

RTKP68145DE0000BU

RRP68145 100V, 3A Source, 4A Sink, High-Frequency Half-Bridge Evaluation Board

Description

The RTKP68145DE0000BU evaluation board provides a quick and comprehensive method for evaluating the [RRP68145](#) 100V 3A source, 4A sink high frequency half-bridge driver for driving the gates of two N-channel MOSFETs in a half-bridge configuration. Two N-channel MOSFETs (with dual footprint supporting both 5×6mm and 3×3mm packages) and an inductor-capacitor LC filter is included on the evaluation board to allow for the evaluation of a half-bridge driven load such as a synchronous buck switching regulator.

The RRP68145 half-bridge driver is offered in a 16 Ld QFN package. The RTKP68145DE0000BU evaluation board operates from a supply voltage of 6V to 18V DC with the capability of driving both the high-side and low-side MOSFETs in a 100V half-bridge configuration ICs.

Key Features

- 3A source and 4A sink NMOS gate drivers
- Internal level shifter and bootstrap diode for gate driver on high-side NFET
- Up to 100V high-side bootstrap reference
- 6V to 18V bias supply operation
- Fast 30ns typical propagation delay and 2ns typical propagation delay match supports up to 1MHz operation

Specifications

This board is optimized for the following operating conditions:

Parameter	Rating
VDD voltage	6 to 18V
Input voltage	Up to 80V ^[1]
Input current	Up to 9A ^[1]
PWM Switching Frequency	Up to 1MHz ^[2]
PWM Input Voltage	5V
Typical Output Voltage	12V
Output voltage	Up tp 72V ^[1]
Output current	Up to 10A ^[1]

1. Voltages and currents outside the indicated range can still be applied if required. **IMPORTANT:** Improper input/output configurations might result in damage to the board.
2. Higher frequencies lead to greater power loss. Ensure to monitor the temperature of components such as FETs and inductors.

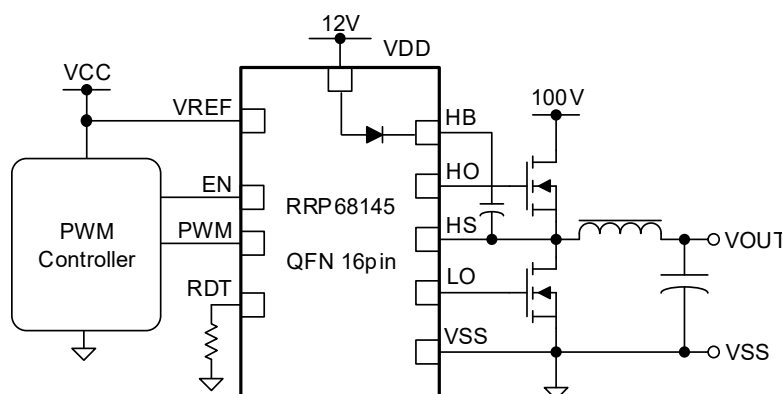


Figure 1. RRP68145 Typical Application Block Diagram

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1. Functional Description

The RTKP68145DE0000BU provides a comprehensive and versatile platform for users to evaluate the functionality and prototype an application of the RRP68145 N-channel MOSFET half-bridge drivers. This evaluation board includes the MOSFETs (dual-footprint supporting both 5×6mm and 3×3mm packages) and an inductor-capacitor output filter for evaluating an open-loop type synchronous buck DC/DC converter where the output voltage is controlled through the duty cycle of the signals into the PWM pin.

