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# BLP05H6350XR; BLP05H6350XRG

Power LDMOS transistor

Rev. 4 — 21 September 2016

AMPLEON

Product data sheet

## 1. Product profile

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### 1.1 General description

A 350 W extremely rugged LDMOS power transistor for broadcast and industrial applications in the HF to 600 MHz band.

Table 1. Application information

Test signal	f (MHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	η <sub>D</sub> (%)
pulsed RF	108	50	350	27	75

### 1.2 Features and benefits

- Easy power control
- Integrated ESD protection
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (HF to 600 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
<b>BLP05H6350XR (SOT1223-2)</b>			
1	gate 2		 aaa-003574
2	gate 1		
3	drain 1		
4	drain 2		
5	source <a href="#">[1]</a>		
<b>BLP05H6350XRG (SOT1224-2)</b>			
1	gate 2		 aaa-003574
2	gate 1		
3	drain 1		
4	drain 2		
5	source <a href="#">[1]</a>		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLP05H6350XR	HSOP4F	plastic, heatsink small outline package; 4 leads (flat)	SOT1223-2
BLP05H6350XRG	HSOP4F	plastic, heatsink small outline package; 4 leads	SOT1224-2

## 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		-	135	V
$V_{GS}$	gate-source voltage		-6	+11	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature	<a href="#">[1]</a>	-	225	°C

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

## 5. Thermal characteristics

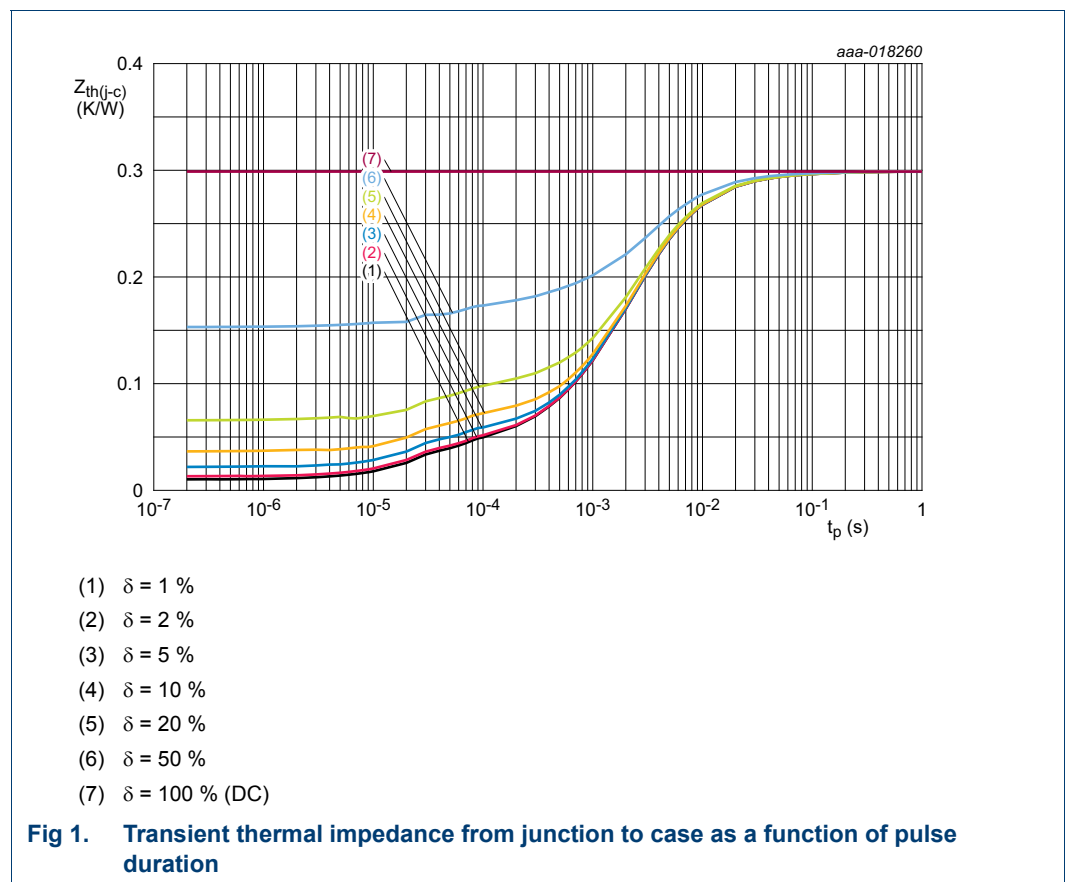
Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_j = 115\text{ °C}$ [1][2]	0.30	K/W
$Z_{th(j-c)}$	transient thermal impedance from junction to case	$T_j = 150\text{ °C}$ ; $t_p = 100\text{ }\mu\text{s}$ ; $\delta = 20\text{ %}$ [3]	0.098	K/W

[1]  $T_j$  is the junction temperature.

