

DS26F32MQML Quad Differential Line Receivers

Check for Samples: [DS26F32MQML](#)

FEATURES

- **Input Voltage Range of $\pm 7.0V$ (Differential or Common Mode) $\pm 0.2V$ 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 $\pm 7.0V$. 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.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

Connection Diagrams

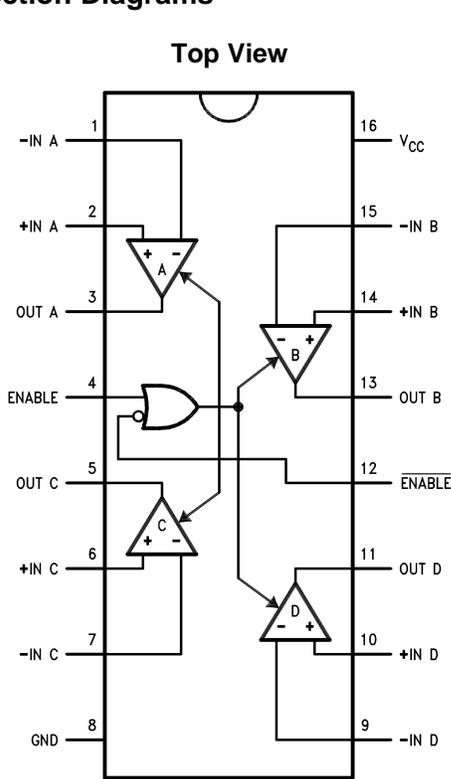


Figure 1. 16-Lead CDIP Package
See Package Number NAC0016A, NFE0016A, or NAD0016A

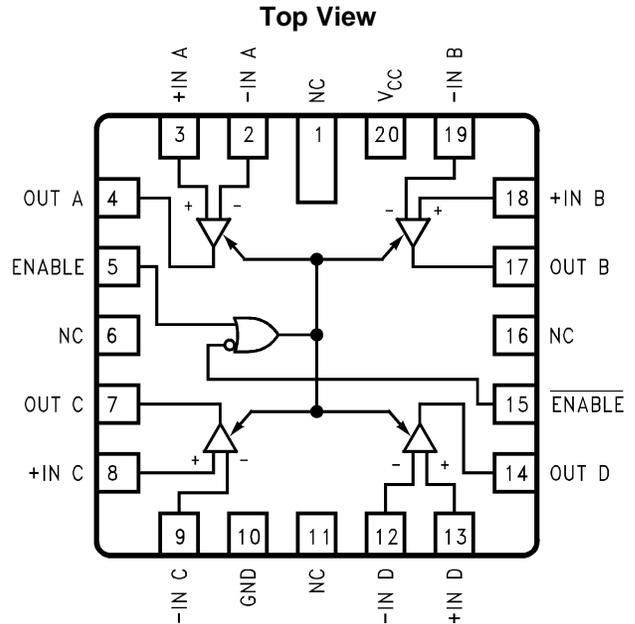


Figure 2. 20-Lead LCCC Package
See Package Number NAJ0020A

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

Differential Inputs	Enables		Outputs
	E	\bar{E}	
$V_{ID} = (V_{I+}) - (V_{I-})$	H	X	H
$V_{ID} \geq 0.2V$	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.

Absolute Maximum Ratings ⁽¹⁾

Storage Temperature Range	$-65^{\circ}\text{C} \leq T_A \leq +150^{\circ}\text{C}$
Operating Temperature Range	$-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$
Lead Temperature (soldering, 60 sec)	300°C
Supply Voltage	7.0V
Common Mode Voltage Range	$\pm 25\text{V}$
Differential Input Voltage	$\pm 25\text{V}$
Enable Voltage	7.0V
Output Sink Current	50 mA
Maximum Power Dissipation ($P_{D\text{ max}}$ 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 guarantee specific performance limits. For guaranteed specifications and test conditions, see the Electrical Characteristics. The guaranteed 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	$-55^{\circ}\text{C} \leq T_A \leq +125^{\circ}\text{C}$
Supply Voltage	4.5V to 5.5V

Table 2. Radiation Features

DS26F32MJRQMLV	100 krad(Si)
DS26F32MWRQMLV	100 krad(Si)
DS26F32MWGRQMLV	100 krad(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

