

CDCVF111 1:9 DIFFERENTIAL LVPECL CLOCK DRIVER

SCAS670B – SEPTEMBER 2001 – REVISED JUNE 2002

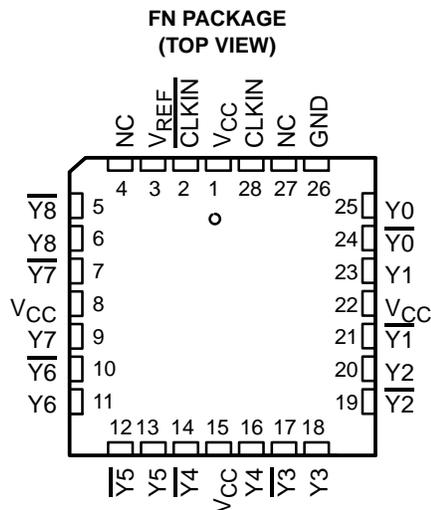
- Low-Output Skew for Clock-Distribution Applications
- Differential Low-Voltage Pseudo-ECL (LVPECL) Compatible Inputs and Outputs
- Distributes Differential Clock Inputs to Nine Differential Clock Outputs
- Output Reference Voltage (V_{REF}) Allows Distribution From a Single-Ended Clock Input
- Packaged In a 28-Pin Plastic Chip Carrier

description

The differential LVPECL clock-driver circuit distributes one pair of differential LVPECL clock inputs (\overline{CLKIN} , $CLKIN$) to nine pairs of differential clock (Y , \overline{Y}) outputs with minimum skew for clock distribution. It is specifically designed for driving 50- Ω transmission lines.

The V_{REF} output can be strapped to the \overline{CLKIN} input for a single-ended $CLKIN$ input.

The CDCVF111 is characterized for operation from -40°C to 85°C .



NC – No internal connection

FUNCTION TABLE

INPUTS		OUTPUTS	
$CLKIN$	\overline{CLKIN}	Y_n	\overline{Y}_n
X	X	L	H
L	H	L	H
H	L	H	L
L	V_{REF}	L	H
H	V_{REF}	H	L
V_{REF}	L	H	L
V_{REF}	H	L	H



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.

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**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

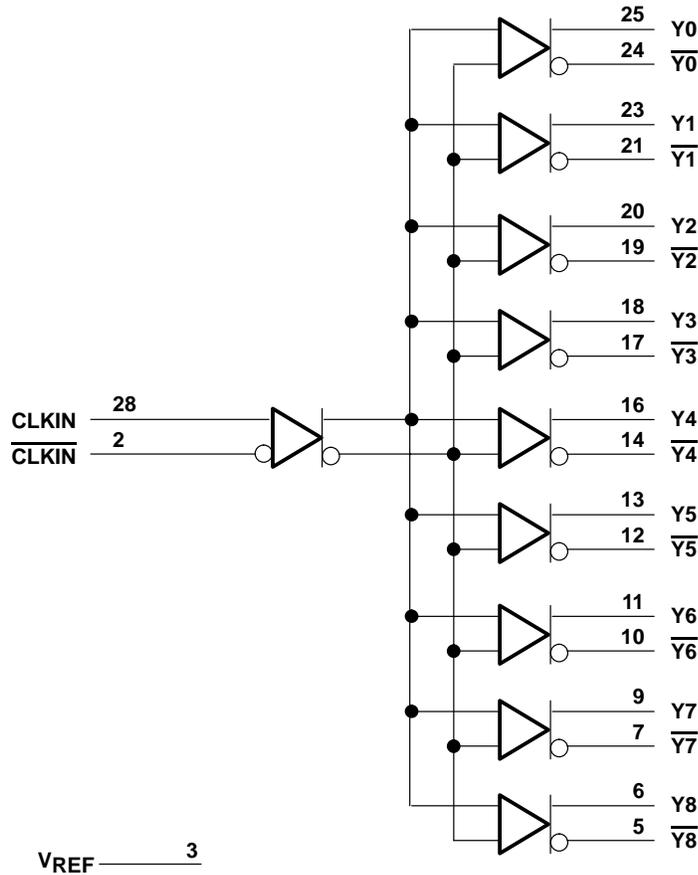
Copyright © 2002, Texas Instruments Incorporated

