

1. 特性

- 低偏置电压: $\pm 100\mu\text{V}$ (max)
- 低偏置电压温漂: $0.6\mu\text{V}/^\circ\text{C}$ (typ)
- 低噪声: $14.8\text{nV}/\sqrt{\text{Hz}}$
- 共模抑制比: 146dB (Typ)
- 支持轨到轨输入/输出
- 单位增益稳定
- 输入电压范围支持负电源轨
- 增益带宽: 2.5MHz
- 低静态电流: $550\mu\text{A}$
- 滤波输入集成 RFI
- 支持 1 通道或者 2 通道

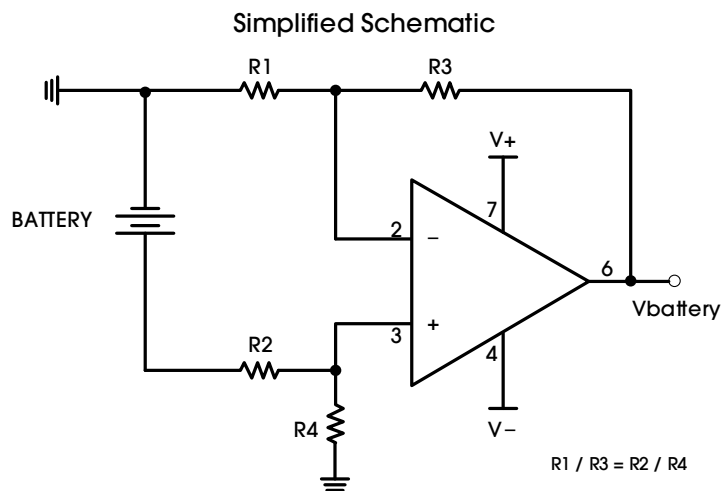
2. 应用

- 电池测试设备
- 商用电源
- 换能放大器
- 温度测试设备
- 功率模块跟随器
- 应变计

3. 说明

OPA305 是一款 36V 高性能支持轨到轨输入输出的运算放大器, 其具有常温下 $100\mu\text{V}(\text{max})$ 的极低输入失调电压和 146dB 的高 CMRR。在配置为差分放大器时可提供出色的初始精度和轨到轨输出。该产品适用于单电源供电的便携式设备等应用中。

OPA305 具备 2.5MHz 的带宽, 配合出色的直流性能, 使得 OPA305 非常适用于有源滤波器电路。此外, OPA305 具备很好的稳定性, 在 $\text{Gain} = 1$ 时, 最大可以驱动 600pF 的容性负载。OPA305 适用于多样化的电路, 并提供小外形封装以减少 PCB 使用面积, 降低设计成本。OPA305 封装类型包括: SOT23-5, MSOP-8 和 SOIC-8, 其中 OPA3052 为 2 通道版本, 封装为 SOIC-8, MSOP-8 和 TSSOP-8。所有版本的额定温度范围为 -40°C 至 $+125^\circ\text{C}$ 。有关订购信息, 请参见表 1。.



OPA305/OPA3052

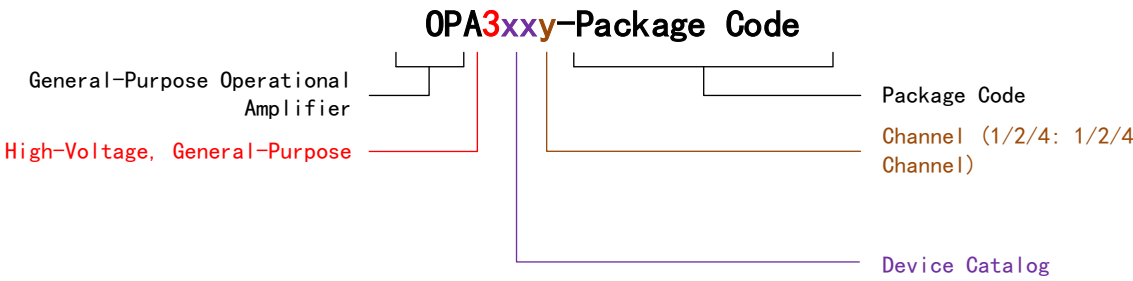
36V 高性能通用运算放大器

Table 1. Order Information

ORDER NUMBER (See Note 1)	PART NUMBER	CH (#)	PACKAGE	MARKING INFO.	I _Q PER CH (TYP) (μA)	GBW (MHz)	SLEW RATE (TYP) (V/μs)	OPERATING TEMP (°C)	PACKAGE OPTION
OPA305ASOIC8	OPA305	1	SOIC-8	OPA305	550	2.5	1.6	-40-125	T/R-4000
OPA305ASOT235	OPA305	1	SOT23-5	OPA305				-40-125	T/R-3000
OPA305AMSOP8	OPA305	1	MSOP-8	OPA305				-40-125	T/R-4000
OPA3052ASOIC8	OPA3052	2	SOIC-8	OPA3052				-40-125	T/R-4000
OPA3052AMSOP8	OPA3052	2	MSOP-8	OPA3052				-40-125	T/R-4000
OPA3052ATSSOP8	OPA3052	2	TSSOP-8	OPA3052				-40-125	T/R-4000

Note 1:

Order Info.



4. PIN CONFIGURATION AND FUNCTIONS

Figure 1 illustrates the pin configuration of the 1 CH devices.

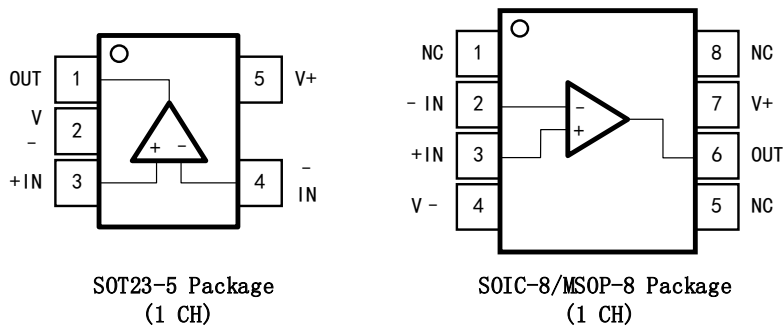


Figure 1. Pin Configuration (1 CH Devices)

Table 2 lists the pin functions of the 1 CH devices.

