# BLL8H0514L-130; BLL8H0514LS-130

## LDMOS driver transistor

AMPLEON

Rev. 3 — 1 September 2015

Product data sheet

# 1. Product profile

## 1.1 General description

130 W LDMOS transistor intended for pulsed applications in the 0.5 GHz to 1.4 GHz range.

**Table 1. Application information**

*Typical RF performance at $T_{case}$ = 25 °C; $I_{Dq}$ = 50 mA; in a class-AB application circuit.*

| Test signal | f | $t_p$ | δ | $V_{DS}$ | $P_L$ | $G_p$ | $RL_{in}$ | $\eta_D$ | $P_{droop(pulse)}$ | $t_r$ | $t_f$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (MHz) | (μs) | (%) | (V) | (W) | (dB) | (dB) | (%) | (dB) | (ns) | (ns) |
| pulsed RF | 960 to 1215 | 128 | 10 | 50 | 130 | 19 | 10 | 54 | 0 | 15 | 8 |
| | 1200 to 1400 | 300 | 10 | 50 | 130 | 17 | 10 | 50 | 0 | 15 | 8 |

## 1.2 Features and benefits

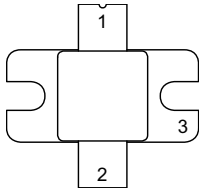
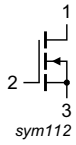
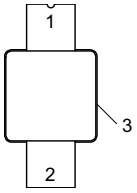
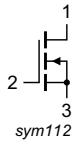
- Easy power control
- Integrated dual side ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (0.5 GHz to 1.4 GHz)
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

## 1.3 Applications

- Amplifiers for pulsed applications in the 0.5 GHz to 1.4 GHz frequency range

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| **BLL8H0514L-130 (SOT1135A)** | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source [1] | | |
| **BLL8H0514LS-130 (SOT1135B)** | | | |
| 1 | drain |  |  |
| 2 | gate | | |
| 3 | source [1] | | |

[1] Connected to flange.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BLL8H0514L-130 | - | flanged ceramic package; 2 mounting holes; 2 leads | SOT1135A |
| BLL8H0514LS-130 | - | earless flanged ceramic package; 2 leads | SOT1135B |

## 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 | | - | 100 | V |
| $V_{GS}$ | gate-source voltage | | –6 | +13 | V |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $T_j$ | junction temperature | [1] | - | 225 | °C |

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


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## 5. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | Typ | Unit |
|---|---|---|---|---|
| $Z_{th(j-c)}$ | transient thermal impedance from junction to case | $T_{case}$ = 85 °C; $P_L$ = 130 W | | |
| | | $t_p$ = 100 μs; δ = 10 % | 0.17 | K/W |
| | | $t_p$ = 200 μs; δ = 10 % | 0.22 | K/W |
| | | $t_p$ = 300 μs; δ = 10 % | 0.25 | K/W |
| | | $t_p$ = 100 μs; δ = 20 % | 0.23 | K/W |
| | | $t_p$ = 1 ms; δ = 10 % | 0.36 | K/W |

## 6. Characteristics

**Table 6. DC characteristics**

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{(BR)DSS}$ | drain-source breakdown voltage | $V_{GS}$ = 0 V; $I_D$ = 630 mA | 100 | - | - | V |
| $V_{GS(th)}$ | gate-source threshold voltage | $V_{DS}$ = 10 V; $I_D$ = 135 mA | 1.3 | 1.8 | 2.25 | 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 | 15.8 | 18 | - | A |
| $I_{GSS}$ | gate leakage current | $V_{GS}$ = 11 V; $V_{DS}$ = 0 V | - | - | 140 | nA |
| $g_{fs}$ | forward transconductance | $V_{DS}$ = 10 V; $I_D$ = 135 mA | 806 | - | 1578 | mS |
| $R_{DS(on)}$ | drain-source on-state resistance | $V_{GS}$ = $V_{GS(th)}$ + 6.25 V; $I_D$ = 135 mA | - | 200 | 275 | mΩ |

