

# DATA SHEET

## **BLV859**

**UHF linear push-pull power  
transistor**

Product specification  
Supersedes data of 1995 Oct 04

1996 Jul 26

# UHF linear push-pull power transistor

**BLV859**

## FEATURES

- Double internal input and output matching for an optimum wideband capability and high gain
- Polysilicon emitter ballasting resistors for an optimum temperature profile
- Gold metallization ensures excellent reliability.

## APPLICATION

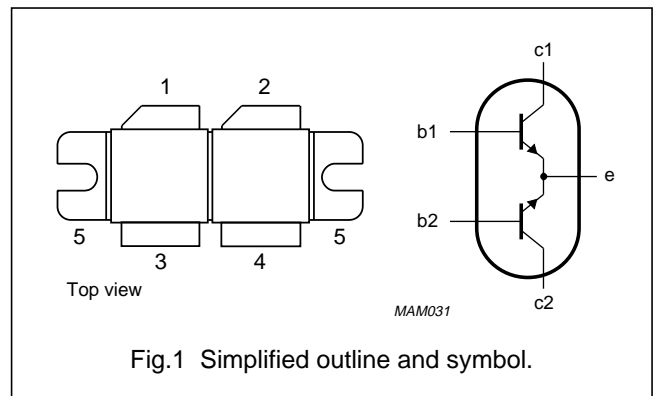
- Common emitter class-A operation in linear transposers/transmitters (television) in the 470 to 860 MHz frequency band.

## DESCRIPTION

NPN silicon planar transistor with two sections in push-pull configuration. The device is encapsulated in a SOT262B 4-lead rectangular flange package, with two ceramic caps. It delivers a  $P_{o\ sync} = 20\text{ W}$  in class-A operation at 860 MHz and a supply voltage of 25 V.

## PINNING SOT262B

PIN	SYMBOL	DESCRIPTION
1	c1	collector 1
2	c2	collector 2
3	b1	base 1
4	b2	base 2
5	e	emitter



## QUICK REFERENCE DATA

RF performance at  $T_h = 25\text{ °C}$  in a common emitter push-pull test circuit.

MODE OF OPERATION	f (MHz)	$V_{CE}$ (V)	$I_{CQ}$ (A)	$P_{o\ sync}$ (W)	$G_p$ (dB)
CW class-A	860	25	$2 \times 2.25$	$\geq 20^{(1)}$	$\geq 10^{(1)}$

## Note

1. Three-tone test signal (-8, -16 and -10 dB);  $d_{im} = -54\text{ dB}$ .

## WARNING

### Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO discs are not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste.

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## LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

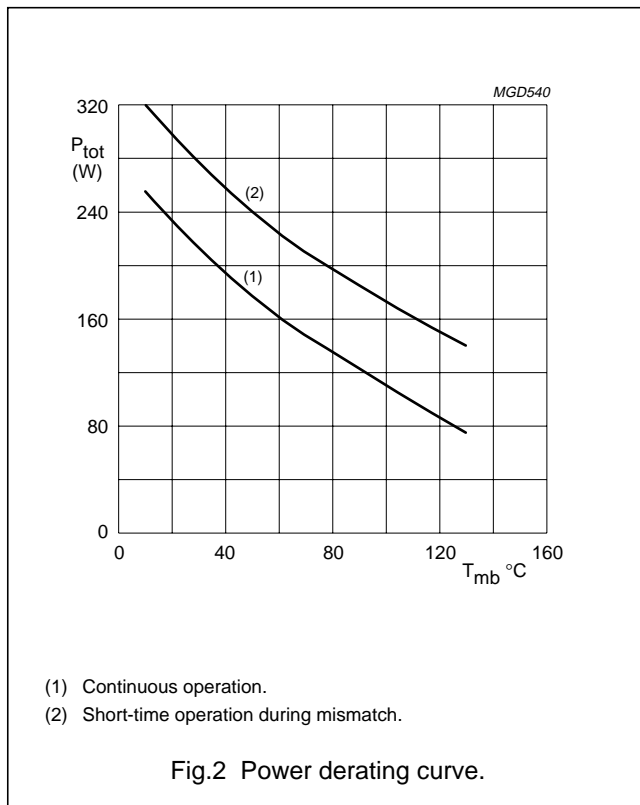
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	60	V
$V_{CEO}$	collector-emitter voltage	open base	–	28	V
$V_{EBO}$	emitter-base voltage	open collector	–	2.5	V
$I_C$	collector current (DC)		–	15	A
$I_{C(AV)}$	average collector current		–	15	A
$P_{tot}$	total power dissipation	$T_{mb} = 70\text{ °C}$ ; note 1	–	145	W
$T_{stg}$	storage temperature		–65	+150	°C
$T_j$	operating junction temperature		–	200	°C

## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-mb}$	thermal resistance from junction to mounting-base	$P_{tot} = 145\text{ W}$ ; $T_{mb} = 70\text{ °C}$ note 1	0.9	K/W
$R_{th\ mb-h}$	thermal resistance from mounting-base to heatsink	note 1	0.15	K/W

### Note to Limiting values and Thermal characteristics

1. Total device; both sections equally loaded.



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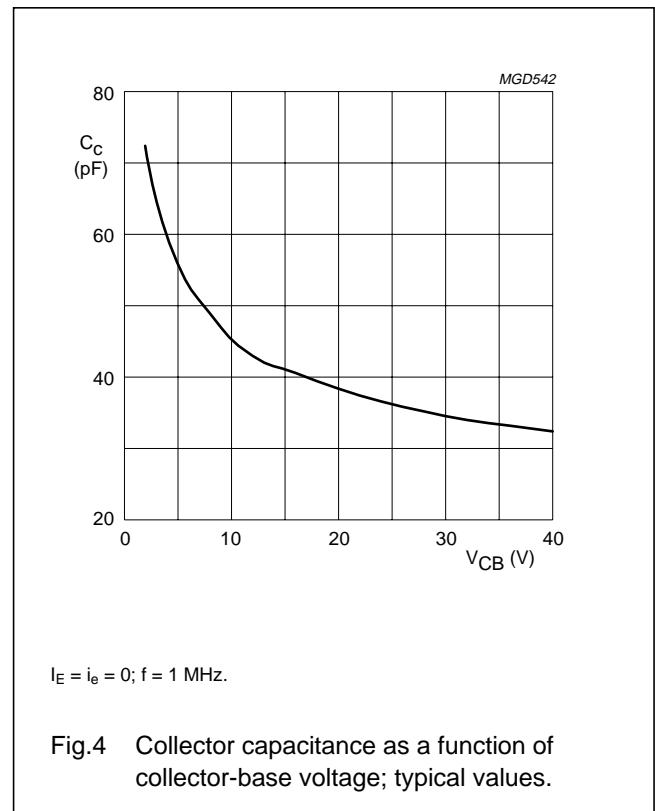
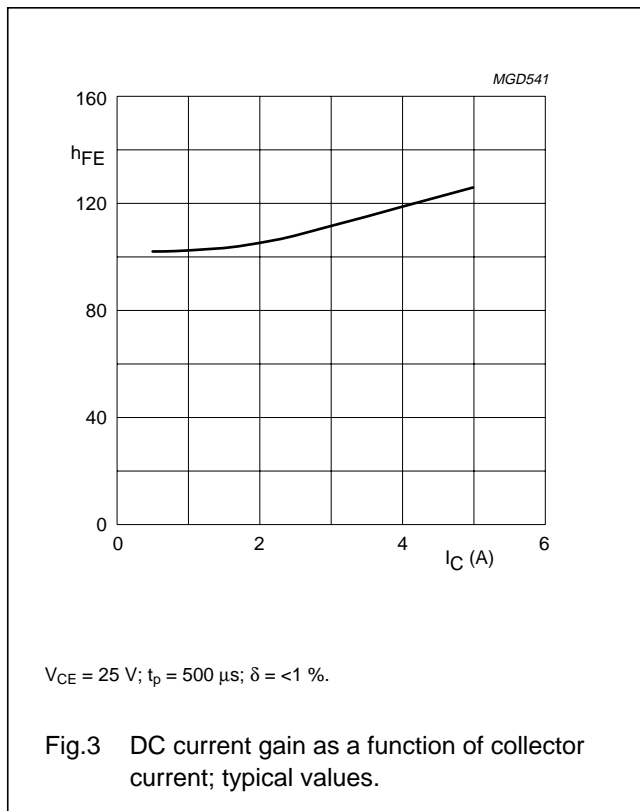
## CHARACTERISTICS

