



▶ TUNING VARACTOR

Selection Guide

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A tuning varactor is a P-N diode that acts as a voltage controlled capacitor. These devices perform the same function as the familiar, bulky, air dielectric stacked capacitors featured in traditional broadcast band receivers.

TUNING VARACTOR

Plastic package Surface Mount Silicon abrupt tuning varactor



SOT23 SURFACE MOUNT SILICON ABRUPT TUNING VARACTOR

Description

This series of silicon tuning varactors have an epitaxial mesa design with a high temperature passivation. This technology is used to produce abrupt tuning varactor in SOT23 package. This family is designed for a low cost medium to high volume market that may be supplied in tape and reel for automated pick and place assembly on surface mount circuit boards.

Applications

The DH71000 series abrupt tuning varactor are offered in a large selection of capacitance range. They provide the highest Q factor (low reverse series resistance) available for a 30 volts silicon device. Typical applications include low noise narrow and moderate frequency bandwidth applications (VCO mainly) from HF to Microwave frequencies (up to 3 GHz). Other applications are voltage tuned filters, phase shifters, delay line, etc.

NOTE: Variation of the junction capacitance versus reverse voltage follows this equation:

$$C_j (V_r) = \frac{C_j (0 V)}{\left[1 + \frac{V_r}{\phi} \right]^\gamma}$$

V_r : Reverse voltage

ϕ : Built-in potential .7V for Si

γ : .5 for abrupt tuning varactor

Electrical characteristics at $T_a = +25^\circ C$

Reverse breakdown voltage, $V_b = @10 \mu A: 30 V \text{ min.}$

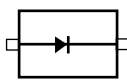
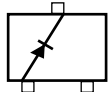
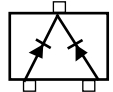
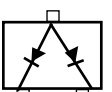
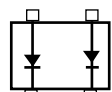
| Electrical parameters | Breakdown voltage V_{BR} | Junction capacitance C_j | Tuning ratio | Figure of merit Q |
|-----------------------|-------------------------------|--|--------------------|---|
| Test Conditions | $I_R = 10 \mu A$ | $F = 1 \text{ MHz}$ $V_R = 4 \text{ V}$ | C_{j0V}/C_{j30V} | $V_R = 4 \text{ V}$ $F = 50 \text{ MHz}$ |
| Type | V | pF | typ. | typ. |
| | min. | (1) | | |
| DH71010 | 30 | $1.0 \pm 20\%$ | 4.0 | 4300 |
| DH71016 | 30 | $1.6 \pm 20\%$ | 4.5 | 4100 |
| DH71020 | 30 | $2.0 \pm 20\%$ | 4.6 | 3900 |
| DH71030 | 30 | $3.0 \pm 20\%$ | 4.7 | 3400 |
| DH71045 | 30 | $4.5 \pm 20\%$ | 4.8 | 2200 |
| DH71067 | 30 | $6.7 \pm 10\%$ | 4.9 | 2600 |
| DH71100 | 30 | $10 \pm 10\%$ | 5.0 | 2200 |

(1) Other tolerance on request

Temperature ranges:

Operating junction (T_j): $-55^\circ C$ to $+125^\circ C$ Storage: $-65^\circ C$ to $+150^\circ C$

Packages

| Packages | SOD323 | SOT23 | SOT23 | SOT23 | SOT143 |
|----------|---|---|---|---|---|
| |  |  |  |  |  |
| DH71010 | DH71010-60 | DH71010-51 | DH71010-53 | DH71010-54 | DH71010-70 |
| DH71016 | DH71016-60 | DH71016-51 | DH71016-53 | DH71016-54 | DH71016-70 |
| DH71020 | DH71020-60 | DH71020-51 | DH71020-53 | DH71020-54 | DH71020-70 |
| DH71030 | DH71030-60 | DH71030-51 | DH71030-53 | DH71030-54 | DH71030-70 |
| DH71045 | DH71045-60 | DH71045-51 | DH71045-53 | DH71045-54 | DH71045-70 |
| DH71067 | DH71067-60 | DH71067-51 | DH71067-53 | DH71067-54 | DH71067-70 |
| DH71100 | DH71100-60 | DH71100-51 | DH71100-53 | DH71100-54 | DH71100-70 |

(1) Other configuration available on request.

