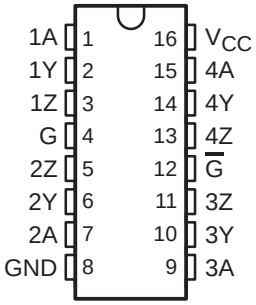
Jameco Part Number 758840

- **Meets or Exceeds the Requirements of ANSI Standard EIA/TIA-422-B and ITU Recommendation V.11**
- **Designed to Operate up to 20 Mbaud**
- **3-State TTL Compatible**
- **Single 5-V Supply Operation**
- **High Output Impedance in Power-Off Condition**
- **Complementary Output-Enable Inputs**
- **Improved Replacement for the AM26LS31**

D OR N PACKAGE
(TOP VIEW)



description

The four differential line drivers are designed for data transmission over twisted-pair or parallel-wire transmission lines. They meet the requirements of ANSI Standard EIA/TIA-422-B and ITU Recommendations V.11 and are compatible with 3-state TTL circuits. Advanced low-power Schottky technology provides high speed without the usual power penalties. Standby supply current is typically only 26 mA, while typical propagation delay time is less than 10 ns.

High-impedance inputs maintain low input currents, less than 1 μA for a high level and less than 100 μA for a low level. Complementary output-enable inputs (G and $\overline{G}$) allow these devices to be enabled at either a high input level or low input level. The SN75ALS192 is capable of data rates in excess of 20 Mbit/s and is designed to operate with the SN75ALS193 quadruple line receiver.

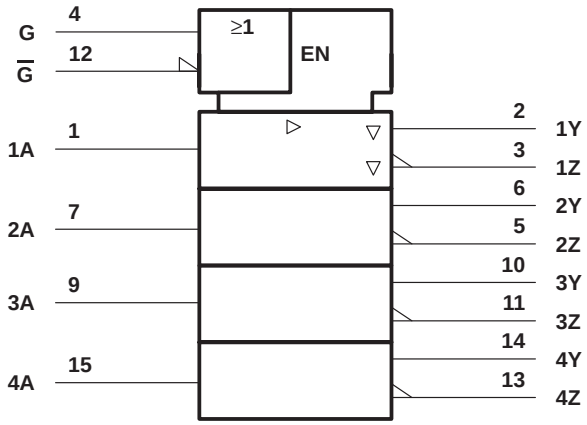
The SN75ALS192 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE
(each driver)

INPUT	ENABLES		OUTPUTS	
A	G	$\overline{G}$	Y	Z
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z

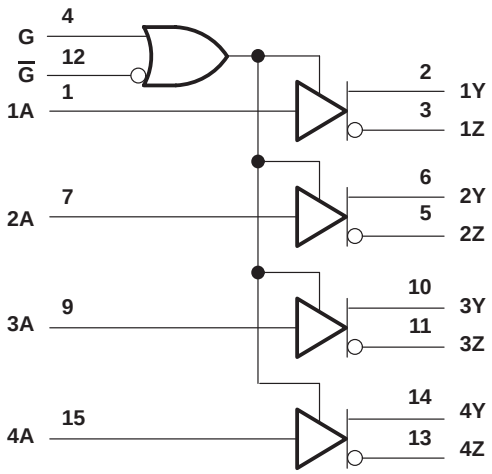
H = high level, L = low level, X = irrelevant,
Z = high impedance (off)

