

TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013A – D2943, FEBRUARY 1987 – REVISED DECEMBER 2010

- Functionally Equivalent to the TIBPAL22V10/10A, with Additional Feedback Paths in the Output Logic Macrocell
- Choice of Operating Speeds:
TIBPAL22VP10-20C . . . 20 ns Max
TIBPAL22VP10-25M . . . 25 ns Max
- Variable Product Term Distribution Allows More Complex Functions to Be Implemented
- Each Output Is User Programmable for Registered or Combinational Operation, Polarity, and Output Enable Control
- TTL-Level Preload for Improved Testability
- Extra Terms Provide Logical Synchronous Set and Asynchronous Reset Capability
- Fast Programming, High Programming Yield, and Unsurpassed Reliability Ensured Using Ti-W Fuses
- AC and DC Testing Done at the Factory Utilizing Special Designed-In Test Features
- Dependable Texas Instruments Quality and Reliability
- Package Options Include Plastic Dual-In-Line and Chip Carrier Packages

description

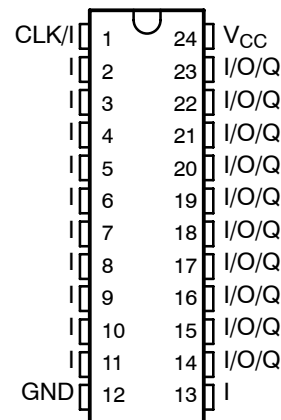
The TIBPAL22VP10' is equivalent to the TIBPAL22V10A but offers additional flexibility in the output structure. The improved output macrocell uses the registered outputs as inputs when in a high-impedance condition. This provides two additional output configurations for a total of six possible macrocell configurations all of which are shown in Figure 1.

These devices contain up to 22 inputs and 10 outputs. They incorporate the unique capability of defining and programming the architecture of each output on an individual basis. Outputs may be registered or nonregistered and inverting or noninverting. In addition, the data may be fed back into the array from either the register or the I/O port. The ten potential outputs are enabled through the use of individual product terms.

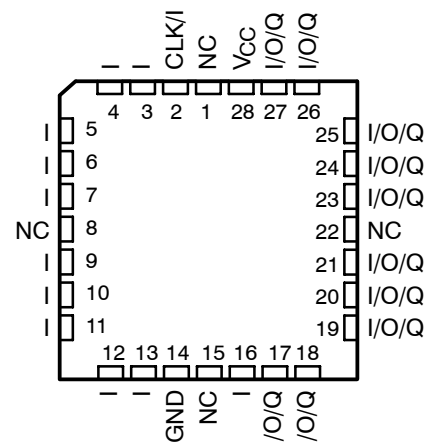
Further advantages can be seen in the introduction of variable product term distribution. This technique allocates from 8 to 16 logical product terms to each output for an average of 12 product terms per output. This variable allocation of terms allows far more complex functions to be implemented than in previously available devices.

IMPACT-X is a trademark of Texas Instruments Incorporated.

C SUFFIX . . . NT PACKAGE
M SUFFIX . . . JT PACKAGE
(TOP VIEW)



C SUFFIX . . . FN PACKAGE
M SUFFIX . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection
Pin assignments in operating mode

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.



TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013A – D2943, FEBRUARY 1987 – REVISED DECEMBER 2010

description (continued)

Circuit design is enhanced by the addition of a synchronous set and an asynchronous reset product term. These functions are common to all registers. When the synchronous set product term is a logic 1, the output registers are loaded with a logic 1 on the next low-to-high clock transition. When the asynchronous reset product term is a logic 1, the output registers are loaded with a logic 0. The output logic level after set or reset depends on the polarity selected during programming. Output registers can be preloaded to any desired state during testing. Preloading permits full logical verification during product testing.

With features such as programmable output logic macrocells and variable product term distribution, the TIBPAL22VP10' offers quick design and development of custom LSI functions with complexities of 500 to 800 equivalent gates. Since each of the ten output pins may be individually configured as inputs on either a temporary or permanent basis, functions requiring up to 21 inputs and a single output or down to 12 inputs and 10 outputs are possible.

A power-up clear function is supplied that forces all registered outputs to a predetermined state after power is applied to the device. Registered outputs selected as active-low power-up with their outputs high. Registered outputs selected as active-high power-up with their outputs low.

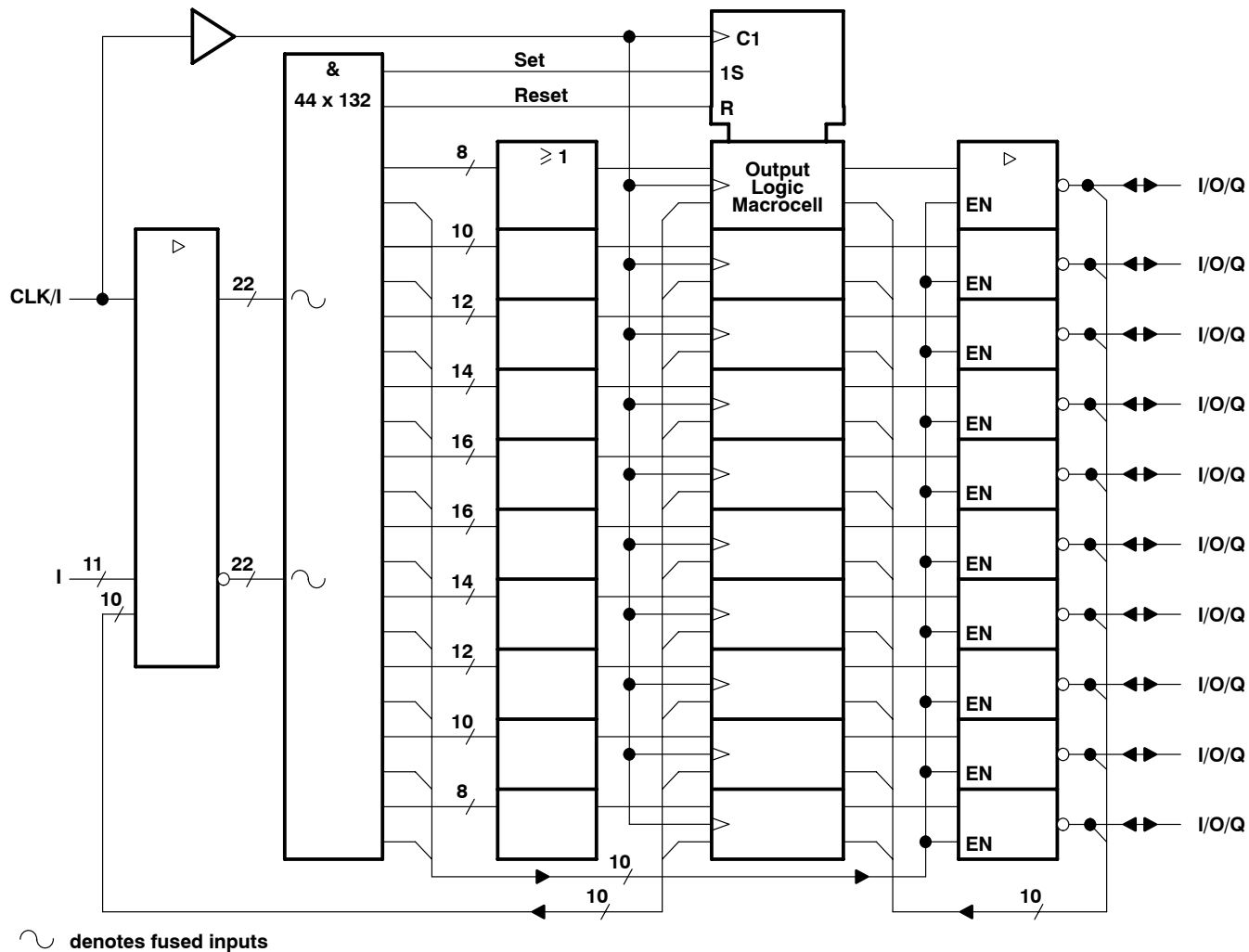
A single security fuse is provided on each device to discourage unauthorized copying of fuse patterns. Once blown, the verification circuitry is disabled and all other fuses will appear to be open.

The TIBPAL22V10-20C is characterized for operation from 0°C to 75°C. The TIBPAL22V10-25M is characterized for operation over the full military temperature range of –55°C to 125°C.

TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

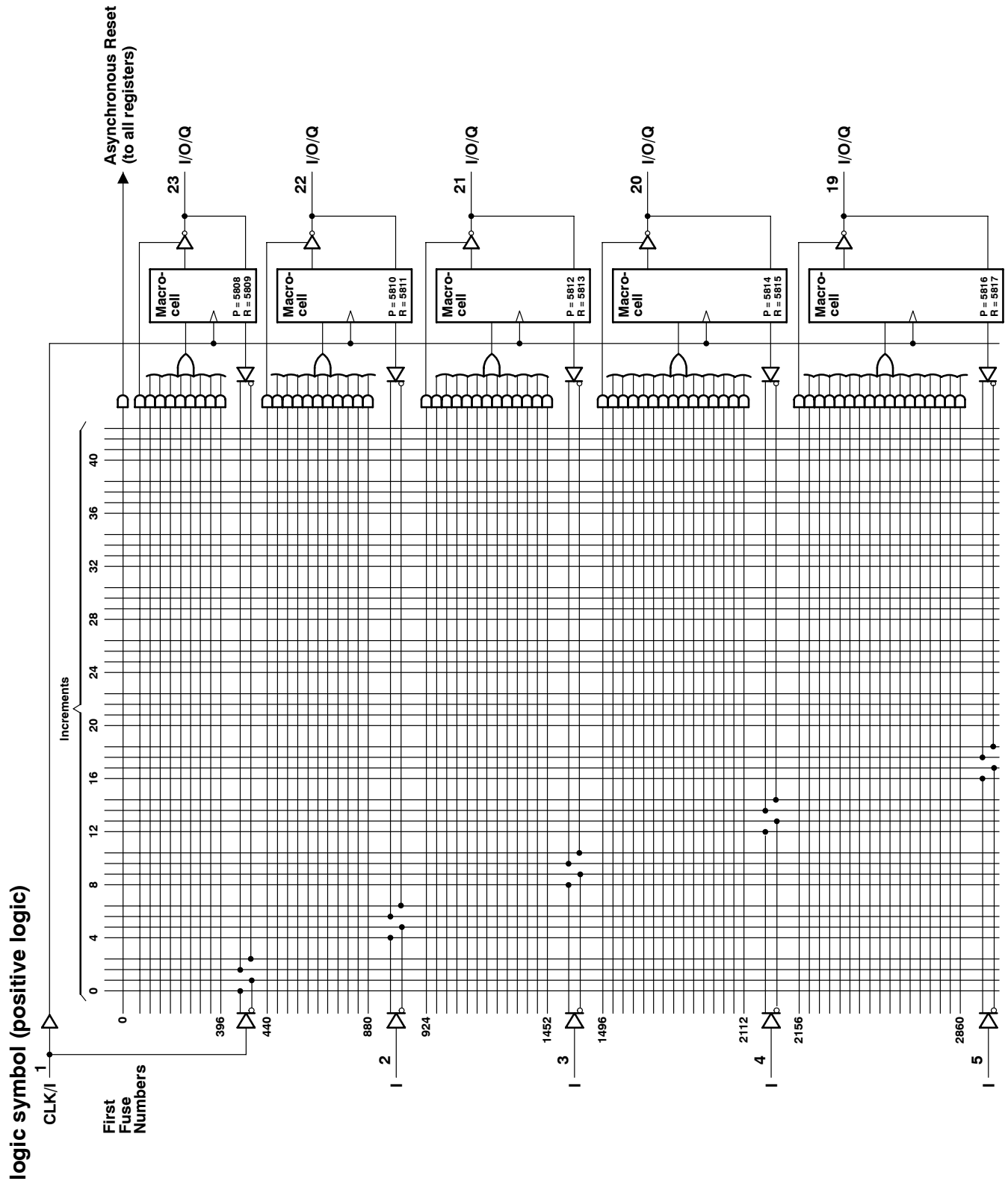
SRPS013A – D2943, FEBRUARY 1987 – REVISED DECEMBER 2010

functional block diagram (positive logic)



