

# 100325

## Low Power Hex ECL-to-TTL Translator

### General Description

The 100325 is a hex translator for converting F100K logic levels to TTL logic levels. Differential inputs allow each circuit to be used as an inverting, non-inverting or differential receiver. An internal reference voltage generator provides  $V_{BB}$  for single-ended operation, or for use in Schmitt trigger applications. All inputs have  $50k\Omega$  pull-down resistors. When the inputs are either unconnected or at the same potential the outputs will go LOW.

When used in single-ended operation the apparent input threshold of the true inputs is 20mV to 40mV higher (positive) than the threshold of the complementary inputs. The  $V_{EE}$  and  $V_{TTL}$  power may be applied in either order.

### Features

- Pin/function compatible with 100125
- Meets 100125 AC specifications
- 50% power reduction of the 100125
- Differential inputs with built in offset
- Standard FAST® outputs
- 2000V ESD protection
- -4.2V to -5.7V operating range
- Available to industrial grade temperature range

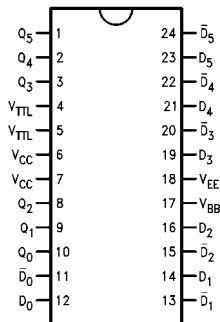
### Ordering Code:

Order Number	Package Number	Package Description
100325SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
100325PC	N24E	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.400 Wide
100325QI	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square
100325QC	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square Industrial Temperature Range (-40°C to +85°C)

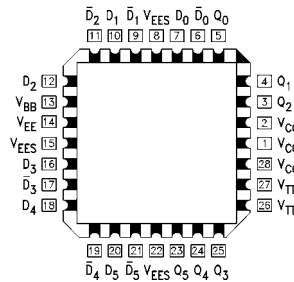
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Connection Diagrams

24-Pin DIP/SOIC



28-Pin PLCC



### Pin Descriptions

Pin Names	Description
$D_0$ - $D_5$	Data Inputs
$\bar{D}_0$ - $\bar{D}_5$	Inverting Data Inputs
$Q_0$ - $Q_5$	Data Outputs

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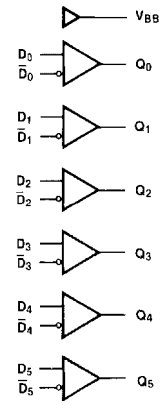
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**Truth Table**

Inputs		Outputs
$D_n$	$\bar{D}_n$	$Q_n$
L	H	L
H	L	H
L	L	L
H	H	L
OPEN	OPEN	L
$V_{EE}$	$V_{EE}$	L
L	$V_{BB}$	L
H	$V_{BB}$	H
$V_{BB}$	L	H
$V_{BB}$	H	L