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

[3] See Figure 1.



## 6. Characteristics

Table 6. DC characteristics

$T_j = 25\text{ °C}$ ; per section unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$ ; $I_D = 1.5\text{ mA}$	135	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 150\text{ mA}$	1.33	2.0	2.33	V
$V_{GSq}$	gate-source quiescent voltage	$V_{DS} = 50\text{ V}$ ; $I_D = 50\text{ mA}$	-	1.9	-	V

**Table 6. DC characteristics ...continued**  
*T<sub>j</sub> = 25 °C; per section unless otherwise specified.*

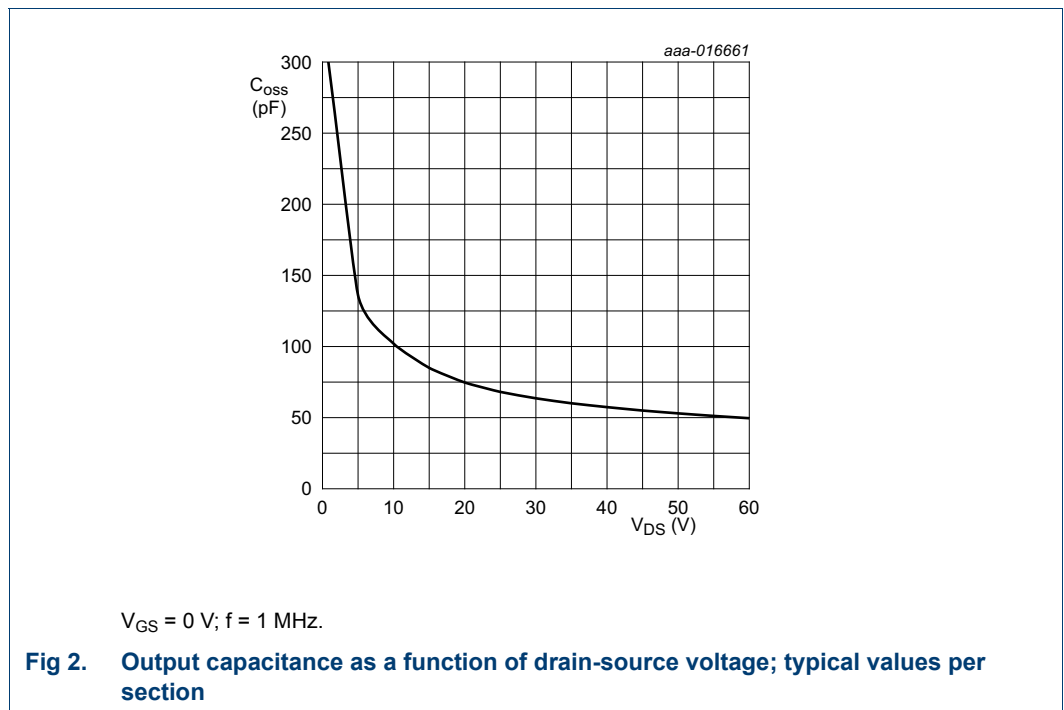
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>DSS</sub>	drain leakage current	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 50 V	-	-	1.4	μA
I <sub>DSX</sub>	drain cut-off current	V <sub>GS</sub> = V <sub>GS(th)</sub> + 3.75 V; V <sub>DS</sub> = 10 V	-	21	-	A
I <sub>GSS</sub>	gate leakage current	V <sub>GS</sub> = 11 V; V <sub>DS</sub> = 0 V	-	-	140	nA
R <sub>DS(on)</sub>	drain-source on-state resistance	V <sub>GS</sub> = V <sub>GS(th)</sub> + 3.75 V; I <sub>D</sub> = 5.25 A	-	0.29	-	Ω

**Table 7. AC characteristics**  
*T<sub>j</sub> = 25 °C; per section unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C <sub>rs</sub>	feedback capacitance	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 50 V; f = 1 MHz	-	1.3	-	pF
C <sub>iss</sub>	input capacitance	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 50 V; f = 1 MHz	-	161	-	pF
C <sub>oss</sub>	output capacitance	V <sub>GS</sub> = 0 V; V <sub>DS</sub> = 50 V; f = 1 MHz	-	53	-	pF

