

SN55LBC172 QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

SGLS084C – MARCH 1995 – REVISED JANUARY 2003

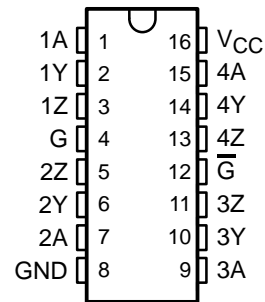
- Meets Standard EIA-485
- Designed for High-Speed Multipoint Transmission on Long Bus Lines in Noisy Environments
- Supports Data Rates up to and Exceeding Ten Million Transfers Per Second
- Common-Mode Output Voltage Range of –7 V to 12 V
- Positive- and Negative-Current Limiting
- Low Power Consumption . . . 1.5 mA Max (Output Disabled)

description

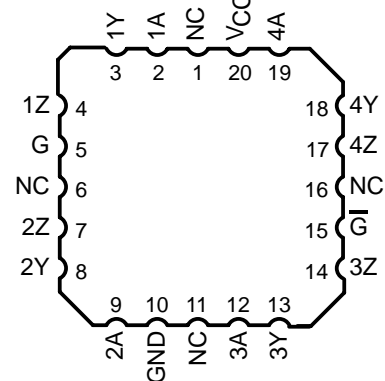
The SN55LBC172 is a monolithic quadruple differential line driver with 3-state outputs. This device is designed to meet the requirements of the Electronics Industry Association (EIA) standard RS-485. The SN55LBC172 is optimized for balanced multipoint bus transmission at data rates up to and exceeding 10 million bits per second. The driver features wide positive and negative common-mode output voltage ranges, current limiting, and thermal-shutdown circuitry, making it suitable for party-line applications in noisy environments. The device is designed using the LinBiCMOS™ process, facilitating ultralow power consumption and inherent robustness.

The SN55LBC172 provides positive- and negative-current limiting and thermal shutdown for protection from line fault conditions on the transmission bus line. This device offers optimum performance when used with the SN55LBC173M quadruple line receiver.

J OR W PACKAGE
(TOP VIEW)



FK PACKAGE
(TOP VIEW)



NC – No internal connection

ORDERING INFORMATION†

TA	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–55°C to 125°C	LCCC – FK	Tube	SNJ55LBC172FK	SNJ55LBC172FK
	CDIP – J	Tube	SNJ55LBC172J	SNJ55LBC172J
	CFP – W	Tube	SNJ55LBC172W	SNJ55LBC172W

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



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.

LinBiCMOS is a trademark of Texas Instruments Incorporated.

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.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1995–2003, Texas Instruments Incorporated

SN55LBC172

QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

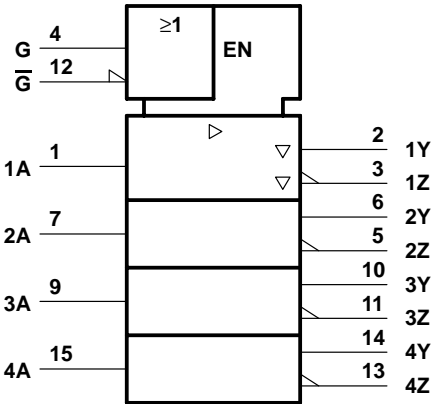
SGLS084C – MARCH 1995 – REVISED JANUARY 2003

FUNCTION TABLE
(each driver)

INPUT A	ENABLES		OUTPUTS	
	G	\overline{G}	Y	Z
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z

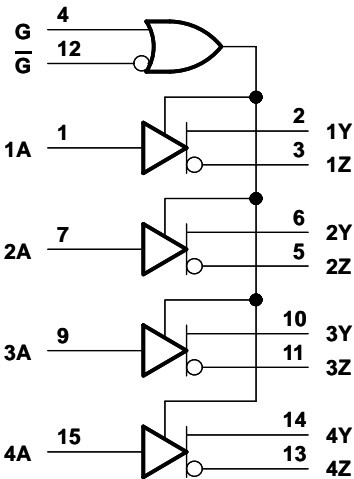
H = high level, L = low level, X = irrelevant,
Z = high impedance (off)

logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984
and IEC Publication 617-12.
Pin numbers shown are for the J or W package.

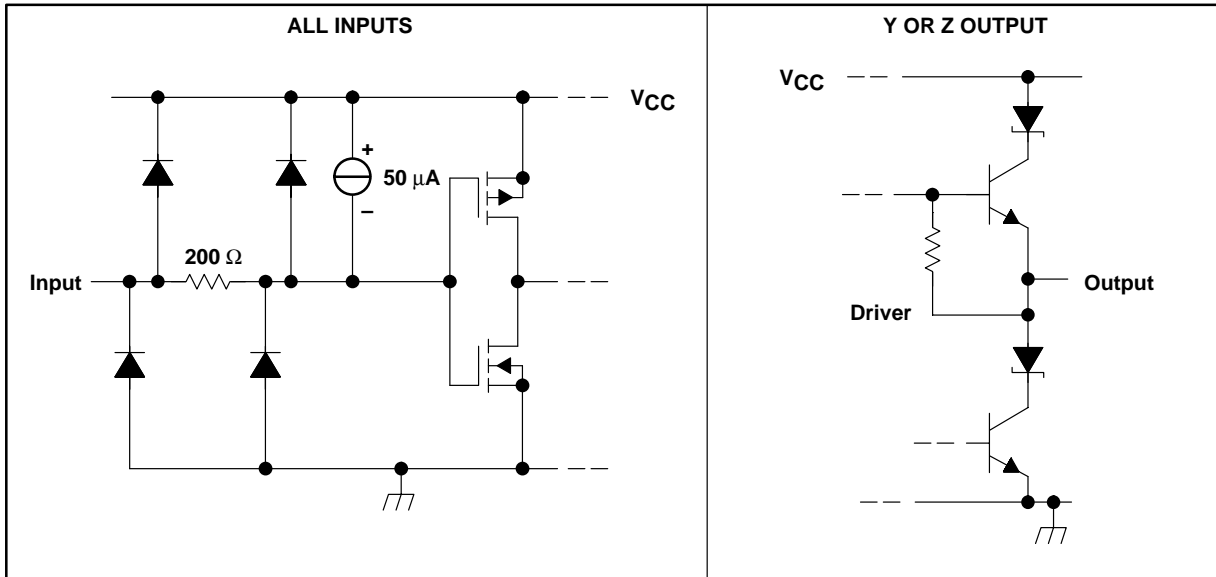
logic diagram (positive logic)



