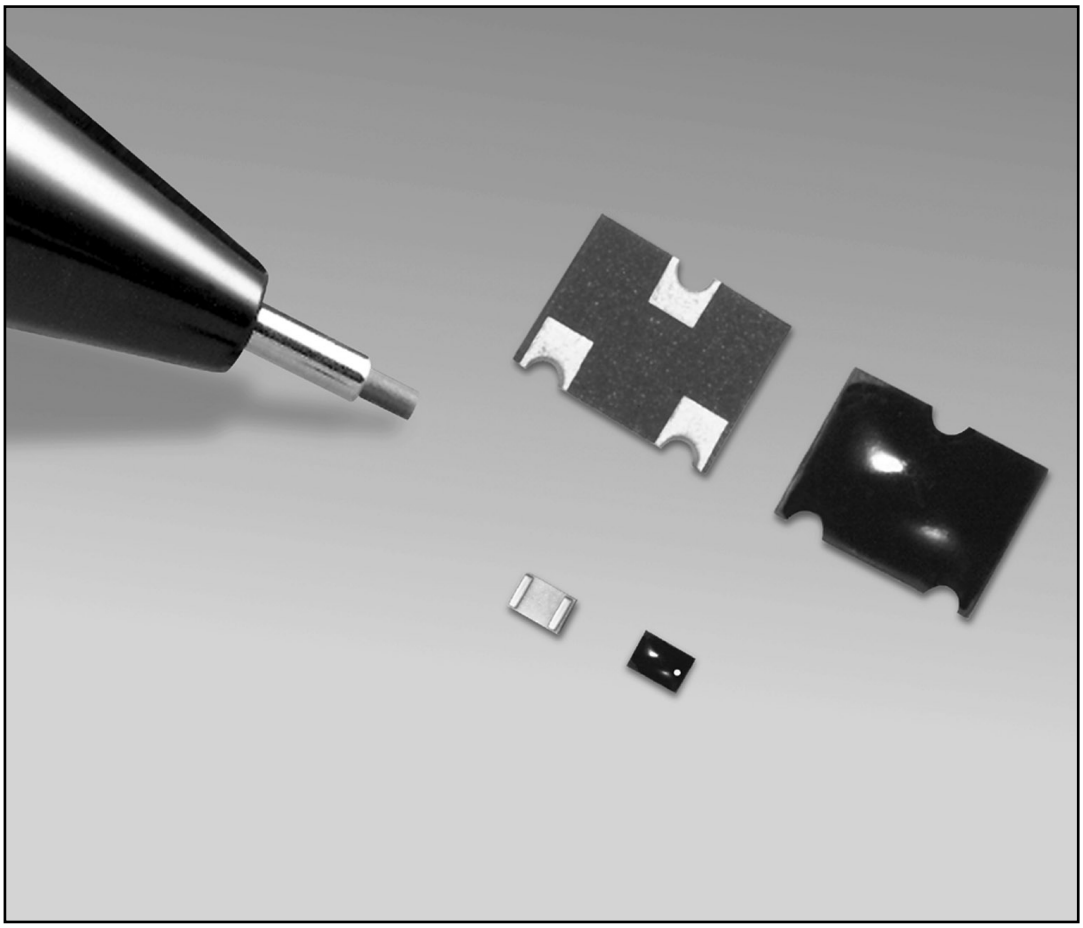
Sprague-Goodman

ENGINEERING BULLETIN
SG-950

VARACTOR DIODES



Sprague-Goodman Electronics, Inc.
1700 SHAMES DRIVE, WESTBURY, NY 11590
TEL: 516-334-8700 • FAX: 516-334-8771
E-MAIL: info@spraguegoodman.com

SUPER HYPERABRUPT TUNING VARACTOR DIODES

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Superior mid range linear characteristics
- High tuning ratios
- High Q
- Available in common cathode style
- Available in chip form (add suffix -000)

APPLICATIONS

- TCXOs, VCXOs
- Low voltage wireless open loop VCOs
- Low voltage wireless phase locked loop VCOs
- Phase shifters

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 12 V min

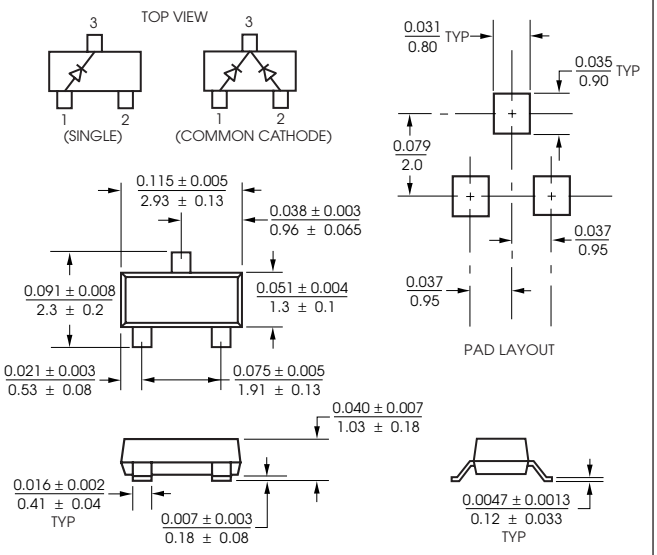
Maximum reverse leakage current at –10 V (at 25°C): 0.05 µA DC

