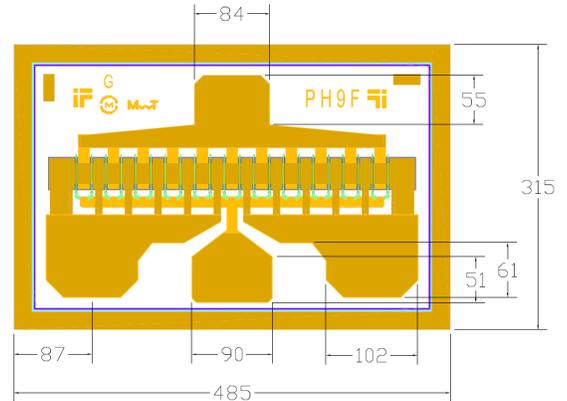


### Features:

- 28 dBm of typical Output Power at 12 GHz
- 13 dB typical Small Signal Gain at 12 GHz
- 45% typical PAE at 12 GHz
- 0.25 x 750 Micron Refractory Metal/Gold Gate
- Excellent for Power, Gain, and High Power Added Efficiency Applications
- Ideal for Commercial, Military, Hi-Rel Space Applications



Chip Dimensions: 485 x 315 microns  
Chip Thickness: 100 microns

### Description:

The MwT-PH9F is a AlGaAs/InGaAs pHEMT (Pseudomorphic-High-Electron-Mobility-Transistor) device whose nominal 0.25 micron gate length and 750 micron gate width make it ideally suited for applications requiring high-gain and power up to 18 GHz frequency range with power outputs ranging from 400 to 500 milli-watts. The device is equally effective for either wideband (e.g. 6 to 18 GHz) or narrow-band applications. The chip is produced using reliable metal systems and passivated to insure excellent reliability.

### Electrical Specifications: • at $T_a = 25^\circ C$

| PARAMETERS & CONDITIONS   | SYMBOL | FREQ   | UNITS | MIN | TYP  |
|---|--------|--------|-------|-----|------|
| Output Power at 1dB Compression<br>$V_{ds}=8.0V$ $I_{ds}=0.7I_{dss}$    | P1dB   | 12 GHz | dBm   |     | 25.0 |
| Saturated Power<br>$V_{ds}=8.0V$ $I_{ds}=0.7I_{dss}$                    | Psat   | 12 GHz | dBm   |     | 28.0 |
| Output Third Order Intercept Point<br>$V_{ds}=8.0V$ $I_{ds}=0.7I_{dss}$ | OIP3   | 12 GHz | dBm   |     | 34.0 |
| Small Signal Gain<br>$V_{ds}=8.0V$ $I_{ds}=0.7I_{dss}$                  | SSG    | 12 GHz | dB    |     | 13.0 |
| Power Added Efficiency<br>$V_{ds}=8.0V$ $I_{ds}=0.7I_{dss}$             | PAE    | 12 GHz | %     |     | 45   |

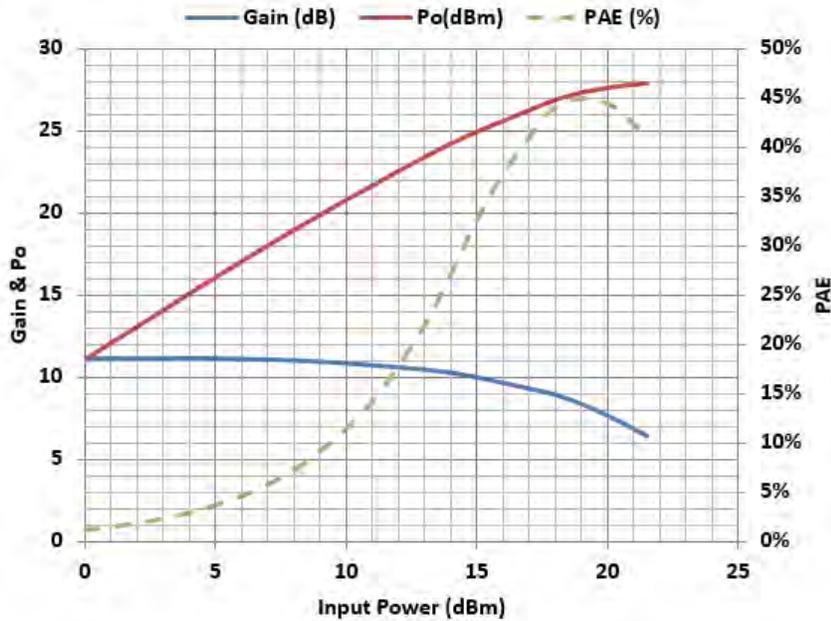
Note:  $I_{ds}$  should be between 40% and 80% of  $I_{dss}$ . Currently, our data shows  $I_{ds}$  at 70% of  $I_{dss}$ . Low  $I_{ds}$  will improve efficiency, but high  $I_{ds}$  will make Psat and IP3 better.

