

Multi-Mode Charge Pump for Piezoelectric Detector Driver

FEATURES

- Power supply voltage range: 2.15V 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
- Short-circuit protection current less than 1mA
- Over-temperature and under-voltage protection

- Smart wearable watches
- Handheld GPS devices
- PDAs
- Security devices
- Alarms
- Bluetooth anti-loss devices

DESCRIPTION

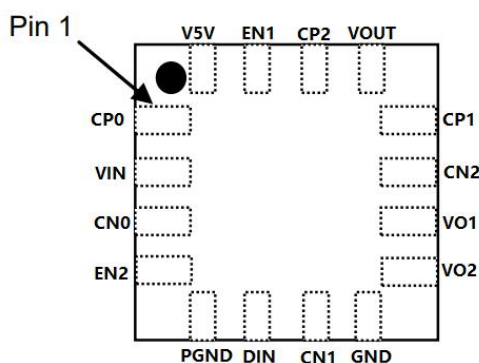
The SD118 is a switching driver with a multi-mode charge pump designed for piezoelectric transducers. It can drive up to 30V_{PP} output from a 2.5V power supply. To adjust the volume of the piezoelectric sounder, the charge pump can operate in 1x, 2x, or 3x modes. The SD118 is suitable for battery-powered applications due to its standby functionality.

The SD118 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.

APPLICATIONS

- Healthcare systems
- Smart home devices

PACKAGES (QFN16 AND QFN12)



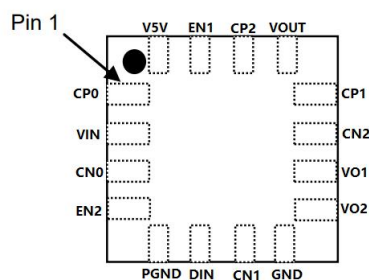
QFN3*3_16

ORDING INFORMATION

Model	Package Type	Package Quantity	Operating Temperature (° C)	Marking
SD118	QFN16	5000	-40~85	SD118 XXX

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PIN DIAGRAM



QFN3*3_16

PIN FUNCTIONS (QFN16)

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

Pin No.		Pin Name	Pin Type	Pin Description
QFN3*3_16	QFN3*3_12			
1	/	CP0	O	Positive terminal of charge pump capacitor 0
2	12	VIN	P	Power supply
3	/	CN0	O	Negative terminal of charge pump capacitor 0
4	2	EN2	I	Charge pump mode selection 2
5	/	PGND	G	Power ground
6	3	DIN	I	Signal input
7	4	CN1	O	Negative terminal of charge pump capacitor 1
8	5	GND	G	Ground
9	6	VO2	O	High-voltage drive terminal 2
10	7	VO1	O	High-voltage drive terminal 1
11	8	CN2	O	Negative terminal of charge pump capacitor 2
12	9	CP1	O	Positive terminal of charge pump capacitor 1
13	10	VOUT	O	Charge pump output
14	11	CP2	O	Positive terminal of charge pump capacitor 2
15	1	EN1	I	Charge pump mode selection 1
16	/	V5V	O	5V primary charge pump output

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Absolute Maximum Ratings (Note 1)

(@ $T_A = +25^{\circ}\text{C}$, unless otherwise specified)

Symbol	Parameter	Rating	Unit
VIN	Power supply voltage	-0.3 to 6.0	V
VOUT	Output voltage	-0.3 to 16.5	V
VEN1	EN1 voltage	-0.3 to $V_{IN} + 0.3$	V
TA	Operating temperature in free air	-40 to +85	$^{\circ}\text{C}$
TJ	Junction temperature	-40 to +150	$^{\circ}\text{C}$
TSTG	Storage temperature range	-65 to +150	$^{\circ}\text{C}$
ESD Rating	Human Body Model (HBM)	± 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

(@ $T_A = +25^{\circ}\text{C}$, unless otherwise specified)

Symbol	Parameter	Condition	Min	Max	Unit
VIN	Supply Voltage	1x Mode, 2x Mode, 3x Mode	2.15	5.5	V