SN55LBC172 QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

SGLS084C – MARCH 1995 – REVISED JANUARY 2003

schematic diagrams of inputs and outputs



SN55LBC172

QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

SGLS084C – MARCH 1995 – REVISED JANUARY 2003

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

Supply voltage range, V_{CC} (see Note 1)	–0.3 V to 7 V
Output voltage range, V_O	–10 V to 15 V
Input voltage range, V_I	–0.3 V to 7 V
Continuous power dissipation	Internally limited‡
Operating free-air temperature range, T_A	–55°C to 125°C
Storage temperature range, T_{stg}	–65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	–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.

‡ The maximum operating junction temperature is internally limited. Use the dissipation rating table to operate below this temperature.

NOTE 1: All voltage values are with respect to GND.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A=125^\circ\text{C}$	$T_A = 125^\circ\text{C}$ POWER RATING
FK	1375 mW	11.0 mW/°C	275 mW
J	1375 mW	11.0 mW/°C	275 mW
W	1000 mW	8.0 mW/°C	200 mW

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
High-level input voltage, V_{IH}		2			V
Low-level input voltage, V_{IL}				0.8	V
Output voltage at any bus terminal (separately or common mode), V_O	Y or Z			12	V
				–7	
High-level output current, I_{OH}	Y or Z			–60	mA
Low-level output current, I_{OL}	Y or Z			60	mA
Continuous total power dissipation		See Dissipation Rating Table			
Operating free-air temperature, T_A		–55		125	°C



SN55LBC172

QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

SGLS084C – MARCH 1995 – REVISED JANUARY 2003

electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_{IK} Input clamp voltage	$I_I = -18 \text{ mA}$			-1.5	V
$ V_{OD} $ Differential output voltage‡	$R_L = 54 \Omega$, See Figure 1	1.1	1.8	5	V
	$R_L = 60 \Omega$, See Figure 2	1.1	1.7	5	
$\Delta V_{OD} $ Change in magnitude of differential output voltage§				± 0.2	V
V_{OC} Common-mode output voltage	$R_L = 54 \Omega$, See Figure 1			3 -1	V
$\Delta V_{OC} $ Change in magnitude of common-mode output voltage§				± 0.2	V
I_O Output current with power off	$V_{CC} = 0$, $V_O = -7 \text{ V to } 12 \text{ V}$			± 100	μA
I_{OZ} High-impedance-state output current	$V_O = -7 \text{ V to } 12 \text{ V}$			± 100	μA
I_{IH} High-level input current	$V_I = 2.4 \text{ V}$			-100	μA
I_{IL} Low-level input current	$V_I = 0.4 \text{ V}$			-100	μA
I_{OS} Short-circuit output current	$V_O = -7 \text{ V to } 12 \text{ V}$			± 250	mA
I_{CC} Supply current (all drivers)	No load	Outputs enabled		7	mA
		Outputs disabled		1.5	

† All typical values are at $V_{CC} = 5 \text{ V}$ and $T_A = 25^\circ\text{C}$.

‡ The minimum V_{OD} specification does not fully comply with EIA-485 at operating temperatures below 0°C . The lower output signal should be used to determine the maximum signal transmission distance.

§ $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitude of V_{OD} and V_{OC} , respectively, that occur when the input is changed from a high level to a low level.

switching characteristics, $V_{CC} = 5 \text{ V}$

PARAMETER	TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
$t_{d(OD)}$ Differential output delay time	$R_L = 54 \Omega$, See Figure 3	25°C	2	11	20	ns
		$-55^\circ\text{C to } 125^\circ\text{C}$	2		40	
$t_{t(OD)}$ Differential output transition time	$R_L = 54 \Omega$, See Figure 3	25°C	10	15	25	ns
		$-55^\circ\text{C to } 125^\circ\text{C}$	4		60	
t_{PZH} Output enable time to high level	$R_L = 110 \Omega$, See Figure 4	25°C			30	ns
		$-55^\circ\text{C to } 125^\circ\text{C}$			40	
t_{PZL} Output enable time to low level	$R_L = 110 \Omega$, See Figure 5	25°C			30	ns
		$-55^\circ\text{C to } 125^\circ\text{C}$			40	
t_{PHZ} Output disable time from high level	$R_L = 110 \Omega$, See Figure 4	25°C			60	ns
		$-55^\circ\text{C to } 125^\circ\text{C}$			115	
t_{PLZ} Output disable time from low level	$R_L = 110 \Omega$, See Figure 5	25°C			30	ns
		$-55^\circ\text{C to } 125^\circ\text{C}$			55	



