DATA SHEET

NEC

Si ANALOG INTEGRATED CIRCUIT

μPC8218T5A

SILICON RF POWER AMPLIFIER IC FOR 1.9 GHz PHS

DESCRIPTION

The μPC8218T5A is a silicon monolithic integrated circuit designed for use as power amplifier 1.9 GHz PHS. This IC consists of three stage amplifiers as driver stage and final stage of power amplifier.

This device is packaged in surface mount 16-pin TSON (Thin Small Outline Non-leaded) plastic package.

FEATURES

- Output Power : P_{out} = +20.5 dBm MIN. @ P_{in} = −19 dBm, f = 1.9 GHz
- Operation Current : I_{op} = 150 mA TYP.
- Single Supply Voltage : V_{DS} = 3.0 V TYP.
- Suitable for High-density Surface Mounting : 16-pin Plastic TSON package (3.3 × 2.3 × 0.6 mm)

APPLICATION

- 1.9 GHz applications (Example : PHS etc.)

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPC8218T5A-E1	16-pin Plastic TSON	8218	• Embossed tape 12 mm wide • Pin 8, 9 face the perforation side of the tape • Qty 3 kpcs/reel

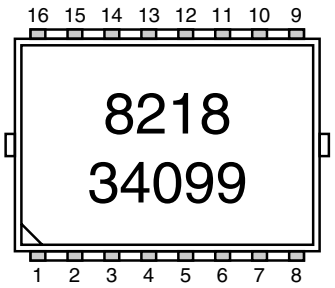
Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: μPC8218T5A

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

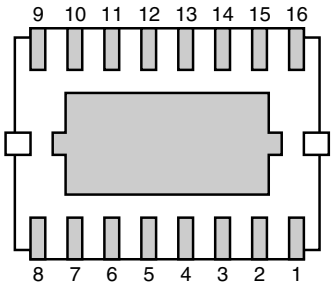
Document No. PU10480EJ01V0DS (1st edition)
Date Published November 2004 CP(K)
Printed in Japan

PIN CONNECTIONS

(Top View)

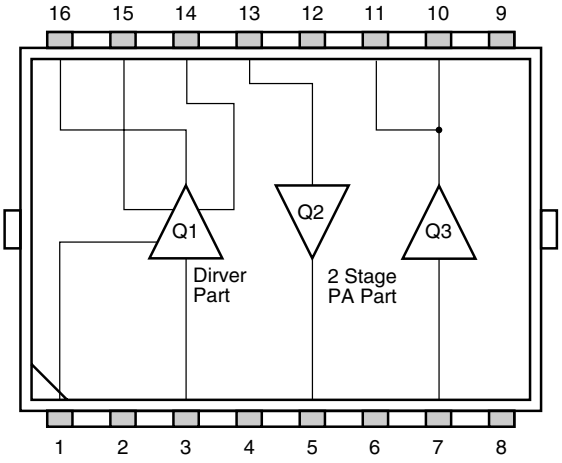


(Bottom View)



Pin No.	Pin Name
1	$V_{CC}1$
2	GND
3	INPUT1
4	GND
5	OUTPUT2
6	GND
7	INPUT3
8	NC
9	GND
10	OUTPUT3
11	OUTPUT3
12	GND
13	INPUT2
14	GND
15	GND
16	OUTPUT1

INTERNAL BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	Ratings	Unit
Operating Ambient Temperature	T_A		−40 to +85	°C
Storage Temperature	T_{stg}		−55 to +150	°C
Channel Temperature	T_{ch}		150	°C
Power Dissipation of Package	P_D	T_A = +85°C **Note**	4.33	W
Driver Part (Q1)				
Supply Voltage	V_{CC}		3.6	V
Circuit Current	$I_{CC}1$		60	mA
Maximum Input Power	$P_{in}1$		+10	dBm
2 Stage PA Part (Q2+Q3)				
Drain to Source Voltage	V_{DS}		8.0	V
Gate to Source Voltage	V_{GS}		8.0	V
Drain Current of Q2	$I_{DS}2$		45	mA
Drain Current of Q3	$I_{DS}3$		259	mA
Maximum Input Power to Q2	$P_{in}2$		+12	dBm
Maximum Input Power to Q3	$P_{in}3$		+16	dBm

