1. Product profile

1.1 General description

600 W LDMOS power module for Industrial, Scientific and Medical (ISM) applications at frequencies from 902 MHz to 928 MHz. The module is designed for high-power CW applications.

1.2 Features and benefits

- High efficiency
- Small size: 92 x 60 mm
- Input/output 50 Ω matched
- Designed for broadband operation (902 MHz to 928 MHz)
- Built-in temperature sensor
- Built-in temperature compensation networks
- 100 % RF testing in production
- For RoHS compliance see the product details on the Ampleon website

1.3 Applications

- RF power amplifiers for CW applications in the 902 MHz to 928 MHz frequency range such as industrial heating and drying, scientific, medical
2. Pinning information

2.1 Pinning

Fig 1. Pin configuration

2.2 Pin description

Table 2. Pin description

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF IN</td>
<td>1</td>
<td>RF input</td>
</tr>
<tr>
<td>RF OUT</td>
<td>2</td>
<td>RF output</td>
</tr>
<tr>
<td>VD</td>
<td>3</td>
<td>drain-source voltage</td>
</tr>
<tr>
<td>VG</td>
<td>4</td>
<td>gate-source voltage</td>
</tr>
<tr>
<td>TEMP</td>
<td>5</td>
<td>temperature sensor</td>
</tr>
</tbody>
</table>

3. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPF0910H9X600</td>
<td>-</td>
<td>pallet; 8 mounting holes; 5 terminations</td>
<td>-</td>
</tr>
</tbody>
</table>
4. Block diagram

![Block diagram](amp07163)

**Fig 2.** Block diagram

5. Limiting values

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_\text{DS}</td>
<td>drain-source voltage</td>
<td>non operating</td>
<td>0</td>
<td>106</td>
<td>V</td>
</tr>
<tr>
<td>V_\text{GS}</td>
<td>gate-source voltage</td>
<td>non operating</td>
<td>-6</td>
<td>+11</td>
<td>V</td>
</tr>
<tr>
<td>T_\text{slg}</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>T_\text{mb}</td>
<td>mounting base temperature</td>
<td></td>
<td>0</td>
<td>65</td>
<td>°C</td>
</tr>
</tbody>
</table>

[1] Continuous use at maximum temperature will affect the reliability, for details refer to the online MTF calculator.

6. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_\text{(BR)DSS}</td>
<td>drain-source breakdown voltage</td>
<td>$V_{\text{GS}} = 0 \text{ V}; I_D = 4 \text{ mA}$</td>
<td>106</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>V_\text{GS(th)}</td>
<td>gate-source threshold voltage</td>
<td>$V_{\text{DS}} = 50 \text{ V}; I_D = 90 \text{ mA}$</td>
<td>-</td>
<td>1.8</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>I_\text{DSS}</td>
<td>drain leakage current</td>
<td>$V_{\text{GS}} = 0 \text{ V}; V_{\text{DS}} = 50 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>2.8</td>
<td>μA</td>
</tr>
<tr>
<td>R_\text{GS}</td>
<td>gate-source resistance</td>
<td></td>
<td>400</td>
<td>1750</td>
<td>6200</td>
<td>Ω</td>
</tr>
<tr>
<td>C_\text{iss}</td>
<td>input capacitance</td>
<td>VG pin</td>
<td>-</td>
<td>4.7</td>
<td>-</td>
<td>μF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VD pin</td>
<td>-</td>
<td>4.7</td>
<td>-</td>
<td>μF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>G_p</td>
<td>power gain</td>
<td>$P_L = 600 \text{ W}$</td>
<td>17.0</td>
<td>19.0</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>P_L(1\text{dB})</td>
<td>output power at 1 dB gain compression</td>
<td></td>
<td></td>
<td>550</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td>P_L(3\text{dB})</td>
<td>output power at 3 dB gain compression</td>
<td></td>
<td></td>
<td>600</td>
<td>-</td>
<td>W</td>
</tr>
<tr>
<td>G_\text{flat}</td>
<td>gain flatness</td>
<td>$P_L = 600 \text{ W}$</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>dB</td>
</tr>
<tr>
<td>R_\text{Lin}</td>
<td>input return loss</td>
<td>$P_L = 600 \text{ W}$</td>
<td>-</td>
<td>-18</td>
<td>-7</td>
<td>dB</td>
</tr>
<tr>
<td>η_\text{D}</td>
<td>drain efficiency</td>
<td>$P_L = 600 \text{ W}$</td>
<td>65</td>
<td>69</td>
<td>-</td>
<td>%</td>
</tr>
<tr>
<td>α_\text{sup(H)}</td>
<td>harmonic suppression</td>
<td>$P_L = 600 \text{ W}$</td>
<td>-</td>
<td>27</td>
<td>-</td>
<td>dBc</td>
</tr>
</tbody>
</table>

Table 5. DC characteristics

Test signal: CW; $f = 915 \text{ MHz}$; RF performance at $T_{\text{mb}} = 25 \degree \text{ C}$; $V_{\text{DS}} = 50 \text{ V}; I_{\text{Dq}} = 90 \text{ mA}$; unless otherwise specified.