SN55LBC172

QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

SGLS084C – MARCH 1995 – REVISED JANUARY 2003

PARAMETER MEASUREMENT INFORMATION

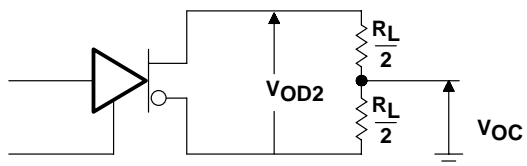


Figure 1. Differential and Common-Mode Output Voltages

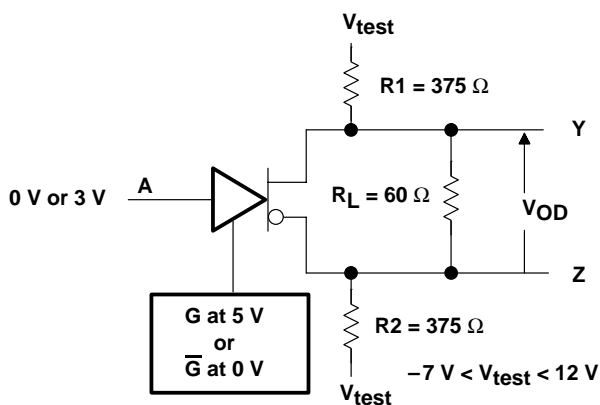
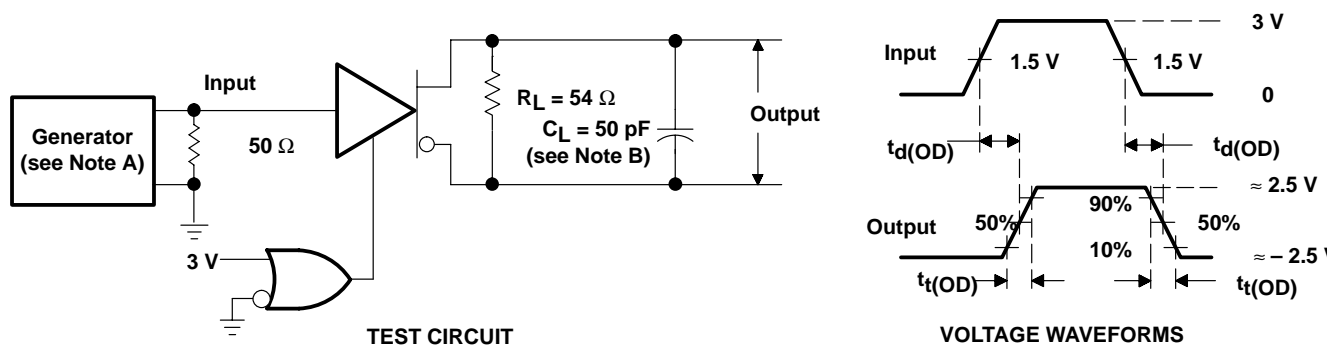


Figure 2. Driver V_{OD} Test Circuit

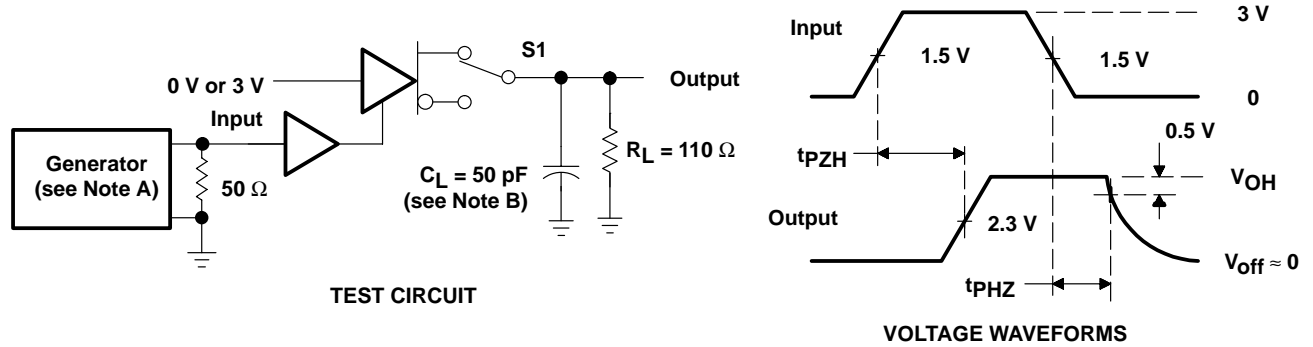


NOTES: A. The input pulses are supplied by a generator having the following characteristics: $PRR \leq 1$ MHz, duty cycle $\leq 50\%$, $t_r \leq 5$ ns, $t_f \leq 5$ ns, $Z_O = 50 \Omega$.

