



1.8~3.3V

Low-Power Precision CMOS Oscillator

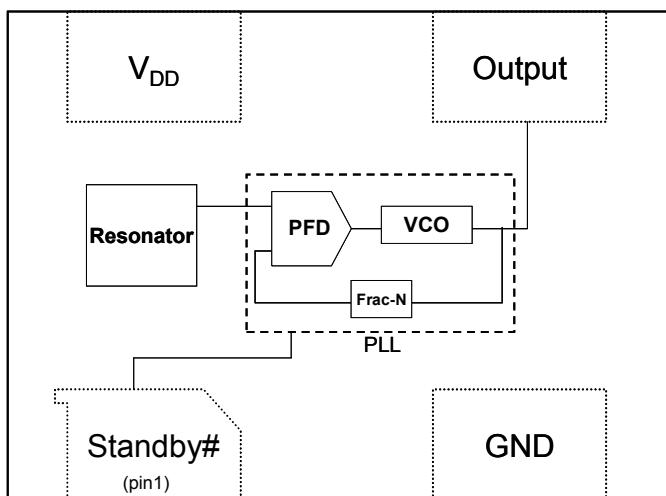
## General Description

The DSC1003 is a silicon MEMS based CMOS oscillator offering excellent jitter and stability performance over a wide range of supply voltages and temperatures. The device operates from 1 to 150MHz with supply voltages between 1.8 to 3.3 Volts and extended temperatures from -40°C to 105°C. The DSC1003 has the same functionality and performance as the DSC1001 but with greater output drive ( $C_L < 25\text{pf}$ ).

The DSC1003 incorporates an all silicon resonator that is extremely robust and nearly immune to stress related fractures, common to crystal based oscillators. Without sacrificing the performance and stability required of today's systems, a crystal-less design allows for a higher level of reliability, making the DSC1003 ideal for rugged, industrial, and portable applications where stress, shock, and vibration can damage quartz crystal based systems.

Available in industry standard packages, the DSC1003 can be "dropped-in" to the same PCB footprint as standard crystal oscillators.

## Block Diagram



## Features

- Frequency Range: 1 to 150MHz
- Exceptional Stability over Temperature
  - ±10 PPM, ±25 PPM, ±50 PPM
- Operating voltage
  - 1.7 to 3.6V
- Operating Temperature Range
  - Ext. Industrial -40°C to 105°C
  - Industrial -40°C to 85°C
  - Ext. Commercial -20°C to 70°C
  - Commercial 0°C to 70°C
- Low Operating and Standby Current
  - 6mA Operating (40MHz)
  - 15uA Standby
- Ultra Miniature Footprint
  - 2.5 x 2.0 x 0.85 mm
  - 3.2 x 2.5 x 0.85 mm
  - 5.0 x 3.2 x 0.85 mm
  - 7.0 x 5.0 x 0.85 mm
- Excellent Shock and Vibration Resistance
- Lead Free, RoHS & Reach SVHC Compliant

## Benefits

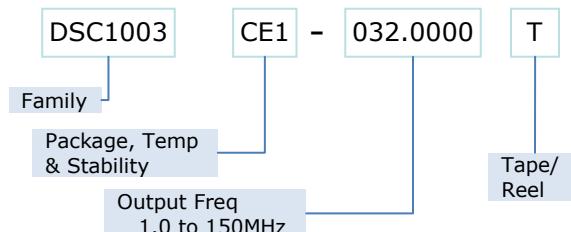
- Pin for pin "drop in" replacement for industry standard oscillators
- Semiconductor level reliability, significantly higher than quartz
- Short mass production lead-times
- Longer Battery Life / Reduced Power
- Compact Plastic package
- Cost Effective

## Applications

- Mobile Applications
- Consumer Electronics
- Portable Electronics
- CCD Clock for VTR Cameras
- Low Profile Applications
- Industrial