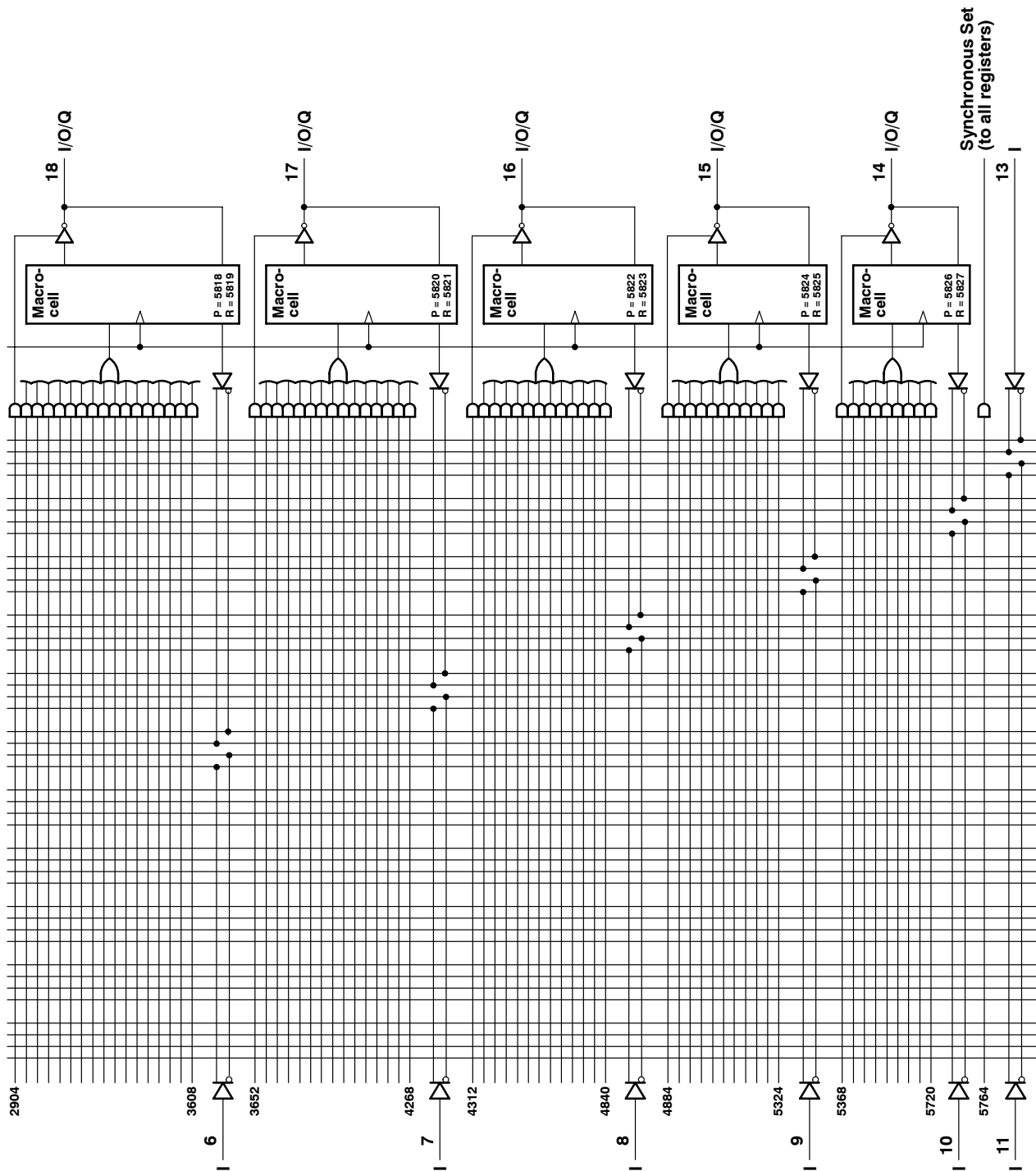
TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013A – D2943, FEBRUARY 1987 – REVISED DECEMBER 2010



TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013A – D2943, FEBRUARY 1987 – REVISED DECEMBER 2010



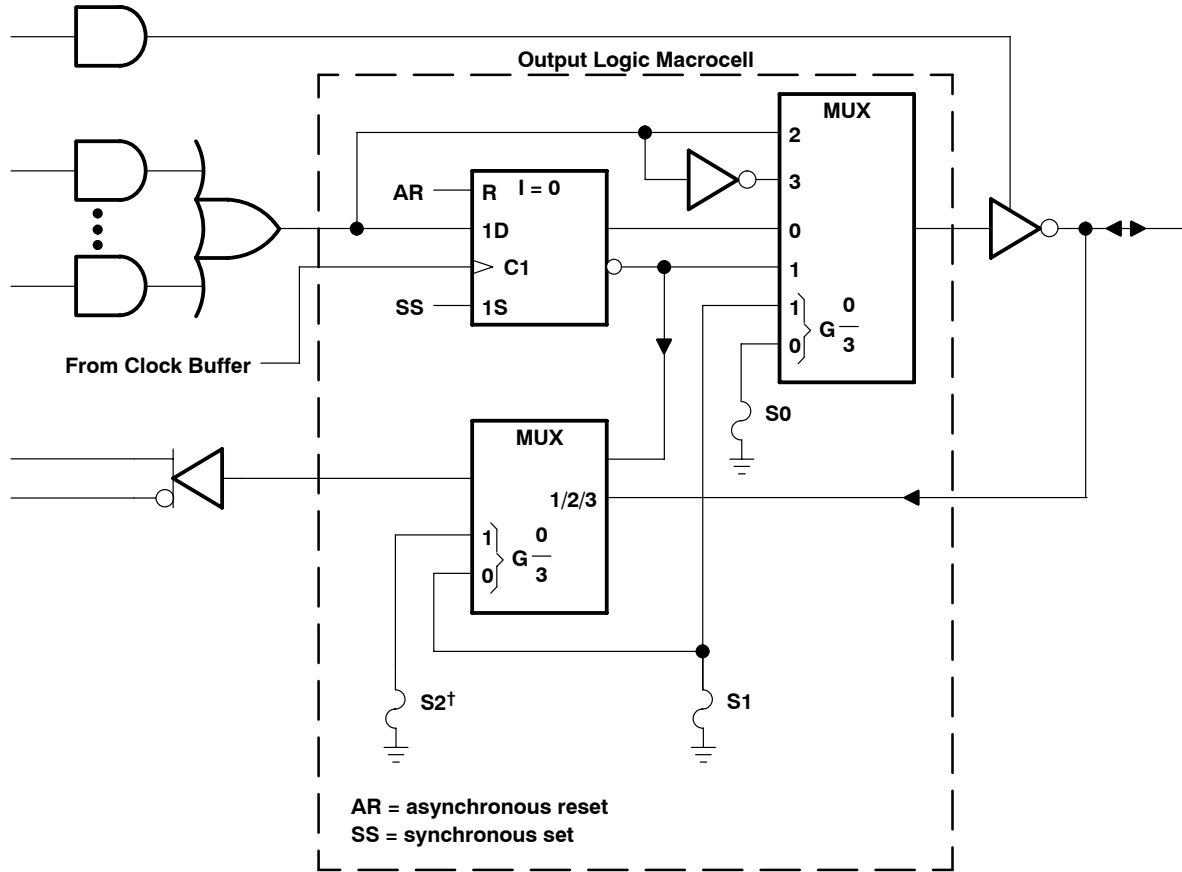
Fuse number = First fuse number + Increment
Inside each MACROCELL, the "P" fuse is the polarity fuse and the "R" fuse is the register fuse.



TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013A - D2943, FEBRUARY 1987 - REVISED DECEMBER 2010

