

1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H

Pin Configuration

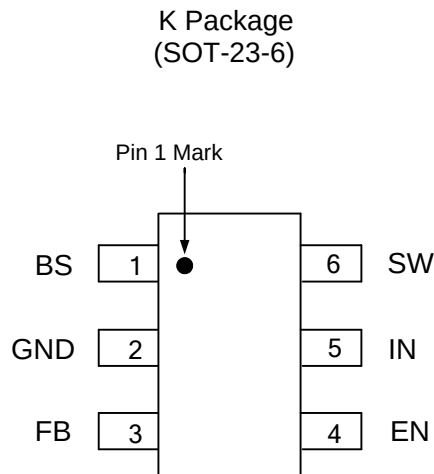


Figure 2. Pin Configuration of AP3211H (Top View)

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 NMOS switch
2	GND	Ground pin
3	FB	Feedback pin. This pin is connected to an external resistor divider to program the system output voltage. When V_{FB} exceeds 20% of the nominal regulation value of 0.81V, the OVP is triggered. When $V_{FB} < 0.25V$, the oscillator frequency is lowered to realize short circuit protection
4	EN	Control input pin. Forcing this pin above 1.5V enables the IC. Forcing this pin below 0.4V shuts down the IC. When the IC is in shutdown mode, all functions are disabled to decrease the supply current below 1 μ A
5	IN	Supply input pin. A capacitor should be connected between the IN pin and GND pin to keep the DC input voltage constant
6	SW	Power switch output pin. This pin is connected to the inductor and bootstrap capacitor

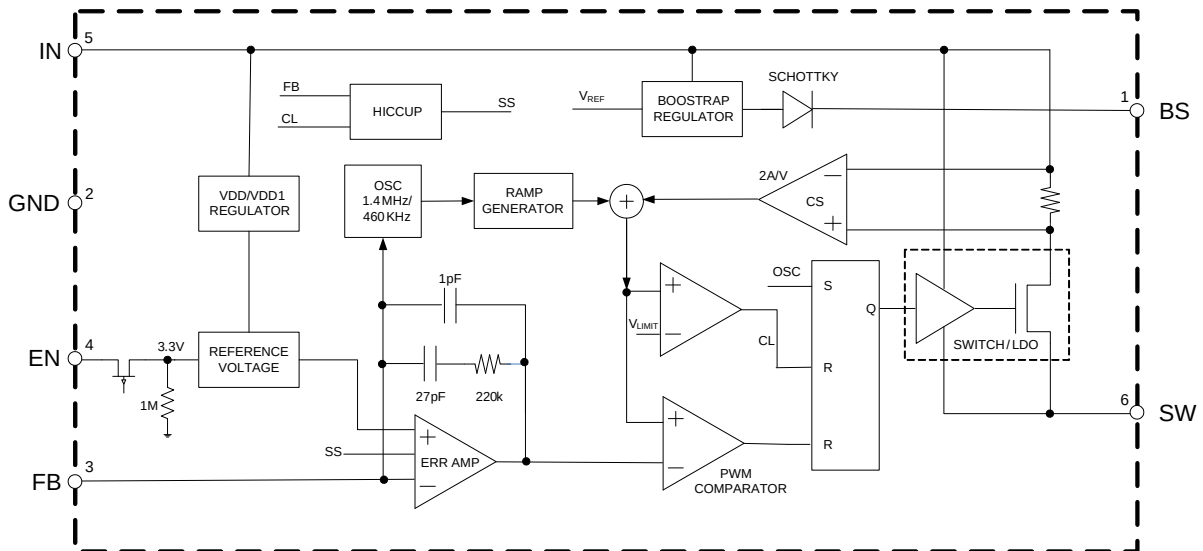
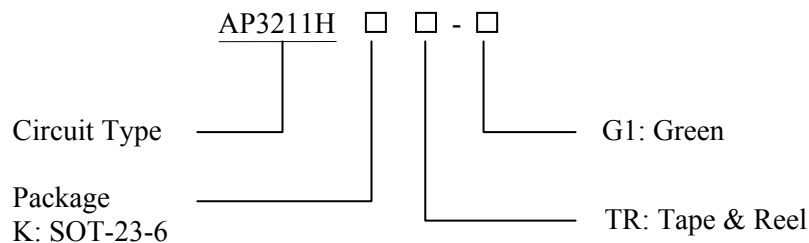
**1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H****Functional Block Diagram**

