



SGM8278-2

Low Noise, High Voltage, Rail-to-Rail I/O Operational Amplifier

GENERAL DESCRIPTION

The dual SGM8278-2 is a low noise, high voltage operational amplifier that is designed to offer a wide input common mode voltage range and output voltage swing. The device can operate from $\pm 1.5\text{V}$ to $\pm 18\text{V}$ dual power supplies or from 3V to 36V single supply.

The device features low noise, low input bias and offset current, low offset voltage and low offset voltage temperature coefficient.

The SGM8278-2 is available in Green SOIC-8, MSOP-8, TDFN-2 $\times$ 2-8AL, TDFN-3 $\times$ 3-8BL and WLCSP-1.57 $\times$ 1.57-8B packages. It is specified over the extended -40°C to $+125^{\circ}\text{C}$ temperature range.

FEATURES

- Wide Input Common Mode and Differential Voltage Ranges
- Support Single or Dual Power Supplies
- High Output Current: 95mA (Able to Drive 32 Ω Load)
- Low Input Bias and Offset Current
- Output Short-Circuit Protection
- Rail-to-Rail Input and Output
- High Input Impedance
- Low Input Offset Voltage: 2mV (MAX)
- Low Noise: 15nV/ $\sqrt{\text{Hz}}$ at 1kHz
- Gain-Bandwidth Product: 3.3MHz
- Slew Rate: 2V/ μs
- -40°C to $+125^{\circ}\text{C}$ Operating Temperature Range
- Available in Green SOIC-8, MSOP-8, TDFN-2 $\times$ 2-8AL, TDFN-3 $\times$ 3-8BL and WLCSP-1.57 $\times$ 1.57-8B Packages

APPLICATIONS

High Impedance Sensor
Photodiode Amplifier
High End, Professional Audio
DAC Output Amplifier
Medical

PACKAGE/ORDERING INFORMATION

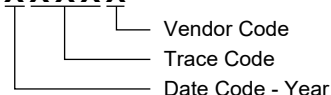
MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM8278-2	SOIC-8	-40°C to +125°C	SGM8278-2XS8G/TR	SGM 82782XS8 XXXXX	Tape and Reel, 4000
	MSOP-8	-40°C to +125°C	SGM8278-2XMS8G/TR	SGM82782 XMS8 XXXXX	Tape and Reel, 4000
	TDFN-2×2-8AL	-40°C to +125°C	SGM8278-2XTDE8G/TR	R41 XXXX	Tape and Reel, 3000
	TDFN-3×3-8BL	-40°C to +125°C	SGM8278-2XTDD8G/TR	SGM R42DD XXXXX	Tape and Reel, 4000
	WLCSP-1.57×1.57-8B	-40°C to +125°C	SGM8278-2XG/TR	XXXX R40	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XXXX = Date Code and Trace Code. XXXXX = Date Code, Trace Code and Vendor Code.

SOIC-8/MSOP-8

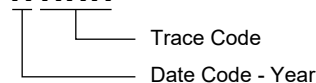
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TDFN-2×2-8AL

YYY — Serial Number

XXXX

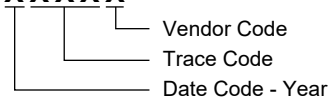


TDFN-3×3-8BL

Serial Number

YYYDD

XXXXX



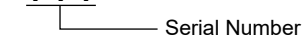
WLCSP-1.57×1.57-8B

Date Code - Year

Trace Code

XXXX

YYY



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, $+V_S$ to $-V_S$	40V
Input/Output Voltage Range.....	$(-V_S) - 0.3V$ to $(+V_S) + 0.3V$
Junction Temperature	+150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM.....	4000V
CDM	1000V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range	-40°C to +125°C
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NOTE: 1. Proper power supply sequencing is recommended for the CMOS device. Always sequence V_S on first, followed by the inputs and outputs.

OVERSTRESS CAUTION

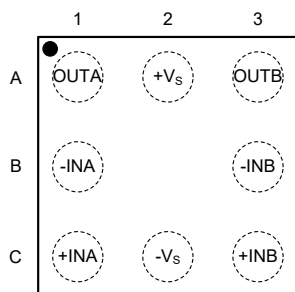
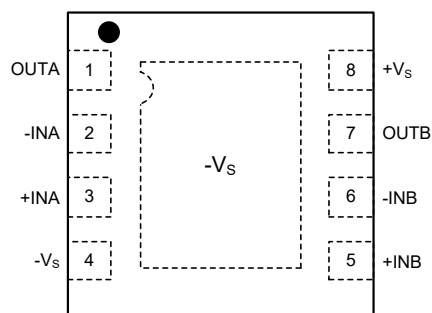
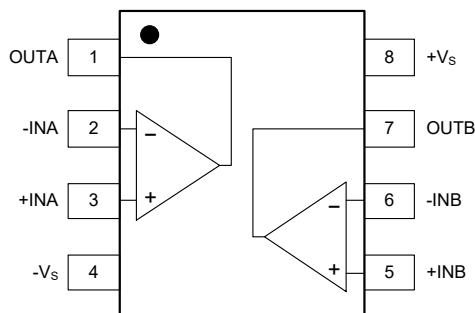
Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

ESD SENSITIVITY CAUTION

This integrated circuit can be damaged if ESD protections are not considered carefully. 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 even small parametric changes could cause the device not to meet the published specifications.

DISCLAIMER

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

PIN CONFIGURATIONS**(TOP VIEW)****WLCSP-1.57x1.57-8B****(TOP VIEW)****TDFN-2x2-8AL/TDFN-3x3-8BL****(TOP VIEW)****SOIC-8/MSOP-8**

NOTE: For TDFN-2x2-8AL and TDFN-3x3-8BL packages, connect the exposed pad to $-V_S$ or leave it unconnected.

