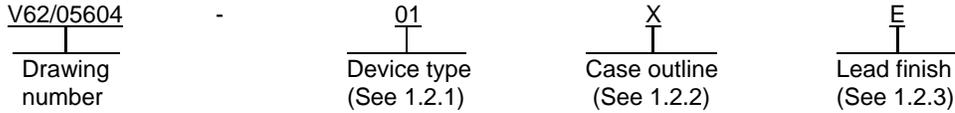


1. SCOPE

1.1 Scope. This drawing documents the general requirements of a high performance 3.3 V RS-485 transceiver microcircuit, with device types 01 and 02 having a operating temperature range of -40°C to +125°C, device type 03 having a operating temperature range of -40°C to +85°C, and device type 04 having a 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>	<u>Signaling rate</u>
01	SN65HVD10-EP	3.3 V RS-485 transceiver	25 Mbps
02	SN65HVD11-EP	3.3 V RS-485 transceiver	10 Mbps
03	SN65HVD12-EP	3.3 V RS-485 transceiver	1 Mbps
04	SN65HVD10-EP	3.3 V RS-485 transceiver	25 Mbps

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

<u>Outline letter</u>	<u>Number of pins</u>	<u>JEDEC PUB 95</u>	<u>Package style</u>
X	8	MS-012 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

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 2

1.3 Absolute maximum ratings. 1/ 2/

Supply voltage range (V_{CC})	-0.3 V to 6 V
Voltage range at A or B	-9 V to 14 V
Input voltage range at D, DE, R, or \overline{RE}	-0.5 V to $V_{CC} + 0.5$ V
Voltage input range, transient pulse, A and B through 100 Ω (see figure 15)	-50 V to 50 V
Electrostatic discharge (ESD):	
Human body model: 3/	
A, B, and GND	16 kV
All pins	4 kV
Charged device model: 4/	
All pins charge	1 kV
Continuous total power dissipation	See dissipation rating table
Junction temperature (T_J)	170°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
Thermal resistance, junction-to-ambient (θ_{JA})	5/

1.4 Recommended operating conditions. 6/

Supply voltage range (V_{CC})	3 V minimum to 3.6 V maximum
Voltage at any bus terminal (separately or common mode) V_I or V_{IC}	-7 V minimum to 12 V maximum 7/
High level input voltage (V_{IH}) at D, DE, \overline{RE} pins	2 V minimum to V_{CC} maximum
Low level input voltage (V_{IL}) at D, DE, \overline{RE} pins	0 V minimum to 0.8 V maximum
Differential input voltage (V_{ID}) (see figure 11)	-12 V minimum to 12 V maximum
High level output current (I_{OH}):	
Driver	-60 mA minimum
Receiver	-8 mA minimum
Low level output current (I_{OL}):	
Driver	60 mA maximum
Receiver	8 mA maximum
Differential load resistance (R_L)	54 Ω minimum
Differential load capacitance (C_L)	50 pF nominal
Signaling rate	
Device types 01 and 04	25 Mbps maximum
Device type 02	10 Mbps maximum
Device type 03	1 Mbps maximum
Junction temperature (T_J)	145°C maximum 5/

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 I/O bus voltages, are with respect to network ground terminal.

3/ Tested in accordance with JEDEC standard 22, test method A114-A.

4/ Tested in accordance with JEDEC standard 22, test method C101.

5/ See thermal characteristics section in 1.5.

6/ 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.

7/ The algebraic convention, in which the least positive (most negative) limit is designated as minimum in this data sheet.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 3

1.5 Thermal characteristics.

Junction-to-ambient thermal resistance (θ_{JA}) (high K board, no airflow) 121°C/W typical 8/ 9/
 Junction-to-board thermal resistance (θ_{JB}) (high K board) 67°C/W typical
 Junction-to-case thermal resistance (θ_{JC}) 41°C/W typical
 Device power dissipation (P_D):
 ($R_L = 60 \Omega$, $C_L = 50 \text{ pF}$, DE at V_{CC} \overline{RE} at 0 V, input to D a 50% duty cycle square wave at indicated signaling rate)
 Device types 01 and 04 (25 Mbps) 233 mW maximum
 Device type 02 (10 Mbps) 176 mW maximum
 Device type 03 (500 kbps) 161 mW maximum
 Ambient air temperature (T_A) (high K board, no airflow) -40°C to +116°C
 Thermal shutdown junction temperature (T_{JSD}) 165°C typical

Package dissipation ratings table.

Package	$T_A \leq 25^\circ\text{C}$ power rating	Derating factor <u>1/</u> above $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$ power rating	$T_A = 85^\circ\text{C}$ power rating	$T_A = 125^\circ\text{C}$ power rating
X <u>2/</u>	597 mW	4.97 mW/°C	373 mW	298 mW	100 mW
X <u>3/</u>	990 mW	8.26 mW/°C	620 mW	496 mW	165 mW

- 1/ This is the inverse of the junction-to-ambient thermal resistance when board mounted and with no air flow.
- 2/ Tested in accordance with the low-K thermal metric definitions of EIA/JESD51-3.
- 3/ Tested in accordance with the high-K thermal metric definitions of EIA/JESD51-7.

