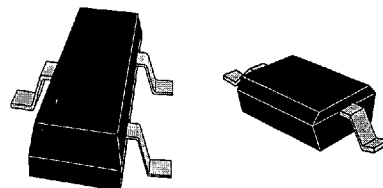


# Plastic Packaged Surface Mount Varactor Diodes

SMV1100, SMV1200, SMV1400 Series

## Features

- Industry Standard Outlines: SOD-323 and SOT SOT 23 Packages
- High "Q" Abrupt and Hyperabrupt Junction Designs
- Single and Common Cathode Configurations
- Available for 3 Volt Battery Operated Circuits
- Priced for High Volume Commercial Applications
- Available in Tape and Reel



4

## Maximum Ratings (Ta = 25 °C)

Forward Current:	100 mA
Power Dissipation:	250 mW
Junction Temperature:	125 °C
Storage Temperature:	-55 to 150 °C
Operating Temperature:	-55 to 125 °C

## Description

The surface mount plastic varactor diodes are designed for RF and Microwave applications in VCOs, electronically tunable filters and matching networks. Package offerings include the SOT-23 and the small footprint SOD-323 package. Alpha offers a comprehensive capability in capacitance values, package options and voltage ratings all aggressively priced for high volume commercial applications.

The SMV1200-49 to SMV1200-55 varactors were specifically designed for battery operated applications where 3 to 5 volts is available. These varactors have capacitance ratios of greater than 12 from 0.3 to 4.7 volts.

Alpha's hyperabrupt varactors are available in a wide variety of tightly specified capacitance values and

high capacitance ratios. They are available as single junctions and common cathode configurations where they may be employed in a back-to-back orientation to reduce distortion.

Alpha's abrupt junction varactors are noted for extremely high Q factor and are the preferred choice in applications that require low phase noise and high temperature stability.

The inductance of the SOT-23 package is typically 1.5 nH for each junction. Employing a common cathode SOT-23 with the varactor junctions connected in parallel reduces the inductance to approximately 0.9 nH. The inductance of a varactor in the SOD-323 package is approximately 1.2 nH.

# 2–16 GHz Low Noise Gallium Arsenide FET

## Technical Data

### ATF-13736

#### Features

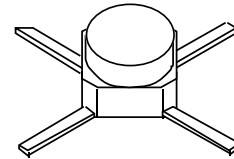
- **Low Noise Figure:**  
1.8 dB Typical at 12 GHz
- **High Associated Gain:**  
9.0 dB Typical at 12 GHz
- **High Output Power:**  
17.5 dB Typical at 12 GHz
- **Cost Effective Ceramic Microstrip Package**
- **Tape-and-Reel Packaging Option Available<sup>[1]</sup>**

#### Description

The ATF-13736 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor housed in a cost effective microstrip package. Its noise figure makes this device appropriate for use in the gain stages of low noise amplifiers operating in the 2-16 GHz frequency range.

This GaAs FET device has a nominal 0.3 micron gate length with a total gate periphery of

#### 36 micro-X Package



250 microns. Proven gold based metallization systems and nitride passivation assure a rugged, reliable device.

#### Electrical Specifications, $T_A = 25^\circ\text{C}$

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.	
NF <sub>O</sub>	Optimum Noise Figure: $V_{DS} = 2.5\text{ V}$ , $I_{DS} = 20\text{ mA}$	$f = 8.0\text{ GHz}$	dB	1.5	2.2	
		$f = 12.0\text{ GHz}$	dB	1.8		
		$f = 14.0\text{ GHz}$	dB	2.1		
G <sub>A</sub>	Gain @ NF <sub>O</sub> : $V_{DS} = 2.5\text{ V}$ , $I_{DS} = 20\text{ mA}$	$f = 8.0\text{ GHz}$	dB	8.0	11.5	
		$f = 12.0\text{ GHz}$	dB		9.0	
		$f = 14.0\text{ GHz}$	dB		7.0	
P <sub>1dB</sub>	Power Output @ 1 dB Gain Compression: $V_{DS} = 4\text{ V}$ , $I_{DS} = 40\text{ mA}$	$f = 12.0\text{ GHz}$	dBm	17.5		
G <sub>1dB</sub>	1 dB Compressed Gain: $V_{DS} = 4\text{ V}$ , $I_{DS} = 40\text{ mA}$	$f = 12.0\text{ GHz}$	dB	8.5		
g <sub>m</sub>	Transconductance: $V_{DS} = 2.5\text{ V}$ , $V_{GS} = 0\text{ V}$		mmho	25	55	
I <sub>DSS</sub>	Saturated Drain Current: $V_{DS} = 2.5\text{ V}$ , $V_{GS} = 0\text{ V}$		mA	40	50	90
V <sub>P</sub>	Pinch-off Voltage: $V_{DS} = 2.5\text{ V}$ , $I_{DS} = 1\text{ mA}$		V	-4.0	-1.5	-0.5

