

SN54LS399, SN74LS399 QUADRUPLE 2-INPUT MULTIPLEXERS WITH STORAGE

SDLS174 – OCTOBER 1976 – REVISED MARCH 1988

- Single-Rail Outputs on 'LS399
- Selects One of Two 4-Bit Data Sources and Stores Data Synchronously with System Clock
- Applications:
 - Dual Source for Operands and Constants in Arithmetic Processor; Can Release Processor Register Files for Acquiring New Data
 - Implement Separate Registers Capable of Parallel Exchange of Contents Yet Retain External Load Capability
 - Universal Type Register for Implementing Various Shift Patterns: Even Has Compound Left-Right Capabilities

description

This monolithic quadruple two-input multiplexer with storage provides essentially the equivalent functional capabilities of two separate MSI functions (SN54LS157/SN74LS157 and SN54LS175/SN74LS175) in a single 16-pin package.

When the word-select input is low, word 1 (A1, B1, C1, D1) is applied to the flip-flops. A high input to word select will cause the selection of word 2 (A2, B2, C2, D2). The selected word is clocked to the output terminals on the positive-going edge of the clock pulse.

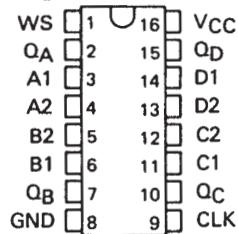
Typical power dissipation is 37 milliwatts. The SN54LS399 is characterized for operation over the full military range of -55°C to 125°C . The SN74LS399 is characterized for operation from 0°C to 70°C .

FUNCTION TABLE

INPUTS		OUTPUTS			
WORD SELECT	CLOCK	Q _A	Q _B	Q _C	Q _D
L	↑	a ₁	b ₁	c ₁	d ₁
H	↑	a ₂	b ₂	c ₂	d ₂
X	L	Q _{A0}	Q _{B0}	Q _{C0}	Q _{D0}

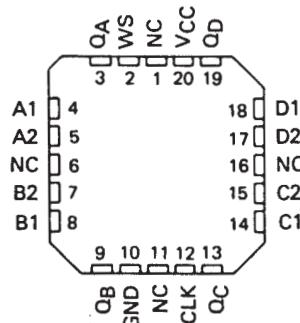
SN54LS399 . . . J OR W PACKAGE
SN74LS399 . . . D OR N PACKAGE

(TOP VIEW)



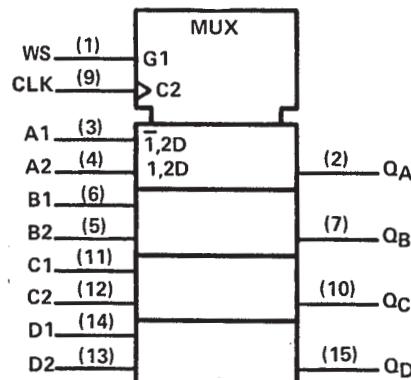
SN54LS399 . . . FK PACKAGE

(TOP VIEW)



NC – No internal connection

logic symbol[†]



