



## US321S

Advance

CMOS IC

### PWM CONTROLLER

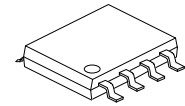
#### DESCRIPTION

Featured Device, UTC **US321S**, is a PWM controller with innovative technology. The controller can work in high voltage with a high voltage MOS in PCB.

UTC **US321S** provides several protection features. It includes a cycle-by-cycle current limit to the power switch; output over-voltage protection;  $V_{DD}$  UVLO protection.

#### FEATURES

- \* Integrated 650V HV start-up circuit
- \* Low standby power dissipation
- \* Under-voltage lockout (UVLO) with hysteresis
- \* Provides complete protection functions
  - Cycle-by-cycle current limit
  - Output over-voltage Protection



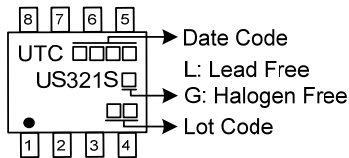
SOP-8

#### ORDERING INFORMATION

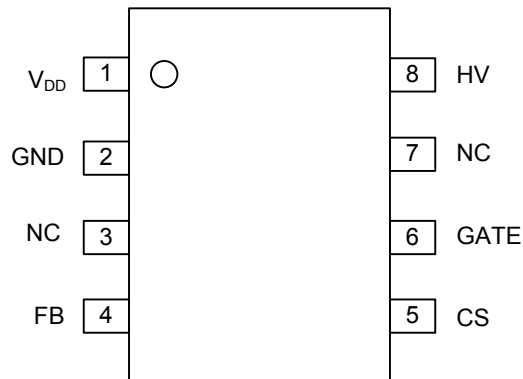
Ordering Number		Package	Packing
Lead Free	Halogen Free		
US321SL-S08-R	US321SG-S08-R	SOP-8	Tape Reel

<p>US321SG-S08-R</p> <ul style="list-style-type: none"> <li>(1) Packing Type</li> <li>(2) Package Type</li> <li>(3) Green Package</li> </ul>	<ul style="list-style-type: none"> <li>(1) R: Tape Reel</li> <li>(2) S08: SOP-8</li> <li>(3) G: Halogen Free and Lead Free, L: Lead Free</li> </ul>
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#### MARKING



