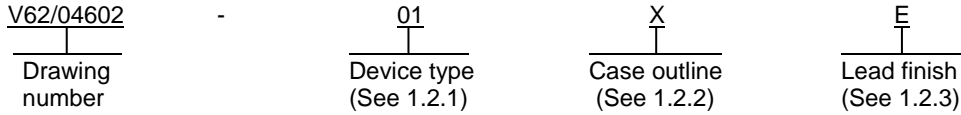


1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance 3.3-V ABT 16-bit bus transceiver with 3-state outputs microcircuit, with an operating temperature range of -40°C to +125°C for device type 01, -40°C to +85°C for device type 02, and -55°C to +125°C for device type 03.

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	SN74LVTH16245A-EP	3.3-V ABT 16-bit bus transceiver with 3-state outputs
02	SN74LVTH16245A-EP	3.3-V ABT 16-bit bus transceiver with 3-state outputs
03	SN74LVTH16245A-EP	3.3-V ABT 16-bit bus transceiver with 3-state outputs

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	48	JEDEC MO-118	Plastic small-outline
Y	48	JEDEC MO-153	Plastic small-outline
Z	48	JEDEC MO-153	Plastic small-outline
U	56	JEDEC MO-225	Plastic ball grid array

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
Z	Other

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1.3 Absolute maximum ratings. 1/

Supply voltage range (V_{CC})	-0.5 V to 4.6 V
Input voltage range (V_{IN})	-0.5 V to 7 V 2/
Voltage range applied to any output in the high impedance or power off state (V_O)	-0.5 V to 7 V 2/
Voltage range applied to any output in the high state (V_O).....	-0.5 V to $V_{CC} + 0.5 V$ 2/
Current into any output in the low state (I_O):	
Device types 01 and 03.....	96 mA
Device type 02	128 mA
Current into any output in the high state (I_O):	
Device types 01 and 03.....	48 mA 3/
Device type 02	64 mA 3/
Input clamp current (I_{IK}) ($V_I < 0 V$)	-50 mA
Output clamp current (I_{OK}) ($V_O < 0 V$)	-50 mA
Package thermal impedance (θ_{JA}):	
Case outline X.....	63°C/W 4/
Case outline Y.....	70°C/W 4/
Case outline Z.....	58°C/W 4/
Case outline U.....	42°C/W 4/
Storage temperature range (T_{STG}).....	-65°C to 150°C

1.4 Recommended operating conditions. 5/

Supply voltage range (V_{CC})	2.7 V to 3.6 V
High level input voltage (V_{IH})	2 V minimum
Low level input voltage (V_{IL})	0.8 V maximum
Input voltage (V_{IN})	5.5 V maximum
High level output current (I_{OH}):	
Device types 01 and 03.....	-24 mA maximum
Device type 02	-32 mA maximum
Low level output current (I_{OH}):	
Device types 01 and 03.....	24 mA maximum
Device type 02	64 mA maximum
Input transition rise or fall rate ($\Delta t/\Delta V$) (outputs enabled)	10 ns/V maximum
Power-up ramp rate ($\Delta t/\Delta V_{CC}$).....	200 μ s/V minimum
Operating free-air temperature range (T_A):	
Device type 01	-40°C to +125°C
Device type 02	-40°C to +85°C
Device type 03	-55°C to + 125°C

- 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/ The input and output negative voltage ratings may be exceeded if the input and output clamp current rating are observed.
- 3/ This current flows only when the output is in the high state and $V_O > V_{CC}$.
- 4/ The package thermal impedance is calculated in accordance with JESD 51-7.
- 5/ All unused control inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

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2. APPLICABLE DOCUMENTS

JEDEC – SOLID STATE TECHNOLOGY ASSOCIATION (JEDEC)

- JEP95 – Registered and Standard Outlines for Semiconductor Devices
- JEDEC STD 51-7 – High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages

(Applications for copies should be addressed to the Electronic Industries Alliance, 3103 North 10th Street, Suite 240–S, Arlington, VA 22201-2107 or 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.

