

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Make change to the case outline X maximum "L" dimension as specified under figure 1. Make clarifications to notes 2 and 3 for case outlines Y and Z as specified under figure 1. Update document paragraphs to current requirements. - ro	15-05-13	C. SAFFLE
B	Update JEDEC package from MO-178-AA to MO-178. Update document paragraphs to current requirements. - ro	20-11-24	J. ESCHMEYER



CURRENT DESIGN ACTIVITY CAGE CODE 16236
HAS CHANGED NAMES TO:
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990

Prepared in accordance with ASME Y14.24

Vendor item drawing

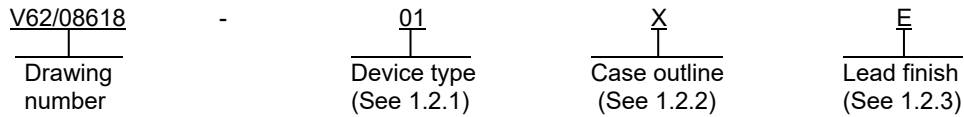
REV																				
PAGE																				
REV																				
PAGE																				
REV STATUS OF PAGES	REV	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
	PAGE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				

PMIC N/A	PREPARED BY RICK OFFICER	DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990	
Original date of drawing YY-MM-DD 08-10-07	CHECKED BY RAJESH PITHADIA	TITLE MICROCIRCUIT, LINEAR, CMOS SINGLE SUPPLY, RAIL TO RAIL OPERATIONAL AMPLIFIER, MONOLITHIC SILICON	
	APPROVED BY ROBERT M. HEBER		
	SIZE A	CODE IDENT. NO. 16236	DWG NO. V62/08618
	REV	B	PAGE 1 OF 15

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance single supply rail to rail operational amplifier microcircuit, with an operating temperature range of -55°C to +125°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	OPA340-EP	Single supply, rail to rail single operational amplifier
02	OPA2340-EP	Single supply, rail to rail dual operational amplifier
03	OPA4340-EP	Single supply, rail to rail quad operational 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	5	MO-178	Plastic surface mount
Y	8	MS-012-AA	Plastic surface mount
Z	14	MS-012-AB	Plastic surface mount

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

<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

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 2

1.3 Absolute maximum ratings. 1/

Supply voltage (VS)	5.5 V
Signal input voltage (VI)	-VS – 0.5 V to +VS + 0.5 V 2/
Signal input current (VO)	10 mA 2/
Power dissipation (PD) at TA = +125°C:	
Case X	125 mW
Case Y	166 mW
Case Z	250 mW
Output short circuit	Continuous 3/
Storage temperature range (TSTG)	-55°C to +125°C
Operating virtual junction temperature (TJ)	+150°C
Thermal resistance, junction to ambient (θJA):	
Case X	200°C/W
Case Y	150°C/W
Case Z	100°C/W

1.4 Recommended operating conditions. 4/

Supply voltage range (VS)	2.7 V to 5 V
Operating free-air temperature range (TA)	-55°C to +125°C

-
- 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 under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- 2/ Input terminals are diode clamped to the power supply rails. Input signals that can swing more than 0.5 V beyond the supply rails should be current limited to 10 mA or less.
- 3/ Short circuit to ground, one amplifier per package.
- 4/ 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.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 3

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 outlines. The case outlines 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.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 4

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions 2/ Vs = 2.7 V to 5 V unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Offset voltage section							
Input offset voltage	VOS	Vs = 5 V	+25°C	01		±500	µV
			-55°C to +125°C			±1600	
Input offset voltage versus temperature	$\Delta V_{OS} / \Delta T$		+25°C	01	±2.5 typical		µV/°C
Input offset voltage versus power supply	PSRR	Vs = 2.7 V to 5.5 V, VCM = 0 V	-55°C to +125°C	01		150	µV/V
Channel separation, dc			+25°C	01	0.2 typical		µV/V
Input bias current section							
Input bias current	IB		-55°C to +125°C	01		±500	pA
Input offset current	IOS		-55°C to +125°C	01		±600	pA
Noise section							
Input voltage noise		f = 0.1 kHz to 50 kHz	+25°C	01	8 typical		µVrms
Input voltage noise density	en	f = 1 kHz	+25°C	01	25 typical		nV / √Hz
Current noise density	in	f = 1 kHz	+25°C	01	3 typical		fA / √Hz
Input voltage range section							
Common mode voltage range	VCM		-55°C to +125°C	01	-0.3	+Vs + 0.3	V
Common mode rejection ratio	CMRR	-0.3 V < VCM < (+Vs) - 1.8 V	+25°C	01	78		dB
			-55°C to +125°C		75		
		-0.3 V < VCM < 5.3 V, Vs = 5 V	+25°C		70		
			-55°C to +125°C		64		
		-0.3 V < VCM < 3 V, Vs = 2.7 V	+25°C		66		

