

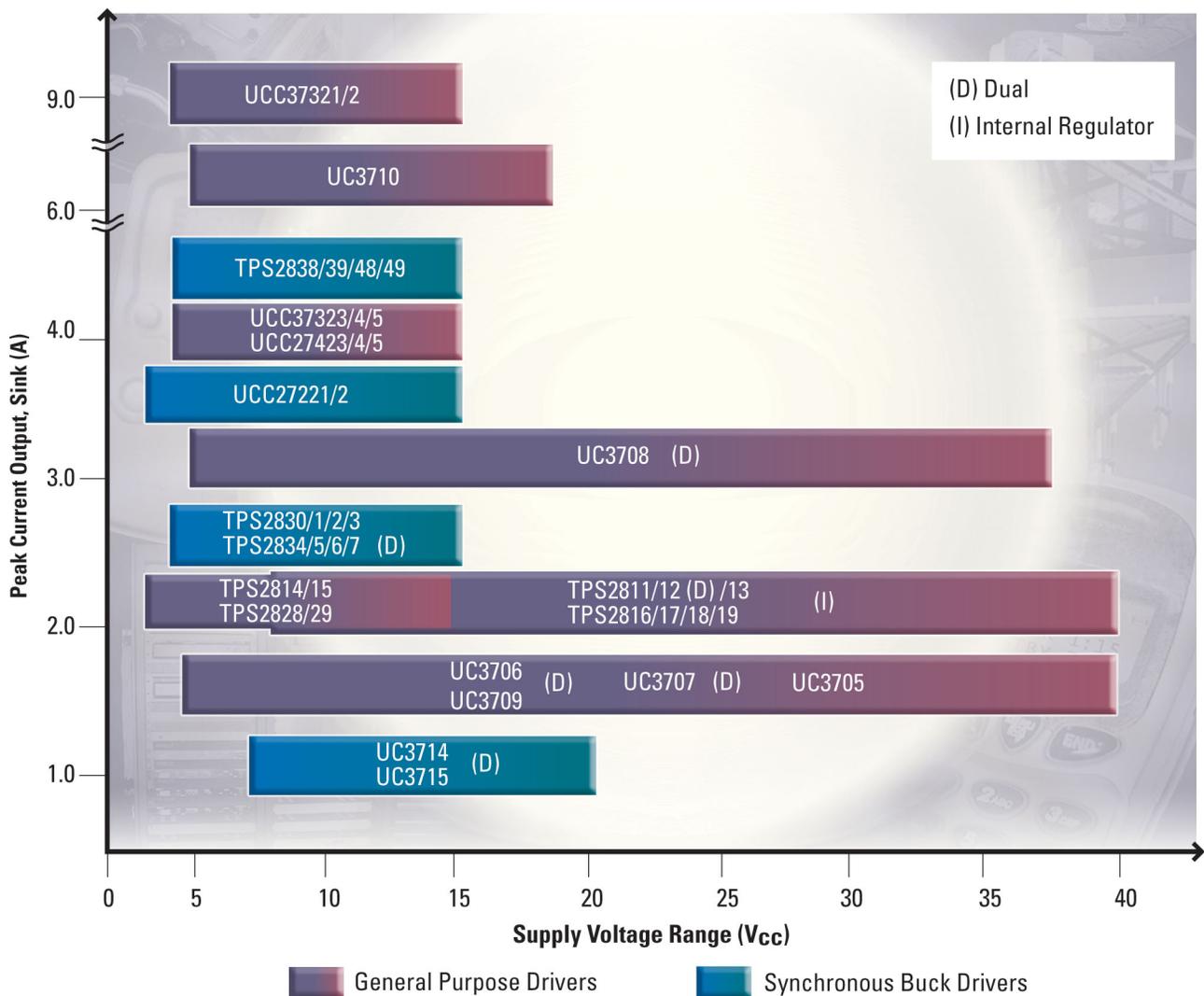
Power Management

# MOSFET Gate Drivers from Texas Instruments

**Includes:**

- Pin-Compatible Cross Reference to Industry Standard Drivers
- MOSFET Driver Selection Guide
- Digital Control Compatible Drivers
- Complete MOSFET Driver Resource Listing

## MOSFET Drivers Family of Products



Demanding high frequency and synchronous rectifier power management applications require robust gate drive solutions to achieve the highest efficiency. The powerful family of Texas Instruments Gate Driver ICs features a combined Bipolar and MOSFET manufacturing process that delivers

fast switching transitions and high current output capability. Developed with industry standard pinouts, many of these drivers are enhanced replacements for popular driver ICs used in the industry.

