# BLP10H610

## Broadband LDMOS driver transistor

Rev. 3 — 25 September 2014 Product data sheet

## 1. Product profile

### 1.1 General description

A 10 W plastic LDMOS power transistor for broadcast transmitter and ISM applications at frequencies from HF to 1400 MHz.

**Table 1. Application performance**

| Test signal | f | $V_{DS}$ | $P_L$ | $G_p$ | $\eta_D$ |
|---|---|---|---|---|---|
| | (MHz) | (V) | (W) | (dB) | (%) |
| CW | 27 | 50 | 10 | 26.7 | 46 |
| | 40 | 50 | 20 | 25 | 65 |
| | 60 | 50 | 19 | 24 | 65 |
| | 80 | 50 | 19 | 25 | 67 |
| | 88 to 108 | 50 | 16 | 25 | 62 |
| | 400 to 450 | 50 | >14 | >25.5 | >62 |
| | 950 to 1225 | 50 | >13 | >16 | >42 |
| Pulsed RF [1] | 860 | 50 | 10 | 22 | 60 |
| | 1190 to 1410 | 45 | 11 | >14 | - |
| DVB-T | 860 | 50 | 1 | >21 | - |

[1] $t_p$= 100 μs; δ = 10 %.

### 1.2 Features and benefits

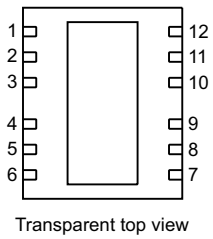
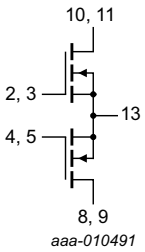
- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (HF to 1400 MHz)
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| 1, 6, 7, 12 | n.c. |   Transparent top view |   aaa-010491 |
| 2, 3 | gate1 | | |
| 4, 5 | gate2 | | |
| 8, 9 | drain2 | | |
| 10, 11 | drain1 | | |
| 13 | source [1] | | |

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BLP10H610 | HVSON12 | plastic thermal enhanced very thin small outline package; no leads; 12 terminals; body 5 × 6 × 0.85 mm | SOT1352-1 |

## 4. Limiting values

**Table 4. Limiting values**

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | | - | 104 | V |
| $V_{GS}$ | gate-source voltage | | –6 | +11 | V |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $T_j$ | junction temperature | | - | 150 | °C |

## 5. Recommended operating conditions

See application note *AN11520* for more details.

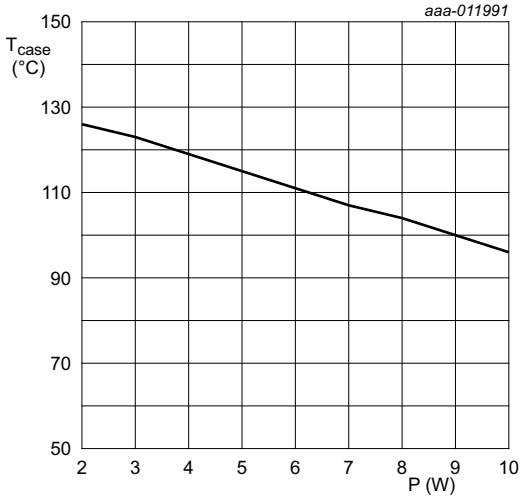



**Fig 1. Recommended operating area; case temperature as a function of power dissipation**

## 6. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | Typ | Unit |
|---|---|---|---|---|
| $R_{th(j-c)}$ | thermal resistance from junction to case | $T_{case}$ = 80 °C; $P_L$ = 10 W [1] | 3.5 | K/W |

[1] $R_{th(j-c)}$ is measured under RF conditions

## 7. Characteristics

**Table 6. DC characteristics**

*$T_j$ = 25 °C; unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS}$ = 0 V; $I_D$ = 0.12 mA | 104 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 10 V; $I_D$ = 12 mA | 1.25 | 1.75 | 2.25 | V |
| $V_{GSq}$ | gate-source quiescent voltage | $V_{DS}$ = 50 V; $I_D$ = 60 mA | 1.4 | 1.8 | 2.15 | V |
| $I_{DSS}$ | drain leakage current | $V_{GS}$ = 0 V; $V_{DS}$ = 50 V | - | - | 1.4 | µA |
| $I_{DSX}$ | drain cut-off current | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $V_{DS}$ = 10 V | - | 1.88 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 11 V; $V_{DS}$ = 0 V | - | - | 140 | nA |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 3.75 V; $I_D$ = 420 mA | - | 2300 | - | mΩ |

