

**DESCRIPTION**

The RS6331, RS6332, RS6334, RS6331S, RS6332S families of products offer low voltage operation and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth (1.1MHz) and slew rate of 0.5V/us. The op-amps are unity gain stable and feature an ultra-low input bias current.

The devices are ideal for sensor interfaces, active filters and portable applications. The RS6331S, RS6332S include a shutdown mode. Under logic control, the amplifiers can be switched from normal operation to a standby current that is less than 1uA. The RS6331, RS6332, RS6334, RS6331S, RS6332S families of operational amplifiers are specified at the full temperature range of -40°C to +125°C under single or dual power supplies of 2.5V to 5.5V.

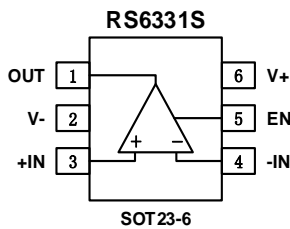
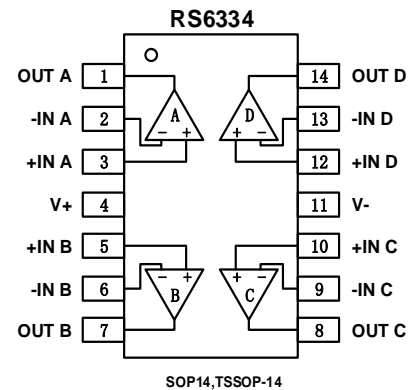
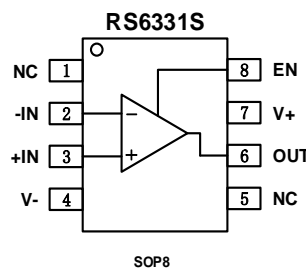
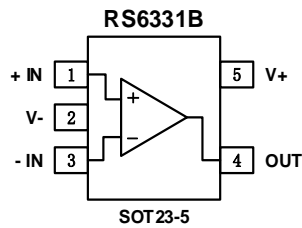
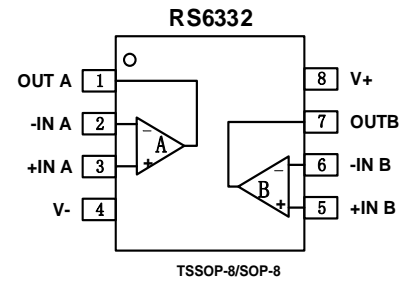
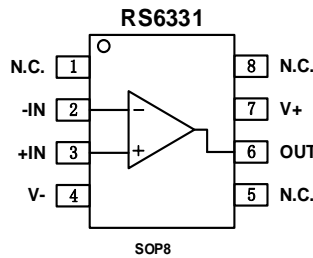
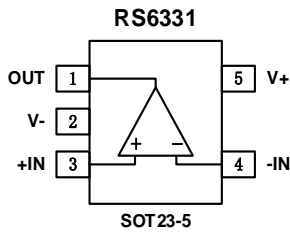
**FEATURES**

- HIGH GAIN BANDWIDTH: 1.1MHz
- RAIL-TO-RAIL INPUT AND OUTPUT  
0.6mV Typical  $V_{os}$
- INPUT VOLTAGE RANGE: -0.1V to +5.6V  
with  $V_s = 5.5V$
- SUPPLY RANGE: +2.5V to +5.5V
- SHUTDOWN: RS6331S/RS6332S
- SPECIFIED UP TO +125°C