Figure 3. Functional Block Diagram of AP3211H

Ordering Information

Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-6	-40 to 85°C	AP3211HKTR-G1	GBK	Tape & Reel

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

**1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Input Pin Voltage	V_{IN}	-0.3 to 25	V
EN Pin Voltage	V_{EN}	-0.3 to $V_{IN}+0.3$	V
SW Pin Voltage	V_{SW}	26	V
Bootstrap Pin Voltage	V_{BS}	-0.3 to $V_{SW}+6$	V
Feedback Pin Voltage	V_{FB}	-0.3 to 6	V
Operating Junction Temperature	T_J	150	°C
Storage Temperature	T_{STG}	-65 to 150	°C
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C
Thermal Resistance (Junction to Ambient)	θ_{JA}	220	°C/W

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}	4.5	23	V
Operating Ambient Temperature	T_A	-40	85	°C

**1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H****Electrical Characteristics**

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage	V_{IN}		4.5		23	V
Quiescent Current	I_Q	$V_{FB}=0.9V$		0.8	1.1	mA
Shutdown Supply Current	I_{SHDN}	$V_{EN}=0V$		0.1	1.0	μA
Feedback Voltage	V_{FB}		0.785	0.810	0.835	V
Feedback Over Voltage Threshold	V_{FBOV}			0.972		V
Feedback Bias Current	I_{FB}	$V_{FB}=0.85V$	-0.1		0.1	μA
Switch On-resistance	$R_{DS(on)}$	$I_{SW}=1A$		0.385		Ω
Switch Leakage Current	I_{LEAK}	$V_{IN}=23V$, $V_{EN}=0V$		0.1	10	μA
Switch Current Limit	I_{LIM}		1.8	2.4		A
EN Pin Threshold	V_{ENH}		1.5			V
	V_{ENL}				0.4	
Input UVLO Threshold	V_{UVLO}	V_{IN} Rising	3.3	3.8	4.3	V
Input UVLO Hysteresis	V_{HYS}			0.2		V
Oscillator Frequency	f_{OSC1}		1.1	1.4	1.7	MHz
	f_{OSC2}	Short Circuit		460		kHz
Max. Duty Cycle	D_{MAX}	$V_{FB}=0.6V$		90		%
Min. Duty Cycle	D_{MIN}	$V_{FB}=0.9V$			0	%
Minimum On Time	t_{ON}			100		ns
Thermal Shutdown	T_{OTSD}			160		$^{\circ}C$
Thermal Shutdown Hysteresis	T_{HYS}			20		$^{\circ}C$
Soft-start Time	t_{SS}			200		μs

Note 2: $R_{DS(on)}$, t_{ON} , T_{OTSD} , T_{HYS} and t_{SS} are guaranteed by design.

