

1MHz, 45µA, CMOS, Rail-to-Rail OPERATIONAL AMPLIFIERS

DESCRIPTION

The OPA348 series amplifiers are single supply, low-power, CMOS op amps in micro packaging. Featuring an extended bandwidth of 1MHz, and a supply current of 45µA, the OPA348 series is useful for low-power applications on single supplies of 2.1V to 5.5V.

Low supply current of 45µA, and an input bias current of 0.5pA, make the OPA348 series an optimal candidate for low-power, high-impedance applications such as smoke detectors and other sensors.

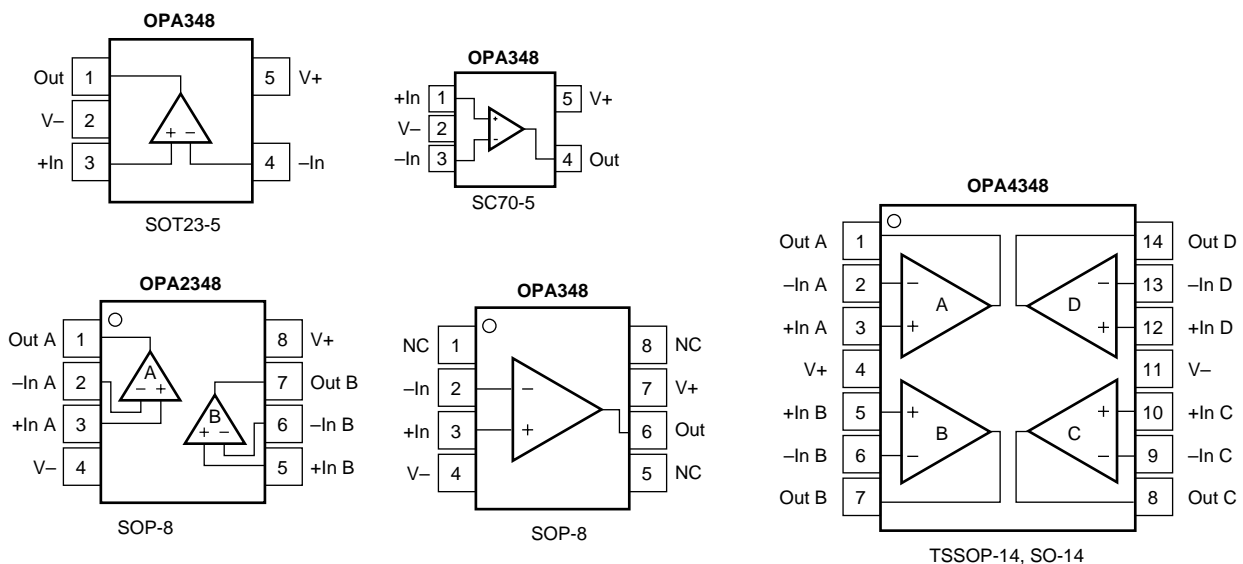
The OPA348 is available in the miniature SC70-5, SOT23-5 and SO-8 packages. The OPA2348 is available in SOT23-8 and SO-8 packages, and the OPA4348 is offered in space-saving TSSOP-14 and SO-14 packages. The extended temperature range of -40°C to +125°C over all supply voltages offers additional design flexibility.

FEATURES

- LOW I_Q: 45µA typical
- LOW COST
- RAIL-TO-RAIL INPUT AND OUTPUT
- SINGLE SUPPLY: +2.1V to +5.5V
- INPUT BIAS CURRENT: 0.5pA
- Micro SIZE PACKAGES: SC70-5, SOP-8 and TSSOP-14
- HIGH SPEED:POWER WITH BANDWIDTH: 1MHz

APPLICATIONS

- PORTABLE EQUIPMENT
- BATTERY-POWERED EQUIPMENT
- SMOKE ALARMS
- CO DETECTORS
- MEDICAL INSTRUMENTATION



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ELECTRICAL CHARACTERISTICS: $V_S = 2.5V$ to $5.5V$
Boldface limits apply over the specified temperature range, $T_A = -40^{\circ}C$ to $+125^{\circ}C$

