

# Signetics

# 74ALS139 Decoder/Demultiplexer

## ALS Products

## Dual 1-Of-4 Decoder//Demultiplexer

### FEATURES

- Demultiplexing capability
- Two independent 1-of-4 decoders
- Multifunction capability

### Preliminary Specification

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74ALS139	9ns	8mA

### DESCRIPTION

The 74ALS139 is a dual 1-of-4 decoder/demultiplexer. This device has two independent decoders, each accepting two binary weighted inputs ( $A_{0n}, A_{1n}$ ) and providing four mutually exclusive active-Low outputs ( $\bar{Q}_{0n} - \bar{Q}_{3n}$ ). Each decoder has an active-Low Enable ( $\bar{E}$ ). When  $\bar{E}$  is High, every output is forced High. The Enable can be used as the Data input for a 1-of-4 demultiplexer application.

### ORDERING INFORMATION

PACKAGES	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ ; $T_A = 0^\circ C$ to $+70^\circ C$
16-Pin Plastic DIP	N74ALS139N
16-Pin Plastic SO	N74ALS139D

### FUNCTION TABLE

INPUTS			OUTPUTS			
$\bar{E}$	$A_0$	$A_1$	$\bar{Q}_0$	$\bar{Q}_1$	$\bar{Q}_2$	$\bar{Q}_3$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	L	H	H	H	L	H
L	H	H	H	H	H	L

H = High voltage level  
L = Low voltage level  
X = Don't care

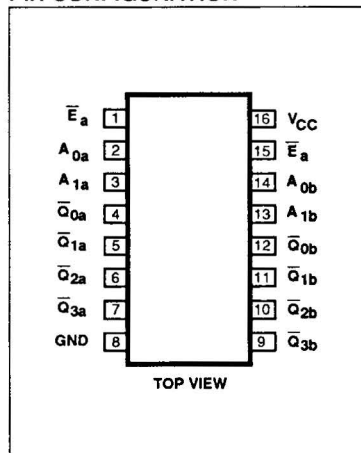
### INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74ALS(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
$A_{0n}, A_{1n}$	Address inputs	1.0/1.0	20 $\mu$ A/0.1mA
$\bar{E}_a, \bar{E}_b$	Enable inputs (active Low)	1.0/1.0	20 $\mu$ A/0.1mA
$\bar{Q}_{0n} - \bar{Q}_{3n}$	Data outputs (active Low)	20/80	0.4mA/8mA

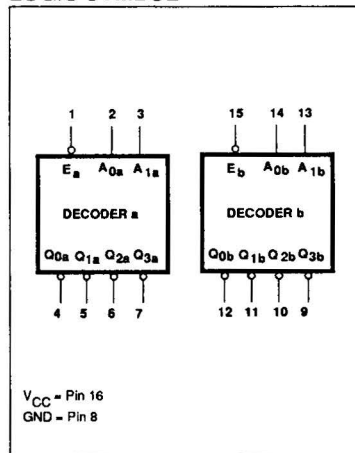
#### NOTE:

One (1.0) ALS Unit Load is defined as: 20 $\mu$ A in the High state and 0.1mA in the Low state.

