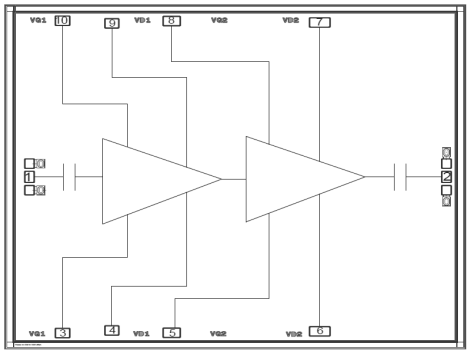
Features

- Frequency: 2-6GHz
- Small Signal Gain: 23dB Typical
- Power Gain: 15dB Typical
- Gain Flatness: ±1.0dB Typical
- Psat: 46dBm CW Typical
- PAE: 38% Typical
- Supply Voltage:
  VD=+28V@1.2A,VG=-2.18V
- Input/Output: 50Ω
- Die Size: 4.1 x 3.8 x 0.1mm

Functional Block Diagram



Typical Applications

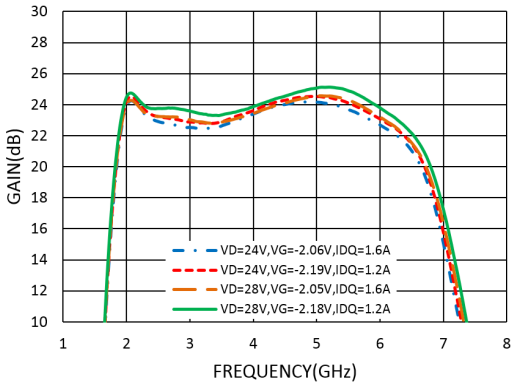
- Test Instrumentation
- Microwave Radio & VSAT
- Military & Space
- Telecom Infrastructure
- Fiber Optics

Electrical Specifications

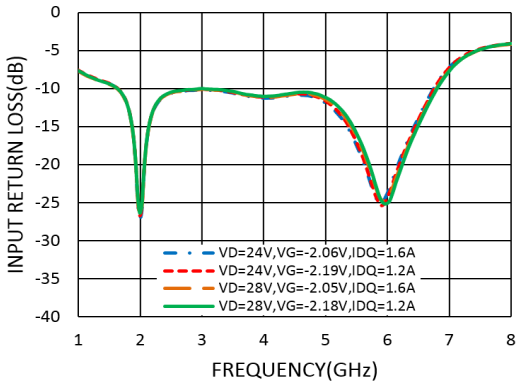
TA = +25°C, VD=+28V , VG=-2.18V , IDQ =1.2A Typical

Parameters	Min.	Typ.	Max.	Units
Frequency	2		6	GHz
Small Signal Gain	22	23		dB
Power Gain		15		dB
Gain Flatness		±1.0		dB
Psat - Saturated Output Power		46		dBm
PAE-Power Added Efficiency		38		%
Input Return Loss		-10		dB
Output Return Loss		-10		dB

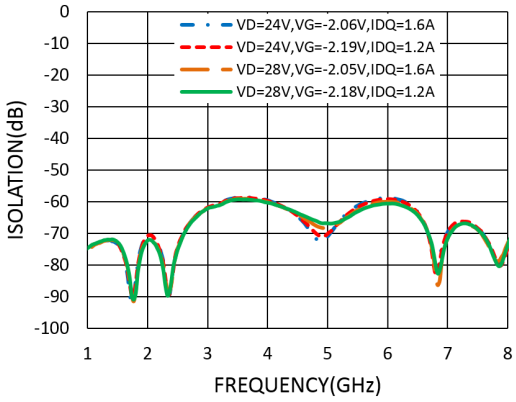
Measurement Plots: Gain
T_A = +25°C



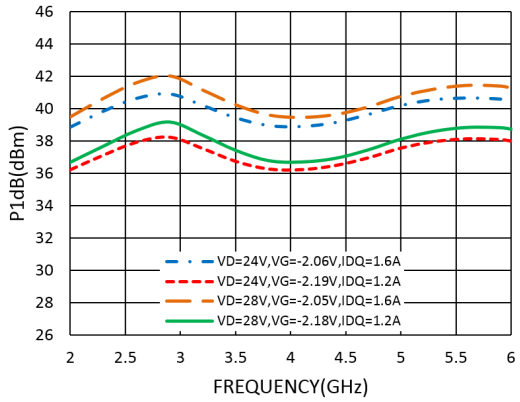
Measurement Plots: Input Return Loss
T_A = +25°C



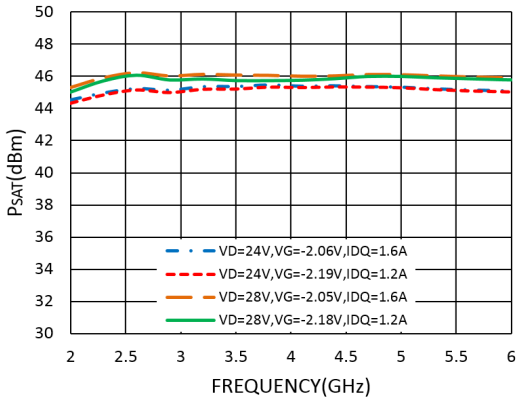
Measurement Plots: Isolation
T_A = +25°C



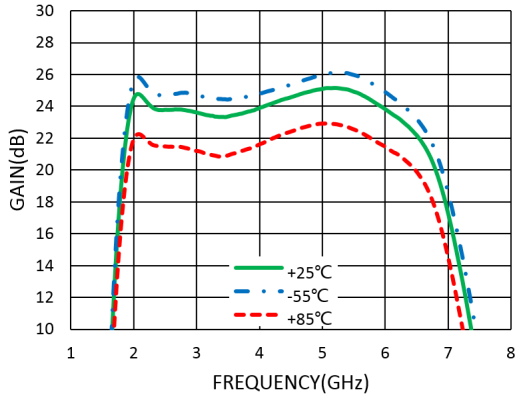
Measurement Plots: P1dB(CW)
T_A = +25°C



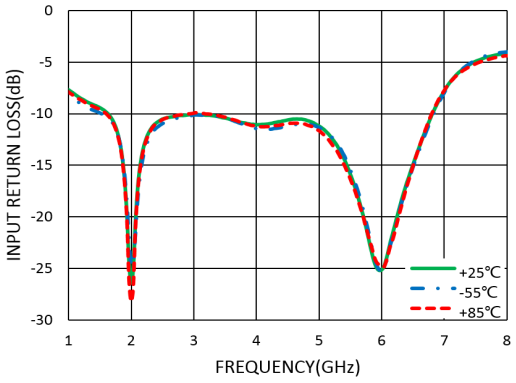
Measurement Plots: P_{SAT}(CW)
T_A = +25°C



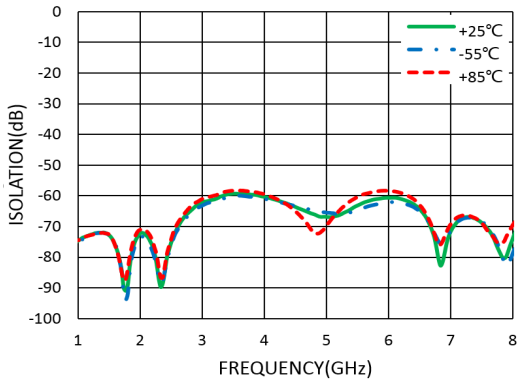
Measurement Plots: Gain
VD=28V , VG=-2.18V , IDQ=1.2A



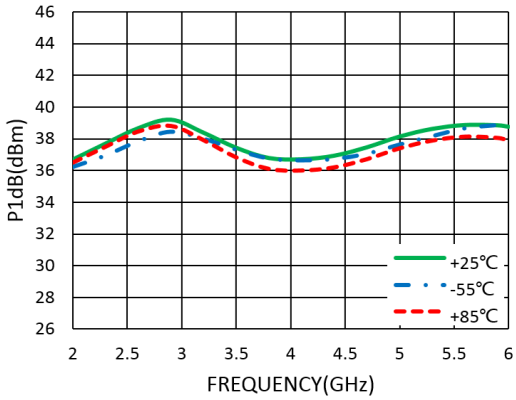
Measurement Plots: Input Return Loss
VD=28V , VG=-2.18V , IDQ=1.2A



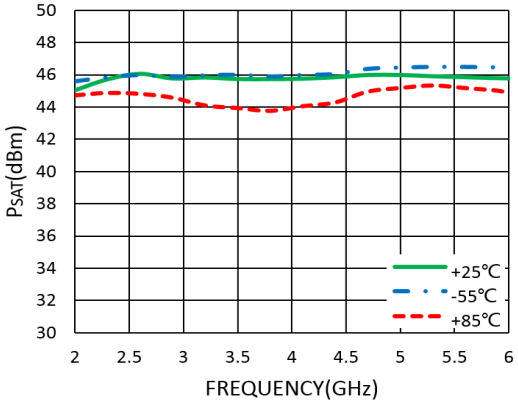
Measurement Plots: Isolation
VD=28V , VG=-2.18V , IDQ=1.2A



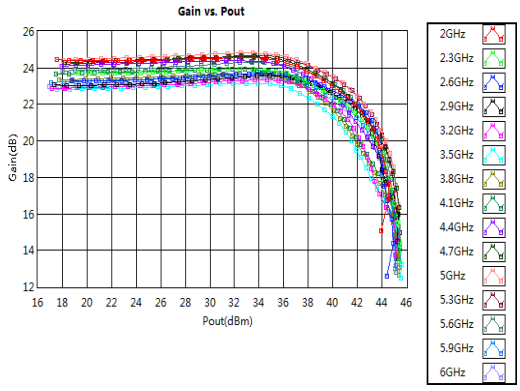
Measurement Plots: P1dB(CW)
VD=28V , VG=-2.18V , IDQ=1.2A



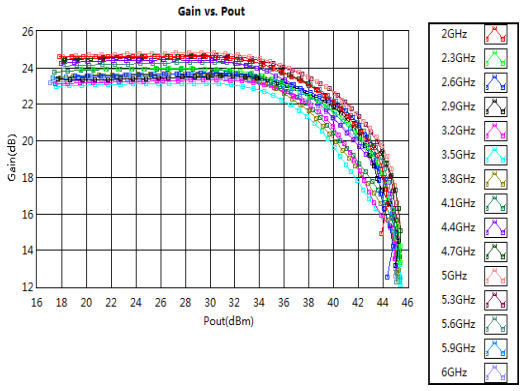
Measurement Plots: P_{SAT}(CW)
VD=28V , VG=-2.18V , IDQ=1.2A



