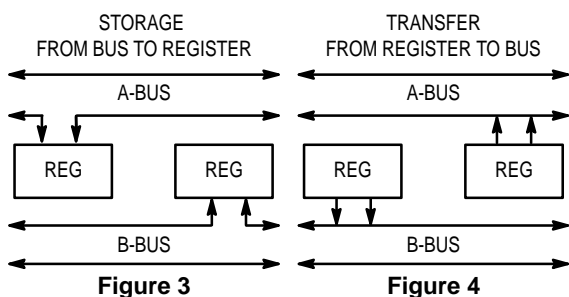
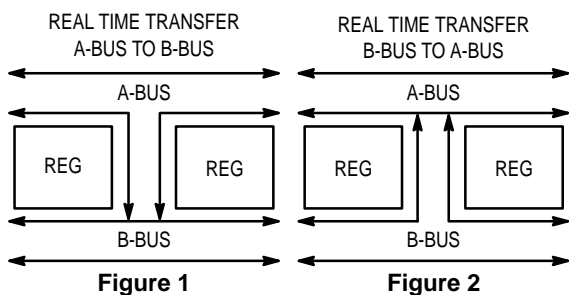




## MC74AC646 MC74ACT646

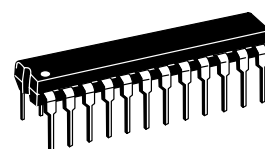
### Octal Transceiver/Register with 3-State Outputs (Non-inverting)

The MC74AC646/74ACT646 consist 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 the following figures.

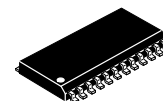


- Independent Registers for A and B Buses
- Multiplexed Real-Time and Stored Data Transfers
- Choice of True and Inverting Data Paths
- 3-State Outputs
- 300 mil Slim Dual In-Line Package
- Outputs Source/Sink 24 mA
- 'ACT646 Has TTL Compatible Inputs

OCTAL  
TRANSCEIVER/REGISTER  
WITH 3-STATE OUTPUTS  
(NON-INVERTING)

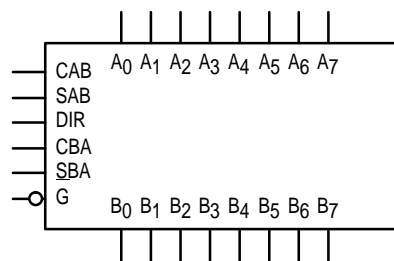


N SUFFIX  
CASE 724-03  
PLASTIC



DW SUFFIX  
CASE 751E-04  
SOIC PACKAGE

#### LOGIC SYMBOL



# MC74AC646 MC74ACT646

## FUNCTION TABLE

Inputs						Data I/O*		Operation or Function
G	DIR	CAB	CBA	SAB	SBA	A <sub>0</sub> -A <sub>7</sub>	B <sub>0</sub> -B <sub>7</sub>	
H	X	H or L	H or L	X	X	Input	Input	Isolation Store A and B Data
H	X	$\lceil$	$\lceil$	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	X	X	H			
L	H	X	X	L	X	Input	Output	Real Time A Data to B Bus Stored A Data to B Bus
L	H	H or L	X	H	X			

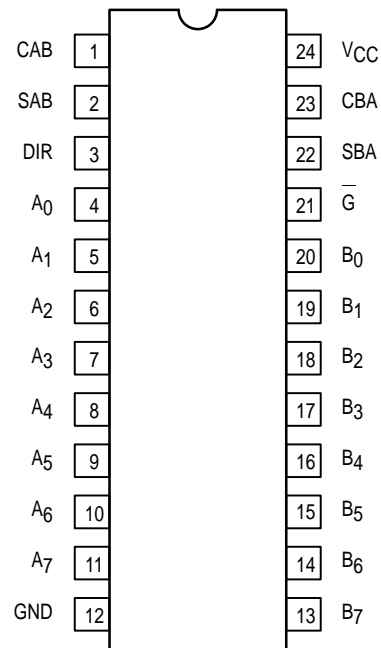
\* The data output functions may be enabled or disabled by various signals at the G and DIR inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the appropriate clock inputs.

