

**DUAL FREQUENCY VCXO (10 MHz TO 1.4 GHz)****Features**

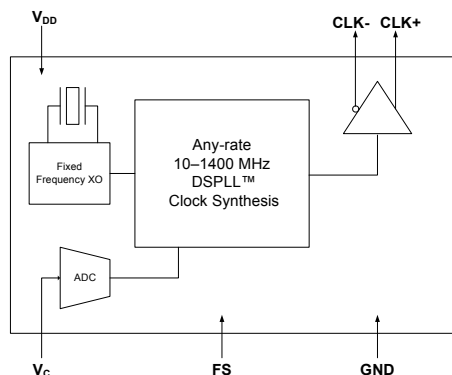
- Available with any-rate output frequencies from 10 to 945 MHz and selected frequencies to 1.4 GHz
- Two selectable output frequencies
- Industry-standard 7x5 mm package
- Available CMOS, LVPECL, LVDS & CML outputs
- 3x better frequency stability than SAW-based oscillators
- 3rd generation DSPLL<sup>®</sup> with superior jitter performance
- Internal fixed crystal frequency ensures high reliability and low aging
- Lead-free/RoHS-compliant

**Applications**

- SONET / SDH
- xDSL
- 10 GbE LAN / WAN
- Low jitter clock generation
- Optical Modules
- Test and Measurement

**Description**

The Si552 dual frequency VCXO utilizes Silicon Laboratories advanced DSPLL<sup>®</sup> circuitry to provide a very low jitter clock for all output frequencies. The Si552 is available with any-rate output frequency from 10 to 945 MHz and selected frequencies to 1400 MHz. Unlike traditional VCXO's where a different crystal is required for each output frequency, the Si552 uses one fixed crystal frequency to provide a wide range of output frequencies. This IC based approach allows the crystal resonator to be optimized for superior frequency stability and reliability. In addition, DSPLL clock synthesis provides superior supply noise rejection, simplifying the task of generating low jitter clocks in noisy environments often found in communication systems. The Si552 IC based VCXO is factory configurable for a wide variety of user specifications including frequency, supply voltage and output format. Specific configurations are factory programmed into the Si552 at time of shipment, thereby eliminating the long lead times associated with custom oscillators.

**Functional Block Diagram****Ordering Information:**

See page 7.

## 1. Electrical Specifications

**Table 1. Si552 Electrical Specifications**

Parameter	Min	Typ	Max	Units	Notes
<b>Frequency</b>					
Nominal Frequency LVDS/CML/LVPECL CMOS	10 10	— —	945 160	MHz	Specified at time of order by P/N. Also available in bands from 970 to 1134 MHz and 1213 to 1417 MHz.
Initial Accuracy	-1.5	—	1.5	ppm	Measured at +25 °C at time of shipping and at $V_C = V_{DD}/2$ .
Temperature Stability	-20 -50 -100	— — —	+20 +50 +100	ppm	Selectable option by P/N. See Section 4. "Ordering Information" on page 7. Measured at $V_C = V_{DD}/2$ .
Linearity BSL Incremental	-5 -10	±1 ±5	+5 +10	%	BSL determined from deviation from best straight line fit with $V_C$ ranging from 10 to 90% of $V_{DD}$ . Incremental slope determined with $V_C$ ranging from 10 to 90% of $V_{DD}$ .
Tuning Slope (kV) from 10 to 90% of $V_{DD}$	— — —	180 90 45	— — —	ppm/V	Positive slope; selectable option by P/N. See Section 4. "Ordering Information" on page 7.
Modulation Bandwidth	—	10	—	kHz	
$V_C$ Input Impedance	500	—	—	k $\Omega$	
Absolute Pull Range (APR)	—	See Notes	—	—	See Section 4. "Ordering Information" on page 7.
Aging	—	—	±10	ppm	Projected frequency drift over 15 year life.
<b>Outputs</b>					
Symmetry	45	—	55	%	LVPECL: $V_{DD} - 1.3$ V (differential) LVDS: 1.25 V (differential) CMOS: $V_{DD}/2$
RMS Jitter for $F_{OUT} \geq 500$ MHz Kv = 180 ppm/V 12 kHz to 20 MHz 50 kHz to 80 MHz  Kv = 45, 90 ppm/V 12 kHz to 20 MHz 50 kHz to 80 MHz	— — — — —	0.42 0.34  0.28 0.31	— — — — —	ps	$F_{OUT} \geq 500$ MHz Differential Modes: LVPECL/LVDS/CML

Table 1. Si552 Electrical Specifications (Continued)

