



BIPOLAR ANALOG INTEGRATED CIRCUIT

μ PC3237TK

LOW NOISE WIDE BAND SILICON GERMANIUM MMIC AMPLIFIER FOR MOBILE COMMUNICATIONS

DESCRIPTION

The μ PC3237TK 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 ($1.5 \times 1.1 \times 0.55$ mm)

APPLICATIONS

- Low noise amplifier for the mobile digital TV etc.

ORDERING INFORMATION

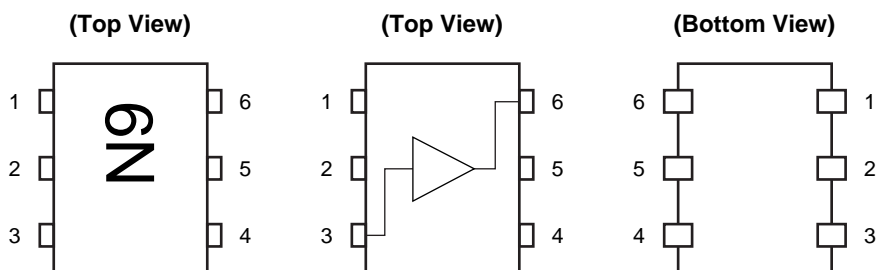
Part Number	Order Number	Package	Marking	Supplying Form
μ PC3237TK-E2	μ PC3237TK-E2-A	6-pin lead-less minimold (1511 PKG) (Pb-Free)	6N	<ul style="list-style-type: none">• Embossed tape 8 mm wide• Pin 1, 6 face the perforation side of the tape• Qty 5 kpcs/reel

Remark To order evaluation samples, please contact your nearby sales office
Part number for sample order: μ PC3237TK-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.

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

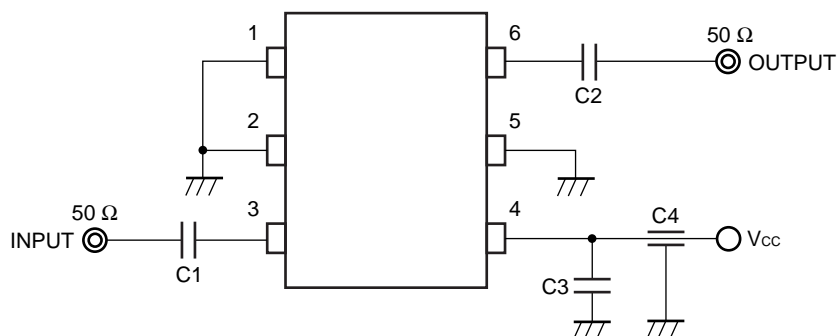
ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $Z_S = Z_L = 50\ \Omega$, unless otherwise specified)

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}	$f = 470\text{ MHz}$, $P_{in} = -30\text{ dBm}$	13.0	15.3	17.5	dB
Power Gain 2	G_{P2}	$f = 770\text{ MHz}$, $P_{in} = -30\text{ dBm}$	11.0	13.5	16.0	dB
Noise Figure 1	NF1	$f = 470\text{ MHz}$	–	1.4	1.9	dB
Noise Figure 2	NF2	$f = 770\text{ MHz}$	–	1.5	2.0	dB
Input Return Loss 1	RL_{in1}	$f = 470\text{ MHz}$, $P_{in} = -30\text{ dBm}$	6.5	9.5	–	dB
Input Return Loss 2	RL_{in2}	$f = 770\text{ MHz}$, $P_{in} = -30\text{ dBm}$	5.5	8.5	–	dB
Output Return Loss 1	RL_{out1}	$f = 470\text{ MHz}$, $P_{in} = -30\text{ dBm}$	9	14	–	dB
Output Return Loss 2	RL_{out2}	$f = 770\text{ MHz}$, $P_{in} = -30\text{ dBm}$	10	15	–	dB
Isolation 1	ISL1	$f = 470\text{ MHz}$, $P_{in} = -30\text{ dBm}$	17	22	–	dB
Isolation 2	ISL2	$f = 770\text{ MHz}$, $P_{in} = -30\text{ dBm}$	16	21	–	dB
Gain 1 dB Compression Output Power 1	$P_{O(1\text{ dB})1}$	$f = 470\text{ MHz}$	–8	–5.5	–	dBm
Gain 1 dB Compression Output Power 2	$P_{O(1\text{ dB})2}$	$f = 770\text{ MHz}$	–8	–5.5	–	dBm