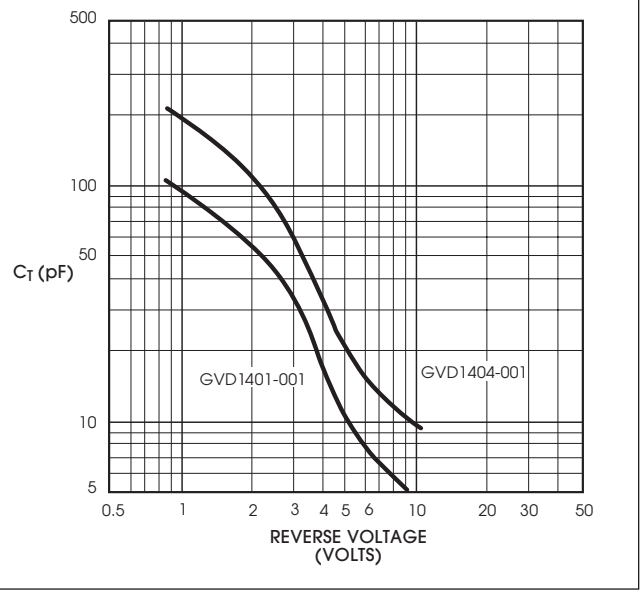
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –55°C to +125°C

Storage temperature: –55°C to +125°C

Total Capacitance C_T (pF) at –2 V min	max	Total Capacitance C_T (pF) at –7 V typ	Total Capacitance C_T (pF) at –10 V min	max	Q min at –2 V (10 MHz)	Model Number Single	Model Number Common Cathode
46	68	6.1	4.2	5.2	75	GVD1401-001	—
100	150	13.0	8.6	10.6	50	GVD1404-001	—





SOT-23 PACKAGE - Consult factory for additional package configurations.
All dimensions are in / mm.
Unless otherwise specified, the tolerance on dimensions is ± 0.004 / 0.1.

SUPER HYPERABRUPT TUNING VARACTOR DIODES

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
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APPLICATIONS

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- Low voltage wireless phase locked loop VCOs
- Phase shifters

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 12 V min

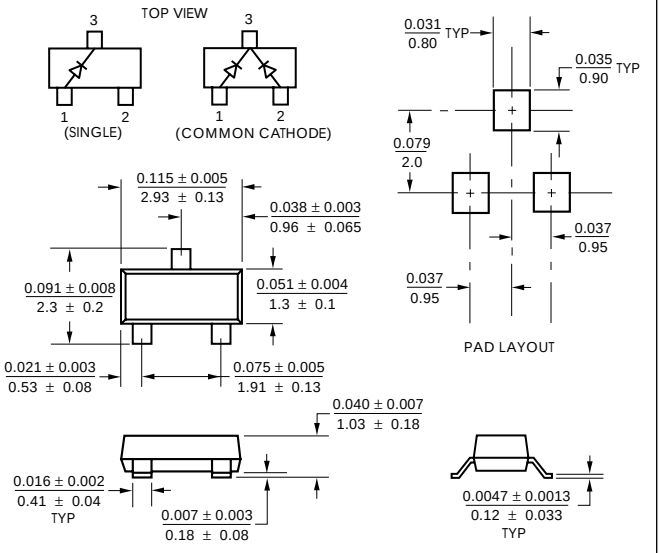
Maximum reverse leakage current at –10 V (at 25°C): 0.05 µA DC

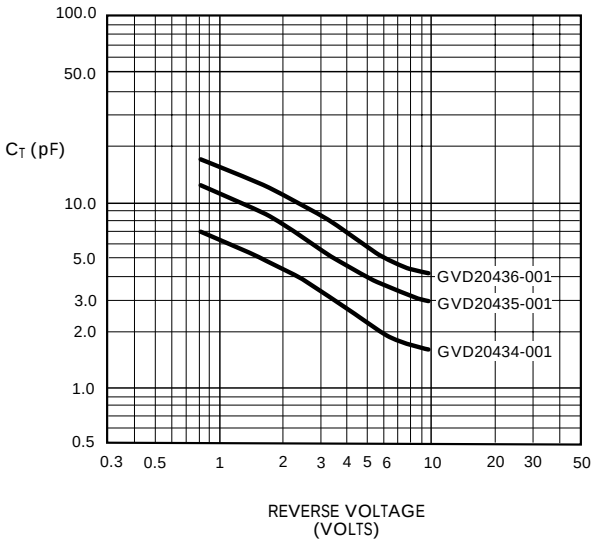
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –55°C to +125°C

Storage temperature: –55°C to +125°C

Total Capacitance C_T (pF) at –1 V min	max	Capacitance Ratio $\frac{C_T \text{ at } -1 \text{ V}}{C_T \text{ at } -3 \text{ V}}$ min	max	Capacitance Ratio $\frac{C_T \text{ at } -1 \text{ V}}{C_T \text{ at } -6 \text{ V}}$ min	max	Q min at –4 V (50 MHz)	Model Number Single	Common Cathode
3.00	3.60	1.4	1.9	2.6	3.3	1500	GVD20433-001	GVD20433-004
5.85	7.15	1.6	2.0	2.8	3.4	1200	GVD20434-001	GVD20434-004
10.35	12.65	1.6	2.0	2.9	3.4	1000	GVD20435-001	GVD20435-004
15.50	18.50	1.6	2.0	3.0	3.5	900	GVD20436-001	GVD20436-004
45.00	54.00	1.6	2.0	3.0	3.5	750	GVD20437-001	---





SOT-23 PACKAGE - Consult factory for additional package configurations.
All dimensions are in / mm.
Unless otherwise specified, the tolerance on dimensions is ± 0.004 / 0.1.

