
36V Industry-Standard Operational Amplifiers

General Description

The ET85B1X series amplifiers are the industry-standard operational amplifiers which include single-channel (ET85B11) and dual-channel (ET85B12) and quad-channel (ET85B14) of high-voltage(36V) op-amps. These devices provide outstanding value for cost-sensitive applications, with features including low offset, common-mode input range to ground.

These series standard op-amps could simplify circuit design with enhanced features, such as unity-gain stability and lower quiescent current of 220 μ A per amplifier(typical).

The ET85B11 single amplifier is available in a SOT23-5 package.

The ET85B12 dual amplifier is available in a SOP8/MSOP8 package.

The ET85B14 quad amplifier is available in a SOP14 packages.

Features

- Wide Supply: ± 1.5 V to ± 18 V, 3.0 V to 36 V
- Extended Temperature Range: -40°C to $+125^{\circ}\text{C}$
- Offset Voltage: ± 2 mV (typical)
- Offset Voltage Temperature Drift: $5\mu\text{V}/^{\circ}\text{C}$
- Input Common-Mode Voltage Range Includes Ground
- Large Voltage Gain: 85 dB (typical)
- Gain Bandwidth: 0.7 MHz
- Slew Rate: 0.3 V/ μ s
- Quiescent Current: 220 μ A/ch (typical)

Applications

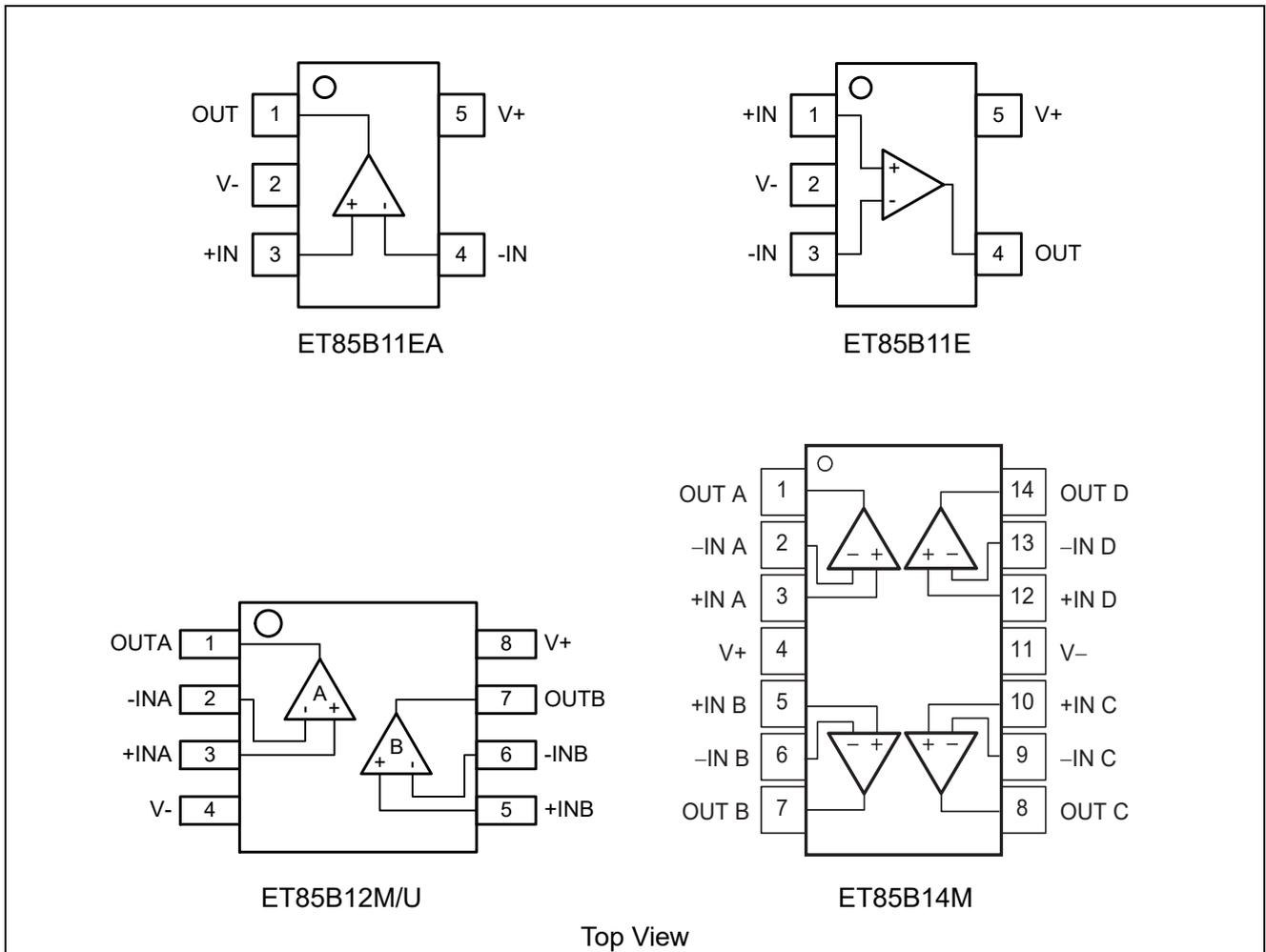
- Merchant Network and Server Power Supply Units
- Multi-function Printers
- Power Supplies and Mobile Chargers
- Motor Control: AC induction, BDC, BLDC and Stepper Moter.etc
- Indoor and Outdoor Air Conditioners
- Washers, Dryers, and Refrigerators
- AC Inverters, String Inverters, Central Inverters
- Electronic Point-of-sale Systems

