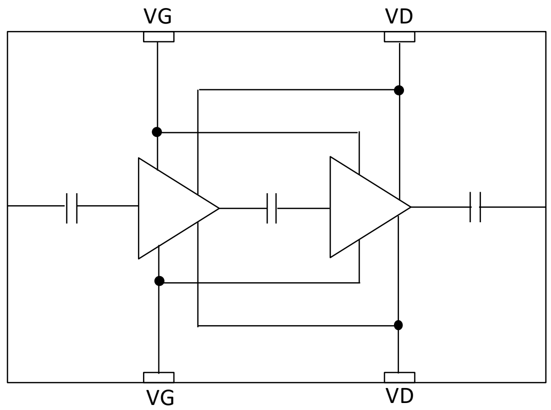
MECX10W-2

X-Band GaAs pHEMT High Power Amplifier

MICROWAVE ELECTRONICS FOR COMMUNICATIONS



Main Features

- 0.25µm GaAs pHEMT Technology
- 8.5 – 10.8 GHz full performances Frequency Range
- Saturated Output Power > 11W
- PAE = 32% - 43%
- Small Signal Gain > 21 dB
- Bias: Vd = 8.5V, Id = 2.6A, Vg = -0.43V (Typ.)
- Chip Size: 5 x 3.3 x 0.07 mm

Product Description

MECX10W-2 is a 0.25µm GaAs pHEMT based High Power Amplifier designed by MEC for X-Band applications.

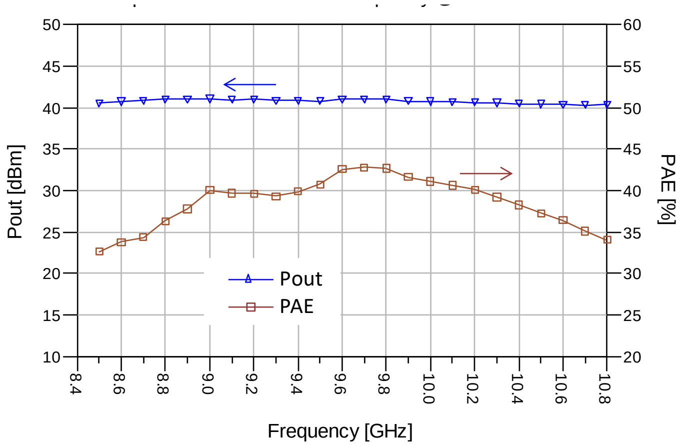
The MECX10W-2 provides more than 11W of saturated output power in the frequency range from 8.5 GHz to 10.8 GHz, with PAE up to 43% and 21 dB of small signal Gain.

The MECX10W-2 is fully matched to 50 Ω with DC decoupling capacitors on both Input and Output ports. Bond Pad are gold plated for compatibility with thermo-compression bonding process.

Primary Applications

- Radar
- Telecom

Measured Data



Main Characteristics

Test Conditions: T_{base_plate} = 20°C , Vd = 8.5 V, Idq = 2.6 A, Pulse Width = 100 µs, Duty Cycle = 30%

Parameter	Min	Typ	Max	Unit
Operating frequency	8.5		10.8	GHz
Small Signal Gain		23.3		dB
Input Return Loss		-14		dB
Output Return Loss		-19		dB
Saturated Output Power		41		dBm
Power Added Efficiency @ Pout=Psat	32		43	%
Gain @ Pout=Psat		18.8		dB
Drain Supply Voltage		8.5		V
Supply Quiescent Drain Current		2.6		A
Supply Drain Current	3.2		4	A
Psat Vs. Temperature		-0.007		dB/°C
PAE @Psat Vs. Temperature		-0.03		%/°C
Drain Current @Psat Vs. Temperature		-0.004		A/°C
Linear Gain Vs. Temperature		-0.028		dB/°C

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X-Band GaAs pHEMT High Power Amplifier

