FAIRCHILD SEMICONDUCTOR™

November 1988
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74AC151 • 74ACT151
8-Input Multiplexer

General Description

The AC/ACT151 is a high-speed 8-input digital multiplexer. It provides, in one package, the ability to select one line of data from up to eight sources. The AC/ACT151 can be used as a universal function generator to generate any logic function of four variables. Both true and complementary outputs are provided.

Features

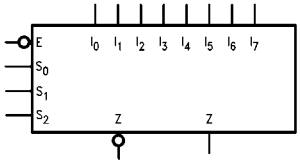
- I_{CC} reduced by 50%
- Outputs source/sink 24 mA
- ACT151 has TTL-compatible inputs

Ordering Code:

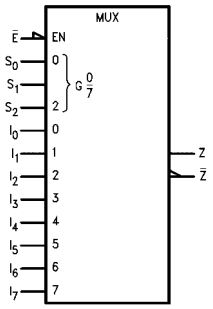
Order Number	Package Number	Package Description
74AC151SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150” Narrow Body
74AC151SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74AC151MTC	MTC16	16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
74AC151PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300” Wide
74ACT151SC	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150” Narrow Body
74ACT151SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74ACT151PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300” Wide

Device also available in Tape and Reel. Specify by appending suffix letter “X” to the ordering code.

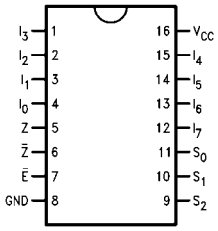
Logic Symbols



IEEE/IEC



Connection Diagram



Pin Descriptions

Pin Names	Description
I_0–I_7	Data Inputs
S_0–S_2	Select Inputs
$\overline{E}$	Enable Input
Z	Data Output
$\overline{Z}$	Inverted Data Output

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Truth Table

Inputs				Outputs	
$\overline{E}$	S_2	S_1	S_0	$\overline{Z}$	Z
H	X	X	X	H	L
L	L	L	L	$\overline{I}_0$	I_0
L	L	L	H	$\overline{I}_1$	I_1
L	L	H	L	$\overline{I}_2$	I_2
L	L	H	H	$\overline{I}_3$	I_3
L	H	L	L	$\overline{I}_4$	I_4
L	H	L	H	$\overline{I}_5$	I_5
L	H	H	L	$\overline{I}_6$	I_6
L	H	H	H	$\overline{I}_7$	I_7

