

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Under figure 1, JEDEC standard MO-220-WEED has been updated to MO-220-WEED-2 along with dimensions b, D1/E1, and L1. Update document paragraphs to current requirements. - ro	18-12-05	C. SAFFLE
B	Add typical limits to V _{IO} , I _{IB} , I _{IO} , I _Q , CMRR, PSRR, R _{IN} and A _V parameters as specified under Table I. Update document to current requirements. - ro	24-03-15	J. ESCHMEYER



Prepared in accordance with ASME Y14.24

Vendor Item Drawing

Revision Status of Sheets

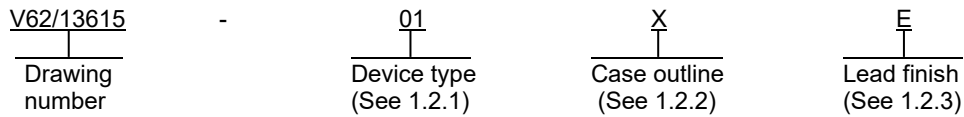
REV																				
SHEET																				
REV	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B			
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17			

PMIC N/A Original date of drawing YY-MM-DD 13-05-29	PREPARED BY RICK OFFICER		DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 https://www.dla.mil/landandmaritime	
	CHECKED BY RAJESH PITHADIA		TITLE MICROCIRCUIT, LINEAR, LOW NOISE HIGH SPEED DIFFERENTIAL AMPLIFIER, MONOLITHIC SILICON	
	APPROVED BY CHARLES F. SAFFLE			
	SIZE A	CAGE CODE 16236	DWG NO. V62/13615	
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1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance low noise, high speed differential amplifier microcircuit, with an operating temperature range of -55°C to +105°C.

1.2 Vendor Item Drawing Administrative Control Number. The manufacturer's PIN is the item of identification. The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation:



1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Circuit function</u>
01	ADA4930-1-EP	Low noise, high speed differential amplifier

1.2.2 Case outline(s). The case outline(s) are as specified herein.

<u>Outline letter</u>	<u>Number of pins</u>	<u>JEDEC PUB 95</u>	<u>Package style</u>
X	16	MO-220-WEED-2	Lead frame chip scale

1.2.3 Lead finishes. The lead finishes are as specified below or other lead finishes as provided by the device manufacturer:

<u>Finish designator</u>	<u>Material</u>
A	Hot solder dip
B	Tin-lead plate
C	Gold plate
D	Palladium
E	Gold flash palladium
F	Tin-lead alloy (BGA/CGA)
Z	Other

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1.3 Absolute maximum ratings. 1/

Supply voltage range (VS)	5.5 V
Power dissipation (PD) at TA = +105°C	550 mW
Junction temperature range (TJ)	150°C
Storage temperature range (TSTG)	-65°C to +125°C
Lead temperature (soldering, 10 seconds)	300°C

1.4 Recommended operating conditions. 2/

Supply voltage range (VS)	3.3 V to 5 V
Operating free-air temperature range (TA)	-55°C to +105°C

1.5 Thermal characteristics.

Thermal resistance, junction to ambient (θJA)	81.6°C/W
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2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices

(Copies of these documents are available online at <https://www.jedec.org>.)

3. REQUIREMENTS

3.1 Marking. Parts shall be permanently and legibly marked with the manufacturer’s part number as shown in 6.3 herein and as follows:

- A. Manufacturer’s name, CAGE code, or logo
- B. Pin 1 identifier
- C. ESDS identification (optional)

3.2 Unit container. The unit container shall be marked with the manufacturer’s part number and with items A and C (if applicable) above.

3.3 Electrical characteristics. The maximum and recommended operating conditions and electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.4 Design, construction, and physical dimension. The design, construction, and physical dimensions are as specified herein.

3.5 Diagrams.

3.5.1 Case outline. The case outline shall be as shown in 1.2.2 and figure 1.

3.5.2 Terminal connections. The terminal connections shall be as shown in figure 2.

1/ Stresses beyond those listed under “absolute maximum rating” 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 under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

2/ Use of this product beyond the manufacturers design rules or stated parameters is done at the user’s risk. The manufacturer and/or distributor maintain no responsibility or liability for product used beyond the stated limits.

