

1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H**General Description**

The AP3211H is a 1.4MHz fixed frequency, current mode, PWM buck (step-down) DC-DC converter, capable of driving a 1.5A 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 AP3211H. This feature greatly simplifies the design of switch-mode power supplies.

The AP3211H is available in SOT-23-6 package.

Features

- Input Voltage Range: 4.5V to 23V
- Fixed 1.4MHz Frequency
- High Efficiency: up to 92%
- Output Current: 1.5A
- 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
- DPF
- Portable DVD

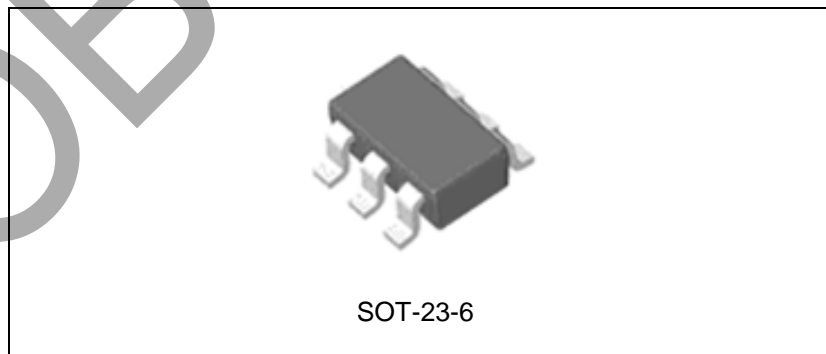


Figure 1. Package Type of AP3211H

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

Pin Configuration

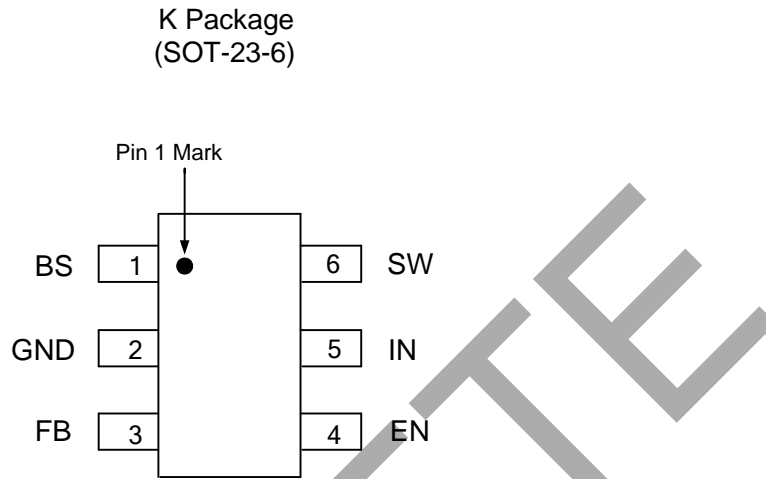


Figure 2. Pin Configuration of AP3211H (Top View)

