REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

Prepared in accordance with ASME Y14.24

Vendor item drawing

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	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 10-01-26	**CHECKED BY** RAJESH PITHADIA	**TITLE** MICROCIRCUIT, LINEAR, FAIL SAFE, RS-485/RS-422 TRANSCEIVER, MONOLITHIC SILICON
	APPROVED BY CHARLES F. SAFFLE	
	SIZE **A** / **CODE IDENT. NO.** **16236**	**DWG NO.** **V62/09646**
	REV	**PAGE** 1 **OF** 14

1. SCOPE

1.1 Scope. This drawing documents the general requirements of a +3.3 V, fail safe, RS-485/RS-422 transceiver 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:

V62/09646	-	01	X	B
Drawing number		Device type (See 1.2.1)	Case outline (See 1.2.2)	Lead finish (See 1.2.3)

1.2.1 Device type(s).

Device type	Generic	Circuit function
01 1/	MAX3077EMSA/PR	+3.3 V fail safe RS-485 / RS-422 transceiver
02 2/	MAX3077EMSA/PR2	+3.3 V fail safe RS-485 / RS-422 transceiver

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

Outline letter	Number of pins	JEDEC PUB 95	Package style
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:

Finish designator	Material
A	Hot solder dip
B	Tin-lead plate
C	Gold plate
D	Palladium
E	Gold flash palladium
Z	Other

_____

1/ Device type 01 100% burn-in and 100% testing at room, hot, and cold temperatures.

2/ Device type 02, 100% testing at room, hot, and cold temperatures.

1.3 Absolute maximum ratings. 3/ 4/

Supply voltage (V_{CC}) ..... +6 V
Driver input voltage (DI) ..... -0.3 V to +6 V
Driver output voltage (Z, Y) ..... -8 V to +13 V
Receiver input voltage (A, B) ..... -8 V to +13 V
Receiver output voltage (RO) ..... -0.3 V to (V_{CC} + 0.3 V)
Driver output current ..... ±250 mA
Junction temperature (T_J) ..... +150°C
Storage temperature range (T_{STG}) ..... -65°C to +150°C
Lead temperature (soldering, 10 seconds) ..... +300°C

1.4 Recommended operating conditions. 5/

Supply voltage range (V_{CC}) ..... +3.3 V ±10%
Operating free-air temperature range (T_A) ..... -55°C to +125°C

1.5 Thermal data table.

Case outline letter	X	X	Unit
PC board	Single layer	Multi-layer 6/	
Power dissipation (P_D), maximum at +70°C	471	606	mW
Power dissipation (P_D) derating above +70°C	5.9	7.6	mW/°C
Thermal resistance, junction to case (θ_{JC})	40	38	°C/W
Thermal resistance, junction to ambient (θ_{JA})	170	132	°C/W

3/ 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.
4/ All voltages referenced to GND.
5/ Use of this product beyond the manufacturer’s 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.
6/ Package thermal resistances were obtained using the method described in JEDEC specification JESD51-7, using a four-layer board. For detailed information on package thermal considerations, refer to www.maxim-ic.com/thermal-tutorial.

2. APPLICABLE DOCUMENTS

JEDEC PUB 95 – Registered and Standard Outlines for Semiconductor Devices
JEDEC JESD51-7 – High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages

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

3.5.4 Driver DC test load. The driver DC test load shall be as shown in figure 4.

3.5.5 Driver timing test circuit. The driver timing test circuit shall be as shown in figure 5.

3.5.6 Driver propagation delay waveforms. The driver propagation delay waveform shall be as shown in figure 6.

3.5.7 Receiver timing test circuit. The receiver timing test circuit shall be as shown in figure 7.

3.5.8 Receiver propagation delay waveforms. The receiver propagation delay waveforms shall be as shown in figure 8.

TABLE I. Electrical performance characteristics. 1/

Test	Symbol	Conditions 2/ V_{CC} = 3.3 V ±10% unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Driver section.							
Differential driver output	V_{OD}	R_L = 100 Ω (RS422), see figure 4	-55°C to +125°C	01, 02	2	V_{CC}	V
		R_L = 54 Ω (RS485), see figure 4			1.5	V_{CC}	
		No load				V_{CC}	
Change in magnitude of differential output voltage	ΔV_{OD}	R_L = 100 Ω or 54 Ω, 3/ see figure 4	-55°C to +125°C	01, 02		0.2	V
Driver common mode output voltage	V_{OC}	R_L = 100 Ω or 54 Ω, see figure 4	-55°C to +125°C	01, 02		3	V
Change in magnitude of common mode voltage	ΔV_{OC}	R_L = 100 Ω or 54 Ω, 3/ see figure 4	-55°C to +125°C	01, 02		0.2	V
Input high voltage	V_{IH}	DI	-55°C to +125°C	01, 02	2		V
Input low voltage	V_{IL}	DI	-55°C to +125°C	01, 02		0.8	V
Input hysteresis	V_{HYS}	DI, V_{CC} = 3.3 V	+25°C	01, 02	100 typical		mV
Input current	I_{IN1}	DI	-55°C to +125°C	01, 02		±1	µA
Driver short circuit output current	I_{OSD}	0 V ≤ V_{OUT} ≤ 12 V 4/	-55°C to +125°C	01, 02	40	250	mA
		-7 V ≤ V_{OUT} ≤ V_{CC} 4/			-250	-40	
Driver short-circuit foldback output current	I_{OSDF}	(V_{CC} – 1 V) ≤ V_{OUT} ≤ 12 V 4/	-55°C to +125°C	01, 02	20		mA
		-7 V ≤ V_{OUT} ≤ 1 V 4/				-20	
Thermal-shutdown threshold	T_{TS}	V_{CC} = 3.3 V	+25°C	01, 02	175 typical		°C
Thermal-shutdown hysteresis	T_{TSH}	V_{CC} = 3.3 V	+25°C	01, 02	15 typical		°C

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions 2/ V_{CC} = 3.3 V ±10% unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Receiver section.							
Receiver differential threshold voltage	V_{TH}	-7 V ≤ V_{CM} ≤ 12 V	-55°C to +125°C	01, 02	-200	-50	mV
Receiver input hysteresis	ΔV_{TH}	V_A + V_B = 0 V, V_{CC} = 3.3 V	+25°C	01, 02	15 typical		mV
Receiver output (RO) high voltage	V_{OH}	I_O = -1 mA	-55°C to +125°C	01, 02	V_{CC} – 0.6		V
Receiver output (RO) low voltage	V_{OL}	I_O = 1 mA	-55°C to +125°C	01, 02		0.4	V
Receiver input resistance	R_{IN}	-7 V ≤ V_{CM} ≤ 12 V	-55°C to +125°C	01, 02	96		kΩ
Receiver output short-circuit current	I_{OSR}	0 V ≤ V_{RO} ≤ V_{CC}	-55°C to +125°C	01, 02		±80	mA
Supply current section.							
Supply current	I_{CC}	No load	-55°C to +125°C	01, 02		1.5	mA
Electrostatic discharge (ESD) protection section.							
ESD protection for Y, Z, A, and B		Human body model, V_{CC} = 3.3 V	+25°C	01, 02	±15 typical		kV
Driver switching characteristics section.							
Driver propagation delay	t_{DPLH}	C_L = 50 pF, R_L = 54 Ω, see figures 5 and 6	-55°C to +125°C	01, 02		50	ns
	t_{DPHL}					50	
Driver differential output rise or fall time	t_{DR}, t_{DF}	C_L = 50 pF, R_L = 54 Ω, see figures 5 and 6	-55°C to +125°C	01, 02		15	ns
Differential driver output skew | t_{DPLH} – t_{DPHL} |	t_{DSKEW}	C_L = 50 pF, R_L = 54 Ω, see figures 5 and 6	-55°C to +125°C	01, 02		8	ns
Maximum data rate			-55°C to +125°C	01, 02	16		Mbps

See footnotes at end of table.