### ■ PIN CONFIGURATION

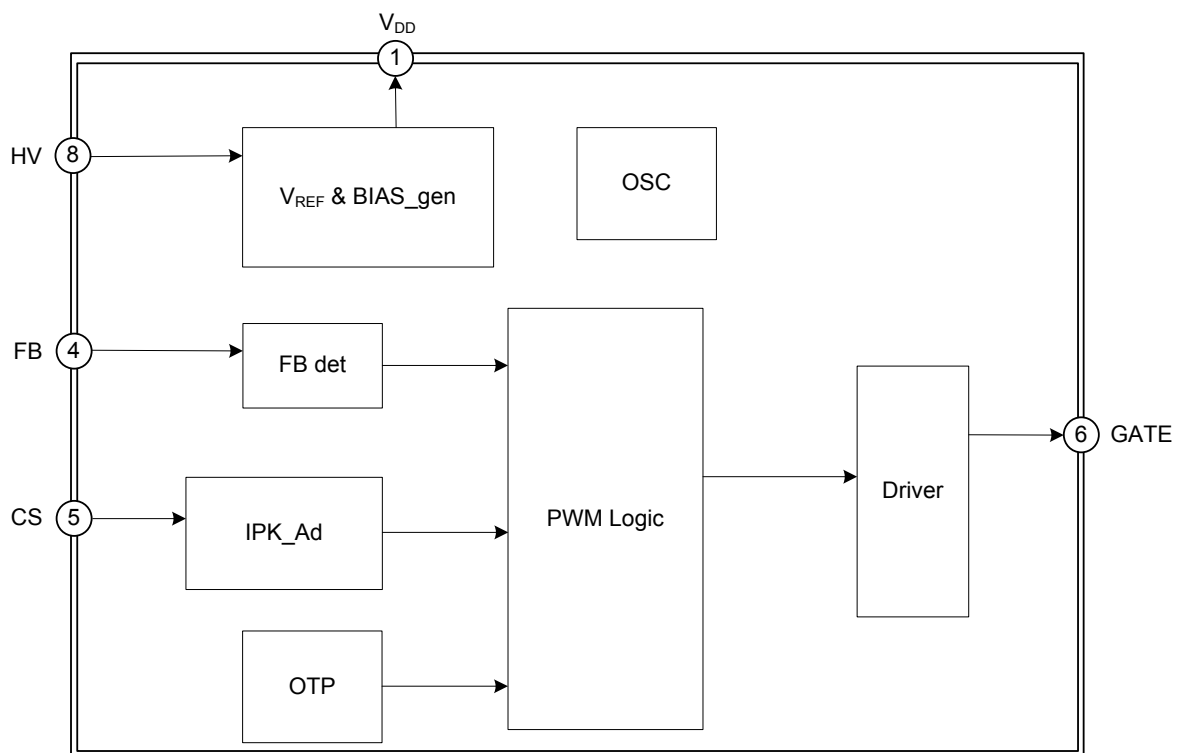


### ■ PIN DESCRIPTION

PIN NO.	PIN NAME	I/O (Note 1)	DESCRIPTION
1	V <sub>CC</sub>	V <sub>DD</sub>	Power supply
2	V <sub>B</sub>	GND	Power ground
3, 7	HO	NC	No connection
4	V <sub>S</sub>	FB	Output feedback
5	HIN	CS	Sensed current of power mos
6	LIN	GATE	Gate driver for power mos
8	COM	HV	HV input

Note: I=Input, O=Output

### ■ BLOCK DIAGRAM



### ■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
HV Pin Voltage	HV	-0.3 ~ 650	V
V <sub>DD</sub> Pin Voltage	V <sub>DD</sub>	30	V
FB, CS, GATE Pin Voltage		-0.3 ~ 7	V
Maximum Operating Junction Temperature	T <sub>J</sub>	+150	°C
Storage Temperature	T <sub>STG</sub>	-55 ~ +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 RANGE

PARAMETER	SYMBOL	RATINGS	UNIT
Switch Frequency	f <sub>SW</sub>	40 ~ 60	kHz
Operation Ambient Temperature	T <sub>A</sub>	-40 ~ +85	°C
Operating Junction Temperature	T <sub>J</sub>	+125	°C

### ■ THERMAL DATA

PARAMETER	SYMBOL	RATINGS	UNIT
Junction to Ambient	θ <sub>JA</sub>	165	°C/W

Note: Not to exceed the maximum junction temperature of the IC, which relates to the operating power of the IC and the thermal resistance of the IC/package as above. The operation power of the IC can be calculated by  $P_D = V_{DD\_IN} \times I_{IN}$ , where  $V_{DD\_IN}$  represents the input voltage at the V<sub>DD</sub> pin of the IC and  $I_{IN}$  represents the current flow into the V<sub>DD</sub> pin of the IC.