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 |



PART OBSOLETE - USE AP3211 and AP5100

Preliminary Datasheet

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

Functional Block Diagram

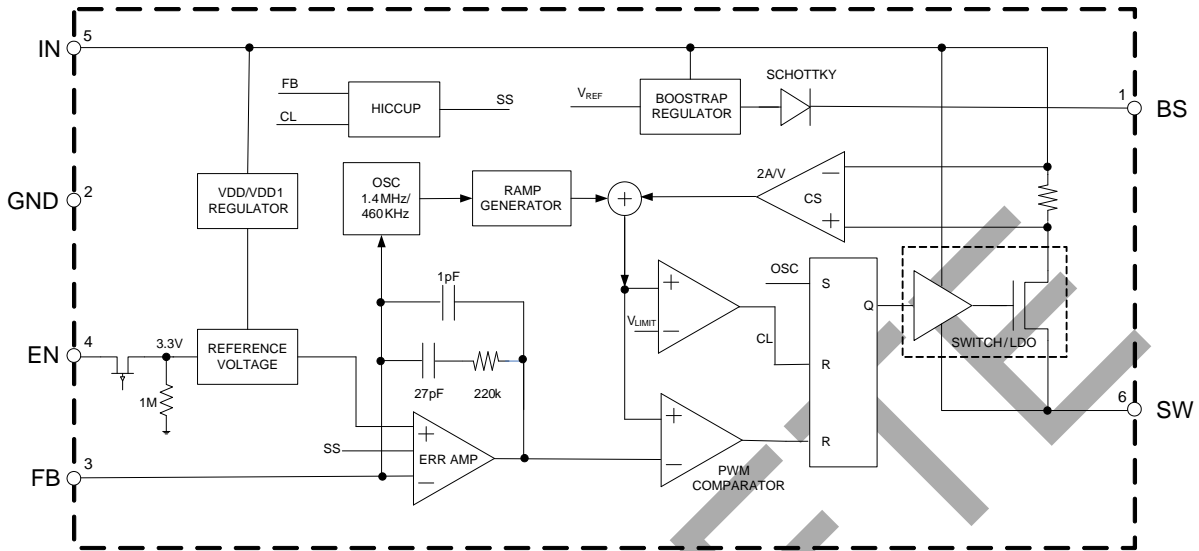
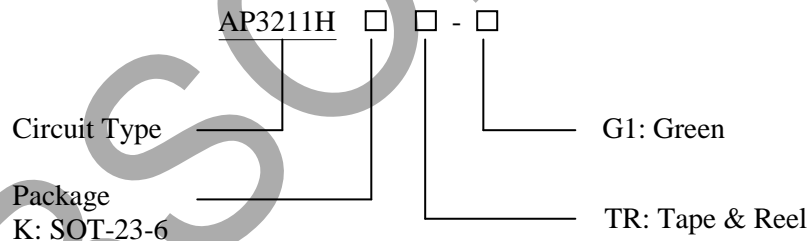


Figure 3. Functional Block Diagram of AP3211H

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.

OBSOLETE - PART DISCONTINUED



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**

$V_{IN}=V_{EN}=12V$, $V_{OUT}=3.3V$, $T_A=25\text{ }^\circ\text{C}$, 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_{DSON} | $I_{SW}=1A$ | | 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 | | $^\circ\text{C}$ |
| Thermal Shutdown Hysteresis | T_{HYS} | | | 20 | | $^\circ\text{C}$ |
| Soft-start Time | t_{SS} | | | 200 | | μs |