**1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H****Typical Performance Characteristics**

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

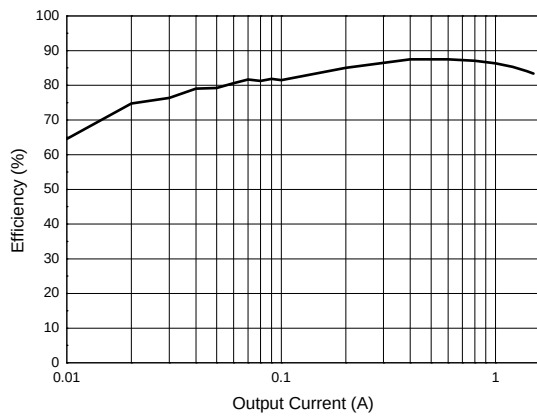


Figure 4. Efficiency vs. Output Current

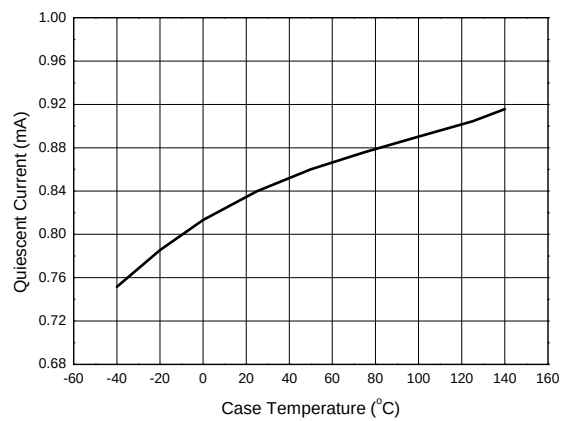


Figure 5. Quiescent Current vs. Case Temperature

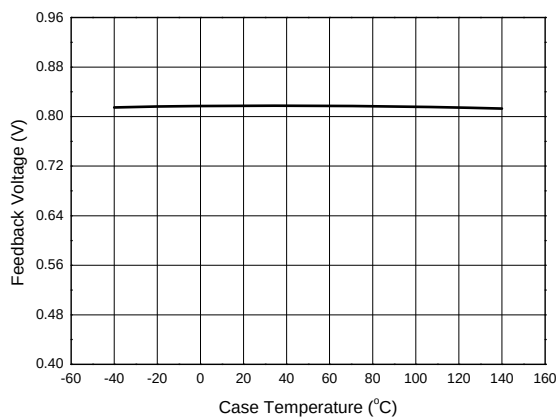


Figure 6. Feedback Voltage vs. Case Temperature

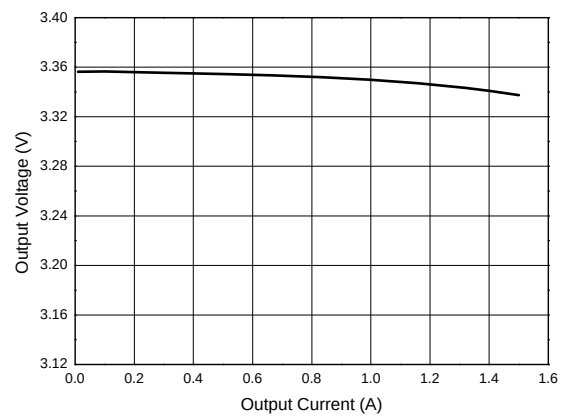
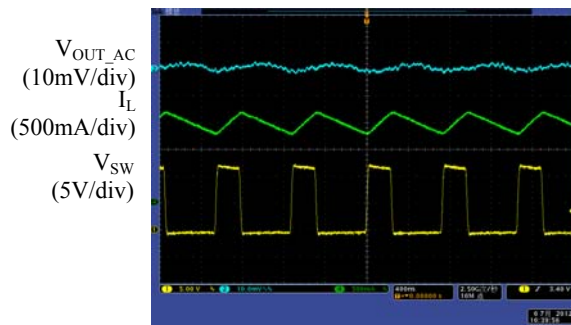


Figure 7. Output Voltage vs. Output Current

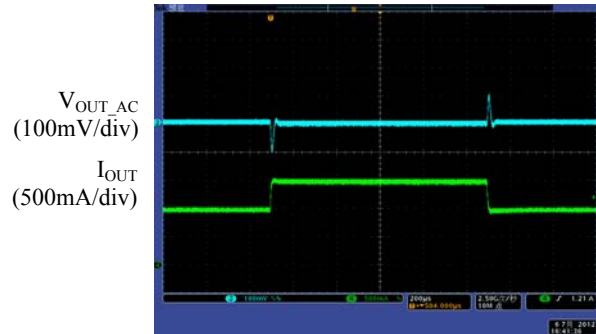
**1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H****Typical Performance Characteristics (Continued)**

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



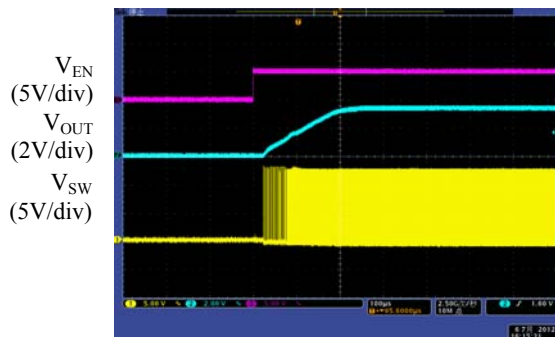
Time (400ns/div)

