

BLA6H1011-600

LDMOS avionics power transistor

Rev. 01 — 22 April 2010

Product data sheet

1. Product profile

1.1 General description

600 W LDMOS pulsed power transistor intended for TCAS and IFF applications in the 1030 MHz to 1090 MHz range.

Table 1. Test information

Typical RF performance at $T_{case} = 25\text{ }^{\circ}\text{C}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$; $I_{DQ} = 100\text{ mA}$; in a class-AB production test circuit.

Mode of operation	f (MHz)	V _{DS} (V)	P _L (W)	G _p (dB)	η_D (%)	t _r (ns)	t _f (ns)
pulsed RF	1030 to 1090	48	600	17	52	11	5

CAUTION



This device is sensitive to ElectroStatic Discharge (ESD). Therefore care should be taken during transport and handling.

1.2 Features and benefits

- Typical pulsed RF performance at a frequency of 1030 MHz to 1090 MHz, a supply voltage of 48 V, an I_{DQ} of 100 mA, a t_p of 50 μs with δ of 2 %:
 - ◆ Output power = 600 W
 - ◆ Power gain = 17 dB
 - ◆ Efficiency = 52 %
- Easy power control
- Integrated ESD protection
- High flexibility with respect to pulse formats
- Excellent ruggedness
- High efficiency
- Excellent thermal stability
- Designed for broadband operation (1030 MHz to 1090 MHz)
- Internally matched for ease of use
- Compliant to Directive 2002/95/EC, regarding restriction of hazardous substances (RoHS)

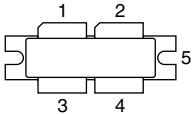
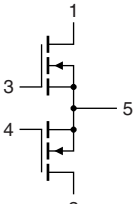


1.3 Applications

- 600 W LDMOS pulsed power transistor intended for TCAS and IFF applications in the 1030 MHz to 1090 MHz frequency range

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	drain1		
2	drain2		
3	gate1		
4	gate2		
5	source		

[1] Connected to flange.

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BLA6H1011-600	-	flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads	SOT539A

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		0.5	13	V
I_D	drain current		-	72	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
$Z_{th(j-case)}$	transient thermal impedance from junction to case	$T_{case} = 85\text{ °C}; P_L = 600\text{ W}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\text{ }\%$	0.06	K/W
		$t_p = 50\text{ }\mu\text{s}; \delta = 2\text{ }\%$	0.035	K/W

6. Characteristics

Table 6. DC characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{GS} = 0\text{ V}$; $I_D = 2.7\text{ mA}$	100	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}$; $I_D = 270\text{ mA}$	1.25	1.8	2.25	V
I_{DSS}	drain leakage current	$V_{GS} = 0\text{ V}$; $V_{DS} = 50\text{ V}$	-	-	1.4	μA
I_{DSX}	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $V_{DS} = 10\text{ V}$	32	42	-	A
I_{GSS}	gate leakage current	$V_{GS} = 11\text{ V}$; $V_{DS} = 0\text{ V}$	-	-	140	nA
g_{fs}	forward transconductance	$V_{DS} = 10\text{ V}$; $I_D = 270\text{ mA}$	1.6	3	-	S
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}$; $I_D = 9.5\text{ A}$	-	100	169	$\text{m}\Omega$

Table 7. RF characteristics

Mode of operation: pulsed RF; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$; RF performance at $V_{DS} = 48\text{ V}$; $I_{Dq} = 100\text{ mA}$; $T_{case} = 25\text{ }^{\circ}\text{C}$; unless otherwise specified, in a class-AB production test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
P_L	output power		600	-	-	W
V_{DS}	drain-source voltage	$P_L = 600\text{ W}$	-	-	48	V
G_p	power gain	$P_L = 600\text{ W}$	16	17	-	dB
RL_{in}	input return loss	$P_L = 600\text{ W}$	8	12	-	dB
$P_{L(1dB)}$	output power at 1 dB gain compression		-	700	-	W
η_D	drain efficiency	$P_L = 600\text{ W}$	47	52	-	%
$P_{droop(pulse)}$	pulse droop power	$P_L = 600\text{ W}$	-	0	0.3	dB
t_r	rise time	$P_L = 600\text{ W}$	-	11	30	ns
t_f	fall time	$P_L = 600\text{ W}$	-	5	30	ns

6.1 Ruggedness in class-AB operation

The BLA6H1011-600 is capable of withstanding a load mismatch corresponding to $VSWR = 5 : 1$ through all phases under the following conditions: $V_{DS} = 48\text{ V}$; $I_{Dq} = 100\text{ mA}$; $P_L = 600\text{ W}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\%$; $f = 1030\text{ MHz}$.

