housing Model No. XAP-07V-1, 2.5mm pitch

JST

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8. Typical test result

Table 3. Test Conditions

Item	Value
Input DC Voltage	300V
Inverter output Current	50Apeak
Inverter output frequency	50Hz
Switching frequency	8kHz
Dead time	4usec

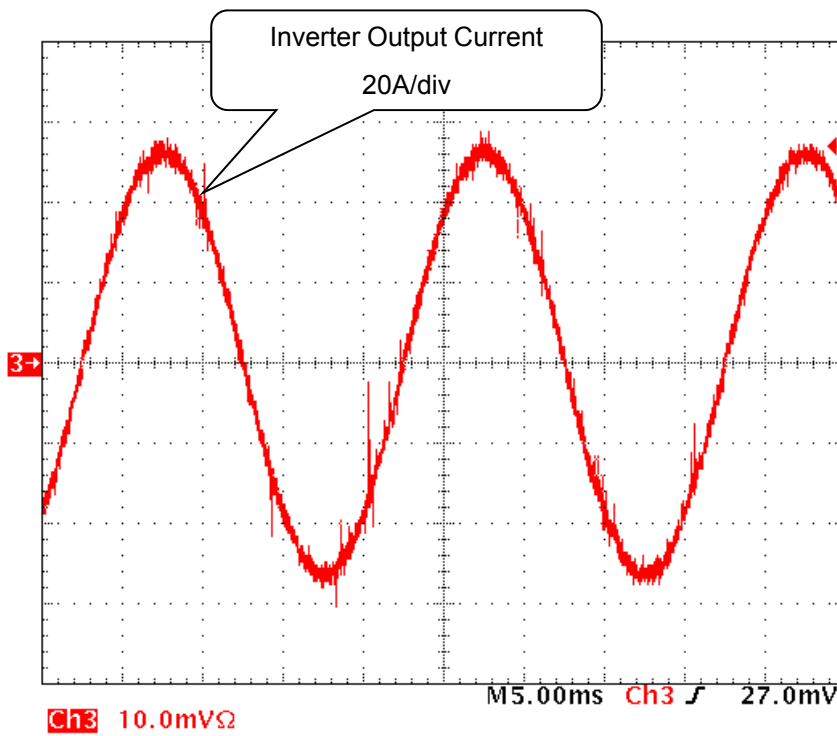


Figure 4 Output Current waveform

Table 4. Current Sensor amp. Output characteristics

DC Current (A)	Output Voltage (V)
5	0.8023
10	1.0017
15	1.2016
20	1.4000
25	1.5955

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9. Bill of Material of FA5650N_7MBR100VP060 (1/3)

