

WHITE LED DRIVER**AP3008****General Description**

The AP3008 is a 1.2MHz PWM boost switching regulator designed for constant-current white LED driver applications.

The AP3008 can drive a string of 2 to 3 white LEDs from a 2.7V supply in series, ensuring uniform brightness and eliminating several ballast resistors. The AP3008 implements a constant frequency 1.2MHz PWM control scheme. The high frequency PWM operation also saves board space by reducing external component sizes. To improve efficiency, the feedback voltage is set to 95mV, which reduces the power dissipation in the current setting resistor.

The AP3008 is equipped with OVP protection ability, the SW pin monitors the output voltage and will turn off the device if an over-voltage condition is present to prevent damage from an open circuit condition.

The AP3008 is available in SOT-23-5 package.

Features

- Inherently Uniform LED Current
- High Efficiency up to 84%
- Drives 2 to 3 LEDs from a 2.7V Supply
- 1.2MHz PWM Operation Frequency
- Requires Only 0.22 μ F Output Capacitor
- Shutdown Current: <1 μ A
- Built-in Output Over-Voltage Protection
- Under Voltage Lock Out (UVLO)

Applications

- Digital Cameras
- LCD modules
- GPS Receivers
- Cellular Phones
- PDAs, Handheld Computers

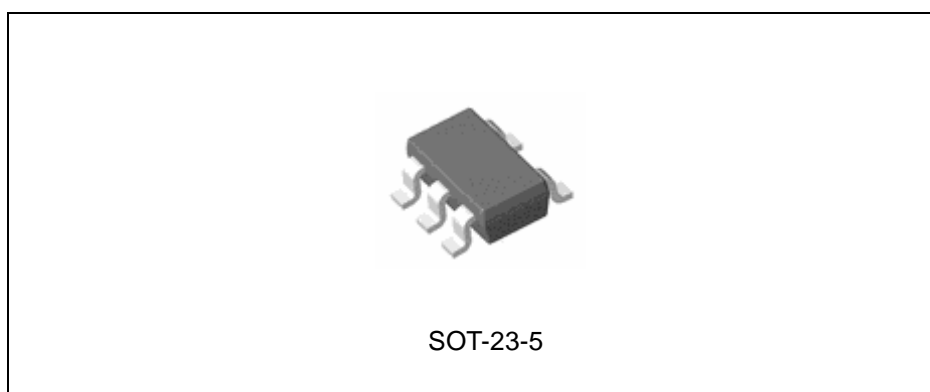


Figure 1. Package Type of AP3008

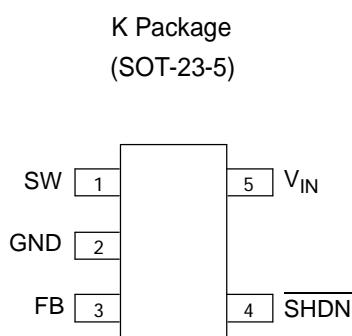
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Pin Configuration


Figure 2. Pin Configuration of AP3008 (Top View)

Pin Description

Pin Number	Pin Name	Function
1	SW	Switch Pin. Connect inductor/diode here. The output voltage can range up to 29V but not extend this limit. If the voltage on this pin is higher than the overvoltage protection threshold (OVP), the device comes back to shutdown mode. To restart the chip, one must then send a low to high sequence on shutdown pin or switch off the V_{IN} supply.
2	GND	Ground Pin.
3	FB	Voltage Feedback. Reference voltage is 95mV.
4	$\overline{\text{SHDN}}$	Shutdown Pin. Connect to 1.5V or higher to enable device; Connect to 0.4V or less to disable device.
5	V_{IN}	Input Supply Pin. Must be locally bypassed.

