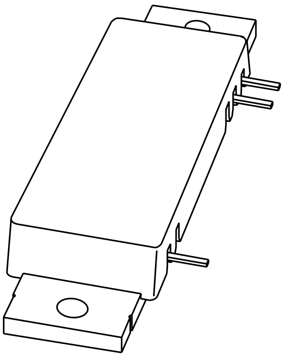
DATA SHEET



BGF802-20
CDMA800 power module

Product specification
Supersedes data of 2003 Jun 13

2005 Jun 03

Philips
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FEATURES

- Typical CDMA IS95 performance at a supply voltage of 28 V:
  - Output power = 3 W
  - Gain = 30 dB
  - Efficiency = 18%
  - ACPR < –53 dBc at 750 kHz and BW = 30 kHz
  - ACPR < –69 dBc at 1.98 MHz and BW = 30 kHz.
- Low distortion to CDMA signals
- Excellent 2-tone performance
- Low die temperature due to copper flange
- Integrated temperature compensated bias
- 50 Ω input/output system
- Flat gain over frequency range.

APPLICATIONS

- Base station RF power amplifiers in the 869 to 894 MHz frequency range
- CDMA IS95, CDMA2000, multi carrier applications
- Macrocell (driver stage) and Microcell (final stage).

DESCRIPTION

25 W LDMOS power amplifier module for base station amplifier applications in the 869 to 894 MHz range.

PINNING - SOT365C

PIN	DESCRIPTION
1	RF input
2	V_S
3	RF output
Flange	ground

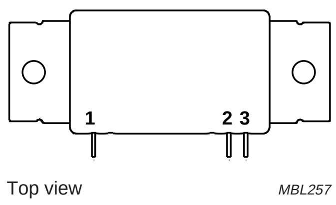


Fig.1 Simplified outline.

QUICK REFERENCE DATA

Typical RF performance at T_{mb} = 25 °C.

MODE OF OPERATION	f (MHz)	V_{DS} (V)	P_L (W)	G_p (dB)	η (%)	ACPR (dBc)	EVM (%)
CW	869 to 894	28	25	29	48	–	–
IS95 CDMA(1)	869 to 894	28	3	30	18	–53(2) –69(3)	–
GSM EDGE	869 to 894	26	2.5	30	16	–65(4)	0.4

Notes

1. IS95 CDMA (Pilot, paging, sync and traffic codes 8–13).
2. ACPR 750 kHz at 30 kHz resolution bandwidth.
3. ACPR 1.98 MHz at 30 kHz resolution bandwidth.
4. ACPR 400 kHz at 30 kHz resolution bandwidth.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	MIN.	MAX.	UNIT
V_S	DC supply voltage	–	30	V
P_D	input drive power	–	100	mW
P_L	load power	–	30	W
T_{stg}	storage temperature	–40	+100	°C
T_{mb}	operating mounting base temperature	–20	+90	°C

