National Semiconductor

MICROCIRCUIT DATA SHEET

MNDS26F31M-X-RH REV 0B0

Original Creation Date: 11/02/00
Last Update Date: 05/04/01
Last Major Revision Date:

QUAD HIGH SPEED DIFFERENTIAL LINE DRIVER: ALSO AVAILABLE GUARANTEED TO 300K RAD(Si) TESTED TO MIL-STD-883, METHOD 1019.5

General Description

The DS26F31 is a quad differential line driver designed for digital data transmission over balanced lines. The DS26F31 meets all the requirements of EIA Standard RS-422. It is designed to provide unipolar differential driver to twisted-pair or parallel-wire transmission lines.

The DS26F31 offers improved performance due to the use of state-of-the-art L-FAST bipolar technology. The L-FAST technology allows for higher speeds and lower currents by utilizing extremely short gate delay times.

The circuit provides an enable and disable function common to all four drivers. The DS26F31M features TRI-STATE outputs and logical OR-ed complementary enable inputs. The inputs are all LS compatible and are all one unit load.

The DS26F31M offers optimum performance when used with the DS26F32 Quad Differential Line Receiver.

Industry Part Number

DS26F31

Prime Die

M631

Controlling Document

SEE FEATURES SECTION

NS Part Numbers

DS26F31ME/883
DS26F31MJ-QMLV
DS26F31MJ/883
DS26F31MJFQMLV
DS26F31MW-QMLV
DS26F31MW/883
DS26F31MWFQMLV
DS26F31MWG/883
DS26F31MWGFQMLV

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (^{O}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

- Military temperature range
- Operation from single +5.0V supply
- Outputs won't load line when Vcc = 0V
- Output short circuit protection
- Meets the requirements of EIA standard RS-422
- High output drive capability for 100 Ohms terminated transmission lines.

CONTROLLING DOCUMENTS:

DS26F31ME/883	5962-7802302M2A
DS26F31MJ-QMLV	5962-7802302VEA
DS26F31MJ/883	5962-7802302MEA
DS26F31MJFQMLV	5962F7802302VEA
DS26F31MW-QMLV	5962-7802302VFA
DS26F31MW/883	5962-7802302MFA
DS26F31MWFQMLV	5962F7802302VFA
DS26F31MWG/883	5962-7802302MZA
DS26F31MWGFQMLV	5962F7802302VZA

(Absolute Maximum Ratings)
(Note 1)

Storage Temperature Range	-65 C to +175 C
Lead Temperature	
Soldering, 60 seconds	300 C
Supply Voltage	7.0V
Input Voltage	7.0V
Output Voltage	5.5V
Maximum Power Dissipation	450mW
Thermal Resistance (Junction to Case)	
J pkg - (CerDip)	14 C/W
W pkg - (CerPak)	13 C/W
E pkg - (LCC)	15 C/W
Thermal Resistance (Junction to Ambient)	
J pkg (CerDip), derate above +25C at 11.4mW/C	88 C/W
W pkg (CerPak), derate above +25C at 6.6mW/C	151 C/W
E pkg (LCC), derate above +25C at 12.3mW/C	81 C/W

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 tables of "Electrical Characteristics" provide conditions for actual device operation.

Recommended Operating Conditions

Temperature	-55 C to +125 C
Supply Voltage	4.5V to 5.5V

Electrical Characteristics

DC PARAMETERS: (SEE NOTE 6)

