DSC1004

1.8~3.3V Low-Power Precision CMOS Oscillator

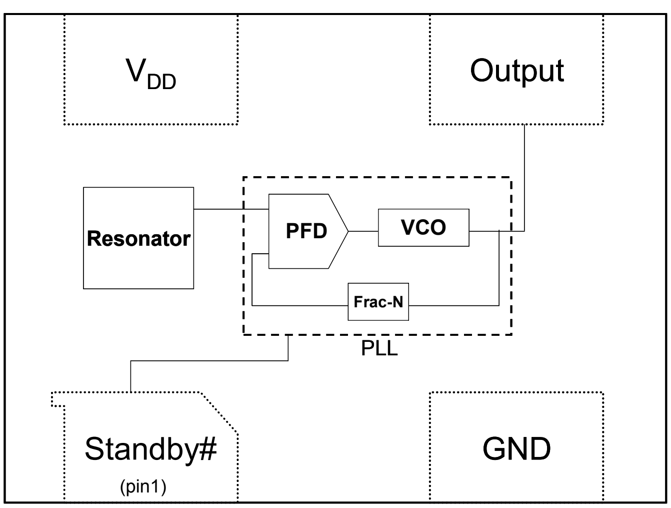
General Description

The DSC1004 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 -40ºC to 105ºC. The DSC1004 has the same functionality and performance as the DSC1001 but with greater output drive (C_L< 40pf).

The DSC1004 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 DSC1004 ideal for rugged, industrial, and portable applications where stress, shock, and vibration can damage quartz crystal based systems.

Available in industry standard packages, the DSC1004 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 -40ºC to 105ºC
  - Industrial -40ºC to 85ºC
  - Ext. Commercial -20ºC to 70ºC
  - Commercial 0ºC to 70ºC
- Low Operating and Standby Current
  - 8mA 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

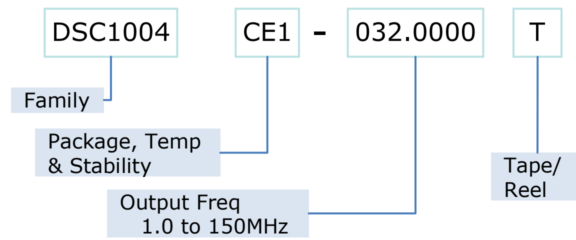
- Pin for pin "drop in" replacement for industry standard oscillators
- Semiconductor level reliability, significantly higher than quartz
- Short mass production lead-times
- Longer Battery Life / Reduced Power
- Compact Plastic package
- Cost Effective

Applications

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

Absolute Maximum Ratings[1]

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



* See Ordering Information for details

Ordering Code

Recommended Operating Conditions

Parameter	Symbol	Range
Supply Voltage	V_{DD}	1.7 – 3.6V
Output Load	Z_L	R>10KΩ, C≤40pF
Operating Temperature **Option 1** **Option 2** **Option 3** **Option 4**	T	 -40 to +105 °C -40 to +85 °C -20 to +70 °C 0 to +70 °C

Specifications (VDD = 1.8 to 3.3v) T_A=85^{0}C unless otherwise specified

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Frequency	f_0	Single Frequency	1		150	MHz
Frequency Tolerance	Δf	Includes frequency variations due to initial tolerance, temperature and power supply voltage			±10,±25,±50	ppm
Aging	Δf	1 year @25°C			±5	ppm
Supply Current, standby	I_{DD}	T=25°C			15	uA
Output Startup Time[2]	t_{SU}	T=25°C		1.0	1.3	ms
Output Disable Time	t_{DA}			20	100	ns
Output Duty Cycle	SYM		45		55	%
Input Logic Levels **Input logic high** **Input logic low**	 V_{IH} V_{IL}		 0.75*V_{DD} -		 - 0.25* V_{DD}	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_{SU} is time to stable output frequency after V_{DD} is applied. t_{SU} and t_{EN} (after EN is asserted) are identical values.
3. Measured over 50k clock cycles.

