

# LEADLESS CERAMIC SMT SUBSTRATES, PACKAGES AND COMPONENTS

**PCTF® technology offers optimal economy, performance and reliability for SMT packaging with low up-front costs and fast market entrance.**

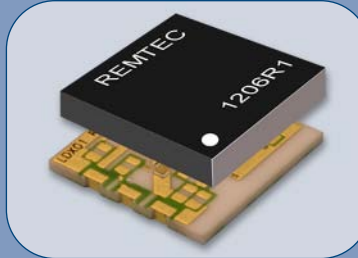
**R**emtec designs and manufactures cost effective ceramic leadless SMT substrates, chip carriers and packages for direct PCB mount using PCTF® (Plated Copper on Thick Film) technology. Packages house active and passive RF and microwave components as well as multichip modules. A PCTF SMT package includes three essential features: copper metallization, copper-plated solid plugged 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. The DC resistance of plugged via holes is below 0.5 mΩ. In addition, 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.

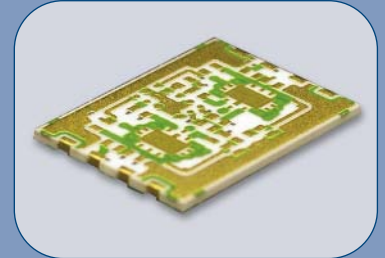
The time-proven capability of directly soldering large leadless ceramic surface-mountable RF modules (greater than 0.75" on a side) onto PCBs is a unique benefit. Other benefits are excellent solderability and the capability of withstanding multiple and prolonged soldering operations at 300°C and higher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

Parts supply to a customer in large panels with a multiple-image format for automatic assembly significantly reduces cost of PCTF substrates and packages.

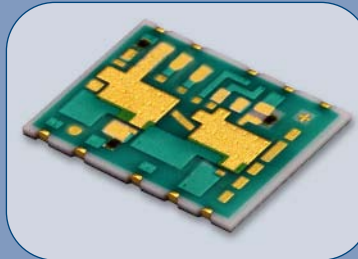
Technical data are shown on the reverse side.



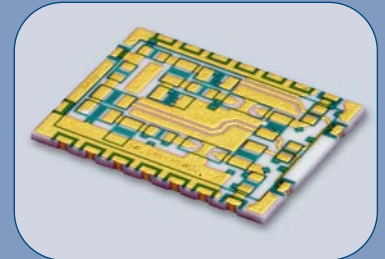
**Remtec's package concept** is based on creating an interconnect pattern on a ceramic substrate with **PCTF® (Plated Copper on Thick Film)** metallization including solid vias and castellations.



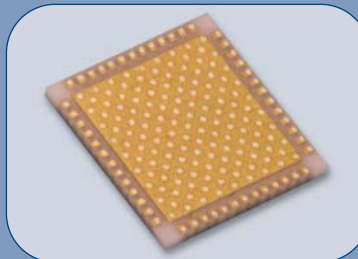
**PCTF SMT substrates** supplied for the CL, GB, WI, and LCL Series of **broadband LNA's**. High power gain, low cost and small size. (Courtesy of RFHIC, Korea)



**Driver for Optical Modulator** in the leadless SMT ceramic package with integrated precision thick film resistors. Plated copper and thermal vias under IC's enable dissipation of 2 watts.



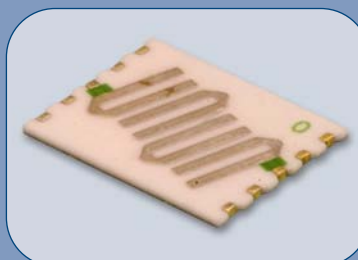
**A 2-stage GaN Amplifier with 10 W output power** built on PCTF BeO ceramic resulted in a higher power gain and increased power level in a compact 15.4x20x4 mm SMT leadless package.



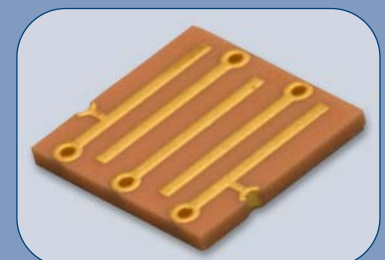
**A QFN compatible ceramic package with PCTF** has thermal resistance of 0.4-1.5°C/W for 8 mm and 4 mm. This mm wave package operates at a wide bandwidth with a low insertion loss. (Courtesy of MPT.)



**PCTF leadless ceramic package** for the **6-GHz transmitter module** was developed for RFID/RLTS applications. It significantly improved performance, repeatability and reliability.



The **6-GHz filter** fabricated on a **PCTF base** reduced size while meeting low insertion loss requirements across 400 MHz passband. Significantly reduced cross coupling.



**Bandpass filter** with insertion loss less than 1dB across operational range (s-band).

# TECHNICAL DATA

**PCTF offers RF designers a viable, cost-effective packaging option in quantities from a few thousand parts per year to 100,000 parts per month.**

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  $\Delta T=7^{\circ}\text{C}$ .

Typical applications include RF power amplifiers, MMIC modules, encoders, optical drivers, attenuators, filters and transmit-receive modules for telecom, satellite communication, optical networks, WiMAX and other communication markets as well as for radar, military and aerospace applications.

Please send your electronic files in DXF and/or DWG formats to [sales@remtec.com](mailto: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](http://www.remtec.com)



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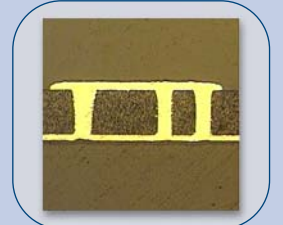
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## Typical Electrical Characteristics

Package Type	Frequency Range	Insertion Loss, dB	Return Loss, dB
QFN Compatible	DC to 30 GHz	0.2	18

## Design Guide: Plugged Via Holes

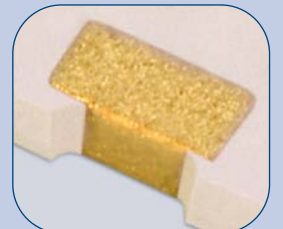
Ceramic Thickness mm (in)	Dia mm (in)
0.25-0.6 (0.010-0.025)	0.15-0.4 (0.006-0.016)
DC resistance	
0.5 mΩ	



## Design Guide: Castellations

### Typical Castellation

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



## Typical 8 mm Package Outline with varying castellations width for signal & ground.

