

Description

LMV321 (single channel) is a rail-to-rail input, output voltage feedback, low power consumption operational amplifier. It has wide input common mode voltage and output swing. The minimum working voltage can be up to 2.1V, and the maximum working voltage is recommended to be 5.5V. Used as power amplifier in all kinds of pocket or portable stereo radio recorders.

LMV321 has the following characteristics: Can provide 1MHz gain bandwidth product. It has an extremely low input bias current (about 10pA TYP) and can be used for integration, photo diode amplifiers and piezoelectric sensors. The Rail to Rail input and output buffers are also used for specific IC designs in single power systems. Applications of this series of amplifiers include safety monitoring, portable devices, batteries and power supplies, supply control, signal processing and interfaces in low power sensor systems.

The LMV321 single is available in Green SC70-5 and SOT23-5 packages. The LMV358 dual is available in Green SOP-8 and TSSOP-8 packages. The LMV324 Quad is available in Green SOP-14 and TSSOP-14 packages.

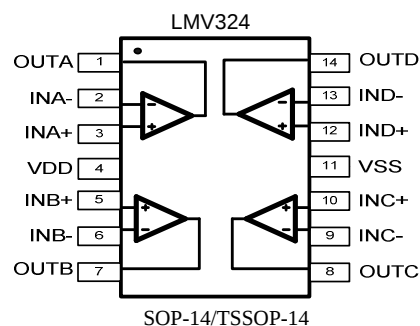
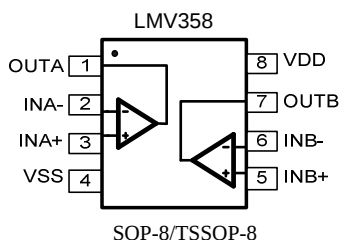
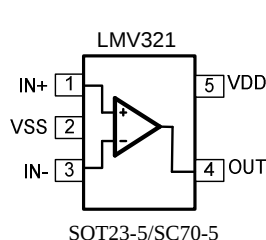
Features

- Rail to rail input and output, typical 0.8mv Vos
- Gain bandwidth product 1MHz
- Low input bias current: 10pA (TYP)
- Low Power consumption
- 2.1V ~ 5.5V working voltage
- Low operating current: 45uA

Application

- ASIC input and output amplifier
- Sensor interface
- Piezoelectric sensing amplifier
- Battery-powered equipment
- The mobile communication
- Audio output

Pin Configuration



Low-Power rail-to-rail Operational Amplifier

Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$) ^{Note1}

Parameter	Symbol	Value	Units
Supply Voltage	V_{CC}	7.5	V
Common-mode Input Voltage	V_{ICR}	$(-V_S)-0.5\sim(+V_S)0.5$	V
Junction Temperature	T_J	150	$^{\circ}\text{C}$
Operating Temperature Range	T_{OPR}	-40 to 125	$^{\circ}\text{C}$
Lead Temperature (Soldering, 10 sec)	T_L	250	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	-50 to 150	$^{\circ}\text{C}$

