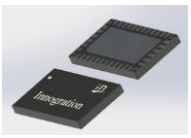
# 0.1-3.3GHz,2 stages, 12W, 28V GaN Fully matched PA Module

## Description



The G2MAH0133-12 is a 12-watt ,2 stage integrated Power Amplifier Module, designed for broad band applications, with frequencies from 100MHz to 3.3GHz. The module is 50 Ω input/output matched and requires minimal external components.

The module implements distributed power amplifier in form of multi chips, housed in cost effective plastic open cavity package, offers a much lower cost than traditional MMIC solutions.

- Vds=28V, Idq1=10 mA, Idq2=40 mA, CW

| Parameter | 0.1GHz | 0.5GHz | 1.0GHz | 1.5GHz | 2.0GHz | 2.5GHz | 3.0GHz | 3.3GHz | Units |
|---|---|---|---|---|---|---|---|---|---|
| Linear Gain | 29.0 | 26.2 | 25.7 | 25.6 | 25.0 | 24.1 | 24.8 | 24.6 | dB |
| Gain@Pin=19dBm | 23.5 | 23.8 | 23.5 | 22.8 | 22.7 | 22.3 | 22.2 | 21.5 | dB |
| Pout@Pin=19dBm | 18.4 | 18.9 | 17.7 | 15.3 | 14.9 | 13.4 | 13.1 | 12.2 | W |
| PAE@Pin=19dBm | 64 | 61 | 55 | 49 | 48 | 41 | 45 | 45 | % |

Vds=32V, Idq1=10 mA, Idq2=40 mA, CW

| Parameter | 0.1GHz | 0.5GHz | 1.0GHz | 1.5GHz | 2.0GHz | 2.5GHz | 3.0GHz | 3.3GHz | Units |
|---|---|---|---|---|---|---|---|---|---|
| Linear Gain | 29.5 | 26.5 | 26.1 | 26.0 | 25.3 | 24.3 | 25.3 | 25.1 | dB |
| Gain@Pin=19dBm | 24.4 | 24.6 | 24.3 | 23.6 | 23.4 | 22.9 | 22.9 | 22.7 | dB |
| Pout@Pin=19dBm | 22.7 | 23.1 | 21.2 | 18.4 | 17.5 | 15.5 | 15.4 | 14.6 | W |
| Eff@Pin=19dBm | 64 | 60 | 54 | 48 | 45 | 39 | 44 | 45 | % |

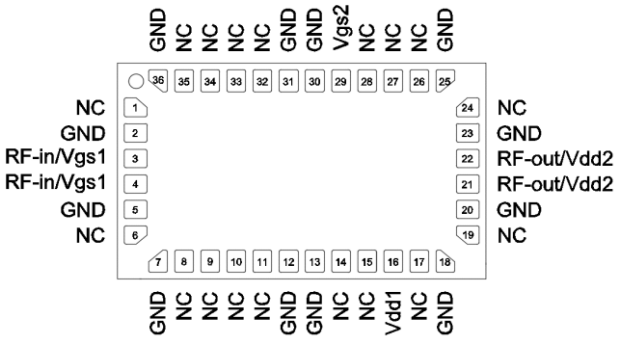
## Product Features

- Operating Frequency Range: 0.1-3.3GHz
- Operating Drain Voltage: +28 V (Up to 32V)
- 50 Ω Input/Output
- Psat: ≥12W @28V, ≥14W @32V
- Small signal gain:>24dB, Power gain:>21dB @Pin=19dBm
- Minimum efficiency:>40%
- 6x10 mm Surface Mount Package
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

## Applications

- Ultra Broadband Amplifiers
- Fiber Drivers
- Test Instrumentation
- EMC Amplifier Drivers
- 2-way Radios

## Pin Configuration and Description




| Pin No. | Symbol | Description |
|---|---|---|
| 21,22 | RFout/Vdd2 | Transistor 1, Drain Bias2 & RF Output |
| 3,4 | RFin/Vgs1 | Transistor 1, Gate Bias1 & RF Input |
| 29 | Vgs2 | Transistor 1, Gate Bias2 |
| 16 | Vdd1 | Transistor 1, Drain Bias1 |
| Others | NC | No connection |
| 2,5,7,12, 13,18,20,23,25, 30, 31,36 Package Base | GND | DC/RF Ground. Must be soldered to EVB ground plane over array of vias for thermal and RF performance. Solder voids under Pkg Base will result in excessive junction temperatures causing permanent damage. |