Note Mounted on 33 × 21 × 0.4 mm epoxy glass PWB

RECOMMENDED OPERATING RANGE

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Operating Ambient Temperature	T_A		−40	+25	+85	°C
Driver Part (Q1)						
Supply Voltage	V_{CC}		2.7	3.0	3.3	V
2 Stage PA Part (Q2+Q3)						
Drain to Source Voltage	V_{DS}		2.7	3.0	3.5	V
Gate to Source Voltage	V_{GS}	T_A = +25°C	0	2.0	2.5	V
Maximum Input Power to Q2	$P_{in}2$	V_{DS} = 3 V, T_A = +25°C		2.0	5.0	dBm
Maximum Input Power to Q3	$P_{in}3$	V_{DS} = 3 V, T_A = +25°C		11.0	15.0	dBm

ELECTRICAL CHARACTERISTICS (f = 1.9 GHz, V_{CC} = V_{DS} = 3.0 V, T_A = +25°C, unless otherwise specified, using our standard test fixture)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
All Part (Driver Part + 2 Stage PA Part, Q1+Q2+Q3)						
Gate Voltage Adjusted Range	V_{GS}	P_{in} = –19 dBm, P_{out} = 20.5 dBm	1.2	1.8	2.3	V
Power Added Efficiency	η_{add}		–	25.0	–	%
Operation Current Consumption	I_{op}		–	150	175	mA
Input Return Loss	RL_{in}	P_{in} = –20 dBm	–	8	–	dB
Output Return Loss	RL_{out}		–	3	–	dB
Output Power	P_{out}	P_{in} = –19 dBm	20.5	–	–	dBm
Power Gain	G_P		39.5	–	–	dB
Liner Gain	G_L	P_{in} = –20 dBm	–	40.5	–	dB
Adjacent Channel Power 1	$P_{adj\ (600)}$	P_{in} = –19 dBm, ⊿600 kHz	–	–62	–55	dBc
	$P_{adj\ (900)}$	P_{in} = –19 dBm, ⊿900 kHz	–	–70	–60	dBc
Occupied Band Width	OBW	P_{in} = –19 dBm	–	250.0	270.0	kHz
2nd Harmonics Frequency Level	$2f_0$		–	–44	–	dBc
3rd Harmonics Frequency Level	$3f_0$		–	–60	–	dBc
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$		–	21.0	–	dBm
Driver Part (Q1)						
Circuit Current	I_{CC}	No RF Signal	–	23	–	mA
Power Gain	G_P	P_{in} = –30 dBm	–	21.0	–	dB
Isolarion	ISL		–	32.0	–	dB
Input Return Loss	RL_{in}		–	10.5	–	dB
Output Return Loss	RL_{out}		–	10.0	–	dB
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$		–	8.5	–	dBm
Saturated Output Power	$P_{O\ (sat)}$	P_{in} = –5 dBm	–	10.0	–	dBm

ELECTRICAL CHARACTERISTICS (f = 1.9 GHz, V_{CC} = V_{DS} = 3.0 V, T_A = +25°C, unless otherwise specified, using our standard test fixture)

