DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUITS

μPC2745T, μPC2749T

3V-BIAS, 2.7 GHz/2.9 GHz WIDE-BAND SiMMIC AMPLIFIER FOR MOBILE COMMUNICATIONS

DESCRIPTION

μPC2745T and μPC2749T are silicon monolithic integrated circuits designed as buffer amplifiers for mobile communications. These ICs feature 3V bias supply and 2.7 or 2.9 GHz wide band operation. 3 V supply operation is suitable for low voltage systems. 2.7 GHz or 2.9 GHz wide band operation is applicable for not only celular/cordless telephones but also wireless LAN and so on. Due to the 50 Ω cascadable and mini-mold package, these ICs are suitable for high-density surface mounting.

These ICs are manufactured using NEC's 20 GHz f_T NESAT™ III silicon bipolar process. This process uses silicon nitride passivation film and gold electrodes. These materials can protect chip surface from external pollution and prevent corrosion/migration. Thus, this series have exellent performance, uniformity and reliability.

FEATURES

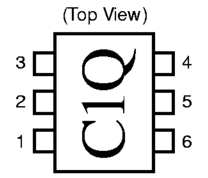
• Recommended supply voltage	: V_{CC} = 3.0 V ± 0.3 V
(minimum operation voltage	: μPC2745T – V_{CC} = 1.8 V, μPC2749T – V_{CC} = 2.7 V)
• Wide band operation	: μPC2745T – G_P = 12 dB, f_u = 2.7 GHz
	μPC2749T – G_P = 16 dB, f_u = 2.9 GHz
• Noise Figure	: μPC2745T – NF = 6.0 dB @ 0.5 GHz, NF = 5.5 dB @ 1.0 GHz
	μPC2749T – NF = 3.2 dB @ 0.9 GHz, NF = 4.0 dB @ 1.9 GHz
• Isolation	: μPC2745T – ISL = 38 dB @ 0.5 GHz
	μPC2749T – ISL = 30 dB @ 1.9 GHz
• 50 Ω cascadable	: 50 Ω input/output impedance
• High-density surface mounting	: 6 pin mini mold package

OPDERING INFORMATION

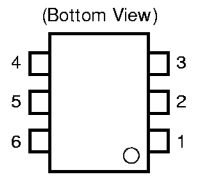
PART NUMBER	PACKAGE	SUPPLYING FORM
μPC2745T-E3 μPC2749T-E3	6 pin mini mold	Embossed tape 8 mm wide. Pin 1, 2, 3 face to perforation side of the tape. QTY 3 kp/reel.

Caution To order evaluation samples, please contact your local NEC sales office. (Part number: μPC2745T, μPC2749T)

PIN CONNECTION



Markings μPC2745T : C1Q
μPC2749T : C1U



Pin No	Pin name
1	Input
2	GND
3	GND
4	Output
5	GND
6	V_{CC}

Caution Electro-static sensitive devices

The information in this document is subject to change without notice.

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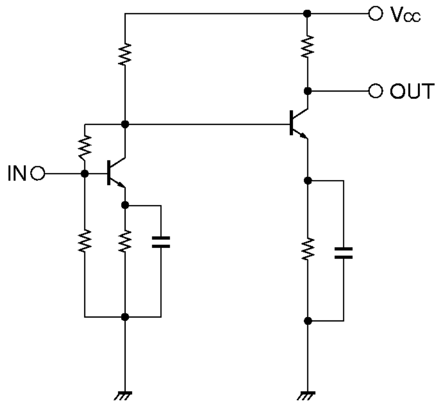
Selector Guide (T_A = +25 °C, Z_L = Z_S = 50 Ω)

TYPE	PART NUMBER	V_{CC} (V)	I_{CC} (mA)	G_P (dB)	fu (GHz)	NF (dB)	ISL (dB)	$P_{O(sat)}$ (dBm)
5 V, 13 dB gain	μPC2711T	4.5 - 5.5	12	13	2.9	5.0	30	+1
5 V, 20 dB gain	μPC2712T	4.5 - 5.5	12	20	2.6	4.5	33	+3
3 V, 13 dB gain	μPC2745T	(1.8 -) 2.7 - 3.3	7.5	12	2.7	6.0	38	–1
3 V, 16 dB gain	μPC2749T	2.7 - 3.3	6	16	2.9	4.0	30	–6

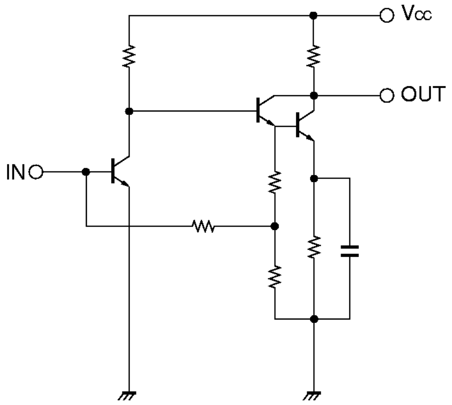
Note 1 Typical performance. Please refer to ELECTRICAL CHARACTERISTICS in detail.

