

# BLS7G2933S-150

LDMOS S-band radar power transistor

Rev. 3 — 1 September 2015

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

150 W LDMOS power transistor intended for radar applications in the 2.9 GHz to 3.3 GHz range.

**Table 1. Typical performance**

Typical RF performance at  $T_{case} = 25\text{ °C}$ ;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\%$ ;  $I_{Dq} = 100\text{ mA}$ ; in a class-AB production test circuit.

Mode of operation	f (GHz)	V <sub>DS</sub> (V)	P <sub>L</sub> (W)	G <sub>p</sub> (dB)	$\eta_D$ (%)	t <sub>r</sub> (ns)	t <sub>f</sub> (ns)
pulsed RF	2.9 to 3.3	32	150	13.5	47	20	6

### 1.2 Features and benefits

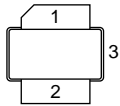
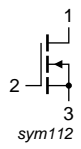
- Typical pulsed RF performance at a frequency of 2.9 GHz to 3.3 GHz, a supply voltage of 32 V, an  $I_{Dq}$  of 100 mA, a  $t_p$  of 300  $\mu\text{s}$  with  $\delta$  of 10 %:
  - ◆ Output power = 150 W
  - ◆ Power gain = 13.5 dB
  - ◆ Efficiency = 47 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (2.9 GHz to 3.3 GHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

### 1.3 Applications

- S-band power amplifiers for radar applications in the 2.9 GHz to 3.3 GHz frequency range

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		 sym112
2	gate		
3	source		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLS7G2933S-150	-	ceramic earless flanged cavity package; 2 leads	SOT922-1

## 4. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Min	Max	Unit
$V_{DS}$	drain-source voltage	-	60	V
$V_{GS}$	gate-source voltage	-0.5	+13	V
$I_D$	drain current	-	33	A
$T_{stg}$	storage temperature	-65	+150	°C
$T_j$	junction temperature	-	200	°C

## 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$Z_{th(j-mb)}$	transient thermal impedance from junction to mounting base	$T_{case} = 85\text{ °C}; P_L = 150\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.12	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.14	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.16	K/W
		$t_p = 500\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.18	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 20\text{ }\%$	0.15	K/W

## 6. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}; I_D = 0.6\text{ mA}$	65	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 180\text{ mA}$	1.5	1.8	2.3	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 28\text{ V}$	-	-	4.2	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	29	35	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}; V_{DS} = 0\text{ V}$	-	-	420	nA
$g_{fs}$	forward transconductance	$V_{DS} = 10\text{ V}; I_D = 9\text{ A}$	-	12.7	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 6.3\text{ A}$	-	0.085	0.135	$\Omega$

## 7. Application information

**Table 7. Application information**

Mode of operation: pulsed RF;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\%$ ; RF performance at  $V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 100\text{ mA}$ ;  $T_{case} = 25\text{ }^\circ\text{C}$ ; unless otherwise specified, in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$P_L$	output power		-	150	-	W
$V_{CC}$	supply voltage	$P_L = 150\text{ W}$	-	-	32	V
$G_p$	power gain	$P_L = 150\text{ W}$	11	13.5	-	dB
$RL_{in}$	input return loss	$P_L = 150\text{ W}$		-10	-5.5	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		-	170	-	W
$\eta_D$	drain efficiency	$P_L = 150\text{ W}$	44	47	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 150\text{ W}$	-	0	0.3	dB
$t_r$	rise time	$P_L = 150\text{ W}$	-	20	50	ns
$t_f$	fall time	$P_L = 150\text{ W}$	-	6	50	ns

Table 8. Typical impedance

f GHz	Z <sub>S</sub> Ω	Z <sub>L</sub> Ω
2.9	2.2 – j7.4	4.2 – j6.3
3.0	2.9 – j6.5	3.8 – j6.4
3.1	4.2 – j5.9	3.4 – j6.3
3.2	6.0 – j6.5	2.9 – j6.2
3.3	6.5 – j8.9	2.5 – j5.9

