Pure rotational spectra of SiCCN ($\tilde{X}^2\Pi_{3/2}$) have been observed using Fourier-transform microwave (FTMW) spectroscopy in the frequency region 13 to 35 GHz. The SiCCN radical was produced in a supersonic jet by discharging a mixture gas, 0.2% SiCl$_4$ and 0.2% CH$_3$CN diluted in Ar. The effective rotational constant $B_{\text{eff},3/2}$, the centrifugal distortion constant $D$, and the hyperfine coupling constants, $a + (b + c)/2$ and $eQq_0$, were determined with a standard deviation of the fit to be 6 kHz. Determined $B$ and $eQq_0$ are consistent with those derived from ab initio calculations. $A$-type doublings were not resolved for the observed spectra.