MIC4605 Evaluation Board

85V Half-Bridge MOSFET Drivers with Adaptive Dead Time and Shoot-Through Protection

General Description

The MIC4605 is an 85V half-bridge MOSFET driver that features adaptive-dead-time and shoot-through protection. The adaptive-dead-time circuitry actively monitors the half-bridge outputs to minimize the time between high-side and low-side MOSFET transitions, thus maximizing power efficiency. Anti-shoot-through circuitry prevents erroneous inputs and noise from turning both MOSFETs on at the same time. Additionally, the MIC4605's adjustable gate drive sets the gate drive voltage to VDD for optimal MOSFET $R_{DS(ON)}$, which minimizes power loss due to the MOSFET's $R_{DS(ON)}$.

Requirements

At a minimum, the evaluation board requires a 5.5V to 16V power supply to power the VDD terminal (J1) of the MIC4605 and another supply (up to 85V) may be used to power the MOSFETs connected to the VIN terminal (J2). A pulse generator or the output of a PWM control IC may be connected to the HI and LI terminals (–1), or PWM single input (–2).

Precautions

There is no reverse input protection on this board. When connecting the input sources, make sure that the correct polarity is observed.

Under extreme load conditions and with a high supply voltage (>48V) connected to the VIN terminal (J2), input transients can be quite large if long test leads are used. In such cases a 100µF, 100V electrolytic capacitor is needed across the VIN terminals to prevent overvoltage damage to the IC. This can be removed if a clean supply voltage on VIN is always guaranteed.

Datasheets and support documentation are available on Micrel's web site at: www.micrel.com.

Getting Started

1. **Connect VIN supply between the VIN and GND terminals and VDD supply between the VDD and GND terminals.**

   Connect a supply between the VIN terminal (J2) and the GND terminal (J3), paying careful attention to polarity and supply range (VIN ≤ 85V). Do not apply power until Step 5.

   Connect a supply between the VDD terminal (J1) and the GND terminal (J3), paying careful attention to polarity and supply range (5.5V ≤ VDD < 16V). Do not apply power until Step 5.

2. **Connect the TTL-compatible HI and LI inputs (–1), or the PWM single input (–2).**

   Connect the HI input (JP2) and LI input (JP3) to a pulse generator or the output of a PWM control IC. Ensure that they are non-overlapping signals and are TTL compatible logic-levels. The PWM single input replaces the HI input (JP2) for the –2 option.

3. **Monitor inputs and outputs.**

   Monitor the inputs HI (JP2) and LI (JP3) or PWM (JP2) and outputs HO (JP1) and LO (JP4) with an oscilloscope.

4. **Connect motor across HS and GND or connect HS to GND.**

   The simplest way to observe the MIC4605 operation is to connect a motor across the HS terminal (J8) and GND (J9). Alternatively the HS terminal (J8) can be shorted to GND (J9) with the VIN supply turned OFF. DC and AC parameters can be easily measured in this configuration.

5. **Turn-on supplies and HI/LI inputs.**

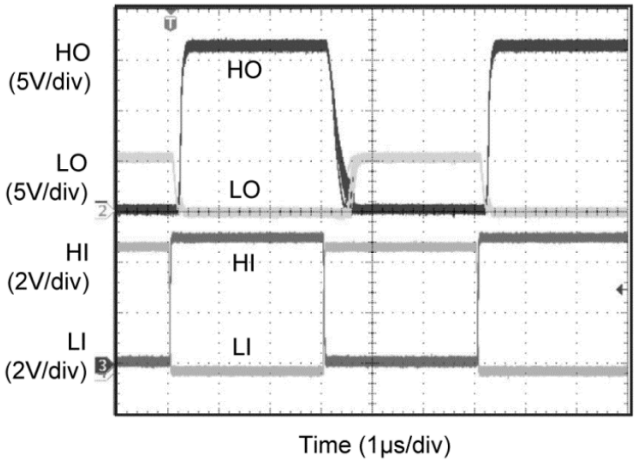
   Turn-on the VDD power supply, followed by the VIN power supply. Turn on the HI and LI inputs (–1) or PWM single input (–2).