**Table 1. Maximum Ratings**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain--Source Voltage | $V_{DSS}$ | 150 | Vdc |
| Gate--Source Voltage | $V_{GS}$ | -10 to +2 | Vdc |
| Operating Voltage | $V_{DD}$ | +36 | Vdc |
| Input CW Power | RFin | 22 | dBm |
| Storage Temperature Range | Tstg | -65 to +150 | °C |
| Case Operating Temperature | $T_C$ | +150 | °C |
| Operating Junction Temperature | $T_J$ | +225 | °C |

**Table 2. Thermal Characteristics**

| Characteristic | Symbol | Value | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case, FEA<br>$T_C$= 25°C, DC test | RθJC | 4.7 | °C/W |

**Table 3. Electrical Characteristics**

| Parameter | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Frequency Range | | 100 | | 3300 | MHz |
| Power Gain | | 21 | | | dB |
| $P_{OUT}$ | Pin=19dBm | | 41 | | dBm |
| Drain Efficiency @ $P_{SAT}$ | | 40 | | | % |
| Unless otherwise noted: TA = 25°C, $V_{DD}$ =28 V, Pulse Width=100 us, Duty cycle=10% | | | | | |

**Load Mismatch of per Section (On Test Fixture, 50 ohm system):** $V_{DD}$ =28 V, $I_{DQ}$ =90 mA, f = 3GHz

| | |
|---|---|
| VSWR 10:1 at pulse CW Output Power @Pin=22dBm | No Device Degradation |

## Reference Circuit of Test Fixture Assembly Diagram

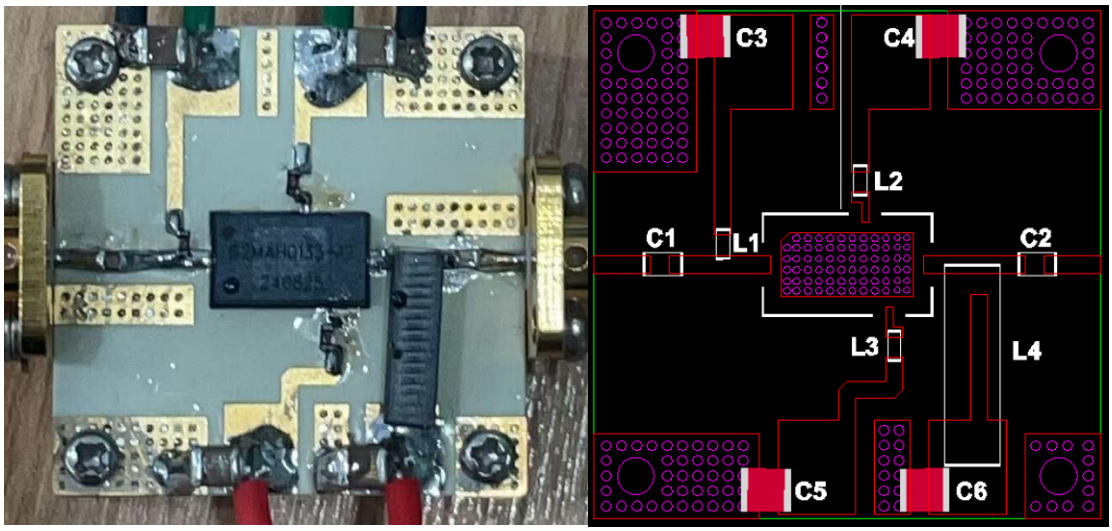



**Figure 1. Test Circuit Component Layout**

| | | Part NO. | Vendor |
|---|---|---|---|
| C1, C2 | 50V 1uF Chip Capacitor | GRM21BR71H105KA12L | muRata |
| C3,C4,C5,C6 | 10uF 100V Chip Capacitor | C5750X7S2A106M230KB | TDK |
| L1, L2,L3 | 100 nH Capacitor(0603) | LQW18CNR10K00D | muRata |
| L4 | 1.3uH 4.2A Inductor | 4310LC-132KEC | Coilcraft |
| PCB | RO4350B,20mil,er=3.48 | | |

