

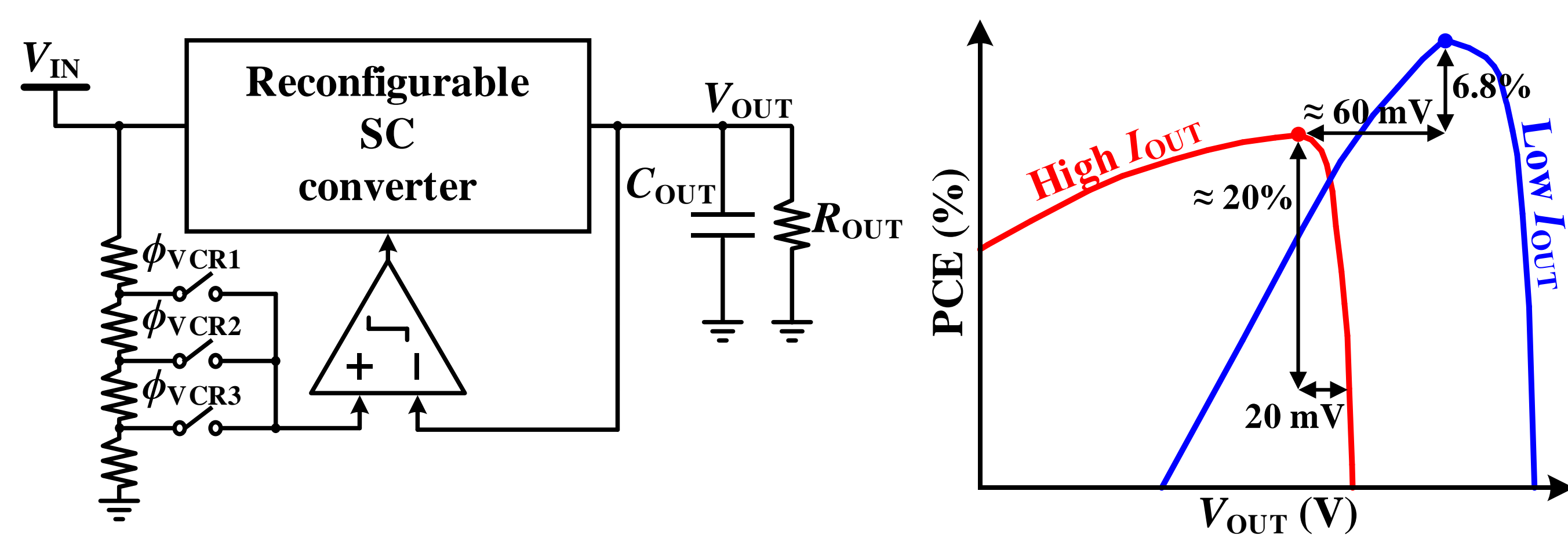
An Overlapped-Conversion-Ratio Modulation for Tri-Loop 3-D Reconfigurable SC Feedback Network

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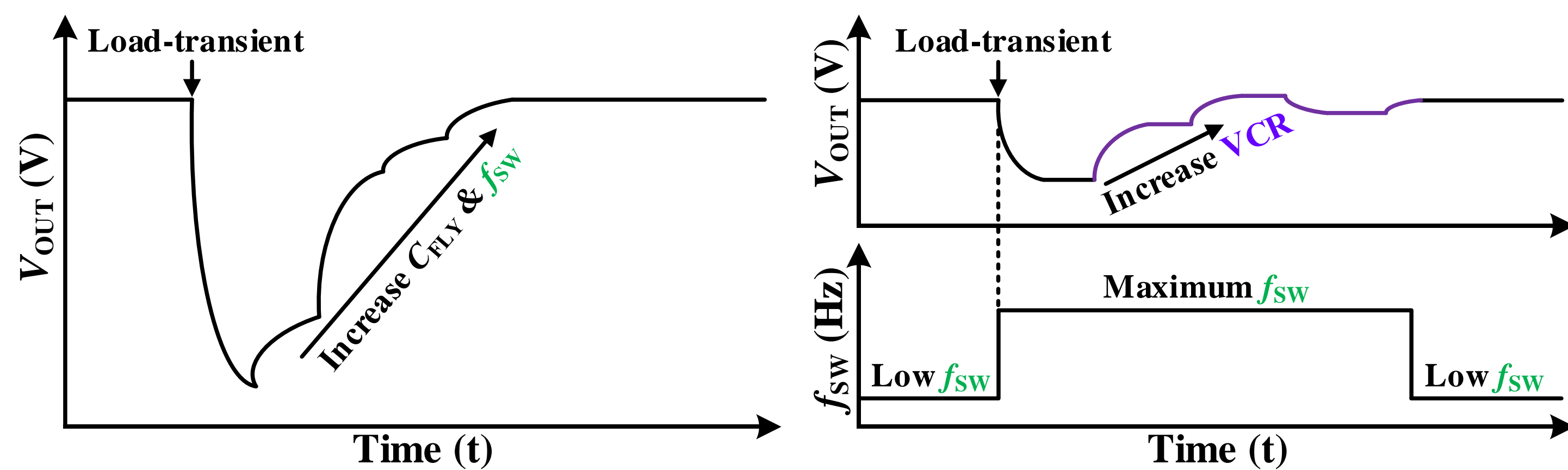


