

## Low Jitter Configurable Dual Output Oscillators for Automotive

### Features

- Automotive AEC-Q100 Qualified
- Two Independent Outputs with Any Format Combination from LVPECL, LVDS, HCSL, and LVCMOS
- Wide Frequency Range:
  - 2.3 MHz to 460 MHz LVDS/HCSL/LVPECL Output
  - 2.3 MHz to 170 MHz CMOS Output
- Low RMS Phase Jitter: <1 ps (typical)
- High Stability:  $\pm 25$  ppm,  $\pm 50$  ppm
- Wide Temperature Range
  - Automotive Grade 2:  $-40^{\circ}$  to  $+105^{\circ}\text{C}$
  - Automotive Grade 3:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- High Supply Noise Rejection:  $-50$  dBc
- Pin-Selectable Configurations
  - 3-bit Output Drive Strength (CMOS)
  - 3-bit Output Frequency Combinations
- Miniature Footprint of 3.2 mm x 2.5 mm
- Excellent Shock and Vibration Immunity
  - Qualified to MIL-STD-883
- High Reliability
  - 20x Better MTF Than Quartz Oscillators
- Supply Range of 2.25V to 3.6V
- Short Sample Lead Time: <2 weeks
- Lead Free & RoHS Compliant

### Applications

- Automotive Infotainment
- Automotive ADAS
- Autonomous Driving
- In-Vehicle Network

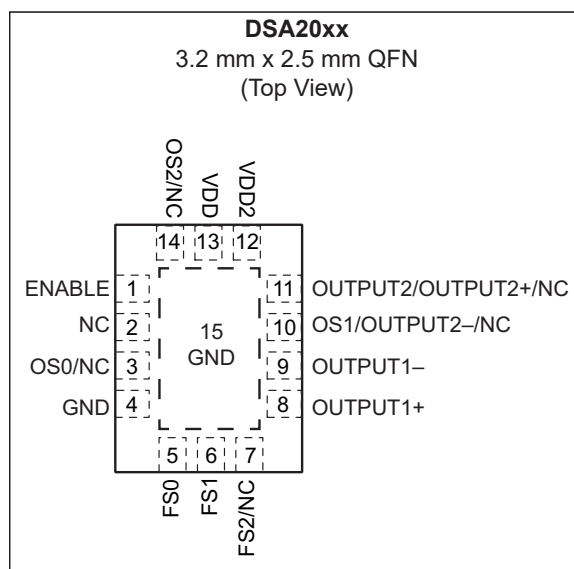
### General Description

The DSA20xx family of high performance dual output oscillators utilizes proven silicon MEMS technology to provide excellent jitter and stability while incorporating additional device functionality. The two outputs are controlled by separate supply voltages to allow for independent voltage level control. The frequencies of the outputs can be identical or independently derived from a common PLL frequency source. The DSA20xx have provisions for up to eight user-defined pre-programmed, pin-selectable output frequency combinations. The DSA20x1 is also equipped with independent pin-selectable output drive strengths for the CMOS output to reduce EMI and noise.

Please visit the Microchip ClockWorks® Configurator website at <http://clockworks.microchip.com/timing/> to configure the part number for customized frequencies.

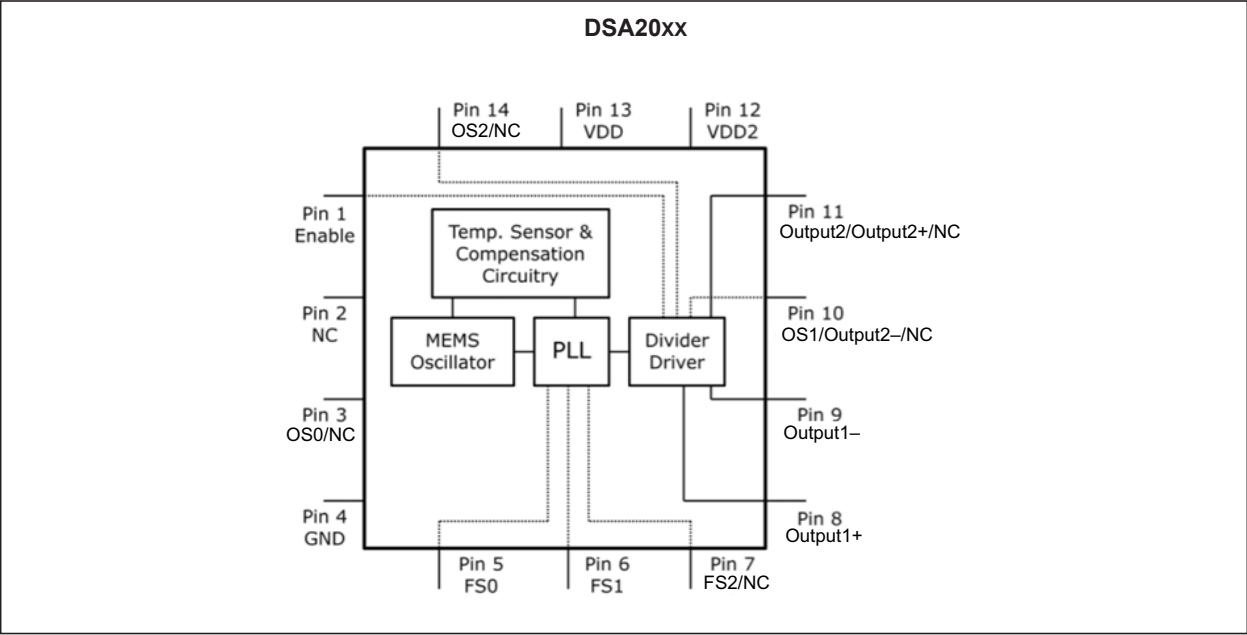
All DSA20xx devices are packaged in a 14-lead 3.2 mm x 2.5 mm QFN package and is available in Automotive Grade 2 and Grade 3 temperatures.

