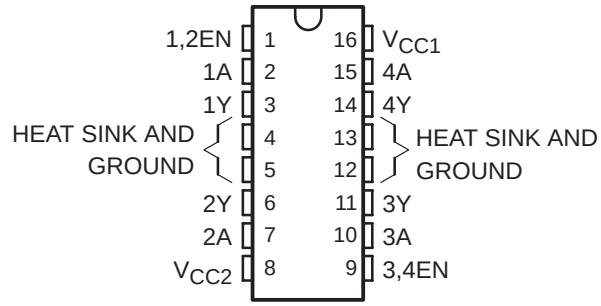
- **1-A Output-Current Capability Per Driver**
- **Applications Include Half-H and Full-H Solenoid Drivers and Motor Drivers**
- **Designed for Positive-Supply Applications**
- **Wide Supply-Voltage Range of 4.5 V to 36 V**
- **TTL- and CMOS-Compatible High-Impedance Diode-Clamped Inputs**
- **Separate Input-Logic Supply**
- **Thermal Shutdown**
- **Internal ESD Protection**
- **Input Hysteresis Improves Noise Immunity**
- **3-State Outputs**
- **Minimized Power Dissipation**
- **Sink/Source Interlock Circuitry Prevents Simultaneous Conduction**
- **No Output Glitch During Power Up or Power Down**
- **Improved Functional Replacement for the SGS L293**

NE PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each driver)

INPUTS†		OUTPUT
A	EN	Y
H	H	H
L	H	L
X	L	Z

H = high-level, L = low-level
X = irrelevant
Z = high-impedance (off)
† In the thermal shutdown mode, the output is in a high-impedance state regardless of the input levels.

description

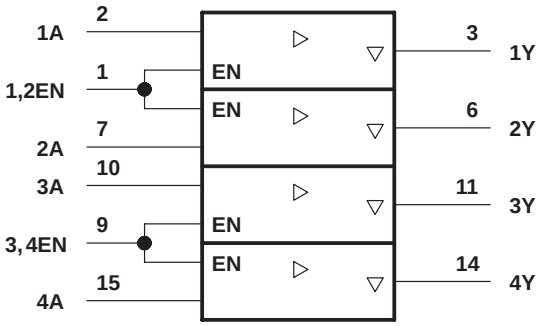
The SN754410 is a quadruple high-current half-H driver designed to provide bidirectional drive currents up to 1 A at voltages from 4.5 V to 36 V. The device is designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as other high-current/high-voltage loads in positive-supply applications.

All inputs are compatible with TTL-and low-level CMOS logic. Each output (Y) is a complete totem-pole driver with a Darlington transistor sink and a pseudo-Darlington source. Drivers are enabled in pairs with drivers 1 and 2 enabled by 1,2EN and drivers 3 and 4 enabled by 3,4EN. When an enable input is high, the associated drivers are enabled and their outputs become active and in phase with their inputs. When the enable input is low, those drivers are disabled and their outputs are off and in a high-impedance state. With the proper data inputs, each pair of drivers form a full-H (or bridge) reversible drive suitable for solenoid or motor applications.

A separate supply voltage (V_{CC1}) is provided for the logic input circuits to minimize device power dissipation. Supply voltage V_{CC2} is used for the output circuits.

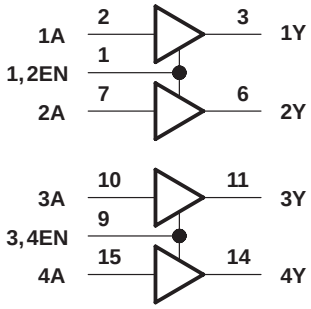
The SN754410 is designed for operation from −40°C to 85°C.