How to order?

| | | | |
|------------|---|--|---|
| DH71010 | - | 51 | T3 |
| Diode type | | Package information | Conditioning |
| | | 51: single SOT23 53: dual common cathode SOT23 54: dual common anode SOT23 60: single SOD323 70: dual SOT143 | T3: 3000 pieces tape & reel T10: 10000 pieces tape & reel blank: bulk |

TUNING VARACTOR

High Q silicon abrupt junction tuning varactor



HIGH Q SILICON ABRUPT JUNCTION TUNING VARACTOR

$V_{BR} 30V$

Description

This series of high Q epi-junction microwave tuning varactors (30 V) incorporates a passivated mesa technology. It is well suited for frequency tuning applications up to Ku band.

| CHIP DIODES | | | CHIP AND PACKAGED DIODES | | PACKAGED DIODES (1) | | | | |
|-------------------------|------|----------------------|-------------------------------|-----------------------------|---------------------|------------------------|-------------------------------|------------------------|-------------------------------|
| | | | $V_{BR} (10 \mu A) \geq 30 V$ | | Standard cases | | | Other cases | |
| Characteristics at 25°C | | Gold dia \emptyset | junction capacitance C_j | Fig. of merit Q | | | Tuning ratio C_{T0}/C_{T30} | | Tuning ratio C_{T0}/C_{T30} |
| Test Conditions | | | $V_R = 4 V$ $f = 1 MHz$ | $V_R = 4 V$ $f = 50 MHz$ | | CASE CAPACITANCE C_b | | CASE CAPACITANCE C_b | |
| Type | Case | μm | pF | | Type | Case | | Case | |
| | | typ. | $\pm 20 \% (2)$ | min. | | $C_b = 0.18 pF (3)$ | min. | $C_b = 0.12 pF (3)$ | min. |
| EH71004 | C2a | 50 | 0.4 | 4500 | DH71004 | F27d | 3.0 | M208 | 3.3 |
| EH71006 | C2a | 60 | 0.6 | 4500 | DH71006 | F27d | 3.4 | M208 | 3.7 |
| EH71008 | C2a | 70 | 0.8 | 4400 | DH71008 | F27d | 3.7 | M208 | 4.0 |
| EH71010 | C2a | 80 | 1.0 | 4300 | DH71010 | F27d | 4.0 | M208 | 4.3 |
| EH71012 | C2a | 90 | 1.2 | 4200 | DH71012 | F27d | 4.3 | M208 | 4.5 |
| EH71016 | C2a | 100 | 1.6 | 4100 | DH71016 | F27d | 4.5 | M208 | 4.6 |
| EH71020 | C2a | 110 | 2.0 | 3900 | DH71020 | F27d | 4.6 | M208 | 4.7 |
| EH71025 | C2a | 120 | 2.5 | 3600 | DH71025 | F27d | 4.6 | M208 | 4.8 |
| EH71030 | C2a | 140 | 3.0 | 3400 | DH71030 | F27d | 4.7 | M208 | 4.8 |
| EH71037 | C2a | 150 | 3.7 | 3200 | DH71037 | F27d | 4.7 | M208 | 4.8 |
| EH71045 | C2a | 170 | 4.5 | 3000 | DH71045 | F27d | 4.8 | M208 | 4.9 |
| EH71054 | C2a | 180 | 5.4 | 2800 | DH71054 | F27d | 4.8 | M208 | 4.9 |
| | | | $\pm 10 \% (2)$ | | | $C_b = 0.18 pF (3)$ | | $C_b = 0.2 pF (3)$ | |
| EH71067 | C2a | 200 | 6.7 | 2600 | DH71067 | F27d | 4.9 | BH142 | 4.9 |
| EH71080 | C2b | 220 | 8.0 | 2400 | DH71080 | F27d | 5.0 | BH142 | 5.0 |
| EH71100 | C2b | 250 | 10.0 | 2200 | DH71100 | F27d | 5.0 | BH142 | 5.0 |
| EH71120 | C2b | 270 | 12.0 | 2000 | DH71120 | F27d | 5.1 | BH142 | 5.1 |
| EH71150 | C2b | 300 | 15.0 | 1800 | DH71150 | F27d | 5.1 | BH142 | 5.1 |
| EH71180 | C2b | 330 | 18.0 | 1700 | DH71180 | F27d | 5.2 | BH142 | 5.2 |
| EH71200 | C2b | 350 | 20.0 | 1500 | DH71200 | F27d | 5.2 | BH142 | 5.2 |
| EH71220 | C2b | 370 | 22.0 | 1400 | DH71220 | F27d | 5.2 | BH142 | 5.2 |
| EH71270 | C2b | 410 | 27.0 | 1300 | DH71270 | F27d | 5.2 | BH142 | 5.2 |
| EH71330 | C2c | 450 | 33.0 | 1200 | DH71330 | F27d | 5.2 | BH142 | 5.2 |
| EH71390 | C2c | 500 | 39.0 | 950 | DH71390 | F27d | 5.2 | BH142 | 5.2 |
| EH71470 | C2c | 540 | 47.0 | 750 | DH71470 | F27d | 5.2 | BH142 | 5.2 |
| EH71560 | C2c | 590 | 56.0 | 650 | DH71560 | F27d | 5.2 | BH142 | 5.2 |
| EH71680 | C2c | 650 | 68.0 | 500 | DH71680 | F27d | 5.2 | BH142 | 5.2 |
| EH71820 | C2d | 720 | 82.0 | 400 | DH71820 | F27d | 5.2 | BH142 | 5.2 |
| EH71999 | C2d | 800 | 100.0 | 300 | DH71999 | F27d | 5.2 | BH142 | 5.2 |