3.5.3 Truth table. The truth table shall be as shown in figure 3.

3.5.4 Logic diagram. The logic diagram shall be as shown in figure 4.

3.5.5 Timing waveforms and test circuit. The timing waveforms and test circuit shall be as shown in figure 5.

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TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions <u>2/</u>	V _{CC}	Device type	Limits		Unit
					Min	Max	
Input clamp voltage	V _{IK}	I _I = -18 mA	2.7 V	All		-1.2	V
High output voltage	V _{OH}	I _{OH} = -100 μA	2.7 V to 3.6 V	All	V _{CC} - 0.2		V
		I _{OH} = -8 mA	2.7 V	All	2.4		
		I _{OH} = -24 mA	3 V	01, 03	2		
		I _{OH} = -32 mA	3 V	02	2		
Low output voltage	V _{OL}	I _{OL} = 100 μA	2.7 V	All		0.2	V
		I _{OL} = 24 mA	2.7 V	All		0.5	
		I _{OL} = 16 mA	3 V	All		0.4	
		I _{OL} = 32 mA	3 V	02		0.5	
		I _{OL} = 64 mA	3 V	02		0.55	
Input current	I _I	Control inputs, V _I = V _{CC} or GND	3.6 V	All		±1	μA
		Control inputs, V _I = 5.5 V	0 V or 3.6 V	All		10	
		A or B ports, V _I = 5.5 V <u>3/</u>	3.6 V	All		20	
		A or B ports, V _I = V _{CC} <u>3/</u>	3.6 V	01, 03		5	
		A or B ports, V _I = V _{CC} <u>3/</u>	3.6 V	02		1	
		A or B ports, V _I = 0 V <u>3/</u>	3.6 V	All		-5	
Input/output power-off leakage current	I _{off}	V _I or V _O = 0 to 4.5 V	0 V	02		±100	μA
Input hold current	I _{I(hold)}	A or B ports, V _I = 0.8 V	3 V	All	75	μA	
		A or B ports, V _I = 2 V			-75		
		A or B ports, V _I = 0 to 3.6 V <u>4/</u>	3.6 V	02	+500 -750		
High output impedance power up	I _{OZPU}	V _O = 0.5 V to 3 V \overline{OE} = don't care	0 V to 1.5 V	All		±100	μA
Low output impedance power down	I _{OZPD}	V _O = 0.5 V to 3 V \overline{OE} = don't care	1.5 V to 0 V	All		±100	μA
Supply current	I _{CC}	Outputs high I _O = 0, V _I = V _{CC} or GND	3.6 V	All		0.19	mA
		Outputs low I _O = 0, V _I = V _{CC} or GND				5	
		Outputs disabled I _O = 0, V _I = V _{CC} or GND				0.19	
Supply current	ΔI _{CC} <u>5/</u>	One input at V _{CC} - 0.6 V, Other inputs at V _{CC} or GND	3 V to 3.6 V	All		0.2	mA
Input capacitance	C _I	V _I = 3 V or 0, T _A = 25°C	3.3 V	All	4 typical		pF
Input/output capacitance	C _{IO}	V _O = 3 V or 0, T _A = 25°C	3.3 V	All	10 typical		pF

See footnotes at end of table.