1.1 Recommended Equipment

- A power supply that can deliver 12V or higher with at least 2A source current capability
- A power supply that can deliver 5V or higher
- A power supply that can deliver 80V or higher to bias the half bridge
- A square wave or pulse generator with 0V to 5V logic levels output and 200kHz capability
- Minimum 4-channel oscilloscope to monitor LI, HI, LO, HO, and HS signals
- Optional: A DC electronic load to draw current out of the LC filter output

1.2 Operating Range

The RTKP68145DE0000BU evaluation board is designed for 80V half-bridge applications with 12V supply to bias the VDD of the RRP68145 IC. While the RRP68145 voltage ratings for the bootstrap reference and VDD supply are much higher, monitor the transient voltages at the switching nodes for applications exceeding 80V on the half-bridge or 12V on the driver bias to ensure they do not violate the absolute maximum ratings of the RRP68145 driver.

The inductance and capacitance value of the output LC filter is chosen for a 200kHz switching operation. Replace these components with different values if a different switching frequency is required.

1.3 Quick Start Guide

1. Remove the jumper or place the jumper between Pin 2 and Pin 3 on J8 to ensure that the EN function is disabled.
2. Place a jumper between Pin 2 and Pin 3 on J11 for choosing a dead time of 35ns.
Note: The programmable dead time of the HO and LO signal can be set using RDT resistors. R_{11} is 10k Ω and provides around 35ns dead time, while R_{12} is 20k Ω and provides around 70ns dead time. To change it, replace the resistor of R_{11} or R_{12} with a value corresponding to the required dead time.
3. Connect a 6V to 18V supply to the VDD terminals {J2 (+) and TP9 (-)}.
4. Connect a 5V supply to VREF terminal {TP5}.
5. Connect a power supply capable of 80V or higher and 10A to the V_BRIDGE terminals {J18 (+) and J17 (-)}.
6. Connect a 0V to 5V 200kHz square wave signal to the PWM BNC connector J9.
Note: The magnitude of the square wave signal needs to match VREF.
7. Turn on the VDD supply to 12V. Turn on the VREF supply to 5V.
8. Turn on the 0V to 5V 200kHz square wave signal.
9. Place a jumper between Pin 1 and Pin 2 on J8 to enable EN pin.
10. Verify the HO and LO outputs are switching. LO switches between GND and VDD (12V in this case) phase inverted from the PWM. HO switches between GND and V_{HB} in phase with PWM.
11. Turn on the bridge voltage supply V_BRIDGE to the required voltage (such as 48V). Verify switching waveforms at the HS node and output voltage on the V_OUT terminals {J19 (+) and J20 (-)}.

