

# BGY787

750 MHz, 21.5 dB gain push-pull

Rev. 08 — 1 April 2005

Product data sheet

## 1. Product profile

### 1.1 General description

Hybrid amplifier module in a SOT115J package operating with a voltage supply of 24 V (DC).

#### CAUTION



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

### 1.2 Features

- Extremely low noise
- Silicon nitride passivation
- Rugged construction
- Gold metallization ensures excellent reliability
- Excellent linearity

### 1.3 Applications

- CATV systems operating in the frequency range of 40 MHz to 750 MHz

### 1.4 Quick reference data

Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$G_p$	power gain	$f = 50$ MHz	21	21.5	22	dB	
		$f = 750$ MHz	21.5	22.5	-	dB	
$I_{tot}$	total current consumption (DC)	$V_B = 24$ V	[1]	-	220	240	mA

[1] The module normally operates at  $V_B = 24$  V, but is able to withstand supply transients up to 30 V.

# PHILIPS

## 2. Pinning information

**Table 2: Pinning**

Pin	Description	Simplified outline	Symbol
1	input		
2	common		
3	common		
5	+V <sub>B</sub>		
7	common		
8	common		
9	output		

## 3. Ordering information

**Table 3: Ordering information**

Type number	Package		
	Name	Description	Version
BGY787	-	rectangular single-ended package; aluminium flange; 2 vertical mounting holes; 2 × 6-32 UNC and 2 extra horizontal mounting holes; 7 gold-plated in-line leads	SOT115J

## 4. Limiting values

**Table 4: Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>i</sub>	RF input voltage		-	60	dBmV
T <sub>stg</sub>	storage temperature		-40	+100	°C
T <sub>mb</sub>	mounting base temperature		-20	+100	°C

## 5. Characteristics

**Table 5: Characteristics at bandwidth 40 MHz to 750 MHz**

$V_B = 24\text{ V}$ ;  $T_{case} = 30\text{ }^\circ\text{C}$ ;  $Z_S = Z_L = 75\ \Omega$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$f = 50\text{ MHz}$	21	21.5	22	dB
		$f = 750\text{ MHz}$	21.5	22.5	-	dB
SL	slope cable equivalent	$f = 40\text{ MHz to }750\text{ MHz}$	0	1	1.5	dB
FL	flatness of frequency response	$f = 40\text{ MHz to }750\text{ MHz}$	-	$\pm 0.2$	$\pm 0.5$	dB
$S_{11}$	input return losses	$f = 40\text{ MHz to }80\text{ MHz}$	20	33	-	dB
		$f = 80\text{ MHz to }160\text{ MHz}$	18.5	30	-	dB
		$f = 160\text{ MHz to }320\text{ MHz}$	17	25	-	dB
		$f = 320\text{ MHz to }640\text{ MHz}$	15.5	22	-	dB
		$f = 640\text{ MHz to }750\text{ MHz}$	14	20.5	-	dB
$S_{22}$	output return losses	$f = 40\text{ MHz to }80\text{ MHz}$	20	28.5	-	dB
		$f = 80\text{ MHz to }160\text{ MHz}$	18.5	27.5	-	dB
		$f = 160\text{ MHz to }320\text{ MHz}$	17	25	-	dB
		$f = 320\text{ MHz to }640\text{ MHz}$	15.5	22	-	dB
		$f = 640\text{ MHz to }750\text{ MHz}$	14	20	-	dB
$\varphi_{S21}$	phase response	$f = 50\text{ MHz}$	-45	-	+45	deg
CTB	composite triple beat	110 channels flat; $V_o = 44\text{ dBmV}$ ; measured at 745.25 MHz	-	-54.5	-53	dB
$X_{mod}$	cross modulation	110 channels flat; $V_o = 44\text{ dBmV}$ ; measured at 55.25 MHz	-	-54	-52	dB
CSO	composite second order distortion	110 channels flat; $V_o = 44\text{ dBmV}$ ; measured at 746.5 MHz	-	-57.5	-53	dB
$d_2$	second order distortion		[1] -	-75	-63	dB
$V_o$	output voltage	$d_{im} = -60\text{ dB}$	[2] 61	63	-	dBmV
F	noise figure	$f = 50\text{ MHz}$	-	4	5	dB
		$f = 450\text{ MHz}$	-	-	5.5	dB
		$f = 550\text{ MHz}$	-	-	5.5	dB
		$f = 600\text{ MHz}$	-	-	6	dB
		$f = 750\text{ MHz}$	-	5	6.5	dB
$I_{tot}$	total current consumption (DC)		[3] -	220	240	mA

