

# Study of Ti/Pt/Au ohmic contacts on P-type boron doped (100) diamond with linear and circular TLM structures

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*Keywords: Ohmic contacts, TLM, cTLM, p-type*

Diamond has demonstrated interesting properties for high power applications. However numerous technological obstacles make difficult the fabrication of power devices on diamond. Concerning ohmic contacts on p-type diamond, most studies concern highly doped layers (with a boron content, [B], above  $2 \times 10^{20}$  at.cm<sup>-3</sup>). Yet, the fabrication of high-performance contacts on less doped layers is necessary to promote power devices manufacturing.

In this work Ti/Pt/Au metallic contacts are fabricated on boron doped diamond layers ([B] =  $1 \times 10^{20}$  at.cm<sup>-3</sup>) and annealed under argon atmosphere during one hour at different temperatures (500°C and 600°C). They are characterized using the Transmission Line Method (linear TLM) and the Circular Transmission Line Method (cTLM).

The current / voltage (I/V) measurements show a linear behavior indicating that the electrical contact is ohmic. No effect is observed on the contact by increasing the annealing temperature. The total resistance of two neighboring contacts is plotted as a function of the distance between them. Such plot allows to extract electrical parameters. The transfer length,  $L_T$ , is worth 4.48  $\mu\text{m}$  and 5.72  $\mu\text{m}$  for the TLM and cTLM, respectively. The sheet resistance,  $R_{SH}$ , of the TLM is of 1070  $\Omega/\square$  while the value of the layer resistance,  $R_S$ , of the cTLM is 1693  $\Omega$ . The resistance values being of the same order of magnitude, the cTLM pattern can be used for the characterization of ohmic contacts.

The sheet resistance of the p-type diamond beneath the contact,  $R_{SK}$ , is of 33  $\Omega/\square$ , much lower than  $R_{SH}$ . This indicates the presence of an alloyed layer at the interface metal/diamond that induces the ohmic behavior of the Ti/Pt/Au contacts.

The specific contact resistances,  $\rho_c$ , are in the range of  $10^{-3}$  to  $10^{-4}$   $\Omega.\text{cm}^2$ , higher than the current record value of  $10^{-5}$   $\Omega.\text{cm}^2$ . Optimization of the manufacturing process still seems necessary.