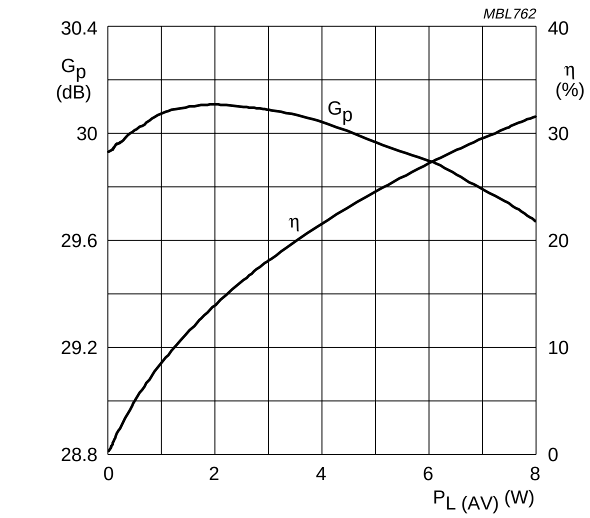
CHARACTERISTICS

T_{mb} = 25 °C; V_S = 28 V; P_L = 3.0 W; f = 869 to 894 MHz; $Z_S = Z_L$ = 50 Ω; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{DQ}	quiescent current (pin 2)	P_D = 0 mW	245	280	320	mA
P_{1dB}	load power	at 1 dB gain compression	18	25	–	W
G_p	power gain		28	30	32	dB
$\Delta G_{p\ freq}$	gain flatness over frequency range		–	0.2	1	dB
$\Delta G_{p\ pwr}$	gain flatness over power band	P_L = 30 mW up to 3 W	–0.8	–0.2	0.2	dB
$\Delta\varphi_{freq}$	phase linearity over frequency range		–	0.2	–	deg
	delay flatness		–	200	–	ps
G_{OB}	out of band gain	small signal, P_D = 0 dBm; 894 MHz < f < 869 MHz	–	–	$G_{Pi\ max}$ + 1 note 1	dB
$VSWR_{in}$	input VSWR		–	1.6 : 1	2 : 1	
H_2	second harmonic		–	–37	–34	dBc
H_3	third harmonic		–	–61	–58	dBc
	stability	VSWR ≤ 3 : 1 through all phases; V_{S2} = 25 to 28 V	all spurious outputs more than 60 dB below desired signal			
	ruggedness	VSWR = 10 : 1 through all phases; P_L = 5 W	no degradation in output power			
IS95 CDMA (P_L = 3 W average)						
η	efficiency		15	18	–	%
$ACPR_{750\ kHz}$	spectral regrowth; measured in 30 kHz RBW		–	–53	–49	dBc
$ACPR_{1.98\ MHz}$			–	–69	–66	dBc

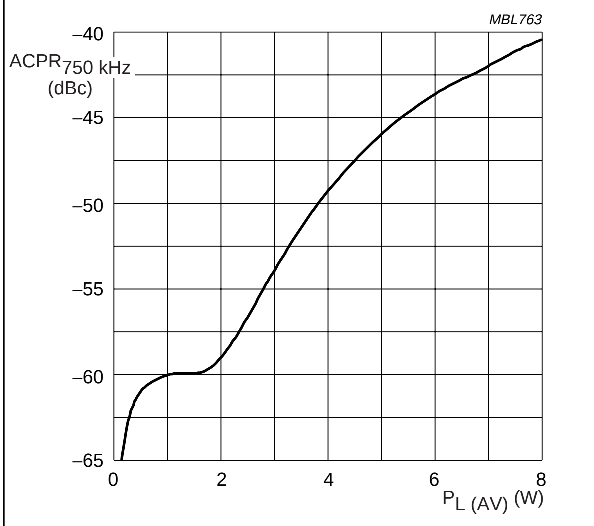
Note

1. G_{Pi} is small signal in-band gain.



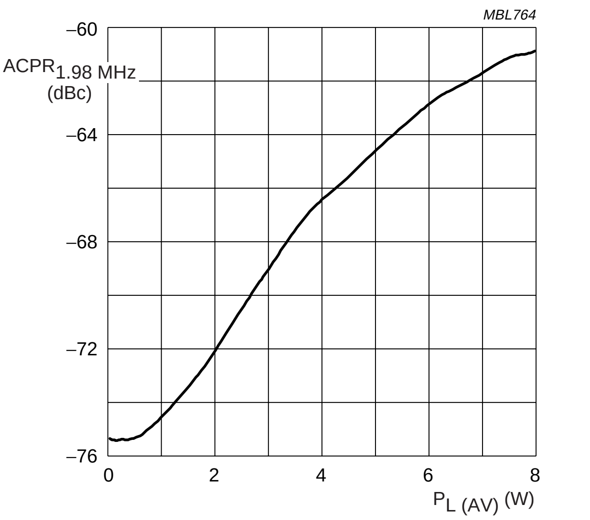
f = 882 MHz.