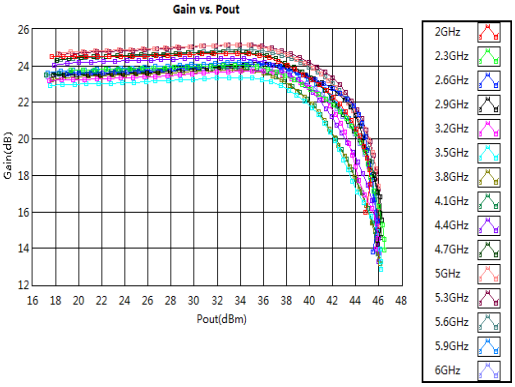
Measurement Plots: Gain vs. Pout(CW)
T_A = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



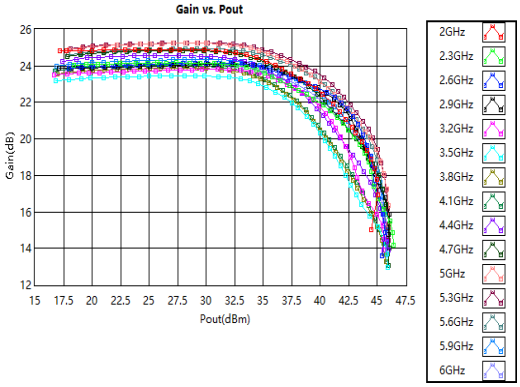
Measurement Plots: Gain vs. Pout(CW)
T_A = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



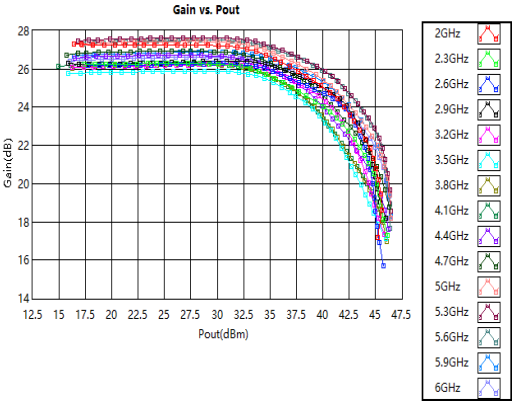
Measurement Plots: Gain vs. Pout(CW)
T_A = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



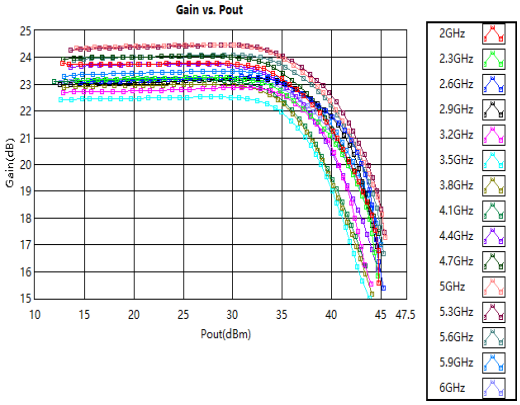
Measurement Plots: Gain vs. Pout(CW)
T_A = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



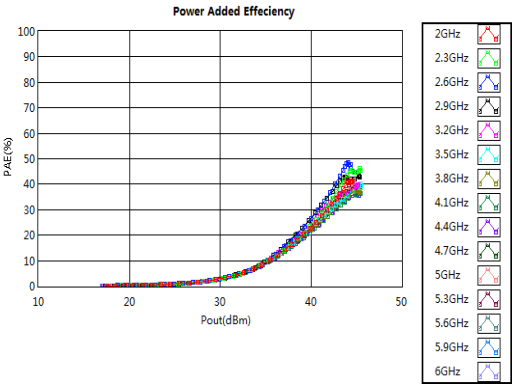
Measurement Plots: Gain vs. Pout(CW)
T_A = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



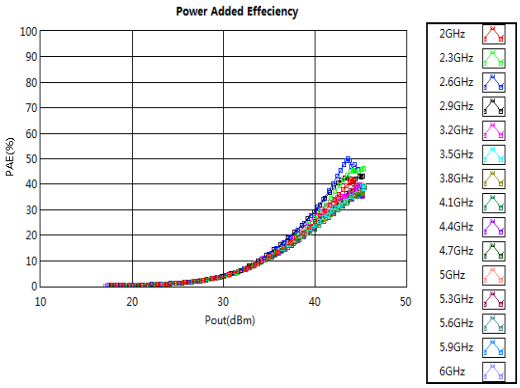
Measurement Plots: Gain vs. Pout(CW)
T_A = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



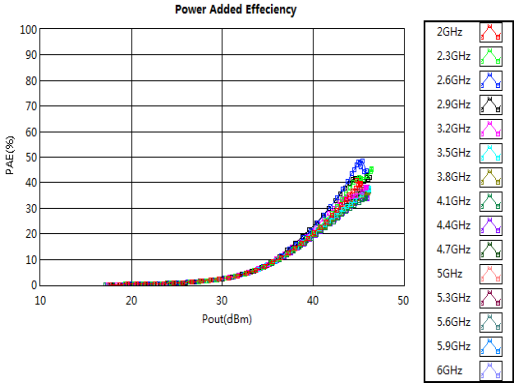
Measurement Plots: PAE(CW)
T_A = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



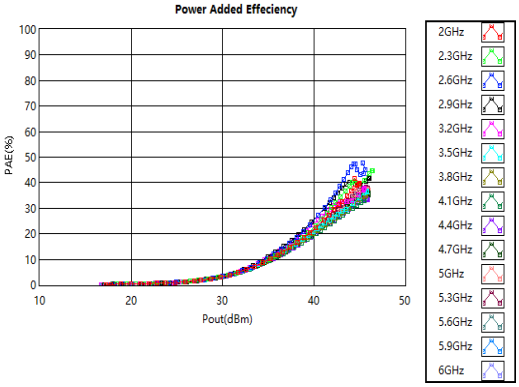
Measurement Plots: PAE(CW)
T_A = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



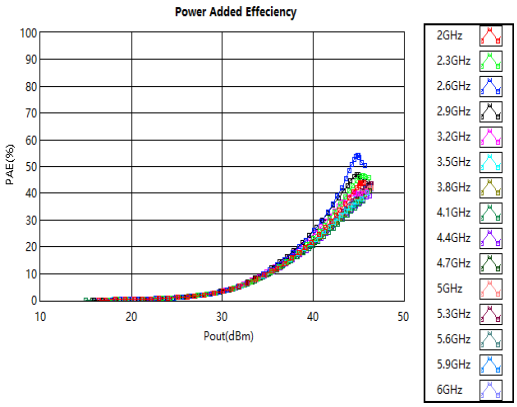
Measurement Plots: PAE(CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



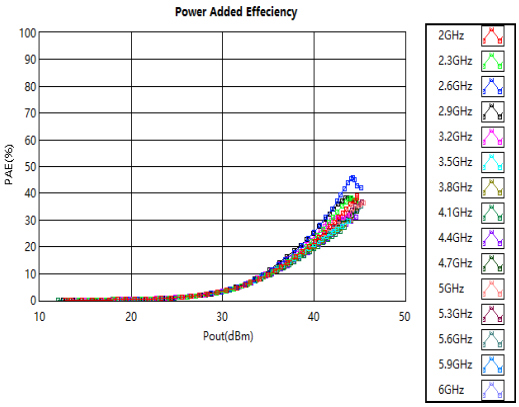
Measurement Plots: PAE(CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



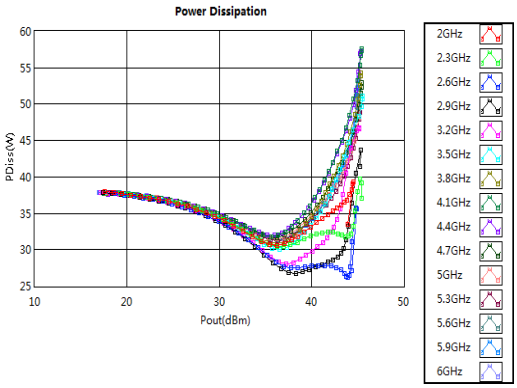
Measurement Plots: PAE(CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



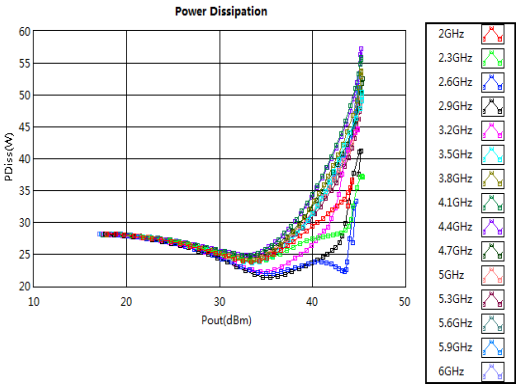
Measurement Plots: PAE(CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



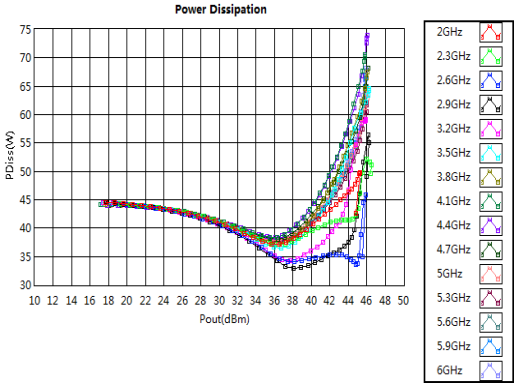
Measurement Plots: Power Dissipation(CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



