BGV503

Negative Voltage Generator for biasing GaAs FETs and Power Amplifiers

Wireless
Silicon Discretes

Never stop thinking.

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BGV503
Data sheet
Revision History: 2002-11-11

Previous Version: 2001-05-16

Page	Subjects (major changes since last revision)
*	Preliminary removed, Figure 3 (Application) updated

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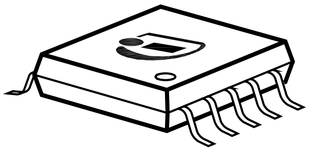
Negative Voltage Generator **BGV503**

for biasing GaAs FETs and Power Amplifiers

Features



- one-stage charge-pump with internal drain current regulator for biasing GaAs-FETs
- Operating Voltage Range: + 2.7V … 5.0V
- Typical Output Voltage: – 2.5V
- Output Current: 3mA (typ)
- p-p Output Voltage Ripple: 25mV … 40mV @ C_{OUT} = 1µF; I_{OUT} = 3mA
- Integrated Oscillator f_{OSZ} : 230kHz
- Standby Supply Current: < 5µA
- Logic-Level Shutdown Mode

ESD: Electrostatic discharge sensitive device, observe handling precaution!

Type	Package	Marking
BGV503	P-TSSOP-10	BGV503S

Electrical Characteristics at T_A=25°C, unless otherwise specified

Characteristics	Limit Values			Unit	Test Conditions
	min.	**typ.**	**max.**		
Input Voltage Range	2.7		5.0	V	
Ground (V_{SS})		0		V	
Output Voltage		- 2.1	- 1.4	V	V_{CC} = 2.7 V; I_{OUT} = 3 mA
		- 2.5	- 1.7	V	V_{CC} = 3.0 V; I_{OUT} = 3 mA
		- 4.6	- 3.9	V	V_{CC} = 5.0 V; I_{OUT} = 3 mA
Power Efficiency		76		%	V_{CC} = 3.0 V; R_{load} = 1 kΩ
Output Voltage Ripple[1)]		20		mV	V_{CC} = 3.0 V; I_{OUT} = 0 mA
		100		mV	V_{CC} = 3.0 V; I_{OUT} = 3 mA
No-Load Supply Current T_A=-40°C		0.65	2.0	mA	V_{CC} = 3.0 V
Voltage Conversion Efficiency		99.6		%	I_{OUT} = 0 mA
Shutdown/Enable Input Bias Current			1	µA	
Shutdown Input Supply Current			5	µA	
Turn On Time		51		µs	
Temperature Range	- 40		105	°C	

1) C_{OUT} = 100 nF

Pin Descripion

Pin No.	Pin Name	Description
1	R_{REF}	Sense resistor for the regulator
2	V_{REF}	Reference voltage of the regulator
3	NV	Negative output-voltage (unregulated)
4	V_{SS}	Ground connection
5	V_{CC}	Positive supply voltage
6	V_{DISQ}	Enable (TTL compatible)
7	V_{CON}	Reference voltage of the regulator
8	V_{NEG}	Regulated output voltage for biasing GaAs FETs
9	C1D	Charge pump capacitor
10	C2P	Charge pump capacitor

Pin Configuration

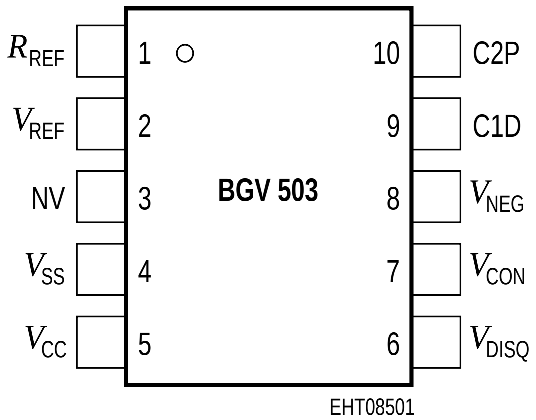


Figure 1 BGV503 in Package P-TSSOP-10

Functional Block Diagram

The BGV503 is a charge pump based negative voltage generator. The supply voltage (V_{CC}) is inverted and applied to the output NV

The BGV503 consists of an internal oscillator, a switching control circuit, the internal charge pump switches and a drain current regulator.

