

# BLU6H0410L-600P; BLU6H0410LS-600P

Power LDMOS transistor

Rev. 2 — 12 July 2013

Product data sheet

## 1. Product profile

### 1.1 General description

A 600 W LDMOS RF power transistor for radar transmitter applications and industrial applications in the frequency range of 400 MHz to 900 MHz.

**Table 1. Application information**

Typical RF performance at  $V_{DS} = 50$  V; in a common source 860 MHz narrowband test circuit; unless otherwise specified.

Test signal	f (MHz)	$I_{DQ}$ (mA)	$P_{L(AV)}$ (W)	$P_{L(M)}$ (W)	$G_p$ (dB)	$\eta_D$ (%)	IMD3 (dBc)
pulsed, class-AB [1]	860	1.3	-	600	20	58	-

[1] Measured at  $\delta = 10$  %;  $t_p = 1$  ms.

### 1.2 Features and benefits

- Excellent ruggedness ( $VSWR \geq 40 : 1$  through all phases)
- Optimum thermal behavior and reliability,  $R_{th(j-c)} = 0.15$  K/W
- High power gain
- High efficiency
- Internal input matching for high gain and optimum broadband operation
- Excellent reliability
- Easy power control
- Compliant to Directive 2002/95/EC, regarding Restriction of Hazardous Substances (RoHS)

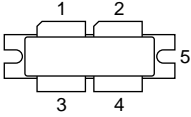
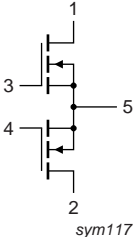
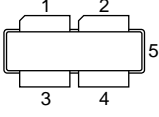
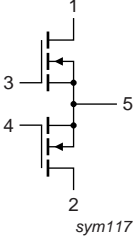
### 1.3 Applications

- Power amplifier for radar transmitter applications in the 400 MHz to 900 MHz frequency range



## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
<b>BLU6H0410L-600P (SOT539A)</b>			
1	drain1		 sym117
2	drain2		
3	gate1		
4	gate2		
5	source		
<b>BLU6H0410LS-600P (SOT539B)</b>			
1	drain1		 sym117
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
BLU6H0410L-600P	-	flanged balanced LDMOST ceramic package; 2 mounting holes; 4 leads	SOT539A
BLU6H0410LS-600P	-	earless flanged balanced LDMOST ceramic package; 4 leads	SOT539B

## 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		-	110	V
$V_{GS}$	gate-source voltage		-0.5	+11	V
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	200	°C

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	$T_j = 150\text{ °C}$	[1] 0.15	K/W
$Z_{th(j-c)}$	transient thermal impedance from junction to case	$T_j = 150\text{ °C}$		
		$t_p = 100\text{ }\mu\text{s}; \delta = 10\%$	0.020	K/W
		$t_p = 200\text{ }\mu\text{s}; \delta = 10\%$	0.023	K/W
		$t_p = 300\text{ }\mu\text{s}; \delta = 10\%$	0.025	K/W
		$t_p = 500\text{ }\mu\text{s}; \delta = 10\%$	0.028	K/W
		$t_p = 100\text{ }\mu\text{s}; \delta = 20\%$	0.035	K/W

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

## 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	$V_{GS} = 0\text{ V}; I_D = 2.4\text{ mA}$	[1] 110	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	$V_{DS} = 10\text{ V}; I_D = 240\text{ mA}$	[1] 1.4	1.9	2.4	V
$I_{DSS}$	drain leakage current	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}$	-	-	2.8	$\mu\text{A}$
$I_{DSX}$	drain cut-off current	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; V_{DS} = 10\text{ V}$	-	36	-	A
$I_{GSS}$	gate leakage current	$V_{GS} = 10\text{ V}; V_{DS} = 0\text{ V}$	-	-	280	nA
$R_{DS(on)}$	drain-source on-state resistance	$V_{GS} = V_{GS(th)} + 3.75\text{ V}; I_D = 8.5\text{ A}$	[1] -	143	-	$\text{m}\Omega$
$C_{iss}$	input capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$	[2] -	220	-	pF
$C_{oss}$	output capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$	-	74	-	pF
$C_{rss}$	reverse transfer capacitance	$V_{GS} = 0\text{ V}; V_{DS} = 50\text{ V}; f = 1\text{ MHz}$	-	1.2	-	pF

[1]  $I_D$  is the drain current.