8/ The intent of θ_{JA} specification is solely for thermal performance comparison of one package to another in a standardized environment. This methodology is not meant to and will not predict the performance of a package in an application specific environment.
9/ JESD51-7, high effective thermal conductivity test board for leaded surface mount packages.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 4

2. APPLICABLE DOCUMENTS

JEDEC Solid State Technology Association

- EIA/JEDEC 51-3 – Low Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages
- EIA/JEDEC 51-7 – High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages
- JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices
- JESD22-A114 – Electrostatic Discharge Sensitivity Testing Human Body Model
- JESD22-C101 – Field Induced Charged Device Model Test Method for Electrostatic Discharge Withstand Thresholds of Microelectronic Components

(Copies of these documents are available online at <http://www.jedec.org> or from JEDEC – Solid State Technology Association, 3103 North 10th Street, Suite 240–S, Arlington, VA 22201-2107).

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 Truth tables. The truth tables 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 circuits. The timing waveforms and test circuits shall be as shown in figures 5 through 15.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 5

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit	
					Min	Max		
Driver electrical characteristics section.								
Input clamp voltage	V _{IK}	I _I = -18 mA	-40°C to +125°C	01,02	-1.5		V	
			-40°C to +85°C	03	-1.5			
			-55°C to +125°C	04	-1.5			
Differential output voltage 2/	V _{OD}	I _O = 0	-40°C to +125°C	01,02	2	V _{CC}	V	
			-40°C to +85°C	03	2	V _{CC}		
			-55°C to +125°C	04	2	V _{CC}		
		R _L = 54 Ω, see figure 5	-40°C to +125°C	01,02	1.5			
			-40°C to +85°C	03	1.5			
			-55°C to +125°C	04	1.5			
		V _{test} = -7 V to 12 V, see figure 6	-40°C to +125°C	01,02	1.5			
			-40°C to +85°C	03	1.5			
			-55°C to +125°C	04	1.5			
Change in magnitude of differential output voltage	Δ V _{OD}	See figures 5 and 6	-40°C to +125°C	01,02	-0.2	0.2	V	
			-40°C to +85°C	03	-0.2	0.2		
			-55°C to +125°C	04	-0.2	0.2		
Peak-to-peak common mode output voltage	V _{OC(PP)}	See figure 7 3/	+25°C	01,02, 03,04	400 typical		mV	
Steady state common mode output voltage	V _{OC(SS)}	See figure 7	-40°C to +125°C	01,02	1.4	2.5	V	
			-40°C to +85°C	03	1.4	2.5		
			-55°C to +125°C	04	1.4	2.5		
Change in steady state common mode output voltage	ΔV _{OC(SS)}	See figure 7	-40°C to +125°C	01,02	-0.05	0.05	V	
			-40°C to +85°C	03	-0.05	0.05		
			-55°C to +125°C	04	-0.05	0.05		

See footnotes at end of Driver electrical characteristics section.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 6

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Driver electrical characteristics section - continued.							
High impedance output current	I _{OZ}	See receiver input currents	-40°C to +125°C	01,02			
			-40°C to +85°C	03			
			-55°C to +125°C	04			
Input current	I _I	D pin	-40°C to +125°C	01,02	-100	0	μA
			-40°C to +85°C	03	-100	0	
			-55°C to +125°C	04	-100	0	
		DE pin	-40°C to +125°C	01,02	0	100	
			-40°C to +85°C	03	0	100	
			-55°C to +125°C	04	0	100	
Short circuit output current	I _{OS}	-7 V ≤ V _O ≤ 12 V	-40°C to +125°C	01,02	-250	250	mA
			-40°C to +85°C	03	-250	250	
			-55°C to +125°C	04	-250	250	
Differential output ^{3/} capacitance	C _(OD)	V _{OD} = 0.4 sin (4E6πt) + 0.5 V, DE at 0 V	+25°C	01,02, 03,04	16 typical		pF
Supply current	I _{CC}	$\overline{\text{RE}}$ at V _{CC} , D and DE at V _{CC} , no load, receiver disabled and driver enabled	-40°C to +125°C	01,02		15.5	mA
			-40°C to +85°C	03		15.5	
			-55°C to +125°C	04		15.5	
		$\overline{\text{RE}}$ at V _{CC} , D at V _{CC} , DE at 0 V, no load, receiver disabled and driver disabled (standby)	-40°C to +125°C	01,02		5	μA
			-40°C to +85°C	03		5	
			-55°C to +125°C	04		5	
		$\overline{\text{RE}}$ at 0 V, D and DE at V _{CC} , no load, receiver enabled and driver enabled	-40°C to +125°C	01,02		15.5	mA
			-40°C to +85°C	03		15.5	
			-55°C to +125°C	04		15.5	

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/ For T_A > 85°C, V_{CC} is ±5 %.

3/ All typical values are at 25°C and with a 3.3 V supply.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 7

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Driver switching characteristics section.							
Propagation delay time, low to high level output	t _{PLH}	R _L = 54 Ω, C _L = 50 pF, see figure 8	-40°C to +125°C	01	5	16	ns
			-40°C to +125°C	02	18	40	
			-40°C to +85°C	03	135	330	
			-55°C to +125°C	04	5	16	
Propagation delay time, high to low level output	t _{PHL}	R _L = 54 Ω, C _L = 50 pF, see figure 8	-40°C to +125°C	01	5	16	ns
			-40°C to +125°C	02	18	40	
			-40°C to +85°C	03	135	330	
			-55°C to +125°C	04	5	16	
Differential output signal rise time	t _r	R _L = 54 Ω, C _L = 50 pF, see figure 8	-40°C to +125°C	01	3	11.5	ns
			-40°C to +125°C	02	10	30	
			-40°C to +85°C	03	100	330	
			-55°C to +125°C	04	3	11.5	
Differential output signal fall time	t _r	R _L = 54 Ω, C _L = 50 pF, see figure 8	-40°C to +125°C	01	3	11.5	ns
			-40°C to +125°C	02	10	30	
			-40°C to +85°C	03	100	330	
			-55°C to +125°C	04	3	11.5	

