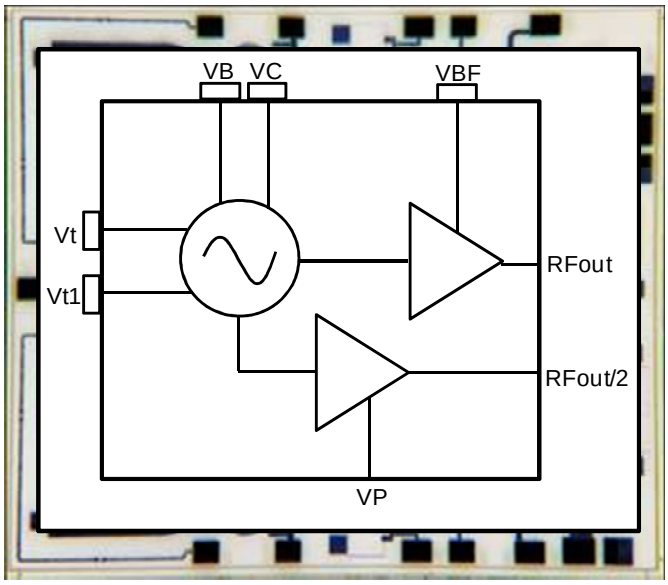
MECVCOKU2

Ku-Band GaAs HBT VCO



Product Description

MECVCOKU2 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).

To improve the output power flatness, the tuning voltage Vt1, normally swept as Vt, can be set to a fixed value.

In the frequency range from 11 GHz to 12.56 GHz MECVCOKU2 provides more than 7 dBm of output power and a noise phase of about -75 dBc/Hz at 10 KHz offset with 5 V supply voltage.

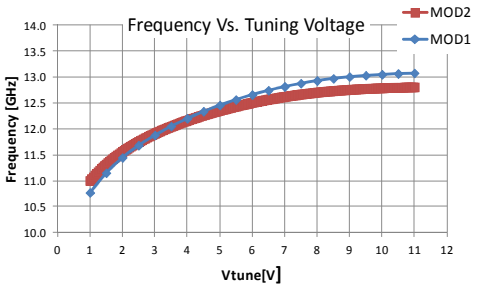
Main Features

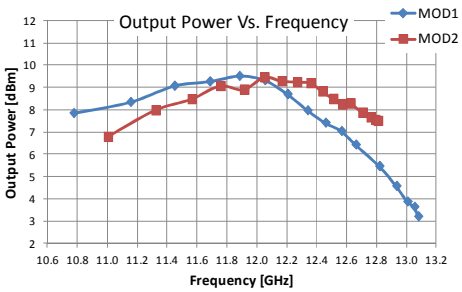
- GaAs HBT Technology
- Dual output frequency range: f_{out} and $f_{out}/2$
  - MOD1: Vt=Vt1 from 1 to 11 V
    f_{out} = 10.77 to 13.08 GHz
    Phase Noise = -75 dBc/Hz @10 kHz
  - MOD2: Vt from 1 to 11 V, Vt1=3.5 V
    f_{out} = 11 to 12.81 GHz
    Phase Noise = -75 dBc/Hz @10 kHz
- No external resonator needed
- Chip size: 2.6 x 3 mm^2

Typical Applications

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

Measured Data





Main Characteristics

Test Conditions: T_{base_plate} = 25 °C, MOD1 (sweeping Vt=Vt1)

Parameter	Min	Typ	Max	Unit
Frequency Range Output Frequency (fout) Half Output Frequency (fout/2)	 11 5.5		 12.56 6.28	 GHz GHz
Output Power RFout RFout/2	 7 6		 9.5 7.7	 dBm dBm
Phase Noise @ 10 kHz Offset @ 100 kHz Offset @ 1 MHz Offset		 -75 -104 -128		 dBc/Hz dBc/Hz dBc/Hz
Tuning Voltage (Vt=Vt1)	1.3		5.5	V
Supply Voltage (Vcc)		5		V
Supply Current (Icc)		145		mA
Harmonic Attenuation 1/2 3/2 2nd	 -19 -39 -33			 dBc dBc dBc
Pulling (into a 2.0:1 VSWR)			0.3	MHz_pp
Pushing @ Vtune=5V			32	MHz/V
Sensitivity			700	MHz/V
DC Power Consumption		0.725		W

