

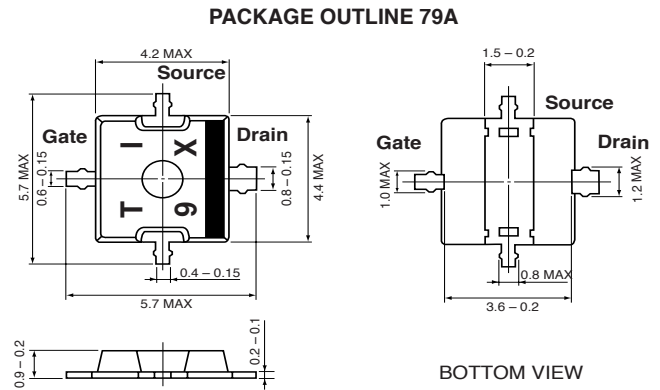
### FEATURES

- **LOW COST PLASTIC SURFACE MOUNT PACKAGE**  
Available on Tape and Reel
- **USABLE TO 3.7 GHz:**  
Fixed Wireless Access, ISM, WLL, MMDS, IMT-2000, PCS
- **HIGH OUTPUT POWER:**  
35 dBm TYP with 5.0 V Vdc  
32.5 dBm TYP with 3.5 V Vdc
- **HIGH LINEAR GAIN:**  
10 dB TYP at 1.9 GHz
- **LOW THERMAL RESISTANCE:**  
5°C/W

### DESCRIPTION

NEC's NE6510179A is a GaAs HJ-FET designed for medium power mobile communications, Fixed Wireless Access, ISM, WLL, PCS, IMT-2000, and MMDS transmitter and subscriber applications. It is capable of delivering 1.8 watts of output power(C/W) at 3.5 V and 3 Watts of ouptut power (CW) at 5 V with high linear gain, high efficiency, and excellent linearity. Reliability and performance uniformity are assured by NEC's stringent quality and control procedures.

### OUTLINE DIMENSIONS (Units in mm)



Note: Unless otherwise specified, tolerance is  $\pm 0.2$  mm

### ELECTRICAL CHARACTERISTICS (T<sub>c</sub> = 25°C)

| PART NUMBER                   |                  |                                 |              | NE6510179A |      |      | TEST CONDITIONS  |
|-------------------------------|------------------|---------------------------------|--------------|------------|------|------|--|
| PACKAGE OUTLINE               |                  |                                 |              | 79A        |      |      |  |
| Functional Characteristics    | SYMBOLS          | CHARACTERISTICS                 | UNITS        | MIN        | TYP  | MAX  | f = 1900 MHz, V <sub>DS</sub> = 3.5 V,<br>Pin = +25 dBm, R <sub>g</sub> = 100 Ω<br>I <sub>DSQ</sub> = 200 mA (RF OFF) <sup>2</sup> |
|                               |                  | P <sub>OUT</sub>                | Output Power | dBm        | 31.5 | 32.5 |  |
|                               | GL               | Linear Gain <sup>1</sup>        | dB           |            | 10.0 |      |  |
|                               | η <sub>ADD</sub> | Power Added Efficiency          | %            | 50         | 58   |      |  |
| Electrical DC Characteristics | I <sub>D</sub>   | Drain Current                   | A            |            | 0.72 |      |  |
|                               | I <sub>DSS</sub> | Saturated Drain Current         | A            |            | 2.4  |      | V <sub>DS</sub> = 2.5 V; V <sub>GS</sub> = 0 V   |
|                               | V <sub>P</sub>   | Pinch-Off Voltage               | V            | -2.0       |      | -0.4 | V <sub>DS</sub> = 2.5 V; I <sub>D</sub> = 14 mA  |
|                               | R <sub>TH</sub>  | Thermal Resistance              | °C/W         |            | 5    | 8    | Channel to Case  |
|                               | BV <sub>GD</sub> | Gate to Drain Breakdown Voltage | V            | 12         |      |      | I <sub>GD</sub> = 14 mA  |

Notes:

1. Pin = 0 dBm
2. DC performance is tested 100% . Several samples per wafer are tested for RF performance. Wafer rejection criteria for standard devices is 1 reject for several samples.

