



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



**380kHz, 2A Asynchronous DC-DC Buck Converter****AP3202****General Description**

The AP3202 is a 380kHz fixed frequency, current mode, PWM buck (step-down) DC-DC converter, capable of driving a 2A load with high efficiency, excellent line and load regulation. The device integrates N-channel power MOSFET switch with low on-resistance. Current mode control provides fast transient response and cycle-by-cycle current limit.

A standard series of inductors are available from several different manufacturers optimized for use with the AP3202. This feature greatly simplifies the design of switch-mode power supplies.

This IC is available in SOIC-8 package.

**Features**

- Input Voltage Range: 4.75V to 18V
- Fixed 380kHz Frequency
- High Efficiency: up to 93%
- Output Current: 2A
- Current Mode Control
- Built-in Over Current Protection
- Built-in Thermal Shutdown Function
- Built-in UVLO Function
- Built-in Over Voltage Protection
- Built-in Soft-start

**Applications**

- LCD TV
- Set Top Box
- Portable DVD
- Digital Photo Frame



Figure 1. Package Type of AP3202

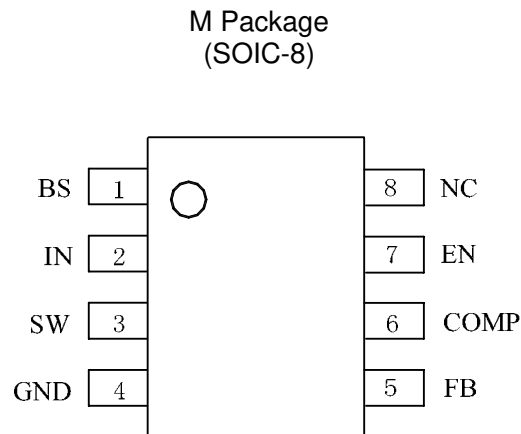
**380kHz, 2A Asynchronous DC-DC Buck Converter**
**AP3202**
**Pin Configuration**


Figure 2. Pin Configuration of AP3202 (Top View)

**Pin Description**

Pin Number	Pin Name	Function
1	BS	Bootstrap pin. A bootstrap capacitor is connected between the BS pin and SW pin. The voltage across the bootstrap capacitor drives the internal high-side power MOSFET
2	IN	Supply input pin. A capacitor should be connected between the IN pin and GND pin to keep the input voltage constant
3	SW	Power switch output pin. This pin is connected to the inductor and bootstrap capacitor
4	GND	Ground pin
5	FB	Feedback pin. This pin is connected to an external resistor divider to program the system output voltage. When the FB pin voltage exceeds 20% of the nominal regulation value of 1.222V, the over voltage protection is triggered. When the FB pin voltage is below 0.6V, the oscillator frequency is lowered to realize short circuit protection
6	COMP	Compensation pin. This pin is the output of the transconductance error amplifier and the input to the current comparator. It is used to compensate the control loop. Connect a series RC network from this pin to GND. In some cases, an additional capacitor from this pin to GND pin is required
7	EN	Control input pin. Forcing this pin above 1.5V or set this pin floating enables the IC. Forcing this pin below 0.5V shuts down the IC. When the IC is in shutdown mode, all functions are disabled to decrease the supply current below 1 $\mu$ A
8	NC	No Connection

