



SV8541A, SV8542A, SV8544A

Micro Power, Low Noise Operational Amplifiers

v0.95
SAVITECH Corporation

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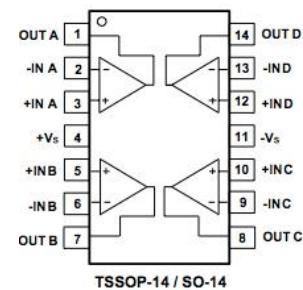
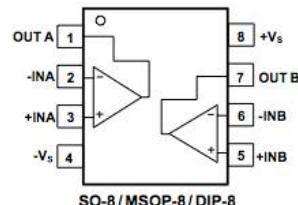
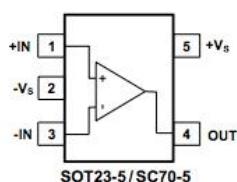
Features

Wide power supply range: +1.8 V to +5.5V
Very low quiescent current per amplifier: 25 μ A
Low Noise: $eN = 17\text{nV}/\sqrt{\text{Hz}}$
Gain bandwidth product, GBP(typ)= 1.2 MHz
Low drift: V_{OS} (typ) = 0.6mV, I_{OS} (typ)= 0.5pA
Low input bias current: I_B (typ) = 0.5pA
Unity Gain Stable
Excellent Radio Frequency Immunity
(Pass IEC 1000-4-3 Radiated Immunity Class 2)

Description

The SV8541A/SV8542A/SV8544A consist of 1/2/4 independent, high gain, internally frequency-compensated operational amplifiers. They operate from a single power supply ranging from +1.8V to +5.5V and consume very low current that make them idea for two to four battery powered applications. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. The family also features low noise, low output offset voltage, low input offset current and low input bias current that make the family idea for sensor application within noisy environment

Pin connection



Order codes

Part number	Operation range	Package	Packing
SV8541A-05SC-TR3	-40°C, +85°C	SC70-5	Tape & reel, 3000pcs
SV8541A-05OT-TR3		SOT23-5	Tape & reel, 3000pcs
SV8542A-08SP-TR2		SOP-8	Tape & reel, 2500pcs
SV8542A-08MP-TR2		MSOP-8	Tape & reel, 2500pcs
SV8544A-14TP-TR2		TSSOP-14	Tube, 56ea / tube, 6720ea / carton
SV8544A14SP-TR2		SOP-14	Tube, 56ea / tube, 6720ea / carton

Absolute maximum ratings

Symbol	Parameter	SV8541A	SV8542A	SV8544A	Unit
V_{CC}	Supply voltage	7.5			V
V_{in}	Input voltage	-0.5 to 8			V
	Output short-circuit duration	Infinite			
I_{in}	Input current : V_{in} driven negative Input current : V_{in} driven positive above	5 mA in DC or 50 mA in AC (duty cycle = 10%, T=1s)			mA
T_{oper}	Operating free-air temperature range	-40 to +85			°C
T_{stg}	Storage temperature range	-65 to +150			°C
T_j	Maximum junction temperature	150			°C
R_{thja}	Thermal resistance junction to ambient SO14 MSOP-8 SO23-5	103 210 180			°C/W
	HBM: human body mode	8K			
ESD	MM: machine mode	400			V

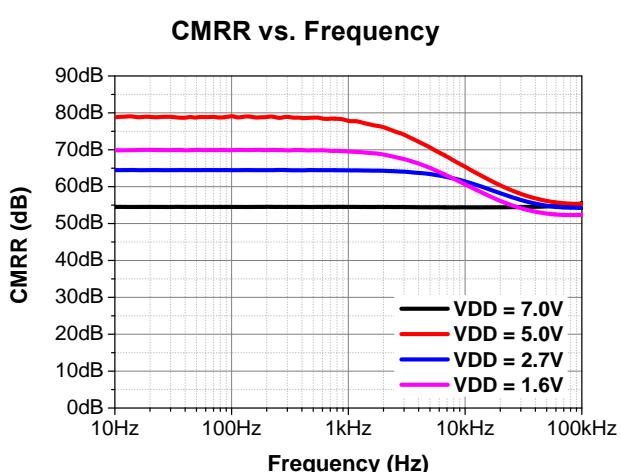
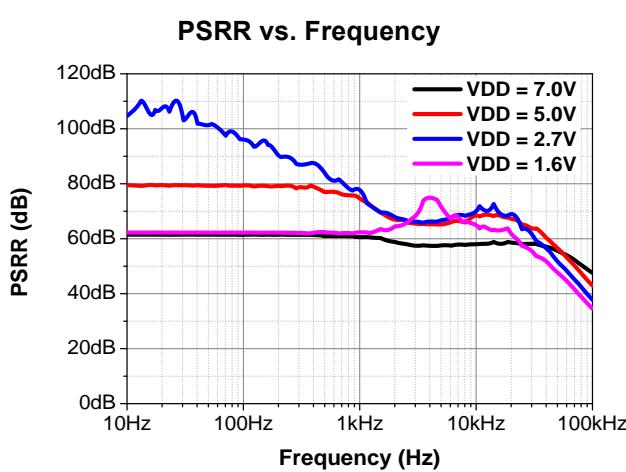
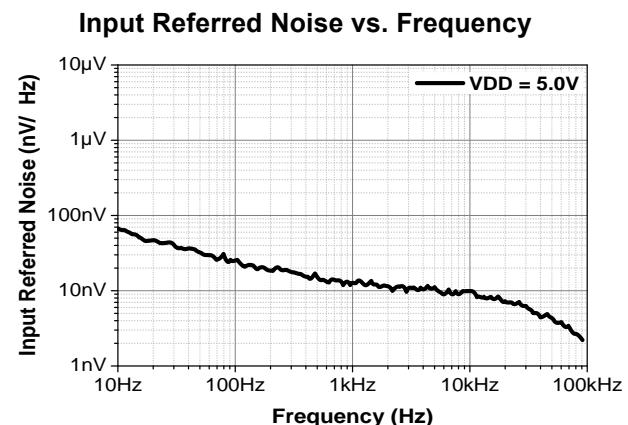
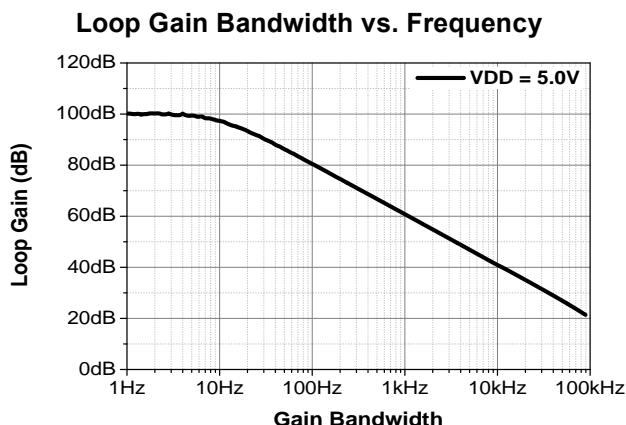
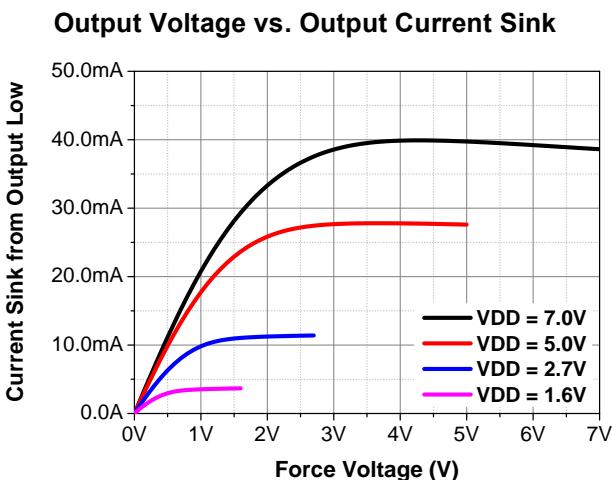
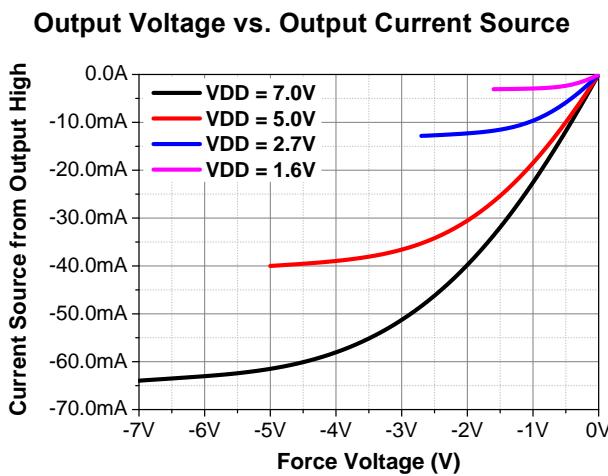
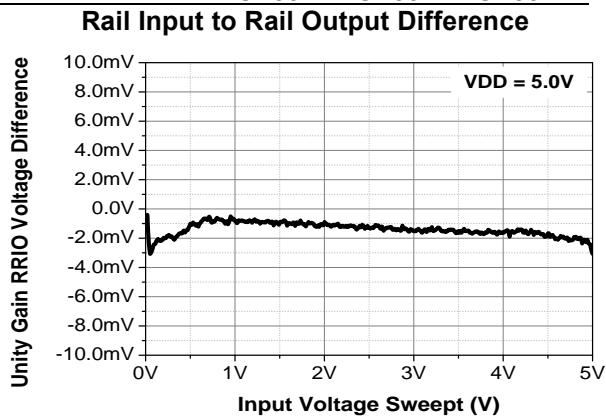
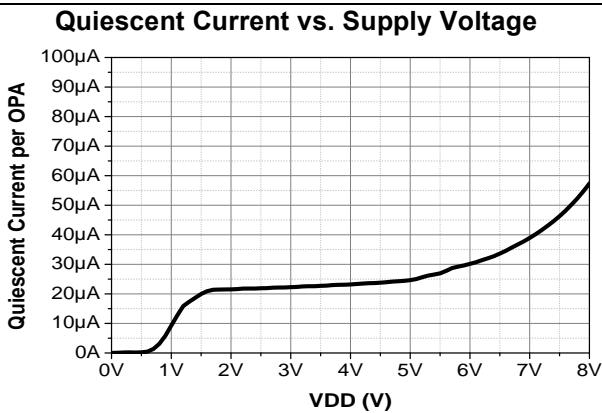
NOTE: Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure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