STANDARD CHARACTERISTICS FOR REFERENCE**($T_A = +25^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $Z_S = Z_L = 50\ \Omega$, unless otherwise specified)**

Parameter	Symbol	Test Conditions	Reference Value	Unit
Saturated Output Power 1	$P_{O(sat)1}$	$f = 470\text{ MHz}$, $P_{in} = +2\text{ dBm}$	+1.3	dBm
Saturated Output Power 2	$P_{O(sat)2}$	$f = 770\text{ MHz}$, $P_{in} = +2\text{ dBm}$	+1.3	dBm
Input 3rd Order Distortion Intercept Point 1	IIP ₃₁	$f_1 = 470\text{ MHz}$, $f_2 = 471\text{ MHz}$	–10.5	dBm
Input 3rd Order Distortion Intercept Point 2	IIP ₃₂	$f_1 = 770\text{ MHz}$, $f_2 = 771\text{ MHz}$	–9.5	dBm
Output 3rd Order Distortion Intercept Point 1	OIP ₃₁	$f_1 = 470\text{ MHz}$, $f_2 = 471\text{ MHz}$	+4.8	dBm
Output 3rd Order Distortion Intercept Point 2	OIP ₃₂	$f_1 = 770\text{ MHz}$, $f_2 = 771\text{ MHz}$	+4.0	dBm
K factor 1	K1	$f = 470\text{ MHz}$	1.15	–
K factor 2	K2	$f = 770\text{ MHz}$	1.20	–

TEST CIRCUIT

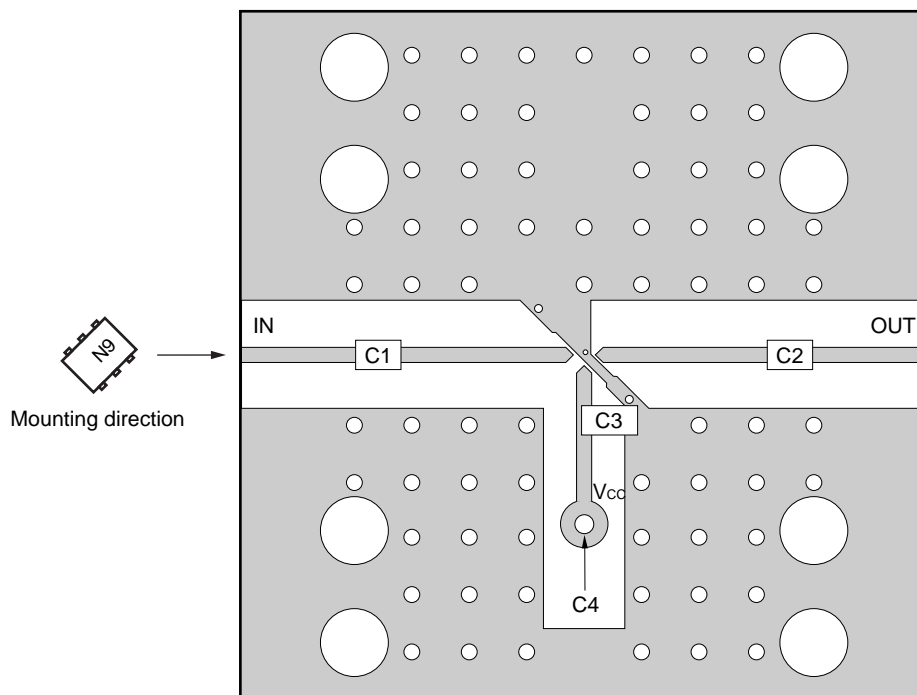


The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

**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

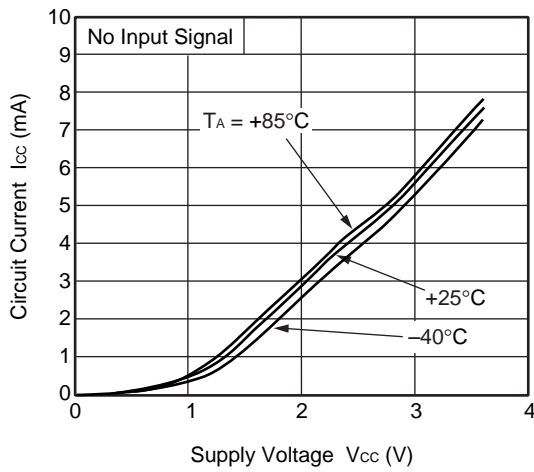
ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

