MIC4223/4/5 Evaluation Boards

Dual 4A, Low-Side MOSFET Drivers with Enable

General Description

The MIC4223/MIC4224/MIC4225 is a family of dual 4A, high-speed, low-side MOSFET drivers with logic-level driver enables. These evaluation boards provide a platform to evaluate the parts.

The parts are packaged in either an 8-pin SOIC (YM suffix) or 8-pin ePAD-MSOP (YMME suffix). An evaluation board is available for each package. The evaluation boards are populated with a MIC4224YM or MIC4224YMME, but may be used with any of the 3 driver configurations. To evaluate the MIC4223 or MIC4225, order a MIC4224 evaluation board and populate with MIC4223 or MIC4225 devices.

Please refer to the MIC4223/MIC4225/MIC4225 datasheet for a detailed explanation of the driver IC. Datasheets and support documentation can be found on Micrel's web site at: www.micrel.com.

Evaluation Board Description

Control IC MIC4223/MIC4224/MIC4225
Topology.....Dual Low-Side MOSFET Driver with Enable
V_{DD} Supply Voltage Range.....4.5V to 18V
Maximum Input Pin Voltage ..... V_{DD}
Maximum Enable Pin Voltage ..... V_{DD}
Maximum External FET Supply Voltage 25V

Requirements

The evaluation board requires:

- An V_{DD} supply to power the driver
- An square or pulse input signal
- An external supply voltage for the MOSFET drains

Features

- External MOSFETs on the board for ease of testing
- Voltage divider resistor locations for adjusting V_{DD} turn-on UVLO
- Resistor and capacitor component locations on the driver output for ease of testing

Related Documentation

- MIC4223/MIC4225/MIC4225 Datasheet

Precautions

The evaluation board does not have reverse polarity protection. Applying a negative voltage to the V_{DD}, V_{EN} or V_{IN} terminals may damage the device.

Ordering Information

Part Number	Description	Package
MIC4223YM	Dual Inverting Driver	8-pin SOIC
MIC4224YM	Dual Non-Inverting Driver	8-pin SOIC
MIC4225YM	Inverting and Non-Inverting Driver	8-pin SOIC
MIC4223YMME	Dual Inverting Driver	8-pin ePAD MSOP
MIC4224YMME	Dual Non-Inverting Driver	8-pin ePAD MSOP
MIC4225YMME	Inverting and Non-Inverting Driver	8-pin ePAD MSOP
MIC4224YM EV	Evaluation Board	8-pin SOIC
MIC4224YMME EV	Evaluation Board	8-pin ePAD MSOP

Getting Started

1. V_{DD} Supply

Connect the V_{DD} and GND terminals to an external supply voltage. The input voltage range is from 4.5V to 18V.

2. V_{INA} and V_{INB} Signals

Apply a square wave or pulse to the INA or INB terminals. The logic 0 level is less than 0.8V and the logic 1 level is greater than 2.4V. The maximum logic 1 level voltage is V_{DD}.

Headers TP1 and TP4 can be used to apply an input signal or monitor the input.

3. Monitor Output

The output signal can be monitored with a scope probe at the OUT_A and OUT_B pins.

Headers TP3 and TP6 can also be used to monitor the driver output.

Enable

An internal pull-up enables the driver if the enable pins (ENA and ENB) are open. Pulling the enable pins low disables the driver and forces the output low. Headers TP2 and TP5 can be used to apply an enable signal or monitor the output.

A resistor divider may be used to program a supply voltage UVLO. Resistors pairs (R1, R2) and (R6, R8) form voltage dividers from V_{DD} to ground. The dividers can be used to enable the driver output when V_{DD} rises above a desired value.

The V_{DD} threshold voltage is calculated as follows:

$$V_{DD\_UVLO} = V_{EN\_H} \times \left(1 + \frac{R1}{R2}\right)$$

Where: V_{EN_H} = 1.9V (typical)

The value of R1 should be in the 1k range to allow it to over-ride the internal 100k pull-up resistor on the enable pin. For R1=1k, and a known V_{DD} UVLO voltage, the value of R2 can be calculated by rearranging the above equation.

$$R2 = \frac{R1}{\frac{V_{DD\_UVLO}}{V_{EN\_H}} - 1}$$

Driver Output

The evaluation board allows the option of driving a MOSFET or capacitance. The board comes with a 30V N-channel MOSFET to show “real world” operation. The MOSFET may be removed and a capacitor used if a standardized test is required. Capacitor locations C3 (OUT_A) and C6 (OUT_B) allow the option of testing the driver output with a capacitance.

