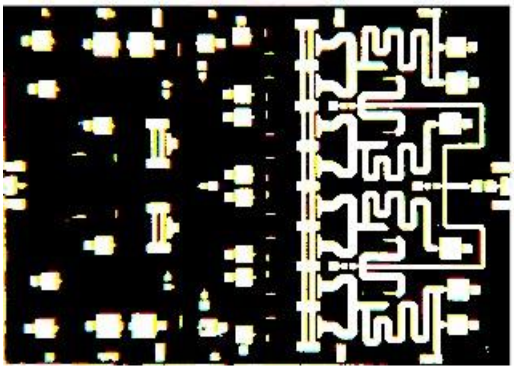
MECGaNC30

4 to 6 GHz GaN HEMT Power Amplifier



Product Description

MECGaNC30 is a GaN HEMT based High Power Amplifier designed by MEC for C-Band applications and fabricated on 0.25µm GaN on SiC process.

The MECGaNC30 provides more than 30W of saturated output power in the frequency range from 4.1 GHz to 5.9 GHz with a PAE higher than 37% and 27 dB of small signal Gain. Operating in the reduced range from 4.6 GHz to 5.8 GHz it reaches an output Power from 35W to 40W.

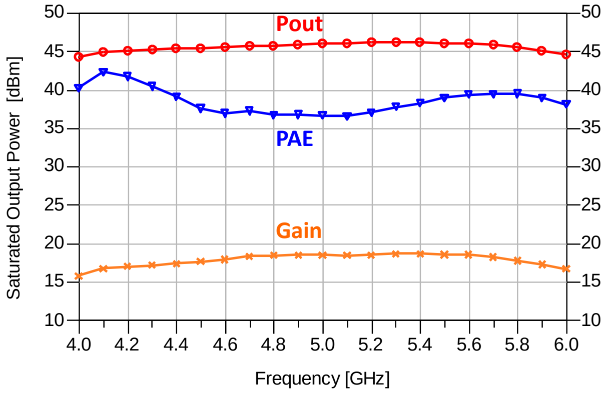
The MECGaNC30 is fully matched to 50 Ω with DC decoupling capacitors on both Input and Output ports. Bond Pad are gold plated for compatibility with thermo-compression bonding process.

Main Features

- 0.25µm GaN HEMT Technology
- 4.1 – 5.9 GHz full performances Frequency Range
- 30W Output Power @ Pin 27.5 dBm
- 37% PAE @ Pin 27.5 dBm
- 30% PAE @ Pout 20 Watt
- 27 dB Small Signal Gain
- Bias: Vd = 28V, Id = 1A, Vg = -3V (Typ.)
- Chip Size: 5.5 x 3.8 x 0.1 mm

Applications

- Radar
- Telecom
- Test Instrumentation



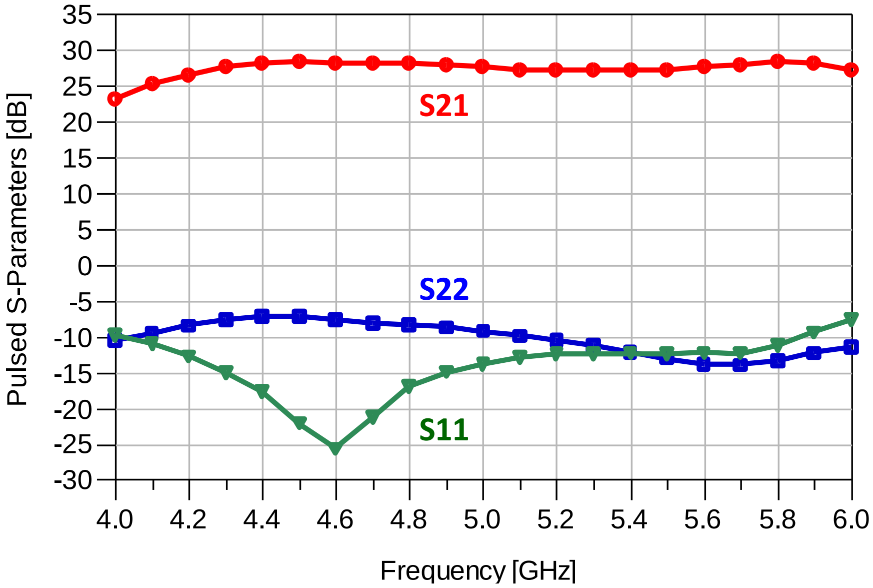
Main Characteristics

Test Conditions: T_{base_plate} = 25°C , Vd = 28 V, Idq = 1 A, Pulse Width = 50 µs, Duty Cycle = 15%

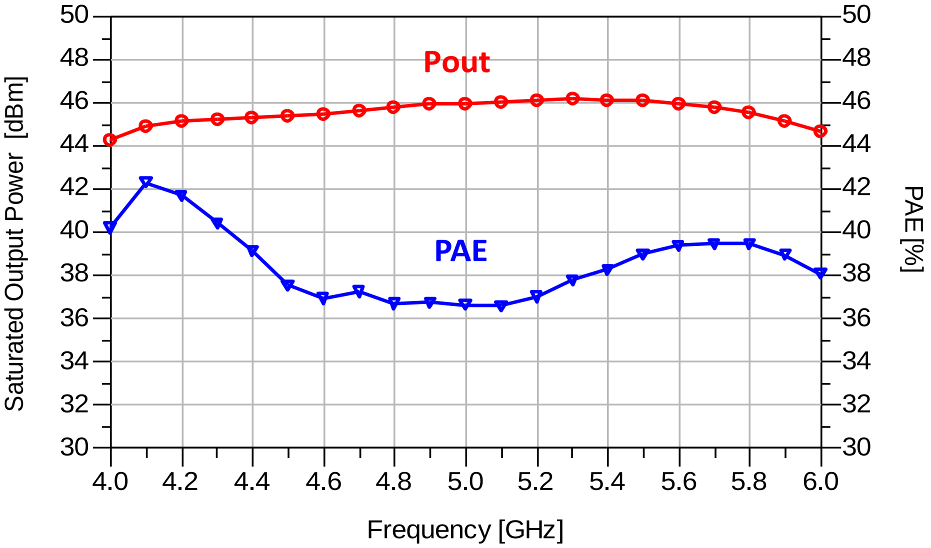
Parameter	Min	Typ	Max	Unit
Operating frequency	4.1	5	5.9	GHz
Small Signal Gain	25	27	28	dB
Input Return Loss	10	13		dB
Output Return Loss	7	10		dB
Saturated Output Power	45		46	dBm
Power Added Efficiency	37		42	%
Power Added Efficiency @ Pout = 20 Watt	30		37	%
Saturated Output Power @ [4.6 – 5.8] GHz	45		46	dBm
Drain Supply Voltage	25	28	30	V
Supply Quiescent Drain Current		1		A
Supply Drain Current	2.5		3.8	A
Gate Voltage		-3		V

