

Rail-to-Rail Input and Output

Low Voltage 2.1V, Low Supply Current

Dual Amplifiers

FEATURES

- CMOS rail-to-rail input and output
- 2.1 to 6.5V single supply operation
- Low supply current : 90uA (per amplifier at $V_{DD}=2.1V$)
- Gain-Bandwidth Product : 1MHz
- Slew rate : 0.5V/ μs at 5V
- No crossover distortion
- Space saving package SOP8, MSOP8
- Pin assignments is the same as the general-purpose dual operational amplifiers

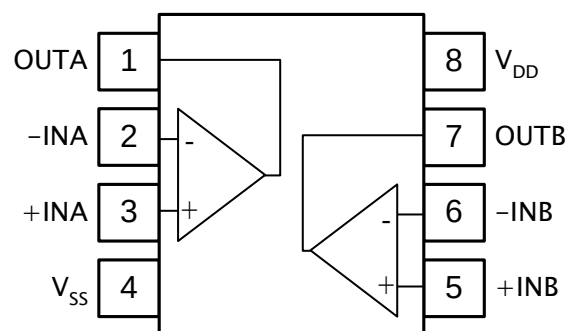
APPLICATIONS

- Supply current monitoring
- Battery monitoring
- Active filters, Voice preamplifier
- General purpose low voltage applications, portable devices
- Cross-reference : LMV922, LMV932

DESCRIPTION

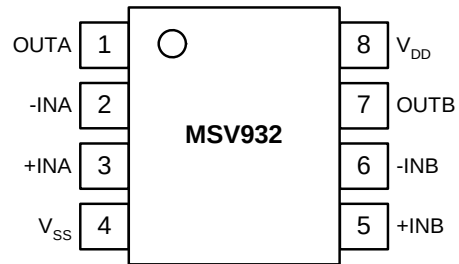
The MSV932 is a low voltage, low power dual operational amplifier. MSV932 is guaranteed to operate from 2.1V to 5V supply voltages with the rail-to-rail input and output. Each amplifier has low supply current of 90uA at 2.1V supply.

BLOCK DIAGRAM



PIN CONFIGURATION

Symbol	Pin	Description
OUTA	1	Output A
-INA	2	Inverting input A
+INA	3	Non-inverting input A
V _{SS}	4	Negative supply
+INB	5	Non-inverting input B
-INB	6	Inverting input B
OUTB	7	Output B
V _{DD}	8	Positive supply



ORDERING INFORMATION

Package	Part number	Packaging Marking	Transport Media
8-Pin SOP	MSV932GTR	MSV932G	2.5k Units Tape and Reel
8-Pin SOP	MSV932GU	MSV932G	100 Units Tube
8-Pin MSOP	MSV932MGTR	V932G	3.5k Units Tape and Reel
8-Pin MSOP	MSV932MGU	V932G	80 Units Tube

Lead free, RoHS Compliance

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Rating	Unit
V _{DD}	Supply Voltage	6.5	V
V _{ESD}	Electrostatic Handling	-2000 to 2000	V
T _{STG}	Storage Temperature Range	-65 to 150	°C
T _A	Operating Ambient Temperature Range	-40 to 125	°C
T _J	Maximum Junction Temperature	150	°C
T _S	Soldering Temperature, 10 seconds	260	°C
R _{THJA}	Thermal Resistance from Junction to Ambient in Free Air SOP8 MSOP8	175 235	°C/W

