

# 100319

## Low Power Hex Line Driver with Cut-Off

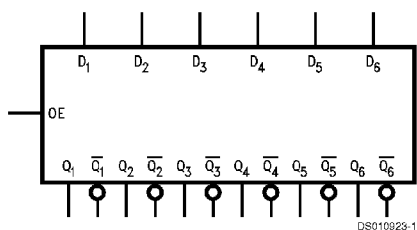
### General Description

The 100319 is a Hex Line Driver with output cut-off capability. The 100319 has single ended ECL inputs and differential ECL outputs, designed to drive a differential, doubly terminated 50Ω transmission line (25Ω equivalent impedance) in an ECL backplane. A LOW on the Output Enable (OE) will set both the true and complementary outputs, to a high impedance or cut-off state. The cut-off state is designed to be more negative than a normal ECL LOW state.

### Features

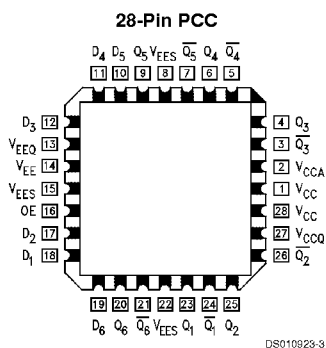
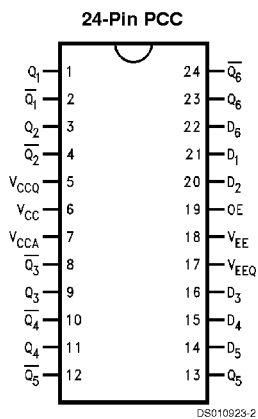
- Differential outputs
- Output cut-off capability
- Drives a 25Ω ECL load
- 2000V ESD protection
- Voltage compensated range = -4.2V to -5.7V
- Available to industrial grade temperature range

### Ordering Code: Logic Symbol



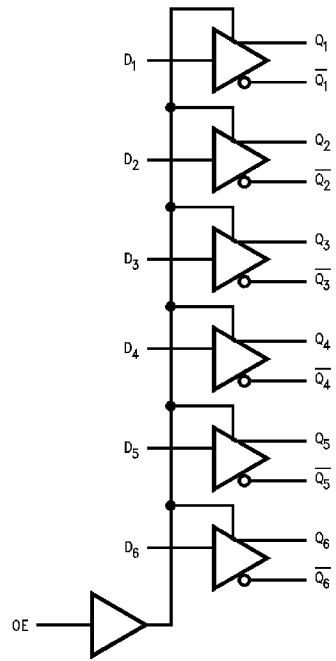
Pin Names	Description
D <sub>n</sub>	Data Inputs
Q <sub>n</sub>	Data Outputs
$\bar{Q}_n$	Complementary Data Outputs
OE	Output Enable

### Connection Diagrams



100319 Low Power Hex Line Driver with Cut-Off

## Logic Diagram



DS010923-5

## Truth Table

Inputs		Outputs	
$D_n$	OE	$Q_n$	$\overline{Q_n}$
L	H	L	H
H	H	H	L
X	L	Cut-Off	Cut-Off

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Don't Care  
 Cut-off = Lower-than-Low State

## Absolute Maximum Ratings (Note 1)

Above which the useful life may be impaired

Storage Temperature ( $T_{STG}$ )	-65°C to +150°C
Maximum Junction Temperature ( $T_J$ )	
Ceramic	+175°C
Plastic	+150°C
Pin Potential to Ground Pin ( $V_{EE}$ )	-7.0V to +0.5V
Input Voltage (DC)	$V_{EE}$ to +0.5V
Output Current (DC Output HIGH)	-100 mA
ESD (Note 2)	≥2000V

## Recommended Operating Conditions

Case Temperature ( $T_C$ )	
Commercial	0°C to +85°C
Industrial	-40°C to +85°C
Military	-55°C to +125°C
Supply Voltage ( $V_{EE}$ )	-5.7V to -4.2V

**Note 1:** Absolute maximum ratings are those values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 2:** ESD testing conforms to MIL-STD-883, Method 3015.

