

## **QT725S Series**

### **3.3V and 5.0V SPACE QUALIFIED VCSO**

#### **Description**

Q-Tech QT725S low phase noise Space Qualified, 100kRad(Si) Tolerant Voltage Controlled SAW Oscillators (VCSO) which operated at 3.3Vdc and 5Vdc, provided superior performance at operating frequencies of 450MHz to 1.3GHz. The VCSO QT725S delivers low phase noise – 110dBc/Hz at 1kHz offset and –155dBc/Hz noise floor and less than 2ppb/g vibration sensitivity.

The QT725S 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. Absolute Pull range (APR) is  $\pm 20$ ppm min. over the temperature –40°C to +85°C



#### **Applications**

- Phase Lock Loops (PLL)
- 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 –40°C to +85°C with guaranteed APR
- Screened to MIL-PRF-55310, Level S or Modified MIL-PRF-38534, Class K

- Fundamental mode fast start-up
- Sine Wave Output
- 100k(Si) Radiation Tolerant
- Low Phase Noise –110dBc/Hz at 1kHz
- Low Vibration sensitivity <2ppb/g

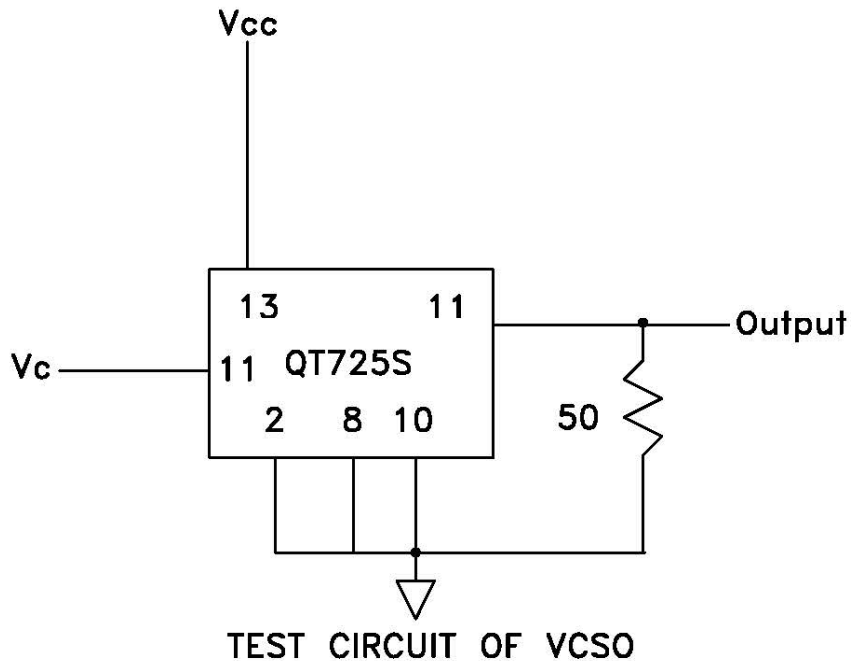


Figure 1

### Absolute Maximum Ratings

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage *1	$V_{CC}$	Between $V_{CC}$ and $V_{SS}$	- 0.5 to +7.0	V
Operating Temperature	$T_{op}$		-55 to +125	°C
Junction Temperature	$T_j$		+150	°C
Storage Temperature	$T_{stg}$		- 65 to +150	°C
Lead solder Temperature/Time			+250/10	°C/s
Package Thermal Resistance	$\theta_{JC}$		50	°C/W