ET85B1X

Device Information

Part No.	Package	Packing Option	MSL
ET85B11E / ET85B11EA	SOT23-5	Tape and Reel , 3K	3
ET85B12M	SOP8	Tape and Reel , 4K	3
ET85B12U	MSOP8	Tape and Reel , 4K	3
ET85B14M	SOP14	Tape and Reel , 4K	3

Pin Configuration



Pin Function

Symbol	Descriptions
OUTx	Output
V-	Negative supply
+INx	Non-inverting input
-INx	Inverting input
V+	Positive supply

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Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are only stress ratings, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions are not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

Symbol	Parameter	Value	Unit
V _S	Supply Voltage, V+ to V-	0 to 40	V
V _{IN}	Signal input terminals Voltage	(-V _S) -0.3 to (+V _S) +0.3	V
I _{IN}	Signal input terminals Current	-10 to +10	mA
I _O	Output Short-Circuit Current	Continuous	
T _{J(MAX)}	Maximum Junction Temperature	+150	°C
T _{STG}	Storage Temperature	-65 to +150	°C
V _{ESD}	Human body model (HBM), per ANSI/ESDA/JEDECJS-001 ⁽¹⁾	500	V
	Charged device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	1000	V

Note1: JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500V HBM is possible if necessary precautions are taken.

Note2: JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250V CDM is possible if necessary precautions are taken.

Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V _S	Supply Voltage: (V+) - (V-)	3(±1.5) to 36(±18)	V
T _A	Operating Temperature Range	-40 to +125	°C

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
R _{θJA}	SOT23-5	Thermal Characteristics, Thermal Resistance, Junction-to-Air	220	°C/W
	MSOP8		180	°C/W
	SOP8		125	°C/W
	SOP14		108	°C/W

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Electrical Characteristics

$V_S = 5.0\text{ V}$ to 36 V , $V_{CM} = V_{OUT} = V_S/2$, and $R_L = 10\text{ k}\Omega$ connected to $V_S/2$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OFFSET VOLTAGE						
V_{OS}	Input Offset Voltage	$V_S = 5.0\text{V}$ to 30V , $V_{CM} = 0$		± 2	± 7	mV
		$V_S = 5.0\text{V}$ to 30V , $V_{CM} = 0$ $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			± 10	
dV_{OS}/dT	V_{OS} vs Temperature	$T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$		± 5		$\mu\text{V}/^\circ\text{C}$
PSRR	Power Supply Rejection Ratio	$V_S = 3.0$ to 30 V	60	100		dB
INPUT BIAS CURRENT						
I_B	Input Bias Current	$V_{CM} = 0$		± 20	± 200	nA
		$V_{CM} = 0$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			± 500	
I_{OS}	Input Offset Current	$V_{CM} = 0$		± 5	± 50	nA
		$V_{CM} = 0$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			± 150	
NOISE						
e_n	Input Voltage Noise Density	$f = 1\text{ kHz}$		40		$\text{nV}/\sqrt{\text{Hz}}$
INPUT VOLTAGE						
V_{CM}	Common-mode Voltage Range	$V_S = 30\text{V}$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	$-V_S$		$+V_S - 2$	V
CMRR	Common-mode Rejection Ratio	$V_S = 30\text{V}$, $V_{CM} = 0\text{V}$ to $(+V_S - 2)$	60	80		dB
OPEN-LOOP GAIN						
A_{OL}	Open-loop Voltage Gain	$V_S = 15\text{V}$, $V_{OUT} = 1.0\text{V}$ to 11V , $R_L > 2\text{ k}\Omega$		85	100	dB
FREQUENCY RESPONSE						
GBP	Gain Bandwidth Product			0.7		MHz
SR	Slew Rate	$V_S = 5\text{ V}$, $G = +1$		0.3		$\text{V}/\mu\text{s}$

