

BLP05H6350XR; BLP05H6350XRG

Power LDMOS transistor

Rev. 4 — 21 September 2016

AMPLEON

Product data sheet

1. Product profile

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 _{DS} (V)	P _L (W)	G _p (dB)	η _D (%)
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
BLP05H6350XR (SOT1223-2)			
1	gate 2		
2	gate 1		
3	drain 1		
4	drain 2		
5	source ^[1]		
BLP05H6350XRG (SOT1224-2)			
1	gate 2		
2	gate 1		
3	drain 1		
4	drain 2		
5	source ^[1]		

[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		-	225	°C

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

5. Thermal characteristics

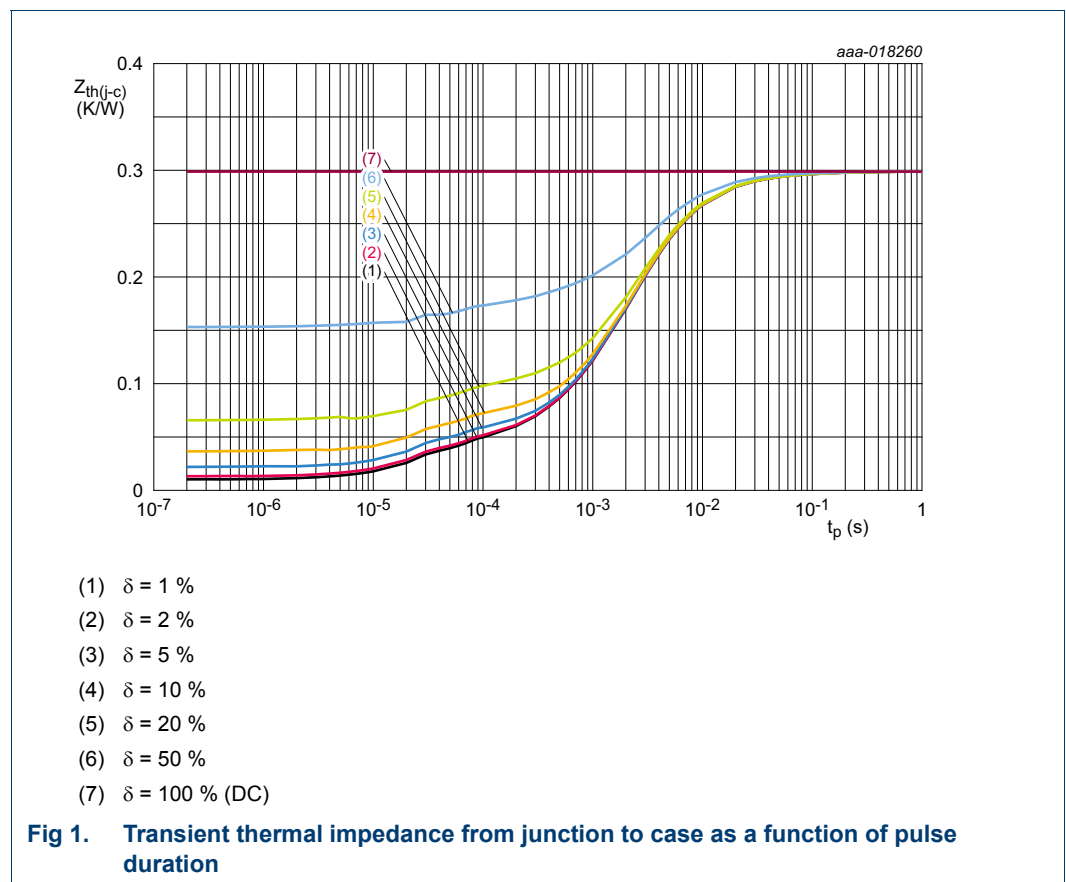
Table 5. Thermal characteristics

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	$T_j = 150\text{ °C}$; $t_p = 100\text{ }\mu\text{s}$; $\delta = 20\%$ [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_j = 25 °C; per section unless otherwise specified.