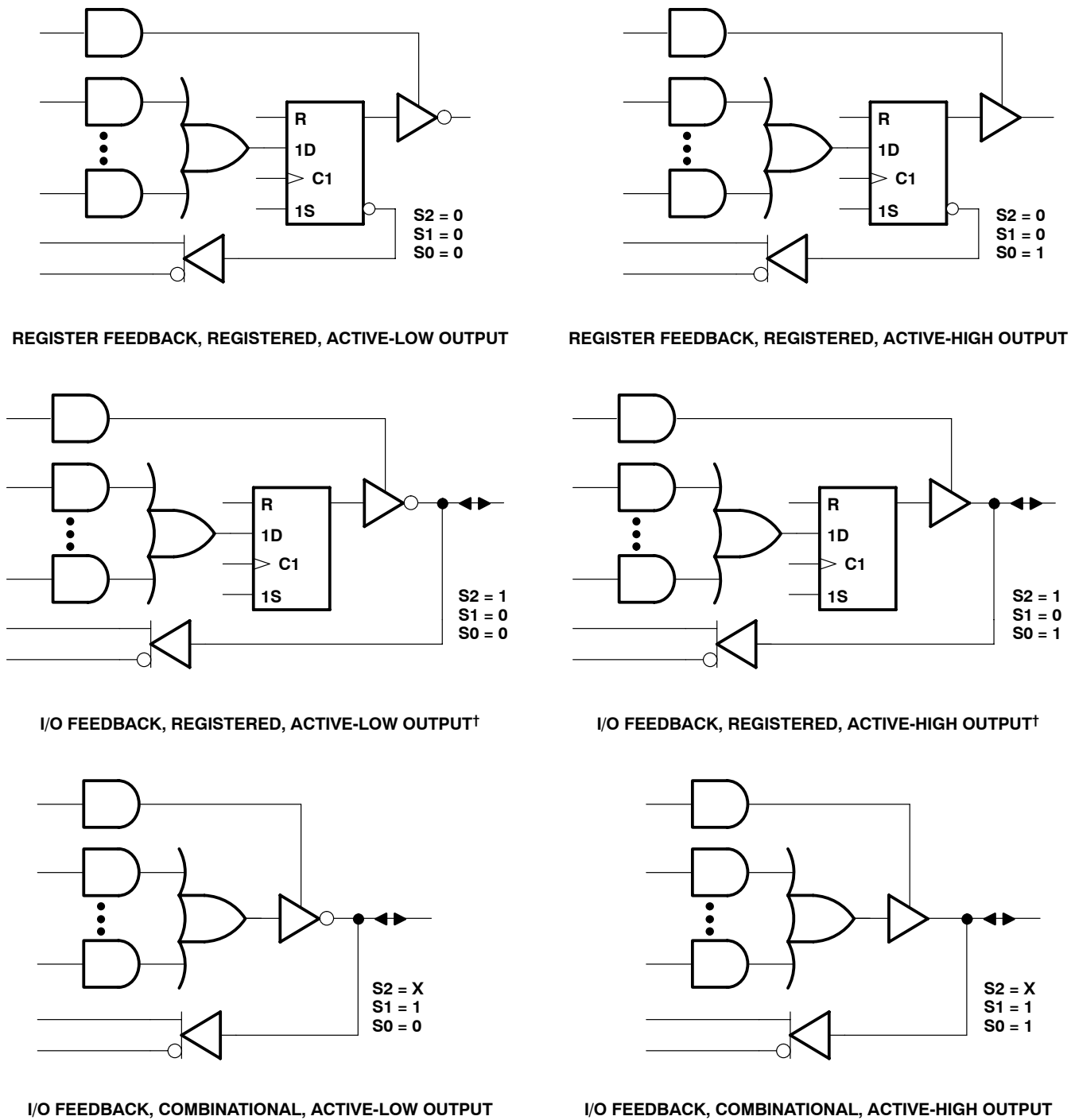
output logic macrocell diagram



† This fuse is unique to the Texas Instruments TIBPAL22VP10'. It allows feedback from the I/O port using registered outputs as shown in the macrocell fusing logic function table.

TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013A – D2943, FEBRUARY 1987 – REVISED DECEMBER 2010



† These configurations are unique to the TIBPAL22VP10[†] and provide added flexibility when comparing it to the TIBPAL22V10 or TIBPAL22V10A.

Figure 1. Resultant Macrocell Feedback and Output Logic After Programming

TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013A – D2943, FEBRUARY 1987 – REVISED DECEMBER 2010

MACROCELL FEEDBACK AND OUTPUT FUNCTION TABLE

FUSE SELECT			FEEDBACK AND OUTPUT CONFIGURATION		
S2	S1	S0			
0	0	0	Register feedback	Registered	Active low
0	0	1	Register feedback	Registered	Active high
1	0	0	I/O feedback	Registered	Active low
1	0	1	I/O feedback	Registered	Active high
X	1	0	I/O feedback	Combinational	Active low
X	1	1	I/O feedback	Combinational	Active high

0 = unblown fuse, 1 = blown fuse, X = unblown or blown fuse
S2, S1 and S0 are select-function fuses as shown in the output logic macrocell diagram.

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

Supply voltage, V _{CC} (see Note 1)	7 V
Input voltage (see Note 1)	5.5 V
Voltage applied to disabled output (see Note 1)	5.5 V
Operating free-air temperature range: TIBPAL22VP10-20C	0°C to 75°C
TIBPAL22VP10-25M	-55°C to 125°C
Storage temperature range	-65°C to 150°C

NOTE 1: These ratings apply except for programming pins during a programming cycle or during a preload cycle.

recommended operating conditions

		TIBPAL22VP10-20C			TIBPAL22VP10-25M			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V _{CC}	Supply voltage	4.75	5	5.25	4.5	5	5.5	V
V _{IH}	High-level input voltage	2		5.5	2		5.5	V
V _{IL}	Low-level input voltage			0.8			0.8	V
I _{OH}	High-level output current			-3.2			-2	mA
I _{OL}	Low-level output current			16			12	mA
f _{clock}	Clock frequency†			37			25	MHz
t _w	Pulse duration	Clock high or low		10	20		ns	
		Asynchronous Reset high or low		20	30			
t _{su}	Setup time before clock↑	Input		15	20		ns	
		Feedback		15	20			
		Synchronous Preset (active)		15	20			
		Asynchronous Reset (inactive)		20	25			
t _h	Hold time, input, preset, or feedback after clock↑	0		0		ns		
T _A	Operating free-air temperature	0		75	-55		125	°C

† f_{clock} (with feedback) = $\frac{1}{t_{su} + t_{pd}(\text{CLK to Q})}$; f_{clock} without feedback can be calculated as

f_{clock} (without feedback) = $\frac{1}{t_w \text{ high} + t_w \text{ low}}$



TIBPAL22VP10-20C

HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013 – D2943, FEBRUARY 1987 – REVISED JUNE 1991

electrical characteristics over recommended operating free-air temperature range

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V _{IK}		V _{CC} = 4.75 V,	I _I = -18 mA			-1.2	V
V _{OH}		V _{CC} = 4.75 V,	I _{OH} = -3.2 mA	2.4	3.5		V
V _{OL}		V _{CC} = 4.75 V,	I _{OL} = 16 mA		0.35	0.5	V
I _{OZH}		V _{CC} = 5.25 V,	V _O = 2.7 V			0.1	mA
I _{OZL}	Any output	V _{CC} = 5.25 V,	V _O = 0.4 V			-100	μA
	Any I/O					-250	
I _I		V _{CC} = 5.25 V,	V _I = 5.5 V			1	mA
I _{IH}		V _{CC} = 5.25 V,	V _I = 2.7 V			25	μA
I _{IL}		V _{CC} = 5.25 V,	V _I = 0.4 V			-0.25	mA
I _{OS} ‡		V _{CC} = 5.25 V,	V _O = 0.5 V	-30		-90	mA
I _{CC}		V _{CC} = 5.25 V,	V _I = GND, Outputs open		140	180	mA

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITION	MIN	TYP†	MAX	UNIT
f _{max} §			C _L = 50 pF, R1 = 300 Ω, R2 = 390 Ω, See Figure 4	37	50		MHz
t _{pd}	I, I/O	I/O			12	20	ns
t _{pd}	I, I/O (reset)	Q			12	20	ns
t _{pd}	CLK	Q			8	12	ns
t _{en}	I, I/O	I/O, Q			12	20	ns
t _{dis}	I, I/O	I/O, Q			12	20	ns

† All typical values are at V_{CC} = 5 V, T_A = 25°C.

‡ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second. V_O is set at 0.5 V to avoid test problems caused by test equipment ground degradation.

§ f_{max} (with feedback) = $\frac{1}{t_{su} + t_{pd} \text{ (CLK to Q)}}$, f_{max} without feedback can be calculated as

$$f_{max} \text{ (without feedback)} = \frac{1}{t_w \text{ high} + t_w \text{ low}}$$

TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013 – D2943, FEBRUARY 1987 – REVISED JUNE 1991

electrical characteristics over recommended operating free-air temperature range

PARAMETER	TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	$V_{CC} = 4.5\text{ V}$,	$I_I = -18\text{ mA}$			-1.2	V
V_{OH}	$V_{CC} = 4.5\text{ V}$,	$I_{OH} = -2\text{ mA}$	2.4	3.5		V
V_{OL}	$V_{CC} = 4.5\text{ V}$,	$I_{OL} = 12\text{ mA}$		0.25	0.5	V
I_{OZH}	$V_{CC} = 5.5\text{ V}$,	$V_O = 2.7\text{ V}$			0.1	mA
I_{OZL}	$V_{CC} = 5.5\text{ V}$,	$V_O = 0.4\text{ V}$			-0.1	mA
I_I	$V_{CC} = 5.5\text{ V}$,	$V_I = 5.5\text{ V}$			1	mA
I_{IH}	$V_{CC} = 5.5\text{ V}$,	$V_I = 2.7\text{ V}$			25	μA
I_{IL}	$V_{CC} = 5.5\text{ V}$,	$V_I = 0.4\text{ V}$			-0.25	mA
I_{OS}^\ddagger	$V_{CC} = 5.5\text{ V}$,	$V_O = 0.5\text{ V}$	-30		-90	mA
I_{CC}	$V_{CC} = 5.5\text{ V}$,	$V_I = \text{GND}$, Outputs open		140	200	mA

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITION	MIN	TYP†	MAX	UNIT	
f_{max}^\S			$C_L = 50\text{ pF}$, $R1 = 390\ \Omega$, $R2 = 750\ \Omega$, See Figure 4	25	50		MHz	
t_{pd}	I, I/O	I/O				12	25	ns
t_{pd}	I, I/O (reset)	Q				12	25	ns
t_{pd}	CLK	Q				8	15	ns
t_{en}	I, I/O	I/O, Q				12	25	ns
t_{dis}	I, I/O	I/O, Q				12	25	ns

† 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, and the duration of the short circuit should not exceed one second. V_O is set at 0.5 V to avoid test problems caused by test equipment ground degradation.

§ f_{max} (with feedback) = $\frac{1}{t_{su} + t_{pd}(\text{CLK to Q})}$, f_{max} without feedback can be calculated as

$$f_{\text{max}} \text{ (without feedback)} = \frac{1}{t_w \text{ high} + t_w \text{ low}}$$

TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013 – D2943, FEBRUARY 1987 – REVISED JUNE 1991

preload procedure for registered outputs (see Notes 2 and 3)

The output registers can be preloaded to any desired state during device testing. This permits any state to be tested without having to step through the entire state-machine sequence. Each register is preloaded individually by following the steps given below:

- Step 1. With V_{CC} at 5 V and pin 1 at V_{IL} , raise pin 13 to V_{IHH} .
- Step 2. Apply either V_{IL} or V_{IH} to the output corresponding to the register to be preloaded.
- Step 3. Pulse pin 1, clocking in preload data.
- Step 4. Remove output voltage, then lower pin 13 to V_{IL} . Preload can be verified by observing the voltage level at the output pin.

