

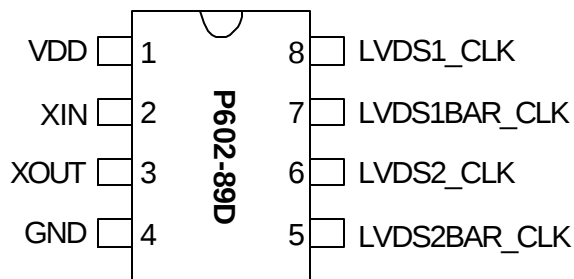
## 12-27 MHz XO IC with 2 Pairs of LVDS Outputs

### FEATURES

- Low jitter XO for the 12MHz to 27MHz range.
- Integrated crystal load capacitor: no external load capacitor required.
- 2 pairs of LVDS outputs.
- 12-27 MHz fundamental crystal input.
- Low jitter (RMS): 4.5 ps period jitter (1 sigma).
- 3.3V operation.
- Available in 8-Pin SOP package.

### PIN CONFIGURATION

(Top View)

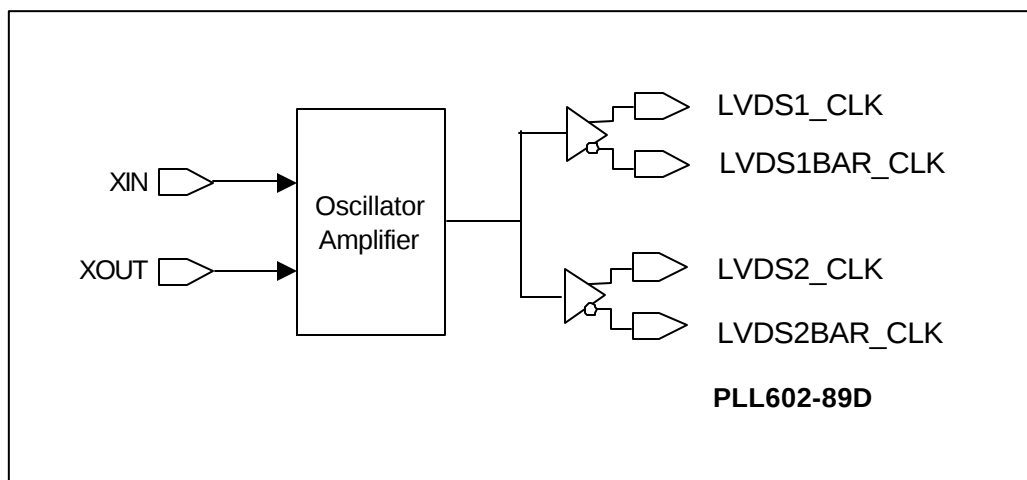


(8 pin SOP)

### DESCRIPTION

The P602-89D is a high performance multiple output XO IC chip. It provides 2 pairs of LVDS outputs. The chip combines a crystal oscillator (XO) with a multiple-output buffer. It accepts a low cost fundamental parallel resonant mode crystal from 12MHz to 27MHz, which is reproduced at the outputs. The very low jitter (4.5 ps RMS period jitter) makes this chip ideal for data and telecommunication applications.

### BLOCK DIAGRAM



## 12-27 MHz XO IC with 2 Pairs of LVDS Outputs

### PIN DESCRIPTION

| Name        | Pin Number | Type | Description                                                                                                                                                                      |
|-------------|------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VDD         | 1          | P    | +3.3V VDD connection.                                                                                                                                                            |
| XIN         | 2          | I    | Crystal in connector. This is the input of the crystal oscillator circuitry. The crystal should be mounted as close to the IC as possible, with minimum parasitic capacitance.   |
| XOUT        | 3          | I    | Crystal out connector. This is the output of the crystal oscillator circuitry. The crystal should be mounted as close to the IC as possible, with minimum parasitic capacitance. |
| GND         | 4          | P    | Ground connection.                                                                                                                                                               |
| LVDSBAR_CLK | 5,7        | O    | LVDS complementary output.                                                                                                                                                       |
| LVDS_CLK    | 6,8        | O    | LVDS output.                                                                                                                                                                     |

### ELECTRICAL SPECIFICATIONS

#### 1. Absolute Maximum Ratings

| PARAMETERS                                | SYMBOL   | MIN.         | MAX.         | UNITS |
|-------------------------------------------|----------|--------------|--------------|-------|
| Supply Voltage                            | $V_{DD}$ |              | 7            | V     |
| Input Voltage, dc                         | $V_I$    | $V_{SS}-0.5$ | $V_{DD}+0.5$ | V     |
| Output Voltage, dc                        | $V_O$    | $V_{SS}-0.5$ | $V_{DD}+0.5$ | V     |
| Storage Temperature                       | $T_S$    | -65          | 150          | °C    |
| Ambient Operating Temperature             | $T_A$    | 0            | 70           | °C    |
| Junction Temperature                      | $T_J$    |              | 125          | °C    |
| Lead Temperature (soldering, 10s)         |          |              | 260          | °C    |
| Input Static Discharge Voltage Protection |          |              | 2            | kV    |

Exposure of the device under conditions beyond the limits specified by Maximum Ratings for extended periods may cause permanent damage to the device and affect product reliability. These conditions represent a stress rating only, and functional operations of the device at these or any other conditions above the operational limits noted in this specification is not implied.

