

# CGD985HCI

1 GHz, 25 dB gain GaAs high output power doubler

Rev. 1 — 5 April 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Hybrid amplifier module in a SOT115J package, operating at a supply voltage of 24 V Direct Current (DC), employing Hetero junction Field Effect Transistor (HFET) GaAs dies.

### 1.2 Features and benefits

- Excellent linearity
- Optimized for flat PAL D and flat NTSC loading
- Superior levels of ESD protection
- Extremely low noise
- Excellent return loss properties
- Gain compensation over temperature
- Rugged construction
- Unconditionally stable
- Thermally optimized design
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)
- Integrated ring wave surge protection

### 1.3 Applications

- CATV systems operating in the 40 MHz to 862 MHz / 1003 MHz frequency range using PAL D or NTSC channel conditions.

### 1.4 Quick reference data

**Table 1. Quick reference data**

Bandwidth 40 MHz to 1003 MHz;  $V_B = 24$  V (DC);  $Z_S = Z_L = 75$   $\Omega$ ;  $T_{mb} = 35$  °C; unless otherwise specified.

| Symbol    | Parameter                         | Conditions                 | Min  | Typ  | Max  | Unit    |
|-----------|-----------------------------------|----------------------------|------|------|------|---------|
| $G_p$     | power gain                        | $f = 50$ MHz               | -    | 23.2 | -    | dB      |
|           |                                   | $f = 1003$ MHz             | 23.5 | 24.4 | 25.5 | dB      |
| CTB       | composite triple beat             | $V_o = 48$ dBmV at 862 MHz | [1]  | -    | -66  | -62 dBc |
| CSO       | composite second-order distortion | $V_o = 48$ dBmV at 862 MHz | [1]  | -    | -69  | -62 dBc |
| $I_{tot}$ | total current                     |                            | [2]  | -    | 440  | 460 mA  |

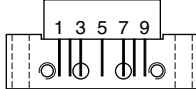
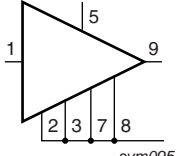
[1] 98 PAL D channels with 8 MHz bandwidth per channel; [ $f = 47$  MHz to 862 MHz]; flat  $V_o$  till 862 MHz.

[2] Direct Current (DC).



## 2. Pinning information

Table 2. Pinning

| Pin  | Description     | Simplified outline   | Graphic symbol  |
|------|-----------------|--|---|
| 1    | input           |  |  |
| 2, 3 | common          |  |   |
| 5    | +V <sub>B</sub> |  |   |
| 7, 8 | common          |  |   |
| 9    | output          |  |   |

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| CGD985HCl   | -       | rectangular single-ended package; aluminium flange; 2 vertical mounting holes; 2 × 6-32 UNC and 2 extra horizontal mounting holes; 7 gold-plated in-line leads | SOT115J |

## 4. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol             | Parameter                       | Conditions  | Min | Max  | Unit |   |
|--------------------|---------------------------------|---|-----|------|------|---|
| V <sub>B</sub>     | supply voltage                  |   | -   | 30   | V    |   |
| V <sub>i(RF)</sub> | RF input voltage                | single tone   | -   | 75   | dBmV |   |
| V <sub>ESD</sub>   | electrostatic discharge voltage | Human Body Model (HBM); According JEDEC standard 22-A114E | [1] | -    | 2000 | V |
|                    |                                 | Biased; According IEC61000-4-2                            | -   | 1500 | V    |   |
| T <sub>stg</sub>   | storage temperature             |   | -40 | +100 | °C   |   |
| T <sub>mb</sub>    | mounting base temperature       |   | -20 | +100 | °C   |   |

[1] The ESD pulse of 2000 V corresponds to a class 2 sensitivity level.

## 5. Characteristics

**Table 5. Characteristics**

Bandwidth 40 MHz to 1003 MHz;  $V_B = 24$  V (DC);  $Z_S = Z_L = 75 \Omega$ ;  $T_{mb} = 35$  °C; unless otherwise specified.

| Symbol     | Parameter                      | Conditions              | Min  | Typ  | Max  | Unit   |
|------------|--------------------------------|-------------------------|------|------|------|--------|
| $G_p$      | power gain                     | f = 50 MHz              | -    | 23.2 | -    | dB     |
|            |                                | f = 870 MHz             | -    | 24.0 | -    | dB     |
|            |                                | f = 1003 MHz            | 23.5 | 24.4 | 25.5 | dB     |
| $SL_{sl}$  | slope straight line            | f = 40 MHz to 1003 MHz  | [1]  | 0.5  | -    | 2 dB   |
| FL         | flatness of frequency response | f = 40 MHz to 1003 MHz  | [2]  | -    | -    | 1 dB   |
| $RL_{in}$  | input return loss              | f = 40 MHz to 160 MHz   | 20   | -    | -    | dB     |
|            |                                | f = 160 MHz to 320 MHz  | 20   | -    | -    | dB     |
|            |                                | f = 320 MHz to 640 MHz  | 19   | -    | -    | dB     |
|            |                                | f = 640 MHz to 870 MHz  | 17   | -    | -    | dB     |
|            |                                | f = 870 MHz to 1003 MHz | 16   | -    | -    | dB     |
| $RL_{out}$ | output return loss             | f = 40 MHz to 160 MHz   | 20   | -    | -    | dB     |
|            |                                | f = 160 MHz to 320 MHz  | 20   | -    | -    | dB     |
|            |                                | f = 320 MHz to 640 MHz  | 19   | -    | -    | dB     |
|            |                                | f = 640 MHz to 870 MHz  | 18   | -    | -    | dB     |
|            |                                | f = 870 MHz to 1003 MHz | 17   | -    | -    | dB     |
| NF         | noise figure                   | f = 50 MHz              | -    | 4.5  | 5.5  | dB     |
|            |                                | f = 1003 MHz            | -    | 5    | 6    | dB     |
| $I_{tot}$  | total current                  |                         | [3]  | -    | 440  | 460 mA |

