

MDDS26LS31M-X REV 1A0

 Original Creation Date: 01/24/96
 Last Update Date: 03/17/97
 Last Major Revision Date: 03/06/96

QUAD HIGH SPEED DIFFERENTIAL LINE DRIVER
General Description

The DS26LS31 is a quad differential line driver designed for digital data transmission over balanced lines. The DS26LS31 meets all the requirements of EIA Standard RS-422 and Federal Standard 1020. It is designed to provide unipolar differential drive to twisted-pair or parallel-wire transmission lines.

The circuit provides an enable and disable function common to all four drivers. The DS26LS31 features TRI-STATE outputs and logically ANDed complementary outputs. The inputs are all LS compatible and are all one unit load.

The DS26LS31 features a power up/down protection circuit which keeps the output in a high impedance state (TRI-STATE) during power up or down preventing erroneous glitches on the transmission lines.

Industry Part Number

DS26LS31

NS Part Numbers

 DS26LS31ME-SMD *
 DS26LS31MJ-QMLV**
 DS26LS31MJ-SMD ***
 DS26LS31MW-QMLV****
 DS26LS31MW-SMD*****

Prime Die

DS26LS31

Controlling Document

SEE FEATURES SECTION

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- Operation from Single 5V Supply
- Outputs Won't Load Line When Vcc=0V
- Four Line Drivers in One Package For Maximum Package Density
- Output Short-Circuit Protection
- Complementary Outputs
- Meets the requirements of EIA Standard RS-422
- Pin Compatible with AM26LS31
- Glitch Free Power Up/Down
- Controlling Document: 5962-7802301Q2A*, VEA**, MEA***, VFA****, MFA*****

(Absolute Maximum Ratings)

(Note 1)

Supply Voltage	7V
Input Voltage	7V
Output Voltage	5.5V
Output Voltage (Power OFF)	-0.25 to 6V
Maximum Power Dissipation @ 25 C	
(Note 2)	
Cavity Package	1400 mW
LCC	1600 mW
Flat Pack	850 mW

Note 1: Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provide conditions for actual device operation.

Note 2: Derate CDip 11.5mW/C, CLCC= 13mW/C, CERPACK = 7.4mW/C above 25C.

Recommended Operating Conditions

Supply Voltage, Vcc	MIN 4.5	MAX 5.5	UNITS V
Temperature, TA	MIN -55	MAX +125	UNITS C

Electrical Characteristics

DC PARAMETERS

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vih	Logical "1" Input Voltage	Vcc= 4.5V	1, 2		2		V	1, 2, 3
Vil	Logical "0" Input Voltage	Vcc= 5.5V	1, 2			.8	V	1, 2, 3
Voh	Logical "1" Output Voltage	Vcc= 4.5V, Ioh= -20mA	2		2.5		V	1, 2, 3
Vol	Logical "0" Output Voltage	Vcc= 4.5V, Iol= 20mA	2			.5	V	1, 2, 3
Iih	Logical "1" Input Current	Vcc= 5.5V, Vin=2.7V	2		-2.0	20	uA	1, 2, 3
Iil	Logical "0" Input Current	Vcc= 5.5V, Vin= .4V	2		100	-360	uA	1, 2, 3
Ii	Input Reverse Current	Vcc=5.5V, Vin=7V	2		-.01	.1	mA	1, 2, 3
Io	TRI-STATE Output Current	Vcc=5.5V, Vo= .5V	2			-20	uA	1, 2, 3
		Vcc=5.5V, Vo=2.5V	2			20	uA	1, 2, 3
Vic	Input Clamp Voltage	Vcc=4.5V, Iin= -18mA	2			-1.5	V	1, 2, 3
Ios	Output Short Circuit Current	Vcc=5.5V	2		-30	-150	mA	1, 2, 3
Icc	Power Supply Current	Vcc=5.5V, All Outputs Disabled or Active	2			80	mA	1, 2, 3

Electrical Characteristics

AC PARAMETERS: PROPAGATION DELAY TIME:

(The following conditions apply to all the following parameters, unless otherwise specified.)

