DSC1001

discera

1.8~3.3V Low-Power Precision CMOS Oscillator

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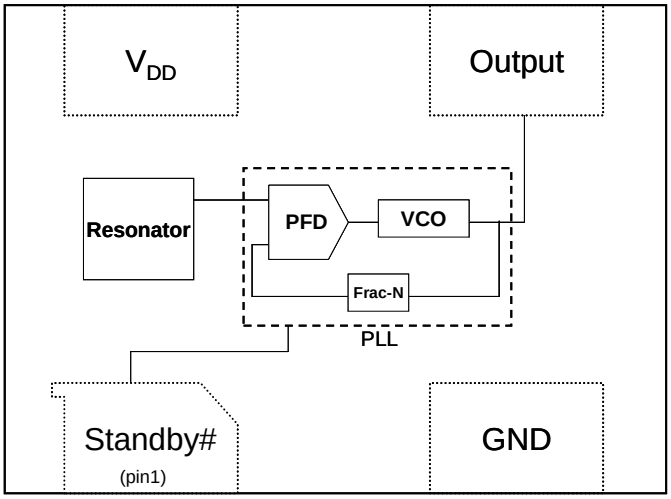
General Description

The DSC1001 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 temperature ranges up to -40ºC to 105ºC.

The DSC1001 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 DSC1001 ideal for rugged, industrial, and portable applications where stress, shock, and vibration can damage quartz crystal based systems.

Available in industry standard packages, the DSC1001 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
  - 5mA 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
- MIL-STD 883 Shock and Vibration Resistant
- Pb Free, RoHS, Reach SVHC Compliant
- AEC-Q100 Reliability Qualified

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

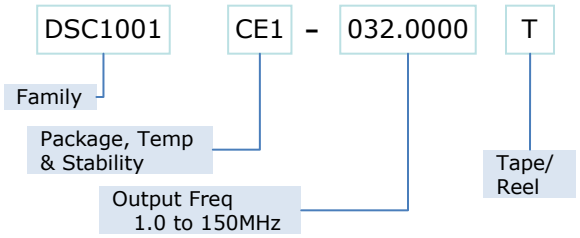
Applications

- Mobile Applications
- Consumer Electronics
- Portable Electronics
- DVR, CCTV, Surveillance Cameras
- Low Profile Applications
- Industrial Applications

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 **HBM** **MM** **CDM**	-	 4000 200 1500	V	

Ordering Code



* See Ordering Information for details

Recommended Operating Conditions

Parameter	Symbol	Range
Supply Voltage	V_{DD}	1.7 – 3.6V
Output Load	Z_L	R>10KΩ, C≤15pF
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 Logic Levels **Output logic high** **Output logic low**	 V_{OH} V_{OL}	 -4mA 4mA	 0.8*V_{DD} -		 - 0.2*V_{DD}	Volts
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

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		6.0 6.5 7.2 8.3	6.3 6.9 7.5 9.1	mA
Output Transition time **Rise Time** **Fall Time**	 t_R t_F	C_L=15pF; T=25°C 20%/80%*V_{DD}			 1.8 1.0	 3 3	ns
Jitter, Max Cycle to Cycle	J_{CC}	F = 100MHz[3]			60		Ps

VDD = 2.5v

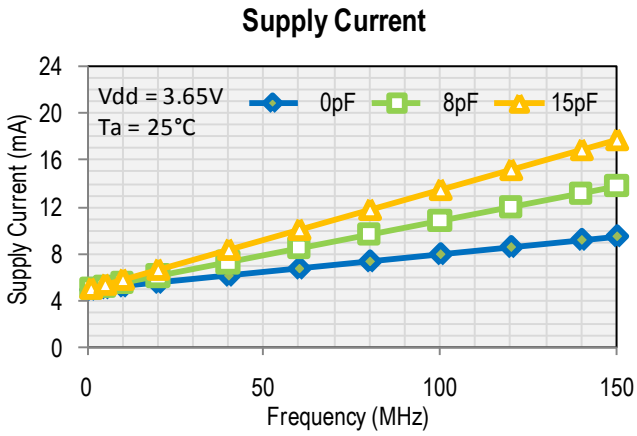
Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Current, no load	I_{DD}	C_L=0p R_L=∞ T=25°C	1MHz 27MHz 70MHz 150MHz		6.0 6.7 7.7 9.6	6.3 7.0 8.1 10.6	mA
Output Transition time **Rise Time** **Fall Time**	 t_R t_F	C_L=15pF; T=25°C 20%/80%*V_{DD}			 1.0 0.9	 2 2	ns
Jitter, Max Cycle to Cycle	J_{CC}	F = 100MHz[3]			50		ps

