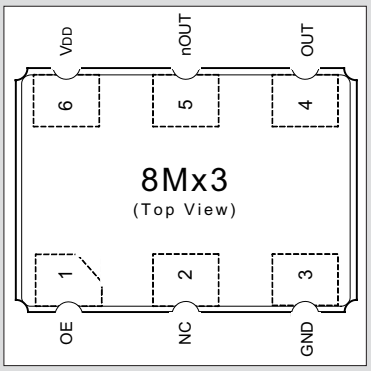
PRELIMINARY

Integrated Circuit Systems, Inc.

ICS8Mx3
LVPECL Clock Oscillator

ICS8Mx3
Low Jitter, High Frequency XTAL Oscillator

- Stable, ultra low jitter, LVPECL clock generation
- For Gigabit Ethernet, Fibre Channel, PCI-Express™, other applications
- Clock output frequencies from 75MHz to 750MHz
- One differential LVPECL 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)



6-pin CERHERMETIC 5mm x 7mm x 1.5mm SMT

Electrical Specifications

Unless stated otherwise, V_{CC} = 3.3V ± 5% or 2.5V ± 5%, T_A = 0°C to +70°C (commercial), T_A = -40°C to +85°C (industrial)

Item		Symbol	Specifications Min.	Typ.	Max.	Units	Test Conditions	
DC Characteristics								
Power Supply (V_{CC}, V_{EE} pins)	Power Supply Voltage	V_{CC}	3.135	3.3	3.465	V	3.3V operation	
			2.375	2.5	2.625	V	2.5V operation (8MJ3 and 8MK3 only)	
	Power Supply Current	I_{EE}		75		mA	OE = V_{CC}	
	Current w/Output Disabled	I_{OED}			<0.6	mA	OE = V_{EE}	
	Input Capacitance	C_{IN}		4		pF		
Output Enable (OE pin) LVCMOS/LVTTL	Input High Voltage	V_{IH}	0.7 * V_{CC}			V		
	Input Low Voltage	V_{IL}			0.3 * V_{CC}	V		
	Input High Current	I_{IH}			5	µA	V_{CC} = V_{IN} = 3.465V or 2.625V	
	Input Low Current	I_{IL}	-150			µA	V_{CC} = 3.465V or 2.625V, V_{IN} = 0V	
	Internal Pullup Resistor	R_{PULLUP}		51		kΩ		
Clock Output Level (OUT, nOUT) LVPECL	Output High Voltage[1]	V_{OH}	V_{CC} - 1.4		V_{CC} - 0.9	V	Outputs terminated with 50Ω to V_{CC} - 2V. See Parameter Measurement Information, *Output Load AC Test Circuit diagrams.*	
	Output Low Voltage[1]	V_{OL}	V_{CC} - 2.0		V_{CC} - 1.7	V		
	Peak-to-Peak Output Voltage Swing	V_{SWSING}	0.6		1.0	V	See Parameter Measurement Information, *Output Rise/Fall Time diagram*	
AC Characteristics								
Output (OUT, nOUT)	Output Frequency Range		75		750	MHz	All conditions	
	Frequency Stability Error	$\Delta f/f_O$			±100	ppm p-p	8MH3 & 8MK3	Includes frequency set, V_{CC}, TA and load variation, reflow drift, 10 yr. aging
					±50	ppm p-p	8MG3 & 8MJ3	
	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_{OH} - V_{OL}	
	Output Fall Time	t_F			600	ps		
	Oscillator Start-up Time	t_{OSC}			10	ms	Time at Min. V_{CC} (3.135V or 2.375V) to be 0s	
	RMS Phase Jitter, Random[2]	*t*jit (Ø)			<1	ps rms	design target	
	Jitter	t_{DS}[3]		0.2		ps	Deterministic	
		t_{RS}[3]		3		ps	Random, σ of random jitter	
		t_{RMS}[3]		3		ps	Root Mean Square, σ of total jitter distribution	
		t_{P-P}[3]		25		ps	Peak-to-Peak	
		t_{acc}[3]		4		ps	Accumulated Jitter, n = 2 to 50,000 cycles	

NOTE 1: Outputs terminated with 50Ω to V_{CC} - 2V. See Parameter Measurement Information, *Output Load AC Test Circuit diagrams.*

NOTE 2: Measured using an Aeroflex PN9500 with a 12kHz to 20MHz integration range.

