



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-AD8531/AD8532/AD8534

Low Cost, 250 mA Output, Single-Supply Amplifiers

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**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



FEATURES

Single-supply operation: 2.7 V to 6 V
High output current: ± 250 mA
Low supply current: 750 μ A/amplifier
Wide bandwidth: 3 MHz
Slew rate: 5 V/ μ s
No phase reversal
Low input currents
Unity gain stable
Rail-to-rail input and output

APPLICATIONS

Multimedia audio
LCD drivers
ASIC input or output amplifiers
Headphone drivers

GENERAL DESCRIPTION

The AD8531, AD8532, and AD8534 are single, dual, and quad rail-to-rail input/output single-supply amplifiers featuring 250 mA output drive current. This high output current makes these amplifiers excellent for driving either resistive or capacitive loads. AC performance is very good with 3 MHz bandwidth, 5 V/ μ s slew rate, and low distortion. All are guaranteed to operate from a 3 V single supply as well as a 5 V supply.

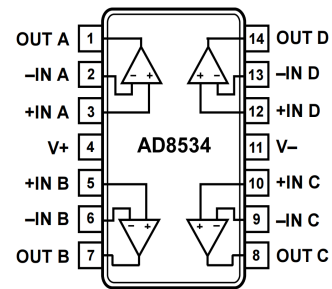
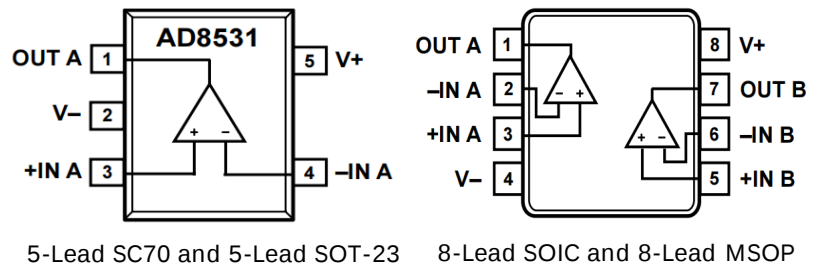
The very low input bias currents enable the AD853x to be used for integrators, diode amplification, and other applications requiring low input bias current. Supply current is only 750 μ A per amplifier at 5 V, allowing low current applications to control high current loads.

Applications include audio amplification for computers, sound ports, sound cards, and set-top boxes. The AD853x family is very stable, and it is capable of driving heavy capacitive loads such as those found in LCDs.

The ability to swing rail-to-rail at the inputs and outputs enables designers to buffer CMOS DACs, ASICs, or other wide output swing devices in single-supply systems.

The AD8531/AD8532/AD8534 are specified over the extended industrial temperature range (–40°C to +85°C). The AD8531 is available in 8-lead SOIC, 5-lead SC70, and 5-lead SOT-23 packages.

The AD8532 is available in 8-lead SOIC, 8-lead MSOP, and 8-lead TSSOP surface-mount packages. The AD8534 is available in narrow 14-lead SOIC and 14-lead TSSOP surface-mount packages.





SPECIFICATIONS

ELECTRICAL CHARACTERISTICS

$V_S = 3.0\text{ V}$, $V_{CM} = 1.5\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 1.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$			25	mV
					30	mV
Input Bias Current	I_B	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		5	50	pA
					60	pA
Input Offset Current	I_{OS}	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		1	25	pA
					30	pA
Input Voltage Range			0		3	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = 0\text{ V to } 3\text{ V}$	38	45		dB
Large Signal Voltage Gain	A_{VO}	$R_L = 2\text{ k}\Omega$, $V_O = 0.5\text{ V to } 2.5\text{ V}$		25		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$			20		$\mu\text{V}/^\circ\text{C}$
Bias Current Drift	$\Delta I_B/\Delta T$			50		fA/ $^\circ\text{C}$
Offset Current Drift	$\Delta I_{OS}/\Delta T$			20		fA/ $^\circ\text{C}$
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$I_L = 10\text{ mA}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$	2.85 2.8	2.92		V V
Output Voltage Low	V_{OL}	$I_L = 10\text{ mA}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		60	100 125	mV mV
Output Current	I_{OUT}			± 250		mA
Closed-Loop Output Impedance	Z_{OUT}	$f = 1\text{ MHz}$, $A_V = 1$		60		Ω
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = 3\text{ V to } 6\text{ V}$	45	55		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		0.70	1 1.25	mA mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 2\text{ k}\Omega$		3.5		V/ μs
Settling Time	t_s	To 0.01%		1.6		μs
Gain Bandwidth Product	GBP			2.2		MHz
Phase Margin	ϕ_o			70		Degrees
Channel Separation	CS	$f = 1\text{ kHz}$, $R_L = 2\text{ k}\Omega$		65		dB
NOISE PERFORMANCE						
Voltage Noise Density	e_n	$f = 1\text{ kHz}$		45		nV/ $\sqrt{\text{Hz}}$
		$f = 10\text{ kHz}$		30		nV/ $\sqrt{\text{Hz}}$
Current Noise Density	i_n	$f = 1\text{ kHz}$		0.05		pA/ $\sqrt{\text{Hz}}$