## Commercial Version DC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$ ,  $T_C = 0^\circ C$  to  $+85^\circ C$  (Note 3)

Symbol	Parameter	Min	Typ	Max	Units	Conditions	
$V_{OH}$	Output HIGH Voltage	-1025	-955	-870	mV	$V_{IN} = V_{IH(Max)}$ or $V_{IL(Min)}$	Loading with $25\Omega$ to $-2.0V$
$V_{OL}$	Output LOW Voltage	-1830	-1705	-1620	mV		
$V_{OHC}$	Output HIGH Voltage	-1035			mV	$V_{IN} = V_{IH(Min)}$ or $V_{IL(Max)}$	Loading with $25\Omega$ to $-2.0V$
$V_{OLC}$	Output LOW Voltage			-1610	mV		
$V_{OLZ}$	Cut-Off LOW Voltage			-1950	mV	$V_{IN} = V_{IH(Min)}$ or $V_{IL(Max)}$	OE = LOW
$V_{IH}$	Input HIGH Voltage	-1110		-870	mV	Guaranteed HIGH Signal for All Inputs	
$V_{IL}$	Input LOW Voltage	-1830		-1530	mV	Guaranteed LOW Signal for All Inputs	
$I_{IL}$	Input LOW Current			100	$\mu A$	$V_{IN} = V_{IL(Min)}$	
$I_{IH}$	Input HIGH Current			360	$\mu A$	$V_{IN} = V_{IH(Max)}$	
$I_{EE}$	Power Supply Current, Normal	-119		-30	mA		
$I_{EEZ}$	Power Supply Current, Cut-Off	-219		-75	mA	Inputs Open, OE = LOW	

**Note 3:** The specified limits represent the "worst case" value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guardbanding can be achieved by decreasing the allowable system operating ranges. Conditions for testing shown in the tables are chosen to guarantee operation under "worst case" conditions.

## DIP AC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$

Symbol	Parameter	$T_C = 0^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		Units	Conditions
		Min	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay Data to Output	0.65	2.30	0.65	2.30	0.65	2.30	ns	Figures 1, 2
$t_{PZH}$	Propagation Delay OE to Output	1.8	4.3	1.8	4.3	1.8	4.3	ns	
$t_{PHZ}$	Transition Time 20% to 80%, 80% to 20%	0.45	1.50	0.45	1.50	0.45	1.50	ns	
$t_{TLH}$									
$t_{THL}$									

### PCC AC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$

Symbol	Parameter	$T_C = 0^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		Units	Conditions
		Min	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay	0.65	2.10	0.65	2.10	0.65	2.10	ns	Figures 1, 2
$t_{PHL}$	Data to Output								
$t_{PZH}$	Propagation Delay	1.8	4.1	1.8	4.1	1.8	4.1	ns	
$t_{PHZ}$	OE to Output	1.2	2.9	1.2	2.9	1.2	2.9	ns	
$t_{TLH}$	Transition Time	0.45	1.30	0.45	1.30	0.45	1.30	ns	
$t_{THL}$	20% to 80%, 80% to 20%								

### Industrial Version PCC DC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$  (Note 4)

Symbol	Parameter	$T_C = -40^\circ C$		$T_C = 0^\circ C$ to $+85^\circ C$		Units	Conditions	
		Min	Max	Min	Max			
$V_{OH}$	Output HIGH Voltage	-1085	-870	-1025	-870	mV	$V_{IN} = V_{IH(Max)}$	Loading with $25\Omega$ to $-2.0V$
$V_{OL}$	Output LOW Voltage	-1830	-1575	-1830	-1620	mV	or $V_{IL(Min)}$	
$V_{OHC}$	Output HIGH Voltage	-1095		-1035		mV	$V_{IN} = V_{IH(Min)}$	Loading with $25\Omega$ to $-2.0V$
$V_{OLC}$	Output LOW Voltage		-1565		-1610	mV	or $V_{IL(Max)}$	
$V_{IH}$	Input HIGH Voltage	-1115	-870	-1110	-870	mV	Guaranteed HIGH Signal for All Inputs	
$V_{OLZ}$	Cut-Off LOW Voltage		-1900		-1950	mV	$V_{IN} = V_{IH(Min)}$ or $V_{IL(Max)}$	OE = LOW
$V_{IL}$	Input LOW Voltage	-1830	-1535	-1830	-1530	mV	Guaranteed LOW Signal for All Inputs	
$I_{IL}$	Input LOW Current		130		100	$\mu A$	$V_{IN} = V_{IL(Min)}$	
$I_{IH}$	Input HIGH Current		360		360	$\mu A$	$V_{IN} = V_{IH(Max)}$	
$I_{EE}$	Power Supply Current, Normal	-119	-30	-119	-30	mA		
$I_{EEZ}$	Power Supply Current, Cut-Off	-219	-75	-219	-75	mA	Inputs Open OE = LOW	

**Note 4:** The specified limits represent the "worst case" value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guardbanding can be achieved by decreasing the allowable system operating ranges. Conditions for testing shown in the tables are chosen to guarantee operation under "worst case" conditions.

