# CMPA0760020F

## 0.7 – 6.0 GHz, 25 W GaN MMIC HPA

### Description

Wolfspeed's CMPA0760020F is a 25W package MMIC HPA utilizing Wolfspeed's high performance, 0.15um GaN on SiC production process. The CMPA0760020F operates from 0.7-6 GHz and supports military communications and electronic warfare along with ISM and EMC amplification. The CMPA0760020F achieves 25 W of saturated output power with 21 dB of large signal gain and typically 36% power-added efficiency under CW operation.

Packaged in a bolt-down, flange package, the CMPA0760020F provides superior performance in a thermally-enhanced package allowing customers to improve SWaP-C benchmarks in their next-generation systems.


**Figure 1. CMPA0760020F**

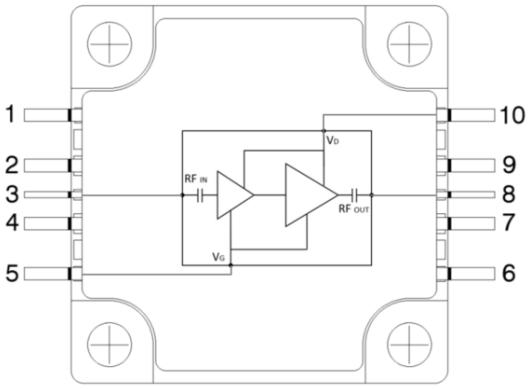


**Figure 2. Functional Block Diagram**

### Features

- Psat: 25 W
- PAE: 36 %
- LSG: 21 dB
- S21: 33 dB
- S11: -12 dB
- S22: -10 dB
- CW operation

### Applications

- Electronic Warfare
- Military Communications
- ISM Amplifiers
- EMC Amplifers

Note: Features are typical performance across frequency under 25C operation. Please reference performance charts for additional information.

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## Absolute Maximum Ratings

| Parameter | Symbol | Units | Value | Conditions |
|---|---|---|---|---|
| Drain to Source Voltage | $V_{DSS}$ | V | 84 | |
| Drain Voltage | $V_D$ | V | 31 | |
| Gate Voltage | $V_G$ | V | -1 | |
| Drain Current | $I_D$ | A | 3 | |
| Gate Current | $I_G$ | mA | 20 | |
| Input Power | $P_{in}$ | dBm | 30 | |
| Dissipated Power | $P_{diss}$ | W | 50 | 85 °C |
| Storage Temperature | $T_{stg}$ | °C | -55, +150 | |
| Mounting Temperature | $T_J$ | °C | 260 | 30 seconds |
| Junction Temperature | $T_J$ | °C | 225 | MTTF > 1E6 |
| Output Mismatch Stress | VSWR | Ψ | 5:1 | |

## Recommended Operating Conditions

| Parameter | Symbol | Units | Typical Value | Conditions |
|---|---|---|---|---|
| Drain Voltage | Vd | V | 28 | |
| Gate Voltage | Vg | V | -1.85 | |
| Drain Current | Idq | mA | 600 | |
| Input Power | Pin | dBm | 23 | |
| Case Temperature | Tcase | °C | -40 to 85 | |

## RF Specifications

Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

| Parameter | Units | Frequency | Min | Typical | Max | Conditions |
|---|---|---|---|---|---|---|
| Frequency | GHz | | 0.7 | | 6.0 | |
| Output Power | dBm | 0.7 | | 44 | | |
| | | 3 | | 44 | | |
| | | 6 | | 43 | | |
| Power-added Efficiency | % | 0.7 | | 40 | | |
| | | 3 | | 36 | | |
| | | 6 | | 33 | | |
| LSG | dB | 0.7 | | 21 | | |
| | | 3 | | 21 | | |
| | | 6 | | 20 | | |
| Small-Signal Gain | dB | 0.7 | | 30 | | Pin = -20 dBm |
| | | 3 | | 33 | | |
| | | 6 | | 35 | | |
| Input Return Loss | dB | | | 12 | | Pin = -20 dBm |
| Output Return Loss | dB | | | 10 | | Pin = -20 dBm |

Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

**Figure 3: Pout v. Frequency v. Temperature**

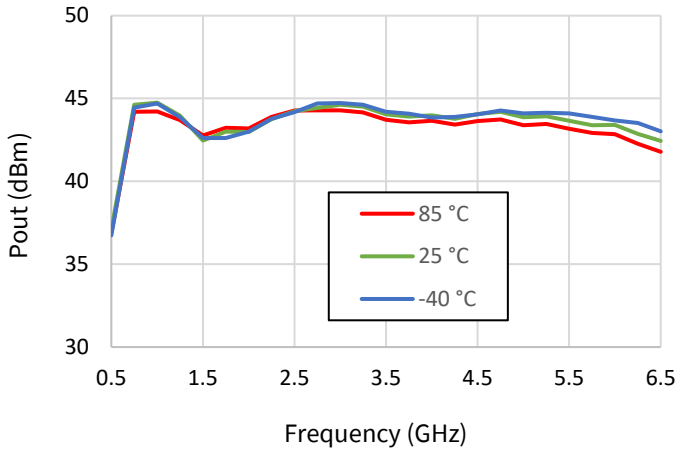



**Figure 4: PAE v. Frequency v. Temperature**

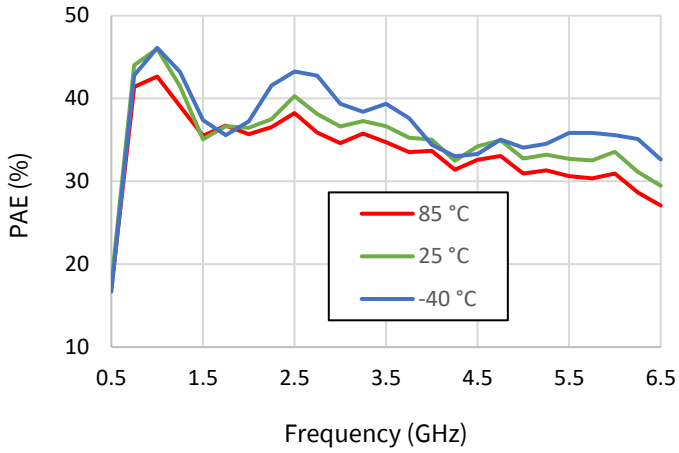



**Figure 5: Id v. Frequency v. Temperature**

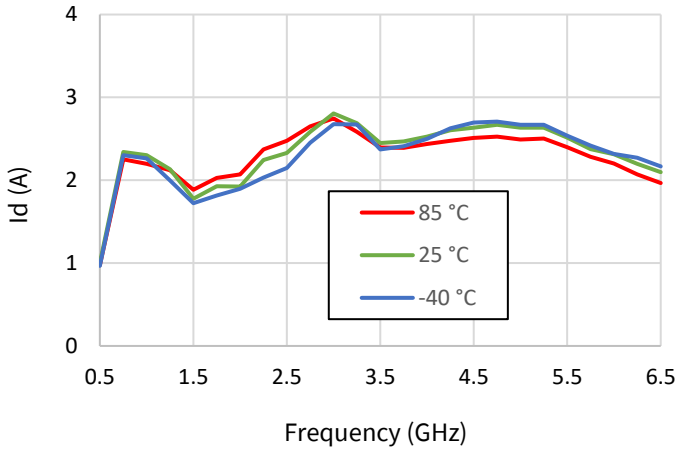



**Figure 6: Ig v. Frequency v. Temperature**

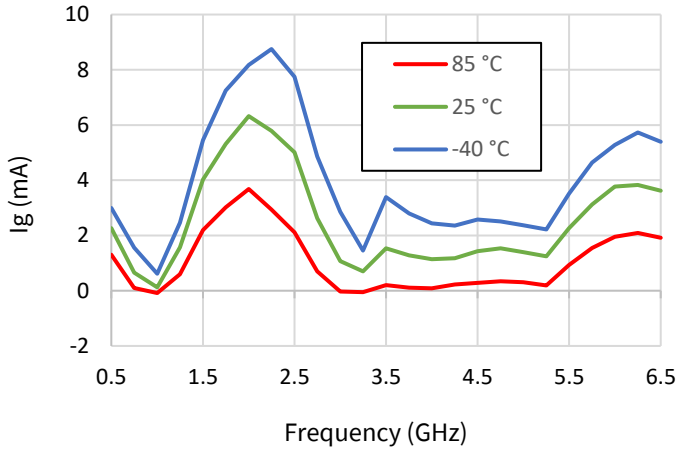
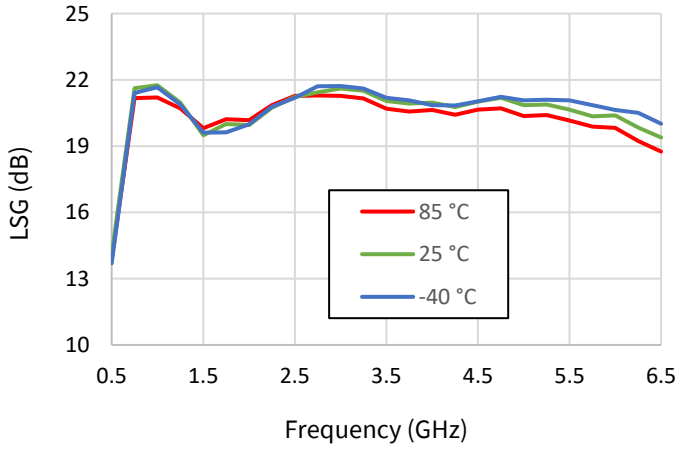



