MIC4600 Evaluation Board

28V Half-Bridge MOSFET Driver

General Description

The MIC4600 is a 28V half-bridge MOSFET driver targeted for cost sensitive applications that require high performance such as set-top boxes, gateways, routers, computing peripherals, telecom, and networking equipment.

The MIC4600 operates over a supply range of 4.5V to 28V. It has an internal linear regulator that provides a regulated 5V to power the MOSFET gate drive and operates up to 1.5MHz switching frequency.

The MIC4600 uses an adjustable dead time circuit to prevent shoot-through in the external high- and low-side MOSFETs.

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

Requirements

The evaluation board consists of the driver, external MOSFETs, and an output LC filter to duplicate the power stage of a synchronous buck converter.

When a pulse generator drives the MIC4600 inputs, the output voltage depends on the input duty cycle and PV_{IN} voltage. The evaluation board may also be connected to a PWM control IC or µC, where the output voltage is regulated with closed loop control. The maximum output voltage is limited to 6V by the output capacitor (C6) voltage rating. Higher output voltages are possible if C6 is replaced with a suitable capacitor.

In addition to the input drive signals, the MIC4600 evaluation board requires a PV_{IN} power supply with an output between 4.5V and 28V and a load connected to the output.

Precautions

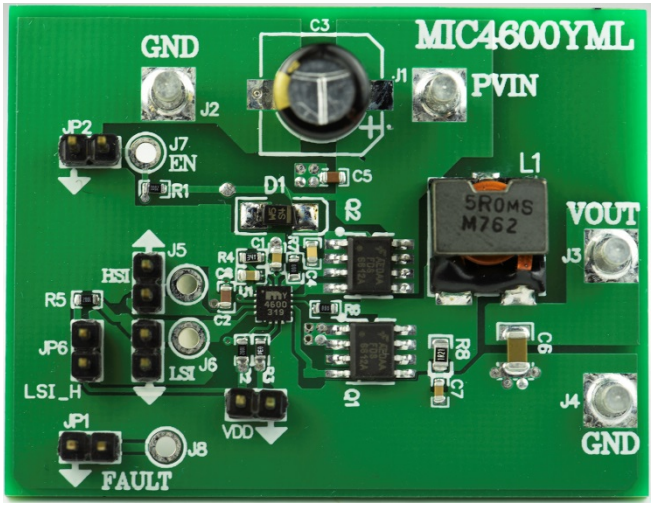
The evaluation board does not have reverse polarity protection. Applying a negative voltage to the PVIN (J1) terminal may damage the device. Do not exceed 28V on the input to prevent damage to the driver. Do not exceed 6V on the output to prevent damage to the output capacitor.

The enable pin is pulled up to PV_{IN}. If an external signal is connected to EN, make sure it can withstand PV_{IN}. If not, R1 may be removed or the enable pin must be buffered.

Ordering Information

Part Number	Description
MIC4600YML EV	MIC4600YML Evaluation Board

Evaluation Board



Circuit Description

EN, HSI, and LSI Inputs

The input signals can be injected at terminal J5/JP3 (HSI) and J6/JP4 (LSI). The EN signal can be injected at terminal J7/JP2. All inputs are TTL compatible. The maximum HSI and LSI signal amplitude is V_{DD} (5V nominal). The maximum EN pin amplitude is PV_{IN}. The EN pin is pulled up to PV_{IN} through resistor R1. Do not leave the HSI or LSI pins floating.

Fault Pin

The FAULT pin asserts low during an overtemperature condition. The pin is pulled up to V_{DD} through R2 and may be monitored at terminal J8/JP1. By removing R2, the FAULT pin may be pulled up to an external voltage. Do not exceed a pull-up voltage of V_{DD}.

Getting Started

Connect the input supply.

Connect the input supply to the PVIN (J1) and Ground (J2) terminals. Pay careful attention to the polarity and supply voltage range (28V maximum operating). An ammeter may be placed between the input supply and the PVIN terminal to measure input current.

Connect the output load

Connect a resistive or electronic load to the evaluation board output (J3) and ground (J4) terminals. Do not exceed 6V on the output unless C6 is replaced with a higher voltage capacitor.

