



# MIC5019 Evaluation Board

## Ultra-Small High-Side N-Channel MOSFET Driver with Integrated Charge Pump

### General Description

The MIC5019 is a high-side MOSFET driver with integrated charge pump designed to switch an N-channel enhancement type MOSFET in high-side or low-side applications.

The MIC5019 operates from a 2.7V to 9V supply. It generates gate voltages of 9.2V from a 3V supply and 16V from a 9V supply. The device consumes a low 77µA of supply current and less than 1µA of supply current in shutdown mode.

In high-side configurations, the source voltage of the MOSFET approaches the supply voltage when switched on. To keep the MOSFET on, the MIC5019's output drives the MOSFET gate voltage higher than the supply voltage.

Data sheets and support documentation can be found on Micrel's web site at: [www.micrel.com](http://www.micrel.com).

### Requirements

The MIC5019 evaluation board needs only a single power supply to power the driver and a function generator or logic signal to drive the IN pin. If the application needs different supplies for driver and load, then another supply may be used to power the external MOSFET at the VEXT (J7 and J6) by loading the resistor R1 and cutting the traces indicated by R4.

### Precautions

The MIC5019 evaluation board does not have reverse polarity protection. Applying a negative voltage to the VDD and GND terminals may damage the device. The maximum  $V_{DD}$  of the board is rated at 10V. Exceeding 10V on the VDD could damage the device.

### Getting Started

#### 1. $V_{DD}$ Supply

Connect a supply to the VDD and GND terminals, paying careful attention to the polarity and the supply range ( $2.7V < V_{IN} < 9V$ ). Monitor  $I_{IN}$  with a current meter and  $V_{IN}$  at VDD and GND terminals with a voltmeter. Do not apply power until step 4.

#### 2. Connect Function Generator to IN pin

Connect the function generator output to the IN pin and GND.

#### 3. OUT Signal

The voltage on the OUT pin can be monitored by using either a voltmeter or a high-impedance scope probe.

#### 4. Turn on the Power

Turn on the VDD supply, apply a logic high signal to the IN pin, and verify the OUT signal. The OUT pin is supplied by an internal charge pump; the charge pump is enabled when IN is logic high. The charge pump consists of an oscillator and a voltage quadrupler (4x). The oscillator operates from 70kHz to 100kHz, depending on the supply voltage and temperature. The output voltage is limited to 16V, typically by an internal zener diode clamp. The charge pump output voltage is approximately:

$$V_{OUT} = 4 \times V_{DD} - 2.8V, \text{ but not exceeding } 19V_{max}.$$

Refer to the "Output Voltage vs. Supply Voltage" graph in the "Typical Characteristics" section.

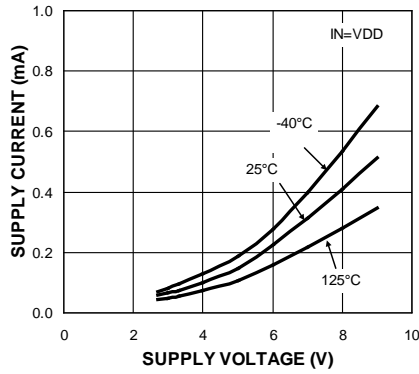
The user has a flexibility of either soldering a FET (Q1) or using different values of capacitors to imitate the gate capacitance (C5).

### Ordering Information

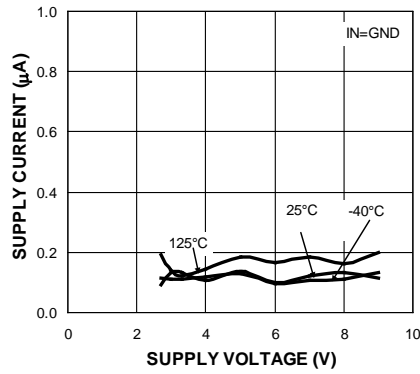
Part Number	Description
MIC5019YFT EV	MIC5019 Evaluation Board

## Typical Characteristics

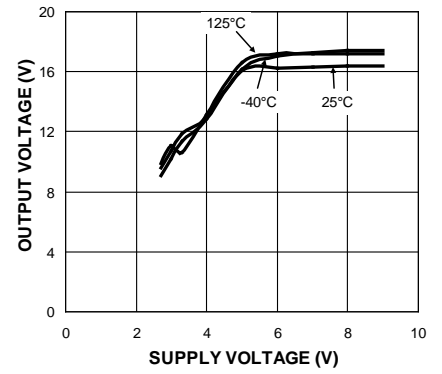
**VDD Supply Current vs. Supply Voltage**



