



Integrated  
Circuit  
Systems, Inc.

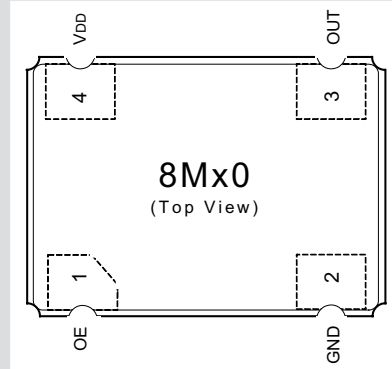
**PRELIMINARY**

**ICS8Mx0**  
LVCMOS/LVTTL CLOCK OSCILLATOR

**ICS8Mx0**

**LOW JITTER, HIGH FREQUENCY XTAL OSCILLATOR**

- Stable, ultra low jitter, LVCMOS/LVTTL clock generation
- For Gigabit Ethernet, Fibre Channel, PCI-Express, other applications
- Clock output frequencies from 75MHz to 250MHz
- One single-ended LVCMOS/LVTTL clock output
- Output Enable (OE) pin (high impedance – when low)
- Small 4-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)



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

**ELECTRICAL SPECIFICATIONS**

Unless stated otherwise,  $V_{DD} = 3.3V \pm 0.3V$  or  $2.5V \pm 5\%$ ,  $T_A = 0^\circ C$  to  $+70^\circ C$  (commercial),  $T_A = -40^\circ C$  to  $+85^\circ C$  (industrial)

| Item  | Symbol                                | Specifications    |                |      |                | Units                                      | Test Conditions   |   |
|---|---------------------------------------|-------------------|----------------|------|----------------|--|---|---|
|   |                                       | Min.              | Typ.           | Max. |                |  |   |   |
| <b>DC Characteristics</b>                       |                                       |                   |                |      |                |  |   |   |
| Power Supply<br>( $V_{DD}$ , GND pins)          | Power Supply Voltage                  | $V_{DD}$          | 3.0            | 3.3  | 3.6            | V  | 3.3V operation  |   |
|   |                                       |                   | 2.375          | 2.5  | 2.625          | V  | 2.5V operation (8MJ0 and 8MK0 only)                     |   |
|   | Power Supply Current                  | $I_{DD}$          |                | 75   |                | mA   | $OE = V_{DD}$   |   |
|   | Current w/Output Disabled             | $I_{OED}$         |                |      | <0.6           | mA   | $OE = GND$  |   |
|   | Input Capacitance                     | $C_{IN}$          |                | 4    |                | pF   |   |   |
| Output Enable<br>(OE pin)<br>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              | $\mu A$                                    | $V_{DD} = V_{IN} = 3.6V$ or $2.625V$                    |   |
|   | Input Low Current                     | $I_{IL}$          | -150           |      |                | $\mu A$                                    | $V_{DD} = 3.6V$ or $2.625V$ , $V_{IN} = 0V$             |   |
|   | Internal Pullup Resistor              | $R_{PULLUP}$      |                | 51   |                | k $\Omega$                                 |   |   |
| Clock Output<br>Level (OUT pin)<br>LVCMOS/LVTTL | Output High Voltage <sup>1</sup>      | $V_{OH}$          | $V_{DD} - 0.4$ |      |                | V  | $V_{DD} = 3.3V \pm 0.3V$ or $2.5V \pm 5\%$              |   |
|   | Output Low Voltage <sup>1</sup>       | $V_{OL}$          |                |      | 0.4            | V  |   |   |
|   | Output Load Condition                 | $C_L$             |                |      | 25             | pF   | $f_o \leq 250MHz$                                       |   |
|   | Output Impedance                      | $R_{OUT}$         |                | 20   |                | $\Omega$                                   |   |   |
| <b>AC Characteristics</b>                       |                                       |                   |                |      |                |  |   |   |
| Output<br>(OUT pin)                             | Output Frequency Range                |                   | 75             |      | 250            | MHz  | All conditions  |   |
|   | Frequency Stability Error             | $\Delta f/f_o$    |                |      | $\pm 100$      | ppm p-p                                    | 8MH0 & 8MK0   | Includes frequency set, $V_{DD}$ , $T_A$ and load variation, reflow drift, 10 yr. aging |
|   |                                       |                   |                |      | $\pm 50$       | ppm p-p                                    | 8MG0 & 8MJ0   |   |
|   | Output Duty Cycle                     | odc               |                | 50   |                | %  | $V_{TH} = V_{DD} / 2$ , $C_L \leq$ Max. pF              |   |
|   | Output Rise Time                      | $t_R$             |                |      | 1.5            | ns   | 20% to 80% of $V_{DD}$ , $C_L \leq$ Max. pF             |   |
|   | Output Fall Time                      | $t_F$             |                |      | 1.5            | ns   |   |   |
|   | Oscillator Start-up Time              | $t_{OSC}$         |                |      | 10             | ms   | Time at Min. $V_{DD}$ (3.0V or 2.375V) to be 0s         |   |
|   | RMS Phase Jitter, Random <sup>2</sup> | $t_{jit}(\sigma)$ |                |      | <1             | ps rms                                     | design target   |   |
|   | Jitter                                | $t_{DS}^3$        |                |      | 0.2            |  | ps  | Deterministic   |
|   |                                       |                   |                |      | 3              |  | ps  | Random, $\sigma$ of random jitter   |
| 3   |                                       |                   |                |      |                | ps   | Root Mean Square, $\sigma$ of total jitter distribution |   |
| 25  |                                       |                   |                |      |                | ps   | Peak-to-Peak  |   |
|   | $t_{acc}^3$                           |                   | 4              |      | ps             | Accumulated Jitter, n = 2 to 50,000 cycles |   |   |