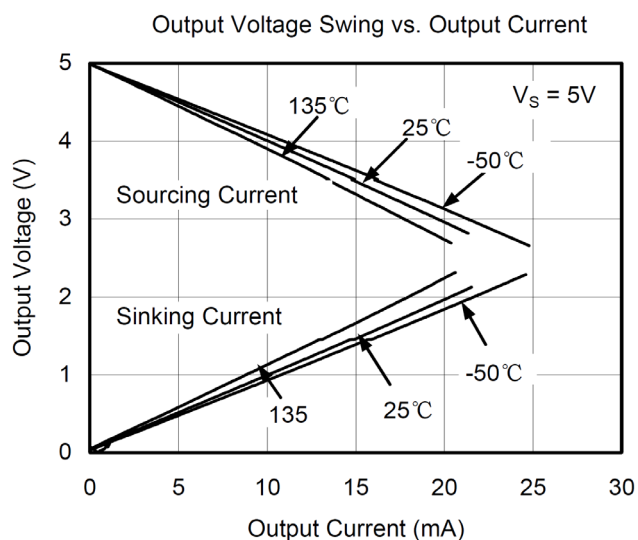
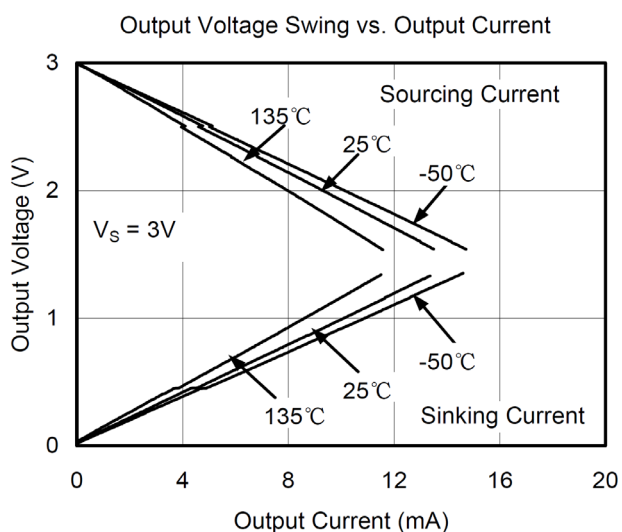
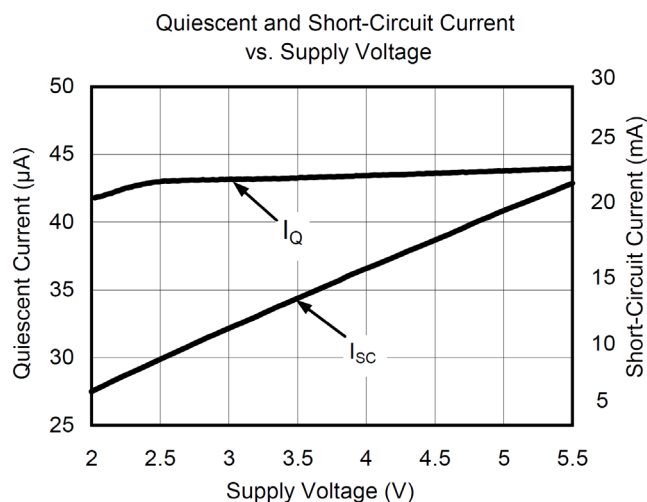
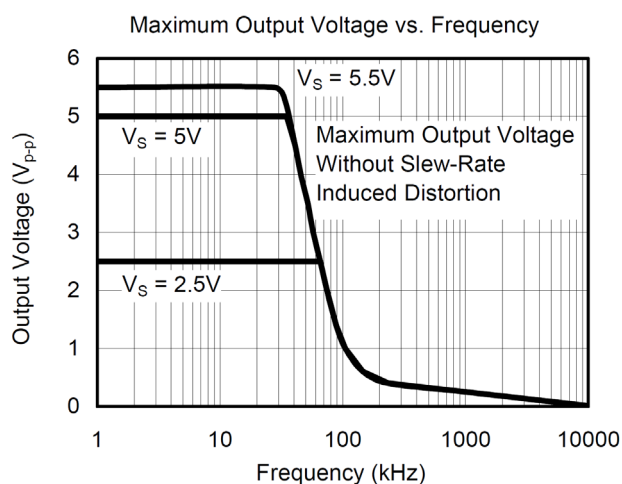
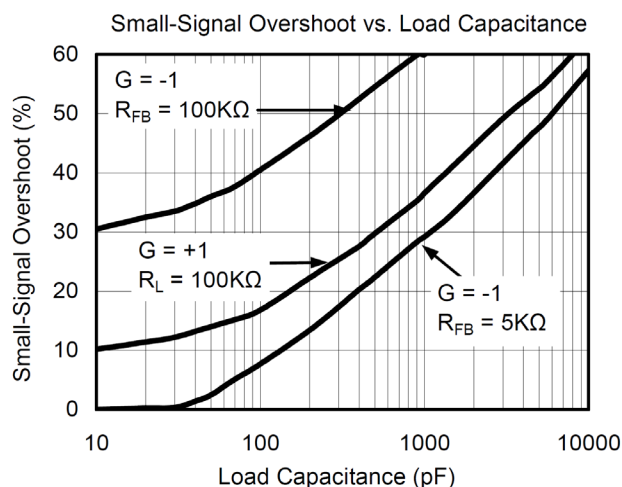
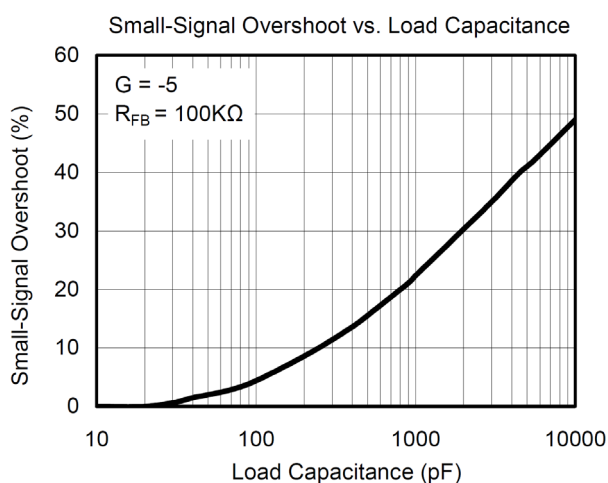
Note1: Exceeding the above limits may damage to the chip. The reliability of the device will also be affected if the device works under the limit conditions. Electrostatic discharge can also cause damage to chips, so it is suggested to take some preventive measures for integrated circuits. Failure to follow proper handling and installation can also cause damage. Precision LMV321 and other devices are more vulnerable to damage than ordinary devices in the case of tiny electrostatic, and small parameter changes may make the whole circuit performance substandard.