Typical Measured Performances

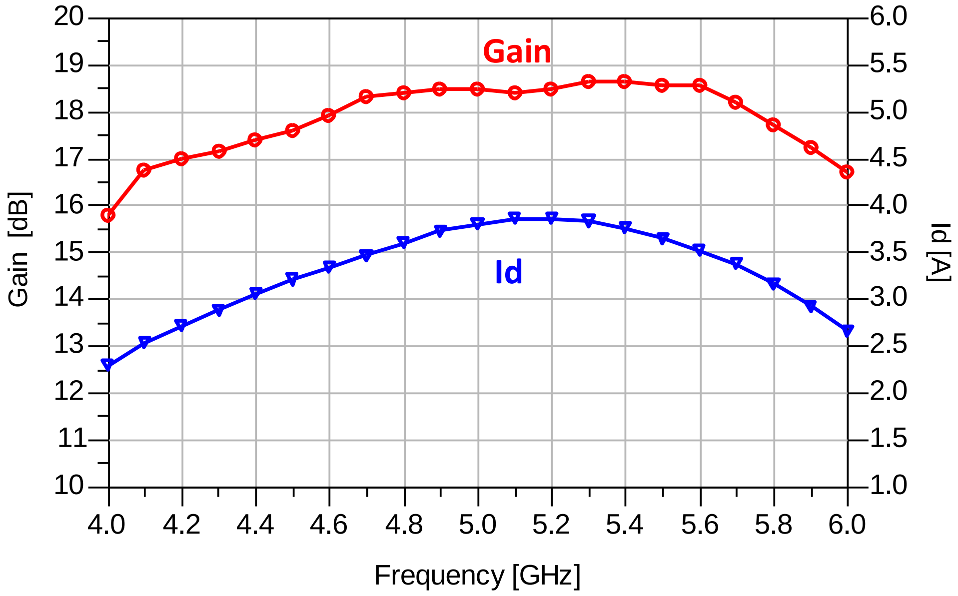
Linear Gain (S21), Input (S11) and Output (S22) Reflection Coefficients Vs. Frequency



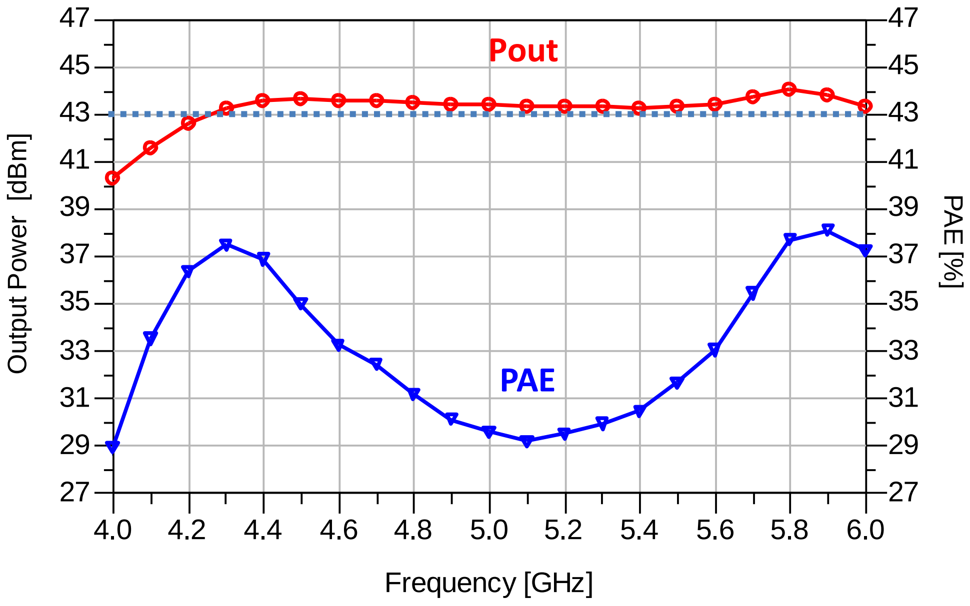
Output Power and PAE @ Pin = 27.5 dBm Vs. Frequency



Gain and Drain Current @ Pin = 27.5 dBm Vs. Frequency



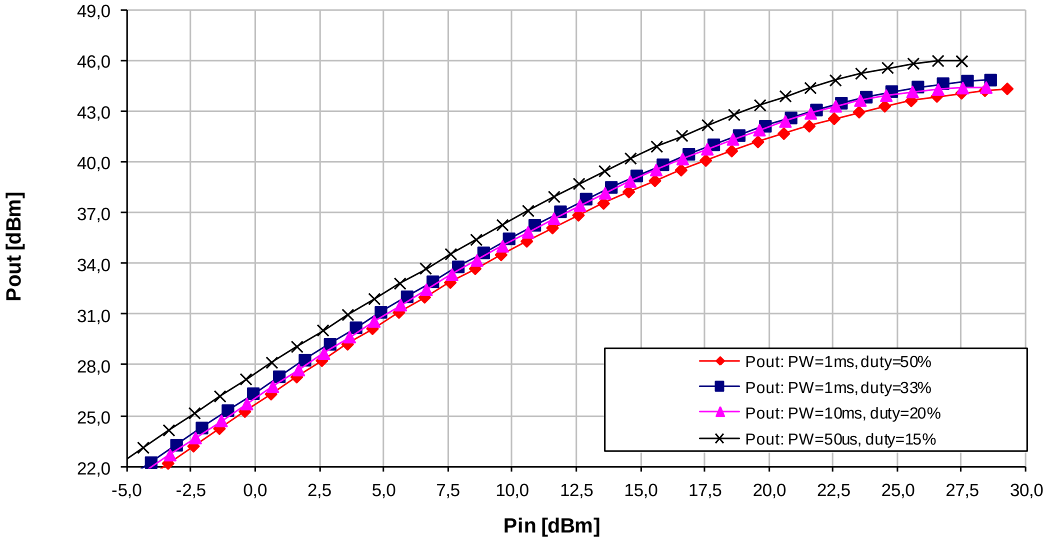
Output Power and PAE @ Pin = 19.5 dBm Vs. Frequency

