

General Description

The DSC2033FI2-F0038 is a programmable, high performance dual LVDS output oscillator utilizing Microchip's proven silicon MEMS technology to provide excellent jitter and stability while incorporating additional device functionality. Two LVDS outputs are controlled by separate supply voltages to allow for high output isolation. The frequencies of the outputs can be identical or independently derived from a common PLL frequency source.

The DSC2033FI2-F0038 has provision for up to eight user-defined pre-programmed, pin-selectable output frequency combinations.

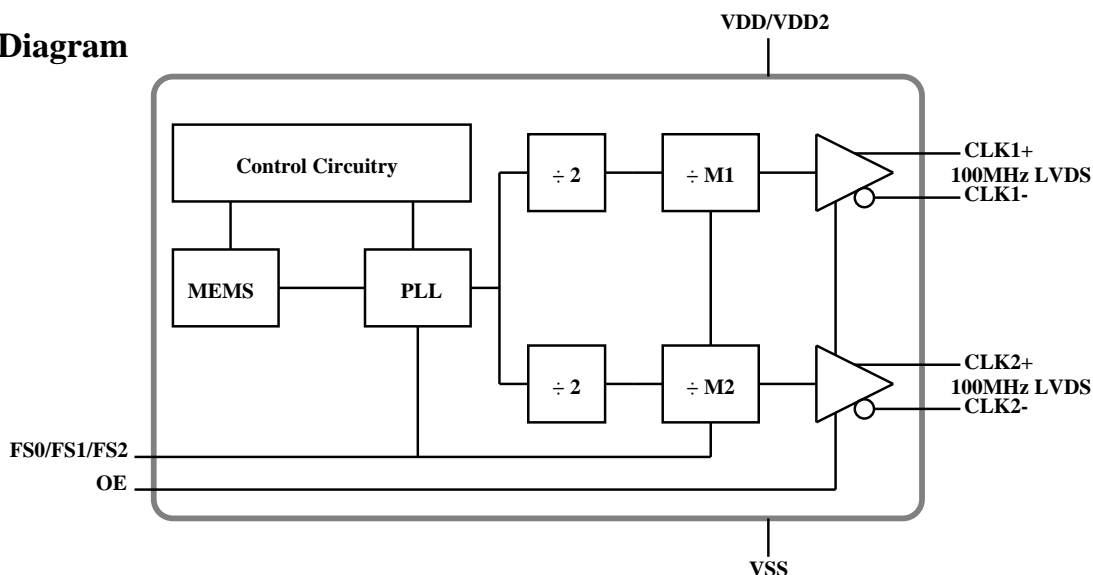
Applications

- Consumer Electronics
- Storage Area Networks
 - SATA, SAS, Fibre Channel
- Passive Optical Networks
 - EPON, 10G-EPON, GPON, 10G-GPON
- Ethernet
 - 1G, 10GBASE-T/KR/LR/SR, and FCoE
- HD/SD/SDI Video & Surveillance
- PCI Express
- Automotive

Features

- Frequency and output formats:
 - LVDS
100/125/156.25/312.5/312.898/439.597/440.625/450.68
 - LVDS
100/125/156.25/312.5/312.898/439.597/440.625/450.68
- Low RMS phase jitter: <1ps (typ)
- ±25ppm frequency stability
- -40°C to +85°C industrial temperature range
- High supply noise rejection: -50dBc
- Pin-selectable configurations
 - Up to 8 output frequency combinations
- Excellent shock & vibration immunity
 - Qualified to MIL-STD-883
- High reliability
 - 20x better MTF than quartz oscillators
- Supply range of 2.25 to 3.6V
- AEC-Q100 automotive qualified
- 14-pin 3.2mm x 2.5mm QFN package