OPERATING RATINGS

Symbol	Parameter	Min	Typ	Max	Unit
V _{DD}	Supply Voltage	2.1	-	6.5	V

2.1V ELECTRICAL CHARACTERISTICS

(Ta=25°C, V_{DD}=2.1V, V_{SS}=0V, V_{CM}=V_O= V_{DD}/2; unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DC Characteristics						
I _Q	Quiescent current	Per Amplifier	-	90	-	μA
V _{OS}	Input offset voltage			1	5	mV
CMRR	Common mode rejection ratio	V _{CM} =0 to 2.1V	-	55	-	dB
PSRR	Power supply rejection ratio	Ripple = 0.2Vpp, 100Hz	-	63	-	dB
CS	Cannel separation	f = 10kHz	100	-	-	dB
V _{ICM}	Input common-mode voltage range	CMRR ≥ 50dB	0	-	2.1	V
V _O	Maximum output voltage swing	A _v = +1, (THD+N) < 0.1% R _L = 600Ω to 1.05V	-	1.980	-	Vpp
		R _L = 2kΩ to 1.05V	-	2.056	-	
AC Characteristics						
SR	Slew rate	Note1	-	0.35	-	V/μs
GBWP	Gain bandwidth product		-	1	-	MHz
THD+N	Total harmonic distortion plus noise	A _v = +1 R _L = 600Ω to 1.05V V _O = 1Vpp, f = 1kHz	-	-64	-59	dB

2.7V ELECTRICAL CHARACTERISTICS

(Ta=25°C, V_{DD}=2.7V, V_{SS}=0V, V_{CM}=V_O= V_{DD}/2; unless otherwise specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DC Characteristics						
I _Q	Quiescent current	Per Amplifier	-	100	-	μA
V _{OS}	Input offset voltage			1	5	mV
CMRR	Common mode rejection ratio	V _{CM} =0 to 2.7V	-	56	-	dB
PSRR	Power supply rejection ratio	Ripple = 0.2Vpp, 100Hz	-	73	-	dB
CS	Cannel separation	f = 10kHz	100	-	-	dB
V _{ICM}	Input common-mode voltage range	CMRR ≥ 50dB	0	-	2.7	V
V _O	Maximum output voltage swing	A _v = +1, (THD+N) < 0.1% R _L = 600Ω to 1.35V	-	2.588	-	Vpp
		R _L = 2kΩ to 1.35V	-	2.676	-	
AC Characteristics						
SR	Slew rate	Note1	-	0.39	-	V/μs
GBWP	Gain bandwidth product		-	1	-	MHz
THD+N	Total harmonic distortion plus noise	A _v = +1 R _L = 600Ω to 1.35V V _O = 1Vpp, f = 1kHz	-	-63	-58	dB

5V ELECTRICAL CHARACTERISTICS(Ta=25°C, V_{DD}=5V, V_{SS}=0V, V_{CM}=V_O= V_{DD}/2; unless otherwise specified)

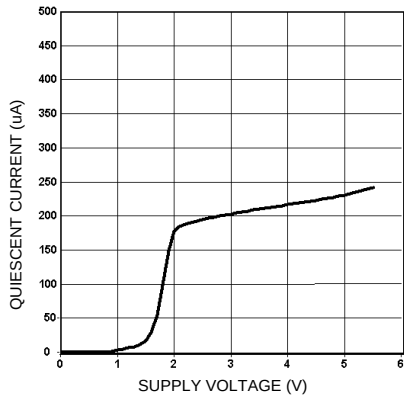
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DC Characteristics						
I _Q	Quiescent current	Per Amplifier	-	115	-	μA
V _{OS}	Input offset voltage			1	5	mV
CMRR	Common mode rejection ratio	V _{CM} =0 to 5V	-	60	-	dB
PSRR	Power supply rejection ratio	Ripple = 0.2Vpp, 100Hz	-	61	-	dB
CS	Cannel separation	f = 10kHz	100	-	-	dB
V _{ICM}	Input common-mode voltage range	CMRR ≥ 50dB	0	-	5	V
V _O	Maximum output voltage swing	A _v = +1, (THD+N) < 0.1% R _L = 600Ω to 2.5V	-	4.885	-	Vpp
		R _L = 2kΩ to 2.5V	-	4.981	-	
AC Characteristics						
SR	Slew rate	Note1	-	0.5	-	V/μs
GBWP	Gain bandwidth product		-	1	-	MHz
THD+N	Total harmonic distortion plus noise	A _v = +1 R _L = 600Ω to 2.5V V _O = 1Vpp, f = 1kHz	-	-74	-69	dB

Note1: Connected as voltage follower with input step from V_{SS} to V_{DD}.

