

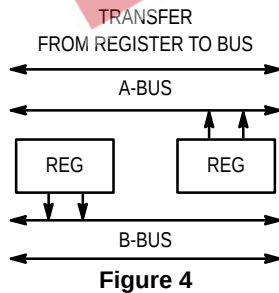
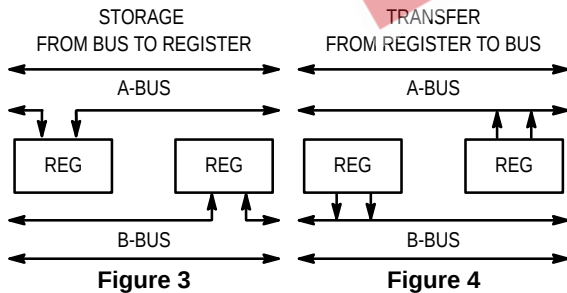
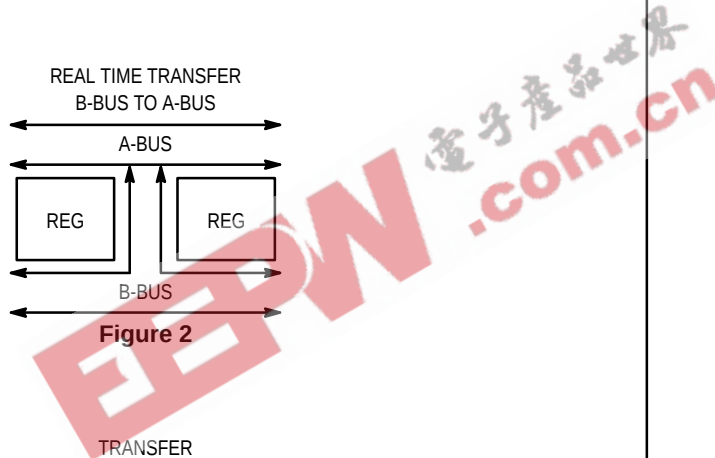
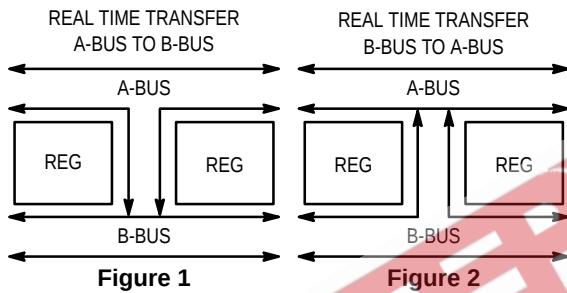


MOTOROLA

MC74AC646 MC74ACT646

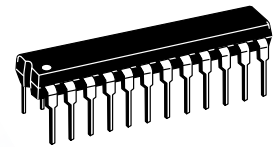
Octal Transceiver/Register with 3-State Outputs (Non-inverting)

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.

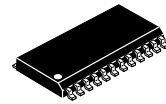


- Independent Registers for A and B Buses
- Multiplexed Real-Time and Stored Data Transfers
- Choice of True and Inverting Data Paths
- 3-State Outputs
- 300 mil Slim Dual In-Line Package
- Outputs Source/Sink 24 mA
- 'ACT646 Has TTL Compatible Inputs

