CEL

BIPOLAR ANALOG INTEGRATED CIRCUIT
μPC3237TK

LOW NOISE WIDE BAND SILICON GERMANIUM MMIC AMPLIFIER FOR MOBILE COMMUNICATIONS

DESCRIPTION

The μPC3237TK is a silicon germanium (SiGe) monolithic integrated circuit designed as low noise amplifier for the mobile digital TV etc. This device exhibits low noise figure and high power gain characteristics.

This package is 6-pin lead-less minimold, suitable for surface mount.

This IC is manufactured using our 50 GHz f_{max} UHS2 (Ultra High Speed Process) SiGe bipolar process.

FEATURES

- Supply voltage : V_{CC} = 2.4 to 3.3 V (2.8 V TYP.)
- Low current consumption : I_{CC} = 5 mA TYP. @ V_{CC} = 2.8 V
- Low Noise : NF = 1.4 dB TYP. @ f = 470 MHz
  : NF = 1.5 dB TYP. @ f = 770 MHz
- Power gain : G_P = 15.3 dB TYP. @ f = 470 MHz
  : G_P = 13.5 dB TYP. @ f = 770 MHz
- High-density surface mounting : 6-pin lead-less minimold package (1.5 × 1.1 × 0.55 mm)

APPLICATIONS

- Low noise amplifier for the mobile digital TV etc.

ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
μPC3237TK-E2	μPC3237TK-E2-A	6-pin lead-less minimold (1511 PKG) (Pb-Free)	6N	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 5 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office
Part number for sample order: μPC3237TK-A

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

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

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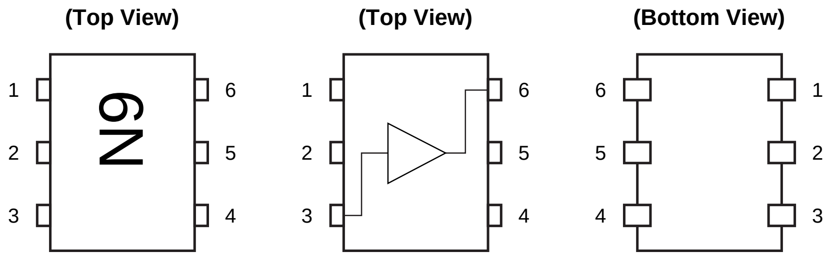
PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM



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

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C	3.6	V
Circuit Current	I_{CC}	T_A = +25°C	10	mA
Power Dissipation	P_D	T_A = +85°C **Note**	203	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	+8	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}	2.4	2.8	3.3	V
Operating Ambient Temperature	T_A	–40	+25	+85	°C

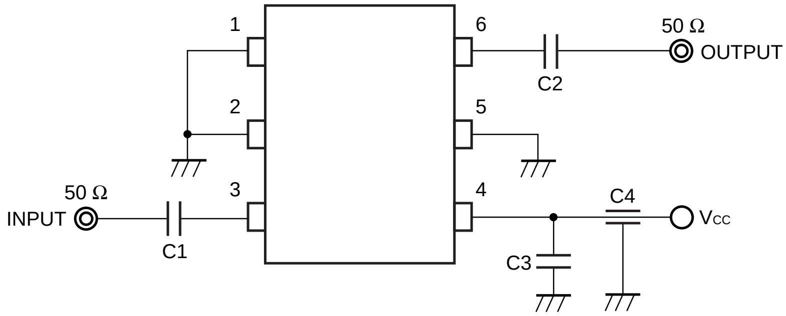
ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{CC} = 2.8 V, Z_S = Z_L = 50 Ω, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No input signal	3.5	5	7	mA
Power Gain 1	G_P1	f = 470 MHz, P_{in} = –30 dBm	13.0	15.3	17.5	dB
Power Gain 2	G_P2	f = 770 MHz, P_{in} = –30 dBm	11.0	13.5	16.0	dB
Noise Figure 1	NF1	f = 470 MHz	–	1.4	1.9	dB
Noise Figure 2	NF2	f = 770 MHz	–	1.5	2.0	dB
Input Return Loss 1	$RL_{in}1$	f = 470 MHz, P_{in} = –30 dBm	6.5	9.5	–	dB
Input Return Loss 2	$RL_{in}2$	f = 770 MHz, P_{in} = –30 dBm	5.5	8.5	–	dB
Output Return Loss 1	$RL_{out}1$	f = 470 MHz, P_{in} = –30 dBm	9	14	–	dB
Output Return Loss 2	$RL_{out}2$	f = 770 MHz, P_{in} = –30 dBm	10	15	–	dB
Isolation 1	ISL1	f = 470 MHz, P_{in} = –30 dBm	17	22	–	dB
Isolation 2	ISL2	f = 770 MHz, P_{in} = –30 dBm	16	21	–	dB
Gain 1 dB Compression Output Power 1	$P_{O (1 dB)} 1$	f = 470 MHz	–8	–5.5	–	dBm
Gain 1 dB Compression Output Power 2	$P_{O (1 dB)} 2$	f = 770 MHz	–8	–5.5	–	dBm