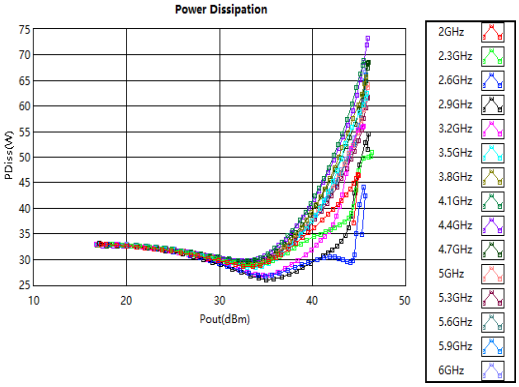
Measurement Plots: Power Dissipation(CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



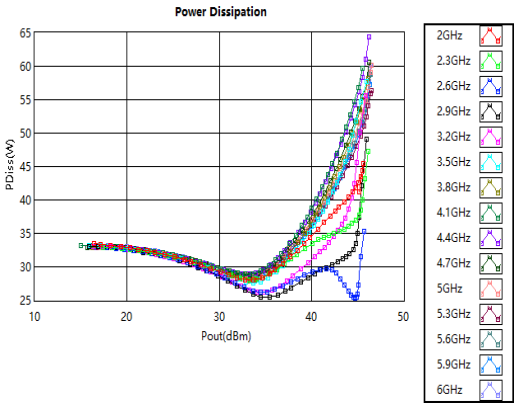
Measurement Plots: Power Dissipation(CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



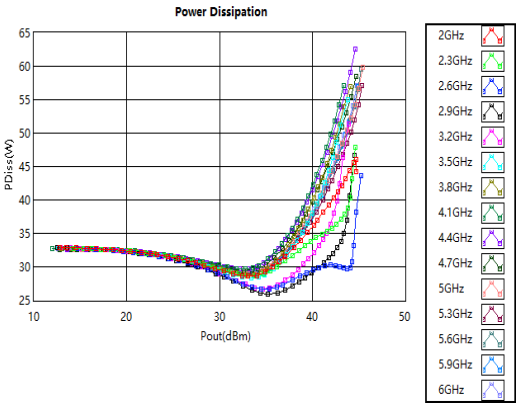
Measurement Plots: Power Dissipation(CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



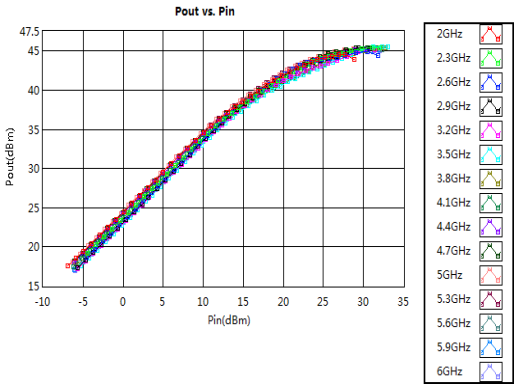
Measurement Plots: Power Dissipation(CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



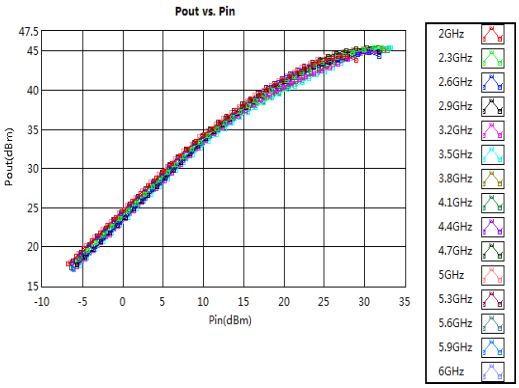
Measurement Plots: Power Dissipation(CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



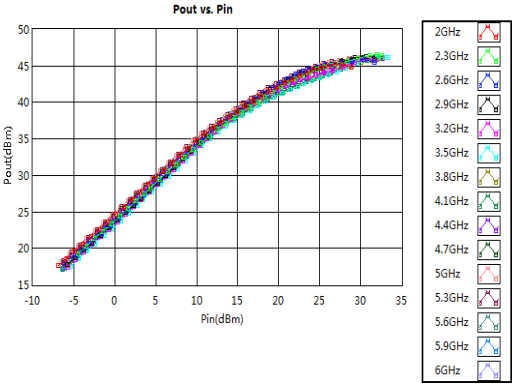
Measurement Plots: Pout vs. Pin(CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



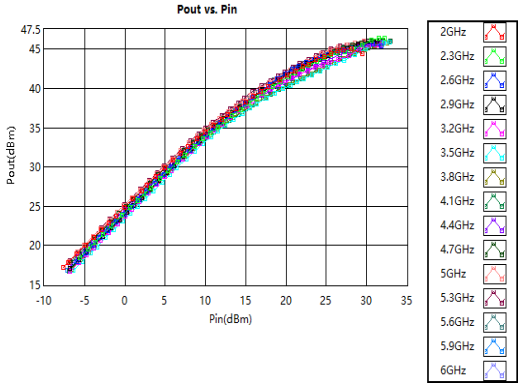
Measurement Plots: Pout vs. Pin(CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



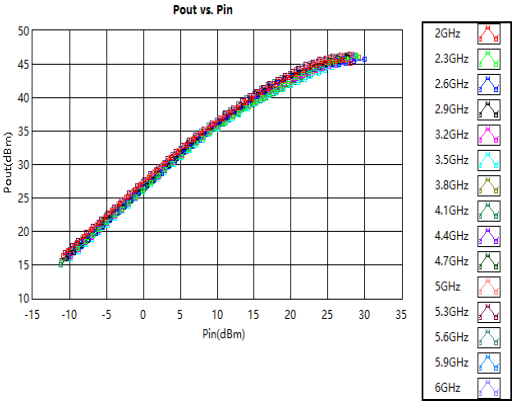
Measurement Plots: Pout vs. Pin(CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



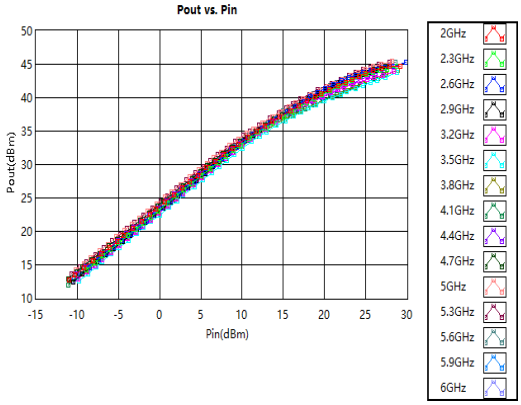
Measurement Plots: Pout vs. Pin(CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



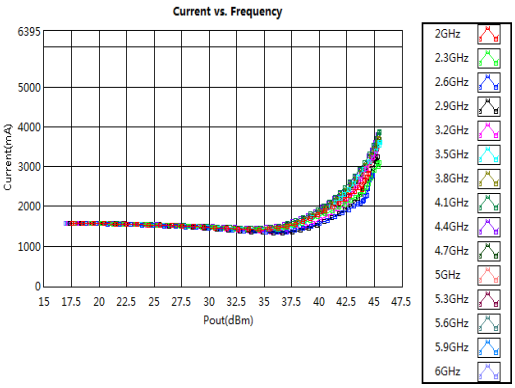
Measurement Plots: Pout vs. Pin(CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



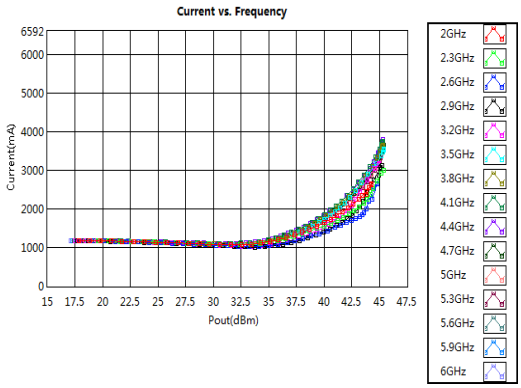
Measurement Plots: Pout vs. Pin(CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



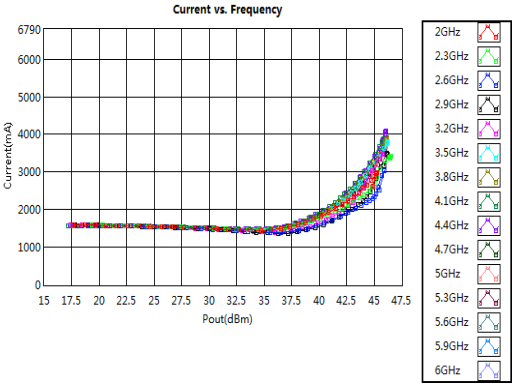
Measurement Plots: Current(CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



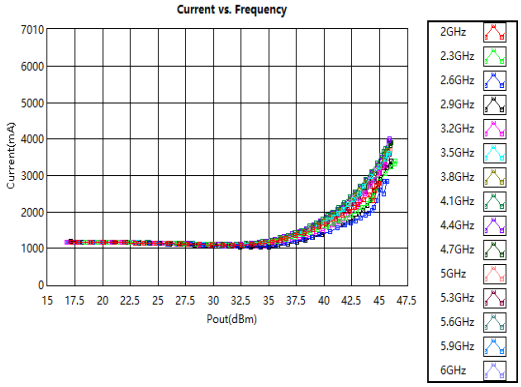
Measurement Plots: Current(CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



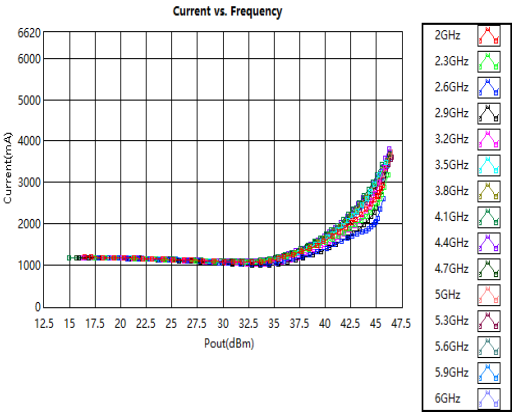
Measurement Plots: Current(CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



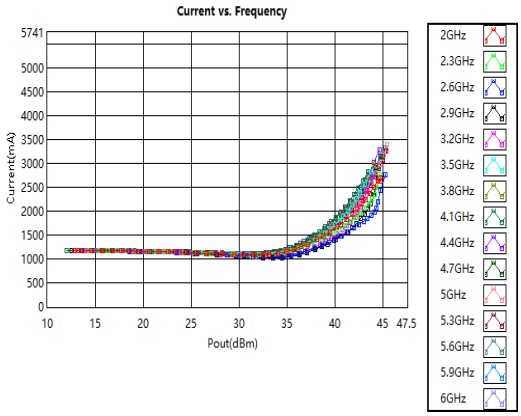
Measurement Plots: Current(CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



