To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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

April 1st, 2010
Renesas Electronics Corporation

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

Send any inquiries to http://www.renesas.com/inquiry.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics 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 Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

   “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.

   “High Quality”: 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; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

DATA SHEET

BIPOLAR ANALOG INTEGRATED CIRCUITS

μPC8190K,μPC8191K

RX/TX-IF SiMMIC FOR W-CDMA

Phase-out/Discontinued

DESCRIPTION

The μPC8190K and μPC8191K are silicon monolithic integrated circuit designed as receiver (RX) and transmitter (TX) IF section for W-CDMA. The μPC8190K is a RX-IF IC including IF-AGC amplifier and demodulator. The μPC8191K is a TX-IF IC including IF-AGC amplifier and quadrature modulator. These two ICs are suitable for kit-use for W-CDMA IF section.

The ICs are developed using NEC's new ultra high speed silicon bipolar process.

FEATURES

- RX-IF: 380 MHz, TX-IF: 570 MHz
- Low power consumption
- Built-in power saving function
- Small size: 20-pin plastic QFN package (3.2 × 4.2 × 0.8 mm)

APPLICAION

- W-CDMA

ORDERING INFORMATION

Part Number	Package	Supplying Form
μPC8190K-E1	20-pin plastic QFN	• Embossed tape 12 mm wide.
μPC8191K-E1	(3.2 × 4.2 × 0.8 mm)	• Pin 1 indicates pull-out direction of tape
		• Qty 2.5 kpcs/reel

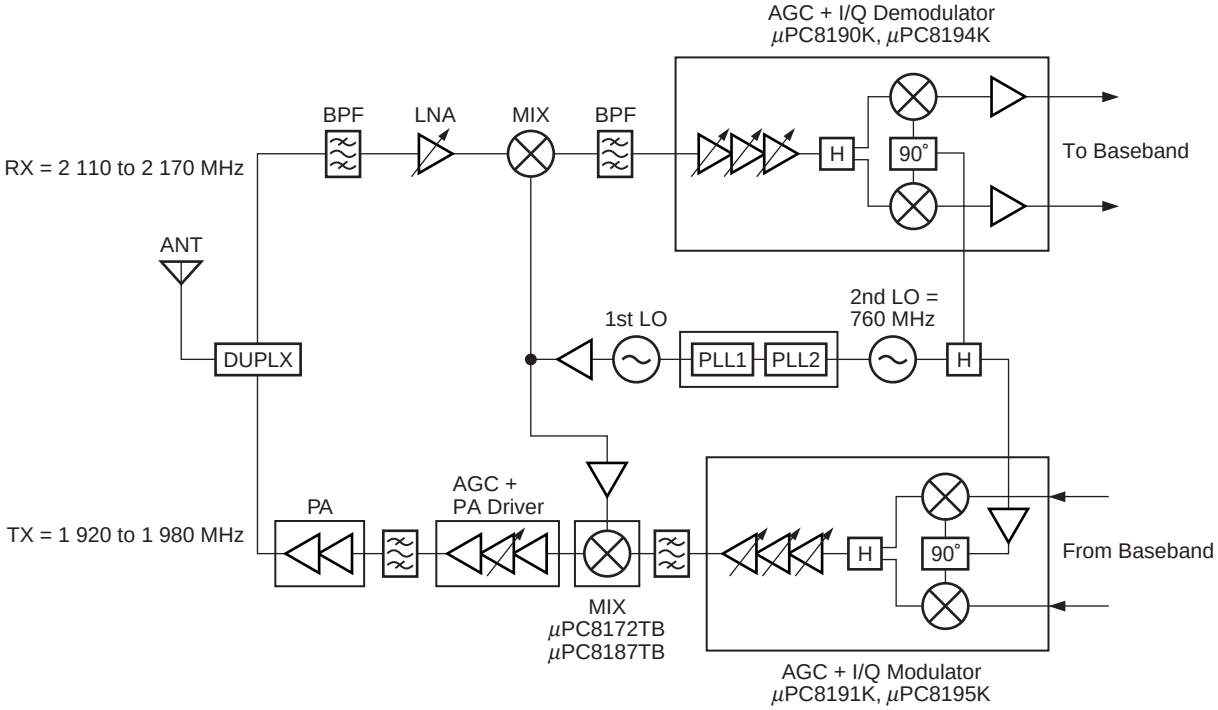
Remark To order evaluation samples, please contact your local NEC sales office.
Part number for sample order: μPC8190K, μPC8191K

Caution electro-static sensitive devices.

