5 V Charge Pump HDMI Tx Companion Chip

Data Sheet **AD9394**

FEATURES

- 5 V at 55 mA output for an HDMI +5 V requirement
  - For hot plug detect with HDMI Tx
- 3.3 V at 60 mA output
- Lithium battery input: 2.5 V to 4.5 V
- Short-circuit limitation: 100 mA
- 3 × 4 array WLCSP package
- Package footprint: 3 mm² (2 mm × 1.5 mm)
- Package height: 0.5 mm

APPLICATIONS

- Cellular phones with HDMI/DVI output
- Companion chip with HDMI Tx
- Portable media players (PMPs)
- Mobile Internet devices
- Digital still cameras

GENERAL DESCRIPTION

The AD9394 uses charge pump technology to provide the power required to drive 55 mA of 5 V for HDMI interface requirements.

FUNCTIONAL BLOCK DIAGRAM

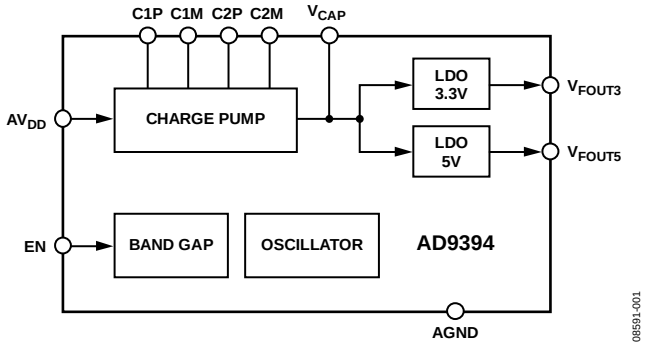


Figure 1.

Rev. B
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TABLE OF CONTENTS

Features 1
Applications 1
General Description 1
Functional Block Diagram 1
Revision History 2
Specifications 3
Absolute Maximum Ratings 4
Thermal Characteristics 4
ESD Caution 4
Pin Configuration and Function Descriptions 5
Typical Performance Characteristics 6
Application Schematic 7
Outline Dimensions 8
Ordering Guide 8

REVISION HISTORY

10/11—Rev. A to Rev. B

Changes to Table 1 3
Added Typical Performance Characteristics Section and Figure 3; Renumbered Figures Consecutively 6
Changes to Detail A Dimensions, Figure 6; Updated Outline Dimensions 8

6/10—Rev. 0 to Rev. A

Changes to Supply Current Parameter and Short-Circuit Load Current Parameter, Added Maximum Load Current Parameter, Table 1 3

1/10—Revision 0: Initial Version

SPECIFICATIONS

Table 1.

Parameter	Min	Typ	Max	Unit	Test Conditions/Comments
INPUT VOLTAGE, AV_{DD}	2.5		4.5	V	
Enable Pin (EN), V_{IH}	1.4		AV_{DD}	V	
Enable Pin (EN), V_{IL}	−0.4		+0.4	V	
SUPPLY CURRENT					
I_{AVDD}		$1 \times I_{LDO3} + 2 \times I_{LDO5}$	1.1 × typ	mA	$AV_{DD} > 4.1$ V
		$2 \times I_{LDO3} + 2 \times I_{LDO5}$	1.1 × typ	mA	3.4 V < $AV_{DD} \leq 4.1$ V
		$2 \times I_{LDO3} + 3 \times I_{LDO5}$	1.1 × typ	mA	$AV_{DD} \leq 3.4$ V
		60	66	mA	I_{LDO3} = 60 mA, $AV_{DD} > 4.1$ V
		120	132	mA	I_{LDO3} = 60 mA, $AV_{DD} \leq 4.1$ V
		110	121	mA	I_{LDO5} = 55 mA, $AV_{DD} > 3.4$ V
		165	182	mA	I_{LDO5} = 55 mA, $AV_{DD} \leq 3.4$ V
I_{AVDD}, No Load			1	mA	AV_{DD} = 4.5 V, EN high, I_{LDO3} = 0 mA, I_{LDO5} = 0 mA
MAXIMUM LOAD CURRENT					
V_{FOUT5} Load Compliance	4.8	5.0	5.2	V	55 mA load
V_{FOUT3} Load Compliance[1]	3.0	3.3	3.6	V	60 mA load
SHUTDOWN CURRENT			2	µA	EN low
V_{FOUT5} Ripple			50	mV	
V_{FOUT3} Ripple			50	mV	
LDO3 Shutdown of LDO5[1]	10		20	mA	
SHORT-CIRCUIT LOAD CURRENT					
LDO5			100	mA	Shorted LDO5 draws ≤100 mA from AV_{DD}
LDO3			>500	mA	No short-circuit limit for LDO3
LDO5 REVERSE VOLTAGE			7.5	V	AV_{DD} = 0 V, voltage applied to V_{FOUT5} pin
START-UP TIME			1	ms	Time from EN high to stable output voltage

