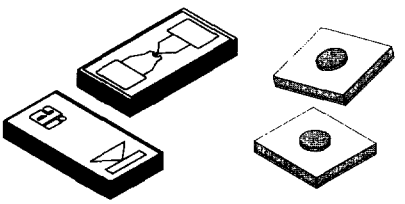
GaAs Hyperabrupt Varactor Diodes

Alpha

CVG7864, CVG9800 Series

Features



- Constant Gamma of 1.0 and 1.25
- Highly Linear Frequency Tuning
- Constant Modulation Sensitivity
- Lower Series Resistance and Higher Q in Comparison to Equivalent Silicon Hyperabrupt Varactors
- Available in a Wide Range of Packages Including Surface Mountable Outlines, and in Die Form

Description

Gallium arsenide hyperabrupt varactor diodes in this series feature a constant gamma of 1.0 and 1.25, which allows for a relatively linear frequency tuning for VCOs, modulators and tunable filters. The GaAs varactors in this series are grown by MBE (Molecular Beam Epitaxy) which allows monolayer control of the doping profile. This translates to superb wafer–to–wafer uniformity. The series resistance is lower, and Q is higher, when compared to an equivalent silicon hyperabrupt varactor. These diodes are suited for applications at X band frequencies and above, where wide change in frequency is desired. However in certain applications the gallium arsenide hyperabrupt varactor exhibits a higher surface noise, in comparison to an equivalent silicon varactor. For availability of other GaAs Hyperabrupt varactors, please consult the factory.

Maximum Ratings

Reverse Voltage, V_R:	22V
Forward Current, I_F:	100 mA
Power Dissipation at 25°C:	250 mW
Operating Temperature:	–55 to 150°C
Storage Temperature:	–65 to 200°C

ALPHA INDUSTRIES, INC. • 20 SYLVAN ROAD, WOBURN, MA 01801
TEL: (617) 935–5150 • FAX: (617) 824–4579

Electrical Characteristics

GaAs Hyperabrupt Varactor Chips (Gamma = 1.0)

Reverse Breakdown Voltage, V_{BR} (10 μA): 18V Minimum
Reverse Leakage Current, I_R (14.4V): 100 nA Maximum
Typical Linearity Range of Gamma = 1.0 ± 10%: 2–12V
Chip Outline: 150–808

Chip Part Number	Junction Capacitance C_J @ 4V (pF)		C_J Ratio		C_T Ratio (C_P = 0.15)		Q @ 4V, 50 MHz[1]	Available Outlines[2]
	Min	Max	C_J2/C_J12 ±10%	C_J2/C_J20 ±10%	C_T2/C_T12 ±10%	C_T2/C_T20 ±10%	Min	
CVG7864–01	0.4	0.6	4.0	4.5	2.75	2.90	4000	290–001/304–001/325–001/540–001
CVG7864–02	0.6	0.8	4.0	4.5	3.00	3.20	3500	290–001/304–001/325–001/540–001
CVG7864–03	0.8	1.0	4.0	4.5	3.10	3.40	3200	290–001/304–001/325–001/540–001
CVG7864–04	1.0	1.5	4.0	4.5	3.30	3.60	3000	290–001/304–001/325–001/540–001
CVG7864–05	1.5	2.0	4.0	4.5	3.50	3.80	2500	290–001/304–001/325–001/540–001
CVG7864–06	2.0	2.5	4.0	4.5	3.60	3.95	2500	290–001/304–001/325–001/540–001
CVG7864–07	2.5	3.0	4.0	4.5	3.70	4.00	2200	290–001/304–001/325–001/540–001
CVG7864–08	3.0	4.0	4.0	4.5	3.70	4.10	2200	290–001/304–001/325–001/540–001

1. The measured values of figure of merit, Q, and series resistance, R_S, for a varactor diode are sensitive to the measurement method and set–up. The test set–up and test conditions used at Alpha are specified in this section.
2. For availability and delivery on other package styles, please consult the factory.

GaAs Hyperabrupt Varactor Chips (Gamma = 1.25)

Reverse Breakdown Voltage, V_{BR} (10 μA): 18V Minimum
Reverse Leakage Current, I_R (14.4V): 50 nA Maximum
Typical Linearity Range of Gamma = 1.25 ± 10%: 2–12V
Chip Outline: 150–808