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Vih	Logical "1" Input Voltage	Vcc = 4.5V	2		2		V	1, 2, 3
Vil	Logical "0" Input Voltage	Vcc = 5.5V	2			.8	V	1, 2, 3
Voh	Logical "1" Output Voltage	Vcc = 4.5V, Ioh = -20mA, Vil = .8V, Vih = 2V			2.5		V	1, 2, 3
Vol	Logical "0" Output Voltage	Vcc = 4.5V, Iol = 20mA, Vil = .8V, Vih = 2V				.5	V	1, 2, 3
Iih	Logical "1" Input Current	Vcc = 5.5V, Vin = 2.7V	5		-2.0	20	uA	1, 2, 3
Iil	Logical "0" Input Current	Vcc = 5.5V, Vin = .4V	5		100	-200	uA	1, 2, 3
Ii	Input Reverse Current	Vcc = 5.5V, Vin = 7V	5		-0.01	.1	mA	1, 2, 3
Ioz	TRI-STATE Output Current	Vcc = 5.5V, Vo = .5V				-20	uA	1, 2, 3
		Vcc = 5.5V, Vo = 2.5V				20	uA	1, 2, 3
Vi	Input Clamp Voltage	Vcc = 4.5V, Iin = -18mA				-1.5	V	1, 2, 3
Isc(min)	Output Short Circuit Current	Vcc = 5.5V, Vo = 0V			-30		mA	1, 2, 3
Isc(max)	Output Short Circuit Current	Vcc = 5.5V, Vo = 0V				-150	mA	1, 2, 3
Icc Dis	Power Supply Current	Vcc = 5.5V, Vin = .8V or 2V, Ven = .8V, $\overline{Ven}$ = 2V				50	mA	1, 2, 3
Icc En	Power Supply Current	Vcc = 5.5V, Ven = 2V, $\overline{Ven}$ = .8V				40	mA	1, 2, 3

Electrical Characteristics

AC PARAMETERS: PROPAGATION DELAY TIME (SEE NOTE 6)

(The following conditions apply to all the following parameters, unless otherwise specified.)
AC: Vcc = 5V, Cl = 50pF or equivalent impedance provided by diode load

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tPLH	Input to Output		3			16	nS	9
			3			24	nS	10, 11
		Cl = 30pF	4			15	nS	9
			4			23	nS	10, 11
tPHL	Input to Output		3			17	nS	9
			3			25	nS	10, 11
		Cl = 30pF	4			15	nS	9
			4			23	nS	10, 11
tLZ	Disable Time		3			38	nS	9
			3			56	nS	10, 11
		CL = 10 pF	4			35	nS	9
			4			53	nS	10, 11
tHZ	Disable Time		3			23	nS	9
			3			30	nS	10, 11
		CL = 10 pF	4			20	nS	9
			4			27	nS	10, 11
tZL	Enable Time		3			28	nS	9
			3			40	nS	10, 11
		CL = 30pF	4			25	nS	9
			4			37	nS	10, 11
tZH	Enable Time		3			32	nS	9
			3			52	nS	10, 11
		CL = 30 pF	4			30	nS	9
			4			50	nS	10, 11
Skew	Output to Output		3			6	nS	9
			3			9	nS	10, 11
		Cl = 30pF	4			4.5	nS	9
			4			7	nS	10, 11

Electrical Characteristics

DC PARAMETERS - DRIFT VALUES

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: This section applies to -QMLV devices only and shall be read & recorded at TA = +25C before and after each burn-in, and subgroup B5, and shall not change by more than the limits indicated. The delta rejects shall be included in the PDA calculation.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
Voh	Logical "1" Output Voltage	Vcc = 4.5V, Ioh = -20mA, Vil = 0.8V, Vih = 2V.			-250	250	mV	1
Vol	Logical "0" Output Voltage	Vcc = 4.5V, Iol = 20mA, Vil = 0.8V, Vih = 2V.			-50	50	mV	1
Icc En	Power Supply Current	Vcc = 5.5V, Vin = 0.8V or 2V, Ven = 2V, $\overline{Ven}$ = 0.8V.			-8	8	mA	1
Icc Dis	Power Supply Current	Vcc = 5.5V, Vin = 0.8V or 2V, Ven = 0.8V, $\overline{Ven}$ = 2V.			-8	8	mA	1

