SYLM3xxA high voltage general purpose op amp

Product characteristics

- Ultralow input offset voltage: ±3mV
- Power supply voltage: 3V ~ 36V
- Supports single and dual power supply
- Low quiescent current: 117μA/channel
- Low wideband noise: 35 nV/√Hz
- Rail-to-rail input
- Unity-bandwidth gain: 1.0 MHz
- Built-in fast overload recovery effectively improves the reliability of the op amp
- Operating temperature range: –40°C ~ 125°C

Product application

- Motor driver
- Sensor module
- Household appliances
- Power supply module
- inverter
- UPS
- Air conditioning inside and outside
- Automotive electronics

Product description

The SYLM3xxA series of high-voltage general-purpose operational amplifiers from Semiment is manufactured using advanced processes with full-process standardization and control. The series includes single op-amp (SYLM321A), dual op-amp (SYLM358A), and quad op-amp (SYLM324A), which feature unique circuit design techniques and classic rail-to-rail input swing. They exhibit high consistency and symmetry within the entire working voltage and temperature range, making them particularly suitable for applications that have high cost requirements and limited space, where the amplifiers can be well-coordinated and balanced with the overall circuit design.

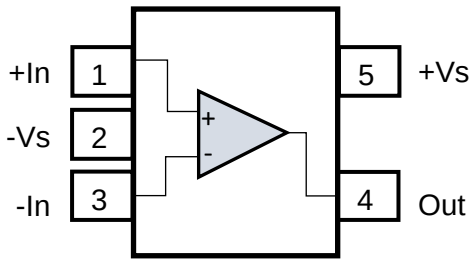
The SYLM3xxA series includes built-in overload protection circuits that allow the amplifiers to recover from overloads and resume operation in a short amount of time, greatly enhancing the circuit's reliability.

These operational amplifiers are available in industry-standard packages such as SOP, MSOP, SOT-23, and TSSOP.

Category

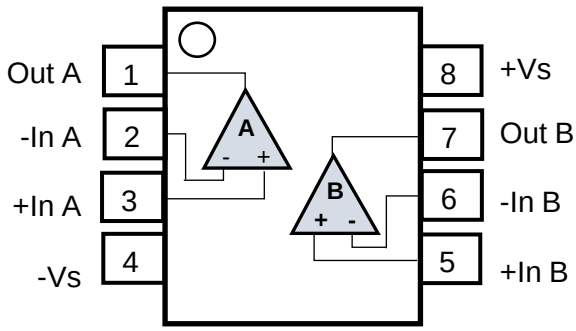
Pin description

SYLM321A



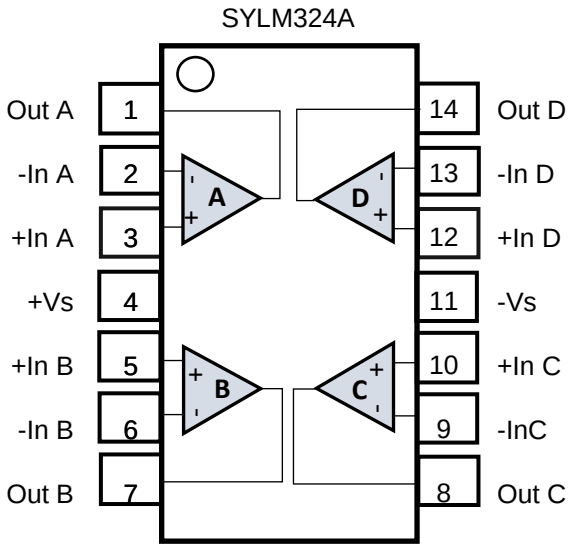
PIN NAME	PIN ORDER	FEATURE DESCRIPTION
+In	1	Noninverting input
-Vs	2	Power negative terminal
-In	3	Inverting input
Out	4	Output
+Vs	5	Power positive terminal

SYLM358A



PIN NAME	PIN ORDER	FEATURE DESCRIPTION
Out A	1	A channel output
-In A	2	A channel inverting input
+In A	3	A channel noninverting input
-Vs	4	Power positive terminal
+In B	5	B Channel noninverting input
-In B	6	B Channel inverting input
Out B	7	B channel output
+Vs	8	Power negative terminal

Pin description



PIN NAME	PIN ORDER	FEATURE DESCRIPTION
Out A	1	A channel output
-In A	2	A channel inverting input
+In A	3	A channel noninverting input
+Vs	4	Power positive terminal
+In B	5	B channel noninverting input
-In B	6	B channel inverting input
Out B	7	B-channel output
Out C	8	C-channel output
-In C	9	C-channel inverting input
+In C	10	C-channel noninverting input
-Vs	11	Power negative terminal
+In D	12	D-channel noninverting input
-In D	13	D-channel inverting input
Out D	14	D channel output