STANDARD CHARACTERISTICS FOR REFERENCE
(T_A = +25°C, V_{CC} = 2.8 V, Z_S = Z_L = 50 Ω, unless otherwise specified)

Parameter	Symbol	Test Conditions	Reference Value	Unit
Saturated Output Power 1	$P_{O (sat)} 1$	f = 470 MHz, P_{in} = +2 dBm	+1.3	dBm
Saturated Output Power 2	$P_{O (sat)} 2$	f = 770 MHz, P_{in} = +2 dBm	+1.3	dBm
Input 3rd Order Distortion Intercept Point 1	IIP_31	f1 = 470 MHz, f2 = 471 MHz	–10.5	dBm
Input 3rd Order Distortion Intercept Point 2	IIP_32	f1 = 770 MHz, f2 = 771 MHz	–9.5	dBm
Output 3rd Order Distortion Intercept Point 1	OIP_31	f1 = 470 MHz, f2 = 471 MHz	+4.8	dBm
Output 3rd Order Distortion Intercept Point 2	OIP_32	f1 = 770 MHz, f2 = 771 MHz	+4.0	dBm
K factor 1	K1	f = 470 MHz	1.15	–
K factor 2	K2	f = 770 MHz	1.20	–

TEST CIRCUIT

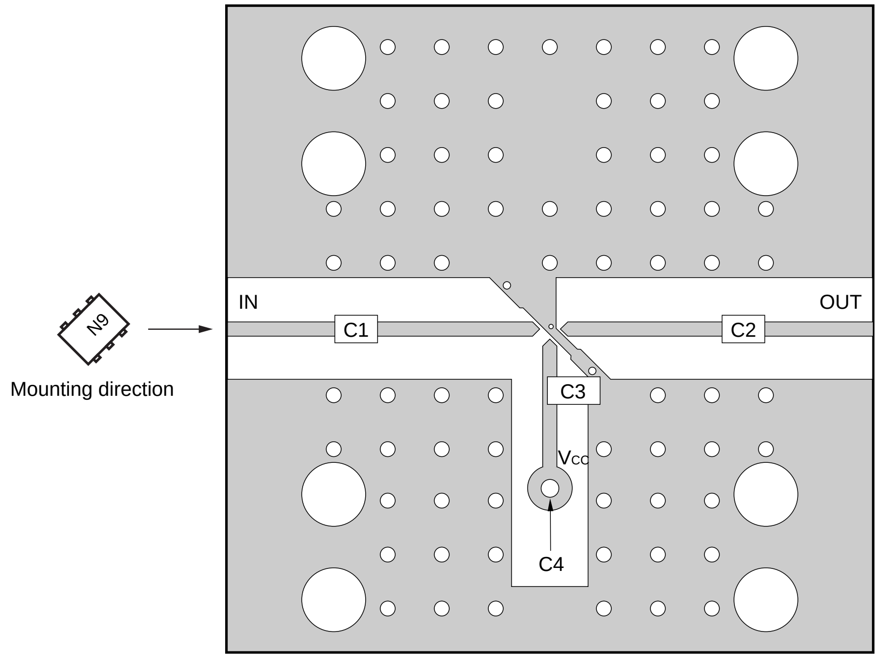


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

COMPONENTS OF TEST CIRCUIT FOR MEASURING ELECTRICAL CHARACTERISTICS

	Type	Value
C1, C2	Chip Capacitor	100 pF
C3	Chip Capacitor	1 000 pF
C4	Feed-through Capacitor	1 000 pF