[1]  $f_p = 55.25\text{ MHz}$ ;  $V_p = 44\text{ dBmV}$ ;  $f_q = 691.25\text{ MHz}$ ;  $V_q = 44\text{ dBmV}$ ; measured at  $f_p + f_q = 746.5\text{ MHz}$ .

[2] Measure according to DIN45004B;

$f_p = 740.25\text{ MHz}$ ;  $V_p = V_o$ ;  $f_q = 747.25\text{ MHz}$ ;  $V_q = V_o - 6\text{ dB}$ ;  $f_r = 749.25\text{ MHz}$ ;  $V_r = V_o - 6\text{ dB}$ ; measured at  $f_p + f_q - f_r = 738.25\text{ MHz}$ .

[3] The module normally operates at  $V_B = 24\text{ V}$ , but is able to withstand supply transients up to 30 V.

**Table 6: Characteristics at bandwidth 40 MHz to 770 MHz** $V_B = 24\text{ V}$ ;  $T_{case} = 30\text{ °C}$ ;  $Z_S = Z_L = 75\ \Omega$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$G_p$	power gain	$f = 50\text{ MHz}$	21	21.5	22	dB
		$f = 770\text{ MHz}$	21.5	22.5	-	dB
SL	slope cable equivalent	$f = 40\text{ MHz to }770\text{ MHz}$	0	1	1.5	dB
FL	flatness of frequency response	$f = 40\text{ MHz to }770\text{ MHz}$	-	$\pm 0.2$	$\pm 0.5$	dB
$s_{11}$	input return losses	$f = 40\text{ MHz to }80\text{ MHz}$	20	33	-	dB
		$f = 80\text{ MHz to }160\text{ MHz}$	18.5	30	-	dB
		$f = 160\text{ MHz to }320\text{ MHz}$	17	25	-	dB
		$f = 320\text{ MHz to }640\text{ MHz}$	15.5	22.5	-	dB
		$f = 640\text{ MHz to }770\text{ MHz}$	14	20.5	-	dB
$s_{22}$	output return losses	$f = 40\text{ MHz to }80\text{ MHz}$	20	28.5	-	dB
		$f = 80\text{ MHz to }160\text{ MHz}$	18.5	27.5	-	dB
		$f = 160\text{ MHz to }320\text{ MHz}$	17	25	-	dB
		$f = 320\text{ MHz to }640\text{ MHz}$	15.5	22	-	dB
		$f = 640\text{ MHz to }770\text{ MHz}$	14	20	-	dB
$\varphi_{S21}$	phase response	$f = 50\text{ MHz}$	-45	-	+45	deg
CTB	composite triple beat	110 channels flat; $V_o = 44\text{ dBmV}$ ; measured at 745.25 MHz	-	-54.5	-53	dB
$X_{mod}$	cross modulation	110 channels flat; $V_o = 44\text{ dBmV}$ ; measured at 55.25 MHz	-	-54	-52	dB
CSO	composite second order distortion	110 channels flat; $V_o = 44\text{ dBmV}$ ; measured at 746.5 MHz	-	-57.5	-53	dB
$d_2$	second order distortion		[1] -	-75	-63	dB
$V_o$	output voltage	$d_{im} = -60\text{ dB}$	[2] 61	63	-	dBmV
F	noise figure	$f = 50\text{ MHz}$	-	4	5	dB
		$f = 450\text{ MHz}$	-	-	5.5	dB
		$f = 550\text{ MHz}$	-	-	5.5	dB
		$f = 600\text{ MHz}$	-	-	6	dB
		$f = 770\text{ MHz}$	-	5	6.5	dB
$I_{tot}$	total current consumption (DC)		[3] -	220	240	mA

[1]  $f_p = 55.25\text{ MHz}$ ;  $V_p = 44\text{ dBmV}$ ;  $f_q = 691.25\text{ MHz}$ ;  $V_q = 44\text{ dBmV}$ ; measured at  $f_p + f_q = 746.5\text{ MHz}$ .

