

## Piezo-sounder Driver with Multi-mode charge pump

### FEATURES

- Supply Voltage Range from 1.3 V to 5.5V
- 18V<sub>PP</sub> Output from a 3V Supply
- Integrated Boost Converter Generates up to 16.5V Supply
- Input Signal 20Hz to 10kHz
- No Voltage Cross Output at Shutdown Mode
- Low Current Consumption
- Automatic Standby and Wake-up Control
- Available CPC14 and SOP14 package
- Short protection current about 100mA
- OTP feature

- PDAs
- Security Devices
- Alarm Clocks

### DESCRIPTION

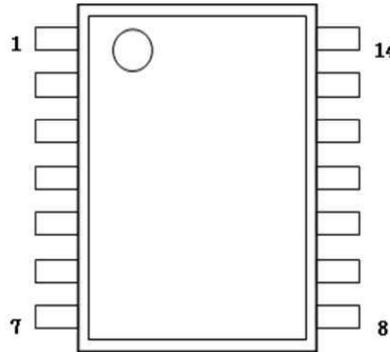
The SD117 is a switching driver with multi-mode charge pump for piezo-sounder. It can drive outputs up to 18V<sub>pp</sub> from 1.3V supply. For adjusting the piezoelectric sounder sound volume, the charge pump can operate in either of a 1x, 2x or 3x mode. Because SD117 has the shutdown function, it is suitable for the battery application.

SD117 includes built-in automatic shutdown and wake up that guarantees longer battery life. SD117 features thermal shutdown and output short protection circuits.

### APPLICATIONS

- Health Care Systems Home Appliances
- Wrist Watches
- Handheld GPS devices

### PACKAGE (CPC14 and SOP14)

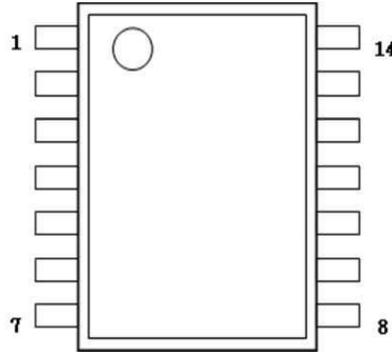


### ORDERING INFORMATION

Part Number	Package Type	Package Qty	Op Temp(°C)	Mark
SD117	CPC14	3000	-40~85	SD117 XXX
SD117	SOP14	3000	-40~85	SD117 XXX

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**PINOUT**



**PIN FUNCTIONS(CPC14)**

Pin Number	Pin Name	Type	Function
1	EN1	I	Charge pump mode select 1
2	DIN	I	Signal Input
3	CN1	I	Capacitor 1 Negative Terminal
4	GND	G	Ground
5	VO2	O	Positive Output
6	VO1	O	Negative Output
7	CN2	I	Capacitor 2 Negative Terminal
8	CP1	I	Capacitor 1 Positive Terminal
9	NC	—	No Connection
10	VOOUT	O	Boost Output
11	CP2	I	Capacitor 2 Positive Terminal
12	VIN	P	Power Supply
13	NC	—	No Connection
14	FEED	I	Feedback Terminal

(1) G = Ground, I = Input, O = Output, P = Power

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### PIN FUNCTIONS(SOP14)

Pin Number	Pin Name	Type	Function
1	DIN	I	Signal Input
2	VO2	O	Positive Output
3	VO1	O	Negative Output
4	FEED	I	Feedback Terminal
5	GND	G	Ground
6	VOOUT	O	Boost Output
7	CN2	I	Capacitor 2 Negative Terminal
8	CP2	I	Capacitor 2 Positive Terminal
9	NC	—	No Connection
10	CN1	I	Capacitor 1 Negative Terminal
11	CP1	I	Capacitor 1 Positive Terminal
12	VIN	P	Power Supply
13	NC	—	No Connection
14	EN1	I	Charge pump mode select 1

(1) G = Ground, I = Input, O = Output, P = Power

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### ABSOLUTE MAXIMUM RATINGS (Note 1)

(@ T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Characteristics	Value	Unit
V <sub>IN</sub>	Supply Voltage	-0.3 to 6.0	V
V <sub>OUT</sub>	Output Voltage	-0.3 to 16.5	V
V <sub>EN1</sub>	EN1 Voltage	-0.3 to V <sub>IN</sub> +0.3	V
T <sub>A</sub>	Operating Free-Air Temperature Range	-40 to +85	°C
T <sub>J</sub>	Operating Junction Temperature Range	-40 to +150	°C
T <sub>STG</sub>	Storage Temperature Range	-65 to +150	°C

Note: 1. Stresses beyond 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-rated conditions for extended periods may affect device reliability.