### MOSFET Gate Drivers with True Drive™ Technology

Single Low Side Drivers	Dual Low Side Drivers	Synchronous Buck Drivers
<p><b>TPS2816 thru TPS2819</b> <b>TPS2828/29</b></p> <ul style="list-style-type: none"> <li>• Single <math>\pm 2</math> A Peak Gate Drivers</li> <li>• Very cost effective</li> <li>• Noise-immune CMOS Schmitt Input</li> <li>• 4 V to 14 V supply operation</li> <li>• Internal Gate Drive Regulator extends operation to 40 V (TPS2816-19)</li> <li>• 5-pin SOT-23 package</li> </ul>	<p><b>TPS2811 thru TPS2815</b></p> <ul style="list-style-type: none"> <li>• Dual <math>\pm 2</math> A Peak Gate Drivers</li> <li>• Cost effective</li> <li>• Noise-immune CMOS Schmitt Input</li> <li>• 4 V to 15 V supply operation</li> <li>• Internal Gate Drive Regulator extends operation to 40 V (TPS2811/12/13)</li> <li>• Flexible input options (TPS2814/15)</li> <li>• 8-pin TSSOP, SOIC, and PDIP packages in industry standard pinout</li> </ul>	<p><b>TPS2830-37</b> <b>TPS2838/39/48/49</b></p> <ul style="list-style-type: none"> <li>• <math>\pm 2.4</math> A Peak Gate Drivers for 5 V and 12 V input applications (TPS2830-37)</li> <li>• <math>\pm 4.0</math> A Peak Gate Drivers for 12 V input applications (TPS2838/39/48/49)</li> <li>• Adaptive drive</li> <li>• 8-pin SOIC and PowerPAD™ HTSSOP 14-pin and 16-pin packages</li> </ul>
<p><b>UCC37321/2</b></p> <ul style="list-style-type: none"> <li>• Single <math>\pm 9</math> A Peak Gate Drivers suitable for high current 6 A, 9 A, and 12 A drive applications</li> <li>• 4 V to 15 V supply operation</li> <li>• 8-pin SOIC, PDIP, and PowerPAD MSOP packages</li> <li>• Industry standard pinout plus Enable function for improved driver control</li> </ul>	<p><b>UCC37323/4/5 and UCC27423/4/5</b></p> <ul style="list-style-type: none"> <li>• Dual <math>\pm 4</math> A Peak Gate Drivers</li> <li>• Suitable for dual 1.5 A and 3 A Gate Drive applications</li> <li>• 4 V to 15 V supply operation</li> <li>• 8-pin SOIC, PDIP, and PowerPAD MSOP packages</li> <li>• Industry standard pinouts</li> <li>• UCC27423/4/5 has an enable pin</li> </ul>	<p><b>UCC27221/2</b></p> <ul style="list-style-type: none"> <li>• <math>\pm 3.3</math> A Peak Gate Drivers</li> <li>• 3.3 V, 5 V, or 12 V input applications</li> <li>• Predictive Gate Drive™ technology to minimize body diode conduction losses</li> <li>• 2% to 4% efficiency gains over competing adaptive technologies</li> <li>• PowerPAD 14-pin HTSSOP package</li> </ul>

### General Purpose MOSFET Drivers: Pin-Compatible Devices

Texas Instruments	MicroChip	Micrel	Maxim	ON Semi	Texas Instruments
<b>UCC37323 and UCC27423</b>	TC426	MIC426	MAX626	MC33151	<b>TPS2811</b>
4 A dual inverting	TC1426	MIC1426	TSC426	MC34151	2 A dual inverting
	TC4423	MIC4423	MAX4426	NCP4413	
	TC4426	MIC4426		NCP4423	
<b>UCC37324 and UCC27424</b>	TC427	MIC427	MAX627	MC33152	<b>TPS2812</b>
4 A dual non-inverting	TC1427	MIC1427	TSC427	MC34152	2 A dual non-inverting
	TC4424	MIC4424	MAX4427	NCP4414	
	TC4427	MIC4427		NCP4424	
<b>UCC37325 and UCC27425</b>	TC428	MIC428	MAX628	MC33153	<b>TPS2812</b>
4 A Dual	TC1428	MIC1428	TSC428	MC34152	2 A dual
(one inverting, one non-inverting)	TC4428	MIC4428	MAX4428	NCP4425	(one inverting, one non-inverting)
<b>UCC37321</b>		MIC4420		NCP4421	
Single 9 A inverting		MIC4421			
		MIC4451			
<b>UCC37322</b>		MIC4429		NCP4422	
Single 9 A non-inverting		MIC4422			
		MIC4452			

