

## CMOS Dual Precision Monostable Multivibrator

High-Voltage Types (20-Volt Rating)

**Features:**

- Retriggerable/resettable capability
- Trigger and reset propagation delays independent of  $R_x$ ,  $C_x$
- Triggering from leading or trailing edge
- Q and  $\bar{Q}$  buffered outputs available
- Separate resets
- Replaces CD4538B Type

■ CD14538B dual precision monostable multivibrator provides stable retriggerable/resettable one-shot operation for any fixed-voltage timing application.

An external resistor ( $R_x$ ) and an external capacitor ( $C_x$ ) control the timing and accuracy for the circuit. Adjustment of  $R_x$  and  $C_x$  provides a wide range of output pulse widths from the Q and  $\bar{Q}$  terminals. The time delay from trigger input to output transition (trigger propagation delay) and the time delay from reset input to output transition (reset propagation delay) are independent of  $R_x$  and  $C_x$ . Precision control of output pulse widths is achieved through linear CMOS techniques.

Leading-edge-triggering (+TR) and trailing-edge-triggering (-TR) inputs are provided for triggering from either edge of an input pulse. An unused +TR input should be tied to  $V_{SS}$ . An unused -TR input should be tied to  $V_{DD}$ . A RESET (on low level) is provided for immediate termination of the output pulse or to prevent output pulses when power is turned on. An unused RESET input should be tied to  $V_{DD}$ . However, if an entire section of the CD14538B is not used, its inputs must be tied to either  $V_{DD}$  or  $V_{SS}$ . See Table I.

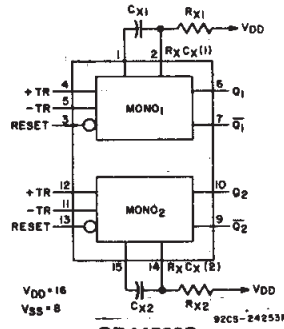
In normal operation the circuit retriggers (extends the output pulse one period) on the application of each new trigger pulse. For operation in the non-retriggerable mode,  $\bar{Q}$  is connected to -TR when leading-edge triggering (+TR) is used or Q is connected to +TR when trailing-edge triggering (-TR) is used. The time period (T) for this multivibrator can be calculated by:  $T = R_x C_x$ .

The minimum value of external resistance,  $R_x$ , is 4 K $\Omega$ . The minimum and maximum values of external capacitance,  $C_x$ , are 0 pF and 100  $\mu$ F, respectively.

The CD14538B is interchangeable with type MC14538 and is similar to and pin-compatible with the CD4098B\* and CD4538B. It can replace the CD4538B which type is not recommended for new designs.

The CD14538B types are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix), 16-lead dual-in-line plastic packages (E suffix), 16-lead small-outline packages (M, M96, MT, and NSR suffixes), and 16-lead thin shrink small-outline packages (PW and PWR suffixes).

\*T = 0.5  $R_x C_x$  for  $C_x \geq 1000$  pF #T =  $R_x C_x$ ;  $C_{x\min} = 5000$  pF

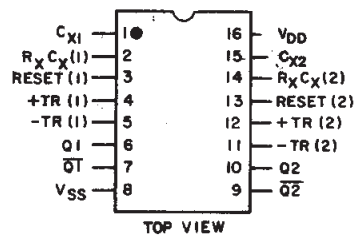


**CD14538B FUNCTIONAL DIAGRAM**

- Wide range of output-pulse widths
- Schmitt-trigger input allows unlimited rise and fall times on +TR and -TR inputs
- 100% tested for maximum quiescent current at 20 V
- Maximum input current of 1  $\mu$ A at 18 V over full package-temperature range; 100 nA at 18 V and 25 $^{\circ}$ C
- Noise margin (full package-temperature range):
  - 1 V at  $V_{DD} = 5$  V
  - 2 V at  $V_{DD} = 10$  V
  - 2.5 V at  $V_{DD} = 15$  V
- 5-V, 10-V, and 15-V parametric ratings
- Standardized, symmetrical output characteristics
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices."

**Applications:**

- Pulse delay and timing
- Pulse shaping



TERMINALS 1, 8, 15 ARE ELECTRICALLY CONNECTED INTERNALLY

**Terminal Assignment**

## CD14538B Types

### MAXIMUM RATINGS, Absolute-Maximum Values:

#### DC SUPPLY-VOLTAGE RANGE, ( $V_{DD}$ )

Voltages referenced to  $V_{SS}$  Terminal ..... -0.5V to +20V

INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5V to  $V_{DD} + 0.5V$

DC INPUT CURRENT, ANY ONE INPUT .....  $\pm 10mA$

#### POWER DISSIPATION PER PACKAGE ( $P_D$ ):

For  $T_A = -55^\circ C$  to  $+100^\circ C$  ..... 500mW

For  $T_A = +100^\circ C$  to  $+125^\circ C$  ..... Derate Linearly at 12mW/ $^\circ C$  to 200mW

#### DEVICE DISSIPATION PER OUTPUT TRANSISTOR

FOR  $T_A =$  FULL PACKAGE-TEMPERATURE RANGE (All Package Types) ..... 100mW

OPERATING-TEMPERATURE RANGE ( $T_A$ ) .....  $-55^\circ C$  to  $+125^\circ C$

STORAGE TEMPERATURE RANGE ( $T_{stg}$ ) .....  $-65^\circ C$  to  $+150^\circ C$

#### LEAD TEMPERATURE (DURING SOLDERING):

At distance  $1/16 \pm 1/32$  inch ( $1.58 \pm 0.79mm$ ) from case for 10s max .....  $+265^\circ C$

### RECOMMENDED OPERATING CONDITIONS

For maximum reliability, nominal operating conditions should be selected so that operating is always within the following ranges:

CHARACTERISTIC	$V_{DD}$ (V)	LIMITS		UNITS
		Min.	Max.	
Supply-Voltage Range (For $T_A$ =Full Package-Temperature Range)	—	3	18	V
Input Pulse Width +TR, -TR, or RESET	$t_{WH}, t_{WL}$	5	140	ns
		10	80	
		15	60	