### ■ ELECTRICAL CHARACTERISTICS (T<sub>A</sub>=25°C unless additional specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>Supply Voltage</b>						
HV Pin Current	I <sub>HV</sub>			2		mA
V <sub>DD</sub> Startup Current	I <sub>VDD_ST</sub>			100	300	uA
V <sub>DD</sub> Operation Current	I <sub>VDD_OP</sub>			800		uA
V <sub>DD</sub> Static Current	I <sub>VDD_Q</sub>			200		uA
V <sub>DD</sub> ON Voltage	V <sub>DD_ON</sub>			7.5		V
V <sub>DD</sub> off Voltage	V <sub>DD_OFF</sub>			7		V
V <sub>DD</sub> OVP Threshold	V <sub>DD_OVP</sub>			28		V
V <sub>DD</sub> Clamp Voltage	V <sub>DD_CLAMP</sub>			30		V
V <sub>DD</sub> Regulation Voltage	V <sub>DD_reg1</sub>		11.8	12	12.2	V
<b>FB PIN</b>						
Reference for Non-Inverting Input	V <sub>FB_REF</sub>		1.97	2	2.03	V
FB OVP Threshold	V <sub>FB_OVP</sub>			2.4		V
FB OLP Threshold	V <sub>FB_OLP</sub>			1.87		V
<b>CS PIN</b>						
LEB Time	T <sub>LEB</sub>			350		ns
Peak Current Threshold	V <sub>IPK</sub>		0.5	0.55	0.6	V
OCP Threshold	V <sub>AOCP</sub>			0.9		V
<b>GATE Drive Output</b>						
Typical Minimum Off Time	T <sub>OFF_MIN</sub>			16		uS
Typical Maximum Off Time	T <sub>OFF_MAX</sub>			1.4		mS
Maximum on Time	T <sub>ON_MAX</sub>			12		uS
Auto-Recovery Time	T <sub>AUR</sub>			500		mS

**■ FUNCTIONAL DESCRIPTION**

Refer to both the Block Diagram and a reference design circuit for the following discussions. All parameters mentioned below are typical values.

**Start-up Circuit**

Applying power to the input port in Figure 4, initiates the operation.  $V_{DD}$  voltage is lower than  $V_{DD\_OFF}$  pwm logic is off and output voltage cannot keep at a constant value.

After  $V_{DD}$  voltage is over  $V_{DD\_ON}$  normal operation starts. PWM logic is running and output voltage goes to pre-set value gradually.

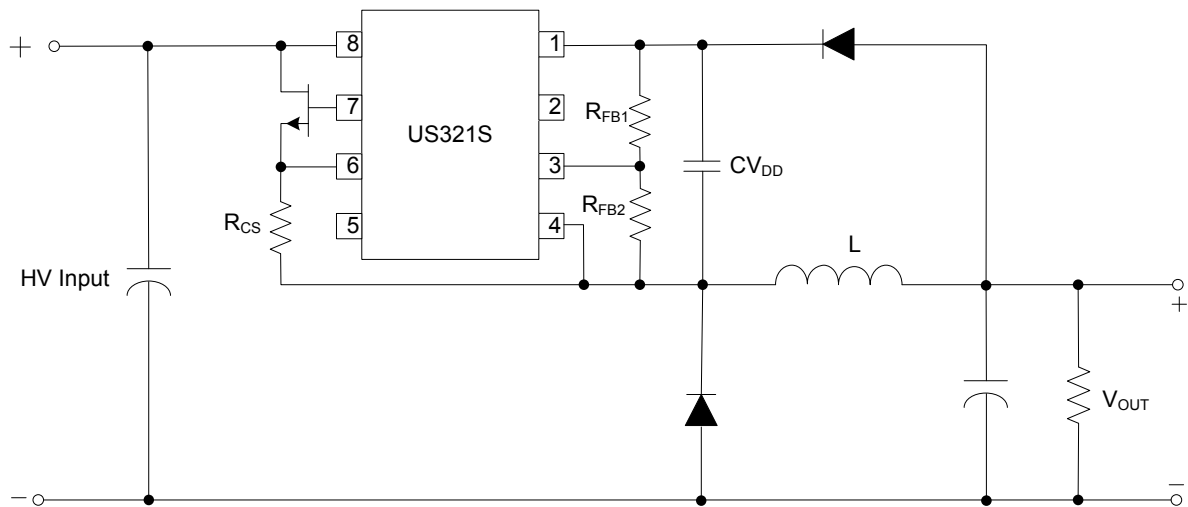
**Output voltage Setting**

Output voltage can be set by two divided-resistors. Reference voltage in the chip is 2V. The output voltage can be calculated by

$$V_{OUT}=(1+R_{FB1}/R_{FB2})\times 2+V_{D1}.$$

$V_{D1}$  is forward voltage drop of a diode, 0.6V typically.

### ■ TYPICAL APPLICATION CIRCUIT



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