

## Ku-Band GaAs HBT VCO

### Main Features

- GaAs HBT Technology
- Dual output frequency range:  $f_{out}$  and  $f_{out}/2$   
 $V_t = V_{t1}$  from 1.5 to 11 V  
 $f_{out} = 10.39$  to  $12.31$  GHz  
Phase Noise =  $-75$  dBc/Hz @ 10 kHz
- No external resonator needed
- Chip size:  $2.6 \times 3$  mm<sup>2</sup>

### Typical Applications

- Point to point and multipoint radios
- Test equipment and industrial controls
- SAR antennas

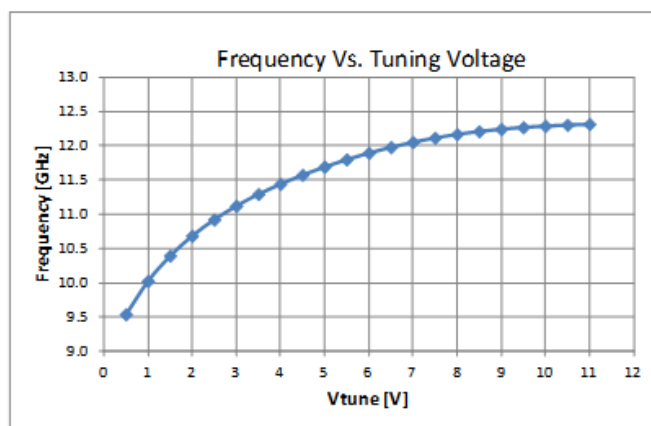
### Product Description

MEVCOKU1 is a monolithic microwave integrated circuit (MMIC) voltage-controlled oscillator (VCO) designed and tested by MEC for Ku-Band applications.

In addition to the Ku band RF output (RFout), this VCO provides a half frequency output (RFout/2).

In the frequency range from 10.4 GHz to 12.3 GHz MECVCOKU1 provides more than 7 dBm of output power and a phase noise of about  $-75$  dBc/Hz at 10 KHz offset with 5 V supply voltage.