### Recommended Operating Conditions

(@ T<sub>A</sub> = +25°C, unless otherwise specified.)

Symbol	Characteristics	Conditions	Min	Max	Unit
V <sub>IN</sub>	Supply Voltage	1x Mode, 2x Mode, 3x Mode	1.3	5.5	V

### ESD Susceptibility

HBM	Human Body Model	8	kV
MM	Machine Model	600	V
CDM	Charged Device Model	1	kV

### Thermal Information

Parameter	Symbol	Package	Maximum	Unit
Thermal Resistance (Junction to Ambient)	JA	CPC14	TBD	°C/W
Thermal Resistance (Junction to Case)	JC	CPC14	TBD	°C/W
Thermal Resistance (Junction to Ambient)	JA	SOP14	TBD	°C/W
Thermal Resistance (Junction to Case)	JC	SOP14	TBD	°C/W

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### Electrical Characteristics

(@T<sub>A</sub> = +25°C, V<sub>IN</sub> = 3.0V, C<sub>PIEZO</sub> = 30nF, f<sub>DIN</sub> = 4 kHz, unless otherwise specified.)

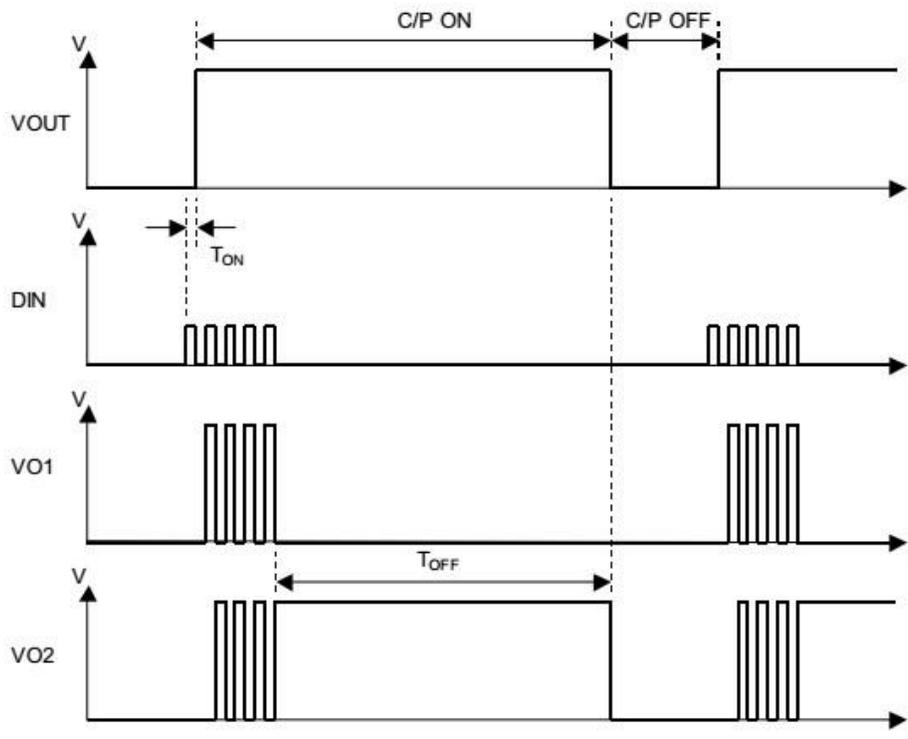
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	VOUT1	1x Mode	1.2	—	3	V
	VOUT2	2x Mode	5.2	—	6	V
	VOUT3	3x Mode (Note 2)	7.2	—	9.1	V
Operating Current 1	IDD11	1x Mode, C <sub>PIEZO</sub> = No Load	—	105	—	μA
	IDD12	2x Mode, C <sub>PIEZO</sub> = No Load	—	249	—	μA
	IDD13	3x Mode, C <sub>PIEZO</sub> = No Load	—	354	—	μA
Operating Current 2	IDD21	1x Mode, Single-ended application	—	0.38	—	mA
	IDD22	2x Mode, Single-ended application	—	1.33	—	mA
	IDD23	3x Mode, Single-ended application	—	2.8	—	mA
Operating Current 3	IDD31	1x Mode, Differential application	—	1.1	—	mA
	IDD32	2x Mode, Differential application	—	4.46	—	mA
	IDD33	3x Mode, Differential application	—	9.83	—	mA
Shutdown Current	ISD	DIN = 0V	—	—	1	μA
Input Frequency	f <sub>IN</sub>	Rectangular pulse	—	3	—	kHz
Oscillating Frequency	f <sub>OSC</sub>	—	—	200	—	kHz
VOUT Start Delay Time	t <sub>ON1</sub>	1x Mode, From DIN signal High to 90% V <sub>OUT</sub> steady state	—	95	—	μs
	t <sub>ON2</sub>	2x Mode, From DIN signal High to 90% V <sub>OUT</sub> steady state	—	310	—	μs
	t <sub>ON3</sub>	3 x Mode From DIN signal High to 90% V <sub>OUT</sub> steady state	—	390	—	μs
Shutdown Delay Time	t <sub>OFF</sub>	DIN = H- > L	—	42	—	ms
Output Short-Circuit Current	ISC	—	—	40	—	mA
Control Terminal Voltage H	VIH	EN1, DIN pins	0.8*V <sub>IN</sub>	—	V <sub>IN</sub>	V
Control Terminal Voltage L	VIL	EN1, DIN pins	0	—	0.2*V <sub>IN</sub>	V
Control Terminal Current 1	IIH1	DIN = 3V	—	1.7	—	μA
Control Terminal Current 2	IIH2	V <sub>EN1</sub> = 3V, DIN = 3V	—	1.7	—	μA
Control Terminal Current 3	IIH3	V <sub>EN1</sub> = 3V, DIN = 0V	—	—	1	μA