Conventional Feedback Network

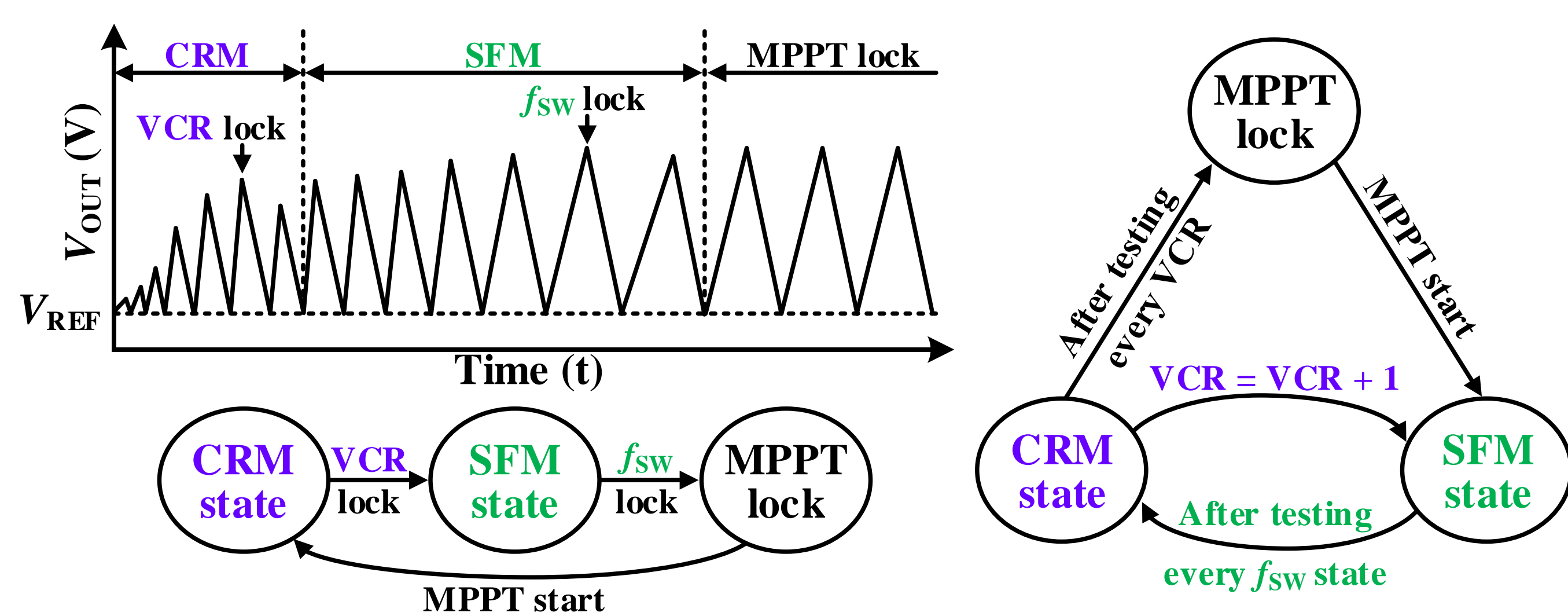
* Conventional fixed conversion ratio modulation (CRM) scheme



