

SECTION 1.5

**TEMPERATURE COMPENSATED VOLTAGE CONTROLLED
CRYSTAL OSCILLATORS**

TEMPERATURE COMPENSATED VOLTAGE CONTROLLED OSCILLATORS (VC-TCXO) INTRODUCTION

1. Application and Technology Notes:

Temperature Compensated Voltage Controlled Crystal Oscillators (TC-VCXO) are the result of combining the temperature stability of the TCXO with the pulling characteristics of the VCXO. The method of producing such devices is centred on the TCXO circuitry. The addition of a voltage control prior to the signal output (Vco) allows the electrical frequency adjustment (pulling).

The SMD TCXO series features the S7 making today's demanding specifications for voice and data transmission applications available in Surface Mountable packaging.

The TC-VCXO is the ideal solution where the systems design requests a single oscillator to perform both slave and master functions. The ability to adjust the frequency for locking onto an incoming signal while at the same time providing excellent frequency stability on the output. The TC-VCXO is the logical choice for applications such as miniature radio link networks that may require the base stations to function independently under certain conditions.

2. Code definition

D F A V - Φ 16.384 MHz

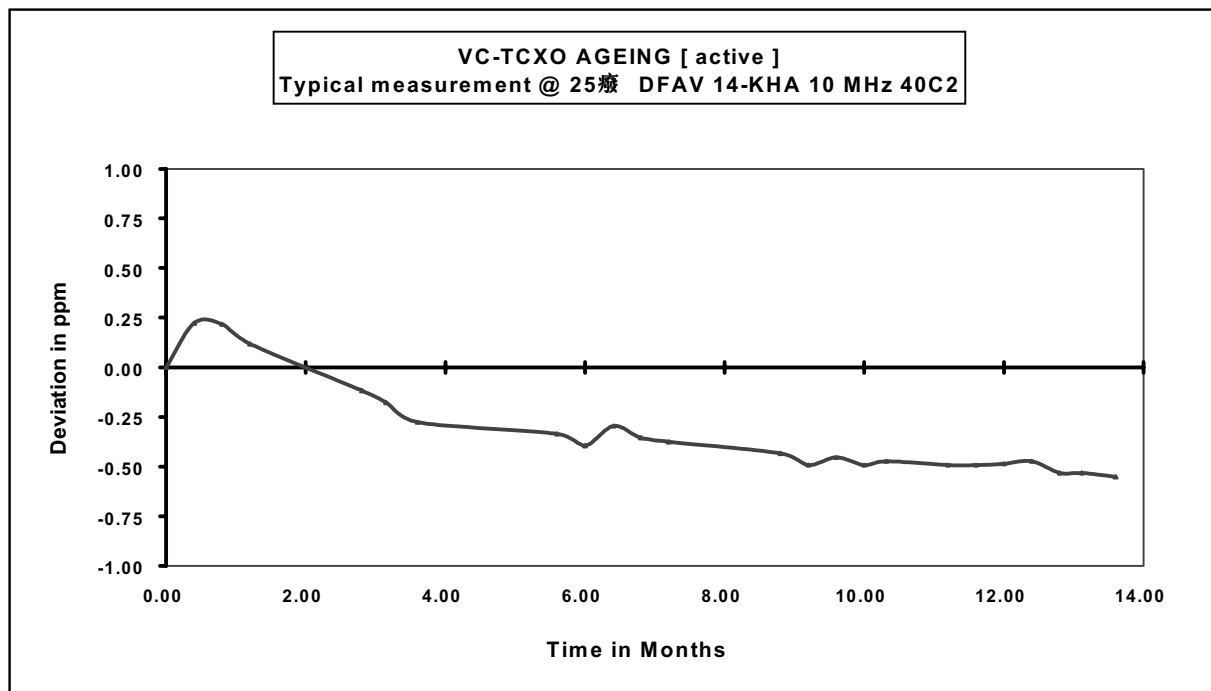
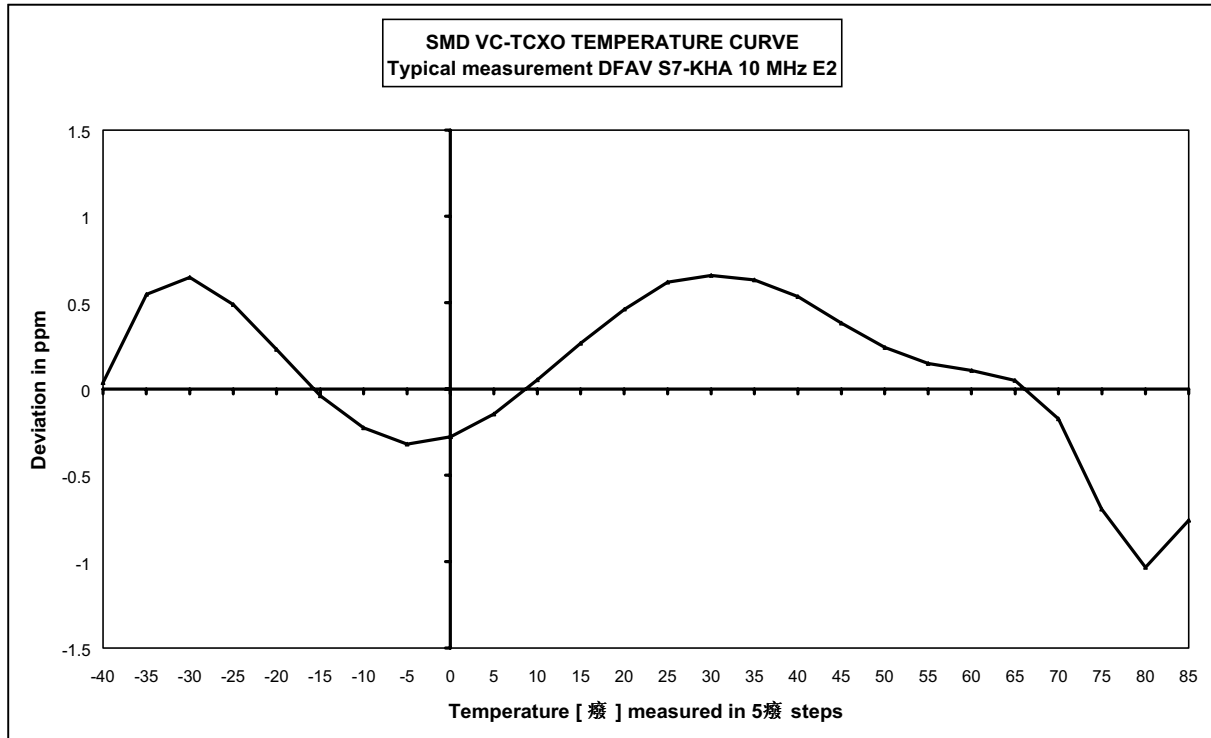
	Package Code [L x W x H mm]	Output Code	Option Code	Pulling Range [$\geq \pm$ ppm]	Temperature Code	Temperature Stability [$\leq \pm$ ppm]
S M D	S7 = 20 x 13 x H	H = HCMOS	A = internal trimmer	40	A = 0 to 50°C	1.0
		EC = PECL	Z = tri-state output		B = 0 to 70°C	2.0
		O = clipped sine			D = -10 to 60°C	2.5
L E A D E D	14 = DIL 14 x H	S = sine wave		C = -20 to 70°C	3.0	
		T = TTL		E = -40 to 85°C	5.0	
	36 = 27 x 36 x H					

