

BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC3211GR

AGC AMPLIFIER FOR DIGITAL CATV RETURN PASS

DESCRIPTION

The μ PC3211GR is a silicon monolithic integrated circuit designed as AGC amplifier for digital CATV systems. This IC is the AGC amplifier with 55 dB gain control range which is packaged in 20-pin SSOP. The device is able to use for digital QPSK system, therefore it contributes to make design of transmission system simplicity.

FEATURES

- Wide gain control range 55 dB TYP.
- Low distortion $IM_3 = 57$ dBc TYP. @ $P_{out} = -10$ dBm
 $IM_2 = 44$ dBc TYP. @ $P_{out} = -10$ dBm
- Supply Voltage 9 V
- Packaged in 20-pin SSOP suitable for high-density surface mount.

ORDERING INFORMATION

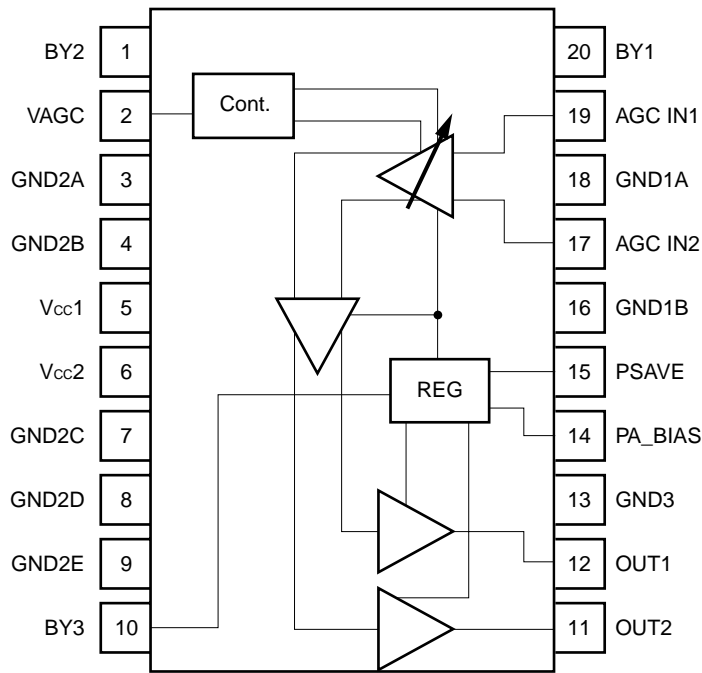
Part Number	Package	Supplying Form
μ PC3211GR-E1	20-pin plastic SSOP (225 mil)	Embossed tape 12 mm wide. Pin 1 indicates pull-out direction of tape. Qty 2.5 kp/reel

To order evaluation samples, please contact your local NEC office. (Part number for sample order: μ PC3211GR)

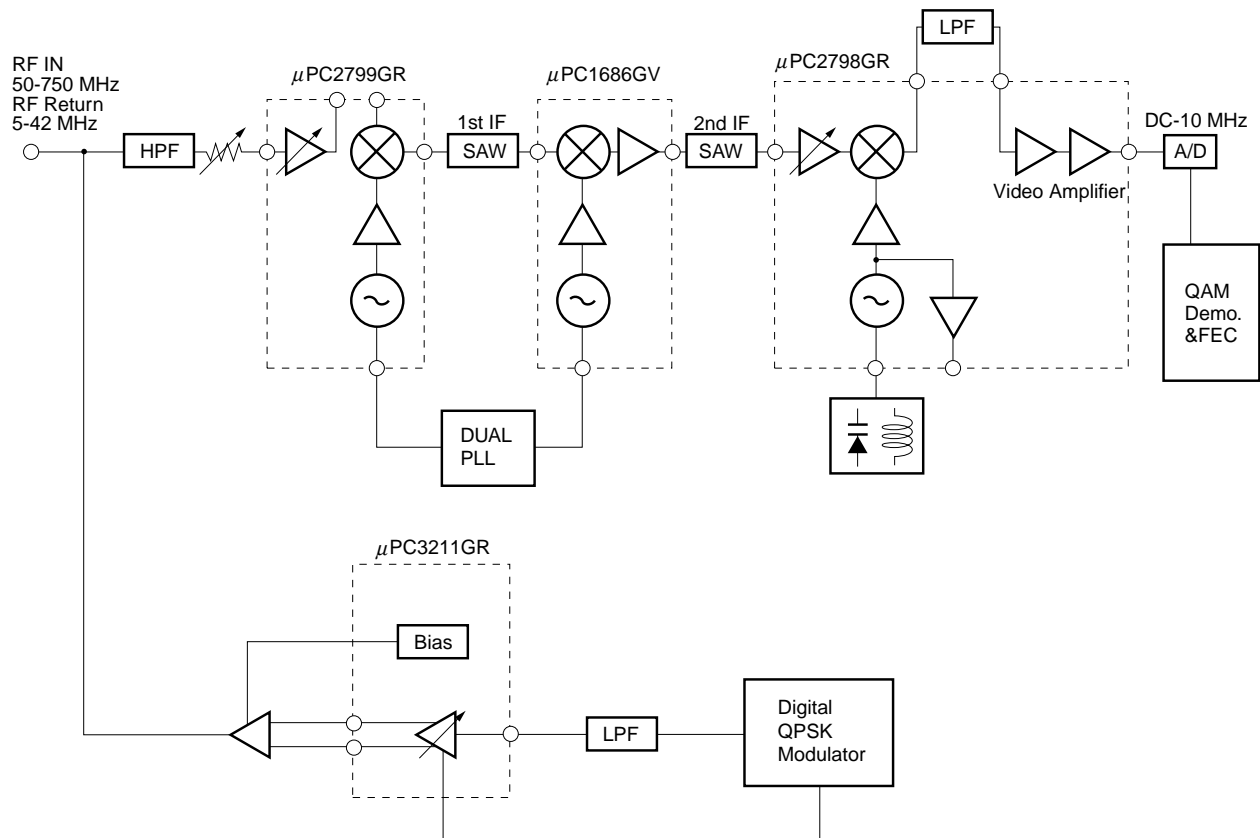
Caution electro-static sensitive device

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 Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

INTERNAL BLOCK DIAGRAM AND PIN CONFIGURATION (TOP VIEW)