**Figure 7: LSG v. Frequency v. Temperature**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

**Figure 8: Pout v. Frequency v. Vd**

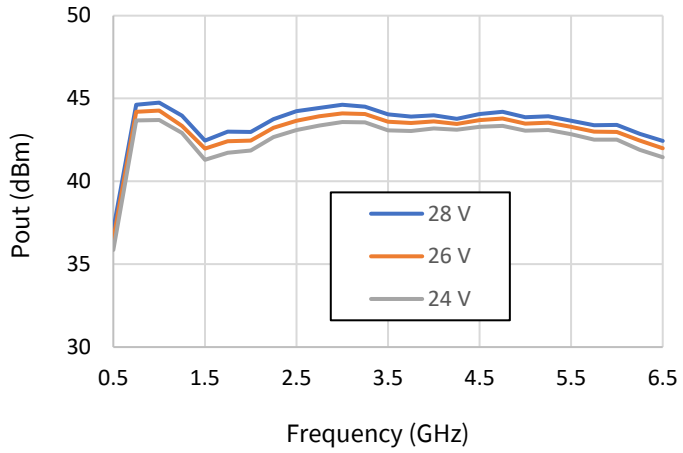



**Figure 9: PAE v. Frequency v. Vd**

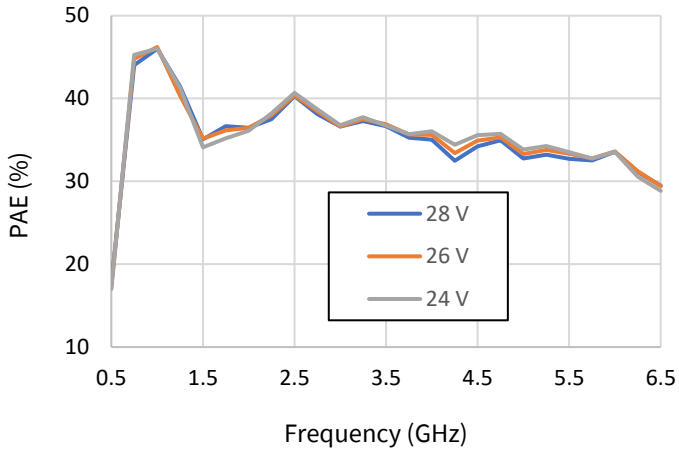



**Figure 10: Id v. Frequency v. Vd**

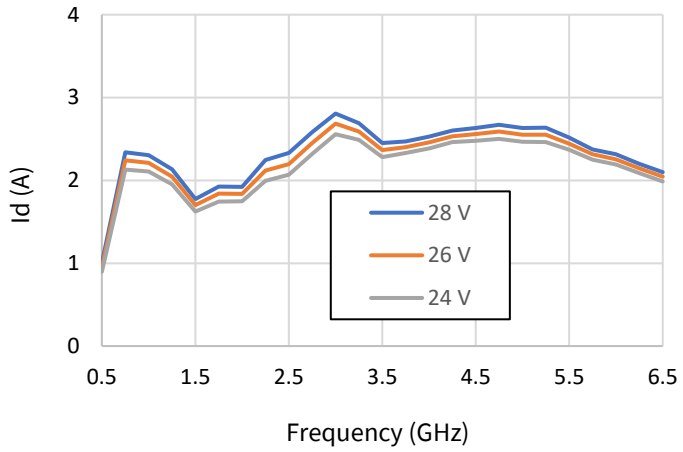



**Figure 11: Ig v. Frequency v. Vd**

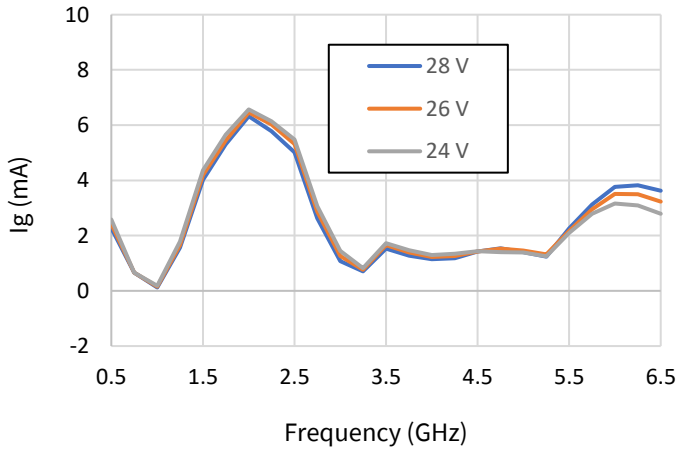
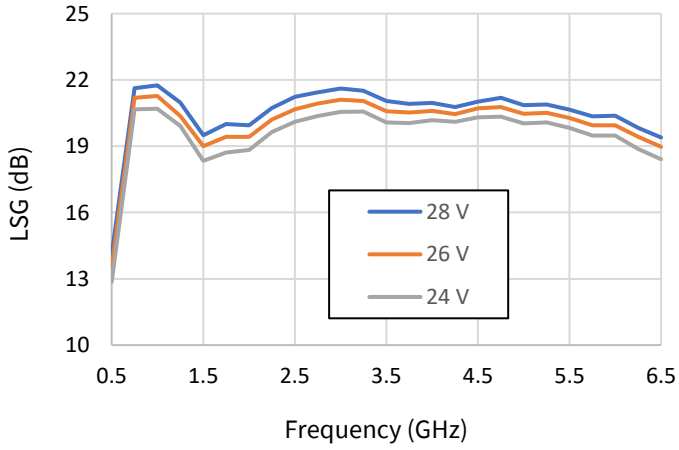