EQUIVALENT CIRCUITS

μPC2745T

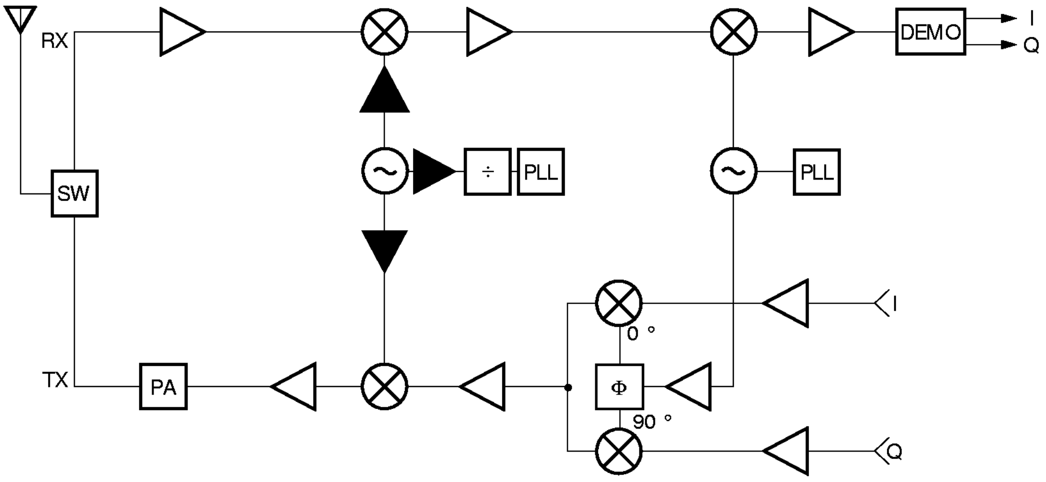


μPC2749T



SYSTEM APPLICATION EXAMPLE

Digital cellular telephone



▶ : μPC2745T, μPC2749T

This system diagram presents schematic application only of these ICs. Suitable IC and block can be chosen in accordance with required RF performance on customer's systems.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATING	UNIT	CONDITIONS
Supply Voltage	V_{CC}	4.0	V	T_A = +25 °C
Circuit Current	I_{CC}	15 Note 2	mA	T_A = +25 °C
Power Dissipation	P_D	280	mW	Mounted on 50 × 50 × 1.6 mm double side copper clad epoxy glass PWD T_A = +85 °C
Operating Temperature	T_A	–40 to +85	°C	
Storage Temperature	T_{stg}	–55 to +150	°C	
Input Power	P_{in}	0	dBm	T_A = +25 °C

Note 2 μPC2745T: 16 mA

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	2.7	3.0	3.3	V
Operating Temperature	T_A	–40	+25	+85	°C

ELECTRICAL CHARACTERISTICS (T_A = +25 °C, Vcc = 3.0 V, Z_L = Zs = 50 Ω)

PARAMETER	SYMBOL	μPC2745T			μPC2749T			UNIT	CONDITION
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.		
Circuit Current	I_{CC}	5.0	7.5	10.0	4	6	8	mA	No input signals
Power Gain	G_P	9.0	12	14	13	16	18.5	dB	**Note 3**
Noise Figure	NF		6	7.5		4.0	5.5	dB	**Note 3**
Upper Limit Operating Frequency	f_u	2.3	2.7		2.5	2.9		GHz	3 dB less than the gain at 0.1 GHz
Isolation	ISL	33	38		25	30		dB	**Note 3**
Input Return Loss	RL_{in}	8	11		7	10		dB	**Note 3**
Output Return Loss	RL_{out}	2.5	5.5		9.5	12.5		dB	**Note 3**
Saturated output power	$P_{O(sat)}$	–4	–1		–9	–6		dBm	**Note 3** P_{in} = –6 dBm

Note 3 Specified frequency condition: μPC2745T – f = 500 MHz, μPC2749T – f = 1.9 GHz

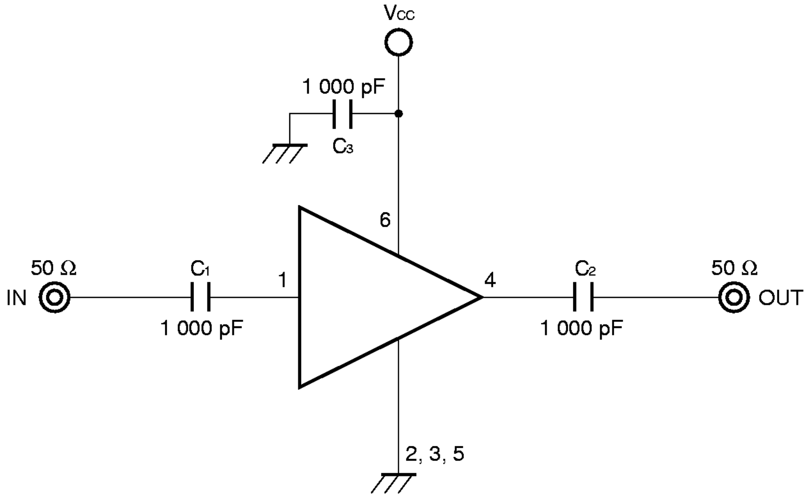
STANDARD CHARACTERISTICS FOR REFERENCE (T_A = +25 °C, Z_L = Z_S = 50 Ω)

PARAMETER	SYMBOL	CONDITION	μPC2745T REFERENCE VALUE	UNIT
Circuit Current	I_{CC}	V_{CC} = 1.8 V, No input signals	4.5	mA
Power Gain	G_P	V_{CC} = 3.0 V, f = 1 GHz V_{CC} = 3.0 V, f = 2 GHz V_{CC} = 1.8 V, f = 500 MHz	12 11 7	dB
Noise Figure	NF	V_{CC} = 3.0 V, f = 1 GHz V_{CC} = 3.0 V, f = 2 GHz V_{CC} = 1.8 V, f = 500 MHz	5.5 5.7 8.0	dB
Upper Limit Operating Frequency	f_u	V_{CC} = 1.8 V, 3 dB less than the gain at 0.1 GHz	1.8	GHz
Isolation	ISL	V_{CC} = 3.0 V, f = 1 GHz V_{CC} = 3.0 V, f = 2 GHz V_{CC} = 1.8 V, f = 500 MHz	33 30 35	dB
Input Return Loss	RL_{in}	V_{CC} = 3.0 V, f = 1 GHz V_{CC} = 3.0 V, f = 2 GHz V_{CC} = 1.8 V, f = 500 MHz	13 14 6.5	dB
Output Return Loss	RL_{out}	V_{CC} = 3.0 V, f = 1 GHz V_{CC} = 3.0 V, f = 2 GHz V_{CC} = 1.8 V, f = 500 MHz	6.5 8.5 6.0	dB
Saturated Output Power	$P_{O(sat)}$	V_{CC} = 3.0 V, f = 1 GHz, P_{in} = –6 dBm V_{CC} = 3.0 V, f = 2 GHz, P_{in} = –6 dBm V_{CC} = 1.8 V, f = 500 MHz, P_{in} = –10 dBm	–2.5 –3.5 –11	dBm
3rd Order Intermodulation Distortion	IM_3	V_{CC} = 3.0 V, P_{out} = –20 dBm, f_1 = 500 MHz, f_2 = 502 MHz V_{CC} = 3.0 V, P_{out} = –20 dBm, f_1 = 1000 MHz, f_2 = 1002 MHz V_{CC} = 1.8 V, P_{out} = –20 dBm, f_1 = 500 MHz, f_2 = 502 MHz	–54 –50 –31	dBc