TYPICAL APPLICATION



PIN FUNCTIONS

Pin No.	Pin Name	Pin Voltage TYP. (V)	Function and Explanation	Equivalent Circuit
1	BY2	–	Non Connection pin. This pin should be opened.	
2	VAGC	0 to 3	Automatic gain control pin.	
3	GND2A	0.0	Ground pins of differential amplifier.	
4	GND2B	0.0		
5	V _{cc} 1	9.0	Power supply pin of AGC amplifier block.	
6	V _{cc} 2	9.0	Power supply pin of differential amplifier and output block.	
7	GND2C	0.0	Ground pins of differential amplifier.	
8	GND2D	0.0		
9	GND2E	0.0		
10	BY3	1.64	Bypass pin of regulator block.	
11	OUT2	6.9	Signal output pins. This pins feature low-impedance because of its emitter-follower output port.	
12	OUT1	6.9	The pin that is not used should be grounded through 50 ohm resistor.	
13	GND3	0.0	Ground pin of output block.	
14	PA_BIAS	2.45	This is the pin to feed base bias in case of connection to transistor as power amplifier.	
15	Psave	9.0 (+5 kΩ)	Power-save pin. V _{cc} : ON GND : SLEEP The 5 kΩ resistor should be connected between 15 pin and V _{cc} .	
16	GND1B	0.0	Ground pin of AGC amplifier block.	
18	GND1A	0.0		
17	AGC IN2	2.43	Signal input pin. In the case of single input, 17 or 19 pin should be grounded through capacitor.	
19	AGC IN1	2.43		
20	BY1	–	Non Connection pin. This pin should be opened.	

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

Parameter	Symbol	Test Condition	Rating	Unit
Supply Voltage	V _{CC}		11.0	V
Power-save Voltage	V (Psave)	Note 1	11.0	V
AGC Voltage	V _{AGC}		3.6	V
Power Dissipation	P _D	T _A = +75°C Note 2	500	mW
Operating Ambient Temperature	T _A		-40 to +75	°C
Storage Temperature	T _{stg}		-55 to +150	°C
Maximum Input Level	P _{in} (MAX)		+5	dBm

- Notes**
1. Bias to 15 pin through 5 kΩ resistor.
 2. Mounted on 50 mm × 50 mm × 1.6 mm double epoxy glass board.

RECOMMENDED OPERATING RANGE

Parameter	Symbol	Test Condition	MIN.	TYP.	MAX.	Unit
Supply Voltage	V _{CC}		8.0	9.0	10.0	V
Power-save Voltage	V (Psave)	Note	0	–	10.0	V
AGC Control Voltage	V _{AGC}		0	–	3.3	V
Operating Ambient Temperature	T _A		-40	+25	+75	°C
Input Frequency	f _{in}		5	–	100	MHz
Maximum Input Level	P _{in} (MAX)		–	–	0	dBm

Note Bias to 15 pin through 5 kΩ resistor.

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{CC} = 9 V, V_{AGC} = 0 V, V (Psave) = 9 V (+5 kΩ), unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current 1	I _{CC1}	No input signal Note 1	29	38	51	mA
Maximum Gain	G _{MAX}	f _{in} = 65 MHz, P _{in} = -20 dBm Note 2	14	16	18	dB
Gain Control Range	GCR	f _{in} = 65 MHz, P _{in} = -20 dBm, V _{AGC} = 0 to 3 V Note 2	47	55	–	dB
Isolation at sleep mode	I _{sol}	f _{in} = 65 MHz, P _{in} = -20 dBm, V (Psave) = 0 V (+5 kΩ) Note 2	60	65	–	dB
2nd order intermodulation distortion	IM ₂	f _{in1} = 65 MHz, f _{in2} = 66.8 MHz, P _{out} = -10 dBm Note 2	–	-44	-40	dBc
3rd order intermodulation distortion	IM ₃	f _{in1} = 65 MHz, f _{in2} = 66.8 MHz, P _{out} = -10 dBm Note 2	–	-57	-50	dBc