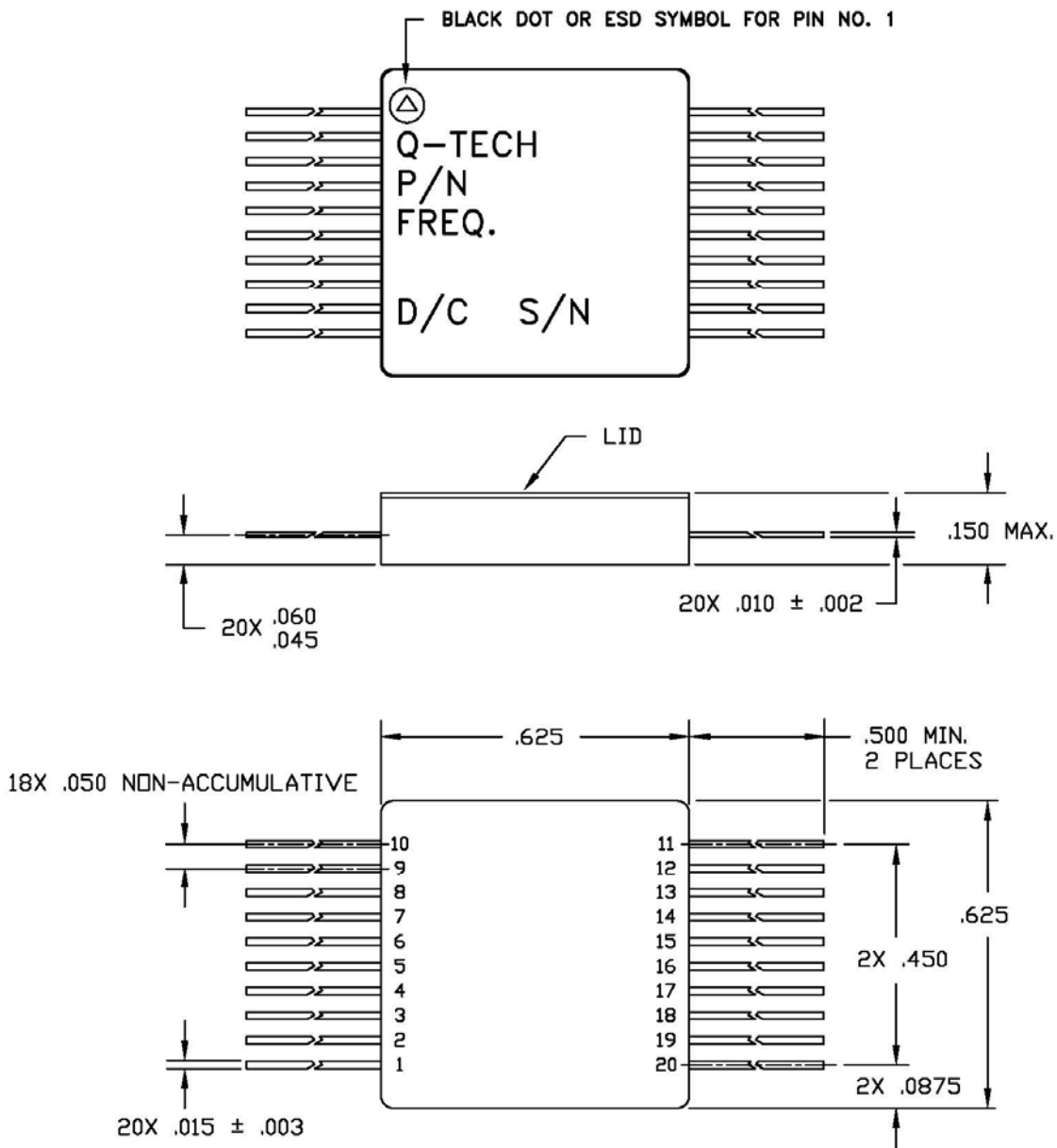
\*1.  $V_{CC}$  parameter ratings are values that must never be exceeded even for a moment. This product may suffer breakdown if this parameter rating is exceeded. Operation and characteristics are guaranteed operated at recommended operating conditions.

## Electrical Specifications

Parameter	Symbol	Test Conditions <sup>*1</sup>	Min	Typ	Max	Unit
Center Frequency	F0		450		1.3	GHz
Supply voltage	Vcc		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	-200		+50	ppm
Input Current	Icc	Vcc = 3.465V Vcc = 5.5V			60 80	mA
Absolute Pull Range	APR		±20	±30		ppm
Tuning K	Kvco			67		kHz/V
Tuning Kr=Kmax/Kmin				3:1	4:1	
Output Power	Po	50ohms	7.0	8.0	12.0	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 -155 -160	-90 -120 -150 -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