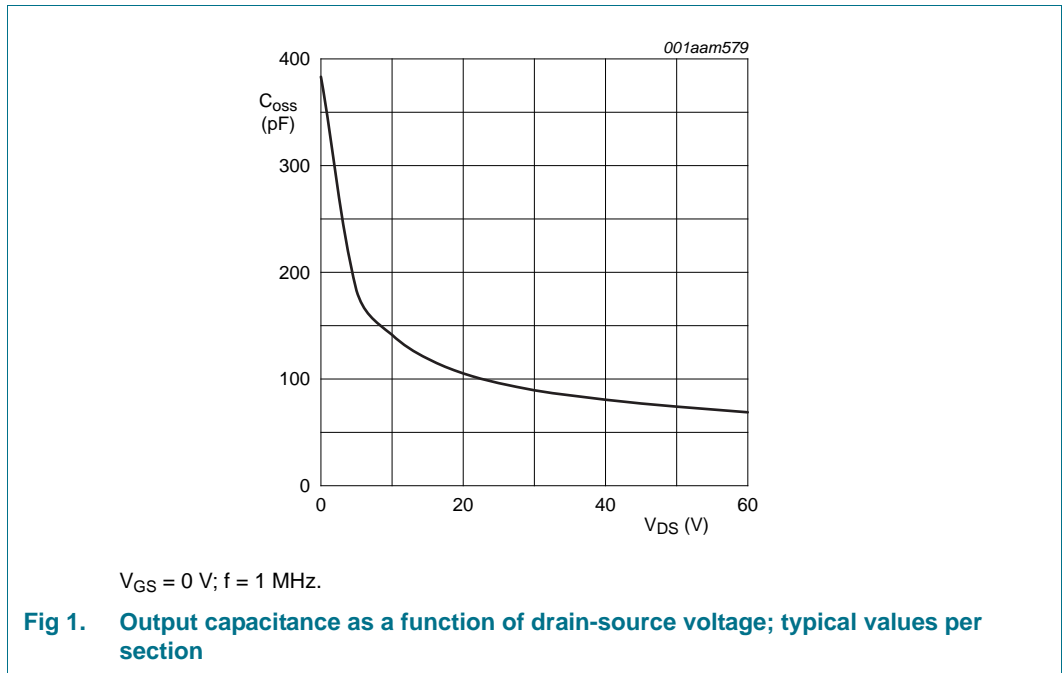
[2] Capacitance values without internal matching.

**Table 7. RF characteristics**

Test signal: 2-Tone;  $T_{case} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified; in a class-AB NXP production narrowband test circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DS}$	drain-source voltage		-	50	-	V
$I_{Dq}$	quiescent drain current		[1]	1.3	-	A
$P_{L(AV)}$	average output power	$f_1 = 860\text{ MHz};$ $f_2 = 860.1\text{ MHz}$	250	-	-	W
$G_p$	power gain	$f_1 = 860\text{ MHz};$ $f_2 = 860.1\text{ MHz}$	20	21	-	dB
$\eta_D$	drain efficiency	$f_1 = 860\text{ MHz};$ $f_2 = 860.1\text{ MHz}$	42	46	-	%
IMD3	third-order intermodulation distortion	$f_1 = 860\text{ MHz};$ $f_2 = 860.1\text{ MHz}$	-	-32	-28	dBc

[1]  $I_{Dq}$  for total device.