MOSFET Gate Driver Selection Guide

Device	No. of Outputs	Supply Voltage (V)	Logic	Input Architecture	Output Architecture <sup>(1)</sup>	Peak Output Current (Sink/Source)	On-Time (Delay Rise Time)	Off-Time (Delay Fall time)	Load	Regulator	Enable	Dead Time Control	Protection Features <sup>(2)</sup>
<b>General Purpose Low Side Drivers</b>													
TPS2811	2	4 to 40	Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	40 ns	40 ns	1 nF	Extend Supply Range	—	—	—
TPS2812	2	4 to 40	Non-Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	40 ns	40 ns	1 nF	Extend Supply Range	—	—	—
TPS2813	2	4 to 40	Inverting + Non-Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	40 ns	40 ns	1 nF	Extend Supply Range	—	—	—
TPS2814	2	4 to 15	Dual 2-Input AND; 1 Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	40 ns	40 ns	1 nF	—	—	—	—
TPS2815	2	4 to 15	2-Input NAND	CMOS Schmitt	TrueDrive™	2 A/2 A	40 ns	40 ns	1 nF	—	—	—	—
TPS2816	1	4 to 40	Inverting w/ Active Pull-up	CMOS Schmitt	TrueDrive™	2 A/2 A	—	38 ns	1 nF	Extend Supply Range	—	—	—
TPS2817	1	4 to 40	Non-Inverting w/ Active Pull-up	CMOS Schmitt	TrueDrive™	2 A/2 A	38 ns	38 ns	1 nF	Extend Supply Range	—	—	—
TPS2818	1	4 to 40	Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	38 ns	38 ns	1 nF	Extend Supply Range	—	—	—
TPS2819	1	4 to 40	Non-Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	38 ns	38 ns	1 nF	Extend Supply Range	—	—	—
TPS2828	1	4 to 14	Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	38 ns	38 ns	1 nF	—	—	—	—
TPS2829	1	4 to 14	Non-Inverting	CMOS Schmitt	TrueDrive™	2 A/2 A	38 ns	38 ns	1 nF	—	—	—	—
UC3705	1	5 to 40	2-Input OR; 1 Inverting	TTL	Bipolar	1.5 A/1.5 A	140 ns	140 ns	1 nF	—	—	—	TSD
UC3706	2	5 to 40	Configurable	TTL	Bipolar	1.5 A/1.5 A	160 ns	160 ns	1 nF	—	—	Inhibit Circuit	TSD, OCP
UC3707	2	5 to 40	Non-Inverting	TTL	Bipolar	1.5 A/1.5 A	90 ns	90 ns	1 nF	—	—	—	TSD
UC3708	2	5 to 35	Non-Inverting	TTL	Bipolar	3 A/3 A	—	—	—	—	—	—	TSD, UVLO
UC3709	2	5 to 40	Inverting	TTL	Bipolar	1.5 A/1.5 A	—	—	—	—	—	—	TSD
UC3710	1	4.7 to 18	2-Input OR; 1 Inverting	TTL	Bipolar	6A/ 6A	—	—	—	—	—	—	TSD, UVLO
UCC37321	1	4 to 15	Inverting + Enable	TTL	TrueDrive™	9 A/9 A	45 ns	55 ns	10 nF	—	Yes	—	—
