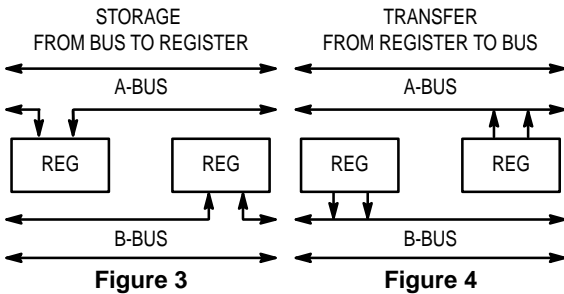
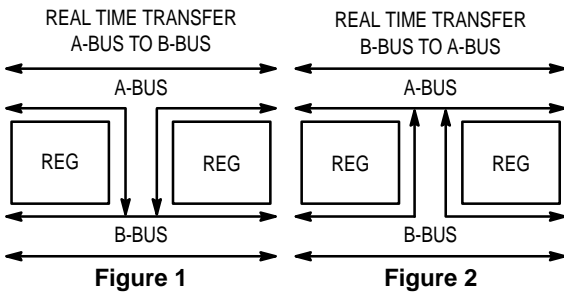




Product Preview

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

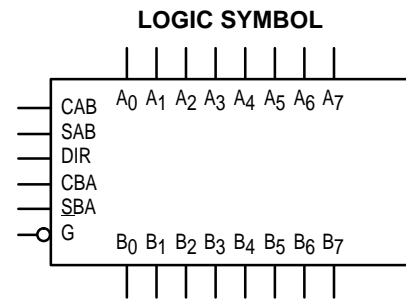
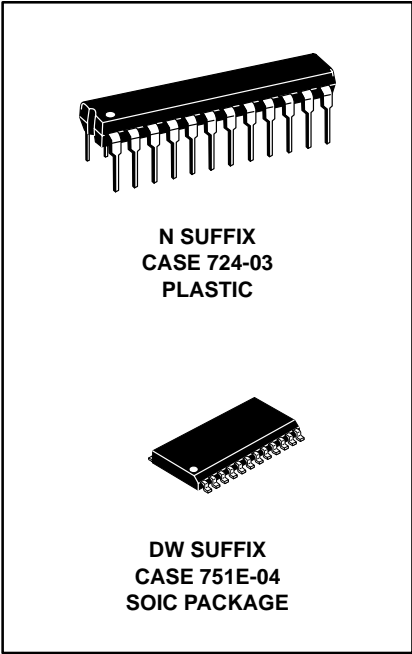
The MC74AC648/74ACT648 consist of registered bus transceiver circuits, with outputs, D-type flip-flops and control circuitry providing multiplexed transmission of data directly from the input bus or from the internal storage registers. Data on the A or B bus will be loaded into the respective registers 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

MC74AC648
MC74ACT648

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



This document contains information on a product under development. Motorola reserves the right to change or discontinue this product without notice.

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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			

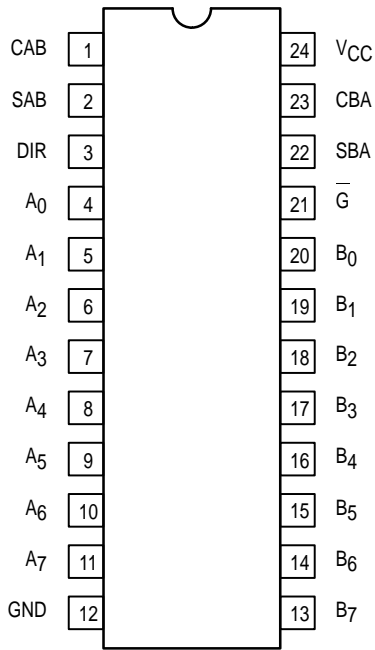
* The data output functions may be enabled or disabled by various signals at the G and DIR inputs. Data input functions are always enabled; i.e., data at the bus pins will be stored on every LOW-to-HIGH transition of the appropriate clock inputs.

