A product Line of
Diodes Incorporated

PI6C49CB04BQ

Low Skew, 1-TO-4 LVCMOS/LVTTL Fanout Buffer

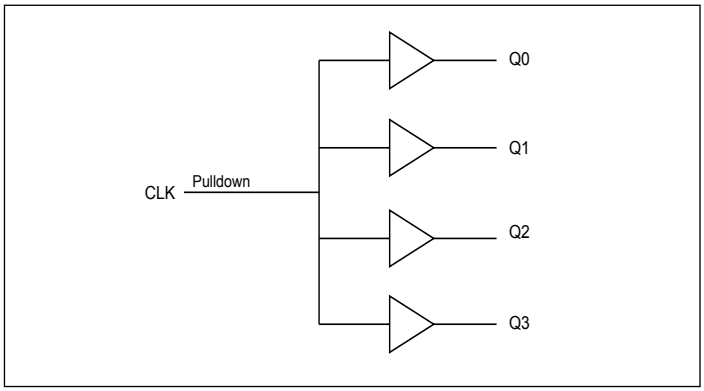
Features

- Four LVCMOS / LVTTL Outputs
- LVCMOS / LVTTL Clock Input
- CLK Accepts LVCMOS, LVTTL Input Levels
- Maximum Output Frequency: 250MHz
- Additive Phase Jitter, RMS: 0.173ps (Typical) @ 3.3V
- Output Skew: 45ps (Maximum) @ 3.3V
- Part-to-Part Skew: 500ps (Maximum)
- Small 8 Lead SOIC Package Saves Board Space
- Full 3.3V, 2.5V, 1.8V Operation Mode or 3.3V/2.5V/1.8V Core with 2.5V, 1.8V, 1.5V Supply Modes
- AEC-Q100 Qualified
- Automotive Grade 2 Temperature Range (-40°C to 105°C)
- Automotive Grade 3 Temperature Range (-40°C to 85°C)
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- The PI6C49CB04BQ is suitable for automotive applications requiring specific change control and is AEC-Q100 qualified, PPAP capable, and manufactured in IATF 16949 certified facilities.
- https://www.diodes.com/quality/product-definitions/
- Packaging (Pb-free & Green): 8-pin, SOIC (W)

Description

The PI6C49CB04BQ is a low-skew, 1-to-4 fanout buffer. Guaranteed output and part-to-part skew characteristics make the PI6C49CB04BQ ideal for clock distribution applications that demand well-defined performance and repeatability.

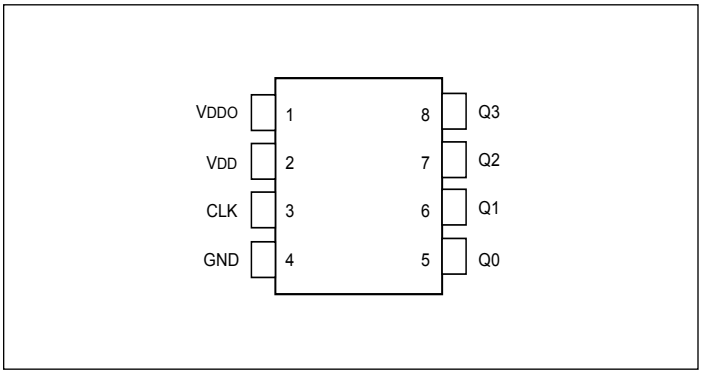
Block Diagram



Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Configuration



Pin Descriptions

Pin#	Pin Name	Pin Type		Pin Description
1	V_{DDO}	Power	—	Output supply pin
2	V_{DD}	Power	—	Positive supply pin
3	CLK	Input	Pulldown	LVCMOS / LVTTL clock input
4	GND	Power	—	Power supply ground
5	Q0	Output	—	Single clock output. LVCMOS / LVTTL interface levels
6	Q1	Output	—	Single clock output. LVCMOS / LVTTL interface levels
7	Q2	Output	—	Single clock output. LVCMOS / LVTTL interface levels
8	Q3	Output	—	Single clock output. LVCMOS / LVTTL interface levels

Note: *Pulldown* refers to internal input resistors. See Table 2, *Pin Characteristics*, for typical values.

