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PART OBSOLETE - USE AP3211 and AP5100

Preliminary Datasheet

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.

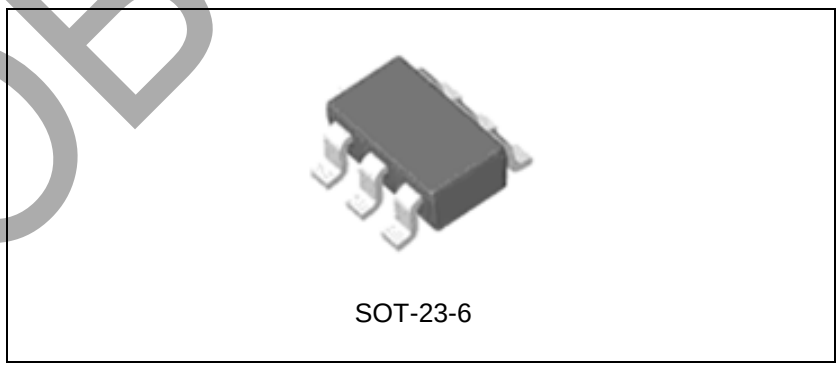
Features

- 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

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SOT-23-6

Figure 1. Package Type of AP3211H

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

Pin Configuration

K Package
(SOT-23-6)

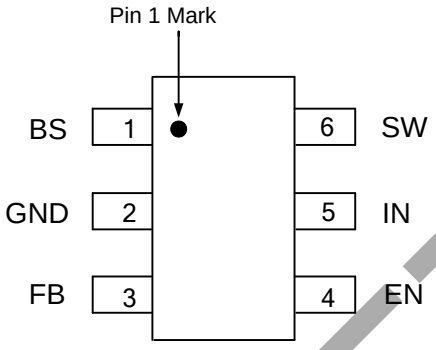


Figure 2. Pin Configuration of AP3211H (Top View)

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 1μA
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

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

Functional Block Diagram

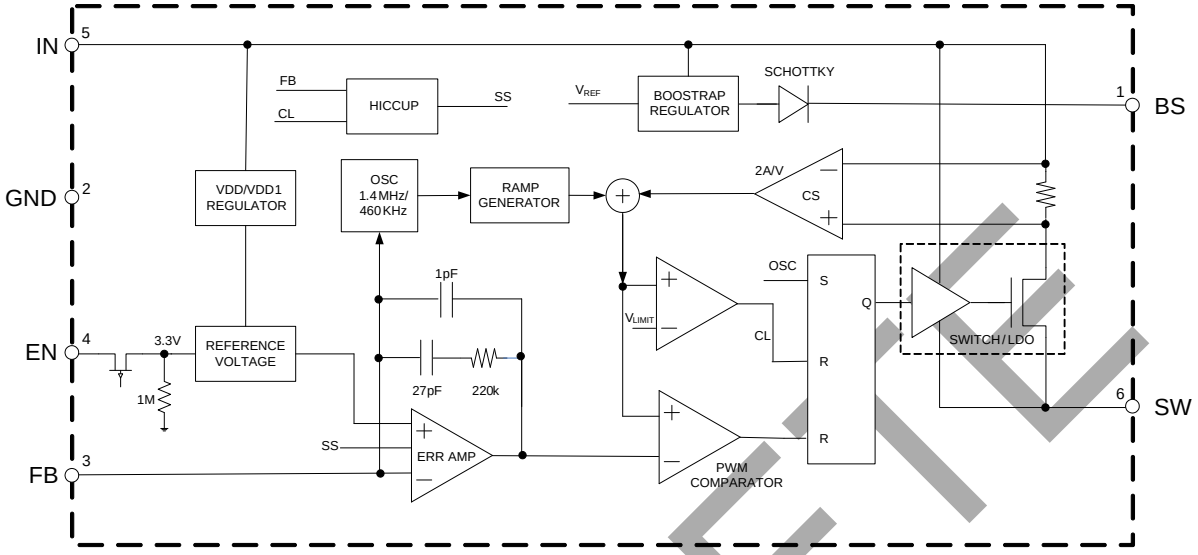


Figure 3. Functional Block Diagram of AP3211H

Ordering Information

AP3211H □ □ - □

Circuit Type

Package
K: SOT-23-6

G1: Green

TR: Tape & Reel

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.