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Functional Block Diagram

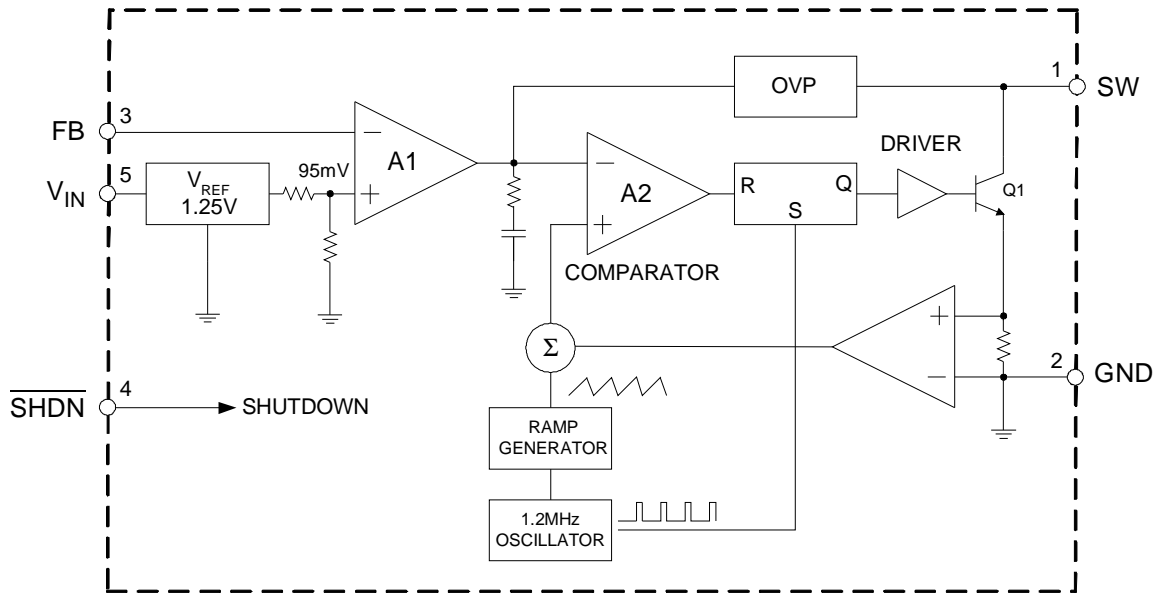
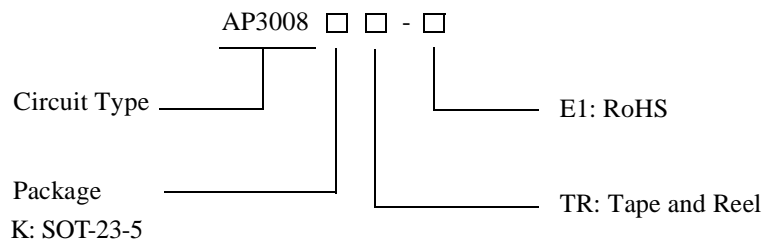


Figure 3. Functional Block Diagram of AP3008

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-5	-40 to 85°C	AP3008KTR-E1	E1B	Tape & Reel

BCD Semiconductor's products as designated with "E1" suffix in the part number are RoHS compliant.

**WHITE LED DRIVER****AP3008****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	15	V
SW Voltage		38	V
FB Voltage		10	V
SHDN Voltage		15	V
Thermal Resistance (Junction to Atmosphere, no Heat sink)	$R_{\theta JA}$	265	$^{\circ}C/W$
Operating Junction Temperature		150	$^{\circ}C$
Storage Temperature Range	T_{STG}	-65 to 150	$^{\circ}C$
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	$^{\circ}C$
ESD (Machine Model)		250	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
Operating Temperature Range	T_{OP}	-40	85	$^{\circ}C$
Operating Voltage Range		2.5	12	V