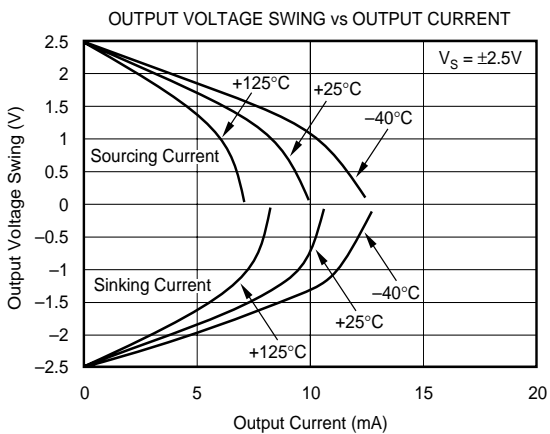
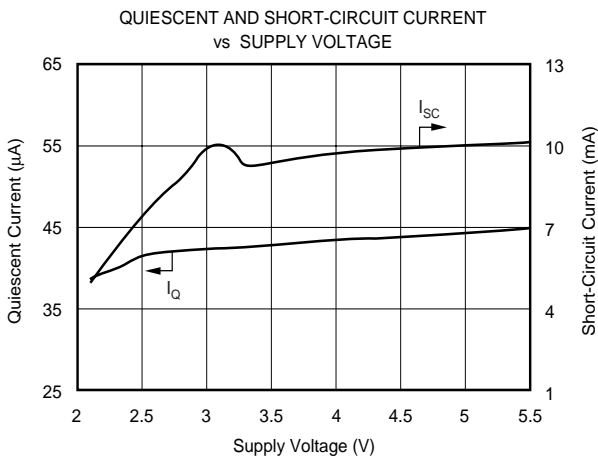
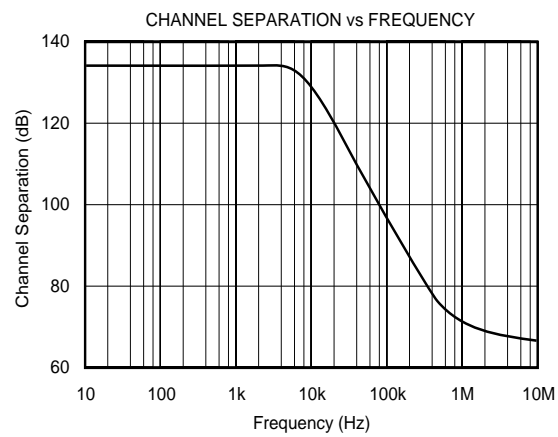
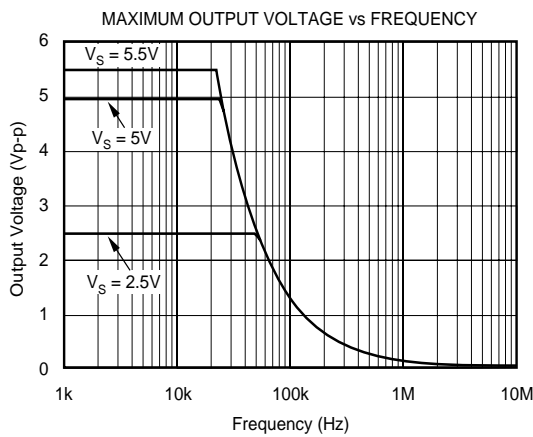
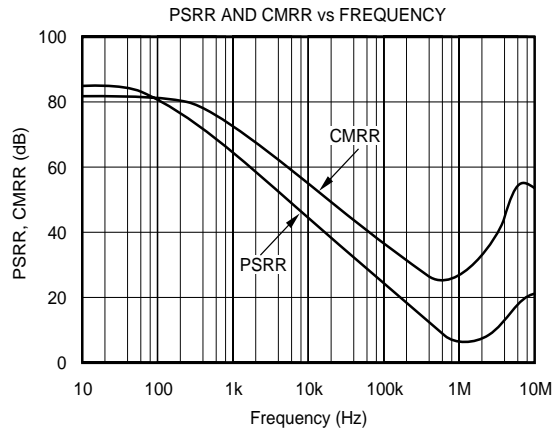
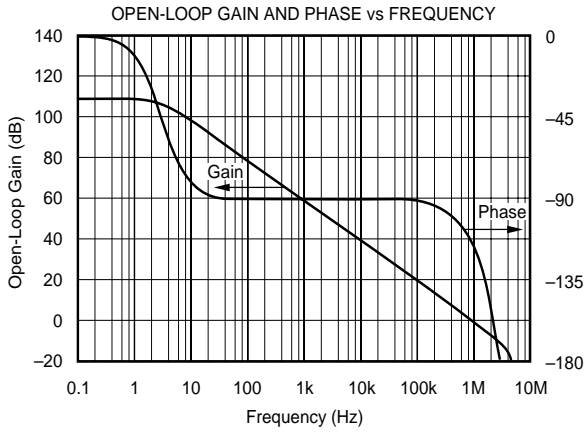
 At $T_A = +25^{\circ}C$, $R_L = 100k\Omega$ connected to $V_S/2$ and $V_{OUT} = V_S/2$, unless otherwise noted.