**Table 7. RF characteristics**

*Test signal: pulsed RF; $t_p$ = 300 μs; δ = 10 %; RF performance at $V_{DS}$ = 50 V; $I_{Dq}$ = 50 mA; f = 1.2 GHz to 1.4 GHz; $T_{case}$ = 25 °C; unless otherwise specified, in a class-AB production test circuit.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{DS}$ | drain-source voltage | $P_L$ = 130 W | - | - | 50 | V |
| $G_p$ | power gain | $P_L$ = 130 W | 15 | 17 | - | dB |
| $RL_{in}$ | input return loss | $P_L$ = 130 W | - | −10 | −7 | dB |
| $\eta_D$ | drain efficiency | $P_L$ = 130 W | 45 | 50 | - | % |
| $P_{droop(pulse)}$ | pulse droop power | $P_L$ = 130 W | - | 0 | 0.3 | dB |
| $t_r$ | rise time | $P_L$ = 130 W | - | 20 | 50 | ns |
| $t_f$ | fall time | $P_L$ = 130 W | - | 6 | 50 | ns |


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# 7. Application information

## 7.1 Ruggedness in class-AB operation

The BLL8H0514L-130 and BLL8H0514LS-130 are capable of withstanding a load mismatch corresponding to VSWR = 5 : 1 through all phases under the following conditions: $V_{DS}$ = 50 V; $I_{Dq}$ = 50 mA; $P_L$ = 130 W; f = 1.2 GHz to 1.4 GHz; $t_p$ = 300 μs; δ = 10 %.

## 7.2 Impedance information

**Table 8. Typical impedance**

| f | $Z_S$ | $Z_L$ |
|---|---|---|
| (MHz) | (Ω) | (Ω) |
| 1200 | 1.21 – j3.44 | 2.40 – j0.63 |
| 1300 | 1.56 – j4.49 | 2.30 – j0.87 |
| 1400 | 2.21 – j4.86 | 2.00 – j1.71 |

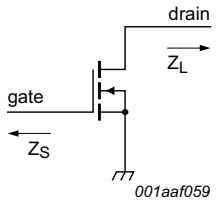
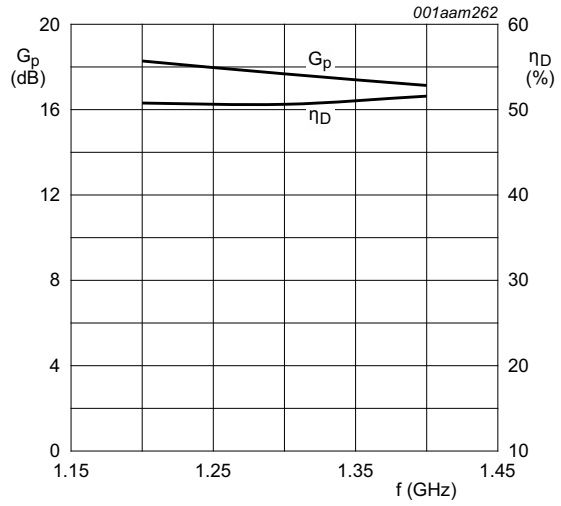



