μPD5756T6N

SiGe BiCMOS Integrated Circuit
Wide Band LNA IC with Through Function

Data Sheet

R09DS0026EJ0100
Rev.1.00
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DESCRIPTION

The μPD5756T6N is a low noise wideband amplifier IC with the through function mainly designed for the digital TV application. This IC exhibits low noise figure and low distortion characteristics.
This IC is manufactured using our latest SiGe BiCMOS process that shows superior high frequency characteristics.

FEATURES

- Low voltage operation : V_{CC} = 3.1 to 3.5 V (3.3 V TYP.)
- Low current consumption : $I_{CC}1$ = 25 mA TYP. @V_{CC} = 3.3 V (LNA-mode)
  : $I_{CC}2$ = 1 μA MAX. @V_{CC} = 3.3 V (Bypass-mode)
- Operation frequency : f = 40 to 1 000 MHz
- Low noise : NF = 3.2 dB TYP. @f = 1 000 MHz (LNA-mode)
- Low distortion : IIP_3 = +9 dBm TYP. @f1 = 500 MHz, f2 = 505 MHz (LNA-mode)
- Low insertion loss : L_{ins} = 1.7 dB TYP. @f = 1 000 MHz (Bypass-mode)
- High-density surface mounting : 6-pin plastic TSON (T6N) package (1.5 × 1.5 × 0.37 mm)

APPLICATIONS

- Low noise amplifier for the digital TV system, etc.

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPD5756T6N-E2	μPD5756T6N-E2-A	6-pin plastic TSON (T6N) (Pb-Free)	C4C	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 3 kpcs/reel

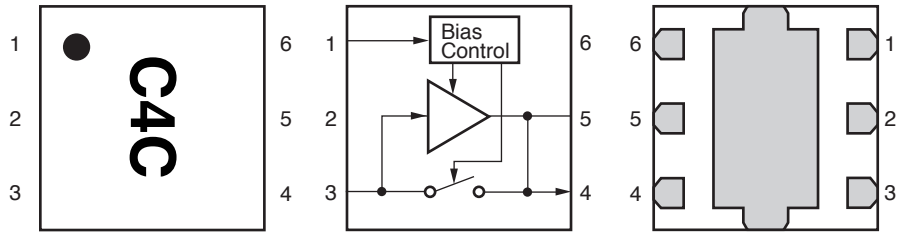
Remark To order evaluation samples, please contact your nearby sales office.
Part number for sample order: μPD5756T6N-A

CAUTION

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

PIN CONNECTIONS, MARKING AND INTERNAL BLOCK DIAGRAM

(Top View) (Top View) (Bottom View)



Pin No	Pin Name
1	V_{cont}
2	GND
3	INPUT
4	OUTPUT
5	Load
6	V_{CC}

Remark Exposed pad : GND

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C	4.0	V
Mode Control Voltage	V_{cont}	T_A = +25°C	4.0	V
Total Power Dissipation	P_{tot}	T_A = +85°C **Note**	300	mW
Operating Ambient Temperature	T_A		–40 to +85	°C
Storage Temperature	T_{stg}		–55 to +150	°C
Input Power	P_{in}	T_A = +25°C, $Z_S = Z_L$ = 75 Ω	+15	dBm

Note: Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB

RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	3.1	3.3	3.5	V
Mode Control Voltage (H)	$V_{cont\ (H)}$	1.0	—	V_{CC}	V
Mode Control Voltage (L)	$V_{cont\ (L)}$	–0.1	—	0.4	V
Operating Frequency	f	40	—	1 000	MHz
Operating Ambient Temperature	T_A	–40	+25	+85	°C
Input Power (LNA-mode) **Note**	P_{in}	—	—	0	dBm
Input Power (Bypass-mode) **Note**	P_{in}	—	—	+10	dBm

Note: T_A = +25°C, $Z_S = Z_L$ = 75 Ω

ELECTRICAL CHARACTERISTICS 1 (DC Characteristics) (T_A = +25°C, V_{CC} = 3.3 V, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current 1	$I_{CC}1$	V_{cont} = 3.3 V, No Signal (LNA-mode)	16	25	34	mA
Circuit Current 2	$I_{CC}2$	V_{cont} = 0 V, No Signal (Bypass-mode)	–	0.01	1	μA
Mode Control Current 1	$I_{cont}1$	V_{cont} = 3.3 V, No Signal (LNA-mode)	–	50	100	μA
Mode Control Current 2	$I_{cont}2$	V_{cont} = 0 V, No Signal (Bypass-mode)	–	0.01	1	μA

ELECTRICAL CHARACTERISTICS 2 (LNA-mode)
(T_A = +25°C, V_{CC} = V_{cont} = 3.3 V, Z_S = Z_L = 75 Ω, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Power Gain 1	G_P1	f = 40 MHz, P_{in} = –20 dBm	10.5	13	15.5	dB
Power Gain 2	G_P2	f = 1 000 MHz, P_{in} = –20 dBm	10.5	13	15.5	dB
Noise Figure 1	NF1	f = 40 MHz, Z_S = Z_L = 50 Ω, excluded PCB and connector losses **Note**	–	3.2	4.2	dB
Noise Figure 2	NF2	f = 1 000 MHz, Z_S = Z_L = 50 Ω, excluded PCB and connector losses **Note**	–	3.2	4.2	dB
Input Return Loss 1	$RL_{in}1$	f = 40 MHz, P_{in} = –20 dBm	7	9	–	dB
Input Return Loss 2	$RL_{in}2$	f = 1 000 MHz, P_{in} = –20 dBm	7	10	–	dB
Output Return Loss 1	$RL_{out}1$	f = 40 MHz, P_{in} = –20 dBm	7	10	–	dB
Output Return Loss 2	$RL_{out}2$	f = 1 000 MHz, P_{in} = –20 dBm	7	12	–	dB
Input 3rd Order Intercept Point	IIP_3	f1 = 500 MHz, f2 = 505 MHz, P_{in} = –20 dBm	+5	+9	–	dBm

Note: Input PCB and connector losses : 0.03 dB (at 40 MHz), 0.10 dB (at 1 000 MHz)

ELECTRICAL CHARACTERISTICS 3 (Bypass-mode)
(T_A = +25°C, V_{CC} = 3.3 V, V_{cont} = 0 V, Z_S = Z_L = 75 Ω, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss 1	$L_{ins}1$	f = 40 MHz, P_{in} = –10 dBm, excluded PCB and connector losses **Note**	–	0.5	1.5	dB
Insertion Loss 2	$L_{ins}2$	f = 1 000 MHz, P_{in} = –10 dBm, excluded PCB and connector losses **Note**	–	1.7	2.5	dB
Input Return Loss 1	$RL_{in}1$	f = 40 MHz, P_{in} = –10 dBm	10	26	–	dB
Input Return Loss 2	$RL_{in}2$	f = 1 000 MHz, P_{in} = –10 dBm	7	8	–	dB
Output Return Loss 1	$RL_{out}1$	f = 40 MHz, P_{in} = –10 dBm	10	25	–	dB
Output Return Loss 2	$RL_{out}2$	f = 1 000 MHz, P_{in} = –10 dBm	7	8	–	dB
Input 3rd Order Intercept Point	IIP_3	f1 = 500 MHz, f2 = 505 MHz, P_{in} = –5 dBm	+20	+29	–	dBm