PARAMETER	CONDITION	OPA348 OPA2348 OPA4348			UNITS
		MIN	TYP	MAX	
OFFSET VOLTAGE					
Input Offset Voltage	V_{OS}	$V_S = 5V, V_{CM} = (V-) + 0.8V$			mV
Over Temperature					
Drift	dV_{OS}/dT				$\mu V/^{\circ}C$
vs Power Supply	PSRR	$V_S = 2.5V$ to $5.5V, V_{CM} < (V+) - 1.7V$			$\mu V/V$
Over Temperature					
Channel Separation, dc					$\mu V/V$
$f = 1kHz$					dB
INPUT VOLTAGE RANGE					
Common-Mode Voltage Range	V_{CM}	$(V-) - 0.2$			V
Common-Mode Rejection Ratio	CMRR	$(V-) - 0.2V < V_{CM} < (V+) - 1.7V$			dB
over Temperature					
		$(V-) < V_{CM} < (V+) - 1.7V$			dB
over Temperature					
		$V_S = 5.5V, (V-) - 0.2V < V_{CM} < (V+) + 0.2V$			dB
over Temperature					
		$V_S = 5.5V, (V-) < V_{CM} < (V+)$			dB
INPUT BIAS CURRENT					
Input Bias Current	I_B				pA
Input Offset Current	I_{OS}				pA
INPUT IMPEDANCE					
Differential		$10^{13} \parallel 3$			$\Omega \parallel pF$
Common-Mode		$10^{13} \parallel 6$			$\Omega \parallel pF$
NOISE					
Input Voltage Noise, $f = 0.1Hz$ to $10Hz$					$\mu Vp-p$
Input Voltage Noise Density, $f = 1kHz$	e_n				nV/\sqrt{Hz}
Input Current Noise Density, $f = 1kHz$	i_n				fA/\sqrt{Hz}
OPEN-LOOP GAIN					
Open-Loop Voltage Gain	A_{OL}	$V_S = 5V, R_L = 100k\Omega, 0.025V < V_O < 4.975V$			dB
over Temperature					
		$V_S = 5V, R_L = 100k\Omega, 0.025V < V_O < 4.975V$			dB
over Temperature					
		$V_S = 5V, R_L = 5k\Omega, 0.125V < V_O < 4.875V$			dB
over Temperature					
		$V_S = 5V, R_L = 5k\Omega, 0.125V < V_O < 4.875V$			dB
OUTPUT					
Voltage Output Swing from Rail		$R_L = 100k\Omega, A_{OL} > 94dB$			mV
over Temperature					
		$R_L = 100k\Omega, A_{OL} > 90dB$			mV
over Temperature					
		$R_L = 5k\Omega, A_{OL} > 90dB$			mV
over Temperature					
		$R_L = 5k\Omega, A_{OL} > 88dB$			mV
over Temperature					
Short-Circuit Current	I_{SC}	± 10			mA
Capacitive Load Drive	C_{LOAD}	See Typical Characteristics			
FREQUENCY RESPONSE					
Gain-Bandwidth Product	GBW	$C_L = 100pF$			MHz
Slew Rate	SR	$G = +1$			V/ μs
Settling Time, 0.1%	t_S	$V_S = 5.5V, 2V$ Step, $G = +1$			μs
0.01%		$V_S = 5.5V, 2V$ Step, $G = +1$			μs
Overload Recovery Time		$V_{IN} \cdot Gain > V_S$			μs
Total Harmonic Distortion + Noise	THD+N	$V_S = 5.5V, V_O = 3Vp-p, G = +1, f = 1kHz$			%
POWER SUPPLY					
Specified Voltage Range	V_S	2.5			V
Minimum Operating Voltage		2.1 to 5.5			V
Quiescent Current (per amplifier)	I_Q	45			μA
over Temperature					
		75			μA
TEMPERATURE RANGE					
Specified Range		-40			$^{\circ}C$
Operating Range		-65			$^{\circ}C$
Storage Range		-65			$^{\circ}C$
Thermal Resistance	θ_{JA}				$^{\circ}C/W$
SOT23-5 Surface-Mount		200			$^{\circ}C/W$
SOT23-8 Surface-Mount		150			$^{\circ}C/W$
MSOP-8 Surface-Mount		150			$^{\circ}C/W$
SOP-8 Surface-Mount		150			$^{\circ}C/W$
SOP-14 Surface-Mount		100			$^{\circ}C/W$
TSSOP-14 Surface-Mount		100			$^{\circ}C/W$
SC70-5 Surface-Mount		250			$^{\circ}C/W$

