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DSC8004 Series



1.8~3.3V

Programmable Low-Power Precision CMOS Oscillator

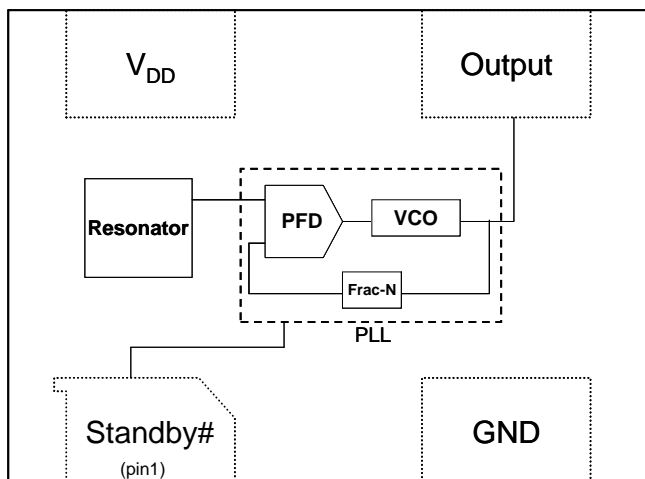
General Description

The DSC8004 is a programmable 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 in increments of 100Hz (up to four decimal point resolution) with supply voltages between 1.8 to 3.3 Volts and extended temperatures from -40°C to 105°C. The DSC8004 has the same functionality and performance as the DSC8001 but with greater output drive ($C_L=40\text{pf}$).

The DSC8004 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 DSC8004 ideal for rugged, industrial, and portable applications where stress, shock, and vibration can damage quartz crystal based systems.

Available in industry standard packages, the DSC8004 can be "dropped-in" to the same PCB footprint as standard crystal oscillators.

Block Diagram



Features

- Frequency Range: Programmable from 1 to 150MHz
- Exceptional Stability over Temperature
 - ± 20 PPM, ± 25 PPM, ± 50 PPM
- Operating voltage
 - 1.71 to 3.60V
- Operating Temperature Range
 - Ext. Industrial -40°C to 105°C
 - Industrial -40°C to 85°C
 - Ext. Commercial -20°C to 70°C
- 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
- Frequency Resolution to 4 decimals
- Short mass production lead-times
- Longer Battery Life / Reduced Power
- Compact Plastic package
- Cost Effective

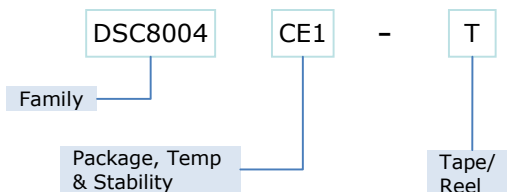
Applications

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

Absolute Maximum Ratings¹

Item	Min.	Max	Unit	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	40 sec max.
ESD	-		V	
HBM		4000		
MM		200		
CDM		1500		

Ordering Code



* See Ordering Information for details

Recommended Operating Conditions

Parameter	Symbol	Range
Supply Voltage	V _{DD}	1.71 – 3.60V
Output Load	Z _L	R>10KΩ, C≤40pF
Operating Temperature Option 1 Option 2 Option 3	T	-40 to +105 °C -40 to +85 °C -20 to +70 °C

Specifications (VDD = 1.8 to 3.3v) T_A=85°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.

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VDD = 1.8v

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Current, no load	I_{DD}	$C_L=0p$ $R_L=\infty$ $T=25^{\circ}C$	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		$0.8 \cdot V_{DD}$ -		- $0.2 \cdot V_{DD}$	Volts
Output Transition time Rise Time Fall Time	t_R t_F	$C_L=40pF$; $T=25^{\circ}C$ 20%/80%* V_{DD}			1.4 1.1	3 3	ns
Output Transition time Rise Time Fall Time	t_R t_F	$C_L=40pF$; $T=25^{\circ}C$ 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}	$C_L=0p$ $R_L=\infty$ $T=25^{\circ}C$	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		$0.9 \cdot V_{DD}$ -		- $0.1 \cdot V_{DD}$	Volts
Output Transition time Rise Time Fall Time	t_R t_F	$C_L=40pF$; $T=25^{\circ}C$ 20%/80%* V_{DD}			1.0 0.9	2 2	ns
Output Transition time Rise Time Fall Time	t_R t_F	$C_L=40pF$; $T=25^{\circ}C$ 10%/90%* V_{DD}			1.7 1.5	3.5 3	ns
Period Jitter	J_p	$F = 100MHz^3$			5	10	ps rms