Document No. P15669EJ2V0DS00 (2nd edition)
Date Published August 2001 NS CP(K)
Printed in Japan

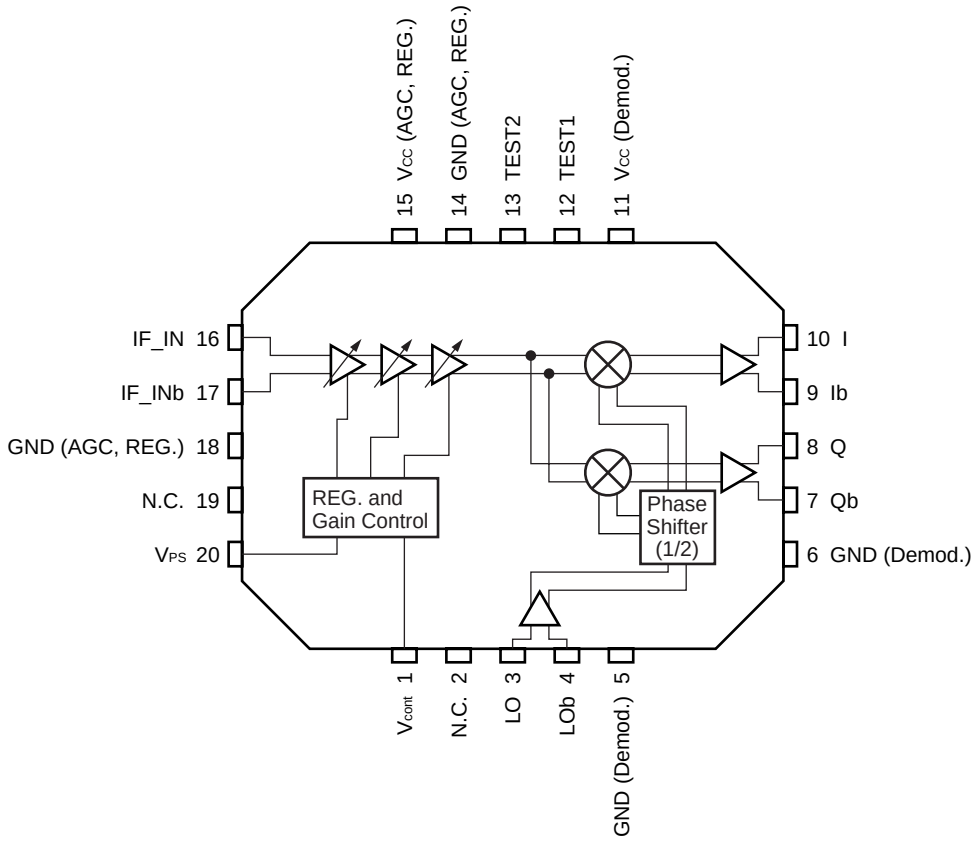
APPLICATION EXAMPLE

Variation of IF plan μPC8190K, μPC8191K: RX-IF = 380 MHz, TX-IF = 570 MHz
μPC8194K, μPC8195K: RX-IF = 190 MHz, TX-IF = 380 MHz

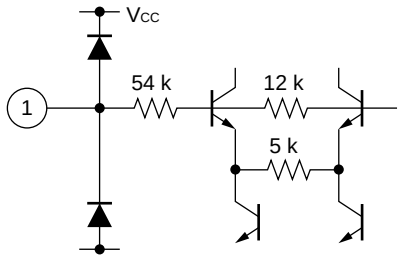
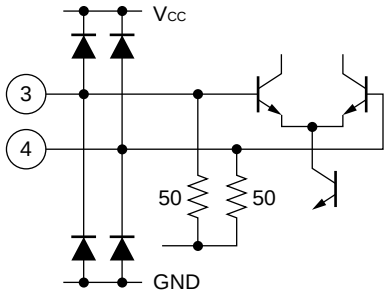
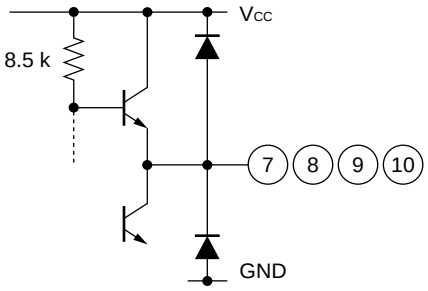


INTERNAL BLOCK DIAGRAM AND PIN CONFIGURATION – μPC8190K (RX) –

(Top View)