**Absolute Maximum Ratings<sup>1</sup>**

Item	Min.	Max	Unit	Condition
<b>Input Voltage</b>	-0.3	VDD+0.3	V	
<b>Junction Temp</b>	-	+150	°C	
<b>Storage Temp</b>	-55	+150	°C	
<b>Soldering Temp</b>	-	+260	°C	40 sec max.
<b>ESD</b>	-		V	
<b>HBM</b>		4000		
<b>MM</b>		200		
<b>CDM</b>		1500		



\* See Ordering Information for details

**Ordering Code****Recommended Operating Conditions**

Parameter	Symbol	Range
<b>Supply Voltage</b>	V <sub>DD</sub>	1.7 – 3.6V
<b>Output Load</b>	Z <sub>L</sub>	R>10KΩ, C≤25pF
<b>Operating Temperature</b>	T	
<b>Option 1</b>		-40 to +105 °C
<b>Option 2</b>		-40 to +85 °C
<b>Option 3</b>		-20 to +70 °C
<b>Option 4</b>		0 to +70 °C

**Specifications (VDD = 1.8 to 3.3v) T<sub>A</sub>=85°C unless otherwise specified**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
<b>Frequency</b>	f <sub>0</sub>	Single Frequency	1		150	MHz
<b>Frequency Tolerance</b>	Δf	Includes frequency variations due to initial tolerance, temperature and power supply voltage			±10,±25,±50	ppm
<b>Aging</b>	Δf	1 year @25°C			±5	ppm
<b>Supply Current, standby</b>	I <sub>DD</sub>	T=25°C			15	uA
<b>Output Startup Time<sup>2</sup></b>	t <sub>SU</sub>	T=25°C		1.0	1.3	ms
<b>Output Disable Time</b>	t <sub>DA</sub>			20	100	ns
<b>Output Duty Cycle</b>	SYM		45		55	%
<b>Input Logic Levels</b> <b>Input logic high</b> <b>Input logic low</b>	V <sub>IH</sub> V <sub>IL</sub>		0.75*V <sub>DD</sub> -		- 0.25* V <sub>DD</sub>	Volts

## Notes:

1. Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated beyond these limits.
2. t<sub>SU</sub> is time to stable output frequency after V<sub>DD</sub> is applied. t<sub>SU</sub> and t<sub>EN</sub> (after EN is asserted) are identical values.
3. Measured over 50k clock cycles.

**VDD = 1.8v**

Parameter	Symbol	Condition		Min	Typ	Max	Unit
<b>Supply Current, no load</b>	I <sub>DD</sub>	C <sub>L</sub> =0p R <sub>L</sub> =∞ T=25°C	1MHz 27MHz 70MHz 150MHz		5.7 6.4 7.7 10.0	6.0 6.8 8.0 11.0	mA
<b>Output Logic Levels</b> <b>Output logic high</b> <b>Output logic low</b>	V <sub>OH</sub> V <sub>OL</sub>		-6mA 6mA	0.8*V <sub>DD</sub> -		- 0.2*V <sub>DD</sub>	Volts
<b>Output Transition time</b> <b>Rise Time</b> <b>Fall Time</b>	t <sub>R</sub> t <sub>F</sub>		C <sub>L</sub> =25pF; T=25°C 20%/80%*V <sub>DD</sub>		1.5 1.2	3 3	ns
<b>Output Transition time</b> <b>Rise Time</b> <b>Fall Time</b>	t <sub>R</sub> t <sub>F</sub>		C <sub>L</sub> =25pF; T=25°C 10%/90%*V <sub>DD</sub>		2.6 1.9	4 4	ns
<b>Period Jitter</b>	J <sub>p</sub>		F = 100MHz <sup>3</sup>		10	15	ps rms

