National Semiconductor

MICROCIRCUIT DATA SHEET

MNDS96F174M-X REV 1B0

Original Creation Date: 06/19/95
Last Update Date: 10/23/01
Last Major Revision Date: 06/19/95

RS-485 COMPARABLE QUAD DIFFERENTIAL DRIVER

General Description

The DS96F174 is a high speed quad differential line driver designed to meet EIA Standard RS-485. The DS96F174 offers improved performance due to the use of new, 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. Thus, the DS96F174 features lower power, extended temperature range, improved RS-485 specifications.

The DS96F174 has wide positive and negative common mode range for multipoint applications in noisy environments. Positive and negative current-limiting is provided to protect the driver from line fault conditions over a + 12V to -7v common mode range. The DS96F174 features separate active high Enables for each driver pair.

Industry Part Number

DS96F174

Prime Die

DS96M174

Controlling Document

SEE FEATURES SECTION

NS Part Numbers

DS96F174ME/883
DS96F174MJ-QMLV
DS96F174MJ/883
DS96F174MW/883

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

CONTROLLING DOCUMENTS:

DS96F174MJ/883	5962-9076502MEA
DS96F174MJ-QMLV	5962-9076502VEA

(Absolute Maximum Ratings)

Supply Voltage	7.0V
Enable Input Voltage	5.5V
Maximum Power Dissipation at 25 C (Note 1, 2, 3)	
E pkg	2000mW
J pkg	1800mW
W pkg	1000mW
Storage Temperature Range	-65 C to + 175 C
Lead Temperature Ceramic Dip (Soldering, 60 sec.)	300 C

Note 1: Derate W Pkg 7.1 mW/C above 25C.
Note 2: Derate E Pkg 13.3 mW/C above 25C.
Note 3: Derate J Pkg 12.5 mW/C above 25C.

Recommended Operating Conditions

Output Current Low (Iol)	60mA
Output Current High (Ioh)	-60mA
Supply Voltage (Vcc)	Min=4.50V Typ=5.0V, Max=5.5V
Common Mode Output Voltage (Voc)	Min=-7.0V, Max=+12.0V
Operating Temperature (Ta)	Min=-55,Typ=+25,Max=+125c

Electrical Characteristics

(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: VCC = 5.5V
AC: VCC = 5.0V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
VIL	Logical 0 Input Voltage					.8	V	1
						.7	V	2, 3
VIH	Logical 1 Input Voltage				2		V	1, 2, 3
VIC	Input Clamp Voltage	I = -18mA			-1.5		V	1, 2, 3
VOD1	Differential Output Voltage	IO = 0mA				6	V	1, 2, 3
VOD2 (1)	Differential Output Voltage	VCC = 4.5V, RL = 54 ohms			1.5		V	1, 2
					1.2		V	3
VOD2 (2)	Differential Output Voltage	VCC = 4.5V, RL = 100 ohms			2.0		V	1, 2, 3
Delta VOD (1)	Change In Magnitude of (VOD2)	VCC = 4.5V, RL = 54 ohms			-200	200	mV	1, 2
					-400	400	mV	3
Delta VOD (2)	Change In Magnitude of (VOD2)	VCC = 4.5V, RL = 100 ohms			-200	200	mV	1, 2
					-400	400	mV	3
VOC (1)	Common Mode Output Voltage	RL = 54 ohms				3	V	1, 2, 3
VOC (2)	Common Mode Output Voltage	RL = 100 ohms				3	V	1, 2, 3
Delta VOC (1)	Change in Magnitude of VOC	VCC = 4.5V, RL = 54 ohms			-200	200	mV	1, 2, 3
Delta VOC (2)	Change in Magnitude of VOC	VCC = 4.5V, RL = 100 ohms			-200	200	mV	1, 2, 3
IO	Output Current With Power Off	VCC = 0V, VO = -7V to 12V			-50	50	uA	1, 2, 3
IOZ	High Impedance State Output Current	VO = -7V to 12V			-50	50	uA	1, 2, 3
IIH	Logical 1 Input Current	VI = 2.4V				20	uA	1, 2, 3
IIL	Logical 0 Input Current	VI = 0.4V			-50		uA	1, 2, 3
ICC	Supply Current	Outputs Enabled				50	mA	1, 2, 3
ICCX	Supply Current	Outputs Disabled				30	mA	1, 2, 3

