钍地半导体
Tudi Semiconductor

Product Specification

TUDI-SN75ALS194

Quadruple Differential Line Drivers

网址 www.sztdbdt.com

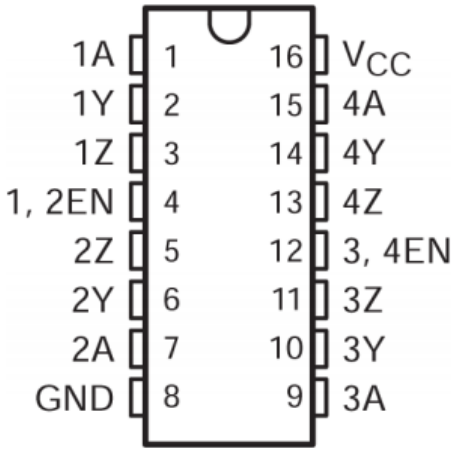
用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features

- Meet or exceed 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 outputs
- Single 5V supply operation
- High output impedance in power-off condition
- Two pairs of drivers, independently enabled
- Designed as improved replacements for the MC3487



D, N, or NS Package
(Top View)

Applications

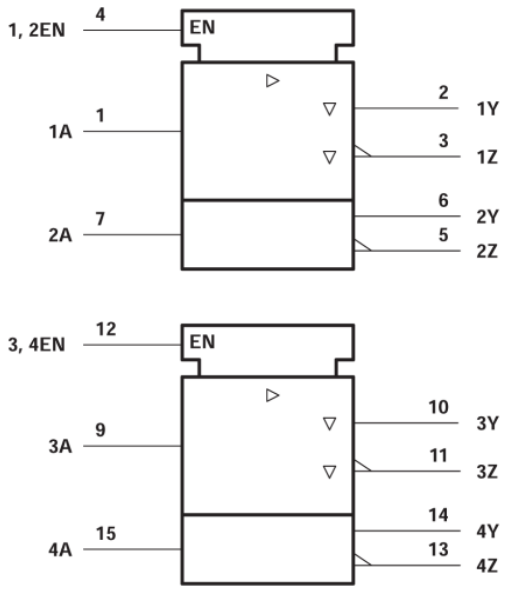
- Factory automation
- ATM and cash counters
- Smart grid
- AC and servo motor drives

Description

These 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 Recommendation V.11 and are compatible with 3- state TTL circuits. Advanced low-power Schottky technology provides high speed without the usual power penalty. Standby supply current is typically only 26mA. Typical propagation delay time is less than 10ns, and enable/disable times are typically less than 16ns.

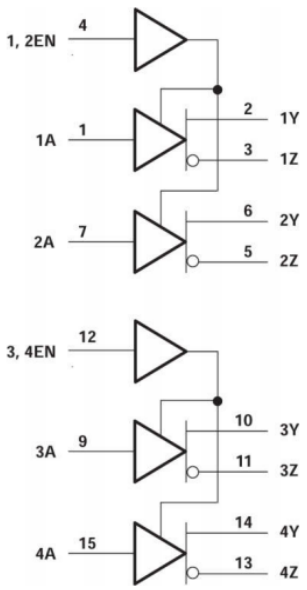
High-impedance inputs keep input currents low: less than 1 μ A for a high level and less than 100 μ A for a low level. The driver circuits can be enabled in pairs by separate active-high enable inputs. The SN75ALS194 is capable of data rates in excess of 20 megabits per second and is designed to operates with the SN75ALS195 quadruple line receiver.

The SN75ALS194 is characterized for operation from 0 ° C to 70 ° C.



Pin numbers shown are for the D, J, N, and W packages.