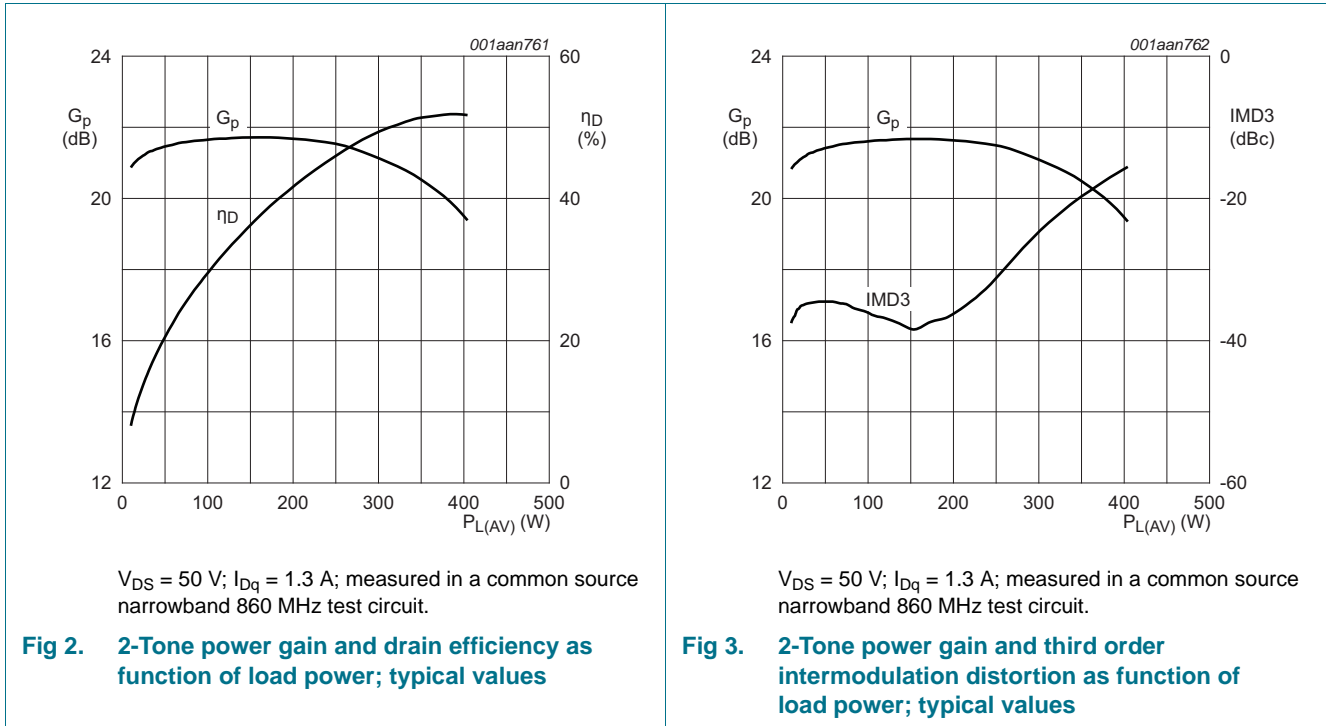
**6.1 Ruggedness in class-AB operation**

The BLU6H0410L-600P and BLU6H0410LS-600P are capable of withstanding a load mismatch corresponding to  $VSWR \geq 40 : 1$  through all phases under the following conditions:  $V_{DS} = 50\text{ V}; f = 860\text{ MHz}$  at rated power.

7. Application information

7.1 Narrowband RF figures

7.1.1 2-Tone



7.2 Impedance information

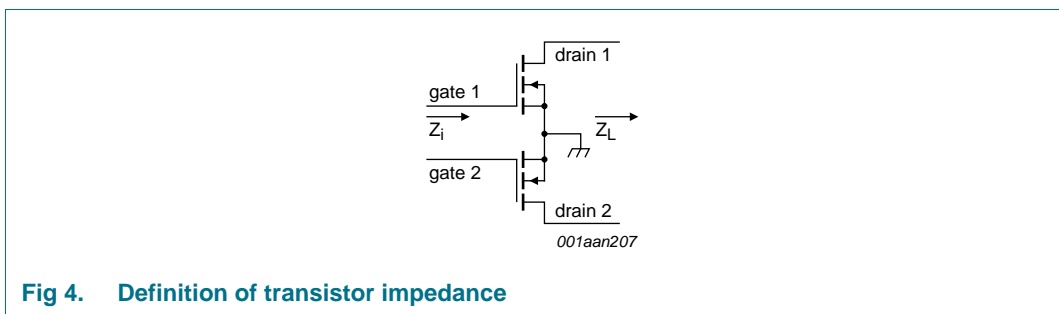


Table 8. Typical push-pull impedance

Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 50\text{ V}$  and  $P_{L(M)} = 600\text{ W}$ .

f MHz	$Z_i$ $\Omega$	$Z_L$ $\Omega$
300	$0.617 - j1.715$	$4.989 + j1.365$
325	$0.635 - j1.355$	$4.867 + j1.424$
350	$0.655 - j1.026$	$4.741 + j1.472$
375	$0.677 - j0.721$	$4.614 + j1.511$