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

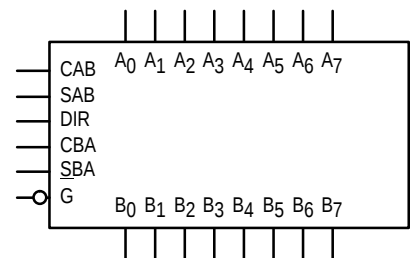


N SUFFIX
CASE 724-03
PLASTIC



DW SUFFIX
CASE 751E-04
SOIC PACKAGE

LOGIC SYMBOL



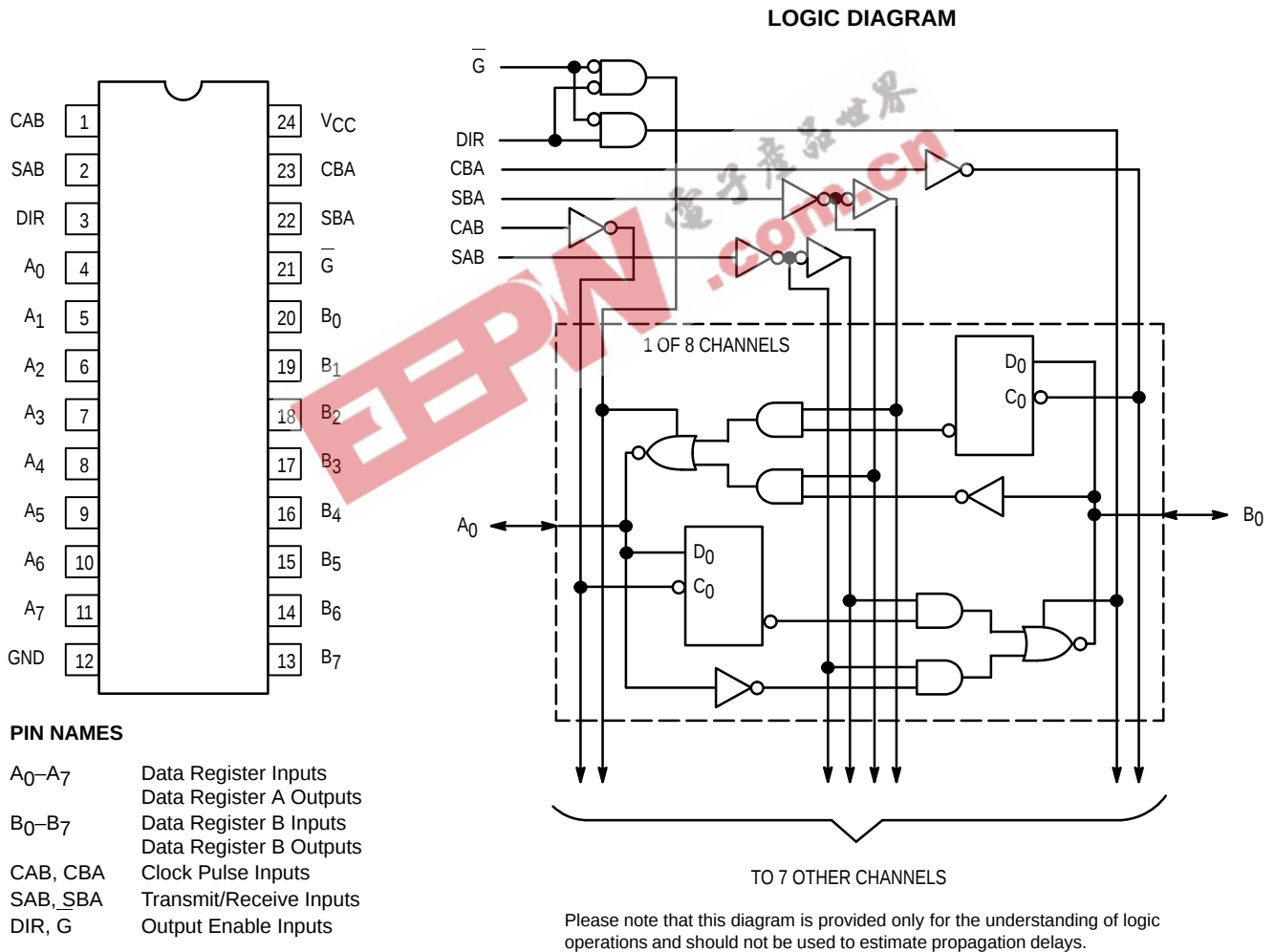
MC74AC646 MC74ACT646

FUNCTION TABLE

Inputs						Data I/O*		Operation or Function
G	DIR	CAB	CBA	SAB	SBA	A ₀ –A ₇	B ₀ –B ₇	
H	X	H or L	H or L	X	X	Input	Input	Isolation Store A and B Data
H	X			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
 = LOW-to-HIGH Transition



