



# BIPOLAR ANALOG INTEGRATED CIRCUIT

## $\mu$ PC8215TU

### SiGe LOW NOISE AMPLIFIER FOR GPS/MOBILE COMMUNICATIONS

#### DESCRIPTION

The  $\mu$ PC8215TU is a silicon germanium (SiGe) monolithic integrated circuit designed as low noise amplifier for GPS and mobile communications.

The package is 8-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

- Low noise : NF = 1.3 dB TYP. @  $V_{CC} = 3.0$  V
- High gain :  $G_P = 27.0$  dB TYP. @  $V_{CC} = 3.0$  V
- Low distortion :  $OIP_3 = +12.5$  dBm TYP. @  $V_{CC} = 3.0$  V
- High-density surface mounting : 8-pin lead-less minimold package ( $2.0 \times 2.2 \times 0.5$  mm)
- High performance with minimum external components
- Output matched to 50  $\Omega$

#### APPLICATION

- Low noise amplifier for GPS and mobile communications

#### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
$\mu$ PC8215TU-E2	$\mu$ PC8215TU-E2-A	8-pin lead-less minimold (Pb-Free) <sup>Note</sup>	8215	<ul style="list-style-type: none"><li>• 8 mm wide embossed taping</li><li>• Pin 5, 6, 7, 8 indicates pull-out direction of tape</li><li>• Qty 5 kpcs/reel</li></ul>

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

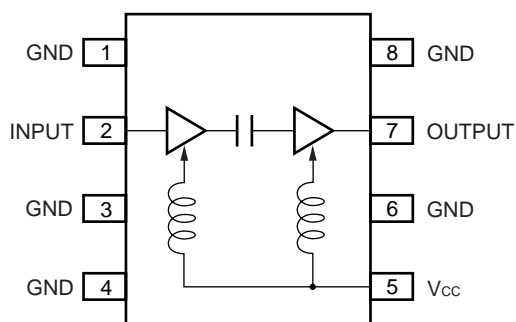
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PC8215TU

**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



## ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Supply Voltage	$V_{CC}$	$T_A = +25^\circ\text{C}$	4.0	V
Power Dissipation of Package	$P_D$	$T_A = +85^\circ\text{C}$ <b>Note</b>	1.06	W
Operating Ambient Temperature	$T_A$		-40 to +85	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$
Input Power	$P_{in}$		+10	dBm

**Note** Mounted on double-side copper-clad  $50 \times 50 \times 1.6$  mm epoxy glass PWB

## RECOMMENDED OPERATING RANGE

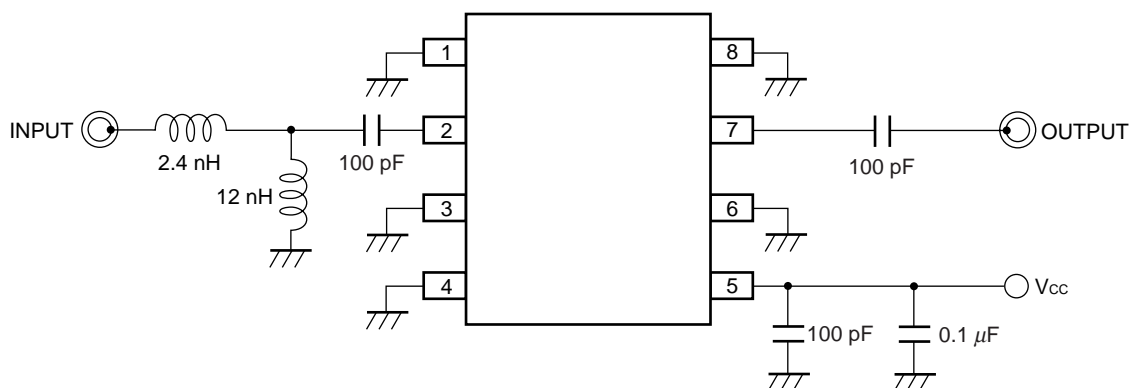
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	$V_{CC}$	2.7	3.0	3.3	V
Operating Ambient Temperature	$T_A$	-25	+25	+85	$^\circ\text{C}$
Operating Frequency Range	$f_{in}$	—	1 575	—	MHz

