DS26LS32MQML Quad Differential Line Receivers

Check for Samples: DS26LS32MQML

FEATURES

- **High Differential or Common-Mode Input Voltage Ranges of ±7V on the DS26LS32.**
- **±0.2V Sensitivity Over the Input Voltage Range on the DS26LS32.**
- **DS26LS32 Meet All Requirements of RS-422 and RS-423**
- **6k Minimum Input Impedance**
- **100 mV Input Hysteresis on the DS26LS32**
- **Operation From a single 5V Supply**
- **TRI-STATE Outputs, with Choice of Complementary Output Enables for Receiving Directly onto a Data Bus**

DESCRIPTION

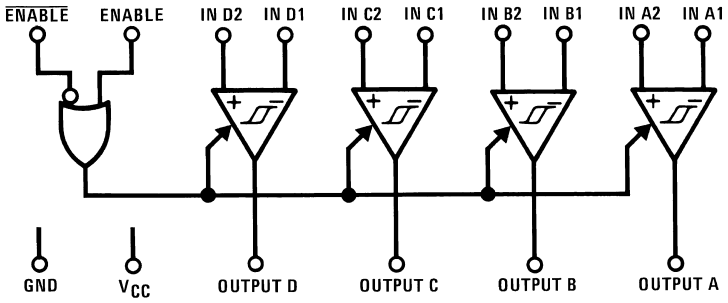
The DS26LS32 and DS26LS32A are quad differential line receivers designed to meet the RS-422, RS-423 and Federal Standards 1020 and 1030 for balanced and unbalanced digital data transmission.

The DS26LS32 and DS26LS32A have an input sensitivity of 200 mV over the input voltage range of ±7V. The DS26LS33 has an input sensitivity of 500 mV over the input voltage range of ±15V.

The DS26LS32A differs in function from the popular DS26LS32 and DS26LS33 in that input pull-up and pull-down resistors are included which prevent output oscillation on unused channels.

Each version provides an enable and disable function common to all four receivers and features TRI-STATE outputs with 8 mA sink capability. Constructed using low power Schottky processing, these devices are available over the full military and commercial operating temperature ranges.

Logic Diagram



Connection Diagram

Top View

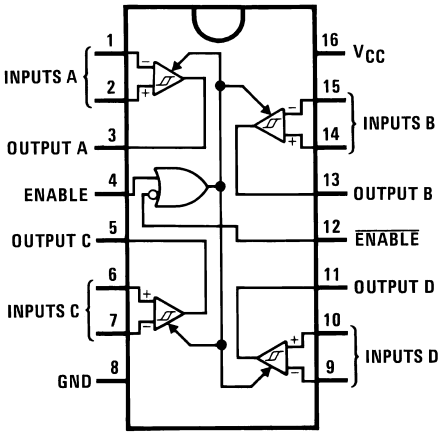


Figure 1. CDIP Package
See Package Numbers NFE0016A, NAD0016A

Top View

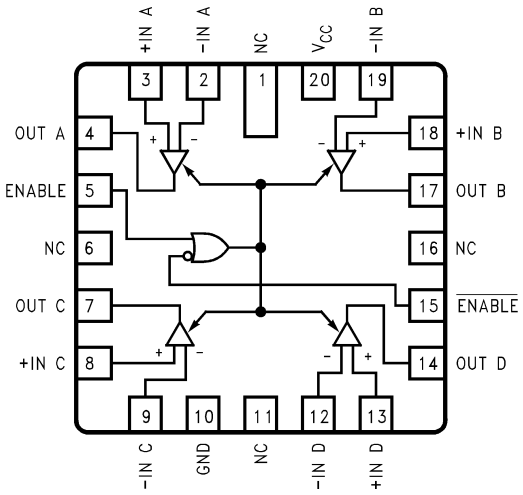


Figure 2. 20-Lead LCCC Package
See Package Number NAJ0020A

Truth Table(1)

ENABLE	$\overline{\text{ENABLE}}$	Input	Output
0	1	X	Hi-Z
See Note Below		$V_{ID} \geq V_{TH}$ (Max)	1
		$V_{ID} \leq V_{TH}$ (Min)	0

(1) Hi-Z = TRI-STATE
Note: Input conditions may be any combination not defined for ENABLE and $\overline{\text{ENABLE}}$.