Pin Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
C_{IN}	Input Capacitance	—	—	4	—	pF
C_{PD}	Power Dissipation Capacitance (per Output)	V_{DD} , V_{DDO} = 3.465V	—	—	15	pF
$R_{PULLDOWN}$	Input Pulldown Resistor	—	—	51	—	kΩ
R_{OUT}	Output Impedance	V_{DD} , V_{DDO} >2.5V	5	7	12	Ω

Maximum Ratings

(Above which useful life may be impaired. For user guidelines, not tested.)

Supply Voltage, V_{DD} 4.6V
Inputs, V_I . . . . . –0.5V to V_{DD} +0.5V
Output, V_O . . . . . –0.5V to V_{DDO} +0.5V
Storage Temperature, T_{STG} . . . . . -65°C to 150°C
ESD Protection (HBM) 2000V
Junction Temperature . . . . . 125 °C max

Note:

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These ratings are stress specifications only. Functional operation of product at these conditions or any conditions beyond those listed in the DC Characteristics or AC Characteristics is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.

Recommended Operation Conditions

Parameter	Min.	Typ.	Max.	Units
Ambient Operating Temperature (Automotive Grade 2)	-40	—	+105	°C
Ambient Operating Temperature (Automotive Grade 3)	-40	—	+85	°C
Power Supply Voltage (Measured in Respect to GND)	+1.425	—	+3.6	V

Table 3A. Power Supply DC Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD	Core Supply Voltage	3.3V Operation	3.135	3.3	3.465	V
		2.5V Operation	2.375	2.5	2.625	
		1.8V Operation	1.6	1.8	2.0	
VDDO	Output Power Supply Voltage	3.3V Supply	3.135	3.3	3.465	V
		2.5V Supply	2.375	2.5	2.625	
		1.8V Supply	1.6	1.8	2.0	
		1.5V Supply	1.425	1.5	1.575	
$I_{DD} + I_{DDO}$	Total Power Supply Current	5pF, 100MHz	—	—	38	mA

DC ELECTRICAL CHARACTERISTICS

VDD = 1.8V, VDDO =1.5 V ±5%, Ambient temperature -40°C to +105°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD	Operating Voltage	—	1.7	1.8	1.89	V
VDDO	Output Operating Voltage	—	1.425	1.5	1.575	V
V_{IH}	Input High Voltage	CLK(1)	0.9	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.575	V
I_{IH}	Input High Current	CLK(1)	—	—	40	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -6mA	0.95	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 6mA	—	—	0.45	V
IDD	Operating Supply Current	5pF, 160MHz	—	15	21	mA
		5pF, 100MHz	—	13	17	mA
		5pF, 50MHz	—	7	9	mA
		5pF, 25MHz	—	4	5.5	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±12	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

VDD, VDDO=1.8 V ±5%, Ambient temperature -40°C to +105°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD, VDDO	Operating Voltage	—	1.7	1.8	1.89	V
V_{IH}	Input High Voltage	CLK(1)	1.1	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.6	V
I_{IH}	Input High Current	CLK(1)	—	—	50	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -8mA	1.4	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 8mA	—	—	0.4	V
IDD	Operating Supply Current	5pF, 160MHz	—	22	28	mA
		5pF, 100MHz	—	17	21	mA
		5pF, 50MHz	—	9	12	mA
		5pF, 25MHz	—	5	7	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±20	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

VDD, VDDO =2.5 V ±5%, Ambient temperature -40°C to +105°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD, VDDO	Operating Voltage	—	2.375	2.5	2.625	V
V_{IH}	Input High Voltage	CLK(1)	1.7	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.7	V
I_{IH}	Input High Current	CLK(1)	—	—	60	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -8mA	2	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 8mA	—	—	0.4	V
IDD	Operating Supply Current	5pF, 100MHz	—	24	30	mA
		5pF, 50MHz	—	12	15	mA
		5pF, 25MHz	—	7	9	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±50	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

VDD, VDDO=3.3 V ±10%, Ambient temperature -40°C to +105°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD, VDDO	Operating Voltage	—	3.0	3.3	3.6	V
V_{IH}	Input High Voltage	CLK(1)	2.4	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.7	V
I_{IH}	Input High Current	CLK(1)	—	—	85	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -8 mA	2.8	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 8 mA	—	—	0.2	V
IDD	Operating Supply Current	5pF, 100MHz	—	32	38	mA
		5pF, 50MHz	—	16	19	mA
		5pF, 25MHz	—	10	12	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±50	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

