DATA SHEET

BLV859
UHF linear push-pull power transistor

Product specification
Supersedes data of 1995 Oct 04

1996 Jul 26

Philips
Semiconductors

PHILIPS

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 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

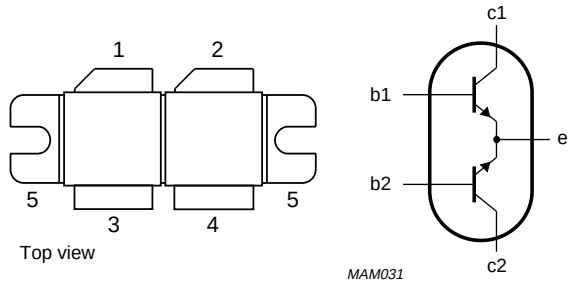


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_h = 25 °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 × 2.25	≥20[1]	≥10[1]

Note

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

LIMITING VALUES

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

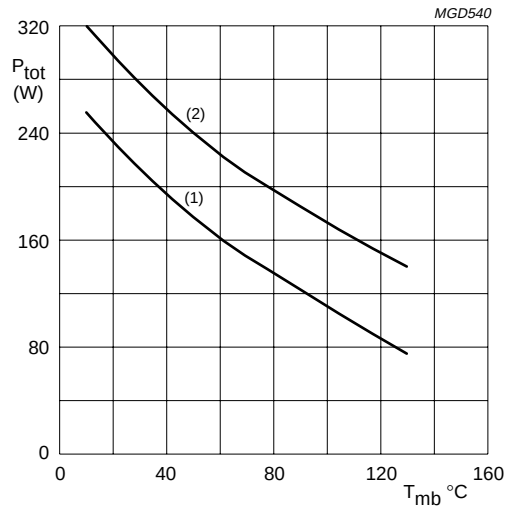
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	28	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	15	A
$I_{C(AV)}$	average collector current		–	15	A
P_{tot}	total power dissipation	T_{mb} = 70 °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
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	P_{tot} = 145 W; T_{mb} = 70 °C note 1	0.9	K/W
$R_{th\ mb\text{-}h}$	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.



(1) Continuous operation.
(2) Short-time operation during mismatch.

Fig.2 Power derating curve.

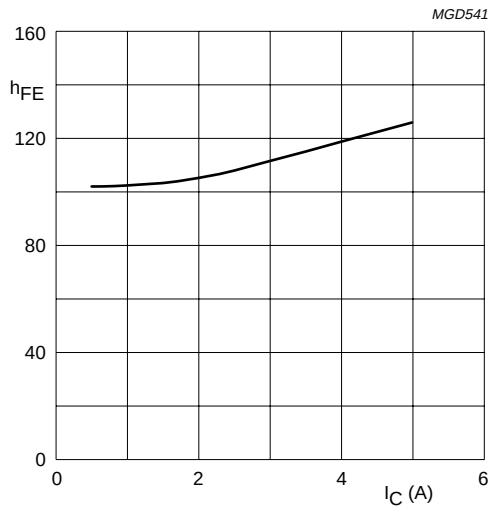
CHARACTERISTICS

Values apply to either transistor section; T_j = 25 °C unless otherwise specified.

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

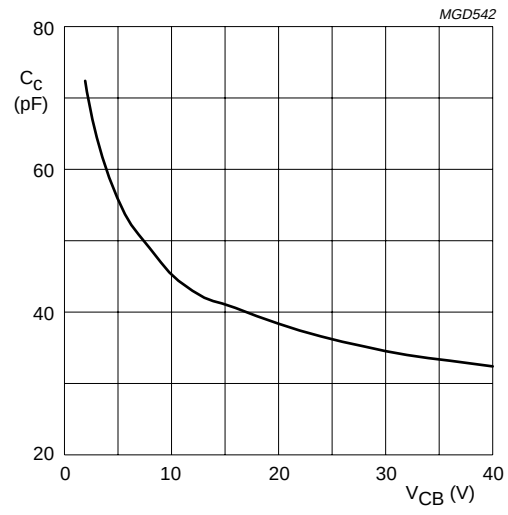
Note

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



V_{CE} = 25 V; t_p = 500 µs; δ = <1 %.