## ELECTRICAL CHARACTERISTICS

( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = 3.0$  V,  $f_{in} = 1\,575$  MHz, unless otherwise specified)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	$I_{CC}$	No Signal	—	10.0	13.0	mA
Power Gain	$G_P$		24.0	27.0	30.0	dB
Noise Figure	NF		—	1.3	1.5	dB
Output 3rd Order Distortion Intercept Point	$OIP_3$		—	+12.5	—	dBm
Input Return Loss	$RL_{in}$		6.0	7.0	—	dB
Output Return Loss	$RL_{out}$		10	14.0	—	dB
Isolation	ISL		30	40.0	—	dB
Gain 1 dB Compression Output Power	$P_O$ (1 dB)		—	+5.0	—	dBm

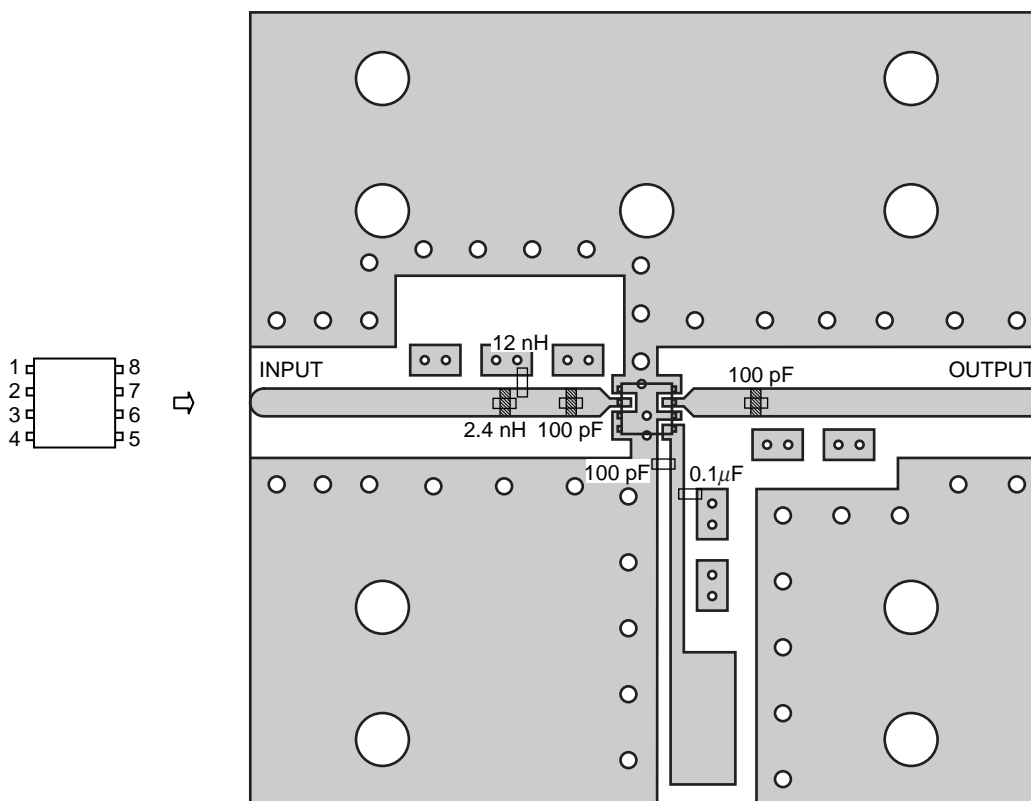
## TEST CIRCUIT




### Notes

1. High performance with minimum external components.
