



A FERRO COMPANY

# TECHNICAL DATA SHEET "K"-2200 X8R dielectric "LF-222M"

LF-222M is an environmentally friendly low fire X8R/BX dielectric with excellent reliability. It is RoHS compliant (not formulated with lead or cadmium). LF-222M meets the EIA X8R/BX temperature characteristic and exhibits very good insulation resistance to 200°C. This dielectric is compatible with up to 85% Ag / 15% Pd electrode systems.

## Key Features

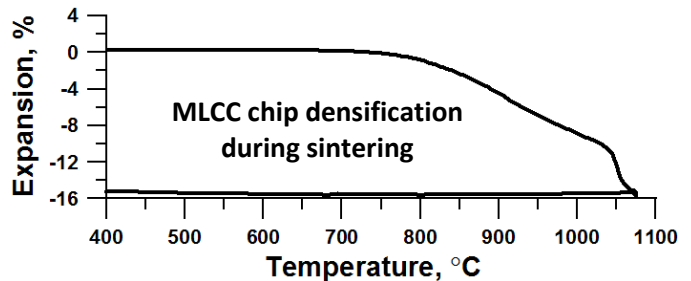
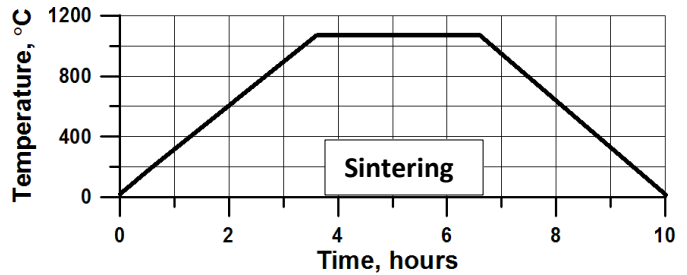
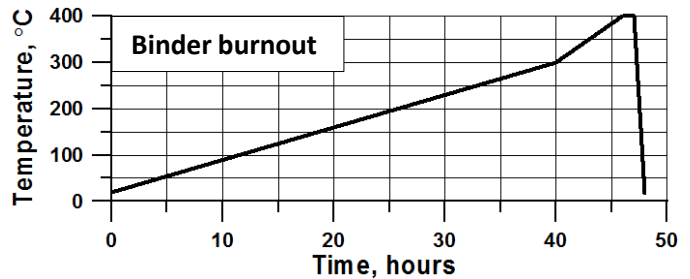
- ❖ Environmentally friendly (RoHS compliant)
- ❖ Based on 8x rated 180°C HALT
- ❖ Good high temperature characteristics to 200°C
- ❖ Compatible with up to 85% Ag / 15% Pd electrode systems
- ❖ Excellent lot to lot uniformity

### Typical powder properties

- Powder density, g/cm<sup>3</sup> **≥ 5.80**
- Surface area, m<sup>2</sup>/g **2.65 ± 0.65**
- Particle size, μm
  - D<sub>90</sub> **≤ 1.50**
  - D<sub>50</sub> **0.60 ± 0.15**
  - D<sub>10</sub> **0.35 ± 0.15**
- LOI (650°C, 6 hours), % **≤ 0.30**

### Sintering conditions

- Binder burnout up to 400°C in air
- Sintering 1070°C ± 20°C/3 hours in air
- Heating rate 5°C/min
- Open ZrO<sub>2</sub> setter
- Fired density ≥ 5.7 g/cm<sup>3</sup>



