多模式电荷泵的压电探测器驱动器

特 性

- 电源电压范围为 1.3V ~ 5.5V
- 3V 电源可驱动 $18V_{PP}$ 电压输出
- 集成升压转换器可产生高达 16.5V 的电压
- 输入信号范围：20Hz to 10kHz
- 待机模式下无电压交叉输出
- 低电流消耗
- 自动待机和唤醒控制
- 可提供 QFN16 和 QFN12 封装
- 短路保护电流约 100mA
- 具有过温保护

应 用

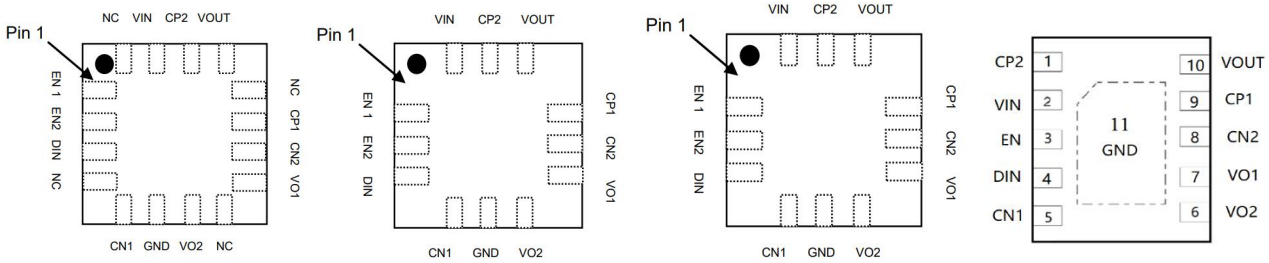
- 健康医疗系统
- 智能家居
- 智能穿戴手表
- 手持 GPS 设备
- PDA
- 安全设备
- 闹钟
- 蓝牙防丢器

描 述

SD116 是一种用于压电测深仪的具有多模式电荷泵的开关驱动器。它可以从 1.3V 电源驱动高达 $18V_{pp}$ 的输出。为了调节压电发声器的音量，电荷泵可以在 1x、2x 或 3x 模式中操作。由于 SD116 具有待机功能，因此适用于电池应用。

SD116 包括内置的自动待机和唤醒功能，可保证更长的电池寿命。SD116 具有过热保护和输出短路保护电路

封装 (QFN16 和 QFN12)



QFN3*3_16　　QFN3*3_12　　QFN2*2_12　　DFN2*2_10

包装信息

型号	封装类型	包装数量	工作温度(° C)	丝印
SD116	QFN16	7000	-40~85	SD116 XXX
SD116	QFN12	5000	-40~85	SD116 XXX
SD116	DFN10	3000	-40~85	SD116 XXX
SD116	QFN2*2	3000	-40~85	SD116 XXX

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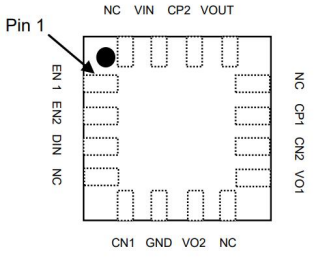
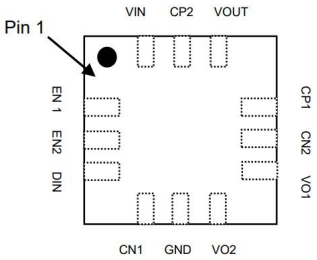
丝印描述(QFN3*3_12)

第一行	SD116	Part Number
第二行	AXXX E.g A503	A 代表芯片厚度 0.75mm，xxx 的第一个 x 代表年份，最后两个 xx 代表周数；例如：A503 代表厚度 0.75mm，生产于 2025 年第三周。。
	PXXX E.g P503	P 代表 0.50mm 的芯片厚度，xxx 的第一个 x 代表年份，最后两个 xx 代表周数；例如：P503 代表厚度 0.50mm，2025 年第三周生产。