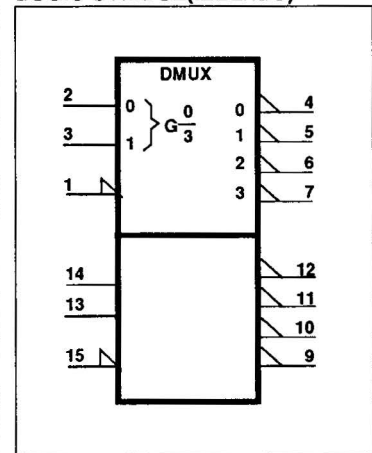
### PIN CONFIGURATION



### LOGIC SYMBOL



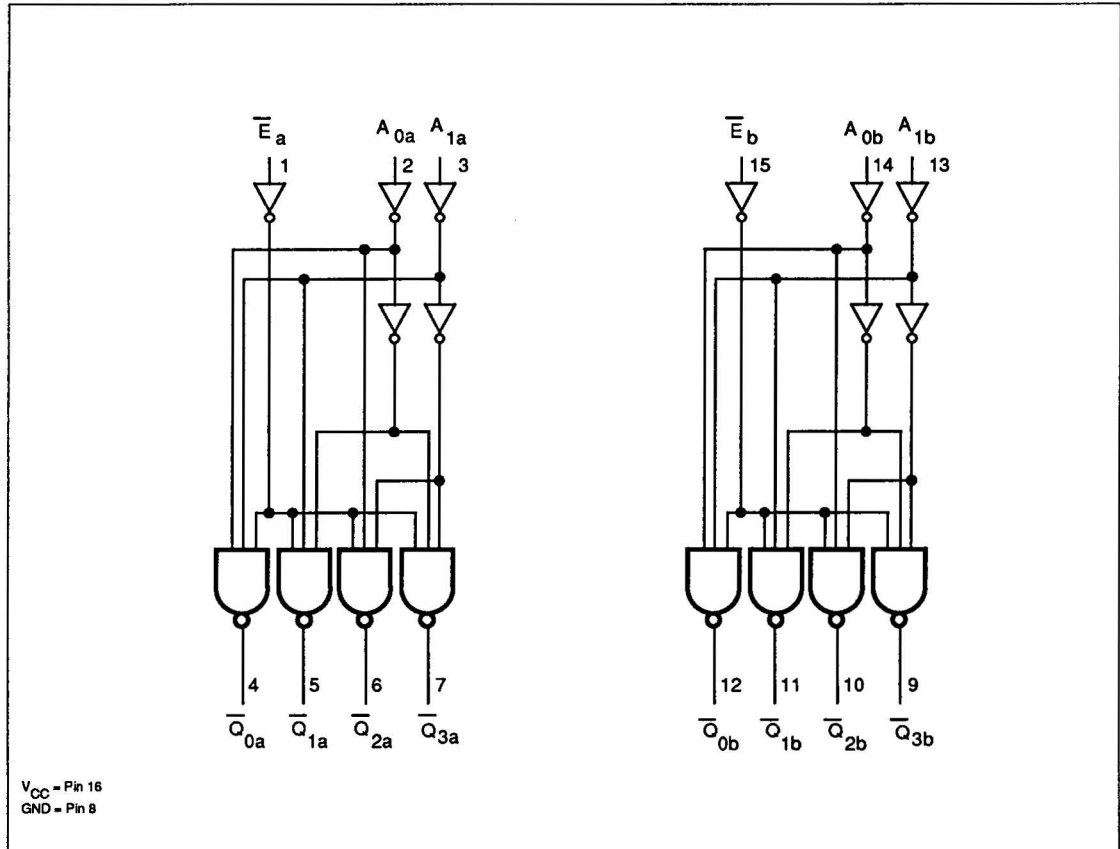
### LOGIC SYMBOL (IEEE/IEC)



Decoder/Demultiplexer

74ALS139

LOGIC DIAGRAM



**ABSOLUTE MAXIMUM RATINGS** (Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
$V_{CC}$	Supply voltage	-0.5 to +7.0	V
$V_{IN}$	Input voltage	-0.5 to +7.0	V
$I_{IN}$	Input current	-30 to +5	mA
$V_{OUT}$	Voltage applied to output in High output state	-0.5 to $V_{CC}$	V
$I_{OUT}$	Current applied to output in Low output state	16	mA
$T_A$	Operating free-air temperature range	0 to +70	°C
$T_{STG}$	Storage temperature	-65 to +150	°C

## Decoder/Demultiplexer

74ALS139

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS			UNIT
		Min	Nom	Max	
$V_{CC}$	Supply voltage	4.5	5.0	5.5	V
$V_{IH}$	High-level input voltage	2.0			V
$V_{IL}$	Low-level input voltage			0.8	V
$I_{IK}$	Input clamp current			-18	mA
$I_{OH}$	High-level output current			-0.4	mA
$I_{OL}$	Low-level output current			8	mA
$T_A$	Operating free-air temperature range	0		70	°C

## DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS <sup>1</sup>	LIMITS			UNIT
			Min	Typ <sup>2</sup>	Max	
$V_{OH}$	High-level output voltage	$V_{CC} \pm 10\%$ , $V_{IL} = \text{MAX}$ , $V_{IH} = \text{MIN}$ , $I_{OH} = -0.4\text{mA}$	$V_{CC} - 2$			V
$V_{OL}$	Low-level output voltage	$V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$ , $V_{IH} = \text{MIN}$	$I_{OL} = 4\text{mA}$	0.25	0.4	V
			$I_{OL} = 8\text{mA}$	0.35	0.5	V
$V_{IK}$	Input clamp voltage	$V_{CC} = \text{MIN}$ , $I_I = I_{IK}$		-0.73	-1.5	V
$I_I$	Input current at maximum input voltage	$V_{CC} = \text{MAX}$ , $V_I = 7.0\text{V}$			0.1	mA
$I_{IH}$	High-level input current	$V_{CC} = \text{MAX}$ , $V_I = 2.7\text{V}$			20	$\mu\text{A}$
$I_{IL}$	Low-level input current	$V_{CC} = \text{MAX}$ , $V_I = 0.4\text{V}$			-0.1	mA
$I_O^3$	Output current	$V_{CC} = \text{MAX}$ , $V_O = 2.25\text{V}$	-30		-112	mA
$I_{CC}$	Supply current (total)	$V_{CC} = \text{MAX}$		8	13	mA

## NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at  $V_{CC} = 5\text{V}$ ,  $T_A = 25^\circ\text{C}$ .
- The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OC}$ .

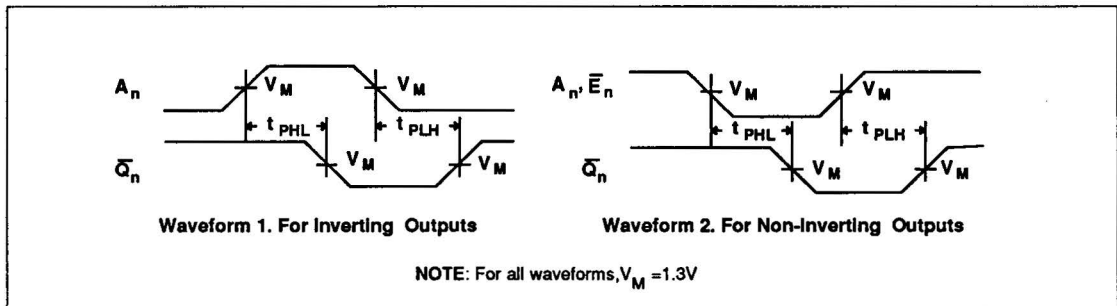
Decoder/Demultiplexer

74ALS139

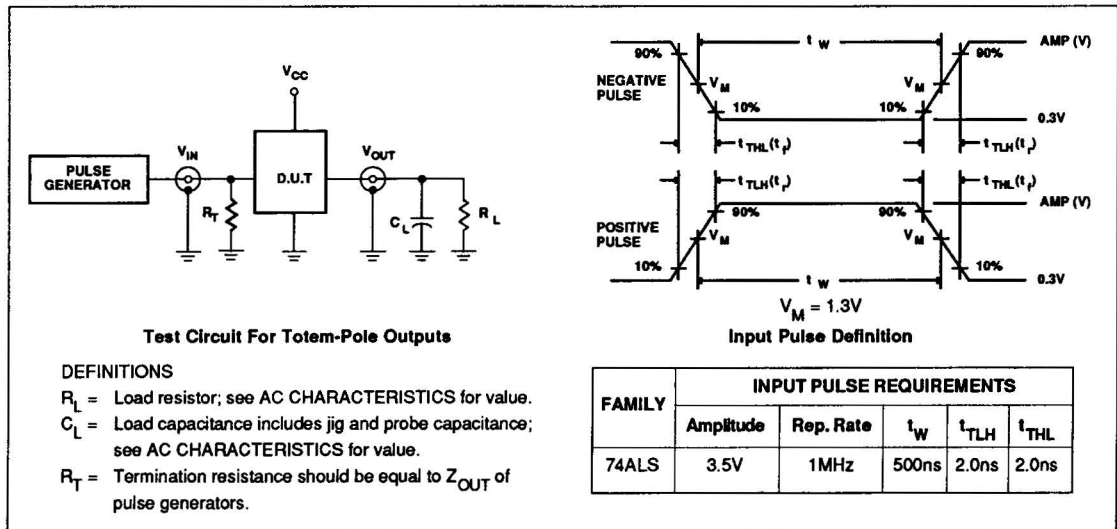
AC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITION	LIMITS		UNIT
			$T_A = 0^\circ\text{C to } +70^\circ\text{C}$		
			$V_{CC} = 5V \pm 10\%$ $C_L = 50\text{pF}$ $R_L = 500\Omega$		
			Min	Max	
$t_{PLH}$ $t_{PHL}$	Propagation delay $A_n$ to $\bar{Q}_n$	Waveform 1, 2	3	14	ns
$t_{PLH}$ $t_{PHL}$	Propagation delay $\bar{E}_n$ to $\bar{Q}_n$	Waveform 2	3	15	ns

AC WAVEFORMS



TEST CIRCUIT AND WAVEFORMS



**Signetics**

**Package Outlines**

T-90-20

**ALS Products**

**PACKAGE OUTLINES FOR PLASTIC PACKAGES**

The following information applies to all plastic packages unless otherwise specified on individual package outline drawings.