**Table 7. AC characteristics**

*$T_j$ = 25 °C; unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $C_{rs}$ | feedback capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 50 V; f = 1 MHz | - | 0.13 | - | pF |
| $C_{iss}$ | input capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 0 V; f = 1 MHz | - | 13.5 | - | pF |
| $C_{oss}$ | output capacitance | $V_{GS}$ = 0 V; $V_{DS}$ = 50 V; f = 1 MHz | - | 4.5 | - | pF |

**Table 8. RF characteristics**

*Test signal: CW; f = 860 MHz; RF performance at $V_{DS}$ = 50 V; $I_{Dq}$ = 60 mA; $T_{case}$ = 25 °C; unless otherwise specified, in a class-AB production test circuit [1].*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $G_p$ | power gain | $P_L$ = 10 W | 19.3 | 22 | 25.7 | dB |
| $\eta_D$ | drain efficiency | $P_L$ = 10 W | 56.8 | 60 | - | % |

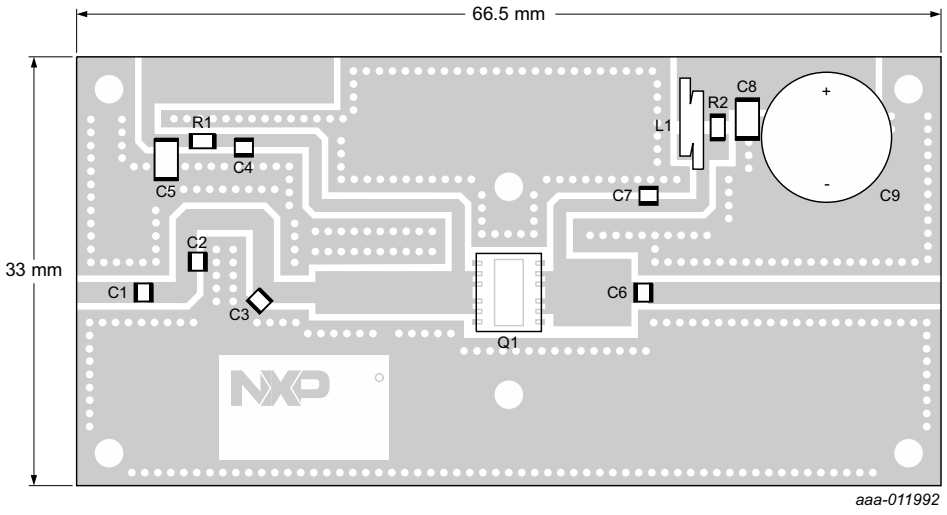
[1] The industrial test method is performed on special hardware to accommodate the requirements of production. The test results in this table are correlated to correspond with a performance in the application.

# 8. Test information

## 8.1 Ruggedness in class-AB operation

The BLP10H610 is capable of withstanding a load mismatch corresponding to VSWR = 35 : 1 through all phases under the following conditions: $V_{DS}$ = 50 V; $I_{Dq}$ = 60 mA; $P_L$ = 10 W; f = 860 MHz.

## 8.2 Test circuit




Printed-Circuit Board (PCB): Rogers RO4350; $\varepsilon_r$ = 3.48; height = 0.762 mm; thickness copper plating = 35 μm.

See Table 9 for a list of components.