Note 2: R_{DSON} , 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

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

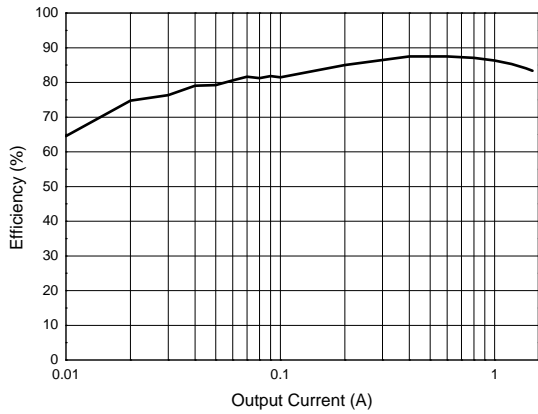


Figure 4. Efficiency vs. Output Current

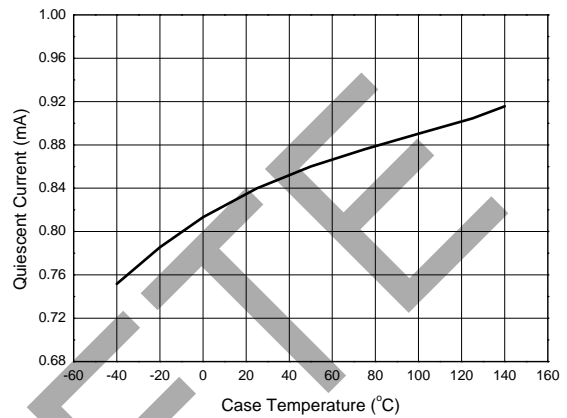


Figure 5. Quiescent Current vs. Case Temperature

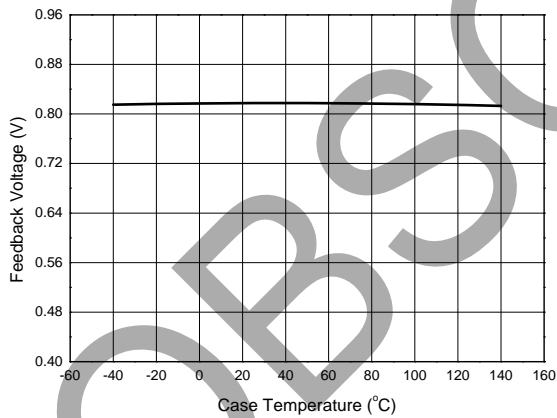


Figure 6. Feedback Voltage vs. Case Temperature

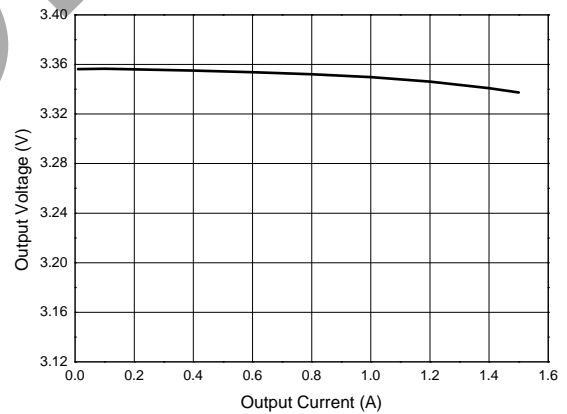


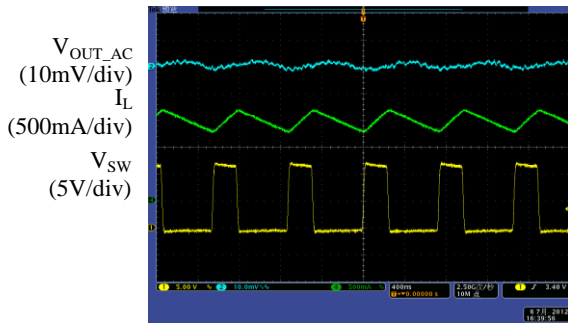
Figure 7. Output Voltage vs. Output Current



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

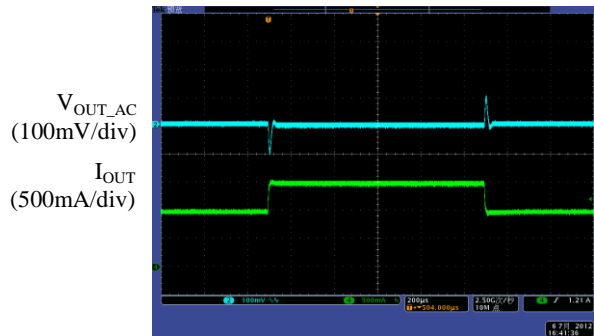
Typical Performance Characteristics (Continued)

T_A=25 °C, V_{IN}=12V, V_{OUT}=3.3V, unless otherwise noted.