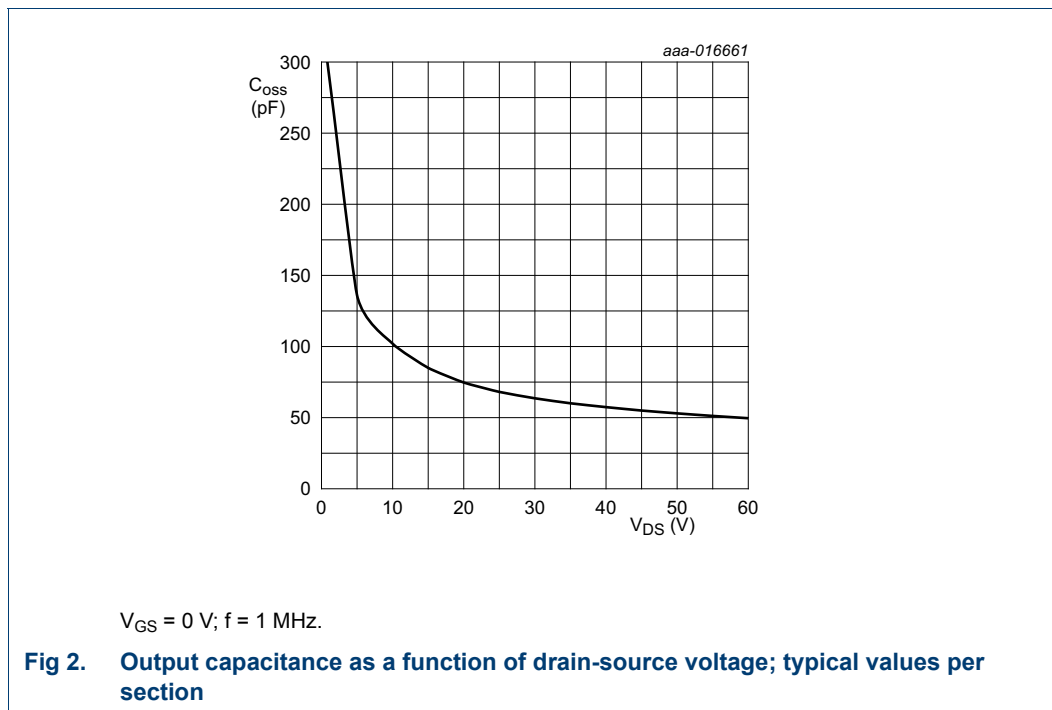
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{DSS}	drain leakage current	V _{GS} = 0 V; V _{DS} = 50 V	-	-	1.4	μA
I _{DSX}	drain cut-off current	V _{GS} = V _{GS(th)} + 3.75 V; V _{DS} = 10 V	-	21	-	A
I _{GSS}	gate leakage current	V _{GS} = 11 V; V _{DS} = 0 V	-	-	140	nA
R _{DS(on)}	drain-source on-state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

Table 7. AC characteristics
T_j = 25 °C; per section 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	-	1.3	-	pF
C _{iss}	input capacitance	V _{GS} = 0 V; V _{DS} = 50 V; f = 1 MHz	-	161	-	pF
C _{oss}	output capacitance	V _{GS} = 0 V; V _{DS} = 50 V; f = 1 MHz	-	53	-	pF

Table 8. RF characteristics
Test signal: pulsed RF; t_p = 100 μs; δ = 20 %; f = 108 MHz; RF performance at V_{DS} = 50 V; I_{Dq} = 100 mA; T_{case} = 25 °C; unless otherwise specified; in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G _p	power gain	P _L = 350 W	26.5	27.5	-	dB
RL _{in}	input return loss	P _L = 350 W	-	-10	-	dB
η _D	drain efficiency	P _L = 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

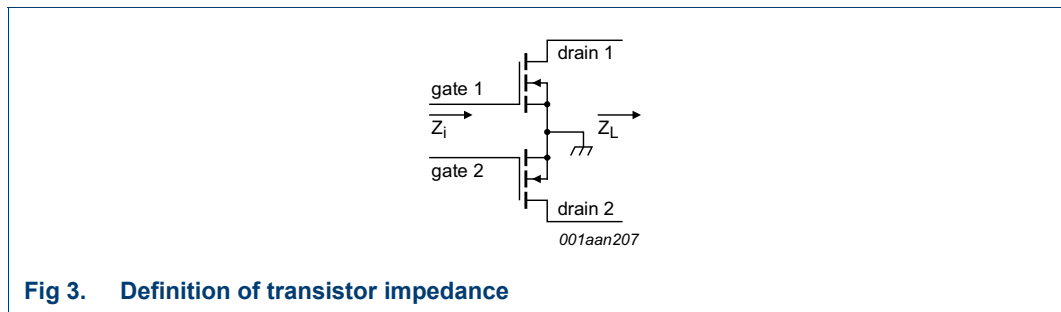


Fig 3. Definition of transistor impedance

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 (Ω)	Z_L (Ω)
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