CDCVF111

1:9 DIFFERENTIAL LVPECL CLOCK DRIVER

SCAS670B – SEPTEMBER 2001 – REVISED JUNE 2002

logic diagram (positive logic)



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

Supply voltage range, V_{CC}	-0.5 V to 4.6 V
Input voltage range, V_I (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Output voltage range, V_O (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	-18 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	-18 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	-50 mA
Continuous current through V_{CC} or GND	± 80 mA
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2)	525 mW
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 negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils. For more information, refer to the *Package Thermal Considerations* application note in the *ABT Advanced BiCMOS Technology Data Book*, literature number SCBD002.



CDCVF111 1:9 DIFFERENTIAL LVPECL CLOCK DRIVER

SCAS670B – SEPTEMBER 2001 – REVISED JUNE 2002

recommended operating conditions

			MIN	MAX	UNIT
V _{CC}	Supply voltage		3	3.6	V
V _{IH}	High-level input voltage	V _{CC} = 3 V to 3.6 V	V _{CC} -1.165	V _{CC} -0.88	V
		V _{CC} = 3.3 V	2.135	2.42	V
V _{IL}	Low-level input voltage	V _{CC} = 3 V to 3.6 V	V _{CC} -1.81	V _{CC} -1.475	V
		V _{CC} = 3.3 V	1.49	1.825	V
T _A	Operating free-air temperature		-40	85	°C
f _{clock}	Input frequency			650	MHz

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

PARAMETER	TEST CONDITIONS		MIN	MAX	UNIT
V _{REF}	V _{CC} = 3 V to 3.6 V	I _{REF} = 100 μA	V _{CC} -1.38	V _{CC} -1.26	V
	V _{CC} = 3.3 V		1.92	2.04	
V _{OH}	V _{CC} = 3 V to 3.6 V, T _A = 0°C to 85°C, f _(max) = 650 MHz		V _{CC} -1.12	V _{CC} -0.83	V
	V _{CC} = 3 V to 3.6 V, T _A = -40°C to 85°C, f _(max) = 650 MHz		V _{CC} -1.15	V _{CC} -0.83	
	V _{CC} = 3.3 V		2.275	2.42	
V _{OL}	V _{CC} = 3 V to 3.6 V, T _A = 0°C to 85°C, f _(max) = 650 MHz		V _{CC} -1.86	V _{CC} -1.49	V
	V _{CC} = 3 V to 3.6 V, T _A = -40°C to 85°C, f _(max) = 650 MHz		V _{CC} -1.86	V _{CC} -1.52	
	V _{CC} = 3.3 V		1.49	1.68	
I _I	V _I = 2.4 V,	V _{CC} = 3.6 V		150	μA
I _{CC} (Internal)	I _O = 0,	V _{CC} = 3.6 V		100	mA

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (see Figure 1 and Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	MIN	MAX	UNIT
t _{PLH}	CLKIN, $\overline{\text{CLKIN}}$	Y, $\overline{\text{Y}}$	450	600	ps
t _{PHL}					
t _{sk(o)}		Y, $\overline{\text{Y}}$		50	ps
t _{sk(pr)}		Y, $\overline{\text{Y}}$		150	ps
t _r		Y, $\overline{\text{Y}}$	200	600	ps
t _f					

CDCVF111

1:9 DIFFERENTIAL LVPECL CLOCK DRIVER

SCAS670B – SEPTEMBER 2001 – REVISED JUNE 2002

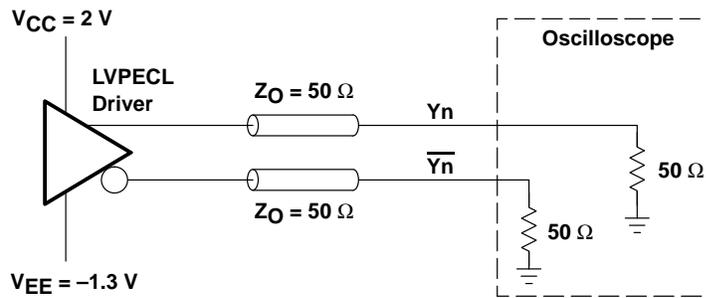
ESD information

ESD MODELS	LIMIT
Human Body Model (HBM)	2.0 kV
Machine Model (MM)	200 V
Charge Device Model (CDM)	2.0 kV