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

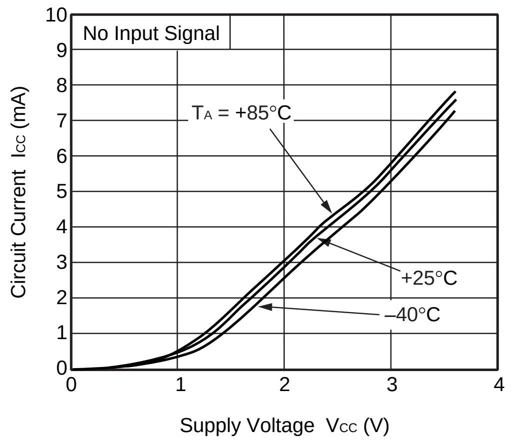


Notes

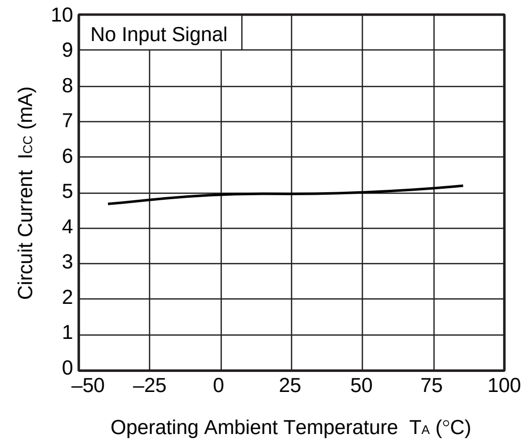
1. 30 × 30 × 0.4 mm double sided copper clad FR-4 board.
2. Back side: GND pattern
3. Au plated on pattern
4. ∘ ○: Through holes

TYPICAL CHARACTERISTICS (T_A = +25°C, V_{CC} = 2.8 V, Z_S = Z_L = 50 Ω, unless otherwise specified)

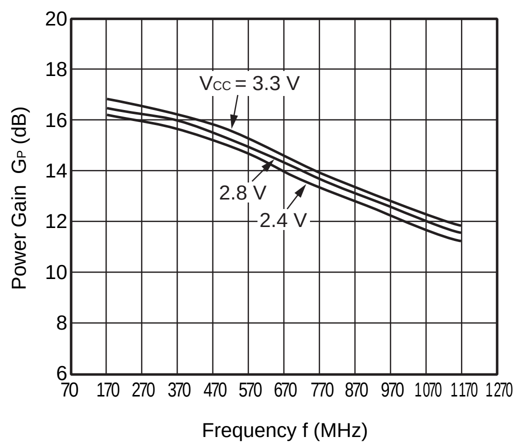
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



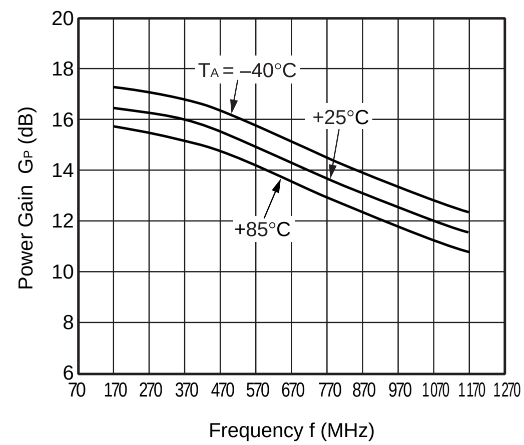
CURCUIT CURRENT vs.
OPERATING AMBIENT TEMPERATURE