Electrical Characteristics

(Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)
DC: VCC = 5.5V
AC: VCC = 5.0V

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IOS (1)	Short Circuit Output Current	VO = -7V	2		-250		mA	1, 2, 3
IOS (2)	Short Circuit Output Current	VO = 0V	2		-150		mA	1, 2, 3
IOS (3)	Short Circuit Output Current	VO = VCC	2			150	mA	1, 2, 3
IOS (4)	Short Circuit Output Current	VO = 12V	2			250	mA	1, 2, 3
tPLH	Propagation Delay Lo to Hi level	RL = 27 ohms, CL = 15pF				25	ns	10, 11
						16	ns	9
tPHL	Propagation Delay Hi to Low Level	RL = 27 ohms, CL = 15pF				25	ns	10, 11
						16	ns	9
SKEW	Output to Output Delay Time	RL = 60 ohms				10	ns	10, 11
						4	ns	9
tLZ	Output Disable Time From Low Level	RL = 110 ohms, CL = 50pF				40	ns	10, 11
						25	ns	9
tHZ	Output Disable Time From High Level	RL = 110 ohms, CL = 50pF				80	ns	10, 11
						30	ns	9
tZL	Output Enable Time to Low Level	RL = 110 ohms, CL = 50pF				100	ns	10, 11
						40	ns	9
tZH	Output Enable Time to High Level	RL = 110 ohms, CL = 50pF				40	ns	10, 11
						32	ns	9
tDD	Differential Output Delay Time	RL = 60 ohms, CL = 15pF				30	ns	10, 11
						22	ns	9
tTD	Differential Output Transition Time	RL = 60 ohms, CL = 15pF				40	ns	10, 11
						22	ns	9

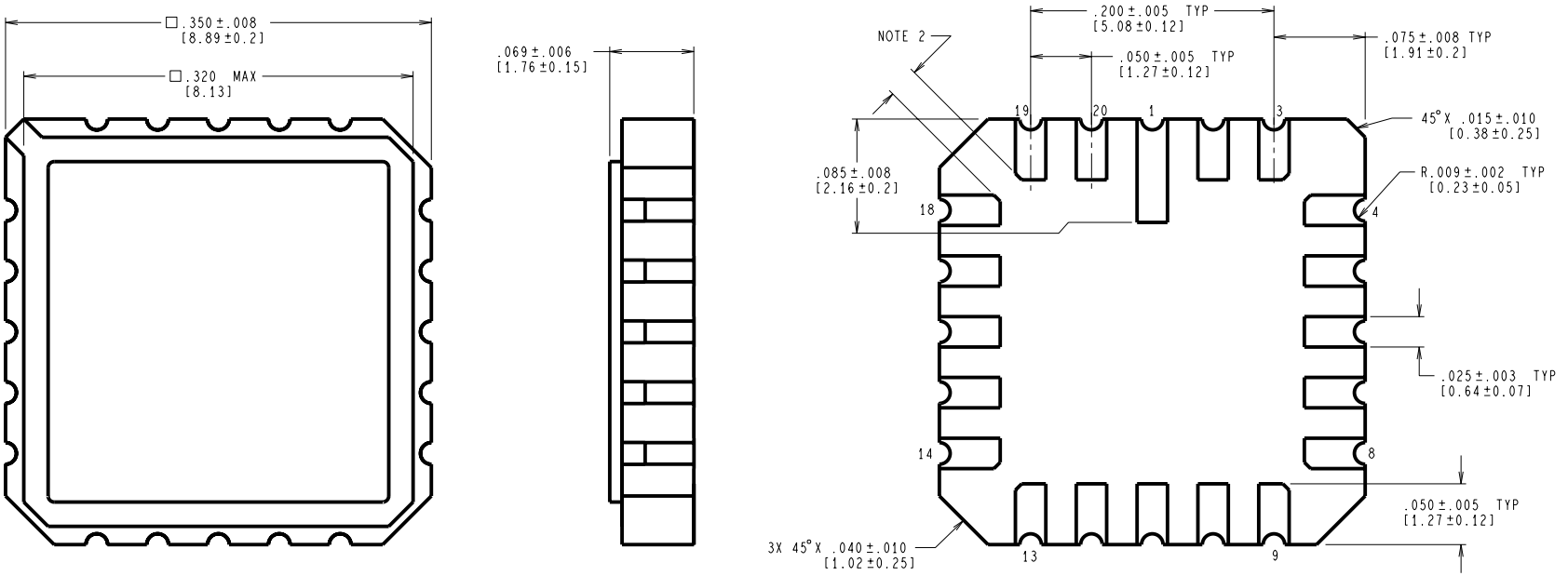
Note 1: -55 C limit exceeds EIA standard RS-485 specification.
Note 2: .2uF cap is connected between the output and GND to reduce oscilation.