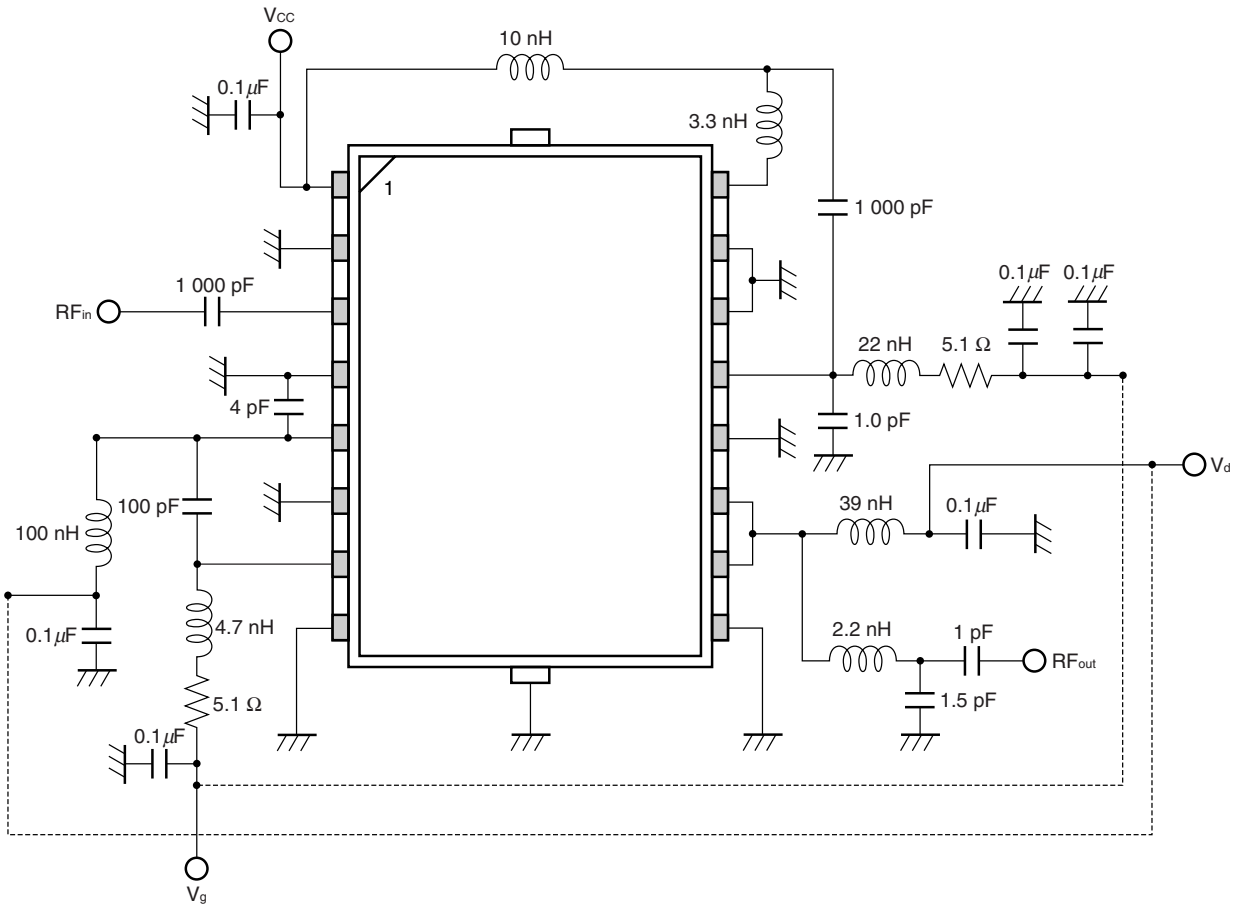
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
2 Stage PA Part (Q2+Q3)						
Gate Bias Voltage	V_{GS}	P_{in} = –5 dBm, P_{out} = –20.5 dBm	–	1.8	–	V
Power Added Efficiency	η_{add}		–	30.0	–	%
Drain Current	I_{DS} Note		–	121	–	mA
Input Return Loss	RL_{in}	P_{in} = –20 dBm	–	10.0	–	dB
Output Return Loss	RL_{out}		–	3	–	dB
Output Power	P_{out}	P_{in} = –5 dBm	–	21.0	–	dBm
Power Gain	G_P		–	26.0	–	dB
Linear Gain	G_L	P_{in} = –20 dBm	–	26.0	–	dB
Adjacent Channel Power 1	$P_{adj\ (600)}$	P_{in} = –5 dBm, ⊿600 kHz	–	–60	–	dBc
Adjacent Channel Power 1	$P_{adj\ (900)}$	P_{in} = –5 dBm, ⊿900 kHz	–	–70	–	dBc
Occupied Band Width	OBW	P_{in} = –5 dBm	–	250.0	–	kHz
2nd Harmonics Frequency Level	$2f_0$		–	–40	–	dBc
3rd Harmonics Frequency Level	$3f_0$		–	–45	–	dBc
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$		–	21.0	–	dBm

Note I_{DS} is total drain currents of Q2 and Q3 part

DC CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Driver Part (Q1)						
Collector Current	I_{CC}	V_{CC} = 3.0 V	–	23	30	mA
2 Stage PA Part (Q2)						
On-state Resistance 2	$R_{on}2$	V_{DS} = 0.1 V, V_{GS} = 6 V	–	4.35	–	Ω
Drain to Source Breakdown Voltage 2	$BV_{DSS}2$	I_{DS} = 1.4 μA	10.0	12.0	16.0	V
Gate to Source Breakdown Voltage 2	$BV_{GSS}2$	I_{GS} = 1.4 μA	6.0	11.5	16.0	V
Gate Threshold Voltage 2	$V_{th}2$	V_{DS} = 3.5 V, I_{DS} = 1.4 mA	1.15	1.40	1.65	V
Transconductance 2	g_m2	V_{DS} = 3.5 V, I_{DS} = 25 mA	50	70	–	mS
2 Stage PA Part (Q3)						
On-state Resistance 3	$R_{on}3$	V_{DS} = 0.1 V, V_{GS} = 6 V	–	1.02	–	Ω
Drain to Source Breakdown Voltage 3	$BV_{DSS}3$	I_{DS} = 8.0 μA	10.0	12.0	16.0	V
Gate to Source Breakdown Voltage 3	$BV_{GSS}3$	I_{GS} = 8.0 μA	6.0	11.5	16.0	V
Gate Threshold Voltage 3	$V_{th}3$	V_{DS} = 3.5 V, I_{DS} = 8.0 mA	1.15	1.40	1.65	V
Transconductance 3	g_m3	V_{DS} = 3.5 V, I_{DS} = 150 mA	290	370	–	mS