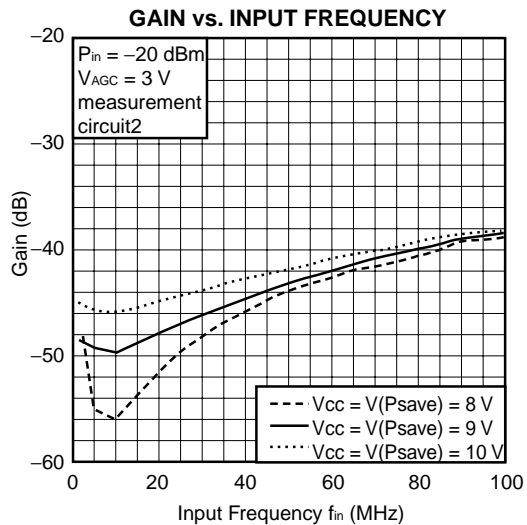
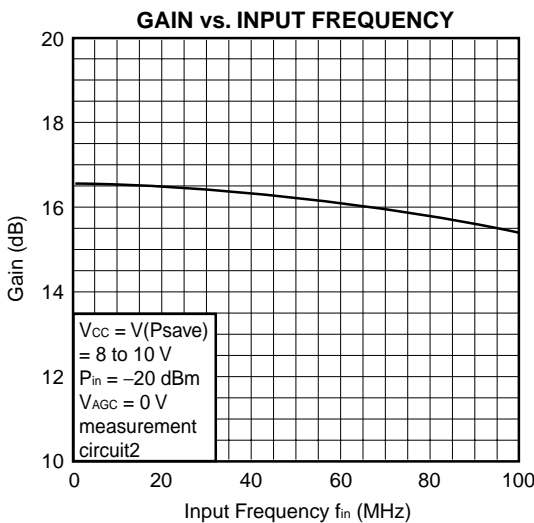
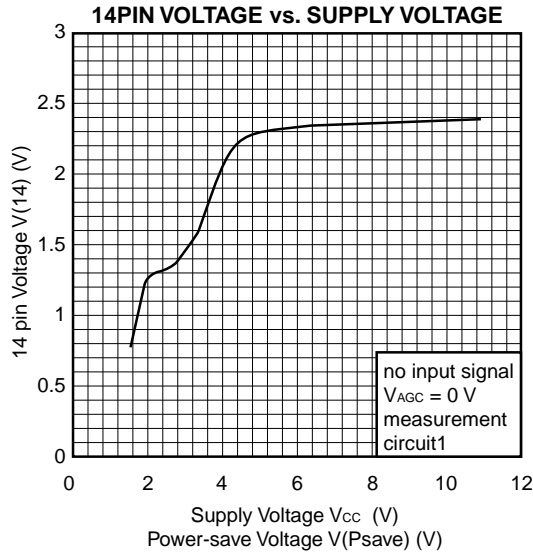
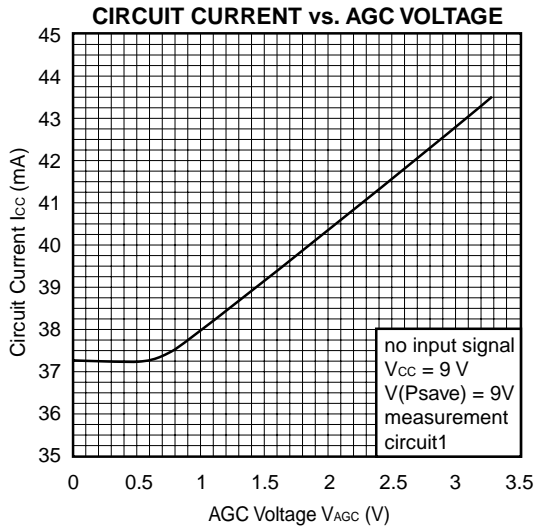
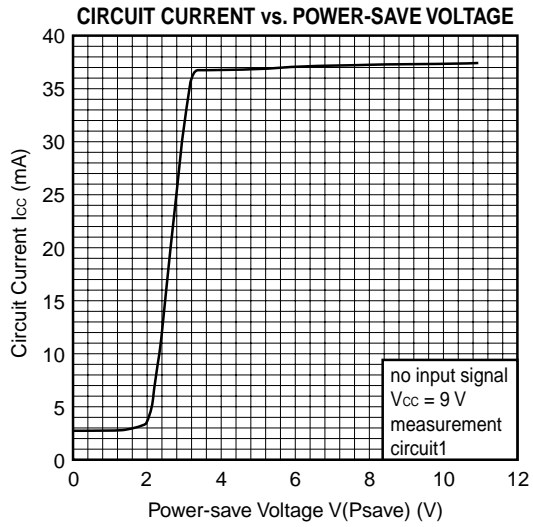
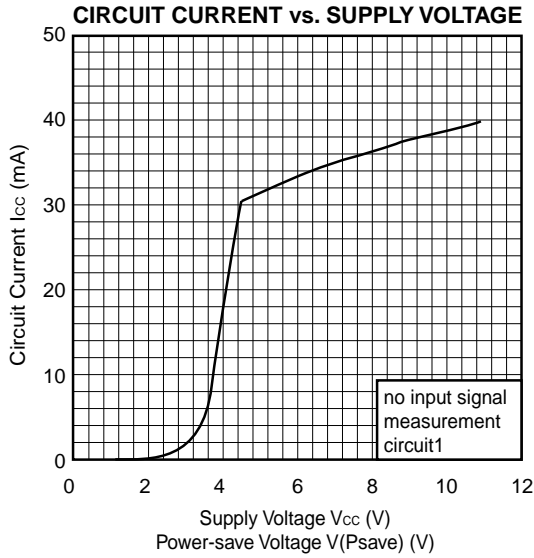
- Notes**
1. By measurement circuit 1
 2. By measurement circuit 2

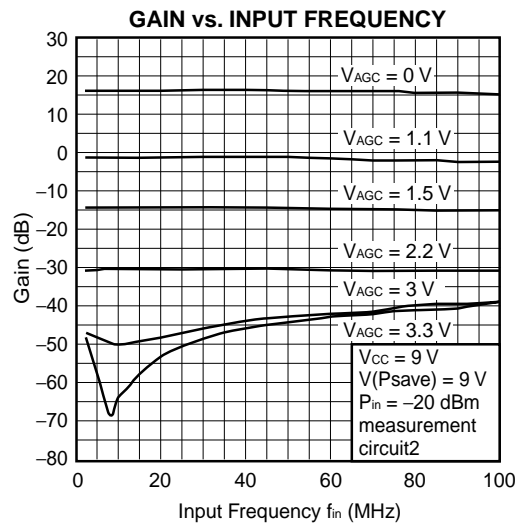
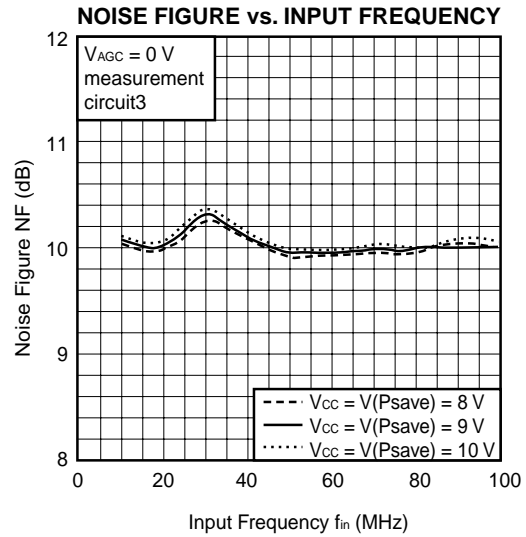
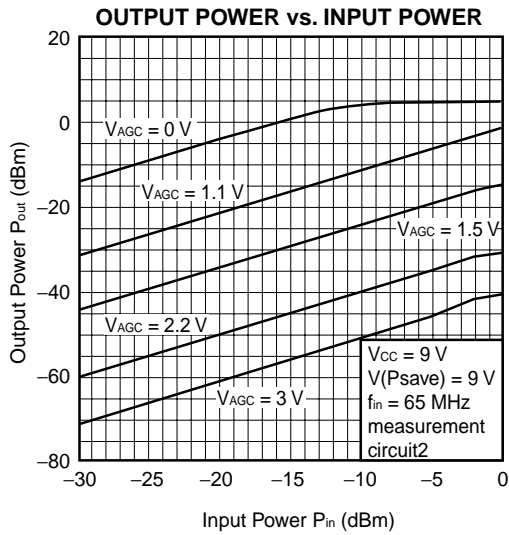
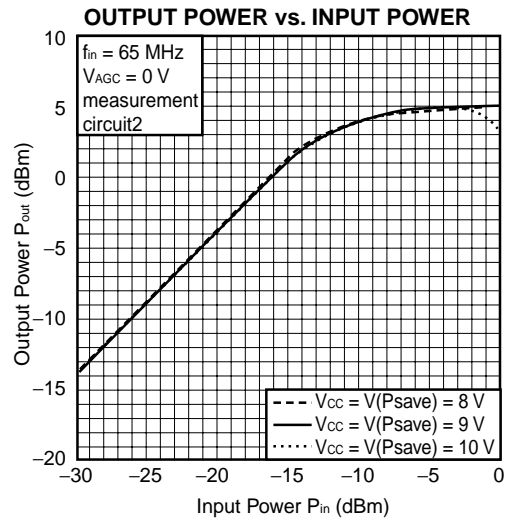
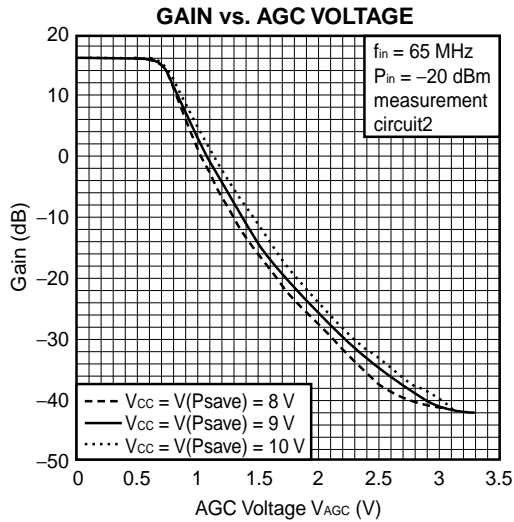
STANDARD CHARACTERISTICS (T_A = +25°C, V_{CC} = 9 V, V_{AGC} = 0 V, V (Psave) = 9 V (+5 kΩ), unless otherwise specified)