**Table 8. RF characteristics**  
*Test signal: pulsed RF; t<sub>p</sub> = 100 μs; δ = 20 %; f = 108 MHz; RF performance at V<sub>DS</sub> = 50 V; I<sub>Dq</sub> = 100 mA; T<sub>case</sub> = 25 °C; unless otherwise specified; in a class-AB production test circuit.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G <sub>p</sub>	power gain	P <sub>L</sub> = 350 W	26.5	27.5	-	dB
RL <sub>in</sub>	input return loss	P <sub>L</sub> = 350 W	-	-10	-	dB
η <sub>D</sub>	drain efficiency	P <sub>L</sub> = 350 W	71	75	-	%



## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLP05H6350XR and BLP05H6350XRG are capable of withstanding a load mismatch corresponding to VSWR > 65 : 1 through all phases under the following conditions:  $V_{DS} = 50\text{ V}$ ;  $I_{DQ} = 100\text{ mA}$ ;  $P_L = 350\text{ W}$  pulsed;  $f = 108\text{ MHz}$ .

### 7.2 Impedance information

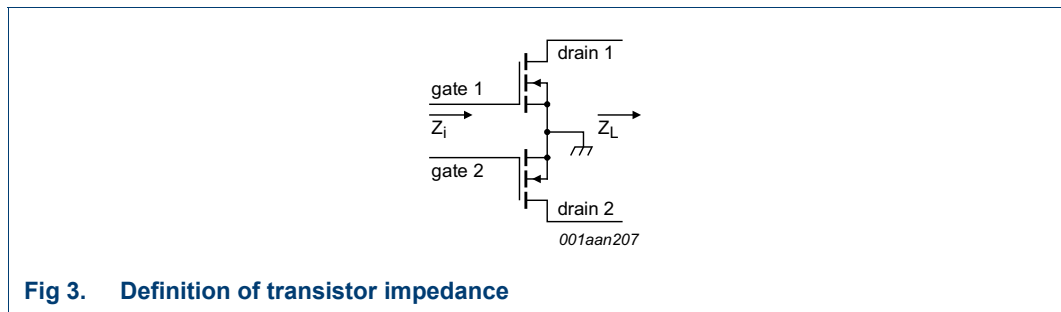


Fig 3. Definition of transistor impedance

Table 9. Typical push-pull impedance

Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 50\text{ V}$  and  $P_L = 350\text{ W}$ .

f (MHz)	$Z_i$ ( $\Omega$ )	$Z_L$ ( $\Omega$ )
108	$10.6 - j36.2$	$10.8 + j2.5$

### 7.3 UIS avalanche energy

Table 10. Typical avalanche data per section

$T_{amb} = 25\text{ }^\circ\text{C}$ ; typical test data; test jig without water cooling.

$I_{AS}$ (A)	$E_{AS}$ (J)
10	1.8
12.5	1.3
15	0.9

For information see application note AN10273.

