

# BLP15M9S70G

Power LDMOS transistor

Rev. 4 — 12 January 2023

AMPLEON

Product data sheet

## 1. Product profile

### 1.1 General description

A 70 W general purpose LDMOS RF power transistor for broadcast and ISM applications in HF to 2 GHz band.

Table 1. Application performance

Test signal	f	P <sub>L</sub>	G <sub>p</sub>	η <sub>D</sub>	RL <sub>in</sub>
	(MHz)	(W)	(dB)	(%)	(dB)
pulsed CW	1400	70	17.6	70	-14
CW	915	70	17	75	-17

### 1.2 Features and benefits

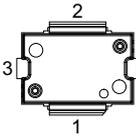
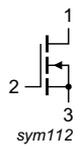
- High efficiency
- Integrated dual sided ESD protection
- Excellent ruggedness
- High power gain
- Excellent reliability
- Easy power control
- For RoHS compliance see the product details on the Ampleon website

### 1.3 Applications

- Industrial, scientific and medical applications
- Broadcast transmitter applications
- RF power amplifiers for CW applications

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain		
2	gate		
3	source <sup>[1]</sup>		

[1] Connected to flange.

## 3. Ordering information

Table 3. Ordering information

Package name	Orderable part number	12NC	Packing description	Min. orderable quantity (pieces)
TO-270-2G-1	BLP15M9S70GZ	9349 602 44515	TR13; 500-fold; 24 mm; dry pack	500
	BLP15M9S70GXY	9349 602 44538	TR7; 100-fold; 24 mm; dry pack	100

## 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		-	65	V
$V_{GS}$	gate-source voltage		-6	+13	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature	<sup>[1]</sup>	-	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	$T_{case} = 85\text{ °C}; V_{DS} = 32\text{ V}; P_L = 70\text{ W}$	1.0	K/W

## 6. Characteristics

**Table 6. DC 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	$V_{GS} = 0\text{ V}$ ; $I_D = 0.66\text{ mA}$	65	70	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$ ; $I_D = 66\text{ mA}$	1.5	2.0	2.5	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 32\text{ V}$	-	-	1.4	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $V_{DS} = 10\text{ V}$	-	12.6	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 11\text{ V}$ ; $V_{DS} = 0\text{ V}$	-	-	140	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$ ; $I_D = 2.31\text{ A}$	-	185	-	$\text{m}\Omega$

**Table 7. AC characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$	-	61	-	pF
$C_{oss}$	output capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$	-	22	-	pF
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0\text{ V}$ ; $V_{DS} = 50\text{ V}$ ; $f = 1\text{ MHz}$	-	0.45	-	pF

**Table 8. RF characteristics**

RF characteristics in Ampleon production test circuit; typical RF performance at  $T_{case} = 25\text{ }^\circ\text{C}$ ;  
 $V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 300\text{ mA}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Pulsed RF, class-AB</b>						
$G_p$	power gain	$f = 1400\text{ MHz}$ ; $P_L = 70\text{ W}$	15.5	17.6	-	dB
$\eta_D$	drain efficiency	$f = 1400\text{ MHz}$ ; $P_L = 70\text{ W}$	66	70	-	%
$RL_{in}$	input return loss	$f = 1400\text{ MHz}$ ; $P_L = 70\text{ W}$	-	-20	-	dB

## 7. Test information

### 7.1 Ruggedness in class-AB operation

The BLP15M9S70G is capable of withstanding a load mismatch corresponding to a  $V_{SWR} = 10 : 1$  through all phases under the following conditions:  $V_{DS} = 32\text{ V}$ ;  $f = 1400\text{ MHz}$  at rated load power on RF development board using a pulsed CW RF signal which has  $\sim 150\text{ ns}$  rise and fall time.