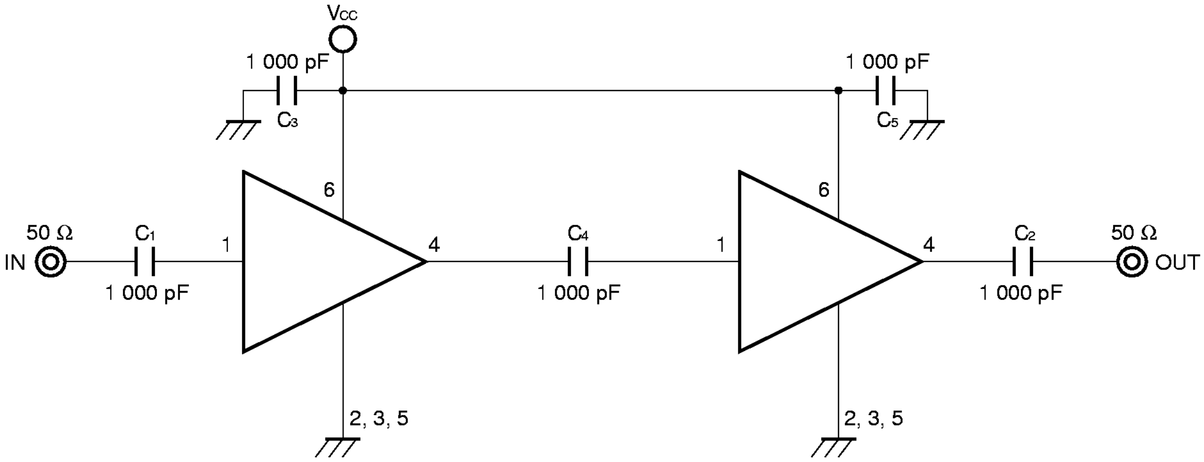
STANDARD CHARACTERISTICS FOR REFERENCE (T_A = +25 °C, V_{CC} = 3.0 V, Z_L = Z_S = 50 Ω)

PARAMETER	SYMBOL	CONDITION	μPC2749T REFERENCE VALUE	UNIT
1 dB compression output	$P_{O(1dB)}$	f = 1.9 GHz	–12.5	dBm
3rd Order Intermodulation Distortion	IM_3	Pout = –25 dBm, f_1 = 1.9 GHz, f_2 = 1.902 GHz	–43	dBc
Power Gain	G_P	f = 0.9 GHz	14.5	dB
Noise Figure	NF	f = 0.9 GHz	3.2	dB

TEST CIRCUIT



EXAMPLE OF APPLICATION CIRCUIT



The application circuit and their parameters are for references only and are not intended for use in actual design-in's

Capacitors for V_{CC}, input and output pins

1 000 pF capacitors are recommendable as bypass capacitor for V_{CC} pin and coupling capacitors for input/output pins.

Bypass capacitor for V_{CC} pin is intended to minimize V_{CC} pin' s ground impedance. Therefore, stable bias can be supplied against V_{CC} fluctuation.

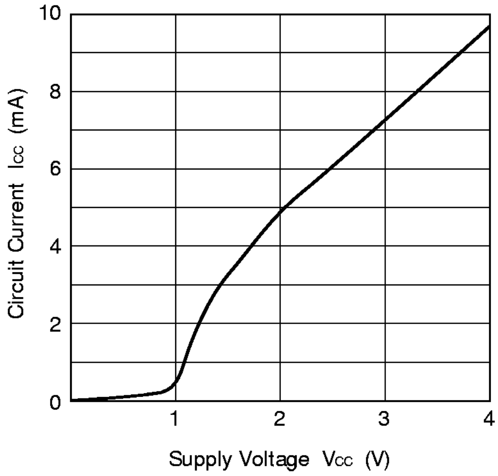
Coupling capacitors for input/output pins are intended to minimize RF serial impedance and cut DC.

To get flat gain from 100 MHz up, 1 000 pF capacitors are assembled on the test circuit. [Actually, 1000 pF capacitors give flat gain at least 10 MHz. In the case of under 10 MHz operation, increase the value of coupling capacitor such as 2 200 pF. Because the coupling capacitors are determined by the equation of
$C = 1/(2 \pi fZs)$.]

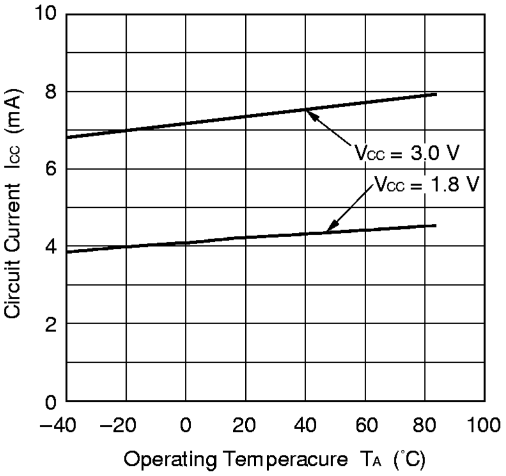
TYPICAL CHARACTERISTICS — μPC2745T —

(Unless otherwise specified, T_A = +25 °C)