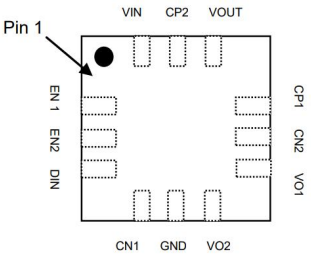
脚位图



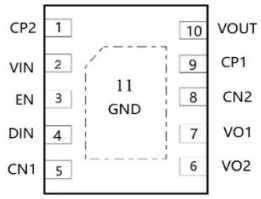
QFN3*3_16



QFN3*3_12



QFN2*2_12



DFN2*2_10

PIN 定义

Pin Number				Pin Name	Type	Function
QFN3*3_16	QFN3*3_12	QFN2*2_12	DFN2*2_10			
1	1	1	3	EN1	I	Charge pump mode select 1
2	2	2		EN2	I	Charge pump mode select 2
3	3	3	4	DIN	I	Signal Input
4				NC	—	No Connection
5	4	4	5	CN1	I	Capacitor 1 Negative Terminal
6	5	5		GND	P	Ground
7	6	6	6	VO2	O	Positive Output
8				NC	—	No Connection
9	7	7	7	VO1	O	Negative Output
10	8	8	8	CN2	I	Capacitor 2 Negative Terminal
11	9	9	9	CP1	I	Capacitor 1 Positive Terminal
12				NC	—	No Connection
13	10	10	10	VOUT	O	Boost Output
14	11	11	1	CP2	I	Capacitor 2 Positive Terminal
15	12	12	2	VIN	P	Power supply

16				NC	—	No Connection

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

最大额定参数 (注 1)

(@ T_A = +25°C, 除非另有说明)

符号	功能	额定值	单位
VIN	电源电压	-0.3 to 6.0	V
VOUT	输出电压	-0.3 to 16.5	V
VEN1	EN1 电压	-0.3 to V_{IN} +0.3	V
TA	自然冷却下的工作温度	-40 to +85	°C
T_J	半导体裸片的工作温度	-40 to +150	°C
TSTG	储存温度范围	-65 to +150	°C
ESD Rating	Human Body Model	+/-3	kV

注意:1.超出绝对最大额定值的应力可能会对设备造成永久性损害。我们不建议设备在超出建议的操作条件和其他任何条件下运行。长时间在绝对最大额定条件下可能会影响设备的可靠性。

建议的工作条件

(@ T_A = +25°C, 除非另有说明)

符号	功能	条件	最小值	最大值	单位
VIN	Supply Voltage	1x Mode, 2x Mode,3x Mode	1.3	5.5	V

热力特性

参数	符号	封装	最大值	单位
热阻(与环境的连接)	θ_{JA}	QFN16	35	°C/W
热阻(结到外壳)	θ_{JC}	QFN16	14	°C/W
热阻(与环境的连接)	θ_{JA}	QFN12L	68	°C/W
热阻(结到外壳)	θ_{JC}	QFN12L	25	°C/W
热阻(与环境的连接)	θ_{JA}	DFN2*2_10	68	°C/W
热阻(结到外壳)	θ_{JC}	DFN2*2_10	25	°C/W
热阻(与环境的连接)	θJA	QFN2*2_10	68	°C/W
热阻(结到外壳)	θJC	QFN2*2_10	25	°C/W

电气特性 (@T_A = +25°C, V_{IN} = 3.0V, C_{PIEZO} = 30NF, F_{DIN} = 4 KHZ, 除非另有说明)