Table 2. Pin Functions (1 CH Devices)

PIN	POSITION		TYPE	DESCRIPTION
	SOT23-5	SOIC-8		
OUT	1	6	O	Output
V-	2	4	PWR	Negative (lowest) power supply
+IN	3	3	I	Positive (non-inverting) input
-IN	4	2	I	Negative (inverting) input
V+	5	7	PWR	Positive (highest) power supply
NC	—	1, 5, 8	I/O	No internal connection (can be left floating)

Figure 2 illustrates the pin configuration of the 2 CH devices.

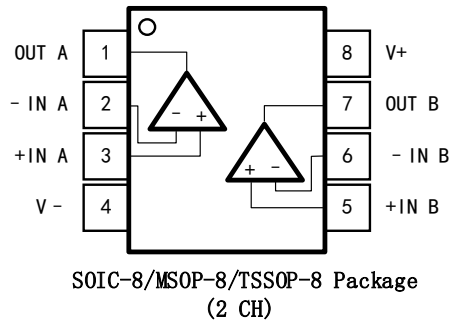


Figure 2. Pin Configuration (2 CH Devices)

Table 3 lists the pin functions of the 2 CH devices.

Table 3. Pin Functions (2 CH Devices)

PIN	POSITION	TYPE	DESCRIPTION
OUT A	1	O	Output, channel A
-IN A	2	I	Inverting input, channel A
+IN A	3	I	Non-inverting input, channel A
V-	4	PWR	Negative (lowest) power supply
+IN B	5	I	Non-inverting input, channel B
-IN B	6	I	Inverting input, channel B
OUT B	7	O	Output, channel B
V+	8	PWR	Positive (highest) power supply

5. SPECIFICATIONS

5.1 ABSOLUTE MAXIMUM RATINGS

Table 4 lists the absolute maximum ratings of the OPA305 family. Over operating free-air temperature range, unless otherwise noted (see Note 1 under Table 4).

Table 4. Absolute Maximum Ratings

PARAMETER	DESCRIPTION		MIN	MAX	UNITS
Voltage	Supply	Split supply	± 0	± 20	V
		Single supply	0	40	
	Signal input pins	Common-mode	$(V-) - 0.5$	$(V+) + 0.5$	
		Differential		± 6	
Current	Signal input pins			± 10	mA
	Output short-circuit (see Note 2 under Table 4)		Continuous		
Temperature	Operating, T_A		-40	125	°C
	Junction, T_J			150	
	Storage, T_{stg}		-65	150	

Note 1: Stresses beyond those listed under Table 4 may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Table 6. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

Note 2: Short-circuit to ground, one amplifier per package.

5.2 ESD RATINGS

Table 5 lists the ESD ratings of the OPA305 family.

Table 5. ESD Ratings

PARAMETER	SYMBOL	DESCRIPTION	VALUE	UNITS
Electrostatic Discharge	V _(ESD)	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 (see Note 1 under Table 5)	±2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101 (see Note 2 under Table 5)	±1000	

Note 1: JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process.

Note 2: JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process.

5.3 RECOMMENDED OPERATING CONDITIONS

Table 6 lists the recommended operating conditions for the OPA305 family. Over operating free-air temperature range, unless otherwise noted.

Table 6. Recommended Operating Conditions

PARAMETER	DESCRIPTION	MIN	NOM	MAX	UNITS
Operating Voltage Range	Split supply	±1.35		±18	V
	Single supply	2.7		36	V
Specified Temperature Range		−40		125	°C

5.4 ELECTRICAL CHARACTERISTICS

Table 7 lists the electrical characteristics of the OPA305. $T_A = 25^\circ\text{C}$, $V_S = 36\text{V}$, $V_{CM} = V_{OUT} = V_S/2$, and $R_{LOAD} = 10\text{k}\Omega$ connected to $V_S/2$, unless otherwise noted.

Table 7. Electrical Characteristics

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
OFFSET VOLTAGE						
Input Offset Voltage	V _{OS}	V _S = 36V, T _A = 25°C		±5	±100	μV
Offset Voltage Drift		T _A = -40°C to +125°C		±0.6	±4	μV/°C
V _S Power Supply	PSRR	V _S = 5V to 36V, T _A = -40°C to +125°C		0.15	±4.3	μV/V
INPUT BIAS CURRENT						
Input Bias Current	I _B			1.5		pA
Over Temperature		T _A = -40°C to +125°C			7.8	nA
Input Offset Current	I _{OS}			6		pA
Over Temperature		T _A = -40°C to +125°C			1.5	nA
NOISE						
Input Voltage Noise		f = 0.1Hz to 10Hz		4.5		μVPP
Input Voltage Noise Density	e _n	f = 100Hz		27.4		nV/√Hz
		f = 1kHz		17		nV/√Hz
INPUT VOLTAGE						
Common-Mode Voltage Range (See Note under Table 7)	V _{CM}		(V-)		(V+)	V
Common-Mode Rejection Ratio	CMRR	V _S = ±18V, (V-) V < V _{CM} < (V+) - 2.5V, T _A = -40°C to +125°C	108	146		dB
INPUT IMPEDANCE						
Differential				100 3		MΩ pF
Common-Mode				6 3		10 ¹² Ω pF
OPEN-LOOP GAIN						
Open-Loop Voltage Gain	A _{OL}	(V-) < V _O < (V+), T _A = -40°C to +125°C	129	130		dB
FREQUENCY RESPONSE						
Gain Bandwidth Product	GBP			2.5		MHz
Slew Rate	SR	G = 1		1.6		V/μs
Settling Time	t _s	To 0.1%, V _S = ±18V, G = 1, 10V step		7		μs
		To 0.01% (12bit), V _S = ±18V, G = 1, 10V step		13		μs
Overload Recovery Time		V _{IN} × gain > V _S		1		μs
OUTPUT						
Voltage Output Swing from Rail	V _O	V _S =36V, R _L = 10kΩ		10		mV
Over Temperature		R _L = 10kΩ, A _{OL} ≥ 110dB, T _A = -40°C to +125°C	V-		V+	V
Short-Circuit Current	I _{SC}			±25		mA
Capacitive Load Drive	C _{LOAD}			600		pF