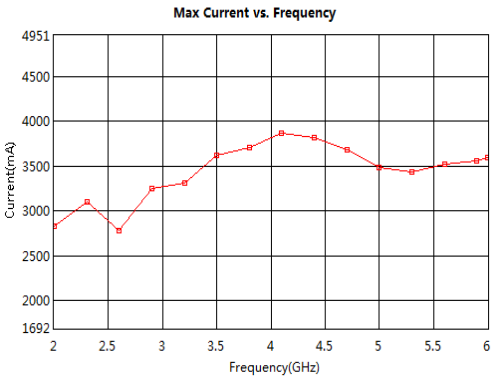
Measurement Plots: Current(CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



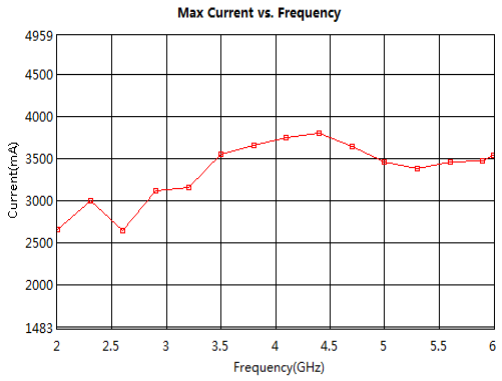
Measurement Plots: Current(CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



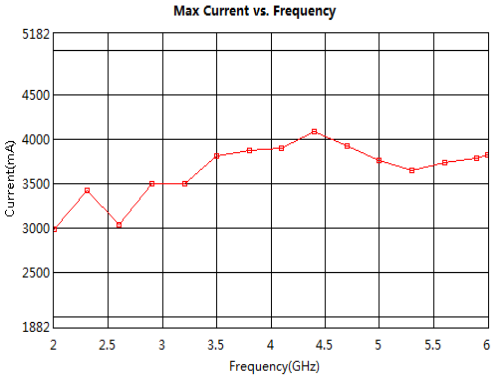
Measurement Plots: Max Current(CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



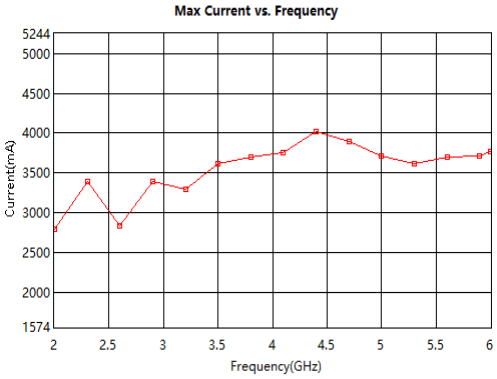
Measurement Plots: Max Current(CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



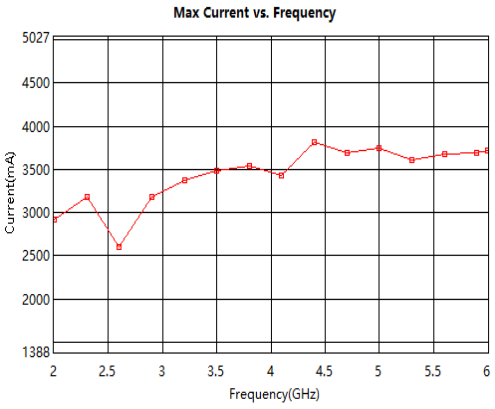
Measurement Plots: Max Current(CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



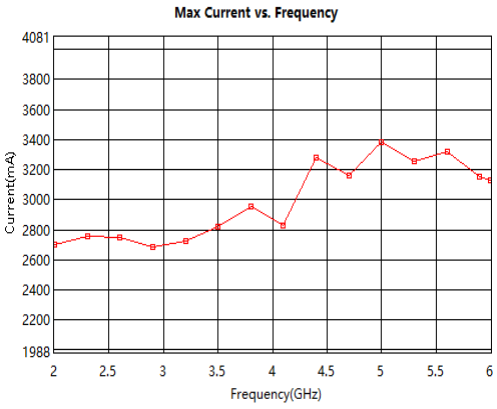
Measurement Plots: Max Current(CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



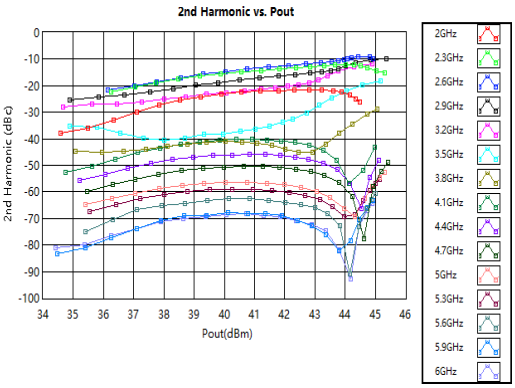
Measurement Plots: Max Current(CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



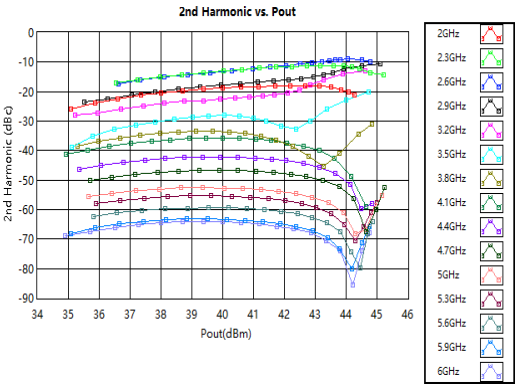
Measurement Plots: Max Current(CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



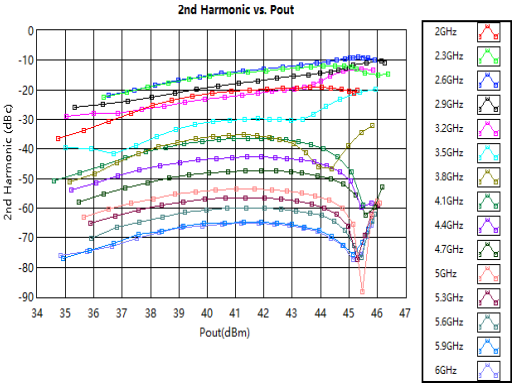
2nd Harmonic vs. Pout(CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



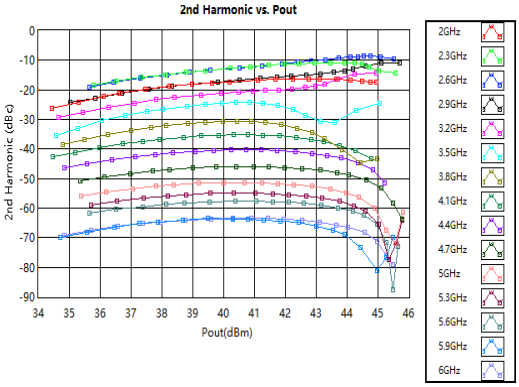
2nd Harmonic vs. Pout(CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



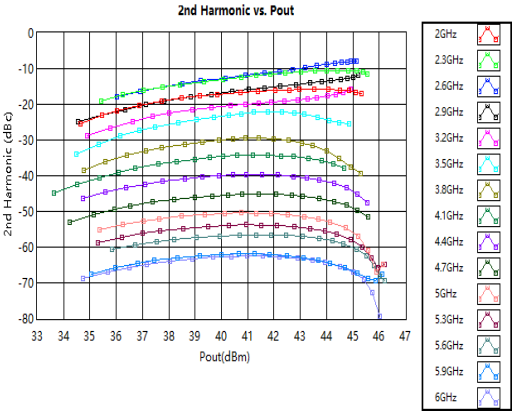
2nd Harmonic vs. Pout(CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



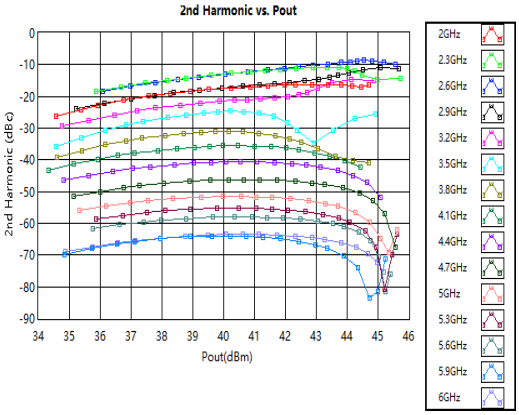
2nd Harmonic vs. Pout(CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



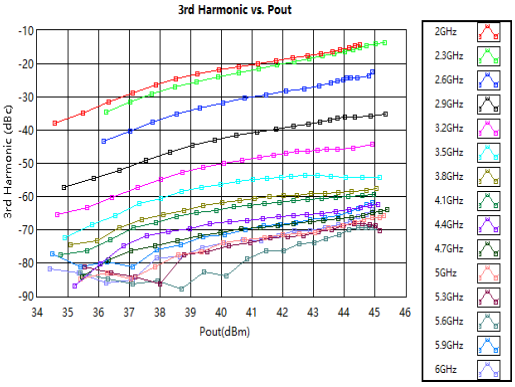
2nd Harmonic vs. Pout(CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



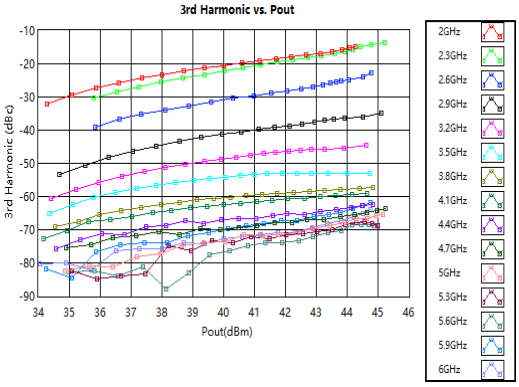
2nd Harmonic vs. Pout(CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