**Notes**

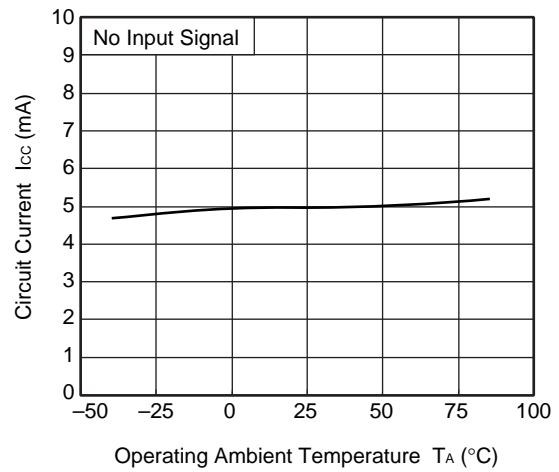
1. 30 × 30 × 0.4 mm double sided copper clad FR-4 board.
2. Back side: GND pattern
3. Au plated on pattern
4. o○: Through holes

TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, $Z_S = Z_L = 50\ \Omega$, unless otherwise specified)

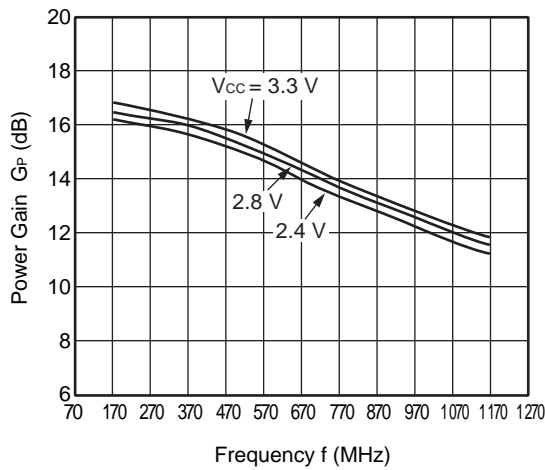
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



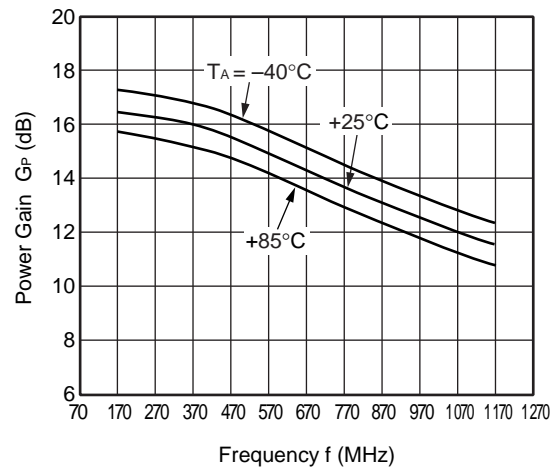
CIRCUIT CURRENT vs. OPERATING AMBIENT TEMPERATURE