[2] Measure according to DIN45004B;

$f_p = 740.25\text{ MHz}$ ;  $V_p = V_o$ ;  $f_q = 747.25\text{ MHz}$ ;  $V_q = V_o - 6\text{ dB}$ ;  $f_r = 749.25\text{ MHz}$ ;  $V_r = V_o - 6\text{ dB}$ ; measured at  $f_p + f_q - f_r = 738.25\text{ MHz}$ .

[3] The module normally operates at  $V_B = 24\text{ V}$ , but is able to withstand supply transients up to 30 V.

**Table 7: Characteristics at bandwidth 40 MHz to 600 MHz** $V_B = 24\text{ V}$ ;  $T_{case} = 30\text{ °C}$ ;  $Z_S = Z_L = 75\ \Omega$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G <sub>p</sub>	power gain	f = 50 MHz	21	21.5	22	dB
		f = 600 MHz	21.5	-	-	dB
SL	slope cable equivalent	f = 40 MHz to 600 MHz	0	-	1.5	dB
FL	flatness of frequency response	f = 40 MHz to 600 MHz	-	-	±0.3	dB
S <sub>11</sub>	input return losses	f = 40 MHz to 80 MHz	20	33	-	dB
		f = 80 MHz to 160 MHz	18.5	30	-	dB
		f = 160 MHz to 320 MHz	17	25	-	dB
		f = 320 MHz to 600 MHz	16	22.5	-	dB
S <sub>22</sub>	output return losses	f = 40 MHz to 80 MHz;	20	28.5	-	dB
		f = 80 MHz to 160 MHz	18.5	27.5	-	dB
		f = 160 MHz to 320 MHz	17	25	-	dB
		f = 320 MHz to 600 MHz	16	22	-	dB
φ <sub>S21</sub>	phase response	f = 50 MHz	-45	-	+45	deg
CTB	composite triple beat	85 channels flat; V <sub>o</sub> = 44 dBmV; measured at 595.25 MHz	-	-59.5	-58	dB
X <sub>mod</sub>	cross modulation	85 channels flat; V <sub>o</sub> = 44 dBmV; measured at 55.25 MHz	-	-55.5	-53	dB
CSO	composite second order distortion	85 channels flat; V <sub>o</sub> = 44 dBmV; measured at 596.5 MHz	-	-64	-56	dB
d <sub>2</sub>	second order distortion		[1] -	-	-68	dB
V <sub>o</sub>	output voltage	d <sub>im</sub> = -60 dB	[2] 62.5	-	-	dBmV
F	noise figure	see <a href="#">Table 5</a>	-	-	-	dB
I <sub>tot</sub>	total current consumption (DC)		[3] -	220	240	mA

[1] f<sub>p</sub> = 55.25 MHz; V<sub>p</sub> = 44 dBmV; f<sub>q</sub> = 541.25 MHz; V<sub>q</sub> = 44 dBmV; measured at f<sub>p</sub> + f<sub>q</sub> = 596.5 MHz.

[2] Measure according to DIN45004B;

f<sub>p</sub> = 590.25 MHz; V<sub>p</sub> = V<sub>o</sub>; f<sub>q</sub> = 597.25 MHz; V<sub>q</sub> = V<sub>o</sub> - 6 dB; f<sub>r</sub> = 599.25 MHz; V<sub>r</sub> = V<sub>o</sub> - 6 dB; measured at f<sub>p</sub> + f<sub>q</sub> - f<sub>r</sub> = 588.25 MHz.