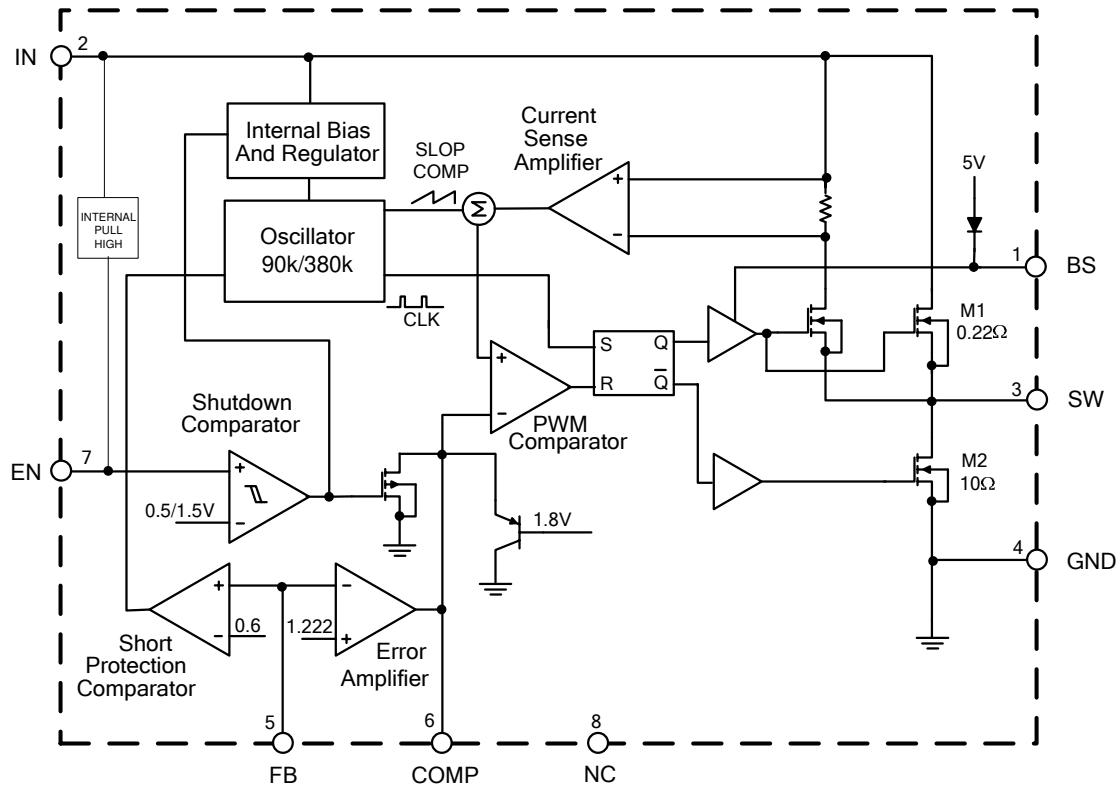
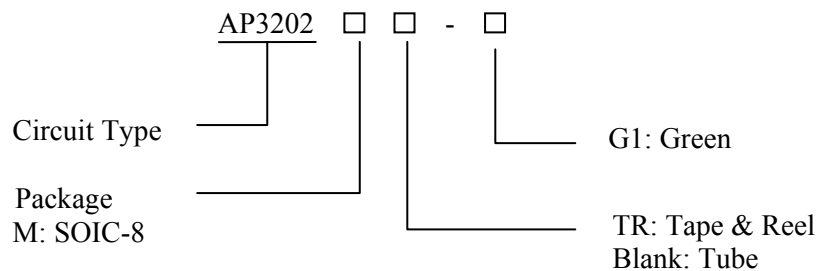
**380kHz, 2A Asynchronous DC-DC Buck Converter**
**AP3202**
**Functional Block Diagram**


Figure 3. Functional Block Diagram of AP3202

**Ordering Information**


Package	Temperature Range	Part Number	Marking ID	Packing Type
SOIC-8	-40 to 85°C	AP3202M-G1	3202M-G1	Tube
		AP3202MTR-G1	3202M-G1	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

**380kHz, 2A Asynchronous DC-DC Buck Converter****AP3202****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
IN Pin Voltage	$V_{IN}$	-0.3 to 20	V
EN Pin Voltage	$V_{EN}$	-0.3 to $V_{IN}$	V
SW Pin Voltage	$V_{SW}$	20	V
BS Pin Voltage	$V_{BS}$	-0.3 to $V_{SW}+6$	V
FB Pin Voltage	$V_{FB}$	-0.3 to 6	V
COMP Pin Voltage	$V_{COMP}$	-0.3 to 6	V
Thermal Resistance	$\theta_{JA}$	105	°C/W
Operating Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{STG}$	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	$T_{LEAD}$	260	°C
ESD (Machine Model)		200	V
ESD (Human Body Model)		2000	V