**TYPICAL RF PERFORMANCE FOR REFERENCE (NOT SPECIFIED) (T<sub>C</sub> = 25°C)**

| SYMBOLS          | CHARACTERISTICS          | UNITS | MIN | TYP  | MAX | TEST CONDITIONS   |
|------------------|--------------------------|-------|-----|------|-----|---|
| P <sub>OUT</sub> | Output Power             | dBm   |     | 35.0 |     | f = 1900 MHz, V <sub>DS</sub> = 5.0 V,<br>Pin = +25 dBm, R <sub>g</sub> = 100 Ω<br>I <sub>DSQ</sub> = 200 mA (RF OFF) |
| G <sub>L</sub>   | Linear Gain <sup>1</sup> | dB    |     | 10.0 |     |   |
| η <sub>ADD</sub> | Power Added Efficiency   | %     |     | 56   |     |   |
| I <sub>D</sub>   | Drain Current            | A     |     | 1.2  |     |   |
| P <sub>OUT</sub> | Output Power             | dBm   |     | 31.5 |     | f = 900 MHz, V <sub>DS</sub> = 3.5 V,<br>Pin = +20 dBm, R <sub>g</sub> = 100 Ω<br>I <sub>DSQ</sub> = 200 mA (RF OFF)  |
| G <sub>L</sub>   | Linear Gain <sup>1</sup> | dB    |     | 15.0 |     |   |
| η <sub>ADD</sub> | Power Added Efficiency   | %     |     | 70   |     |   |
| I <sub>D</sub>   | Drain Current            | A     |     | 0.53 |     |   |

Notes:

- Pin = 0 dBm

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup> (T<sub>C</sub> = 25 °C)**

| SYMBOLS          | PARAMETERS  | UNITS | RATINGS     |
|------------------|---|-------|-------------|
| V <sub>DS</sub>  | Drain to Source Voltage                           | V     | 8           |
| V <sub>GS</sub>  | Gate to Source Voltage                            | V     | -4          |
| I <sub>DS</sub>  | Drain Current                                     | A     | 2.8         |
| I <sub>GS</sub>  | Gate Current (I <sub>GF</sub> , I <sub>GR</sub> ) | mA    | ±25         |
| P <sub>T</sub>   | Total Power Dissipation <sup>2</sup>              | W     | 15          |
| T <sub>CH</sub>  | Channel Temperature                               | °C    | 150         |
| T <sub>STG</sub> | Storage Temperature                               | °C    | -65 to +150 |

Note:

- Operation in excess of any one of these parameters may result in permanent damage.

**RECOMMENDED OPERATING LIMITS**

| SYMBOLS           | PARAMETERS                    | UNITS | TYP | MAX  |
|-------------------|-------------------------------|-------|-----|------|
| V <sub>DS</sub>   | Drain to Source Voltage       | V     | 3.5 | 6.0  |
| T <sub>CH</sub>   | Channel Temperature           | °C    |     | +125 |
| G <sub>COMP</sub> | Gain Compression <sup>1</sup> | dB    |     | 3.0  |

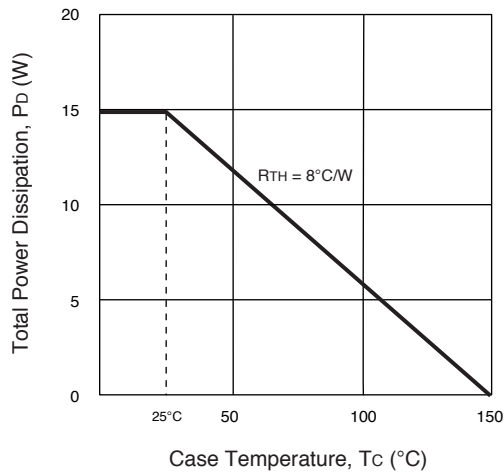
Note:

- Recommended maximum gain compression is 3.0 dB at V<sub>DS</sub> > 4.2 V.

**ORDERING INFORMATION**

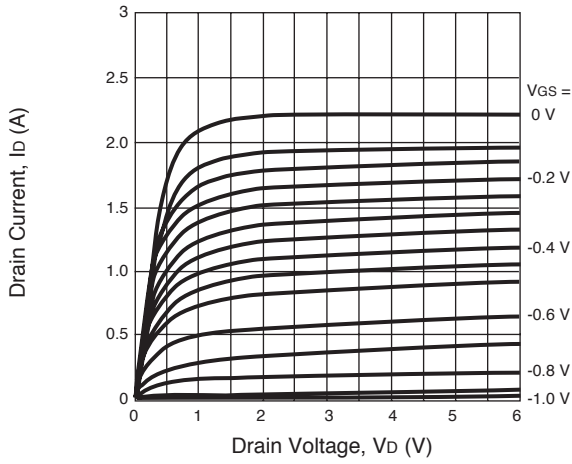
| PART NUMBER     | QTY                  |
|-----------------|----------------------|
| NE6510179A-T1-A | 1 K/Reel             |
| NE6510179A-A    | Bulk, 100 piece min. |