**Figure 12: LSG v. Frequency v. Vd**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

**Figure 13: Pout v. Frequency v. Idq**

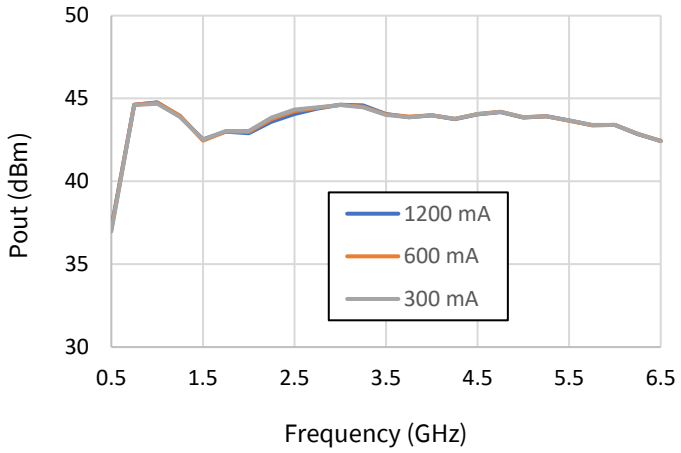



**Figure 14: PAE v. Frequency v. Idq**

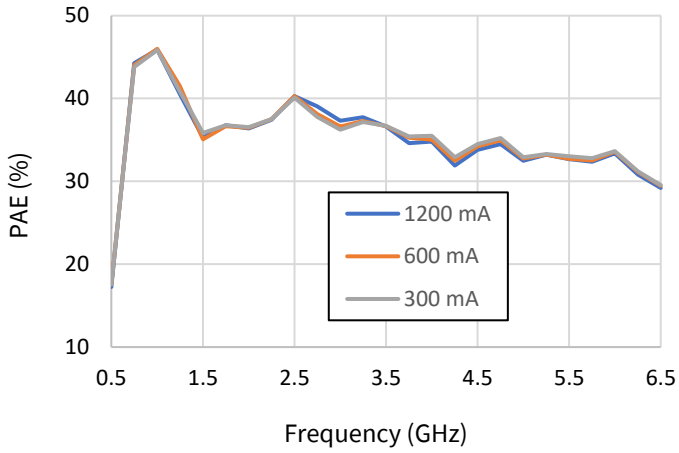



**Figure 15: Id v. Frequency v. Idq**

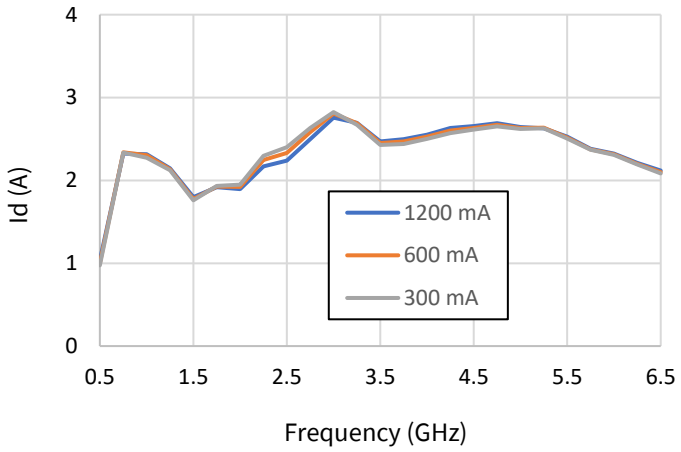



**Figure 16: Ig v. Frequency v. Idq**

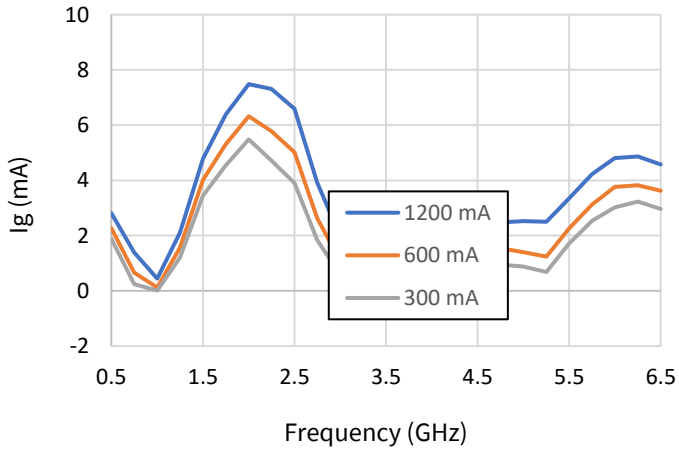
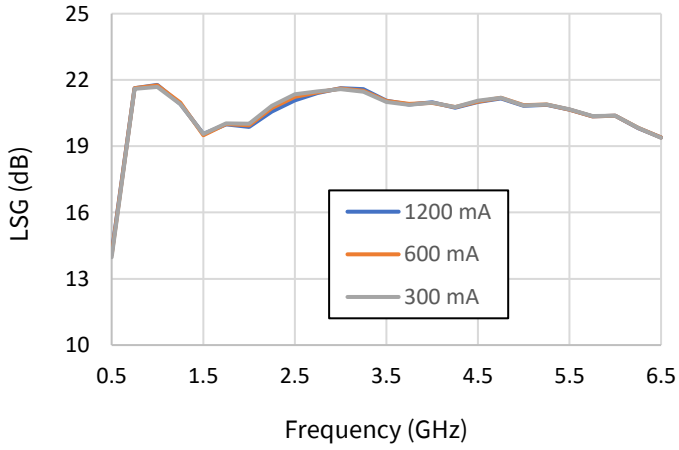



**Figure 17: LSG v. Frequency v. Idq**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

**Figure 18: Pout v. Pin v. Frequency**

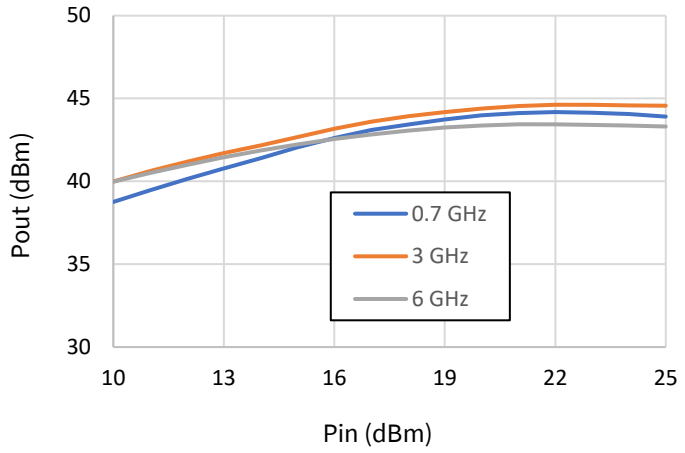



**Figure 19: PAE v. Pin v. Frequency**

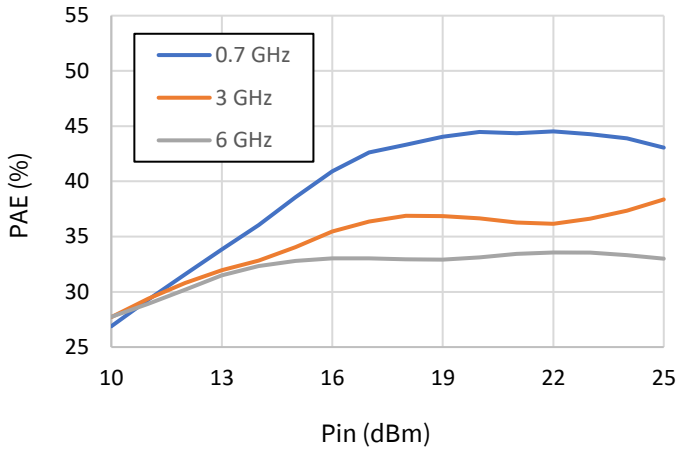



**Figure 20: Id v. Pin v. Frequency**

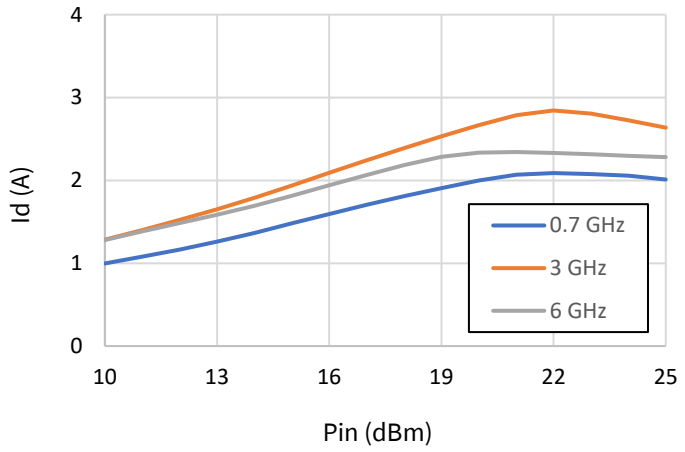



**Figure 21: Ig v. Pin v. Frequency**

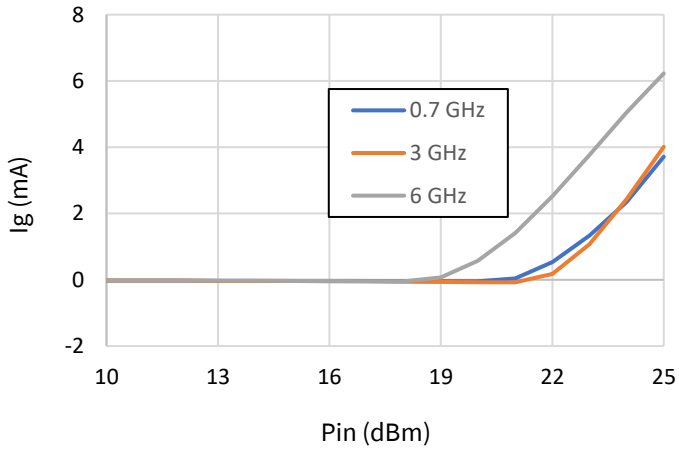
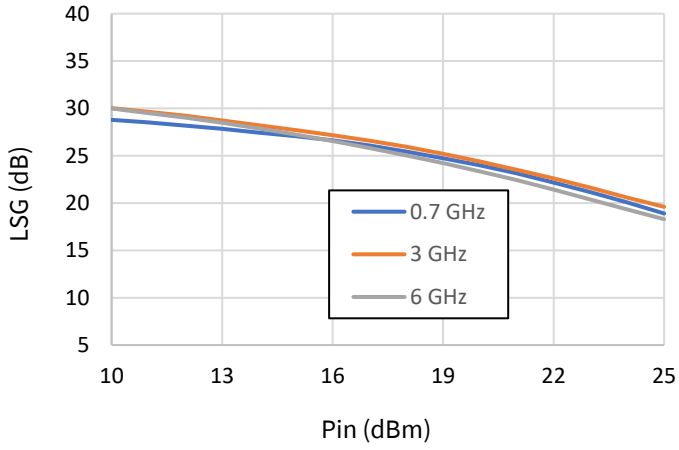