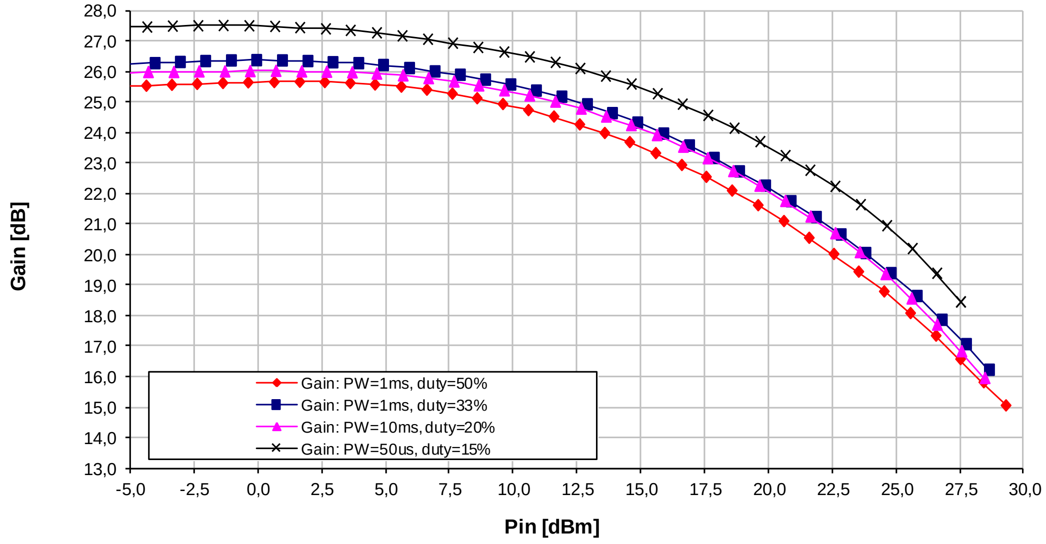


Input Power sweeps at 5 GHz Vs. Pulse Width and Duty Cycle:

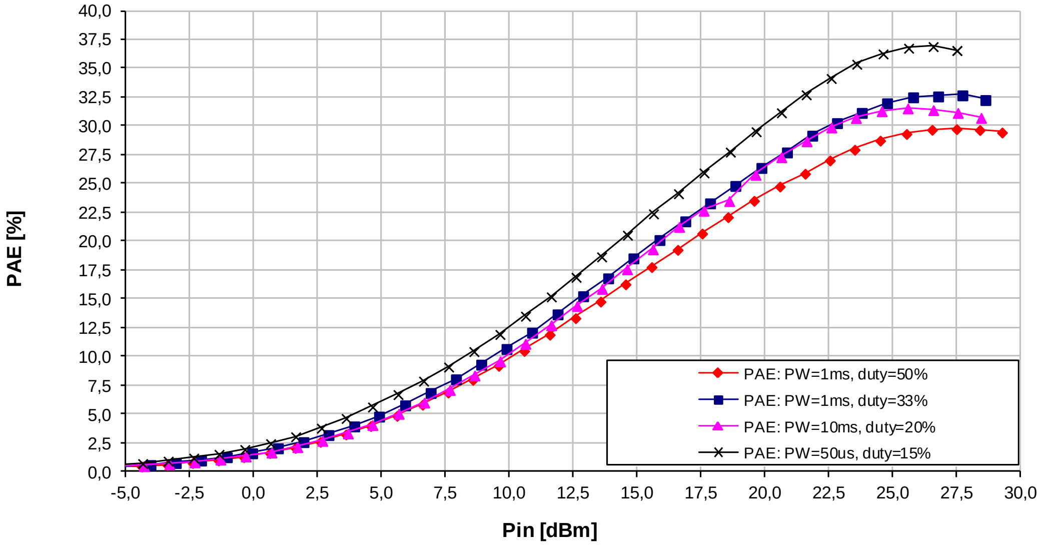
- **Vd = 28 V; Idq = 0.98 A; Pulsed Vd: Pulse width = 50 µs, Period = 333 µs, duty cycle = 15 %**
- **Vd = 28 V; Idq = 0.98 A; Pulsed Vd: Pulse width = 1 ms, Period = 2 ms, duty cycle = 50 %**
- **Vd = 28 V; Idq = 0.98 A; Pulsed Vd: Pulse width = 1 ms, Period = 3 ms, duty cycle = 33 %**
- **Vd = 28 V; Idq = 0.98 A; Pulsed Vd: Pulse width = 10 ms, Period = 50 ms, duty cycle = 20 %**