CAUTION

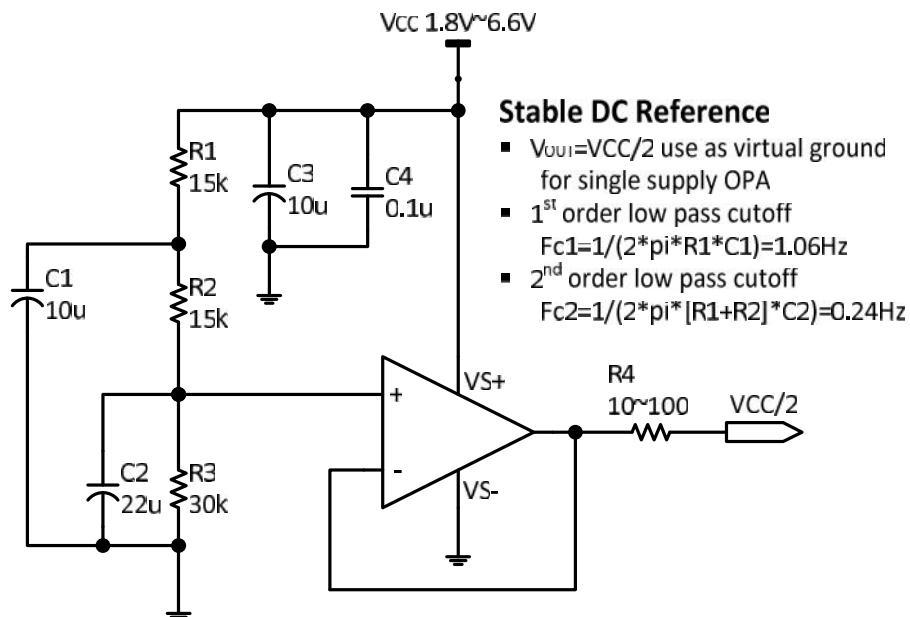
This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SAVITECH recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Electrical characteristics