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_{PIEZO} = No Load	—	105	—	μA
	IDD12	2x Mode, C_{PIEZO} = No Load	—	249	—	μA
	IDD13	3x Mode, C_{PIEZO} = 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	—	8	20	nA
Input Frequency	fIN	Rectangular pulse	—	3	—	kHz
Oscillating Frequency	f_{OSC}	—	—	200	—	kHz
VOUT Start Delay Time	t_{ON1}	1x Mode, From DIN signal High to 90% V_{OUT} steady state	—	95	—	μs
	t_{ON2}	2x Mode, From DIN signal High to 90% V_{OUT} steady state	—	310	—	μs
	t_{ON3}	3 x Mode From DIN signal High to 90% V_{OUT} steady state	—	390	—	μs
Shutdown Delay Time	t_{OFF}	DIN = H- > L	—	42	—	ms
Output Short-Circuit Current	ISC	—	—	40	—	mA
Control Terminal Voltage H	VIH	EN1, EN2, DIN pins	0.8*V_{IN}	—	VIN	V
Control Terminal Voltage L	VIL	EN1, EN2,DIN pins	0	—	0.2*V_{IN}	V
Control Terminal Current 1	IIH1	DIN = 3V	—	1.7	—	μA
Control Terminal Current 2	IIH2	V_{EN1} = 3V, DIN = 3V	—	1.7	—	μA
Control Terminal Current 3	IIH3	V_{EN1} = 3V, DIN = 0V	—	—	1	μA