7.4 Test circuit

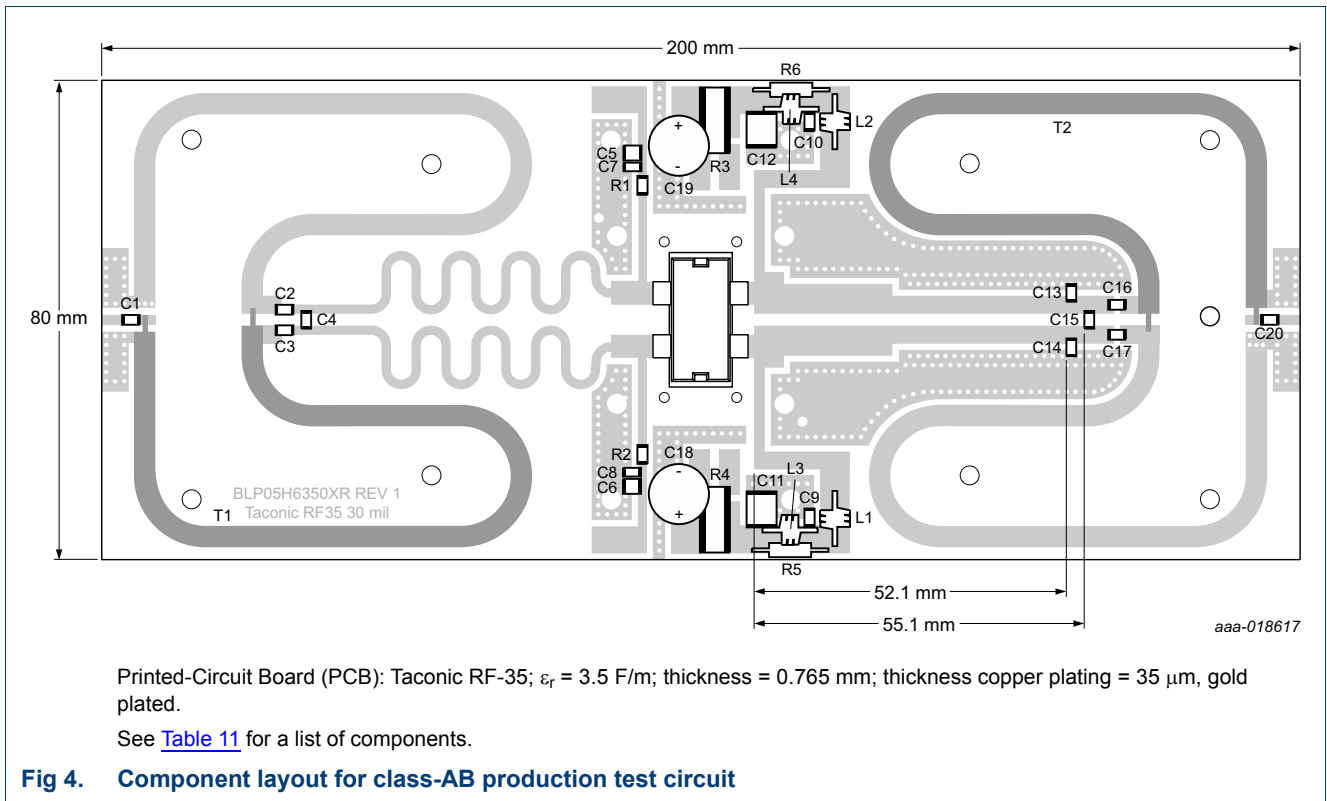


Table 11. List of components

For test circuit see [Figure 4](#).

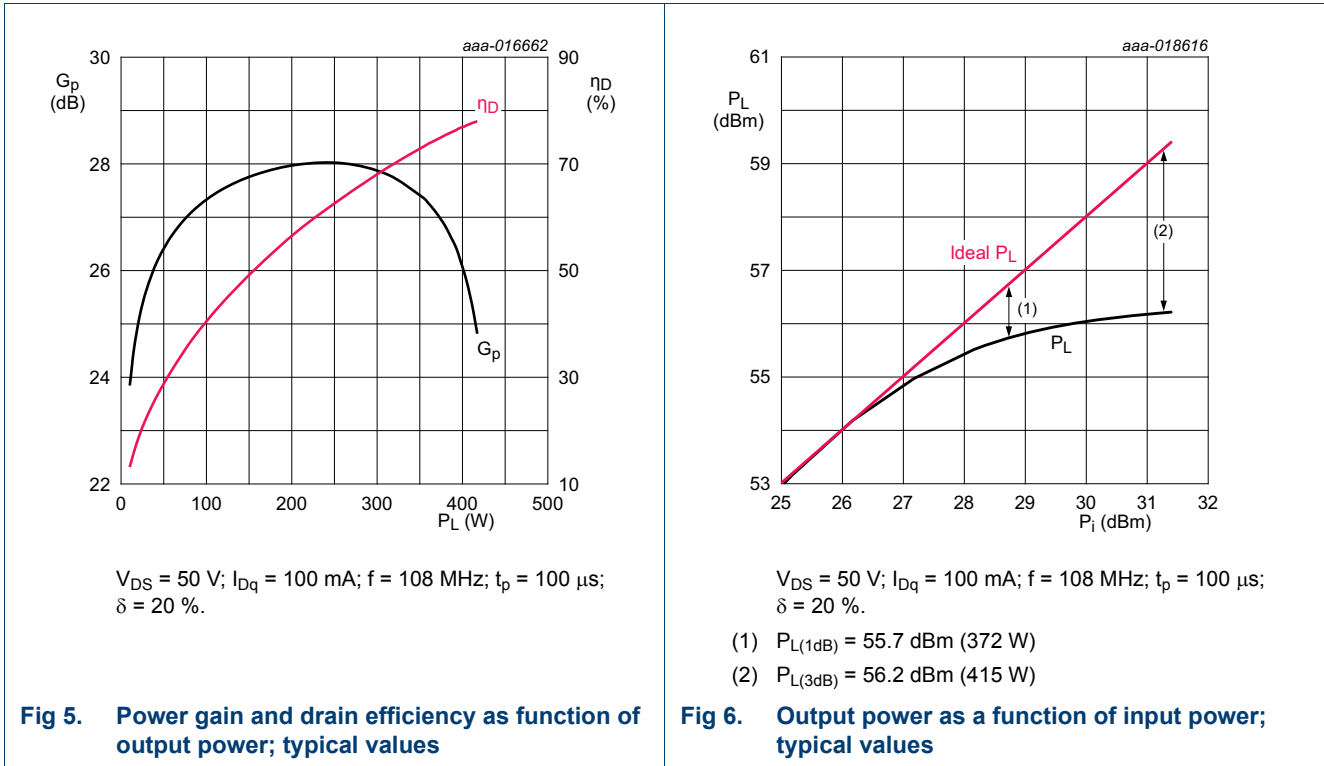
Component	Description	Value	Remarks
C1, C4	multilayer ceramic chip capacitor	51 pF	[1]
C2, C3	multilayer ceramic chip capacitor	150 pF	[1]
C5, C6	multilayer ceramic chip capacitor	4.7 $\mu$ F, 50 V	
C7, C8	multilayer ceramic chip capacitor	820 pF	[1]
C9, C10	multilayer ceramic chip capacitor	820 pF	[1]
C11, C12	multilayer ceramic chip capacitor	4.7 $\mu$ F, 100 V	
C13, C14	multilayer ceramic chip capacitor	62 pF	[1]
C15	electrolytic capacitor	7.5 $\mu$ F	[1]
C16, C17	multilayer ceramic chip capacitor	110 pF	[1]
C18,C19	electrolytic capacitor	2200 $\mu$ F, 64 V	
C20	multilayer ceramic chip capacitor	51 pF	[1]
L1, L2, L3, L4	wire inductor	3 turns, D = 3 mm, 1 mm copper wire	
R1, R2	resistor	510 $\Omega$	SMD 1206
R3, R4	shunt resistor	0.01 $\Omega$	Ohmite: FC4L110R010FER
R5, R6	metal film resistor	10 $\Omega$ , 0.6 W	
T1, T2	semi rigid coax	50 $\Omega$ , length = 160 mm	EZ Form: EZ-141-AL-TP-M17