ELECTRICAL CHARACTERISTICS

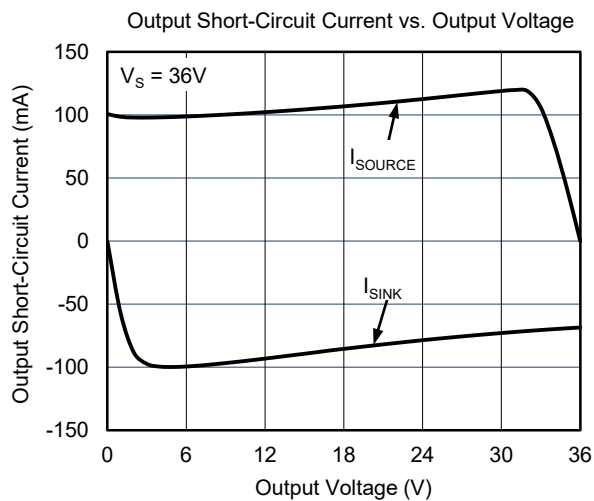
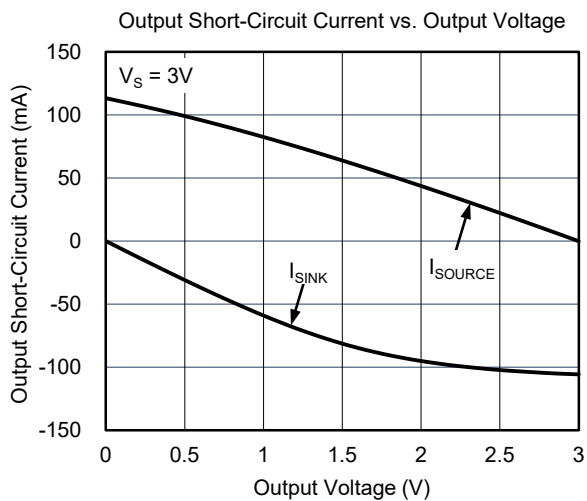
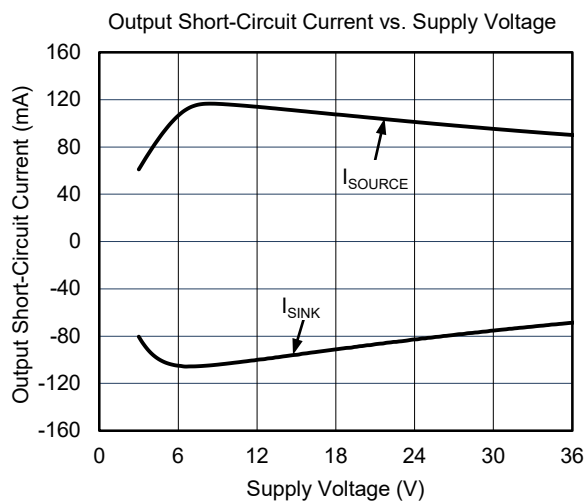
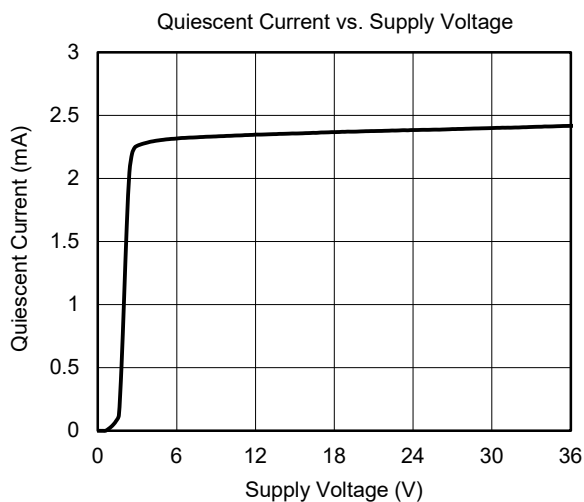
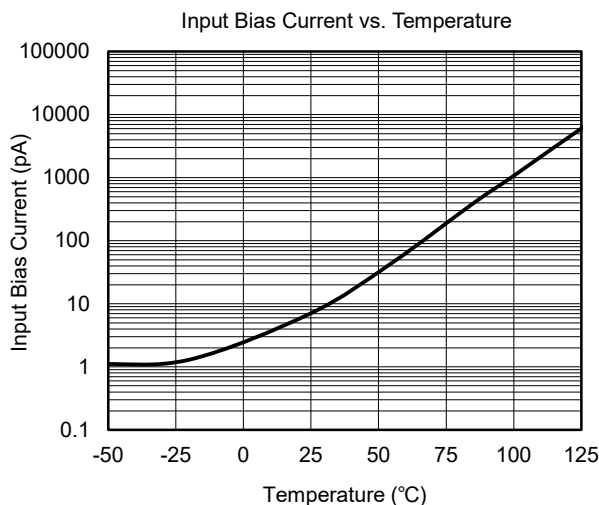
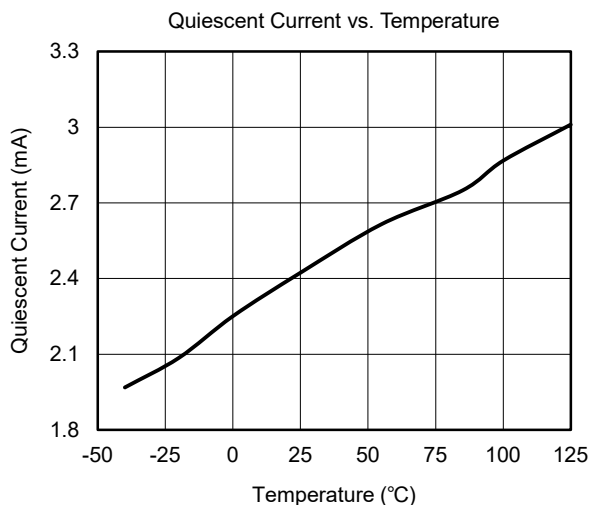
(At $T_A = +25^\circ\text{C}$, $V_S = \pm 1.5\text{V}$ to $\pm 18\text{V}$ and $R_L = 2\text{k}\Omega$ connected to 0V , Full = -40°C to $+125^\circ\text{C}$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Input Characteristics							
Input Offset Voltage	V _{OS}	V _{CM} = 0V	+25°C		0.4	2	mV
			Full			2.5	
Input Offset Voltage Drift	ΔV _{OS} /ΔT		Full		2		μV/°C
Input Bias Current	I _B	V _{CM} = 0V	+25°C		±10	800	pA
Input Offset Current	I _{OS}	V _{CM} = 0V	+25°C		±10	800	pA
Maximum Differential Input Voltage	V _{ID}		Full			(+V _S) - (-V _S)	V
Maximum Input Difference Bias Current	I _{ID}	V _S = ±18V, V _{ID} = ±18V	+25°C		2	3.5	μA
			Full			5	
Input Common Mode Voltage Range	V _{CM}		Full	(-V _S) - 0.1		(+V _S) + 0.1	V
Common Mode Rejection Ratio	CMRR	V _S = ±18V, (-V _S) - 0.1V < V _{CM} < (+V _S) - 2V	+25°C	98	115		dB
			Full	95			
		V _S = ±18V, (-V _S) - 0.1V < V _{CM} < (+V _S) + 0.1V	+25°C	83	100		
			Full	80			
Open-Loop Voltage Gain	A _{OL}	(-V _S) + 0.2V < V _{OUT} < (+V _S) - 0.2V, R _L = 10kΩ	+25°C	103	125		dB
			Full	100			
		(-V _S) + 0.5V < V _{OUT} < (+V _S) - 0.5V, R _L = 2kΩ	+25°C	100	120		
			Full	97			
Output Characteristics							
Output Voltage Swing from Rail	V _{OUT}	V _S = ±18V, R _L = 10kΩ	+25°C		25	40	mV
			Full			60	
		V _S = ±18V, R _L = 2kΩ	+25°C		120	150	
			Full			230	
		V _S = ±3V, R _L = 600Ω	+25°C		65	85	
			Full			125	
		V _S = ±3V, R _L = 32Ω	+25°C		920	1200	
			Full			1500	
Output Short-Circuit Current	I _{SC}	V _S = ±3V	+25°C	55	95		mA
Power Supply							
Operating Voltage Range	V _S		Full	3		36	V
Quiescent Current	I _Q	I _{OUT} = 0A	+25°C		2.4	3.2	mA
			Full			4	
Power Supply Rejection Ratio	PSRR	V _S = 5V to 36V	+25°C	100	124		dB
			Full	97			

