

# MC74AC652, MC74ACT652

## Octal Transceiver/Register with 3-State Outputs (Non-Inverting)

The MC74AC/ACT652 consists of registered bus transceiver circuits, with outputs, D-type flip-flops and control circuitry providing multiplexed transmission of data directly from the input bus or from the internal storage registers. Data on the A or B bus will be loaded into the respective registers on the LOW-to-HIGH transition of the appropriate clock pin (CAB or CBA). The four fundamental data handling functions available are illustrated in Figures 1 to 4.

- Independent Registers for A and B Buses
- Multiplexed Real-Time and Stored Data Transfers
- Choice of True and Inverting Data Paths
- 3-State Outputs
- 300 mil Slim Dual-in-Line Package
- Outputs Source/Sink 24 mA
- 'ACT652 Has TTL Compatible Inputs

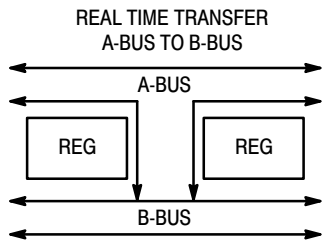


Figure 1.

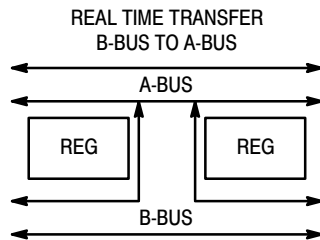


Figure 2.

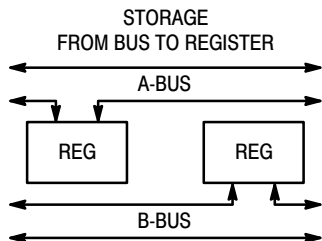


Figure 3.

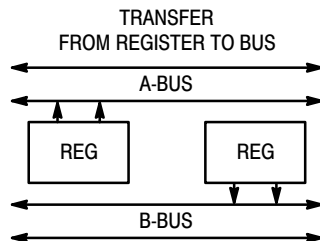
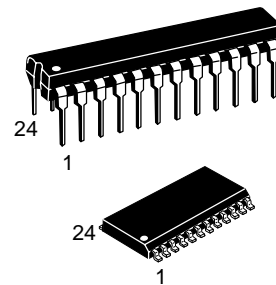


Figure 4.



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PDIP-24  
N SUFFIX  
CASE 724

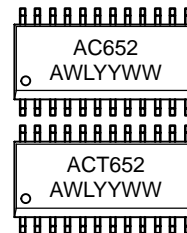
SO-24  
DW SUFFIX  
CASE 751E

### MARKING DIAGRAMS

#### PDIP-24



#### SO-24

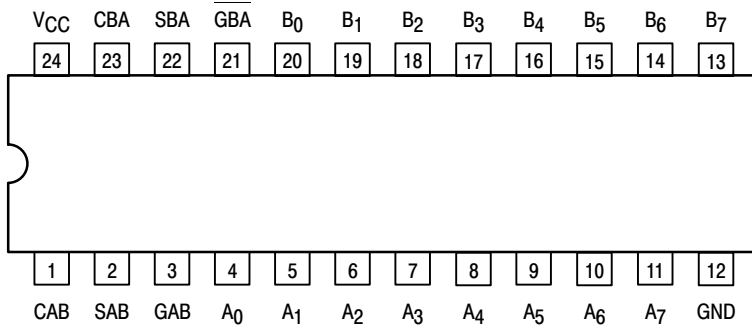


A = Assembly Location  
L, WL = Wafer Lot  
Y, YY = Year  
W, WW = Work Week

### ORDERING INFORMATION

Device	Package	Shipping
MC74AC652N	PDIP-24	15 Units/Rail
MC74ACT652N	PDIP-24	15 Units/Rail
MC74AC652DW	SOIC-24	30 Units/Rail
MC74AC652DWR2	SOIC-24	1000 Tape & Reel
MC74ACT652DW	SOIC-24	30 Units/Rail
MC74ACT652DWR2	SOIC-24	1000 Tape & Reel

