

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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# GaAs INTEGRATED CIRCUIT

## MC-5963, MC-5964

### 800 M TO 900 MHz-BAND POWER AMPLIFIER FOR THE ANALOG HAND-HELD PHONE (FOR AMPS, E-TACS)

#### DESCRIPTION

The MC-5963, 5964 are 800 to 900 MHz band GaAs Multi-chip IC's which were developed for digital Cellular hand-held phone. The device incorporates new GaAs FETs which was developed for L-band application and realizes high power and high efficiency at 4.6 V operation voltage.

#### FEATURES

- Low Operation Current :  $I_{DD} = 410$  mA typ. @  $P_{out} = +30.0$  dBm
- High Efficiency : 60 % typ. @  $P_{out} = P_{sat}$
- Low Operation Voltage :  $V_{DD} = 4.6$  V
- 0.6 cc SMD type package (PKG size :  $17.0 \times 12.3 \times 3.0$  mm)
- Tape & Reel packaging option available

#### ORDERING INFORMATION

PART NUMBER	PACKAGE	PACKING FORM
MC-5963 MC-5964	0.6 cc SMD type	100 pcs/tray
MC-5963-E1 MC-5964-E1		24 mm tape width, 1 pin faces toward the open end of the tape, 500 pcs/Reel

**Remark** For evaluation sample order, please contact your local NEC sales office. (Order number: MC-5963, MC-5964)

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C)

PARAMETERS	SYMBOL	RATINGS	UNIT
Supply Voltage 1, 2	$V_{DD1,2}$	10 <sup>Note1</sup>	V
Supply Voltage 3	$V_{GG}$	-5.0	V
Input Power	$P_{in}$	+10	dBm
Operating Case Temperature	$T_C$	-30 to +90	°C
Storage Temperature	$T_{stg}$	-35 to +120	°C

**Note**  $V_{GG} = -3.5$  V (MC-5963),  $V_{GG} = -3.3$  V (MC-5964)

**Caution** The IC must be handled with care to prevent static discharge because its circuit is composed of GaAs MES FET.

The information in this document is subject to change without notice.

[MC-5963]

**RECOMMENDED OPERATING CONDITIONS**

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage 1	V <sub>DD1</sub>		4.6	4.8	V
Supply Voltage 2	V <sub>DD2</sub>	4.2	4.6	7.0	V
Supply Voltage 3	V <sub>GG</sub>	-3.6	-3.5	-3.4	V
Input Power	P <sub>in</sub>	+4.0		+8.0	dBm

**ELECTRICAL CHARACTERISTICS**

(Unless otherwise specified, T<sub>c</sub> = 25 °C, Z<sub>s</sub> = Z<sub>L</sub> = 50 Ω, Using NEC standard test fixture.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Frequency	f		824		849	MHz
Output Power 1	P <sub>out1</sub>	P <sub>in</sub> = +8 dBm V <sub>DD1</sub> = V <sub>DD2</sub> = 4.6 V, V <sub>GG</sub> = -3.5 V	+30.0	+30.8		dBm
Output Power 2	P <sub>out2</sub>	P <sub>in</sub> = +8 dBm V <sub>DD1</sub> = V <sub>DD2</sub> = 4.2 V, V <sub>GG</sub> = -3.5 V		+29.0		dBm
Total Current	I <sub>DD</sub>	I <sub>DD</sub> = I <sub>DD1</sub> + I <sub>DD2</sub> P <sub>in</sub> = +8 dBm		410	460	mA
Harmonics	2, 3.4 f <sub>0</sub>	P <sub>out</sub> = +30.0 dBm V <sub>DD1</sub> = Controlled = 4.6 V max. V <sub>DD2</sub> = 4.6 V			-30	dBc
Input VSWR	-	V <sub>GG</sub> = -3.5 V			3:1	-
Gate Current	I <sub>GG</sub>	P <sub>in</sub> = None V <sub>DD1</sub> = V <sub>DD2</sub> = 4.6 V, V <sub>GG</sub> = -3.5 V	-3.0	-1.2	0	mA
Damage Withstanding	-	P <sub>in</sub> = +8 dBm, P <sub>out</sub> = +30.0 dBm Z <sub>s</sub> = 50 Ω, V <sub>GG</sub> = -3.5 V V <sub>DD1</sub> = 0 to 8.0 V, V <sub>DD1</sub> ≤ V <sub>DD2</sub> V <sub>DD2</sub> = 4.0 to 8.0 V, LOAD VSWR = 20 : 1, ALL PHASE LOAD TIME 30 sec	No damage is allowed			