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Electrical Characteristics (Continued)

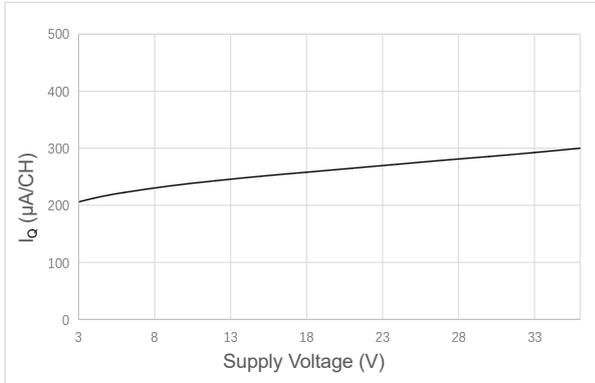
$V_S = 5$ to 36 V, $V_{CM} = V_{OUT} = V_S/2$, and $R_L = 10k\Omega$ connected to $V_S/2$, $T_A = 25^\circ\text{C}$, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
OUTPUT						
V_{OH}	High output voltage swing	$V_S = 30\text{V}$, $R_L = 2k\Omega$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			$+V_S - 4$	V
		$V_S = 30\text{V}$, $R_L = 10k\Omega$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			$+V_S - 3$	V
V_{OL}	Low output voltage swing	$V_S = 5\text{V}$, $R_L = 10k\Omega$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$			$-V_S + 2$	V
I_{SOURCE}	Out Source Current	$V_S = 15\text{V}$, $V_{OUT} = 0\text{V}$, $V_{ID} = 1\text{V}$	20	40		mA
		$V_S = 15\text{V}$, $V_{OUT} = 0\text{V}$, $V_{ID} = 1\text{V}$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	10			
I_{SINK}	Out Sink Current	$V_S = 15\text{V}$, $V_{OUT} = 0\text{V}$, $V_{ID} = 1\text{V}$, $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	5			mA
POWER SUPPLY						
V_S	Specified Voltage Range	$T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$	3.0		36	V
I_Q	Quiescent Current per Amplifier	$V_S = 5\text{V}$		220	400	μA
		$V_S = 30\text{V}$		290	500	μA

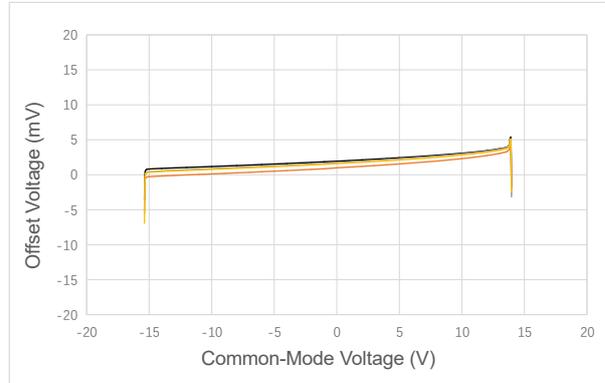
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Typical Characteristics

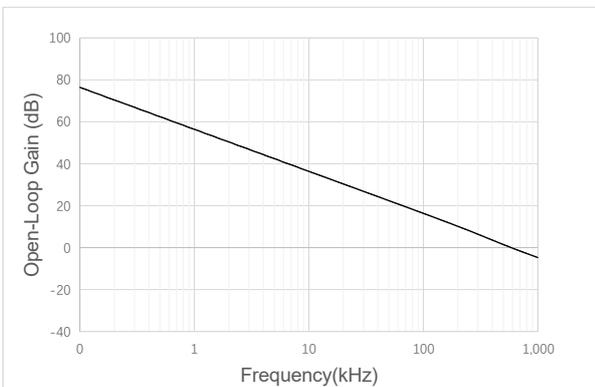
$V_S = 5$ to 36 V, $V_{CM} = V_{OUT} = V_S/2$, and $R_L = 10k\Omega$ connected to $V_S/2$, $T_A = 25^\circ\text{C}$, unless otherwise noted.



