



## UC4601

CMOS IC

### PWM STEP-DOWN DC-DC CONTROLLER

#### DESCRIPTION

The UTC **UC4601** is a PWM step-down DC/DC controller. It has a low supply current. The step-down DC/DC converter with low ripple, high efficiency performance is conveniently configured with additional external components, such as a power-transistor, an inductor, a diode and capacitors. The output voltage can be adjusted with external components.

The UTC **UC4601** contains a high precision band-gap voltage reference, a PWM control circuit, a soft-start circuit, a protection circuit, an oscillator, an error amplifier with built-in compensation network and input/output voltage detection circuits.

The UTC **UC4601** based DC/DC converter can performance well when maintaining stability, which is due to its built-in state-of-art control algorithm. Further, if the term of maximum duty cycle retains on a certain time, the embedded protection circuits restart the operation with soft-start and repeat until the maximum duty cycle condition is released. Finally, the internal UVLO function blocks potentially unstable output when the input voltage reaches the UVLO threshold or less. This is aiming at making this circuit standby for low power consumption.

The UTC **UC4601** can be applied in battery-powered equipment, hand-held communication equipment, cameras, video instruments such as VCRs, camcorders, household electrical appliances.

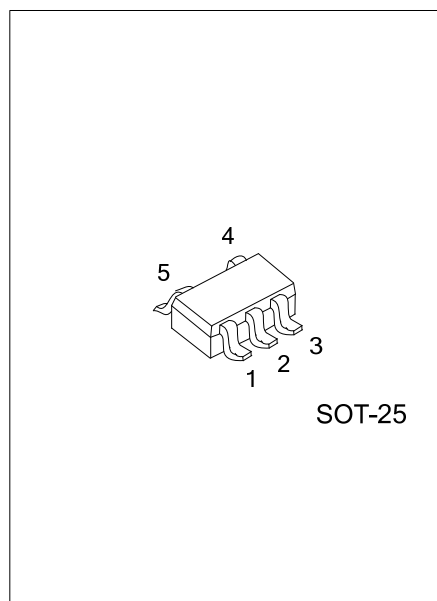
#### FEATURES

- \* Input voltage varies from 2.3V to 15V
- \* Low temperature coefficient of output voltage: Typ.  $\pm 100\text{ppm}/^\circ\text{C}$
- \* Internal soft-start and protection function
- \* High efficiency up to 90% (TYP.)
- \* High output voltage accuracy:  $\pm 2\%$
- \* Standby current:  $0.1\mu\text{A}$  (TYP.)
- \* CMOS output capability

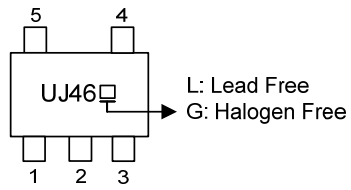
#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
UC4601XL-AF5-R	UC4601XG-AF5-R	SOT-25	Tape Reel

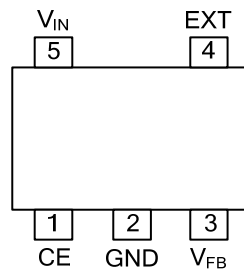
<p>UC4601XG-AF5-R</p> <p>(1) Packing Type</p> <p>(2) Package Type</p> <p>(3) Green Package</p> <p>(4) F<sub>OSC</sub></p>		<p>(1) R: Tape Reel</p> <p>(2) AF5: SOT-25</p> <p>(3) G: Halogen Free, L: Lead Free</p> <p>(4) Blank: 1000K, A: 500K</p>
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## ■ MARKING



## ■ PIN CONFIGURATION



## ■ PIN DESCRIPTION

PIN NO	PIN NAME	DESCRIPTION
1	CE	Chip Enable. Active with "H"
2	GND	Ground
3	V <sub>FB</sub>	Feedback Voltage
4	EXT	External Transistor Driver Pin (CMOS output)
5	V <sub>IN</sub>	Power input voltage

## ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
V <sub>IN</sub> Supply Voltage	V <sub>IN</sub>	15	V
Ext Pin Output Voltage	V <sub>EXT</sub>	V <sub>IN</sub>	V
CE Pin Input Voltage	V <sub>CE</sub>	V <sub>IN</sub>	V
V <sub>OUT</sub> /V <sub>FB</sub> Pin Input Voltage	V <sub>OUT</sub> /V <sub>FB</sub>	6	V
Ext Pin Output Current	I <sub>EXT</sub>	±50	mA
Power Dissipation	P <sub>D</sub>	+250	mW
Operating Temperature	T <sub>OPR</sub>	-40 ~ +85	°C
Storage Temperature	T <sub>STG</sub>	-55 ~ +125	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.

Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ OPERATING RANGE

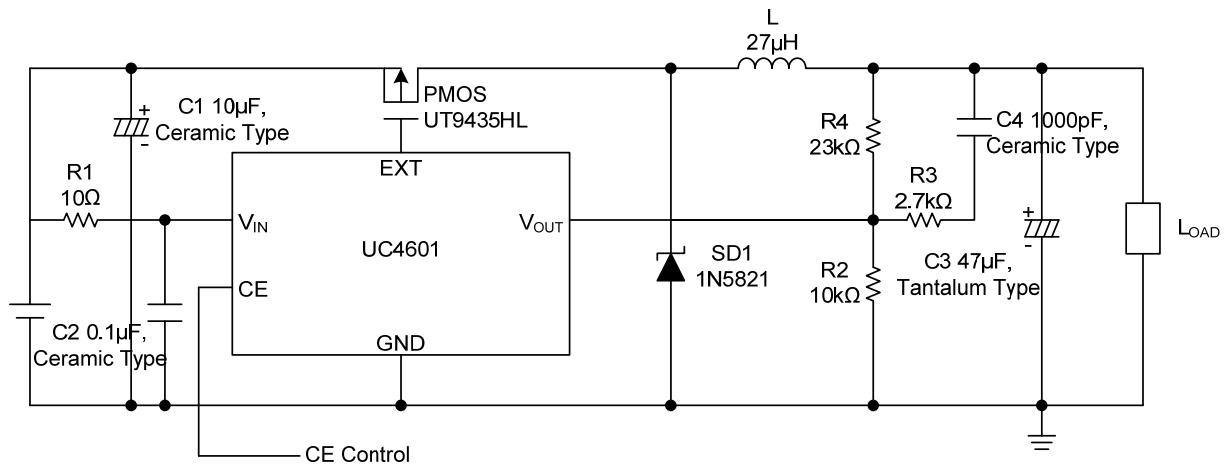
PARAMETER	SYMBOL	RATINGS	UNIT
V <sub>IN</sub> Supply Voltage	V <sub>IN</sub>	2.5 ~ 15	V
Ext Pin Output Voltage	V <sub>EXT</sub>	V <sub>IN</sub>	V
CE Pin Input Voltage	V <sub>CE</sub>	V <sub>IN</sub>	V
V <sub>OUT</sub> /V <sub>FB</sub> Pin Input Voltage	V <sub>OUT</sub> /V <sub>FB</sub>	5.5	V
Ext Pin Output Current	I <sub>EXT</sub>	±50	mA

## ■ ELECTRICAL CHARACTERISTICS (T<sub>OPR</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>ADJUSTABLE OUTPUT VOLTAGE TYPE</b>						
Operating Voltage	V <sub>IN</sub>		2.3		15	V
Feedback Voltage	V <sub>FB</sub>	V <sub>IN</sub> =V <sub>CE</sub> =8V, I <sub>LOAD</sub> =350mA	0.98	1.00	1.02	V
Feedback Voltage Temperature coefficient	ΔV <sub>FB</sub> /ΔT	-40°C < T <sub>OPR</sub> < 85°C		±100		ppm/°C
Supply Current	I <sub>Q1</sub>	V <sub>IN</sub> =V <sub>CE</sub> =12V, V <sub>FB</sub> =2V		40	80	μA
Shutdown Current	I <sub>Q2</sub>	V <sub>IN</sub> =12V, V <sub>CE</sub> =V <sub>FB</sub> =0V		0.1	1	μA
UC4601 Oscillator Frequency	f <sub>OSC1</sub>	V <sub>IN</sub> =V <sub>CE</sub> =8V, I <sub>LOAD</sub> =350mA	800	1000	1200	kHz
UC4601A Oscillator Frequency	f <sub>OSC2</sub>	V <sub>IN</sub> =V <sub>CE</sub> =8V, I <sub>LOAD</sub> =350mA	400	500	600	kHz
Maximum Duty Cycle	D <sub>MAX</sub>		100			%
Minimum Duty Cycle	D <sub>MIN</sub>				0	%
EXT "H" Output Current	I <sub>EXTH</sub>	V <sub>IN</sub> =V <sub>CE</sub> =8V, V <sub>EXT</sub> =7.9V, V <sub>FB</sub> =3V		-17	-10	mA
EXT "L" Output Current	I <sub>EXTL</sub>	V <sub>IN</sub> =V <sub>CE</sub> =8V, V <sub>EXT</sub> =0.1V, V <sub>FB</sub> =0V	20	30		mA
CE "H" Output Current	I <sub>CEH</sub>	V <sub>IN</sub> =V <sub>CE</sub> =V <sub>OUT</sub> =12V		0	0.5	μA
CE "L" Output Current	I <sub>CEL</sub>	V <sub>IN</sub> =V <sub>OUT</sub> =12V, V <sub>CE</sub> =0V	-0.3	0		μA
CE "H" Input Voltage	V <sub>CEH</sub>	V <sub>IN</sub> =8V, V <sub>FB</sub> =0V	1.8			V
CE "L" Input Voltage	V <sub>CEL</sub>	V <sub>IN</sub> =8V, V <sub>FB</sub> =0V			0.3	V
UVLO Voltage	V <sub>UVLO1</sub>	V <sub>IN</sub> =V <sub>CE</sub> =2.5V≥1.5V, V <sub>FB</sub> =0V	1.75	2.0	2.25	V
UVLO Release Voltage	V <sub>UVLO2</sub>	V <sub>IN</sub> =V <sub>CE</sub> =1.5V≥2.5V, V <sub>FB</sub> =0V		V <sub>UVLO1</sub> +0.1	2.4	V
Delay Time by Soft-Start	T <sub>SST</sub>	V <sub>IN</sub> =8V, I <sub>LOAD</sub> =10mA, V <sub>CE</sub> =0V≥2.5V	5	10	20	ms
Delay Time by Protection	T <sub>PROT</sub>	V <sub>IN</sub> =V <sub>CE</sub> =2.5V, V <sub>FB</sub> =2.5V≥0V	5	15	30	ms

# ■ TYPICAL APPLICATION CIRCUIT

**Adjustable Output Voltage Type. For example, Output Voltage=3.3V**



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