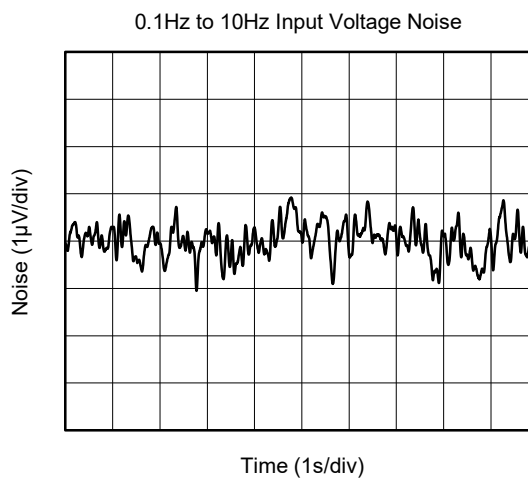
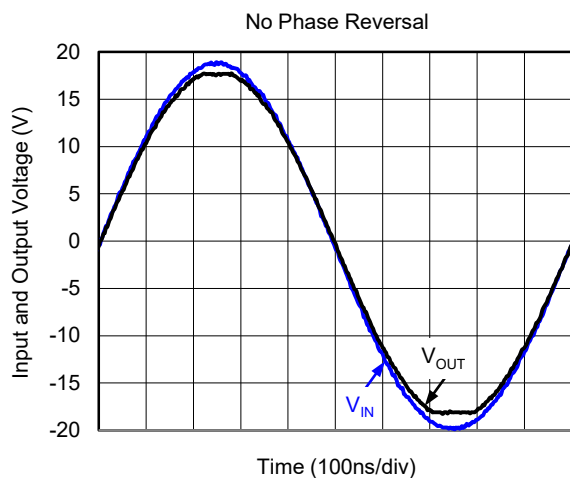
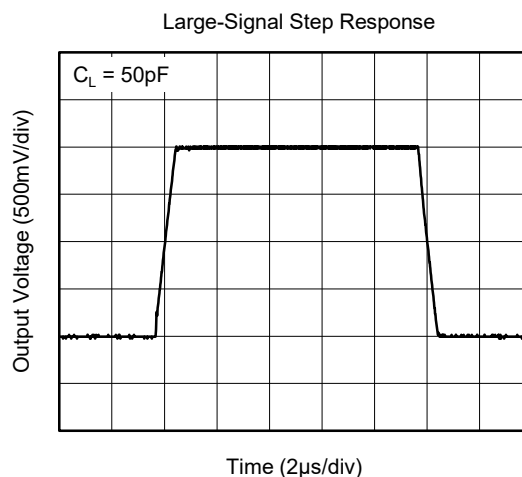
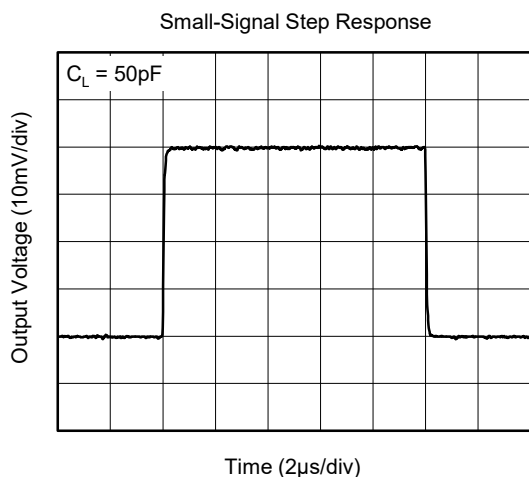
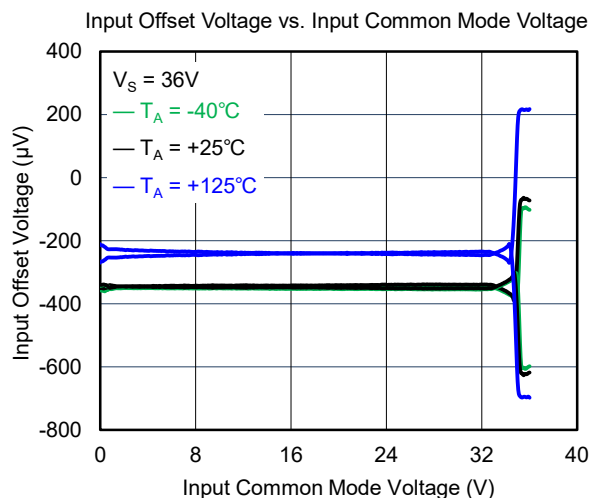
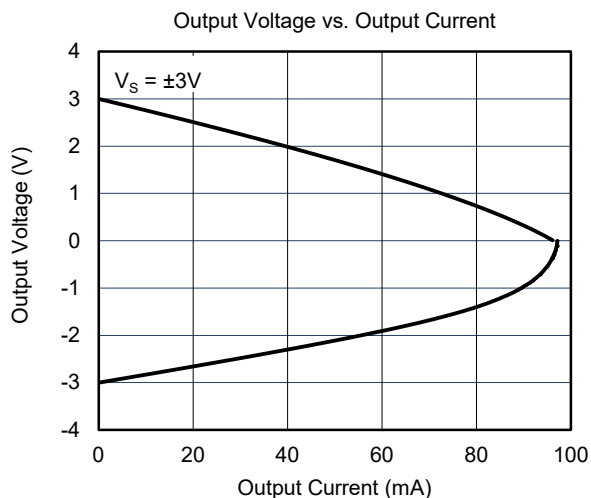
ELECTRICAL CHARACTERISTICS (continued)(At $T_A = +25^\circ\text{C}$, $V_S = \pm 1.5\text{V}$ to $\pm 18\text{V}$ and $R_L = 2\text{k}\Omega$ connected to 0V, Full = -40°C to $+125^\circ\text{C}$, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Dynamic Performance							
Gain-Bandwidth Product	GBP	C _L = 50pF	+25°C		3.3		MHz
Phase Margin	φ _O	C _L = 50pF	+25°C		70		°
Slew Rate	SR	G = +1	+25°C		2		V/μs
Overload Recovery Time	ORT	V _{IN} × G > V _S	+25°C		0.4		μs
Total Harmonic Distortion + Noise	THD+N	V _S = ±2.5V to ±18V, V _{OUT} = 2V _{P-P} , f = 1kHz, G = +1, R _L = 600Ω, BW = 20Hz to 80kHz	+25°C		0.001		%
		V _S = ±2.5V to ±18V, V _{OUT} = 2V _{P-P} , f = 1kHz, G = +1, R _L = 2kΩ, BW = 20Hz to 80kHz	+25°C		0.0005		
Noise							
Input Voltage Noise		f = 0.1Hz to 10Hz	+25°C		2		μV _{P-P}
Input Voltage Noise Density	e _n	f = 10Hz	+25°C		60		nV/√Hz
		f = 1kHz	+25°C		15		
Input Current Noise Density	i _n	f = 1kHz	+25°C		300		fA/√Hz