#### Note:

1. Refer to PACKAGING section "Tape-and-Reel Packaging for Surface Mount Semiconductors".

# 2–16 GHz General Purpose Gallium Arsenide FET

## Technical Data

**ATF-26884**

### Features

- **High Output Power:**  
18.0 dBm Typical  $P_{1\text{dB}}$  at 12 GHz
- **High Gain:**  
9.0 dB Typical  $G_{\text{SS}}$  at 12 GHz
- **Low Cost Plastic Package**
- **Tape-and-Reel Packaging Option Available<sup>[1]</sup>**

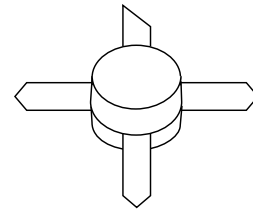
### Description

The ATF-26884 is a high performance gallium arsenide Schottky-barrier-gate field effect transistor

housed in a cost effective microstrip package. This device is designed for use in oscillator applications and general purpose amplifier applications in the 2-16 GHz frequency range.

This GaAs FET device has a nominal 0.3 micron gate length with a total gate periphery of 250 microns. Proven gold based metallization systems and nitride passivation assure a rugged, reliable device.

### 84 Plastic Package



### Electrical Specifications, $T_A = 25^\circ\text{C}$

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
$G_{\text{SS}}$	Tuned Small Signal Gain: $V_{\text{DS}} = 5\text{ V}$ , $I_{\text{DS}} = 30\text{ mA}$ $f = 12.0\text{ GHz}$	dB	7.0	9.0	
$\text{NF}_O$	Optimum Noise Figure: $V_{\text{DS}} = 3\text{ V}$ , $I_{\text{DS}} = 10\text{ mA}$ $f = 12.0\text{ GHz}$	dB		2.2	
$G_A$	Gain @ $\text{NF}_O$ : $V_{\text{DS}} = 3\text{ V}$ , $I_{\text{DS}} = 10\text{ mA}$ $f = 12.0\text{ GHz}$	dB		6.0	
$P_{1\text{dB}}$	Power Output @ 1 dB Gain Compression: $V_{\text{DS}} = 5\text{ V}$ , $I_{\text{DS}} = 30\text{ mA}$ $f = 12.0\text{ GHz}$	dBm	15.0	18.0	
$g_m$	Transconductance: $V_{\text{DS}} = 3\text{ V}$ , $V_{\text{GS}} = 0\text{ V}$	mmho	15	35	
$I_{\text{DSS}}$	Saturated Drain Current: $V_{\text{DS}} = 3\text{ V}$ , $V_{\text{GS}} = 0\text{ V}$	mA	30	50	90
$V_P$	Pinch-off Voltage: $V_{\text{DS}} = 3\text{ V}$ , $I_{\text{DS}} = 1\text{ mA}$	V	-3.5	-1.5	-0.5

#### Note:

1. Refer to PACKAGING section "Tape-and-Reel Packaging for Surface Mount Semiconductors."

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# Up to 6 GHz Medium Power Silicon Bipolar Transistor

## Technical Data

**AT-42035**

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### Features

- **High Output Power:**  
21.0 dBm Typical  $P_{1\text{ dB}}$  at 2.0 GHz  
20.5 dBm Typical  $P_{1\text{ dB}}$  at 4.0 GHz
- **High Gain at 1 dB  
Compression:**  
14.0 dB Typical  $G_{1\text{ dB}}$  at 2.0 GHz  
9.5 dB Typical  $G_{1\text{ dB}}$  at 4.0 GHz
- **Low Noise Figure:**  
1.9 dB Typical  $NF_0$  at 2.0 GHz
- **High Gain-Bandwidth  
Product:** 8.0 GHz Typical  $f_T$
- **Cost Effective Ceramic  
Microstrip Package**