# TYPICAL CHARACTERISTICS

**Figure 2. Network analyzer output S11/S21 (VDS= 28V, IDQ1=10 mA, IDQ2=40 mA Pin=0dBm)**

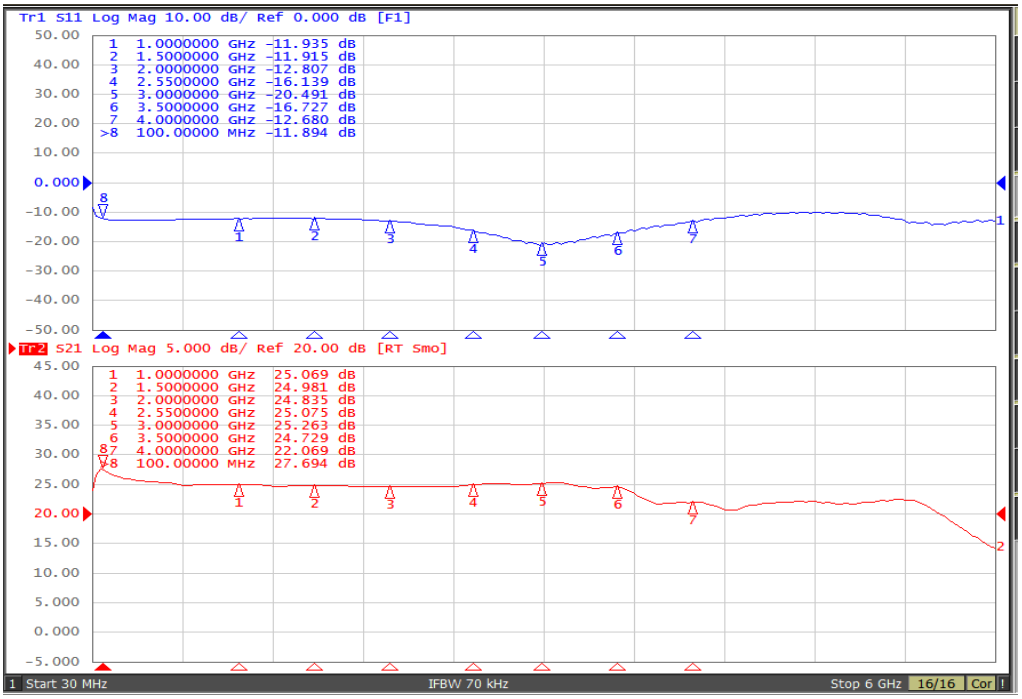
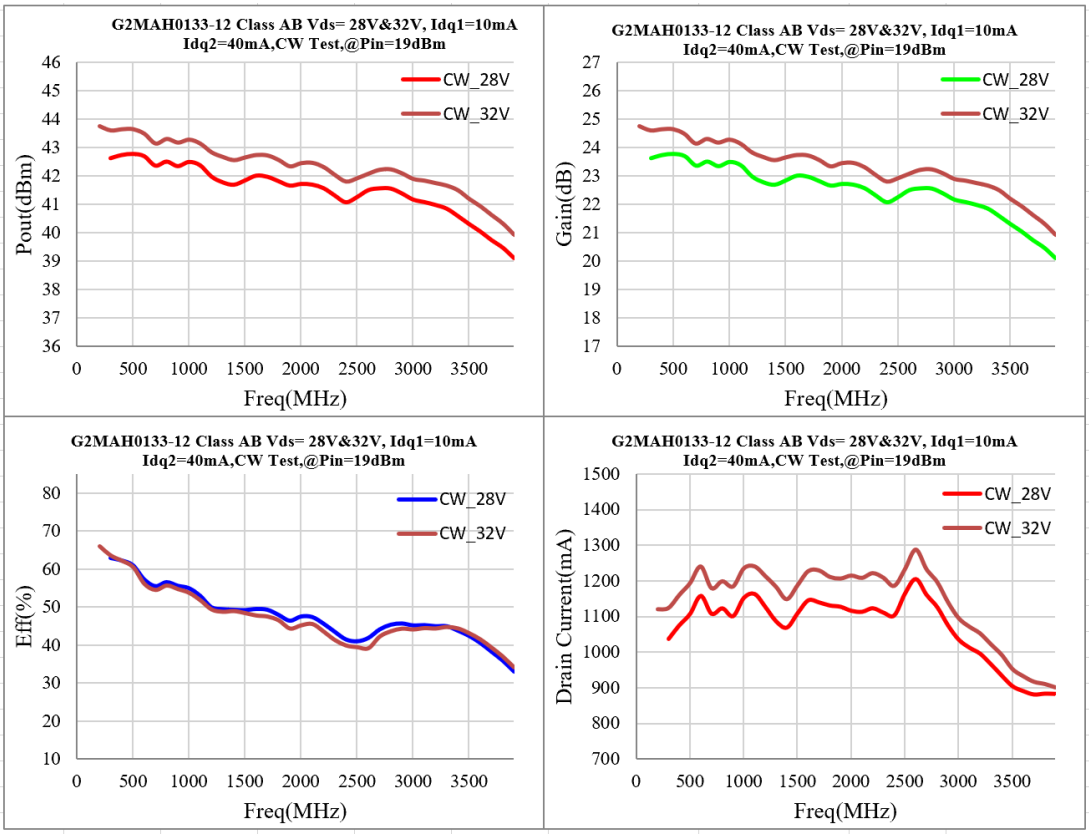