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PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Open-Loop Output Resistance	R_o	$f = 1\text{MHz}$, $I_o = 0\text{A}$		150		Ω

POWER SUPPLY

Specified Voltage Range	V_s		2.7		36	V
Quiescent Current per Amplifier	I_Q	$I_o = 0\text{A}$		550	650	μA
Over Temperature		$I_o = 0\text{A}$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			750	μA

TEMPERATURE

Operating Range			-40		125	$^\circ\text{C}$
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Note: The input range can be extended beyond $(V+) - 2\text{V}$ up to $V+$.

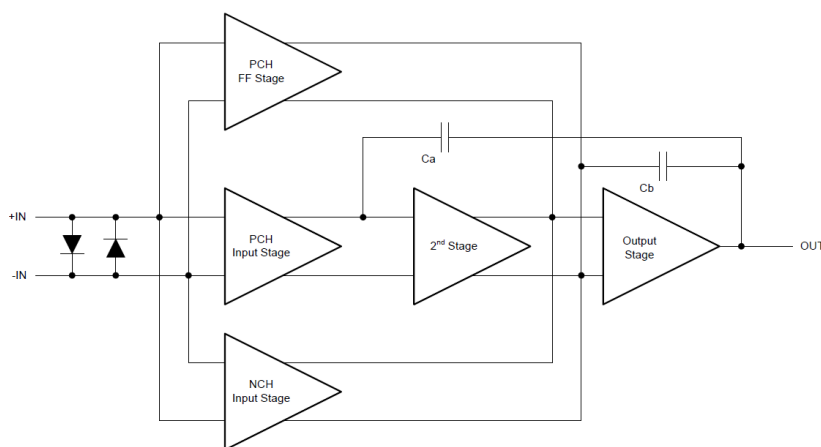
6. 详细说明

6.1 概述

OPA305 是一款 36V 高性能支持轨到轨输入输出的运算放大器，其具有常温下 $100\mu\text{V}(\text{max})$ 的极低输入失调电压和 146dB 的高 CMRR。在配置为差分放大器时可提供出色的初始精度和轨到轨输出。该产品适用于单电源供电的便携式设备等应用中。

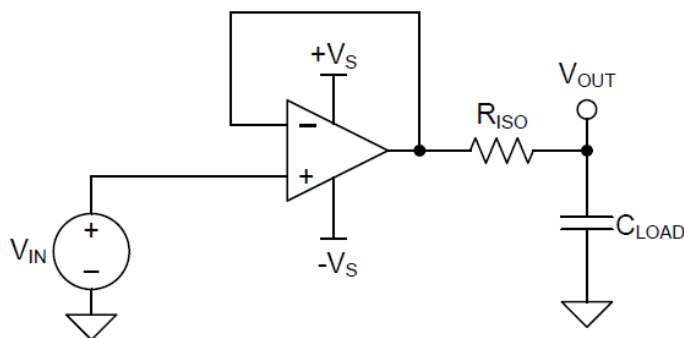
6.2 功能模块框图

OPA305 功能框图如下图所示：



6.3 典型应用

OPA305典型应用如下图所示，具体场景包括驱动容性负载，例如MOSFET栅极，参数的缓冲或者线束的屏蔽。通常其在电路中配置为单位增益。输入 R_{ISO} 电阻可以帮助实现环路的稳定：



7. 电源供电推荐

OPA305 工作电压为 2.7V 到 36V，温度范围为 $-40 - 125^\circ\text{C}$ 。建议电源供电端介入一个 100nF 以上的去耦电容，并且该电容建议尽量靠近芯片供电引脚。

8. 布局

针对布局布线建议，请联系类比半导体技术支持获取详细信息。

9. PACKAGE INFORMATION

The OPA305 family is available in the SOT23-5, SOIC-8, and TSSOP-14 packages.

9.1 SOT23-5 PACKAGE

Figure 3 shows the SOT23-5 package view.

