



## UD36061

Preliminary

CMOS IC

## 0.6A, 36V, 2MHZ STEP-DOWN CONVERTER

### ■ DESCRIPTION

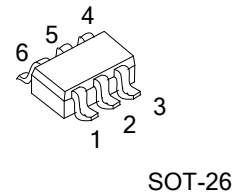
The UTC **UD36061** is a high frequency (2MHz) step-down switching regulator with integrated internal high-side high voltage power MOSFET. It regulates input voltages from 3.3V to 36V down to an output voltage as low as 0.8V, and supplies 0.6A highly efficient output with current mode control for fast loop response.

In shutdown mode the supply current drops to 3 $\mu$ A, it allows use in battery-powered applications.

High power conversion efficiency over a wide load range is achieved by scaling down the switching frequency at light load condition to reduce the switching and gate driving losses.

The converter uses internal N-Channel MOSFET switches to step-down the input voltage to the regulated output voltage. Since the high side MOSFET requires a gate voltage greater than the input voltage, a boost capacitor connected between SW and BST is needed to drive the high side gate. The boost capacitor is charged from the internal 5V rail when SW is low.

Frequency fold-back helps prevent inductor current runaway during start-up. Thermal shutdown provides reliable, fault-tolerant operation.



SOT-26

### ■ APPLICATIONS

- \* High Voltage Power Conversion
- \* Automotive Systems
- \* Industrial Power Systems
- \* Distributed Power Systems
- \* Battery Powered Systems

### ■ FEATURES

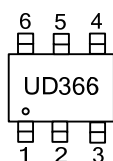
- \* Wide 3.3V ~ 36V Operating Input Range
- \* 500m $\Omega$  Internal Power MOSFETs
- \* 230 $\mu$ A Operating Quiescent Current
- \* > 90% Efficiency
- \* 2MHz Fixed Switching Frequency
- \* Internally Compensated
- \* Internal Soft-Start
- \* Adjustable Output Voltage from 0.8V to  $0.8 \times V_{IN}$
- \* Precision Current Limit Without Current Sensing Resistor
- \* Stable with Ceramic Output Capacitors
- \* 3 $\mu$ A Low Shutdown Supply Current

## ■ ORDERING INFORMATION

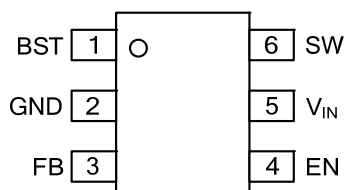
Ordering Number	Package	Packing
UD36061G-AG6-R	SOT-26	Tape Reel

<p>UD36061G-AG6-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p>	<p>(1) R: Tape Reel</p> <p>(2) AG6: SOT-26</p> <p>(3) G : Halogen Free and Lead Free</p>
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## ■ MARKING