7.2 Test circuit

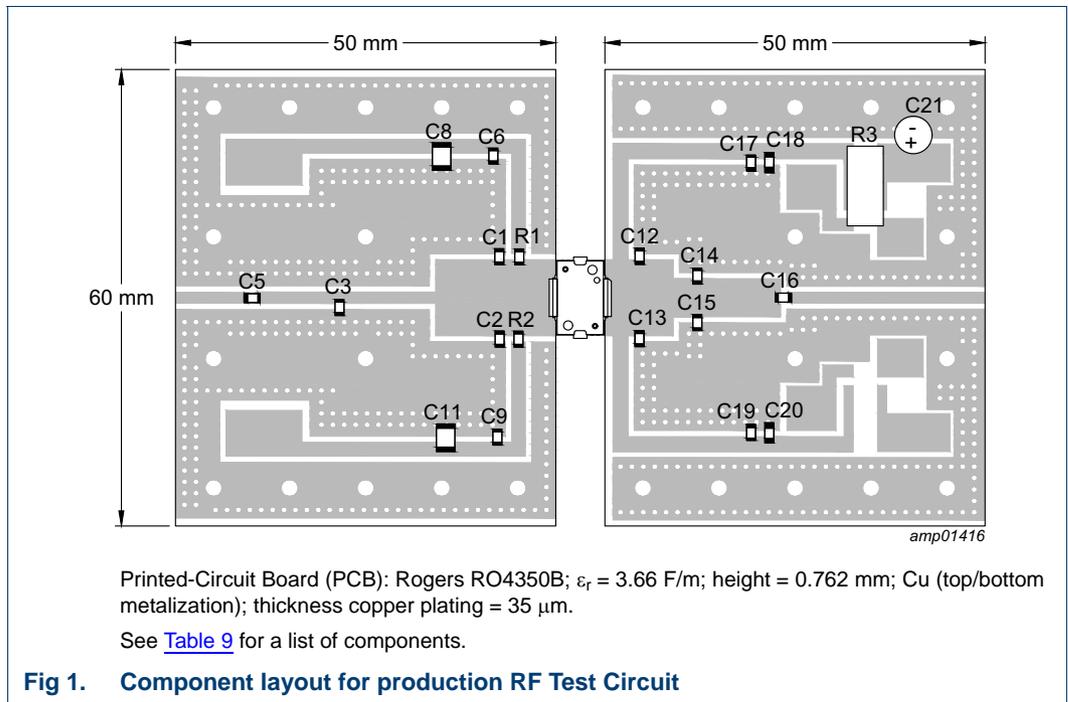
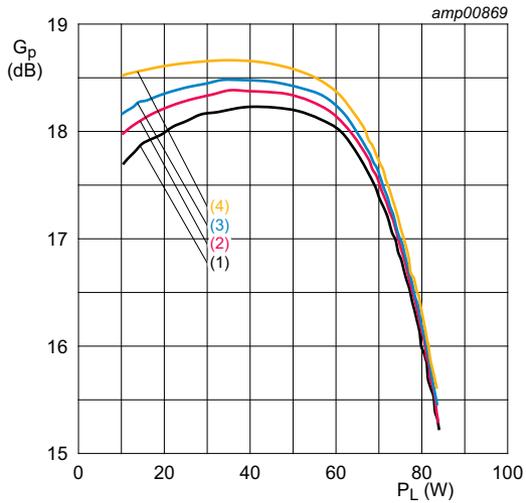


Table 9. List of components

See [Figure 1](#) for component layout.

