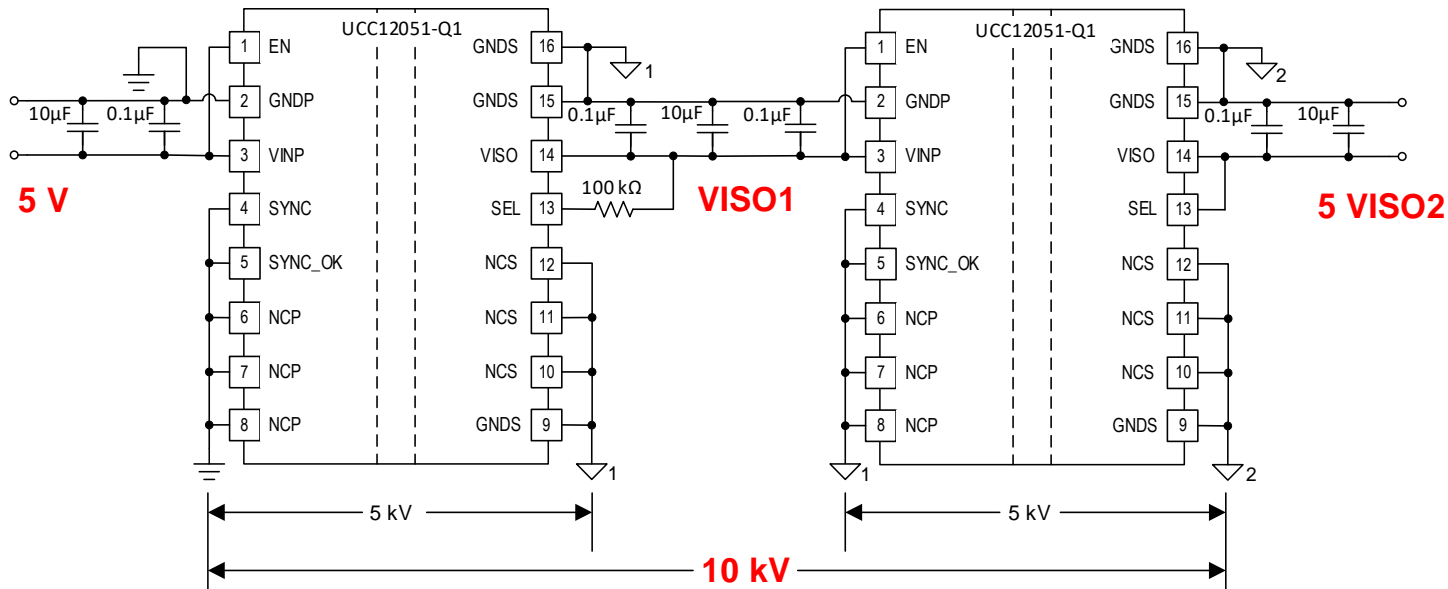


Achieving Higher Isolation Voltage Rating with UCC12051-Q1

S. Mappus, 02/26/2024

UCC12051-Q1: Double Isolation Voltage



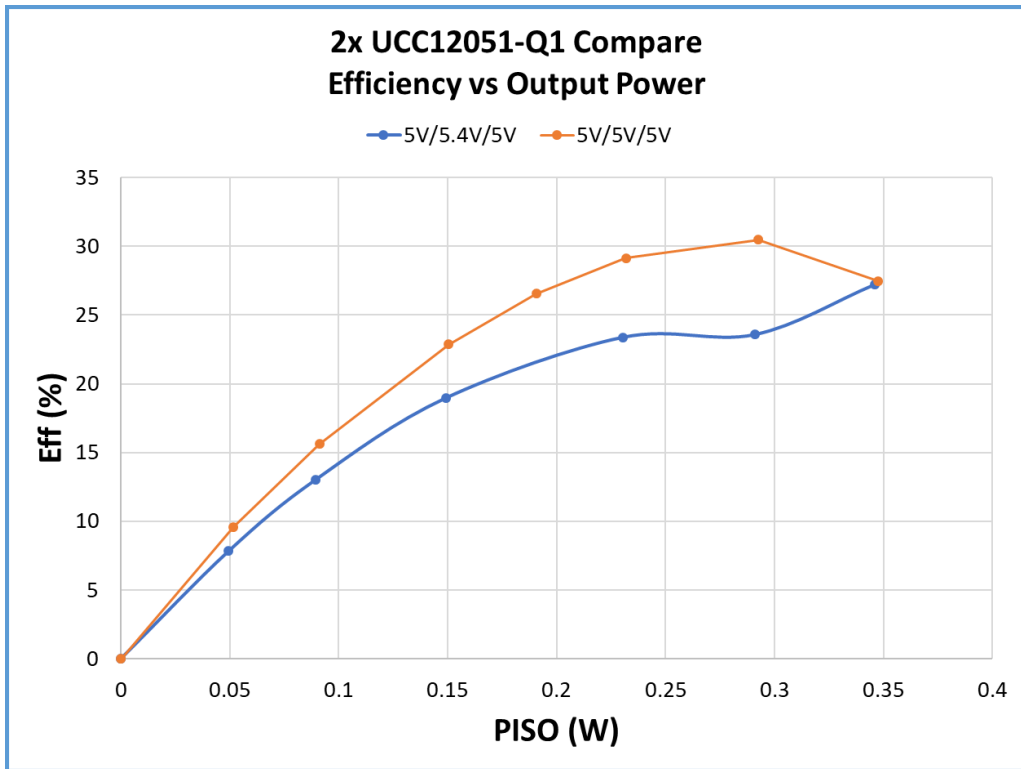
- Isolation voltage is double
- PD3 achievable through increased creepage clearance
- Total efficiency is lower according to: $\eta_{\text{Total}} = \eta_1 * \eta_2$, refer to efficiency curves in this report and UCC12051-Q1 data sheet