**Figure 22: Gain v. Pin v. Frequency**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

**Figure 23: Pout v. Pin v. Temperature**

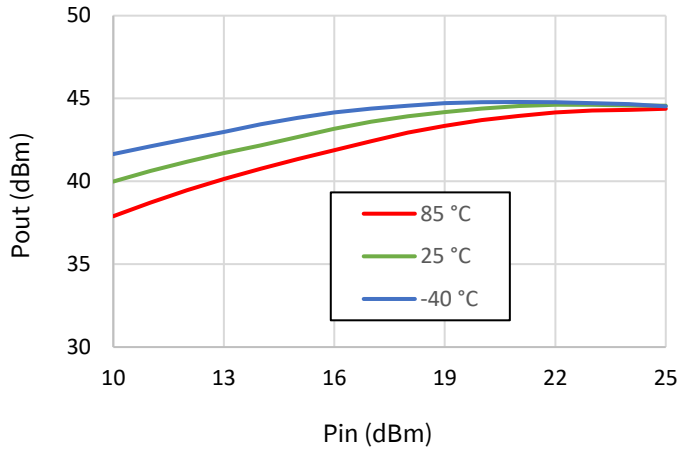



**Figure 24: PAE v. Pin v. Temperature**

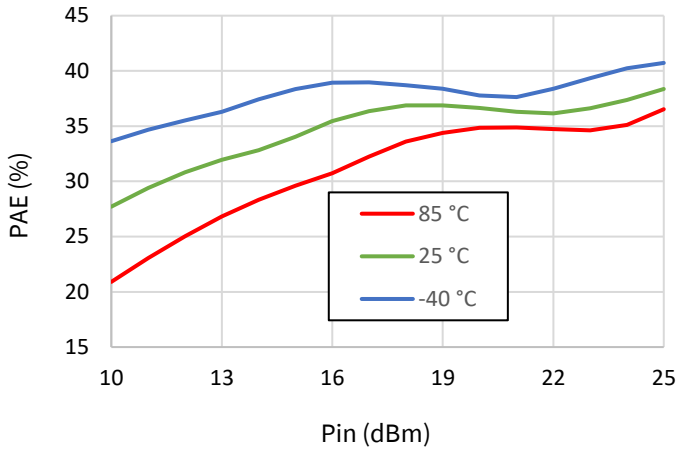



**Figure 25: Id v. Pin v. Temperature**

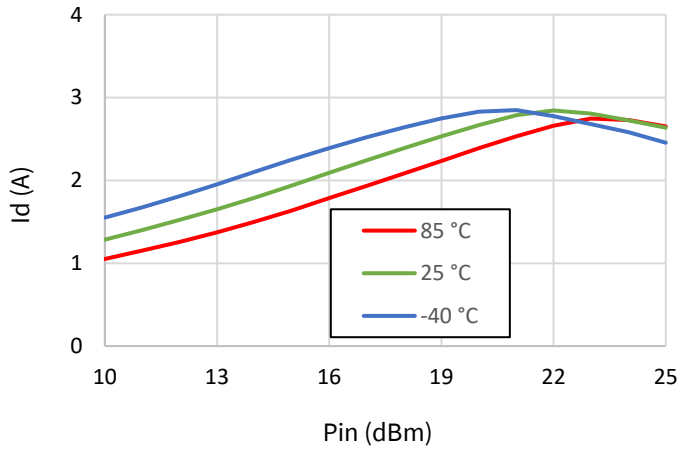



**Figure 26: Ig v. Pin v. Temperature**

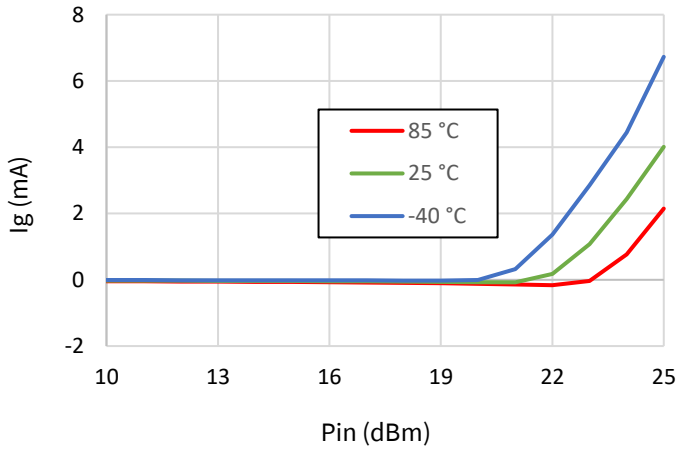
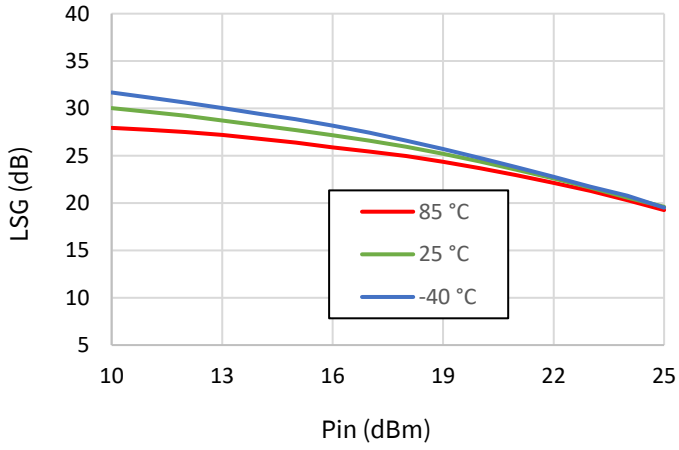



