

R.W.008

PA Module for Dual-band GSM900 and DCS1800 Applications

The RM008 is a dual-band Power Amplifier Module (PAM) designed in a compact form factor for Class 4 GSM900 and Class 1 DCS1800 operation.

The PAM consists of two Gallium Arsenide (GaAs) Heterojunction Bipolar Transistor (HBT) power amplifiers and internal components that match the RF input and output ports to 50 ohms, which reduces the number of external components for a dual-band design. Optimized for lithium-ion battery operation, both PAs share common power supply pins to distribute current. The RM008 dual PAM has extremely low standby current, which maximizes handset standby time.

A block diagram of the RM008 is shown below. The Analog Power Control (APC) pins (GSM APC and DCS APC), control output power level. Table 4 of this data sheet shows the complete signal pin assignments and descriptions of the RM008 dual-band Power Amplifier Module.

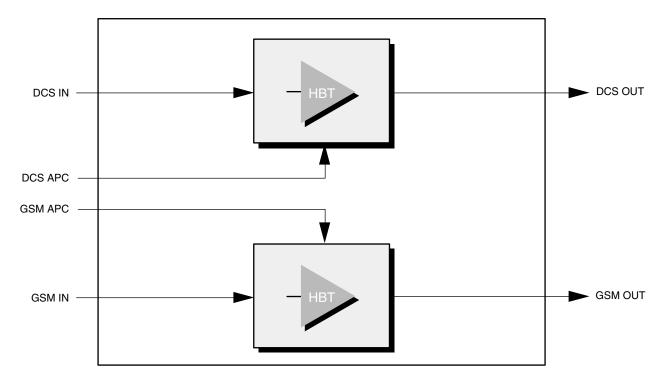
Distinguishing Features

- · High efficiency **GSM 50%** DCS 45%
- Input and output matching 50 ohms internal
- Small outline 9.1 mm x 11.61 mm
- Low profile 1.64 mm

Applications

Class 4 GSM900 and Class 1 DCS1800 dual-band cellular handsets

Functional Block Diagram



www.DataSheet4

Electrical Characteristics

The following tables list the electrical characteristics of the RM008 Power Amplifier. Table 1 depicts the absolute maximum ratings and Table 2 specifies the recommended operating conditions to achieve the performance specifications in Table 3.

Table 1. Absolute Maximum Ratings

Parameter	Minimum	Maximum	Units	
Supply Voltage (Vcc)	_	7	V	
Storage Temperature	- 55	+125	°C	

Table 2. Recommended Operating Conditions

Parameter	Minimum	Typical	Maximum	Units
Supply Voltage (Vcc)	2.9	3.3	4.6	V
Temperature	-30	_	+85	°C

Table 3. Electrical Specifications for Nominal Operating Conditions (1 of 2)

Parameter	Test Conditions	Symbol	Minimum	Typical	Maximum	Units	
GSM Mode (f = 880–915 MHz and P _{IN} = 8 to 13 dBm)							
Frequency Range	_	f1	880	_	915	MHz	
Input Power	_	Pingsm	8	10	13	dBm	
Control Voltage Range	VGSMAPC	VAPC	0.2	_	2.5	V	
Control Current Into VAPC	trol Current Into Vapc —		_	40	70	mA	
Leakage Current	Vcc = 4.6 V VAPC = 0 V	I _{LEAKAGE}	_	_	25	μА	
Efficiency	ciency PINGSM = 10 dBm PoutgsM = 34 dBm		_	50	_	%	
2nd Harmonic Distortion Poutgsm = 34.5 dBm		H _{2GSM}	_	_	- 5	dBm	
3rd-7th Harmonic Distortion Poutgsm = 34.5 dBm		H3-H7	_	_	-7	dBm	
Output Power	Pingsm = 10 dBm	Роитсям	34.0	34.5	_	dBm	
	PINGSM = 10 dBm Vcc = 2.9 V TCASE = -30 °C to +85 °C	Poutdcs	32.5	33.0	_	dBm	
Input VSWR	All	VSWR _(IN)	_	1.5:1	2:1	_	

RM008 Electrical Characteristics

PA Module for Dual-band GSM900 and DCS1800 Applications

Table 3. Electrical Specifications for Nominal Operating Conditions (2 of 2)