B. C_L includes probe and stray capacitance.

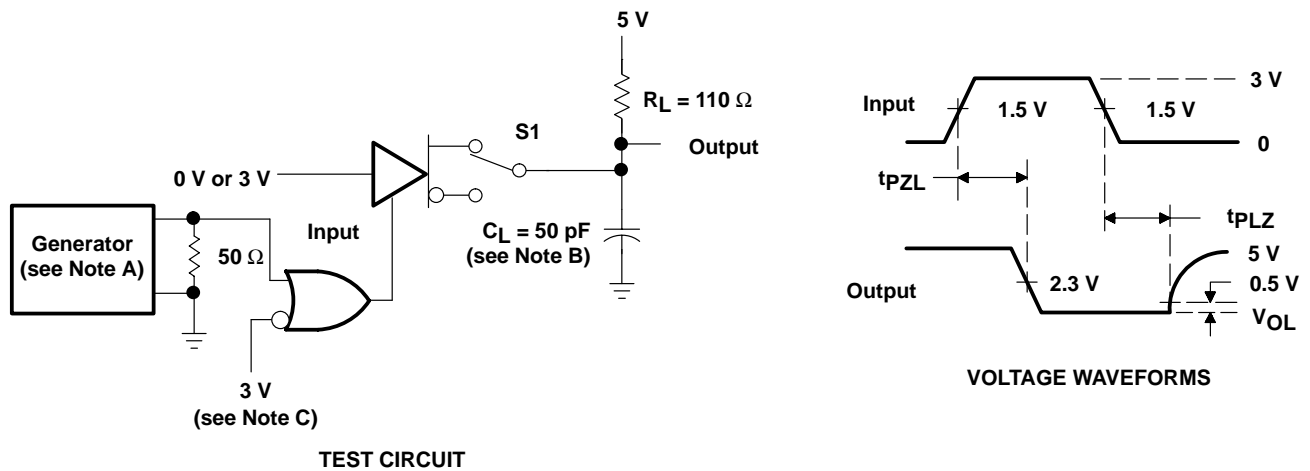
Figure 3. Driver Differential-Output Test Circuit and Delay and Transition-Time Waveforms

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1 \text{ MHz}$, duty cycle $\leq 50\%$, $t_r \leq 5 \text{ ns}$, $t_f \leq 5 \text{ ns}$, $Z_O = 50 \Omega$.
 B. C_L includes probe and stray capacitance.

Figure 4. t_{pZH} and t_{pHZ} Test Circuit and Voltage Waveforms



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $PRR \leq 1 \text{ MHz}$, duty cycle $\leq 50\%$, $t_r \leq 5 \text{ ns}$, $t_f \leq 5 \text{ ns}$, $Z_O = 50 \Omega$.
 B. C_L includes probe and stray capacitance.
 C. To test the active-low enable \overline{G} , ground G and apply an inverted waveform to \overline{G} .