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TABLE I. Electrical performance characteristics – continued. 1/

Test	Symbol	Conditions <u>2/</u>	V _{CC}	Device type	Limits		Unit
					Min	Max	
Propagation delay time, A or B to B or A	t _{PLH}	See figure 5. C _L = 50 pF	2.7 V	01, 03		4.6	ns
				02		3.7	
	3.3 V ±0.3 V		01, 03	0.5	4.5		
			02	1.5	3.3		
	t _{PHL}		2.7 V	01, 03		3.9	
				02		3.5	
3.3 V ±0.3 V	01, 03	0.5	4.4				
	02	1.3	3.3				
Propagation delay time, output enable, \overline{OE} to A or B	t _{PZH}	See figure 5. C _L = 50 pF	2.7 V	01, 03		6.6	ns
				02		5.3	
	3.3 V ±0.3 V		01, 03	0.5	6.5		
			02	1.5	4.5		
	t _{PZL}		2.7 V	01, 03		6.2	
				02		5.2	
3.3 V ±0.3 V	01, 03	0.5	5.4				
	02	1.6	4.6				
Propagation delay time, output disable, \overline{OE} to A or B	t _{PHZ}	See figure 5. C _L = 50 pF	2.7 V	01, 03		7	Ns
				02		5.5	
	3.3 V ±0.3 V		01, 03	1	6.8		
			02	2.3	5.1		
	t _{PLZ}		2.7 V	01, 03		6.3	
				02		5.4	
3.3 V ±0.3 V	01, 03	1	6.2				
	02	2.2	5.1				
Output skew time	t _{sk(o)}		2.7 V	02		0.5	ns
			3.3 V ±0.3 V			0.5	

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 stated, the operating free-air temperature (T_A) range for device type 01 is from -40°C to +125°C, the operating free-air temperature (T_A) range for device type 02 is from -40°C to +85°C, and the operating free-air temperature (T_A) range for device type 03 is from -55°C to +125°C.

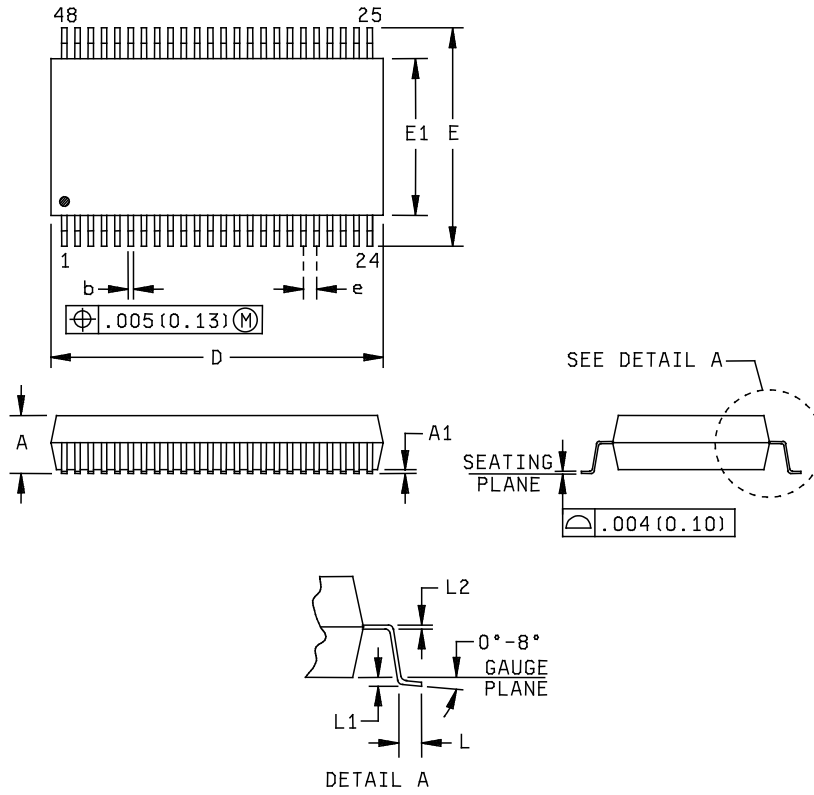
3/ Unused pins at V_{CC} or GND.

4/ This is the bus-hold maximum dynamic current. It is the minimum overdrive current required to switch the input from one state to another.

5/ This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V_{CC} or GND.