Values apply to either transistor section;  $T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 30\text{ mA}; I_E = 0$	60	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 60\text{ mA}; I_B = 0$	28	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 1.2\text{ mA}; I_C = 0$	2.5	–	–	V
$I_{CBO}$	collector-base leakage current	$V_{CB} = 27\text{ V}; V_{BE} = 0$	–	–	3	mA
$I_{CEO}$	collector-emitter leakage current	$V_{CE} = 20\text{ V}$	–	–	6	mA
$h_{FE}$	DC current gain	$V_{CE} = 25\text{ V}; I_C = 2.25\text{ A}$	30	–	140	
$C_c$	collector capacitance	$V_{CB} = 25\text{ V}; I_E = i_e = 0;$ $f = 1\text{ MHz}$	–	36 <sup>(1)</sup>	–	pF
$C_{re}$	feedback capacitance	$V_{CE} = 25\text{ V}; I_B = 0; f = 1\text{ MHz}$	–	22	–	pF

### Note

1. The value of  $C_c$  is that of the die only; it is not measurable, because of the internal matching network.



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## APPLICATION INFORMATION

RF performance at  $T_h = 25\text{ }^\circ\text{C}$  in a common emitter push-pull class-A test circuit.

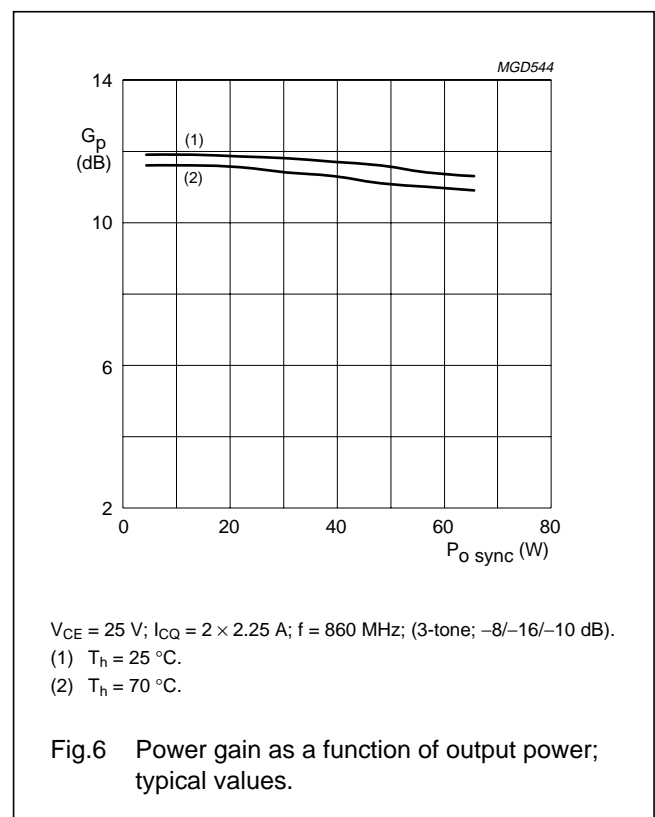
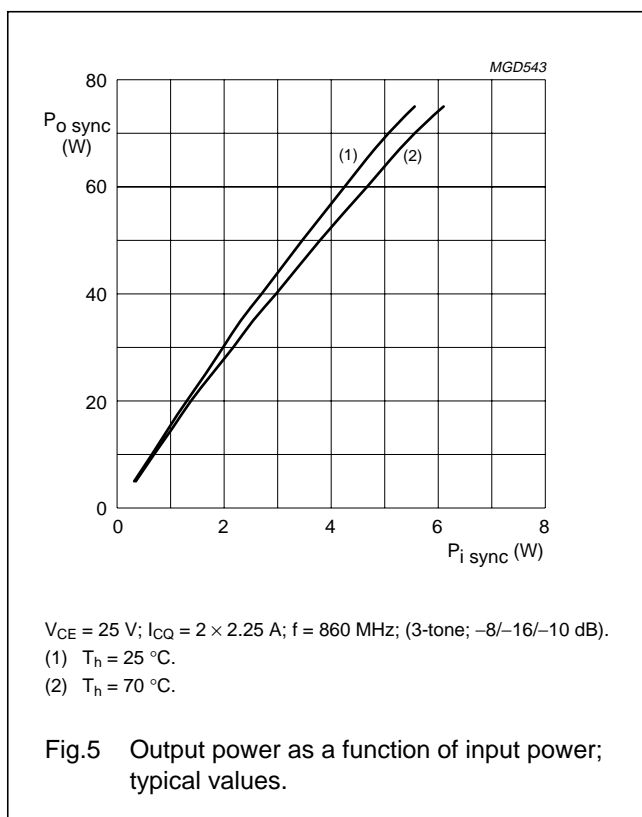
MODE OF OPERATION	f (MHz)	V <sub>CE</sub> (V)	I <sub>CQ</sub> (A)	P <sub>o sync</sub> (W)	G <sub>p</sub> (dB)	d <sub>im</sub> (dB)
CW class-A	860	25	2 × 2.25	≥20 <sup>(1)</sup>	≥10 <sup>(1)</sup>	≤-54 <sup>(1)</sup>
CW class-A	860	25	2 × 2.25	≥20 <sup>(2)</sup>	≥10 <sup>(2)</sup>	≤-51 <sup>(2)</sup>