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)

Supply Voltage	7V
Common-Mode Range	±25V
Differential Input Voltage	±25V
Enable Voltage	7V
Output Sink Current	50 mA
Maximum Power Dissipation at 25°C (2)	
NFE0016A Package	1666.5 mW
NAJ0020A Package	1875 mW
NAD0016A Package	967.74 mW
Junction Temperature (T_J)	+150°C
Thermal Resistance, Junction-to-Ambient θ_{JA}	
NFE0016A Package	100°C/W
NAJ0020A Package	130°C/W
NAD0016A Package	140°C/W
Thermal Resistance, Junction-to-Ambient θ_{JC}	See MIL-STD-1835
Storage Temperature Range	−65°C to +165°C
Lead Temperature (Soldering, 4 seconds)	260°C
ESD Tolerance (3)	500V

(1) Absolute Maximum Ratings are those values beyond which the safety of the device cannot be verified. They are not meant to imply that the device should be operated at these limits. The table of “Electrical Characteristics” provides conditions for actual device operation.
(2) Derate NFE0016A, package 11.11 mW/°C above 25°C; derate NAJ0020A package 12.5 mW/°C above 25°C; derate NAD0016A Package 6.4516 mW/°C for above 25°C.
(3) Human body model, 1.5kΩ in series with 100pF.

Recommended Operating Conditions

Supply Voltage, V_{CC}	4.5 V to 5.5 V
Temperature, T_A	−55°C to +125°C

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

DS26LS32M 883 Electrical Characteristics DC Parameters

The following conditions apply, unless otherwise specified. V_{CC} = 5V

Parameter		Test Conditions	Notes	Min	Max	Unit	Sub-groups
I_{IN}	Input Current	V_{CC} = 5.5V, V_{IN} = 15V (Pin under test), other inputs -15V, ≤ V_{IN} ≤ +15V	(1)		2.3	mA	1, 2, 3
		V_{CC} = 5.5V, V_{IN} = -15V (Pin under test), other inputs -15V, ≤ V_{IN} ≤ +15V	(1)		-2.8	mA	1, 2, 3
I_{IL}	Logical "0" ENABLE Current	V_{CC} = 5.5V, V_{IN} = 0.4V	(1)		-360	uA	1, 2, 3
I_{IH}	Logical "1" ENABLE Current	V_{CC} = 5.5V, V_{IN} = 2.7V	(1)		20	uA	1, 2, 3
I_I	Logical "1" ENABLE Current	V_{CC} =5.5V, V_{IN} = 5.5V	(1)		100	uA	1, 2, 3
V_{IC}	Input Clamp Voltage (ENABLE)	V_{CC} = 4.5V, I_{IN} = -18mA	(1)		-1.5	V	1, 2, 3
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, I_{OH} = -440uA, ΔV_{IN} = 1V, V $\overline{\text{ENABLE}}$ = 0.8V	(1)	2.5		V	1, 2, 3
V_{OL}	Logical "0" Output Voltage	V_{CC} = 4.5V, I_{OL} = 4mA, ΔV_{IN} = -1V, V $\overline{\text{ENABLE}}$ = 0.8V	(1)		.4	V	1, 2, 3
		V_{CC} = 4.5V, I_{OL} = 8mA, ΔV_{IN} = -1V, V $\overline{\text{ENABLE}}$ = 0.8V	(1)		.45	V	1, 2, 3
I_{OS} (MIN)	Output Short Circuit Current	V_{CC} = 5.5V, V_O = 0V, ΔV_{IN} = 1V	(1)	-15		mA	1, 2, 3
I_{OS} (MAX)	Output Short Circuit Current	V_{CC} = 5.5V, V_O = 0V, ΔV_{IN} = 1V	(1)		-85	mA	1, 2, 3
I_{CC}	Supply Current	V_{CC} = 5.5V, All V_{IN} = GND, Outputs Disabled	(1)		70	mA	1, 2, 3
I_O	Off-State Output Current	V_{CC} = 5.5V, V_O = 0.4V	(1)		-20	uA	1, 2, 3
		V_{CC} = 5.5V, V_O = 2.4V	(1)		20	uA	1, 2, 3
V_{TH}	Differential Input Voltage	-7V ≤ V_{CM} ≤ 7V	(1) (2)	-0.2	0.2	V	1, 2, 3
R_{IN}	Input Resistance	-15V ≤ V_{CM} ≤ 15V	(1)	6		kohm	1, 2, 3
V_{IL}	Logical "0" Input Voltage (ENABLE)	V_{CC} = 4.5V	(1) (2)		0.8	V	1, 2, 3
V_{IH}	Logical "1" Input Voltage (ENABLE)	V_{CC} = 4.5V	(1) (2)	2		V	1, 2, 3