2. Board Design

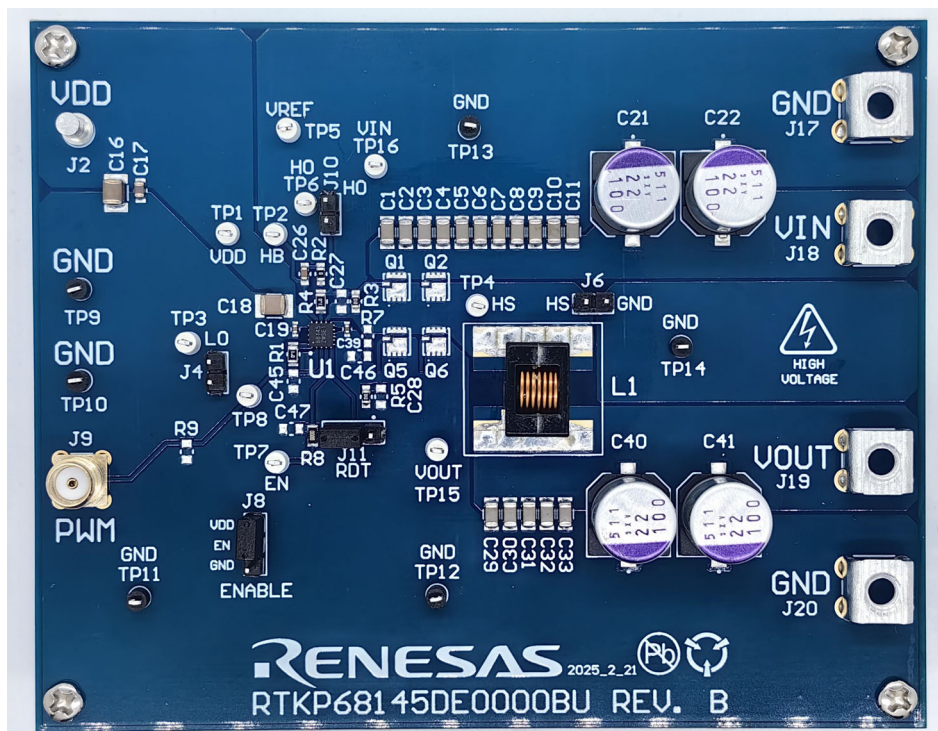


Figure 2. RTKP68145DE0000BU Evaluation Board (Top)

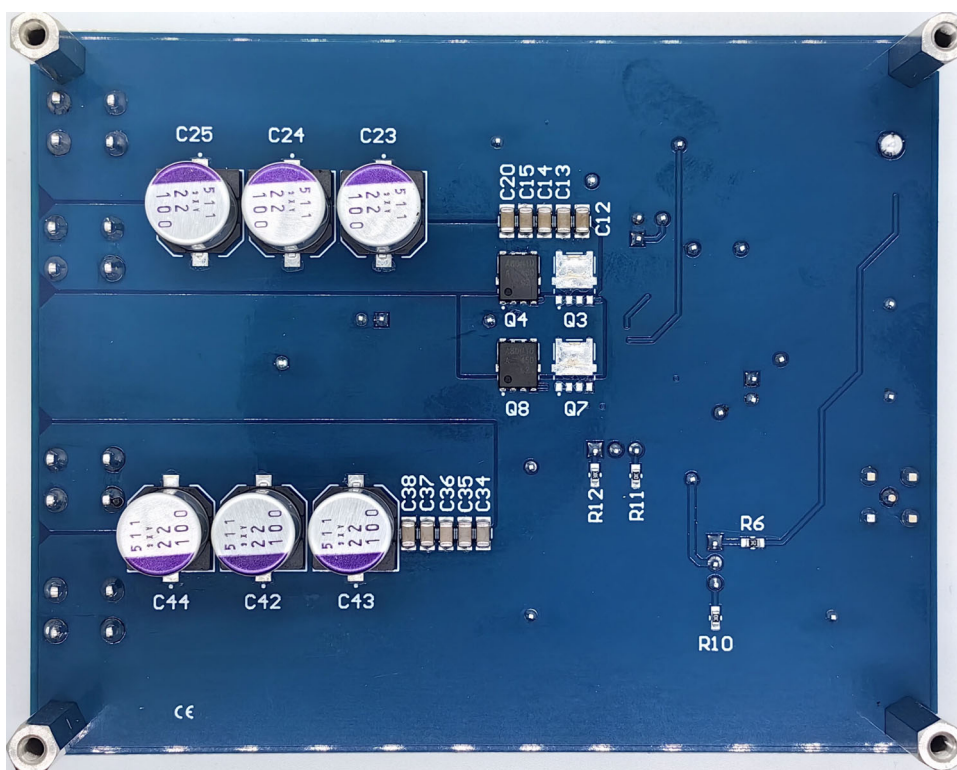


Figure 3. RTKP68145DE0000BU Evaluation Board (Bottom)

2.1 PCB Layout Guidelines

For best thermal performance, use as many vias as possible to connect the top layer PCB thermal land to the ground planes on other PCB layers.

When adjustable dead time is used, connect the resistor to the RDT pin and GND plane close to the IC to minimize ground noise from disrupting the timing performance.

Place the VDD decoupling capacitors and bootstrap capacitors close to the VDD-VSS and HB-HS pins, respectively. Use decoupling capacitors to reduce the influence of parasitic inductors. To be effective, these capacitors must also have the shortest possible lead lengths. If vias are used, connect several paralleled vias to reduce the inductance.