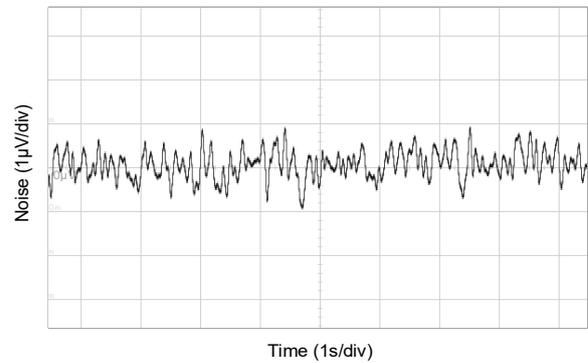
Quiescent Current vs Supply Voltage



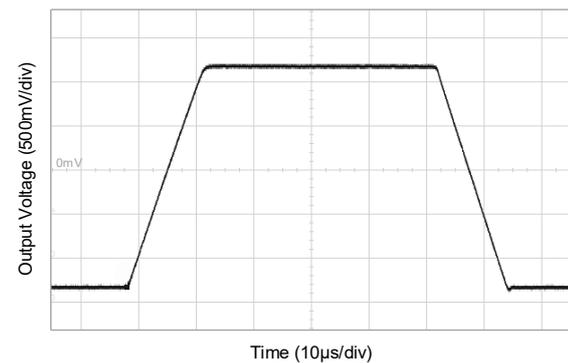
Offset Voltage vs Common-Mode Voltage ($V_S = \pm 15\text{V}$)



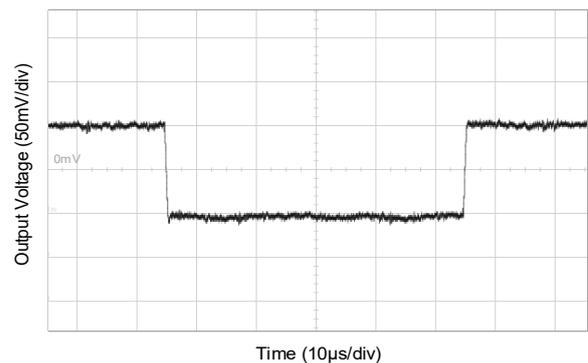
Open-Loop Gain vs Frequency



0.1 Hz to 10 Hz Noise



Large-Signal Step Response

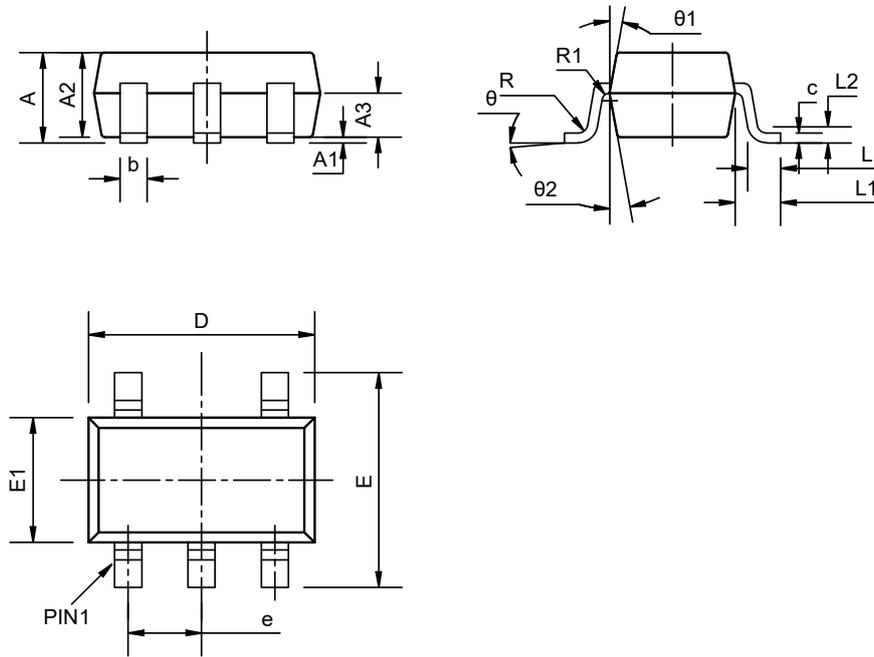


Small-Signal Step Response (100 mV)