H = HIGH Voltage Level  
L = LOW Voltage Level

**Logic Diagram**



Absolute Maximum Ratings <sup>(Note 1)</sup>				Recommended Operating Conditions					
Storage Temperature ( $T_{STG}$ )	-65°C to +150°C			Case Temperature ( $T_C$ )	Commercial 0°C to +85°C				
Maximum Junction Temperature ( $T_J$ )	+150°C			Industrial	-40°C to +85°C				
$V_{EE}$ Pin Potential to Ground Pin	-7.0V to +0.5V			Supply Voltage ( $V_{EE}$ )	-5.7V to -4.2V				
$V_{TTL}$ Pin Potential to Ground Pin	-0.5V to +6.0V								
Input Voltage (DC)	$V_{EE}$ to +0.5V								
Voltage Applied to Output									
in HIGH State (with $V_{CC} = 0V$ )	-0.5V to $V_{CC}$								
Current Applied to Output									
in LOW State (Max)	twice the rated $I_{OL}$ (mA)								
ESD (Note 2)	≥2000V								
<p><b>Note 1:</b> The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum rating. The "Recommended Operating Conditions" table will define the conditions for actual device operation.</p> <p><b>Note 2:</b> ESD testing conforms to MIL-STD-883, Method 3015.</p>									
<b>Commercial Version</b>									
<b>DC Electrical Characteristics</b>									
$V_{EE} = -4.2V$ to $-5.7V$ , $V_{CC} = GND$ , $V_{TTL} = +4.5V$ to $5.5V$ , $T_C = 0°C$ to $+85°C$ (Note 3)									
Symbol	Parameter	Min	Typ	Max	Units	Conditions			
$V_{BB}$	Output Reference Voltage	-1380	-1320	-1260	mV	$I_{VBB} = -2.1$ mA			
$V_{IH}$	Single-Ended Input HIGH Voltage	-1165		-870	mV	Guaranteed HIGH Signal for All Inputs (with One Input Tied to $V_{BB}$ )			
$V_{IL}$	Single-Ended Input LOW Voltage	-1830		-1475	mV	Guaranteed LOW Signal for All Inputs (with One Input Tied to $V_{BB}$ )			
$V_{OH}$	Output HIGH Voltage	2.5			V	$I_{OH} = -2.0$ mA	$V_{IN} = V_{IH} (Max)$		
$V_{OL}$	Output LOW Voltage			0.5	V	$I_{OL} = 20$ mA	or $V_{IL} (Min)$		
$V_{DIFF}$	Input Voltage Differential	150			mV	Required for Full Output Swing			
$V_{CM}$	Common Mode Voltage	$V_{CC} - 2.0$		$V_{CC} - 0.5$	V				
$I_{IH}$	Input HIGH Current			350	μA	$V_{IN} = V_{IH} (Max)$ , $D_0-D_5 = V_{BB}$ , $\bar{D}_0-\bar{D}_5 = V_{IL} (Min)$			
$I_{IL}$	Input LOW Current	0.5			μA	$V_{IN} = V_{IL} (Min)$ , $D_0-D_5 = V_{BB}$			
$I_{OS}$	Output Short-Circuit Current	-150		-60	mA	$V_{OUT} = GND$ (Note 4)			
$I_{EE}$	$V_{EE}$ Power Supply Current	-37	-27	-17	mA	$D_0-D_5 = V_{BB}$			
$I_{TTL}$	$V_{TTL}$ Power Supply Current		45	65	mA	$D_0-D_5 = V_{BB}$			
<p><b>Note 3:</b> The specified limits represent the "worst case" value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guardbanding can be achieved by decreasing the allowable system operating ranges. Conditions for testing shown in the tables are chosen to guarantee operation under "worst case" conditions.</p> <p><b>Note 4:</b> Test one output at a time.</p>									
<b>DIP AC Electrical Characteristics</b>									
$V_{EE} = -4.2V$ to $-5.7V$ , $V_{CC} = GND$ , $V_{TTL} = +4.5V$ to $+5.5V$									
Symbol	Parameter	$T_C = 0°C$		$T_C = +25°C$		$T_C = +85°C$		Units	Conditions
		Min	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay							ns	$C_L = 15$ pF Figures 1, 2
$t_{PHL}$	Data to Output	0.80	3.50	0.90	3.70	1.00	4.00		
$t_{PLH}$	Propagation Delay							ns	$C_L = 50$ pF Figures 1, 3
$t_{PHL}$	Data to Output	1.60	4.30	1.70	4.50	1.80	4.80		

### Commercial Version (Continued) SOIC and PLCC AC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = GND$ ,  $V_{TTL} = +4.5V$  to  $+5.5V$

Symbol	Parameter	$T_C = 0^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		Units	Conditions
		Min	Max	Min	Max	Min	Max		
$t_{PLH}$ $t_{PHL}$	Propagation Delay Data to Output	0.80	3.30	0.90	3.50	1.00	3.80	ns	$C_L = 15$ pF Figures 1, 2
$t_{PLH}$ $t_{PHL}$	Propagation Delay Data to Output	1.60	4.10	1.70	4.30	1.80	4.60	ns	$C_L = 50$ pF Figures 1, 3
$t_{OSHL}$	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		0.65		0.65		0.65	ns	PLCC Only (Note 5)
$t_{OSLH}$	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		0.65		0.65		0.65	ns	PLCC Only (Note 5)
$t_{OST}$	Maximum Skew Opposite Edge Output-to-Output Variation Data to Output Path		2.20		2.20		2.20	ns	PLCC Only (Note 5)
$t_{PS}$	Maximum Skew Pin (Signal) Transition Variation Data to Output Path		2.10		2.10		2.10	ns	PLCC Only (Note 5)

**Note 5:** Output-to-Output Skew is defined as the absolute value of the difference between the actual propagation delay for any outputs within the same packaged device. The specifications apply to any outputs switching in the same direction either HIGH-to-LOW ( $t_{OSHL}$ ), or LOW-to-HIGH ( $t_{OSLH}$ ), or in opposite directions both HL and LH ( $t_{OST}$ ). Parameters  $t_{OST}$  and  $t_{PS}$  guaranteed by design.

