

DC-DC CONVERTERS

SINGLE/DUAL/TRIPLE OUTPUT, UP TO 40 WATT

ISOLATED, WIDE INPUT RANGE

MWA40/B2A SERIES



FEATURES

- 2:1 Input Range
- 1600Vdc Isolation Voltage
- Miniature Package: 2" x 2" x 0.4"
- Efficiency to 90%
- Six-Sided Shielding
- Remote ON/OFF Control
- Over Current Protection
- Over Temperature Protection
- Over Voltage Protection
- Under Voltage Protection
- Short Circuit Protection
- Safety Meets: IEC/UL/EN60950-1
- RoHS Compliant
- REACH Compliant
- CE Mark

SELECTION GUIDE All specifications are typical at 230Vac input, full load and 25°C, unless otherwise noted.

Input Range Vdc	Output Voltage Vdc	Output Current at Full Load		Input Current at No Load mA	Efficiency %	Model Number*	Maximum Capacitor Load µF
		Min. Load mA	Full Load A				
9 - 18	1.5	0	8000	110	84	MWA40-12S1.5/B2A	45000
9 - 18	1.8	0	8000	110	82	MWA40-12S1.8/B2A	37700
9 - 18	2.5	0	8000	110	84	MWA40-12S2.5/B2A	27000
9 - 18	3.3	0	8000	175	86	MWA40-12S3.3/B2A	21000
9 - 18	5	0	8000	225	86	MWA40-12S5/B2A	13600
9 - 18	12	0	3333	255	86	MWA40-12S12/B2A	2360
9 - 18	15	0	2666	310	87	MWA40-12S15/B2A	1510
18 - 36	1.5	0	8000	40	81	MWA40-24S1.5/B2A	45000
18 - 36	1.8	0	8000	40	83	MWA40-24S1.8/B2A	37700
18 - 36	2.5	0	8000	40	86	MWA40-24S2.5/B2A	27000
18 - 36	3.3	0	8000	60	87	MWA40-24S3.3/B2A	21000
18 - 36	5	0	8000	80	89	MWA40-24S5/B2A	13600
18 - 36	12	0	3333	70	88	MWA40-24S12/B2A	2360
18 - 36	15	0	2666	85	89	MWA40-24S15/B2A	1510
36 - 75	1.5	0	8000	25	82	MWA40-48S1.5/B2A	45000
36 - 75	1.8	0	8000	25	84	MWA40-48S1.8/B2A	37700
36 - 75	2.5	0	8000	25	86	MWA40-48S2.5/B2A	27000
36 - 75	3.3	0	8000	35	88	MWA40-48S3.3/B2A	21000
36 - 75	5	0	8000	40	90	MWA40-48S5/B2A	13600
36 - 75	12	0	3333	50	89	MWA40-48S12/B2A	2360
36 - 75	15	0	2666	50	89	MWA40-48S15/B2A	1510

* The output requires a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification.

* Any condition of dual output (3.3Vout, 5Vout) rated lout current do not exceed 8A of total output currents.

MWA40/B2A SERIES

SELECTION GUIDE All specifications are typical at 230Vac input, full load and 25°C, unless otherwise noted.