The switching frequency (clk) of the charge-pump is determined by the integrated oscillator and is between 100 kHz and 400 kHz. It is possible to stop the operating of the BGV503 by connecting V_{DISQ} to a voltage lower than 1 V (shutdown mode). The switching control circuit ensures that the internal MOS-switches of the charge-pump operate at the correct time. The regulator consists of two transistors and two internal resistors. It can be used to control the biasing of Power amplifiers or GaAs-FET amplifiers (see Figure 3).

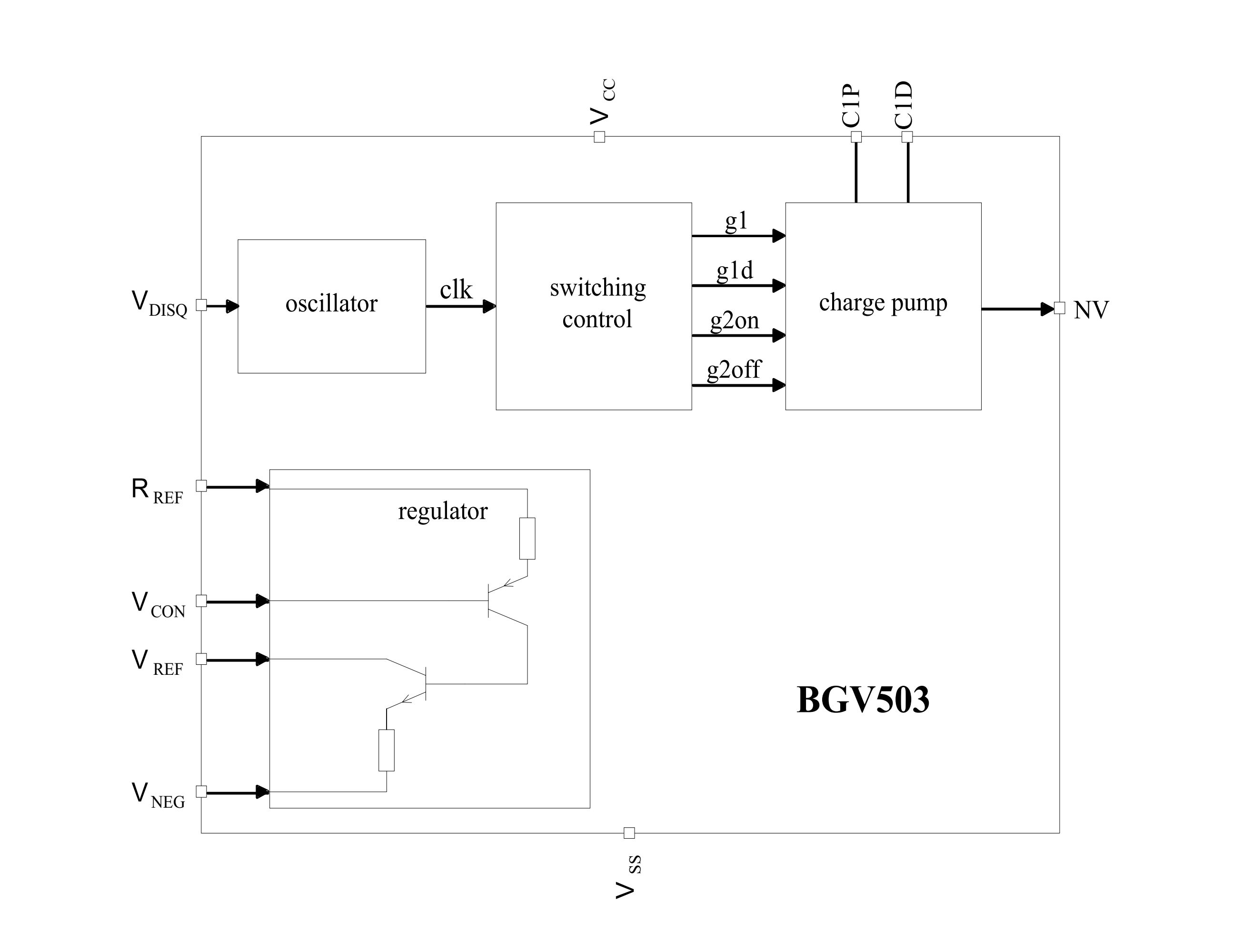


Figure 2 Block Diagram of the Negative Voltage Generator

Typical Applications

For all applications use capacitors with low effective series resistance (ESR) to maintain a low dropout voltage with high stability, good conversion efficiency and a low p-p voltage ripple.

An additional capacitor in the supply line (between V_{CC} and V_{SS}) is useful to reduce the AC input impedance. As a consequence, this minimize the spurious signals (EMI) on the supply lines, that came from the current peaks when the BGV503 is switching. The value of this capacitor depends on the circuit configuration and on customer requirements concerning EMI; 1 µF is regarded as sufficient.