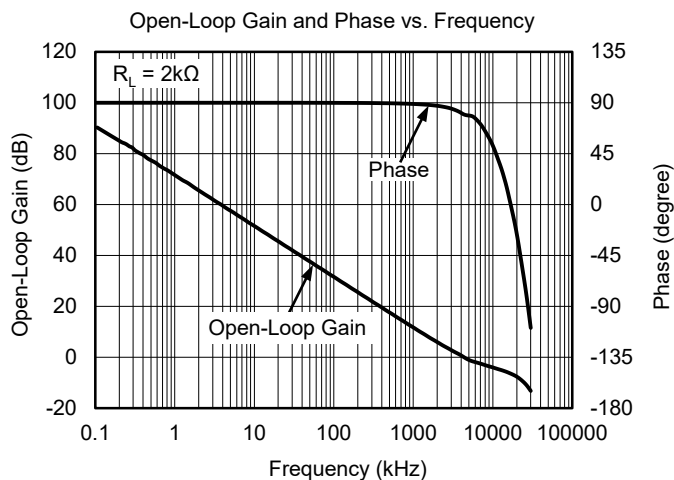
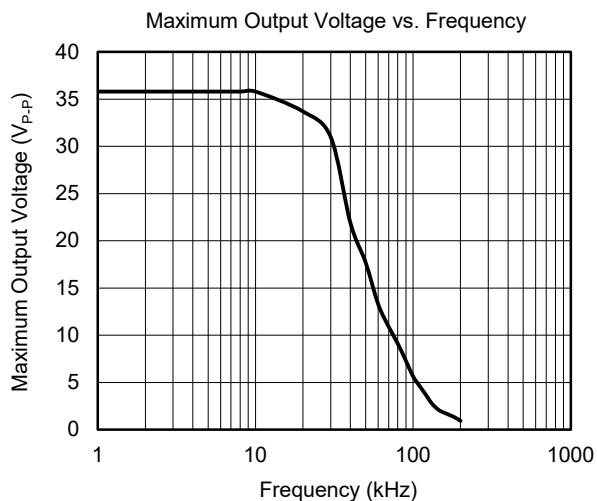
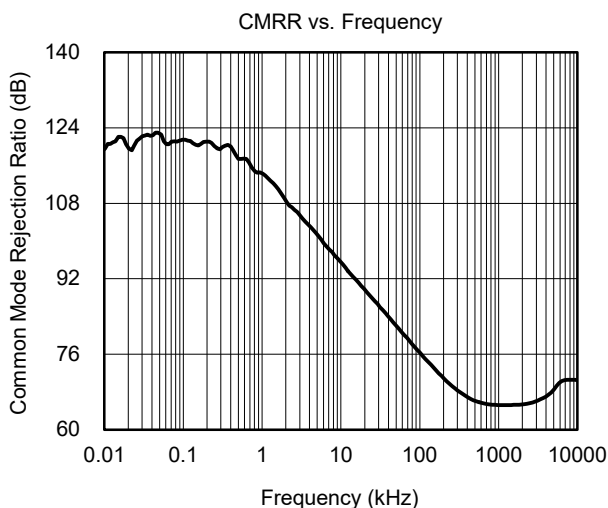
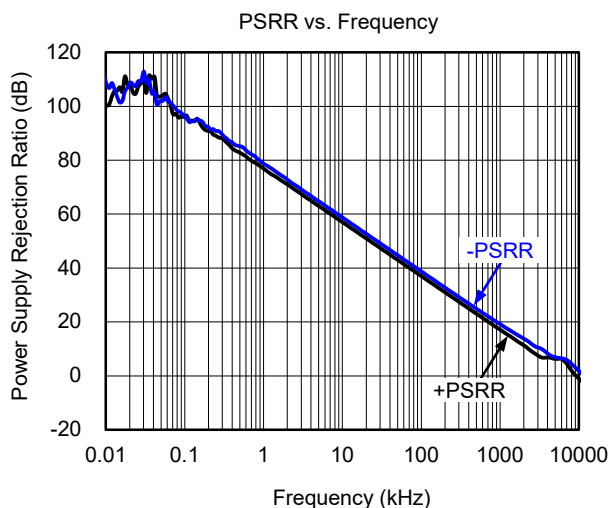
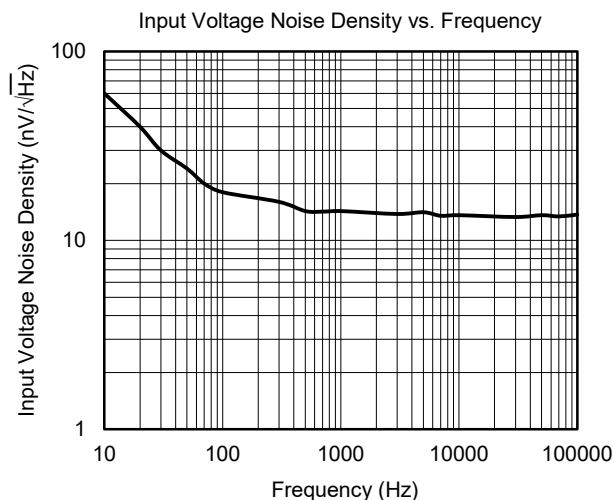
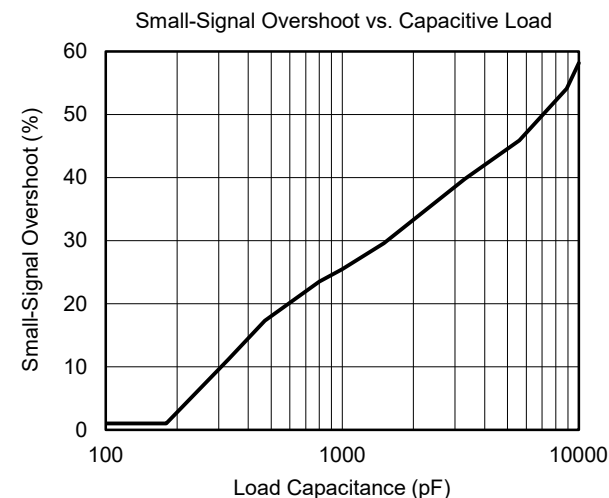
TYPICAL PERFORMANCE CHARACTERISTICS