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TYPICAL CHARACTERISTICS

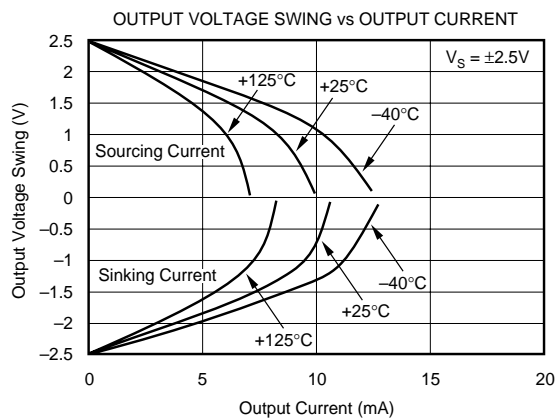
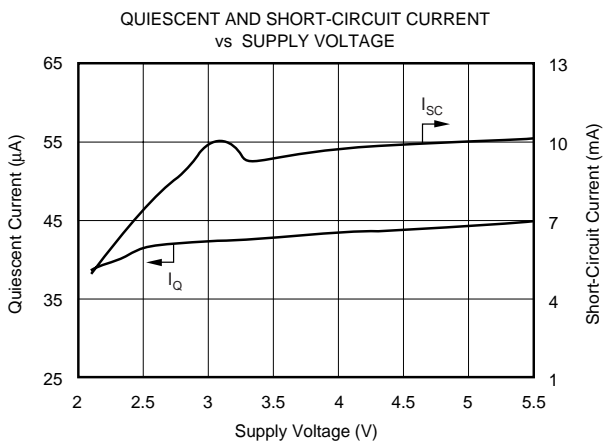
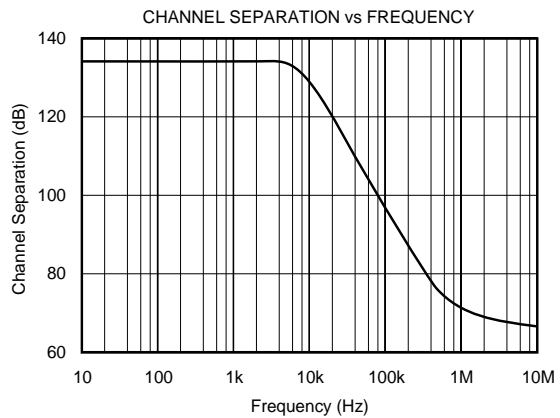
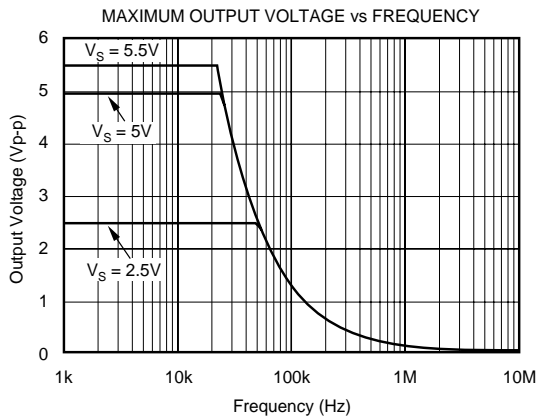
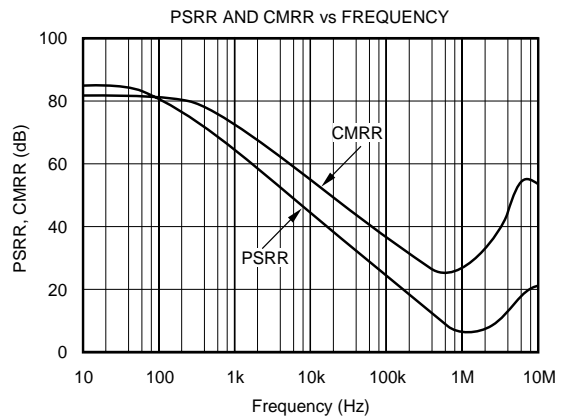
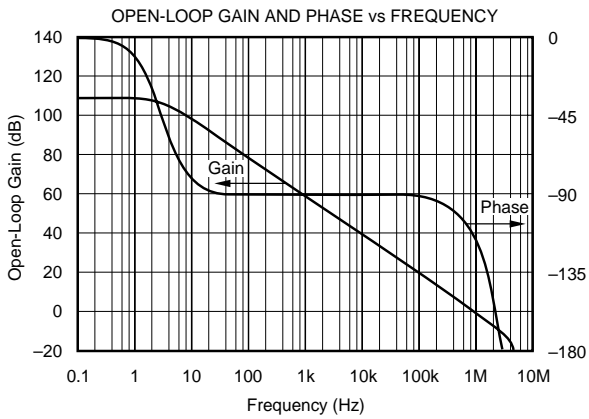
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TYPICAL CHARACTERISTICS (Cont.)