**Figure 27: Gain v. Pin v. Temperature**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

**Figure 28: Pout v. Pin v. Vd**

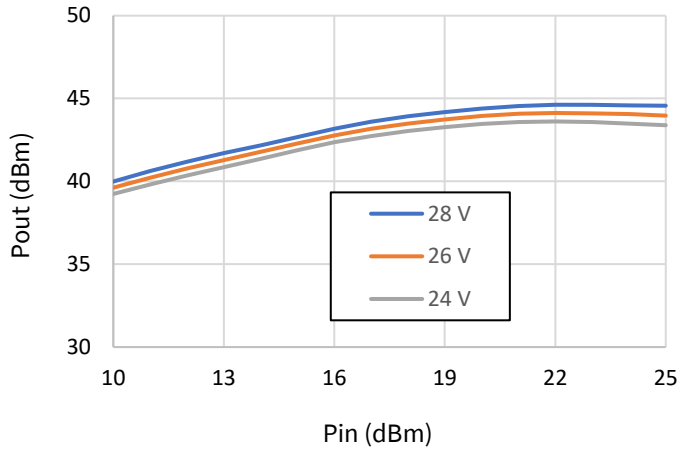



**Figure 29: PAE v. Pin v. Vd**

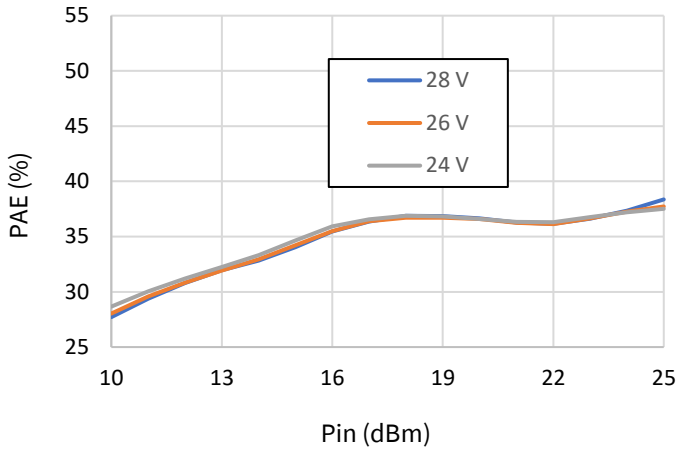



**Figure 30: Id v. Pin v. Vd**

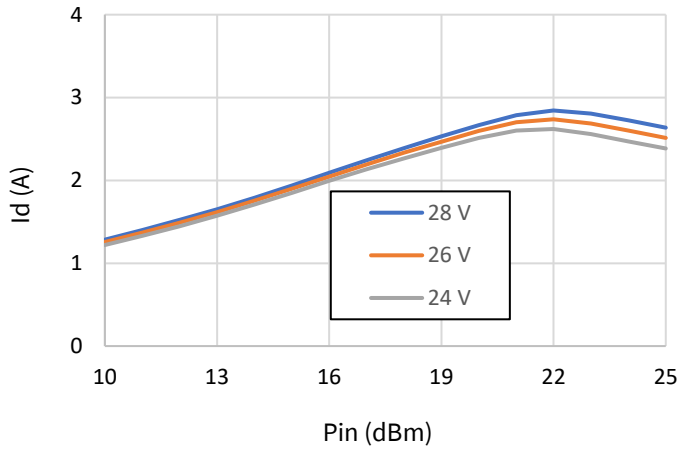



**Figure 31: Ig v. Pin v. Vd**

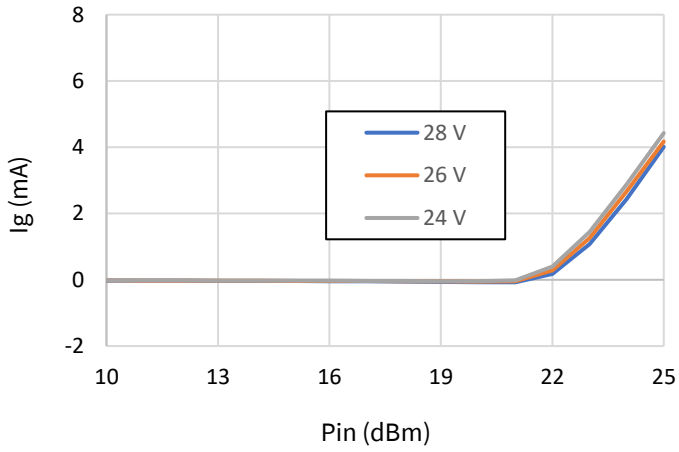
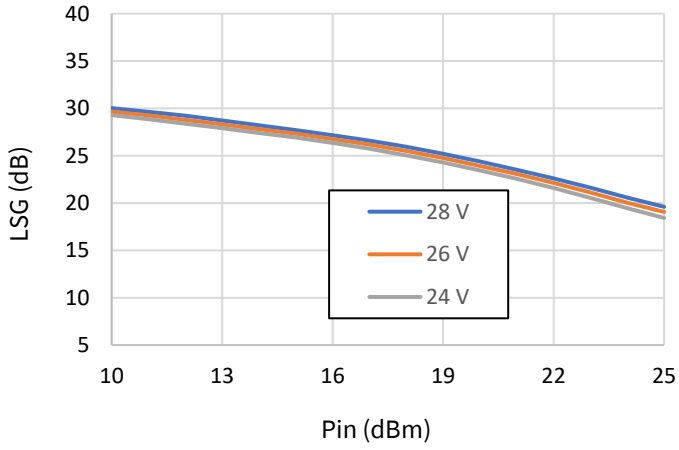



**Figure 32: Gain v. Pin v. Vd**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C, Frequency: 3GHz

**Figure 33: Pout v. Pin v. Idq**

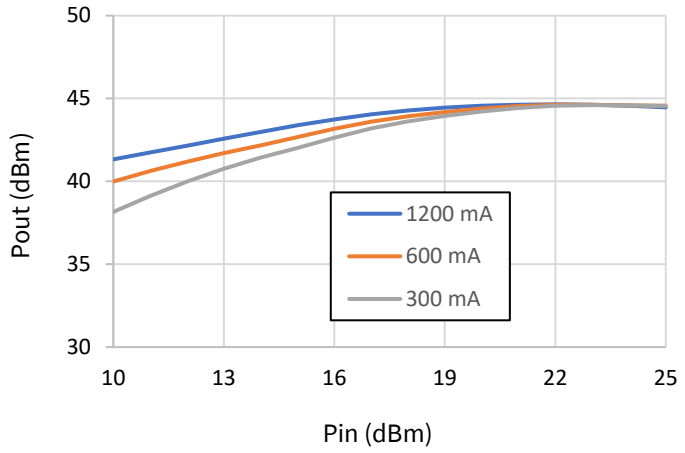



**Figure 34: PAE v. Pin v. Idq**

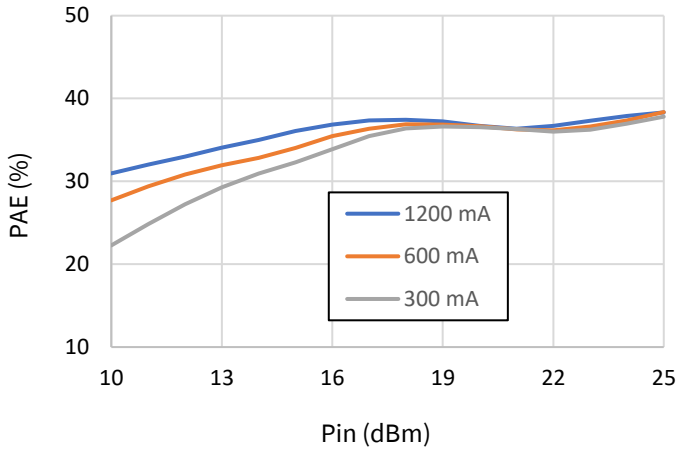



**Figure 35: Id v. Pin v. Idq**

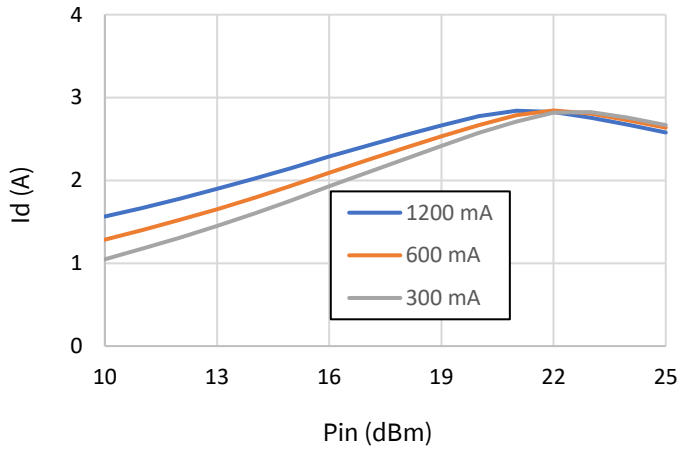



**Figure 36: Ig v. Pin v. Idq**

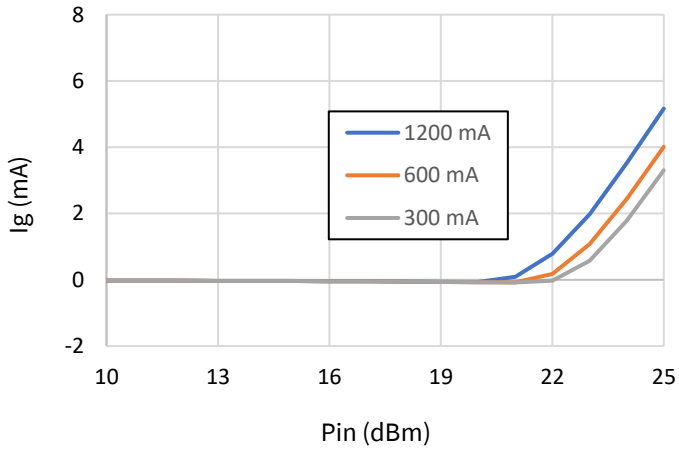
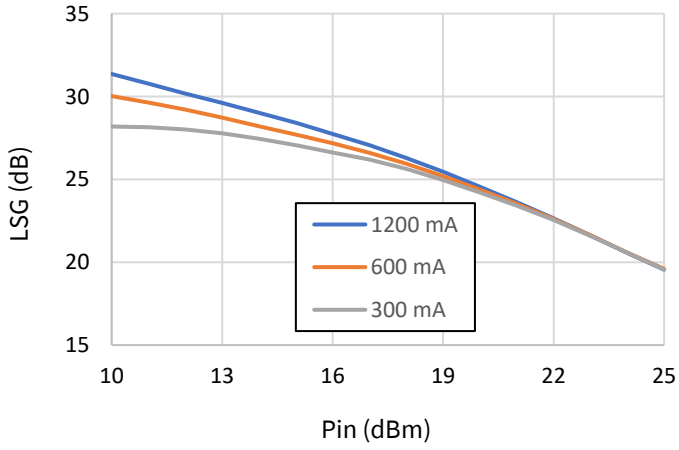