**Fig 1. Definition of transistor impedance**

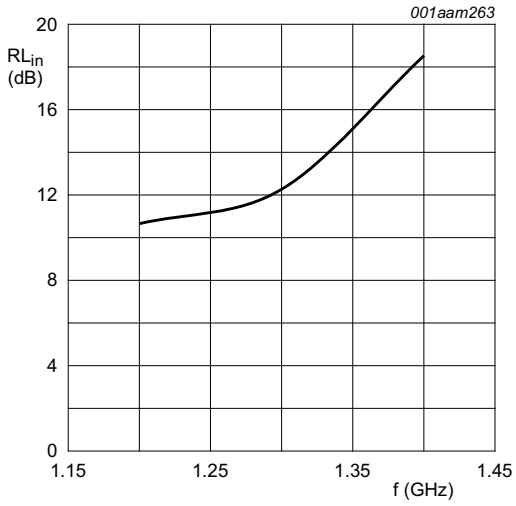

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## 7.3 Performance curves



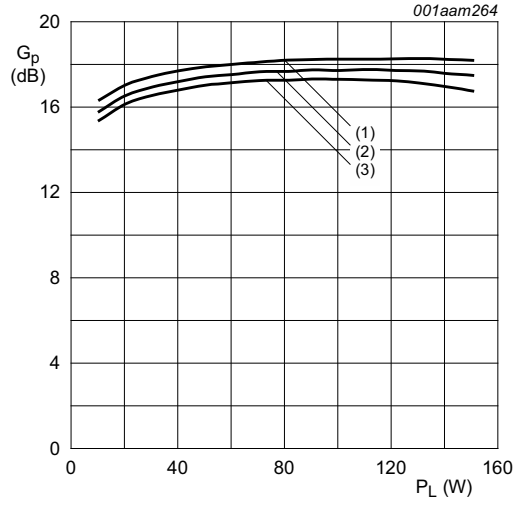

$V_{DS}$ = 50 V; $I_{Dq}$ = 50 mA; $t_p$ = 300 μs; δ = 10 %.

**Fig 2. Power gain and drain efficiency as function of frequency; typical values**




$V_{DS}$ = 50 V; $I_{Dq}$ = 50 mA; $t_p$ = 300 μs; δ = 10 %.

**Fig 3. Input return loss as a function of frequency; typical values**



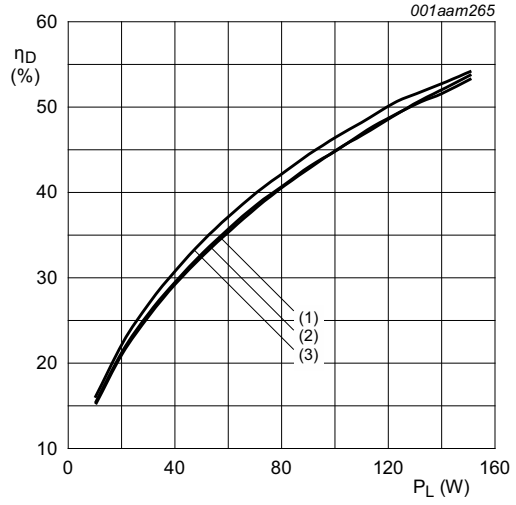

$V_{DS}$ = 50 V; $I_{Dq}$ = 50 mA; $t_p$ = 300 μs; δ = 10 %.

(1) f = 1.2 GHz

(2) f = 1.3 GHz

(3) f = 1.4 GHz

**Fig 4. Power gain as a function of output power; typical values**




$V_{DS}$ = 50 V; $I_{Dq}$ = 50 mA; $t_p$ = 300 μs; δ = 10 %.

(1) f = 1.2 GHz

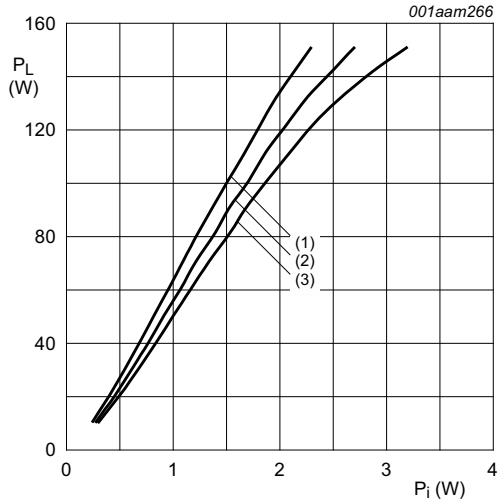
(2) f = 1.3 GHz

(3) f = 1.4 GHz

**Fig 5. Drain efficiency as a function of output power; typical values**


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$V_{DS}$ = 50 V; $I_{Dq}$ = 50 mA; $t_p$ = 300 μs; δ = 10 %.