(1) Custom cases available on request

(2) Closer capacitance tolerances available on request

(3) $C_T = C_j + C_b$

Temperature ranges:

Operating junction (T_j) : -55° C to +150° C

Storage : -65° C to +175° C



V_{BR} 45 V

Description

This series of high Q epi-junction microwave tuning varactors (45 V) incorporates a passivated mesa technology. It is well suited for frequency tuning applications up to X band.

| Chip diodes | | | Chip and packaged diodes | | Packaged diodes (1) | | | | |
|--------------------------|------|----------------------|-----------------------------------|-----------------------------|---------------------|---------------------|-------------------------------|------------------------|------|
| | | | V_{BR} (10 μ A) \geq 45 V | | STANDARD CASES | | OTHER CASES | | |
| Characteristics at 25° C | | GOLD DIA \emptyset | Junction capacitance C_j | Fig. of merit Q | | | Tuning Ratio C_{T0}/C_{T45} | | |
| Test conditions | | | $V_R = 4$ V $f = 1$ MHz | $V_R = 4$ V $f = 50$ MHz | | | | Case Capacitance C_b | |
| Type | Case | μ m | pF | | Type | Case | Case | Case | |
| | | typ. | $\pm 20\%$ (2) | | min. | $C_b = 0.18$ pF (3) | min. | $C_b = 0.12$ pF (3) | min. |
| EH72004 | C2a | 60 | 0.4 | 3000 | DH72004 | F27d | 3.5 | M208 | 3.7 |
| EH72006 | C2a | 80 | 0.6 | 2900 | DH72006 | F27d | 3.9 | M208 | 4.1 |
| EH72008 | C2a | 90 | 0.8 | 2800 | DH72008 | F27d | 4.2 | M208 | 4.5 |
| EH72010 | C2a | 110 | 1.0 | 2700 | DH72010 | F27d | 4.5 | M208 | 4.7 |
| EH72012 | C2a | 110 | 1.2 | 2700 | DH72012 | F27d | 4.7 | M208 | 4.9 |
| EH72016 | C2a | 120 | 1.6 | 2600 | DH72016 | F27d | 5.0 | M208 | 5.2 |
| EH72020 | C2a | 140 | 2.0 | 2500 | DH72020 | F27d | 5.2 | M208 | 5.5 |
| EH72025 | C2a | 150 | 2.5 | 2400 | DH72025 | F27d | 5.4 | M208 | 5.6 |
| EH72030 | C2a | 170 | 3.0 | 2300 | DH72030 | F27d | 5.5 | M208 | 5.7 |
| EH72037 | C2a | 190 | 3.7 | 2200 | DH72037 | F27d | 5.6 | M208 | 5.7 |
| EH72045 | C2a | 210 | 4.5 | 2000 | DH72045 | F27d | 5.7 | M208 | 5.8 |
| EH72054 | C2a | 230 | 5.4 | 1900 | DH72054 | F27d | 5.8 | M208 | 5.9 |
| | | | $\pm 10\%$ (2) | | | $C_b = 0.18$ pF (3) | | $C_b = 0.2$ pF (3) | |
| EH72067 | C2b | 250 | 6.7 | 1800 | DH72067 | F27d | 5.9 | BH142 | 6.0 |