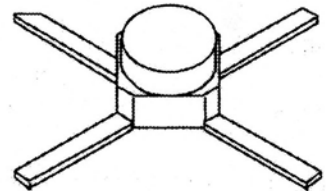
### Description

Hewlett-Packard's AT-42035 is a general purpose NPN bipolar transistor that offers excellent high frequency performance. The AT-42035 is housed in a cost effective surface mount 100 mil micro-X package. The 4 micron emitter-to-emitter pitch enables this transistor to be used in many

different functions. The 20 emitter finger interdigitated geometry yields a medium sized transistor with impedances that are easy to match for low noise and medium power applications. This device is designed for use in low noise, wideband amplifier, mixer and oscillator applications in the VHF, UHF, and microwave frequencies. An optimum noise match near  $50\ \Omega$  up to 1 GHz, makes this device easy to use as a low noise amplifier.

The AT-42035 bipolar transistor is fabricated using Hewlett-Packard's 10 GHz  $f_T$  Self-Aligned-Transistor (SAT) process. The die is nitride passivated for surface protection. Excellent device uniformity, performance and reliability are produced by the use of ion-implantation, self-alignment techniques, and gold metalization in the fabrication of this device.

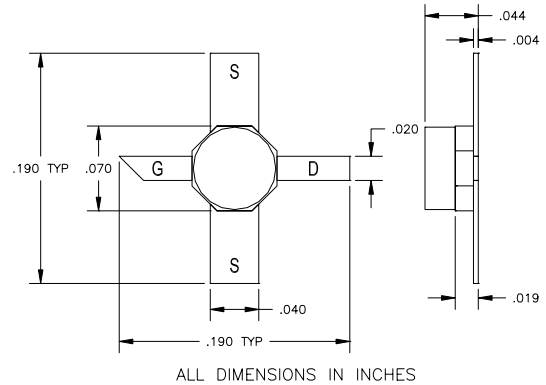
### 35 micro-X Package



## Low Distortion GaAs Power FET

### FEATURES

- None-Hermetic Low Cost Ceramic 70mil Package
- +20.0 dBm Output Power at 1dB Compression
- 10.0 dB Power Gain at 12GHz
- 7.0 dB Power Gain at 18GHz
- Typical 1.50 dB Noise Figure and 10.0 dB Associated Gain at 12GHz
- 0.3 x 250 Micron Recessed "Mushroom" Gate
- Si<sub>3</sub>N<sub>4</sub> Passivation
- Advanced Epitaxial Heterojunction Profile Provides High Power Efficiency, Linearity and Reliability



### ELECTRICAL CHARACTERISTICS (T<sub>a</sub> = 25°C)



Caution! ESD sensitive device.

SYMBOL	PARAMETERS/TEST CONDITIONS <sup>1</sup>	MIN	TYP	MAX	UNITS
P <sub>1dB</sub>	Output Power at 1dB Compression V <sub>DS</sub> = 6V, I <sub>DS</sub> ≈ 50% I <sub>DSS</sub>	17.0	20.0 20.0		dBm
G <sub>1dB</sub>	Gain at 1dB Compression V <sub>DS</sub> = 6V, I <sub>DS</sub> ≈ 50% I <sub>DSS</sub>	8.5	10.0 7.0		dB
PAE	Power Added Efficiency at 1dB Compression V <sub>DS</sub> = 6V, I <sub>DS</sub> ≈ 50% I <sub>DSS</sub>		35		%
NF	Noise Figure V <sub>DS</sub> = 3V, I <sub>DS</sub> = 15mA		1.5		dB
GA	Associate Gain V <sub>DS</sub> = 3V, I <sub>DS</sub> = 15mA		10		dB
I <sub>DSS</sub>	Saturated Drain Current V <sub>DS</sub> = 3 V, V <sub>GS</sub> = 0 V	35	65	105	mA
G <sub>M</sub>	Transconductance V <sub>DS</sub> = 3 V, V <sub>GS</sub> = 0 V	30	40		mS
V <sub>P</sub>	Pinch-off Voltage V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 1.0 mA		-2.0	-3.5	V
BV <sub>GD</sub>	Drain Breakdown Voltage I <sub>GD</sub> = 1.0mA	-10	-15		V
BV <sub>GS</sub>	Source Breakdown Voltage I <sub>GS</sub> = 1.0mA	-6	-14		V
R <sub>TH</sub>	Thermal Resistance		370*		°C/W

Notes: \* Overall Rth depends on case mounting.