**WHITE LED DRIVER****AP3008****Electrical Characteristics** $(V_{IN}=3V, V_{SHDN}=3V, T_A=25^{\circ}C, \text{ unless otherwise specified.})$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Feedback Voltage	V_{FB}	$I_{SW}=100mA, \text{ Duty Cycle}=66\%$	86	95	104	mV
FB Pin Bias Current				45	100	nA
Supply Current	I_{CC}	$V_{SHDN}=V_{IN}, V_{FB}=V_{IN}, \text{ No switching}$		1.9	2.5	mA
Supply Current	I_Q	$V_{SHDN}=0V$		0.1	1.0	μA
Switch Frequency	f		0.8	1.2	1.6	MHz
Maximum Duty Cycle	D_{MAX}		85	90		%
Switch Current Limit	I_{LIM}	Duty=15%		320		mA
Switch VCESAT	V_{CESAT}	$I_{SW}=250mA$		350		mV
Switch Leakage Current		$V_{SW}=5V$		0.01	5	μA
SHDN Voltage	V_{TH}	High	1.5			V
	V_{TL}	Low			0.4	
SHDN Pin Bias Current				50		μA
OVP Voltage	V_{OVP}			29		V
Thermal Resistance (Junction to Case)	θ_{JC}			86.10		$^{\circ}C/W$



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Typical Performance Characteristics