NOTE 3: 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.

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	V_{EE}	Power		Negative supply pin.
4, 5	OUT, nOUT	Output		Differential clock outputs. LVPECL interface levels.
6	V_{CC}	Power		Power supply pin.

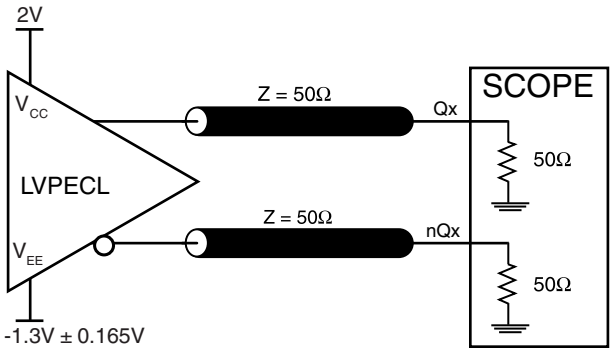
For typical value of internal Pullup resistor, see DC Characteristics.

ABSOLUTE MAXIMUM RATINGS

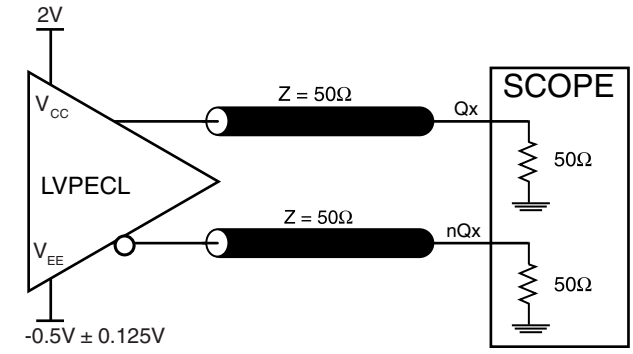
Item	Symbol	Condition	Unit
Input Voltage	V_I	-0.5 to V_{CC} +0.5	V
Output Voltage	V_O	-0.5 to V_{CC} +0.5	V
Positive Supply Voltage	V_{CC}	4.6	V
Package Thermal Impedence		TBD	°C/W (0lfpm)
Storage Temperature	T_S	-40 to +100	°C

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.