**Figure 3. Power Gain and, efficiency and Pout @Pin=19dBm, P3dB vs. Frequency**



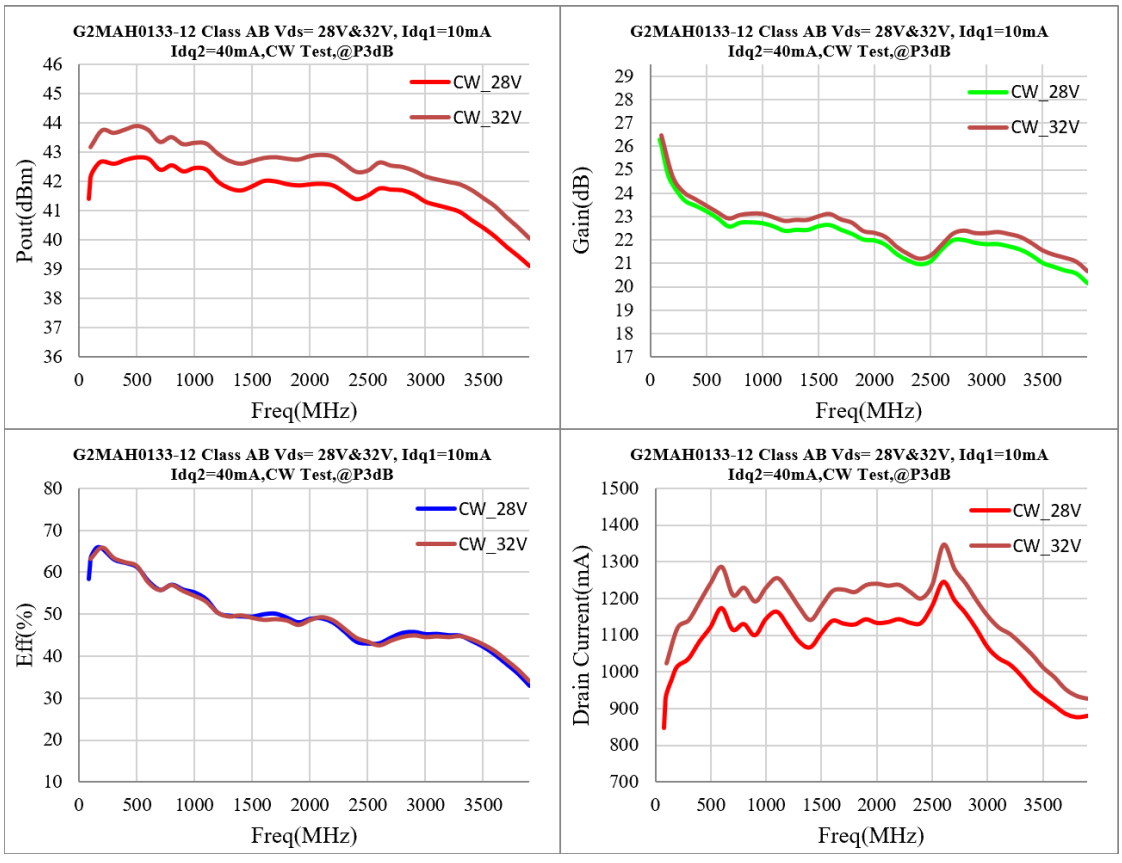
