

**Harsh-environment-stable organic heterojunction memristor  
enabling reliable neuromorphic computing and hardware-aware  
neural network implementation**

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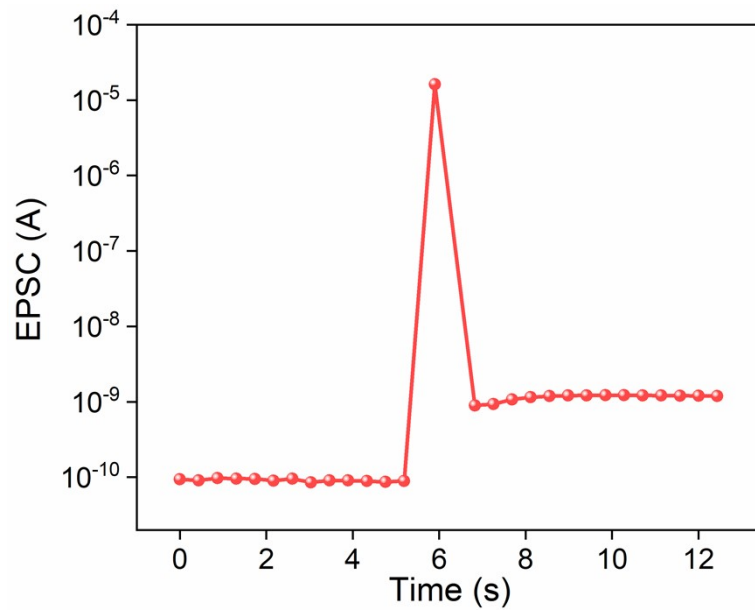
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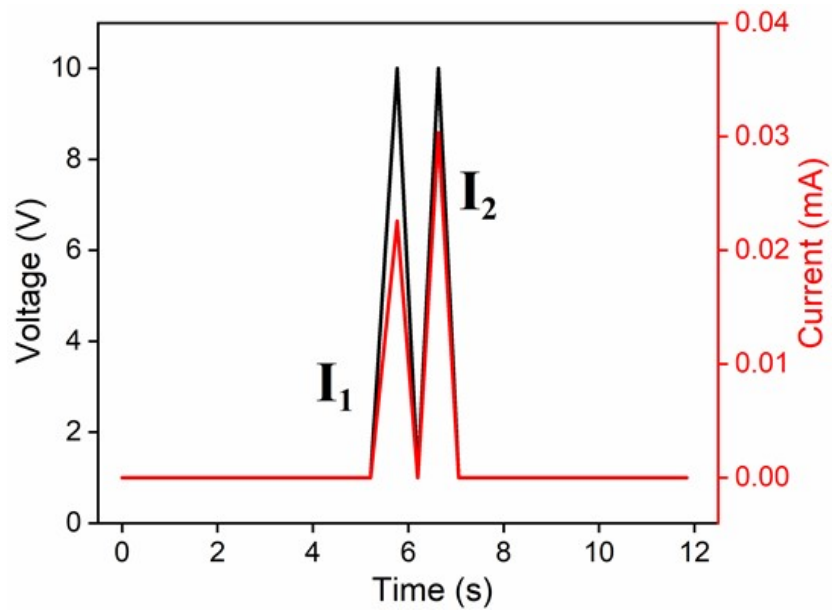
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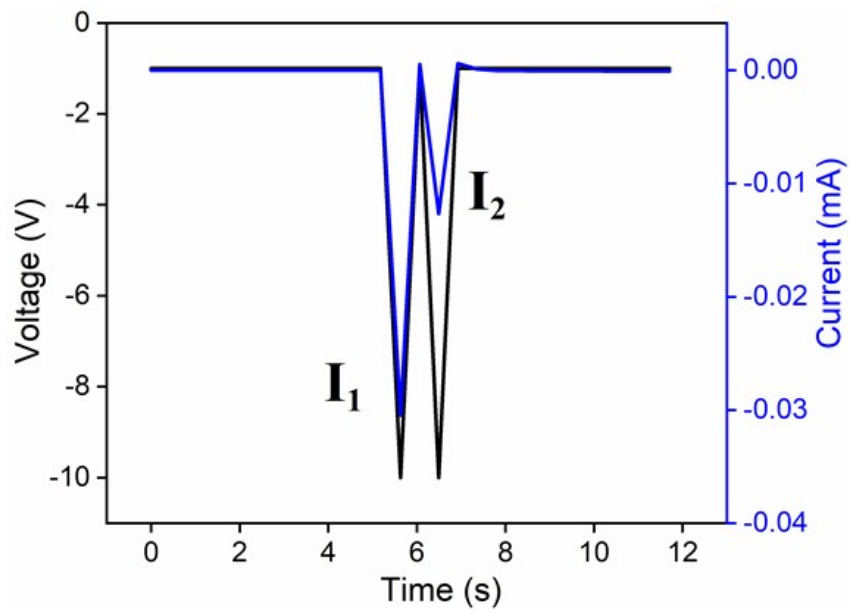
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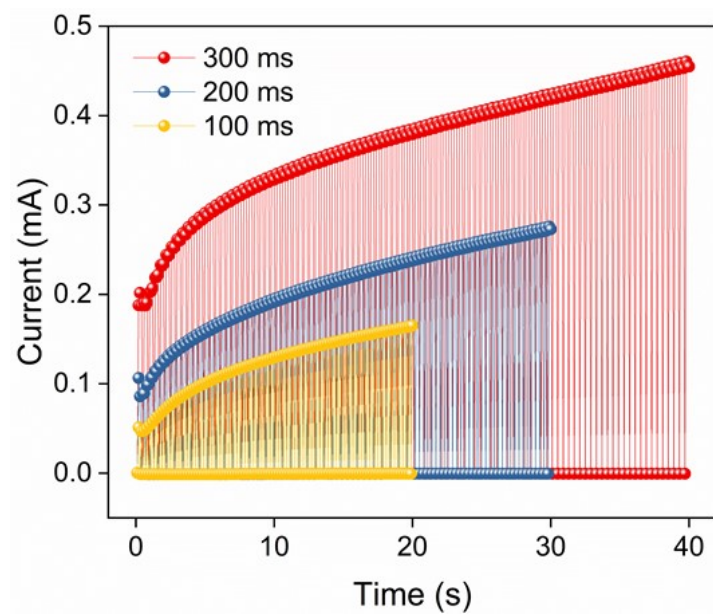
**Fig. S1** The  $F_{16}CuPc$  /MDMO-PPV organic heterojunction memristor simulates EPSC behavior.



