

## PRODUCT BRIEF

# MM101

## 8 Channel MEMS High Voltage Driver



The MM101 is an 8-Channel Low-Voltage Serial to High-Voltage Parallel Converter with Push-Pull Outputs and an Internal Charge Pump Converter.

The device is designed for MEMS applications where high voltage generation and driving capability are desired in a high integration form factor. The internal Charge Pump operates with a 5.0 V input source to generate a high-voltage source for the 8-Channel Output Drivers.

The circuitry includes Power-On-Reset and Power ON/OFF Sequence Control. The communication interface consists of two modes of operation: GPIO and SPI, selected with the input control MODE pin.

### FEATURES

- Eight High-Voltage Push-Pull Output Channels
- Internal Charge Pump Voltage Converter
- Power-On-Reset (POR)
- Selectable Communication Interface (SPI, GPIO)
- Up to 33MHz SPI Clock Speed
- VDD\_IO Supply allows I/O levels to range from 1.8V to 5.0V
- SPI can be daisy-chained
- Under Voltage Protection for VPP and VDD
- Fault Indicators (Latched SPI register bit and unlatched Open-Drain FLTB pin)
- Available in a 5x5mm QFN package, and WLCSP Flip Chip package.

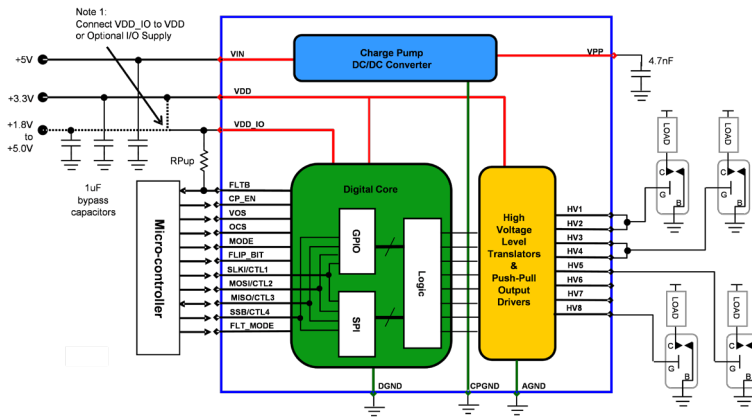
### APPLICATIONS

- Microelectromechanical Systems
- Displays
- High Voltage Driver Applications

### MARKETS

- Load/DIB for Semiconductor Test
- RF Systems
- Test and Measurement

**FIG. 1** Functional Block Diagram



#### Functional Description

The MM101 is an 8-Channel Low-Voltage Serial to High-Voltage Parallel Converter with Push-Pull Outputs and an Internal Charge Pump Converter. The device is designed for MEMS applications where high voltage generation and driving capability are desired in a high integration form factor. The device consists of three main design blocks: Internal Charge Pump, Communication Interface, and 8-High Voltage Push-Pull Drivers.

#### Charge Pump

The Internal Charge Pump operates from a 5.0V nominal input to generate the high voltage VPP for the HV Drivers. The output voltage can be selected to be either 90V or 80V using the VOS pin in GPIO mode or VOSET bit in SPI mode. The VOS pin has a low current internal pull-down to GND. If the pin is left open or connected to VDD, the output voltage defaults to 80 V. Pulling the pin to VDD\_IO sets the output high level to 90V. Likewise, in SPI mode, if the VOSET register bit is zero, the output level (HV#) high levels are 80V. If VOSET is set to 1, the HV# output levels are 90V.

The charge pump is designed to simultaneously drive 8 High-Voltage Push-Pull Drivers with a total load capacitance of 10pF.

**FIG. 2** Power Supply Specifications Table

Parameter	Min	Typ	Max	Unit	Test Condition
Charge Pump Power Supply	4.5	5.0	5.5	V	
VIN Current (Dynamic)		15	25	mA	Charge pump ON, VPP = 85V, I <sub>OUT</sub> = 20uA, outputs switching at 10 kHz, C <sub>L</sub> = 2pF per CH
VIN Quiescent Current		1.25	2.0	mA	Charge pump ON, VPP = 85V, I <sub>OUT</sub> = 20uA, all I/O static
Low Voltage Logic Supply	3.0	3.3	3.6	V	
VDD UVLO Rising Threshold	2.77		2.95	V	
VDD UVLO Falling Threshold	2.72		2.90	V	
Low Voltage Digital Current		400	500	μA	SPI mode outputs switching at 10 kHz, OCS = 0, C <sub>L</sub> = 2pF per CH
Low Voltage Digital Quiescent Current		285	350	μA	Charge Pump OFF, all I/O static
Low Voltage Digital Sleep Mode Current		<1	10	μA	Charge pump OFF, Sleep Mode ON
Logic Reference Level	1.71		5.5		
I/O Logic Supply Current		<10	50	μA	Outputs switching at 10 kHz

**FIG. 3** MM101 Evaluation Board