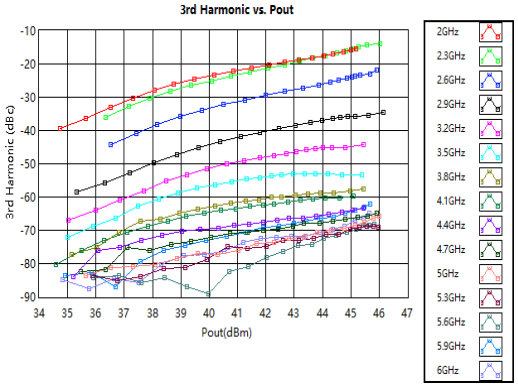
3rd Harmonic vs. Pout(CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



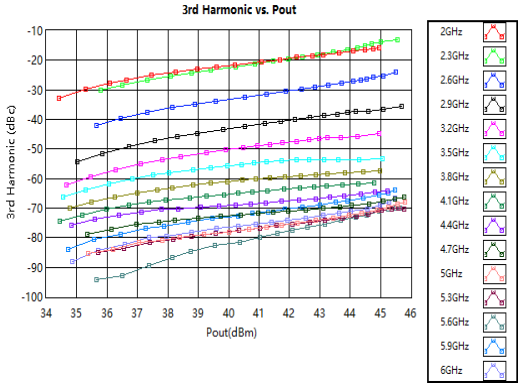
3rd Harmonic vs. Pout(CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



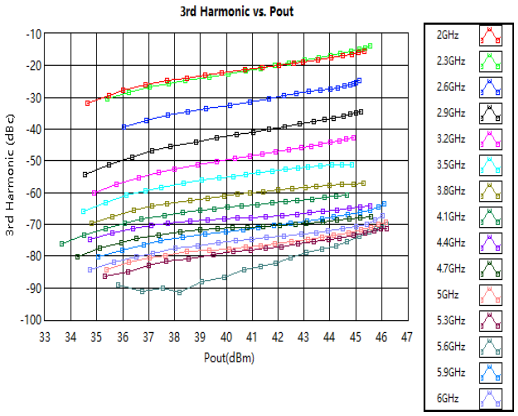
3rd Harmonic vs. Pout(CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



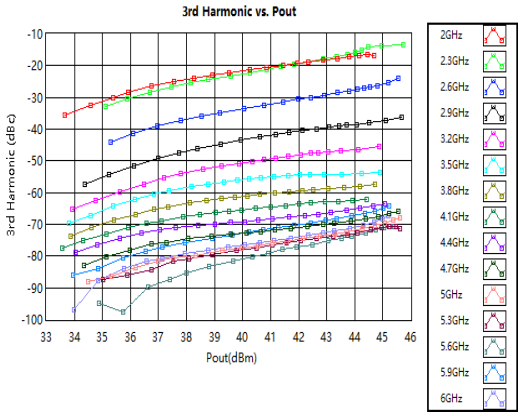
3rd Harmonic vs. Pout(CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



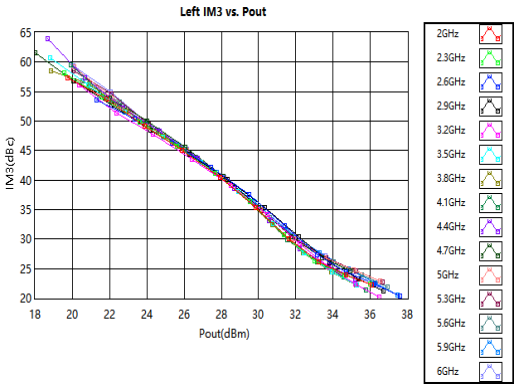
3rd Harmonic vs. Pout(CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



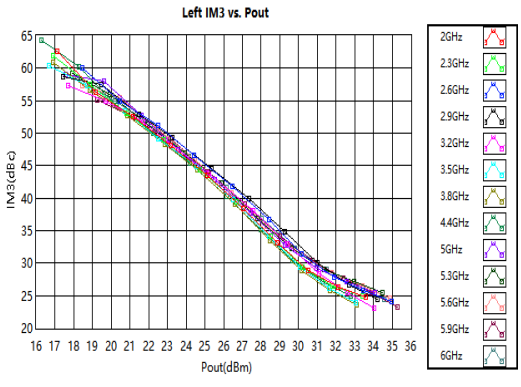
3rd Harmonic vs. Pout(CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



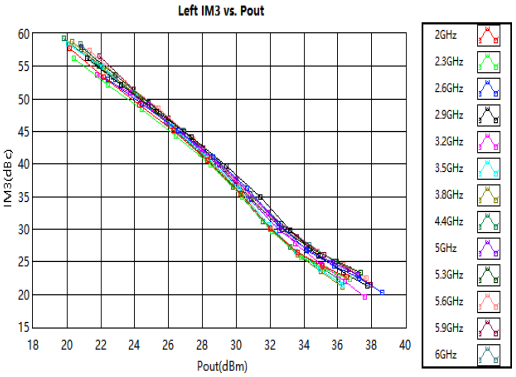
Left IM3 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



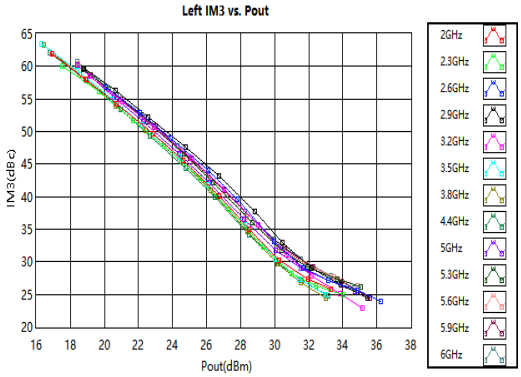
Left IM3 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



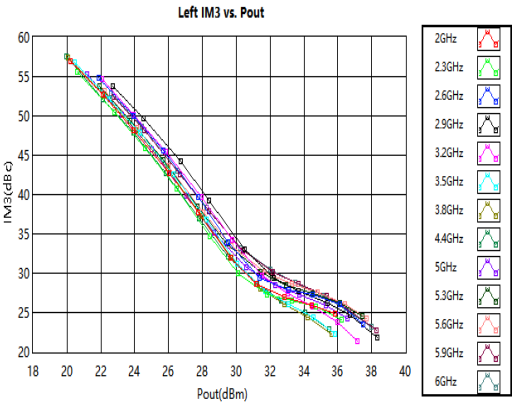
Left IM3 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



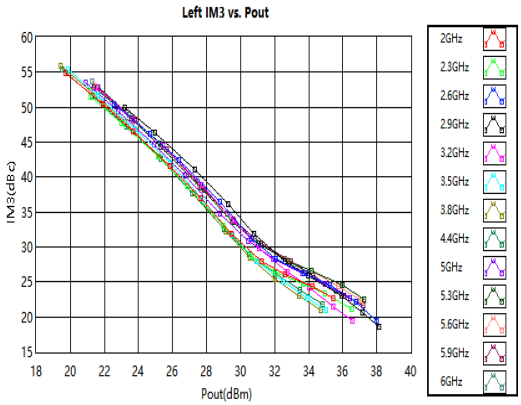
Left IM3 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



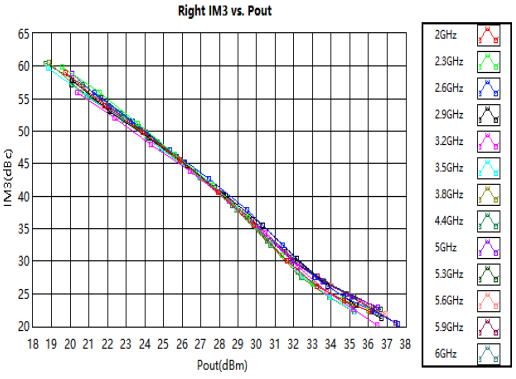
Left IM3 vs. Pout (CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



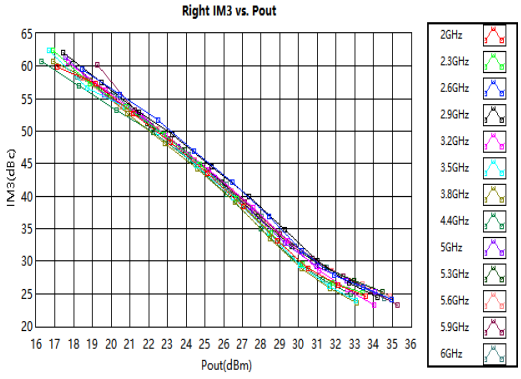
Left IM3 vs. Pout (CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



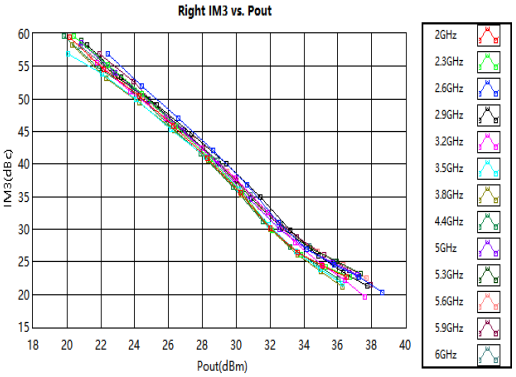
Right IM3 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



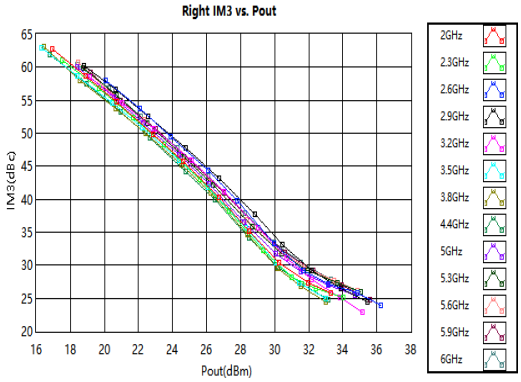
Right IM3 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



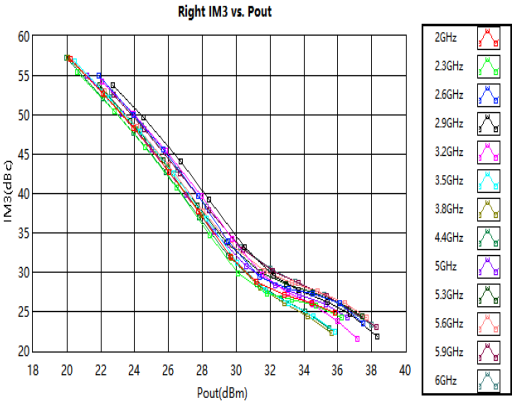
Right IM3 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