### MAXIMUM RATINGS AT 25°C

SYMBOL	CHARACTERISTIC	VALUE
V <sub>DS</sub>	Drain to Source Voltage	6 V
V <sub>GS</sub>	Gate to Source Voltage	-4 V
I <sub>DS</sub>	Drain Current	52 mA
I <sub>Gsf</sub>	Forward Gate Current	1 mA
P <sub>IN</sub>	Input Power	@ 3dB compression
P <sub>T</sub>	Total Power Dissipation	310 mW
T <sub>CH</sub>	Channel Temperature	150°C
T <sub>STG</sub>	Storage Temperature	-65/+150°C

Note: 1. Exceeding any of the above ratings may result in permanent damage.

2. Exceeding any of the above ratings may reduce MTTF below design goals.

Specifications are subject to change without notice.

# LMC6482 CMOS Dual Rail-To-Rail Input and Output Operational Amplifier

## General Description

The LMC6482 provides a common-mode range that extends to both supply rails. This rail-to-rail performance combined with excellent accuracy, due to a high CMRR, makes it unique among rail-to-rail input amplifiers.

It is ideal for systems, such as data acquisition, that require a large input signal range. The LMC6482 is also an excellent upgrade for circuits using limited common-mode range amplifiers such as the TLC272 and TLC277.

Maximum dynamic signal range is assured in low voltage and single supply systems by the LMC6482's rail-to-rail output swing. The LMC6482's rail-to-rail output swing is guaranteed for loads down to 600Ω.

Guaranteed low voltage characteristics and low power dissipation make the LMC6482 especially well-suited for battery-operated systems.

LMC6482 is also available in MSOP package which is almost half the size of a SO-8 device.

See the LMC6484 data sheet for a Quad CMOS operational amplifier with these same features.

## Features

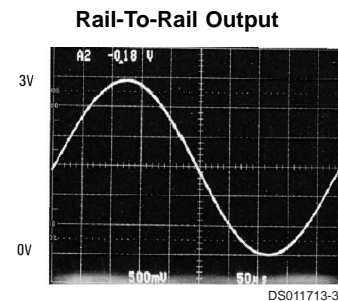
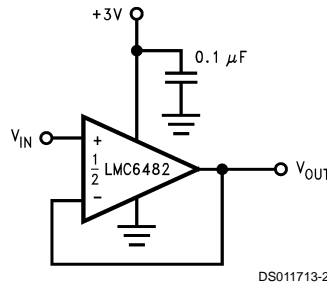
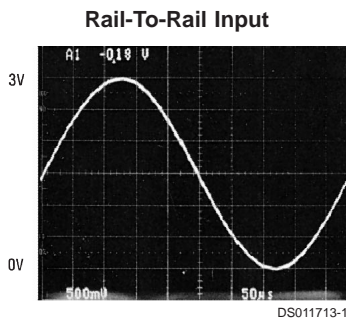
(Typical unless otherwise noted)

- Rail-to-Rail Input Common-Mode Voltage Range (Guaranteed Over Temperature)
- Rail-to-Rail Output Swing (within 20 mV of supply rail, 100 kΩ load)
- Guaranteed 3V, 5V and 15V Performance
- Excellent CMRR and PSRR: 82 dB
- Ultra Low Input Current: 20 fA
- High Voltage Gain ( $R_L = 500 \text{ k}\Omega$ ): 130 dB
- Specified for 2 kΩ and 600Ω loads
- Available in MSOP Package

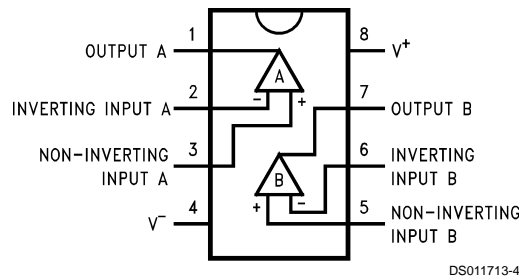
## Applications

- Data Acquisition Systems
- Transducer Amplifiers
- Hand-held Analytic Instruments
- Medical Instrumentation
- Active Filter, Peak Detector, Sample and Hold, pH Meter, Current Source
- Improved Replacement for TLC272, TLC277