Ordering Information

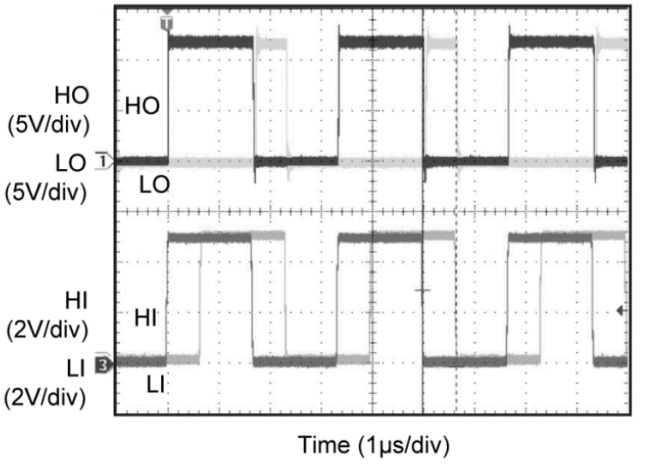
Part Number	Description
MIC4605-1YMT EV	Evaluation Board Featuring the MIC4605-1YMT Half-Bridge MOSFET Driver with Dual-TTL Inputs
MIC4605-2YMT EV	Evaluation Board Featuring the MIC4605-2YMT Half-Bridge MOSFET Driver with Dual-TTL Inputs
MIC4605-1YM EV	Evaluation Board Featuring the MIC4605-1YM Half-Bridge MOSFET Driver with Single-PWM Input
MIC4605-2YM EV	Evaluation Board Featuring the MIC4605-2YM Half-Bridge MOSFET Driver with Single-PWM Input

Evaluation Board Performance

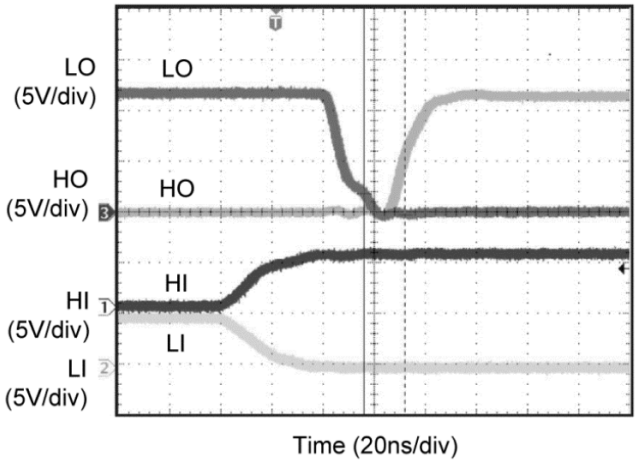
MIC4605-1 166kHz Operation
Fan Load Showing LI, HI, LO, and HO Signals



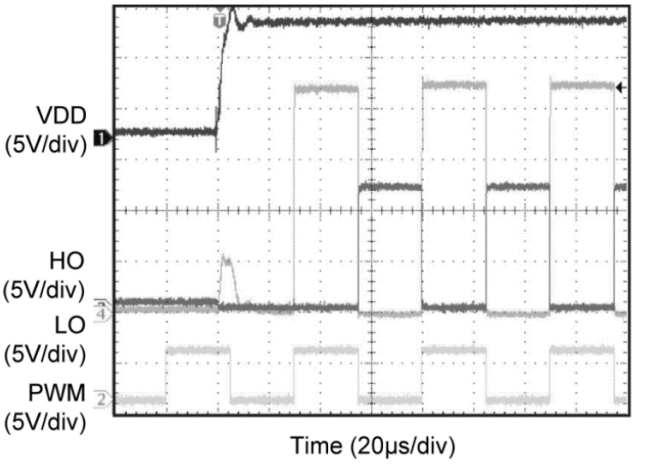
MIC4605-1 166kHz Overlapping Inputs
Fan Load Showing LI, HI, LO, and HO Signals