logic symbol†

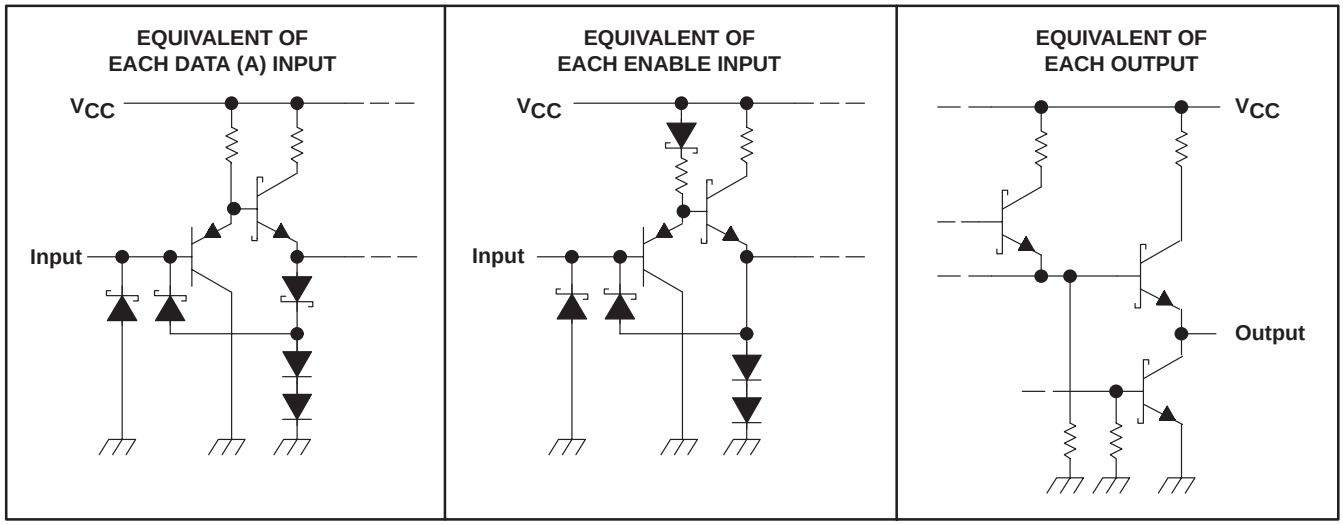


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage, V_{CC} (see Note 1) . . . . . 7 V
Input voltage, V_I . . . . . 7 V
Off-state output voltage . . . . . 6 V
Continuous total dissipation . . . . . See Dissipation Rating Table
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: All voltage values except differential output voltage, V_{OD}, are with respect to network ground terminal.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	950 mW	7.6 mW/°C	608 mW	N/A
N	1150 mW	9.2 mW/°C	736 mW	N/A

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High level input voltage, V_{IH}	2			V
Low-level input voltage, V_{IL}			0.8	V
High-level output current, I_{OH}			–20	mA
Low-level output current, I_{OL}			20	mA
Operating free-air temperature, T_A	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
V_{IK}	Input clamp voltage	V_{CC} = MIN,	I_I = –18 mA			–1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN,	I_{OH} = –20 mA	2.5			V
V_{OL}	Low-level output voltage	V_{CC} = MIN,	I_{OL} = 20 mA			0.5	V
V_O	Output voltage	V_{CC} = MAX,	I_O = 0	0		6	V
$\|V_{OD1}\|$	Differential output voltage	V_{CC} = MIN,	I_O = 0	1.5		6	V
$\|V_{OD2}\|$	Differential output voltage	R_L = 100 Ω,	See Figure 1	1/2 V_{OD1} or 2§			V
$\Delta\|V_{OD}\|$	Change in magnitude of differential output voltage¶	R_L = 100 Ω,	See Figure 1			±0.2	V
V_{OC}	Common-mode output voltage#	R_L = 100 Ω,	See Figure 1			±3	V
$\Delta\|V_{OC}\|$	Change in magnitude of common-mode output voltage¶	R_L = 100 Ω,	See Figure 1			±0.2	V
I_O	Output current with power off	V_{CC} = 0	V_O = 6 V			100	µA
			V_O = –0.25 V			–100	
I_{OZ}	Off-state (high-impedance state) output current	V_{CC} = MAX	V_O = 0.5 V			–20	µA
			V_O = 2.5 V			20	
I_I	Input current at maximum input voltage	V_{CC} = MAX,	V_I = 7 V			100	µA
I_{IH}	High-level input current	V_{CC} = MAX,	V_I = 2.7 V			20	µA
I_{IL}	Low-level input current	V_{CC} = MAX,	V_I = 0.4 V			–200	µA
I_{OS}	Short-circuit output current‖	V_{CC} = MAX		–30		–150	mA
I_{CC}	Supply current (all drivers)	V_{CC} = MAX,	All outputs disabled		26	45	mA

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at V_{CC} = 5 V and T_A = 25°C.
§ The minimum V_{OD2} with a 100-Ω load is either 1/2 V_{OD1} or 2 V, whichever is greater.
¶ $|V_{OD}|$ and $|V_{OC}|$ are the changes in magnitude of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level.
# In ANSI Standard EIA/TIA-422-B, V_{OC}, which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS}.
‖ Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 2)

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	S1 and S2 open,	C_L = 30 pF		6	13	ns
t_{PHL}	Propagation delay time, high-to-low-level output	S1 and S2 open,	C_L = 30 pF		9	14	ns
	Output-to-output skew	S1 and S2 open,	C_L = 30 pF		3	6	ns
t_{PZH}	Output enable time to high level	S1 open and S2 closed			11	15	ns
t_{PZL}	Output enable time to low level	S1 closed and S2 open			16	20	ns
t_{PHZ}	Output disable time from high level	S1 open and S2 closed,	C_L = 10 pF		8	15	ns
t_{PLZ}	Output disable time from low level	S1 and S2 closed,	C_L = 10 pF		18	20	ns