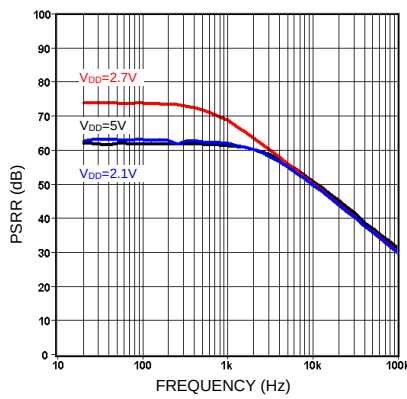
Number specified is the slower of the positive and negative slew rates.

TYPICAL PERFORMANCE CHARACTERISTICS

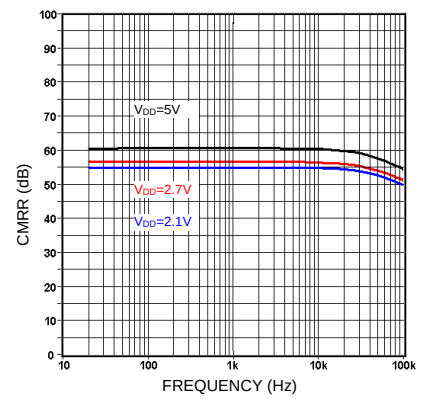
(Ta=25°C ; unless otherwise specified)