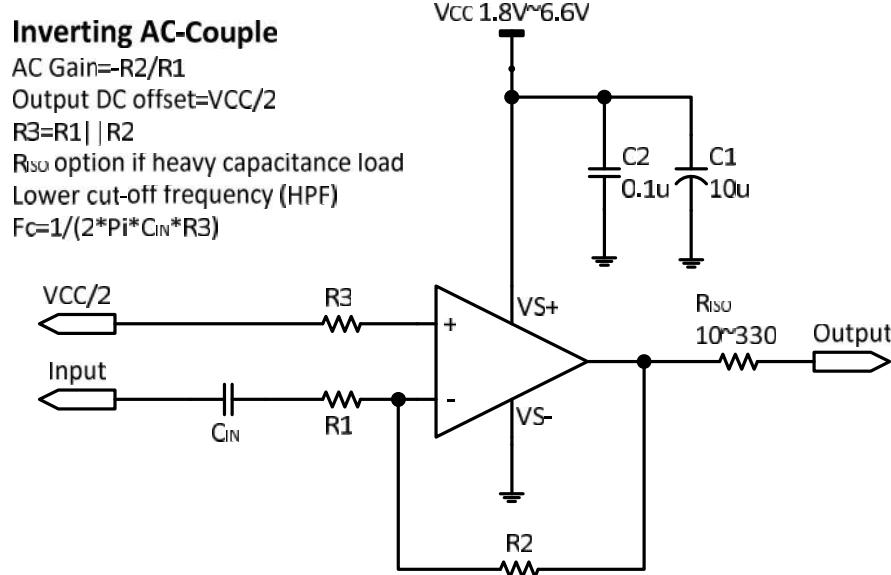
At $V_S = +5V$, $T_A = +25^\circ C$, $V_{CM} = V_S/2$, $R_L = 600 \Omega$, unless otherwise noted								
PARAMETER	CONDITION	TYP	MIN/MAX OVER TEMPERATURE					
		+25°C	+25°C	0°C to 70°C	0°C to 85°C	0°C to 125°C	UNITS	MIN/MAX
INPUT CHARACTERISTICS								
Input Offset Voltage (V_{OS})		0.6	4	4.5	4.75	5	mV	MAX
Input Bias Current (I_B)		0.5					pA	TYP
Input Offset Current (I_{OS})		0.5					pA	TYP
Common-Mode Voltage Range (V_{CM})	$V_S = 5.5V$	-0.1 to +5.6					V	TYP
Common-Mode Rejection Ration(CMRR)	$V_S = 5.5V$, $V_{CM} = -0.1V$ to 4V	88	72				dB	MIN
	$V_S = 5.5V$, $V_{CM} = -0.1V$ to 5.6V	85	60				dB	MIN
Open-Loop Voltage Gain (A_{OL})	$R_L = 600 \Omega$, $V_O = 0.15V$ to 4.85V	90	80				dB	MIN
	$R_L = 10K \Omega$, $V_O = 0.05V$ to 4.95V	95	85				dB	MIN
Input Offset Voltage Drift (V_{OS}/T)		2.1					$\mu V/^\circ C$	TYP
OUTPUT CHARACTERISTICS								
Output Voltage Swing from Rail	$R_L = 600 \Omega$	0.1					V	TYP
	$R_L = 10K \Omega$	0.015					V	TYP
Output Current (I_{OUT})		57	53	52	50	45	mA	MIN
Close-Loop Output Impedance	$F = 1MHz$, $G = +1$	5.7						TYP
POWER SUPPLY								
Operating Voltage Range			1.8	1.8	1.8	1.8	V	MIN
			5.5	5.5	5.5	5.5	V	MAX
Power Supply Rejection Ration (PSRR)	$V_S = +2.5V$ to +5.5V							
	$V_{CM} = (-V_S) + 0.5V$	90	74	79	78	77	dB	MIN
Quiescent Current/Amplifier (I_Q)	$I_{OUT} = 0$	25	35				μA	MAX
DYNAMIC PERFORMANCE								
Gain-Bandwidth Product (GBP)	$R_L = 600 \Omega$	1.2					MHz	TYP
Phase Margin (ϕ)		63.5					degrees	TYP
Full Power Bandwidth (BWp)	< 1% distortion	400					KHz	TYP
Slew Rate(SR)	$G = +1$, 2V Output Step	0.52					V/ μs	TYP
Settling Time to 0.1% (ts)	$G = +1$, 2V Output Step	0.36					μs	TYP
Overload Recovery Time	$V_{in} \cdot \text{Gain} = V_S$	0.4					μs	TYP
ESD SUSCEPTIBILITY								
HBM		8000					V	TYP
MM		400					V	TYP
NOISE PERFORMANCE	$f = 1kHz$	17					nv/\sqrt{Hz}	TYP
Voltage Noise Density	$f = 10kHz$	11					nv/\sqrt{Hz}	TYP



Virtual Ground for Single Supply OPA



Inverting AC gain stage for Single Supply OPA



Non-Inverting AC gain stage for Single Supply OPA

Non-Inverting AC-Couple

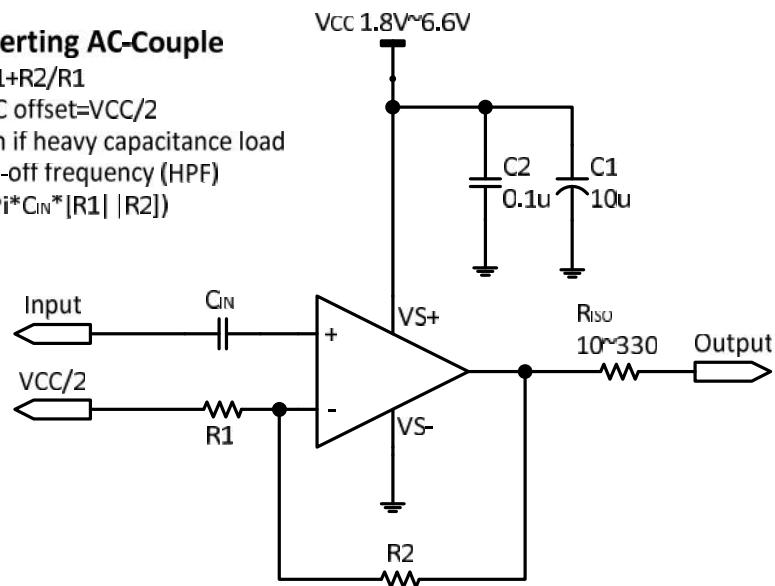
AC Gain=1+R2/R1

Output DC offset=VCC/2

R_{SO} option if heavy capacitance load

Lower cut-off frequency (HPF)

F_c=1/(2*Pi*C_{IN}*|R1| |R2|)



Differential AC gain stage for Single Supply OPA

Differential AC-Couple

R1=R3, R2=R4, C_{IN1}=C_{IN2}

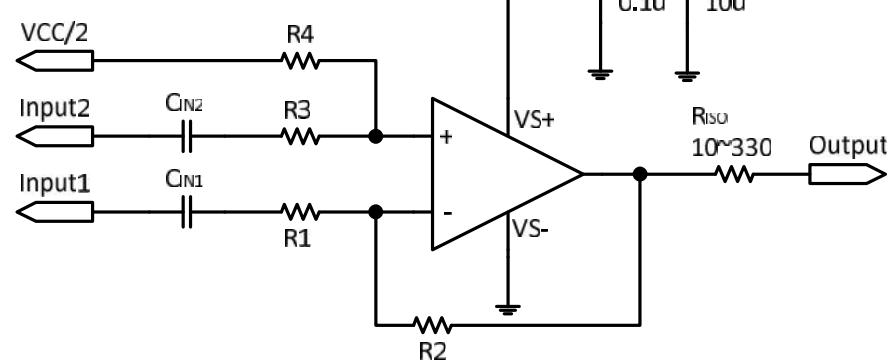
V_{OUT1}=(V_{IN2}-V_{IN1})*(R2/R1)

Output DC offset=VCC/2

R_{SO} option if heavy capacitance load

Lower cut-off frequency (HPF)

F_c=1/(2*Pi*C_{IN1}*|R1| |R2|)