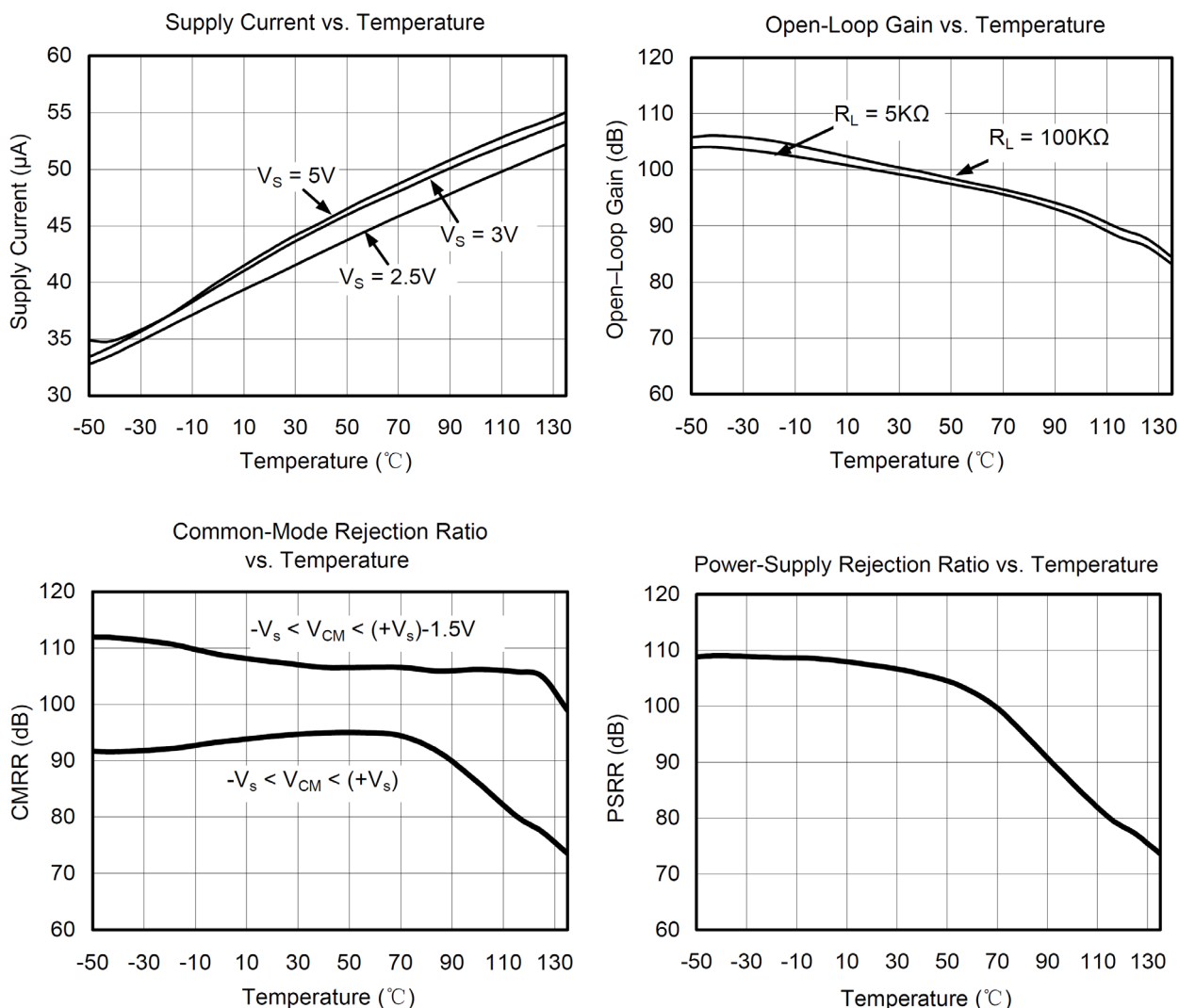
Electrical Characteristics

At $R_L = 100\text{k}\Omega$ connected to $V_S/2$, and $V_{OUT} = V_S/2$, $T_A=25^{\circ}\text{C}$, unless otherwise noted.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Offset Voltage	V_{OS}		--	0.8	5	mV
Input offset current	I_{OS}		--	10	--	pA
Input bias current	I_B		--	10	--	pA
Common-mode input voltage range	V_{CM}	$V_S=5.5\text{V}$	--	-0.1~5.6	--	V
Open-loop Gain	AOL	$V_O=0.1\text{V}$ to 4.9V , $R_L=5\text{k}\Omega$	70	80	--	dB
		$V_O=0.035\text{V}$ to 4.96V , $R_L=100\text{k}\Omega$	80	84	--	
Common Mode Rejection	CMRR	$V_{CM} = -0.1\text{V}\sim 4\text{V}$, $V_S=5.5\text{V}$	62	70	--	dB
		$V_{CM} = -0.1\text{V}\sim 5.6\text{V}$, $V_S=5.5\text{V}$	56	68	--	
Power Supply Rejection	PSRR	$V_{CM} = (-V_S)+0.5\text{V}$, $V_S=2.5\text{V}\sim 5.5\text{V}$	60	80	--	dB
Input offset voltage drift	$\Delta V_{OS}/\Delta T$		--	2.7	--	$\mu\text{V}/^{\circ}\text{C}$
Input voltage swing	V_I	$R_L=100\text{k}\Omega$	--	8	--	mV
		$R_L=10\text{k}\Omega$	--	80	--	mV
Operating voltage range	V_W		2.1	--	5.5	mV
Output Current	I_O		20	25	--	mA
Quiescent Current	I_Q	$I_{OUT}=0$	--	45	60	μA
Slew Rate	SR	$G = +1$, 2V Output Step	--	0.52	--	$\text{V}/\mu\text{s}$
Gain Bandwidth Product	GBP	$CL = 100\text{pF}$	--	1	--	MHz
Equivalent Input Noise Voltage	eN	$f=1\text{KHz}$	--	27	--	$\text{nV}/\sqrt{\text{Hz}}$
		$f=10\text{KHz}$	--	20	--	