At $T_A = +25^\circ\text{C}$, $V_S = \pm 18\text{V}$, unless otherwise noted.

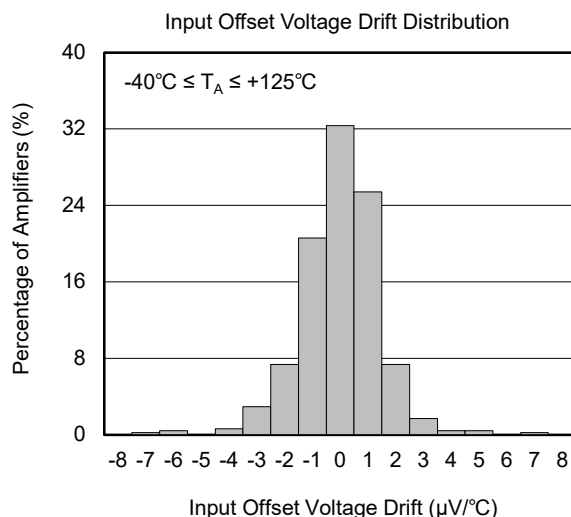
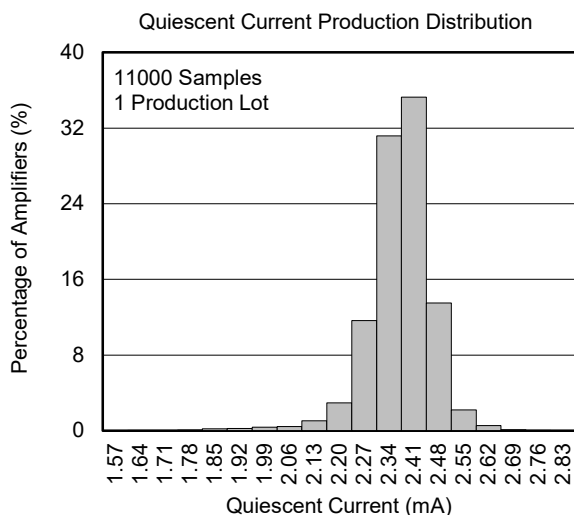
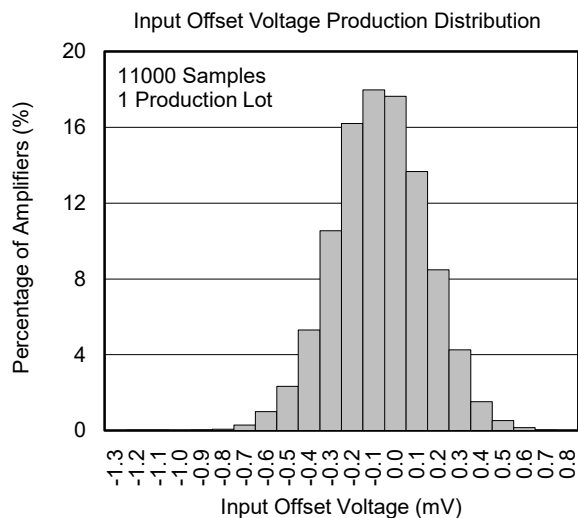
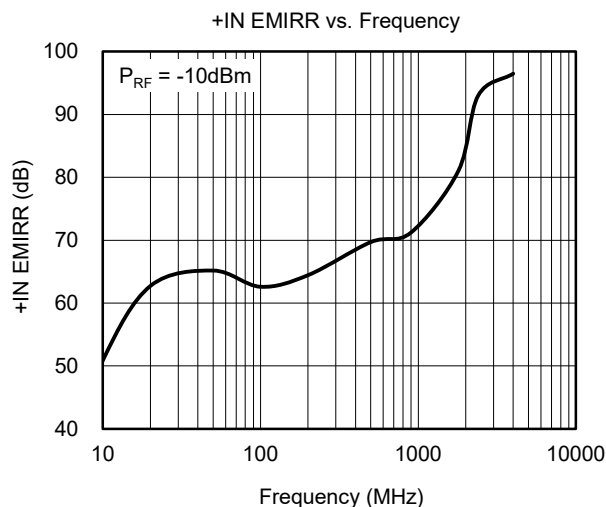
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