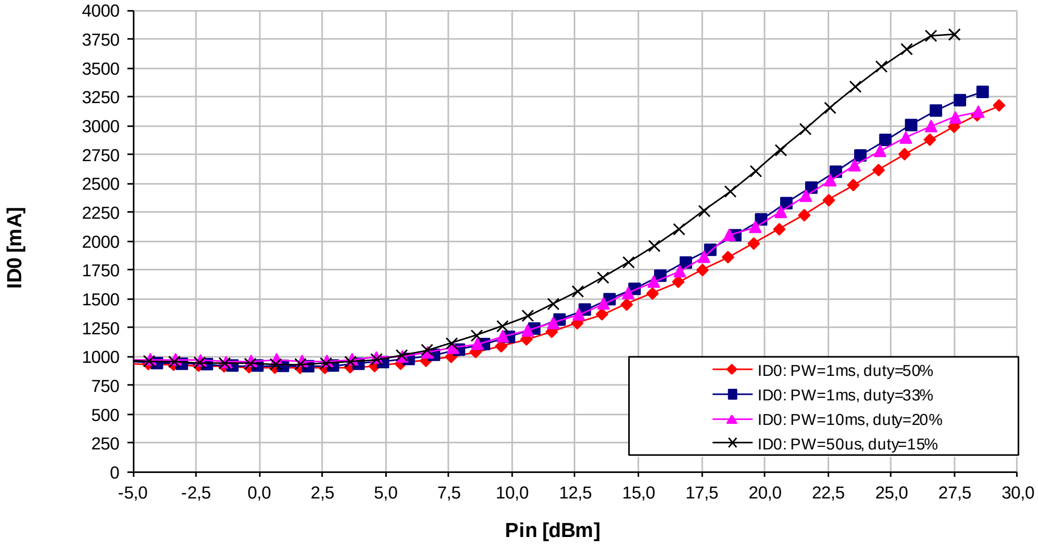
Pout and Gain





PAE and Drain Current (ID0)

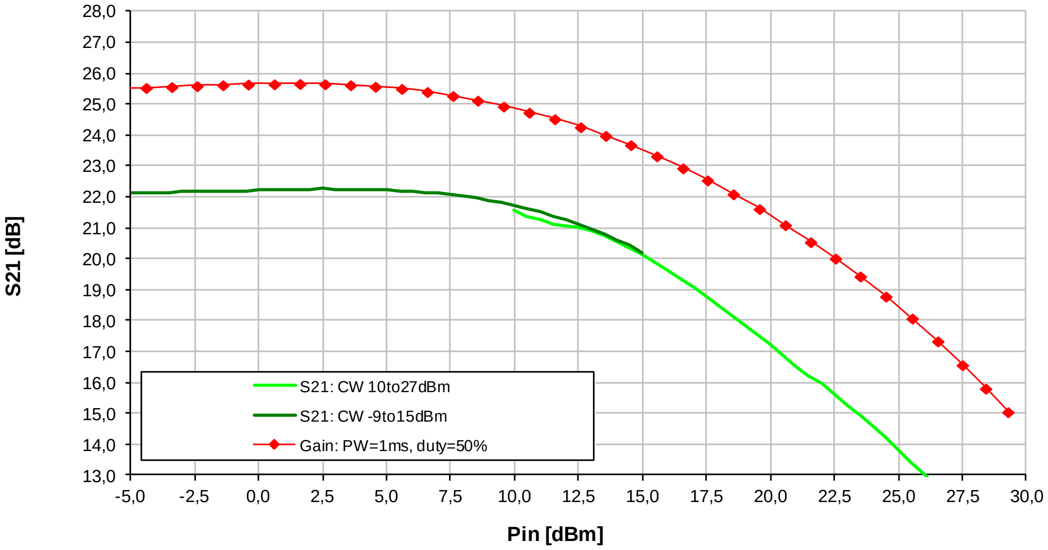


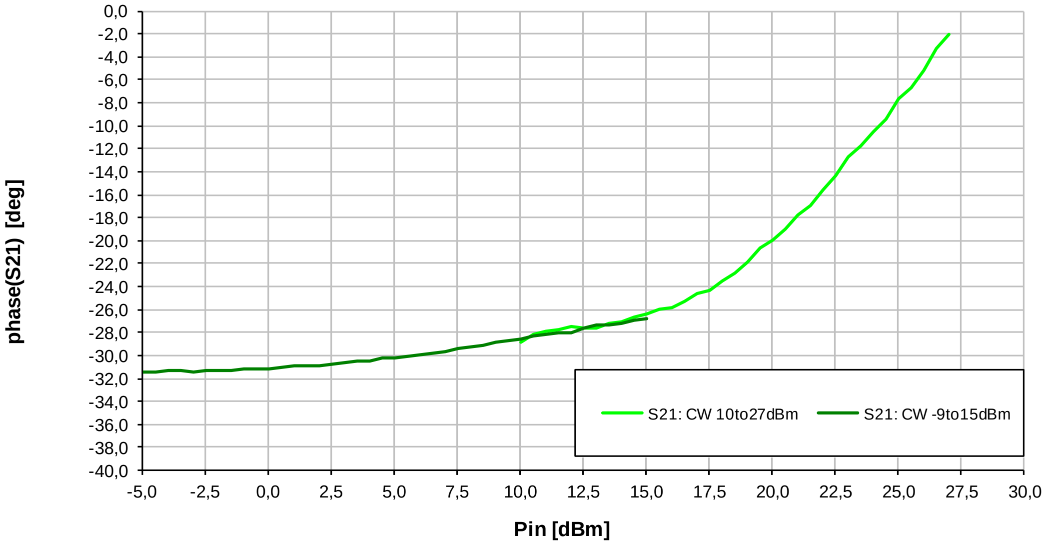


Magnitude and Phase of S21 at 5 GHz Vs. Input Power (CW):

- **Gain measurement Vd = 28 V; Idq = 0.98 A; Pulsed Vd: PW = 1 ms, Per. = 2 ms, duty = 50 %**
- **S21 measurement Vd = 28 V; Idq = 0.98 A, CW; Pin = -5 to 15 dBm**
- **S21 measurement Vd = 28 V; Idq = 0.98 A, CW; Pin = 10 to 27 dBm**