**TOTAL POWER DISSIPATION vs. CASE TEMPERATURE**

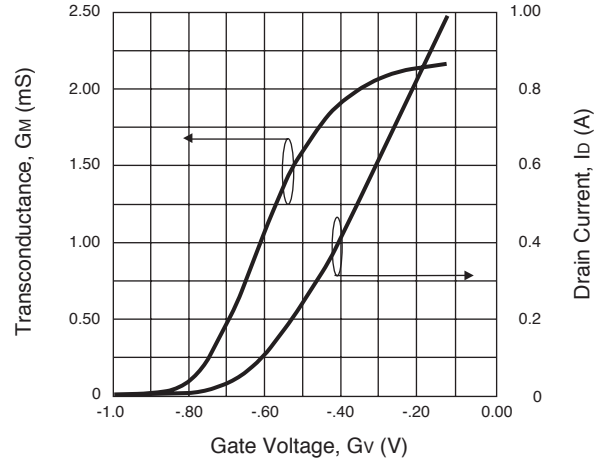


**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )

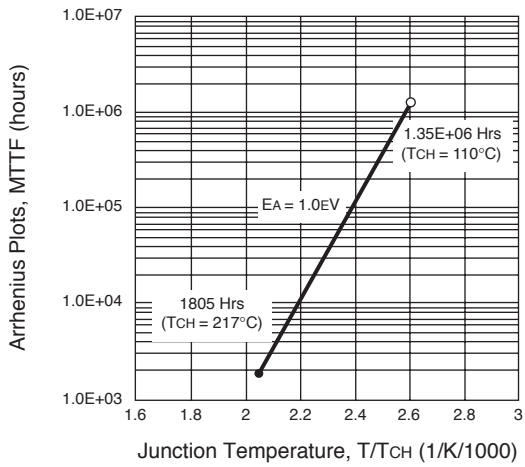
**DRAIN CURRENT vs. DRAIN VOLTAGE**



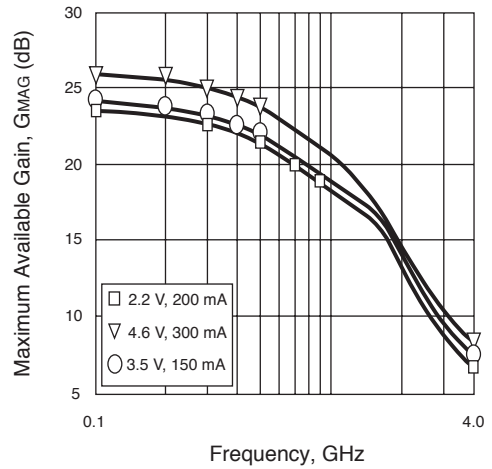
**TRANSCONDUCTANCE AND DRAIN CURRENT vs. GATE VOLTAGE**



**ARRHENIUS PLOTS vs. JUNCTION TEMPERATURE**

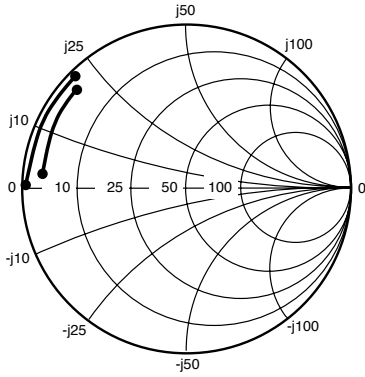


**MAXIMUM AVAILABLE GAIN vs. FREQUENCY**

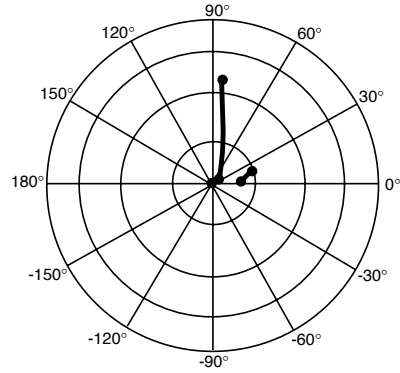


**TYPICAL SCATTERING PARAMETERS** (T<sub>A</sub> = 25°C)

Note: This file and many other s-parameter files can be downloaded from [www.cel.com](http://www.cel.com)



Coordinates in Ohms  
Frequency in GHz  
V<sub>D</sub> = 3.5 V, I<sub>D</sub> = 150 mA