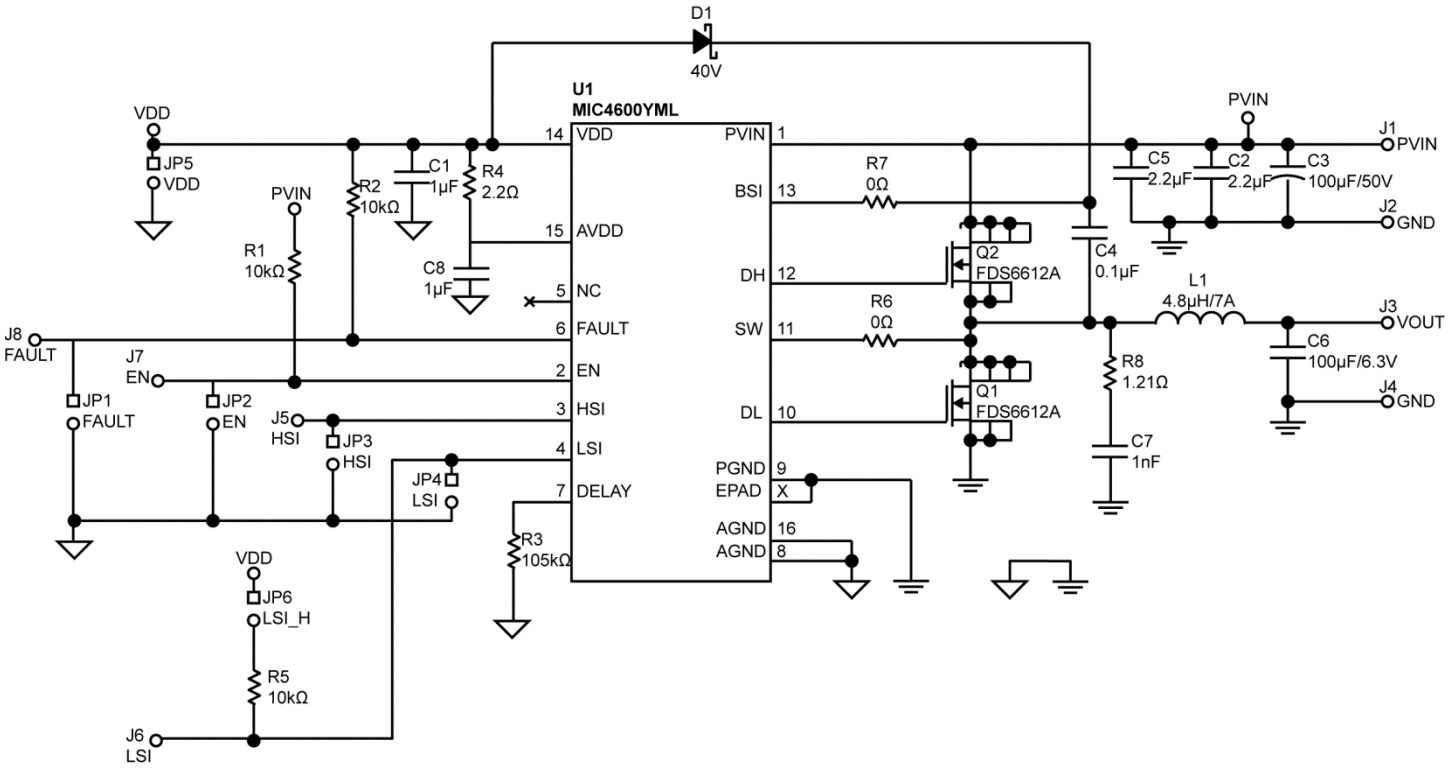
Enable the MIC4600.

The enable pin (J7/JP2) is pulled up to PV_{IN} with a 100kΩ resistor. The evaluation board does not require an external enable signal to turn on. The output turns on when PV_{IN} exceeds the input UVLO threshold. The output is turned off by pulling the EN pin low.

Single Input (PWM) Mode

The MIC4600 may be driven with a single input on the HSI pin. The LSI pin must first be pulled high to V_{DD} by shorting header JP6. In this mode, the HSI pin controls both the high-side and low-side MOSFETs in a synchronous manner. When HSI goes high, the low-side MOSFET, Q1, is turned off and the high-side MOSFET, Q2, is then turned on. When HSI goes low, Q2 is first turned off and then Q1 is turned on. The internal anti-shoot-through circuitry prevents both MOSFETs from being on at the same time. Additional delay during the transition can be adjusted with R3. Please see the MIC4600 datasheet for additional details.