### Measured Data



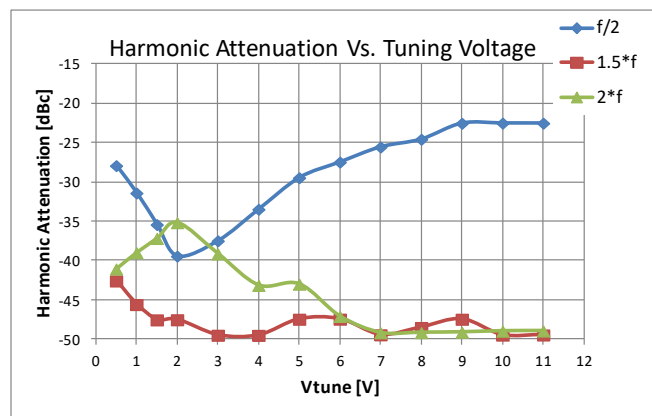
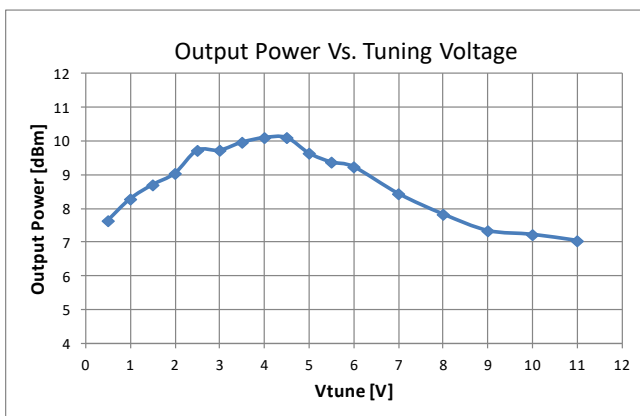
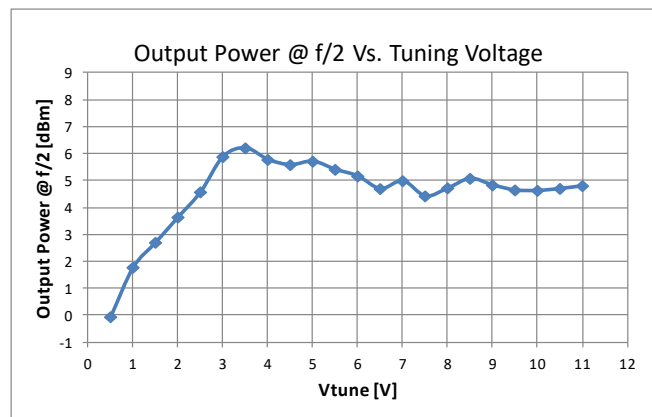
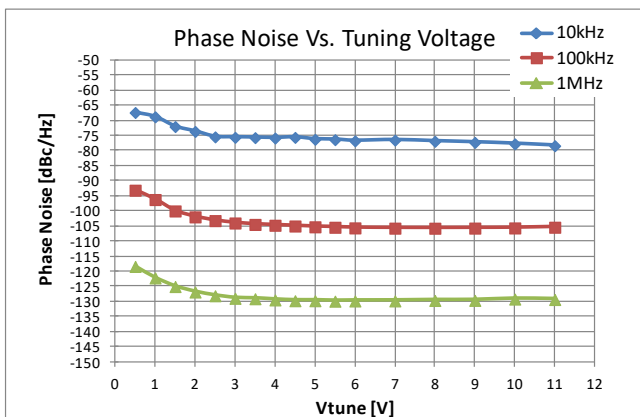
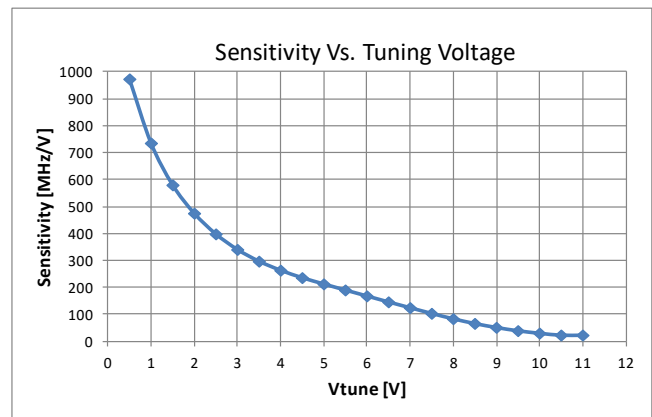
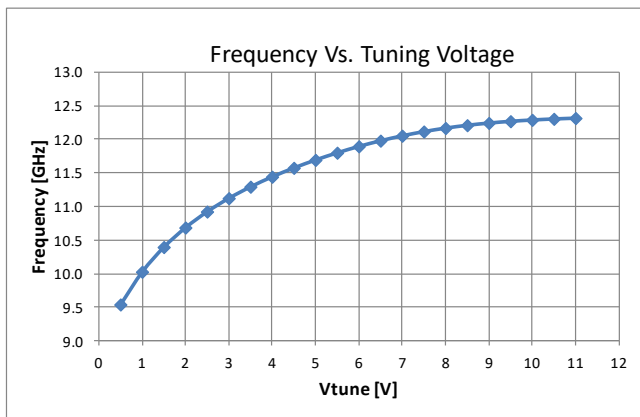
### Main Characteristics

Test Conditions:  $T_{\text{base\_plate}} = 25\text{ }^{\circ}\text{C}$

Parameter	Min	Typ	Max	Unit
Frequency Range				
Output Frequency ( $f_{\text{out}}$ )	10.39		12.31	GHz
Half Output Frequency ( $f_{\text{out}}/2$ )	5.19		6.15	GHz
Output Power				
$\text{RF}_{\text{out}}$	7		10.1	dBm
$\text{RF}_{\text{out}}/2$	2.7		6.2	dBm
Phase Noise				
@ 10 kHz Offset		-75		dBc/Hz
@ 100 kHz Offset		-105		dBc/Hz
@ 1 MHz Offset		-130		dBc/Hz
Tuning Voltage ( $V_t=V_{t1}$ )	1.5		11	V
Supply Voltage ( $V_{\text{cc}}$ )		5		V
Supply Current ( $I_{\text{cc}}$ )		143		mA
Harmonic Attenuation				
1/2	-22			dBc
3/2	-47			dBc
2nd	-35			dBc
Pulling (into a 2.0:1 VSWR)			0.4	MHz <sub>pp</sub>
Pushing @ $V_{\text{tune}}=5\text{V}$			12.8	MHz/V
Sensitivity			580	MHz/V
DC Power Consumption		0.715		W

