DS26F32MQML Quad Differential Line Receivers

Check for Samples: DS26F32MQML

FEATURES

- **Input Voltage Range of ±7.0V (Differential or Common Mode) ±0.2V Sensitivity over the Input Voltage Range**
- **High Input Impedance**
- **Operation from Single +5.0V Supply**
- **Input Pull-Down Resistor Prevents Output Oscillation on Unused Channels**
- **TRI-STATE Outputs, with Choice of Complementary Enables, for Receiving Directly onto a Data Bus**

DESCRIPTION

The DS26F32 is a quad differential line receiver designed to meet the requirements of EIA Standards RS-422 and RS-423, and Federal Standards 1020 and 1030 for balanced and unbalanced digital data transmission.

The DS26F32 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. Thus, the DS26F32 features lower power, extended temperature range, and improved specifications.

The device features an input sensitivity of 200 mV over the input common mode range of ±7.0V. The DS26F32 provides an enable function common to all four receivers and TRI-STATE outputs with 8.0 mA sink capability. Also, a fail-safe input/output relationship keeps the outputs high when the inputs are open.

The DS26F32 offers optimum performance when used with the DS26F31 Quad Differential Line Driver.

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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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Connection Diagrams

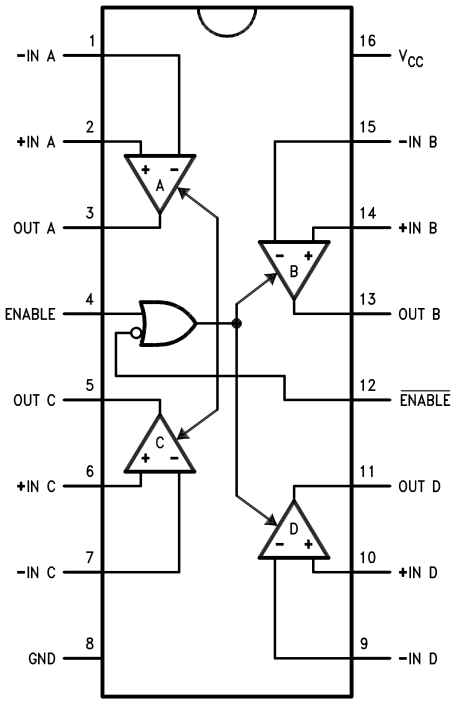


Figure 1. 16-Lead CDIP Package-Top View
See Package Number NAC0016A, NFE0016A, or NAD0016A

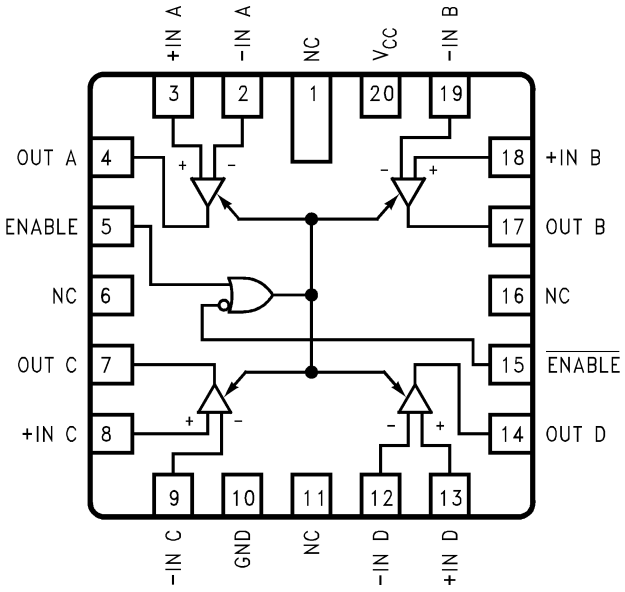


Figure 2. 20-Lead LCCC Package-Top View
See Package Number NAJ0020A

Table 1. Function Table (Each Receiver)(1)

Differential Inputs	Enables		Outputs
$V_{ID} = (V_I+) - (V_I-)$	E	$\overline{E}$	OUT
$V_{ID} \geq 0.2V$	H	X	H
	X	L	H
$V_{ID} \leq -0.2V$	H	X	L
	X	L	L
X	L	H	Z