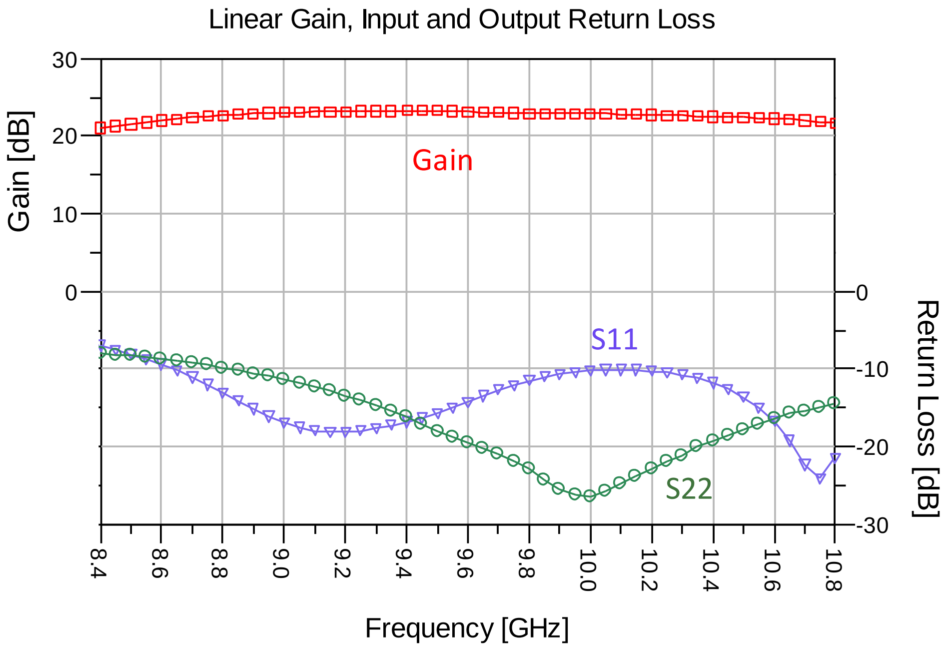
Absolute Maximum Rating*		
Parameter	**Values**	**Unit**
Compression Level	6	dB
Drain Supply Voltage with RF input Power	9.0	V
Drain Supply Voltage without RF input Power	10	V
Supply Quiescent Drain Current	3.5	A
Max. forward gate current	12	mA
Max. negative gate source voltage	-2.5	V
Max. negative gate drain voltage	-10	V
Maximum junction temperature	175	°C

* Tamb = 20°C

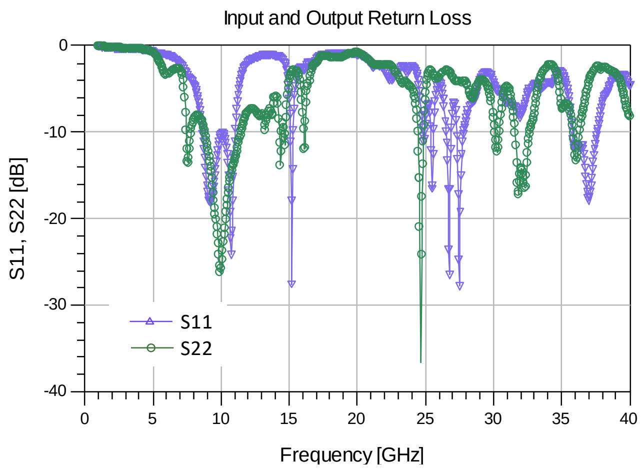
Thermal and Reliability Information*			
Test Conditions	**Parameter**	**Values**	**Unit**
VD = 8.5 V, ID = 2.6 A PDC = 22W, **No RF Input** Tbaseplate = 80°C	Equivalent Thermal Resistance (No RF Drive)	4	°C/W
	Channel Temperature (No RF Drive)	168	°C
	Mean Time Failure (No RF Drive)	3E+5	Hrs
VD = 8.5 V, ID = 3.3 A PDC = 28W, **Pout= 41dBm** Tbaseplate = 80°C	Thermal Resistance (Under RF Drive)	4	°C/W
	Channel Temperature (Under RF Drive)	142	°C
	Mean Time Failure (Under RF Drive)	2.8E+6	Hrs

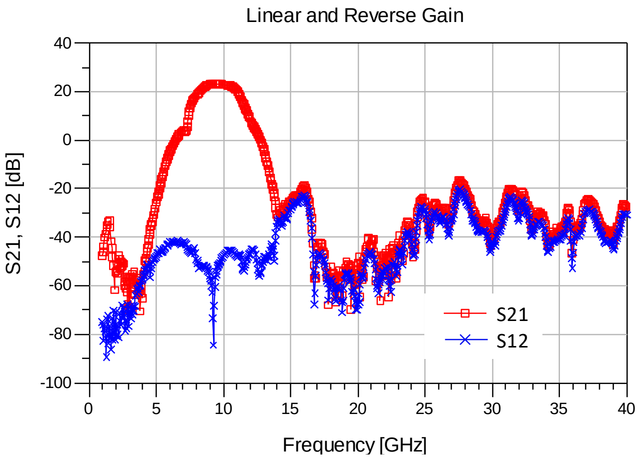
*Assumes eutectic attach using 1.5 mil thick 80/20 AuSn mounted to a 20 mil CuMo Carrier Plate.