AC: $V_{CC}=5V$, $V_{in} = 1.3V$ to $V_o = 1.3V$, $V(pulse) = 0$ to $3V$

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPLH	Input to Output	CL = 30 pF	2			20	nS	9
			2			30	nS	10, 11
tPHL	Input to Output	CL = 30 pF	2			20	nS	9
			2			30	nS	10, 11
Skew	Output to Output	CL = 30 pF	2			6	nS	9
			2			9	nS	10, 11
tPLZ	Enable Time	S2 Open, Enable, CL = 10 pF	2			35	nS	9
			2			53	nS	10, 11
		S2 Open, $\overline{\text{Enable}}$, CL = 10 pF	2			35	nS	9
		S2 Open, $\overline{\text{Enable}}$, CL = 10 pF	2			53	nS	10, 11
tPHZ	Enable Time	S1 Open, Enable, CL = 10 pF	2			30	nS	9
			2			45	nS	10, 11
		S1 Open, $\overline{\text{Enable}}$, CL = 10 pF	2			30	nS	9
		S1 Open, $\overline{\text{Enable}}$, CL = 10 pF	2			45	nS	10, 11
tPZL	Disable Time	S2 Open, Enable, CL = 30 pF	2			45	nS	9
			2			68	nS	10, 11
		S2 Open, $\overline{\text{Enable}}$, CL = 30 pF	2			45	nS	9
		S2 Open, $\overline{\text{Enable}}$, CL = 30 pF	2			68	nS	10, 11
tPZH	Disable Time	S1 Open, Enable, CL = 30 pF	2			40	nS	9
			2			60	nS	10, 11
		S1 Open, $\overline{\text{Enable}}$, CL = 30 pF	2			40	nS	9
		S1 Open, $\overline{\text{Enable}}$, CL = 30 pF	2			60	nS	10, 11

DC PARAMETERS - DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: Delta calculations performed on QMLV only devices after burn-in and at Group B5.

AC:

Voh	Output High Voltage	$V_{CC} = 4.5$, $I_{oh} = -20$ mA	2		-250	250	mV	1
Vol	Output Low Voltage	$V_{CC} = 4.5$, $I_{ol} = 20$ mA	2		-50	50	mV	1
Icc	Power Supply Current	$V_{CC} = 5.5$, All outputs disabled or active	2		-8	8	mA	1

Note 1: Parameter tested go-no-go only.

(Continued)

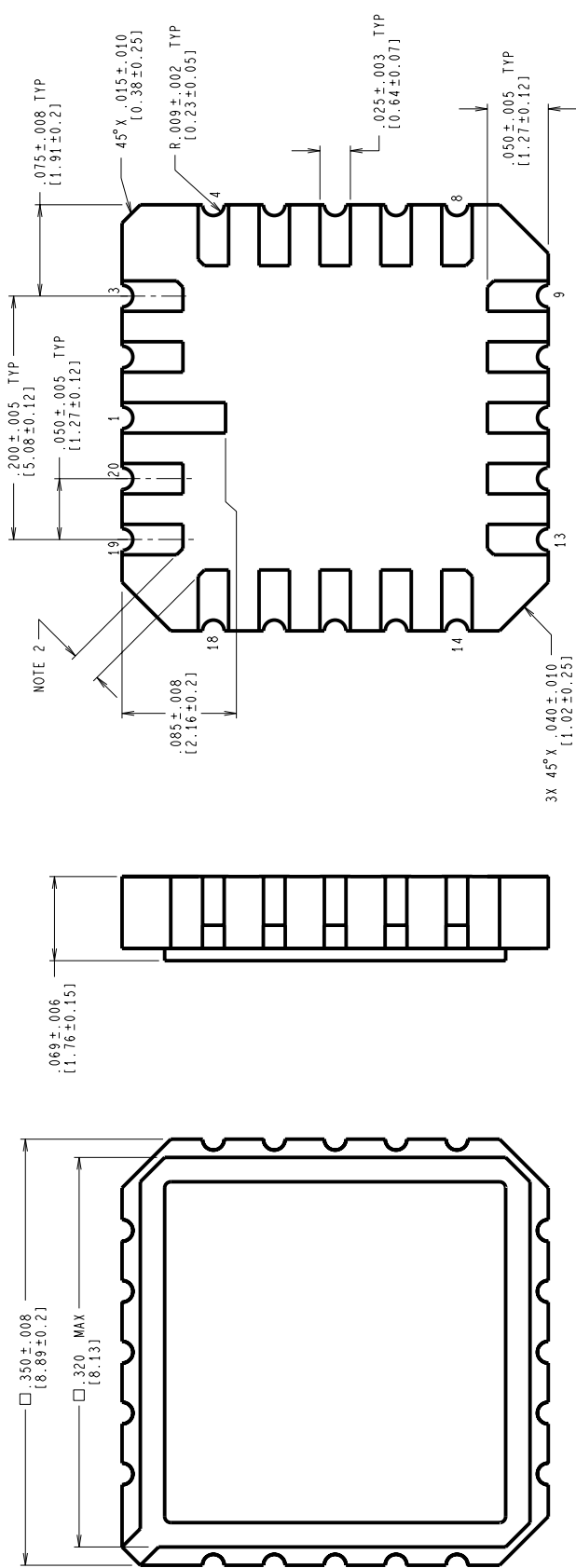
Note 2: Subgroups 1,2 and 9,10: Power dissipation must be externally controlled at elevated temperatures.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
E20ARE	LDLESS CHIP CARRIER, TYPE C 20 TERMINAL (P/P DWG)
J16ARL	CERDIP (J), 16 LEAD (P/P DWG)
W16ARL	CERPACK (W), 16 LEAD (P/P DWG)

