MITSUBISHI ELECTRIC

**< Low Noise GaAs HEMT >**

# MGF4938AM

**4pin flat lead package**

## DESCRIPTION

The MGF4938AM super-low noise InGaAs HEMT (High Electron Mobility Transistor) is designed for use in S to Ku band amplifiers.

The 4pin flat lead package is small-thin size, and offers high cost performance.

## FEATURES

Very Low noise figure @ f=12GHz
NFmin. = 0.32dB (Typ.)
High associated gain @ f=12GHz
Gs = 12.5dB (Typ.)

## APPLICATION

S to Ku band low noise amplifiers

## QUALITY GRADE

GG

## RECOMMENDED BIAS CONDITIONS

$V_{DS}$=2V , $I_D$=10mA

## ORDERING INFORMATION

Tape & reel 15000pcs/reel

## RoHS COMPLIANT

MGF4938AM is a RoHS2 compliant product.

Outline Drawing

Fig.1

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## ABSOLUTE MAXIMUM RATINGS (Ta=25°C )

| Symbol | Parameter | Ratings | Unit |
|---|---|---|---|
| $V_{GDO}$ | Gate to drain voltage | -3 | V |
| $V_{GSO}$ | Gate to source voltage | -3 | V |
| $V_{DS}$ | Drain to source voltage | 3 | V |
| $I_D$ | Drain current | IDSS | mA |
| PT | Total power dissipation | 50 | mW |
| Tch | Channel temperature | 125 | °C |
| Tstg | Storage temperature | -55 to +125 | °C |
| Top | Operation temperature | -55 to +125 | °C |

## ELECTRICAL CHARACTERISTICS (Ta=25°C )

| Symbol | Parameter | Test conditions | Limits | | | Unit |
|---|---|---|---|---|---|---|
| | | | MIN. | TYP. | MAX | |
| $V_{(BR)GDO}$ | Gate to drain breakdown voltage | $I_G$=-10μA | -3.5 | -- | -- | V |
| $I_{GSS}$ | Gate to source leakage current | $V_{GS}$=-2V,$V_{DS}$=0V | -- | -- | 50 | μA |
| $I_{DSS}$ | Saturated drain current | $V_{GS}$=0V,$V_{DS}$=2V | 12 | -- | 60 | mA |
| $V_{GS(off)}$ | Gate to source cut-off voltage | $V_{DS}$=2V,$I_D$=500μA | -0.1 | -- | -1.5 | V |
| Gs | Associated gain | $V_{DS}$=2V, | 11.0 | 12.5 | -- | dB |
| NFmin. | Minimum noise figure | $I_D$=10mA,f=12GHz | -- | 0.32 | 0.47 | dB |

Note: Gs and NFmin. are tested with sampling inspection.
Thermal resistance (Rth) of this product: 800 deg.C/W.