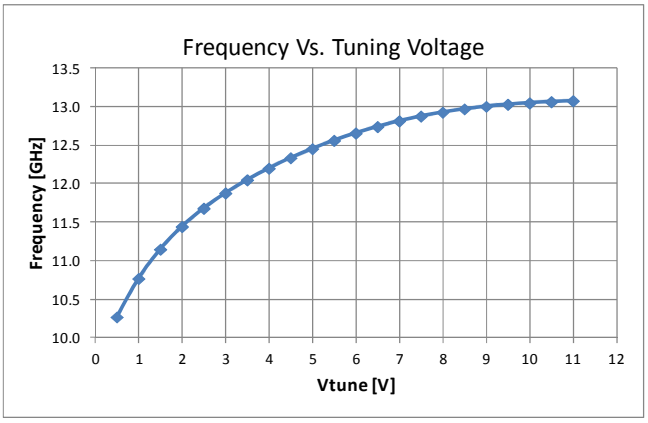
Main Characteristics

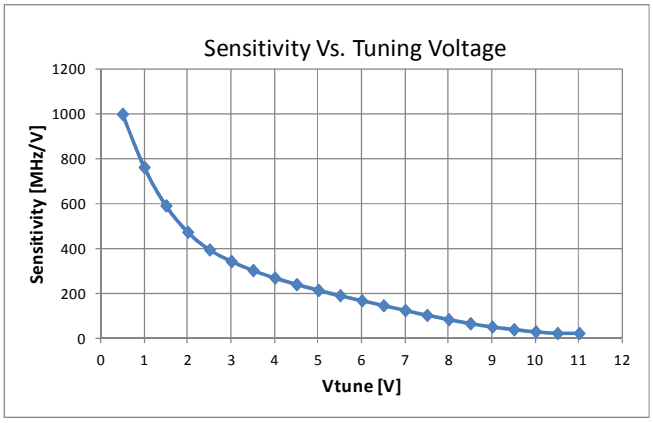
Test Conditions: T_{base_plate} = 25 °C, MOD2 (sweeping Vt, Vt1=3.5 V)

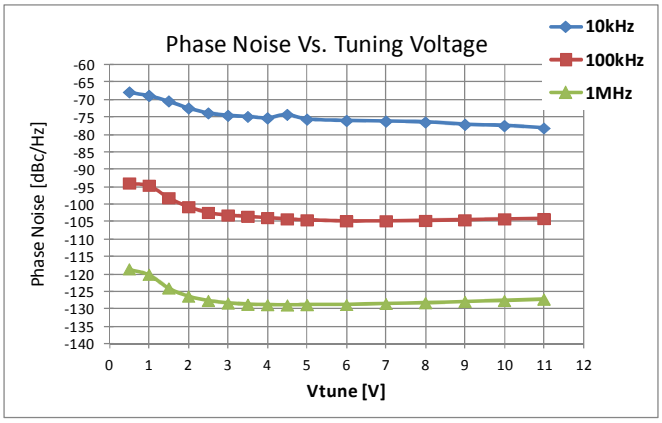
Parameter	Min	Typ	Max	Unit
Frequency Range Output Frequency (fout) Half Output Frequency (fout/2)	 11.65 5.78		 12.81 6.4	 GHz GHz
Output Power RFout RFout/2	 7.5 6.5		 9.4 8	 dBm dBm
Phase Noise @ 10 kHz Offset @ 100 kHz Offset @ 1 MHz Offset		 -75 -103 -128		 dBc/Hz dBc/Hz dBc/Hz
Tuning Voltage (Vt), Vt1=3.5 V	2		11	V
Supply Voltage (Vcc)		5		V
Supply Current (Icc)		145		mA
Sensitivity			430	MHz/V
DC Power Consumption		0.725		W

