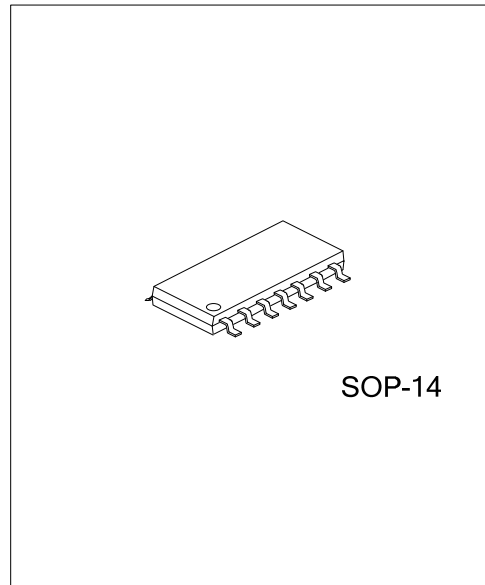




### VOLTAGE MODE PWM CONTROLLER WITH LINEAR POWER REGULATOR



#### DESCRIPTION

The UTC **U8021** provides the control and protection features necessary for a synchronous buck converter and a linear regulator in high performance graphic card applications.

The UTC **U8021** is designed to directly drive the high and low MOSFETs of the buck converter. It allows the converter to operate with 4V~25V power rail and as low as 0.5V output. The UTC **U8021** is capable to drive a N-type MOSFET in a linear regulator with as low as 0.5V output.

The UTC **U8021** features soft-start, UVLO, and OCP. The UTC **U8021** monitors the output current by using the R<sub>ds(on)</sub> of the low MOSFET in the buck converter that eliminates the need for a current sensing resistor.

#### FEATURES

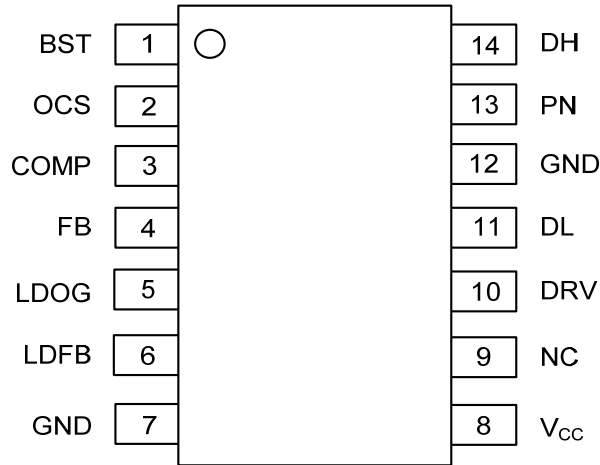
- \* 4V~25V power rails
- \* Internal LDO
- \* 1.5A gate drive current
- \* Adaptive non-overlapping gate drives provide shoot-through protection for MOSFETs
- \* Programmable output voltages
- \* Internal soft start
- \* Under voltage lockout
- \* Short circuit protection

#### ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U8021L-S14-T	U8021G-S14-T	SOP-14	Tube
U8021L-S14-R	U8021G-S14-R	SOP-14	Tape Reel