| EH72080 | C2b | 280 | 8.0 | 1700 | DH72080 | F27d | 5.9 | BH142 | 6.0 |
| EH72100 | C2b | 310 | 10.0 | 1600 | DH72100 | F27d | 6.0 | BH142 | 6.0 |
| EH72120 | C2b | 340 | 12.0 | 1500 | DH72120 | F27d | 6.0 | BH142 | 6.0 |
| EH72150 | C2b | 380 | 15.0 | 1400 | DH72150 | F27d | 6.0 | BH142 | 6.0 |
| EH72180 | C2b | 420 | 18.0 | 1300 | DH72180 | F27d | 6.0 | BH142 | 6.0 |
| EH72200 | C2b | 440 | 20.0 | 1200 | DH72200 | F27d | 6.0 | BH142 | 6.0 |
| EH72220 | C2c | 470 | 22.0 | 1100 | DH72220 | F27d | 6.0 | BH142 | 6.0 |
| EH72270 | C2c | 520 | 27.0 | 1000 | DH72270 | F27d | 6.0 | BH142 | 6.0 |
| EH72330 | C2c | 570 | 33.0 | 900 | DH72330 | F27d | 6.0 | BH142 | 6.0 |
| EH72390 | C2c | 620 | 39.0 | 800 | DH72390 | F27d | 6.0 | BH142 | 6.0 |
| | | | $\pm 10\%$ (2) | | | $C_b = 0.18$ pF (3) | | | |
| EH72470 | C2d | 680 | 47.0 | 700 | DH72470 | BH28 | 6.0 | | |
| EH72560 | C2d | 740 | 56.0 | 600 | DH72560 | BH28 | 6.0 | | |
| EH72680 | C2d | 820 | 68.0 | 450 | DH72680 | BH28 | 6.0 | | |
| | | | $\pm 10\%$ (2) | | | $C_b = 0.4$ pF (3) | | | |
| EH72820 | C2g | 900 | 82.0 | 350 | DH72820 | BH141 | 6.0 | | |
| EH72999 | C2g | 1000 | 100.0 | 250 | DH72999 | BH141 | 6.0 | | |

(1) Custom cases available on request

(2) Closer capacitance tolerances available on request

(3) $C_T = C_j + C_b$

Temperature ranges:

Operating junction (T_j) : -55° C to +150° C

Storage : -65° C to +175° C

TUNING VARACTOR

Plastic package, Surface Mount hyperabrupt tuning varactor



PLASTIC PACKAGE, SURFACE MOUNT HYPERABRUPT TUNING VARACTOR

Description

This series of silicon tuning varactors consists of hyperabrupt epitaxial devices. They incorporate a passivated mesa technology. This family is designed for a low cost medium to high volume market that may be supplied in tape and reel for automated pick and place assembly on surface mount circuit boards.

Application

The DH76000 and DH77000 series hyperabrupt tuning varactor are offered in a large selection of capacitance range. They provide the highest Q factor (low reverse series resistance). Typical applications include low noise narrow and moderate frequency bandwidth applications (VCO mainly) from HF to Microwave frequencies (up to 3 GHz). Other applications are voltage tuned filters, phase shifters, delay lines...