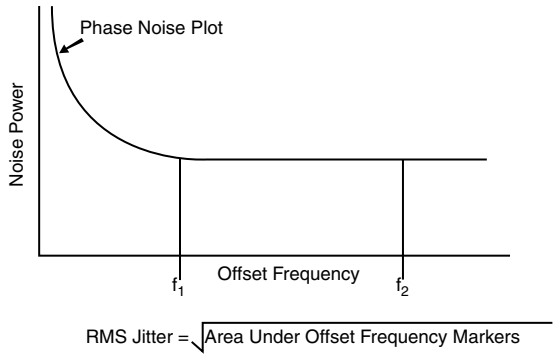
PARAMETER MEASUREMENT INFORMATION



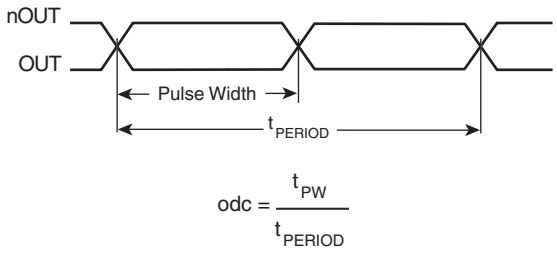
3.3V OUTPUT LOAD AC TEST CIRCUIT



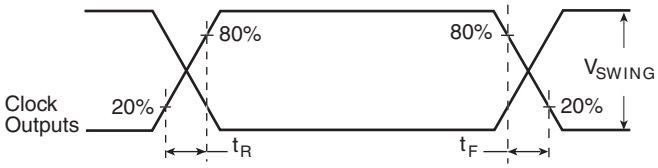
2.5V OUTPUT LOAD AC TEST CIRCUIT



RMS PHASE JITTER



OUTPUT DUTY CYCLE/PULSE WIDTH/PERIOD



OUTPUT RISE/FALL TIME

APPLICATION INFORMATION

TERMINATION FOR 3.3V LVPECL OUTPUT

The clock layout topology shown below is a typical termination for LVPECL outputs. The two different layouts mentioned are recommended only as guidelines.

FOUT and nFOUT are low impedance following outputs that generate ECL/LVPECL compatible outputs. Therefore, terminating resistors (DC current path to ground) or current sources must be used for functionality. These outputs are designed to drive 50Ω transmission lines. Matched impedance techniques should be used to maximize operating frequency and minimize signal distortion. *Figures 1A and 1B* show two different layouts which are recommended only as guidelines. Other suitable clock layouts may exist and it would be recommended that the board designers simulate to guarantee compatibility across all printed circuit and clock component process variations.

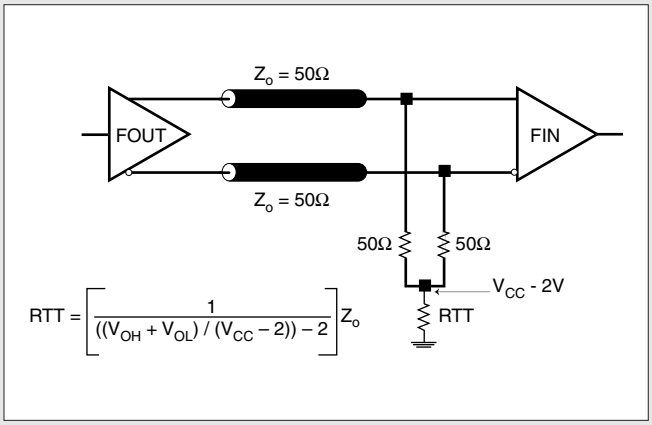


FIGURE 1A. LVPECL OUTPUT TERMINATION

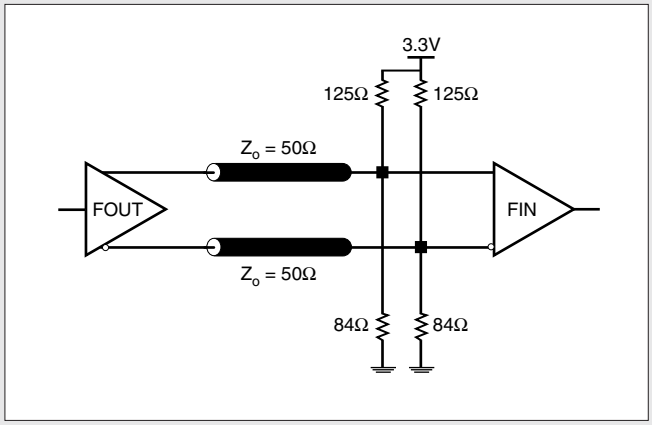


FIGURE 1B. LVPECL OUTPUT TERMINATION

TERMINATION FOR 2.5V LVPECL OUTPUT

Figure 2A and *Figure 2B* show examples of termination for 2.5V LVPECL driver. These terminations are equivalent to terminating 50Ω to V_{CC} - 2V. For V_{CC} = 2.5V, the V_{CC} - 2V is very close to ground level. The R3 in Figure 2B can be eliminated and the termination is shown in *Figure 2C.*

