PI6C2405A-1/PI6C2405A-1H

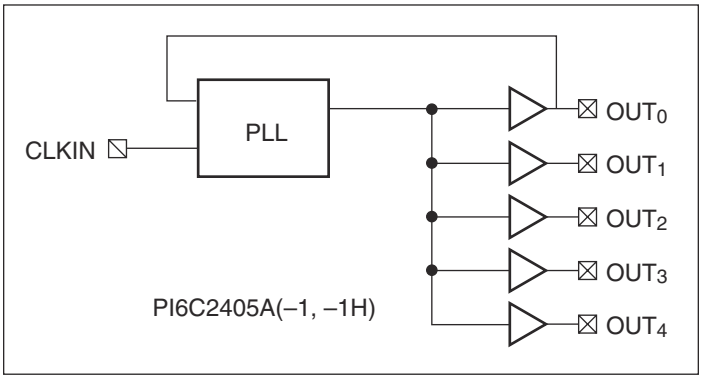
Zero-Delay Clock Buffer

Features

- Maximum rated frequency: 133 MHz
- Low cycle-to-cycle jitter
- Input to output delay, less than 300ps
- Internal feedback allows outputs to be synchronized to the clock input
- 5V tolerant input*
- Spread spectrum clock ready
- Operates at 3.3V V_{DD}
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please contact us or your local Diodes representative.
  https://www.diodes.com/quality/product-definitions/
- Packaging (Pb-free & Green available):
  -8-pin, 150-mil SOIC (W)
  -8-pin, 173-mil TSSOP (L)

* *CLKIN must reference the same voltage thresholds for the PLL to deliver zero delay skewing*

Block Diagram



Description

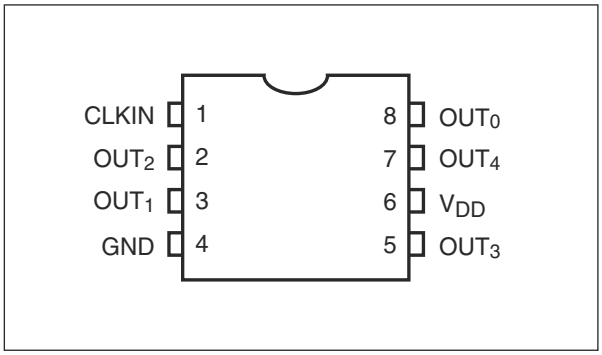
The PI6C2405A-1/PI6C2405A-1H is a PLL based, zero-delay buffer, with the ability to distribute five outputs of up to 133MHz at 3.3V. All the outputs are distributed from a single clock input CLKIN and output OUT0 performs zero delay by connecting a feedback to PLL.

An internal feedback on OUT0 is used to synchronize the outputs to the input; the relationship between loading of this signal and the outputs determines the input-output delay. PI6C2405A-1/PI6C2405A-1H is able to track spread spectrum clocking for EMI reduction. PI6C2405A-1/PI6C2405A-1H is characterized for both commercial and industrial operation.

PI6C2405A-1H is a high-drive version of PI6C2405A-1.