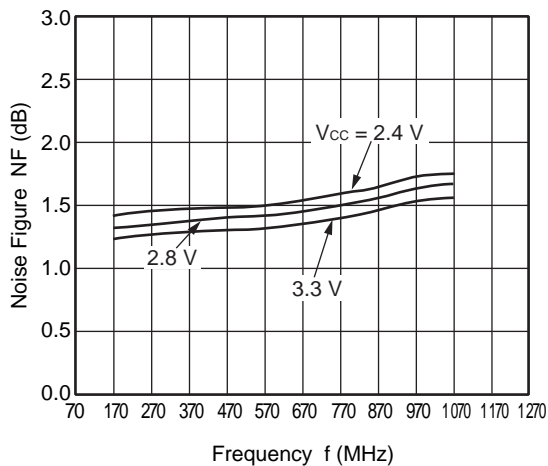
POWER GAIN vs. FREQUENCY



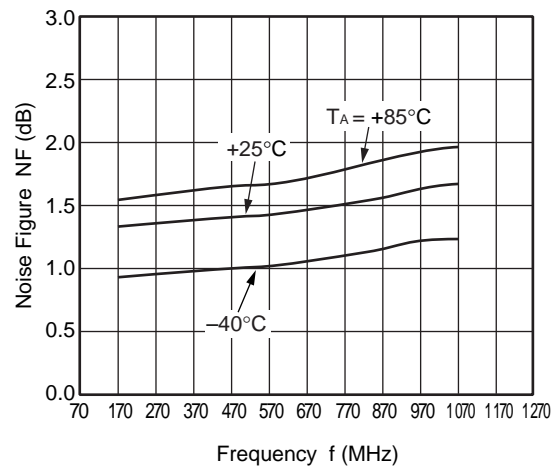
POWER GAIN vs. FREQUENCY



NOISE FIGURE vs. FREQUENCY

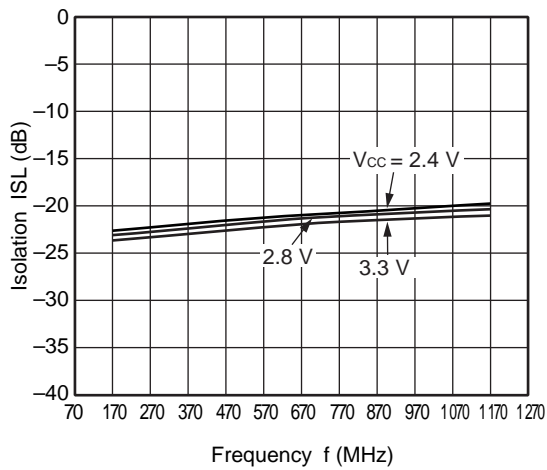


NOISE FIGURE vs. FREQUENCY

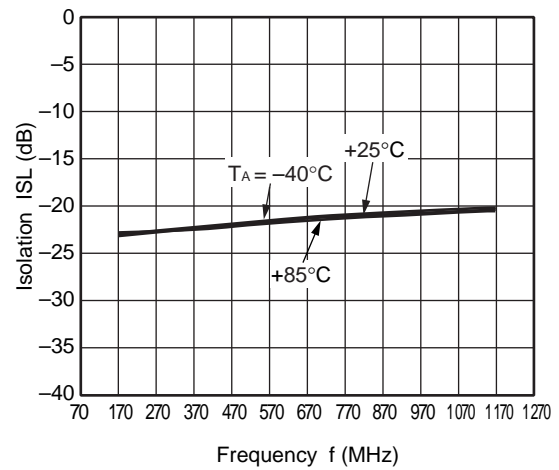


Remark The graphs indicate nominal characteristics.

