Supplementary data for
“Improvement of thermoelectric performance of single-wall carbon nanotubes by heavy doping: Effect of one-dimensional band multiplicity” by D. Hayashi¹, Y. Nakai¹, H. Kyakuno², T. Yamamoto⁴, Y. Miyata¹³, K. Yanagi¹, and Y. Maniwa¹

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Figure S1 Energy dependence of electrical conductance $G(\mu)$ for $(n,0)$ SWCNTs with $n = 18, 24, 25,$ and $38$. The slope, $\frac{d\ln G(\mu)}{d\mu}$, is reflected in the magnitude of $S$. The $(24,0)$-SWCNT shows the steepest slope and the largest $S = 90 \ \mu$V/K, while the $(25,0)$-SWCNT has the mildest slope and the smallest $S = 40 \ \mu$V/K. Lower panel: Transmission function $\zeta(\varepsilon)$ of a carrier with energy $\varepsilon$ in $(24,0)$ and $(25,0)$ SWCNTs.
Figure S2 $S$ and $P$ for parallel junctions (see Fig. S3) of (19,0) s-SWCNT and (11,11) m-SWCNT for various m-SWCNT content. (a) $S$ and $P$ as a function of the chemical potential, $\mu$. (b) Magnitude of $S$ and $P$ peaks defined in (a) as a function of the m-SWCNT content.
Figure S3 Schematic illustration of the parallel junction model. The equivalent total Seebeck coefficient $S$, and conductance $G$, are given by:

$$S = \frac{S_s(1-\beta)G_s + S_mG_m\beta}{G_s(1-\beta) + G_m\beta} \quad \text{and} \quad G = \frac{1}{N} \sum_{j=1}^{N} G_j = G_s(1 - \beta) + G_m\beta,$$

where $N$ is the number of parallel passes, $\beta$ is the m-SWCNT content, $S_j$ (or $G_j$) is the Seebeck coefficient (or electrical conductance) of the $j$-th parallel pass. $S_j$ ($G_j$) is $S_s$ ($G_s$) for s-SWCNTs, and $S_j$ ($G_j$) is $S_m$ ($G_m$) for m-SWCNTs. Note that the voltage generated at the $j$-th parallel pass is given by $V_j = -S_j\Delta T$, and the total voltage is given by $V = -S\Delta TV = -S\Delta T$, where $\Delta T$ is the temperature difference.