**TABLE I**  
**CD4538B FUNCTIONAL TERMINAL CONNECTIONS**

FUNCTION	$V_{DD}$ TO TERM. NO.		$V_{SS}$ TO TERM. NO.		INPUT PULSE TO TERM. NO.		OTHER CONNECTIONS	
	MONO <sub>1</sub>	MONO <sub>2</sub>	MONO <sub>1</sub>	MONO <sub>2</sub>	MONO <sub>1</sub>	MONO <sub>2</sub>	MONO <sub>1</sub>	MONO <sub>2</sub>
Leading-Edge Trigger/ Retriggerable	3, 5	11, 13			4	12		
Leading-Edge Trigger/ Non-Retriggerable	3	13			4	12	5-7	11-9
Trailing-Edge Trigger/ Retriggerable	3	13	4	12	5	11		
Trailing-Edge Trigger/ Non-Retriggerable	3	13			5	11	4-6	12-10

#### NOTES:

1. A RETRIGGERABLE ONE-SHOT MULTIVIBRATOR HAS AN OUTPUT PULSE WIDTH WHICH IS EXTENDED ONE FULL TIME PERIOD (T) AFTER APPLICATION OF THE LAST TRIGGER PULSE.
2. A NON-RETRIGGERABLE ONE-SHOT MULTIVIBRATOR HAS A TIME PERIOD (T) REFERENCED FROM THE APPLICATION OF THE FIRST TRIGGER PULSE.

#### INPUT PULSE TRAIN



#### RETRIGGERABLE MODE PULSE WIDTH (+TR MODE)



#### NON-RETRIGGERABLE MODE PULSE WIDTH (+TR MODE)



## CD14538B Types

### STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
	V <sub>O</sub> (V)	V <sub>IN</sub> (V)	V <sub>DD</sub> (V)	-55	-40	+85	+125	Min.	+25 Typ.	Max.	
Quiescent Device Current, I <sub>DD</sub> Max.	—	0,5	5	5	5	150	150	—	0,04	5	μA
	—	0,10	10	10	10	300	300	—	0,04	10	
	—	0,15	15	20	20	600	600	—	0,04	20	
	—	0,20	20	100	100	3000	3000	—	0,08	100	
Output Low (Sink) Current, I <sub>OL</sub> Min.	0,4	0,5	5	0,64	0,61	0,42	0,36	0,51	1	—	mA
	0,5	0,10	10	1,6	1,5	1,1	0,9	1,3	2,6	—	
	1,5	0,15	15	4,2	4	2,8	2,4	3,4	6,8	—	
Output High (Source) Current, I <sub>OH</sub> Min.	4,6	0,5	5	-0,64	-0,61	-0,42	-0,36	-0,51	-1	—	mA
	2,5	0,5	5	-2	-1,8	-1,3	-1,15	-1,6	-3,2	—	
	9,5	0,10	10	-1,6	-1,5	-1,1	-0,9	-1,3	-2,6	—	
Output Voltage: Low-Level, V <sub>OL</sub> Max.	—	0,5	5	0,05				—	0	0,05	V
	—	0,10	10	0,05				—	0	0,05	
	—	0,15	15	0,05				—	0	0,05	
Output Voltage: High-Level, V <sub>OH</sub> Min.	—	0,5	5	4,95				4,95	5	—	V
	—	0,10	10	9,95				9,95	10	—	
	—	0,15	15	14,95				14,95	15	—	
Input Low Voltage, V <sub>IL</sub> Max.	0,5,4,5	—	5	1,5				—	—	1,5	V
	1,9	—	10	3				—	—	3	
	1,5,13,5	—	15	4				—	—	4	
Input High Voltage, V <sub>IH</sub> Min.	0,5,4,5	—	5	3,5				3,5	—	—	V
	1,9	—	10	7				7	—	—	
	1,5,13,5	—	15	11				11	—	—	
Input Current, I <sub>IN</sub> Max.	—	0,18	18	±0,1	±0,1	±1	±1	—	±10 <sup>-5</sup>	±0,1	μA

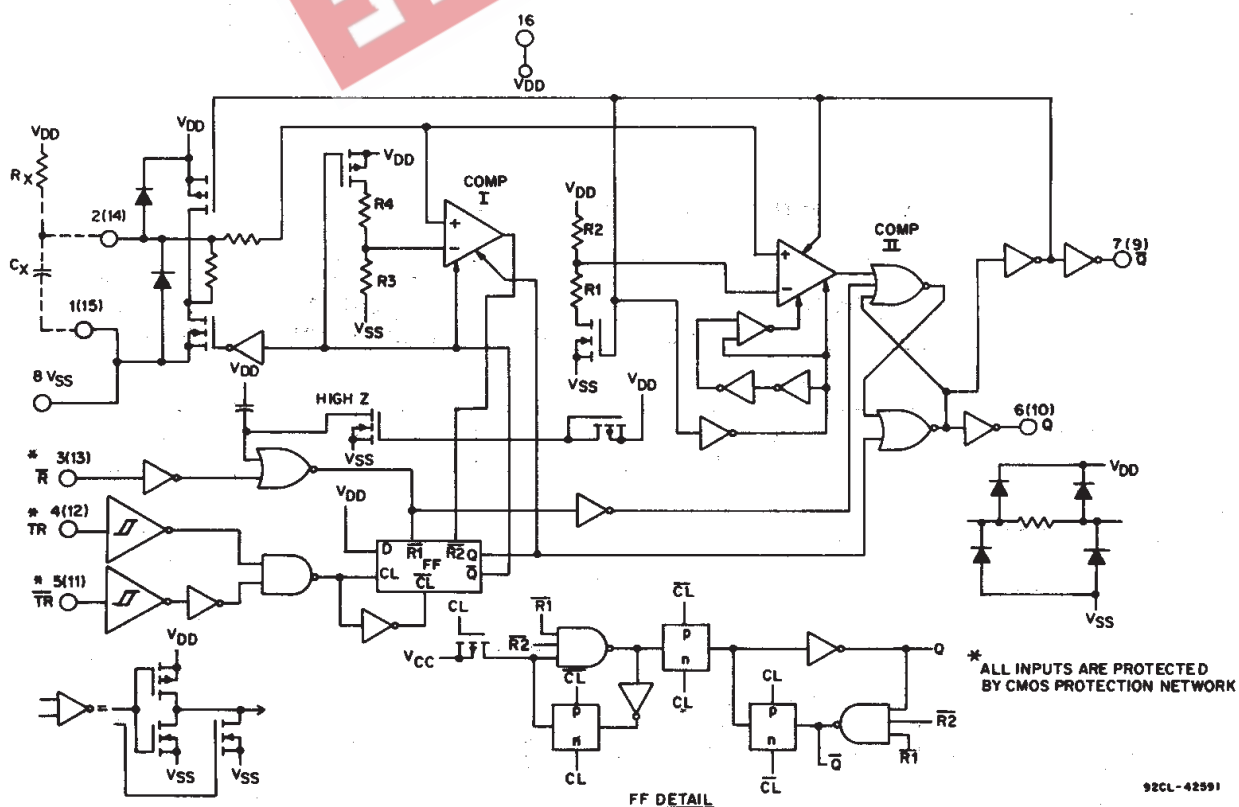


Fig. 1 - Logic diagram (1/2 of device shown).