<p>U8021L-S14-T</p> <ul style="list-style-type: none"> <li>(1)Packing Type</li> <li>(2)Package Type</li> <li>(3)Halogen Free</li> </ul>	<ul style="list-style-type: none"> <li>(1) T: Tube, R: Tape Reel</li> <li>(2) S14: SOP-14</li> <li>(3) L: Lead Free, G: Halogen Free</li> </ul>
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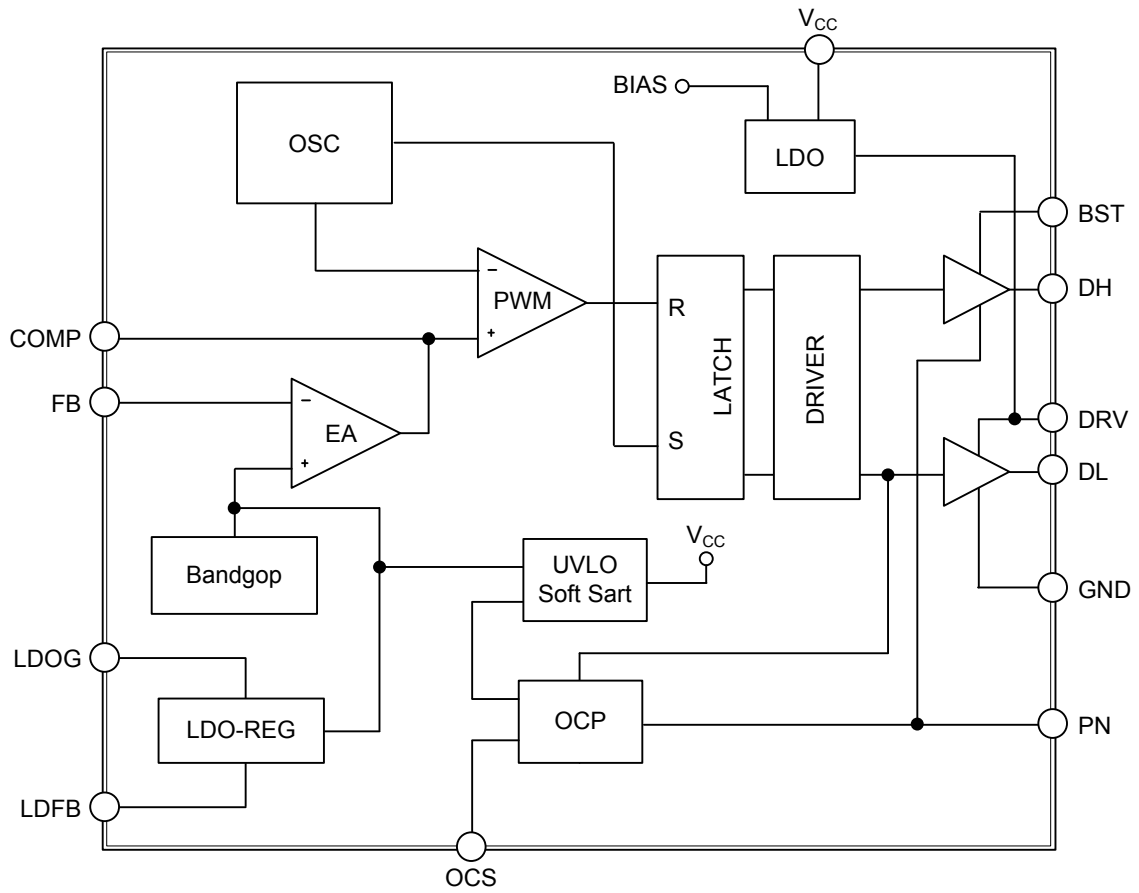
■ PIN CONFIGURATION



■ PIN DESCRIPTION

PIN NO.	PIN NAME	DESCRIPTION
1	BST	Boost input for top gate drive bias.
2	OCS	Current limit setting.
3	COMP	Compensation PIN.
4	FB	Feedback voltage
5	LDOG	External LDO gate drive.
6	LDFB	External LDO feedback voltage.
7	GND	Ground.
8	V <sub>CC</sub>	Power supply.
9	NC	No Bonding.
10	DRV	Internal LDO output.
11	DL	Gate drive for low MOSFET.
12	GND	Ground.
13	PN	Phase PIN.
14	DH	Gate drive for high MOSFET.

■ BLOCK DIAGRAM



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### ■ ABSOLUTE MAXIMUM RATING

Exceeding the specifications below may result in permanent damage to the device, or device malfunction. Operation outside of the parameters specified in the Electrical Characteristics section is not implied.

PARAMETER	SYMBOL	RATINGS	UNIT
Input Supply Voltage	$V_{CC}$	18	V
BST to GND	$V_{BST}$	40	V
BST to PN	$V_{BST\_PN}$	10	V
PN to GND	$V_{PN}$	-1~30	V
PN to GND Negative Pulse ( $t_{pulse} < 20ns$ )	$V_{PN\_PULSE}$	-5	V
DL to GND	$V_{DL}$	-1~+10	V
DL to GND Negative Pulse ( $t_{pulse} < 20ns$ )	$V_{DL\_PULSE}$	-3	V
DH to PN	$V_{DH\_PN}$	-1~+10	V
DH to PN Negative Pulse ( $t_{pulse} < 20ns$ )	$V_{DH\_PULSE}$	-3	V
DRV to GND	$V_{DRV}$	10	V
Operating Ambient Temperature Range	$T_A$	-25~85	°C
Operating Junction Temperature	$T_J$	-25~125	°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.

### ■ THERMAL RESISTANCES

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	$\theta_{JA}$	100	°C/W
Junction to Case	$\theta_{JC}$	32	°C/W

