

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	Make updates to c, D, E, and L dimensions as specified for MO-178-AA under figure 1. Update boilerplate paragraphs to current requirements. - ro	10-06-08	C. SAFFLE

Prepared in accordance with ASME Y14.24

Vendor item drawing

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

PMIC N/A	PREPARED BY RICK OFFICER	DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43218-3990	
Original date of drawing YY-MM-DD  04-05-10	CHECKED BY TOM HESS	TITLE MICROCIRCUIT, LINEAR, NANOPower PUSH-PULL OUTPUT COMPARATOR, MONOLITHIC SILICON	
	APPROVED BY RAYMOND MONNIN		
	SIZE A	CODE IDENT. NO. 16236	DWG NO. <b>V62/04726</b>
	REV A		PAGE 1 OF 14

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance nanopower push-pull output comparator microcircuit, with an operating temperature range of -40°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:

<u>V62/04726</u>   Drawing number	-	<u>01</u>   Device type (See 1.2.1)	<u>X</u>   Case outline (See 1.2.2)	<u>E</u>   Lead finish (See 1.2.3)
--	---	--	--	---

1.2.1 Device type(s).

<u>Device type</u>	<u>Generic</u>	<u>Circuit function</u>
01	TLV3701-EP	Nanopower push-pull output comparator

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-AA	Plastic small outline

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
Z	Other

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	SIZE <b>A</b>	CODE IDENT NO. <b>16236</b>	DWG NO. <b>V62/04726</b>
		REV    A	PAGE    2

1.3 Absolute maximum ratings. 1/

Supply voltage ( $V_{CC}$ ) .....	17 V 2/
Differential input voltage ( $V_{ID}$ ) .....	$\pm 20$ V
Input voltage range ( $V_I$ ) .....	0 to $V_{CC} + 5$ V 2/ 3/
Input current range ( $I_I$ ) .....	$\pm 10$ mA
Output current range ( $I_O$ ) .....	$\pm 10$ mA
Continuous total power dissipation ( $P_D$ ) .....	See dissipation rating table
Maximum junction temperature ( $T_J$ ) .....	150°C
Storage temperature range ( $T_{STG}$ ) .....	-65°C to 150°C
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds .....	260°C

1.4 Recommended operating conditions. 4/

Supply voltage range ( $V_{CC}$ ):	
Single supply .....	2.7 V to 16 V
Split supply .....	$\pm 1.35$ V to $\pm 8$ V
Common mode input voltage range ( $V_{ICR}$ ) .....	-0.1 V to $V_{CC} + 5$ V
Operating free-air temperature range ( $T_A$ ) .....	-40°C to +125°C

DISSIPATION RATING TABLE

Package	$\theta_{JC}$	$\theta_{JA}$	$T_A \leq 25^\circ\text{C}$ power rating	$T_A = 125^\circ\text{C}$ power rating
Case X	55°C/W	324.1°C/W	385 mW	77.1 mW

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/ All voltage values, except differential voltages, are with respect to GND.

3/ Input voltage range is limited to 20 V max or  $V_{CC} + 5$  V, whichever is smaller.

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.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		<b>REV     A</b>	<b>PAGE    3</b>

## 2. APPLICABLE DOCUMENTS

JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices

(Applications for copies should be addressed to the Electronic Industries Alliance, 2500 Wilson Boulevard, Arlington, VA 22201-3834 or online at <http://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.

