



EVQ6530-V-00A

5V to 60V, Three-Phase Brushless DC Motor Pre-Driver Evaluation Board

DESCRIPTION

The EVQ6530-V-00A is an evaluation board designed to demonstrate the capabilities of the MPQ6530, a three-phase brushless DC (BLDC) motor pre-driver.

The MPQ6530 integrates a regulated charge pump to generate gate drive power, and uses a bootstrap (BST) capacitor to generate a supply voltage for the high-side MOSFET (HS-FET) driver. An internal trickle-charge circuit maintains a sufficient HS-FET driver voltage even when the output is at 100% duty cycle.

Internal safety features include configurable short-circuit protection (SCP), over-current protection (OCP), adjustable dead-time (DT) control, under-voltage lockout (UVLO), and thermal shutdown.

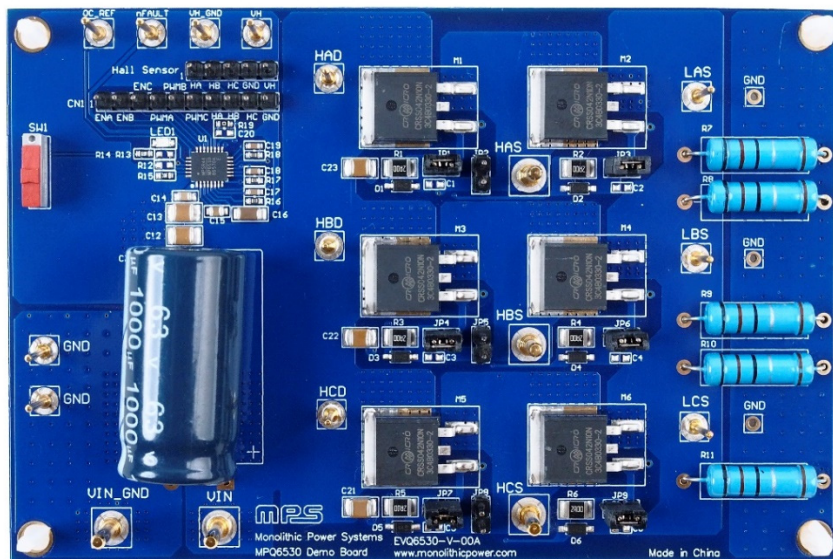
The MPQ6530 is available in a QFN-28 (4mmx5mm) package with an exposed thermal pad on the back, and is AEC-Q100 qualified.

PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$, unless otherwise noted.

Parameters	Conditions	Value
Input power supply voltage (V_{IN}) range		5V to 60V
OC_REF voltage (V_{OC_REF}) range		0.125 to 2.4V
Hall voltage (V_H)		3.3 or 5V

EVQ6530-V-00A EVALUATION BOARD



LxWxH (11.7cmx7.8cmx1cm)

Board Number	MPS IC Number
EVQ6530-V-00A	MPQ6530GVE-ACE1

QUICK START GUIDE

The EVQ6530-V-00A evaluation board is easy to set up and use to evaluate the MPQ6530's performance. For proper measurement equipment set-up, refer to Figure 1 and follow the steps below:

1. Connect the input voltage ($5V \leq V_{IN} \leq 60V$) and input ground to the VIN and GND connectors, respectively.
2. Connect a 3.3V or 5V constant voltage to the VH connector, then ensure that SW1 is in position 1 (top side) to enable the MPQ6530.
3. To set the OCP threshold, connect the over-current protection (OCP) reference voltage ($0.125V \leq V_{OC_REF} \leq 2.4V$) to the OC_REF connector.
4. Connect the Hall signals coming from the motor to the Hall sensor connector.
5. Connect the driving control signals generated by the external controller to the CN1 connector.