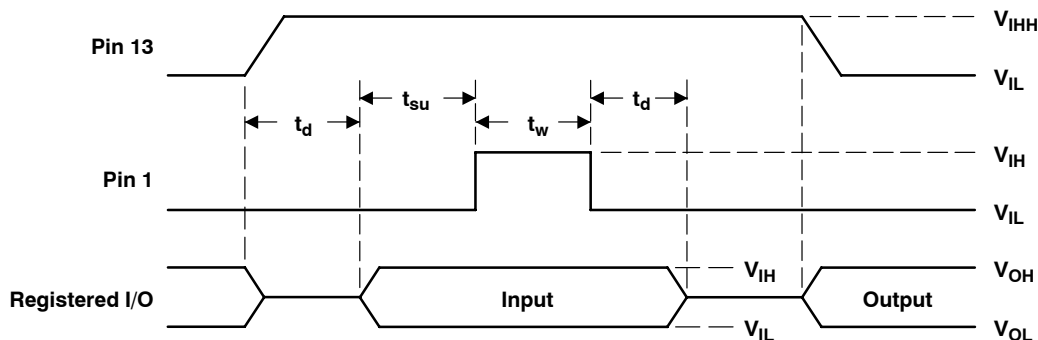


Figure 2. Preload Waveforms

NOTES: 2. Pin numbers shown are for JT and NT packages only. If chip-carrier socket adapter is not used, pin numbers must be changed accordingly.

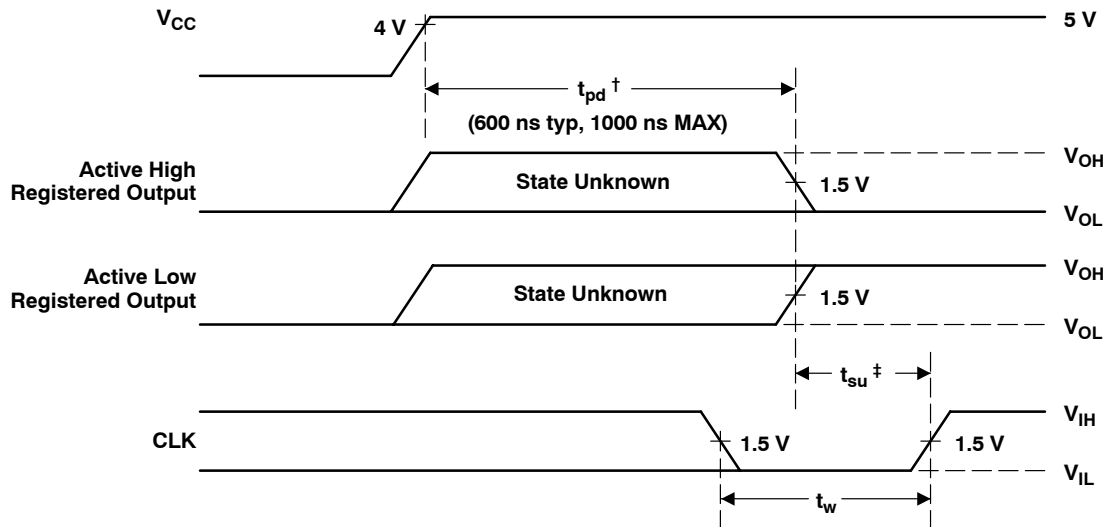
3. $t_d = t_{su} = t_w = 100$ ns to 1000 ns. $V_{IHH} = 10.25$ V to 10.75 V.

TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013 – D2943, FEBRUARY 1987 – REVISED JUNE 1991

power-up reset

Following power up, all registers are reset to zero. The output level depends on the polarity selected during programming. This feature provides extra flexibility to the system designer and is especially valuable in simplifying state-machine initialization. To ensure a valid power-up reset, it is important that the rise of V_{CC} be monotonic. Following power-up reset, a low-to-high clock transition must not occur until all applicable input and feedback setup times are met.



[†] This is the power-up reset time and applies to registered outputs only. The values shown are from characterization data.

[‡] This is the setup time for input or feedback.

Figure 3. Power-Up Reset Waveforms

programming information

Texas Instruments programmable logic devices can be programmed using widely available software and inexpensive device programmers.

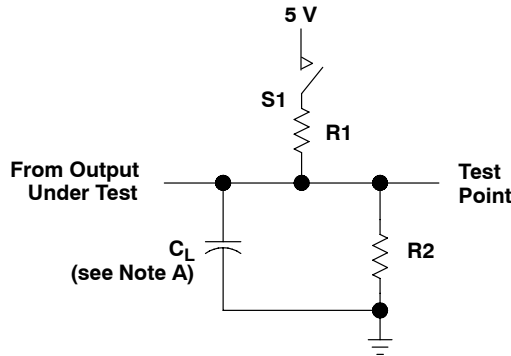
When the additional fuses are not being used, the TIBPAL22VP10 can be programmed using the TIBPAL22V10/10A programming algorithm. The fuse configuration data can either be from a JEDEC file (format per JEDEC Standard No. 3-A) or a TIBPAL22V10/10A master.

Complete programming specifications, algorithms, and the latest information on hardware, software, and firmware are available upon request. Information on programmers capable of programming Texas Instruments programmable logic is also available, upon request, from the nearest TI field sales office, local authorized TI distributor, or by calling Texas Instruments at (214) 997-5666.

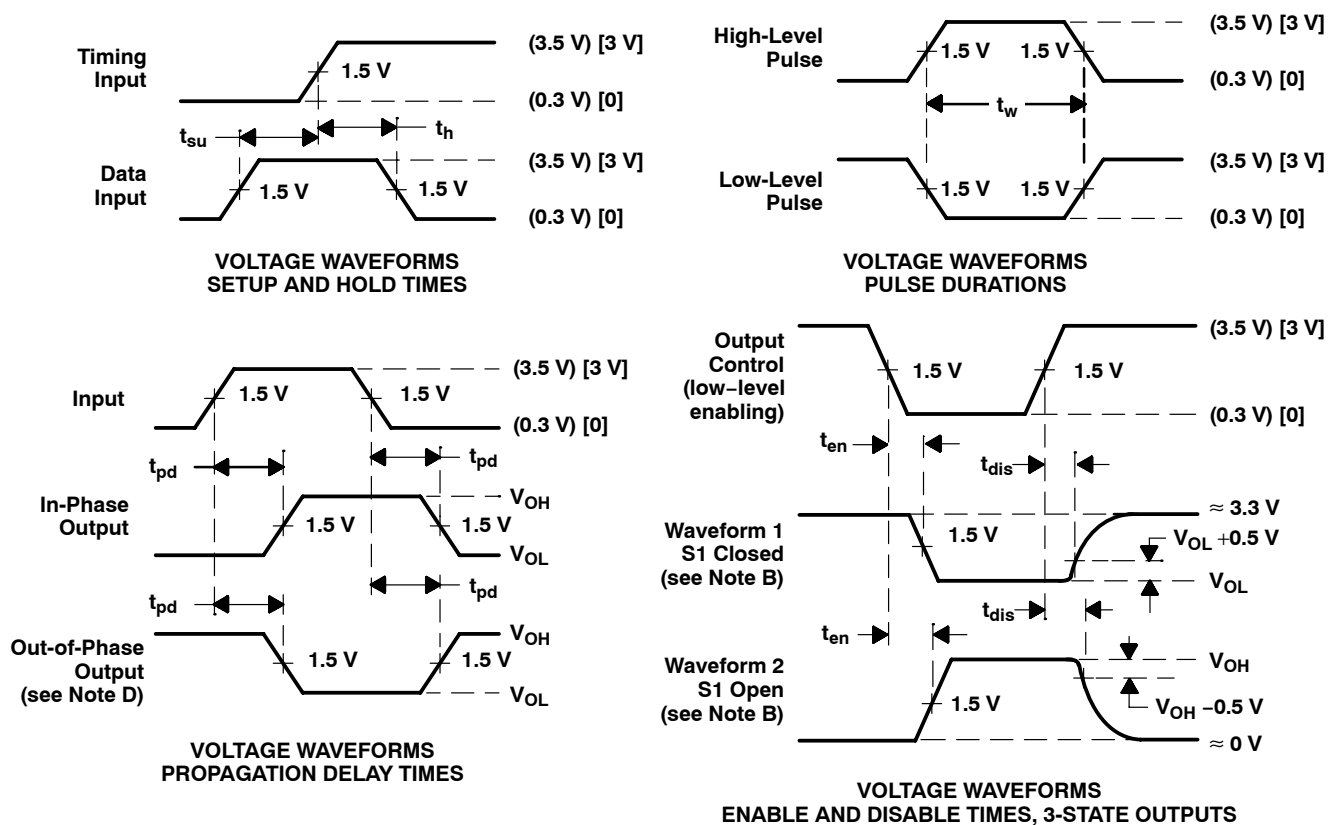
TIBPAL22VP10-20C, TIBPAL22VP10-25M HIGH-PERFORMANCE *IMPACT-X*™ PROGRAMMABLE ARRAY LOGIC CIRCUITS

SRPS013 – D2943, FEBRUARY 1987 – REVISED JUNE 1991

PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT FOR 3-STATE OUTPUTS



- NOTES: A. C_L includes probe and jig capacitance and is 50 pF for t_{pd} and t_{en} , 5 pF for t_{dis} .
 B. 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.
 C. All input pulses have the following characteristics: For C suffix, use the voltage levels indicated in parentheses (). $PRR \leq 1$ MHz, $t_r = t_f \leq 2$ ns, duty cycle = 50%. For M suffix, use the voltage levels indicated in brackets []. $PRR \leq 10$ MHz, t_r and $t_f \leq 2$ ns, duty cycle = 50%.
 D. When measuring propagation delay times of 3-state outputs, switch S1 is closed.
 E. Equivalent loads may be used for testing.

Figure 4. Load Circuit and Voltage Waveforms

TI Worldwide Sales Offices

ALABAMA: Huntsville: 4960 Corporate Drive, Suite 150, Huntsville, AL 35805, (205) 837-7530.

ARIZONA: Phoenix: 8825 N. 23rd Avenue, Suite 100, Phoenix, AZ 85021, (602) 995-1007.

CALIFORNIA: Irvine: 1920 Main Street, Suite 900, Irvine, CA 92714, (714) 860-1200;
San Diego: 5625 Ruffin Road, Suite 100, San Diego, CA 92123, (619) 278-9600;
Santa Clara: 5353 Betsy Ross Drive, Santa Clara, CA 95054, (408) 980-9000;
Woodland Hills: 21550 Oxnard Street, Suite 700, Woodland Hills, CA 91367, (818) 704-8100.

COLORADO: Aurora: 1400 S. Potomac Street, Suite 101, Aurora, CO 80012, (303) 368-8000.

CONNECTICUT: Wallingford: 9 Barnes Industrial Park So., Wallingford, CT 06492, (203) 269-0074.