**APPLICATIONS**

- SENSORS
- PHOTODIODE AMPLIFICATION
- ACTIVE FILTERS
- TEST EQUIPMENT
- DRIVING A/D CONVERTERS

**PIN CONFIGURATIONS**



**Note: N.C. indicates no internal connection**

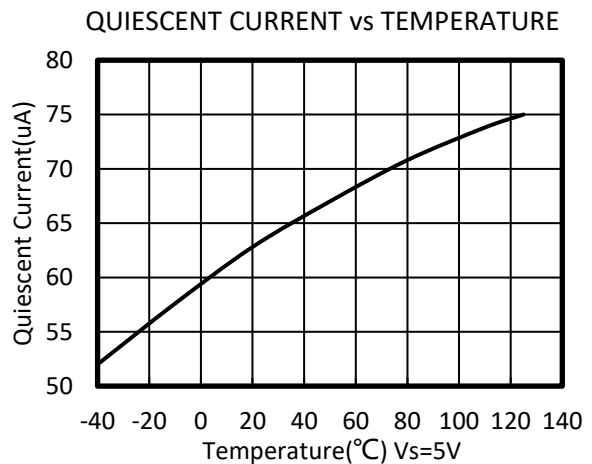
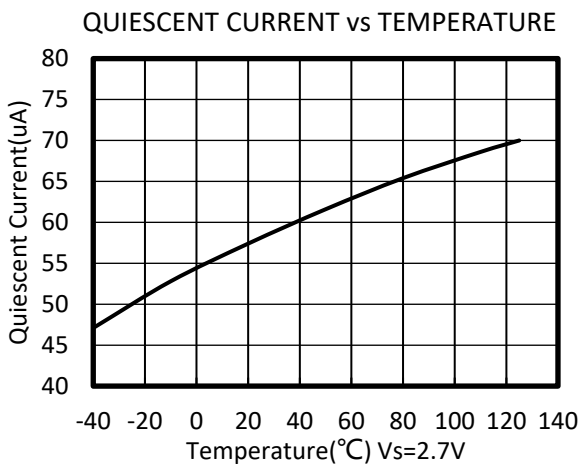
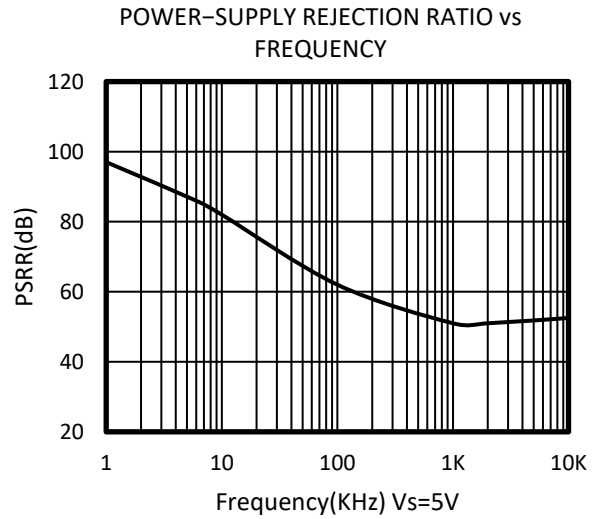
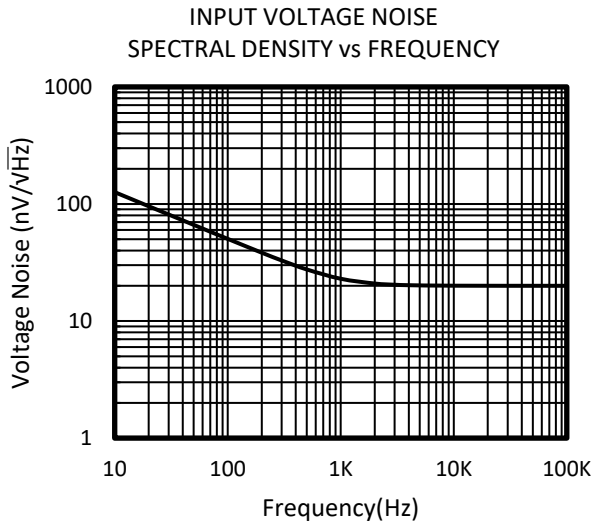
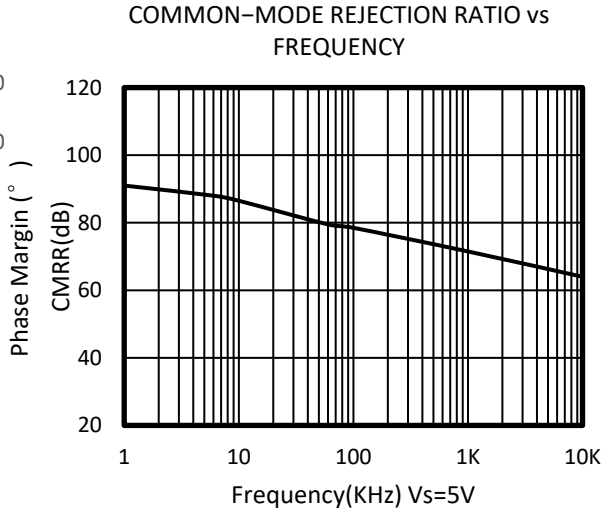
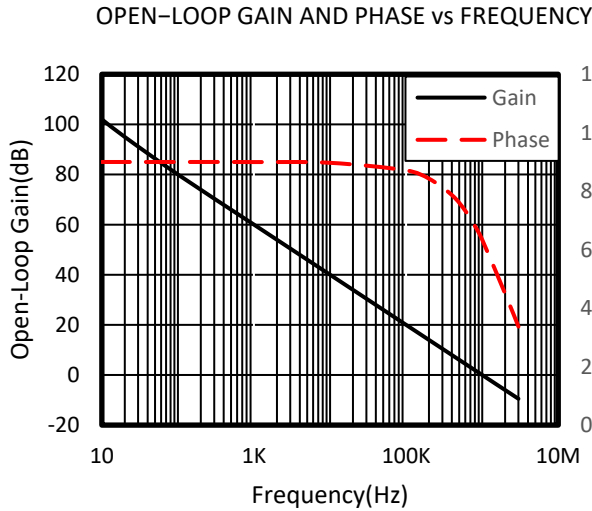
**1.1MHz, Rail-to-Rail I/O CMOS Operational Amplifier**
**ELECTRICAL CHARACTERISTICS**