Input Range Vdc	Output Voltage Vdc	Output Current at Full Load		Input Current at No Load mA	Efficiency %	Model Number*	Maximum Capacitor Load µF
		Min. Load mA	Full Load A				
9 - 18	±12	±144	±1800	30	85	MWA40-12-12/B2A	±1200
9 - 18	±15	±112	±1400	35	85	MWA40-12-15/B2A	±750
9 - 18	3.3 / 5	0	4000 / 4000	325	85	MWA40-12S33S5/B2A	11000 / 6800
9 - 18	3.3 / ±12	600 / ±40	6000 / ±400	215	84	MWA40-12S33-12/B2A	13000 / ±330
9 - 18	3.3 / ±15	600 / ±30	6000 / ±300	230	84	MWA40-12S33-15/B2A	13000 / ±110
9 - 18	5 / ±12	600 / ±40	6000 / ±400	280	86	MWA40-12S5-12/B2A	6800 / ±330
9 - 18	5 / ±15	600 / ±30	6000 / ±300	255	86	MWA40-12S5-15/B2A	6800 / ±110
18 - 36	±12	±144	±1800	20	87	MWA40-24-12/B2A	±1200
18 - 36	±15	±112	±1400	20	87	MWA40-24-15/B2A	±750
18 - 36	3.3 / 5	0	4000 / 4000	80	86	MWA40-24S33S5/B2A	11000 / 6800
18 - 36	3.3 / ±12	600 / ±40	6000 / ±400	65	85	MWA40-24S33-12/B2A	13000 / ±330
18 - 36	3.3 / ±15	600 / ±30	6000 / ±300	65	85	MWA40-24S33-15/B2A	13000 / ±110
18 - 36	5 / ±12	600 / ±40	6000 / ±400	60	87	MWA40-24S5-12/B2A	6800 / ±330
18 - 36	5 / ±15	600 / ±30	6000 / ±300	75	87	MWA40-24S5-15/B2A	6800 / ±110
36 - 75	±12	±144	±1800	15	87	MWA40-48-12/B2A	±1200
36 - 75	±15	±112	±1400	15	87	MWA40-48-15/B2A	±750
36 - 75	3.3 / 5	0	4000 / 4000 ⁽³⁾	45	88	MWA40-48S33S5/B2A	11000 / 6800
36 - 75	3.3 / ±12	600 / ±40	6000 / ±400	35	86	MWA40-48S33-12/B2A	13000 / ±330
36 - 75	3.3 / ±15	600 / ±30	6000 / ±300	35	86	MWA40-48S33-15/B2A	13000 / ±110
36 - 75	5 / ±12	600 / ±40	6000 / ±400	30	88	MWA40-48S5-12/B2A	6800 / ±330
36 - 75	5 / ±15	600 / ±30	6000 / ±300	40	88	MWA40-48S5-15/B2A	6800 / ±110

* The output requires a minimum loading on the output to maintain specified regulation. Operation under no-load condition will not damage these devices, however they may not meet all listed specification.

* Any condition of dual output (3.3Vout, 5Vout) rated lout current do not exceed 8A of total output currents.

MWA40/B2A SERIES

Input Specifications			Output Specifications			
Operating input voltage range, Vdc	9 Min., 12 Typ., 18 Max.	12Vin(nom)	Voltage accuracy, %	-1 Min., 1 Max.	Single/Dual	
	18 Min., 24 Typ., 36 Max.	24Vin(nom)		-1 Min., 1 Max.	Triple, 3.3Vout, 5Vout	
	36 Min., 48 Typ., 75 Max.	48Vin(nom)		-5 Min., 5 Max.	Triple, 12Vout, 15Vout	
Start up voltage, Vdc	9 Max.	12Vin(nom)	Line regulation, %		Low Line to High Line at Full Load	
	17.8 Max.	24Vin(nom)		-0.5 Min., 0.5 Max.	Single/Dual	
	36 Max.	48Vin(nom)		-1 Min., 1 Max.	Triple, 3.3Vout, 5Vout	
Shutdown voltage, Vdc	7 Min., 8 Typ., 8.8 Max.	12Vin(nom)	Load regulation, %	-5 Min., 5 Max.	Triple, 12Vout, 15Vout	
	15 Min., 16 Typ., 17.5 Max.	24Vin(nom)			Min. load to full load, Single/Dual	
	32.5 Min., 34 Typ., 35.5 Max.	48Vin(nom)		-0.5 Min., 0.5 Max.	Single	
Start up time, ms	25 Typ.	Constant resistive load, Power up	Cross regulation, %	-1 Min., 1 Max.	Dual	
	25 Typ.	Remote ON/OFF			Main output: (3.3Vout, 5Vout) 10% to 100% with 10% to 100% balanced on auxiliaries, Triple	
	36 Max.	12Vin(nom), 100 ms, Max.		-2 Min., 2 Max.	Triple, 3.3Vout, 5Vout	
Input surge voltage, Vdc	50 Max.	24Vin(nom),	Voltage adjustability, %	-5 Min., 5 Max.	Triple, 12Vout, 15Vout	
	100 Max.	48Vin(nom)			Auxiliary outputs 10% to 100% balanced on all outputs.	
				-5 Min., 5 Max.	Asymmetrical load 25%/100% FL, Dual	
Input filter	L-C type		Ripple and noise, mVp-p		Main output: (3.3Vout, 5Vout) 100% load, auxiliary 100%, other auxiliary 25% to 100% load or main output: (3.3Vout, 5Vout) 25%, auxiliary 25%, other auxiliary 25% to 100%, Triple	
		Referred to -Vin pin		-1 Min., 1 Max.	Triple, 3.3Vout, 5Vout	
Remote ON/OFF Control, Vdc	Open or 3.5 - 12	Positive logic DC-DC ON		Temperature coefficient, %/°C	-5 Min., 5 Max.	Triple, 12Vout, 15Vout
	Short or 0 - 1.2	DC-DC OFF	Transient response recovery time, μs		-10 Min., 10 Max.	Single and Dual output (not including Dual Positive and triple)
	-0.5 Min., 0.5 Max.	Input current of Ctrl pin				20MHz bandwidth
	2.5 Typ.	Remote OFF input current			With a 0.1μF/50V MLCC	
			Over voltage protection, Vdc	50 Typ.	Single, Others	
				75 Typ.	Single, 12Vout, 15Vout	
		120 Typ.		Dual, 12Vout		
		Over load protection, %	150 Typ.	Dual, 15Vout		
			50 Typ.	Triple, 3.3Vout, 5Vout		
			75 Typ.	Triple, 12Vout, 15Vout		
		Short circuit protection		With a 1μF ceramic output capacitors		
			100 Typ.	Dual Positive, 3.3Vout, 5Vout		