电荷泵模式设置

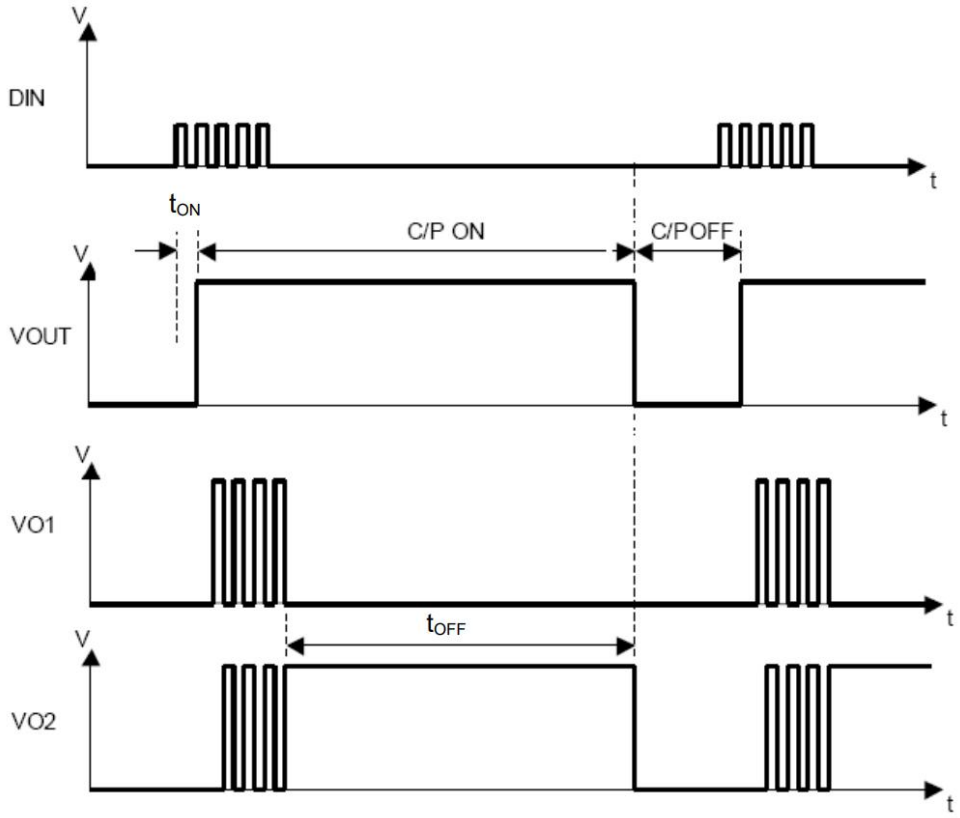
QFN3*3_12/QFN3*3_16 MODE SETTING

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

DFN2*2 MODE SETTING

DIN	EN	MODE
0	--	Shunt down Mode
1	0	2x mode
1	1	3x mode

时序图



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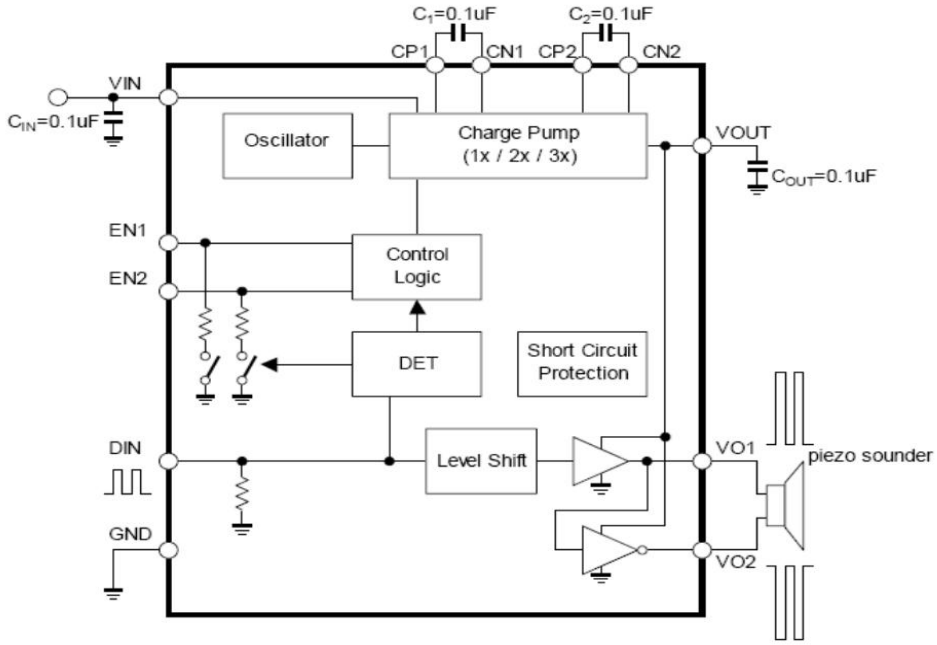
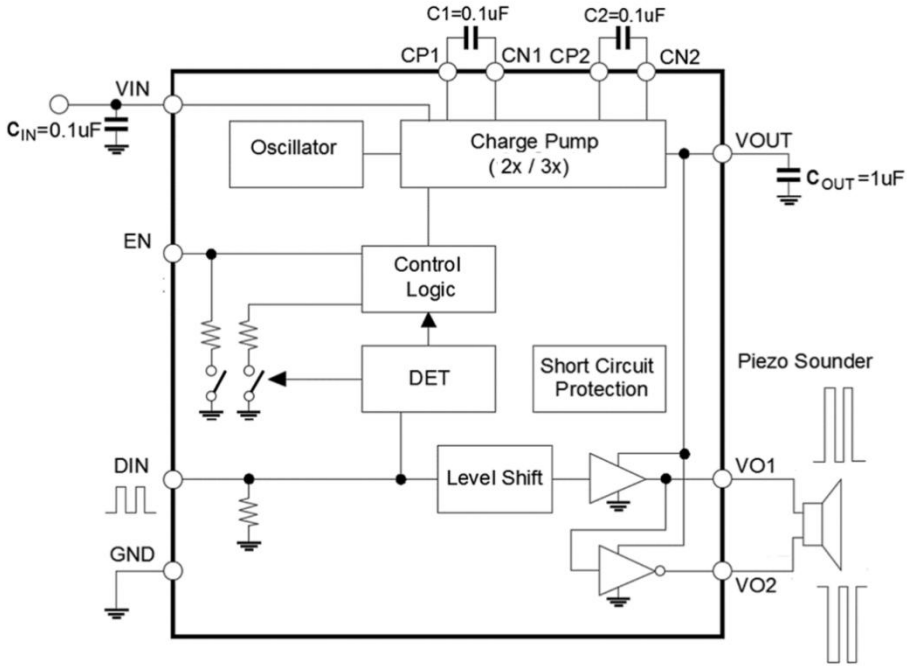
应用电路



