

Multi-Mode Charge Pump for Piezoelectric Detector Driver

FEATURES

- Power supply voltage range: 1.5V to 5.5V
- 2.5V power supply can drive 30V_{PP} (Vo1-Vo2) voltage output
- Integrated boost converter capable of generating up to 15V
- Input signal range: 20Hz to 10kHz
- No voltage crossover output in standby mode
- Low current consumption
- Automatic standby and wake-up control
- Available in QFN16 packages
- Over-temperature and under-voltage protection

- PDAs
- Security devices
- GPS Alarms
- Bluetooth anti-loss devices

DESCRIPTION

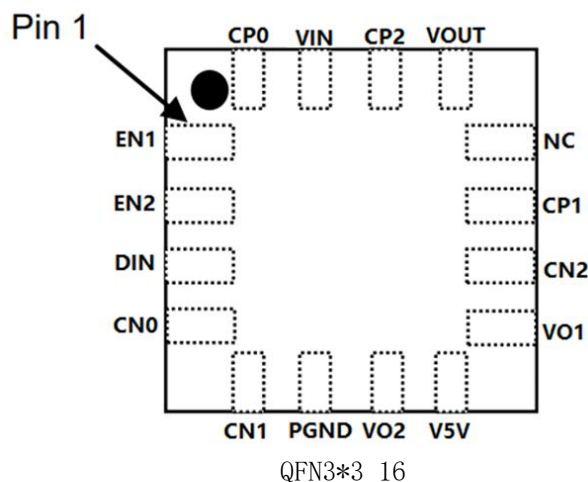
The SD121 is a switching driver with a multi-mode charge pump designed for piezoelectric transducers. It can drive up to 30V~PP~ output from a 2.5V power supply. To adjust the volume of the piezoelectric sounder, the charge pump can operate in 1x, 2x, or 3x modes. The SD121 is suitable for battery-powered applications due to its standby functionality.

APPLICATIONS

- Healthcare systems
- Smart home devices

The SD121 includes built-in automatic standby and wake-up functions, ensuring longer battery life. It also features over-temperature protection, output short-circuit protection, and under-voltage protection.

PACKAGES

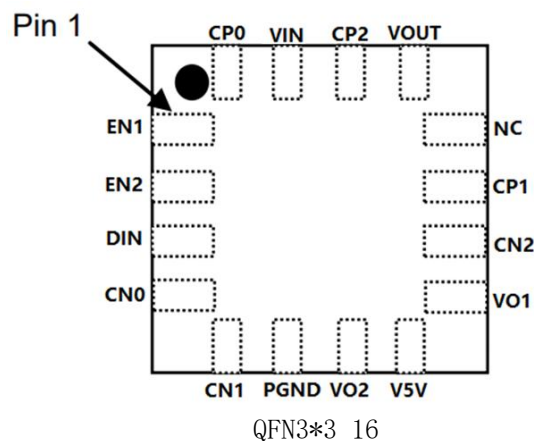


ORDING INFORMATION

Model	Package Type	Package Quantity	Operating Temperature (° C)	Marking	Marking information
SD121	QFN16	3000	-40~85	SD121X XXX	SD121A: V5V output 5V SD121B: V5V output 4.5V

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PIN DIAGRAM



PIN FUNCTIONS (QFN16)

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

Pin No.	Pin Name	Pin Type	Pin Description
1	EN1	I	Charge pump mode selection 1
2	EN2	I	Charge pump mode selection 2
3	DIN	I	Signal input
4	CN0	O	Negative terminal of charge pump capacitor 0
5	CN1	O	Negative terminal of charge pump capacitor 1
6	PGND	G	Power ground
7	VO2	O	High-voltage drive terminal 2
8	V5V	O	5V primary charge pump output
9	VO1	O	High-voltage drive terminal 1
10	CN2	O	Negative terminal of charge pump capacitor 2
11	CP1	O	Positive terminal of charge pump capacitor 1
12	NC	O	No Connection
13	VOUT	O	Charge pump output
14	CP2	O	Positive terminal of charge pump capacitor 2
15	VIN	P	Power supply
16	CP0	O	Positive terminal of charge pump capacitor 0

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Absolute Maximum Ratings (Note 1)

(@ T_A = +25°C, unless otherwise specified)

Symbol	Parameter	Rating	Unit
V _{IN}	Power supply voltage	-0.3 to 6	V
V _{OUT}	Output voltage	-0.3 to 16.5	V
V _{EN1}	EN1 voltage	-0.3 to V _{IN} +0.3	V
T _A	Operating temperature in free air	-40 to +85	°C
T _J	Junction temperature	-40 to +150	°C
T _{STG}	Storage temperature range	-65 to +150	°C
ESD Rating	Human Body Model	±3	kV