Order Information

Partnumber	Package	Number	Package code	Moisture sensitivity level	Operating temperature
SYLM321ASOR	5-Pin SOT23	Reel 4000	SO	3	-40 to 125°C
SYLM358APA1R	8-Pin SOP	Reel 3000	PA1	3	-40 to 125°C
SYLM358APA3R	8-Pin TSSOP	Reel 2500	PA3	3	-40 to 125°C
SYLM358APA4R	8-Pin MSOP	Reel 3000	PA4	3	-40 to 125°C
SYLM324APD1R	14-Pin SOP	Reel 3000	PD1	3	-40 to 125°C
SYLM324APD2R	14-Pin TSSOP	Reel 3000	PD2	3	-40 to 125°C

Note: Dimensional information refers to the final package specification

Absolute Maximum Ratings

Full operating temperature range (unless otherwise noted) (1)			
parameter	minimum	maximum	unit
Supply voltage	0	40	V
Input pin voltage	(-Vs) – 0.3	(+Vs) + 0.3	V
Input pin differential voltage	-VS	+VS	V
Input pin clamping current	-10	+10	mA
The output is shorted	Consistent		
Operating temperature, TA	-40	125	℃
Maximum junction temperature, T_J	-45	160	℃
Storage temperature, T_{STG}	-65	150	℃
(1) Pressures higher than those listed here may result in permanent damage to the device, and prolonged exposure to absolute maximum ratings may affect device reliability。			

ESD protection

Type	Symbol	Reference value		unit
ESD protection（HBM-ANSI/ESDA/JEDEC JS-001）	V_{ESD}	-3	3	kV
ESD protection（CDM-JEDEC JESD22-C101）	V_{ESD}	-3	+3	kV

Working conditions

Symbol	Name	Condition	Unit
V_S	Supply voltage range	3 ~ 36	V
T_A	Operating temperature	-40 ~ 125	℃

Electrical parameters

Specification parameters (no special instructions, simulation and test conditions are Vs=(Vs+-Vs-)=30V, TEMP=25°C, RL=10KΩ, Vo=Vs/2.)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
OFFSET						
Vos	Input Offset Voltage	(VS+)=15V,(VS-)=-15V	-3	±0.35	3	mV
dVos/dT	Vos VS Temp.	Vs=30V, TA=-40℃ to 125℃	-	±3	-	uV/℃
PSRR	Power-supply rejection ratio	Vs=30V, TA=-40℃ to 125℃	70	100	-	dB
Power Supply						
V_S	Power supply	No load	3	-	36	V
I_Q	Quiescent Current/Per ch	No load	-	117	180	uA
INPUT						
Vcm	Common-Mode Voltage Range		(V-)	-	(V+)-1.5	V
CMRR	Common-Mode Rejection Ration	(V-)<Vcm<(V+)-1.5	65	95	-	dB
Input capacitor	Differential	-	-	7.7	-	pF
Input capacitor	Common-Mode	-	-	9	-	pF
IB	Input Bias Current	TA = -40℃~85℃	-	30	-	pA
Ios	Input Offset Current	-	-	2	-	pA
OUTPUT						
Vo	Voltage output swing from supply rails	Vs=30V,Iout = -1mA	-	0.5	1.5	V
Isc	Short-circuit current	Vs=30V	-	45	-	mA
AC						
AOL	Open-loop voltage gain		85	100	-	dB
SR	Slew Rate	Vs- = -15V ,Vs+ = 15V ,Av=1,Vout=-1V to 1,Cload=30pF,Rload=10KΩ	-	1	-	V/uS
GBW	Gain-Bandwidth Product	Vs=5V	-	1.0	-	MHz
GM	Gain Margin		-	60	-	deg
PM	Phase Margin		-	12	-	dB
ts	Setting time,0.1%	Vs- = -15V ,Vs+ = 15V ,Av=1, 2-V step, Cload=60pF, Rload=10KΩ	-	3.3	-	uS
NOISE						
THD+N	Total harmonic distortion + noise	Vs=30V,Av=1,f=1KHz,Rload=10KΩ,Vout=1Vpp	-	0.002	-	%
EN	Input voltage noise(rms)	Vs=30V,f=0.1Hz to 10Hz	-	2.9	-	uVrms
e_N	Input voltage noise density	Vs=5V,f=1KHz	-	35	-	nV/√Hz
In	Input current noise density	Vs=5V,f=1KHz	-	23	-	fA/√Hz

Characteristic curve

(No special instructions, the simulation and test conditions are Vs=(Vs+-Vs-)=30V, TEMP=25°C, RL=10KΩ, Vo=Vs/2)