1. Dimensions are shown in Metric units (Millimeters) and English units (Inches).
2. Lead material: Copper Alloy, solder (63%Sn/37%Pb) dipped.
3. Body material: Plastic (Epoxy)
4. Thermal resistance values are determined by temperature sensitive parameter (TSP) method. This method uses the forward voltage drop of a calibrated diode to measure the change in junction temperature due to a known power application. The substrate diode of a Bipolar technology device is generally the diode used in these tests. Die size and test environment have significant effects on thermal resistance values.

PLASTIC PACKAGES OUTLINES								
Package Type	Number of Leads	Package Feature	Package Ordering Code	Package Outline Code	Thermal Resistance $\theta_{JA}/\theta_{JC}$ ( $^{\circ}C/W$ )	Die Size (square mils)	Test Conditions	
							Test Ambient	Test Fixture
SO <sup>1</sup> (Copper Leadframe)	14-pin (SO-14)	3.9mm (0.15") Body width	D	DH1	124/37	2,500	Still air at room temperature	Device soldered to Philips glass epoxy test board (1.12" x 0.75" x 0.059") with 0.008 - 0.009" stand-off. Accuracy: ± 15%
	16-pin (SOL-16)		D	DJ1	113/36			
	20-pin (SOL-20)	7.5mm (0.30") Body width	D	DL2	90/28	5,000		Device soldered to Philips glass epoxy test board (1.58" x 0.75" x 0.059") with 0.008 - 0.009" stand-off. Accuracy: ± 15%
	24-pin (SOL-24)		D	DN2	76/26			
DIP <sup>2</sup> (Copper Leadframe)	14-pin (DIP-14)	0.300" Lead row centers	N	NH1	89/44	2,500	Still air at room temperature	Device in Textool ZIF socket with 0.040", stand-off. Accuracy: ± 15%
	16-pin (DIP-16)		N	NJ1	86/43			
	20-pin (DIP-20)		N	NL1	74/32	5,000		Device in Textool ZIF socket with 0.040", stand-off. Accuracy: ± 15%
	24-pin SLIM DIP (DIP-24)		N	NN1	65/36			

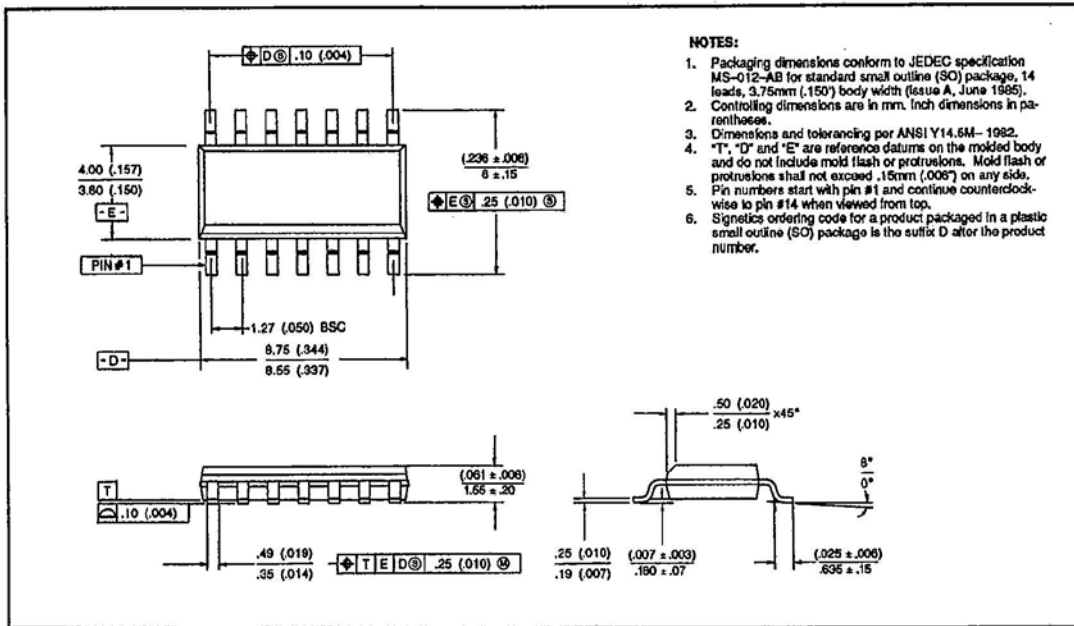
**NOTES:**  
 1. SO = Small Outline  
 2. DIP = Dual-In-Line Package

