SGM8292
High Voltage Rail-to-Rail Output Operational Amplifier

GENERAL DESCRIPTION

The SGM8292 (dual) is a high voltage operational amplifier that is designed to offer a wide input common mode voltage range and output voltage swing. This device can operate from ±2.25V to ±18V dual power supplies or from +4.5V to +36V single supplies.

The device features high slew rate, low input bias and offset current, low offset voltage and low offset-voltage temperature coefficient.

The SGM8292 dual is available in Green SOIC-8 and MSOP-8 packages. It is specified over the extended -40℃ to +125℃ temperature range.

FEATURES

- **Low Power Consumption: 150μA/Amplifier**
- **Low Offset Voltage: 1.5mV (MAX)**
- **Wide Input Common Mode and Differential Voltage Ranges**
- **Low Input Bias and Offset Currents**
- **Output Short-Circuit Protection**
- **Rail-to-Rail Output**
- **High Input Impedance**
- **High Slew Rate: 7V/μs**
- **SGM8292 Available in MSOP-8 and SOIC-8 Packages**

APPLICATIONS

High Impedance Sensors
Photodiode Amplifier
Precision Instrumentation
Phase-Locked Loop Filters
High End, Professional Audio
DAC Output Amplifier
ATE
Medical

PACKAGE/ORDERING INFORMATION

MODEL	ORDER NUMBER	SPECIFIED TEMPERATURE RANGE	PACKAGE DESCRIPTION	PACKAGE OPTION	MARKING INFORMATION
SGM8292	SGM8292YMS8G/TR	-40℃ to +85℃	MSOP-8	Tape and Reel, 3000	SGM8292 YMS8 XXXXX
	SGM8292YS8G/TR	-40℃ to +85℃	SOIC-8	Tape and Reel, 2500	SGM 8292YS8 XXXXX
	SGM8292XS8G/TR	-40℃ to +125℃	SOIC-8	Tape and Reel, 2500	SGM 8292XS8 XXXXX

NOTE: **XXXXX** = Date Code and Vendor Code.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, $+V_S$ to $-V_S$ 40V
Input Common Mode Voltage Range
……(-V_S) - 0.1V to (+V_S) - 1.5V
Input/Output Voltage Range…….(-V_S) - 0.3V to (+V_S) + 0.3V
Storage Temperature Range.....-65℃ to +150℃
Junction Temperature .....150℃
Operating Temperature Range.....-40℃ to +125℃
Lead Temperature Range (Soldering 10sec)
.....260℃
ESD Susceptibility
HBM.....4000V
MM…….....150V

NOTES:
1. Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

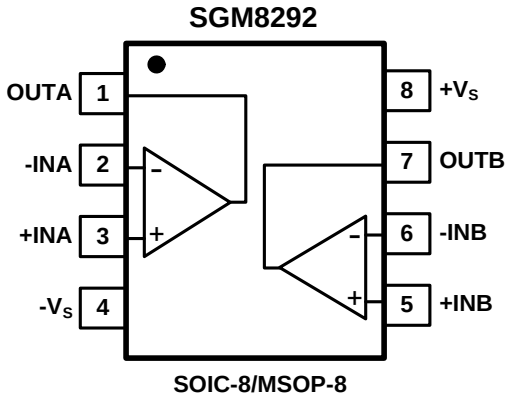
2. Proper power-supply sequencing is recommended for the CMOS device. Always sequence V_S on first, followed by the inputs and outputs.

CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. SGMICRO 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.

SGMICRO reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact SGMICRO sales office to get the latest datasheet.

PIN CONFIGURATIONS (TOP VIEW)



ELECTRICAL CHARACTERISTICS: V_S = +5V

(At R_L = 2kΩ connected to +2.5V, unless otherwise noted.)