See footnotes at end of table.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 5

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions <u>2/</u> VS = 2.7 V to 5 V unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Input impedance section							
Differential input impedance <u>3/</u>			+25°C	01	10 ¹³ 3 typical		Ω pF
Common mode input impedance <u>3/</u>			+25°C	01	10 ¹³ 6 typical		Ω pF
Open loop gain section							
Open loop voltage gain	AOL	10 mV < VO < (+VS) – 10 mV, RL = 100 kΩ	-55°C to +125°C	01	103		dB
		70 mV < VO < (+VS) – 70 mV, RL = 10 kΩ			98		
		250 mV < VO < (+VS) – 250 mV, RL = 2 kΩ			92		
Frequency response section							
Gain bandwidth product	GBW	G = 1	+25°C	01	5.5 typical		MHz
Slew rate	SR	VS = 5 V, G = 1, CL = 100 pF	+25°C	01	6 typical		V/μs
Settling time, 0.1 %	ts	VS = 5 V, 2 V step, CL = 100 pF	+25°C	01	1 typical		μs
Settling time, 0.01 %	ts	VS = 5 V, 2 V step, CL = 100 pF	+25°C	01	1.6 typical		μs
Overload recovery time		VIN • G = VS	+25°C	01	0.2 typical		μs
Total harmonic distortion + noise	THD + N	VS = 5 V, VO = 3 VPP, <u>4/</u> G = 1, f = 1 kHz	+25°C	01	0.0007 typical		%

See footnotes at end of table.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 6

TABLE I. Electrical performance characteristics - Continued. 1/

Test	Symbol	Conditions <u>2/</u> VS = 2.7 V to 5 V unless otherwise specified	Temperature, TA	Device type	Limits		Unit
					Min	Max	
Output section							
Voltage output swing from rail <u>5/</u>		RL = 100 kΩ, AOL ≥ 104 dB	-55°C to +125°C	01		10	mV
		RL = 10 kΩ, AOL ≥ 98 dB				70	
		RL = 2 kΩ, AOL ≥ 92 dB				250	
Short circuit current	ISC		+25°C	01	±50 typical		mA
Power supply section							
Specified voltage range	VS		-55°C to +125°C	01	2.7	5	V
Operating voltage range			+25°C	01	2.5 to 5.5 typical		V
Quiescent current (per amplifier)	IQ	IO = 0, VS = 5 V	+25°C	01		950	μA
			-55°C to +125°C			1300	

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, VS = 5 V, RL = 10 kΩ connected to VS / 2, VOUT = VS / 2.

3/ The || symbols represent that the values and symbols are in parallel to each other.

4/ VOUT = 0.25 V to 3.25 V.

5/ Output voltage swings are measured between the output and power supply rails.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 7