SUPER HYPERABRUPT TUNING VARACTOR DIODES

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Superior mid range linear characteristics
- High tuning ratios
- High Q
- Available in common cathode style
- Available in chip form (add suffix -000)

APPLICATIONS

- TCXOs, VCXOs
- Low voltage wireless open loop VCOs
- Low voltage wireless phase locked loop VCOs
- Phase shifters

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 12 V min

Maximum reverse leakage current at –10 V (at 25°C): 0.05 µA DC

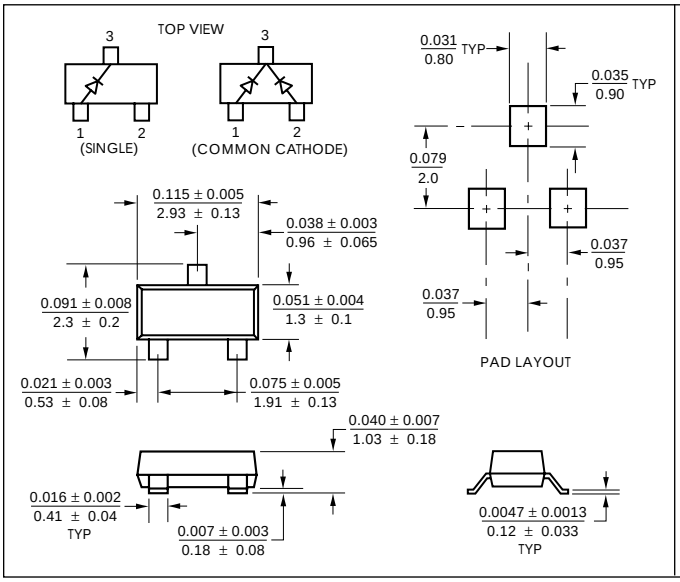
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

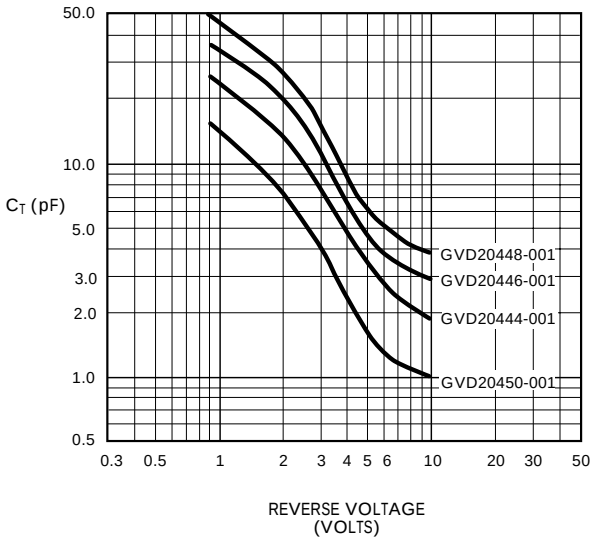
Operating junction temperature: –55°C to +125°C

Storage temperature: –55°C to +125°C

Total Capacitance C_T (pF) at –1 V min	Total Capacitance C_T (pF) at –2.5 V min	max	Total Capacitance C_T (pF) at –8 V max	Q min at –4 V (50 MHz)	Model Number Single	Model Number Common Cathode
13.0	6.5	10.0	2.7	750	GVD20442-001	GVD20442-004
13.0	6.5	10.0	2.7	350	GVD20443-001	GVD20443-004
17.0	8.5	13.0	3.2	600	GVD20444-001	GVD20444-004
17.0	8.5	13.0	3.2	300	GVD20445-001	GVD20445-004
26.0	13.0	20.0	4.7	500	GVD20446-001	---
26.0	13.0	20.0	4.7	225	GVD20447-001	---
36.0	18.0	27.0	6.2	400	GVD20448-001	---
36.0	18.0	27.0	6.2	150	GVD20449-001	---

Total Capacitance C_T (pF) at –1 V min	Total Capacitance C_T (pF) at –2.5 V min	max	Total Capacitance C_T (pF) at –4 V max	Q min at –4 V (50 MHz)	Model Number Single	Model Number Common Cathode
9.0	4.5	6.5	3.0	400	GVD20450-001	GVD20450-004





SOT-23 PACKAGE - Consult factory for additional package configurations.
All dimensions are in / mm.
Unless otherwise specified, the tolerance on dimensions is ± 0.004 / 0.1.

SUPER HYPERABRUPT TUNING VARACTOR DIODES

Surface Mount Low Parasitic Package (SMLP)

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Fits footprint for SOD-323, SOD-123 and smaller
- High frequency (VHF to 8 GHz)
- Available on carrier and reel
- Available in chip form (add suffix -000)
- Two package styles including lower cost, flat top version
- Alternate notched termination version available, contact factory for outline drawing

APPLICATIONS

- PCS
- WANS
- DECT
- GSM
- TAGS
- AMPS
- Cellular

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 12 V min

Maximum reverse leakage current at –10 V (at 25°C): 0.05 µA DC

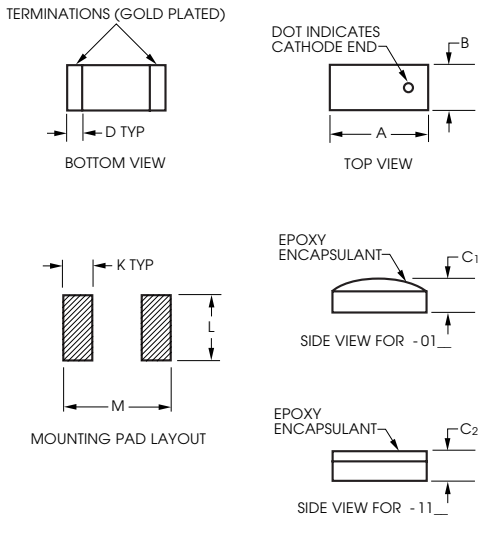
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –65°C to +125°C

Storage temperature: –65°C to +125°C

Total Capacitance C_T (pF) at –1 V min	Total Capacitance C_T (pF) at –2.5 V min	Total Capacitance C_T (pF) at –2.5 V max	Total Capacitance C_T (pF) at –4 V max	Total Capacitance C_T (pF) at –8 V max	Q min at –4 V (50 MHz)	Model Number*
36.0	18.0	27.0	12.0	6.2	400	GVD90001 – _ _ _
26.0	13.0	20.0	9.0	4.7	500	GVD90002 – _ _ _
17.0	8.5	13.0	6.0	3.2	600	GVD90003 – _ _ _
13.0	6.5	10.0	4.5	2.7	750	GVD90004 – _ _ _
9.0	4.5	6.5	3.0	1.7	900	GVD90005 – _ _ _
4.0	2.0	3.0	1.5	1.0	1200	GVD90006 – _ _ _
1.8	1.1	1.5	0.8	0.55	1400	GVD90007 – _ _ _
1.2	0.8	1.1	0.6	0.45	1600	GVD90008 – _ _ _
0.6	0.5	0.8	0.4	0.35	1800	GVD90009 – _ _ _

* For complete model number, select "Dash No." from chart below.



