EXPRESS ELECTRONICS

MATERIAL DATASHEET

SILICON CARBIDE EE-SC1

DESCRIPTION

Silicon Carbide is a ceramic material which has light weight but very high hardness only slightly less than diamond. It is an ideal material for high temperature using because it has high strength and oxidation resistance when high temperature. It is widely used for sealing parts due to its excellent wear resistance and self-lubrication property. The high thermal conductivity is also its advantage. According to the different manufacturing methods, Silicon Carbide ceramics can be divided into:

- Sintered Silicon Carbide (SSiC)
- Reaction Bonded Silicon Carbide (SiSiC)

PROS

- High Temperature Resistance
- High Hardness and Abrasiveness
- Wide Bandgap Semiconductor
- High Thermal Conductivity
- Lightweight and High Strength
- Corrosion and Wear Resistance
- Energy Efficiency
- Improved Power Conversion

CONS

- Higher Cost
- Manufacturing Complexity
- Material Brittleness
- Limited Industry Experience
- Thermal Shock Sensitivity
- Availability of Large Wafers
- Gate Drive Complexity
- Market Transition

APPLICATIONS:

APPLICATION AREA	EXAMPLE OF USE
POWER ELECTRONICS	High-voltage, high-temperature devices for power conversion and control in electric vehicles, renewable energy systems, and industrial equipment.
ABRASIVES	Cutting, grinding, and polishing applications in manufacturing, construction, and automotive industries.
THERMAL MANAGEMENT	Heat sinks, heat exchangers, and components for efficient heat dissipation in electronics and industrial processes.
AEROSPACE AND DEFENSE	Lightweight structural components, coatings, and high-temperature materials for aircraft, spacecraft, and military equipment.
REFRACTORY MATERIALS	Furnace linings, kiln furniture, and crucibles for high-temperature applications in metallurgy and ceramics.
SEMICONDUCTOR DEVICES	High-frequency, high-power transistors, diodes, and switches for electronic applications requiring improved efficiency and high-temperature performance.

COATINGS AND SURFACE PROTECTION	Corrosion-resistant coatings for various materials in aggressive environments, such as chemical processing and oil exploration.
CERAMICS AND COMPOSITES	Advanced ceramic materials, ceramic matrix composites (CMCs), and reinforced composites for structural and high-temperature applications.
LED LIGHTING	SiC-based LEDs for lighting applications, benefiting from the material's wide bandgap and thermal properties.

PHYSICAL PROPERTIES:

*Please note that all values quoted are based on test pieces and may vary according to component design. These values are not guaranteed in anyway whatsoever and should only be treated as indicative and for guidance only.

Property	Unit	Value
Melting Point	℃	~2730
Density	g/cm^3	3.21 – 3.23
Thermal Conductivity	20℃ W/(m · K)	2.5 – 4.9
Coefficient of Thermal Expansion	10^{-6}/℃	4 – 5.6
Specific Heat Capacity	J/(g · ℃)	0.7 – 0.75
Young's Modulus	GPa	410 - 550
Poisson's Ratio	-	0.15 - 0.22
Vickers Hardness	Kgf/mm^2	2200 - 3000
Maximum Use Temperature	℃	>1500
Electrical Resistivity	Ω · cm	$10^{-2} - 10^{6}$
Transparency (Thin Layers)	-	Translucent/Transparent
Dielectric Constant	ε	9 - 10
Dielectric Strength	Kv/mm	100 - 200
Loss Tangent	-	0.001 – 0.05