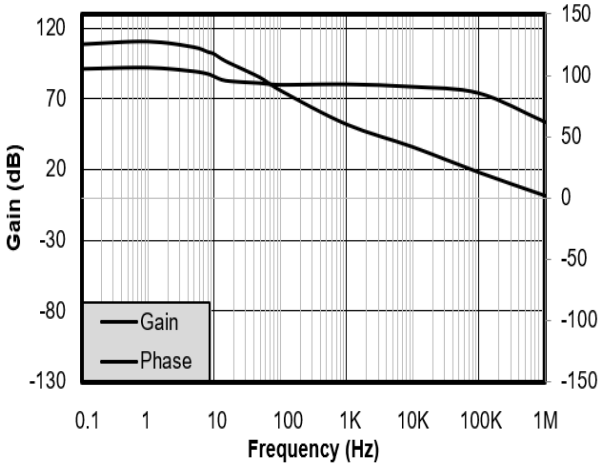


Figure 1. Open Loop Gain and Phase vs. Frequency

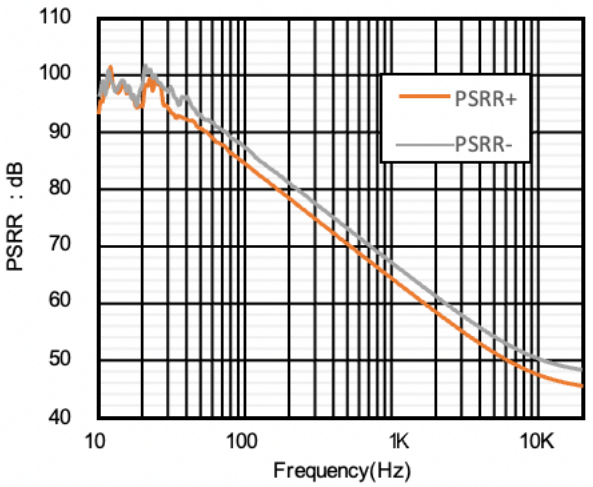


Figure 2. PSRR vs Frequency

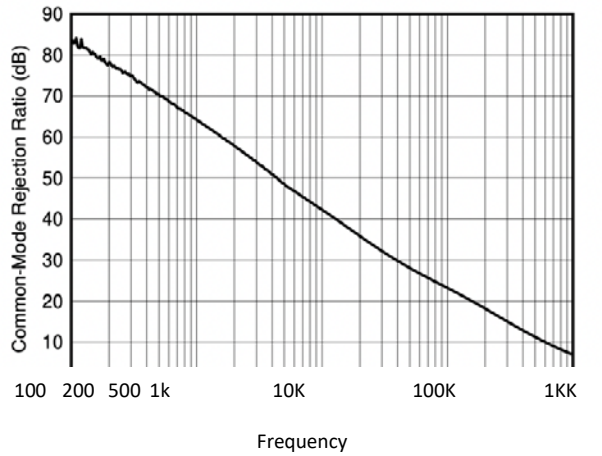


Figure 3. CMRR vs Frequency

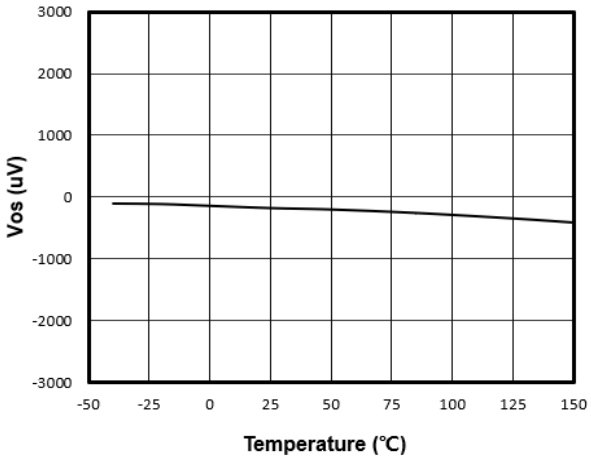


Figure 4. Offset Voltage vs. Temperature

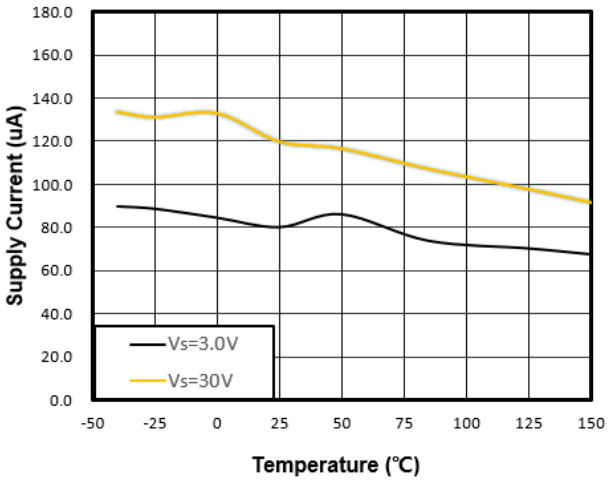


Figure 5. Quiescent Current vs. Temperature

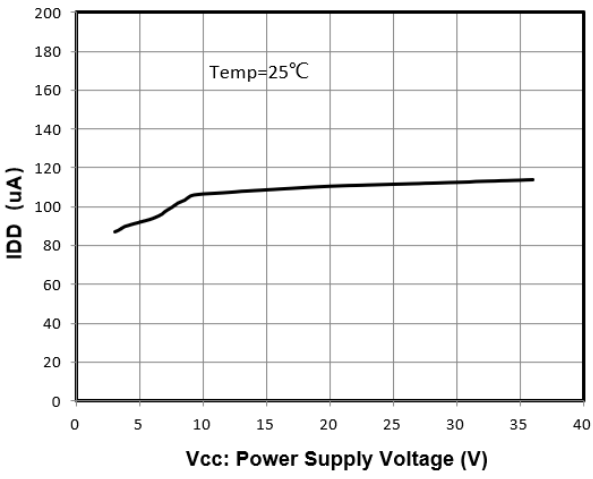


Figure 6. Quiescent Current vs. Power Supply Voltage

General Description

These devices contain four independent high gain frequency compensation op amps designed for single supply over a wide voltage range. Dual-supply operation is also possible if the voltage difference between the two supplies is between 3V and 36V and VCC is at least 1.5V higher than the positive value of the input common-mode voltage. The low supply current drain is independent of the magnitude of the supply voltage.

Applications include sensor amplifiers, DC amplifiers, and all traditional op amp circuits, which can now be more easily implemented in single-supply voltage systems.

Detailed Description

Input common mode

The valid common-mode range is from device ground to VCC – 1.5V (VCC – 2V over temperature). The input may exceed VCC up to the maximum VCC without damaging the device. At least one input must be within a valid input common-mode range for the output to have the correct phase. If both inputs are outside the valid range, the output phase is undefined. If either input is below –0.3V, the input current should be limited to 1mA and the output phase should be undefined.

Slew rate

Slew rate is the rate at which the op amp can change the output when the input changes. Slew rates are better for different occasions, sometimes bigger is better, sometimes smaller is better, SYLM3xxA series, these devices have a slew rate of 1.0 V/μs.

Bandwidth

The gain-bandwidth product is equal to the measured amplifier bandwidth multiplied by the gain corresponding to the measured bandwidth. For op amps, the increase in bandwidth means an increase in speed, but at the same time it brings a large amount of power consumption, for general occasions, the bandwidth around 1Mhz can take into account the balance of all aspects of the op amp parameters, these devices have a high gain bandwidth of 1.0MHz.

Low input offset voltage

The SYLM3xxA family features a low input offset voltage as low as 0.35mV typical from a high voltage supply because the input offset voltage is amplified by noise gain, creating offset errors at the output. For a high-voltage general-purpose op amp, the application scenarios and scope of the op amp are maximized while minimizing the design of the low offset voltage while taking into account other op amp parameters. It is especially suitable for some occasions with high sensitivity