Fig.3 DC current gain as a function of collector current; typical values.



$I_E = i_e$ = 0; f = 1 MHz.

Fig.4 Collector capacitance as a function of collector-base voltage; typical values.

APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter push-pull class-A test circuit.

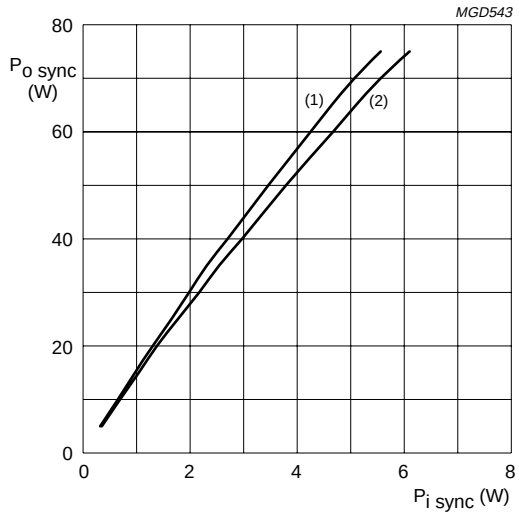
MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (A)	$P_{o\ sync}$ (W)	G_p (dB)	d_{im} (dB)
CW class-A	860	25	2 × 2.25	≥20(1)	≥10(1)	≤–54(1)
CW class-A	860	25	2 × 2.25	≥20(2)	≥10(2)	≤–51(2)

Notes

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

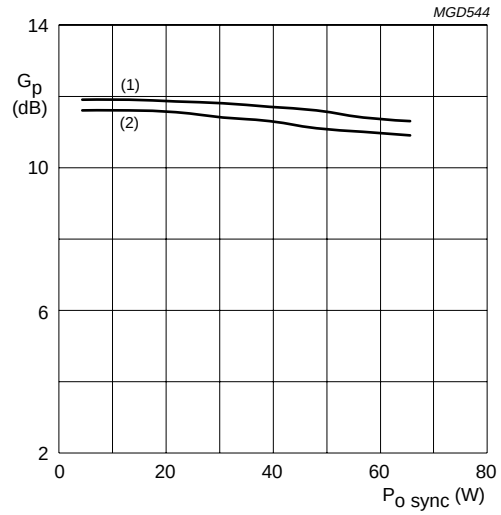
Ruggedness in class-A operation

The BLV859 is capable of withstanding a load mismatch corresponding to VSWR = 50 : 1 through all phases under the conditions: V_{CE} = 25 V; I_{CQ} = 2 × 2.25 A; f = 860 MHz; T_h = 25 °C; $P_{o\ sync}$ = 20 W.



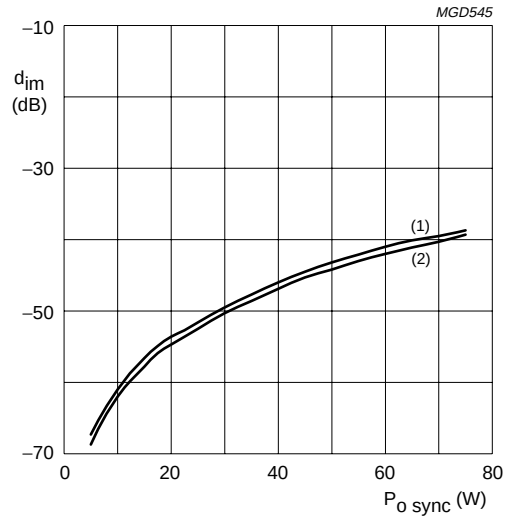
V_{CE} = 25 V; I_{CQ} = 2 × 2.25 A; f = 860 MHz; (3-tone; –8/–16/–10 dB).
(1) T_h = 25 °C.
(2) T_h = 70 °C.