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Input Voltage	$V_{IN}$	4.75	18	V
Maximum Output Current	$I_{OUT(Max)}$	2		A
Operating Ambient Temperature	$T_A$	-40	85	°C



**380kHz, 2A Asynchronous DC-DC Buck Converter**

**AP3202**

**Electrical Characteristics**

$V_{IN}=V_{EN}=12V$ ,  $V_{OUT}=3.3V$ , unless otherwise specified. Specification with standard typeface are for  $T_A=25^{\circ}C$ , and those in **boldface type** apply over the full operating temperature range ( $T_A=-40^{\circ}C$  to  $85^{\circ}C$ )

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage	$V_{IN}$		4.75		18	V
Quiescent Current	$I_Q$	$V_{FB}=1.4V, V_{EN}=2V$		1.0	1.5	mA
Shutdown Supply Current	$I_{SHDN}$	$V_{EN}=0V$		1	10	$\mu A$
Feedback Voltage	$V_{FB}$		<b>1.185</b>	<b>1.222</b>	<b>1.258</b>	V
Feedback Over Voltage Threshold	$V_{FBOV}$			1.48		V
Feedback SCP Voltage Threshold	$V_{FBSCP}$			0.6		V
Feedback Bias Current	$I_{FB}$	$V_{FB}=1V$	-0.1		0.1	$\mu A$
High-side Switch On-resistance (Note 2)	$R_{DSONH}$	$I_{SW}=0.5A$		0.22		$\Omega$
Low-side Switch On-resistance (Note 2)	$R_{DSONL}$	$I_{SW}=0.05A$		10		$\Omega$
High-side Switch Leakage Current	$I_{LEAKH}$	$V_{IN}=18V, V_{EN}=0V$ $V_{SW}=0V$		0.1	10	$\mu A$
High-side Switch Current Limit	$I_{LIMH}$		2.8	3.8		A
Low-side Switch Current Limit	$I_{LIML}$	From drain to source		0.15		A
EN Pin Threshold	$V_{ENH}$		1.5			V
	$V_{ENL}$				0.5	
EN Pull-up Current	$I_{EN-PH}$	$V_{EN}=0V$		1.0		$\mu A$
Input UVLO Threshold	$V_{UVLO}$	$V_{IN}$ Rising	3.5	3.9	4.4	V
Input UVLO Hysteresis	$V_{HYS}$			0.3		V
Oscillator Frequency	$F_{OSC1}$			380		kHz
Short Circuit Oscillator Frequency	$F_{OSC2}$			90		kHz
Maximum Duty Cycle	$D_{MAX}$	$V_{FB}=1.0V$		90		%
Minimum Duty Cycle	$D_{MIN}$	$V_{FB}=1.5V$			0	%
Error Amplifier Voltage Gain (Note 3)	$A_{EA}$			400		V/V
Error Amplifier Transconductance	$G_{EA}$			700		$\mu A/V$
COMP to Current Sense Transconductance	$G_{CS}$			2.4		A/V
Thermal Shutdown (Note 3)	$T_{OTSD}$			160		$^{\circ}C$
Thermal Shutdown Hysteresis (Note 3)	$T_{HYS}$			30		$^{\circ}C$
Soft-start Time (Note 3)	$t_{SS}$	$I_{OUT}=0A$		500		$\mu s$

Note 2:  $R_{DSON} = \frac{V_{SW1} - V_{SW2}}{I_{SW1} - I_{SW2}}$

Note 3: Not tested, guaranteed by design.