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

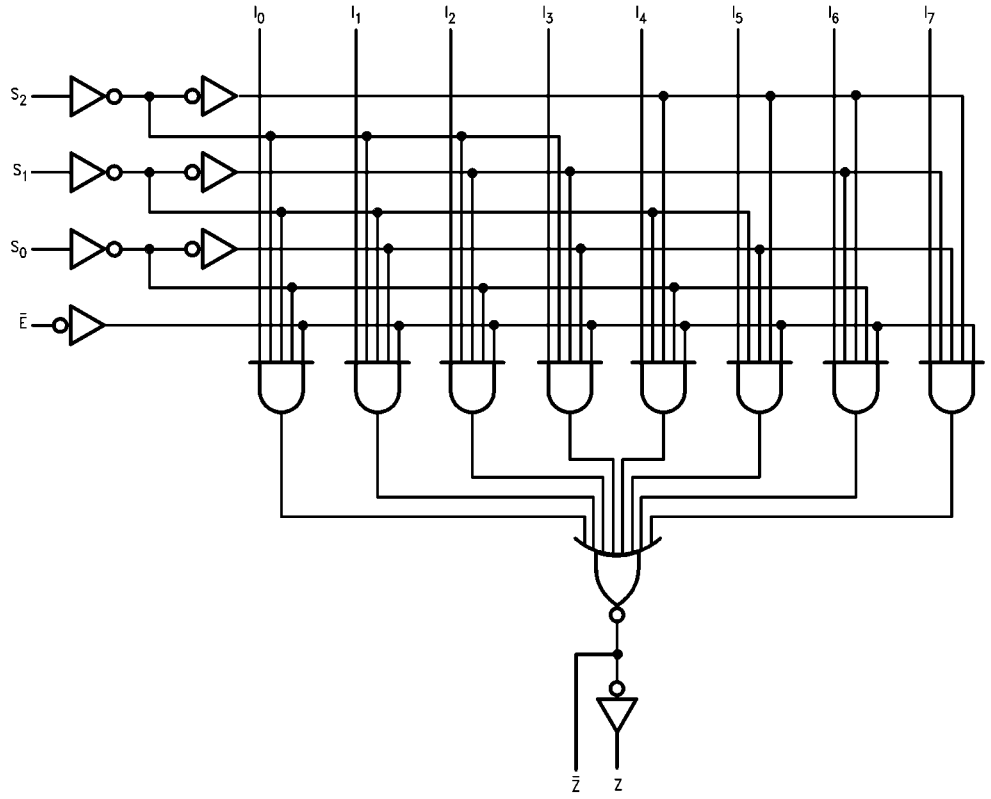
Functional Description

The AC/ACT151 is a logic implementation of a single pole, 8-position switch with the switch position controlled by the state of three Select inputs, S_0, S_1, S_2. Both true and complementary outputs are provided. The Enable input ($\overline{E}$) is active LOW. When it is not activated, the complementary output is HIGH and the true output is LOW regardless of all other inputs. The logic function provided at the output is:

$$Z = \overline{E} \bullet (I_0 \bullet \overline{S}_0 \bullet \overline{S}_1 \bullet \overline{S}_2 + I_1 \bullet S_0 \bullet \overline{S}_1 \bullet \overline{S}_2 +$$
$$I_2 \bullet \overline{S}_0 \bullet S_1 \bullet \overline{S}_2 + I_3 \bullet S_0 \bullet S_1 \bullet \overline{S}_2 + I_4 \bullet \overline{S}_0 \bullet \overline{S}_1 \bullet S_2 + I_5 \bullet$$
$$S_0 \bullet \overline{S}_1 \bullet S_2 + I_6 \bullet \overline{S}_0 \bullet S_1 \bullet S_2 + I_7 \bullet S_0 \bullet S_1 \bullet S_2)$$

The AC/ACT151 provides the ability, in one package, to select from eight sources of data or control information. By proper manipulation of the inputs, the AC/ACT151 can provide any logic function of four variables and its complement.

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.

Absolute Maximum Ratings(Note 1)

Supply Voltage (V_{CC})	−0.5V to +7.0V
DC Input Diode Current (I_{IK})	
V_I = −0.5V	−20 mA
V_I = V_{CC} + 0.5V	+20 mA
DC Input Voltage (V_I)	−0.5V to V_{CC} + 0.5V
DC Output Diode Current (I_{OK})	
V_O = −0.5V	−20 mA
V_O = V_{CC} + 0.5V	+20 mA
DC Output Voltage (V_O)	−0.5V to V_{CC} + 0.5V
DC Output Source	
or Sink Current (I_O)	±50 mA
DC V_{CC} or Ground Current	
per Output Pin (I_{CC} or I_{GND})	±50 mA
Storage Temperature (T_{STG})	−65°C to +150°C
Junction Temperature (T_J)	
PDIP	140°C

Recommended Operating Conditions

Supply Voltage (V_{CC})	
AC	2.0V to 6.0V
ACT	4.5V to 5.5V
Input Voltage (V_I)	0V to V_{CC}
Output Voltage (V_O)	0V to V_{CC}
Operating Temperature (T_A)	−40°C to +85°C
Minimum Input Edge Rate (ΔV/Δt)	
AC Devices	
V_{IN} from 30% to 70% of V_{CC}	
V_{CC} @ 3.3V, 4.5V, 5.5V	125 mV/ns
Minimum Input Edge Rate (ΔV/Δt)	
ACT Devices	
V_{IN} from 0.8V to 2.0V	
V_{CC} @ 4.5V, 5.5V	125 mV/ns

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation of FACT™ circuits outside databook specifications.

