

Blue LED Driver and Piezo-sounder Driver with Multi-mode charge pump

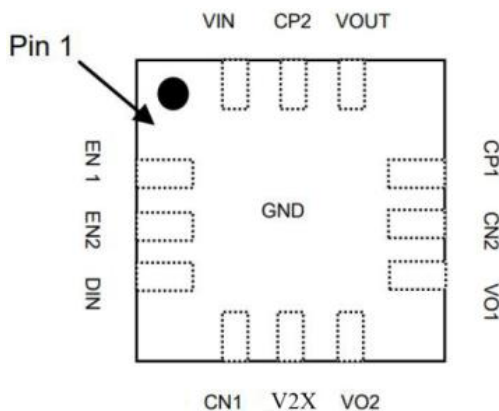
FEATURES

- Supply Voltage Range from 1 V to 5V
- Bigger than 100mA 6V output to drive Blue LED
- 24V_{PP} Output from a 3V Supply
- Input Signal 1Hz to 50kHz
- No Voltage Cross Output at Shutdown Mode
- Low Current Consumption
- Automatic Standby and Wake-up Control
- Available QFN3*3_12 package
- OTP feature

APPLICATIONS

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

PACKAGE



QFN3*3_12

- PADs
- Security Devices
- Alarm Clocks

DESCRIPTION

The BVT04A is a switching driver with multi-mode charge pump for piezo-sounder. It can drive outputs up to 24V_{pp} from 3V supply. For adjusting the piezoelectric sounder sound volume, the charge pump can operate in either of a 1x, 2x or 4x mode. Because BVT04A has the shutdown function, it is suitable for the battery application. And more BVT04A have a bigger than 100mA 6V output to drive blue LED.

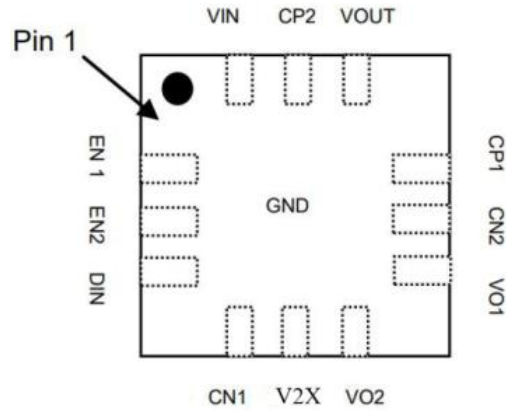
BVT04A includes built-in automatic shutdown and wake up that guarantees longer battery life. BVT04A features thermal shutdown and output short protection circuits.

ORDING INFORMATION

Part Number	Package Type	Package Qty	Op Temp(°C)	Mark
BVT04A	QFN3*3_12	5000	-40~85	BVT04A XXX

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PINOUT



QFN3*3_12

PIN FUNCTIONS

Pin Number	Pin Name	Type	Function
QFN3*3_12			
1	EN1	I	Charge pump mode select 1
2	EN2	I	Charge pump mode select 2
3	DIN	I	Signal Input
4	CN1	I	Capacitor 1 Negative Terminal
5	V2X	O	Boost Vin
6	VO2	O	Positive Output
7	VO1	O	Negative Output
8	CN2	I	Capacitor 2 Negative Terminal
9	CP1	I	Capacitor 1 Positive Terminal
10	VOUT	O	Boost Output
11	CP2	I	Capacitor 2 Positive Terminal
12	VIN	P	Power supply
EPAD	GND	G	GND

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

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ABSOLUTE MAXIMUM RATINGS^(Note 1)

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

Symbol	Characteristics	Value	Unit
V _{IN}	Supply Voltage	-0.3 to 5.0	V
V _{OUT}	Output Voltage	-0.3 to 20	V
V _{EN1}	EN1 Voltage	-0.3 to V _{IN} +0.3	V
T _A	Operating Free-Air Temperature Range	-40 to +85	°C
T _J	Operating Junction Temperature Range	-40 to +150	°C
T _{STG}	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_A = +25°C, unless otherwise specified.)