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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	℃
Storage Temperature	T_{STG}	-65 to 150	℃
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	℃
Thermal Resistance (Junction to Ambient)	θ_{JA}	220	℃/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	℃

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Electrical Characteristics

V_{IN}=V_{EN}=12V, V_{OUT}=3.3V, T_A=25℃, 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		℃
Thermal Shutdown Hysteresis	T_{HYS}			20		℃
Soft-start Time	t_{SS}			200		μs

Note 2: R_{DSON}, t_{ON}, T_{OTSD}, T_{HYS} and t_{SS} are guaranteed by design.

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Typical Performance Characteristics

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

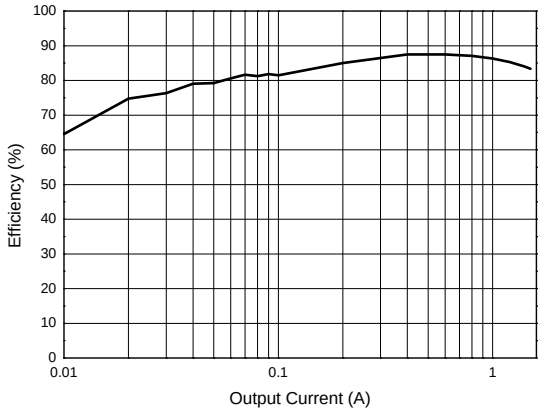


Figure 4. Efficiency vs. Output Current

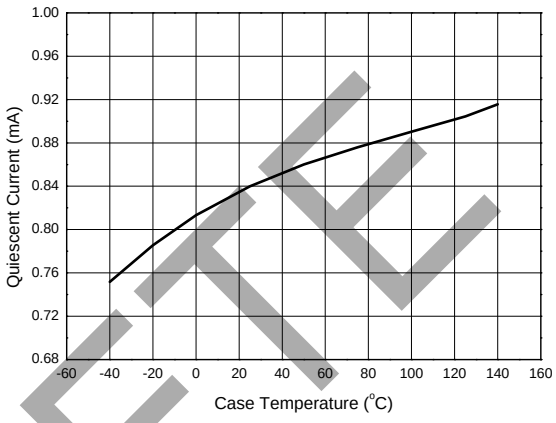


Figure 5. Quiescent Current vs. Case Temperature

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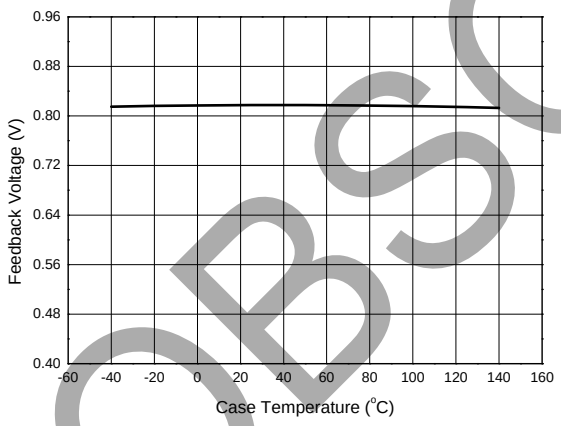


Figure 6. Feedback Voltage vs. Case Temperature

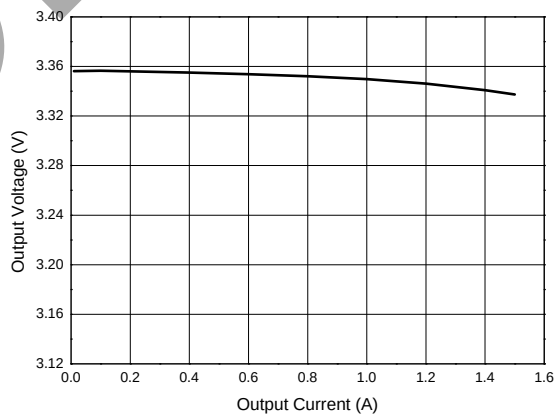


Figure 7. Output Voltage vs. Output Current

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Typical Performance Characteristics (Continued)

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

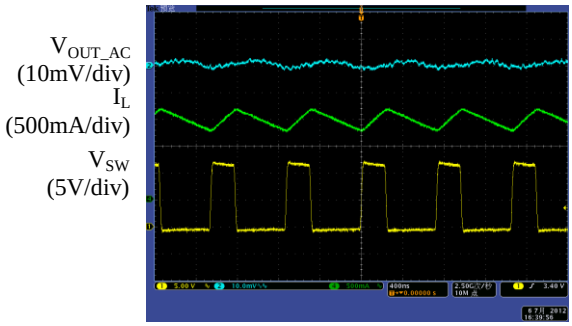


Figure 8. Output Ripple (I_{OUT}=1.5A)