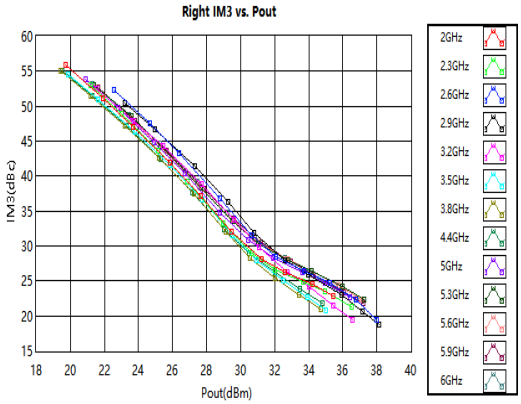
Right IM3 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



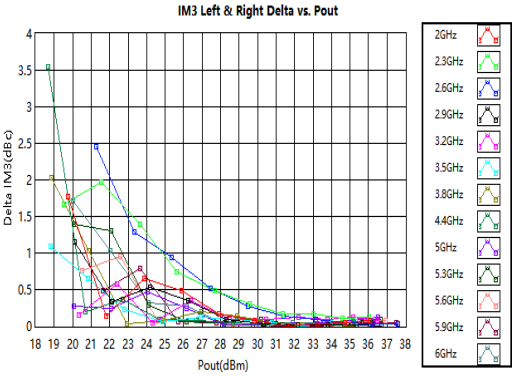
Right IM3 vs. Pout (CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



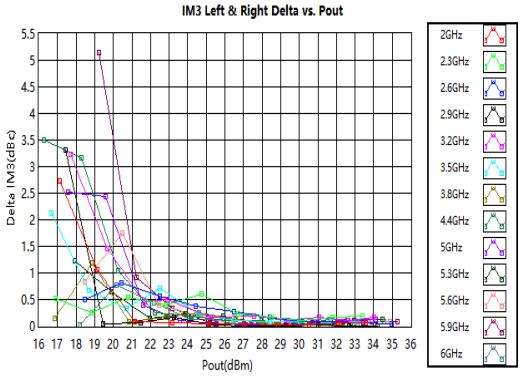
Right IM3 vs. Pout (CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



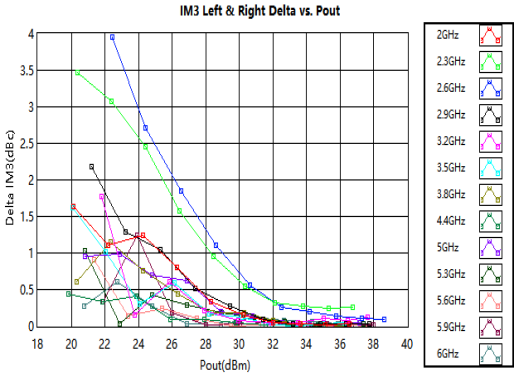
IM3 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



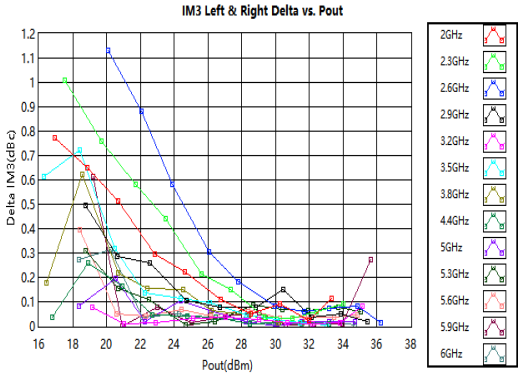
IM3 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



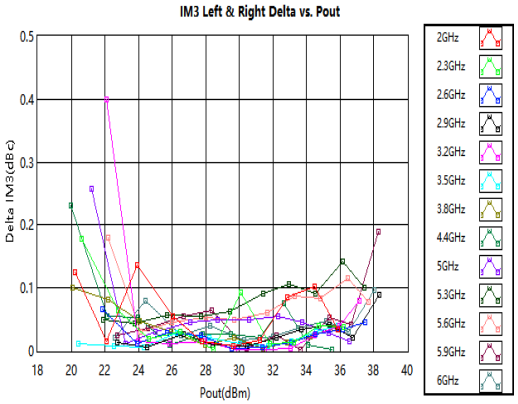
IM3 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



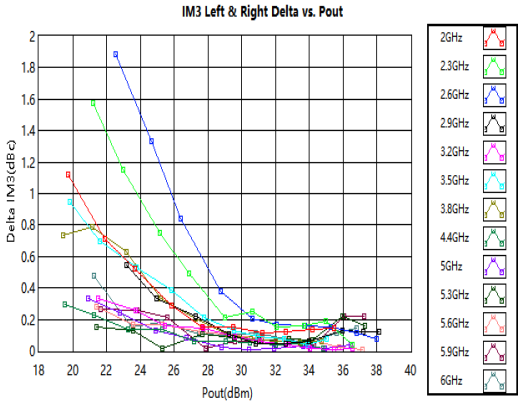
IM3 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



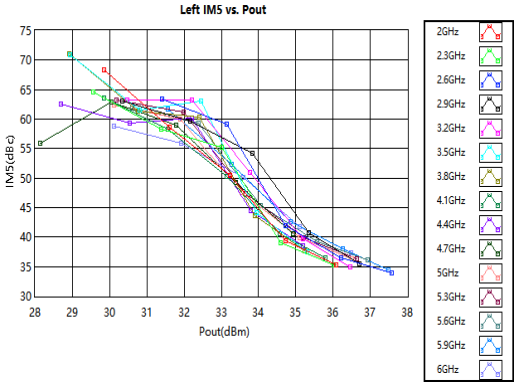
IM3 Left & Right Delta vs. Pout (CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



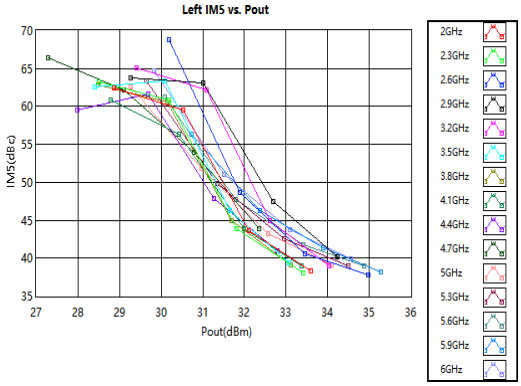
IM3 Left & Right Delta vs. Pout (CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



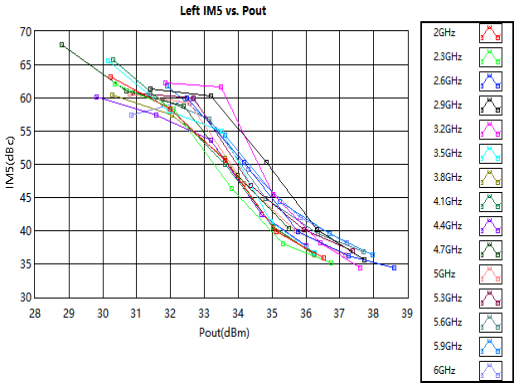
Left IM5 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



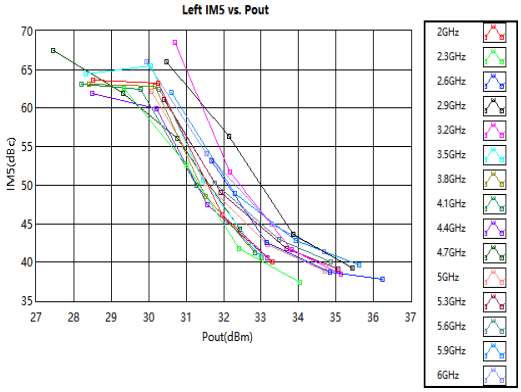
Left IM5 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



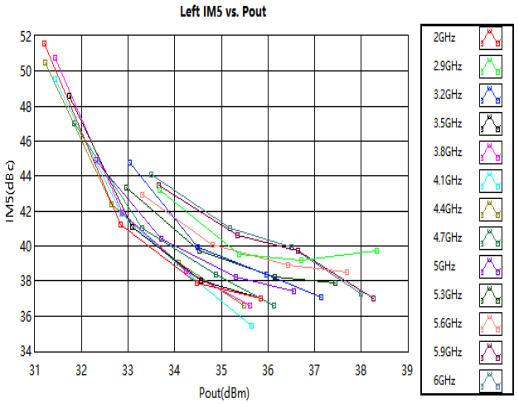
Left IM5 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



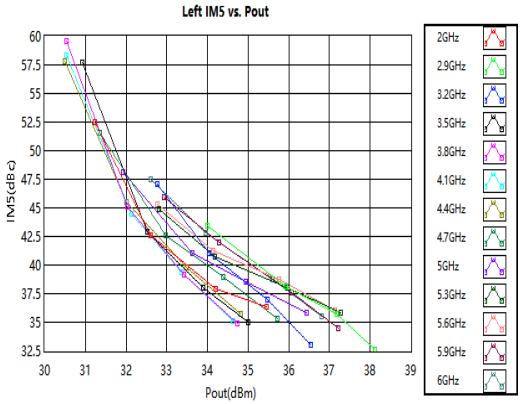
Left IM5 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



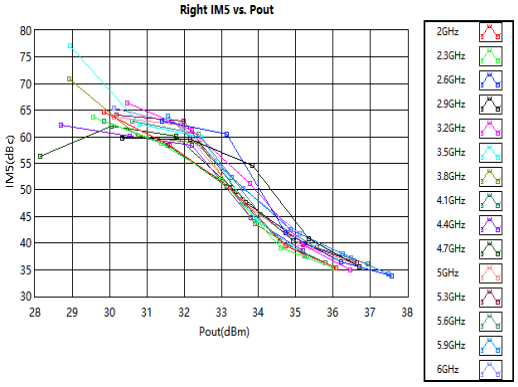
Left IM5 vs. Pout (CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