### Package Type



# DSA20XX

## Block Diagram



## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings

Supply Voltage ..... -0.3V to +4.0V  
 Input Voltage ( $V_{IN}$ ) ..... -0.3V to  $V_{DD} + 0.3V$   
 ESD Protection ..... 4 kV HBM, 400V MM, 1.5 kV CDM

### ELECTRICAL CHARACTERISTICS

**Electrical Characteristics:** Unless otherwise indicated,  $T = +25^{\circ}\text{C}$ .

| Parameters                | Sym.       | Min.                 | Typ. | Max.                 | Units      | Conditions                                                                                                                                    |
|---------------------------|------------|----------------------|------|----------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Supply Voltage            | $V_{DD}$   | 2.25                 | —    | 3.6                  | V          | Note 1                                                                                                                                        |
| Supply Current            | $I_{DD}$   | —                    | 21   | 23                   | mA         | EN pin low, outputs are disabled                                                                                                              |
| Supply Current (Note 2)   | $I_{DD}$   | —                    | 49   | —                    | mA         | EN pin high, outputs are enabled; LVDS: $R_L = 100\Omega$ , $F_{O1} = 125\text{ MHz}$ ; CMOS: $C_L = 15\text{ pF}$ , $F_{O2} = 75\text{ MHz}$ |
| Frequency Stability       | $\Delta f$ | —                    | —    | $\pm 25$             | ppm        | Includes frequency variations due to initial tolerance, temperature, and power supply voltage.                                                |
|                           |            | —                    | —    | $\pm 50$             |            |                                                                                                                                               |
| Aging                     | $\Delta f$ | —                    | —    | $\pm 5$              | ppm        | First year                                                                                                                                    |
|                           |            | —                    | —    | $\pm 1$              |            | Subsequent years                                                                                                                              |
| Startup Time              | $t_{SU}$   | —                    | —    | 5                    | ms         | $T = +25^{\circ}\text{C}$ , Note 3                                                                                                            |
| Input Logic Level High    | $V_{IH}$   | $0.75 \times V_{DD}$ | —    | —                    | V          | —                                                                                                                                             |
| Input Logic Level Low     | $V_{IL}$   | —                    | —    | $0.25 \times V_{DD}$ |            |                                                                                                                                               |
| Output Disable Time       | $t_{DA}$   | —                    | —    | 5                    | ns         | Note 4                                                                                                                                        |
| Output Enable Time        | $t_{EN}$   | —                    | —    | 20                   | ns         | —                                                                                                                                             |
| Pull-Up Resistor          | $R_{PU}$   | —                    | 40   | —                    | k $\Omega$ | Note 2, Pull-up exists on all digital I/Os                                                                                                    |
| <b>LVDS Outputs</b>       |            |                      |      |                      |            |                                                                                                                                               |
| Output Offset Voltage     | —          | 1.125                | —    | 1.4                  | V          | $R_L = 100\Omega$ differential                                                                                                                |
| Delta Offset Voltage      | —          | —                    | —    | 50                   | mV         | —                                                                                                                                             |
| Peak-to-Peak Output Swing | —          | —                    | 350  | —                    | mV         | Single-ended                                                                                                                                  |
| Output Rise/Fall Time     | $t_r/t_f$  | 200                  | —    | 350                  | ps         | 20% to 80%, $R_L = 100\Omega$ , $C_L = 2\text{ pF}$ (to GND)                                                                                  |
| Frequency                 | $f_0$      | 2.3                  | —    | 460                  | MHz        | Single frequency                                                                                                                              |
| Output Duty Cycle         | SYM        | 48                   | —    | 52                   | %          | Differential                                                                                                                                  |

- Note 1:** Pin 4  $V_{DD}$  should be filtered with 0.01  $\mu\text{F}$  capacitor.  
**2:** Output is enabled if Enable pad is floated or not connected  
**3:**  $t_{SU}$  is time to stable output frequency after  $V_{DD}$  is applied and outputs are enabled.  
**4:** Output Waveform and Test Circuit figures define the parameters.  
**5:** Period Jitter include crosstalk from adjacent output.

## ELECTRICAL CHARACTERISTICS (CONTINUED)

**Electrical Characteristics:** Unless otherwise indicated, T = +25°C.

| Parameters                | Sym.             | Min.                   | Typ. | Max.                   | Units             | Conditions                              |
|---------------------------|------------------|------------------------|------|------------------------|-------------------|-----------------------------------------|
| Period Jitter (Note 5)    | J <sub>PER</sub> | —                      | 2.5  | —                      | ps <sub>RMS</sub> | F <sub>O1</sub> = 125 MHz               |
| Integrated Phase Noise    | J <sub>CC</sub>  | —                      | 0.28 | —                      | ps <sub>RMS</sub> | 200 kHz to 20 MHz @ 156.25 MHz          |
|                           |                  | —                      | 0.4  | —                      |                   | 100 kHz to 20 MHz @ 156.25 MHz          |
|                           |                  | —                      | 1.7  | 2                      |                   | 12 kHz to 20 MHz @ 156.25 MHz           |
| CMOS Output               |                  |                        |      |                        |                   |                                         |
| Output Logic Level High   | V <sub>OH</sub>  | 0.9xV <sub>DD</sub>    | —    | —                      | V                 | I = ±6 mA                               |
| Output Logic Level Low    | V <sub>OL</sub>  | —                      | —    | 0.1xV <sub>DD</sub>    |                   |                                         |
| Output Rise/Fall Time     | t <sub>r</sub>   | —                      | 1.1  | 2                      | ns                | 20% to 80%, C <sub>L</sub> = 15 pF      |
|                           | t <sub>f</sub>   | —                      | 1.3  | 2                      |                   |                                         |
| Frequency                 | f <sub>0</sub>   | 2.3                    | —    | 170                    | MHz               | Commercial/Industrial temperature range |
| Output Duty Cycle         | SYM              | 45                     | —    | 55                     | %                 | —                                       |
| Period Jitter (Note 5)    | J <sub>PER</sub> | —                      | 3    | —                      | ps <sub>RMS</sub> | F <sub>O2</sub> = 125 MHz               |
| Integrated Phase Noise    | J <sub>CC</sub>  | —                      | 0.3  | —                      | ps <sub>RMS</sub> | 200 kHz to 20 MHz @ 125 MHz             |
|                           |                  | —                      | 0.38 | —                      |                   | 100 kHz to 20 MHz @ 125 MHz             |
|                           |                  | —                      | 1.7  | 2                      |                   | 12 kHz to 20 MHz @ 125 MHz              |
| LVPECL Outputs            |                  |                        |      |                        |                   |                                         |
| Output Logic Level High   | V <sub>OH</sub>  | V <sub>DD</sub> – 1.08 | —    | —                      | V                 | R <sub>L</sub> = 50Ω                    |
| Output Logic Level Low    | V <sub>OL</sub>  | —                      | —    | V <sub>DD</sub> – 1.55 |                   |                                         |
| Peak to Peak Output Swing | —                | —                      | 800  | —                      | mV                | Single-Ended                            |
| Output Rise/Fall Time     | t <sub>r</sub>   | —                      | 250  | —                      | ps                | 20% to 80%, R <sub>L</sub> = 50Ω        |
|                           | t <sub>f</sub>   |                        |      |                        |                   |                                         |
| Frequency                 | f <sub>0</sub>   | 2.3                    | —    | 460                    | MHz               | Single Frequency                        |
| Output Duty Cycle         | SYM              | 48                     | —    | 52                     | %                 | Differential                            |
| Period Jitter (Note 5)    | J <sub>PER</sub> | —                      | 2.5  | —                      | ps <sub>RMS</sub> | f <sub>01</sub> = 125 MHz               |
| Integrated Phase Noise    | J <sub>CC</sub>  | —                      | 0.25 | —                      | ps <sub>RMS</sub> | 200 kHz to 20 MHz @ 156.25 MHz          |
|                           |                  | —                      | 0.38 | —                      |                   | 100 kHz to 20 MHz @ 156.25 MHz          |
|                           |                  | —                      | 1.7  | 2                      |                   | 12 kHz to 20 MHz @ 156.25 MHz           |