Inverting AC gain Low Pass Filter for Single Supply OPA

Inverting Low Pass Filter

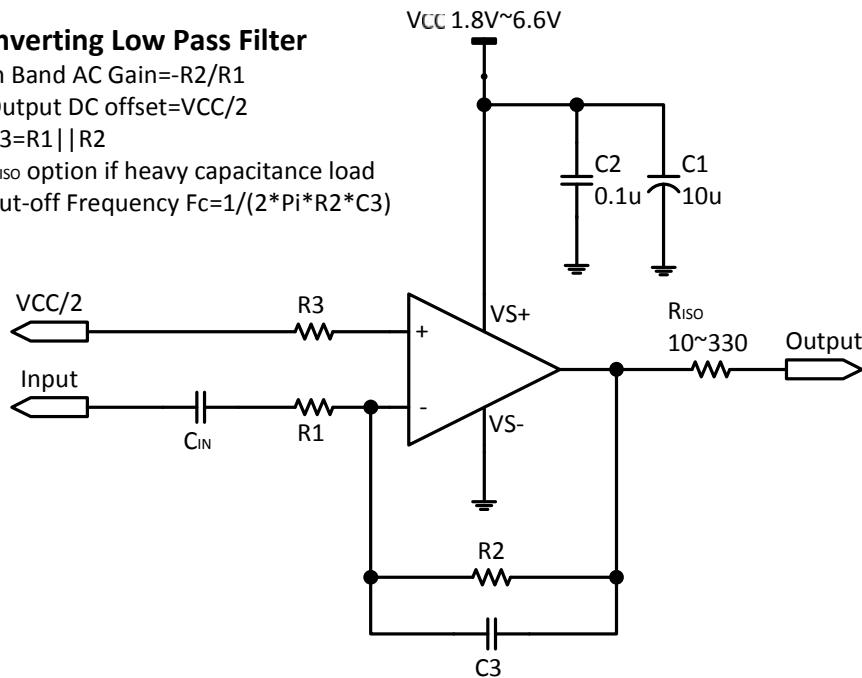
In Band AC Gain= $-R_2/R_1$

Output DC offset= $VCC/2$

$R_{ISO} = R_1 || R_2$

R_{ISO} option if heavy capacitance load

Cut-off Frequency $F_c = 1/(2\pi R_2 C_3)$



Non-Inverting AC gain Low Pass Filter for Single Supply OPA

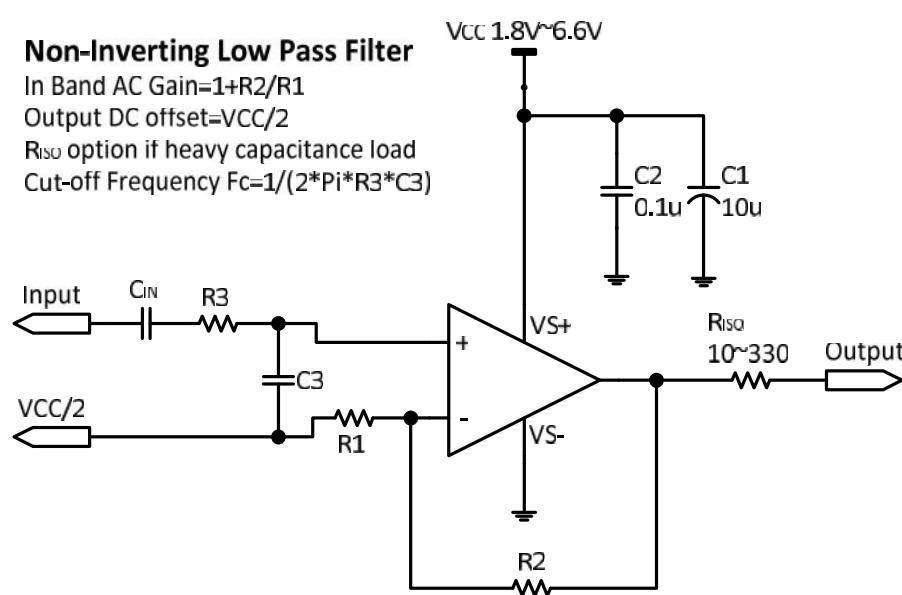
Non-Inverting Low Pass Filter

In Band AC Gain= $1+R_2/R_1$

Output DC offset= $VCC/2$

R_{ISO} option if heavy capacitance load

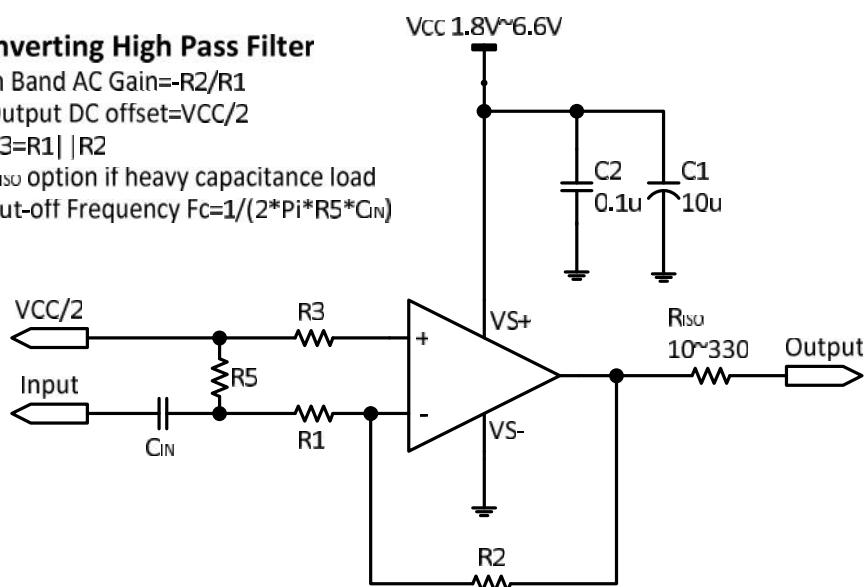
Cut-off Frequency $F_c = 1/(2\pi R_3 C_3)$



Inverting AC gain High Pass Filter for Single Supply OPA

Inverting High Pass Filter

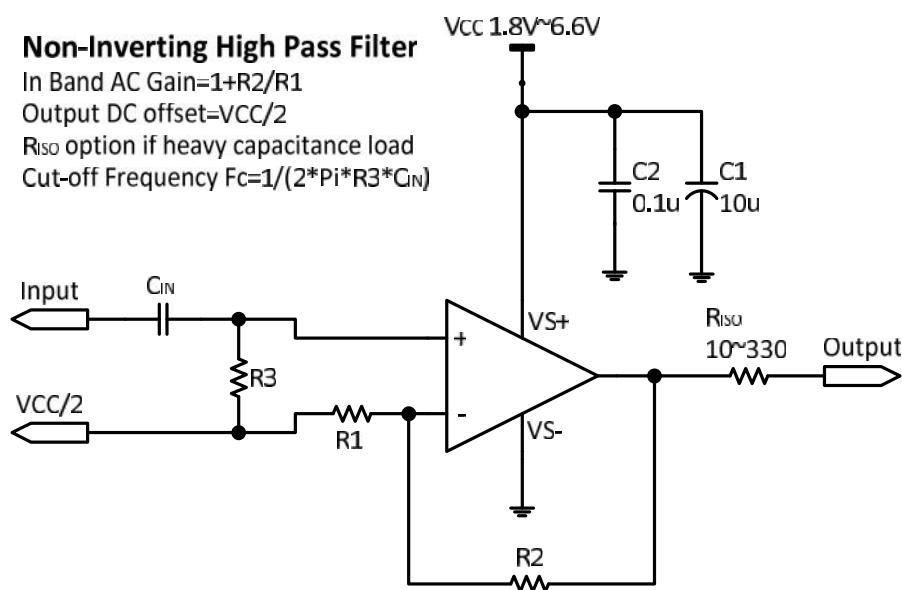
In Band AC Gain= $-R_2/R_1$
 Output DC offset= $V_{CC}/2$
 $R_3=R_1 \parallel R_2$
 R_{ISO} option if heavy capacitance load
 Cut-off Frequency $F_c=1/(2\pi R_5 C_{IN})$



