CEL

NEC's 13 GHz INPUT DIVIDE BY 4 PRESCALER IC FOR SATELLITE COMMUNICATIONS

UPB1513TU

FEATURES

- **OPERATING FREQUENCY:**
  f_{in} = 5 to 13 GHz
- **LOW CURRENT CONSUMPTION:**
  I_{CC} = 48 mA @ V_{CC} = 5.0 V
- **HIGH-DENSITY SURFACE MOUNTING:**
  8-pin lead-less minimold
- **SUPPLY VOLTAGE:**
  V_{CC} = 4.5 to 5.5 V
- **DIVISION RATIO:**
  4

DESCRIPTION

NEC's UPB1513TU is a silicon germanium (SiGe) monolithic integrated circuit designed as a divide by 4 prescaler IC for satellite communications and point-to-point/multi-point radios.

The package is 8-pin lead-less minimold suitable for surface mount.

This IC is manufactured using our 50 GHz fmax UHS2 (Ultra High Speed Process) silicon bipolar process.

APPLICATIONS

- **POINT-TO-POINT/ MULTI-POINT RADIOS**
- **VSAT RADIOS**

ORDERING INFORMATION

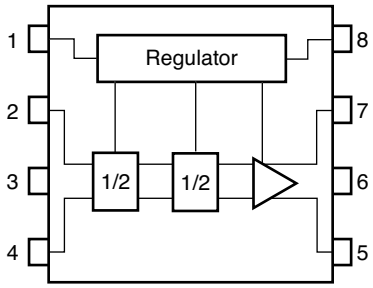
PART NUMBER	ORDER NUMBER	PACKAGE	MARKING	SUPPLYING FORM
UPB1513TU-E2	UPB1513TU-E2-A	8-pin lead-less minimold (Pb-Free) **Note**	1513	• 8 mm wide embossed taping • Pin 5, 6, 7, 8 indicates pull-out direction of tape • Qty 5 kpcs/reel

Note With regards to terminal solder (the solder contains lead) plated products (conventionally plated), contact your nearby sales office.

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: UPB1513TU

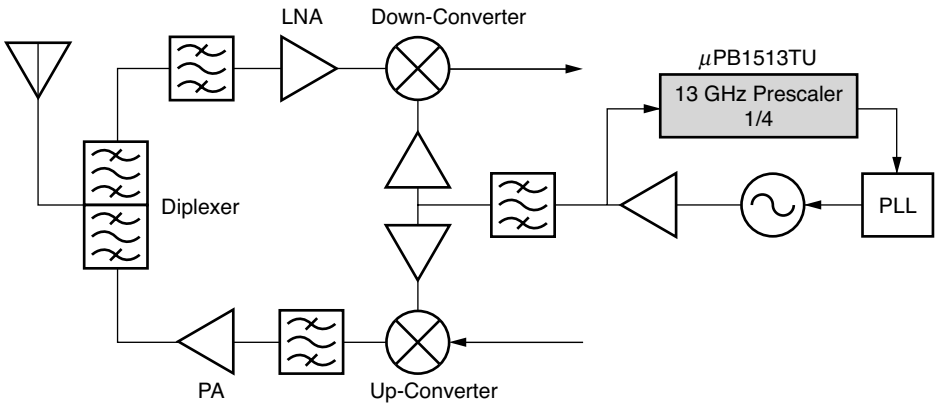
INTERNAL BLOCK DIAGRAM AND PIN CONNECTIONS

(Top View)



PIN NO.	PIN NAME
1	$V_{CC}1$
2	IN
3	GND
4	$\overline{IN}$
5	$\overline{OUT}$
6	GND
7	OUT
8	$V_{CC}2$

SYSTEM APPLICATION EXAMPLE



PIN EXPLANATION

PIN NO.	PIN NAME	APPLIED VOLTAGE (V)	FUNCTION AND APPLICATIONS
1	$V_{CC}1$	5	Power supply pin. This pin must be equipped with bypass capacitor (example : 100 pF and 10 nF) to minimize ground impedance.
2	IN	–	Signal input pin. This pin should be coupled to signal source with capasitor (example : 100 pF) for DC cut.
3	GND	0	Ground pin. Ground pattern on the board should be formed as widely as possible to minimize ground impedance.
4	$\overline{IN}$	–	Signal input bypass pin. This pin must be equipped with bypass capacitor (example : 100 pF) to minimize ground impedance.
5	$\overline{OUT}$	–	Divided frequency output pin. This pin shoud be coupled to load device with capasitor (example : 100 pF) for DC cut.
6	GND	0	Ground pin. Ground pattern on the board should be formed as widely as possible to minimize ground impedance.
7	OUT	–	Divided frequency output pin. This pin should be coupled to load device with capasitor (example : 100 pF) for DC cut.
8	$V_{CC}2$	5	Power supply pin. This pin must be equipped with bypass capacitor (example : 100 pF and 10 nF) to minimize ground impedance.