PARAMETER MEASUREMENT INFORMATION

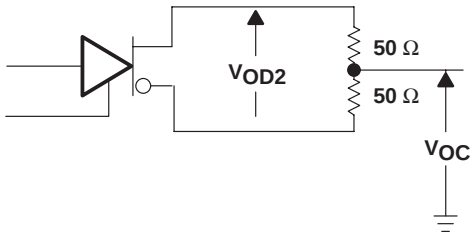
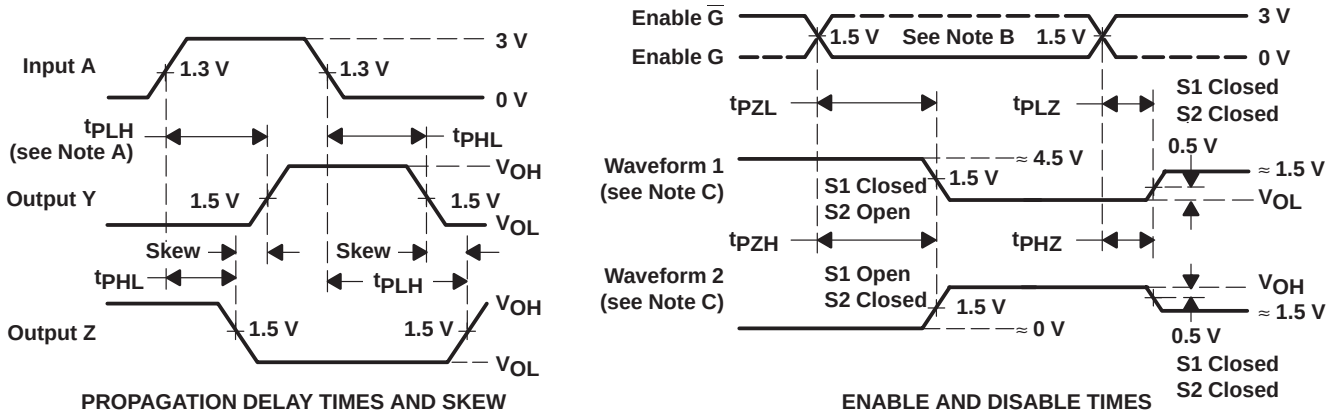
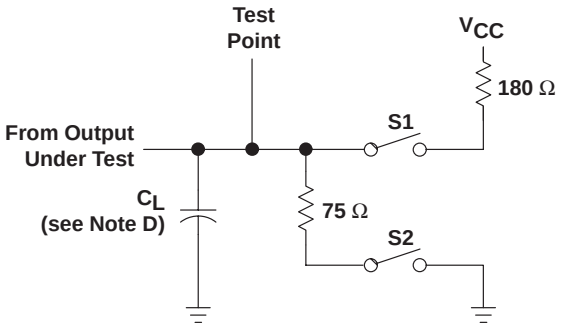


Figure 1. Differential and Common-Mode Output Voltages





NOTES: A. When measuring propagation delay times and skew, switches S1 and S2 are open.
B. Each enable is tested separately.
C. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
D. C_L includes probe and jig capacitance.
E. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O \approx 50\ \Omega$, $t_r \le 15$ ns, and $t_f \le 6$ ns.

Figure 2. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS†

Y OUTPUT VOLTAGE vs DATA INPUT VOLTAGE

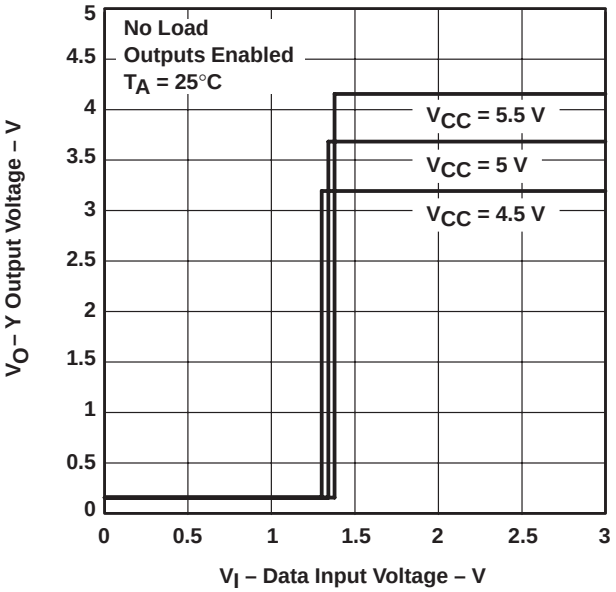


Figure 3

Y OUTPUT VOLTAGE vs DATA INPUT VOLTAGE

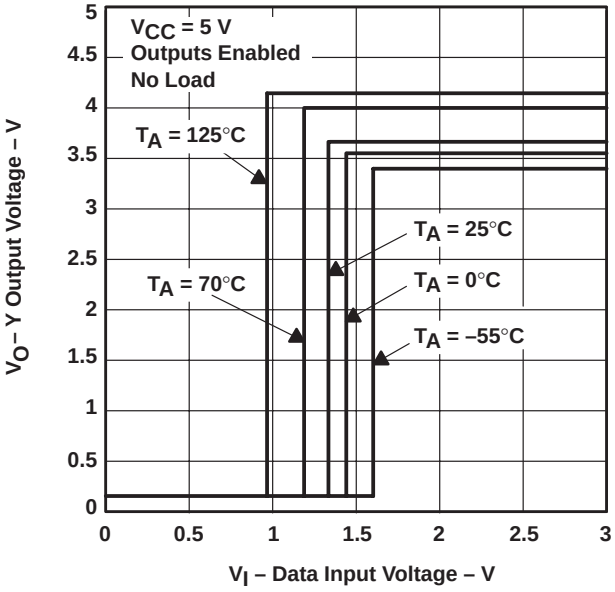
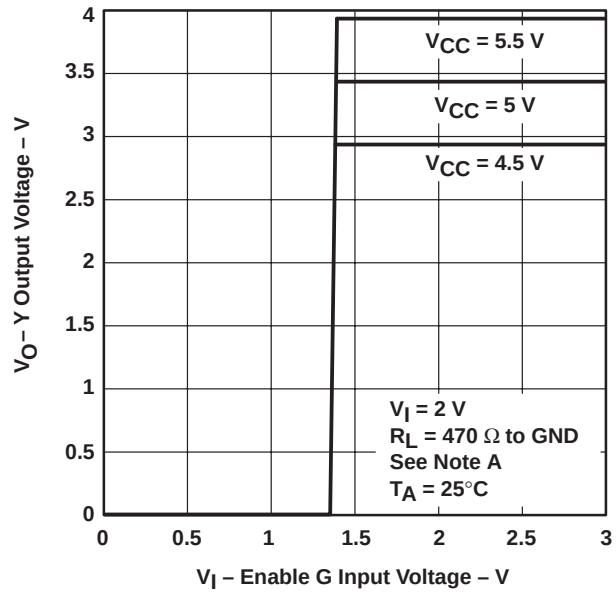