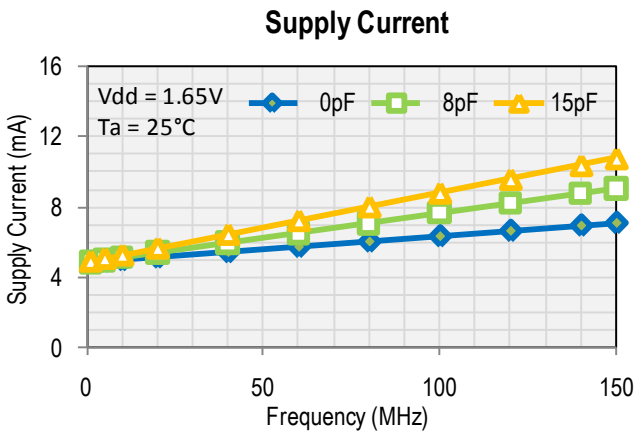
VDD = 3.3v

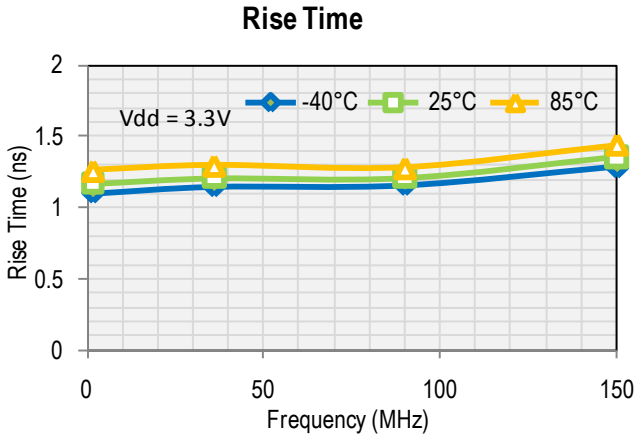
Parameter	Symbol	Condition		Min	Typ	Max	Unit
Supply Current, no load	I_{DD}	C_L=0p R_L=∞ T=25°C	1MHz 27MHz 70MHz 150MHz		6.0 6.8 8.2 10.8	6.3 7.2 8.7 12.2	mA
Output Transition time **Rise Time** **Fall Time**	 t_R t_F	C_L=15pF; T=25°C 20%/80%*V_{DD}			 1.0 0.9	 2 2	ns
Jitter, Max Cycle to Cycle	J_{CC}	F = 100MHz[3]			50		ps

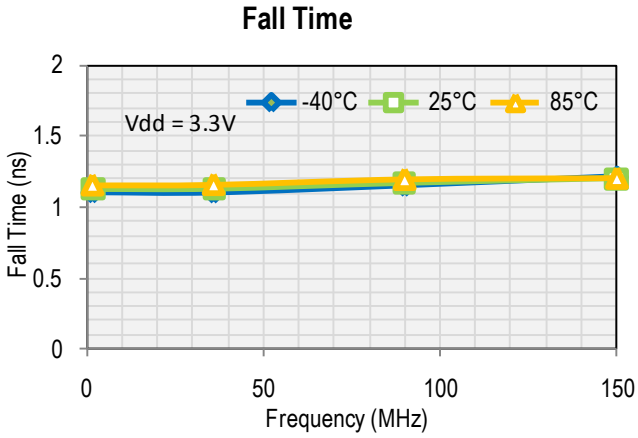
Notes:
1. Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated beyond these limits.
2. t_{SU} is time to stable output frequency after V_{DD} is applied. t_{SU} and t_{EN} (after EN is asserted) are identical values.
3. Measured over 50k clock cycles.

