

## DESCRIPTION

The CHP5020A is a low-drop diode emulator IC that, when combined with an external switch, replaces Schottky diodes in high-efficiency fly-back converters.

The CHP5020A regulates the forward drop of an external synchronous rectifier (SR) MOSFET to about 35mV, which switches off once the voltage becomes negative.

The CHP5020A can generate its own supply voltage for battery charging applications with potential low output voltage, and at short circuit output condition, or for high-side SR configuration. Programmable ringing detection circuitry prevents the CHP5020A from turning on falsely at Vds oscillations during discontinuous conduction mode (DCM) and quasi-resonant operation.

The CHP5020A is available in a space-saving SOT23-6 package.

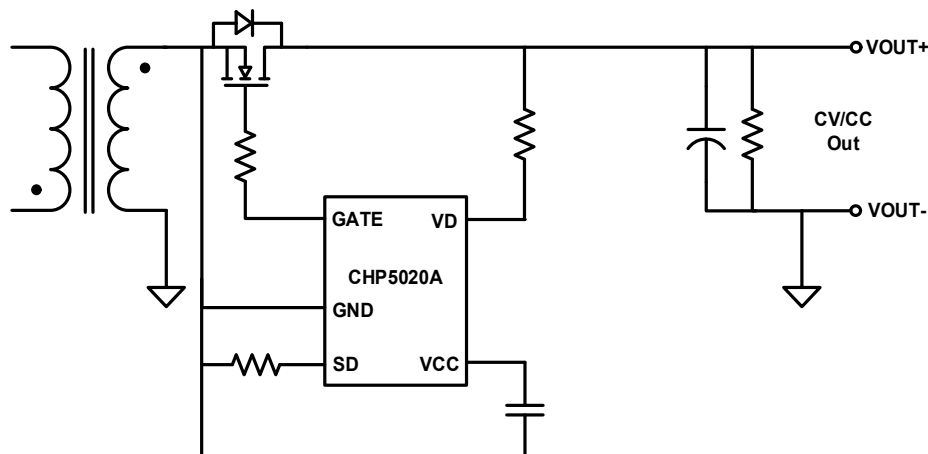
## FEATURES

- Supports DCM/CCM/QR and ACF Operations Mode
- Supports Maximum 300KHz Switching Frequency
- Wide Output Range down to 0V, No Short Circuit Current Flows through Body Diode
- Supports both High-Side and Low-Side Self-supply
- Ringing Detection Prevents False Turn-On during DCM and Quasi-Resonant Operations
- Compatible with Energy Star
- ~30ns Fast Turn-Off and Turn-On Delay
- High to 200V Withstand Voltage, It can be used in GaN high frequency power supply
- Supports both High-Side and Low-Side Rectification

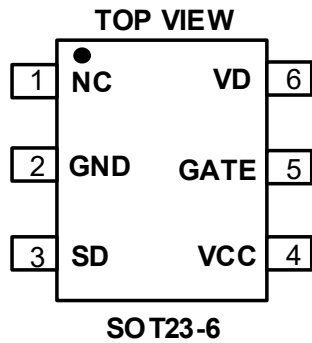
## APPLICATIONS

- USB PD Quick Chargers
- Adaptors
- Flyback Power Supplies with Very Low and/or Variable Output Voltage

## TYPICAL APPLICATION



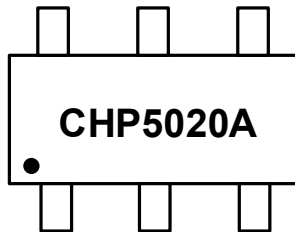
## PACKAGE REFERENCE



## PIN FUNCTIONS

Pin #	Name	Description
1	NC	Not Connect.
2	GND	Ground.
3	SD	Programming for turn-on signal slew rate detection. Any signal slower than the pre-set slew rate cannot turn on VG.
4	VCC	High voltage LDO output, Power supply.
5	GATE	Gate drive output.
6	VD	MOSFET drain voltage sense.

## TOP MARKING



CHP5020A Represents Part Number.

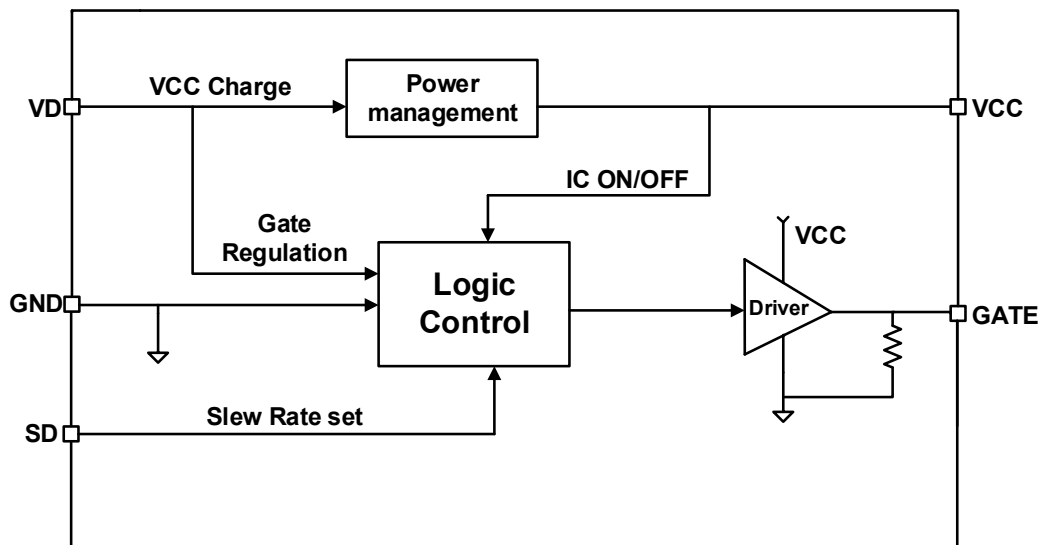
## ORDERING INFORMATION

Part Number	Package	MOS	Packing	230Vac	90-265Vac
CHP5020A	SOT23-6	External	Tape 4K/Reel	120W	120W

Note: The maximum output power is limited by chip junction temperature. Typical test conditions: ambient temperature  $T_a=50^\circ\text{C}$ ,

IC PIN has enough copper heat dissipation, the adapter is fully sealed.

