

BiCMOS INTEGRATED CIRCUIT μ PC2807,2807A

PREAMPLIFIER FOR INFRARED REMOTE CONTROLLER

DESCRIPTION

The μ PC2807 and 2807A are semiconductors integrated circuit developed as preamplifiers for the receiver module of infrared remote controllers. These preamplifiers can be directly connected to a PIN photodiode, and integrate a high-gain first stage amplifier, limiter, bandpass filter, detector circuit, and waveform-shaping circuit on a single chip.

FEATURES

- Only PIN photodiode required as an external component.
- Following carrier frequencies (f_0) selectable (five types):
- ★ μ PC2807 : $f_0 = 32.7, 36.0, 36.7, 37.9$ kHz
- ★ μ PC2807A : $f_0 = 40.0$ kHz
- Fixed trap frequency
- ★ $f_T = 54$ kHz
- Active-low output
- Supplied in form of wafer

APPLICATION

- Receiver module of infrared remote controller

ORDERING INFORMATION

Part Number	Condition in shipment
μ PC2807W	Wafer
μ PC2807AW	Wafer

Contact an NEC sales representative in advance since a memorandum on product quality need to be prepared for shipment in the form of wafer.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

PAD FUNCTION

Symbol	Pad No.	Function
V _{CC}	6	Power pad. Apply a voltage of 5 V ± 10 %. Connect an external smoothing filter if noise on power line is high.
GND1	7	GND pad (for output transistor)
GND2	8	GND pad (for circuits excluding output transistor)
IN	9	Input pad. Internal impedance is 190 kΩ TYP. PIN photodiode can be directly connected.
OUT	5	Output pad. Open-collector output with pull-up resistor (22 kΩ TYP.) To connect pull-up resistor, use resistor of 10 kΩ or higher.
S1	1	BPF center frequency setting pads. Connect pad corresponding to carrier frequency to be used to GND ^{Note} .
S2	2	
S3	4	
PAD1	3	BPF output pad. Parameters such as voltage gain and BPF bandwidth can be tested. Do not connect this pad to anything on final assembly.
PAD3	10	Test and trimming pads. Do not connect these pads to anything.
PAD4	11	
PAD5	12	
PAD6	13	

Note Connect each of BPF center frequency setting pads as follows depending on the carrier frequency.

• μ PC2807

Carrier Frequency	S1	S2	S3
32.7 kHz	GND	Leave unconnected.	Leave unconnected.
36.0 kHz	GND	GND	GND
36.7 kHz	Leave unconnected.	GND	GND
37.9 kHz	Leave unconnected.	Leave unconnected.	Leave unconnected.



• μ PC2807A

Carrier Frequency	S1	S2	S3
40.0 kHz	Leave unconnected.	Leave unconnected.	Leave unconnected.

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings ($T_A = +25 \pm 3 \text{ }^\circ\text{C}$)

Parameter	Symbol	Ratings	Unit
Supply voltage	V_{CC}	5.5	V
Output sink current	I_{OSINK}	2.5	mA
Input voltage	V_{IN}	0 to V_{CC}	V
Storage temperature	T_{stg}	-40 to +125	$^\circ\text{C}$

Caution Product quality may suffer if the absolute maximum rating is exceeded even momentarily for any parameter. That is, the absolute maximum ratings are rated values at which the product is on the verge of suffering physical damage, and therefore the product must be used under conditions that ensure that the absolute maximum ratings are not exceeded.

Recommended Operating Conditions ($T_A = 25 \pm 3 \text{ }^\circ\text{C}$)

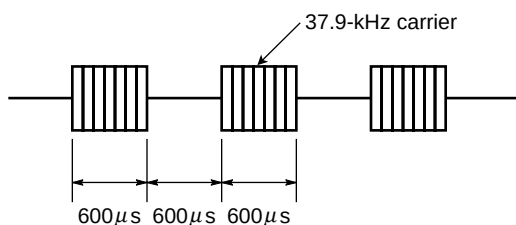
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{CC}		4.5	5.0	5.5	V
Operating ambient temperature	T_A		-25	+25	+80	$^\circ\text{C}$

Electrical Characteristics ($T_A = +25 \pm 3 \text{ }^\circ\text{C}$, $V_{CC} = 5 \text{ V}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
★ Circuit current	I_{CC}	With no signal applied. S1, S2, and S3: Leave unconnected.	1.1	1.5	1.9	mA
★ Low-level output voltage 1	V_{OL1}	Without external pull-up resistor	–	0.05	0.4	V
★ Low-level output voltage 2	V_{OL2}	With external 10-kΩ pull-up resistor connected	–	0.10	0.5	V
High-level output voltage	V_{OH}		4.8	5.0	–	V
★ Voltage gain 1 μ PC2807	A_{v1}	S1, S2, and S3: Leave unconnected., $V_{IN} = 30 \text{ dB } \mu\text{V}^{\text{Note1}}$, $f = 37.9 \text{ kHz}$	70	80	86	dB
★ Voltage gain 2 μ PC2807A	A_{v2}	S1, S2, and S3: Leave unconnected., $V_{IN} = 30 \text{ dB } \mu\text{V}^{\text{Note1}}$, $f = 40.0 \text{ kHz}$	72	82	88	dB
★ BPF bandwidth	f_{BW}	–3 dB bandwidth. S1, S2, S3: Leave unconnected., $V_{IN} = 30 \text{ dB } \mu\text{V}^{\text{Note1}}$	1.5	3.0	4.5	kHz
Output pulse width 1	t_{BW1}	S1, S2, and S3: Leave unconnected., $V_{IN} = 500 \mu\text{V}_{p-p}$, $f = 37.9 \text{ kHz}^{\text{Note3}}$, Burst length: $600 \mu\text{s}$, Cycle: $1.2 \text{ ms}^{\text{Note2}}$ Average value of output from start of signal input to 60th pulse	400	600	800	μs
Output pulse width 2	t_{PW2}	S1, S2, and S3: Leave unconnected., $V_{IN} = 50 \text{ mV}_{p-p}$, $f = 37.9 \text{ kHz}^{\text{Note3}}$, Burst length: $600 \mu\text{s}$, Cycle: $1.2 \text{ ms}^{\text{Note2}}$ Average value of output from start of signal input to 60th pulse	400	600	800	μs