## Industrial Version

### PLCC DC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = GND$ ,  $T_C = -40^\circ C$  to  $+85^\circ C$  (Note 6)

Symbol	Parameter	$T_C = -40^\circ C$		$T_C = 0^\circ C$ to $+85^\circ C$		Units	Conditions
		Min	Max	Min	Max		
$V_{BB}$	Output Reference Voltage	-1395	-1255	-1380	-1260	mV	$I_{V_{BB}} = -2.1$ mA
$V_{IH}$	Single-Ended Input HIGH Voltage	-1170	-870	-1165	-870	mV	Guaranteed HIGH Signal for All Inputs (with One Input Tied to $V_{BB}$ )
$V_{IL}$	Single-Ended Input LOW Voltage	-1830	-1480	-1830	-1475	mV	Guaranteed LOW Signal for All Inputs (with One Input Tied to $V_{BB}$ )
$V_{OH}$	Output HIGH Voltage	2.5		2.5		V	$I_{OH} = -2.0$ mA
$V_{OL}$	Output LOW Voltage		0.5		0.5	V	$I_{OL} = 20$ mA
$V_{DIFF}$	Input Voltage Differential	150		150		mV	Required for Full Output Swing
$V_{CM}$	Common Mode Voltage	$V_{CC} - 2.0$	$V_{CC} - 0.5$	$V_{CC} - 2.0$	$V_{CC} - 0.5$	V	
$I_{IH}$	Input HIGH Current		450		350	$\mu A$	$V_{IN} = V_{IH} (Max)$ , $D_0-D_5 = V_{BB}$ , $\bar{D}_0-\bar{D}_5 = V_{IL} (Min)$
$I_{IL}$	Input LOW Current	0.5		0.5		$\mu A$	$V_{IN} = V_{IL} (Min)$ , $D_0-D_5 = V_{BB}$
$I_{OS}$	Output Short-Circuit Current	-150	-60	-150	-60	mA	$V_{OUT} = GND$ (Note 7)
$I_{EE}$	$V_{EE}$ Power Supply Current	-37	-15	-37	-17	mA	$D_0-D_5 = V_{BB}$
$I_{TTL}$	$V_{TTL}$ Power Supply Current		65		65	mA	$D_0-D_5 = V_{BB}$

**Note 6:** The specified limits represent the "worst case" value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guardbanding can be achieved by decreasing the allowable system operating ranges. Conditions for testing shown in the tables are chosen to guarantee operation under "worst case" conditions.

**Note 7:** Test one output at a time.

### PLCC AC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = GND$ ,  $V_{TTL} = +4.5V$  to  $+5.5V$

Symbol	Parameter	$T_C = -40^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		Units	Conditions
		Min	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay							ns	$C_L = 15$ pF
$t_{PHL}$	Data to Output	0.80	3.30	0.90	3.50	1.00	3.80		Figures 1, 2
$t_{PLH}$	Propagation Delay							ns	$C_L = 50$ pF
$t_{PHL}$	Data to Output	1.60	4.10	1.70	4.30	1.80	4.60		Figures 1, 3