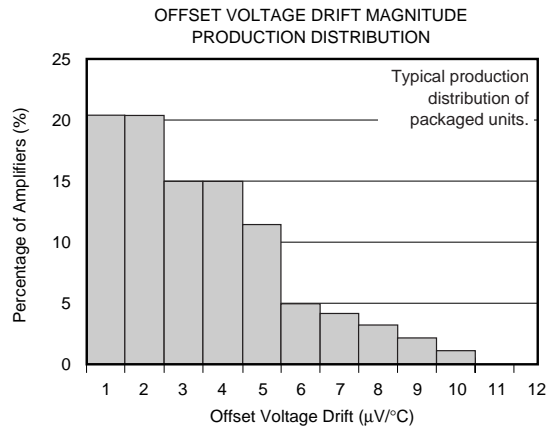
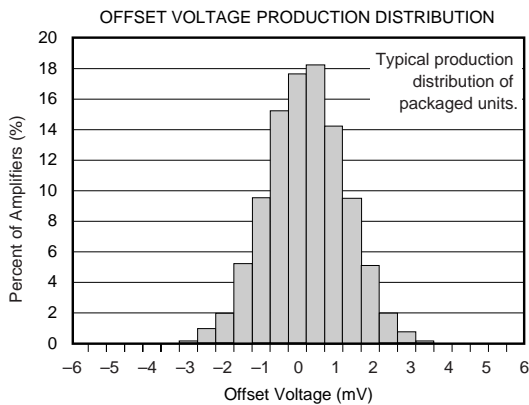
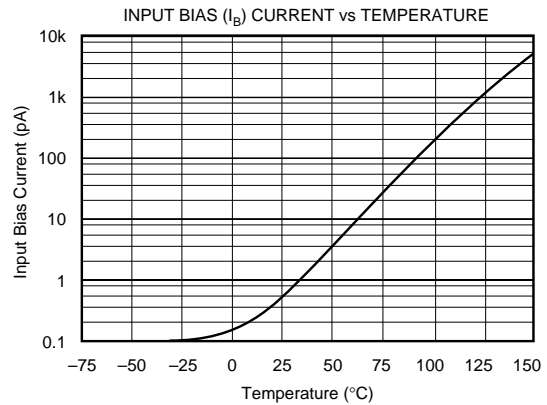
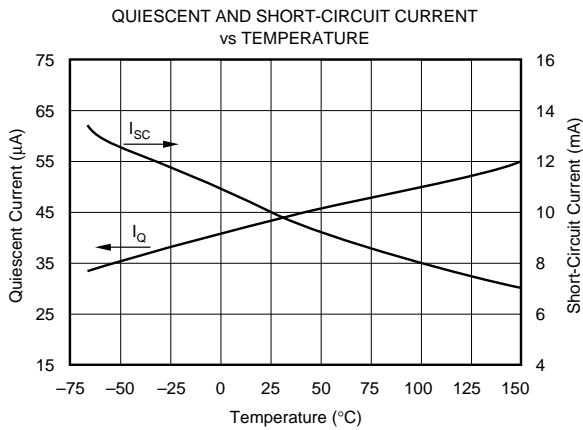
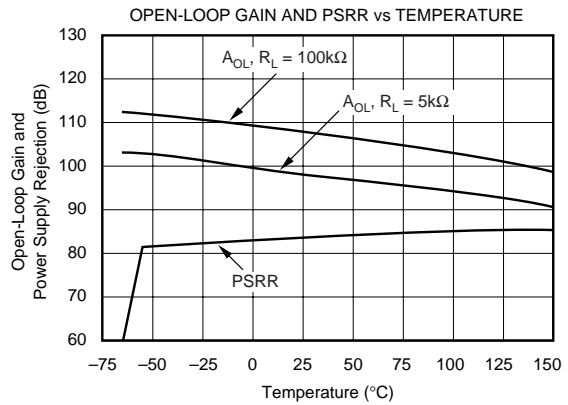