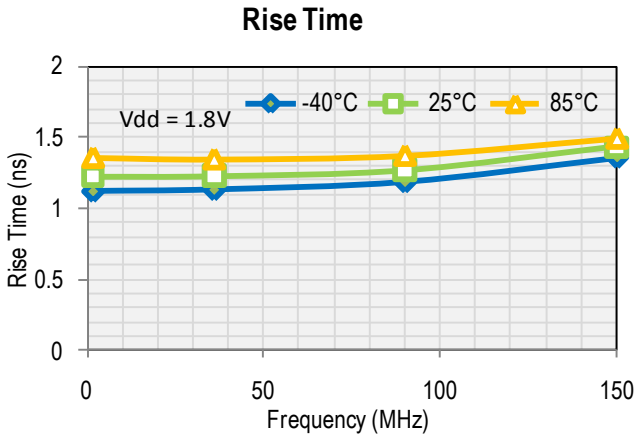
Nominal Performance Characteristics

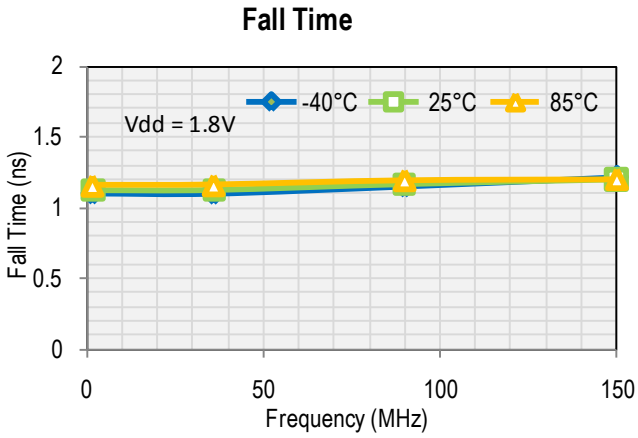




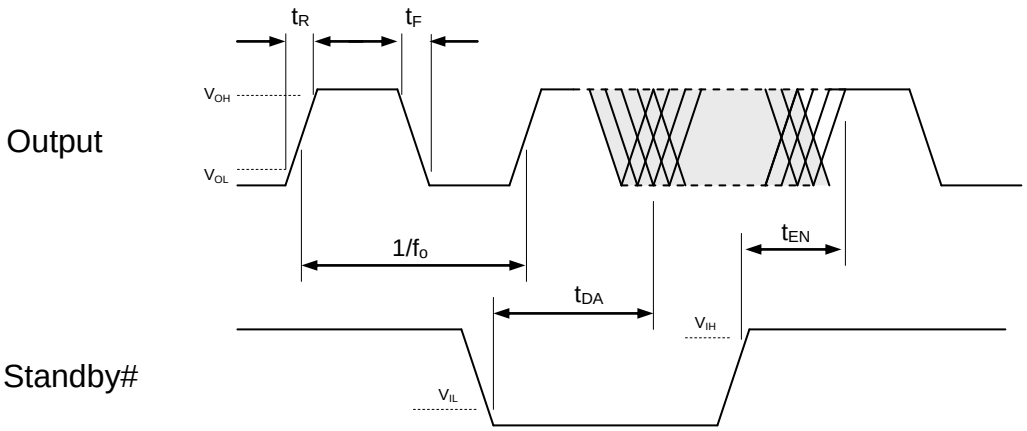








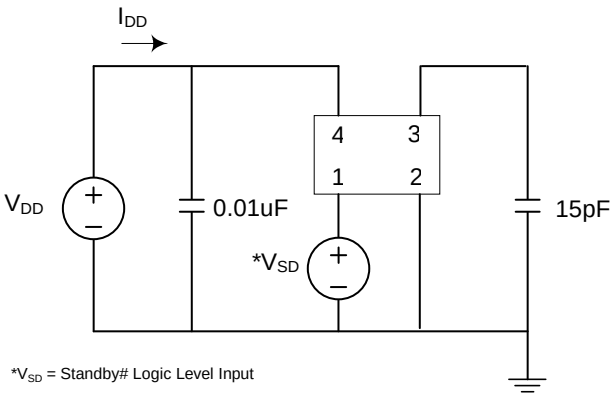
Output Waveform



Standby Function

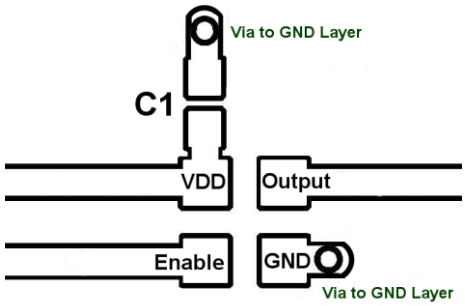
Standby# (pin 1)	Output (pin 3)
Hi Level	Output ON
Open (no connect)	Output ON
Low Level	High Impedance