## 12-27 MHz XO IC with 2 Pairs of LVDS Outputs

### 2. Crystal Specifications

| PARAMETERS                  | SYMBOL        | CONDITIONS                | MIN. | TYP. | MAX. | UNITS |
|-----------------------------|---------------|---------------------------|------|------|------|-------|
| Crystal Resonator Frequency | $F_{XIN}$     | Parallel Fundamental Mode | 12   |      | 27   | MHz   |
| Crystal Loading Rating      | $C_{L(xtal)}$ |                           |      | 21.5 |      | pF    |
| Recommended ESR             | $R_E$         |                           |      |      | 30   | ?     |

### 3. General Electrical Specifications

| PARAMETERS                                    | SYMBOL   | CONDITIONS                                                           | MIN. | TYP.     | MAX. | UNITS |
|-----------------------------------------------|----------|----------------------------------------------------------------------|------|----------|------|-------|
| Supply Current, Dynamic (with Loaded Outputs) | $I_{DD}$ | CMOS outputs loaded with 15pF, LVDS outputs loaded with 100 $\Omega$ |      |          |      | mA    |
|                                               |          | $F_{out} = 12 \text{ MHz}^*$                                         |      | 15*      | 20*  |       |
|                                               |          | $F_{out} = 25 \text{ MHz}^*$                                         |      | 20*      | 25*  |       |
| Operating Voltage                             | $V_{DD}$ |                                                                      | 3.13 |          | 3.47 | V     |
| Short Circuit Current                         |          |                                                                      |      | $\pm 50$ |      | mA    |

\* To be measured.

### 4. AC Electrical Specifications

| PARAMETERS              | SYMBOL | CONDITIONS                   | MIN. | TYP.     | MAX. | UNITS |
|-------------------------|--------|------------------------------|------|----------|------|-------|
| Input Crystal Frequency |        |                              | 12   |          | 27   | MHz   |
| Output Clock Rise Time  |        | 0.8V ~ 2.0V with 10 pF load  |      |          | 1.5  | ns    |
|                         |        | 0.3V ~ 3.0V with 15 pF load  |      | 2        | 5    |       |
| Output Clock Fall Time  |        | 2.0V ~ 0.8V with 10 pF load  |      |          | 1.5  |       |
|                         |        | 3.0V ~ 0.3V with 15pF load   |      | 2        | 5    |       |
| Output Clock Duty Cycle |        | Measured @ 1.25 V (LVDS)     | 45   | 50       | 55   | %     |
|                         |        | Measured @ $V_{DD}/2$ (CMOS) | 45   | 50       | 55   |       |
| Short Circuit Current   |        |                              |      | $\pm 50$ |      | MA    |

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### 5. Jitter specifications

| PARAMETERS          | CONDITIONS                                                          | FREQUENCY | MIN. | TYP. | MAX. | UNITS |
|---------------------|---------------------------------------------------------------------|-----------|------|------|------|-------|
| Period jitter RMS   | With capacitive decoupling between VDD and GND.                     | 25MHz     |      | 4.5  | 9    | ps    |
| Peak to Peak jitter | With capacitive decoupling between VDD and GND. Over 10,000 cycles. | 25MHz     |      | 30   | 60   | ps    |

### 6. LVDS Electrical Characteristics

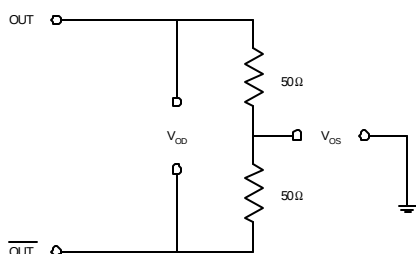
| PARAMETERS                   | SYMBOL          | CONDITIONS                                 | MIN.  | TYP.    | MAX.     | UNITS   |
|------------------------------|-----------------|--------------------------------------------|-------|---------|----------|---------|
| Output Differential Voltage  | $V_{OD}$        | $R_L = 100 \Omega$<br>(see figure)         | 247   | 355     | 454      | mV      |
| $V_{DD}$ Magnitude Change    | $\Delta V_{OD}$ |                                            | -50   |         | 50       | mV      |
| Output High Voltage          | $V_{OH}$        |                                            |       | 1.4     | 1.6      | V       |
| Output Low Voltage           | $V_{OL}$        |                                            | 0.9   | 1.1     |          | V       |
| Offset Voltage               | $V_{OS}$        |                                            | 1.125 | 1.2     | 1.375    | V       |
| Offset Magnitude Change      | $\Delta V_{OS}$ |                                            | 0     | 3       | 25       | mV      |
| Power-off Leakage            | $I_{OXD}$       | $V_{out} = V_{DD}$ or GND<br>$V_{DD} = 0V$ |       | $\pm 1$ | $\pm 10$ | $\mu A$ |
| Output Short Circuit Current | $I_{OSD}$       |                                            |       | -5.7    | -8       | mA      |