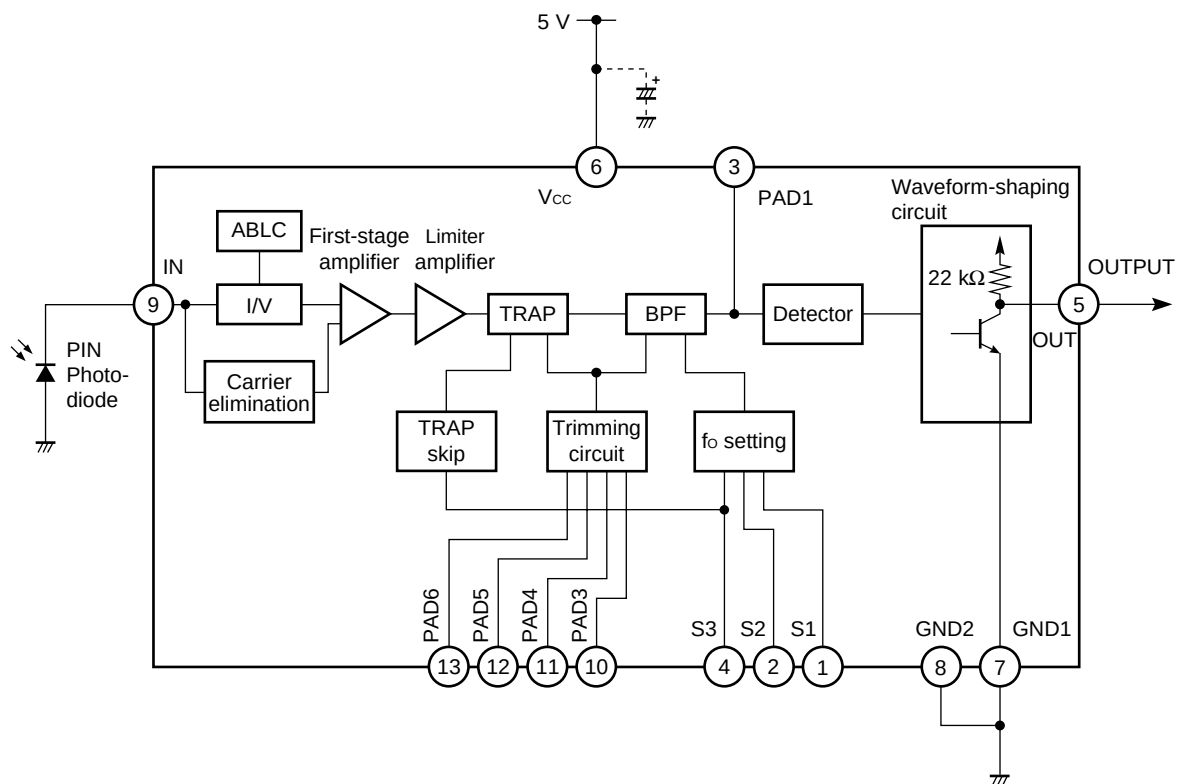
Notes 1. $30 \text{ dB } \mu\text{V} = 31.6 \mu\text{V}_{r.m.s.}$

2. Input the following burst signal.



★ 3. $f = 37.9 \text{ kHz}$ for the μ PC2807. In the μ PC2807A, measurement is at $f = 40.0 \text{ kHz}$.

APPLICATION CIRCUIT EXAMPLE (at carrier frequency of 37.9 kHz)



★ **Remark** $f = 37.9$ kHz for the μ PC2807. In the μ PC2807A, $f = 40.0$ kHz.

NOTES FOR BiCMOS DEVICES

① PRECAUTION AGAINST ESD FOR SEMICONDUCTORS

Note:

Strong electric field, when exposed to a device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Environmental control must be adequate. When it is dry, humidifier should be used. It is recommended to avoid using insulators that easily build static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work bench and floor should be grounded. The operator should be grounded using wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with semiconductor devices on it.

② HANDLING OF UNUSED INPUT PINS

Note:

No connection for device inputs can be cause of malfunction. If no connection is provided to the input pins, it is possible that an internal input level may be generated due to noise, etc., hence causing malfunction. Input levels of devices must be fixed high or low by using a pull-up or pull-down circuitry. Each unused pin should be connected to V_{DD} or GND with a resistor, if it is considered to have a possibility of being an output pin. All handling related to the unused pins must be judged device by device and related specifications governing the devices.

③ STATUS BEFORE INITIALIZATION OF BiCMOS DEVICES

Note:

Power-on does not necessarily define initial status of device. Production process of BiCMOS does not define the initial operation status of the device. Immediately after the power source is turned ON, the devices with reset function have not yet been initialized. Hence, power-on does not guarantee out-pin levels, I/O settings or contents of registers. Device is not initialized until the reset signal is received. Reset operation must be executed immediately after power-on for devices having reset function.

- **The information in this document is current as of May, 2000. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
 "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product 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": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.
 The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.
 (Note)
 (1) "NEC" as used in this statement means NEC Corporation and also includes its majority-owned subsidiaries.
 (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).