Logic Symbol[1]



Logic Diagram (Positive Logic)

Table 4-1. Pin Functions

PIN		TYPE(1)	DESCRIPTION
NAME	NO.		
1A	1	I	Single Ended Data Input for Channel 1
1Y	2	O	Non-Inverting Output for Differential Driver on Channel 1
1Z	3	O	Inverting Output of Differential Driver on Channel 1
1, 2EN	4	I	Channel 1 and 2 Enable
2Z	5	O	Inverting Output of Differential Driver on Channel 2
2Y	6	O	Non-Inverting Output for Differential Driver on Channel 2
2A	7	I	Single Ended Data Input for Channel 2
GND	8	GND	Device GND
3A	9	I	Single Ended Data Input for Channel 3
3Y	10	O	Non-Inverting Output for Differential Driver on Channel 3
3Z	11	O	Inverting Output of Differential Driver on Channel 3
3, 4EN	12	I	Channel 3 and 4 Enable
4Z	13	O	Inverting Output of Differential Driver on Channel 4
4Y	14	O	Non-Inverting Output for Differential Driver on Channel 4
4A	15	I	Single Ended Data Input for Channel 4
V_{CC}	16	PWR	Device VCC (4.75V to 5.25V)

(1) Signal Types: I = Input, O = Output, I/O = Input or Output.

5 Specifications

5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

			MIN	MAX	UNIT
V_{CC}	Supply voltage, (see (2))			7	V
V_I	Input voltage			5.5	V
V_O	Output voltage			7	V
	Continuous total dissipation			See *Dissipation Ratings* table	
T_A	Operating free-air temperature range:	SN75ALS194	0	70	°C
	Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds:	D or N package		260	°C
T_{stg}	Storage temperature range		–65	150	°C

(1) 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.
(2) All voltage values are with respect to network ground terminal

5.2 Dissipation Ratings

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

5.3 Recommended Operating Conditions

(1)		SN75ALS194			UNIT
		MIN	NOM	MAX	
Supply voltage, V_{CC}		4.75	5	5.25	V
High-level input voltage, V_{IH}	All inputs, T_A = 25°C	2			
	A inputs, T_A = Full range	2			V
	EN inputs, T_A = Full range	2			
Low-level input voltage, V_{IL}				0.8	V
High-level output current, I_{OH}				-20	mA
Low-level output current, I_{OL}	T_A = 25°C			48	mA
	T_A = Full range			48	
Operating free-air temperature, T_A		0		70	°C

(1) Full range is TA = 0°C to 70°C for SN75ALS194.

5.4 Thermal Information

THERMAL METRIC(1)		D (SOIC)	N (PDIP)	NS (SOP)	UNIT
		16-PINS			
$R_{\theta JA}$	Junction-to-ambient thermal resistance	84.6	60.6	88.5	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	43.5	48.1	46.2	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	43.2	40.6	50.7	°C/W
ψ_{JT}	Junction-to-top characterization parameter	10.4	27.5	13.5	°C/W
ψ_{JB}	Junction-to-board characterization parameter	42.8	40.3	50.3	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC package thermal metrics* application report.

5.5 Electrical Characteristics

over recommended ranges of supply voltage and operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS(1)		MIN	TYP(2)	MAX	UNIT
V_{IK}	Input clamp voltage	V_{CC} = MIN,	I_I = –18mA			–1.5	V
V_{OH}	High-level output voltage	V_{CC} = MIN, I_{OH} = –20mA	SN75ALS194	2.5			V
V_{OL}	Low-level output voltage	V_{CC} = MIN,	I_{OL} = MAX			0.5	V
V_O	Output voltage	I_O = 0		0		6	V
$\|V_{OD1}\|$	Differential output voltage	I_O = 0		1.5		6	V
$\|V_{OD2}\|$	Differential output voltage	R_L = 100W,	See Figure 5-1	1/2 V_{OD1} or 2(3)			V
$\Delta\|V_{OD}\|$	Change in magnitude of differential output voltage(4)					±0.4	V
V_{OC}	Common-mode output voltage					±3	V
$\Delta\|V_{OC}\|$	Change in magnitude of common-mode output voltage(4)					±0.4	V
I_O	Output current with power off	V_{CC} = 0	V_O = 6V			100	mA
			V_O = –0.25V			–100	
I_{OZ}	High-impedance-state output current	V_{CC} = MAX, Output enables at 0.8V	V_O = 2.7V			100	
			V_O = 0.5V			–100	mA
I_I	Input current at maximum input voltage	V_{CC} = MAX,	V_I = 5.5V			100	mA
I_{IH}	High-level input current	V_{CC} = MAX,	V_I = 2.7V			50	mA
I_{IL}	Low-level input current	V_{CC} = MAX,	V_I = 0.5V			–200	mA
I_{OS}	Short-circuit output current(5)	V_{CC} = MAX,	V_I = 2V	–40		–140	mA
I_{CC}	Supply current (all drivers)	V_{CC} = MAX,	All outputs disabled		26	45	mA