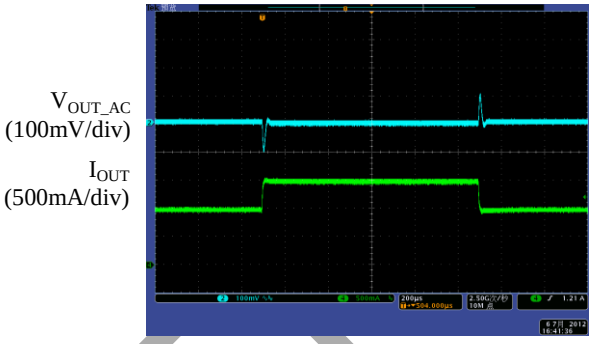


Figure 9. Load Transient (I_{OUT}=1A to 1.5A)

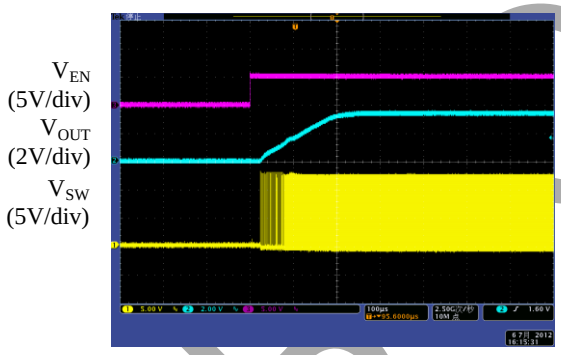


Figure 10. Enable Turn on Characteristic

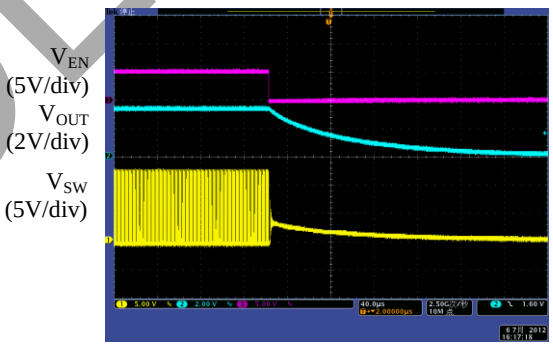


Figure 11. Enable Turn off Characteristic

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Typical Performance Characteristics (Continued)

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

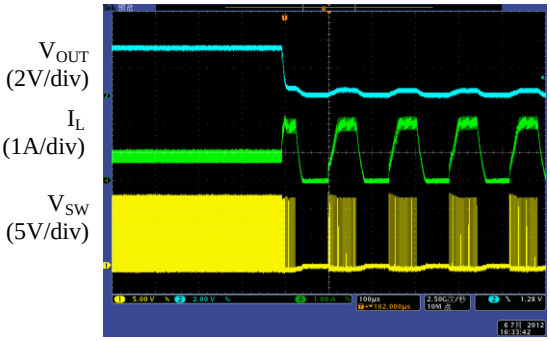


Figure 12. Short Circuit Protection (I_{OUT}=1A)

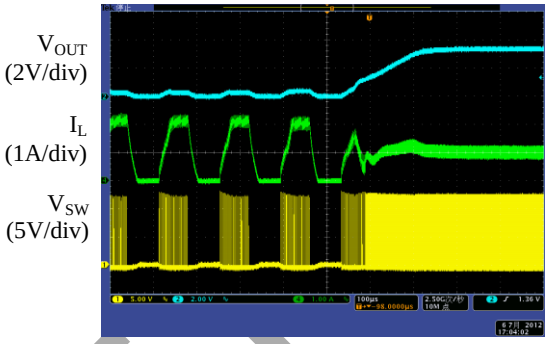


Figure 13. Short Circuit Recovery (I_{OUT}=1A)