Description	Designator	Quantity	Text Field1	Text Field2	Comment	Text Field5	NM
CAPACITOR	C1	1	ECQE6474kF	630V	0.47uF	松下	
CAPACITOR	C2	1	TMK107BJ105KA	25V	25V1uF	Taiyo Yuden	
CAPACITOR	C3	1	GRM21BB31E475KA75L	25V	25V4.7uF	MURATA	
CAPACITOR	C4	1	GRM1882C1H101JA01D	50V	100p	MURATA	
CAPACITOR	C5	1	GRM1882C1H471JA01D	50V	470p	MURATA	
CAPACITOR	C6	0	GRM188B31H104KA92D	50V	NM	MURATA	○
CAPACITOR	C7	1	GRM188B31H104KA92D	50V	0.1uF	MURATA	
CAPACITOR	C8	0	GRM188B31H104KA92D	50V	NM	MURATA	○
CAPACITOR	C9	0	GRM188B31H104KA92D	50V	NM	MURATA	○
CAPACITOR	C10	1	GRM188B31H104KA92D	50V	0.1uF	MURATA	
CAPACITOR	C11	0	GRM188B31H104KA92D	50V	NM	MURATA	○
CAPACITOR	C12	0	GRM188B31H104KA92D	50V	NM	MURATA	○
CAPACITOR	C13	1	GRM188B31H104KA92D	50V	0.1uF	MURATA	
CAPACITOR	C14	0	GRM188B31H104KA92D	50V	NM	MURATA	○
CAPACITOR	C15	1	GRM188B31H104KA92D	50V	0.1uF	MURATA	
CAPACITOR	C16	1	GRM1882C1H101JA01D	50V	100pF	MURATA	
CAPACITOR	C17	1	GRM1882C1H101JA01D	50V	100pF	MURATA	
CAPACITOR	C18	1	GRM1882C1H101JA01D	50V	100pF	MURATA	
CAPACITOR	C19	1	GRM1882C1H101JA01D	50V	100pF	MURATA	
CAPACITOR	C20	1	GRM1882C1H101JA01D	50V	100pF	MURATA	
CAPACITOR	C21	1	GRM1882C1H101JA01D	50V	100pF	MURATA	
CAPACITOR	C22	1	GRM21BB31E475KA75L	25V	4.7uF	MURATA	
CAPACITOR	C23	1	GRM21BB31E475KA75L	25V	4.7uF	MURATA	
CAPACITOR	C24	1	GRM21BB31E475KA75L	25V	4.7uF	MURATA	
CAPACITOR	C25	1	GRM21BB31E475KA75L	25V	4.7uF	MURATA	
CAPACITOR	C26	1	GRM21BB31E475KA75L	25V	4.7uF	MURATA	
CAPACITOR	C27	1	GRM21BB31E475KA75L	25V	4.7uF	MURATA	
CAPACITOR	C28	1	EKMG250ELL470ME11D	25V		日本ケミコン	
CAPACITOR	C29	1	TMK107BJ105KA	25V	25V1uF	Taiyo Yuden	
CAPACITOR	C30	1	GRM188B31H104KA92D	50V	NM	MURATA	○
CAPACITOR	C31	1	TMK107BJ105KA	25V	25V1uF	Taiyo Yuden	
CONNECTOR	CN1	1	B06B-XASK-1	250V		日本圧着端子	
CONNECTOR	CN2	1	B04B-XASK-1	250V		日本圧着端子	
CONNECTOR	CN3	1	B07B-XASK-1	250V		日本圧着端子	
SMT-DIODE-ST	D1	1	D3FK60	600V	D3FK60	新電元	
SMT-DIODE-ST	D2	1	D3FK60	600V	D3FK60	新電元	
SMT-DIODE-ST	D3	1	D3FK60	600V	D3FK60	新電元	
ZENER-DIODE	D4	1	RD18S-A	18V	DZ-18S	Renesas	
ZENER-DIODE	D5	1	RD18S-A	18V	DZ-18S	Renesas	
ZENER-DIODE	D6	1	RD18S-A	18V	DZ-18S	Renesas	
ZENER-DIODE	D7	1	RD18S-A	18V	DZ-18S	Renesas	
ZENER-DIODE	D8	1	RD18S-A	18V	DZ-18S	Renesas	
ZENER-DIODE	D9	1	RD18S-A	18V	DZ-18S	Renesas	
SMT-DIODE-SCHOTTKY	D10	1	M1FS4	40V	M1FS4	新電元	
SMT-DIODE-SCHOTTKY	D11	1	M1FS4	40V	M1FS4	新電元	
SMT-DIODE-SCHOTTKY	D12	1	M1FS4	40V	M1FS4	新電元	
SMT-DIODE-SCHOTTKY	D13	1	M1FS4	40V	M1FS4	新電元	
SMT-DIODE-SCHOTTKY	D14	1	M1FS4	40V	M1FS4	新電元	
SMT-DIODE-SCHOTTKY	D15	1	M1FS4	40V	M1FS4	新電元	

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9. Bill of Material of FA5650N_7MBR100VP060 (2/3)