In addition:

- Keep power loops as short as possible by paralleling the source and return traces.
- Adding resistance might be necessary to dampen resonating parasitic circuits. In PCB designs with long leads on the LO and HO outputs, add series gate resistors on the bridge FETs to dampen the oscillations.
- Large power components (such as power FETs, electrolytic capacitors, and power resistors) have internal parasitic inductance, which cannot be eliminated. This must be accounted for in the PCB layout and circuit design.
- If simulating the circuits is required, consider including parasitic components.



2.3 Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Manufacturer Part
1	-	PWB-PCB, RTKP68145DE0000BU, REVA, ROHS	Imagineering Inc	RTKP68145DE0000BU
26	C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C20, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38	CAP, SMD, 1206 1μF, 100V, 10%, X7R, ROHS	Murata	GRJ31CR72A105KE11L
2	C16, C18	CAP, SMD, 1210, 4.7μF, 50V, 10%, X7R, ROHS	Murata	GCM32ER71H475KA55
1	C17	CAP, SMD, 0805, 1.0μF, 50V, 10%, X7R, ROHS	Murata	GCM21BR71H105KA03
1	C19	CAP, SMD, 0402, 0.1μF, 50V, 10%, X7R, ROHS	Murata	GRM155R71H104KE14D
10	C21, C22, C23, C24, C25, C40, C41, C42, C43, C44	CAP, SMD, 10.3×10.3×12.7mm, 22μF, 100V, 20%, ROHS	Panasonic	100SXV22M
1	C26	CAP, SMD, 0603, 0.22μF, 50V, 10%, X7R, ROHS	Murata	GRM188R71H224KAC4D
5	C27, C28, C45, C46, C47	CAP, SMD, 0805, DNP-PLACE HOLDER	DNP	DNP
1	C39	CAP, SMD, 0402, 0.1μF, 16V, X7R, ROHS	Murata	GCM155R71C104KA55D
4	J17, J18, J19, J20	50A BRASS PCB CONNECTOR	XFCN	T44008
1	J2	CONN-TURRET, TERMINAL POST, TH, ROHS	Keystone	1514-2
3	J4, J6, J10	CONN HEADER VERT 2POS 2.54MM, ROHS	Samtec	HTS-102-T-A
2	J8, J11	CONN HEADER VERT 3POS 2.54MM, ROHS	Samtec	HTS-103-T-A
1	J9	BRASS 50Ohm FEMALE SMA C0-AXIS CONNECTOR	Bat Wireless	BWSMA-KE-Z001
1	L1	COIL-INDUCTOR, SMD, 12x10mm, 3.3μH, 20%, 20A, ROHS	Pocomagnetic	PXG240929V5
1	U1	IC-100V 4A HALF BRIDGE DRIVER, 16P, QFN, 3×3, ROHS	Renesas Electronics America	RRP68145
2	Q4, Q8	TRANSIST-MOS, N-CHANNEL, SMD, SO8-FL, 100V, 80A, ROHS	Renesas	RBA80N10EANS
2	R1, R4	RES, SMD, 0805, 1Ω, 1/8W, 1%, ROHS	Panasonic	ERJ-6RQF1R0V
1	R2	RES, SMD, 0603, 0Ω, 1/10W, ROHS	Venkel	CR0603-10W-000T
2	R3, R5	RES, SMD, 0603, 100K, 1/10W, 1%, ROHS	Venkel	CR0603-10W-1003FT
3	R6, R10, R11	RES, SMD, 0603, 10K, 1/10W, 1%, ROHS	Venkel	CR0603-10W-1002FT
2	R7, R9	RES, SMD, 0603, DNP	DNP	DNP
1	R8	RES, SMD, 0805, 0Ω, 1/8W, ROHS	Rohm Semi	PMR10EZPJ000
1	R12	RES, SMD, 0603, 20K, 1/10W, 1%, ROHS	Venkel	CR0603-10W-2002FT