Parameter	Symbol	Test Conditions	Reference Value	Unit
Maximum Output Power	P _{O (sat)}	f _{in} = 65 MHz, P _{in} = -5 dBm Note 1	+5	dBm
Circuit Current at Power-save mode	I _{CC (P/S)}	No input signal, V (Psave) = 0 V (+5 kΩ) Note 2	3	mA
Noise Figure	NF	f _{in} = 65 MHz Note 3	10	dB
Output Intercept Point	OIP ₃	f _{in1} = 65 MHz, f _{in2} = 66.8 MHz Note 1	+16	dBm
Gain Flatness	G _{flat}	f _{in} = 5 to 100 MHz, 6 MHz Band width P _{in} = -20 dBm Note 1	±0.1	dB
Circuit Current 2	I _{CC2}	No input signal, V _{AGC} = 3 V Note 2	43	mA
ON Time	t _{ON}	f _{in} = 65 MHz, V (Psave) = 0 → 9 V (+5 kΩ) Note 4	200	μsec
OFF Time	t _{OFF}	f _{in} = 65 MHz, V (Psave) = 9 → 0 V (+5 kΩ) Note 4	1.7	msec

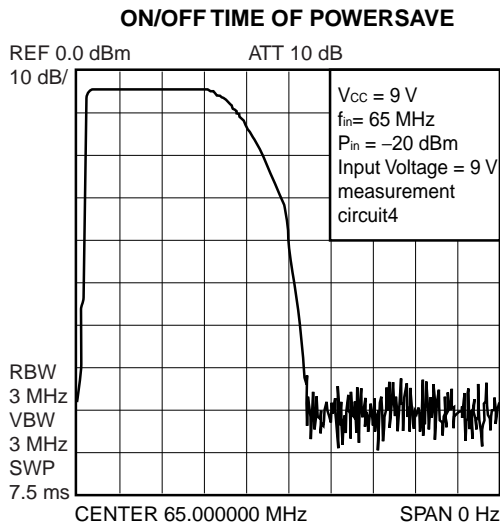
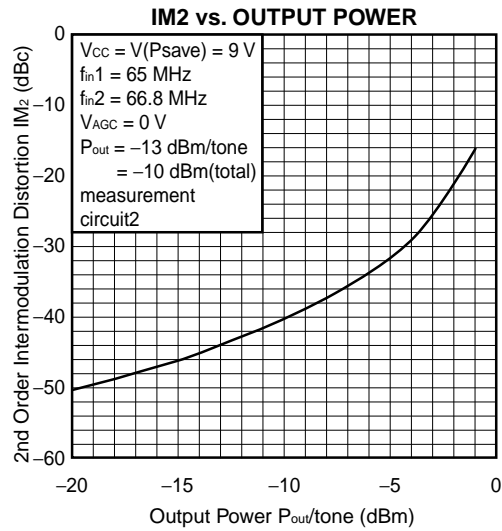
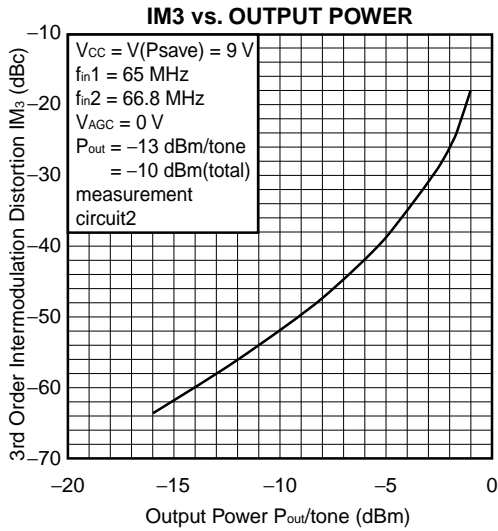
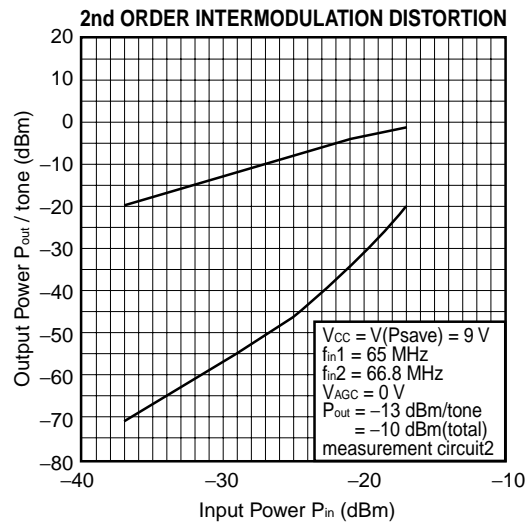
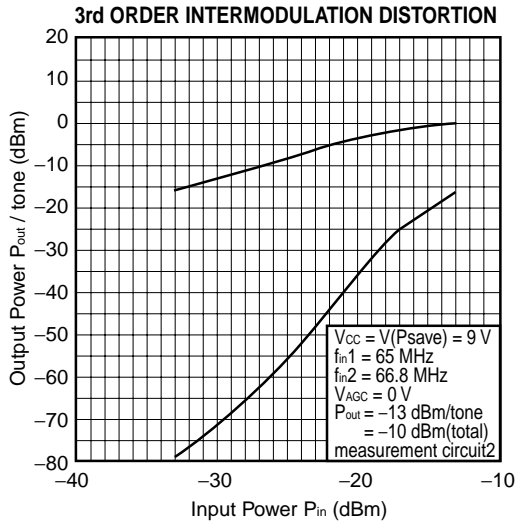
- Notes**
1. By measurement circuit 2
 2. By measurement circuit 1
 3. By measurement circuit 3
 4. By measurement circuit 4