Block Diagram



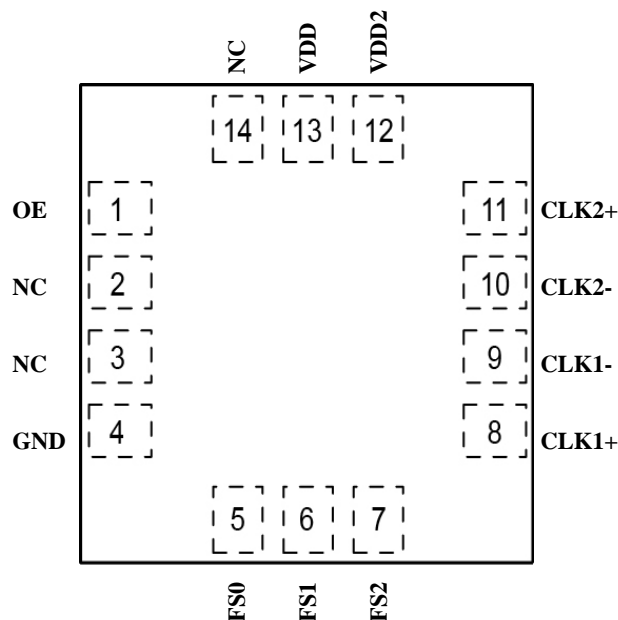
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Ordering Information

| Ordering Part Number | Industrial Temperature Range | Shipping | Package |
|----------------------|------------------------------|---------------|--------------------------|
| DSC2033FI2-F0038 | -40°C to +85°C | Tube | 14-pin 3.2mm x 2.5mm QFN |
| DSC2033FI2-F0038T | -40°C to +85°C | Tape and Reel | 14-pin 3.2mm x 2.5mm QFN |

Devices are Green and RoHS compliant. Sample material may have only a partial top mark.

Pin Configuration



14-pin 3.2mm x 2.5mm QFN

Pin Description

| Pin Number | Pin Name | Pin Type | Pin Function |
|------------|----------|----------|--|
| 1 | OE | I | Enables outputs when high and disables outputs when low |
| 2 | NC | | Leave unconnected or connect to ground |
| 3 | NC | | Leave unconnected or connect to ground |
| 4 | GND | PWR | Ground |
| 5 | FS0 | I | Least significant bit for frequency selection, see Table 1 for details |
| 6 | FS1 | I | Middle bit for frequency selection, see Table 1 for details |
| 7 | FS2 | I | Most significant bit for frequency selection, see Table 1 for details |
| 8 | CLK1+ | O | Positive LVDS output |
| 9 | CLK1- | O | Negative LVDS output |
| 10 | CLK2- | O | Negative LVDS output |
| 11 | CLK2+ | O | Positive LVDS output |
| 12 | VDD2 | PWR | Power supply for LVDS output CLK2, 1.65V to 3.6V ($VDD2 \leq VDD$) |
| 13 | VDD | PWR | Power supply |
| 14 | NC | | Leave unconnected or connect to ground |

Operational Description

The DSC2033FI2-F0038 is a dual output LVDS oscillator consisting of a MEMS resonator and a supporting PLL IC. The two LVDS outputs are generated through independent 8-bit programmable dividers from the output of the internal PLL. The two constraints are imposed on the output frequencies: 1) $f_2 = M \times f_1/N$, where M and N are even integers between 4 and 254, 2) $1.2\text{GHz} < N \times f_2 < 1.7\text{GHz}$. The actual frequencies output by DSC2033FI2-F0038 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 - FS2) select the output frequency combination.

When OE (pin 1) is floated or connected to VDD, the DSC2033 is in operational mode. Driving OE to ground will tri-state both output drivers (high-impedance mode).

Output Clock Frequencies

Frequency select bits are weakly tied high so if left unconnected the default setting will be [111] and the device will output the associated frequency highlighted in bold.

| Freq (MHz) | Freq Select Bits [FS2, FS1, FS0] - Default is [111] | | | | | | | |
|------------|---|--------|-------|---------|---------|---------|---------|------------|
| | 000 | 001 | 010 | 011 | 100 | 101 | 110 | 111 |
| CLK1 | 125 | 156.25 | 312.5 | 312.898 | 439.597 | 440.625 | 450.688 | 100 |
| CLK2 | 125 | 156.25 | 312.5 | 312.898 | 439.597 | 440.625 | 450.688 | 100 |