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

PARAMETER		CONDITIONS	$T_J$	RS6331S, RS6332S, RS6331, RS6332, RS6334			UNIT
				MIN	TYP	MAX	
$V_S$	Operating Voltage Range		$25^\circ\text{C}$	2.5		5.5	V
$I_Q$	Quiescent Current/Amplifier		$25^\circ\text{C}$		58	80	$\mu\text{A}$
PSRR	Power-Supply Rejection Ratio	$V_S = 2.5\text{V to } 5.5\text{V}$ , $V_{cm} = (V_-) + 0.5\text{V}$	$25^\circ\text{C}$	72	90		dB
			$-40^\circ\text{C to } 125^\circ\text{C}$	65			
$V_{os}$	Input Offset Voltage		$25^\circ\text{C}$		0.6	3	mV
$V_{os\ TC}$	Input Offset Voltage Average Drift	$-40^\circ\text{C to } 125^\circ\text{C}$			2		$\mu\text{V}/^\circ\text{C}$
$I_B$	Input Bias Current		$25^\circ\text{C}$		1	10	pA
$I_{os}$	Input Offset Current		$25^\circ\text{C}$		1	10	pA
$V_{cm}$	Common-Mode Voltage Range	$V_S = 5.5\text{V}$	$25^\circ\text{C}$	-0.1		5.6	V
CMRR	Common-Mode Rejection Ratio	$V_S = 5.5\text{V}$ , $V_{cm} = -0.1\text{V to } 4\text{V}$	$25^\circ\text{C}$	71	90		dB
			$-40^\circ\text{C to } 125^\circ\text{C}$	68			
			$25^\circ\text{C}$	60	80		
			$-40^\circ\text{C to } 125^\circ\text{C}$	57			
AOL	Open-Loop Voltage Gain	$R_L = 2\text{k}\Omega$ , $V_o = 0.15\text{V to } 4.85\text{V}$	$25^\circ\text{C}$	94	105		dB
			$-40^\circ\text{C to } 125^\circ\text{C}$	85			
			$25^\circ\text{C}$	100	110		
			$-40^\circ\text{C to } 125^\circ\text{C}$	90			
	Output Swing From Rail	$R_L = 2\text{k}\Omega$ $R_L = 10\text{k}\Omega$	$25^\circ\text{C}$		25 8		mV
$I_{out}$	Output Short-Circuit Current		$25^\circ\text{C}$		55		mA
SR	Slew Rate		$25^\circ\text{C}$		0.5		V/ $\mu\text{s}$
GBP	Gain-Bandwidth Product		$25^\circ\text{C}$		1.1		MHz
PM	Phase Margin		$25^\circ\text{C}$		64		$^\circ$
$t_s$	Setting Time, 0.1%				1.3		$\mu\text{s}$
	Overload Recovery Time	$V_{IN} \cdot \text{Gain} \geq V_S$			2.3		$\mu\text{s}$
$e_n$	Input Voltage Noise Density	$f = 1\text{KHz}$	$25^\circ\text{C}$		22		$\text{nV}/\sqrt{\text{Hz}}$
		$f = 10\text{KHz}$	$25^\circ\text{C}$		20		$\text{nV}/\sqrt{\text{Hz}}$
$I_{Q(OFF)}$	Supply Current in Shutdown		$25^\circ\text{C}$		<1		$\mu\text{A}$
$t_{OFF}$			$25^\circ\text{C}$		3		$\mu\text{s}$
$t_{ON}$			$25^\circ\text{C}$		20		$\mu\text{s}$
$V_L$	Shut Down		$25^\circ\text{C}$	$V_-$		$(V_-) + 0.8$	V
$V_H$	Amplifier Is Active		$25^\circ\text{C}$	$(V_-) + 2$		$V_+$	V