Description	Designator	Quantity	Text Field1	Text Field2	Comment	Text Field5	NM
LED	D16	1	PR5304S	RED LED	PR5304S	スタンレー	
High Side Driver	IC1	1	FA5650N-A2	830V	U-FA5650N	FUJIDENKI	
High Side Driver	IC2	1	FA5650N-A2	830V	U-FA5650N	FUJIDENKI	
High Side Driver	IC3	1	FA5650N-A2	830V	U-FA5650N	FUJIDENKI	
DUAL Comparator	IC4	1	LM393AD	MONO POWER	LM393A	Renesas	
3TERM REGULATOR	IC5	1	NJM78L07UA	5V	NJM78L07UA	JRC	
3TERM REGULATOR	IC6	1	RP173N501B	5V(1%)		JRC	
IGBT Module	Q1	1	7MBR100VP060-50	600V100A		Fuji electric	
Resistor	R1	1	RK73H2ATTD2203F	1/8W	100kF	KOA	
Resistor	R2	1	RK73H2ATTD1202F	1/8W	12kF	KOA	
Resistor	R3	1	RK73H2ATTD1001F	1/8W	1kF	KOA	
Resistor	R4	1	RK73H2ATTD1001F	1/8W	1kF	KOA	
Resistor	R5	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R6	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R7	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R8	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R9	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R10	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R11	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R12	1	RK73H2ATTD1001F	1/8W	1k	KOA	
Resistor	R13	1	RK73H2ATTD1001F	1/8W	100	KOA	
Resistor	R14	1	RPC10KT242F	1/8W	2.4kF	太陽舎	
Resistor	R15	0	RK73Z2ATTD 000	2A	0	KOA	○
Resistor	R16	1	RK73Z2ATTD 000	2A	0	KOA	
Resistor	R17	1	RK73H2ATTD2202F	1/8W	22k	KOA	
Resistor	R18	1	RK73H2ATTD2202F	1/8W	22k	KOA	
Resistor	R19	1	RK73H2ATTD2202F	1/8W	22k	KOA	
Resistor	R20	1	RK73H2ATTD2202F	1/8W	22k	KOA	
Resistor	R21	1	RK73H2ATTD2202F	1/8W	22k	KOA	
Resistor	R22	1	RK73H2ATTD2202F	1/8W	22k	KOA	
Resistor	R23	1	RK73H2ATTD30R0F	1/8W	30	KOA	
Resistor	R24	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R25	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R26	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R27	1	RK73H2ATTD30R0F	1/8W	30	KOA	
Resistor	R28	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R29	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R30	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R31	1	RK73H2ATTD30R0F	1/8W	30	KOA	
Resistor	R32	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R33	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R34	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R35	1	RK73H2ATTD30R0F	1/8W	30	KOA	
Resistor	R36	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R37	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R38	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R39	1	RK73H2ATTD30R0F	1/8W	30	KOA	
Resistor	R40	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R41	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○

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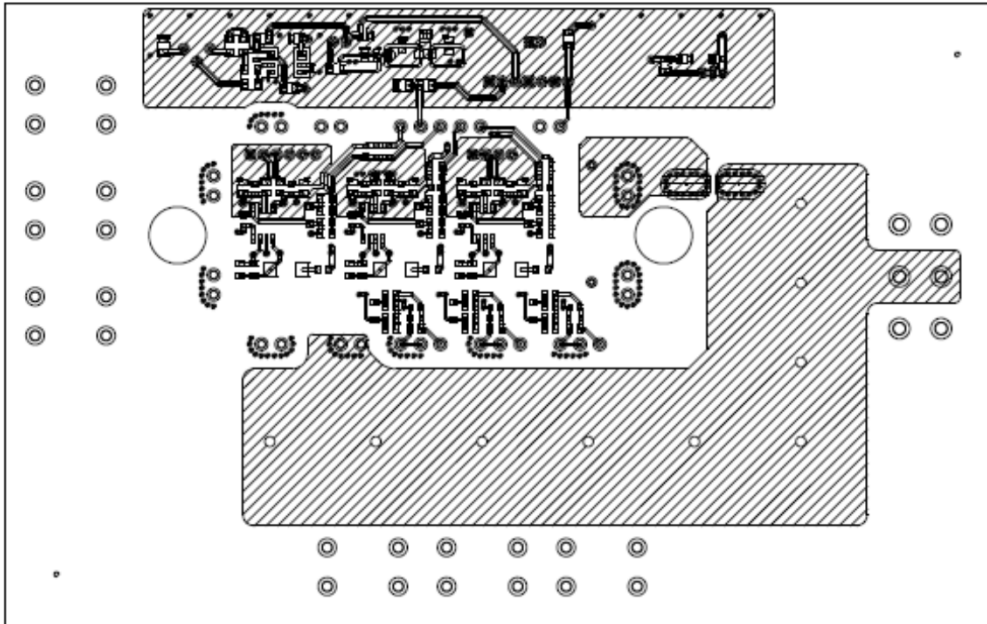
9. Bill of Material of FA5650N_7MBR100VP060 (3/3)