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

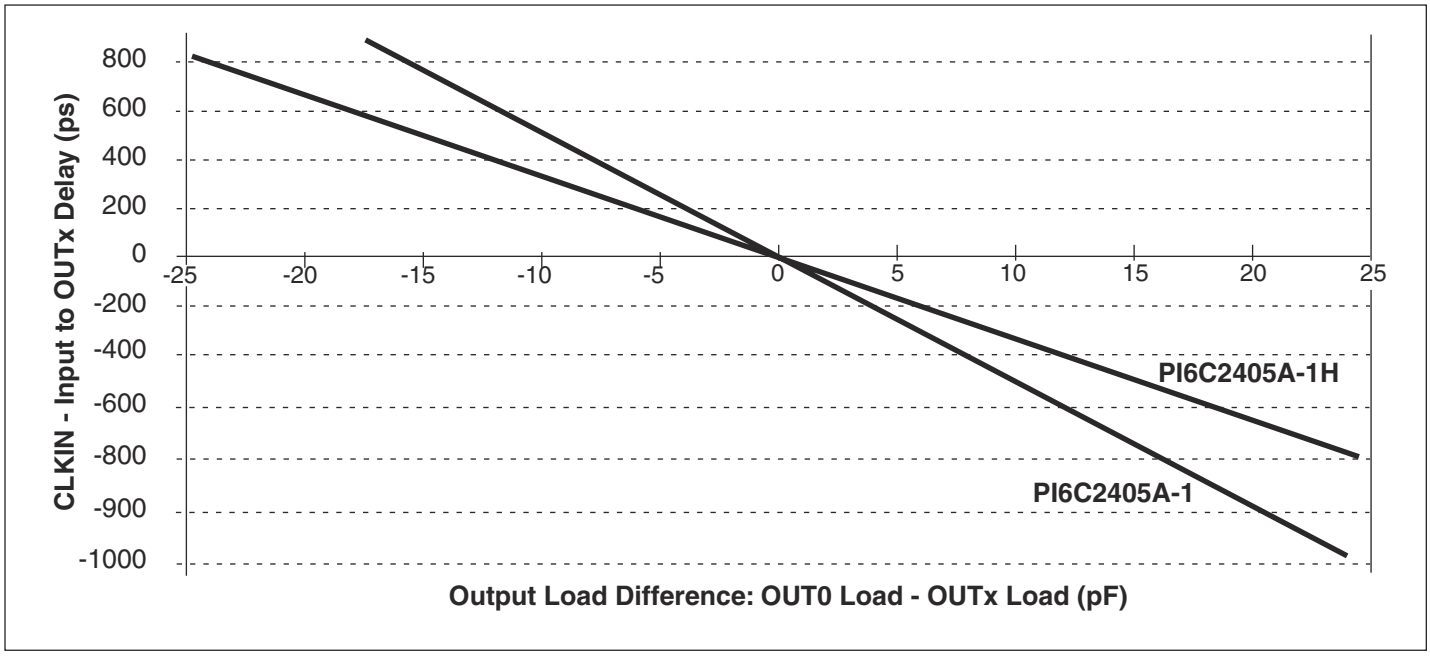


Pin Description

Pin#	Pin Name	Description
1	CLKIN	Input clock reference frequency (weak pull-down)
2, 3, 5, 7	OUT[1-4]	Clock Outputs
4	GND	Ground
6	V_{DD}	3.3V Supply
8	OUT0	Clock output, internal PLL feedback (weak pull-down)

Zero Delay and Skew Control

CLKIN Input to OUTx Delay vs. Difference in Loading between OUT0 pin and OUTx pins



The relationship between loading of the OUT0 signal and other outputs determines the input-output delay. Zero delay is achieved when all outputs, including feedback, are loaded equally.

Maximum Ratings

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

Storage Temperature..... –65°C to +150°C
Junction Temperature ..... +125°C Max.
Supply Voltage to Ground Potential.....–0.5V to +4.6V
DC Input Voltage (Except CLKIN)..... -0.5V to V_{DD} +5.5V
ESD Protection (Input) ..... 2000 V min (HBM)

Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Operating Conditions (V_{CC} = 3.3V ±0.3V)

Parameter	Description	Min.	Max.	Units
V_{DD}	Supply Voltage	3.0	3.6	V
T_A	Commercial Operating Temperature	0	70	°C
	Industrial Operating Temperature	-40	85	
C_L	Load Capacitance, below 100 MHz		30	pF
	Load Capacitance, from 100 MHz to 133		15	
C_{IN}	Input Capacitance		7	

