100kRAD(Si) RADIATION TOLERANT

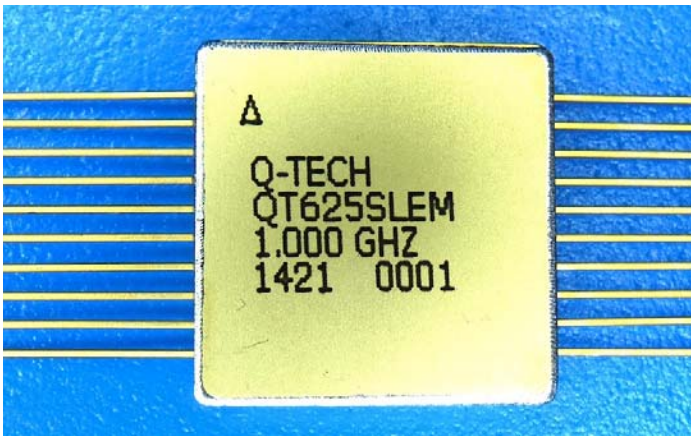
HYBRID SAW OSCILLATOR

QT625S Series

3.3V and 5.0V SPACE QUALIFIED SAW OSCILLATORS

Description

Q-Tech QT625S low phase noise Space Qualified, 100kRad(Si) Tolerant Hybrid SAW Oscillators (VCSO) which operated at 3.3Vdc and 5Vdc, provided superior performance at operating frequencies of 450MHz to 1.3GHz. The SO QT625S delivers low phase noise –110dBc/Hz at 1kHz offset and –155dBc/Hz noise floor and less than 2ppb/g vibration sensitivity. The QT625S VCSO is a Class 2 hybrid construction per MIL-PRF-55310, fully hermetically sealed, and operated over a wide frequency temperature –55°C to +125°C. The design employed an internal frequency multiplication of 2 to provide output frequency between 1GHz and 1.3GHz.



Applications

- Satellites
- Aerospace
- Space Clock Recovery
- Low Phase Noise High Frequency

Features

- Made in USA
- Hermetically sealed packages
- Supply voltages 3.3Vdc and 5.0Vdc
- Wide temperature range –55°C to +125°C
- Fundamental mode fast start-up
- Sine Wave Output
- 100k(Si) Radiation Tolerant
- Low Phase Noise –110dBc/Hz at 1kHz
- Low Vibration sensitivity <2ppb/g

