PRELIMINARY

![ICS logo] Integrated Circuit Systems, Inc.

ICS8Mx4
LVDS CLOCK OSCILLATOR

ICS8Mx4
LOW JITTER, HIGH FREQUENCY XTAL OSCILLATOR

- Stable, ultra low jitter, LVDS clock generation
- For Gigabit Ethernet, Fibre Channel, PCI-Express™, other applications
- Clock output frequencies from 75MHz to 750MHz
- One differential LVDS clock output
- Output Enable (OE) pin (high impedance – when low)
- Small 6-pin 5mm x 7mm x 1.5mm SMT ceramic package
- Low profile package allows back-side PCB mounting
- Pb-free RoHS compliant (by default; no additional code required)
- 3.3V or 2.5V device power supply options
- Commercial (0 to +70 °C) and Industrial (-40 to +85 °C) temperatures
- Frequency stability of ±50ppm or ±100ppm
  (including initial accuracy, operating temperature variation, supply voltage variation, load variation, reflow drift, and aging for 10 years)
- Low phase jitter < 1 ps rms maximum (12kHz to 20MHz)

8Mx4
(Top View)

Pin layout: 6 VDD, 5 nOUT, 4 OUT, 1 OE, 2 NC, 3 GND
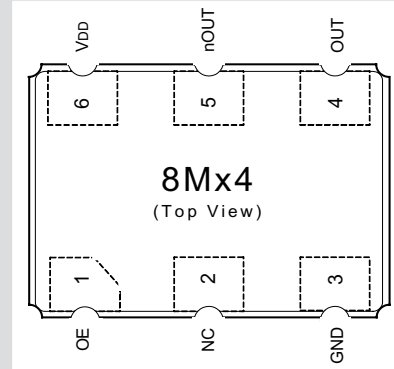
6-pin CERHERMETIC 5mm x 7mm x 1.5mm SMT

ELECTRICAL SPECIFICATIONS

Unless stated otherwise, V_{DD} = 3.3V ± 5% or 2.5V ± 5%, T_A = 0°C to +70°C (commercial), T_A = -40°C to +80°C (industrial)

Item		Symbol	Min.	Typ.	Max.	Units	Test Conditions
DC Characteristics							
Power Supply (V_{DD}, GND pins)	Power Supply Voltage	V_{DD}	3.135	3.3	3.465	V	3.3V operation
			2.375	2.5	2.625	V	2.5V operation (8MJ4 and 8MK4 only)
	Power Supply Current	I_{DD}		83		mA	OE = V_{DD}
	Current w/Output Disabled	I_{OED}			<0.6	mA	OE = GND
	Input Capacitance	C_{IN}		4		pF	
Output Enable (OE pin) LVCMOS/LVTTL	Input High Voltage	V_{IH}	0.7 * V_{DD}			V	
	Input Low Voltage	V_{IL}			0.3 * V_{DD}	V	
	Input High Current	I_{IH}			5	µA	V_{DD} = V_{IN} = 3.465V or 2.625V
	Input Low Current	I_{IL}	-150			µA	V_{DD} = 3.465V or 2.625V, V_{IN} = 0V
	Internal Pullup Resistor	R_{PULLUP}		51		kΩ	
Clock Output Level (OUT, nOUT) LVDS	Differential Output Voltage	V_{OD}		350		mV	100Ω termination between OUT and nOUT. See Parameter Measurement Information.
	V_{OD} Magnitude Change	Δ V_{OD}			50	mV	
	Offset Voltage	V_{OS}		1.25		V	
	V_{OS} Magnitude Change	Δ V_{OS}			150	mV	
AC Characteristics							
Output (OUT, nOUT)	Output Frequency Range		75		750	MHz	All conditions
	Frequency Stability Error	Δ f/f_O			±100	ppm p-p	8MH4 & 8MK4 — Includes frequency set, V_{DD}, T_A and load variation, reflow drift, 10 yr. aging
					±50	ppm p-p	8MG4 & 8MJ4
	Output Duty Cycle	odc		50		%	See Output Duty Cycle Diagram and Rise/Fall Time Diagram in Parameter Measurement Information
	Output Rise Time	t_R			600	ps	20% to 80% of V_{OD}
	Output Fall Time	t_F			600	ps	
	Oscillator Start-up Time	t_{OSC}			10	ms	Time at Min. V_{DD} (3.135V or 2.375V) to be 0s
	RMS Phase Jitter, Random[1]	$t$jit (Ø)			<1	ps rms	design target
	Jitter	t_{DS}[2]		0.2		ps	Deterministic
		t_{RS}[2]		3		ps	Random, σ of random jitter
		t_{RMS}[2]		3		ps	Root Mean Square, σ of total jitter distribution
		t_{P-P}[2]		25		ps	Peak-to-Peak
		t_{acc}[2]		4		ps	Accumulated Jitter, n = 2 to 50,000 cycles