3.5.3 Timing waveforms. The timing waveforms shall be as shown in figure 3.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		<b>REV     A</b>	<b>PAGE    4</b>

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions 2/	Temperature, T <sub>A</sub>	Device type	Limits		Unit
					Min	Max	
DC performance section							
Input offset voltage	V <sub>IO</sub>	V <sub>IC</sub> = V <sub>CC</sub> / 2, R <sub>S</sub> = 50 Ω	+25°C	01		5000	μV
			-40°C to +125°C			7000	
Offset voltage drift	αV <sub>IO</sub>	V <sub>IC</sub> = V <sub>CC</sub> / 2, R <sub>S</sub> = 50 Ω	+25°C	01	3 typical		μV/°C
Common mode rejection ratio	CMRR	V <sub>IC</sub> = 0 to 2.7 V, R <sub>S</sub> = 50 Ω	+25°C	01	55		dB
			-40°C to +125°C		50		
		V <sub>IC</sub> = 0 to 5 V, R <sub>S</sub> = 50 Ω	+25°C		60		
			-40°C to +125°C		55		
		V <sub>IC</sub> = 0 to 15 V, R <sub>S</sub> = 50 Ω	+25°C		65		
			-40°C to +125°C		60		
Large signal differential voltage amplification	A <sub>VD</sub>		+25°C	01	1000 typical		V/mV
Input / output characteristics section							
Input offset current	I <sub>IO</sub>	V <sub>IC</sub> = V <sub>CC</sub> / 2, R <sub>S</sub> = 50 Ω	+25°C	01		100	pA
			-40°C to +125°C			1000	
Input bias current	I <sub>IB</sub>	V <sub>IC</sub> = V <sub>CC</sub> / 2, R <sub>S</sub> = 50 Ω	+25°C	01		250	pA
			-40°C to +125°C			2000	
Differential input resistance	ri(d)		+25°C	01	300 typical		MΩ
High level output voltage	V <sub>OH</sub>	V <sub>IC</sub> = V <sub>CC</sub> / 2, V <sub>ID</sub> = 1 V, I <sub>OH</sub> = 2 μA	+25°C	01	V <sub>CC</sub> - 0.08 typical		mV
			+25°C		V <sub>CC</sub> - 320		
		I <sub>OH</sub> = -50 μA	-40°C to +125°C		V <sub>CC</sub> - 450		

See footnotes at end of table.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		<b>REV A</b>	<b>PAGE 5</b>

TABLE I. Electrical performance characteristics – continued. 1/

Test	Symbol	Conditions <u>2/</u>	Temperature, T <sub>A</sub>	Device type	Limits		Unit
					Min	Max	
Input / output characteristics section – continued.							
Low level output voltage	V <sub>OL</sub>	V <sub>IC</sub> = V <sub>CC</sub> / 2, V <sub>ID</sub> = -1 V, I <sub>OH</sub> = 2 μA	+25°C	01	8 typical		mV
		V <sub>IC</sub> = V <sub>CC</sub> / 2, V <sub>ID</sub> = -1 V, I <sub>OH</sub> = 50 μA	+25°C			200	
			-40°C to +125°C			300	
Power supply section							
Supply current	I <sub>CC</sub>	Output state high	+25°C	01		800	nA
			-40°C to +125°C			1200	
Power supply rejection ratio	PSRR	V <sub>IC</sub> = V <sub>CC</sub> / 2, no load, V <sub>CC</sub> = 2.7 V to 5 V	+25°C	01	75		dB
			-40°C to +125°C		70		
		V <sub>IC</sub> = V <sub>CC</sub> / 2, no load, V <sub>CC</sub> = 5 V to 15 V	+25°C		85		
			-40°C to +125°C		80		
Switching characteristics section							
Propagation response time, low-to-high level output <u>3/</u>	t(PLH)	Overdrive = 2 mV, f = 1 kHz, V <sub>STEP</sub> = 100 mV, C <sub>L</sub> = 10 pF, V <sub>CC</sub> = 2.7 V	+25°C	01	240 typical		μs
		Overdrive = 10 mV, f = 1 kHz, V <sub>STEP</sub> = 100 mV, C <sub>L</sub> = 10 pF, V <sub>CC</sub> = 2.7 V			64 typical		
		Overdrive = 50 mV, f = 1 kHz, V <sub>STEP</sub> = 100 mV, C <sub>L</sub> = 10 pF, V <sub>CC</sub> = 2.7 V			36 typical		