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CC}	T_A = +25°C	6	V
Total Power Dissipation	P_D	T_A = +85°C **Note**	867	mW
Thermal Resistance (junction to ground paddle)	$R_{th(j-c)}$	T_A = +85°C **Note**	75	°C/W
Operating Ambient Temperature	T_A		−40 to +85	°C
Storage Temperature	T_{stg}		−55 to +150	°C

Note Mounted on 33 × 21 × 0.4 mm polyimide PCB, with copper patterning on both sides.

RECOMMENDED OPERATING RANGE

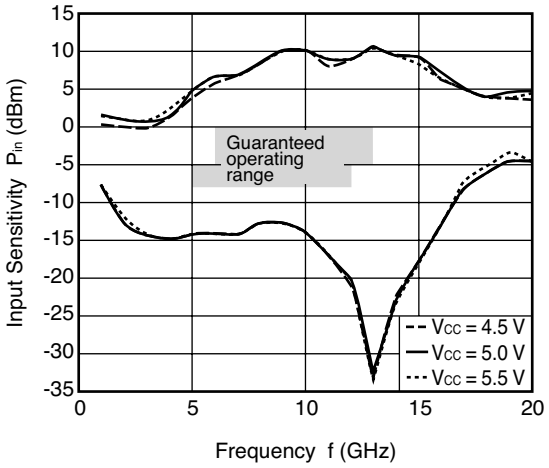
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
Operating Ambient Temperature	T_A	−40	+25	+85	°C

ELECTRICAL CHARACTERISTICS (V_{CC} = 4.5 to 5.5 V, T_A = −40 to +85°C, Z_S = Z_L = 50 Ω)

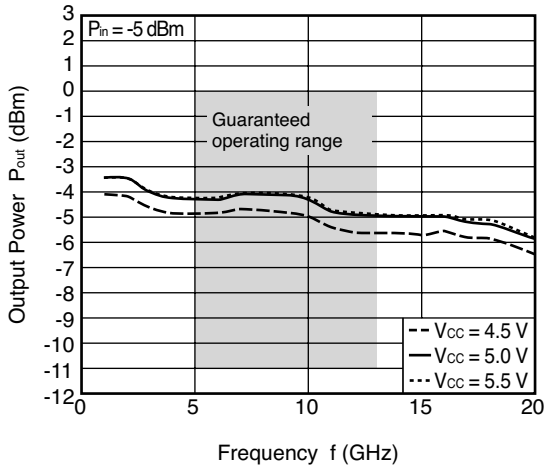
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Circuit Current	I_{CC}	No Signals	−	48	75	mA
Input Sensitibity	P_{in1}	f_{in} = 5 to 6 GHz	−8	−	−5	dBm
	P_{in2}	f_{in} = 6 to 12 GHz	−8	−	0	dBm
	P_{in3}	f_{in} = 12 to 13 GHz	−5	−	0	dBm
Output Power	P_{out}	f_{in} = 5 to 13 GHz, single ended, P_{in} = −5 dBm	−11	−4	2	dBm