- PISO2 limited to 345mW
- Additional VISO1 capacitance recommended

UCC12051-Q1: 2x UCC12051-Q1 in series



- 2x UCC12050EVM-052 EVMs in series
- Resistor load shown for transient response only
- E-load used for efficiency curve

UCC12051-Q1: Efficiency



5V/5.4V/5V

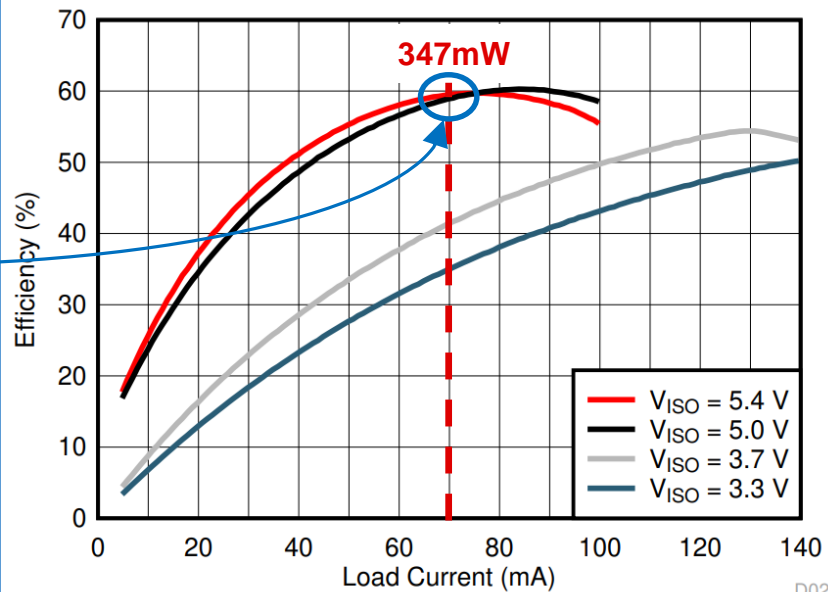
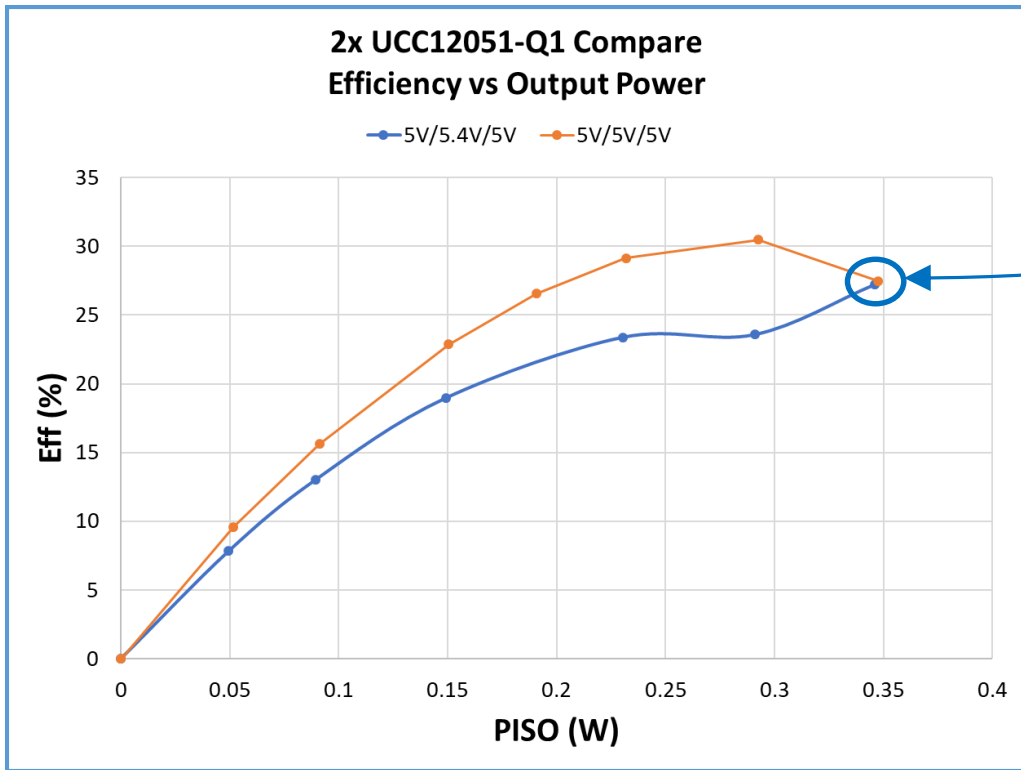
VIN(V)	IIN(mA)	VISO(V)	IISO(mA)	PIN(W)	PISO(W)	eff(%)
5.01	114.48	4.99	0.00	0.57	0.00	0.00
5.00	126.31	4.99	9.91	0.63	0.05	7.83
5.00	137.27	4.99	17.92	0.69	0.09	13.02
5.00	157.21	4.99	29.87	0.79	0.15	18.96
5.01	196.92	4.99	46.16	0.99	0.23	23.38
5.00	246.73	4.99	58.28	1.23	0.29	23.57
5.00	254.25	4.99	69.35	1.27	0.35	27.21
5.00	267.53	3.11	81.62	1.34	0.25	18.96
	VREG = 0.0601%	0-346mW				

