FAIRCHILD SEMICONDUCTOR™

September 1989
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100313
Low Power Quad Driver

General Description

The 100313 is a monolithic quad driver with two OR and two NOR outputs and common enable. The common input is buffered to minimize input loading. If the D inputs are not used the Enable can be used to drive sixteen 50Ω lines. All inputs have 50 kΩ pull-down resistors and all outputs are buffered.

Features

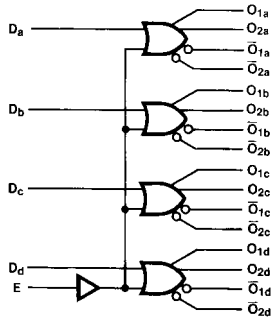
- 50% power reduction of the 100113
- 2000V ESD protection
- Pin/function compatible with 100113 and 100112
- Voltage compensated operating range = –4.2V to –5.7V
- Available to industrial grade temperature range (PLCC package only)

Ordering Code:

Order Number	Package Number	Package Description
100313SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
100313PC	N24E	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.400 Wide
100313QC	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square
100313QI	V28A	28-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.450 Square Industrial Temperature Range (–40°C to +85°C)

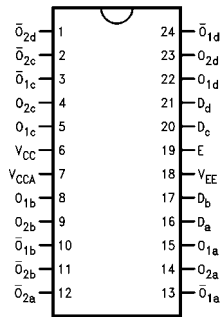
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbol

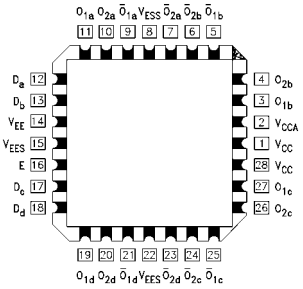


Connection Diagrams

24-Pin DIP/SOIC



28-Pin PLCC



Pin Descriptions

Pin Names	Description
D_a–D_d	Data Inputs
E	Enable Input
O_{na}–O_{nd}	Data Outputs
$\overline{O}_{na}$–$\overline{O}_{nd}$	Complementary Data Outputs

Truth Table

Inputs					Outputs							
E	D_a	D_b	D_c	D_d	O_{1a}, 0_{2a}	$\overline{O}_{1a}$, $\overline{O}_{2a}$	O_{1b}, 0_{2b}	$\overline{O}_{1b}$, $\overline{0}_{2b}$	O_{1c}, 0_{2c}	$\overline{O}_{1c}$, $\overline{0}_{2c}$	O_{1d}, 0_{2d}	$\overline{O}_{1d}$, $\overline{0}_{2d}$
H	X	X	X	X	H	L	H	L	H	L	H	L
L	L	L	L	L	L	H	L	H	L	H	L	H
L	L	L	L	H	L	H	L	H	L	H	H	L
L	L	L	H	L	L	H	L	H	H	L	L	H
L	L	L	H	H	L	H	L	H	H	L	H	L
L	L	H	L	L	L	H	H	L	L	H	L	H
L	L	H	L	H	L	H	H	L	L	H	H	L
L	L	H	H	L	L	H	H	L	H	L	L	H
L	L	H	H	H	L	H	H	L	H	L	H	L
L	H	L	L	L	H	L	L	H	L	H	L	H
L	H	L	L	H	H	L	L	H	L	H	H	L
L	H	L	H	L	H	L	L	H	H	L	L	H
L	H	L	H	H	H	L	L	H	H	L	H	L
L	H	H	L	L	H	L	H	L	L	H	L	H
L	H	H	L	H	H	L	H	L	L	H	H	L
L	H	H	H	L	H	L	H	L	H	L	L	H
L	H	H	H	H	H	L	H	L	H	L	H	L

H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care

Absolute Maximum Ratings (Note 1)

Storage Temperature (T_{STG})	−65°C to +150°C
Maximum Junction Temperature (T_J)	+150°C
V_{EE} Pin Potential to Ground Pin	−7.0V to +0.5V
Input Voltage (DC)	V_{EE} to +0.5V
Output Current (DC Output HIGH)	−50 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 ratings. 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		or $V_{IL\ (Min)}$	50Ω to −2.0V
V_{OHC}	Output HIGH Voltage	−1035			mV	V_{IN} = $V_{IH\ (Min)}$	Loading with
V_{OLC}	Output LOW Voltage			−1610		or $V_{IL\ (Max)}$	50Ω to −2.0V
V_{IH}	Input HIGH Voltage	−1165		−870	mV	Guaranteed HIGH Signal for All Inputs	
V_{IL}	Input LOW Voltage	−1830		−1475	mV	Guaranteed LOW Signal for All Inputs	
I_{IL}	Input LOW Current	0.50			µA	V_{IN} = $V_{IL\ (Min)}$	
I_{IH}	Input HIGH Current						
	Data			350	µA	V_{IN} = $V_{IH\ (Max)}$	
	Enable			240			
I_{EE}	Power Supply Current	−59		−29	mA	Inputs OPEN	