- Note 1:** Pin 4 V<sub>DD</sub> should be filtered with 0.01 μF capacitor.  
**2:** Output is enabled if Enable pad is floated or not connected  
**3:** t<sub>SU</sub> is time to stable output frequency after V<sub>DD</sub> is applied and outputs are enabled.  
**4:** Output Waveform and Test Circuit figures define the parameters.  
**5:** Period Jitter include crosstalk from adjacent output.

## ELECTRICAL CHARACTERISTICS (CONTINUED)

**Electrical Characteristics:** Unless otherwise indicated, T = +25°C.

| Parameters                        | Sym.             | Min.  | Typ. | Max. | Units             | Conditions                                                 |
|-----------------------------------|------------------|-------|------|------|-------------------|------------------------------------------------------------|
| <b>HCSL Outputs</b>               |                  |       |      |      |                   |                                                            |
| Output Logic Level High           | V <sub>OH</sub>  | 0.725 | —    | —    | V                 | R <sub>L</sub> = 50Ω                                       |
| Output Logic Level Low            | V <sub>OL</sub>  | —     | —    | 0.1  |                   |                                                            |
| Peak to Peak Output Swing         | —                | —     | 750  | —    | mV                | Single-Ended                                               |
| Output Rise/Fall Time<br>(Note 4) | t <sub>r</sub>   | 200   | —    | 400  | ps                | 20% to 80%, R <sub>L</sub> = 50Ω,<br>C <sub>L</sub> = 2 pF |
|                                   | t <sub>f</sub>   |       |      |      |                   |                                                            |
| Frequency                         | f <sub>0</sub>   | 2.3   | —    | 460  | MHz               | Single Frequency                                           |
| Output Duty Cycle                 | SYM              | 48    | —    | 52   | %                 | Differential                                               |
| Period Jitter (Note 5)            | J <sub>PER</sub> | —     | 2.8  | —    | ps <sub>RMS</sub> | f <sub>01</sub> = f <sub>02</sub> = 125 MHz                |
| Integrated Phase Noise            | J <sub>PH</sub>  | —     | 0.25 | —    | ps <sub>RMS</sub> | 200 kHz to 20 MHz @<br>156.25 MHz                          |
|                                   |                  | —     | 0.37 | —    |                   | 100 kHz to 20 MHz @<br>156.25 MHz                          |
|                                   |                  | —     | 1.7  | 2    |                   | 12 kHz to 20 MHz @<br>156.25 MHz                           |

- Note 1:** Pin 4 V<sub>DD</sub> should be filtered with 0.01 μF capacitor.  
**2:** Output is enabled if Enable pad is floated or not connected  
**3:** t<sub>SU</sub> is time to stable output frequency after V<sub>DD</sub> is applied and outputs are enabled.  
**4:** Output Waveform and Test Circuit figures define the parameters.  
**5:** Period Jitter include crosstalk from adjacent output.

## TEMPERATURE SPECIFICATIONS (Note 1)

| Parameters                        | Sym.           | Min. | Typ. | Max. | Units | Conditions         |
|-----------------------------------|----------------|------|------|------|-------|--------------------|
| <b>Temperature Ranges</b>         |                |      |      |      |       |                    |
| Junction Operating Temperature    | T <sub>J</sub> | —    | —    | +150 | °C    | —                  |
| Ambient Operating Temperature     | T <sub>A</sub> | −40  | —    | +105 | °C    | Automotive Grade 2 |
| Ambient Operating Temperature     | T <sub>A</sub> | −40  | —    | +85  | °C    | Automotive Grade 3 |
| Storage Ambient Temperature Range | T <sub>A</sub> | −55  | —    | +150 | °C    | —                  |
| Soldering Temperature             | T <sub>S</sub> | —    | +260 | —    | °C    | 40 sec. max.       |

- Note 1:** The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e., T<sub>A</sub>, T<sub>J</sub>, θ<sub>JA</sub>). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum +150°C rating. Sustained junction temperatures above +150°C can impact the device reliability.

2.0 TYPICAL OPERATING CHARACTERISTICS

Unless specified otherwise, T = +25°C, V<sub>DD</sub> = 3.3V

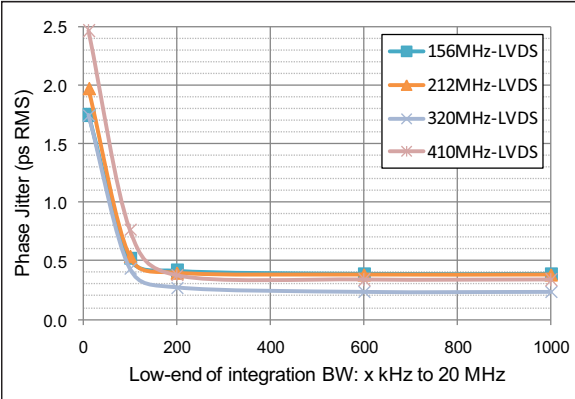


FIGURE 2-1: LVDS Phase Jitter (Integrated Phase Noise).

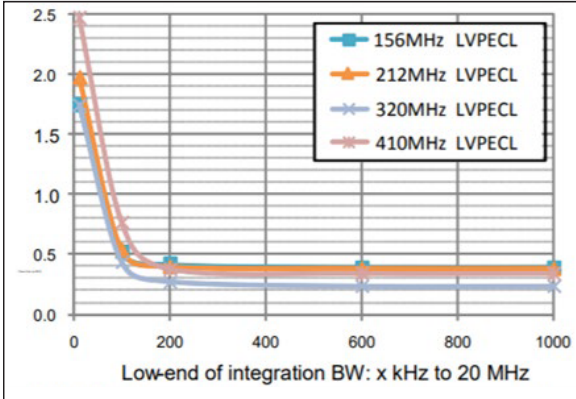


FIGURE 2-3: PECL Phase Jitter.