Figure 5. t_{pZL} and t_{pLZ} Test Circuit and Waveforms

SN55LBC172

QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

SGLS084C – MARCH 1995 – REVISED JANUARY 2003

TYPICAL CHARACTERISTICS

OUTPUT CURRENT
vs
OUTPUT VOLTAGE

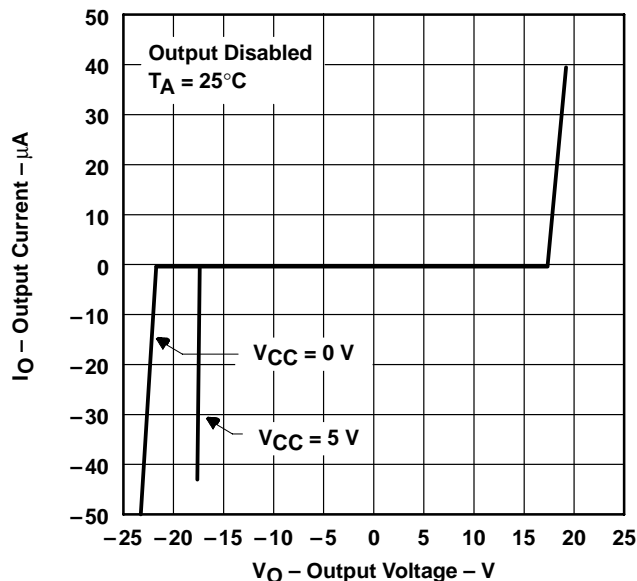


Figure 6

LOW-LEVEL OUTPUT VOLTAGE
vs
LOW-LEVEL OUTPUT CURRENT

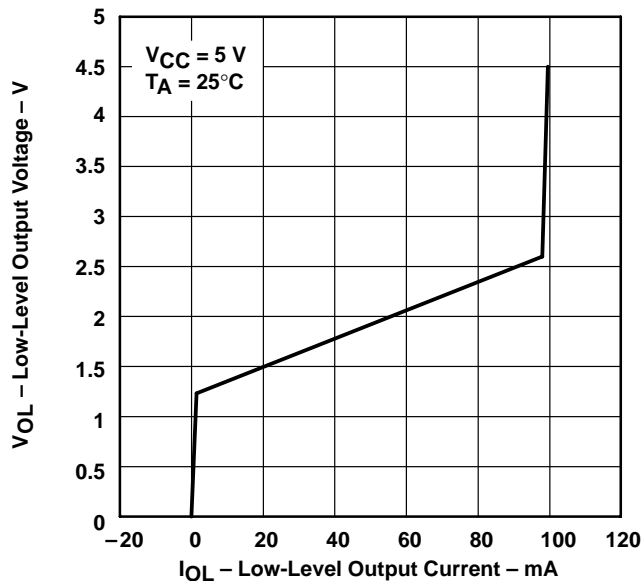


Figure 7

DRIVER
DIFFERENTIAL OUTPUT VOLTAGE
vs
FREE-AIR TEMPERATURE

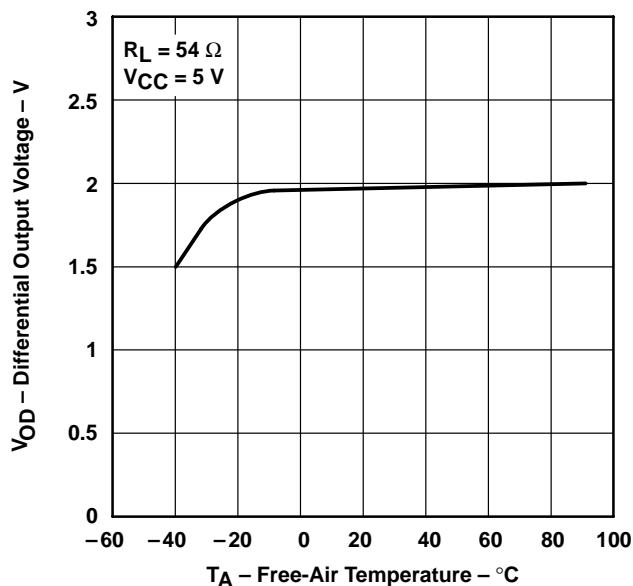


Figure 8

HIGH-LEVEL OUTPUT VOLTAGE
vs
HIGH-LEVEL OUTPUT CURRENT

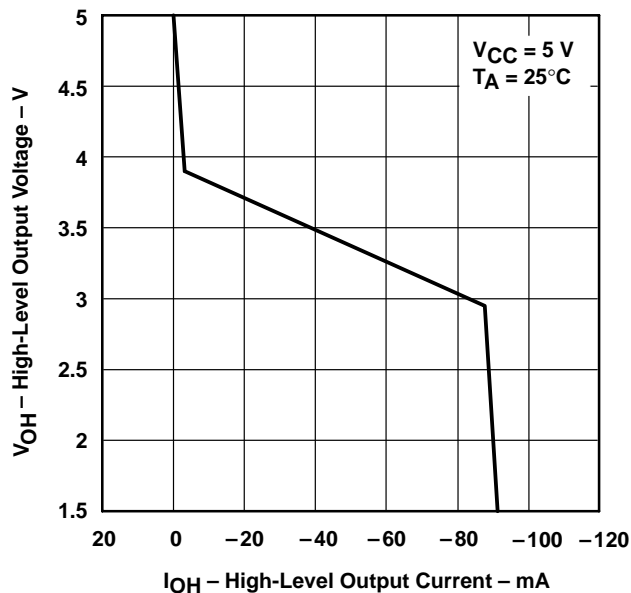
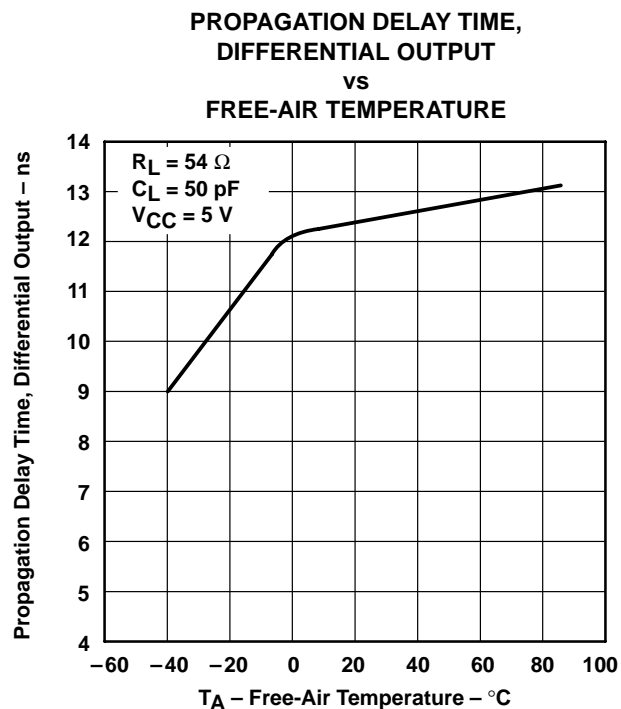
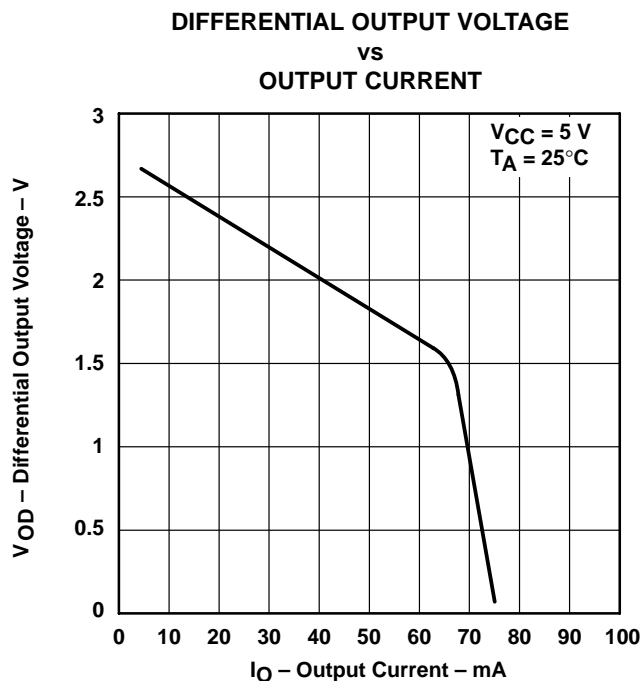