See footnotes at end of Driver switching characteristics section.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 8

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Driver switching characteristics section – continued.							
Pulse skew (t _{PHL} – t _{PLH})	t _{sk(p)}	R _L = 54 Ω, C _L = 50 pF, see figure 8	-40°C to +125°C	01		1.5	ns
			-40°C to +125°C	02		2.5	
			-40°C to +85°C	03		9	
			-55°C to +125°C	04		1.5	
Part to part skew <u>2/</u>	t _{sk(pp)}		-40°C to +125°C	01		6	ns
			-40°C to +125°C	02		11	
			-40°C to +85°C	03		100	
			-55°C to +125°C	04		6	
Propagation delay time, high impedance to high level output	t _{PZH}	R _L = 110 Ω, \overline{RE} at 0 V, see figure 9	-40°C to +125°C	01		33	ns
			-40°C to +125°C	02		55	
			-40°C to +85°C	03		320	
			-55°C to +125°C	04		33	
Propagation delay time, high level to high impedance output	t _{PHZ}	R _L = 110 Ω, \overline{RE} at 0 V, see figure 9	-40°C to +125°C	01		26	ns
			-40°C to +125°C	02		55	
			-40°C to +85°C	03		320	
			-55°C to +125°C	04		26	
Propagation delay time, high impedance to low level output	t _{PZL}	R _L = 110 Ω, \overline{RE} at 0 V, see figure 10	-40°C to +125°C	01		26	ns
			-40°C to +125°C	02		55	
			-40°C to +85°C	03		320	
			-55°C to +125°C	04		26	

See footnotes at end of Driver switching characteristics section.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 9

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Driver switching characteristics section - continued.							
Propagation delay time, low level to high impedance output	t _{PLZ}	R _L = 110 Ω, \overline{RE} at 0 V, see figure 10	-40°C to +125°C	01		26	ns
			-40°C to +125°C	02		75	
			-40°C to +85°C	03		420	
			-55°C to +125°C	04		26	
Propagation delay time, standby to high level output	t _{PZH}	R _L = 110 Ω, \overline{RE} at 3 V, see figure 9	-40°C to +125°C	01,02		6	μs
			-40°C to +85°C	03		6	
			-55°C to +125°C	04		14	
Propagation delay time, standby to low level output	t _{PZL}	R _L = 110 Ω, \overline{RE} at 3 V, see figure 10	-40°C to +125°C	01,02		6	μs
			-40°C to +85°C	03		6	
			-55°C to +125°C	04		14	

- 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/ tsk(pp) is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 10

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Receiver electrical characteristics section.							
Positive going input threshold voltage	V _{IT+}	I _O = -8 mA	-40°C to +125°C	01,02		-0.01	V
			-40°C to +85°C	03		-0.01	
			-55°C to +125°C	04		-0.01	
Negative going input threshold voltage	V _{IT-}	I _O = 8 mA	-40°C to +125°C	01,02	-0.2		V
			-40°C to +85°C	03	-0.2		
			-55°C to +125°C	04	-0.2		
Hysteresis voltage ^{2/} (V _{IT+} - V _{IT-})	V _{hys}		+25°C	01,02, 03,04	35 typical		mV
Enable input clamp voltage	V _{IK}	I _I = -18 mA	-40°C to +125°C	01,02	-1.5		V
			-40°C to +85°C	03	-1.5		
			-55°C to +125°C	04	-1.5		
High level output voltage	V _{OH}	V _{ID} = 200 mV, I _{OH} = -8 mA, see figure 11	-40°C to +125°C	01,02	2.4		V
			-40°C to +85°C	03	2.4		
			-55°C to +125°C	04	2.4		
Low level output voltage	V _{OL}	V _{ID} = -200 mV, I _{OH} = 8 mA, see figure 11	-40°C to +125°C	01,02		0.4	V
			-40°C to +85°C	03		0.4	
			-55°C to +125°C	04		0.4	
High impedance state output current	I _{OZ}	V _O = 0 or V _{CC} , \overline{RE} at V _{CC}	-40°C to +125°C	01,02	-1	1	μA
			-40°C to +85°C	03	-1	1	
			-55°C to +125°C	04	-1	1	

See footnotes at end of Receiver electrical characteristics section.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 11

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Receiver electrical characteristics section – continued.							
Bus input current	I _I	V _A or V _B = 12 V, other input at 0 V	-40°C to +125°C	01		0.5	mA
		V _A or V _B = 12 V, V _{CC} = 0 V, other input at 0 V				0.5	
		V _A or V _B = -7 V, other input at 0 V			-0.4		
		V _A or V _B = -7 V, V _{CC} = 0 V, other input at 0 V			-0.4		
		V _A or V _B = 12 V, other input at 0 V	-40°C to +125°C	02		0.11	
			-40°C to +85°C	03		0.11	
		V _A or V _B = 12 V, V _{CC} = 0 V, other input at 0 V	-40°C to +125°C	02		0.13	
			-40°C to +85°C	03		0.13	
		V _A or V _B = -7 V, other input at 0 V	-40°C to +125°C	02	-0.1		
			-40°C to +85°C	03	-0.1		
		V _A or V _B = -7 V, V _{CC} = 0 V, other input at 0 V	-40°C to +125°C	02	-0.05		
			-40°C to +85°C	03	-0.05		
		V _A or V _B = 12 V, other input at 0 V	-55°C to +125°C	04		0.5	
		V _A or V _B = 12 V, V _{CC} = 0 V, other input at 0 V				0.5	
		V _A or V _B = -7 V, other input at 0 V			-0.4		
		V _A or V _B = -7 V, V _{CC} = 0 V, other input at 0 V			-0.4		