VDD = 1.8v

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Current, no load	I_{DD}	C_L=0p R_L=∞ T=25°C	1MHz 27MHz 70MHz 150MHz		5.9 6.7 8.1 10.6	6.2 7.1 8.5 11.9	mA
Output Logic Levels **Output logic high** **Output logic low**	V_{OH} V_{OL}	-6mA 6mA		0.8*V_{DD} -		- 0.2*V_{DD}	Volts
Output Transition time **Rise Time** **Fall Time**	t_R t_F	C_L=40pF; T=25°C 20%/80%*V_{DD}			1.4 1.1	3 3	ns
Output Transition time **Rise Time** **Fall Time**	t_R t_F	C_L=40pF; T=25°C 10%/90%*V_{DD}			2.2 1.8	4 4	ns
Period Jitter	J_p	F = 100MHz[3]			10	15	ps rms

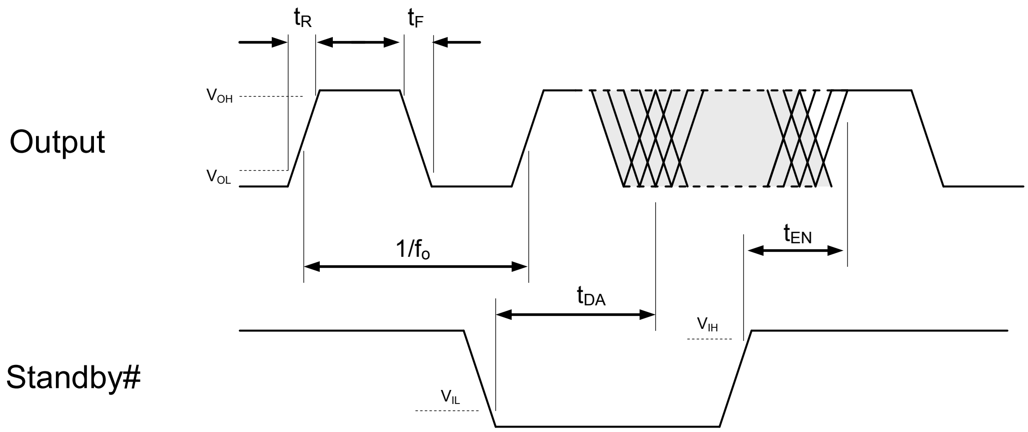
VDD = 2.5v

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Current, no load	I_{DD}	C_L=0p R_L=∞ T=25°C	1MHz 27MHz 70MHz 150MHz		6.1 7.2 8.9 12.2	6.4 7.5 9.4 13.9	mA
Output Logic Levels **Output logic high** **Output logic low**	V_{OH} V_{OL}	-6mA 6mA		0.9*V_{DD} -		- 0.1*V_{DD}	Volts
Output Transition time **Rise Time** **Fall Time**	t_R t_F	C_L=40pF; T=25°C 20%/80%*V_{DD}			1.0 0.9	2 2	ns
Output Transition time **Rise Time** **Fall Time**	t_R t_F	C_L=40pF; T=25°C 10%/90%*V_{DD}			1.7 1.5	3.5 3	ns
Period Jitter	J_p	F = 100MHz[3]			5	10	ps rms

VDD = 3.3v

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Current, no load	I_{DD}	C_L=0p R_L=∞ T=25°C	1MHz 27MHz 70MHz 150MHz		6.2 7.6 10.0 14.4	6.5 8.0 10.5 16.6	mA
Output Logic Levels **Output logic high** **Output logic low**	V_{OH} V_{OL}	-8mA 8mA		0.9*V_{DD} -		- 0.1*V_{DD}	Volts
Output Transition time **Rise Time** **Fall Time**	t_R t_F	C_L=40pF; T=25°C 20%/80%*V_{DD}			0.8 0.8	2 2	ns
Output Transition time **Rise Time** **Fall Time**	t_R t_F	C_L=40pF; T=25°C 10%/90%*V_{DD}			1.4 1.3	3 3	ns
Period Jitter	J_p	F = 100MHz[3]			5	10	ps rms