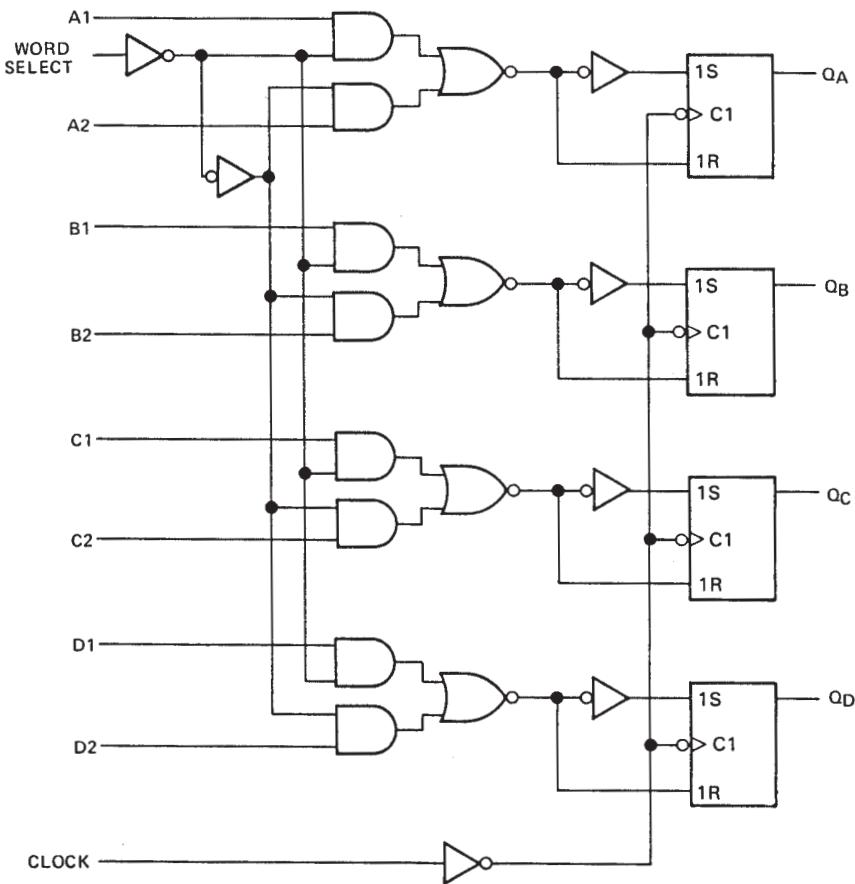
[†]This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for D, J, N, and W packages.

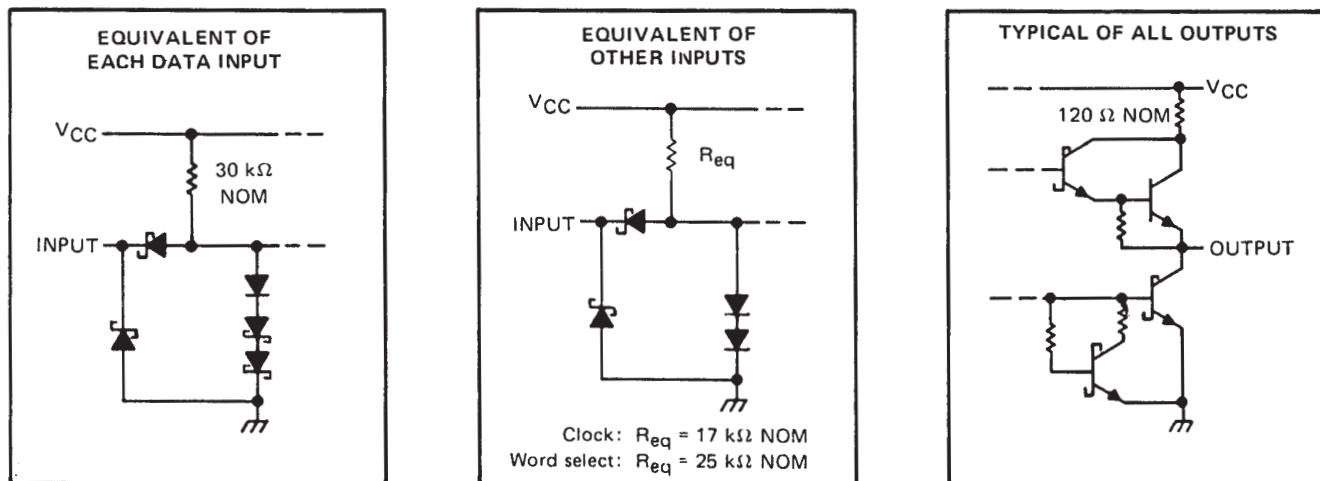
SN54LS399, SN74LS399 QUADRUPLE 2-INPUT MULTIPLEXERS WITH STORAGE