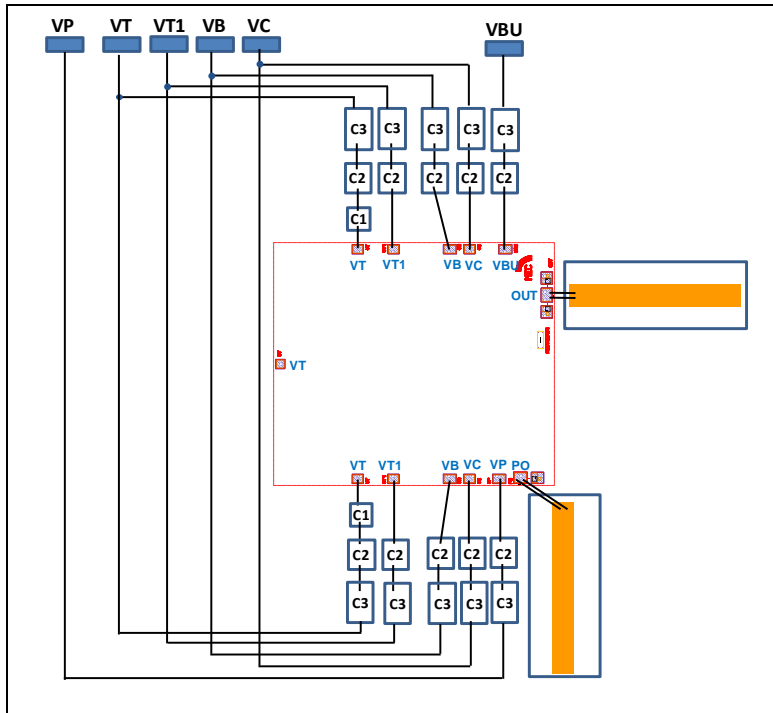
### Measurement Performances

Test Conditions:  $T_{\text{base\_plate}} = 25\text{ }^{\circ}\text{C}$ ,  $V_{\text{cc}} = 5\text{ V}$ ,  $I_{\text{cc}} = 143\text{ mA}$