Symbol	Characteristics	Conditions	Min	Max	Unit
V _{IN}	Supply Voltage	1x Mode, 2x Mode, 4x Mode	1.3	5.0	V

ESD Susceptibility

HBM	Human Body Model	4	kV
MM	Machine Model	600	V
CDM	Charged Device Model	3	kV

THERMAL INFORMATION

Parameter	Symbol	Package	Maximum	Unit
Thermal Resistance (Junction to Ambient)	θ _{JA}	QFN3*3_12	35	°C/W
Thermal Resistance (Junction to Case)	θ _{JC}	QFN3*3_12	14	°C/W

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ELECTRICAL CHARACTERISTICS

(@T_A = +25°C, V_{IN} = 3.0V, C_{PIEZO} = 30nF, f_{DIN} = 3 kHz, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	VOUT1	1x Mode	1.2	—	5	V
	VOUT2	2x Mode	5.2	—	10.4	V
	VOUT3	4x Mode (Note 2)	7.8	—	20	V
Operating Current 1	IDD11	1x Mode, C _{PIEZO} = No Load	—	150	—	μA
	IDD12	2x Mode, C _{PIEZO} = No Load	—	330	—	μA
	IDD13	4x Mode, C _{PIEZO} = No Load	—	600	—	μA
Operating Current 2	IDD21	1x Mode, Single-ended application	—	0.5	—	mA
	IDD22	2x Mode, Single-ended application	—	2.0	—	mA
	IDD23	4x Mode, Single-ended application	—	7.6	—	mA
Operating Current 3	IDD41	1x Mode, Differential application	—	0.3	—	mA
	IDD42	2x Mode, Differential application	—	1.1	—	mA
	IDD43	4x Mode, Differential application	—	3.8	—	mA
V2X	V2X	V _{in} =3V, Driving capability	100			mA
Shutdown Current	ISD	DIN = 0V	—	8	20	nA
Input Frequency	F _{in}	Rectangular pulse	—	3	—	kHz
Oscillating Frequency	F _{OSC}	Charge Pump Frequency	—	220	—	kHz
VOUT Start Delay Time	t _{ON1}	1x Mode, From DIN signal High to 90% V _{OUT} steady state	—	1	—	mS
	t _{ON2}	2x Mode, From DIN signal High to 90% V _{OUT} steady state	—	1	—	mS
	t _{ON3}	4 x Mode From DIN signal High to 90% V _{OUT} steady state	—	1	—	mS
Shutdown Delay Time	t _{OFF}	DIN = H- > L	—	40	—	ms
Output Short-Circuit Current	ISC	—	—	125	—	mA
Control Terminal Voltage H	VIH	EN1, EN2, DIN pins	0.5*V _{IN}	—	V _{IN}	V
Control Terminal Voltage L	VIL	EN1, EN2, DIN pins	0	—	0.2*V _{IN}	V
Control Terminal Current 1	IIH1	DIN = 3V	—	1.3	—	μA
Control Terminal Current 2	IIH2	V _{EN1} = 3V, DIN = 3V	—	1.3	—	μA
Control Terminal Current 3	IIH3	V _{EN1} = 3V, DIN = 0V	—	—	1	μA

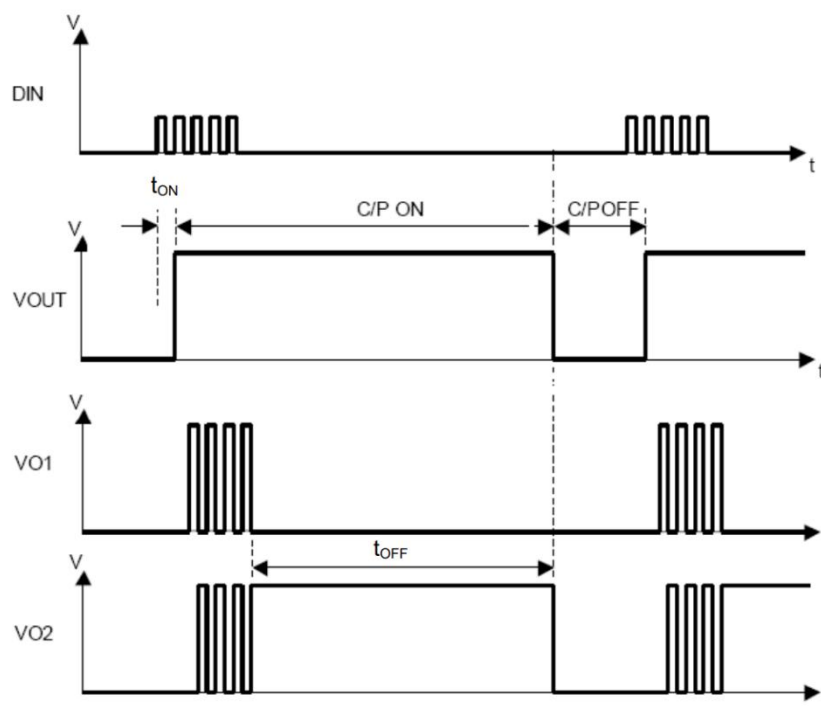
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CHARGE PUMP MODE SETTING