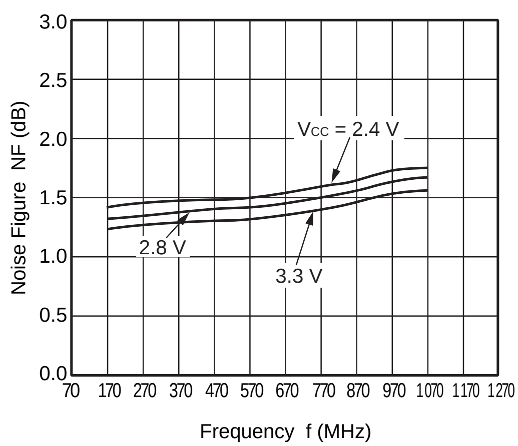
POWER GAIN vs. FREQUENCY



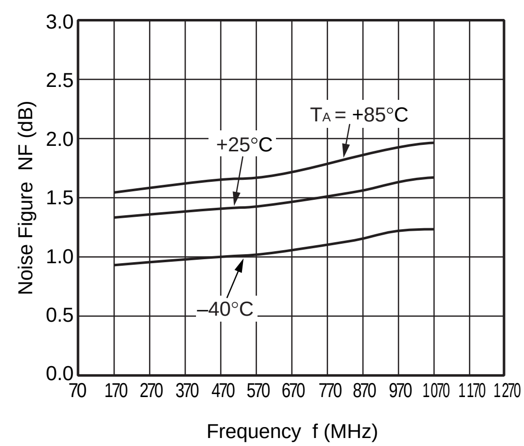
POWER GAIN vs. FREQUENCY



NOISE FIGURE vs. FREQUENCY

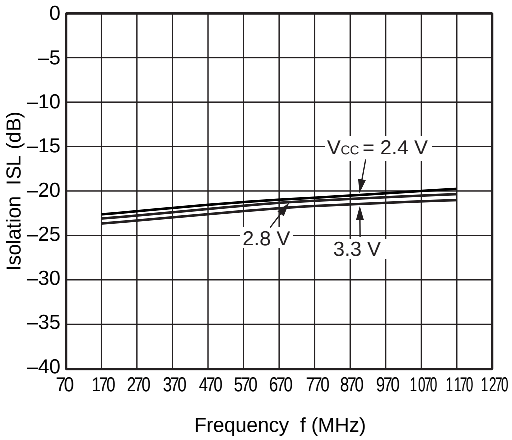


NOISE FIGURE vs. FREQUENCY

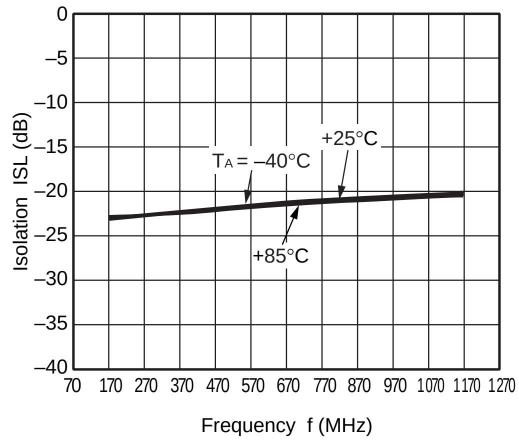


Remark The graphs indicate nominal characteristics.