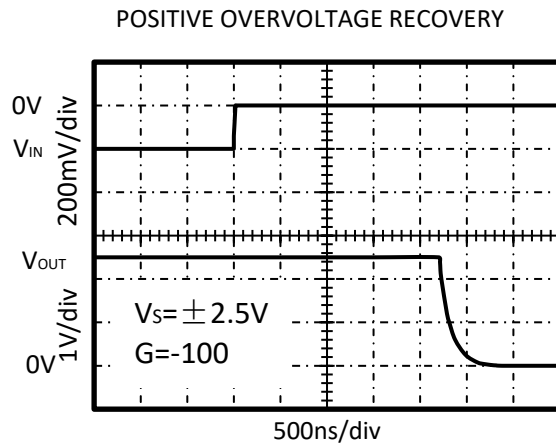
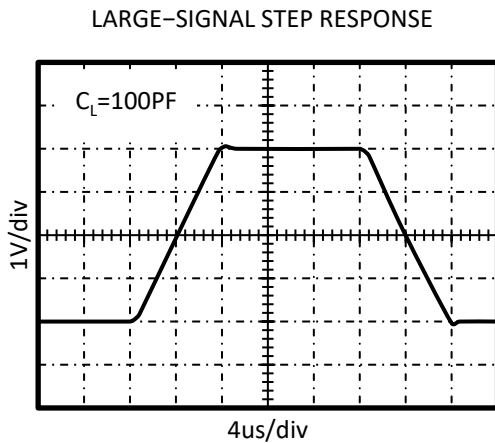
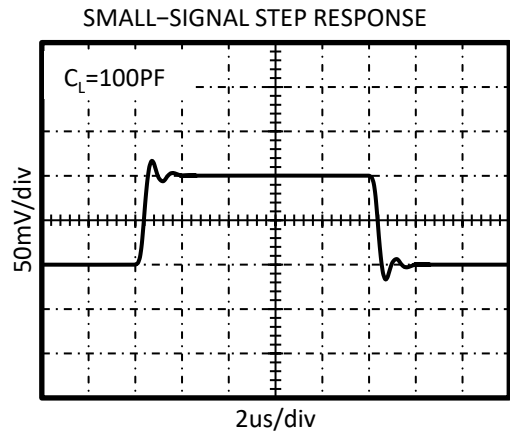
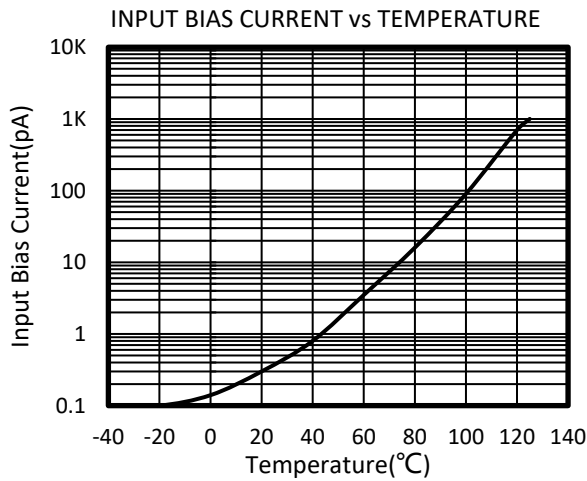
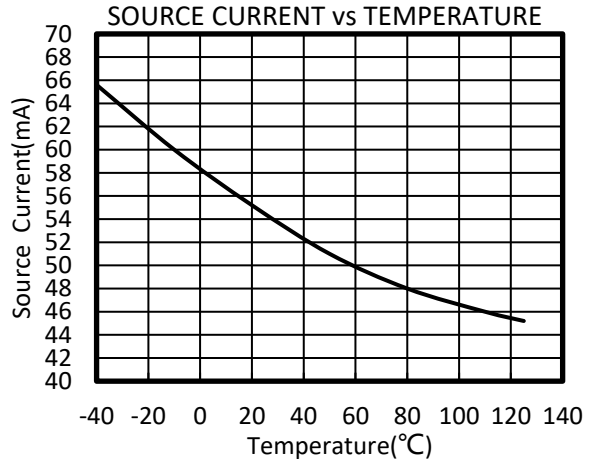
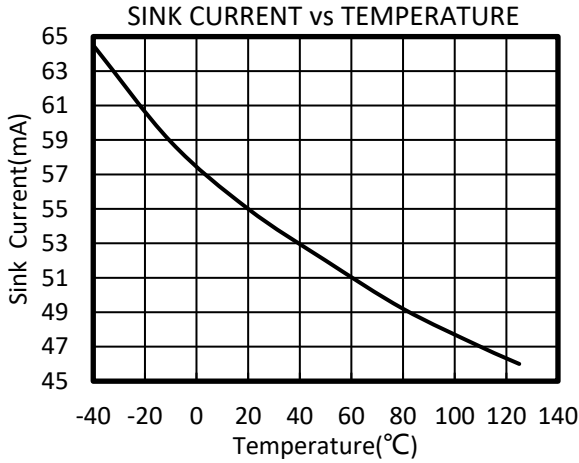
**TYPICAL CHARACTERISTICS**