DIN	EN1	EN2	MODE
0	--	--	Shutdown Mode
1	0	1	1x Mode
1	1	0	2x Mode
1	1	1	4x Mode

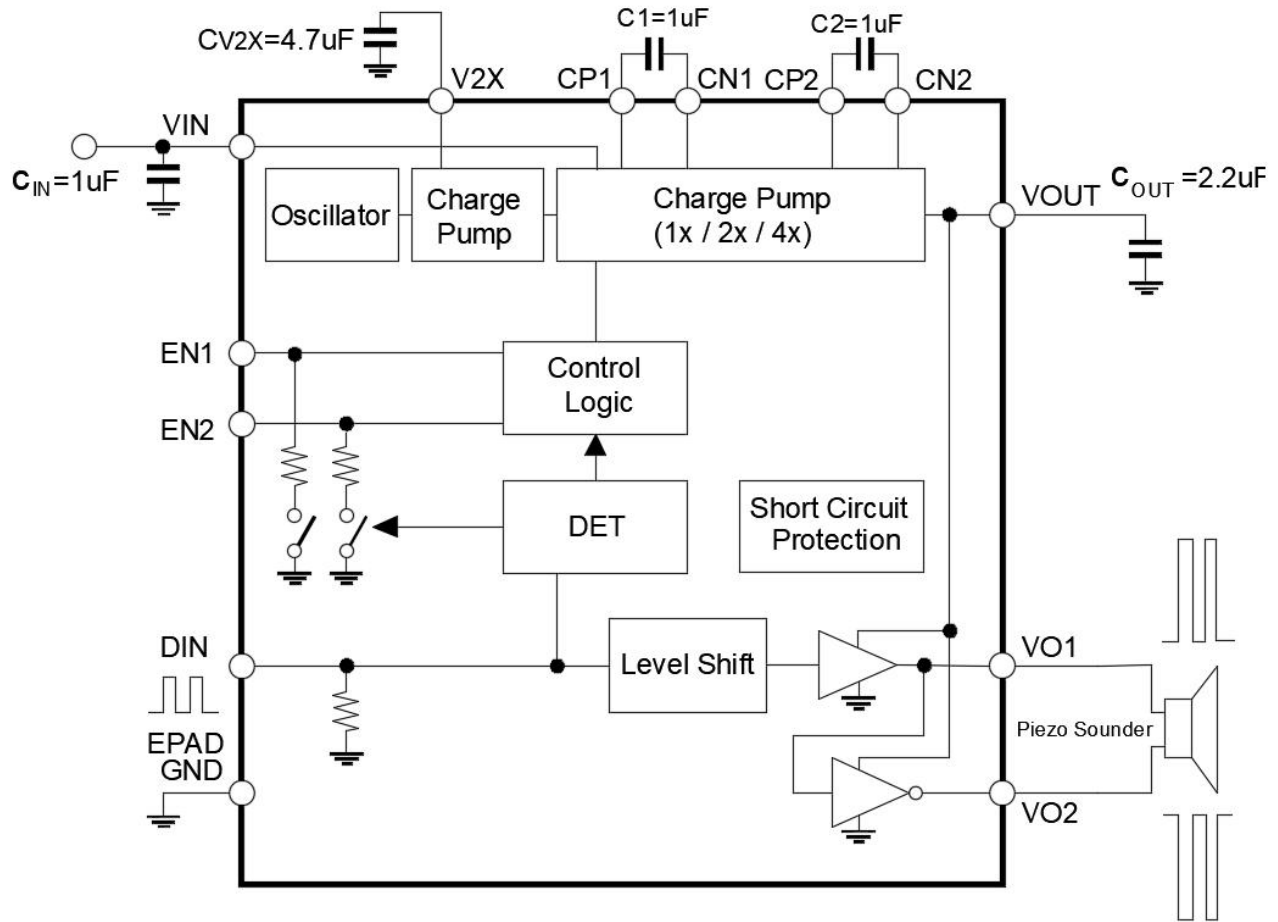
Notes: When DIN is triggered, EN1 and EN2 are prohibited from square-wave input or open-circuit state.