TYPICAL CHARACTERISTICS (T_A = +25°C)

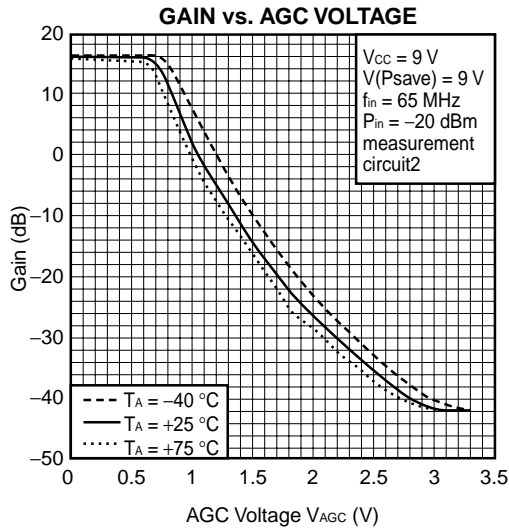
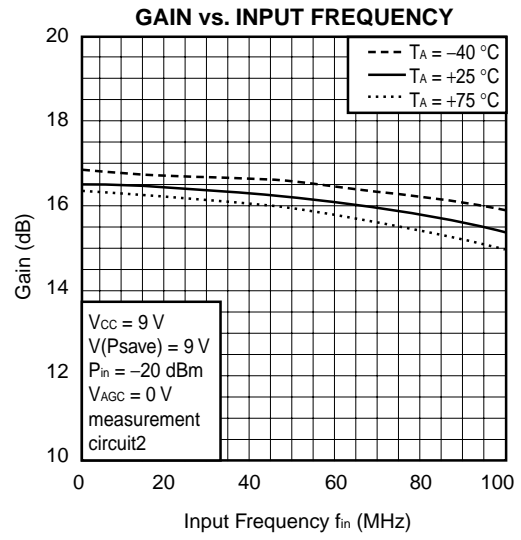
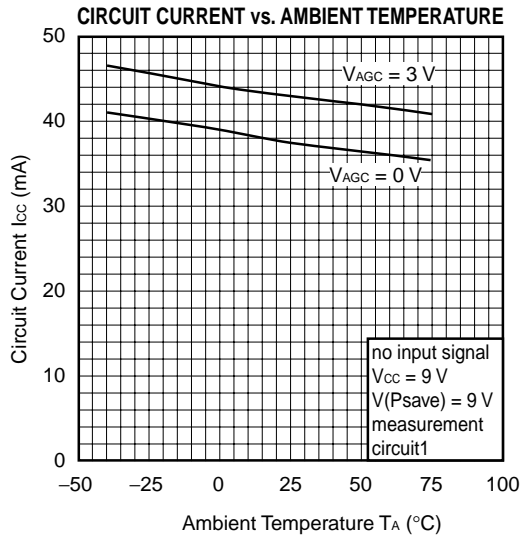




STANDARD CHARACTERISTICS (T_A = +25°C)



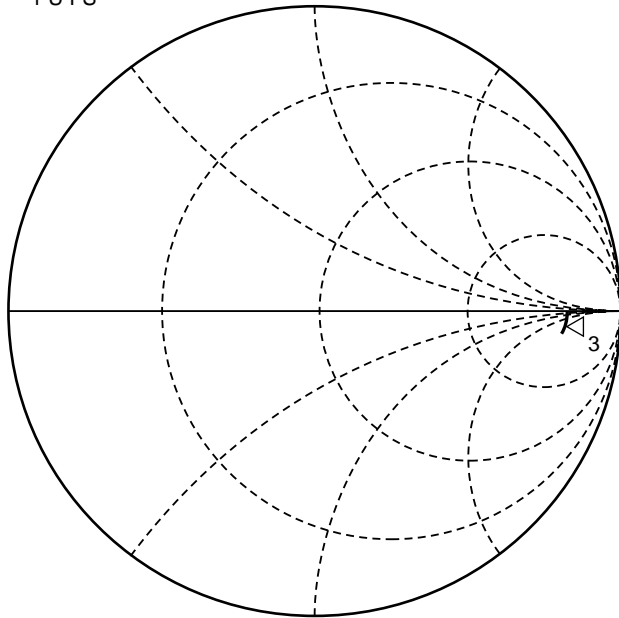
THERMAL CHARACTERISTICS (FOR REFERENCE)



STANDARD CHARACTERISTICS

INPUT IMPEDANCE (19 PIN)

S₁₁ 1 U FS
hp

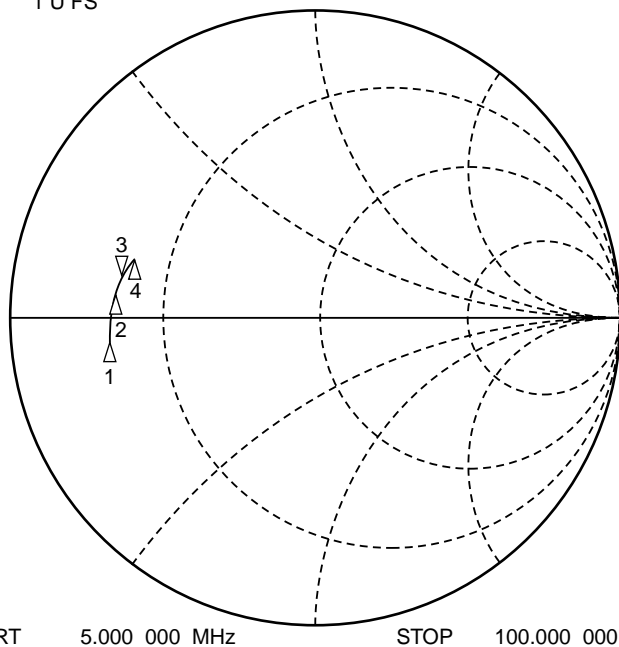


- Δ 1: 5 MHz
533.6 Ω
-16.4 Ω
- Δ 2: 40 MHz
515.2 Ω
-81.4 Ω
- Δ 3: 65 MHz
493.7 Ω
-123.3 Ω
- Δ 4: 100 MHz
455.9 Ω
-190.3 Ω