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 $-15V \leq V_I \leq +15V$			2.3	mA	1, 2, 3
		Pin under test $V_{CC} = 5.5V$, $V_I = -15V$ Other inputs $-15V \leq V_I \leq +15V$			-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	$V_{CC} = 4.5V$, $I_{OH} = -440\mu A$, $\Delta V_I = 1V$, $\overline{V_{En}} = .8 = V_{En}$		2.5		V	1, 2, 3
V_{OL}	Logical "0" Output Voltage	$V_{CC} = 4.5V$, $\overline{V_{En}} = 0.8V = V_{En}$, $I_{OL} = 4mA$, $\Delta V_I = -1V$			0.4	V	1, 2, 3
		$V_{CC} = 4.5V$, $\overline{V_{En}} = 8V = V_{En}$, $I_{OL} = 8mA$, $\Delta V_I = -1V$.45	V	1, 2, 3
I_{CC}	Supply Current	$V_{CC} = 5.5V$, All $V_I = Gnd$, $V_{En} = 0V$, $\overline{V_{En}} = 2V$			50	mA	1, 2, 3
I_{OZ}	Off-State Output Current	$V_{CC} = 5.5V$, $V_O = 0.4V$, $V_{En} = 0.8V$, $\overline{V_{En}} = 2V$			-20	μA	1, 2, 3
		$V_{CC} = 5.5V$, $V_O = 2.4V$, $V_{En} = 0.8V$, $\overline{V_{En}} = 2V$			20	μA	1, 2, 3
R_I	Input Resistance	$-15 \leq V_{CM} \leq 15V$		14		K Ω	1, 2, 3
V_{Th}	Differential Input Voltage	$V_{CC} = 4.5V$, $V_{OUT} = V_{OL}$ or V_{OH} $-7V \leq V_{CM} \leq 7V$, $V_{En} = \overline{V_{En}} = 2.5V$	(2)	-0.2	0.2	V	1, 2, 3
		$V_{CC} = 5.5V$, $V_{OUT} = V_{OL}$ or V_{OH} $-7V \leq V_{CM} \leq 7V$, $V_{En} = \overline{V_{En}} = 2.5V$	(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	$V_{CC} = 4.5V$, $V_O = 0V$, $\Delta V_I = 1V$		-15		mA	1, 2, 3
$I_{SC Max}$	Output Short Circuit Current	$V_{CC} = 5.5V$, $V_O = 0V$, $\Delta V_I = 1V$			-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 guaranteed only for the conditions as specified in Mil-Std-883, Method 1019.5, Condition A

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

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 guaranteed 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 guarantees 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, V _{En} = 0.8V = V _{En}		-250	250	mV	1
V _{OL}	Logical "0" Output Voltage	V _{CC} = 4.5V, I _{OL} = 4mA, ΔV _I = -1V, V _{En} = 0.8V = V _{En}		-45	45	mV	1
		V _{CC} = 4.5V, I _{OL} = 8mA, ΔV _I = -1V, V _{En} = 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

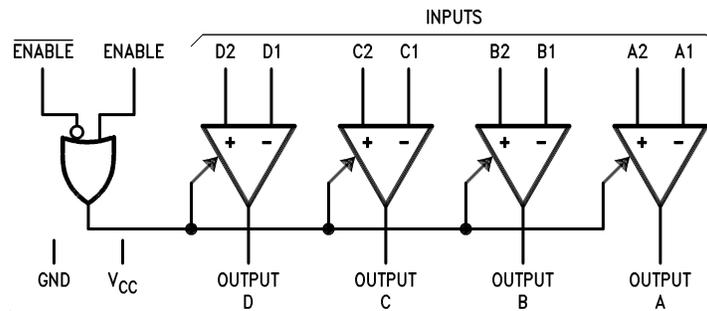
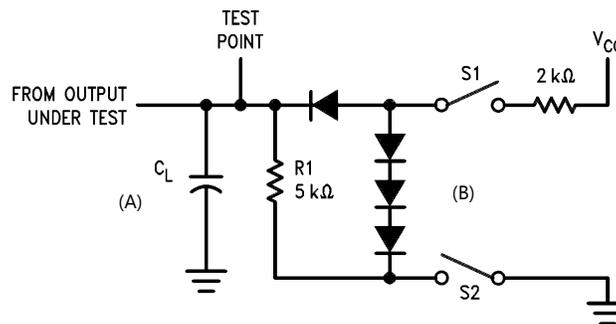


Figure 3. Logic Symbol



C_L includes probe and jig capacitance.