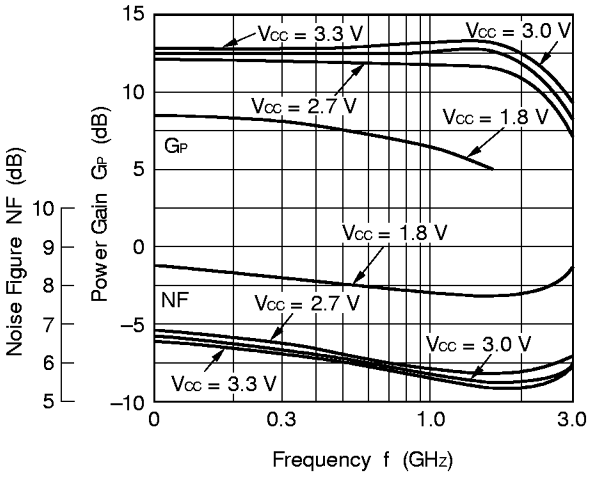
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



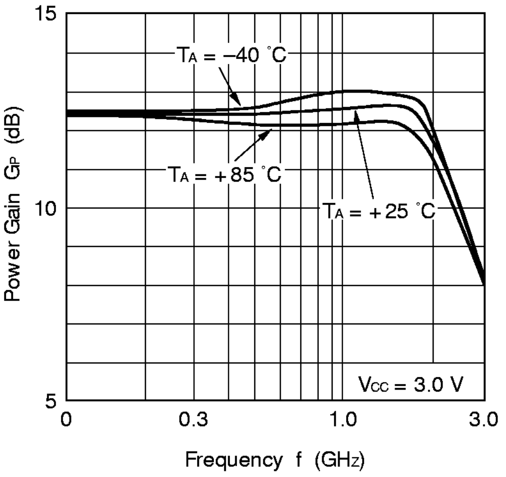
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