|S21| and ∠S21



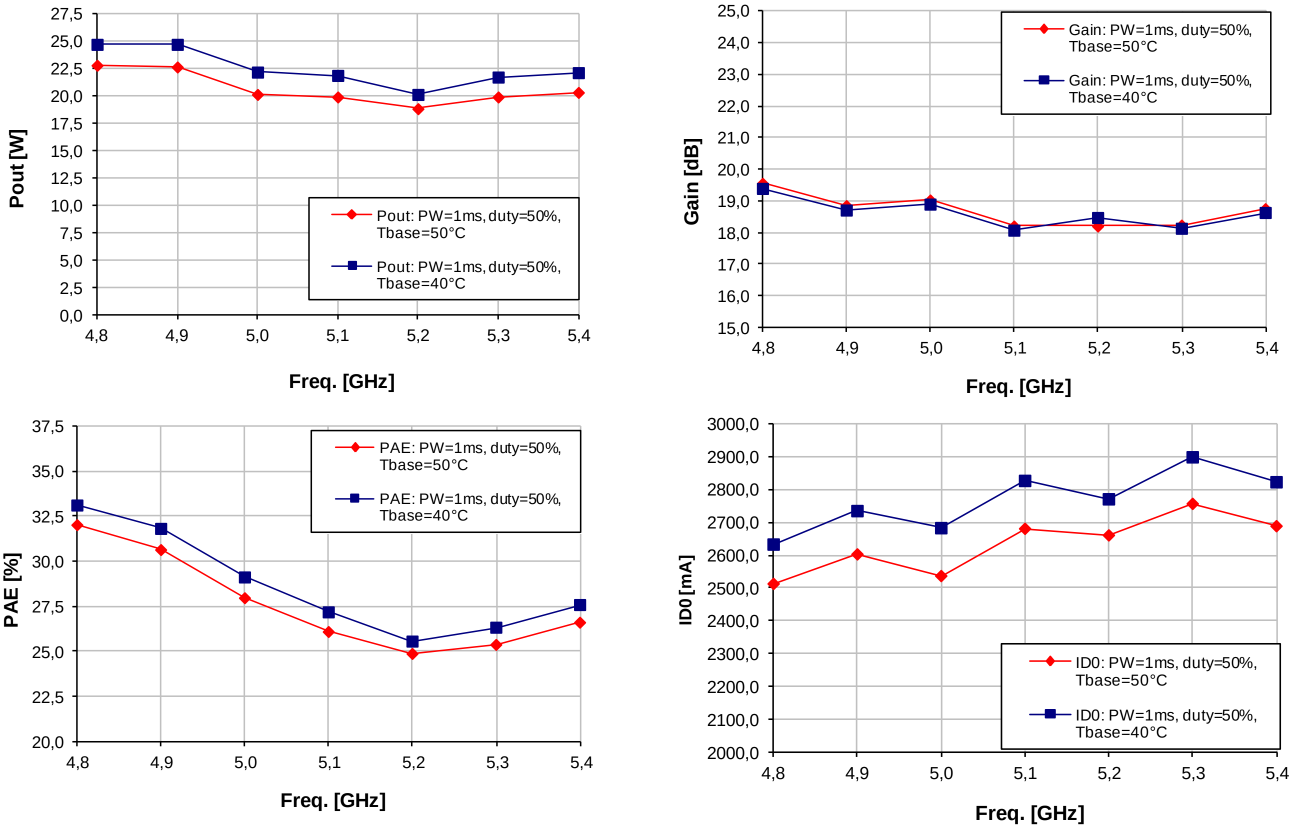


Frequency Sweep at Pout ≅ 20 Watt Vs. Base Plate Temperature

Vd = 28 V, Idq = 0.98 A, pulsed Vd;
Pulse Width = 1 ms, Period = 2 ms, Duty Cycle = 50 %

- **Base Plate Temperature = 50 deg C**
- **Base Plate Temperature = 40 deg C**

Pout, Gain, PAE and Drain Current (ID0) - Required Pin = 24.5 dBm



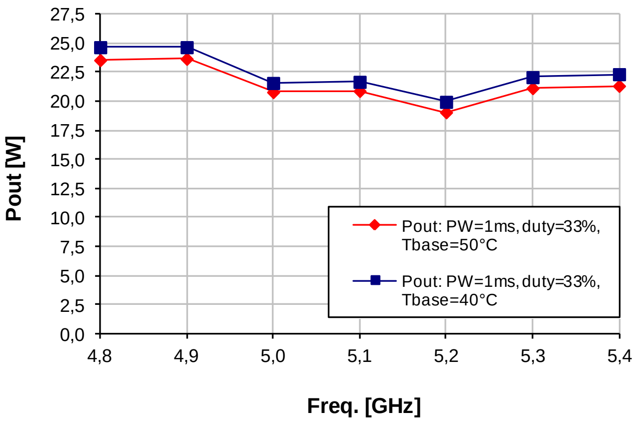
Pout Variation over Temperature ≅ -0.037 dB/degC
Gain Variation over Temperature ≅ -0.012 dB/degC
PAE Variation over Temperature ≅ -0.1 %/degC

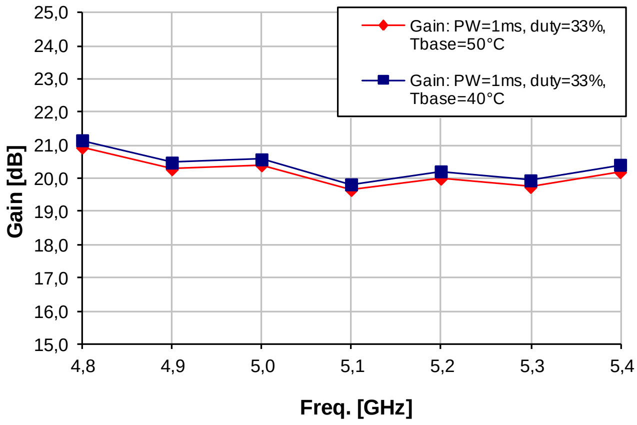
Frequency Sweep at Pout ≅ 20 Watt Vs. Base Plate Temperature

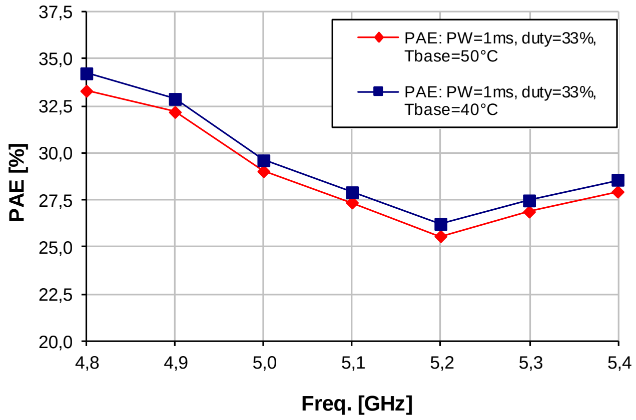
Vd = 28 V, Idq = 0.98 A, pulsed Vd;
Pulse Width = 1 ms, Period = 3 ms, Duty Cycle = 33 %