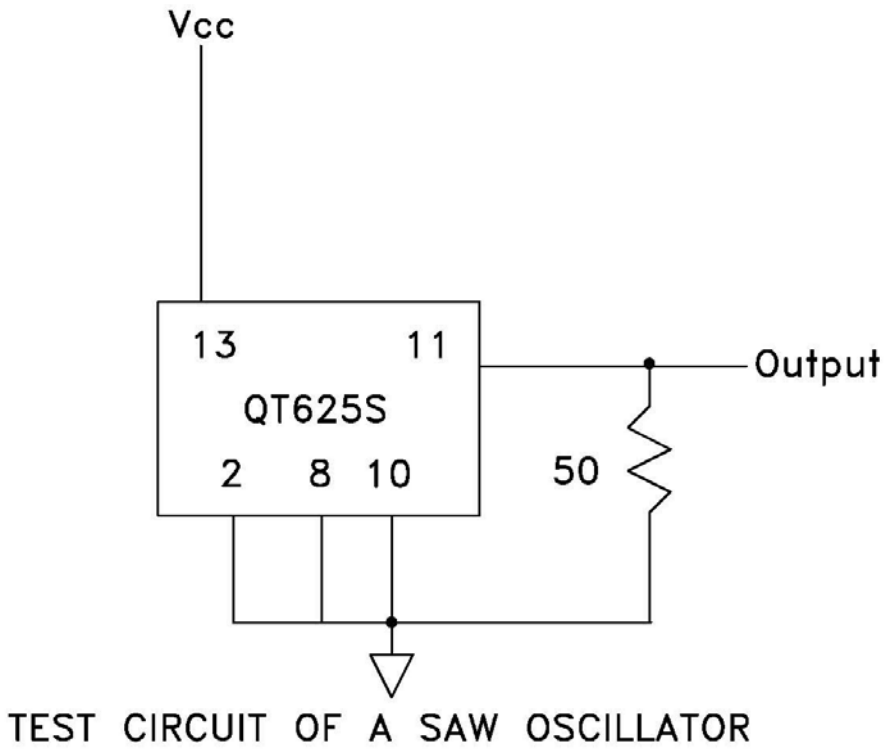


Figure 1

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage *1	V_{CC}	Between V_{CC} and Vss	- 0.5 to +7.0	V
Operating Temperature	Top		-55 to +125	°C
Junction Temperature	Tj		+150	°C
Storage Temperature	Tstg		- 65 to +150	°C
Lead solder Temperature/Time			+250/10	°C/s