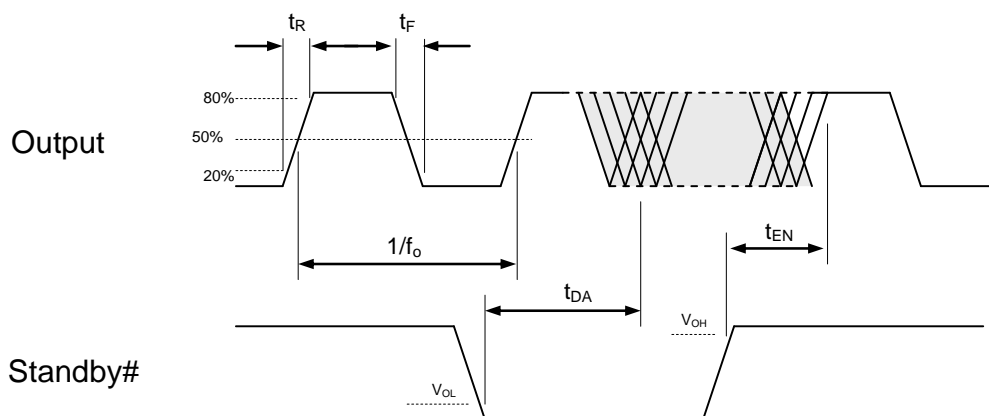
VDD = 3.3v

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Current, no load	I_{DD}	$C_L=0p$ $R_L=\infty$ $T=25^{\circ}C$	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		$0.9 \cdot V_{DD}$ -		- $0.1 \cdot V_{DD}$	Volts
Output Transition time Rise Time Fall Time	t_R t_F	$C_L=40pF$; $T=25^{\circ}C$ 20%/80%* V_{DD}			0.8 0.8	2 2	ns
Output Transition time Rise Time Fall Time	t_R t_F	$C_L=40pF$; $T=25^{\circ}C$ 10%/90%* V_{DD}			1.4 1.3	3 3	ns
Period Jitter	J_p	$F = 100MHz^3$			5	10	ps rms

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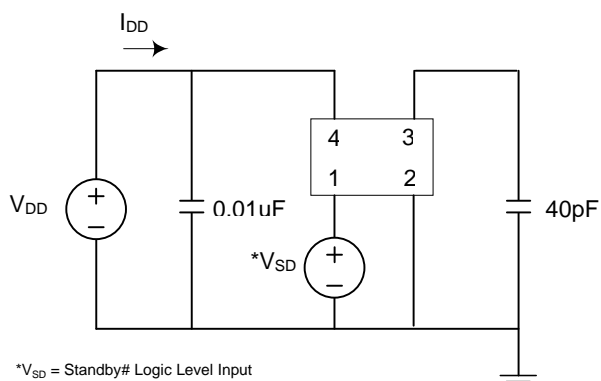
Output Waveform



Standby Function

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

Test Circuit



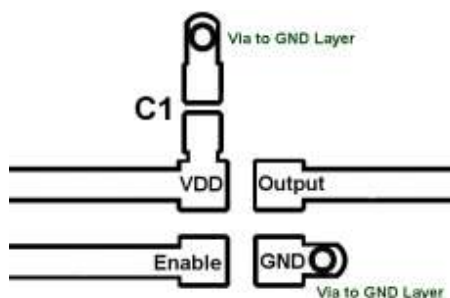
DSC8004 Series

1.8~3.3V

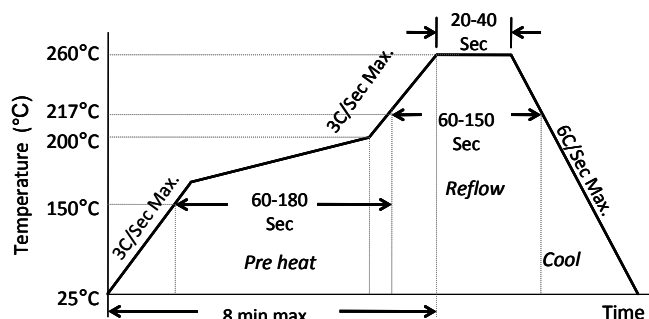
Programmable Low-Power Precision CMOS Oscillator