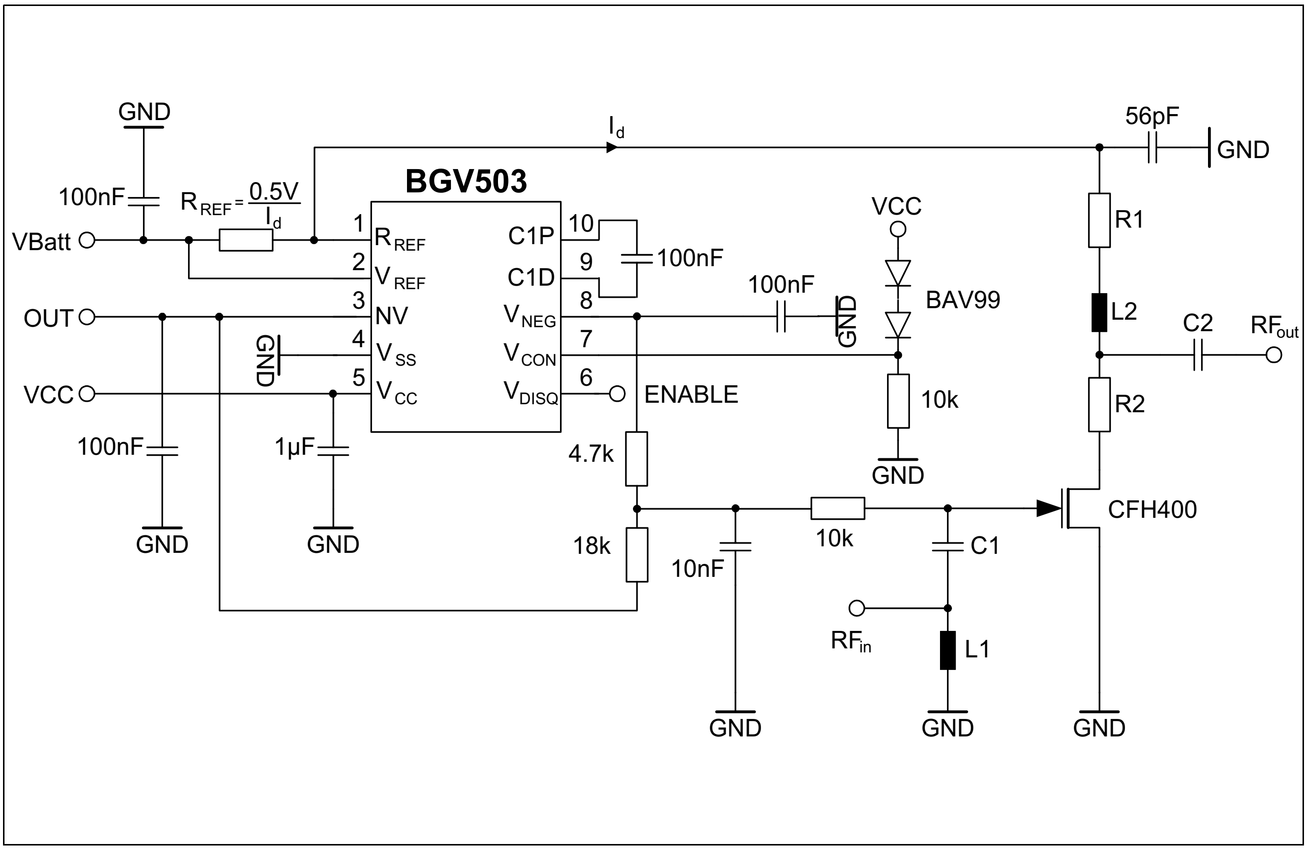


Figure 3 BGV503; Inverting charge pump with GaAs FET drain current regulation loop

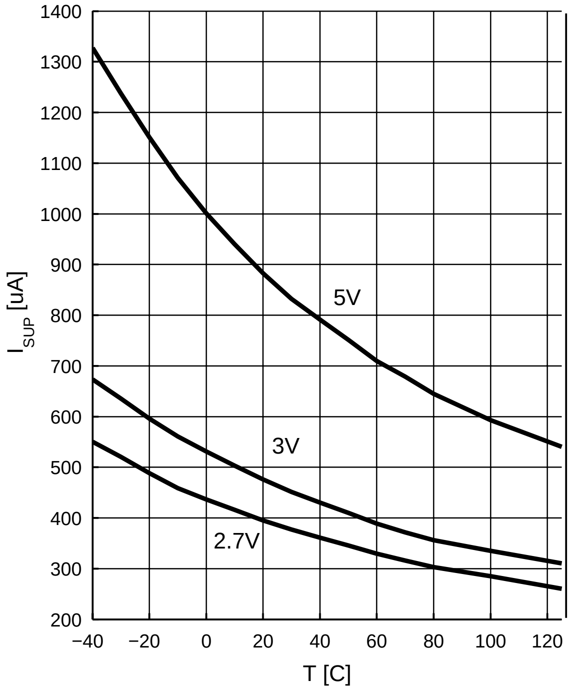
Note: For the above application see Application note No. 80