NOTE 1: Measured using an Aeroflex PN9500 with a 12kHz to 20MHz integration range.   NOTE 2: Measured using a Wavecrest SIA-3000.

Supply Voltage & Frequency Accuracy		
G =	3.3V / 3.3V	±50 ppm
H =	3.3V / 3.3V	±100 ppm
J =	2.5V / 3.3V	±50 ppm
K =	2.5V / 3.3V	±100 ppm

The Preliminary Information presented herein represents a product in prototyping or pre-production. The noted characteristics are based on initial product characterization. Integrated Circuit Systems, Incorporated (ICS) reserves the right to change any circuitry or specifications without notice.

PRELIMINARY

Integrated
Circuit
Systems, Inc.

ICS8Mx4
LVDS CLOCK OSCILLATOR

PIN DESCRIPTIONS

Number	Name	Type		Description
1	OE	Input	Pullup	Output enable pin. High Impedance when LOW. LVCMOS/LVTTL interface levels.
2	nc	Unused		No connect.
3	GND	Power		Power supply ground.
4, 5	OUT, nOUT	Output		Differential clock outputs. LVDS interface levels.
6	V_{DD}	Power		Power supply pin.

For typical value of internal Pullup resistor, see DC Characteristics.

ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Unit
Input Voltage	V_I	-0.5 to V_{DD} +0.5	V
Output Voltage	V_O	-0.5 to V_{DD} +0.5	V
Positive Supply Voltage	V_{DD}	4.6	V
Package Thermal Impedence		TBD	°C/W (0lfpm)
Storage Temperature	T_S	-40 to +100	°C

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 DC Characteristics or AC Characteristics is not implied. Exposure to absolute maximum rating conditions for extended periods may affect product reliability.
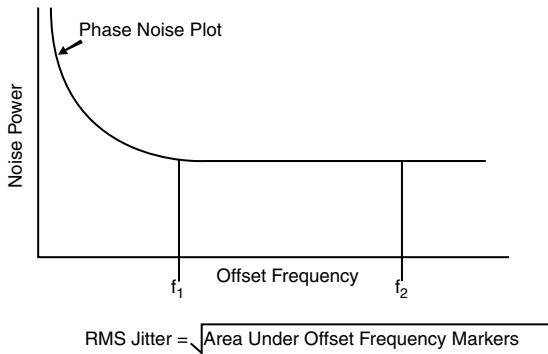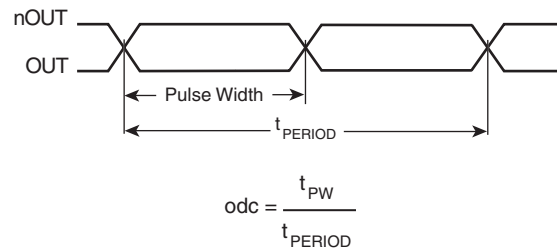
PARAMETER MEASUREMENT INFORMATION
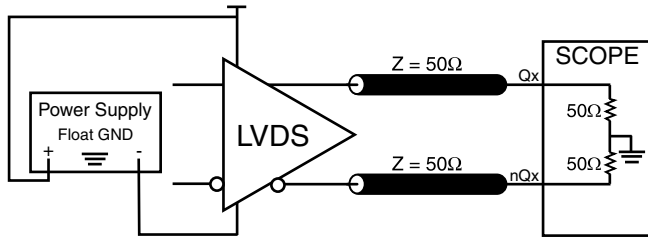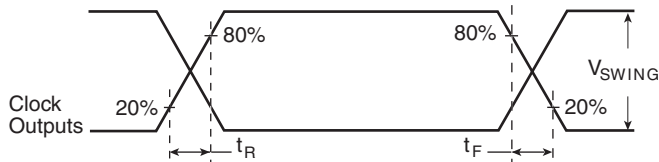