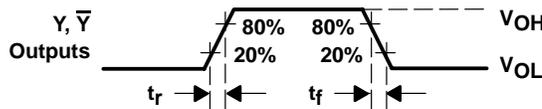
thermal information

CDCVF111 28-PIN PLCC		THERMAL AIR FLOW (CFM)				UNIT
		0	150	250	500	
R θ JA	High K	48	44	42	39	°C/W
R θ JA	Low K	70	58	52	46	°C/W
R θ JC	High K	22				°C/W
R θ JC	Low K	28				°C/W

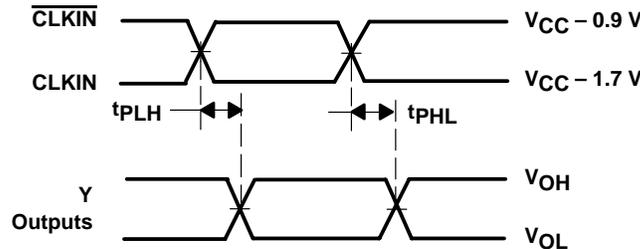
PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT (See Note B)



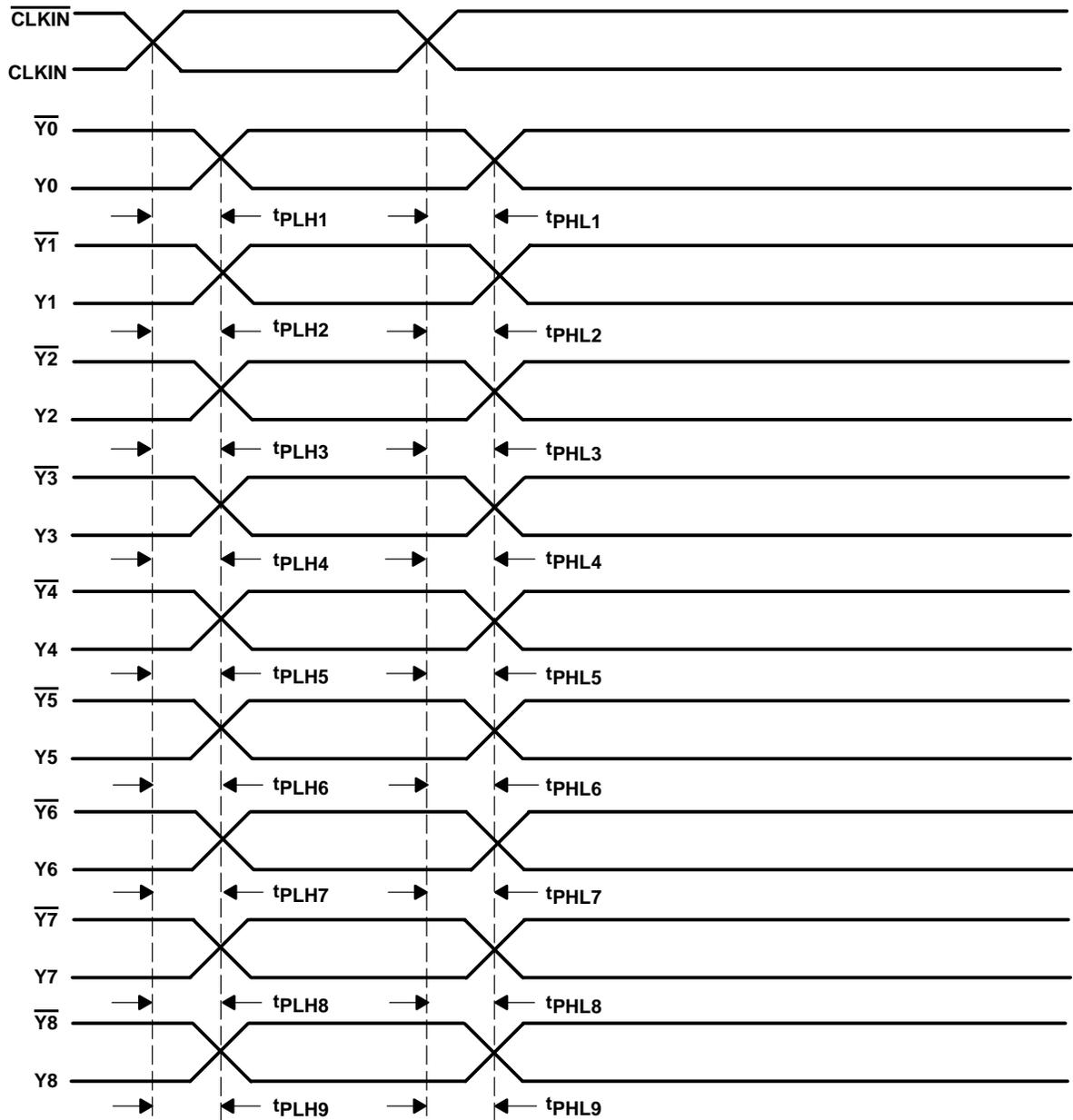
VOLTAGE WAVEFORMS
RISE AND FALL TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES

- NOTES: A. All input pulses are supplied by generators having the following characteristics: PRR \leq 45 MHz, $Z_O = 50 \Omega$, $t_r \leq 1$ ns, $t_f \leq 1$ ns.
B. For additional signal interface, see the *Interfacing Between LVPECL, LVDS, and CML* application note, Literature Number SCAA056.

Figure 1. Load Circuit and Voltage Waveforms



- NOTES: A. Output skew, $t_{sk(o)}$, is calculated as the greater of:
- The difference between the fastest and slowest t_{PLHn} ($n = 1, 2, \dots, 9$)
 - The difference between the fastest and slowest t_{PHLn} ($n = 1, 2, \dots, 9$)
- B. Process skew, $t_{sk(pr)}$, is calculated as the greater of:
- The difference between the fastest and slowest t_{PLHn} ($n = 1, 2, \dots, 9$)
 - The difference between the fastest and slowest t_{PHLn} ($n = 1, 2, \dots, 9$) across multiple devices
- C. For additional information on skew and propagation delay parameters, see the *Defining Skew, Propagation Delay, Phase-Offset (Phase Error)* application note, literature number SCAA055.

Figure 2. Waveforms for Calculation of $t_{sk(o)}$, $t_{sk(pr)}$

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
CDCVF111FN	ACTIVE	PLCC	FN	28	37	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CDCVF111FNG4	ACTIVE	PLCC	FN	28	37	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CDCVF111FNR	ACTIVE	PLCC	FN	28	750	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CDCVF111FNRG4	ACTIVE	PLCC	FN	28	750	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽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.