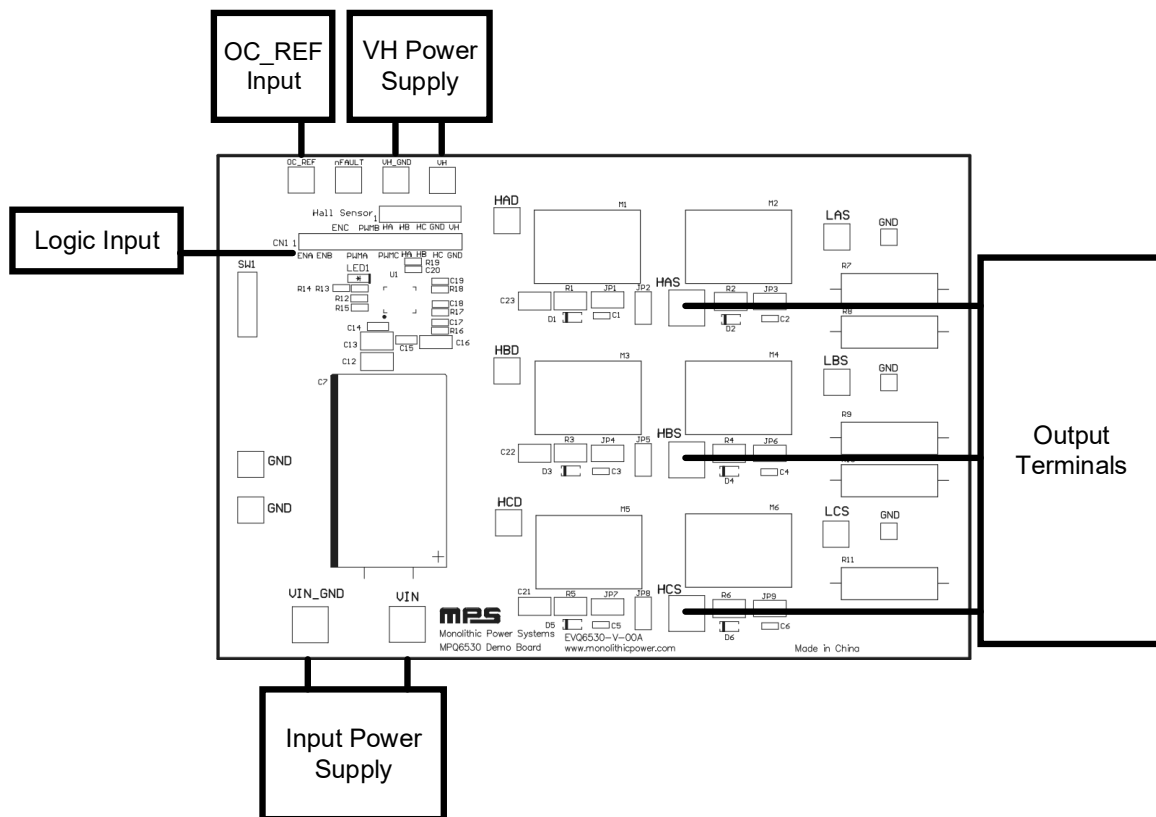


Figure 1: Measurement Equipment Set-Up

EVALUATION BOARD SCHEMATIC

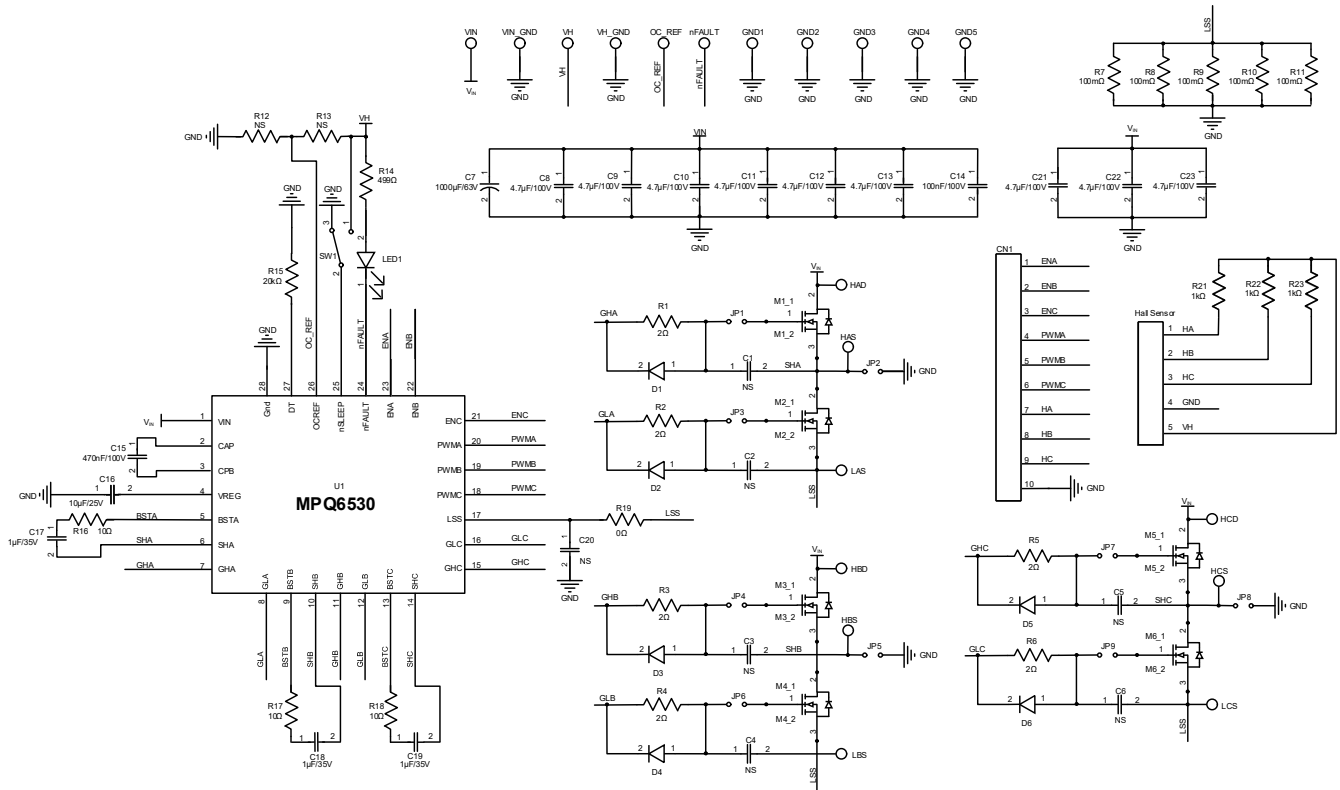


Figure 2: Evaluation Board Schematic

EVQ6530-V-00A BILL OF MATERIALS

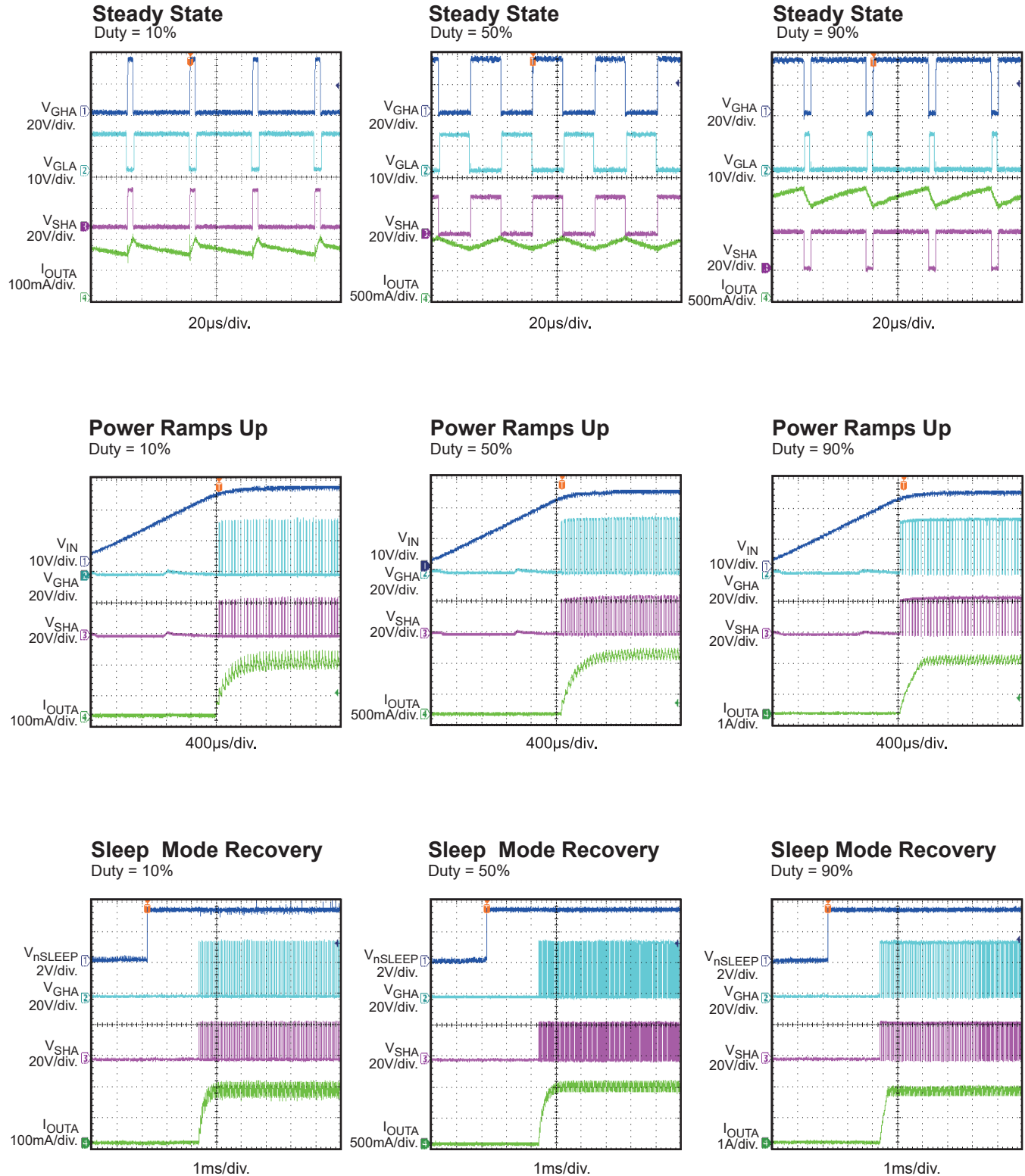
Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
12	C1, C2, C3, C4, C5, C6, C20, R12, R13, R21, R22, R23	NS				
1	C7	1000 μ F	Electrolytic capacitor, 63V	DIP	Jianghai	CD263-63V1000
9	C8, C9, C10, C11, C12, C13, C21, C22, C23	4.7 μ F	Ceramic capacitor, 100V, X7S	1210	Murata	GRM32DL8EL475KE07
1	C14	100nF	Ceramic capacitor, 100V, X7R	0805	Murata	GRM21BR72A104KAC4L
1	C15	470nF	Ceramic capacitor, 100V, X7R	0805	Murata	GRM21BR72A474K73L