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)

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/



CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

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.

MIL/AERO
CONFIGURATION CONTROL

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

PROJECTION INCH [MM]

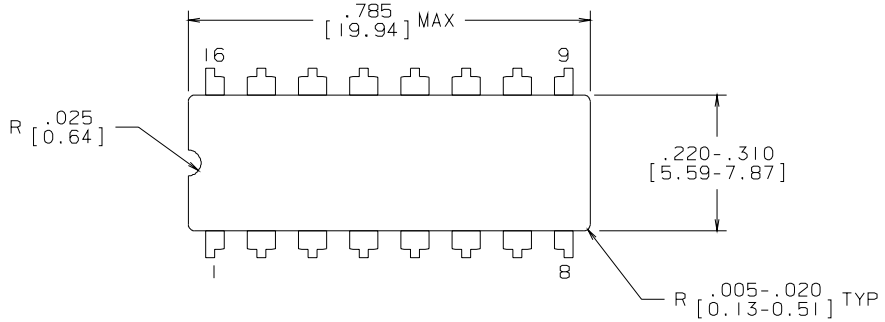
NATIONAL SEMICONDUCTOR CORPORATION
2900 Semiconductor Drive, Santa Clara, CA 95052-8090

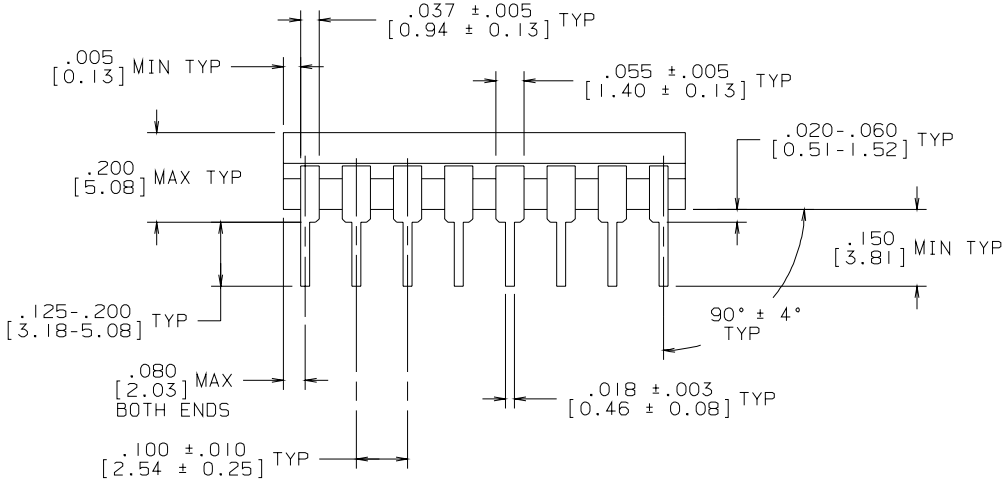
LEADLESS CHIP CARRIER, TYPE C, 20 TERMINAL

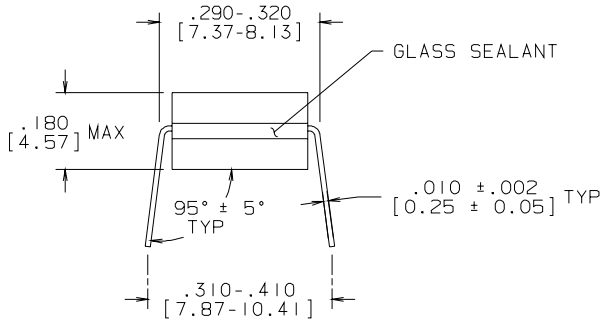
SCALE	SIZE	DRAWING NUMBER	REV
N/A	C	MKT-E20A	E