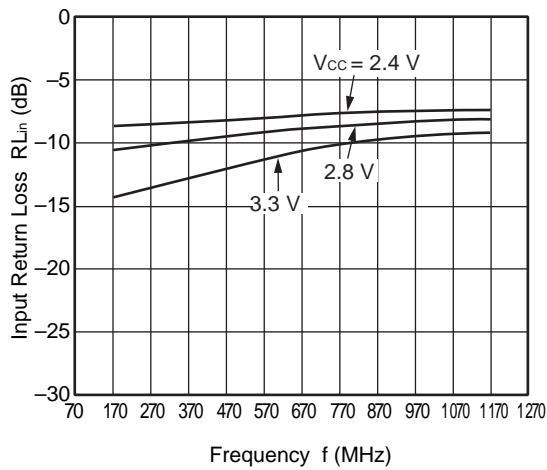
ISOLATION vs. FREQUENCY



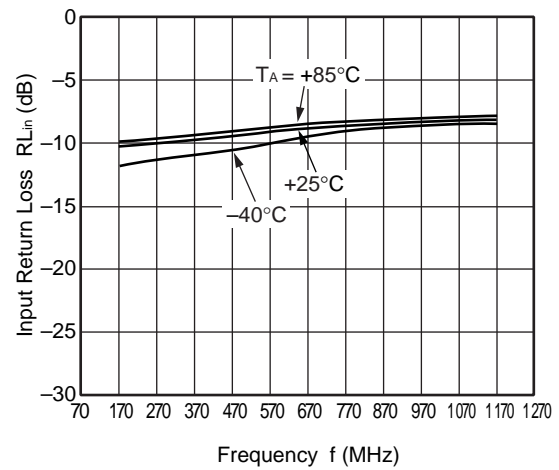
ISOLATION vs. FREQUENCY



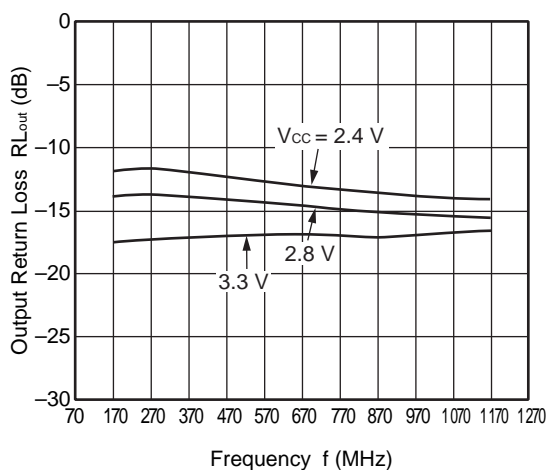
INPUT RETURN LOSS vs. FREQUENCY



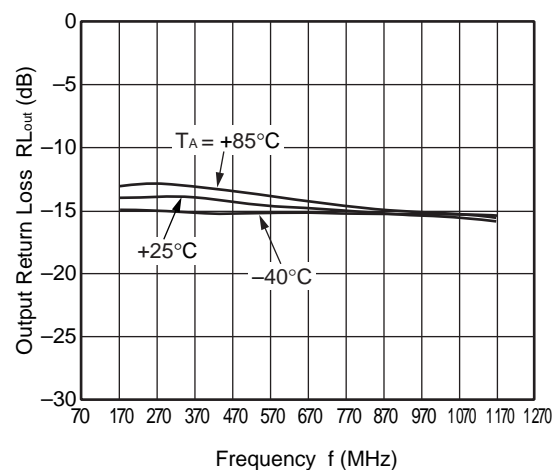
INPUT RETURN LOSS vs. FREQUENCY