## CD14538B Types

**DYNAMIC ELECTRICAL CHARACTERISTICS, At  $T_A=25^\circ\text{C}$ ; Input  $t_r, t_f=20\text{ ns}$ ,  $C_L=50\text{ pF}$**

CHARACTERISTIC	TEST CONDITIONS $V_{DD}$ (V)	LIMITS			UNITS	
		Min.	Typ.	Max.		
Transition Time $t_{TLH}, t_{THL}$	5	—	100	200	ns	
	10	—	50	100		
	15	—	40	80		
Propagation Delay Time: +TR or -TR to Q or $\bar{Q}$	5	—	300	600		
	10	—	150	300		
	15	—	100	220		
Reset to Q or $\bar{Q}$	5	—	250	500		
	10	—	125	250		
	15	—	95	190		
Minimum Input Pulse Width: +TR, -TR or Reset	5	—	80	140		
	10	—	40	80		
	15	—	30	60		
Output Pulse Width - Q or $\bar{Q}$ : $C_x = 0.002\ \mu\text{F}$ , $R_x = 100\ \text{K}\Omega$	5	198	210	230	$\mu\text{s}$	
	10	200	212	232		
	15	202	214	234		
$C_x = 0.1\ \mu\text{F}$ , $R_x = 100\ \text{K}\Omega$	5	9.4	9.97	10.5	ms	
	10	9.4	9.95	10.6		
	15	9.5	10	10.6		
$C_x = 10\ \mu\text{F}$ , $R_x = 100\ \text{K}\Omega$	5	0.95	1	1.06	s	
	10	0.95	1	1.06		
	15	0.96	1.01	1.07		
Pulse Width Match between circuits in same package: $C_x = 0.1\ \mu\text{F}$ , $R_x = 100\ \text{K}\Omega$	5	—	$\pm 1$	—	%	
	10	—	$\pm 1$	—		
	15	—	$\pm 1$	—		
Minimum Retrigger Time	5	0	—	—	ns	
	10	0	—	—		
	15	0	—	—		
Input Capacitance	$C_{IN}$	Any Input	—	5	7.5	pF

\*Note: Minimum  $R_x$  value=4 K $\Omega$ , minimum  $C_x$  value=5000 pF.

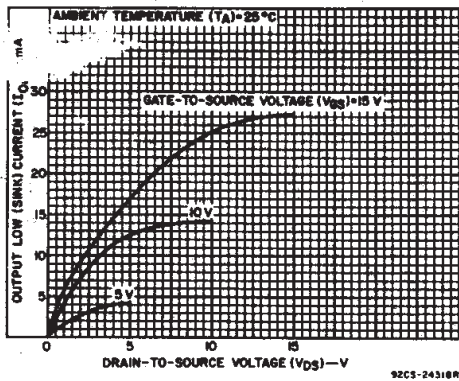


Fig. 2 - Typical output low (sink) current characteristics.

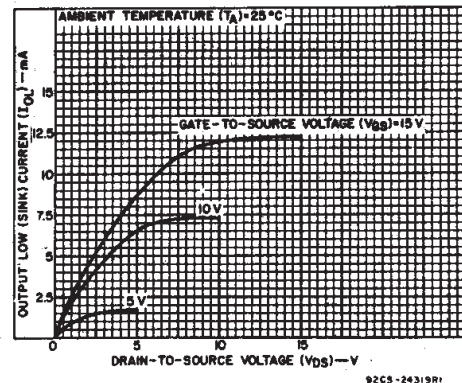


Fig. 3 - Minimum output low (sink) current characteristics.



# CD14538B Types

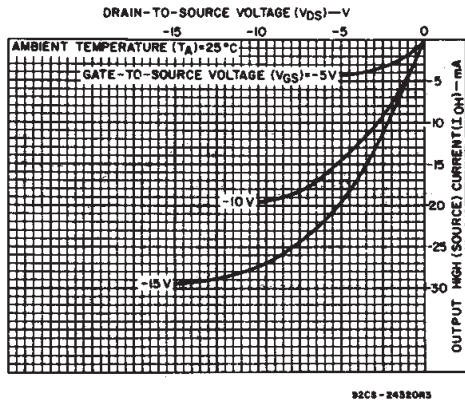


Fig. 4 - Typical output high (source) current characteristics.

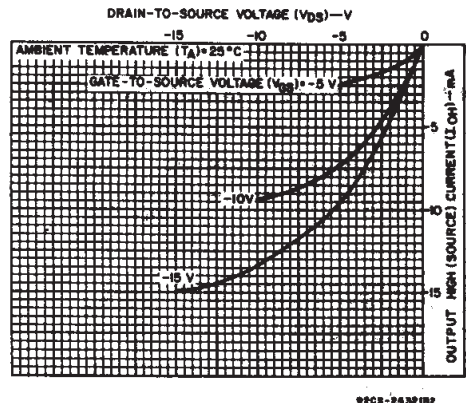


Fig. 5 - Minimum output high (source) current characteristics.

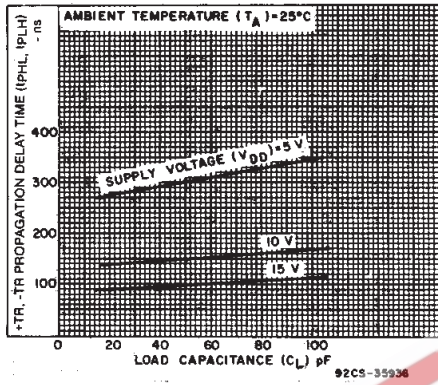


Fig. 6 - Typical propagation delay time as a function of load capacitance (+TR or -TR to Q or  $\bar{Q}$ ).