(1) For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
(2) All typical values are at V_{CC} = 5V, TA = 25°C.
(3) The minimum V_{OD2} with a 100Ω load is either 1/2V_{OD1} or 2V, whichever is greater.
(4) $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ 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.
(5) Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

5.6 Switching Characteristics

V_{CC} = 5V, T_A = 25°C

PARAMETER		TEST CONDITIONS	SN75ALS194			UNIT
			MIN	TYP	MAX	
t_{PLH}	Propagation delay time, low- to high-level output	C 15 F L = 15pF, See Figure 6-1		6	13	ns
t_{PHL}	Propagation delay time, high- to low-level output			9	14	ns
	Output-to-output skew			3.5	6	ns
$t_{t(OD)}$	Differential output transition time	C_L = 15pF, See Figure 6-2		8	14	ns
t_{PZH}	Output enable time to high level	C_L = 15pF, See Figure 6-3		9	12	ns
t_{PZL}	Output enable time to low level			12	20	ns
t_{PHZ}	Output disable time from high level			9	14	ns
t_{PLZ}	Output disable time from low level			12	15	ns

Table 5-1. Symbol Equivalents

DATA SHEET PARAMETER	EIA/TIA-422-B
V_O	V_{oa}, V_{ob}
$\lvert V_{OD1} \rvert$	V_o
$\lvert V_{OD2} \rvert$	V_t (R_L = 100 Ω)
$\Delta \lvert V_{OD} \rvert$	$\lvert \lvert V_t \rvert - \lvert \overline{V}_t \rvert \rvert$
V_{OC}	$\lvert V_{os} \rvert$
$\Delta \lvert V_{OC} \rvert$	$\lvert V_{os} - \overline{V}_{os} \rvert$
I_{OS}	$\lvert I_{sa} \rvert$, $\lvert I_{sb} \rvert$
I_O	$\lvert I_{xa} \rvert$, $\lvert I_{xb} \rvert$

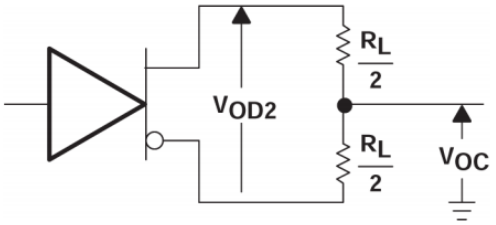
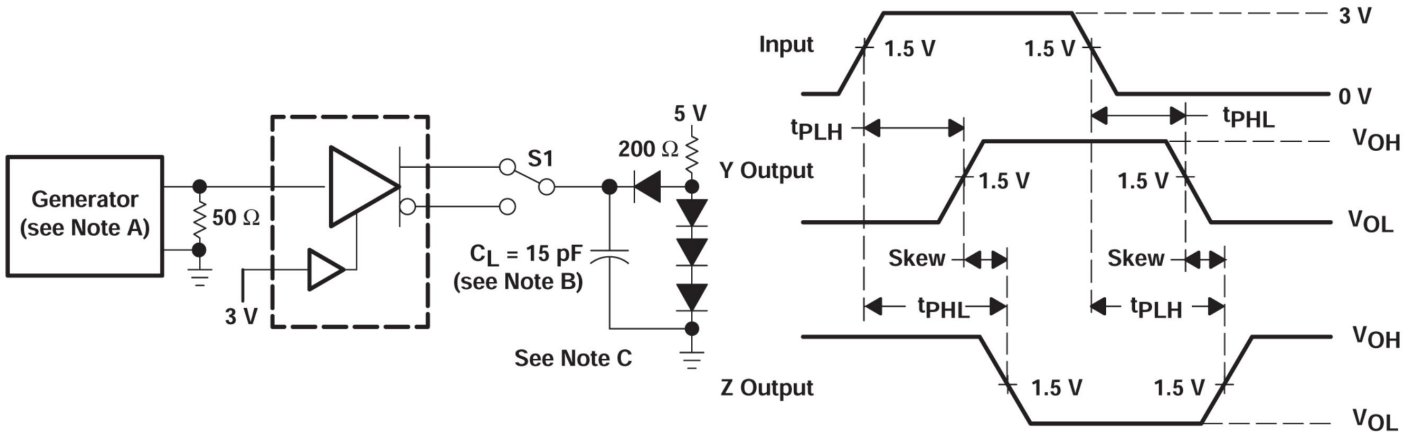