- A. Parameter tested go-no-go only.
- B. Tested at 50pF guarantees limit at 15pF and 5pF.

Figure 4. Load Test Circuit for Three-State Outputs

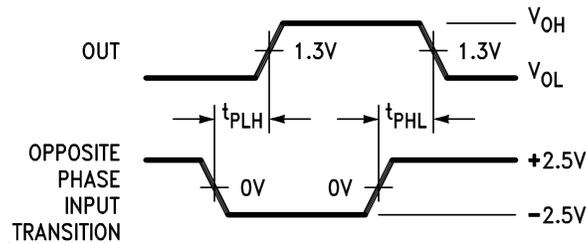


Diagram shown for $\overline{\text{ENABLE}}$ Low.

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

Pulse Generator of all Pulses: Rate \leq 1.0 MHz, $Z_O = 50\Omega$, $t_r \leq 6.0$ ns, $t_f \leq 6.0$ ns.

Figure 5. Propagation Delay

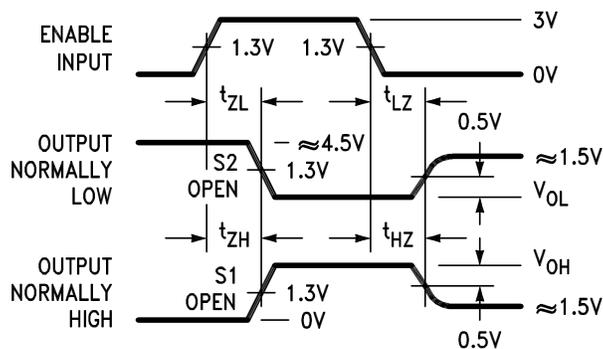


Diagram shown for $\overline{\text{ENABLE}}$ Low.

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

Pulse Generator of all Pulses: Rate \leq 1.0 MHz, $Z_0 = 50\Omega$, $t_r \leq 6.0$ ns, $t_f \leq 6.0$ ns.

All diodes are IN916 or IN3064.