Figure 9

TYPICAL CHARACTERISTICS



SN55LBC172 QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

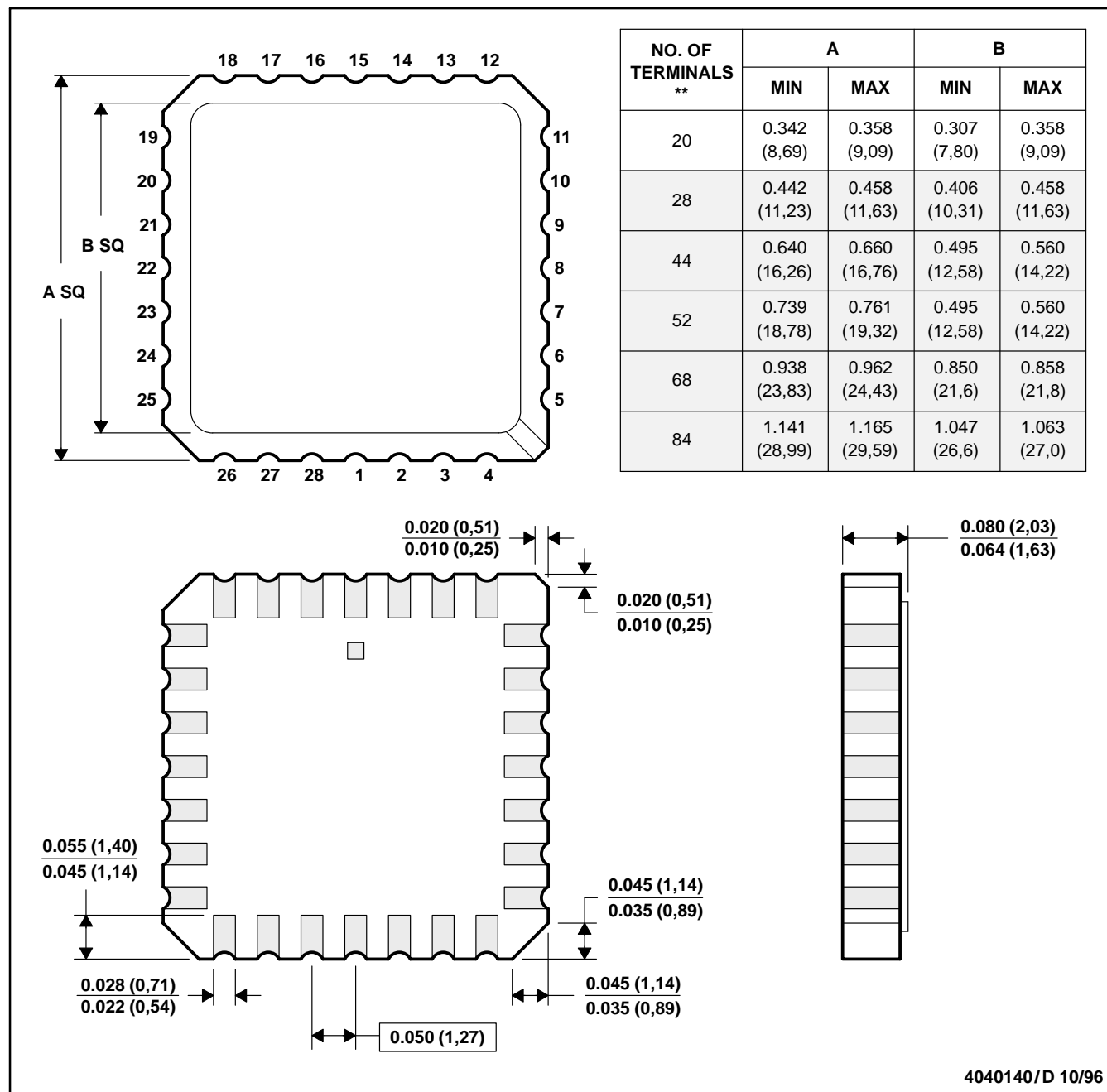
SGLS084C – MARCH 1995 – REVISED JANUARY 2003

MECHANICAL DATA

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



4040140/D 10/96

- 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. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