See footnotes at end of Receiver electrical characteristics section.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 12

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit	
					Min	Max		
Receiver electrical characteristics section - continued.								
High level input current, \overline{RE}	I _{IH}	V _{IH} = 2 V	-40°C to +125°C	01,02	-30	0	μA	
			-40°C to +85°C	03	-30	0		
			-55°C to +125°C	04	-30	0		
Low level input current, \overline{RE}	I _{IL}	V _{IL} = 0.8 V	-40°C to +125°C	01,02	-30	0	μA	
			-40°C to +85°C	03	-30	0		
			-55°C to +125°C	04	-30	0		
Differential input capacitance	C _(ID)	V _{ID} = 0.4 sin (4E6πt) + 0.5 V, DE at 0 V	+25°C	01,02, 03,04	15 typical 2/		pF	
Supply current	I _{CC}	\overline{RE} at 0 V, D and DE at 0 V, no load, receiver enabled and driver disabled	-40°C to +125°C	01,02		8	mA	
			-40°C to +85°C	03		8		
			-55°C to +125°C	04		8		
			\overline{RE} at V _{CC} , D at V _{CC} , DE at 0 V, no load, receiver disabled and driver disabled (standby)	-40°C to +125°C	01,02		5	μA
				-40°C to +85°C	03		5	
				-55°C to +125°C	04		5	
			\overline{RE} at 0 V, D and DE at V _{CC} , no load, receiver enabled and driver enabled	-40°C to +125°C	01,02		15.5	mA
				-40°C to +85°C	03		15.5	
				-55°C to +125°C	04		15.5	

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/ All typical values are at 25°C and with a 3.3 V supply.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 13

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Receiver switching characteristics section.							
Propagation delay time, low to high level output	t _{PLH}	V _{ID} = -1.5 V to 1.5 V, C _L = 15 pF, see figure 12	-40°C to +125°C	01	12.5	25	ns
			-55°C to +125°C	04	12.5	25	
Propagation delay time, high to low level output	t _{PHL}	V _{ID} = -1.5 V to 1.5 V, C _L = 15 pF, see figure 12	-40°C to +125°C	01	12.5	25	ns
			-55°C to +125°C	04	12.5	25	
Propagation delay time, low to high level output	t _{PLH}	V _{ID} = -1.5 V to 1.5 V, C _L = 15 pF, see figure 12	-40°C to +125°C	02	30	70	ns
			-40°C to +85°C	03	30	70	
Propagation delay time, high to low level output	t _{PHL}	V _{ID} = -1.5 V to 1.5 V, C _L = 15 pF, see figure 12	-40°C to +125°C	02	30	70	ns
			-40°C to +85°C	03	30	70	
Pulse skew (t _{PHL} – t _{PLH})	t _{sk(p)}	V _{ID} = -1.5 V to 1.5 V, C _L = 15 pF, see figure 12	-40°C to +125°C	01		1.5	ns
			-40°C to +125°C	02		4	
			-40°C to +85°C	03		4	
			-55°C to +125°C	04		1.5	
Part to part skew <u>2</u> /	t _{sk(pp)}		-40°C to +125°C	01		8	ns
			-40°C to +125°C	02		15	
			-40°C to +85°C	03		15	
			-55°C to +125°C	04		8	
Output signal rise time	t _r	C _L = 15 pF, see figure 12	-40°C to +125°C	01,02	1	6	ns
			-40°C to +85°C	03	1	6	
			-55°C to +125°C	04	1	6	
Output signal fall time	t _f	C _L = 15 pF, see figure 12	-40°C to +125°C	01,02	1	6	ns
			-40°C to +85°C	03	1	6	
			-55°C to +125°C	04	1	6	

See footnotes at end of Receiver switching characteristics section.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 14

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions	Temperature, T _A	Device type	Limits		Unit
					Min	Max	
Receiver switching characteristics section - continued.							
Output enable time to high level	t _{PZH}	C _L = 15 pF, DE at 3 V, see figure 13	-40°C to +125°C	01,02		16	ns
			-40°C to +85°C	03		16	
			-55°C to +125°C	04		16	
Output enable time to low level	t _{PZL}	C _L = 15 pF, DE at 3 V, see figure 13	-40°C to +125°C	01,02		16	ns
			-40°C to +85°C	03		16	
			-55°C to +125°C	04		16	
Output disable time from high level	t _{PHZ}	C _L = 15 pF, DE at 3 V, see figure 13	-40°C to +125°C	01,02		21	ns
			-40°C to +85°C	03		21	
			-55°C to +125°C	04		21	
Output disable time from low level	t _{PLZ}	C _L = 15 pF, DE at 3 V, see figure 13	-40°C to +125°C	01,02		16	ns
			-40°C to +85°C	03		16	
			-55°C to +125°C	04		16	
Propagation delay time, standby to high level output	t _{PZH}	C _L = 15 pF, DE at 0 V, see figure 14	-40°C to +125°C	01,02		6	μs
			-40°C to +85°C	03		6	
			-55°C to +125°C	04		14	
Propagation delay time, standby to low level output	t _{PZL}	C _L = 15 pF, DE at 0 V, see figure 14	-40°C to +125°C	01,02		6	μs
			-40°C to +85°C	03		6	
			-55°C to +125°C	04		14	