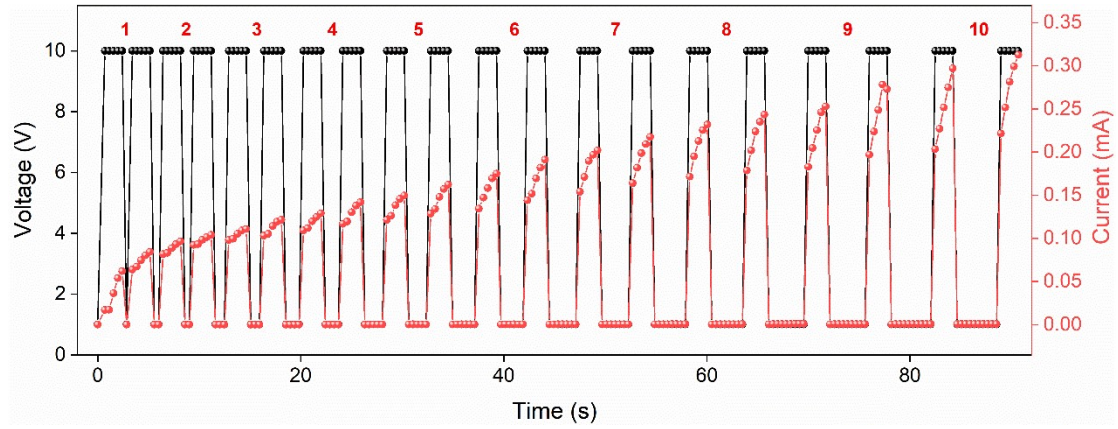
**Fig. S2** The  $F_{16}CuPc$  /MDMO-PPV organic heterojunction memristor simulates PPF behavior.