Small Signal Measurements

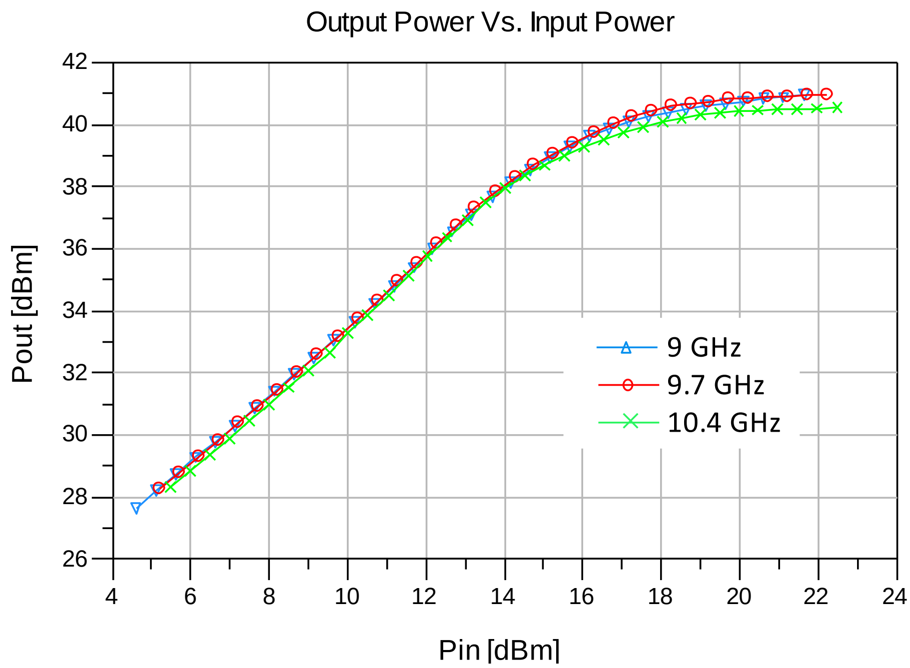


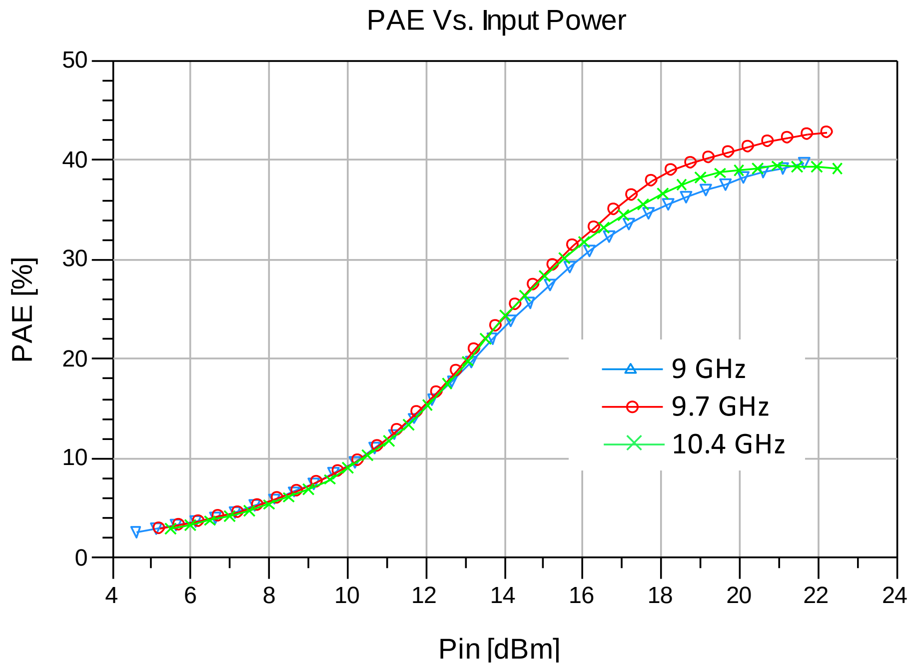
Broadband Small Signal Measurements