**380kHz, 2A Asynchronous DC-DC Buck Converter**

**AP3202**

**Typical Performance Characteristics**

$T_A=25^{\circ}\text{C}$ ,  $V_{IN}=12\text{V}$ ,  $V_{OUT}=3.3\text{V}$ , unless otherwise noted.

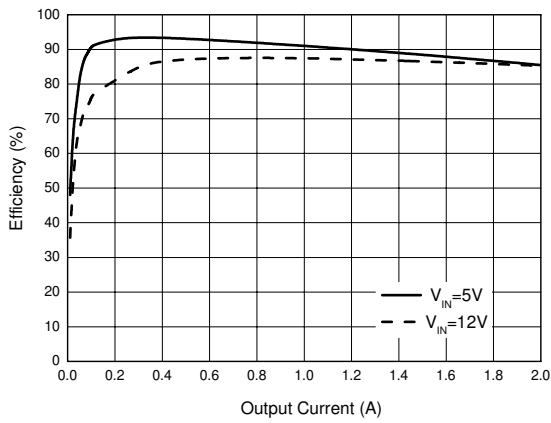


Figure 4. Efficiency vs. Output Current

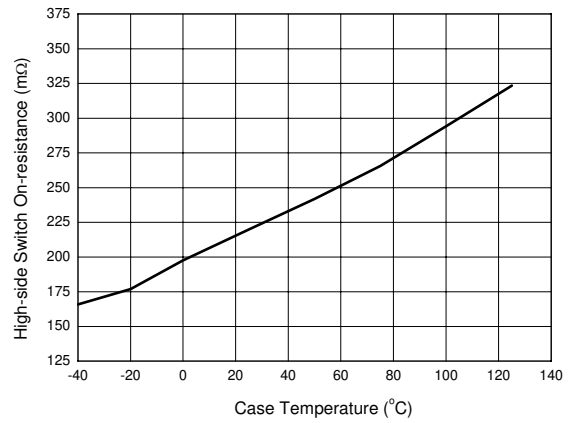


Figure 5.  $R_{DS(on)}$  vs. Case Temperature

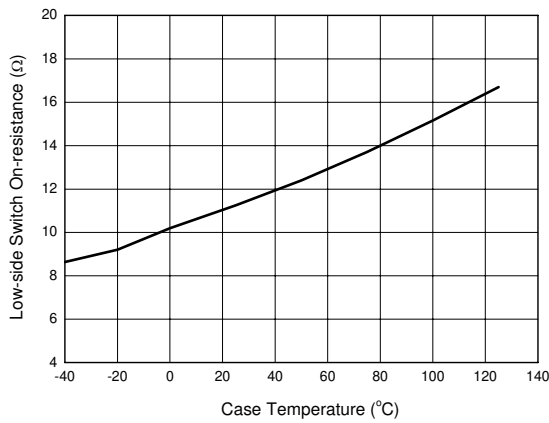


Figure 6.  $R_{DS(on)}$  vs. Case Temperature

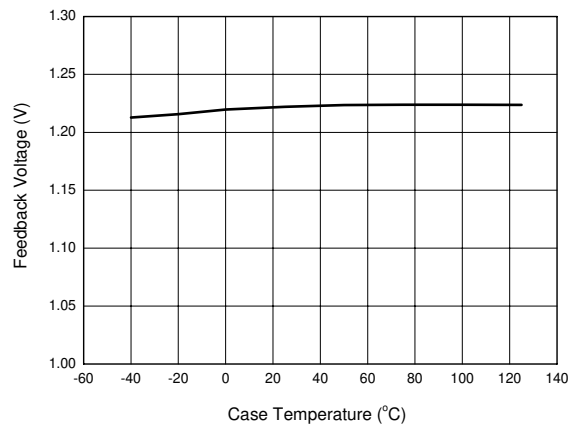


Figure 7. Feedback Voltage vs. Case Temperature

**380kHz, 2A Asynchronous DC-DC Buck Converter**

**AP3202**

**Typical Performance Characteristics (Continued)**

$T_A=25^{\circ}\text{C}$ ,  $V_{IN}=12\text{V}$ ,  $V_{OUT}=3.3\text{V}$ , unless otherwise noted.