PARAMETER		CONDITIONS	SGM8292					
			TYP	MIN/MAX OVER TEMPERATURE				
			+25℃	+25℃	-40℃ to 85℃	-40℃ to 125℃	UNITS	MIN/ MAX
Input Offset Voltage (V_{OS})		V_{CM} = +2.5V	0.3	1.5	2.4	2.75	mV	MAX
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta_T$)			3				μV/℃	TYP
Input Bias Current (I_B)			20				pA	TYP
Input Offset Current (I_{OS})			20				pA	TYP
Open-Loop Voltage Gain (A_{OL})		V_{OUT} = +0.5V to +4.5V, R_L = 5kΩ	86	75	72	70	dB	MIN
Output Voltage Swing from Rail	V_{OH}	R_L = 10kΩ	16	39	43	46	mV	MAX
	V_{OL}	R_L = 10kΩ	14	30	34	38	mV	MAX
Output Short-Circuit Current (I_{SC})	Sink	R_L = 10Ω	46.2	34.1	21.5	11.0	mA	MIN
	Source	R_L = 10Ω	44.4	30.5	20.7	12.3		
Input Common Mode Voltage Range (V_{CM})			-0.1 to +3.5				V	TYP
Common Mode Rejection Ratio (CMRR)		V_{CM} = -0.1V to +3.5V	84	69	64	62	dB	MIN
Power Supply Rejection Ratio (PSRR)		V_S = +4.5V to +36V	103	82	80	78	dB	MIN
Quiescent Current (per Amplifier)		I_{OUT} = 0A	144	275	309	329	μA	MAX
Gain-Bandwidth Product (GBP)		C_L = 100pF, V_{CM} = +2.5V	1.4				MHz	TYP
Gain Margin		C_L = 100pF, V_{CM} = +2.5V	-10				dB	TYP
Phase Margin		C_L = 100pF, V_{CM} = +2.5V	50				°	TYP
Channel-to-Channel Crosstalk		f = 1MHz	-80				dB	TYP
Slew Rate (SR)	Up	V_{OUT} = $2V_{PP}$ step, C_L = 100pF, A_V = 1	5				V/μs	TYP
	Down	V_{OUT} = $2V_{PP}$ step, C_L = 100pF, A_V = 1	5				V/μs	TYP
Overload Recovery Time (ORT)	Up	V_{IN} × Gain = V_S	2.0				μs	TYP
	Down	V_{IN} × Gain = V_S	4.0					
Settling Time (t_S)		C_L = 100pF, A_V = 1, 200mV output step	2				μs	TYP
Voltage Noise Density (e_n)		f = 20kHz, V_{CM} = +2.5V	30				nV/$\sqrt{Hz}$	TYP
		f = 1kHz, V_{CM} = +2.5V	45					
Total Harmonic Distortion + Noise (THD+N)		V_{OUT} = $2V_{PP}$, f = 1kHz, A_V = 1, R_L = 600Ω	0.018				%	TYP
		V_{OUT} = $2V_{PP}$, f = 1kHz, A_V = 1, R_L = 2kΩ	0.009					

ELECTRICAL CHARACTERISTICS: V_S = ±5V

(At R_L = 2kΩ connected to 0V, unless otherwise noted.)

PARAMETER		CONDITIONS	SGM8292					
			TYP	MIN/MAX OVER TEMPERATURE				
			+25℃	+25℃	-40℃ to 85℃	-40℃ to 125℃	UNITS	MIN/ MAX
Input Offset Voltage (V_{OS})		V_{CM} = 0V	0.3	1.5	2.4	2.75	mV	MAX
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta_T$)			3				μV/℃	TYP
Input Bias Current (I_B)			20				pA	TYP
Input Offset Current (I_{OS})			20				pA	TYP
Open-Loop Voltage Gain (A_{OL})		V_{OUT} = -4.5V to +4.5V, R_L = 5kΩ	93	81	78	76	dB	MIN
Output Voltage Swing from Rail	V_{OH}	R_L = 10kΩ	28	67	73	79	mV	MAX
	V_{OL}	R_L = 10kΩ	23	39	47	62	mV	MAX
Output Current (I_{OUT})		R_L = 10kΩ	60				mA	TYP
Input Common Mode Voltage Range (V_{CM})			-5.1 to +3.5				V	TYP
Common Mode Rejection Ratio (CMRR)		V_{CM} = -5.1V to +3.5V	92	76	69	67	dB	MIN
Quiescent Current (per Amplifier)		I_{OUT} = 0A	145	276	311	332	μA	MAX
Gain-Bandwidth Product (GBP)		C_L = 100pF, V_{CM} = 0V	1.4				MHz	TYP
Gain Margin		C_L = 100pF, V_{CM} = 0V	-10				dB	TYP
Phase Margin		C_L = 100pF, V_{CM} = 0V	50				°	TYP
Channel-to-Channel Crosstalk		f = 1MHz	-80				dB	TYP
Slew Rate (SR)	Up	V_{OUT} = 2V_{PP} step, C_L = 100pF, A_V = 1	6				V/μs	TYP
	Down	V_{OUT} = 2V_{PP} step, C_L = 100pF, A_V = 1	4				V/μs	TYP
Overload Recovery Time (ORT)	Up	V_{IN} × Gain = V_S	1.5				μs	TYP
	Down	V_{IN} × Gain = V_S	2.5					
Settling Time (t_S)		C_L = 100pF, A_V = 1, 200mV output step	2				μs	TYP
Voltage Noise Density (e_n)		f = 20kHz, V_{CM} = 0V	30				nV/$\sqrt{Hz}$	TYP
		f = 1kHz, V_{CM} = 0V	45					
Total Harmonic Distortion + Noise (THD+N)		V_{OUT} = 2V_{PP}, f = 1kHz, A_V = 1, R_L = 600Ω	0.018				%	TYP
		V_{OUT} = 2V_{PP}, f = 1kHz, A_V = 1, R_L = 2kΩ	0.009					