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Package Dimension

SOT23-5

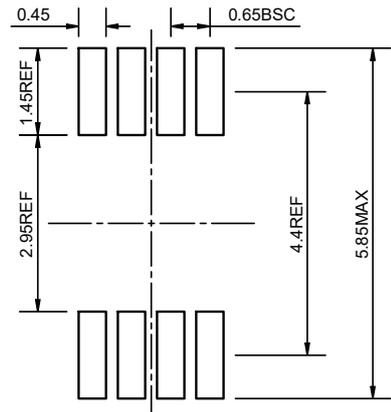
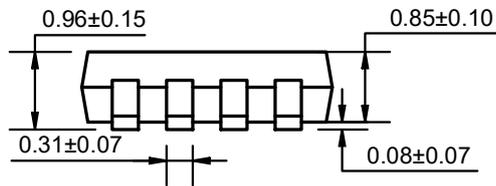
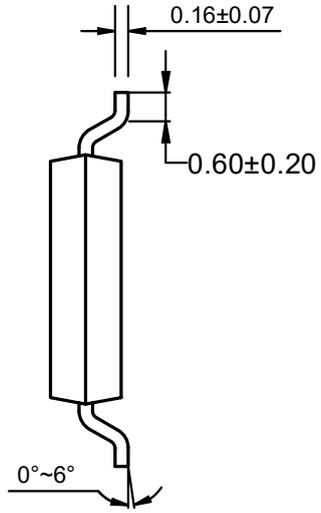
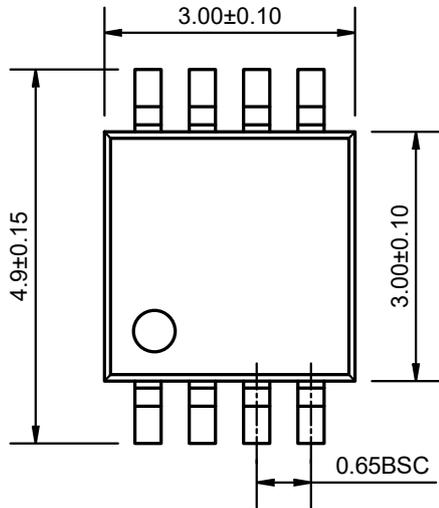


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	-	-	1.25
A1	0	-	0.15
A2	1	1.1	1.2
A3	0.6	0.65	0.7
b	0.36	-	0.5
c	0.14	-	0.2
D	2.82	2.92	3.02
E	2.6	2.8	3
E1	1.5	1.6	1.7
e	0.9	0.95	1
L	0.35	0.45	0.6
L1	0.59REF		
L2	0.25BSC		
R	0.1	-	-
R1	0.1	-	0.2
theta	0°	-	8°
theta1	3°	5°	7°
theta2	6°	-	14°