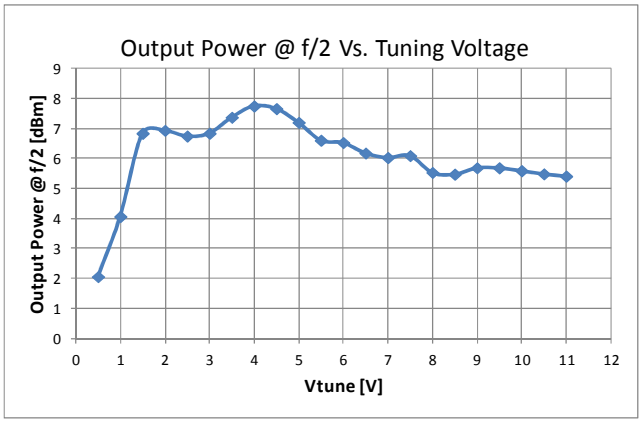
Measurement Performances

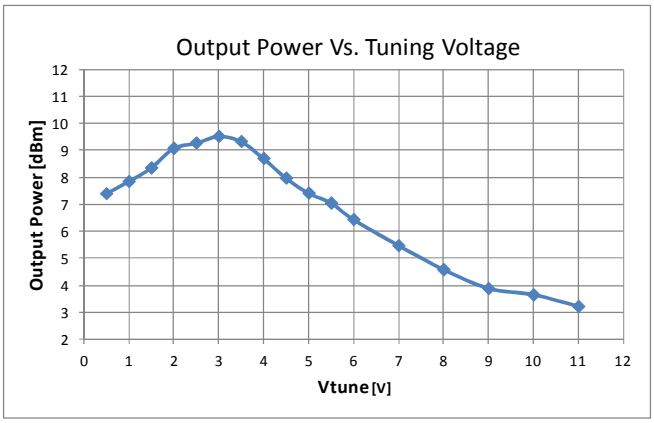
Test Conditions: T_{base_plate} = 25 °C, Vcc = 5 V, Icc = 145 mA, MOD1 (sweeping Vt=Vt1)