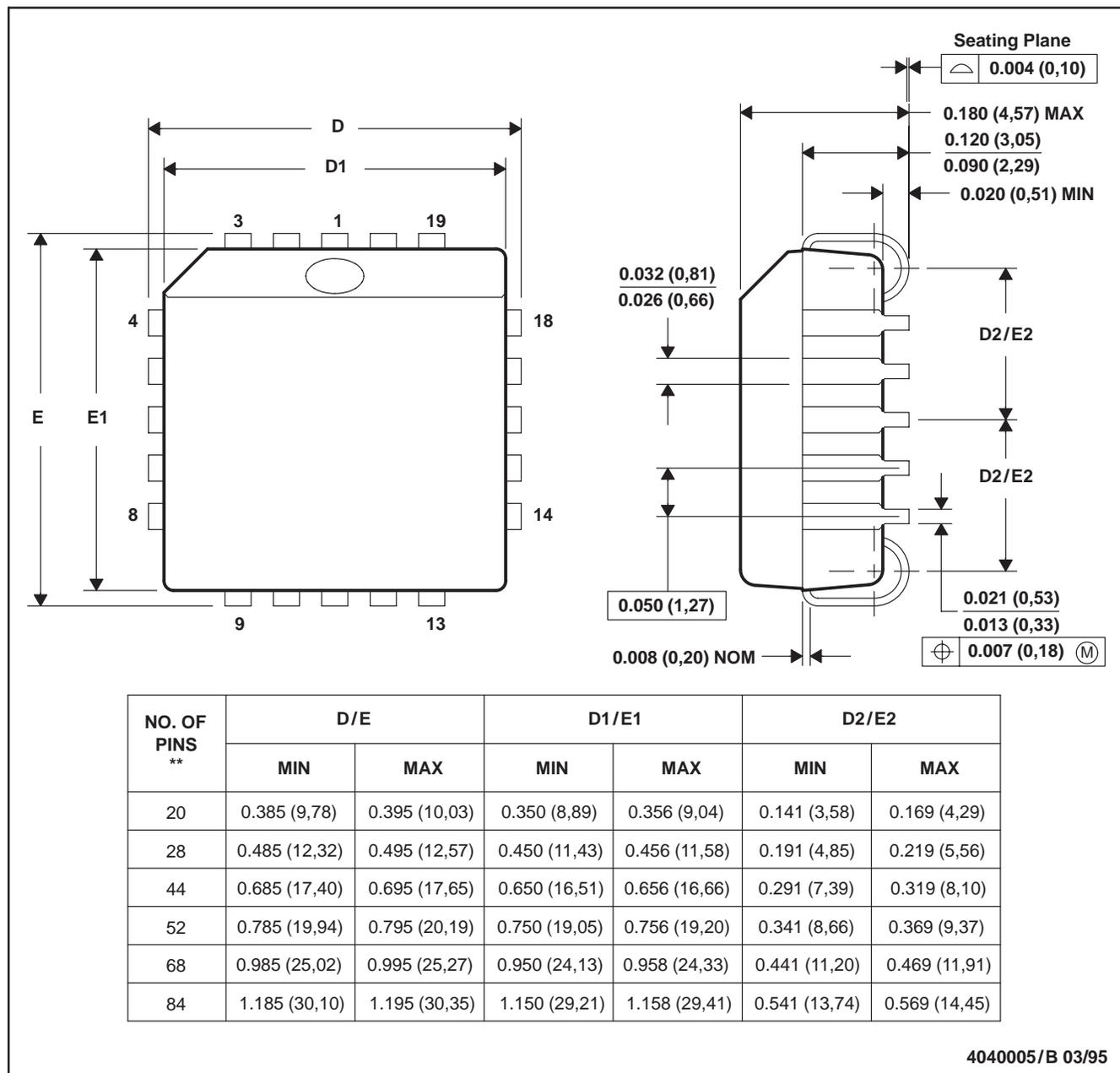
Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. 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.

FN (S-PQCC-J**)

PLASTIC J-LEADED CHIP CARRIER

20 PIN SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).
 B. This drawing is subject to change without notice.
 C. Falls within JEDEC MS-018

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
DLP® Products	www.dlp.com	Communications and Telecom	www.ti.com/communications
DSP	dsp.ti.com	Computers and Peripherals	www.ti.com/computers
Clocks and Timers	www.ti.com/clocks	Consumer Electronics	www.ti.com/consumer-apps
Interface	interface.ti.com	Energy	www.ti.com/energy
Logic	logic.ti.com	Industrial	www.ti.com/industrial
Power Mgmt	power.ti.com	Medical	www.ti.com/medical
Microcontrollers	microcontroller.ti.com	Security	www.ti.com/security
RFID	www.ti-rfid.com	Space, Avionics & Defense	www.ti.com/space-avionics-defense
RF/IF and ZigBee® Solutions	www.ti.com/lprf	Video and Imaging	www.ti.com/video
		Wireless	www.ti.com/wireless-apps

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2010, Texas Instruments Incorporated