[1] LDO3 current in excess of 10 mA may shut down the LDO5 output.

ABSOLUTE MAXIMUM RATINGS

T_A = 25°C, unless otherwise noted.

Table 2.

Parameter	Rating
Supply Voltage, AV_{DD}	5.0 V
Operating Temperature Range	−40°C to +85°C
Storage Temperature Range	−65°C to +150°C
Junction Temperature	150°C
Power Dissipation	0.7 W

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL CHARACTERISTICS

Table 3. Thermal Resistance

Package Type	θ_{JA}	Unit
3 × 4 Array WLCSP Package	65	°C/W

ESD CAUTION



ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS

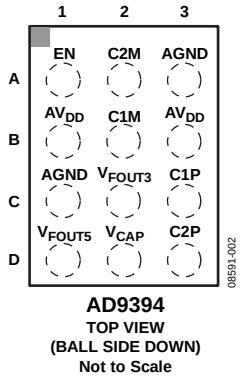


Figure 2. Pin Configuration

Table 4. Pin Function Descriptions

Pin No.	Mnemonic	Description
A1	EN	Enable Part. When EN = 1, the part is on.
A2	C2M	Flying Capacitor. Connect with a 1 µF capacitor to C2P (Pin D3).
A3	AGND	Ground.
B1	AV_{DD}	Input Voltage from Battery.
B2	C1M	Flying Capacitor. Connect with a 1 µF capacitor to C1P (Pin C3).
B3	AV_{DD}	Input Voltage from Battery.
C1	AGND	Ground.
C2	V_{FOUT3}	3.3 V Output. Connect with a 1 µF capacitor to AGND.
C3	C1P	Flying Capacitor Connection.
D1	V_{FOUT5}	5 V Output. Connect with a 1 µF capacitor to AGND.
D2	V_{CAP}	Charge Pump Output Voltage (~5.6 V). Connect with a 2.2 µF capacitor to AGND.
D3	C2P	Flying Capacitor Connection.