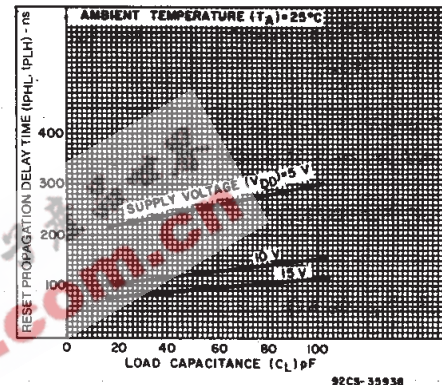


Fig. 7 - Typical propagation delay time as a function of load capacitance (RESET to Q or  $\bar{Q}$ ).

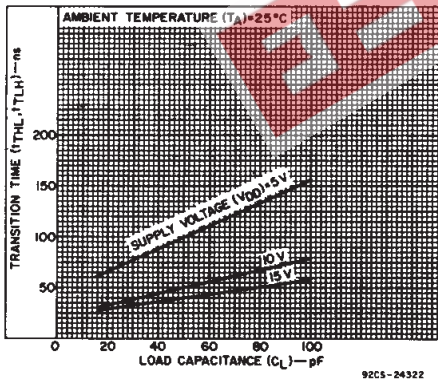


Fig. 8 - Typical transition time as a function of load capacitance.

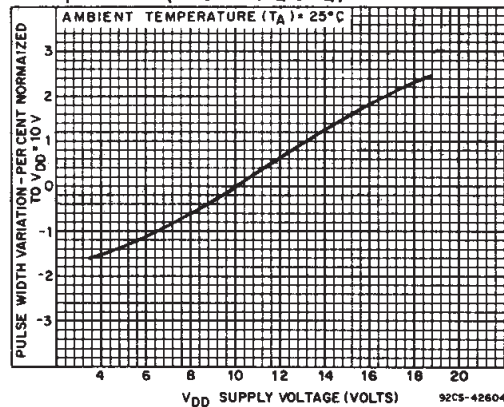


Fig. 9 - Typical pulse-width variation as a function of supply voltage.

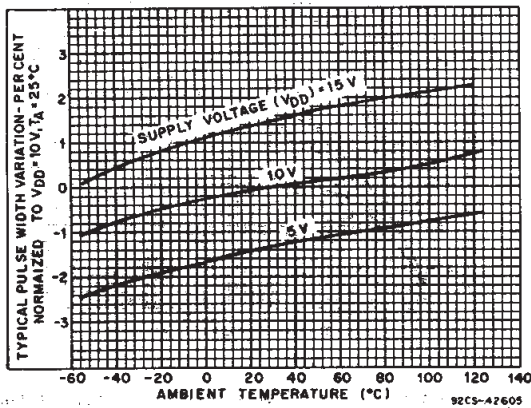


Fig. 10 - Typical pulse-width variation as a function of temperature ( $R_X=100\text{ K}\Omega$ ,  $C_X=0.1\text{ }\mu\text{F}$ ).

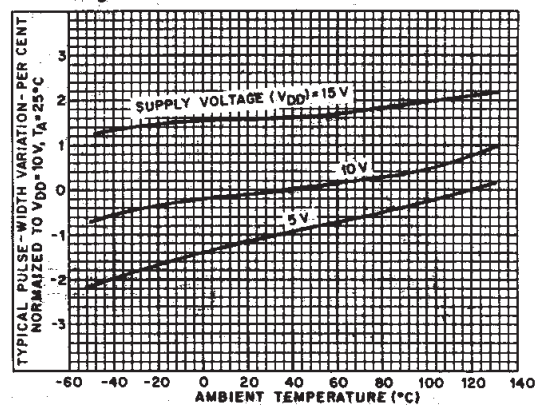


Fig. 11 - Typical pulse-width variation as a function of temperature ( $R_X=100\text{ K}\Omega$ ,  $C_X=2000\text{ pF}$ ).

## CD14538B Types

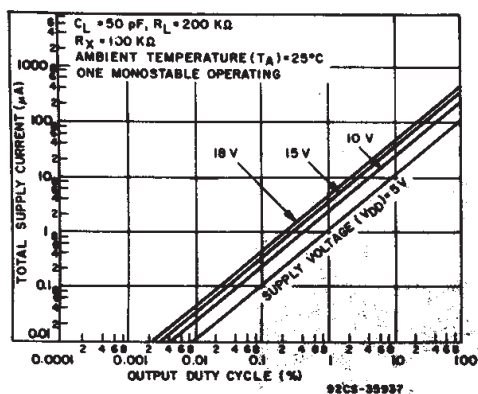


Fig. 12 - Typical total supply current as a function of output duty cycle.

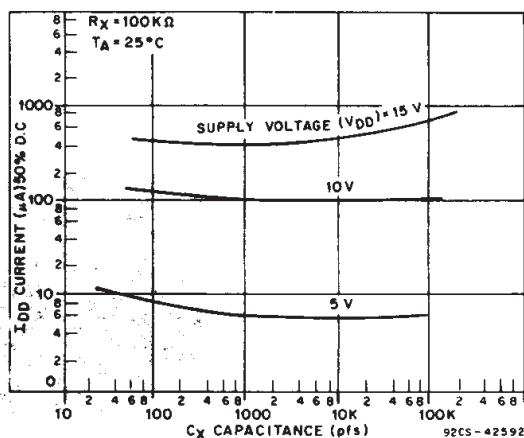
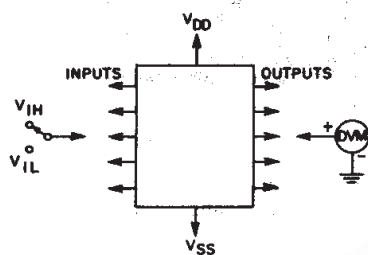


Fig. 13 - Typical total supply current as a function of load capacitance.