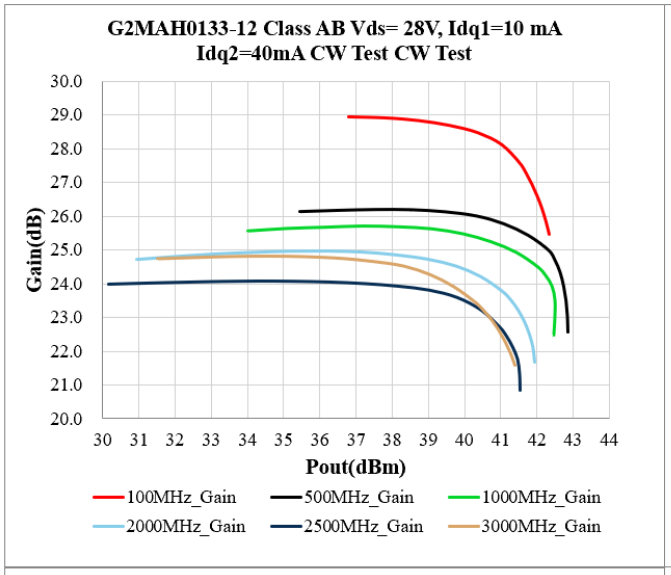
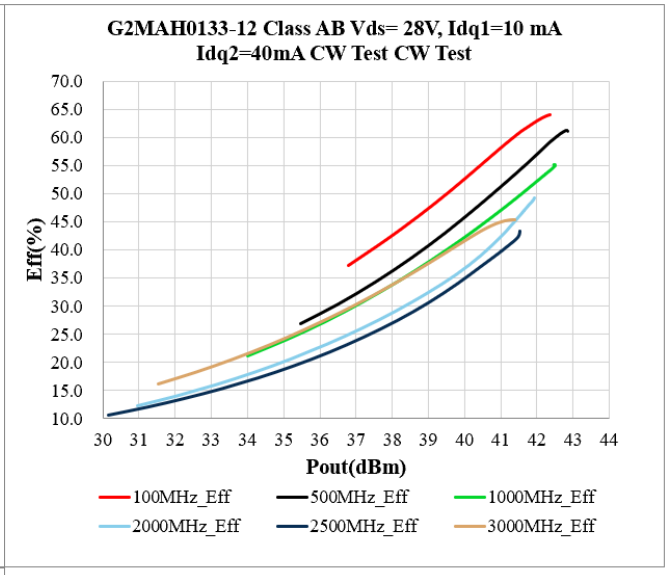
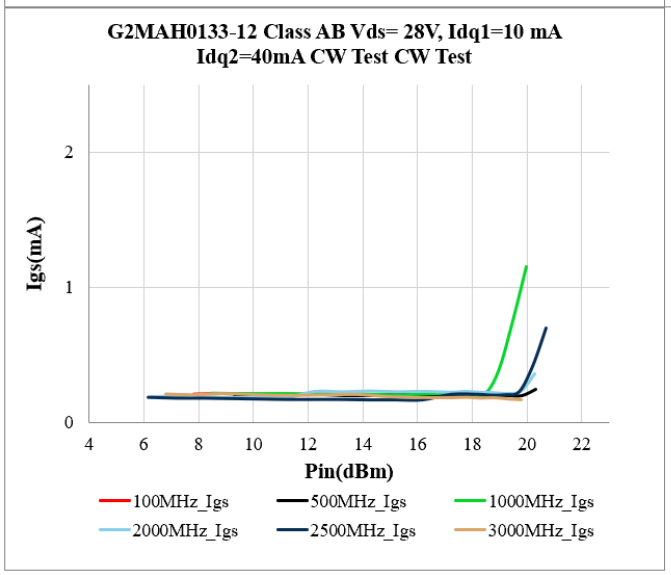



