TUNING VARACTOR

Selection Guide

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.

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 Ta = +25° C

Reverse breakdown voltage, Vb = @10 µA: 30 V min.

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

(1) Other tolerance on request

Temperature ranges:

Operating junction (T_j): -55° C to +125° C Storage: -65° C to +150° 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** 51: single SOT23 53: dual common cathode SOT23 54: dual common anode SOT23 60: single SOD323 70: dual SOT143	**Conditioning** T3: 3000 pieces tape & reel T10: 10000 pieces tape & reel blank: bulk

HIGH Q SILICON ABRUPT JUNCTION TUNING VARACTOR

V_{BR} 30 V

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 µA) ≥ 30 V		Standard cases			Other cases	
Characteristics at 25°C		Gold dia Ø	junction capacitance C_j	Fig. of merit Q			Tuning ratio C_{TO}/C_{T30}		Tuning ratio C_{TO}/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.	± 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
			± 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 µA) ≥ 45 V		Standard Cases			Other Cases	
Characteristics at 25° C		Gold Dia Ø	Junction capacitance C_j	Fig. of merit Q			Tuning Ratio C_{TO}/C_{T45}		Tuning Ratio C_{TO}/C_{T45}
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.	± 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
			± 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
			± 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		
			± 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

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

	Total capacitance (pF) Ct				Tuning ratio	
Test conditions	**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	**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

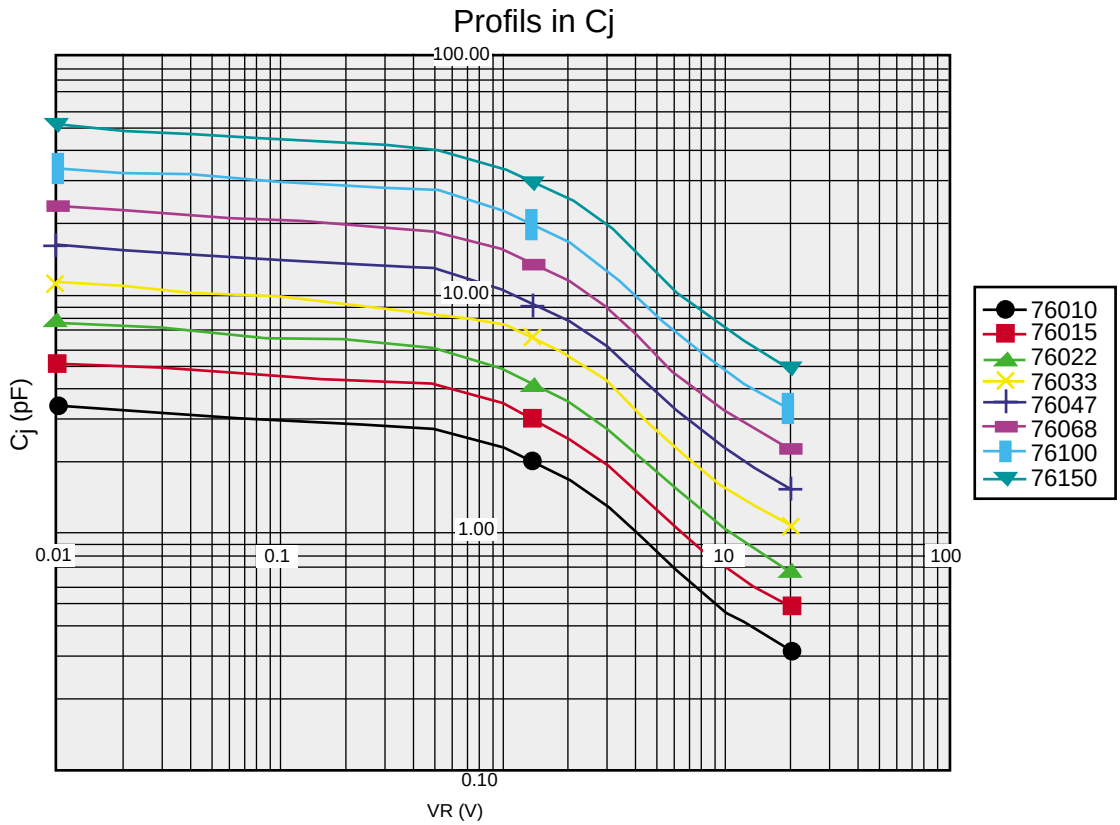
Reverse breakdown voltage, Vb = 12 V min. @ 10 µA
Reverse Current, Ir = 200 nA @ 8 V