(1) For Subgroups 1 and 2, power dissipation must be externally controlled at elevated temperatures.
(2) Parameter tested go-no-go only.

DS26LS32M 883 Electrical Characteristics AC Parameters - Propagation Delay Time

The following conditions apply, unless otherwise specified. V_{CC} = 5V

Parameter		Test Conditions	Notes	Min	Max	Unit	Sub-groups
t_{PLH}	Propagation Delay Time	C_L = 15pF	(1)		30	nS	9,11,
t_{PLH}	Propagation Delay Time	C_L = 15pF	(1)		120	nS	10
t_{PHL}	Propagation Delay Time	C_L = 15pF	(1)		30	nS	9,11,
t_{PHL}	Propagation Delay Time	C_L = 15pF	(1)		120	nS	10
t_{PLZ}	Enable to Output	$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		34	nS	9
		$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		64	nS	10
		$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		27	nS	11
t_{PHZ}	Enable to Output	$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		32	nS	9,11,
		$\overline{\text{ENABLE}}$ C_L = 5pF	(1)		35	nS	10
t_{PZL}	Enable to Output	$\overline{\text{ENABLE}}$ C_L = 15pF	(1)		34	nS	9
		$\overline{\text{ENABLE}}$ C_L = 15pF	(1)		65	nS	10
		$\overline{\text{ENABLE}}$ C_L = 15pF	(1)		27	nS	11

(1) Tested at 25°C, specified but not tested at +125°C & −55°C

DS26LS32M 883 Electrical Characteristics AC Parameters - Propagation Delay Time (continued)

The following conditions apply, unless otherwise specified. V_{CC} = 5V

Parameter		Test Conditions	Notes	Min	Max	Unit	Sub-groups
t_{PZH}	Enable to Output	$\overline{ENABLE}$ C_L = 15pF	(1)		35	nS	9, 11
		$\overline{ENABLE}$ C_L = 15pF	(1)		65	nS	10

AC TEST CIRCUIT AND SWITCHING TIME WAVEFORMS

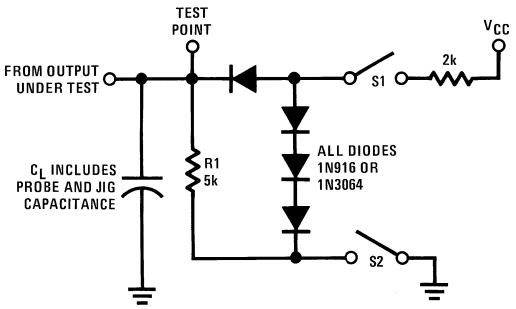
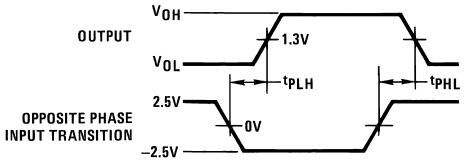


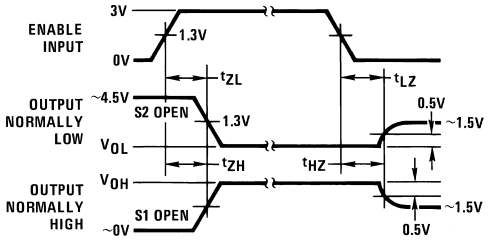
Figure 3. Load Test Circuit for TRI-STATE Outputs



(1) Diagram shown for $\overline{ENABLE}$ low.