Test Circuit

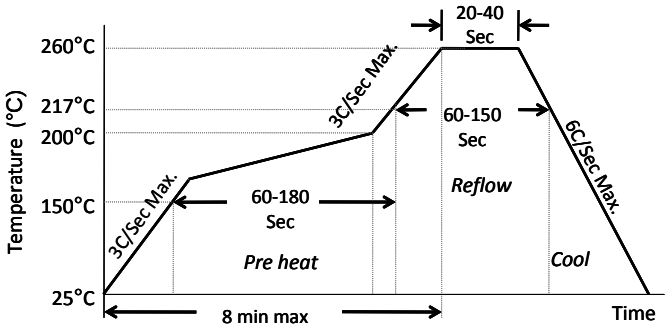


*VSD = Standby# Logic Level Input

Board Layout (recommended)



Solder Reflow Profile

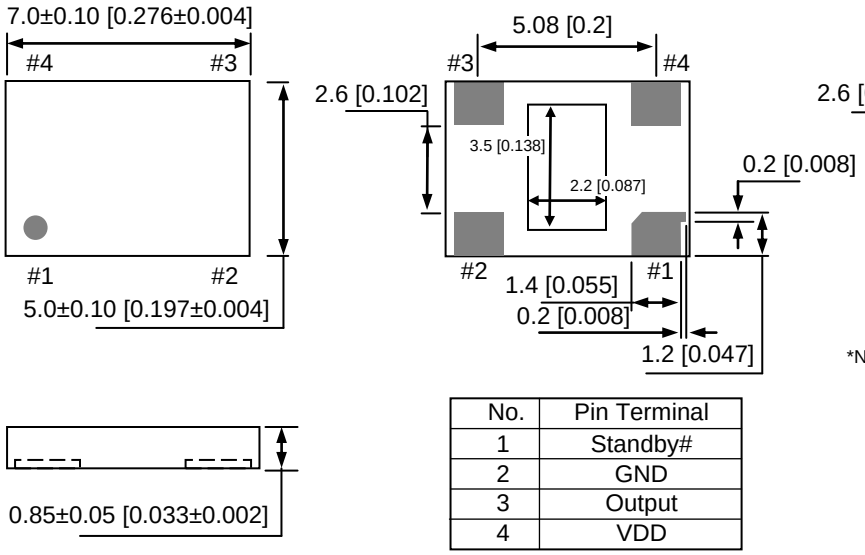


MSL 1 @ 260°C refer to JSTD-020C	
Ramp-Up Rate (200°C to Peak Temp)	3°C/Sec Max.
Preheat Time 150°C to 200°C	60-180 Sec
Time maintained above 217°C	60-150 Sec
Peak Temperature	255-260°C
Time within 5°C of actual Peak	20-40 Sec
Ramp-Down Rate	6°C/Sec Max.
Time 25°C to Peak Temperature	8 min Max.

Package Dimensions

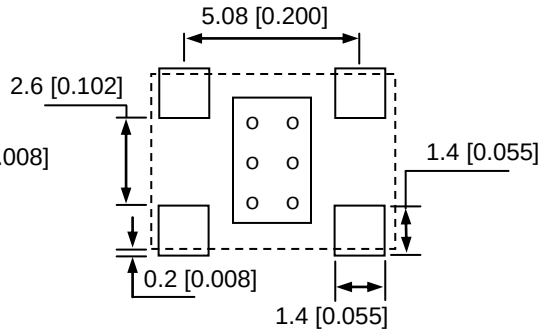
7.0 x 5.0 mm Plastic Package

External Dimensions



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

Recommended Land Pattern*

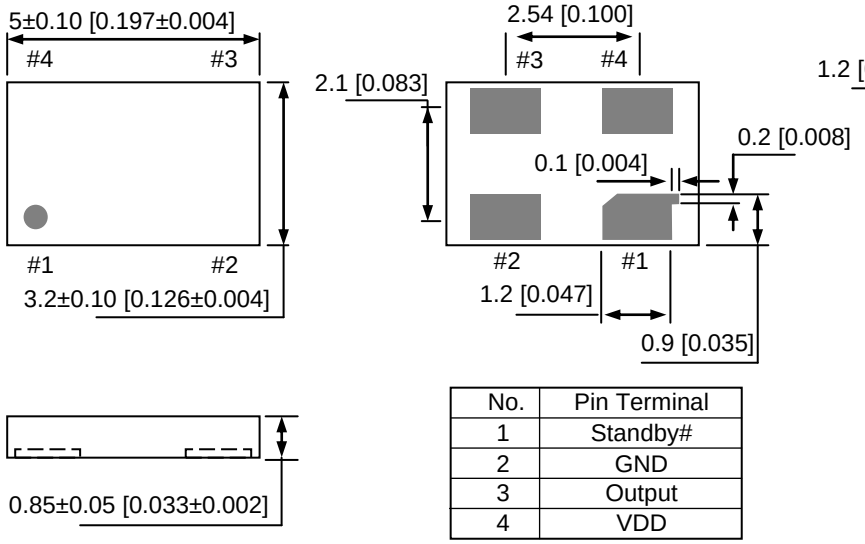


*Note: The center pad is not connected internally and should be left un-connected or tied to GND.