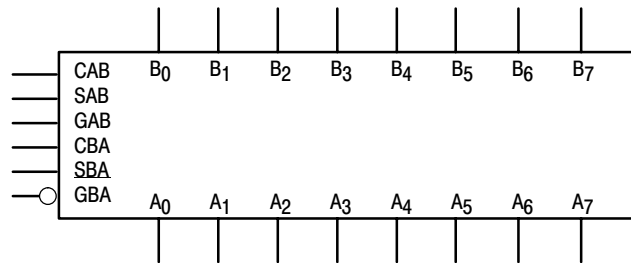
# MC74AC652, MC74ACT652



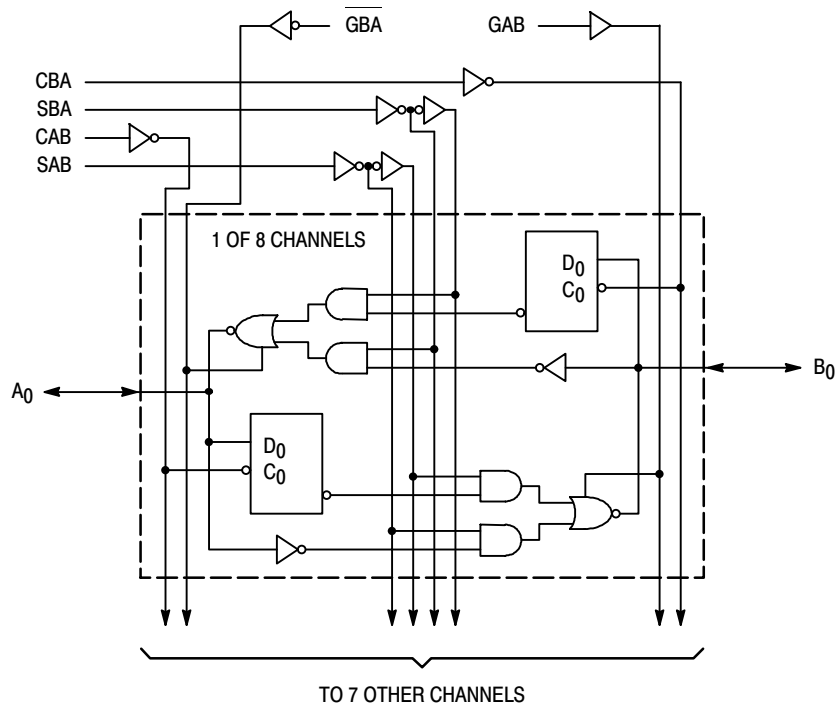
## PIN ASSIGNMENT

PIN	FUNCTION
A <sub>0</sub> –A <sub>7</sub>	Data Register A Inputs Data Register A Outputs
B <sub>0</sub> –B <sub>7</sub>	Data Register B Inputs Data Register B Outputs
CAB, CBA	Clock Pulse Inputs
SAB, SBA	Transmit/Receive Inputs
GAB, GBA	Output Enable Inputs

**Figure 5. Pinout: 24-Lead Plastic Package**  
(Top View)



**Figure 6. Logic Symbol**



NOTE: This diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

**Figure 7. Logic Diagram**

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## FUNCTION TABLE

Inputs						Data I/O*		Operation or Function
GAB	GBA	CAB	CBA	SAB	SBA	A <sub>0</sub> – A <sub>7</sub>	B <sub>0</sub> – B <sub>7</sub>	
L	H	H or L	H or L	X	X	Input	Input	Isolation Store A and B Data
L	H	↑	↑	X	X			
X	H	↑	H or L	X	X	Input	Unspecified* Output	Store A, Hold B Store A in Both Registers
H	H	↑	↑	X**	X			
L	X	H or L	↑	X	X	Unspecified* Output	Input Input	Hold A, Store B Store B in Both Registers
L	L	↑	↑	X	X**			
L	L	X	X	X	L	Output	Input	Real-Time B Data to A Bus Stored B Data to A Bus
L	L	X	H or L	X	H			
H	H	X	X	L	X	Input	Output	Real-Time A Data to B Bus Stored A Data to B Bus
H	H	H or L	X	H	X			
H	L	H or L	H or L	H	H	Output	Output	Stored A Data to B Bus and Stored B Data to A Bus

\*The data output functions may be enabled or disabled by various signals at the GBA and GAB inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the appropriate clock inputs.