DC Electrical Characteristics for Industrial Temperature Devices

Parameter	Description	Test Conditions	Min.	Max.	Units
V_{IL}	Input LOW Voltage			0.8	V
V_{IH}	Input HIGH Voltage		2.0		
I_{IL}	Input LOW Current	V_{IN} = 0V		50	µA
I_{IH}	Input HIGH Current	V_{IN} = V_{DD}		125	
V_{OL}	Output LOW Voltage	I_{OL} = 8mA(-1); I_{OL} = 12mA(-1H)		0.4	V
V_{OH}	Output HIGH Voltage	I_{OH} = -8mA(-1); I_{OH} = -12mA(-1H)	2.4		
I_{DD}	Supply Current	Unloaded outputs 100 MHz, Select inputs at V_{DD} or GND		54	mA
		Unloaded outputs 66 MHz, CLKIN		39	

AC Electrical Characteristics for Industrial Temperature Devices

Parameter	Description	Test Conditions	Min.	Typ.	Max.	Units
F_O	Output Frequency	30pF load	10		100	MHz
		15pF load	10		133	
t_{DC}	Duty Cycle(1) (-1)	Measured at $V_{DD}/2$, F_{OUT} < 66.67MHz, 30pF load	40	50	60	%
		Measured at $V_{DD}/2$, F_{OUT} < 45MHz 15pF load	45		55	
	Duty Cycle(1) (-1H)	Measured at $V_{DD}/2$, F_{OUT} < 100MHz 15pF load	40		60	
		Measured at $V_{DD}/2$, F_{OUT} < 45MHz 30pF load	45		55	
t_R	Rise Time(1)(-1)	Measured between 0.8V and 2.0V, 30pF load			2.2	ns
		Measured between 0.8V and 2.0V, 15pF load			1.5	
	Rise Time(1)(-1H)	Measured between 0.8V and 2.0V, 30pF load			1.7	
t_F	Fall Time(1)(-1)	Measured between 0.8V and 2.0V, 30pF load			2.2	
		Measured between 0.8V and 2.0V, 15pF load			1.5	
	Fall Time(1)(-1H)	Measured between 0.8V and 2.0V, 30pF load			1.5	
$t_{sk(o)}$	Output to Output skew (-1, -1H)(1)	All outputs equally loaded			200	ps
t_0	Delay, CLKIN Rising Edge to OUT0 Rising Edge(1)	Measured at $V_{DD}/2$		0	±300	
$t_{SK(D)}$	Device-to-device skew(1)	Measured at $V_{DD}/2$ on OUT0 pins of device		0	600	
t_{SLEW}	Output slew rate (1)	Measured between 0.8V and 2.0V on -1H device using Test Circuit #2	1			V/ns
t_{JIT}	Cycle-to-Cycle Jitter (-1, -1H)	Measured at 66.67 MHz, loaded 30pF load			200	ps
t_{LOCK}	PLL Lock time (1)	Stable power supply, valid clocks presented on CLKIN pin			1.0	ms

Notes:
1. See Switching Waveforms on page 6.

DC Electrical Characteristics for Commercial Temperature Devices

Parameter	Description	Test Conditions	Min.	Max.	Units
V_{IL}	Input LOW Voltage			0.8	V
V_{IH}	Input HIGH Voltage		2.0		
I_{IL}	Input LOW Current	V_{IN} = 0V		50	µA
I_{IH}	Input HIGH Current	V_{IN} = V_{DD}		125	
V_{OL}	Output LOW Voltage	I_{OL} = -8mA(-1); I_{OL} = 12mA(-1H)		0.4	V
V_{OH}	Output HIGH Voltage	I_{OH} = -8mA(-1); I_{OH} = -12mA(-1H)	2.4		
I_{DD}	Supply Current	Unloaded outputs 100 MHz, Select inputs at V_{DD} or GND		54	mA
		Unloaded outputs 66.67 MHz, select inputs at V_{DD} or GND		39	

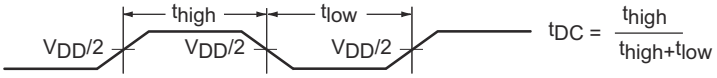
AC Electrical Characteristics for Commercial Temperature Devices