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



**TYPICAL CHARACTERISTICS**

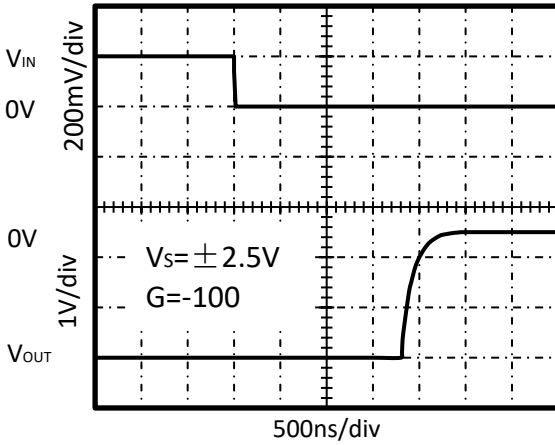
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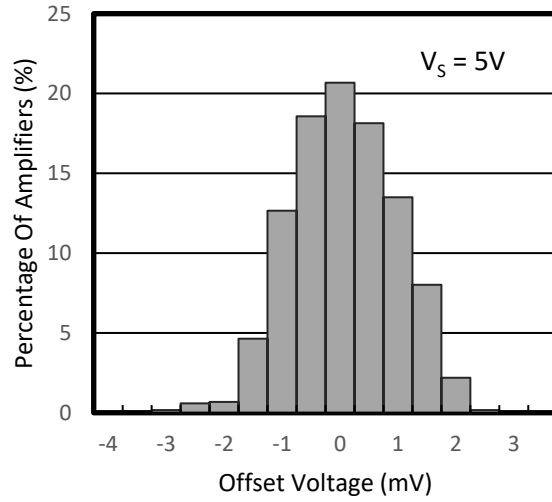
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At  $T_A = +25^\circ\text{C}$ ,  $V_S = 5\text{V}$ ,  $R_L = 10\text{k}\Omega$  connected to  $V_S/2$ ,  $V_{OUT} = V_S/2$ , unless otherwise noted.