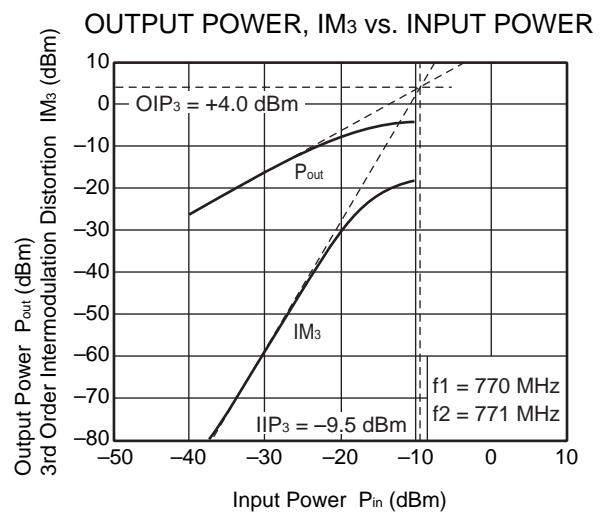
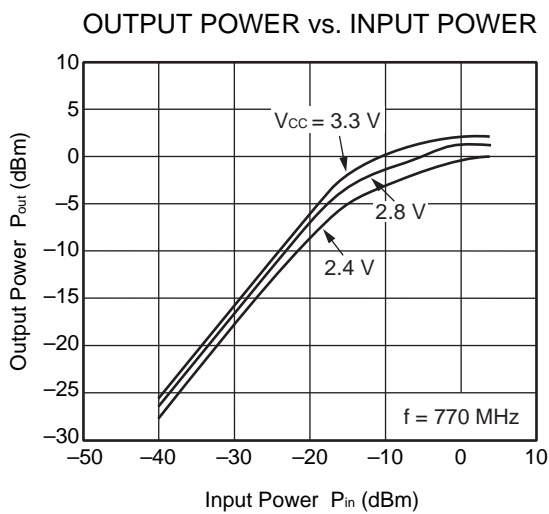
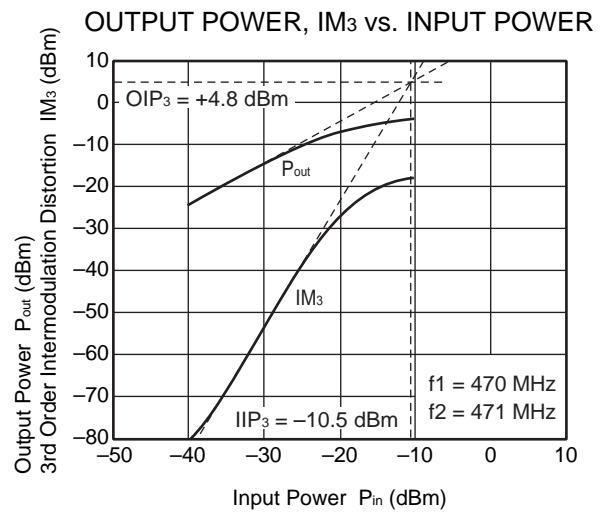
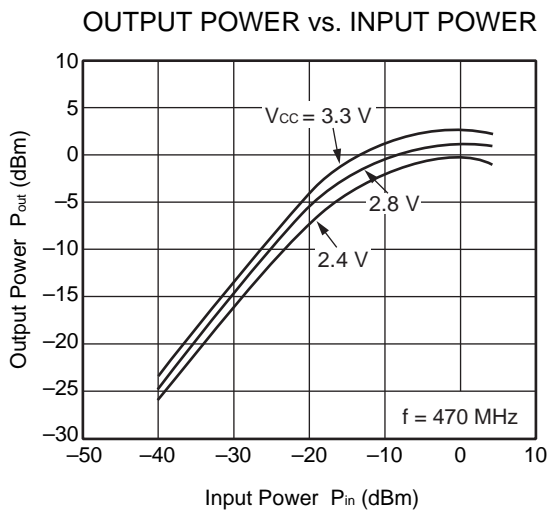
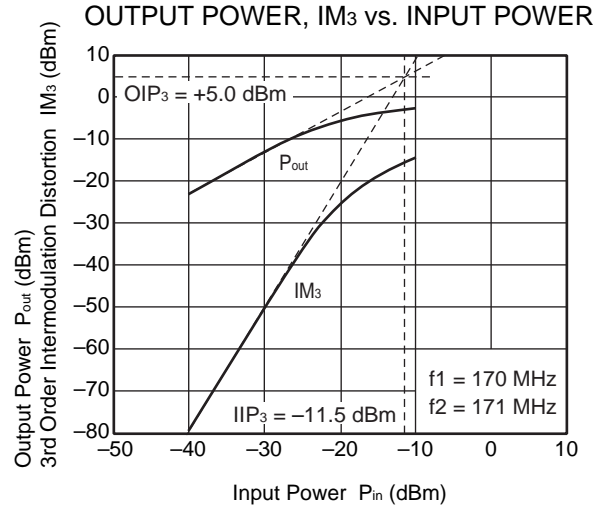
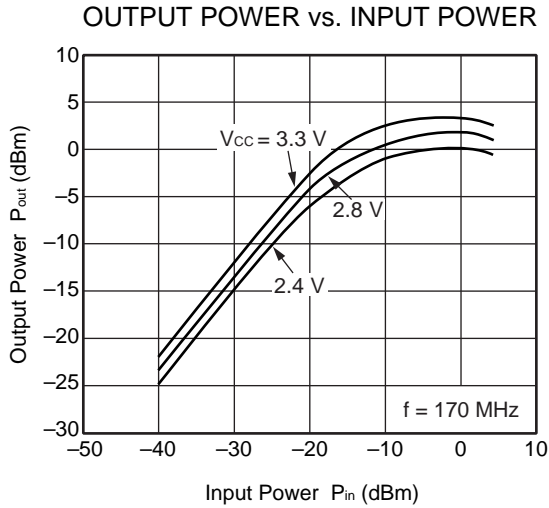
OUTPUT RETURN LOSS vs. FREQUENCY