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



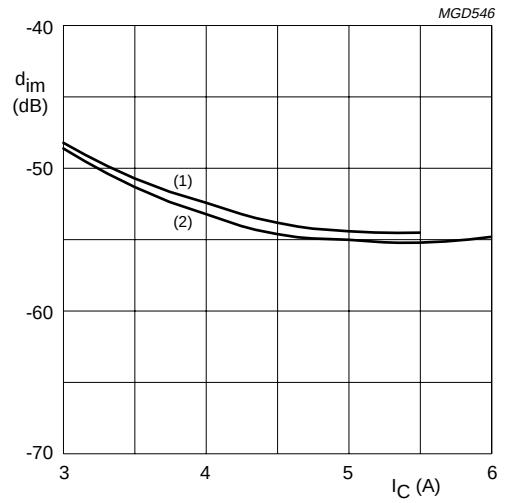
V_{CE} = 25 V; I_{CQ} = 2 × 2.25 A; f = 860 MHz; (3-tone; –8/–16/–10 dB).
(1) T_h = 25 °C.
(2) T_h = 70 °C.

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



V_{CE} = 25 V; I_{CQ} = 2 × 2.25 A; f = 860 MHz; (3-tone; –8/–16/–10 dB).
(1) T_h = 70 °C.
(2) T_h = 25 °C.

Fig.7 Intermodulation distortion as a function of output power; typical values.



V_{CE} = 25 V; f = 860 MHz; (3-tone; –8/–16/–10 dB).
(1) T_h = 70 °C.
(2) T_h = 25 °C.

Fig.8 Intermodulation distortion as a function of collector current; typical values.