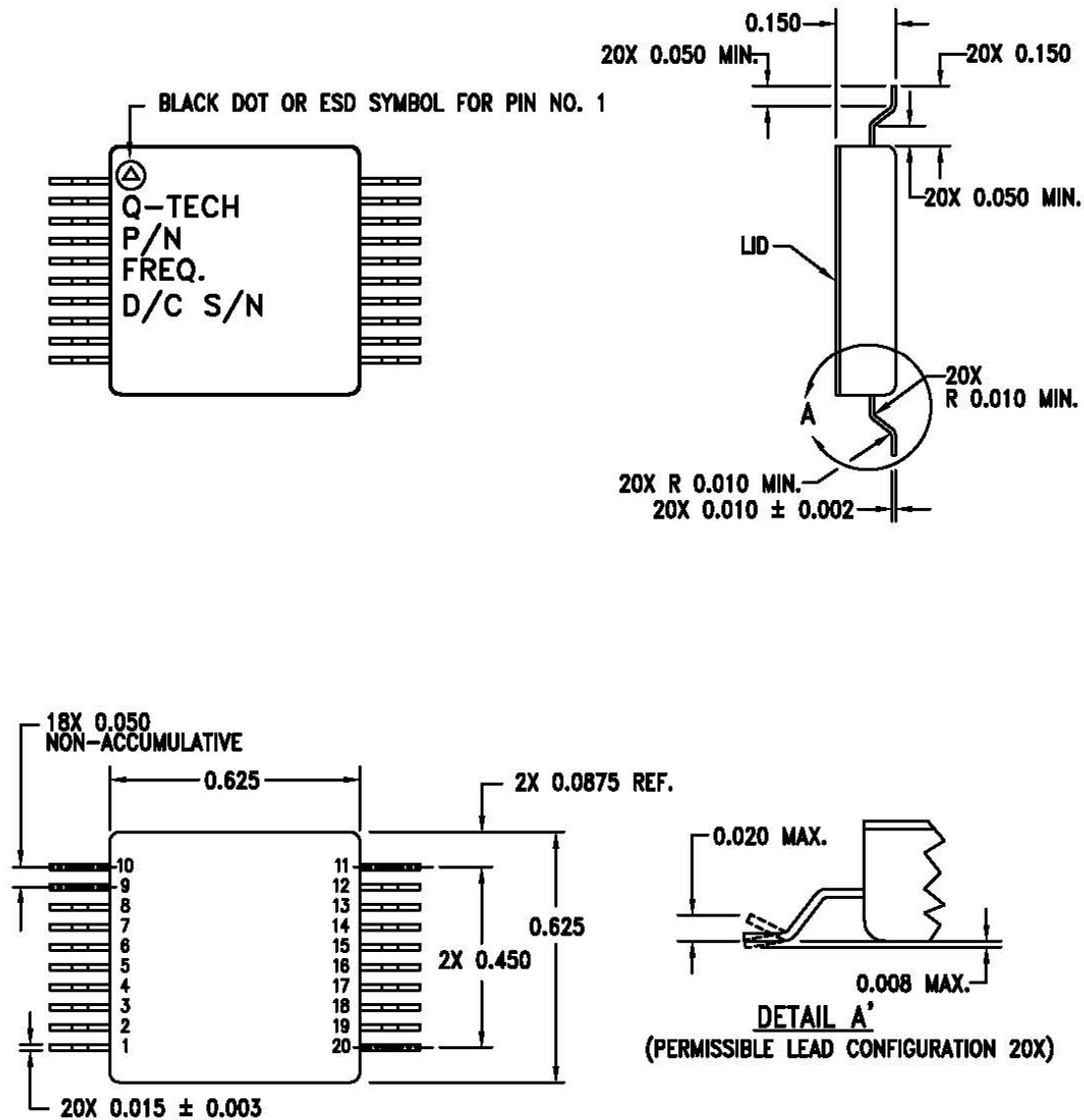
\* 1 Test Conditions Unless Stated Otherwise: Nominal V<sub>cc</sub>, Nominal Load, +25°C ± 3°C.

