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MOTOROLA

SN75173
SN75175

Quad EIA-485 Line Receivers

The Motorola SN75173/175 are monolithic quad differential line receivers with three–state outputs. They are designed specifically to meet the requirements of EIA–485, EIA–422A/23A Standards and CCITT recommendations.

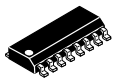
The devices are optimized for balanced multipoint bus transmission at rates up to 10 megabits per second. They also feature high input impedance, input hysteresis for increased noise immunity, and input sensitivity of ±200 mV over a common mode input voltage range of –12 V to 12 V. The SN75173/175 are designed for optimum performance when used with the SN75172 or SN75174 quad differential line drivers.

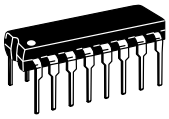
- Meets EIA Standards EIA–422A and EIA–423A, EIA–485
- Meets CCITT Recommendations V.10, V.11, X.26, and X.27
- Designed for Multipoint Transmission on Long Bus Lines in Noisy Environments
- 3–State Outputs
- Common–Mode Input Voltage Range . . . –12 V to 12 V
- Input Sensitivity . . . ±200 mV
- Input Hysteresis . . . 50 mV Typ
- High Input Impedance . . . 1 EIA–485 Unit Load
- Operates from Single 5.0 V Supply
- Lower Power Requirements
- Plug–In Replacement for MC3486 (SN75175)
  AM26LS32 (SN75173)

QUAD EIA–485 LINE RECEIVERS WITH THREE–STATE OUTPUTS

SEMICONDUCTOR TECHNICAL DATA

D SUFFIX
PLASTIC PACKAGE
CASE 751B
(SO–16)

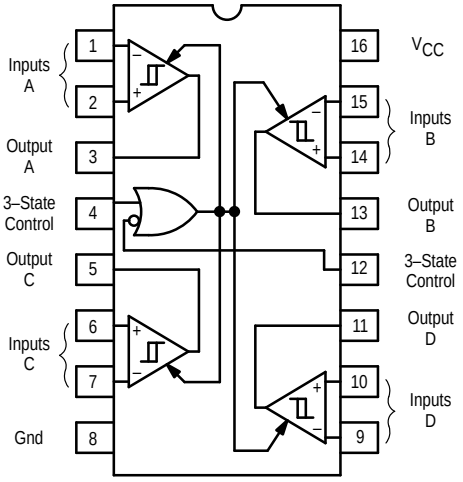




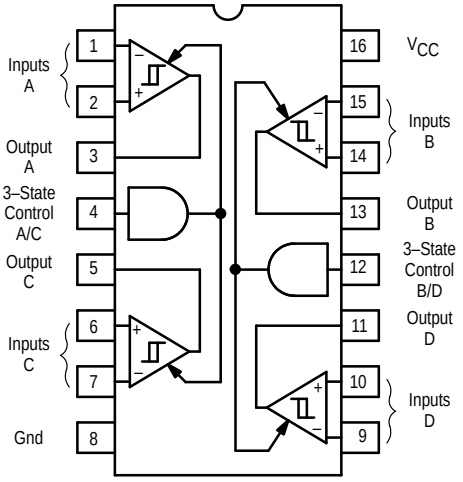
N SUFFIX
PLASTIC PACKAGE
CASE 648

PIN CONNECTIONS

SN75173



SN75175



ORDERING INFORMATION

Device	Operating Temperature Range	Package
SN75173N	T_A = 0 to +70°C	Plastic DIP

ORDERING INFORMATION

Device	Operating Temperature Range	Package
SN75175N	T_A = 0 to +70°C	Plastic DIP
SN75175D		SO–16

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	7.0	Vdc
Input Common Mode Voltage	V_{ICM}	±25	Vdc
Input Differential Voltage	V_{ID}	±25	Vdc
Three–State Control Input Voltage	V_I	7.0	Vdc
Output Sink Current	I_O	50	mA
Storage Temperature	T_{stg}	–65 to +150	°C
Operating Junction Temperature	T_J	+150	°C

RECOMMENDED OPERATING CONDITIONS

Rating	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	4.75 to 5.25	Vdc
Operating Ambient Temperature	T_A	0 to +70	°C
Input Common Mode Voltage Range	V_{ICM}	–12 to +12	Vdc
Input Differential Voltage Range	V_{IDR}	–12 to +12	Vdc

ELECTRICAL CHARACTERISTICS (Unless otherwise noted, minimum and maximum limits apply over recommended temperature and power supply voltage ranges. Typical values are for T_A = 25°C, V_{CC} = 5.0 V, and V_{ICM} = 0 V, Note 1).