See footnotes at end of table.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		<b>REV A</b>	<b>PAGE 6</b>

TABLE I. Electrical performance characteristics – continued. 1/

Test	Symbol	Conditions <u>2/</u>	Temperature, T <sub>A</sub>	Device type	Limits		Unit
					Min	Max	
Switching characteristics section - continued							
Propagation response time, high-to-low level output <u>3/</u>	t <sub>(PHL)</sub>	Overdrive = 2 mV, f = 1 kHz, V <sub>STEP</sub> = 100 mV, C <sub>L</sub> = 10 pF, V <sub>CC</sub> = 2.7 V	+25°C	01	167 typical		μs
		Overdrive = 10 mV, f = 1 kHz, V <sub>STEP</sub> = 100 mV, C <sub>L</sub> = 10 pF, V <sub>CC</sub> = 2.7 V			67 typical		
		Overdrive = 50 mV, f = 1 kHz, V <sub>STEP</sub> = 100 mV, C <sub>L</sub> = 10 pF, V <sub>CC</sub> = 2.7 V			37 typical		
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 2.7 V, C <sub>L</sub> = 10 pF	+25°C	01	7 typical		μs
Fall time	t <sub>f</sub>	V <sub>CC</sub> = 2.7 V, C <sub>L</sub> = 10 pF	+25°C	01	9 typical		μs

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<sub>CC</sub> = 2.7 V, 5 V, and 15 V.

3/ The response time specified is the interval between the input step function and the instant when the output crosses 1.4 V. Propagation responses are longer at higher supply voltages, refer to figure 3.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		REV A	PAGE 7