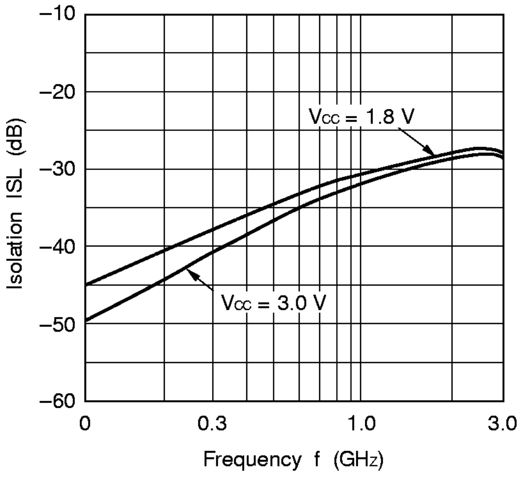
NOISE FIGURE POWER GAIN vs. FREQUENCY



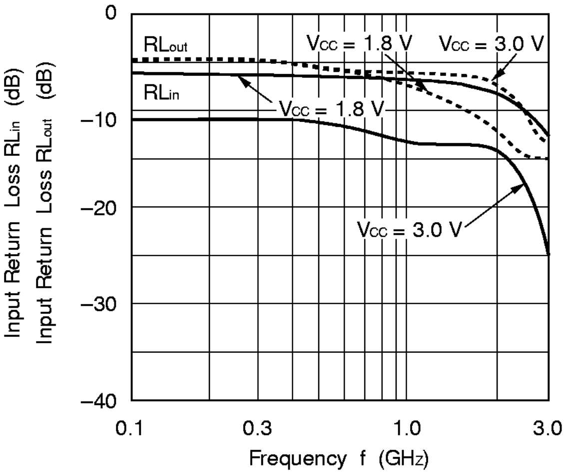
POWER GAIN vs.FREQUENCY



ISOLATION vs. FREQUENCY

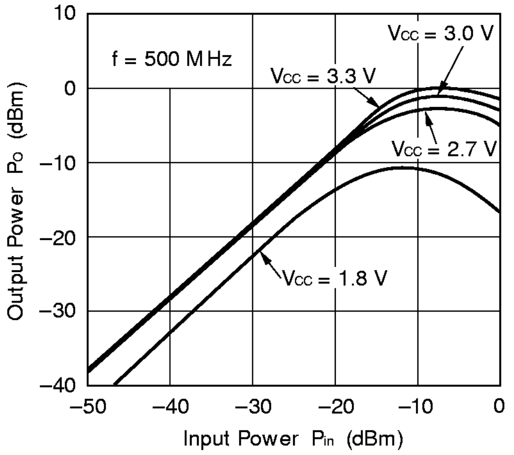


INPUT RETURN LOSS, OUTPUT RETURN LOSS vs. FREQUENCY

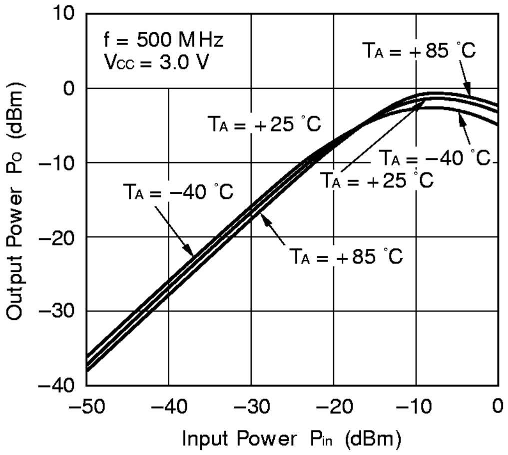


— μPC2745T —

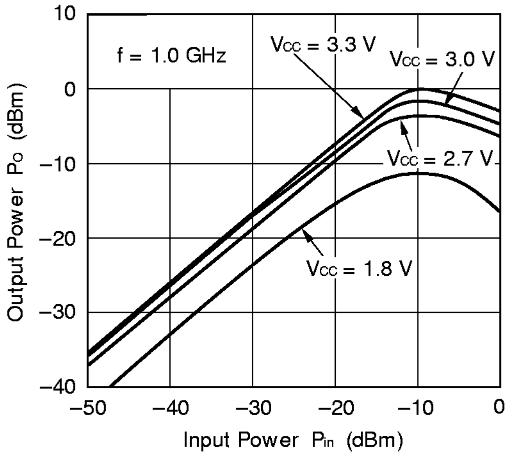
OUTPUT POWER vs. INPUT POWER



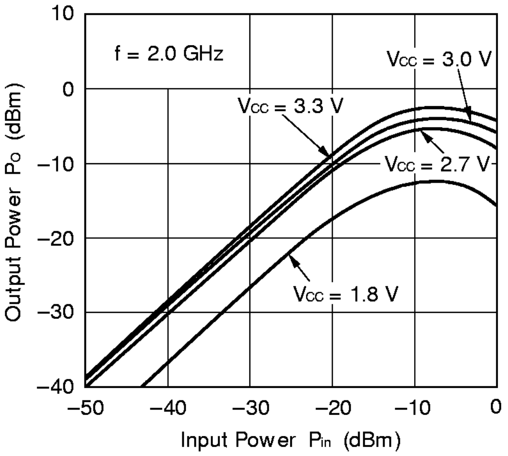
OUTPUT POWER vs. INPUT POWER



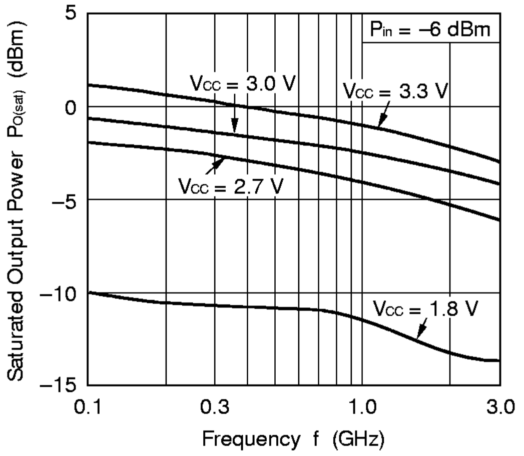
OUTPUT POWER vs. INPUT POWER



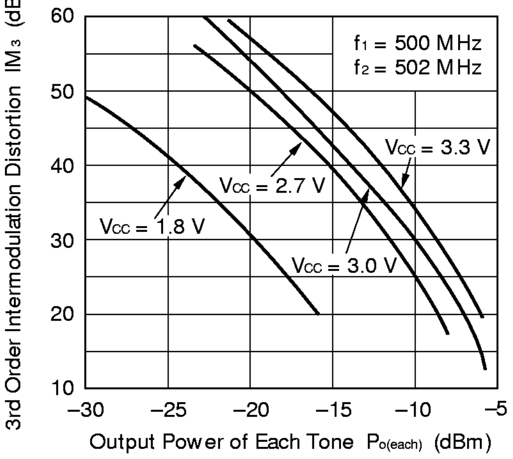
OUTPUT POWER vs. INPUT POWER



SATURATED OUTPUT POWER vs. FREQUENCY



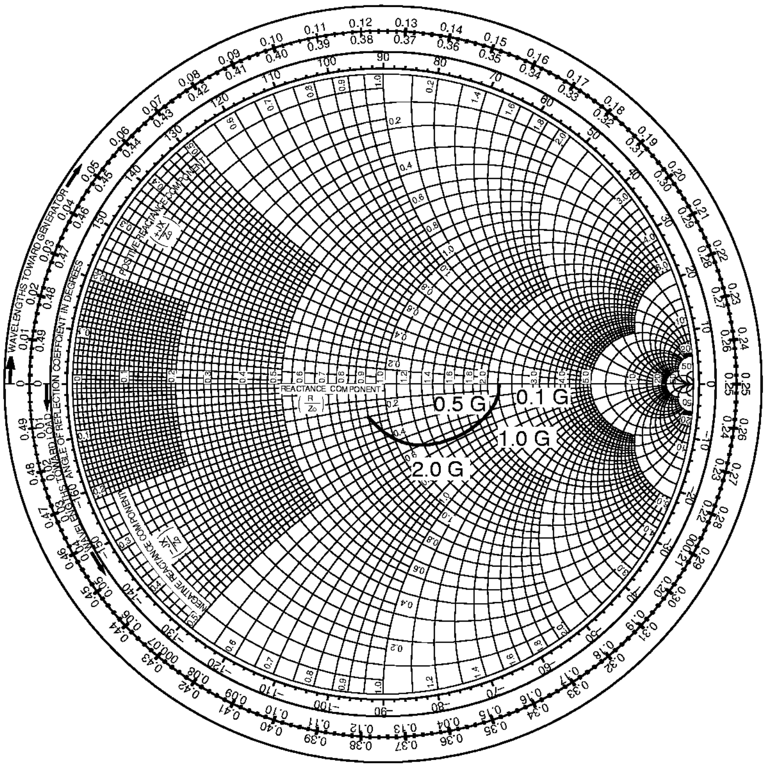
3RD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER OF EACH TONE



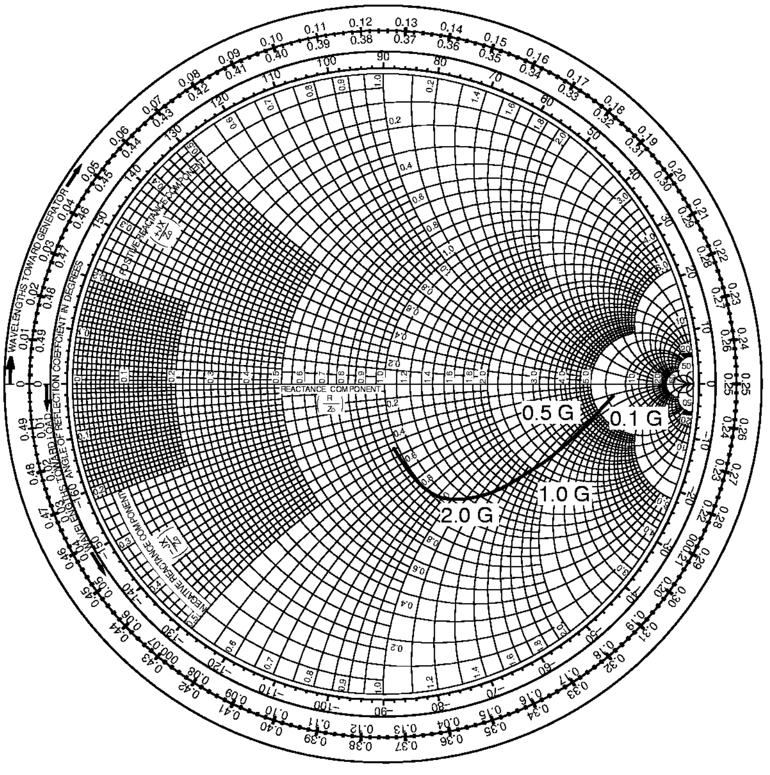
— μPC2745T —

S Parameter (V_{CC} = 3.0 V)