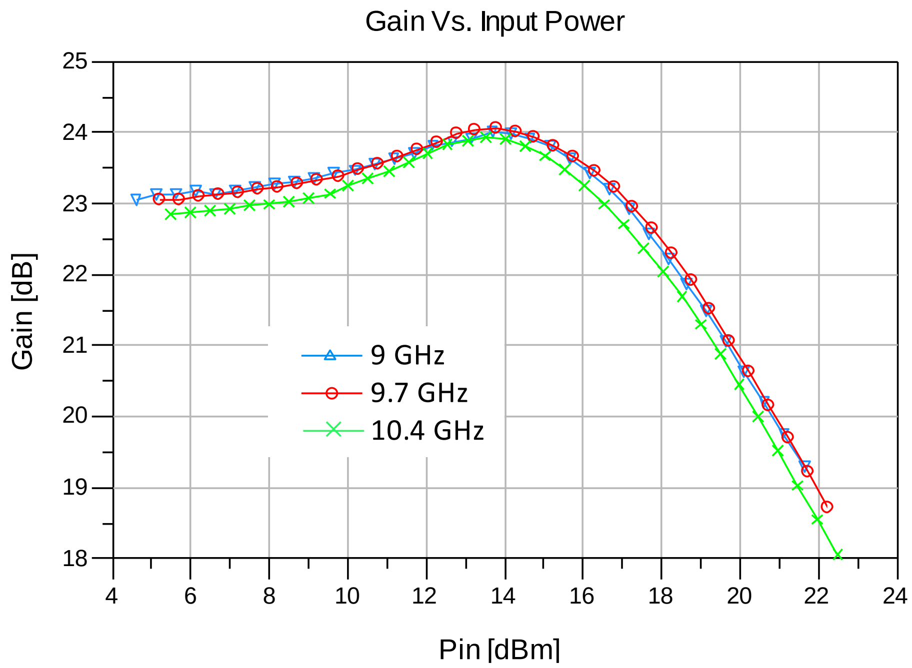




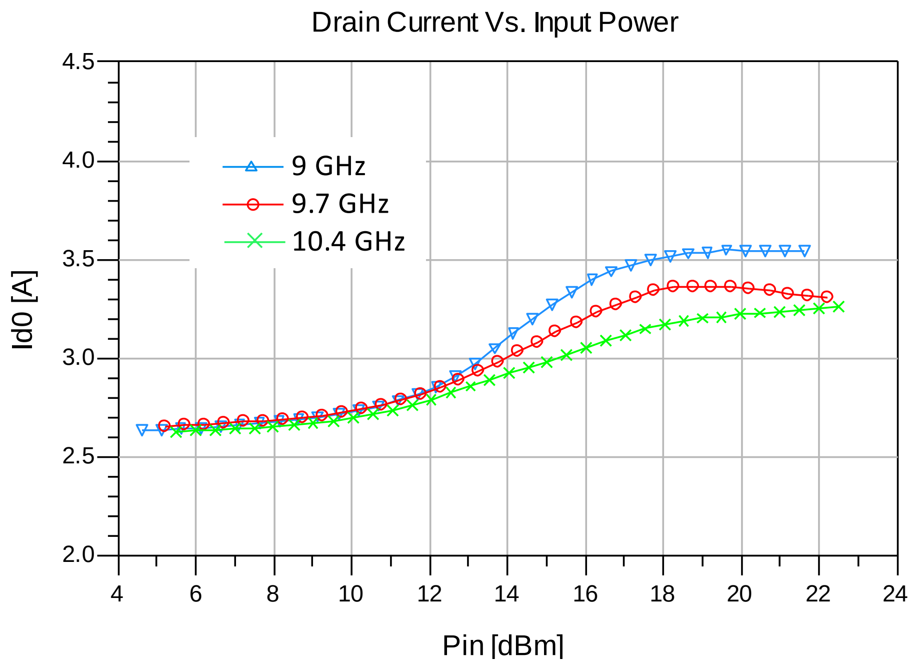
Measured Performances Vs. Pin @ Frequency [9, 9.7, 10.4] GHz