Dash No.	A	B	C_1	C_2	D	K	L	M
- 011	0.10	0.050	0.035	0.050	0.015 ± 0.004	0.030	0.070	0.112
- 111	2.5	1.3	0.89	1.3	0.38 ± 0.1	0.76	1.8	2.84
- 012	0.12	0.060	0.035	0.050	0.020 ± 0.005	0.030	0.080	0.132
- 112	3.0	1.5	0.89	1.3	0.51 ± 0.1	0.76	2.0	3.35
- 013	0.200	0.100	0.035	0.050	0.020 ± 0.005	0.030	0.120	0.212
- 113	5.08	2.54	0.89	1.3	0.51 ± 0.1	0.76	3.05	5.38
- 014	0.075	0.050	0.035	0.050	0.015 ± 0.004	0.030	0.070	0.087
- 114	1.9	1.3	0.89	1.3	0.38 ± 0.1	0.76	1.8	2.2
- 015	0.062	0.042	0.030	0.050	0.011 ± 0.003	0.020	0.060	0.072
- 115	1.6	1.1	0.76	1.3	0.28 ± 0.08	0.51	1.5	1.8

All dimensions are in **/** mm.
Unless otherwise specified, the tolerance on dimensions is ± 0.003**/** 0.08.

Note: An SMLP package with three terminations sized to fit the pad layout for an SOT-23 package is also available. This package can be used for multiple diode designs (such as common cathode or common anode). Contact factory for the three-terminal SMLP outline drawing, and for further information on the multiple diode configurations.

WIDEBAND HYPERABRUPT TUNING VARACTOR DIODES

Microwave Hyperabrupt Series

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Superior wide range linear characteristics
- High tuning ratios
- High Q
- Available in common cathode style
- Available in chip form (add suffix -000)

APPLICATIONS

- Low phase noise VCOs
- Phase locked loop VCOs
- High linearity VCOs
- Phase shifters

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 20 V min

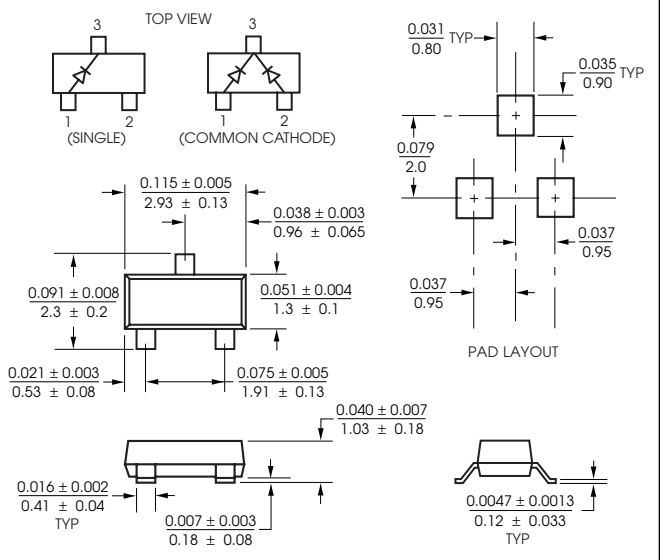
Maximum reverse leakage current at –20 V (at 25°C): 0.05 µA DC

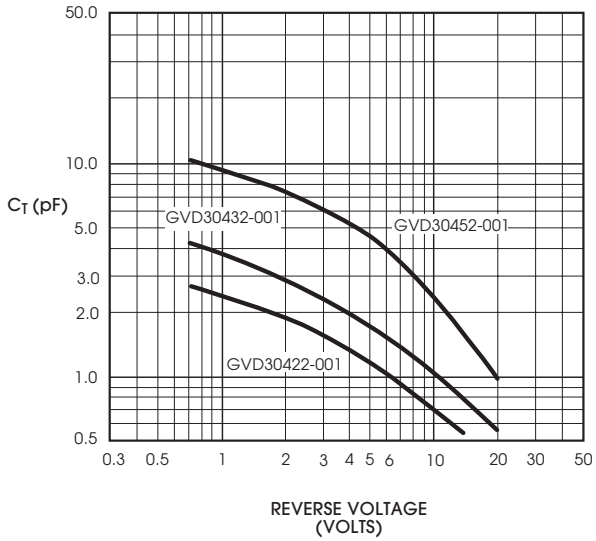
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –55°C to +125°C

Storage temperature: –55°C to +125°C

Total Capacitance C_T (pF) at –0 V min	Total Capacitance C_T (pF) at –4 V min	max	Total Capacitance C_T (pF) at –20 V min	max	Q min at –4 V (50 MHz)	Model Number Single	Model Number Common Cathode
2.7	1.25	1.75	0.43	0.57	1000	GVD30422-001	GVD30422-004
4.2	1.70	2.50	0.52	0.72	850	GVD30432-001	GVD30432-004
6.3	2.20	3.80	0.68	0.96	700	GVD30442-001	GVD30442-004
11.9	3.70	5.50	0.94	1.30	600	GVD30452-001	GVD30452-004
26.0	9.00	11.00	1.90	2.50	400	GVD30462-001	GVD30462-004





SOT-23 PACKAGE - Consult factory for additional package configurations.
All dimensions are in **/** mm.
Unless otherwise specified, the tolerance on dimensions is ± 0.004 **/** 0.1.