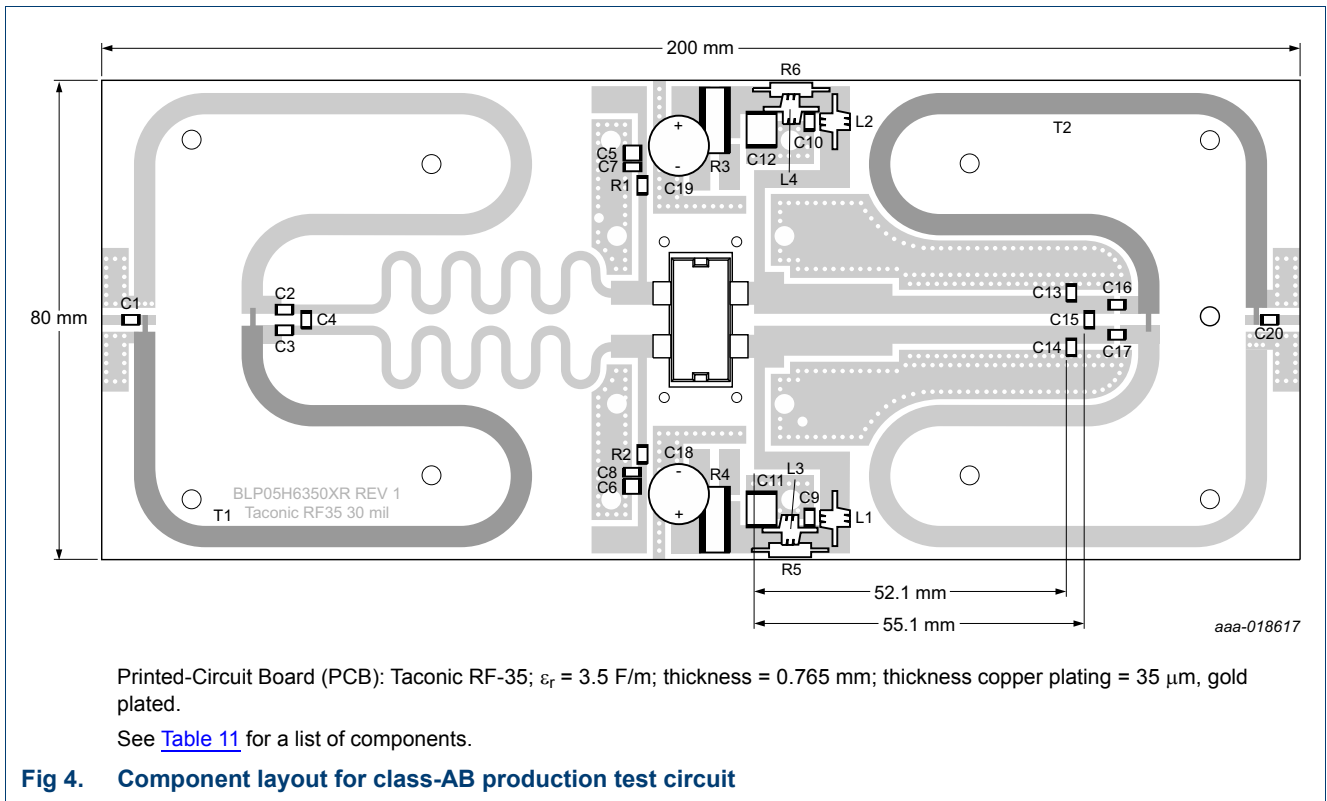


Table 11. List of components

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

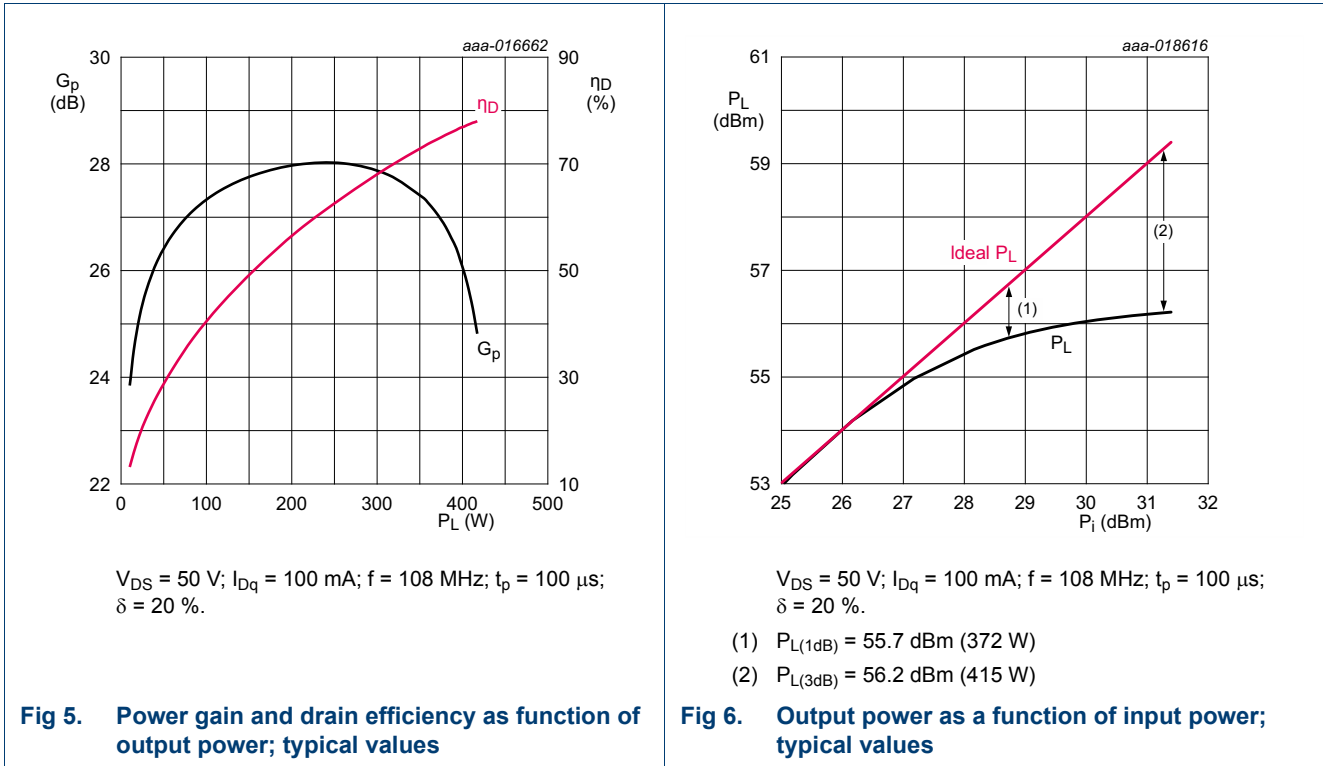
Component	Description	Value	Remarks
C1, C4	multilayer ceramic chip capacitor	51 pF	[1]
C2, C3	multilayer ceramic chip capacitor	150 pF	[1]
C5, C6	multilayer ceramic chip capacitor	4.7 μ F, 50 V	
C7, C8	multilayer ceramic chip capacitor	820 pF	[1]
C9, C10	multilayer ceramic chip capacitor	820 pF	[1]
C11, C12	multilayer ceramic chip capacitor	4.7 μ F, 100 V	