Case X

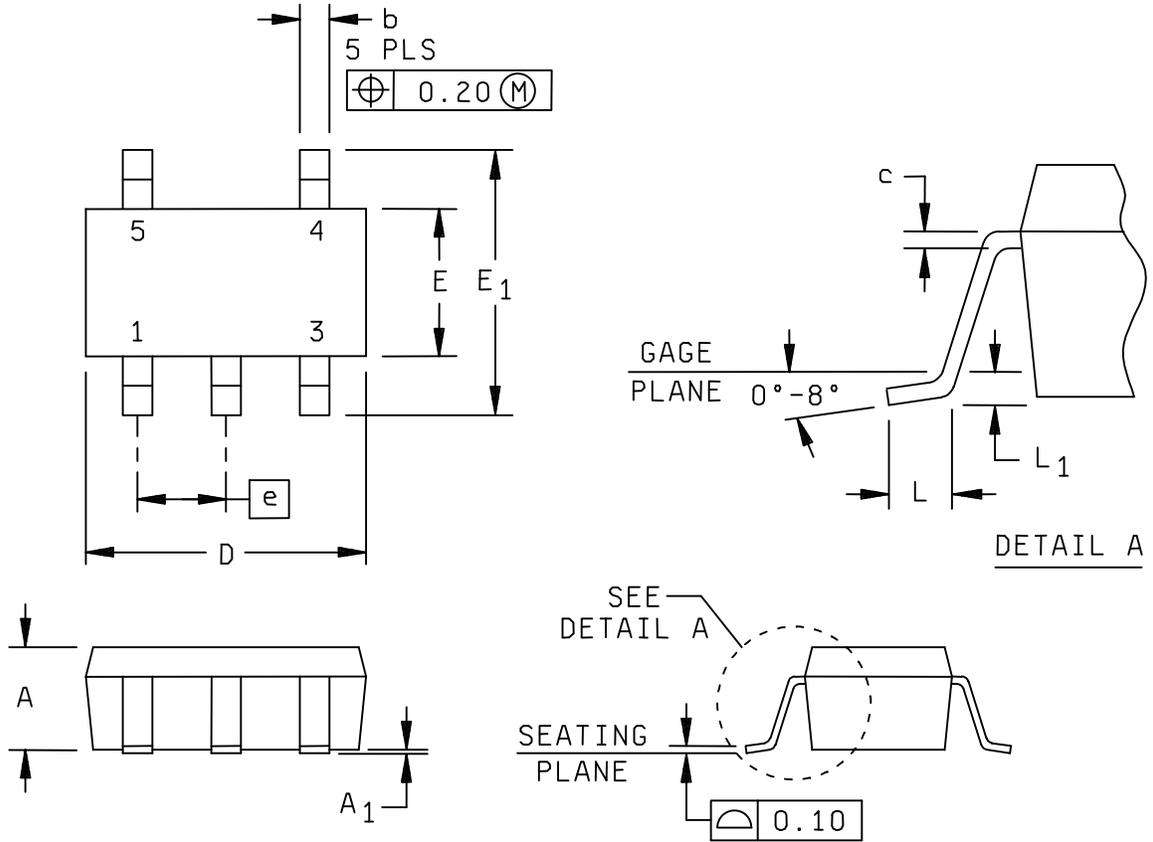


FIGURE 1. Case outline.

<p><b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b></p>	<p><b>SIZE A</b></p>	<p><b>CODE IDENT NO. 16236</b></p>	<p><b>DWG NO. V62/04726</b></p>
		<p>REV A</p>	<p>PAGE 8</p>

Case X - continued.

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	---	.057	---	1.45
A1	.000	.006	0.00	0.15
b	.011	.019	0.30	0.50
c	.003	.008	0.08	.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	.021	0.30	0.55
L1	.009 BSC		0.25 BSC	
n	5 leads			

Notes:

1. All linear dimensions are in millimeters. Inch dimensions are for reference only.
2. This drawing is subject to change without notice.
3. Body dimensions do not include mold flash or protrusions. Mold flash and protrusion shall not exceed 0.15 mm ( .006 inch ) per side.
4. Falls within JEDEC MO-178 variation AA.

FIGURE 1. Case outline - Continued.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		REV A	PAGE 9

Device type	01
Case outline	X
Terminal number	Terminal symbol
1	OUT
2	GND
3	+IN
4	-IN
5	VCC

FIGURE 2. Terminal connections.

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		REV    A	PAGE    10

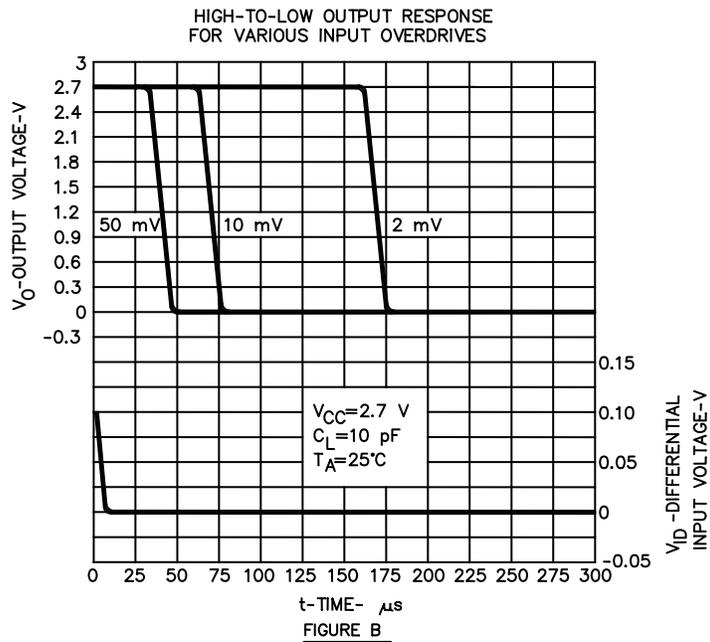
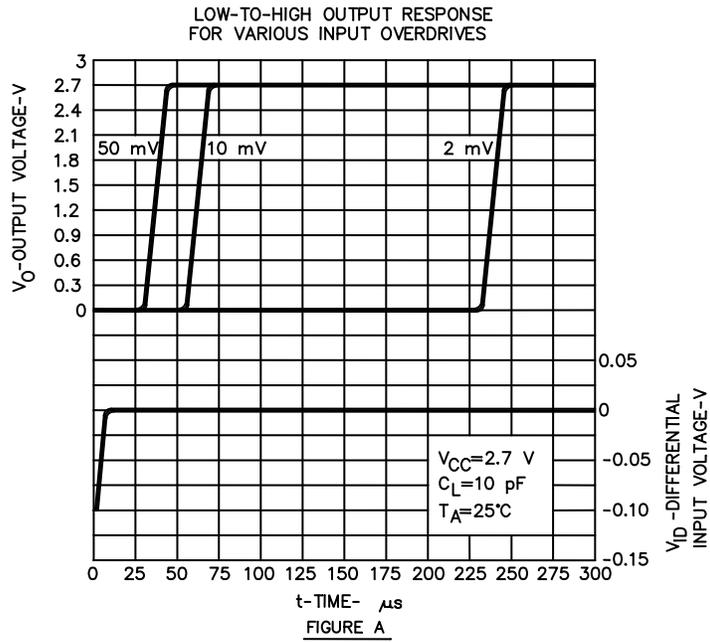