NE6510179A

V<sub>D</sub> = 3.5 V, I<sub>D</sub> = 150 mA

| FREQUENCY<br>GHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |       | S <sub>22</sub> |        | K    | MAG <sup>1</sup><br>(dB) |
|------------------|-----------------|--------|-----------------|-------|-----------------|-------|-----------------|--------|------|--------------------------|
|                  | MAG             | ANG    | MAG             | ANG   | MAG             | ANG   | MAG             | ANG    |      |                          |
| 0.50             | 0.956           | 179.67 | 2.813           | 82.32 | 0.018           | 5.20  | 0.842           | 176.48 | 0.29 | 21.87                    |
| 0.60             | 0.955           | 177.71 | 2.343           | 79.83 | 0.018           | 5.02  | 0.842           | 175.21 | 0.34 | 21.09                    |
| 0.70             | 0.956           | 175.93 | 2.016           | 77.44 | 0.018           | 5.41  | 0.843           | 173.93 | 0.40 | 20.38                    |
| 0.80             | 0.955           | 174.33 | 1.765           | 75.21 | 0.018           | 5.58  | 0.843           | 172.76 | 0.46 | 19.81                    |
| 0.90             | 0.955           | 172.86 | 1.573           | 73.00 | 0.019           | 5.93  | 0.842           | 171.63 | 0.51 | 19.24                    |
| 1.00             | 0.955           | 171.45 | 1.418           | 70.78 | 0.019           | 6.32  | 0.842           | 170.47 | 0.57 | 18.79                    |
| 1.10             | 0.955           | 170.09 | 1.289           | 68.54 | 0.019           | 6.08  | 0.841           | 169.22 | 0.62 | 18.33                    |
| 1.20             | 0.954           | 168.81 | 1.187           | 66.57 | 0.019           | 6.55  | 0.843           | 168.26 | 0.67 | 17.95                    |
| 1.30             | 0.954           | 167.51 | 1.097           | 64.47 | 0.019           | 6.48  | 0.842           | 167.19 | 0.72 | 17.59                    |
| 1.40             | 0.953           | 166.27 | 1.021           | 62.40 | 0.019           | 6.73  | 0.842           | 166.12 | 0.78 | 17.26                    |
| 1.50             | 0.953           | 165.06 | 0.955           | 60.35 | 0.019           | 6.94  | 0.843           | 165.06 | 0.82 | 16.92                    |
| 1.60             | 0.953           | 163.84 | 0.898           | 58.36 | 0.019           | 6.98  | 0.843           | 164.05 | 0.88 | 16.65                    |
| 1.70             | 0.953           | 162.63 | 0.847           | 56.38 | 0.020           | 7.33  | 0.843           | 163.06 | 0.92 | 16.36                    |
| 1.80             | 0.952           | 161.41 | 0.802           | 54.34 | 0.020           | 7.16  | 0.842           | 161.99 | 0.98 | 16.12                    |
| 1.90             | 0.951           | 160.23 | 0.761           | 52.35 | 0.020           | 7.48  | 0.844           | 160.95 | 1.05 | 14.59                    |
| 2.00             | 0.951           | 159.05 | 0.726           | 50.45 | 0.020           | 8.27  | 0.844           | 159.99 | 1.10 | 13.76                    |
| 2.10             | 0.952           | 157.87 | 0.693           | 48.50 | 0.020           | 8.79  | 0.845           | 159.02 | 1.13 | 13.19                    |
| 2.20             | 0.951           | 156.61 | 0.662           | 46.53 | 0.020           | 8.70  | 0.844           | 158.03 | 1.20 | 12.48                    |
| 2.30             | 0.951           | 155.50 | 0.635           | 44.55 | 0.020           | 8.69  | 0.845           | 157.05 | 1.23 | 12.10                    |
| 2.40             | 0.950           | 154.36 | 0.611           | 42.67 | 0.020           | 8.71  | 0.846           | 156.09 | 1.27 | 11.66                    |
| 2.50             | 0.950           | 153.22 | 0.587           | 40.91 | 0.020           | 8.92  | 0.847           | 155.25 | 1.31 | 11.27                    |
| 2.60             | 0.950           | 152.11 | 0.565           | 39.04 | 0.020           | 8.87  | 0.847           | 154.33 | 1.37 | 10.81                    |
| 2.70             | 0.950           | 150.95 | 0.545           | 37.19 | 0.020           | 9.41  | 0.848           | 153.36 | 1.41 | 10.49                    |
| 2.80             | 0.950           | 149.81 | 0.528           | 35.36 | 0.021           | 9.87  | 0.850           | 152.46 | 1.44 | 10.17                    |
| 2.90             | 0.949           | 148.69 | 0.510           | 33.69 | 0.020           | 10.32 | 0.852           | 151.70 | 1.50 | 9.81                     |
| 3.00             | 0.949           | 147.51 | 0.494           | 31.91 | 0.021           | 10.98 | 0.852           | 150.82 | 1.52 | 9.50                     |
| 3.10             | 0.949           | 146.33 | 0.478           | 30.21 | 0.021           | 11.59 | 0.854           | 149.99 | 1.59 | 9.17                     |
| 3.20             | 0.949           | 145.20 | 0.465           | 28.41 | 0.021           | 12.25 | 0.855           | 149.11 | 1.58 | 8.94                     |
| 3.30             | 0.950           | 144.05 | 0.452           | 26.80 | 0.021           | 13.46 | 0.857           | 148.32 | 1.61 | 8.71                     |
| 3.40             | 0.949           | 142.93 | 0.439           | 25.05 | 0.022           | 13.17 | 0.858           | 147.55 | 1.62 | 8.41                     |
| 3.50             | 0.949           | 141.85 | 0.427           | 23.40 | 0.022           | 13.36 | 0.860           | 146.79 | 1.64 | 8.21                     |
| 3.60             | 0.949           | 140.70 | 0.416           | 21.75 | 0.022           | 13.56 | 0.862           | 146.14 | 1.64 | 8.00                     |
| 3.70             | 0.949           | 139.60 | 0.405           | 20.23 | 0.023           | 13.89 | 0.864           | 145.53 | 1.64 | 7.85                     |
| 3.80             | 0.949           | 138.47 | 0.394           | 18.70 | 0.023           | 13.96 | 0.865           | 145.01 | 1.65 | 7.64                     |
| 3.90             | 0.951           | 137.45 | 0.384           | 17.31 | 0.023           | 14.08 | 0.869           | 144.58 | 1.59 | 7.67                     |
| 4.00             | 0.950           | 136.38 | 0.374           | 15.99 | 0.023           | 14.68 | 0.875           | 144.34 | 1.59 | 7.50                     |