H = HIGH Voltage Level

L = LOW Voltage Level

X = Immaterial

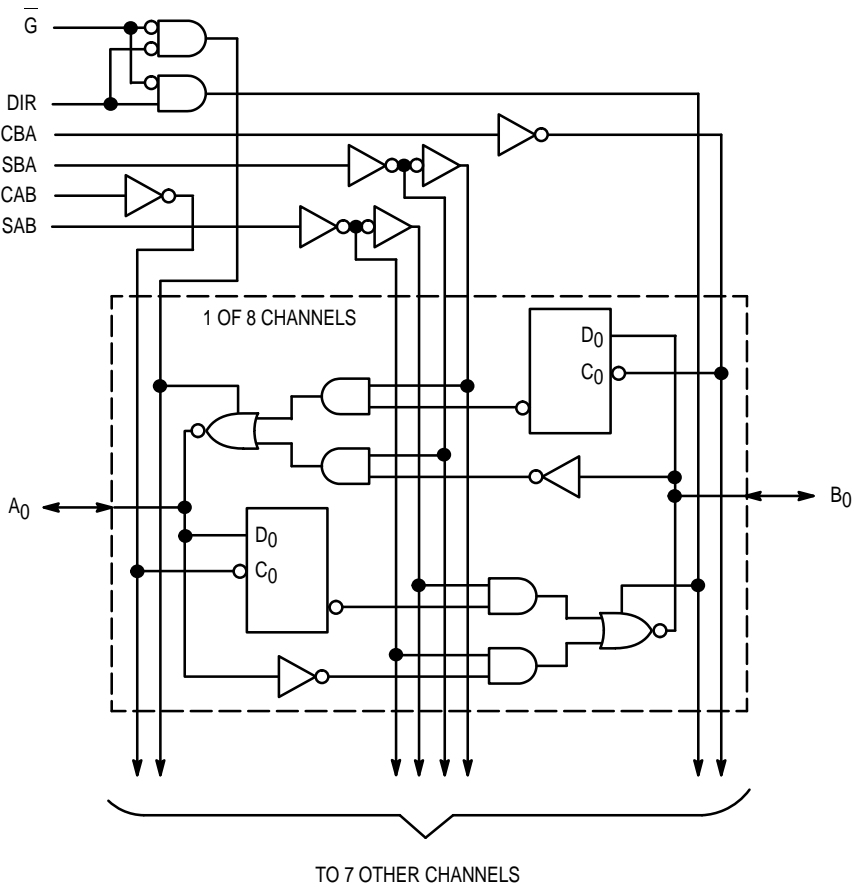
┐ = LOW-to-HIGH Transition



PIN NAMES

A₀-A₇ Data Register Inputs
Data Register A Outputs
B₀-B₇ 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.

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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	6.0	V
		'ACT	4.5	5.0	5.5	
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 V		150		ns/V
		V _{CC} @ 4.5 V		40		
		V _{CC} @ 5.5 V		25		
t _r , t _f	Input Rise and Fall Time (Note 2) 'ACT Devices except Schmitt Inputs	V _{CC} @ 4.5 V		10		ns/V
		V _{CC} @ 5.5 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.

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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}.

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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	1.5 1.5	10 7.0	15.5 11	1.5 1.5	17 12	ns	3-6
t _{PHL}	Propagation Delay Clock to Bus	3.3 5.0	1.5 1.5	8.5 6.0	13.5 10.5	1.5 1.5	14.5 11.5	ns	3-6
t _{PLH}	Propagation Delay Bus to Bus	3.3 5.0	1.5 1.5	6.0 4.0	10 7.0	1.5 1.0	11 7.5	ns	3-5
t _{PHL}	Propagation Delay Bus to Bus	3.3 5.0	1.5 1.5	5.5 3.5	9.0 7.5	1.5 1.0	10 8.0	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)	3.3 5.0	1.5 1.5	7.5 5.5	12.5 9.0	1.5 1.5	14 10	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	7.5 5.5	12.5 9.5	1.5 1.5	14 10.5	ns	3-6
t _{PZH}	Enable Time G to A _n or B _n	3.3 5.0	1.5 1.5	6.5 5.0	11 8.0	1.0 1.0	11.5 9.0	ns	3-7
t _{PZL}	Enable Time G to A _n or B _n	3.3 5.0	1.5 1.5	7.0 5.0	11 8.0	1.0 1.0	12.5 9.0	ns	3-8
t _{PHZ}	Disable Time G to A _n or B _n	3.3 5.0	1.5 1.5	7.5 6.0	12 10	1.0 1.0	13 11	ns	3-7
t _{PLZ}	Disable Time G to A _n or B _n	3.3 5.0	1.5 1.5	7.0 5.5	11.5 9.0	1.0 1.0	12.5 10	ns	3-8
t _{PZH}	Enable Time DIR to A _n or B _n	3.3 5.0	1.5 1.5	6.0 4.5	12.5 9.5	1.0 1.0	14 10.5	ns	3-7
t _{PZL}	Enable Time DIR to A _n or B _n	3.3 5.0	1.5 1.5	6.5 4.5	13 9.0	1.5 1.0	14.5 10.5	ns	3-8
t _{PHZ}	Disable Time DIR to A _n or B _n	3.3 5.0	1.5 1.5	7.0 5.5	11.5 9.0	1.0 1.0	13.5 10	ns	3-7
t _{PLZ}	Disable Time DIR to A _n or B _n	3.3 5.0	1.5 1.5	7.0 5.0	13.5 9.5	1.5 1.0	15 10	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.

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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	3.0	3.5	ns	3-9	
		5.0	1.5	2.0	2.0			
t _h	Hold Time, HIGH or LOW Bus to Clock	3.3	-1.5	0	0	ns	3-9	
		5.0	-0.5	1.0	1.0			
t _w	Clock Pulse Width HIGH or LOW	3.3	2.0	3.5	4.0	ns	3-6	
		5.0	2.0	3.0	3.0			

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

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	
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	
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.