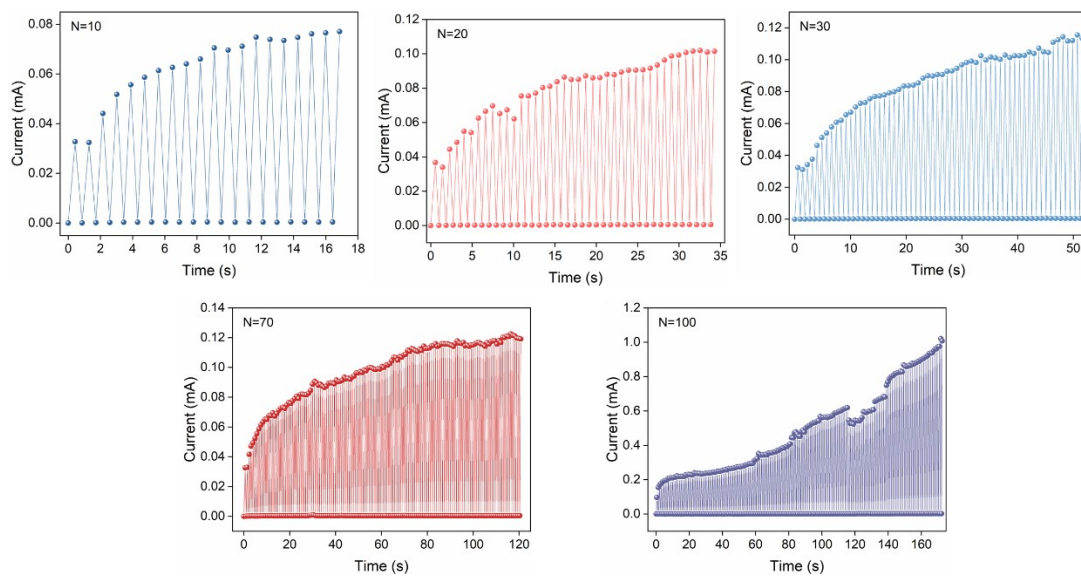
**Fig. S3** The  $F_{16}CuPc$  /MDMO-PPV organic heterojunction memristor simulates PPD behavior.



**Fig. S4** Current responses with different pulse widths (100, 200 and 300 ms).

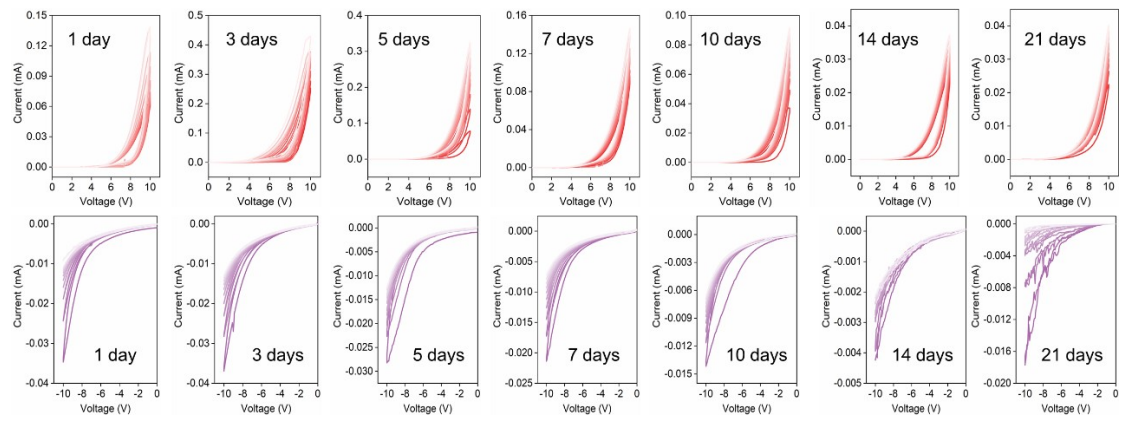


**Fig. S5** Current responses under pulse stimulation with simultaneously increased pulse width and interval at a fixed amplitude.