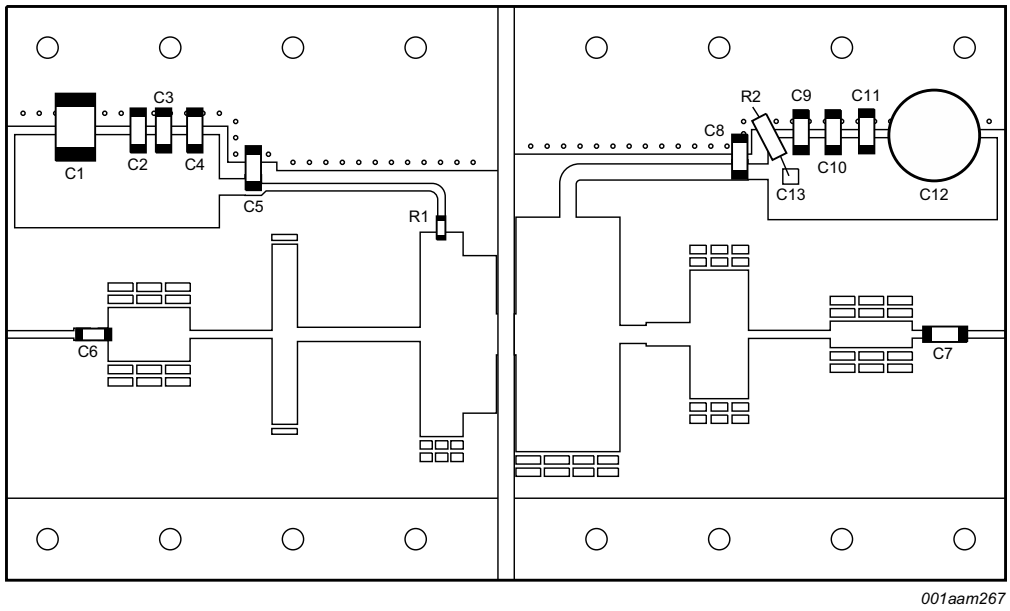
(1) f = 1.2 GHz

(2) f = 1.3 GHz

(3) f = 1.4 GHz

**Fig 6. Output power as a function of input power; typical values**

## 8. Test information




Printed-Circuit Board (PCB) material: Duroid 6006 with $\varepsilon_r$ = 6.15 and thickness = 0.64 mm.

See Table 9 for list of components.

**Fig 7. Component layout**


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**Table 9. List of components**

*See Figure 7 for component layout.*

| Component | Description | Value | Remarks |
|---|---|---|---|
| C1 | multilayer ceramic chip capacitor | 10 μF, 50 V | |
| C2, C11 | multilayer ceramic chip capacitor | 1 nF [1] | |
| C3, C4, C6, C9, C10 | multilayer ceramic chip capacitor | 100 pF [2] | |
| C5, C7, C8 | multilayer ceramic chip capacitor | 43 pF [2] | |
| C12 | electrolytic capacitor | 220 μF, 63 V | |
| C13 | multilayer ceramic chip capacitor | 1 nF [3] | fitted vertically in series with R2 |
| R1 | SMD resistor | 10 Ω | SMD 0603 |
| R2 | wirewound lead resistor | 2.61 Ω, 0.25 W | fitted in series with C13 |

[1] American Technical Ceramics type 700A or capacitor of same quality.