$V_S = 5.0\text{ V}$, $V_{CM} = 2.5\text{ V}$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Table 2.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$			25	mV
					30	mV
Input Bias Current	I_B	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		5	50	pA
					60	pA
Input Offset Current	I_{OS}	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		1	25	pA
					30	pA
Input Voltage Range			0		5	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = 0\text{ V to } 5\text{ V}$	38	47		dB
Large Signal Voltage Gain	A_{VO}	$R_L = 2\text{ k}\Omega$, $V_O = 0.5\text{ V to } 4.5\text{ V}$	15	80		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		20		$\mu\text{V}/^\circ\text{C}$
Bias Current Drift	$\Delta I_B/\Delta T$			50		fA/ $^\circ\text{C}$
Offset Current Drift	$\Delta I_{OS}/\Delta T$			20		fA/ $^\circ\text{C}$
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$I_L = 10\text{ mA}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$	4.9	4.94		V
			4.85			V
Output Voltage Low	V_{OL}	$I_L = 10\text{ mA}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		50	100	mV
					125	mV
Output Current	I_{OUT}			± 250		mA
Closed-Loop Output Impedance	Z_{OUT}	$f = 1\text{ MHz}$, $A_V = 1$		40		Ω
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = 3\text{ V to } 6\text{ V}$	45	55		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$		0.75	1.25	mA
					1.75	mA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 2\text{ k}\Omega$		5		V/ μs
Full-Power Bandwidth	BW_p	1% distortion		350		kHz
Settling Time	t_s	To 0.01%		1.4		μs
Gain Bandwidth Product	GBP			3		MHz
Phase Margin	ϕ_o			70		Degrees
Channel Separation	CS	$f = 1\text{ kHz}$, $R_L = 2\text{ k}\Omega$		65		dB
NOISE PERFORMANCE						
Voltage Noise Density	e_n	$f = 1\text{ kHz}$		45		nV/ $\sqrt{\text{Hz}}$
		$f = 10\text{ kHz}$		30		nV/ $\sqrt{\text{Hz}}$
Current Noise Density	i_n	$f = 1\text{ kHz}$		0.05		pA/ $\sqrt{\text{Hz}}$



ABSOLUTE MAXIMUM RATINGS

Table 3.

Parameter	Rating
Supply Voltage (V_S)	7 V
Input Voltage	GND to V_S
Differential Input Voltage ¹	± 6 V
Storage Temperature Range	-65°C to $+150^{\circ}\text{C}$
Operating Temperature Range	-40°C to $+85^{\circ}\text{C}$
Junction Temperature Range	-65°C to $+150^{\circ}\text{C}$
Lead Temperature (Soldering, 60 sec)	300°C

¹ For supplies less than 6 V, the differential input voltage is equal to $\pm V_S$.

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; the functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL RESISTANCE

θ_{JA} is specified for the worst-case conditions, that is, a device soldered in a circuit board for surface-mount packages.

Table 4.