Package Thermal Resistance	θJC		50	°C/W

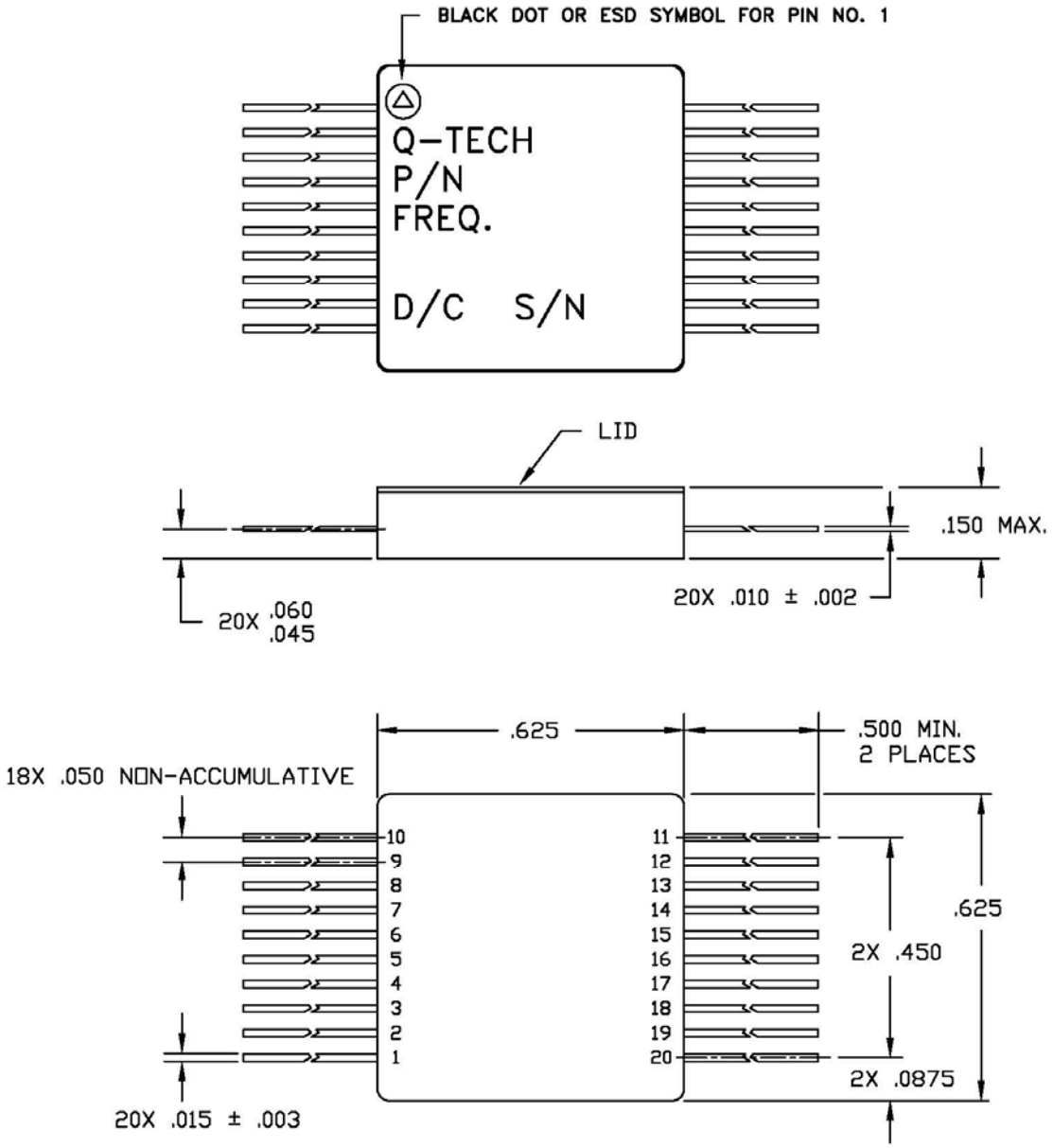
*1. V_{CC} parameter ratings are values that must never be exceeded even for a moment. This product may suffer breakdown if this parameter rating is exceeded. Operation and characteristics are guaranteed operated at recommended operating conditions.