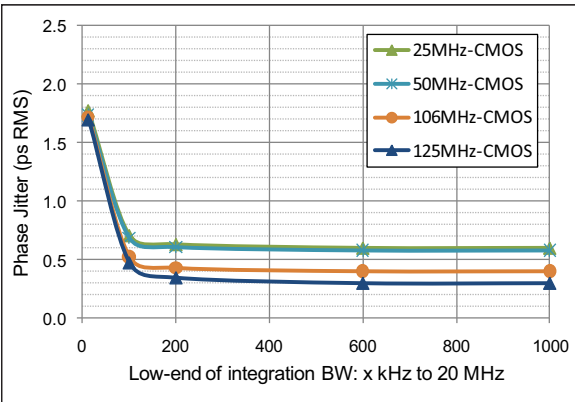


FIGURE 2-2: CMOS Phase Jitter (Integrated Phase Noise).

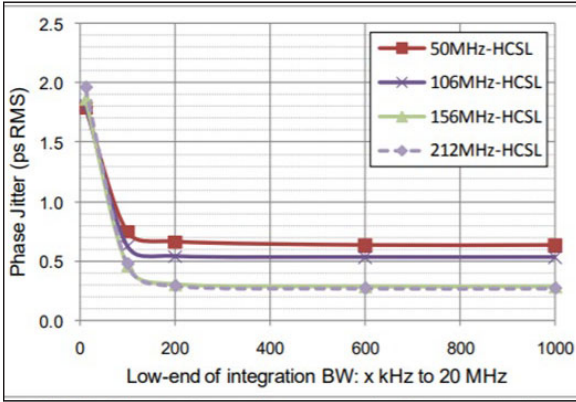


FIGURE 2-4: HCSL Phase Jitter.

## 3.0 OPERATIONAL DESCRIPTION

The DSA20xx are a family of dual output oscillators consisting of a MEMS resonator and a support PLL IC. The two outputs can be any LVPECL/LVDS/HCSL/LVCMOS combination. The “xx” represent the Output 1 and Output 2 logics. For example, DSA2031 offers LVDS-CMOS, DSA2032 offers LVPECL-LVDS, DSA2033 offers LVDS-LVDS, and DSA2030 offers a single LVDS output. The two outputs are generated through independent 8-bit programmable dividers from the output of the internal PLL. Two constraints are imposed on the output frequencies:

- $f_2 = M \times f_1/N$ ; where M and N are even integers between 4 and 254.
- $1.2 \text{ GHz} < N \times f_2 < 1.7 \text{ GHz}$

The actual frequencies output by the DSA20xx are controlled by an internal pre-programmed memory (OTP). This memory stores all coefficients required by the PLL for up to eight different frequency combinations. Three control pins (FS0, FS1, FS2) select the output frequency combination. Microchip

supports customer-defined versions of the DSA20xx. Standard frequency options are described in the following sections.

The DSA20xx provides control of the output voltage levels of the CMOS output. VDD2 (pin 12) sets the high voltage level of Output 2 and must be equal to or less than VDD at all times to ensure proper operation. VDD2 can be as low as 1.65V.

When Enable (pin 1) is floated or connected to VDD, the DSA20xx is in operational mode. Driving Enable to ground will tri-state both output drivers (high-impedance mode).

The DSA20xx have programmable output drive strength for CMOS output. Using three control pins (OS0, OS1, OS2), the drive strength for the CMOS output can be adjusted to match circuit board impedances to reduce power supply noise, overshoot/undershoot, and EMI. [Table 3-1](#) displays typical rise/fall times for the output with a 15 pF load capacitance as a function of these control pins at  $V_{DD} = 3.3V$  and at room temperature.

**TABLE 3-1: RISE/FALL TIMES FOR DRIVE STRENGTHS**

|       | Output Drive Strength Bits [OS0, OS1, OS2] – Default is 111 |        |        |        |        |        |        |        |
|-------|-------------------------------------------------------------|--------|--------|--------|--------|--------|--------|--------|
|       | 000                                                         | 001    | 010    | 011    | 100    | 101    | 110    | 111    |
| $t_r$ | 2.1 ns                                                      | 1.7 ns | 1.6 ns | 1.4 ns | 1.3 ns | 1.3 ns | 1.2 ns | 1.1 ns |
| $t_f$ | 2.5 ns                                                      | 2.4 ns | 2.4 ns | 2.0 ns | 1.8 ns | 1.6 ns | 1.3 ns | 1.3 ns |

### 3.1 Output Clock Frequencies

[Table 3-2](#) lists the standard frequency configurations and the associated ordering information to be used in conjunction with the ordering information in the [Product Identification System](#) section. Customer-defined combinations are available.

**TABLE 3-2: PRE-PROGRAMMED PIN-SELECTABLE OUTPUT FREQUENCY COMBINATIONS**

| Ordering Code | Freq. (MHz) | Frequency Select Bits [FS0, FS1, FS2] – Default is 111 |       |        |     |     |     |     |     |
|---------------|-------------|--------------------------------------------------------|-------|--------|-----|-----|-----|-----|-----|
|               |             | 000                                                    | 001   | 010    | 011 | 100 | 101 | 110 | 111 |
| J0001         | $f_{OUT1}$  | 148.25                                                 | 74.25 | 156.25 | 150 | 125 | 125 | 100 | 100 |
|               | $f_{OUT2}$  | 74.25                                                  | 74.25 | 125    | 125 | 25  | 50  | 50  | 75  |
| J000X         | $f_{OUT1}$  | Contact Microchip for additional configurations.       |       |        |     |     |     |     |     |
|               | $f_{OUT2}$  |                                                        |       |        |     |     |     |     |     |

Frequency select bits are weakly tied high. So if they are left unconnected, the default setting will be [111] and the device will output the associated frequencies in the table above.