(1) H = High Level
L = Low Level
X = Immaterial

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

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Absolute Maximum Ratings (1)

Storage Temperature Range	−65°C ≤ T_A ≤ +150°C
Operating Temperature Range	−55°C ≤ T_A ≤ +125°C
Lead Temperature (soldering, 60 sec)	300°C
Supply Voltage	7.0V
Common Mode Voltage Range	±25V
Differential Input Voltage	±25V
Enable Voltage	7.0V
Output Sink Current	50 mA
Maximum Power Dissipation ($P_{D\ max}$at 25°C) (2), (3)	500 mW
Thermal Resistance	
θ_{JA}	
NFE0016A package	100°C/W
NAD0016A package	142°C/W
NAJ0020A package	87°C/W
θ_{JC}	
Junction-to- case	See MIL-STD-1835

(1) Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not verify specific performance limits. For verified specifications and test conditions, see the Electrical Characteristics. The verified specifications apply only for the test conditions listed. Some performance characteristics may degrade when the device is not operated under the listed test conditions.
(2) Derate J package 10.0mW/°C above +25°C, derate W package 7.1mW/°C above +25°C, derate E package 11.5mW/°C above +25°C.
(3) Power dissipation must be externally controlled at elevated temperatures.

Recommended Operating Range

Operating Temperature	−55°C ≤ T_A ≤ +125°C
Supply Voltage	4.5V to 5.5V

Table 2. Radiation Features

DS26F32MJRQMLV	100 krads (Si)
DS26F32MWRQMLV	100 krads (Si)
DS26F32MWGRQMLV	100 krads (Si)

Table 3. Quality Conformance Inspection Mil-Std-883, Method 5005 - Group A

Subgroup	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
12	Settling time at	25
13	Settling time at	125
14	Settling time at	-55

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DS26F32 Electrical Characteristics DC Parameters

The following conditions apply, unless otherwise specified.

DC: V_{CC} = 5V (1)

Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
I_{In}	Input Current	Pin under test V_{CC} = 4.5V, V_I = 15V Other inputs -15V ≤ V_I ≤ +15V			2.3	mA	1, 2, 3
		Pin under test V_{CC} = 5.5V, V_I = -15V Other inputs -15V ≤ V_I ≤ +15V			-2.8	mA	1, 2, 3
I_{IL}	Logical "0" Enable Current	V_{CC} = 5.5V, V_{En} = 0.4V			-360	µA	1, 2, 3
I_{IH}	Logical "1" Enable Current	V_{CC} = 5.5V, V_I = 2.7V			10	µA	1, 2, 3
I_I	Logical "1" Enable Current	V_{CC} = 5.5V, V_I = 5.5V			50	µA	1, 2, 3
V_{IK}	Input Clamp Voltage (Enable)	V_{CC} = 4.5V, I_I = -18mA			-1.5	V	1, 2, 3
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, I_{OH} = -440µA, ΔV_I = 1V, $V\overline{En}$ = .8 = V_{En}		2.5		V	1, 2, 3
V_{OL}	Logical "0" Output Voltage	V_{CC} = 4.5V, $V\overline{En}$ =0.8V = V_{En}, I_{OL} = 4mA, ΔV_I = -1V			0.4	V	1, 2, 3
		V_{CC} = 4.5V, $V\overline{En}$ = 8V = V_{En}, I_{OL} = 8mA, ΔV_I = -1V			.45	V	1, 2, 3
I_{CC}	Supply Current	V_{CC} = 5.5V, All V_I = Gnd, V_{En} = 0V, $V\overline{En}$ = 2V			50	mA	1, 2, 3
I_{OZ}	Off-State Output Current	V_{CC} = 5.5V, V_O = 0.4V, V_{En} = 0.8V, $V\overline{En}$ = 2V			-20	µA	1, 2, 3
		V_{CC} = 5.5V, V_O = 2.4V, V_{En} = 0.8V, $V\overline{En}$ = 2V			20	µA	1, 2, 3
R_I	Input Resistance	-15 ≤ V_{CM} ≤ 15V		14		KΩ	1, 2, 3
V_{Th}	Differential Input Voltage	V_{CC} = 4.5V, V_{OUT} = V_{OL} or V_{OH} -7V ≤ V_{CM} ≤ 7V, V_{En} = $V\overline{En}$ = 2.5V	(2)	-0.2	0.2	V	1, 2, 3
		V_{CC} = 5.5V, V_{OUT} = V_{OL} or V_{OH} -7V ≤ V_{CM} ≤ 7V, V_{En} = $V\overline{En}$ = 2.5V	(2)	-0.2	0.2	V	1, 2, 3
V_{IL}	Logical "0" Input Voltage (Enable)	V_{CC} = 5.5V	(2)		0.8	V	1, 2, 3
V_{IH}	Logical "1" Input Voltage (Enable)	V_{CC} = 4.5V	(2)	2.0		V	1, 2, 3
$I_{SC\ Min}$	Output Short Circuit Current	V_{CC} = 4.5V, V_O = 0V, ΔV_I = 1V		-15		mA	1, 2, 3
$I_{SC\ Max}$	Output Short Circuit Current	V_{CC} = 5.5V, V_O = 0V, ΔV_I = 1V			-85	mA	1, 2, 3