7. Application information

7.1 Impedance information

Table 8. Typical impedance
Typical values per section unless otherwise specified.

f	Z _S	Z _L
MHz	Ω	Ω
1030	1.702 – j1.816	0.977 + j0.049
1060	1.815 – j1.760	1.033 + j0.221
1090	1.912 – j1.751	1.086 + j0.379

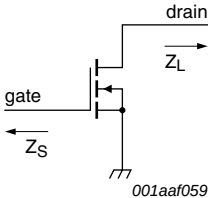
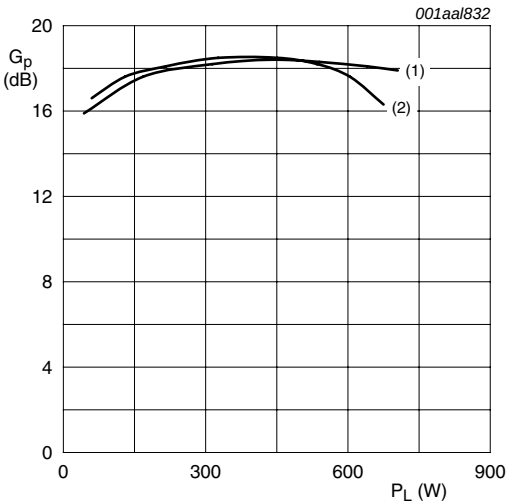


Fig 1. Definition of transistor impedance

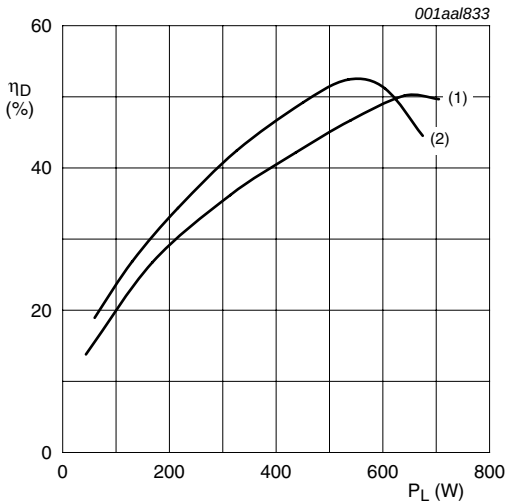
7.2 Performance curves



$T_h = 25\text{ }^{\circ}\text{C}$; $V_{DS} = 48\text{ V}$; $I_{DQ} = 100\text{ mA}$; $t_p = 50\text{ }\mu\text{s}$;
 $\delta = 2\text{ }\%$.

(1) $f = 1030\text{ MHz}$
 (2) $f = 1090\text{ MHz}$

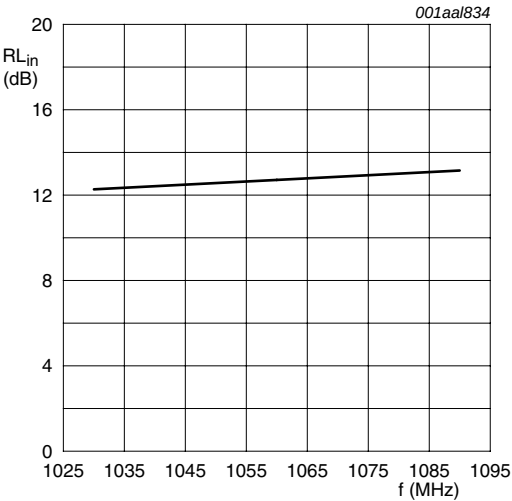
Fig 2. Power gain as a function of load power; typical values



$T_h = 25\text{ }^{\circ}\text{C}$; $V_{DS} = 48\text{ V}$; $I_{DQ} = 100\text{ mA}$; $t_p = 50\text{ }\mu\text{s}$;
 $\delta = 2\text{ }\%$.