**Figure 37: Gain v. Pin v. Idq**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C

**Figure 38: S21 v. Frequency v. Temperature**

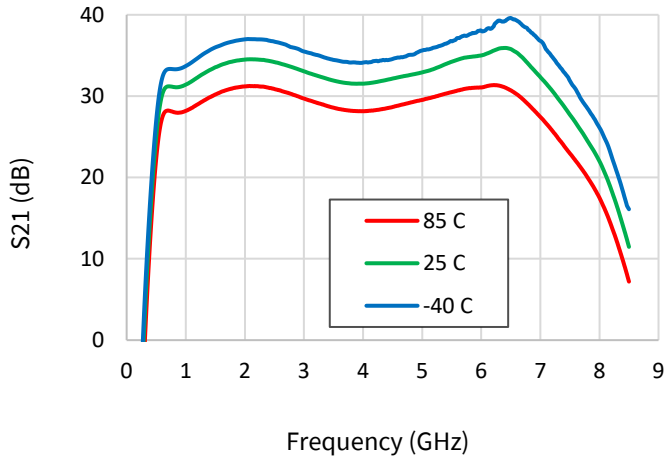



**Figure 39: S21 v. Frequency v. Vd**

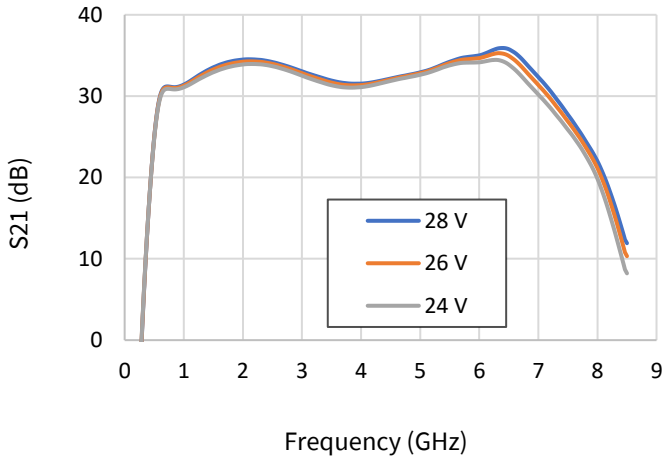



**Figure 40: S11 v. Frequency v. Temperature**

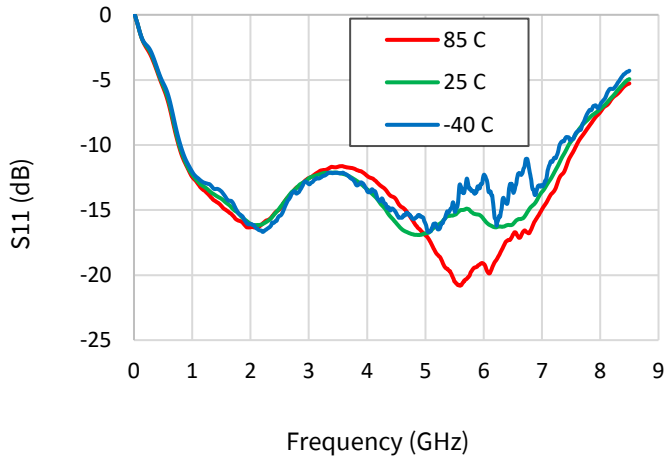



**Figure 41: S11 v. Frequency v. Vd**

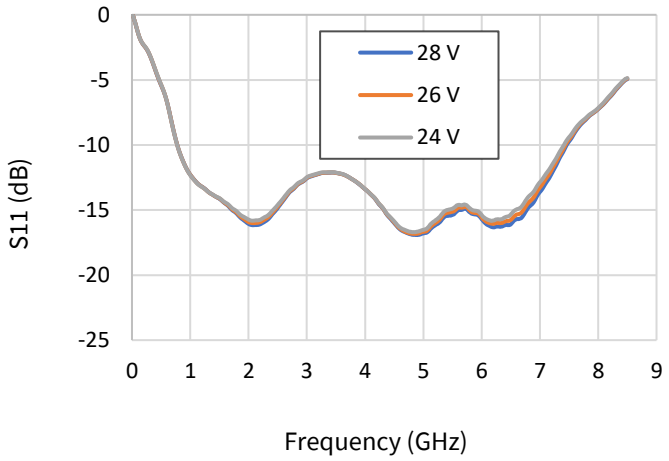



**Figure 42: S22 v. Frequency v. Temperature**

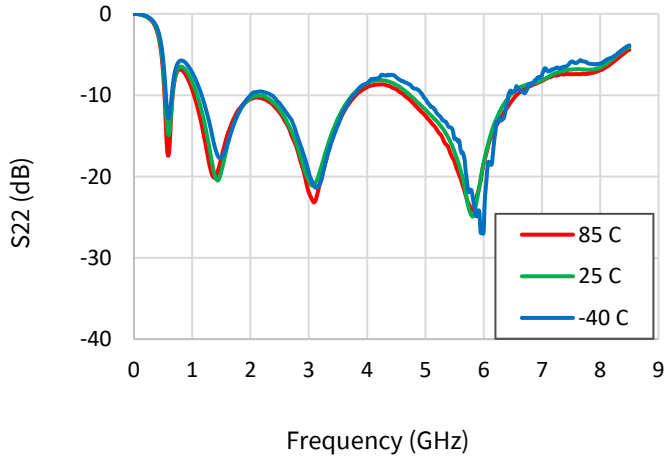
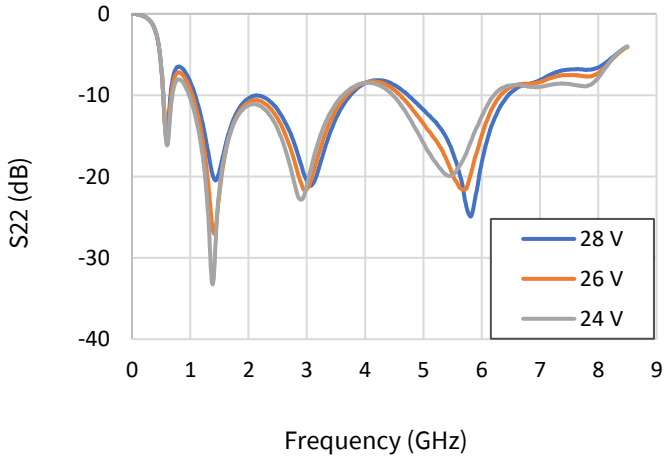



**Figure 43: S22 v. Frequency v. Vd**



Test conditions unless otherwise noted: Vd=28 V, Idq=600mA, CW, Pin = 23 dBm, $T_{base}$=25 °C

**Figure 44: S21 v. Frequency v. Idq**

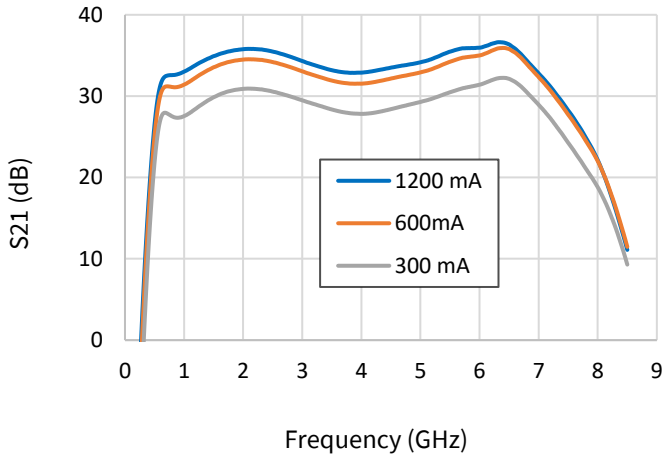



**Figure 45: S11 v. Frequency v. Idq**

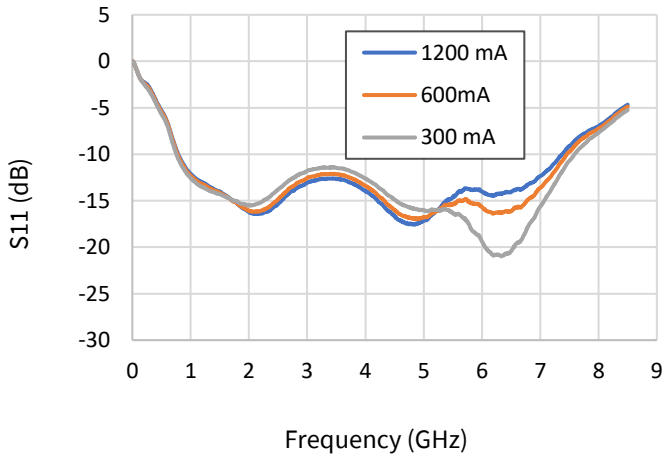
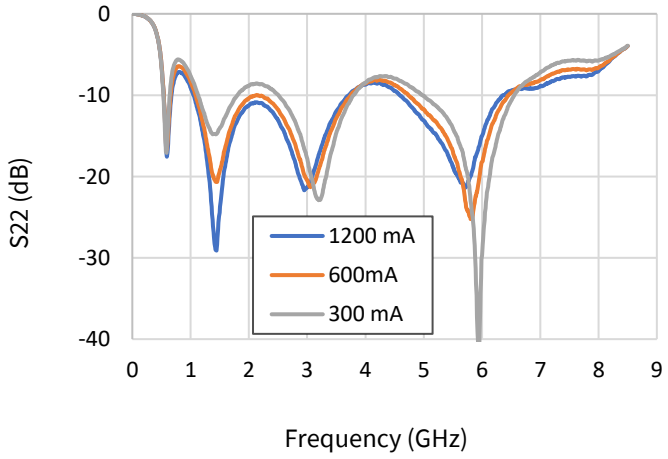