3.3V OUTPUT LOAD AC TEST CIRCUIT

2.5V OUTPUT LOAD AC TEST CIRCUIT

$$\text{RMS Jitter} = \sqrt{\text{Area Under Offset Frequency Markers}}$$

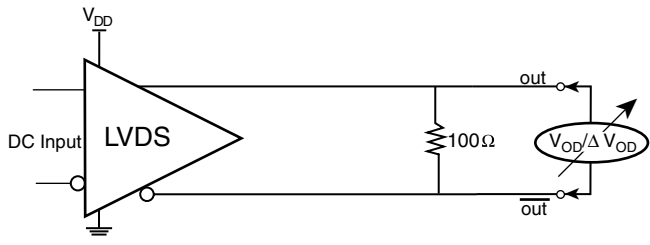**RMS PHASE JITTER**

$$odc = \frac{t_{PW}}{t_{PERIOD}}$$
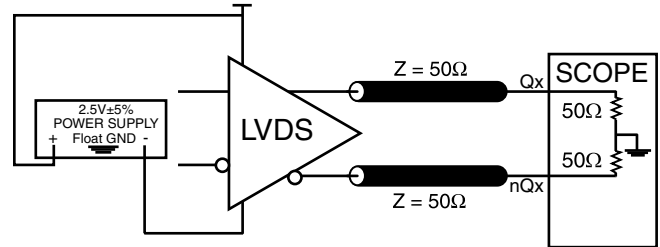
OUTPUT DUTY CYCLE/PULSE WIDTH/PERIOD

OUTPUT RISE/FALL TIME

POWER OFF LEAKAGE SETUP

Integrated
Circuit
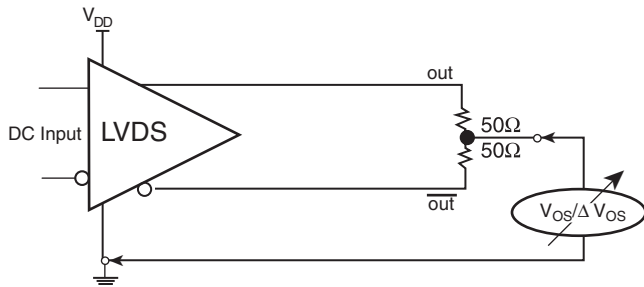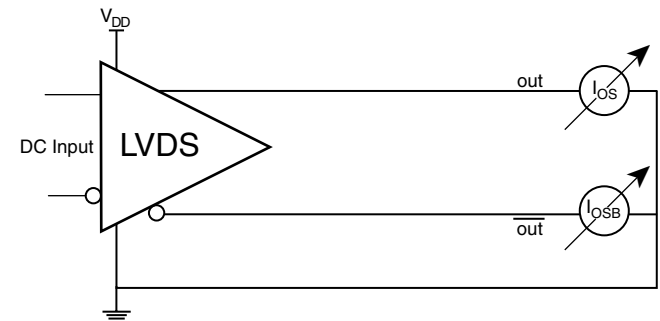Systems, Inc.
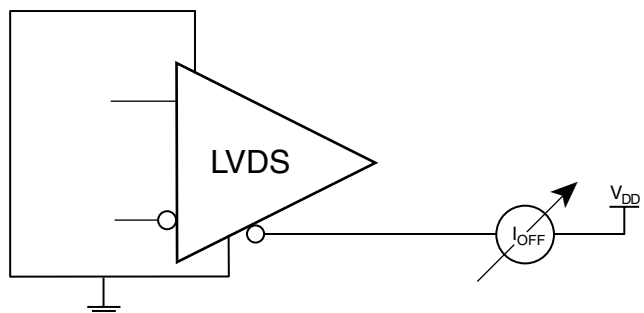
DIFFERENTIAL OUTPUT VOLTAGE SETUP
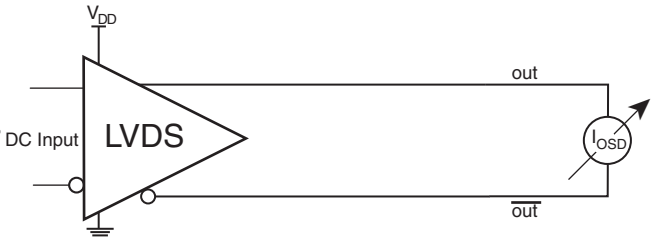
DIFFERENTIAL OUTPUT SHORT CIRCUIT SETUP