Typical Operating Characteristics

Supply Current vs. Temperature

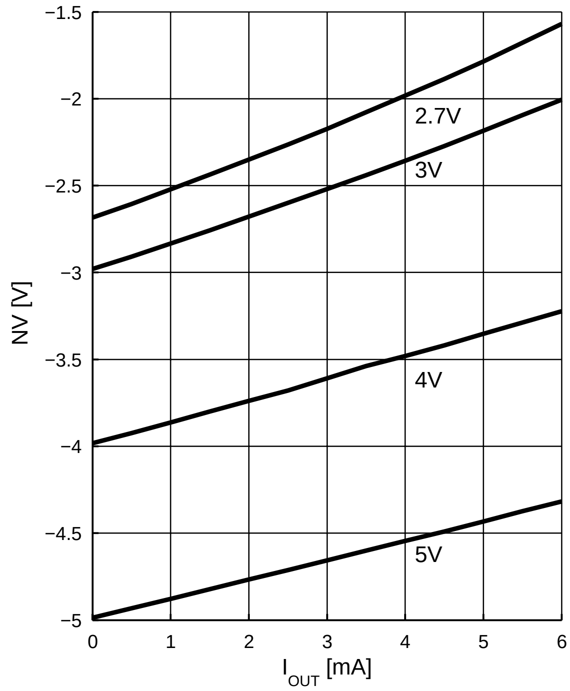
@ I_{out} = 0mA

V_{CC} = parameter



Output Voltage vs. Load Current

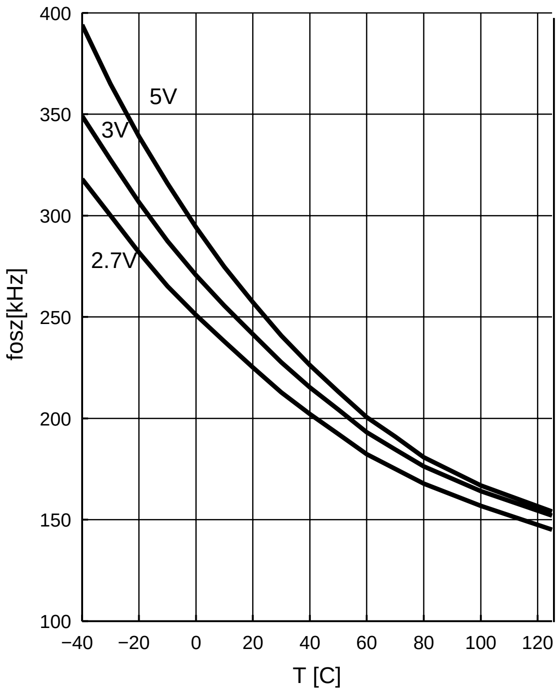
V_{CC} = parameter



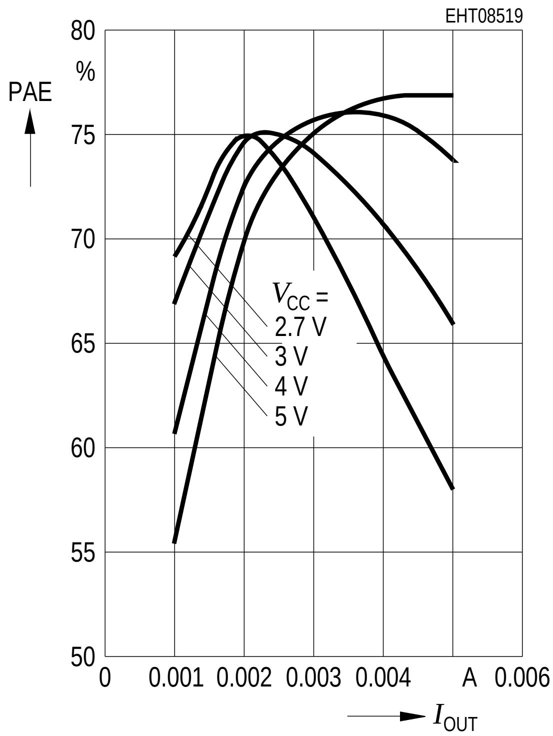