## 3V Single Supply Buffer Circuit



## Connection Diagram



# Surface Mount GaAs Tuning Varactors

## MA46 Series

V3.00

### Features

- Low Cost
- Surface Mount Packages
- Very High Quality Factor
- Constant Gamma Abrupt Junction: 0.5  
Hyperabrupt Junctions: 0.75, 1.25 and 1.5
- Capacitance Ratio to 10:1
- Case Style 1056 is Hermetic and may be  
Screened to JANTX levels
- Tape and Reel Packaging Available

### Description

M/A-COM offers four families of low cost surface mount gallium arsenide tuning varactors. All families have silicon nitride protected junctions for low leakage current and high reliability.

The **MA46H500 through MA46H504** family has hyperabrupt junctions with constant gamma of 1.5 from 2 to 12 volts and high quality factor.

The **MA46H200 through MA46H206** family has hyperabrupt junctions with constant gamma of 1.25 from 2 to 20 volts and higher quality factor.

The **MA46H070 through MA46H073** family has hyperabrupt junctions with constant gamma of 0.75 from 0 to 20 volts and very high quality factor.

The **MA46504 through MA46506** family has abrupt junctions with constant gamma of 0.5 from 0 to 30 volts and the highest quality factor.

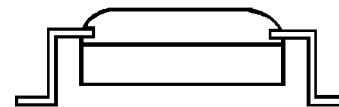
### Applications

The **MA46H500 through MA46H504 (gamma 1.5)** family of constant gamma hyperabrupt GaAs tuning varactors is designed for wide bandwidth VCOs and voltage tuned filters where limited bias voltage is available. These varactors have greatest capacitance change versus voltage at the cost of slightly lower quality factor than the other families of GaAs varactors.

### Case Styles



**1056**



**1088**

The **MA46H200 through MA46H206 (gamma 1.25)** family of constant gamma hyperabrupt GaAs tuning varactors has the largest capacitance ratio of the families of GaAs varactors and high quality factor. These diodes are very well suited for wide bandwidth VCOs and VTFs where the optimum combination of very wide tuning range and high quality factor is required.

The **MA46H070 through MA46H073 (gamma 0.75)** family of constant gamma hyperabrupt GaAs tuning varactors has quality factor approaching that of abrupt junction varactors, but higher capacitance change versus tuning voltage. These diodes are very well suited for narrower bandwidth VCOs and VTFs where wide tuning range and very high quality factor are required.

The **MA46504 through MA46506 (gamma 0.5)** family of constant gamma abrupt GaAs tuning varactors has the highest quality factor. These diodes are very well suited for narrower bandwidth VCOs and VTFs where highest quality factor is of paramount concern.

Specifications Subject to Change Without Notice.

**M/A-COM, Inc.**

North America: Tel. (800) 366-2266  
Fax (800) 618-8883

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Fax +81 3 3263 8769

■ Europe: Tel. +44 (1344) 869 595  
Fax +44 (1344) 300 020

# MB1502

## SERIAL INPUT PLL FREQUENCY SYNTHESIZER

### LOW POWER SERIAL INPUT PLL SYNTHESIZER WITH 1.1 GHz PRESCALER

The Fujitsu MB1502, utilizing BI-CMOS technology, is a single chip serial input PLL synthesizer with pulse-swallow function. The MB1502 contains a 1.1GHz two modulus prescaler that can select of either 64/65 or 128/129 divide ratio, control signal generator, 16-bit shift register, 15-bit latch, programmable reference divider (binary 14-bit programmable reference counter), 1-bit switch counter, phase comparator with phase conversion function, charge pump, crystal oscillator, 19-bit shift register, 18-bit latch, programmable divider (binary 7-bit swallow counter and binary 11-bit programmable counter) and analog switch to speed up lock up time.

It operates supply voltage of 5V typ. and achieves very low supply current of 8mA typ. realized through the use of Fujitsu Advanced Process Technology.