units: mm [inch]

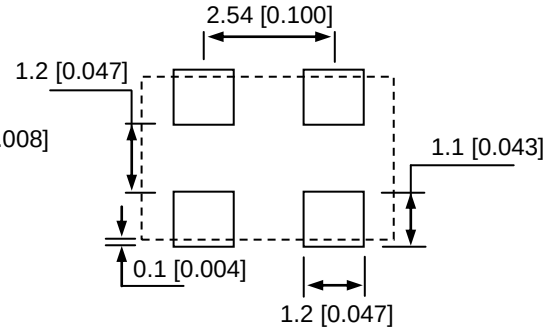
5.0 x 3.2 mm Plastic Package

External Dimensions



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

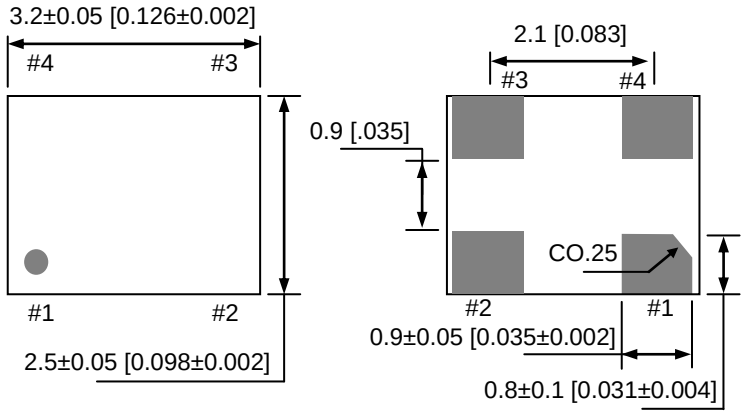
Recommended Land Pattern



units: mm [inch]

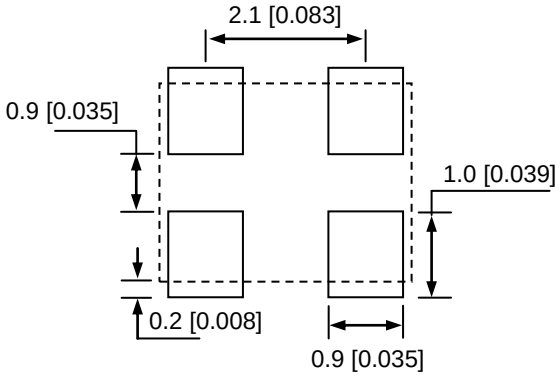
3.2 x 2.5 mm Plastic Package

External Dimensions



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

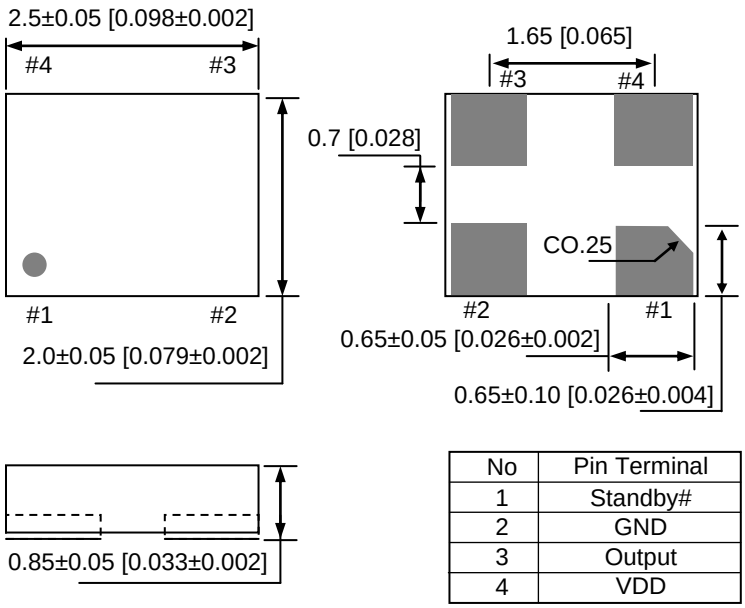
Recommended Land Pattern



units: mm [inch]