DC Electrical Characteristics for AC

Symbol	Parameter	V_{CC} (V)	T_A = +25°C Typ	T_A = −40°C to +85°C Guaranteed Limits		Units	Conditions
V_{IH}	Minimum HIGH Level Input Voltage	3.0	1.5	2.1	2.1	V	V_{OUT} = 0.1V or V_{CC} − 0.1V
		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} = 0.1V or V_{CC} − 0.1V
		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		
							V_{IN} = V_{IL} or V_{IH}
		3.0		2.56	2.46		I_{OH} = −12 mA
		4.5		3.86	3.76	V	I_{OH} = −24 mA
		5.5		4.86	4.76		I_{OH} = −24 mA(Note 2)
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		
							V_{IN} = V_{IL} or V_{IH}
		3.0		0.36	0.44		I_{OL} = 12 mA
		4.5		0.36	0.44	V	I_{OL} = 24 mA
		5.5		0.36	0.44		I_{OL} = 24 mA (Note 2)
I_{IN} (Note 4)	Maximum Input Leakage Current	5.5		±0.1	±1.0	μA	V_I = V_{CC}, GND
I_{OLD}	Minimum Dynamic	5.5			75	mA	V_{OLD} = 1.65V Max
I_{OHD}	Output Current (Note 3)	5.5			−75	mA	V_{OHD} = 3.85V Min
I_{CC} (Note 4)	Maximum Quiescent Supply Current	5.5		4.0	40.0	μA	V_{IN} = V_{CC} or GND

Note 2: All outputs loaded; thresholds on input associated with output under test.

Note 3: Maximum test duration 2.0 ms, one output loaded at a time.

Note 4: I_{IN} and I_{CC} @ 3.0V are guaranteed to be less than or equal to the respective limit @ 5.5V V_{CC}.

DC Electrical Characteristics for ACT

Symbol	Parameter	V_{CC} (V)	$T_A = +25°C$ Typ	$T_A = -40°C$ to $+85°C$ Guaranteed Limits		Units	Conditions
V_{IH}	Minimum HIGH Level Input Voltage	4.5	1.5	2.0	2.0	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	1.5	2.0	2.0		
V_{IL}	Maximum LOW Level Input Voltage	4.5	1.5	0.8	0.8	V	$V_{OUT} = 0.1V$ or $V_{CC} - 0.1V$
		5.5	1.5	0.8	0.8		
V_{OH}	Minimum HIGH Level Output Voltage	4.5	4.49	4.4	4.4	V	$I_{OUT} = -50\ \mu A$
		5.5	5.49	5.4	5.4		
							$V_{IN} = V_{IL}$ or V_{IH}
		4.5		3.86	3.76	V	$I_{OH} = -24$ mA
		5.5		4.86	4.76		$I_{OH} = -24$ mA (Note 5)
V_{OL}	Maximum LOW Level Output Voltage	4.5	0.001	0.1	0.1	V	$I_{OUT} = 50\ \mu A$
		5.5	0.001	0.1	0.1		
							$V_{IN} = V_{IL}$ or V_{IH}
		4.5		0.36	0.44	V	$I_{OL} = 24$ mA
		5.5		0.36	0.44		$I_{OL} = 24$ mA (Note 5)
I_{IN}	Maximum Input Leakage Current	5.5		±0.1	±1.0	µA	$V_I = V_{CC}$, GND
I_{CCT}	Maximum I_{CC}/Input	5.5	0.6		1.5	mA	$V_I = V_{CC} - 2.1V$
I_{OLD}	Minimum Dynamic Output Current (Note 6)	5.5			75	mA	$V_{OLD} = 1.65V$ Max
I_{OHD}		5.5			−75	mA	$V_{OHD} = 3.85V$ Min
I_{CC}	Maximum Quiescent Supply Current	5.5		4.0	40.0	µA	$V_{IN} = V_{CC}$ or GND

Note 5: All outputs loaded; thresholds on input associated with output under test.

Note 6: Maximum test duration 2.0 ms, one output loaded at a time.

AC Electrical Characteristics for AC

Symbol	Parameter	V_{CC} (V) (Note 7)	$T_A = +25°C$, $C_L = 50$ pF Min	Typ	Max	$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF Min	Max	Units
t_{PLH}	Propagation Delay S_n to Z or $\overline{Z}$	3.3	3.0	11.5	18.0	3.0	20.0	ns
		5.0	2.5	8.5	13.0	2.0	15.0	
t_{PHL}	Propagation Delay S_n to Z or $\overline{Z}$	3.3	2.5	12.0	18.0	2.5	20.0	ns
		5.0	2.0	8.5	13.0	1.5	15.0	
t_{PLH}	Propagation Delay $\overline{E}$ to Z or $\overline{Z}$	3.3	2.5	8.0	13.0	2.0	14.0	ns
		5.0	2.0	6.0	10.0	1.5	11.0	
t_{PHL}	Propagation Delay $\overline{E}$ to Z or $\overline{Z}$	3.3	1.5	8.5	13.0	1.5	14.0	ns
		5.0	1.5	6.5	10.0	1.5	11.0	
t_{PLH}	Propagation Delay I_n to Z or $\overline{Z}$	3.3	2.5	9.5	14.0	2.0	15.5	ns
		5.0	1.5	7.0	10.5	1.5	11.0	
t_{PHL}	Propagation Delay I_n to Z or $\overline{Z}$	3.3	2.5	9.5	15.0	2.0	16.0	ns
		5.0	1.5	7.0	11.0	1.5	12.0	