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TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions 2/ VS = 3.3 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Dynamic performance.							
-3 dB small signal bandwidth	SSBW	VO,dm = 0.1 VP-P	+25°C	01	1430 typical		MHz
-3 dB large signal bandwidth	LSBW	VO,dm = 2 VP-P	+25°C	01	887 typical		MHz
Bandwidth for 0.1 dB flatness		VO,dm = 0.1 VP-P	+25°C	01	380 typical		MHz
Slew rate	SR	VO,dm = 2 V step, 25% to 75%	+25°C	01	2877 typical		V / μs
Settling time to 0.1%	ts	VO,dm = 2 V step, RL = 200 Ω	+25°C	01	6.3 typical		ns
Overdrive recovery time		G = 3, VIN,dm = 0.7 VP-P pulse	+25°C	01	1.5 typical		ns
Noise / harmonic performance.							
Second harmonic distortion	HD2	VO,dm = 2 VP-P, fC = 10 MHz	-55°C to +105°C	01	-98 typical		dBc
		VO,dm = 2 VP-P, fC = 30 MHz			-91 typical		
		VO,dm = 2 VP-P, fC = 70 MHz			-79 typical		
		VO,dm = 2 VP-P, fC = 100 MHz			-73 typical		
Third harmonic distortion	HD3	VO,dm = 2 VP-P, fC = 10 MHz	-55°C to +105°C	01	-97 typical		dBc
		VO,dm = 2 VP-P, fC = 30 MHz			-88 typical		
		VO,dm = 2 VP-P, fC = 70 MHz			-79 typical		
		VO,dm = 2 VP-P, fC = 100 MHz			-73 typical		
Third order intermodulation distortion (IMD)		VO,dm = 1 VP-P / tone, fC = 70.05 MHz ±0.05 MHz	+25°C	01	91 typical		dBc
		VO,dm = 1 VP-P / tone, fC = 140.05 MHz ±0.05 MHz			86 typical		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> VS = 3.3 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Noise / harmonic performance - continued.							
Input voltage noise		f = 100 kHz	+25°C	01	1.15 typical		nV / √Hz
			-55°C to +105°C		1.2 typical		
Input current noise		f = 100 kHz	+25°C	01	3 typical		pA / √Hz
DC performance.							
Input offset voltage	V _{IO}	V _{IP} = V _{IN} = V _{OCM} = 0 V, R _L = open circuit	-55°C to +105°C	01	-3.1	+3.1	mV
					-0.5 typical		
Input offset voltage drift	ΔV _{IO}		-55°C to +105°C	01	2.75 typical		μV / °C
Input bias current	I _{IB}		+25°C	01	-36	-16	μA
					-24 typical		
Input bias current drift	ΔI _{IB}		-55°C to +105°C	01	-0.05 typical		μA / °C
Input offset current	I _{IO}		+25°C	01	-1.8	+1.8	μA
					+0.1 typical		
Open loop gain		R _F = R _G = 10 kΩ, ΔV _O = 0.5 V, R _L = open circuit	+25°C	01	64 typical		dB
			-55°C to +105°C		61 typical		
Input characteristics.							
Input common mode voltage range			+25°C	01	0.3	1.2	V
Input resistance	R _{IN}	Differential	+25°C	01	150 typical		kΩ
		Common mode			3 typical		MΩ