Typical Characteristic Curves



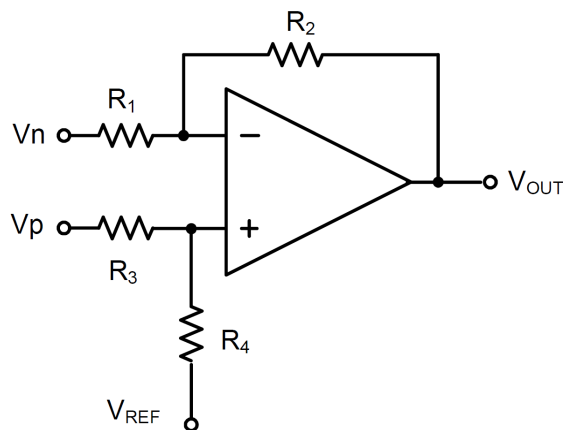


Typical applications

1. differential amplifier

As shown in the figure, if the resistance is equal, ($R_4 / R_3 = R_2 / R_1$), then the output $V_{OUT} =$

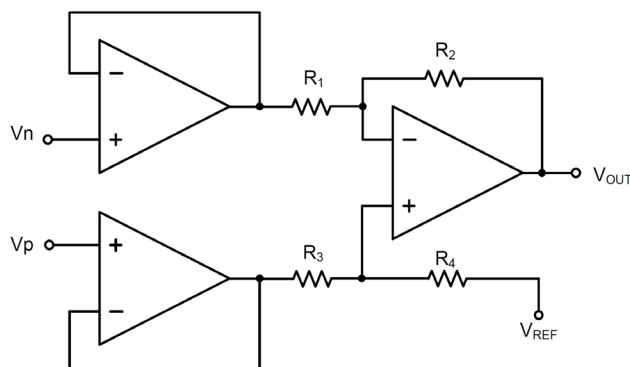
$$(V_p - V_n) \times R_2 / R_1 + V_{REF}$$



Low-Power rail-to-rail Operational Amplifier

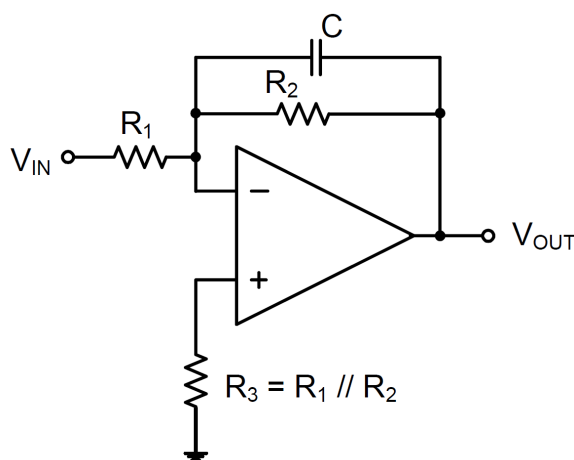
2. instrumentation amplifier

The circuit in the figure above performs the same function, but the input is high impedance.

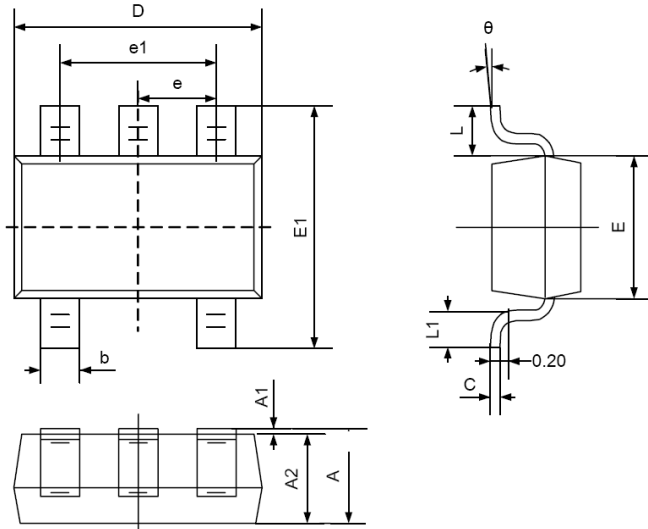


3. Low pass active filtering

The low-pass filter circuit shown here has a $(-R_2 / R_1)$ DC gain and -3db at a frequency of $1/2 \pi R_2 C$ corner. Make sure the filter is within the amplifier's bandwidth. Large feedback resistors are easily accompanied by parasitic capacitance at high speed, resulting in adverse effects such as oscillation. Keep the resistance value as low as possible and consider the appropriate output load.