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

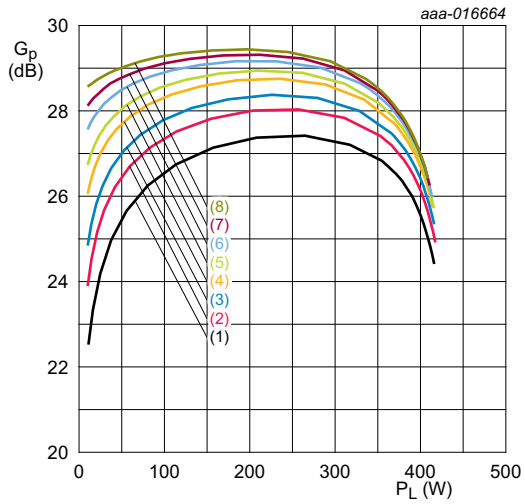
7.5 Graphical data

The following figures are measured in a class-AB production test circuit.

7.5.1 1-Tone CW pulsed



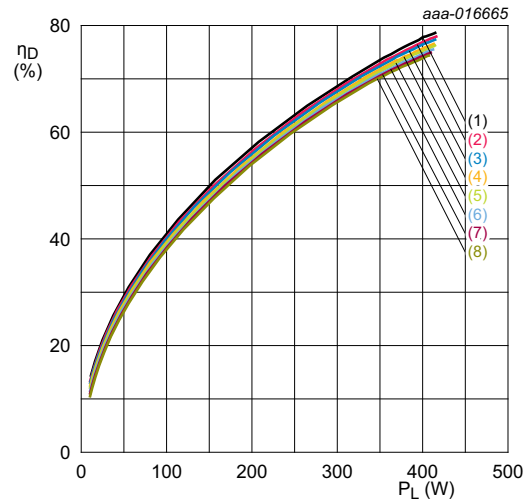




$V_{DS} = 50 \text{ V}; f = 108 \text{ MHz}; t_p = 100 \text{ } \mu\text{s}; \delta = 20 \text{ } \%$ .