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/ t_{sk(pp)} is the magnitude of the difference in propagation delay times between any specified terminals of two devices when both devices operate with the same supply voltages, at the same temperature, and have identical packages and test circuits.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 15

Case X

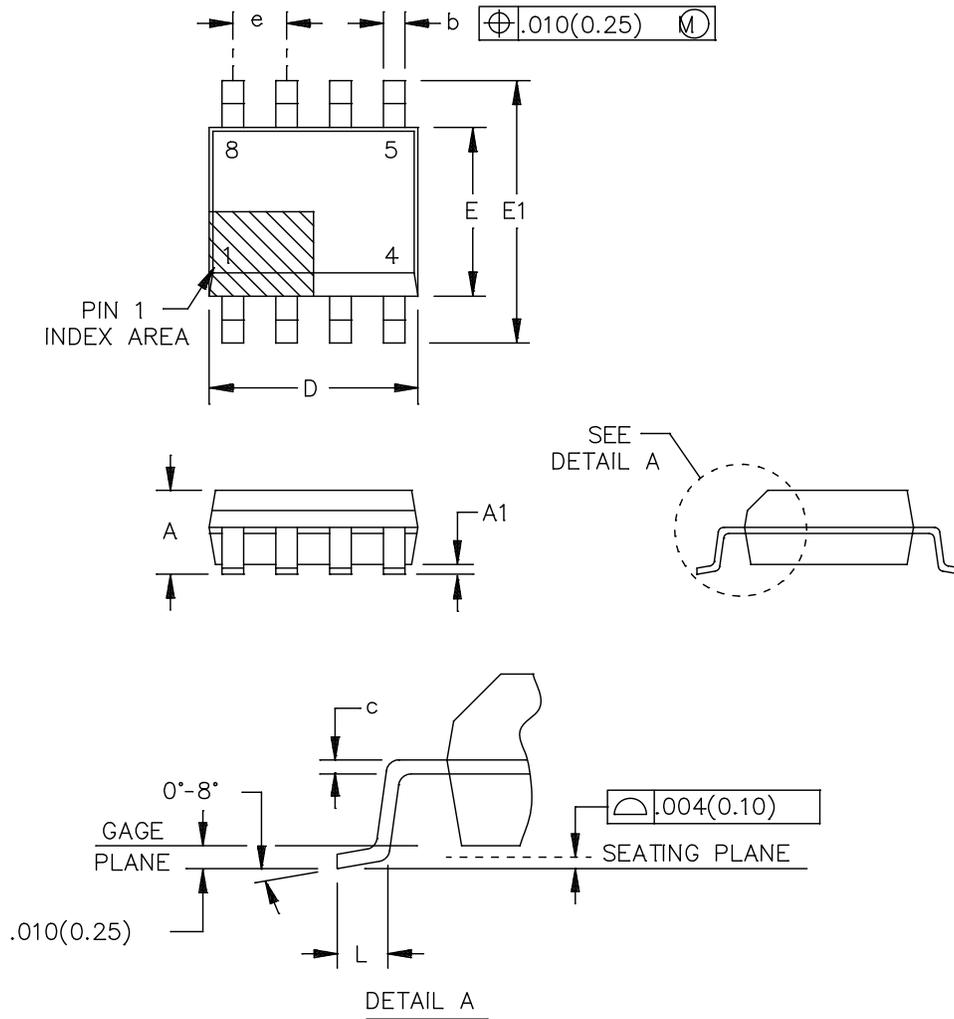


FIGURE 1. Case outline.

<p>DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO</p>	<p>SIZE A</p>	<p>CODE IDENT NO. 16236</p>	<p>DWG NO. V62/05604</p>
		<p>REV D</p>	<p>PAGE 16</p>

Case X

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	0.005	0.010	0.13	0.25
D	0.189	0.197	4.80	5.00
e	0.050 BSC		1.27 BSC	
E	0.150	0.157	3.80	4.00
E1	0.228	0.244	5.80	6.20
L	0.016	0.050	0.40	1.27
n	8 leads		8 leads	

NOTE:

1. All linear dimensions are in inches. Millimeter dimensions are given for information only.
2. This drawing is subject to change without notice.
3. 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 (0.15 mm) per end.
4. Dimension E body width does not include interlead flash. Interlead flash shall not exceed 0.017 inch (0.43 mm) per side.
5. Falls within JEDEC MS-012 variation AA.

FIGURE 1. Case outline. – continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 17

Device types	01,02,03,04	
Case outline	X	
Terminal number	Terminal symbol	Description
1	R	Receiver output.
2	\overline{RE}	Receiver enable.
3	DE	Driver enable.
4	D	Driver input.
5	GND	Ground.
6	A	Driver output A.
7	B	Driver output B.
8	VCC	Supply voltage.