## 4.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 4-1](#) and [Table 4-2](#).

**TABLE 4-1: DSA20XX PIN FUNCTION TABLE (GLOBAL)**

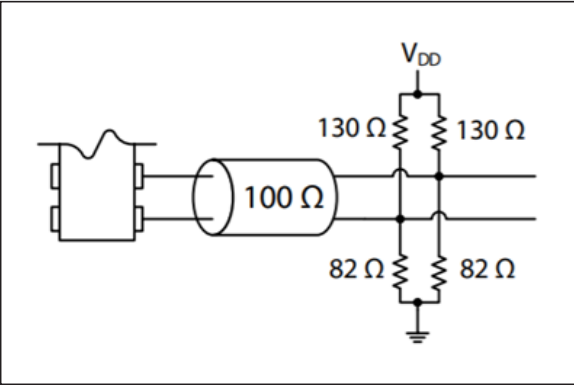
| Pin Number | Pin Name             | Pin Type | Description                                                                                                                             |
|------------|----------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1          | Enable               | I        | Enables all outputs when high and disables (tri-state) them when low.                                                                   |
| 2          | NC                   | N/A      | Leave unconnected or grounded.                                                                                                          |
| 3          | O2S0/OS0/NC          | I        | Least significant bit for output strength selection for LVCMOS Output 2/Leave unconnected or grounded.                                  |
| 4          | GND                  | Power    | Ground.                                                                                                                                 |
| 5          | FS0                  | I        | Least significant bit for frequency selection.                                                                                          |
| 6          | FS1                  | I        | Middle bit for frequency selection.                                                                                                     |
| 7          | FS2/NC               | I        | Most significant bit for frequency selection/Leave unconnected or grounded.                                                             |
| 8          | Output1/Output1+     | O        | LVCMOS Output 1/True Output 1 for differential output.                                                                                  |
| 9          | O1S0/OS0/Output1-    | I/O      | Least significant bit for output strength selection for LVCMOS Output 1/Complementary Output 1 for differential output.                 |
| 10         | O1S1/OS1/Output2-/NC | I/O      | Middle bit for output strength selection for LVCMOS Output/Complementary Output2 for differential output/Leave unconnected or grounded. |
| 11         | Output2/Output2+/NC  | O        | LVCMOS Output 2/True Output2 for differential output/Leave unconnected or grounded.                                                     |
| 12         | VDD2/VDD             | Power    | Power supply for Output 2/Connect to Power supply for configuration with only Output 1.                                                 |
| 13         | VDD                  | Power    | Power supply.                                                                                                                           |
| 14         | O2S1/OS2/NC          | I        | Most significant bit for output strength selection for LVCMOS Output/Leave unconnected or grounded.                                     |
| 15         | ePAD                 | Power    | Connect to GND.                                                                                                                         |

**TABLE 4-2: PIN FUNCTION TABLE (SPECIFIC)**

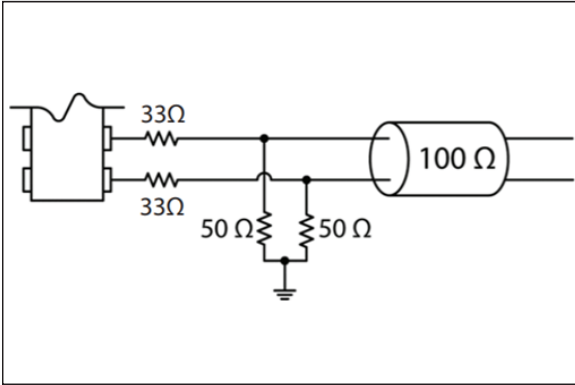
| Pin No.  | Part Number |          |          |          |          |          |          |
|----------|-------------|----------|----------|----------|----------|----------|----------|
| —        | DSA2010     | DSA2011  | DSA2020  | DSA2021  | DSA2022  | DSA2023  | DSA2024  |
| Output 1 | LVC MOS     | LVC MOS  | LVPECL   | LVPECL   | LVPECL   | LVPECL   | LVPECL   |
| Output 2 | OFF         | LVC MOS  | OFF      | LVC MOS  | LVPECL   | LVDS     | HCSL     |
| 1        | Enable      | Enable   | Enable   | Enable   | Enable   | Enable   | Enable   |
| 2        | NC          | NC       | NC       | NC       | NC       | NC       | NC       |
| 3        | NC          | O2S0     | NC       | OS0      | NC       | NC       | NC       |
| 4        | GND         | GND      | GND      | GND      | GND      | GND      | GND      |
| 5        | FS0         | FS0      | FS0      | FS0      | FS0      | FS0      | FS0      |
| 6        | FS1         | FS1      | FS1      | FS1      | FS1      | FS1      | FS1      |
| 7        | NC          | FS2      | NC       | FS2      | FS2      | FS2      | FS2      |
| 8        | Output1     | Output1  | Output1+ | Output1+ | Output1+ | Output1+ | Output1+ |
| 9        | OS0         | O1S0     | Output1– | Output1– | Output1– | Output1– | Output1– |
| 10       | OS1         | O1S1     | NC       | OS1      | Output2– | Output2– | Output2– |
| 11       | NC          | Output2  | NC       | Output2  | Output2+ | Output2+ | Output2+ |
| 12       | VDD         | VDD2     | VDD      | VDD2     | VDD2     | VDD2     | VDD2     |
| 13       | VDD         | VDD      | VDD      | VDD      | VDD      | VDD      | VDD      |
| 14       | OS2         | O2S1     | NC       | OS2      | NC       | NC       | NC       |
| 15       | ePad        | ePad     | ePad     | ePad     | ePad     | ePad     | ePad     |
| —        | DSA2030     | DSA2031  | DSA2033  | DSA2040  | DSA2041  | DSA2043  | DSA2044  |
| Output 1 | LVDS        | LVDS     | LVDS     | HCSL     | HCSL     | HCSL     | HCSL     |
| Output 2 | OFF         | LVC MOS  | LVDS     | OFF      | LVC MOS  | LVDS     | HCSL     |
| 1        | Enable      | Enable   | Enable   | Enable   | Enable   | Enable   | Enable   |
| 2        | NC          | NC       | NC       | NC       | NC       | NC       | NC       |
| 3        | NC          | OS0      | NC       | NC       | OS0      | NC       | NC       |
| 4        | GND         | GND      | GND      | GND      | GND      | GND      | GND      |
| 5        | FS0         | FS0      | FS0      | FS0      | FS0      | FS0      | FS0      |
| 6        | FS1         | FS1      | FS1      | FS1      | FS1      | FS1      | FS1      |
| 7        | NC          | FS2      | FS2      | NC       | FS2      | FS2      | FS2      |
| 8        | Output1+    | Output1+ | Output1+ | Output1+ | Output1+ | Output1+ | Output1+ |
| 9        | Output1–    | Output1– | Output1– | Output1– | Output1– | Output1– | Output1– |
| 10       | NC          | OS1      | Output2– | NC       | OS1      | Output2– | Output2– |
| 11       | NC          | Output2  | Output2+ | NC       | Output2  | Output2+ | Output2+ |
| 12       | VDD         | VDD2     | VDD2     | VDD      | VDD2     | VDD2     | VDD2     |
| 13       | VDD         | VDD      | VDD      | VDD      | VDD      | VDD      | VDD      |
| 14       | NC          | OS2      | NC       | NC       | OS2      | NC       | NC       |
| 15       | ePad        | ePad     | ePad     | ePad     | ePad     | ePad     | ePad     |

Please visit the ClockWorks® Configurator website at <http://clockworks.microchip.com/timing> to configure the part number for the eight customer-defined frequencies.