FLORIDA: Altamonte Springs: 370 S. North Lake Boulevard, Suite 1008, Altamonte Springs, FL 32701, (407) 260-2116;
Fort Lauderdale: 2950 N.W. 62nd Street, Suite 100, Fort Lauderdale, FL 33309, (305) 973-8502; **Tampa:** 4803 George Road, Suite 390, Tampa, FL 33634-6234, (813) 885-7588.

GEORGIA: Norcross: 5515 Spalding Drive, Norcross, GA 30092-2560, (404) 662-7967.

ILLINOIS: Arlington Heights: 515 West Algonquin, Arlington Heights, IL 60005, (708) 640-6925.

INDIANA: Carmel: 550 Congressional Drive, Suite 100, Carmel, IN 46032, (317) 573-6400;
Fort Wayne: 103 Airport North Office Park, Fort Wayne, IN 46825, (219) 489-4697.

KANSAS: Overland Park: 7300 College Boulevard, Lighton Plaza, Suite 150, Overland Park, KS 66210, (913) 451-4511.

MARYLAND: Columbia: 8815 Centre Park Drive, Suite 100, Columbia, MD 21045, (410) 964-2003.

MASSACHUSETTS: Waltham: Bay Colony Corporate Center 950 Winter Street, Suite 2800, Waltham, MA 02154, (617) 895-9100.

MICHIGAN: Farmington Hills: 33737 W. 12 Mile Road, Farmington Hills, MI 48018, (313) 553-1581.

MINNESOTA: Eden Prairie: 11000 W. 78th Street, Suite 100, Eden Prairie, MN 55344, (612) 828-9300.

MISSOURI: St. Louis: 12412 Powerscourt Drive, Suite 125, St. Louis, MO 63131, (314) 821-8400.

NEW JERSEY: Iselin: Metropolitan Corporate Plaza, 485 Bldg E. U.S. 1 South, Iselin, NJ 08830, (908) 750-1050.

NEW MEXICO: Albuquerque: 2709 J. Pan American Freeway, N.E., Albuquerque, NM 87101, (505) 345-2555.

NEW YORK: East Syracuse: 6365 Collamer Drive, East Syracuse, NY 13057, (315) 463-9291;
Fishkill: 300 Westage Business Center, Suite 140, Fishkill, NY 12524, (914) 897-2900;
Melville: 48 South Service Road, Suite 100, Melville, NY 11747, (516) 454-6601;
Pittsford: 2851 Clover Street, Pittsford, NY 14534, (716) 385-6770.

NORTH CAROLINA: Charlotte: 8 Woodlawn Green, Suite 100, Charlotte, NC 28217, (704) 527-0930;
Raleigh: 2809 Highwoods Boulevard, Suite 100, Raleigh, NC 27625, (919) 876-2725.

OHIO: Beachwood: 23775 Commerce Park Road, Beachwood, OH 44122-5875, (216) 765-7258;
Beavercreek: 4200 Colonel Glenn Highway, Suite 600, Beavercreek, OH 45431, (513) 427-6200.

OREGON: Beaverton: 6700 S.W. 105th Street, Suite 110, Beaverton, OR 97005, (503) 643-6758.

PENNSYLVANIA: Blue Bell: 670 Sentry Parkway, Suite 200, Blue Bell, PA 19422, (215) 825-9500.

PUERTO RICO: Hato Rey: 615 Mercantile Plaza Building, Suite 505, Hato Rey, PR 00919, (809) 753-8700.

TEXAS: Austin: 12501 Research Boulevard, Austin, TX 78759, (512) 250-6789;
Dallas: 7839 Churchill Way, Dallas, TX 75251, (214) 917-1264;
Houston: 9301 Southwest Freeway, Commerce Park, Suite 360, Houston, TX 77074, (713) 778-6592;
Midland: FM 1788 & I-20, Midland, TX 79711-0448, (915) 561-7137.

UTAH: Salt Lake City: 2180 South 1300 East, Suite 335, Salt Lake City, UT 54106, (801) 466-8972.

WISCONSIN: Waukesha: 20825 Swenson Drive, Suite 900, Waukesha WI 53186, (414) 798-1001.

CANADA: Nepean: 301 Moodie Drive, Suite 102, Mallom Center, Nepean, Ontario, Canada K2H 9C4, (613) 726-1970;
Richmond Hill: 280 Centre Street East, Richmond Hill, Ontario, Canada L4C 1B1, (416) 884-9181;
St. Laurent: 9460 Trans Canada Highway, St. Laurent, Quebec, Canada H4S 1R7, (514) 335-8392.

AUSTRALIA (& NEW ZEALAND): Texas Instruments Australia Ltd., 6-10 Talavera Road, North Ryde (Sydney), New South Wales, Australia 2113, 2-878-9000; 14th Floor, 380 Street, Kilda Road, Melbourne, Victoria, Australia 3004, 3-696-1211; 171 Philip Highway, Elizabeth, South Australia 5112, 8 255-2066.

BELGIUM: Texas Instruments Belgium S.A./N.V., Avenue Jules Bordetlaan 11, 1140 Brussels, Belgium, (02) 242 30 80.

BRAZIL: Texas Instruments Electronicos do Brasil Ltda., Av. Eng. Luiz Carlos Berrini 1461-110 andar, 04571, Sao Paulo, SP, Brazil, 11-535-5133.

DENMARK: Texas Instruments A/S, Borupvang 2D, 2750 Ballerup, Denmark, (44) 68 74 00.

FINLAND: Texas Instruments OY, Ahertajantie 3, P.O. Box 86, 02321 Espoo, Finland, (0) 802 6517.

FRANCE: Texas Instruments France, 8-10 Avenue Morane-Saulnier, B.P. 67, 78141 Velizy Villacoublay Cedex, France, (1) 30 70 1003.

GERMANY: Texas Instruments Deutschland GmbH., Haggertystrasse 1, 8050 Freising, (08161) 80-0; Kurturstendamm 195-196, 1000 Berlin 15, (030) 8 82 73 65; Dusseldorfer Strasse 40, 6236 Eschborn 1, (06196) 80 70; Kirchhorster Strasse 2, 3000 Hannover 51, (0511) 64 68-0; Maybachstrasse II, 7302 Ostfildern 2 (Nellingen), (0711) 3403257; Gildehofcenter, Hollestrasses 3, 4300 Essen 1, (0201) 24 25-0.

HOLLAND: Texas Instruments Holland B.V., Hogehilweg 19, Postbus 12995, 1100 AZ Amsterdam-Zuidoost, Holland, (020) 5602911.

HONG KONG: Texas Instruments Hong Kong Ltd., 8th Floor, World Shipping Center, 7 Canton Road, Kowloon, Hong Kong, 737-0338.

HUNGARY: Texas Instruments Representation, Budaorsi ut.42, 1112 Budapest, Hungary, (1) 1 66 66 17.

IRELAND: Texas Instruments Ireland Ltd., 7/8 Harcourt Street, Dublin 2, Ireland, (01) 7525233.

ITALY: Texas Instruments Italia S.p.A., Centro Direzionale Colleoni, Palazzo Perseo-Via Paracelso 12, 20041 Agrate Brianza (Mi), Italy, (039) 63221; Via Castello della Magliana, 38, 00148 Roma, Italy (06) 6572651; Via Amendola, 17, 40100 Bologna, Italy (051) 554004.

JAPAN: Texas Instruments Japan Ltd., Aoyama Fuji Building 3-6-12 Kita-Aoyama Minato-ku, Tokyo, Japan 107, 03-498-2111; MS Shibaura Building 9F, 4-13-23 Shibaura, Minato-ku, Tokyo, Japan 108, 03-769-8700; Nishio-iwai Building 5F, 2-5-8 Imabashi, Chuou-ku, Osaka, Japan 541, 06-204-1881; Dai-ni Toyota Building Nishi-kan 7F, 4-10-27 Meieki, Nakamura-ku, Nagoya, Japan 450, 052-583-8691; Kanazawa Oyama-cho Daiichi Seimei Building 6F, 3-10 Oyama-cho, Kanazawa, Ishikawa, Japan 920, 0762-23-5471; Matsumoto Showa Building 6F, 1-2-11 Fukushima, Matsumoto, Nagano, Japan 390, 0263-33-1060; Daiichi Olympic Tachikawa Building 6F, 1-25-12, Akebono-cho, Tachikawa, Tokyo, Japan 190, 0425-27-6760; Yokohama Business Park East Tower 10F, 134 Goudo-cho Hodogaya-ku, Yokohama-shi, Kanagawa, Japan 240, 045-338-1220; Nihon Seimei Kyoto Yasaka Building 5F, 843-2, Higashi Shiokohji-cho, Higashi-iru, Nishinotoh-in, Shiokohji-dori, Shimogyo-ku, Kyoto, Japan 600, 075-341-7713; Sumitomo Seimei Kumagaya Building 8F, 2-44 Yavoi, Kumagaya, Saitama, Japan 360, 0485-22-2440; 2597-1, Aza Harudai, Oaza Yasaka, Kitsuki, Oita, Japan 873, 09786-3-3211.

KOREA: Texas Instruments Korea Ltd., 28th Floor, Trade Tower, 159, Samsung-Dong, Kangnam-ku Seoul, Korea, 2 551-2800.

MALAYSIA: Texas Instruments Malaysia, Sdn. Bhd., Asia Pacific, Lot 36.1 #Box 93, Menara Maybank, 100 Jalan Tun Perak, 50050 Kuala Lumpur, Malaysia, 2306001.

MEXICO: Texas Instruments de Mexico S.A., de C.V., Alfonso Reyes 115, Col. Hipodromo Condessa, Mexico, D.F., Mexico 06170, 5-515-6081.

NORWAY: Texas Instruments Norge A/S, P.B. 106, Refstad (Sinsveien 53), 0513 Oslo 5, Norway, (02) 155 090.

PEOPLE'S REPUBLIC OF CHINA: Texas Instruments China Inc., Beijing Representative Office, 7-05 CITIC Building, 19 Jianguomenwai Dajie, Beijing, China, 500-2255, Ext. 3750.

PHILIPPINES: Texas Instruments Asia Ltd., Philippines Branch, 14th Floor, Ba-Lepanto Building, Paseo de Roxas, Makati, Metro Manila, Philippines, 2-8176031.

PORTUGAL: Texas Instruments Equipamento Electronico (Portugal) Ltda., Ing. Frederico Ulricho, 2650 Moreira Da Maia, 4470 Maia, Portugal (2) 948 1003.

SINGAPORE (& INDIA, INDONESIA, MALAYSIA, THAILAND): Texas Instruments Singapore (PTE) Ltd., Asia Pacific, 101 Thomson Road, #23-01, United Square, Singapore 1130, 3508100.