### Switching Waveform

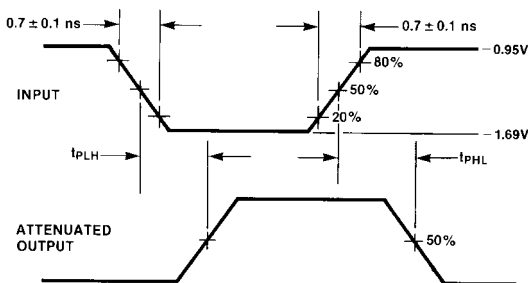
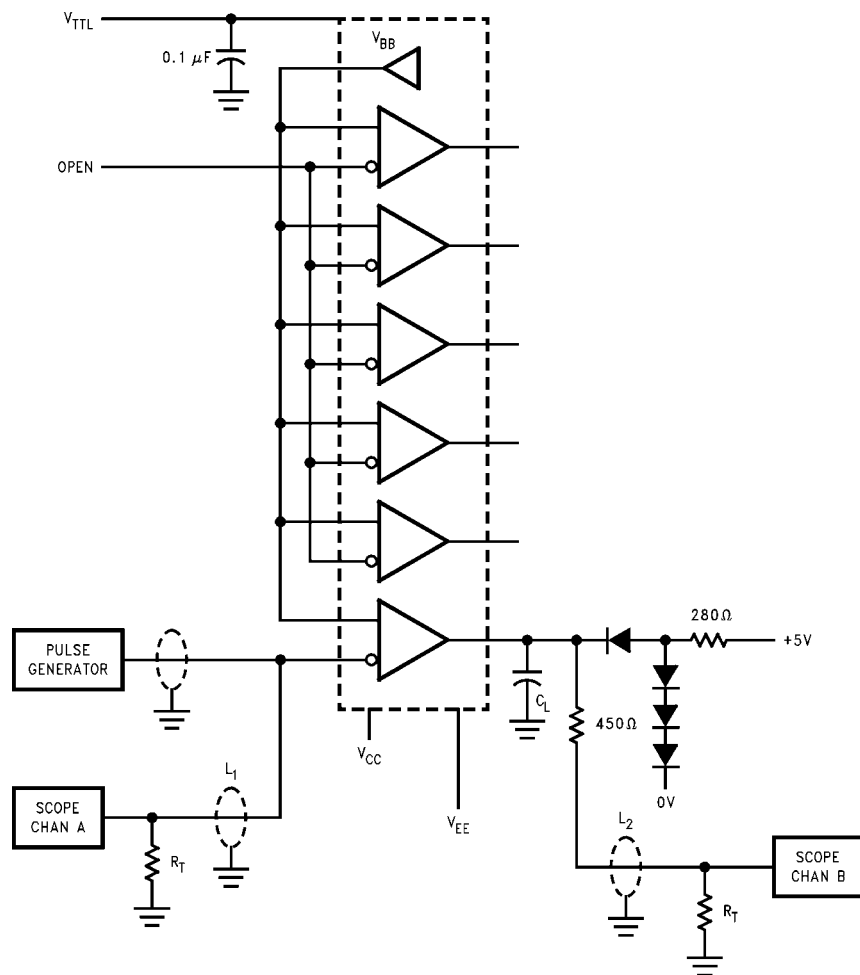