QFN3*3_12/QFN3*3_16 Application

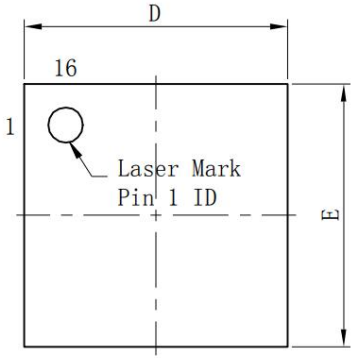


DFN2*2_10 Application

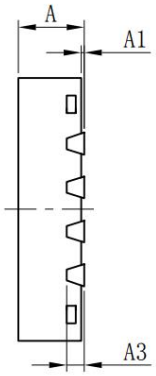
多模式电荷泵的压电探测器驱动器

封装信息(QFN3*3_16)

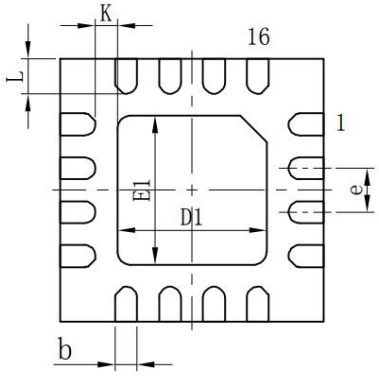
尺寸 / 标注	最小	标准	最大	尺寸 / 标注	最小	标准	最大
A	0.70	0.75	0.80	D1	1.60	1.70	1.80
A1	0.00	—	0.05	E1	1.60	1.70	1.80
A3	0.203REF			e	0.50TYP		
b	0.20	0.25	0.30	K	0.20	-	-
D	2.90	3.00	3.10	L	0.30	0.40	0.50
E	2.90	3.00	3.10				