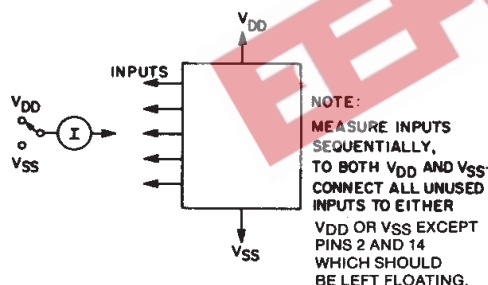


92CS-27441R1

Fig. 14 - Input voltage test circuit.

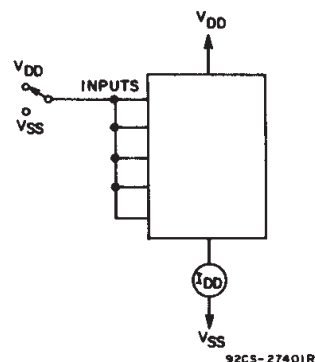
### NOTE:

1. Test any combination of inputs.
2. When measuring  $V_{IH}$  or  $V_{IL}$  for Schmitt trigger inputs (+TR, -TR), the input must first be brought to  $V_{DD}$  or  $V_{SS}$ , respectively, then reduced to the specified limit.



NOTE:  
MEASURE INPUTS SEQUENTIALLY, TO BOTH  $V_{DD}$  AND  $V_{SS}$ . CONNECT ALL UNUSED INPUTS TO EITHER  $V_{DD}$  OR  $V_{SS}$  EXCEPT PINS 2 AND 14 WHICH SHOULD BE LEFT FLOATING.

Fig. 15 - Input leakage-current test circuit.



92CS-27401R1

Fig. 16 - Quiescent device current test circuit.

### Power-Down Mode

During a rapid power-down condition, as would occur with a power-supply short circuit or with a poorly filtered power supply, the energy stored in  $C_x$  could discharge into Pin 2 or 14. To avoid possible device damage in this mode, when  $C_x$  is  $\geq 0.5$  microfarad, a protection diode with a 1-ampere or higher rating (1N5395 or equivalent) and a separate ground return for  $C_x$  should be provided as shown in Fig. 17.

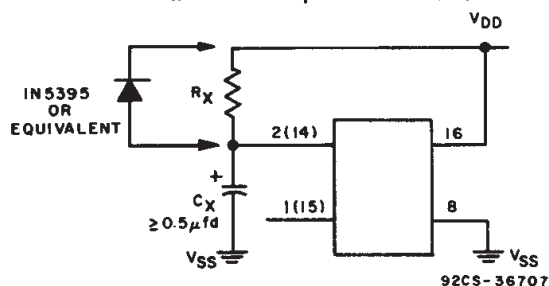


Fig. 17 - Rapid power-down protection circuit.

An alternate protection method is shown in Fig. 18, where a 51-ohm current-limiting resistor is inserted in series with  $C_x$ . Note that a small pulse width decrease will occur however, and  $R_x$  must be appropriately increased to obtain the originally desired pulse width.

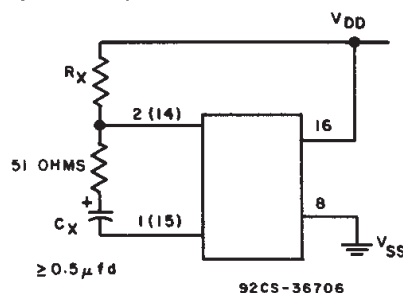
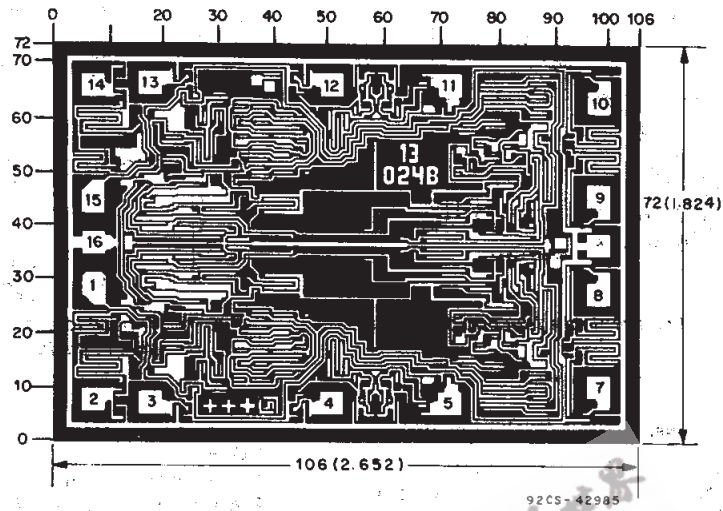


Fig. 18 - Alternate rapid power-down protection circuit.

## CD14538B Types



Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils ( $10^{-3}$  inch).

Dimensions and pad layout for CD14538BH.

PACKAGING INFORMATION

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
5962-9055701EA	ACTIVE	CDIP	J	16	1	None	Call TI	Level-NC-NC-NC
CD14538BE	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD14538BF	ACTIVE	CDIP	J	16	1	None	Call TI	Level-NC-NC-NC
CD14538BF3A	ACTIVE	CDIP	J	16	1	None	Call TI	Level-NC-NC-NC
CD14538BM	ACTIVE	SOIC	D	16	40	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
CD14538BM96	ACTIVE	SOIC	D	16	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
CD14538BMT	ACTIVE	SOIC	D	16	250	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
CD14538BNSR	ACTIVE	SO	NS	16	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
CD14538BPW	ACTIVE	TSSOP	PW	16	90	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
CD14538BPWR	ACTIVE	TSSOP	PW	16	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM

<sup>(1)</sup> 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 - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**None:** Not yet available Lead (Pb-Free).