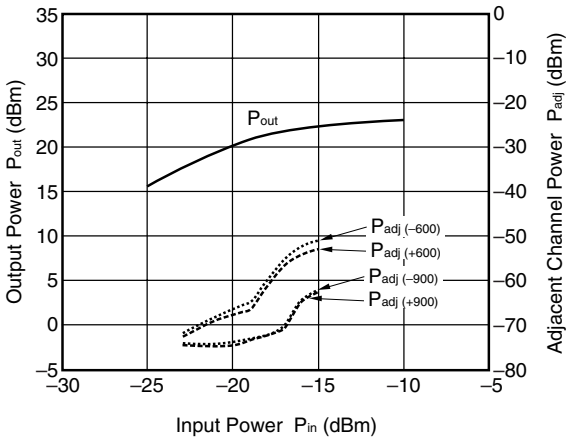
TEST CIRCUIT



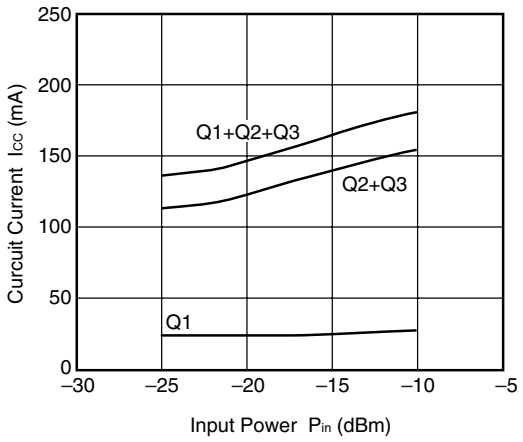
Remark Back Surface on GND

TYPICAL CHARACTERISTICS (f = 1.9 GHz, V_{DS} = V_{CC} = 3 V, T_A = +25°C , unless otherwise specified)

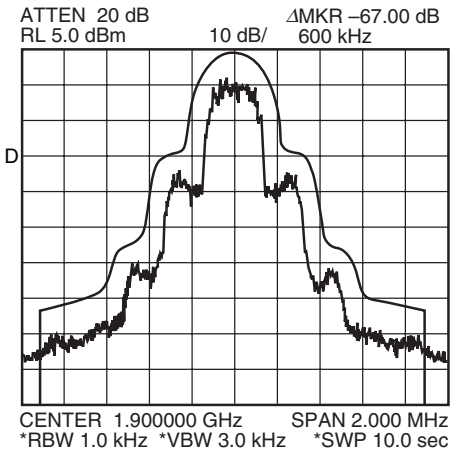
OUTPUT POWER, ADJACENT CHANNEL POWER vs. INPUT POWER



CURCUIT CURRENT vs. INPUT POWER



ADJACENT CHANNEL POWER

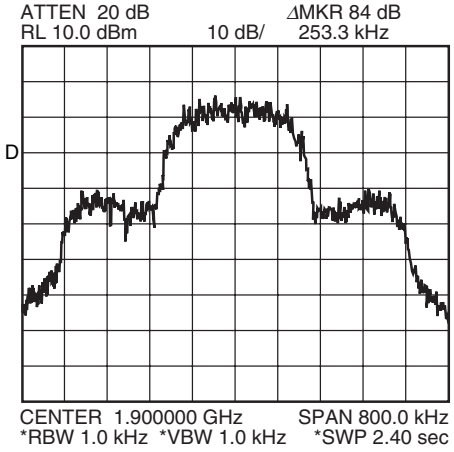


P_{out} = 20.5 dBm, P_{in} = –19 dBm
$P_{adj\ (+600\ kHz)}$ = –67.0 dBc
$P_{adj\ (+900\ kHz)}$ = –73.3 dBc