**Table 8. Typical push-pull impedance ...continued**Simulated  $Z_i$  and  $Z_L$  device impedance; impedance info at  $V_{DS} = 50$  V and  $P_{L(M)} = 600$  W.

f MHz	$Z_i$ $\Omega$	$Z_L$ $\Omega$
400	0.702 - j0.435	4.486 + j1.540
425	0.731 - j0.164	4.357 + j1.559
450	0.762 + j0.096	4.228 + j1.570
475	0.798 + j0.347	4.100 + j1.573
500	0.839 + j0.592	4.974 + j1.567
525	0.884 + j0.833	3.850 + j1.554
550	0.936 + j1.072	3.728 + j1.534
575	0.995 + j1.310	3.608 + j1.508
600	1.063 + j1.549	3.492 + j1.475
625	1.141 + j1.791	3.378 + j1.437
650	1.230 + j2.037	3.268 + j1.394
675	1.334 + j2.289	3.161 + j1.347
700	1.456 + j2.548	3.057 + j1.295
725	1.599 + j2.814	2.957 + j1.239
750	1.768 + j3.090	2.860 + j1.180
775	1.971 + j3.376	2.676 + j1.118
800	2.214 + j3.671	2.677 + j1.053
825	2.510 + j3.975	2.591 + j0.985
850	2.873 + j4.282	2.508 + j0.915
875	3.320 + j4.584	2.428 + j0.843
900	3.875 + j4.865	2.351 + j0.770
925	4.562 + j5.095	2.277 + j0.695
950	5.409 + j5.223	2.206 + j0.618
975	6.426 + j5.166	2.138 + j0.540
1000	7.587 + j4.807	2.073 + j0.461

## 8. Test information

**Table 9. List of components**

For test circuit, see [Figure 5](#), [Figure 6](#) and [Figure 7](#).

Component	Description	Value	Remarks
B1, B2	semi rigid coax	25 $\Omega$ ; 49.5 mm	UT-090C-25 (EZ 90-25)
C1	multilayer ceramic chip capacitor	12 pF	[1]
C2, C3, C4, C5, C6	multilayer ceramic chip capacitor	8.2 pF	[1]
C7	multilayer ceramic chip capacitor	6.8 pF	[2]
C8	multilayer ceramic chip capacitor	2.7 pF	[2]
C9	multilayer ceramic chip capacitor	2.2 pF	[2]
C10, C13, C14	multilayer ceramic chip capacitor	100 pF	[3]
C11, C12	multilayer ceramic chip capacitor	10 pF	[2]
C15, C16	multilayer ceramic chip capacitor	4.7 $\mu$ F; 50 V	Kemet C1210X475K5RAC-TU or capacitor of same quality.
C17, C18, C23, C24	multilayer ceramic chip capacitor	100 pF	[2]
C19, C20	multilayer ceramic chip capacitor	10 $\mu$ F; 50 V	TDK C570X7R1H106KT000N or capacitor of same quality.
C21, C22	electrolytic capacitor	470 $\mu$ F; 63 V	
C30	multilayer ceramic chip capacitor	10 pF	[4]
C31	multilayer ceramic chip capacitor	9.1 pF	[4]
C32	multilayer ceramic chip capacitor	3.9 pF	[4]
C33, C34, C35	multilayer ceramic chip capacitor	100 pF	[4]
C36, C37	multilayer ceramic chip capacitor	4.7 $\mu$ F; 50 V	TDK C4532X7R1E475MT020U or capacitor of same quality.
L1	microstrip	-	[5] (W $\times$ L) 15 mm $\times$ 13 mm
L2	microstrip	-	[5] (W $\times$ L) 5 mm $\times$ 26 mm
L3, L32	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 49.5 mm
L4	microstrip	-	[5] (W $\times$ L) 1.7 mm $\times$ 3.5 mm
L5	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 9.5 mm
L30	microstrip	-	[5] (W $\times$ L) 5 mm $\times$ 13 mm
L31	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 11 mm
L33	microstrip	-	[5] (W $\times$ L) 2 mm $\times$ 3 mm
R1, R2	wire resistor	10 $\Omega$	
R3, R4	SMD resistor	5.6 $\Omega$	0805
R5, R6	wire resistor	100 $\Omega$	
R7, R8	potentiometer	10 k $\Omega$	