Package outline dimensions inch (mm) Figure 3



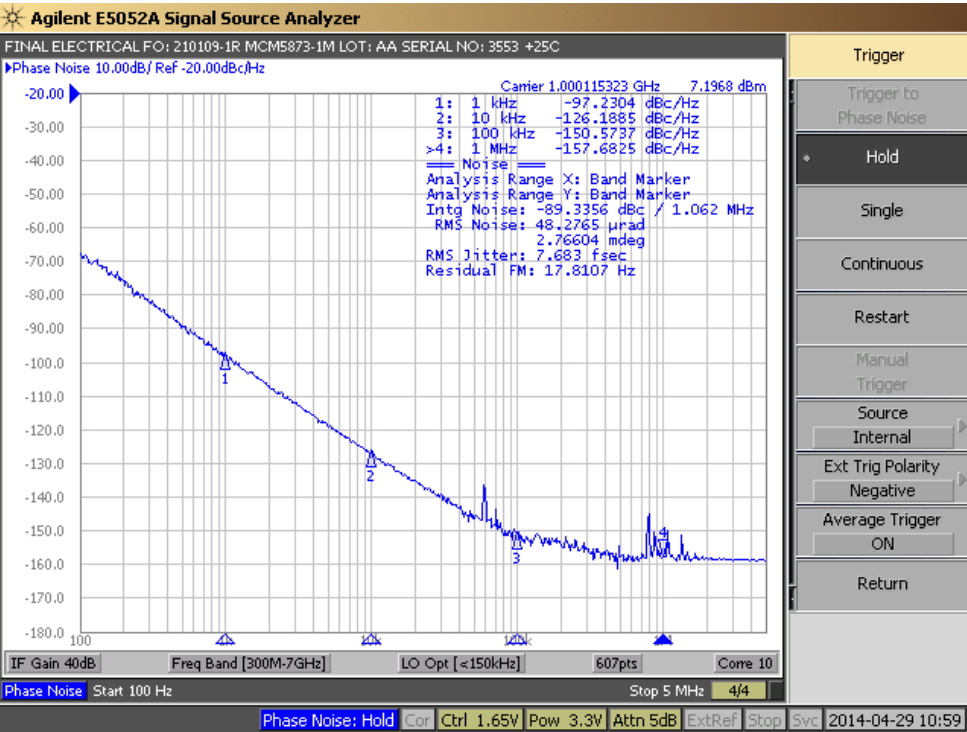
Pin no.	Function
2, 8, 10	GND/CASE
11	OUTPUT
13	Vcc
9	Vc
OTHERS	NC

**Package outline dimensions inch (mm) Figure 4**



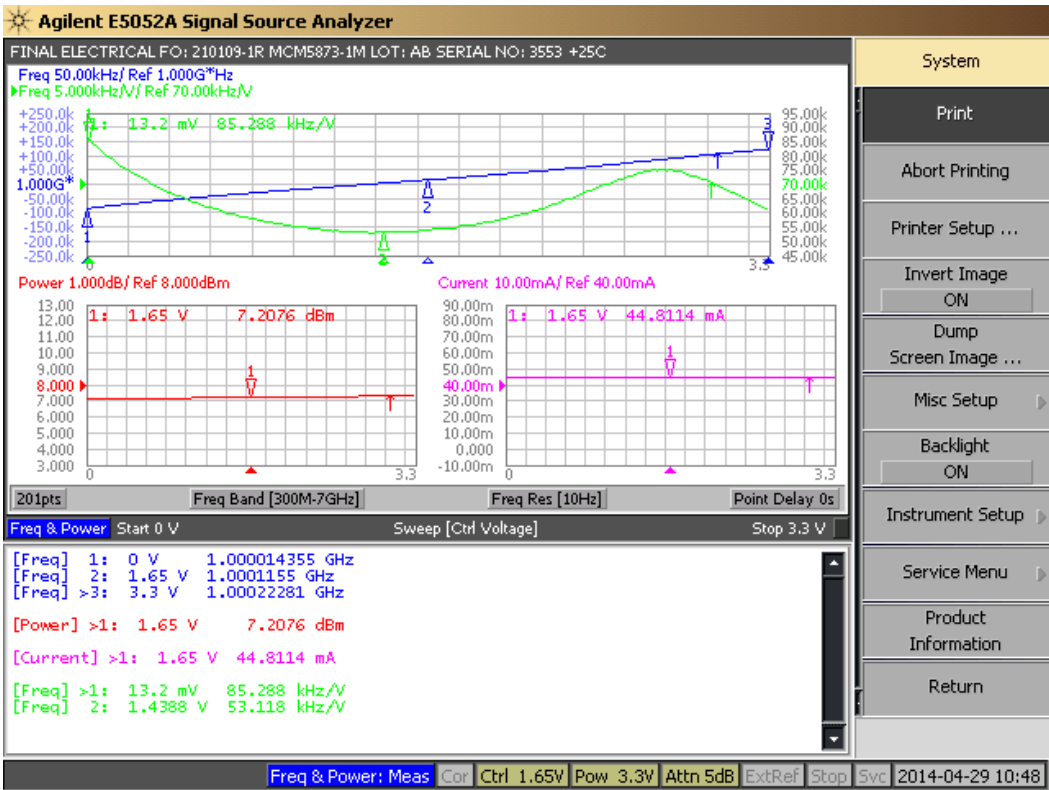
Pin no.	Function
2, 8, 10	GND/CASE
11	OUTPUT
13	Vcc
9	Vc
OTHERS	NC