ELECTRICAL CHARACTERISTICS: V_S = ±15V

(At R_L = 2kΩ connected to 0V, unless otherwise noted.)

PARAMETER		CONDITIONS	SGM8292					
			TYP	MIN/MAX OVER TEMPERATURE				
			+25℃	+25℃	-40℃ to 85℃	-40℃ to 125℃	UNITS	MIN/ MAX
Input Offset Voltage (V_{OS})		V_{CM} = 0V	0.3	1.5	2.4	2.75	mV	MAX
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta_T$)			3				μV/℃	TYP
Input Bias Current (I_B)			20				pA	TYP
Input Offset Current (I_{OS})			20				pA	TYP
Open-Loop Voltage Gain (A_{OL})		V_{OUT} = -14.5V to +14.5V, R_L = 5kΩ	100	85	82	80	dB	MIN
Output Voltage Swing from Rail	V_{OH}	R_L = 10kΩ	67	174	193	210	mV	MAX
	V_{OL}	R_L = 10kΩ	63	102	124	148	mV	MAX
Output Current (I_{OUT})		R_L = 10kΩ	60				mA	TYP
Input Common Mode Voltage Range (V_{CM})			-15.1 to +13.5				V	TYP
Common Mode Rejection Ratio (CMRR)		V_{CM} = -15.1V to +13.5V	95	79	71	66	dB	MIN
Quiescent Current (per Amplifier)		I_{OUT} = 0A	150	286	320	337	μA	MAX
Gain-Bandwidth Product (GBP)		C_L = 100pF, V_{CM} = 0V	1.4				MHz	TYP
Gain Margin		C_L = 100pF, V_{CM} = 0V	-10				dB	TYP
Phase Margin		C_L = 100pF, V_{CM} = 0V	50				°	TYP
Channel-to-Channel Crosstalk		f = 1MHz	-80				dB	TYP
Slew Rate (SR)	Up	V_{OUT} = 2V_{PP} step, C_L = 100pF, A_V = 1	7				V/μs	TYP
	Down	V_{OUT} = 2V_{PP} step, C_L = 100pF, A_V = 1	4				V/μs	TYP
Overload Recovery Time (ORT)	Up	V_{IN} × Gain = V_S	0.5				μs	TYP
	Down	V_{IN} × Gain = V_S	1.0					
Settling Time (t_S)		C_L = 100pF, A_V = 1, 200mV output step	2				μs	TYP
Voltage Noise Density (e_n)		f = 20kHz, V_{CM} = 0V	29				nV/$\sqrt{Hz}$	TYP
		f = 1kHz, V_{CM} = 0V	43					
Total Harmonic Distortion + Noise (THD+N)		V_{OUT} = 2V_{PP}, f = 1kHz, A_V = 1, R_L = 600Ω	0.018				%	TYP
		V_{OUT} = 2V_{PP}, f = 1kHz, A_V = 1, R_L = 2kΩ	0.009					

ELECTRICAL CHARACTERISTICS: V_S = ±18V

(At R_L = 2kΩ connected to 0V, unless otherwise noted.)

