On the Turán number of the expansion of the t-fan

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The t-fan, F_t, is the graph on $2t+1$ vertices consisting of t triangles that intersect at exactly one common vertex. For a given graph F, the r-expansion F^r of F is the r-uniform hypergraph obtained from F by adding $r-2$ distinct new vertices to each edge of F. The Turán number of an r-uniform hypergraph $\mathcal{H}$, $ex_r(n,\mathcal{H})$, is the maximum number of hyperedges an r-uniform n-vertex hypergraph can have without containing $\mathcal{H}$ as a subhypergraph. We determine the Turán number of the 3-expansion of the t-fan for sufficiently large n. Namely, we show that $\mathrm{ex}_3(n,\mathcal{F}_t^3)=\binom{n}{3}-\binom{n-t}{3}$.