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Case X



Dimensions									
Symbol	Inches		Millimeters		Symbol	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A		.110		2.79	E1	.291	.299	7.39	7.59
A1	.008		0.20		L	.020	.040	0.51	1.02
b	.008	.0135	0.203	0.343	L1	.010	---	0.25	---
D	.620	.630	15.75	16.00	L2	.005	.010	0.13	0.25
e	.025		0.635		n	48 leads		48 leads	
E	.395	.420	10.03	10.67					

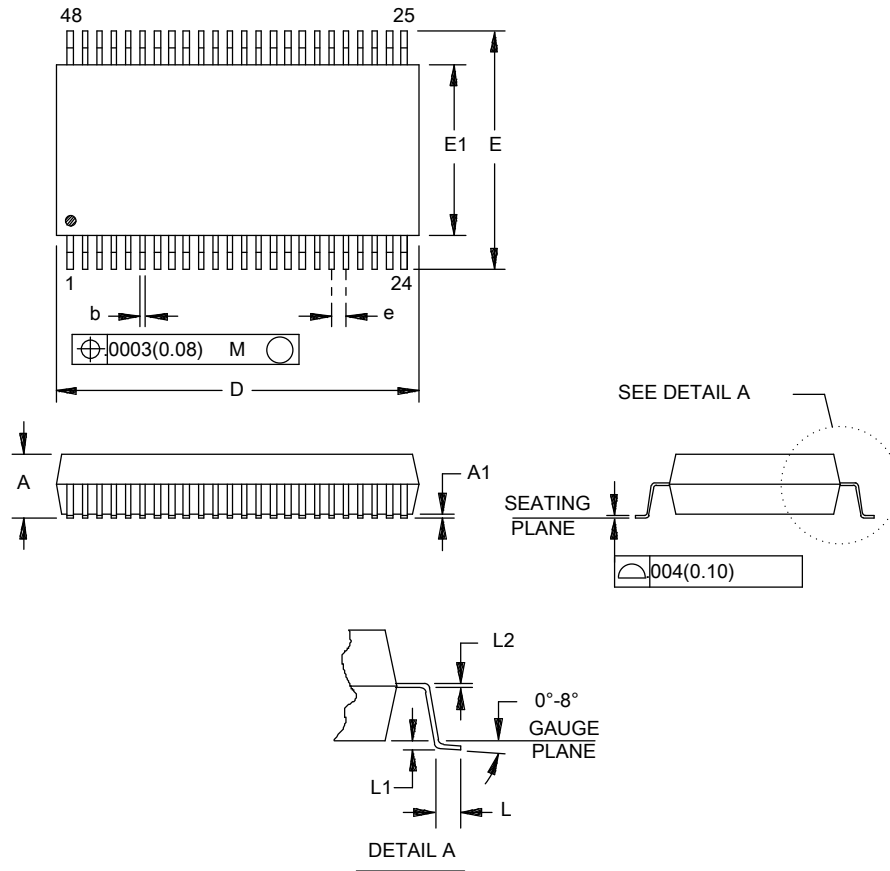
NOTES:

1. All linear dimensions are in inches (millimeters).
2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion not to exceed 0.006 inch (0.15 mm).
4. Fall within JEDEC MO-118.

FIGURE 1. Case outlines.

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Case Y



Dimensions									
Symbol	Inches		Millimeters		Symbol	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	---	.047	---	1.20	E1	.236	.244	6.00	6.20
A1	.002	.006	0.05	0.15	L	.020	.030	0.50	0.75
b	.007	.011	0.17	0.27	L1	.010 TYP		0.25 TYP	
D	.488	.496	12.40	12.60	L2	.006 NOM		0.15 NOM	
e	.020 TYP		0.50 TYP		n	48 leads		48 leads	
E	.311	0.327	7.90	8.30					