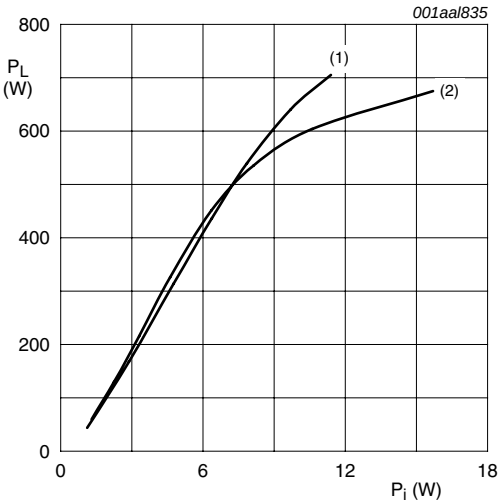
(1) $f = 1030\text{ MHz}$
 (2) $f = 1090\text{ MHz}$

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



$T_h = 25\text{ }^{\circ}\text{C}$; $P_L = 600\text{ W}$; $V_{DS} = 48\text{ V}$; $I_{DQ} = 100\text{ mA}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$.

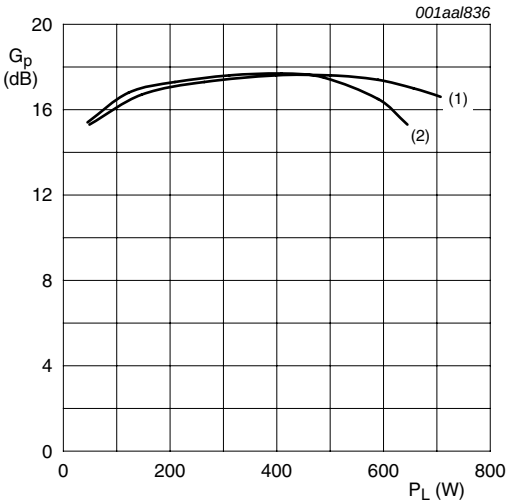
Fig 4. Input return loss as a function of frequency; typical values



$T_h = 25\text{ }^{\circ}\text{C}$; $V_{DS} = 48\text{ V}$; $I_{DQ} = 100\text{ mA}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$.

- (1) $f = 1030\text{ MHz}$
- (2) $f = 1090\text{ MHz}$

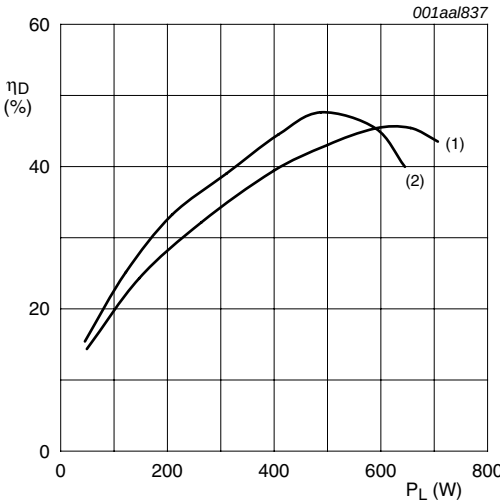
Fig 5. Load power as a function of input power; typical values



$T_h = 65\text{ }^{\circ}\text{C}$; $V_{DS} = 48\text{ V}$; $I_{DQ} = 100\text{ mA}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$.