Top View



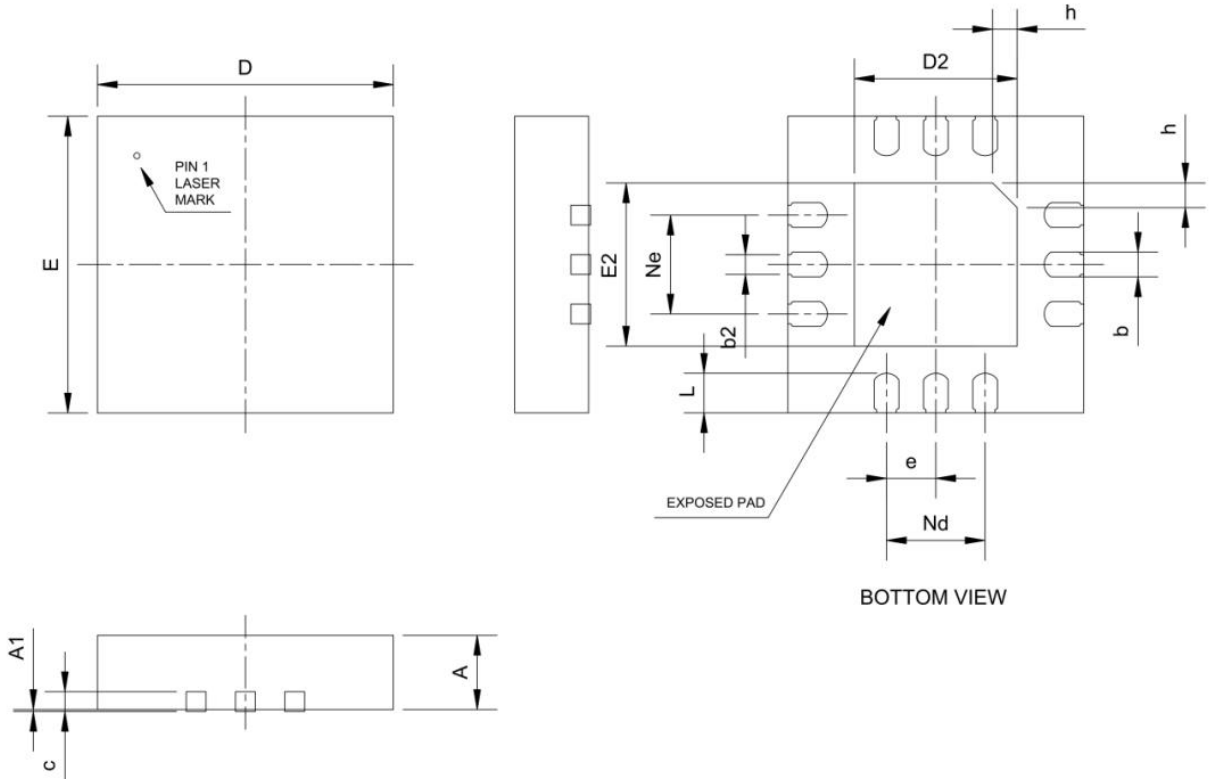
Side View



Bottom View

多模式电荷泵的压电探测器驱动器

封装信息(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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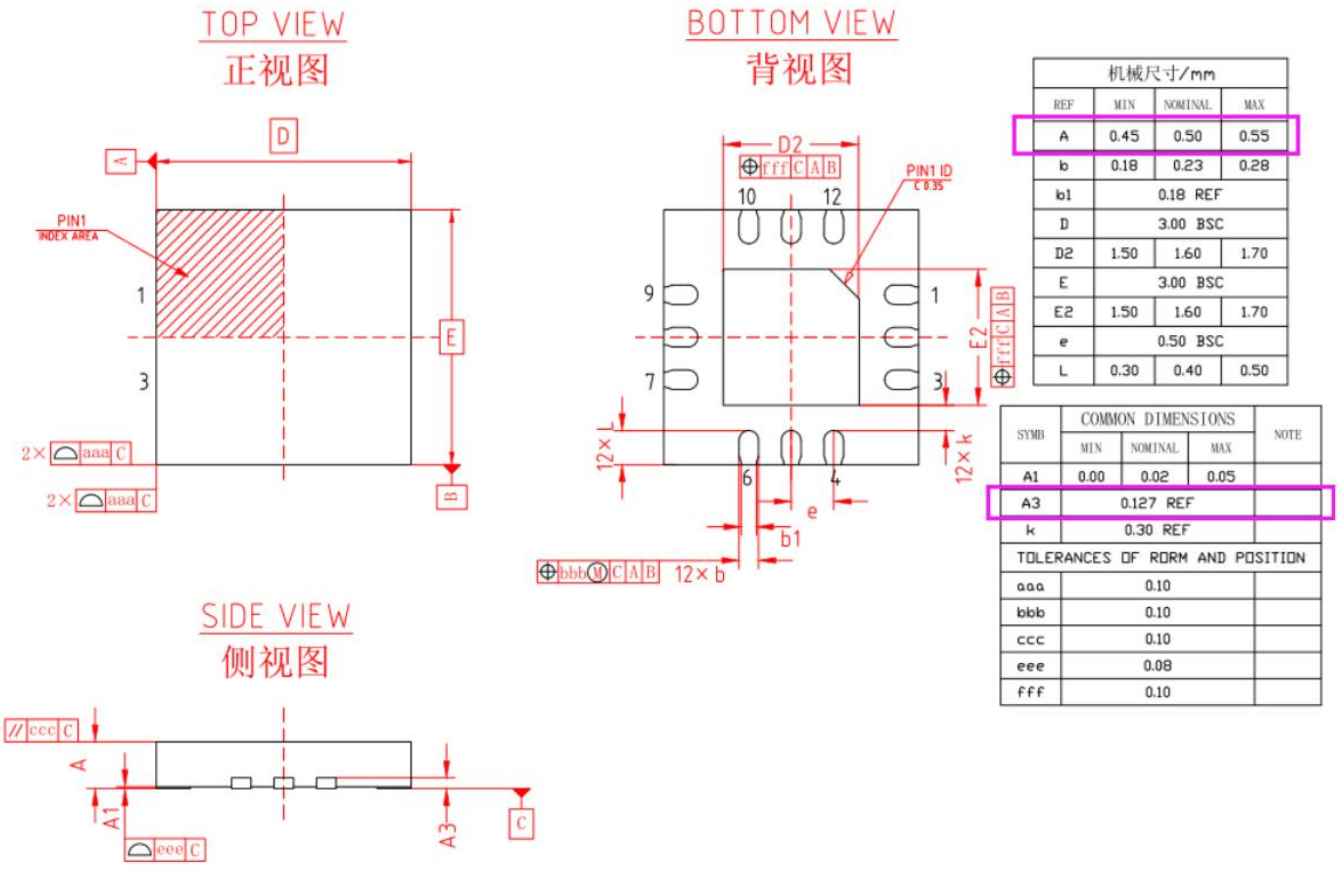
封装信息(QFN3*3_12)