S_{11}-FREQUENCY



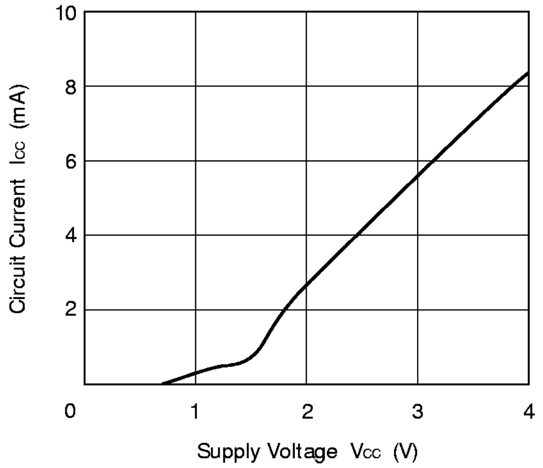
S_{22}-FREQUENCY



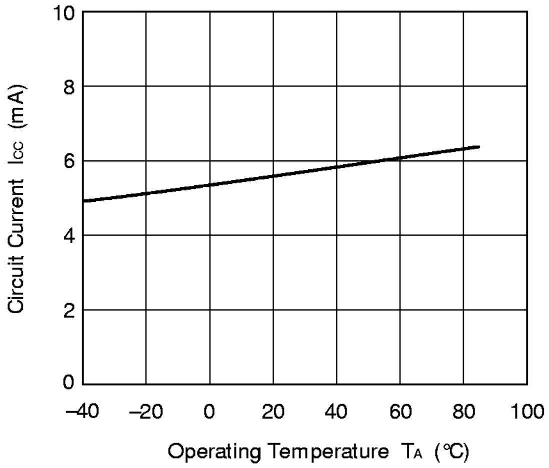
TYPICAL CHARACTERISTICS — μPC2749T —

(Unless otherwise specified, T_A = +25 °C)

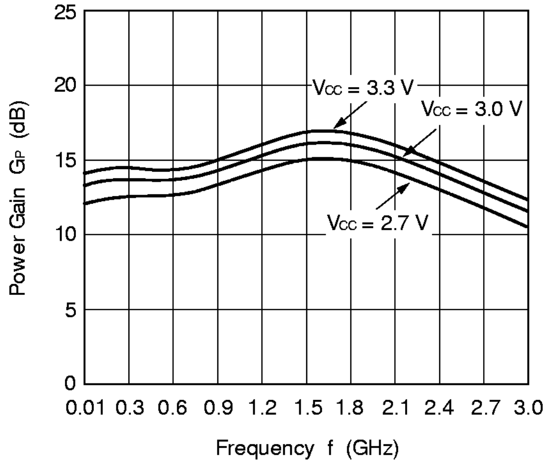
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



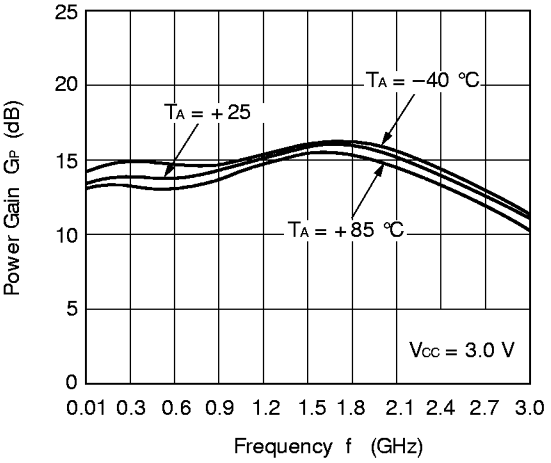
CIRCUIT CURRENT vs. OPERATING TEMPERATURE