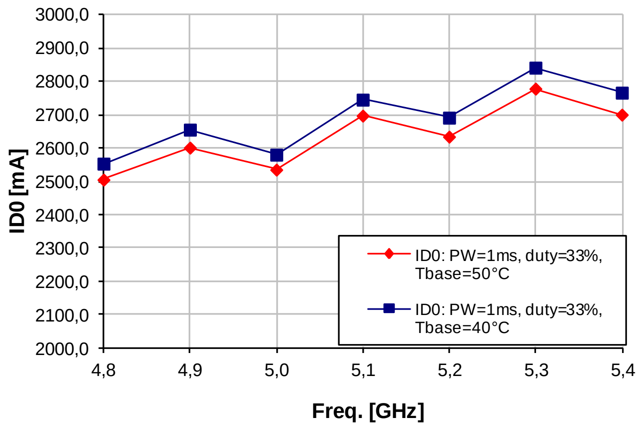
- **Base Plate Temperature = 50 deg C**
- **Base Plate Temperature = 40 deg C**

Pout, Gain, PAE and Drain Current (ID0) - Required Pin = 23.0 dBm









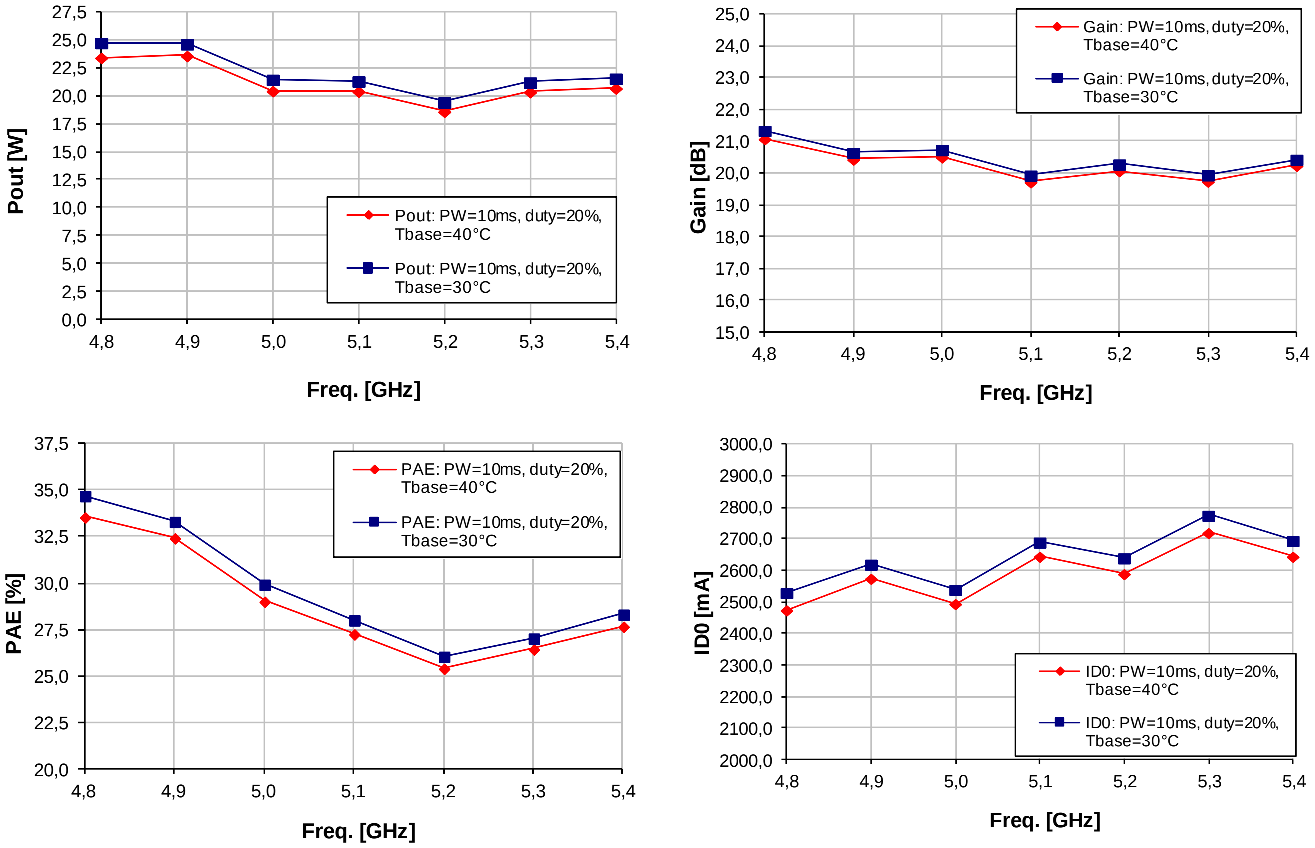
Pout Variation over Temperature ≅ -0.018 dB/degC
Gain Variation over Temperature ≅ -0.020 dB/degC
PAE Variation over Temperature ≅ -0.066 %/degC

Frequency Sweep at Pout ≅ 20 Watt Vs. Base Plate Temperature

Vd = 28 V, Idq = 0.98 A, pulsed Vd;
Pulse Width = 10 ms, Period = 50 ms, Duty Cycle = 20 %