NOTE 1: Outputs terminated with  $50\Omega$  to  $V_{DD}/2$ . 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      | GND             | Power  |        | Power supply ground.   |
| 3      | OUT             | Output |        | Single-ended clock output. LVCMOS/LVTTL interface levels.                  |
| 4      | V <sub>DD</sub> | Power  |        | Power supply pin.  |

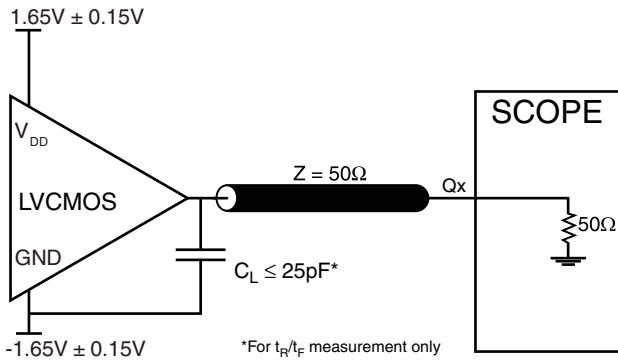
For typical value of internal Pullup resistor, see DC Characteristics.

**ABSOLUTE MAXIMUM RATINGS**

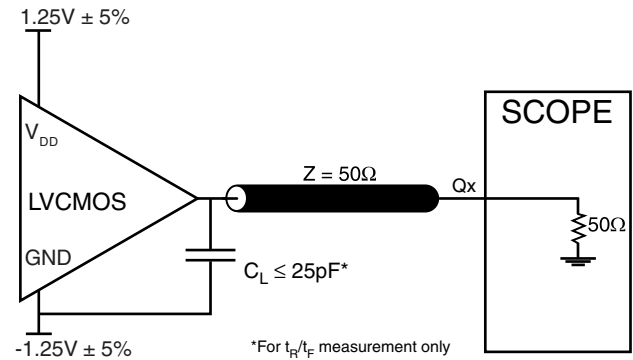
| Item                      | Symbol          | Condition                    | Unit         |
|---------------------------|-----------------|------------------------------|--------------|
| Input Voltage             | V <sub>I</sub>  | -0.5 to V <sub>DD</sub> +0.5 | V            |
| Output Voltage            | V <sub>O</sub>  | -0.5 to V <sub>DD</sub> +0.5 | V            |
| Positive Supply Voltage   | V <sub>DD</sub> | 4.6                          | V            |
| Package Thermal Impedence |                 | TBD                          | °C/W (0lfpm) |
| Storage Temperature       | T <sub>s</sub>  | -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.