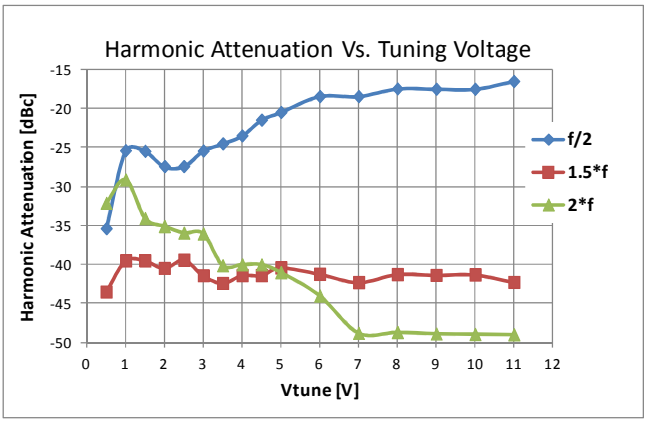






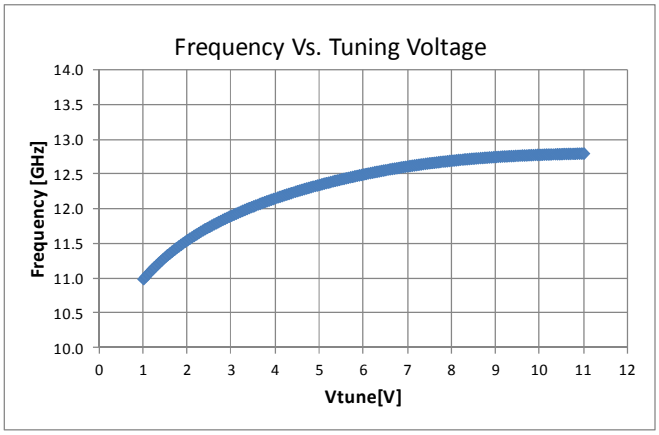


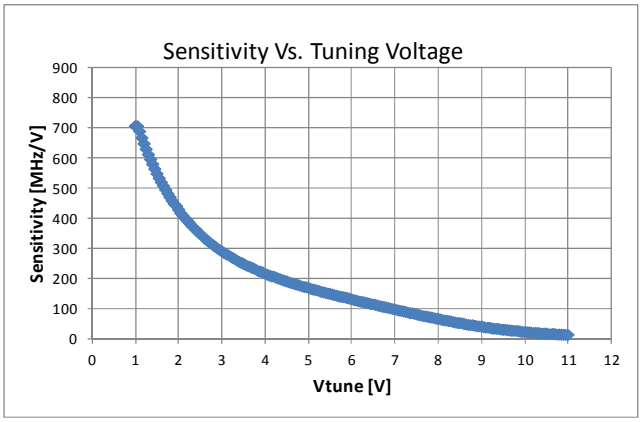


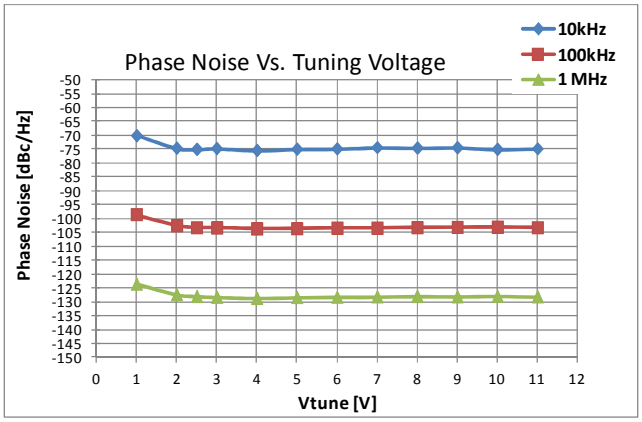


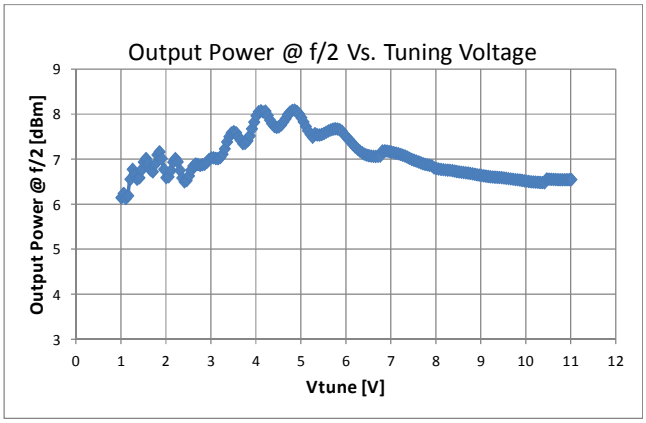
Measurement Performances

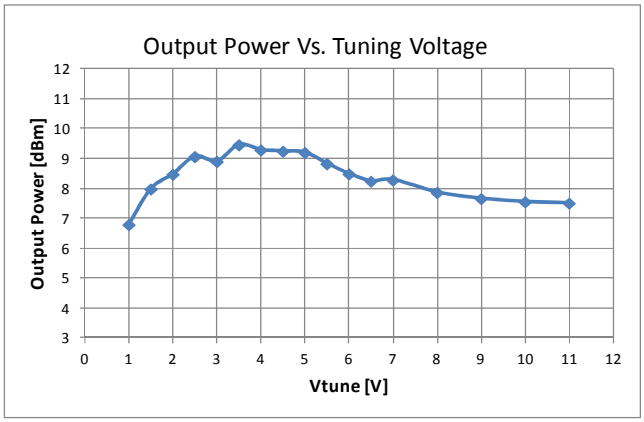
Test Conditions: T_{base_plate} = 25 °C, Vcc = 5 V, Icc = 145 mA, MOD2 (sweeping Vt, Vt1=3.5 V)