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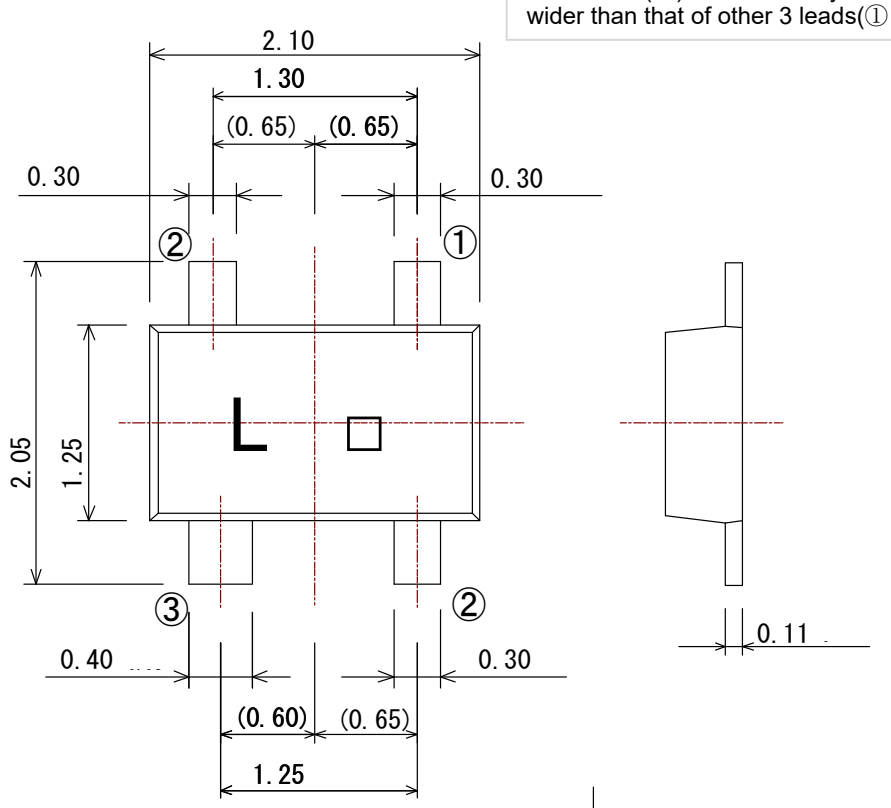
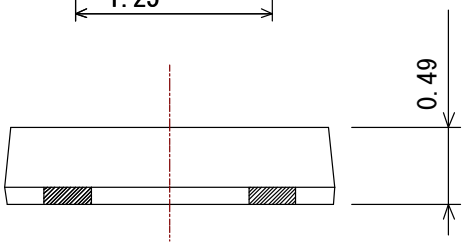
Fig.1

Drain lead (③) width is always at least 0.03mm wider than that of other 3 leads(① and ②)

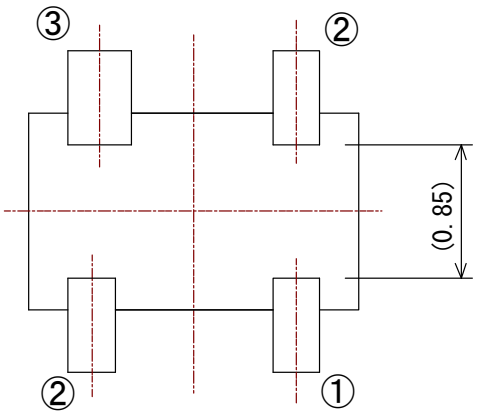
Top




Side




Bottom




Unit: mm

① Gate
② Source
③ Drain

(GD-30)

## S PARAMETERS

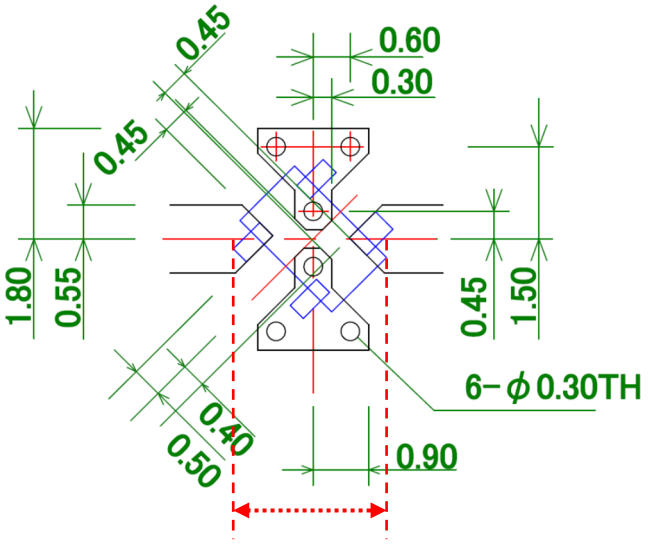
($V_{DS}$=2V, $I_D$=10mA, Ta=room temperature)