[1]  $G_p$  at 1003 MHz minus  $G_p$  at 40 MHz.

[2] Flatness is defined as peak deviation to straight line.

[3] Direct Current (DC).

**Table 6. Distortion characteristics**

Bandwidth 40 MHz to 1003 MHz;  $V_B = 24$  V (DC);  $Z_S = Z_L = 75 \Omega$ ;  $T_{mb} = 35$  °C; unless otherwise specified.

| Symbol  | Parameter                         | Conditions                    | Min | Typ | Max | Unit    |
|---|-----------------------------------|-------------------------------|-----|-----|-----|---------|
| <b>98 PAL D channels</b>                      |                                   |                               |     |     |     |         |
| CTB   | composite triple beat             | $V_o = 48$ dBmV at 862 MHz    | [1] | -   | -66 | -62 dBc |
|   |                                   | $V_o = 50$ dBmV at 862 MHz    | [1] | -   | -62 | - dBc   |
| CSO   | composite second-order distortion | $V_o = 48$ dBmV at 862 MHz    | [1] | -   | -69 | -62 dBc |
|   |                                   | $V_o = 50$ dBmV at 862 MHz    | [1] | -   | -65 | - dBc   |
| Xmod  | cross modulation                  | $V_o = 48$ dBmV at 862 MHz    | [1] | -   | -68 | - dB    |
|   |                                   | $V_o = 50$ dBmV at 862 MHz    | [1] | -   | -60 | - dB    |
| <b>112 NTSC channels</b>                      |                                   |                               |     |     |     |         |
| CTB   | composite triple beat             | $V_o = 48$ dBmV at 750 MHz    | [2] | -   | -63 | - dBc   |
| CSO   | composite second-order distortion | $V_o = 48$ dBmV at 750 MHz    | [2] | -   | -66 | - dBc   |
| Xmod  | cross modulation                  | $V_o = 48$ dBmV at 750 MHz    | [2] | -   | -66 | - dB    |
| <b>79 NTSC channels + 75 digital channels</b> |                                   |                               |     |     |     |         |
| CTB   | composite triple beat             | $V_o = 56.4$ dBmV at 1003 MHz | [3] | -   | -75 | - dBc   |
| CSO   | composite second-order distortion | $V_o = 56.4$ dBmV at 1003 MHz | [3] | -   | -77 | - dBc   |
| Xmod  | cross modulation                  | $V_o = 56.4$ dBmV at 1003 MHz | [3] | -   | -68 | - dB    |
| CCN   | carrier-to-composite noise        | $V_o = 56.4$ dBmV at 1003 MHz | [3] | -   | 57  | - dBc   |

[1] 98 PAL D channels with 8 MHz bandwidth per channel; [f = 47 MHz to 862 MHz]; flat  $V_o$  till 862 MHz.