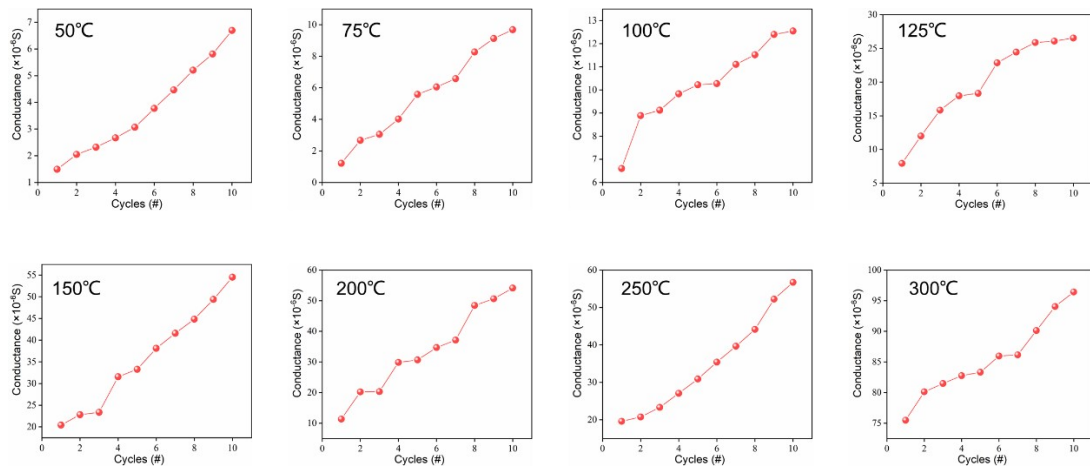
**Fig. S6** Current responses with different pulse numbers ( $N = 10, 20, 30, 70$  and  $100$ ).

25°C 70% RH



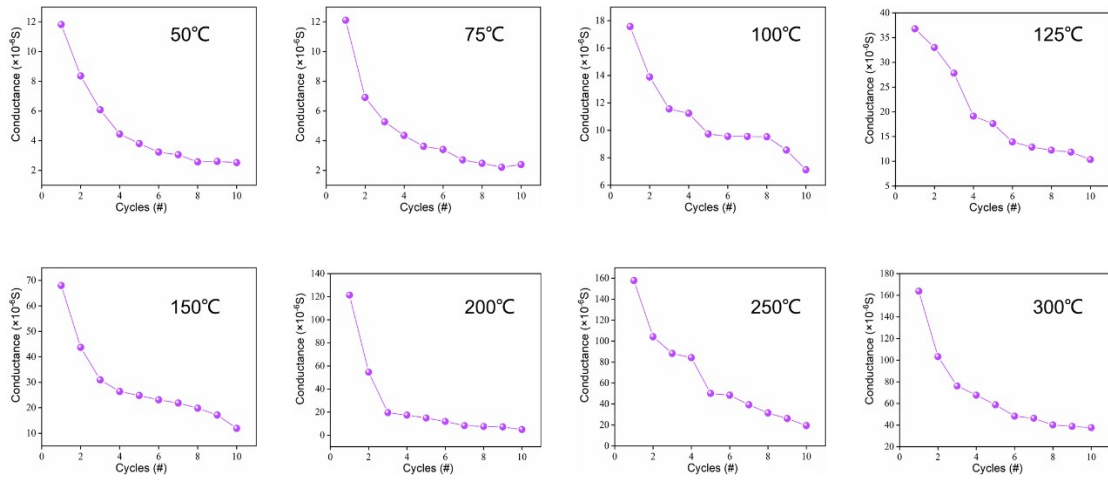
**Fig. S7**  $I-V$  characteristics of the  $F_{16}CuPc/MDMO-PPV$  heterojunction memristor measured after different storage durations under 25°C and 70% RH.