SPAIN: Texas Instruments Espana S.A., c/Gobelos 43, Urbanizacion, La Florida, 28023, Madrid, Spain, (1) 372 8051; c/Diputacion, 279-3-5, 08007 Barcelona, Spain, (3) 317 91 80.

SWEDEN: Texas Instruments International Trade Corporation (Sverigeffilialen), Isafordsgaton, Box 30, S-166 93 Kista, Sweden, (08) 752 58 00.

SWITZERLAND: Texas Instruments Switzerland AG, Riedstrasse 6, C8953 Dietikon, Switzerland, (01) 744 2811.

TAIWAN: Texas Instruments Taiwan Limited, Taipei Branch, 10th Floor Bank Tower, 205 Tung Hwa N. Road, Taipei, Taiwan, 10592 Republic of China, 2-7139311.

TURKEY: Texas Instruments, DSEG MidEast Regional Marketing Office, Karum Center, Suite 442, Iran Caddesi 21, 06680 Kavaklidere, Ankara, Turkey, 4-468-0155.

UNITED KINGDOM: Texas Instruments Ltd., Manton Lane, Bedford, England, MK41 7PA, (0234) 270 111.

TI Authorized North American Distributors

Alliance Electronics, Inc. (military product only)
 Almac/Arrow
 Anthem Electronics
 Arrow/Schweber
 Future Electronics (Canada)
 GRS Electronics Co., Inc. *
 Hall-Mark Electronics
 Marshall Industries
 Newark Electronics *
 Wyle Laboratories
 Zeus Components
 Rochester Electronics, Inc. (obsolete product only)

*Not authorized for TI military products



TI North American Sales Offices

ALABAMA: Huntsville: (205) 837-7530
ARIZONA: Phoenix: (602) 995-1007
CALIFORNIA: Irvine: (714) 660-1200
 San Diego: (619) 278-9600
 Santa Clara: (408) 980-9000
 Woodland Hills: (818) 704-8100
COLORADO: Aurora: (303) 368-8000
CONNECTICUT: Wallingford: (203) 269-0074
FLORIDA: Altamonte Springs: (407) 260-2116
 Fort Lauderdale: (305) 973-8502
 Tampa: (813) 885-7588
GEORGIA: Norcross: (404) 662-7967
ILLINOIS: Arlington Heights: (708) 640-3000
INDIANA: Carmel: (317) 573-6400
 Fort Wayne: (219) 489-4697
KANSAS: Overland Park: (913) 451-4511
MARYLAND: Columbia: (410) 964-2003
MASSACHUSETTS: Waltham: (617) 895-9100
MICHIGAN: Farmington Hills: (313) 553-1581
MINNESOTA: Eden Prairie: (612) 828-9300
MISSOURI: St. Louis: (314) 821-8400
NEW JERSEY: Iselin: (908) 750-1050
NEW MEXICO: Albuquerque: (505) 345-2555
NEW YORK: East Syracuse: (315) 463-9291
 Fishkill: (914) 897-2900
 Melville: (516) 454-6600
 Pittsford: (716) 385-6770
NORTH CAROLINA: Charlotte: (704) 527-0930
 Raleigh: (919) 876-2725
OHIO: Beachwood: (216) 765-7258
 Beavercreek: (513) 427-6200
OREGON: Beaverton: (503) 643-6758
PENNSYLVANIA: Blue Bell: (215) 825-9500
PUERTO RICO: Hato Rey: (809) 753-8700
TEXAS: Austin: (512) 250-6769
 Dallas: (214) 917-1264
 Houston: (713) 778-6592
 Midland: (915) 561-7137
UTAH: Salt Lake City: (801) 466-8972
WISCONSIN: Waukesha: (414) 798-1001
CANADA: Nepean: (613) 726-1970
 Richmond Hill: (416) 884-9181
 St. Laurent: (514) 335-8392

TI Regional Technology Centers

CALIFORNIA: Irvine: (714) 660-8140
 Santa Clara: (408) 748-2222
GEORGIA: Norcross: (404) 662-7945
ILLINOIS: Arlington Heights: (708) 640-2909
INDIANA: Indianapolis: (317) 573-6400
MASSACHUSETTS: Waltham: (617) 895-9196
MEXICO: Mexico City: 491-70834
MINNESOTA: Minneapolis: (612) 828-9300
TEXAS: Dallas: (214) 917-3881
CANADA: Nepean: (613) 726-1970

Customer Response Center

TOLL FREE: (800) 336-5236
OUTSIDE USA: (214) 995-6611
 (8:00 a.m. – 5:00 p.m. CST)

TI Authorized North American Distributors

Alliance Electronics, Inc. (military product only)
 Almac/Arrow
 Anthem Electronics
 Arrow/Schweber
 Future Electronics (Canada)
 GRS Electronics Co., Inc.
 Hall-Mark Electronics
 Marshall Industries
 Newark Electronics
 Rochester Electronics, Inc.
 (obsolete product only (508) 462-9332)
 Wyle Laboratories
 Zeus Components

TI Distributors

ALABAMA: Arrow/Schweber (205) 837-6955; Hall-Mark (205) 837-8700; Marshall (205) 881-9235.
ARIZONA: Anthem (602) 966-6600; Arrow/Schweber (602) 437-0750; Hall-Mark (602) 431-0030; Marshall (602) 496-0290; Wyle (602) 437-2088.
CALIFORNIA: Los Angeles/Orange County: Anthem (818) 775-1333, (714) 768-4444; Arrow/Schweber (818) 380-9686, (714) 838-5422; Hall-Mark (818) 773-4500, (714) 727-6000; Marshall (818) 878-7000, (714) 458-5301; Wyle (818) 880-9000, (714) 863-9953; Zeus (714) 921-9000, (818) 889-3838;
Sacramento: Anthem (916) 624-9744; Hall-Mark (916) 624-9781; Marshall (916) 635-9700; Wyle (916) 638-5282;
San Diego: Anthem (619) 453-9005; Arrow/Schweber (619) 565-4800; Hall-Mark (619) 268-1201; Marshall (619) 578-9600; Wyle (619) 565-9171; Zeus (619) 277-9681.
San Francisco Bay Area: Anthem (408) 453-1200; Arrow/Schweber (408) 441-9700, (510) 430-9477; Hall-Mark (408) 432-4000; Marshall (408) 942-4600; Wyle (408) 727-2500; Zeus (408) 629-4789.
COLORADO: Anthem (303) 790-4500; Arrow/Schweber (303) 799-0258; Hall-Mark (303) 790-1662; Marshall (303) 451-8383; Wyle (303) 457-9953.
CONNECTICUT: Anthem (203) 575-1575; Arrow/Schweber (203) 265-7741; Hall-Mark (203) 271-2844; Marshall (203) 265-3822.
FLORIDA: Fort Lauderdale: Arrow/Schweber (305) 429-8200; Hall-Mark (305) 971-9280; Marshall (305) 977-4880.
Orlando: Arrow/Schweber (407) 333-9300; Hall-Mark (407) 830-5855; Marshall (407) 767-8585; Zeus (407) 788-9100.
Tampa: Hall-Mark (813) 541-7440; Marshall (813) 573-1399.
GEORGIA: Arrow/Schweber (404) 497-1300; Hall-Mark (404) 623-4400; Marshall (404) 923-5750.
ILLINOIS: Anthem (708) 884-0200; Arrow/Schweber (708) 250-0500; Hall-Mark (312) 860-3800; Marshall (708) 490-0155; Newark (312) 784-5100.
INDIANA: Arrow/Schweber (317) 299-2071; Hall-Mark (317) 872-8875; Marshall (317) 297-0483.
IOWA: Arrow/Schweber (319) 395-7230.
KANSAS: Arrow/Schweber (913) 541-9542; Hall-Mark (913) 888-4747; Marshall (913) 492-3121.
MARYLAND: Anthem (301) 995-6640; Arrow/Schweber (301) 596-7800; Hall-Mark (301) 988-9800; Marshall (301) 622-1118; Zeus (301) 997-1118.
MASSACHUSETTS: Anthem (508) 657-5170; Arrow/Schweber (508) 658-0900; Hall-Mark (508) 667-0902; Marshall (508) 658-0810; Wyle (617) 272-7300; Zeus (617) 246-8200.



MICHIGAN: Detroit: Arrow/Schweber (313) 462-2290; Hall-Mark (313) 416-5800; Marshall (313) 525-5850; Newark (313) 967-0600.
MINNESOTA: Anthem (612) 944-5454; Arrow/Schweber (612) 941-5280; Hall-Mark (612) 881-2600; Marshall (612) 559-2211.
MISSOURI: Arrow/Schweber (314) 567-6888; Hall-Mark (314) 291-5350; Marshall (314) 291-4650.
NEW JERSEY: Anthem (201) 227-7960; Arrow/Schweber (201) 227-7880, (609) 596-8000; Hall-Mark (201) 515-3000, (609) 235-1900; Marshall (201) 882-0320, (609) 234-9100.
NEW MEXICO: Alliance (505) 292-3360.
NEW YORK: Long Island: Anthem (516) 864-6600; Arrow/Schweber (516) 231-1000; Hall-Mark (516) 737-0600; Marshall (516) 273-2424; Zeus (914) 937-7400.
Rochester: Arrow/Schweber (716) 427-0300; Hall-Mark (716) 425-3300; Marshall (716) 235-7620.
Syracuse: Marshall (607) 785-2345.
NORTH CAROLINA: Arrow/Schweber (919) 876-3132; Hall-Mark (919) 872-0712; Marshall (919) 878-9882.
OHIO: Cleveland: Arrow/Schweber (216) 248-3990; Hall-Mark (216) 349-4632; Marshall (216) 248-1788.
Columbus: Hall-Mark (614) 888-3313.
Dayton: Arrow/Schweber (513) 435-5563; Marshall (513) 898-4480; Zeus (513) 293-6162.
OKLAHOMA: Arrow/Schweber (918) 252-7537; Hall-Mark (918) 254-6110.
OREGON: Almac/Arrow (503) 629-8090; Anthem (503) 643-1114; Marshall (503) 644-5050; Wyle (503) 643-7900.
PENNSYLVANIA: Anthem (215) 443-5150; Arrow/Schweber (215) 928-1800; GRS (215) 922-7037; (609) 964-8560; Marshall (412) 788-0441.
TEXAS: Austin: Arrow/Schweber (512) 835-4180; Hall-Mark (512) 258-8848; Marshall (512) 837-1991; Wyle (512) 345-8853;
Dallas: Anthem (214) 238-7100; Arrow/Schweber (214) 380-6464; Hall-Mark (214) 553-4300; Marshall (214) 233-5200; Wyle (214) 235-9953; Zeus (214) 783-7010;
Houston: Arrow/Schweber (713) 530-4700; Hall-Mark (713) 781-6100; Marshall (713) 467-1666; Wyle (713) 879-9953.
UTAH: Anthem (801) 973-8555; Arrow/Schweber (801) 973-6913; Marshall (801) 973-2288; Wyle (801) 974-9953.
WASHINGTON: Almac/Arrow (206) 643-9992, Anthem (206) 483-1700; Marshall (206) 486-5747; Wyle (206) 881-1150.
WISCONSIN: Arrow/Schweber (414) 792-0150; Hall-Mark (414) 797-7844; Marshall (414) 797-8400.
CANADA: Calgary: Future (403) 235-5325;
Edmonton: Future (403) 438-2858;
Montreal: Arrow/Schweber (514) 421-7411; Future (514) 694-7710; Marshall (514) 694-8142
Ottawa: Arrow/Schweber (613) 226-6903; Future (613) 820-8313.
Quebec: Future (418) 897-6666.
Toronto: Arrow/Schweber (416) 670-7769; Future (416) 612-9200; Marshall (416) 458-8046.
Vancouver: Arrow/Schweber (604) 421-2333; Future (604) 294-1166.