Component	Description	Value	Remarks
C1, C2	multilayer ceramic chip capacitor	6.2 pF	ATC 800A
C3	multilayer ceramic chip capacitor	2 pF	ATC 800A
C5, C6, C9, C17, C19, C16	multilayer ceramic chip capacitor	100 pF	ATC 800A
C8, C11, C18, C20	multilayer ceramic chip capacitor	100 nF, 100 V	
C12, C13	multilayer ceramic chip capacitor	3 pF	ATC 800A
C14, C15	multilayer ceramic chip capacitor	2.1 pF	ATC 800A
C21	electrolytic capacitor	220 $\mu\text{F}$ , 63 V	
R1, R2	chip resistor	10 $\Omega$	SMD 0805
R3	shunt resistor	10 m $\Omega$	for current monitoring

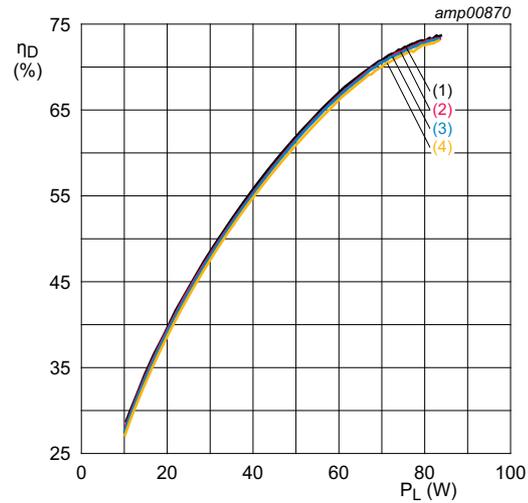
7.3 Graphical data



$V_{DS} = 32\text{ V}$ ;  $f = 1400\text{ MHz}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

- (1)  $I_{Dq} = 200\text{ mA}$
- (2)  $I_{Dq} = 250\text{ mA}$
- (3)  $I_{Dq} = 300\text{ mA}$
- (4)  $I_{Dq} = 400\text{ mA}$

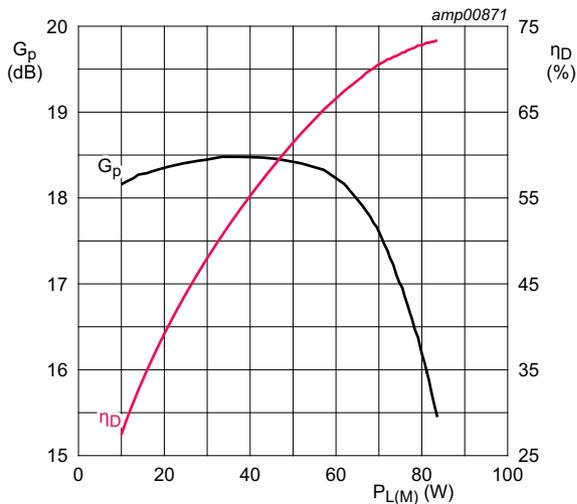
Fig 2. Power gain as a function of output power; typical values



$V_{DS} = 32\text{ V}$ ;  $f = 1400\text{ MHz}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

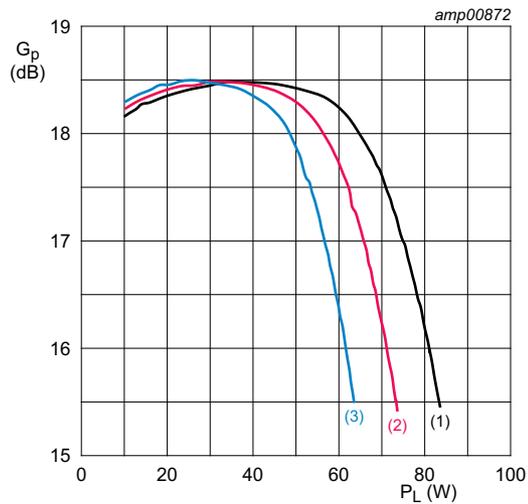
- (1)  $I_{Dq} = 200\text{ mA}$
- (2)  $I_{Dq} = 250\text{ mA}$
- (3)  $I_{Dq} = 300\text{ mA}$
- (4)  $I_{Dq} = 400\text{ mA}$