Note:

1. Gain Calculation:

$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$

. When  $K \leq 1$ , MAG is undefined and MSG values are used.  $MSG = \frac{|S_{21}|}{|S_{12}|}$ ,  $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12} S_{21}|}$ ,  $\Delta = S_{11} S_{22} - S_{21} S_{12}$

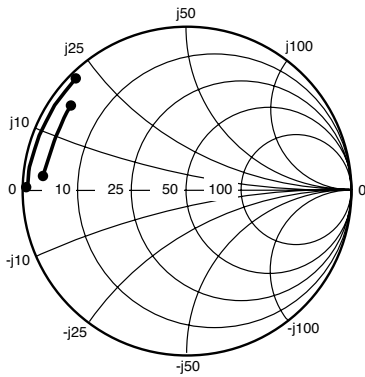
MAG = Maximum Available Gain

MSG = Maximum Stable Gain

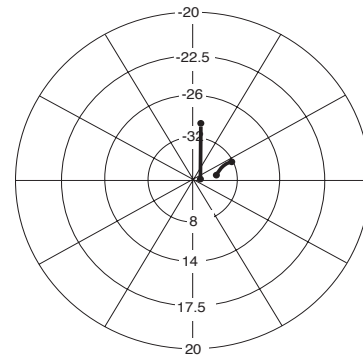
# NE6510179A

## TYPICAL SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)

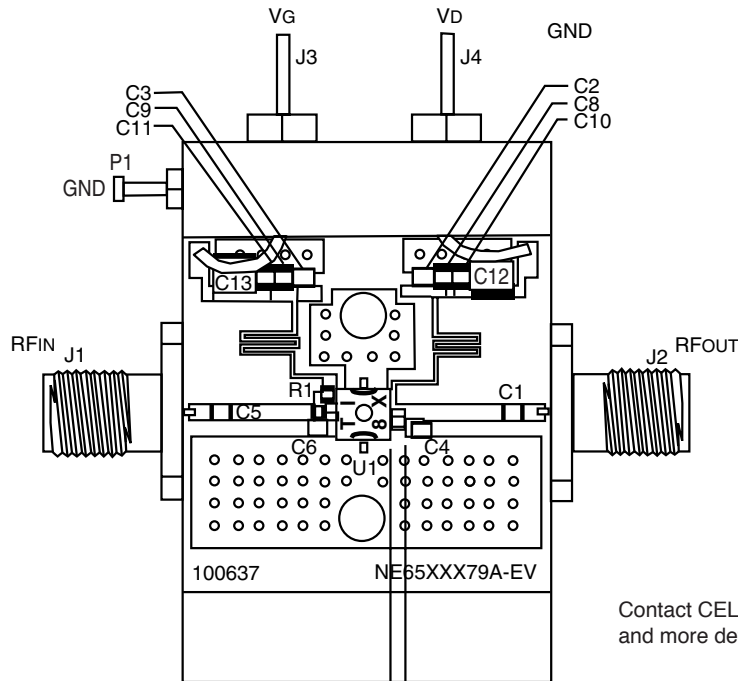
Note: This file and many other s-parameter files can be downloaded from [www.cel.com](http://www.cel.com)