Package Outlines

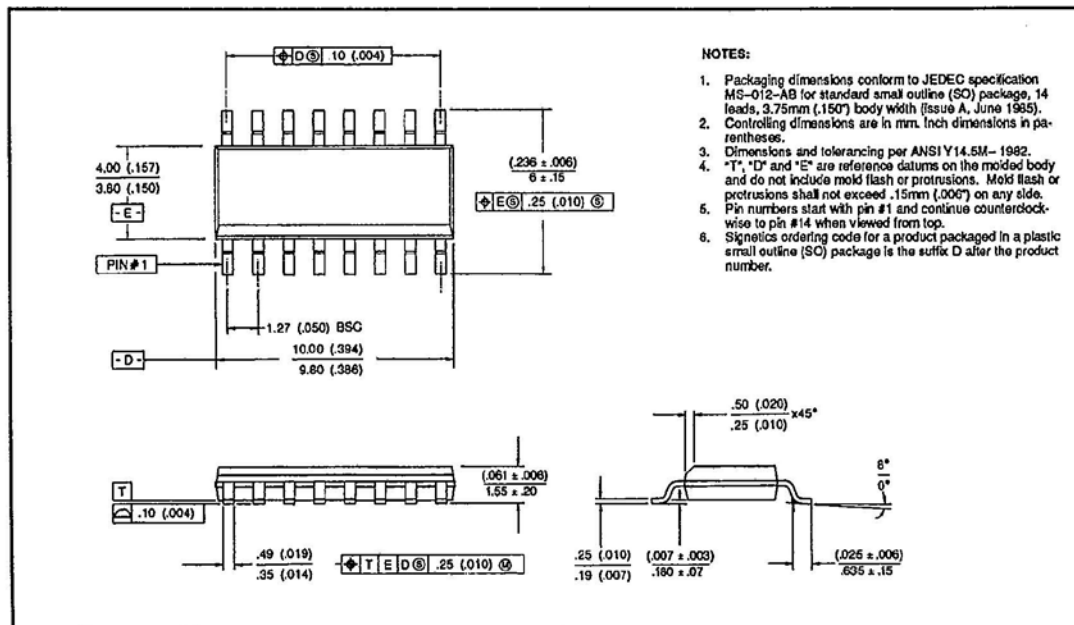
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14-PIN PLASTIC SO