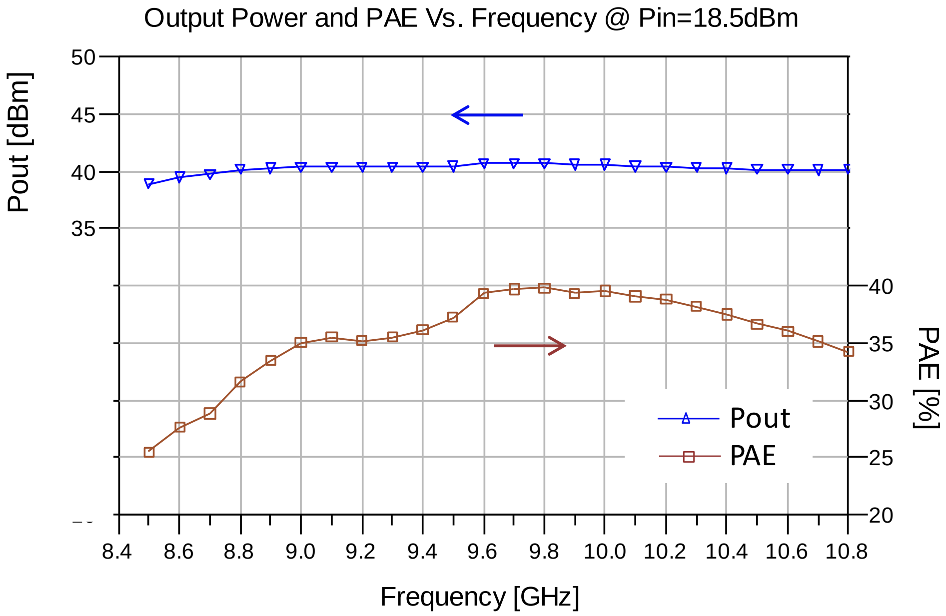


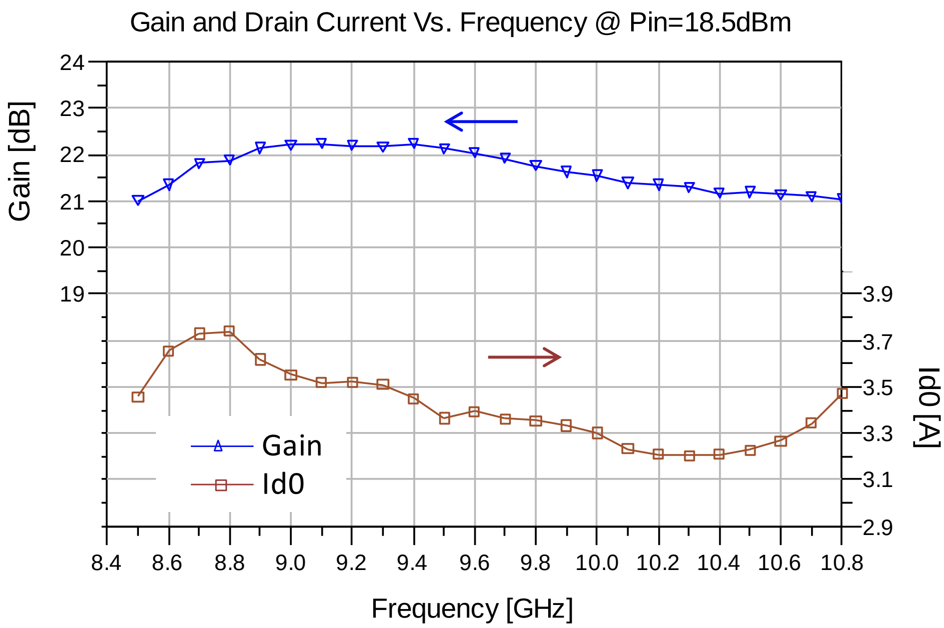
Gain Vs. Input Power
Gain [dB]
Pin [dBm]
9 GHz
9.7 GHz
10.4 GHz



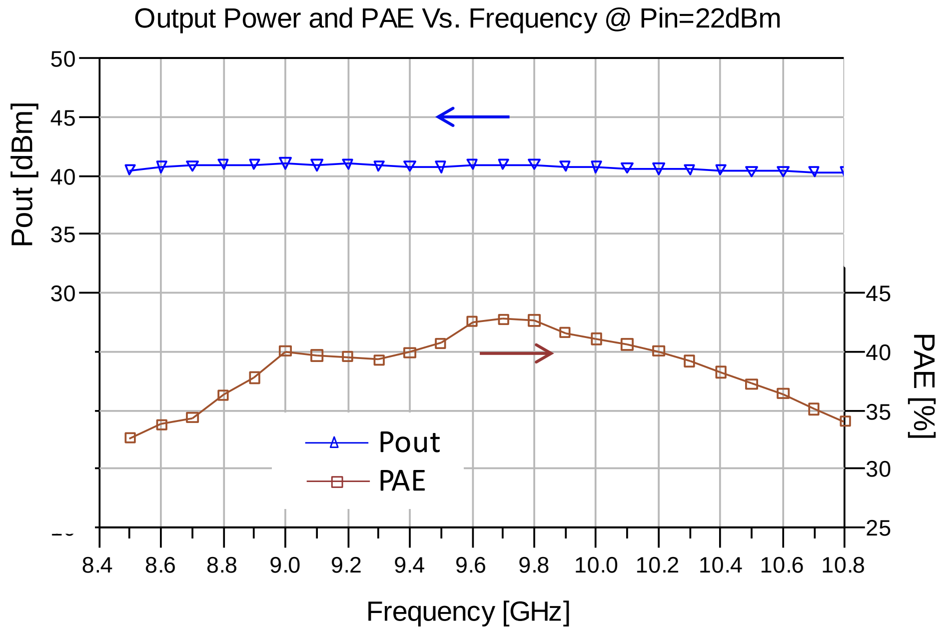
Drain Current Vs. Input Power
Id0 [A]
Pin [dBm]
9 GHz
9.7 GHz
10.4 GHz