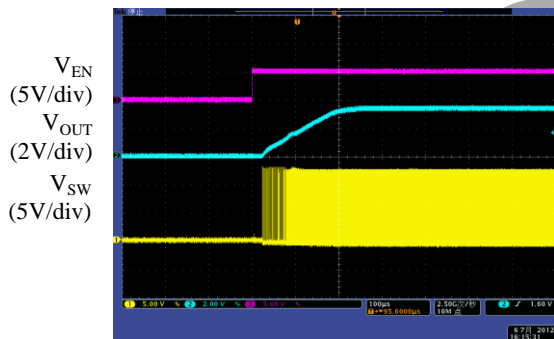
Time (400ns/div)

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



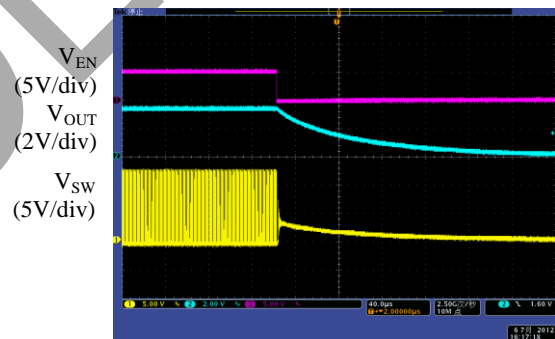
Time (200µs/div)

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



Time (100µs/div)

Figure 10. Enable Turn on Characteristic



Time (40µs/div)

Figure 11. Enable Turn off Characteristic

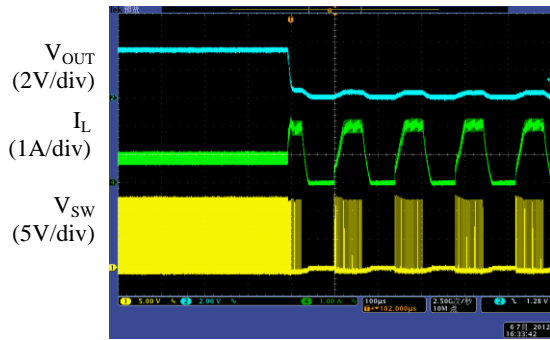
OBSOLETE - PART DISCONTINUED



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

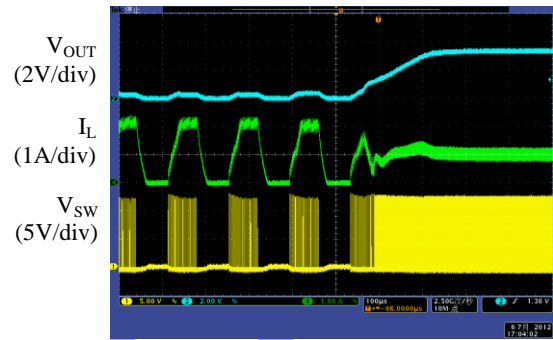
Typical Performance Characteristics (Continued)

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



Time (100µs/div)

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



Time (100µs/div)

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

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OBSOLETE - PART DISCONTINUED