Case X

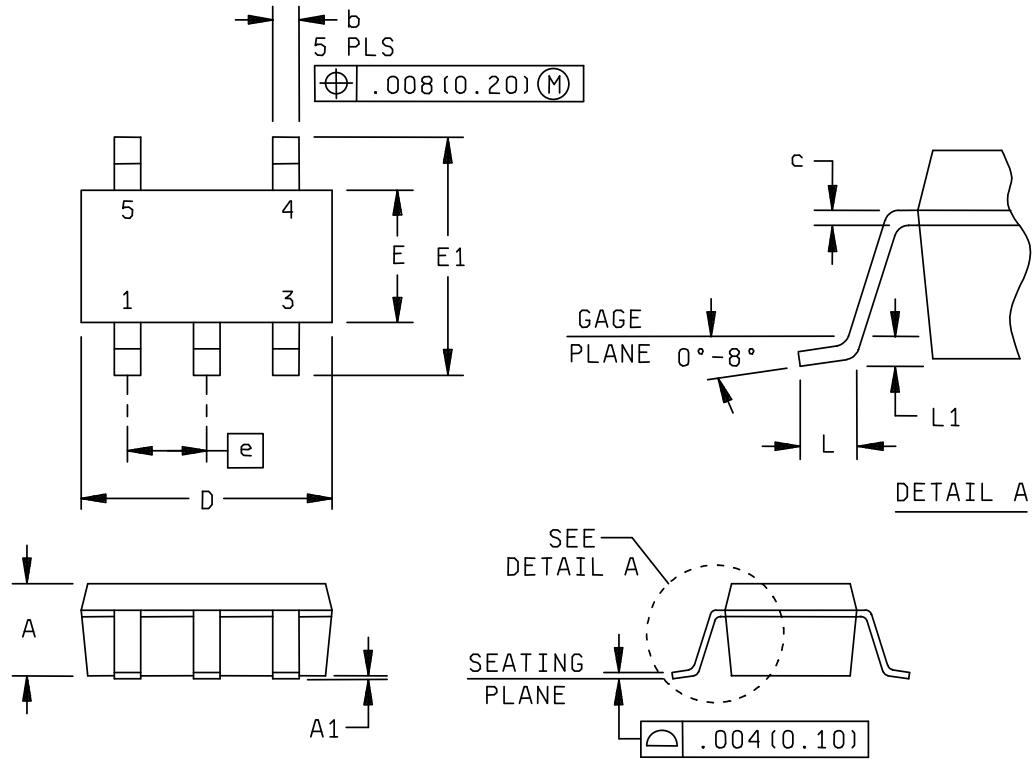


FIGURE 1. Case outlines.

<p>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 16236</p>	<p>DWG NO. V62/08618</p>
		<p>REV B</p>	<p>PAGE 8</p>

Case X – continued.

Symbol	Dimensions			
	Inch		Millimeters	
	Min	Max	Min	Max
A	---	.057	---	1.45
A1	.000	.005	0.00	0.15
b	.011	.019	0.30	0.50
c	.003	.008	0.08	0.22
D	.108	.120	2.75	3.05
E	.057	.068	1.45	1.75
E1	.102	.118	2.60	3.00
e	.037 BSC		0.95 BSC	
L	.011	.023	0.30	0.60
L1	.009 BSC		0.25 BSC	
n	5 leads		5 leads	

NOTES:

1. Controlling dimensions are millimeter, inch dimensions are given for reference only.
2. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 mm (.005 inch) per side.
3. Falls within JEDEC MO-178.