UCC37322	1	4 to 15	Non-Inverting + Enable	TTL	TrueDrive™	9 A/9 A	45 ns	55 ns	10 nF	—	Yes	—	—
UCC37323	2	4 to 15	Inverting	TTL	TrueDrive™	4 A/4 A	45 ns	50 ns	1.8 nF	—	—	—	—
UCC37324	2	4 to 15	Non-Inverting	TTL	TrueDrive™	4 A/4 A	45 ns	50 ns	1.8 nF	—	—	—	—
UCC37325	2	4 to 15	Inverting + Non-Inverting	TTL	TrueDrive™	4 A/4 A	45 ns	50 ns	1.8 nF	—	—	—	—
<b>Synchronous Buck Drivers</b>													
TPS2830	2	4.5 to 15	Non-Inverting	CMOS Schmitt	TrueDrive™	2.4 A/2.4 A	125 ns	125 ns	3.3 nF	—	Yes	Adaptive	OVPC
TPS2831	2	4.5 to 15	Inverting	CMOS Schmitt	TrueDrive™	2.4 A/2.4 A	125 ns	125 ns	3.3 nF	—	Yes	Adaptive	OVPC
TPS2832	2	4.5 to 15	Non-Inverting	CMOS Schmitt	TrueDrive™	2.4 A/2.4 A	125 ns	125 ns	3.3 nF	—	—	Adaptive	—
TPS2833	2	4.5 to 15	Inverting	CMOS Schmitt	TrueDrive™	2.4 A/2.4 A	125 ns	125 ns	3.3 nF	—	—	Adaptive	—
TPS2834	2	4.5 to 15	Non-Inverting	TTL	TrueDrive™	2.4 A/2.4 A	100 ns	100 ns	3.3 nF	—	Yes	Adaptive	OVPC
TPS2835	2	4.5 to 15	Inverting	TTL	TrueDrive™	2.4 A/2.4 A	100 ns	100 ns	3.3 nF	—	Yes	Adaptive	OVPC
TPS2836	2	4.5 to 15	Non-Inverting	TTL	TrueDrive™	2.4 A/2.4 A	100 ns	100 ns	3.3 nF	—	—	Adaptive	—
TPS2837	2	4.5 to 15	Inverting	TTL	TrueDrive™	2.4 A/2.4 A	100 ns	100 ns	3.3 nF	—	—	Adaptive	—
TPS2838	2	10 to 15	Non-Inverting	TTL	TrueDrive™	4 A/4 A	120 ns	120 ns	3.3 nF	Adjustable Gate Drive	Yes	Adaptive	—
TPS2839	2	10 to 15	Inverting	TTL	TrueDrive™	4 A/4 A	120 ns	120 ns	3.3 nF	Adjustable Gate Drive	Yes	Adaptive	—
TPS2848	2	10 to 15	Non-Inverting	TTL	TrueDrive™	4 A/4 A	120 ns	120 ns	3.3 nF	Fixed 8 V Gate Drive	Yes	Adaptive	—
TPS2849	2	10 to 15	Inverting	TTL	TrueDrive™	4 A/4 A	120 ns	120 ns	3.3 nF	Fixed 8 V Gate Drive	Yes	Adaptive	—
UC3714	2	7 to 20	Inverting	TTL	Bipolar	2 A/1 A	80 ns	75 ns	1 nF	—	Yes	Prog.Delay	—
UC3715	2	7 to 20	Non-Inverting	TTL	Bipolar	1 A/2 A	80 ns	75 ns	1 nF	—	Yes	Prog.Delay	—
UCC27221	2	4.15 to 20	Inverted Input	TTL	TrueDrive™	3.3 A/3.3 A	81 ns	103 ns	2.2 nF	Fixed 6.5 V Gate Drive	—	PGD <sup>(3)</sup>	—
UCC27222	2	4.15 to 20	Non-Inverting	TTL	TrueDrive™	3.3 A/3.3 A	81 ns	103 ns	2.2 nF	Fixed 6.5 V Gate Drive	—	PGD <sup>(3)</sup>	—