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 rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

(@ T_A = +25°C, unless otherwise specified)

Symbol	Parameter	Condition	Min	Max	Unit
V _{IN}	Supply Voltage	1x Mode, 2x Mode, 3x Mode	1.5	5.5	V

Thermal Characteristics

Parameter	Symbol	Package	Max	Unit
Thermal resistance (junction-to-ambient)	θ _{JA}	QFN16	35	°C/W
Thermal resistance (junction-to-case)	θ _{JC}	QFN16	14	°C/W

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Electrical Characteristics

(@T_A = +25°C, V_{IN} = 3.0V, V5V=5V, C_{PIEZO}= 22nF, f_{DIN}= 3 kHz, unless otherwise specified)

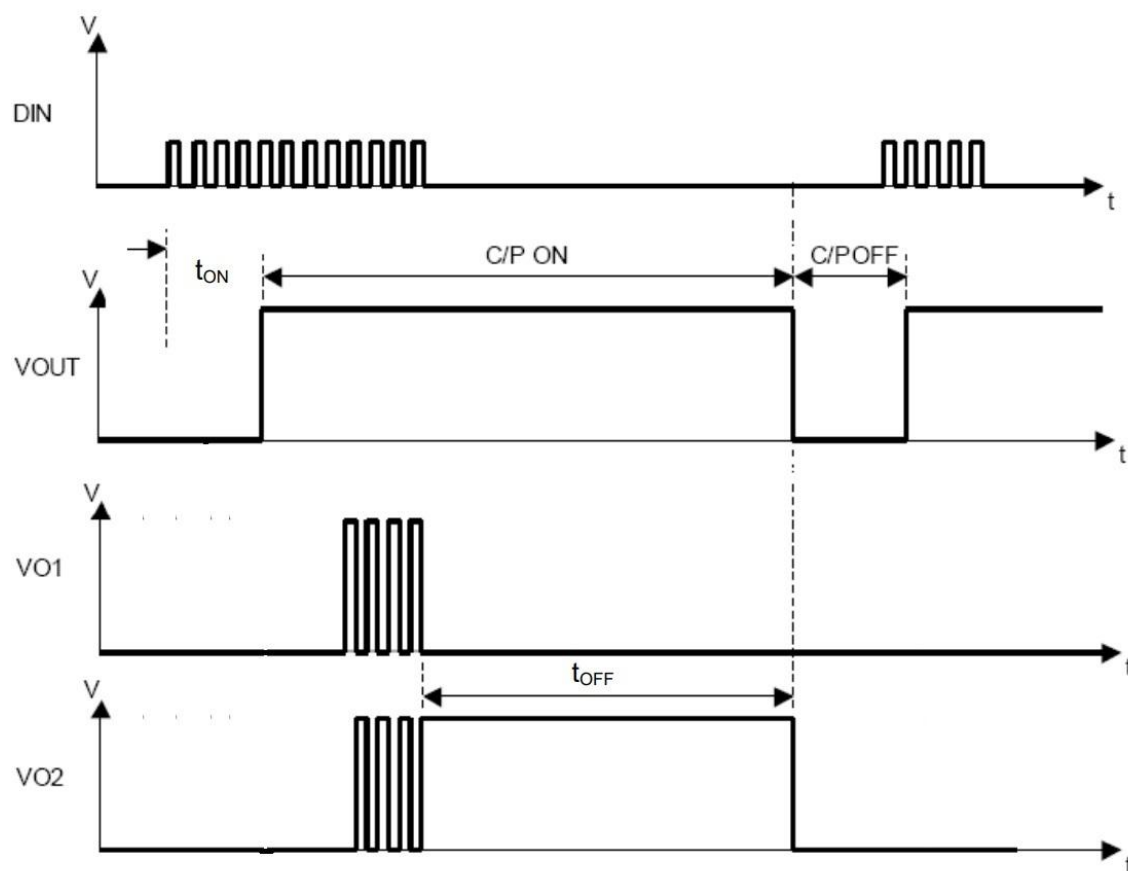
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	VOUT1	1x Mode	4.7	5 (#1)	5.3	V
	VOUT2	2x Mode	9.3	10 (#1)	10.6	V
	VOUT3	3x Mode (Note 2)	13.9	15 (#1)	15.9	V
Operating Current 1	IDD11	1x Mode, C _{PIEZO} = No Load	—	0.6	—	mA
	IDD12	2x Mode, C _{PIEZO} = No Load	—	0.7	—	mA
	IDD13	3x Mode, C _{PIEZO} = No Load	—	1.3	—	mA
Operating Current 2	IDD21	1x Mode, Single-ended application	—	1.2	—	mA
	IDD22	2x Mode, Single-ended application	—	3.3	—	mA
	IDD23	3x Mode, Single-ended application	—	7.0	—	mA
Operating Current 3	IDD31	1x Mode, Differential application	—	3	—	mA
	IDD32	2x Mode, Differential application	—	11	—	mA
	IDD33	3x Mode, Differential application	—	32	—	mA
Shutdown Current	ISD	DIN = 0V	0	—	0.1	μA
Input Frequency	f _{IN}	Rectangular pulse	20Hz	3	10	kHz
V5V Output Current	IV5V	—	100	120	140	mA
Oscillating Frequency	f _{OSC}	—	300	—	1200	kHz
VOUT Start Delay Time	t _{ON1}	1x Mode, From DIN signal High to 90% V _{OUT} steady state	—	2.3	—	ms
	t _{ON2}	2x Mode, From DIN signal High to 90% V _{OUT} steady state	—	2.3	—	ms
	t _{ON3}	3 x Mode From DIN signal High to 90% V _{OUT} steady state	—	2.3	—	ms
Shutdown Delay Time	t _{OFF}	DIN = H- > L	—	50	—	ms
Output Short-Circuit Current	ISC	—	—	1	—	mA
Control Terminal Voltage H	VIH	EN1, EN2, DIN pins	—	1.1	—	V
Control Terminal Voltage L	VIL	EN1, EN2, DIN pins	—	0.9	—	V
Control Terminal Current 1	IIH1	DIN = 3V	—	1.5	—	μA
Control Terminal Current 2	IIH2	V _{EN1} = 3V, DIN = 3V	—	1.5	—	μA
Control Terminal Current 3	IIH3	V _{EN1} = 3V, DIN = 0V	0	—	1	μA
UVLO				2.0		V