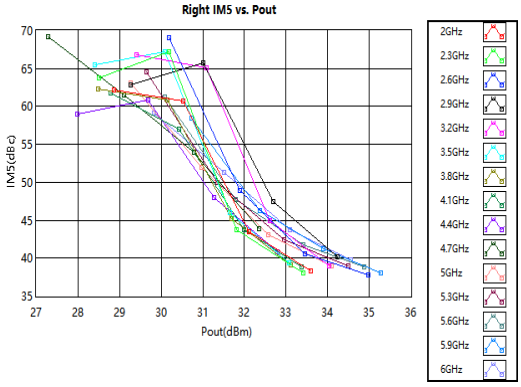
Left IM5 vs. Pout (CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



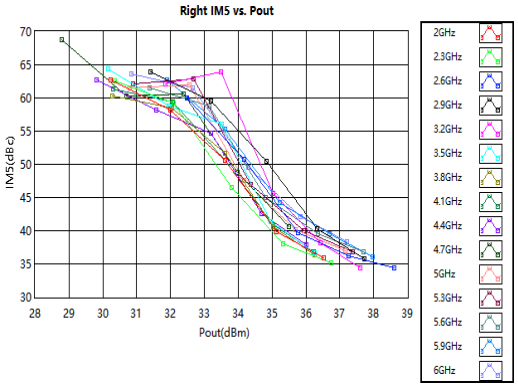
Right IM5 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



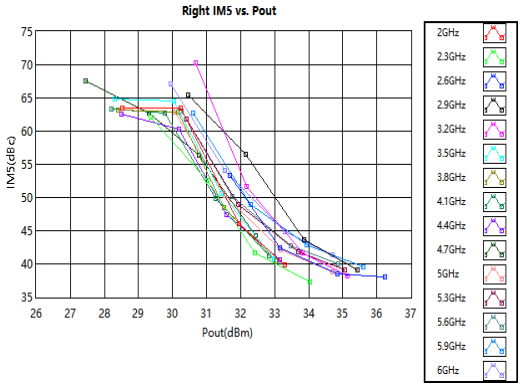
Right IM5 vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



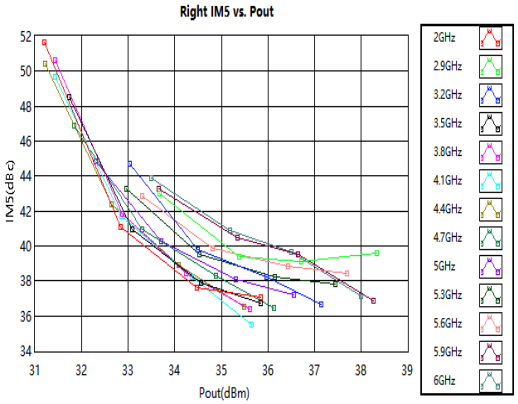
Right IM5 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



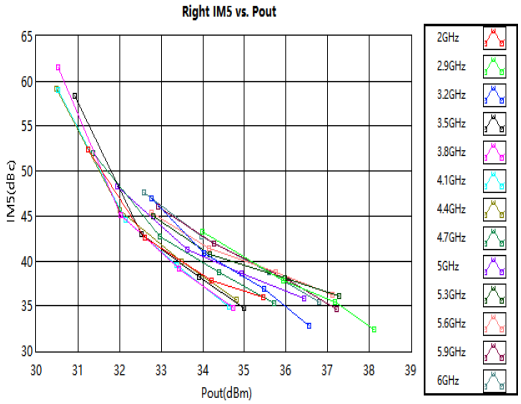
Right IM5 vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



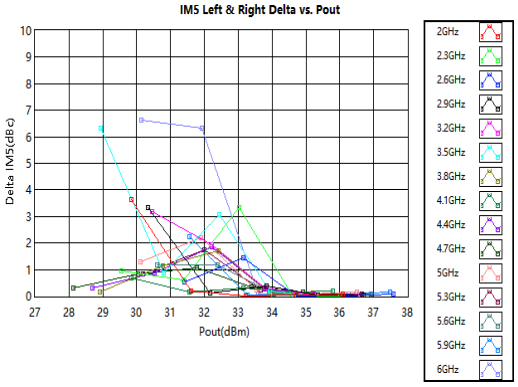
Right IM5 vs. Pout (CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



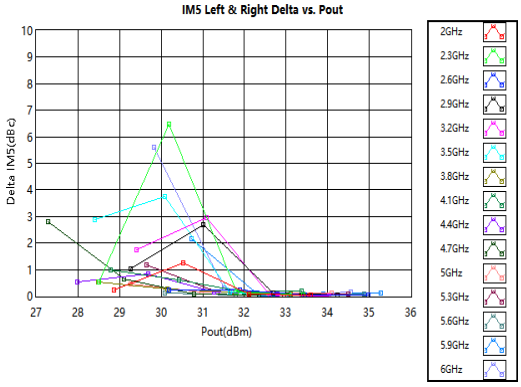
Right IM5 vs. Pout (CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



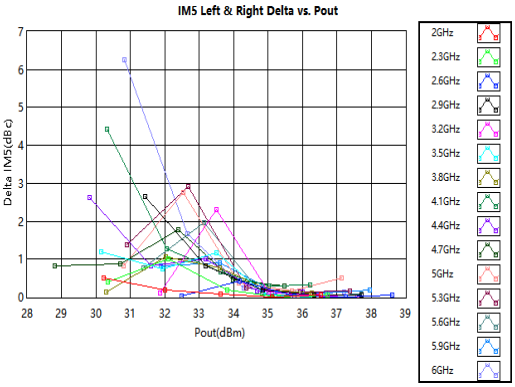
IM5 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.06V
IDQ=1.6A



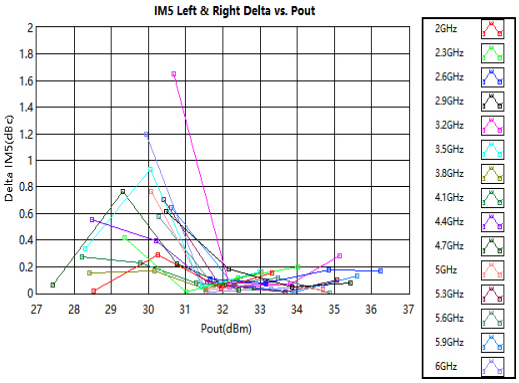
IM5 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=24V , VG=-2.19V
IDQ=1.2A



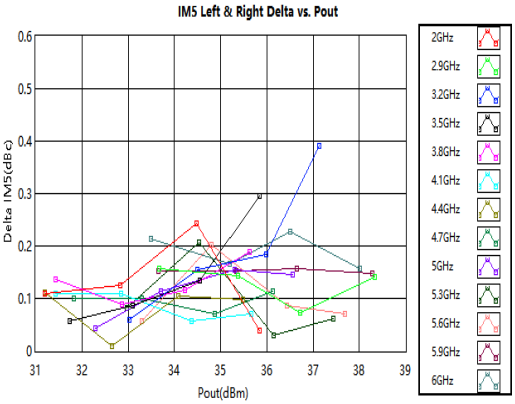
IM5 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.05V
IDQ=1.6A



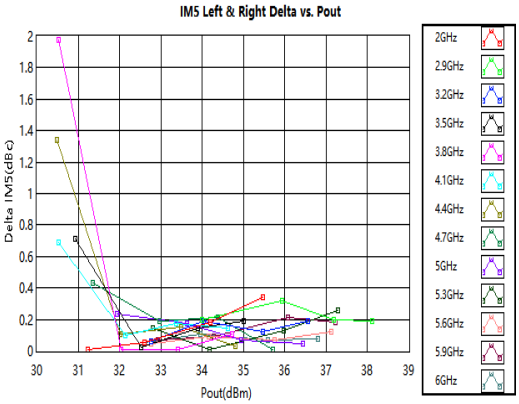
IM5 Left & Right Delta vs. Pout (CW)
TA = +25°C , VD=28V , VG=-2.18V
IDQ=1.2A



IM5 Left & Right Delta vs. Pout (CW)
TA = -55°C , VD=28V , VG=-2.18V
IDQ=1.2A



IM5 Left & Right Delta vs. Pout (CW)
TA = +85°C , VD=28V , VG=-2.18V
IDQ=1.2A



Absolute Maximum Ratings

Drain Voltage (V_D)	+30V
Gate Voltages Range(V_G)	–5V to 0V
Drain Current(I_D)	4500mA
Gate Current(I_G)	See plot on page 8
Input Power(P_{IN}) ,50Ω,Vswr 3:1, VD=+28V,IDQ=1200mA , 85°C , CW	+38dBm
*Thermal Resistance (Channel to die bottom)	2.66°C/W
Maximum Channel Temperature	+220°C
Operating Temperature	-55°C to +85°C
Storage Temperature	-65°C to +150°C

*Thermal resistance measured to back of carrier plate. MMIC mounted on 18mm x 10mm x 1mm Ag - diamond carrier using eutectic die attach.