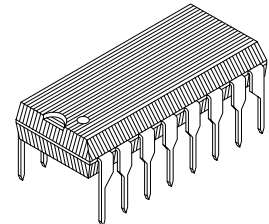
#### FEATURES

- High operating frequency:  $f_{IN\ MAX}=1.1\text{GHz}$  ( $V_{IN\ MIN}=10\text{dBm}$ )
- Pulse swallow function: 64/65 or 128/129
- Low supply current:  $I_{CC}=8\text{mA}$  typ.
- Serial input 18-bit programmable divider consisting of:
  - Binary 7-bit swallow counter: 0 to 127
  - Binary 11-bit programmable counter: 16 to 2047
- Serial input 15-bit programmable reference divider consisting of:
  - Binary 14-bit programmable reference counter: 8 to 16383
  - 1-bit switch counter (SW) sets divide ratio of prescaler
- On-chip analog switch achieves fast lock up time
- 2 types of phase detector output
  - On-chip charge pump (Bipolar type)
  - Output for external charge pump
- Wide operating temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- 16-pin Plastic DIP Package (Suffix: —P)  
16-pin Plastic Flat Package (Suffix: —PF)

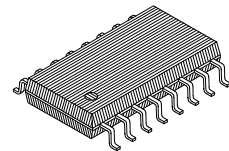
#### ABSOLUTE MAXIMUM RATINGS (See NOTE)

Rating	Symbol	Value	Unit
Power Supply Voltage	$V_{CC}$	-0.5 to +7.0	V
	$V_P$	$V_{CC}$ to 10.0	V
Output Voltage	$V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
Open-drain Voltage	$V_{OOP}$	-0.5 to 0.8	V
Output Current	$I_{OUT}$	$\pm 10$	mA
Storage Temperature	$T_{STG}$	-55 to +125	$^{\circ}\text{C}$

NOTE: Permanent device damage may occur if the above Absolute Maximum Ratings are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

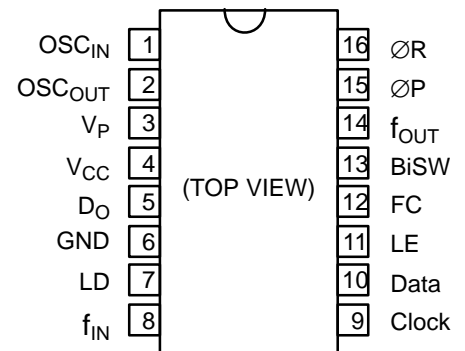


Plastic Package  
DIP-16P-M04



Plastic Package  
FPT-16P-M06

#### Pin Assignment



This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields. However, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.



# BIPOLAR DIGITAL INTEGRATED CIRCUIT

# $\mu$ PB1508GV

### 3 GHz INPUT DIVIDE BY 2 PRESCALER IC FOR DBS TUNERS

$\mu$ PB1508GV is a 3.0 GHz input divide by 2 prescaler IC for DBS tuner applications.  $\mu$ PB1508GV can make VHF/UHF band PLL frequency synthesizer apply to DBS/ECS tuners.  $\mu$ PB1508GV is a shrink package version of  $\mu$ PB584G so that this small package contributes to reduce the mounting space.

$\mu$ PB1508GV is manufactured using NEC's high fr NESAT™ IV silicon bipolar process. This process uses silicon nitride passivation film and gold electrodes. These materials can protect chip surface from external pollution and prevent corrosion/migration. Thus, this IC has excellent performance, uniformity and reliability.

#### FEATURES

- High toggle frequency :  $f_{in} = 0.5 \text{ GHz to } 3.0 \text{ GHz}$
- High-density surface mounting : 8 pin plastic SSOP (175 mil)
- Low current consumption : 5 V, 12 mA
- Fixed division :  $\div 2$

#### APPLICATION

- Prescaler between local oscillator and PLL frequency synthesizer included modulus prescaler
- DBS tuners with kit use of VHF/UHF band PLL frequency synthesizer

#### ORDERING INFORMATION

PART NUMBER	PACKAGE	MARKING	SUPPLYING FORM
$\mu$ PB1508GV-E1	8 pin plastic SSOP (175 mil)	1508	Embossed tape 8 mm wide. Pin 1 is in tape pull-out direction. 1 000 p/reel.

**Remarks** To order evaluation samples, please contact your local NEC sales office.  
(Part number for sample order:  $\mu$ PB1508GV)

**Caution: Electro-static sensitive devices**