MC74AC646 MC74ACT646

MAXIMUM RATINGS*

Symbol	Parameter	Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)	−0.5 to +7.0	V
V_{in}	DC Input Voltage (Referenced to GND)	−0.5 to $V_{CC} + 0.5$	V
V_{out}	DC Output Voltage (Referenced to GND)	−0.5 to $V_{CC} + 0.5$	V
I_{in}	DC Input Current, per Pin	±20	mA
I_{out}	DC Output Sink/Source Current, per Pin	±50	mA
I_{CC}	DC V_{CC} or GND Current per Output Pin	±50	mA
T_{stg}	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_{CC}	Supply Voltage	'AC	2.0	5.0	V
		'ACT	4.5	5.0	
V_{in}, V_{out}	DC Input Voltage, Output Voltage (Ref. to GND)	0		V_{CC}	V
t_r, t_f	Input Rise and Fall Time (Note 1) 'AC Devices except Schmitt Inputs	$V_{CC} @ 3.0\text{ V}$	150		ns/V
		$V_{CC} @ 4.5\text{ V}$	40		
		$V_{CC} @ 5.5\text{ V}$	25		
t_r, t_f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	$V_{CC} @ 4.5\text{ V}$	10		ns/V
		$V_{CC} @ 5.5\text{ V}$	8.0		
T_J	Junction Temperature (PDIP)			140	°C
T_A	Operating Ambient Temperature Range	−40	25	85	°C
I_{OH}	Output Current — High			−24	mA
I_{OL}	Output Current — Low			24	mA

1. V_{in} from 30% to 70% V_{CC} ; see individual Data Sheets for devices that differ from the typical input rise and fall times.

2. V_{in} 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 _{CC} (V)	74AC		74AC	Unit	Conditions
			T _A = +25°C		T _A = –40°C to +85°C		
			Typ	Guaranteed Limits			
V _{IH}	Minimum High Level Input Voltage	3.0	1.5	2.1	2.1	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
		4.5	2.25	3.15	3.15		
		5.5	2.75	3.85	3.85		
V _{IL}	Maximum Low Level Input Voltage	3.0	1.5	0.9	0.9	V	V _{OUT} = 0.1 V or V _{CC} – 0.1 V
		4.5	2.25	1.35	1.35		
		5.5	2.75	1.65	1.65		
V _{OH}	Minimum High Level Output Voltage	3.0	2.99	2.9	2.9	V	I _{OUT} = –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 _{IN} = V _{IL} or V _{IH} –12 mA I _{OH} –24 mA –24 mA
		4.5		3.86	3.76		
		5.5		4.86	4.76		
V _{OL}	Maximum Low Level Output Voltage	3.0	0.002	0.1	0.1	V	I _{OUT} = 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 _{IN} = V _{IL} or V _{IH} 12 mA I _{OL} 24 mA 24 mA
		4.5		0.36	0.44		
		5.5		0.36	0.44		
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND
I _{OZT}	Maximum 3-State Current	5.5		±0.6	±6.0	μA	V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = V _{CC} , GND
I _{OLD}	†Minimum Dynamic Output Current	5.5			75	mA	V _{OLD} = 1.65 V Max
I _{OHD}		5.5			–75	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V _{IN} = V _{CC} 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_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