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Typical Application

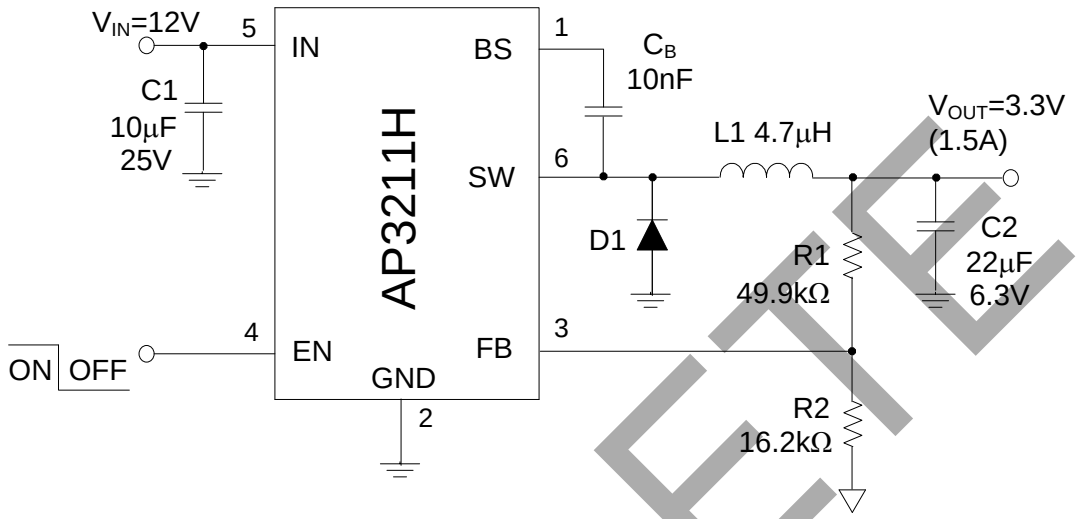


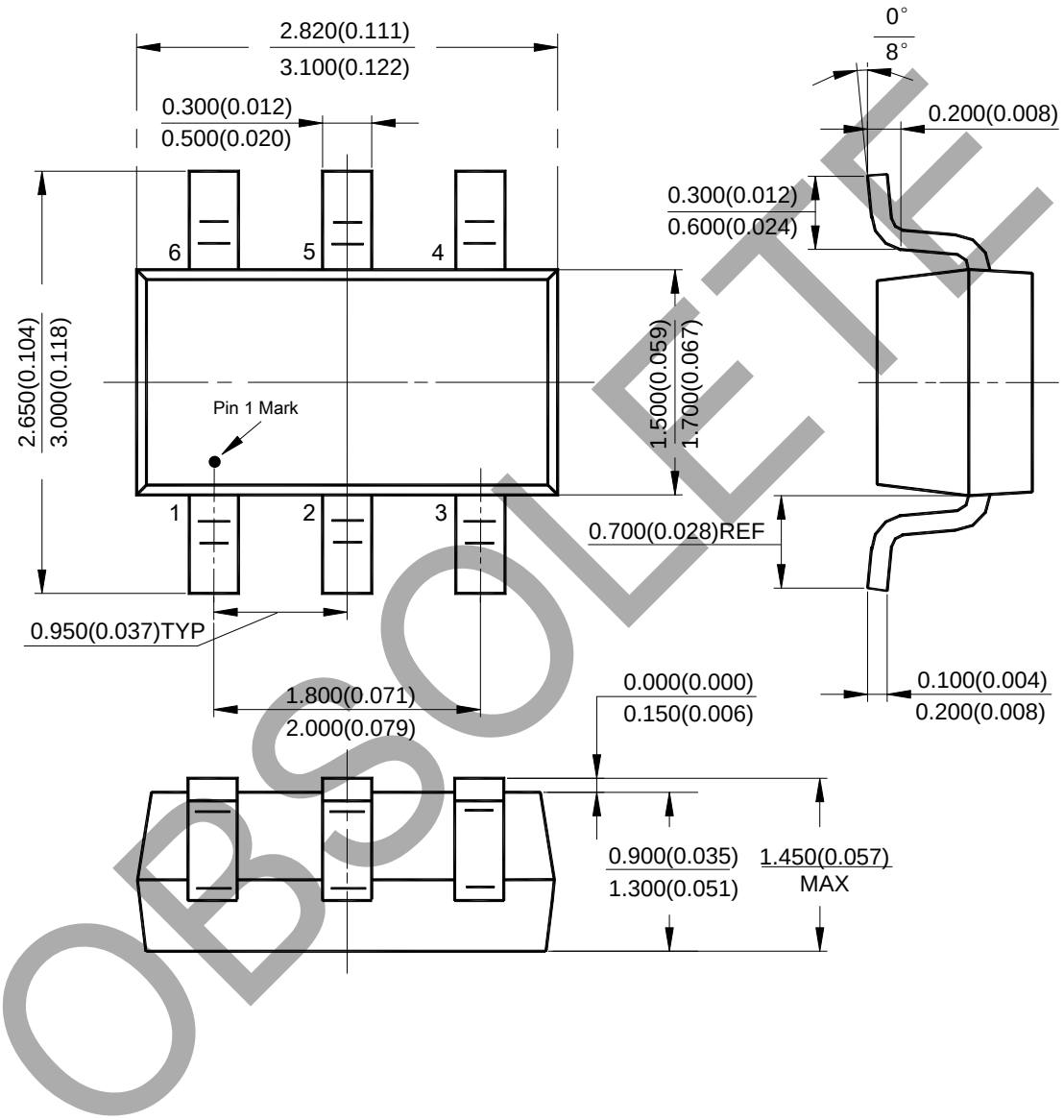
Figure 14. Typical Application Circuit of AP3211H