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Charge Pump Mode Settings

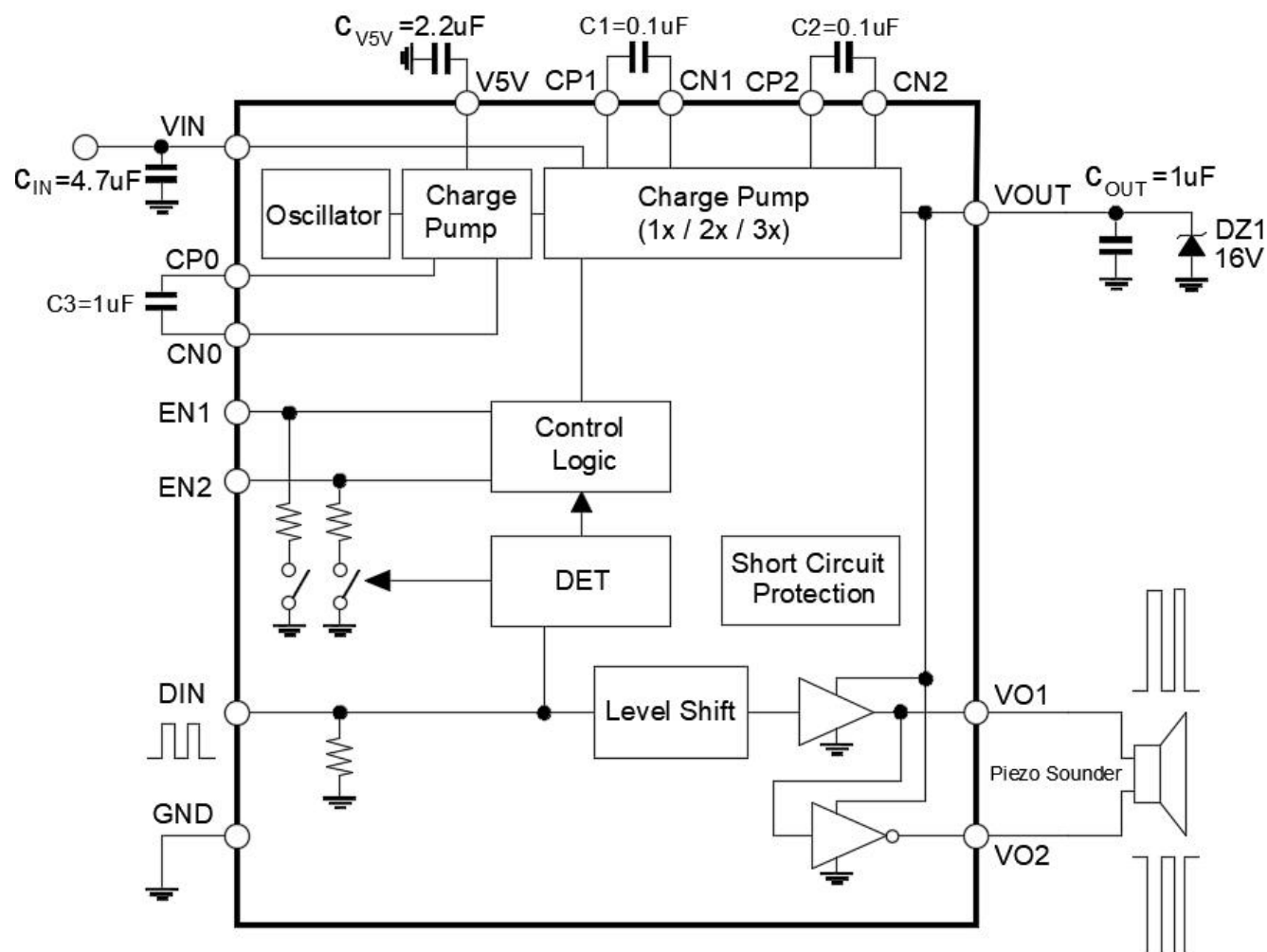
DIN	EN1	EN2	MODE
0	--	--	Shutdown Mode
1	0	1	1x Mode
1	1	0	2x Mode
1	1	1	3x Mode