Note: Input-output PCB and connector losses : 0.06 dB (at 40 MHz), 0.20 dB (at 1 000 MHz)

STANDARD CHARACTERISTICS FOR REFERENCE 1 (LNA-mode)
(T_A = +25°C, V_{CC} = V_{cont} = 3.3 V, Z_S = Z_L = 75 Ω, unless otherwise specified)

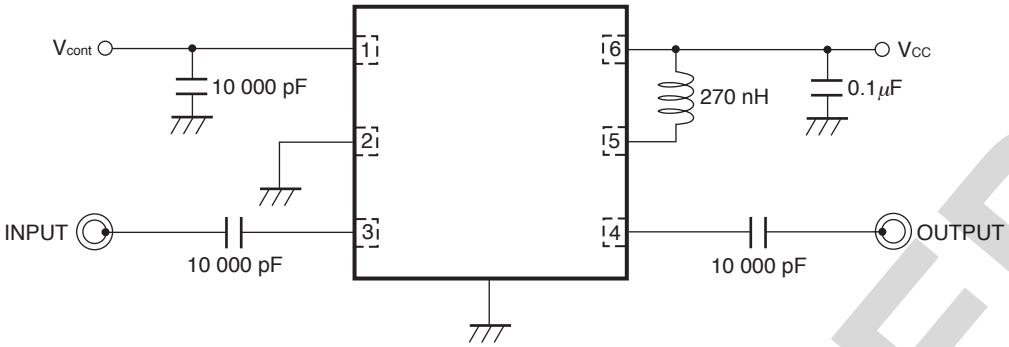
Parameter	Symbol	Test Conditions	Reference Value	Unit
Isolation 1	ISL1	f = 40 MHz, P_{in} = –20 dBm	20	dB
Isolation 2	ISL2	f = 1 000 MHz, P_{in} = –20 dBm	20	dB
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$	f = 500 MHz	+10	dBm

STANDARD CHARACTERISTICS FOR REFERENCE 2 (Bypass-mode)
(T_A = +25°C, V_{CC} = 3.3 V, V_{cont} = 0 V, Z_S = Z_L = 75 Ω, unless otherwise specified)

Parameter	Symbol	Test Conditions	Reference Value	Unit
Gain 1 dB Compression Output Power	$P_{O\ (1\ dB)}$	f = 500 MHz	**Note**	dBm

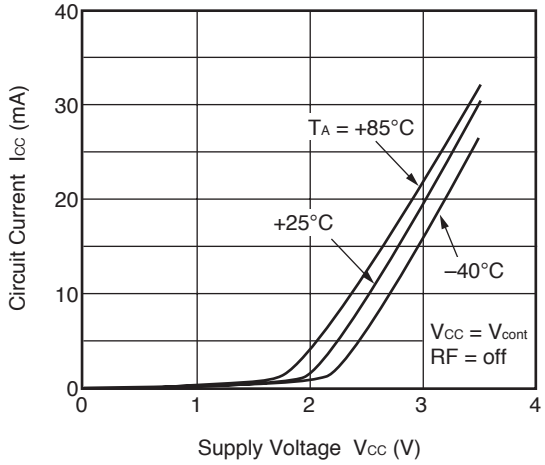
Note: The input-output power characteristic is not saturated up to +15 dBm of input power.

TEST CIRCUIT

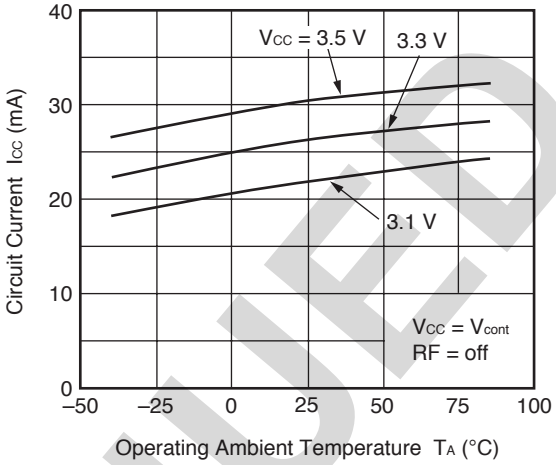


TYPICAL CHARACTERISTICS 1 (DC Characteristics)
(T_A = +25°C, unless otherwise specified)

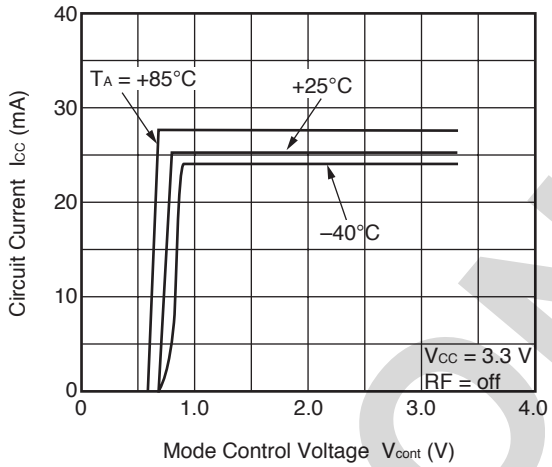
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



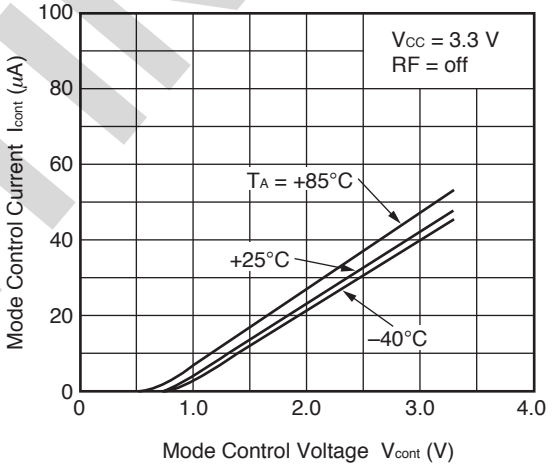
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



CIRCUIT CURRENT vs. MODE CONTROL VOLTAGE



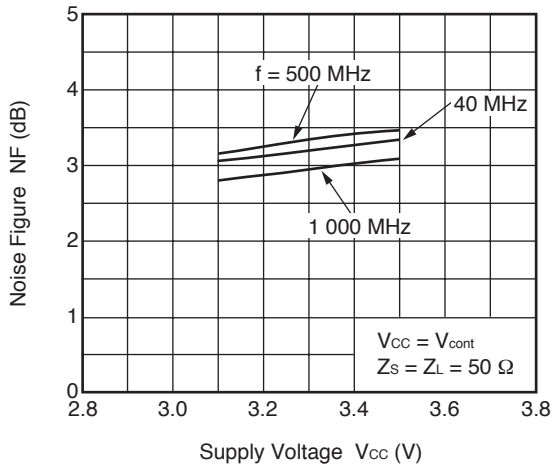
MODE CONTROL CURRENT vs. MODE CONTROL VOLTAGE