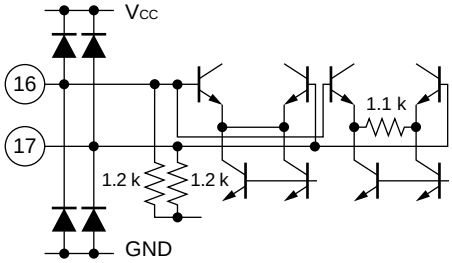
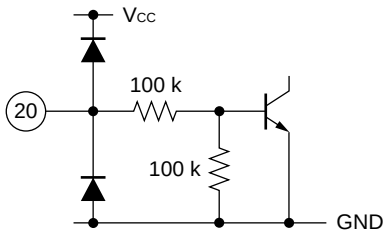


PIN EXPLANATIONS – μPC8190K (RX) –

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (TYP.) (V) Note	Functions and Applications	Internal Equivalent Circuits
1	V_{cont}	0 to 3.0	–	Gain cnotrol pin of AGC amplifier. Variable gains are available in accordance with applied voltage.	
2 19	N.C.	–	–	Non connection. This pin is not connected to internal circuit. This pin should be opened or grounded.	———
3	LO	–	–	Local signal input pin of I/Q demodulator. Input frequency is 760 MHz.	
4	LOb	–	–	Bypass pin of local signal input for I/Q demodulator. In the case of single local input, this pin must be decoupled with capacitor ex. 100 to 1 000 pF.	
5 6	GND (Demod.)	0	–	Ground pin of I/Q demodulator. This pin should be grounded with minimum inductance. Form the ground pattern as widely as possible to minimize ground impeadance.	———
7	Qb	–	–	I/Q/Ib/Qb signal output pins. Each pin is an emitter follower. Each of Ib and Qb is differential output of I and Q. Recommendable load impedance is 10 to 20 kΩ.	
8	Q	–	–		
9	Ib	–	–		
10	I	–	–		

Note Pin voltage is measured at V_{CC} = 3.0 V

– μPC8190K (RX) –

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (TYP.) (V) Note	Functions and Applications	Internal Equivalent Circuits
11	V_{CC} (Demod.)	2.7 to 3.3	–	Supply voltage pin of I/Q demodulator (phase shifter + I/Q Mixer).	———
12	TEST 1	0	–	TEST pin. In actual use, this pin should be grounded.	———
13	TEST 2	0	–		
14 18	GND (AGC, REG.)	0	–	Ground pin of AGC amplifier and internal regulator. This pin should be grounded with minimum inductance. Form the ground pattern as widely as possible to minimize ground impedance.	———
15	V_{CC} (AGC, REG.)	2.7 to 3.3	–	Supply voltage pin of AGC amplifier and internal regulator.	———
16	IF_IN	–	–	IF signal input pin. This pin is input of AGC amplifier. Balance input between 16, 17 pin. Input frequency is 380 MHz.	
17	IF_INb	–	–	IF signal input pin. In the case of signal local input, this pin must be decoupled with capacitor.	
20	V_{PS}	H: 2.2 to V_{CC} L: 0 to 0.5	–	Power saving pin. This pin modulator can control Active/Sleep state with bias as follows. V_{PS} (V): 0 to 0.5 – State: Sleep Mode V_{PS} (V): 2.2 to 3 – State: Active Mode	

Note Pin voltage is measured at V_{CC} = 3.0 V

ABSOLUTE MAXIMUM RATINGS – μPC8190K (RX) –

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{CC}	4.0	V
Applied Voltage	V_{PS}, V_{cont}	–0.3 to V_{CC} + 0.3	V
Operating Ambient Temperature	T_A	–40 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

RECOMMENDED OPERATING RANGE – μPC8190K (RX) –

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	2.7	3.0	3.3	V
Operating Ambient Temperature	T_A	–25	25	85	°C
IF Frequency	f_{IF}	–	380	–	MHz
Local Frequency	f_{LO}	–	760	–	MHz
Local Input Level	P_{LO}	–18	–15	–12	dBm