C13, C14	multilayer ceramic chip capacitor	62 pF	[1]
C15	electrolytic capacitor	7.5 μ F	[1]
C16, C17	multilayer ceramic chip capacitor	110 pF	[1]
C18,C19	electrolytic capacitor	2200 μ 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 Ω	SMD 1206
R3, R4	shunt resistor	0.01 Ω	Ohmite: FC4L110R010FER
R5, R6	metal film resistor	10 Ω , 0.6 W	
T1, T2	semi rigid coax	50 Ω , length = 160 mm	EZ Form: EZ-141-AL-TP-M17

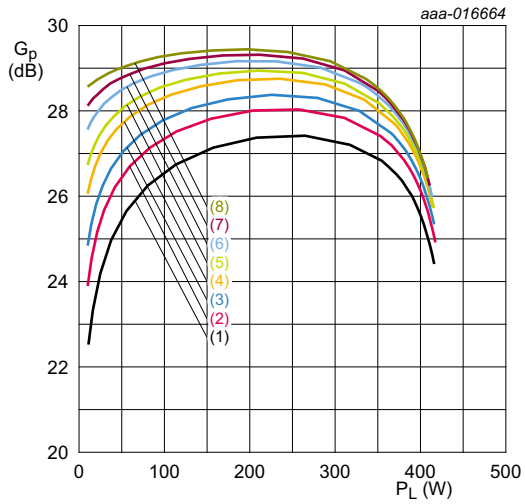
[1] American Technical Ceramics type 100B or capacitor of same quality.