Figure 4

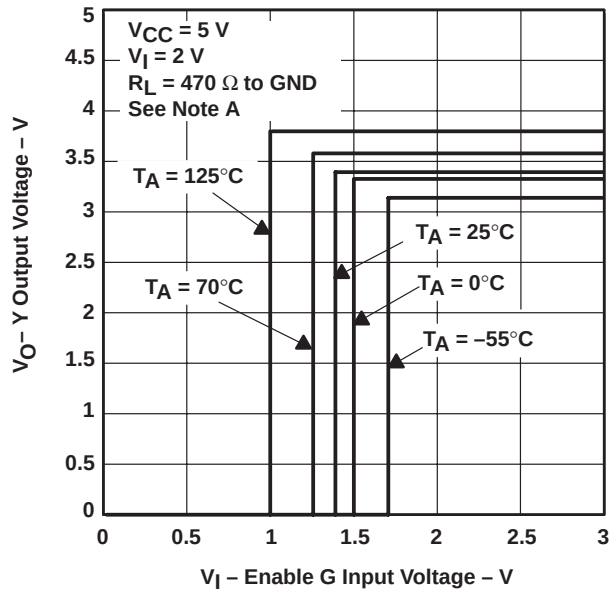
Y OUTPUT VOLTAGE vs ENABLE G INPUT VOLTAGE



NOTE A: The A input is connected to V_{CC} during the testing of the Y outputs and to ground during the testing of the Z outputs.

Figure 5

Y OUTPUT VOLTAGE vs ENABLE G INPUT VOLTAGE



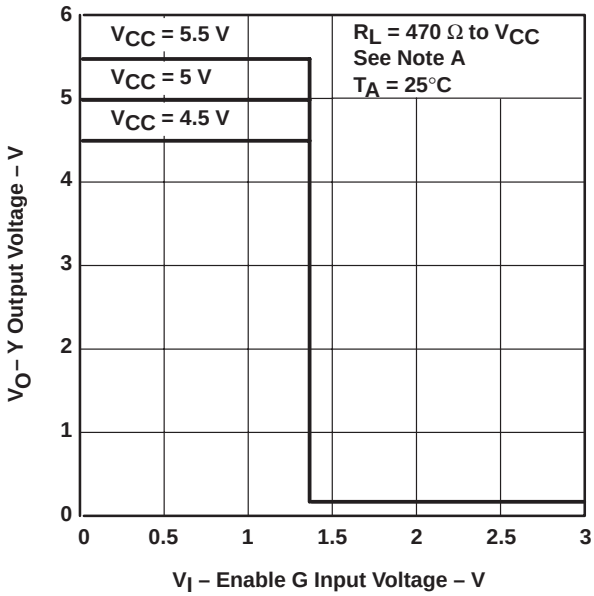
NOTE A: The A input is connected to V_{CC} during the testing of the Y outputs and to ground during the testing of the Z outputs.

Figure 6

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

TYPICAL CHARACTERISTICS†

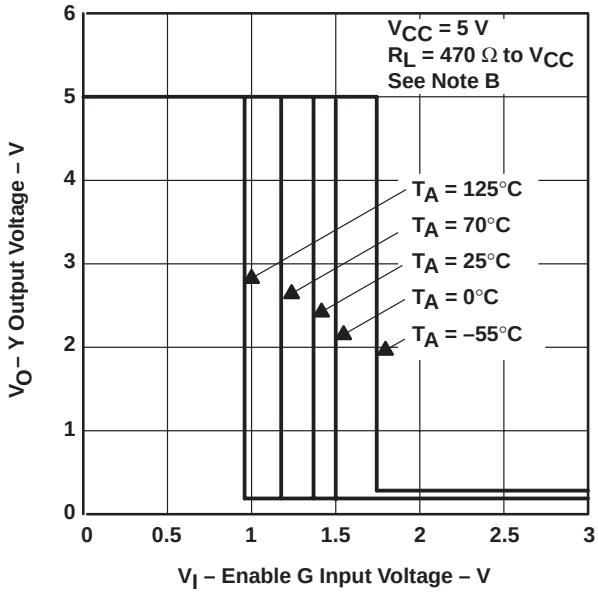
Z OUTPUT VOLTAGE vs ENABLE G INPUT VOLTAGE



NOTE A: The A input is connected to V_{CC} during the testing of the Y outputs and to ground during the testing of the Z outputs.