Note 7: Voltage Range 3.3 is 3.3V ± 0.3V
Voltage Range 5.0 is 5.0V ± 0.5V

AC Electrical Characteristics for ACT

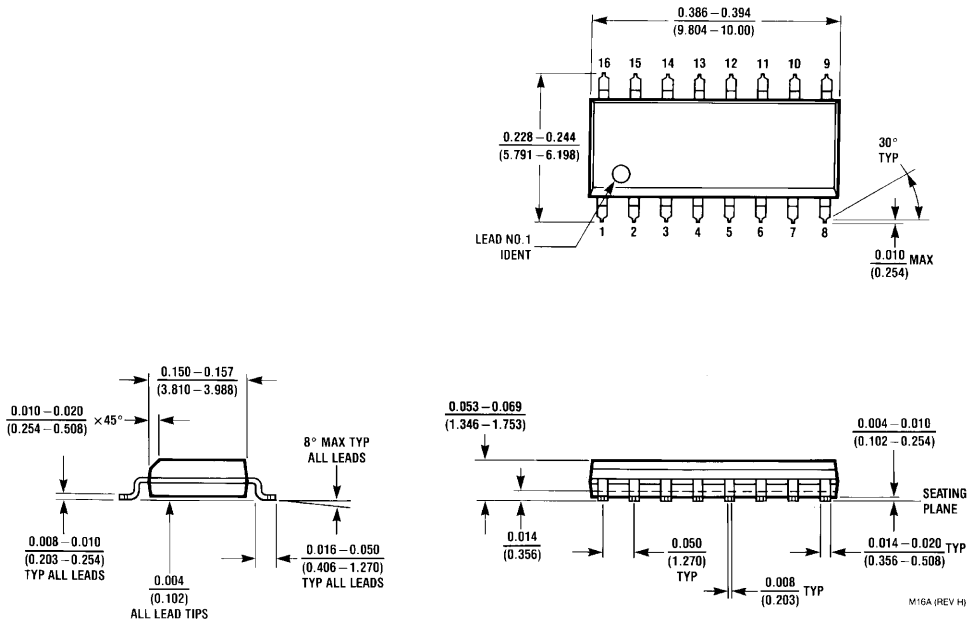
Symbol	Parameter	V_{CC} (V) (Note 8)	$T_A = +25°C$, $C_L = 50$ pF			$T_A = -40°C$ to $+85°C$, $C_L = 50$ pF		Units
			Min	Typ	Max	Min	Max	
t_{PLH}	Propagation Delay S_n to Z	5.0	3.5	12.5	15.5	3.0	17.0	ns
t_{PHL}	Propagation Delay S_n to Z	5.0	3.5	12.5	15.5	3.0	16.5	ns
t_{PLH}	Propagation Delay S_n to $\overline{Z}$	5.0	3.5	12.5	15.0	3.0	16.5	ns
t_{PHL}	Propagation Delay S_n to $\overline{Z}$	5.0	4.0	12.5	16.5	3.5	18.5	ns
t_{PLH}	Propagation Delay $\overline{E}$ to Z	5.0	2.5	6.0	9.5	2.5	10.0	ns
t_{PHL}	Propagation Delay $\overline{E}$ to Z	5.0	2.5	6.0	9.0	2.5	10.0	ns
t_{PLH}	Propagation Delay $\overline{E}$ to $\overline{Z}$	5.0	2.5	6.0	8.5	2.5	9.5	ns
t_{PHL}	Propagation Delay $\overline{E}$ to $\overline{Z}$	5.0	3.0	6.5	10.0	2.5	10.5	ns
t_{PLH}	Propagation Delay I_n to Z	5.0	3.5	7.5	11.5	3.0	12.5	ns
t_{PHL}	Propagation Delay I_n to Z	5.0	3.5	8.0	12.0	3.0	13.5	ns
t_{PLH}	Propagation Delay I_n to $\overline{Z}$	5.0	3.5	8.0	12.0	3.0	13.0	ns
t_{PHL}	Propagation Delay I_n to $\overline{Z}$	5.0	4.0	8.0	12.5	3.0	14.0	ns