Thermal Characteristics

Parameter	Symbol	Package	Max	Unit
Thermal resistance (junction-to-ambient)	θ_{JA}	QFN16	35	$^{\circ}\text{C}/\text{W}$
Thermal resistance (junction-to-case)	θ_{JC}	QFN16	14	$^{\circ}\text{C}/\text{W}$

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Electrical Characteristics

(@T_A = +25°C, V_{IN} = 3.0V, V5V=4.55V, 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
V5V Output Current	Iv5V	—	100	120	140	mA
Input Frequency	f _{IN}	Rectangular pulse	20Hz	3	10	kHz
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

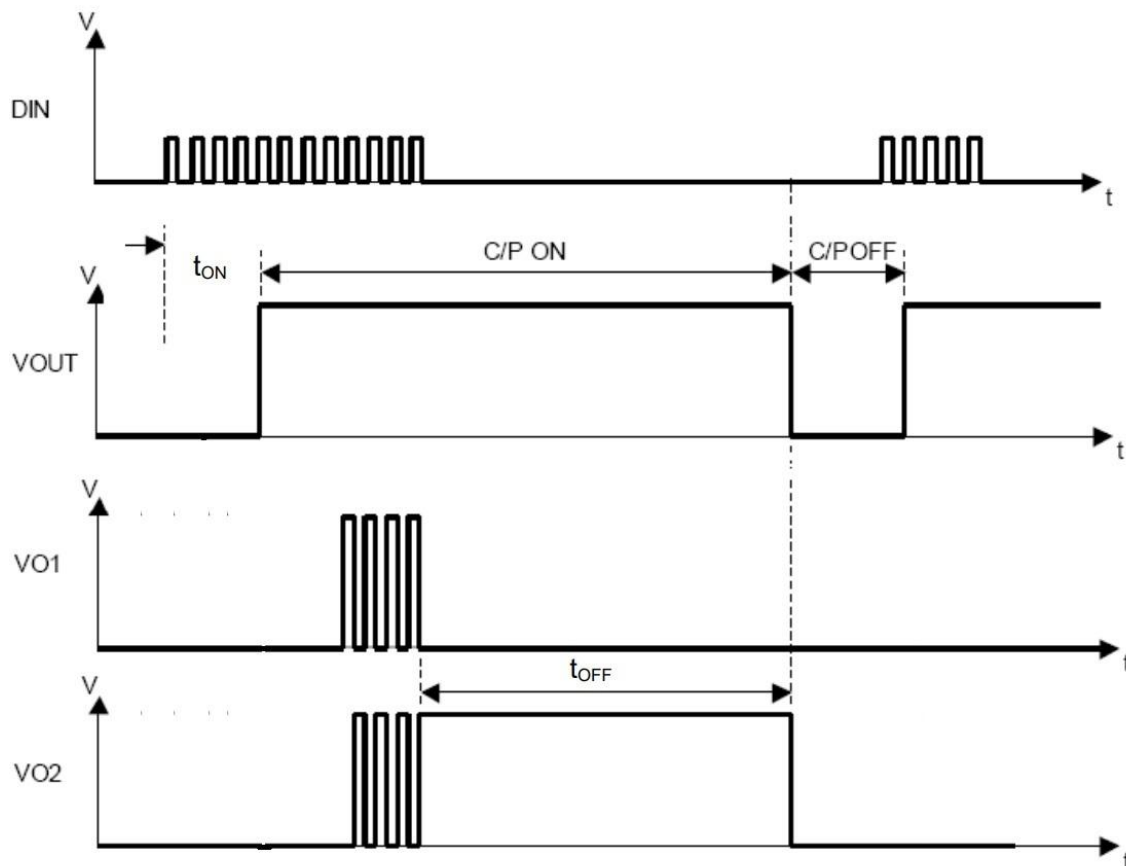
#1: When 1.9V < V_{in} < 2.5V, the output voltage in 1x mode is 2 × V_{in}, with other modes scaling accordingly. Additionally, an FT-trimmed version with a center value of 5V is available.