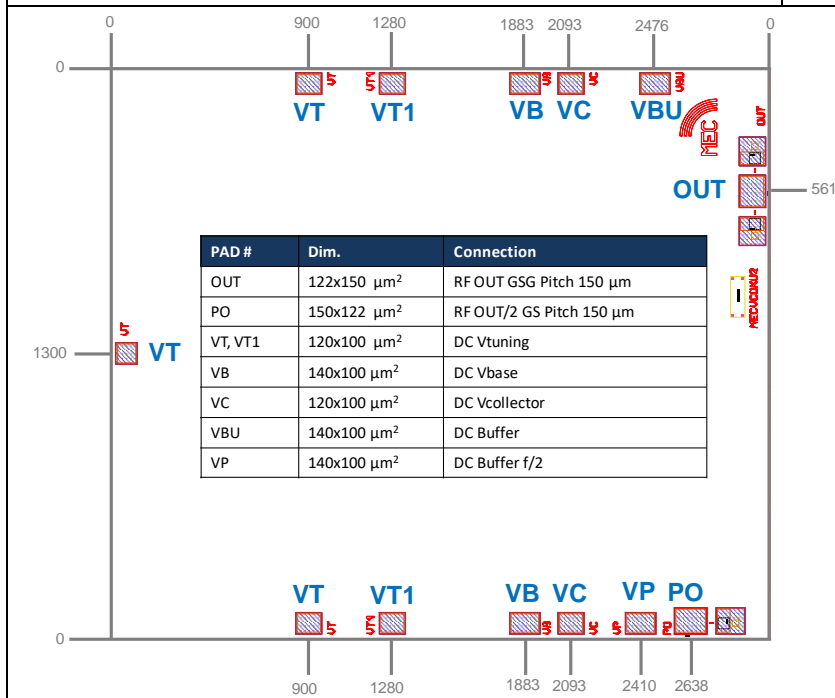


### Bond Pad Configuration & Assembly Recommendations

#### 1<sup>st</sup> configuration



Bond Pad #	Connection	External Components
OUT and PO	2 Bonding Wires $L_{\text{bond}} = 0.3 \text{ nH}$	
VT Vtuning	$L_{\text{bond}} \leq 1 \text{ nH}$	C1 = 100pF/10V C2 = 10nF/10V C3 = 1μF/10V
VT1 Vtuning	$L_{\text{bond}} \leq 1 \text{ nH}$	C2 = 10nF/10V C3 = 1μF/10V
VB Vbase	$L_{\text{bond}} \leq 1 \text{ nH}$	C2 = 10nF/10V C3 = 1μF/10V
VC Vcollector	$L_{\text{bond}} \leq 1 \text{ nH}$	C2 = 10nF/10V C3 = 1μF/10V
VBU Vbuffer	$L_{\text{bond}} \leq 1 \text{ nH}$	C2 = 10nF/10V C3 = 1μF/10V
VP Vbuffer f/2	$L_{\text{bond}} \leq 1 \text{ nH}$	C2 = 10nF/10V C3 = 1μF/10V



Eutectic Die bond using AuSn (80/20) solder is recommended.

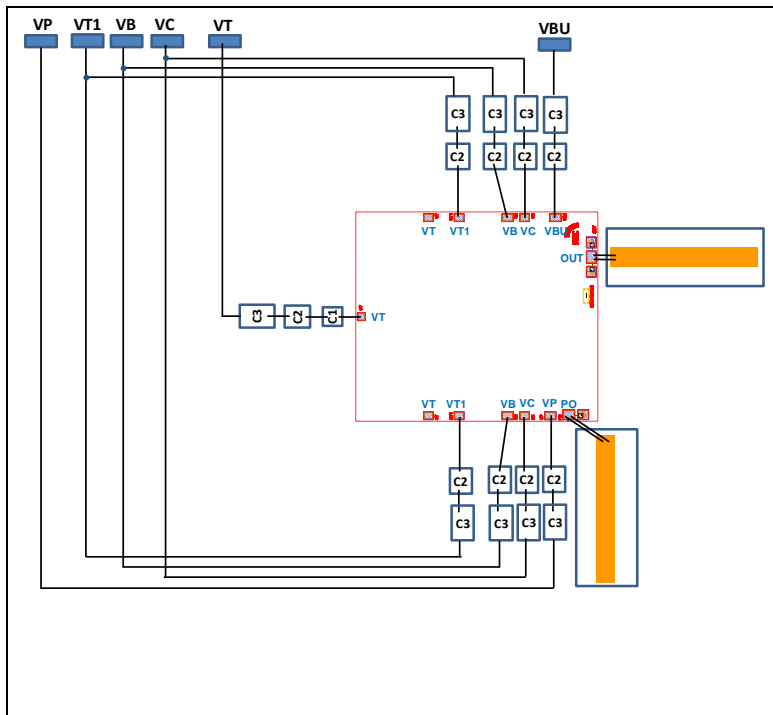
The backside of the die is the Source (ground) contact.

Thermosonic ball or wedge bonding are the preferred connection methods.