| Freq. | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| (GHz) | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) |
| 6 | 0.785 | -85.7 | 5.150 | 90.9 | 0.081 | 27.7 | 0.491 | -75.4 |
| 7 | 0.701 | -104.9 | 5.070 | 74.2 | 0.091 | 16.1 | 0.439 | -90.8 |
| 8 | 0.623 | -126.4 | 4.886 | 57.6 | 0.101 | 3.4 | 0.388 | -108.7 |
| 9 | 0.536 | -148.2 | 4.592 | 42.1 | 0.102 | -8.7 | 0.331 | -125.0 |
| 10 | 0.465 | -171.2 | 4.287 | 27.9 | 0.100 | -19.6 | 0.272 | -139.2 |
| 11 | 0.445 | 166.4 | 4.079 | 14.4 | 0.101 | -28.3 | 0.244 | -156.1 |
| 12 | 0.443 | 143.3 | 3.872 | 0.9 | 0.102 | -36.9 | 0.223 | -174.1 |
| 13 | 0.472 | 119.8 | 3.657 | -13.6 | 0.102 | -47.0 | 0.209 | 164.7 |
| 14 | 0.510 | 99.8 | 3.462 | -27.2 | 0.101 | -55.5 | 0.195 | 146.3 |
| 15 | 0.553 | 82.2 | 3.262 | -40.6 | 0.100 | -65.5 | 0.194 | 125.5 |
| 16 | 0.603 | 65.9 | 3.011 | -56.3 | 0.098 | -73.0 | 0.220 | 104.1 |
| 17 | 0.640 | 52.4 | 2.749 | -69.7 | 0.095 | -80.9 | 0.230 | 85.9 |
| 18 | 0.676 | 40.4 | 2.485 | -82.2 | 0.095 | -88.1 | 0.256 | 68.1 |

## Noise Parameter

($V_{DS}$=2V, $I_D$=10mA, Ta=room temperature)

| Freq. | NFmin | Γopt | | Rn/50 |
|---|---|---|---|---|
| (GHz) | (dB) | (mag) | (ang) | (Ω) |
| 6 | 0.19 | 0.713 | 39.7 | 0.198 |
| 7 | 0.20 | 0.646 | 55.8 | 0.182 |
| 8 | 0.21 | 0.580 | 74.1 | 0.149 |
| 9 | 0.24 | 0.517 | 94.0 | 0.123 |
| 10 | 0.26 | 0.458 | 115.6 | 0.096 |
| 11 | 0.29 | 0.408 | 138.6 | 0.068 |
| 12 | 0.32 | 0.368 | 162.4 | 0.057 |
| 13 | 0.34 | 0.340 | -173.2 | 0.044 |
| 14 | 0.38 | 0.326 | -149.0 | 0.040 |
| 15 | 0.40 | 0.328 | -125.0 | 0.047 |
| 16 | 0.43 | 0.346 | -101.8 | 0.068 |
| 17 | 0.47 | 0.382 | -79.5 | 0.084 |
| 18 | 0.50 | 0.437 | -57.7 | 0.116 |




Measurement plane (2.58mm)

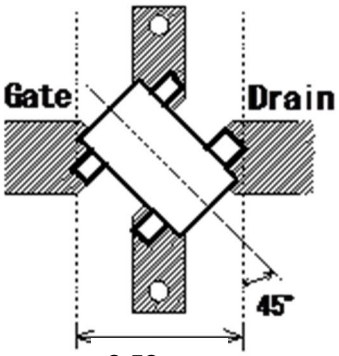
Board: εr=3.38
Thickness: 0.508mm
(Rogers RO4003C)
(6-φ0.3: through-hole)

**Note:** We are ready to provide nonlinear model for ADS and MWO users. If you are interested, please contact our sales offices.