Note 8: Voltage Range 5.0 is 5.0V ± 0.5V

Capacitance

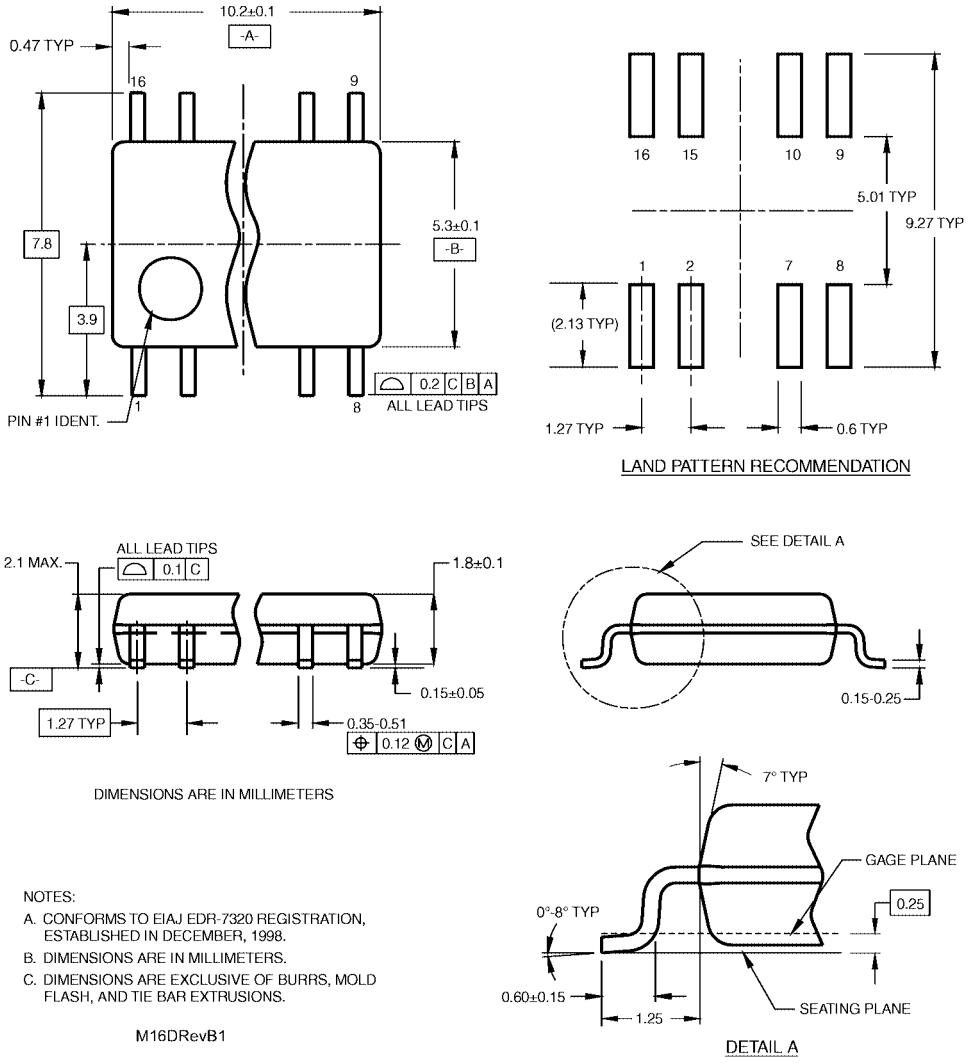
Symbol	Parameter	Typ	Units	Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = OPEN
C_{PD}	Power Dissipation Capacitance	70.0	pF	V_{CC} = 5.0V

Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150” Narrow Body
Package Number M16A