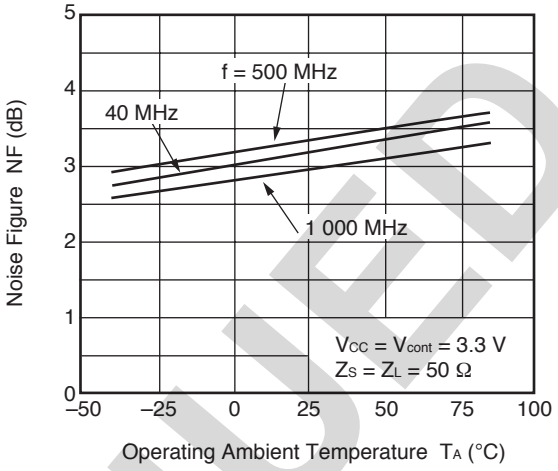
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS 2 (LNA-mode)
(T_A = +25°C, Z_S = Z_L = 75 Ω, unless otherwise specified)

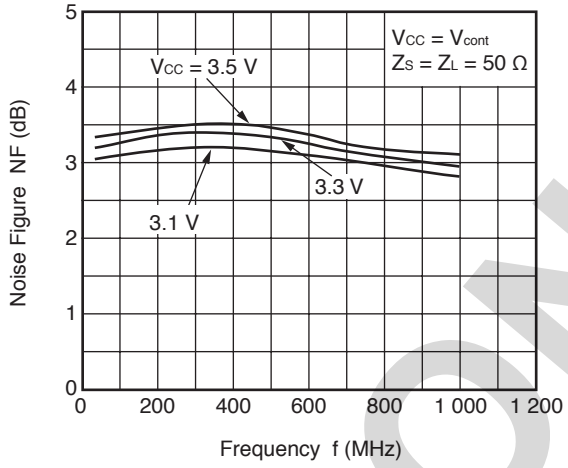
NOISE FIGURE vs. SUPPLY VOLTAGE



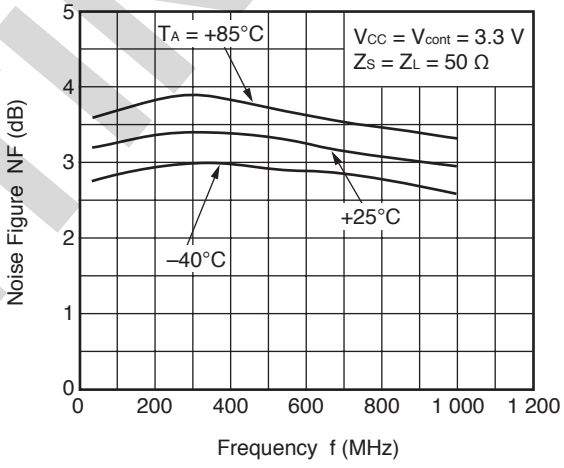
NOISE FIGURE vs. OPERATING AMBIENT TEMPERATURE



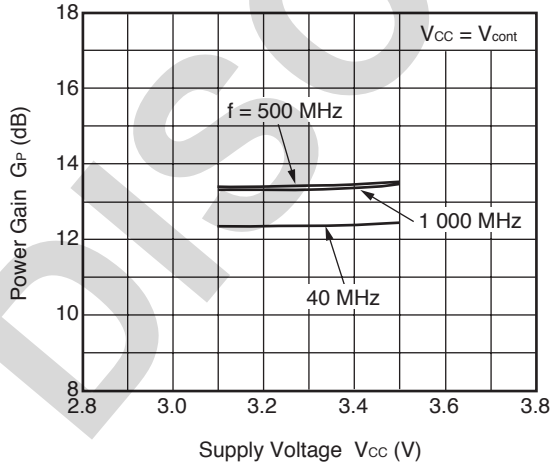
NOISE FIGURE vs. FREQUENCY



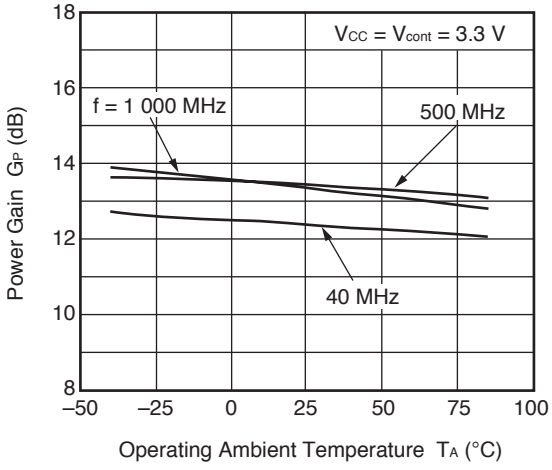
NOISE FIGURE vs. FREQUENCY



POWER GAIN vs. SUPPLY VOLTAGE

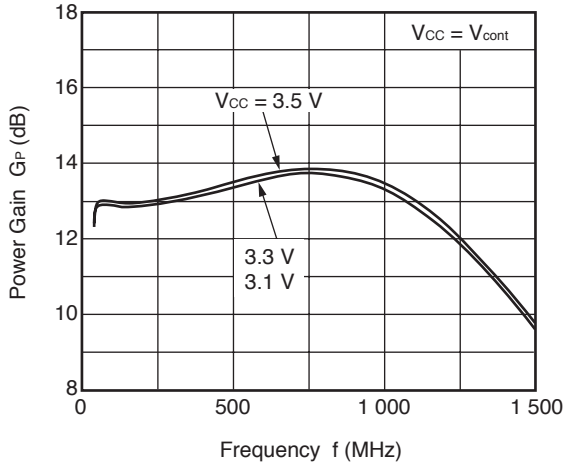


POWER GAIN vs. OPERATING AMBIENT TEMPERATURE

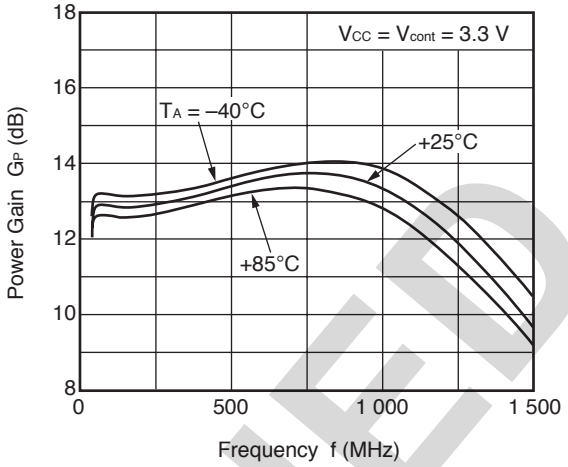


Remark The graphs indicate nominal characteristics.