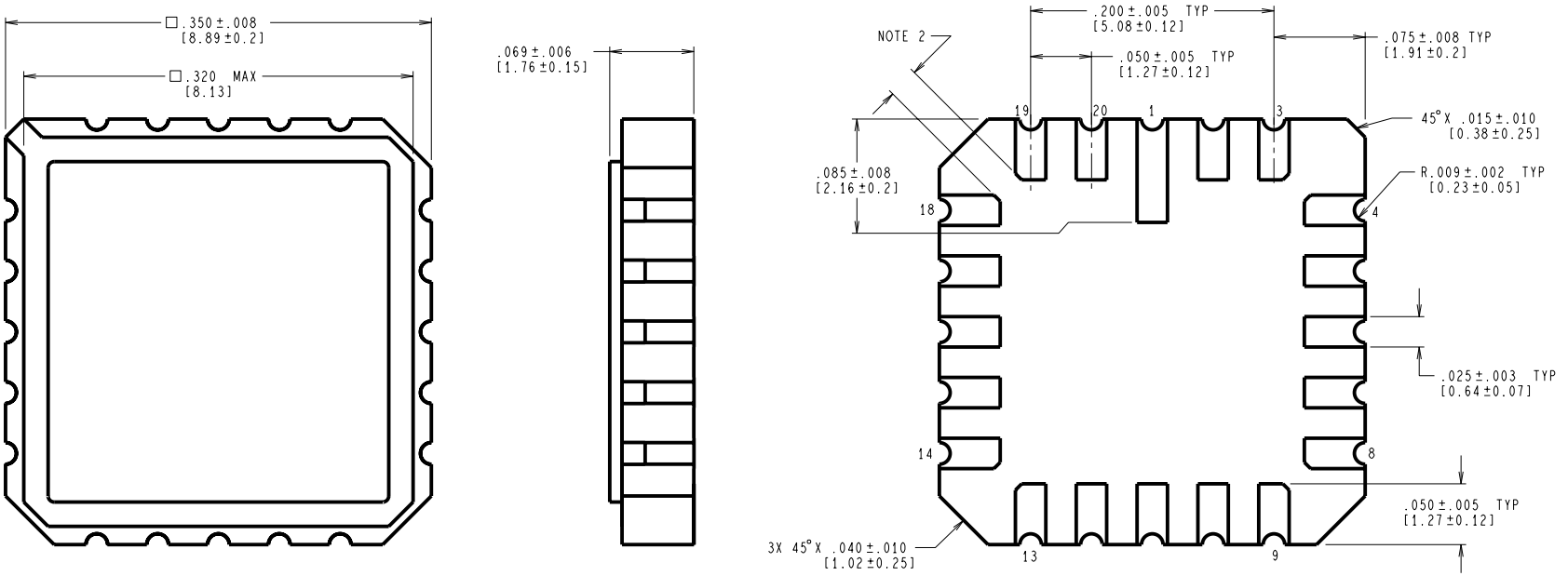
Note 1: Power dissipation must be externally controlled at elevated temperatures.
Note 2: Parameter tested go-no-go only.
Note 3: Tested at 50pF, system capacitance exceed 10 and 30pF.
Note 4: Testing at 50pF guarantees limits at 10 and 30pF.
Note 5: The minimum limits apply to device Class Q and V. The limits specified for the INPUT LOW CURRENT represents the numerical range in which this parameter will pass.
Note 6: Pre and post irradiaton limits are identical to those listed under AC and DC electrical characteristics except as listed in the Post Radiation Limits Table (IF APPLICABLE). Radiation end point limits for the noted parameters are guaranteed only for the conditions as specified.

Graphics and Diagrams

GRAPHICS#	DESCRIPTION
E20ARE	LCC (E), TYPE C, 20 TERMINAL(P/P DWG)
J16ARL	CERDIP (J), 16 LEAD (P/P DWG)
W16ARL	CERPACK (W), 16 LEAD (P/P DWG)
WG16ARC	CERAMIC SOIC (WG), 16 LEAD (P/P DWG)

See attached graphics following this page.

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



NOTES: UNLESS OTHERWISE SPECIFIED.