Parameter	Min	Typ	Max	Units	Notes
RMS Jitter for $F_{OUT}$ of 125 to 500 MHz 12 kHz to 20 MHz 50 kHz to 80 MHz	— —	0.61 0.52	— —	ps	$125 < F_{OUT} < 500$ MHz Differential Modes: LVPECL/LVDS/CML
Period Jitter for $F_{OUT} \leq 160$ MHz Peak-to-Peak RMS	— —	7 2	— —	ps	Any output N = 1000 cycles
LVPECL Output Option mid-level swing (diff) swing (single-ended)	$V_{DD} - 1.42$ 1.1 0.5	— — —	$V_{DD} - 1.25$ 1.9 0.93	V $V_{PP}$ $V_{PP}$	$50 \Omega$ to $V_{DD} - 2.0$ V
LVDS Output Option mid-level swing (diff)	1.125 0.5	1.2 0.7	1.275 0.9	V $V_{PP}$	$R_{term} = 100 \Omega$ (differential)
CML Output Option mid-level swing	— 0.35	$V_{DD} - 0.36$ 0.425	— 0.5	V $V_{PP}$	$R_{term} = 100 \Omega$ (differential)
CMOS Output Option $V_{OH}$ $V_{OL}$	$0.8 \times V_{DD}$ —	— —	$V_{DD}$ 0.4	V	$C_L = 15$ pF
Rise/Fall time	—	1	350 —	ps ns	CML/LVPECL/LVDS at 20% / 80% CMOS
<b>Inputs</b>					
Voltage 3.3 V option 2.5 V option 1.8 V option	2.97 2.25 1.71	3.3 2.5 1.8	3.63 2.75 1.89	V	Optional parameter specified by P/N
Supply Current	—	90	—	mA	
Control Voltage ( $V_C$ )	0	—	$V_{DD}$	V	Tuning range for control voltage
Frequency Select $V_{IL}$ $V_{IH}$	0 $0.75 \times V_{DD}$	— —	0.5 $V_{DD}$	V	"0" selects F1 "1" selects F2

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Supply Voltage	$V_{DD}$	-0.5 to +3.8	V
Storage Temperature	$T_S$	-55 to +125	°C

**Table 3. Environmental Conditions**

Parameter	Conditions/ Test Method
Operating Temperature	-40 to +85 °C
Mechanical Shock	MIL-STD-883F, Method 2002.3 B
Mechanical Vibration	MIL-STD-883F, Method 2007.3 A
Solderability	MIL-STD-883F, Method 203.8
Gross & Fine Leak	MIL-STD-883F, Method 1014.7
Resistance to Solvents	MIL-STD-883F, Method 2016

**Table 4. Pinout**

Pin	Symbol	Function
1	Vc	Control Voltage
2	FS	Frequency Select
3	Gnd	Ground
4	Output	Oscillator Output
5	Coutput (N/A for CMOS)	Complementary Output (N/C for CMOS)
6	V <sub>DD</sub>	Power Supply Voltage

## 2. Outline Diagram and Suggested Pad Layout

Figure 1 illustrates the package details for the Si552. Table 5 lists the values for the dimensions shown in the illustration.