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MSOP8

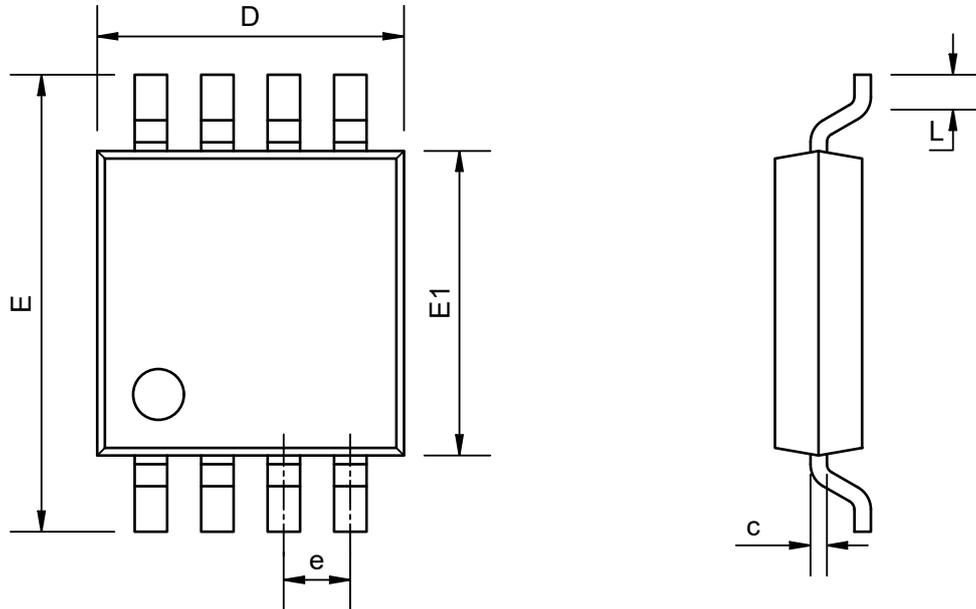


Recommended Land Pattern

Unit: mm

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SOP8

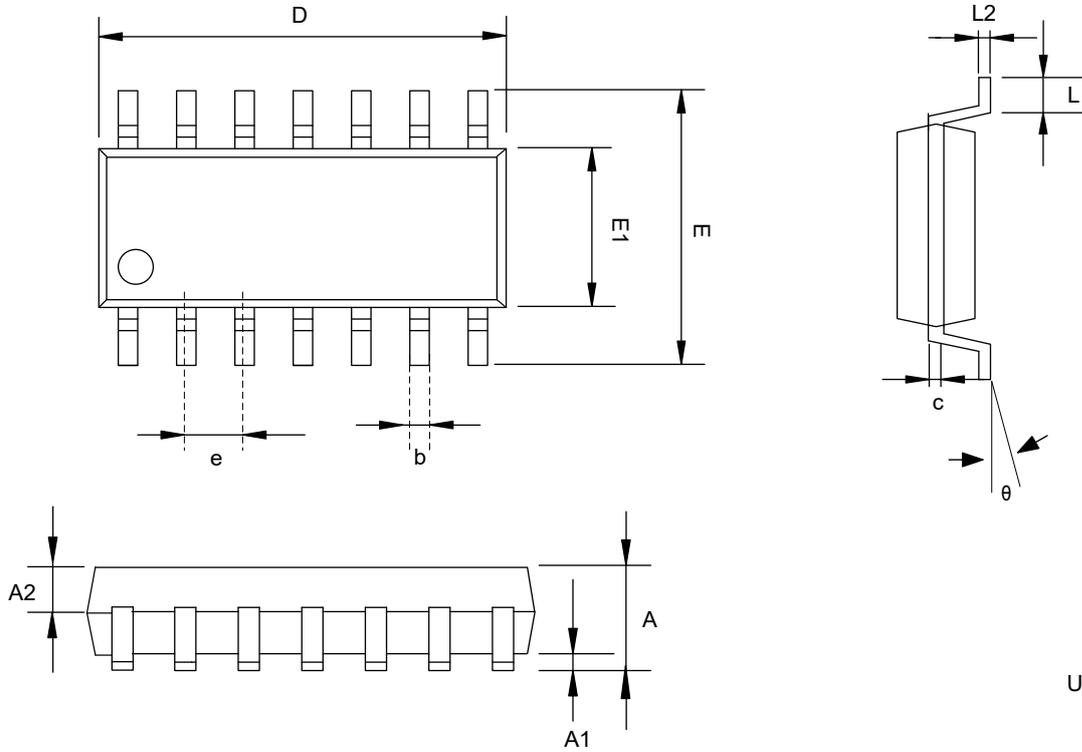


COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A1	0.15	—	0.22
A2	1.40	1.55	1.50
b	0.40 BSC		
c	0.20	—	0.25
D	4.85	4.90	4.95
E	5.99	6.04	6.09
E1	3.85	3.90	3.95
e	1.27 BSC		
L	0.50	0.60	0.70