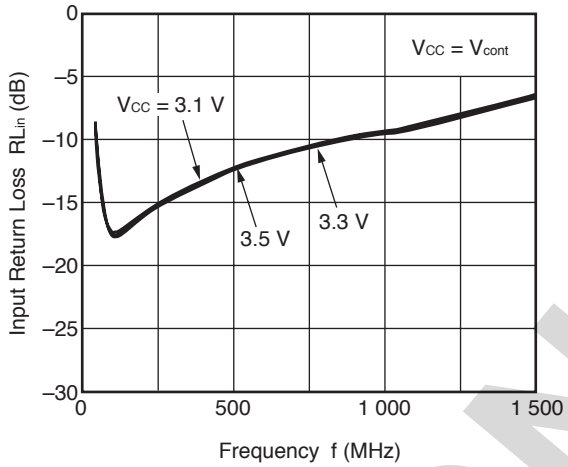
POWER GAIN vs. FREQUENCY



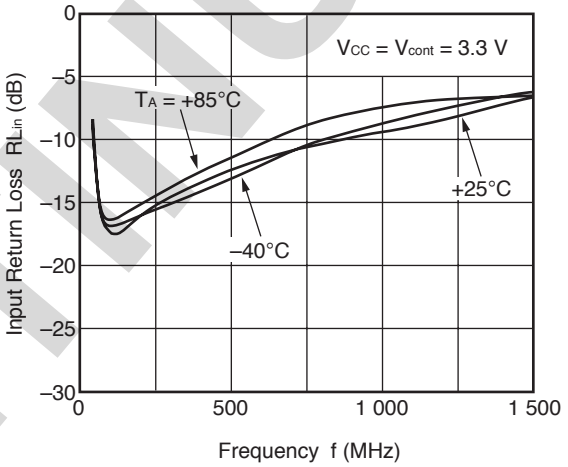
POWER GAIN vs. FREQUENCY



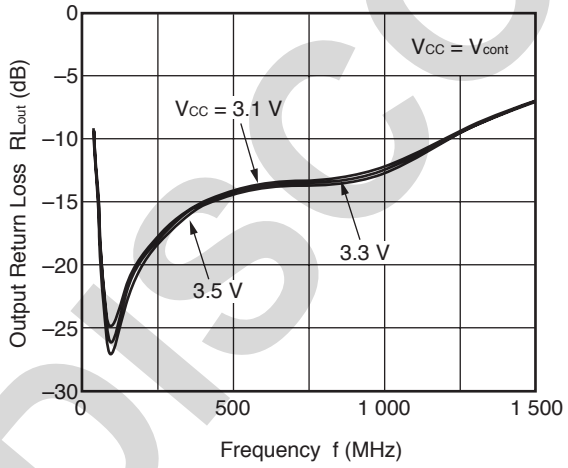
INPUT RETURN LOSS vs. FREQUENCY



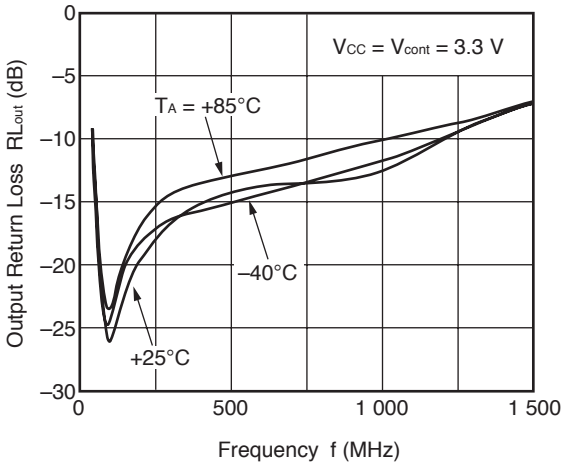
INPUT RETURN LOSS vs. FREQUENCY



OUTPUT RETURN LOSS vs. FREQUENCY

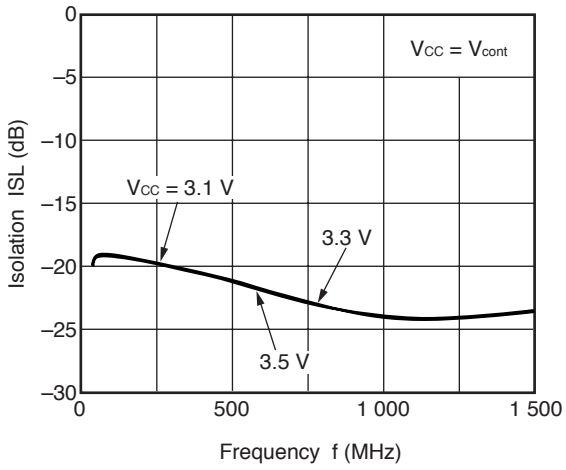


OUTPUT RETURN LOSS vs. FREQUENCY

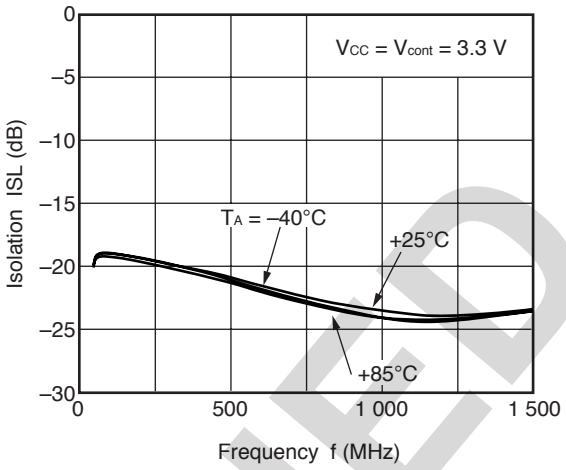


Remark The graphs indicate nominal characteristics.

