

Table 6: Key Characteristics of common MMIC substrate materials.

			substrate			underfill	
			Alumina	Quartz	AlN	LCP	U8410-73A
Dielectric constant	1MHz	unitless	9.9	3.8	8.6		3.8
	10GHz		9.7			3.14	
tan δ	1MHz	unitless	0.0001	0.000015	0.001		0.013
	10GHz		0.002			0.0025	
Thermal conductivity		W/mK	26.9	1.4	185	0.2	0.5
CTE- Thermal coefficient of expansion		ppm/ $^{\circ}$ C	7-8.3	0.55	4.6	17 (x, y)	28
Transparency to infra-red			no	yes		no	no