FAIRCHILD SEMICONDUCTOR™

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100316
Low Power Quad Differential Line Driver with Cut-Off

General Description

The 100316 is a quad differential line driver with output cut-off capability. The outputs are designed to drive a doubly terminated 50Ω transmission line (25Ω equivalent impedance) in an ECL backplane. The 100316 is ideal for driving low noise, differential ECL backplanes. A LOW on the output enable (OE) will set both the true and complementary outputs into a high impedance or cut-off state, isolating them from the backplane. The cut-off state is designed to be more negative than a normal ECL LOW state.

Unlike most 100K devices, the data inputs (D_n, $\overline{D}_n$) do not have input pull-down resistors. An internal reference supply (V_{BB}) is available for single-ended operation.

Features

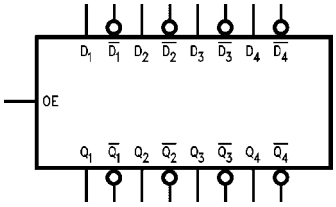
- Differential inputs and outputs
- Output cut-off capability
- Drives 25Ω load
- V_{BB} available for single-ended operation
- 2000V ESD protection
- Voltage compensated operating range = –4.2V to –5.7V
- Available to industrial grade temperature range

Ordering Code:

Order Number	Package Number	Package Description
100316QC	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square
100316QI	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square Industrial Temperature Range (–40°C to +85°C)

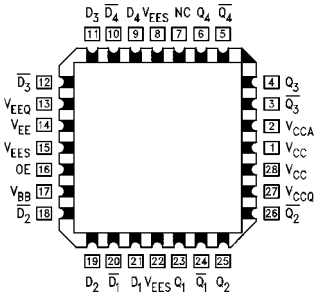
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbol



Connection Diagram

28-Pin PLCC



Pin Descriptions

Pin Names	Description
D_n	Data Inputs
Q_n	Data Outputs
$\overline{Q}_n$	Complementary Data Outputs
OE	Output Enable

Truth Table

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

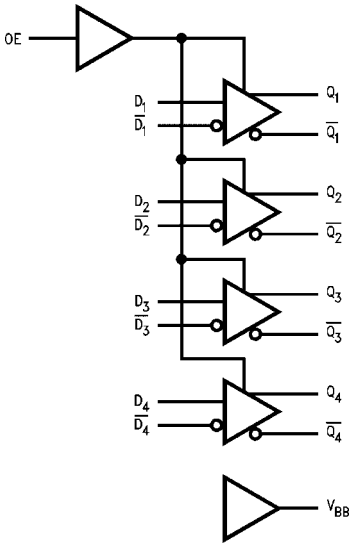
H = HIGH Voltage Level

L = LOW Voltage Level

X = Don't Care

Cut-Off = Lower-than-LOW State

Logic Diagram



Absolute Maximum Ratings (Note 1)

Storage Temperature (T_{STG})	−65°C to +150°C
Maximum Junction Temperature (T_J)	+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
Supply Voltage (V_{EE})	−5.7V to −4.2V

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum rating. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

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

Commercial Version

DC Electrical Characteristics (Note 3)

V_{EE} = −4.2V to −5.7V, V_{CC} = V_{CCA} = GND, T_C = 0°C to +85°C

Symbol	Parameter	Min	Typ	Max	Units	Conditions	
V_{OH}	Output HIGH Voltage	−1025	−955	−870	mV	V_{IN} = $V_{IH\ (Max)}$	Loading with
V_{OL}	Output LOW Voltage	−1830	−1705	−1620	mV	or $V_{IL\ (Min)}$	25Ω to −2.0V
V_{OHC}	Output HIGH Voltage	−1035			mV	V_{IN} = $V_{IH\ (Min)}$	Loading with
V_{OLC}	Output LOW Voltage			−1610	mV	or $V_{IL\ (Max)}$	25Ω to −2.0V
V_{OLZ}	Cut-Off LOW Voltage			−1950	mV	V_{IN} = $V_{IH\ (Min)}$ or $V_{IL\ (Max)}$	OE = LOW
V_{BB}	Output Reference Voltage	−1380	−1320	−1260	mV	I_{VBB} = −1 mA	
V_{DIFF}	Input Voltage Differential	150			mV	Required for Full Output Swing	
V_{CM}	Common Mode Voltage	V_{CC} − 2.0		V_{CC} − 0.5	V		
V_{IH}	Single-Ended Input HIGH Voltage	−1110		−870	mV	Guaranteed HIGH Signal for All Inputs (with one input tied to V_{BB}) $V_{BB\ (Max)}$ + V_{DIFF}	
V_{IL}	Single-Ended Input LOW Voltage	−1830		−1530	mV	Guaranteed LOW Signal for All Inputs (with one input tied to V_{BB}) $V_{BB\ (Min)}$ − V_{DIFF}	
I_{IL}	Input LOW Current	0.50			µA	V_{IN} = $V_{IL\ (Min)}$	
I_{IH}	Input HIGH Current D_N			250	µA	V_{IN} = $V_{IH\ (Max)}$, D_1 = V_{BB}, $\overline{D}_1$ = $V_{IL\ (Min)}$	
I_{IHZ}	Input HIGH Current OE			360	µA	V_{IN} = $V_{IH\ (Max)}$, D_1 = V_{BB}, $\overline{D}_1$ = $V_{IL\ (Min)}$	
I_{CBO}	Input Leakage Current	−10			µA	V_{IN} = V_{EE}, D_1 = V_{BB}, $\overline{D}_1$ = $V_{IL\ (Min)}$	
I_{EE}	Power Supply Current, Normal	−85		−30	mA	D_1 = V_{BB}, $\overline{D}_1$ = $V_{IL\ (Min)}$	
I_{EEZ}	Power Supply Current, Cut-Off	−152		−75	mA	D_1–D_4 = V_{BB}, $\overline{D}_1$–$\overline{D}_4$ = $V_{IL\ (Min)}$, 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.