Electrical Specifications

Parameter	Symbol	Test Conditions*1	Min	Typ	Max	Unit
Center Frequency	F0		450		1.3	GHz
Supply voltage	Vdd	3.3V±5% 5.0V±5%	3.135 4.75	3.3 5.0	3.465 5.25	V
Operating temperature	Top		-55	25	+125	°C
Frequency stability	DF/DT	Temperature dependent $-0.037 * (T1-T2)^2$	-400		+50	ppm
Input Current	Icc	Vcc = 3.465V Vcc = 5.5V			60 80	mA
Output Power	Po	50ohms	7.0	8.0	12	dBm
Load		AC Load		50		Ω
Sub-Harmonics				-30	-20	dBc
Non-harmonics Spurious				<-80	<-80	dBc
SSB Phase Noise		At 1kHz At 10kHz At 100kHz At 1MHz (Noise floor)		-105 -135 -160 -160	-90 -120 -155 -155	dBc/Hz
Vibration Sensitivity				1	2	ppb/g
Output Freq. multiplier		450MHz to 550MHz >550MHz to 1.3GHz		1 2		
Aging (at 70°C±3°C)		First (1) Year	-20		20	ppm
		Life	-30		30	ppm

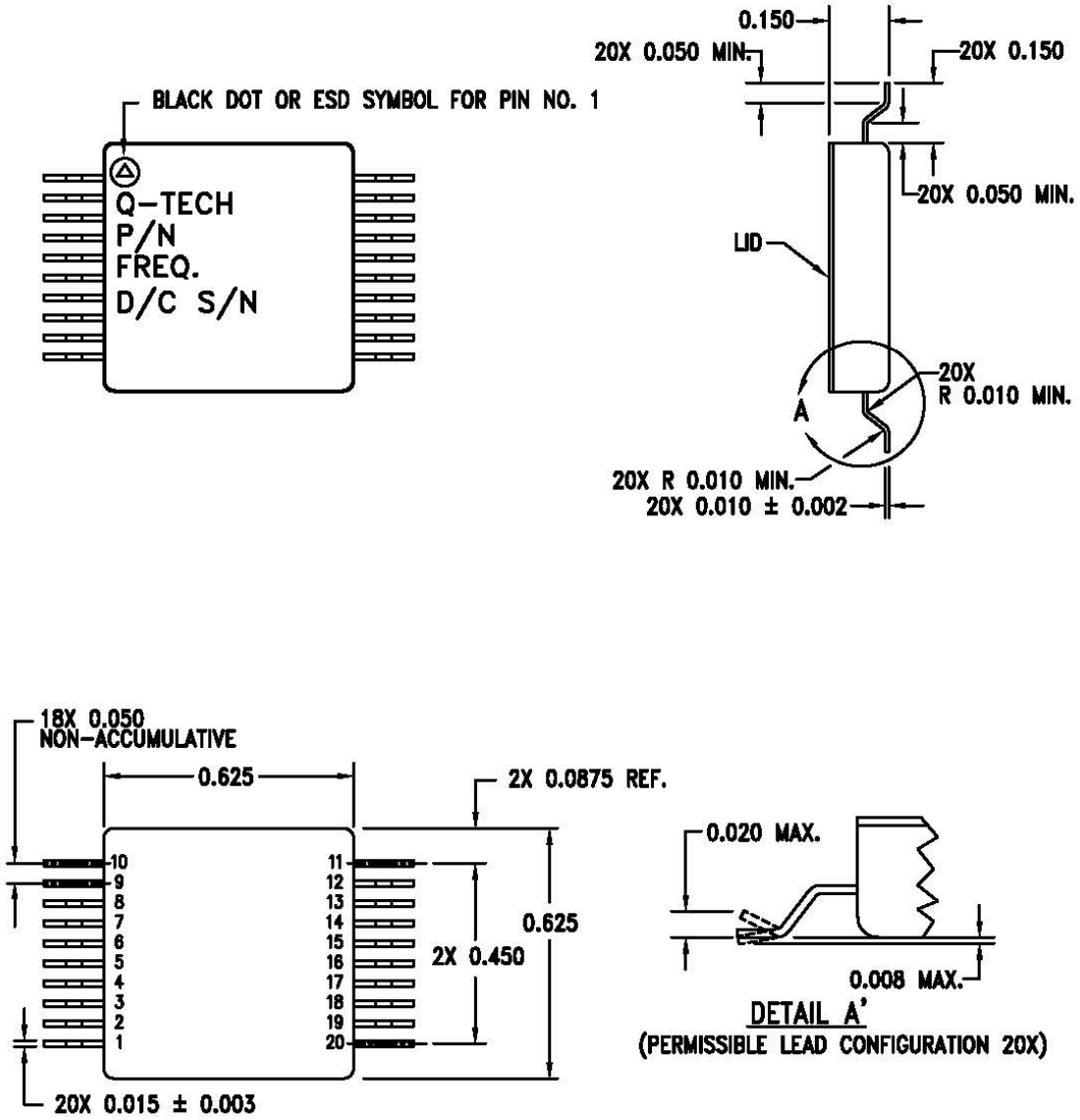
* 1 Test Conditions Unless Stated Otherwise: Nominal V_{cc}, Nominal Load, +25°C ± 3°C.