Resistor locations R4 and R9 allow a resistor to be placed in series with the driver output. The board comes with the resistor pads shorted. The etch between the pads must be cut before a resistor may be added.

External MOSFETs

An external 30V MOSFET is included with the board to facilitate testing of the driver. Terminals are provided for an external supply to be connected (DRAIN_A and DRAIN_B). A 1k load resistor is also supplied so MOSFET switching can be observed. A 1µF capacitor, connected to the DRAIN_A and DRAIN_B terminals helps decouple switching currents on the board.

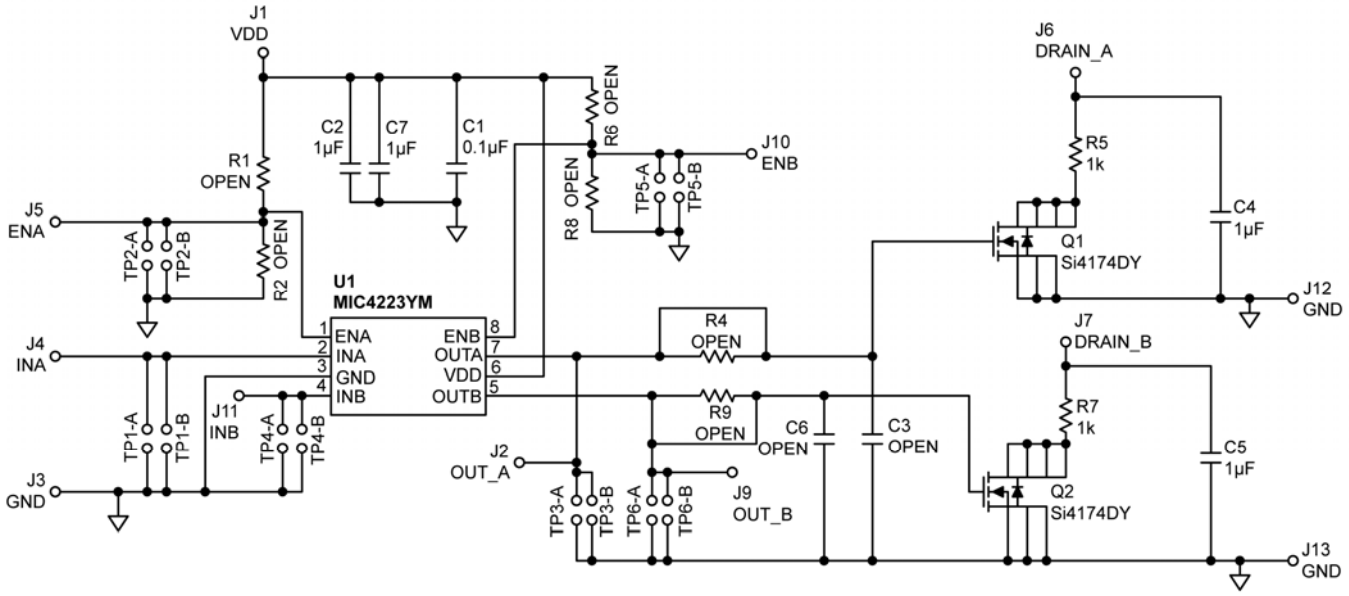
Evaluation Board Layout

The evaluation board is constructed of two layers with the bottom layer predominately ground.

Layer Section	Description
L1	Power, Signal
L2	Ground

Table 1. Layer Stack

Evaluation Board Schematic (8-Pin SOIC)



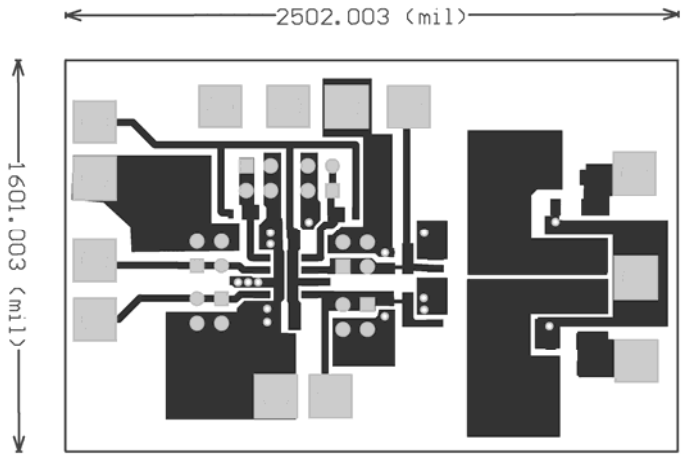
Bill of Materials (8-Pin SOIC)