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



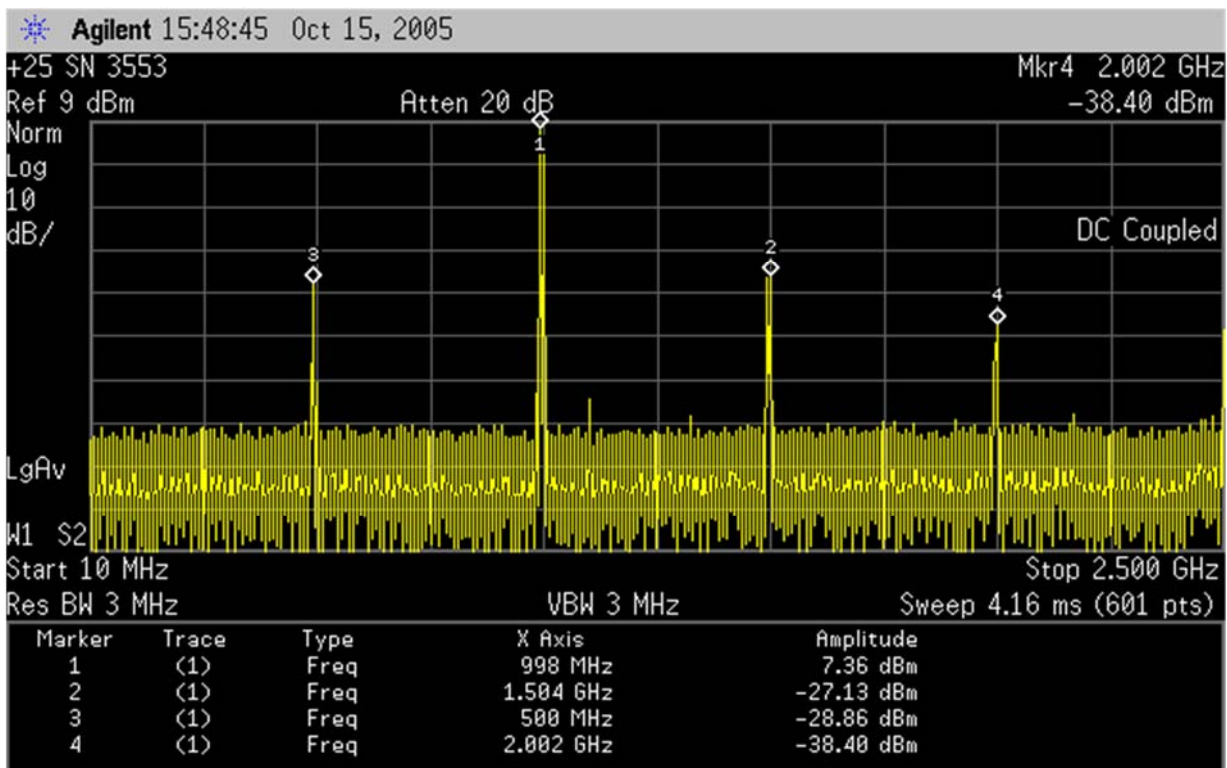
Offset Freq. (Hz)	dBc/Hz
1E3	-97
1E4	-126
1E5	-150
1E6	-158