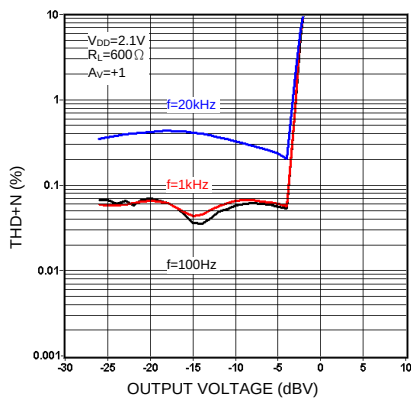
Quiescent current vs. supply voltage



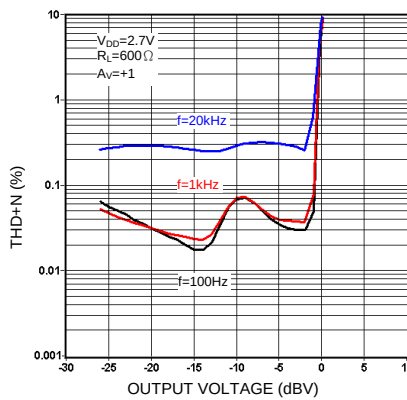
PSRR vs. frequency



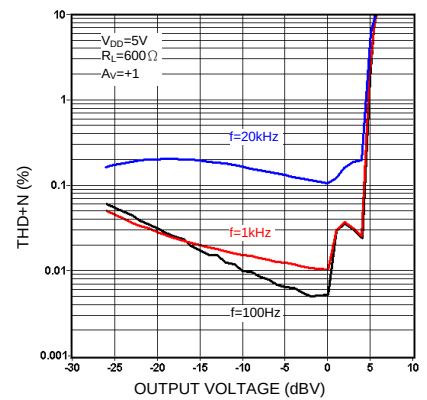
CMRR vs. frequency



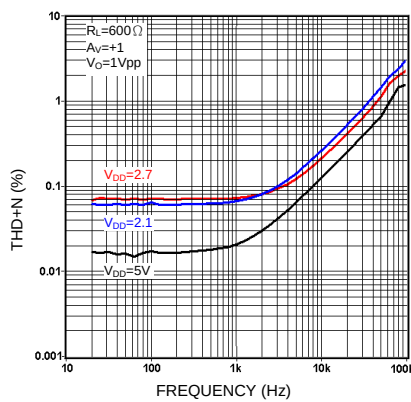
THD+N vs. output voltage



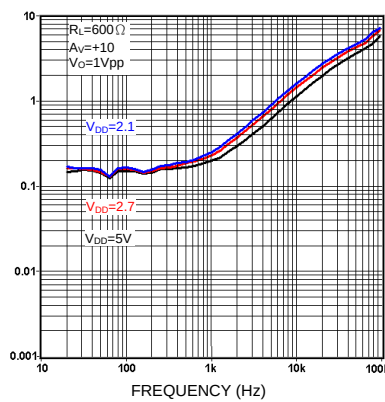
THD+N vs. output voltage



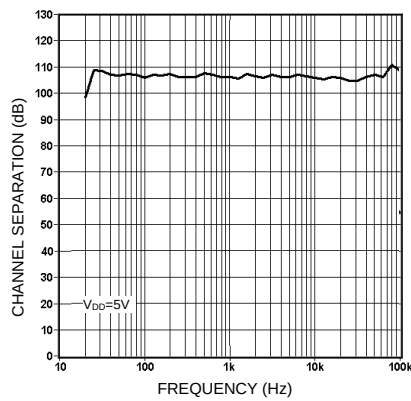
THD+N vs. output voltage



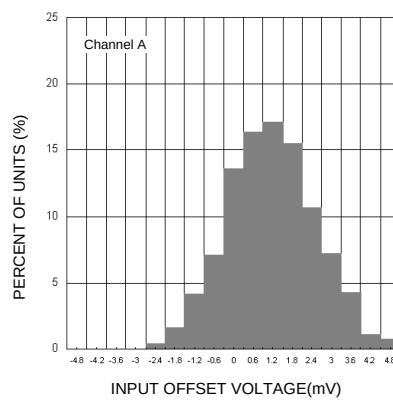
THD+N vs. frequency



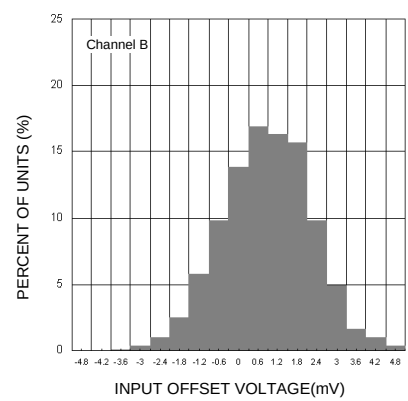
THD+N vs. frequency



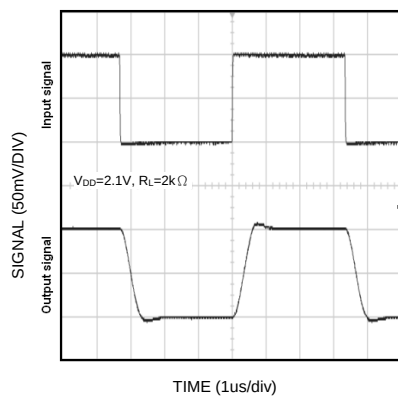
Channel separation vs. frequency