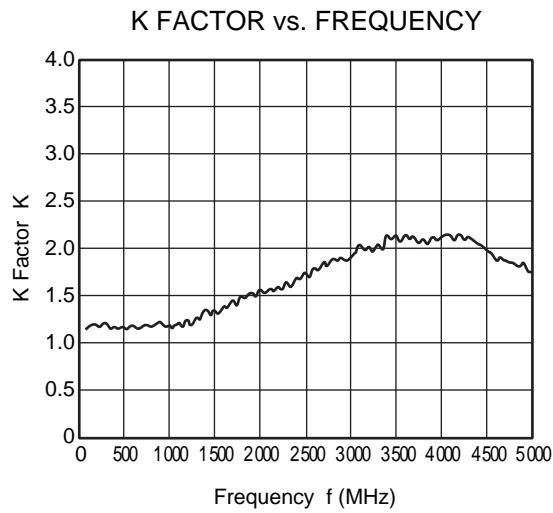
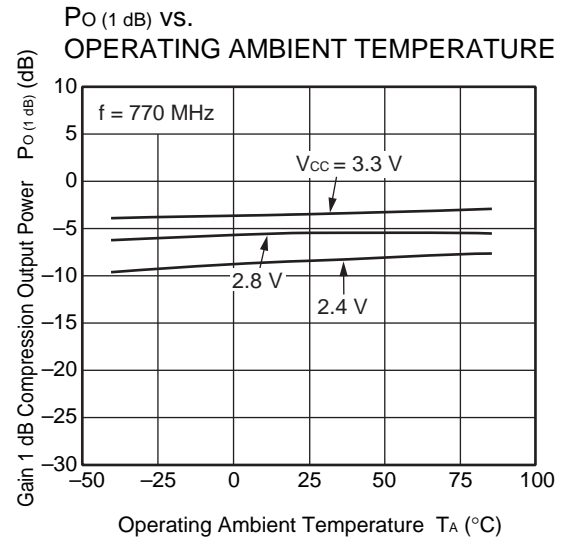
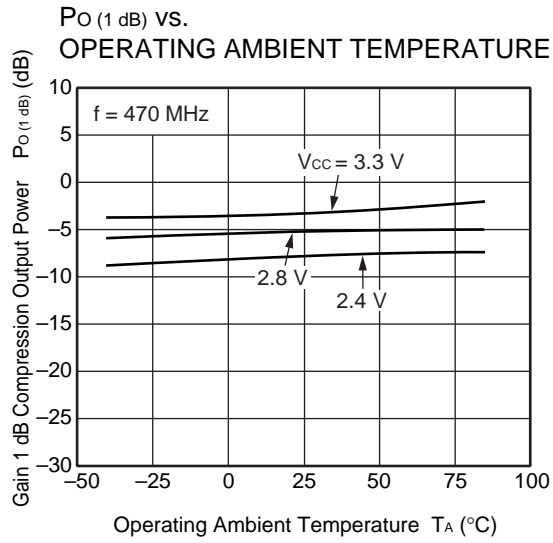
OUTPUT RETURN LOSS vs. FREQUENCY



Remark The graphs indicate nominal characteristics.



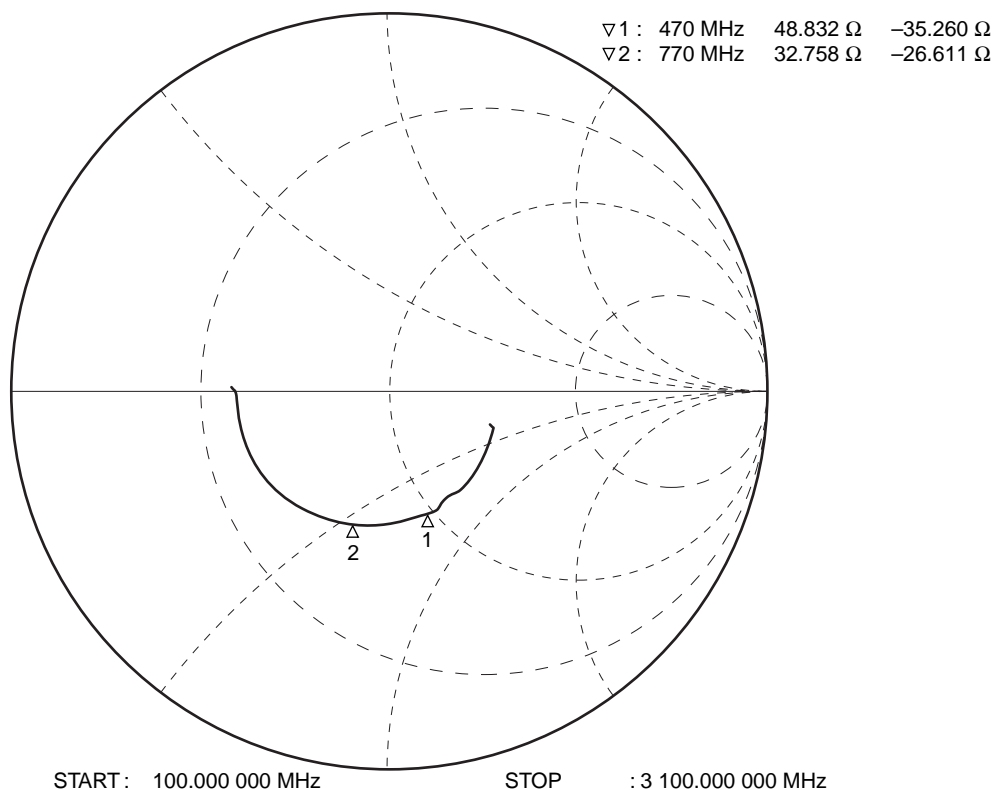
Remark The graphs indicate nominal characteristics.