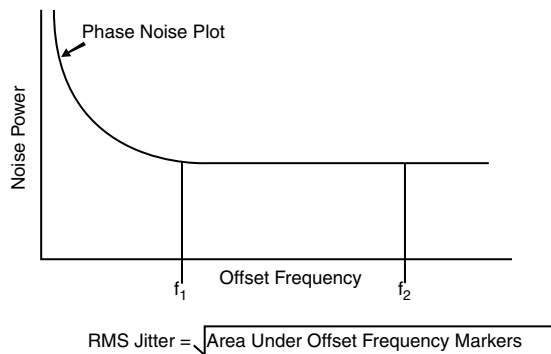
**PARAMETER MEASUREMENT INFORMATION**



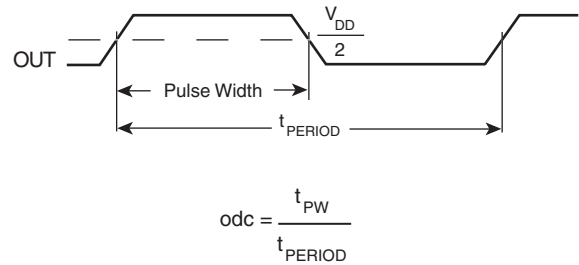
**3.3V OUTPUT LOAD AC TEST CIRCUIT**



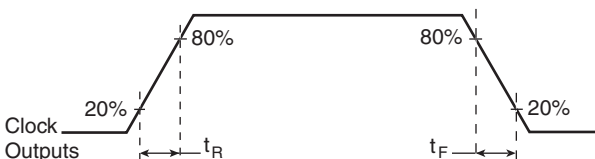
**2.5V OUTPUT LOAD AC TEST CIRCUIT**



**RMS PHASE JITTER**



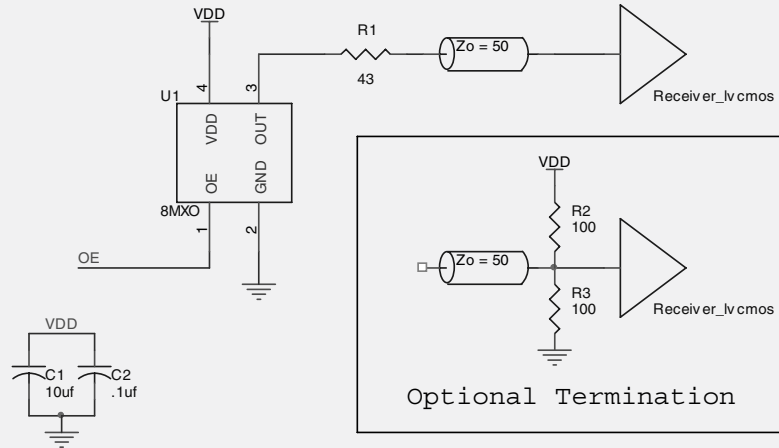
**OUTPUT DUTY CYCLE/PULSE WIDTH/PERIOD**