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TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 18\text{V}$, unless otherwise noted.

TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_A = +25^\circ\text{C}$, $V_S = \pm 18\text{V}$, unless otherwise noted.

REVISION HISTORY

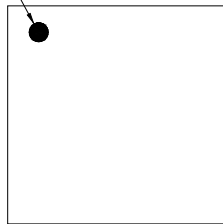
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (DECEMBER 2020) to REV.A	Page
Changed from product preview to production data.....	All

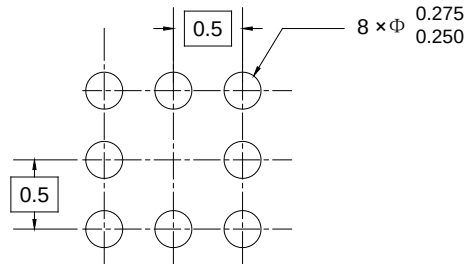
PACKAGE OUTLINE DIMENSIONS

WLCSP-1.57×1.57-8B

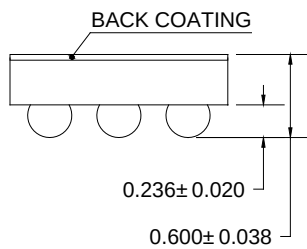
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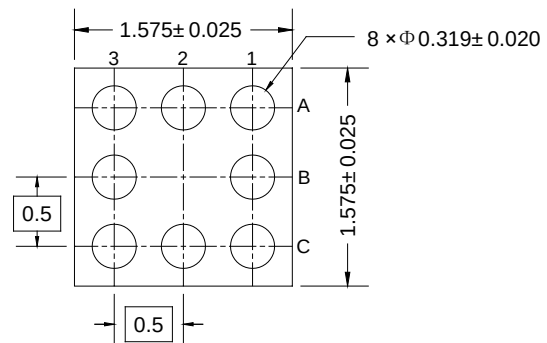
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW

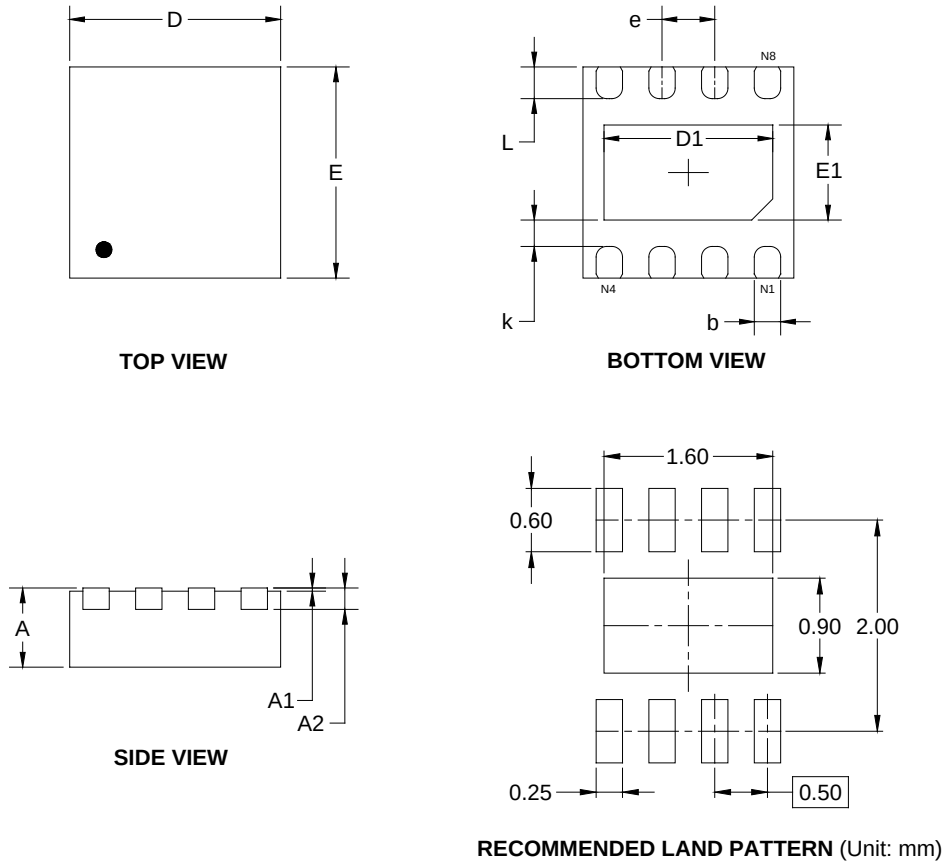


BOTTOM VIEW

NOTE: All linear dimensions are in millimeters.