Item	Part Number	Manufacturer	Description	Qty
C1	06033C104KAT	AVX[1]	0.1µF Ceramic Capacitor, X7R, Size 0603, 25V	1
	C1608X7R1H104K	TDK[2]		
	GMR188R71H104KA93D	muRata[3]		
C2, C7	06033D105MAT2A	AVX[1]	1µF Ceramic Capacitor, X5R, Size 0603, 25V	2
	C1608X4R1E105M	TDK[2]		
	GRM188R61E105KA93	muRata[3]		
C4, C5	12063D105MAT2A	AVX[1]	1µF Ceramic Capacitor, X5R, Size 1206, 25V	2
	C3216X7R1E105K	TDK[2]		
	GRM31MR71H105KA01	muRata[3]		
C3, C6			Open Location, Size 0603	2
Q1, Q2	Si4174DY	Vishay[4]	30V, N-Channel MOSFET	2
R1, R2, R4, R6, R8, R9			Open Location, Size 0603	6
R5, R7	CRCW12061001FRT1	Vishay[4]	1kΩ Resistor, size 1206, 1%	2
U1	**MIC4224YM**	**Micrel, Inc.[5]**	**Dual, Non-Inverting 4A MOSFET Driver with Enable**	**1**
U1[6]	**MIC4223YM**	**Micrel, Inc.[5]**	**Dual, Inverting 4A MOSFET Driver with Enable**	**0**
	MIC4225YM		**Dual, Inverting and Non-Inverting 4A MOSFET Driver with Enable**	

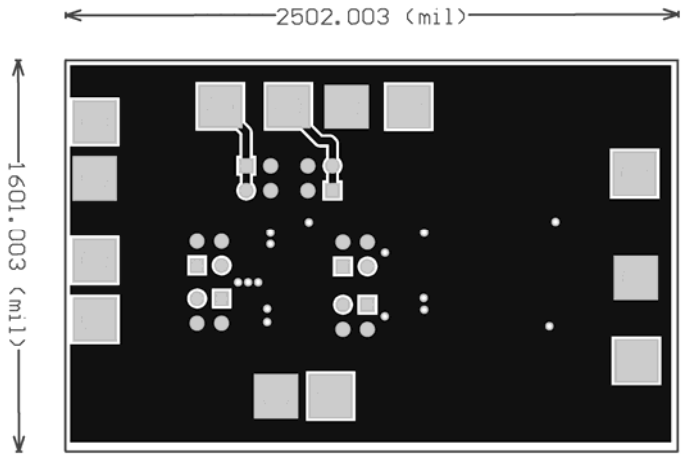
Notes:

1. AVX: www.avx.com.
2. TDK: www.tdk.com.
3. muRata: www.murata.com.
4. Vishay: www.vishay.com.
5. **Micrel, Inc.: www.micrel.com.**
6. **6.** Not included with evaluation kit. Part must be ordered separately.

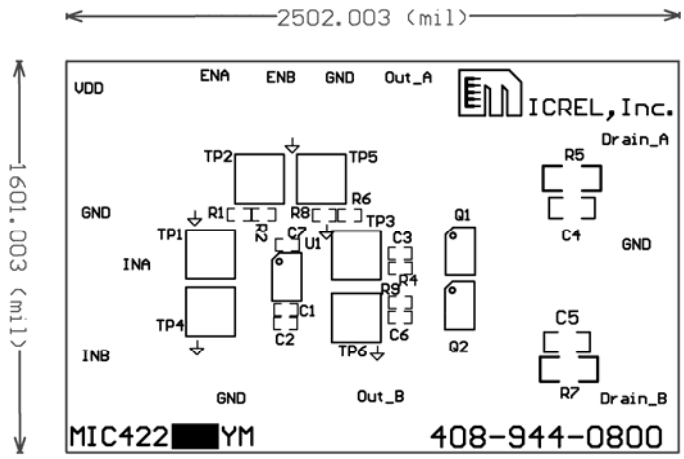
Evaluation Board Layers (8-Pin SOIC)



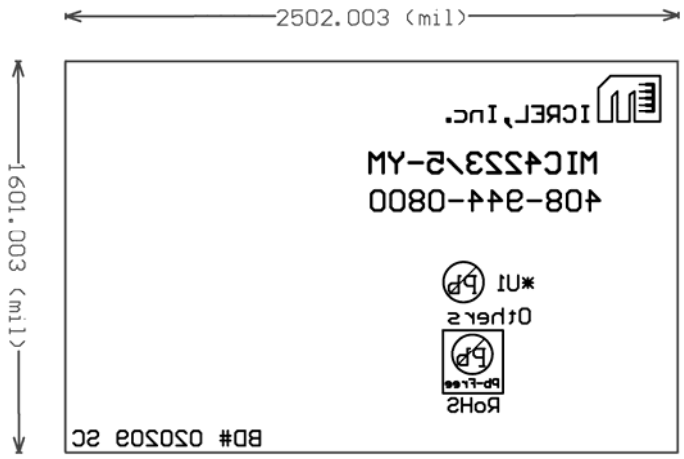
Top Layer (L1)