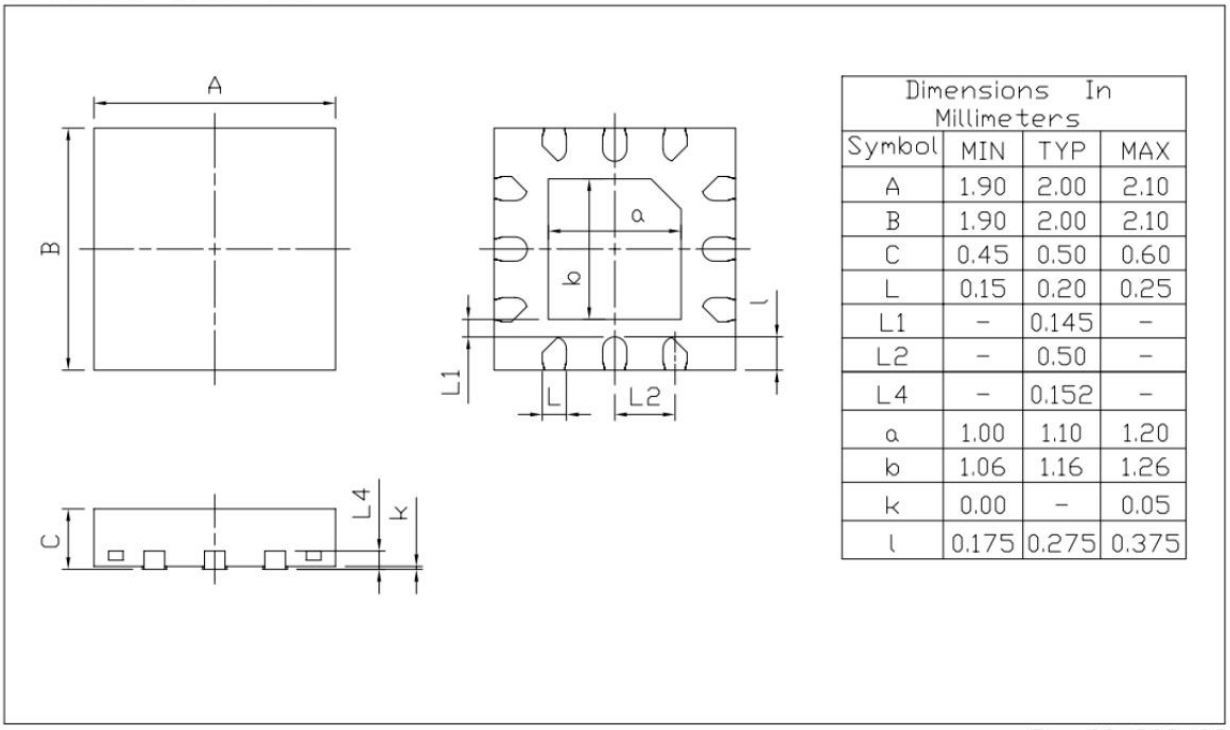


机械尺寸/mm			
REF	MIN	NOMINAL	MAX
A	0.45	0.50	0.55
b	0.18	0.23	0.28
b1		0.18 REF	
D		3.00 BSC	
D2	1.50	1.60	1.70
E		3.00 BSC	
E2	1.50	1.60	1.70
e		0.50 BSC	
L	0.30	0.40	0.50