20 Volt hyperabrupt junction varactors

Characteristics @ Ta=+25° C

Reverse breakdown voltage, Vb = 20 V min. @ 10 µA
Reverse Current, Ir = 200 nA @ 16 V

Temperature ranges:

Operating junction (Tj) : -55° C to +125° C
Storage : -55° C to +150° C

| Test conditions | Total capacitance (pF) Ct | | | | Tuning ratio | |
|-----------------|------------------------------|-----------------------|----------------------|------------------------|-------------------------|-------------------------|
| | f = 1 MHz Vr = 1 V | f = 1 MHz Vr = 4 V | f=1 MHz Vr = 12 V | f = 1 MHz Vr = 20 V | Ct1V/Ct12V f = 1 MHz | Ct1V/Ct20V f = 1 MHz |
| | typ | ±20 % | typ. | typ. | typ. | typ. |
| DH76010 | 2.5 | 1.2 | 0.6 | 0.5 | 4.1 | 4.9 |
| DH76015 | 3.6 | 1.7 | 0.8 | 0.7 | 4.4 | 5.4 |
| DH76022 | 5.2 | 2.4 | 1.1 | 0.9 | 4.7 | 5.8 |
| DH76033 | 8.0 | 3.5 | 1.6 | 1.3 | 4.9 | 6.1 |
| DH76047 | 11.0 | 4.9 | 2.2 | 1.7 | 5.0 | 6.4 |
| DH76068 | 16.0 | 7.0 | 3.1 | 2.4 | 5.1 | 6.5 |
| DH76100 | 23.0 | 10.0 | 4.5 | 3.5 | 5.2 | 6.7 |
| DH76150 | 35.0 | 15.0 | 6.6 | 5.1 | 5.2 | 6.8 |

12 Volt hyperabrupt junction varactors

Characteristics @ Ta=+25° C

Reverse breakdown voltage, Vb = 12 V min. @ 10 µA
Reverse Current, Ir = 200 nA @ 8 V