## BLOCK DIAGRAM



### ABSOLUTE MAXIMUM RATINGS (Comment 1)

Parameters	Value	Units
VCC, GATE Voltage Range	-0.3 to 14	V
VD Voltage Range	-1 to 230	V
SD Voltage Range	-0.3 to 6.5	V
Power Dissipation(25°C)	0.56	W
Junction Temperature	150	°C
Lead Temperature (Soldering 10 sec)	260	°C
Storage temperature	-55 to 150	°C

Comment 1: Exceeding the list limit parameter may cause permanent damage to the chip. The limit parameter is the rated stress value.

The device may not function properly under conditions and stresses beyond the recommended operating conditions.

So it is not recommended to allow the device to operate under these conditions.

Overexposure to higher than recommended maximum operating conditions can affect device reliability.

### RECOMMENDED OPERATION CONDITIONS (Comment 2)

Parameters	Value	Units
VCC Operating Range	4 to 13	V
VD Operating Range	-1 to 200	V
Maximum Junction Temperature	125	°C
SOT23-6 Thermal Resistance	220	°C/W

Comment 2: Beyond the above working conditions, cannot guarantee the normal operation of the chip.

### ELECTRICAL CHARACTERISTICS (VCC=5V,TJ= -40°C~125°C, unless otherwise noted.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
<b>VCC Supply Section</b>						
V <sub>ST</sub>	VCC UVLO rising			3.9		V
V <sub>HY</sub>	VCC UVLO hysteresis			0.3		V
V <sub>OP</sub>	VCC Operating Voltage	VD= 12V	8.5	9	9.5	V
I <sub>VCC-MAX</sub>	VCC maximum charging	VCC= 7V,VD= 40V		70		mA
I <sub>CC</sub>	VCC Operating Current	VCC= 9V,CLOAD= 2.2nF, FSW= 100kHz		2.8	3.5	mA
		VCC= 9V,CLOAD= 2.2nF, FSW= 100kHz		1.6	2.0	mA
I <sub>Q</sub>	VCC Quiescent current	VCC=5V		200		μA
I <sub>ST</sub>	VCC Start-up Current	VCC=UVLO-0.1V			100	μA
<b>Control Circuit Section</b>						
V <sub>fwd</sub>	Regulation voltage (VSS - VD)		-50	-35	-20	mV
	Turn-on threshold (VDS)		-130	-100	-70	mV
	Turn-off threshold (GND -		-10	0	10	mV

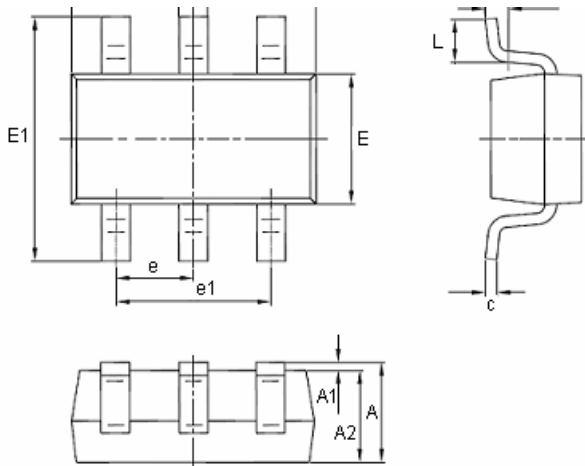
T <sub>Don</sub>	Turn-on delay	CLOAD=2.2nF		30	50	ns
T <sub>Doff</sub>	Turn-off delay	CLOAD=2.2nF		25	45	ns
	Turn-off propagation delay	Comment 3		15		ns
T <sub>B-ON</sub>	Turn-on blanking time	Comment 3, CLOAD=2.2nF	0.35	0.45	0.55	μs
V <sub>B-OFF</sub>	Turn-off blanking threshold (VDS)		2		3	V
	Turn-off threshold during minimum on time (VDS)			2		V
T <sub>SD</sub>	SD timer	Comment 3, RSD=400kΩ	75	100	125	ns
<b>Gate Driver Section</b>						
V <sub>GATE-L</sub>	VGATE(Low)	ILOAD=10mA		0.01	0.02	V
V <sub>GATE-H</sub>	VGATE(High)	ILOAD=0mA		VCC		V
	Maximum source current			0.5		A
	Maximum sink current			3		A
	Pull-down impedance	Same as VGATE-Low		1	2	Ω

Comment 3: The parameters depend on the design, and the batch is manufactured through functional test.

## PACKAGE SIZE

### SOT23-6 Package information

(units: mm)



Designation	Minimum	Maximum
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.500
c	0.100	0.200
D	2.280	3.020
E	1.500	1.700
E1	2.650	2.950
e	0.950 (BSC)	
e1	1.800	2.000
L	0.300	0.600
$\theta$	0°	8°

## STATEMENT

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