Fig.2 IS95 power gain and efficiency as functions of load power; typical values.



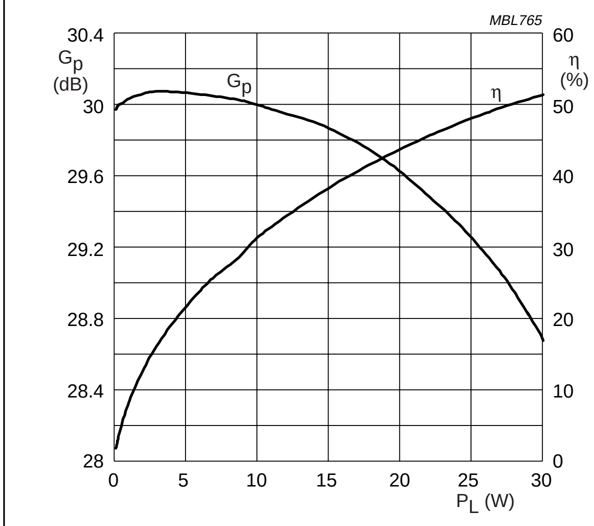
f = 882 MHz.

Fig.3 ACPR at 750 kHz as a function of output power; typical values.



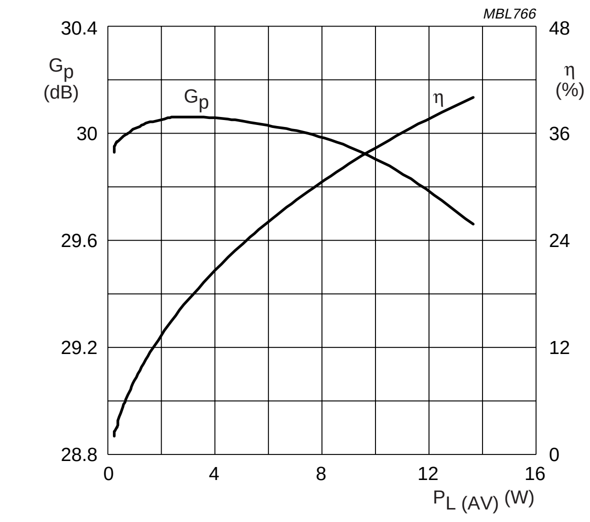
f = 882 MHz.

Fig.4 ACPR at 1.98 MHz as a function of output power; typical values.



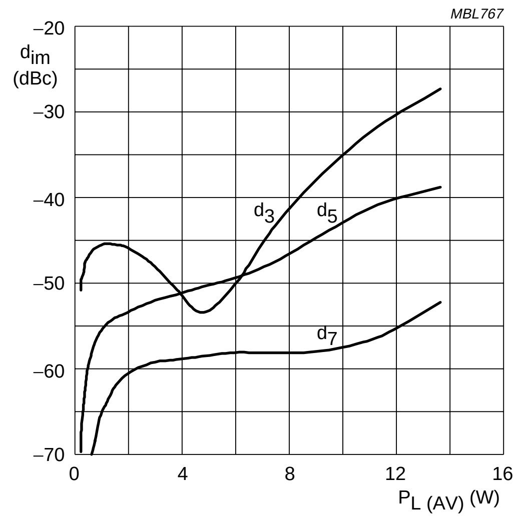
f = 882 MHz.

Fig.5 CW power gain and efficiency as functions of load power; typical values.