- (1) $f = 1030\text{ MHz}$
- (2) $f = 1090\text{ MHz}$

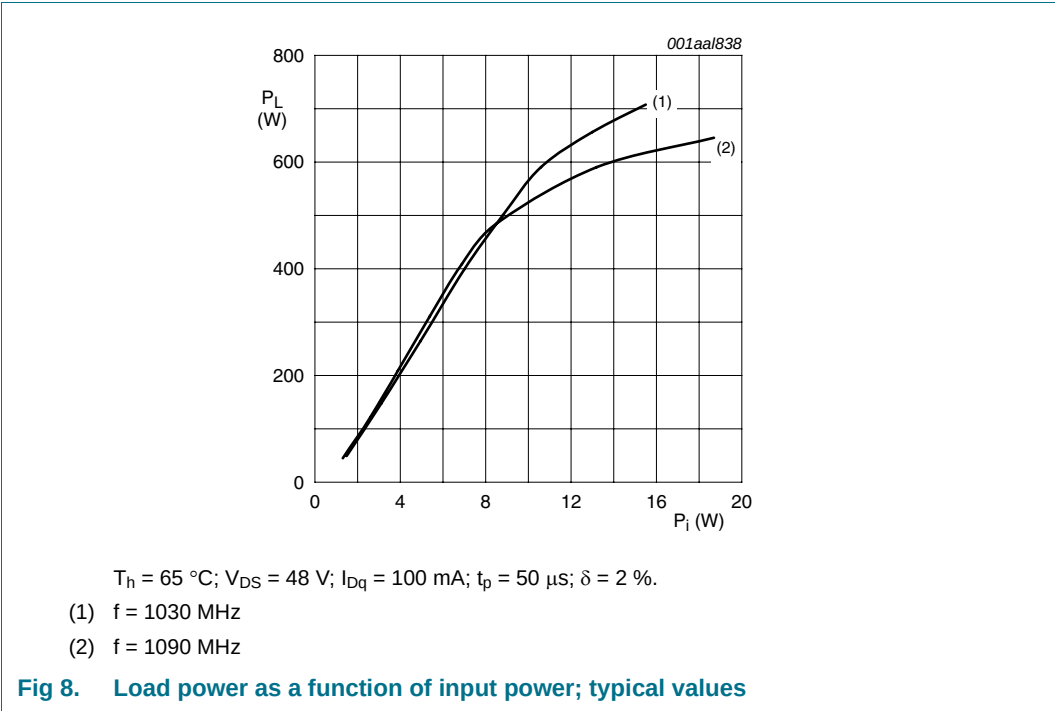
Fig 6. Power gain as a function of load power; typical values



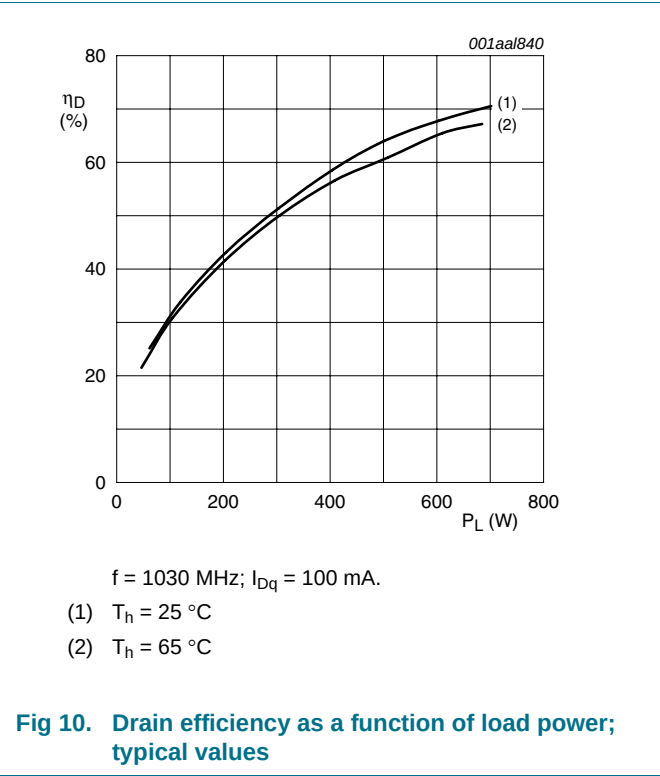
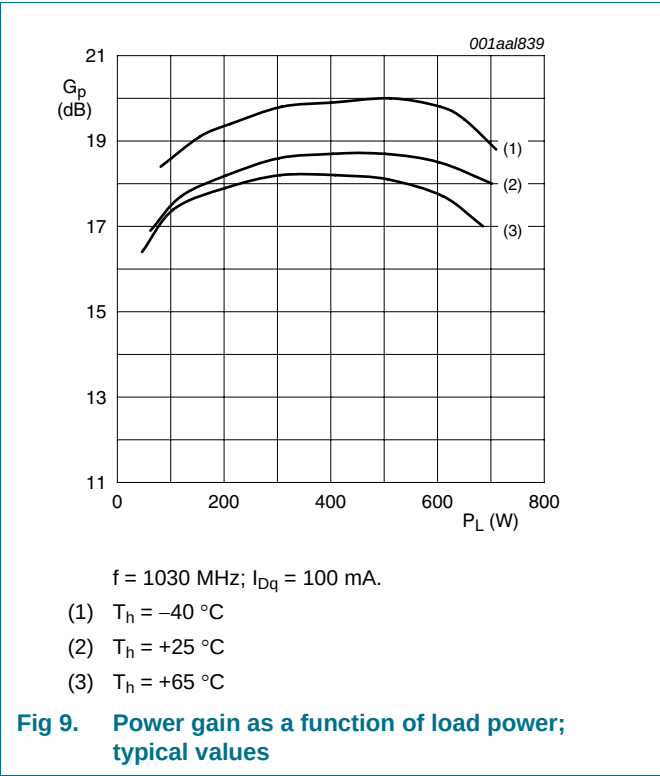
$T_h = 65\text{ }^{\circ}\text{C}$; $V_{DS} = 48\text{ V}$; $I_{DQ} = 100\text{ mA}$; $t_p = 50\text{ }\mu\text{s}$; $\delta = 2\text{ }\%$.