5V/5V/5V

VIN(V)	IIN(mA)	VISO(V)	IISO(mA)	PIN(W)	PISO(W)	eff(%)
5.00	97.82	4.99	0.00	0.49	0.00	0.00
5.00	107.98	4.99	10.36	0.54	0.05	9.58
5.00	116.63	4.99	18.26	0.58	0.09	15.62
5.00	131.34	4.99	30.13	0.66	0.15	22.89
5.00	143.47	4.99	38.21	0.72	0.19	26.57
5.00	158.97	4.99	46.44	0.80	0.23	29.15
5.00	191.98	4.99	58.62	0.96	0.29	30.47
5.01	252.40	4.99	69.61	1.26	0.35	27.49
5.01	206.09	0.80	13.00	1.03	0.01	1.01
	VREG = 0.0441%	0-347mW				

- VREG as good as single UCC12051-Q1 case

UCC12051-Q1: Efficiency vs Data Sheet Efficiency

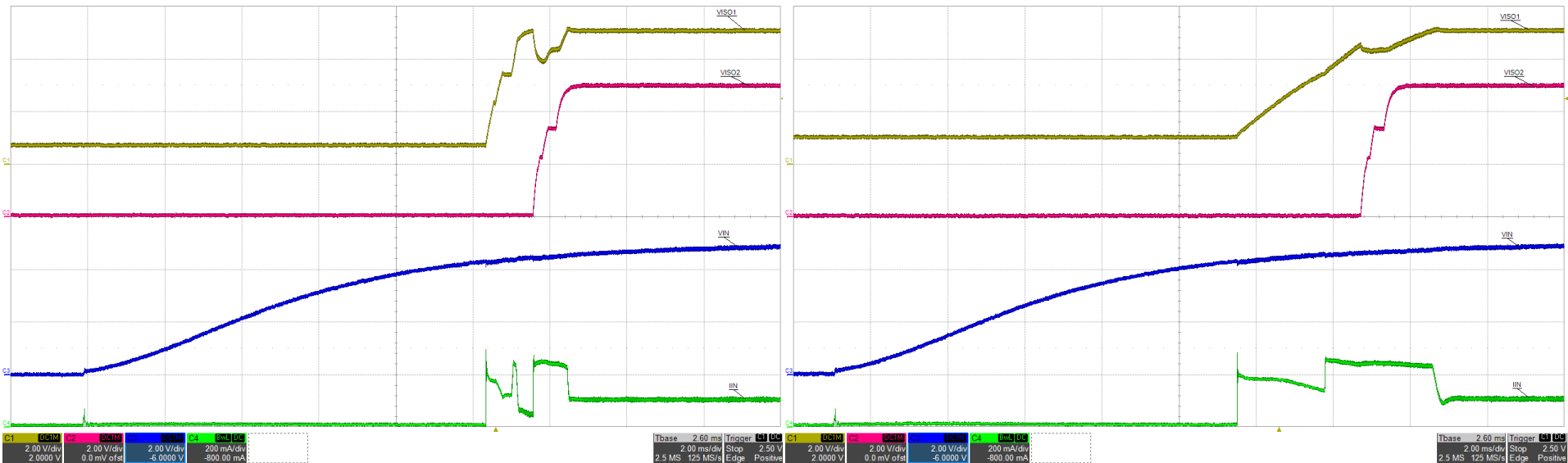


V_{INP} = 5.0 V

T_A = 25°C

D021

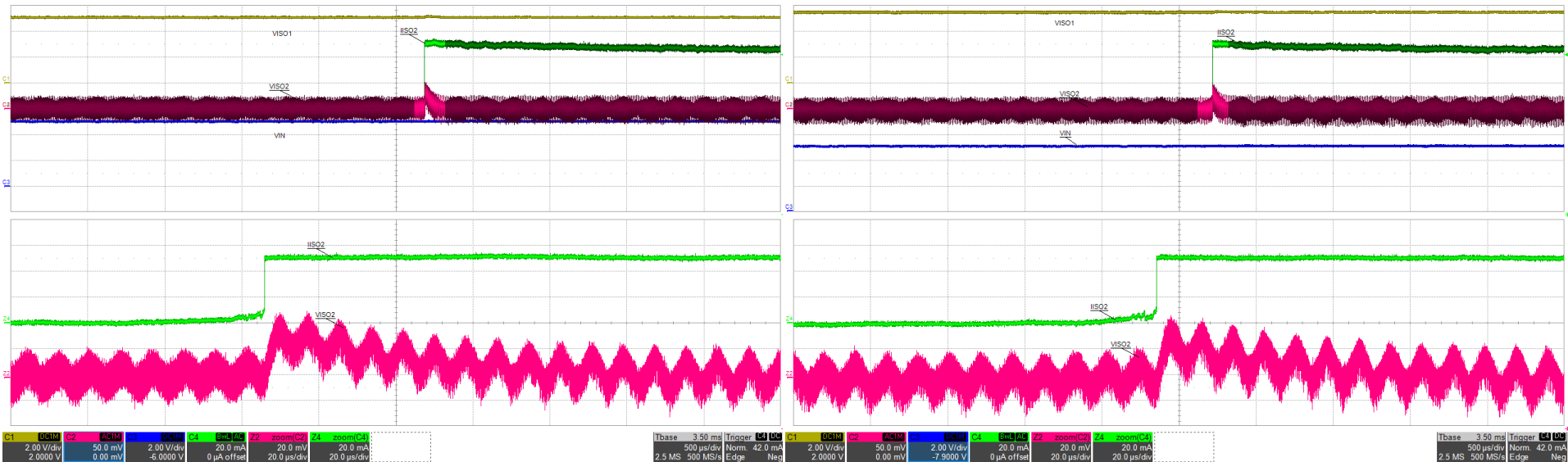
UCC12051-Q1: No-Load Startup



- 2x UCC12051 in series 5V-to-5V-to-5V
 - All CIN, CISO caps are 10 μ F
 - VISO1 nearly at VIN UVLO_OFF
 - Needs more capacitance to support VISO2 inrush current demand

- 2x UCC12051 in series 5V-to-5V-to-5V
 - Add 100 μ F//10 μ F CIN at VISO1

UCC12051-Q1: Load Transient



- 2x UCC12051 in series 5V-to-5V-to-5V
 - 0mA-to-50mA (250mW)

- 2x UCC12051 in series 5V-to-5.4V-to-5V
 - 0mA-to-50mA (250mW)