[3] The module normally operates at V<sub>B</sub> = 24 V, but is able to withstand supply transients up to 30 V.

**Table 8: Characteristics at bandwidth 40 MHz to 550 MHz**

$V_B = 24\text{ V}$ ;  $T_{case} = 30\text{ °C}$ ;  $Z_S = Z_L = 75\ \Omega$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
G <sub>p</sub>	power gain	f = 50 MHz	21	21.5	22	dB
		f = 550 MHz	21.5	-	-	dB
SL	slope cable equivalent	f = 40 MHz to 550 MHz	0	-	1.5	dB
FL	flatness of frequency response	f = 40 MHz to 550 MHz	-	-	±0.3	dB
S <sub>11</sub>	input return losses	f = 40 MHz to 80 MHz	20	33	-	dB
		f = 80 MHz to 160 MHz	18.5	30	-	dB
		f = 160 MHz to 320 MHz	17	25	-	dB
		f = 320 MHz to 550 MHz	16	22.5	-	dB
S <sub>22</sub>	output return losses	f = 40 MHz to 80 MHz	20	28.5	-	dB
		f = 80 MHz to 160 MHz	18.5	27.5	-	dB
		f = 160 MHz to 320 MHz	17	25	-	dB
		f = 320 MHz to 550 MHz	16	22	-	dB
φ <sub>S21</sub>	phase response	f = 50 MHz	-45	-	+45	deg
CTB	composite triple beat	77 channels flat; V <sub>o</sub> = 44 dBmV; measured at 547.25 MHz	-	-61	-60	dB
X <sub>mod</sub>	cross modulation	77 channels flat; V <sub>o</sub> = 44 dBmV; measured at 55.25 MHz	-	-56.5	-55	dB
CSO	composite second order distortion	77 channels flat; V <sub>o</sub> = 44 dBmV; measured at 548.5 MHz	-	-65.5	-58	dB
d <sub>2</sub>	second order distortion		[1] -	-	-70	dB
V <sub>o</sub>	output voltage	d <sub>im</sub> = -60 dB	[2] 63	-	-	dBmV
F	noise figure	see <a href="#">Table 5</a>	-	-	-	dB
I <sub>tot</sub>	total current consumption (DC)		[3] -	220	240	mA

[1] f<sub>p</sub> = 55.25 MHz; V<sub>p</sub> = 44 dBmV; f<sub>q</sub> = 493.25 MHz; V<sub>q</sub> = 44 dBmV; measured at f<sub>p</sub> + f<sub>q</sub> = 548.5 MHz.

[2] Measure according to DIN45004B;

f<sub>p</sub> = 540.25 MHz; V<sub>p</sub> = V<sub>o</sub>; f<sub>q</sub> = 547.25 MHz; V<sub>q</sub> = V<sub>o</sub> - 6 dB; f<sub>r</sub> = 549.25 MHz; V<sub>r</sub> = V<sub>o</sub> - 6 dB; measured at f<sub>p</sub> + f<sub>q</sub> - f<sub>r</sub> = 538.25 MHz.

[3] The module normally operates at V<sub>B</sub> = 24 V, but is able to withstand supply transients up to 30 V.