Characteristic	Symbol	Min	Typ	Max	Unit
Differential Input Threshold Voltage (Note 2) (–12 V ≤ V_{ICM} ≤ 12 V, V_{IH} = 2.0 V) (I_O = –0.4 mA, V_{OH} ≥ 2.7 V) (I_O = 16 mA, V_{OL} ≤ 0.5 V)	$V_{TH(D)}$	 – –	 – –	 0.2 –0.2	V
Input Hysteresis	$V_{T+} - V_{T–}$	–	50	–	mV
Input Line Current (Differential Inputs) (Unmeasured Input at 0 V, Note 3) (V_I = 12 V) (V_I = –7.0 V)	I_I	 – –	 – –	 1.0 –0.8	mA
Input Resistance (Note 4)	r_i	1 Unit Load	–	–	
Input Balance and Output Level (Note 3) (–12 V ≤ V_{ICM} ≤ 12 V, V_{IH} = 2.0 V) (I_O = –0.4 mA, V_{ID} = 0.2 V) (I_O = 8.0 mA, V_{ID} = –0.2 V) (I_O = 16 mA, V_{ID} = –0.2 V)	 V_{OH} V_{OL} V_{OL}	 2.7 – –	 – – –	 – 0.45 0.5	V
Input Voltage – High Logic State (Three–State Control)	V_{IH}	2.0	–	–	V
Input Voltage – Low Logic State (Three–State Control)	V_{IL}	–	–	0.8	V
Input Current – High Logic State (Three–State Control) (V_{IH} = 2.7 V) (V_{IH} = 5.5 V)	I_{IH}	 – –	 – –	 20 100	µA
Input Current – Low Logic State (Three–State Control) (V_{IL} = 0.4 V)	I_{IL}	–	–	–100	µA
Input Clamp Diode Voltage (Three–State Control) (I_{IK} = –18 mA)	V_{IK}	–	–	–1.5	V
Output Third State Leakage Current ($V_{I(D)}$ = 3.0 V, V_{IL} = 0.8 V, V_O = 0.4 V) ($V_{I(D)}$ = –3.0 V, V_{IL} = 0.8 V, V_O = 2.4 V)	I_{OZ}	 – –	 – –	 –20 20	µA
Output Short–Circuit Current (Note 5) ($V_{I(D)}$ = 3.0 V, V_{IH} = 2.0 V, V_O = 0 V)	I_{OS}	–15	–	–85	mA
Power Supply Current (V_{IL} = 0 V) (All Inputs Grounded)	I_{CC}	–	–	70	mA

NOTES: 1. All currents into device pins are shown as positive, out of device pins are negative. All voltages referenced to ground unless otherwise noted.
2. Differential input threshold voltage and guaranteed output levels are done simultaneously for worst case.
3. Refer to EIA–485 for exact conditions. Input balance and guaranteed output levels are done simultaneously for worst case.
4. Input resistance should be derived from input line current specifications and is shown for reference only. See EIA–485 and input line current specifications for more specific input resistance information.
5. Only one output at a time should be shorted.

SWITCHING CHARACTERISTICS (Unless otherwise noted, V_{CC} = 5.0 V and T_A = 25°C)

Characteristic	Symbol	SN75173			SN75175			Unit
		Min	Typ	Max	Min	Typ	Max	
Propagation Delay Time – Differential Inputs to Output								ns
Output High to Low	$t_{PHL(D)}$	–	25	35	–	25	35	
Output Low to High	$t_{PLH(D)}$	–	25	35	–	25	35	
Propagation Delay Time – Three–State Control to Output								ns
Output Low to Third State	t_{PLZ}	–	20	40	–	16	35	
Output High to Third State	t_{PHZ}	–	20	30	–	19	35	
Output Third State to High	t_{PZH}	–	16	22	–	11	30	
Output Third State to Low	t_{PZL}	–	16	25	–	11	30	

SN75173
FUNCTION TABLE (EACH RECEIVER)