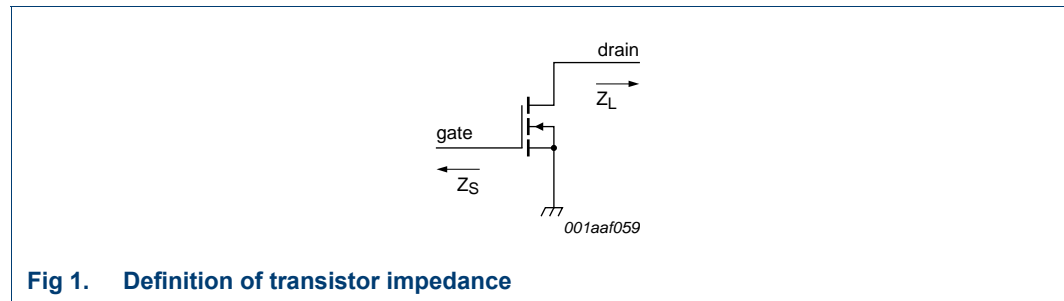
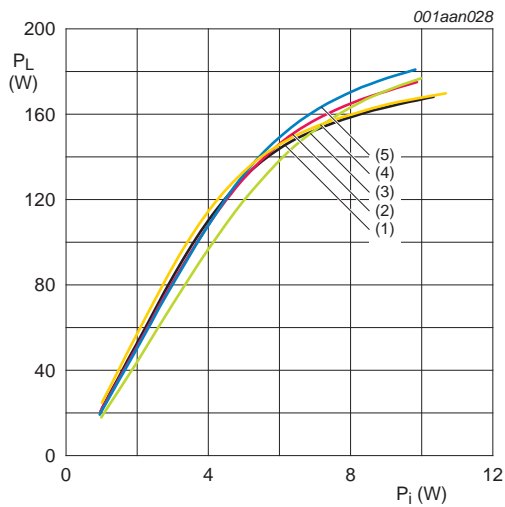


Fig 1. Definition of transistor impedance

### 7.1 Ruggedness in class-AB operation

The BLS7G2933S-150 is capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions:  $V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 100\text{ mA}$ ;  $P_L = 150\text{ W}$ ;  $t_p = 300\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

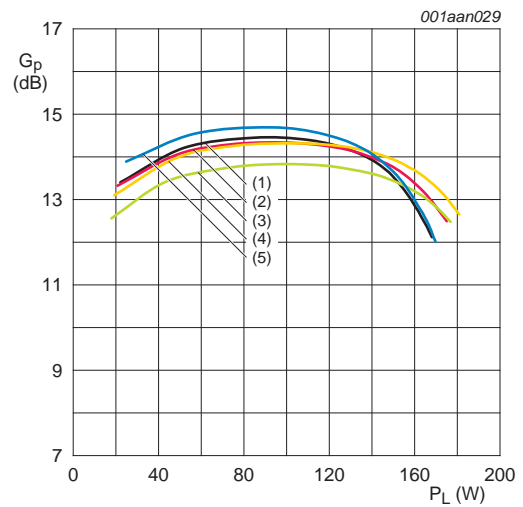
7.2 Graphs



$V_{DS} = 32$  V;  $I_{Dq} = 100$  mA;  $t_p = 300$   $\mu$ s;  $\delta = 10$  %.