SYMB	COMMON DIMENSIONS			NOTE
	MIN	NOMINAL	MAX	
A1	0.00	0.02	0.05	
A3		0.127 REF		
k		0.30 REF		
TOLERANCES OF RORM AND POSITION				
aaa		0.10		
bbb		0.10		
ccc		0.10		
eee		0.08		
fff		0.10		

PACKAGE INFORMATION(QFN2*2_12)

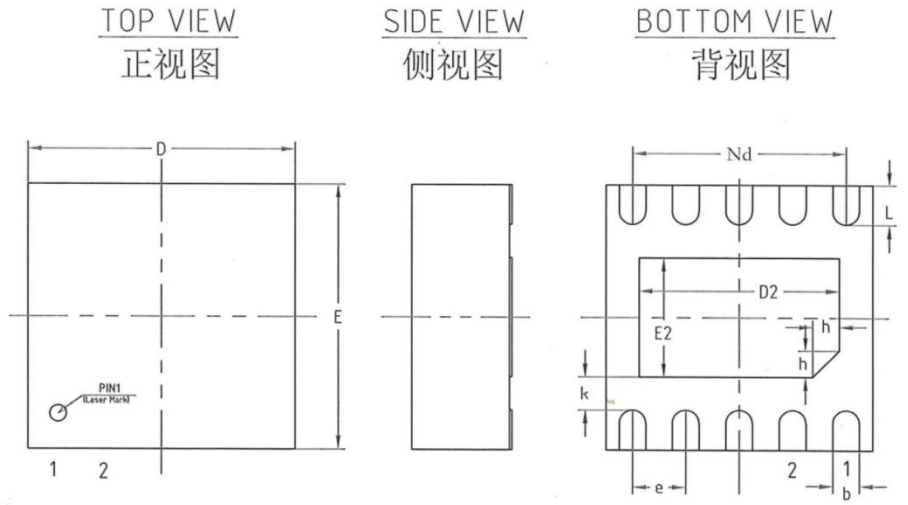
QFN2X2-12L-0.5 Unit:mm



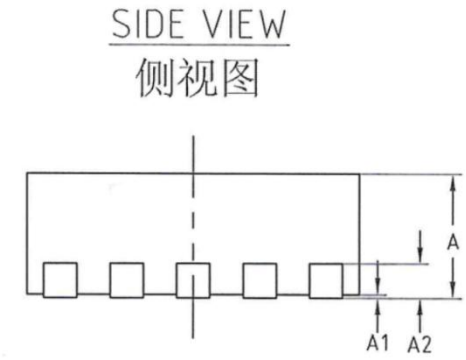
Dimensions In Millimeters			
Symbol	MIN	TYP	MAX
A	1.90	2.00	2.10
B	1.90	2.00	2.10
C	0.45	0.50	0.60
L	0.15	0.20	0.25
L1	-	0.145	-
L2	-	0.50	-
L4	-	0.152	-
a	1.00	1.10	1.20
b	1.06	1.16	1.26
k	0.00	-	0.05
l	0.175	0.275	0.375

Rev.00 202409

PACKAGE INFORMATION(DFN2*2_10)



机械尺寸/mm			
字符 SYMBOL	最小值 MIN	典型值 NOMINAL	最大值 MAX
A	0.70	0.75	0.80
A1	-	0.02	0.05
A2	0.203 REF		
b	0.15	0.20	0.25
D	1.90	2.00	2.10
D2	1.45	1.50	1.55
E	1.90	2.00	2.10
E2	0.85	0.90	0.95
e	0.40 BSC		
K	0.20	0.25	0.30
L	0.25	0.30	0.35
h	0.15	0.20	0.25
Nd	1.60 BSC		



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REVISION HISTORY

Document revision history

Data	Version	Changes
26-Aug-2018	Ver1.0	First issue
17-Mar-2025	Ver1.9	Update the I_{SD} current
16-Jul-2025	Ver2.0	Add the DFN package information
2-Aug-2025	Ver2.1	Update QFN12 package information
14-Aug-2025	Ver2.2	Add the QFN2*2 package information