- **Base Plate Temperature = 40 deg C**
- **Base Plate Temperature = 30 deg C**

Pout, Gain, PAE and Drain Current (ID0) - Required Pin = 23.0 dBm



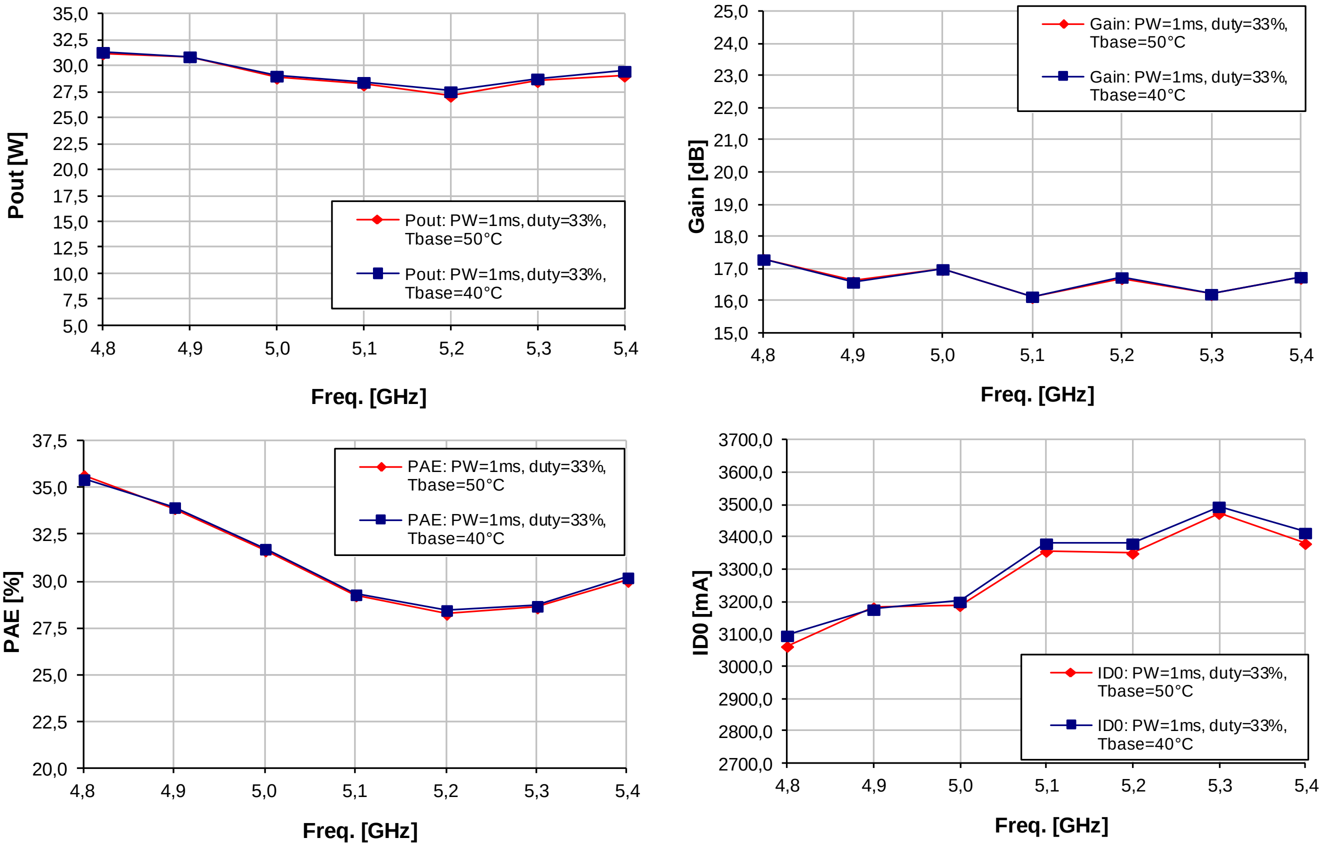
Pout Variation over Temperature ≅ -0.020 dB/degC
Gain Variation over Temperature ≅ -0.022 dB/degC
PAE Variation over Temperature ≅ -0.080 %/degC

Frequency Sweep at Pin ≅ 28 dBm Vs. Base Plate Temperature

Vd = 28 V, Idq = 0.98 A, pulsed Vd;
Pulse Width = 1 ms, Period = 3 ms, Duty Cycle = 33 %

- **Base Plate Temperature = 50 deg C**
- **Base Plate Temperature = 40 deg C**

Pout, Gain, PAE and Drain Current (ID0)



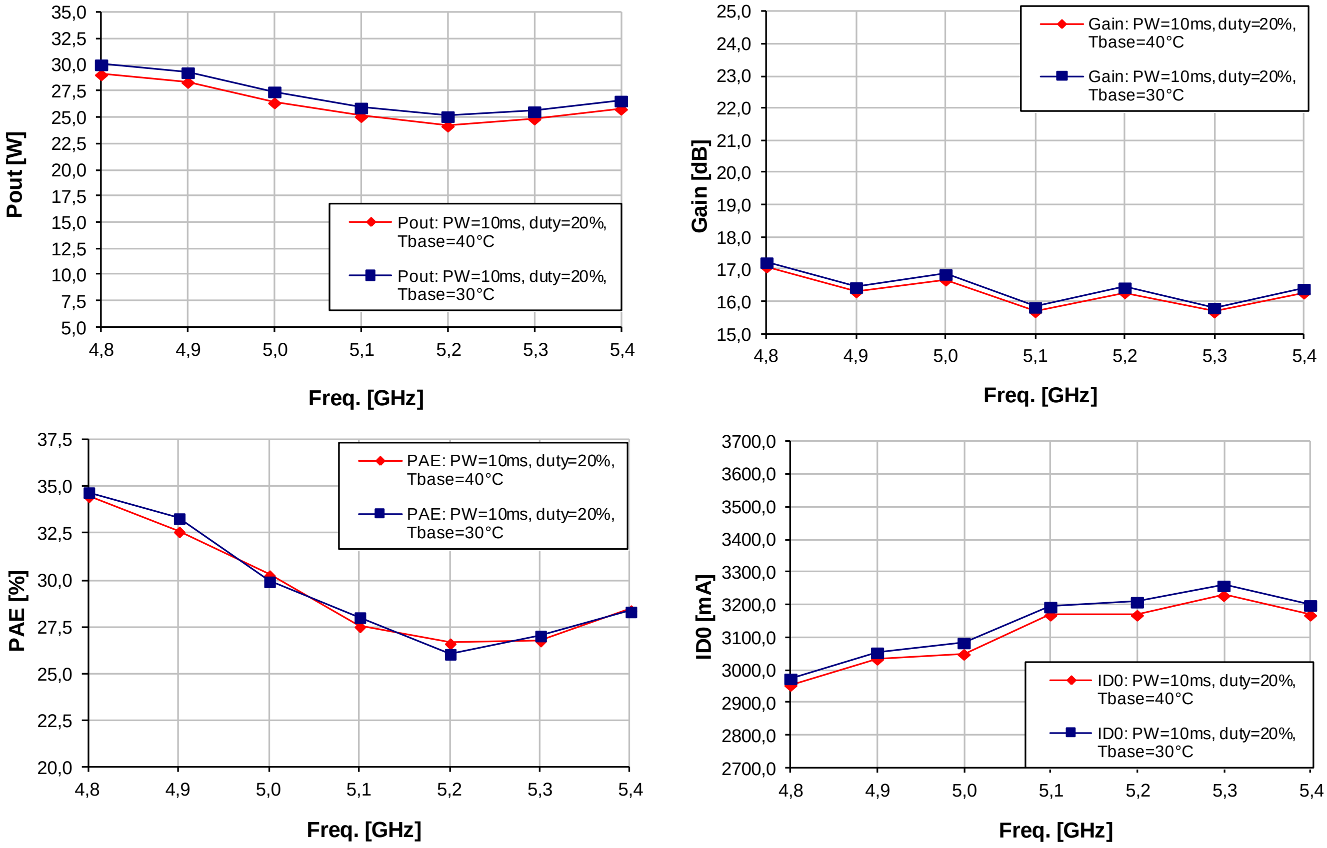
Pout Variation over Temperature ≅ -0.0038 dB/degC
Gain Variation over Temperature ≅ -0.0015 dB/degC
PAE Variation over Temperature ≅ -0.0073 %/degC