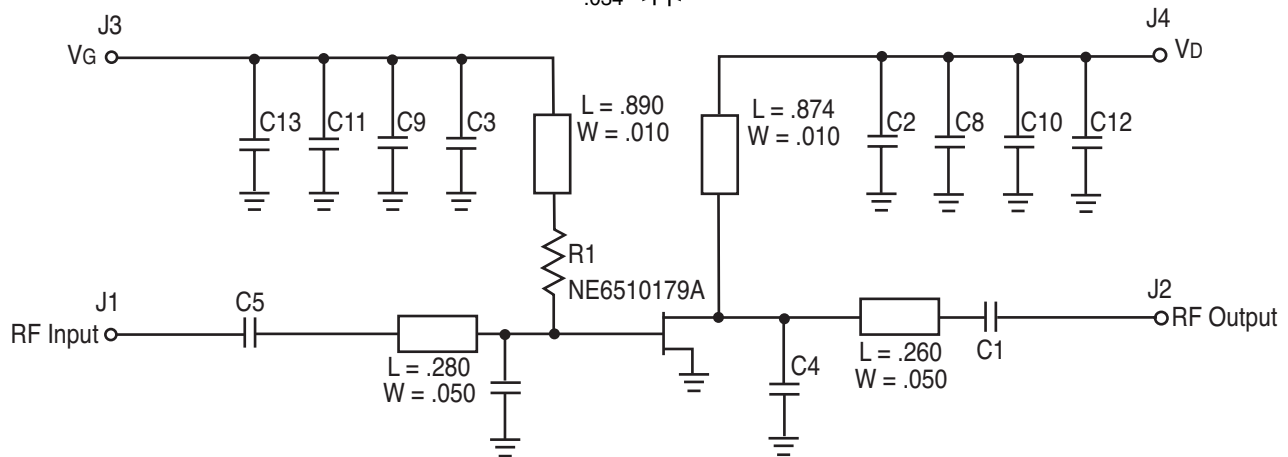
Coordinates in Ohms  
Frequency in GHz  
V<sub>D</sub> = 5.0 V, I<sub>D</sub> = 300 mA



APPLICATION CIRCUIT (1.93-1.99 GHz)