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

Typical Application

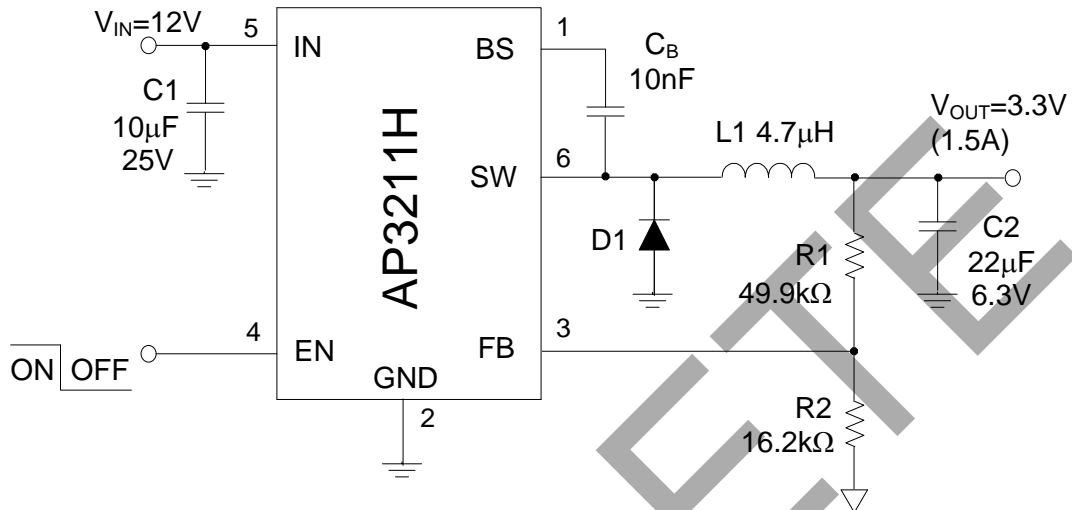


Figure 14. Typical Application Circuit of AP3211H

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PART OBSOLETE - USE AP3211 and AP5100

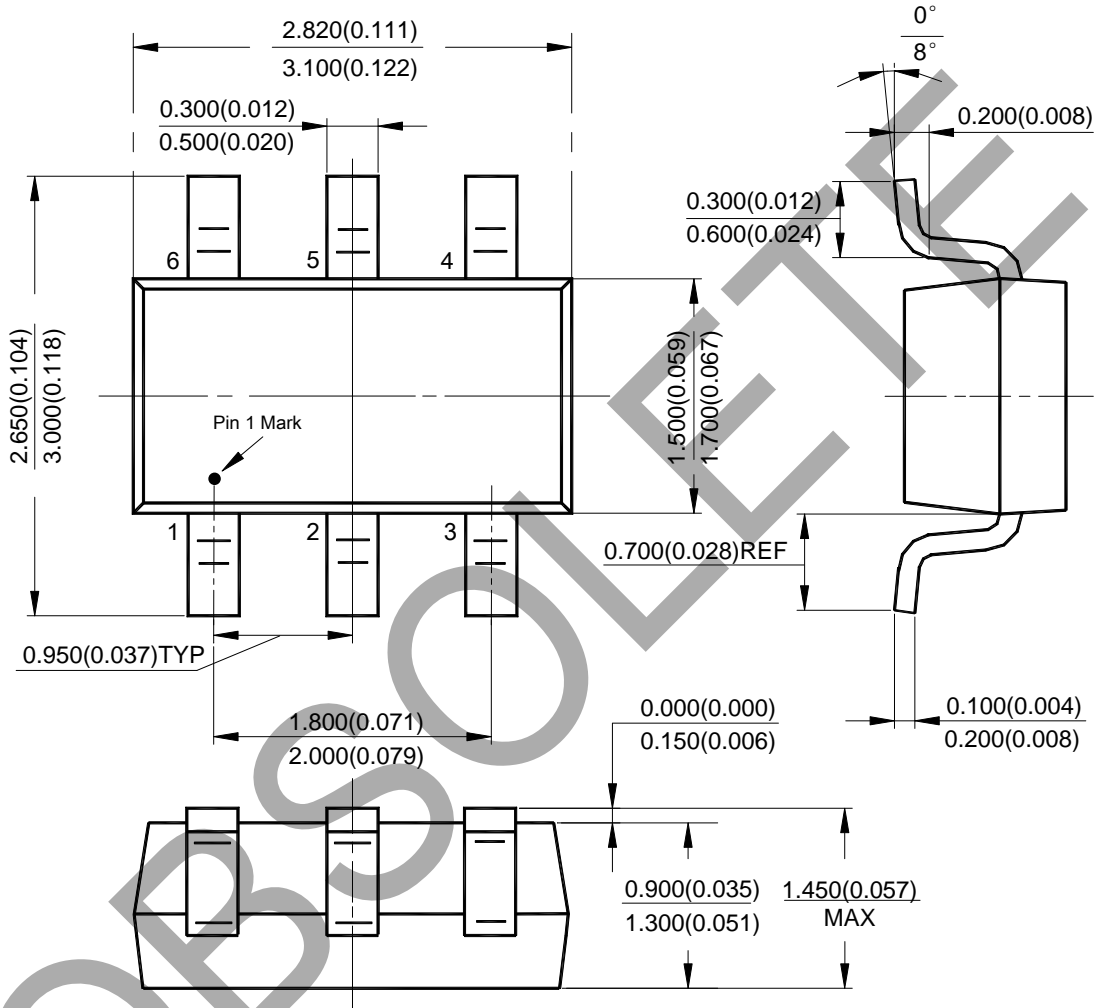
Preliminary Datasheet

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

Mechanical Dimensions

SOT-23-6

Unit: mm(inch)