Figure 8. Output Ripple ($I_{OUT}=1.5\text{A}$)



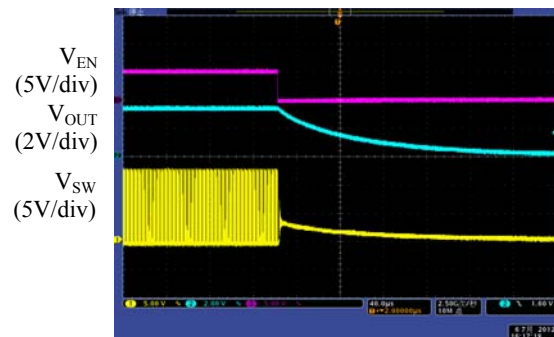
Time (200µs/div)

Figure 9. Load Transient ($I_{OUT}=1\text{A}$ to 1.5A)



Time (100µs/div)

Figure 10. Enable Turn on Characteristic

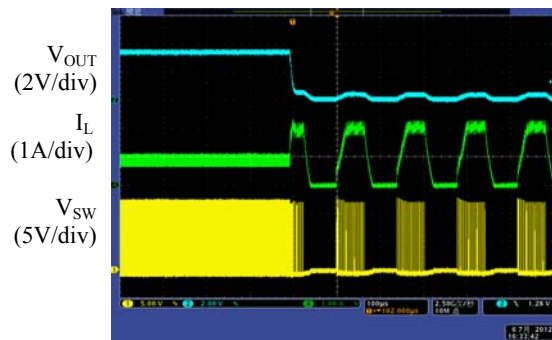


Time (40µs/div)

Figure 11. Enable Turn off Characteristic

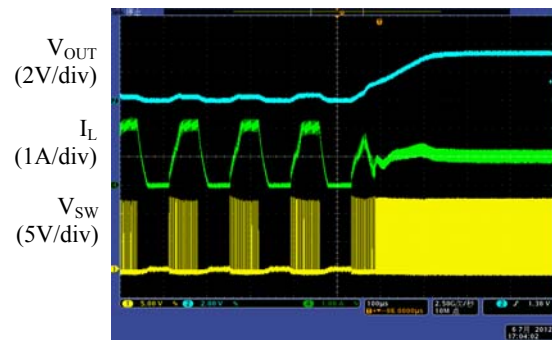
**1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H****Typical Performance Characteristics (Continued)**

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



Time (100 μs /div)

Figure 12. Short Circuit Protection ($I_{\text{OUT}}=1\text{A}$)



Time (100 μs /div)

Figure 13. Short Circuit Recovery ($I_{\text{OUT}}=1\text{A}$)