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°C		T_C = +25°C		T_C = +85°C		Units	Conditions
		Min	Max	Min	Max	Min	Max		
t_{PLH}	Propagation Delay	0.55	1.30	0.55	1.30	0.55	1.40	ns	Figures 1, 2 (Note 4)
t_{PHL}	Data to Output								
t_{PLH}	Propagation Delay	0.80	1.80	0.80	1.80	0.80	1.90	ns	
t_{PHL}	Enable to Output								
t_{TLH}	Transition Time	0.45	1.30	0.45	1.30	0.45	1.30	ns	Figures 1, 2
t_{THL}	20% to 80%, 80% to 20%								

Note 4: The propagation delay specified is for single output switching. Delays may vary up to 150 ps with multiple outputs switching.

Commercial Version (Continued)
SOIC and PLCC 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	0.55	1.20	0.55	1.20	0.55	1.30	ns	Figures 1, 2 (Note 5)
t_{PLH} t_{PHL}	Propagation Delay Enable to Output	0.80	1.70	0.80	1.70	0.80	1.80	ns	
t_{TLH} t_{THL}	Transition Time 20% to 80%, 80% to 20%	0.45	1.30	0.45	1.30	0.45	1.30	ns	Figures 1, 2
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		280		280		280	ps	PLCC Only (Note 6)
t_{OSHL}	Maximum Skew Common Edge Output-to-Output Variation Enable to Output Path		290		290		290	ps	PLCC Only (Note 6)
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation Data to Output Path		330		330		330	ps	PLCC Only (Note 6)
t_{OSLH}	Maximum Skew Common Edge Output-to-Output Variation Enable to Output Path		360		360		360	ps	PLCC Only (Note 6)
t_{OST}	Maximum Skew Opposite Edge Output-to-Output Variation Data to Output Path		330		330		330	ps	PLCC Only (Note 6)
t_{OST}	Maximum Skew Opposite Edge Output-to-Output Variation Enable to Output Path		360		360		360	ps	PLCC Only (Note 6)
t_{PS}	Maximum Skew Pin (Signal) Transition Variation Data to Output Path		200		200		200	ps	PLCC Only (Note 6)
t_{PS}	Maximum Skew Pin (Signal) Transition Variation Enable to Output Path		200		200		200	ps	PLCC Only (Note 6)

Note 5: The propagation delay specified is for single output switching. Delays may vary up to 150 ps with multiple outputs switching.

Note 6: Output-to-Output Skew is defined as the absolute value of the difference between the actual propagation delay for any outputs within the same packaged device. The specifications apply to any outputs switching in the same direction either HIGH-to-LOW (t_{OSHL}), or LOW-to-HIGH (t_{OSLH}), or in opposite directions both HL and LH (t_{OST}). Parameters t_{OST} and t_{PS} guaranteed by design.

Industrial Version

PLCC DC Electrical Characteristics (Note 7)

V_{EE} = –4.2V to –5.7V, V_{CC} = V_{CCA} = GND, T_C = –40°C to +85°C

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} = $V_{IH(Max)}$	Loading with
V_{OL}	Output LOW Voltage	–1830	–1575	–1830	–1620		or $V_{IL(Min)}$	50Ω to –2.0V
V_{OHC}	Output HIGH Voltage	–1095		–1035		mV	V_{IN} = $V_{IH(Min)}$	Loading with
V_{OLC}	Output LOW Voltage		–1565		–1610		or $V_{IL(Max)}$	50Ω to –2.0V
V_{IH}	Input HIGH Voltage	–1170	–870	–1165	–870	mV	Guaranteed HIGH Signal for All Inputs	
V_{IL}	Input LOW Voltage	–1830	–1480	–1830	–1475	mV	Guaranteed LOW Signal for All Inputs	
I_{IL}	Input LOW Current	0.50		0.50		µA	V_{IN} = $V_{IL(Min)}$	
I_{IH}	Input HIGH Current							
	Data		350		350	µA	V_{IN} = $V_{IH(Max)}$	
	Enable		240		240			
I_{EE}	Power Supply Current	–59	–29	–59	–29	mA	Inputs OPEN	

Note 7: 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.