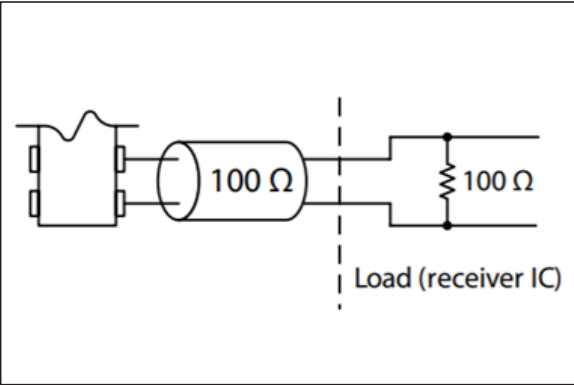
5.0 TERMINATION SCHEMES



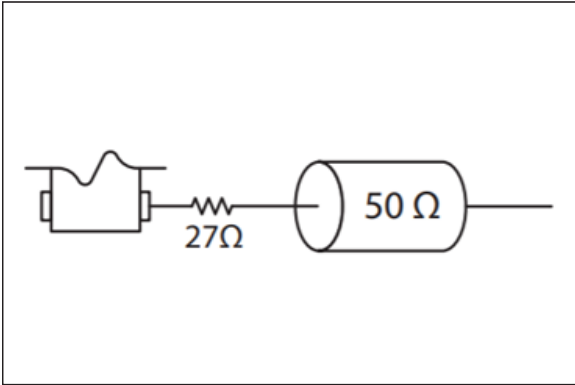
**FIGURE 5-1:** Typical LVPECL Termination Scheme.



**FIGURE 5-3:** Typical HCSL Termination Scheme.



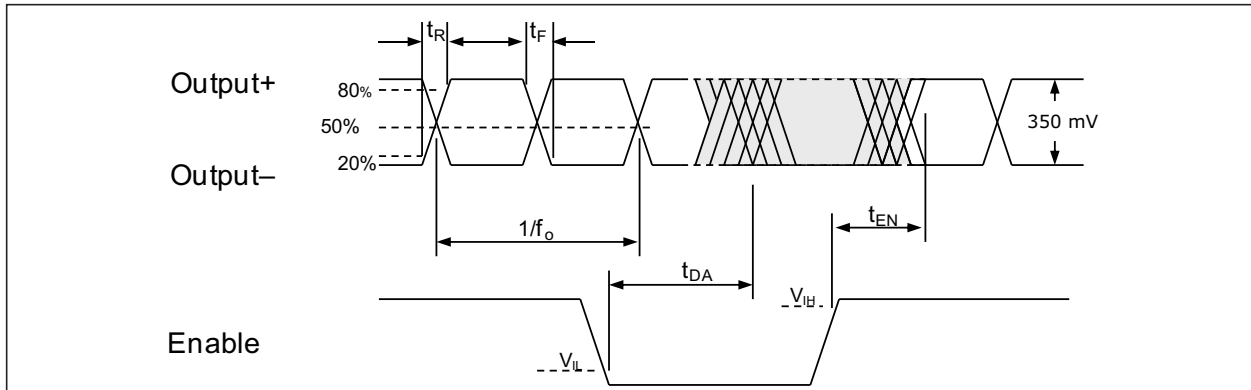
**FIGURE 5-2:** Typical LVDS Termination Scheme.



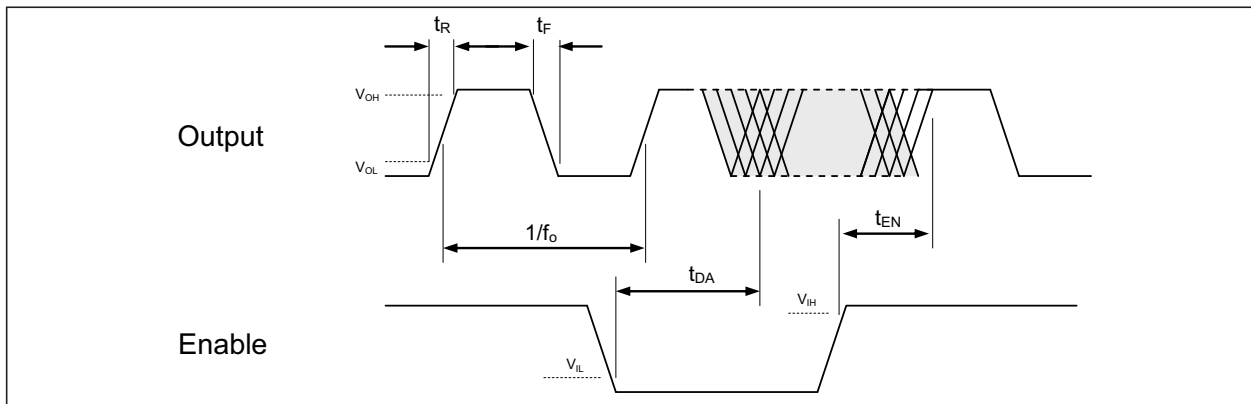
**FIGURE 5-4:** Typical LVCMOS Termination Scheme.

## 6.0 DIAGRAMS

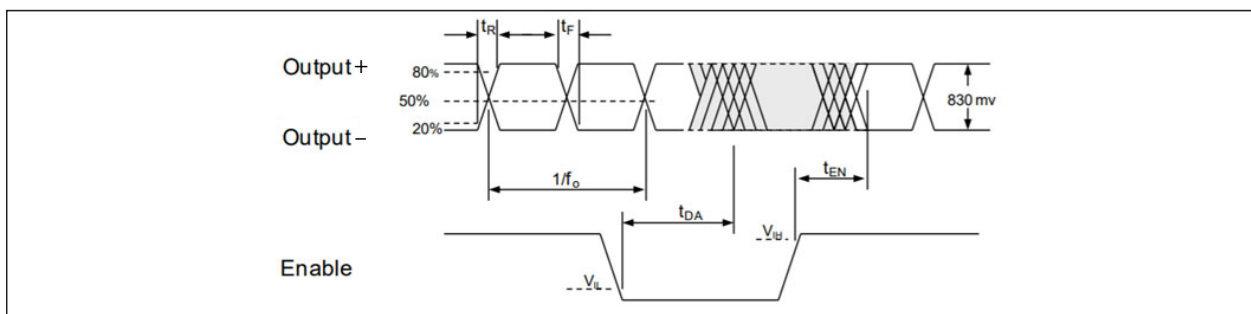
Unless otherwise specified,  $T = +25^{\circ}\text{C}$ ,  $V_{DD} = 3.3\text{V}$ .