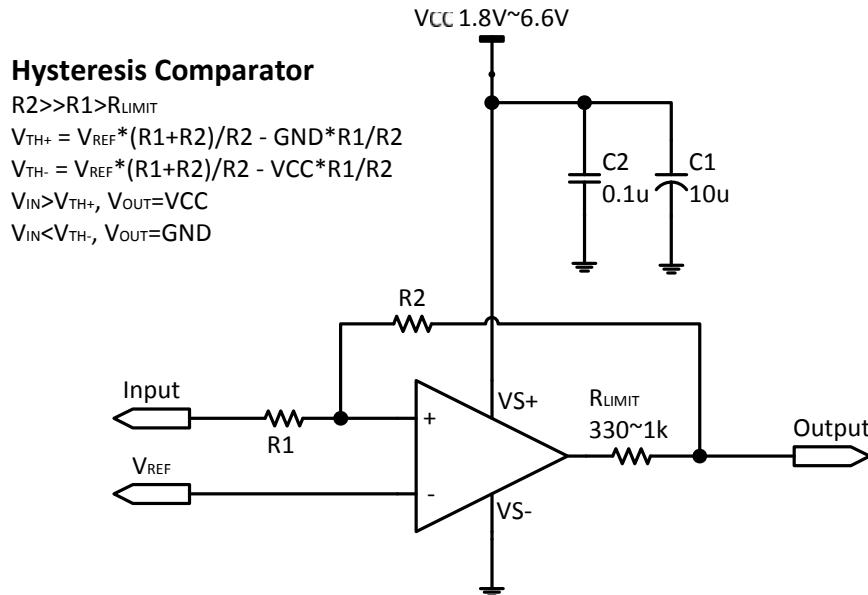
Non-Inverting AC gain High Pass Filter for Single Supply OPA

Non-Inverting High Pass Filter

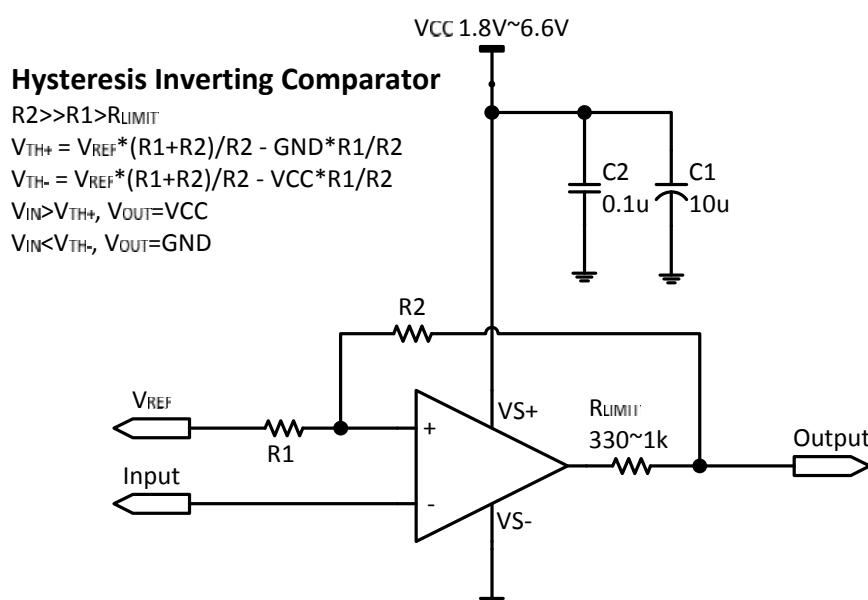
In Band AC Gain= $1+R_2/R_1$
 Output DC offset= $V_{CC}/2$
 R_{ISO} option if heavy capacitance load
 Cut-off Frequency $F_c=1/(2\pi R_3 C_{IN})$



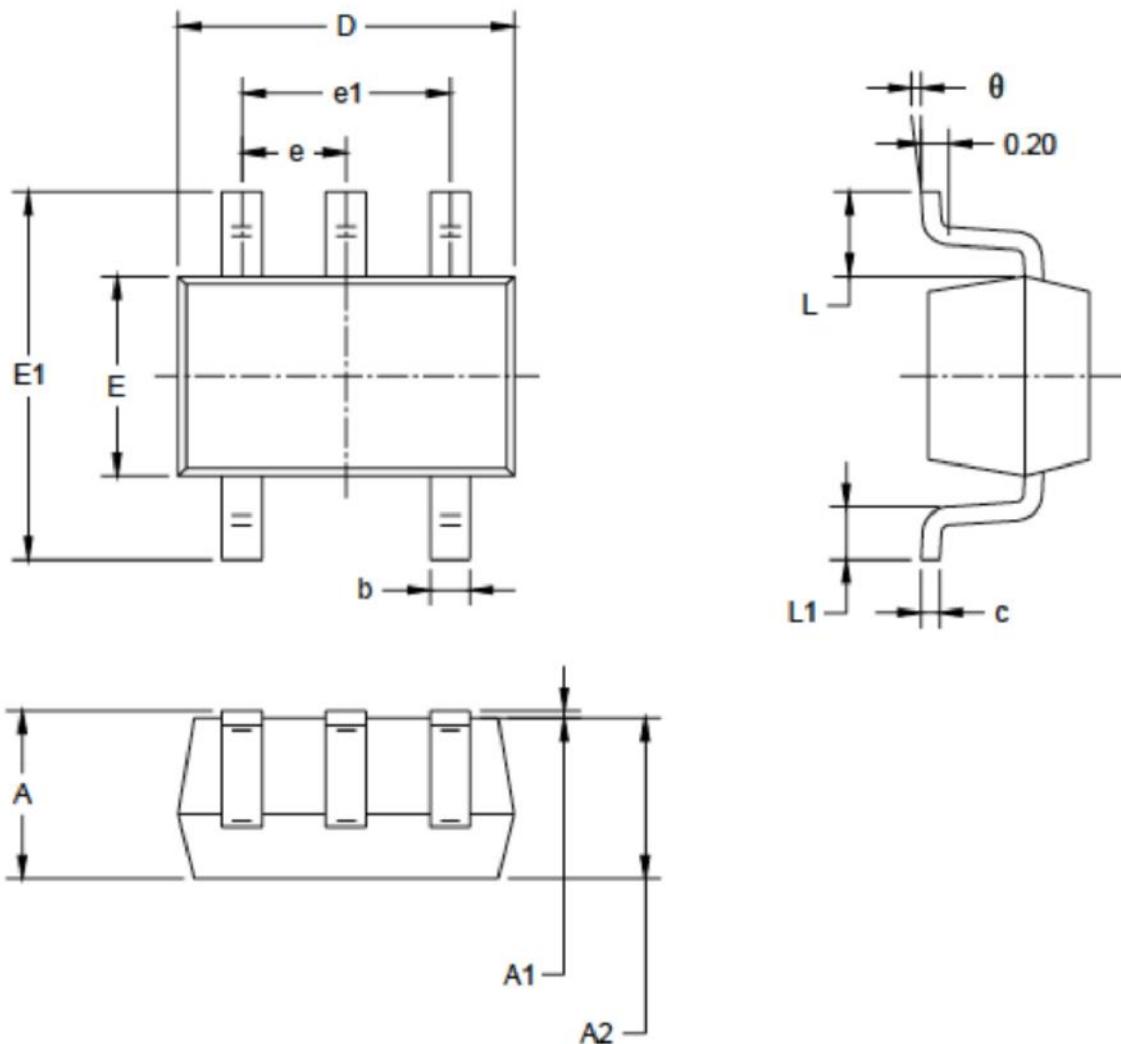
Hysteresis Comparator for Single Supply OPA