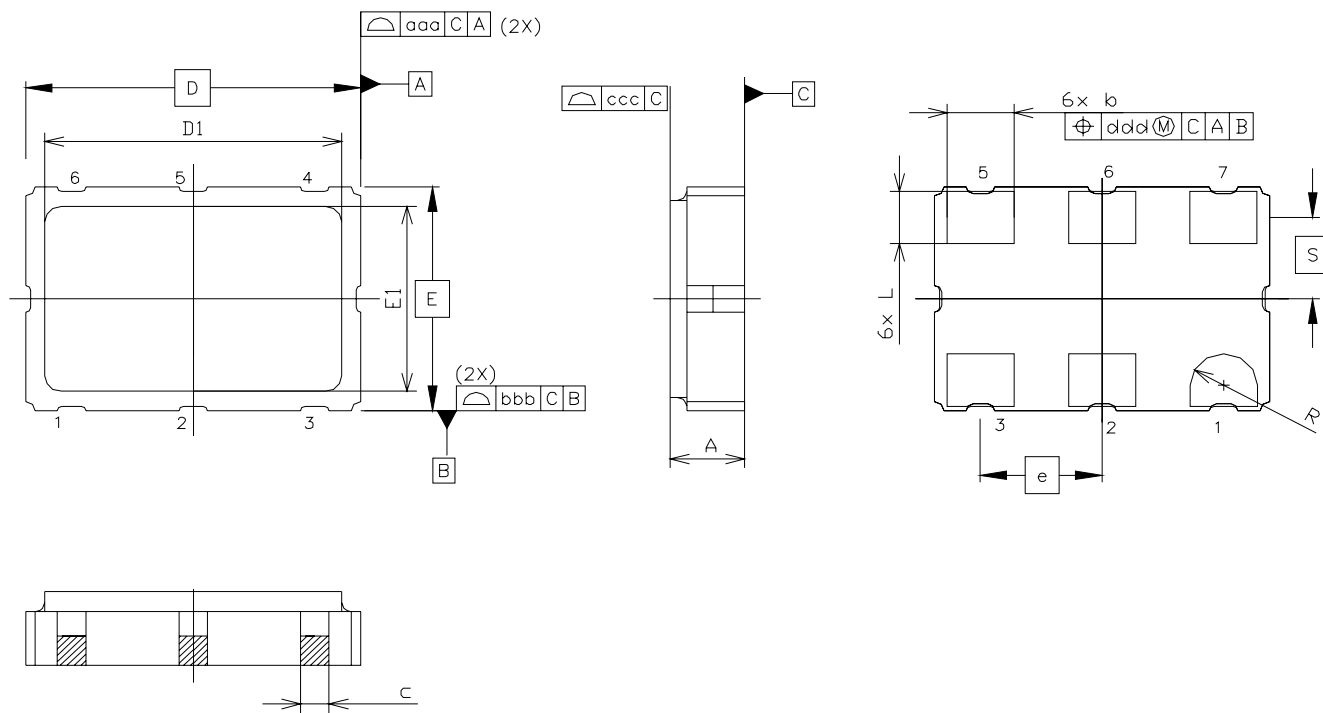


Figure 1. Si552 Outline Diagram

Table 5. Package Diagram Dimensions (mm)

Dimension	Min	Nom	Max
A	1.45	1.65	1.85
b	1.2	1.4	1.6
c	0.60 TYP.		
D	7.00 BSC.		
D1	6.10	6.2	6.30
e	2.54 BSC.		
E	5.00 BSC.		
E1	4.30	4.40	4.50
L	1.07	1.27	1.47
S	1.815 BSC.		
R	0.7 REF.		
aaa	—	—	0.15
bbb	—	—	0.15
ccc	—	—	0.10
ddd	—	—	0.10

## 3. 6-Pin PCB Land Pattern

Figure 2 illustrates the 6-pin PCB land pattern for the Si552. Table 6 lists the values for the dimensions shown in the illustration.

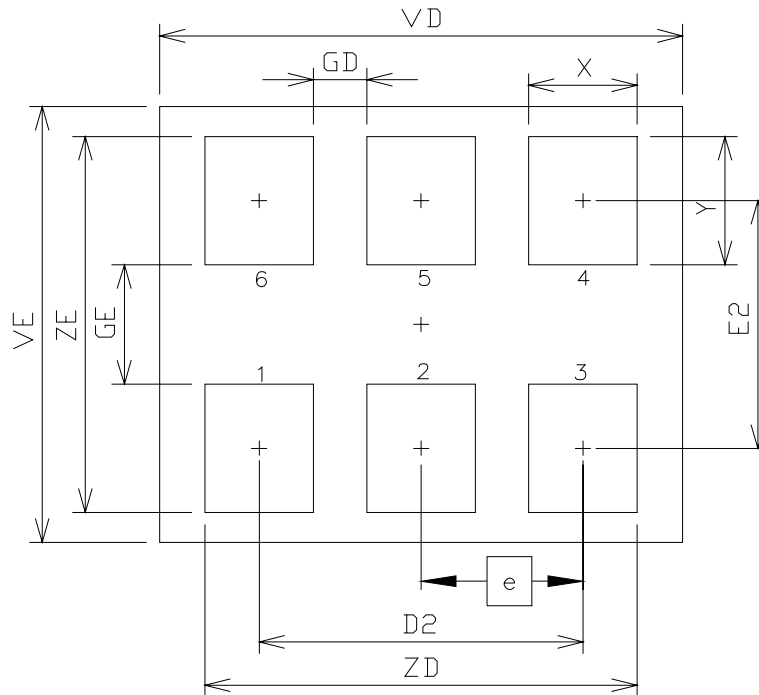


Figure 2. Si530 PCB Land Pattern

Table 6. PCB Land Pattern Dimensions (mm)

Dimension	Min	Max
D2		5.08 REF
e		2.54 BSC
E2		4.15 REF
GD	0.84	—
GE	2.00	—
VD		8.20 REF
VE		7.30 REF
X		1.70 TYP
Y		2.15 REF
ZD	—	6.78
ZE	—	6.30