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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

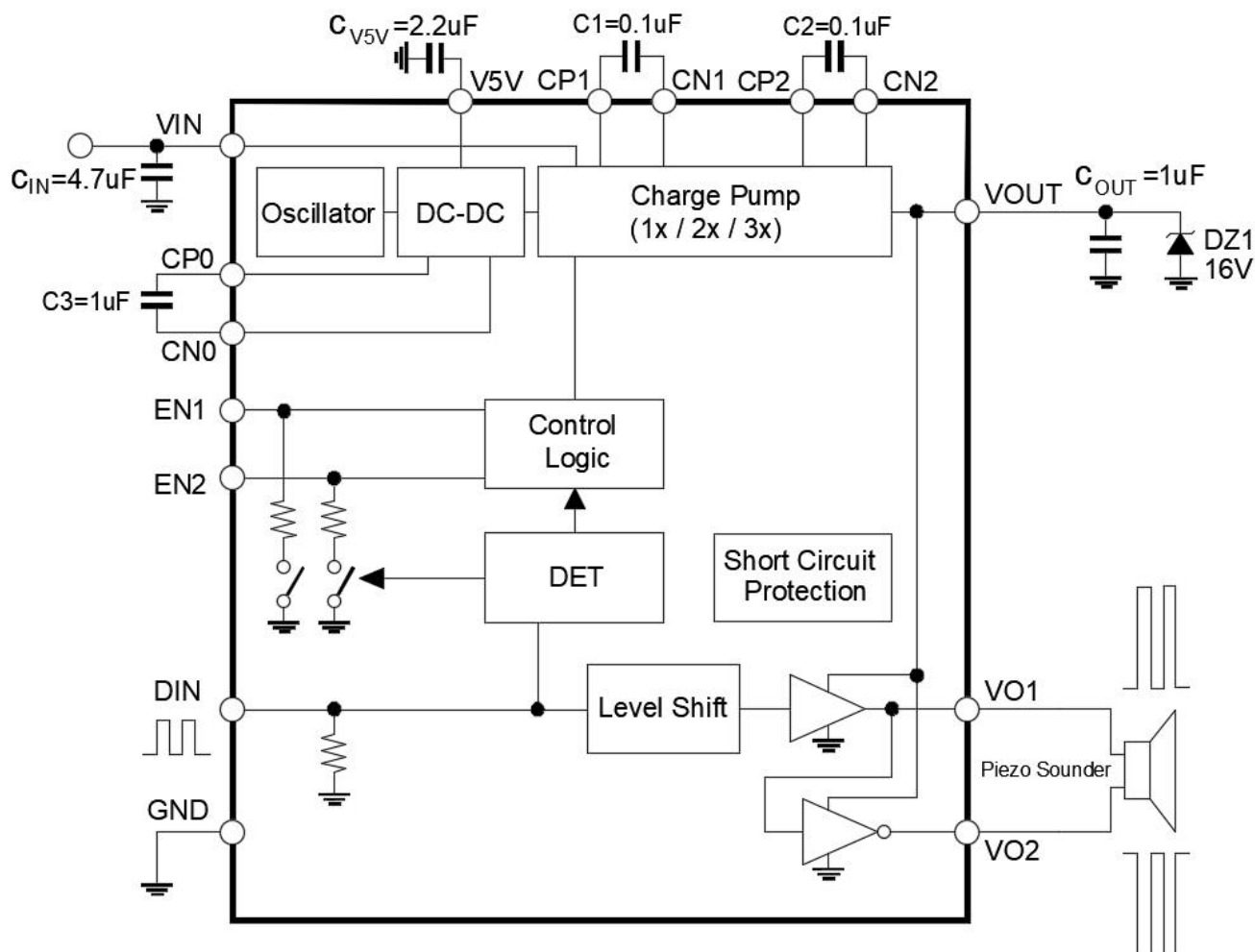
Timing Diagram1:



note: Due to the time required for V5V voltage doubling and the limited charge storage capacity of the 2.2 μ F capacitor, the output delay of VO1 and VO2 must be at least 2.3ms.