2. Output matched to 50  $\Omega$ .

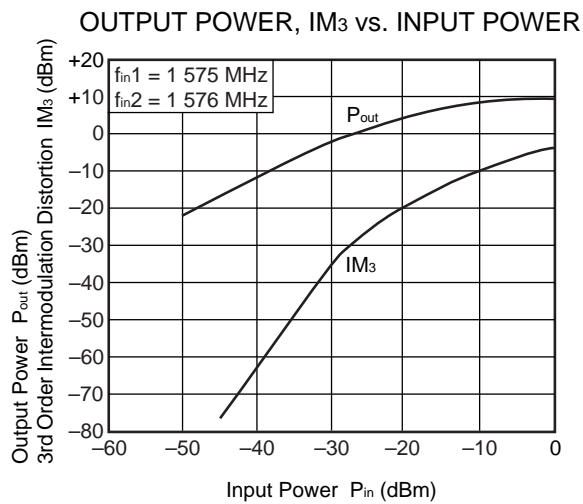
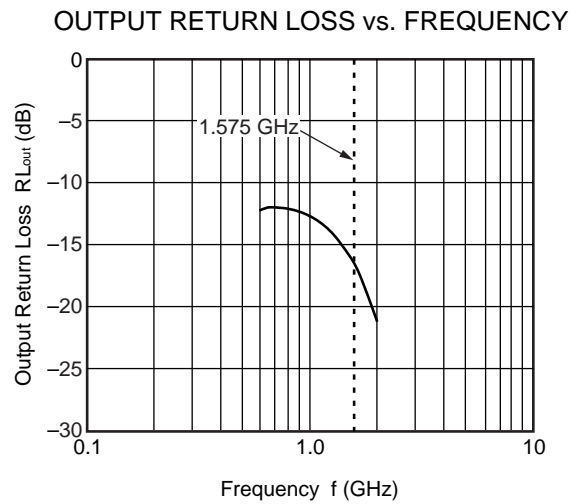
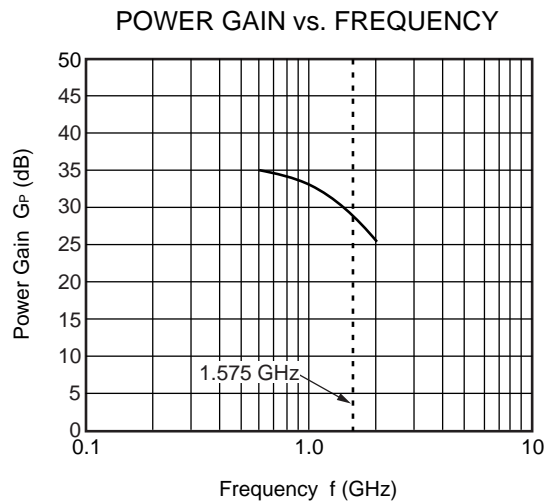
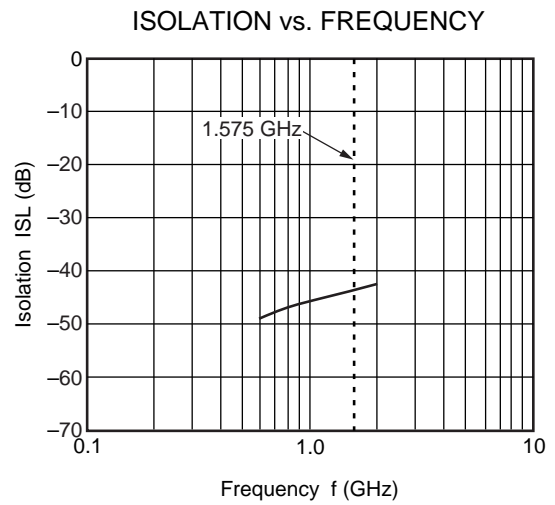
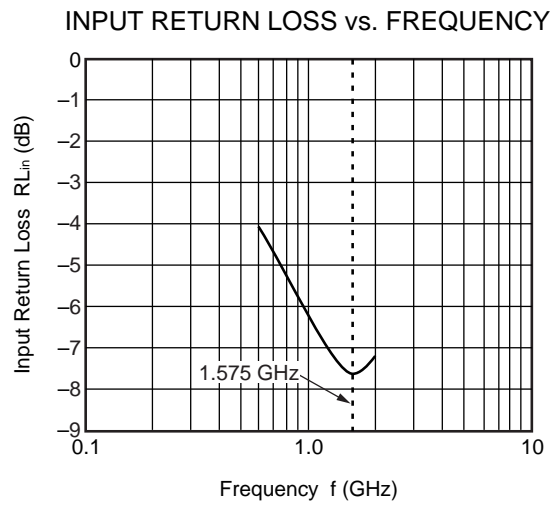
## ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



### Notes

1. 30 × 30 × 0.51 mm double sided copper-clad hydrocarbon ceramic woven glass PWB (Rogers : R04003,  $\epsilon_r = 3.38$ ).
2. Au plated on pattern
3. 12 nH/2.4 nH : Murata LQP15M
4. 100 pF/0.1  $\mu$ F : Murata GRM15
5.  represents cutout
6.  $\circ$   $\bigcirc$ : Through holes