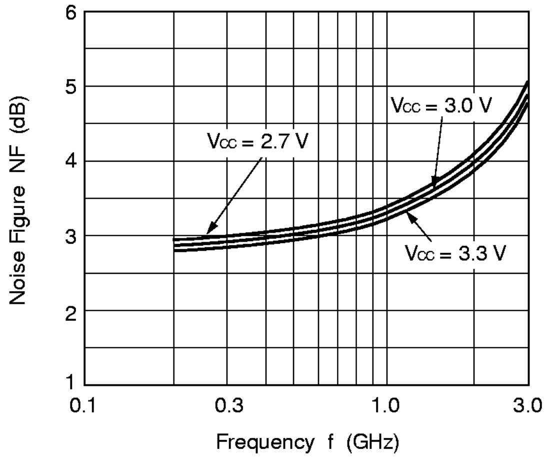
POWER GAIN vs. FREQUENCY



POWER GAIN vs. FREQUENCY

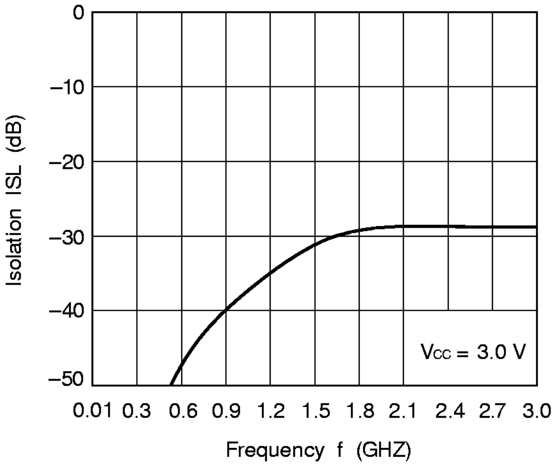


NOISE FIGURE vs. FREQUENCY

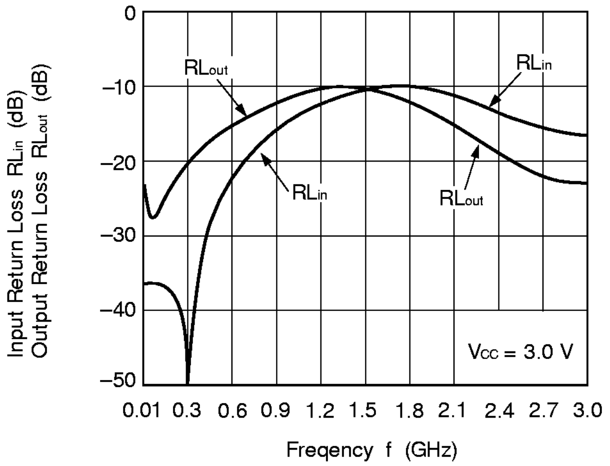


— μ**PC2749T** —

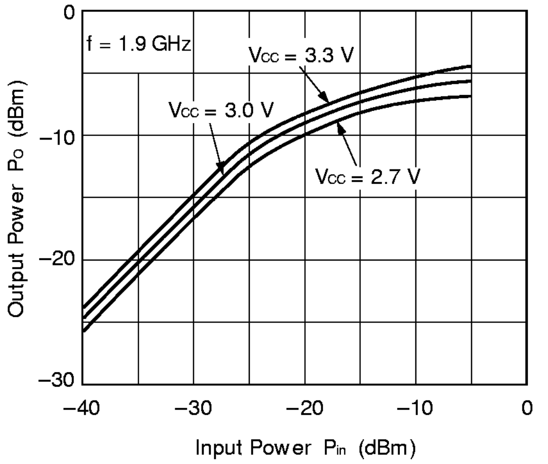
ISOLATION vs. FREQUENCY



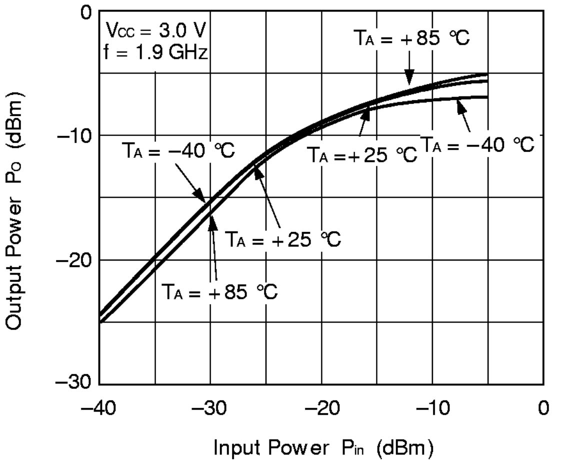
INPUT RETURN LOSS, OUTPUT RETURN LOSS vs. FREQUENCY



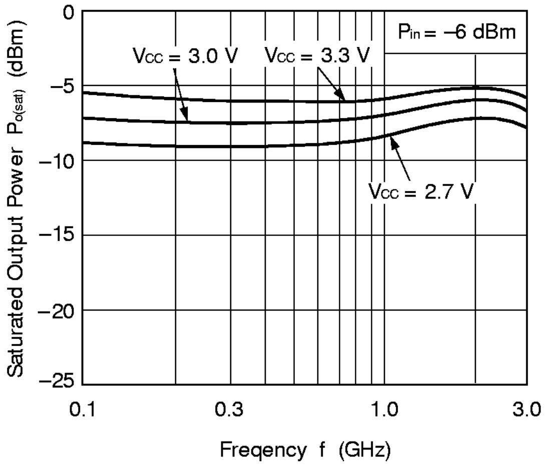
OUTPUT POWER vs. INPUT POWER



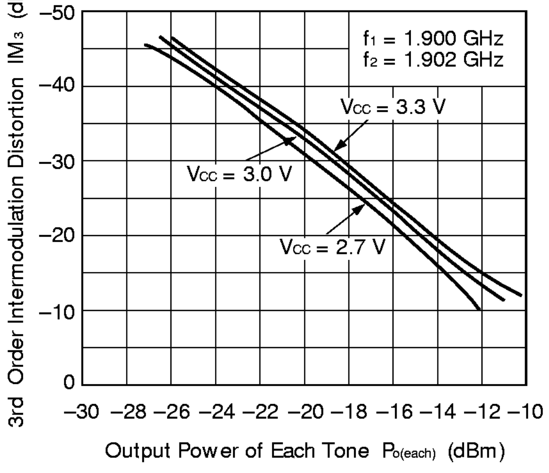
OUTPUT POWER vs. INPUT POWER



SATURATED OUTPUT POWER vs. FREQUENCY



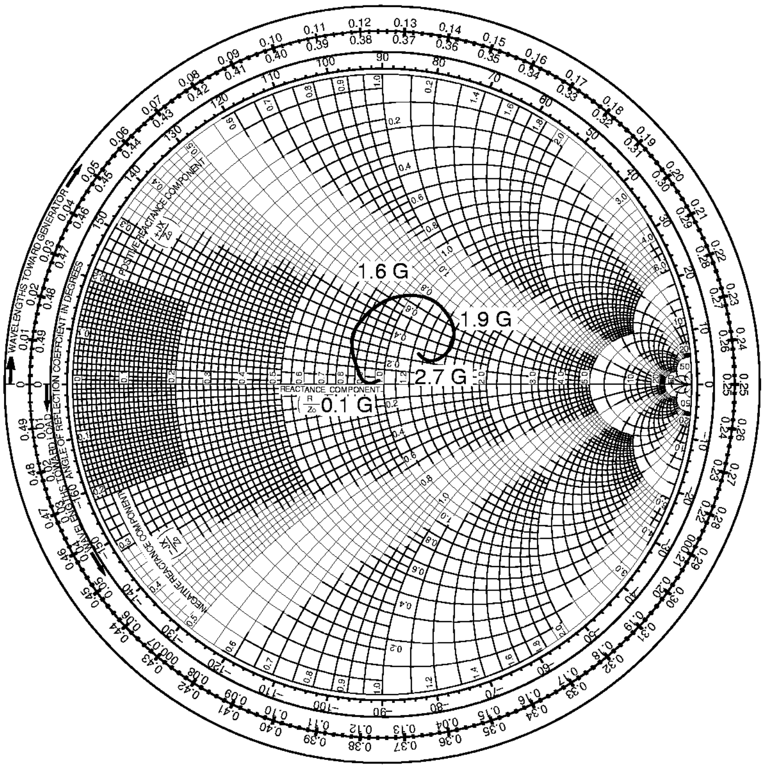
3RD ORDER INTERMODULATION DISTORTION vs. OUTPUT POWER OF EACH TONE