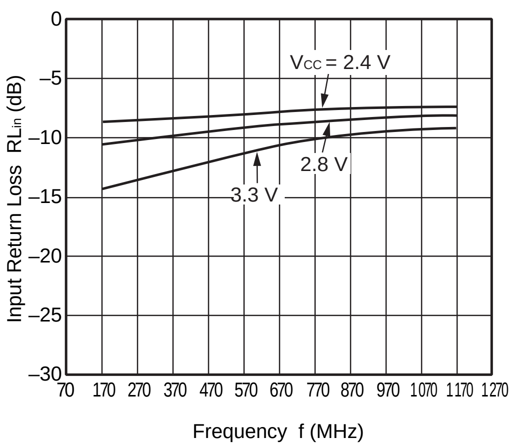
ISOLATION vs. FREQUENCY



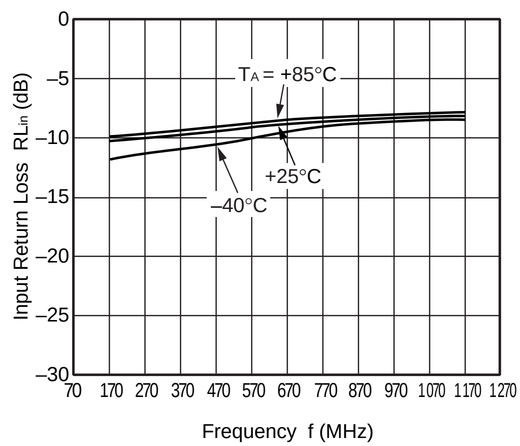
ISOLATION vs. FREQUENCY



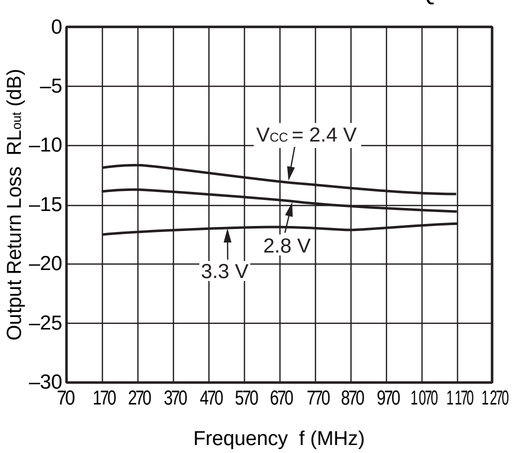
INPUT RETURN LOSS vs. FREQUENCY



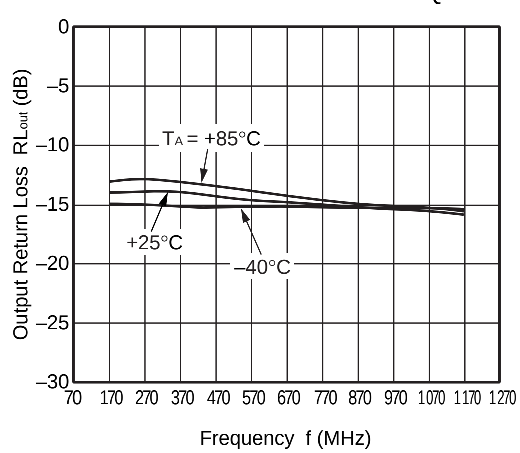
INPUT RETURN LOSS vs. FREQUENCY



OUTPUT RETURN LOSS vs. FREQUENCY

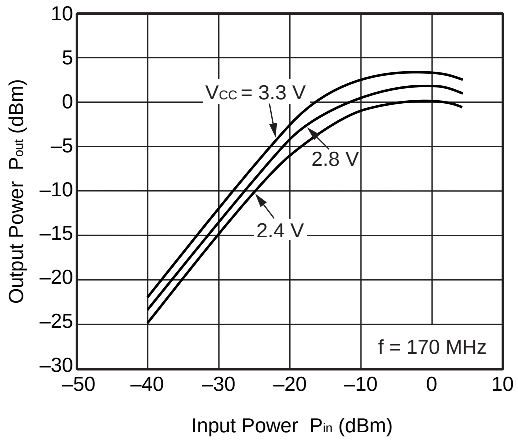


OUTPUT RETURN LOSS vs. FREQUENCY

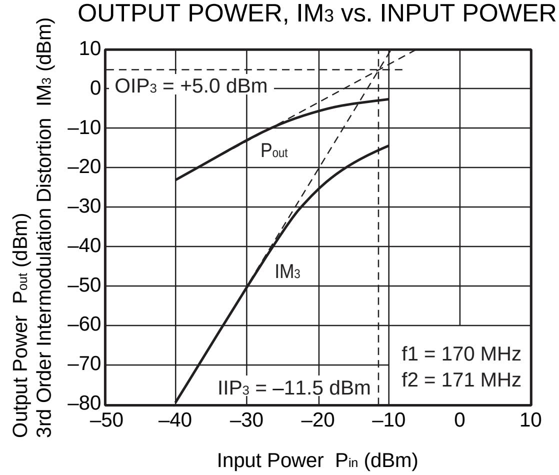


Remark The graphs indicate nominal characteristics.