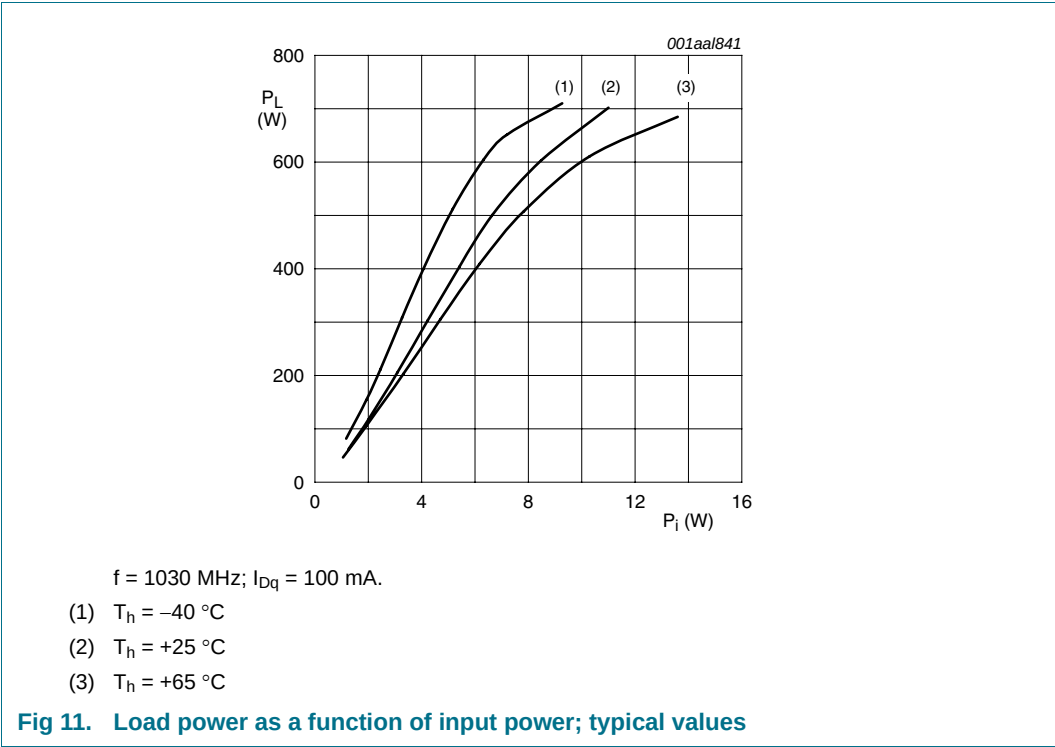
- (1) $f = 1030\text{ MHz}$
- (2) $f = 1090\text{ MHz}$