Parameter	Description	Test Conditions	Min.	Typ.	Max.	Units
F_O	Output Frequency	30pF load	10		100	MHz
		15pF load	10		133	
t_{DC}	Duty Cycle(1) (-1)	Measured at $V_{DD}/2$, F_O < 66 MHz, 30pF load	40	50	60	%
	Duty Cycle(1) (-1H)	Measured at $V_{DD}/2$, F_O < 66 MHz, 30pF load	45	50	55	
t_R	Rise Time(1) @ 30pF	Measured between 0.8V and 2.0V			2.2	ns
	Rise Time(1) @ 15pF				1.5	
	Rise Time(1) @ 30pF (-1H)				1.5	
t_F	Fall Time(1) @ 30pF	Measured between 0.8V and 2.0V			2.2	
	Fall Time(1) @ 15pF				1.5	
	Fall Time(1) @ 30pF (-1H)				1.5	
$t_{sk(o)}$	Output to Output skew (-1, -1H)(1)	All outputs equally loaded			200	ps
t_0	Input to output delay, CLKIN Rising Edge to OUT0 Rising Edge(1)	Measured at $V_{DD}/2$		0	±300	
$t_{SK(D)}$	Device-to-device skew(1)	Measured at $V_{DD}/2$ on OUT0 pins of device		0	600	
t_{SLEW}	Output slew rate (1)	Measured between 0.8V and 2.0V on -1H device using Test Circuit #2	1			V/ns
t_{JIT}	Cycle-to-Cycle Jitter (-1, -1H)	Measured at 66.67 MHz, loaded 30pF load			200	ps
t_{LOCK}	PLL Lock time (1)	Stable power supply, valid clocks presented on CLKIN pin			1.0	ms

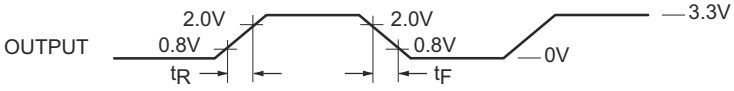
Notes:
1. See Switching Waveforms on page 6.