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions 2/ VS = 3.3 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Input characteristics – continued.							
Input capacitance	CIN	Common mode	+25°C	01	1 typical		pF
Common mode rejection mode	CMRR	$\Delta V_{ICM} = 0.5$ V dc; RF = RG = 10 k Ω , RL = open circuit	+25°C	01		-77	dB
					-82 typical		
			-55°C to +105°C		-76 typical		
Output characteristics.							
Output voltage	VOUT	Each single ended output, RF = RG = 10 k Ω	+25°C	01	0.11	1.74	V
			-55°C to +105°C			1.54	
Linear output current		Each single ended output, f = 1 MHz, THD \leq 60 dBc	+25°C	01	30 typical		mA
Output balance error		f = 1 MHz	+25°C	01	55 typical		dB
3.3 V VO _{CM} to VO,CM performance.							
VO _{CM} dynamic performance.							
-3 dB bandwidth		VO,CM = 0.1 VP-P	+25°C	01	745 typical		MHz
Slew rate	SR	VO,CM = 2 VP-P , 25% to 75%	+25°C	01	828 typical		V / μ s
VO _{CM} input characteristics.							
Input voltage range	VIN		+25°C	01	0.8	1.1	V
Input resistance	RIN		+25°C	01	7.0	10.3	k Ω
					8.3 typical		
Input offset voltage	VIO	VOS,CM = VO,CM – VO _{CM} ; VIP = VIN = VO _{CM} = 0 V	+25°C	01	-25	+31	mV
					+15.4 typical		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> VS = 3.3 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
3.3 V VOCM to VO,CM performance – continued.							
VOCM input characteristics continued.							
Input voltage noise		f = 100 kHz	+25°C	01	23.5 typical		nV / √Hz
Gain	Av		+25°C	01	0.99	1.02	V / V
			-55°C to +105°C		1 typical		
Common mode rejection ratio	CMRR	$\Delta V_{ICM} = 0.5$ V dc; RF = RG = 10 k Ω , RL = open circuit	+25°C	01		-77	dB
			-55°C to +105°C		-83 typical		
					-76 typical		
3.3 V general performance.							
Power supply.							
Operating range			+25°C	01	3.3 typical		V
Quiescent current per amplifier	IQ	Enabled	+25°C	01	32	40	mA
			-55°C to +105°C		35 typical		
	Disabled		+25°C	01	81 typical		μ A / °C
			-55°C to +105°C		0.44	2.35	
					1.8 typical		
Power supply rejection ratio	+PSRR	$\Delta V_{ICM} = 0.5$ V dc; RF = RG = 10 k Ω , RL = open circuit	+25°C	01		-70	dB
			-55°C to +105°C		-74 typical		
					-68 typical		
	-PSRR	$\Delta V_{ICM} = 0.5$ V dc; RF = RG = 10 k Ω , RL = open circuit	+25°C	01		-76	dB
			-55°C to +105°C		-87 typical		
					-77 typical		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> VS = 3.3 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
3.3 V general performance - continued.							
Power down (\overline{PD}).							
\overline{PD} input voltage		Disabled	+25°C	01	< 0.8 typical		V
		Enabled			> 1.3 typical		
Turn off time			+25°C	01	1 typical		μs
Turn on time			+25°C	01	12 typical		ns
\overline{PD} pin bias current		Enabled, $\overline{PD} = 3.3$ V	+25°C	01	0.09 typical		μA
		Disabled, $\overline{PD} = 0$ V			97 typical		
Operating temperature range				01	-55	+105	°C