### Notes

- Three-tone test method (vision carrier -8 dB, sound carrier -10 dB, sideband signal -16 dB), 0 dB corresponds to peak sync level.
- Three-tone test method (vision carrier -8 dB, sound carrier -7 dB, sideband signal -16 dB), 0 dB corresponds to peak sync level.

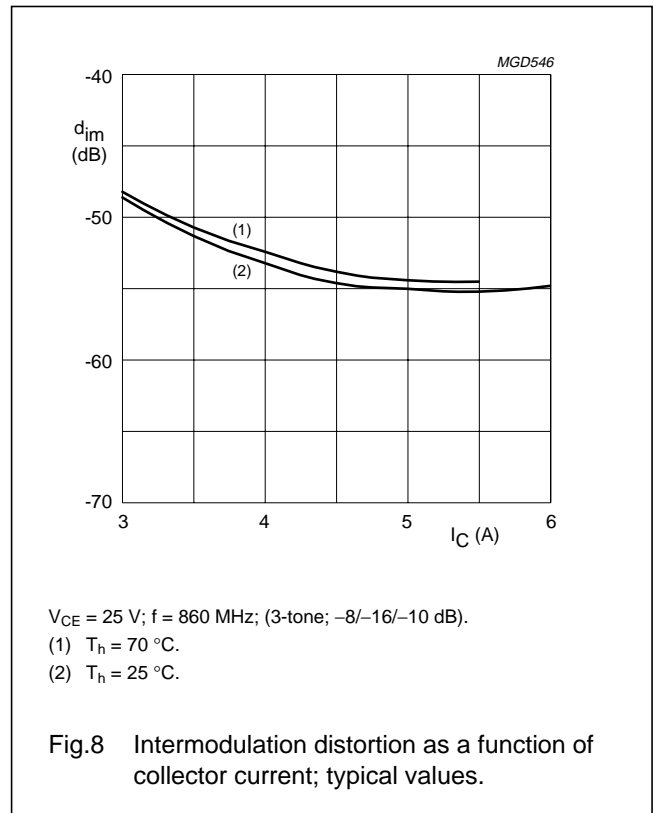
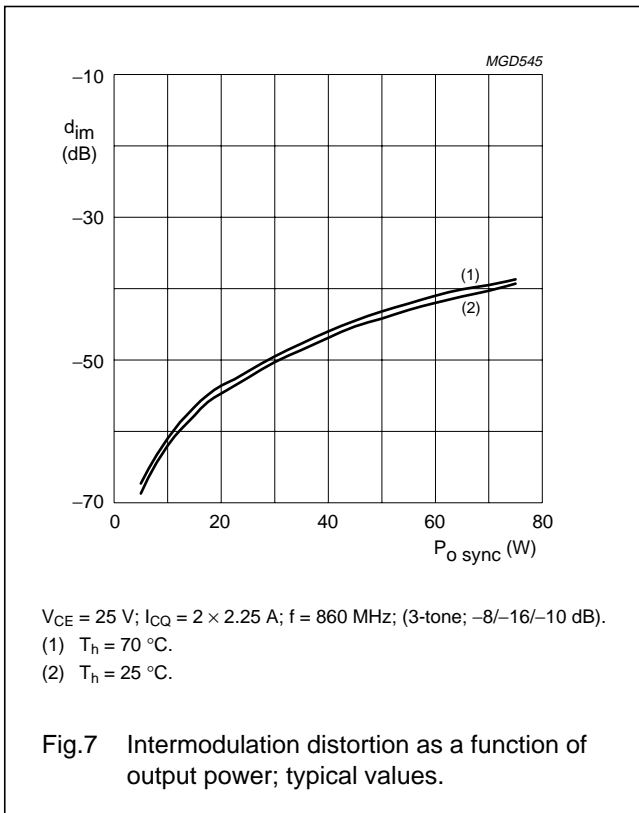
### Ruggedness in class-A operation