FIGURE 2. Terminal connections.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 18

DRIVER

INPUT	ENABLE	OUTPUTS	
		A	B
D	DE		
H	H	H	L
L	H	L	H
X	L	Z	Z
Open	H	H	L

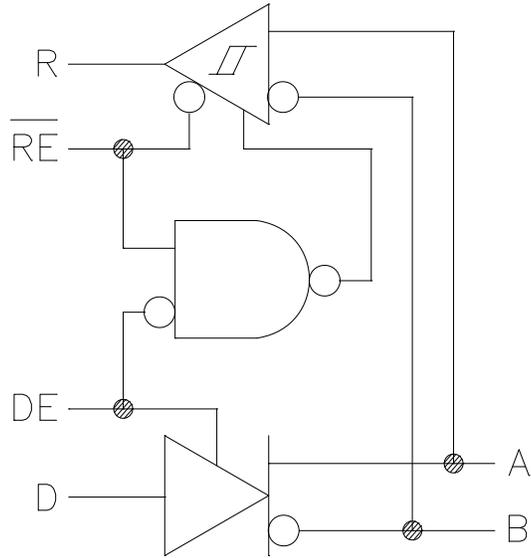
RECEIVER

DIFFERENTIAL INPUTS $V_{ID} = V_A - V_B$	ENABLE \overline{RE}	OUTPUT R
$V_{ID} \leq -0.2 \text{ V}$	L	L
$-0.2 \text{ V} < V_{ID} < -0.01 \text{ V}$	L	?
$-0.01 \text{ V} \leq V_{ID}$	L	H
X	H	Z
Open circuit	L	H
Short circuit	L	H

H = high level
L = low level
Z = high impedance
X = irrelevant
? = indeterminate

FIGURE 3. Truth tables.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 19



LOGIC DIAGRAM
(POSITIVE LOGIC)

FIGURE 4. Logic diagram.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 20

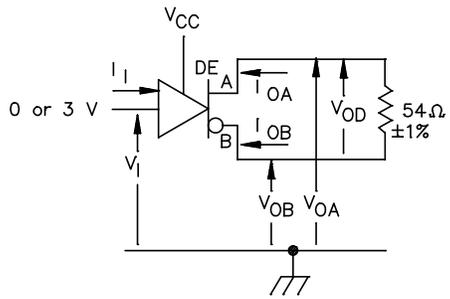


FIGURE 5. DRIVER V_{OD} TEST CIRCUIT AND VOLTAGE AND CURRENT DEFINITIONS

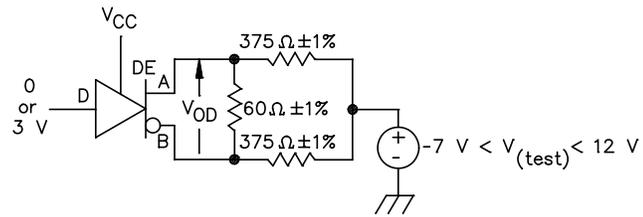
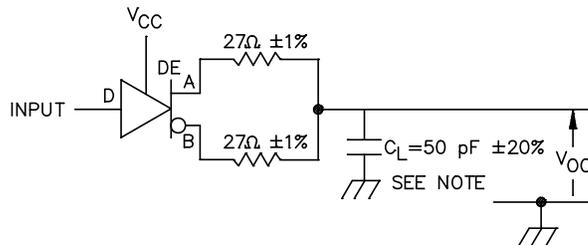
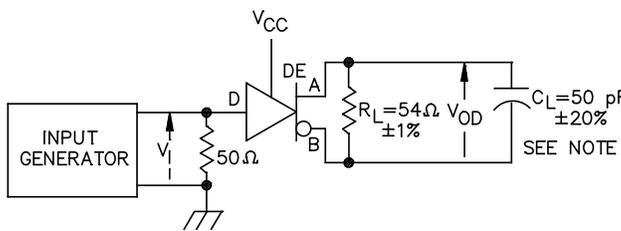
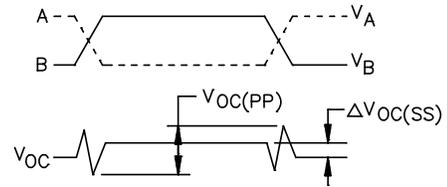


FIGURE 6. DRIVER V_{OD} WITH COMMON-MODE LOADING TEST CIRCUIT



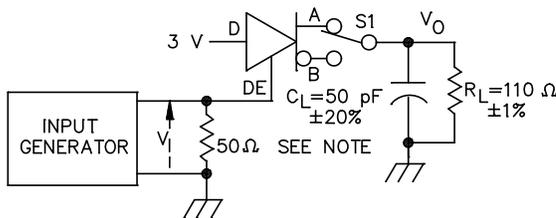
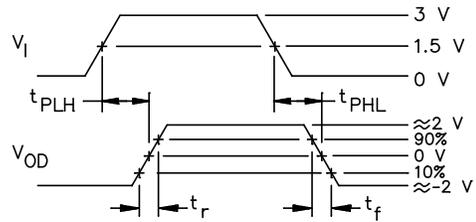
INPUT: PRR=500 kHz, 50% DUTY CYCLE, $t_r < 6$ ns, $t_f < 6$ ns, $Z = 50 \Omega$

FIGURE 7. TEST CIRCUIT AND DEFINITIONS FOR THE DRIVER COMMON-MODE OUTPUT VOLTAGE



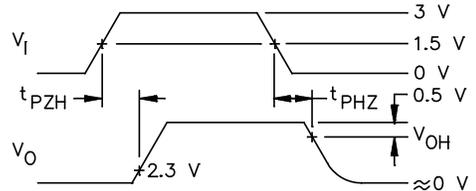
GENERATOR: PRR=500 kHz, 50% DUTY CYCLE, $t_r < 6$ ns, $t_f < 6$ ns, $Z = 50 \Omega$