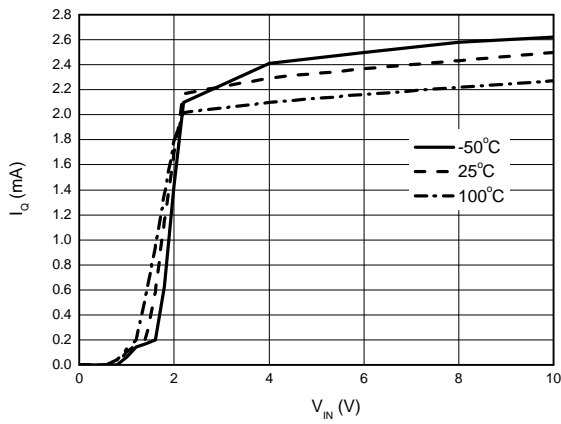


Figure 4. Quiescent Current vs. V_{IN}

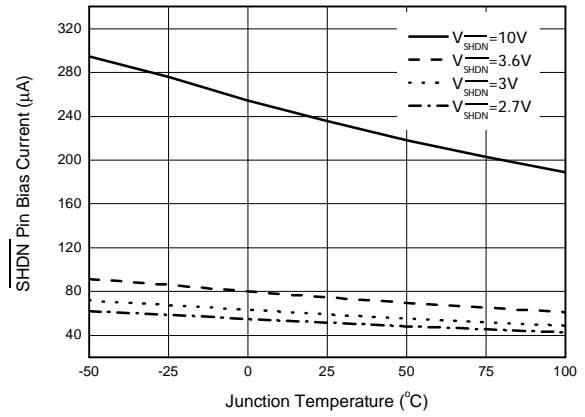


Figure 5. SHDN Pin Bias Current vs. Junction Temperature

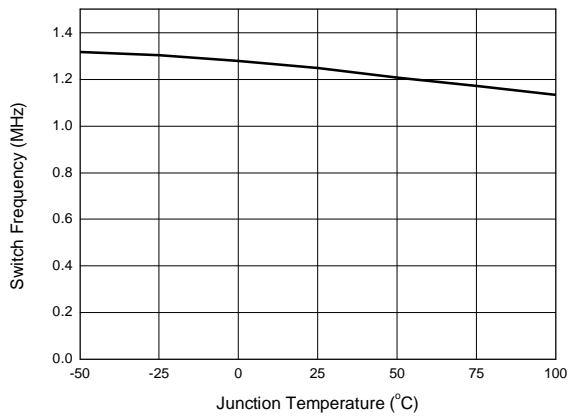


Figure 6. Switch Frequency vs. Junction Temperature

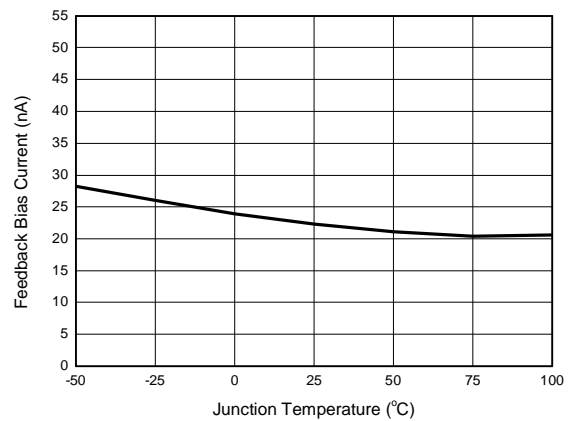


Figure 7. Feedback Bias Current vs. Junction Temperature



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Typical Performance Characteristics (Continued)

