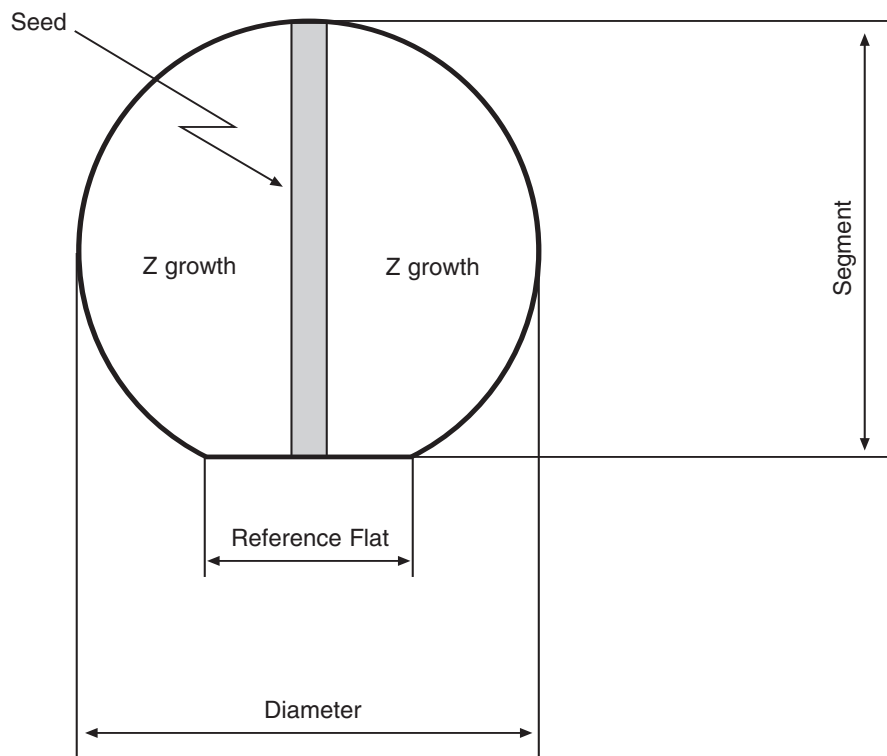


### General

This document describes single crystal cultured quartz substrates suitable for use in surface acoustic wave applications. Such wafers are most commonly specified as 3" or 100 mm with a reference flat. The wafers are Y-cut with rotations specified between about 25° and 42.75° around the X-axis. Individual wafers are laser scribed with the relevant orientation. A high quality, low damage surface is prepared on one major (propagating) surface by polishing. The back side is usually lapped to a rough finish to attenuate unwanted vibration modes.

### Outline Drawing



### References

International Electrotechnical Commission Standard, CEI/IEC 758, Second edition, 1993-04.

Institute of Electrical and Electronic Engineers Standard on Piezoelectricity ANSI/IEEE Std. 176-1987.

## Physical Dimensions

	Units	Tolerance	3" / 100mm
Diameter	mm	± 0.1	76.2 / 100.0
Thickness	mm	± 0.01	0.25 – 0.50
Total thickness variation	µm	maximum	4.0
Local thickness variation (5mm sites with 2mm edge exclusion)	µm	maximum	1.5
Orientation of propagating surface			
around X-axis	arc minute	± 6	Customer specified
around Z'-axis	arc minute	± 15	0.00
Reference flat width	mm	± 3	22 / 32
Reference flat orientation (⊥ to Y'-axis)	arc minute	± 6	0
Segment	mm	nominal	74.7 / 98.5
Centricity of seed	mm		within central 5

## Surface Characteristics

Roughness			
R <sub>rms</sub> - Propagating surface	nm	maximum	0.6
R <sub>a</sub> - Back side	nm	± 50	250
Bow	µm	maximum	40
Scratch length	µm	maximum	10
Dig diameter	µm	maximum	2
Observable flaws	count	maximum	2
Pin holes (at the seed)	count	maximum	0
Dimensions of chips within 1.5mm of edge			
on the circular segment	mm	maximum	0.5
on the reference flat	mm	maximum	0.2
Wafer edge treatment (not including reference flat)		semiconductor standard radius profile	

## Material Properties

Growth type			Basal (Z)
Handedness			right
Twins			none
α-value (3500 cm <sup>-1</sup> )	α-units	maximum	0.060
Inclusions (diameter)			
25-75 µm	cm <sup>-3</sup>		5
75-100 µm	cm <sup>-3</sup>	maximum	4
> 100 µm	cm <sup>-3</sup>		3
Etch channel density	cm <sup>-2</sup>	maximum	150

Surface Acoustic Wave Substrates - Quartz  
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