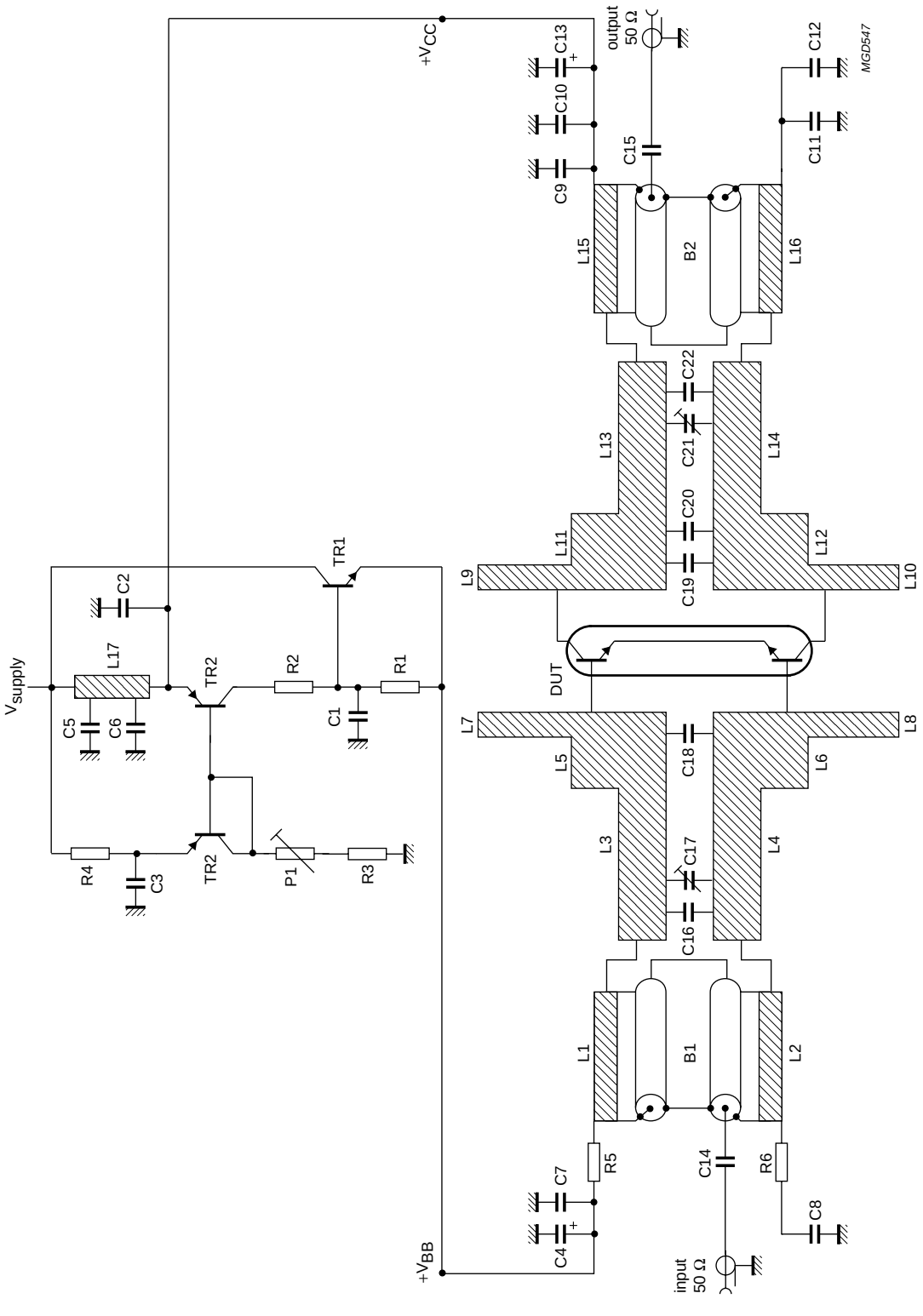
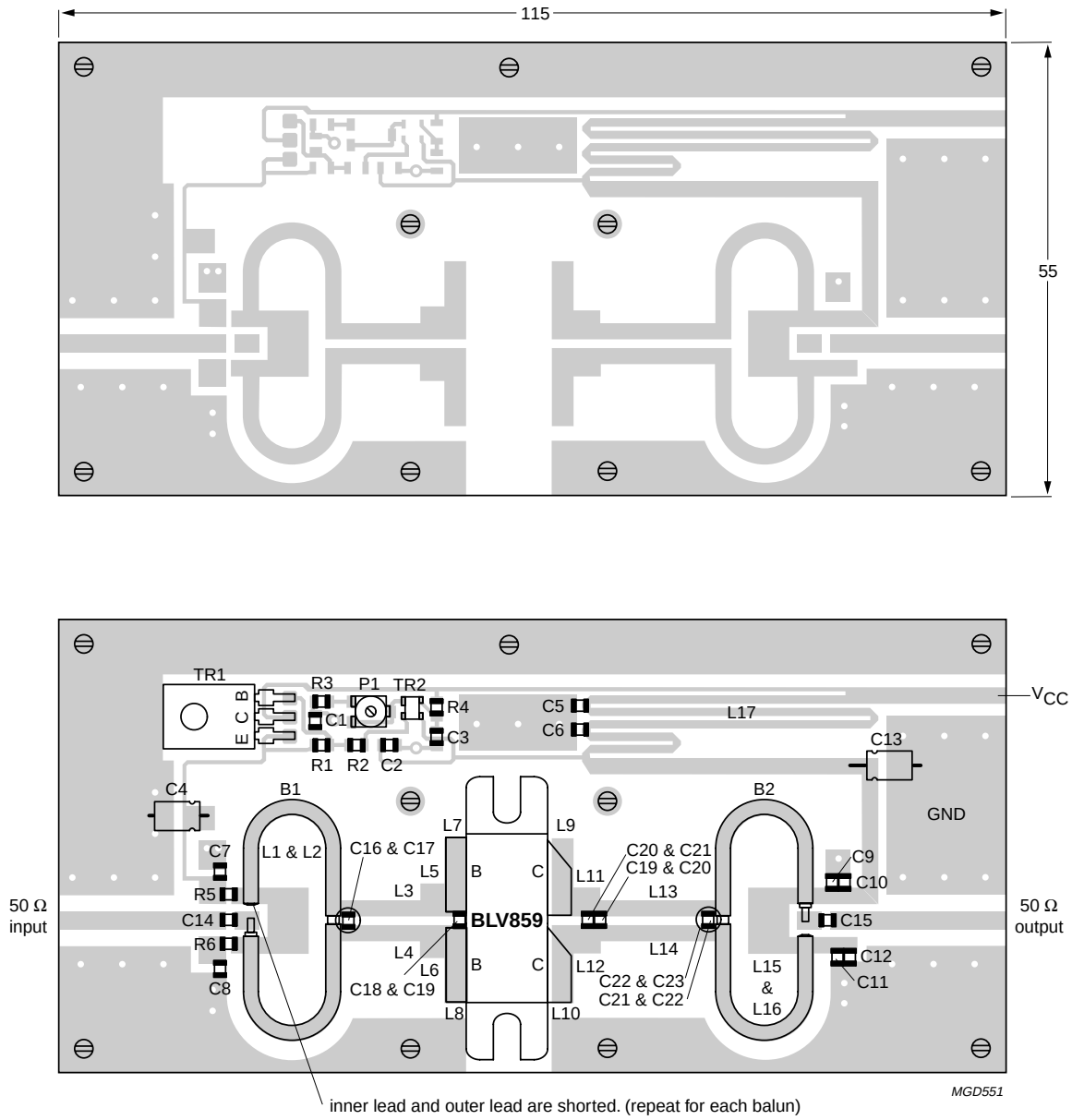