- (1)  $f = 2900$  MHz
- (2)  $f = 3000$  MHz
- (3)  $f = 3100$  MHz
- (4)  $f = 3200$  MHz
- (5)  $f = 3300$  MHz

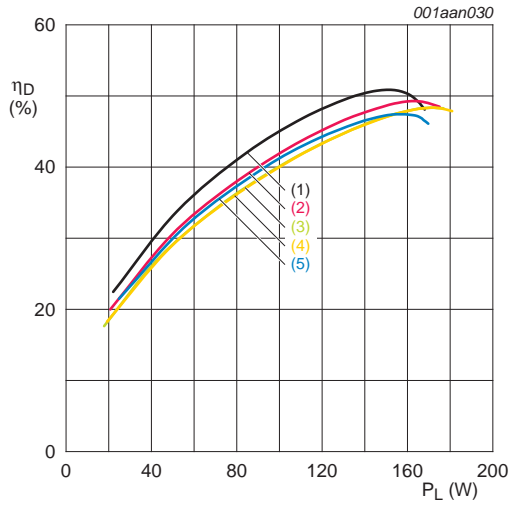
**Fig 2. Load power as a function of input power; typical values**



$V_{DS} = 32$  V;  $I_{Dq} = 100$  mA;  $t_p = 300$   $\mu$ s;  $\delta = 10$  %.

- (1)  $f = 2900$  MHz
- (2)  $f = 3000$  MHz
- (3)  $f = 3100$  MHz
- (4)  $f = 3200$  MHz
- (5)  $f = 3300$  MHz

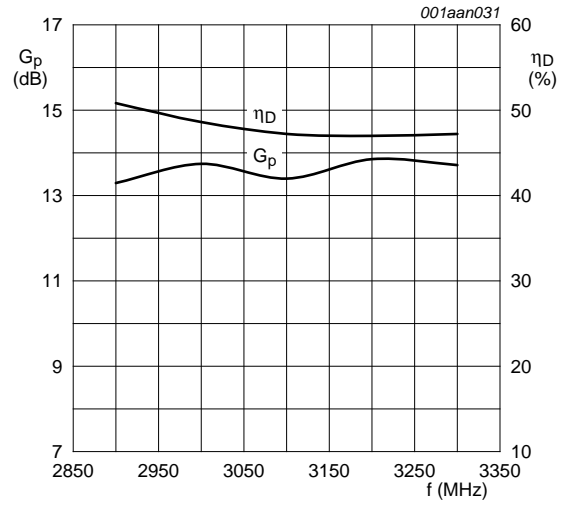
**Fig 3. Power gain as a function of load power; typical values**



$V_{DS} = 32\text{ V}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$ .

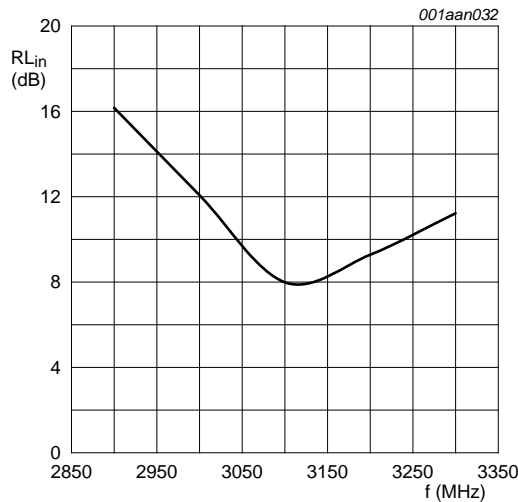
- (1)  $f = 2900\text{ MHz}$
- (2)  $f = 3000\text{ MHz}$
- (3)  $f = 3100\text{ MHz}$
- (4)  $f = 3200\text{ MHz}$
- (5)  $f = 3300\text{ MHz}$

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



$V_{DS} = 32\text{ V}; P_L = 150\text{ W}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$ .