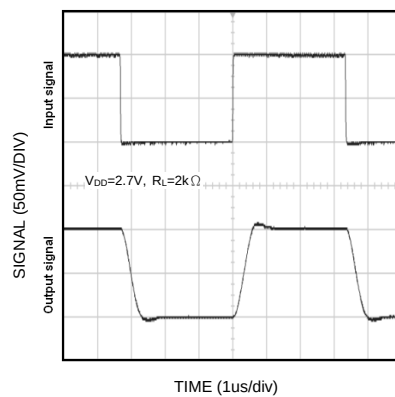
Distribution of offset voltage



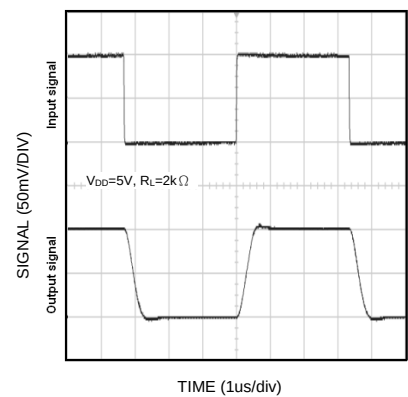
Distribution of offset voltage



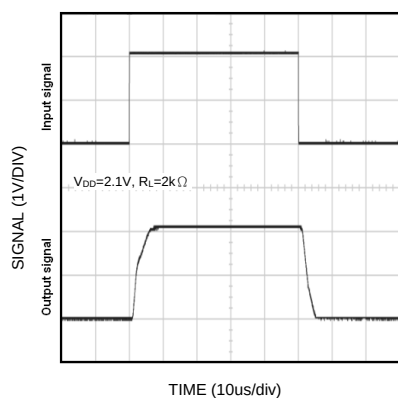
Small signal non-inverting response



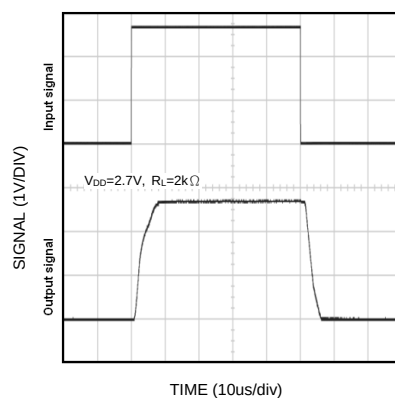
Small signal non-inverting response



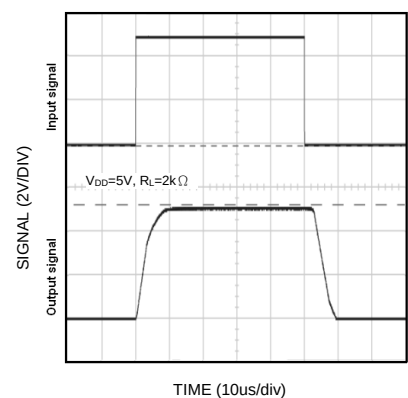
Small signal non-inverting response



Large signal non-inverting response



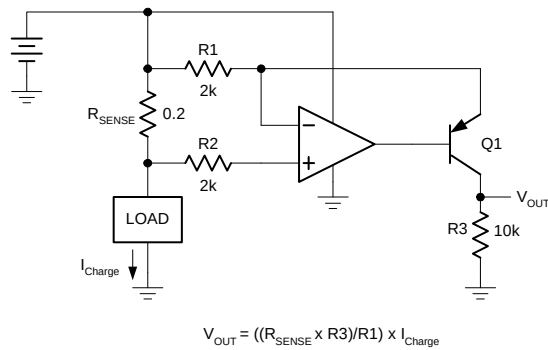
Large signal non-inverting response



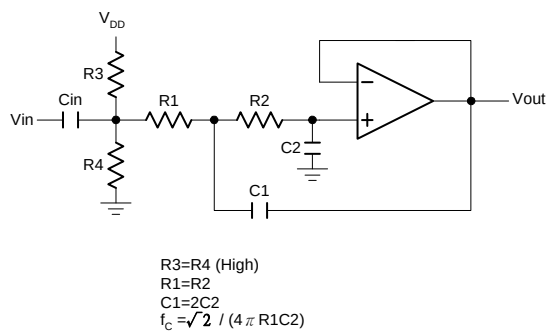
Large signal non-inverting response

APPLICATION INFORMATION (Single Supply)