logic symbol†

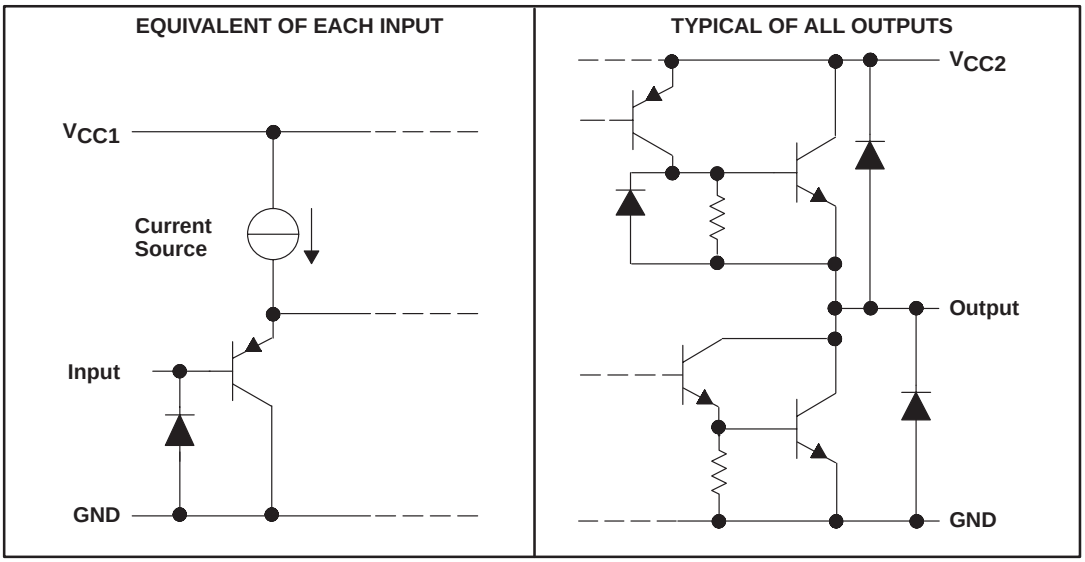


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram



schematics of inputs and outputs



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

Output supply voltage range, V_{CC1} (see Note 1) . . . . . −0.5 V to 36 V
Output supply voltage range, V_{CC2} . . . . . −0.5 V to 36 V
Input voltage, V_I . . . . . 36 V
Output voltage range, V_O . . . . . −3 V to V_{CC2} + 3 V
Peak output current (nonrepetitive, $t_w \leq 5$ ms) . . . . . ±2 A
Continuous output current, I_O . . . . . ±1.1 A
Continuous total power dissipation at (or below) 25°C free-air temperature (see Note 2) . . . . . 2075 mW
Operating free-air temperature range, T_A . . . . . −40°C to 85°C
Operating virtual junction temperature range, T_J . . . . . −40°C to 150°C
Storage temperature range, T_{stg} . . . . . −65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°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. All voltage values are with respect to network GND.
2. For operation above 25°C free-air temperature, derate linearly at the rate of 16.6 mW/°C. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. Due to variations in individual device electrical characteristics and thermal resistance, the built-in thermal overload protection can be activated at power levels slightly above or below the rated dissipation.

recommended operating conditions

	MIN	MAX	UNIT
Output supply voltage, V_{CC1}	4.5	5.5	V
Output supply voltage, V_{CC2}	4.5	36	V
High-level input voltage, V_{IH}	2	5.5	V
Low-level input voltage, V_{IL}	−0.3‡	0.8	V
Operating virtual junction temperature, T_J	−40	125	°C
Operating free-air temperature, T_A	−40	85	°C

‡ The algebraic convention, in which the least positive (most negative) limit is designated as minimum, is used in this data sheet for logic voltage levels.

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}	Input clamp voltage	I_I = −12 mA			−0.9	−1.5	V
V_{OH}	High-level output voltage	I_{OH} = −0.5 A		V_{CC2}−1.5	V_{CC2}−1.1		V
		I_{OH} = −1 A		V_{CC2}−2			
		I_{OH} = −1 A,	T_J = 25°C	V_{CC2}−1.8	V_{CC2}−1.4		
V_{OL}	Low-level output voltage	I_{OL} = 0.5 A			1	1.4	V
		I_{OL} = 1 A				2	
		I_{OL} = 1 A,	T_J = 25°C		1.2	1.8	
V_{OKH}	High-level output clamp voltage	I_{OK} = −0.5 A			V_{CC2}+1.4	V_{CC2}+2	V
		I_{OK} = 1 A			V_{CC2}+1.9	V_{CC2}+2.5	
V_{OKL}	Low-level output clamp voltage	I_{OK} = 0.5 A			−1.1	−2	V
		I_{OK} = −1 A			−1.3	−2.5	
$I_{OZ(off)}$	Off-state high-impedance-state output current	V_O = V_{CC2}				500	µA
		V_O = 0				−500	
I_{IH}	High-level input current	V_I = 5.5 V				10	µA
I_{IL}	Low-level input current	V_I = 0				−10	µA
I_{CC1}	Output supply current	I_O = 0	All outputs at high level			38	mA
			All outputs at low level			70	
			All outputs at high impedance			25	
I_{CC2}	Output supply current	I_O = 0	All outputs at high level			33	mA
			All outputs at low level			20	
			All outputs at high impedance			5	