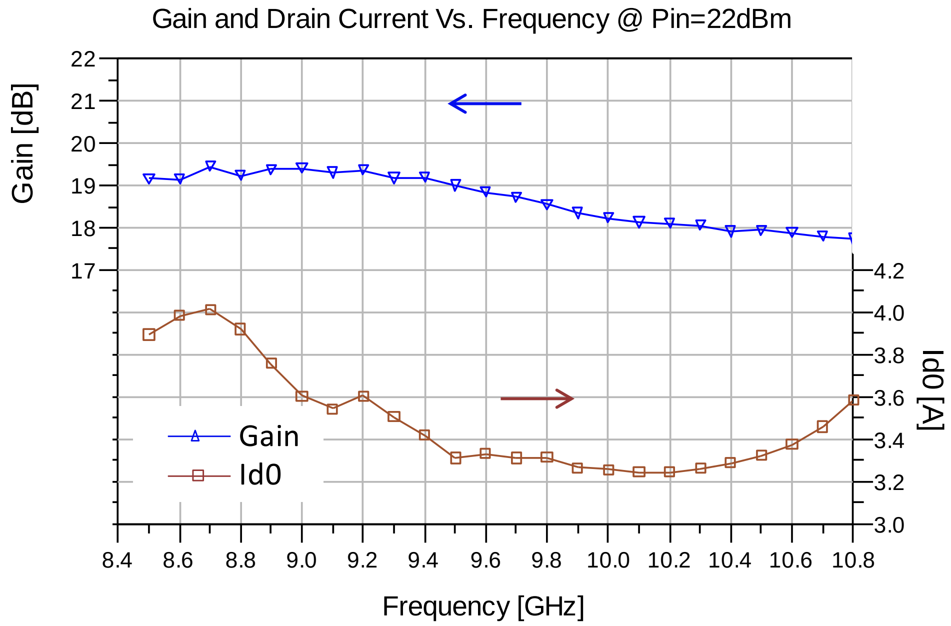
Measured Performances Vs. Frequency @ 1dB of Gain Compression



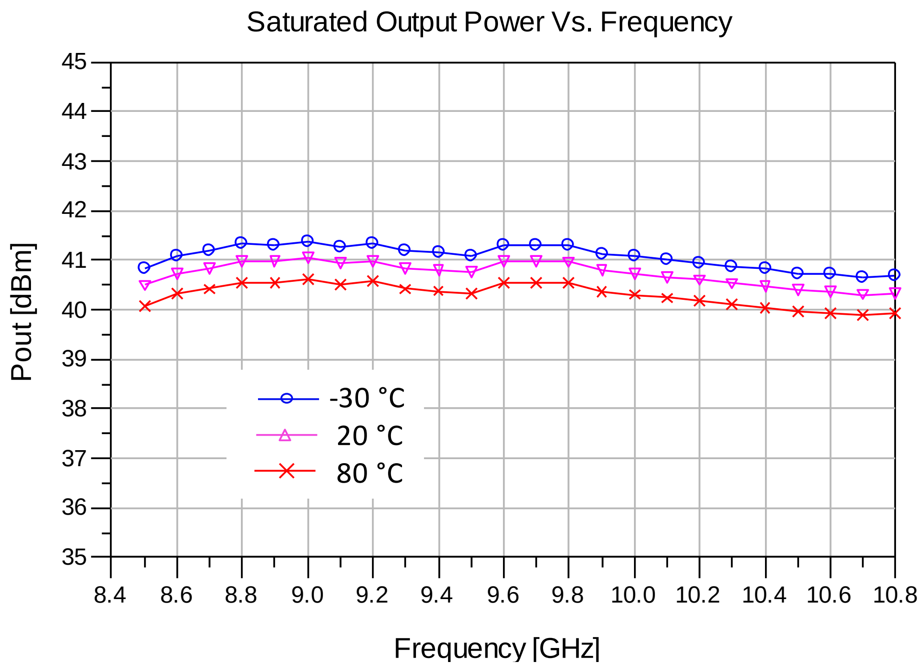


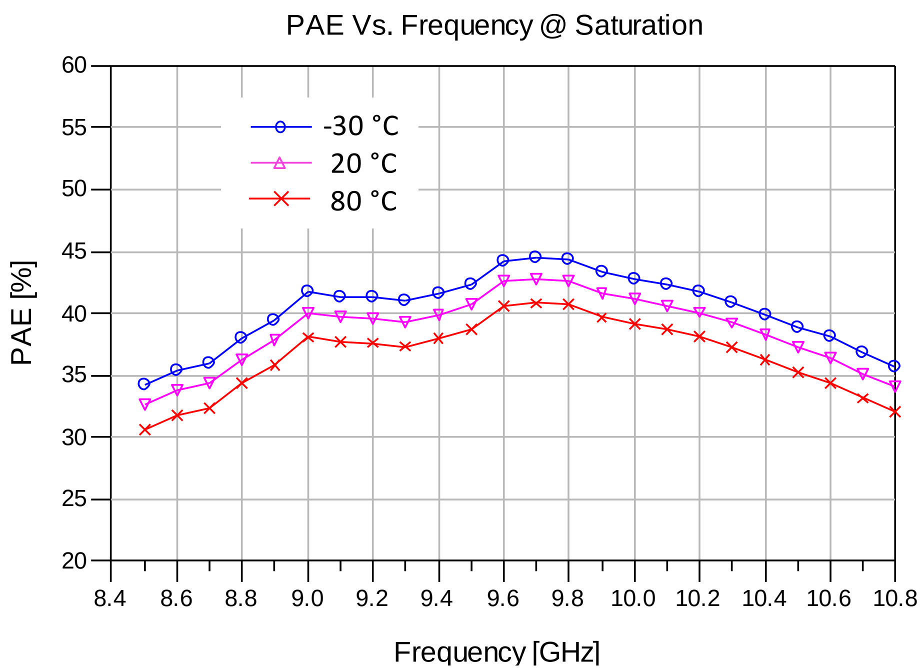
Measured Performances Vs. Frequency @ Saturation