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Mechanical Dimensions

SOT-23-6 **Unit: mm(inch)**

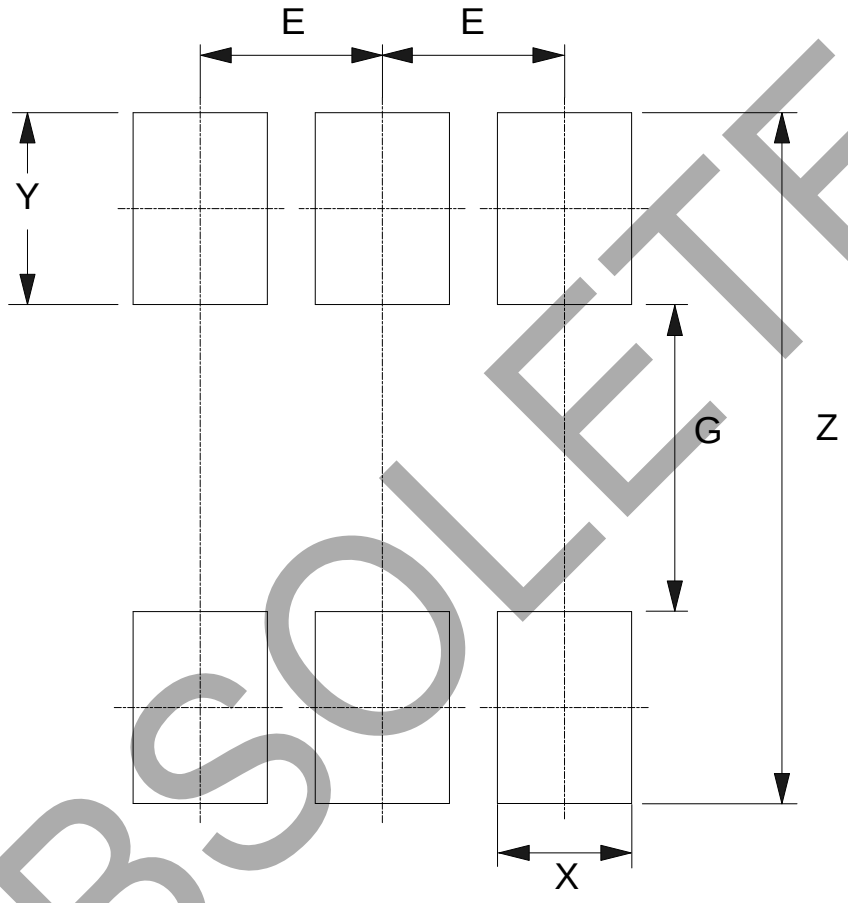


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Mounting Pad Layout

SOT-23-6



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (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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MAIN SITE

- Headquarters
BCD (Shanghai) Micro-electronics Limited
No. 1600, Zi Xing Road, Shanghai ZiZhu Science-based Industrial Park, 200241, P. R.C.
Tel: +86-021-2416-2266, Fax: +86-021-2416-2277

- Wafer Fab
Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.
800 Yishan Road, Shanghai 200233, China
Tel: +021-6485-1491, Fax: +86-021-5450-0008

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 518057, China
Tel: +86-0755-8660-4900, Fax: +86-0755-8660-4958

Taiwan Office (Taipei)
BCD Semiconductor (Taiwan) Company Limited
3F, No.17, Lane 171, Sec. 2, Jiu-Zong Rd., Nei-Hu Dist., Taipei(114), Taiwan, R.O.C
Tel: +886-2-2656 2808
Fax: +886-2-2656-2806/26562950

Taiwan Office (Hsinchu)
BCD Semiconductor (Taiwan) Company Limited
8F, No.176, Sec. 2, Gong-Dao 5th Road, East District
HsinChu City 300, Taiwan, R.O.C
Tel: +886-3-5160181, Fax: +886-3-5160181

USA Office
BCD Semiconductor Corp.
48460 Kato Road, Fremont, CA 94538, USA
Tel: +1-510-668-1950
Fax: +1-510-668-1990

Korea Office
BCD Semiconductor Limited Korea office.
Room 101-1112, Digital-Empire II, 486 Sin-dong,
Yeongtong-Gu, Suwon-city, Gyeonggi-do, Korea
Tel: +82-31-695-8430