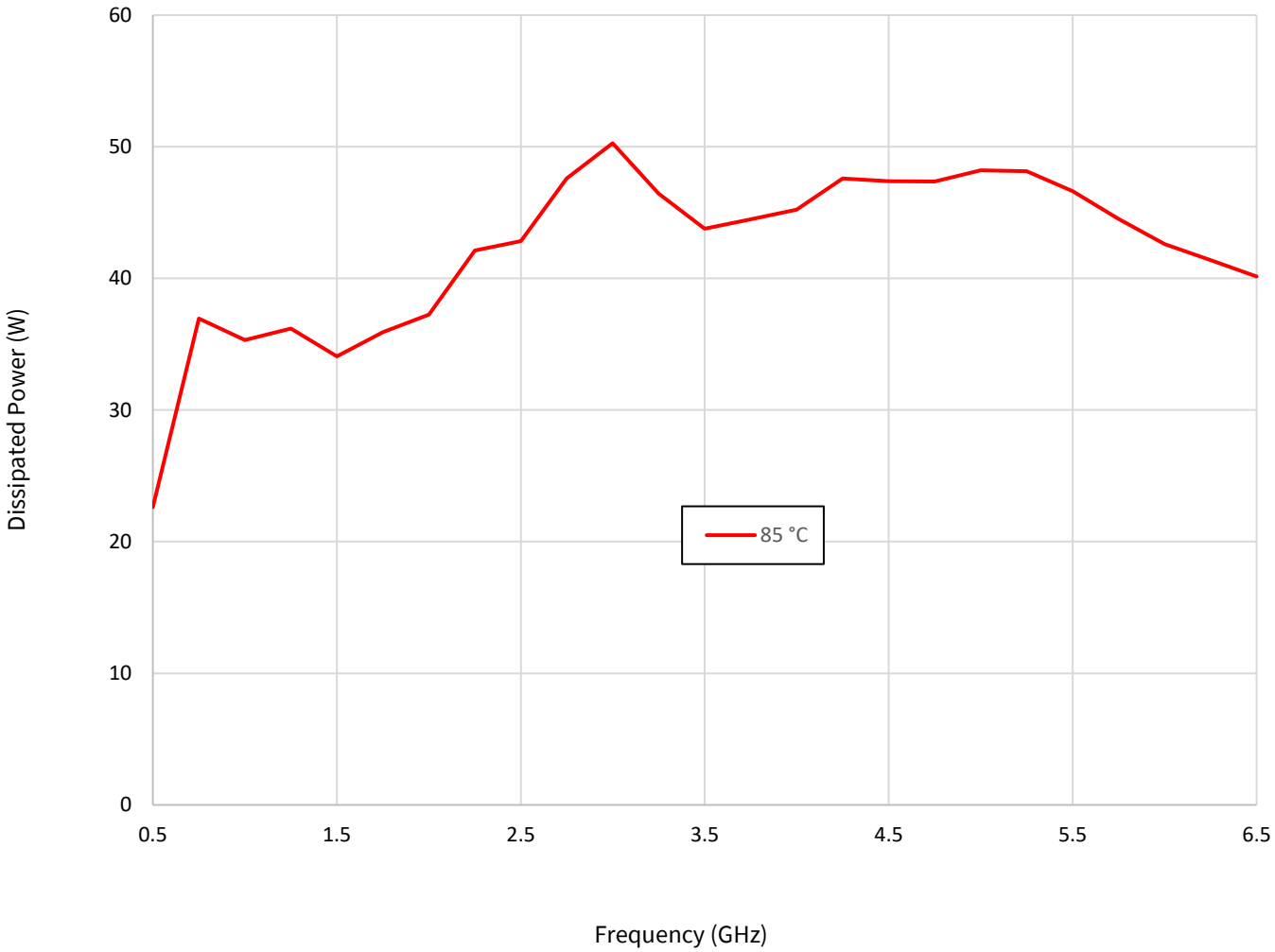

**Figure 46: S22 v. Frequency v. Idq**



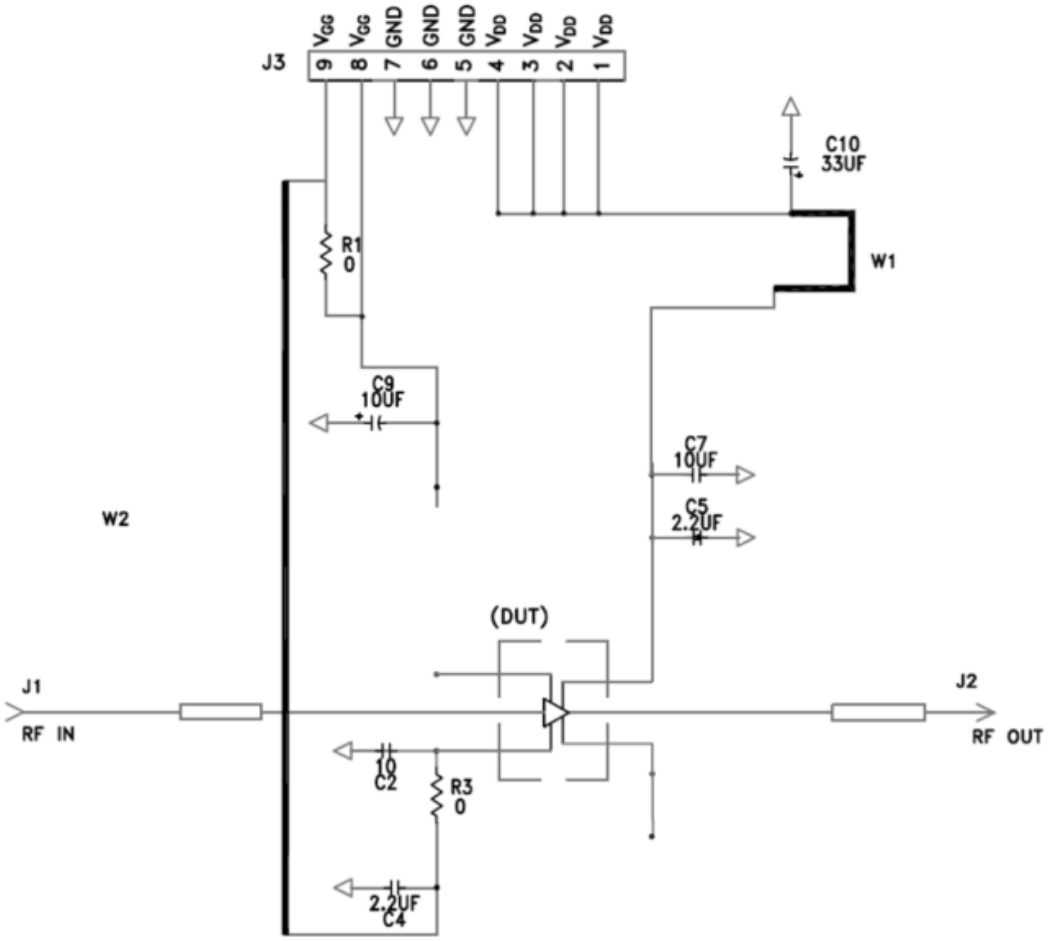
## Thermal Characteristics

| Parameter | Symbol | Value | Operating Conditions |
|---|---|---|---|
| Operating Junction Temperature | $T_J$ | 150 | Freq = 3.0 GHz, $V_d$ = 28 V, $I_{dq}$ = 600 mA, $I_{drive}$ = 2.8 A , $P_{in}$ = 23 dBm, $P_{out}$ = 44.6 dBm, $P_{diss}$ = 50 W, $T_{case}$ = 85°C, PW=CW |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 1.3 | |