TIMING CHART1



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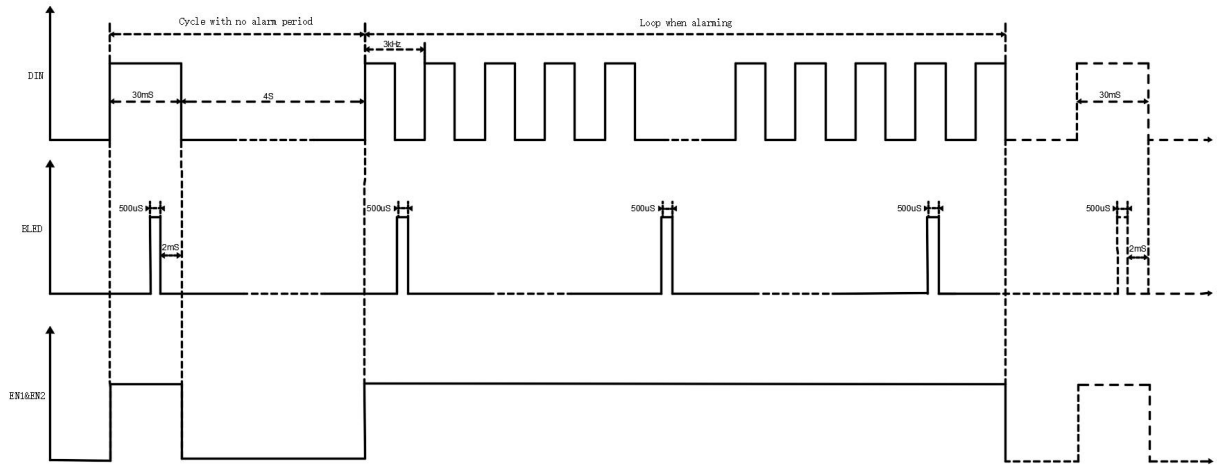
APPLICATION CIRCUIT1



Application 1

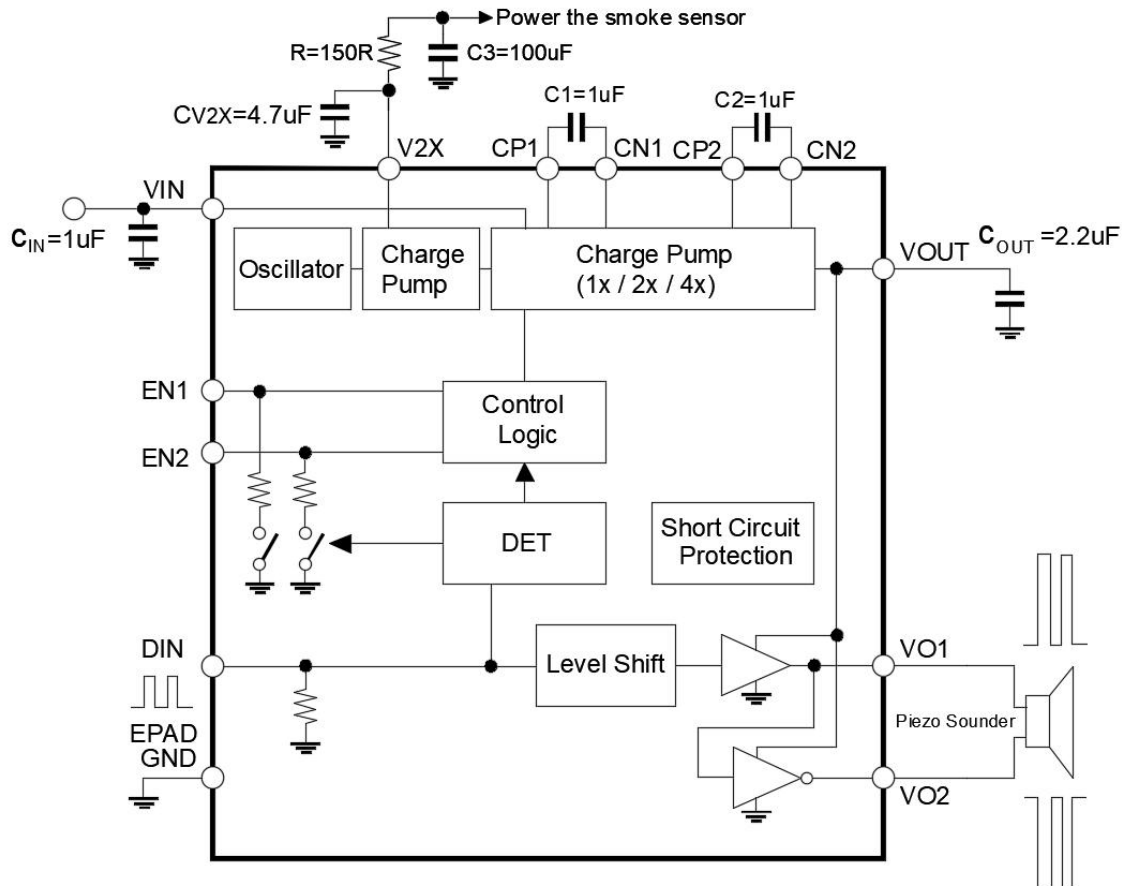
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TIMING CHART2