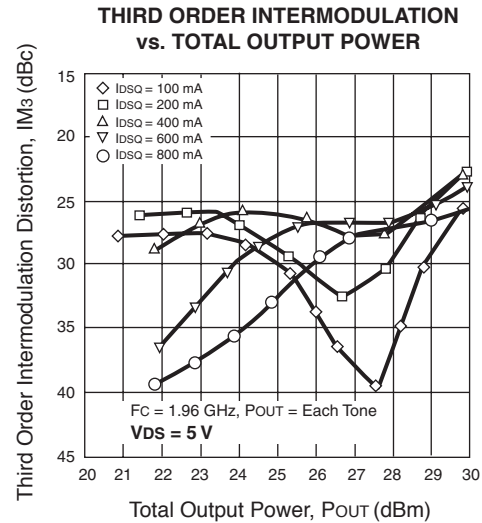
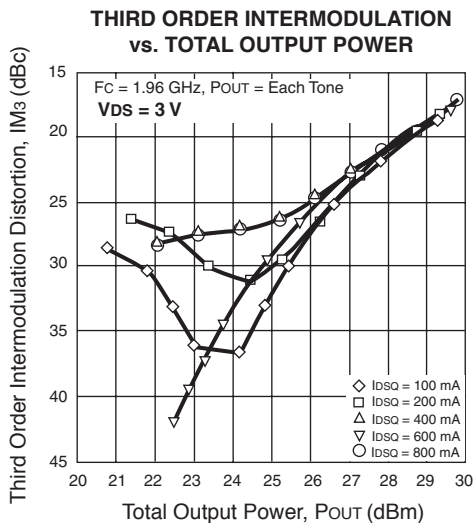
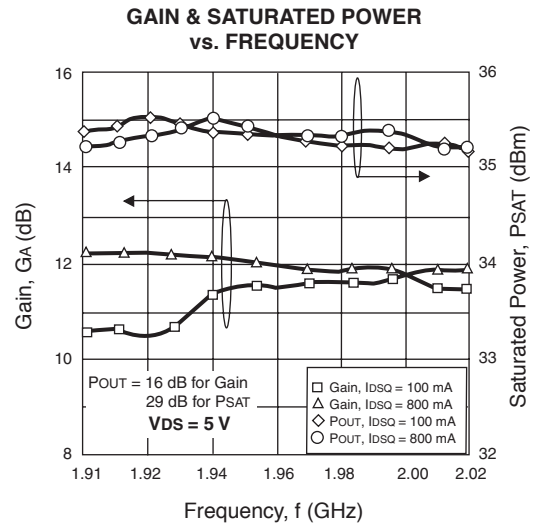
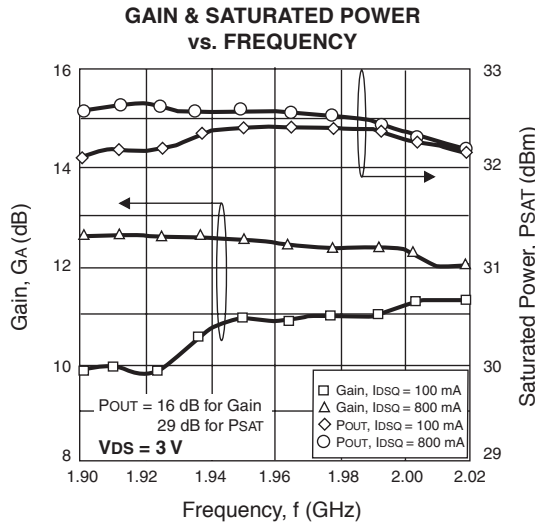
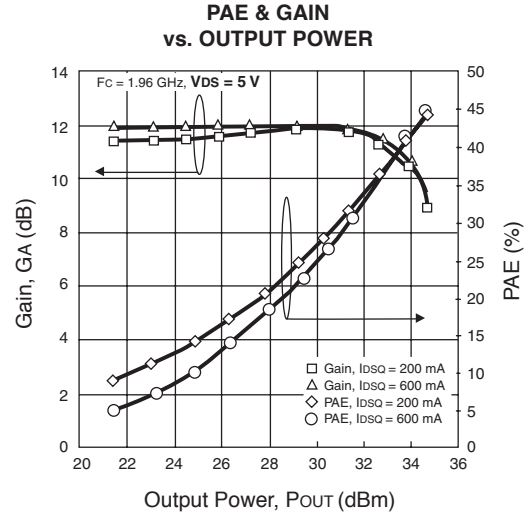
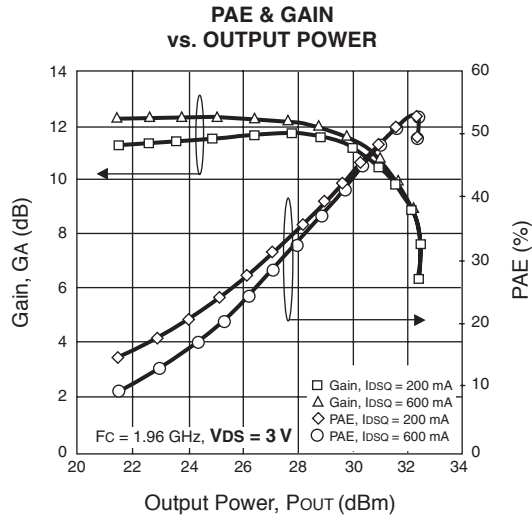


Contact CEL Engineering for artwork and more detailed information.