Fig 7. Drain efficiency as a function of load power; typical values



7.3 Curves measured under Mode-S ELM pulse-conditions



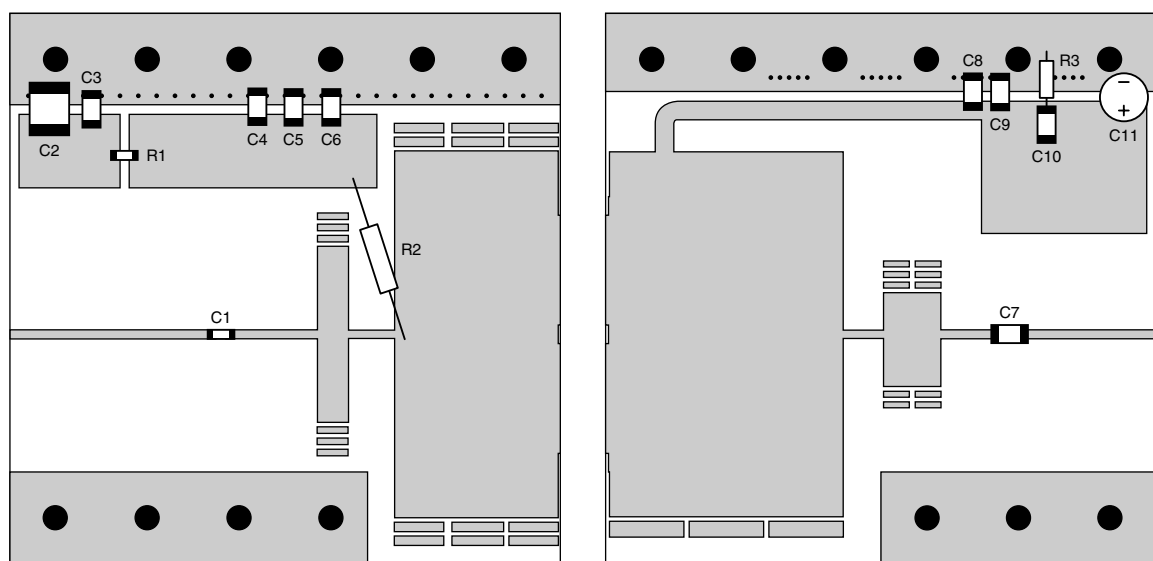


8. Test information

Table 9. List of components
For test circuit see Figure 12.

Component	Description	Value	Remarks
C1, C4, C7	multilayer ceramic chip capacitor	82 pF	[1]
C2	multilayer ceramic chip capacitor	22 µF; 35 V	
C3, C5, C8	multilayer ceramic chip capacitor	39 pF	[2]
C6, C9	multilayer ceramic chip capacitor	1 nF	[2]
C10	multilayer ceramic chip capacitor	20 nF	[3]
C11	electrolytic capacitor	47 µF; 63 V	
R1	SMD resistor	56 Ω	0603
R2	metal film resistor	51 Ω	
R3	resistor	11 Ω	

[1] American Technical Ceramics type 800B or capacitor of same quality.
[2] American Technical Ceramics type 100B or capacitor of same quality.
[3] American Technical Ceramics type 200B or capacitor of same quality.



001aal842

Printed-Circuit Board (PCB): Duroid 6006; $\epsilon_r = 6.15$ F/m; thickness = 0.64 mm; thickness copper plating = 35 μm .

See [Table 9](#) for a list of components.