* Conventional fast transient tracking schemes

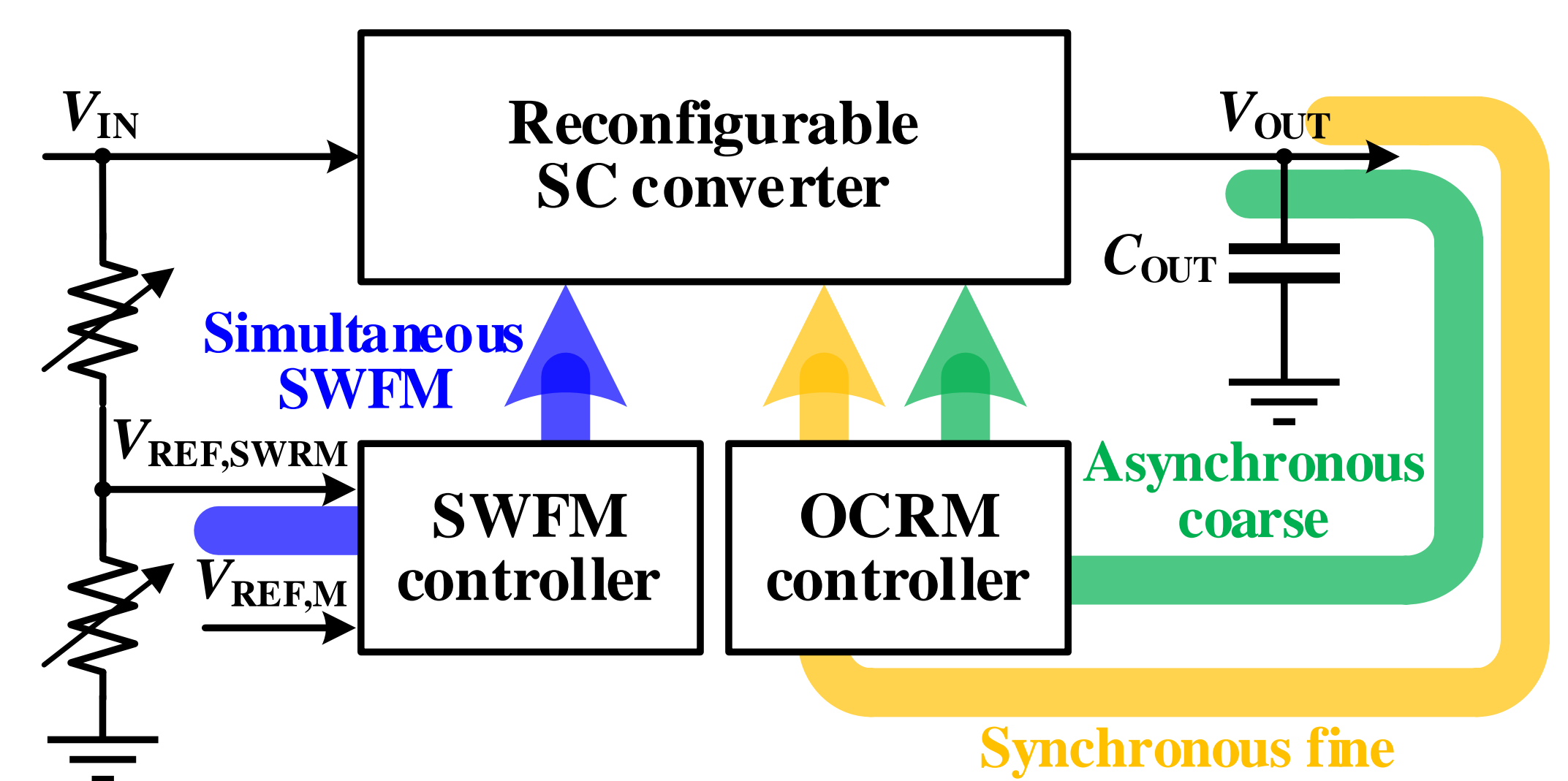
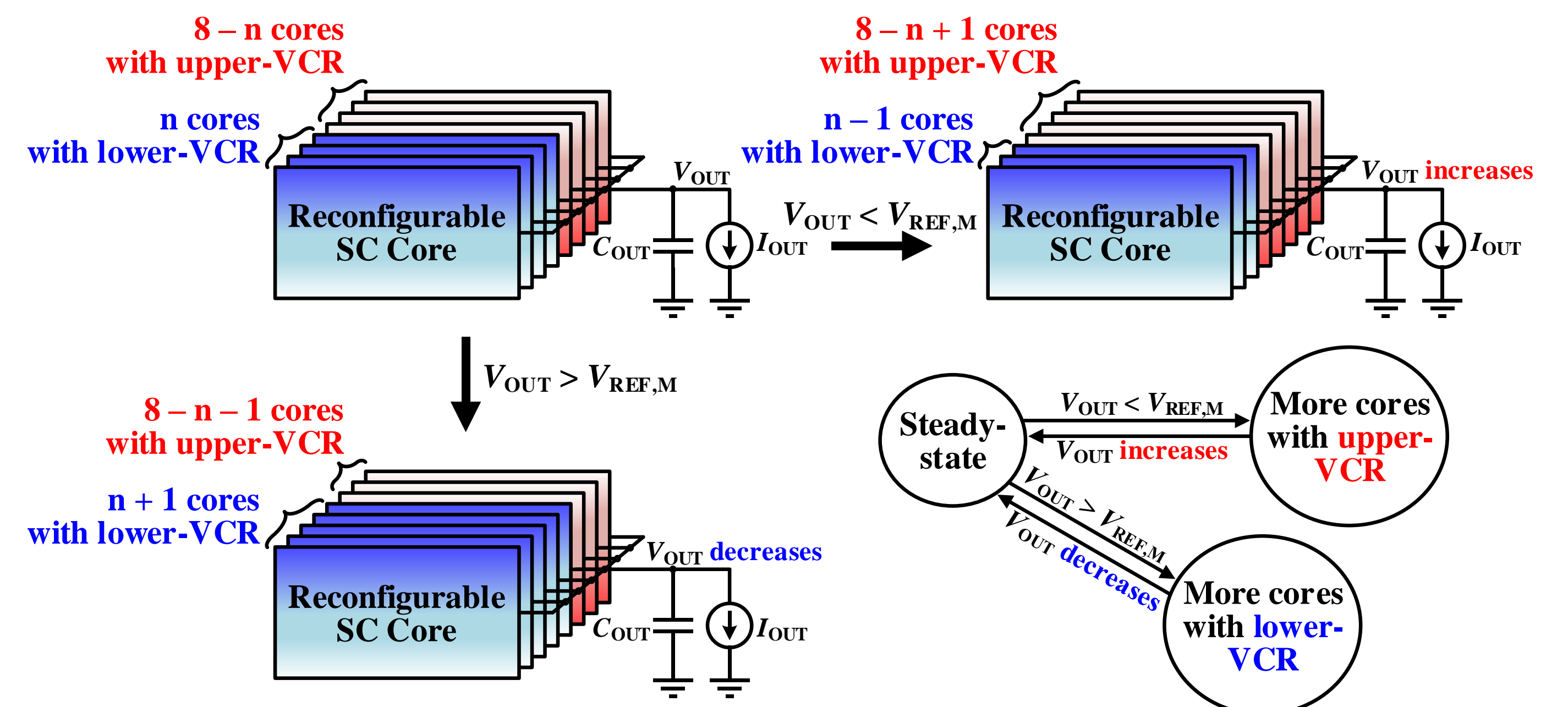