AC Electrical Characteristics

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

Symbol	Parameter	T_C = 0°C		T_C = +25°C		T_C = +85°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	0.65	2.10	0.65	2.10	0.65	2.10	ns	Figures 1, 2
t_{PZH}	Propagation Delay	1.8	4.00	1.8	4.00	1.8	4.00	ns	
t_{PHZ}	OE to Output	1.2	2.90	1.2	2.90	1.2	2.90		
t_{TLH} t_{THL}	Transition Time, D_n to Q_n 20% to 80%, 80% to 20%	0.45	1.50	0.45	1.50	0.45	1.50	ns	

Industrial Version

DC Electrical Characteristics (Note 4)

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

Symbol	Parameter	T_C = −40°C		T_C = 0°C to +85°C		Units	Conditions	
		Min	Max	Min	Max			
V_{OH}	Output HIGH Voltage	−1085	−870	−1025	−870	mV	V_{IN} = $V_{IH\ (Max)}$ or $V_{IL\ (Min)}$	Loading with 25Ω to −2.0V
V_{OL}	Output LOW Voltage	−1830	−1585	−1830	−1620	mV		
V_{OHC}	Output HIGH Voltage	−1095		−1035		mV	V_{IN} = $V_{IH\ (Min)}$ or $V_{IL\ (Max)}$	Loading with 25Ω to −2.0V
V_{OLC}	Output LOW Voltage		−1575		−1610	mV		
V_{OLZ}	Cut-Off LOW Voltage		−1900		−1950	mV	OE = LOW, V_{IN} = $V_{IH\ (Min)}$ or $V_{IL\ (Max)}$	
V_{BB}	Output Reference Voltage	−1395	−1255	−1380	−1260	mV	I_{VBB} = −1 mA	
V_{DIFF}	Input Voltage Differential	150		150		mV	Required for Full Output Swing	
V_{CM}	Common Mode Voltage	V_{CC} − 2.0	V_{CC} − 0.5	V_{CC} − 2.0	V_{CC} − 0.5	V		
V_{IH}	Single-Ended Input HIGH Voltage	−1115	−870	−1110	−870	mV	Guaranteed HIGH Signal for All Inputs (with one input tied to V_{BB}) $V_{BB\ (Max)}$ + V_{DIFF}	
V_{IL}	Single-Ended Input LOW Voltage	−1830	−1535	−1830	−1530	mV	Guaranteed LOW Signal for All Inputs (with one input tied to V_{BB}) $V_{BB\ (Min)}$ − V_{DIFF}	
I_{IL}	Input LOW Current	0.50		0.50		µA	V_{IN} = $V_{IL\ (Min)}$	
I_{IH}	Input HIGH Current, D_N		240		240	µA	V_{IN} = $V_{IH\ (Max)}$, D_1 = V_{BB}, $\overline{D}_1$ = $V_{IL\ (Min)}$	
I_{IHZ}	Input HIGH Current, OE		360		360			
I_{CBO}	Input Leakage Current	−10		−10		µA	V_{IN} = V_{EE}, D_1 = V_{BB}, $\overline{D}_1$ = $V_{IL\ (Min)}$	
I_{EE}	Power Supply Current, Normal	−85	−30	−85	−30	mA	D_1 = V_{BB}, $\overline{D}_1$ = $V_{IL\ (Min)}$	
I_{EEZ}	Power Supply Current, Cut-Off	−152	−75	−152	−75	mA	D_1–D_4 = V_{BB}, $\overline{D}_1$–$\overline{D}_4$ = $V_{IL\ (Min)}$, OE = LOW	