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

$\lceil$  = LOW-to-HIGH Transition



### PIN NAMES

A<sub>0</sub>-A<sub>7</sub> Data Register Inputs  
Data Register A Outputs

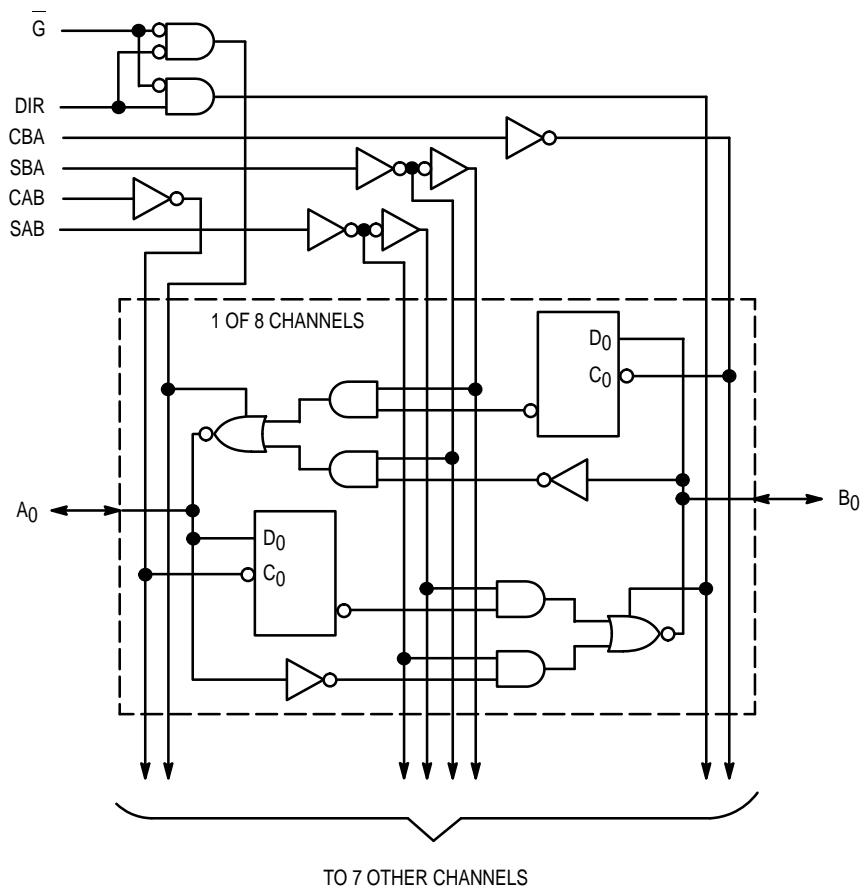
B<sub>0</sub>-B<sub>7</sub> Data Register B Inputs  
Data Register B Outputs

CAB, CBA Clock Pulse Inputs

SAB, SBA Transmit/Receive Inputs

DIR, G Output Enable Inputs

## LOGIC DIAGRAM



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

## MC74AC646 MC74ACT646

### 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	V
		'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		ns/V
		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		ns/V
		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.

## MC74AC646 MC74ACT646

## 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>	Maximum 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 output 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 V<sub>CC</sub>.

## MC74AC646 MC74ACT646

### AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC			74AC		Unit	Fig. No.
			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	Typ	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay Clock to Bus	3.3 5.0	4.0 2.5	10.5 7.5	16.5 12	3.0 2.0	18.5 13	ns	3-6
t <sub>PHL</sub>	Propagation Delay Clock to Bus	3.3 5.0	3.0 2.0	9.5 6.5	14.5 10.5	2.5 1.5	16 11.5	ns	3-6
t <sub>PLH</sub>	Propagation Delay Bus to Bus	3.3 5.0	2.5 1.5	7.5 5.0	12 8.0	2.0 1.0	13.5 9.0	ns	3-5
t <sub>PHL</sub>	Propagation Delay Bus to Bus	3.3 5.0	1.5 1.5	7.5 5.0	12.5 9.0	1.5 1.0	13.5 9.5	ns	3-5
t <sub>PLH</sub>	Propagation Delay SBA or SAB to A <sub>n</sub> or B <sub>n</sub> (w/A <sub>n</sub> or B <sub>n</sub> HIGH or LOW)	3.3 5.0	2.0 1.5	8.5 6.0	13.5 10	1.5 1.5	15.5 11	ns	3-6
t <sub>PHL</sub>	Propagation Delay SBA or SAB to A <sub>n</sub> or B <sub>n</sub> (w/A <sub>n</sub> or B <sub>n</sub> HIGH or LOW)	3.3 5.0	1.5 1.5	8.5 6.0	13.5 10	1.5 1.5	15 11	ns	3-6
t <sub>PZH</sub>	Enable Time G to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	2.5 1.5	7.0 5.0	11.5 8.5	2.0 1.5	12.5 9.0	ns	3-7
t <sub>PZL</sub>	Enable Time G to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	2.5 1.5	7.5 5.5	12.5 9.0	2.0 1.5	14 10	ns	3-8
t <sub>PHZ</sub>	Disable Time G to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	3.0 2.0	8.0 6.5	12.5 10	2.5 2.0	13.5 11	ns	3-7
t <sub>PLZ</sub>	Disable Time G to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	2.0 1.5	7.5 6.0	12 9.5	2.0 1.5	13.5 10.5	ns	3-8
t <sub>PZH</sub>	Enable Time DIR to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	2.0 1.5	6.5 5.0	11 7.5	1.5 1.0	12 8.5	ns	3-7
t <sub>PZL</sub>	Enable Time DIR to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	2.5 1.5	7.0 5.0	11.5 8.0	2.0 1.0	13 9.0	ns	3-8
t <sub>PHZ</sub>	Disable Time DIR to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	2.5 1.5	7.5 5.5	11.5 9.5	1.5 1.5	12.5 10	ns	3-7
t <sub>PLZ</sub>	Disable Time DIR to A <sub>n</sub> or B <sub>n</sub>	3.3 5.0	1.5 1.5	7.5 5.5	12 9.5	1.5 1.5	13.5 10.5	ns	3-8