Figure 6. Enable and Disable Times

TYPICAL APPLICATION

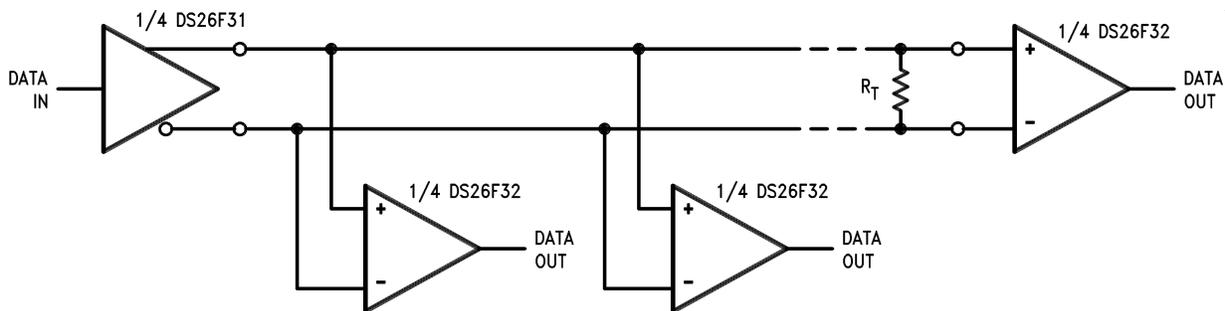


Table 4. Revision History

Released	Revision	Section	Originator	Changes
03/01/06	A	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.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
5962-7802005M2A	ACTIVE	LCCC	NAJ	20	50	TBD	POST-PLATE	Level-1-NA-UNLIM	-55 to 125	DS26F32ME/ 883 Q 5962-78020 05M2A ACO 05M2A >T	Samples
5962-7802005MFA	ACTIVE	CLGA	NAD	16	19	TBD	CU SNPB	Level-1-NA-UNLIM	-55 to 125	DS26F32MW /883 Q 5962-78020 05MFA ACO 05MFA >T	Samples
5962R7802005VEA	ACTIVE	CDIP	NFE	16	25	TBD	A42 SNPB	Level-1-NA-UNLIM	-55 to 125	DS26F32MJRQMLV 5962R7802005VEA Q	Samples
5962R7802005VFA	ACTIVE	CLGA	NAD	16	19	TBD	CU SNPB	Level-1-NA-UNLIM	-55 to 125	DS26F32MWR QMLV Q 5962R78020 05VFA ACO 05VFA >T	Samples
DS26F32ME/883	ACTIVE	LCCC	NAJ	20	50	TBD	POST-PLATE	Level-1-NA-UNLIM	-55 to 125	DS26F32ME/ 883 Q 5962-78020 05M2A ACO 05M2A >T	Samples
DS26F32MJRQMLV	ACTIVE	CDIP	NFE	16	25	TBD	A42 SNPB	Level-1-NA-UNLIM	-55 to 125	DS26F32MJRQMLV 5962R7802005VEA Q	Samples
DS26F32MW/883	ACTIVE	CLGA	NAD	16	19	TBD	CU SNPB	Level-1-NA-UNLIM	-55 to 125	DS26F32MW /883 Q 5962-78020 05MFA ACO 05MFA >T	Samples
DS26F32MWRQMLV	ACTIVE	CLGA	NAD	16	19	TBD	CU SNPB	Level-1-NA-UNLIM	-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⁾ Only one of markings shown within the brackets will appear on the physical device.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

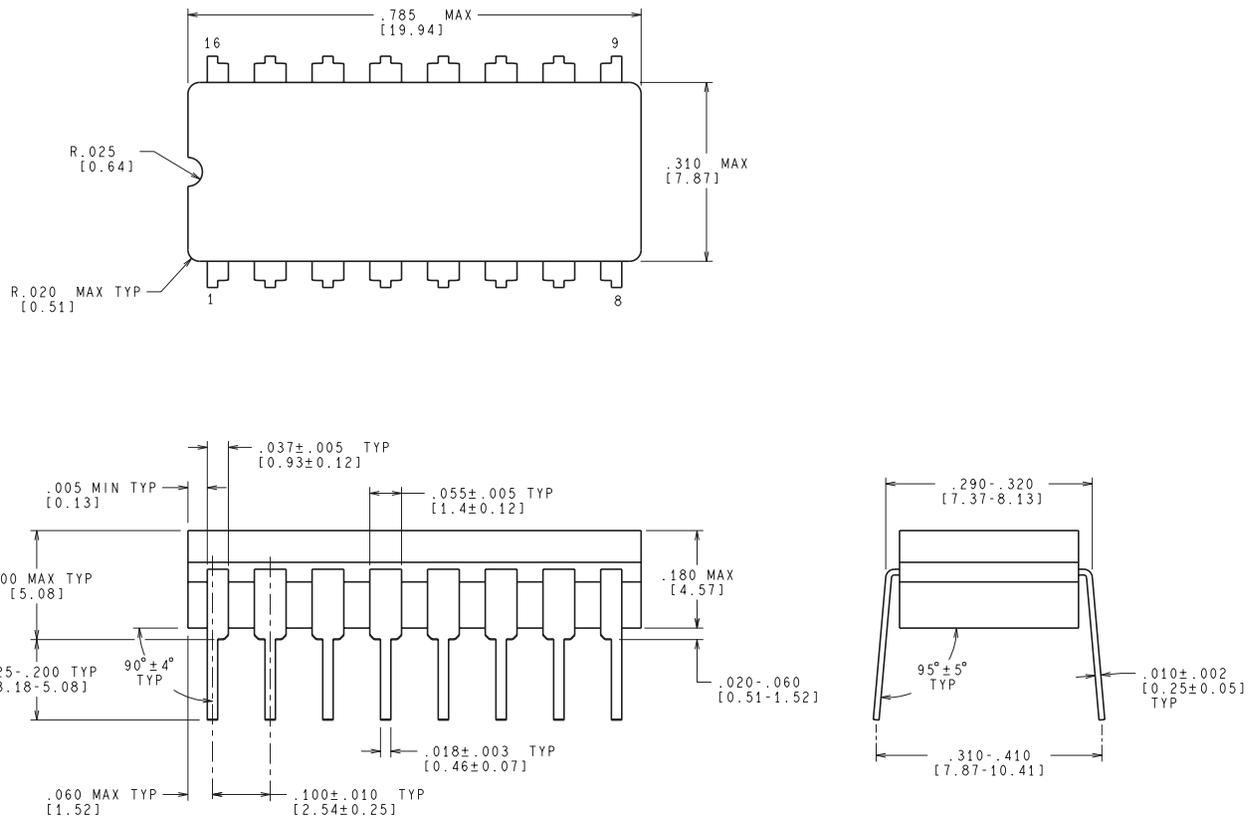
OTHER QUALIFIED VERSIONS OF DS26F32MQML, DS26F32MQML-SP :