MWA40/B2A SERIES

General Specifications

Isolation voltage, Vdc	1 minute	Input to output	1600 Min.		
		Input (output) to case	1600 Min.		
Isolation resistance, GΩ	500Vdc		1 Min.		
Isolation capacitance, pF					1000 Max.
Switching frequency, kHz		Others	270 Min.	300 Typ.	330 Max.
		Dual Positive, 5Vout	270 Min.	300 Typ.	330 Max.
		Dual Positive, 3.3Vout	450 Min.	500 Typ.	550 Max.

Environmental Specifications

Operating ambient temperature, °C		With derating	-40 Min.		85 Max.
Maximum case temperature, °C					100 Max.
Over temperature protection, °C				115 Typ.	
Storage temperature range, °C			-55 Min.		125 Max.
Thermal impedance, °C/W		Without heat-sink		9.2 Typ.	
		With heat-sink		7.6 Typ.	
		With heat-sink (500LFM)		2.8 Typ.	
Thermal shock			MIL-STD-810F		
Vibration			MIL-STD-810F		
Relative humidity			5% to 95% RH		

Physical Specifications

Design meet safety standard	IEC/UL/EN60950-1, UL:E193009, CB:UL(Demko)	
Case material	Nickel-coated copper	
Base material	FR4 PCB	
Potting material	Epoxy (UL94 V-0)	
Weight, g	60g (2.11oz)	
Dimensions	2" × 2" × 0.4" (50.8mm × 50.8mm × 10.2mm)	
MTBF	9.224 × 10 ⁵ hrs, MIL-HDBK-217F, Full load	

EMC Specifications

Specifications	Conditions		Level
EMI	EN55032	With external components	Class A Class B
ESD	EN61000-4-2	Air ±8kV and Contact ±6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10V/m	Perf. Criteria A
Fast transient	EN61000-4-4	±2KV, With an external input filter capacitor (Nippon chemi-con KY series, 220 μF/100V)	Perf. Criteria B
Surge	EN61000-4-5	±1KV, With an external input filter capacitor (Nippon chemi-con KY series, 220 μF/100V)	Perf. Criteria B
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100 A/m continuous; 1000 A/m 1 second	Perf. Criteria A

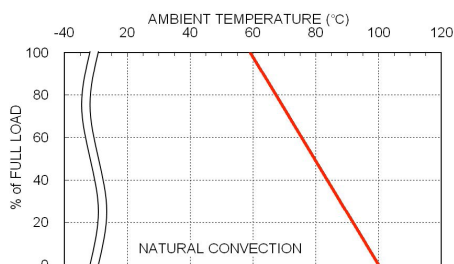
Note:

- For further information, please contact Polytron Devices.