Negative Overvoltage Recovery

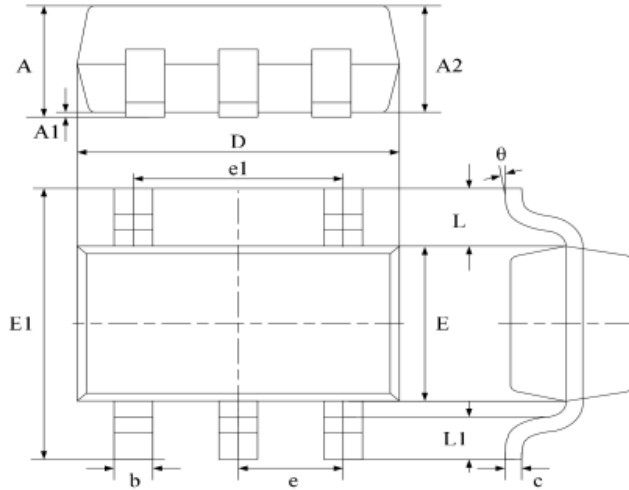


Offset Voltage Production Distribution



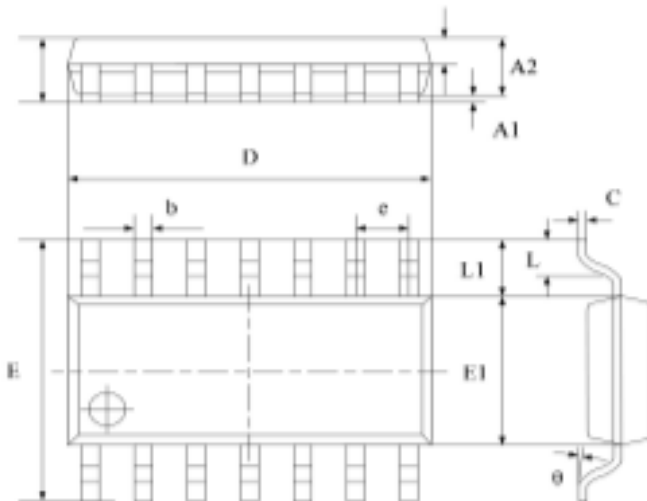
Package Dimension

SOT23-5



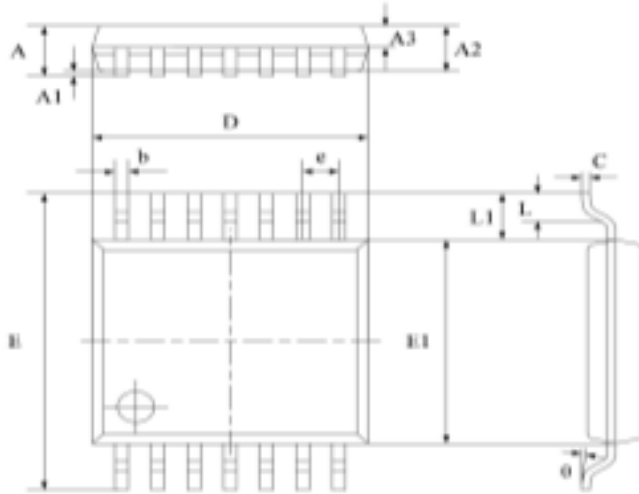
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.040	1.350	0.042	0.055
A1	0.040	0.150	0.002	0.006
A2	1.000	1.200	0.041	0.049
b	0.380	0.480	0.015	0.020
c	0.110	0.210	0.004	0.009
D	2.720	3.120	0.111	0.127
E	1.400	1.800	0.057	0.073
E1	2.600	3.000	0.106	0.122
e	0.950 typ.		0.037 typ.	
e1	1.900 typ.		0.078 typ.	
L	0.700 ref.		0.028 ref.	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOP-14



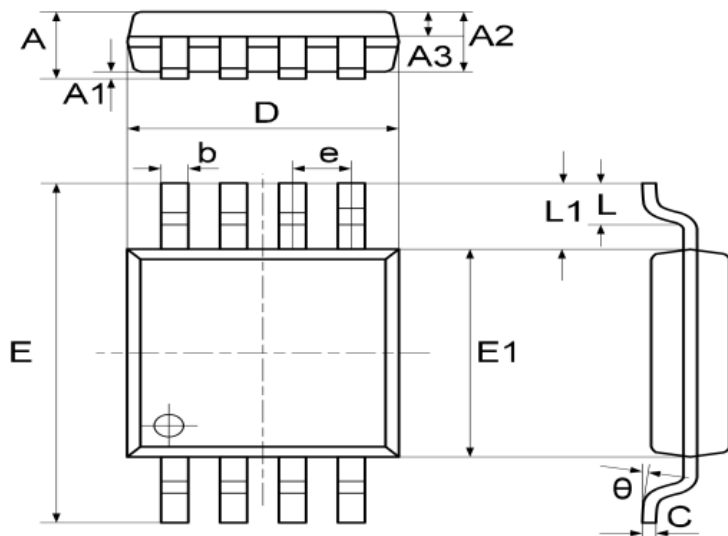
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.450	1.850	0.059	0.076
A1	0.100	0.300	0.004	0.012
A2	1.350	1.550	0.055	0.063
A3	0.550	0.750	0.022	0.031
b	0.406typ.		0.017typ.	
C	0.203typ.		0.008typ.	
D	8.630	8.830	0.352	0.360
E	5.840	6.240	0.238	0.255
E1	3.850	4.050	0.157	0.165
e	1.270 typ.		0.050 typ.	
L1	1.040 ref.		0.041 ref.	
L	0.350	0.750	0.014	0.031
θ	2°	8°	2°	8°