SDLS174 – OCTOBER 1976 – REVISED MARCH 1988

logic diagram (positive logic)



schematics of inputs and outputs



SN54LS399, SN74LS399 QUADRUPLE 2-INPUT MULTIPLEXERS WITH STORAGE

SDLS174 – OCTOBER 1976 – REVISED MARCH 1988

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

NOTE 1: Voltage values are with respect to network ground terminals.

recommended operating conditions

	SN54LS399			SN74LS399			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-400			-400	μA
Low-level output current, I_{OL}			4			8	mA
Width of clock pulse, high or low level, t_W	20			20			ns
Setup time, t_{SU}	Data	25		25			ns
	Word select	45		45			
Hold time, t_H	Data	0		0			ns
	Word select	0		0			
Operating free-air temperature, T_A	-55	125	0	0	70		$^{\circ}C$

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS [†]	SN54LS399			SN74LS399			UNIT
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V _{IH}	High-level input voltage			2			2	V
V _{IL}	Low-level input voltage				0.7		0.8	V
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = -18 mA			-1.5		-1.5	V
V _{OH}	High-level output voltage	V _{CC} = MIN, V _{IL} = V _{IL} max	V _{IH} = 2 V, I _{OH} = -400 μ A	2.5	3.4	2.7	3.4	V
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IL} = V _{IL} max	V _{IH} = 2 V, I _{OL} = 4 mA	0.25	0.4	0.25	0.4	V
			I _{OL} = 8 mA			0.35	0.5	
I _I	Input current at maximum input voltage	V _{CC} = MAX, V _I = 7 V			0.1		0.1	mA
I _{IH}	High-level input current	V _{CC} = MAX, V _I = 2.7 V			20		20	μ A
I _{IL}	Low-level input current	V _{CC} = MAX, V _I = 0.4 V			-0.4		-0.4	mA
I _{OS}	Short-circuit output current [§]	V _{CC} = MAX		-20	-100	-20	-100	mA
I _{CC}	Supply current	V _{CC} = MAX, See Note 2		7.3	13	7.3	13	mA

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡]All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

Not more than one output should be shorted at a time, due to the low current rating of the MOSFETs, and no more than one output should be connected to ground.

NOTE 2: With the exception of the short-circuit test, no other test should be conducted on the system until the short-circuit has been removed.

NOTE 2: With all outputs open and all inputs except clock low, I_{CC} is measured after applying a momentary 4.5 V, followed by ground, to the clock input.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	$C_L = 15 \text{ pF}, \quad R_L = 2 \text{ k}\Omega,$ See Note 3		18	27	ns
t_{PHL}	Propagation delay time, high-to-low-level output			21	32	

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



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)	Device Marking (4/5)	Samples
84154012A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84154012A SNJ54LS 399FK	Samples
8415401EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401EA SNJ54LS399J	Samples
8415401EA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401EA SNJ54LS399J	Samples
8415401FA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401FA SNJ54LS399W	Samples
8415401FA	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401FA SNJ54LS399W	Samples
SN54LS399J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54LS399J	Samples
SN54LS399J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54LS399J	Samples
SN74LS399DR	OBsolete	SOIC	D	16		TBD	Call TI	Call TI	0 to 70		
SN74LS399DR	OBsolete	SOIC	D	16		TBD	Call TI	Call TI	0 to 70		
SN74LS399N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS399N	Samples
SN74LS399N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS399N	Samples
SN74LS399N3	OBsolete	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS399N3	OBsolete	PDIP	N	16		TBD	Call TI	Call TI	0 to 70		
SN74LS399NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS399N	Samples
SN74LS399NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74LS399N	Samples
SNJ54LS399FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84154012A SNJ54LS 399FK	Samples
SNJ54LS399FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	84154012A SNJ54LS 399FK	Samples
SNJ54LS399J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401EA SNJ54LS399J	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54LS399J	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401EA SNJ54LS399J	Samples
SNJ54LS399W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401FA SNJ54LS399W	Samples
SNJ54LS399W	ACTIVE	CFP	W	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	8415401FA SNJ54LS399W	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.