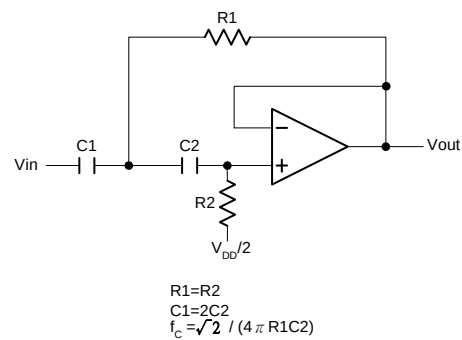
High Side Current Sensing



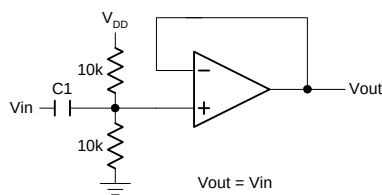
Sallen-Key Low Pass Filter



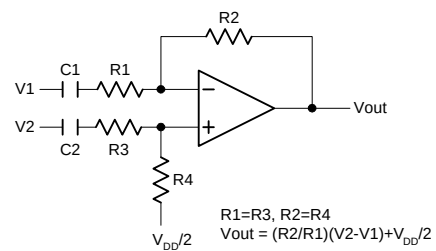
Sallen-Key High Pass Filter



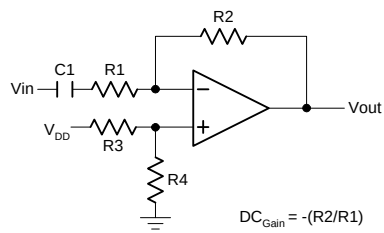
Voltage Follower



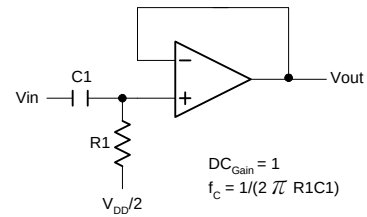
Difference Amplifier



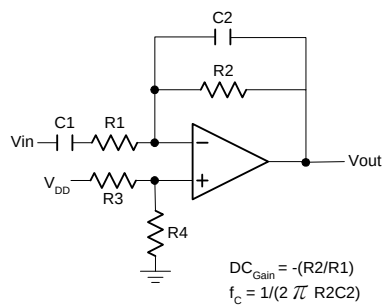