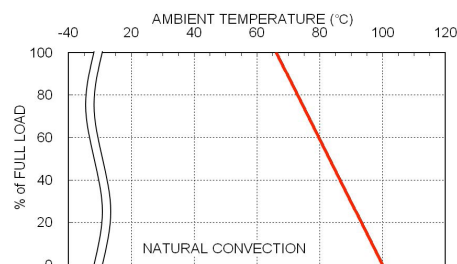
CAUTION: This power module is not internally fused. An input line fuse must always be used.

MWA40/B2A SERIES

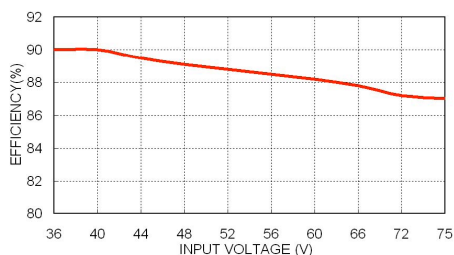
Characteristic Curve



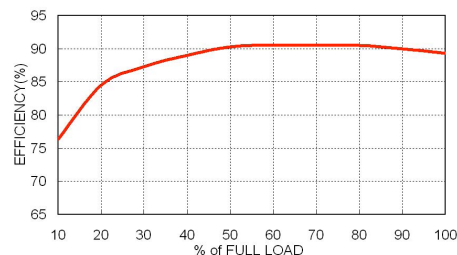
MWA40-48S5 Derating Curve



MWA40-48S5 Derating Curve With Heat Sink



MWA40-48S5 Efficiency vs. Input Voltage



MWA40-48S5 Efficiency vs. Output Load

Fuse Consideration

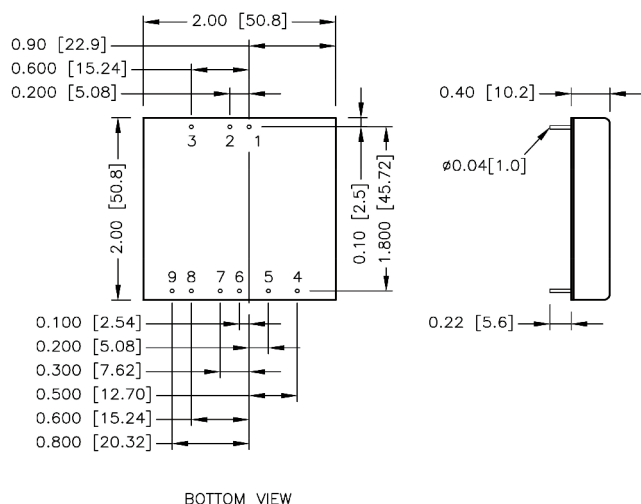
Modules	Fuse Rating (A)	Fuse Type
MWA40-12SXX, MWA40-12-XX, MWA40-12SX-XX	8	Fast-Acting
MWA40-24SXX, MWA40-24-XX, MWA40-S24-XX	4	Slow-Blow
MWA40-48SXX, MWA40-48-XX, MWA40-48SX-XX	2	Slow-Blow

Note:

1. This power module is not internally fused. An input line fuse must always be used.
2. This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.
3. To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.
4. The table is based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

MWA40/B2A SERIES

Mechanical Drawing



PIN CONNECTION

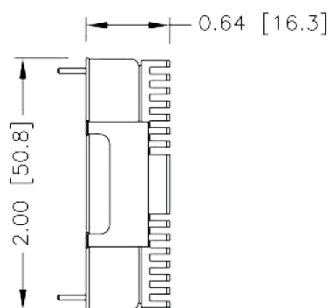
PIN	SINGLE	DUAL	DUAL POSITIVE	TRIPLE
1	+Vin	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin	-Vin
3	Ctrl	Ctrl	Ctrl	Ctrl
4	NC	No pin	3.3Vout	+Aux
5	-Sense	+Vout	Common	Common
6	+Sense	Common	NC	-Aux
7	+Vout	Common	NC	+Vout
8	-Vout	-Vout	5Vout	Common
9	Trim	Trim	Common	NC