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions 2/ VS = 5 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Dynamic performance.							
-3 dB small signal bandwidth	SSBW	VO,dm = 0.1 VP-P	+25°C	01	1350 typical		MHz
-3 dB large signal bandwidth	LSBW	VO,dm = 2 VP-P	+25°C	01	937 typical		MHz
Bandwidth for 0.1 dB flatness		VO,dm = 0.1 VP-P	+25°C	01	369 typical		MHz
Slew rate	SR	VO,dm = 2 V step, 25% to 75%	+25°C	01	3400 typical		V / μs
Settling time to 0.1%	tS	VO,dm = 2 V step, RL = 200 Ω	+25°C	01	6 typical		ns
Overdrive recovery time		G = 3, VIN,dm = 0.7 VP-P pulse	+25°C	01	1.5 typical		ns
Noise / harmonic performance.							
Second harmonic distortion	HD2	VO,dm = 2 VP-P, fC = 10 MHz	-55°C to +105°C	01	-104 typical		dBc
		VO,dm = 2 VP-P, fC = 30 MHz			-91 typical		
		VO,dm = 2 VP-P, fC = 70 MHz			-79 typical		
		VO,dm = 2 VP-P, fC = 100 MHz			-73 typical		
Third harmonic distortion	HD3	VO,dm = 2 VP-P, fC = 10 MHz	-55°C to +105°C	01	-101 typical		dBc
		VO,dm = 2 VP-P, fC = 30 MHz			-93 typical		
		VO,dm = 2 VP-P, fC = 70 MHz			-82 typical		
		VO,dm = 2 VP-P, fC = 100 MHz			-75 typical		
Third order intermodulation distortion (IMD)		VO,dm = 1 VP-P / tone, fC = 70.05 MHz ±0.05 MHz	+25°C	01	94 typical		dBc
		VO,dm = 1 VP-P / tone, fC = 140.05 MHz ±0.05 MHz			90 typical		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions 2/ Vs = 5 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Noise / harmonic performance - continued.							
Input voltage noise		f = 100 kHz	+25°C	01	1.2 typical		nV / √Hz
			-55°C to +105°C		1.3 typical		
Input current noise		f = 100 kHz	+25°C	01	2.8 typical		pA / √Hz
DC performance.							
Input offset voltage	V _{IO}	V _{IP} = V _{IN} = V _{OCM} = 0 V, R _L = open circuit	-55°C to +105°C	01	-3.1	+3.1	mV
					-0.15 typical		
Input offset voltage drift	ΔV _{IO}		-55°C to +105°C	01	1.8 typical		μV / °C
Input bias current	I _{IB}		+25°C	01	-34	-15	μA
					-23 typical		
Input bias current drift	ΔI _{IB}		-55°C to +105°C	01	-0.05 typical		μA / °C
Input offset current	I _{IO}		+25°C	01	-0.82	+0.82	μA
					-0.1 typical		
Open loop gain		R _F = R _G = 10 kΩ, ΔV _O = 1 V, R _L = open circuit	+25°C	01	64 typical		dB
			-55°C to +105°C		61 typical		
Input characteristics.							
Input common mode voltage range			+25°C	01	0.3	2.8	V
Input resistance	R _{IN}	Differential	+25°C	01	150 typical		kΩ
		Common mode			3 typical		MΩ

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> Vs = 5 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Input characteristics – continued.							
Input capacitance	C _{IN}	Common mode	+25°C	01	1 typical		pF
Common mode rejection mode	CMRR	$\Delta V_{ICM} = 1$ V dc; R _F = R _G = 10 k Ω , R _L = open circuit	+25°C	01		-77	dB
					-82 typical		
			-55°C to +105°C		-76 typical		
Output characteristics.							
Output voltage	V _{OUT}	Each single ended output, R _F = R _G = 10 k Ω	-55°C to +105°C	01	0.18	3.38	V
Linear output current		Each single ended output, f = 1 MHz, THD \leq 60 dBc	+25°C	01	30 typical		mA
Output balance error		f = 1 MHz	+25°C	01	55 typical		dB
5 V V _{OCM} to V _{O,CM} performance.							
V _{OCM} dynamic performance.							
-3 dB bandwidth		V _{O,CM} = 0.1 V _{P-P}	+25°C	01	740 typical		MHz
Slew rate	SR	V _{O,CM} = 2 V _{P-P} , 25% to 75%	+25°C	01	1224 typical		V / μ s
V _{OCM} input characteristics.							
Input voltage range	V _{IN}		+25°C	01	0.5	2.3	V
Input resistance	R _{IN}		+25°C	01	7.0	10.2	k Ω
					8.3 typical		
Input offset voltage	V _{IO}	V _{OS,CM} = V _{O,CM} – V _{OCM} ; V _{IP} = V _{IN} = V _{OCM} = 0 V	+25°C	01	-25	+15	mV

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> VS = 5 V, unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
5 V VO _{CM} to VO _{CM} performance – continued.							
VO _{CM} input characteristics - continued.							
Input voltage noise		f = 100 kHz	+25°C	01	23.5 typical		nV / √Hz
Gain	Av		+25°C	01	0.99	1.02	V / V
			-55°C to +105°C		1 typical		
Common mode rejection ratio	CMRR	ΔVO _{CM} = 1.5 V dc; RF = RG = 10 kΩ, RL = open circuit	+25°C	01		-77	dB
			-55°C to +105°C		-80 typical		
					-76 typical		
5 V general performance.							
Power supply.							
Operating range			+25°C	01	5 typical		V
Quiescent current per amplifier	IQ	Enabled	+25°C	01	31.1	38.4	mA
			-55°C to +105°C		34 typical		
	Disabled		+25°C	01	74.5 typical		μA / °C
			-55°C to +105°C		0.45	2.6	
					1.8 typical		
Power supply rejection ratio	+PSRR	ΔVICM = 1 V dc; RF = RG = 10 kΩ, RL = open circuit	+25°C	01		-71	dB
			-55°C to +105°C		-70 typical		
	-PSRR	ΔVICM = 1 V dc; RF = RG = 10 kΩ, RL = open circuit	+25°C	01		-75	
			-55°C to +105°C		-78 typical		