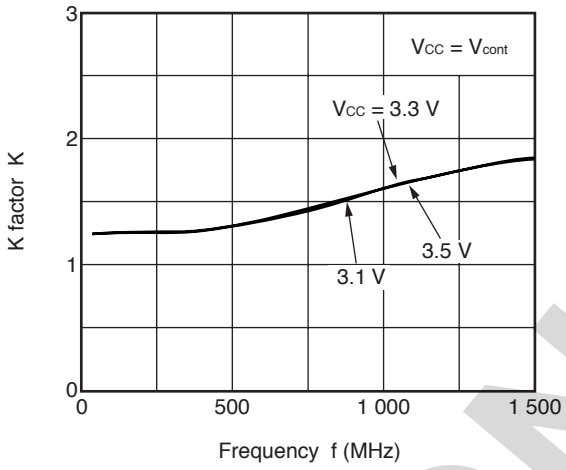
ISOLATION vs. FREQUENCY



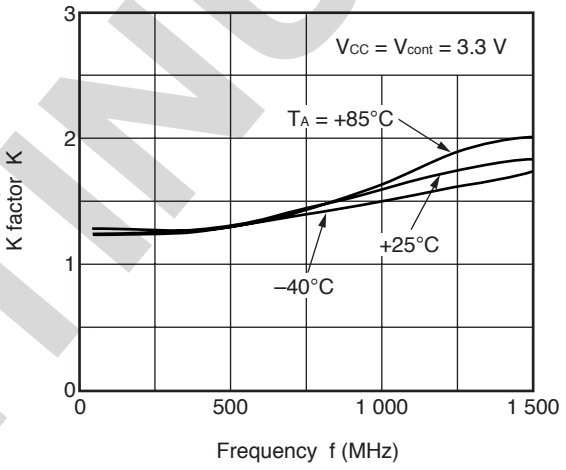
ISOLATION vs. FREQUENCY



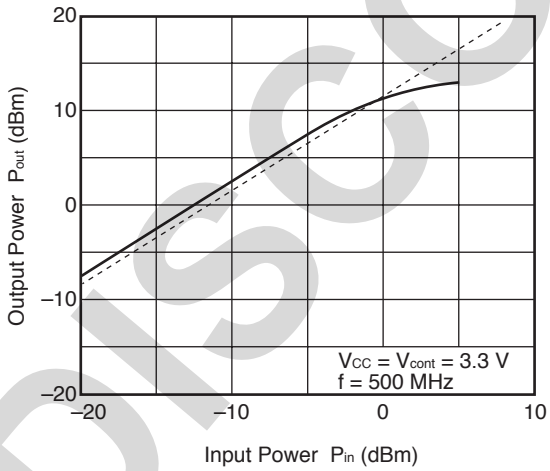
K FACTOR vs. FREQUENCY



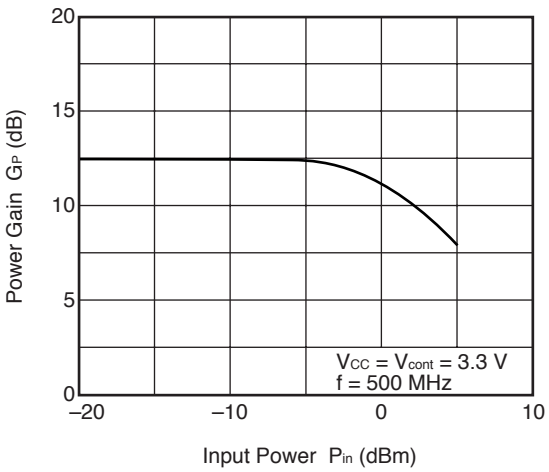
K FACTOR vs. FREQUENCY



OUTPUT POWER vs. INPUT POWER

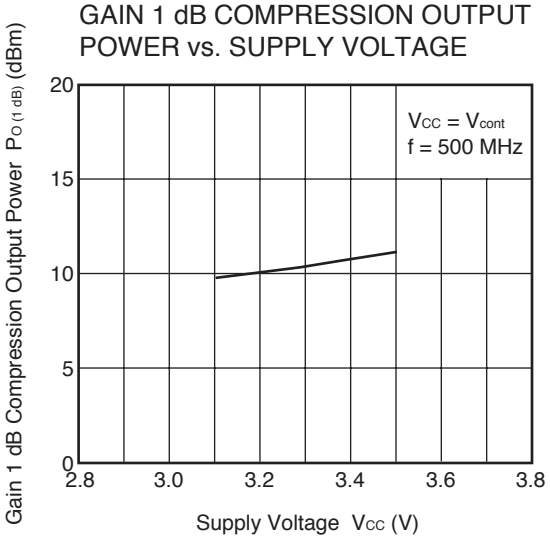


POWER GAIN vs. INPUT POWER

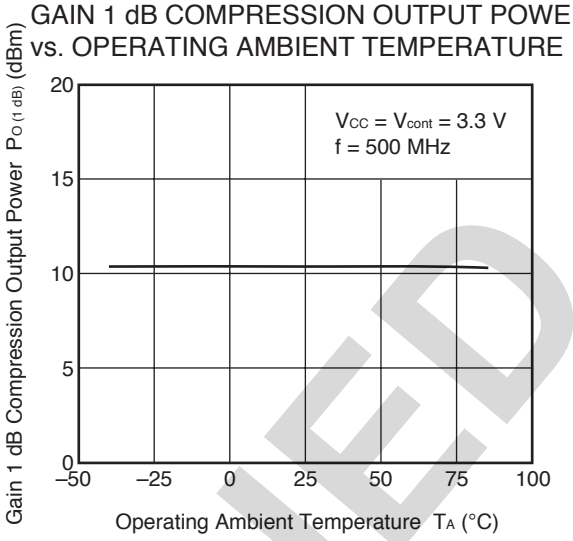


Remark The graphs indicate nominal characteristics.

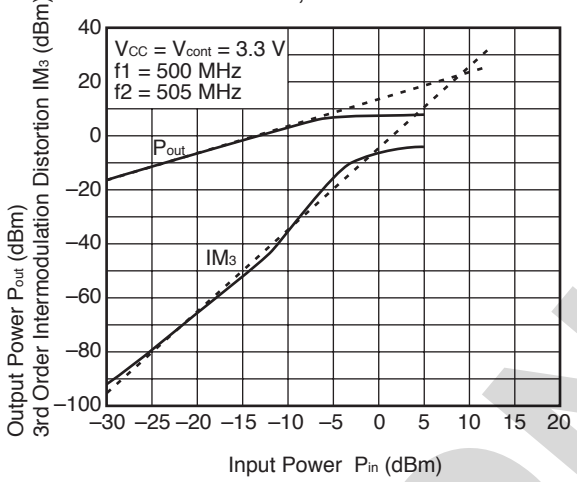
GAIN 1 dB COMPRESSION OUTPUT POWER vs. SUPPLY VOLTAGE



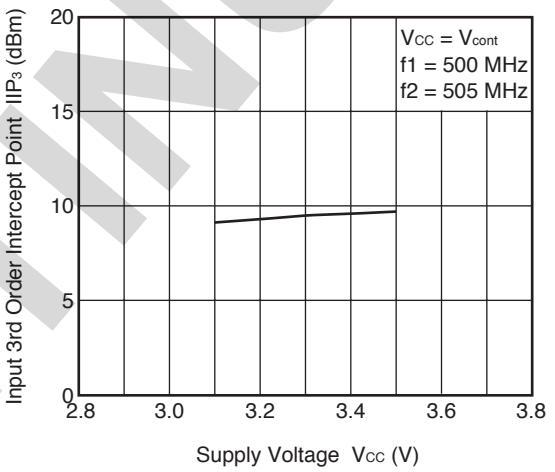
GAIN 1 dB COMPRESSION OUTPUT POWER vs. OPERATING AMBIENT TEMPERATURE