FIGURE 1. Case outlines – Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 9

Case Y

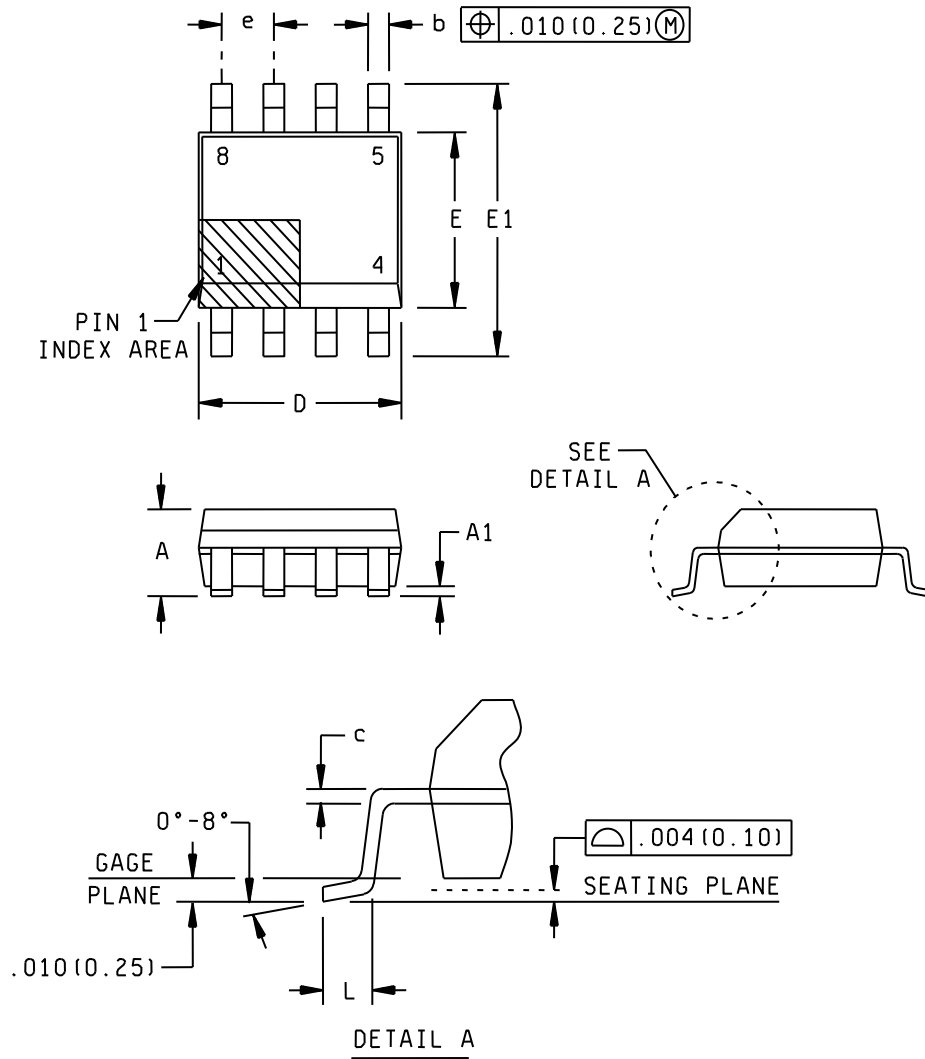


FIGURE 1. Case outlines - Continued.

<p>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 16236</p>	<p>DWG NO. V62/08618</p>
		<p>REV B</p>	<p>PAGE 10</p>

Case Y – continued.

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	---	0.069	---	1.75
A1	0.004	0.010	0.10	0.25
b	0.012	0.020	0.31	0.51
c	0.007	0.010	0.17	0.25
D	0.189	0.197	4.80	5.00
E	0.150	0.157	3.80	4.00
E1	0.228	0.244	5.80	6.20
e	0.050 BSC		1.27 BSC	
L	0.016	0.050	0.40	1.27
n	8		8	

NOTES:

1. Controlling dimensions are inch, millimeter dimensions are given for reference only.
2. For dimension D, body length does not include mold flash, protrusion, or gate burrs. Mold flash, protrusion, or gate burrs shall not exceed 0.006 inch (.15 mm) per end.
3. For dimension E, body width does not include interlead flash. Interlead flash shall not exceed 0.017 inch (.43 mm) per side.
4. Falls within JEDEC MS-012-AA.

FIGURE 1. Case outlines – Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 11