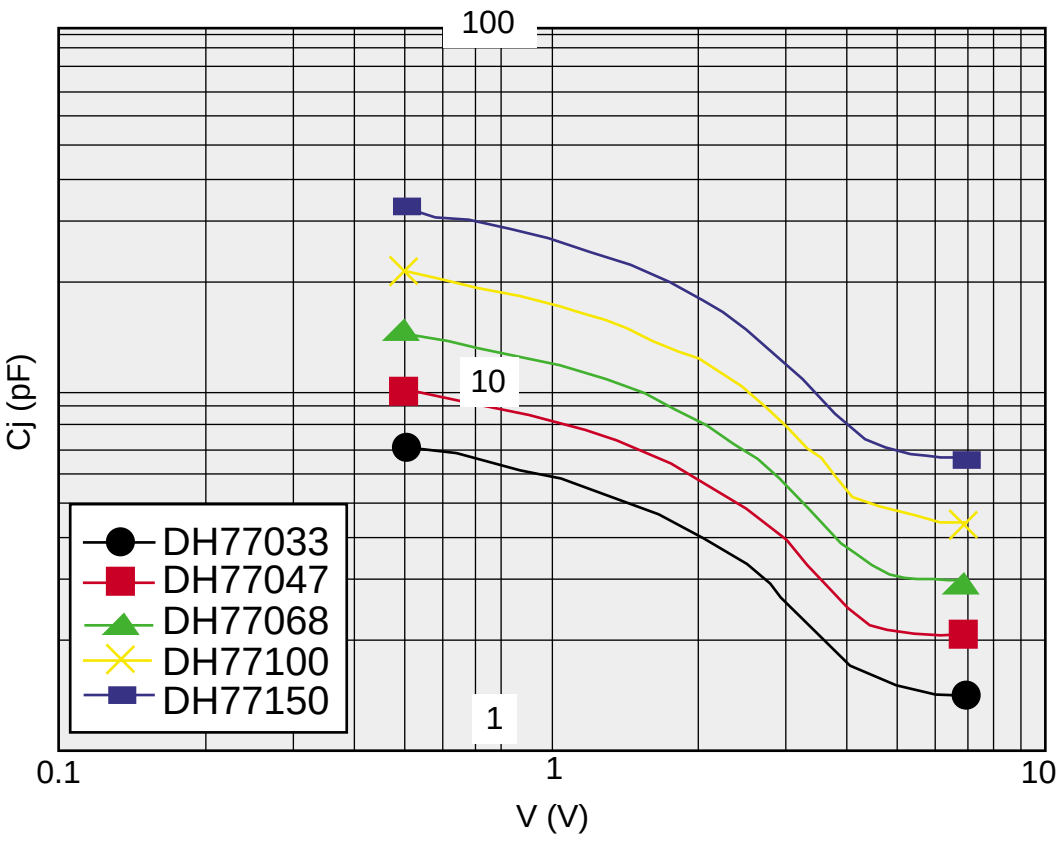
Temperature ranges:

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

	Total capacitance (pF) Ct			Tuning ratio	
Test conditions	**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**
Type	**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





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?

DH76150	-	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

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

		Figure of merit (Q)	Total capacitance (pF) Ct				Tuning ratio		
Test conditions		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.	Chip
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 (T_j) : -55° C to +150° C
Storage : -65° C to +150° C

Typical junction capacitance reverse voltage