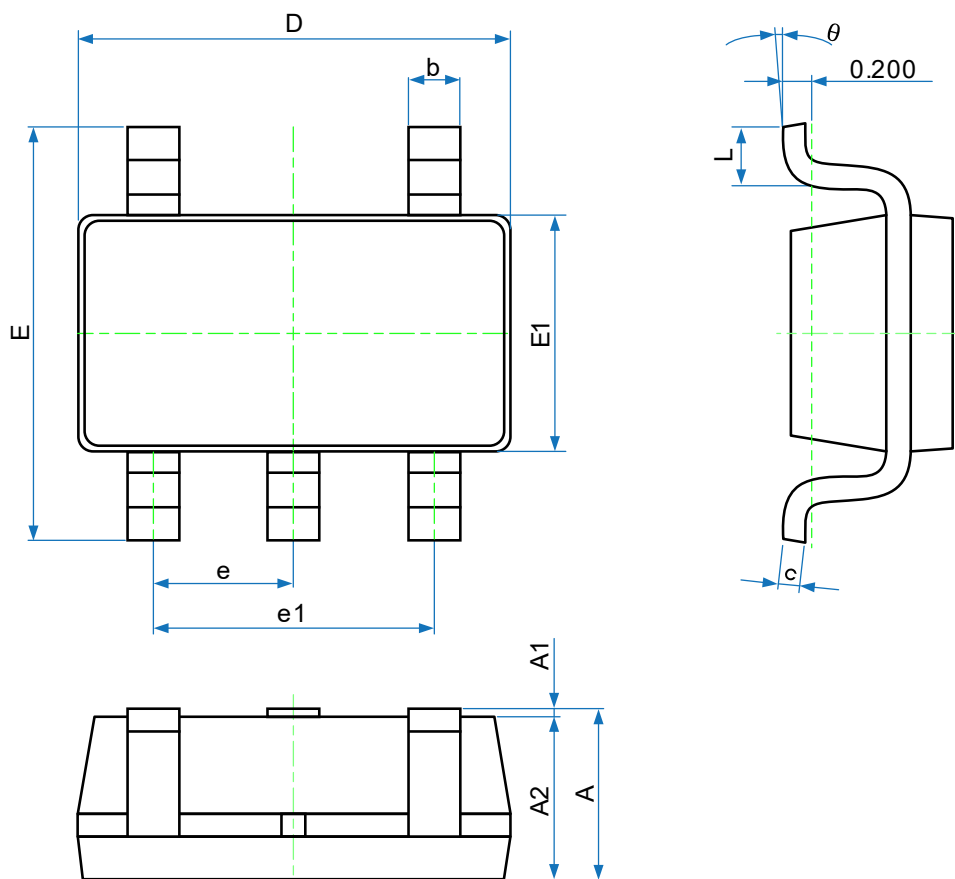


Figure 3. SOT23-5 Package View

Table 8 provides detailed information about the dimensions of the SOT23-5 package.

Table 8. Dimensions of the SOT23-5 Package

SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCHES	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.650	2.950	0.104	0.116
E1	1.500	1.700	0.059	0.067
e	0.950 (BSC)		0.037 (BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

9.2 SOIC-8 PACKAGE

Figure 4 shows the SOIC-8 package view.

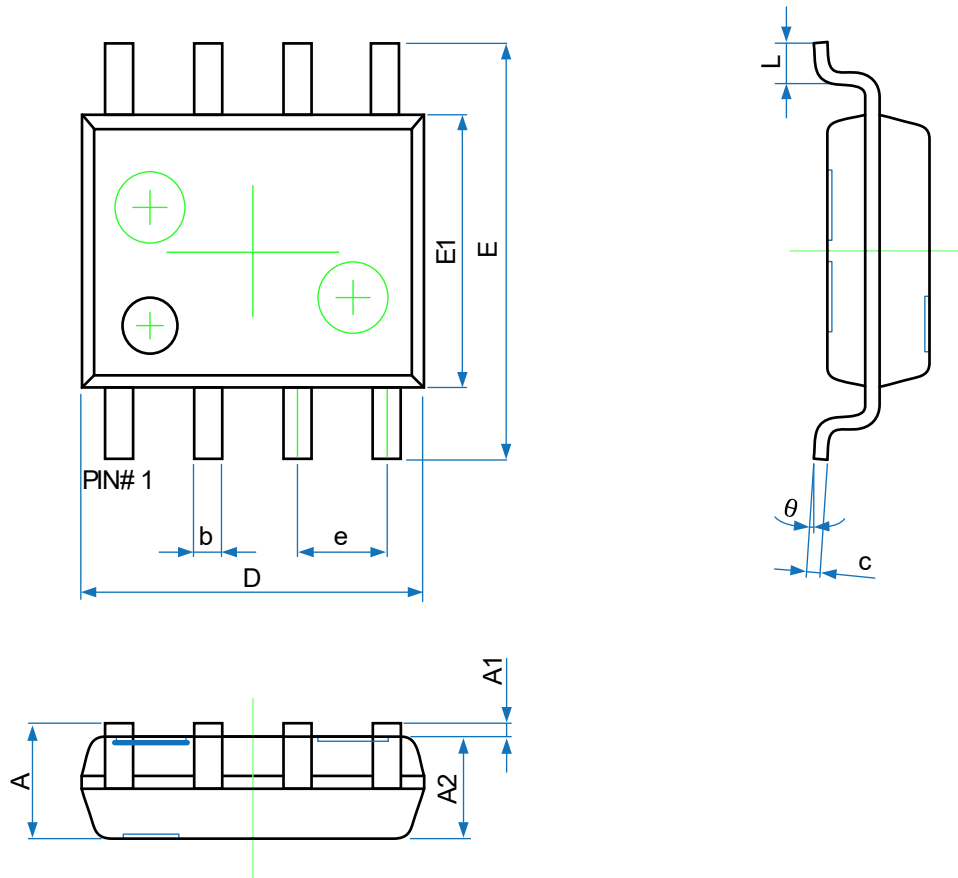


Figure 4. SOIC-8 Package View

Table 9 provides detailed information about the dimensions of the SOIC-8 package.

Table 9. Dimensions of the SOIC-8 Package

SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCHES	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
theta	0°	8°	0°	8°

9.3 MSOP-8 PACKAGE

Figure 5 shows the MSOP-8 package view.