Output Power and Pulling of a VCSO 1GHz at 3.3Vdc 25°C

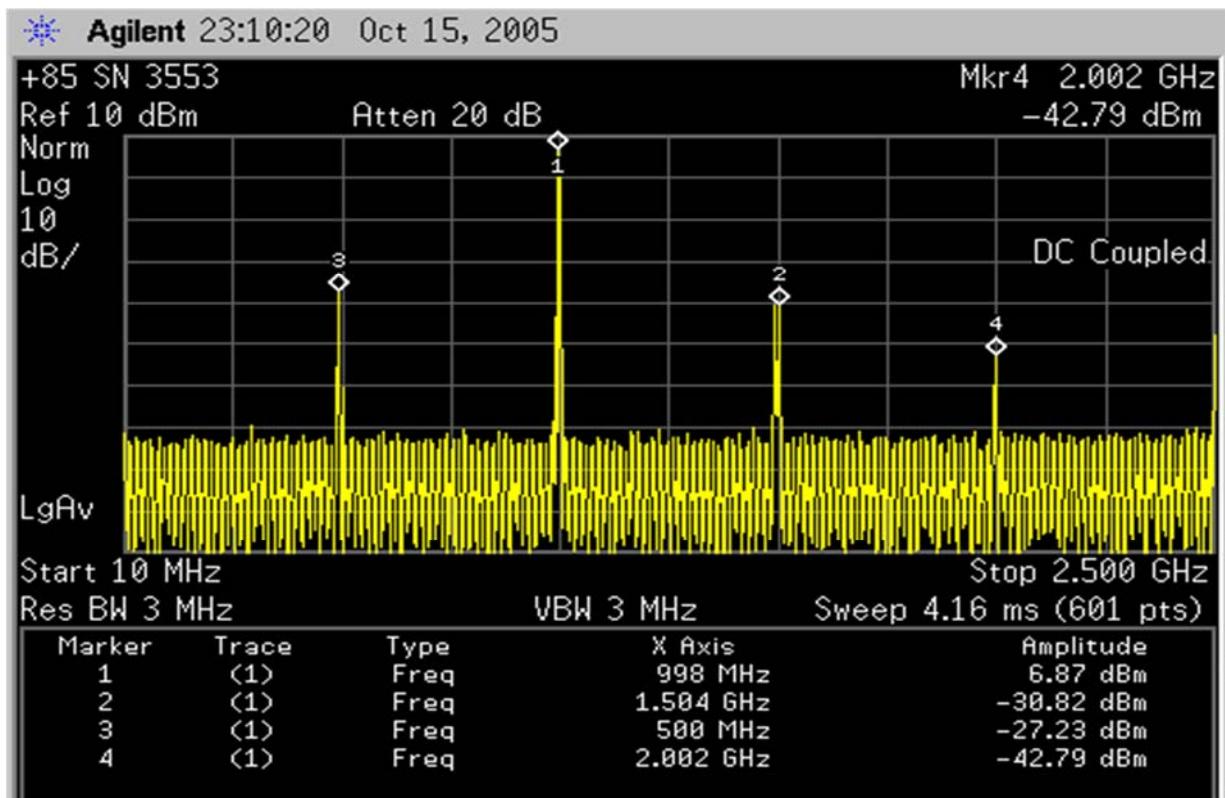




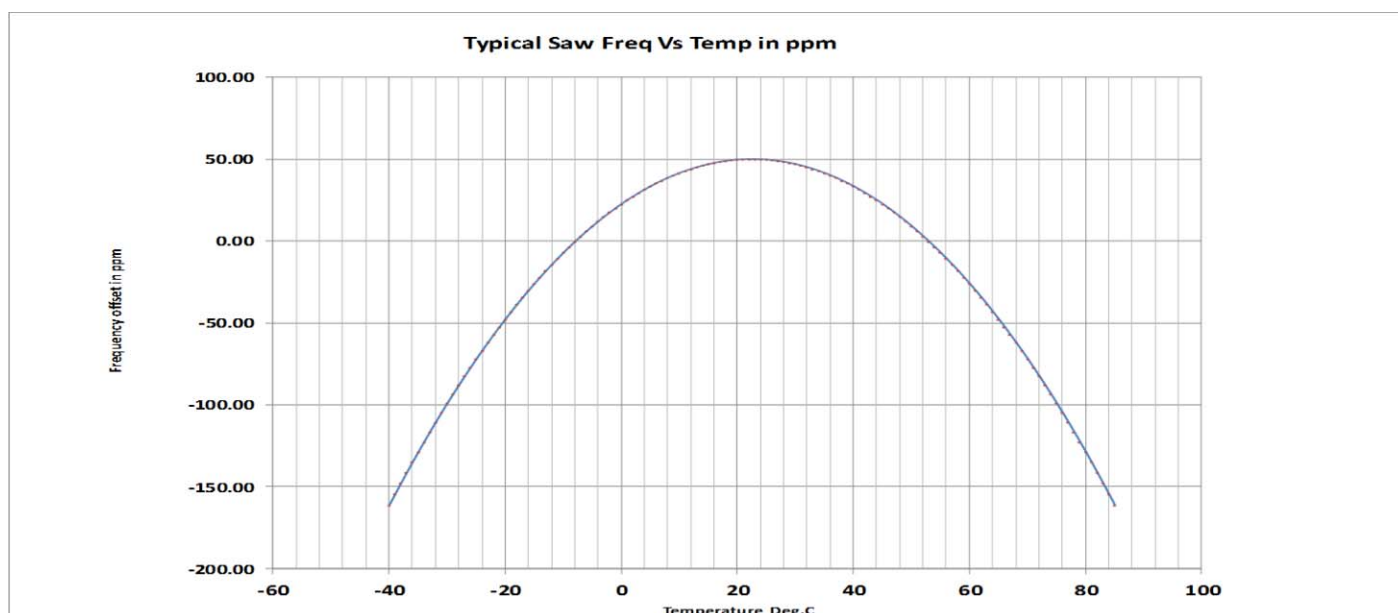
Output power spectrum of a 1GHz VCSO at +25°C