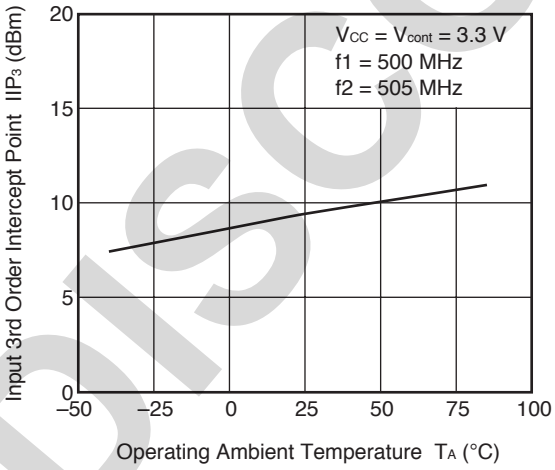
OUTPUT POWER, IM3 vs. INPUT POWER



INPUT 3RD ORDER INTERCEPT POINT vs. SUPPLY VOLTAGE



INPUT 3RD ORDER INTERCEPT POINT vs. OPERATING AMBIENT TEMPERATURE

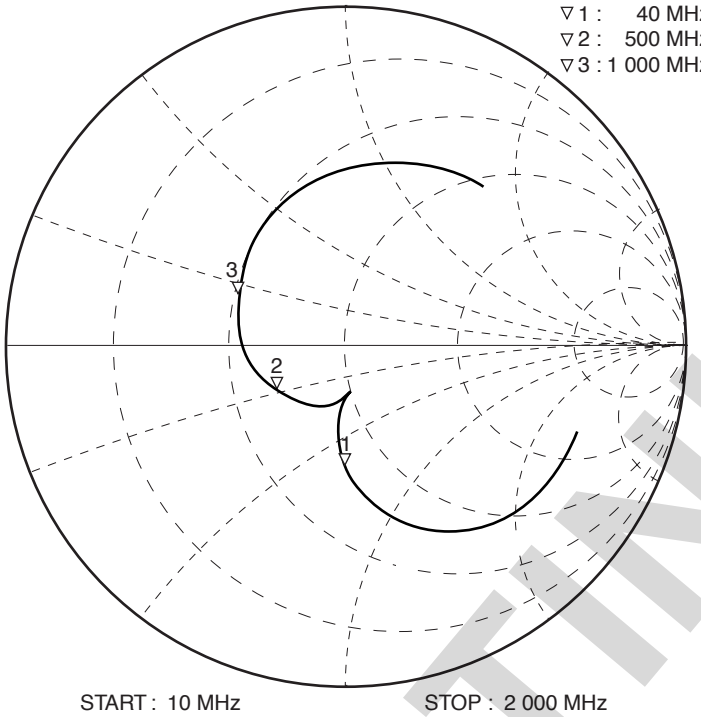


Remark The graphs indicate nominal characteristics.

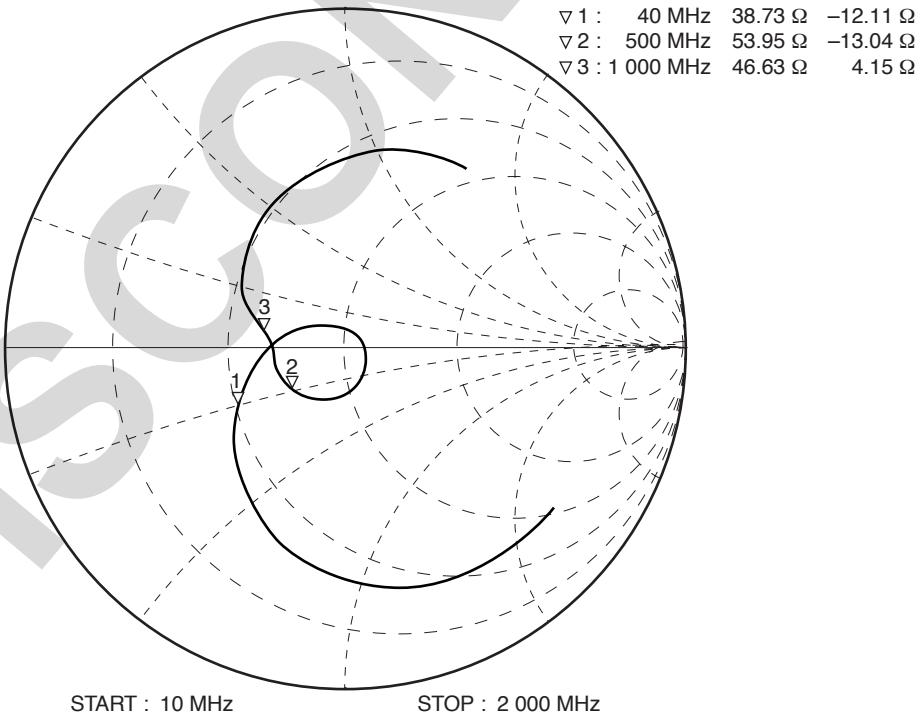
S-PARAMETERS 1 (LNA-mode)

(T_A = +25°C, V_{CC} = V_{cont} = 3.3 V, Z_S = Z_L = 75 Ω, monitored at connector on board)

S_{11}-FREQUENCY



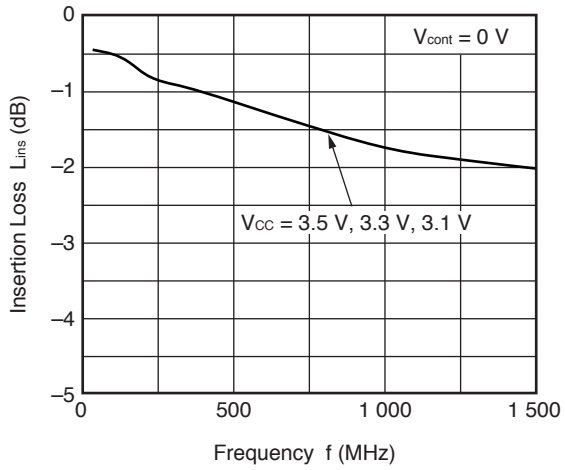
S_{22}-FREQUENCY



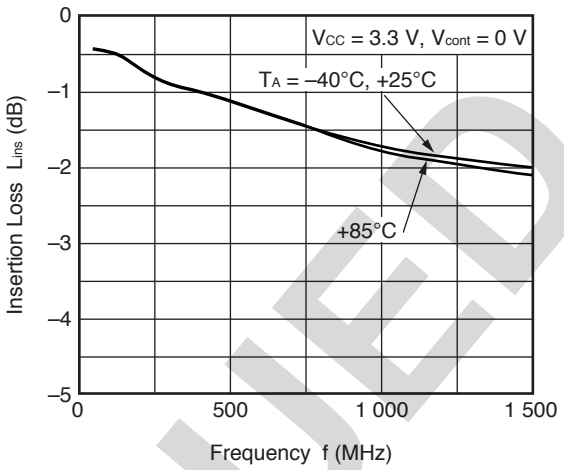
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS 3 (Bypass-mode)
(T_A = +25°C, Z_S = Z_L = 75 Ω, unless otherwise specified)