Package outline dimensions inch (mm) Figure 3



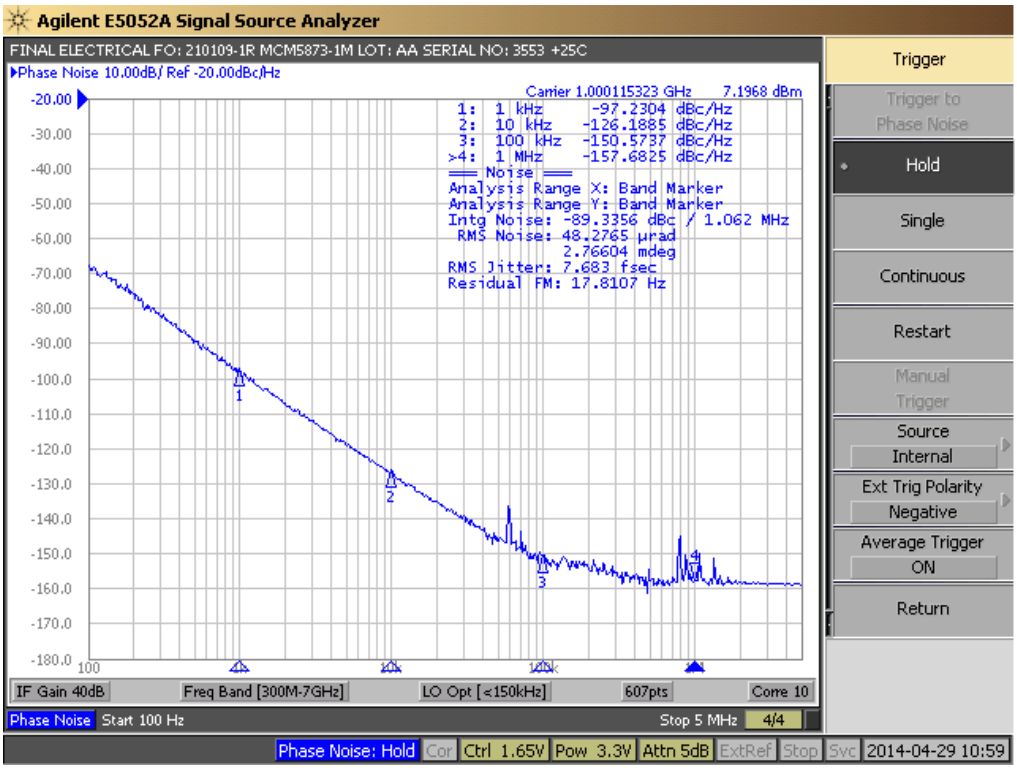
Pin no.	Function
2, 8, 10	GND/CASE
11	OUTPUT
13	Vcc
OTHERS	NC

Package outline dimensions inch (mm) Figure 4



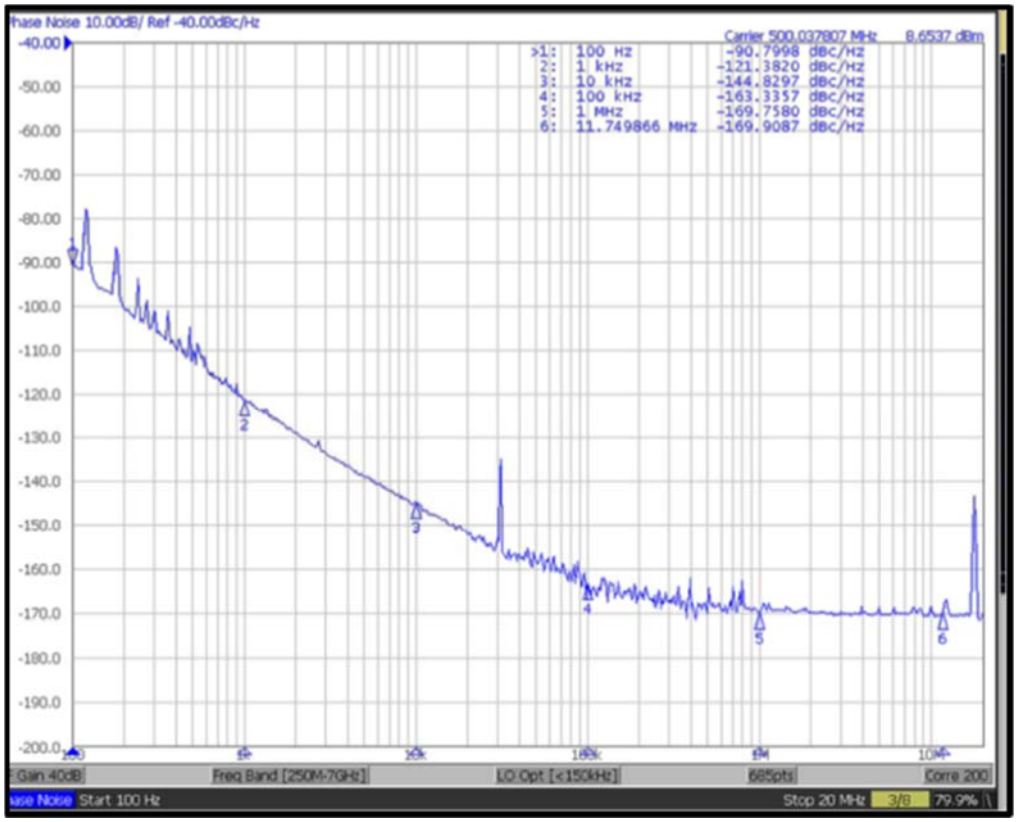
Pin no.	Function
2, 8, 10	GND/CASE
11	OUTPUT
13	Vcc
OTHERS	NC