Fig 12. Component layout for class-AB production test circuit

9. Package outline

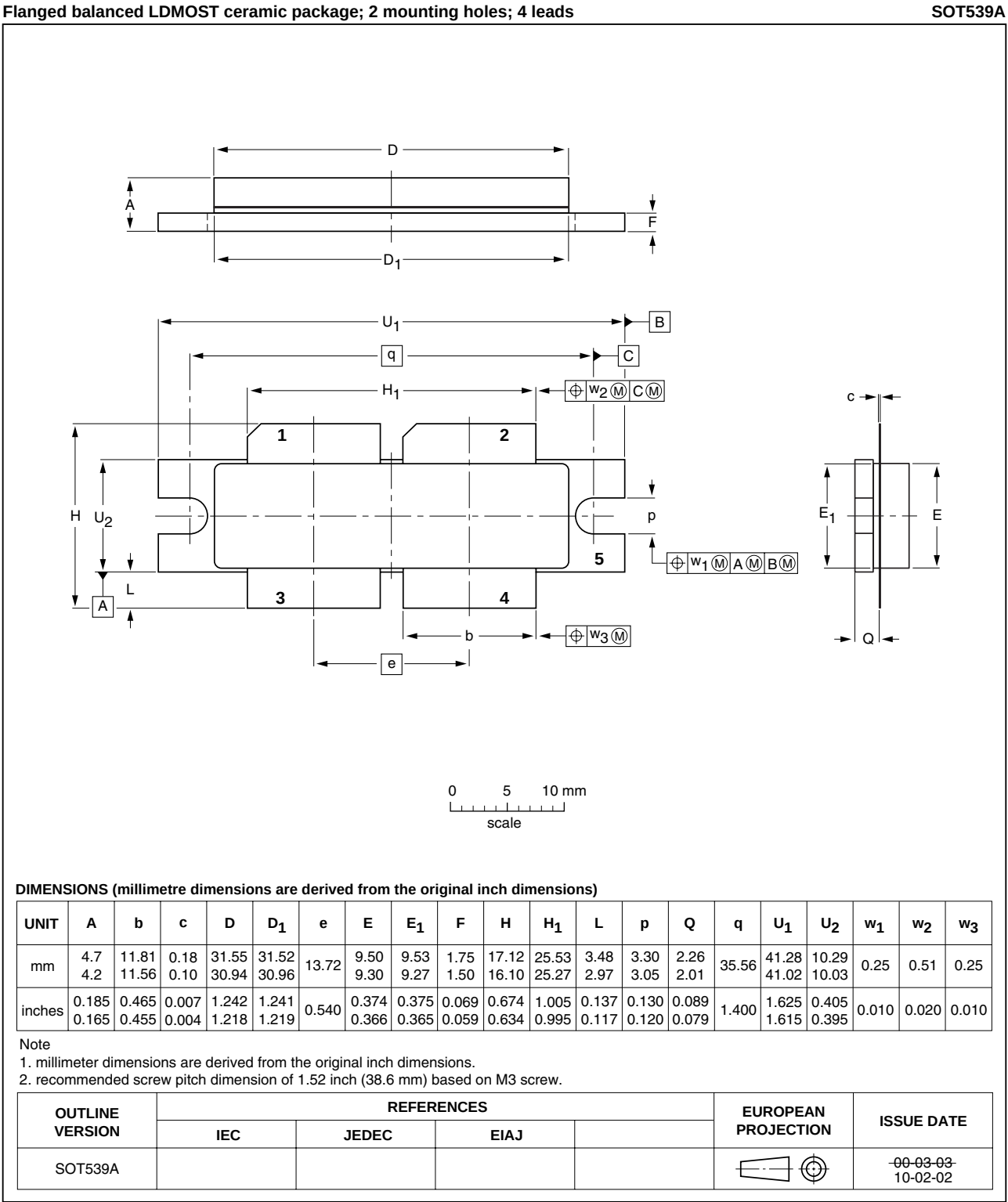


Fig 13. Package outline SOT539A

10. Abbreviations

Table 10. Abbreviations

Acronym	Description
IFF	Identification Friend or Foe
LDMOS	Laterally Diffused Metal-Oxide Semiconductor
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
SMD	Surface Mounted Device
TCAS	Traffic Collision Avoidance System
VSWR	Voltage Standing-Wave Ratio

11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BLA6H1011-600_1	20100422	Product data sheet	-	-

12. Legal information

12.1 Data sheet status

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

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