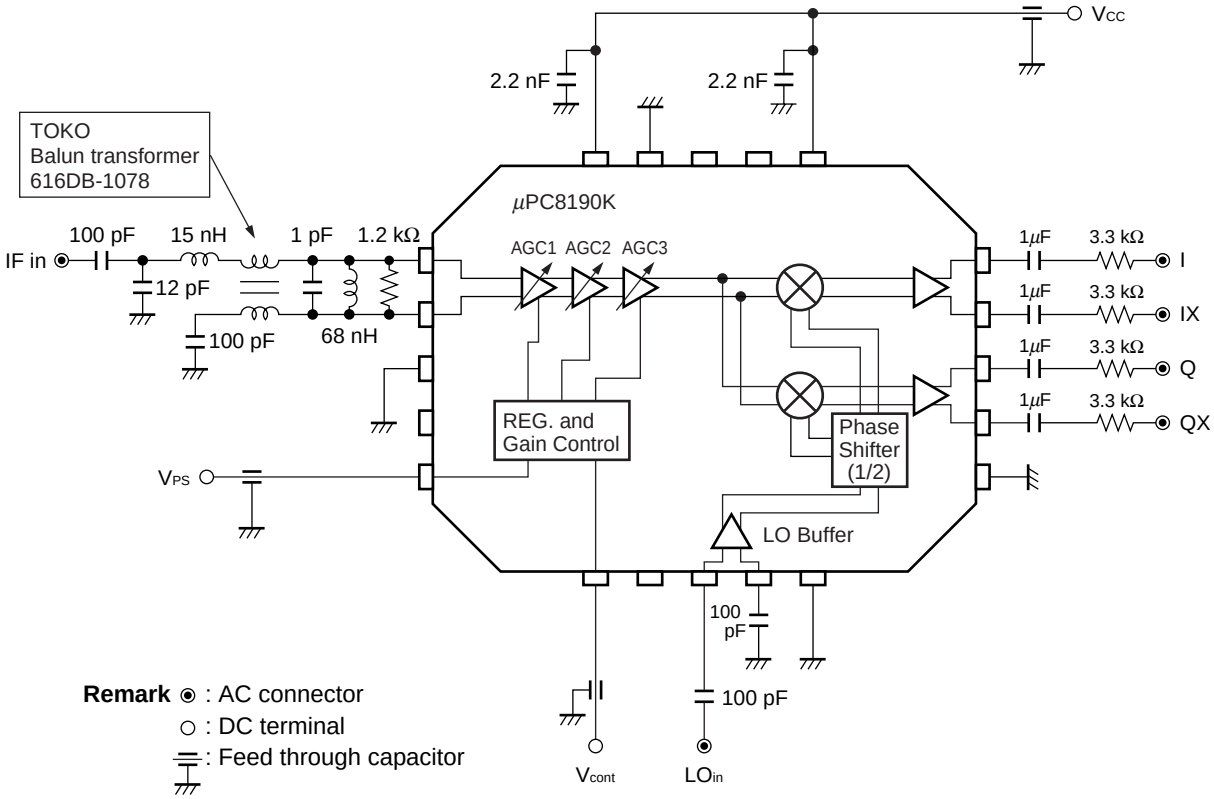
ELECTRICAL CHARACTERISTICS – μPC8190K (RX) – (Unless otherwise specified, V_{CC} = 3.0 V, T_A = +25°C, f_{IF} = 382.5 MHz, f_{LO} = 760 MHz, P_{LO} = –15 dBm, $f_{I/Q}$ = 2.5 MHz)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No input signal	–	9	12	mA
		At power-saving mode	–	–	1	μA
Voltage Gain	V_G1	V_{cont} = 2.5 V	68	77	–	dB
	V_G2	V_{cont} = 0.5 V	–	–20	–15	dB
Input 3rd Order Intercept Point	IIP_3	Gain = +65 dB (R_S= 600 Ω balanced), P_{IFin} = –70 dBm	–60	–55	–	dBm
		Gain = –10 dB (R_S= 600 Ω balanced), P_{IFin} = –10 dBm	0	3	–	dBm
Local Leakage	LOL	Leakage to I/Q port when local = 380 MHz and output = 30 mV_{P-P} balanced	–	–	–20	dBc
I/Q Bandwidth	$f_{I/Q}$	3 dB down	10	–	–	MHz
I/Q Maximum Output Swing	$V_{O\ (sat)}$	Balanced output	1	–	–	V_{P-P}
I/Q Gain Balance	AE	$f_{I/Q}$ = 2.5 MHz	–	–	Δ0.5	dB
I/Q Phase Error	PE	$f_{I/Q}$ = 2.5 MHz	–	–	±4	deg.
Gain Accuracy	Gacc	V_{cont} = 1 to 2 V	–	Δ4.6	Δ6	dB/V
Rise Time from Power-saving Mode	t_{PS}		–	–	20	μs
Rising Voltage from Power-saving Mode	$V_{PS\ on}$		2.2	–	–	V
Falling Voltage from Power-saving Mode	$V_{PS\ off}$		–	–	0.5	V
Gain Flatness	Flat	f_{IF} ± 2.5 MHz	–	–	Δ0.5	dB

STANDARD CHARACTERISTICS FOR REFERENCE – μPC8190K (RX) – (Unless otherwise specified, V_{CC} = 3.0 V, T_A = +25°C, f_{IF} = 382.5 MHz, f_{LO} = 760 MHz, P_{LO} = –15 dBm, $f_{I/Q}$ = 2.5 MHz)