(1) Pre and post irradiation limits are identical to those listed under AC and DC electrical characteristics. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are specified only for the conditions as specified in Mil-Std-883, Method 1019.5, Condition A

(2) Parameter tested go-no-go only.

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DS26F32 Electrical Characteristics AC Parameters

The following conditions apply, unless otherwise specified.
AC: V_{CC} = 5V (1)

Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
t_{PLH}		C_L = 50pF	(2)		23	nS	9
			(2)		31	nS	10, 11
		C_L = 15pF	(3)		22	nS	9
			(3)		30	nS	10, 11
t_{PHL}		C_L = 50pF	(2)		23	nS	9
			(2)		31	nS	10, 11
		C_L = 15pF	(3)		22	nS	9
			(3)		30	nS	10, 11
t_{PZH}	Enable Time	C_L = 50pF	(2)		18	nS	9
			(2)		29	nS	10, 11
		C_L = 15pF	(3)		16	nS	9
			(3)		27	nS	10, 11
t_{PZL}	Enable Time	C_L = 50pF	(2)		20	nS	9
			(2)		29	nS	10, 11
		C_L = 15pF	(3)		18	nS	9
			(3)		27	nS	10, 11
t_{PHZ}	Disable Time	C_L = 50pF	(2)		55	nS	9
			(2)		62	nS	10, 11
		C_L = 5pF	(3)		20	nS	9
			(3)		27	nS	10, 11
t_{PLZ}	Disable Time	C_L = 50pF	(2)		30	nS	9
			(2)		42	nS	10, 11
		C_L = 5pF	(3)		18	nS	9
			(3)		30	nS	10, 11

(1) Pre and post irradiation limits are identical to those listed under AC and DC electrical characteristics. These parts may be dose rate sensitive in a space environment and demonstrate enhanced low dose rate effect. Radiation end point limits for the noted parameters are specified only for the conditions as specified in Mil-Std-883, Method 1019.5, Condition A
(2) Tested at 50pF, system capacitance exceeds 5pF to 15pF.
(3) Tested at 50pF specifies limit at 15pF & 5pF.

DS26F32 Electrical Characteristics DC Drift Parameters

This section applies to -QMLV devices only. Devices shall be read & recorded at T_A = 25°C before and after each burn-in and shall not change by more than the limits indicated. The delta rejects shall be included in the PDA calculation.

Parameter		Test Conditions	Notes	Min	Max	Units	Sub-groups
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, I_{OH} = -440µA, ΔV_I = 1V, $\overline{VEn}$ = 0.8V = V_{En}		-250	250	mV	1
V_{OL}	Logical "0" Output Voltage	V_{CC} = 4.5V, I_{OL} = 4mA, ΔV_I = -1V, $\overline{VEn}$ = 0.8V = V_{En}		-45	45	mV	1
		V_{CC} = 4.5V, I_{OL} = 8mA, ΔV_I = -1V, $\overline{VEn}$ = 0.8V = V_{En}		-45	45	mV	1
I_I	Input Current	Pin under test V_{CC} = 4.5V, V_I = 15V Other inputs -15V ≤ V_I ≤ +15V		-0.28	0.28	mA	1
		Pin under test V_{CC} = 5.5V, V_I = -15V Other inputs -15V ≤ V_I ≤ +15V		-0.28	0.28	mA	1