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

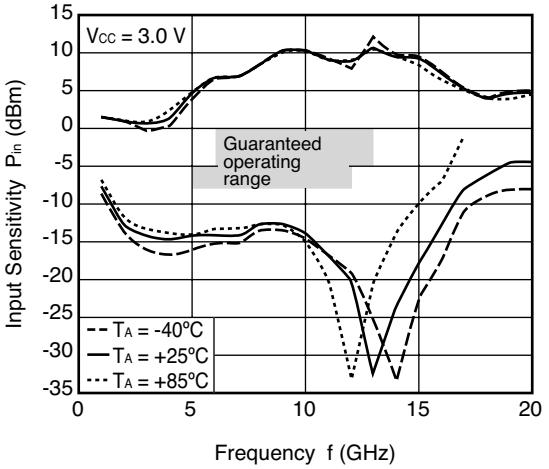
INPUT SENSITIVITY vs. FREQUENCY



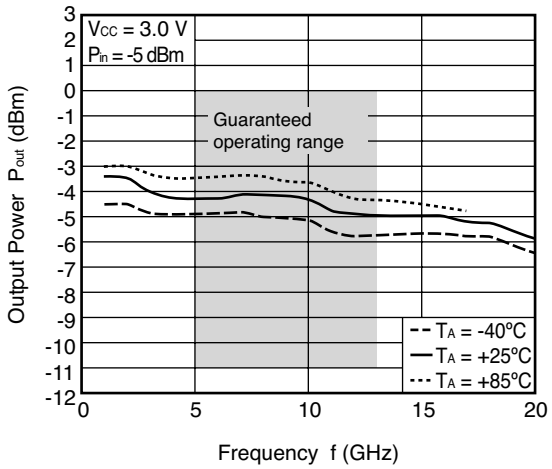
OUTPUT POWER vs. FREQUENCY



INPUT SENSITIVITY vs. FREQUENCY

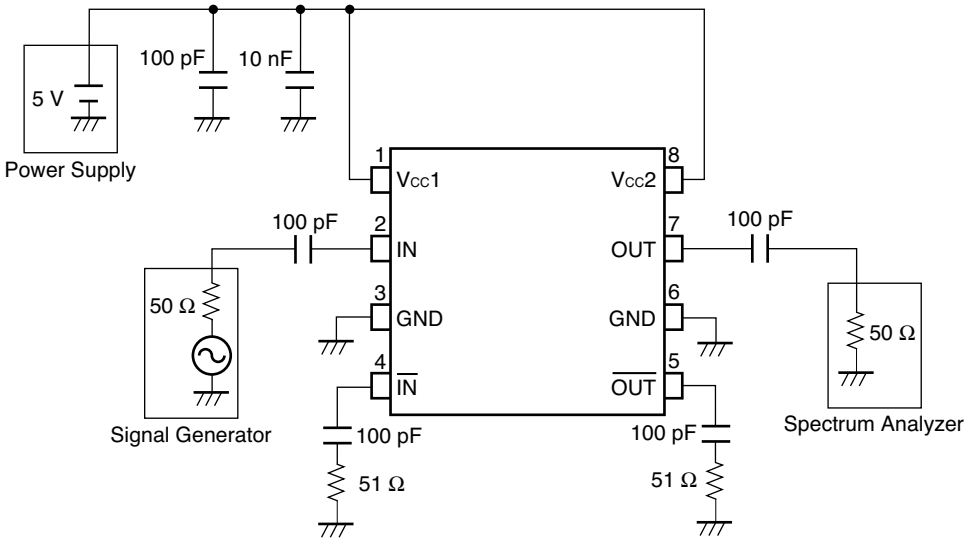


OUTPUT POWER vs. FREQUENCY



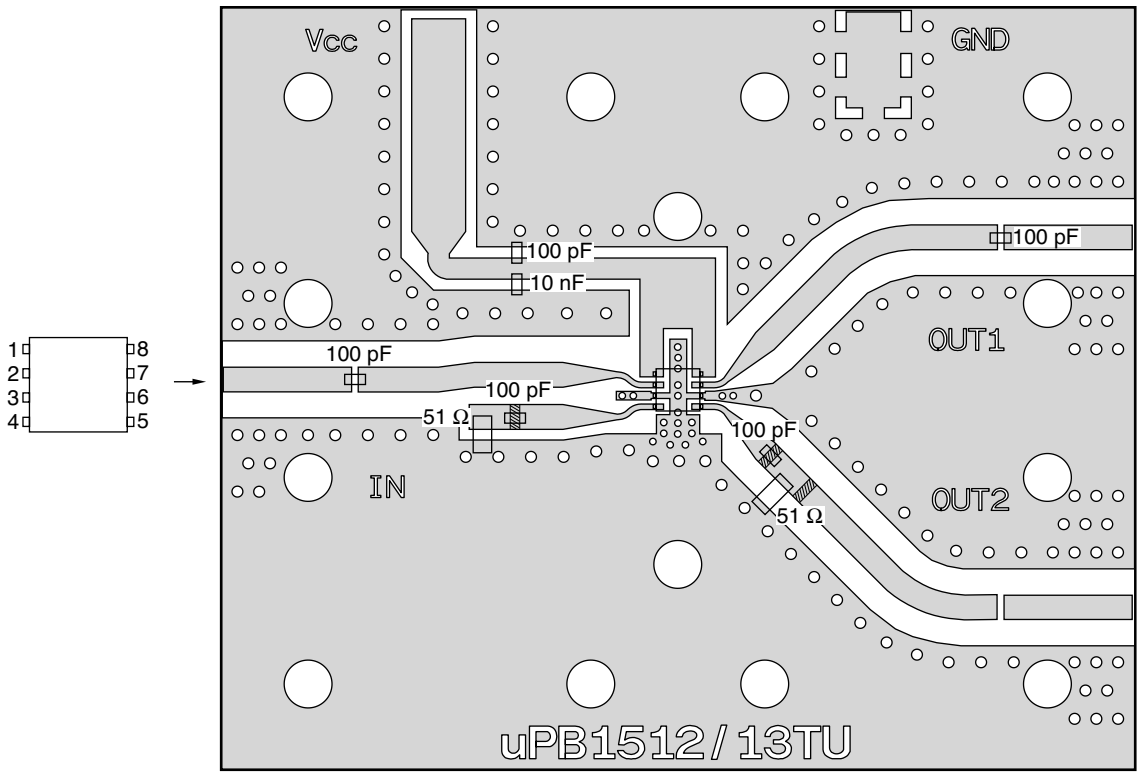
Remark The graphs indicate nominal characteristics.

MEASUREMENT CIRCUITS



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

ILLUSTRATION OF THE MEASUREMENT CIRCUIT ASSEMBLED ON EVALUATION BOARD



Remarks 1. 33 × 21 × 0.4 mm double-sided copper-clad polyimide PCB

2. Back side: GND pattern

3. Solder plated on pattern

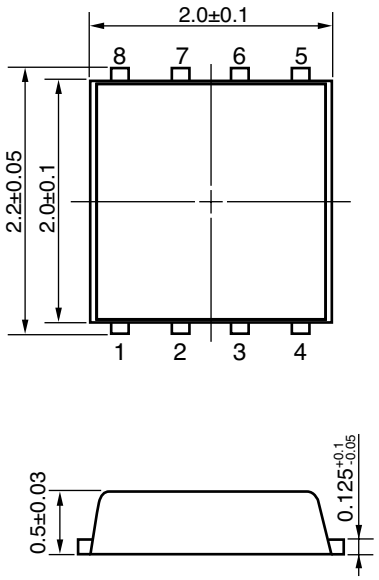
4. ▨ represents cutout

5. ○: Through holes

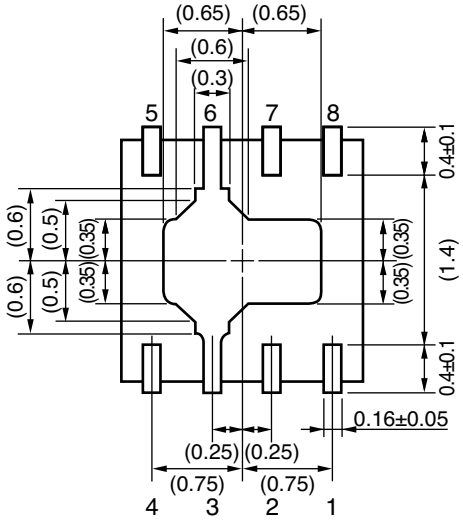
PACKAGE DIMENSIONS

8-PIN LEAD-LESS MINIMOLD (UNIT:mm)

(Top View)



(Bottom View)



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) Keep the track length of the ground terminals as short as possible.

(4) Bypass capacitance must be attached to V_{CC} line.

(5) Exposed heat sink at bottom on package must be soldered to PCB RF/DC ground.

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	IR260
	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	
Wave Soldering	Peak temperature (molten solder temperature)	: 260°C or below	WS260
	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	
Partial Heating	Peak temperature (terminal temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

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

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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	
Lead (Pb)	< 1000 PPM	-A	-AZ
		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.