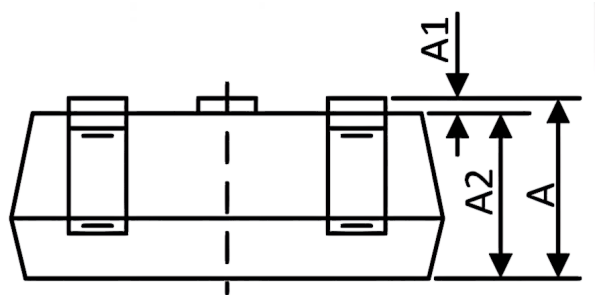
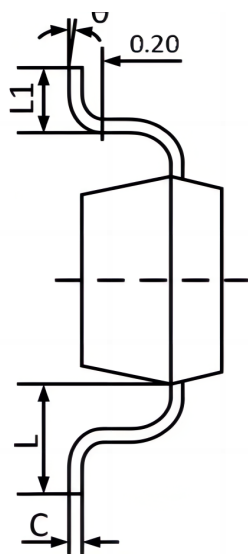
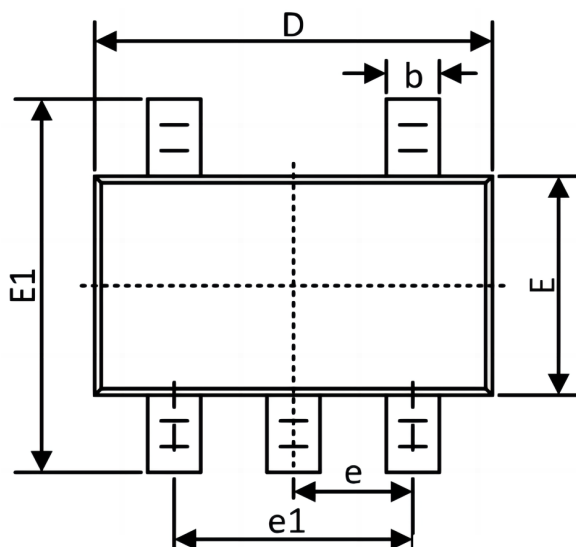
Package Type	θ_{JA}	θ_{JC}	Unit
5-Lead SC70 (KS)	376	126	$^{\circ}\text{C}/\text{W}$
5-Lead SOT-23 (RJ)	230	146	$^{\circ}\text{C}/\text{W}$
8-Lead SOIC (R)	158	43	$^{\circ}\text{C}/\text{W}$
8-Lead MSOP (RM)	210	45	$^{\circ}\text{C}/\text{W}$
8-Lead TSSOP (RU)	240	43	$^{\circ}\text{C}/\text{W}$
14-Lead SOIC (R)	120	36	$^{\circ}\text{C}/\text{W}$
14-Lead TSSOP (RU)	240	43	$^{\circ}\text{C}/\text{W}$



Order information

Order Number	Package	Package Quantity	Marking On The park
AD8531AKSZ-REEL-TUDI	SC70	Tape,Reel,3000	AD8531AKSZ-REEL
AD8531ARTZ-REEL-TUDI	SOT23	Tape,Reel,3000	AD8531ARTZ-REEL
AD8531ARZ-REEL-TUDI	SOP8	Tape,Reel,2500	AD8531ARZ-REEL
AD8532ARMZ-REEL-TUDI	MSOP8	Tape,Reel,2500	AD8532ARMZ-REEL
AD8532ARZ-REEL-TUDI	SOP8	Tape,Reel,2500	AD8532ARZ-REEL
AD8534ARUZ-REEL-TUDI	TSSOP14	Tape,Reel,2500	AD8534ARUZ-REEL
AD8534ARZ-REEL-TUDI	SOP14	Tape,Reel,2500	AD8534ARZ-REEL