Figure 5-1. Driver V_{OD} And V_{OC}

6 Parameter Measurement Information



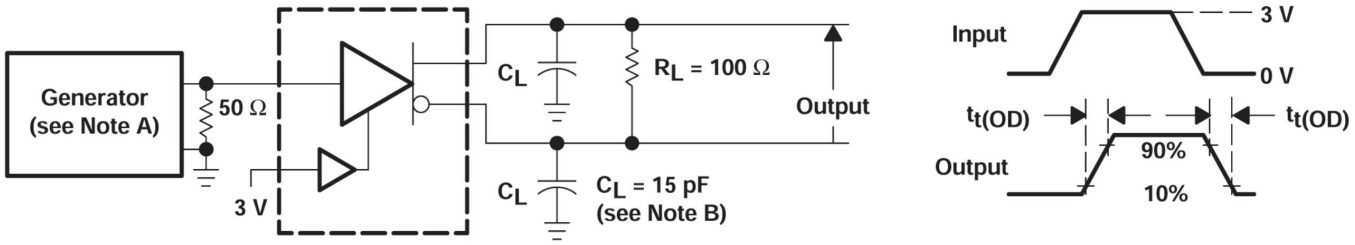
TEST CIRCUIT VOLTAGE WAVEFORM

A. The input pulse is supplied by a generator having the following characteristics: t_r ≤ 5ns, t_f ≤ 5ns, PRR ≤ 1MHz, duty cycle ≤ 50%, Z_O ≈ 50Ω.