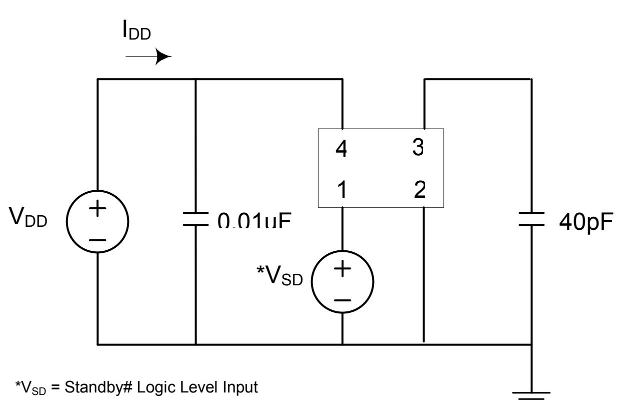
Output Waveform



Standby Function

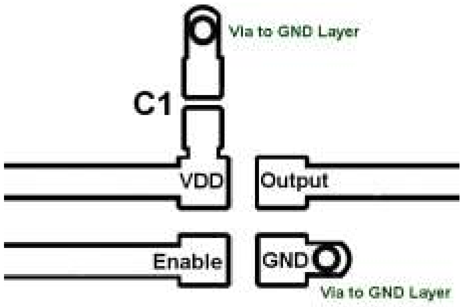
Standby# (pin 1)	Output (pin 3)
Hi Level	Output ON
Open (no connect)	Output ON
Low Level	High Impedance

Test Circuit

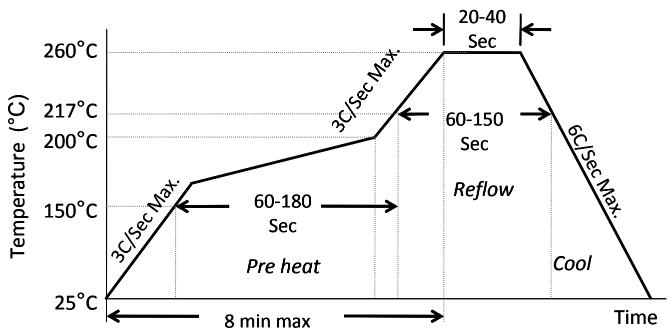


$^*V_{SD}$ = Standby# Logic Level Input

Board Layout (recommended)



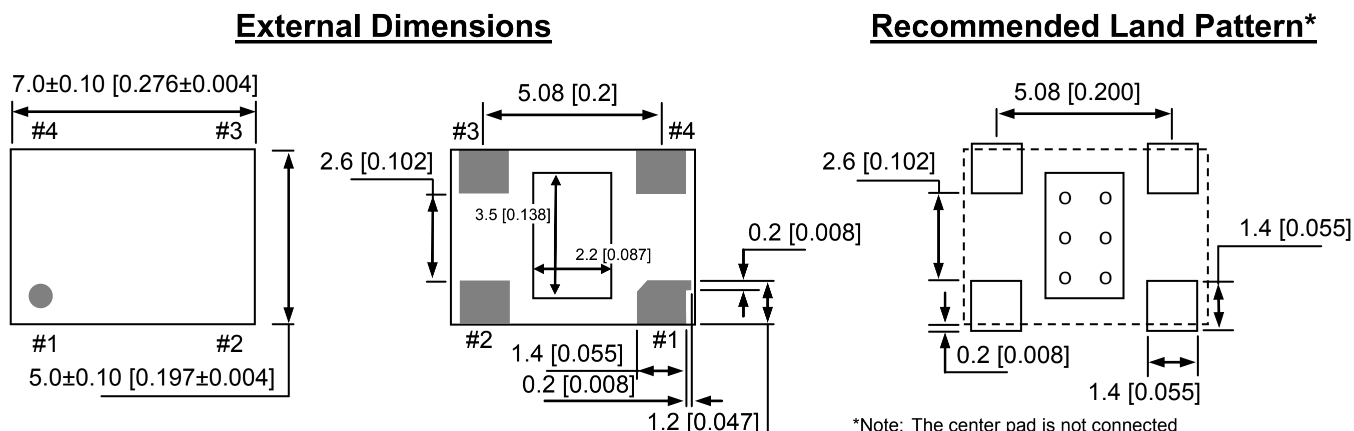
Solder Reflow Profile



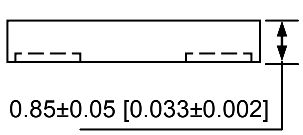
MSL 1 @ 260°C refer to JSTD-020C	
Ramp-Up Rate (200°C to Peak Temp)	3°C/Sec Max.
Preheat Time 150°C to 200°C	60-180 Sec
Time maintained above 217°C	60-150 Sec
Peak Temperature	255-260°C
Time within 5°C of actual Peak	20-40 Sec
Ramp-Down Rate	6°C/Sec Max.
Time 25°C to Peak Temperature	8 min Max.