Chip Part Number	Junction Capacitance C_J @ 4V (pF)		C_J Ratio		C_T Ratio (C_P = 0.15)		Q @ 4V, 50 MHz[1]	Available Outlines[2]
	Min	Max	C_J2/C_J12 ±10%	C_J2/C_J20 ±10%	C_T2/C_T12 ±10%	C_T2/C_T20 ±10%	Min	
CVG9800–01	0.3	0.4	5.7	6.4	2.9	3.0	4000	290–001/304–001/325–001/540–001
CVG9800–02	0.4	0.6	5.7	6.4	3.4	3.5	3500	290–001/304–001/325–001/540–001
CVG9800–03	0.6	0.8	5.7	6.4	3.8	4.0	3500	290–001/304–001/325–001/540–001
CVG9800–04	0.8	1.0	5.7	6.4	4.1	4.4	3200	290–001/304–001/325–001/540–001
CVG9800–05	1.0	1.5	5.7	6.4	4.4	4.8	3000	290–001/304–001/325–001/540–001
CVG9800–06	1.5	2.0	5.7	6.4	4.7	5.1	2500	290–001/304–001/325–001/540–001

1. The measured values of figure of merit, Q, and series resistance, R_S, for a varactor diode are sensitive to the measurement method and set–up. The test set–up and test conditions used at Alpha are specified in this section.
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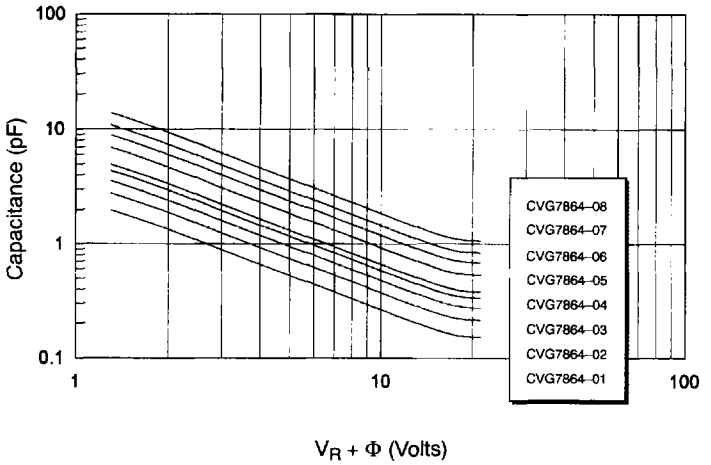
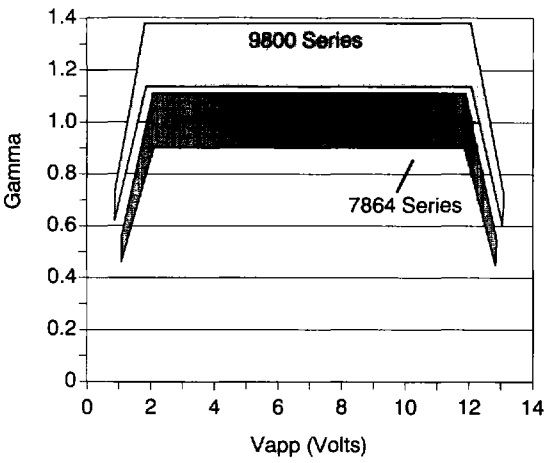
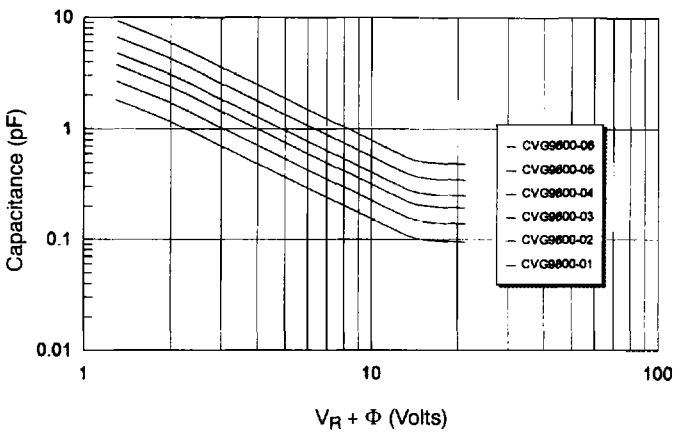
Performance Data



Capacitance vs. Voltage



Sensitivity Factor (γ)



Capacitance vs. Voltage

Package Outlines

GaAs hyperabrupt diodes are available as dice and in a variety of package outlines. Consult the factory for availability of packages not listed. The packages are designed to facilitate the handling of devices and circuit placement. However, the package may influence the device's performance. Please refer to Outline Drawings section for catalog package outlines, their characteristics, and their effect on electrical parameters of the diode.

Ordering Information

To order an unpackaged die, simply identify the desired die by the part numbers as listed in the table of electrical specifications. To order a packaged diode, simply append the package part number to the die part number. For example, CVG7864–01–290–001 represents the varactor diode formed by assembling CVG7864–01 die in a 290–001 package outline.

Hyperabrupt Abrupt Varactor Diodes for High Reliability Applications

Please refer to Reliability section for recommended quality assurance and inspection sequences for varactor diodes. This section also covers package outlines available for high reliability applications and simplified ordering instructions.

Mathematical Model

Please refer to Application Notes section for a mathematical model for a varactor diode.

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