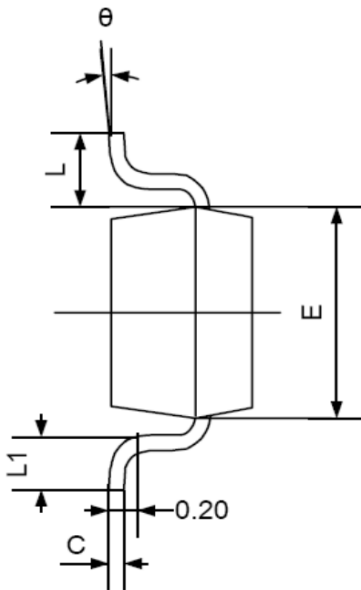
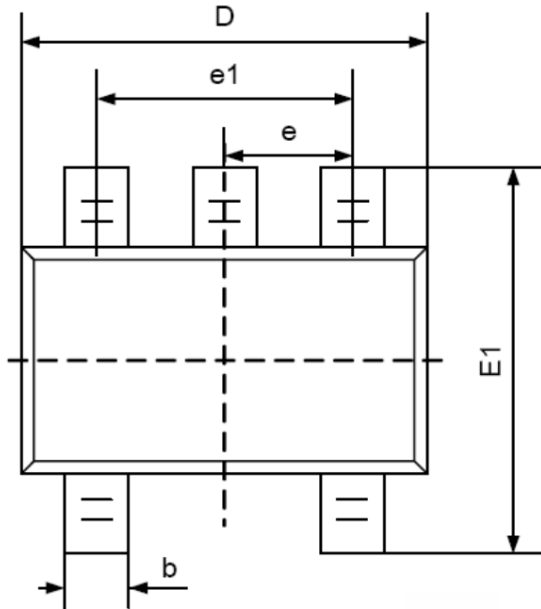
Package SOT23-5



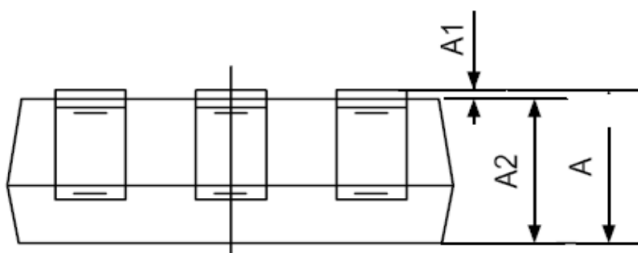
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.400	0.012	0.016
C	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°



Package SC70-5

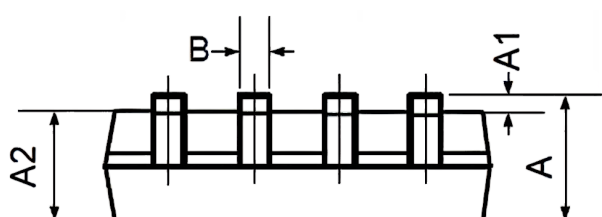
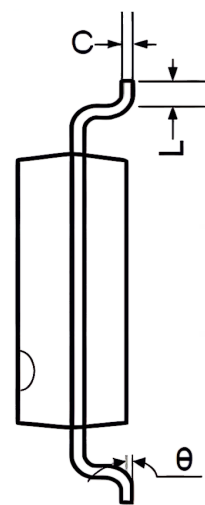
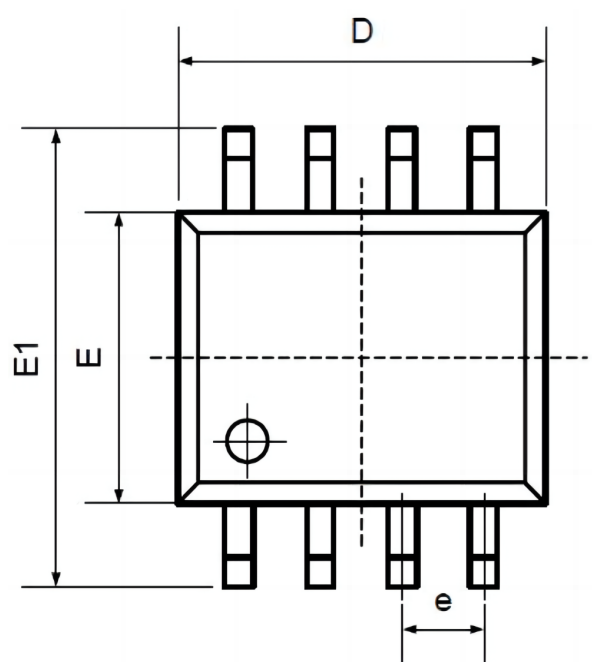


Symbol	DimensionsIn Millimeters		DimensionsIn Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
C	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.525REF		0.021REF	
L1	0.260	0.460	0.010	0.018
theta	0°	8°	0°	8°





