Supplementary Information

Laser Patterned, High-Power Graphene Paper Resistor with Dual Temperature Coefficient of Resistance

Figure S1: Raman spectra of Procured graphene powder and graphene ink printed resistor

Table S1: Change in resistance corresponding to the annealing temperature and time

| Annealing Time (min.) | At 373K | At 423 K |
|-----------------------|---------|----------|
|                       | Change in Resistance per minute |      |
| 10                    | 331     | 1761     |
| 30                    | 88      | 47       |
| 60                    | 13      | 44       |
| 120                   | 55      | 4        |
Figure S2: TGA of the graphene ink

Figure S3: TGA of the graphene ink bar coated on paper
Figure S4: Cryostat setup for I-V characterization
Figure S5: IR imaging of resistor after operating at 200V for 60 sec.

Figure S6: DSC profile of graphene, resin, graphene ink (G-Ink) and graphene ink coated on paper substrate.
Table S2: Mean values along with standard deviation of TCR, thermal index and activation energy for variable annealing temperature and time

| Parameters                  | Annealed at 373 K for 10 min | Annealed at 373 K for 120 min | Annealed at 423 K for 10 min | Annealed at 423 K for 120 min |
|-----------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|
|                             | Cold Region | Hot Region | Cold Region | Hot Region | Cold Region | Hot Region | Cold Region | Hot Region |
| -ve TCR (PPM/K)             | 750 ± 125     | 2100 ± 1000 | 850 ± 100   | 1480 ± 350 | 800 ± 150   | 2000 ± 400 | 700 ± 150   | 1100 ± 200 |
| Thermal Index (K)           | 50 ± 10       | 190 ± 30    | 50 ± 2      | 125 ± 20   | 50 ± 5      | 230 ± 40   | 45 ± 6      | 150 ± 35   |
| Activation Energy (meV)     | 8 ± 2         | 32 ± 5      | 9 ± 0.5     | 22 ± 4     | 9 ± 1       | 40 ± 6     | 8 ± 1       | 25 ± 6     |
| Adj. R-Square               | 0.99          | 0.94        | 0.99        | 0.92      | 0.97        | 0.93       | 0.94        | 0.86       |

Figure S7: Change in relative resistance with temperature in vacuum and open for sample annealed at 373 K
Figure S8: Change in relative resistance with temperature in vacuum and open for sample annealed at 423K