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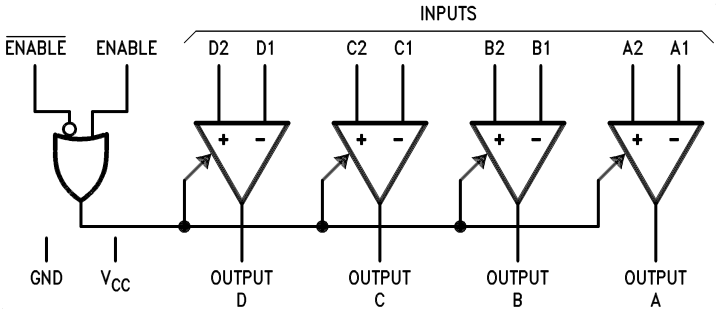
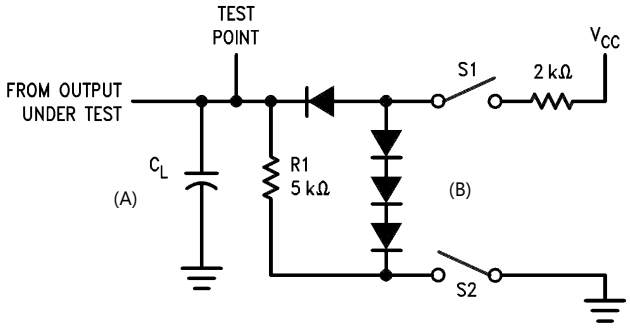


Figure 3. Logic Symbol



C_L includes probe and jig capacitance.

A. Parameter tested go-no-go only.

B. Tested at 50pF specifies limit at 15pF and 5pF.

Figure 4. Load Test Circuit for Three-State Outputs

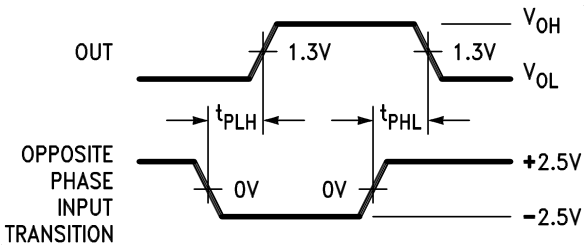


Diagram shown for $\overline{\text{ENABLE}}$ Low.

S1 and S2 of Load Circuit are closed except where shown.

Pulse Generator of all Pulses: Rate ≤ 1.0 MHz, Z_O = 50Ω, t_r ≤ 6.0 ns, t_f ≤ 6.0 ns.

Figure 5. Propagation Delay

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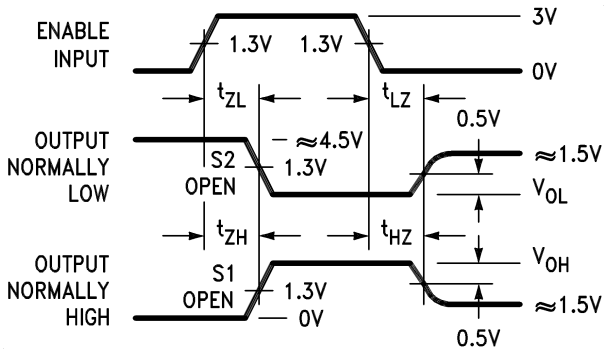


Diagram shown for $\overline{\text{ENABLE}}$ Low.