The BLV859 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases under the conditions: V<sub>CE</sub> = 25 V; I<sub>CQ</sub> = 2 × 2.25 A; f = 860 MHz; T<sub>h</sub> = 25 °C; P<sub>o sync</sub> = 20 W.



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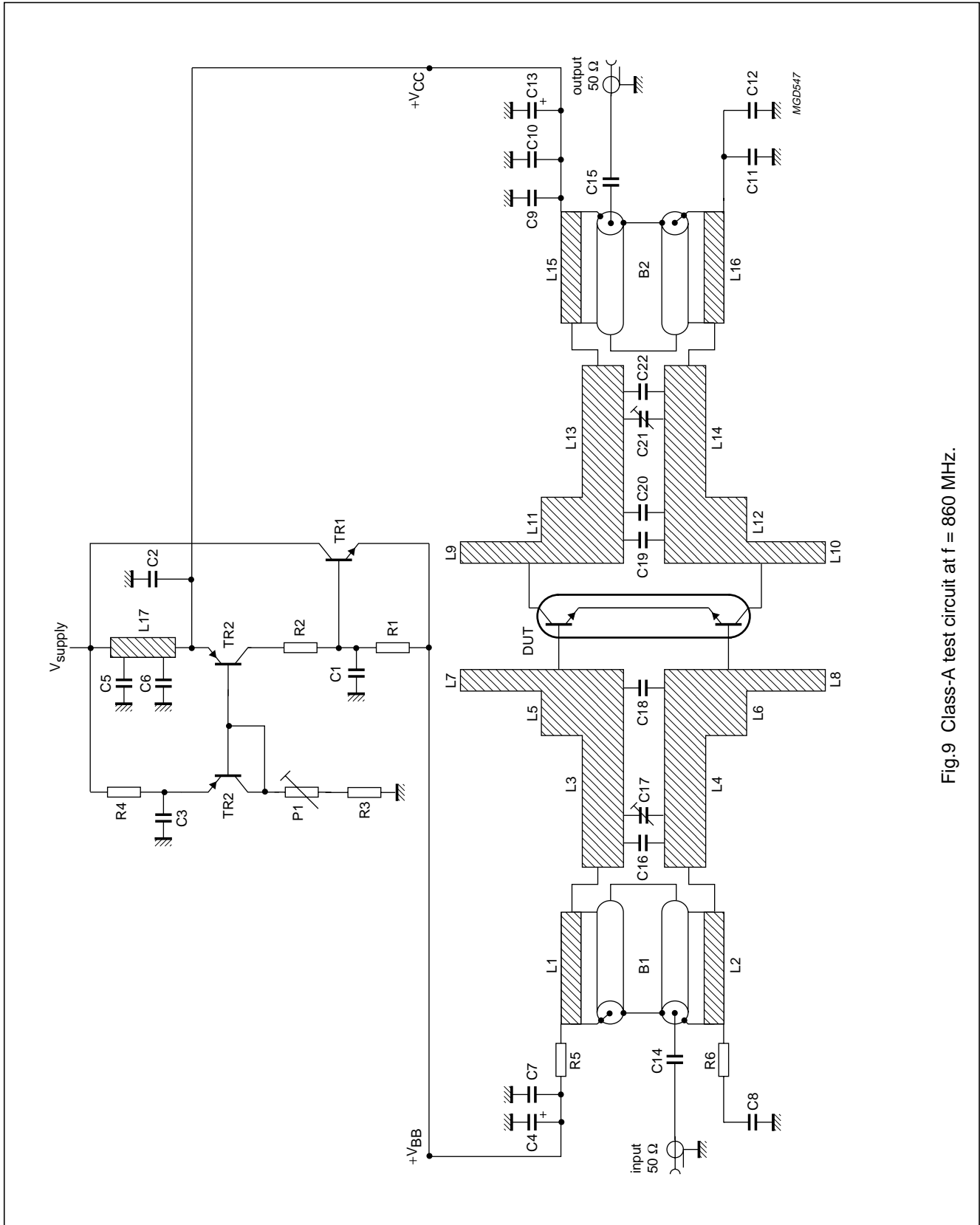