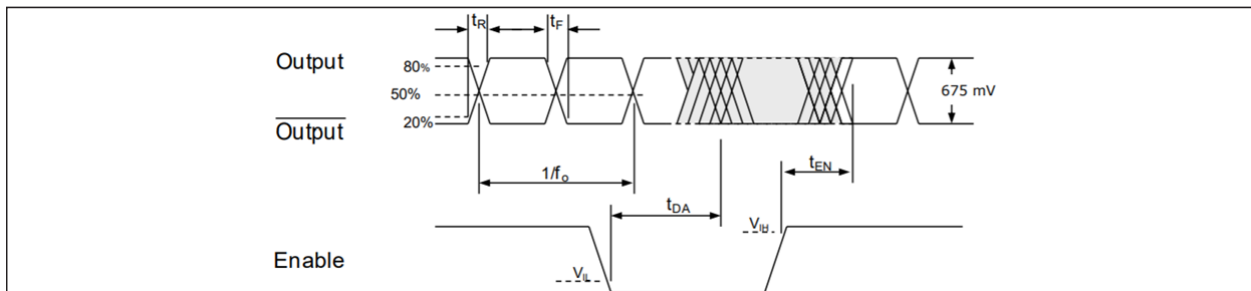
**FIGURE 6-1:** LVDS Output Waveform.



**FIGURE 6-2:** CMOS Output Waveform.



**FIGURE 6-3:** LVPECL Output Waveform.



**FIGURE 6-4:** HCSL Output Waveform.

7.0 SOLDER REFLOW PROFILE

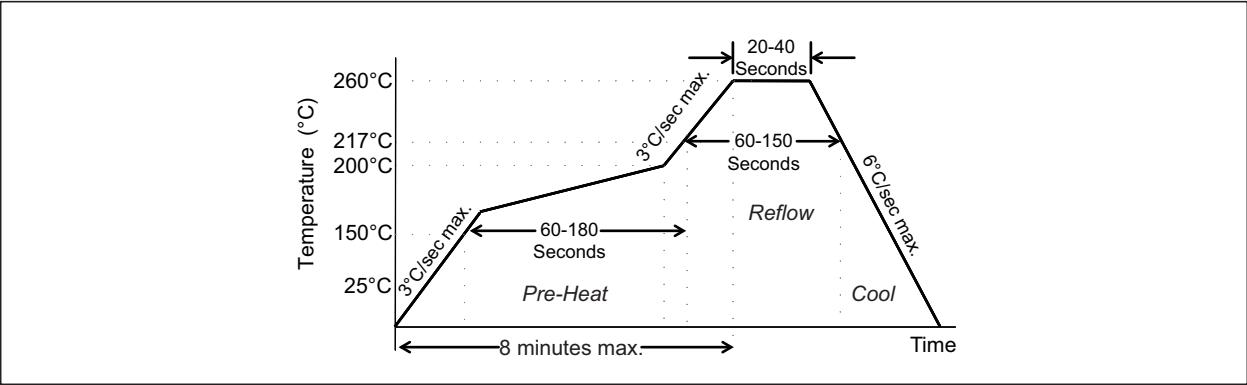


FIGURE 7-1: Solder Reflow Profile.

| MSL 1 @ 260°C refer to JSTD-020C  |                |
|-----------------------------------|----------------|
| Ramp-Up Rate (200°C to Peak Temp) | 3°C/sec. max.  |
| Preheat Time 150°C to 200°C       | 60 to 180 sec. |
| Time maintained above 217°C       | 60 to 150 sec. |
| Peak Temperature                  | 255°C to 260°C |
| Time within 5°C of actual Peak    | 20 to 40 sec.  |
| Ramp-Down Rate                    | 6°C/sec. max.  |
| Time 25°C to Peak Temperature     | 8 minutes max. |