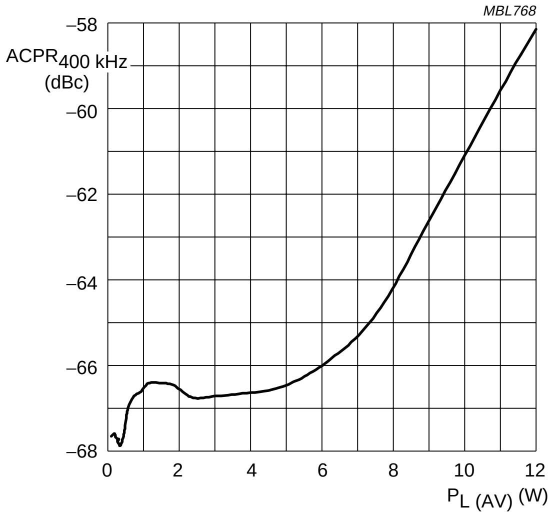
f_1 = 882 MHz; f_2 = 883 MHz.

Fig.6 Two tone power gain and efficiency as functions of load power; typical values.



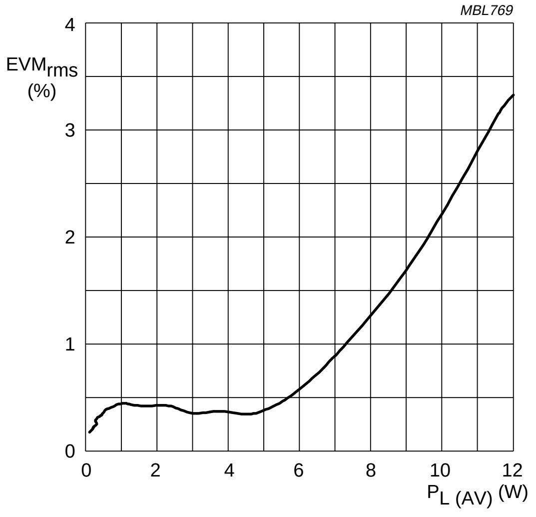
f_1 = 882 MHz; f_2 = 883 MHz.

Fig.7 Two tone intermodulation distortion as function of load power; typical values.



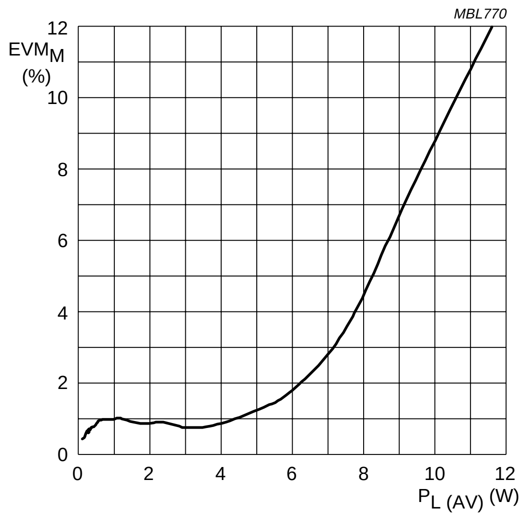
f = 882 MHz.

Fig.8 GSM EDGE ACPR at 400 kHz as a function of load power; typical values.



f = 882 MHz.

Fig.9 GSM EDGE rms EVM as a function of load power; typical values.



f = 882 MHz.

Fig.10 GSM EDGE peak EVM as a function of load power; typical values.

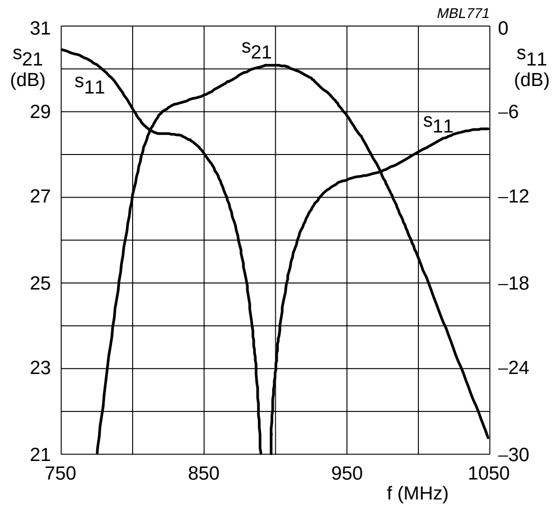


Fig.11 s-parameters as a function of frequency.