- (1)  $I_{Dq} = 20 \text{ mA}$
- (2)  $I_{Dq} = 100 \text{ mA}$
- (3)  $I_{Dq} = 200 \text{ mA}$
- (4)  $I_{Dq} = 400 \text{ mA}$
- (5)  $I_{Dq} = 600 \text{ mA}$
- (6)  $I_{Dq} = 800 \text{ mA}$
- (7)  $I_{Dq} = 1000 \text{ mA}$
- (8)  $I_{Dq} = 1200 \text{ mA}$

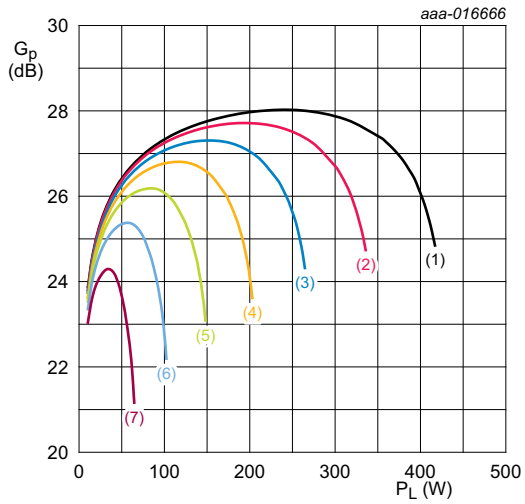
**Fig 7. Power gain as a function of output power; typical values**



$V_{DS} = 50 \text{ V}; f = 108 \text{ MHz}; t_p = 100 \text{ } \mu\text{s}; \delta = 20 \text{ } \%$ .

- (1)  $I_{Dq} = 20 \text{ mA}$
- (2)  $I_{Dq} = 100 \text{ mA}$
- (3)  $I_{Dq} = 200 \text{ mA}$
- (4)  $I_{Dq} = 400 \text{ mA}$
- (5)  $I_{Dq} = 600 \text{ mA}$
- (6)  $I_{Dq} = 800 \text{ mA}$
- (7)  $I_{Dq} = 1000 \text{ mA}$
- (8)  $I_{Dq} = 1200 \text{ mA}$

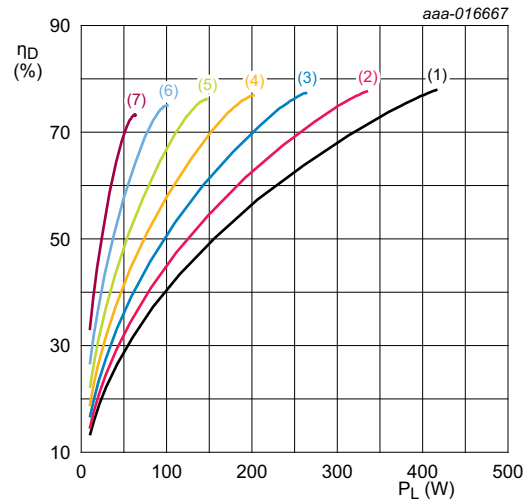
**Fig 8. Drain efficiency as a function of output power; typical values**



$I_{Dq} = 100 \text{ mA}$ ;  $f = 108 \text{ MHz}$ ;  $t_p = 100 \text{ }\mu\text{s}$ ;  $\delta = 20 \text{ \%}$ .

- (1)  $V_{DS} = 50 \text{ V}$
- (2)  $V_{DS} = 45 \text{ V}$
- (3)  $V_{DS} = 40 \text{ V}$
- (4)  $V_{DS} = 35 \text{ V}$
- (5)  $V_{DS} = 30 \text{ V}$
- (6)  $V_{DS} = 25 \text{ V}$
- (7)  $V_{DS} = 20 \text{ V}$

**Fig 9. Power gain as a function of output power; typical values**



$I_{Dq} = 100 \text{ mA}$ ;  $f = 108 \text{ MHz}$ ;  $t_p = 100 \text{ }\mu\text{s}$ ;  $\delta = 20 \text{ \%}$ .

- (1)  $V_{DS} = 50 \text{ V}$
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- (5)  $V_{DS} = 30 \text{ V}$
- (6)  $V_{DS} = 25 \text{ V}$
- (7)  $V_{DS} = 20 \text{ V}$

**Fig 10. Drain efficiency as a function of output power; typical values**

### 8. Package outline

HSOP4F: plastic, heatsink small outline package; 4 leads(flat)