Board Layout (recommended)



Solder Reflow Profile

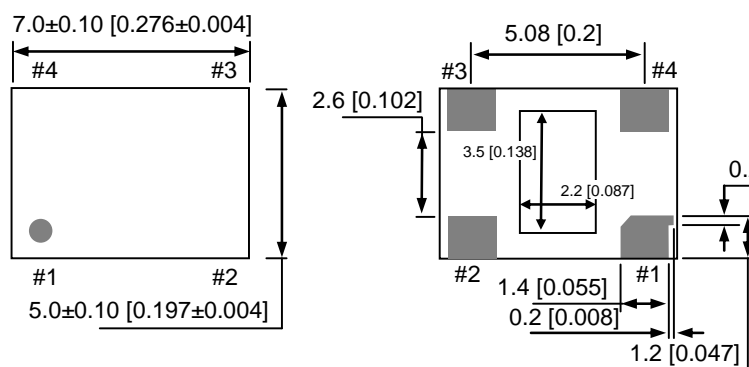


MSL 1 @ 260°C refer to JSTD-020C	
Ramp-Up Rate (200°C to Peak Temp)	3°C/Sec Max.
Preheat Time 150°C to 200°C	60-180 Sec
Time maintained above 217°C	60-150 Sec
Peak Temperature	255-260°C
Time within 5°C of actual Peak	20-40 Sec
Ramp-Down Rate	6°C/Sec Max.
Time 25°C to Peak Temperature	8 min Max.

Package Dimensions

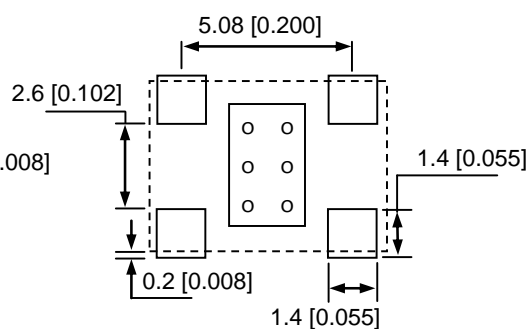
7.0 x 5.0 mm Plastic Package

External Dimensions



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

Recommended Land Pattern*



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

units: mm [inch]

DSC8004 Series

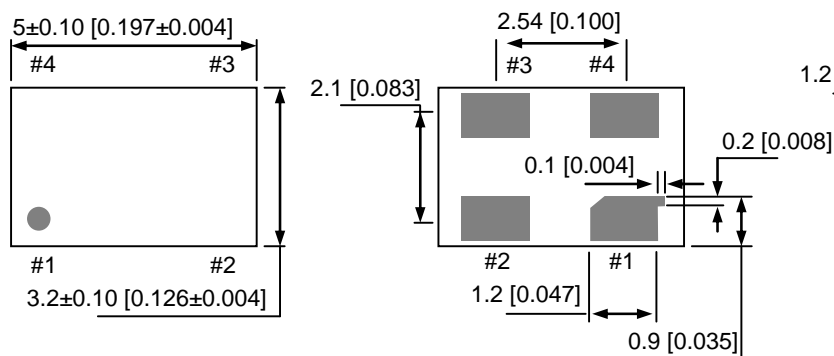
1.8~3.3V

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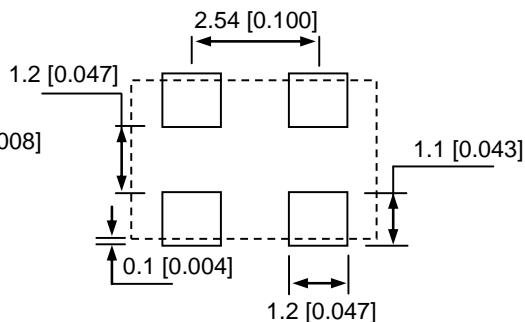
5.0 x 3.2 mm Plastic Package