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 SN54LS399, SN74LS399 :

- Catalog: [SN74LS399](#)
- Military: [SN54LS399](#)

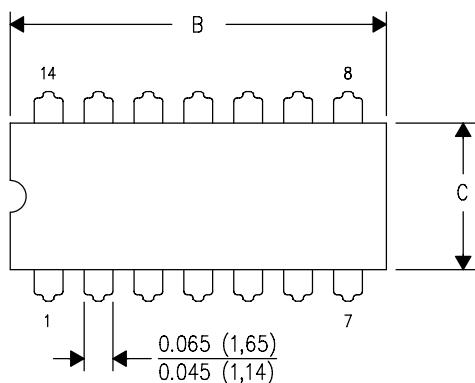
NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

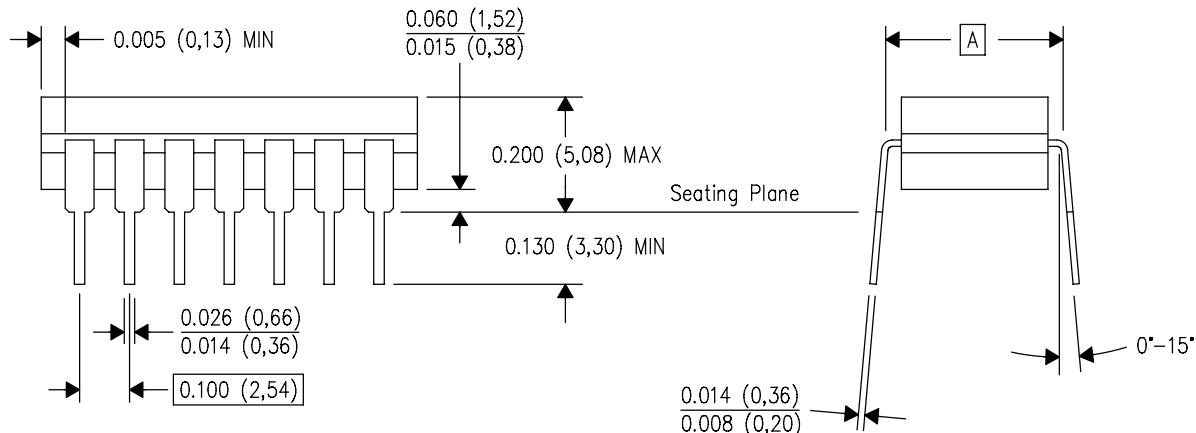
J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)