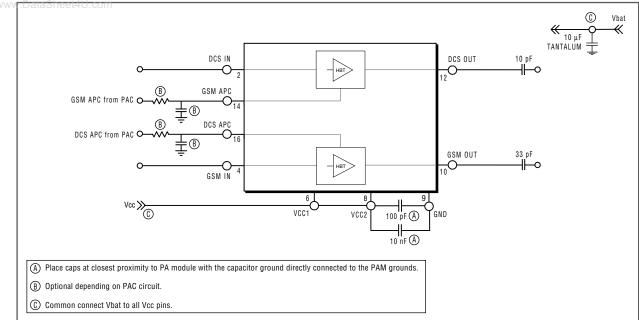
DataSheet41 Loom Parameter	Test Conditions	Symbol	Minimum	Typical	Maximum	Units
Isolation	PINGSM = 10 dBm APC = 0.5 V	_	_	_	-30	dBm
Stability Condition VSWR(load) (no spurious oscillation > -35 dBm)			_	_	8:1 all angles	_
Load Mismatch VSWR(load) (no damage/degradation)	_	_	_	_	10:1 all angles	_
Noise Floor	PINGSM = 10 dBm BW = 100 kHz fo ±20 MHz offset	_	_	_	-85	dBm
Full Power Control Voltage	Роитдям = 34.5 dBm	_	_	2.0	_	_
DI	CS Mode (f = 1710–1785 N	/IHz and P _{IN} =	= 6 to 11 dBm)		
Frequency Range	_	f2	1710	_	1785	MHz
Input Power	_	PINDCS	6	8.0	11	dBm
Control Voltage Range	VDCSAPC	Vapc	0.2	_	2.5	٧
Control Current Into VAPC	_	I _{DCSAPC}	_	30	70	mA
Leakage Current	Vcc = 4.6 V VAPC = 0 V	I _{LEAKAGE}	_	_	25	μА
Efficiency	PINDCS = 8 dBm POUTDCS = 32 dBm	η _{DCS}	η _{DCS} —		_	%
2nd Harmonic Distortion	Роитосs = 32.5 dBm	H _{2DCS}	_	_	-7	dBm
3rd–7th Harmonic Distortion	Роитосs = 32.5 dBm	H3–H7	_	_	-7	dBm
Output Power	Pindcs = 8 dBm	Роитосѕ	32.0	32.5	_	dBm
	PINDCS = 8 dBm Vcc = 2.9 V TCASE = -30 °C to +85 °C	Poutdcs	30.5	31.0	_	dBm
Input VSWR	All	VSWR _(IN)	_	1.5:1	2:1	
Isolation	PINDCS = 8 dBm APC = 0.5 V	_	_	_	-35	dBm
Stability Condition VSWR (load) no spurious oscillation > -35 dBm)	_	_	_	_	8:1 all angles	_
Load Mismatch VSWR(load) (no damage/degradation)	_	_	_	_	10:1 all angles	_
Noise Floor DCS1800	PINDCS = 8 dBm BW = 100 kHz fo ±20 MHz offset	_	_	_	-77	dBm
Full Power Control Voltage	Роитосs = 32.5 dBm	_	_	2.0	_	_

NOTE(S): TCASE = 25 °C, RL = 50Ω , pulsed operation with pulse width = 577 µsec and duty cycle of 1:8, Vcc = 3.3 V unless specified otherwise

Electrical Characteristics RM008

PA Module for Dual-band GSM900 and DCS1800 Applications

Figure 1. Typical RM008 PAM Application



www.DataSheet4

Package Dimensions and Pin Descriptions

Figure 2 provides the package dimensions for the 16-pin RM008 leadless MCM. Figure 3 shows the device pin configuration and Table 4 lists the pins and signal descriptions.

Figure 2. RM008 Package Dimensions—16-pin PAM (All Views)

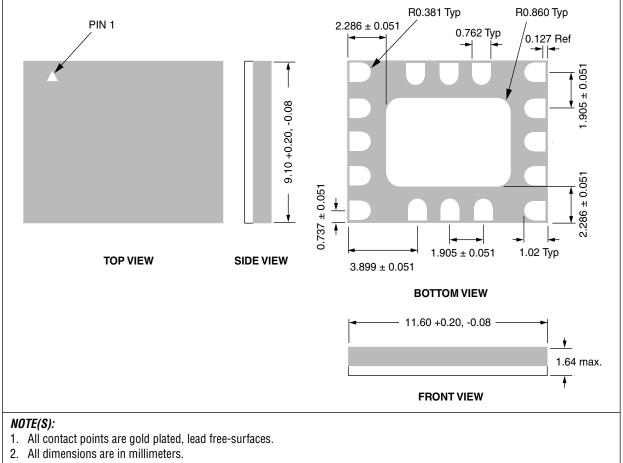


Figure 3. RM008 Pin Configuration-16-Pin Leadless PAM (Top View)