FIGURE 3. Timing waveforms.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/04726
		REV A	PAGE 11

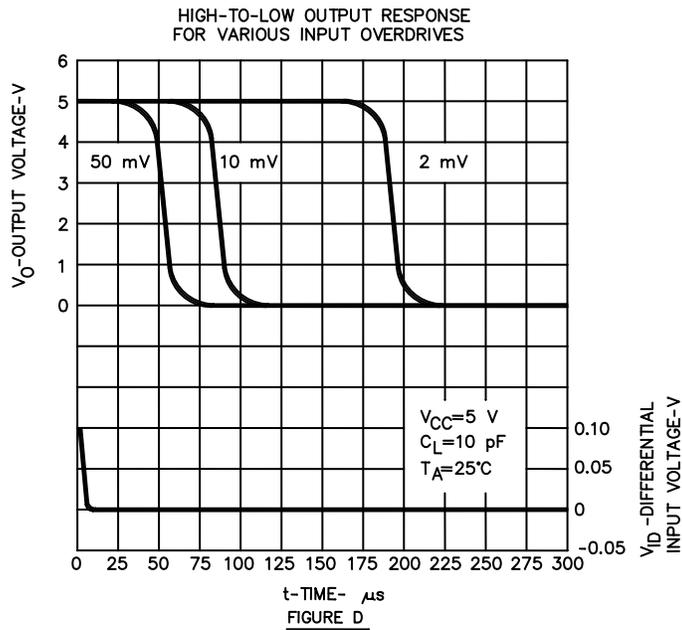
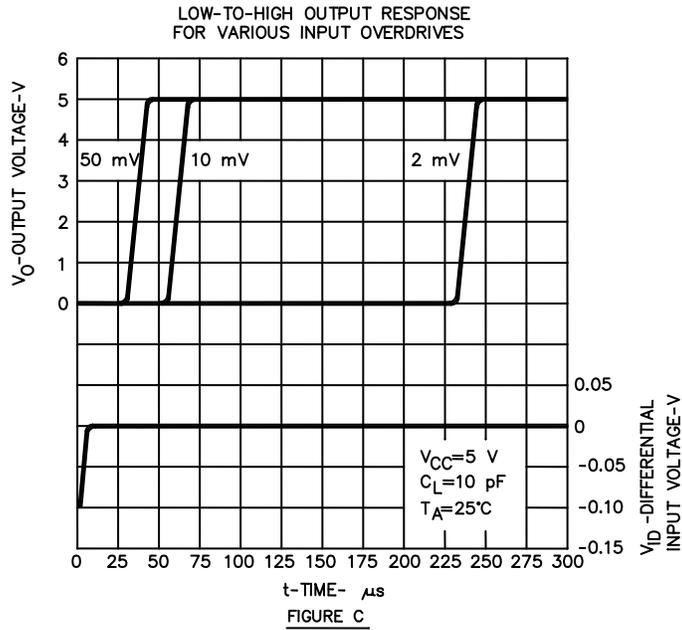