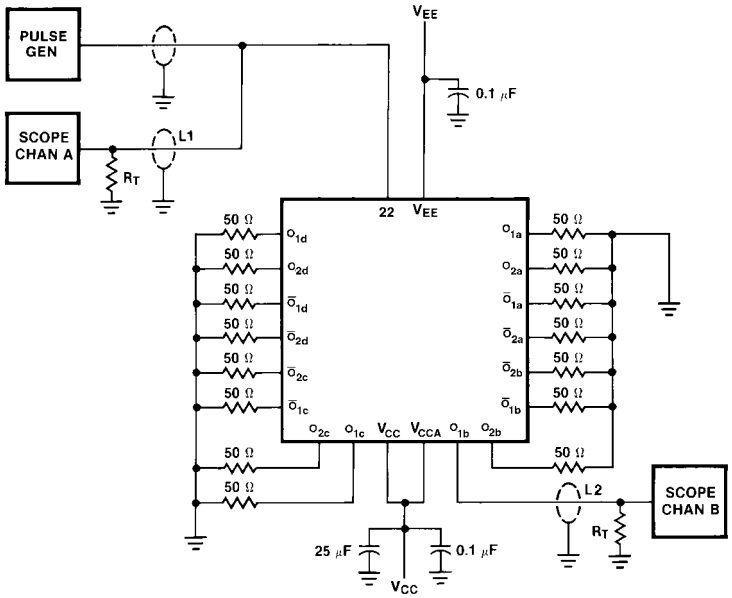
PLCC AC Electrical Characteristics

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}	Propagation Delay	0.55	1.20	0.55	1.20	0.55	1.30	ns	Figures 1, 2 (Note 8)
t_{PHL}	Data to Output								
t_{PLH}	Propagation Delay	0.80	1.70	0.80	1.70	0.80	1.80	ns	
t_{PHL}	Enable to Output								
t_{TLH}	Transition Time	0.45	1.30	0.45	1.30	0.45	1.30	ns	Figures 1, 2
t_{THL}	20% to 80%, 80% to 20%								

Note 8: The propagation delay specified is for single output switching. Delays may vary up to 150 ps with multiple outputs switching.

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 50Ω to GND.

C_L = Fixture and stray capacitance ≤ 3 pF.