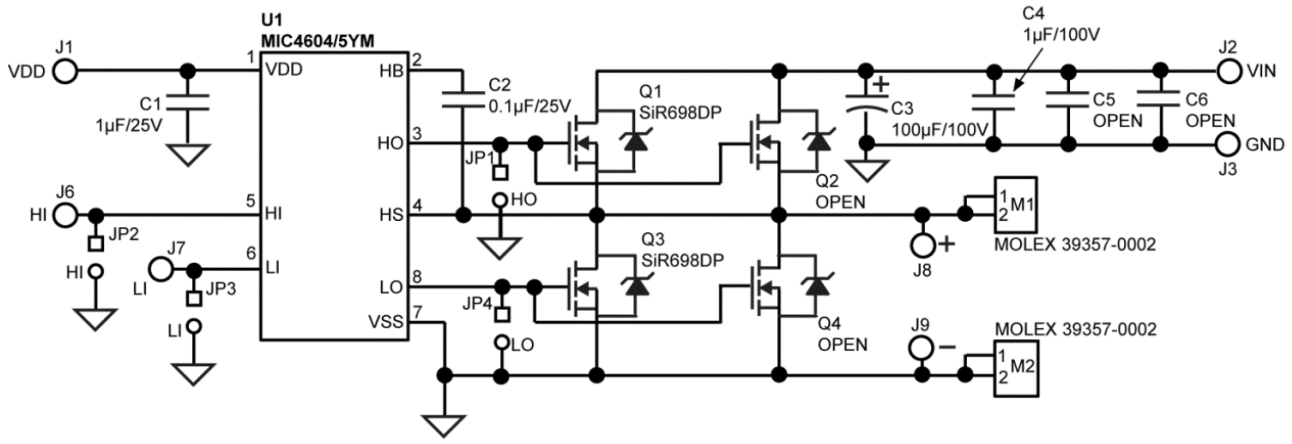
MIC4605-1 Adaptive Dead Time (HS Ground)
Showing LI, HI, HO, and LO Signals



MIC4605-2 VIN Turn-On (Hot Plug)
Fan Load Showing VDD, PWM, HO, and LO Signals



Evaluation Board Schematic (MIC4605YM)



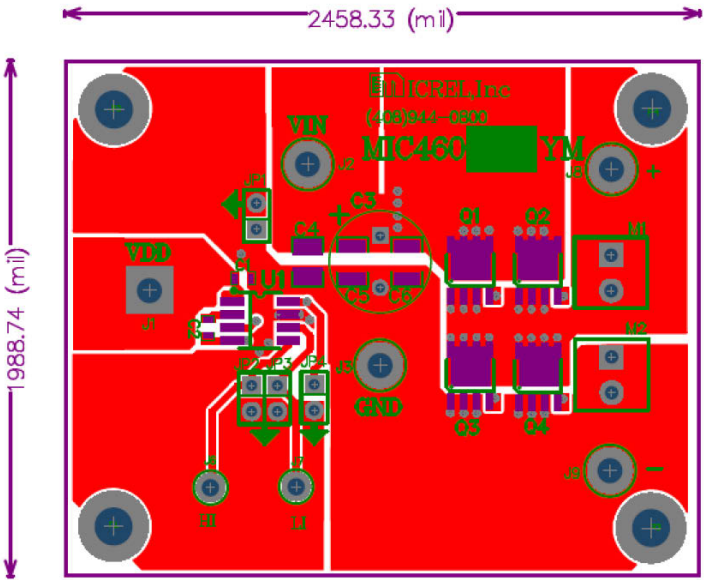
Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1	C1608X7R1E105K	TDK[1]	1.0µF Ceramic Capacitor, 25V, X7R, Size 0603	1
	GRM188R71E105KA12D	Murata[2]		
C2	C1608X7R1E104K	TDK	0.1µF Ceramic Capacitor, 25V, X7R, Size 0603	1
	06033C104KAT2A	AVX[3]		
	GRM188R71E104KA01D	Murata		
C3	B41851-A9107-M008	TDK	100µF, 100V, Radial Electrolytic Capacitor	1
C4	CGA5L2X7R2A105K	TDK	1.0µF Ceramic Capacitor, 100V, X7R, Size 1206	1
	12061C105K4Z4A	AVX		
	GRF31CR72A105KA01L	Murata		
Q1, Q3	AM7414NA	Analog Power[4]	100V , N-Channel MOSFET , SO8	2
	SiR698DP-T1-GE3	Vishay		
U1	**MIC4605YM**	**Micrel, Inc.[5]**	**85V Half-Bridge MOSFET Drivers with 5.5V to 16V Gate Drive**	**1**