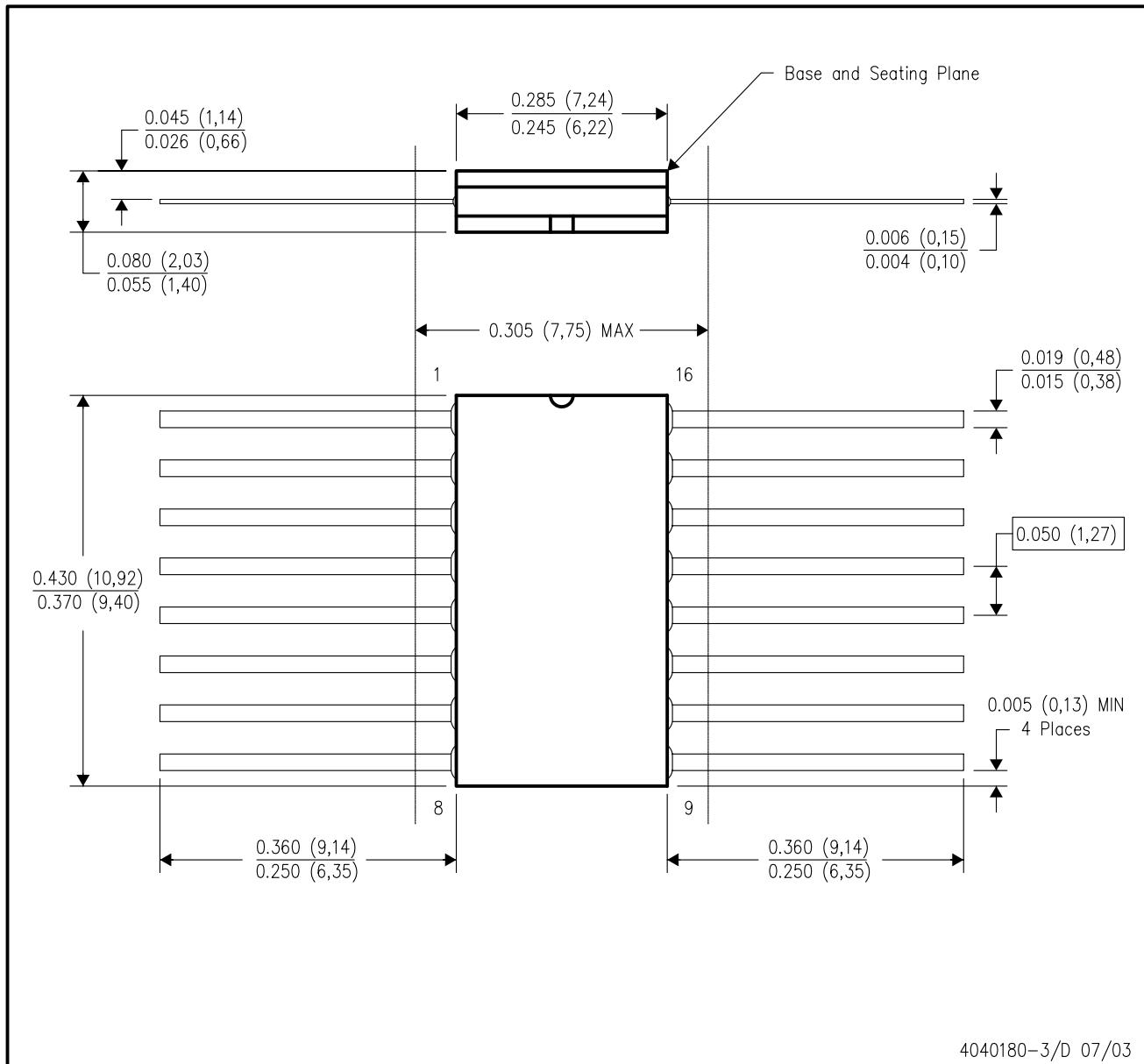


4040083/F 03/03

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package is hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



