

UTC UNISONIC TECHNOLOGIES CO., LTD

UD38251

38V SYNCHRONOUS BUCK CONVERTER

DESCRIPTION

The UTC UD38251 is a monolithic synchronous buck regulator. The device integrates two internal power MOSFETs, and provides 2.5A of continuous load current over a wide input voltage of 8V to 38V. Current mode control provides fast transient response and cycle-by-cycle current limit.

An internal soft-start prevents inrush current at turn-on, provides a very compact solution with minimal external components.

FEATURES

- * Wide 8V to 38V Operating Input Range
- * Integrated 140mΩ Power MOSFET Switches
- * Output Adjustable from V_{FB}(1.00V±2%) to 20V
- * Up to 93% Efficiency
- * Internal Soft-Start
- * Stable with Low ESR Ceramic Output Capacitors
- * Fixed 160KHz Frequency
- * Cycle-by-Cycle Over Current Protection
- * Input Under/Over Voltage Lockout

ORDERING INFORMATION

Ordering Number	Package	Packing
UD38251G-SH2-R	HSOP-8	Tape Reel

UD38251G-SH2-R	
(1)Packing Type	(1) R: Tape Reel
(2)Package Type	(2) SH2: HSOP-8
(3)Green Package	(3) G: Halogen Free and Lead Free

MARKING





CMOS IC

UD38251

■ PIN CONFIGURATION



PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	DC	Boot-Strap Pin. Supply high side gate driver. Decouple this pin to LX pin with 24ohm +
Ι	50	0.1uF ceramic cap.
2	INI	Power Input pin. Bypass IN to GND with a suitably large capacitor to eliminate noise on
2	IIN	the input to the IC.
2	CIW/	Power Switching Output. SW is the switching node that supplies power to the output.
3	500	Connect the output LC filter from SW to the output load.
4	GND	Ground.
	PAD	Ground (Connect to GND).
F		Feedback Input. FB senses the output voltage to regulate that voltage. Drive FB with a
5	FB	resistive voltage divider from the output voltage.
		Compensation Node. COMP is used to compensate the regulation control loop.
6	COMP	Connect a series RC network from COMP to GND to compensate the regulation control
		loop.
7	EN	Enable control. Pull high to turn on. Do not float.
8	V _{DD}	Internal regulator pin

BLOCK DIAGRAM



■ **ABSOLUTE MAXIMUM RATING** (T_A=25°C, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V _{IN}	-0.3 ~ +42	V
Switch Node Voltage	V _{SW}	-0.3 ~ V _{IN} +0.3	V
Boost Voltage	V _{BS}	V _{SW} -0.3 ~ V _{SW} + 6	V
All Other Pins Voltage		-0.3 ~ +6	V
Lead Temperature	TL	260	°C
Junction Temperature	TJ	150	°C
Storage Temperature	T _{STG}	-65 ~ +150	°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.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	RATINGS	UNIT
Input Supply Voltage	V _{IN}	8 ~ 38	V
Output Voltage	V _{OUT}	V _{FB} ~ 20	V
Ambient Temperature	T _A	-40 ~ +85	°C

THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	RATINGS	UNIT
Junction To Ambient	θ _{JA}	40	°C/W
Junction to Case	θις	15	°C/W

Note: θ_{JA} is measured with the PCB copper area of approximately 1 in²(Multi-layer). That need connect to exposed pad.

■ ELECTRICAL CHARACTERISTICS (V_{IN}=12V, T_A=25°C, unless otherwise specified.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range	V _{IN}		8		38	V
Shutdown Supply Current	I _{SD}	V _{EN} = 0V		0.7	1.3	mA
Quiescent Current	Iccq	V _{EN} =5.0V, V _{FB} =1.05V		0.7	1.5	mA
Feedback Voltage	V _{FB}	8V≤V _{IN} ≤38V	0.98	1.00	1.02	V
Feedback Overvoltage Threshold	Ovp fb			1.1X		V_{FB}
High-Side Switch On Resistance (Note)	R _{DS(ON)} 1			150		mΩ
Low-Side Switch On Resistance (Note)	R _{DS(ON) 2}			140		mΩ
High-Side Switch Leakage Current		V _{EN} =0V, V _{SW} =0V			10	μA
Upper Switch Current Limit		Minimum Duty Cycle	2.9	3.5		А
Lower Switch Current Limit		From Drain to Source		0.9		А
Oscillation Frequency	F _{OSC1}			160		KHz
Short Circuit Oscillation Frequency	F _{OSC2}	V _{FB} =<0.5V		60		KHz
Maximum Duty Cycle	D _{MAX}			90		%
Minimum On Time (Note)	T _{ON MIN}			220		ns
EN Lockout Threshold Voltage	E _{NH LOCK}			2.5		V
EN Lockout Hysterisis				210		mV
Input Under Voltage Lockout Threshold	UVLO	V _{IN} Rising	6.5	7.0	7.5	V
Input Under Voltage Lockout Threshold		-	い	800		mV
Hysteresis	UVLO-Hys	- 11×		800		IIIV
Input Over Voltage Lockout Threshold	OVLO	V _{IN} Rising	-0'	40		V
Input Over Voltage Lockout Threshold		* 13 680.		5		V
Hysteresis	OVEO-Hys	A 195-100		5		v
Soft-Start Period		A 104 109		3		ms
Thermal Shutdown	T _{SD}	33. 8/11,		150		°C
Thermal Shutdown Hysterisis	TSH	NN.		30		°C
Note: Guaranteed by design.		Nº -				

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FUNCTION DESCRIPTIONS

The UTC **UD38251** is a synchronous rectified, current-mode, step-down regulator. It regulates input voltages from 8V to 38V down to an output voltage as low as V_{FB} , and supplies up to 2.5A of load current.

The UTC **UD38251** uses current-mode control to regulate the output voltage. The output voltage is measured at FB through a resistive voltage divider and amplified through the internal Tran conductance error amplifier. The voltage at the COMP pin is compared to the switch current measured internally to control the output voltage.

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 BS is needed to drive the high side gate. The boost capacitor is charged from the internal 5V rail when SW is low.

When the UTC **UD38251** FB pin exceeds 10% of the nominal regulation voltage of V_{FB} , the over voltage comparator is tripped and the COMP pin is discharged to GND, forcing the high-side switch off.

APPLICATION INFORMATION

COMPONENT SELECTION

Setting the Output Voltage

The output voltage is set using a resistive voltage divider from the output voltage to FB pin. The voltage divider divides the output voltage down to the feedback voltage by the ratio.

Thus the output voltage is:

$$V_{OUT} = V_{FB} \times \frac{R1 + R2}{R2}$$

For example, V_{FB} =1.00V for a 5.0V output voltage, R2 is 10k Ω , and R1 is 40k Ω .

Inductor Selection

The inductor is required to supply constant current to the output load while being driven by the switched input voltage. A larger value inductor will result in less ripple current that will result in lower output ripple voltage. However, the larger value inductor will have a larger physical size, higher series resistance, and/or lower saturation current. A good rule for determining the inductance to use is to allow the peak-to-peak ripple current in the inductor to be approximately 30% of the maximum switch current limit.

V _{IN}	<28V	<35V
Inductor	33uH	22uH

The choice of which style inductor to use mainly depends on the price vs. size requirements and any EMI requirements.

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TYPICAL APPLICATION CIRCUIT



 $V_{OUT}=V_{FB} \times (1+R1/R2), V_{FB} = 1.00V, R2 \text{ suggest } 1k^30k\Omega$



UD38251

TYPICAL CHARACTERISTICS













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