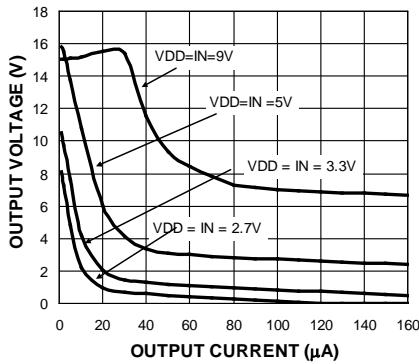
**VDD Supply Current vs. Supply Voltage**



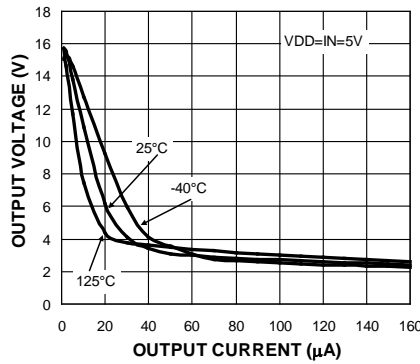
**Output Voltage vs. Supply Voltage**



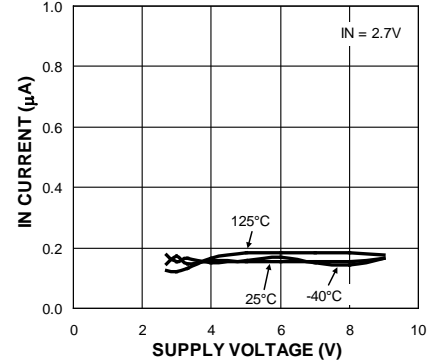
**Output Voltage vs. Output Current**



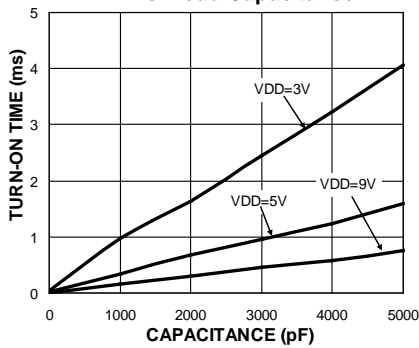
**Output Voltage vs. Output Current**



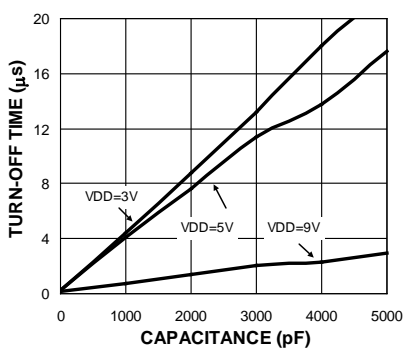
**IN Current vs. Supply Voltage**



**OUT Turn-On Time vs. Load Capacitance**



**OUT Turn-Off Time vs. Load Capacitance**



### MIC5019 Evaluation Board Schematic

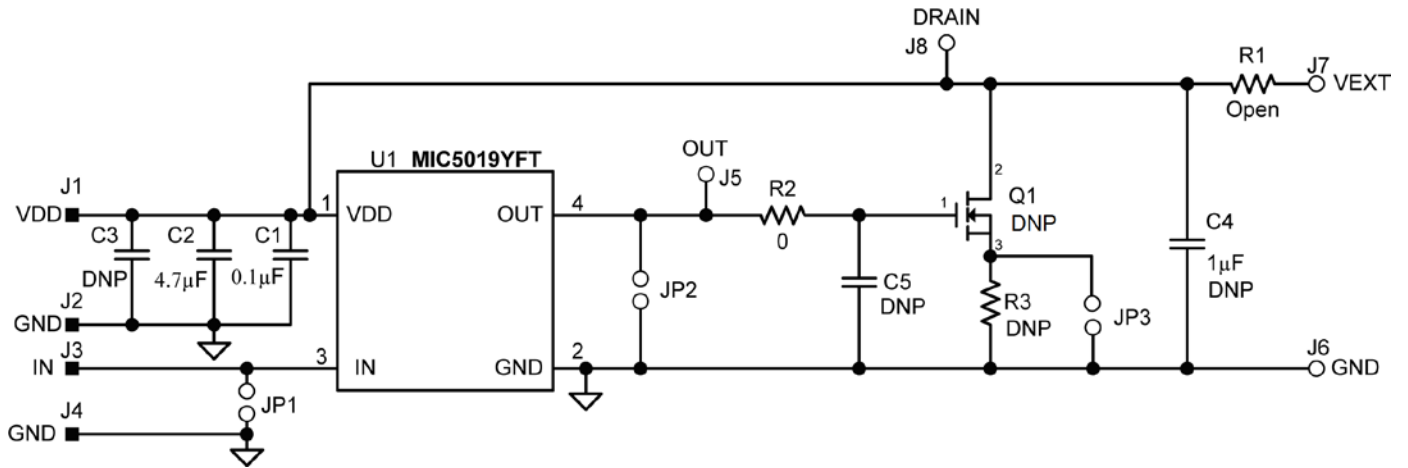


Figure 1. MIC5019 Evaluation Board Schematic

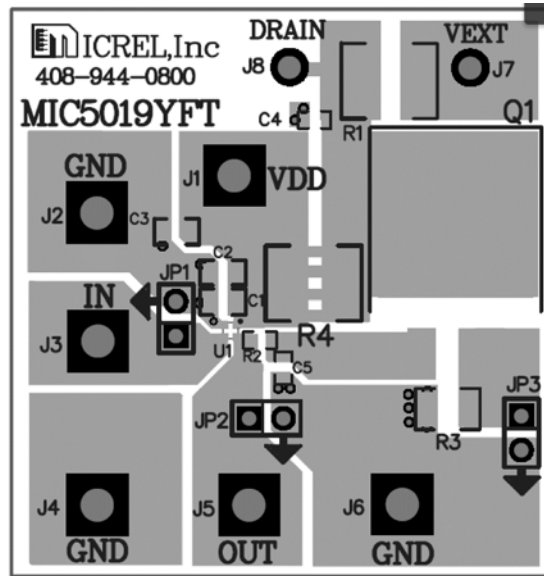
### Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1	GRM188R71C104KA01D	Murata <sup>(1)</sup>	0.1µF/16V Ceramic Capacitor, X7R, Size 0603	1