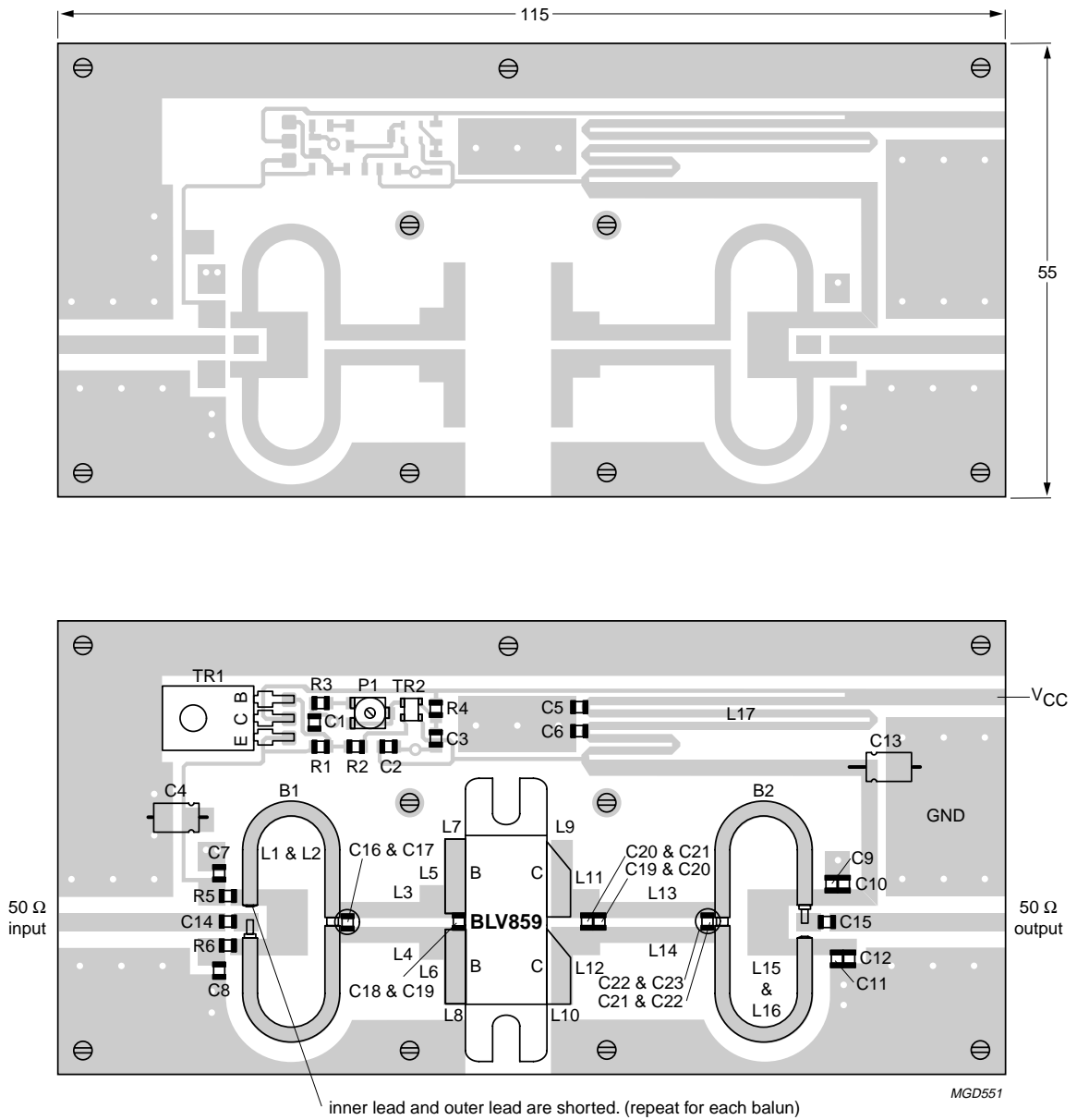


Fig.9 Class-A test circuit at f = 860 MHz.

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Dimensions in mm.

Fig.10 Printed-circuit board and component lay-out for 860 MHz class-A test circuit.