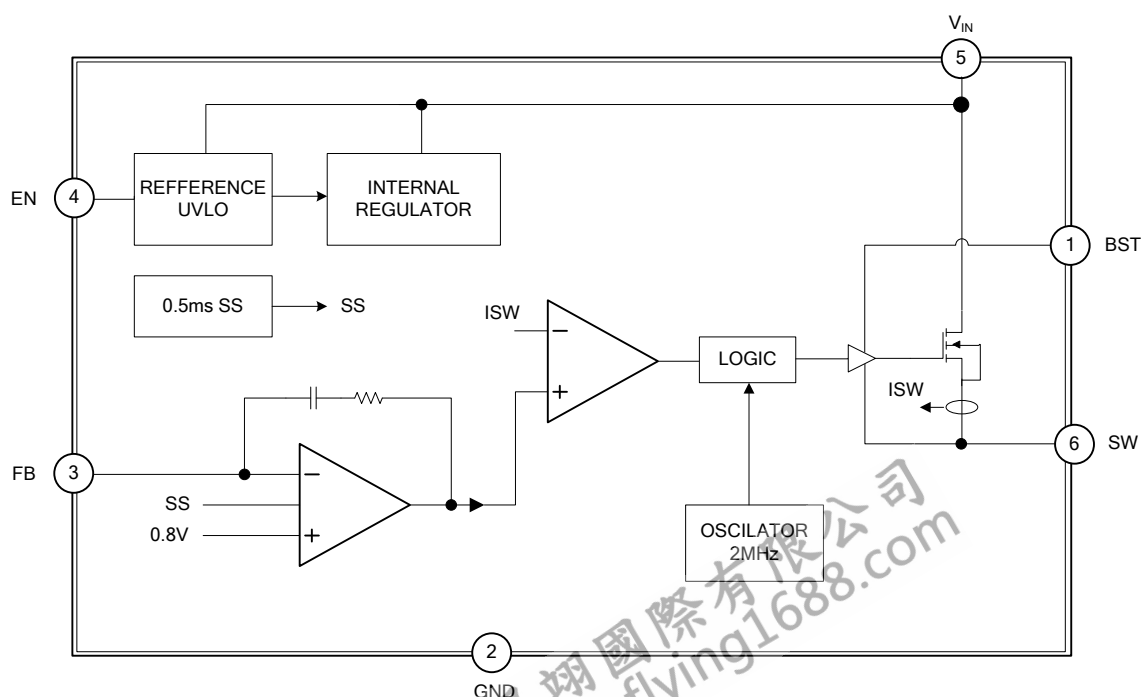
## PIN CONFIGURATION



## PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	BST	High-Side Gate Drive Boost Input. BST supplies the drive for the high-side N-Channel MOSFET switch. Connect a 0.1 $\mu$ F or greater capacitor from SW to BST to power the high side switch.
2	GND	Ground.
3	FB	Feedback Input. FB senses the output voltage to regulate that voltage. Drive FB with a resistive voltage divider from the output voltage. The feedback threshold is 0.8V.
4	EN	Enable Input. Pulling this pin below the specified threshold shuts the chip down. Pulling it above the specified threshold enables the chip. Floating this pin shuts the chip down.
5	V <sub>IN</sub>	Power Input. IN supplies the power to the IC, as well as the step-down converter switches. Drive IN with a 3.3V to 36V power source. Bypass IN to GND with a suitably large capacitor to eliminate noise on the input to the IC.
6	SW	Power Switching Output. SW is the switching node that supplies power to the output. Connect the output LC filter from SW to the output load. A low V <sub>F</sub> Schottky diode to ground is required closed to this pin to reduce switching spikes.

## BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (Note1, 2)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Input Voltage	$V_{IN}$	-0.3V ~ +40	V
SW Voltage	$V_{SW}$	-0.3V ~ $V_{IN}+0.3$	V
BST to SW	$V_{BST}$	-0.3 ~ 6.0	V
All Other Pins Voltage		-0.3V to + 5.0	V
Power Dissipation	$T_A=25^{\circ}\text{C}$ (Note 4) $P_D$	0.57	W
Maximum Junction Temperature Range	$T_J$	+150	$^{\circ}\text{C}$
Storage Temperature Range	$T_{STG}$	-65 ~ 150	$^{\circ}\text{C}$

■ THERMAL DATA (Note 3)

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	220	$^{\circ}\text{C/W}$
Junction to Case	$\theta_{JC}$	110	$^{\circ}\text{C/W}$

■ RECOMMENDED OPERATING CONDITIONS (Note 2)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Input Voltage	$V_{IN}$	+3.3V ~ +36V	V
Output Voltage	$V_{OUT}$	0.8V ~ $0.8 \times V_{IN}$	V
Operating Junction Temperature Range	$T_J$	-40 ~ +125	$^{\circ}\text{C}$
Operating Ambient Temperature Range	$T_A$	-40 ~ +85	$^{\circ}\text{C}$

Notes: 1. Exceeding these ratings may damage the device.

2. The device is not guaranteed to function outside of its operating conditions.

3. Measured on JESD 51-7, 4-layer PCB.

4. The maximum allowable power dissipation is a function of the maximum junction temperature  $T_J$  (MAX), The junction-to-ambient thermal resistance  $\theta_{JA}$ , and the ambient temperature  $T_A$ . the maximum allowable Continuous power dissipation at any ambient temperature is calculated by  $P_D$  (MAX.) =  $(T_J$  (MAX.) -  $T_A$ ) /  $\theta_{JA}$ . Exceeding the maximum allowable power regulator will go into thermal shutdown. Internal thermal shutdown. Circuitry protects the device from permanent damage.