**Table 9: Characteristics at bandwidth 40 MHz to 450 MHz** $V_B = 24\text{ V}$ ;  $T_{case} = 30\text{ °C}$ ;  $Z_S = Z_L = 75\ \Omega$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$G_p$	power gain	$f = 50\text{ MHz}$	21	21.5	22	dB	
		$f = 450\text{ MHz}$	21.5	-	-	dB	
SL	slope cable equivalent	$f = 40\text{ MHz to }450\text{ MHz}$	0	-	1.5	dB	
FL	flatness of frequency response	$f = 40\text{ MHz to }450\text{ MHz}$	-	-	$\pm 0.3$	dB	
$s_{11}$	input return losses	$f = 40\text{ MHz to }80\text{ MHz}$	20	33	-	dB	
		$f = 80\text{ MHz to }160\text{ MHz}$	18.5	30	-	dB	
		$f = 160\text{ MHz to }320\text{ MHz}$	17	25	-	dB	
		$f = 320\text{ MHz to }450\text{ MHz}$	16	22.5	-	dB	
$s_{22}$	output return losses	$f = 40\text{ MHz to }80\text{ MHz}$	20	28.5	-	dB	
		$f = 80\text{ MHz to }160\text{ MHz}$	18.5	27.5	-	dB	
		$f = 160\text{ MHz to }320\text{ MHz}$	17	25	-	dB	
		$f = 320\text{ MHz to }450\text{ MHz}$	16	22	-	dB	
$\varphi_{S21}$	phase response	$f = 50\text{ MHz}$	-45	-	+45	deg	
CTB	composite triple beat	60 channels flat; $V_o = 46\text{ dBmV}$ ; measured at 445.25 MHz	-	-	-59	dB	
$X_{mod}$	cross modulation	60 channels flat; $V_o = 46\text{ dBmV}$ ; measured at 55.25 MHz	-	-	-54	dB	
CSO	composite second order distortion	60 channels flat; $V_o = 46\text{ dBmV}$ ; measured at 446.5 MHz	-	-	-60	dB	
$d_2$	second order distortion		[1]	-	-	-73	dB
$V_o$	output voltage	$d_{im} = -60\text{ dB}$	[2]	64	-	-	dBmV
F	noise figure	see <a href="#">Table 5</a>	-	-	-	dB	
$I_{tot}$	total current consumption (DC)		[3]	-	220	240	mA

[1]  $f_p = 55.25\text{ MHz}$ ;  $V_p = 46\text{ dBmV}$ ;  $f_q = 391.25\text{ MHz}$ ;  $V_q = 46\text{ dBmV}$ ; measured at  $f_p + f_q = 446.5\text{ MHz}$ .

[2] Measure according to DIN45004B;