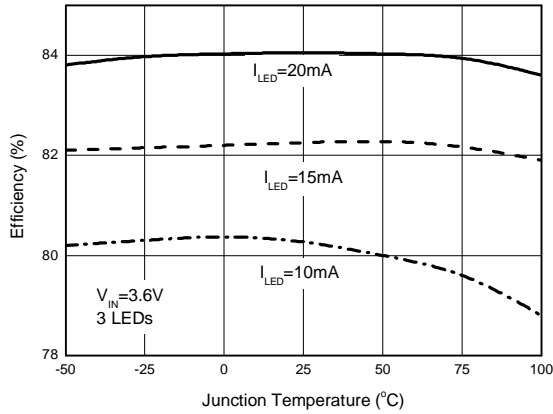


Figure 8. Efficiency vs. Junction Temperature

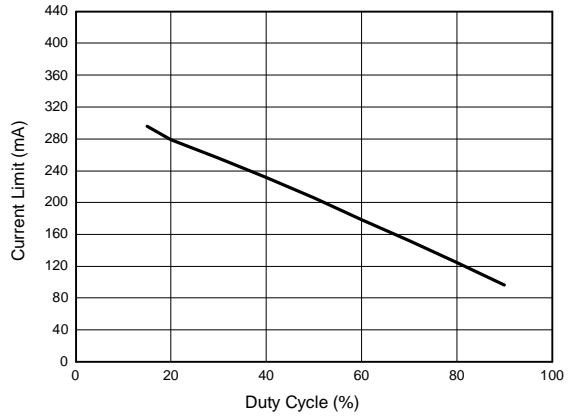


Figure 9. Switch Current vs. Duty Cycle

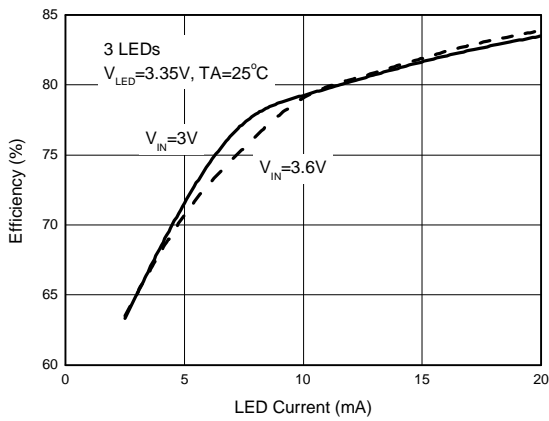


Figure 10. Efficiency vs. LED Current

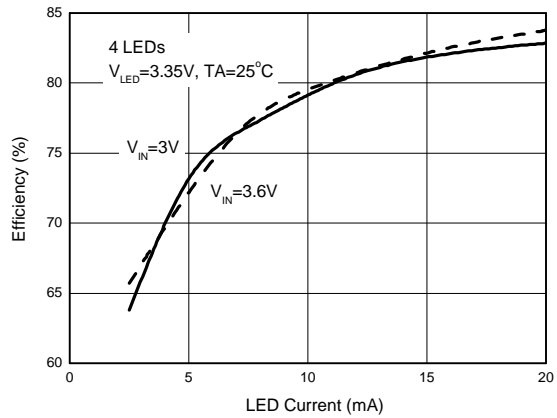
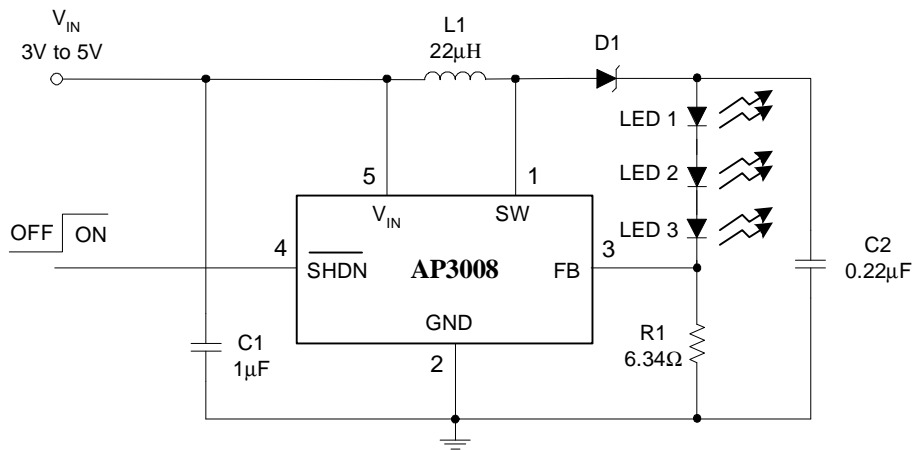