MOUNTING RECOMMENDATIONS

General

LDMOST base station modules are manufactured with the dies directly mounted onto a copper flange. The matching and bias circuit components are mounted on a printed-circuit board (PCB), which is also soldered onto the copper flange. The dies and the PCB are encapsulated in a plastic cap, and pins extending from the module provide a means of electrical connection. This construction allows the module to withstand a limited amount of flexing, although bending of the module is to be avoided as much as possible. Mechanical stress can occur if the bottom surface of the module and the surface of the amplifier casing (external heatsink) are not mutually flat. This, therefore, should be a consideration when mounting the module in the amplifier. Another cause of mechanical stress can arise from thermal mismatch after soldering of the pins. Precautions should be taken during soldering, and efforts made to ensure a good thermal contact between the flange and the external heatsink.

External heatsink (amplifier casing)

The module should always be mounted on a heatsink with a low thermal resistance to keep the module temperature as low as possible. The mounting area of the heatsink should be flat and free from burrs and loose particles. We recommend a flatness for the mounting area of between 50 µm concave and 50 µm convex. The 50 µm concave value is to ensure optimal thermal behaviour, while the 50 µm convex value is intended to limit mechanical stress due to bending.

In order to ensure optimal thermal behaviour, the use of thermal compound is recommended when mounting the module onto the amplifier external heatsink.

The following recommended thermal compounds have a thermal conductivity of >0.5 W/mK:

- WPS II (silicone-free) from Austerlitz-Electronics
- Comp. Trans. from KF
- 340 from Dow Corning
- Trans-Heat from E. Friis-Mikkelsen.

The use of thermal pads instead of thermal compound is not recommended as the pads may not maintain a uniform flatness over a period of time.

Mounting

PREPARATION

Ensure that the surface finishes are free from burrs, dirt and grease.

CAUTION

During the following procedures ESD precautions should be taken to protect the device from electrostatic damage.

PROCEDURE

1. Apply a thin, evenly spread layer of thermal compound to the module flange bottom surface. Excessive use of thermal compound may result in increased thermal resistance and possible bending of the of the flange. Too little thermal compound will result in an increase in thermal resistance.
2. Take care that there is some space between the cap and the PCB. Bring the module into contact with the external heatsink casing, ensuring that there is sufficient space for excessive thermal compound to escape.
3. Carefully align the module with the heatsink casing mounting holes, and secure with two 3 mm bolts and two flat washers. Initially tighten the bolts to “finger tight” (approximately 0.05 Nm). Using a torque wrench, tighten each bolt in alternating steps to a final torque of 0.4 Nm.
4. After the module is secured to the casing, the module leads may be soldered to the PCB. The leads are for electrical connection only, and should not be used to support the module at any time in the assembly process.

   A soldering iron may be used up to a temperature of 250 °C for a maximum of 10 seconds. Avoid contact between the soldering iron and the plastic cap.

Electrical connections

The main ground path of all modules is via the flange. It is therefore important that the flange is well grounded and that return paths are kept as short as possible. An incorrectly grounded flange can result in a loss of output power or in oscillation.

The RF input and output of the module are designed for 50 Ω connections.

Incoming inspection

When incoming inspection is performed, use a properly designed test fixture to avoid excessive mechanical stress and to ensure optimal RF performance. Philips can deliver dedicated test fixtures on request.