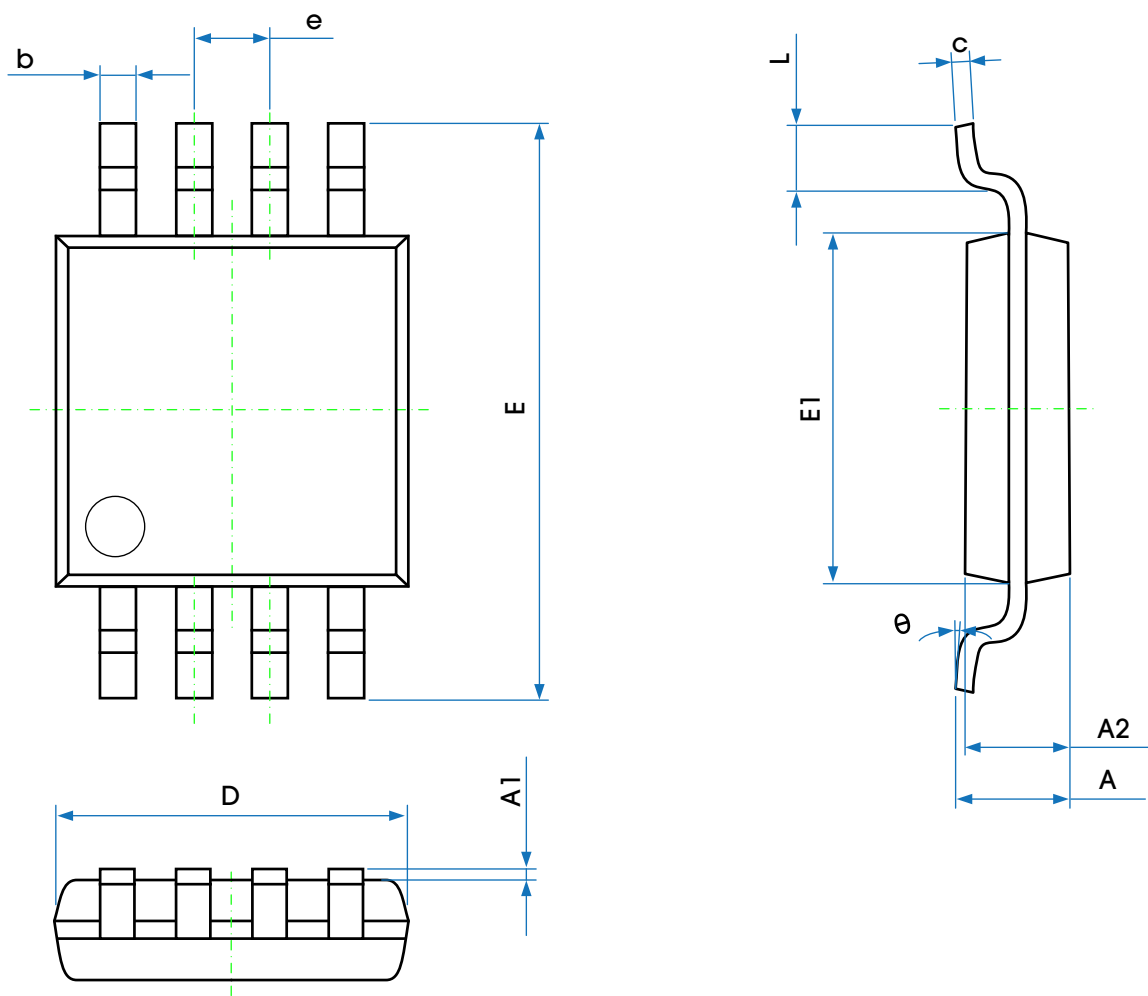


Figure 5. MSOP-8 Package View

Table 10 provides detailed information about the dimensions of the MSOP-8 package.

Table 10. Dimensions of the MSOP-8 Package

SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCHES	
	MIN	MAX	MIN	MAX
A	—	1.100	—	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650 (BSC)		0.026 (BSC)	
E	4.750	5.050	0.187	0.199
E1	2.900	3.100	0.114	0.122
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

9.4 TSSOP-8 PACKAGE

Figure 6 shows the TSSOP-8 package view.