## ■ ELECTRICAL CHARACTERISTICS

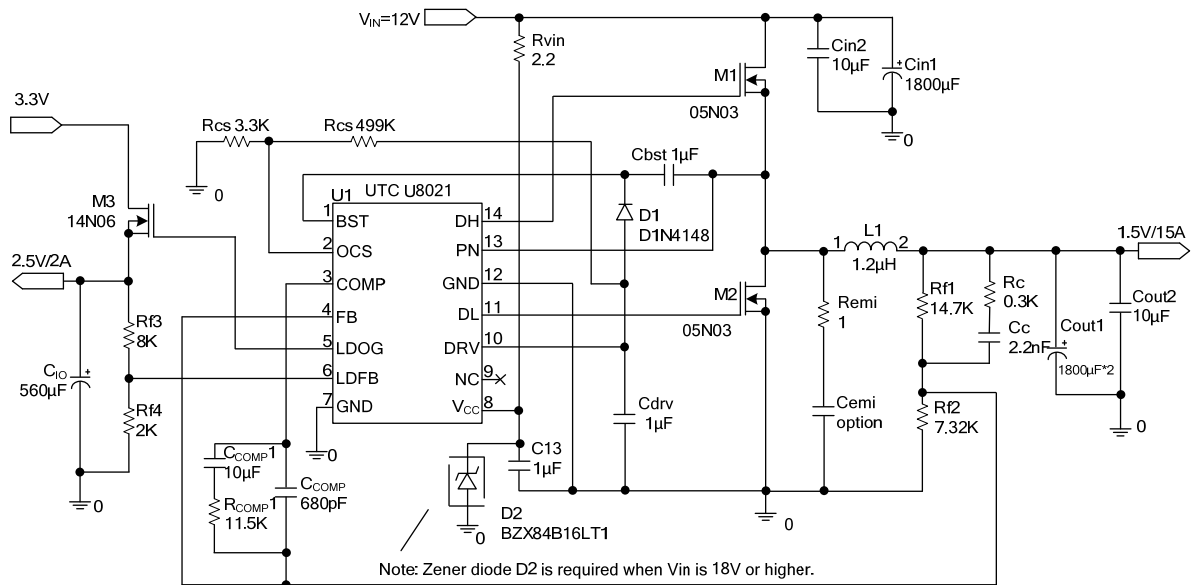
(Unless specified:  $V_{CC}=5V\sim 16V$ ,  $V_{FB}=V_{OUT}$ ,  $V_{BST-V_{PN}}=5V\sim 8.2V$ ,  $T_A=-25^{\circ}C\sim 85^{\circ}C$ )

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>General</b>						
$V_{CC}$ Supply Voltage	$V_{CC}$		4		16	V
$V_{CC}$ Quiescent Current	$I_{QVCC}$	$V_{CC}=12V$ , $V_{BST-V_{PN}}=8.2V$		5	7	mA
$V_{CC}$ Under Voltage Lockout	$UV_{VCC}$	$V_{HYST}=100mV$			4	V
BST to PN Supply Voltage	$V_{BST\_PN}$		4		10	V
BST Quiescent Current	$I_{QBST}$	$V_{CC}=12V$ , $V_{BST-V_{PN}}=8.2V$			3	mA
<b>Internal LDO</b>						
LDO Output	$V_{DRV}$	$8.6V < V_{CC} < 16V$		8		V
Dropout Voltage	$V_{DROP}$	$4V < V_{CC} < 8.6V$		0.4		V
<b>Linear Section</b>						
Reference Voltage	$V_{OL}$	$L_{DFB}=V_{OL}$ , $T_A=25^{\circ}C$ , $V_{CC}=12V$	0.65	0.75	0.85	V
Load Regulation		$I_O=0\sim 1A$ , $V_{IN}=3.3V$ , $V_{CC}=12V$			0.4	%
Line Regulation		$V_{IN}=3.2V\sim 3.4V$ , $V_{CC}=12V$			0.4	%
$V_{CC}$ Supply Rejection		$V_{IN}=3.3V$ , $V_{CC}=10V\sim 14V$			0.4	%
Gate Sourcing Current		$V_{GATE}=6.5V$		1		mA
Gate Sinking Current		$V_{GATE}=6.5V$		1		mA
LDFB Input Bias Current		$L_{DFB}=.5V$		-0.2	-1.0	$\mu A$
Soft Start Time		$V_{IN}=3.3V$ , $V_{CC}=12V$ , $T_A=25^{\circ}C$		1.5		ms
<b>Switching Section</b>						
Reference Voltage	$V_{REF}$	$T_A=25^{\circ}C$ , $V_{CC}=12V$	0.495	0.500	0.505	V
Load Regulation		$I_O=0.2\sim 4A$		0.4		%
Line Regulation		$V_{CC}=10V\sim 14V$		0.4		%
Operating Frequency	$F_S$		500	600	700	KHz
Ramp Amplitude (Note 2)	$V_m$			0.8		V
Maximum Duty Cycle (Note 2)	$D_{MAX}$			97		%
Minimum On-Time (Note 2)	$T_{ON\_MIN}$			125		ns
DH Rising/Falling Time	$t_{SRC\_DH}$	6V Swing at $C_L=3.3nF$ ,		40		ns
	$t_{SINK\_DH}$	$V_{BST-V_{PN}}=8.2V$		25		
DL Rising/Falling Time	$t_{SRC\_DL}$	6V Swing at $C_L=3.3nF$ ,		30		ns
	$t_{SINK\_DL}$	$V_{DRV}=8.2V$		40		
DH, DL Nonoverlapping Time				30		ns
<b>Voltage Error Amplifier</b>						
Output Source Current				0.9		mA
Output Sink Current				0.9		mA

Notes: 1. This device is ESD sensitive. Use of standard ESD handling precautions is required.

2. Guaranteed by design, not tested in production.

■ TYPICAL APPLICATION CIRCUIT



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