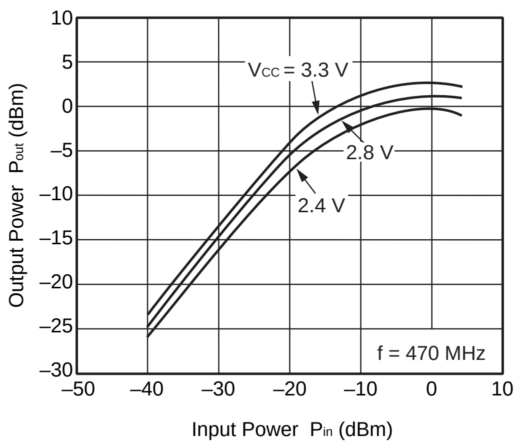
OUTPUT POWER vs. INPUT POWER



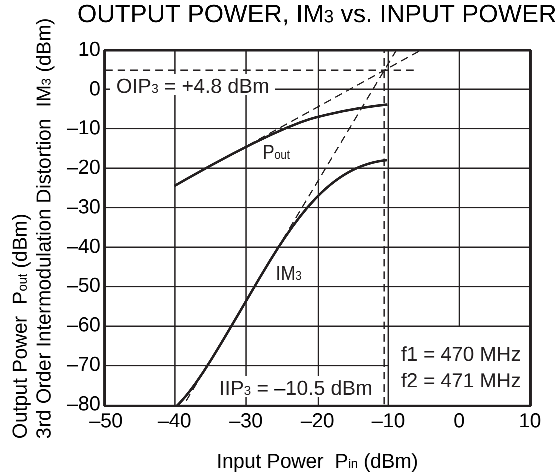
OUTPUT POWER, IM3 vs. INPUT POWER



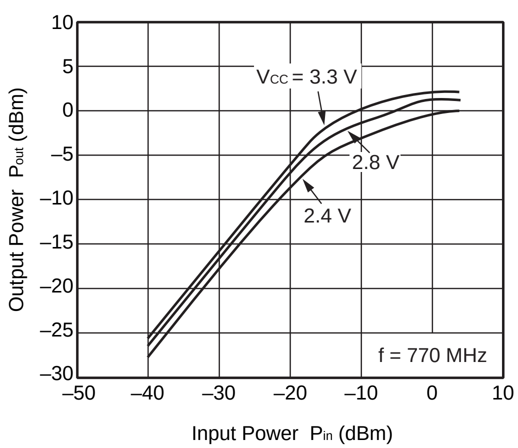
OUTPUT POWER vs. INPUT POWER



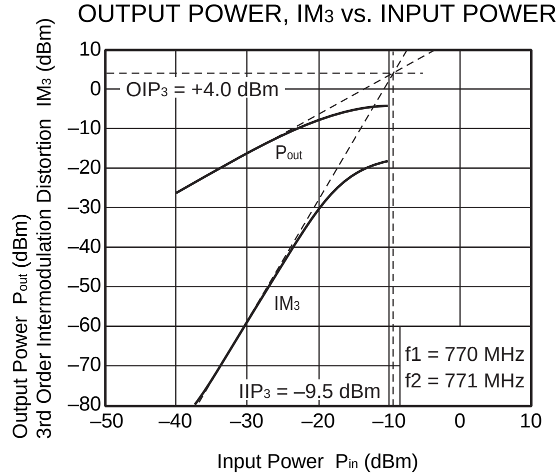