\*\*Select control = L: clocks can occur simultaneously.

H = HIGH Voltage Level; L = LOW Voltage Level; X = Immaterial; ↑ = LOW-to-HIGH Transition

## MAXIMUM RATINGS\*

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	DC Supply Voltage (Referenced to GND)	–0.5 to +7.0	V
V <sub>in</sub>	DC Input Voltage (Referenced to GND)	–0.5 to V <sub>CC</sub> + 0.5	V
V <sub>out</sub>	DC Output Voltage (Referenced to GND)	–0.5 to V <sub>CC</sub> + 0.5	V
I <sub>in</sub>	DC Input Current, per Pin	± 20	mA
I <sub>out</sub>	DC Output Sink/Source Current, per Pin	± 50	mA
I <sub>CC</sub>	DC V <sub>CC</sub> or GND Current per Output Pin	± 50	mA
T <sub>stg</sub>	Storage Temperature	–65 to +150	°C

\*Maximum Ratings are those values beyond which damage to the device may occur. Functional operation should be restricted to the Recommended Operating Conditions.

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Typ	Max	Unit
V <sub>CC</sub>	Supply Voltage	'AC	2.0	5.0	6.0
		'ACT	4.5	5.0	5.5
V <sub>in</sub> , V <sub>out</sub>	DC Input Voltage, Output Voltage (Ref. to GND)	0	–	V <sub>CC</sub>	V
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	V <sub>CC</sub> @ 3.0 V	–	150	–
		V <sub>CC</sub> @ 4.5 V	–	40	–
		V <sub>CC</sub> @ 5.5 V	–	25	–
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V <sub>CC</sub> @ 4.5 V	–	10	–
		V <sub>CC</sub> @ 5.5 V	–	8.0	–
T <sub>J</sub>	Junction Temperature (PDIP)	–	–	140	°C
T <sub>A</sub>	Operating Ambient Temperature Range	–40	25	85	°C
I <sub>OH</sub>	Output Current — HIGH	–	–	–24	mA
I <sub>OL</sub>	Output Current — LOW	–	–	24	mA

1. V<sub>in</sub> from 30% to 70% V<sub>CC</sub>; see individual Data Sheets for devices that differ from the typical input rise and fall times.

2. V<sub>in</sub> from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

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## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74AC		74AC	Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C		
			Typ	Guaranteed Limits			
V <sub>IH</sub>	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	3.15	3.15		
		5.5	2.75	3.85	3.85		
V <sub>IL</sub>	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V
		4.5	2.25	1.35	1.35		
		5.5	2.75	1.65	1.65		
V <sub>OH</sub>	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I <sub>OUT</sub> = - 50 μA
		4.5	4.49	4.4	4.4		
		5.5	5.49	5.4	5.4		
		3.0	-	2.56	2.46	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> - 12 mA I <sub>OH</sub> - 24 mA - 24 mA
		4.5	-	3.86	3.76		
		5.5	-	4.86	4.76		
V <sub>OL</sub>	Minimum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I <sub>OUT</sub> = 50 μA
		4.5	0.001	0.1	0.1		
		5.5	0.001	0.1	0.1		
		3.0	-	0.36	0.44	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> 12 mA I <sub>OL</sub> 24 mA 24 mA
		4.5	-	0.36	0.44		
		5.5	-	0.36	0.44		
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND
I <sub>OZT</sub>	Maximum 3-State Current	5.5	-	±0.6	±6.0	μA	V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> V <sub>I</sub> = V <sub>CC</sub> , GND V <sub>O</sub> = V <sub>CC</sub> , GND
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V <sub>OLD</sub> = 1.65 V Max
I <sub>OHD</sub>		5.5	-	-	-75	mA	V <sub>OHD</sub> = 3.85 V Min
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	-	8.0	80	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND

\*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one input loaded at a time.