### DC Specifications: • at $T_a = 25^\circ C$

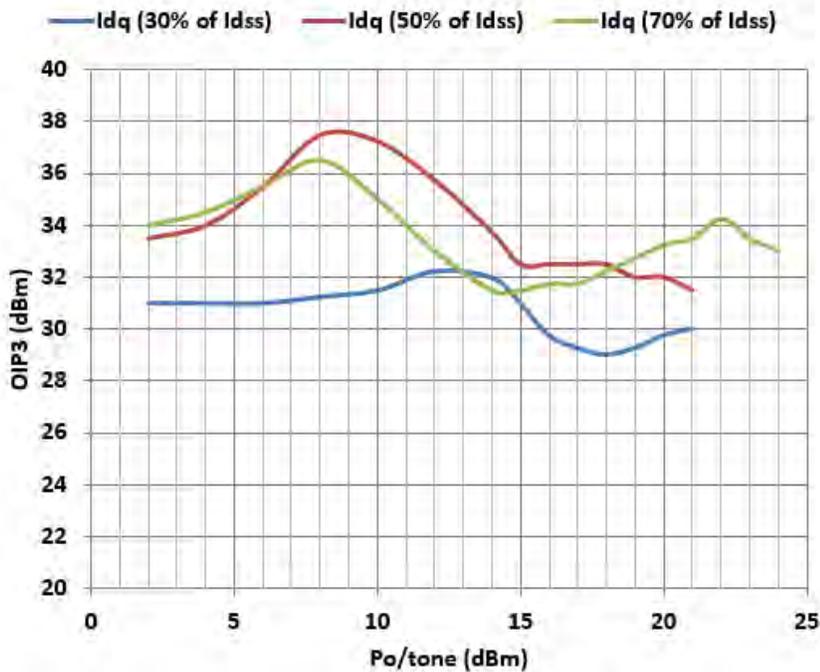
| PARAMETERS & CONDITIONS                                    | SYMBOL                                    | UNITS    | MIN | TYP        | MAX |
|--|---|----------|-----|------------|-----|
| Saturated Drain Current<br>$V_{ds}= 4.0 V$ $V_{gs}= 0.0 V$ | $I_{DSS}$                                 | mA       | 180 |            | 220 |
| Transconductance<br>$V_{ds}= 2.5 V$ $V_{gs}= 0.0 V$        | $G_m$                                     | mS       |     | 270        |     |
| Pinch-off Voltage<br>$V_{ds}= 3.0 V$ $I_{ds}= 5.0 mA$      | $V_p$                                     | V        |     | -0.8       |     |
| Gate-to-Source Breakdown Voltage<br>$I_{gs}= -1.0 mA$      | BVGSO                                     | V        |     | -17.0      |     |
| Gate-to-Drain Breakdown Voltage<br>$I_{gd}= -1.0 mA$       | BVGDO                                     | V        |     | -18.0      |     |
| Chip Thermal Resistance                                    | MwT-PH7F Chip & 70 pkg<br>71 pkg & 73 pkg | $R_{th}$ | C/W | 60<br>175* |     |

\* Overall  $R_{th}$  depends on case mounting

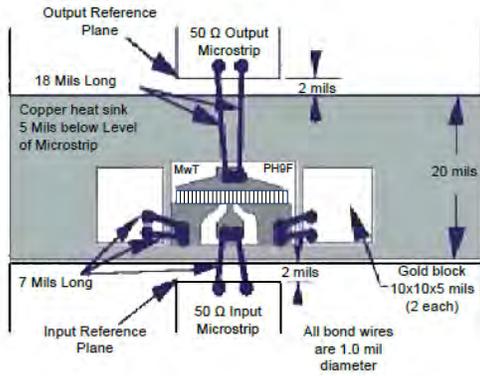
MwT-PH9F, Gain, Po & PAE vs Pin at 12GHz  
 $V_{ds}=8V$ ;  $I_{dq}=0.7 \times I_{DSS}$



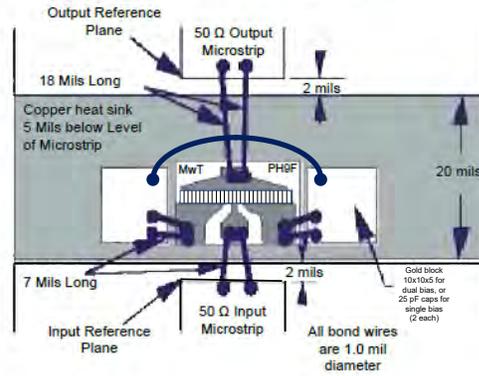
MwT-PH9F, OIP3 at different  $I_{dq}$  vs Po/tone at 12GHz