AC ELECTRICAL CHARACTERISTICS

VDD = 1.8V, VDDO=1.5 V ±5%, Ambient temperature -40°C to +105° C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	160	MHz
tOR	Output Rise Time	20% to 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% to 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay (Note1)	—	2	3	5	ns
T_{SK}	Output-to-Output Skew (Note2)	Rising edges at VDD/2	—	0	±250	ps

VDD, VDDO =1.8 V ±5%, Ambient temperature -40°C to +105° C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	160	MHz
tOR	Output Rise Time	20% to 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% to 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay (Note 1)	—	1.3	2	4	ns
T_{SK}	Output-to-Output Skew (Note 2)	Rising edges at VDD/2	—	0	±250	ps
J_{ADD}	Additive Jitter	@ 156.25MHz, 12k to 20MHz	—	0.1	—	ps

VDD, VDDO =2.5 V ±5%, Ambient temperature -40°C to +105°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	160	MHz
tOR	Output Rise Time	20% TO 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% TO 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay(1)	—	0.8	1.5	3	ns
T_{SK}	Output-to-Output Skew(2)	Rising edges at VDD/2	—	0	±250	ps
J_{ADD}	Additive Jitter	@ 156.25MHz, 12k to 20MHz	—	0.05	—	ps

Notes:
1. With rail-to-rail input clock.
2. Between any two outputs with equal loading.

VDD, VDDO =3.3 V ±10%, Ambient temperature -40°C to +105°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	100	MHz
tOR	Output Rise Time	20% TO 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% TO 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay(1)	—	0.8	1.0	2.5	ns
T_{SK}	Output-to-Output Skew(2)	Rising edges at VDD/2	—	0	±250	ps
J_{ADD}	Additive Jitter	@ 156.25MHz, 12k to 20MHz	—	0.05	—	ps

Notes:
1. With rail-to-rail input clock.
2. Between any two outputs with equal loading.

DC ELECTRICAL CHARACTERISTICS

VDD = 1.8V, VDDO =1.5 V ±5%, Ambient temperature -40°C to +85°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD	Operating Voltage	—	1.7	1.8	1.89	V
VDDO	Output Operating Voltage	—	1.425	1.5	1.575	V
V_{IH}	Input High Voltage	CLK(1)	0.9	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.575	V
I_{IH}	Input High Current	CLK(1)	—	—	40	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -6 mA	0.95	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 6 mA	—	—	0.45	V
IDD	Operating Supply Current	5pF, 160MHz	—	15	21	mA
		5pF, 100MHz	—	13	17	mA
		5pF, 50MHz	—	7	9	mA
		5pF, 25MHz	—	4	5.5	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±12	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

VDD, VDDO =1.8 V ±5%, Ambient temperature -40°C to +85°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD, VDDO	Operating Voltage	—	1.7	1.8	1.89	V
V_{IH}	Input High Voltage	CLK(1)	1.1	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.6	V
I_{IH}	Input High Current	CLK(1)	—	—	50	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -8mA	1.4	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 8mA	—	—	0.4	V
IDD	Operating Supply Current	5pF, 160MHz	—	22	28	mA
		5pF, 100MHz	—	17	21	mA
		5pF, 50MHz	—	9	12	mA
		5pF, 25MHz	—	5	7	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±20	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

VDD, VDDO =2.5 V ±5%, Ambient temperature -40°C to +85° C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD	Operating Voltage	—	2.375	2.5	2.625	V
V_{IH}	Input High Voltage	CLK(1)	1.7	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.7	V
I_{IH}	Input High Current	CLK(1)	—	—	60	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -8 mA	2	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 8 mA	—	—	0.4	V
IDD	Operating Supply Current	5pF, 200MHz	—	46	56	mA
		5pF, 100MHz	—	24	30	mA
		5pF, 50MHz	—	12	15	mA
		5pF, 25MHz	—	7	9	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±50	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

VDD, VDDO =3.3 V ±10%, Ambient temperature -40°C to +85°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
VDD	Operating Voltage	—	3.0	3.3	3.6	V
V_{IH}	Input High Voltage	CLK(1)	2.4	—	3.6	V
V_{IL}	Input Low Voltage	CLK(1)	—	—	0.7	V
I_{IH}	Input High Current	CLK(1)	—	—	85	µA
I_{IL}	Input Low Current	CLK(1)	—	—	1	µA
V_{OH}	Output High Voltage	I_{OH} = -8mA	2.8	—	—	V
V_{OL}	Output Low Voltage	I_{OL} = 8mA	—	—	0.2	V
IDD	Operating Supply Current	5pF, 200MHz	—	62	75	mA
		5pF, 100MHz	—	32	38	mA
		5pF, 50MHz	—	16	19	mA
		5pF, 25MHz	—	10	12	mA
Z_O	Nominal Output Impedance	—	—	20	—	Ω
C_{IN}	Input Capacitance	CLK	—	5	—	pF
I_{OS}	Short-Circuit Current	—	—	±50	—	mA

Notes: 1. Nominal switching threshold is VDD/2.