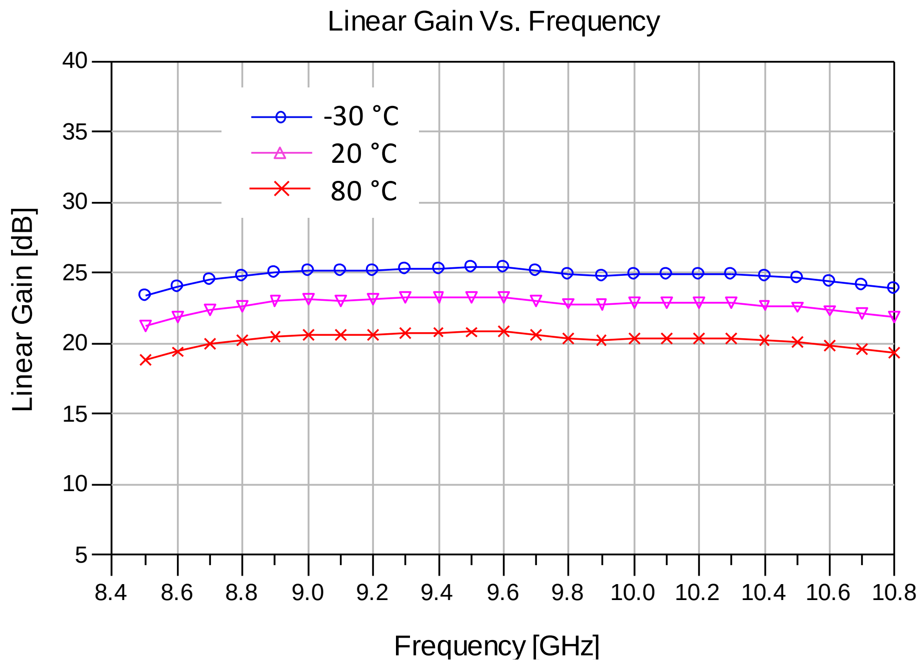


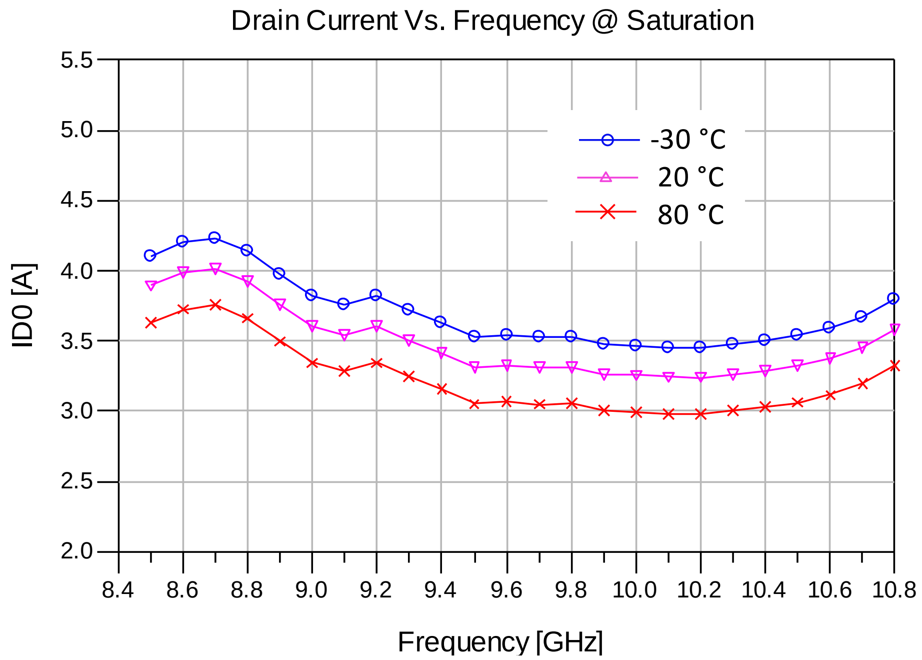


Measured Performances Vs. Frequency @ Temperature [-30, 20, 80]°C

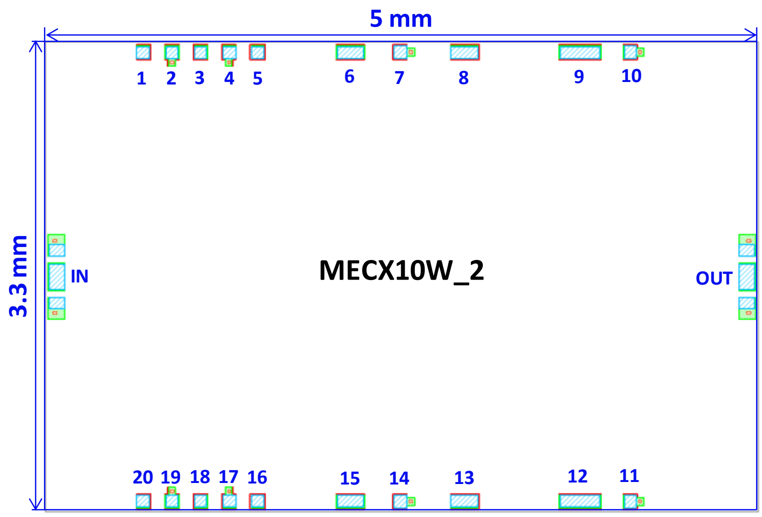





Linear Gain Vs. Frequency
Linear Gain [dB]
Frequency [GHz]
-30 °C
20 °C
80 °C
40
35
30
25
20
15
10
5
8.4
8.6
8.8
9.0
9.2
9.4
9.6
9.8
10.0
10.2
10.4
10.6
10.8


Drain Current Vs. Frequency @ Saturation
ID0 [A]
Frequency [GHz]
-30 °C
20 °C
80 °C
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
8.4
8.6
8.8
9.0
9.2
9.4
9.6
9.8
10.0
10.2
10.4
10.6
10.8

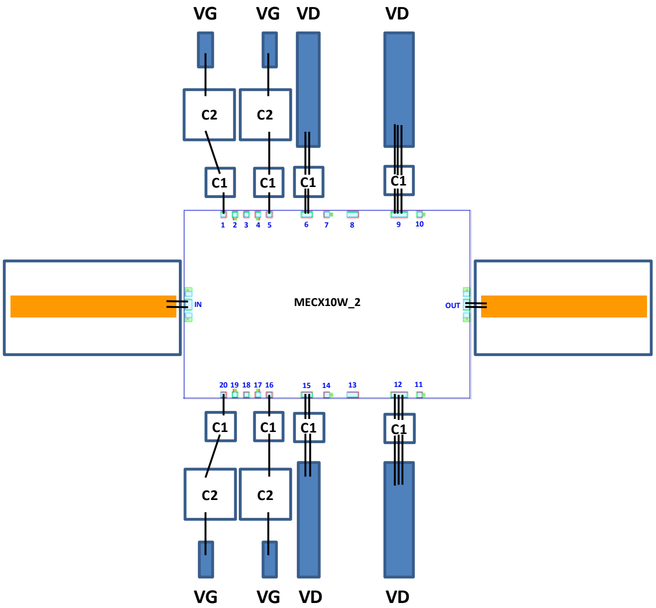
Bond Pad Configuration



- A tolerance of ± 35µm has to be considered for chip dimensions
- Chip Thickness is 70 µm ± 10 µm
- RF Pads [IN, OUT] = 118µm x 196µm
- DC Pads [1, 2, 3, 4, 5, 7, 10, 11, 14, 16, 17, 18, 19, 20] = 100µm x 100µm
- DC Pads [6, 8, 13, 15] = 200µm x 100µm
- DC Pads [9, 12] = 300µm x 100µm

Bond Pad #	Symbol	Description
IN	RFin	Input RF Port
OUT	RFout	Output RF Port
1, 5, 16, 20	Vg	Gate Negative Supply Voltage
6, 9, 12, 15	Vd	Drain Positive Supply Voltage