Smoke sensor Application Timing Diagram

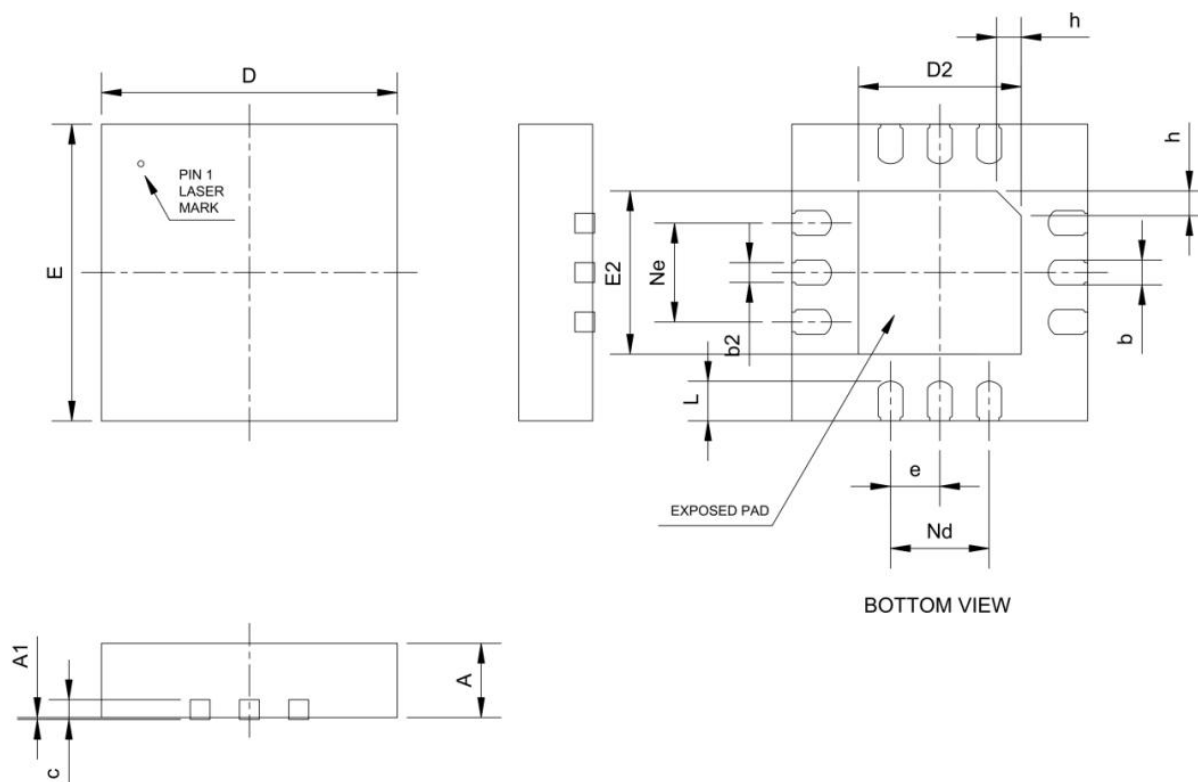
APPLICATION CIRCUIT2



Smoke sensor Application

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PACKAGE INFORMATION(QFN3*3_12)



Symbol	Min	Nom	Max	Unit
PACKAGE DIMENSIONS				
A	0.70	0.75	0.80	mm
A1	---	0.02	0.05	mm
b	0.20	0.25	0.30	mm
b2	0.15	0.20	0.25	mm
c	0.18	0.20	0.25	mm
D	2.90	3.00	3.10	mm
D2 (Exposed.pad)	1.55	1.65	1.75	mm
e	0.50 BSC			mm
Ne	1.00 BSC			mm
Nd	1.00 BSC			mm
E	2.90	3.00	3.10	mm
E2 (Exposed.pad)	1.55	1.65	1.75	mm
L	0.35	0.40	0.45	mm
h	0.20	0.25	0.30	mm

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Data	Version	Changes
18-May-2026	Ver1.0	First issue Spec