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

CONTROLLING DIMENSION: INCH

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

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CERDIP (J), 16 LEAD

PROJECTION

INCH [MM]

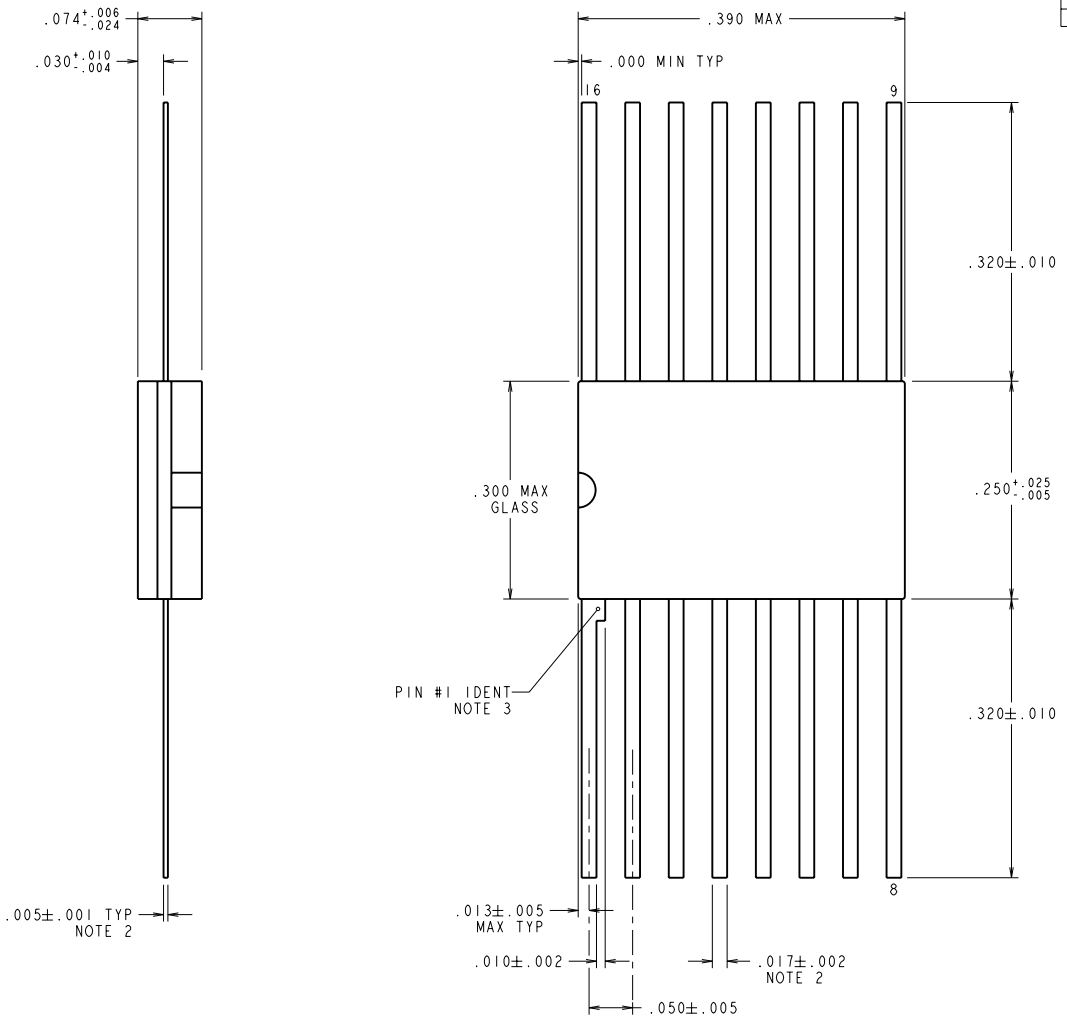
SCALE	SIZE	DRAWING NUMBER	REV
N/A	B	MKT-J16A	L

DO NOT SCALE DRAWING | SHEET 1 OF 1

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.

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.	

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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

Revision History

Rev	ECN #	Rel Date	Originator	Changes
1B0	M0003934	10/23/01	Rose Malone	Update MDS: MNDS96F174M-X, Rev. 1A0 to 1B0. Add DS96F174MJ-QMLV and SMD number reference to Main Table and Features Section, also add Marketing Dwg's. to Graphics Section.