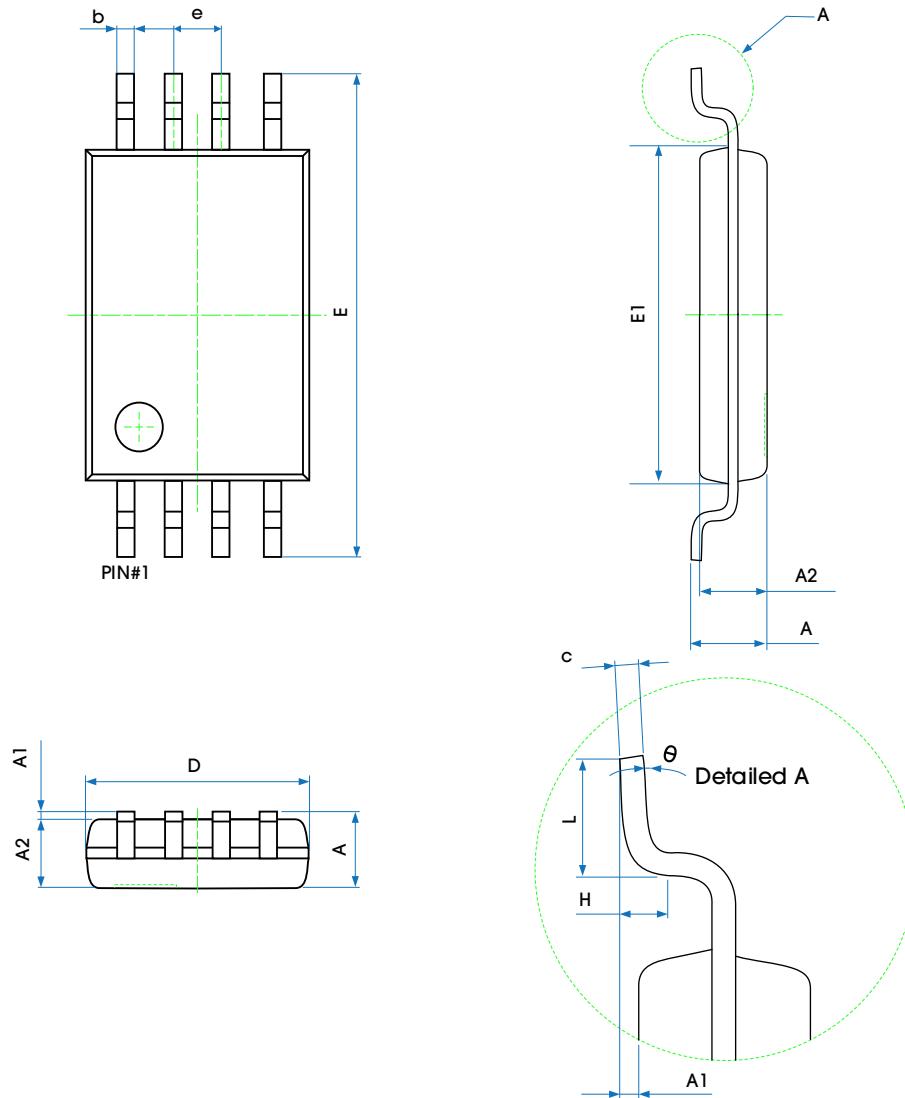


Figure 6. TSSOP-8 Package View

Table 11 provides detailed information about the dimensions of the TSSOP-8 package.

Table 11. Dimensions of the TSSOP-8 Package

SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCHES	
	MIN	MAX	MIN	MAX
A	—	1.200	—	0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	2.900	3.100	0.114	0.122
E	6.250	6.550	0.246	0.258
E1	4.300	4.500	0.169	0.177

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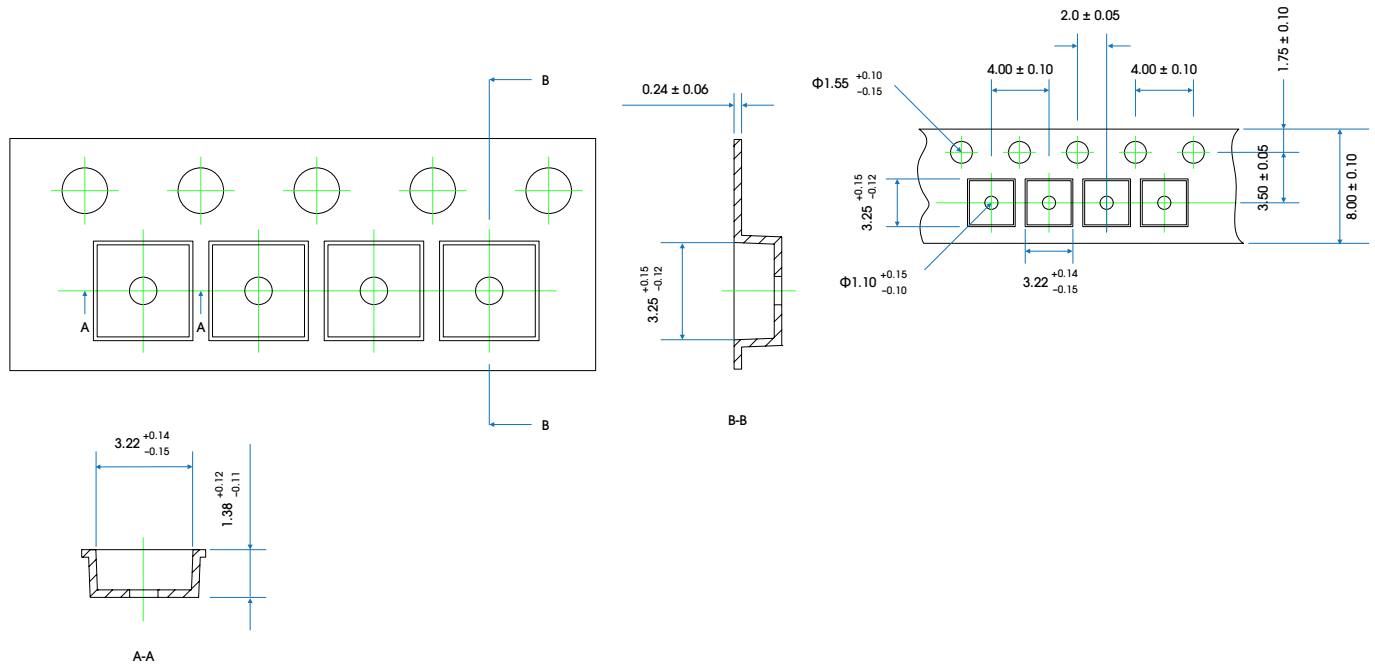
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e	0.650 (BSC)		0.026 (BSC)	
L	0.500	0.700	0.020	0.028
H	0.250 (TYP)		0.010 (TYP)	
θ	1°	7°	1°	7°

10. TAPE AND REEL INFORMATION

10.1 SOT23-5 PACKAGE

Figure 7 illustrates the carrier tape.



- Notes:
1. Cover tape width: 5.5 ± 0.10 .
 2. Cumulative tolerance of 10 sprocket hole pitch: ± 0.20 (max).
 3. Camber: not to exceed 2mm in 250mm.
 4. Mold#: SOT23-5.
 5. All dimensions: mm.
 6. Direction of view:

Figure 7. Carrier Tape Drawing

Table 12 provides information about tape and reel.

Table 12. Tape and Reel Information

PACKAGE TYPE	REEL	QTY/REEL	REEL/ INNER BOX	INNER BOX/ CARTON	QTY/CARTON	INNER BOX SIZE (mm)	CARTON SIZE (mm)
SOT23-5	7"	3000	10	4	120000	210*210*210	440*440*230

Figure 12 shows the product loading orientation—pin 1 is assigned at Q3.