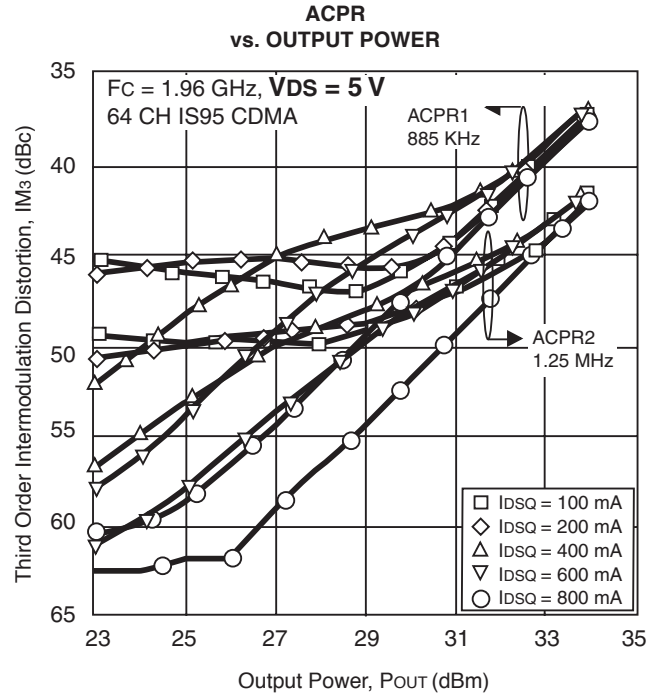
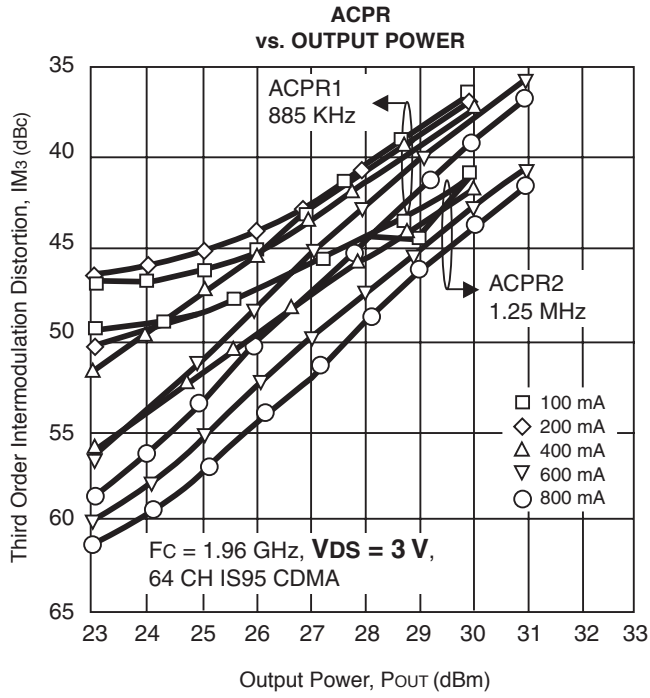


|   |                   |              |                               |    |
|---|-------------------|--------------|-------------------------------|----|
| 1 | TF-100637         |              | TEST CIRCUIT BLK              | 17 |
| 4 |                   |              | 2-56 X 3/16 PHILLIPS PAN HEAD | 16 |
| 2 | MA101J            | C2, C3       | CASE 1 100 pF CAP MURATA      | 15 |
| 1 | MCR03J200         | R1           | 0603 20 OHM RESISTOR ROHM     | 14 |
| 1 | 100A6RBCP150X     | C14 NOT USED | CASE A 6.8 pF CAP ATC         | 13 |
| 1 | 100A4R3CP150X     | C4           | CASE A 4.3 pF CAP ATC         | 12 |
| 2 | 100A240CP150X     | C5, C1       | CASE A 24 pF CAP ATC          | 11 |
| 1 | 100A4R7CP150X     | C6           | CASE A 4.7 pF CAP ATC         | 10 |
| 1 | 100A1RBCP150X     | C7 NOT USED  | CASE A 1.8 pF CAP ATC         | 9  |
| 2 | TAJB475K010R      | C12, C13     | CASE B 4.7 μF CAP AVX         | 8  |
| 2 | GRM40X7R104K025BL | C10, C11     | 0805 .1 μF CAP MURATA         | 7  |
| 2 | GRM40C0G102J050BD | C8, C9       | 0805 1000 pF CAP MURATA       | 6  |
| 1 | NE6510179A        | U1           | IC NEC                        | 5  |
| 1 | 703401            | P1           | GROUND LUG CONCORD            | 4  |
| 1 | 1250-003          | J3, J4       | FEEDTHRU MURATA               | 3  |
| 2 | 2052-5636-02      | J1, J2       | FLANGE MOUNT JACK RECEPTACLE  | 2  |

TYPICAL APPLICATION CIRCUIT PERFORMANCE at  $V_{DS} = 3\text{ V}$  and  $V_{DS} = 5\text{ V}$



TYPICAL APPLICATION CIRCUIT PERFORMANCE at  $V_{DS} = 3\text{ V}$  and  $V_{DS} = 5\text{ V}$







Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices |     |
|-------------------------------|---|--|-----|
|                               |   | -A                                     | -AZ |
| Lead (Pb)                     | < 1000 PPM  | Not Detected                           | (*) |
| Mercury                       | < 1000 PPM  | Not Detected                           |     |
| Cadmium                       | < 100 PPM   | Not Detected                           |     |
| Hexavalent Chromium           | < 1000 PPM  | Not Detected                           |     |
| PBB                           | < 1000 PPM  | Not Detected                           |     |
| PBDE                          | < 1000 PPM  | Not Detected                           |     |

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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