<Measurement Conditions>

Signal Generator	Spectrum Analyzer
Anritsu MG3670B	HP8561E
MOD : π/4DQPSK	PBW : 1.0 kHz
bit rate : 384 kbps	VBW : 3.0 kHz
Source : internal	SPAN : 2 MHz
Filta : RNYQ	SWP : 10 sec
Roll Off : 0.5	ATT : > 10 dB
Phase Encode : Normal	Channel-SP : 600 kHz
Burst : Off	Channel-BW : 192 kHz
Pattern : PN9	

OCCUPIED BAND WIDTH



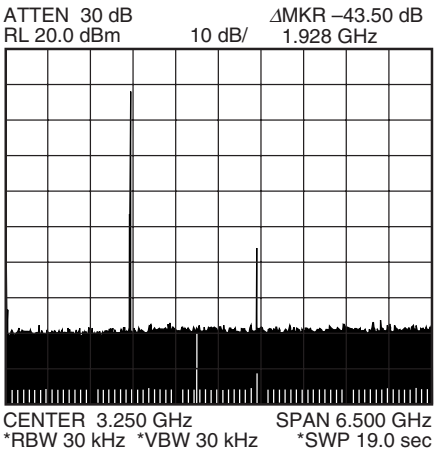
P_{out} = 20.5 dBm, P_{in} = –19 dBm

<Measurement Conditions>

Signal Generator	Spectrum Analyzer
Anritsu MG3670B	HP8561E
MOD : π/4DQPSK	PBW : 1.0 kHz
bit rate : 384 kbps	VBW : 1.0 kHz
Source : internal	SPAN : 800 kHz
Filta : RNYQ	SWP : 2.4 sec
Roll Off : 0.5	Signal : < 5 dB form
Phase Encode : Normal	REF Level
Burst : Off	
Pattern : PN9	

Remark The graphs indicate nominal characteristics.

FREQUENCY BAND WIDTH

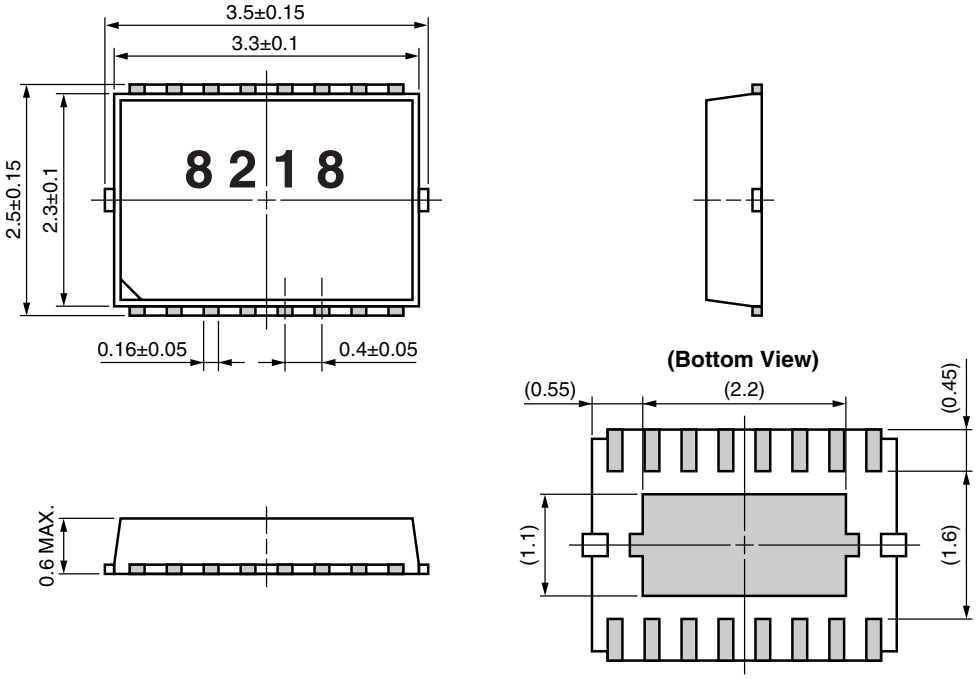


P_{out} = 20.5 dBm, P_{in} = –19 dBm
2f0 = –43.5 dBc
3f0 < –60 dBc

Remark The graph indicates nominal characteristics.

PACKAGE DIMENSIONS

16-PIN PLASTIC TSON (UNIT: mm)



Remark ( ) : Reference value

NOTES ON CORRECT USE

(1) Observe precautions for handling because of electro-static sensitive devices.

(2) Form a ground pattern as widely 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.

(3) The bypass capacitor should be attached to V_{CC} line.

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 nearby sales office.

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

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

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M8E 00.4-0110

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