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**Charge Pump Mode Setting**

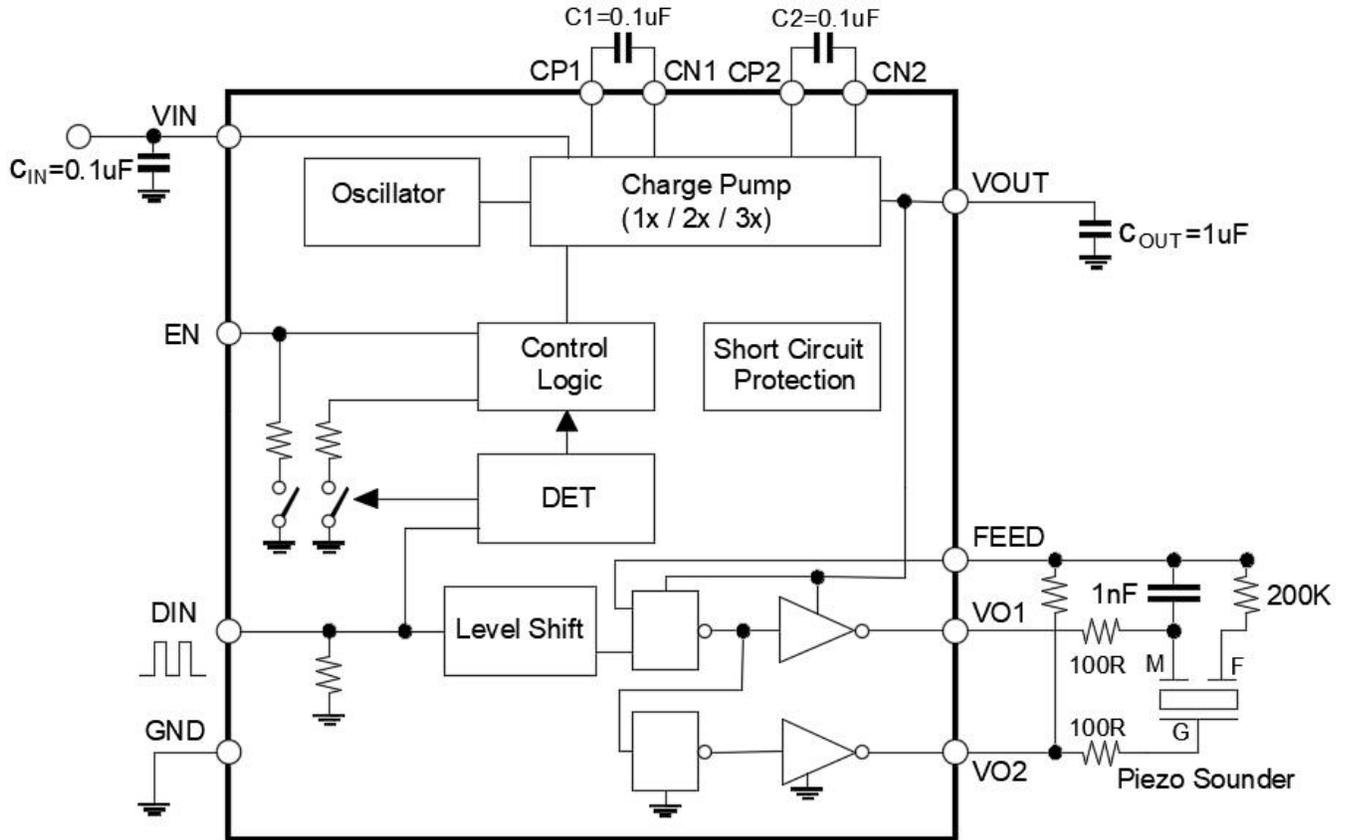
DIN	EN1	MODE
0	-	Shutdown Mode
1	-	1x Mode
1	0	2x Mode
1	1	3x Mode