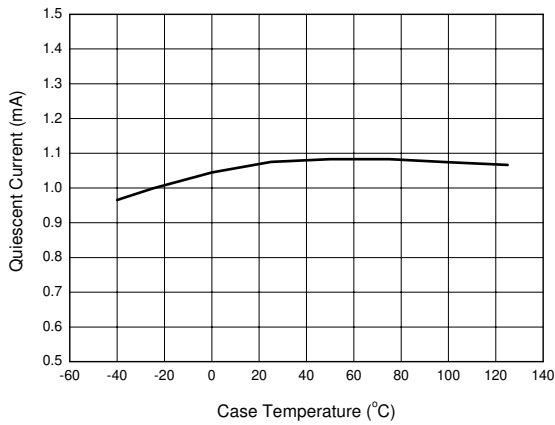


Figure 8. Quiescent Current vs. Case Temperature

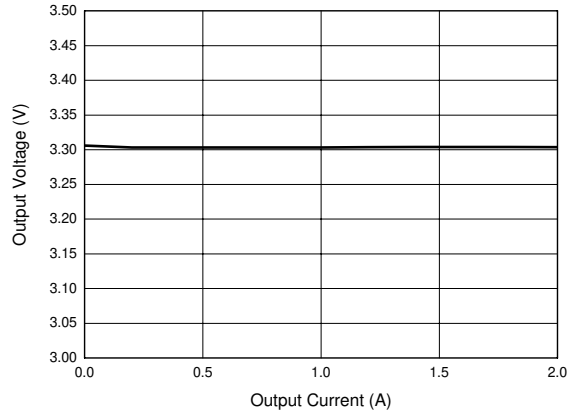


Figure 9. Output Voltage vs. Output Current

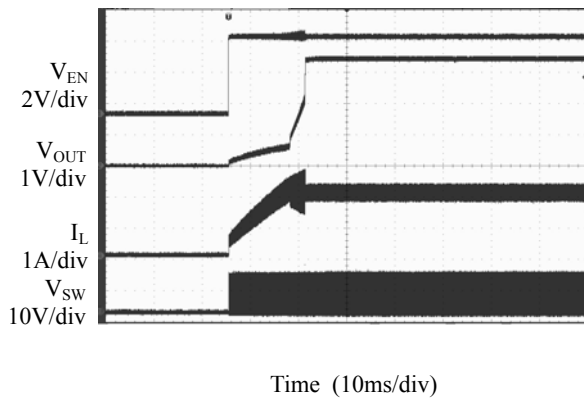


Figure 10. Enable Turn on Characteristic ( $I_{OUT}=2\text{A}$ , CC Mode)