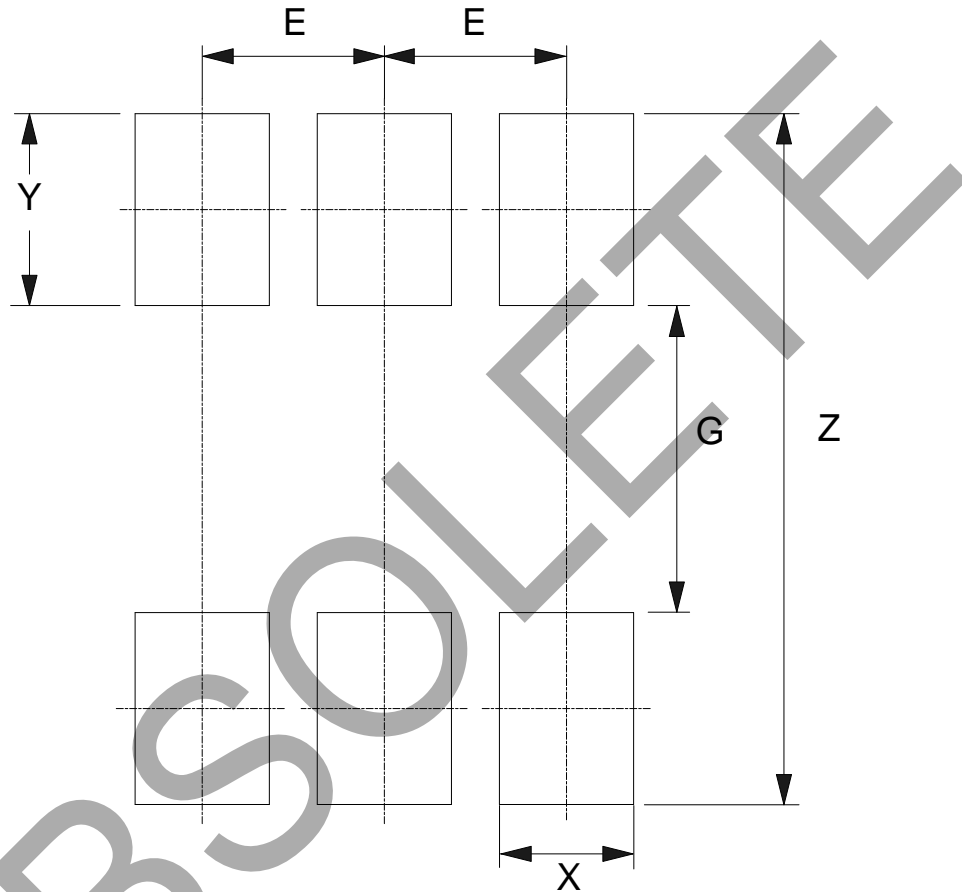


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1.4MHz, 1.5A ASYNCHRONOUS DC-DC BUCK CONVERTER AP3211H

Mounting Pad Layout

SOT-23-6



| Dimensions | Z | G | X | Y | E |
|------------|-------------|-------------|-------------|-------------|-------------|
| | (mm)/(inch) | (mm)/(inch) | (mm)/(inch) | (mm)/(inch) | (mm)/(inch) |
| Value | 3.600/0.142 | 1.600/0.063 | 0.700/0.028 | 1.000/0.039 | 0.950/0.037 |

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