7.5 Graphical data

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

7.5.1 1-Tone CW pulsed

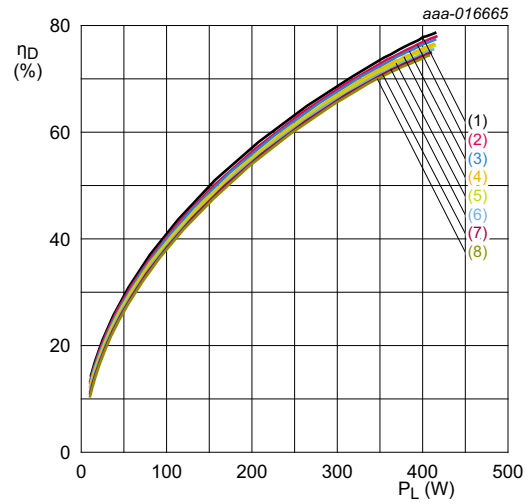




$V_{DS} = 50 \text{ V}$; $f = 108 \text{ MHz}$; $t_p = 100 \text{ } \mu\text{s}$; $\delta = 20 \text{ \%}$.

- (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) $I_{Dq} = 1200 \text{ mA}$

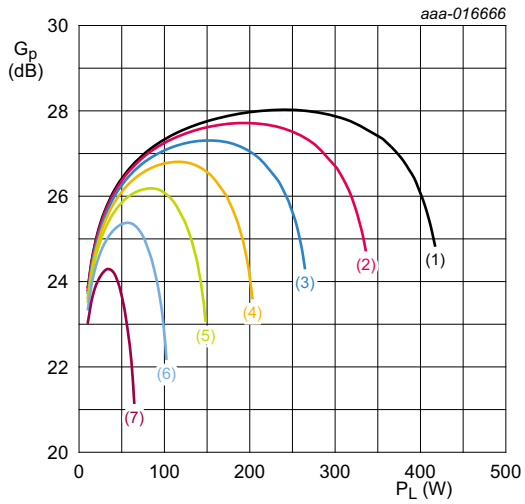
Fig 7. Power gain as a function of output power; typical values



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

- (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) $I_{Dq} = 1200 \text{ mA}$

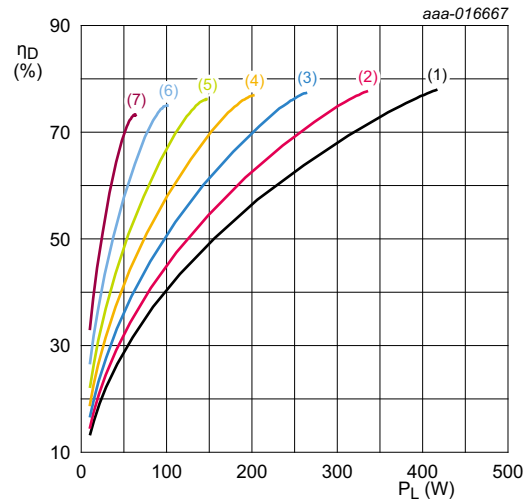
Fig 8. Drain efficiency as a function of output power; typical values



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

- (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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- (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 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