Hysteresis Inverting Comparator for Single Supply OPA

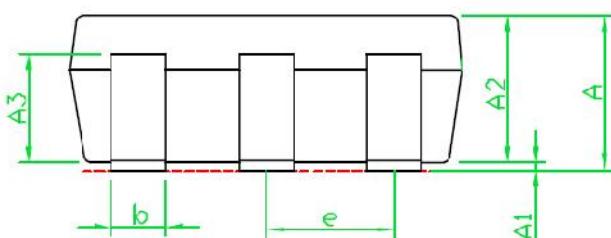
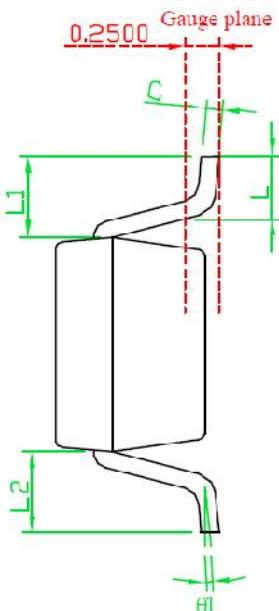
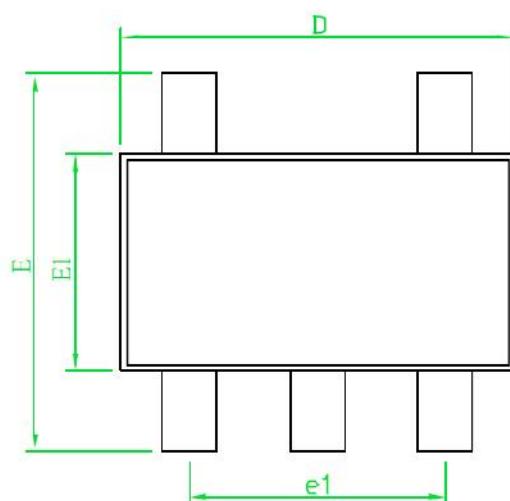


SC70-5 MECHANICAL DATA



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	0.65 TYP		0.026 TYP	
e1	1.300 BSC		0.051 BSC	
L	0.525 REF		0.021 REF	
L1	0.260	0.460	0.010	0.018
θ	0°	8°	0°	8°

SOT23-5 MECHANICAL DATA

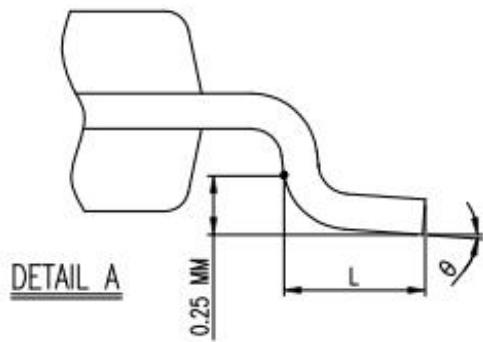
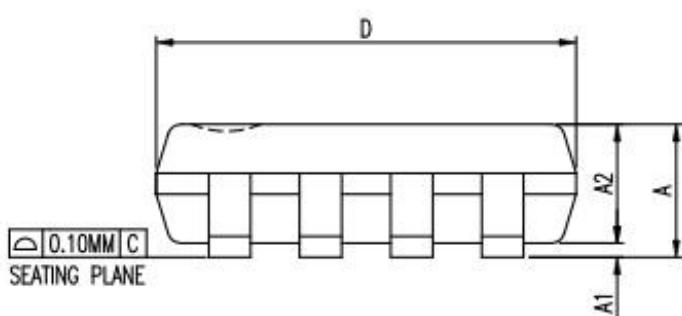
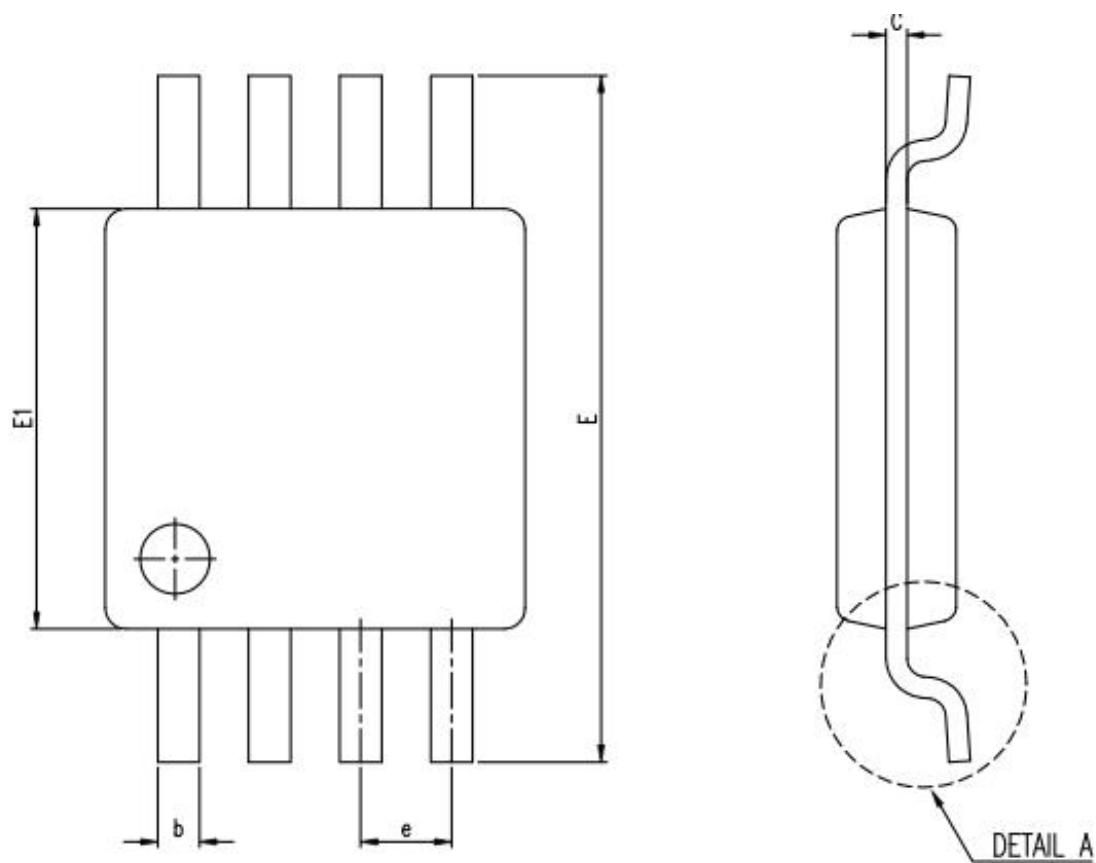


SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.00	1.10	1.40
A1	0.00	0.05	0.10
A2	1.00	1.10	1.30
A3	0.70	0.80	0.90
b	0.35	0.40	0.50
C	0.12	0.125	0.225
D	2.70	2.90	3.10
E	2.60	2.80	3.00
E1	1.40	1.60	1.80
e	---	0.95(TYP)	---
e1	---	1.90(TYP)	---
θ1	1°	5°	9°
L	0.37		
L1	---	0.6REF	---
L1-L2	---	---	0.12

NOTE

1. PACKAGE BODY SIZES EXCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS
2. TOLERANCE ± 0.1000 mm (4 mil) UNLESS OTHERWISE SPECIFIED
3. COPLANARITY : 0.1000 mm
4. DIMENSION L IS MEASURED IN GAUGE PLANE

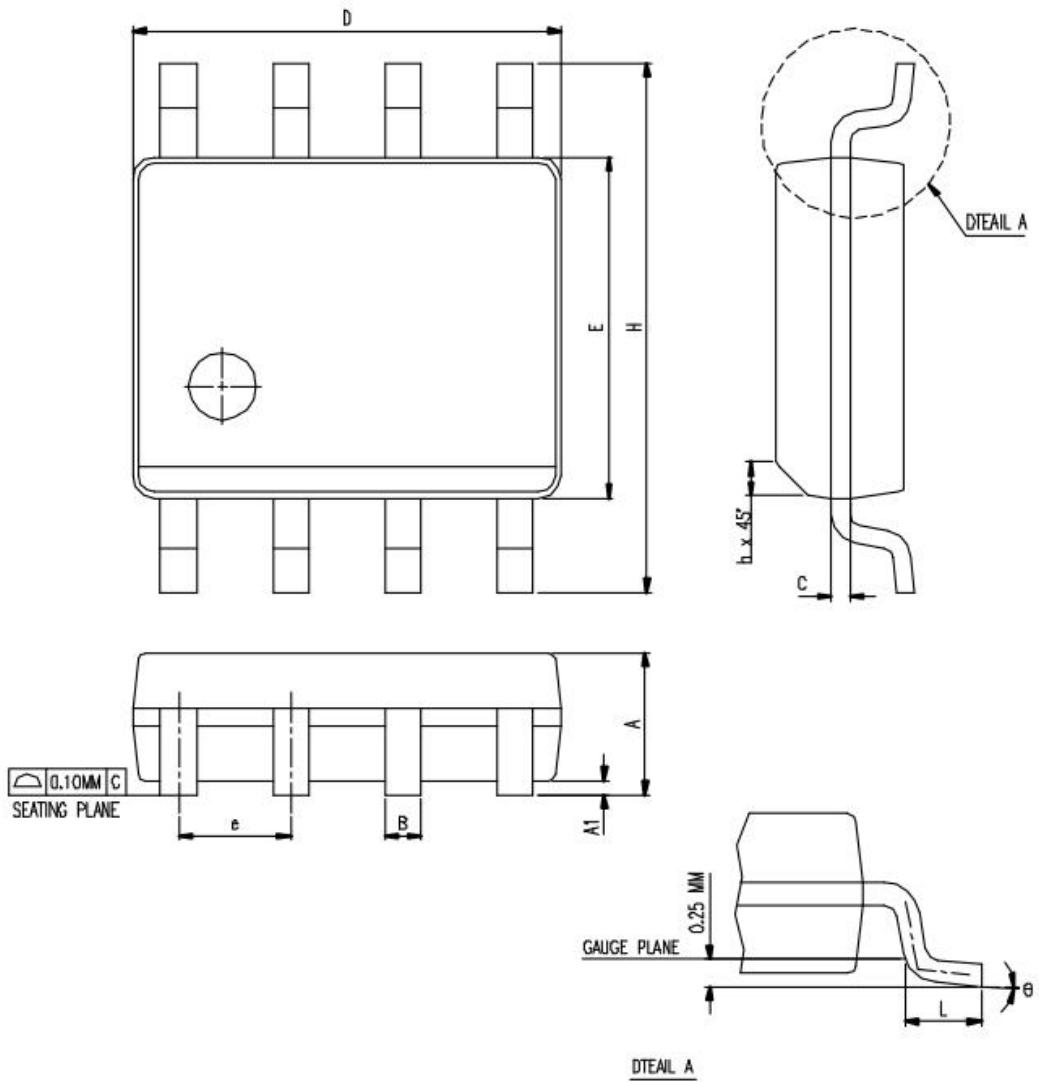
MSOP-8 MECHANICAL DATA



SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.81	1.02	1.10	0.032	0.040	0.043
A1	0.05		0.15	0.002		0.006
A2	0.76	0.86	0.95	0.030	0.034	0.037
b	0.28	0.30	0.38	0.011	0.012	0.015
C	0.13	0.15	0.23	0.005	0.006	0.009
D	2.90	3.00	3.10	0.114	0.118	0.122
E	4.75	4.90	5.05	0.187	0.193	0.199
E1	2.90	3.00	3.10	0.114	0.118	0.122
e	0.65 BASIC			0.026 BASIC		
L	0.40	0.55	0.70	0.016	0.022	0.028
θ	0°	3°	6°	0°	3°	6°
JEDEC						

*NOTES : DIMENSION "D" DOES NOT INCLUDE MOLD PROTRUSIONS OR GATE BURRS.
MOLD PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.006 INCH (0.15 MM) PER SIDE .
DIMENSION "E1" DOES NOT INCLUDE MOLD PROTRUSIONS
MOLD PROTRUSIONS SHALL NOT EXCEED 0.010 INCH (0.25 MM) PER SIDE .