Fig 3. Drain efficiency as a function of output power; typical values



$V_{DS} = 32\text{ V}$ ;  $I_{Dq} = 300\text{ mA}$ ;  $f = 1400\text{ MHz}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

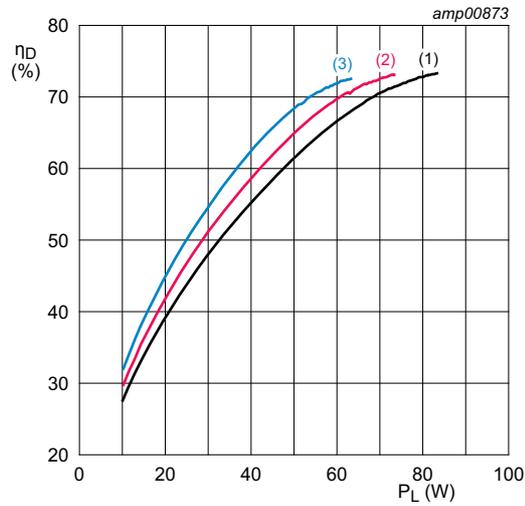
Fig 4. Power gain and drain efficiency as function of peak output power; typical values



$I_{Dq} = 300\text{ mA}$ ;  $f = 1400\text{ MHz}$ ;  $t_p = 100\text{ }\mu\text{s}$ ;  $\delta = 10\text{ }\%$ .

- (1)  $V_{DS} = 32\text{ V}$
- (2)  $V_{DS} = 30\text{ V}$
- (3)  $V_{DS} = 28\text{ V}$

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



$I_{Dq} = 300$  mA;  $f = 1400$  MHz;  $t_p = 100$   $\mu$ s;  $\delta = 10$  %.