— μPC2749T —

S Parameter

S_{11}-FREQUENCY (V_{CC} = 3.0 V)



S_{22}-FREQUENCY (V_{CC} = 3.0 V)

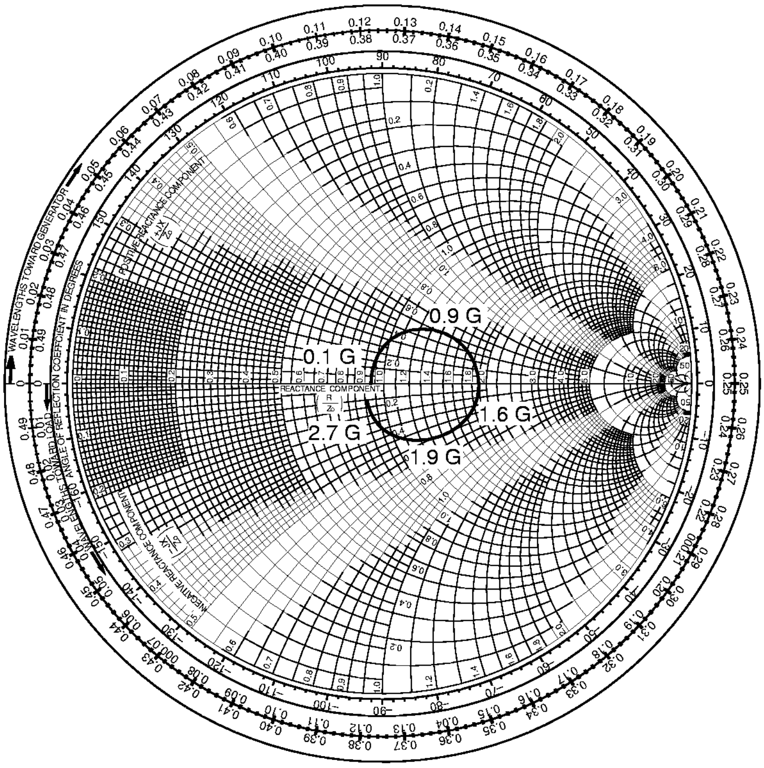
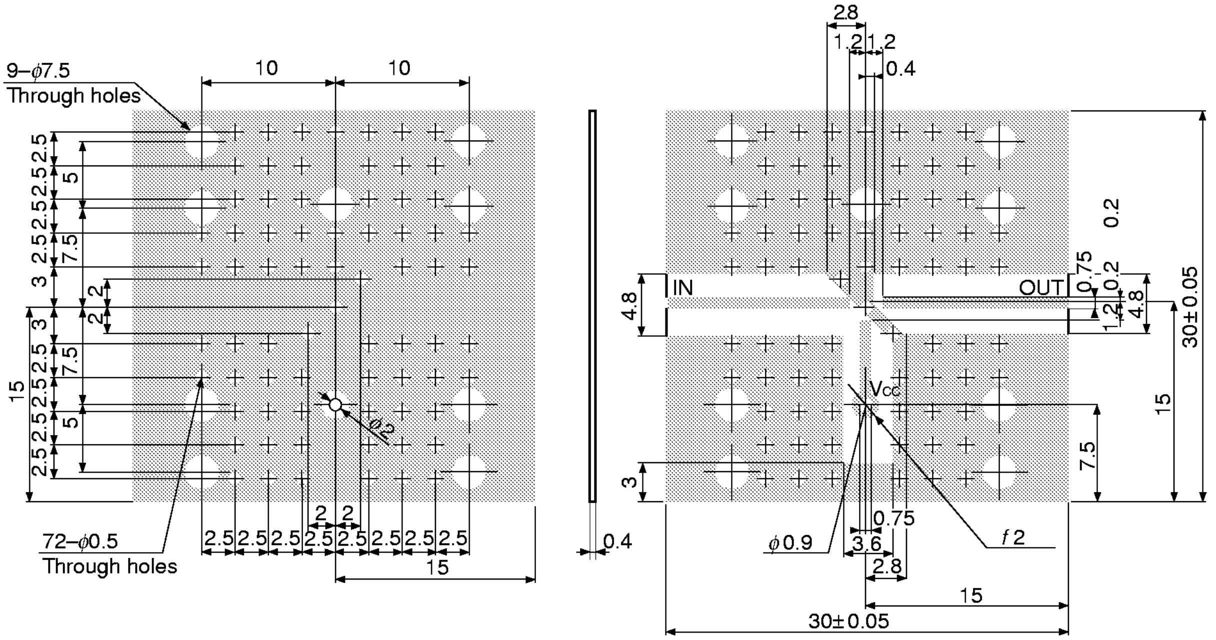


Illustration of evaluation board for the test circuit



(Back side)

(Surface)

Note

(1) 30 × 30 × 0.4 mm double sided copper clad polyimide board.

(2) Back side: GND pattern

(3) Solder plated on pattern

(4) ⊕⊕⊕ : Through holes

6 PIN MINI MOLD PACKAGE DIMENSIONS (Unit: mm)