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SOP14



Unit: mm

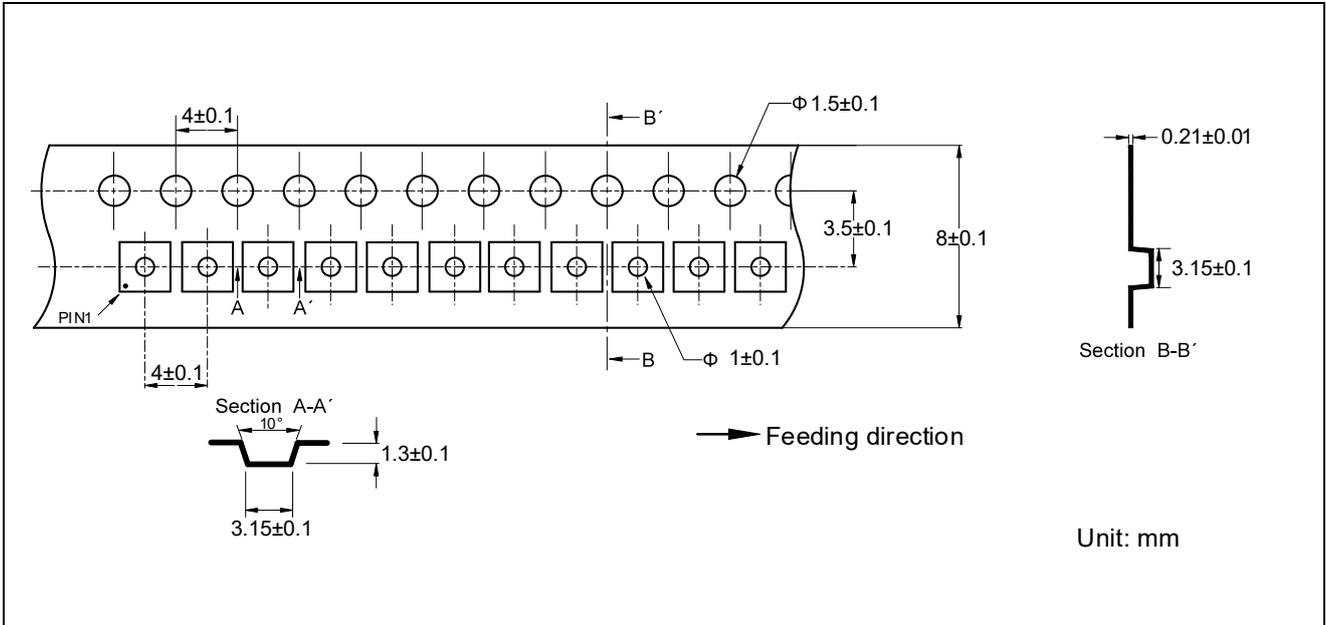
COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	MAX
A	1.4	1.5
A1	0.1	0.2
A2	0.65	0.75
e	1.27	
c	0.203	
D	8.48	8.58
E	6.05	6.25
E1	3.75	3.85
b	0.406	
L	0.4	0.7
L2	0.203	
θ	0°	8°

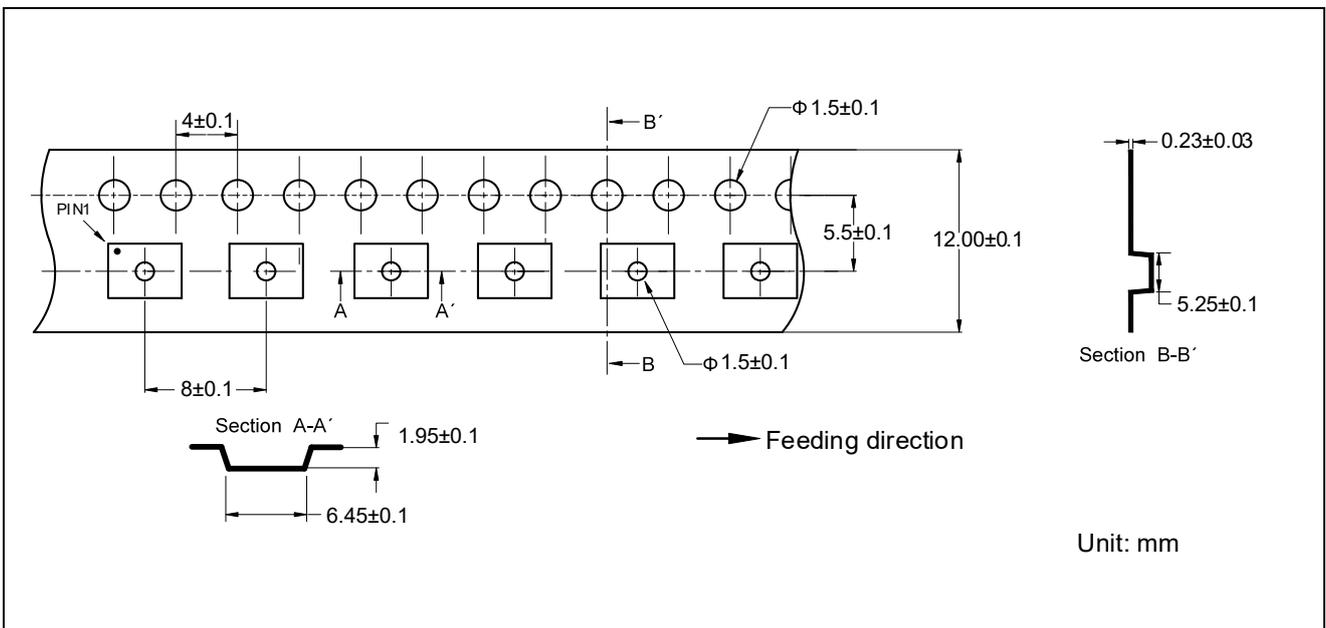
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Tape Information