Package Dimensions

7.0 x 5.0 mm Plastic Package



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

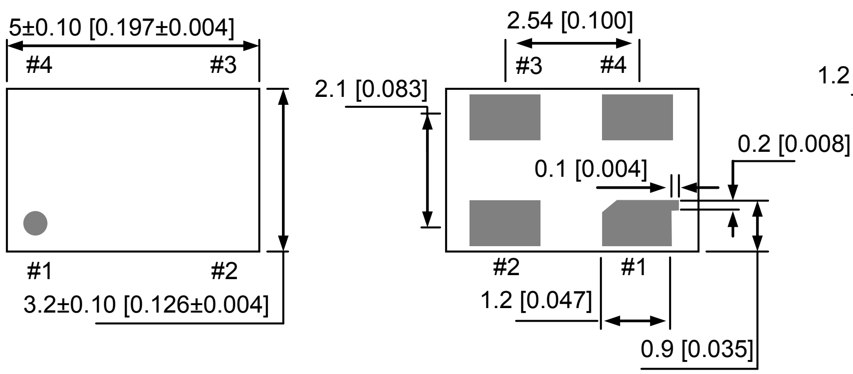


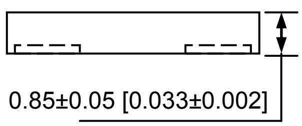
No.	Pin Terminal
1	Standby#
2	GND
3	Output
4	VDD

units: mm [inch]

5.0 x 3.2 mm Plastic Package

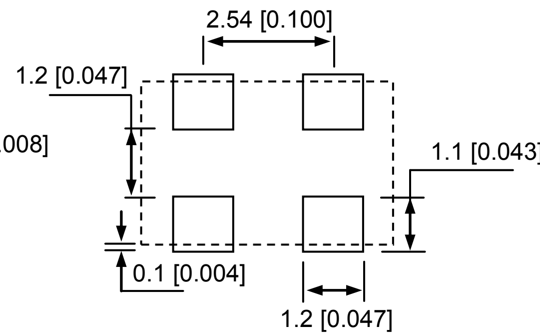
External Dimensions





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

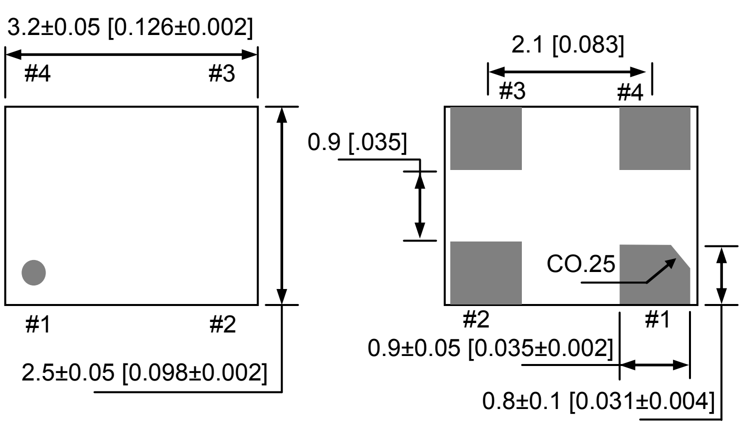
Recommended Land Pattern

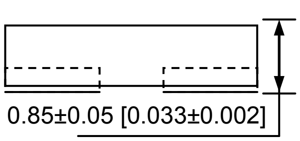


units: mm [inch]