Differential Inputs	3–State Control		Output Y
	4	12	
$V_{ID} \geq 0.2$ V	H	X	H
	X	L	H
$-0.2 < V_{ID} < 0.2$ V	H	X	?
	X	L	?
$V_{ID} \leq -0.2$ V	H	X	L
	X	L	L
X	L	H	Z

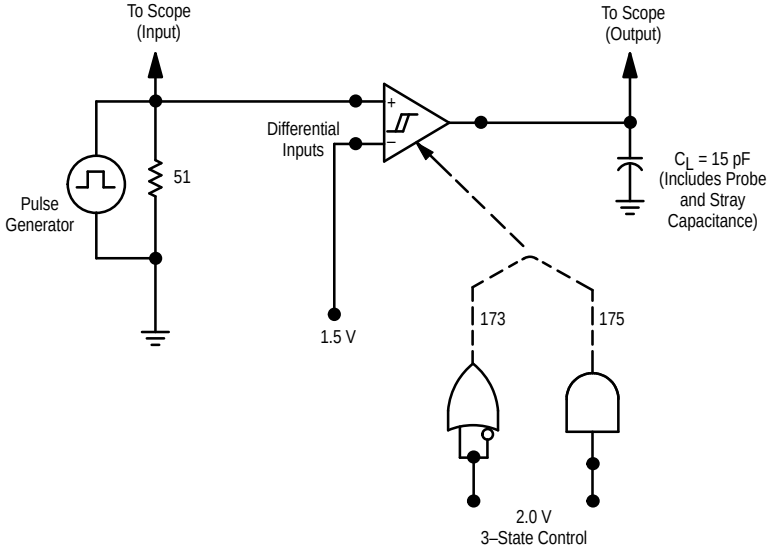
SN75175
FUNCTION TABLE (EACH RECEIVER)

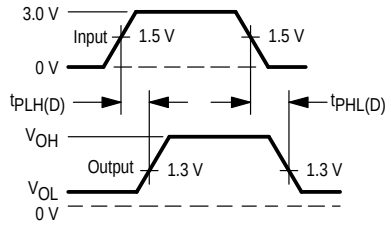
Differential Inputs	3–State Control	Output Y
$V_{ID} \geq 2.0$ V	H	H
-0.2 V $< V_{ID} < 0.2$ V	H	?
$V_{ID} \leq -0.2$ V	H	L
X	L	Z

H = high level
L = low level
X = irrelevant
? = indeterminate
Z = high–impedance (off)