TSSOP-14



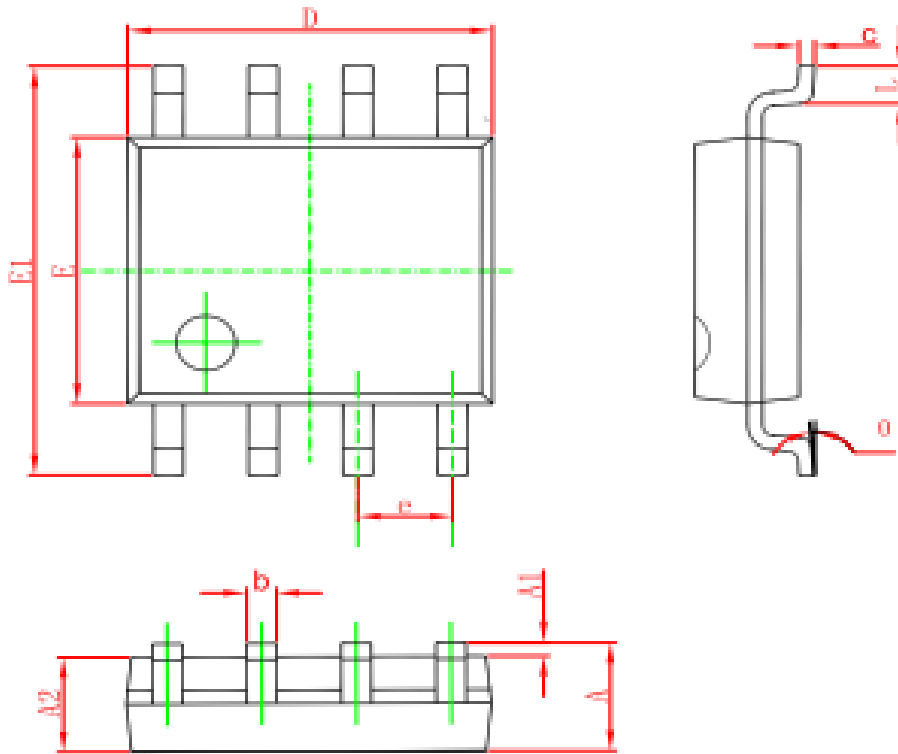
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	-	1.200	-	0.0472
A1	0.050	0.150	0.002	0.006
A2	0.900	1.050	0.037	0.043
A3	0.390	0.490	0.016	0.020
b	0.200	0.290	0.008	0.012
C	0.130	0.180	0.005	0.007
D	4.860	5.060	0.198	0.207
E	6.200	6.600	0.253	0.269
E1	4.300	4.500	0.176	0.184
e	0.650 typ.		0.0256 typ.	
L1	1.000 ref.		0.0393 ref.	
L	0.450	0.750	0.018	0.031
θ	0°	8°	0°	8°

TSSOP-8



Symbol	Dimensions In Millimeters		
	Min	Nom	Max
A	-	-	1.200
A1	0.050	-	0.150
A2	0.900	1.000	1.050
A3	0.390	0.440	0.490
b	0.200	-	0.280
C	0.130	-	0.170
D	2.900	3.000	3.100
E	6.200	6.400	6.600
E1	4.300	4.400	4.500
e	0.65BSC		
L	0.450	-	0.750
L1	1.000 ref		
θ	0°	-	8°

SOP-8



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	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°



Order code	Package	Baseqty	Deliverymode	Marking
UMW RS6331XF	SOT23-5	3000	Tape and reel	6331
UMW RS6331BXF	SOT23-5	3000	Tape and reel	63318
UMW RS6332XK	SOP-8	2500	Tape and reel	RS6332
UMW RS6334XP	SOP-14	2500	Tape and reel	RS6334
UMW RS6334XQ	TSSOP-14	4000	Tape and reel	RS6334
UMW RS6332XQ	TSSOP-8	4000	Tape and reel	RS6332