## 12-27 MHz XO IC with 2 Pairs of LVDS Outputs

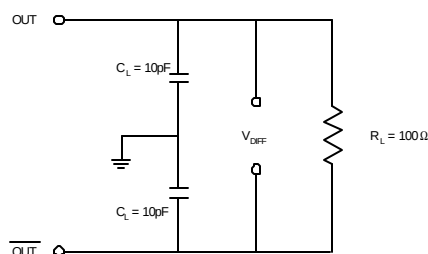
### 7. LVDS Switching Characteristics

| PARAMETERS                   | SYMBOL | CONDITIONS                                                   | MIN. | TYP. | MAX. | UNITS |
|------------------------------|--------|--------------------------------------------------------------|------|------|------|-------|
| Differential Clock Rise Time | $t_r$  | $R_L = 100\ \Omega$<br>$C_L = 10\ \text{pF}$<br>(see figure) | 0.2  | 0.7  | 1.0  | ns    |
| Differential Clock Fall Time | $t_f$  |                                                              | 0.2  | 0.7  | 1.0  | ns    |

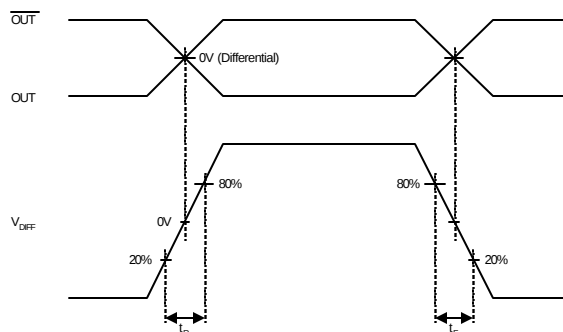
LVDS Levels Test Circuit



LVDS Switching Test Circuit



LVDS Transistion Time Waveform

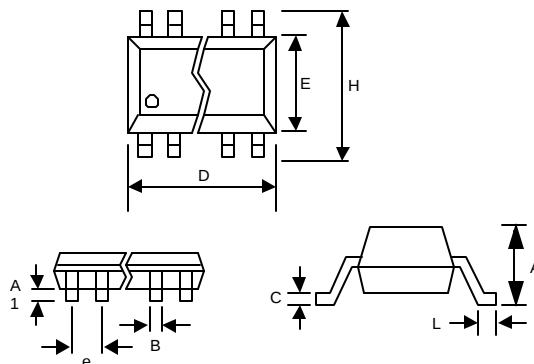


## 12-27 MHz XO IC with 2 Pairs of LVDS Outputs

### PACKAGE INFORMATION

8 PIN SOIC (mm )

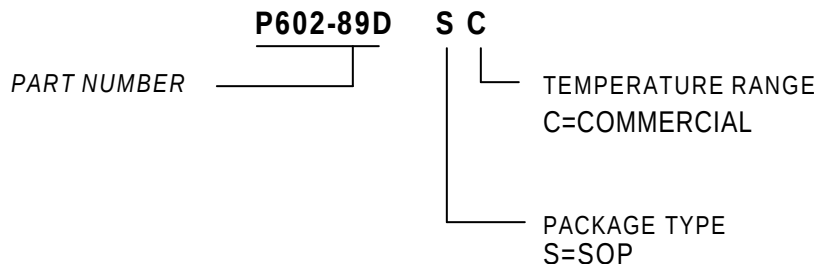
| Narrow SOIC |          |      |
|-------------|----------|------|
| Symbol      | Min.     | Max. |
| A           | 1.47     | 1.73 |
| A1          | 0.10     | 0.25 |
| B           | 0.33     | 0.51 |
| C           | 0.19     | 0.25 |
| D           | 4.80     | 4.95 |
| E           | 3.80     | 4.00 |
| H           | 5.80     | 6.20 |
| L           | 0.38     | 1.27 |
| e           | 1.27 BSC |      |



### ORDERING INFORMATION

#### PART NUMBER

The order number for this device is a combination of the following:  
Device number, Package type and Operating temperature range



| Order Number | Marking     | Package Option      |
|--------------|-------------|---------------------|
| P602-89DSC-R | P602-89D SC | SOP - Tape and Reel |
| P602-89DSC   | P602-89D SC | SOP - Tube          |

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