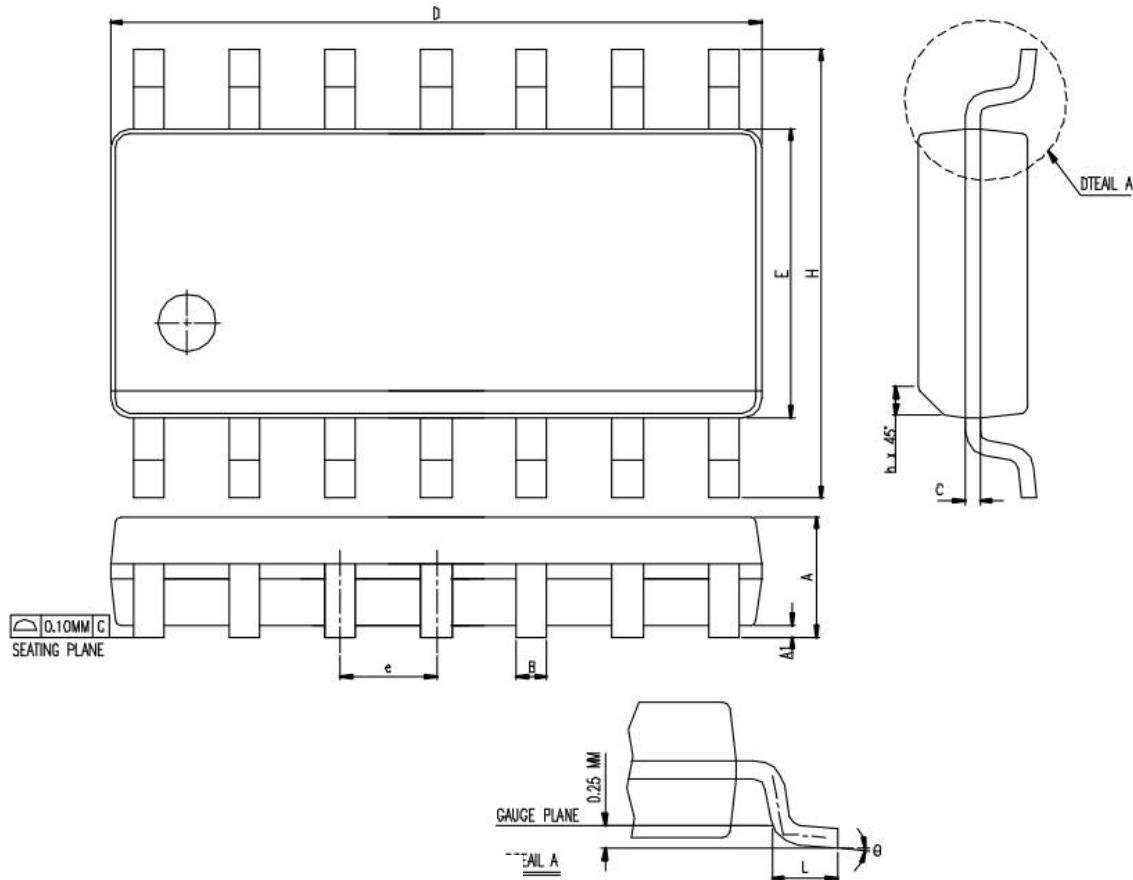
SOP-8 MECHANICAL DATA



SYMBOL	DIMENSION IN MM		DIMENSION IN INCH	
	MIN.	MAX.	MIN.	MAX.
A	1.35	1.75	0.0532	0.0688
A1	0.10	0.25	0.0040	0.0098
B	0.33	0.51	0.013	0.020
C	0.19	0.25	0.0075	0.0098
e	1.27 BSC		0.050 BSC	
D	4.80	5.00	0.1890	0.1968
H	5.80	6.20	0.2284	0.2440
E	3.80	4.00	0.1497	0.1574
L	0.40	1.27	0.016	0.050
h	0.25	0.50	0.0099	0.0196
θ	0°	8°	0°	8°
JEDEC	MS-012 (AA)			

▲*NOTES : DIMENSION "D" DOES NOT INCLUDE MOLD FLASH , PROTRUSIONS OR GATE BURRS. MOLD FLASH , PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.15 MM (0.006 INCH) PER SIDE.

SOP-14 MECHANICAL DATA

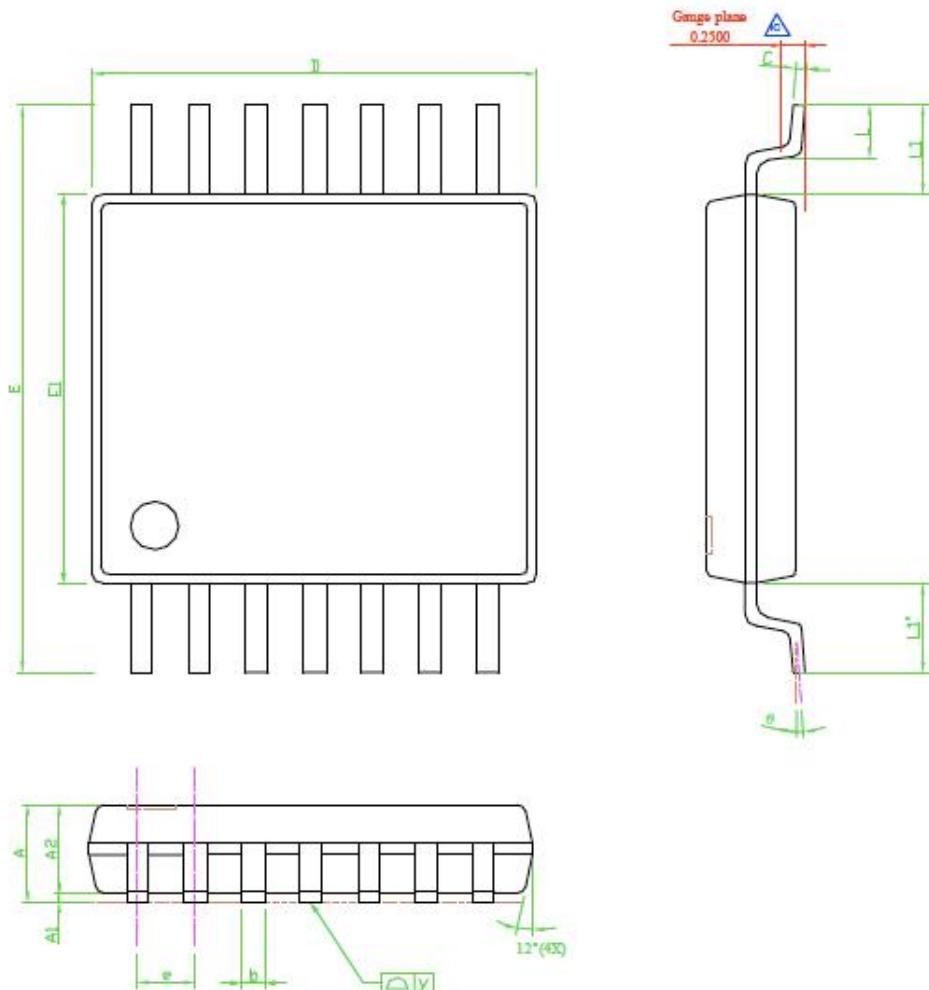


Symbol	Dimension in MM		Dimension in Inch	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.0532	0.0688
A1	0.10	0.25	0.004	0.0098
B	0.33	0.51	0.013	0.02
C	0.19	0.25	0.0075	0.0098
e	1.27BSC		0.050 BSC	
D	8.55	8.75	0.3367	
H	5.80	6.20	0.2284	0.344
E	3.80	4.00	0.1497	0.244
L	0.40	1.27	0.016	0.1574
h	0.25	0.50	0.0099	0.0196
Θ	0*	8*	0*	8*
JEDEC	MS-012 (AB)			

***Notes:**

Dimension "D" does not include mold flash, Protrusions or gate burrs.
Mold flash, protrusions and gate burrs shall not exceed 0.15 MM (0.006 Inch) per side.

TSSOP-14 MECHANICAL DATA



Symbol	Dimension in MM			Dimension in Inch		
	Min.	Mon.	Max.	Min.	Mon.	Max.
A	-	-	1.20	-	-	0.048
A1	0.05	-	0.15	0.002	-	0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
B	0.19	-	0.30	0.007	-	0.012
C	0.09	-	0.20	0.004	-	0.008
D	4.90	5.00	5.10	0.193	0.197	0.201
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.177
E	-	0.65	-	-	0.026	-
L	0.45	0.60	0.75	0.018	0.024	0.030
y	-	-	0.10	-	-	0.004
Θ	0*	-	8*	0*	-	8*
L1-L1'	-	-	0.12	-	-	0.005
L1	1.00REF			0.039REF		

Note:

1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance $\pm 0.1\text{mm}$ unless otherwise specified
3. Coplanarity: 0.1mm
4. Controlling dimension is millimeter converted inch dimensions are not necessarily exact.
5. Follows form JEDEC MO-153

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