Fig.9 Class-A test circuit at f = 860 MHz.



Dimensions in mm.

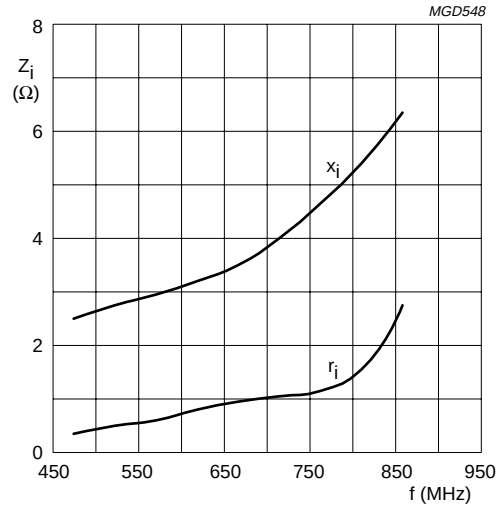
Fig.10 Printed-circuit board and component lay-out for 860 MHz class-A test circuit.

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 μF; 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 μF; 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 Ω	2 × 30.6 mm	
L3, L4	stripline; note 2	50 Ω	2 × 9.5 mm	
L5, L6	stripline; note 2	32.4 Ω	4 × 3 mm	
L7, L8, L9, L10	stripline; note 2	16.2 Ω	9.5 × 2.6 mm	
L11, L12	stripline; note 2	37.5 Ω	3.5 × 3.4 mm	
L13, L14	stripline; note 2	50 Ω	2 × 13.9 mm	
L17	stripline; note 2	77.7 Ω	1 × 120 mm	
B1, B2	Semi rigid coax balun UT70-25	Z = 25 Ω, ±1.5 Ω	70 mm	
R1	SMD resistor	220 Ω	805	2322 734 22201
R2	SMD resistor	1.8 Ω	805	2322 734 21808
R3	SMD resistor	2.7 kΩ	805	2322 734 22702
R4	SMD resistor	33 Ω	805	2322 734 23309
R7, R8	SMD resistor	3.3 Ω	805	2322 734 23308
P1	Murata potentiometer RG4M08-102VM-TG	1 kΩ		
TR1	NPN transistor	BD139		9330 912 20112
TR2	double PNP transistor	BVC62		5332 130 60505