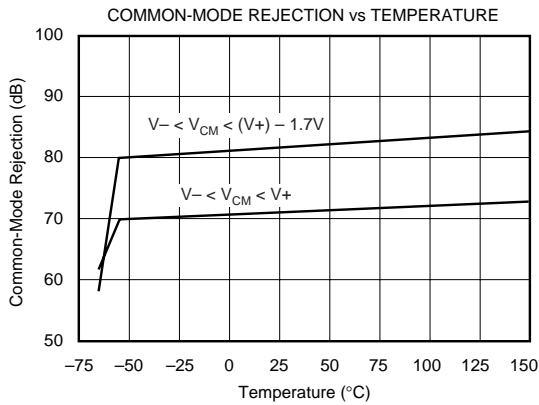
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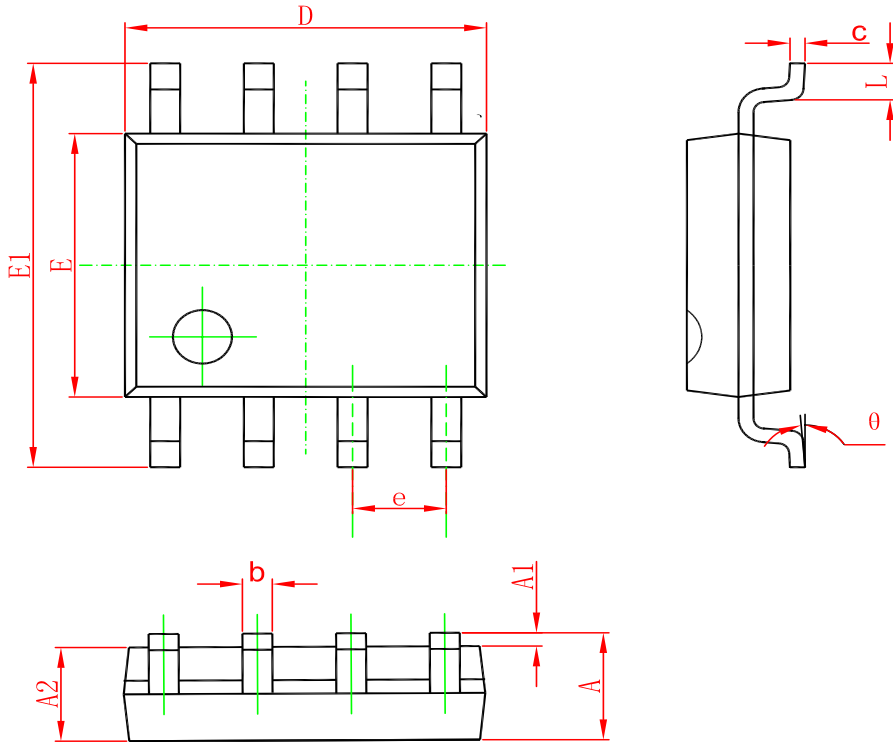
TYPICAL CHARACTERISTICS (Cont.)