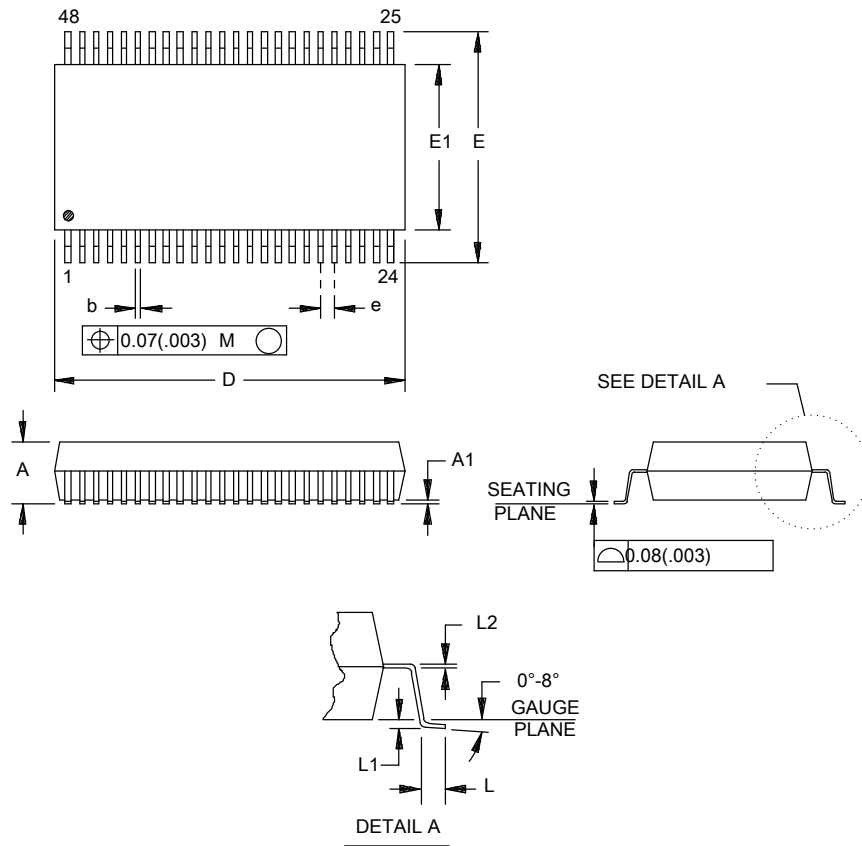
NOTES:

1. All linear dimensions are in millimeters (inches).
2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion not to exceed 0.15 mm (0.006 inch).
4. Fall within JEDEC MO-153.

FIGURE 1. Case outlines – continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/04602
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Case Z



Dimensions									
Symbol	Millimeters		Inches		Symbol	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	---	1.20	---	.047	e	0.40 BSC		.016 BSC	
A1	0.05	0.15	.002	.006	L	0.50	0.75	.020	.030
b	0.13	0.23	.005	.009	L1	0.25 TYP		.010 TYP	
D	9.60	9.80	.378	.386	L2	0.16 NOM		.006 NOM	
E	6.20	6.60	.244	.260	n	48 leads		48 leads	
E1	4.30	4.50	.169	.177					