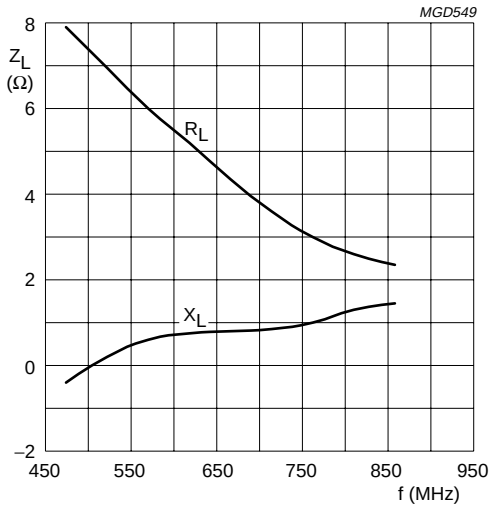
Notes

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) (ε_r = 2.55); thickness 0.76 mm.



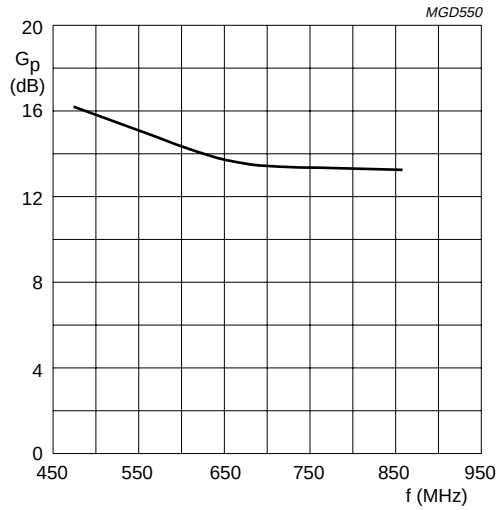
V_{CE} = 25 V; I_{CQ} = 2 × 2.25 A; $P_{o\ sync}$ = 20 W (total device); T_h = 25 °C.

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



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

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



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

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

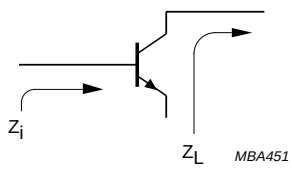
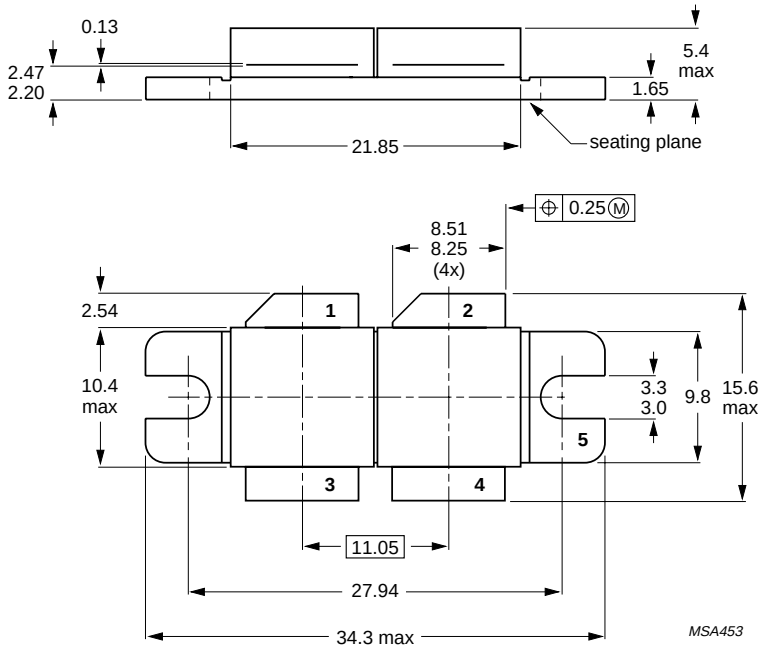


Fig.14 Definition of transistor impedance.

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.