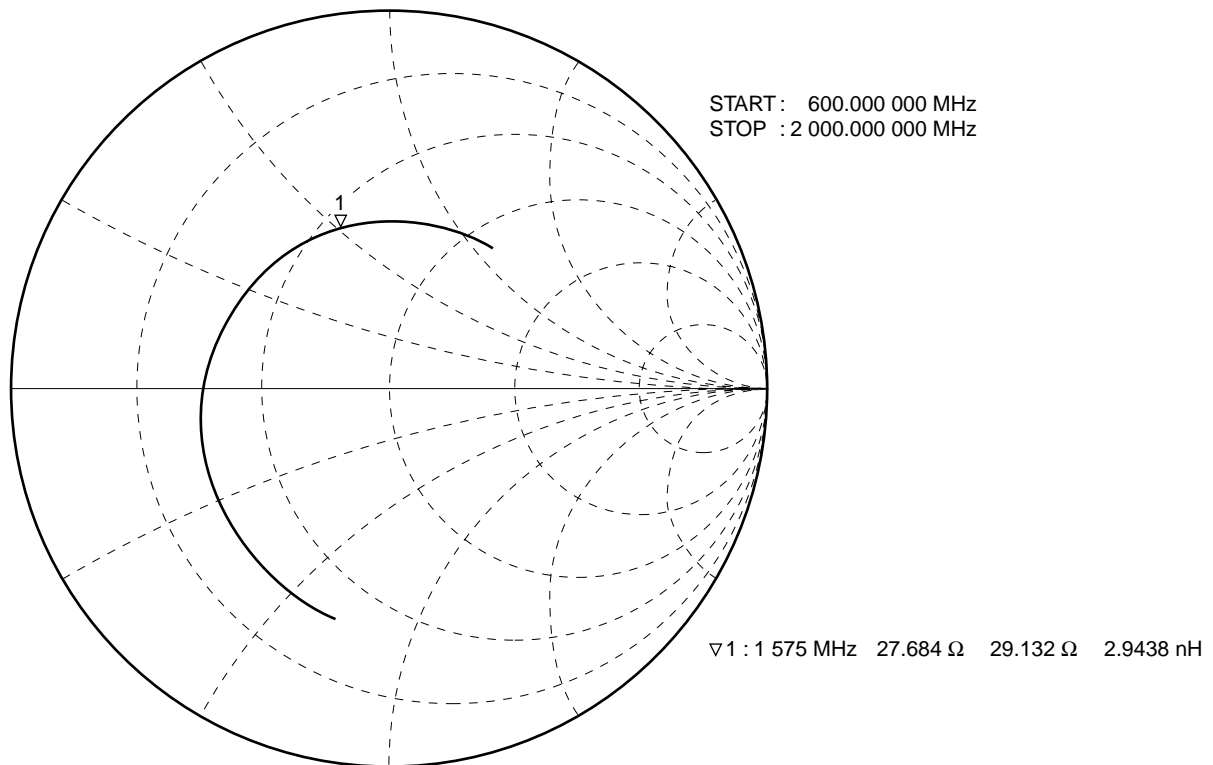
**TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = 3.0\text{ V}$ , unless otherwise specified)**