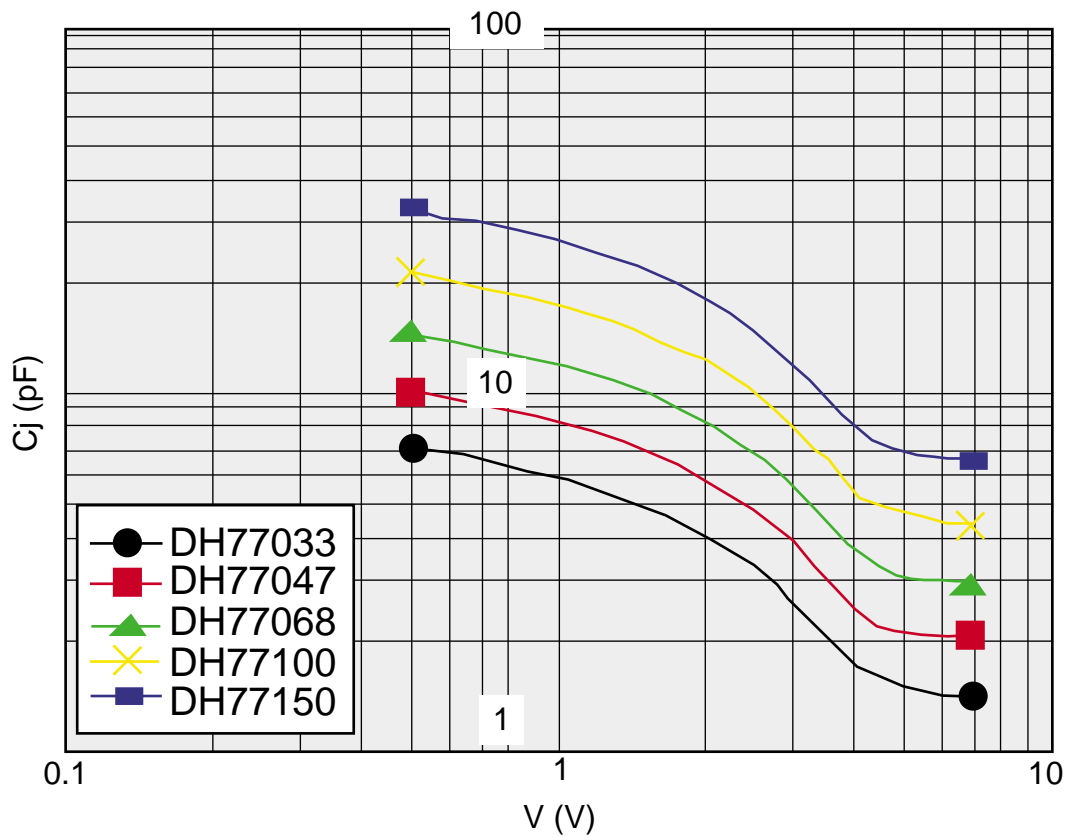
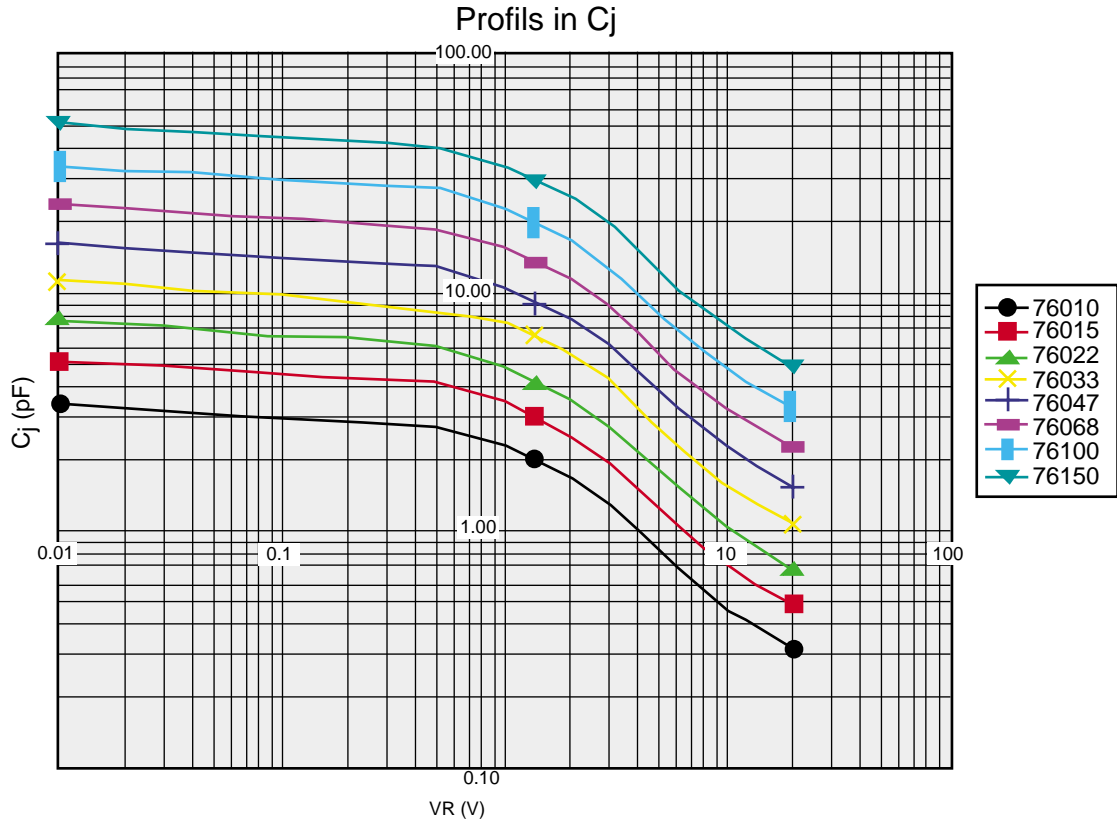
Temperature ranges:

Operating junction (Tj) : -55° C to +125° C
Storage : -55° C to +150° C

| Test conditions | Total capacitance (pF) Ct | | | Tuning ratio | |
|-----------------|------------------------------|-------------------------|---------------------|--------------------------|------------------------|
| | f = 1 MHz Vr = 1 V | f = 1 MHz Vr = 2.5 V | f=1 MHz Vr = 4 V | Ct1V/Ct2.5V f = 1 MHz | Ct1V/Ct4V f = 1 MHz |
| | typ | ±20 % | typ. | typ. | typ. |
| DH77033 | 6.0 | 3.5 | 1.9 | 1.7 | 3.1 |
| DH77047 | 8.5 | 4.9 | 2.7 | 1.7 | 3.2 |
| DH77068 | 12.0 | 7.0 | 3.8 | 1.7 | 3.2 |
| DH77100 | 18.0 | 10.0 | 5.5 | 1.7 | 3.2 |
| DH77150 | 27.0 | 15.0 | 8.1 | 1.8 | 3.3 |



Typical junction capacitance versus reverse voltage



TUNING VARACTOR

Plastic package, Surface Mount hyperabrupt tuning varactor

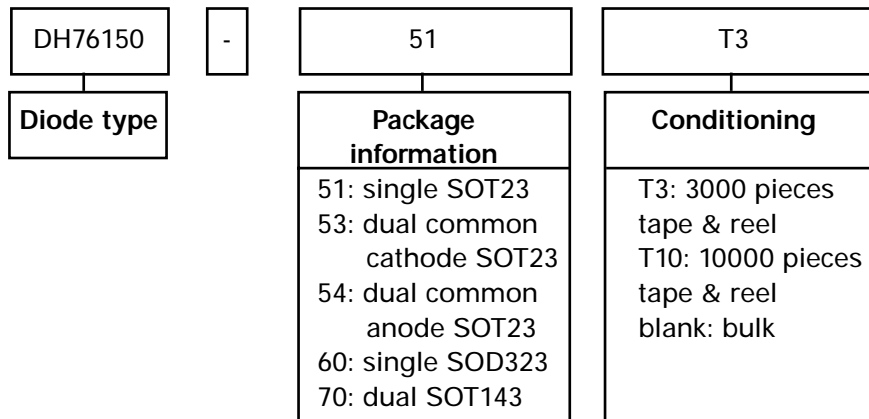


Packages

| Packages | SOD323 | SOT23 | SOT23 | SOT23 | SOT143 |
|----------|------------|------------|------------|------------|------------|
| | | | | | |
| DH76010 | DH76010-60 | DH76010-51 | DH76010-53 | DH76010-54 | DH76010-70 |
| DH76015 | DH76015-60 | DH76015-51 | DH76015-53 | DH76015-54 | DH76015-70 |
| DH76022 | DH76022-60 | DH76022-51 | DH76022-53 | DH76022-54 | DH76022-70 |
| DH76033 | DH76033-60 | DH76033-51 | DH76033-53 | DH76033-54 | DH76033-70 |
| DH76047 | DH76047-60 | DH76047-51 | DH76047-53 | DH76047-54 | DH76047-70 |
| DH76068 | DH76068-60 | DH76068-51 | DH76068-53 | DH76068-54 | DH76068-70 |
| DH76100 | DH76100-60 | DH76100-51 | DH76100-53 | DH76100-54 | DH76100-70 |
| DH76150 | DH76150-60 | DH76150-51 | DH76150-53 | DH76150-54 | DH76150-70 |
| DH77033 | DH77033-60 | DH77033-51 | DH77033-53 | DH77033-54 | DH77033-70 |
| DH77047 | DH77047-60 | DH77047-51 | DH77047-53 | DH77047-54 | DH77047-70 |
| DH77068 | DH77068-60 | DH77068-51 | DH77068-53 | DH77068-54 | DH77068-70 |
| DH77100 | DH77100-60 | DH77100-51 | DH77100-53 | DH77100-54 | DH77100-70 |
| DH77150 | DH77150-60 | DH77150-51 | DH77150-53 | DH77150-54 | DH77150-70 |

(1) Other configuration available on request.

How to order?





HIGH Q SILICON HYPERABRUPT JUNCTION TUNING VARACTOR

Description

This series of silicon tuning varactors consists of hyperabrupt epitaxial devices. They incorporate a passivated mesa technology. Packaged or chip devices are available for linear electronic tuning from VHF up to Ku band.

Characteristics @ Ta = +25° C

Reverse breakdown voltage, Vb = @ 10 µA: 20 V min.