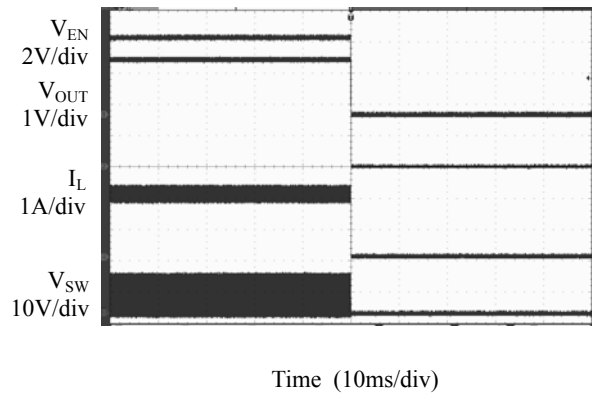
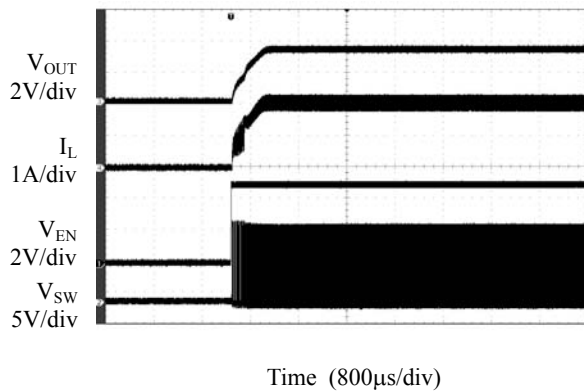
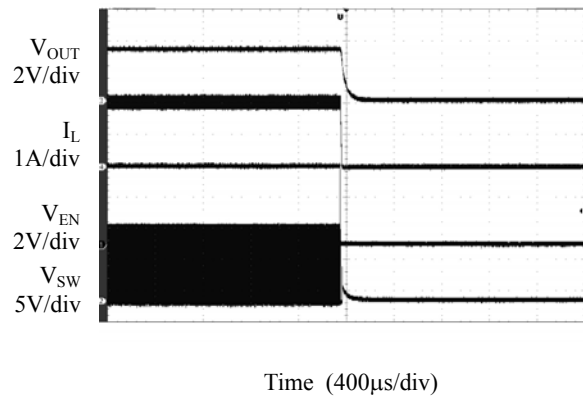
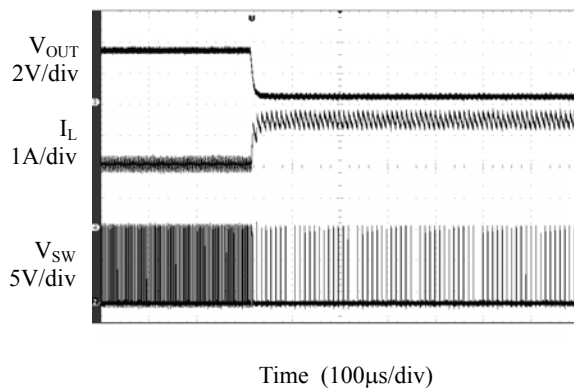
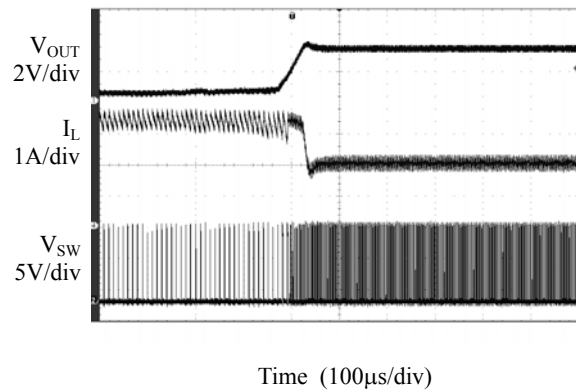


Figure 11. Enable Turn off Characteristic ( $I_{OUT}=2\text{A}$ , CC Mode)



**380kHz, 2A Asynchronous DC-DC Buck Converter**
**AP3202**
**Typical Performance Characteristics (Continued)**
 $T_A=25^{\circ}\text{C}$ ,  $V_{IN}=12\text{V}$ ,  $V_{OUT}=3.3\text{V}$ , unless otherwise noted.

 Figure 12. Enable Turn on Characteristic  
 ( $I_{OUT}=2\text{A}$ , Resistance Load)

 Figure 13. Enable Turn off Characteristic  
 ( $I_{OUT}=2\text{A}$ , Resistance Load)

 Figure 14. Short Circuit Protection  
 ( $I_{OUT}=2\text{A}$ )

 Figure 15. Short Circuit Recovery  
 ( $I_{OUT}=2\text{A}$ )