AC ELECTRICAL CHARACTERISTICS

VDD = 1.8V, VDDO =1.5 V ±5%, Ambient temperature -40°C to +85°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	166	MHz
tOR	Output Rise Time	20% to 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% to 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay (Note 1)	—	2	3	5	ns
T_{SK}	Output-to-Output Skew (Note 2)	Rising edges at VDD/2	—	0	±250	ps

VDD, VDDO =1.8 V ±5%, Ambient temperature -40°C to +85°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	166	MHz
tOR	Output Rise Time	20% to 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% to 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay (Note 1)	—	1.3	2	4	ns
T_{SK}	Output-to-Output Skew (Note 2)	Rising edges at VDD/2	—	0	±250	ps
J_{ADD}	Additive Jitter	@156.25MHz, 12k to 20MHz	—	0.1	—	ps

VDD, VDDO =2.5 V ±5%, Ambient temperature -40°C to +85°C, unless stated otherwise

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	200	MHz
tOR	Output Rise Time	20% TO 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% TO 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay(1)	—	0.8	1.5	3	ns
T_{SK}	Output-to-Output Skew(2)	Rising edges at VDD/2	—	0	±250	ps
J_{ADD}	Additive Jitter	@ 156.25MHz, 12k to 20MHz	—	0.05	—	ps

Notes:
1. With rail-to-rail input clock.
2. Between any two outputs with equal loading.

VDD, VDDO =3.3 V ±10%, Ambient temperature -40°C to +85°C, unless stated otherwise

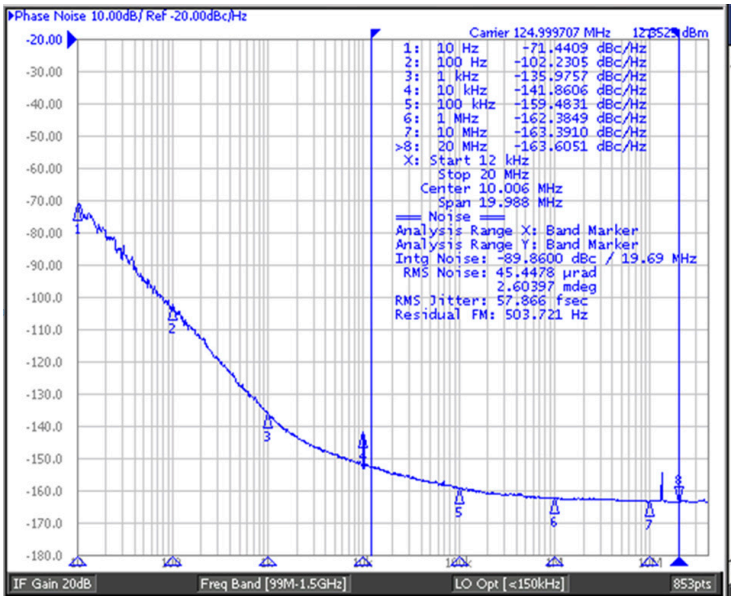
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
F_{OUT}	Output Frequency	—	0	—	200	MHz
tOR	Output Rise Time	20% TO 80%	—	1.0	1.5	ns
tOF	Output Fall Time	20% TO 80%	—	1.0	1.5	ns
T_{PD}	Propagation Delay(1)	—	0.8	1.0	2.5	ns
T_{SK}	Output-to-Output Skew(2)	Rising edges at VDD/2	—	0	±250	ps
J_{ADD}	Additive Jitter	@ 156.25MHz, 12k to 20MHz	—	0.05	—	ps

Notes:
1. With rail-to-rail input clock.
2. Between any two outputs with equal loading.