SWITCHING TEST CIRCUIT AND WAVEFORMS

Figure 1. Propagation Delay, Differential Input to Output

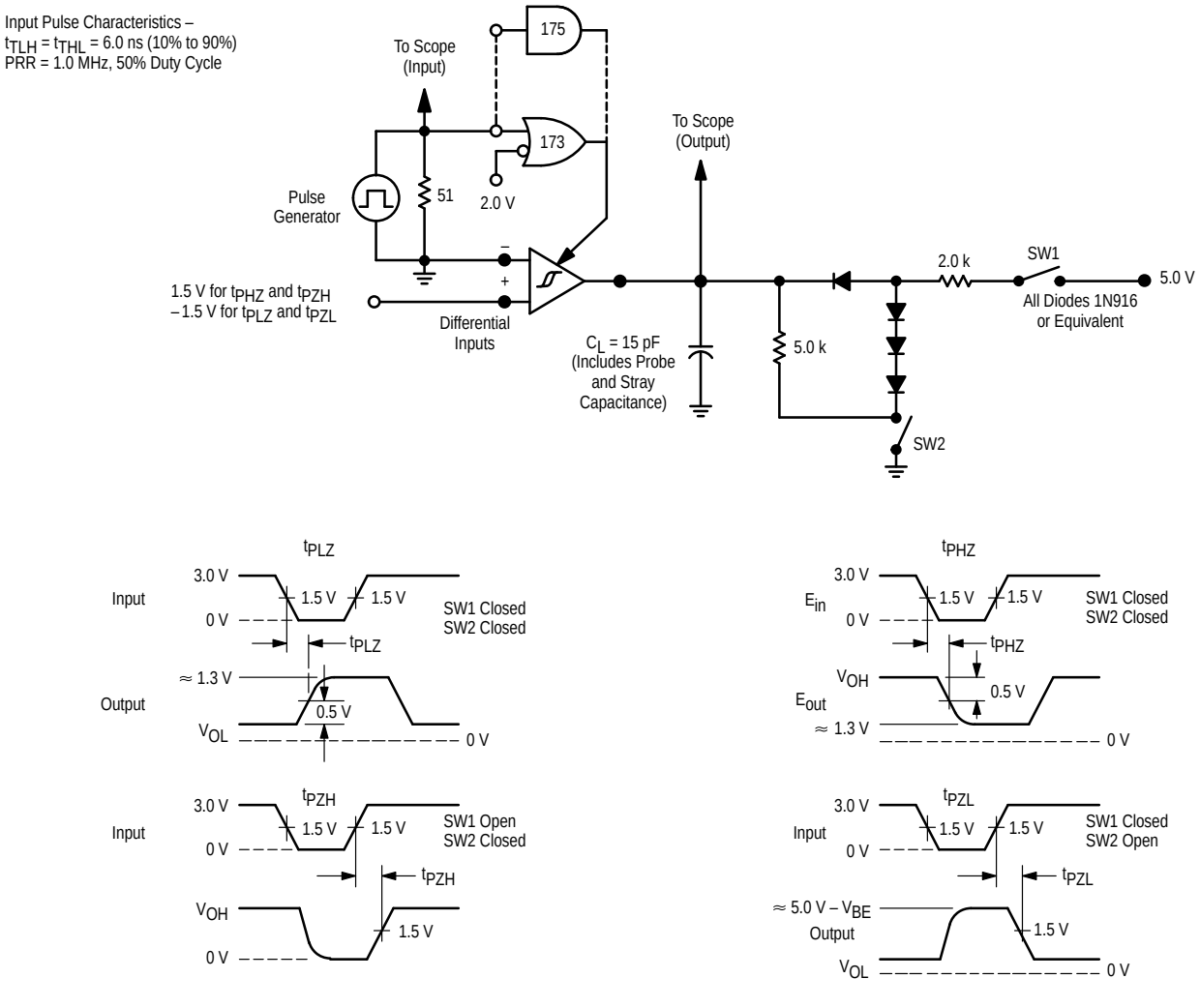




Input Pulse Characteristics –
$t_{TLH} = t_{THL}$ = 6.0 ns (10% to 90%)
PRR = 1.0 MHz, 50% Duty Cycle

SWITCHING TEST CIRCUIT AND WAVEFORMS (continued)

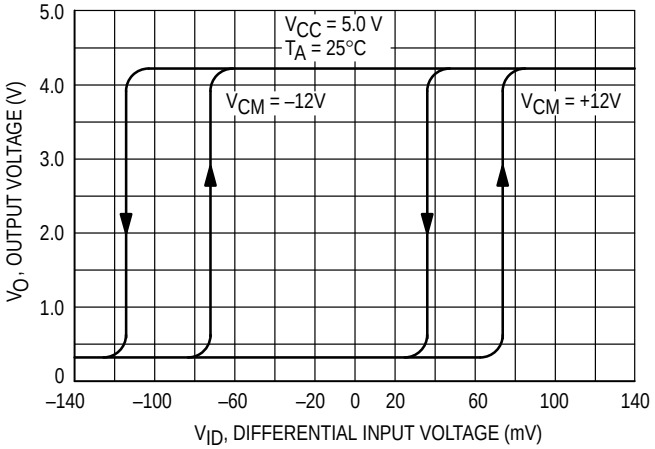
Figure 2. Propagation Delay, Three–State Control Input to Output



TYPICAL CHARACTERISTICS

(Both Device Types, Unless Otherwise Noted)

Figure 3. Output Voltage versus Differential Input Voltage



TYPICAL CHARACTERISTICS (continued)