1. LEAD FINISH TO BE ONE OF THE FOLLOWING:

   a. 50 MICROINCHES/12.7 MICROMETERS MINIMUM GOLD PLATING OVER 50-350 MICROINCHES/1.27-8.89 MICROMETERS NICKEL.

   b. SOLDER DIP.
   SOLDER THICKNESS PER LATEST REVISION OF MIL-STD-1835.

2. CORNER PADS MAY HAVE A 45°X.020IN/0.51mm MAXIMUM CHAMFER TO ACCOMPLISH THE .015IN/0.38mm DIMENSION.

4. REFERENCE JEDEC REGISTRATION MS-004, VARIATION CB, DATED 7/90.

CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

MIL/AERO
CONFIGURATION CONTROL

APPROVALS	DATE
DRAWN: Dwayne Grady	02/10/94
DFTG. CHK.	
ENGR. CHK.	
APPROVAL	

PROJECTION
INCH [MM]

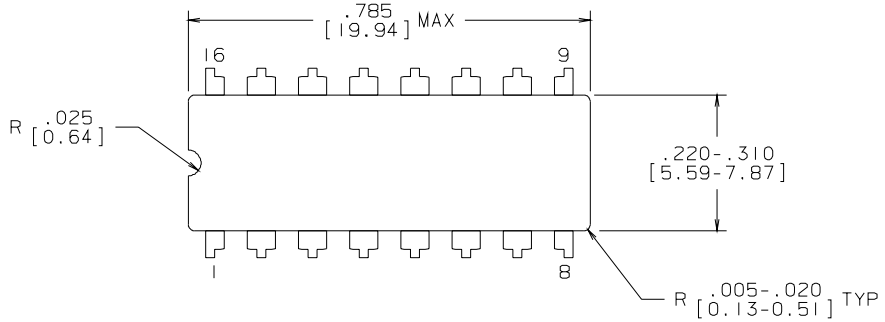
NATIONAL SEMICONDUCTOR CORPORATION
2900 Semiconductor Drive, Santa Clara, CA 95052-8090

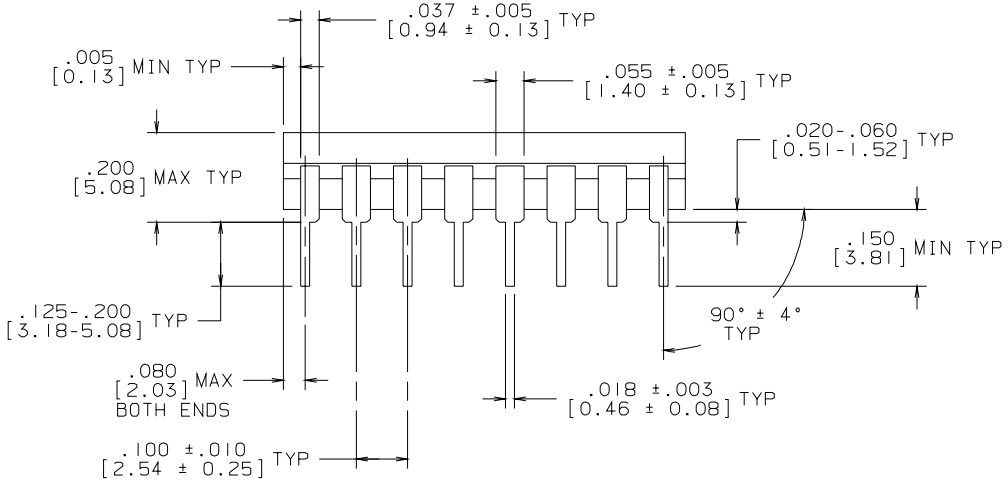
LEADLESS CHIP CARRIER, TYPE C, 20 TERMINAL

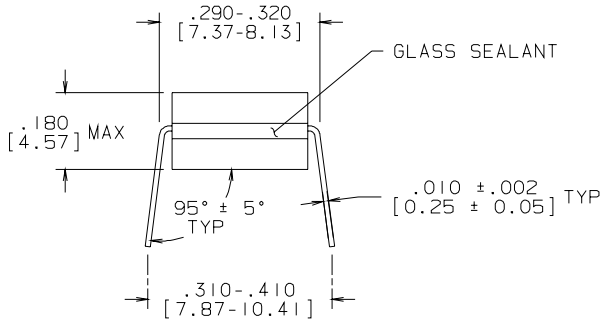
SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-E20A	E