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> V _S = 5 V, unless otherwise specified	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
5 V general performance.							
Power down (\overline{PD}).							
\overline{PD} input voltage		Disabled	+25°C	01	< 2.5 typical		V
		Enabled			>3 typical		
Turn off time			+25°C	01	1 typical		μs
Turn on time			+25°C	01	12 typical		ns
\overline{PD} pin bias current		Enabled, \overline{PD} = 5 V	+25°C	01	0.09 typical		μA
		Disabled, \overline{PD} = 0 V			97 typical		
Operating temperature range				01	-55	+105	°C

1/ Testing and other quality control techniques are used to the extent deemed necessary to assure product performance over the specified temperature range. Product may not necessarily be tested across the full temperature range and all parameters may not necessarily be tested. In the absence of specific parametric testing, product performance is assured by characterization and/or design.

2/ Unless otherwise specified, V_{ICM} = 0.9 V, V_{OCM} = 0.9 V, fixed resistance (R_F) = 301 Ω, gain resistance (R_G) = 301 Ω, load resistance (R_{L,dm}) = 1 kΩ, single ended input, differential output.

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Case X

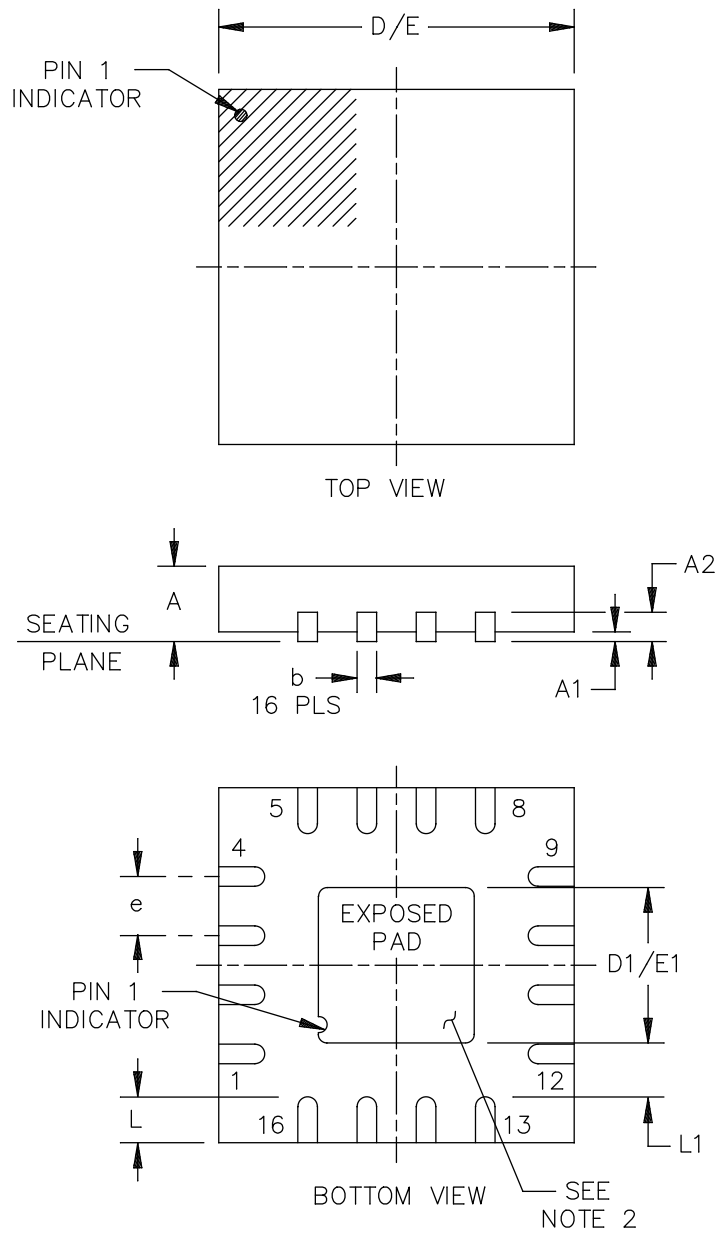


FIGURE 1. Case outline.

