

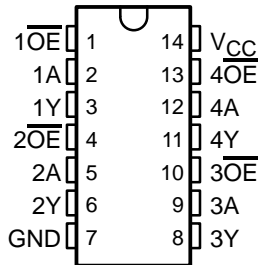
# SN54BCT125A, SN74BCT125A QUADRUPLE BUS BUFFER GATES WITH 3-STATE OUTPUTS

SCBS032F – SEPTEMBER 1988 – REVISED MARCH 2003

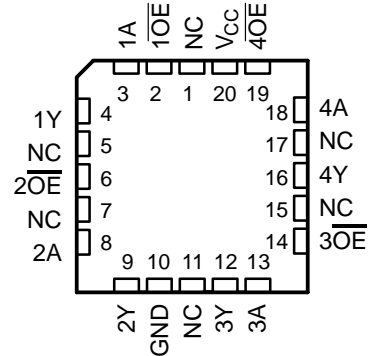
- Operating Voltage Range of 4.5 V to 5.5 V
- State-of-the-Art BiCMOS Design Significantly Reduces  $I_{CCZ}$

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers

SN54BCT125A . . . J OR W PACKAGE  
SN74BCT125A . . . D, N, OR NS PACKAGE  
(TOP VIEW)



SN54BCT125A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

The 'BCT125A bus buffers feature independent line drivers with 3-state outputs. Each output is disabled when the associated output-enable ( $\overline{OE}$ ) input is high.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

## ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	SN74BCT125AN	SN74BCT125AN
	SOIC – D	Tube	SN74BCT125AD	BCT125A
		Tape and reel	SN74BCT125ADR	
	SOP – NS	Tape and reel	SN74BCT125ANSR	BCT125A
–55°C to 125°C	CDIP – J	Tube	SNJ54BCT125AJ	SNJ54BCT125AJ
	CFP – W	Tube	SNJ54BCT125AW	SNJ54BCT125AW
	LCCC – FK	Tube	SNJ54BCT125AFK	SNJ54BCT125AFK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

FUNCTION TABLE  
(each buffer)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	H
L	L	L
H	X	Z



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

 **TEXAS  
INSTRUMENTS**

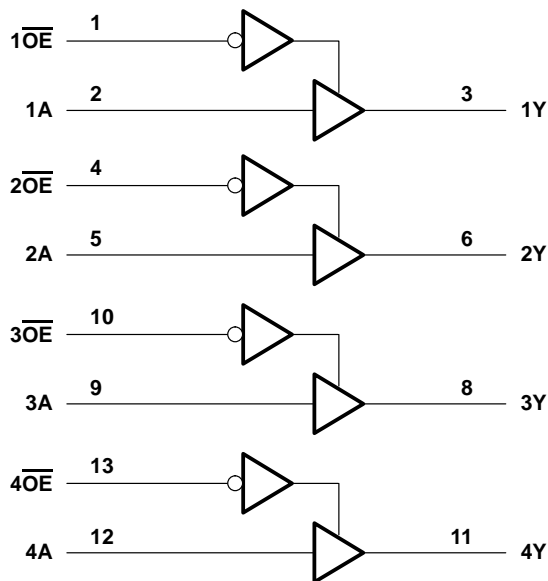
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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

# SN54BCT125A, SN74BCT125A QUADRUPLE BUS BUFFER GATES WITH 3-STATE OUTPUTS

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## logic diagram (positive logic)



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

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

Supply voltage range, $V_{CC}$ .....	-0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 V to 7 V
Voltage range applied to any output in the disabled or power-off state, $V_O$ .....	-0.5 V to 5.5 V
Voltage range applied to any output in the high state, $V_O$ .....	-0.5 V to $V_{CC}$
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-30 mA
Current into any output in the low state, $I_O$ : SN54BCT125A .....	96 mA
SN74BCT125A .....	128 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): D package .....	86°C/W
N package .....	80°C/W
NS package .....	76°C/W
Storage temperature range, $T_{stg}$ .....	-65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.



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# SN54BCT125A, SN74BCT125A QUADRUPLE BUS BUFFER GATES WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 3)

		SN54BCT125A			SN74BCT125A			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
$V_{CC}$	Supply voltage	4.5	5	5.5	4.5	5	5.5	V
$V_{IH}$	High-level input voltage	2			2			V
$V_{IL}$	Low-level input voltage			0.8			0.8	V
$I_{IK}$	Input clamp current			-18			-18	mA
$I_{OH}$	High-level output current			-12			-15	mA
$I_{OL}$	Low-level output current			48			64	mA
$T_A$	Operating free-air temperature	-55		125	0		70	°C