Timing Diagram1



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Application Circuit1



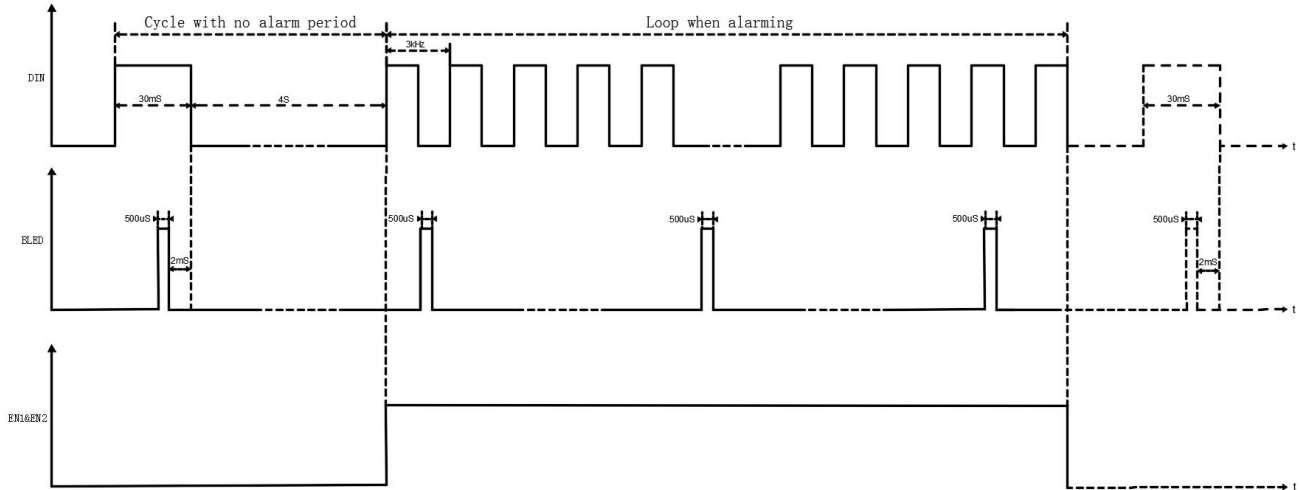
Note:

1. Capacitor parameters should follow the recommended values in the application diagram, and PCB.

2. The button cell exhibits a relatively high internal resistance. When its voltage drops below 2.6V, significant capacity degradation occurs along with further increased internal impedance. For optimal performance in integrated circuit applications, it is recommended to maintain the battery's open-circuit voltage above 2.6V prior to operation. Furthermore, during transient load conditions, the instantaneous terminal voltage should not droop below 2.15V under full load current to ensure proper circuit functionality and avoid brownout conditions in power-sensitive IC components.