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

## MC74AC646 MC74ACT646

### AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	74AC		74AC	Unit	Fig. No.
			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		
			Typ	Guaranteed Minimum			
t <sub>s</sub>	Setup Time, HIGH or LOW Bus to Clock	3.3	2.0	5.0	5.5	ns	3-9
		5.0	1.5	4.0	4.5		
t <sub>h</sub>	Hold Time, HIGH or LOW Bus to Clock	3.3	-1.5	0	0	ns	3-9
		5.0	-0.5	0.5	1.0		
t <sub>w</sub>	Clock Pulse Width HIGH or LOW	3.3	2.0	3.5	4.5	ns	3-6
		5.0	2.0	3.5	3.5		

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

Voltage Range 5.0 V is 5.0 V ±0.5 V.

### 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
5.5		4.86	4.76		I <sub>OH</sub> = -24 mA		
V <sub>OL</sub>	Maximum 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
5.5		0.36	0.44		I <sub>OL</sub> = 24 mA		
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 output loaded at a time.

## MC74AC646 MC74ACT646

### AC CHARACTERISTICS (For Figures and Waveforms — See Section 3)

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT			74ACT		Unit	Fig. No.
			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	Typ	Max	Min	Max		
t <sub>PLH</sub>	Propagation Delay Clock to Bus	5.0	3.5	12.0	14.5	3.0	16.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay Clock to Bus	5.0	4.0	12.0	14.5	3.5	16.0	ns	3-6
t <sub>PLH</sub>	Propagation Delay Bus to Bus	5.0	3.0	8.5	11.0	2.5	12.0	ns	3-5
t <sub>PHL</sub>	Propagation Delay Bus to Bus	5.0	2.5	8.5	11.0	2.0	12.0	ns	3-5
t <sub>PLH</sub>	Propagation Delay SBA or SAB to A <sub>n</sub> or B <sub>n</sub> (w/A <sub>n</sub> or B <sub>n</sub> HIGH or LOW)	5.0	3.0	9.5	12.0	2.5	13.0	ns	3-6
t <sub>PHL</sub>	Propagation Delay SBA or SAB to A <sub>n</sub> or B <sub>n</sub> (w/A <sub>n</sub> or B <sub>n</sub> HIGH or LOW)	5.0	3.0	9.5	12.0	2.5	13.0	ns	3-6
t <sub>PZH</sub>	Enable Time G to A <sub>n</sub> or B <sub>n</sub>	5.0	2.0	9.0	11.0	1.5	12.0	ns	3-7
t <sub>PZL</sub>	Enable Time G to A <sub>n</sub> or B <sub>n</sub>	5.0	3.5	9.0	11.0	3.0	12.0	ns	3-8
t <sub>PHZ</sub>	Disable Time G to A <sub>n</sub> or B <sub>n</sub>	5.0	5.0	10.5	13.0	4.5	14.5	ns	3-7
t <sub>PLZ</sub>	Disable Time G to A <sub>n</sub> or B <sub>n</sub>	5.0	3.5	10.0	12.5	3.0	14.0	ns	3-8
t <sub>PZH</sub>	Enable Time DIR to A <sub>n</sub> or B <sub>n</sub>	5.0	2.0	6.5	12.5	1.5	13.5	ns	3-7
t <sub>PZL</sub>	Enable Time DIR to A <sub>n</sub> or B <sub>n</sub>	5.0	3.5	6.5	12.5	3.0	13.5	ns	3-8
t <sub>PHZ</sub>	Disable Time DIR to A <sub>n</sub> or B <sub>n</sub>	5.0	5.0	8.5	12.5	4.5	13.5	ns	3-7
t <sub>PLZ</sub>	Disable Time DIR to A <sub>n</sub> or B <sub>n</sub>	5.0	3.5	8.5	12.5	3.0	13.5	ns	3-8