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



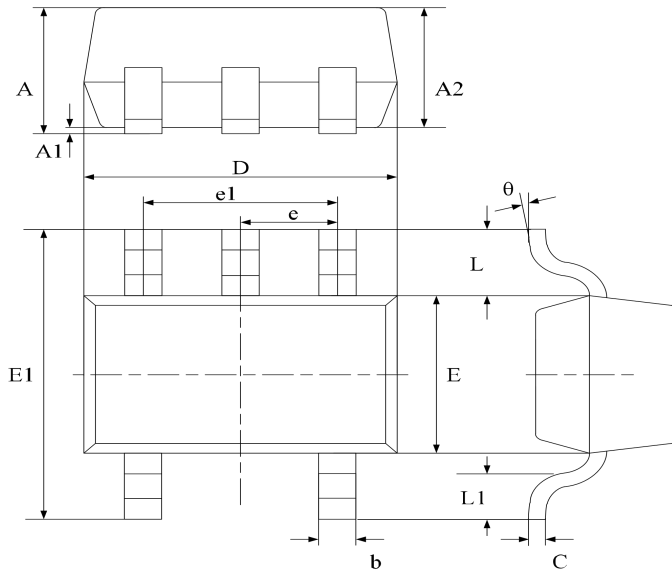
Package Dimension

SOP-8



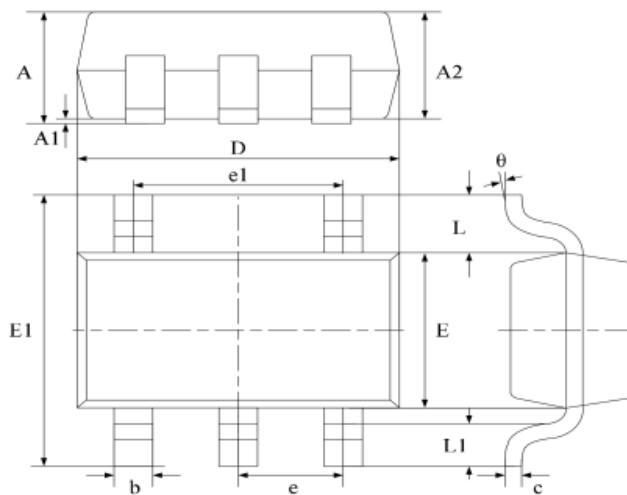
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SC70-5 (SOT353)