DO NOT SCALE DRAWING | SHEET 1 of 1

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







MIL/AERO CONFIGURATION CONTROL

MIL-M-38510 CONFIGURATION CONTROL

NOTES: UNLESS OTHERWISE SPECIFIED

1. LEAD FINISH TO BE 200 MICROINCHES / 5.08 MICROMETERS MINIMUM SOLDER MEASURED AT THE CREST OF THE MAJOR FLATS.
2. JEDEC REGISTRATION MO-036, VARIATION AD, DATED 04/1981.

CONTROLLING DIMENSION: INCH

APPROVALS	DATE
DRAWN T. LEQUANG	09/15/93
DFTG. CHK.	
ENGR. CHK.	
APPROVAL	

PROJECTION

INCH
[MM]

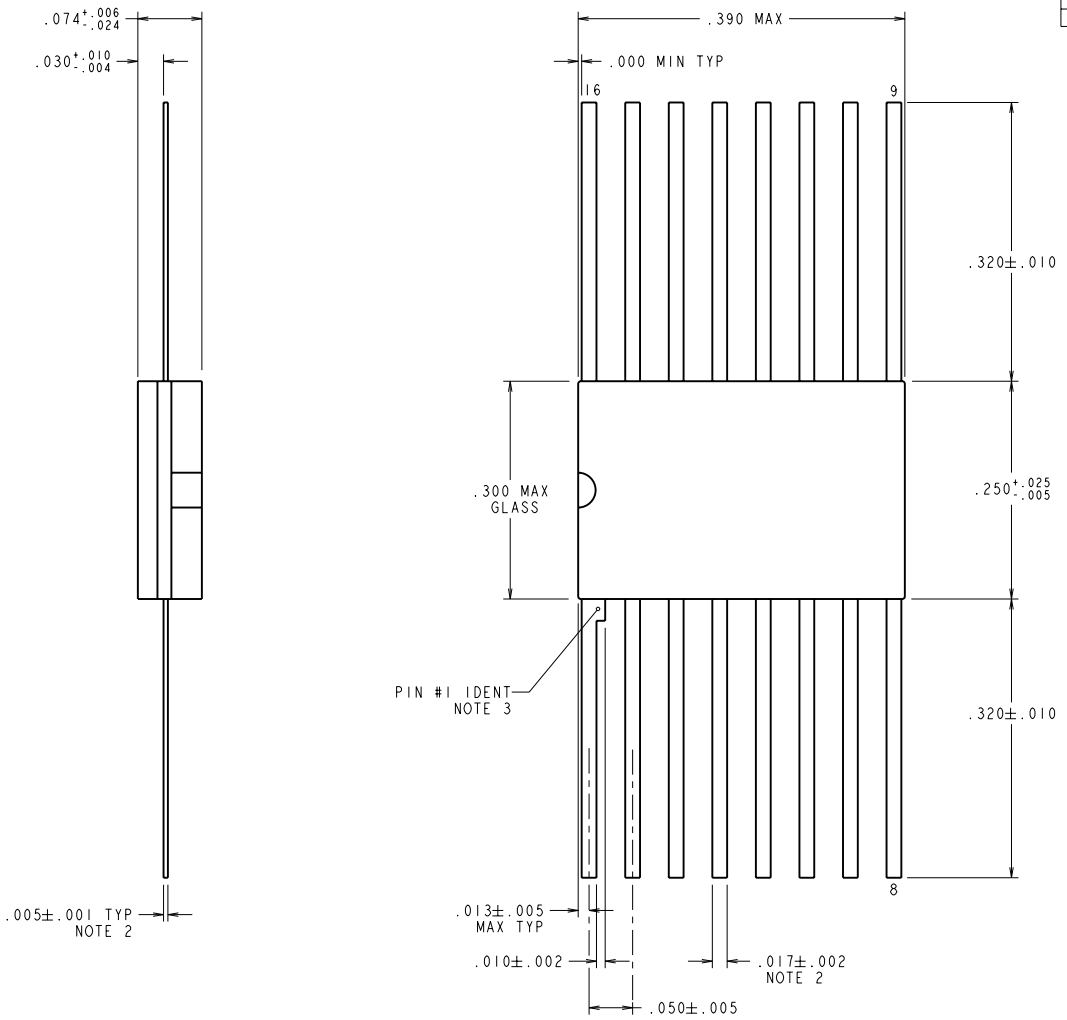
NATIONAL SEMICONDUCTOR CORPORATION
2900 Semiconductor Drive, Santa Clara, CA 95052-8090