APPLICATION INFORMATION

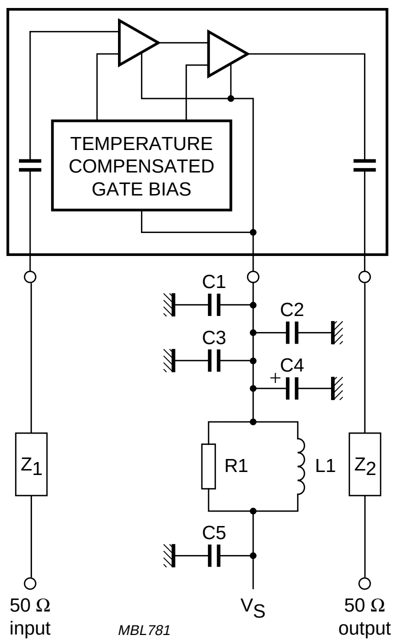


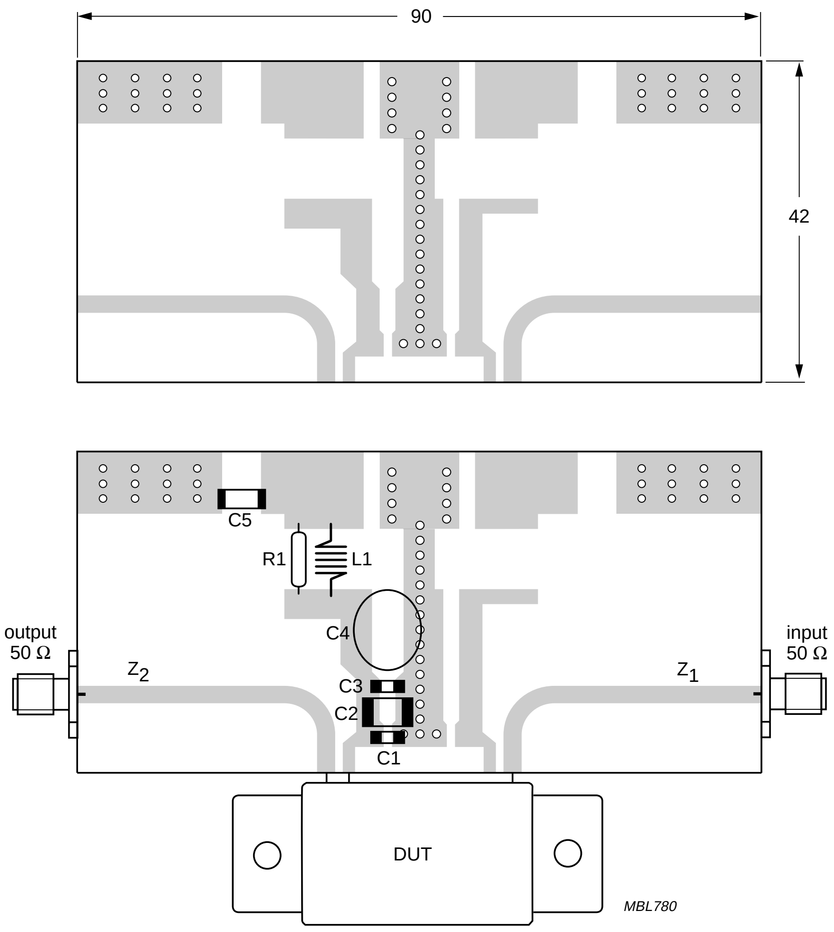
Fig.12 Test circuit.

List of components (see Figs 12 and 13)

COMPONENT	DESCRIPTION	VALUE	CATALOGUE NUMBER
C1, C3	multilayer X7R ceramic chip capacitor	100 nF; 50 V	
C2, C5	tantalum SMD capacitor	10 µF; 35 V	
C4	electrolytic capacitor	100 µF; 35 V	
L1	grade 4S2 Ferroxcube bead		4330 030 36300
R1	metal film resistor	10 Ω; 0.4 W	2322 195 13109
Z_1, Z_2	stripline; note 1	50 Ω	