NOTE: I<sub>IN</sub> and I<sub>CC</sub> @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V.

# MC74AC652, MC74ACT652

## AC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC		74AC		Unit
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		
			Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay CPBA or CPAB to A <sub>N</sub> or B <sub>N</sub>	3.0	4.0	17.0	3.0	19.0	ns
		5.0	2.5	12.0	2.0	14.0	
t <sub>PHL</sub>	Propagation Delay CPBA or CPAB to A <sub>N</sub> or B <sub>N</sub>	3.0	3.0	14.5	2.5	16.5	ns
		5.0	2.0	10.5	1.5	12.0	
t <sub>PLH</sub>	Propagation Delay A or B to B <sub>N</sub> or A <sub>N</sub>	3.0	3.0	14.0	2.5	16.0	ns
		5.0	2.0	9.5	1.5	11.0	
t <sub>PHL</sub>	Propagation Delay A or B to B <sub>N</sub> or A <sub>N</sub>	3.0	2.5	13.0	2.0	15.0	ns
		5.0	1.5	9.0	1.0	10.5	
t <sub>PLH</sub>	Propagation Delay SBA or SAB to A <sub>N</sub> or B <sub>N</sub>	3.0	3.0	14.0	2.5	16.0	ns
		5.0	2.5	10.0	2.0	11.5	
t <sub>PHL</sub>	Propagation Delay SBA or SAB to A <sub>N</sub> or B <sub>N</sub>	3.0	2.5	13.5	2.0	15.5	ns
		5.0	2.0	10.0	1.5	11.5	
t <sub>PZH</sub>	Output Enable Time OEBA to A <sub>N</sub>	3.0	2.5	12.0	2.0	13.5	ns
		5.0	1.5	9.0	1.0	10.0	
t <sub>PZL</sub>	Output Enable Time OEBA to A <sub>N</sub>	3.0	2.5	12.0	2.0	14.0	ns
		5.0	1.5	9.0	1.0	10.5	
t <sub>PHZ</sub>	Output Disable Time OEBA to A <sub>N</sub>	3.0	3.0	13.0	2.5	14.0	ns
		5.0	2.0	11.0	1.5	12.0	
t <sub>PLZ</sub>	Output Disable Time OEBA to A <sub>N</sub>	3.0	2.5	12.5	2.0	14.0	ns
		5.0	2.0	10.5	1.5	12.0	

\*Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.

# MC74AC652, MC74ACT652

## DC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> (V)	74ACT		74ACT		Unit	Conditions
			T <sub>A</sub> = +25°C		T <sub>A</sub> = -40°C to +85°C			
			Typ	Guaranteed Limits				
V <sub>IH</sub>	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	2.0	2.0			
V <sub>IL</sub>	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	V	V <sub>OUT</sub> = 0.1 V or V <sub>CC</sub> - 0.1 V	
		5.5	1.5	0.8	0.8			
V <sub>OH</sub>	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I <sub>OUT</sub> = - 50 μA	
		5.5	5.49	5.4	5.4			
		4.5	-	3.86	3.76	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> - 24 mA I <sub>OH</sub> - 24 mA	
		5.5	-	4.86	4.76			
V <sub>OL</sub>	Minimum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I <sub>OUT</sub> = - 50 μA	
		5.5	0.001	0.1	0.1			
		4.5	-	0.36	0.44	V	*V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> - 24 mA I <sub>OH</sub> - 24 mA	
		5.5	-	0.36	0.44			
I <sub>IN</sub>	Maximum Input Leakage Current	5.5	-	±0.1	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> , GND	
ΔI <sub>CCT</sub>	Additional Max. I <sub>CC</sub> /Input	5.5	0.6	-	1.5	mA	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V	
I <sub>OZT</sub>	Maximum 3-State Current	5.5	-	±0.6	±6.0	μA	V <sub>I</sub> (OE) = V <sub>IL</sub> , V <sub>IH</sub> V <sub>I</sub> = V <sub>CC</sub> , GND V <sub>O</sub> = V <sub>CC</sub> , GND	
I <sub>OLD</sub>	†Minimum Dynamic Output Current	5.5	-	-	75	mA	V <sub>OLD</sub> = 1.65 V Max	
I <sub>OHD</sub>		5.5	-	-	-75	mA	V <sub>OHD</sub> = 3.85 V Min	
I <sub>CC</sub>	Maximum Quiescent Supply Current	5.5	-	8.0	80	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND	