Qty	Reference Designator	Description	Manufacturer	Manufacturer Part
10	TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP15, TP16	PC TEST POINT MINIATURE WHITE, ROHS	Keystone	5002
6	TP9, TP10, TP11, TP12, TP13, TP14	PC TEST POINT MINIATURE BLACK, ROHS	Keystone	5001
4	Four corners	SCREW, 4-40×1/4in, PHILLIPS, PANHEAD, SS, ROHS	APM Hexseal	4-40X1/4-SCREW-SS
4	Four corners	STANDOFF, 4-40×7/8in, F/F, HEX, ALUM, ROHS	Würth	970200324-STANDOFF

2.4 Board Layout

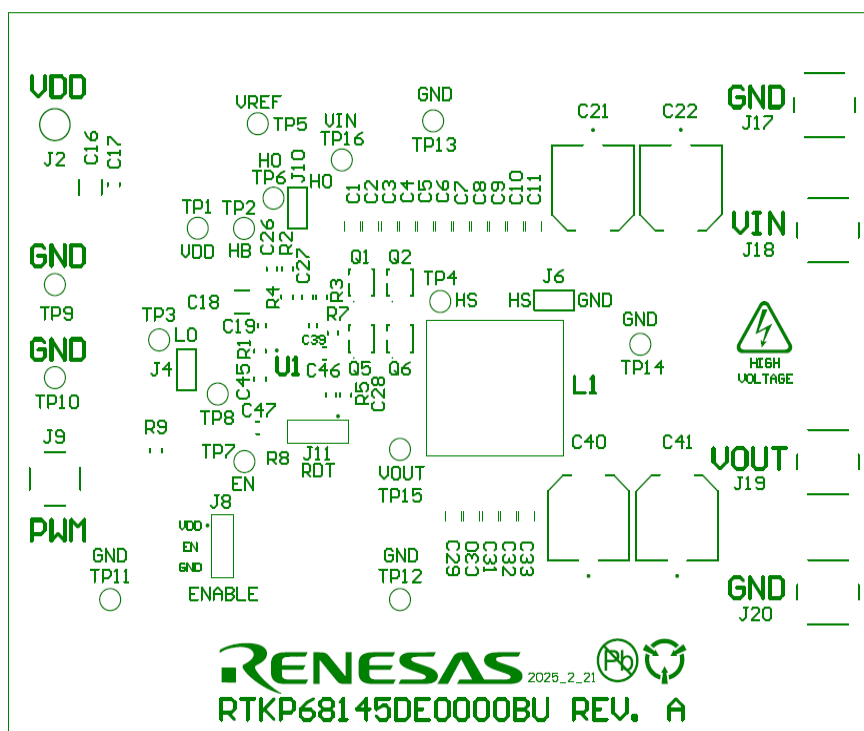


Figure 5. Silkscreen Top Layer

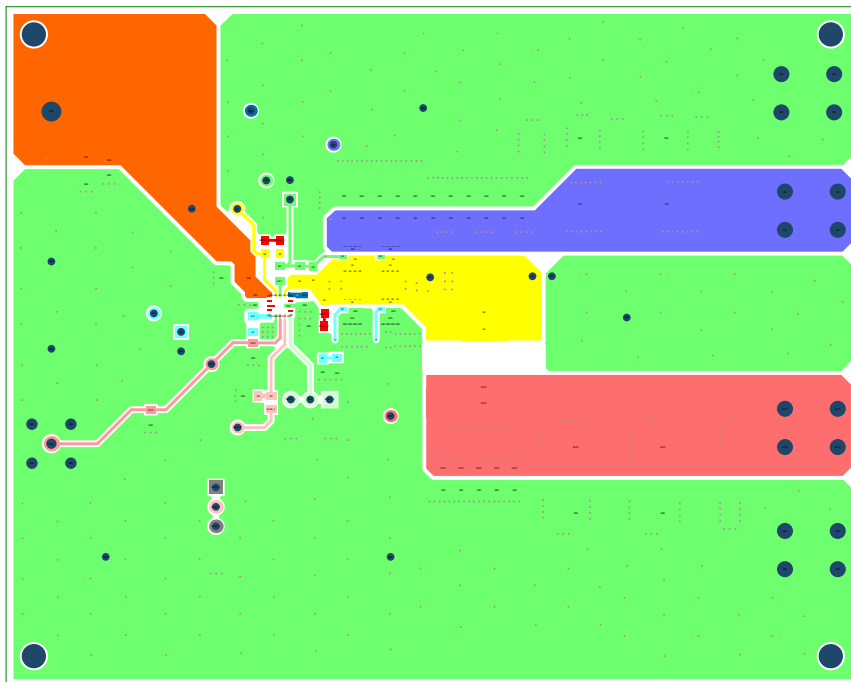


Figure 6. Layer 1

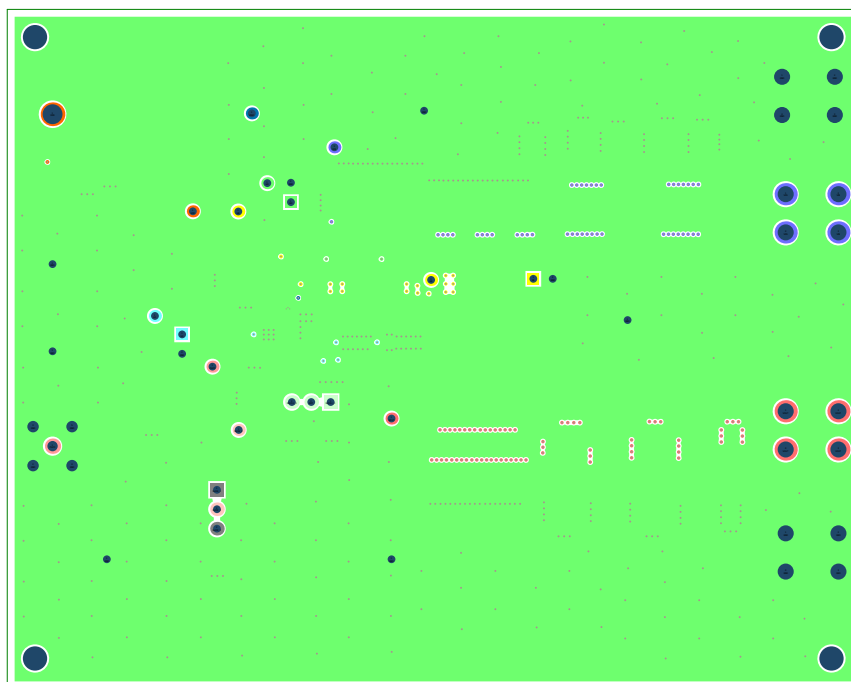


Figure 7. Layer 2

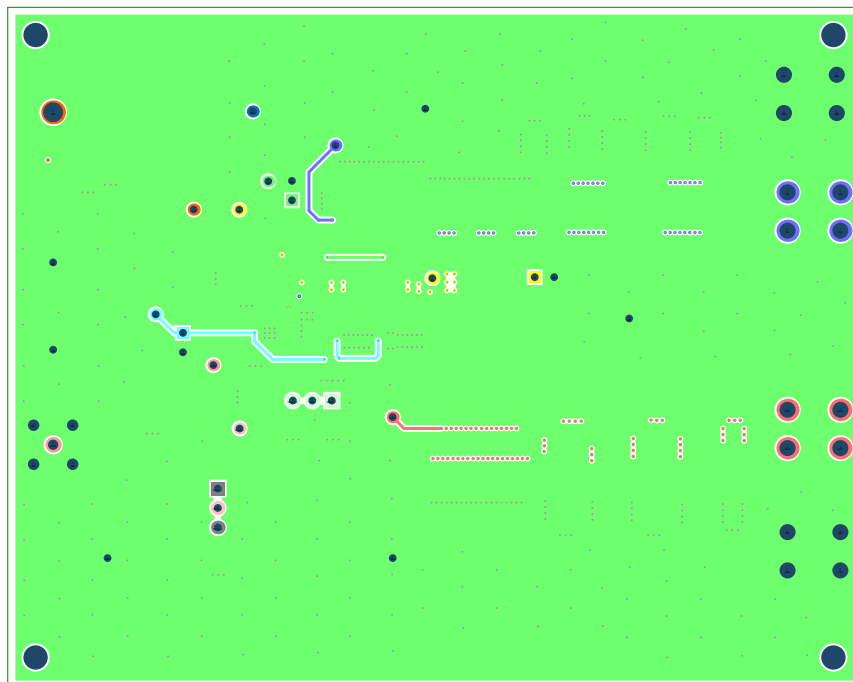


Figure 8. Layer 3