Bottom Layer (L2)

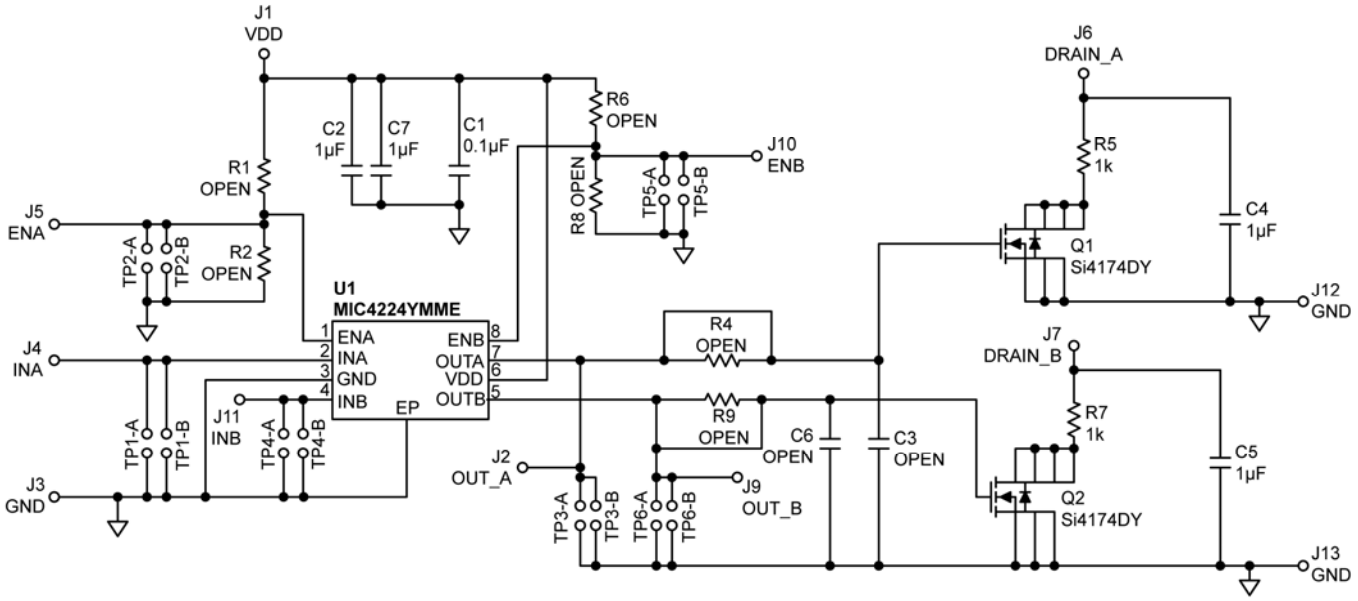


Top Silk Screen



Bottom Silk Screen

Evaluation Board Schematic (8-Pin ePAD MSOP)



Bill of Materials (8-Pin ePAD MSOP)

Item	Part Number	Manufacturer	Description	Qty
C1	06033C104KAT	AVX[1]	0.1µF Ceramic Capacitor, X7R, Size 0603, 25V	1
	C1608X7R1H104K	TDK[2]		
	GMR188R71H104KA93D	muRata[3]		
C2, C7	06033D105MAT2A	AVX[1]	1µF Ceramic Capacitor, X5R, Size 0603, 25V	2
	C1608X4R1E105M	TDK[2]		
	GRM188R61E105KA93	muRata[3]		
C4, C5	12063D105MAT2A	AVX[1]	1µF Ceramic Capacitor, X5R, Size 1206, 25V	2
	C3216X7R1E105K	TDK[2]		
	GRM31MR71H105KA01	muRata[3]		
C3, C6			Open Location, Size 0603	2
Q1, Q2	Si4174DY	Vishay[4]	30V, N-Channel MOSFET	2
R1, R2, R4, R6, R8, R9			Open Location, Size 0603	6
R5, R7	CRCW12061001FRT1	Vishay[4]	1kΩ Resistor, size 1206, 1%	2
U1	**MIC4224YMME**	**Micrel, Inc.[5]**	**Dual, Non-Inverting 4A MOSFET Driver with Enable**	**1**
U1[6]	**MIC4223YMME**	**Micrel, Inc.[5]**	**Dual, Inverting 4A MOSFET Driver with Enable**	**0**
	MIC4225YMME	**Micrel, Inc.[5]**	**Dual, Inverting and Non-Inverting 4A MOSFET Driver with Enable**	