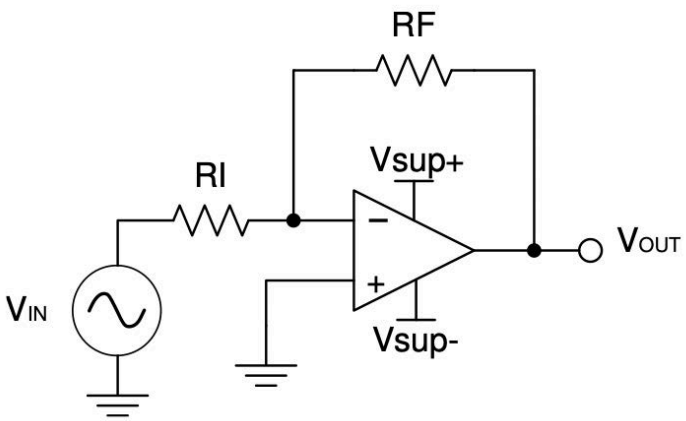
Typical Applications

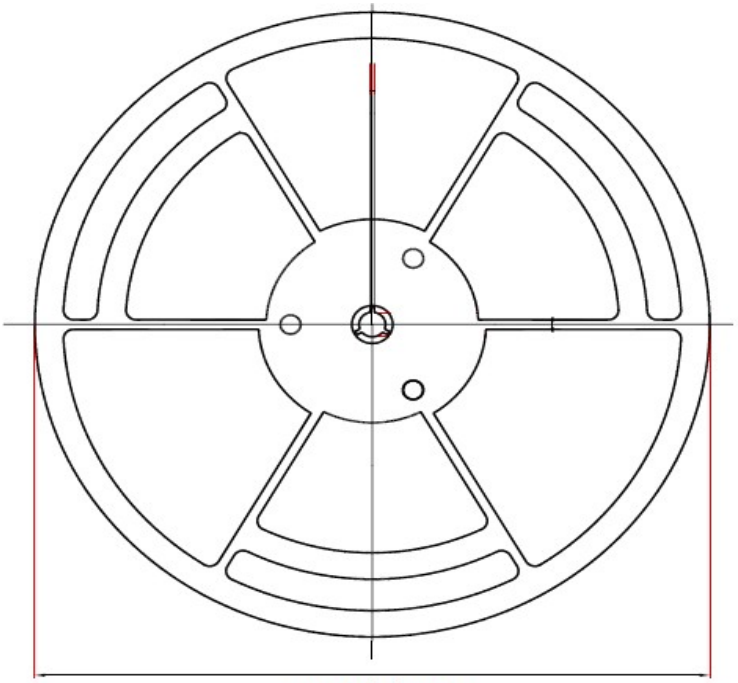
Signal conditioning

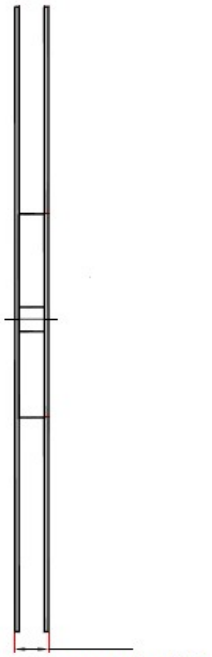
Op amps are suitable for a variety of signal conditioning applications. The input can be powered before Vs, allowing flexibility in multiple supply circuits.

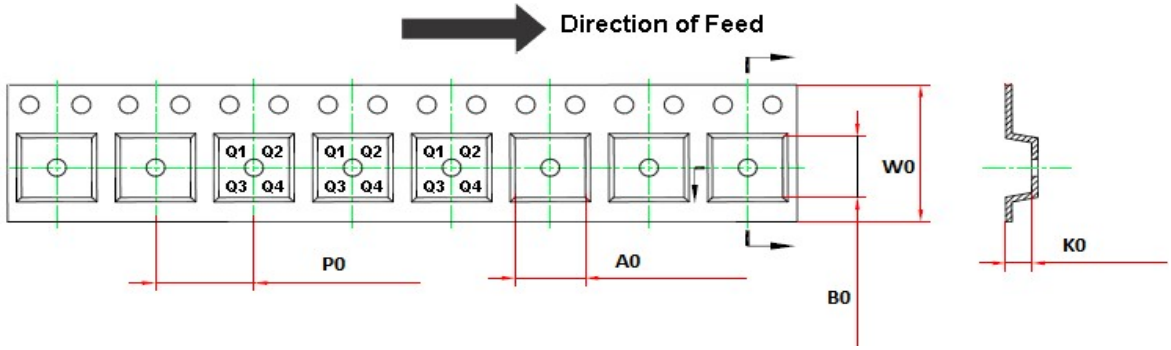
Inverting amplifier

The amplifier accepts a positive voltage at the input and then changes the voltage to a negative voltage of the same magnitude. It also turns the negative input voltage into positive in the same way.