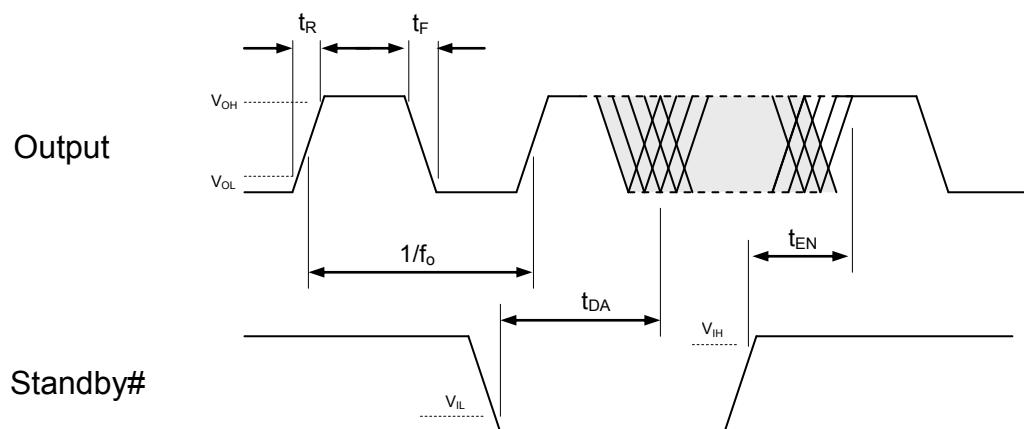
**VDD = 2.5v**

Parameter	Symbol	Condition		Min	Typ	Max	Unit
<b>Supply Current, no load</b>	I <sub>DD</sub>	C <sub>L</sub> =0p R <sub>L</sub> =∞ T=25°C	1MHz 27MHz 70MHz 150MHz		5.7 6.7 8.4 11.4	6.0 7.1 8.8 12.7	mA
<b>Output Logic Levels</b> <b>Output logic high</b> <b>Output logic low</b>	V <sub>OH</sub> V <sub>OL</sub>		-6mA 6mA	0.8*V <sub>DD</sub> -		- 0.2*V <sub>DD</sub>	Volts
<b>Output Transition time</b> <b>Rise Time</b> <b>Fall Time</b>	t <sub>R</sub> t <sub>F</sub>		C <sub>L</sub> =25pF; T=25°C 20%/80%*V <sub>DD</sub>		1.1 0.9	2 2	ns
<b>Output Transition time</b> <b>Rise Time</b> <b>Fall Time</b>	t <sub>R</sub> t <sub>F</sub>		C <sub>L</sub> =25pF; T=25°C 10%/90%*V <sub>DD</sub>		1.9 1.5	3.5 3	ns
<b>Period Jitter</b>	J <sub>p</sub>		F = 100MHz <sup>3</sup>		5	10	ps rms

**VDD = 3.3v**

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
<b>Supply Current, no load</b>	I <sub>DD</sub>	C <sub>L</sub> =0p R <sub>L</sub> =∞ T=25°C	1MHz 27MHz 70MHz 150MHz		5.7 7.0 9.1 13.1	6.0 7.4 9.6 15.0	mA
<b>Output Logic Levels</b> <b>Output logic high</b> <b>Output logic low</b>	V <sub>OH</sub> V <sub>OL</sub>		-6mA 6mA	0.9*V <sub>DD</sub> -		- 0.1*V <sub>DD</sub>	Volts
<b>Output Transition time</b> <b>Rise Time</b> <b>Fall Time</b>	t <sub>R</sub> t <sub>F</sub>		C <sub>L</sub> =25pF; T=25°C 20%/80%*V <sub>DD</sub>		1.1 0.9	2 2	ns
<b>Output Transition time</b> <b>Rise Time</b> <b>Fall Time</b>	t <sub>R</sub> t <sub>F</sub>		C <sub>L</sub> =25pF; T=25°C 10%/90%*V <sub>DD</sub>		1.5 1.5	3 3	ns
<b>Period Jitter</b>	J <sub>p</sub>		F = 100MHz <sup>3</sup>		5	10	ps rms