PARAMETER		CONDITIONS	SGM8292					
			TYP	MIN/MAX OVER TEMPERATURE				
			+25℃	+25℃	-40℃ to 85℃	-40℃ to 125℃	UNITS	MIN/ MAX
Input Offset Voltage (V_{OS})		V_{CM} = 0V	0.3	1.5	2.4	2.75	mV	MAX
Input Offset Voltage Drift ($\Delta V_{OS}/\Delta_T$)			3				μV/℃	TYP
Input Bias Current (I_B)			20				pA	TYP
Input Offset Current (I_{OS})			20				pA	TYP
Open-Loop Voltage Gain (A_{OL})		V_{OUT} = -17.5V to +17.5V, R_L = 5kΩ	101	87	84	82	dB	MIN
Output Voltage Swing from Rail	V_{OH}	R_L = 10kΩ	81	208	231	251	mV	MAX
	V_{OL}	R_L = 10kΩ	73	119	146	172	mV	MAX
Output Current (I_{OUT})		R_L = 10kΩ	60				mA	TYP
Input Common Mode Voltage Range (V_{CM})			-18.1 to +16.5				V	TYP
Common Mode Rejection Ratio (CMRR)		V_{CM} = -18.1V to +16.5V	91	78	72	69	dB	MIN
Quiescent Current (per Amplifier)		I_{OUT} = 0A	157	299	332	352	μA	MAX
Gain-Bandwidth Product (GBP)		C_L = 100pF, V_{CM} = 0V	1.4				MHz	TYP
Gain Margin		C_L = 100pF, V_{CM} = 0V	-10				dB	TYP
Phase Margin		C_L = 100pF, V_{CM} = 0V	50				°	TYP
Channel-to-Channel Crosstalk		f = 1MHz	-80				dB	TYP
Slew Rate (SR)	Up	V_{OUT} = 2V_{PP} step, C_L = 100pF, A_V = 1	7				V/μs	TYP
	Down	V_{OUT} = 2V_{PP} step, C_L = 100pF, A_V = 1	4				V/μs	TYP
Overload Recovery Time (ORT)	Up	V_{IN} × Gain = V_S	0.5				μs	TYP
	Down	V_{IN} × Gain = V_S	1.0					
Settling Time (t_S)		C_L = 100pF, A_V = 1, 200mV output step	2				μs	TYP
Voltage Noise Density (e_n)		f = 20kHz, V_{CM} = 0V	29				nV/$\sqrt{Hz}$	TYP
		f = 1kHz, V_{CM} = 0V	43					
Total Harmonic Distortion + Noise (THD+N)		V_{OUT} = 2V_{PP}, f = 1kHz, A_V = 1, R_L = 600Ω	0.018				%	TYP
		V_{OUT} = 2V_{PP}, f = 1kHz, A_V = 1, R_L = 2kΩ	0.009					

TYPICAL APPLICATION CIRCUITS

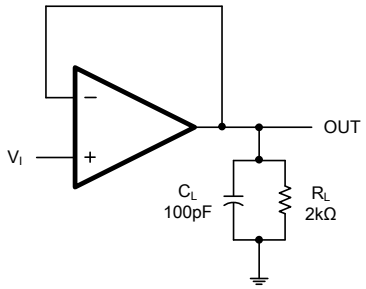


Figure 1

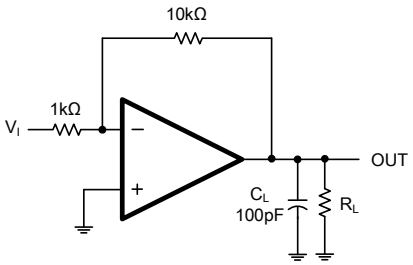


Figure 2

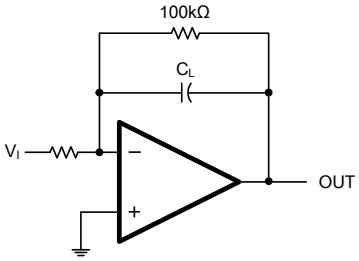
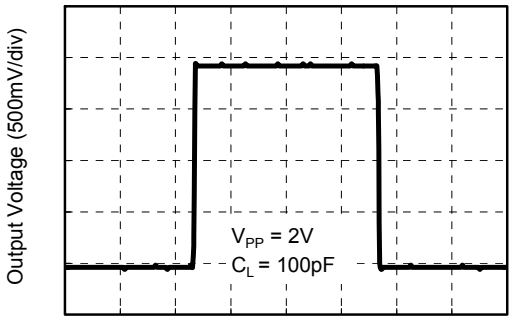