SOT23-5

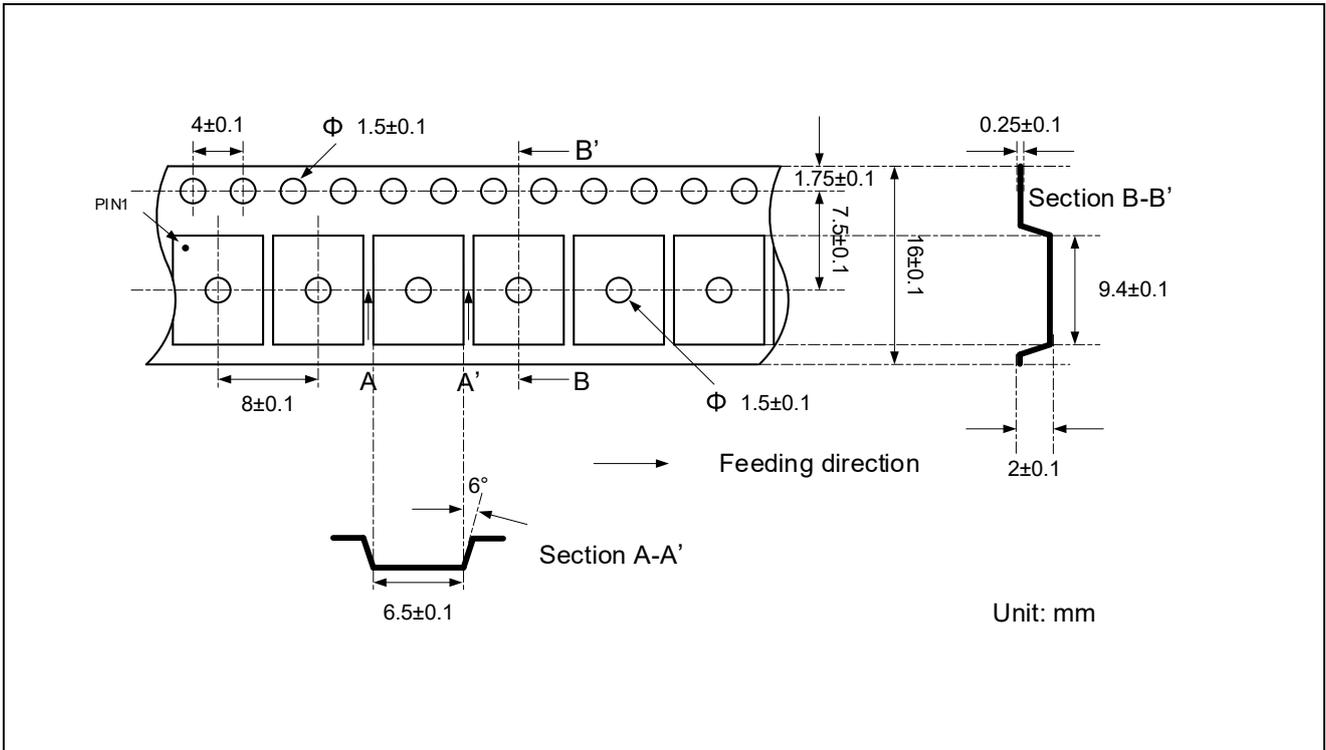


SOP8



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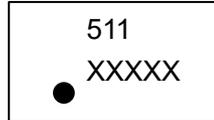
SOP14



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Marking Information

SOT23-5

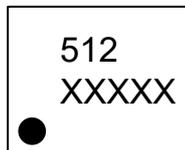


511 - Part Number

XXXXX - Tracking Number

Note: X (Tracking Number) is variable, according to the wafer lot number.

SOP8



512 - Part Number

XXXXX - Tracking Number

Note: X (Tracking Number) is variable, according to the wafer lot number.

SOP14



514 - Part Number

XXXXX - Tracking Number

Note: X (Tracking Number) is variable, according to the wafer lot number.

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Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2025-03-07	Original Version	Jiangqp	Shibo	Liujiy