B. C_L includes probe and stray capacitance.

C. All diodes are 1N916 or 1N3064.

Figure 6-1. Test Circuit and Voltage Waveform

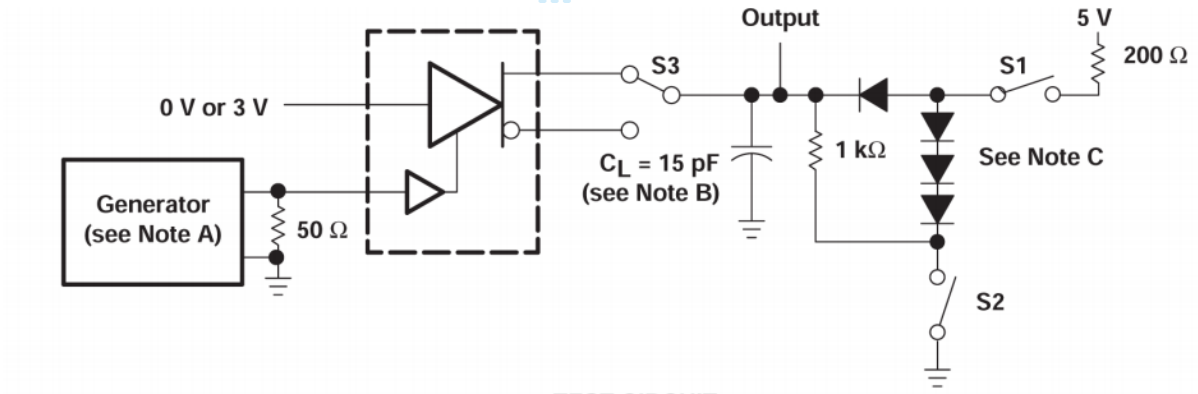


TEST CIRCUIT VOLTAGE WAVEFORM

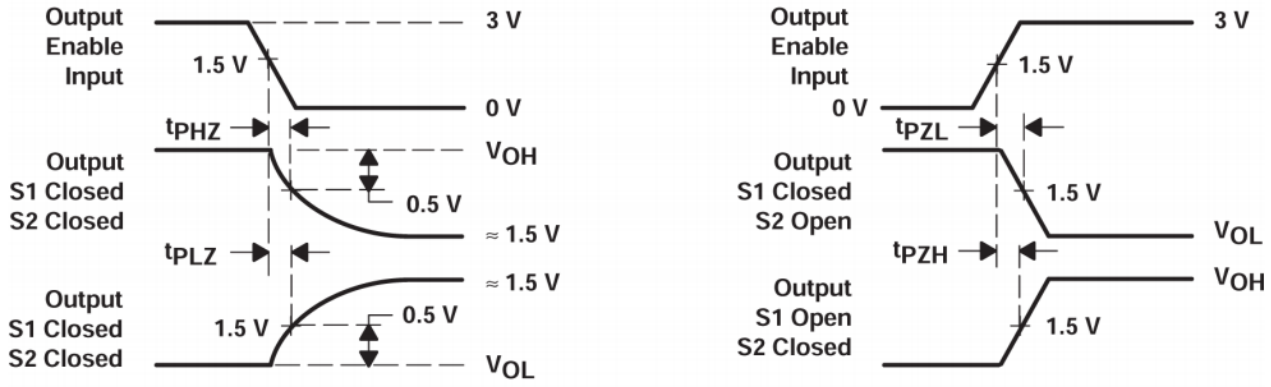
A. The input pulse is supplied by a generator having the following characteristics: t_r ≤ 5ns, t_f ≤ 5ns, PRR ≤ 1MHz, duty cycle ≤ 50%, Z_O ≈ 50Ω.

B. C_L includes probe and stray capacitance.

Figure 6-2. Differential-Output Test Circuit and Voltage Waveform



TEST CIRCUIT



VOLTAGE WAVEFORMS

A. The input pulse is supplied by a generator having the following characteristics: $t_r \le 5ns$, $t_f \le 5ns$, PRR ≤ 1MHz, duty cycle ≤ 50%, $Z_O \approx 50\Omega$.

B. C_L includes probe and stray capacitance.

C. All diodes are 1N916 or 1N3064.

Figure 6-3. Driver Test Circuit and Voltage Waveforms

7 Detailed Description

7.1 Device Functional Modes

Function Table (Each Driver)

INPUTS A(1)	OUTPUT EN	OUTPUTS	
		Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