**OUTPUT RISE/FALL TIME**

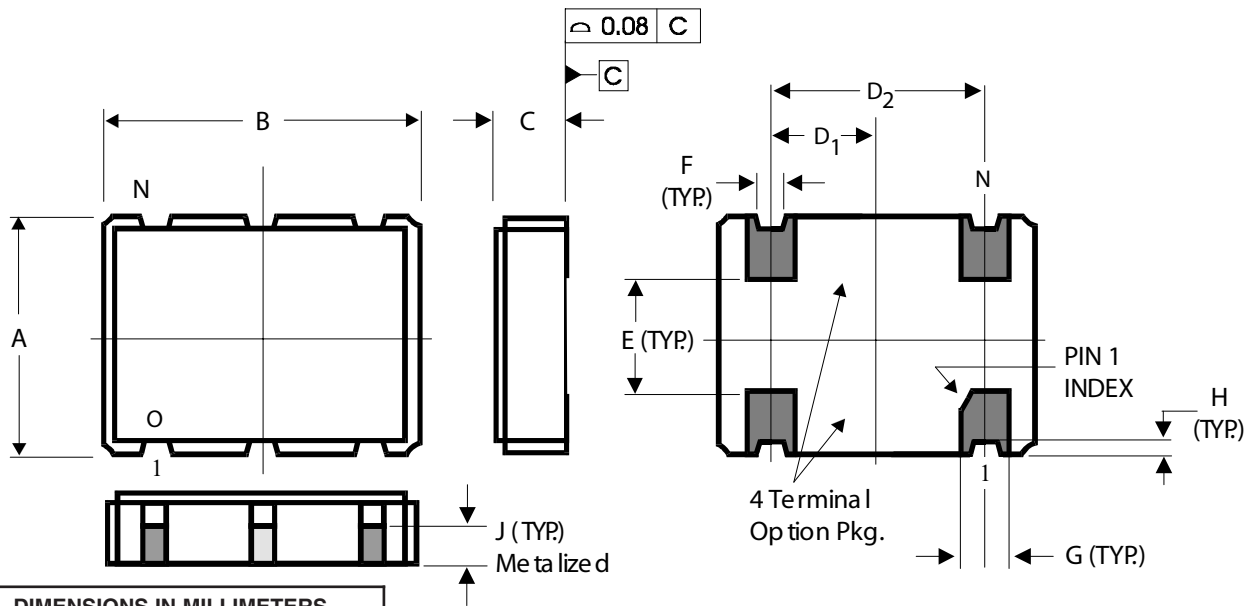


**APPLICATION INFORMATION**



**LVCMOS APPLICATION SCHEMATIC / POWER SUPPLY FILTERING (DECOUPLING CIRCUIT)**

**PACKAGE OUTLINE - J SUFFIX FOR 4 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 <sub>1</sub>            | 2.54      | ±0.13     |
| D <sub>2</sub>            | 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. | -         |



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**ORDERING INFORMATION**

| Part/Order Number* | Marking*        | Package            | Shipping Packaging | Temperature |
|--------------------|-----------------|--------------------|--------------------|-------------|
| ICS8Mx0-100.000AJ  | ICS8Mx0 100.000 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-100.000AJT | ICS8Mx0 100.000 | 4 lead CERHERMETIC | 1000 Tape & Reel   | 0°C to 70°C |
| ICS8Mx0-106.250AJ  | ICS8Mx0 106.250 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-106.250AJT | ICS8Mx0 106.250 | 4 lead CERHERMETIC | 1000 Tape & Reel   | 0°C to 70°C |
| ICS8Mx0-125.000AJ  | ICS8Mx0 125.000 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-125.000AJT | ICS8Mx0 125.000 | 4 lead CERHERMETIC | 1000 Tape & Reel   | 0°C to 70°C |
| ICS8Mx0-156.250AJ  | ICS8Mx0 156.250 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-156.250AJT | ICS8Mx0 156.250 | 4 lead CERHERMETIC | 1000 Tape & Reel   | 0°C to 70°C |
| ICS8Mx0-159.375AJ  | ICS8Mx0 159.375 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-159.375AJT | ICS8Mx0 159.375 | 4 lead CERHERMETIC | 1000 Tape & Reel   | 0°C to 70°C |
| ICS8Mx0-187.500AJ  | ICS8Mx0 187.500 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-187.500AJT | ICS8Mx0 187.500 | 4 lead CERHERMETIC | 1000 Tape & Reel   | 0°C to 70°C |
| ICS8Mx0-212.500AJ  | ICS8Mx0 212.500 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-212.500AJT | ICS8Mx0 212.500 | 4 lead CERHERMETIC | 1000 Tape & Reel   | 0°C to 70°C |
| ICS8Mx0-250.000AJ  | ICS8Mx0 250.000 | 4 lead CERHERMETIC | Tube               | 0°C to 70°C |
| ICS8Mx0-250.000AJT | ICS8Mx0 250.000 | 4 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.

**PART/ORDER NUMBER INFORMATION**

|  |                                    |
|--|------------------------------------|
| <b>Part/Order Number:</b>  | <b>ICS8M x 0 - fff.fff r p t u</b> |
| <b>Device</b>  |                                    |
| <b>Supply Voltage &amp; Frequency Accuracy</b>   |                                    |
| G = 3.3V ±50 ppm   |                                    |
| H = 3.3V ±100 ppm  |                                    |
| J = 2.5/3.3V ±50 ppm   |                                    |
| K = 2.5/3.3V ±100 ppm  |                                    |
| <b>Output Type</b>   |                                    |
| 0 = LVCMOS/LVTTL   |                                    |
| <b>Output Frequency (MHz)</b>  |                                    |
| Leading zeroes dropped. Fourth decimal place added if necessary.<br>Consult ICS for other frequencies. |                                    |
| <b>Revision of Product</b>   |                                    |
| A = Initial Release  |                                    |
| <b>Package Type (individual devices)</b>   |                                    |
| J = 5x7mm ceramic SMT  |                                    |
| <b>Ambient Temperature Range</b>   |                                    |
| none = commercial = 0°C to +70°C   |                                    |
| I = industrial = -40°C to +85°C  |                                    |
| <b>Bulk Packaging option</b>   |                                    |
| none = tube  |                                    |
| T = tape and reel (1000 devices)   |                                    |
| Note: Lead-free by default (no addition "LF" code needed).<br>(Pb-free and RoHS complaint)             |                                    |

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