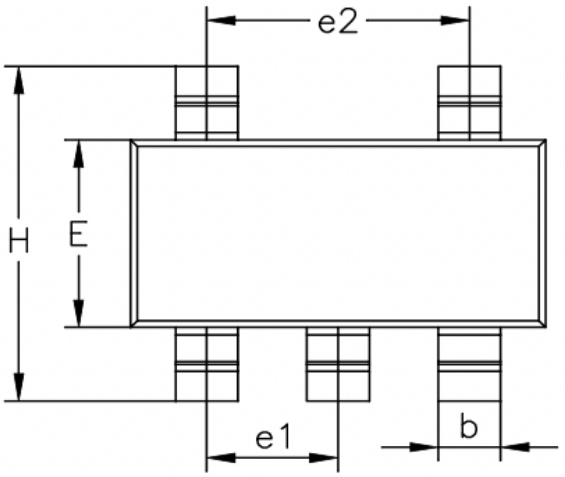


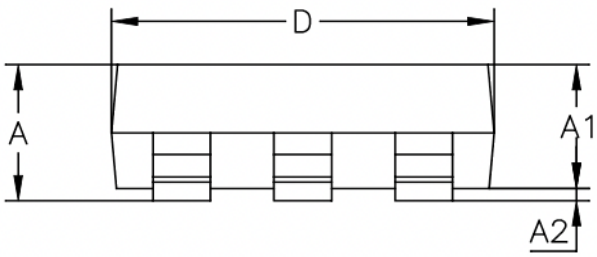


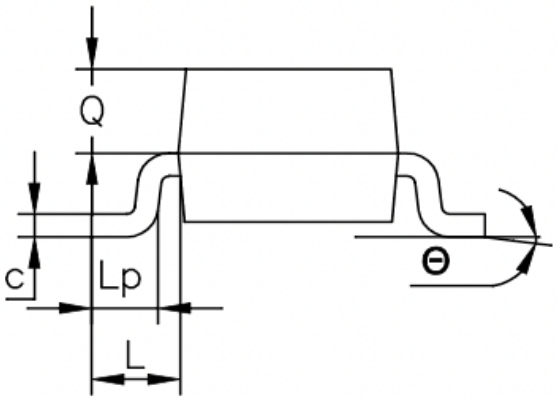


Order part number	Package	D1	W1	A0	B0	K0	P0	W0	Pin1 position
SYLM321ASO6R	5-Pin SOT23	180.0	13.1	3.2	3.2	1.4	4.0	8.0	Q3
SYLM358APA1R	8-Pin SOP	330.0	17.6	6.4	5.4	2.1	8.0	12.0	Q1
SYLM358APA3R	8-Pin MSOP	330.0	17.6	5.2	3.3	1.5	8.0	12.0	Q1
SYLM358APA4R	8-Pin TSSOP	330.0	17.6	6.8	3.3	1.2	8.0	12.0	Q1
SYLM324APD1R	14-Pin SOP	330.0	21.6	6.5	9.0	2.1	8.0	16.0	Q1
SYLM324APD2R	14-Pin TSSOP	330.0	17.6	6.8	5.4	1.2	8.0	12.0	Q1

SOT23-5/6

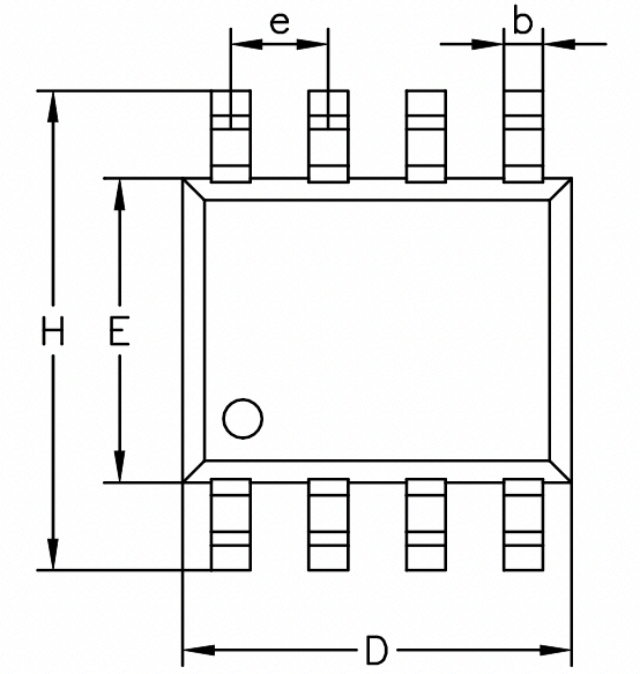


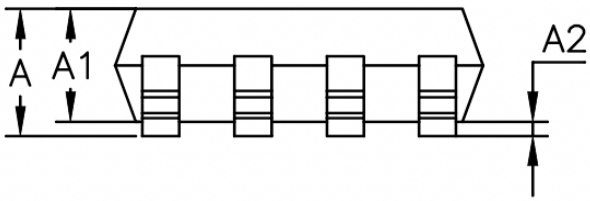


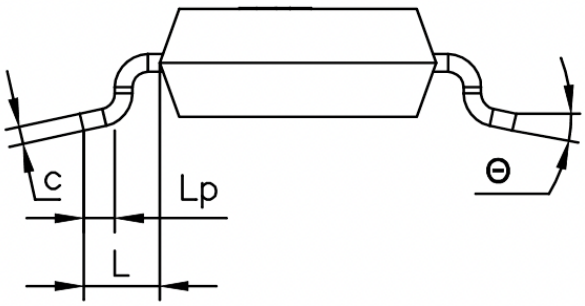


Symbol	Dimensions In Millimeters	
	Min	Max
A	1.050	1.250
A1	1.000	1.150
A2	0.000	0.100
b	0.300	0.500
c	0.100	0.200
D	2.820	3.020
E	1.500	1.700
H	2.600	3.000
e1	0.950	0.950
e2	1.800	2.000
L	0.600	0.600
Lp	0.300	0.600
θ	0°	8°