Figure 7

Z OUTPUT VOLTAGE vs ENABLE G INPUT VOLTAGE



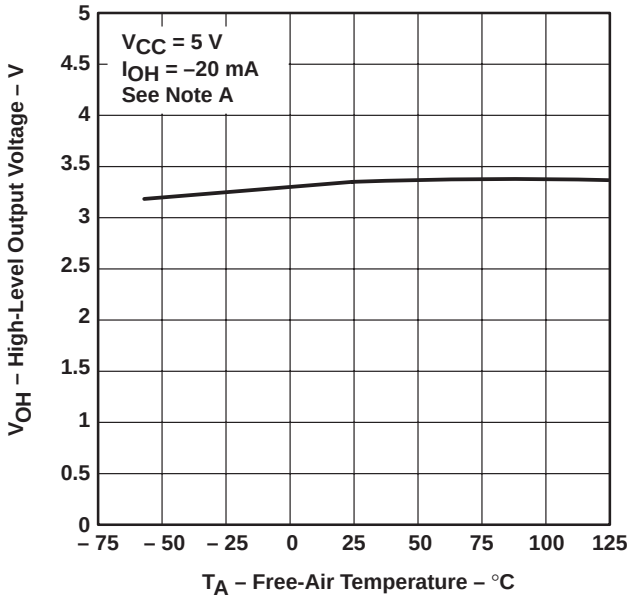
NOTE B: The A input is connected to GND during the testing of the Y outputs and to V_{CC} during the testing of the Z outputs.

Figure 8

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

TYPICAL CHARACTERISTICS†

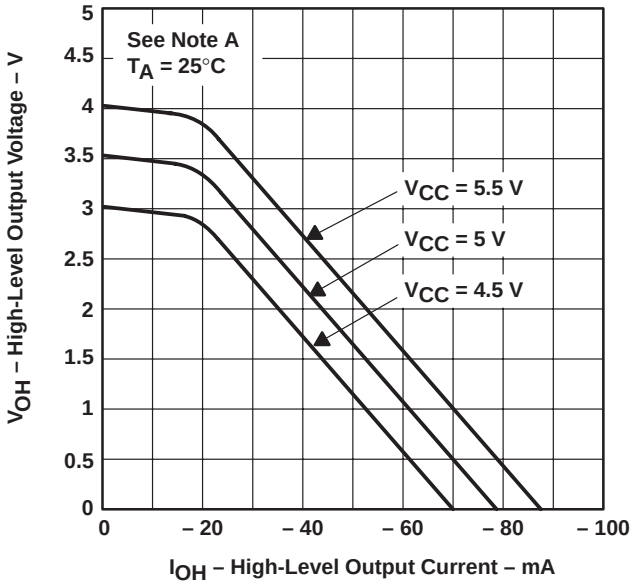
HIGH-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE



NOTE A: The A input is connected to V_{CC} during the testing of the Y outputs and to ground during the testing of the Z outputs.

Figure 9

HIGH-LEVEL OUTPUT VOLTAGE vs OUTPUT CURRENT



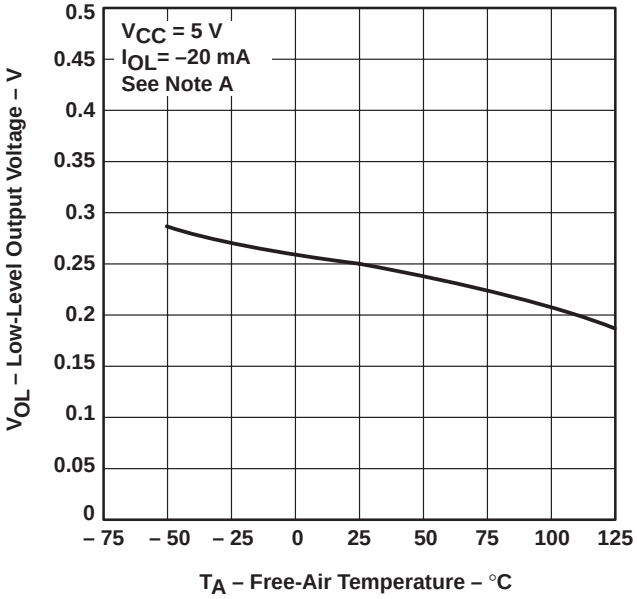
NOTE A: The A input is connected to V_{CC} during the testing of the Y outputs and to ground during the testing of the Z outputs.

Figure 10

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

TYPICAL CHARACTERISTICS†

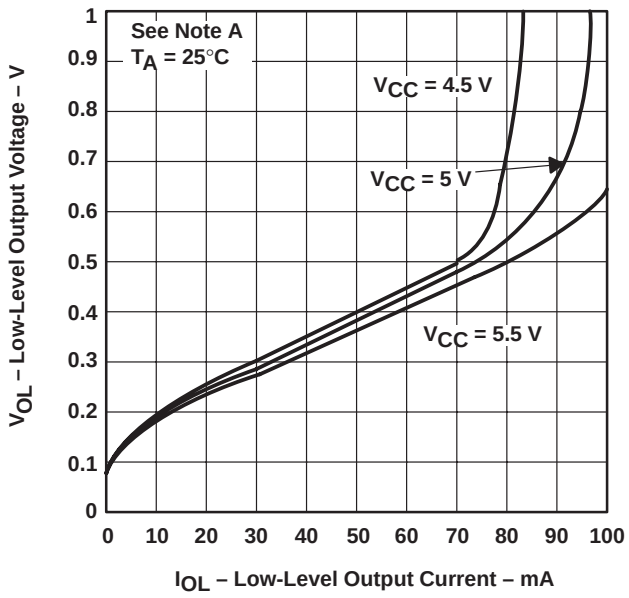
LOW-LEVEL OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE



NOTE A: The A input is connected to GND during the testing of the Y outputs and to V_{CC} during the testing of the Z outputs.