DEFINITIONS

Data sheet status	
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.
Limiting values	
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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

NOTES

NOTES

NOTES

Philips Semiconductors – a worldwide company

Argentina: see South America

Australia: 34 Waterloo Road, NORTH RYDE, NSW 2113,
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

Austria: Computerstr. 6, A-1101 WIEN, P.O. Box 213,
Tel. +43 1 60 101, Fax. +43 1 60 101 1210

Belarus: Hotel Minsk Business Center, Bld. 3, r. 1211, Volodarski Str. 6,
220050 MINSK, Tel. +375 172 200 733, Fax. +375 172 200 773

Belgium: see The Netherlands

Brazil: see South America

Bulgaria: Philips Bulgaria Ltd., Energoproject, 15th floor,
51 James Bourchier Blvd., 1407 SOFIA,
Tel. +359 2 689 211, Fax. +359 2 689 102

Canada: PHILIPS SEMICONDUCTORS/COMPONENTS,
Tel. +1 800 234 7381

China/Hong Kong: 501 Hong Kong Industrial Technology Centre,
72 Tat Chee Avenue, Kowloon Tong, HONG KONG,
Tel. +852 2319 7888, Fax. +852 2319 7700

Colombia: see South America

Czech Republic: see Austria

Denmark: Prags Boulevard 80, PB 1919, DK-2300 COPENHAGEN S,
Tel. +45 32 88 2636, Fax. +45 31 57 1949

Finland: Sinikalliontie 3, FIN-02630 ESPOO,
Tel. +358 615 800, Fax. +358 615 80920

France: 4 Rue du Port-aux-Vins, BP317, 92156 SURESNES Cedex,
Tel. +33 1 40 99 6161, Fax. +33 1 40 99 6427

Germany: Hammerbrookstraße 69, D-20097 HAMBURG,
Tel. +49 40 23 53 60, Fax. +49 40 23 536 300

Greece: No. 15, 25th March Street, GR 17778 TAVROS,
Tel. +30 1 4894 339/911, Fax. +30 1 4814 240

Hungary: see Austria

India: Philips INDIA Ltd, Shivsagar Estate, A Block, Dr. Annie Besant Rd.
Worli, MUMBAI 400 018, Tel. +91 22 4938 541, Fax. +91 22 4938 722

Indonesia: see Singapore

Ireland: Newstead, Clonskeagh, DUBLIN 14,
Tel. +353 1 7640 000, Fax. +353 1 7640 200

Israel: RAPAC Electronics, 7 Kehilat Saloniki St, TEL AVIV 61180,
Tel. +972 3 645 0444, Fax. +972 3 649 1007

Italy: PHILIPS SEMICONDUCTORS, Piazza IV Novembre 3,
20124 MILANO, Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Bldg 13-37, Kohnan 2-chome, Minato-ku, TOKYO 108,
Tel. +81 3 3740 5130, Fax. +81 3 3740 5077

Korea: Philips House, 260-199 Itaewon-dong, Yongsan-ku, SEOUL,
Tel. +82 2 709 1412, Fax. +82 2 709 1415

Malaysia: No. 76 Jalan Universiti, 46200 PETALING JAYA, SELANGOR,
Tel. +60 3 750 5214, Fax. +60 3 757 4880

Mexico: 5900 Gateway East, Suite 200, EL PASO, TEXAS 79905,
Tel. +9-5 800 234 7381

Middle East: see Italy

Netherlands: Postbus 90050, 5600 PB EINDHOVEN, Bldg. VB,
Tel. +31 40 27 82785, Fax. +31 40 27 88399

New Zealand: 2 Wagener Place, C.P.O. Box 1041, AUCKLAND,
Tel. +64 9 849 4160, Fax. +64 9 849 7811

Norway: Box 1, Manglerud 0612, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Philippines: Philips Semiconductors Philippines Inc.,
106 Valero St. Salcedo Village, P.O. Box 2108 MCC, MAKATI,
Metro MANILA, Tel. +63 2 816 6380, Fax. +63 2 817 3474

Poland: Ul. Lukiska 10, PL 04-123 WARSZAWA,
Tel. +48 22 612 2831, Fax. +48 22 612 2327