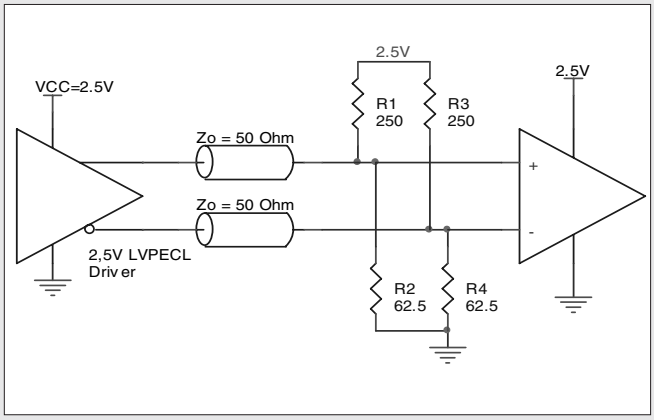


FIGURE 2A. 2.5V LVPECL DRIVER TERMINATION EXAMPLE

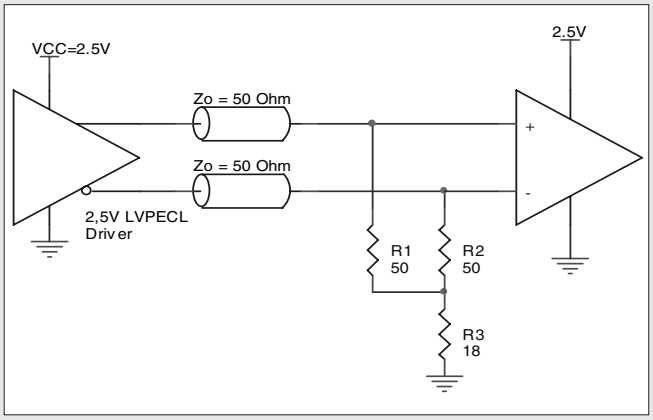


FIGURE 2B. 2.5V LVPECL DRIVER TERMINATION EXAMPLE

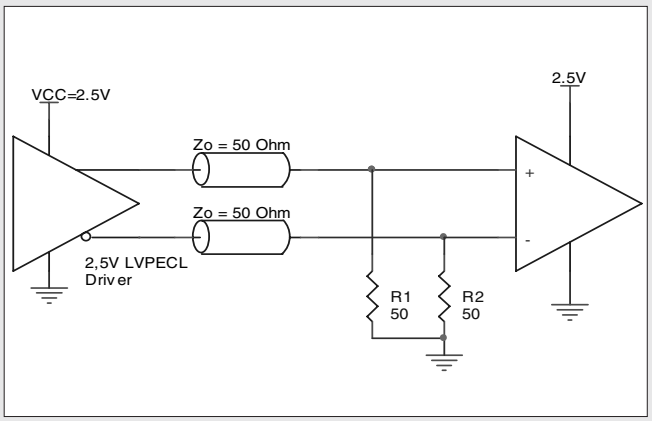
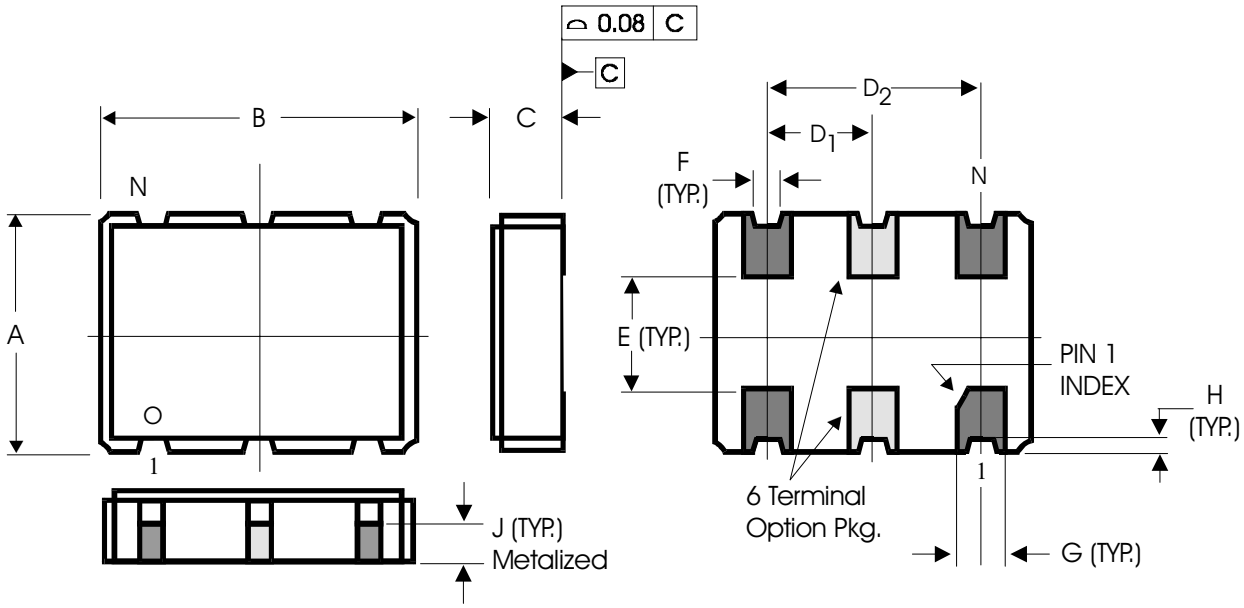