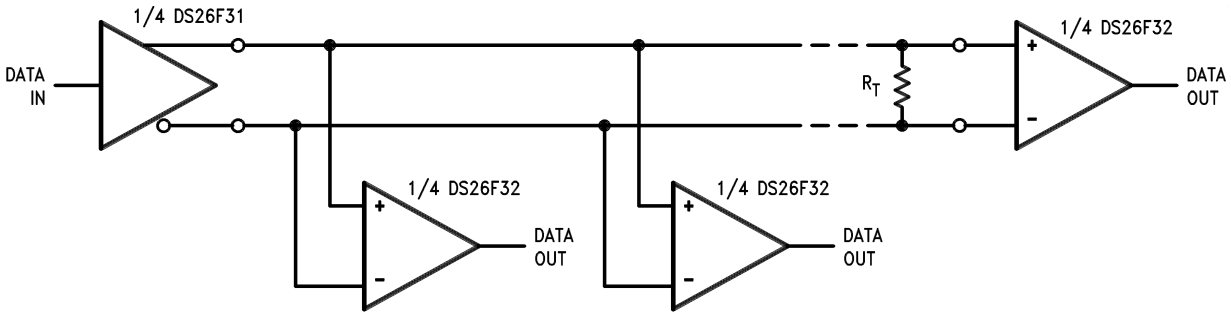
S1 and S2 of Load Circuit are closed except where shown.

Pulse Generator of all Pulses: Rate ≤ 1.0 MHz, Z_O = 50Ω, t_r ≤ 6.0 ns, t_f ≤ 6.0 ns.

All diodes are IN916 or IN3064.

Figure 6. Enable and Disable Times

TYPICAL APPLICATION



REVISION HISTORY

Released	Revision	Section	Originator	Changes
3/01/06	*	New Release, Corporate format	L. Lytle	1 MDS data sheet converted into one Corp. data sheet format. MNDS26F32M-X-RH Rev 0C0 will be archived.
4/15/2013	A		TIS	Changed layout of National Data Sheet to TI format