CERDIP (J), 16 LEAD

SCALE	SIZE	DRAWING NUMBER	REV
N/A	B	MKT-J16A	L

DO NOT SCALE DRAWING | SHEET 1 OF 1

REVISIONS				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
K	REVISE AND REDRAW PER NEW STANDARD.	10514	07/28/94	DEG/AEP
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 MO-092, VARIATION AC, DATED 04/89.

MIL/AERO CONFIGURATION CONTROL

MIL-M-38510 CONFIGURATION CONTROL

APPROVALS	DATE
DRAWN: D.E.Grady	07/28/94
DFTG. CHK.	
ENGR. CHK.	

National Semiconductor
2900 Semiconductor dr, Santa Clara, CA 95052-8090

CERPACK, 16 LEAD

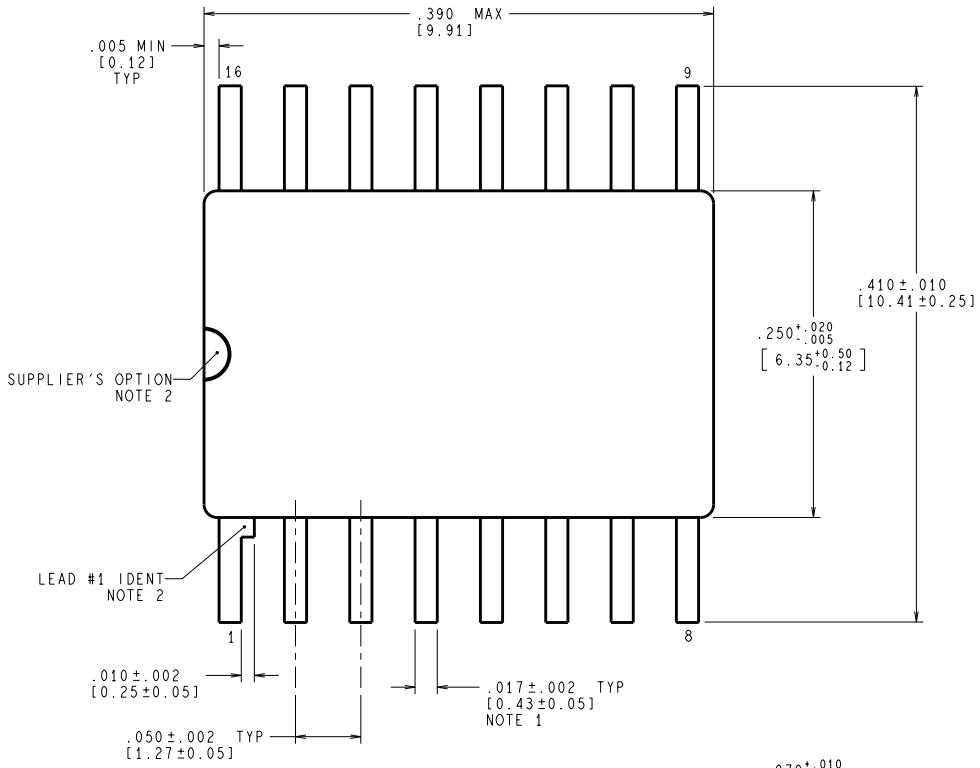
PROJECTION

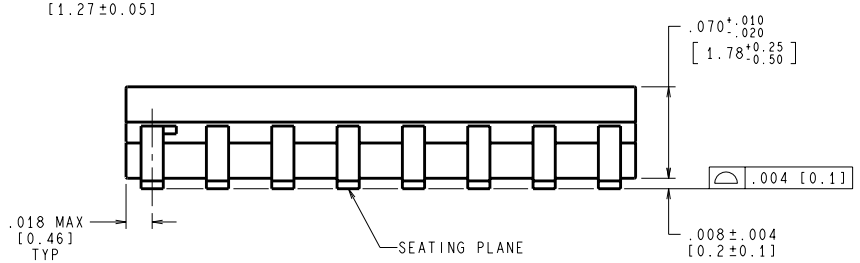
INCH [MM]

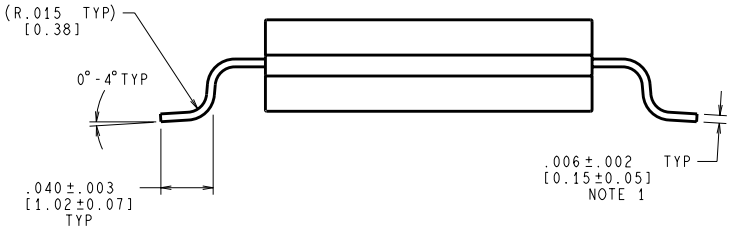
SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-W16A	L

DO NOT SCALE DRAWING | SHEET 1 of 1

REVISIONS				
LTR	DESCRIPTION	E.C.N.	DATE	BY/APP'D
A	RELEASE TO DOCUMENT CONTROL	11376	02/29/1996	MS/KH
B	LD PITCH TOL WAS ±.005; CHANGE LD RADIUS TO REF DIM; REMOVE THE OTHER R.006±.002; DIM .040±.003 WAS .037±.003	11443	04/19/1996	MS/KH
C	R .015[0.38] WAS R .006[0.15]	11840	10/08/1997	TL/







NOTES: UNLESS OTHERWISE SPECIFIED