Figure 11

LOW-LEVEL OUTPUT VOLTAGE vs LOW-LEVEL OUTPUT CURRENT



NOTE A: The A input is connected to GND during the testing of the Y outputs and to V_{CC} during the testing of the Z outputs.

Figure 12

SUPPLY CURRENT vs SUPPLY VOLTAGE

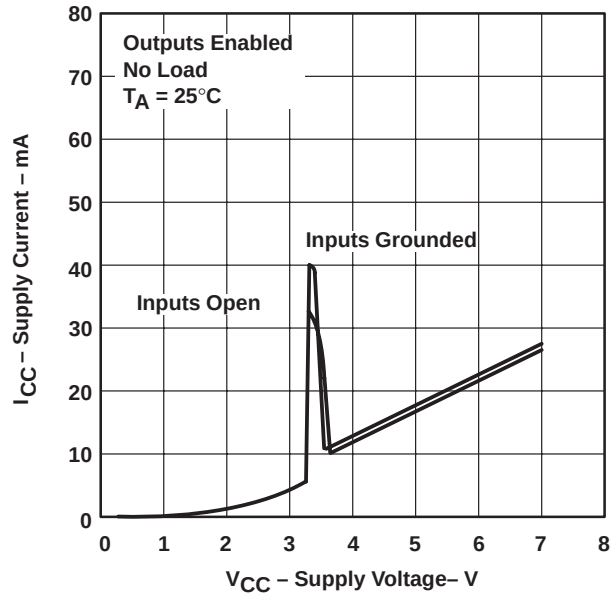


Figure 13

SUPPLY CURRENT vs SUPPLY VOLTAGE

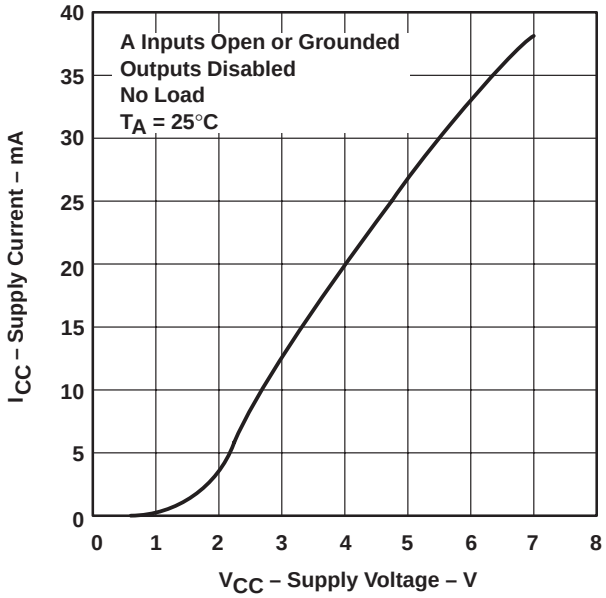


Figure 14

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

TYPICAL CHARACTERISTICS

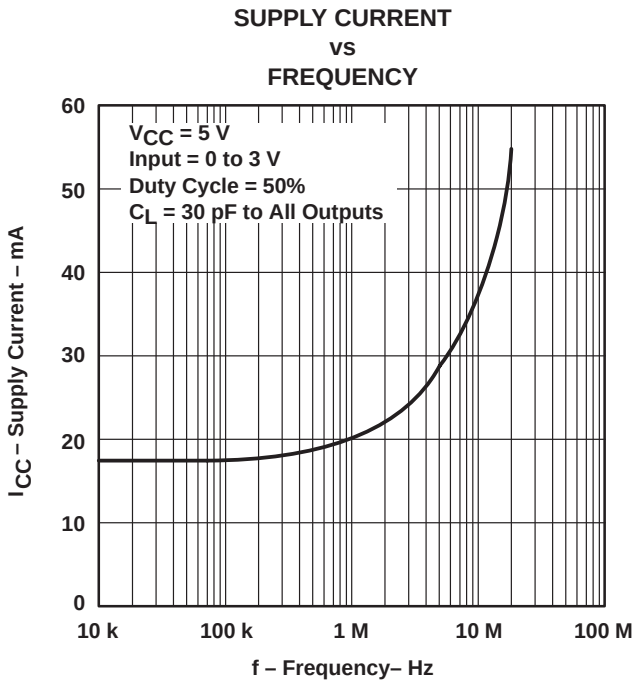


Figure 15

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
SN75ALS192D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75ALS192DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75ALS192DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75ALS192DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75ALS192N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75ALS192NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN75ALS192NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN75ALS192NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