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

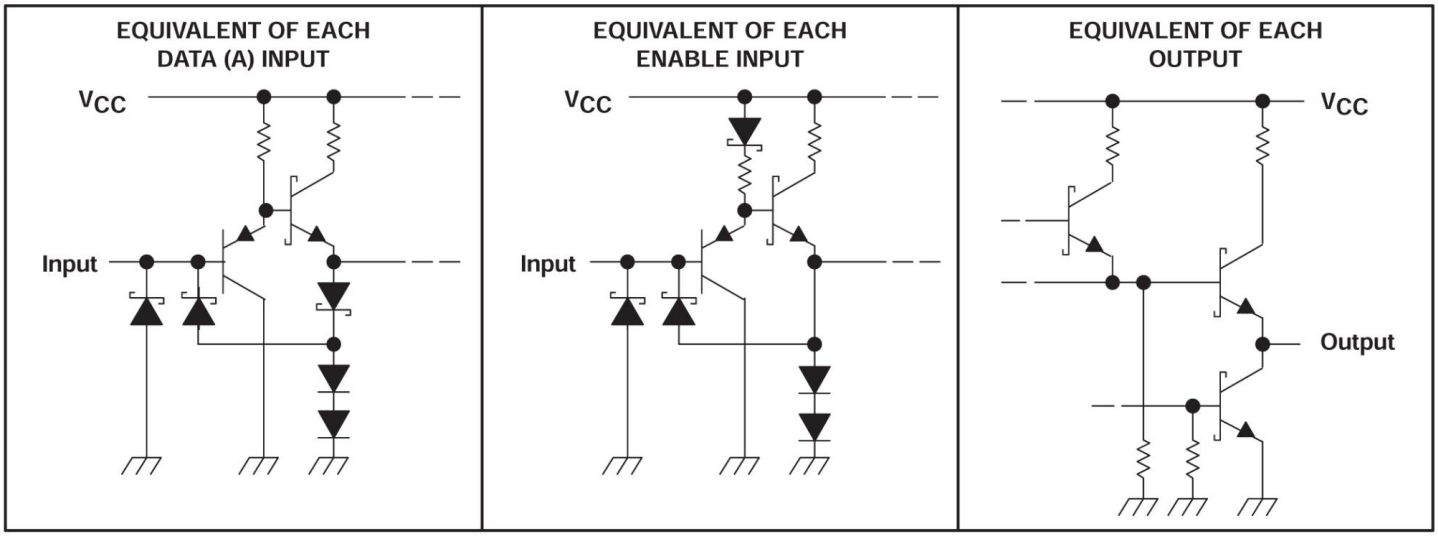
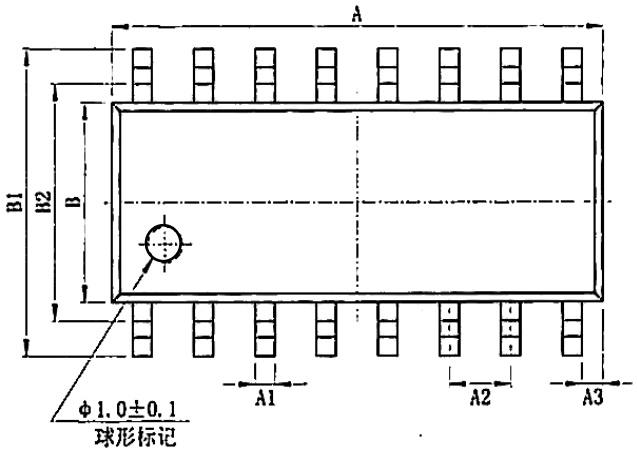


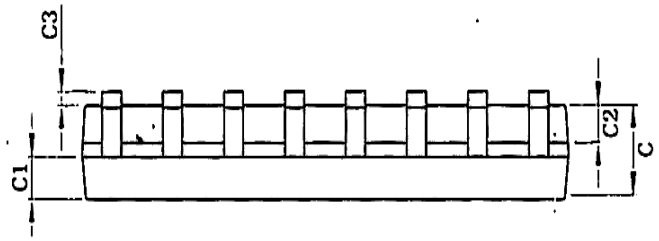
Figure 7-1. Schematics of Inputs and Outputs