**Figure 4. AM/AM Plot**

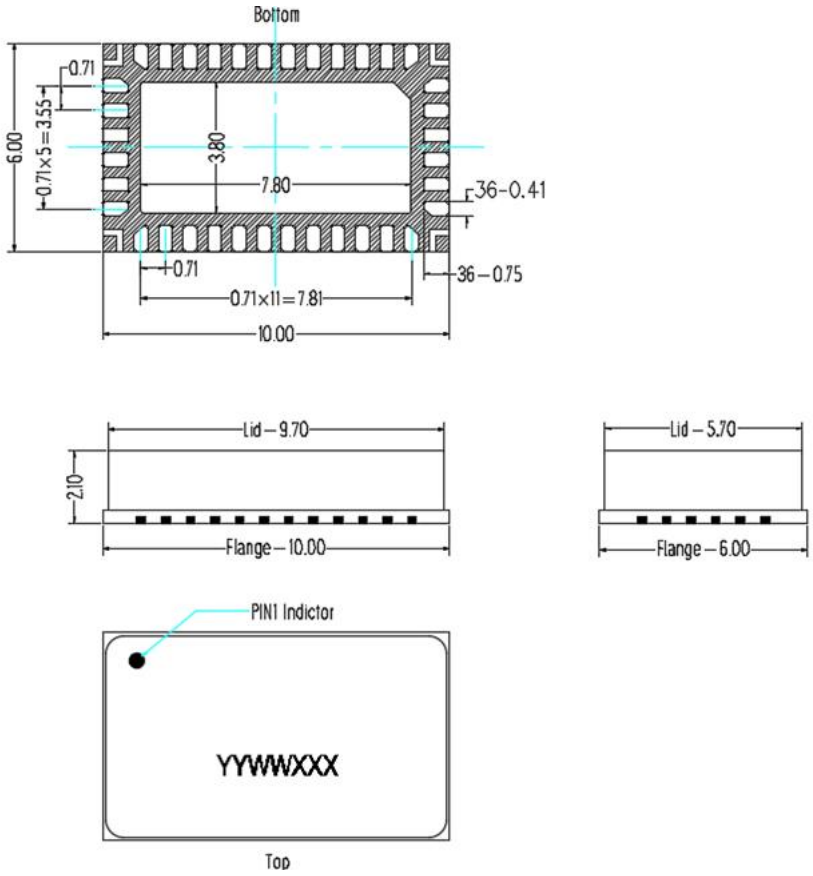


## Package Dimensions

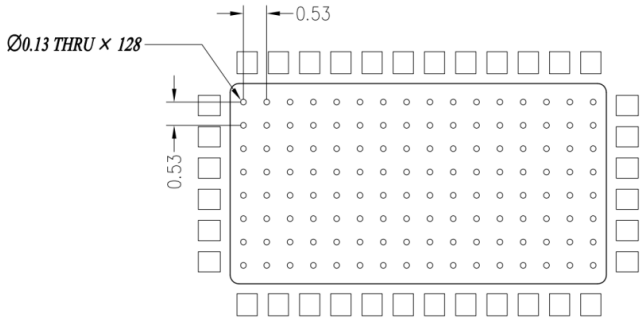
**10*6 Plastic Package**




Notes:

1. All dimensions are in mm;
2. The tolerances unless specified are ±0.2mm.

## Mounting Footprint Pattern




Notes:

1. All dimensions are in mm;
2. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation. ALL vias are PTH to ground.

## Revision history

**Table 6. Document revision history**

| Date | Revision | Datasheet Status |
|---|---|---|
| 2023/7/6 | Rev 1.0 | Preliminary Datasheet Creation |
| 2025/5/16 | Rev 2.0 | Modify the PCB layout by split of Vgs1 and Vgs2 |
| | | |

**Application data based on ZHH-23-12/25-04**

## Disclaimers