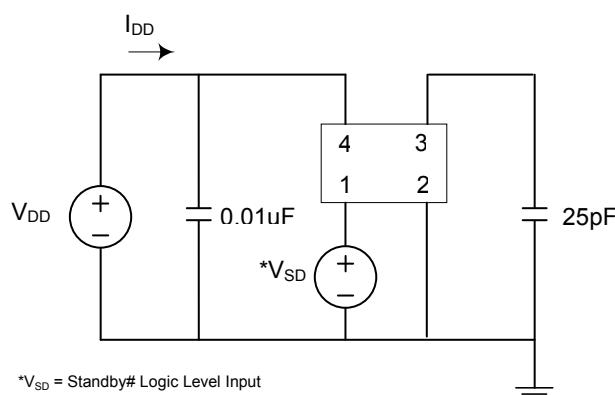
## Output Waveform



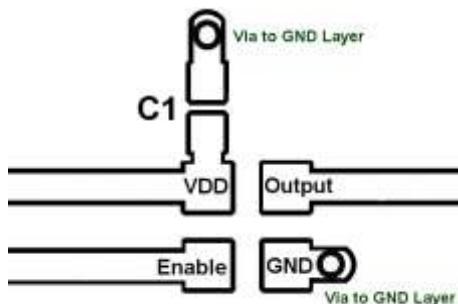
## Standby Function

Standby# (pin 1)	Output (pin 3)
Hi Level	Output ON
Open (no connect)	Output ON
Low Level	High Impedance

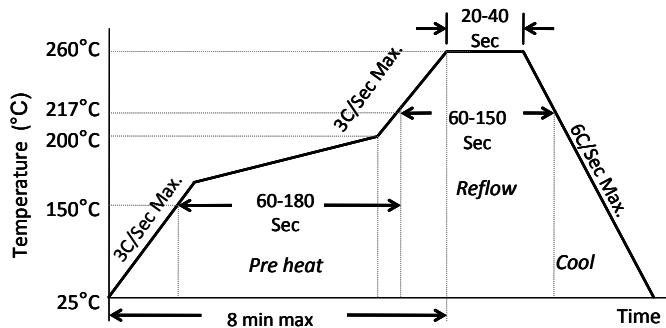
## Test Circuit



## Board Layout (recommended)



## 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	60-180 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.

## Package Dimensions

### 7.0 x 5.0 mm Plastic Package

External Dimensions

External dimensions:

- Overall width: 7.0±0.10 [0.276±0.004]
- Overall height: 5.0±0.10 [0.197±0.004]
- Lead spacing: 2.6 [0.102]
- Lead height: 0.85±0.05 [0.033±0.002]

Recommended Land Pattern\*

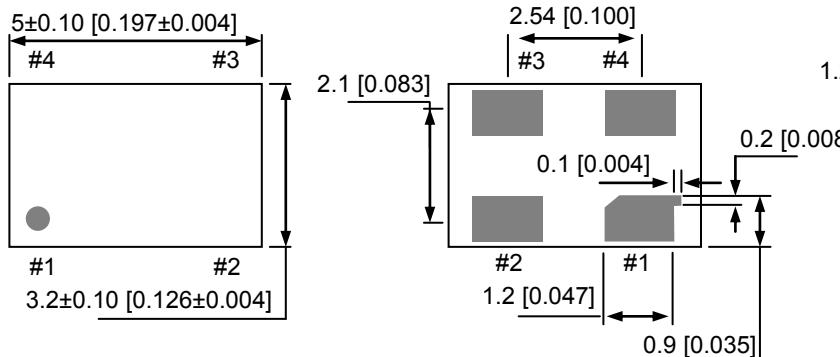
Land pattern dimensions:

- Pad width: 1.4 [0.055]
- Pad height: 0.2 [0.008]
- Pad thickness: 1.2 [0.047]
- Pad to pad distance: 5.08 [0.200]
- Pad to via distance: 0.2 [0.008]
- Via diameter: 0.2 [0.008]
- Via to via distance: 1.4 [0.055]
- Via to lead distance: 1.4 [0.055]
- Total lead width: 2.6 [0.102]
- Total lead height: 1.4 [0.055]

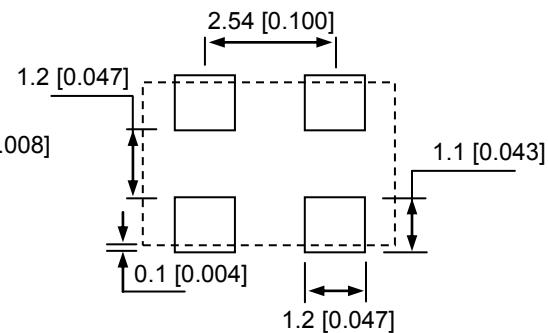
\*Note: The center pad is not connected internally and should be left unconnected or tied to GND.