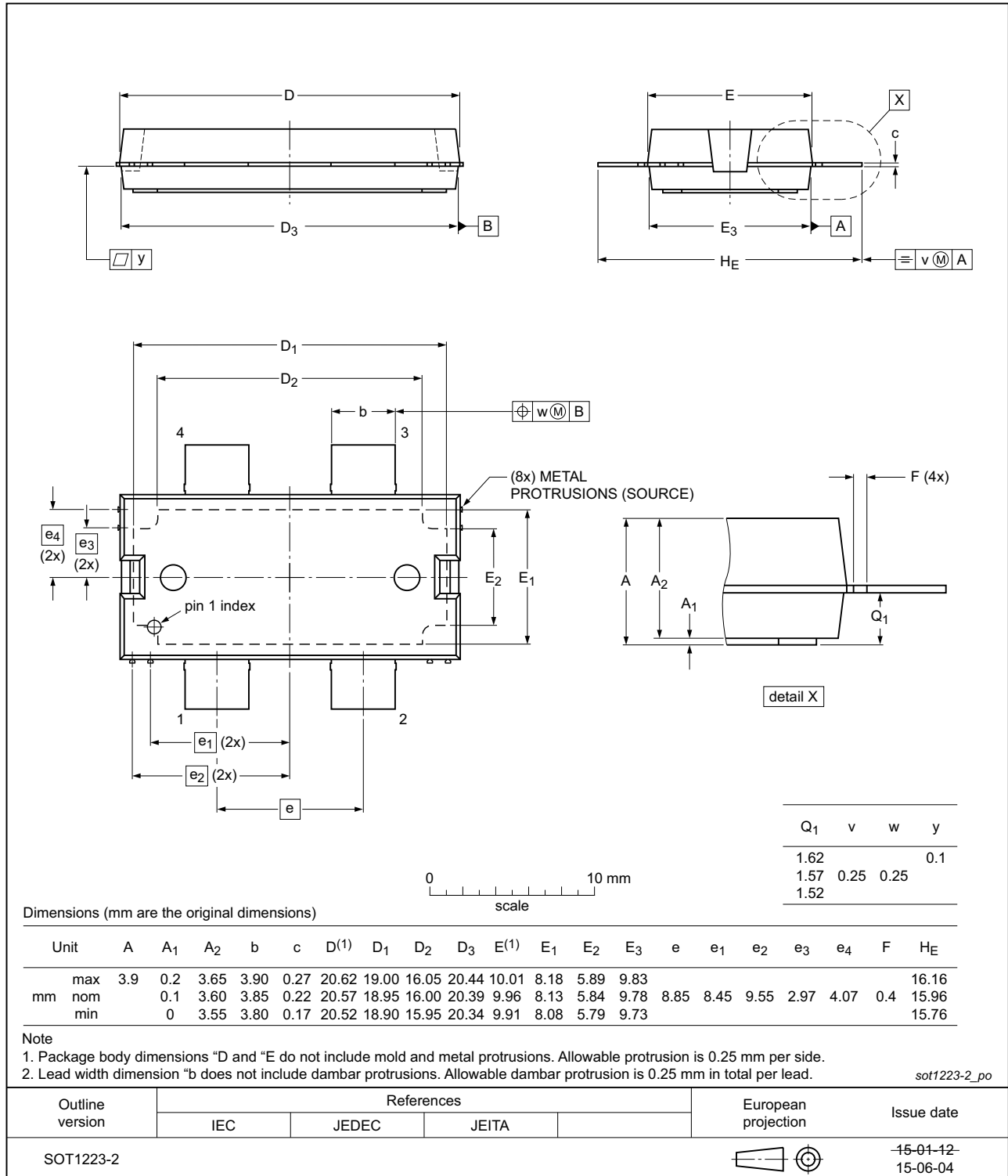


Fig 11. Package outline SOT1223-2 (HSOP4F)