PACKAGE OUTLINE DIMENSIONS

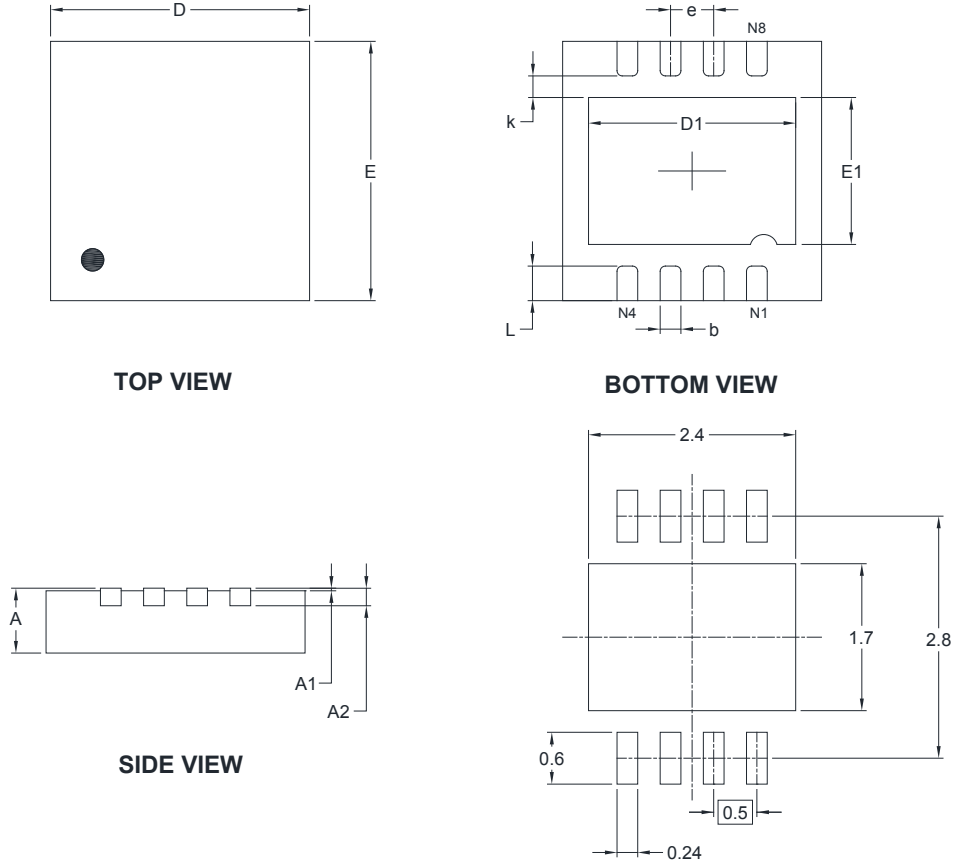
TDFN-2×2-8AL



Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	0.70	0.75	0.80
A1	0.00	0.02	0.05
A2	0.203 REF		
b	0.20	0.25	0.30
D	2 BSC		
D1	1.50	1.60	1.70
E	2 BSC		
E1	0.80	0.90	1.00
k	0.15	0.25	0.35
e	0.5 BSC		
L	0.25	0.30	0.35

PACKAGE OUTLINE DIMENSIONS

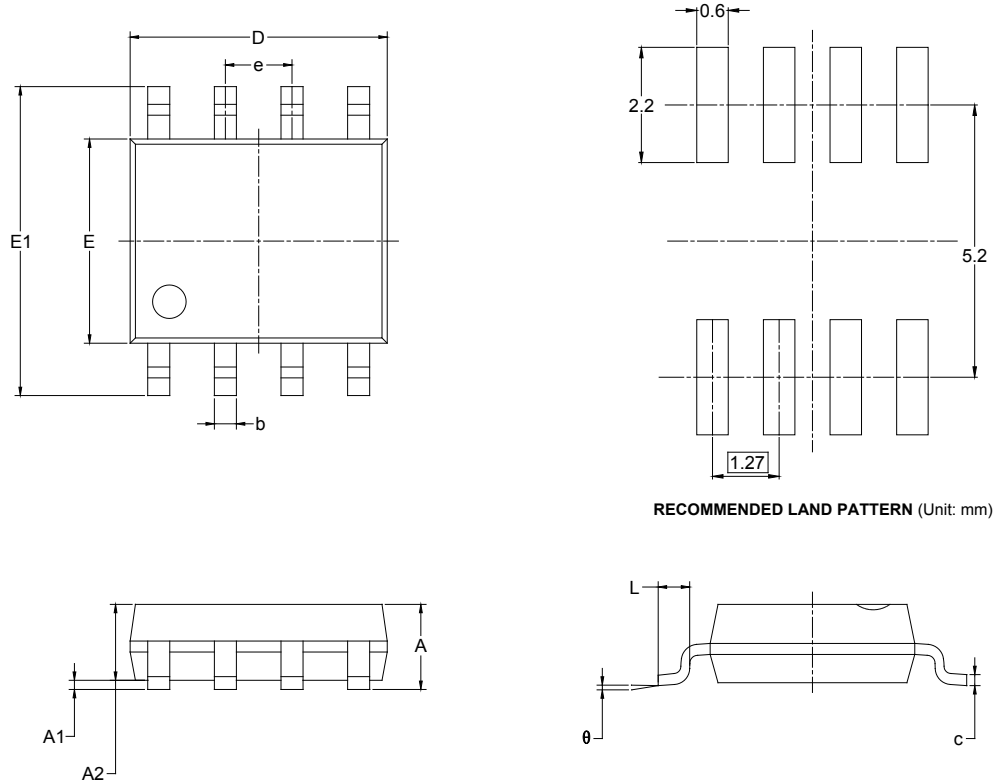
TDFN-3×3-8BL



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.900	3.100	0.114	0.122
D1	2.300	2.500	0.091	0.098
E	2.900	3.100	0.114	0.122
E1	1.600	1.800	0.063	0.071
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.500 TYP		0.020 TYP	
L	0.300	0.500	0.012	0.020