SOP-8

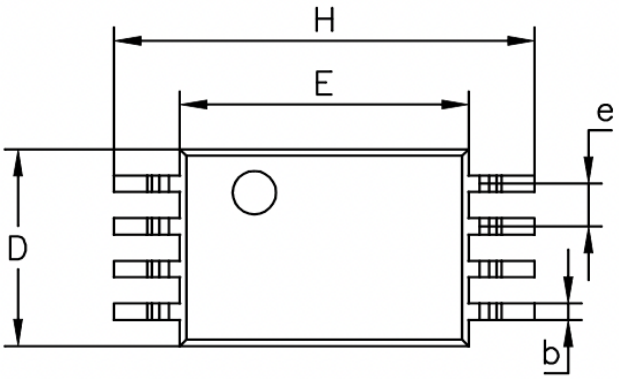


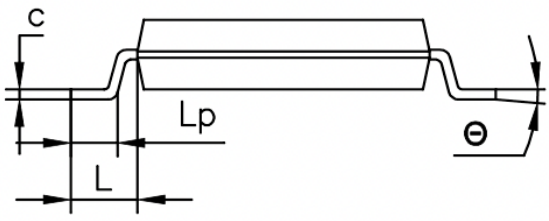


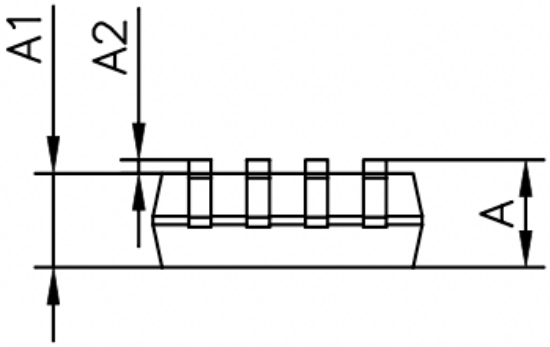


Symbol	Dimensions In Millimeters	
	Min	Max
A	1.400	1.800
A1	0.100	0.250
A2	1.300	1.550
b	0.330	0.510
c	0.170	0.250
D	4.780	5.000
E	3.800	4.000
H	5.800	6.300
e	1.270	1.270
L		
Lp	0.400	0.900
θ	0°	8°

TSSOP-8

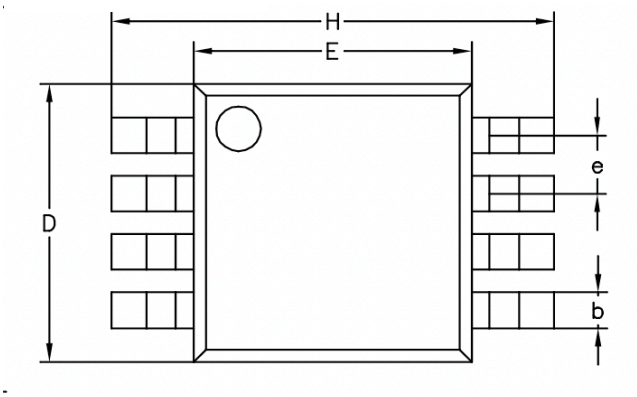


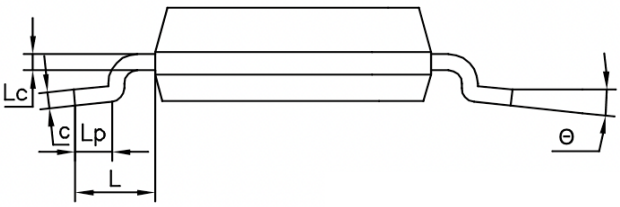


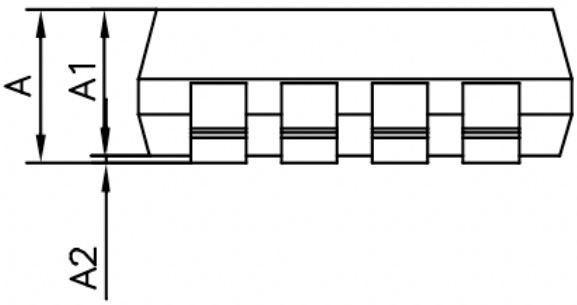


Symbol	Dimensions In Millimeters	
	Min	Max
A	1.200	1.200
A2	0.050	0.150
A1	0.800	1.000
b	0.190	0.300
C	0.090	0.200
D	2.900	3.100
E	4.300	4.500
H	6.250	6.550
e	0.650	0.650
Lp	0.250	0.250
θ	1°	7°