3.2 x 2.5 mm Plastic Package

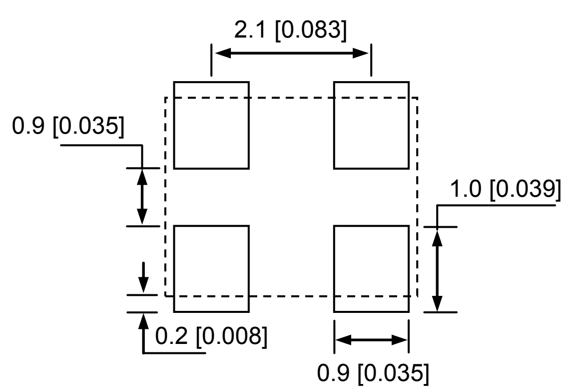
External Dimensions





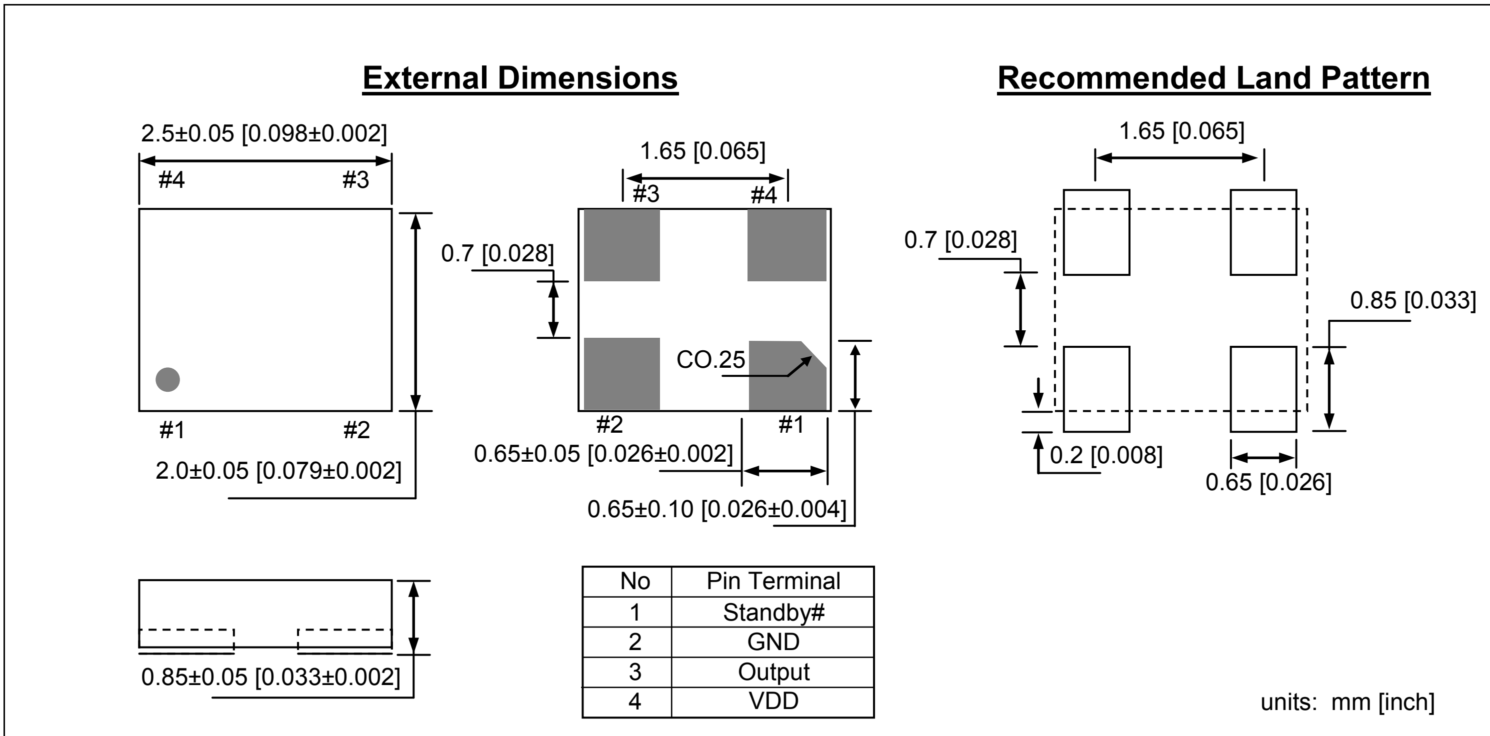
No.	Pin Terminal
1	Standby#
2	GND
3	Output
4	VDD

Recommended Land Pattern



units: mm [inch]

2.5 x 2.0 mm Plastic Package



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

Ordering Information

DSC1004 PTS – xxx.xxxx T

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

Example: DSC1004CE1–123.0000T

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:

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