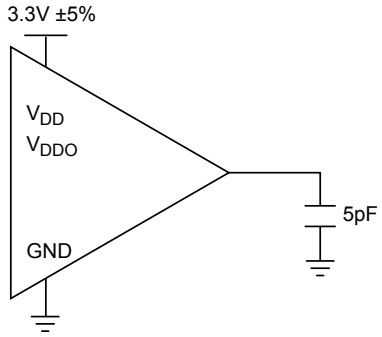
Phase Noise and Additive Jitter

Output phase noise plot provided below.

Additive jitter = $\sqrt{(\text{Output jitter}^2 - \text{Input jitter}^2)}$



Configuration Test Load Board Termination for LVCMOS Outputs

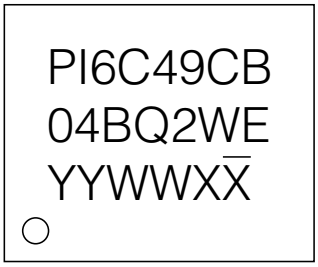


Thermal Information

Symbol	Description	Condition	
Θ_{JA}	Junction-to-Ambient Thermal Resistance	Still air	157°C/W
Θ_{JC}	Junction-to-Case Thermal Resistance	—	42°C/W

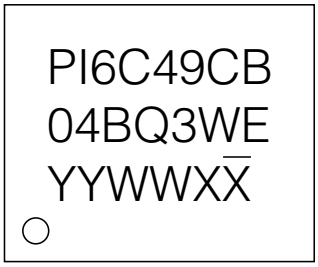
Part Marking

W Package-Q2



YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: Fab Code

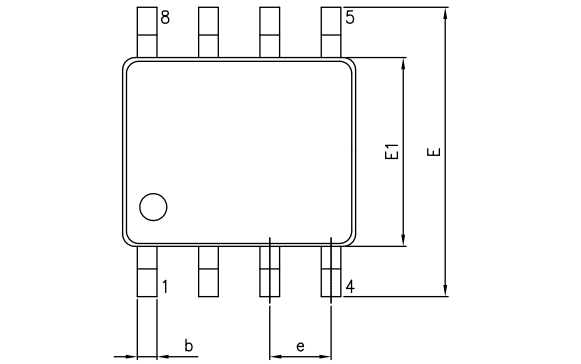
W Package-Q3

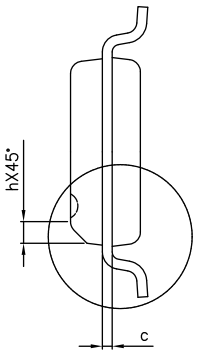


YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: Fab Code

Packaging Mechanical:

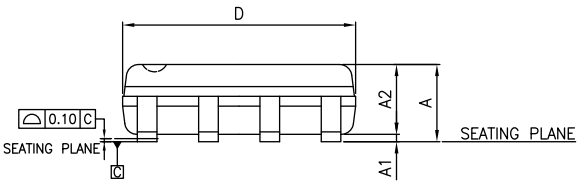
8-SOIC (W)

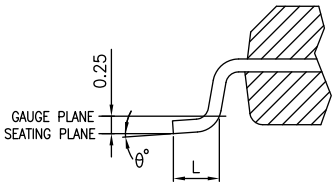




SYMBOLS	MIN.	NOM.	MAX.
A	—	—	1.75
A1	0.10	—	0.25
A2	1.25	—	—
b	0.31	—	0.51
c	0.10	—	0.25
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.40	—	1.27
h	0.25	—	0.50
θ°	0	—	8

UNIT : mm





NOTE :
1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES
2. DIMENSIONS EXCLUDE BURRS, MOLD FLASH OR PROTRUSIONS
3. REFER JEDEC MS-012

PERICOM Enabling Serial Connectivity	DATE: 02/21/14
DESCRIPTION: 8-Pin, 150mil-Wide, SOIC	
PACKAGE CODE: W (W8)	
DOCUMENT CONTROL #: PD-1001	REVISION: G

15-0103

For latest package information:

See http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/.

Ordering Information

Ordering Code	Package Code	Package Description	Operating Temperature
PI6C49CB04BQ2WEX	W	8-pin, 150mil-Wide (SOIC)	-40°C to 105°C
PI6C49CB04BQ3WEX	W	8-pin, 150mil-Wide (SOIC)	-40°C to 85°C

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
4. Q = Automotive Compliant
5. 2 and 3 = AEC-Q100 Grade Level
6. E = Pb-free and Green
7. X suffix = Tape/Reel

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