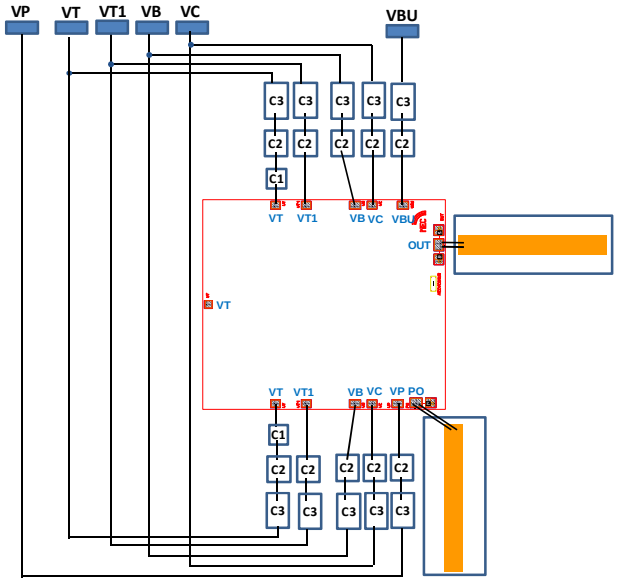




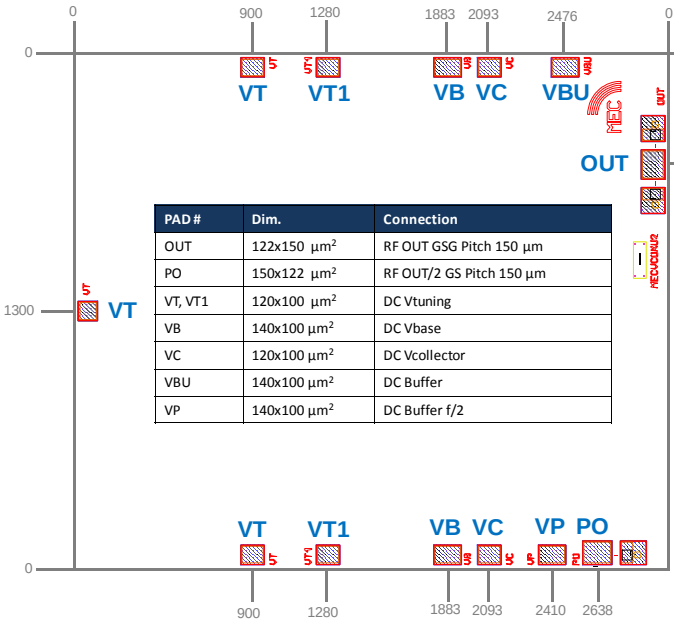


Bond Pad Configuration & Assembly Recommendations

1st configuration



Bond Pad #	Connection	External Components
OUT and PO	**2** Bonding Wires L_bond = 0.3nH	
VT Vtuning	L_bond ≤ 1 nH	C1 = 100pF/10V C2 = 10nF/10V C3 = 1µF/10V
VT1 Vtuning	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VB Vbase	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VC Vcollector	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VBU Vbuffer	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VP Vbuffer f/2	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V



PAD #	Dim.	Connection
OUT	122x150 µm²	RF OUT GSG Pitch 150 µm
PO	150x122 µm²	RF OUT/2 GS Pitch 150 µm
VT, VT1	120x100 µm²	DC Vtuning
VB	140x100 µm²	DC Vbase
VC	120x100 µm²	DC Vcollector
VBU	140x100 µm²	DC Buffer
VP	140x100 µm²	DC Buffer f/2

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

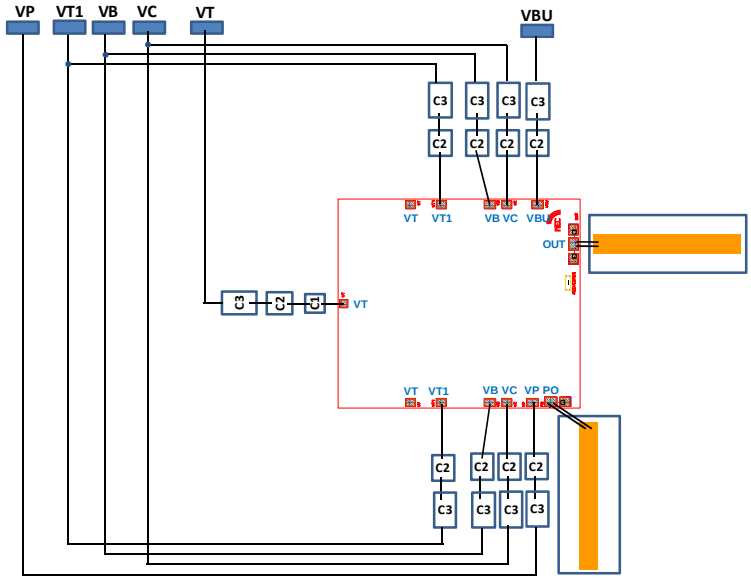
The backside of the die is the Source (ground) contact.