<sup>(1)</sup> TrueDrive™ technology is the hybrid bipolar/CMOS output architecture for improved current drive capability at low voltages (at Miller Threshold). See page 4 for more information.

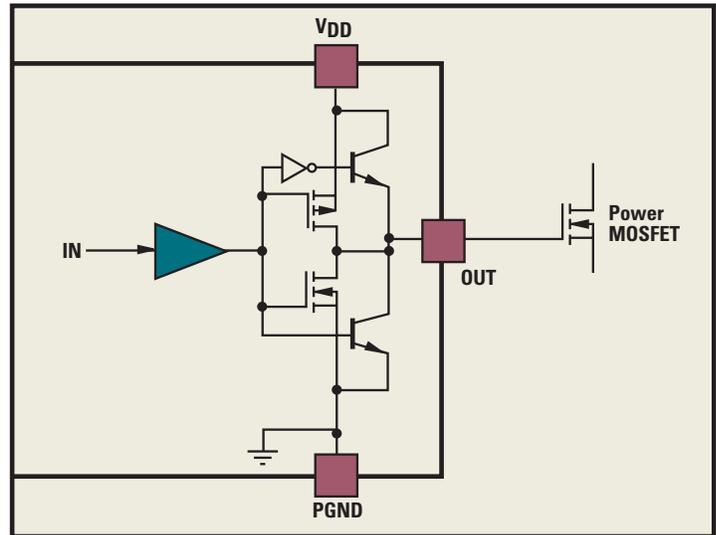
<sup>(2)</sup> TSD = Thermal ShutDown; OVP = Over-Voltage Protection; OCP = Over-Current Protection; OVPC = Over-Voltage Protection Crowbar; UVLO = Under-Voltage LockOut

<sup>(3)</sup> Predictive Gate Drive™ technology

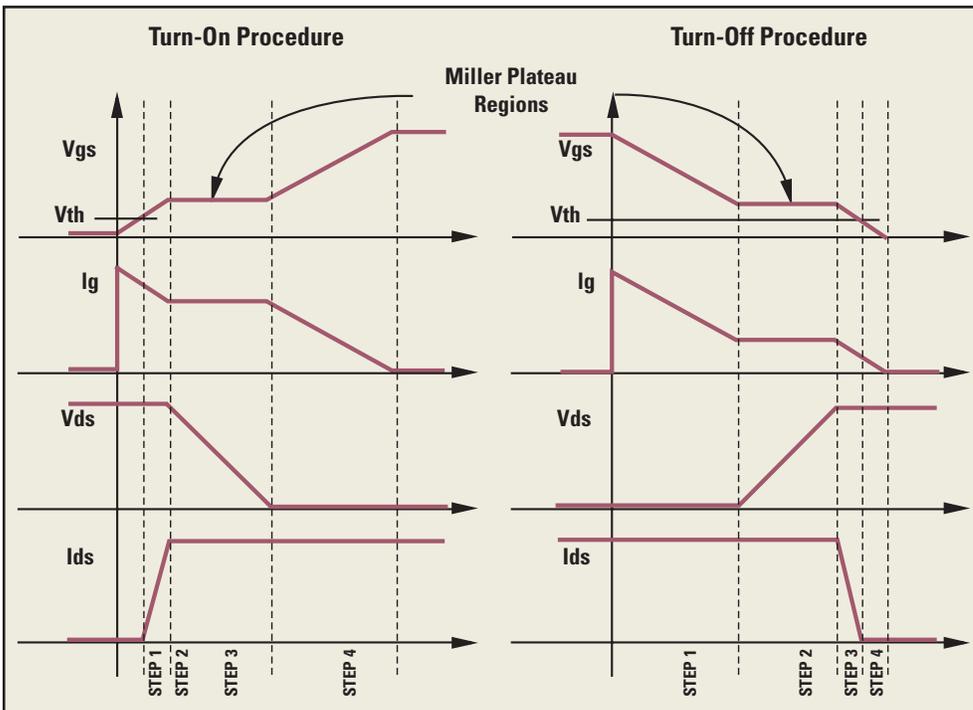
TrueDrive™ Technology

**TrueDrive Output Stage**

Used in TI's high current gate drivers and controllers, the TrueDrive output architecture is constructed of bipolar and CMOS transistors in parallel. The bipolar transistors provide maximum gate drive current during the power MOSFET's switching transition and the CMOS transistors are used to pull the output to the rails at the end of the switching transition. TrueDrive technology delivers high current at where it is needed most at the MOSFET Miller plateau region thresholds, and provides switching efficiency gains.



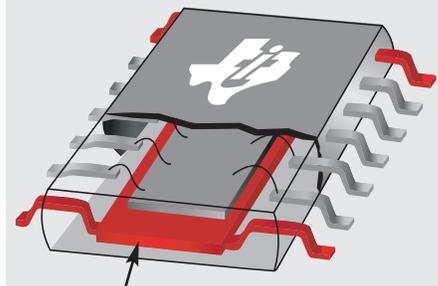
MOSFET Switching Cycles



In a typical switching cycle of a power MOSFET, the critical region that affects the switching losses is the Miller Plateau. The switching speed is dependent on sink and sink current capability of the output driver, while the MOSFET gate-source voltage is between the threshold level and Miller plateau voltage. MOSFET Drivers using TrueDrive™Technology, however, can provide efficient current sourcing and sinking where it is needed most – at the Miller plateau region.