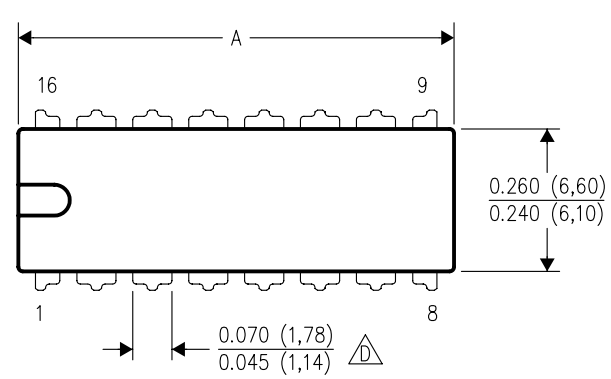
(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

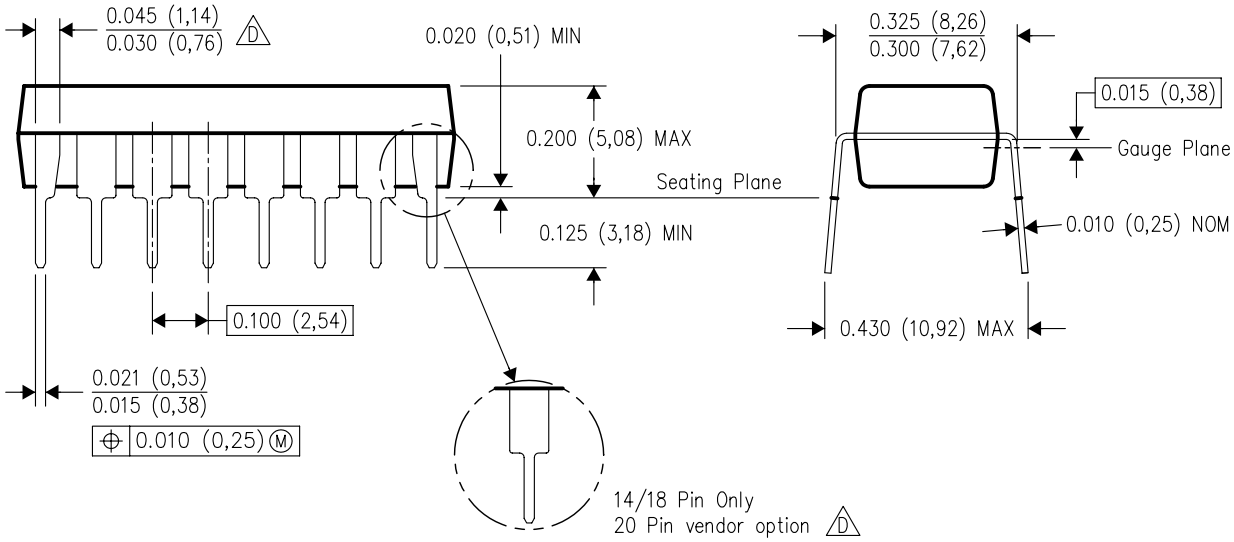
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



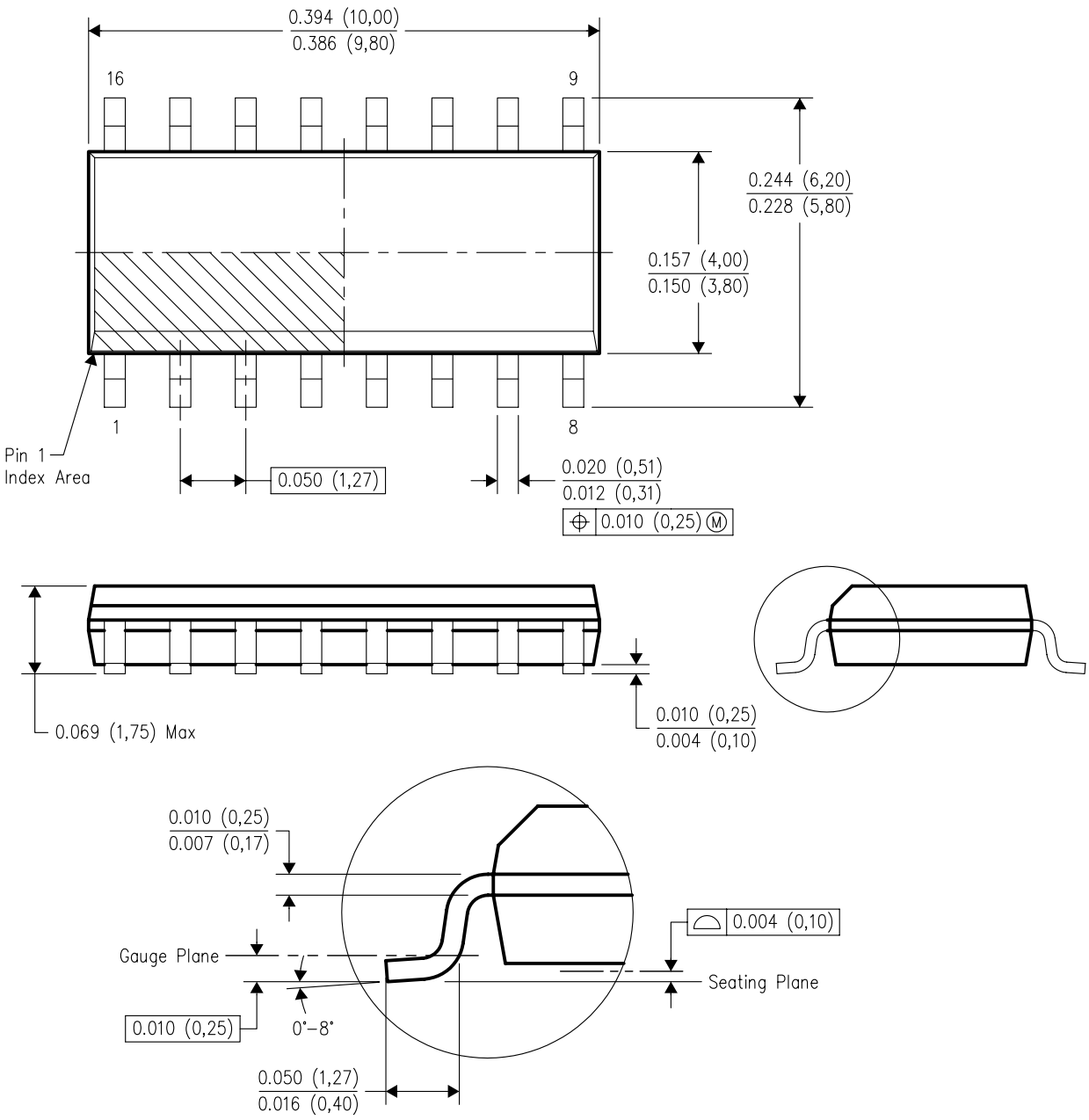
DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R–PDSO–G16) PLASTIC SMALL–OUTLINE PACKAGE