C2	C2012X7R1C475K	TDK <sup>(2)</sup>	4.7µF/16V Ceramic Capacitor, X7R, Size 0805	1
	GRM21BR71C475KA73L	Murata		
	0805YC475KAT2A	AVX <sup>(3)</sup>		
R1, R3, C3, C4, Q1, C5			Do not populate (DNP)	
R2	CRCW06030000FKEA	Vishay Dale <sup>(4)</sup>	0Ω Resistor, Size 0603, 5%	1
U1	MIC5019YFT	Micrel, Inc. <sup>(5)</sup>	High-Side/Low-Side MOSFET Driver	1

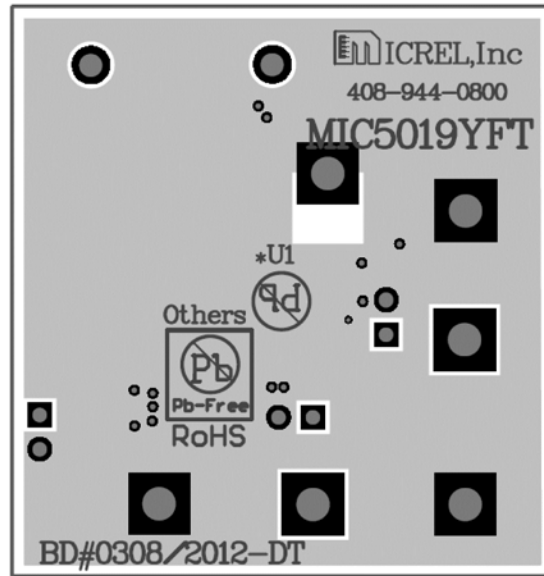
**Notes:**

1. Murata: [www.murata.com](http://www.murata.com).
2. TDK: [www.tdk.com](http://www.tdk.com).
3. AVX: [www.avx.com](http://www.avx.com).
4. Vishay: [www.vishay.com](http://www.vishay.com).
5. Micrel, Inc.: [www.micrel.com](http://www.micrel.com).

### Evaluation Board PCB Layout



MIC5019 Evaluation Board – Copper Layer 1 (Top)



MIC5019 Evaluation Board – Copper Layer 2 (Bottom)

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