- Step 1 corresponds to turn-on/turn-off delay.
- Step 2 + Step 3 indicate switching time.
- Step 4 occurs after switching is complete.

**PowerPAD™ Packaging**



Exposed Thermal Pad

The PowerPAD thermally enhanced package provides greater design flexibility and increased thermal efficiency in a standard size IC package.

See "PowerPAD Thermally Enhanced Package" technical brief (SLMA002) and "PowerPAD Made Easy" application brief (SLMA004) available at [power.ti.com/mosfetgatedrivers](http://power.ti.com/mosfetgatedrivers) for detailed information.

Fusion Digital Power Control Solutions

**UCD7K Family**

**Fusion Digital Power Control Drivers:**

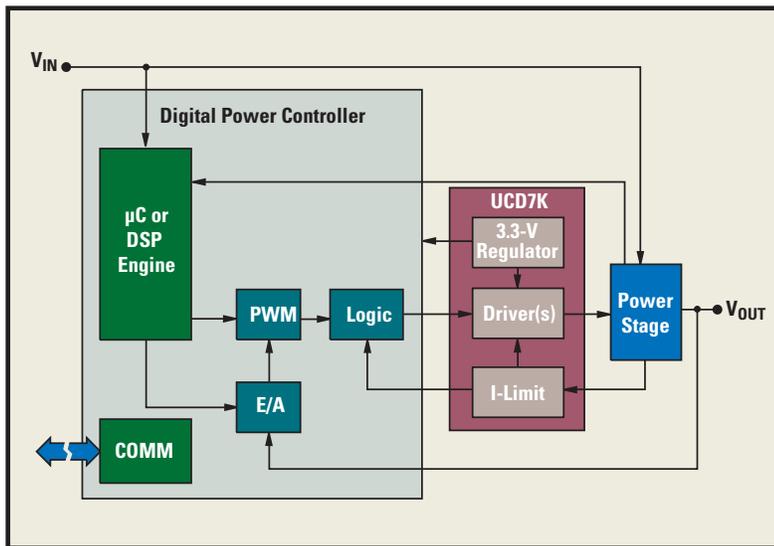
The UCD7K drivers interface the digital controller to the power stage while providing protection for the power supply as well as bias for the digital controller.

**Key Features:**

- High current gate drivers
- Programmable analog over-current limit with flag
- On-board 3.3 V, 10-mA linear regulator

**Key Benefits:**

- Interfaces to the power stage
- Fail-proof and flexible overload protection
- Provides power to the digital controller



Available Now

<b>UCD7201PWP</b>	Digital control compatible dual low side ±4 A MOSFET driver
<b>UCD7100PWP</b>	Digital control compatible single low side ±4 A MOSFET driver with current sense

MOSFET Drivers Power Management

**Resources** For a complete list of Resources (EVMs, data sheets and application notes), visit [power.ti.com](http://power.ti.com)

Part Number	Description	Price
<b>Evaluation Modules (EVMs)</b>		
TPS2817	Power Supply Evaluation Module with TPS2817 MOSFET Driver	\$50
<b>Literature Number</b>		
<b>Application Notes</b>		
SLUA054	UC3705/6/7/9	New Driver ICs Optimize High-Speed Power MOSFET Switching Characteristics
SLUA105	UC3705/6/7/8/9	Practical Considerations in High-Performance MOSFET, IGBT and MCT Gate
SLUA280	UCC27221/2	Predictive Gate Drive™ Technology FAQs
SLMA002	PowerPAD™ Package	PowerPAD Thermally Enhanced Package Technical Brief
SLMA004	Power PAD Package	PowerPAD Made Easy Application Brief
SLUA281	UCC27221/2	Predictive Gate Drive Boosts Synchronous DC/DC Power Converter Efficiency
SLUA285	UCC27221/2	Predictive Gate Drive Boosts Synchronous Rectifier Efficiency

For complete technical information on MOSFET Gate Drivers, consult the website at:

[power.ti.com/mosfetgatedrivers](http://power.ti.com/mosfetgatedrivers)

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