Switching Waveforms

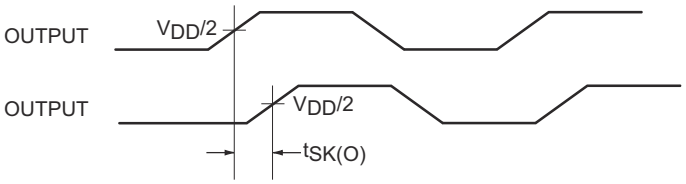
Duty Cycle Timing



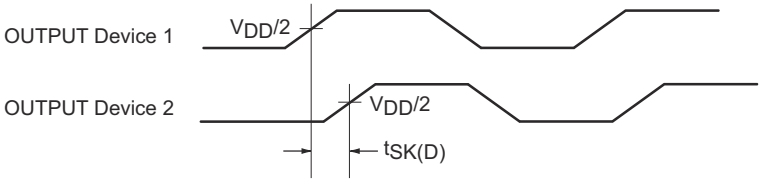
All Outputs Rise/Fall Time



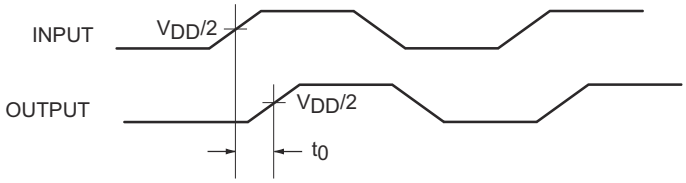
Output-Output Skew



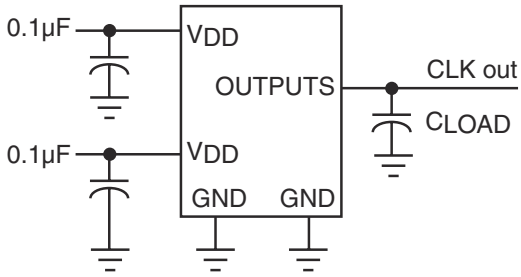
Device-Device Skew



Input-Output Propagation Delay

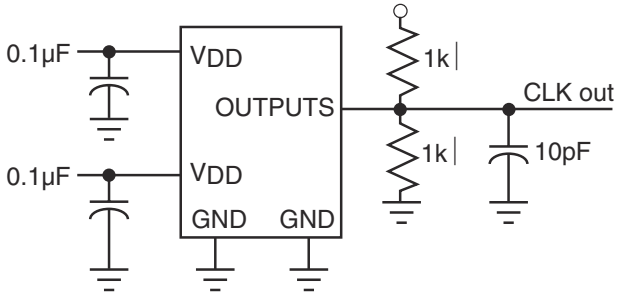


Test Circuit 1



Test Circuit for all parameters except t_{SLEW}

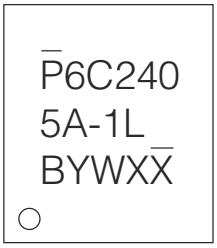
Test Circuit 2



Test Circuit for t_{SLEW} ,Output slew rate on –1H device

Part Marking

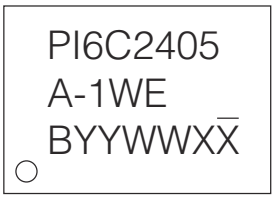
L Package



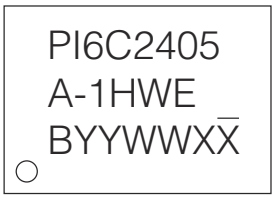
PI6C2405A-1LE
B: Fab Port Code
Y: Year
W: Workweek
1st X: Assembly Code
2nd X: Fab Code

PI6C2405A-1HLE
B: Fab Port Code
Y: Year
W: Workweek
1st X: Assembly Code
2nd X: Fab Code

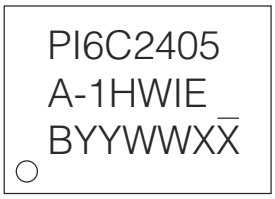
W Package



PI6C2405A-1WE
B: Fab Port Code
YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: FabCode

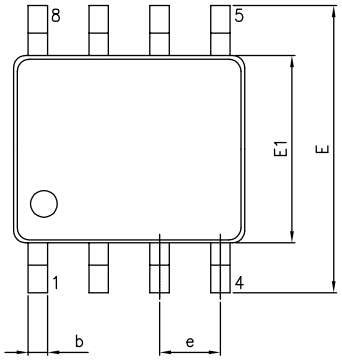


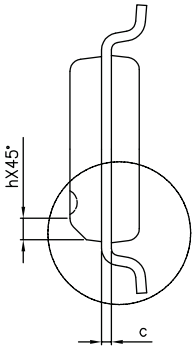
PI6C2405A-1HWE
B: Fab Port Code
YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: FabCode



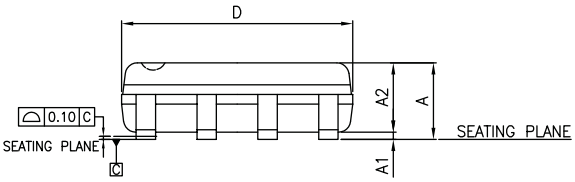
PI6C2405A-1HWIE
B: Fab Port Code
YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: FabCode

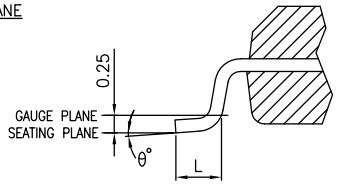
Packaging Mechanical: 8-SOIC (W)

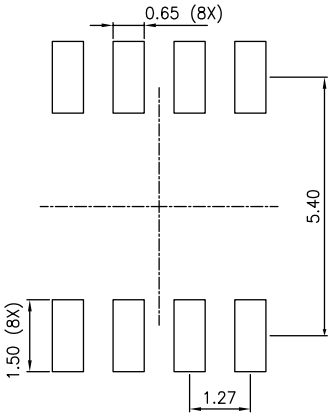




SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.75
A1	0.10	–	0.25
A2	1.25	–	–
b	0.31	–	0.51
c	0.10	–	0.25
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27 BSC		
L	0.40	–	1.27
h	0.25	–	0.50
θ°	0	–	8







Recommended Land Pattern

NOTE :
1. ALL DIMENSIONS ARE IN mm. ANGLES IN DEGREES
2. DIMENSIONS EXCLUDE BURRS, MOLD FLASH OR PROTRUSIONS
3. REFER JEDEC MS-012
4. RECOMMENDED LAND PATTERN IS FOR REFERENCE ONLY.