FIGURE 1. Propagation Delay

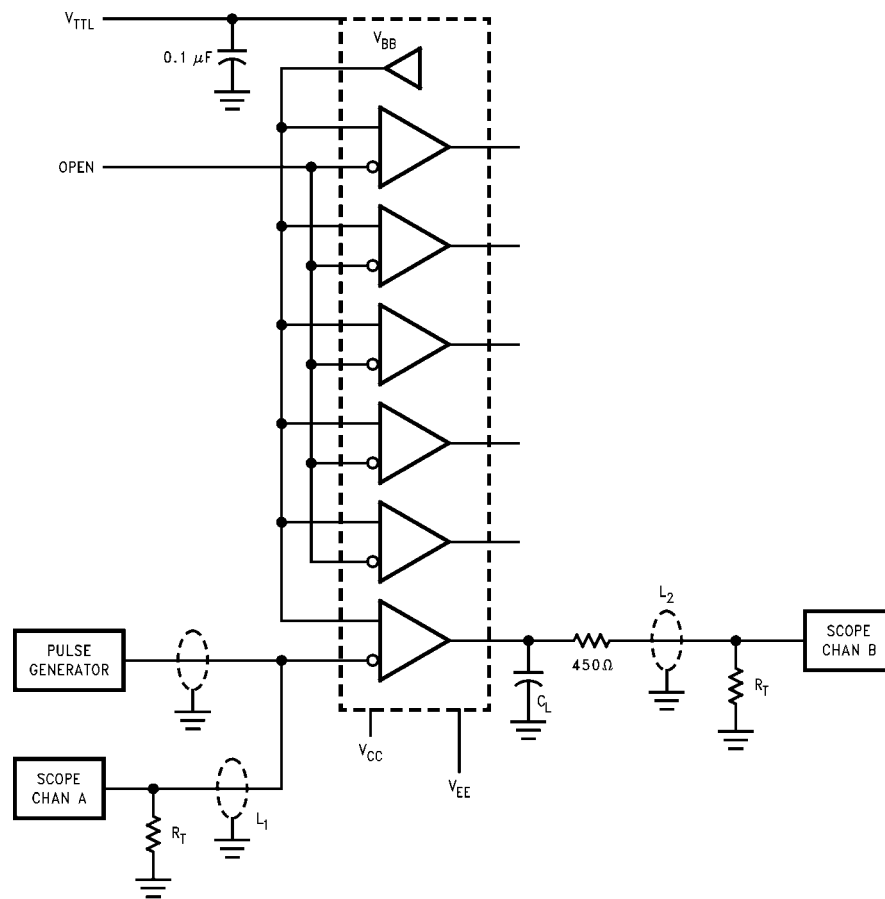
## Test Circuits

**Note:**

- $V_{CC} = 0V$ ,  $V_{EE} = -4.5V$ ,  $V_{TTL} = +5V$
- $L1$  and  $L2$  = equal length  $50\Omega$  impedance lines
- $R_T = 50\Omega$  terminator internal to scope
- Decoupling  $0.1 \mu F$  from GND to  $V_{CC}$ ,  $V_{EE}$  and  $V_{TTL}$
- All unused outputs are loaded with  $500\Omega$  to GND
- $C_L$  = Fixture and stray capacitance =  $15 \text{ pF}$

FIGURE 2. AC Test Circuit for 15 pF Loading

### Test Circuits (Continued)



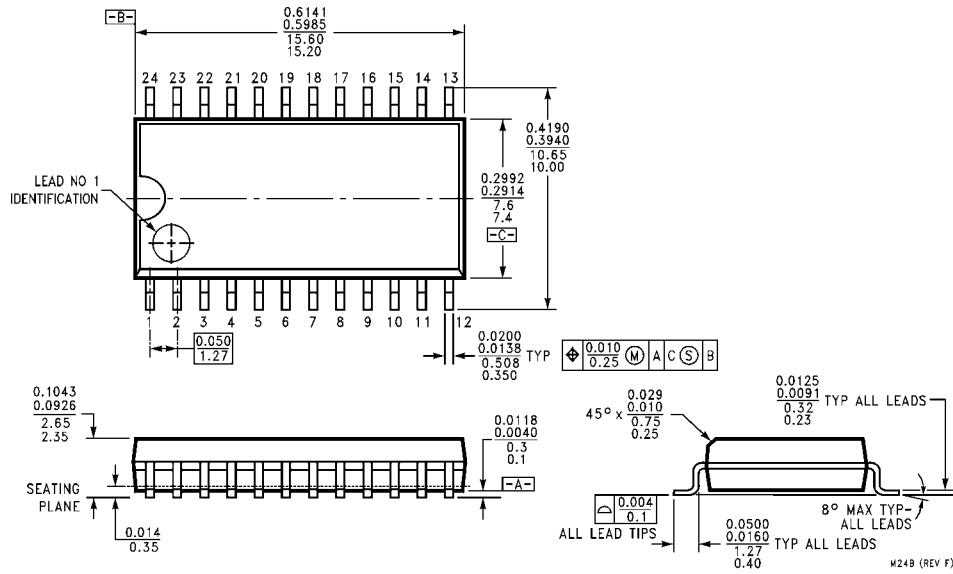
#### Note:

- $V_{CC} = 0V$ ,  $V_{EE} = -4.5V$ ,  $V_{TTL} = +5V$
- $L1$  and  $L2$  = equal length  $50\Omega$  impedance lines
- $R_T = 50\Omega$  terminator internal to scope
- Decoupling  $0.1 \mu F$  from GND to  $V_{CC}$ ,  $V_{EE}$  and  $V_{TTL}$
- All unused outputs are loaded with  $500\Omega$  to GND
- $C_L$  = Fixture and stray capacitance =  $50 pF$