### PCC AC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$

Symbol	Parameter	$T_C = -40^\circ C$		$T_C = +25^\circ C$		$T_C = +85^\circ C$		Units	Conditions
		Min	Max	Min	Max	Min	Max		
$t_{PLH}$	Propagation Delay	0.65	2.10	0.65	2.10	0.65	2.10	ns	Figures 1, 2
$t_{PHL}$	Data to Output								
$t_{PZH}$	Propagation Delay	1.8	4.1	1.8	4.1	1.8	4.1	ns	
$t_{PHZ}$	OE to Output	1.2	2.9	1.2	2.9	1.2	2.9	ns	
$t_{TLH}$	Transition Time	0.45	1.30	0.45	1.30	0.45	1.30	ns	
$t_{THL}$	20% to 80%, 80% to 20%								

## Military Version—Preliminary DC Electrical Characteristics

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$  (Note 7)

Symbol	Parameter	Min	Typ	Max	Units	$T_C$	Conditions	Notes	
$V_{OH}$	Output HIGH Voltage	-1025		-870	mV	0°C to +125°C	$V_{IN} = V_{IH(Max)}$ or $V_{IL(Min)}$	Loading with 25Ω to -2.0V	(Notes 5, 6, 7)
		-1085		-870	mV	-55°C			
$V_{OL}$	Output LOW Voltage	-1830		-1620	mV	0°C to +125°C			
		-1830		-1555	mV	-55°C			
$V_{OHC}$	Output HIGH Voltage	-1035			mV	0°C to +125°C	$V_{IN} = V_{IH(Min)}$ or $V_{IL(Max)}$	Loading with 25Ω to -2.0V	(Notes 5, 6, 7)
		-1085			mV	-55°C			
$V_{OLC}$	Output LOW Voltage			-1610	mV	0°C to +125°C			
				-1555	mV	-55°C			
$V_{OLZ}$	Cut-Off LOW Voltage			-1900	mV	0°C to +125°C	$V_{IN} = V_{IH(Min)}$ or $V_{IL(Max)}$	OE = LOW	(Notes 5, 6, 7)
				-1950	mV	-55°C			
$V_{IH}$	Input HIGH Voltage	-1165		-870	mV	-55°C to +125°C	Guaranteed HIGH Signal for All Inputs	(Notes 5, 6, 7, 8)	
$V_{IL}$	Input LOW Voltage	-1830		-1475	mV	-55°C to +125°C	Guaranteed LOW Signal for All Inputs	(Notes 5, 6, 7, 8)	
$I_{IH}$	Input HIGH Current			50	μA	0°C to +125°C	$V_{IN} = V_{IH(Max)}$		(Notes 5, 6, 7)
				70	μA	-55°C			
$I_{EE}$	Power Supply Current,	-70		-40	mA	-55°C to +125°C			
$I_{EEZ}$	Power Supply Current,	-180		-130	mA	-55°C to +125°C	Inputs Open, OE = LOW	(Notes 5, 6, 7)	
	Cut-Off								

**Note 5:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals -55°C), then testing immediately without allowing for the junction temperature to stabilize due to heat dissipation after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 6:** Screen tested 100% on each device at -55°C, +25°C, and +125°C, Subgroups 1, 2, 3, 7, and 8.

**Note 7:** Sample tested (Method 5005, Table I) on each manufactured lot at -55°C, +25°C, and +125°C, Subgroups A1, 2, 3, 7, and 8.

**Note 8:** Guaranteed by applying specified input condition and testing  $V_{OH}/V_{OL}$ .

## AC Electrical Characteristics—Preliminary

$V_{EE} = -4.2V$  to  $-5.7V$ ,  $V_{CC} = V_{CCA} = GND$

Symbol	Parameter	$T_C = -55^\circ C$		$T_C = +25^\circ C$		$T_C = +125^\circ C$		Units	Conditions	Notes
		Min	Max	Min	Max	Min	Max			
$t_{PLH}$	Propagation Delay	0.40	2.50	0.50	2.40	0.50	2.90	ns	Figures 1, 2	(Notes 9, 10, 11)
$t_{PHL}$	Data to Output									
$t_{TLH}$	Transition Time	0.20	1.70	0.20	1.70	0.20	1.50	ns		(Note 12)
$t_{THL}$	20% to 80%, 80% to 20%									