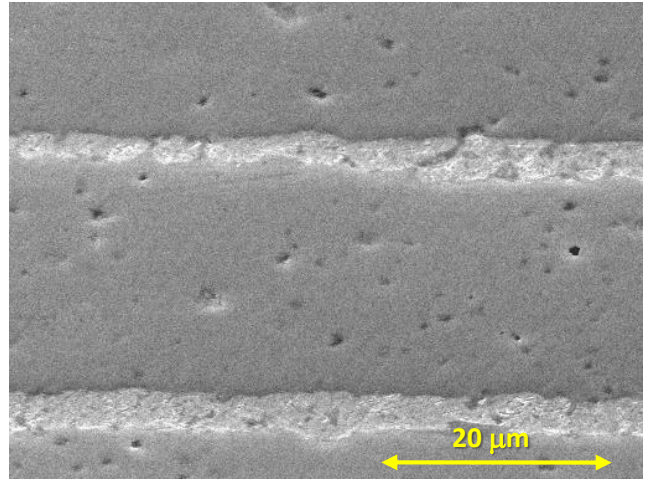
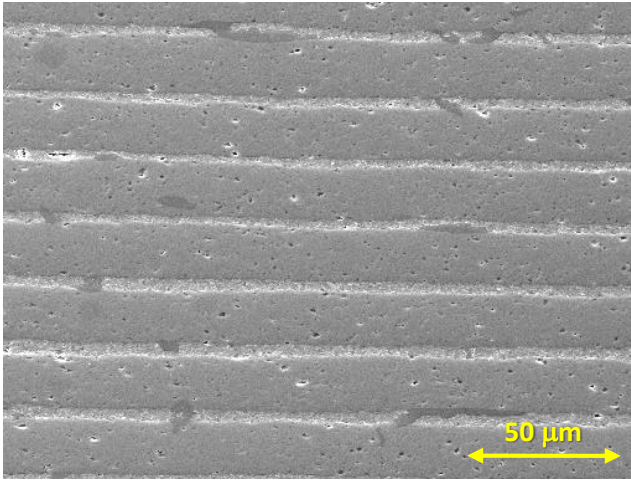
**MRA - committed to excellence in  
multi-layer ceramic device technology.**

ISO 9001:2015

BUREAU VERITAS  
Certification



## Typical cross-sectional microstructure of sintered MLCC chip



### Mechanical properties of the dielectric

- Coefficient of thermal expansion from 200°C to 600°C,  $\mu\text{m}/\text{m}^*\text{K}$  **12.1**

### Typical MLCC characteristics

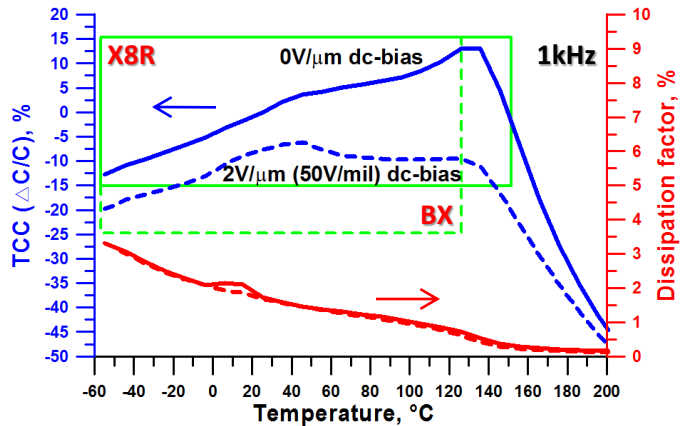
- Chip size **0805**
- Active layers **10**
- Electrode: **80% Ag / 20% Pd**
- Dielectric thickness,  $\mu\text{m}$  **~20**
- Dielectric constant **2300 ± 300**
- Dissipation factor, % **≤ 2.0 @ 1kHz, 1Vrms**

- Insulation resistance at 400V and 180°C,  $\Omega$  **> 10<sup>10</sup>**
- Dielectric withstanding voltage, V/ $\mu\text{m}$  **≥ 40**

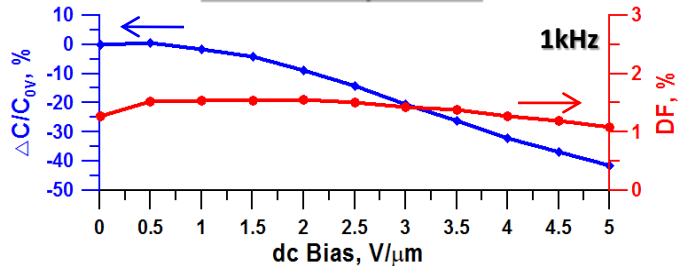
TCC X8R ( $\pm 15\%$  from -55°C to +150°C)

TCC BX (from +15% to -25% from -55°C to +125°C) at rated voltage

### Temperature and voltage variation of capacitance (50V rated MLCC chips)



### Voltage variation of capacitance at room temperature



*The data presented is based on our research and is considered to be fair representation of this product. MRA makes no warranties, expressed or implied, as to its accuracy and assumes no liability out of its use by others.*

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