70% RH

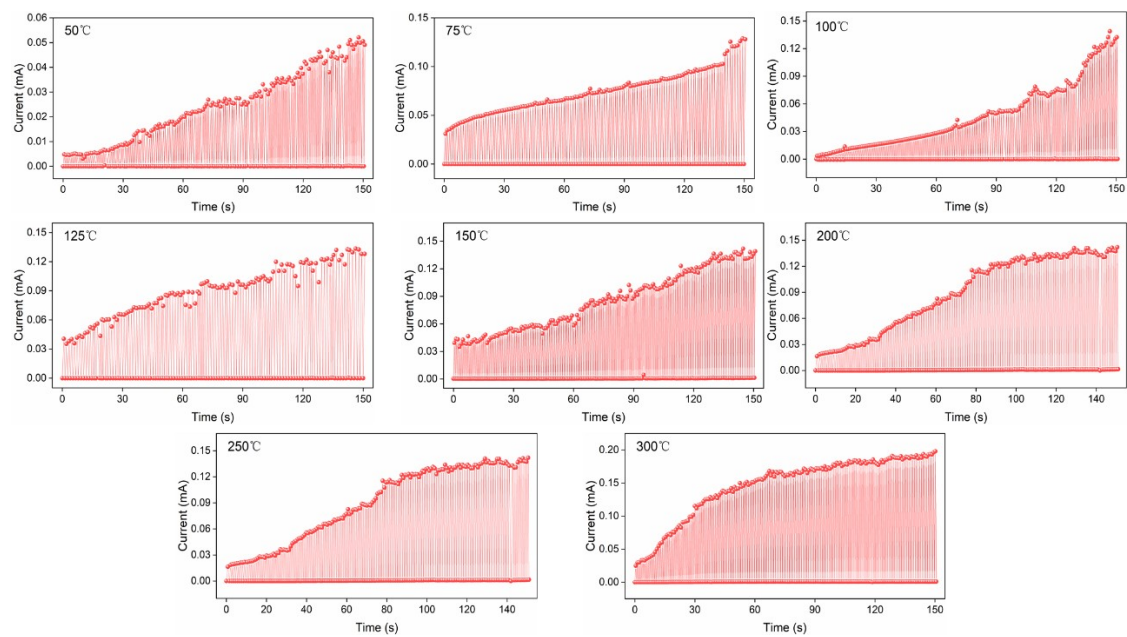


**Fig. S8** Conductance evolution under consecutive positive voltage sweeps at different temperatures (50–300°C) under 70% RH.