Reverse current, Ir @ 16 V: 200 nA

| Test conditions | | Figure of merit (Q) | Total capacitance (pF) Ct | | | | | Tuning ratio | | Chip |
|-----------------|---------------------|---------------------|------------------------------|-----------------------|-----------------------|------------------------|------------------------|-------------------------|-------------------------|------|
| | | | f = 50 MHz Vr = 4 V | f = 1 MHz Vr = 1 V | f = 1 MHz Vr = 4 V | f = 1 MHz Vr = 12 V | f = 1 MHz Vr = 20 V | Ct1V/Ct12V f = 1 MHz | Ct1V/CT20V f = 1 MHz | |
| Type | Case ⁽¹⁾ | typ. | typ. | ±20% | typ. | typ. | typ. | typ. | | |
| DH76010 | F27d | 2200 | 2.5 | 1.2 | 0.6 | 0.5 | 4.1 | 4.9 | EH76010 | |
| DH76015 | F27d | 2000 | 3.6 | 1.7 | 0.8 | 0.7 | 4.4 | 5.4 | EH76015 | |
| DH76022 | F27d | 1700 | 5.2 | 2.4 | 1.1 | 0.9 | 4.7 | 5.8 | EH76022 | |
| DH76033 | F27d | 1400 | 7.7 | 3.5 | 1.6 | 1.3 | 4.9 | 6.1 | EH76033 | |
| DH76047 | F27d | 1000 | 11 | 4.9 | 2.2 | 1.7 | 5.0 | 6.4 | EH76047 | |
| DH76068 | F27d | 700 | 16 | 6.9 | 3.0 | 2.4 | 5.1 | 6.5 | EH76068 | |
| DH76100 | F27d | 400 | 23 | 10.2 | 4.5 | 3.5 | 5.2 | 6.7 | EH76100 | |
| DH76150 | F27d | 140 | 34 | 15.2 | 6.6 | 5.1 | 5.2 | 6.8 | EH76150 | |

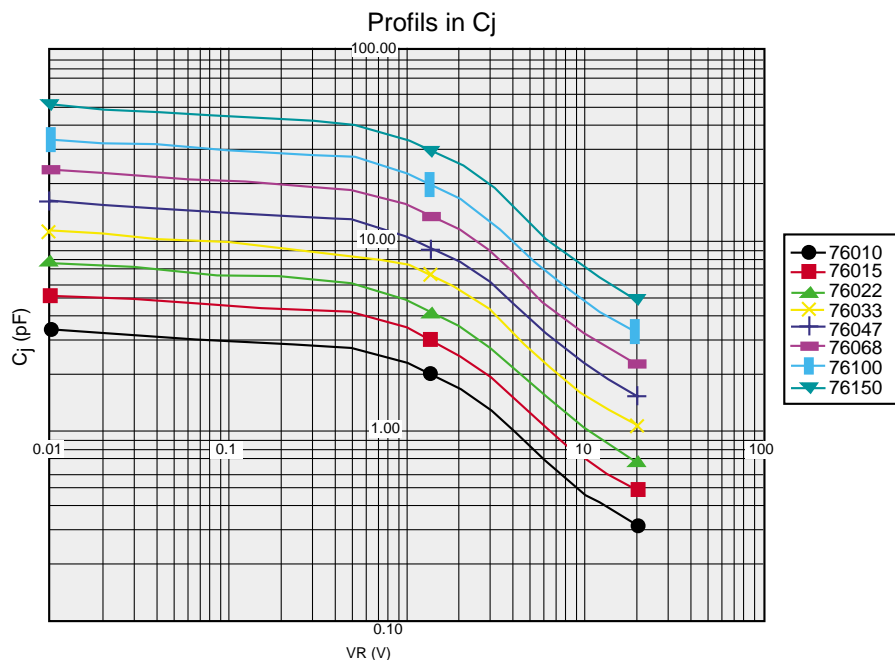
(1) Custom cases available on request

Temperature ranges:

Operating junction (Tj) : -55° C to +150° C

Storage : -65° C to +150° C

Typical junction capacitance reverse voltage



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www.DatasheetCatalog.com

Datasheets for electronic components.