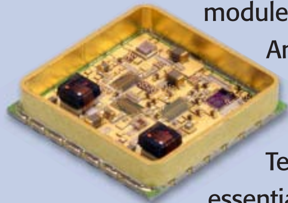
LEADLESS HERMETIC CERAMIC SMT SUBSTRATES AND PACKAGES

PCTF® technology offers an optimal combination of economy and performance for high reliability leadless ceramic hermetic SMT packaging.

Remtec designs and manufactures cost effective hermetic ceramic leadless SMT substrates and packages for RF and microwave components as well as multichip modules for direct PCB mount.



An SMT package built with PCTF® (Plated Copper on Thick film) Technology includes three essential features: copper metallization, copper-plated solid plugged hermetic via holes, and PCTF wraparounds (castellations). Copper metallization is quite suitable for RF signal transmission and also creates an excellent heat spreading effect beneath a semiconductor die.

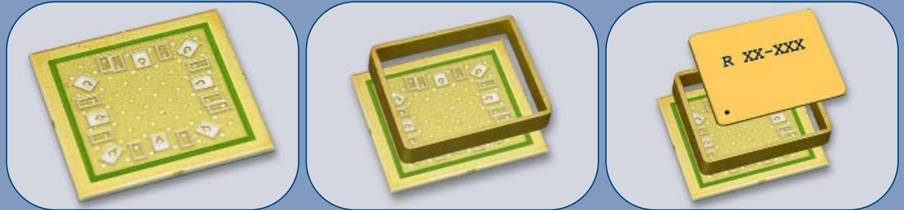
Solid via holes and castellations serve multiple functions. They greatly reduce the thermal resistance of the ceramic base and act as signal and ground connections for the package. They also provide low-inductance interconnects, which are essential for good high-frequency performance. Plugged via holes exhibit DC resistance below 0.5 mΩ. Solid via holes with thermal conductivity greater than 200 W/mx°C result in thermal resistance below 1°C/W and provide excellent thermal management.

The time-proven capability of directly soldering large leadless ceramic surface-mountable RF modules (greater than 0.75 in. on a side) onto PCBs is a unique benefit. Other benefits are excellent solderability and the capability of withstanding multiple soldering operations at 300°C and higher as well as compliance with RoHS requirements without any degradation in package integrity and reliability.

Technical data are shown on the reverse side.

Hermetic Package Options

Ring Frame Approach

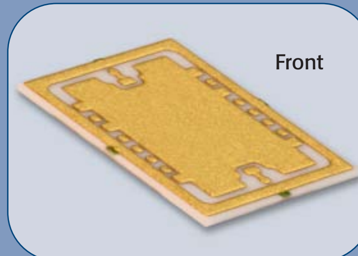


CTE matching metal ring soldered to PCTF ceramic. Metal lid soldered or welded to ring frame after assembly of components.

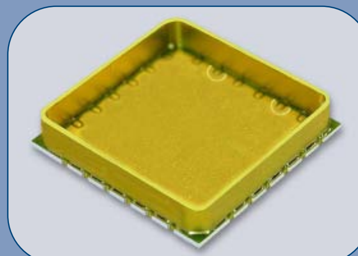
Dome Lid (Metal or Ceramic) Approach

Dome Lid or Ceramic Cover soldered to hermetic PCTF ceramic after assembly of components.

Applications



A .4x.5" hermetic SMT substrate for direct PCB mount for **5 W HPA**. PCTF metallization with .002" copper and thermal vias under the GaAs die enabled a compact power package with a thermal resistance below 1°C/W. Low inductance interconnects allow operating at 6 GHz with insertion losses below .3dB. (Courtesy of IAI Elta Systems)



This 16 mm PCTF package holds a complete **NRZ-to-RF encoder** circuitry with less than 8 ps jitter at 10.709 Gb/s and dissipates 5 W, with a low thermal resistance of less than 1 W/°C. Low inductance connections allow for a high frequency operation and impedance matching to 10 GHz. (Courtesy of Gigoptix, San Jose, CA)

REMTEC®

Ceramic Packaging Solutions For Optimum Performance

TECHNICAL DATA

PCTF offers RF component and module designers a viable, cost-effective packaging option with low up-front costs and fast market entrance.

Leadless SMT ceramic packages and substrates feature consistent dielectric properties, enhanced thermal management, and improved reliability. This packaging approach also supports direct attachment of large ceramic packages and substrates to printed-circuit boards (PCBs), robust RoHS-compliant soldering, and large-panel multiple-array formats. Substrates and packages based on PCTF technology have been used at frequencies from DC to 24 GHz, especially where thermally demanding applications require low thermal resistance of 1 to 2°C/W or lower.

Thermal Management Example. Plugged vias with thermal conductivity of 200 W/mx°C create an effective heat transfer path with a thermal resistance of approximately 30°C/W per via. An array of 20 plugged vias under a single die of 3 mm x 3mm dissipating 5 W provides the effective thermal resistance of 1.5°C/W, with a resulting temperature rise of ∆T=7°C.

Package Hermeticity is ensured using hermetic vias that fully meet MIL STD 883 requirements. Packages pass gross leak and fine leak test to 10^{-8} atm cc/sec and withstand 1000 temperature cycles from –65°C to +150°C.

Typical applications include RF power amplifiers, MMIC modules, encoders, optical drivers, attenuators, filters and transmit-receive modules for radar, satellite, military and aerospace applications.

Please send your electronic files in DXF and/or DWG formats to sales@remtec.com. More detailed design guidelines are available upon request.

Remtec, a RoHS compliant and ISO 9001:2000 registered company, provides ceramic packaging solutions for microwave/RF components and modules, optoelectronics and power electronics.

Additional data are available at www.remtec.com

Typical Electrical Characteristics

Package Type	Frequency	Insertion Loss, dB	Return Loss, dB
16 mm Quad	DC to 10 GHz	< 1	20

Design Guide: Plugged Via Holes

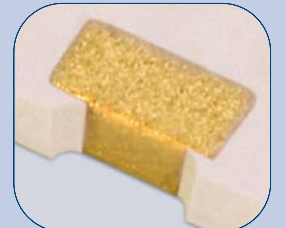
Ceramic Thickness mm (in)	Dia mm (in)
0.25-0.6 (0.010-0.025)	0.15-0.4 (0.006-0.016)

DC resistance
0.5 mΩ

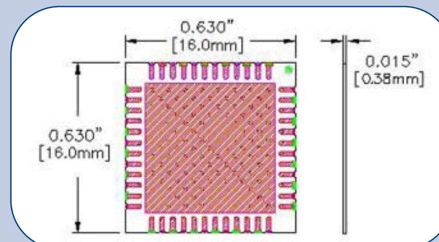
Design Guide: Castellations

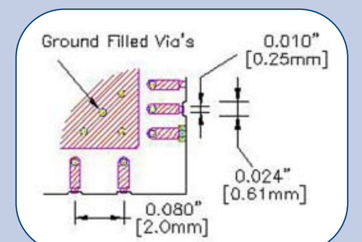
Typical Castellation

Width mm (in)	Pitch mm (in)
0.75-1.0	1.25-2.0
(0.030-0.040)	(0.050-0.080)



Typical 16 mm Package Outline (2mm pitch)





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