**Timing Chart**



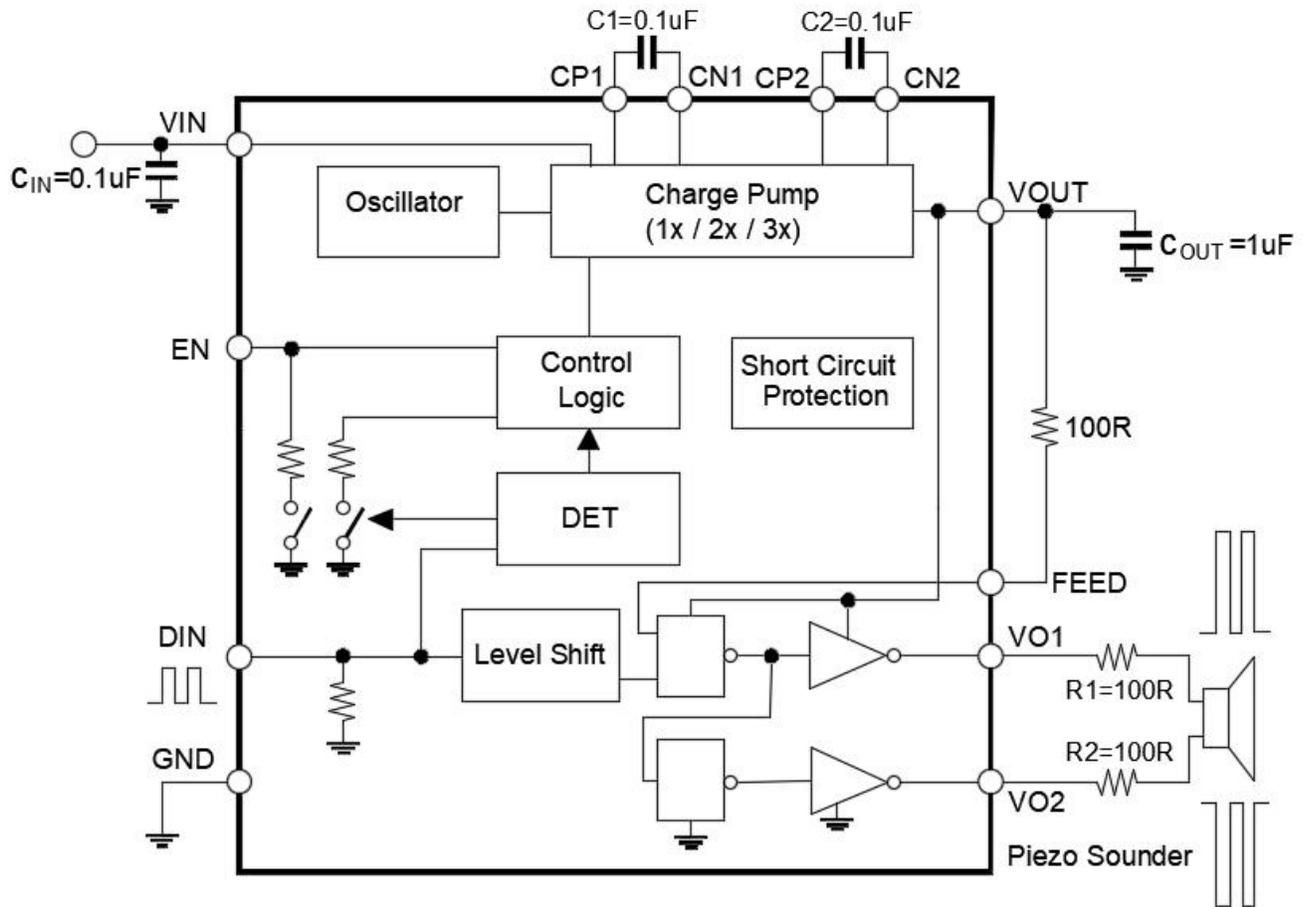
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**APPLICATION CIRCUIT (1) --- (Self-exciting)**