WIDEBAND HYPERABRUPT TUNING VARACTOR DIODES

VHF/UHF Hyperabrupt Series

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Superior wide range linear characteristics
- High tuning ratios
- High Q
- Available in common cathode style
- Available in chip form (add suffix -000)

APPLICATIONS

- Low phase noise VCOs
- Phase locked loop VCOs
- High linearity VCOs
- Phase shifters

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 25 V min

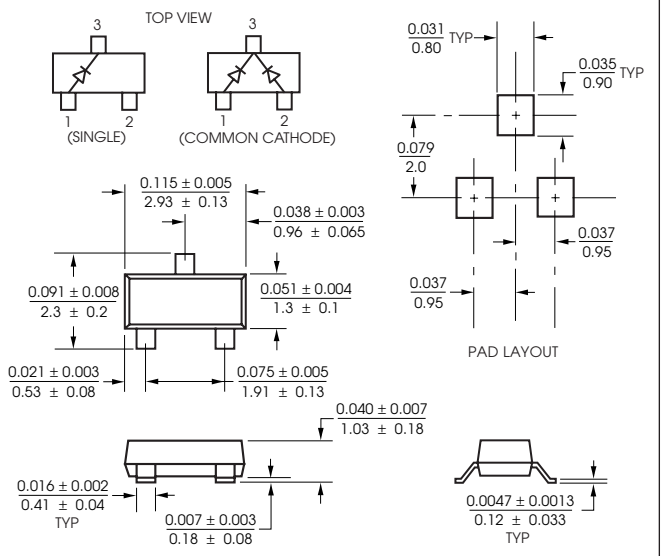
Maximum reverse leakage current at –20 V (at 25°C): 0.05 µA DC

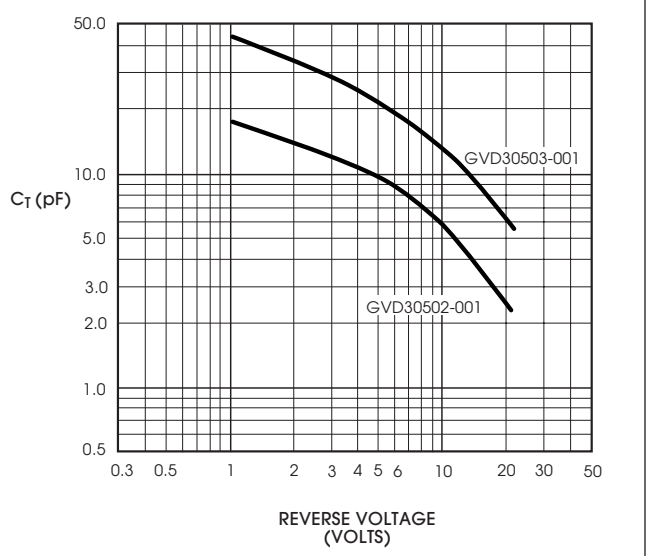
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –55°C to +125°C

Storage temperature: –55°C to +125°C

Total Capacitance C_T (pF) at –3 V min	max	Total Capacitance C_T (pF) at –25 V min	max	Q min at –4 V (50 MHz)	Model Number Single	Common Cathode
9.5	14.5	1.8	2.8	200	GVD30501-001	—
9.5	14.5	1.8	2.8	750	GVD30502-001	—
26.0	32.0	4.3	6.0	200	GVD30503-001	—
26.0	32.0	4.3	6.0	500	GVD30504-001	—





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WIDEBAND HYPERABRUPT TUNING VARACTOR DIODES

VHF/UHF Hyperabrupt Series

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Superior wide range linear characteristics
- High tuning ratios
- High Q
- Available in common cathode style
- Available in chip form (add suffix -000)

APPLICATIONS

- Low phase noise VCOs
- Phase locked loop VCOs
- High linearity VCOs
- Phase shifters

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 22 V min

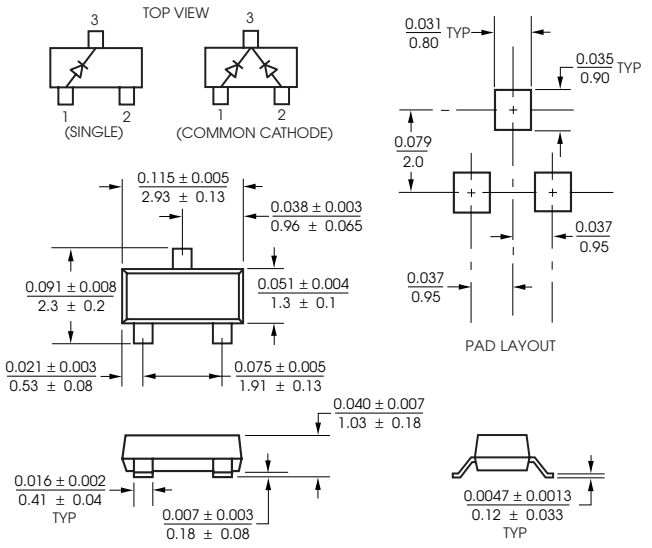
Maximum reverse leakage current at –20 V (at 25°C): 0.05 µA DC

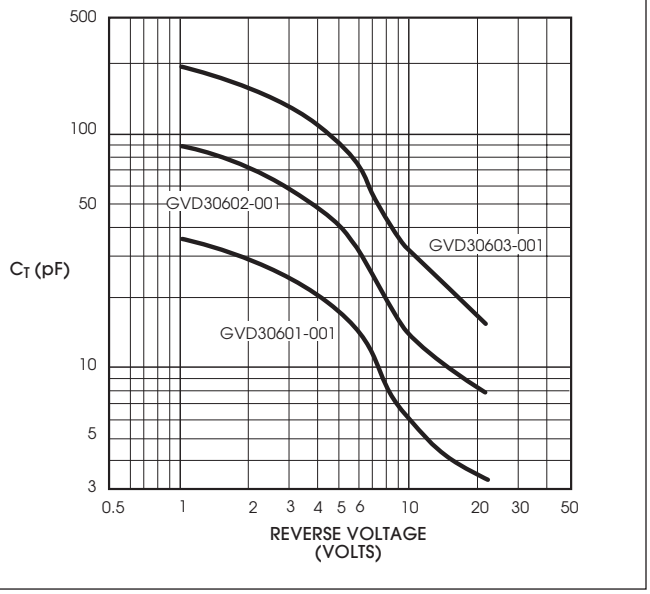
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –55°C to +125°C