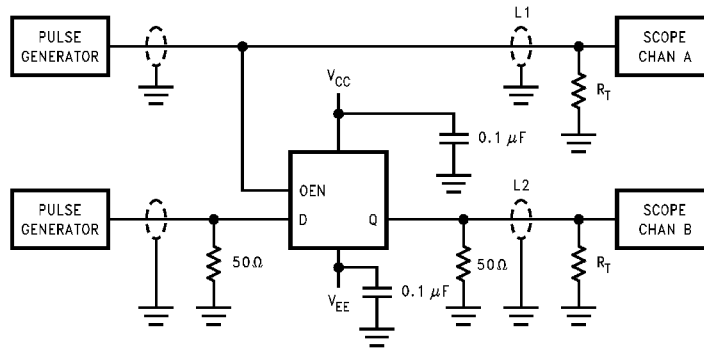
**Note 9:** F100K 300 Series cold temperature testing is performed by temperature soaking (to guarantee junction temperature equals -55°C), then testing immediately after power-up. This provides "cold start" specs which can be considered a worst case condition at cold temperatures.

**Note 10:** Screen tested 100% on each device at +25°C temperature only, Subgroup A9.

**Note 11:** Sample tested (Method 5005, Table I) on each manufactured lot at +25°C, Subgroup A9, and at +125°C and -55°C temperatures, Subgroups A10 and A11.

**Note 12:** Not tested at +25°C, +125°C and -55°C temperature (design characterization data).

## Test Circuitry



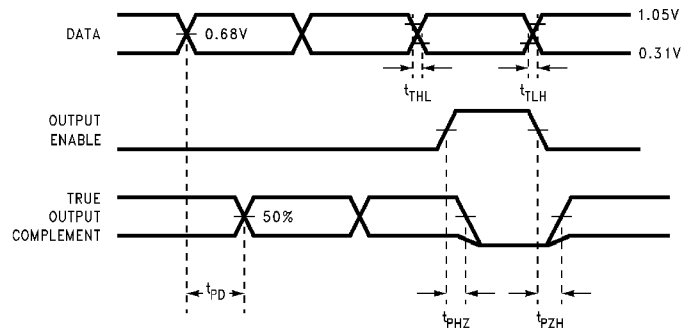
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### Notes:

$V_{CC}, V_{CCA} = +2V, V_{EE} = -2.5V$   
 $L1$  and  $L2$  = equal length  $50\Omega$  impedance lines  
 $R_T = 50\Omega$  terminator internal to scope  
 Decoupling  $0.1 \mu F$  from GND to  $V_{CC}$  and  $V_{EE}$   
 All unused outputs are loaded with  $25\Omega$  to GND  
 $C_L$  = Fixture and stray capacitance  $\leq 3$  pF

FIGURE 1. AC Test Circuit

## Switching Waveforms



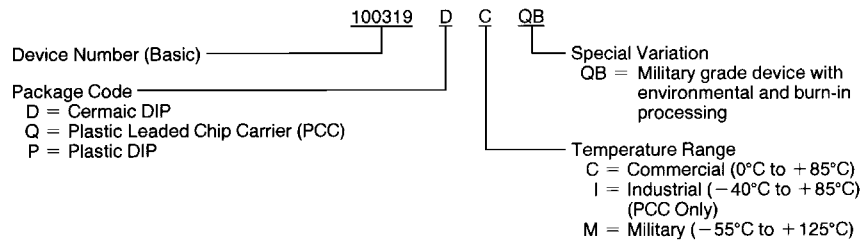
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Note: The output AC measurement point for cut-off propagation delay testing = the 50% voltage point between active  $V_{OL}$  and  $V_{OH}$ .