1. LEAD FINISH: SOLDER DIPPED WITH Sn60 OR Sn63 SOLDER CONFORMING TO MIL-PRF-38535 TO A MINIMUM THICKNESS OF 200 MICROINCHES/ 5.08 MICROMETERS. SOLDER MAY BE APPLIED OVER LEAD BASIS METAL OR Sn PLATE. MAXIMUM LIMIT MAY BE INCREASED BY .003 IN/ 0.08mm AFTER LEAD FINISH APPLIED.
2. LEAD 1 IDENTIFICATION SHALL BE:
   a) A NOTCH OR OTHER MARK WITHIN THIS AREA
   b) A TAB ON LEAD 1, EITHER SIDE
3. NO JEDEC REGISTRATION AS OF FEBRUARY 1996.

CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

MIL-PRF-38535
CONFIGURATION CONTROL

APPROVALS	DATE
DRAWN: MARTA SUCHY	02/29/96
DFTG. CHK.	
ENGR. CHK.	

National Semiconductor
2900 Semiconductor dr, Santa Clara, CA 95052-8090

CERPACK, 16 LEAD, GULL WING

PROJECTION
INCH [MM]

SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	(SC)MKT-WG16A	C

DO NOT SCALE DRAWING | SHEET 1 of 1

Revision History

Rev	ECN #	Rel Date	Originator	Changes
0A0	M0003775	05/04/01	Rose Malone	Initial MDS Release: MNDS26F31M-X-RH, Rev. 0A0. Replaces MNDS26F31M-X, Rev. 2A0.
0B0	M0003795	05/04/01	Rose Malone	Update MDS: MNDS26F31M-X-RH, Rev. 0A0 to MNDS26F31M-X-RH, Rev. 0B0. Added to Main Table NS Part Numbers Section and Features Section reference to WG package and SMD numbers and Marketing Dwg. to Graphics Section.