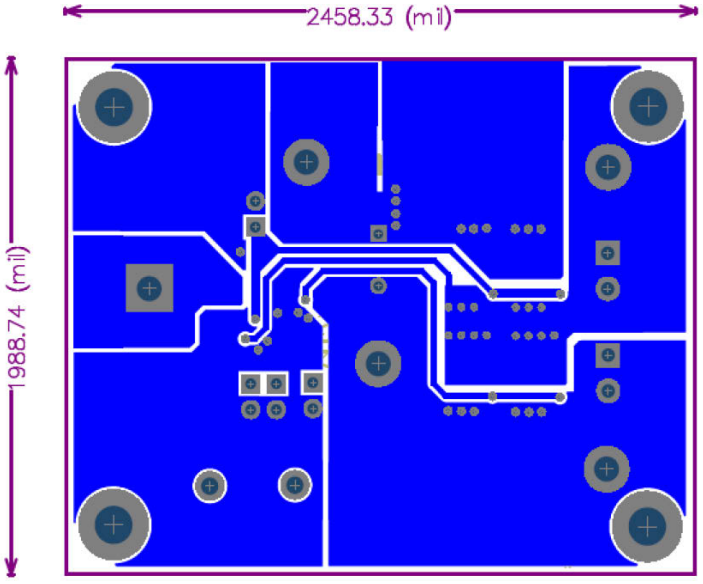
Notes:

1. TDK: www.tdk.com.
2. Murata: www.murata.com.
3. AVX: www.avx.com.
4. Analog Power: www.analogpowerinc.com.
5. **Micrel, Inc.: www.micrel.com.**

PCB Layout Recommendations (MIC4605YM)

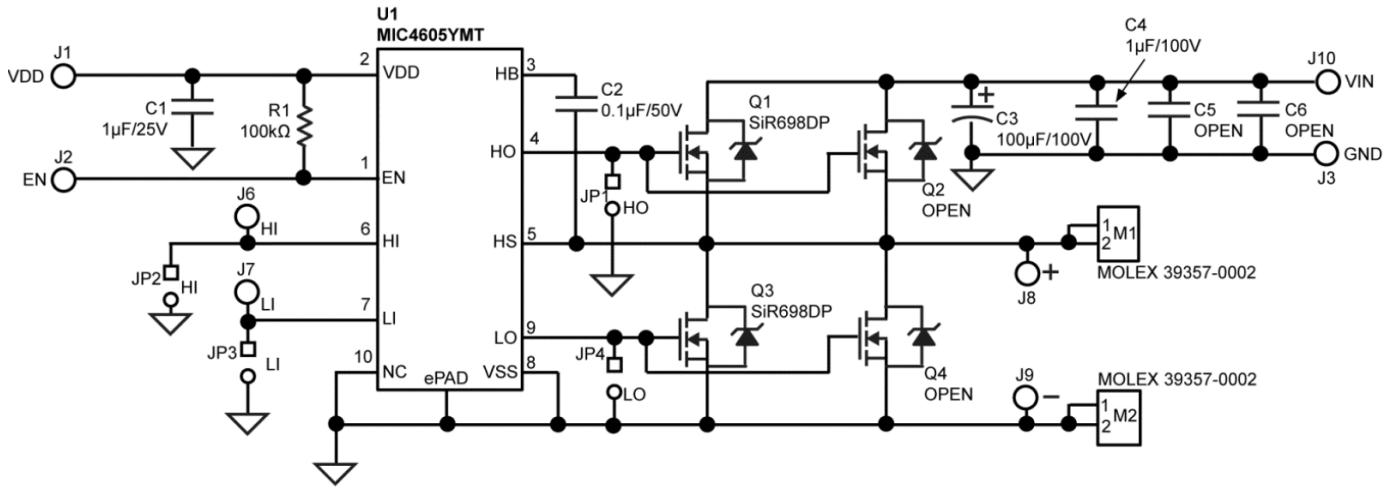


MIC4605YM Evaluation Board – Top Layer



MIC4605YM Evaluation Board – Bottom Layer

Evaluation Board Schematic (MIC4605YMT)