* Conventional SC converter MPPT schemes

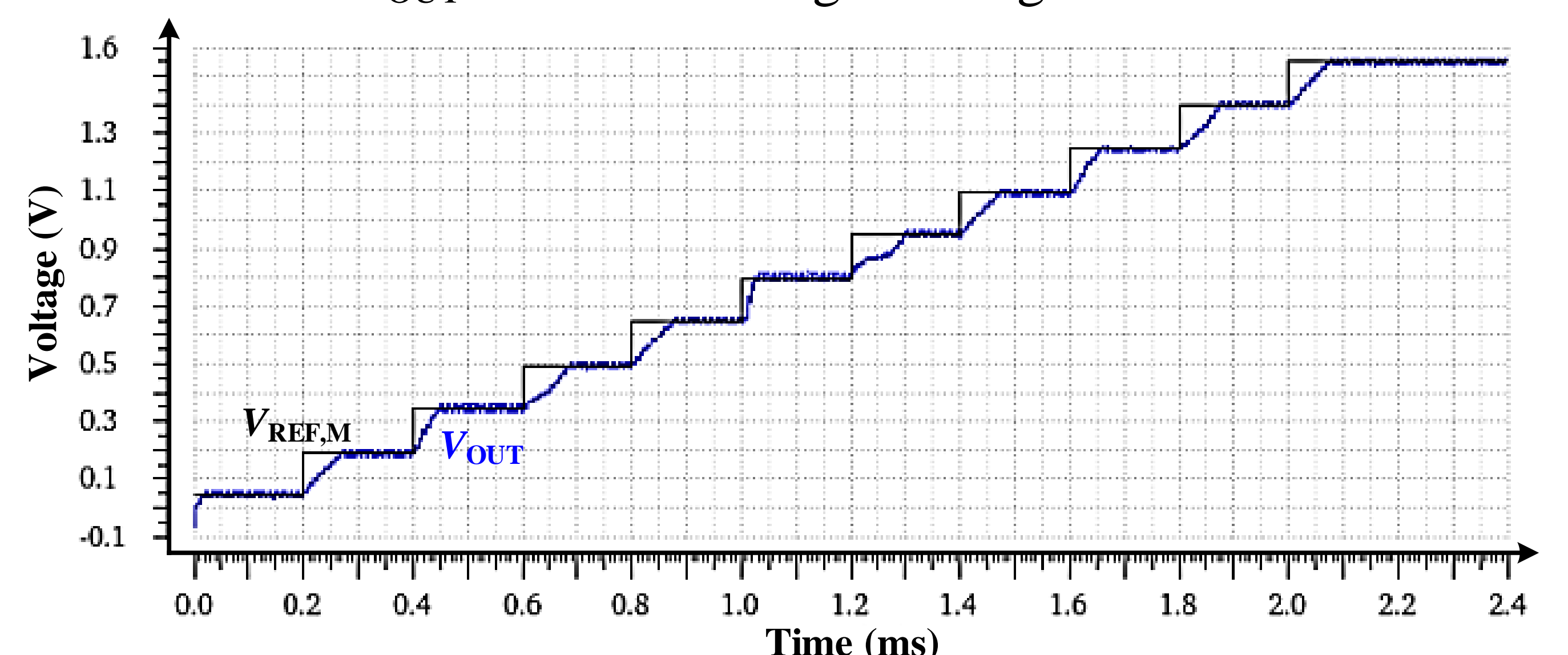


Proposed Feedback Network

* Proposed overlapped-CRM scheme

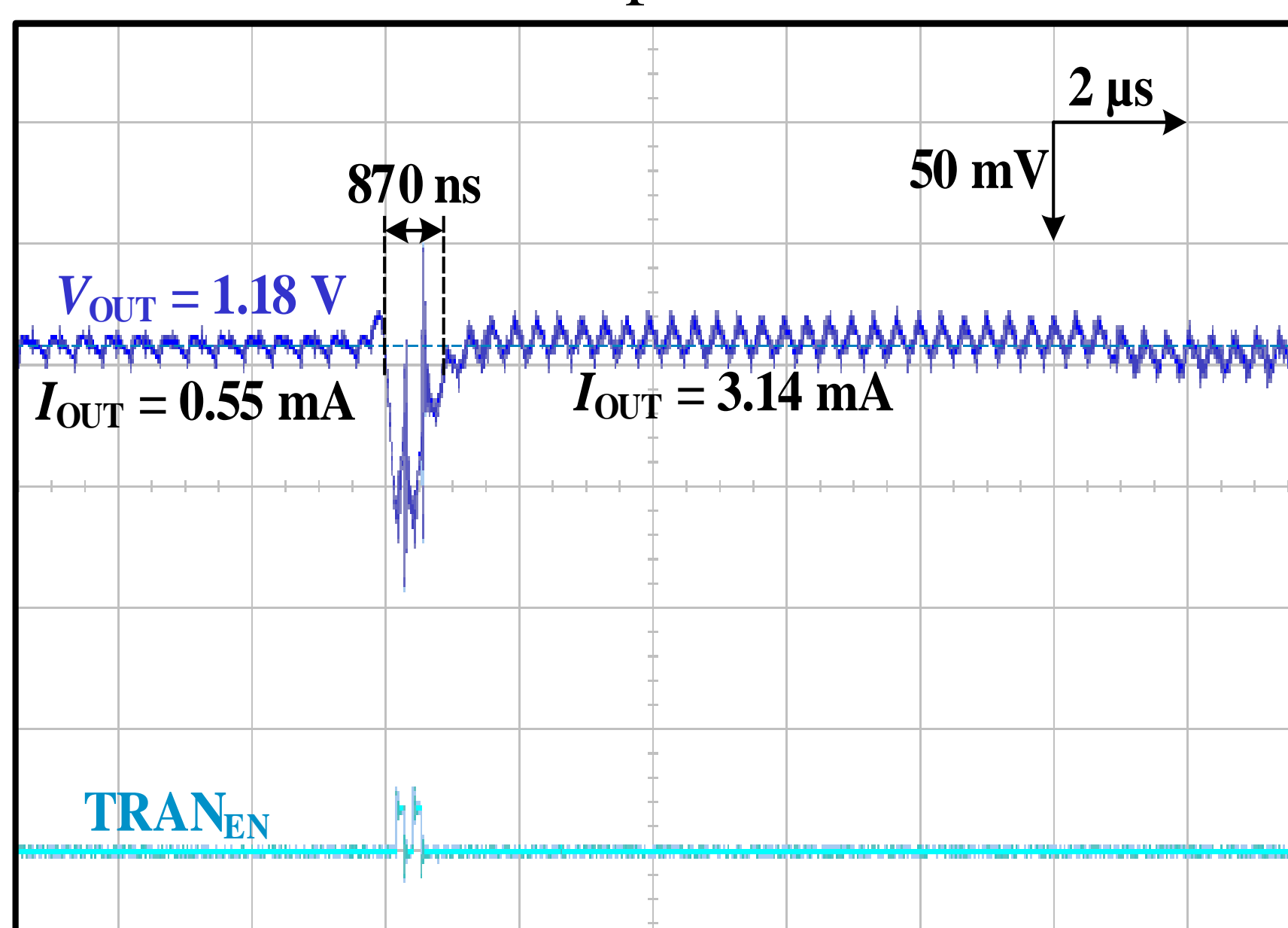


* Simulated VOUT waveform using reconfigurable SC converter

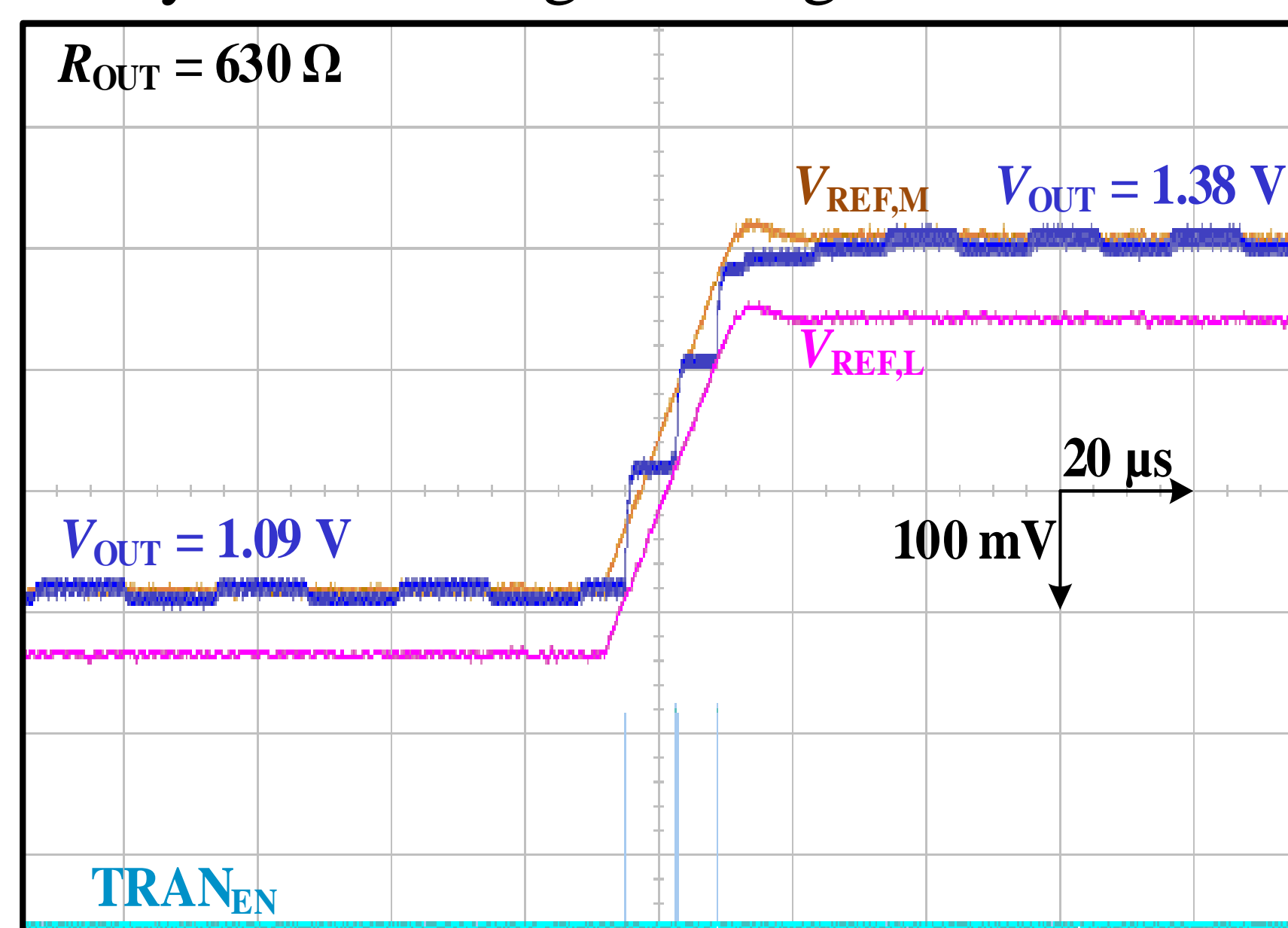


Measurement Results

* Load transient response



* Dynamic voltage scaling