2, 4, 7, 10, 11, 14, 17, 19	GND	Ground Pads – Not Connected
3, 8, 13, 18	\	Not Connected

Assembly Recommendations



Bond Pad #	Connection	External Components
IN and OUT	**2** Bonding Wires L_bond = 0.3nH	
1, 5, 16, 20 - **Vg**	L_bond ≤ 1 nH	C1 = 100pF/10V C2 = 10nF/10V
6, 15 - **Vd**	**2** Bonding Wires L_bond ≤ 1nH	**Pulsed mode** C1 = 100pF/50V
9, 12 - **Vd**	**3** Bonding Wires L_bond ≤ 1nH	**CW mode:** C1 = 100pF/50V C2 = 10nF/50V

- Eutectic Die bond using AuSn (80/20) solder is recommended.
- Great care must be used for thermal dimensioning.
- 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. Vg set to -1.5 V.
2. Vd set to +8.5 V.
3. Adjust Vg until quiescent Id is 2.6 A (Vg = -0.43 V Typical).
4. Apply RF signal.

Bias-Down

1. Turn off RF signal.
2. Reduce Vg to -1.5 V (Id0 ≈ 0 mA).
3. Set Vd to 0 V.
4. Turn off Vd.
5. Turn off Vg.

Contact Information

For additional technical Information and Requirements:

Email: **contact.mec@mec-mmic.com** Tel: **+39 0516333403**

For sales Information and Requirements:

Email: **sales@mec-mmic.com** Tel: **+39 0516333403**

Notice