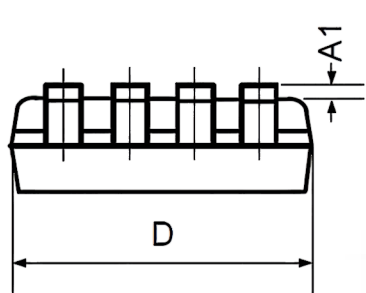
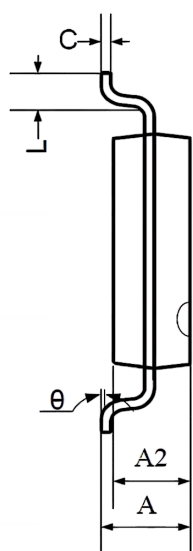
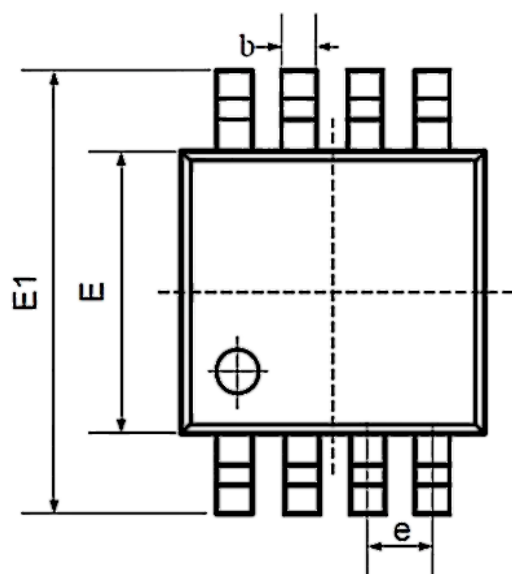
Package SOP8



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	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

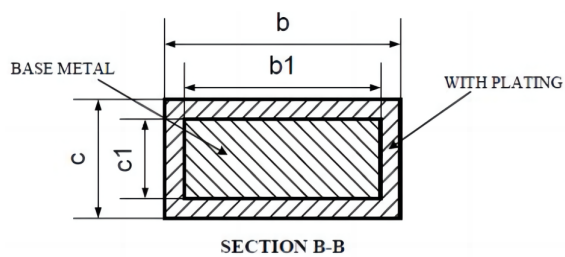
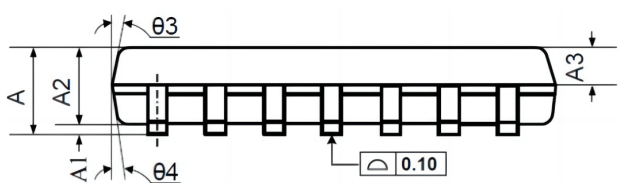
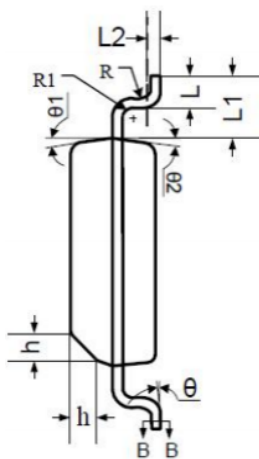
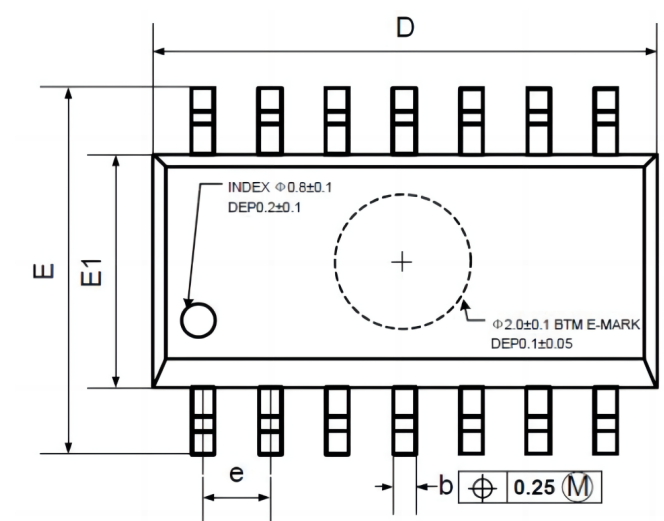