[MC-5964]

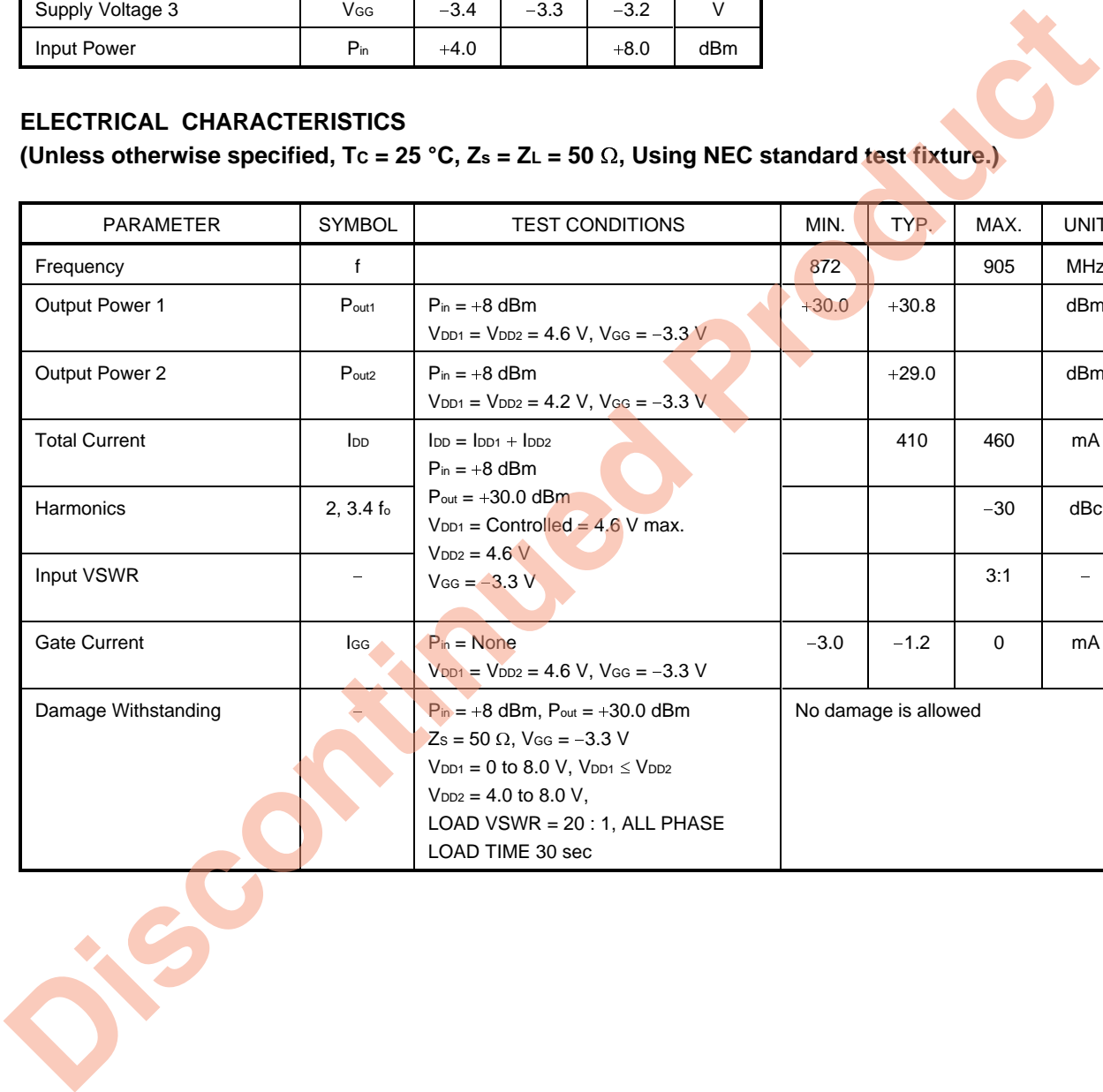
RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage 1	V <sub>DD1</sub>		4.6	4.8	V
Supply Voltage 2	V <sub>DD2</sub>	4.2	4.6	7.0	V
Supply Voltage 3	V <sub>GG</sub>	-3.4	-3.3	-3.2	V
Input Power	P <sub>in</sub>	+4.0		+8.0	dBm