HSOP4: plastic, heatsink small outline package; 4 leads

SOT1224-2

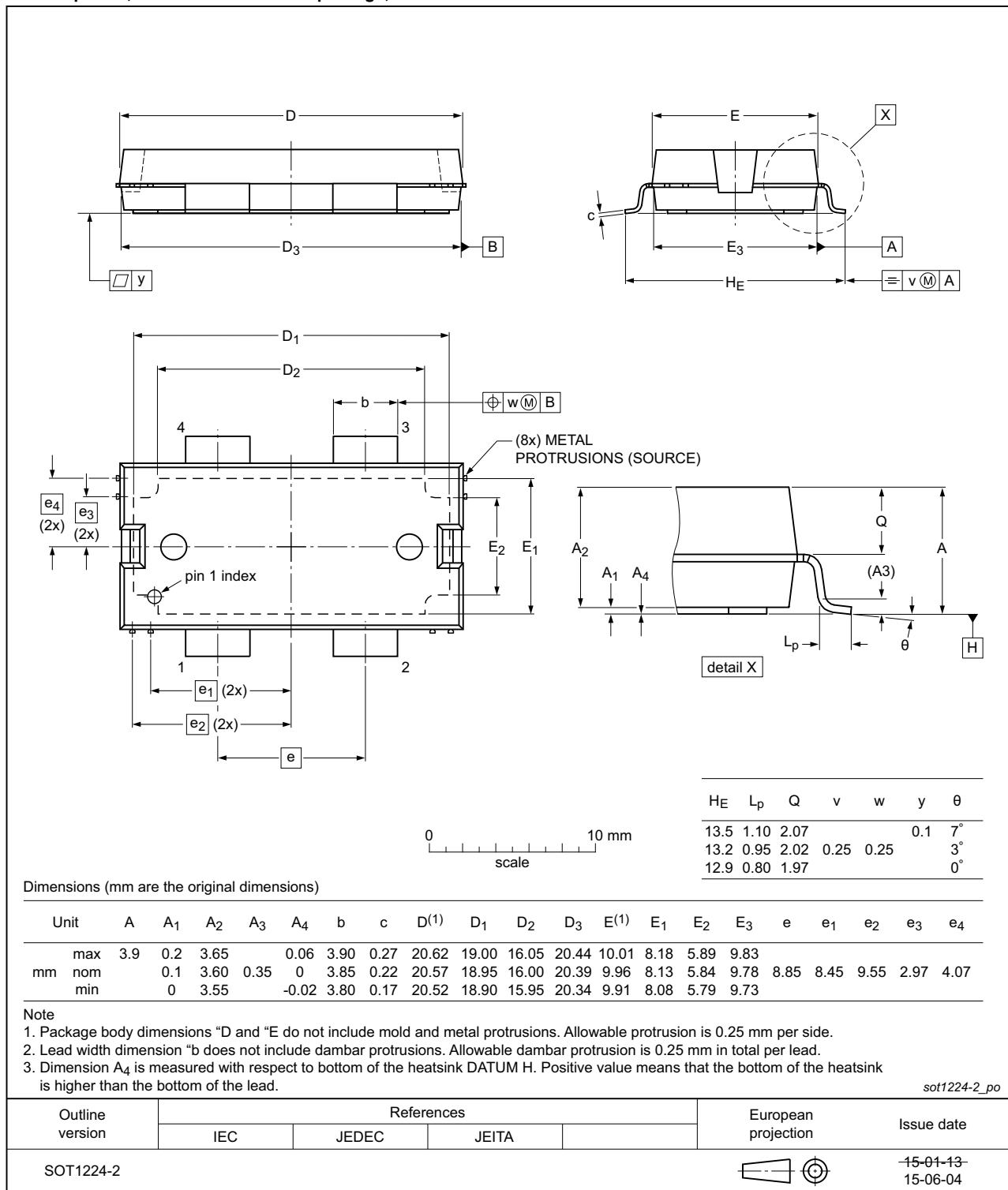



Fig 12. Package outline SOT1224-2 (HSOP4F)

9. Handling information

CAUTION	
	<p>This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices.</p> <p>Such precautions are described in the <i>ANSI/ESD S20.20</i>, <i>IEC/ST 61340-5</i>, <i>JESD625-A</i> or equivalent standards.</p>

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"> The document now describes both the straight lead and gull-wing versions of this product: BLP05H6350XR and BLP05H6350XRG respectively Table 2 on page 2: added BLP05H6350XRG data Table 3 on page 2: added BLP05H6350XRG data Section 7.1 on page 5: added BLP05H6350XRG Figure 12 on page 11: added figure SOT1224-2 		
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

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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.

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[2] The term 'short data sheet' is explained in section "Definitions".

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14. Contents

1 **Product profile** 1

1.1 General description 1

1.2 Features and benefits 1

1.3 Applications 1

2 **Pinning information** 2

3 **Ordering information** 2

4 **Limiting values** 2

5 **Thermal characteristics** 3

6 **Characteristics** 3

7 **Test information** 5

7.1 Ruggedness in class-AB operation 5

7.2 Impedance information 5

7.3 UIS avalanche energy 5

7.4 Test circuit 6

7.5 Graphical data 7

7.5.1 1-Tone CW pulsed 7

8 **Package outline** 10

9 **Handling information** 12

10 **Abbreviations** 12

11 **Revision history** 12

12 **Legal information** 13

12.1 Data sheet status 13

12.2 Definitions 13

12.3 Disclaimers 13

12.4 Trademarks 14

13 **Contact information** 14

14 **Contents** 15

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