Some codes/options are product specific. Other codes/options also available. Please consult factory for details.
 Φ Internal codes for production use only. * A unique specification will be issued for custom requirements.

3. Detailed Specifications

Package	Description	Page No.
SMD	HCMOS or clipped sine wave, tri-state, +5.0 V or +3.3 V supply	62
	HCMOS or clipped sine, +5.0 V or +3.3 V supply	63
DIL 14	HCMOS or clipped sine, +5.0 V or +3.3 V supply	64
27 x 36 x 10	HCMOS or sine, 4 - 70 MHz, +5.0 V to 15.0 V supply	65

**TEMPERATURE COMPENSATED VOLTAGE CONTROLLED
OSCILLATORS (VC-TCXO) MEASUREMENT DATA**



**SURFACE MOUNT LOW POWER VC-TCXO
DFAV S7-KHZ (5 V) & DFAV S7-LHZ (3.3 V)**

RECOMMENDED FOR NEW DESIGNS

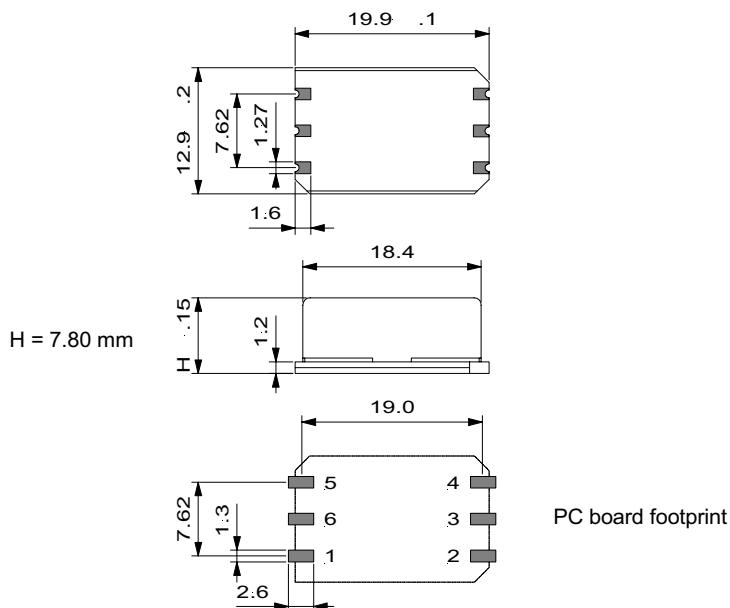
SURFACE MOUNTABLE PACKAGE

5 V OR 3.3 V SUPPLY VOLTAGE

WIDE PULLING RANGE

LOW AGEING

Function	DFAV S7
V control	1
GND	2
N / C	3
Output	4
Vcc	5
E / D	6



TYPE	DFAV S7-KHZ	DFAV S7-LHZ
Frequency Range	2 to 52 MHz	2 to 45 MHz

ELECTRICAL SPECIFICATIONS		
supply voltage	5 V ± 5 %	3.3 V ± 5 %
supply current (no load)	≤ 25 MHz ≤ 20 mA ≤ 35 MHz ≤ 30 mA > 35 MHz ≤ 40 mA	≤ 10 mA ≤ 15 mA ≤ 20 mA
output load	HCMOS 15 pF or 2 TTL	HCMOS 15 pF or 1 TTL
duty cycle @ 2.5V (LH @ 1.65 V)	≤ 45/55...55/45 %	≤ 45/55...55/45 %
rise/fall times (10 to 90 %)	≤ 10 ns	≤ 10 ns
high/low levels or output amplitude	≥ 3.5 V / ≤ 0.5 V	≥ 2.7 V / ≤ 0.2 V
start-up	≤ 10 ms @ 4.75V	≤ 10 ms @ 3.15V
tri-state control on pin 6	high or open = enable, low = high Z	
remark	duty cycle for frequencies > 30 MHz is 40/60%...60/40%	

FREQUENCY STABILITY			detailed tolerances [ppm]					
types	temperature range	model code	stability versus:					pulling range positive function
			temp.	@ 25°C	Vcc range	load ± 10 %	ageing	
all types	-10 to 60°C	40D1	≤ ± 1	≤ ± 1	≤ ± 0.2	≤ ± 0.3	≤ ± 1	≥ ± 40
	-20 to 70°C	40C2	≤ ± 2					
remarks			control voltage range: DFAV S7-K / 2.5 V ± 2 V, DFAV S7-L / 1.5 V ± 1.5 V					
			input impedance ≥ 10 kΩ					
			temperature stability is guaranteed @ 2.5 V control voltage					
			ageing is 1 st year at 25°C					

OPTIONS	CODE
internal trimmer	A
	≥ ± 5 ppm

ORDERING CODE	type + option code + frequency + model code
Example	DFAV S7-KHZ 19.440 MHz 40D1

SURFACE MOUNT LOW POWER VC-TCXO DFAV S7-K (5 V) & DFAV S7-L (3.3 V)

SURFACE MOUNTABLE PACKAGE

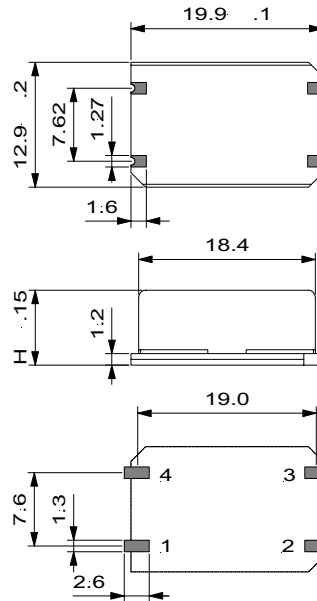
5 V OR 3.3 V SUPPLY VOLTAGE

WIDE PULLING RANGE

LOW AGEING

Function	DFAV S7
V control	1
GND	2
Output	3
Vcc	4

H = 7.80 mm



PC board footprint

TYPE	DFAV S7-KH	DFAV S7-KO	DFAV S7-LH	DFAV S7-LO
Frequency range	2 to 52 MHz	2 to 52 MHz	2 to 45 MHz	2 to 45 MHz