**Fig 2. Component layout**

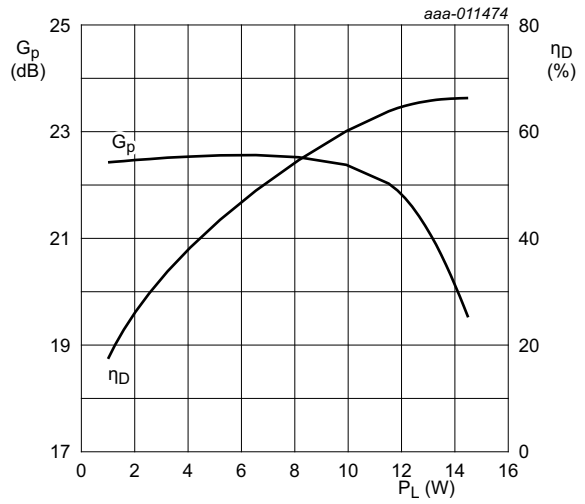
**Table 9. List of components**

*See Figure 2 for component layout.*

| Component | Description | Value | Remarks |
|---|---|---|---|
| C1, C4, C7 | multilayer ceramic chip capacitor | 100 pF [1] | |
| C2 | multilayer ceramic chip capacitor | 5.6 pF [1] | |
| C3 | multilayer ceramic chip capacitor | 3.9 pF [1] | |
| C5 | multilayer ceramic chip capacitor | 1 μF, 25 V | Murata GRM31MR71E105KA01L |
| C6 | multilayer ceramic chip capacitor | 4.3 pF [1] | |
| C8 | multilayer ceramic chip capacitor | 1 μF, 50 V | Murata GRM32RR71H105KA01L |
| C9 | electrolytic capacitor | 220 μF, 63 V | |
| L1 | wire inductor, 0.8 mm copper wire | 2 turn, D = 3 mm | |
| R1 | resistor | 0 Ω | SMD 0805 |
| R2 | resistor | 20 Ω | SMD 0805 |
| Q1 | transistor | - | BLP10H610 |

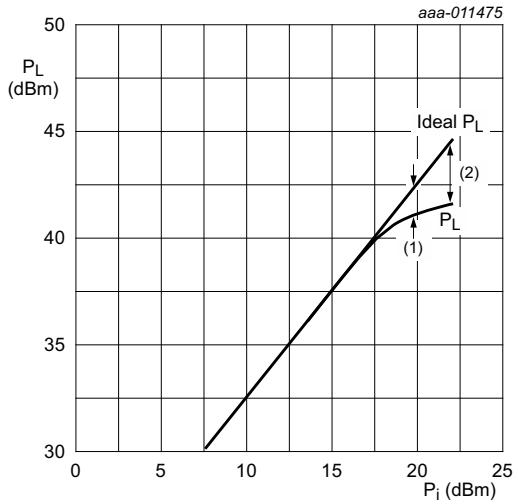
[1] American Technical Ceramics type 100A or capacitor of same quality.

## 8.3 Graphical data




$V_{DS}$ = 50 V; $I_{Dq}$ = 60 mA; f = 860 MHz.

**Fig 3. Power gain and drain efficiency as function of output power; typical values**

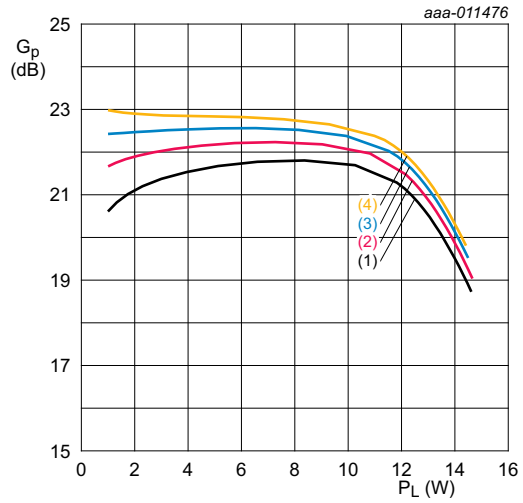



$V_{DS}$ = 50 V; $I_{Dq}$ = 60 mA; f = 860 MHz.

(1) $P_{L(1dB)}$ = 40.93 dBm (12.4 W)

(2) $P_{L(3dB)}$ = 41.61 dBm (14.5 W)

**Fig 4. Output power as a function of input power; typical values**




$V_{DS}$ = 50 V; f = 860 MHz.

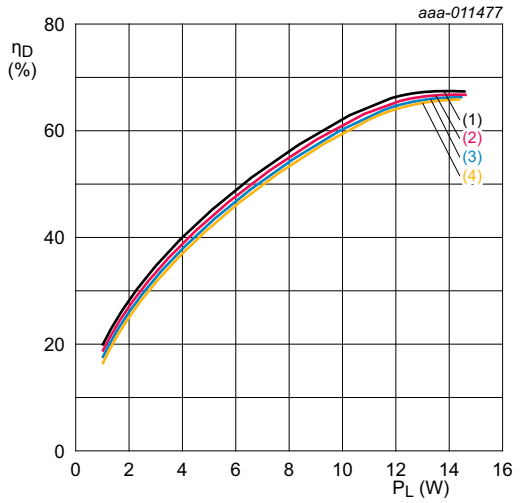
(1) $I_{Dq}$ = 20 mA

(2) $I_{Dq}$ = 40 mA

(3) $I_{Dq}$ = 60 mA

(4) $I_{Dq}$ = 80 mA

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




$V_{DS}$ = 50 V; f = 860 MHz.