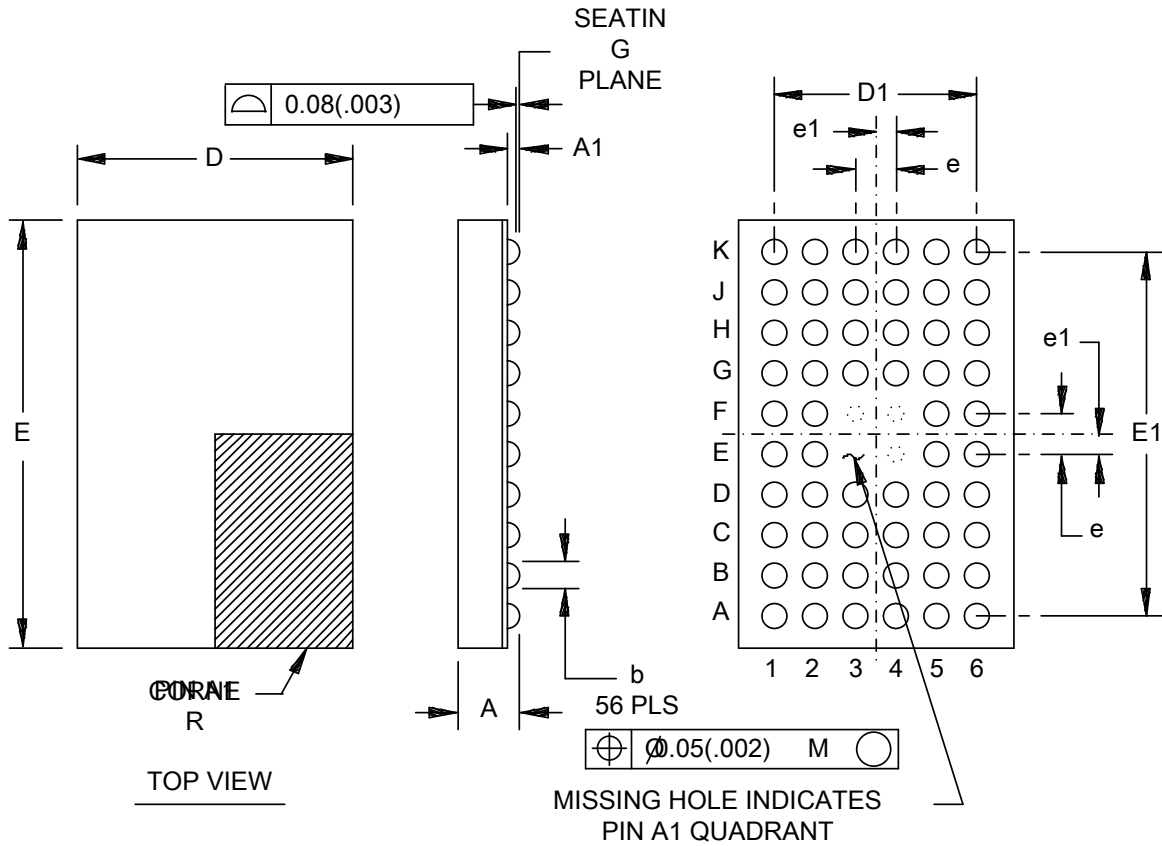
NOTES:

1. All linear dimensions are in millimeters (inches).
2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusion not to exceed 0.15 mm (0.006 inch).
4. Fall within JEDEC MO-153.

FIGURE 1. Case outlines – continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/04602
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Case U



Dimensions									
Symbol	Inches		Millimeters		Symbol	Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
A	---	.039	---	1.00	E	.272	.280	6.90	7.10
A1	.006	.010	0.15	0.25	E1	.230 BSC		5.85 BSC	
b	.014	.018	0.35	0.45	e	.026 BSC		0.65 BSC	
D	.173	.181	4.40	4.60	e1	.013		0.325 BSC	
D1	.128 BSC		3.25 BSC		n	56 leads		56 leads	

NOTES:

1. All linear dimensions are in millimeters (inches).
2. This drawing is subject to change without notice.
3. Falls within JEDEC MO-225 variation BA.

FIGURE 1. Case outlines – continued.

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Device types: 01, 02, and 03			
Case outlines: X, Y, and Z			
Terminal number	Terminal symbol	Terminal number	Terminal symbol
1	1DIR	25	2OE
2	1B1	26	2A8
3	1B2	27	2A7
4	GND	28	GND
5	1B3	29	2A6
6	1B4	30	2A5
7	V _{CC}	31	V _{CC}
8	1B5	32	2A4
9	1B6	33	2A3
10	GND	34	GND
11	1B7	35	2A2
12	1B8	36	2A1
13	2B1	37	1A8
14	2B2	38	1A7
15	GND	39	GND
16	2B3	40	1A6
17	2B4	41	1A5
18	V _{CC}	42	V _{CC}
19	2B5	43	1A4
20	2B6	44	1A3
21	GND	45	GND
22	2B7	46	1A2
23	2B8	47	1A1
24	2DIR	48	1OE