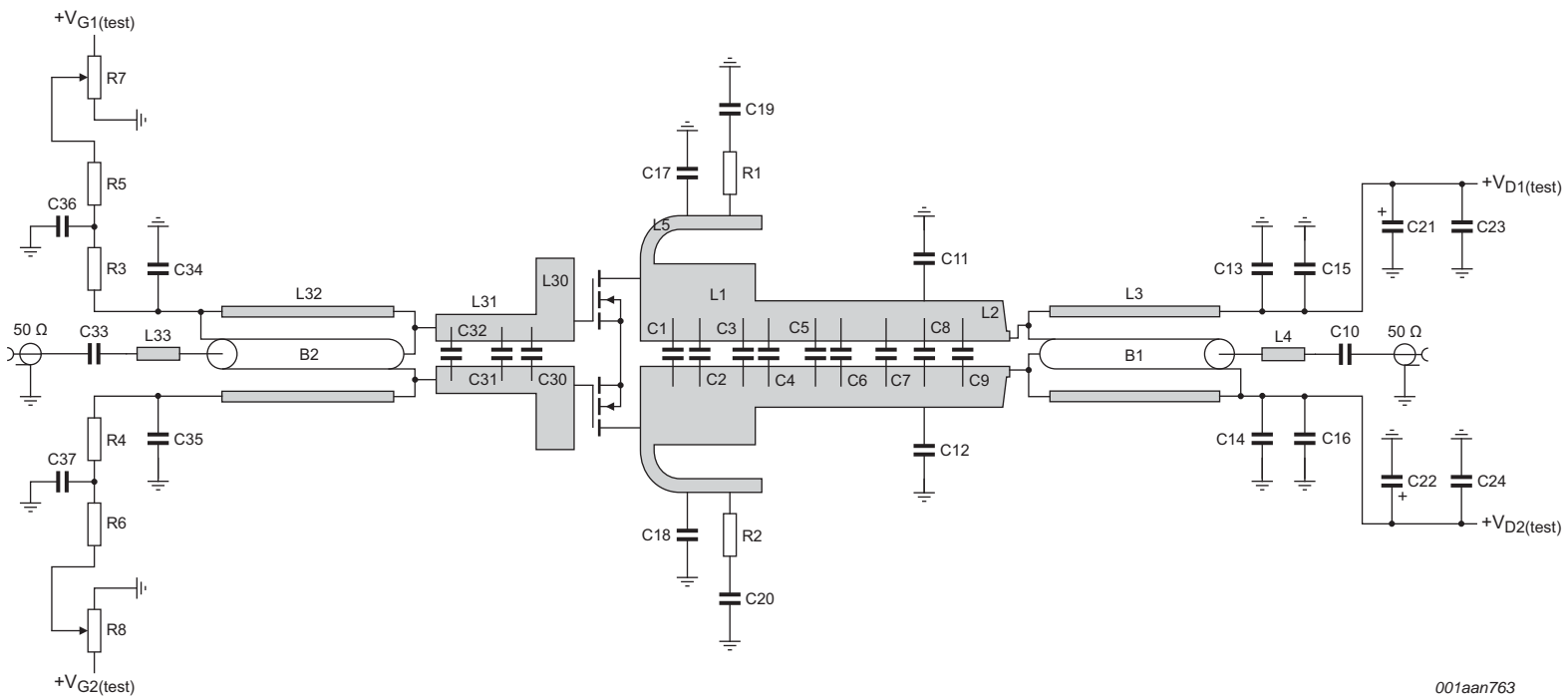
[1] American technical ceramics type 800R or capacitor of same quality.

[2] American technical ceramics type 800B or capacitor of same quality.

[3] American technical ceramics type 180R or capacitor of same quality.

[4] American technical ceramics type 100A or capacitor of same quality.

[5] Printed-Circuit Board (PCB): Taconic RF35;  $\epsilon_r = 3.5$  F/m; height = 0.762 mm; Cu (top/bottom metallization); thickness copper plating = 35  $\mu$ m.