SN55LBC172

QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

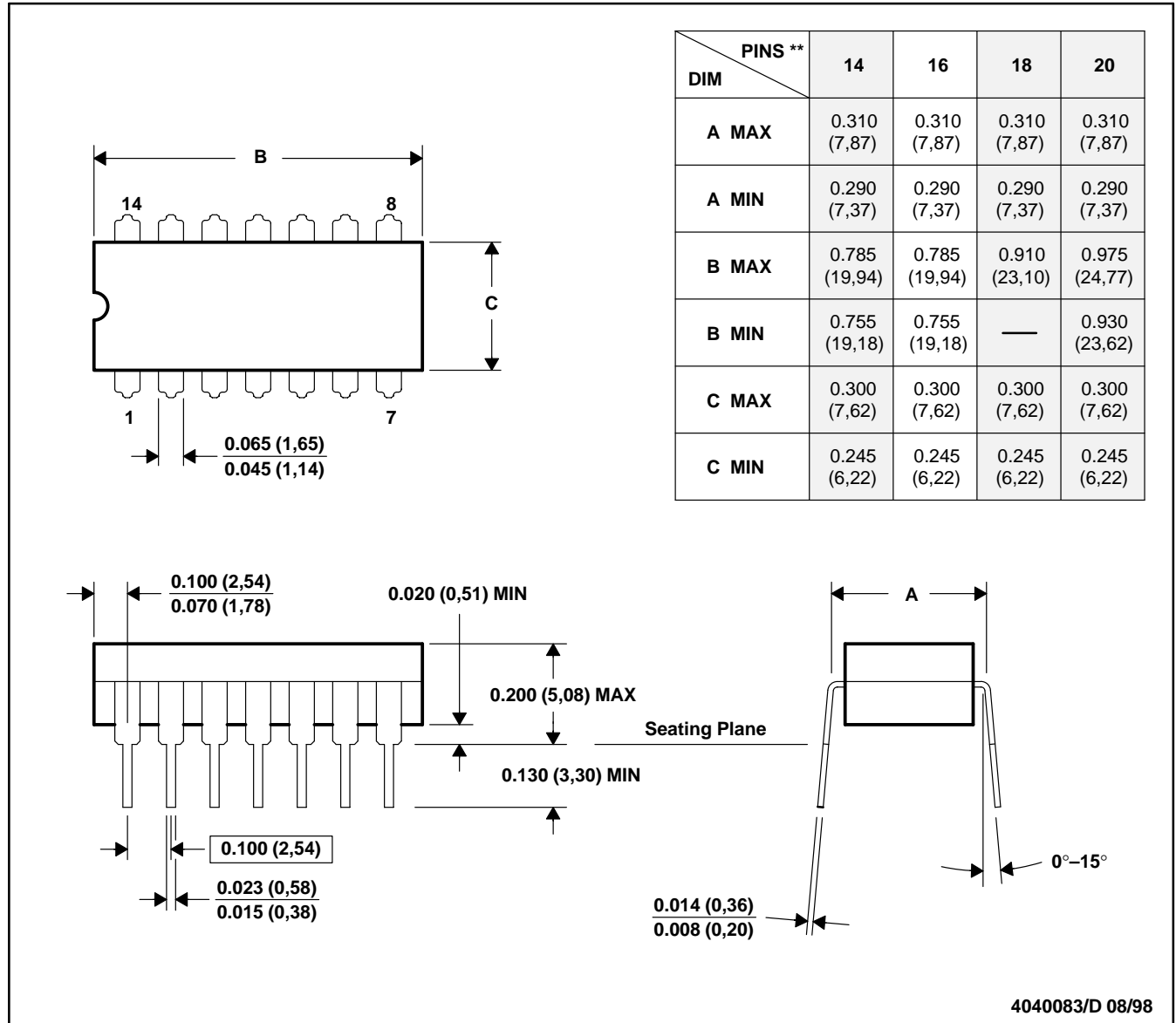
SGLS084C – MARCH 1995 – REVISED JANUARY 2003

MECHANICAL DATA

J (R-GDIP-T)**

CERAMIC DUAL-IN-LINE PACKAGE

14 PIN SHOWN



- 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 on press ceramic glass frit seal only.
 - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18, GDIP1-T20, and GDIP1-T22.

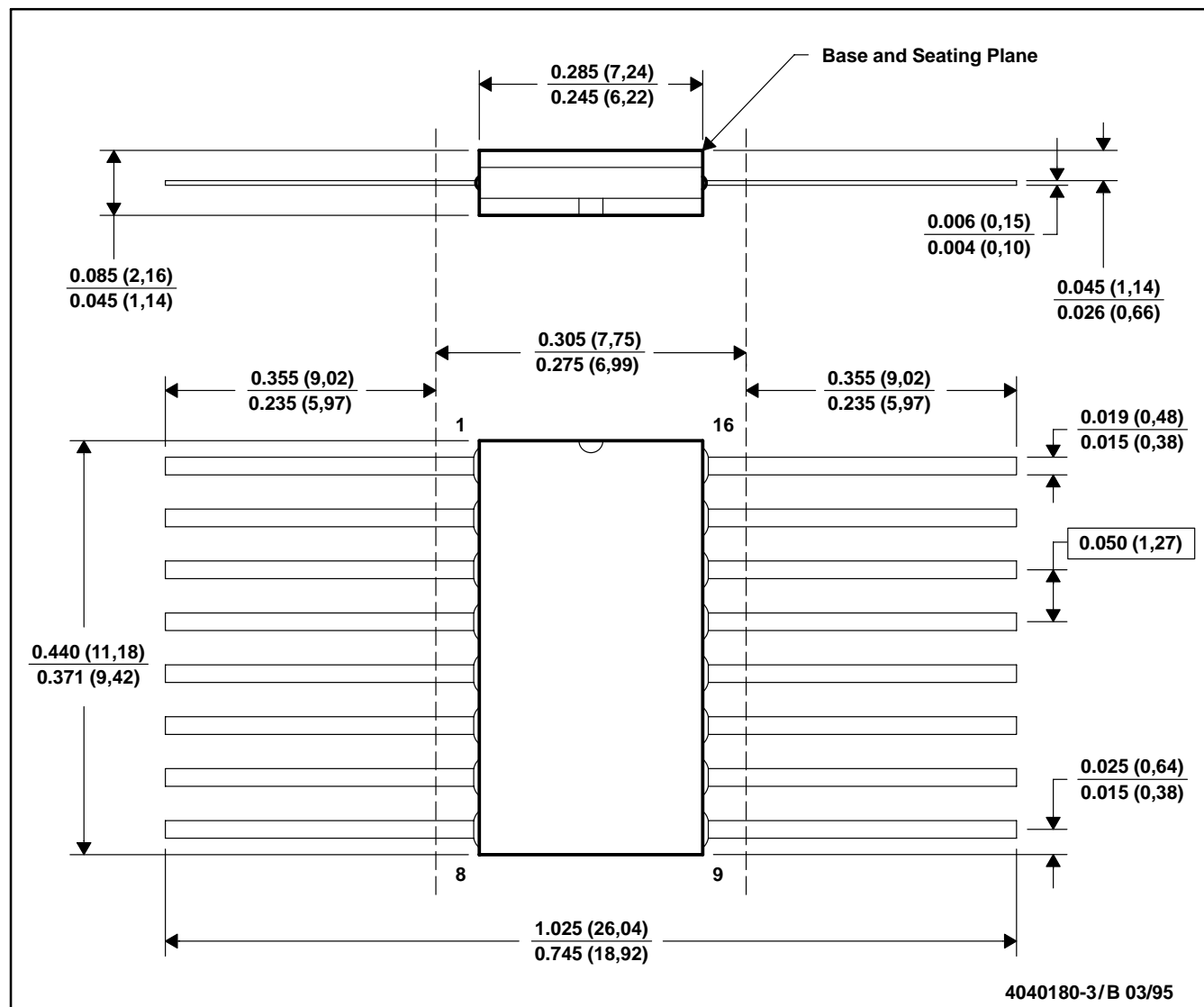
SN55LBC172 QUADRUPLE LOW-POWER DIFFERENTIAL LINE DRIVER

SGLS084C – MARCH 1995 – REVISED JANUARY 2003

MECHANICAL DATA

W (R-GDFP-F16)