Oscillator Frequency vs. Temperature

@ I_{out} = 3mA

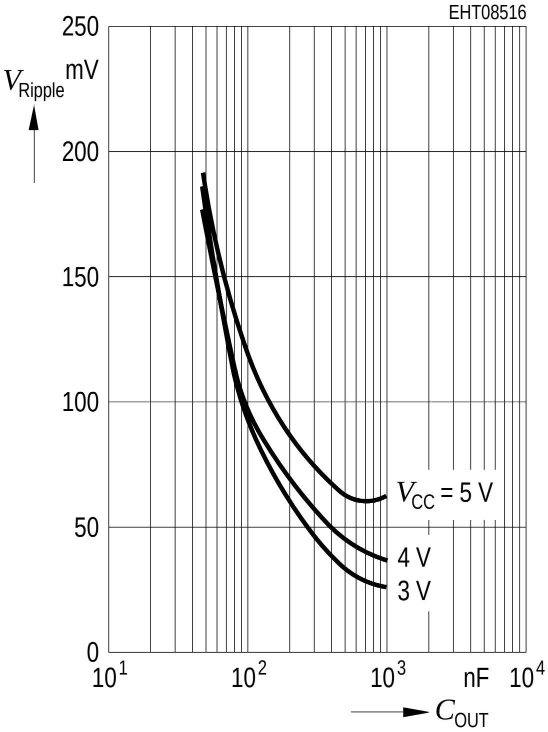
V_{CC} = parameter



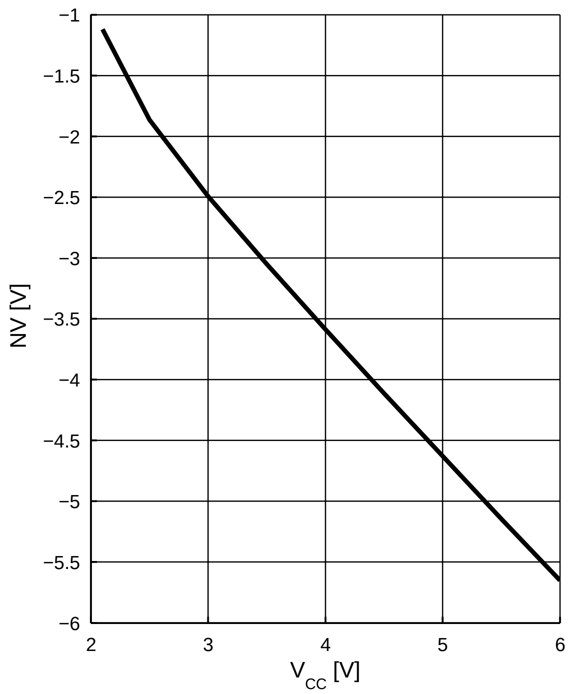
Power Efficiency vs. Load Current



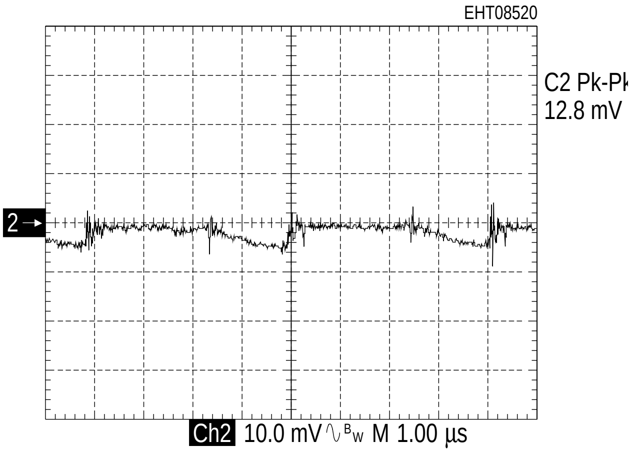
Ripple vs. Output-Capacity (peak to peak) @ I_{OUT} = 3 mA