Portugal: see Spain

Romania: see Italy

Russia: Philips Russia, Ul. Usatcheva 35A, 119048 MOSCOW,
Tel. +7 095 926 5361, Fax. +7 095 564 8323

Singapore: Lorong 1, Toa Payoh, SINGAPORE 1231,
Tel. +65 350 2538, Fax. +65 251 6500

Slovakia: see Austria

Slovenia: see Italy

South Africa: S.A. PHILIPS Pty Ltd., 195-215 Main Road Martindale,
2092 JOHANNESBURG, P.O. Box 7430 Johannesburg 2000,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

South America: Rua do Rocio 220, 5th floor, Suite 51,
04552-903 São Paulo, SÃO PAULO - SP, Brazil,
Tel. +55 11 821 2333, Fax. +55 11 829 1849

Spain: Balmes 22, 08007 BARCELONA,
Tel. +34 3 301 6312, Fax. +34 3 301 4107

Sweden: Kottbygatan 7, Akalla, S-16485 STOCKHOLM,
Tel. +46 8 632 2000, Fax. +46 8 632 2745

Switzerland: Allmendstrasse 140, CH-8027 ZÜRICH,
Tel. +41 1 488 2686, Fax. +41 1 481 7730

Taiwan: PHILIPS TAIWAN Ltd., 23-30F, 66,
Chung Hsiao West Road, Sec. 1, P.O. Box 22978,
TAIPEI 100, Tel. +886 2 382 4443, Fax. +886 2 382 4444

Thailand: PHILIPS ELECTRONICS (THAILAND) Ltd.,
209/2 Sanpavuth-Bangna Road Prakanong, BANGKOK 10260,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Talatpasa Cad. No. 5, 80640 GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

Ukraine: PHILIPS UKRAINE, 4 Patrice Lumumba str., Building B, Floor 7,
252042 KIEV, Tel. +380 44 264 2776, Fax. +380 44 268 0461

United Kingdom: Philips Semiconductors Ltd., 276 Bath Road, Hayes,
MIDDLESEX UB3 5BX, Tel. +44 181 730 5000, Fax. +44 181 754 8421

United States: 811 East Arques Avenue, SUNNYVALE, CA 94088-3409,
Tel. +1 800 234 7381

Uruguay: see South America

Vietnam: see Singapore

Yugoslavia: PHILIPS, Trg N. Pasica 5/v, 11000 BEOGRAD,
Tel. +381 11 825 344, Fax.+381 11 635 777

For all other countries apply to: Philips Semiconductors, Marketing & Sales Communications,
Building BE-p, P.O. Box 218, 5600 MD EINDHOVEN, The Netherlands, Fax. +31 40 27 24825

Internet: http://www.semiconductors.philips.com

Printed in The Netherlands 127041/1200/02/pp16 Date of release: 1996 Jul 26 Document order number: 9397 750 00987

Let's make things better.

Philips Semiconductors

PHILIPS

SUNSTAR 商斯达实业集团是集研发、生产、工程、销售、代理经销 、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一,是一家专业代理和分銷世界各大品牌 IC 芯片和電子元器件的连锁经营綜合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商,已在全国范围内建成强大统一的供货和代理分销网络。 我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件： 晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子元器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适 配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

更多产品请看本公司产品专用销售网站:

商斯达中国传感器科技信息网：http://www.sensor-ic.com/

商斯达工控安防网：http://www.pc-ps.net/

商斯达电子元器件网：http://www.sunstare.com/

商斯达微波光电产品网:HTTP://www.rfoe.net/

商斯达消费电子产品网://www.icasic.com/

商斯达实业科技产品网://www.sunstars.cn/ 微波元器件销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-82884100 83397033 83396822 83398585

传真：0755-83376182 （0）13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:szss20@163.com QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

技术支持: 0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘 ；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL：010-81159046 82615020 13501189838 FAX：010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL：021-28311762 56703037 13701955389 FAX：021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL：029-81022619 13072977981 FAX:029-88789382