Figure 4. Output Voltage versus 3–State Control Voltage

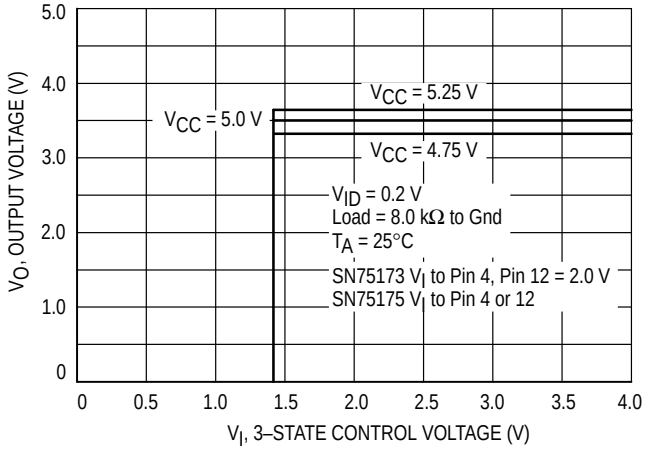


Figure 5. Output Voltage versus (Inverted) 3–State Control Voltage – SN75173

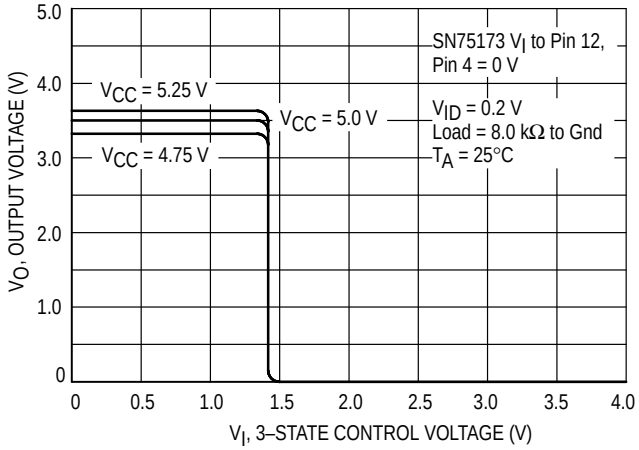


Figure 6. High Level Output Voltage versus Output Current

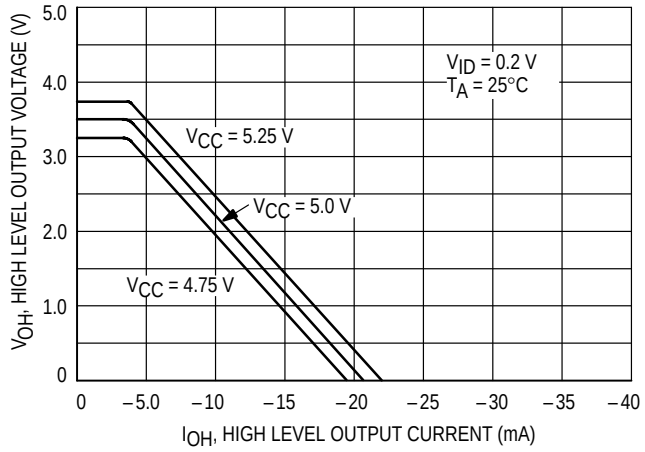


Figure 7. Low Level Output Voltage versus Output Current

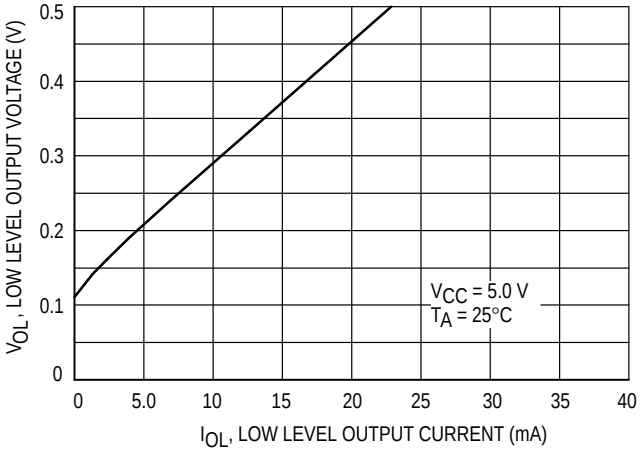


Figure 8. High Level Output Voltage versus Temperature

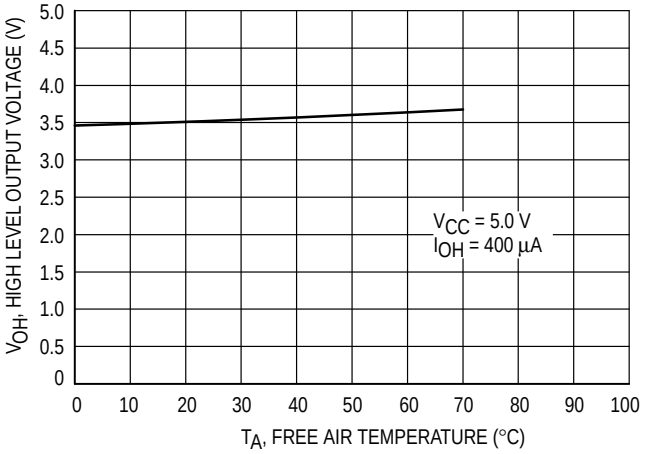