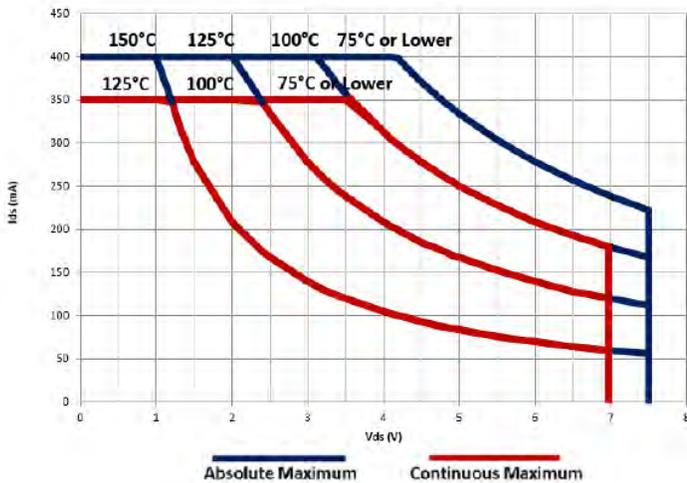
MwT-PH9F  
DUAL BIAS



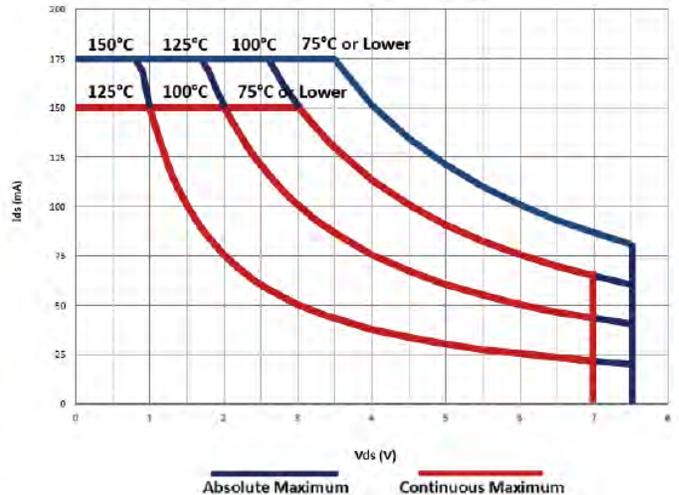
MwT-PH9F  
OPTIONAL BONDING



SAFE OPERATING LIMITS vs BACKSIDE TEMPERATURE  
MwT-PH9F Chip and Pkg



SAFE OPERATING LIMITS vs BACKSIDE TEMPERATURE  
MwT-PH9F with 70Pkg and 73Pkg



### MAXIMUM RATINGS AT Ta = 25 °C

| Symbol | Parameter               | Units | Cont Max1   | Absolute Max2 |
|--------|-------------------------|-------|-------------|---------------|
| VDS    | Drain to Source Volt.   | V     | 7.5         | 8.0           |
| Tch    | Channel Temperature     | °C    | +150        | +175          |
| Tst    | Storage Temperature     | °C    | -65 to +160 | +180          |
| Pin    | RF Input Power          | mW    | 240         | 360           |
| Pt     | Total Power Dissipation | mW    | 2700        | 3300          |

**Notes:**

1. Exceeding any one of these limits in continuous operation may reduce the mean-time-to-failure below the design goal.
2. Exceeding any one of these limits may cause permanent damage.