TYPICAL PERFORMANCE CHARACTERISTICS

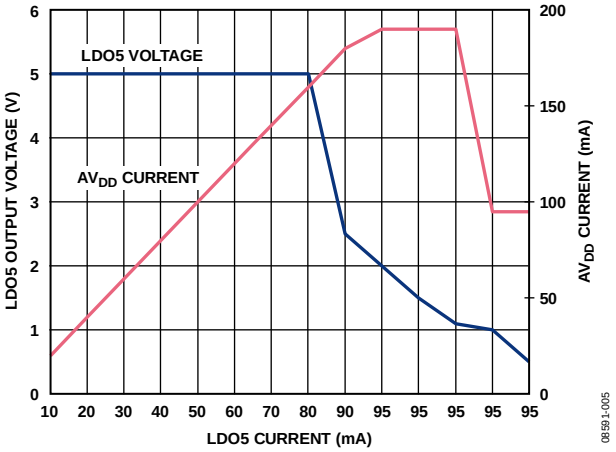


Figure 3. LDO5 Voltage vs. Current

APPLICATION SCHEMATIC

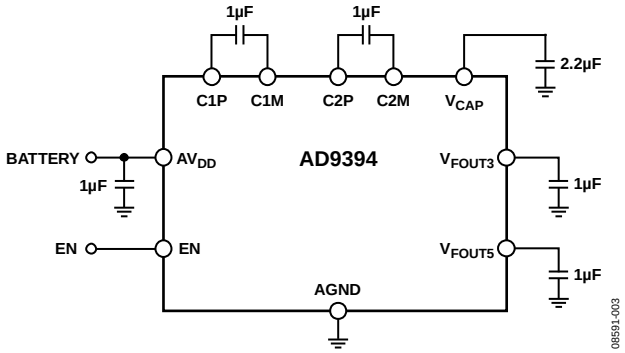


Figure 4. Application Schematic

OUTLINE DIMENSIONS

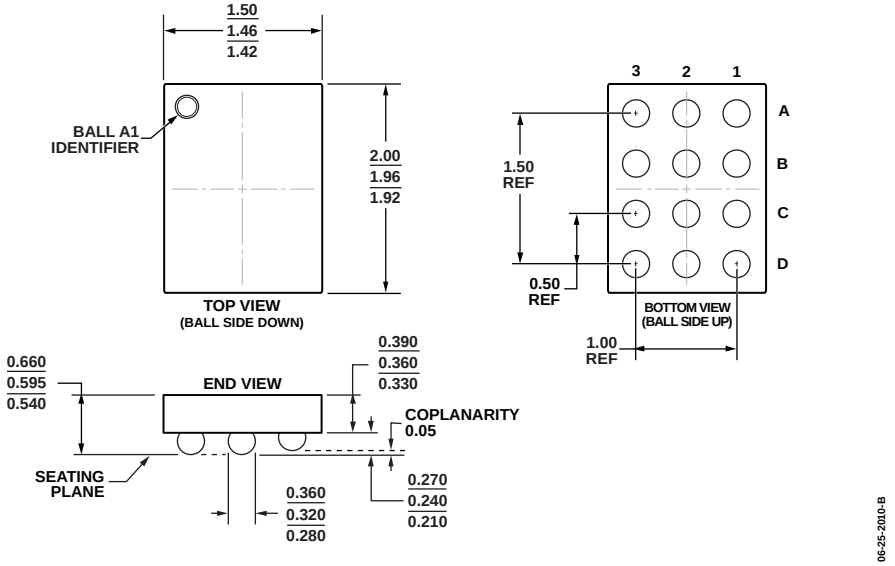


Figure 5. 12-Ball Wafer Level Chip Scale Package [WLCSP]
1.5 mm × 2.0 mm Body
(CB-12-2)
Dimensions shown in millimeters

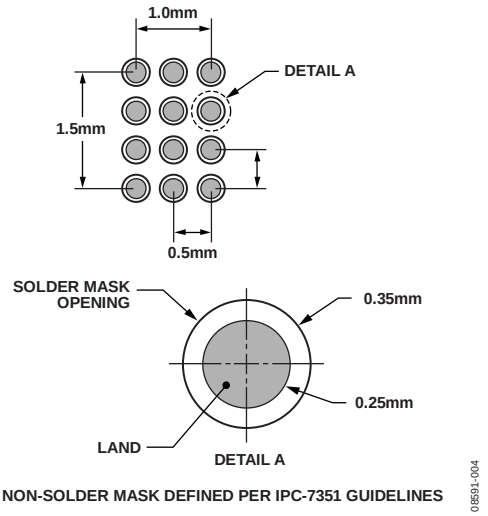


Figure 6. Recommended Solder Land Pattern

ORDERING GUIDE

Model[1]	Temperature Range	Package Description	Package Option	Branding
AD9394BCBZ-R7	−40°C to +85°C	12-Ball WLCSP	CB-12-2	L8V
EVAL-AD9394Z		Evaluation Board		

[1] Z = RoHS Compliant Part.

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