NOTE 3: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER	TEST CONDITIONS		SN54BCT125A			SN74BCT125A			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
$V_{IK}$	$V_{CC} = 4.5\text{ V}$ ,	$I_I = -18\text{ mA}$			-1.2			-1.2	V
$V_{OH}$	$V_{CC} = 4.5\text{ V}$	$I_{OH} = -3\text{ mA}$	2.4	3.3		2.4	3.3		V
		$I_{OH} = -12\text{ mA}$	2	3.2					
		$I_{OH} = -15\text{ mA}$				2	3.1		
$V_{OL}$	$V_{CC} = 4.5\text{ V}$	$I_{OL} = 48\text{ mA}$		0.38	0.55				V
		$I_{OL} = 64\text{ mA}$					0.42	0.55	
$I_I$	$V_{CC} = 0$ ,	$V_I = 7\text{ V}$			0.1			0.1	mA
$I_{IH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 2.7\text{ V}$			35			25	$\mu\text{A}$
$I_{IL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_I = 0.5\text{ V}$			-20			-20	$\mu\text{A}$
$I_{OZH}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 2.7\text{ V}$			50			50	$\mu\text{A}$
$I_{OZL}$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0.5\text{ V}$			-50			-50	$\mu\text{A}$
$I_{OS}^\ddagger$	$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0$	-100		-225	-100		-225	mA
$I_{CCH}$	$V_{CC} = 5.5\text{ V}$ ,	Outputs open		19	31		19	31	mA
$I_{CCL}$	$V_{CC} = 5.5\text{ V}$ ,	Outputs open		46	49		46	49	mA
$I_{CCZ}$	$V_{CC} = 5.5\text{ V}$ ,	Outputs open		6	14		6	14	mA
$C_i$	$V_{CC} = 5\text{ V}$ ,	$V_I = 2.5\text{ V}$ or $0.5\text{ V}$		4			4		pF
$C_o$	$V_{CC} = 5\text{ V}$ ,	$V_O = 2.5\text{ V}$ or $0.5\text{ V}$		9			9		pF

† All typical values are at  $V_{CC} = 5\text{ V}$ .

‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

# SN54BCT125A, SN74BCT125A QUADRUPLE BUS BUFFER GATES WITH 3-STATE OUTPUTS

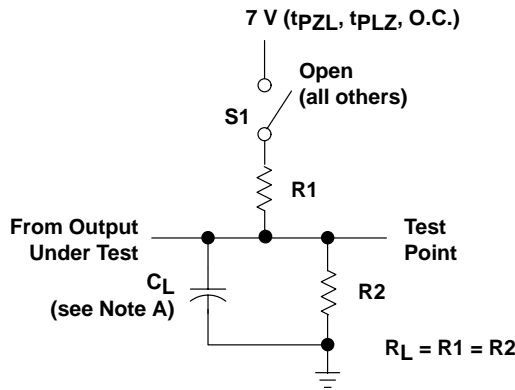
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## switching characteristics (see Figure 1)

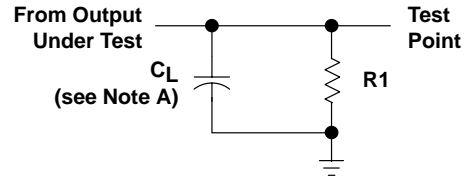
PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = 25°C			V <sub>CC</sub> = 4.5 V to 5.5 V, C <sub>L</sub> = 50 pF, R1 = 500 Ω, R2 = 500 Ω, T <sub>A</sub> = MIN to MAX <sup>§</sup>				UNIT
			'BCT125A			SN54BCT125A		SN74BCT125A		
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>PLH</sub>	A	Y	1.6	3.5	5.2	1.6	6	1.6	5.7	ns
t <sub>PHL</sub>			2.7	5	6.9	2.7	8	2.7	7.7	
t <sub>PZH</sub>	$\overline{OE}$	Y	3.4	6.7	9	3.4	11.1	3.4	10.3	ns
t <sub>PZL</sub>			5	8.2	10.4	5	12.8	5	11.7	
t <sub>PHZ</sub>	$\overline{OE}$	Y	3	5.8	7.4	3	9.4	3	8.9	ns
t <sub>PLZ</sub>			2.8	5.5	7.3	2.8	9.9	2.8	8.6	

<sup>§</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

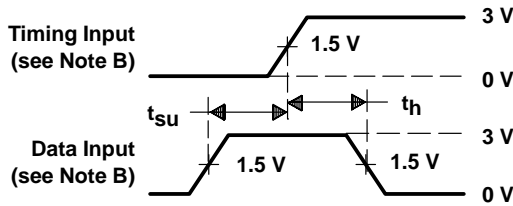
PARAMETER MEASUREMENT INFORMATION



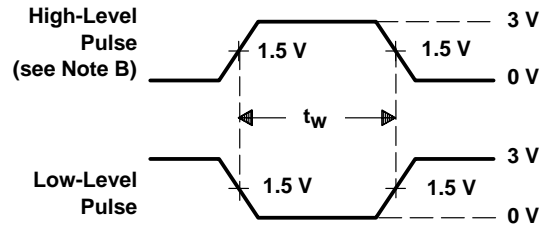
LOAD CIRCUIT FOR 3-STATE AND OPEN-COLLECTOR OUTPUTS