OUTPUT POWER, IM3 vs. INPUT POWER



OUTPUT POWER vs. INPUT POWER



OUTPUT POWER, IM3 vs. INPUT POWER



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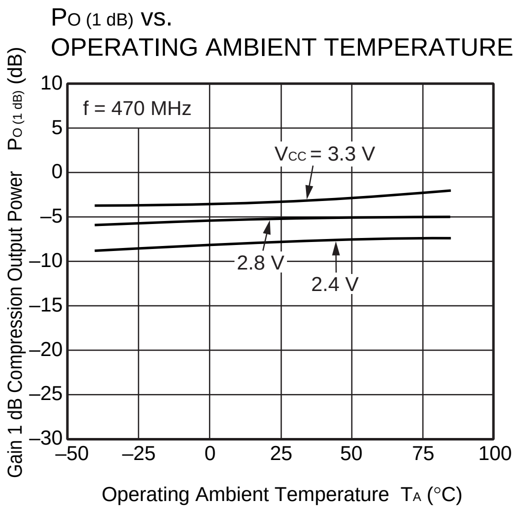
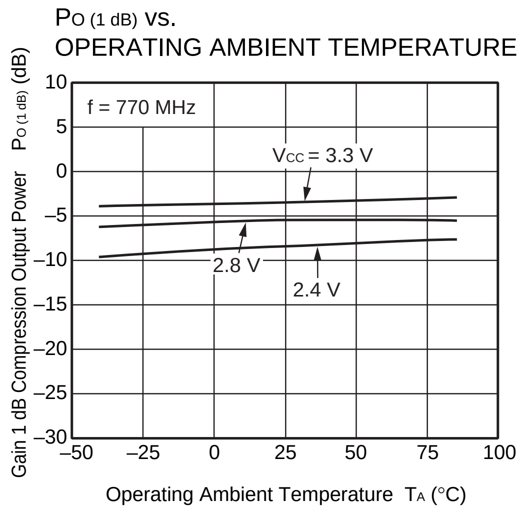
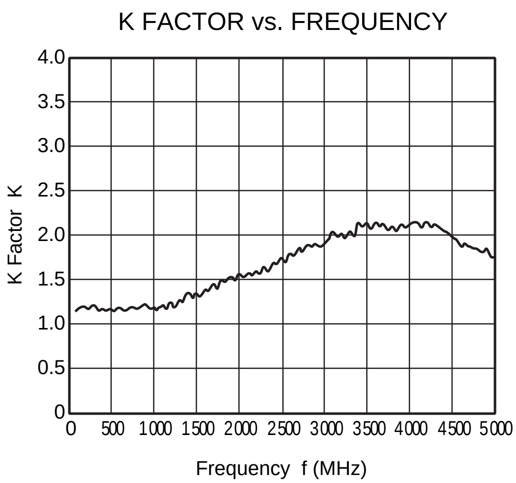