20-1273

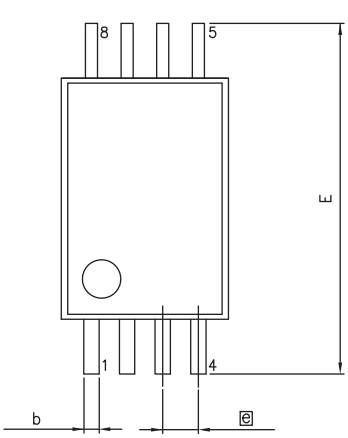
DATE: 06/02/20

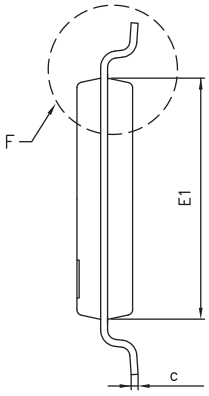
DESCRIPTION: 8-Pin, 150mil-Wide, SOIC

PACKAGE CODE: W (W8)

DOCUMENT CONTROL #: PD-1001 **REVISION: H**

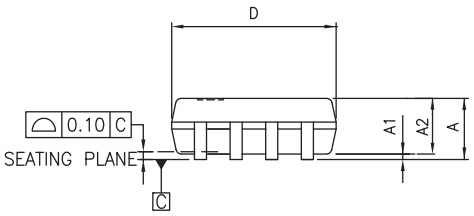
Packaging Mechanical: 8-TSSOP (L)

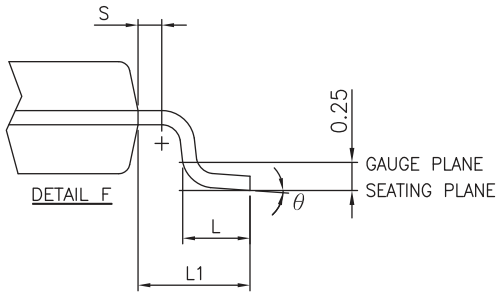




SYMBOLS	MIN.	NOM.	MAX.
A	–	–	1.20
A1	0.05	–	0.15
A2	0.80	1.00	1.05
b	0.19	–	0.30
c	0.09	–	0.20
D	2.90	3.00	3.10
E	6.20	6.40	6.60
e	0.65 BSC		
E1	4.30	4.40	4.50
L	0.45	0.60	0.75
L1	1.00 REF		
S	0.20	–	–
θ°	0	–	8

UNIT : MM





NOTES:
1. ALL DIMENSIONS IN MILLIMETERS. ANGLES IN DEGREES.
2. JEDEC MO-153F/AA
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

PERICOM enabling Serial Connectivity

DATE: 03/24/16

DESCRIPTION: 8-Pin, 173mil Wide TSSOP

PACKAGE CODE: L (L8)

DOCUMENT CONTROL #: PD-1308 REVISION: G

16-0062

For latest package info.

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

Ordering Information

Ordering Code	Package Code	Package Description
PI6C2405A-1HWEX	W	8-pin, 150-mil wide (SOIC)
PI6C2405A-1HLEX	L	8-pin, 173-mil wide (TSSOP)
PI6C2405A-1WEX	W	8-pin, 150-mil wide (SOIC)
PI6C2405A-1LEX	L	8-pin, 173-mil wide (TSSOP)
PI6C2405A-1HWIEX	W	8-pin, 150-mil wide (SOIC)

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. I = Industrial
5. E = Pb-free and Green
6. X suffix = Tape/Reel

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