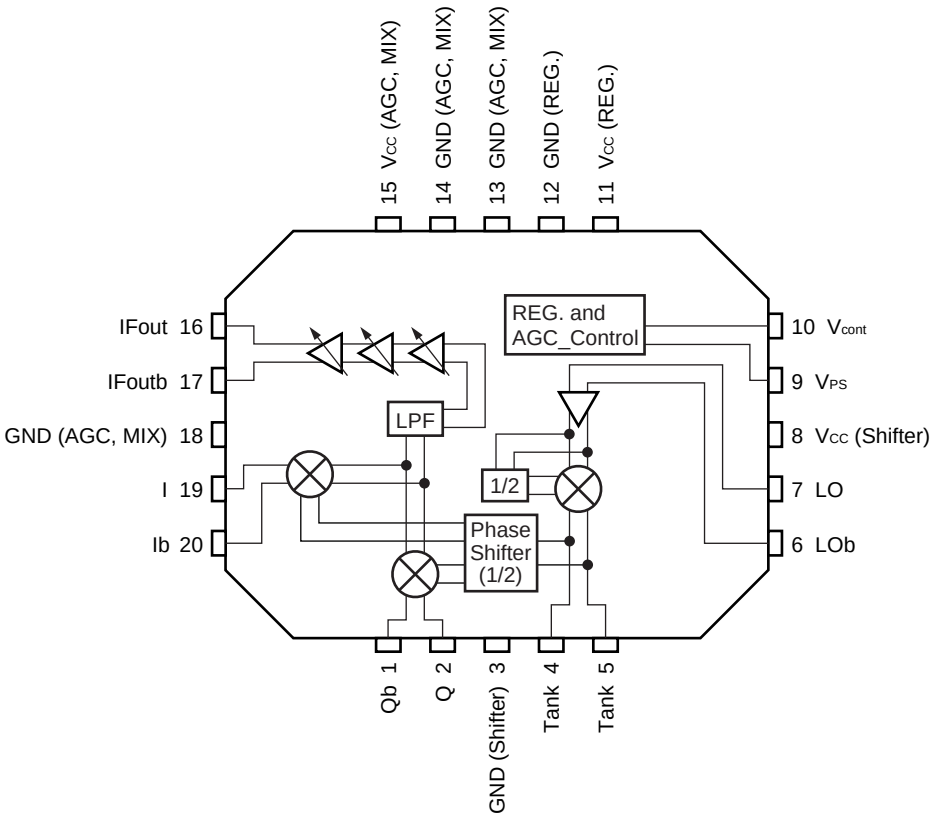
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Noise Figure	NF	Gain = +65 dB	–	9.5	12	dB
Error Vector Magnitude (Vector Error)	EVM	IF = 380 MHz, 3.84 Msps QPSK modulation, gain is adujsted	–	3	–	%rms
Gain 1 dB Compression Input Power	$P_{in\ (1\ dB)}$	Gain = +50 dB	–	–45	–	dBm

MEASUREMENT CIRCUIT – μPC8190K (RX) –

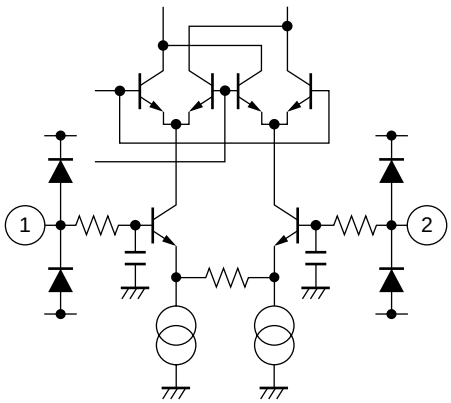
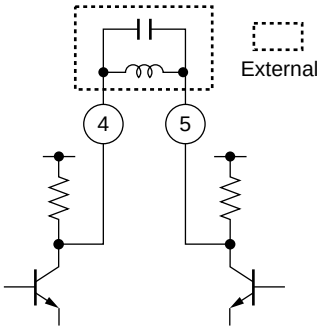
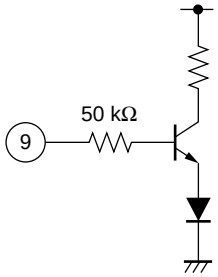


INTERNAL BLOCK DIAGRAM AND PIN CONFIGURATION – μPC8191K (TX) –

(Top View)