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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	1.5		14.0	1.5	15.5	ns	3-6
t _{PHL}	Propagation Delay Clock to Bus	5.0	1.5		14.0	1.5	15.5	ns	3-6
t _{PLH}	Propagation Delay Bus to Bus	5.0	1.5		11.5	1.0	13.0	ns	3-5
t _{PHL}	Propagation Delay Bus to Bus	5.0	1.5		11.5	1.0	13.0	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	1.5		12.0	1.5	14.0	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	1.5		12.0	1.5	14.0	ns	3-6
t _{PZH}	Enable Time G to A _n or B _n	5.0	1.5		11.0	1.0	12.5	ns	3-7
t _{PZL}	Enable Time G to A _n or B _n	5.0	1.5		11.5	1.0	13.0	ns	3-8
t _{PHZ}	Disable Time G to A _n or B _n	5.0	1.5		12.5	1.0	14.0	ns	3-7
t _{PLZ}	Disable Time G to A _n or B _n	5.0	1.5		12.0	1.0	13.5	ns	3-8
t _{PZH}	Enable Time DIR to A _n or B _n	5.0	1.5		13.0	1.0	14.5	ns	3-7
t _{PZL}	Enable Time DIR to A _n or B _n	5.0	1.5		12.0	1.0	13.5	ns	3-8
t _{PHZ}	Disable Time DIR to A _n or B _n	5.0	1.5		11.5	1.0	13.0	ns	3-7
t _{PLZ}	Disable Time DIR to A _n or B _n	5.0	1.5		11.0	1.0	12.5	ns	3-8

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

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AC OPERATING REQUIREMENTS

Symbol	Parameter	V _{CC} * (V)	74ACT		Unit	Fig. No.	
			74ACT				
			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		4.0	5.0	ns	3-9
t _h	Hold Time, HIGH or LOW Bus to Clock	5.0		2.0	3.0	ns	3-9
t _w	Clock Pulse Width HIGH or LOW	5.0		5.0	6.0	ns	3-6

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

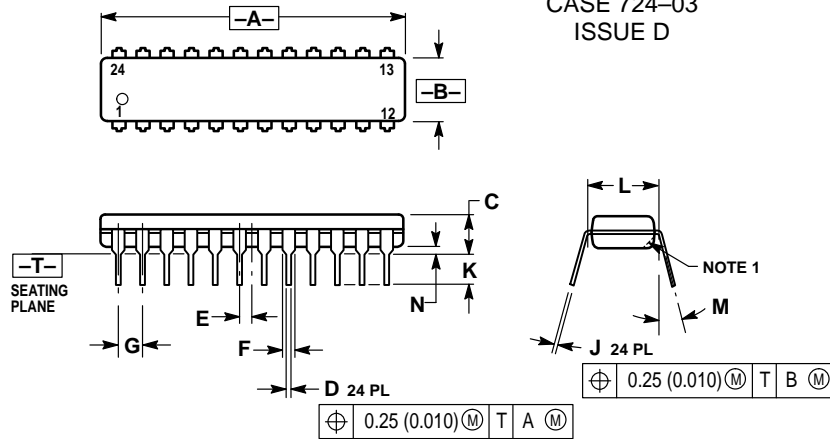
CAPACITANCE

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	65	pF	V _{CC} = 5.0 V

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OUTLINE DIMENSIONS

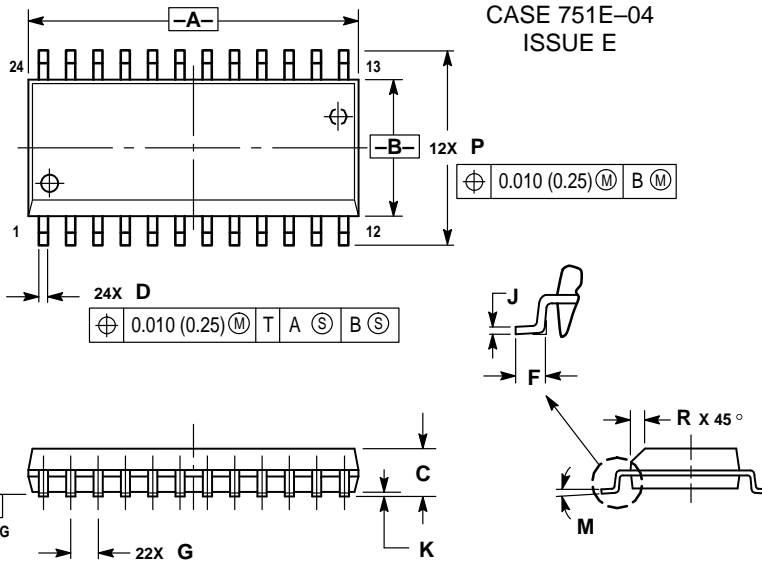
N SUFFIX PLASTIC DIP PACKAGE CASE 724-03 ISSUE D



- 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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MC74AC648/D