Device types: 02			
Case outlines: U			
Terminal number	Terminal symbol	Terminal number	Terminal symbol
A1	1DIR	F1	2B1
A2	NC	F2	2B2
A3	NC	F5	2A2
A4	NC	F6	2A1
A5	NC	G1	2B3
A6	1OE	G2	2B4
B1	1B2	G3	GND
B2	1B1	G4	GND
B3	GND	G5	2A4
B4	GND	G6	2A3
B5	1A1	H1	2B5
B6	1A2	H2	2B6
C1	1B4	H3	V _{CC}
C2	1B3	H4	V _{CC}
C3	V _{CC}	H5	2A6
C4	V _{CC}	H6	2A5
C5	1A3	J1	2B7
C6	1A4	J2	2B8
D1	1B6	J3	GND
D2	1B5	J4	GND
D3	GND	J5	2A8
D4	GND	J6	2A7
D5	1A5	K1	2DIR
D6	1A6	K2	NC
E1	1B8	K3	NC
E2	1B7	K4	NC
E5	1A7	K5	NC
E6	1A8	K6	2OE

NC = No internal connection

FIGURE 2. Terminal connections.

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(Each 8-bit section)

Inputs		Operation
\overline{OE}	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H = High voltage level
L = Low voltage level
X = Immaterial

FIGURE 3. Truth table.