Notes:

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4. Vishay: www.vishay.com.
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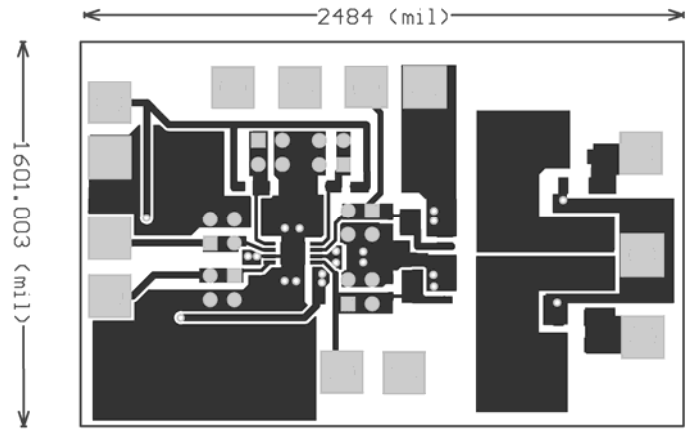
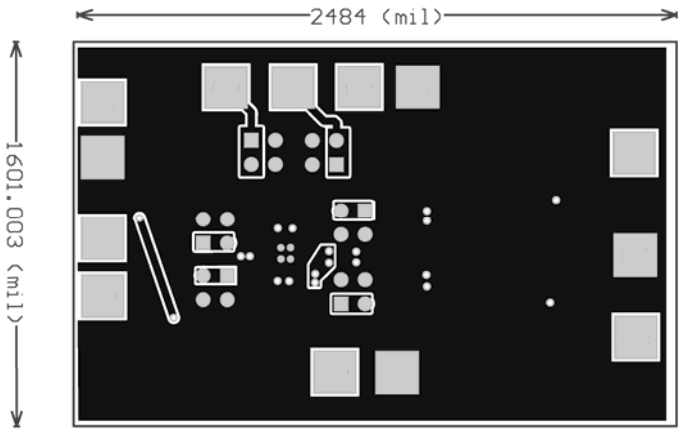
6. Not included with evaluation kit. Part must be ordered separately.

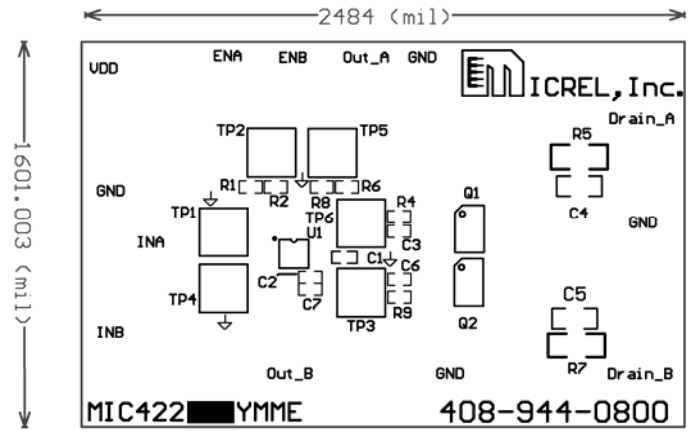
Evaluation Board Layers (8-Pin ePAD MSOP)



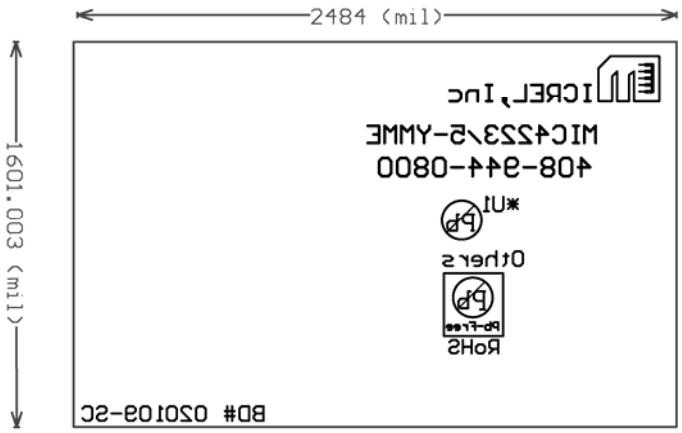
Top Layer (L1)



Bottom Layer (L2)



Top Silk Screen



Bottom Silk Screen

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