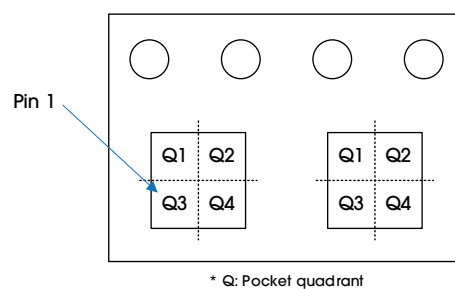
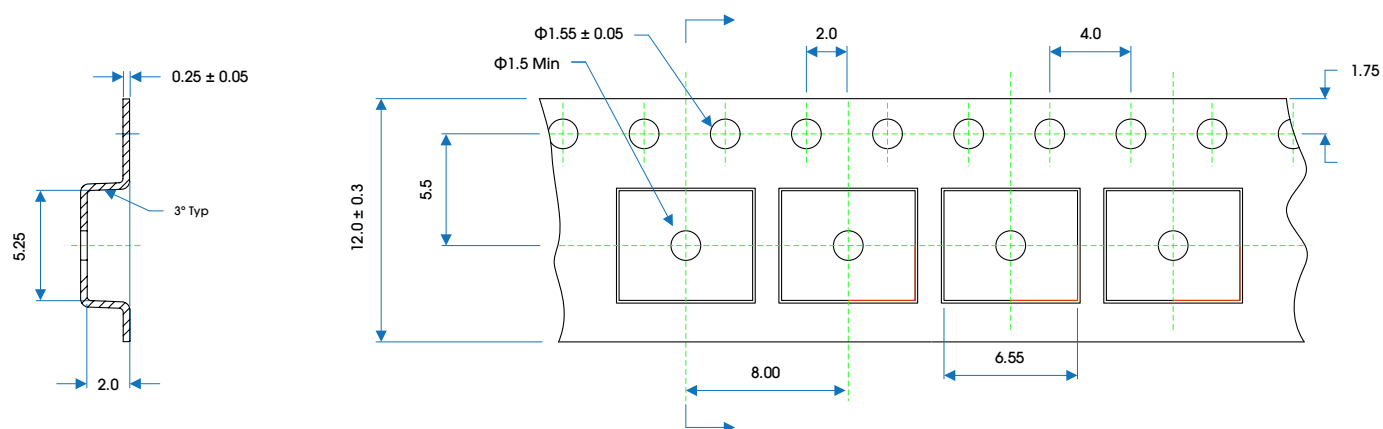


Figure 8. Product Loading Orientation

10.2 SOIC-8 PACKAGE

Figure 9 illustrates the carrier tape.



Notes:

1. Cover tape width: 9.5 ± 0.10 .
2. Cumulative tolerance of 10 sprocket hole pitch: ± 0.20 (max).
3. Camber: not to exceed 1mm in 100mm.
4. Mold#: SOIC-8.
5. All dimensions: mm.
6. Direction of view:

Figure 9. Carrier Tape Drawing

Table 13 provides information about tape and reel.

Table 13. Tape and Reel Information

PACKAGE TYPE	REEL	QTY/REEL	REEL/ INNER BOX	INNER BOX/ CARTON	QTY/CARTON	INNER BOX SIZE (mm)	CARTON SIZE (mm)
SOIC-8	13"	4000	1	8	32000	365*340*36	390*330*360

Figure 10 shows the product loading orientation—pin 1 is assigned at Q1.

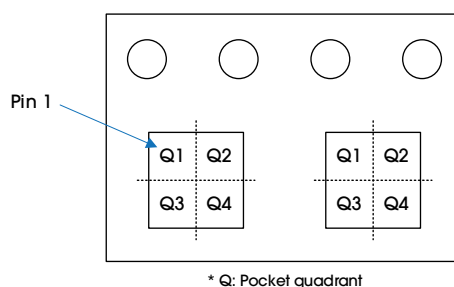
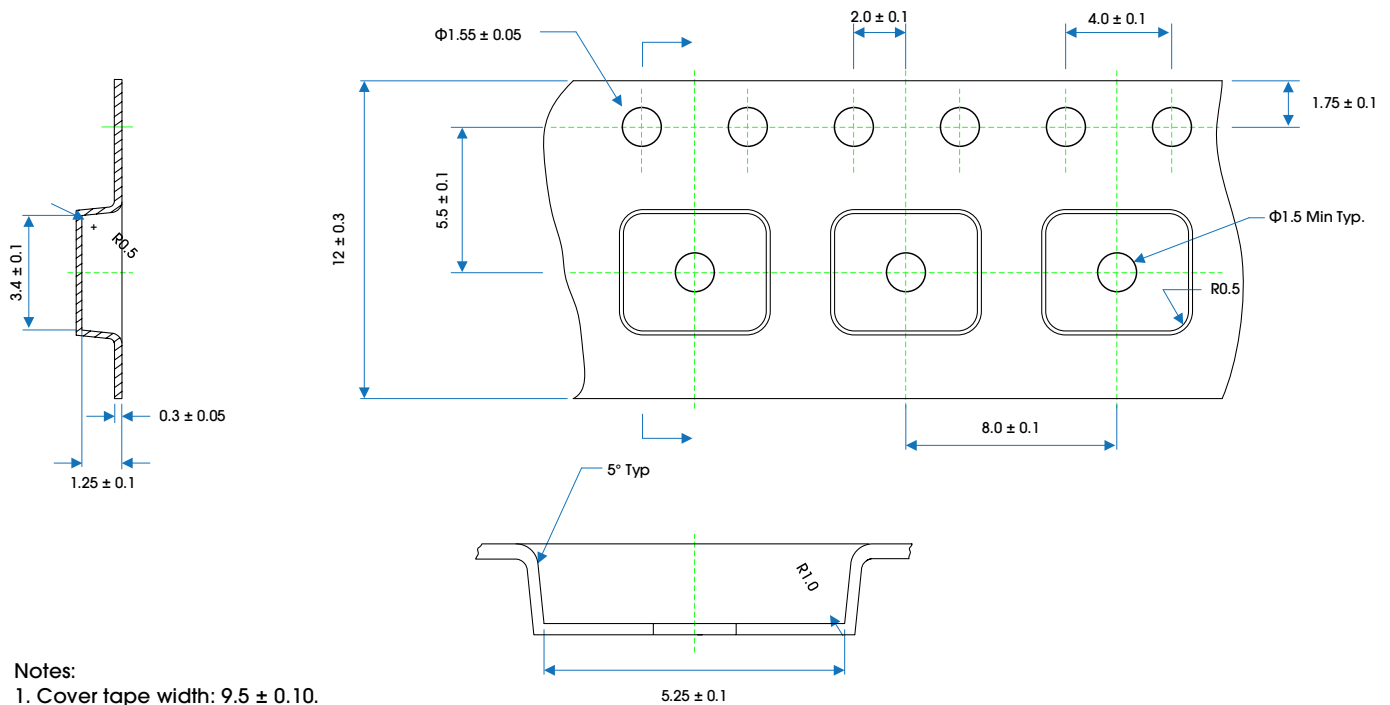