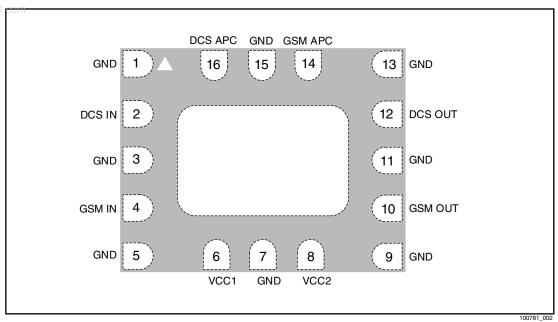


Table 4. RM008 Pin and Signal Descriptions

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	GND	Ground	9	GND	Ground
2	DCS IN	RF input to DCS PA	10	GSM OUT	GSM RF output (DC coupled)
3	GND	Ground	11	GND	Ground
4	GSM IN	RF input to GSM PA	12	DCS OUT	DCS RF output (DC coupled)
5	GND	Ground	13	GND	Ground
6	VCC2	Power supply for PA driver stages	14	GSM APC	GSM analog power control
7	GND	Ground	15	GND	Ground
8	VCC2	Power supply for PA output stages	16	DCS APC	DCS analog power control

www.DataSheet4

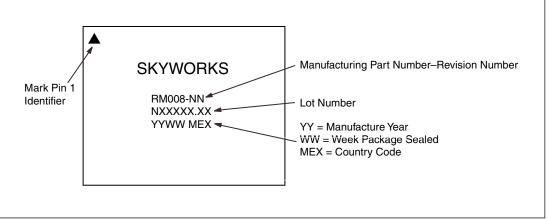
Package and Handling Information

Because of its sensitivity to moisture absorption, this device package is baked and vacuum packed prior to shipment. Instructions on the shipping container label must be followed regarding exposure to moisture after the container seal is broken, otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The RM008 is capable of withstanding an MSL 3/240 °C solder reflow. Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment. If the part is attached in a reflow oven, the temperature ramp rate should not exceed 5 °C per second; maximum temperature should not exceed 240 °C. If the part is manually attached, precaution should be taken to insure that the part is not subjected to temperatures exceeding 240 °C for more than 10 seconds.

For details on both attachment techniques, precautions, and handling procedures recommended by Skyworks, please refer to *Application Note: PCB Design and SMT Assembly/Rework, Document Number 101752*. Additional information on standard SMT reflow profiles can also be found in the *JEDEC Standard J–STD–020A*.

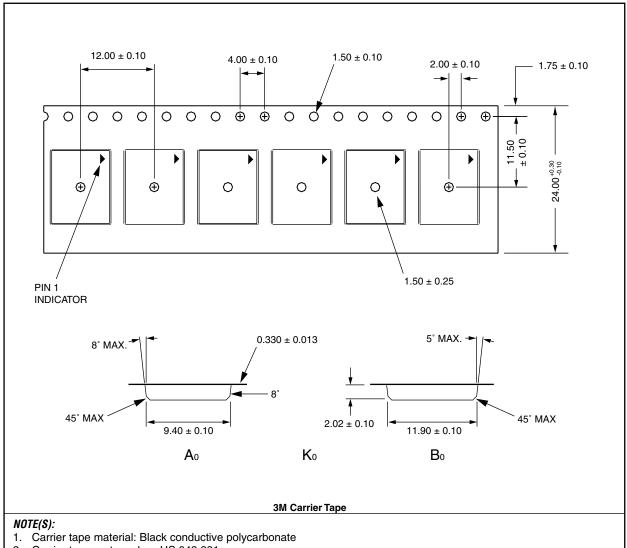
Figure 4. Typical Case Markings



100781_006

Production quantities of this product are shipped in the standard tape and reel format illustrated in www.DataSheet4UFigure 5.

Figure 5. RM008 Tape and Reel - 9.1 mm x 11.6 mm



- 2. Carrier tape part number: US 042 281
- 3. Cover tape material: Conductive Pressure Sensitive Adhesive (PSA)
- 4. Cover tape width: 21.3 mm
- 5. Number of parts per 330 mm (diameter) x 24 mm reel: 2000
- 6. All diagram dimensions in millimeters

100781_005

www.DataSheet41

Electrostatic Discharge Sensitivity

The RM008 is a Class I device. Figure 6 lists the Electrostatic Discharge (ESD) immunity level for each pin of the RM008 product. The numbers in Figure 6 specify the ESD threshold level for each pin where the I-V curve between the pin and ground starts to show degradation. The ESD testing was performed in compliance with MIL-STD-883E Method 3015.7 using the Human Body Model. Since 2000 volts represents the maximum measurement limit of the test equipment used, pins marked > 2000 V pass 2000V ESD stress.