1	C16	10 μ F	Ceramic capacitor, 25V, X7R	1206	Murata	GRM31CR71E106KA12
3	C17, C18, C19	1 μ F	Ceramic capacitor, 35V, X7R	0603	Taiyo Yuden	GMK107AB7105KAHT
6	R1, R2, R3, R4, R5, R6	2 Ω	Film resistor, 1%	1210	Yageo	RC1210FR-072RL
5	R7, R8, R9, R10, R11	100m Ω	Resistor, 2W	DIP	Minda	
1	R14	499 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-07499RL
1	R15	20k Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0720KL
3	R16, R17, R18	10 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-0710RL
1	R19	0 Ω	Film resistor, 1%	0603	Yageo	RC0603FR-070RL
6	D1, D2, D3, D4, D5, D6	30V/1A	Schottky diode. 30V, 1A	SOD-123	Diodes, Inc.	B130LAW-7-F
6	M1, M2, M3, M4, M5, M6	100V/120A	N-channel MOSFET, 100V, 120A, $Q_G = 90$ nC, 3.6m Ω at $V_{GS} = 10$ V, $I_D = 120$ A	TO-263	CRMICRO	CRSS042N10N
1	LED1	Red	LED	0805	Bright LED	BL-HUE35A-AV-TRB
1	SW1	500mA/12V	Button	DIP	Wurth	450301014042
6	JP1, JP3, JP4, JP6, JP7, JP9	2.54mm	2-pin connector with short jumper	DIP	Custom	
3	JP2, JP5, JP8	2.54mm	2-pin connector without short jumper	DIP	Custom	
1	CN1	2.54mm	10-pin connector	DIP	Custom	
1	Hall sensor	2.54mm	5-pin connector	DIP	Custom	
5	VIN, VIN_GND, HAS, HBS, HCS	2mm	Golden pin	DIP	Custom	
12	OC_REF, nFAULT, VH, VH_GND, LAS, LBS, LCS, GND, GND, HAD, HBD, HCD	1mm	Golden pin	DIP	Custom	

EVQ6530-V-00A BILL OF MATERIALS *(continued)*

Qty	Ref	Value	Description	Package	Manufacturer	Manufacturer PN
1	U1	MPQ6530-AEC1	3-phase BLDC motor pre-driver, AEC-Q100 qualified	QFN-28 (4mmx5mm)	MPS	MPQ6530GVE-AEC1