(2) Pulse generator for all pulses: Rate = 1.0 MHz; Z_O = 50Ω; t_r ≤ 6 ns; t_f ≤ 6.0 ns.

Figure 4. Propagation Delay



(1) S1 and S2 of load circuit are closed except where shown.

(2) Pulse generator for all pulses: Rate = 1.0 MHz; Z_O = 50Ω; t_r ≤ 6 ns; t_f ≤ 6.0 ns.

Figure 5. Enable and Disable Times

TYPICAL APPLICATIONS

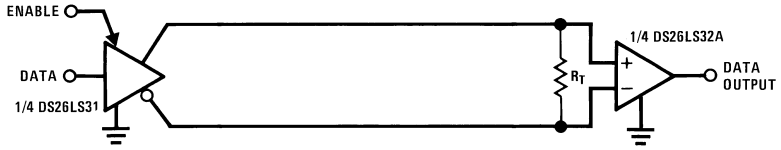


Figure 6. Two-Wire Balanced Interface—RS-422

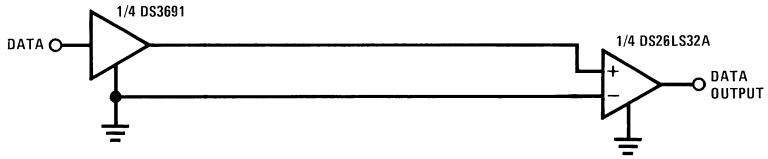


Figure 7. Single Wire with Driver Ground Reference—RS-423

REVISION HISTORY

Date Released	Revision	Section	Originator	Changes
10/20/05	A	New Release, Corporate format. Changes made in conversion: Ordering Info. Table, Absolute Ratings, Maximum Operating Conditions, Typos in QMLV & RH, 883 AC Electrical Characteristics Parameters Column.	R. Malone	1 MDS data sheet converted into Corporate data sheet format. **Added:** SMD reference for 883 NSID's, Juction temp., Thermal Resistance θ_{JA} and θ_{JC}. **Changed:** Maximum Operating Conditions to Recommended Operating Conditions, Enable and Disable Time to Enable to Output. Deleted max limit: 27nS for t_{PZH} and added subgroup 11 to max limit 35nS. MDS data sheet MNDS26LS32–X, Rev. 2B0 will be Archived.
4/15/2013	B		TIS	Changed layout of National Data Sheet to TI format

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-7802006QEA	Active	Production	CDIP (NFE) | 16	25 | TUBE	No	SNPB	Level-1-NA-UNLIM	-55 to 125	(DS26C32AMJ/883, DS26LS32MJ/883) (5962-7802006QEA Q, 5962-9164001MEA Q)
DS26LS32MJ/883	Active	Production	CDIP (NFE) | 16	25 | TUBE	No	SNPB	Level-1-NA-UNLIM	-55 to 125	(DS26C32AMJ/883, DS26LS32MJ/883) (5962-7802006QEA Q, 5962-9164001MEA Q)

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

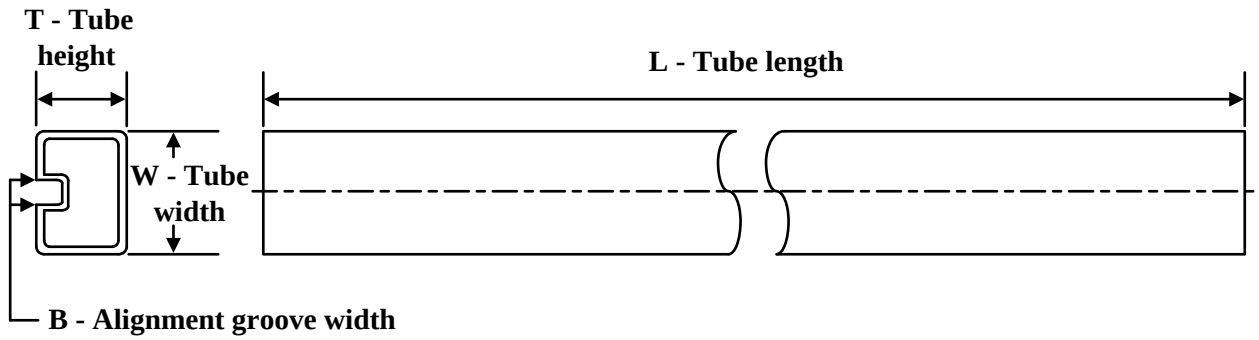
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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.