**Piezo-sounder Driver with Multi-mode charge pump**

**APPLICATION CIRCUIT (2)—(external exciting)**

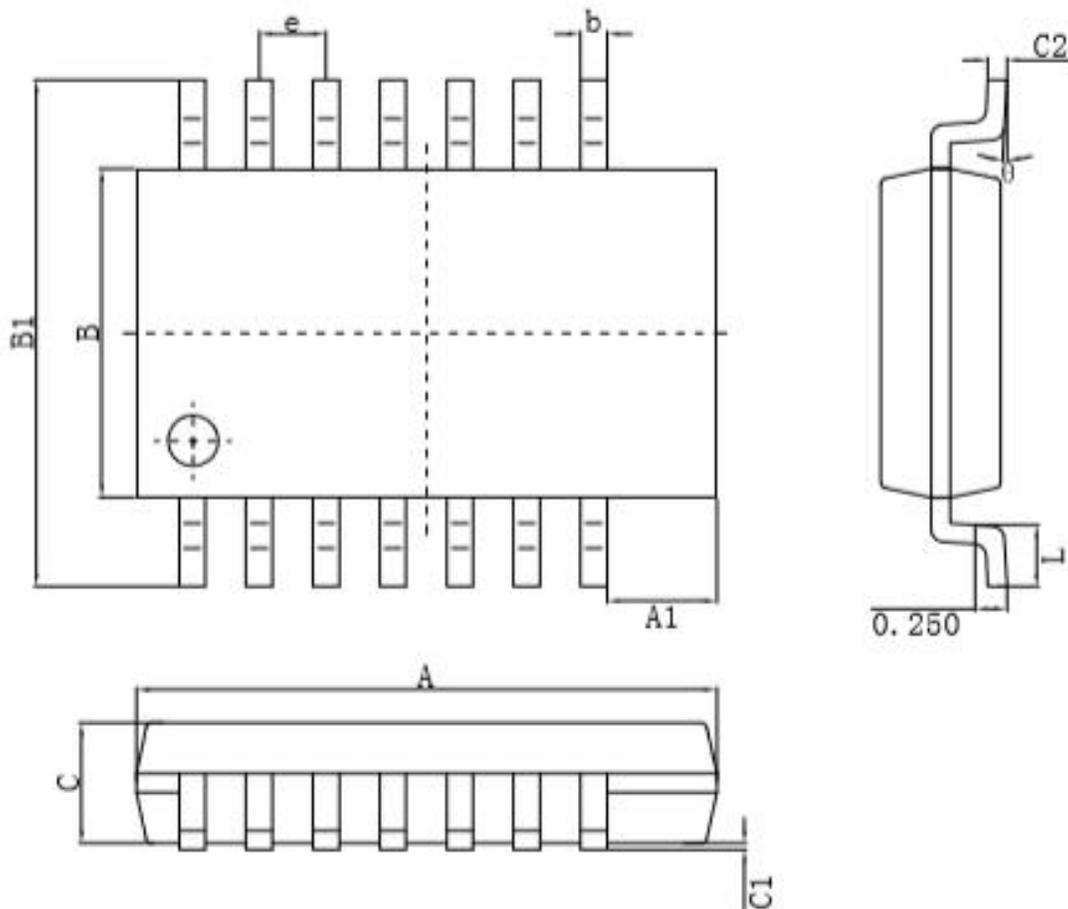


**Piezo-sounder Driver with Multi-mode charge pump**

**PACKAGE INFORMATION**

**PACKAGE INFORMATION(CPC14)**

尺寸 标注	最小 (mm)	最大 (mm)	尺寸 标注	最小 (mm)	最大 (mm)
A	4.50	4.70	C	0.85	1.05
A1	0.82	0.92	C1	0.00	0.15
e	0.53 (BSC)		C2	0.15	0.18
B	2.50	2.70	L	0.40	0.60
B1	3.85	4.15	θ	0°	8°
b	0.16	0.26			



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**PACKAGE INFORMATION(SOP14)**

标注	尺寸	最小(mm)	最大(mm)	标注	尺寸	最小(mm)	最大(mm)
A		8.55	8.75	C4		0.193	0.213
A1		0.356	0.456	D		0.95	1.15
A2		1.27TYP		D1		0.40	0.70
A3		0.312TYP		D2		0.20TYP	
B		3.80	4.00	R1		0.20TYP	
B1		5.80	6.20	R2		0.20TYP	
C		1.40	1.60	θ 1		8° ~ 12° TYP4	
C1		0.60	0.70	θ 2		8° ~ 12° TYP4	
C2		0.55	0.65	θ 3		0° ~ 8°	
C3		0.05	0.25	θ 4		4° ~ 12°	

