MARUWA

List of Characteristic Values

		Condition	Unit	Al_2O_3					Al_2O_3/ZrO_2		AlN			Si_3N_4
				AS970	HA-96-2	HBS	HRA	HA-996	ZTA	HRZ	AN-170	AN-200	AN-230	SN-90
Material		-	-	**96.5%**	**96%**	**96.5%**	**96%**	**99.6%**	**Al_2O_3/ZrO_2**	**Al_2O_3/ZrO_2**	**AlN**	**AlN**	**AlN**	**Si_3N_4**
Color		-	-	**White**	**White**	**White**	**White**	**White**	**White**	**White**	**Gray**	**Gray**	**Beige**	**Gray**
Bulk density		-	g/㎤	**3.74**	**3.75**	**3.75**	**3.60**	**3.90**	**4.00**	**3.85**	**3.30**	**3.30**	**3.30**	**3.22**
Surface roughness Ra		-	μm	**0.4**	**0.4**	**0.3**	**0.3**	**0.1**	**0.2**	**0.2**	**0.2**	**0.3**	**0.3**	**0.4**
Reflectivity		0.3-0.4mmt	%	**70**	**70**	**70**	**85**	**75**	**80**	**87**	**35**	**-**	**-**	**-**
		0.8-1.0mmt		**80**	**80**	**80**	**95**	**85**	**90**	**97**	**25**	**-**	**-**	**-**
Mechanical	Bending strength	3-point method	MPa	**450**	**400**	**500**	**370**	**470**	**700**	**550**	**450**	**400**	**350**	**800**
	Modulus of elasticity	-	GPa	**330**	**330**	**330**	**-**	**330**	**310**	**-**	**320**	**-**	**-**	**310**
	Vickers hardness	-	GPa	**14**	**14**	**14**	**-**	**16**	**15**	**14**	**11**	**11**	**11**	**15**
	Fracture toughness	IF method	$MPa \cdot m^{1/2}$	**3.0**	**3.0**	**-**	**-**	**-**	**3.5**	**-**	**3.0**	**2.6**	**2.4**	**6.5**
Thermal	Coefficient of thermal expansion	40-400°C	$10^{-6}/K$	**6.7**	**6.7**	**6.7**	**6.7**	**6.8**	**7.1**	**7.1**	**4.6**	**4.6**	**4.6**	**2.6**
		40-800°C		**7.8**	**7.8**	**7.8**	**7.8**	**7.9**	**8.0**	**8.0**	**5.2**	**5.2**	**5.2**	**3.1**
	Thermal conductivity	25°C	W/(m・K)	**24**	**24**	**24**	**20**	**29**	**27**	**23**	**180**	**200**	**230**	**85**
		300°C		**12**	**12**	**12**	**-**	**13**	**16**	**-**	**120**	**130**	**145**	**-**
	Specific heat	25°C	J/(kg・K)	**750**	**750**	**750**	**750**	**780**	**720**	**720**	**720**	**720**	**720**	**680**
Electrical	Dielectric constant	1MHz	-	**9.8**	**9.8**	**9.8**	**-**	**9.9**	**10.2**	**-**	**8.5**	**8.5**	**8.5**	**7.8**
	Dielectric loss factor	1MHz	10^{-3}	**0.2**	**0.2**	**0.2**	**-**	**0.2**	**0.2**	**-**	**0.3**	**0.3**	**0.3**	**0.4**
	Volume resistivity	25°C	Ω・㎝	**$>10^{14}$**	**$>10^{14}$**	**$>10^{14}$**	**$>10^{14}$**	**$>10^{14}$**	**$>10^{14}$**	**$>10^{14}$**	**$>10^{14}$**	**$>10^{14}$**	**$>10^{13}$**	**$>10^{14}$**
	Breakdown strength	DC	kV/㎜	**>15**	**>15**	**>15**	**>15**	**>15**	**>15**	**>15**	**>15**	**>15**	**>15**	**>15**
Use/Apprication				Substrates for Chip Resistor / HIC Substrates / Thin Film Metalized Substrates	Glazed Substrates / HIC Substrates / Thin Film Metalized Substrates	Substrates for Heat Dissipation / Substrates for LED Packages	Substrates for LED Packages	Thin Film Metalized Substrates	Substrates for Heat Dissipation / Substrates for LED Packages	Substrates for LED Packages	Substrates for Heat Dissipation / Substrates for LED Packages / Thin Film Metalized Substrates / Substrates for Power Resistors			Thick Film Substrates / Substrates for Heat Dissipation