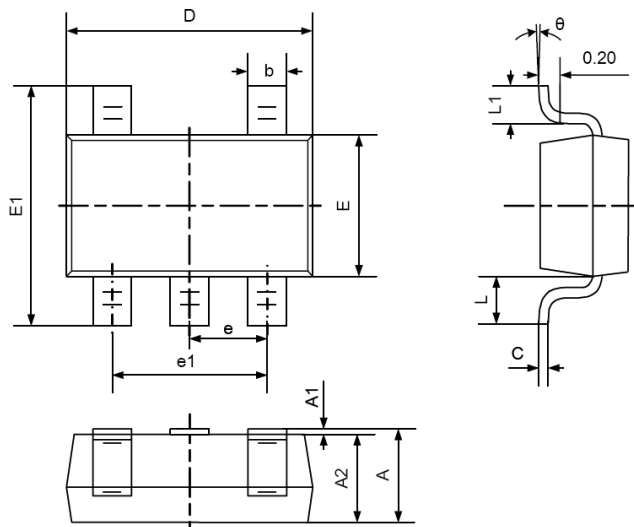


SC70-5



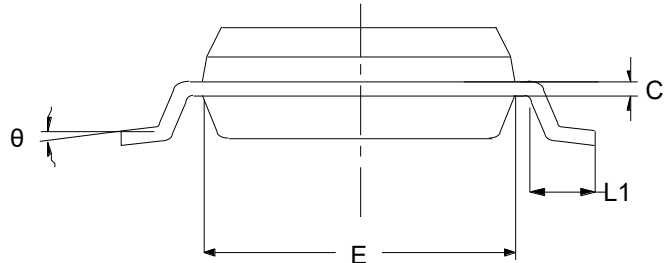
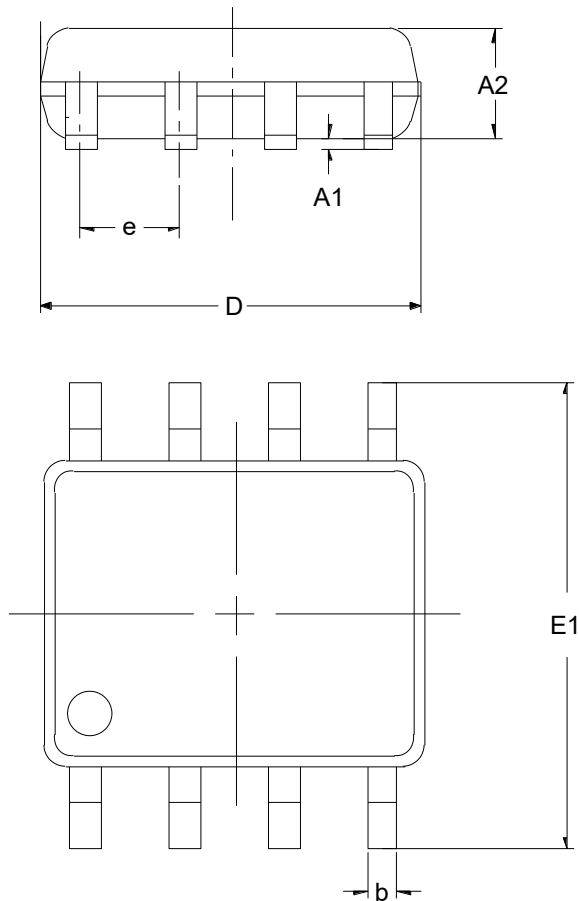
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
C	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650TYP		0.026TYP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