MC74AC646 MC74ACT646

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

Symbol	Parameter	V _{CC} * (V)	74AC			74AC		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = –40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	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 _{PHL}	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 _{PLH}	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 _{PHL}	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 _{PLH}	Propagation Delay SBA or SAB to A _n or B _n (w/A _n or B _n 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 _{PHL}	Propagation Delay SBA or SAB to A _n or B _n (w/A _n or B _n 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 _{PZH}	Enable Time G to A _n or B _n	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 _{PZL}	Enable Time G to A _n or B _n	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 _{PHZ}	Disable Time G to A _n or B _n	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 _{PLZ}	Disable Time G to A _n or B _n	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 _{PZH}	Enable Time DIR to A _n or B _n	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 _{PZL}	Enable Time DIR to A _n or B _n	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 _{PHZ}	Disable Time DIR to A _n or B _n	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 _{PLZ}	Disable Time DIR to A _n or B _n	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 _{CC} * (V)	74AC		74AC	Unit	Fig. No.
			T _A = +25°C C _L = 50 pF		T _A = -40°C to +85°C C _L = 50 pF		
			Typ	Guaranteed Minimum			
t _s	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 _h	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 _w	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 _{CC} (V)	74ACT		74ACT	Unit	Conditions
			T _A = +25°C		T _A = -40°C to +85°C		
			Typ	Guaranteed Limits			
V _{IH}	Minimum High Level Input Voltage	4.5	1.5	2.0	2.0	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
		5.5	1.5	2.0	2.0		
V _{IL}	Maximum Low Level Input Voltage	4.5	1.5	0.8	0.8	V	V _{OUT} = 0.1 V or V _{CC} - 0.1 V
		5.5	1.5	0.8	0.8		
V _{OH}	Minimum High Level Output Voltage	4.5	4.49	4.4	4.4	V	I _{OUT} = -50 μA
		5.5	5.49	5.4	5.4		
		4.5		3.86	3.76	V	*V _{IN} = V _{IL} or V _{IH} -24 mA I _{OH} -24 mA
		5.5		4.86	4.76		
V _{OL}	Maximum Low Level Output Voltage	4.5	0.001	0.1	0.1	V	I _{OUT} = 50 μA
		5.5	0.001	0.1	0.1		
		4.5		0.36	0.44	V	*V _{IN} = V _{IL} or V _{IH} 24 mA I _{OL} 24 mA
		5.5		0.36	0.44		
I _{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V _I = V _{CC} , GND
ΔI _{CCT}	Additional Max. I _{CC} /Input	5.5	0.6		1.5	mA	V _I = V _{CC} - 2.1 V
I _{OZT}	Maximum 3-State Current	5.5		±0.6	±6.0	μA	V _I (OE) = V _{IL} , V _{IH} V _I = V _{CC} , GND V _O = V _{CC} , GND
I _{OLD}	†Minimum Dynamic Output Current	5.5			75	mA	V _{OLD} = 1.65 V Max
I _{OHD}		5.5			-75	mA	V _{OHD} = 3.85 V Min
I _{CC}	Maximum Quiescent Supply Current	5.5		8.0	80	μA	V _{IN} = V _{CC} 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 _{CC} * (V)	74ACT			74ACT		Unit	Fig. No.
			T _A = +25°C C _L = 50 pF			T _A = -40°C to +85°C C _L = 50 pF			
			Min	Typ	Max	Min	Max		
t _{PLH}	Propagation Delay Clock to Bus	5.0	3.5	12.0	14.5	3.0	16.0	ns	3-6
t _{PHL}	Propagation Delay Clock to Bus	5.0	4.0	12.0	14.5	3.5	16.0	ns	3-6
t _{PLH}	Propagation Delay Bus to Bus	5.0	3.0	8.5	11.0	2.5	12.0	ns	3-5
t _{PHL}	Propagation Delay Bus to Bus	5.0	2.5	8.5	11.0	2.0	12.0	ns	3-5
t _{PLH}	Propagation Delay SBA or SAB to A _n or B _n (w/A _n or B _n HIGH or LOW)	5.0	3.0	9.5	12.0	2.5	13.0	ns	3-6
t _{PHL}	Propagation Delay SBA or SAB to A _n or B _n (w/A _n or B _n HIGH or LOW)	5.0	3.0	9.5	12.0	2.5	13.0	ns	3-6
t _{PZH}	Enable Time G to A _n or B _n	5.0	2.0	9.0	11.0	1.5	12.0	ns	3-7
t _{PZL}	Enable Time G to A _n or B _n	5.0	3.5	9.0	11.0	3.0	12.0	ns	3-8
t _{PHZ}	Disable Time G to A _n or B _n	5.0	5.0	10.5	13.0	4.5	14.5	ns	3-7
t _{PLZ}	Disable Time G to A _n or B _n	5.0	3.5	10.0	12.5	3.0	14.0	ns	3-8
t _{PZH}	Enable Time DIR to A _n or B _n	5.0	2.0	6.5	12.5	1.5	13.5	ns	3-7
t _{PZL}	Enable Time DIR to A _n or B _n	5.0	3.5	6.5	12.5	3.0	13.5	ns	3-8
t _{PHZ}	Disable Time DIR to A _n or B _n	5.0	5.0	8.5	12.5	4.5	13.5	ns	3-7
t _{PLZ}	Disable Time DIR to A _n or B _n	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 _{CC} * (V)	74ACT		74ACT	Unit	Fig. No.
			T _A = +25°C C _L = 50 pF		T _A = -40°C to +85°C C _L = 50 pF		
			Typ	Guaranteed Minimum			
t _s	Setup Time, HIGH or LOW Bus to Clock	5.0		7.0	8.0	ns	3-9
t _h	Hold Time, HIGH or LOW Bus to Clock	5.0		2.5	2.5	ns	3-9
t _w	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.