ELECTRICAL SPECIFICATIONS		DFAV S7-KH	DFAV S7-KO	DFAV S7-LH	DFAV S7-LO
supply voltage		5 V ± 5 %	5 V ± 5 %	3.2 V to 3.6 V	3.2 V to 3.6 V
supply current (no load)	≤ 25 MHz ≤ 35 MHz > 35 MHz	≤ 10 mA ≤ 20 mA ≤ 30 mA	≤ 5 mA ≤ 20 mA ≤ 30 mA	≤ 5 mA ≤ 15 mA ≤ 20 mA	≤ 5 mA ≤ 15 mA ≤ 20 mA
output load		HCMOS 15 pF or 2 TTL	clipped sine 20kΩ//5 pF	HCMOS 15 pF or 1 TTL	clipped sine 20kΩ//5 pF
duty cycle	@ 2.5V @ 1.65V	≤ 45/55...55/45 %		≤ 45/55...55/45 %	
rise/fall times (10 to 90 %)		≤ 10 ns		≤ 10 ns	
high/low levels or output amplitude		≥ 3.5 V / ≤ 0.5 V	≥ 2 V p-p	≥ 2.7 V / ≤ 0.2 V	≥ 1.5 V p-p
start up		≤ 10 ms @4.75 V	≤ 10 ms @4.75 V	≤ 10 ms @3.2V	≤ 10 ms @3.2V
remark	duty cycle for frequencies > 30 MHz is 40/60%...60/40%				

FREQUENCY STABILITY			detailed tolerances [ppm]					
types	temperature range	model code	stability versus:					pulling range positive function
			temp.	@ 25°C	Vcc range	load ± 10 %	ageing	
all types	-10 to 60°C	40D1	≤ ± 1	≤ ± 1	≤ ± 0.2	≤ ± 0.3	≤ ± 1	≥ ± 40
	-20 to 70°C	40C2	≤ ± 2					
remarks			control voltage range: DFAV S7-K / 2.5 V ± 2 V, DFAV S7-L / 1.5 V ± 1.5 V					
			input impedance ≥ 10 kΩ					
			temperature stability is guaranteed @ 2.5 V control voltage					
			ageing is 1 st year at 25°C					

OPTIONS	CODE	
internal trimmer	A	≥ ± 5ppm

ORDERING CODE	type + option code + frequency + model code
Example	DFAV S7-LH 19.440 MHz 40C2

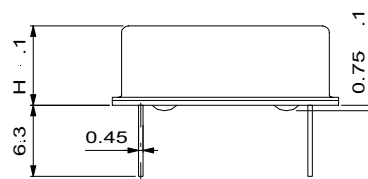
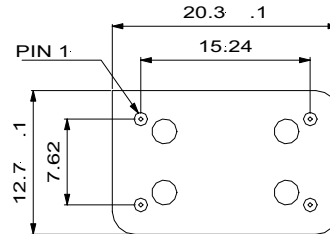
**MINIATURE DIL 14 PACKAGE VC-TCXO
DFAV 14-K (5 V) & DFAV 14-L (3.3 V)**

STANDARD MINIATURE DIL 14 PACKAGE

5 V OR 3.3 V SUPPLY VOLTAGE

HIGH FREQUENCY STABILITY

WIDE PULLING RANGE



H = 8.50 mm

Function	DFAV 14
V control	1
GND	7
Output	8
Vcc	14

TYPE	DFAV 14-KH	DFAV 14-KO	DFAV 14-LH	DFAV 14-LO
Frequency range	2 to 52 MHz	2 to 52 MHz	2 to 45 MHz	2 to 45 MHz

ELECTRICAL SPECIFICATIONS					
supply voltage		5 V ± 5 %	5 V ± 5 %	3.2 V to 3.6 V	3.2 V to 3.6 V
supply current (no load)	≤ 25 MHz ≤ 35 MHz > 35 MHz	≤ 10 mA ≤ 20 mA ≤ 30 mA	≤ 5 mA ≤ 20 mA ≤ 30 mA	≤ 5 mA ≤ 15 mA ≤ 20 mA	≤ 5 mA ≤ 15 mA ≤ 20 mA
output load		HCMOS 15 pF or 2 TTL	clipped sine 20kΩ//5 pF	HCMOS 15 pF or 1 TTL	clipped sine 20kΩ//5 pF
duty cycle	@ 2.5V @ 1.65V	≤ 45/55...55/45 %		≤ 45/55...55/45 %	
rise/fall times (10 to 90 %)		≤ 10 ns		≤ 10 ns	
high/low levels or output amplitude		≥ 3.5 V/ ≤ 0.5 V	≥ 2 V p-p	≥ 2.7 V/ ≤ 0.2 V	≥ 1.5 V p-p
start up		≤ 10 ms @4.75 V	≤ 10 ms @4.75 V	≤ 10 ms @3.2V	≤ 10 ms @3.2V
remark	duty cycle for frequencies > 30 MHz is 40/60%...60/40%				