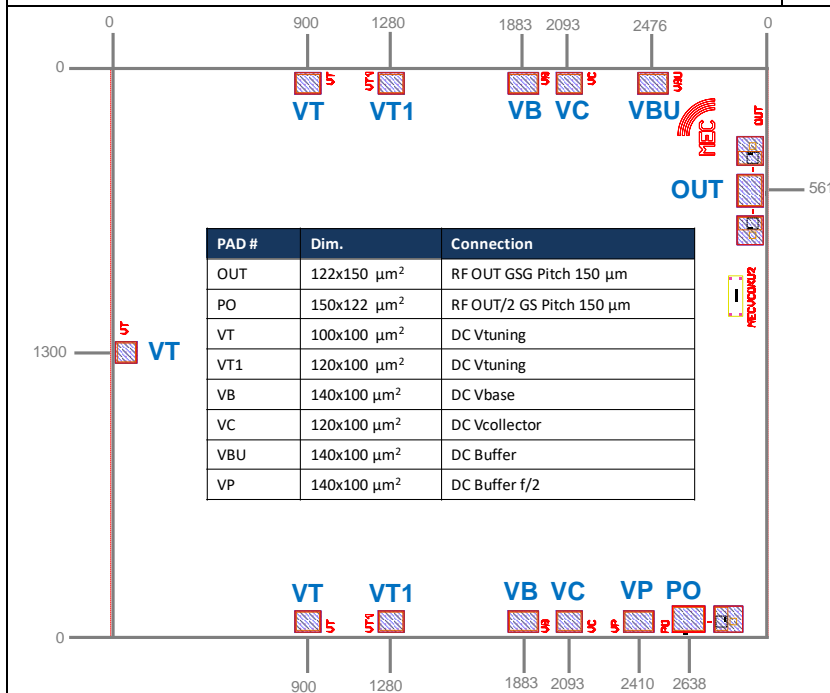
Gold wire must be used for connections.

### Bond Pad Configuration & Assembly Recommendations

#### 2<sup>nd</sup> configuration



Bond Pad #	Connection	External Components
OUT and PO	2 Bonding Wires $L_{bond} = 0.3 \text{ nH}$	
VT Vtuning	$L_{bond} \leq 1 \text{ nH}$	$C1 = 100\text{pF}/10\text{V}$ $C2 = 10\text{nF}/10\text{V}$ $C3 = 1\mu\text{F}/10\text{V}$
VT1 Vtuning	$L_{bond} \leq 1 \text{ nH}$	$C2 = 10\text{nF}/10\text{V}$ $C3 = 1\mu\text{F}/10\text{V}$
VB Vbase	$L_{bond} \leq 1 \text{ nH}$	$C2 = 10\text{nF}/10\text{V}$ $C3 = 1\mu\text{F}/10\text{V}$
VC Vcollector	$L_{bond} \leq 1 \text{ nH}$	$C2 = 10\text{nF}/10\text{V}$ $C3 = 1\mu\text{F}/10\text{V}$
VBU Vbuffer	$L_{bond} \leq 1 \text{ nH}$	$C2 = 10\text{nF}/10\text{V}$ $C3 = 1\mu\text{F}/10\text{V}$
VP Vbuffer f/2	$L_{bond} \leq 1 \text{ nH}$	$C2 = 10\text{nF}/10\text{V}$ $C3 = 1\mu\text{F}/10\text{V}$



Eutectic Die bond using AuSn (80/20) solder is recommended.

The backside of the die is the Source (ground) contact.

Thermosonic ball or wedge bonding are the preferred connection methods.

Gold wire must be used for connections.

### Bias Procedure

#### Bias-Up

1. Set  $V_T$  and  $V_{t1}$  to 5 V and turn on.
2. Set  $V_{BU}$  to 0 V and turn on.
3. Set  $V_P$  to 0 V and turn on.
4. Increase  $V_{BU}$  to 5 V ( $I_{BU} \approx 18$  mA).
5. Increase  $V_P$  to 5 V ( $I_P \approx 25$  mA).
6. Set  $V_B$  to 0 V and turn on.
7. Set  $V_C$  to 0 V and turn on.
8. Increase  $V_C$  to 5 V.
9. Increase  $V_B$  to 5 V ( $I_B \approx 26$  mA,  $I_C = 74$  mA).
10. Sweep  $V_T$  and  $V_{t1}$  from 0.5 V to 11 V.

#### Bias-Down

1. Set  $V_B$  to 0 V and turn off.
2. Set  $V_C$  to 0 V and turn off.
3. Set  $V_P$  to 0 V and turn off.
4. Set  $V_{BU}$  to 0 V and turn off.
5. Turn off  $V_T$  and  $V_{t1}$ .

# MEVCOKU1

## Ku-Band GaAs HBT VCO

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### Notice

The furnished information is believed to be reliable.

However, performances and specifications contained herein are based on preliminary characterizations and then susceptible to possible variations. On the basis of customer requirements, the product can be tested and characterized in specific operating conditions and, if needed, tuned to meet custom specifications.

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