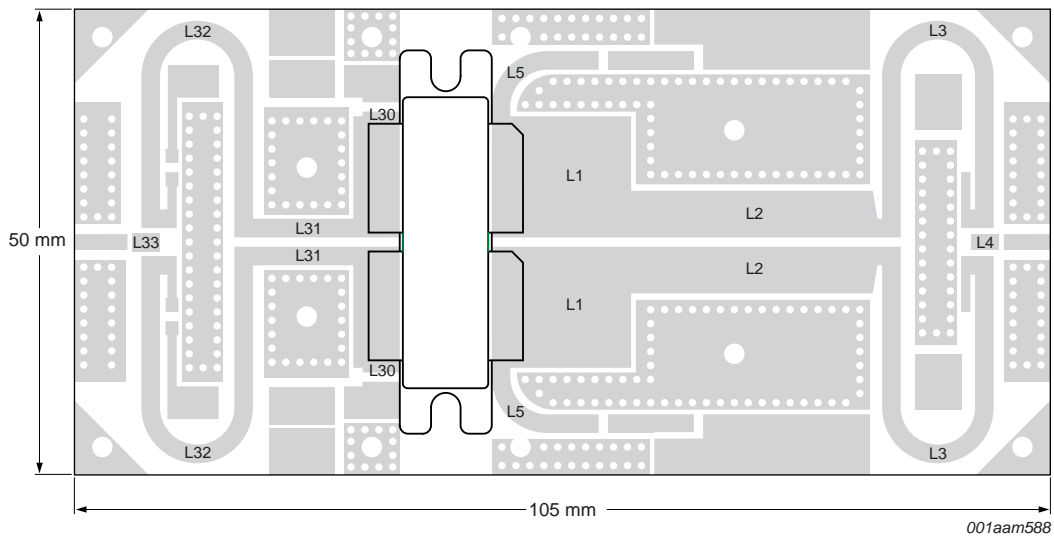


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See [Table 9](#) for a list of components.

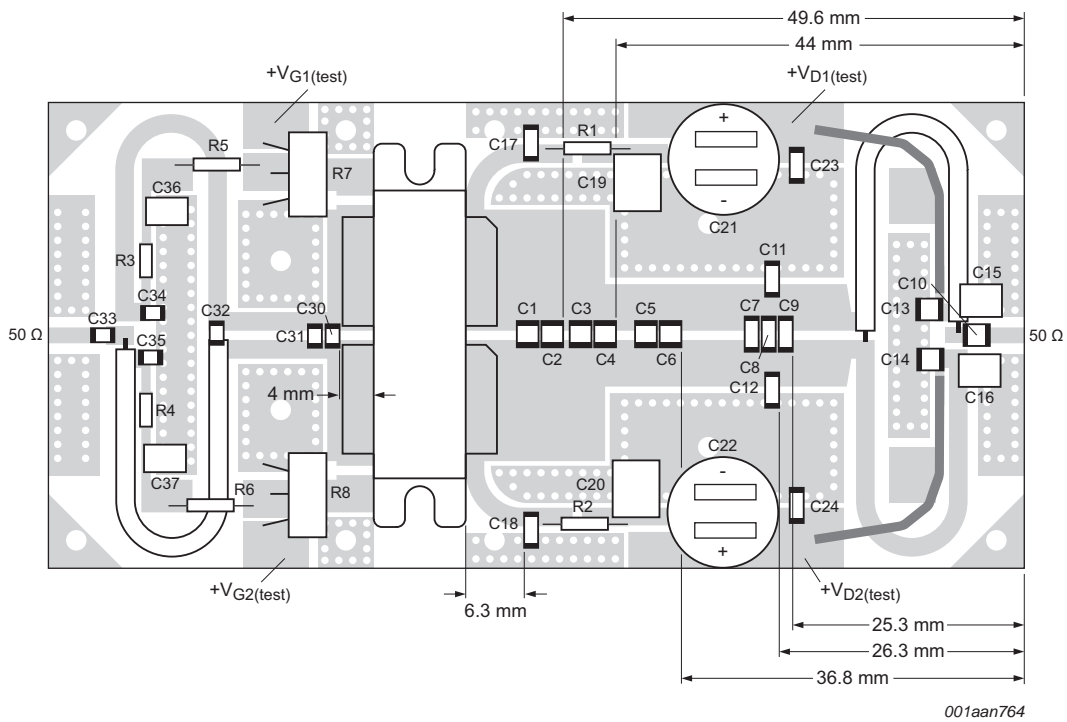
**Fig 5. Class-AB common source broadband amplifier;  $V_{D1(test)}$ ,  $V_{D2(test)}$ ,  $V_{G1(test)}$  and  $V_{G2(test)}$  are drain and gate test voltages**