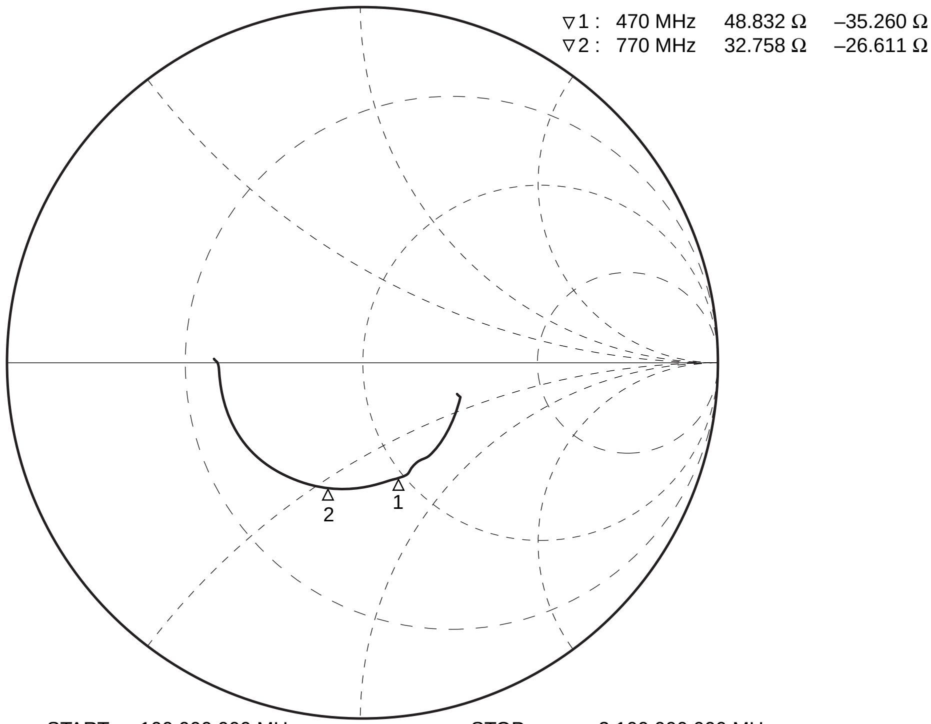




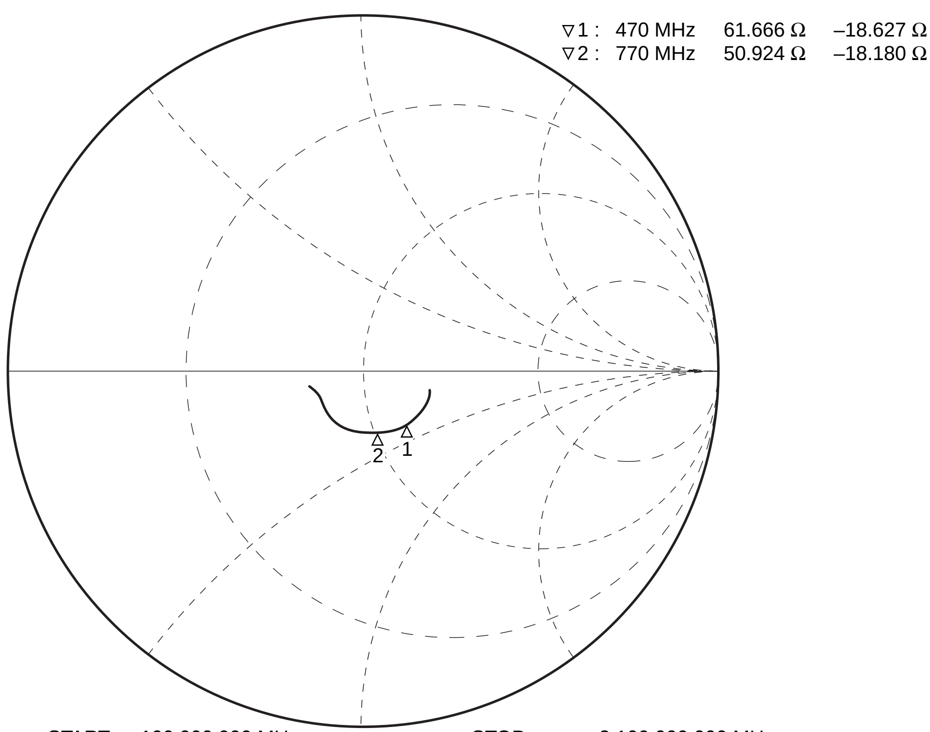
Remark The graphs indicate nominal characteristics.

S-PARAMETERS (T_A = +25°C, V_{CC} = 2.8 V, monitored at connector on board)

S_{11}–FREQUENCY

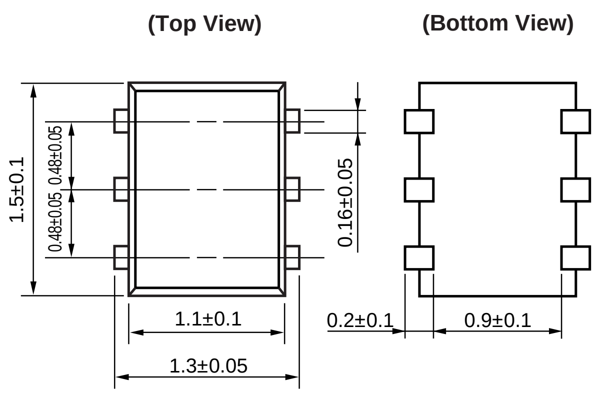


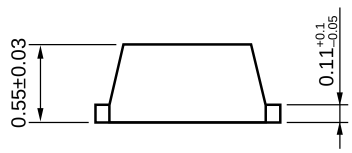
S_{22}–FREQUENCY



PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (1511 PKG) (UNIT: mm)





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 terminals must be connected together with wide ground pattern to decrease impedance difference.
(3) The bypass capacitor should be attached to the V_{CC} line.
(4) The DC cut capacitor should be attached to Input and Output pin.
(5) Pin 1 (NC) should be connected to the ground pattern.

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 (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 (except for partial heating).

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M8E 02.11-1

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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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