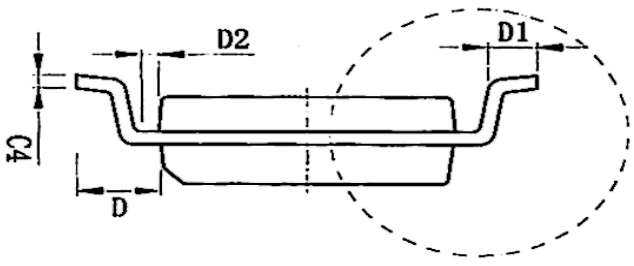
Order information

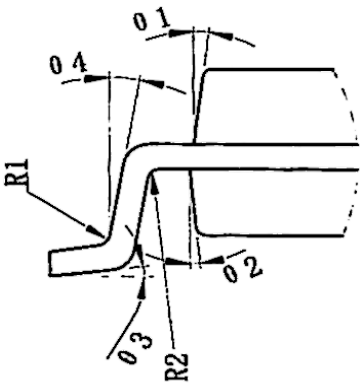
Order Number	Package	Package Quantity	Marking On The park
SN75ALS194DR-TUDI	SOP16	Tape,Reel,2500	SN75ALS194DR
SN75ALS194N-TUDI	DIP16	Tube,25,A box of 1000	SN75ALS194N

Package SOP16



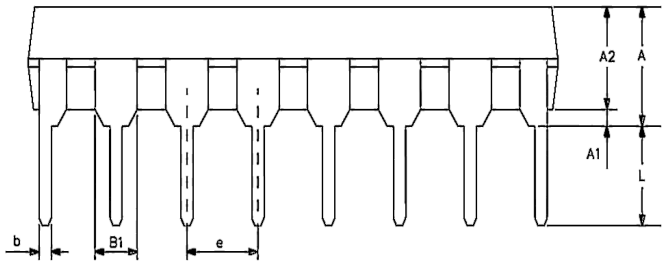


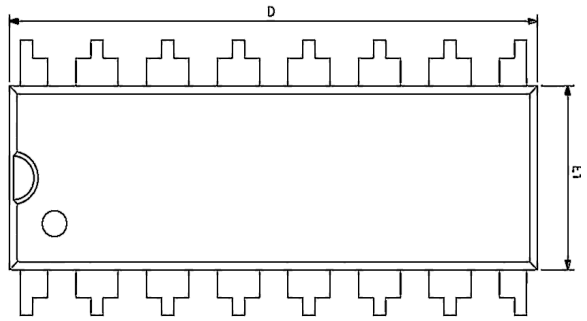


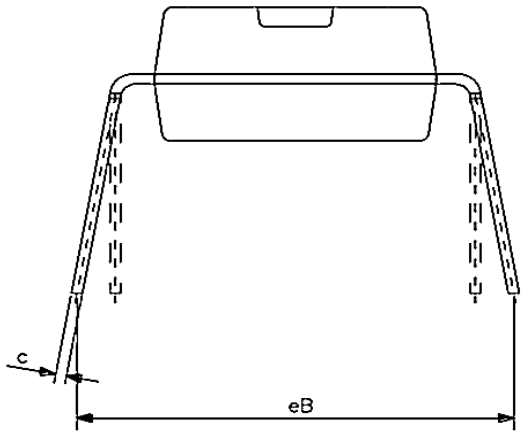


SIZE / SYMBOL	MIN./mm	MAX./mm
A	9.80	10.00
A1	0.356	0.456
A2	1.27TYP	
A3	0.302TYP	
B	3.85	3.95
B1	5.84	6.24
B2	5.00 TYP	
C	1.40	1.60
C1	0.61	0.71
C2	0.54	0.64
C3	0.05	0.25
C4	0.203	0.233
D	1.05 TYP	
D1	0.40	0.70
D2	0.15	0.25
R1	0.20TYP	
R2	0.20TYP	
01	8°~12°TYP4	
02	8°~12°TYP4	
03	0°~8°	
04	4°~12°	

Package DIP16







SIZE / SYMBOL	MIN./mm	MAX./mm
A2	3.20	3.60
A1	0.51	___
A	3.60	5.33
L	3.00	3.60
b	0.36	0.56
B1	1.52	
D	18.80	19.94
E1	6.20	6.60
e	2.54	
C	0.20	0.36
eB	7.62	9.30
R	0.20TYP	
R1	0.30TYP	
θ	0°	8°
θ1	45°TYP	
02	12°TYP	
03	0°	8°
04	0°	10°

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