Table 1. Pin-Selectable Output Frequencies

Absolute Maximum Ratings

| Item | Min. | Max. | Units | Condition |
|----------------|------|-----------|-------|------------|
| Supply Voltage | -0.3 | +4.0 | V | |
| Input Voltage | -0.3 | VDD + 0.3 | V | |
| Junction Temp | - | +150 | °C | |
| Storage Temp | -55 | +150 | °C | |
| Soldering Temp | - | +260 | °C | 40sec max. |
| ESD | | | | |
| HBM | | 4000 | V | |
| MM | | 400 | | |
| CDM | | 1500 | | |

1000+ years of data retention on internal memory

Specifications (Unless specified otherwise: T = 25°C)

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Units |
|---|--------------|--|-----------------|--------------------|-----------------|-------|
| Supply Voltage ¹ | VDD | | 2.25 | | 3.6 | V |
| Supply Current | IDD | OE pin low - output is disabled | | 21 | 23 | mA |
| Supply Current ² | IDD | OE pin high - outputs are enabled RL = 50Ohms, F01 = F02 = 156.25MHz | | 38 | | mA |
| Frequency Stability | ΔF | Includes frequency variation due to initial tolerance, temp. and power supply voltage | | | ± 25 | ppm |
| Aging | ΔF | First year (@ 25°C) | | | ± 5 | ppm |
| Startup Time ³ | tSU | T = 25°C | | | 5 | ms |
| Input Logic Levels Input Logic High Input Logic Low | VIH VIL | | 0.75 x VDD - | | - 0.25 x VDD | V |
| Output Disable Time ⁴ | tDA | | | | 5 | ns |
| Output Enable Time | tEN | | | | 20 | ns |
| Pull-Up Resistor ² | | Pull-up exists on all digital IO | | 40 | | kOhms |
| LVDS Outputs | | | | | | |
| Output Offset Voltage | | RL = 100Ohms Differential | 1.125 | | 1.4 | V |
| Delta Offset Voltage | | | | | 50 | mV |
| Pk to Pk Output Swing | | Single-Ended | | 350 | | mV |
| Output Transition Time ⁴ Rise Time Fall Time | tR tF | 20% to 80% RL = 50Ohms, CL = 2pF (to GND) | | 200 | 350 | ps |
| Frequency | CLK1 CLK2 | [FS2, FS1, FS0] = [1, 1, 1] | | 100 100 | | MHz |
| Output Duty Cycle | SYM | Differential | 48 | | 52 | % |
| Period Jitter ⁵ | JPER | F01 = F02 = 156.25MHz | | 2.5 | | psRMS |
| Integrated Phase Noise | JPH | 200kHz to 20MHz @ 156.25MHz 100kHz to 20MHz @ 156.25MHz 12kHz to 20MHz @ 156.25MHz | | 0.28 0.4 1.7 | 2 | psRMS |

Notes:

- Pin 12 VDD2, and pin 13 VDD should be filtered with 0.1uF capacitors.
- Output is enabled if OE pin is floated or not connected.
- tSU is time to 100ppm stable output frequency after VDD is applied and outputs are enabled.
- Output Waveform and Test Circuit figures below define the parameters.
- Period Jitter includes crosstalk from adjacent output.

Nominal Performance Parameters (Unless specified otherwise: T = 25°C, VDD = 3.3V)

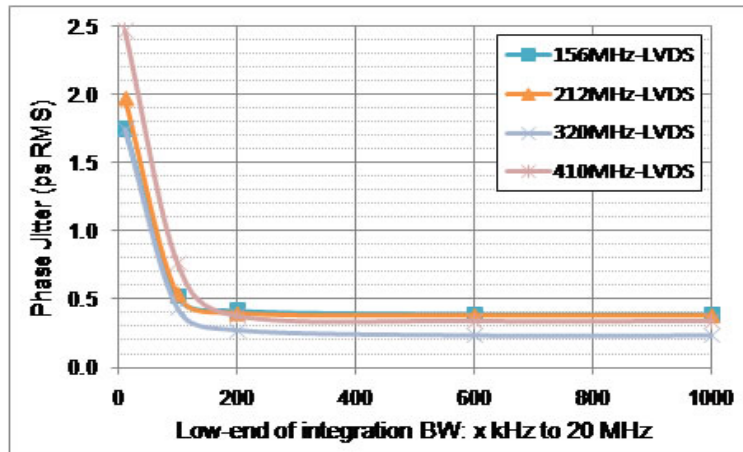


Figure 1. LVDS Phase Jitter (integrated phase noise)