**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.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

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

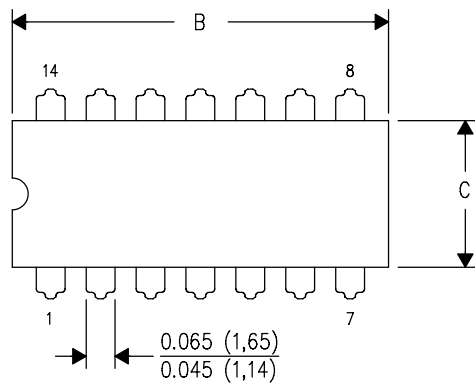
**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information.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

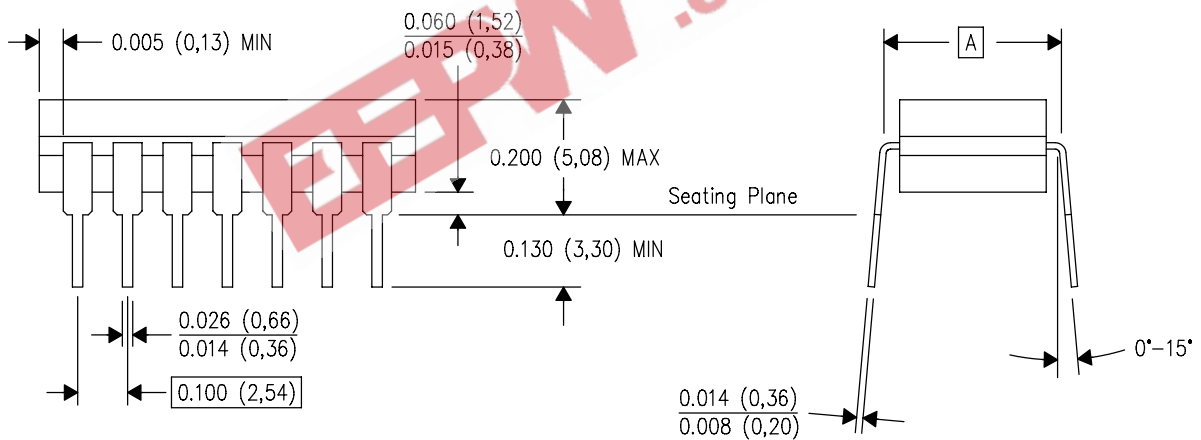


J (R-GDIP-T\*\*)  
14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

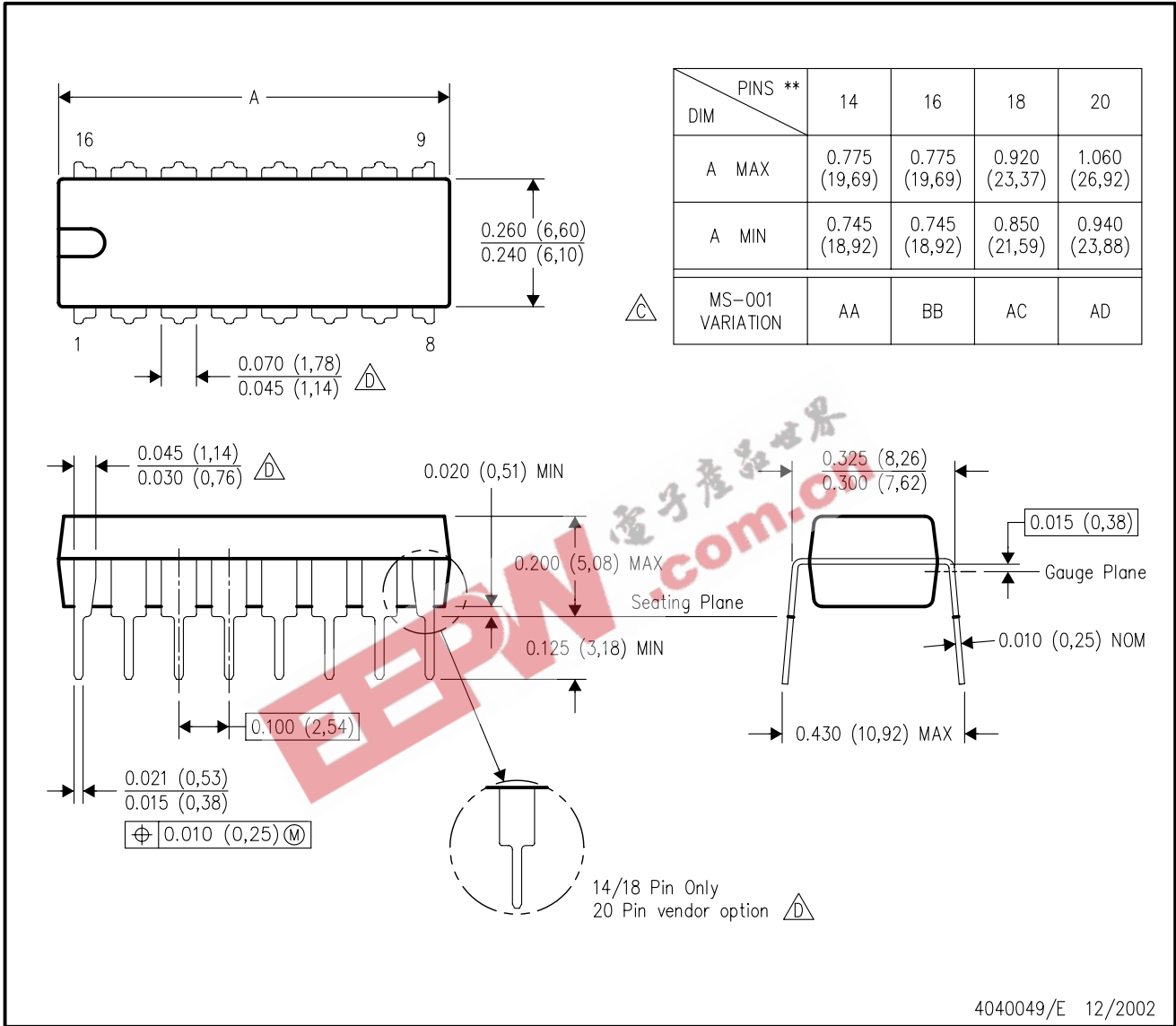
- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
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