Note

1. The striplines are on a double copper-clad printed-circuit board (RO5880) with ε_r = 2.2 and thickness = 0.79 mm.

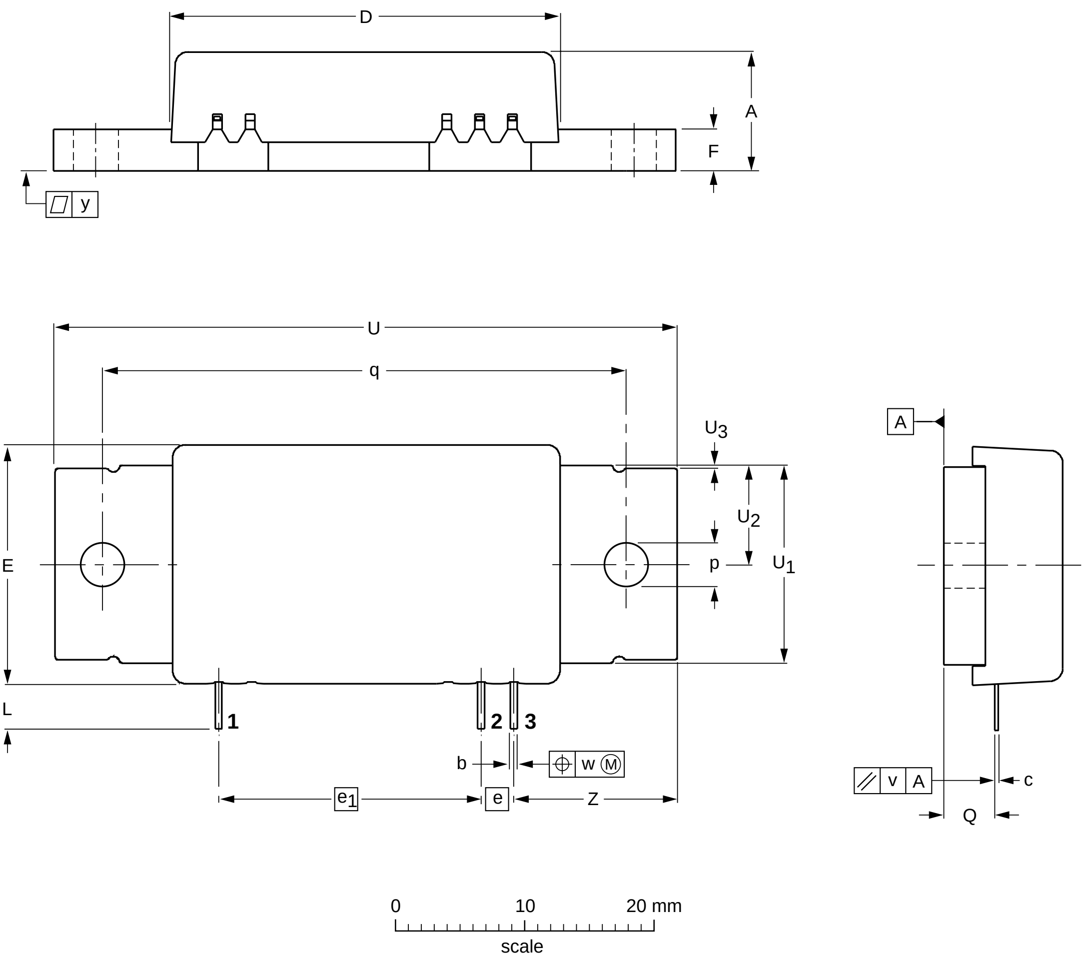


Dimensions in mm.

Fig.13 Printed-circuit board and component layout.

PACKAGE OUTLINE

Plastic rectangular single-ended flat package; flange mounted; 2 mounting holes; 3 in-line leads **SOT365C**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	c	D	E	e	e_1	F	L	p	Q	q	U	U_1	U_2	U_3	v	w	y	Z
mm	9.5 9.0	0.56 0.46	0.3 0.2	30.1 29.9	18.6 18.4	2.54	20.32	3.3 3.1	3.7 3.3	3.55 3.45	4.0 3.8	41.75 41.65	48.4 48.0	15.4 15.2	7.75 7.55	1.1 0.0	0.3	0.25	0.1	12.8 12.6

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT365C						~~01-06-06~~ 02-11-13

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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