No.	Pin Terminal
1	Standby#
2	GND
3	Output
4	VDD

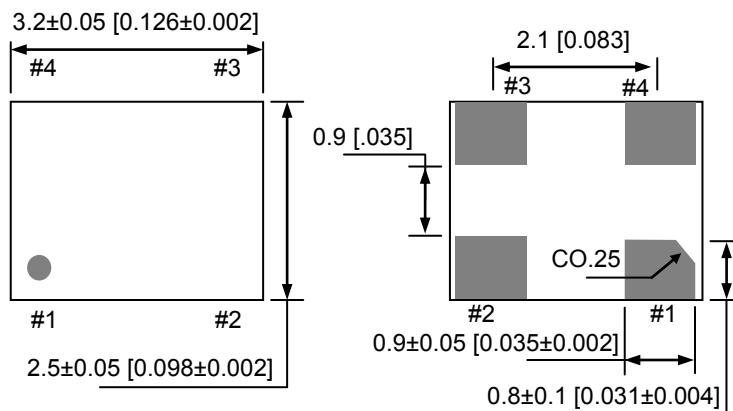
units: mm [inch]

**5.0 x 3.2 mm Plastic Package****External Dimensions**

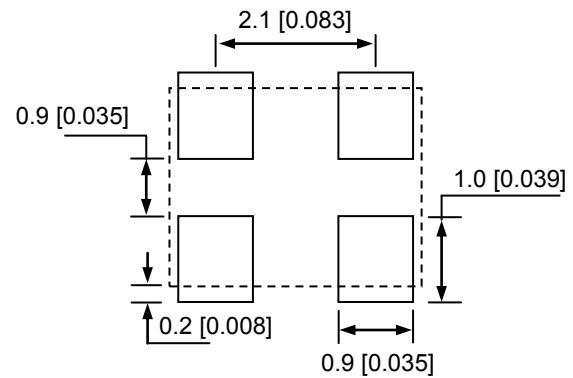
No.	Pin Terminal
1	Standby#
2	GND
3	Output
4	VDD

**Recommended Land Pattern**

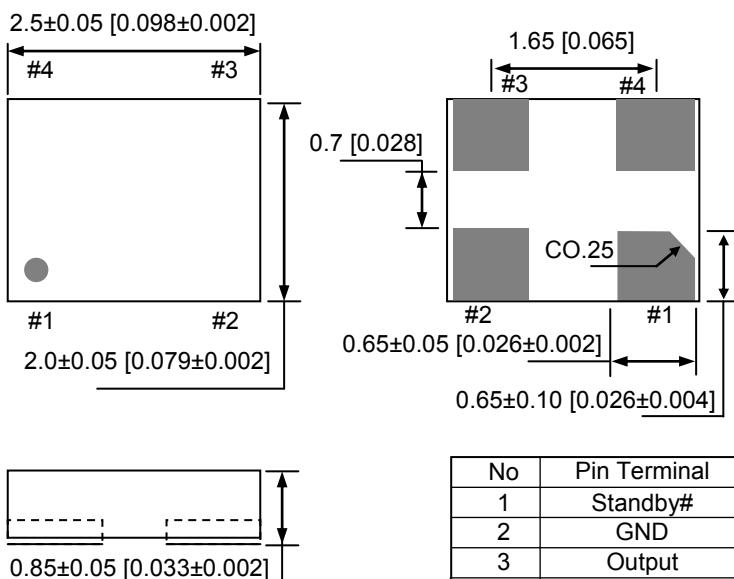
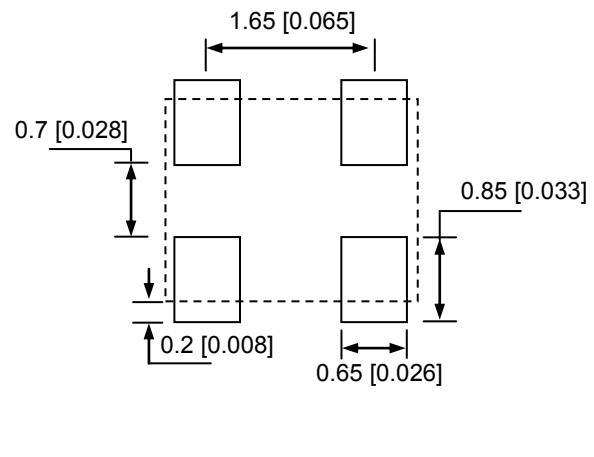
units: mm [inch]