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	0.460	0.012	0.024
θ	0°	8°	0°	8°

SOP-8

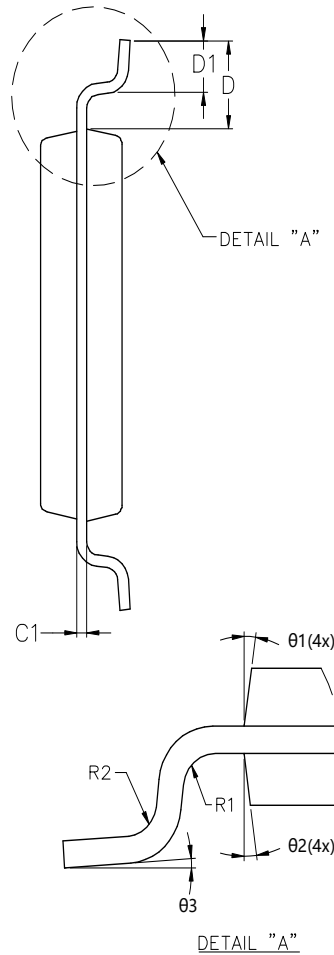
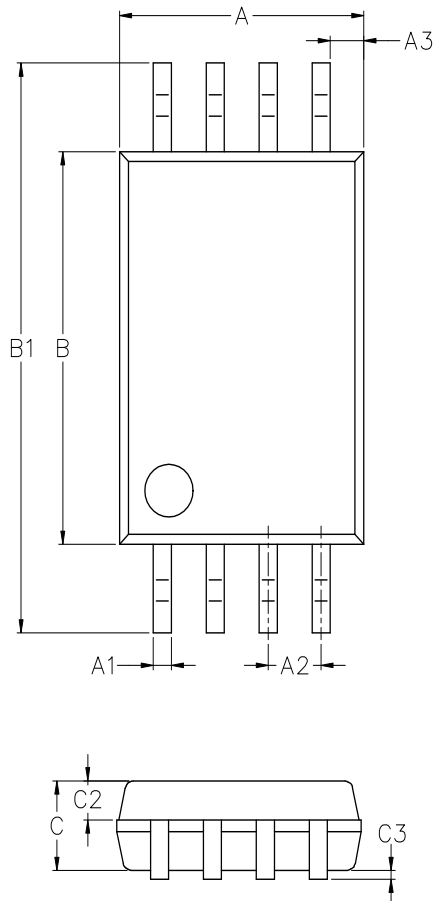


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270 TYP		0.050 TYP	
L1	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

LMV321/LMV358/LMV324

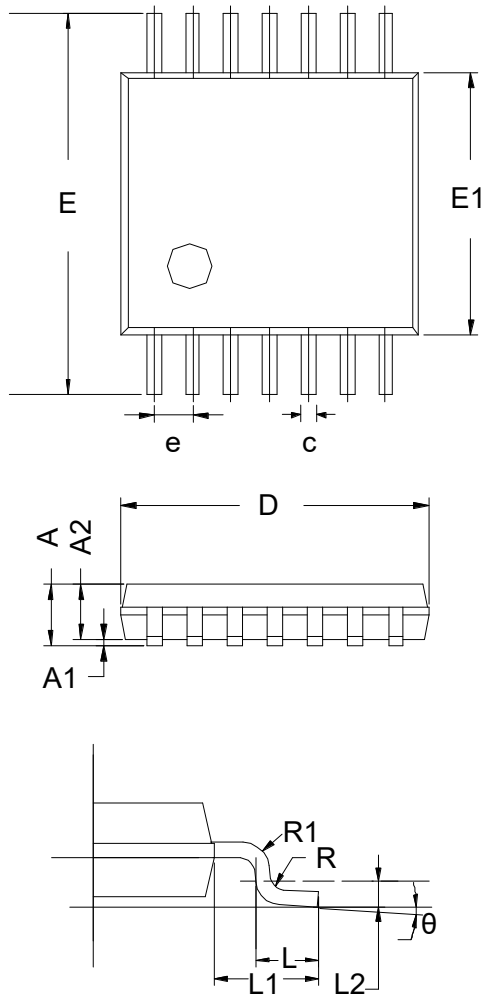
Low-Power rail-to-rail Operational Amplifier