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-7802005M2A	ACTIVE	LCCC	NAJ	20	50	TBD	Call TI	Call TI	-55 to 125	DS26F32ME/ 883 Q 5962-78020 05M2A ACO 05M2A >T	Samples
5962-7802005MFA	ACTIVE	CFP	NAD	16	19	TBD	Call TI	Call TI	-55 to 125	DS26F32MW /883 Q 5962-78020 05MFA ACO 05MFA >T	Samples
5962R7802005VEA	ACTIVE	CDIP	NFE	16	25	TBD	Call TI	Call TI	-55 to 125	DS26F32MJRQMLV 5962R7802005VEA Q	Samples
5962R7802005VFA	ACTIVE	CFP	NAD	16	19	TBD	Call TI	Call TI	-55 to 125	DS26F32MWR QMLV Q 5962R78020 05VFA ACO 05VFA >T	Samples
DS26F32 MW8	ACTIVE	WAFERSALE	YS	0	1	Green (RoHS & no Sb/Br)	Call TI	Level-1-NA-UNLIM	-55 to 125		Samples
DS26F32ME/883	ACTIVE	LCCC	NAJ	20	50	TBD	Call TI	Call TI	-55 to 125	DS26F32ME/ 883 Q 5962-78020 05M2A ACO 05M2A >T	Samples
DS26F32MJRQMLV	ACTIVE	CDIP	NFE	16	25	TBD	Call TI	Call TI	-55 to 125	DS26F32MJRQMLV 5962R7802005VEA Q	Samples
DS26F32MW/883	ACTIVE	CFP	NAD	16	19	TBD	Call TI	Call TI	-55 to 125	DS26F32MW /883 Q 5962-78020 05MFA ACO 05MFA >T	Samples
DS26F32MWRQMLV	ACTIVE	CFP	NAD	16	19	TBD	Call TI	Call TI	-55 to 125	DS26F32MWR QMLV Q 5962R78020 05VFA ACO 05VFA >T	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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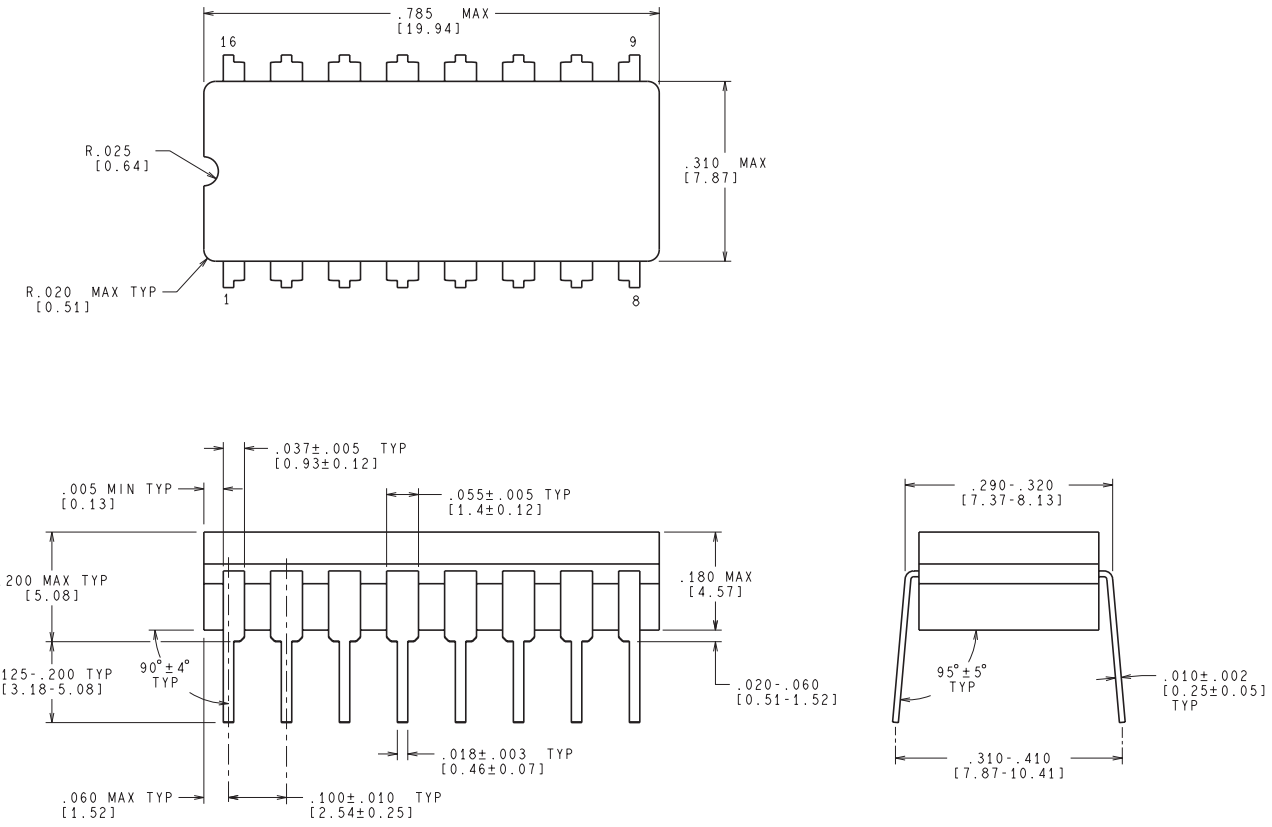
OTHER QUALIFIED VERSIONS OF DS26F32MQML, DS26F32MQML-SP :

- Military: DS26F32MQML
- Space: DS26F32MQML-SP

NOTE: Qualified Version Definitions:

- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

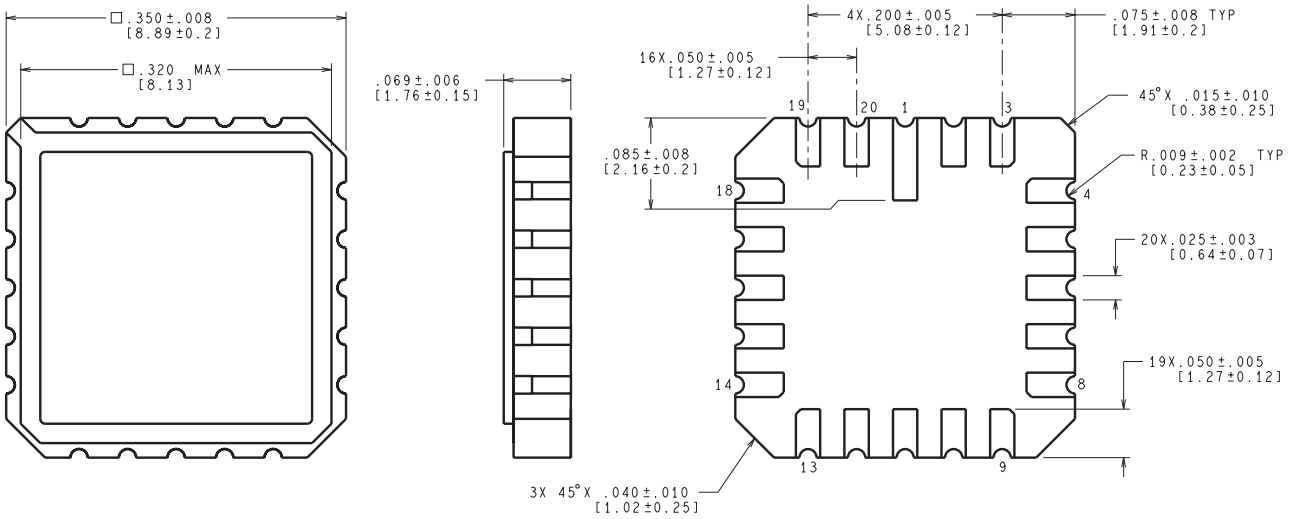
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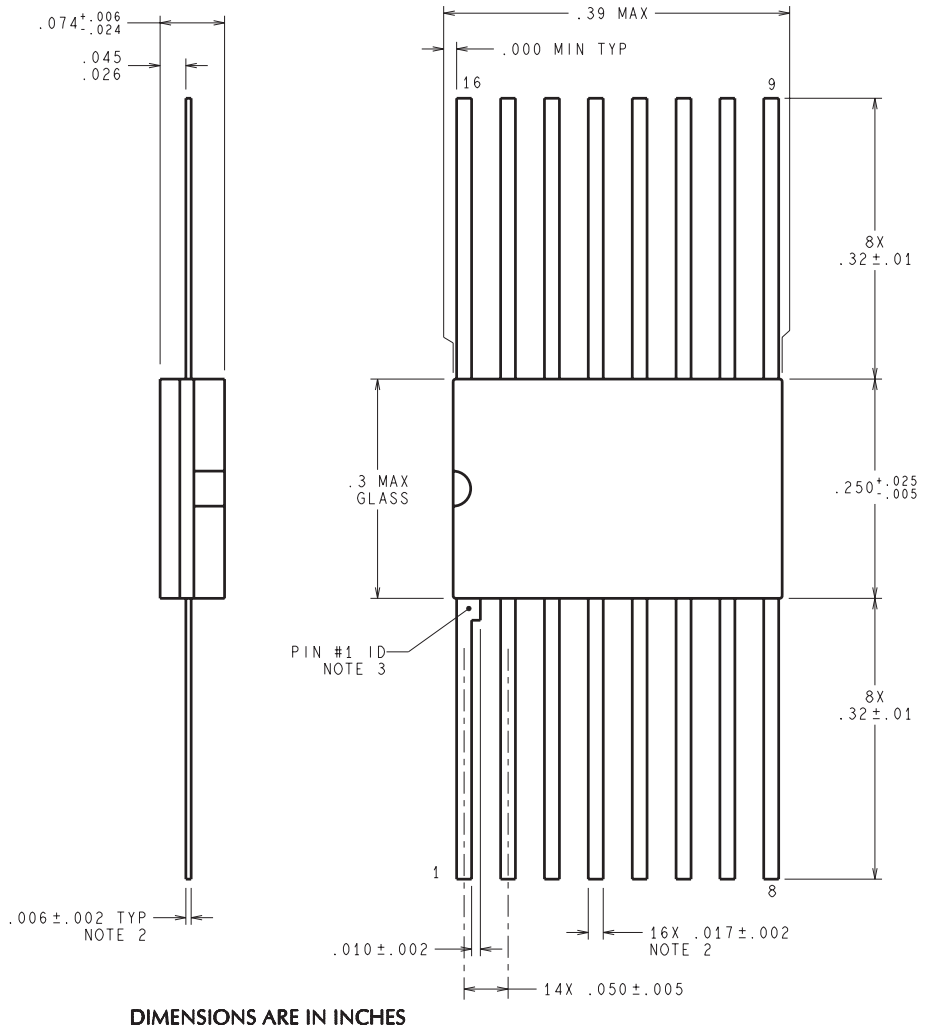
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