	Liu, ISSCC'15	Salem, ISSCC'14	Rawy, ASSCC'17	Cheng, TCASI'20	This Work
Technology (nm)	180	250	65	180	180
Topology	Monolithic SC	4-b SC	SPSC	SPSC	SPSC
Feedforward control	N/A	N/A	CRM	CRM	N/A
Feedback control	CRM → SFM	CRM → SFM	SFM & SWM	SFM & PSM	CRM & SFM & SWM
Seamless CRM	No	No	No	No	Yes
Fully-integrated	Off-chip COUT	Off-chip COUT	Off-chip COUT	Off-chip COUT	Yes
VIN (V)	0.45–3	2.5	0.35–1	0.53–0.7	1.8
VOUT (V)	3.3	0.1–2.2	1	1.2	1.05–1.45
# of VCRs	14	15	6	3	5
Interleaving phase	1	1	1	4	8
Settling time (μs)	208	8	0*	34	0.87
Peak PCE (%)	81	85	88	80.8	80.2
PCEOL–PCECL (%)	8	NR	NR	NR	0.2–1.9
POUT (μW)	<50	30–4940	0.1–300	9–63*	<3700
CFLY (nF)	N/R	3	0.24	2.62	2.8
Active area (mm ²)	4	4.645	0.54	4.04	2.84

* Only small IOUT step response (w/o CRM) is reported

** COUT included

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