**3.2 x 2.5 mm Plastic Package****External Dimensions**

No.	Pin Terminal
1	Standby#
2	GND
3	Output
4	VDD

**Recommended Land Pattern**

units: mm [inch]

**2.5 x 2.0 mm Plastic Package****External Dimensions****Recommended Land Pattern**

No	Pin Terminal
1	Standby#
2	GND
3	Output
4	VDD

units: mm [inch]

**Ordering Information****DSC1003 PTS – xxx.xxxx T****PART NUMBERING GUIDE**

Package (Plastic QFN)	Temperature	Stability	Frequency	Packing Option
<b>P=A:</b> 7.0x5.0mm	<b>T=C:</b> 0° ~ +70° C	<b>S=1:</b> ±50ppm		
<b>P=B:</b> 5.0x3.2mm	<b>T=E:</b> -20° ~ +70° C	<b>S=2:</b> ±25ppm		
<b>P=C:</b> 3.2x2.5mm	<b>T=I:</b> -40° ~ +85° C	<b>S=5:</b> ±10ppm	<b>XXX.XXXX</b>	<b>Blank:</b> Tubes
<b>P=D:</b> 2.5x2.0mm	<b>T=L:</b> -40° ~ +105° C			<b>T:</b> Tape & Reel

Example: DSC1003CE1-123.0000T

The example part number above is a 123.0000MHz oscillator in Plastic 3.2x2.5mm package, with ±50ppm stability over an operating temperature of -20 to +70°C, shipped in Tape and Reel.

**Disclaimer:**

Micrel makes no representations or warranties with respect to the accuracy or completeness of the information furnished in this data sheet. This information is not intended as a warranty and Micrel does not assume responsibility for its use. Micrel reserves the right to change circuitry, specifications and descriptions at any time without notice. No license, whether express, implied, arising by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Micrel's terms and conditions of sale for such products, Micrel assumes no liability whatsoever, and Micrel disclaims any express or implied warranty relating to the sale and/or use of Micrel products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right.

**MICREL, Inc.**  
Phone: +1 (408) 944-0800

- 2180 Fortune Drive, San Jose, California 95131 • USA
- Fax: +1 (408) 474-1000 • Email: [hbwhelp@micrel.com](mailto:hbwhelp@micrel.com) • [www.micrel.com](http://www.micrel.com)

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

## Microchip:

[DSC1003CI5-087.5000](#) [DSC1003DL5-025.0000](#) [DSC1003DL2-070.0000](#) [DSC1003DI2-024.5760](#) [DSC1003DL2-070.0000T](#) [DSC1003CI2-050.0000](#) [DSC1003CI2-025.0000](#) [DSC1003CI2-025.0000T](#) [DSC1003CI2-050.0000T](#) [DSC1003DI2-100.0000](#) [DSC1003DL2-100.0000](#) [DSC1003DL5-020.0000](#) [DSC1003DL2-008.0000](#) [DSC1003DI2-100.0000T](#) [DSC1003DL2-100.0000T](#)