See attached graphics following this page.

REVISIONS			
LTR	DESCRIPTION	E.C.N.	DATE
E	REVISE AND REDRAW	10005	02/10/94 DEG/



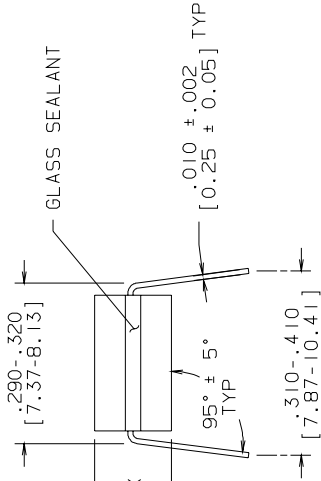
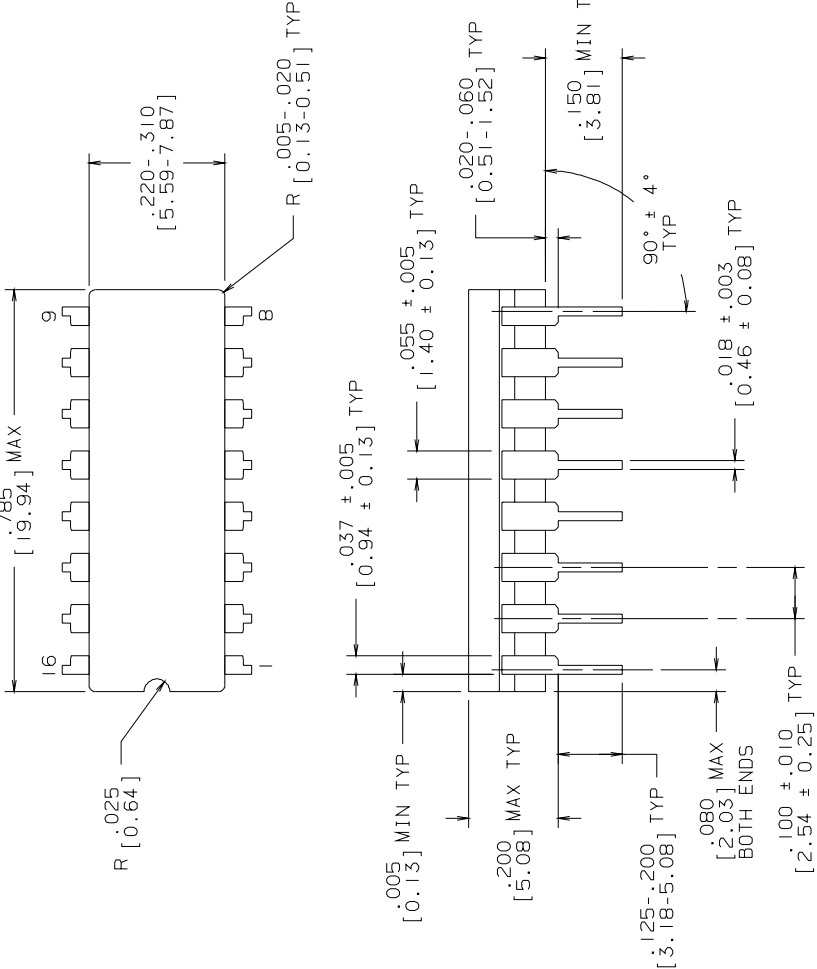
CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS

- NOTES: UNLESS OTHERWISE SPECIFIED.
- LEAD FINISH TO BE ONE OF THE FOLLOWING:
 - 50 MICRONS/12.7 MICROMETERS MINIMUM GOLD PLATING OVER 50-350 MICRONS/1.27-8.89 MICROMETERS NICKEL.
 - SOLDER DIP.
 - SOLDER THICKNESS PER LATEST REVISION OF MIL-STD-1835.
 - CORNER PADS MAY HAVE A 45° X $.020$ IN/0.51mm MAXIMUM CHAMFER TO ACCOMPLISH THE .015 IN/0.38mm DIMENSION.
 - REFERENCE JEDEC REGISTRATION MS-004, VARIATION CB, DATED 7/90.

MIL/AERO CONFIGURATION CONTROL

APPROVALS		DATE	NATIONAL SEMICONDUCTOR CORPORATION	
DESIGN	Design Grady	02/10/94	2000 Semiconductor Drive, Santa Clara, CA 95052-8000	
ESTG. CHK.			LEADLESS CHIP CARRIER, TYPE C, 20 TERMINAL	
ENGR. CHK.				
APPROVAL				
PROJECTION		SCALE	SIZE	REV
		N/A	C	MKT-E20A
		DO NOT SCALE DRAWING		E
				SHEET 1 of 1

R E V I S I O N S				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
L	REVISE PER CURRENT STD; REDRAW	09996	09/15/93	TL/