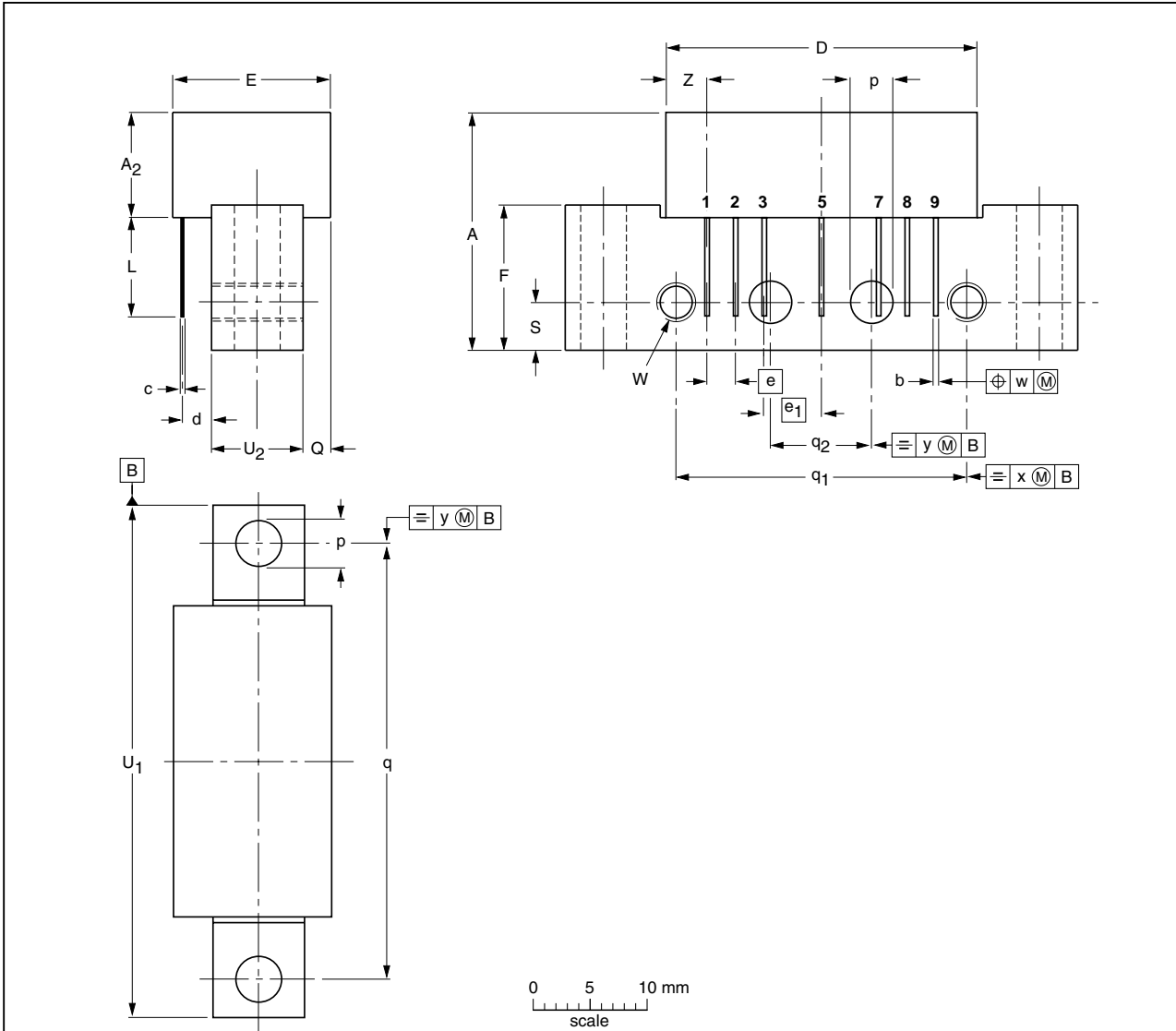
[2] 112 NTSC channels; [f = 45 MHz to 750 MHz]; flat  $V_o$  till 750 MHz.

[3] 79 NTSC channels [f = 54 MHz to 550 MHz] + 75 digital channels [f = 550 MHz to 1003 MHz] (-6 dB offset); tilt extrapolated to 13.5 dB at 1003 MHz.

6. Package outline

Rectangular single-ended package; aluminium flange; 2 vertical mounting holes; 2 x 6-32 UNC and 2 extra horizontal mounting holes; 7 gold-plated in-line leads

SOT115J



DIMENSIONS (mm are the original dimensions)

| UNIT | A max. | A <sub>2</sub> max. | b            | c    | D max. | d            | E max. | e    | e <sub>1</sub> | F    | L min. | p            | Q max. | q    | q <sub>1</sub> | q <sub>2</sub> | S   | U <sub>1</sub> | U <sub>2</sub> | W           | w    | x   | y   | Z max. |
|------|--------|---------------------|--------------|------|--------|--------------|--------|------|----------------|------|--------|--------------|--------|------|----------------|----------------|-----|----------------|----------------|-------------|------|-----|-----|--------|
| mm   | 20.8   | 9.5                 | 0.51<br>0.38 | 0.25 | 27.2   | 2.04<br>2.54 | 13.75  | 2.54 | 5.08           | 12.7 | 8.8    | 4.15<br>3.85 | 2.4    | 38.1 | 25.4           | 10.2           | 4.2 | 44.75<br>44.25 | 8.2<br>7.8     | 6-32<br>UNC | 0.25 | 0.7 | 0.1 | 3.8    |

| OUTLINE VERSION | REFERENCES |       |       |  | EUROPEAN PROJECTION | ISSUE DATE            |
|-----------------|------------|-------|-------|--|---------------------|-----------------------|
|                 | IEC        | JEDEC | JEITA |  |                     |                       |
| SOT115J         |            |       |       |  |                     | 04-02-04-<br>10-06-18 |

Fig 1. Package outline SOT115J

## 7. Abbreviations

Table 7. Abbreviations

| Acronym | Description                            |
|---------|--|
| CATV    | Community Antenna TeleVision           |
| ESD     | ElectroStatic Discharge                |
| GaAs    | Gallium-Arsenide                       |
| NTSC    | National Television Standard Committee |
| PAL     | Phase Alternate Line                   |
| RF      | Radio Frequency                        |
| UNC     | UNified Coarse                         |

## 8. Revision history

Table 8. Revision history

| Document ID   | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| CGD985HCI v.1 | 20110405     | Product data sheet | -             | -          |

## 9. Legal information

### 9.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

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