Figure 3

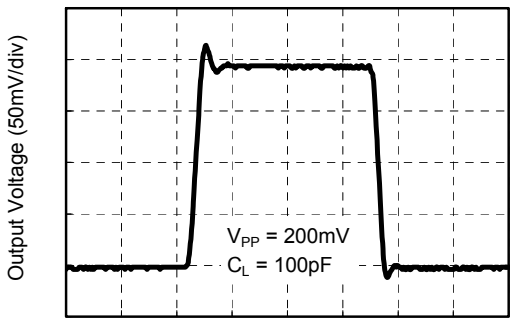
TYPICAL PERFORMANCE CHARACTERISTICS

At T_A = +25℃, V_S = ±15V, R_L = 2kΩ connected to 0V, unless otherwise noted.

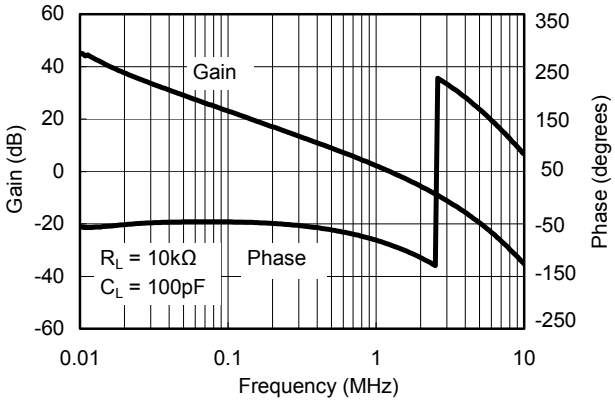
Large Signal Step Response



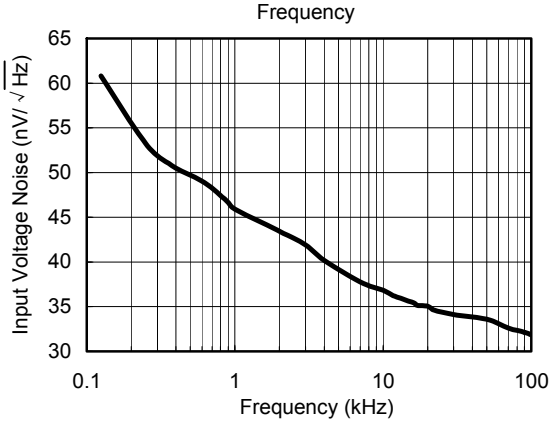
Small Signal Step Response



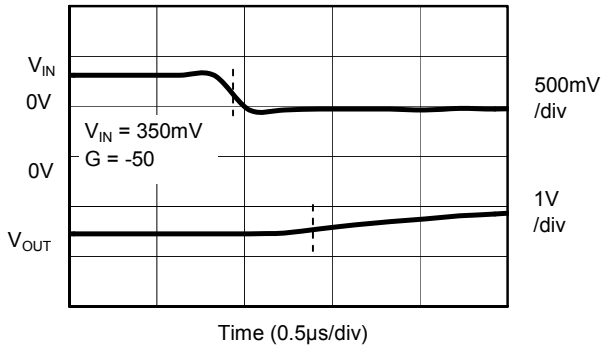
Gain and Phase vs. Frequency



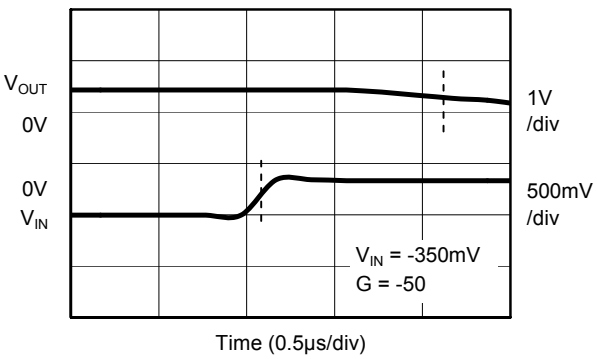
Input Voltage Noise Spectral Density vs. Frequency