† All typical values are at V_{CC1} = 5 V, V_{CC2} = 24 V, T_A = 25°C.

switching characteristics, V_{CC1} = 5 V, V_{CC2} = 24 V, C_L = 30 pF, T_A = 25°C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{d1}	Delay time, high-to-low-level output from A input	See Figure 1		400		ns
t_{d2}	Delay time, low-to-high-level output from A input			800		ns
t_{TLH}	Transition time, low-to-high-level output			300		ns
t_{THL}	Transition time, high-to-low-level output			300		ns
t_r	Rise time, pulse input					
t_f	Fall time, pulse input					
t_w	Pulse duration					
t_{en1}	Enable time to the high level	See Figure 2		700		ns
t_{en2}	Enable time to the low level			400		ns
t_{dis1}	Disable time from the high level			900		ns
t_{dis2}	Disable time from the low level			600		ns

PARAMETER MEASUREMENT INFORMATION

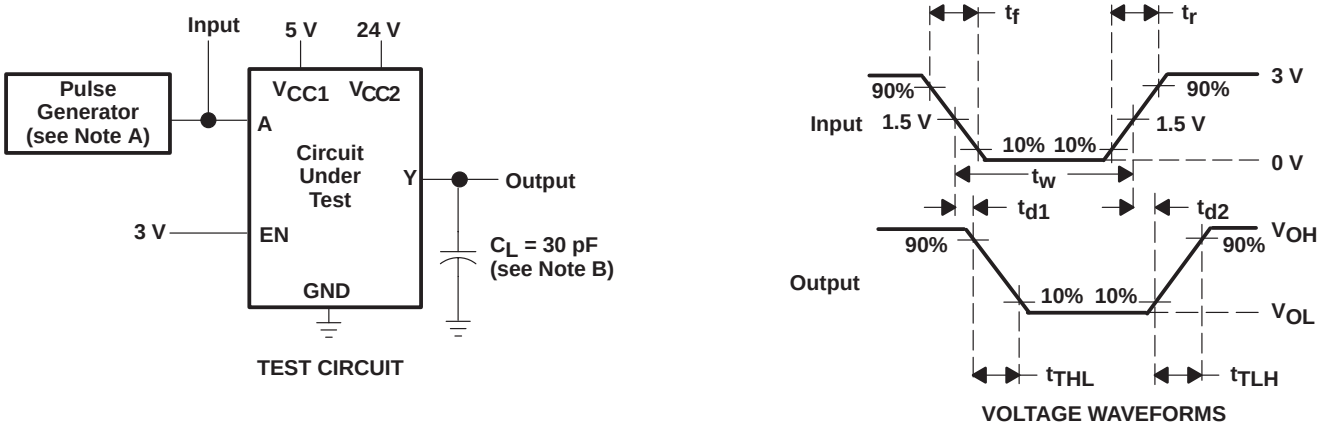


Figure 1. Test Circuit and Switching Times From Data Inputs