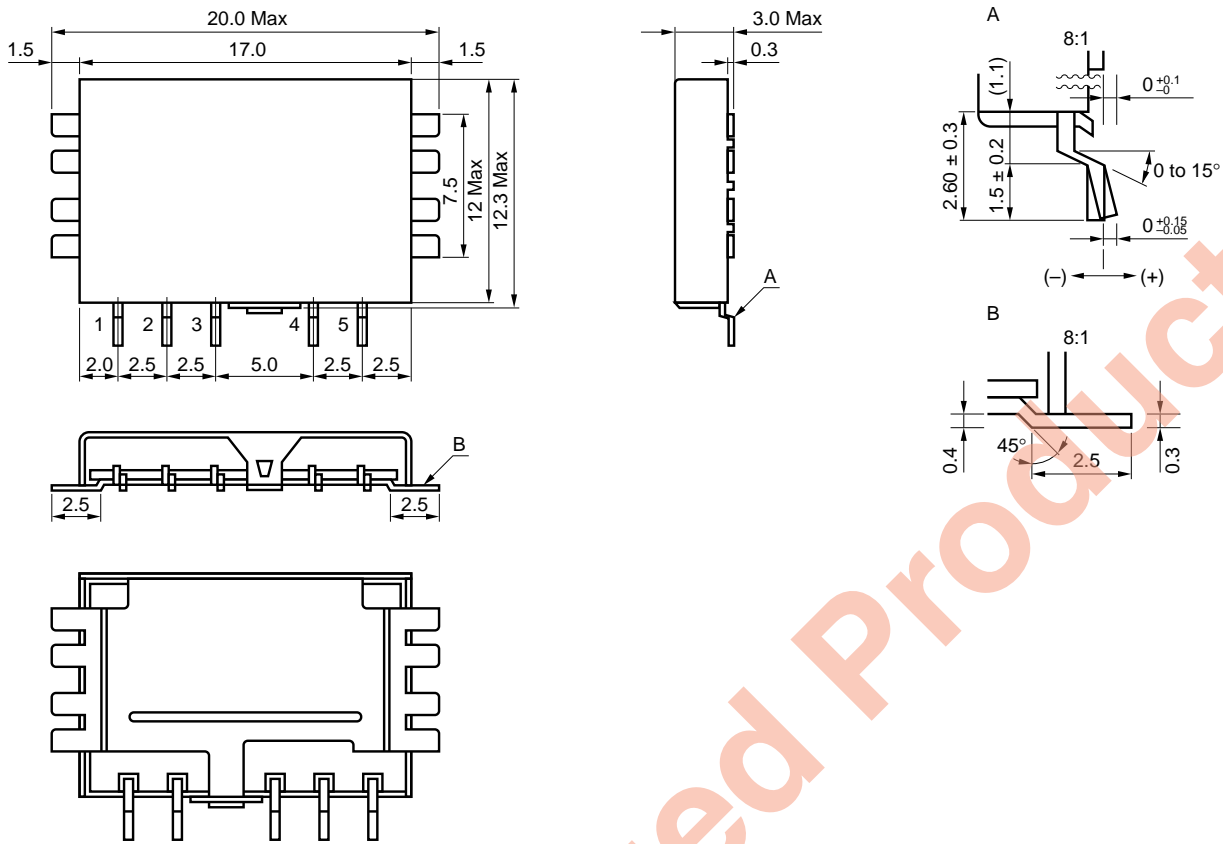
ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, T<sub>c</sub> = 25 °C, Z<sub>s</sub> = Z<sub>L</sub> = 50 Ω, Using NEC standard test fixture.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Frequency	f		872		905	MHz
Output Power 1	P <sub>out1</sub>	P <sub>in</sub> = +8 dBm V <sub>DD1</sub> = V <sub>DD2</sub> = 4.6 V, V <sub>GG</sub> = -3.3 V	+30.0	+30.8		dBm
Output Power 2	P <sub>out2</sub>	P <sub>in</sub> = +8 dBm V <sub>DD1</sub> = V <sub>DD2</sub> = 4.2 V, V <sub>GG</sub> = -3.3 V		+29.0		dBm
Total Current	I <sub>DD</sub>	I <sub>DD</sub> = I <sub>DD1</sub> + I <sub>DD2</sub> P <sub>in</sub> = +8 dBm		410	460	mA
Harmonics	2, 3, 4 f <sub>0</sub>	P <sub>out</sub> = +30.0 dBm V <sub>DD1</sub> = Controlled = 4.6 V max. V <sub>DD2</sub> = 4.6 V			-30	dBc
Input VSWR	-	V <sub>GG</sub> = -3.3 V			3:1	-
Gate Current	I <sub>GG</sub>	P <sub>in</sub> = None V <sub>DD1</sub> = V <sub>DD2</sub> = 4.6 V, V <sub>GG</sub> = -3.3 V	-3.0	-1.2	0	mA
Damage Withstanding	-	P <sub>in</sub> = +8 dBm, P <sub>out</sub> = +30.0 dBm Z <sub>s</sub> = 50 Ω, V <sub>GG</sub> = -3.3 V V <sub>DD1</sub> = 0 to 8.0 V, V <sub>DD1</sub> ≤ V <sub>DD2</sub> V <sub>DD2</sub> = 4.0 to 8.0 V, LOAD VSWR = 20 : 1, ALL PHASE LOAD TIME 30 sec	No damage is allowed			