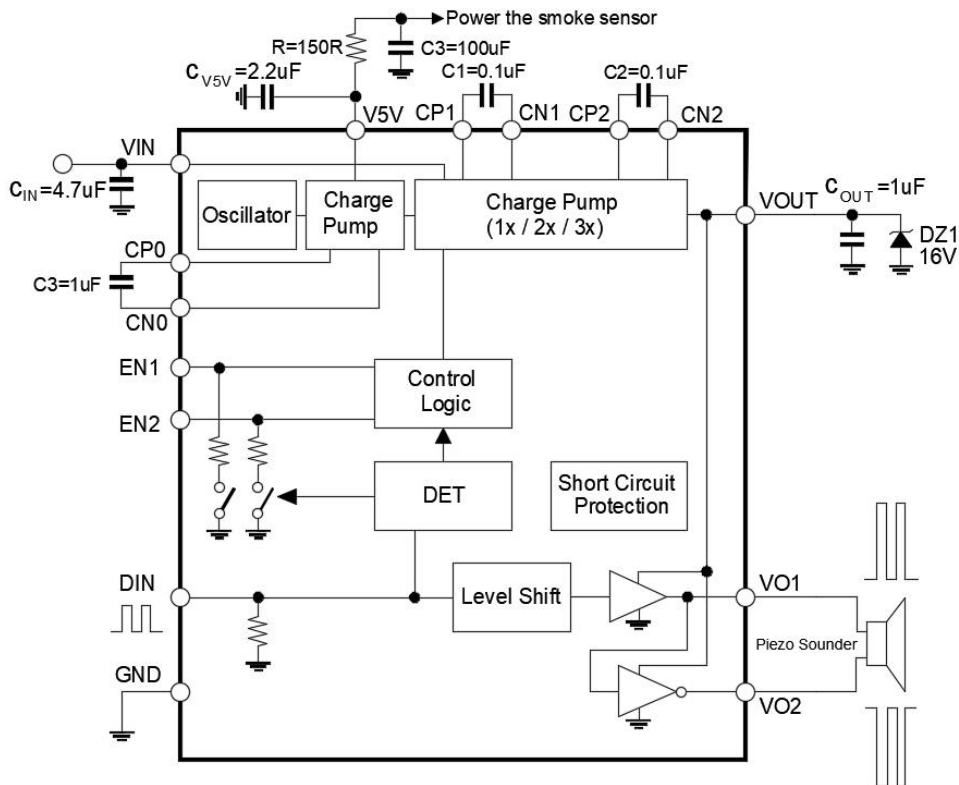
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Timing Diagram2



Smoke sensor Application Timing Diagram

Application Circuit2



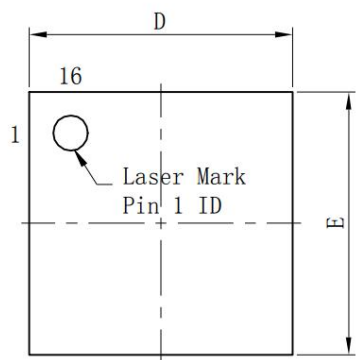
Smoke sensor Application

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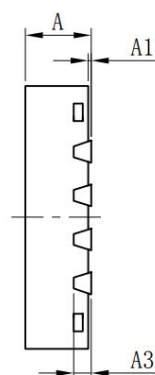
Packaging Information

QFN3*3_16

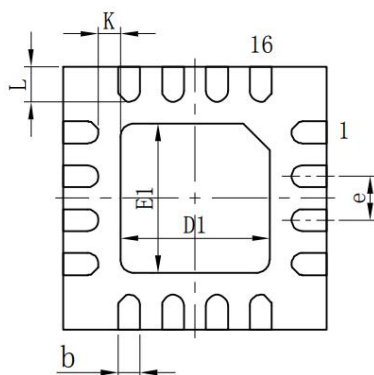
标注	尺寸	最小	标准	最大	标注	尺寸	最小	标准	最大
A		0.70	0.75	0.80	D1		1.60	1.70	1.80
A1		0.00	—	0.05	E1		1.60	1.70	1.80
A3		0.203REF			e		0.50TYP		
b		0.20	0.25	0.30	K		0.20	—	—
D		2.90	3.00	3.10	L		0.30	0.40	0.50
E		2.90	3.00	3.10					



Top View



Side View



Bottom View

Multi-Mode Charge Pump for Piezoelectric Detector Driver**Revision history****Table 1.Document revision history**

Date	Revision	Changes
14-Oct-2025	1.0	Initial release.
28-Oct-2025	1.1	Define the SD121A and SD121B mark information
28-Jan-2026	1.2	Add Zener diode parameters
28-Apr-2026	1.3	Add the Smoke sensor Application

Responsibility and Copyright Declaration

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