# MECHANICAL DATA

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

## PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

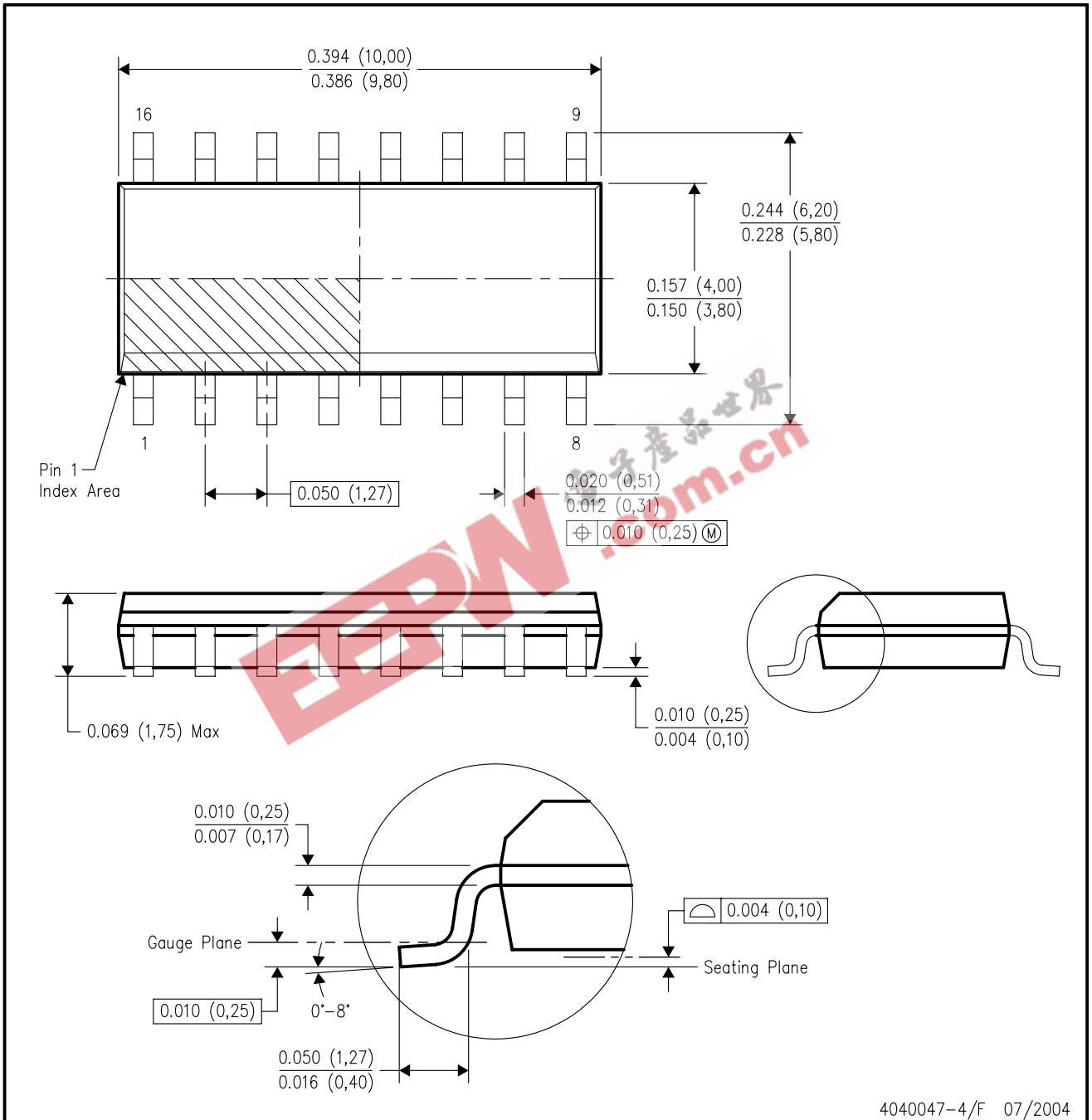


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

# MECHANICAL DATA

## D (R-PDSO-G16)

## PLASTIC SMALL-OUTLINE PACKAGE



4040047-4/F 07/2004

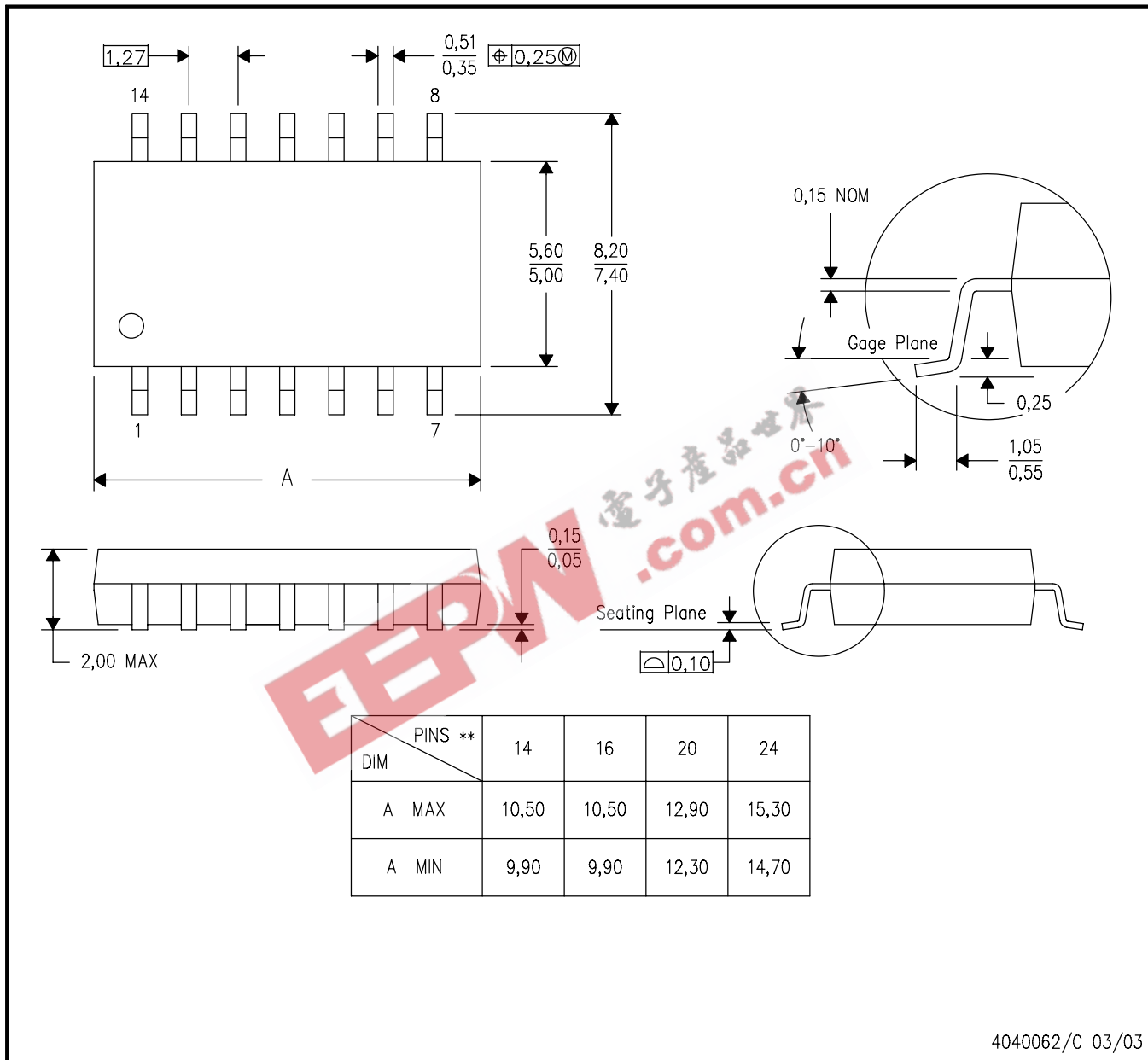
- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0.15).
  - D. Falls within JEDEC MS-012 variation AC.