Negative Overload Recovery Time

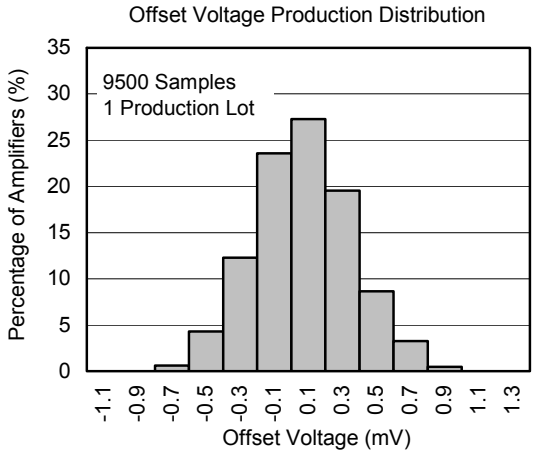


Positive Overload Recovery Time



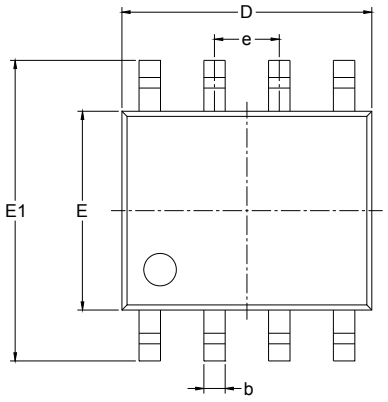
TYPICAL PERFORMANCE CHARACTERISTICS

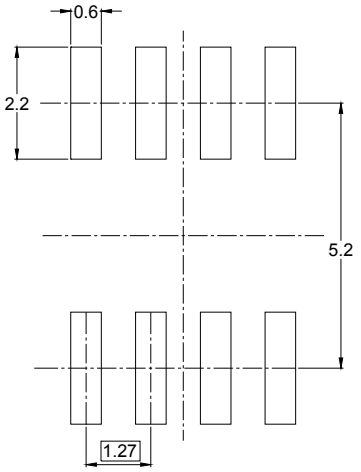
At T_A = +25℃, V_S = ±15V, R_L = 2kΩ connected to 0V, unless otherwise noted.



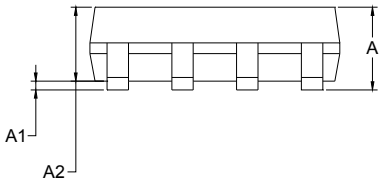
PACKAGE OUTLINE DIMENSIONS

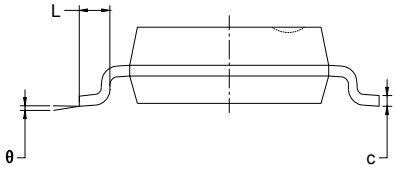
SOIC-8





RECOMMENDED LAND PATTERN (Unit: mm)

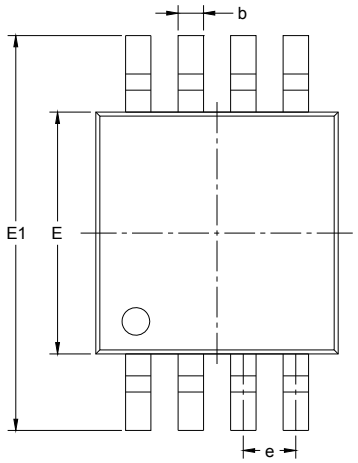


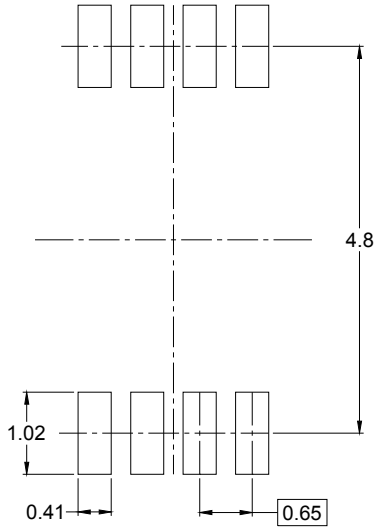


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

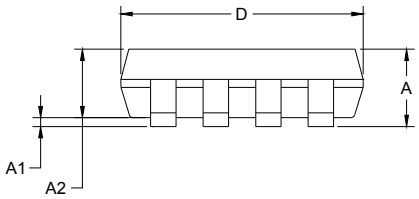
PACKAGE OUTLINE DIMENSIONS

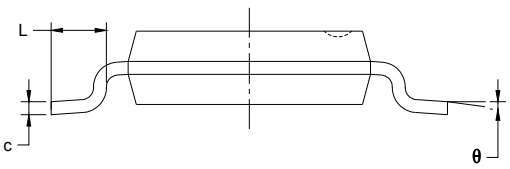
MSOP-8





RECOMMENDED LAND PATTERN (Unit: mm)