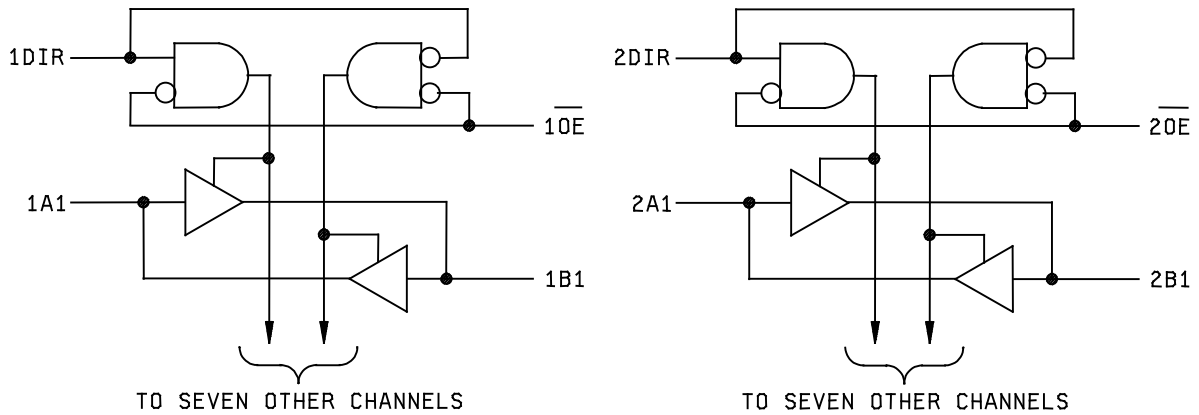
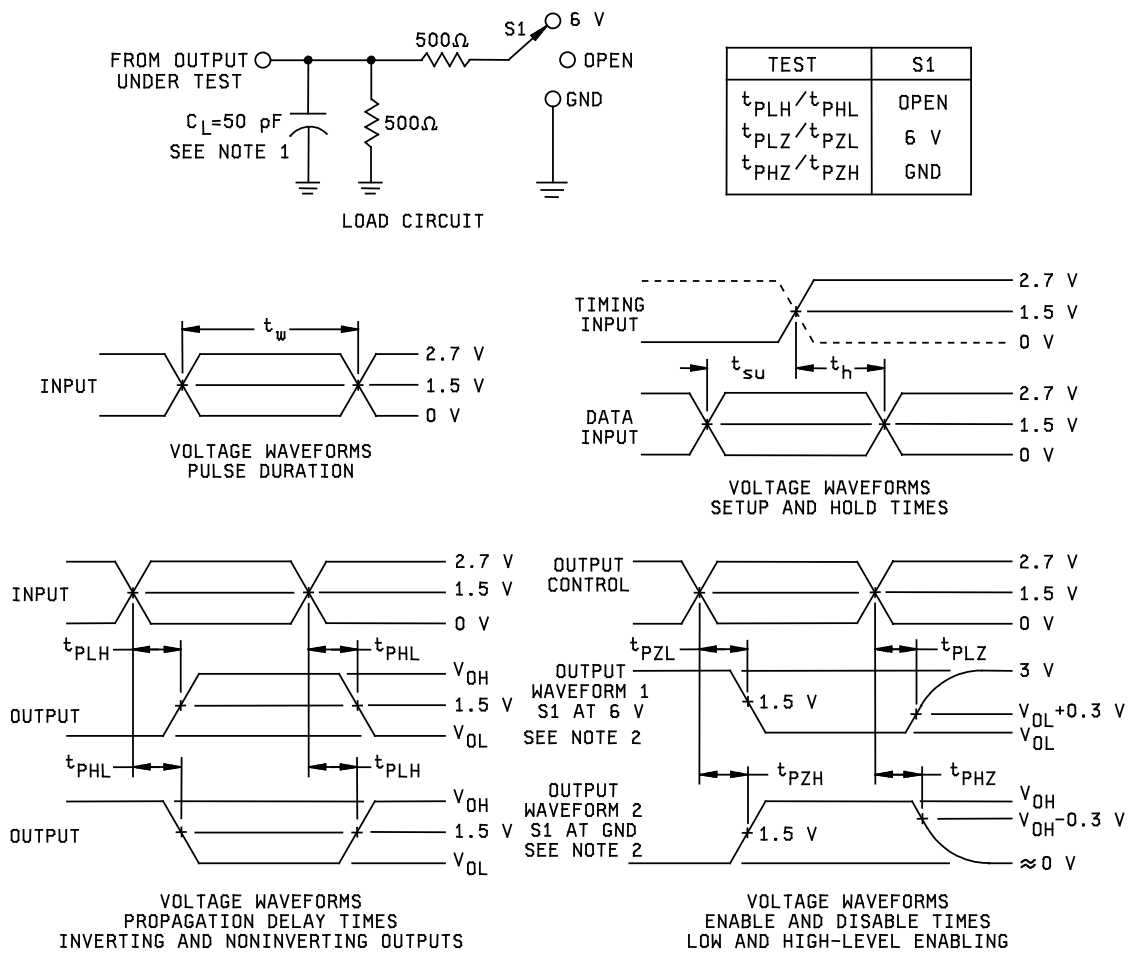


FIGURE 4. Logic diagram.

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NOTES:

1. C_L includes probe and jig capacitance.
2. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
3. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_o = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, and $t_f \leq 2.5 \text{ ns}$.
4. The outputs are measured one at a time with one transition per measurement.

FIGURE 5. Timing waveforms and test circuit.

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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	Vendor part number	Top side marking
V62/04602-01XE	01295	CLVTH16245AQLREP	LH16245AEP
V62/04602-01YE	01295	CLVTH16245AQDGGREP	LH16245AEP
V62/04602-02ZE	01295	CLVTH16245AIDGVREP	LL245AEP
V62/04602-02UA	01295	CLVTH16245AIGQLREP	LL245AEP
V62/04602-03XE	01295	CLVTH16245AMDREP	LH16245AEP

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

CAGE code

01295

Source of supply

Texas Instruments, Inc.
Semiconductor Group
8505 Forest Lane
P.O. Box 660199
Dallas, TX 75243

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