Table 6. RF Characteristics
6.1 Ruggedness in class-AB operation

The BPF0910H9X600 is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 50 V; I_{Dq} = 90 mA; P_{L} = 600 W (CW); f = 915 MHz; T_{mb} = 25 °C; tested with soft power ramp up across predefined integer phase steps.

[1] Device switched on at P_{L} = 300 W, then increased to 600 W, kept at 600 W for a few seconds then decreased to 300 W and switched off.

7. Test information

7.1 Graphical data

7.1.1 CW

![Graph 1: Power gain as a function of output power; typical values](amp01202)

![Graph 2: Drain efficiency as a function of output power; typical values](amp01203)

- I_{Dq} = 90 mA; V_{DS} = 50 V; T_{mb} = 25 °C.
- (1) f = 902 MHz
- (2) f = 915 MHz
- (3) f = 928 MHz

Fig 3. Power gain as a function of output power; typical values

Fig 4. Drain efficiency as a function of output power; typical values
**BPF0910H9X600**

**Power LDMOS module**

---

**IDq = 90 mA; VDS = 50 V; f = 915 MHz.**

(1) $T_{mb} = 5 \, ^\circ C$

(2) $T_{mb} = 25 \, ^\circ C$

(3) $T_{mb} = 45 \, ^\circ C$

(4) $T_{mb} = 65 \, ^\circ C$

**Fig 5.** Power gain as a function of output power; typical values

---

**IDq = 90 mA; VDS = 50 V; f = 915 MHz.**

(1) $T_{mb} = 5 \, ^\circ C$

(2) $T_{mb} = 25 \, ^\circ C$

(3) $T_{mb} = 45 \, ^\circ C$

(4) $T_{mb} = 65 \, ^\circ C$

**Fig 6.** Drain efficiency as a function of output power; typical values

---

**IDq = 90 mA; VDS = 50 V; P_L = 600 W; T_{mb} = 25 \, ^\circ C.**

**Fig 7.** Input return loss as a function of frequency; typical values

---

**IDq = 90 mA; T_{mb} = 25 \, ^\circ C.**

(1) $V_{DS} = 40 \, V; P_L = 400 \, W$

(2) $V_{DS} = 45 \, V; P_L = 500 \, W$

(3) $V_{DS} = 50 \, V; P_L = 600 \, W$

**Fig 8.** Power gain as a function of frequency; typical values
7.1.2 CW pulsed

\( I_{Dq} = 90 \, mA; \, V_{DS} = 50 \, V; \, T_{mb} = 25 \, ^\circ C; \, t_p = 100 \, \mu s; \, \delta = 10 \, \% . \)

(1) \( f = 902 \, MHz \)
(2) \( f = 915 \, MHz \)
(3) \( f = 928 \, MHz \)

**Fig 11.** Power gain as a function of output power; typical values

**Fig 12.** Drain efficiency as a function of output power; typical values

\( I_{Dq} = 90 \, mA; \, V_{DS} = 50 \, V; \, T_{mb} = 25 \, ^\circ C; \, t_p = 100 \, \mu s; \, \delta = 10 \, \% . \)

(1) \( f = 902 \, MHz \)
(2) \( f = 915 \, MHz \)
(3) \( f = 928 \, MHz \)
8. Package outline

Fig 13. Package outline
9. Handling information

**CAUTION**

This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.

Such precautions are described in the ANSI/ESD S20.20, IEC/ST 61340-5, JESD625-A or equivalent standards.

Table 7. ESD sensitivity

<table>
<thead>
<tr>
<th>ESD model</th>
<th>Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002</td>
<td>C1[1]</td>
</tr>
<tr>
<td>Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001</td>
<td>1C[2]</td>
</tr>
</tbody>
</table>

[1] CDM classification C1 is granted to any part that passes after exposure to an ESD pulse of 250 V.

[2] HBM classification 1C is granted to any part that passes after exposure to an ESD pulse of 1000 V.

10. Abbreviations

Table 8. Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CW</td>
<td>Continuous Wave</td>
</tr>
<tr>
<td>LDMOS</td>
<td>Laterally Diffused Metal-Oxide Semiconductor</td>
</tr>
<tr>
<td>MTF</td>
<td>Median Time to Failure</td>
</tr>
<tr>
<td>RoHS</td>
<td>Restriction of Hazardous Substances</td>
</tr>
<tr>
<td>VSWR</td>
<td>Voltage Standing Wave Ratio</td>
</tr>
</tbody>
</table>

11. Revision history

Table 9. Revision history

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPF0910H9X600 v.1</td>
<td>20200326</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
12. Legal information

12.1 Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term ‘short data sheet’ is explained in section “Definitions”.

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.ampleon.com.

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