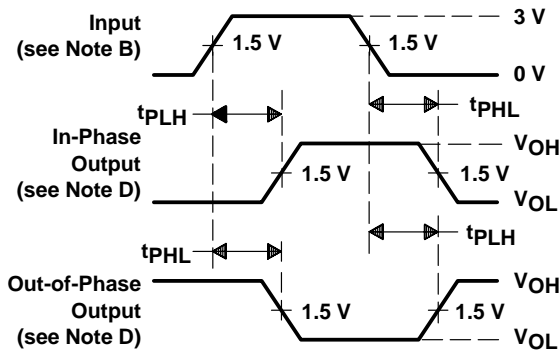
LOAD CIRCUIT FOR TOTEM-POLE OUTPUTS



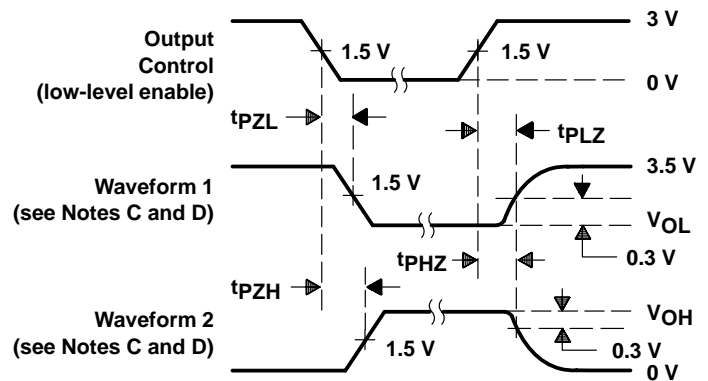
VOLTAGE WAVEFORMS SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES (see Note D)



VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10$  MHz,  $t_r = t_f \leq 2.5$  ns, duty cycle = 50%.  
 C. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 D. The outputs are measured one at a time with one transition per measurement.  
 E. When measuring propagation delay times of 3-state outputs, switch S1 is open.  
 F. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

**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
5962-9093701M2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9093701M2A SNJ54BCT 125AFK	<a href="#">Samples</a>
5962-9093701MCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9093701MC A SNJ54BCT125AJ	<a href="#">Samples</a>
5962-9093701MDA	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9093701MD A SNJ54BCT125AW	<a href="#">Samples</a>
SN54BCT125AJ	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	SN54BCT125AJ	<a href="#">Samples</a>
SN74BCT125AD	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT125A	<a href="#">Samples</a>
SN74BCT125ADG4	ACTIVE	SOIC	D	14	50	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT125A	<a href="#">Samples</a>
SN74BCT125ADR	ACTIVE	SOIC	D	14	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT125A	<a href="#">Samples</a>
SN74BCT125AN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	SN74BCT125AN	<a href="#">Samples</a>
SN74BCT125ANSR	ACTIVE	SO	NS	14	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	0 to 70	BCT125A	<a href="#">Samples</a>
SNJ54BCT125AFK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9093701M2A SNJ54BCT 125AFK	<a href="#">Samples</a>
SNJ54BCT125AJ	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9093701MC A SNJ54BCT125AJ	<a href="#">Samples</a>
SNJ54BCT125AW	ACTIVE	CFP	W	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9093701MD A SNJ54BCT125AW	<a href="#">Samples</a>

(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.

<sup>(2)</sup> 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)

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

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

<sup>(5)</sup> 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.

<sup>(6)</sup> 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 SN54BCT125A, SN74BCT125A :**

● Catalog: [SN74BCT125A](#)

● Military: [SN54BCT125A](#)

NOTE: Qualified Version Definitions:

● Catalog - TI's standard catalog product

- Military - QML certified for Military and Defense Applications



## TAPE AND REEL INFORMATION



### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74BCT125ADR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74BCT125ADR	SOIC	D	14	2500	367.0	367.0	38.0

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



NO. OF TERMINALS **	A		B	
	MIN	MAX	MIN	MAX
20	0.342 (8,69)	0.358 (9,09)	0.307 (7,80)	0.358 (9,09)
28	0.442 (11,23)	0.458 (11,63)	0.406 (10,31)	0.458 (11,63)
44	0.640 (16,26)	0.660 (16,76)	0.495 (12,58)	0.560 (14,22)
52	0.740 (18,78)	0.761 (19,32)	0.495 (12,58)	0.560 (14,22)
68	0.938 (23,83)	0.962 (24,43)	0.850 (21,6)	0.858 (21,8)
84	1.141 (28,99)	1.165 (29,59)	1.047 (26,6)	1.063 (27,0)



4040140/D 01/11

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

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- 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 ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL STD 1835 GDFP1-F14

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - 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.
  - Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AB.

D (R-PDSO-G14)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.

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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.

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