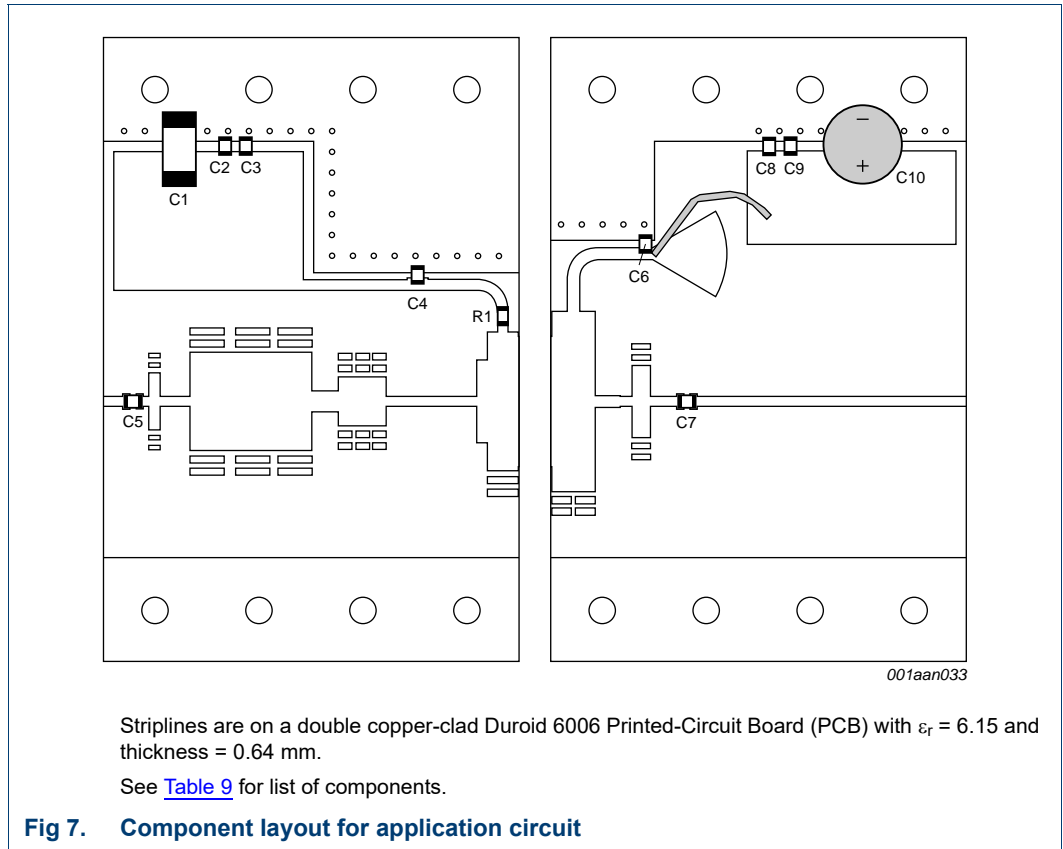
**Fig 5. Power gain and drain efficiency as function of frequency; typical values**



$V_{DS} = 32\text{ V}; P_L = 150\text{ W}; I_{Dq} = 100\text{ mA}; t_p = 300\text{ }\mu\text{s}; \delta = 10\text{ }\%$ .

**Fig 6. Input return loss as a function of frequency; typical values**

8. Test information



**Table 9. List of components**

See [Figure 7](#).

Component	Description	Value	Remarks
C1	multilayer ceramic chip capacitor	10 $\mu$ F; 20 V	
C2, C8	multilayer ceramic chip capacitor	1 nF	ATC 700A or equivalent
C3, C9	multilayer ceramic chip capacitor	100 pF	ATC 100A or equivalent
C4, C5, C6, C7	multilayer ceramic chip capacitor	10 pF	ATC 100A or equivalent
C10	electrolytic capacitor	68 $\mu$ F; 63 V	
R1	SMD resistor	10 $\Omega$	SMD 0603