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

**Fig 6. Printed-Circuit Board (PCB) for class-AB common source amplifier**



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

**Fig 7. Component layout for class-AB common source amplifier**

9. Package outline

Flanged balanced ceramic package; 2 mounting holes; 4 leads

SOT539A

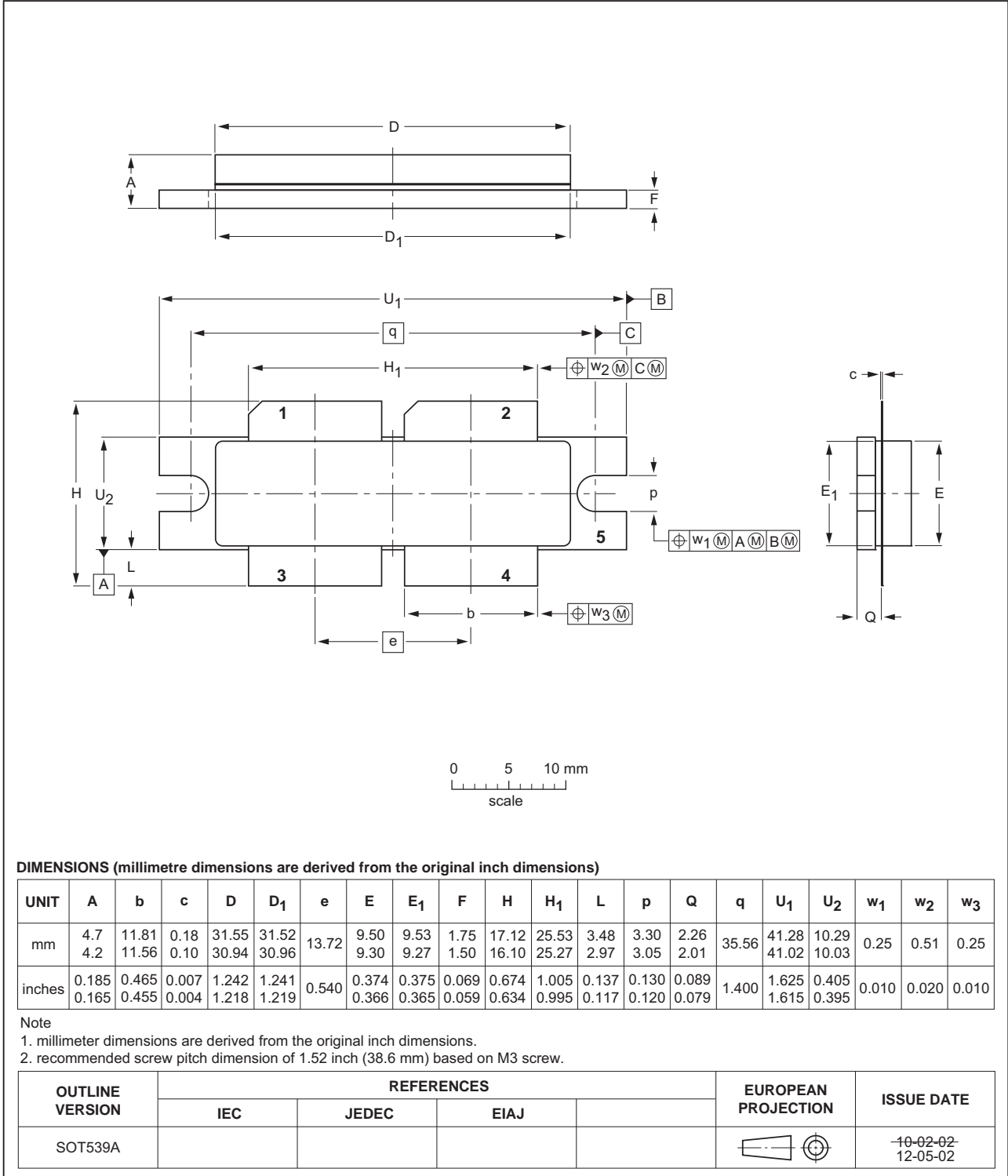


Fig 8. Package outline SOT539A

Earless flanged balanced ceramic package; 4 leads

SOT539B

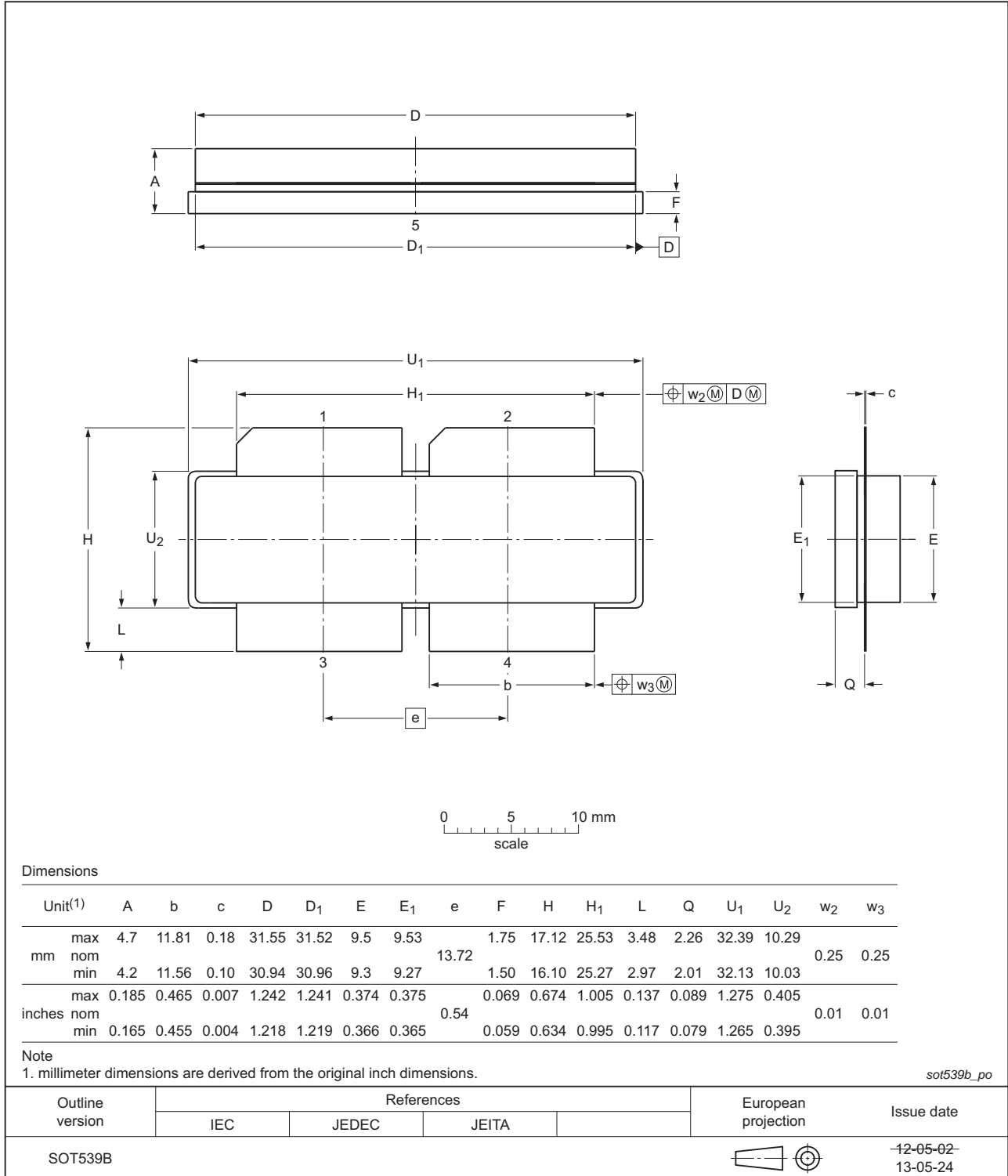


Fig 9. Package outline SOT539B

## 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
LDMOST	Laterally Diffused Metal-Oxide Semiconductor Transistor
RF	Radio Frequency
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
BLU6H0410L-600P_6H0410LS-600P v.2	20130712	Product data sheet	-	BLU6H0410L-600P_6H0410LS-600P v.1
Modifications:		<ul style="list-style-type: none"> <li>The package outline <a href="#">Figure 9</a> is updated.</li> </ul>		
BLU6H0410L-600P_6H0410LS-600P v.1	20120426	Product data sheet	-	-

## 13. Legal information

### 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.
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