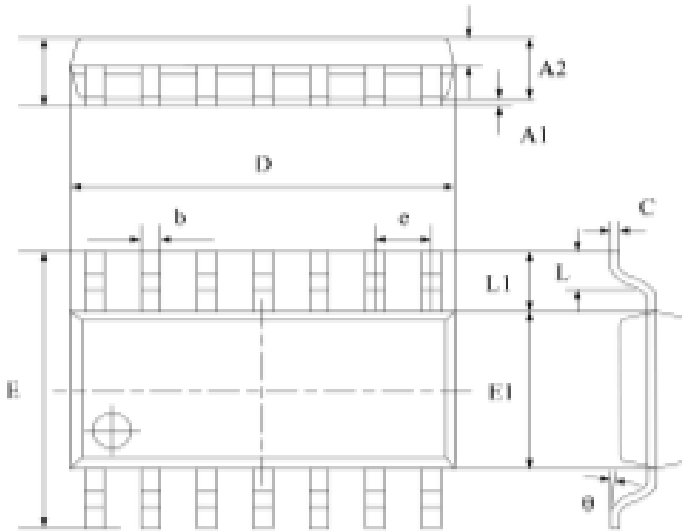
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.800	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	0.900	0.035	0.039
b	0.150	0.350	0.006	0.014
C	0.080	0.150	0.003	0.006
D	1.8500	2.150	0.079	0.087
E	1.100	1.400	0.045	0.053
E1	1.950	2.200	0.085	0.096
e	0.850 typ.		0.026 typ.	
e1	1.200	1.400	0.047	0.055
L	0.42 ref.		0.021 ref.	
L1	0.260	0.460	0.010	0.018
theta	0°	8°	0°	8°

SOT23-5



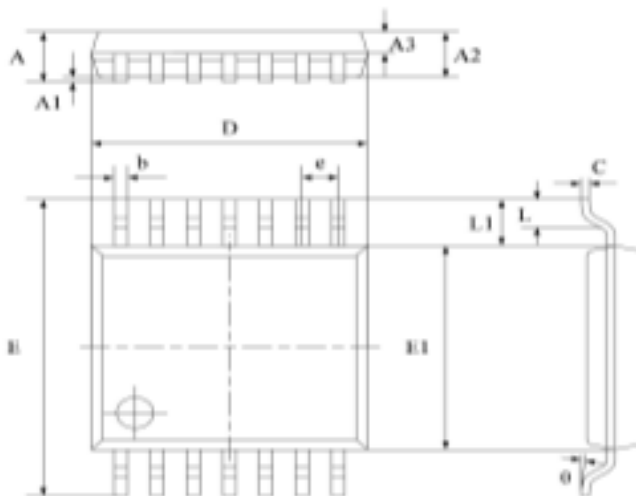
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.040	1.350	0.042	0.055
A1	0.040	0.150	0.002	0.006
A2	1.000	1.200	0.041	0.049
b	0.380	0.480	0.015	0.020
c	0.110	0.210	0.004	0.009
D	2.720	3.120	0.111	0.127
E	1.400	1.800	0.057	0.073
E1	2.600	3.000	0.106	0.122
e	0.950 typ.		0.037 typ.	
e1	1.900 typ.		0.078 typ.	
L	0.700 ref.		0.028 ref.	
L1	0.300	0.600	0.012	0.024
theta	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	0.350	0.750	0.022	0.031
b	0.406 typ.		0.017 typ.	
C	0.203 typ.		0.008 typ.	
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°

Ordering information

Order code	Package	Baseqty	Deliverymode	Marking
UMW OPA348AIDCKR	SC70-5	3000	Tape and reel	S48 U
UMW OPA348AIDBVR	SOT23-5	3000	Tape and reel	A48 U
UMW OPA348AIDR	SOP-8	2500	Tape and reel	OPA348A
UMW OPA2348AID	SOP-8	2500	Tape and reel	OPA2348A
UMW OPA2348AIDR	SOP-8	2500	Tape and reel	OPA2348A
UMW OPA4348AIDR	SOP-14	2500	Tape and reel	OPA4348A
UMW OPA4348AIPWR	TSSOP-14	4000	Tape and reel	OPA4348A
UMW OPA4348AIPWT	TSSOP-14	4000	Tape and reel	OPA4348A