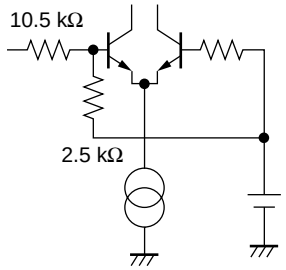
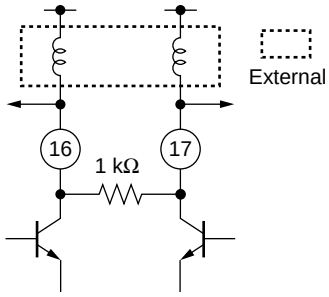
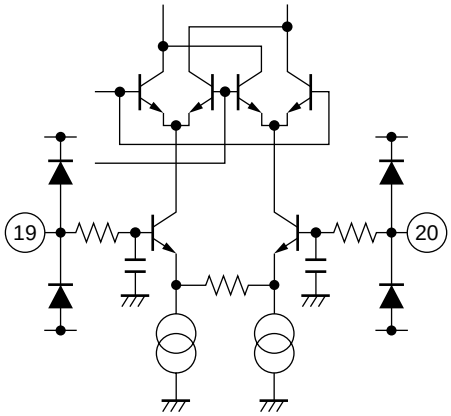


PIN EXPLANATIONS – μPC8191K (TX) –

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (TYP.) (V) Note	Functions and Applications	Internal Equivalent Circuits
1	Qb	V_{CC}/2	–	Q signal input pin. Apply bias voltage externally. Maximum balance input voltage is 1 000 mV_{P-P} (balance).	
2	Q	V_{CC}/2	–		
3	GND (Shifter)	0	–	Ground pin of I/Q modulator. This pin should be grounded with minimum inductance. Form the ground pattern as widely as possible to minimize ground impedance.	———
4 5	Tank	0	2.65	External inductor and capcitor can supress harmonics spurious of LO frequency. LC value should be determined according to LO input frequency and suppression level.	
6	LOb	0	2.02	Bypass pin of local signal inpu for I/Q modulator. In the case of single local input, this pin must be decoupled with capacitor ex. 1 000 pF.	———
7	LO	0	2.02	Local signal input of I/Q modulator. The DC cut capacitor ex. 1 000 pF must be attaced to this pin.	———
8	V_{CC} (Shifter)	2.7 to 3.3	–	Supply voltage pin of I/Q modulator.	———
9	V_{PS}	0 to 3.0	–	Power saving pin of I/Q modulator + AGC amplifier. This pin modulator can control Active/Sleep state with bias as follows. V_{PS} (V) / State: 0 to 0.5 – Sleep Mode; 2.2 to 3 – Active Mode	

Note Pin voltage is measured at V_{CC} = 2.85 V

– μPC8191K (TX) –

Pin No.	Pin Name	Applied Voltage (V)	Pin Voltage (TYP.) (V) Note	Functions and Applications	Internal Equivalent Circuits
10	V_{cont}	0 to 3.0	–	Gain control pin of AGC amplifier. Variable gains are available in accordance with applied voltage between 0 to 3.0 V.	
11	V_{CC} (REG.)	2.7 to 3.3	–	Supply voltage pin of internal regulator.	———
12	GND (REG.)	0	–	Ground pin internal regulator. This pin should be grounded with minimum inductance. Form the ground pattern as widely as possible to minimize ground impedance.	———
13 14 18	GND (AGC, MIX)	0	–	Ground pin of AGC amplifier + I/Q Mixer. This pin should be grounded with minimum inductance. Form the ground pattern as widely as possible to minimize ground impedance.	———
15	V_{CC} (AGC, MIX)	2.7 to 3.3	–	Supply voltage pin of AGC amplifier + I/Q Mixer.	———
16	IFout	2.7 to 3.3	–	IF output pin. The inductor must be attached between V_{CC} and output pin due to open collector. Output frequency is 570 MHz which is 3/4 of local signal frequency 760 MHz.	
17	IFoutb	2.7 to 3.3	–	Balance output of IFout pin. The inductor must be attached between V_{CC} and output pin due to open collector.	
19	I	$V_{CC}/2$	–	I signal input pin. Apply bias voltage externally. Maximum balance input voltage is 1 000 mV_{P-P} (balance).	
20	Ib	$V_{CC}/2$	–		

Note Pin voltage is measured at V_{CC} = 2.85 V

ABSOLUTE MAXIMUM RATINGS – μPC8191K (TX) –

Parameter	Symbol	Ratings	Unit
Supply Voltage	V_{CC}	4.0	V
Applied Voltage	V_{PS}, V_{cont}	–0.3 to V_{CC} + 0.3	V
Operating Ambient Temperature	T_A	–40 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

RECOMMENDED OPERATING RANGE – μPC8191K (TX) –

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}		2.7	3.0	3.3	V
Operating Ambient Temperature	T_A		–25	25	85	°C
IF Frequency	f_{IF}		–	570	–	MHz
Local Frequency	f_{LO}		–	760	–	MHz
Local Input Level	P_{LO}		–18	–15	–12	dBm
IF Output Impedance	Z_{IF}	Balance output internal resistance	–	1	–	kΩ
I/Q Maximum Input Voltage	$VI_{/Q}$	Balance input	–	0.4	1	V_{P-P}