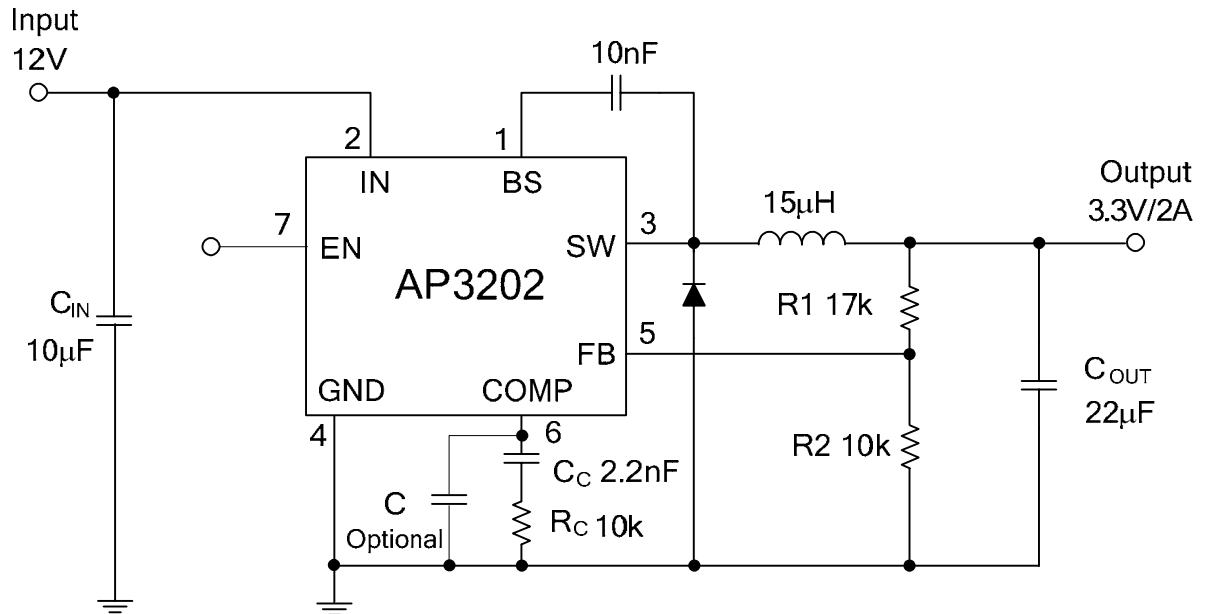
**Typical Application**


Figure 16. Typical Application of AP3202





## BCD Semiconductor Manufacturing Limited

<http://www.bcdsemi.com>

### IMPORTANT NOTICE

BCD Semiconductor Manufacturing Limited reserves the right to make changes without further notice to any products or specifications herein. BCD Semiconductor Manufacturing Limited does not assume any responsibility for use of any its products for any particular purpose, nor does BCD Semiconductor Manufacturing Limited assume any liability arising out of the application or use of any its products or circuits. BCD Semiconductor Manufacturing Limited does not convey any license under its patent rights or other rights nor the rights of others.

---

#### MAIN SITE

##### - Headquarters

##### BCD Semiconductor Manufacturing Limited

No. 1600, Zi Xing Road, Shanghai Zizhu Science-based Industrial Park, 200241, China  
Tel: +86-21-24162266, Fax: +86-21-24162277

##### - Wafer Fab

##### Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.

800 Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

#### REGIONAL SALES OFFICE

##### Shenzhen Office

##### Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd., Shenzhen Office

Unit A Room 1203, Skyworth Bldg., Gaoxin Ave. 1.S., Nanshan District, Shenzhen, China  
Tel: +86-755-8826 7951  
Fax: +86-755-8826 7865

##### Taiwan Office

##### BCD Semiconductor (Taiwan) Company Limited

4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei, Taiwan  
Tel: +886-2-2656 2808  
Fax: +886-2-2656 2806

##### USA Office

##### BCD Semiconductor Corp.

30920 Huntwood Ave. Hayward, CA 94544, USA  
Tel : +1-510-324-2988  
Fax: +1-510-324-2788