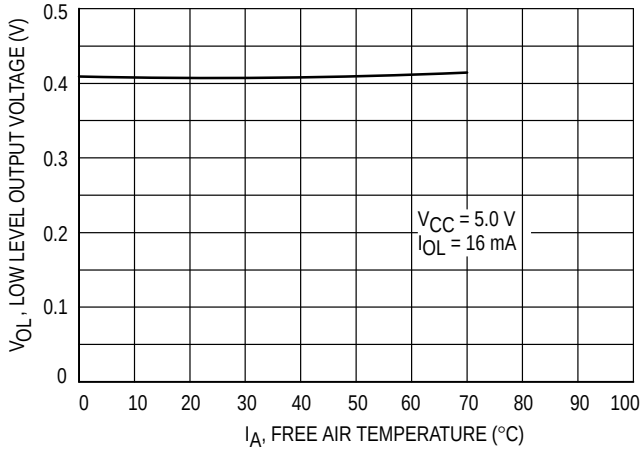
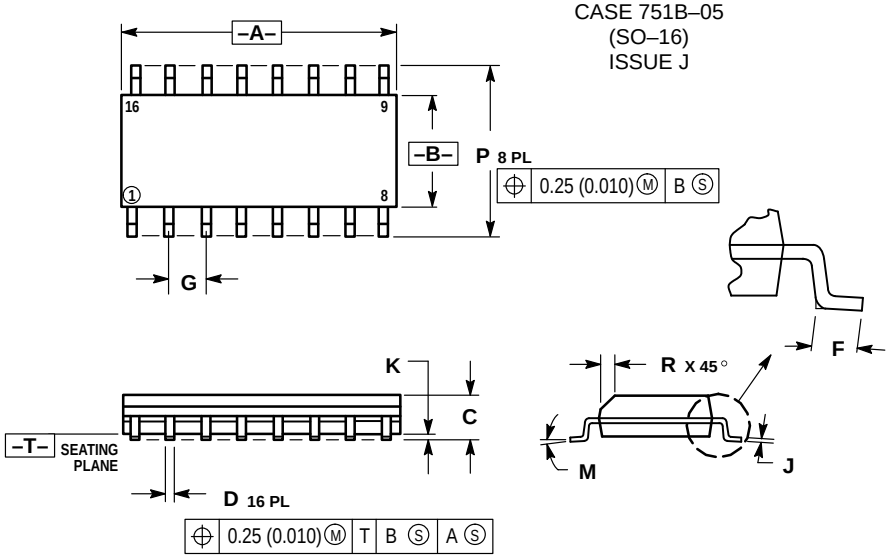


Figure 9. Low Level Output Voltage versus Temperature



OUTLINE DIMENSIONS

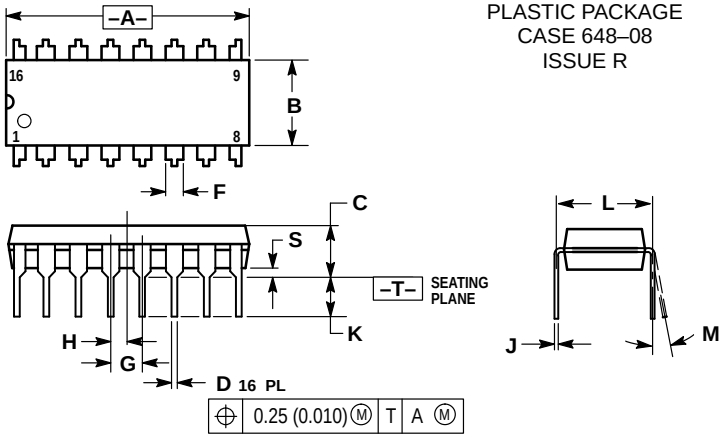
D SUFFIX
PLASTIC PACKAGE
CASE 751B–05
(SO–16)
ISSUE J



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 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

N SUFFIX
PLASTIC PACKAGE
CASE 648–08
ISSUE R



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

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