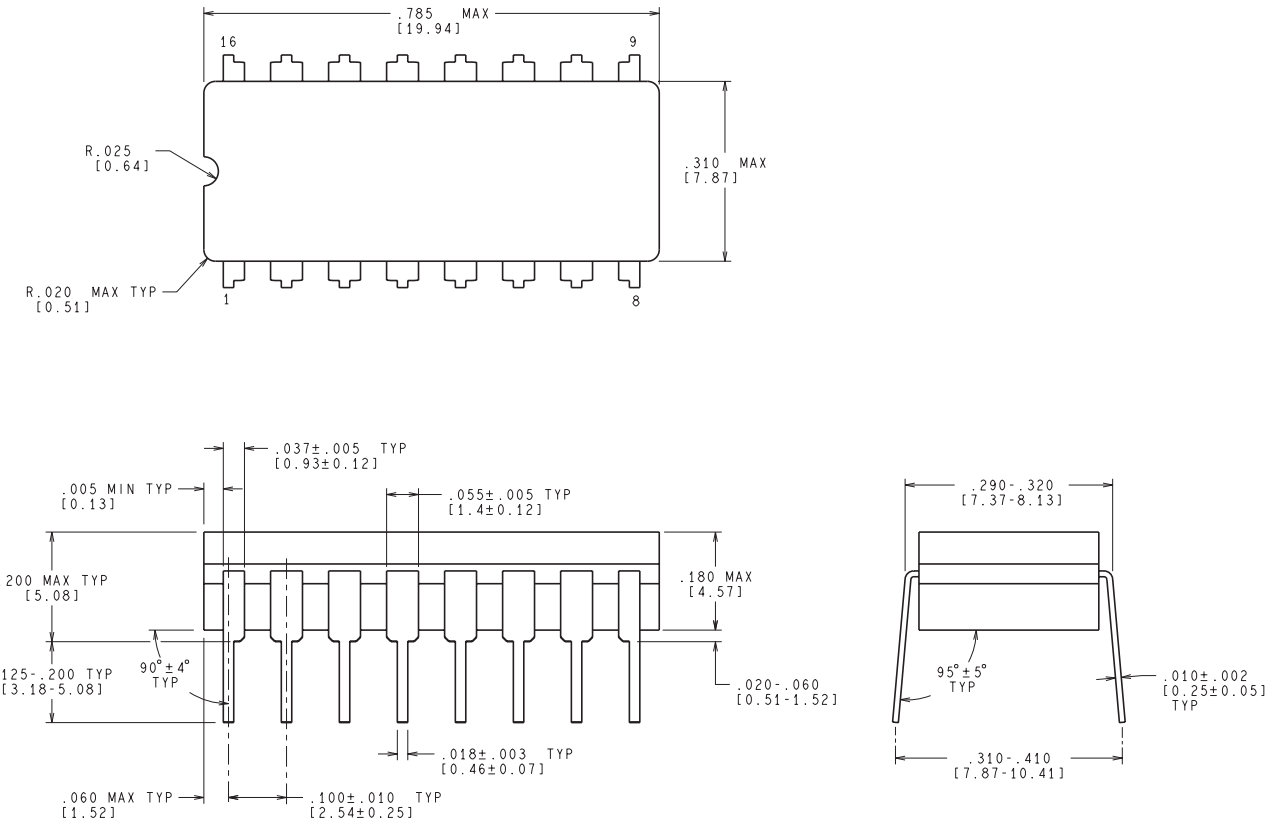
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-7802006QEA	NFE	CDIP	16	25	506.98	15.24	13440	NA
DS26LS32MJ/883	NFE	CDIP	16	25	506.98	15.24	13440	NA

NFE0016A



CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS

J16A (REV L)

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI’s products are provided subject to TI’s Terms of Sale, TI’s General Quality Guidelines, or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI’s provision of these resources does not expand or otherwise alter TI’s applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Last updated 10/2025