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Case X – continued.

Symbol	Dimensions					
	Inches			Millimeters		
	Min	Nom	Max	Min	Nom	Max
A	.027	.029	.031	0.70	0.75	0.80
A1	.0007	---	.001	0.02	---	0.05
A2	.007 REF			0.20 REF		
b	.007	.009	.012	0.20	0.25	0.32
D/E	.114	.118 SQ	.122	2.90	3.00 SQ	3.10
D1/E1	.062	.066 SQ	.070	1.60	1.70 SQ	1.80
e	.019 BSC			0.50 BSC		
L	.011	.015	.019	0.30	0.40	0.50
L1	.007	---	---	0.20	---	---

NOTES:

1. Controlling dimensions are millimeter, inch dimensions are given for reference only.
2. The exposed pad should be connected to a thermal ground to dissipate heat. For proper connection of the exposed pad, refer to the pin configuration and function descriptions section of the manufacturer's datasheet.
3. Falls within reference to JEDEC MO-220-WEED-2.

FIGURE 1. Case outline - Continued.

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Device type	01	
Case outline	X	
Terminal number	Terminal symbol	Description
1	-FB	Negative output for feedback component connection
2	+IN	Positive input summing node.
3	-IN	Negative input summing node.
4	+FB	Positive output for feedback component connection
5	+VS	Positive supply voltage.
6	+VS	Positive supply voltage.
7	+VS	Positive supply voltage.
8	+VS	Positive supply voltage.
9	VOCM	Output common mode voltage.
10	+OUT	Positive output for load connection.
11	-OUT	Negative output for load connection.
12	$\overline{\text{PD}}$	Power down pin.
13	-VS	Negative supply voltage.
14	-VS	Negative supply voltage.
15	-VS	Negative supply voltage.
16	-VS	Negative supply voltage.
	EPAD	Exposed pad. The exposed pad is not electrically connected to the device. It is typically soldered to ground or a power plane on the printed circuit board (PCB) that is thermally conductive.

FIGURE 2. Terminal connections.

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4. VERIFICATION

4.1 Product assurance requirements. The manufacturer is responsible for performing all inspection and test requirements as indicated in their internal documentation. Such procedures should include proper handling of electrostatic sensitive devices, classification, packaging, and labeling of moisture sensitive devices, as applicable.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Preservation, packaging, labeling, and marking shall be in accordance with the manufacturer's standard commercial practices for electrostatic discharge sensitive devices.

6. NOTES

6.1 ESDS. Devices are electrostatic discharge sensitive and are classified as ESDS class 1 minimum.

6.2 Configuration control. The data contained herein is based on the salient characteristics of the device manufacturer's data book. The device manufacturer reserves the right to make changes without notice. This drawing will be modified as changes are provided.

6.3 Suggested source(s) of supply. Identification of the suggested source(s) of supply herein is not to be construed as a guarantee of present or continued availability as a source of supply for the item. DLA Land and Maritime maintains an online database of all current sources of supply at <https://landandmaritimeapps.dla.mil/programs/smcr/>.

Vendor item drawing administrative control number <u>1/</u>	Device manufacturer CAGE code	Transportation mode and order quantity	Vendor part number <u>2/</u>
V62/13615-01XE	24355	Reel, 250	ADA4930-1SCPZ-EPR2
		Reel, 1,500	ADA4930-1SCPZ-EPR7
		Reel, 5,000	ADA4930-1SCPZ-EPRL

1/ The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation.

2/ Due to size limitation, the vendor will mark the part with "H2X" in lieu of the vendor part number.

CAGE code

24355

Source of supply

Analog Devices
 Route 1 Industrial Park
 P.O. Box 9106
 Norwood, MA 02062
 Point of contact: 20 Alpha Road
 Chelmsford, MA 01824-4123

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