TABLE I. Electrical performance characteristics – Continued. 1/

Test	Symbol	Conditions 2/ V_{CC} = 3.3 V ±10% unless otherwise specified	Temperature, T_A	Device type	Limits		Unit
					Min	Max	
Receiver switching characteristics section.							
Receiver propagation delay	t_{RPLH}	C_L = 15 pF, see figures 7 and 8	-55°C to +125°C	01, 02		75	ns
	t_{RPHL}					75	
Receiver output skew $\lvert t_{RPLH} - t_{RPHL} \rvert$	t_{RSKEW}	C_L = 15 pF, see figures 7 and 8	-55°C to +125°C	01, 02		8	ns
Maximum data rate			-55°C to +125°C	01, 02	16		Mbps

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 currents into the device are positive. All currents out of the device are negative. All voltages are referred to device ground, unless otherwise noted.

3/ ΔV_{OD} and ΔV_{OC} are the changes in V_{OD} and V_{OC}, respectively, when the driver input (DI) changes state.

4/ The short-circuit output current applies to peak current just prior to foldback current limiting. The short-circuit foldback output current applies during current limiting to allow a recovery from bus contention.

Case X

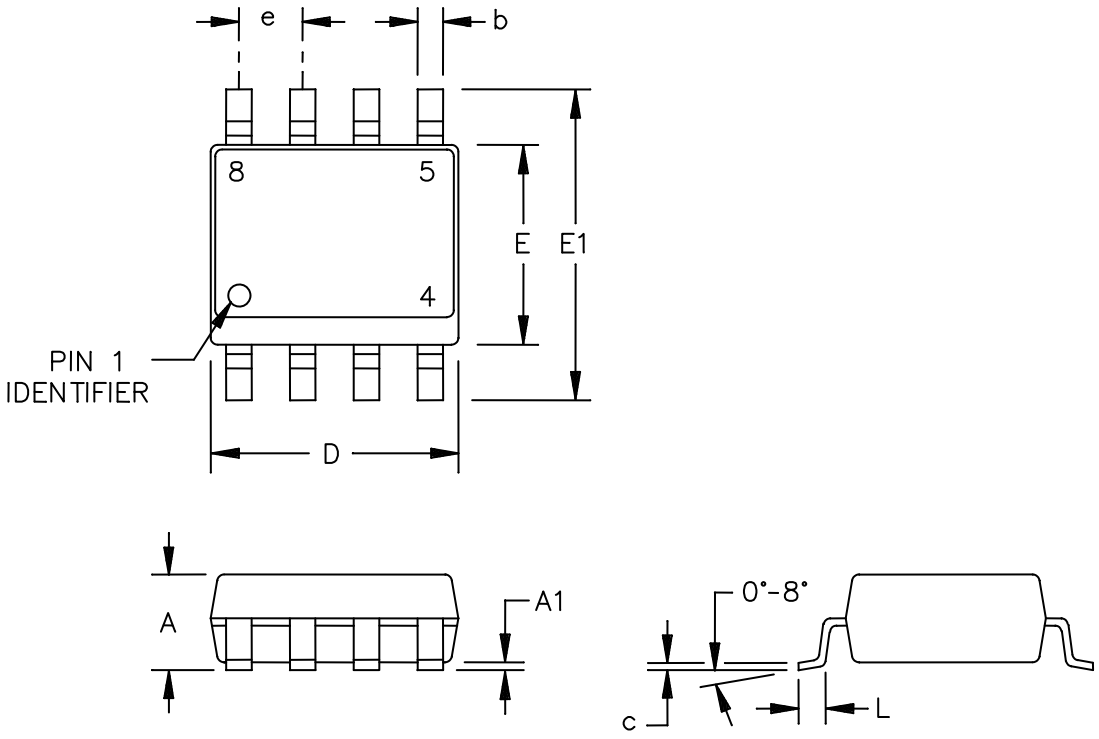

FIGURE 1. Case outline.

DEFENSE SUPPLY CENTER, COLUMBUS COLUMBUS, OHIO	SIZE **A**	CODE IDENT NO. **16236**	DWG NO. **V62/09646**
		REV	PAGE 8

Case X – continued.

Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	0.053	0.069	1.35	1.75
A1	0.004	0.010	0.10	0.25
b	0.014	0.019	0.35	0.49
c	0.007	0.010	0.19	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 millimeters, inch dimensions are given for reference only.
2. Dimensions D and E do not include mold flash.
3. Mold flash or protrusion not to exceed 0.15 mm (0.006 inch).
4. Leads to be coplanar within 0.10 mm (0.004 inch).
5. Falls within reference to JEDEC MS-012-AA.

FIGURE 1. Case outline - Continued.

Device types	01 and 02	
Case outline	X	
Terminal number	Terminal symbol	Function
1	V_{CC}	Positive supply V_{CC} = 3.3 V ±10%. Bypass V_{CC} to GND with a 0.1 μF capacitor.
2	RO	Receiver output. If (A – B) ≥ -50 mV, RO is high; if (A – B) ≤ 200 mV, RO is low.
3	DI	Driver input . A low on DI forces the noninverting output low and the inverting output high. Similarly, a high on DI forces the noninverting output high and the inverting output low.
4	GND	Ground.
5	Y	Noninverting driver output.
6	Z	Inverting driver output.
7	B	Inverting receiver input.
8	A	Noninverting receiver input.

FIGURE 2. Terminal connections.

Transmitting		
Input	Outputs	
DI	Z	Y
1	0	1
0	1	0

Receiving	
Inputs	Output
A, B	RO
≥ -50 mV	1
≤ -200 mV	0
Open/shorted	1

FIGURE 3. Truth table.

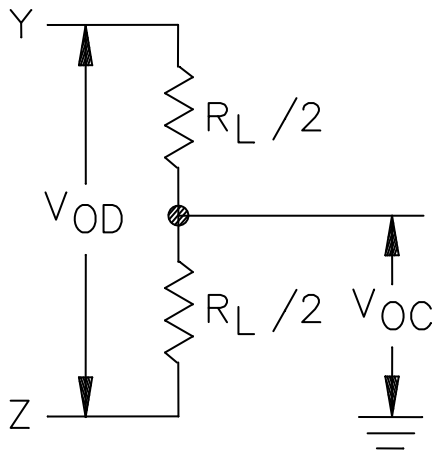

FIGURE 4. Driver dc test load.

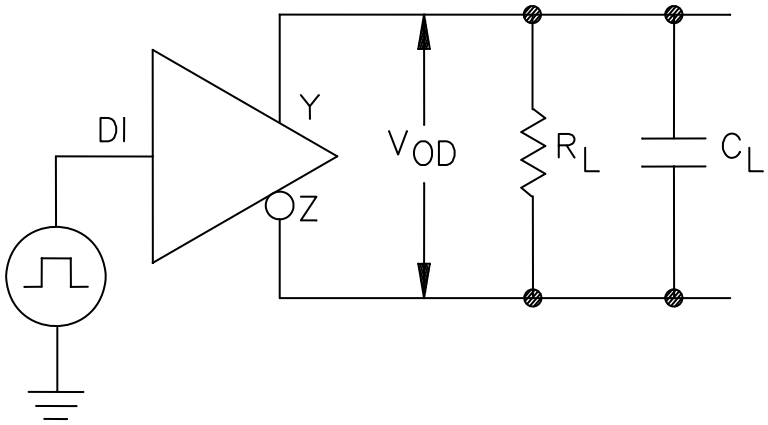

FIGURE 5. Driver timing test circuit.