## ■ ELECTRICAL CHARACTERISTICS

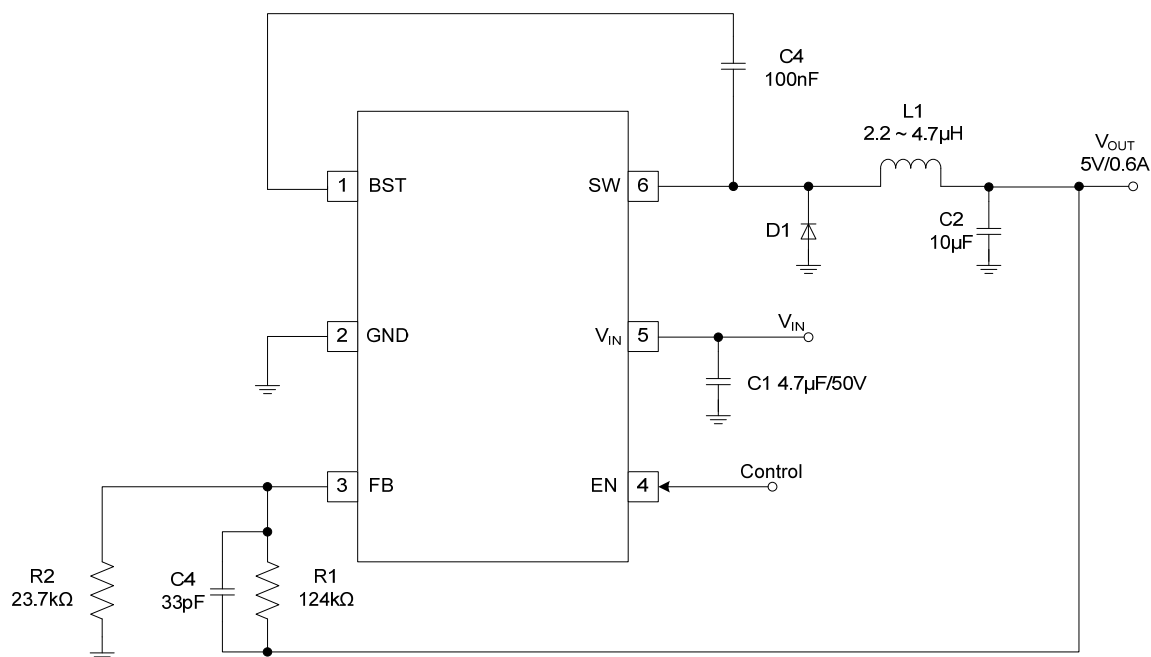
(V<sub>IN</sub> = 12V, V<sub>EN</sub> = 2V, T<sub>A</sub> = +25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Feedback Voltage	V <sub>FB</sub>	4.0V ≤ V <sub>IN</sub> ≤ 36V		794		mV
		3.3V ≤ V <sub>IN</sub> ≤ 4.0V		794		mV
HS Switch-On Resistance (Note 1, 2)	HS <sub>RDS-ON</sub>	V <sub>BST</sub> -V <sub>SW</sub> = 5V		500		mΩ
HS Switch Leakage Current	ISW <sub>LKG</sub>	V <sub>EN</sub> =0V, V <sub>SW</sub> =0V		0.1	1	μA
Current Limit (Note 1, 2)	I <sub>LIMIT</sub>			1.0		A
COMP to Current Sense Trans-conductance	G <sub>CS</sub>			3		A/V
Minimum Operating V <sub>IN</sub> Voltage			3.3			V
V <sub>IN</sub> UVLO Up Threshold			2.7		3.2	V
V <sub>IN</sub> UVLO Hysteresis				0.4		V
Soft-start time	T <sub>SS</sub>	FB from 0 to 1.8V		0.5		msec
Oscillation frequency	F <sub>SW</sub>		1600	2000	2400	KHz
Minimum On Time (Note 1)	T <sub>ON MIN</sub>			100		nS
Shutdown Current	I <sub>SHDN</sub>	V <sub>EN</sub> = 0V.		3	15	μA
Quiescent Current	I <sub>Q</sub>	V <sub>FB</sub> = 0.9V, No load		130		μA
Thermal Shutdown (Note 1)	T <sub>SD</sub>			150		°C
EN Input High Voltage	V <sub>EN H</sub>	V <sub>EN</sub> Rising	1.4	1.55	1.7	V
EN Shutdown Threshold Voltage Hysteresis				300		mV

Notes: 1. Guaranteed by design.

2. Not tested in production and guaranteed by over-temperature correlation.

■ TYPICAL APPLICATION CIRCUIT



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