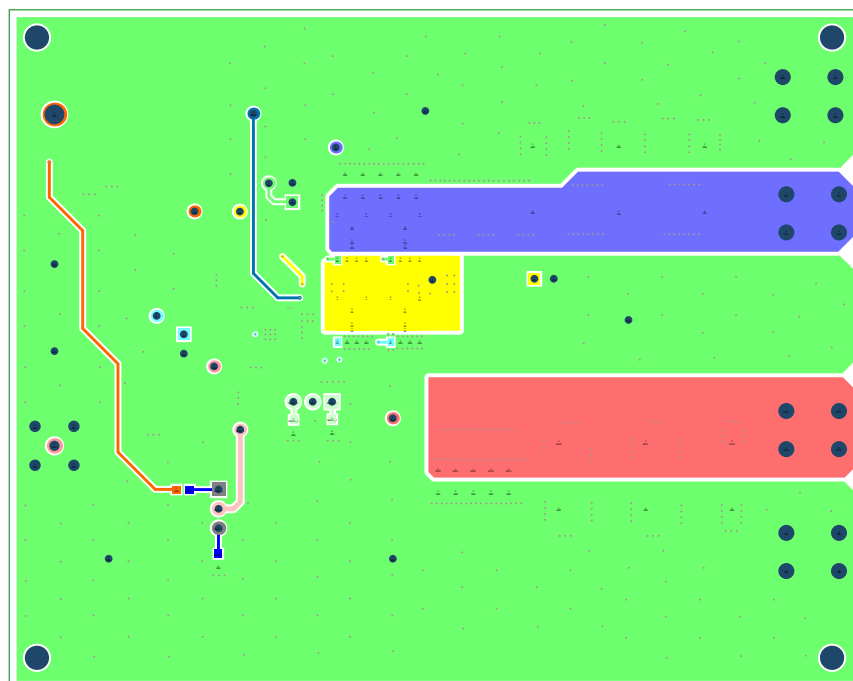


Figure 9. Layer 4

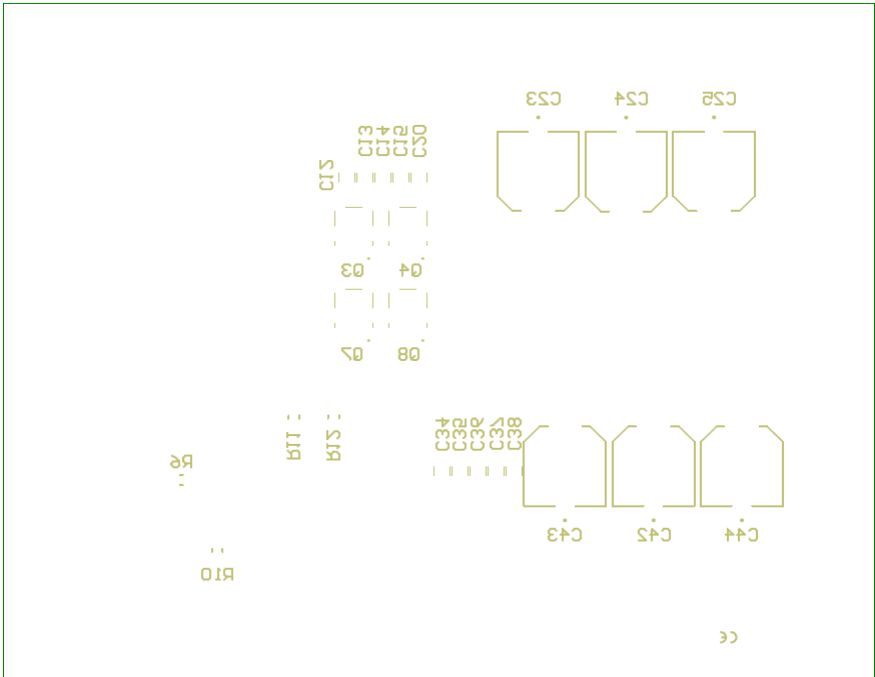


Figure 10. Silkscreen Bottom Layer

3. Typical Performance Curves

Unless noted: $V_{DD} = 12V$, $V_{BRIDGE} = 48V$, PWM = 200kHz square wave, 0V to 5V, 35% duty cycle, $T_A = +25^{\circ}C$

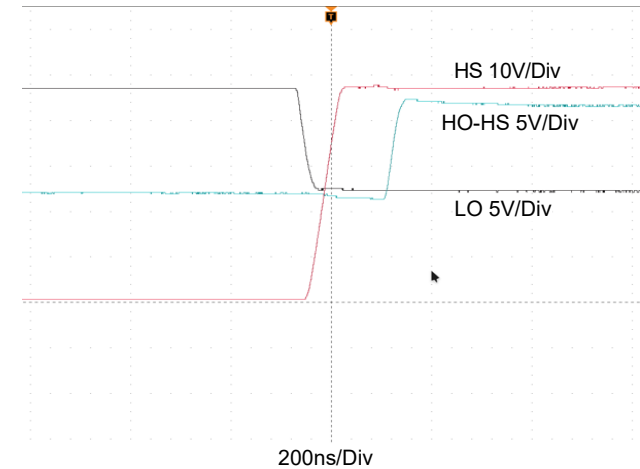


Figure 11. Dead Time LO Falling to HO Rising