FIGURE 2C. 2.5V LVPECL TERMINATION EXAMPLE

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 3 - 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
3 = LVPECL

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)

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

Part/Order Number*	Marking*	Package	Shipping Packaging	Temperature
ICS8Mx3-75.000AJ	ICS8Mx3 75.000	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-75.000AJT	ICS8Mx3 75.000	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-100.000AJ	ICS8Mx3 100.000	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-100.000AJT	ICS8Mx3 100.000	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-106.250AJ	ICS8Mx3 106.250	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-106.250AJT	ICS8Mx3 106.250	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-125.000AJ	ICS8Mx3 125.000	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-125.000AJT	ICS8Mx3 125.000	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-156.250AJ	ICS8Mx3 156.250	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-156.250AJT	ICS8Mx3 156.250	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-159.375AJ	ICS8Mx3 159.375	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-159.375AJ	ICS8Mx3 159.375	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-187.500AJ	ICS8Mx3 187.500	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-187.500AJT	ICS8Mx3 187.500	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-212.500AJ	ICS8Mx3 212.500	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-212.500AJT	ICS8Mx3 212.500	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-250.000AJ	ICS8Mx3 250.000	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-250.000AJT	ICS8Mx3 250.000	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°C
ICS8Mx3-312.500AJ	ICS8Mx3 312.500	6 lead CERHERMETIC	Tube	0°C to 70°C
ICS8Mx3-312.500AJT	ICS8Mx3 312.500	6 lead CERHERMETIC	1000 Tape & Reel	0°C to 70°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.

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

Part/Order Number*	Marking*	Package	Shipping Packaging	Temperature
ICS8Mx3-125.000AJI	ICS8Mx3 125.000	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx3-125.000AJIT	ICS8Mx3 125.000	6 lead CERHERMETIC	1000 Tape & Reel	-40°C to 85°C
ICS8Mx3-212.500AJI	ICS8Mx3 212.500	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx3-212.500AJIT	ICS8Mx3 212.500	6 lead CERHERMETIC	1000 Tape & Reel	-40°C to 85°C
ICS8Mx3-240.000AJI	ICS8Mx3 240.000	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx3-240.000AJIT	ICS8Mx3 240.000	6 lead CERHERMETIC	1000 Tape & Reel	-40°C to 85°C
ICS8Mx3-669.326AJI	ICS8Mx3 669.326	6 lead CERHERMETIC	Tube	-40°C to 85°C
ICS8Mx3-669.326AJIT	ICS8Mx3 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.