ELECTRICAL CHARACTERISTICS – μPC8191K (TX) –

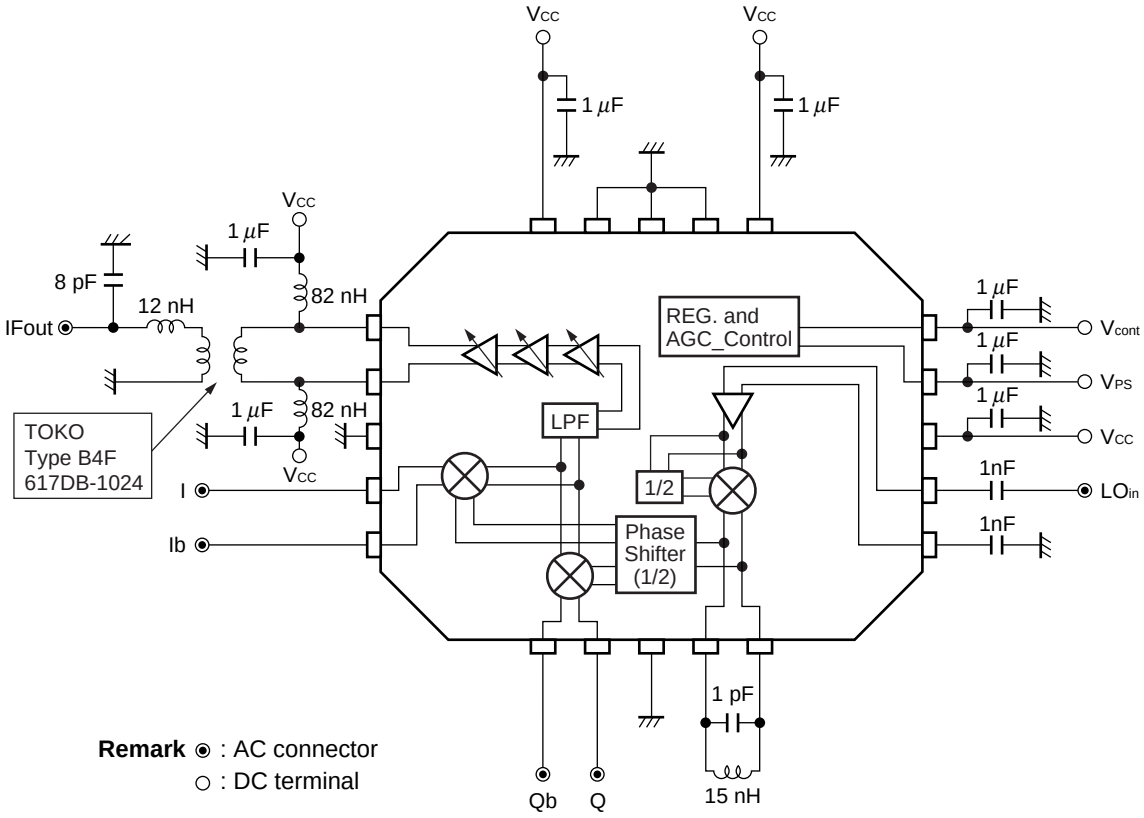
(Unless otherwise specified, V_{CC} = 3.0 V, T_A = +25°C, f_{IF} = 570 MHz, f_{LO} = 760 MHz, P_{LO} = –15 dBm, $f_{I/Q}$ = 10 kHz, 400 mV_{P-P} balanced sine-wave)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No input signal	–	30.5	38	mA
		At power-saving mode	–	0	1	μA
Output Power	P_{out}	V_{cont} = 2.3 V, I/Q = 400mV_{P-P} balanced	–17	–13	–	dBm
		V_{cont} = 0.3 V, I/Q = 400mV_{P-P} balanced	–	–93	–88	dBm
Local Leakage	LOL		–	–	–30	dBc
Image Rejection	ImR		–	–	–30	dBc
Output Harmonics 1	Hm1	Leakage when IF output = 190 MHz	–	–	–20	dBc
Output Harmonics 2	Hm2	Leakage when IF output = 380 MHz	–	–	–30	dBc
Rise Time from Power-saving Mode	t_{PS}		–	–	10	μs
Rising Voltage from Power-saving Mode	$V_{PS\ on}$		–	–	2.2	V
Falling Voltage from Power-saving Mode	$V_{PS\ off}$		0.5	–	–	V