Phase noise performance of a 1GHz SO at +25°C



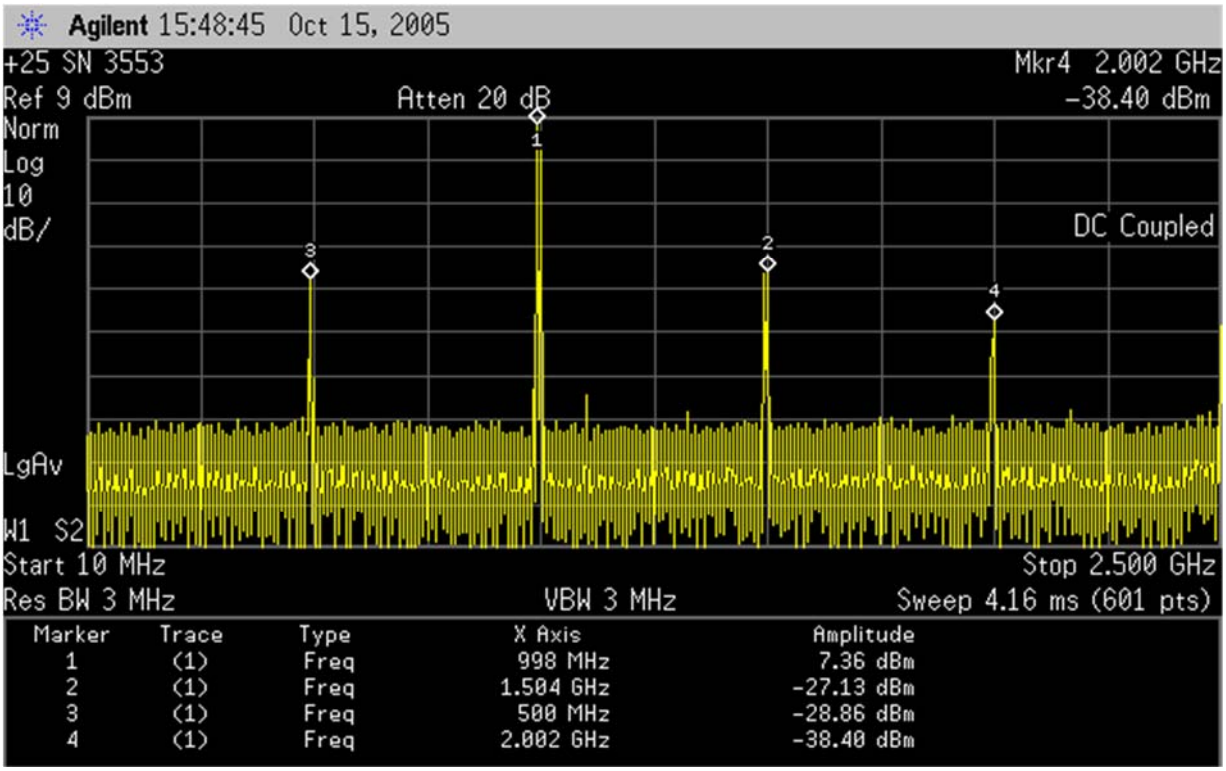
Offset Freq. (Hz)	dBc/Hz
1E3	-97
1E4	-126
1E5	-150
1E6	-158