Storage temperature: –55°C to +125°C

Total Capacitance C_T (pF) at –4 V min	max	Total Capacitance C_T (pF) at –8 V min	max	Total Capacitance C_T (pF) at –20 V min	max	Q min at –4 V (50 MHz)	Model Number Single	Common Cathode
18.0	22.0	7.5	10.5	2.7	3.5	160	GVD30601-001	—
45.0	55.0	18.0	25.0	6.6	9.0	125	GVD30602-001	—
100.0	120.0	39.0	55.0	14.0	19.0	80	GVD30603-001	—





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MICROWAVE HYPERABRUPT TUNING VARACTOR DIODES

Surface Mount Low Parasitic Package (SMLP)

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Fits Footprint for SOD-323, SOD-123 and smaller
- High frequency (VHF to 8 GHz)
- Available on carrier and reel
- Available in chip form (add suffix -000)
- Two package styles including lower cost, flat top version
- Alternate notched termination version available, contact factory for outline drawing

APPLICATIONS

- PCS
- WANS
- AMPS
- GSM
- TAGS
- DECT
- Cellular

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 22 V min

Maximum reverse leakage current at –20 V (at 25°C): 0.05 µA DC

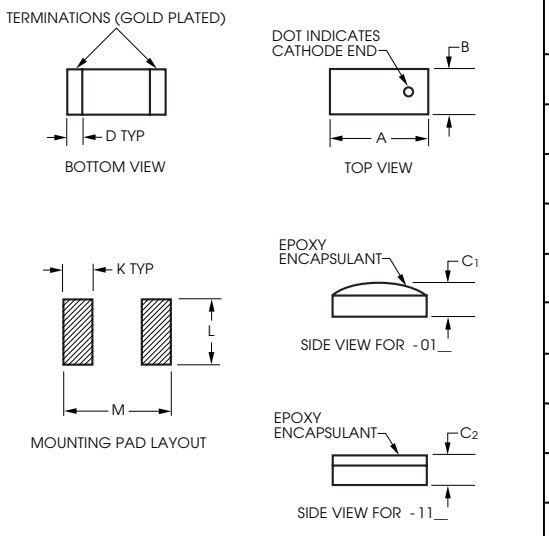
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –65°C to +125°C

Storage temperature: –65°C to +125°C

Total Capacitance C_T (pF) at 0 V typical	Total Capacitance C_T (pF) at –4 V min	max	Total Capacitance C_T (pF) at –20 V min	max	Q min at –4 V (50 MHz)	Model Number*
26.0	8.75	10.80	1.85	2.50	400	GVD92101 – _ _ _
14.0	4.45	5.50	0.85	1.30	600	GVD92102 – _ _ _
7.0	2.65	3.30	0.65	0.90	700	GVD92103 – _ _ _
5.0	1.75	2.20	0.50	0.70	850	GVD92104 – _ _ _
3.0	1.30	1.65	0.40	0.55	1000	GVD92105 – _ _ _
2.0	0.85	1.10	0.30	0.45	1200	GVD92106 – _ _ _

*For complete model number, select "Dash No." from chart below.



Dash No.	A	B	C_1	C_2	D	K	L	M
- 011	0.10	0.050	0.035	0.050	0.015 ± 0.004	0.030	0.070	0.112
- 111	2.5	1.3	0.89	1.3	0.38 ± 0.1	0.76	1.8	2.84
- 012	0.12	0.060	0.035	0.050	0.020 ± 0.005	0.030	0.080	0.132
- 112	3.0	1.5	0.89	1.3	0.51 ± 0.1	0.76	2.0	3.35
- 013	0.200	0.100	0.035	0.050	0.020 ± 0.005	0.030	0.120	0.212
- 113	5.08	2.54	0.89	1.3	0.51 ± 0.1	0.76	3.05	5.38
- 014	0.075	0.050	0.035	0.050	0.015 ± 0.004	0.030	0.070	0.087
- 114	1.9	1.3	0.89	1.3	0.38 ± 0.1	0.76	1.8	2.2
- 015	0.062	0.042	0.030	0.050	0.011 ± 0.003	0.020	0.060	0.072
- 115	1.6	1.1	0.76	1.3	0.28 ± 0.08	0.51	1.5	1.8

All dimensions are in **/** mm.
Unless otherwise specified, the tolerance on dimensions is ± 0.003**/**0.08.

Note: An SMLP package with three terminations sized to fit the pad layout for an SOT-23 package is also available. This package can be used for multiple diode designs (such as common cathode or common anode). Contact factory for the three-terminal SMLP outline drawing, and for further information on the multiple diode configurations.