Multi-Mode Charge Pump for Piezoelectric Detector Driver

Application Circuit1: QFN3*3_16

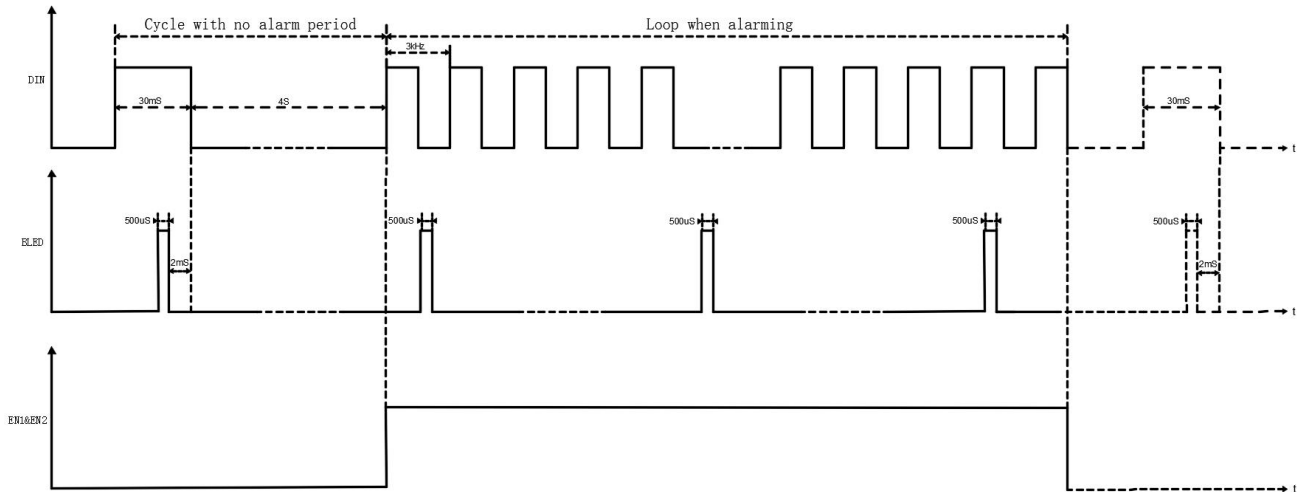


Note:

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.

Multi-Mode Charge Pump for Piezoelectric Detector Driver

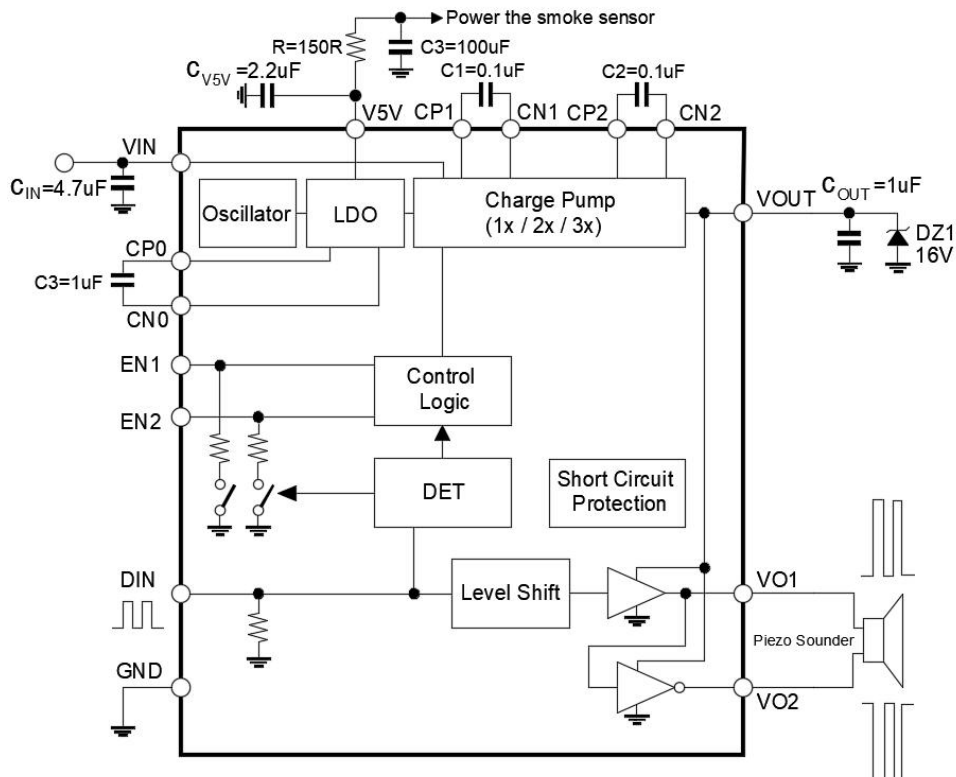
Timing Diagram2:



Smoke sensor Application Timing Diagram

Application Circuit2:

QFN3*3_16

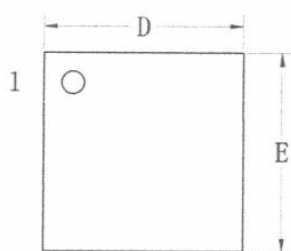


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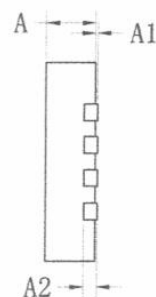
Smoke sensor Application

Packaging Information

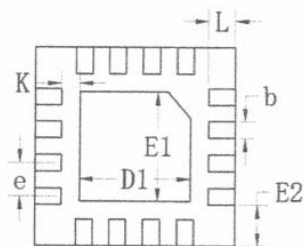
QFN3*3_16 TH:0.55MM



Top View



Side View



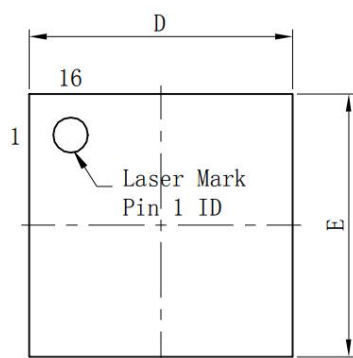
Bottom View

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.50	0.55	0.60
A1	0.00	—	0.05
A2	0.203 TYP		
b	20	0.25	0.30
D	2.95	3.00	3.05
D1	1.55	1.65	1.75
E	2.95	3.00	3.05
E1	1.55	1.65	1.75
E2	0.625 REF		
e	0.50 BSC		
K	0.275 REF		
L	0.35	0.40	0.45

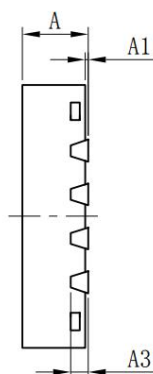
Multi-Mode Charge Pump for Piezoelectric Detector Driver

QFN3*3_16 TH:0.75MM

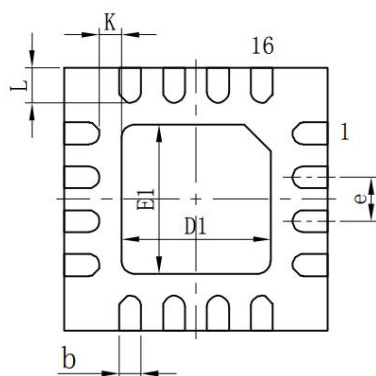
标注	尺寸	最小	标准	最大	标注	尺寸	最小	标准	最大
A		0.70	0.75	0.80	D1		1.60	1.70	1.80
A1		0.00	—	0.05	E1		1.60	1.70	1.80
A3		0.203REF			e		0.50TYP		
b		0.20	0.25	0.30	K		0.20	—	—
D		2.90	3.00	3.10	L		0.30	0.40	0.50
E		2.90	3.00	3.10					



Top View



Side View



Bottom View

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

Date	Revision	Changes
11-Dec-2024	1.0	Initial release.
11-Dec-2024	1.1	Update the Characterization
14-Mar-2025	1.2	Update the application block
8-Sep-2025	1.5	Update the application block
20-Nov-2025	1.6	Delete the QFN3*3_12 package
5-Jan-2026	1.7	Change the package thickness
28-Apr-2026	1.8	Add the Smoke sensor Application

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