\*All outputs loaded; thresholds on input associated with output under test.

†Maximum test duration 2.0 ms, one input loaded at a time.

# MC74AC652, MC74ACT652

## AC CHARACTERISTICS

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT		74ACT		Unit
			T <sub>A</sub> = +25°C C <sub>L</sub> = 50 pF		T <sub>A</sub> = -40°C to +85°C C <sub>L</sub> = 50 pF		
			Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay CPBA or CPAB to A <sub>n</sub> or B <sub>n</sub>	5.0	4.0	14.5	3.5	16.5	ns
t <sub>PHL</sub>	Propagation Delay CPBA or CPAB to A <sub>n</sub> or B <sub>n</sub>	5.0	3.5	14.5	3.0	16.5	ns
t <sub>PLH</sub>	Propagation Delay A or B to B <sub>n</sub> or A <sub>n</sub>	5.0	2.5	11.5	2.0	13.0	ns
t <sub>PHL</sub>	Propagation Delay A or B to B <sub>n</sub> or A <sub>n</sub>	5.0	2.5	11.5	2.0	13.0	ns
t <sub>PLH</sub>	Propagation Delay SBA or SAB to A <sub>n</sub> or B <sub>n</sub>	5.0	2.5	12.0	2.0	13.5	ns
t <sub>PHL</sub>	Propagation Delay SBA or SAB to A <sub>n</sub> or B <sub>n</sub>	5.0	3.0	12.0	2.5	13.5	ns
t <sub>PZH</sub>	Output Enable Time OEBA to A <sub>n</sub>	5.0	2.0	11.5	1.5	13.0	ns
t <sub>PZL</sub>	Output Enable Time OEBA to A <sub>n</sub>	5.0	2.5	11.5	2.0	13.0	ns
t <sub>PHZ</sub>	Output Disable Time OEBA to A <sub>n</sub>	5.0	3.0	13.0	2.5	14.0	ns
t <sub>PLZ</sub>	Output Disable Time OEBA to A <sub>n</sub>	5.0	2.5	12.5	2.0	14.0	ns
t <sub>PZH</sub>	Output Enable time OEAB to B <sub>n</sub>	5.0	2.5	12.0	2.0	13.5	ns
t <sub>PZL</sub>	Output Enable Time OEAB to B <sub>n</sub>	5.0	2.5	12.0	2.0	13.5	ns
t <sub>PHZ</sub>	Output Enable Time OEAB to B <sub>n</sub>	5.0	3.5	13.5	3.0	14.5	ns
t <sub>PLZ</sub>	Output Enable Time OEAB to B <sub>n</sub>	5.0	3.0	13.5	2.5	15.0	ns
t <sub>s</sub>	Setup Time, HIGH or LOW A <sub>n</sub> or B <sub>n</sub> to CPBA or CPAB	5.0	7.0	–	8.0	–	ns
t <sub>h</sub>	Hold Time, HIGH or LOW A <sub>n</sub> or B <sub>n</sub> to CPBA or CPAB	5.0	2.5	–	2.5	–	ns
t <sub>w</sub>	CPAB, CPBA Pulse Width HIGH or LOW	5.0	6.0	–	7.0	–	ns

\*Voltage Range 3.3 V is 3.3 V ±0.3 V.  
Voltage Range 5.0 V is 5.0 V ±0.5 V.