Phase noise performance of a 500MHz SO at +25°C

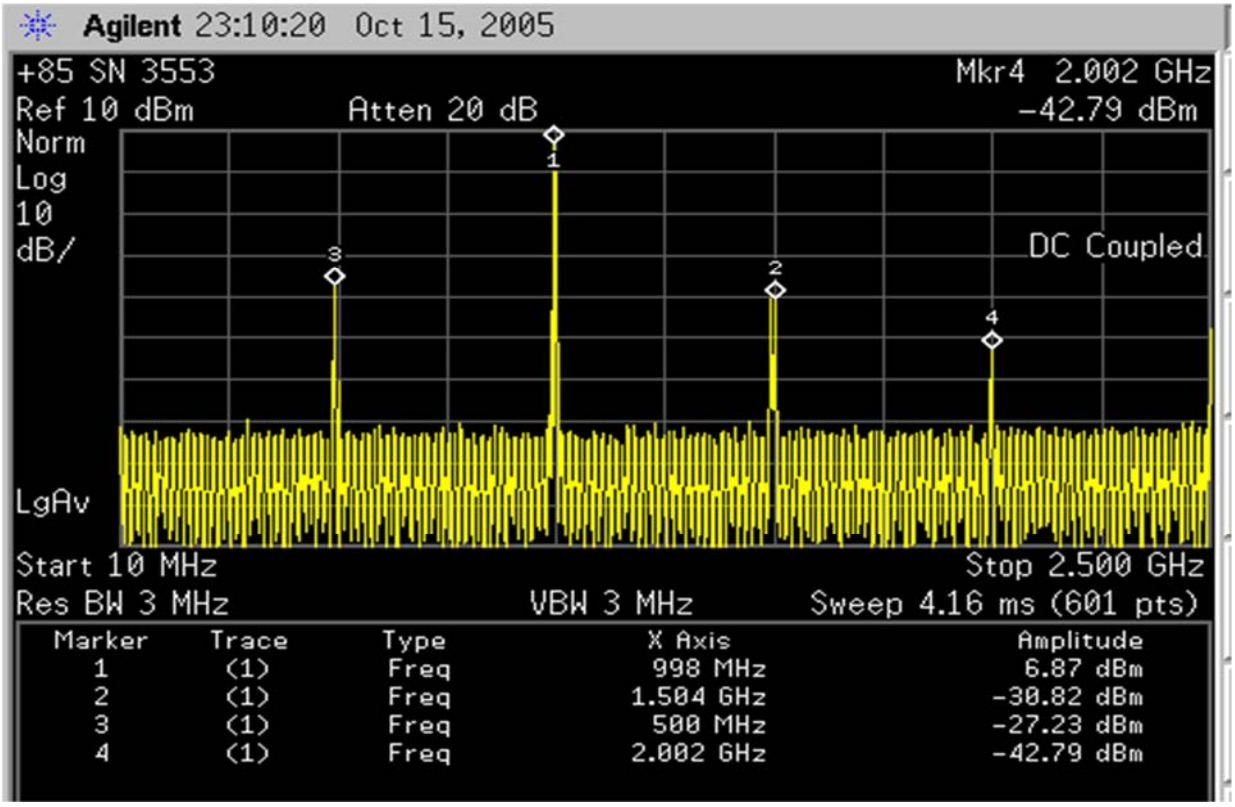


Offset Freq. (Hz)	dBc/Hz
1E3	-121
1E4	-144
1E5	-163
1E6	-168

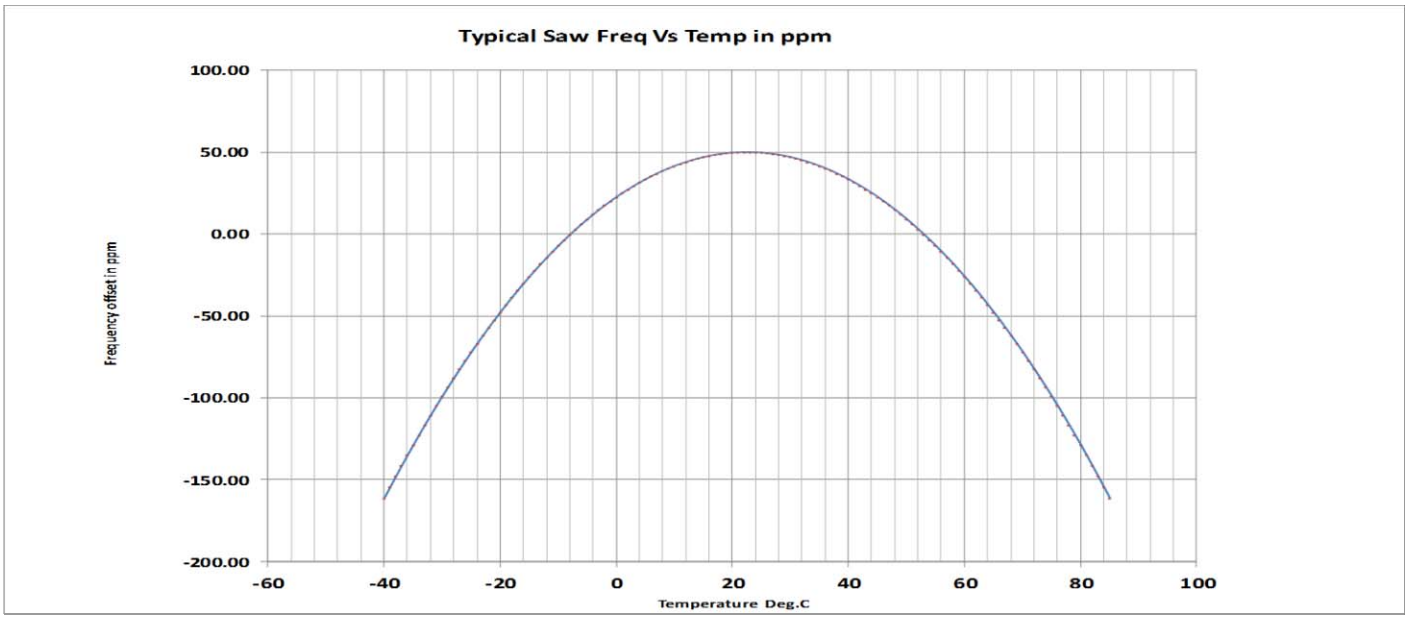
Output power spectrum of a 1GHz SO at +25°C



Output power spectrum of a 1GHz SO at +85°C



FREQUENCY VERSUS TEMPERATURE CURVE OF A SO AT 3.3Vdc



SUPPLY VOLTAGE (V)	FREQUENCY (MHz)	Icc (mA)	Output Power (dBm)	Harmonics (dBc)
3.463	999.977674	48.7	9.07	-34.7
3.3	999.985628		8.48	-33.8
3.135	999.994970		7.82	-33

ORDERING INFORMATION

QT625S	L	B	M	1.000	GHz

Model:
QT625S = Straight leads
QT627S = Lead Formed (Fig. 4)

Supply Voltage:
C = +5Vdc ± 5%
L = +3.3Vdc ± 5%

Operating Temperature:
E = -40°C to +85°C
F = -20°C to +70°C
C = -55°C to +105°C
B = -55°C to +125°C

Screening and QCI:
BB = BreadBoard Model
E = Engineering Model
M = Flight Model (Screening And QCI per 401-0298-022)
S = Flight Model (Screening And QCI per MIL-PRF-55310, Level S)

Frequency:

Unit:
GHz or MHz

ESD Ratings

Proper ESD precautions should be taken when handling and mounting semiconductor products.
Built in ESD protection circuitry is ratings are as follows:

Model	Minimum	Conditions
Human Body Model	Class 1C, 2000V	MIL-STD-883, Method 3015.7