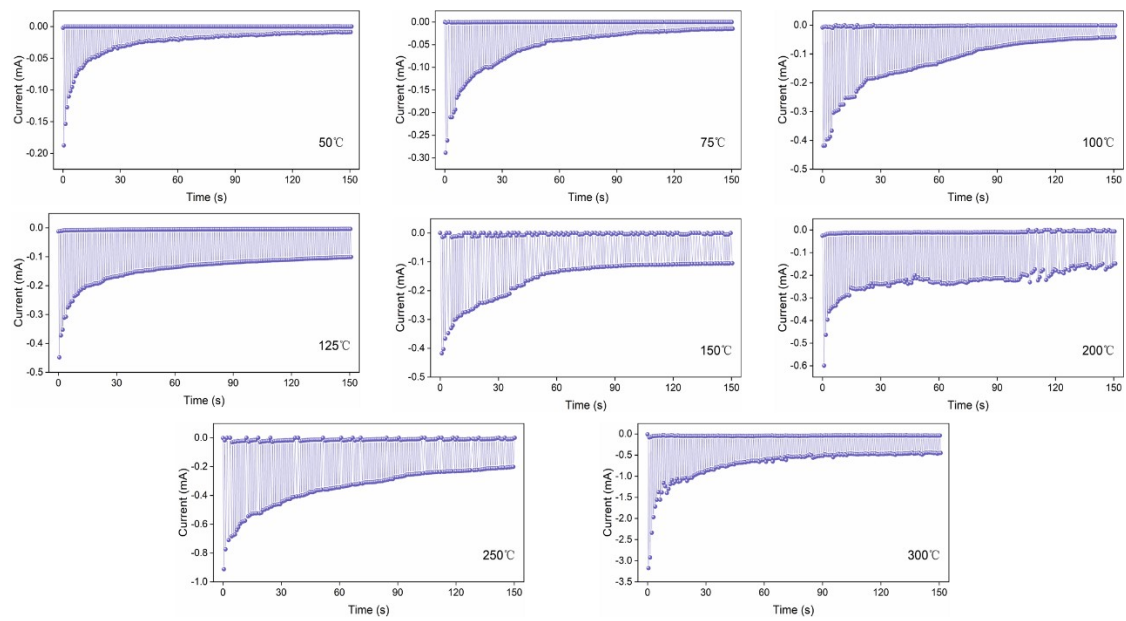
70% RH



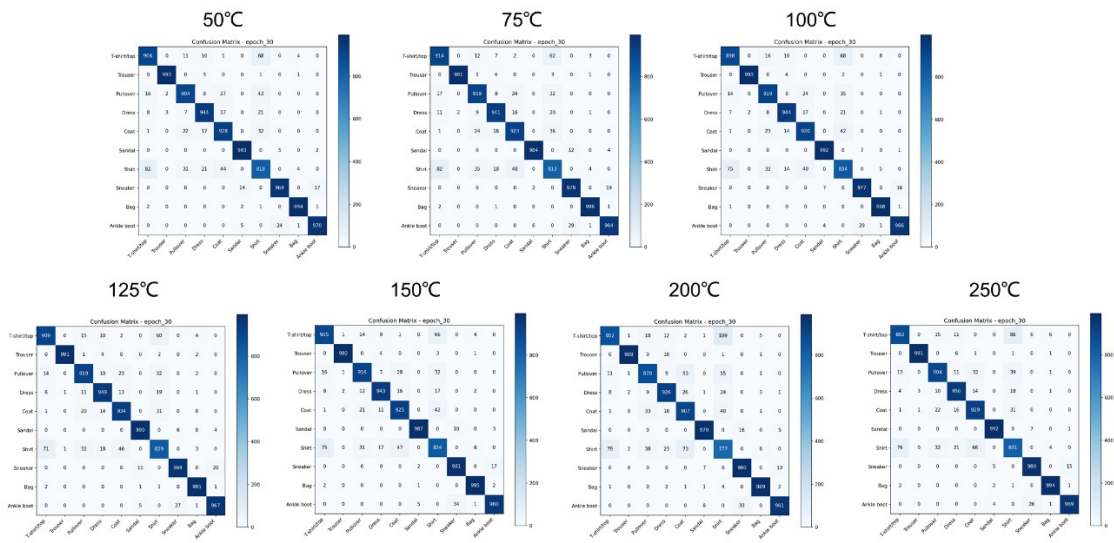
**Fig. S9** Conductance evolution under consecutive negative voltage sweeps at different temperatures (50–300°C) under 70% RH.