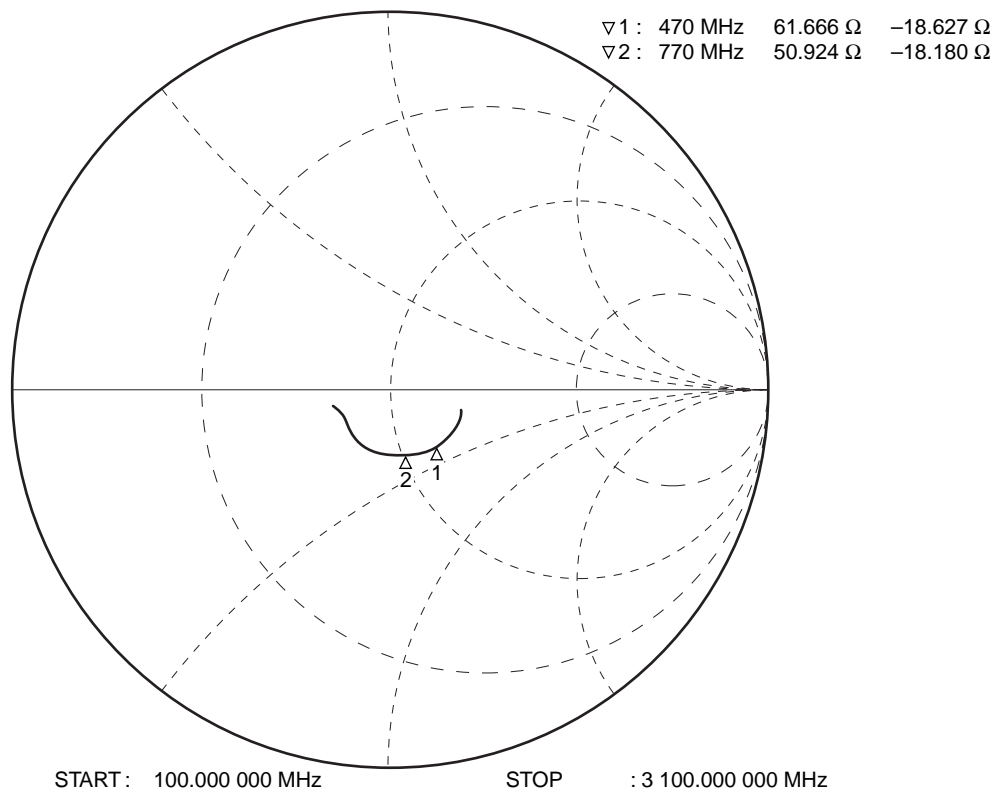
Remark The graphs indicate nominal characteristics.

S-PARAMETERS ($T_A = +25^\circ\text{C}$, $V_{CC} = 2.8\text{ V}$, monitored at connector on board)

S₁₁—FREQUENCY

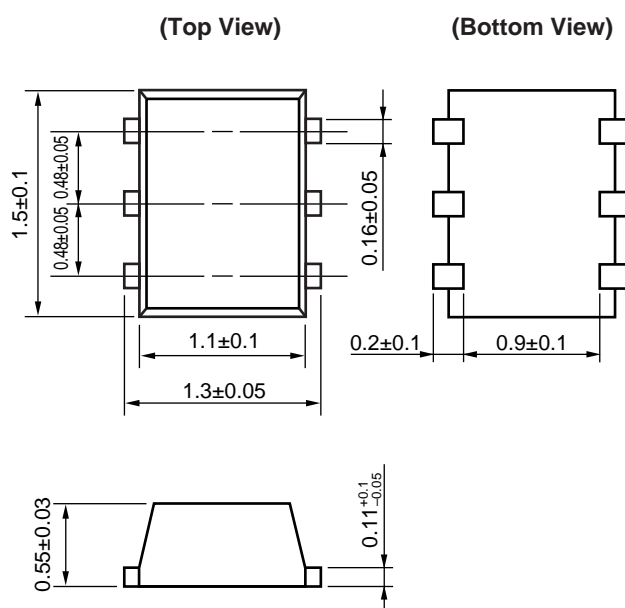


S₂₂—FREQUENCY



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

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

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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	

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