- 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

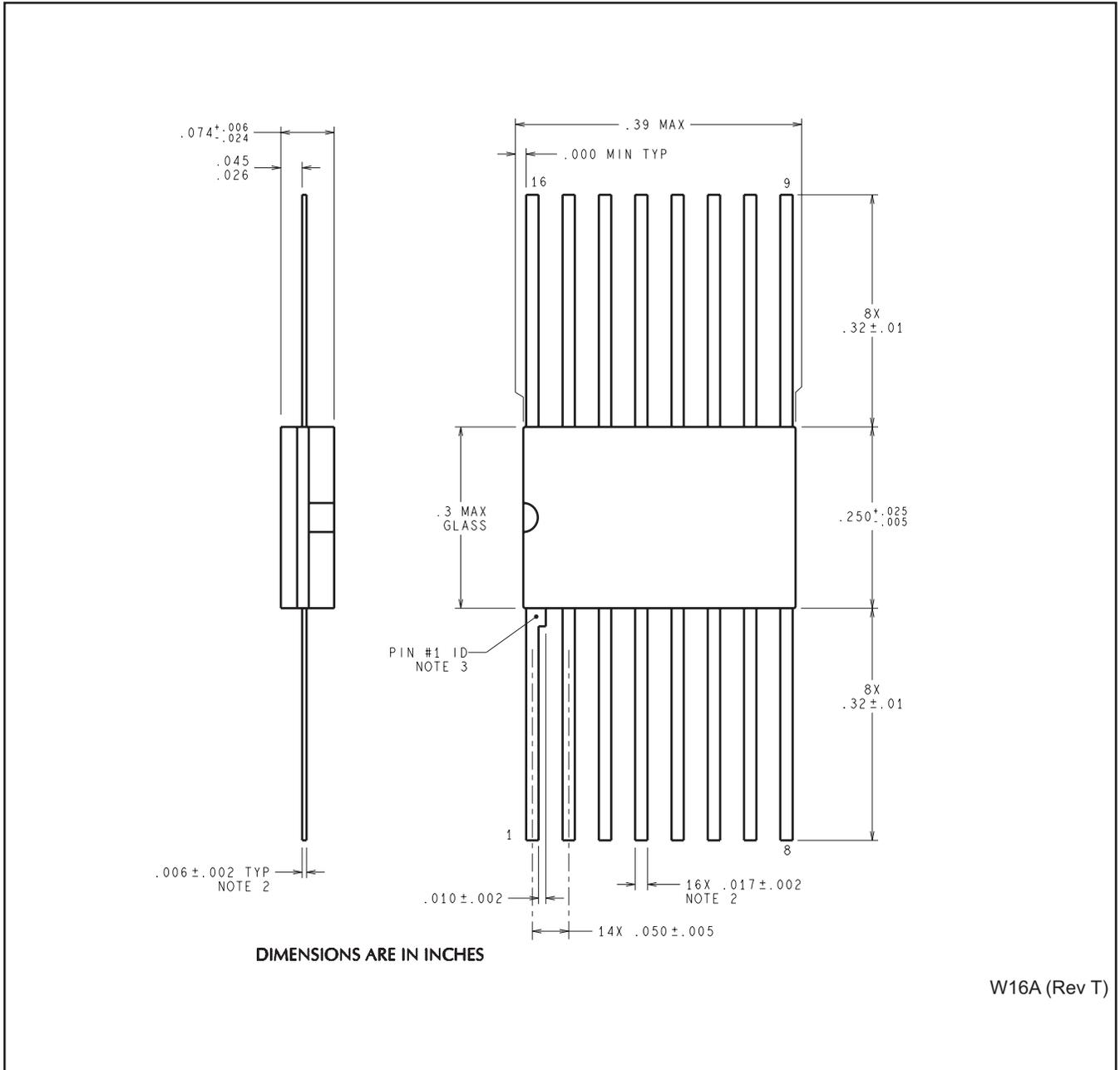
NFE0016A



CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS

J16A (REV L)

NAD0016A



W16A (Rev T)

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com