FREQUENCY STABILITY			detailed tolerances [ppm]					
types	temperature range	model code	stability versus:				pulling range positive function	
			temp.	@ 25°C	Vcc range	load ± 10 %		ageing
all types	-10 to 60°C	40D1	≤ ± 1	≤ ± 1	≤ ± 0.2	≤ ± 0.3	≤ ± 1	≥ ± 40
	-20 to 70°C	40C2	≤ ± 2					
remarks			control voltage range: DFAV 14-K/ 2.5 V ± 2 V, DFAV 14-L/ 1.5 V ± 1.5 V					
			input impedance ≥ 10 kΩ					
			temperature stability is guaranteed @ 2.5 V control voltage					
			ageing is 1 st year at 25°C					

OPTIONS	CODE	
internal trimmer	A	≥ ± 5ppm

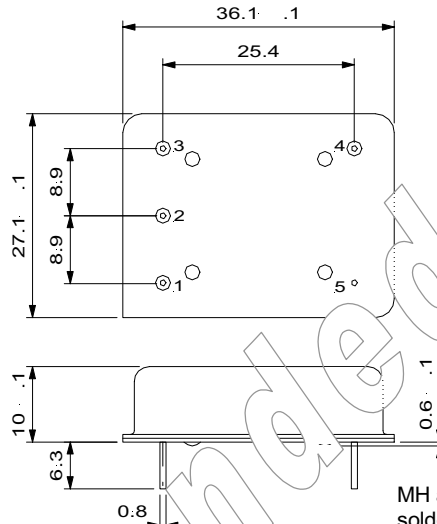
ORDERING CODE	type + frequency + model code
Example	DFAV 14-KH 19.440 MHz 40D1

HIGH STABILITY STANDARD SIZE VC-TCXO DFAV 36 & DFAV 36-M

EXCELLENT PULLING VERSUS STABILITY RATIO

WIDE FREQUENCY RANGE

WIDE PULLING RANGE



MH and MS models supplied in solder sealed package.
Please consult factory for details.

Function	DFAV 36
V control	1
NC	2
Vcc	3
Output	4
GND	5

TYPE	DFAV 36-H	DFAV 36-MH	DFAV 36-S	DFAV 36-MS
Frequency range	4 to 27 MHz	25 to 70 MHz	4 to 27 MHz	25 to 70 MHz

ELECTRICAL SPECIFICATIONS		DFAV 36-H	DFAV 36-MH	DFAV 36-S	DFAV 36-MS
supply voltage		5 to 15 V ± 5 %	5 to 15 V ± 5 %	5 to 15 V ± 5 %	5 to 15 V ± 5 %
supply current (no load)	≤ 25 MHz > 25 MHz	≤ 10 mA ≤ 30 mA	≤ 10 mA ≤ 30 mA	≤ 10 mA ≤ 30 mA	≤ 10 mA ≤ 30 mA
output load		CMOS 15 pF	CMOS 15 pF	50 Ω ± 10 %	50 Ω ± 10 %
duty cycle		60...60/40 % @ 2.5 V	60...60/40 % @ 2.5 V		
rise/fall times (@ 15 pF load)		10 to 90 % : ≤ 10 ns	10 to 90 % : ≤ 10 ns		
high/low levels or output amplitude		≥ 3.5 V / ≤ 0.5 V	≥ 3.5 V / ≤ 0.5 V	0 dBm ± 2 dB	0 dBm ± 2 dB
start up		≤ 10 ms	≤ 10 ms	≤ 10 ms	≤ 10 ms

FREQUENCY STABILITY			Detailed tolerances [ppm]					
types	temperature range	model code	temp.	@ 25°C	Vcc ± 5 %	load ± 10 %	ageing	pulling range positive function
all types	0 to 50°C	40B1	≤ ± 1	≤ ± 1	≤ ± 0.2	≤ ± 0.3	≤ ± 1	≥ ± 40
	-20 to 70°C	40C2	≤ ± 2	≤ ± 2	≤ ± 0.2	≤ ± 0.3	≤ ± 1	≥ ± 40
remarks	control voltage range 2.5 V ± 2 V							
	input impedance ≥ 10 kΩ							
	temperature stability is guaranteed @ 2.5 V control voltage							
	ageing is 1 st year at 25°C							

ORDER CODE	type + frequency + model code / voltage value
Example	DFAV 36-MH 38.88 MHz 40B1/12