MSOP-8

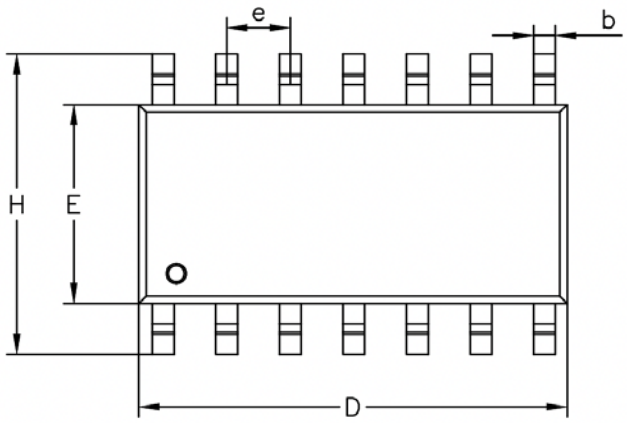


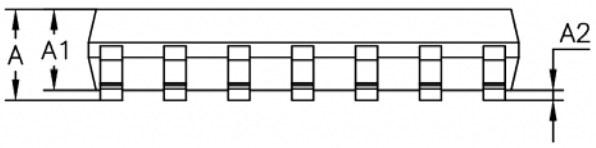


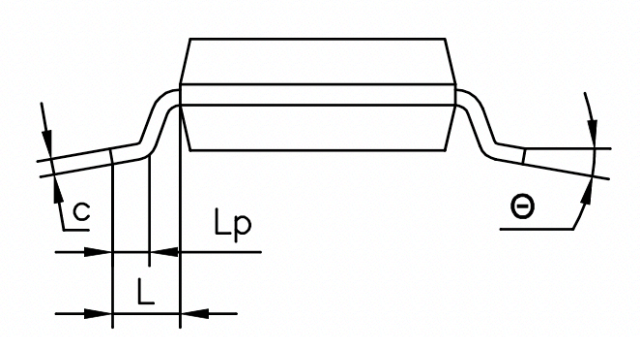


Symbol	Dimensions In Millimeters	
	Min	Max
A	0.800	1.200
A2	0.000	0.200
A1	0.750	0.950
b	0.300	0.300
c	0.090	0.230
D	2.900	3.100
e	0.650	0.650
E	2.900	3.100
H	4.700	5.100
Lp	0.400	0.800
θ	0°	6°

SOP-14

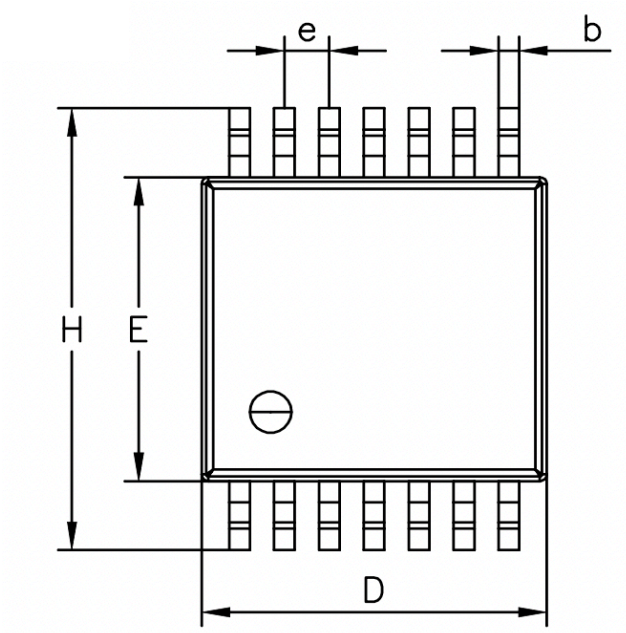


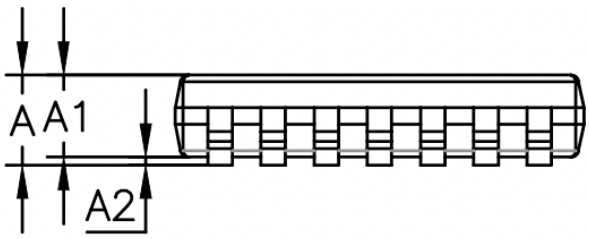


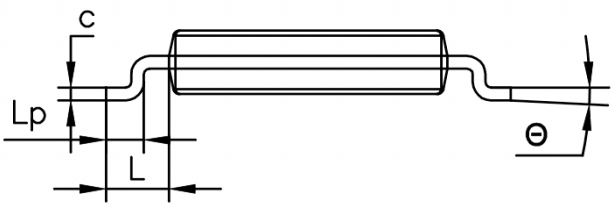


Symbol	Dimensions In Millimeters	
	Min	Max
A	1.350	1.750
A2	0.100	0.250
A1	1.250	1.650
b	0.310	0.510
D	8.450	8.850
H	5.800	6.200
E	3.800	4.000
e	1.270	1.270
Lp	0.400	0.800
L	1.050	1.050
c	0.250	0.250
θ	0°	8°

TSSOP-14







Symbol	Dimensions In Millimeters	
	Min	Max
A	1.200	1.200
A2	0.050	0.150
A1	0.800	1.050
	0.190	0.300
D	4.860	5.100
H	6.200	6.600
E	4.300	4.500
e	0.650	0.650
Lp	0.450	0.750
L	1.000	1.000
c	0.250	0.250
θ	0°	8°

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