Description	Designator	Quantity	Text Field1	Text Field2	Comment	Text Field5	NM
Resistor	R42	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R43	1	RK73H2ATTD30R0F	1/8W	30	KOA	
Resistor	R44	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R45	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R46	0	RK73H2ATTD30R0F	1/8W	NM	KOA	○
Resistor	R47	1	RK73H2ATTD10R0F	1/8W	10	KOA	
Resistor	R48	1	RK73H2ATTD10R0F	1/8W	10	KOA	
Resistor	R49	1	RK73H2ATTD10R0F	1/8W	10	KOA	
Resistor	R50	0	RK73H2ATTD1002F	1/8W	10kF	KOA	○
Resistor	R51	0	RK73H2ATTD1002F	1/8W	10kF	KOA	○
Resistor	R52	0	RK73H2ATTD1002F	1/8W	10kF	KOA	○
Resistor	R53	0	RK73H2ATTD1002F	1/8W	10kF	KOA	○
Resistor	R54	0	RK73H2ATTD1002F	1/8W	10kF	KOA	○
Resistor	R55	0	RK73H2ATTD1002F	1/8W	10kF	KOA	○
Resistor	R56	1	RPC10KT272F	1/8W	2.7k	太陽舎	
Resistor	R57	1	RN732ATTD8200C25	1/8W	820	KOA	
VOLUME	RV1	1	CT-6EP 10K	10K OHM MAX	CT6P 10K	コバル電子	
TERMINAL	TM1_R	1	OT-048	60A	OT-048	OSADA	
TERMINAL	TM1_S	1	OT-048	60A	OT-048	OSADA	
TERMINAL	TM1_T	1	OT-048	60A	OT-048	OSADA	
TERMINAL	TM2	1	ML-300-3P	3P	ML-300-3P	サトーパーツ	
TERMINAL	TM3_U	1	OT-048	60A	OT-048	OSADA	
TERMINAL	TM3_V	1	OT-048	60A	OT-048	OSADA	
TERMINAL	TM3_W	1	OT-048	60A	OT-048	OSADA	
TEST PIN	TP1	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP2	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP3	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP4	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP5	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP6	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP7	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP8	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP9	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP10	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP11	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP12	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP13	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP14	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP15	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP16	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP17	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP18	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP19	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP20	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP21	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP22	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP23	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
TEST PIN	TP24	1	ST-6-2	φ1.0	ST-6-2	マックエイト	
Current Transducer	X1	1	ACS758LCB-100U-PFF-T	100A 5V		Allegro	