External Dimensions



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

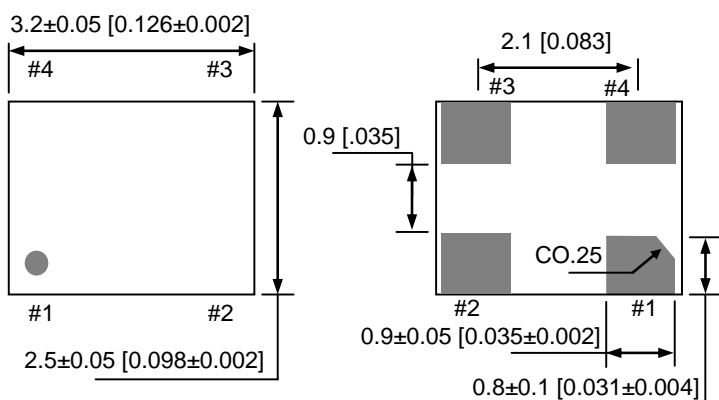
Recommended Land Pattern



units: mm [inch]

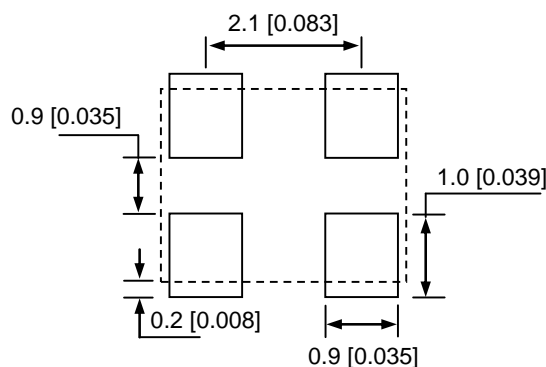
3.2 x 2.5 mm Plastic Package

External Dimensions



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

Recommended Land Pattern



units: mm [inch]

DSC8004 Series

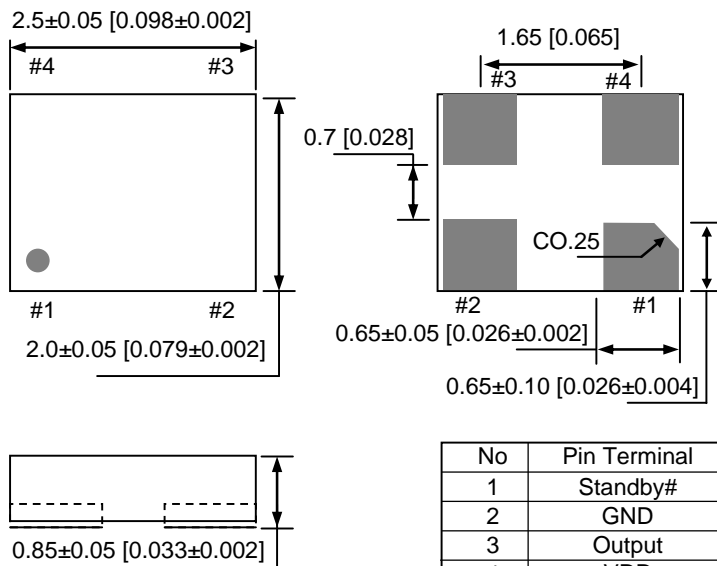
1.8~3.3V

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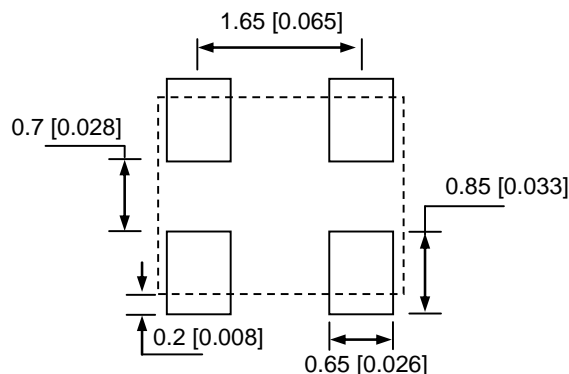


2.5 x 2.0 mm Plastic Package

External Dimensions



Recommended Land Pattern



units: mm [inch]

Ordering Information

DSC8004 PTS - T

PART NUMBERING GUIDE

Package (Plastic QFN)	Temperature	Stability	Packing Option
P=A: 7.0x5.0mm P=B: 5.0x3.2mm P=C: 3.2x2.5mm P=D: 2.5x2.0mm	T=E: -20° ~ +70° C T=I: -40° ~ +85° C T=L: -40° ~ +105° C	S=1: ±50ppm S=2: ±25ppm S=3: ±20ppm	Blank: Tubes T: Tape & Reel

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