# MwT-PH9F

## 26 GHz Medium Power AlGaAs/InGaAs pHEMT

S-PARAMETER Vds=7V, Ids= 0.7 x Idss

| Freq.<br>GHz | S11    |          | S21    |         | S12     |         | S22     |          | K     | GMAX<br>dB |
|--------------|--------|----------|--------|---------|---------|---------|---------|----------|-------|------------|
|              | dB     | Ang (°)  | dB     | Ang (°) | dB      | Ang (°) | dB      | Ang (°)  |       |            |
| 1            | -0.806 | -71.750  | 23.199 | 136.917 | -31.422 | 55.413  | -5.558  | -29.458  | 0.160 | 27.311     |
| 2            | -1.428 | -113.508 | 20.042 | 112.384 | -28.699 | 36.975  | -7.682  | -43.305  | 0.293 | 24.370     |
| 3            | -1.757 | -136.906 | 17.341 | 97.338  | -27.887 | 31.296  | -8.921  | -51.462  | 0.423 | 22.614     |
| 4            | -1.860 | -152.417 | 15.171 | 86.096  | -27.483 | 28.246  | -9.550  | -58.012  | 0.541 | 21.327     |
| 5            | -1.934 | -162.460 | 13.371 | 77.508  | -27.441 | 27.615  | -9.931  | -64.349  | 0.690 | 20.406     |
| 6            | -1.942 | -171.023 | 11.954 | 70.007  | -27.175 | 29.236  | -9.980  | -69.027  | 0.785 | 19.564     |
| 7            | -1.925 | -179.511 | 10.671 | 62.660  | -26.964 | 30.240  | -10.032 | -75.342  | 0.882 | 18.818     |
| 8            | -1.909 | 175.764  | 9.576  | 56.000  | -26.819 | 32.373  | -9.621  | -84.018  | 0.957 | 18.197     |
| 9            | -1.885 | 170.112  | 8.262  | 49.092  | -26.727 | 36.176  | -9.671  | -92.272  | 1.114 | 15.441     |
| 10           | -1.820 | 165.491  | 7.498  | 42.655  | -26.162 | 37.670  | -9.026  | -98.865  | 1.064 | 15.289     |
| 11           | -1.582 | 160.382  | 6.663  | 35.535  | -25.749 | 41.269  | -8.922  | -106.277 | 0.978 | 16.206     |
| 12           | -1.533 | 156.232  | 5.820  | 29.863  | -25.115 | 42.802  | -8.386  | -113.358 | 0.949 | 15.467     |
| 13           | -1.526 | 152.474  | 5.030  | 23.894  | -24.580 | 45.652  | -7.964  | -120.820 | 0.970 | 14.805     |
| 14           | -1.483 | 149.390  | 4.113  | 18.616  | -23.921 | 48.373  | -7.400  | -128.071 | 0.957 | 14.017     |
| 15           | -1.290 | 145.289  | 3.553  | 12.522  | -23.108 | 49.400  | -6.988  | -134.137 | 0.786 | 13.330     |
| 16           | -1.325 | 142.208  | 2.865  | 7.577   | -22.361 | 49.584  | -6.479  | -140.954 | 0.786 | 12.613     |
| 17           | -1.321 | 139.098  | 2.139  | 2.504   | -21.684 | 49.431  | -6.004  | -147.257 | 0.770 | 11.912     |
| 18           | -1.203 | 136.345  | 1.341  | -2.284  | -20.936 | 49.960  | -5.502  | -153.462 | 0.685 | 11.138     |
| 19           | -1.110 | 134.426  | 0.696  | -7.179  | -20.259 | 48.203  | -5.204  | -158.917 | 0.601 | 10.477     |
| 20           | -1.015 | 130.322  | 0.104  | -12.077 | -19.532 | 47.955  | -4.738  | -164.296 | 0.524 | 9.818      |
| 21           | -1.017 | 128.019  | -0.694 | -18.027 | -19.029 | 46.172  | -4.320  | -169.566 | 0.501 | 9.168      |
| 22           | -1.028 | 125.679  | -1.301 | -21.732 | -18.364 | 44.550  | -3.915  | -174.790 | 0.478 | 8.531      |
| 23           | -0.837 | 123.850  | -1.988 | -26.246 | -17.859 | 43.259  | -3.662  | 179.806  | 0.371 | 7.936      |
| 24           | -0.809 | 120.967  | -2.790 | -30.342 | -17.310 | 41.366  | -3.505  | 174.907  | 0.370 | 7.260      |
| 25           | -0.988 | 118.586  | -3.456 | -33.601 | -16.813 | 38.750  | -3.008  | 169.245  | 0.434 | 6.678      |
| 26           | -0.904 | 116.448  | -4.198 | -37.050 | -16.373 | 37.589  | -2.742  | 165.270  | 0.389 | 6.087      |
| 27           | -0.838 | 113.305  | -4.755 | -40.152 | -15.900 | 35.040  | -2.580  | 161.352  | 0.356 | 5.572      |
| 28           | -0.756 | 112.364  | -5.522 | -43.301 | -15.525 | 31.987  | -2.309  | 156.386  | 0.293 | 5.002      |
| 29           | -0.799 | 109.303  | -6.298 | -45.678 | -15.102 | 30.263  | -2.175  | 153.018  | 0.336 | 4.402      |
| 30           | -0.774 | 107.505  | -6.888 | -48.115 | -14.632 | 27.968  | -1.933  | 149.162  | 0.304 | 3.872      |

### ORDERING INFORMATION:

When placing order or inquiring, please specify BIN range, wafer number, if known, and visual screening level required. For details of BIN Selection and Safe Handling Procedure please see supplementary information in available PDF on our website [www.mwtinc.com](http://www.mwtinc.com).

### Available Packaging:

- 70 Package - MwT-PH9F70
- 71 Package - MwT-PH9F71
- 73 Package - MwT-PH9F73