FIGURE 8. DRIVER SWITCHING TEST CIRCUIT AND VOLTAGE WAVEFORMS



GENERATOR: PRR=500 kHz, 50% DUTY CYCLE, $t_r < 6$ ns, $t_f < 6$ ns, $Z = 50 \Omega$

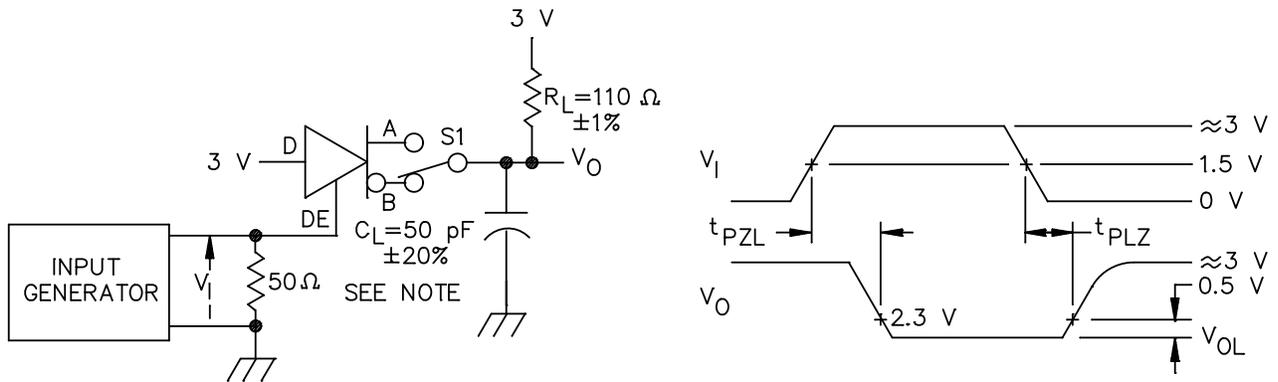
FIGURE 9. DRIVER HIGH-LEVEL ENABLE AND DISABLE TIME TEST CIRCUIT AND VOLTAGE WAVEFORMS



NOTE: C_L includes fixture and instrumentation capacitance.

FIGURES 5 through 9. Timing waveforms and test circuit.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 21



GENERATOR: PRR=500 kHz, 50% DUTY CYCLE, $t_r < 6 \text{ ns}$, $t_f < 6 \text{ ns}$, $Z = 50 \text{ } \Omega$

FIGURE 10. DRIVER LOW-LEVEL OUTPUT ENABLE AND DISABLE TIME TEST CIRCUIT AND VOLTAGE WAVEFORMS

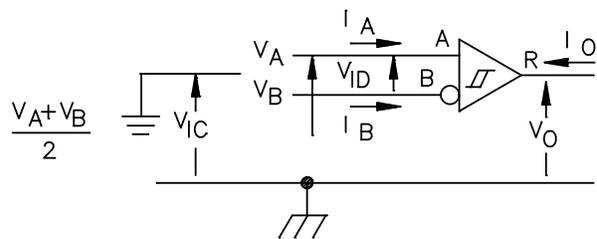
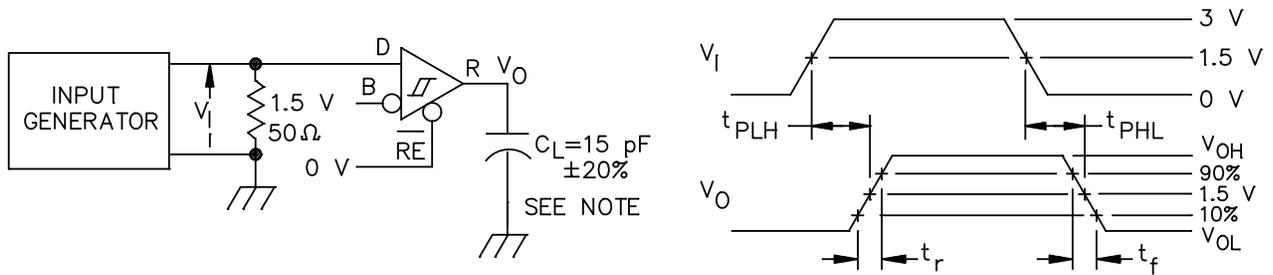


FIGURE 11. RECEIVER VOLTAGE AND CURRENT DEFINITIONS



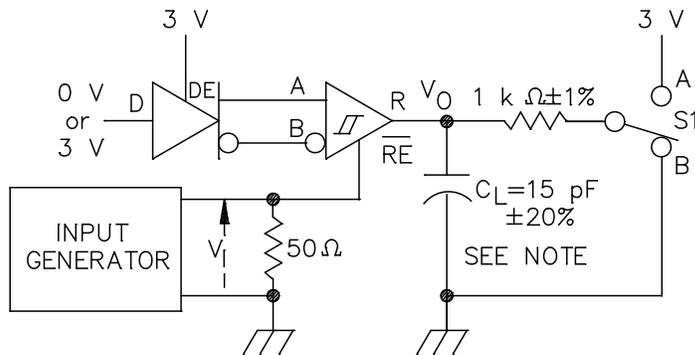
GENERATOR: PRR=500 kHz, 50% DUTY CYCLE, $t_r < 6 \text{ ns}$, $t_f < 6 \text{ ns}$, $Z = 50 \text{ } \Omega$

FIGURE 12. RECEIVER SWITCHING TEST CIRCUIT AND VOLTAGE WAVEFORMS

NOTE: C_L includes fixture and instrumentation capacitance.