> +2000 V > +2000 V< -2000 V< -2000 VGND GSM APC DCS APC 13 14 **GND** 16 **GND** > +2000 V > +2000 V DCS IN 12 DCS OUT < -2000 VRM008 GND 11 GND > +2000 V $+600~\mathrm{V}_{\mathrm{GSM~IN}}$ GSM OUT < -2000 V10 -1650 V 5 7 6 8 GND 9 GND

Figure 6. ESD Sensitivity Ares (Top View)

100781_007

Various failure criteria can be utilized when performing ESD testing. Many vendors employ relaxed ESD failure standards which fail devices only after "the pin fails the electrical specification limits" or "the pin becomes completely non-functional". Skyworks employs most stringent criteria, fails devices as soon as the pin begins to show any degradation on a curve tracer.

GND

VCC2

< -2000 V

+2000 V

To avoid ESD damage, both latent and visible, it is very important that the product assembly and test areas follow the Class-1 ESD handling precautions listed in Table 5.

Table 5. Precautions for GaAs ICs with ESD Thresholds Greater Than 200 V But Less Than 2000 V

VCC1

> +2000 V

< -2000 V

Personnel Grounding Wrist Straps Conductive Smocks, Gloves and Finger Cots Antistatic ID Badges	Facility Relative Humidity Control and Air Ionizers Dissipative Floors (less than $10^9~\Omega$ to GND)
Protective Workstation Dissipative Table Tops Protective Test Equipment (Properly Grounded) Grounded Tip Soldering Irons Conductive Solder Suckers Static Sensors	Protective Packaging & Transportation Bags and Pouches (Faraday Shield) Protective Tote Boxes (Conductive Static Shielding) Protective Trays Grounded Carts Protective Work Order Holders

www.DataSheet4U.com

Ordering Information

www.DataSheet4U.com

Model Number	Manufacturing Part Number	Product Revision	Package	Operating Temperature
RM008	RM008-23	23		−30 °C to +85 °C

Revision History

Revision	Level	Date	Description
А		October 1999	Initial Release
В		October 2000	Revise: Table 4; Figure 4
С		May 2001	Revise: Converted to standard format; Figure 1 Add: ESD data; Packaging and Handling Information
D		July 26, 2002	Revise: Part Number to RM008–23; ESD data, Package and Handling Add: New Figure 5

References

Application Note: PCB Design and SMT Assembly/Rework, Document Number 101752 JEDEC Standard J-STD-020A.

© 1999-2002, Skyworks Solutions, Inc. All Rights Reserved.

Information in this document is provided in connection with Skyworks Solutions, Inc. ("Skyworks") products. These materials are provided by Skyworks as a service to its customers and may be used for informational purposes only. Skyworks assumes no responsibility for errors or omissions in these materials. Skyworks may make changes to its products, specifications and product descriptions at any time, without notice. Skyworks makes no commitment to update the information and shall have no responsibility whatsoever for conflicts, incompatibilities, or other difficulties arising from future changes to its products and product descriptions.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as may be provided in Skyworks' Terms and Conditions of Sale for such products, Skyworks assumes no liability whatsoever.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF SKYWORKS™ PRODUCTS INCLUDING WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, PERFORMANCE, QUALITY OR NON-INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. SKYWORKS FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. SKYWORKS SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS THAT MAY RESULT FROM THE USE OF THESE MATERIALS.

SkyworksTM products are not intended for use in medical, lifesaving or life-sustaining applications. Skyworks' customers using or selling SkyworksTM products for use in such applications do so at their own risk and agree to fully indemnify Skyworks for any damages resulting from such improper use or sale.

The following are trademarks of Skyworks Solutions, Inc.: Skyworks™, the Skyworks symbol, and "Breakthrough Simplicity"™. Product names or services listed in this publication are for identification purposes only, and may be trademarks of third parties. Third-party brands and names are the property of their respective owners.

Additional information, posted at www.skyworksinc.com, is incorporated by reference.

General Information: Skyworks Solutions, Inc. 4311 Jamboree Rd. Newport Beach, CA. 92660-3007 www.skyworksinc.com