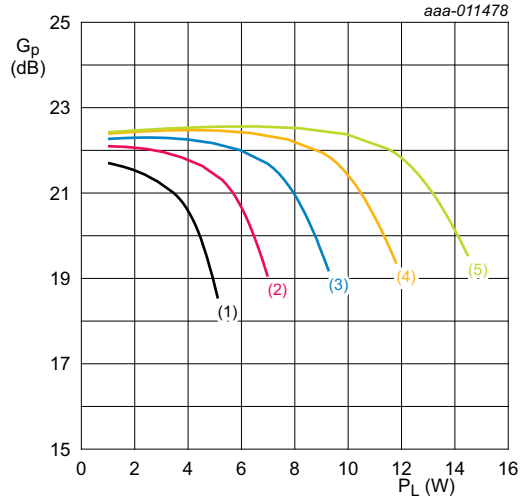
(1) $I_{Dq}$ = 20 mA

(2) $I_{Dq}$ = 40 mA

(3) $I_{Dq}$ = 60 mA

(4) $I_{Dq}$ = 80 mA

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




$I_{Dq}$ = 60 mA; f = 860 MHz.

(1) $V_{DS}$ = 30 V

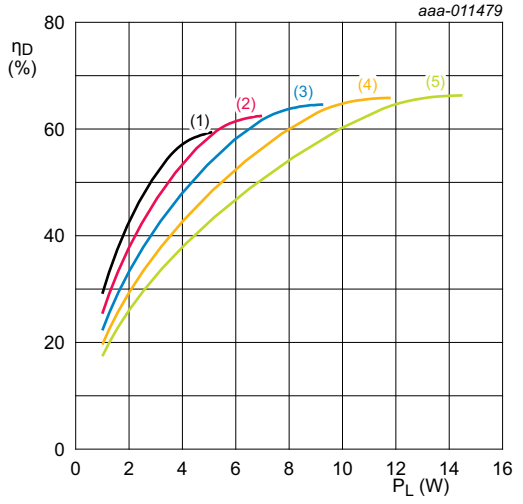
(2) $V_{DS}$ = 35 V

(3) $V_{DS}$ = 40 V

(4) $V_{DS}$ = 45 V

(5) $V_{DS}$ = 50 V

**Fig 7. Power gain as a function of output power; typical values**




$I_{Dq}$ = 60 mA; f = 860 MHz.