FIGURES 10 through 12. Timing waveforms and test circuit – Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 22



GENERATOR: PRR=500 kHz, 50% DUTY CYCLE, $t_r < 6\text{ ns}$, $t_f < 6\text{ ns}$, $Z = 50\ \Omega$

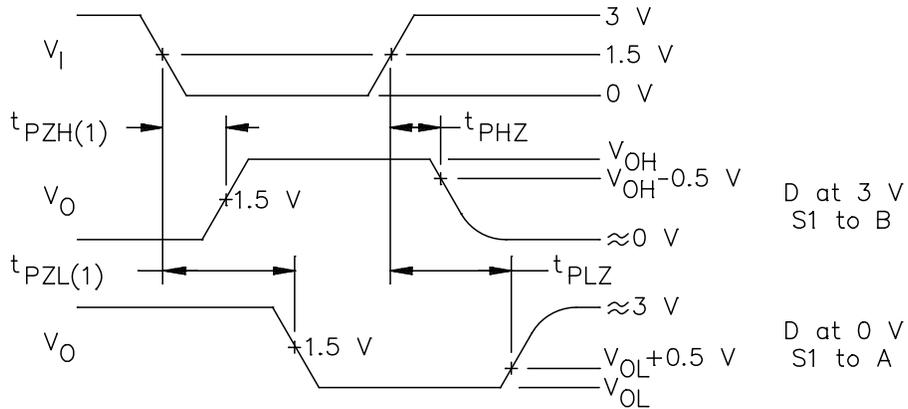
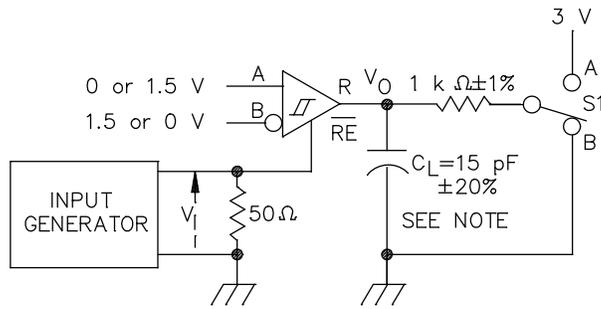


FIGURE 13. RECEIVER ENABLE AND DISABLE TIME TEST CIRCUIT AND VOLTAGE WAVEFORMS WITH DRIVER ENABLED

NOTE: C_L includes fixture and instrumentation capacitance.

FIGURE 13. Timing waveforms and test circuit – Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 23



GENERATOR: PRR=100 kHz, 50% DUTY CYCLE, $t_r < 6$ ns, $t_f < 6$ ps, $Z = 50 \Omega$

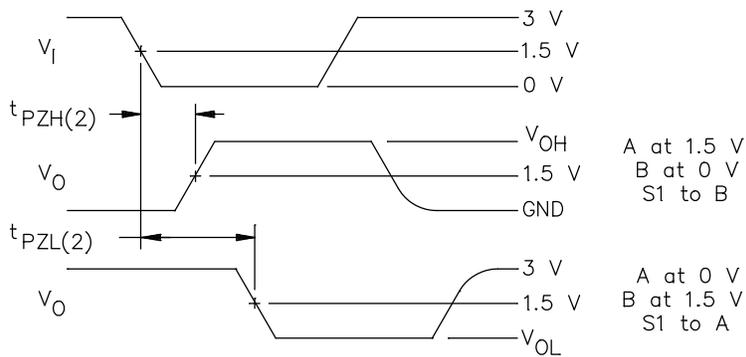


FIGURE 14. RECEIVER ENABLE TIME FROM STANDBY (DRIVER DISABLE)

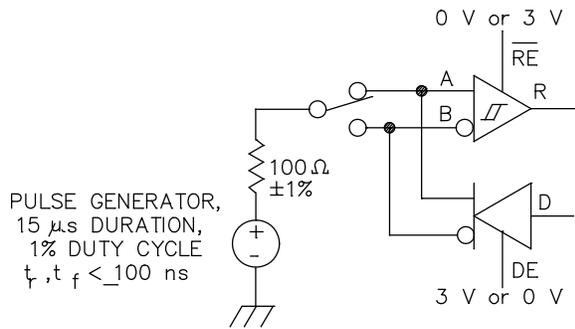


FIGURE 15. TEST CIRCUIT, TRANSIENT OVER VOLTAGE TEST

The transient over voltage test is conducted to test survivability only. Data stability at the R output is not specified.

NOTE: C_L includes fixture and instrumentation capacitance.

FIGURES 14 through 15. Timing waveforms and test circuit – Continued.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 24

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 <http://www.landandmaritime.dla.mil/Programs/Smcr/>.

Vendor item drawing administrative control number <u>1/</u>	Device manufacturer CAGE code	Signaling rate	Unit loads	Vendor part number <u>2/</u>	SOIC marking
V62/05604-01XE	01295	25 Mbps	1/2	SN65HVD10QDREP	V10QEP
V62/05604-02XA	<u>3/</u>	10 Mbps	1/8	SN65HVD11QDREP	V11QEP
V62/05604-03XE	01295	1 Mbps	1/8	SN65HVD12IDREP	V12IEP
V62/05604-04XE	01295	25 Mbps	1/2	SN65HVD10MDREP	V10MEP

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

2/ The D package is taped and reeled as indicated by the R suffix to the part number (for example SN65HVD10QDREP).

3/ No source currently available.

CAGE code

01295

Source of supply

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

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE A	CODE IDENT NO. 16236	DWG NO. V62/05604
		REV D	PAGE 25