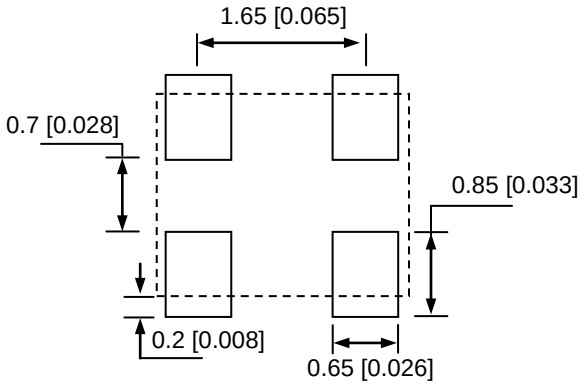
2.5 x 2.0 mm Plastic Package

External Dimensions



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

Recommended Land Pattern



units: mm [inch]

Ordering Information

DSC1001 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: DSC1001CE1–123.0000T

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.

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DSC1001AL1-026.0000T DSC1001BI5-100.0000T DSC1001BI1-001.8432T DSC1001BI1-060.0000T DSC1001CI2-073.7280T DSC1001CL1-008.0000T DSC1001DL5-012.2880T DSC1001DL5-048.0000T DSC1001DL5-020.0000T DSC1001DL5-100.0000T DSC1001DL5-133.3330T DSC1001DI5-012.2880T DSC1001DI5-020.0000T DSC1001DL5-010.0000T DSC1001DL5-050.0000T DSC1001DL5-125.0000T DSC1001DI5-050.0000T DSC1001DI2-029.5000T DSC1001DI2-038.4000 DSC1001DI5-029.4912T DSC1001DI2-108.0000T DSC1001DI2-125.0000T DSC1001DI5-010.0000T DSC1001DI1-009.8304T DSC1001DI1-024.5760T DSC1001DI1-026.0000T DSC1001DI1-060.0000 DSC1001DI1-100.0000T DSC1001DI2-018.0000 DSC1001CL2-033.3000T DSC1001CL5-012.0000T DSC1001CL5-024.5760T DSC1001CL5-125.0000T DSC1001DE1-054.0000T DSC1001DI1-008.0000T DSC1001CI5-016.0000T DSC1001CI5-018.4320T DSC1001CI5-019.2000T DSC1001CI5-125.0000T DSC1001CL2-012.0000 DSC1001CL2-027.0000T DSC1001CI1-024.0000 DSC1001CI1-024.0000T DSC1001CI2-038.8800T DSC1001CI2-054.0000T DSC1001CI2-065.5500T DSC1001CI2-083.2500T DSC1001CE1-004.8000T DSC1001CE1-012.2880T DSC1001CE1-020.8300T DSC1001CE2-024.0000T DSC1001CE2-033.0000T DSC1001CE2-037.1250T DSC1001AI5-048.0000T DSC1001DI2-048.0000T DSC1001DI5-002.4576 DSC1001DI5-004.0000T DSC1001DI5-008.1920T DSC1001DL2-030.0000T DSC1001AI2-013.5000T DSC1001AI2-015.0000T DSC1001AI2-027.1200T DSC1001AI2-032.7680T DSC1001AI2-098.3040T DSC1001AI5-025.0000T DSC1001BL5-012.0000T DSC1001AC2-025.0000T DSC1001AE2-024.0000T DSC1001AE2-054.0000T DSC1001AI1-025.0000T DSC1001AI2-006.0000T DSC1001BI2-001.8432T DSC1001BI2-020.0000T DSC1001BI2-040.0000T DSC1001BI2-044.0000T DSC1001BI2-054.0000T DSC1001BI5-040.0000T DSC1001BE1-048.0000T DSC1001BE2-012.0000 DSC1001BI1-010.0000T DSC1001BI1-014.7456T DSC1001BI1-025.0000T DSC1001BI1-030.0000T DSC1001AI5-100.0000T DSC1001AI5-125.0060T DSC1001AL2-050.0000T DSC1001AL5-008.0000T DSC1001AL5-024.0000T DSC1001BE1-016.0000T DSC1001DI5-026.0000T DSC1001CI2-024.5760 DSC1001CI2-026.0000T DSC1001CI2-027.0000T DSC1001CI2-033.3333T DSC1001AI5-080.0000T DSC1001DI1-032.0000T DSC1001DI2-064.5000 DSC1001DI2-074.2500T DSC1001DI5-006.0000T DSC1001DI5-008.0174T