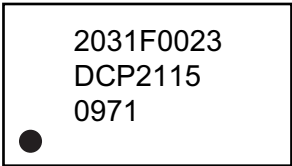
8.0 PACKAGING INFORMATION

8.1 Package Marking Information

14-Lead QFN\*



Example



**Legend:**

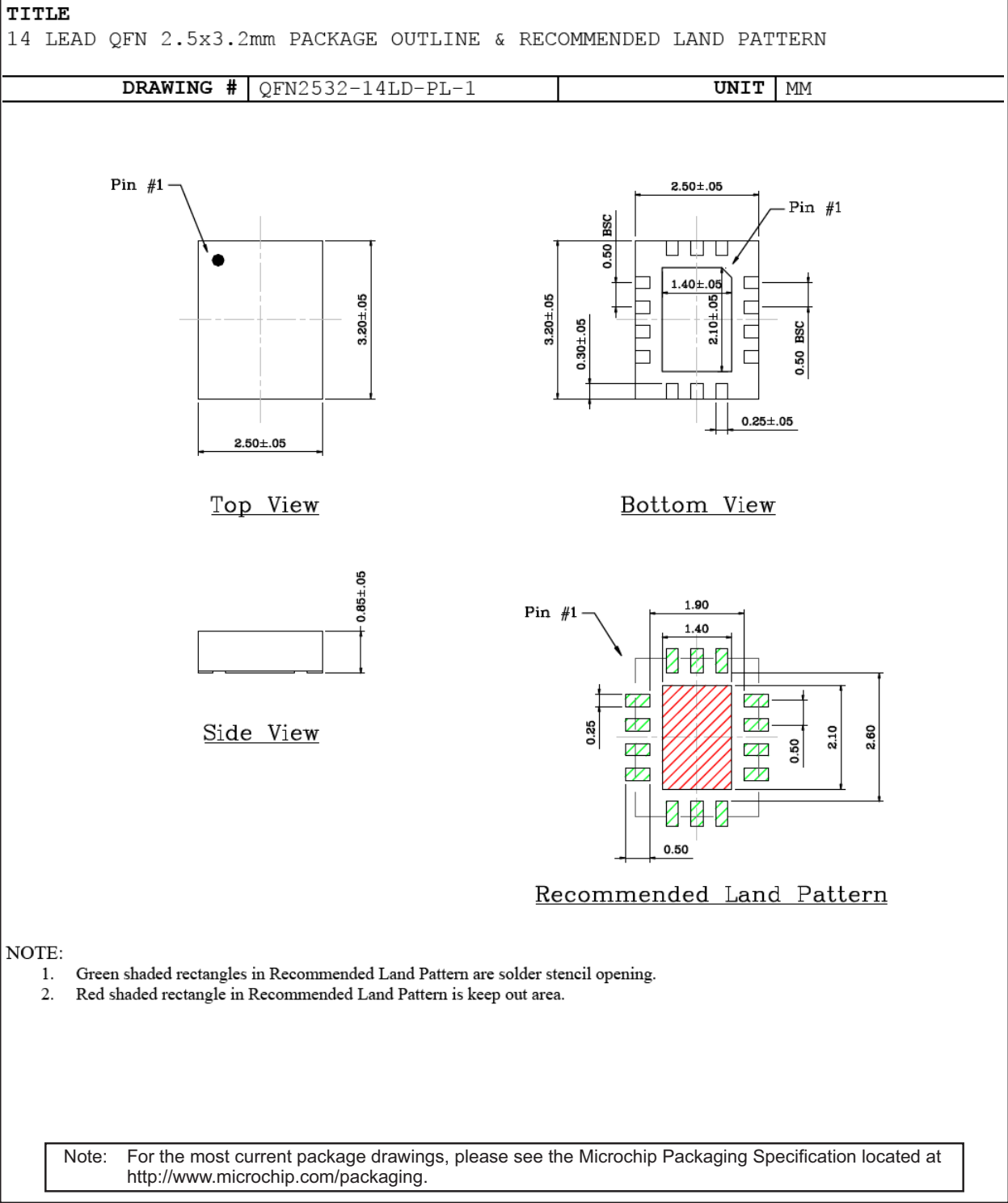
|        |                                                                                                                  |
|--------|------------------------------------------------------------------------------------------------------------------|
| XX...X | Product code or customer-specific information                                                                    |
| Y      | Year code (last digit of calendar year)                                                                          |
| YY     | Year code (last 2 digits of calendar year)                                                                       |
| WW     | Week code (week of January 1 is week '01')                                                                       |
| SSS    | Alphanumeric traceability code                                                                                   |
| (e3)   | Pb-free JEDEC® designator for Matte Tin (Sn)                                                                     |
| *      | This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package. |

●, ▲, ▼ Pin one index is identified by a dot, delta up, or delta down (triangle mark).

**Note:** In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.

Underbar ( \_ ) and/or Overbar ( ¯ ) symbol may not be to scale.

14-Lead 3.2 mm x 2.5 mm QFN Package Outline and Recommended Land Pattern



## APPENDIX A: REVISION HISTORY

### Revision A (July 2020)

- Initial release of DSA20xx Microchip data sheet DS20006384A.

NOTES:

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

| <u>Part No.</u> | <u>X</u> | <u>X</u>    | <u>X</u>        | <u>-XXXXX</u> | <u>X</u>   | <u>XXX</u>        |
|-----------------|----------|-------------|-----------------|---------------|------------|-------------------|
| Device          | Package  | Temp. Range | Freq. Stability | Frequency     | Media Type | Automotive Suffix |

|                |          |          |                 |                 |  |  |
|----------------|----------|----------|-----------------|-----------------|--|--|
| <b>Device:</b> | DSA20xx: | <b>X</b> | <b>Output 1</b> | <b>Output 2</b> |  |  |
|                |          | 0        | OFF             | OFF             |  |  |
|                |          | 1        | LVC MOS         | LVC MOS         |  |  |
|                |          | 2        | LVPECL          | LVPECL          |  |  |
|                |          | 3        | LVDS            | LVDS            |  |  |
|                |          | 4        | HCSL            | HCSL            |  |  |

|                 |   |   |                             |  |  |  |
|-----------------|---|---|-----------------------------|--|--|--|
| <b>Package:</b> | F | = | 14-Lead 3.2 mm x 2.5 mm QFN |  |  |  |
|-----------------|---|---|-----------------------------|--|--|--|

|                           |   |   |                                      |  |  |  |
|---------------------------|---|---|--------------------------------------|--|--|--|
| <b>Temperature Range:</b> | L | = | –40°C to +105°C (Automotive Grade 2) |  |  |  |
|                           | I | = | –40°C to +85°C (Automotive Grade 3)  |  |  |  |

|                             |   |   |          |  |  |  |
|-----------------------------|---|---|----------|--|--|--|
| <b>Frequency Stability:</b> | 1 | = | ± 50 ppm |  |  |  |
|                             | 2 | = | ± 25 ppm |  |  |  |

|                   |       |   |                                              |  |  |  |
|-------------------|-------|---|----------------------------------------------|--|--|--|
| <b>Frequency:</b> | xxxxx | = | User-Defined in the ClockWorks Configurator. |  |  |  |
|-------------------|-------|---|----------------------------------------------|--|--|--|

|                    |         |   |            |  |  |  |
|--------------------|---------|---|------------|--|--|--|
| <b>Media Type:</b> | <blank> | = | 110/Tube   |  |  |  |
|                    | T       | = | 1,000/Reel |  |  |  |

|                           |     |   |                                                                                                                   |  |  |  |
|---------------------------|-----|---|-------------------------------------------------------------------------------------------------------------------|--|--|--|
| <b>Automotive Suffix:</b> | Vxx | = | Automotive suffix in which "xx" is assigned by Microchip. Default value is "AO" for the standard automotive part. |  |  |  |
|---------------------------|-----|---|-------------------------------------------------------------------------------------------------------------------|--|--|--|

Please visit Microchip's ClockWorks® Configurator Website to configure the part number for customized frequency. <http://clockworks.microchip.com/timing/>.

### Examples:

- DSA2031FL2-F0023VAO:  
Output 1 = LVDS; Output 2 = LVC MOS, 14-Lead QFN, –40°C to +105°C Temperature Range, ±25 ppm Stability, 110/Tube, Standard Automotive
- DSA2011FI1-F0050TVAO:  
Output 1 & Output 2 = LVC MOS, 14-Lead QFN, –40°C to +85°C Temperature Range, ±50 ppm Stability, 1,000/Reel, Standard Automotive
- DSA2033FI2-F0004TVAO:  
Output 1 & Output 2 = LVDS, 14-Lead QFN, –40°C to +85°C Temperature Range, ±25 ppm Stability, 1,000/Reel, Standard Automotive
- DSA2030FL1-B0020VAO:  
Output 1 = LVDS; Output 2 = OFF, 14-Lead QFN, –40°C to +105°C Temperature Range, ±50 ppm Stability, 110/Tube, Standard Automotive

**Note 1:** Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

NOTES:

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