T_A = +25°C
V_{CC} = 9 V
V (Psave) = 9 V
P_{in} = -20 dBm

OUTPUT IMPEDANCE (11 PIN)

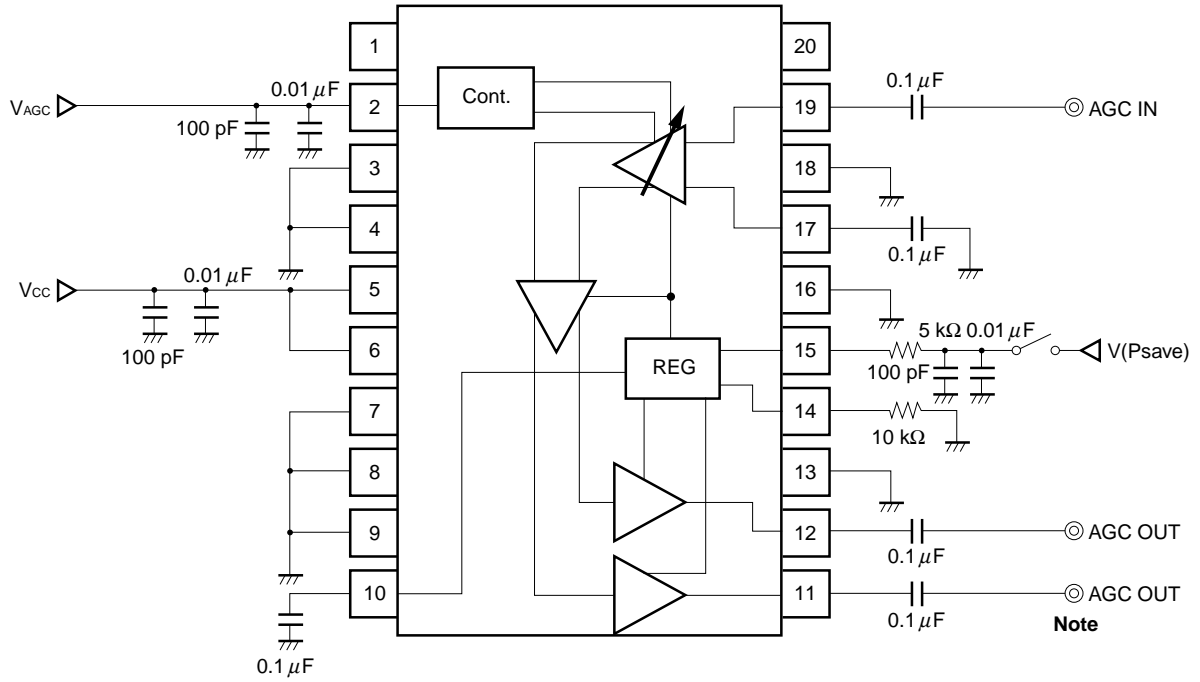
S₂₂ 1 U FS
hp



- Δ 1: 5 MHz
9.779 Ω
-2.306 Ω
- Δ 2: 40 MHz
10.066 Ω
3.033 Ω
- Δ 3: 65 MHz
10.574 Ω
5.237 Ω
- Δ 4: 100 MHz
11.88 Ω
7.805 Ω

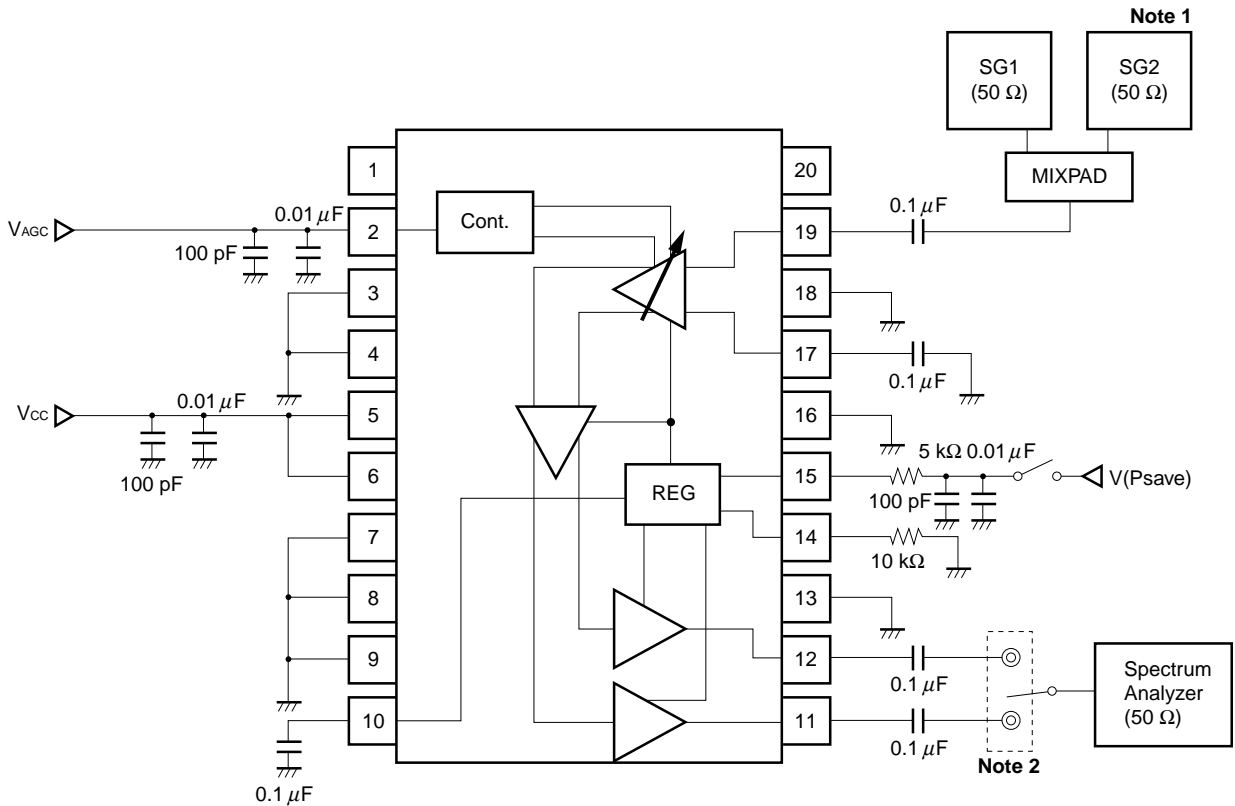
T_A = +25°C
V_{CC} = 9 V
V (Psave) = 9 V
P_{in} = -20 dBm