OFFSET VOLTAGE SETUP

OUTPUT SHORT CIRCUIT CURRENT SETUP

APPLICATION INFORMATION

3.3V, 2.5V LVDS DRIVER TERMINATION

A general LVDS interface is shown in *Figure 1.* In a 100Ω differential transmission line environment, LVDS drivers require a matched load termination of 100Ω across near the receiver input. For a multiple LVDS outputs buffer, if only partial outputs are used, it is recommended to terminate the unused outputs.
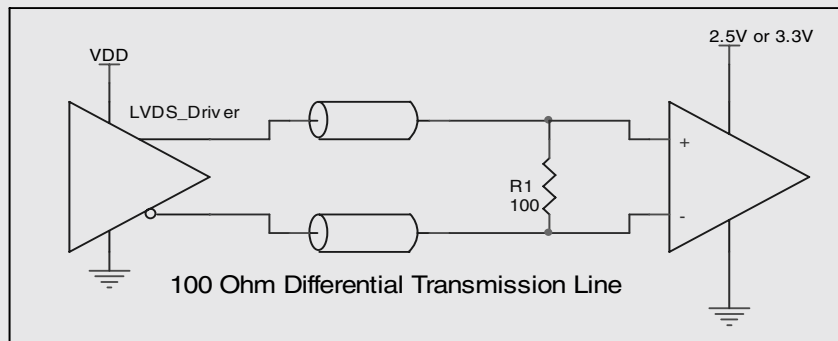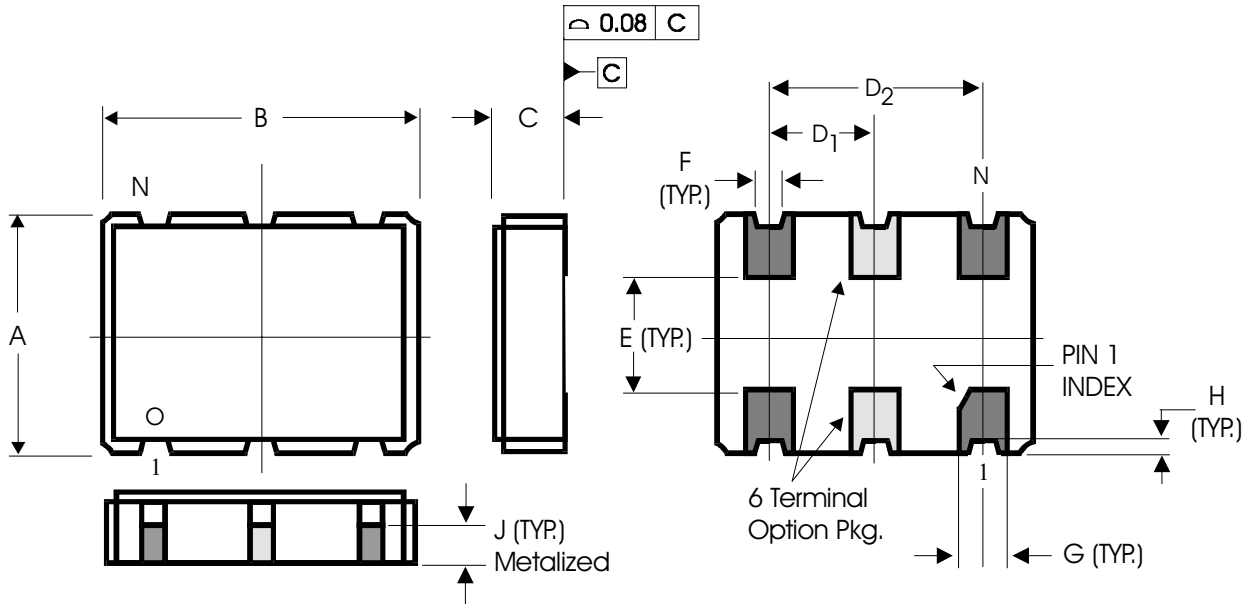
2.5V or 3.3V