1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H

Typical Application

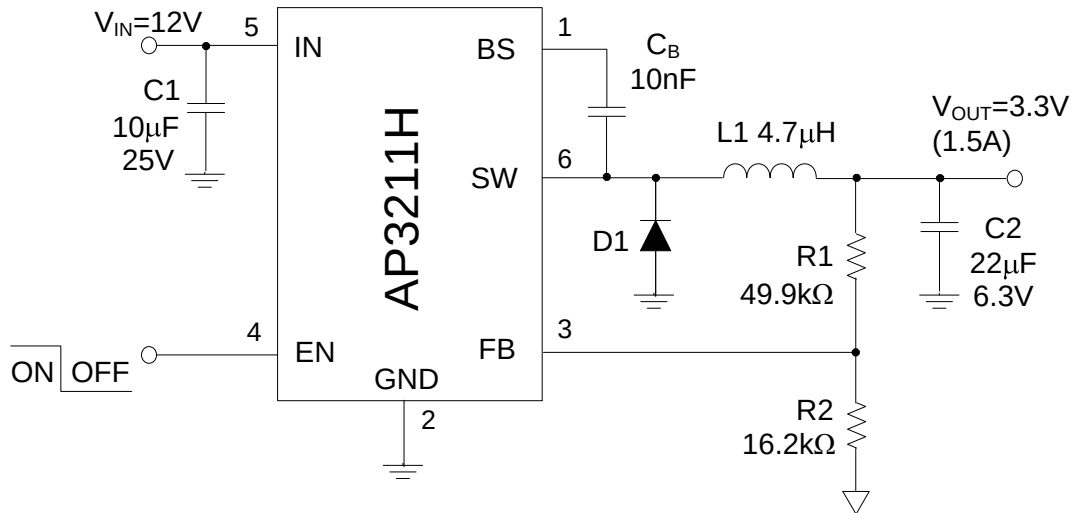
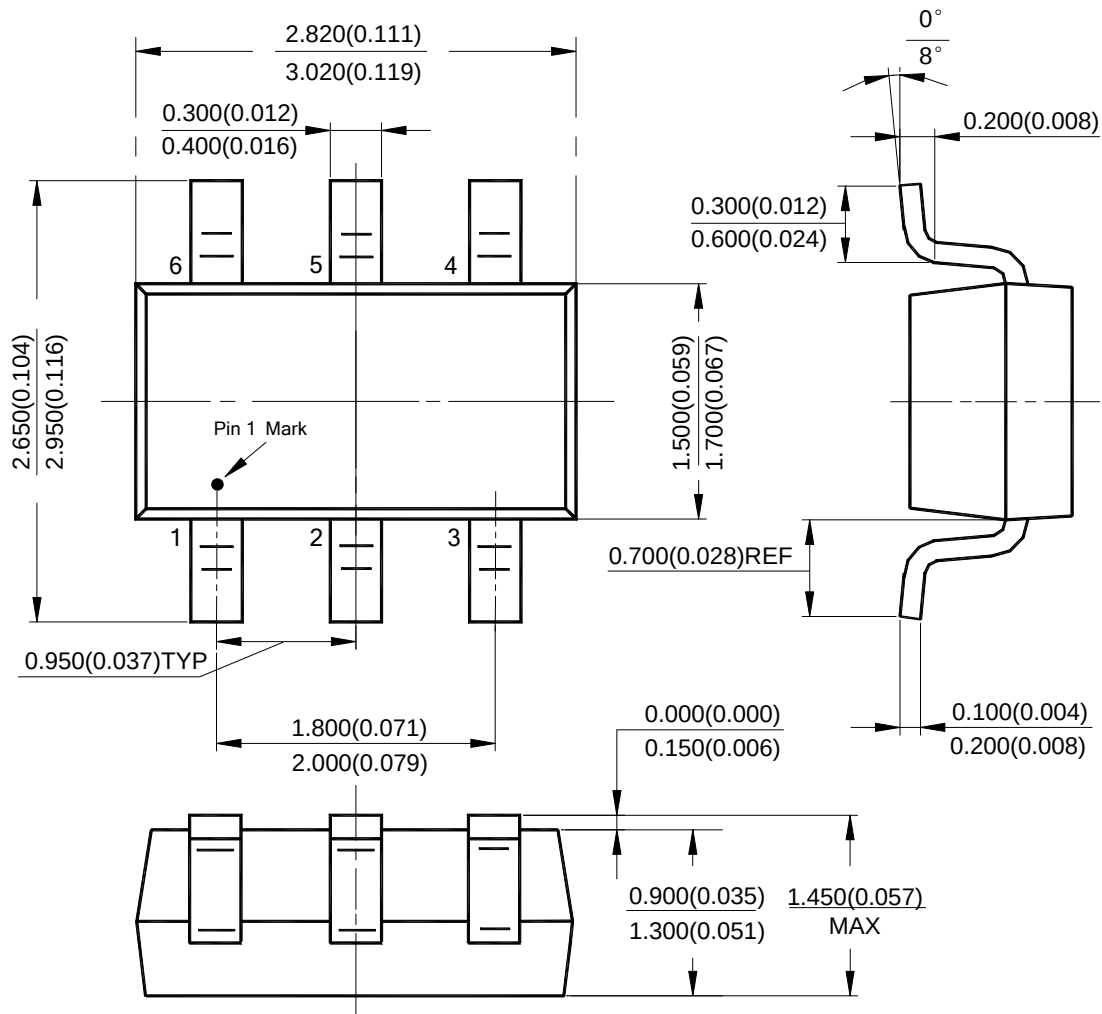


Figure 14. Typical Application Circuit of AP3211H

**1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H****Mechanical Dimensions****SOT-23-6****Unit: mm(inch)**



BCD Semiconductor Manufacturing Limited

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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. I.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