



ESL ELECTROSCIENCE

CERAMIC TAPES &
THICK-FILM MATERIALS

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HIGH K CAPACITOR DIELECTRICS

4160-N Series

Lead-Free Low Temperature Capacitor Dielectric Pastes for Burying in LTCC Tape with Dielectric Constants between 50 and 250

ESL 4160-N Series low firing temperature capacitor pastes are designed to be used for capacitors buried in LTCC tape. The range of dielectric constant achievable depends on the firing schedule and host tape but is approximately 50-250. The dissipation factors are about 1-3% and exhibit X7R temperature characteristics.

PASTE DATA

RHEOLOGY:	Thixotropic, screen printable pastes	
VISCOSITY: (Brookfield RVT, ABZ spindle, 10 rpm, 25.5°C±0.5°C)	4162-N	250±50 Pa·s
	4163-N	150±50 Pa·s
	4164-N	250±50 Pa·s
COLOR:	yellow-tan	
SHELF LIFE: (at 4°C)	6 months	

PROCESSING

SCREEN MESH/EMULSION:	200 mesh/37.5 µm	
LEVELING TIME:	10-15 minutes	
DRYING AT 125°C:	10-15 minutes	
FIRING TEMPERATURE RANGE:	850° - 900°C	
FIRING SCHEDULE	Optimum: 875°C	determined by LTCC tape
	Time at Peak: 10 min.	

4160-N Series 1212-C

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See Caution and Disclaimer on other side.

SUBSTRATE OF CALIBRATION: 96% alumina
THINNER: ESL 401
SCREEN CLEANER: acetone, isopropanol, polar organic solvents

TYPICAL PROPERTIES

(Properties based on capacitors of 1 mm x 1 mm electrode area.)

	<u>4162-N</u>	<u>4163-N</u>	<u>4164-N</u>
FIRED THICKNESS:	35-50 μm	40-55 μm	40-55 μm
DIELECTRIC CONSTANT (K) at 1 kHz: (Fired at 875°C, 9916 conductor, measured at 25°C)	50±50%	100±30%	250±50%
EIA DESIGNATION:	X7R	X7R	X7R
DISSIPATION FACTOR at 1 kHz: (at 25°C)	≤1.0%	≤ 2.0%	≤ 3.0%
BREAKDOWN VOLTAGE: (VDC/25 μm, 25°C in air)	≥ 200	≥ 200	≥ 200
RECOMMENDED CONDUCTORS:		ESL 9916	

Note: X7R: T.C.C. Range = ±15%, -55°C to +125°C

4160-N Series 1212-C

CAUTION: Proper industrial safety precautions should be exercised in using these products. Use with adequate ventilation. Avoid prolonged contact with skin or inhalation of any vapors emitted during use or heating of these compositions. The use of safety eye goggles, gloves or hand protection creams is recommended. Wash hands or skin thoroughly with soap and water after using these products. Do not eat or smoke in areas where these materials are used. Refer to appropriate MSDS sheet.

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