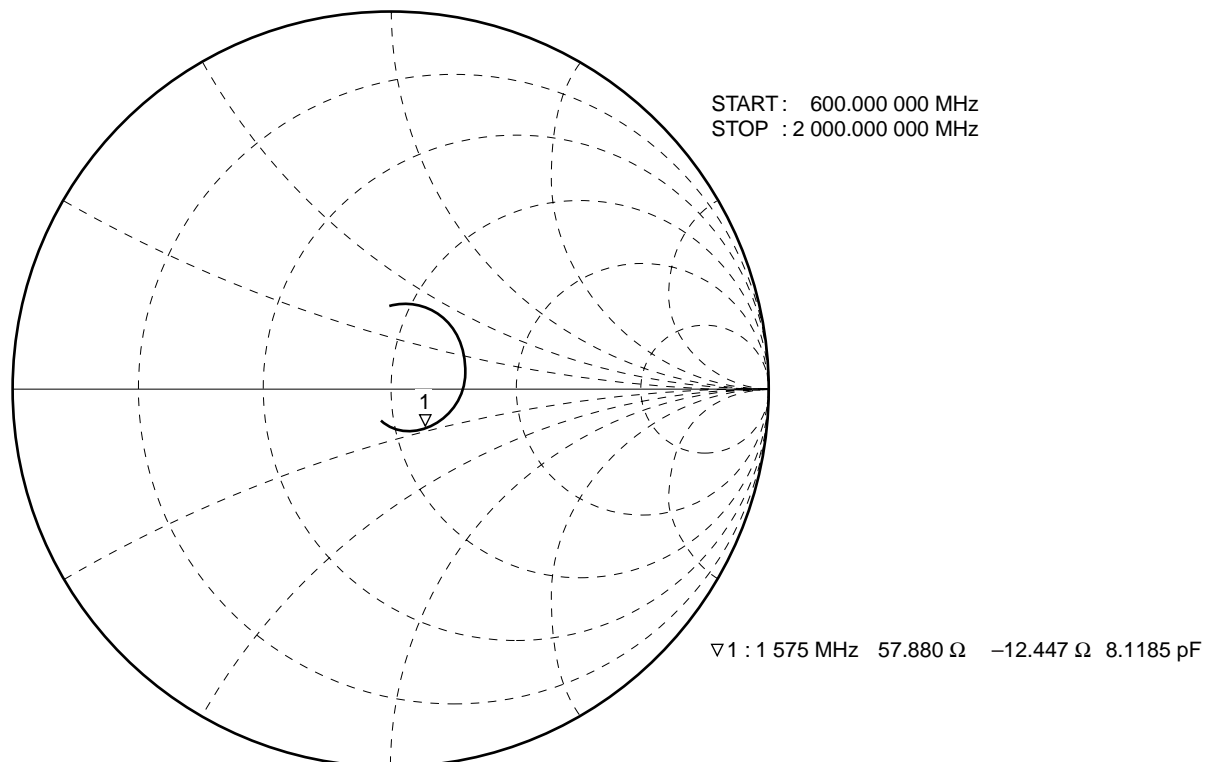
**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS ( $T_A = +25^\circ\text{C}$ ,  $V_{CC} = 3.0\text{ V}$ , monitored at connector on board)**

**S<sub>11</sub>-FREQUENCY**



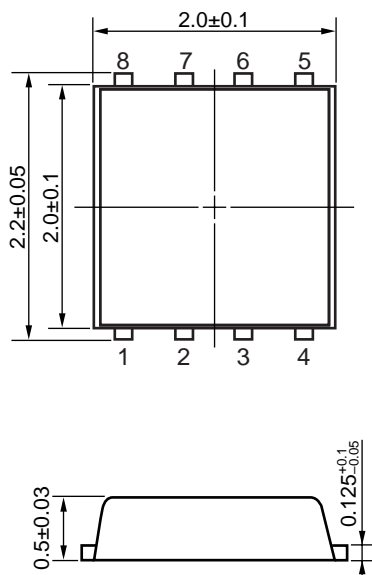
**S<sub>22</sub>-FREQUENCY**



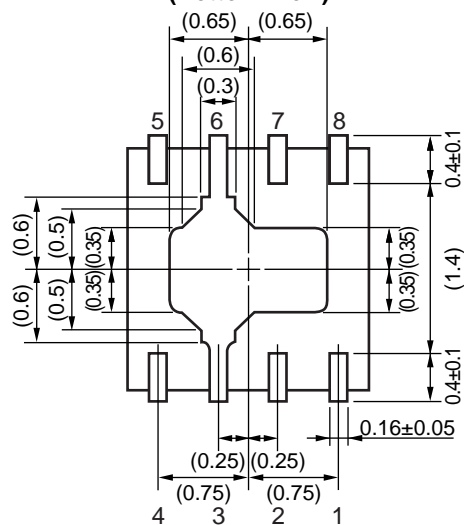
## PACKAGE DIMENSIONS

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

**(Top View)**



**(Bottom View)**



**Remark** ( ): 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).  
All the ground terminals must be connected together with wide ground pattern to decrease impedance difference.
- (3) The bypass capacitor should be attached to Vcc line.

**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).

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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