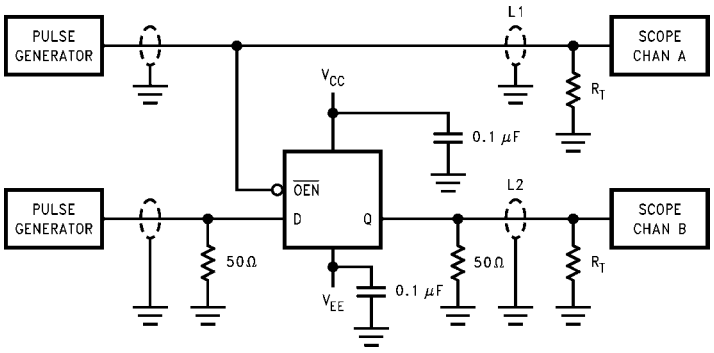
Note 4: The specified limits represent the "worst case" value for the parameter. Since these values normally occur at the temperature extremes, additional noise immunity and guardbanding can be achieved by decreasing the allowable system operating ranges. Conditions for testing shown in the tables are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

AC Electrical Characteristics

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

Symbol	Parameter	T_C = −40°C		T_C = +25°C		T_C = +85°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PLH} t_{PHL}	Propagation Delay Data to Output	0.65	2.10	0.65	2.10	0.65	2.10	ns	
t_{PZH}	Propagation Delay	1.80	4.00	1.80	4.00	1.80	4.00	ns	Figures 1Figure 2
t_{PHZ}	OE to Output	1.20	2.90	1.20	2.90	1.20	2.90		
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.45	1.50	0.45	1.50	0.45	1.50	ns	

Test Circuitry



Notes:

V_{CC}, V_{CCA} = +2V, V_{EE} = −2.5V

L1 and L2 = equal length 50Ω impedance lines

R_T = 50Ω terminator internal to scope

Decoupling 0.1 μF from GND to V_{CC} and V_{EE}

All unused outputs are loaded with 25Ω to GND

C_L = Fixture and stray capacitance ≤ 3 pF

FIGURE 1. AC Test Circuit

Switching Waveforms

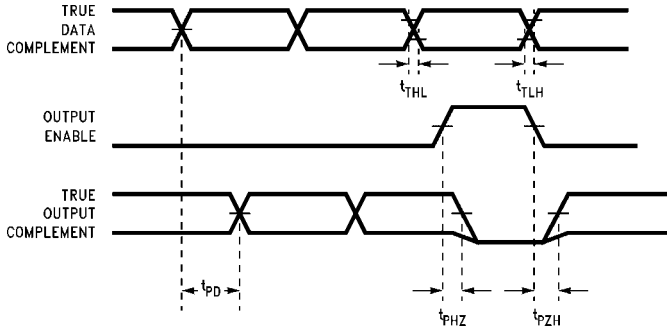
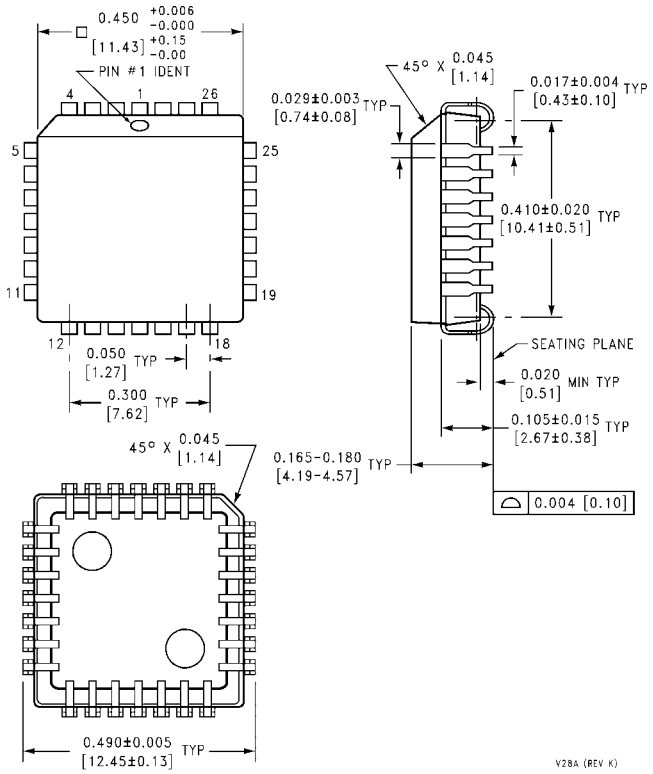


FIGURE 2. Propagation Delay, Cut-Off and Transition Times

Physical Dimensions inches (millimeters) unless otherwise noted



28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square
Package Number V28A

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