## Power Dissipation v. Frequency (Tcase = 85°C)



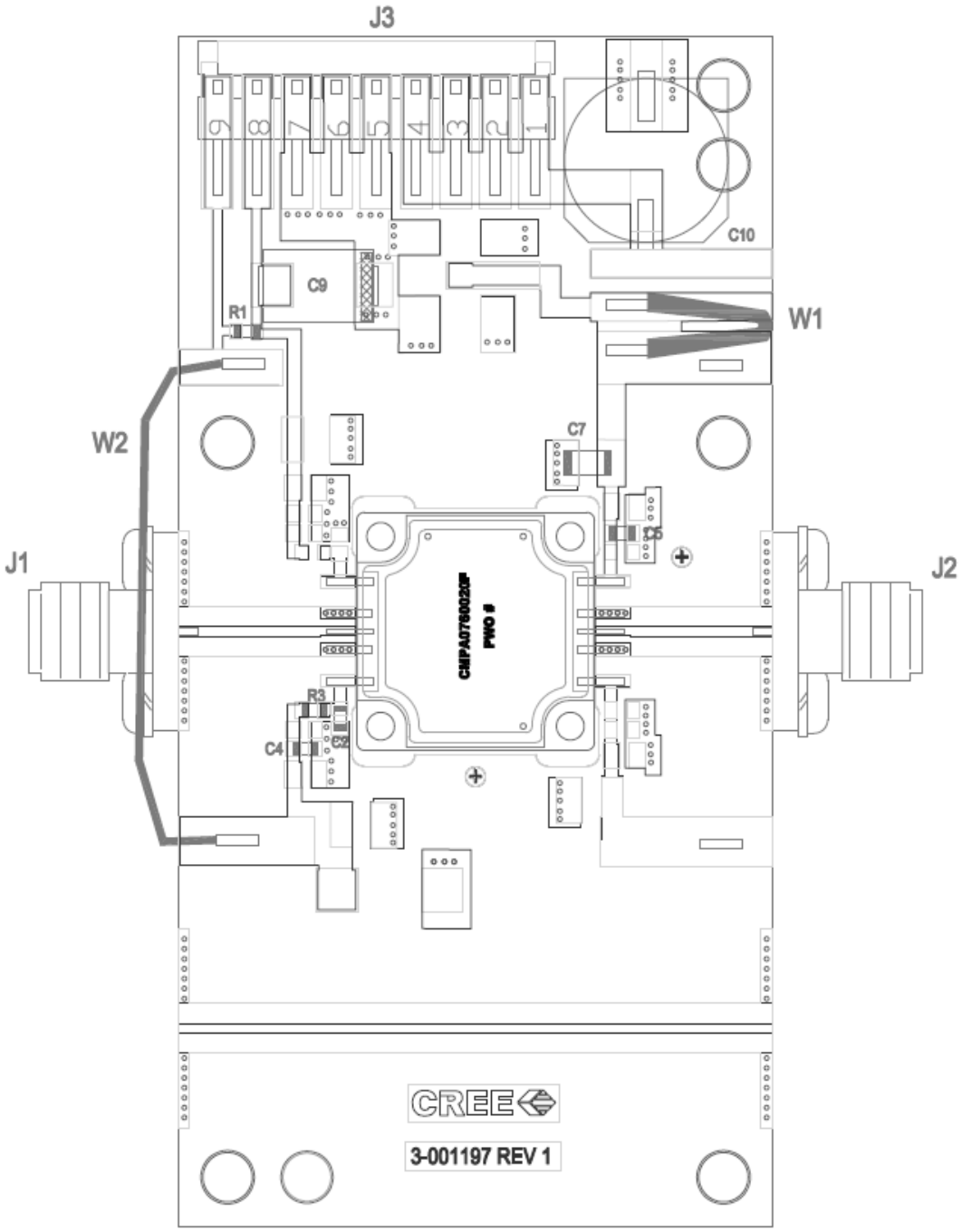
## CMPA0760020F-AMP Evaluation Board Schematic Drawing




## CMPA0760020F-AMP Evaluation Board Bill of Materials

| Reference Designator | Description | Qty |
|---|---|---|
| R1, R3 | RESISTOR 0 ohm, 0603 | 2 |
| C2 | CAP, 10pF,+/- 5%, 0603, ATC | 1 |
| C4, C5 | CAP, 2.2uf, 50v, 0603 | 2 |
| C10 | CAP, 33 UF, 20%, G CASE | 1 |
| C7 | CAP, 10uf, 50v, 1206 | 1 |
| C9 | CAP 10UF 16V TANTALUM, 2312 | 1 |
| - | PCB, RO3003, 3.0 x 1.5 x 0.01 “, CMPA0760020F | 1 |
| - | BASEPLATE 3.0 x 1.5 x 0.25 IN | 1 |
| - | 2-56 SOC HD SCREW 3/16 SS | 4 |
| - | #2 SPLIT LOCKWASHER SS | 4 |
| J1, J2 | CONN, SMA, PANEL MOUNT JACK, FLANGE, 4-HOLE, BLUNT POST, 20MIL | 2 |
| J3 | HEADER RT>PLZ .1CEN LK 9POS | 1 |
| W1-2 | WIRE, BLACK, 22 AWG | 2 |
| U1 (DUT) | CMPA0760020F | 1 |

## CMPA0760020F-AMP Evaluation Board Assembly Drawing




## Bias On Sequence

1. Ensure RF is turned-off
2. Apply pinch-off voltage of -5 V to the gate (Vg)
3. Apply nominal drain voltage (Vd)
4. Adjust Vg to obtain desired quiescent drain current (Idq)
5. Apply RF

## Bias Off Sequence

1. Turn RF off
2. Apply pinch-off to the gate (Vg=-5V)
3. Turn off drain voltage (Vd)
4. Turn off gate voltage (Vg)

## Product Dimensions

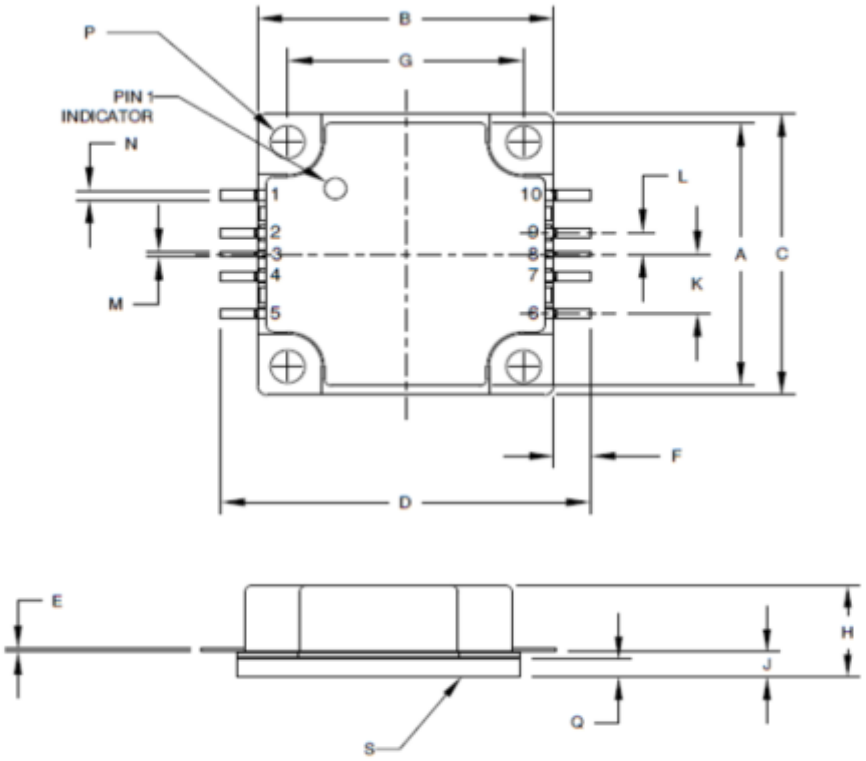
| DIM | INCHES | | | MILLIMETERS | | |
|---|---|---|---|---|---|---|
| | MIN | TYP | MAX | MIN | TYP | MAX |
| A | .555 | .560 | .565 | 14.10 | 14.22 | 14.35 |
| B | .595 | .600 | .605 | 15.11 | 15.24 | 15.37 |
| C | .595 | .600 | .605 | 15.11 | 15.24 | 15.37 |
| D | - | (.750) | - | - | (19.05) | - |
| E | .006 | .008 | .010 | 0.15 | 0.20 | 0.25 |
| F | .065 | .075 | .085 | 1.66 | 1.91 | 2.16 |
| G | .473 | .478 | .483 | 12.01 | 12.14 | 12.27 |
| H | .191 | .203 | .215 | 4.86 | 5.16 | 5.46 |
| J | .049 | .056 | .063 | 1.24 | 1.42 | 1.60 |
| K | .121 | .126 | .131 | 3.07 | 3.20 | 3.33 |
| L | .041 | .046 | .051 | 1.04 | 1.17 | 1.30 |
| M | .005 | .010 | .015 | 0.13 | .25 | 0.38 |
| N | .015 | .020 | .025 | 0.38 | .51 | 0.63 |
| P | .065 | .070 | .075 | 1.65 | 1.78 | 1.90 |
| Q | .038 | .040 | .042 | 0.97 | 1.02 | 1.07 |

NOTES: UNLESS OTHERWISE SPECIFIED

1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994

2. PINS:
   1-10 DEFINED BY PRODUCT

3. THE CONTENTS OF THIS DRAWING ARE INTENDED TO REPRESENT THE PRODUCT IN MARKETING GRAPHICS ONLY AND NOT INTENDED TO BE USED FOR ANY PRODUCTION OR INTERNAL QUALIFICATION PURPOSE.




| PIN | DESC. | PIN | DESC. |
|---|---|---|---|
| 1 | NC | 6 | NC |
| 2 | RFGND | 7 | RFGND |
| 3 | RF input | 8 | RF output |
| 4 | RFGND | 9 | RFGND |
| 5 | Gate | 10 | Drain |

## Electrostatic Discharge (ESD) Classification

| Parameter | Symbol | Class | Classification Level | Test Methodology |
|---|---|---|---|---|
| Human body Model | HBM | TBD | ANSI/ESDA/JEDEC JS-001 Table 3 | JEDEC JESD22 A114-D |
| Charge Device Model | CDM | TBD | ANSI/ESDA/JEDEC JS-002 Table 3 | JEDEC JESD22 C101-C |

## Product Ordering Information

| Part Number | Description | MOQ Increment | Image |
|---|---|---|---|
| CMPA0760020F | 0.7 – 6 GHz, 25W GaN MMIC | |  |
| CMPA0760020F-AMP | Evaluation Board w/ PA | 1 Each | |

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