Bill of Materials

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	GRM188R71E105KA12D	Murata[7]		
C2	C1608X7R1E104K	TDK	0.1µF Ceramic Capacitor, 25V, X7R, Size 0603	1
	06033C104KAT2A	AVX[8]		
	GRM188R71E104KA01D	Murata		
C3	B41851-A9107-M008	TDK	100µF, 100V, Radial Electrolytic Capacitor	1
C4	CGA5L2X7R2A105K	TDK	1.0µF Ceramic Capacitor, 100V, X7R, Size 1206	1
	12061C105K4Z4A	AVX		
	GRF31CR72A105KA01L	Murata		
Q1, Q3	AM7414NA	Analog Power[9]	100V , N-Channel MOSFET , SO8	2
	SiR698DP-T1-GE3	Vishay		
U1	**MIC4605YMT**	**Micrel, Inc.** [10]	**85V Half-Bridge MOSFET Drivers with 5.5V to 16V Gate Drive**	1

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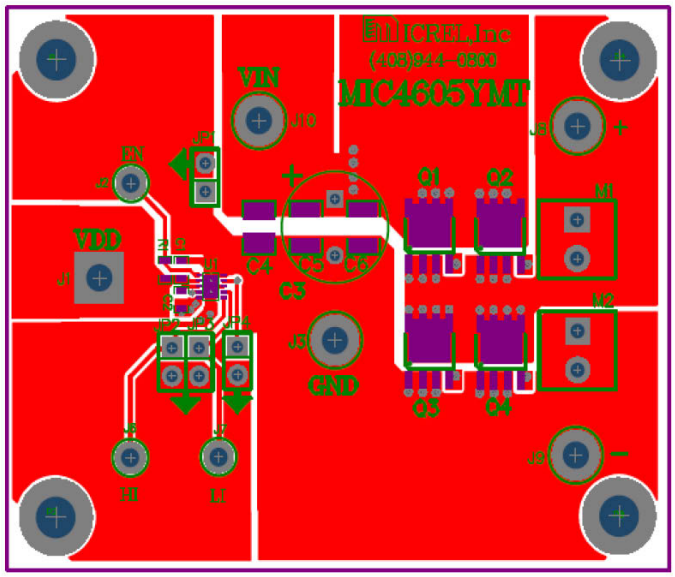
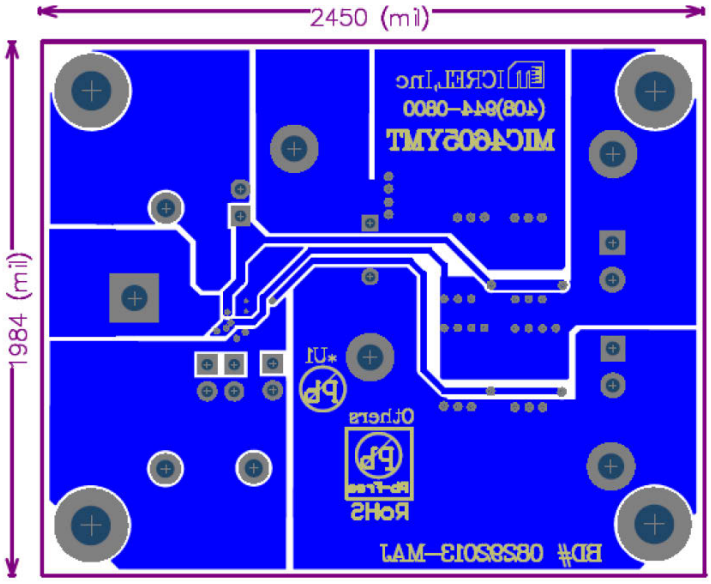
6. TDK: www.tdk.com.
7. Murata: www.murata.com.
8. AVX: www.avx.com.
9. Analog Power: www.analogpowerinc.com.
10. **Micrel, Inc.: www.micrel.com.**

PCB Layout Recommendations (MIC4605YMT)



MIC4605YMT Evaluation Board – Top Layer



MIC4605YMT Evaluation Board – Bottom Layer

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