Inverting Amplifier



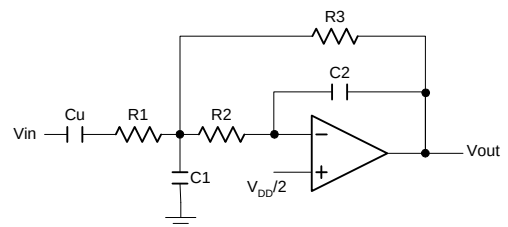
Simple High-Pass Filter



Simple Low-Pass Filter

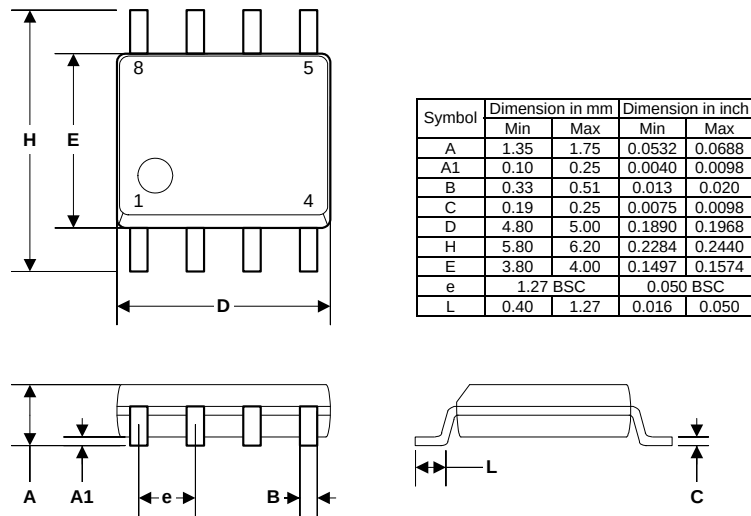


2nd Order Multiple Feedback Low-Pass Filter

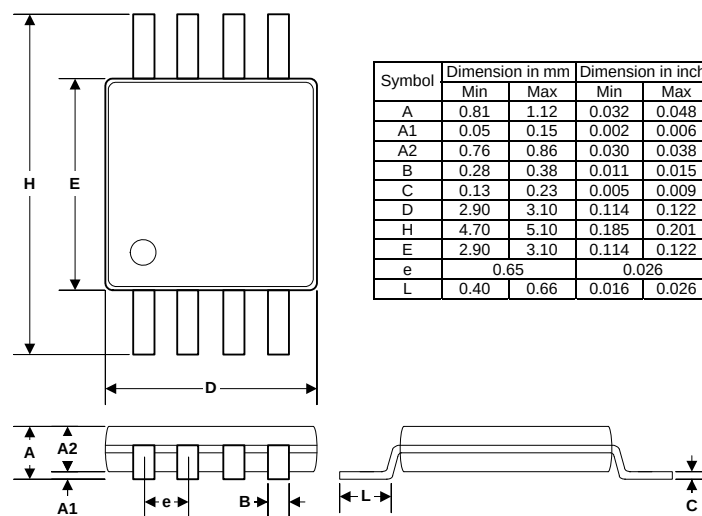


EXTERNAL DIMENSIONS

SOP8

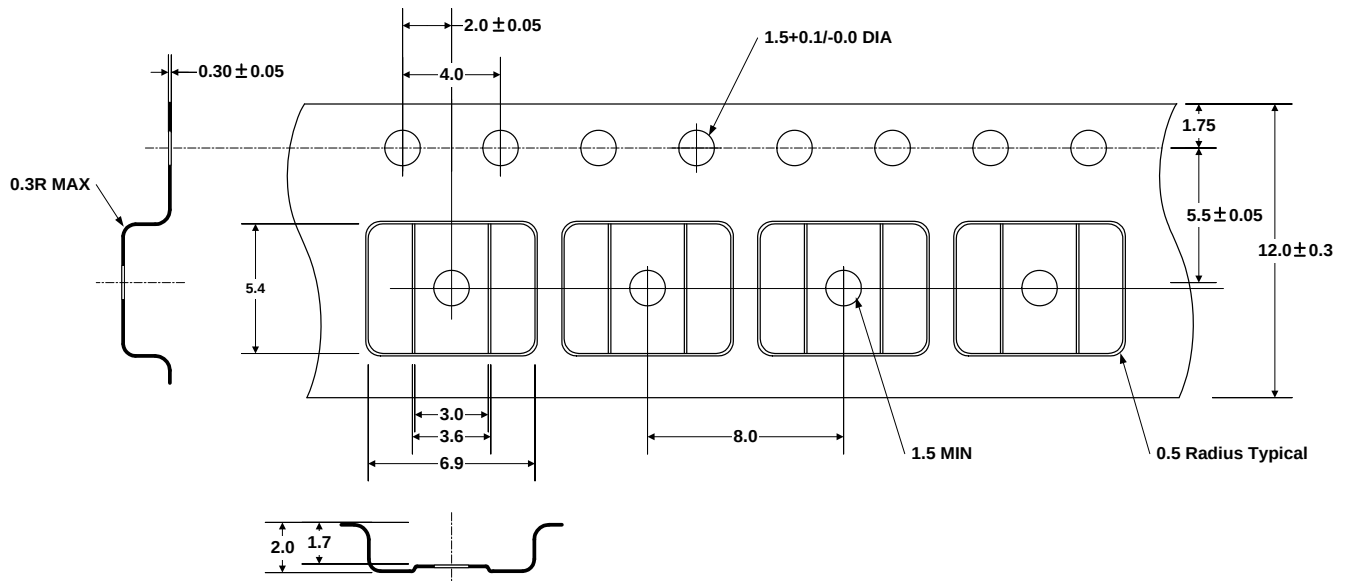


MSOP8



TAPE AND REEL (Unit : mm)

SOP8



MSOP8