- (1)  $V_{DS} = 32$  V
- (2)  $V_{DS} = 30$  V
- (3)  $V_{DS} = 28$  V

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

8. Package outline

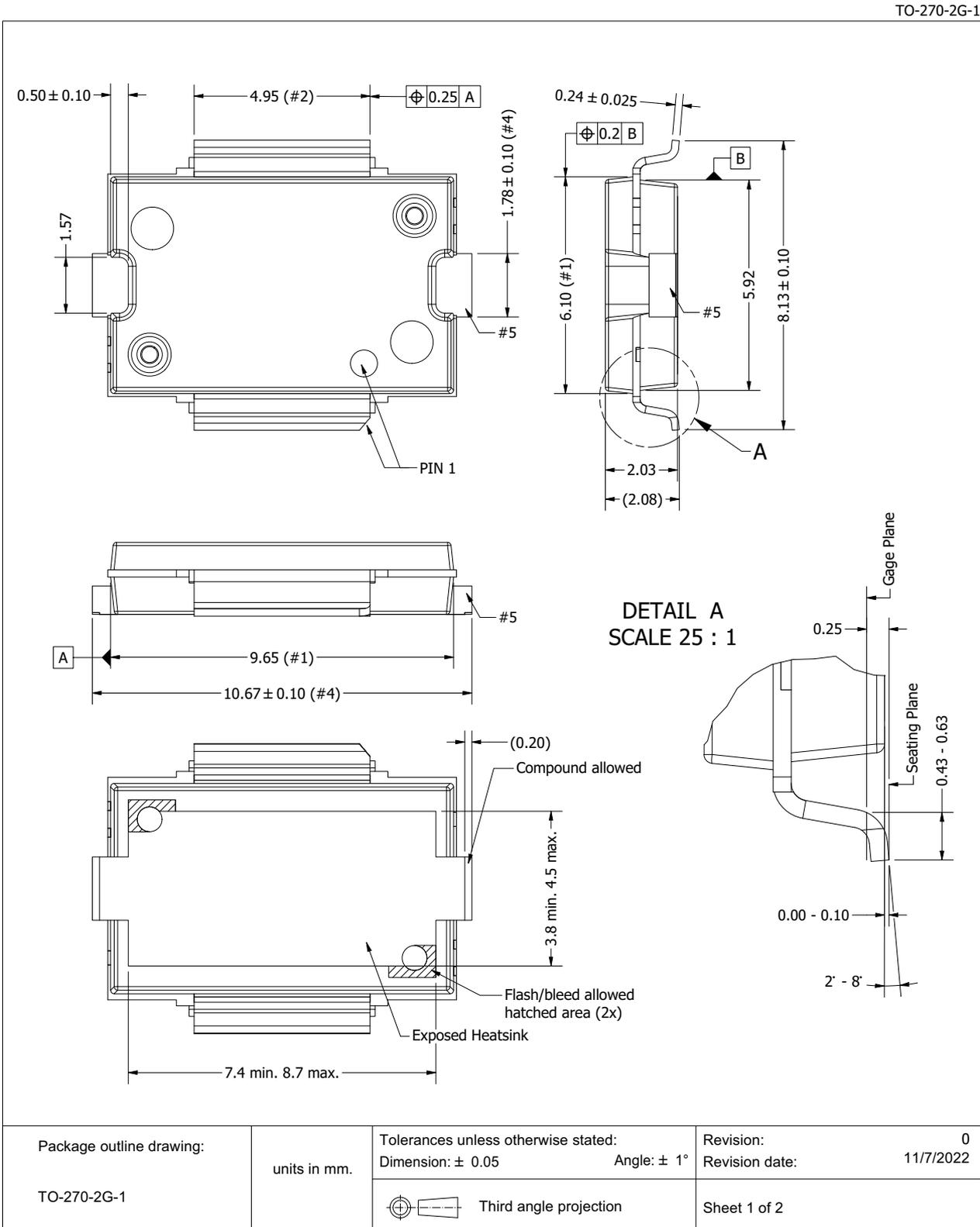
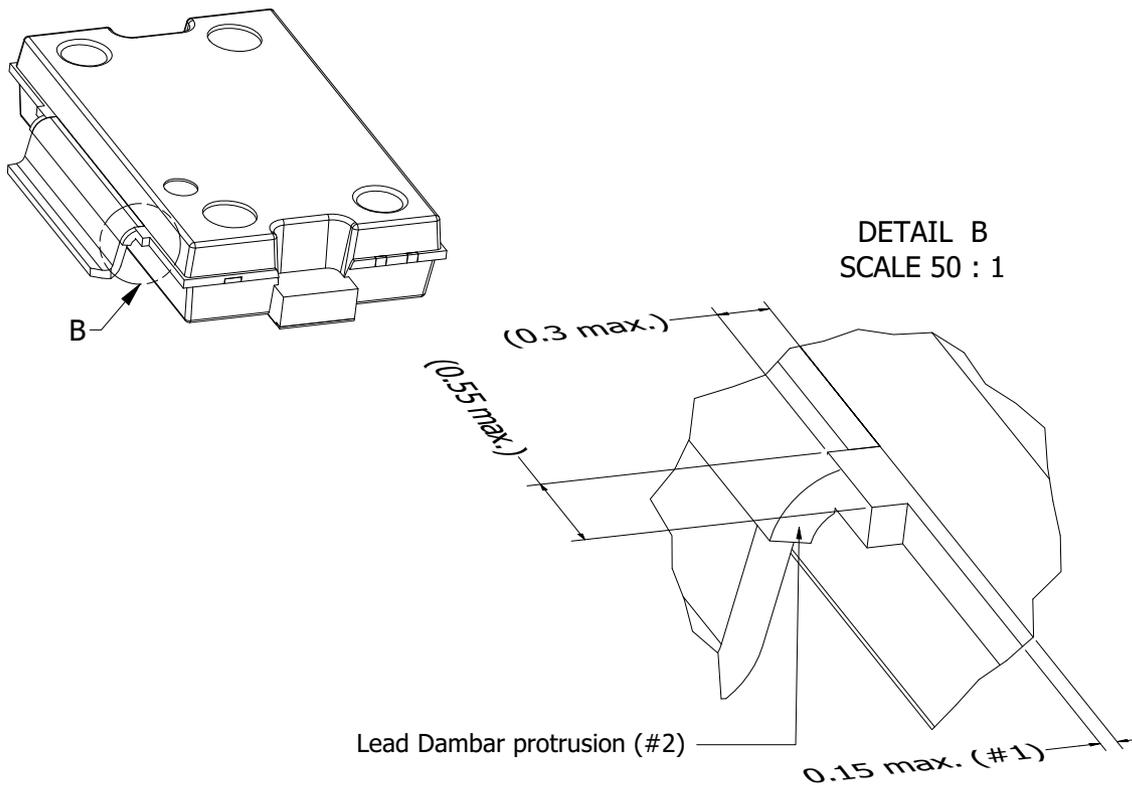