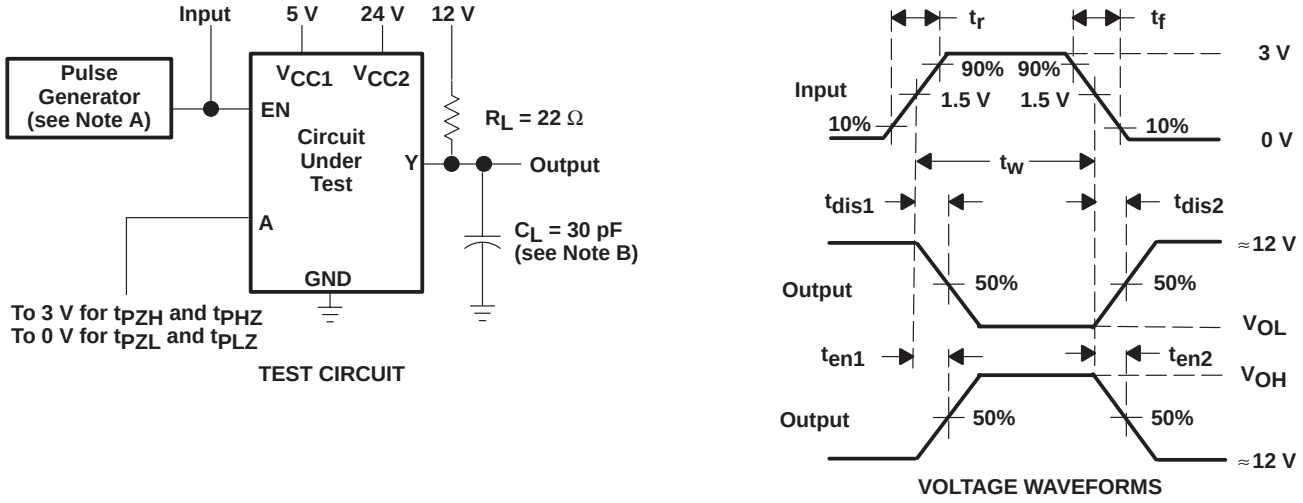


Figure 2. Test Circuit and Switching Times From Enable Inputs

NOTES: A. The pulse generator has the following characteristics: $t_r \leq 10$ ns, $t_f \leq 10$ ns, $t_w = 10$ µs, PRR = 5 kHz, $Z_O = 50$ Ω.
B. C_L includes probe and jig capacitance.

APPLICATION INFORMATION

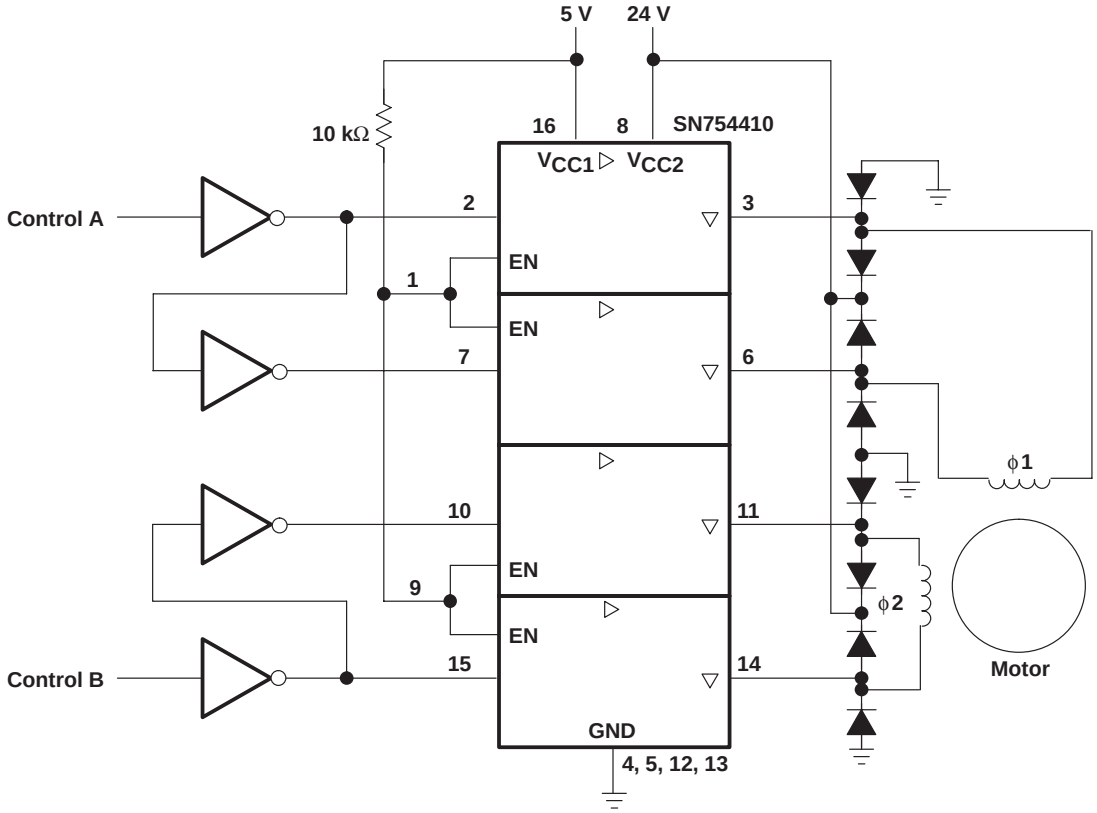


Figure 3. Two-Phase Motor Driver

TEXAS INSTRUMENTS
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265
POST OFFICE BOX 1443 • HOUSTON, TEXAS 77251−1443

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
SN754410NE	ACTIVE	PDIP	NE	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN754410NE	Samples
SN754410NEE4	ACTIVE	PDIP	NE	16	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN754410NE	Samples

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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.