TSSOP-8



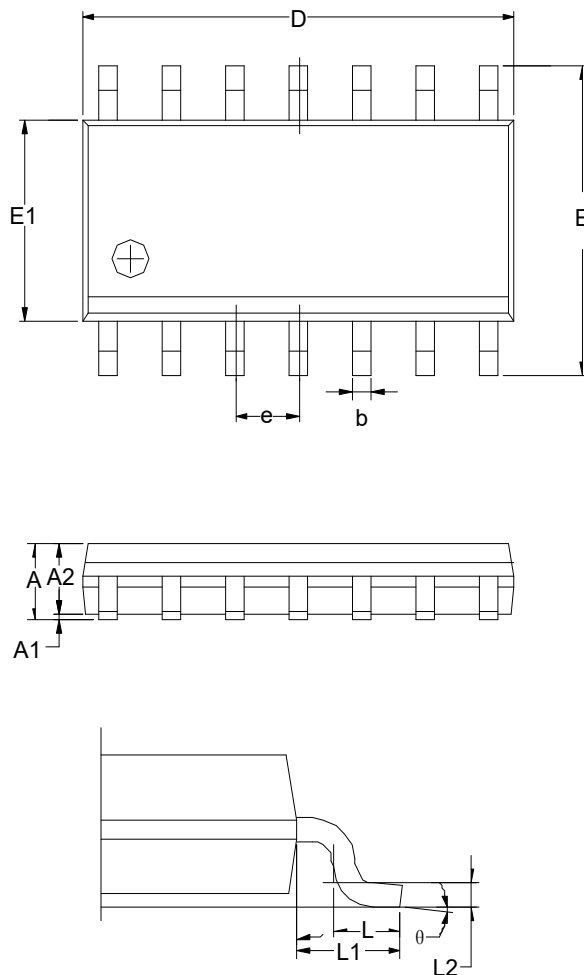
SYMBOL	MILLIMETER		
	MIN	MON	MAX
A	2.90	--	3.10
A1	0.20	--	0.30
A2	0.65 BSC		
A3	0.36	--	0.46
B	4.30	--	4.50
B1	6.30	--	6.50
C	0.95	--	1.05
C1	0.127 BSC		
C2	0.39	--	0.49
C3	0.05	--	0.15
D	1.00 REF		
D1	0.50	--	0.70
R1	0.150 TYP		
R2	0.150 TYP		
θ1	12° TYP		
θ2	12° TYP		
θ3	0°~7°		

TSSOP-14



Symbol	Dimensions In Millimeters		
	MIN	TYP	MAX
A	-	-	1.20
A1	0.05	-	0.15
A2	0.90	1.00	1.05
b	0.20	-	0.28
c	0.10	-	0.19
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	-	-
θ	0°	-	8°

SOP-14



Symbol	Dimensions In Millimeters		
	MIN	TYP	MAX
A	1.35	1.60	1.75
A1	0.10	0.15	0.25
A2	1.25	1.45	1.65
b	0.36		0.49
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		
θ	0°		8°

ORDERING INFORMATION

Order Code	Package	Baseqty	Deliverymode	Making
UMW LMV321IDCKR	SC70-5	3000	Tape and reel	R3F
UMW LMV321IDBVR	SOT23-5	3000	Tapeand reel	RC1F
UMW LMV358IDR	SOP-8	2500	Tape and reel	LMV358
UMW LMV358IPWR	TSSOP-8	4000	Tape and ree	LMV358I
UMW LMV324IDR	SOP-14	2500	Tape and reel	LMV324
UMW LMV324IPWR	TSSOP-14	4000	Tape and reel	LMV324