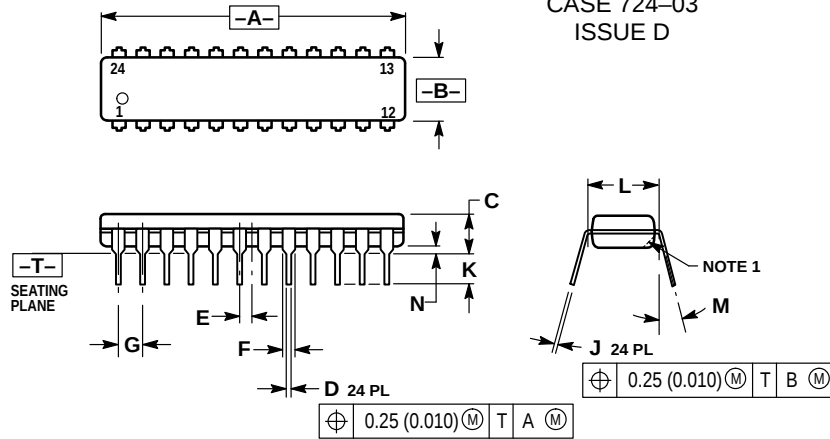
CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C _{IN}	Input Capacitance	4.5	pF	V _{CC} = 5.0 V
C _{I/O}	Input/Output Capacitance	15	pF	V _{CC} = 5.0 V
C _{PD}	Power Dissipation Capacitance	60	pF	V _{CC} = 5.0 V

MC74AC646 MC74ACT646

OUTLINE DIMENSIONS

N SUFFIX PLASTIC DIP PACKAGE CASE 724-03 ISSUE D

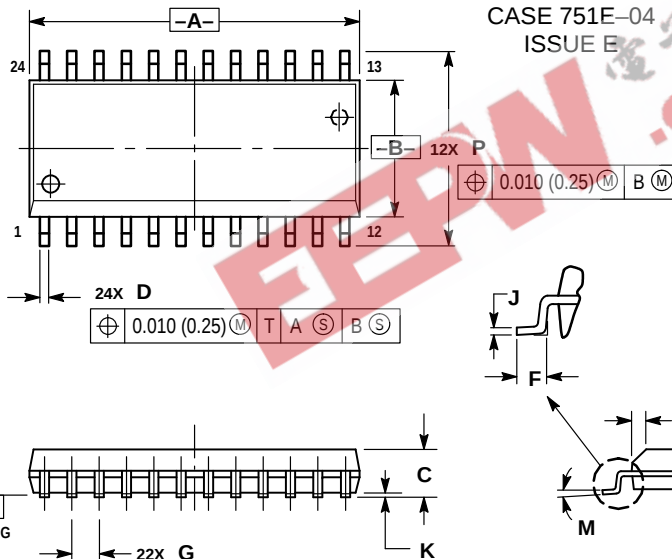


NOTES:

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	1.265	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

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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MC74AC646/D