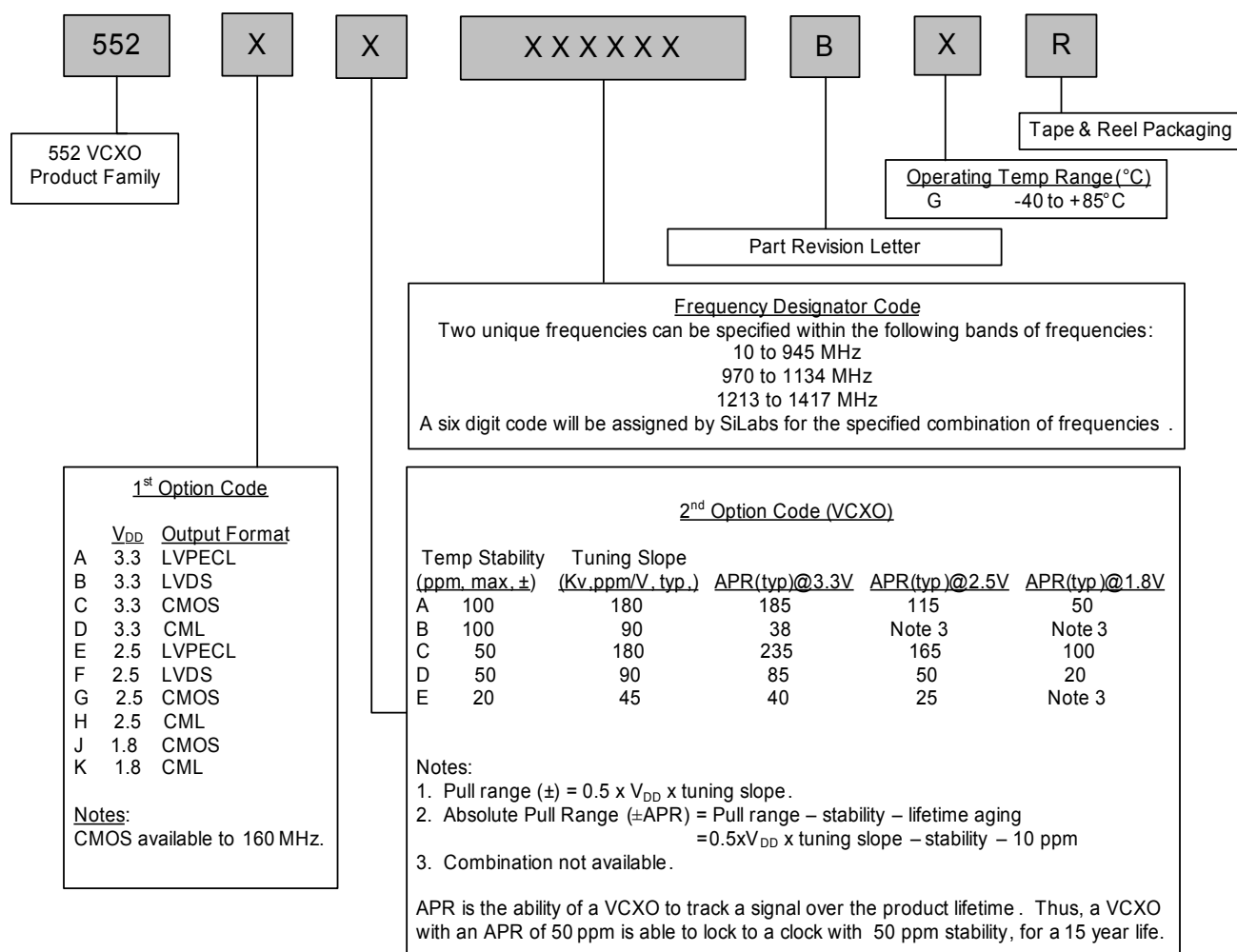
**Notes:**

1. Dimensioning and tolerancing per the ANSI Y14.5M-1994 specification.
2. Land pattern design based on IPC-7351 guidelines.
3. All dimensions shown are at maximum material condition (MMC).
4. Controlling dimension is in millimeters (mm).

## 4. Ordering Information

The Si552 was designed to support a variety of options including frequency, tuning slope, output format, and  $V_{DD}$ . Specific device configurations are programmed into the Si552 at time of shipment. A unique part number associated with these options and frequencies will be assigned. The Si552 Dual Frequency VCXO is provided in an industry-standard, 7x5 package.

Part numbers for the Si552 Dual Frequency VCXO are determined by following configuration tables. Silicon Labs provides a Windows-based part number configuration tool to simplify this process. Refer to [www.silabs.com/VCXO](http://www.silabs.com/VCXO) to access this tool and for further ordering instructions.



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