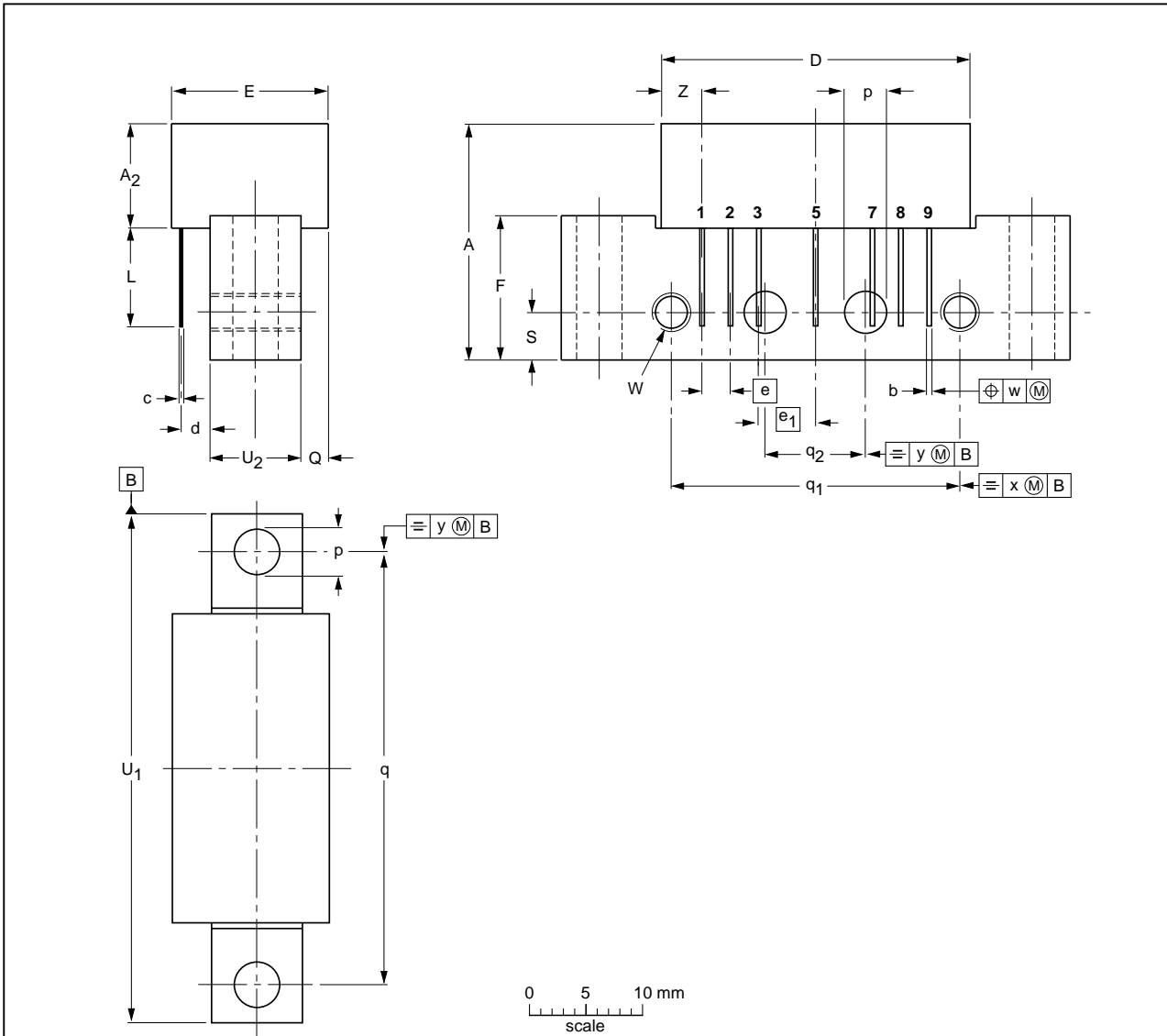
$f_p = 440.25\text{ MHz}$ ;  $V_p = V_o$ ;  $f_q = 447.25\text{ MHz}$ ;  $V_q = V_o - 6\text{ dB}$ ;  $f_r = 449.25\text{ MHz}$ ;  $V_r = V_o - 6\text{ dB}$ ; measured at  $f_p + f_q - f_r = 438.25\text{ MHz}$ .

[3] The module normally operates at  $V_B = 24\text{ V}$ , but is able to withstand supply transients up to 30 V.

**6. Package outline**

Rectangular single-ended package; aluminium flange; 2 vertical mounting holes; 2 x 6-32 UNC and 2 extra horizontal mounting holes; 7 gold-plated in-line leads

SOT115J



**DIMENSIONS** (mm are the original dimensions)

UNIT	A max.	A <sub>2</sub> max.	b	c	D max.	d max.	E max.	e	e <sub>1</sub>	F	L min.	p	Q max.	q	q <sub>1</sub>	q <sub>2</sub>	S	U <sub>1</sub>	U <sub>2</sub>	W	w	x	y	Z max.
mm	20.8	9.1	0.51 0.38	0.25	27.2	2.54	13.75	2.54	5.08	12.7	8.8	4.15 3.85	2.4	38.1	25.4	10.2	4.2	44.75 44.25	8.2 7.8	6-32 UNC	0.25	0.7	0.1	3.8

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT115J						99-02-06 04-02-04

**Fig 1. Package outline SOT115J**



## 7. Revision history

**Table 10: Revision history**

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BGY787_8	20050401	Product data sheet	-	9397 750 14773	BGY787_7
Modifications:	<ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li></ul>				
BGY787_7	20030516	Product specification	-	9397 750 11198	BGY787_6
BGY787_6	20011031	Product specification	-	9397 750 08811	BGY787_5
BGY787_5	19990330	Product specification	-	9397 750 05455	BGY787_4
BGY787_4	19971124	Product specification	-	9397 750 02951	BGY787_3
BGY787_3	19970414	Product specification	-	9397 750 02155	-

## 8. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	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.
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## 9. Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**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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