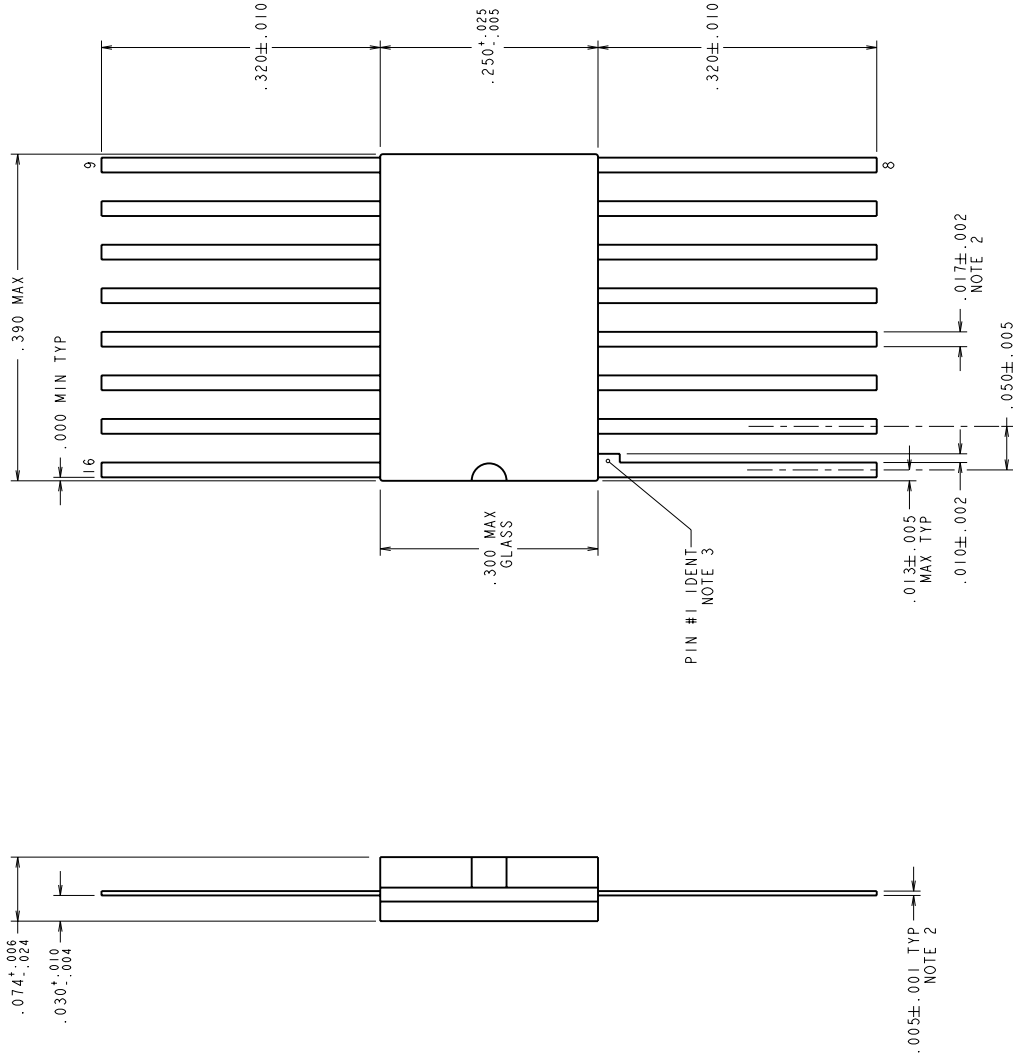
MIL/AERO MIL-M-38510
 CONFIGURATION CONTROL CONFIGURATION CONTROL

CONTROLLING DIMENSION: INCH				
APPROVALS	DATE	NATIONAL SEMICONDUCTOR CORPORATION		
DRAWN LEQUANG	09/15/93	2900 Semiconductor Drive, Santa Clara, CA 95052-8090		
DFTG. CHK.				
ENGR. CHK.				
APPROVAL				
PROJECTION 		SCALE N/A	SIZE B	DRAWING NUMBER MKT-J16A
		DO NOT SCALE	DRAWING	SHEET 1 OF 1

- NOTES: UNLESS OTHERWISE SPECIFIED
1. LEAD FINISH TO BE 200 MICRONS / 5.08 MICROMETERS MINIMUM SOLDER MEASURED AT THE CREST OF THE MAJOR FLATS.
 2. JEDEC REGISTRATION M0-036, VARIATION AD, DATED 04/1981.

CERDIP (J),
 16 LEAD

REVISIONS			
LTR	DESCRIPTION	E.C.N.	DATE
K	REVISE AND REDRAW PER NEW STANDARD.	10514	07/28/94
L	.017±.002 WAS .017±.020.	10656	10/21/94
			DEG/



NOTES: UNLESS OTHERWISE SPECIFIED.

1. LEAD FINISH: SOLDER DIPPED WITH Sn60 OR Sn63 SOLDER CONFORMING TO MIL-M-38510 TO A MINIMUM THICKNESS OF 200 MICROINCHES. SOLDER MAY BE APPLIED OVER LEAD BASIS METAL OR Sn PLATE.
2. MAXIMUM LIMIT MAY BE INCREASED BY .003 INCHES AFTER LEAD FINISH APPLIED.
3. LEAD 1 IDENTIFICATION SHALL BE:
 - a) A NOTCH OR OTHER MARK WITHIN THIS AREA
 - b) A TAB ON LEAD 1, EITHER SIDE
4. REFERENCE JEDEC REGISTRATION M0-092, VARIATION AC, DATED 04/89.

MIL/AERO
CONFIGURATION CONTROL

MIL-M-38510
CONFIGURATION CONTROL

APPROVALS		DATE		 <i>National Semiconductor</i> 2900 Semiconductor dr., Santa Clara, CA 95052-8090
DRN		07/28/94		
DTG		CHK		
EMR		CHK		
PROJECTION				
SCALE	SIZE	DRAWING NUMBER		REV
N/A	C	MKT-WI6A		L
DO NOT SCALE DRAWING		SHEET 1 of 1		

National Semiconductor
2000 Semiconductor dr, Santa Clara, CA 95052-8090

CERPACK, I6 LEAD