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## List of components

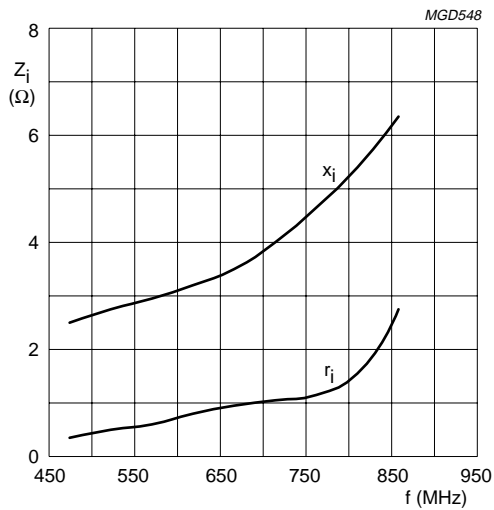
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C2, C3, C5, C6	multilayer ceramic chip capacitor;	15 nF	805	2222 590 16629
C4	solid aluminium capacitor	47 $\mu$ F; 25 V		2222 030 36479
C7, C8	multilayer ceramic chip capacitor	10 nF	805	2222 590 16627
C9, C10, C11, C12	multilayer ceramic chip capacitor	100 nF	1206	2222 591 16641
C13	solid aluminium capacitor	10 $\mu$ F; 63 V		2222 030 381109
C14, C15	multilayer ceramic chip capacitor; note 1	47 pF		
C16	multilayer ceramic chip capacitor; note 1	8.2 pF		
C17, C21	Tekelec Giga trim 37271	0.6 to 4.5 pF		
C18	multilayer ceramic chip capacitor; note 1	13 pF		
C19	multilayer ceramic chip capacitor; note 1	3.9 pF		
C20	multilayer ceramic chip capacitor; note 1	12 pF		
C22	multilayer ceramic chip capacitor; note 1	9.1 pF		
L1, L2, L15, L16	stripline; note 2	50 $\Omega$	2 $\times$ 30.6 mm	
L3, L4	stripline; note 2	50 $\Omega$	2 $\times$ 9.5 mm	
L5, L6	stripline; note 2	32.4 $\Omega$	4 $\times$ 3 mm	
L7, L8, L9, L10	stripline; note 2	16.2 $\Omega$	9.5 $\times$ 2.6 mm	
L11, L12	stripline; note 2	37.5 $\Omega$	3.5 $\times$ 3.4 mm	
L13, L14	stripline; note 2	50 $\Omega$	2 $\times$ 13.9 mm	
L17	stripline; note 2	77.7 $\Omega$	1 $\times$ 120 mm	
B1, B2	Semi rigid coax balun UT70-25	Z = 25 $\Omega$ , $\pm$ 1.5 $\Omega$	70 mm	
R1	SMD resistor	220 $\Omega$	805	2322 734 22201
R2	SMD resistor	1.8 $\Omega$	805	2322 734 21808
R3	SMD resistor	2.7 k $\Omega$	805	2322 734 22702
R4	SMD resistor	33 $\Omega$	805	2322 734 23309
R7, R8	SMD resistor	3.3 $\Omega$	805	2322 734 23308
P1	Murata potentiometer RG4M08-102VM-TG	1 k $\Omega$		
TR1	NPN transistor	BD139		9330 912 20112
TR2	double PNP transistor	BVC62		5332 130 60505

## Notes

1. American Technical Ceramics type 100A or capacitor of same quality.
2. The striplines are on a double copper-clad PCB: Rogers ULTRALAM 200 (B0300M1046QB) ( $\epsilon_r = 2.55$ ); thickness 0.76 mm.