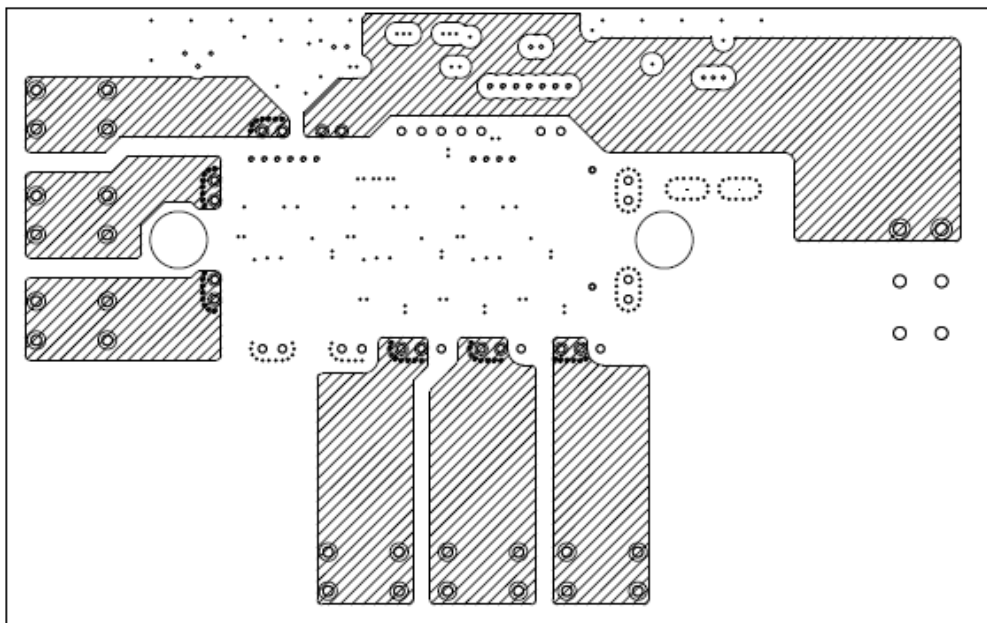
Evaluation Board for IGBT Module

10. Layout (1/3)

L1 部品面



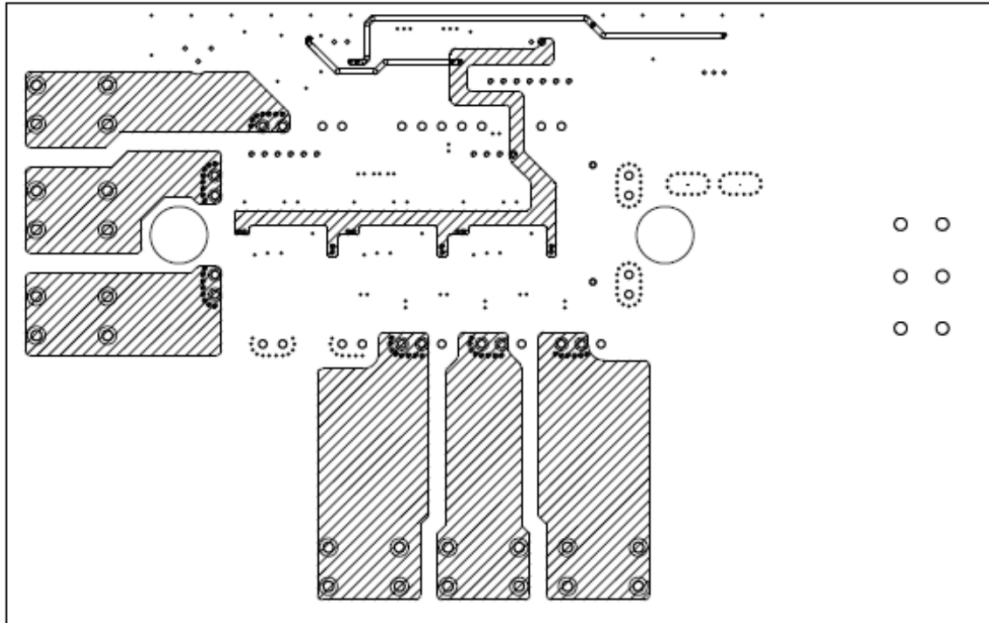
L2 内層1



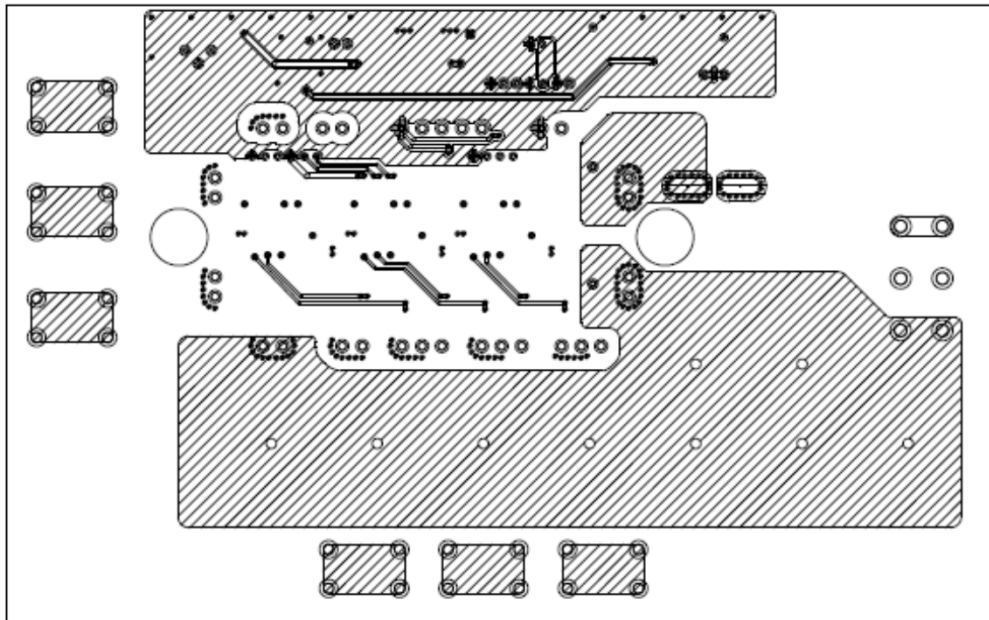
Evaluation Board for IGBT Module

10. Layout (2/3)

L3 内層2



面田半 4 J



Evaluation Board for IGBT Module

10. Layout (3/3)