VDD

LVDS_Driver

R1
100

100 Ohm Differential Transmission Line

FIGURE 1. TYPICAL LVDS DRIVER TERMINATION

PACKAGE OUTLINE - J SUFFIX FOR 6 LEAD SMT CERHERMETIC, 5mm x 7mm x 1.5mm

DIMENSIONS IN MILLIMETERS		
SYMBOL	**Nominal**	**Tolerance**
A	5	±0.15
B	7	±0.15
C	1.5	±0.15
D_1	2.54	±0.13
D_2	5.08	±0.13
E	2.6	±0.13
F	0.6	±0.13
G	1.4	±0.13
H	0.15 Ref.	-
J	0.65 Ref.	-

PART/ORDER NUMBER INFORMATION

Part/Order Number: **ICS8M x 4 - fff.fff r p t u**

Device

Supply Voltage & Frequency Accuracy
G = 3.3V   ±50 ppm
H = 3.3V   ±100 ppm
J = 2.5/3.3V   ±50 ppm
K = 2.5/3.3V   ±100 ppm

Output Type
4 = LVDS

Output Frequency (MHz)
Leading zeroes dropped. Fourth decimal place added if necessary.
Consult ICS for other frequencies.

Revision of Product
A = Initial Release

Package Type (individual devices)
J = 5x7mm ceramic SMT

Ambient Temperature Range
none = commercial = 0°C to +70°C
I = industrial = -40°C to +85°C

Bulk Packaging option
none = tube
T = tape and reel (1000 devices)

Note: Lead-free by default (no addition "LF" code needed).
(Pb-free and RoHS complaint)

PRELIMINARY

Integrated
Circuit
Systems, Inc.

ICS8Mx4
LVDS CLOCK OSCILLATOR

ORDERING INFORMATION - 0°C TO + 70°C (COMMERCIAL)

Part/Order Number*	Marking*	Package	Shipping Packaging	Temperature
ICS8Mx4-100.000AJ	ICS8Mx4 100.000	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-100.000AJT	ICS8Mx4 100.000	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-106.250AJ	ICS8Mx4 106.250	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-106.250AJT	ICS8Mx4 106.250	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-125.000AJ	ICS8Mx4 125.000	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-125.000AJT	ICS8Mx4 125.000	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-156.250AJ	ICS8Mx4 156.250	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-156.250AJT	ICS8Mx4 156.250	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-159.375AJ	ICS8Mx4 159.375	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-159.375AJT	ICS8Mx4 159.375	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-187.500AJ	ICS8Mx4 187.500	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-187.500AJT	ICS8Mx4 187.500	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-212.500AJ	ICS8Mx4 212.500	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-212.500AJT	ICS8Mx4 212.500	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-250.000AJ	ICS8Mx4 250.000	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-250.000AJT	ICS8Mx4 250.000	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx4-312.500AJ	ICS8Mx4 312.500	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx4-312.500AJT	ICS8Mx4 312.500	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C

*See table below for Part/Order Number Information. Where "x" is applied, see *Supply Voltage & Frequency Accuracy* in the Part/Order Number Information table.

ORDERING INFORMATION - -40°C TO +85°C (INDUSTRIAL)

Part/Order Number*	Marking*	Package	Shipping Packaging	Temperature
ICS8Mx4-125.000AJI	ICS8Mx4 125.000	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx4-125.000AJIT	ICS8Mx4 125.000	6 lead CERHERMETIC	1000 Tape & Reel	-40°C to 85°C
ICS8Mx4-212.500AJI	ICS8Mx4 212.500	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx4-212.500AJIT	ICS8Mx4 212.500	6 lead CERHERMETIC	1000 Tape & Reel	-40°C to 85°C
ICS8Mx4-240.000AJI	ICS8Mx4 240.000	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx4-240.000AJIT	ICS8Mx4 240.000	6 lead CERHERMETIC	1000 Tape & Reel	-40°C to 85°C
ICS8Mx4-669.326AJI	ICS8Mx4 669.326	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx4-669.326AJIT	ICS8Mx4 669.326	6 lead CERHERMETIC	1000 Tape & Reel	-40°C to 85°C

*See table on page 4 for Part/Order Number Information. Where "x" is applied, see *Supply Voltage & Frequency Accuracy* in the Part/Order Number Information table.