FIGURE 2. Propagation Delay, Cut-Off and Transition Times

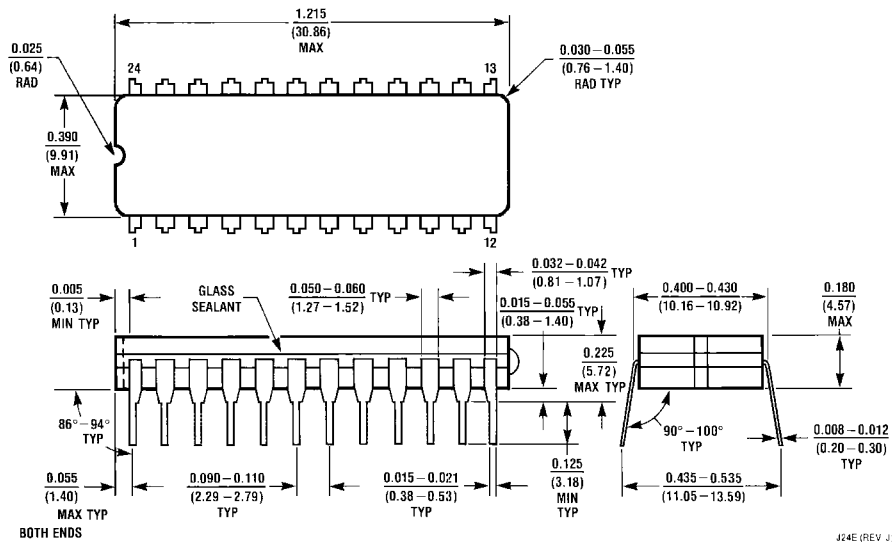
## Ordering Information

The device number is used to form part of a simplified purchasing code where a package type and temperature range are defined as follows:

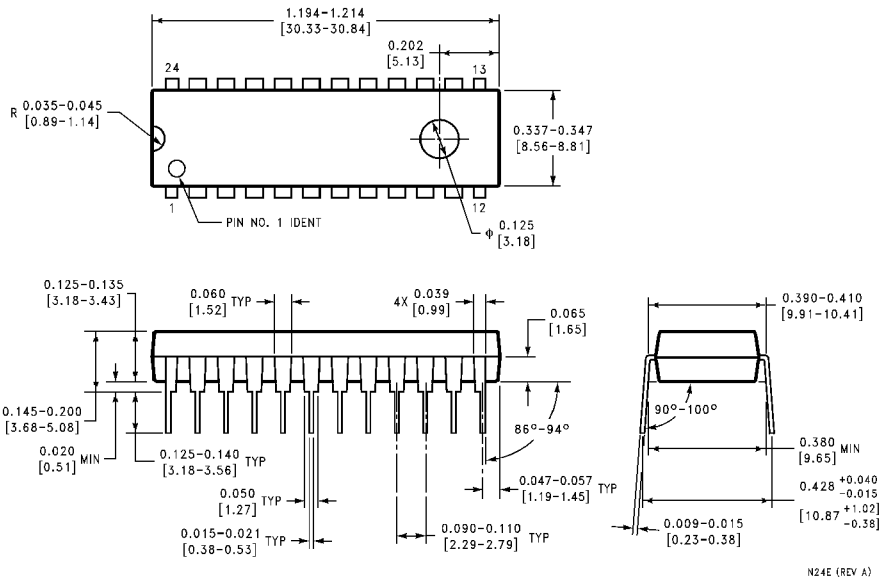


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**Physical Dimensions** inches (millimeters) unless otherwise noted

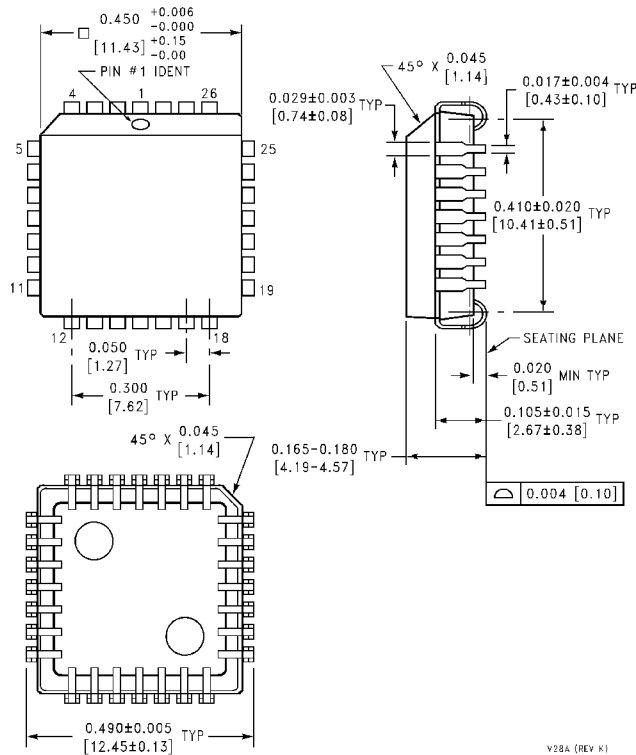


**24-Lead Ceramic Dual-In-Line Package (D)  
Package Number J24E**



**24-Lead Plastic Dual-In-Line Package (P)  
Package Number N24E**

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



**28-Lead Plastic Chip Carrier (Q)  
Package Number V28A**

V28A (REV K)

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