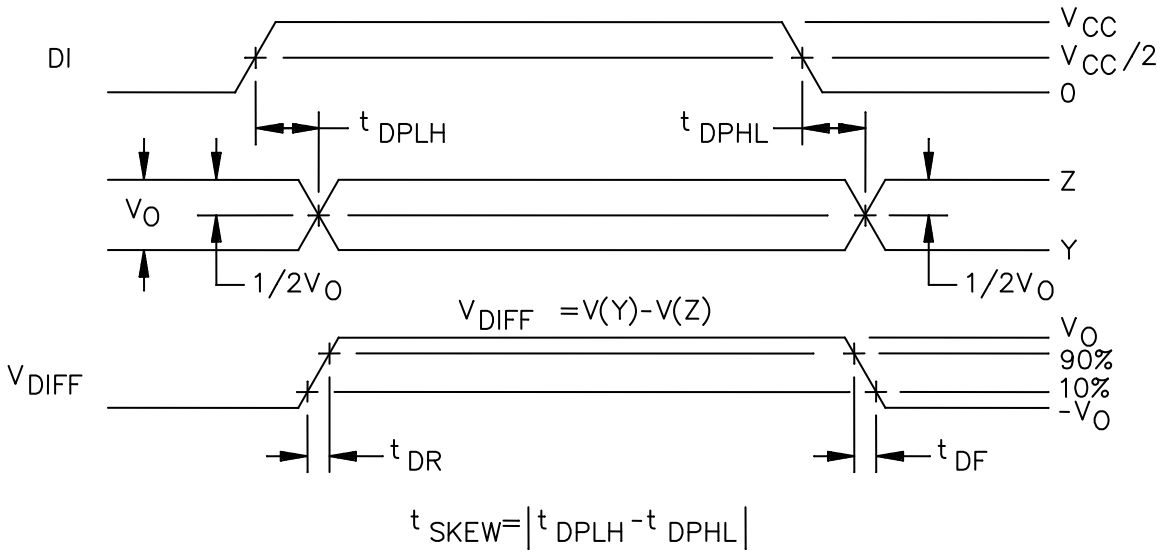

FIGURE 6. Driver propagation delay waveforms.

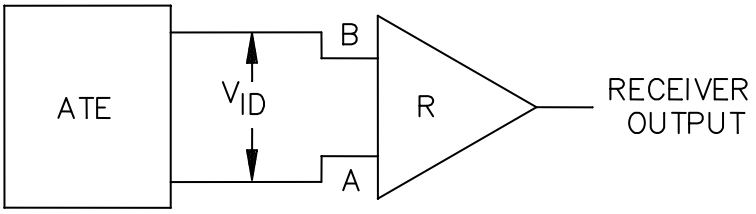

FIGURE 7. Receiver timing test circuit.

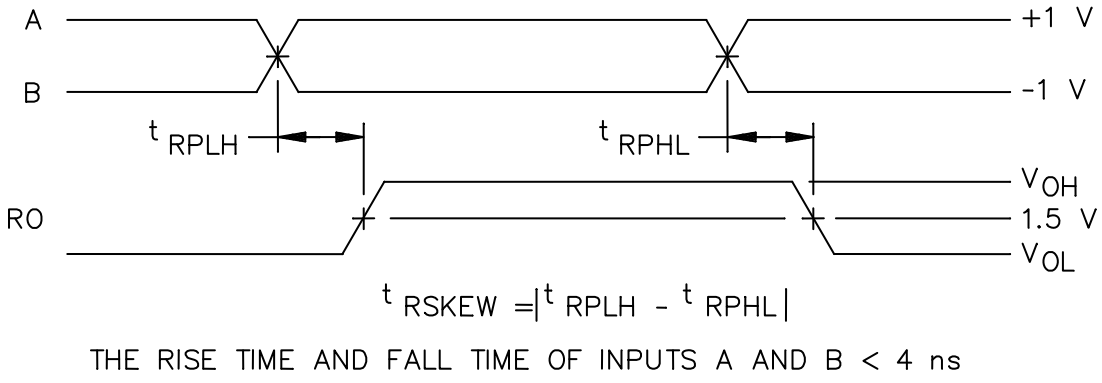

FIGURE 8. Receiver propagation delay waveforms.

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 1/ 2/	Device manufacturer CAGE code	Vendor part number 3/
V62/09646-01XB	1ES66	MAX3077EMSA/PR
V62/09646-02XB	1ES66	MAX3077EMSA/PR2

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

2/ For the latest package outline information and land patterns, go to website www.maxim-ic.com/packages.

3/ See paragraph 1.2.1 for information on /PR and /PR2 differences.

CAGE code	Source of supply
1ES66	Maxim Integrated Products 120 San Gabriel Drive Sunnyvale, CA 94086-5125