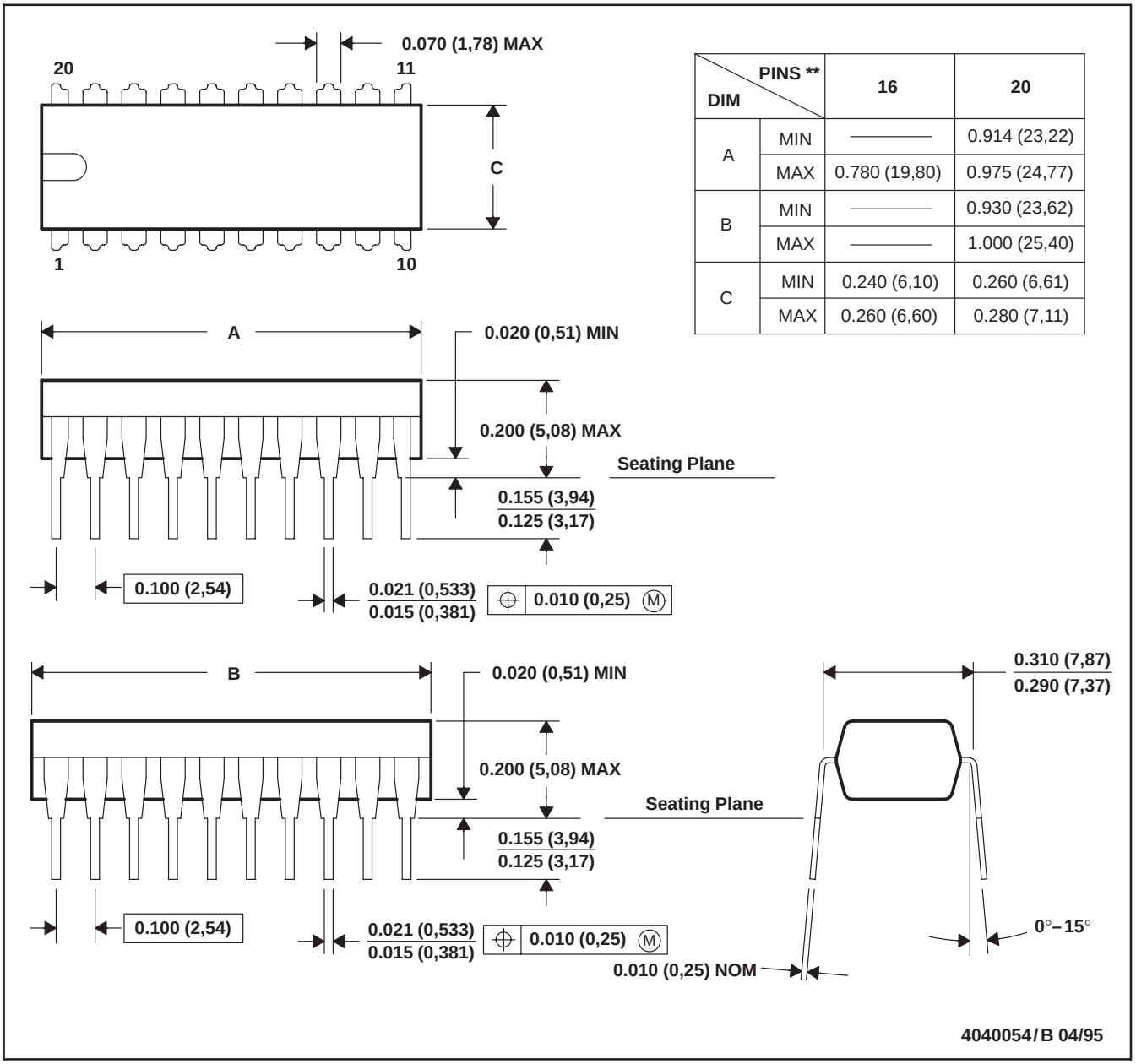
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

MPDI003 – OCTOBER 1994

NE (R-PDIP-T)** **PLASTIC DUAL-IN-LINE PACKAGE**

20 PIN SHOWN



DIM \ PINS **		16	20
A	MIN	———	0.914 (23,22)
	MAX	0.780 (19,80)	0.975 (24,77)
B	MIN	———	0.930 (23,62)
	MAX	———	1.000 (25,40)
C	MIN	0.240 (6,10)	0.260 (6,61)
	MAX	0.260 (6,60)	0.280 (7,11)

NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS-001 (16 pin only)

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