Evaluation Board Schematic



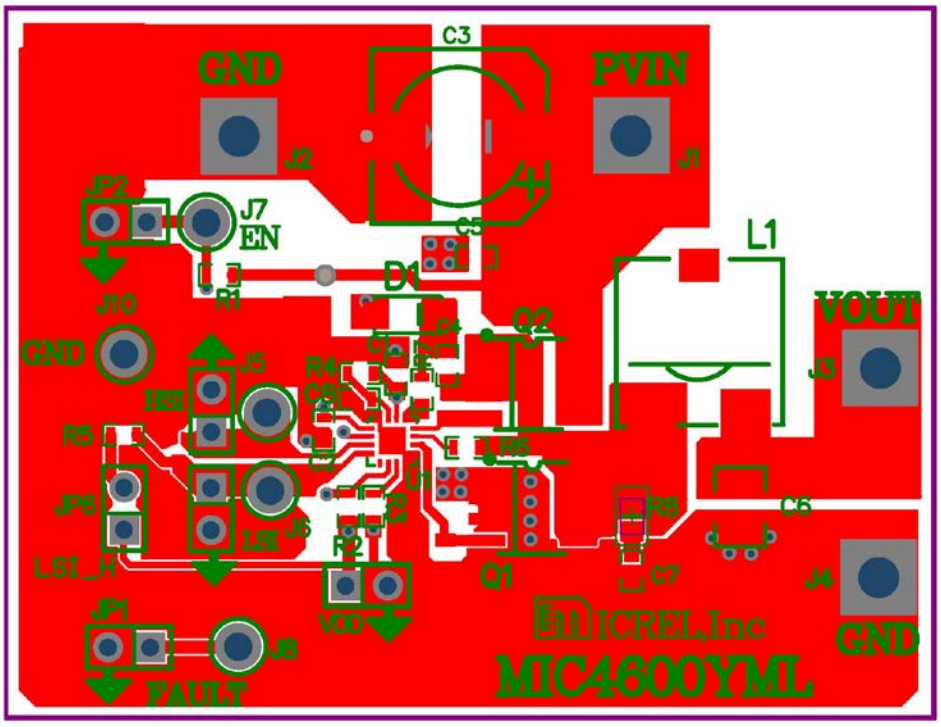
Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1, C8	06036D105MAT2A	AVX[1]	1µF, 6.3V, X5R, Ceramic Capacitor	2
C2, C5	C1608X5R1V225M080AC	TDK[2]	2.2µF, 50V, X5R, Ceramic capacitor	2
C3	EEU-FM1H101B	Panasonic[3]	100µF, 50V, Al. El.	1
C4	06033D107MAT2A	AVX	0.1µF, 25V, X5R, Ceramic Capacitor	1
C7	06035C102KAT2A	AVX	1nF, 50V, X7R, Ceramic Capacitor	1
C6	C3216X5R0J107M160AB	TDK	100µF, 6.3V, X5R, Ceramic Capacitor	1
R1, R2, R5	CRCW06031002FRT1	Vishay Dale[4]	10kΩ (0603 size), 1%	3
R3	CRCW06031053FRT1	Vishay Dale	105kΩ (0603 size), 1%	1
R4	CRCW06032R20JNEA	Vishay Dale	2.2Ω (0603 size), 5%	1
R6, R7	CRCW0600000FRT1	Vishay Dale	0Ω (0603 size)	2
R8	CRCW08051R21FRT1	Vishay Dale	1.21Ω (0603 size), 1%	1
D1	B0540W-7-F	Diodes Inc.[5]	40V, 0.5A, Schottky, SOD123	1
Q1, Q2	FDS6612A	Fairchild[6]	MOSFET	2
L1	CDEP105NP-5R0MC-50	Sumida[7]	4.8µH, 7A, Inductor	1
U1	**MIC4600YML**	**Micrel, Inc.[8]**	**28V Half-Bridge MOSFET Driver**	**1**

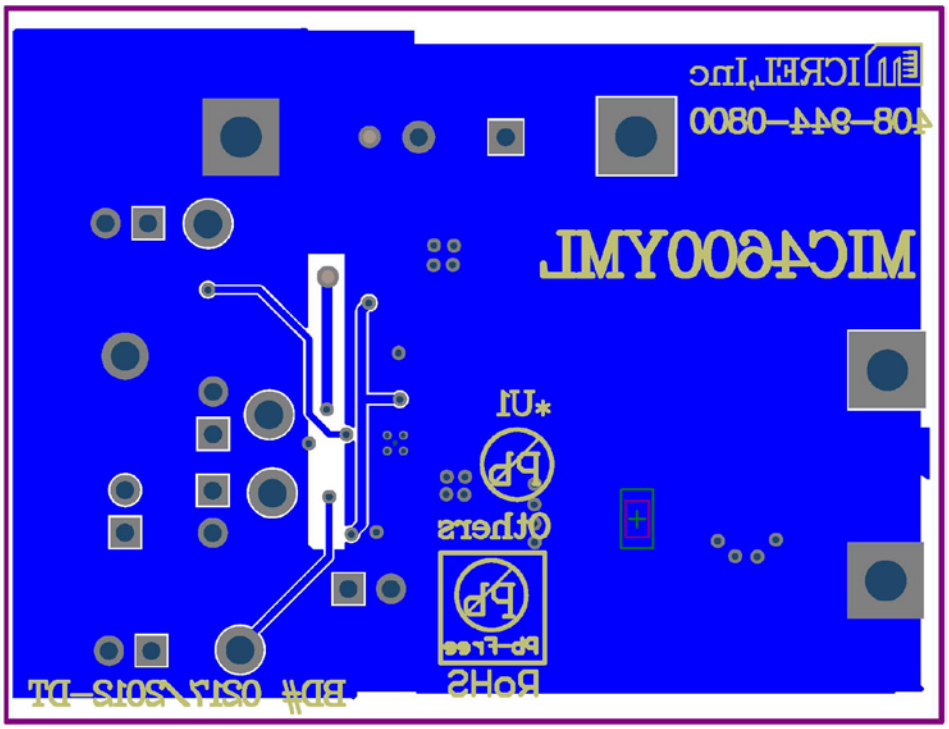
Notes:

1. AVX: www.avx.com.
2. TDK: www.tdk.com.
3. Panasonic: www.panasonic.com.
4. Vishay: www.vishay.com.
5. Diodes Inc.: www.diodes.com.
6. Fairchild: www.fairchildsemi.com.
7. Sumida: www.sumida.com.
8. **Micrel, Inc.:** www.micrel.com.

PCB Layout Recommendations



Top Layer



Bottom Layer

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