The thermal (emitted) infrared frequency bands, 20-40 THz and 60-100 THz, are best known for applications in thermography. This underused and unregulated part of the spectral range offers opportunities for the development of secure communications. The ‘THz Torch’ concept was recently presented by the author. This technology fundamentally exploits engineered blackbody radiation, by partitioning thermally-generated spectral noise power into pre-defined frequency channels; the energy in each channel is then independently pulsed modulated and multiplexing schemes are introduced to create a robust form of short-range secure communications in the far/mid infrared. To date, octave bandwidth (25-50 THz) single-channel links have been demonstrated with 380 bps speeds. Multi-channel ‘THz Torch’ frequency division multiplexing (FDM) and frequency-hopping spread-spectrum (FHSS) schemes have been proposed, but only a slow 40 bps FDM scheme has been demonstrated experimentally. Here, we report a much faster 1,280 bps FDM implementation. In addition, an experimental proof-of-concept FHSS scheme is demonstrated for the first time, having a 320 bps data rate. With both 4-channel multiplexing schemes, measured bit error rates (BERs) of $<10^{-6}$ are achieved over a distance of 2.5 cm. Our approach represents a new paradigm in the way niche secure communications can be established over short links.