MEASUREMENT CIRCUIT 1



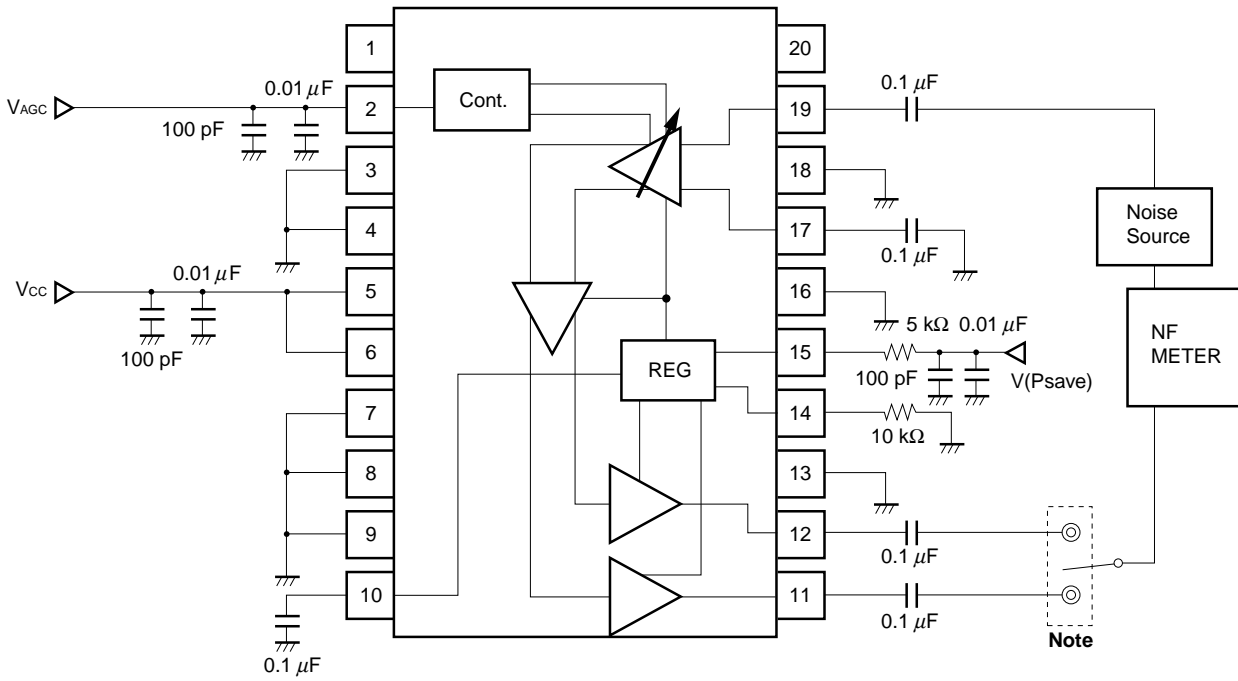
Note The pin that is not connected to Spectrum Analyzer should be grounded through 50 Ω resistor.

MEASUREMENT CIRCUIT 2



- Notes**
1. Connect in the case of measurement of IM_2/IM_3
 2. The pin that is not connected to Spectrum Analyzer should be grounded through 50 Ω resistor.

MEASUREMENT CIRCUIT 3



Note The pin that is not connected to Spectrum Analyzer should be grounded through 50 Ω resistor.