FIGURE 3. Timing waveforms – continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/04726
		REV A	PAGE 12

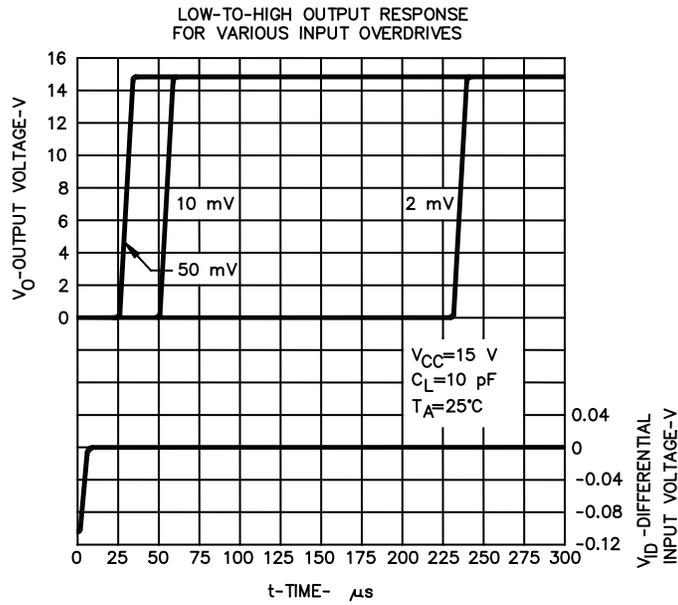


FIGURE E

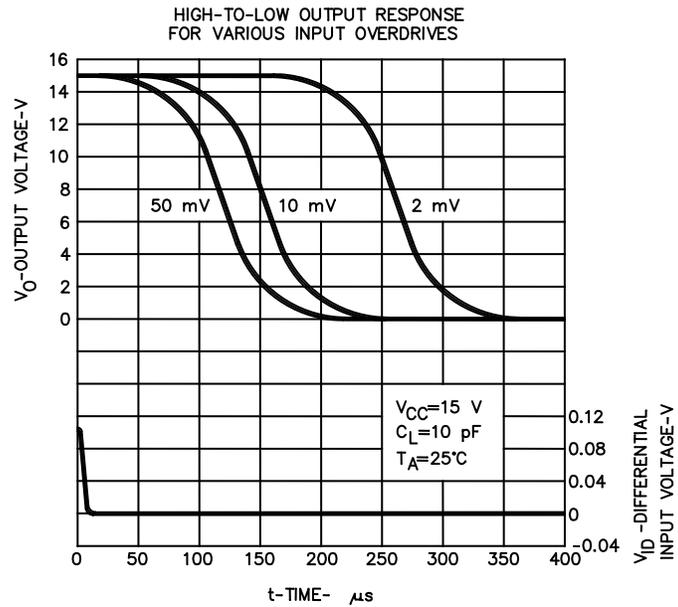


FIGURE F

FIGURE 3. Timing waveforms – continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/04726
		REV A	PAGE 13

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.

Vendor item drawing administrative control number <u>1/ 2/</u>	Device manufacturer CAGE code	Vendor part number
V62/04726-01XE	01295	TLV3701QDBVREP

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

2/ This package is only available taped and reeled with standard quantities of 3,000 pieces per reel.

CAGE code

01295

Source of supply

Texas Instruments, Inc.  
 Semiconductor Group  
 8505 Forest Lane  
 P.O. Box 660199  
 Dallas, TX 75243  
 Point of contact: U.S. Highway 75 South  
 P.O. Box 84, M/S 853  
 Sherman, TX 75090-9493

<b>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</b>	<b>SIZE A</b>	<b>CODE IDENT NO. 16236</b>	<b>DWG NO. V62/04726</b>
		REV A	PAGE 14