HIGH Q ABRUPT TUNING VARACTOR DIODES

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Economy price
- Mil grade performance
- High Q
- Available in common cathode style
- Available in chip form (add suffix -000)

APPLICATIONS

- Low phase noise VCOs
- Phase locked loop VCOs
- Moderate bandwidth VCOs

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 30 V min

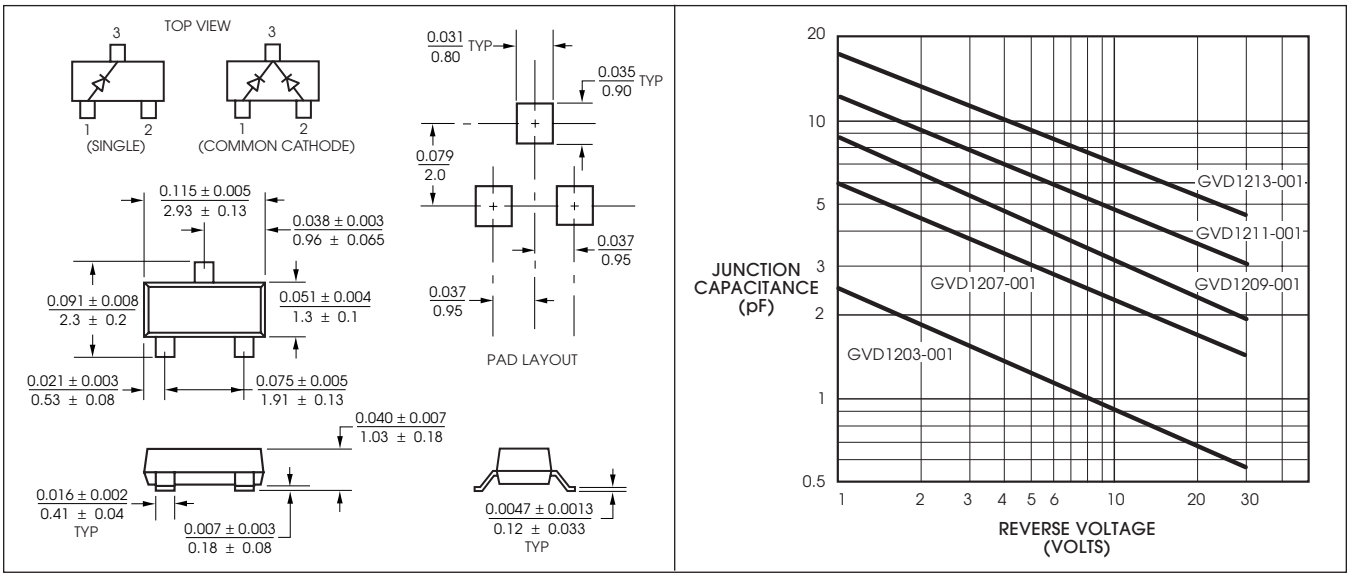
Maximum reverse leakage current at –25 V (at 25°C): 0.05 µA DC

Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –55°C to +125°C

Storage temperature: –55°C to +125°C

Total Capacitance C_T (pF) at –4 V (±10%)	Capacitance Ratio $\frac{C_T \text{ at } 0\text{ V}}{C_T \text{ at } -30\text{ V}}$ min	Q min at –4 V (50 MHz)	Model Number	
			Single	Common Cathode
1.2	3.4	3200	GVD1202-001	GVD1202-004
1.5	3.5	3000	GVD1203-001	GVD1203-004
1.8	3.5	3000	GVD1204-001	GVD1204-004
2.2	3.7	3000	GVD1205-001	GVD1205-004
2.7	3.7	2500	GVD1206-001	GVD1206-004
3.3	3.8	2500	GVD1207-001	GVD1207-004
3.9	3.9	2500	GVD1208-001	GVD1208-004
4.7	3.9	2000	GVD1209-001	GVD1209-004
5.6	4.0	2000	GVD1210-001	GVD1210-004
6.8	4.0	2000	GVD1211-001	—
8.2	4.0	2000	GVD1212-001	—
10.0	4.1	1800	GVD1213-001	—
12.0	4.1	1600	GVD1214-001	—
15.0	4.2	1250	GVD1215-001	—
18.0	4.2	1000	GVD1216-001	—
22.0	4.2	850	GVD1217-001	—



SOT-23 PACKAGE - Consult factory for additional package configurations.
All dimensions are in / mm.
Unless otherwise specified, the tolerance on dimensions is ± 0.004 / 0.1.

MICROWAVE ABRUPT TUNING VARACTOR DIODES

Surface Mount Low Parasitic Package (SMLP)

FEATURES

- Mesa epitaxial silicon construction
- Silicon dioxide passivated
- Fits Footprint for SOD-323, SOD-123 and smaller
- High Frequency (VHF to 8 GHz)
- Available on carrier and reel
- Available in chip form (add suffix -000)
- Two package styles including lower cost, flat top version
- Alternate notched termination version available, contact factory for outline drawing

APPLICATIONS

- PCS
- WANS
- AMPS
- GSM
- TAGS
- DECT
- Cellular

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): 30 V min

Maximum reverse leakage current at –25 V (at 25°C): 0.05 µA DC

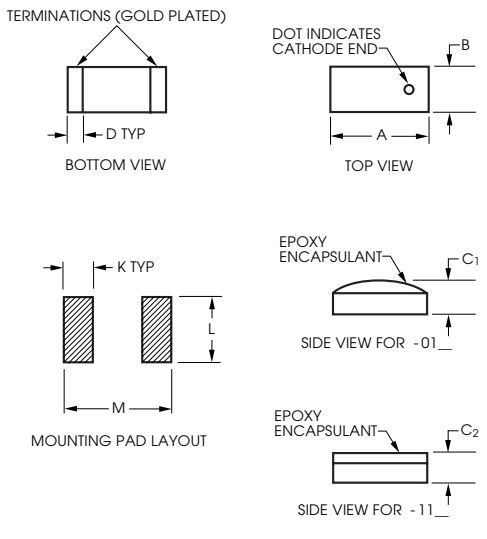
Device dissipation at 25°C: 250 mW (derated linearly to zero at +125°C)