LVDS Output Waveform

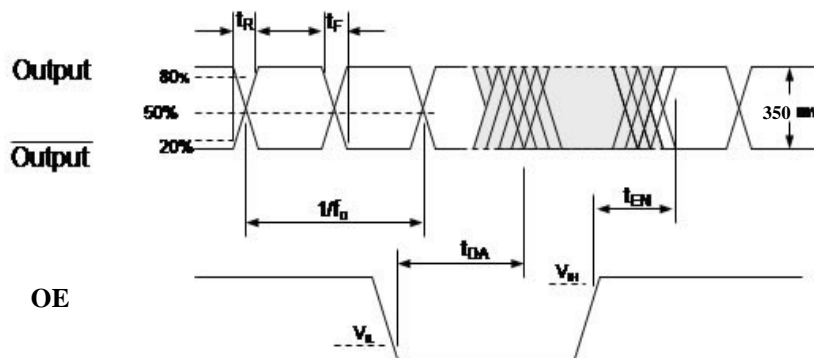


Figure 2. LVDS Output Waveform

| 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 - 180 sec |
| Time maintained above 217°C | 60 - 150 sec |
| Peak Temperature | 255 - 260°C |
| Time within 5°C of actual Peak | 20 - 40 sec |
| Ramp-Down Rate | 6°C/sec Max. |
| Time 25°C to Peak Temperature | 8 min Max. |

Solder Reflow Profile

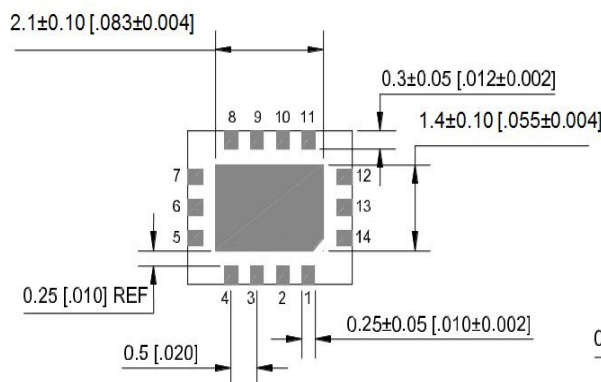
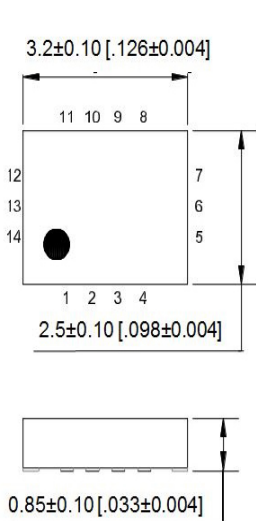


Figure 3. Solder Reflow Profile

Package Information⁷

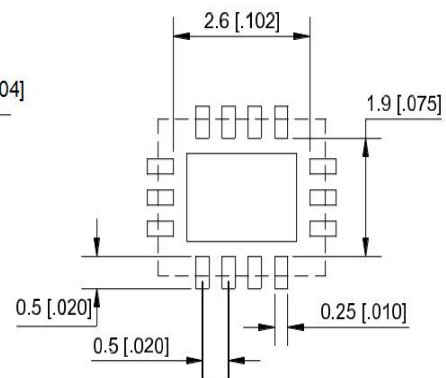
External Dimensions

units: mm[inch]



Recommended Solder Pad Layout

units: mm[inch]



3.2mm x 2.5mm 14 Lead Plastic Package

Notes:

- Connect the exposed die paddle to ground.
- Package information is correct as of the publication date. For updates and most current information, go to www.microchip.com.

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