SOT1223-2

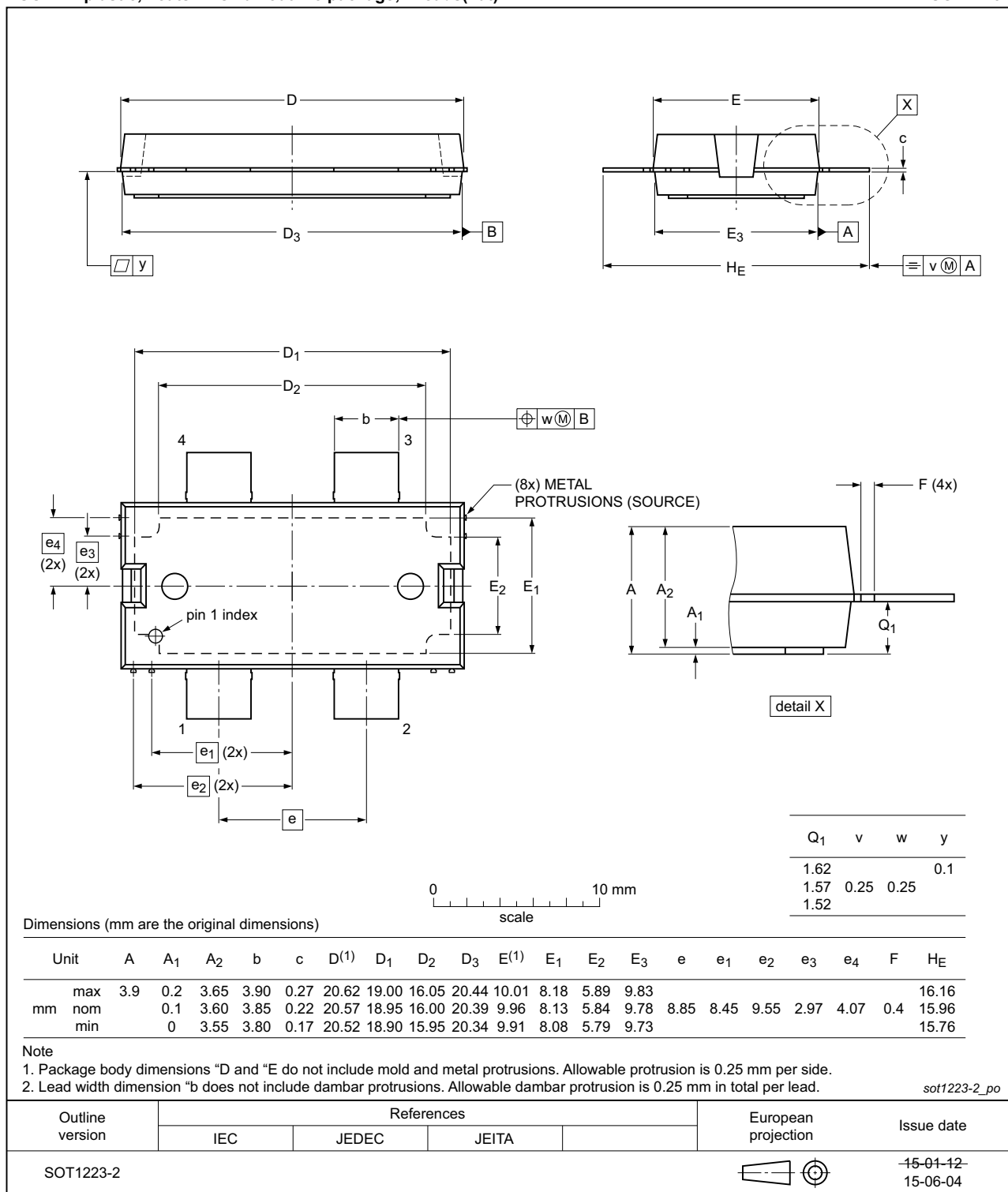


Fig 11. Package outline SOT1223-2 (HSOP4F)