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



NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

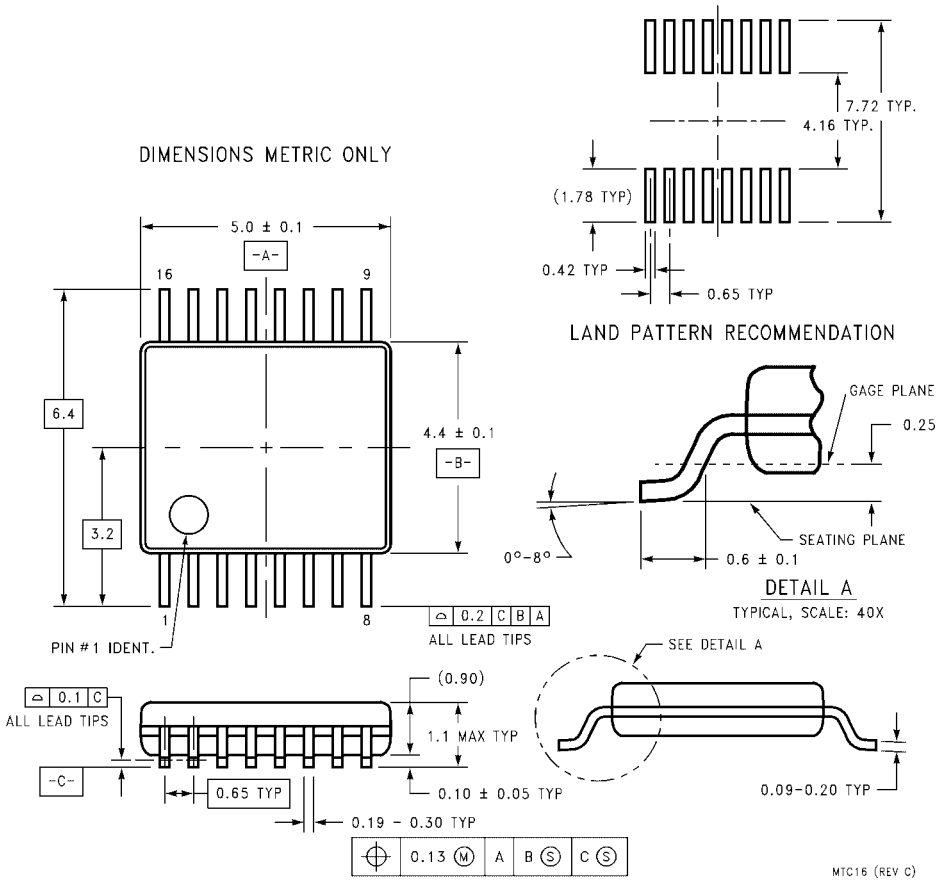
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M16DRevB1

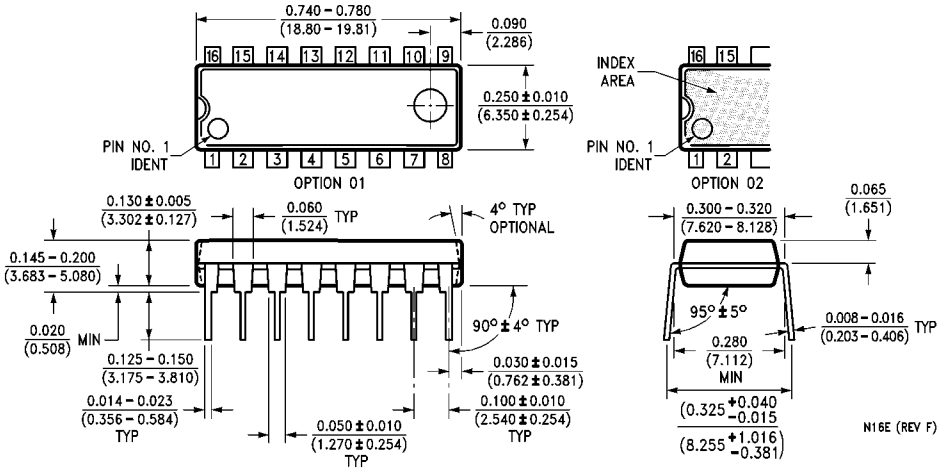
16-Lead Small Outline Package (SOIC), EIAJ TYPE II, 5.3mm Wide
Package Number M16D

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



16-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC16

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



16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N16E