TI Die Processors

Chip Supply (407) 298-7100
 Elmo Semiconductor (818) 768-7400
 Minco Technology Labs (512) 834-2022

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
5962-8605303KA	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125		
TIBPAL22VP10-20CFN	OBSOLETE	PLCC	FN	28		TBD	Call TI	Call TI	0 to 75		
TIBPAL22VP10-20CNT	OBSOLETE	PDIP	NT	24		TBD	Call TI	Call TI	0 to 75		
TIBPAL22VP10-25MFKB	OBSOLETE	LCCC	FK	28		TBD	Call TI	Call TI	-55 to 125		
TIBPAL22VP10-25MJTB	OBSOLETE	CDIP	JT	24		TBD	Call TI	Call TI	-55 to 125		
TIBPAL22VP10-25MWB	OBSOLETE	CFP	W	24		TBD	Call TI	Call TI	-55 to 125	5962-8605303KA TIBPAL22VP10-2 5MWB	

(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.

(6) 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.

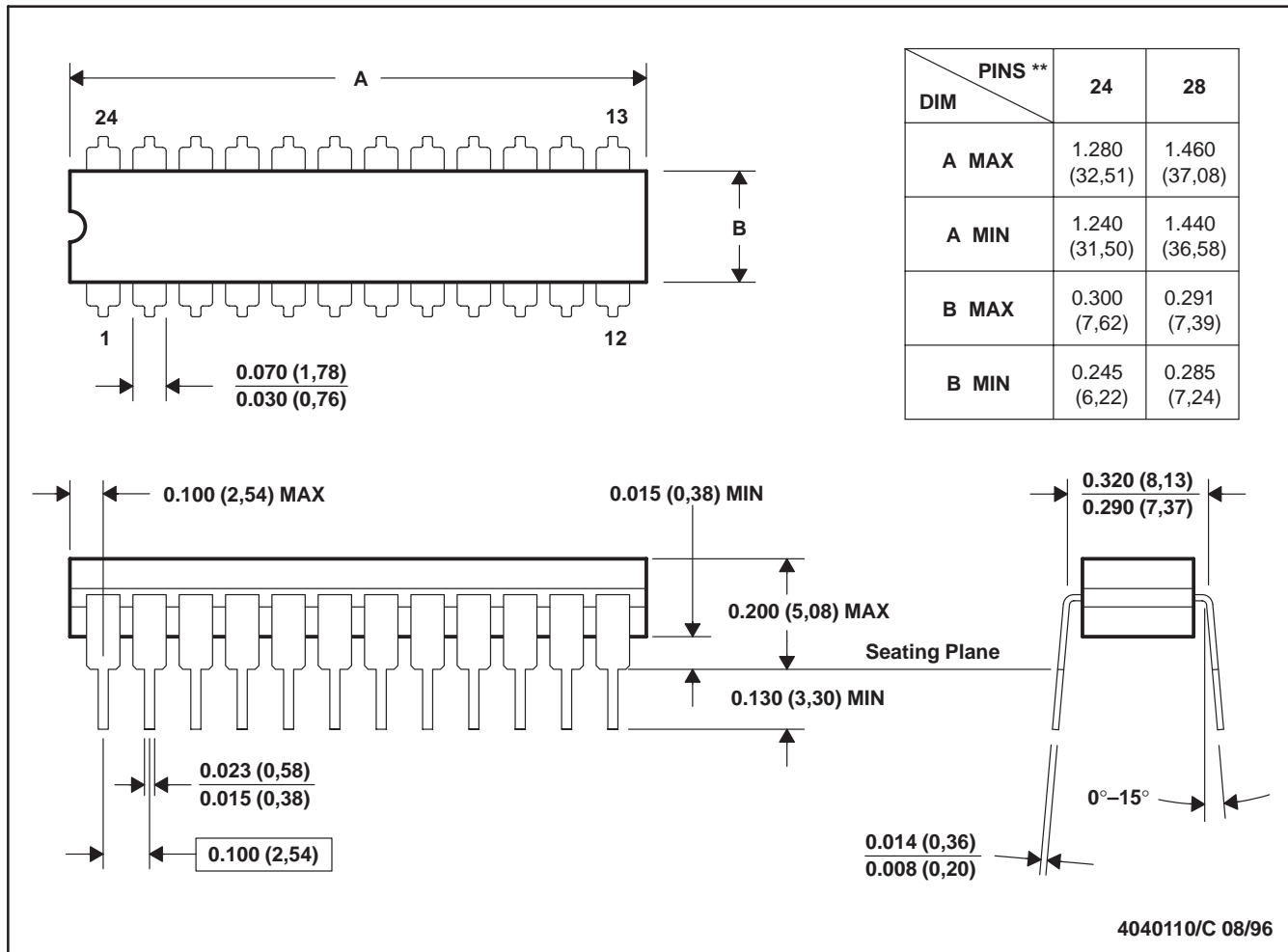
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information.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

JT (R-GDIP-T**)

CERAMIC DUAL-IN-LINE

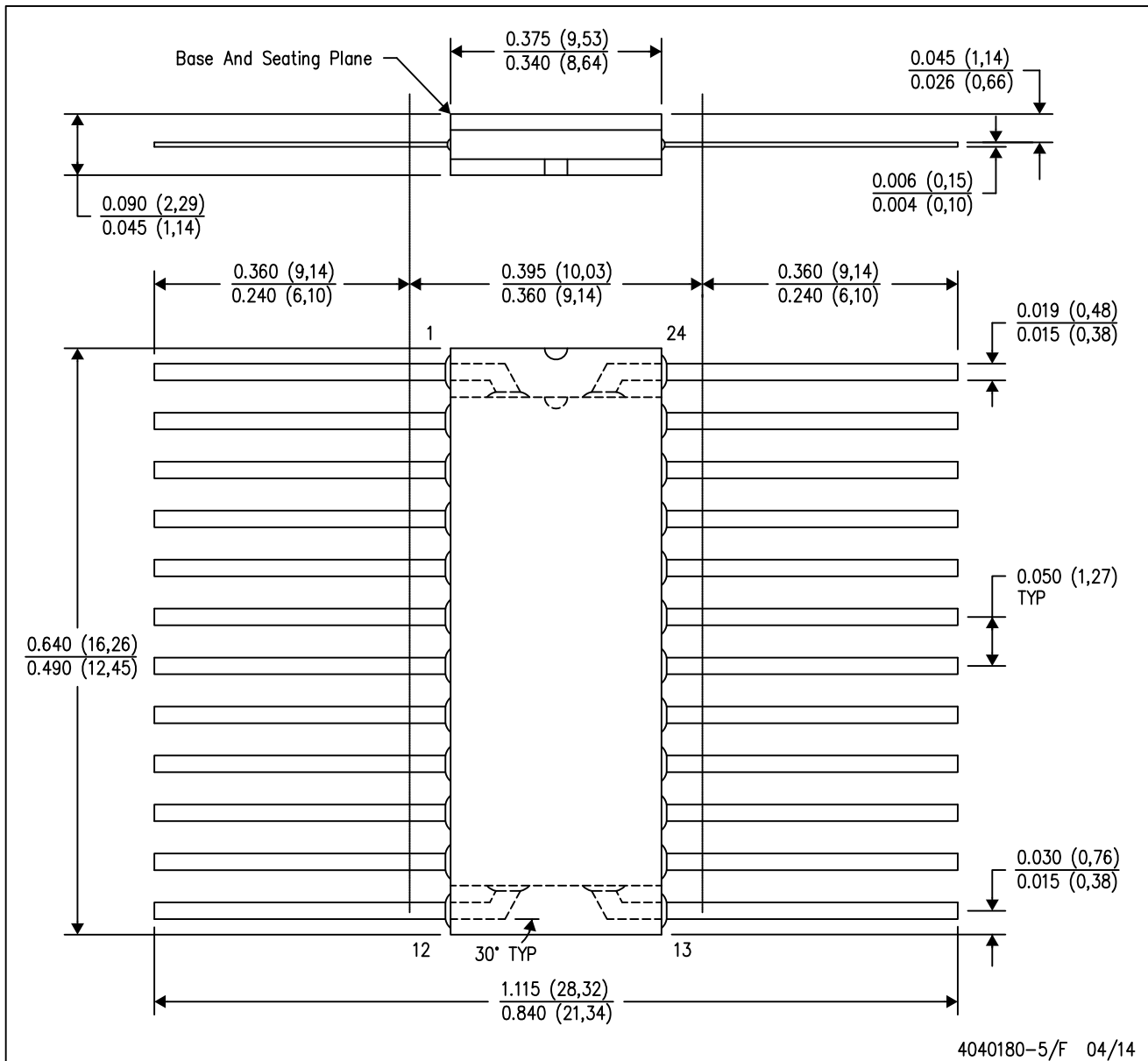
24 LEADS SHOWN



- 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.
 E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

W (R-GDFP-F24)

CERAMIC DUAL FLATPACK

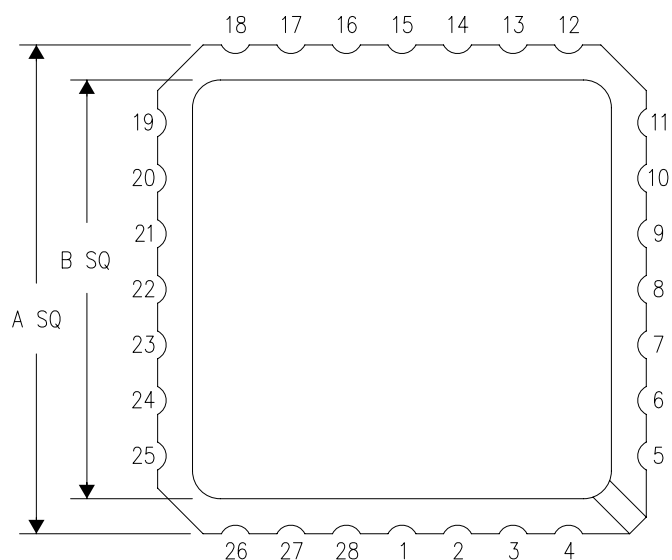


- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within Mil-Std 1835 GDFP2-F20