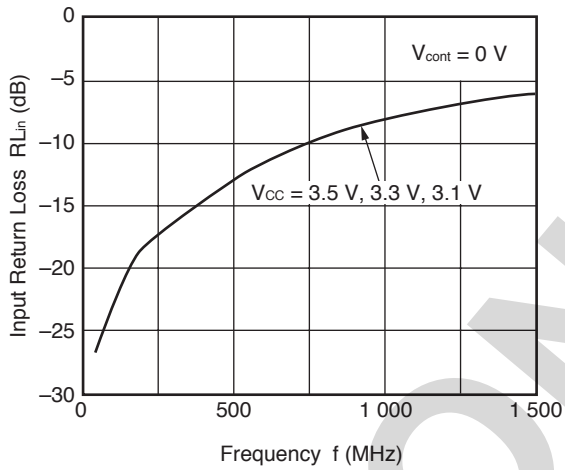
INSERTION LOSS vs. FREQUENCY



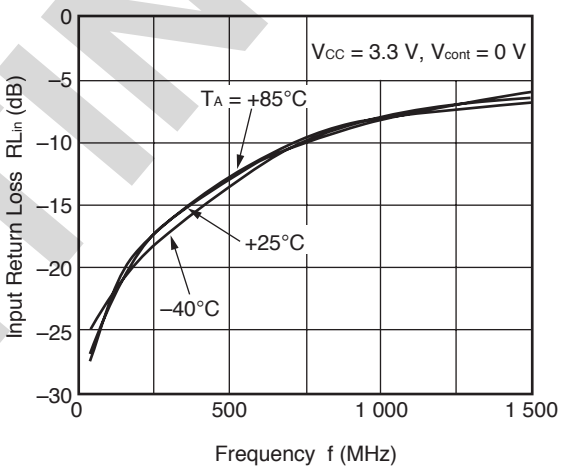
INSERTION LOSS vs. FREQUENCY



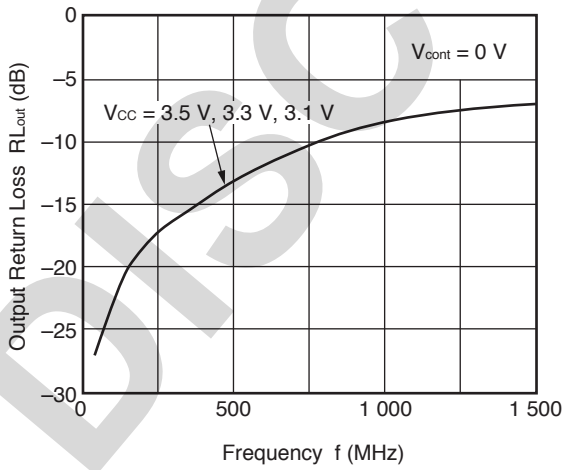
INPUT RETURN LOSS vs. FREQUENCY



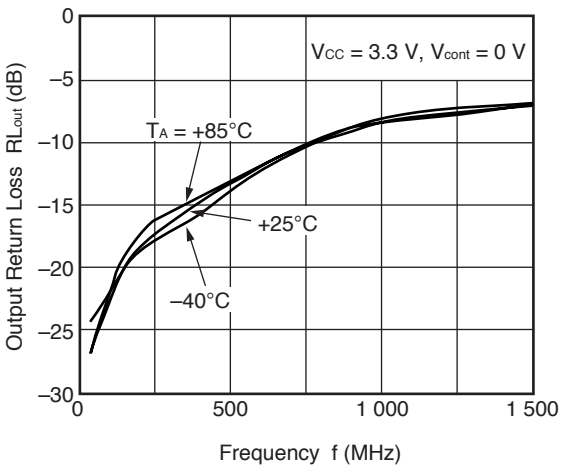
INPUT RETURN LOSS vs. FREQUENCY



OUTPUT RETURN LOSS vs. FREQUENCY

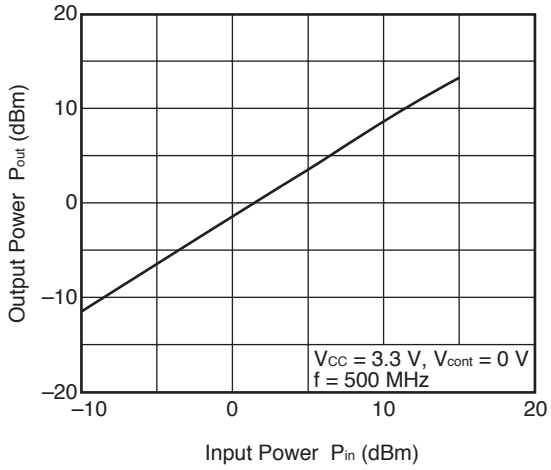


OUTPUT RETURN LOSS vs. FREQUENCY

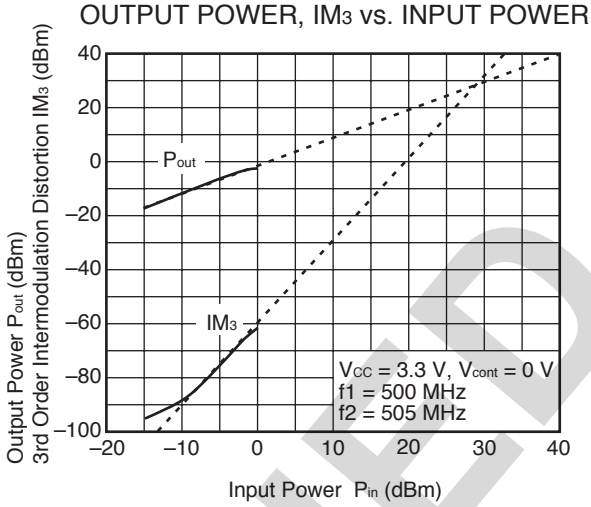


Remark The graphs indicate nominal characteristics.