Fig 7. Package outline TO-270-2G-1 (sheet 1 of 2)

TO-270-2G-1

Drawing Notes	
Items	Description
(1)	Dimensions are excluding mold protrusion. The mold protrusion is maximum 0.15 mm per side. See also detail B. In the dambar area max. protrusion is 0.55mm max. in length and 0.3 mm max. in width (4x) See also detail B.
(2)	The lead dambar (metal) protrusions are not included. Add 0.14 mm max to the total lead dimension at the dambar location.
(3)	The leads and exposed heatsink are plated with matte Tin (Sn).
(4)	Dimensions (Heatsink ears) 10,67 and 1,78 do not include mouldprotrusion. Overall Max. dimensions incl. mould protrusions is 10,92 mm. (max.) and 2,03 mm. (max.).
(5)	Surfaces may remain unplated (not solderable surfaces).



Package outline drawing:	units in mm.	Tolerances unless otherwise stated:	Revision: 0
TO-270-2G-1		Dimension: $\pm 0.05$	Angle: $\pm 1^\circ$
		Third angle projection	Revision date: 11/7/2022
			Sheet 2 of 2

Fig 8. Package outline TO-270-2G-1 (sheet 2 of 2)

## 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.

**Table 10. ESD sensitivity**

ESD model	Class
Charged Device Model (CDM); According to ANSI/ESDA/JEDEC standard JS-002	C2A <a href="#">[1]</a>
Human Body Model (HBM); According to ANSI/ESDA/JEDEC standard JS-001	2 <a href="#">[2]</a>

[1] CDM classification C2A is granted to any part that passes after exposure to an ESD pulse of 500 V.

[2] HBM classification 2 is granted to any part that passes after exposure to an ESD pulse of 2000 V.

## 10. Abbreviations

**Table 11. Abbreviations**

Acronym	Description
CW	Continuous Wave
ESD	ElectroStatic Discharge
ISM	Industrial, Scientific and Medical
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
MTF	Median Time to Failure
RoHS	Restriction of Hazardous Substances
SMD	Surface Mounted Device
VSWR	Voltage Standing Wave Ratio

## 11. Revision history

**Table 12. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLP15M9S70G v.4	20230112	Product data sheet	-	BLP15M9S70G v.3
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Table 3 on page 2</a>: package name changed from SOT1483-1 to TO-270-2G-1</li> <li><a href="#">Table 5 on page 2</a>: value changed from 1.44 K/W to 1.0 K/W</li> <li><a href="#">Section 8 on page 7</a>: package outline drawing changed from SOT1483-1 to TO-270-2G-1</li> <li><a href="#">Section 12 on page 10</a>: updated section</li> </ul>			
BLP15M9S70G v.3	20210716	Product data sheet	-	BLP15M9S70G v.2
BLP15M9S70G v.2	20210223	Product data sheet	-	BLP15M9S70G v.1
BLP15M9S70G v.1	20200507	Product 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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