Operating junction temperature: –65°C to +125°C

Storage temperature: –65°C to +125°C

Total Capacitance C_T (pF) at –4 V (±10%)	Capacitance Ratio $\frac{C_T \text{ at } 0\text{ V}}{C_T \text{ at } -4\text{ V}}$ min	Capacitance Ratio $\frac{C_T \text{ at } -4\text{ V}}{C_T \text{ at } -30\text{ V}}$ min	Q min at –4 V (50 MHz)	Model Number*
0.8	1.5	1.45	3900	GVD91300 – _ _ _
1.0	1.6	1.55	3800	GVD91301 – _ _ _
1.2	1.7	1.60	3700	GVD91302 – _ _ _
1.5	1.8	1.65	3600	GVD91303 – _ _ _
1.8	1.9	1.70	3500	GVD91304 – _ _ _
2.2	2.0	1.75	3400	GVD91305 – _ _ _
2.7	2.0	1.80	3300	GVD91306 – _ _ _
3.3	2.1	1.85	3100	GVD91307 – _ _ _
3.9	2.1	1.90	2700	GVD91308 – _ _ _
4.7	2.2	1.95	2600	GVD91309 – _ _ _
5.6	2.2	2.00	2500	GVD91310 – _ _ _

*For complete model number, select "Dash No." from chart below.



Dash No.	A	B	C_1	C_2	D	K	L	M
- 011	0.10	0.050	0.035	0.050	0.015 ± 0.004	0.030	0.070	0.112
- 111	2.5	1.3	0.89	1.3	0.38 ± 0.1	0.76	1.8	2.84
- 012	0.12	0.060	0.035	0.050	0.020 ± 0.005	0.030	0.080	0.132
- 112	3.0	1.5	0.89	1.3	0.51 ± 0.1	0.76	2.0	3.35
- 013	0.200	0.100	0.035	0.050	0.020 ± 0.005	0.030	0.120	0.212
- 113	5.08	2.54	0.89	1.3	0.51 ± 0.1	0.76	3.05	5.38
- 014	0.075	0.050	0.035	0.050	0.015 ± 0.004	0.030	0.070	0.087
- 114	1.9	1.3	0.89	1.3	0.38 ± 0.1	0.76	1.8	2.2
- 015	0.062	0.042	0.030	0.050	0.011 ± 0.003	0.020	0.060	0.072
- 115	1.6	1.1	0.76	1.3	0.28 ± 0.08	0.51	1.5	1.8

All dimensions are in / mm. Unless otherwise specified, the tolerance on dimensions is ± 0.003/0.08.

Note: An SMLP package with three terminations sized to fit the pad layout for an SOT-23 package is also available. This package can be used for multiple diode designs (such as common cathode or common anode). Contact factory for the three-terminal SMLP outline drawing, and for further information on the multiple diode configurations.

MINIATURE MICROWAVE SILICON VARACTOR DIODES

Surface Mount Monolithic Package (SMMP)

FEATURES

- Multilayer construction
- Low SMT profile
- Low series inductance
- Low parasitic capacitance (0.06 pF)
- High Q
- Available on carrier and reel

APPLICATIONS

Microwave Voltage Controlled Oscillators (VCOs)

Ideal for Wide Bandwidth Applications (VHF-10 GHz)

SPECIFICATIONS

Reverse breakdown voltage at 10 µA DC (at 25°C): See below

Maximum reverse leakage current at –10 V (at 25°C): 0.05 µA DC

Operating junction temperature: –65°C to +125°C

Storage temperature: –65°C to +125°C

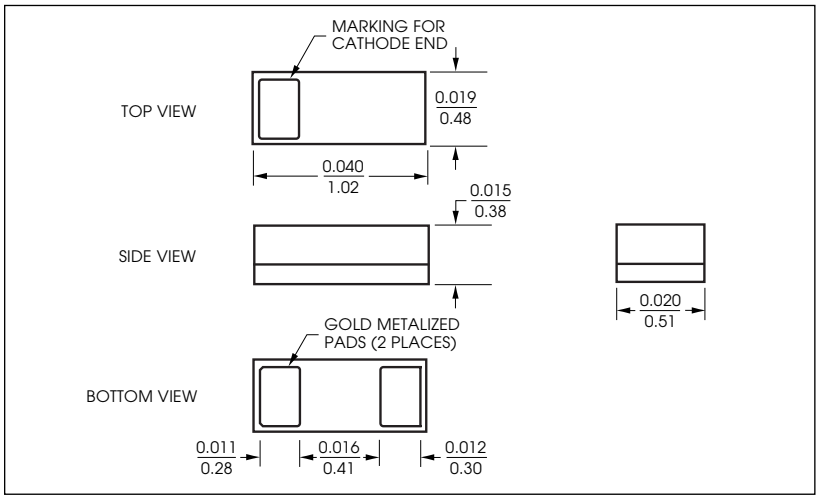
Total Capacitance C_T (pF) at –1 V min	max	Capacitance Ratio $\frac{C_T \text{ at } -1 \text{ V}}{C_T \text{ at } -3 \text{ V}}$ min	max	Capacitance Ratio $\frac{C_T \text{ at } -1 \text{ V}}{C_T \text{ at } -6 \text{ V}}$ min	max	Q min at –4 V (50 MHz)	Model Number
2.6	3.8	1.4	2.2	2.6	3.6	1500	GVD60100

Reverse breakdown voltage at 10 µA DC: 15 V min

Total Capacitance C_T (pF) at –0 V typical	Total Capacitance C_T (pF) at –4 V min	max	Total Capacitance C_T (pF) at –20 V max	max	Q min at –4 V (50 MHz)	Model Number
3.25	0.9	1.5	0.2	0.45	1000	GVD60200

Reverse breakdown voltage at 10 µA DC: 22 V min

Models shown above supplied bulk in vials.
For 300 pc gel pack, add "-03" to the model number.
For 5000 pc carrier and reel, add "-50" to the model number.



All dimensions are in / mm.
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SPRAGUE-GOODMAN ELECTRONICS, INC., 1700 SHAMES DRIVE, WESTBURY, NY 11590 • TEL: 516-334-8700 • FAX: 516-334-8771 • E-MAIL: info@spraguegoodman.com
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Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9