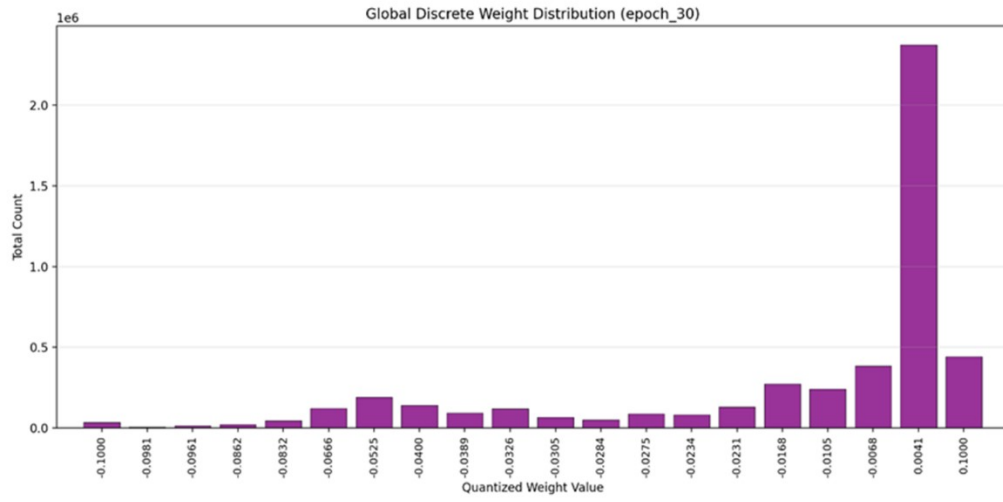
**Fig. S10** Current responses to consecutive positive voltage pulses ( $V_{\text{pos}} = 10$  V) at different temperatures (50–300°C) under 70% RH.



**Fig. S11** Current responses to consecutive negative voltage pulses ( $V_{\text{neg}} = -10$  V) at different temperatures (50–300°C) under 70% RH.