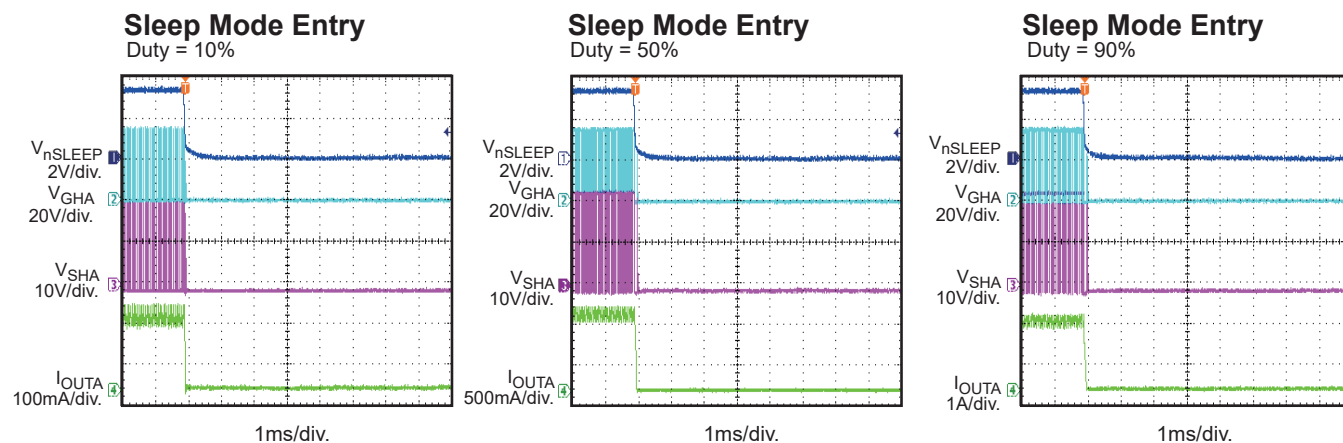
EVB TEST RESULTS

$V_{IN} = 24V$, $OC_REF = 0.5V$, $R_{DT} = 20k\Omega$, $ENA = ENC = H$, $ENB = PWMC = L$, $f_{PWMA} = 20kHz$, $T_A = 25^\circ C$, resistor + inductor load: $5\Omega + 1mH$ /phase with star connection, unless otherwise noted.



EVB TEST RESULTS *(continued)*

$V_{IN} = 24V$, $OC_REF = 0.5V$, $R_{DT} = 20k\Omega$, $ENA = ENC = H$, $ENB = PWMC = L$, $f_{PWMA} = 20kHz$,
 $T_A = 25^\circ C$, resistor + inductor load: $5\Omega + 1mH$ /phase with star connection, unless otherwise noted.