## MECHANICAL DATA

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

**PLASTIC SMALL-OUTLINE PACKAGE**

**14-PINS SHOWN**



4040062/C 03/03

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

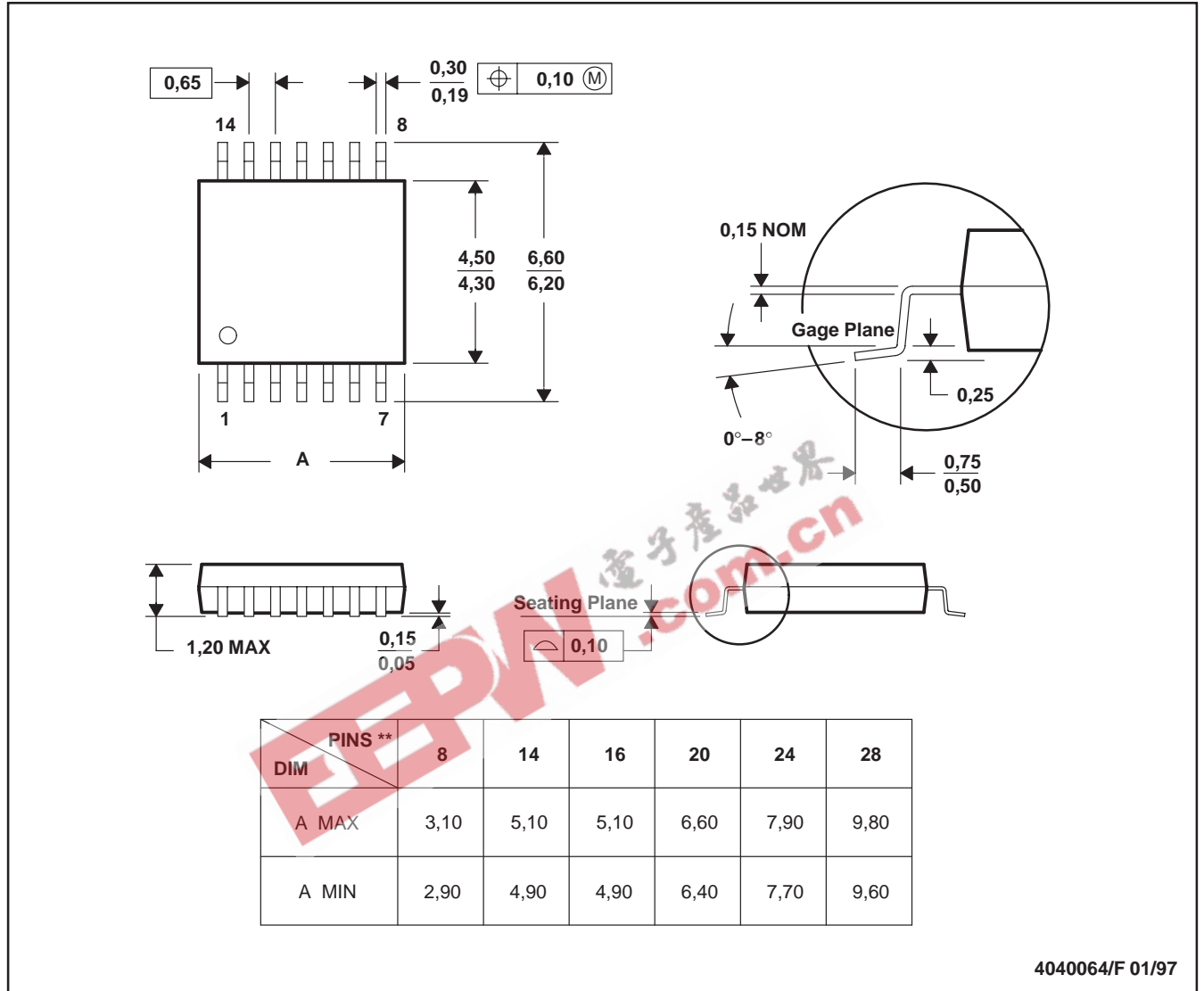
# MECHANICAL DATA

MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

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

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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.
  - D. Falls within JEDEC MO-153



## 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 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.

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.

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

<b>Products</b>		<b>Applications</b>	
Amplifiers	<a href="http://amplifier.ti.com">amplifier.ti.com</a>	Audio	<a href="http://www.ti.com/audio">www.ti.com/audio</a>
Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>	Automotive	<a href="http://www.ti.com/automotive">www.ti.com/automotive</a>
DSP	<a href="http://dsp.ti.com">dsp.ti.com</a>	Broadband	<a href="http://www.ti.com/broadband">www.ti.com/broadband</a>
Interface	<a href="http://interface.ti.com">interface.ti.com</a>	Digital Control	<a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>	Military	<a href="http://www.ti.com/military">www.ti.com/military</a>
Power Mgmt	<a href="http://power.ti.com">power.ti.com</a>	Optical Networking	<a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a>
Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>	Security	<a href="http://www.ti.com/security">www.ti.com/security</a>
		Telephony	<a href="http://www.ti.com/telephony">www.ti.com/telephony</a>
		Video & Imaging	<a href="http://www.ti.com/video">www.ti.com/video</a>
		Wireless	<a href="http://www.ti.com/wireless">www.ti.com/wireless</a>

Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265