Figure 10. Product Loading Orientation

10.3 MSOP-8 PACKAGE

Figure 11 illustrates the carrier tape.



Notes:

1. Cover tape width: 9.5 ± 0.10 .
2. Cumulative tolerance of 10 sprocket hole pitch: ± 0.20 (max).
3. Camber: not to exceed 1mm in 100mm.
4. Mold#: MSOP-8.
5. All dimensions: mm.
6. Direction of view:

Figure 11. Carrier Tape Drawing

Table 14 provides information about tape and reel.

Table 14. Tape and Reel Information

PACKAGE TYPE	REEL	QTY/REEL	REEL/ INNER BOX	INNER BOX/ CARTON	QTY/CARTON	INNER BOX SIZE (mm)	CARTON SIZE (mm)
MSOP-8	13"	4000	1	8	32000	365*340*36	390*330*360

Figure 12 shows the product loading orientation—pin 1 is assigned at Q1.

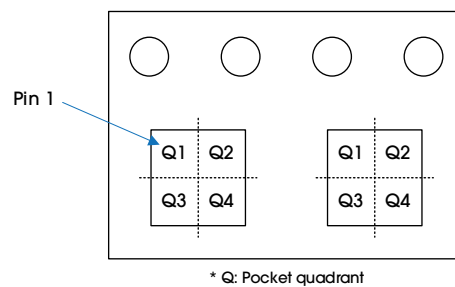


Figure 12. Product Loading Orientation

10.4 TSSOP-8 PACKAGE

Figure 13 illustrates the carrier tape.

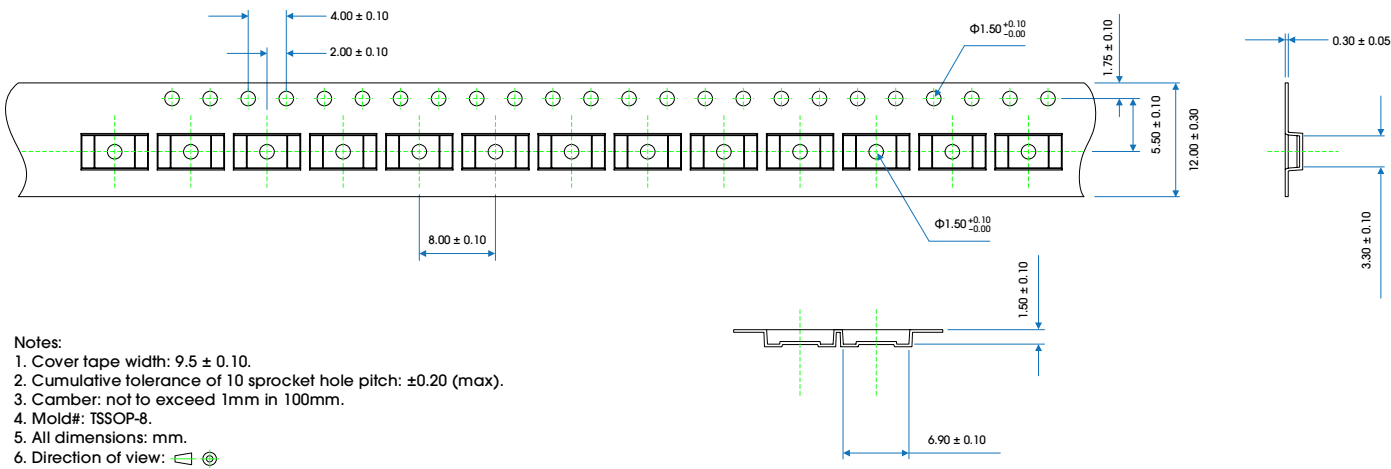


Figure 13. Carrier Tape Drawing

Table 15 provides information about tape and reel.

Table 15. Tape and Reel Information

PACKAGE TYPE	REEL	QTY/REEL	REEL/ INNER BOX	INNER BOX/ CARTON	QTY/CARTON	INNER BOX SIZE (mm)	CARTON SIZE (mm)
TSSOP-8	13"	4000	1	8	32000	365*340*36	390*330*360

Figure 14 shows the product loading orientation—pin 1 is assigned at Q1.

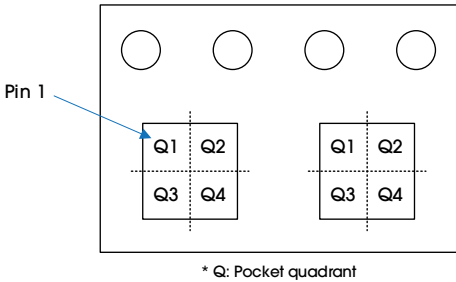


Figure 14. Product Loading Orientation

REVISION HISTORY

REVISION	DATE	DESCRIPTION
Rev A	20 August 2023	RTM release