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-F16 and JEDEC MO-092AC

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
5962-9076503Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
5962-9076503QEA	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
5962-9076503QFA	ACTIVE	CFP	W	16	1	TBD	A42 SNPB	N / A for Pkg Type
SNJ55LBC172FK	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type
SNJ55LBC172J	ACTIVE	CDIP	J	16	1	TBD	A42 SNPB	N / A for Pkg Type
SNJ55LBC172W	ACTIVE	CFP	W	16	1	TBD	A42 SNPB	N / A for Pkg Type

⁽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.

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.

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

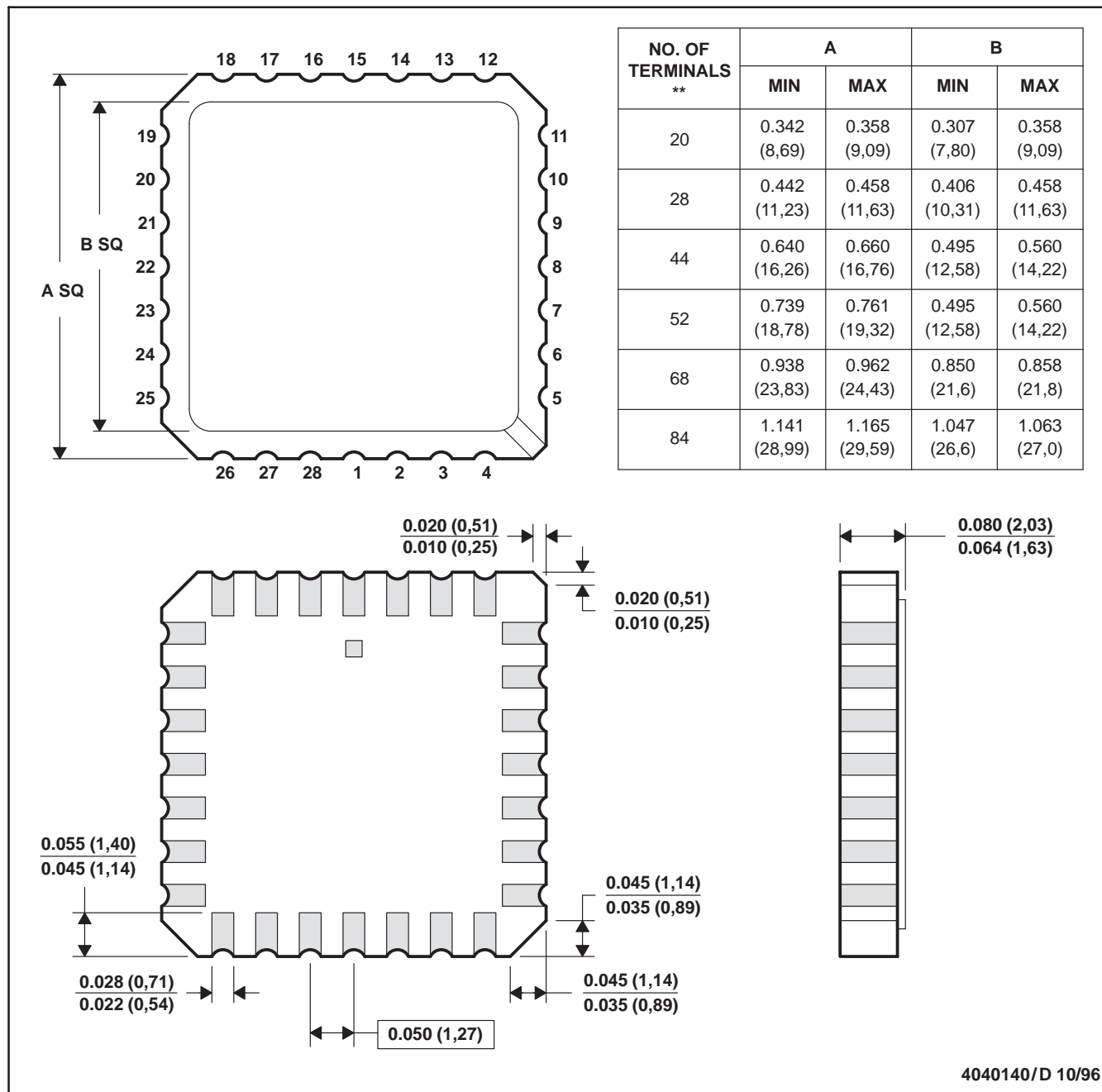


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD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

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- 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.
 - The terminals are gold plated.
 - Falls within JEDEC MS-004

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

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

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

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI 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 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. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

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

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		Applications	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Telephony	www.ti.com/telephony
Low Power Wireless	www.ti.com/lpw	Video & Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2007, Texas Instruments Incorporated