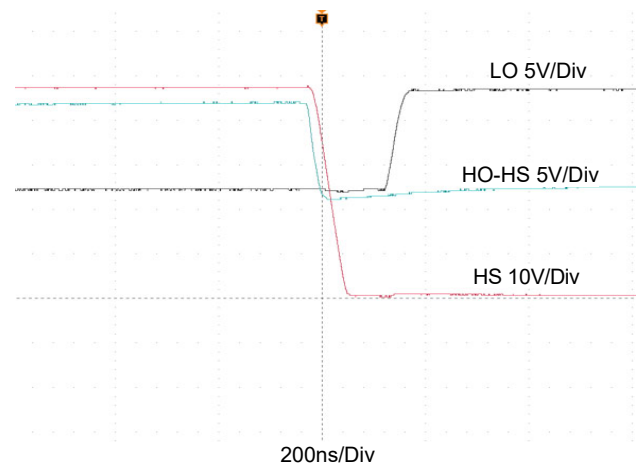


Figure 12. Dead Time HO Falling to LO Rising

4. Ordering Information

Part Number	Description
RTKP68145DE0000BU	RRP68145 100V, 3A Source, 4A Sink, High-Frequency Half-Bridge Evaluation Board

5. Revision History

Revision	Date	Description
1.00	Aug 26, 2025	Initial release.

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