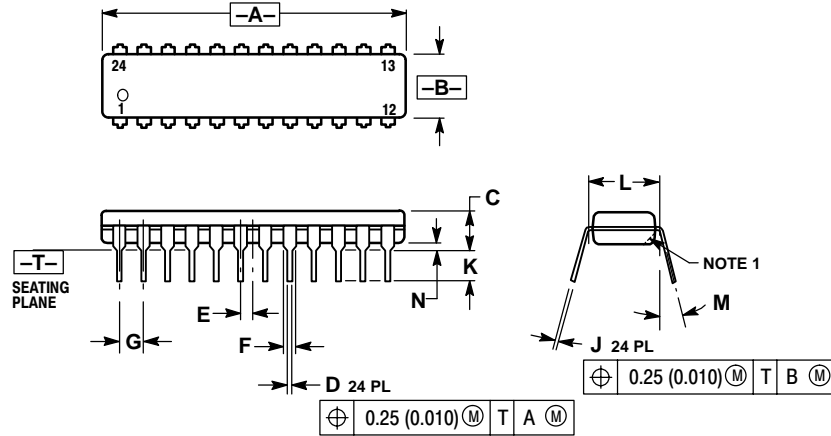
## CAPACITANCE

Symbol	Parameter	74ACT Typ	Unit	Test Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = 5.0 V
C <sub>I/O</sub>	Input/Output Capacitance	15	pF	V <sub>CC</sub> = 5.0 V
C <sub>PD</sub>	Power Dissipation Capacitance	60.0	pF	V <sub>CC</sub> = 5.0 V

# MC74AC652, MC74ACT652

## PACKAGE DIMENSIONS

### PDIP-24 N SUFFIX 24 PIN PLASTIC DIP PACKAGE CASE 724-03 ISSUE D

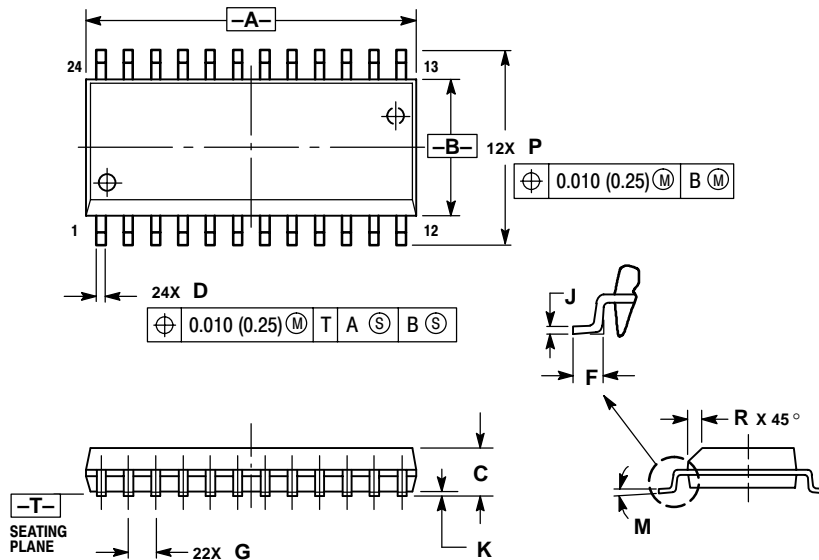


**NOTES:**

1. CHAMFERED CONTOUR OPTIONAL.
2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
4. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.230	1.265	31.25	32.13
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.020	0.38	0.51
E	0.050 BSC		1.27 BSC	
F	0.040	0.060	1.02	1.52
G	0.100 BSC		2.54 BSC	
J	0.007	0.012	0.18	0.30
K	0.110	0.140	2.80	3.55
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

### SO-24 DW SUFFIX 24 PIN PLASTIC SOIC PACKAGE CASE 751E-04 ISSUE E



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	15.25	15.54	0.601	0.612
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.41	0.90	0.016	0.035
G	1.27 BSC		0.050 BSC	
J	0.23	0.32	0.009	0.013
K	0.13	0.29	0.005	0.011
M	0°	8°	0°	8°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029




**Notes**

**Notes**

**Notes**

## MC74AC652, MC74ACT652

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