MEASUREMENT CIRCUIT 4

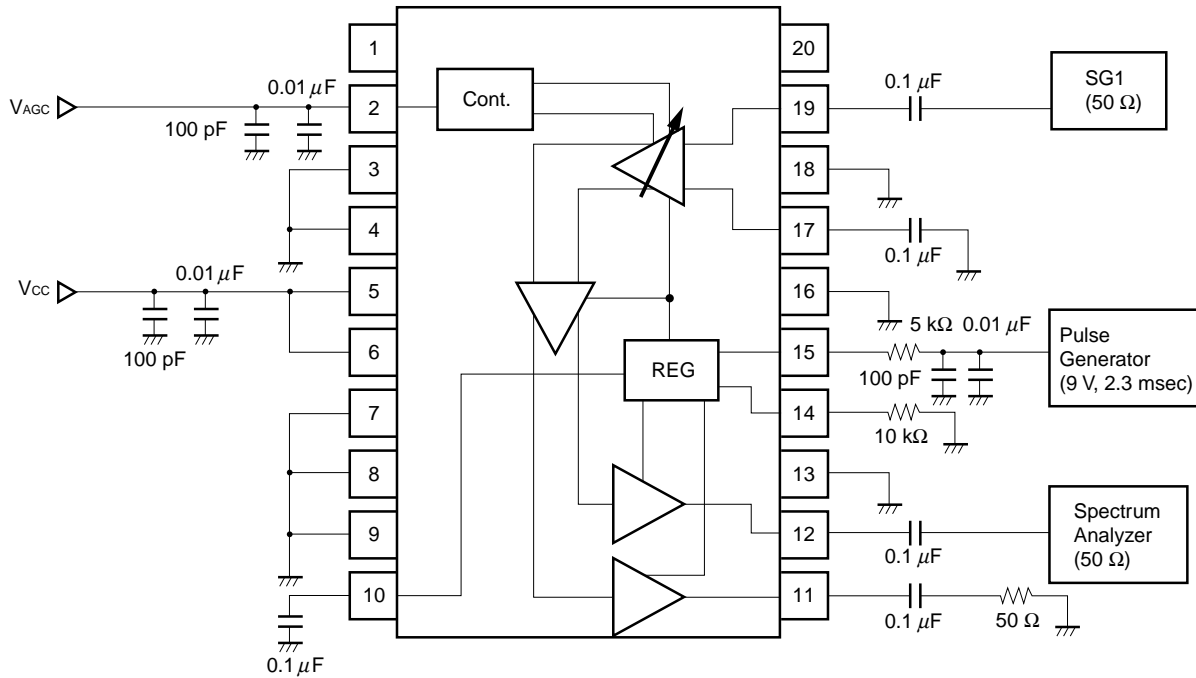
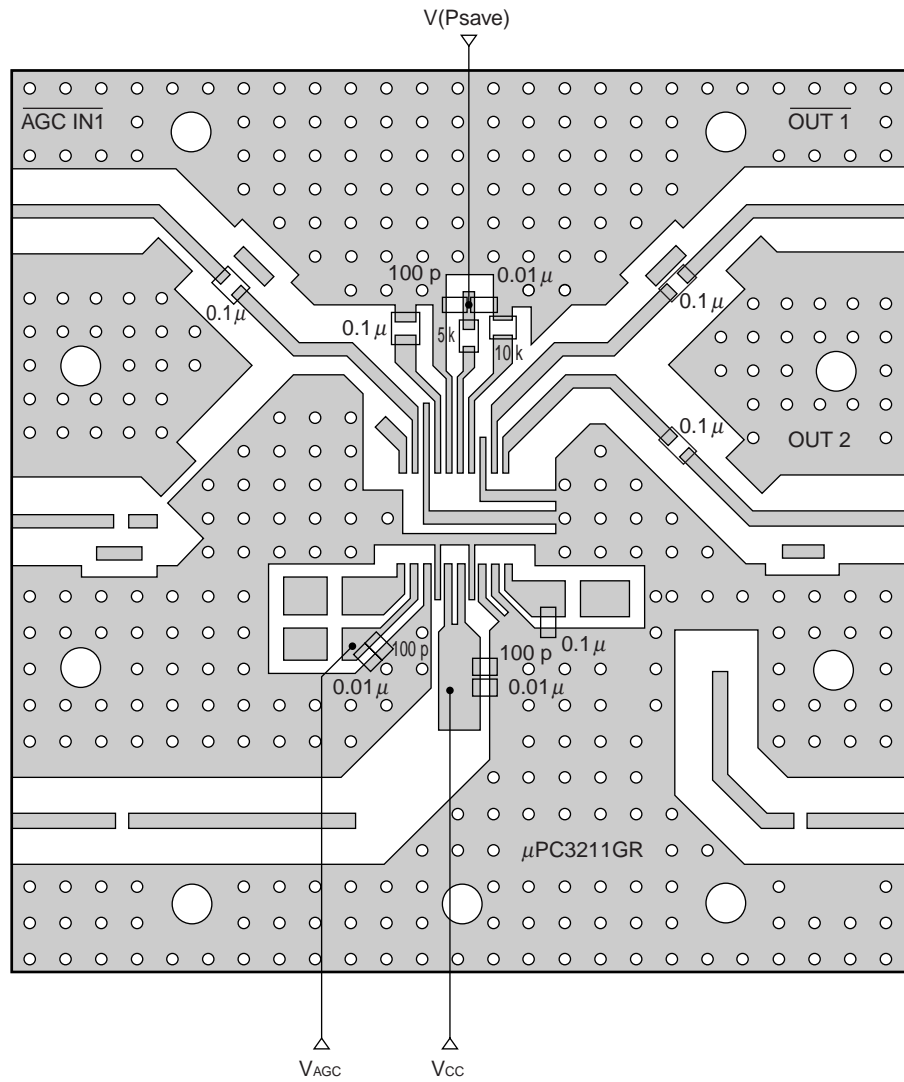


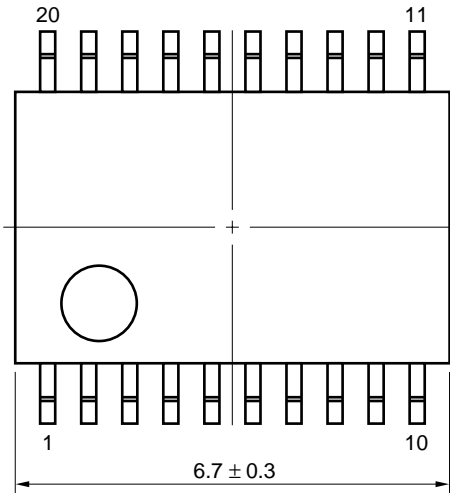
ILLUSTRATION OF THE EVALUATION BOARD FOR MEASUREMENT CIRCUIT



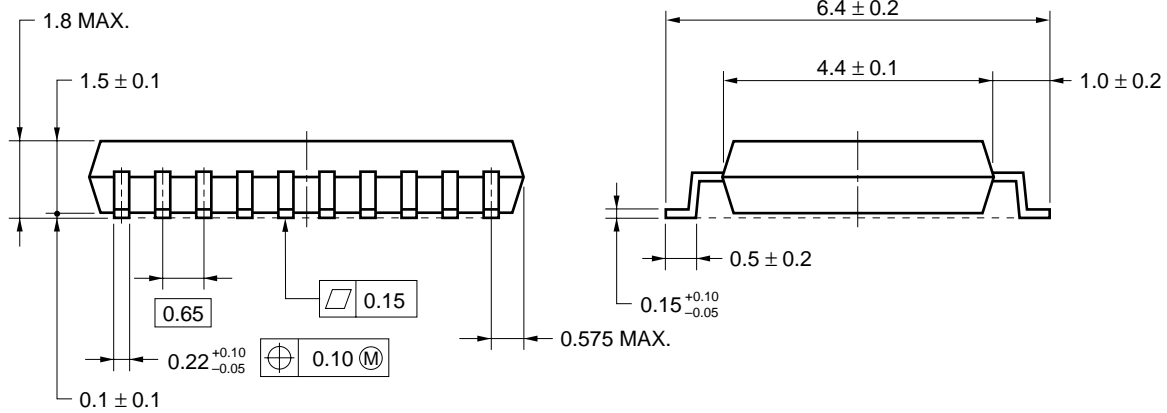
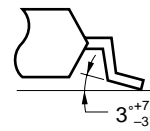
- Notes**
1. 50 × 50 × 1.6 mm double sided copper clad polyimide board.
 2. Back side: GND pattern
 3. Solder plated on pattern
 4. ○: Through holes

PACKAGE DIMENSIONS

★ 20 PIN PLASTIC SSOP (225 mil) (UNIT: mm)



detail of lead end



NOTE Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered 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) Count: 3, Exposure limit ^{Note} : None	IR35-00-3
VPS	Package peak temperature: 215°C or below Time: 40 seconds or less (at 200°C) Count: 3, Exposure limit ^{Note} : None	VP15-00-3
Partial Heating	Pin temperature: 300°C Time: 3 seconds or less (per side of device) Exposure limit ^{Note} : None	—

Note After opening the dry pack, keep it in a place below 25°C and 65% RH for the allowable storage period.

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

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

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 - 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 or medical equipment for life support, etc.
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