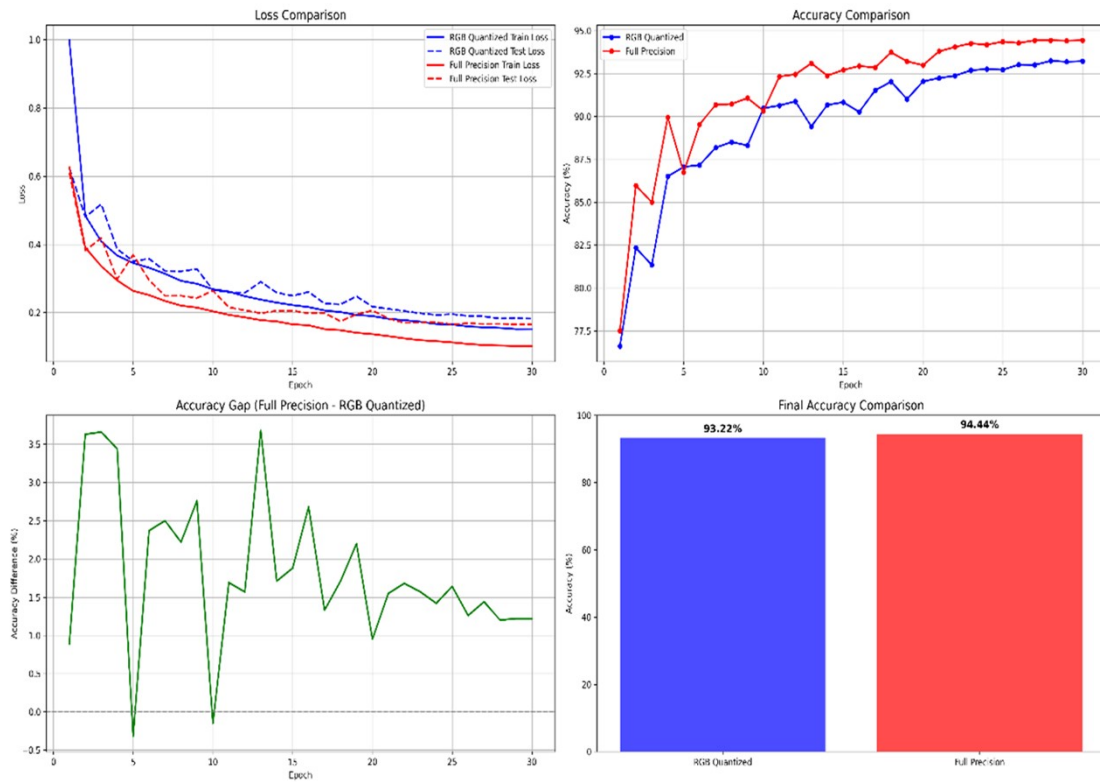


**Fig. S12** Confusion matrices under different temperatures (50, 75, 100, 125, 150, 200, and 250°C).

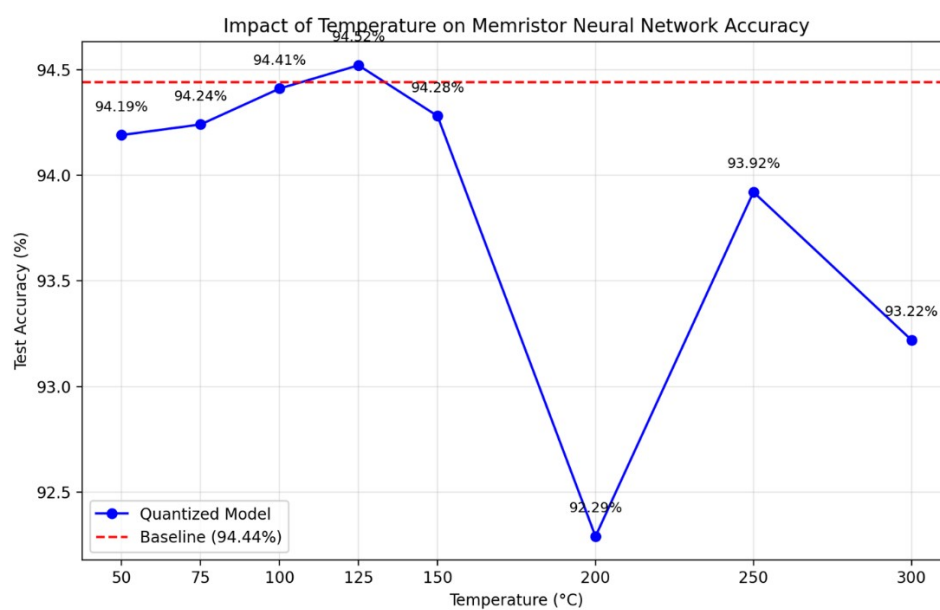


**Fig. S13** The global discrete weight distribution of the 300°C quantized model.

300°C



**Fig. S14** Training dynamics comparison between the quantized model constrained by 300°C device conductance states (blue) and the full-precision baseline (red) over 30 epochs.



**Fig. S15** Inference accuracy of quantized models using device conductance states measured at different temperatures (50–300°C).

**Table. S1** Summary of  $I_1$ ,  $I_{10}$ , and  $I_{10}/I_1$  ratio extracted from consecutive  $I$ - $V$  sweeps of the  $F_{16}$ CuPc/MDMO-PPV memristor after different storage periods under 25°C and 70% RH.

ITO/ $F_{16}$ CuPc/MDMO-PPV/Al <b>(25°C 70% RH)</b>	Time						
	1 day	3 days	5 days	7 days	10 days	14 days	21 days
$I_1$ ( $\times 10^{-3}$ A)	0.06	0.24	0.07	0.09	0.03	0.02	0.02
$I_{10}$ ( $\times 10^{-3}$ A)	0.14	0.41	0.31	0.14	0.09	0.04	0.04
$I_{10}/I_1$	2.33	1.71	4.43	1.56	3.00	2.00	2.00

**Table. S2** Summary of  $G_1$ ,  $G_{10}$ , and  $G_{10}/G_1$  ratio of the F<sub>16</sub>CuPc/MDMO-PPV heterojunction device measured at different temperatures (50–300 °C) under 70% RH.

ITO/ F <sub>16</sub> CuPc/MDMO-PPV/Al <b>(70% RH)</b>	Temperature (°C)							
	50	75	100	125	150	200	250	300
$G_1$ ( $\times 10^{-6}$ S)	1.49	1.21	6.60	7.94	20.40	11.35	19.61	75.48
$G_{10}$ ( $\times 10^{-6}$ S)	6.70	9.68	12.54	26.54	54.52	54.11	56.71	96.42
$G_{10}/G_1$	4.50	8.00	1.90	3.34	2.67	4.77	2.89	1.28