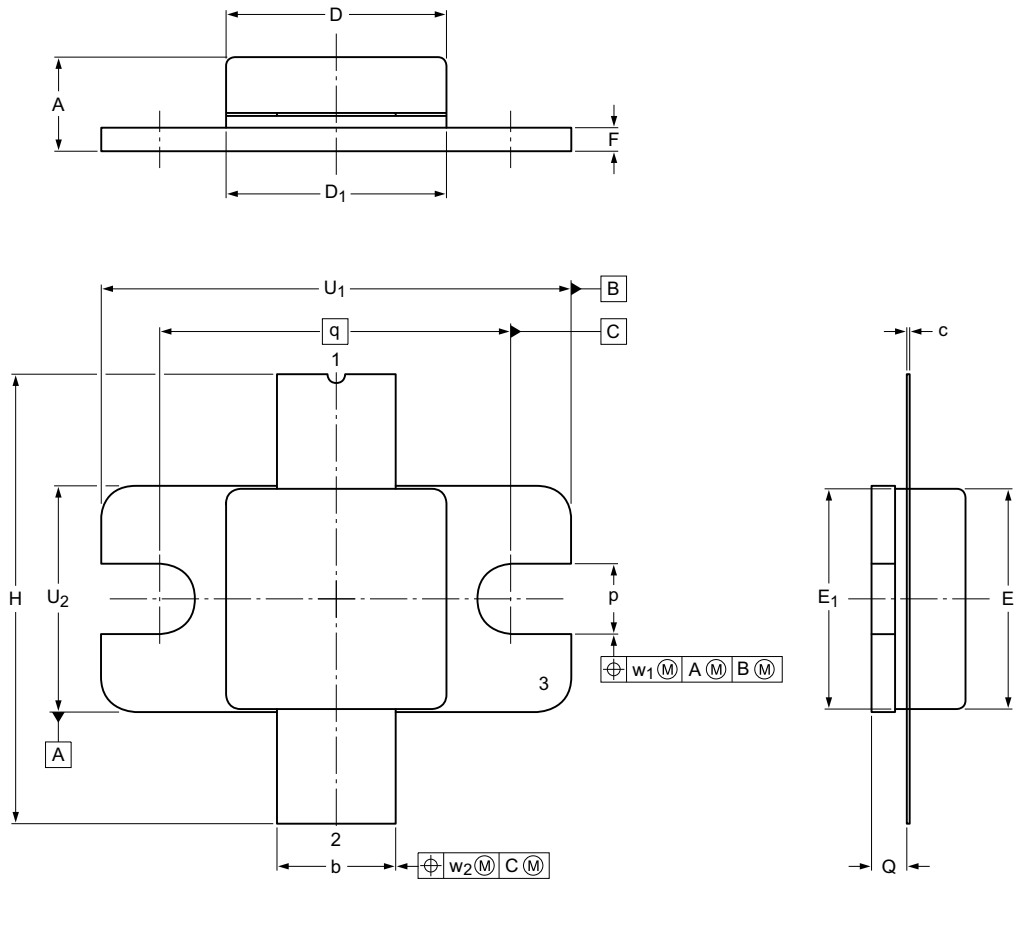
[2] American Technical Ceramics type 100A or capacitor of same quality.

[3] American Technical Ceramics type 100B or capacitor of same quality.


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# 9. Package outline

**Flanged ceramic package; 2 mounting holes; 2 leads** **SOT1135A**




Dimensions

| Unit[1] | | A | b | c | D | $D_1$ | E | $E_1$ | F | H | p | Q | q | $U_1$ | $U_2$ | $w_1$ | $w_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 4.65 | 5.26 | 0.18 | 9.65 | 9.65 | 9.65 | 9.65 | 1.14 | 19.94 | 3.30 | 1.70 | | 20.45 | 9.91 | | |
| | nom | | | | | | | | | | | | 15.24 | | | 0.25 | 0.51 |
| | min | 3.76 | 5.00 | 0.10 | 9.40 | 9.40 | 9.40 | 9.40 | 0.89 | 18.92 | 2.92 | 1.45 | | 20.19 | 9.65 | | |
| inches | max | 0.183 | 0.207 | 0.007 | 0.38 | 0.38 | 0.38 | 0.38 | 0.045 | 0.785 | 0.130 | 0.067 | | 0.805 | 0.39 | | |
| | nom | | | | | | | | | | | | 0.6 | | | 0.01 | 0.02 |
| | min | 0.148 | 0.197 | 0.004 | 0.37 | 0.37 | 0.37 | 0.37 | 0.035 | 0.745 | 0.115 | 0.057 | | 0.795 | 0.38 | | |