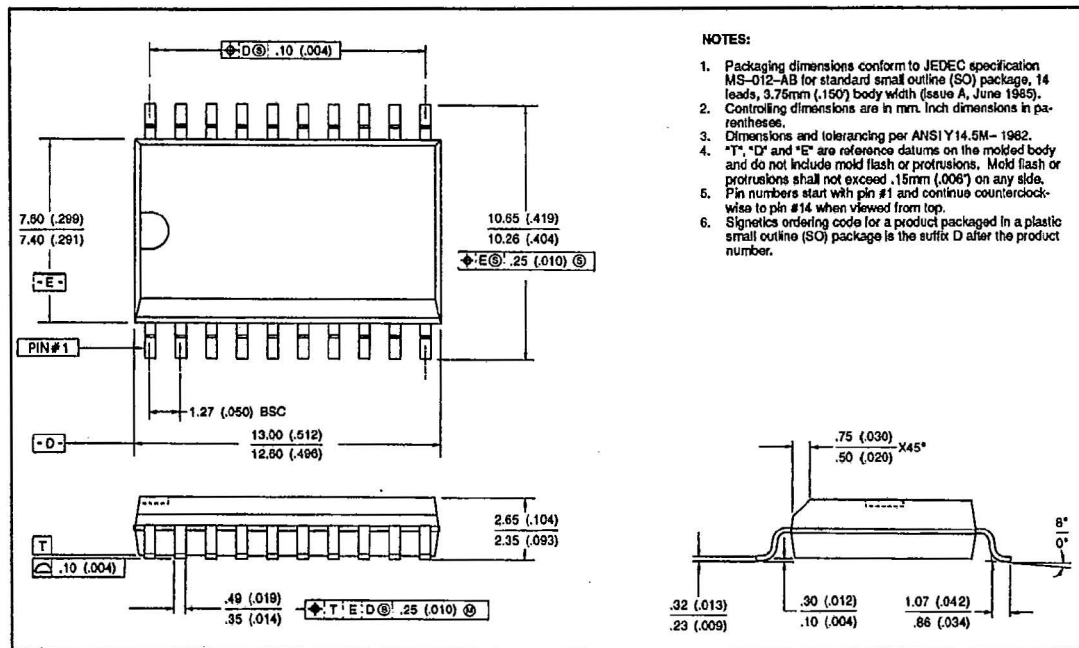
16-PIN PLASTIC SO



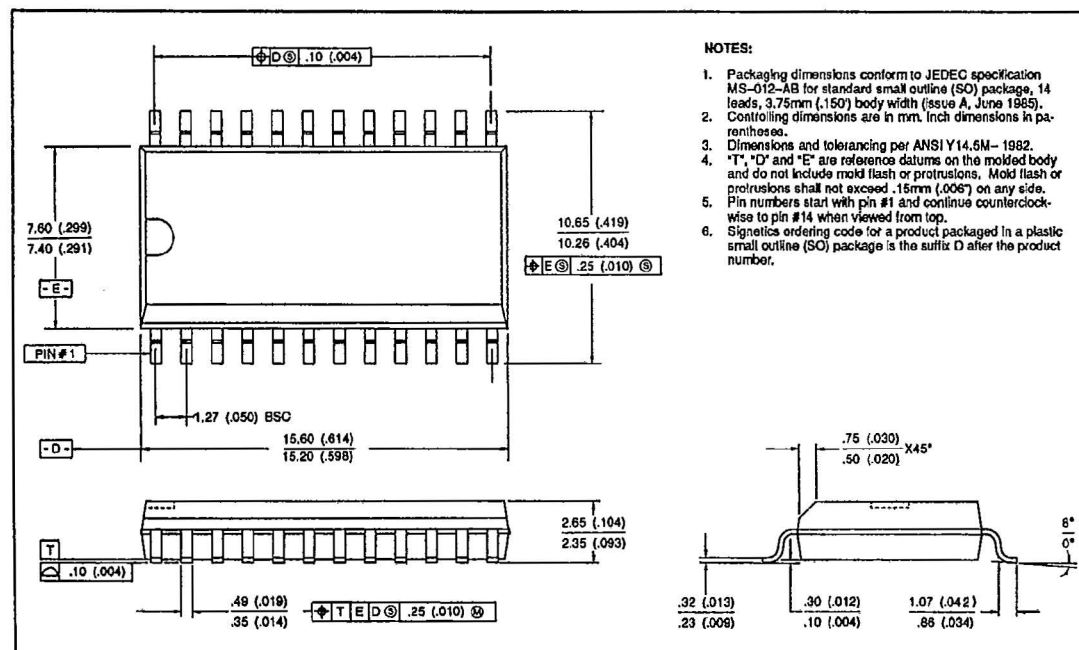
Package Outlines NAPC/ SIGNETICS

T-90-20

20-PIN PLASTIC SOL



24-PIN PLASTIC SOL

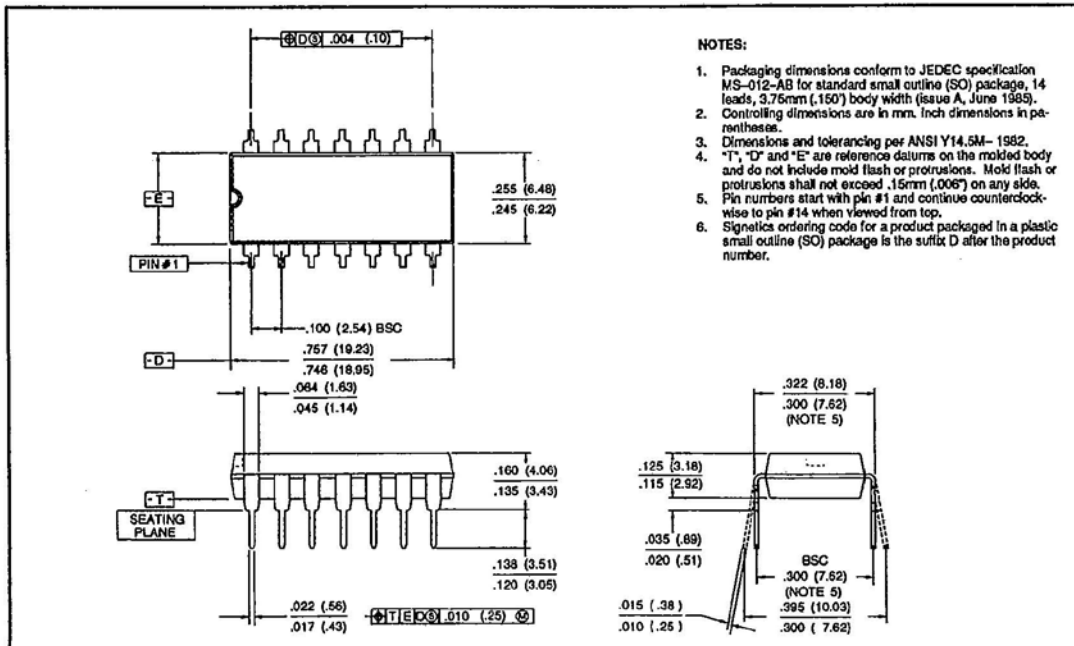


Package Outlines

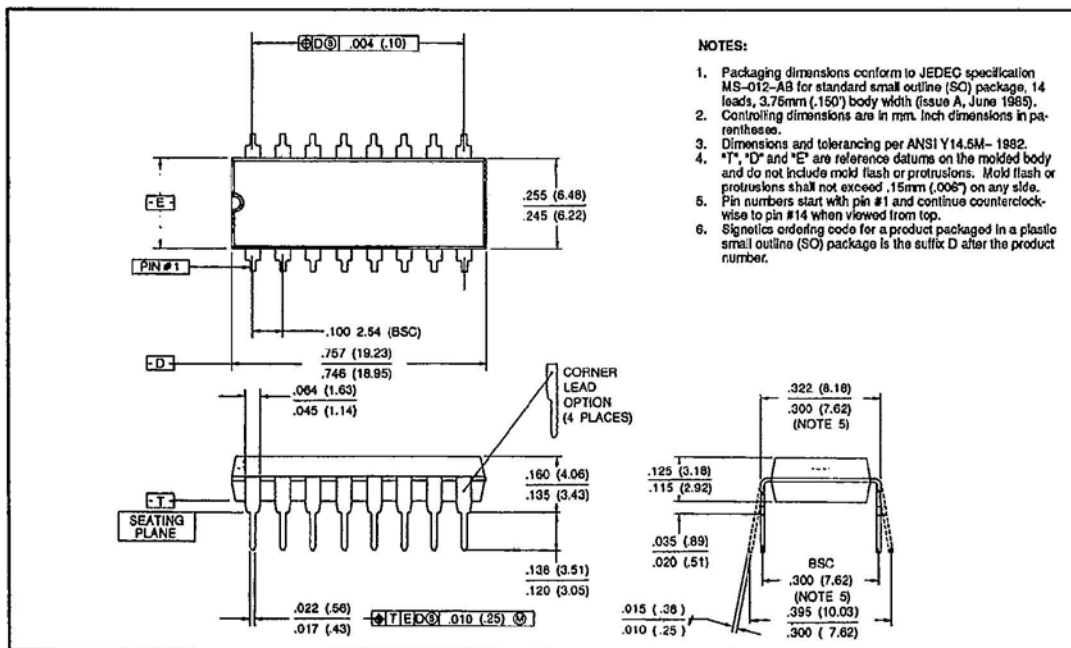
NAPC/ SIGNETICS

T-90-20

14-PIN PLASTIC DIP



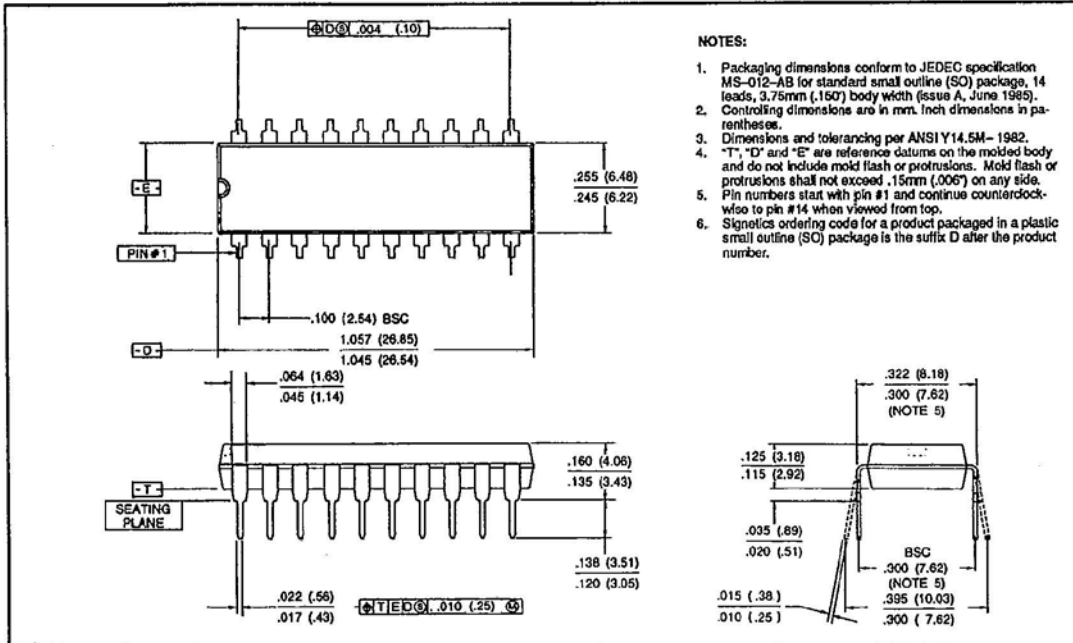
16-PIN PLASTIC DIP



Package Outlines

T-90-20

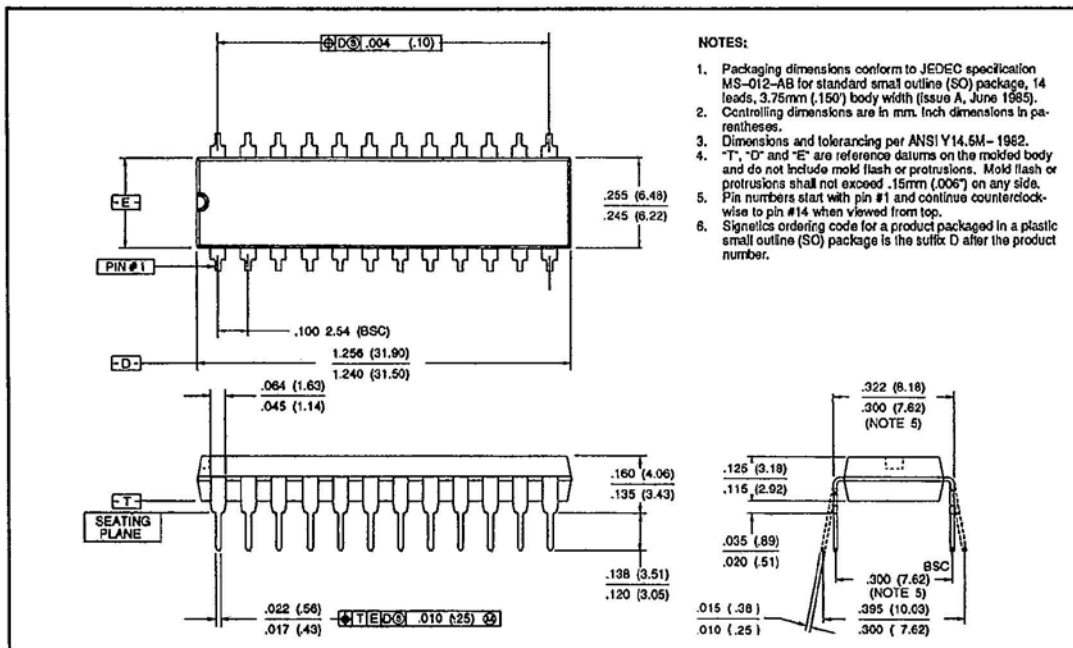
20-PIN PLASTIC PDIP



NOTES:

1. Packaging dimensions conform to JEDEC specification MS-012-AB for standard small outline (SO) package, 14 leads, 3.75mm (.150") body width (issue A, June 1985).
2. Controlling dimensions are in mm. Inch dimensions in parentheses.
3. Dimensions and tolerancing per ANSI Y14.5M-1982.
4. "T", "D" and "E" are reference datums on the molded body and do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .15mm (.006") on any side.
5. Pin numbers start with pin #1 and continue counterclockwise to pin #14 when viewed from top.
6. Signetics ordering code for a product packaged in a plastic small outline (SO) package is the suffix D after the product number.

24-PIN PLASTIC PDIP



NOTES:

1. Packaging dimensions conform to JEDEC specification MS-012-AB for standard small outline (SO) package, 14 leads, 3.75mm (.150") body width (issue A, June 1985).
2. Controlling dimensions are in mm. Inch dimensions in parentheses.
3. Dimensions and tolerancing per ANSI Y14.5M-1982.
4. "T", "D" and "E" are reference datums on the molded body and do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .15mm (.006") on any side.
5. Pin numbers start with pin #1 and continue counterclockwise to pin #14 when viewed from top.
6. Signetics ordering code for a product packaged in a plastic small outline (SO) package is the suffix D after the product number.