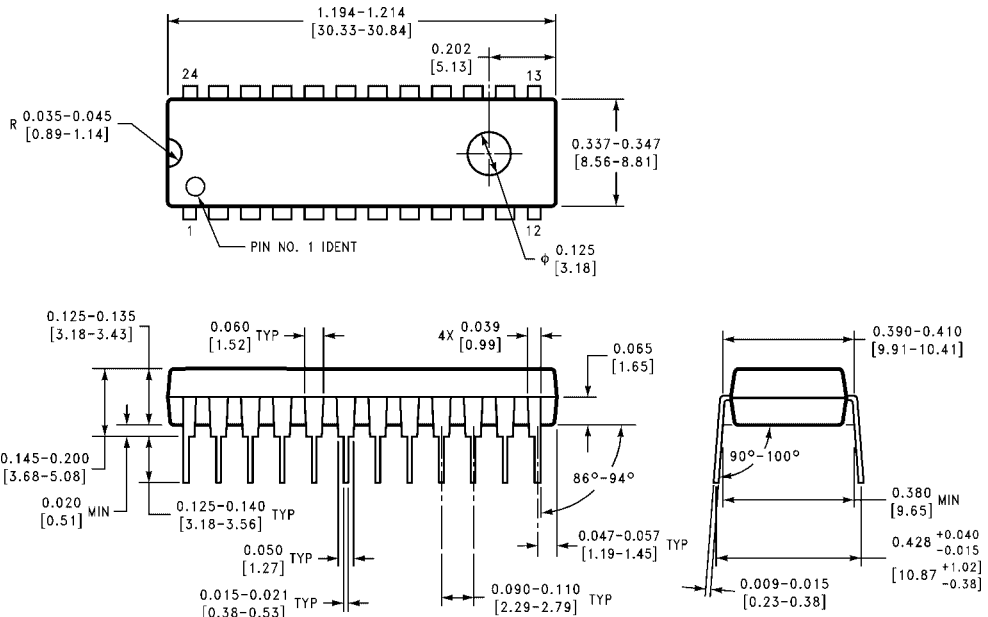
FIGURE 3. AC Test Circuit for 50 pF Loading

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**Physical Dimensions** inches (millimeters) unless otherwise noted



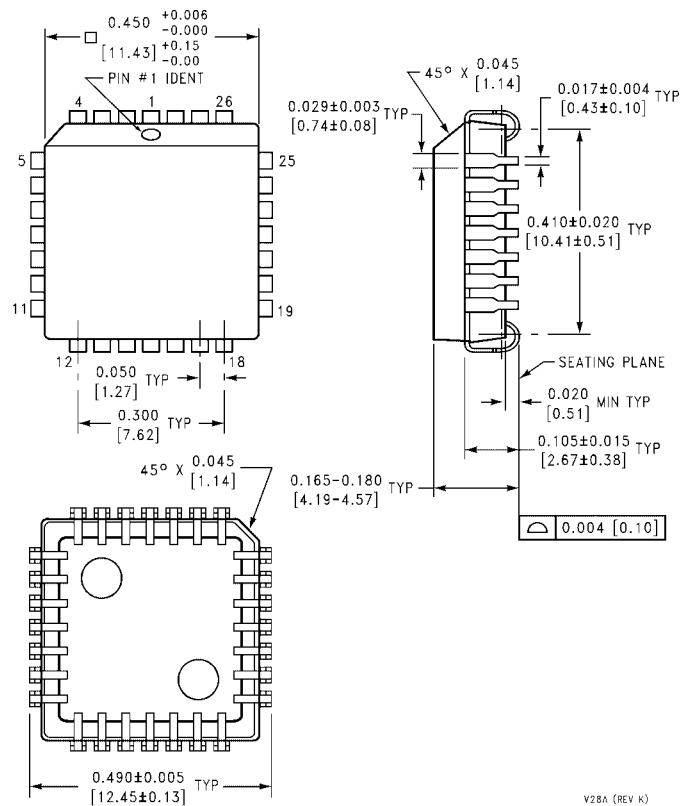
**24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide  
Package Number M24B**



**24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.400 Wide  
Package Number N24E**



**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square  
Package Number V28A**

V28A (REV K)

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