FIGURE 1. AC Test Circuit

Switching Waveforms

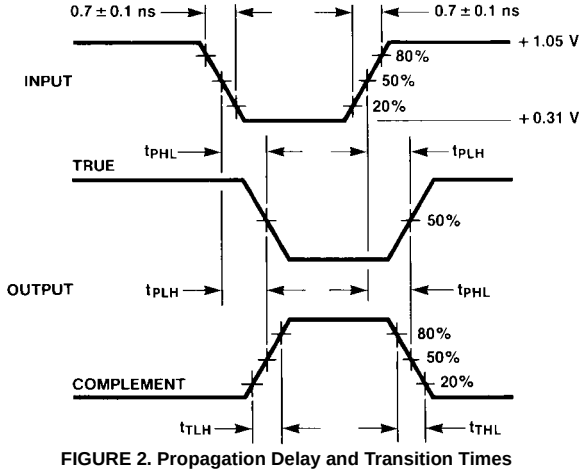
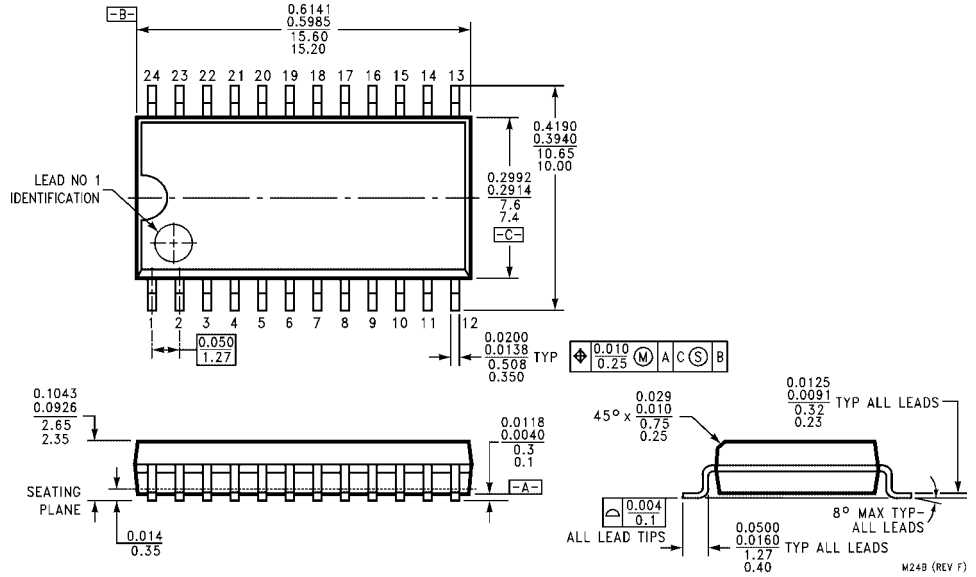
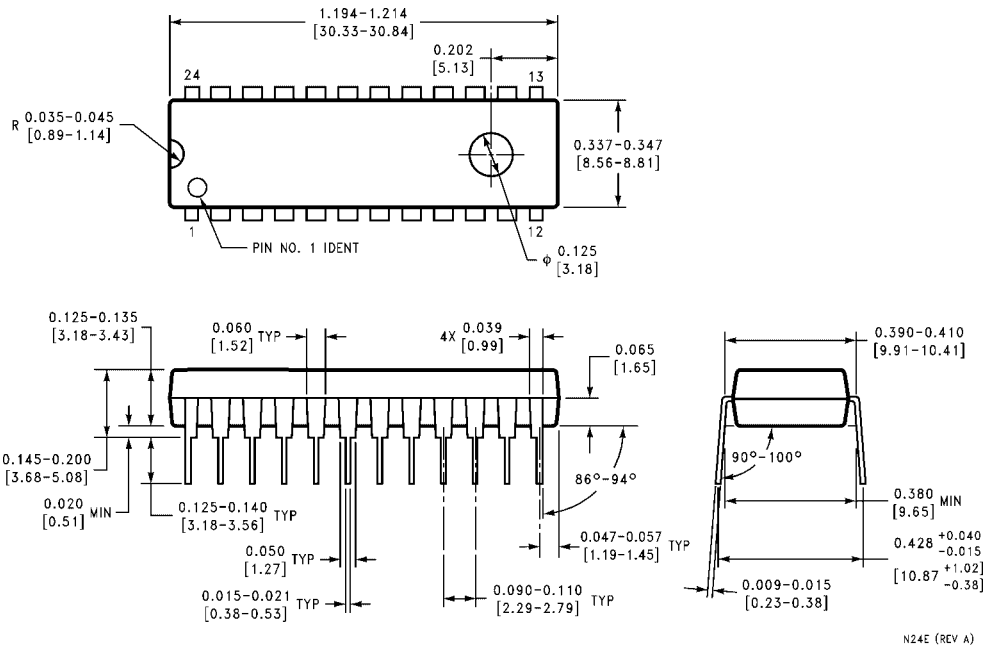


FIGURE 2. Propagation Delay and Transition Times

Physical Dimensions inches (millimeters) unless otherwise noted

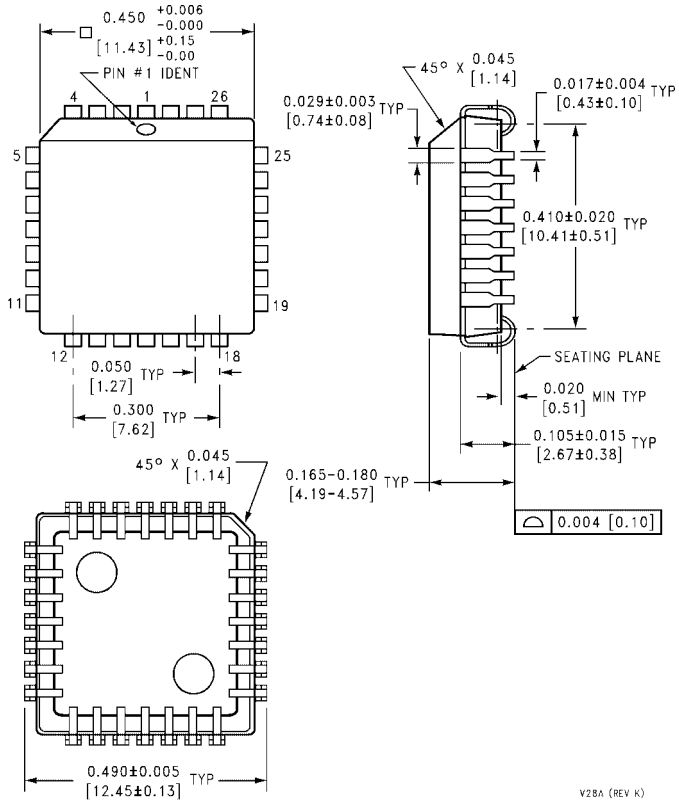


24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
Package Number M24B



24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-010, 0.400 Wide
Package Number N24E

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



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