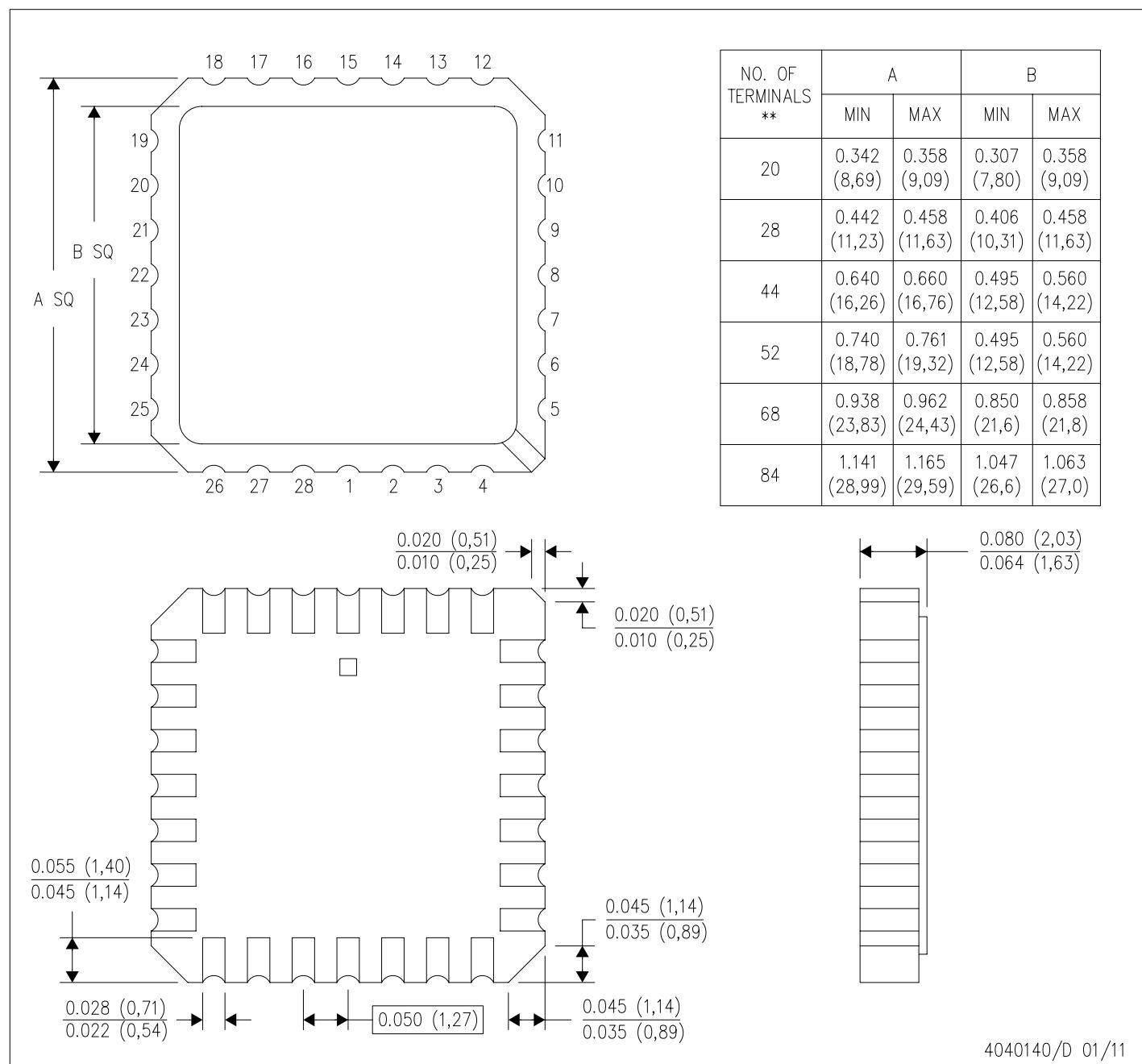
NOTES:

- All linear dimensions are in inches (millimeters).
- This drawing is subject to change without notice.
- This package can be hermetically sealed with a ceramic lid using glass frit.
- Index point is provided on cap for terminal identification only.
- Falls within MIL-STD 1835 GDFP1-F16 and JEDEC MO-092AC

FK (S-CQCC-N**)

28 TERMINAL SHOWN

LEADLESS CERAMIC CHIP CARRIER



NOTES:

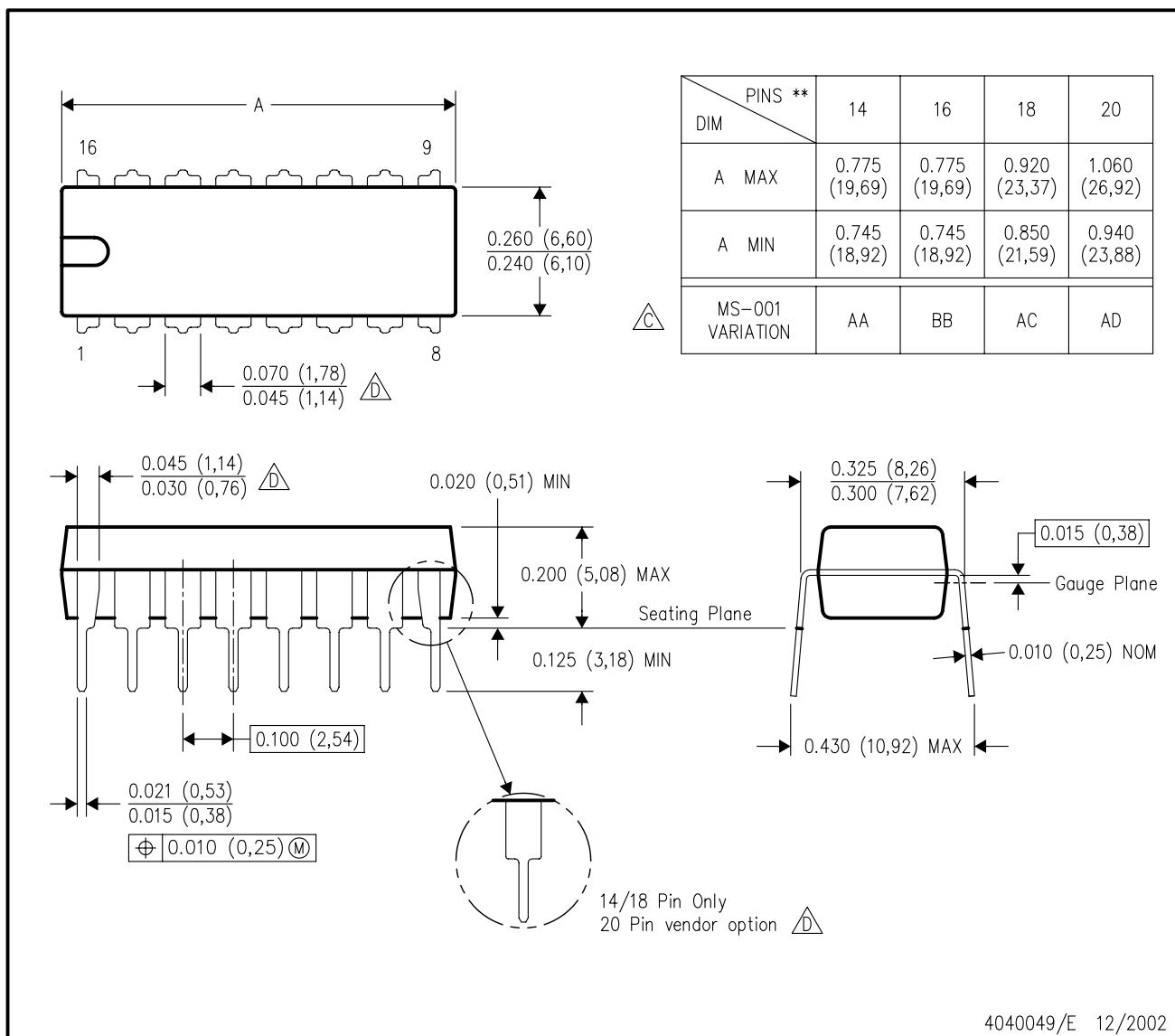
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a metal lid.
- D. Falls within JEDEC MS-004