PCB LAYOUT

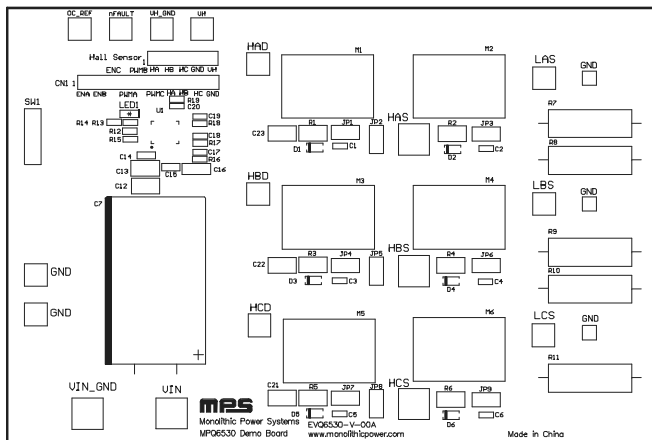


Figure 3: Top Silk

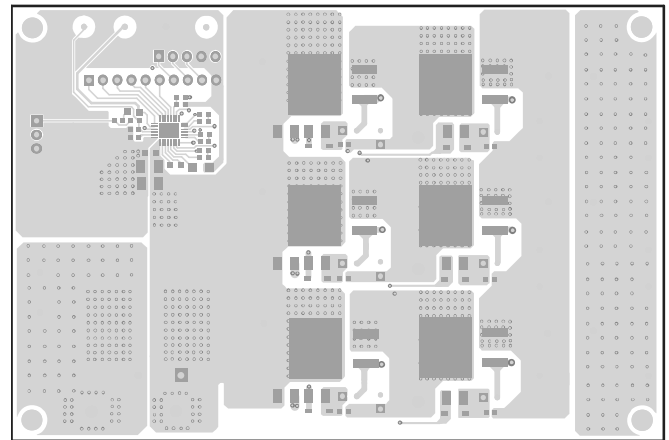


Figure 4: Top Layer

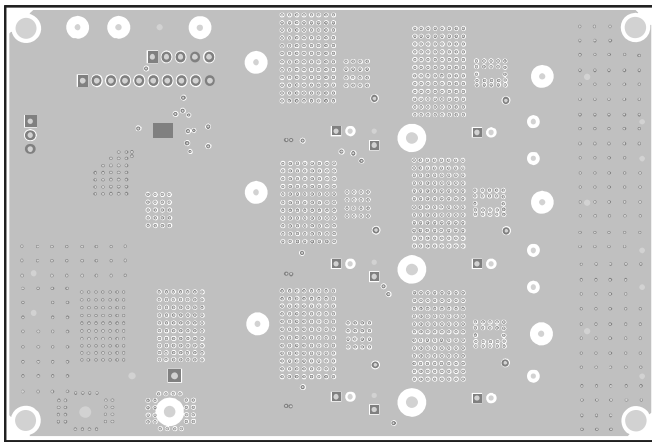


Figure 5: Mid-Layer 1

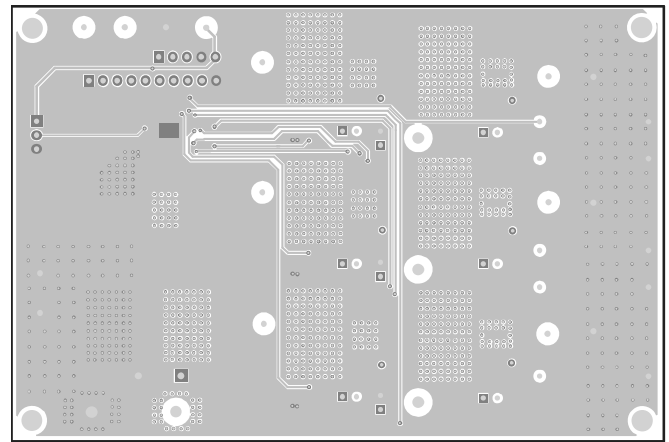


Figure 6: Mid-Layer 2

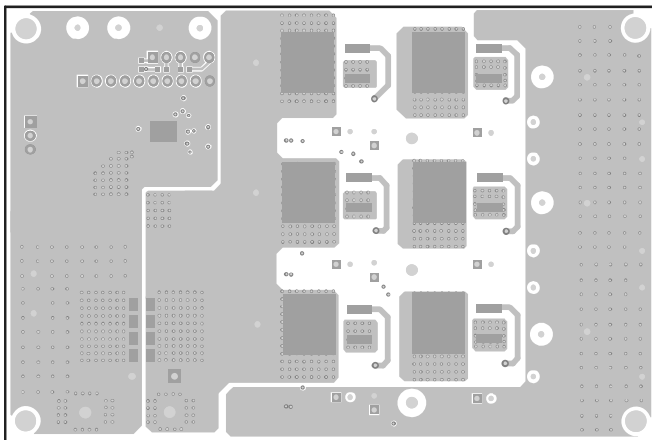


Figure 7: Bottom Layer

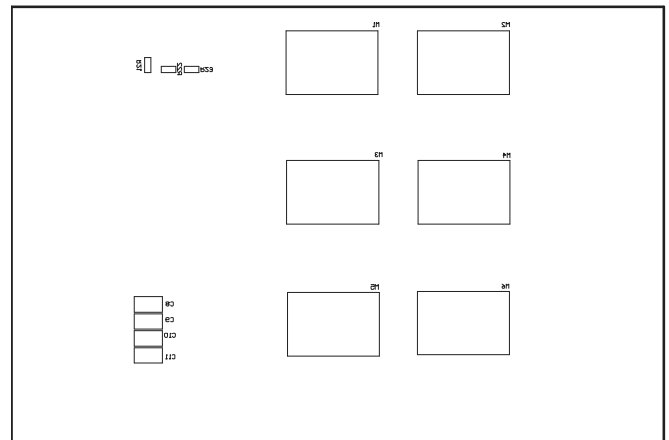


Figure 8: Bottom Silk

REVISION HISTORY

Revision #	Revision Date	Description	Pages Updated
1.0	5/8/2024	Initial Release	-

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