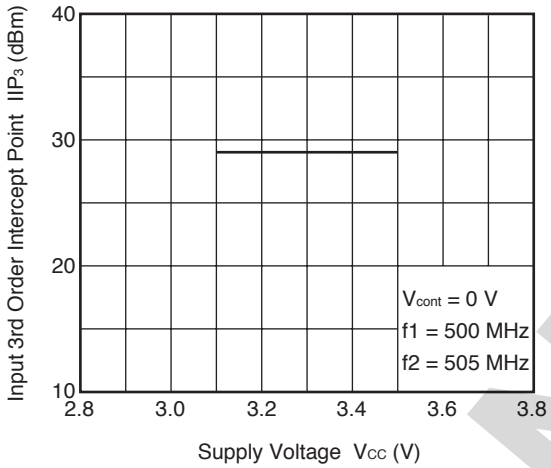
OUTPUT POWER vs. INPUT POWER



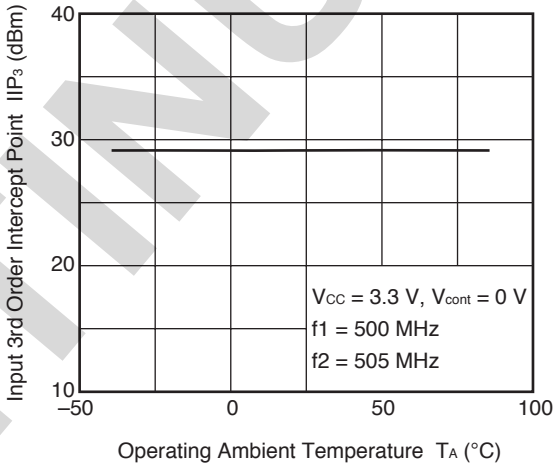
OUTPUT POWER, IM3 vs. INPUT POWER



INPUT 3RD ORDER INTERCEPT POINT
vs. SUPPLY VOLTAGE



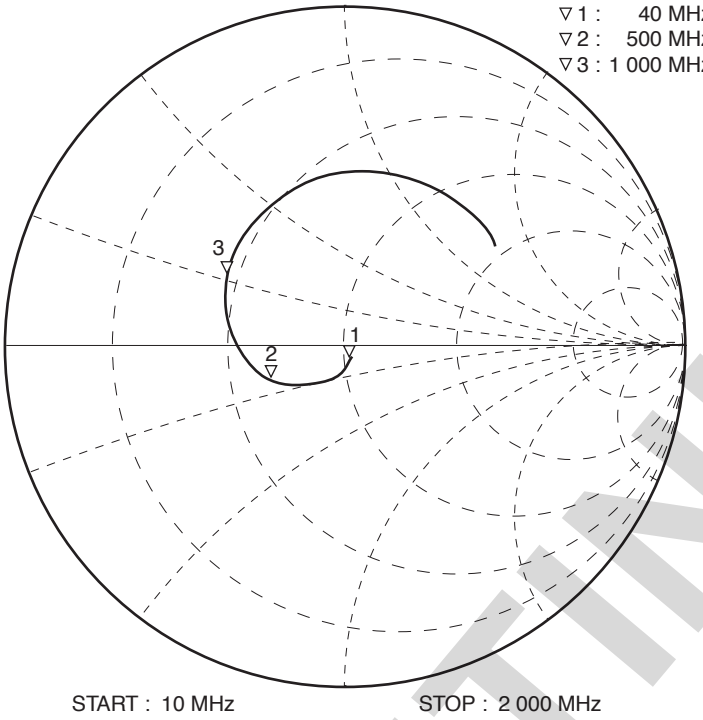
INPUT 3RD ORDER INTERCEPT POINT
vs. OPERATING AMBIENT TEMPERATURE



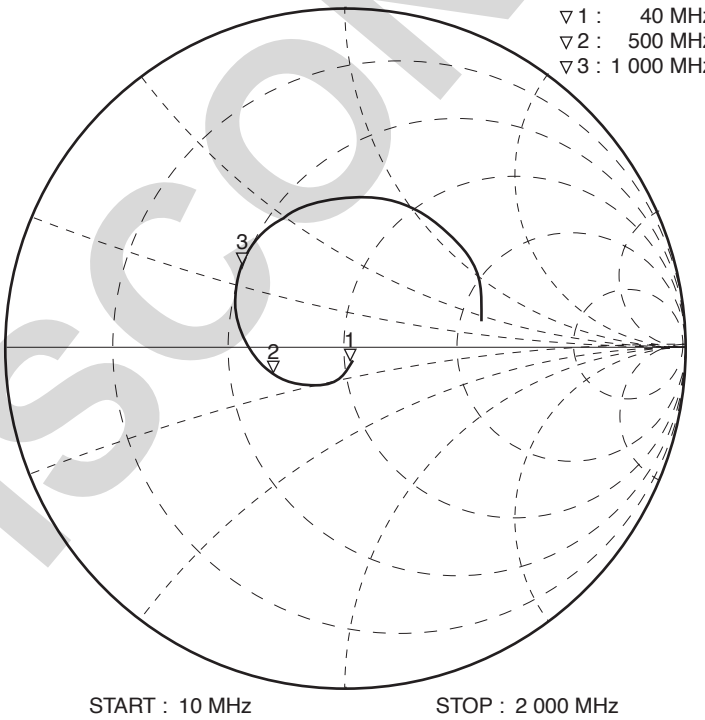
Remark The graphs indicate nominal characteristics.

S-PARAMETERS 2 (Bypass-mode)
(T_A = +25°C, V_{CC} = 3.3 V, V_{cont} = 0 V, Z_S = Z_L = 75 Ω, monitored at connector on board)

S_{11}-FREQUENCY



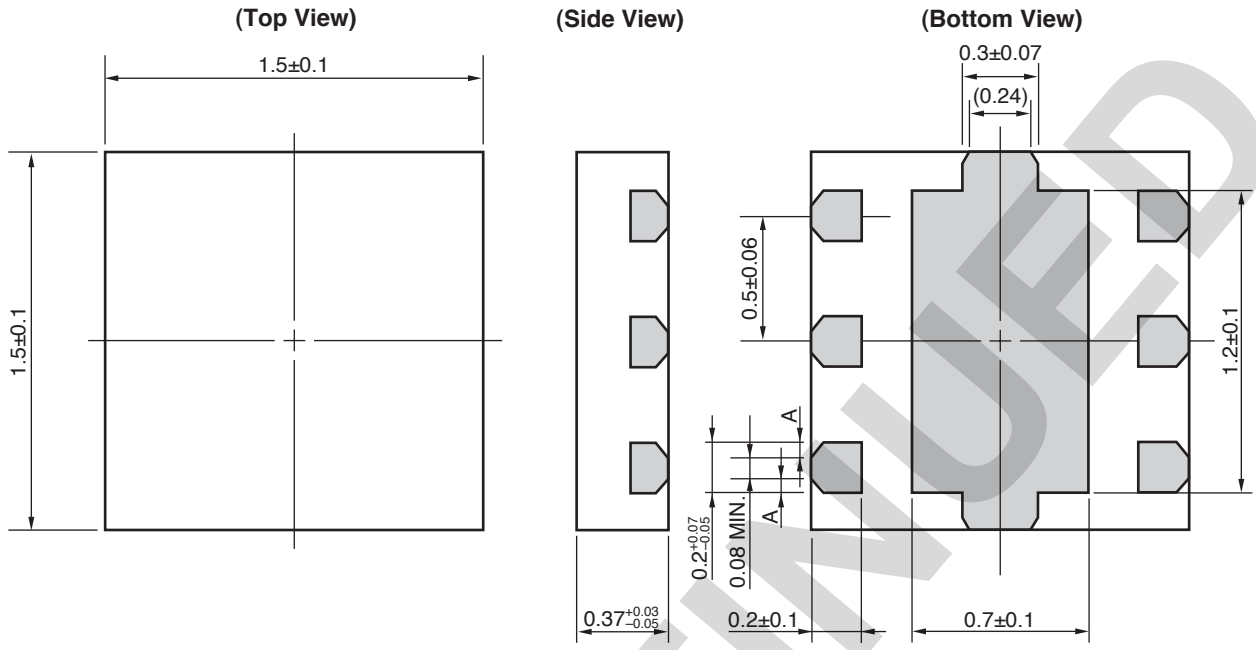
S_{22}-FREQUENCY



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

6-PIN PLASTIC TSON (T6N) (UNIT: mm)



Remark A>0

( ) : 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).
(3) All the ground terminals should be connected to the ground plane as close as possible.
(4) The bypass capacitor should be attached to V_{CC} line.
(5) Do not supply DC voltage to INPUT 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 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
Partial Heating	Peak temperature (terminal 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.

Revision History	μPD5756T6N Data Sheet

Rev.	Date	Description	
		Page	Summary
1.00	Oct 04, 2011	—	First edition issued