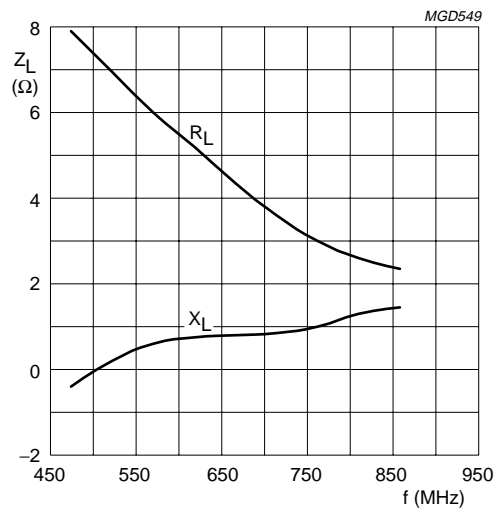
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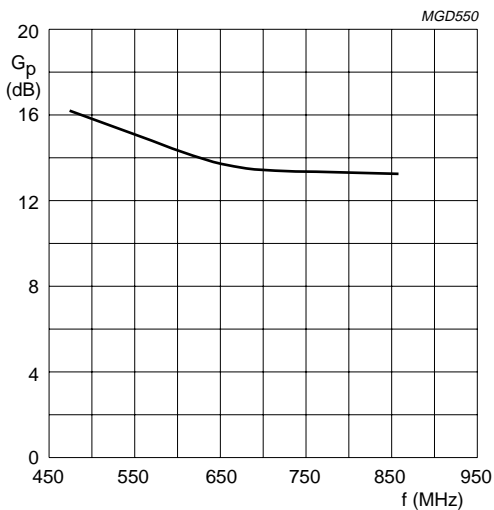
$V_{CE} = 25\text{ V}$ ;  $I_{CQ} = 2 \times 2.25\text{ A}$ ;  $P_{o\text{ sync}} = 20\text{ W}$  (total device);  $T_h = 25\text{ }^\circ\text{C}$ .

Fig. 11 Input impedance (per section) as a function of frequency (series components); typical values.



$V_{CE} = 25\text{ V}$ ;  $I_{CQ} = 2 \times 2.25\text{ A}$ ;  $P_{o\text{ sync}} = 20\text{ W}$  (total device);  $T_h = 25\text{ }^\circ\text{C}$ .

Fig. 12 Load impedance (per section) as a function of frequency (series components); typical values.



$V_{CE} = 25\text{ V}$ ;  $I_{CQ} = 2 \times 2.25\text{ A}$ ;  $P_{o\text{ sync}} = 20\text{ W}$  (total device);  $T_h = 25\text{ }^\circ\text{C}$ .

Fig. 13 Gain as a function of frequency; typical values.

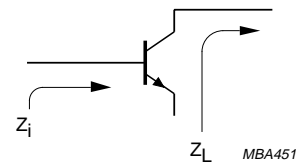
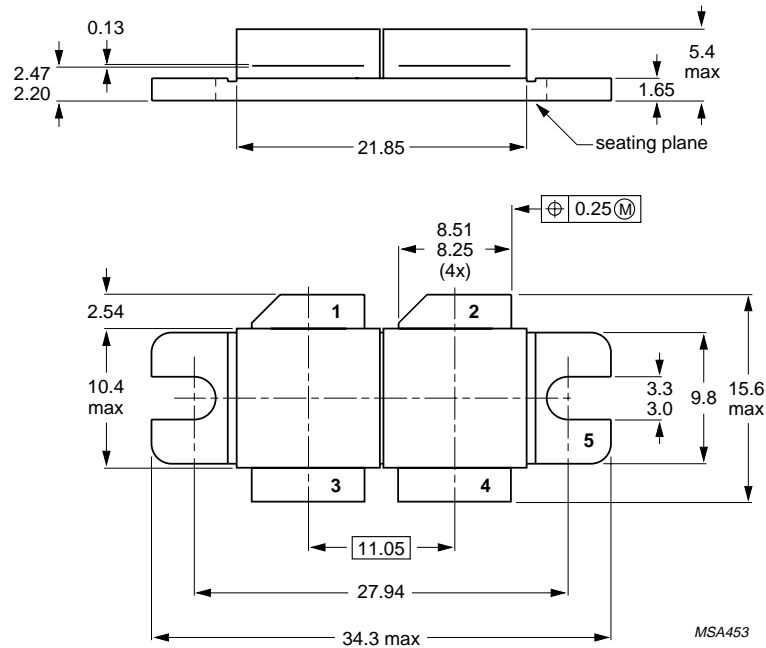


Fig. 14 Definition of transistor impedance.

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PACKAGE OUTLINE



Dimensions in mm.  
 Torque on screw: min. 0.6 Nm; max. 0.75 Nm.  
 Recommended screw: cheese-head 4-40 UNC/2A.  
 Heatsink compound must be applied sparingly and evenly distributed.

Fig.15 SOT262B.

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**DEFINITIONS**

<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

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**NOTES**

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