STANDARD CHARACTERISTICS FOR REFERENCE – μPC8191K (TX) –
(Unless otherwise specified, V_{CC} = 3.0 V, T_A = +25°C, f_{IF} = 570 MHz, f_{LO} = 760 MHz, P_{LO} = –15 dBm, $f_{I/Q}$ = 10 kHz, 400 mV_{P-P} balanced sine-wave)

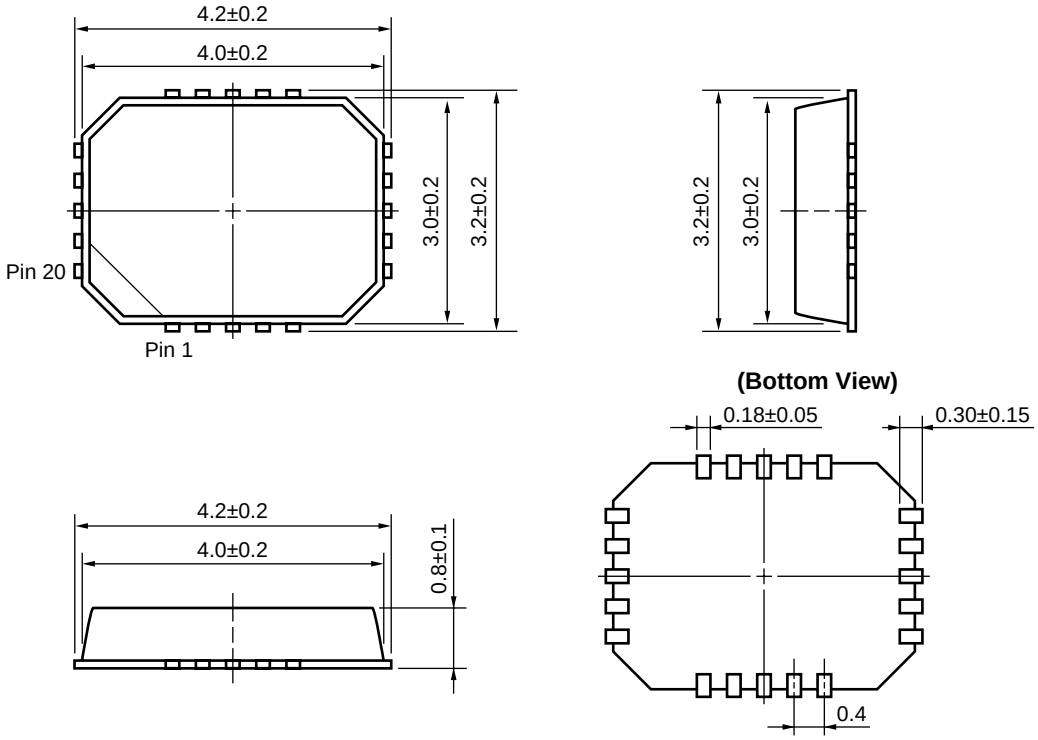
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Noise Level 1	NFL1	P_{out} = –25 dBm, f_{IF} ± 20 MHz	–	–148	–	dBm/Hz
Output Noise Level 2	NFL2	P_{out} = –65 dBm, f_{IF} ± 20 MHz	–	–162	–	dBm/Hz
Error Vector Magnitude (Vector Error)	EVM		–	3	–	%rms
Adjacent Channel Power	ACPR	f_{IF} ± 5 MHz	–	–55	–	dBc

MEASUREMENT CIRCUIT – μPC8191K (TX) –



PACKAGE DIMENSIONS

20-PIN PLASTIC QFN (PIN-PITCH: 0.4 mm, UNIT: mm)



NOTE ON CORRECT USE

(1) Observe precautions for handling because this IC is an electrostatic sensitive device.
(2) Form a ground pattern as widely as possible to minimize its impedance (to prevent undesires oscillation).
(3) Keep the track length of the ground pins as short as possible.
(4) Connect a bypass capacitor to the V_{CC} pin.

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235°C or below, Time: 30 seconds or less (at 210°C or higher), Count: 3 times or less, Exposure limit: None[Note]	IR35-00-3
VPS	Package peak temperature: 215°C or below, Time: 40 seconds or less (at 200°C or higher), Count: 3 times or less, Exposure limit: None[Note]	VP15-00-3
Partial Heating	Pin temperature: 300°C or below, Time: 3 seconds or less (per side of device), Exposure limit: None[Note]	–

Note After opening the dry pack, store it at 25°C or less and 65% RH or less for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

For the details the recommended soldering conditions, refer to the document **SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E)**.

[MEMO]

[MEMO]

[MEMO]

- **The information in this document is current as of August, 2001. 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).

M8E 00.4