Case Z

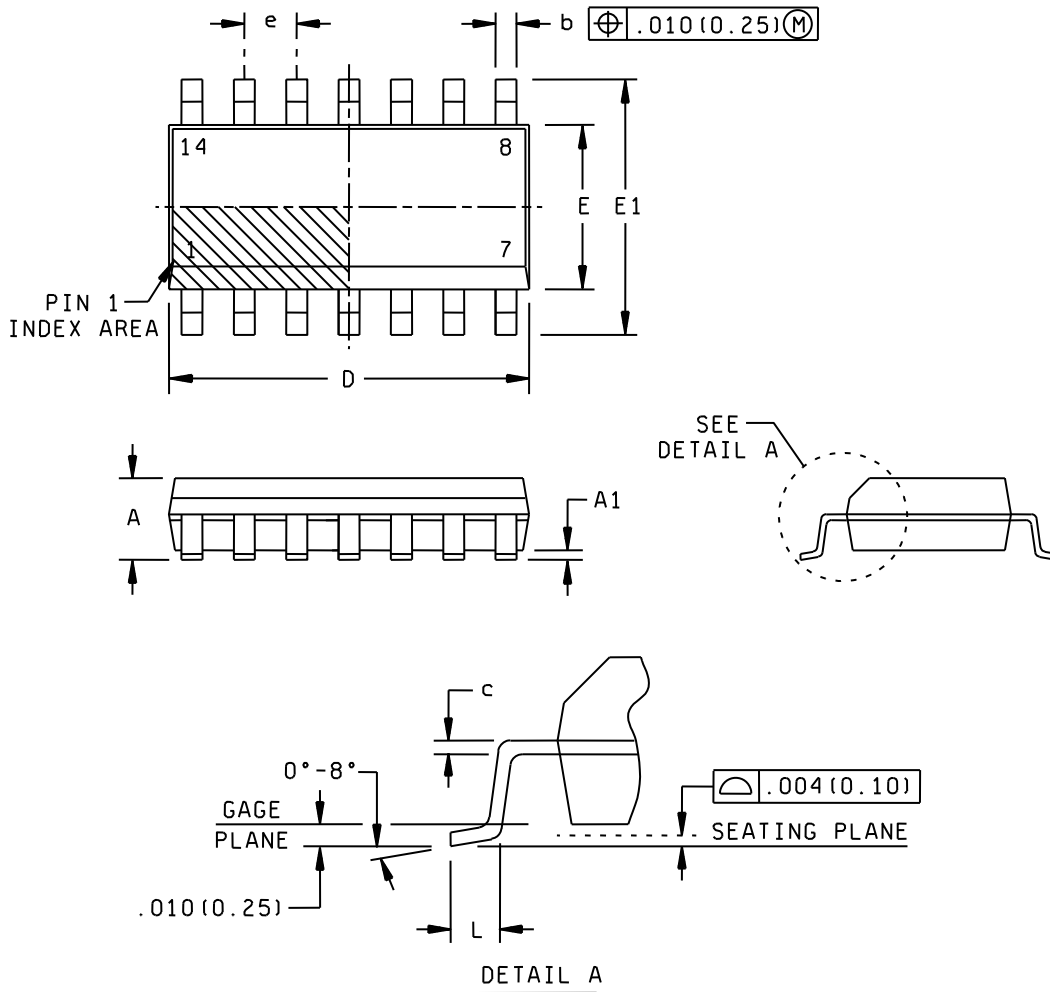


FIGURE 1. Case outlines – Continued.

<p>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 16236</p>	<p>DWG NO. V62/08618</p>
		<p>REV B</p>	<p>PAGE 12</p>

Case Z – continued.

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	---	.069	---	1.75
A1	.004	.010	0.10	0.25
b	.012	.020	0.31	0.51
c	.007	.010	0.17	0.25
D	.337	.344	8.55	8.75
e	.050 BSC		1.27 BSC	
E	.150	.157	3.80	4.00
E1	.228	.244	5.80	6.20
L	.016	.050	0.40	1.27
n	14 leads		14 leads	

NOTES:

1. Controlling dimensions are inch, millimeter dimensions are given for reference only.
2. For dimension D, body length does not include mold flash, protrusion, or gate burrs. Mold flash, protrusion, or gate burrs shall not exceed 0.006 inch (.15 mm) per end.
3. For dimension E, body width does not include interlead flash. Interlead flash shall not exceed 0.017 inch (.43 mm) per side.
4. Falls within JEDEC MS-012-AB.

FIGURE 1. Case outlines - Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 13

Device types	01	01	02	03
Case outlines	X	Y	Y	Z
Terminal number	Terminal symbol			
1	OUTPUT	NC	OUTPUT A	OUTPUT A
2	-Vs	-INPUT	-INPUT A	-INPUT A
3	+INPUT	+INPUT	+INPUT A	+INPUT A
4	-INPUT	-Vs	-Vs	+Vs
5	+Vs	NC	+INPUT B	+INPUT B
6	---	OUTPUT	-INPUT B	-INPUT B
7	---	+Vs	OUTPUT B	OUTPUT B
8	---	NC	+Vs	OUTPUT C
9	---	---	---	-INPUT C
10	---	---	---	+INPUT C
11	---	---	---	-Vs
12	---	---	---	+INPUT D
13	---	---	---	-INPUT D
14	---	---	---	OUTPUT D

NC = No connection

FIGURE 2. Terminal connections.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 14

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	Package <u>2/</u>	Top side marking	Vendor part number
V62/08618-01XE	01295	Reel of 250	CVS	OPA340MDBVTEP
V62/08618-01YE	<u>3/</u>	Reel of 2500	---	OPA340MDREP
V62/08618-02YE	<u>3/</u>	Reel of 2500	---	OPA2340MDREP
V62/08618-03ZE	<u>3/</u>	Reel of 2500	---	OPA4340MDREP

- 1/ The vendor item drawing establishes an administrative control number for identifying the item on the engineering documentation.
- 2/ Package drawings, thermal data, and symbolization are from the manufacturer.
- 3/ No longer available from an approved source of supply.

CAGE code

01295

Source of supply

Texas Instruments, Inc.
Semiconductor Group
8505 Forest Ln.
PO Box 660199
Dallas, TX 75243

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/08618
		REV B	PAGE 15