(1) $V_{DS}$ = 30 V

(2) $V_{DS}$ = 35 V

(3) $V_{DS}$ = 40 V

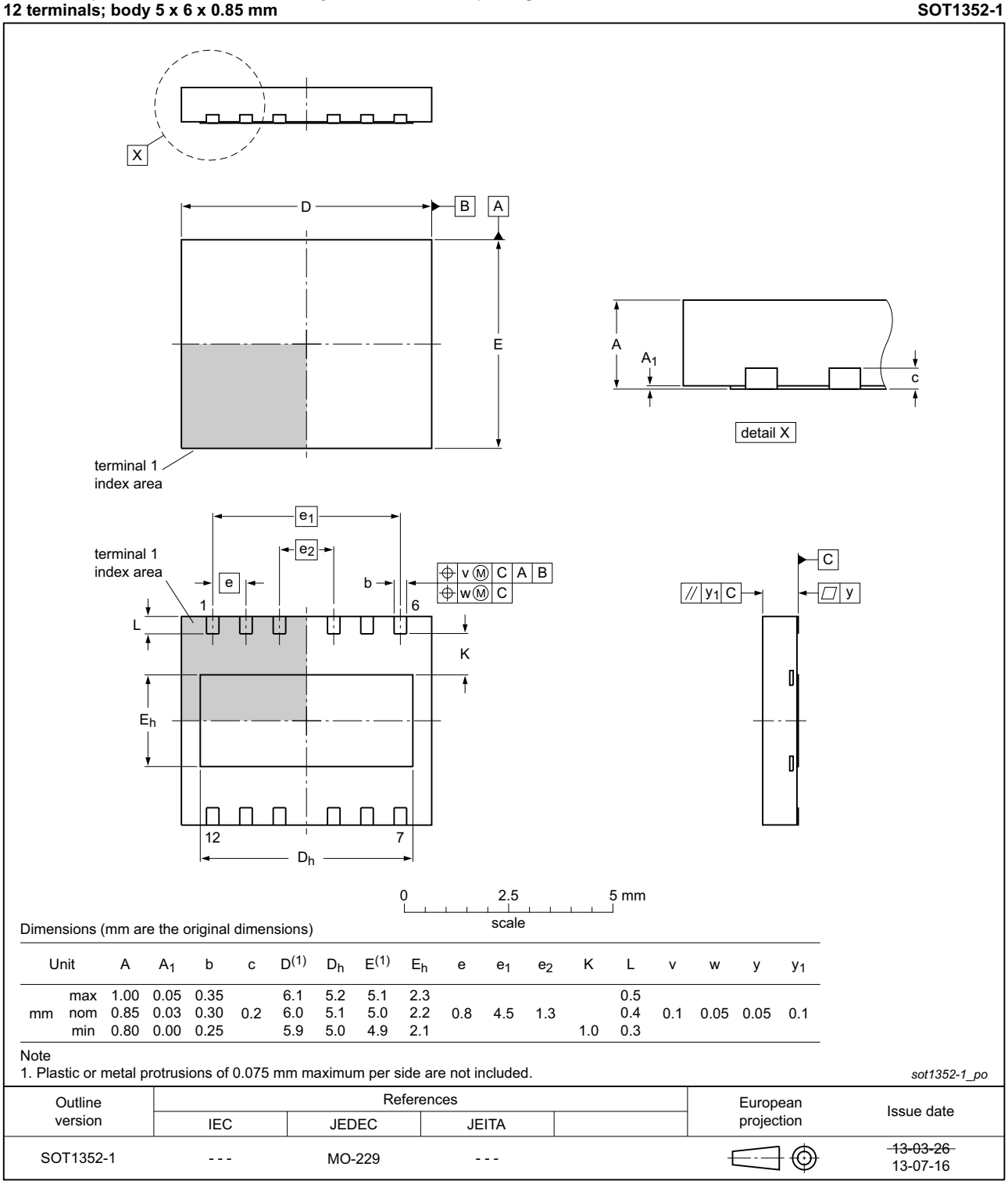
(4) $V_{DS}$ = 45 V

(5) $V_{DS}$ = 50 V

**Fig 8. Drain efficiency as a function of output power; typical values**

# 9. Package outline

**HVSON12: plastic thermal enhanced very thin small outline package; no leads; 12 terminals; body 5 x 6 x 0.85 mm** **SOT1352-1**




Dimensions (mm are the original dimensions)

| Unit | | A | $A_1$ | b | c | $D^{(1)}$ | $D_h$ | $E^{(1)}$ | $E_h$ | e | $e_1$ | $e_2$ | K | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | max | 1.00 | 0.05 | 0.35 | | 6.1 | 5.2 | 5.1 | 2.3 | | | | | 0.5 | | | | |
| mm | nom | 0.85 | 0.03 | 0.30 | 0.2 | 6.0 | 5.1 | 5.0 | 2.2 | 0.8 | 4.5 | 1.3 | | 0.4 | 0.1 | 0.05 | 0.05 | 0.1 |
| | min | 0.80 | 0.00 | 0.25 | | 5.9 | 5.0 | 4.9 | 2.1 | | | | 1.0 | 0.3 | | | | |

Note
1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

*sot1352-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1352-1 | - - - | MO-229 | - - - | | | ~~13-03-26~~ 13-07-16 |

**Fig 9. Package outline SOT1352-1 (HVSON12)**

## 10. 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.

## 11. Abbreviations

**Table 10. Abbreviations**

| Acronym | Description |
|---|---|
| CW | Continuous Wave |
| DVB-T | Digital Video Broadcast - Terrestrial |
| ESD | ElectroStatic Discharge |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| HF | High Frequency |
| ISM | Industrial, Scientific and Medical |
| SMD | Surface Mounted Device |
| VSWR | Voltage Standing-Wave Ratio |

## 12. Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BLP10H610 v.3 | 20140925 | Product data sheet | - | BLP10H610 v.2 |
| Modifications | • Table 6 on page 3: several changes have been made<br>• Table 8 on page 4: several changes have been made | | | |
| BLP10H610 v.2 | 20140422 | Objective data sheet | - | BLP10H610 v.1 |
| BLP10H610 v.1 | 20140120 | Objective data sheet | - | - |

# 13. Legal information

## 13.1 Data sheet status

| Document status[1][2] | Product status[3] | 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. |

[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".

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## 15. Contents





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