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



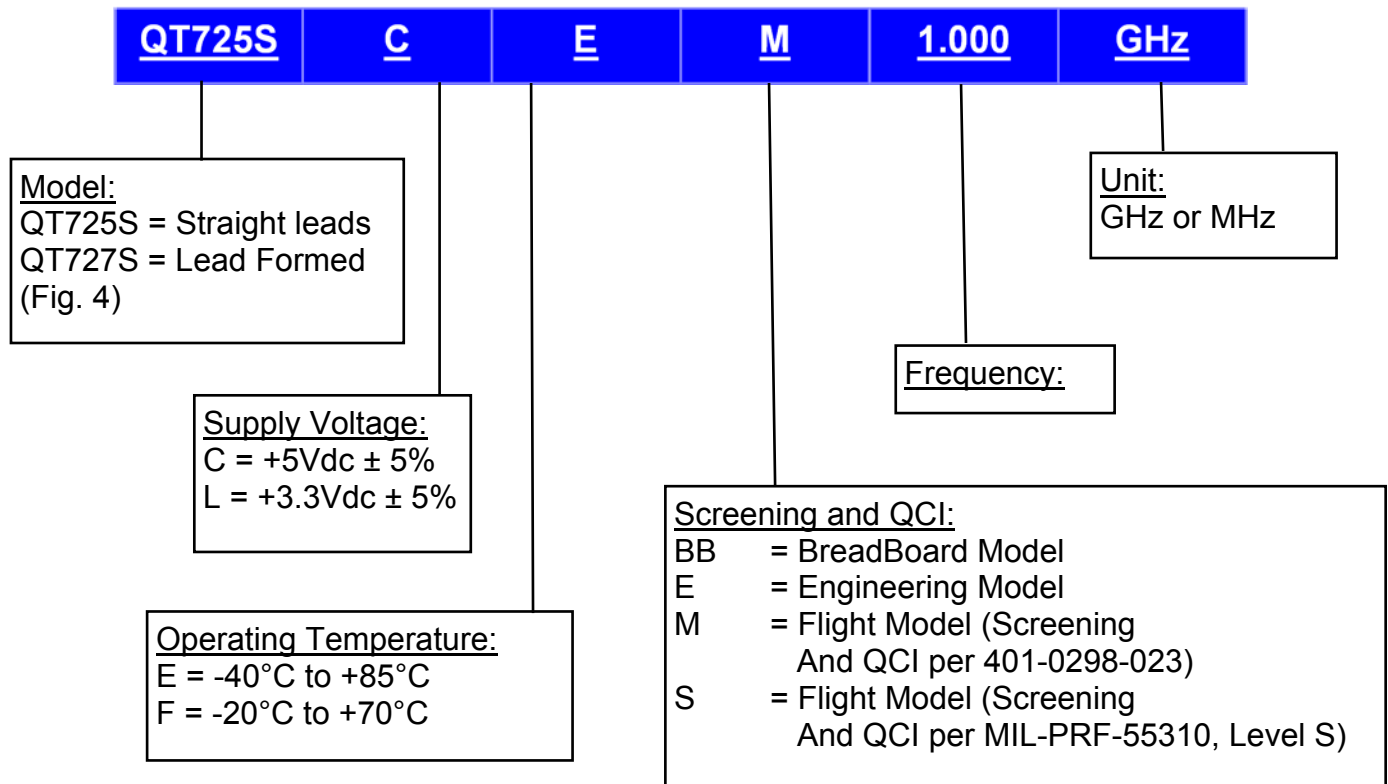
## FREQUENCY VERSUS TEMPERATURE CURVE OF A VCSO AT 3.3Vdc



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



### 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