Figure 11. Efficiency vs. LED Current

Typical Application



C1, C2: X5R or X7R Dielectric
 L1: SUMIDA CDRH5D28R-220NC or Equivalent

Figure 12. Three White LEDs Driver



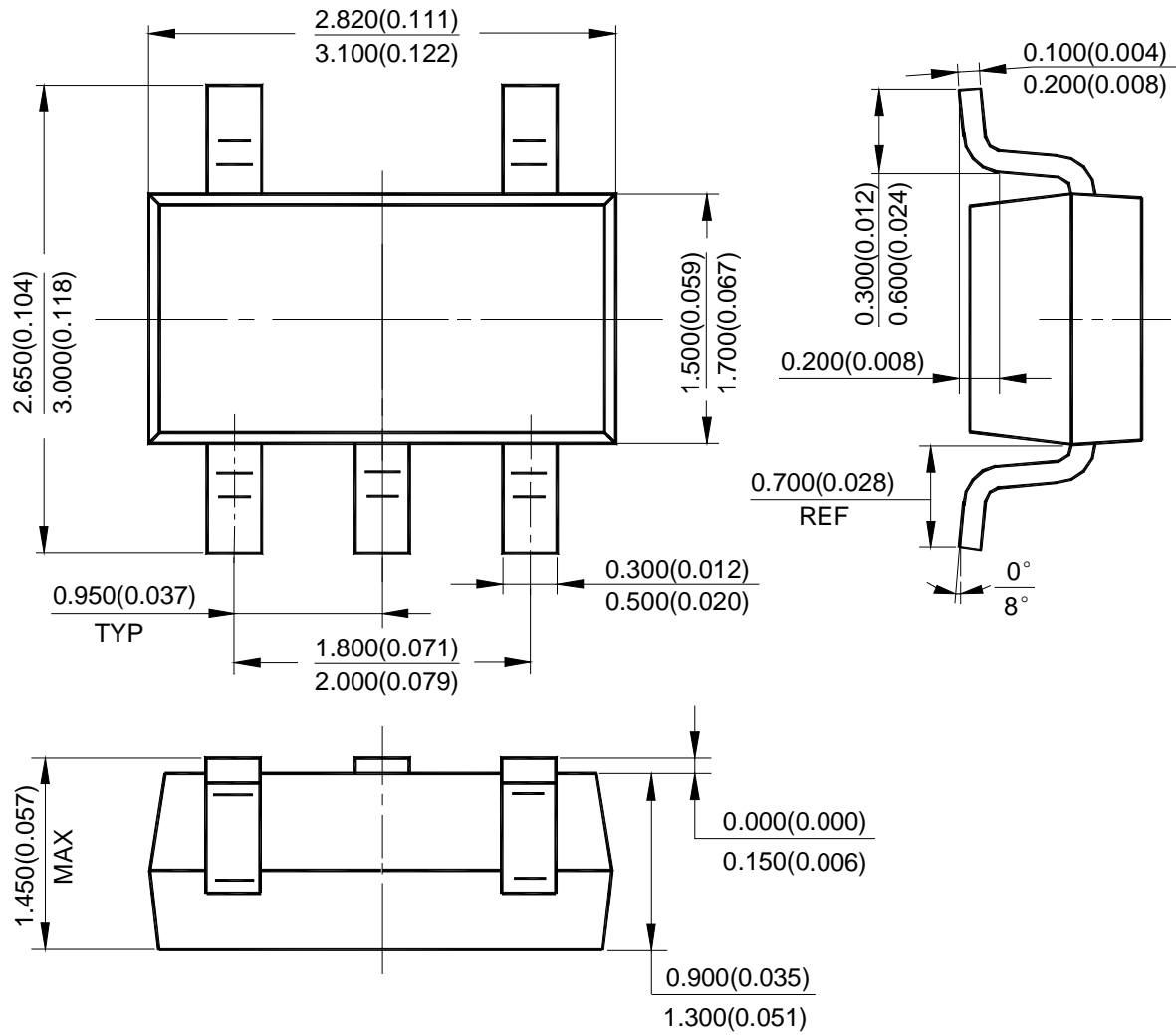
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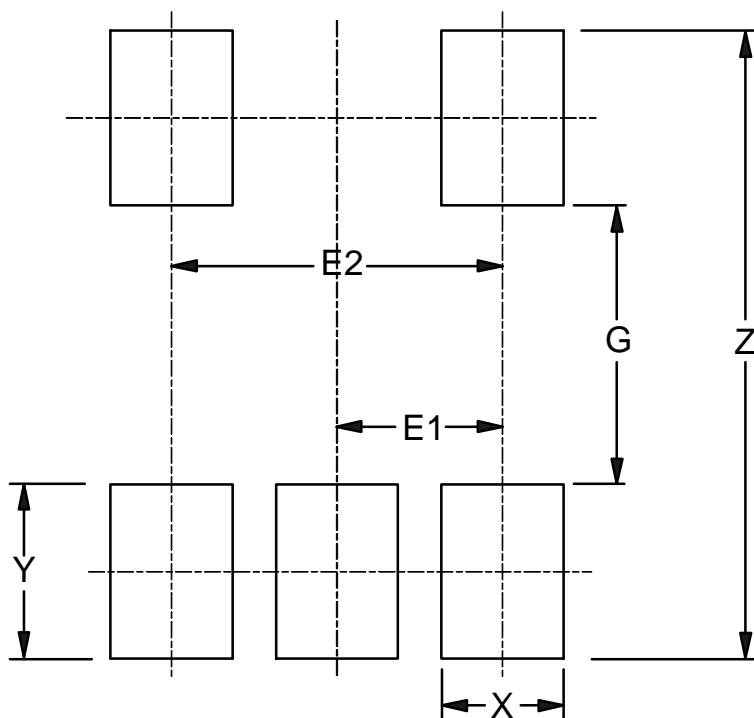
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Mechanical Dimensions

SOT-23-5

Unit: mm(inch)



Mounting Pad Layout
SOT-23-5


Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E1 (mm)/(inch)	E2 (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037	1.900/0.075



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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