Package MSOP8



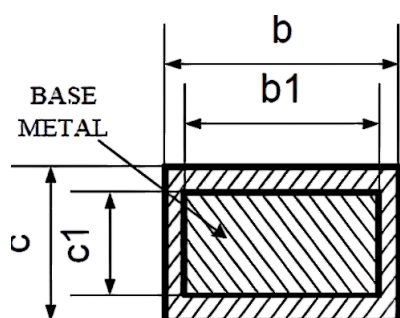
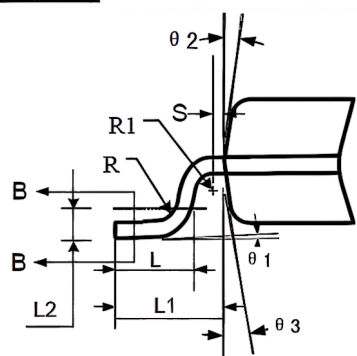
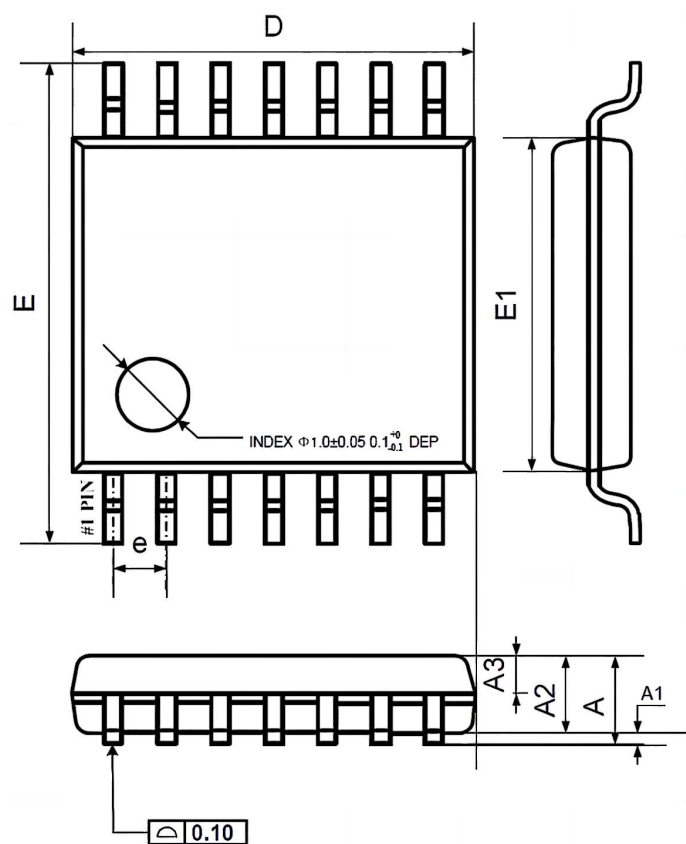
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.200	0.031	0.047
A1	0.000	0.200	0.000	0.008
A2	0.760	0.970	0.030	0.038
b	0.30 TYP		0.012 TYP	
C	0.15 TYP		0.006 TYP	
D	2.900	3.100	0.114	0.122
e	0.65 TYP		0.026 TYP	
E	2.900	3.100	0.114	0.122
E1	4.700	5.100	0.185	0.201
L	0.410	0.650	0.016	0.026
θ	0°	6°	0°	6°

Package SOP14



Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
A3	0.55	0.65	0.75
b	0.36		0.49
b1	0.35	0.40	0.45
C	0.16		0.25
c1	0.15	0.20	0.25
D	8.53	8.63	8.73
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.45	0.60	0.80
L1	1.04 REF		
L2	0.25 BSC		
R	0.07		
R1	0.07		
h	0.30	0.40	0.50
θ	0°		8°
θ1	6°	8°	10°
θ2	6°	8°	10°
θ3	5°	7°	9°
θ4	5°	7°	9°

Package TSSOP14



Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.90	1.00	1.05
A3	0.34	0.44	0.54
b	0.20	—	0.28
b1	0.20	0.22	0.24
C	0.10	—	0.19
c1	0.10	0.13	0.15
D	4.86	4.96	5.06
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65 BSC		
L	0.45	0.60	0.75
L1	1.00 REF		
L2	0.25 BSC		
R	0.09	—	—
R1	0.09	—	—
S	0.20	—	—
θ1	0°	—	8°
θ2	10°	12°	14°
θ3	10°	12°	14°



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