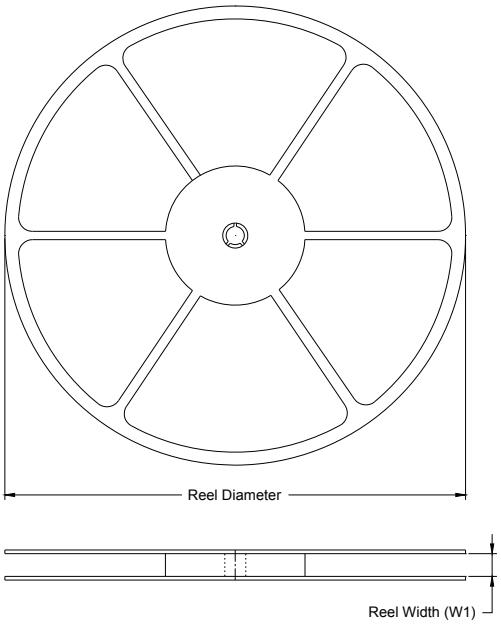




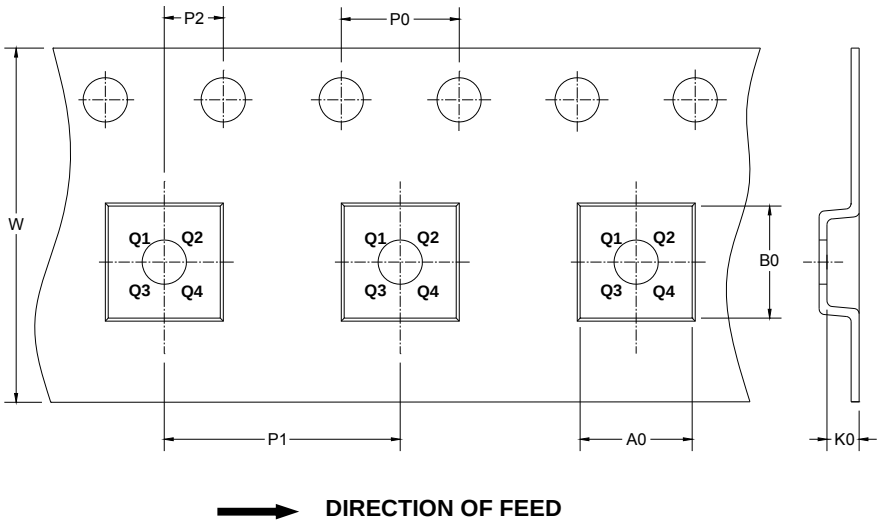
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026 BSC	
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS

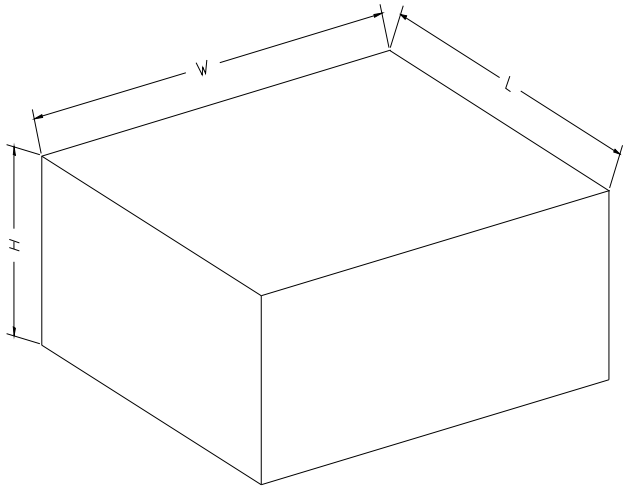


NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOIC-8	13″	12.4	6.4	5.4	2.1	4.0	8.0	2.0	12.0	Q1
MSOP-8	13″	12.4	5.2	3.3	1.5	4.0	8.0	2.0	12.0	Q1

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13”	386	280	370	5