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

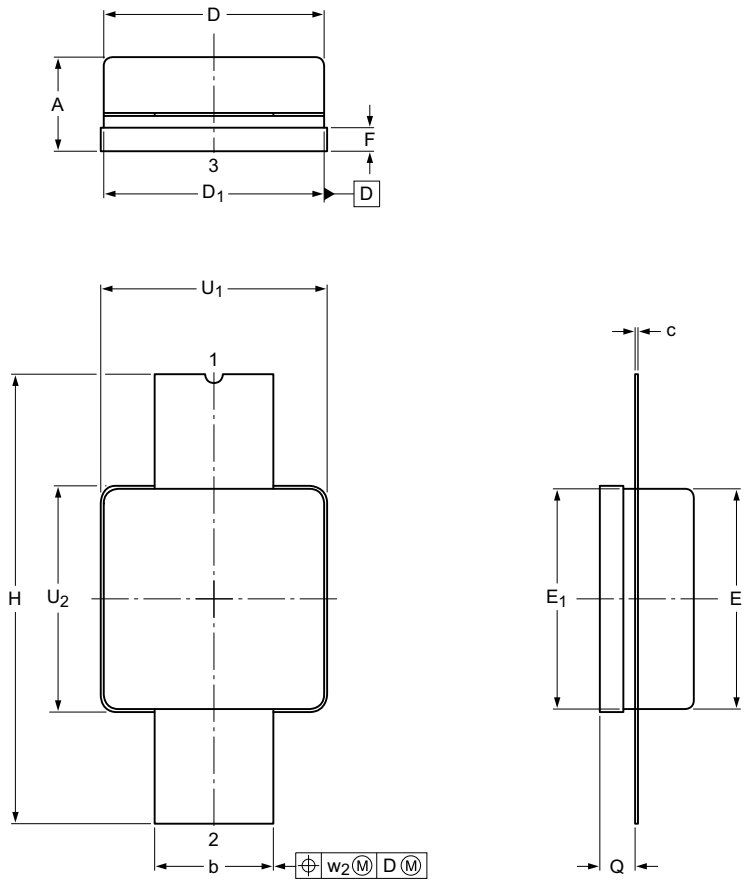
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| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1135A | | | | | | ~~09-10-12~~ 09-12-14 |

**Fig 8. Package outline SOT1135A**


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**Earless flanged ceramic package; 2 leads** **SOT1135B**




Dimensions

| Unit[1] | | A | b | c | D | $D_1$ | E | $E_1$ | F | H | Q | $U_1$ | $U_2$ | $w_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 4.65 | 5.26 | 0.18 | 9.65 | 9.65 | 9.65 | 9.65 | 1.14 | 19.94 | 1.70 | 9.91 | 9.91 | 0.51 |
| | nom | | | | | | | | | | | | | |
| | min | 3.76 | 5.00 | 0.10 | 9.40 | 9.40 | 9.40 | 9.40 | 0.89 | 18.92 | 1.45 | 9.65 | 9.65 | |
| inches | max | 0.183 | 0.207 | 0.007 | 0.38 | 0.38 | 0.38 | 0.38 | 0.045 | 0.785 | 0.067 | 0.39 | 0.39 | 0.02 |
| | nom | | | | | | | | | | | | | |
| | min | 0.148 | 0.197 | 0.004 | 0.37 | 0.37 | 0.37 | 0.37 | 0.035 | 0.745 | 0.057 | 0.38 | 0.38 | |

Note
1. millimeter dimensions are derived from the original inch dimensions.
2. dimension is measured 0.030 inch (0.76 mm) from the body.

*sot1135b_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1135B | | | | | | ~~09-10-12~~ 09-12-14 |

**Fig 9. Package outline SOT1135B**


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## 10. Handling information

| CAUTION | |
|---|---|
|  | This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.<br>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 |
|---|---|
| ESD | ElectroStatic Discharge |
| LDMOS | Laterally Diffused Metal-Oxide Semiconductor |
| MTF | Median Time to Failure |
| 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 |
|---|---|---|---|---|
| BLL8H0514L-130_0514LS-130#3 | 20150901 | Product data sheet | - | BLL8H0514L-130_0514LS-130 #2 |
| Modifications: | • The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.<br>• Legal texts have been adapted to the new company name where appropriate. | | | |
| BLL8H0514L-130_0514LS-130#2 | 20150209 | Product data sheet | - | BLL8H0514L-130_0514LS-130 #1 |
| BLL8H0514L-130_0514LS-130#1 | 20140930 | Objective data sheet | - | - |


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| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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| 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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