HSOP4: plastic, heatsink small outline package; 4 leads

SOT1224-2

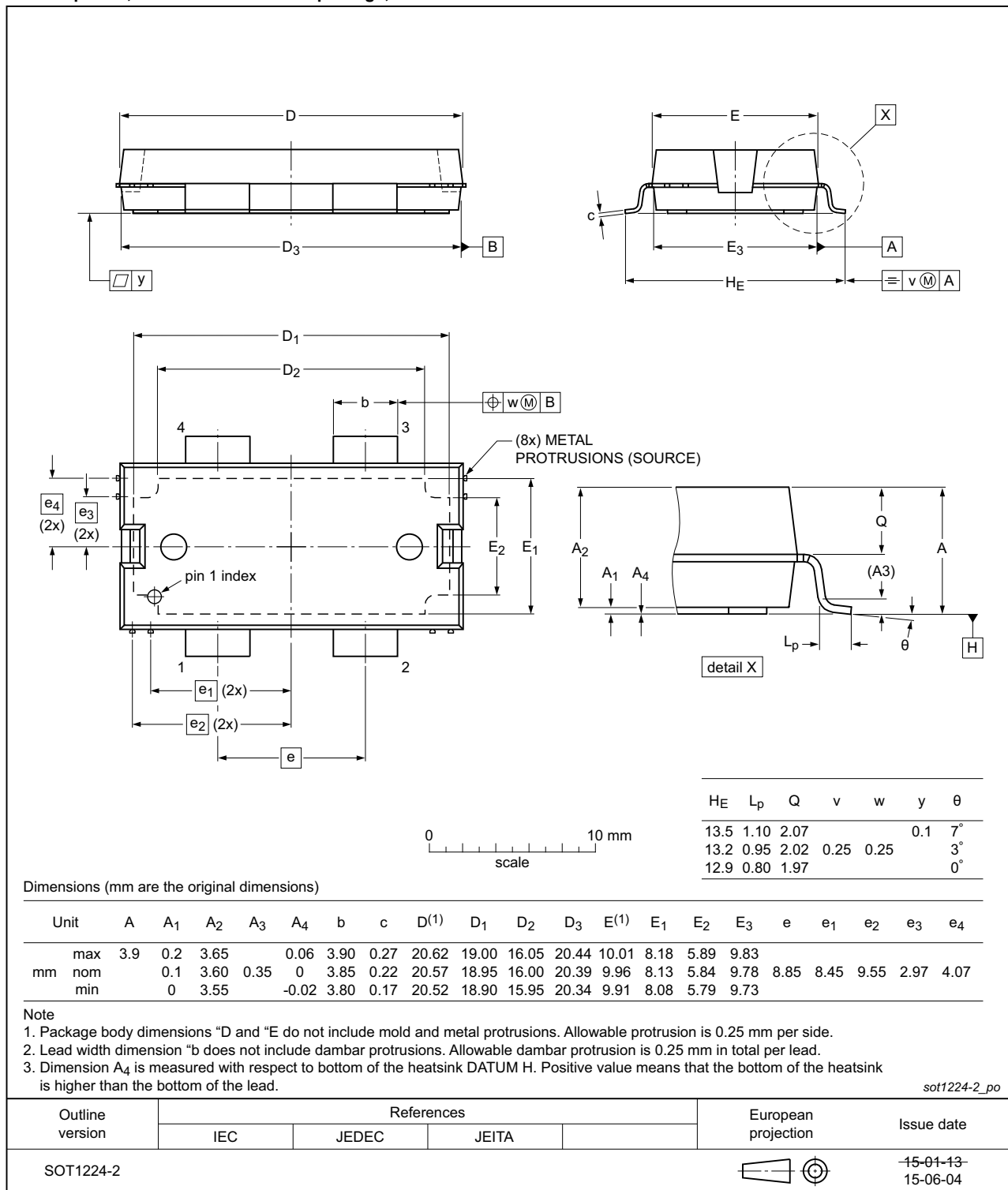


Fig 12. Package outline SOT1224-2 (HSOP4F)

## 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.

## 10. Abbreviations

Table 12. Abbreviations

Acronym	Description
CW	Continuous Wave
ESD	ElectroStatic Discharge
HF	High Frequency
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
MTF	Median Time to Failure
SMD	Surface Mounted Device
UIS	Unclamped Inductive Switching
VSWR	Voltage Standing-Wave Ratio

## 11. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLP05H6350XR_H6350XRG v.4	20160921	Product data sheet	-	BLP05H6350XR v.3
Modifications:		<ul style="list-style-type: none"> <li>The document now describes both the straight lead and gull-wing versions of this product: BLP05H6350XR and BLP05H6350XRG respectively</li> <li><a href="#">Table 2 on page 2</a>: added BLP05H6350XRG data</li> <li><a href="#">Table 3 on page 2</a>: added BLP05H6350XRG data</li> <li><a href="#">Section 7.1 on page 5</a>: added BLP05H6350XRG</li> <li><a href="#">Figure 12 on page 11</a>: added figure SOT1224-2</li> </ul>		
BLP05H6350XR v.3	20151012	Product data sheet	-	BLP05H6350XR#2
BLP05H6350XR#2	20150901	Preliminary data sheet	-	BLP05H6350XR v.1
BLP05H6350XR v.1	20150703	Preliminary data sheet	-	-

## 12. Legal information

### 12.1 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.

[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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