4040140/D 01/11

N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



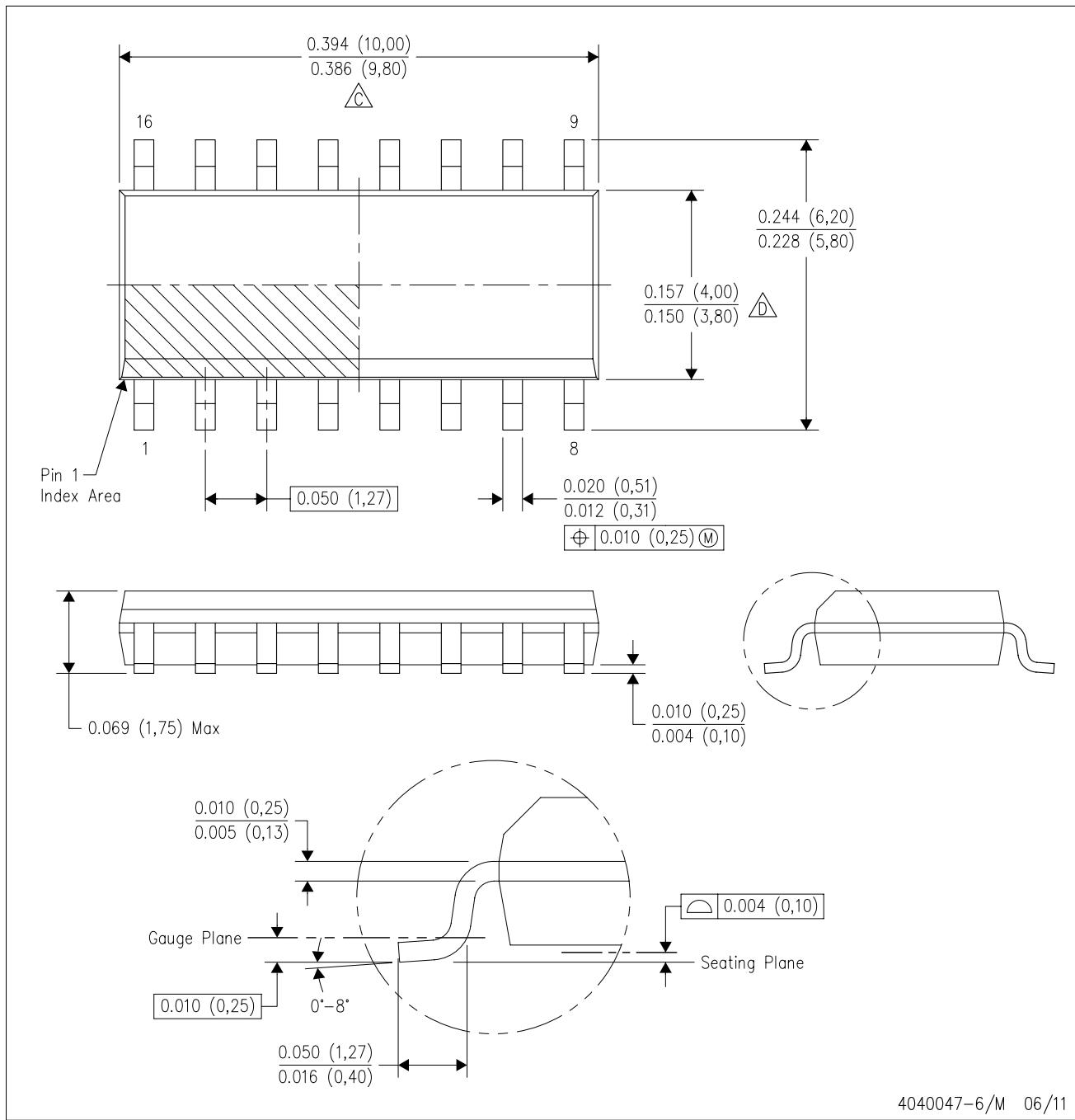
NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.

△ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).

△ The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

B. This drawing is subject to change without notice.

C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.

D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.

E. Reference JEDEC MS-012 variation AC.

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	Applications
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
	TI E2E Community
	e2e.ti.com