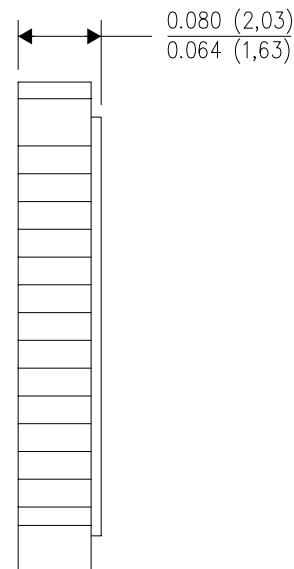
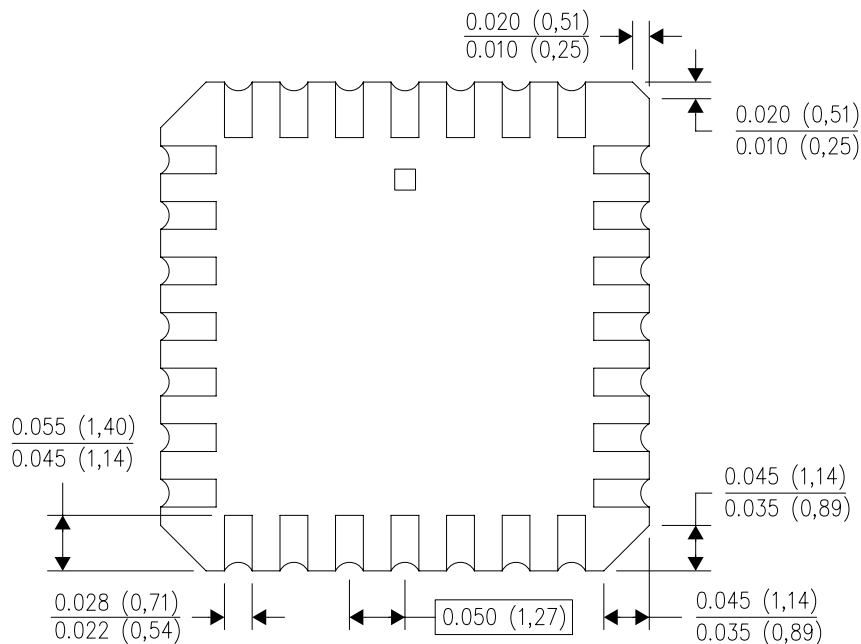
FK (S-CQCC-N**)

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)



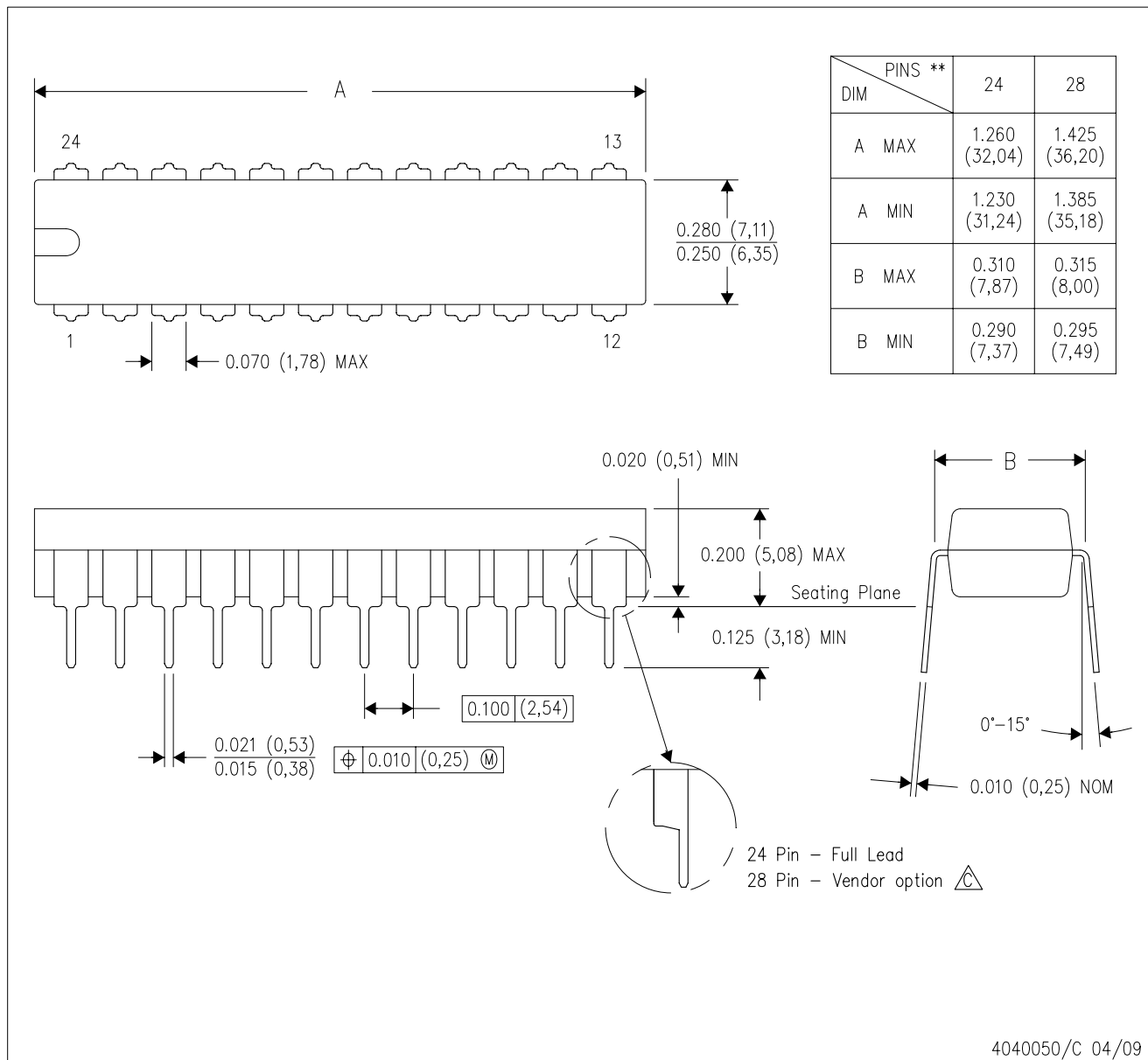
4040140/D 01/11

- NOTES:
- 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

MECHANICAL DATA

NT (R-PDIP-T**) 24 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE

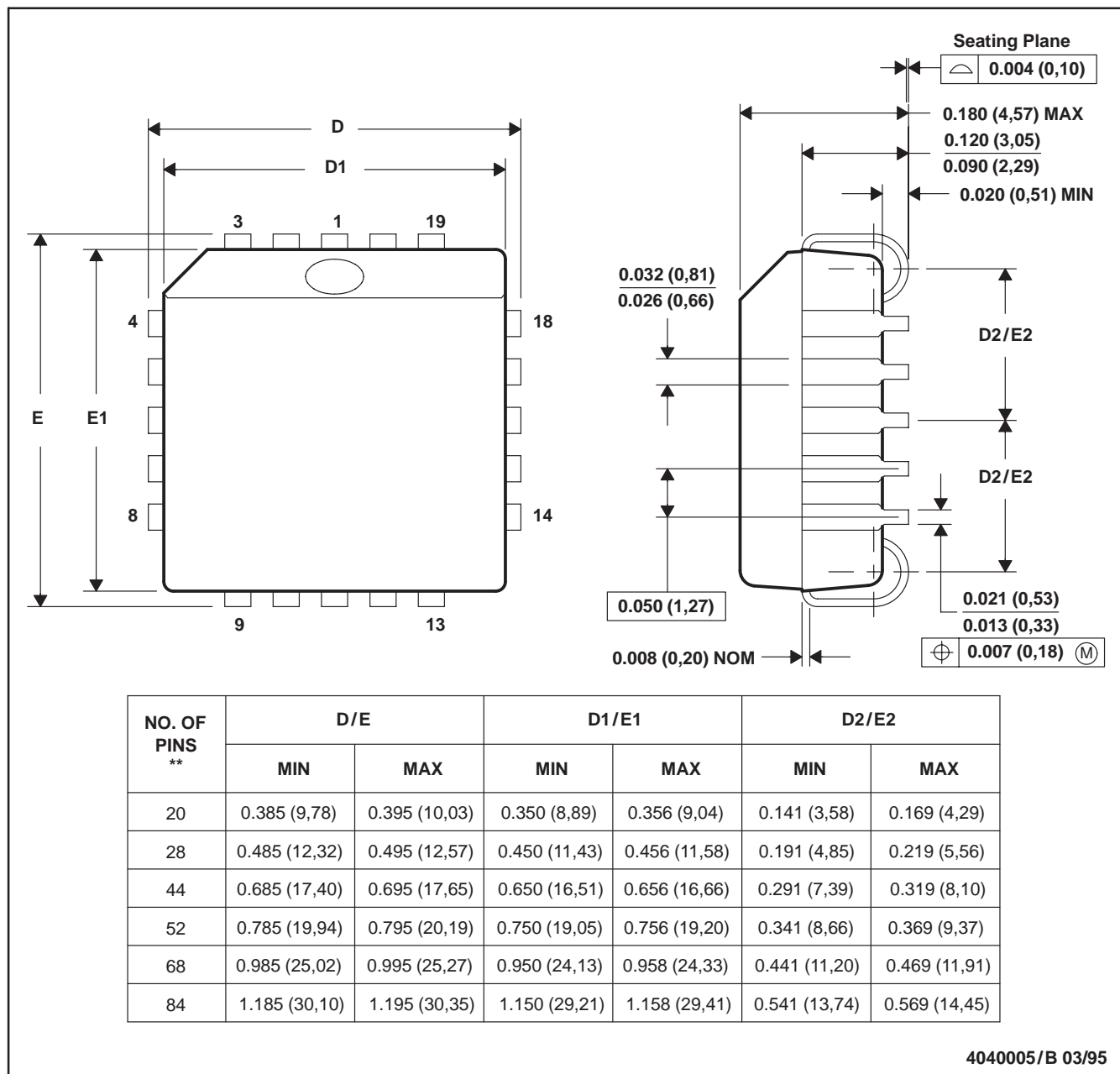


- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - \triangle The 28 pin end lead shoulder width is a vendor option, either half or full width.

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, 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

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

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com