Frequency Sweep at Pin ≅ 28 dBm Vs. Base Plate Temperature

Vd = 28 V, Idq = 0.98 A, pulsed Vd;
Pulse Width = 10 ms, Period = 50 ms, Duty Cycle = 20 %

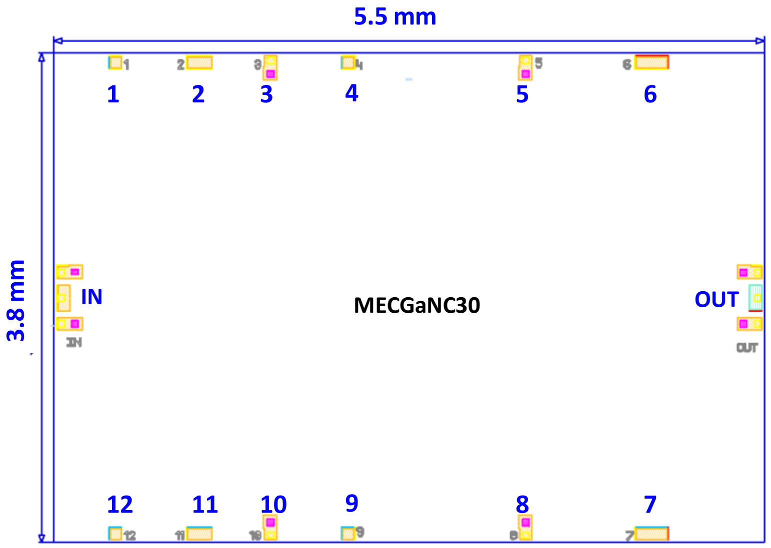
- **Base Plate Temperature = 40 deg C**
- **Base Plate Temperature = 30 deg C**

Pout, Gain, PAE and Drain Current (ID0)



Pout Variation over Temperature ≅ -0.014 dB/degC
Gain Variation over Temperature ≅ -0.015 dB/degC
PAE Variation over Temperature ≅ -0.080 %/degC

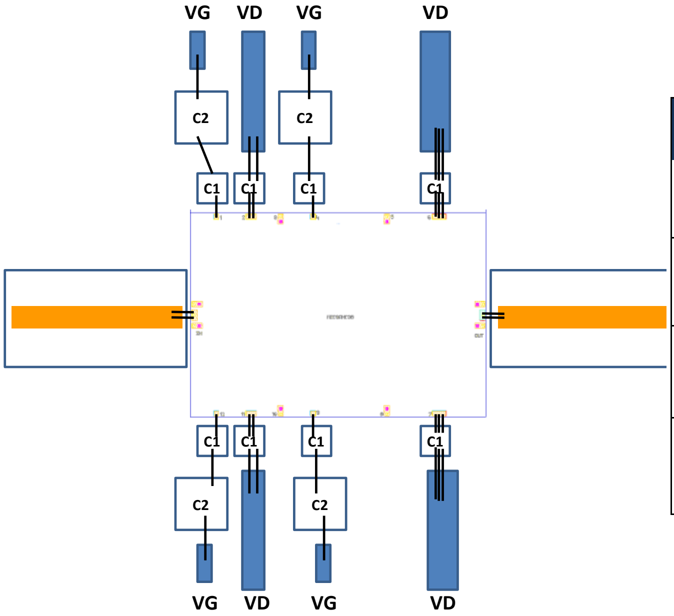
Bond Pad Configuration



- A tolerance of ± 35µm has to be considered for chip dimensions
- Chip Thickness is 100 µm ± 10 µm
- RF Pads [IN, OUT] = 100µm x 200µm
- DC Pads [1, 3, 4, 5, 8, 9, 10, 12] = 100µm x 100µm
- DC Pads [2, 11] = 200µm x 100µm
- DC Pads [6, 7] = 250µm x 100µm

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

Assembly Recommendations



Bond Pad #	Connection	External Components
IN and OUT	**2** Bonding Wires L_bond = 0.3nH	
1, 4, 9, 12 - **Vg**	L_bond ≤ 1 nH	C1 = 100pF/10V C2 = 10nF/10V
2, 11 - **Vd**	**2** Bonding Wires L_bond ≤ 1nH	**Pulsed mode** C1 = 100pF/50V **CW mode:** C1 = 100pF/50V C2 = 10nF/50V
6, 7 - **Vd**	**3** Bonding Wires L_bond ≤ 1nH	

- 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 -5 V.
2. Vd set to +28 V.
3. Adjust Vg until quiescent Id is 1 A (Vg = -3.0 V Typical).
4. Apply RF signal.

Bias-Down

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

Contact Information

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