## S PARAMETERS

($V_{DS}$=2V, $I_D$=10mA, Ta=room temperature)

| Freq. | S11 | | S21 | | S12 | | S22 | |
|---|---|---|---|---|---|---|---|---|
| (GHz) | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) | (mag) | (ang) |
| 6 | 0.739 | -81.6 | 4.930 | 89.5 | 0.076 | 34.2 | 0.485 | -67.4 |
| 7 | 0.648 | -99.0 | 4.810 | 73.6 | 0.086 | 24.8 | 0.430 | -79.4 |
| 8 | 0.564 | -118.4 | 4.656 | 57.9 | 0.097 | 14.4 | 0.372 | -93.0 |
| 9 | 0.469 | -139.2 | 4.402 | 43.0 | 0.098 | 4.6 | 0.306 | -107.0 |
| 10 | 0.389 | -163.2 | 4.127 | 29.0 | 0.098 | -4.5 | 0.236 | -119.2 |
| 11 | 0.369 | 172.4 | 3.949 | 15.7 | 0.101 | -11.2 | 0.196 | -137.1 |
| 12 | 0.373 | 146.3 | 3.772 | 2.1 | 0.104 | -18.0 | 0.166 | -159.1 |
| 13 | 0.416 | 120.8 | 3.557 | -12.5 | 0.107 | -26.8 | 0.157 | 170.7 |
| 14 | 0.459 | 100.8 | 3.352 | -25.4 | 0.107 | -34.0 | 0.155 | 146.3 |
| 15 | 0.510 | 83.8 | 3.172 | -38.3 | 0.106 | -42.3 | 0.176 | 120.5 |
| 16 | 0.574 | 69.3 | 2.971 | -53.5 | 0.108 | -48.1 | 0.235 | 101.1 |
| 17 | 0.618 | 57.5 | 2.739 | -66.7 | 0.107 | -54.3 | 0.272 | 88.2 |
| 18 | 0.665 | 46.7 | 2.515 | -79.7 | 0.110 | -61.2 | 0.313 | 74.1 |




**2.58mm**
Measurement Plane

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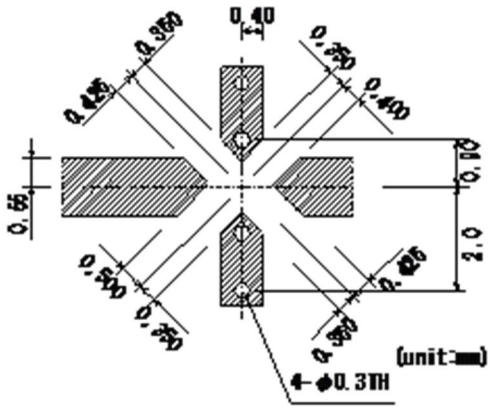
($V_{DS}$=2V, $I_D$=10mA, Ta=room temperature)

| Freq. | NFmin. | Γopt | | Rn/50 |
|---|---|---|---|---|
| (GHz) | (dB) | (mag) | (ang) | (Ω) |
| 6 | 0.23 | 0.664 | 31.0 | 0.201 |
| 7 | 0.24 | 0.586 | 49.4 | 0.185 |
| 8 | 0.25 | 0.510 | 70.4 | 0.151 |
| 9 | 0.28 | 0.440 | 93.6 | 0.125 |
| 10 | 0.29 | 0.377 | 118.6 | 0.091 |
| 11 | 0.31 | 0.327 | 144.6 | 0.072 |
| 12 | 0.34 | 0.291 | 171.4 | 0.063 |
| 13 | 0.36 | 0.273 | -162.2 | 0.059 |
| 14 | 0.40 | 0.275 | -136.0 | 0.054 |
| 15 | 0.42 | 0.299 | -112.0 | 0.060 |
| 16 | 0.45 | 0.344 | -89.4 | 0.081 |
| 17 | 0.48 | 0.417 | -69.4 | 0.112 |
| 18 | 0.51 | 0.516 | -51.0 | 0.143 |

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