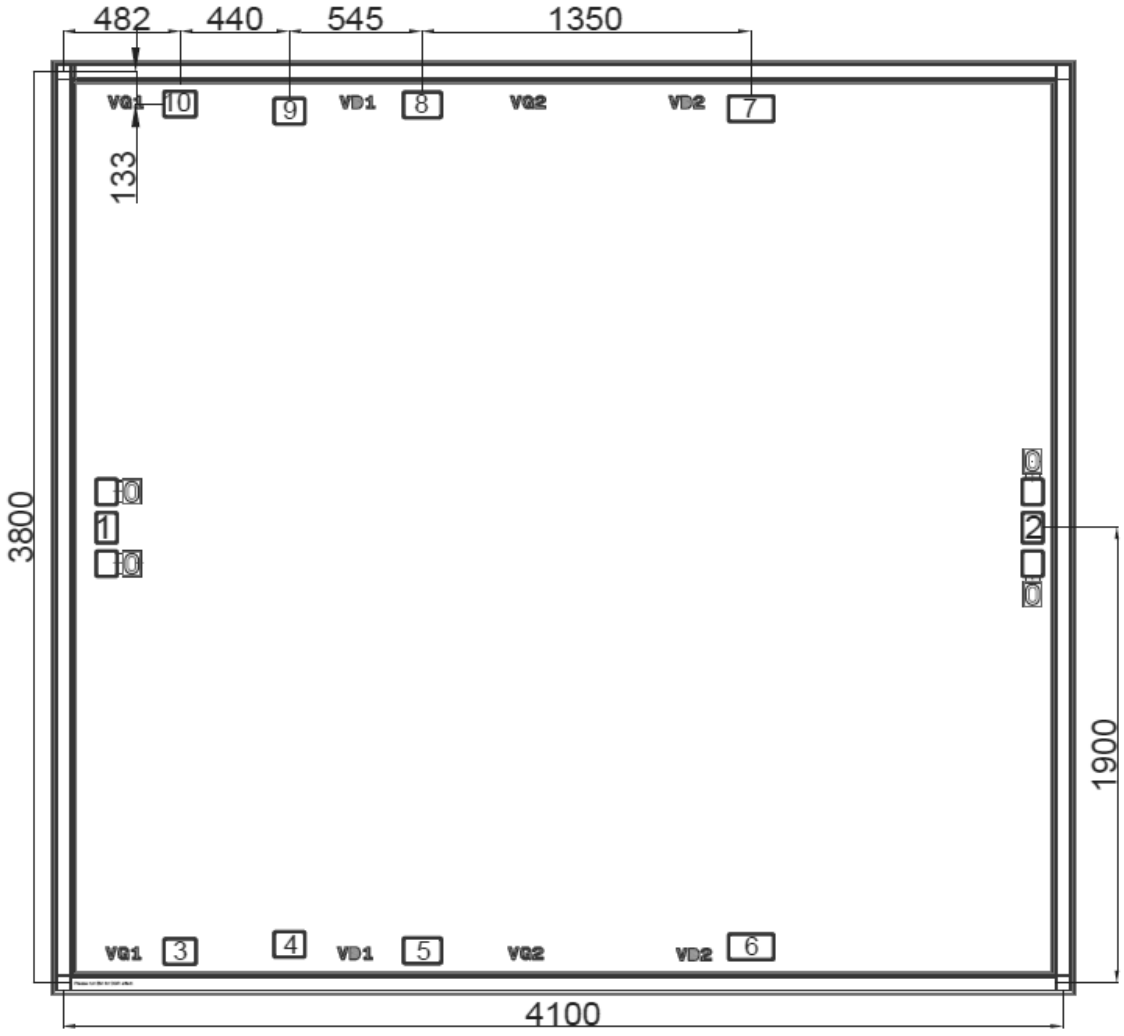
Typical Supply Current vs. VD,VG

VD (V)	VG (V)	IDQ (mA)
+24	-2.06	1600
+24	-2.19	1200
+28	-2.05	1600
+28	-2.18	1200

ELECTROSTATIC SENSITIVE DEVICE
OBSERVE HANDLING PRECAUTIONS

Outline Drawing:

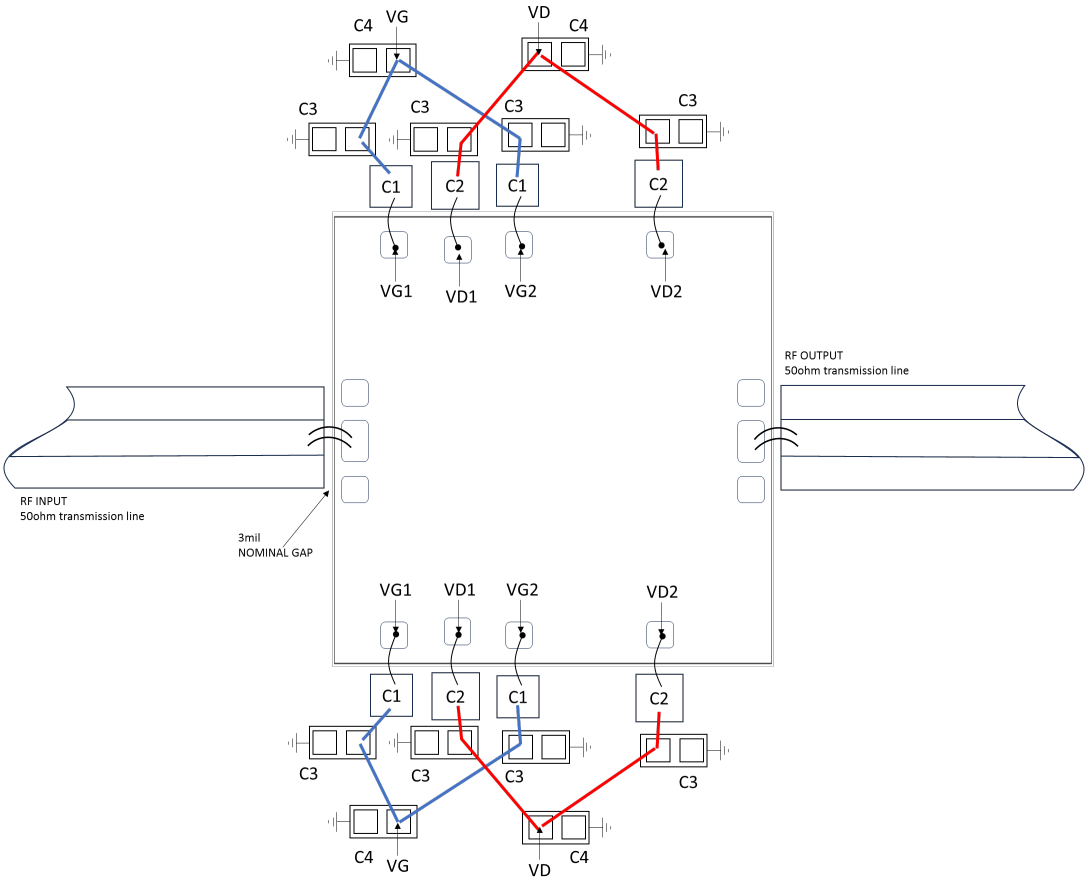
All Dimensions in µm



Notes:

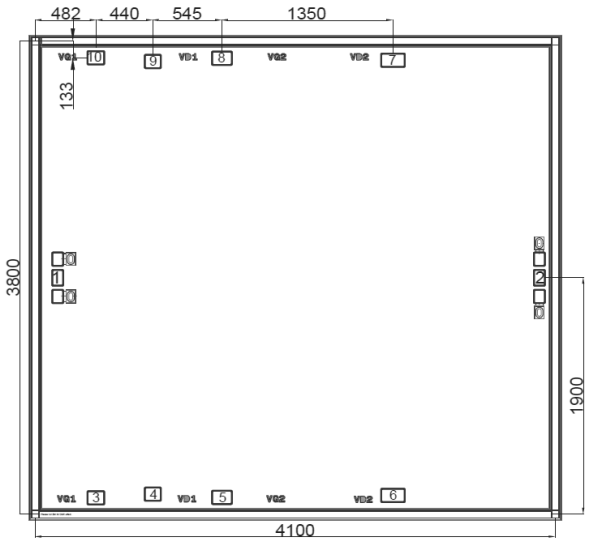
1. **Die thickness: 100µm**
2. **DC bond pads are 100*100µm^2**
3. **RF IN/OUT bond pad is 150*100µm^2**
4. **Bond pad metalization: Gold**
5. **Backside metalization: Gold**

Assembly Drawing



Item	Description	Item	Description
C1	100 pF Example: Skyworks Part : SC10002430	C3	1 µF Example: TDK Part : CGA3E1X7R1V105K080AE
C2	1000 pF Example: Skyworks Part : SC99906068	C4	10 µF Example: Murata Electronics Part : GRM21BC8YA106KE11L

No.	Mnemonic	Description
1	RF IN	RF signal input terminal; no blocking capacitor required.
2	RF OUT	RF signal output terminal; no blocking capacitor required.
3	VD	Amplifier source bias ; An external biasing circuit is required.
4	VG	Amplifier gate bias ; An external biasing circuit is required.
5	Die Bottom	Die bottom must be connected to RF and dc ground.



Biasing and Operation

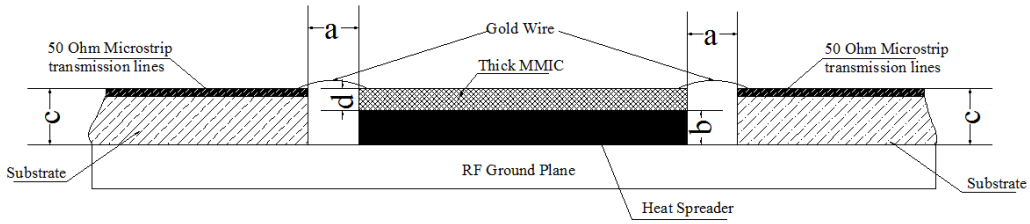
Turn ON procedure:

1. Connect GND to RF and dc ground.
2. Set the gate bias voltages VG to −5V.
3. Set the drain bias voltages VD to +28V .
4. Increase the gate bias voltages to achieve a quiescent supply current of 1.2A.
5. Apply RF signal.

Turn OFF procedure:

1. Turn off the RF signal.
2. Decrease the gate bias voltages, VG to −5V to achieve a I_{DQ} = 0 mA (approximately).
3. Decrease the drain bias voltages to 0 V.
4. Increase the all gate bias voltages to 0 V.

Mounting & Bonding Techniques for MMICs



Direct Mounting

1.it is recommended to first mount the die on a heat spreader, then attach the heat spreader to the ground plane.
2.Heat Spreader Material: Molybdenum-copper (MoCu) alloy is commonly used.
3.The die and transmission line are coplanar.
4.Spacing (a): The gap between the bare die and the 50Ω transmission line should typically be 0.05 mm to 0.1 mm. If the application frequency is higher than 40GHz, then this gap is recommended to be 0.05mm

Wire Bonding Interconnection

The connection between the die and the 50Ω transmission line is usually made using 25 µm diameter gold (Au) wires, bonded via wedge bonding or ball bonding processes.

Die Attachment Methods

1.Conductive Epoxy:

After adhesive application, cure according to the manufacturer's recommended temperature profile.

2.Au-Sn80/20 Eutectic Bonding:

Use preformed Au-Sn80/20 solder preforms.
Perform bonding in an inert atmosphere (N_2 or forming gas: 90% N_2 + 10% H_2).
Keep the time above 320°C to less than 20 seconds to prevent excessive intermetallic formation.