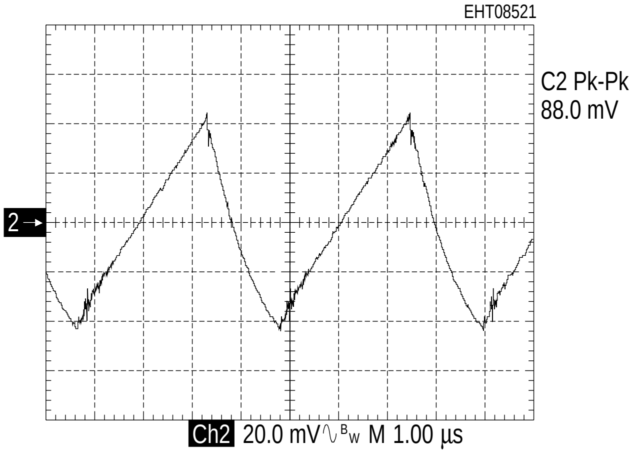
Output Voltage vs. Supply Voltage @ I_{out} = 3mA



Output Voltage, AC-coupled, V_{CC} = 3 V, I_{OUT} = 0 mA, C_{OUT} = 100 nF



Output Voltage, AC-coupled, V_{CC} = 3 V, I_{OUT} = 3 mA, C_{OUT} = 100 nF



Package Outline

P-TSSOP-10
(Plastic Thin Shrink Small Outline Package)