PACKAGE OUTLINE DIMENSIONS

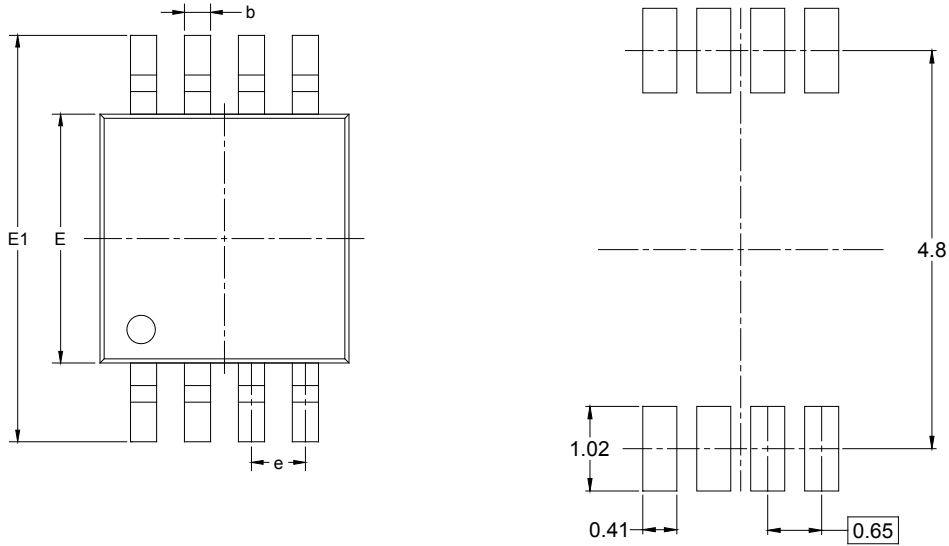
SOIC-8



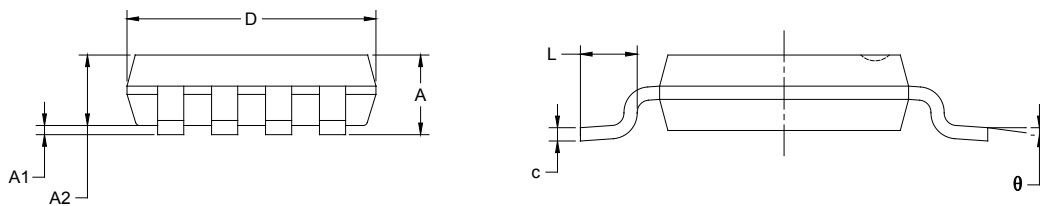
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050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

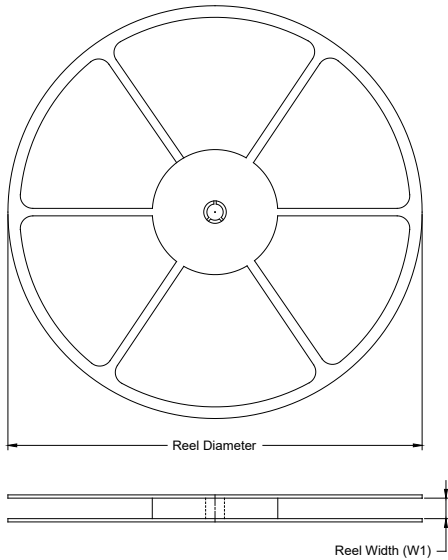


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
e	0.650 BSC		0.026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

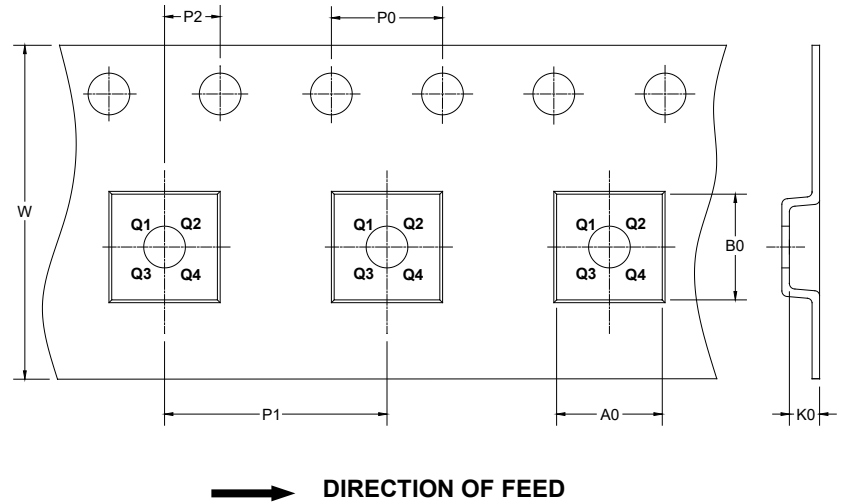
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

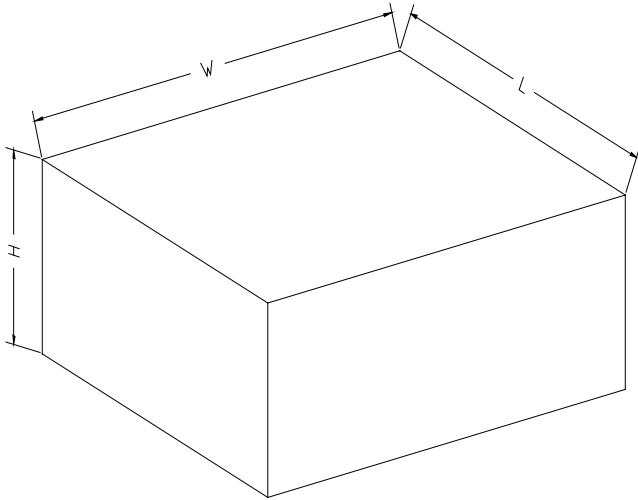
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
WLCSP-1.57×1.57-8B	7"	9.2	1.73	1.73	0.72	4.0	4.0	2.0	8.0	Q1
TDFN-2×2-8AL	7"	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1
TDFN-3×3-8BL	13"	12.4	3.35	3.35	1.13	4.0	8.0	2.0	12.0	Q1
SOIC-8	13"	12.4	6.40	5.40	2.10	4.0	8.0	2.0	12.0	Q1
MSOP-8	13"	12.4	5.20	3.30	1.50	4.0	8.0	2.0	12.0	Q1

D00001

PACKAGE INFORMATION

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
7" (Option)	368	227	224	8
7"	442	410	224	18
13"	386	280	370	5

DD00002