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

## MC74AC646 MC74ACT646

### AC OPERATING REQUIREMENTS

Symbol	Parameter	V <sub>CC</sub> * (V)	74ACT		Unit	Fig. No.
			74ACT			
			Typ	Guaranteed Minimum		
			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	
t <sub>s</sub>	Setup Time, HIGH or LOW Bus to Clock	5.0		7.0	8.0	ns 3-9
t <sub>h</sub>	Hold Time, HIGH or LOW Bus to Clock	5.0		2.5	2.5	ns 3-9
t <sub>w</sub>	Clock Pulse Width HIGH or LOW	5.0		7.0	8.0	ns 3-6

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

### CAPACITANCE

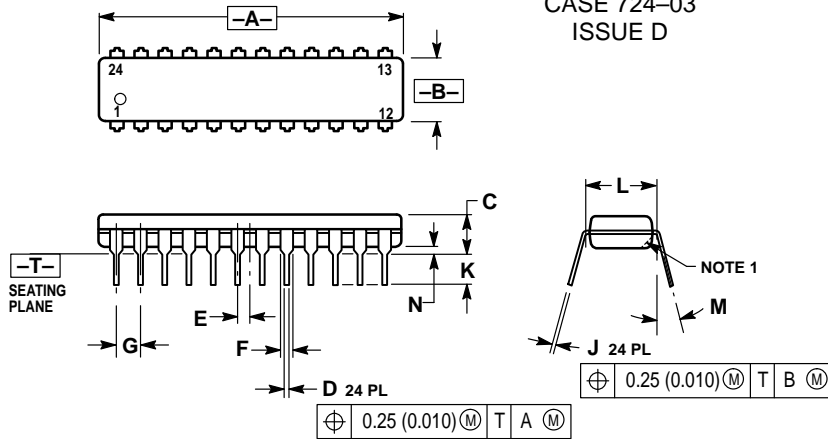
Symbol	Parameter	Value Typ	Unit	Test Conditions
C <sub>IN</sub>	Input Capacitance	4.5	pF	V <sub>CC</sub> = 5.0 V
C <sub>I/O</sub>	Input/Output Capacitance	15	pF	V <sub>CC</sub> = 5.0 V
CPD	Power Dissipation Capacitance	60	pF	V <sub>CC</sub> = 5.0 V



# MC74AC646 MC74ACT646

## OUTLINE DIMENSIONS

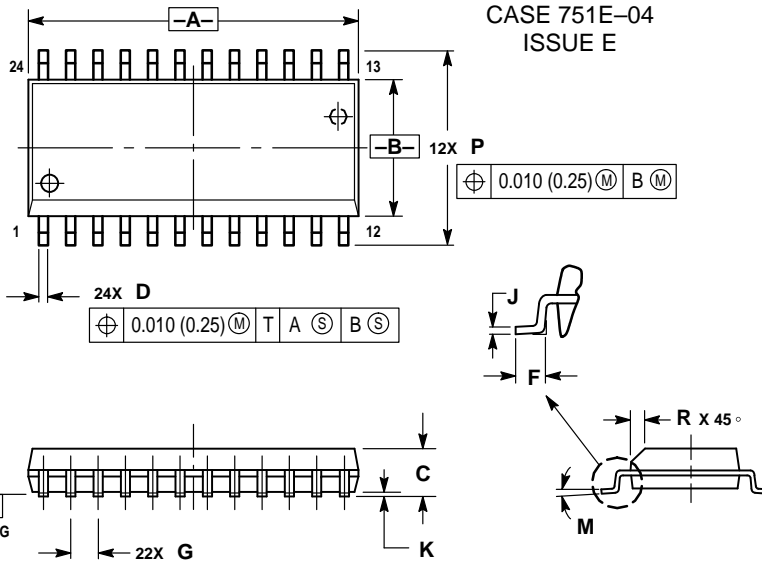
### N SUFFIX PLASTIC DIP PACKAGE CASE 724-03 ISSUE D



- 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	1.285	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

### DW SUFFIX 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

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