9. Package outline

Ceramic earless flanged cavity package; 2 leads

SOT922-1

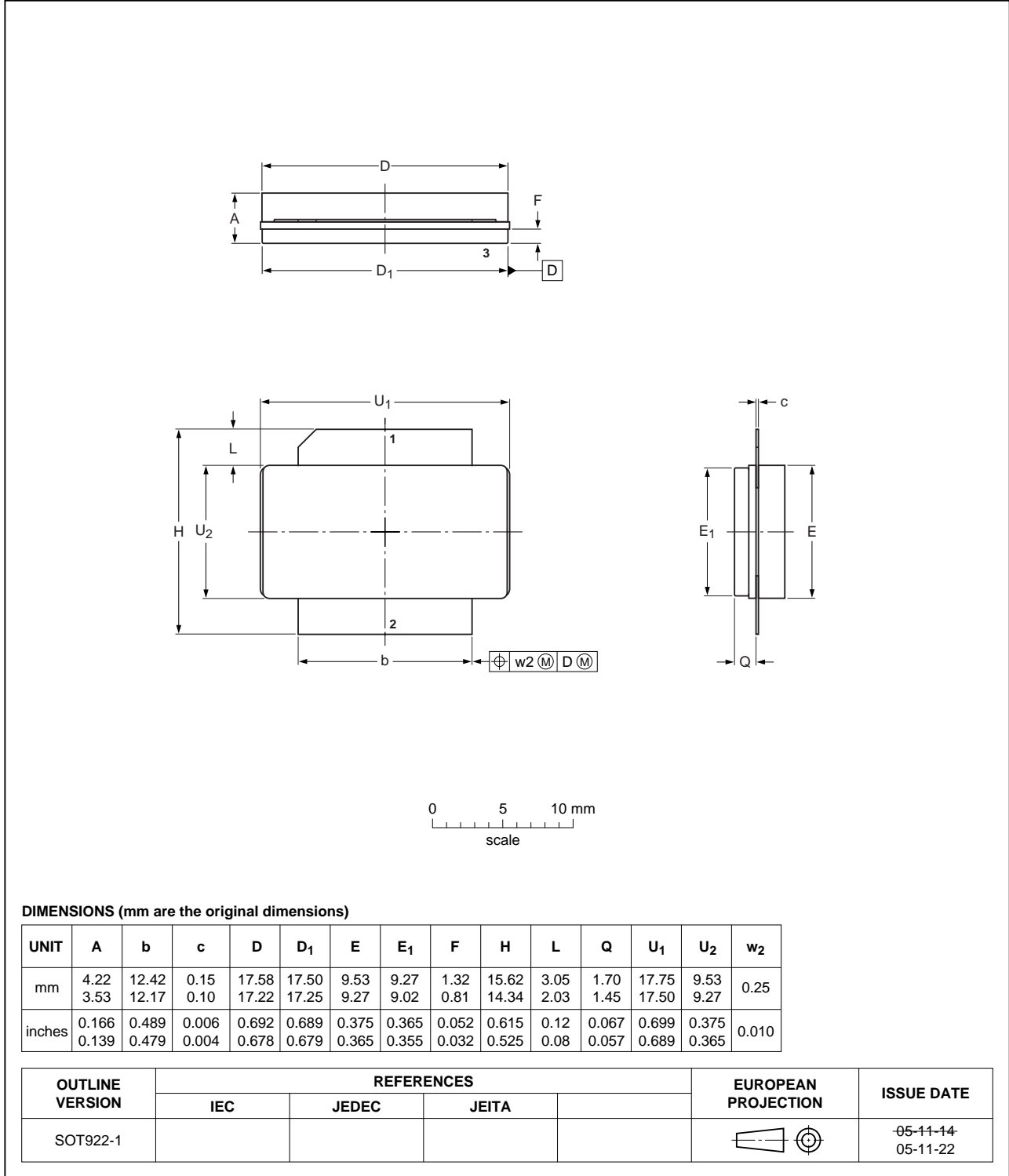


Fig 8. Package outline SOT922-1



## 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
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
RF	Radio Frequency
S-band	Short wave Band
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
BLS7G2933S-150#3	20150901	Product data sheet		BLS7G2933S-150 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this document has been redesigned to comply with the new identity guidelines of Ampleon.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
BLS7G2933S-150 v.2	20110223	Product data sheet	-	BLS7G2933S-150 v.1
BLS7G2933S-150 v.1	20101112	Objective data sheet	-	-

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### 13.1 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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