0.6 cc (M1A) PACKAGE DIMENSIONS (Unit : mm)



**PIN CONNECTIONS**

1. P<sub>in</sub>
2. V<sub>GG</sub>
3. V<sub>DD1</sub>
4. V<sub>DD2</sub>
5. P<sub>out</sub>

**Note** Lead dimensions : 0.25 × 0.5  
 Tolerance of lead pitch : ±0.3  
 Unless otherwise specified tolerance : ±0.3

Discontinued Product

**NOTE ON CORRECT USE**

- (1) Form the ground pattern as wide as possible to minimize ground impedance.  
(to prevent undesired oscillation)

All the ground pins must be connected together with wide ground pattern to decrease impedance difference.

**RECOMMENDED SOLDERING CONDITION**

This product should be soldered in the following recommended condition. Other soldering methods and conditions than the recommended conditions are to be consulted with our sales representatives.

Soldering method	Soldering conditions	Recommended condition symbol
Pin part heating	Pin area temperature : less than 260 °C Hour : within 10 sec./pin.	

For details of recommended soldering conditions, please contact your local NEC sales office.

Discontinued Product

[MEMO]

**Discontinued Product**

[MEMO]

Discontinued Product

## Caution

**The Great Care must be taken in dealing with the devices in this guide.  
The reason is that the material of the devices is GaAs (Gallium Arsenide), which is designated as harmful substance according to the law concerned.  
Keep the law concerned and so on, especially in case of removal.**

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NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

**Standard:** Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

**Special:** Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

**Specific:** Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.