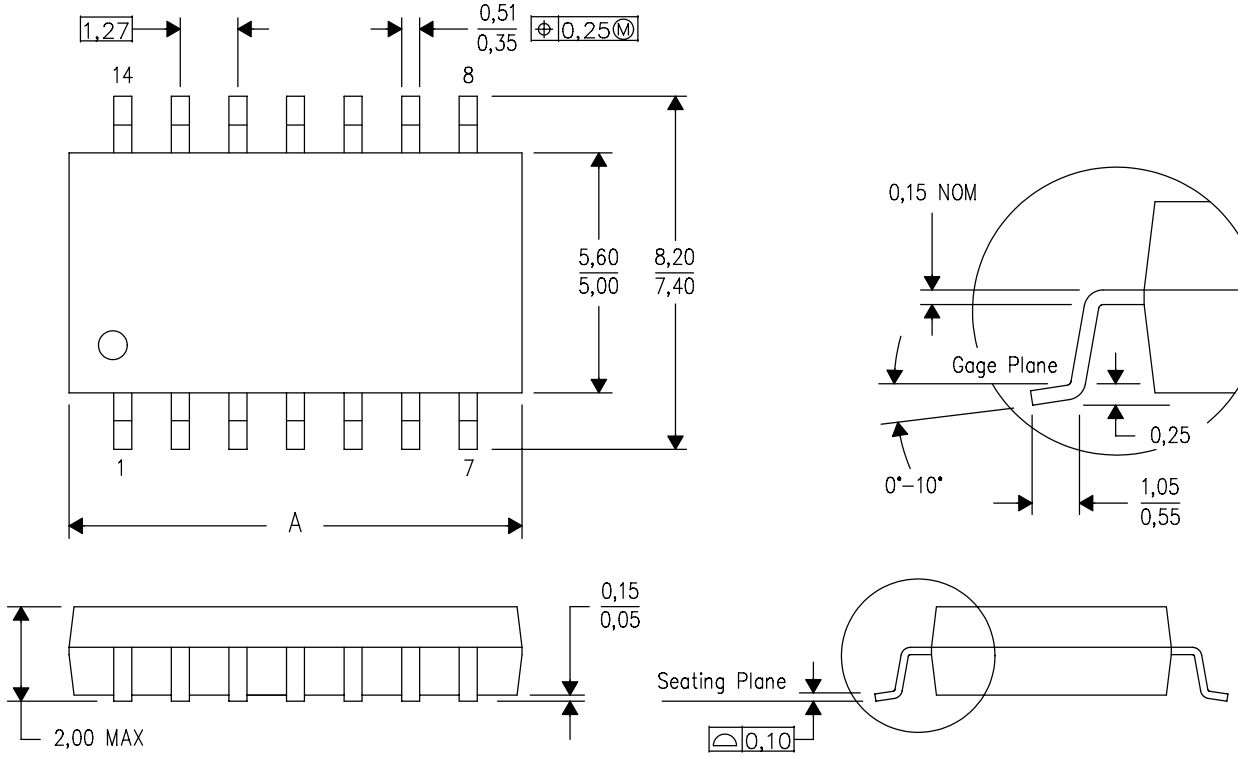


NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–012 variation AC.

MECHANICAL DATA

NS (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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