Thermosonic ball or wedge bonding are the preferred connection methods.

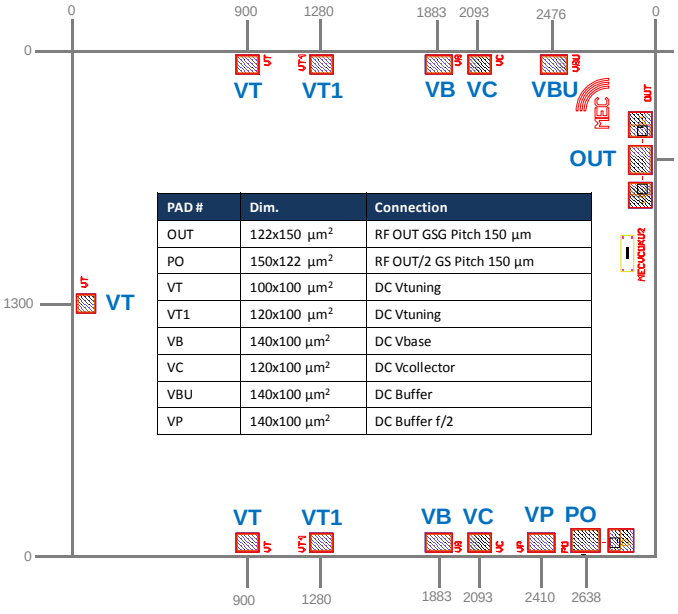
Gold wire must be used for connections.

Bond Pad Configuration & Assembly Recommendations

2nd configuration



Bond Pad #	Connection	External Components
OUT and PO	**2** Bonding Wires L_bond = 0.3nH	
VT Vtuning	L_bond ≤ 1 nH	C1 = 100pF/10V C2 = 10nF/10V C3 = 1µF/10V
VT1 Vtuning	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VB Vbase	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VC Vcollector	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VBU Vbuffer	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V
VP Vbuffer f/2	L_bond ≤ 1 nH	C2 = 10nF/10V C3 = 1µF/10V



PAD #	Dim.	Connection
OUT	122x150 µm²	RF OUT GSG Pitch 150 µm
PO	150x122 µm²	RF OUT/2 GS Pitch 150 µm
VT	100x100 µm²	DC Vtuning
VT1	120x100 µm²	DC Vtuning
VB	140x100 µm²	DC Vbase
VC	120x100 µm²	DC Vcollector
VBU	140x100 µm²	DC Buffer
VP	140x100 µm²	DC Buffer f/2

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 (MOD1)

Bias-Up

1. Set VT and Vt1 to 5 V and turn on.
2. Set VBU to 0 V and turn on.
3. Set VP to 0 V and turn on.
4. Increase VBU to 5 V (IBU ≈ 18 mA).
5. Increase VP to 5 V (IP ≈ 25 mA).
6. Set VB to 0 V and turn on.
7. Set VC to 0 V and turn on.
8. Increase VC to 5 V.
9. Increase VB to 5 V (IB ≈ 26 mA, IC = 76 mA).
10. Sweep VT and Vt1 from 0.5 V to 11 V.

Bias-Down

1. Set VB to 0 V and turn off .
2. Set VC to 0 V and turn off .
3. Set VP to 0 V and turn off .
4. Set VBU to 0 V and turn off .
5. Turn off VT and Vt1.

Bias Procedure (MOD2)

Bias-Up

1. Set VT and VT1 to 5 V and turn on.
2. Set Vt1 to 3.5 V and turn on.
3. Set VBU to 0 V and turn on.
4. Set VP to 0 V and turn on.
5. Increase VBU to 5 V (IBU ≈ 18 mA).
6. Increase VP to 5 V (IP ≈ 25 mA).
7. Set VB to 0 V and turn on.
8. Set VC to 0 V and turn on.
9. Increase VB to 5 V (IB ≈ 26 mA, IC = 76 mA).
10. Sweep VT from 0.5 V to 11 V.

Bias-Down

1. Set VB to 0 V and turn off .
2. Set VC to 0 V and turn off .
3. Set VP to 0 V and turn off .
4. Set VBU to 0 V and turn off .
5. Turn off VT and VT1.

Contact Information

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Notice