*NC: No Connection

1. All dimensions in inches (mm)
2. Tolerance: $x.xx \pm 0.02$ ($x.x \pm 0.5$) $x.xxx \pm 0.01$ ($x.xx \pm 0.25$)
3. Pin pitch tolerance ± 0.01 (0.25)
4. Pin dimension tolerance ± 0.004 (0.1)

Heat-Sink Options

-HC (Heat-sink with clamps)

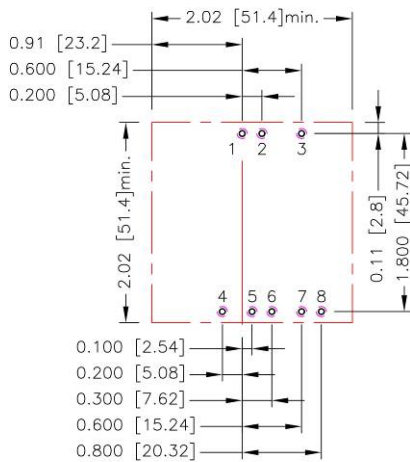


1. All dimensions in inches (mm)

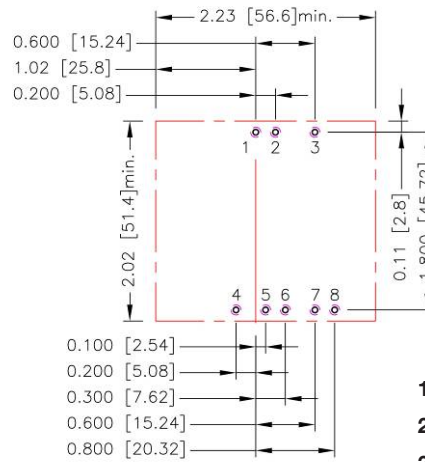
MWA40/B2A SERIES

Recommended Pad Layout

Standard



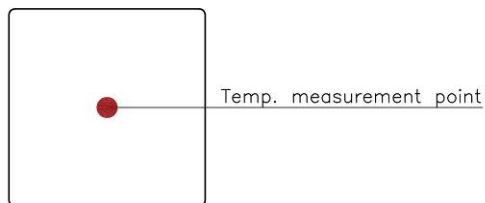
-HC



1. All dimensions in inches (mm)
2. Pad size (lead free recommended)
3. Through hole 1, 2, 3, 4, 5, 6, 7, 8: 0.051 (1.30)
4. Top view pad 1, 2, 3, 4, 5, 6, 7, 8: 0.064 (1.63)
5. Bottom view pad 1, 2, 3, 4, 5, 6, 7, 8: 0.102 (2.60)

Thermal Considerations

Thermal test condition with vertical direction by natural convection (20LFM).



1. The power module operates in a variety of thermal environments.
2. Sufficient cooling should be provided to help ensure reliable operation of the unit.
3. Heat is removed by conduction, convection and radiation to the surrounding environment.
4. Proper cooling can be verified by measuring the point.
5. The temperature at this location should not exceed 105°C.
6. When operating, adequate cooling must be provided to maintain the test point temperature at or below 105°C.
7. Although the maximum point temperature of the power modules is 105°C, you can limit this temperature to a lower value for extremely high reliability.

MWA40/B2A SERIES

Output Voltage Adjustment Trim Up

EXTERNAL OUTPUT TRIMMING

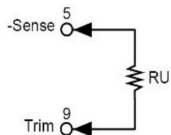
Output can be externally trimmed by using the method shown below.

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point of the module.

Single Output

1. This is accomplished by connecting an external resistor between the Trim pin and either the +Sense or -Sense pins.
2. With an external resistor between the Trim and -Sense pin, the output voltage set point increases.
3. With an external resistor between the Trim and +Sense pin, the output voltage set point decreases.
4. The external Trim resistor needs to be at least 0.16 W of rated power.

Single Output



□□S1.5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.515	1.53	1.545	1.56	1.575	1.59	1.605	1.62	1.635	1.65
RU (k Ω)	4.578	2.605	1.227	0.808	0.557	0.389	0.27	0.18	0.11	0.054

□□S1.8

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.818	1.836	1.854	1.872	1.89	1.908	1.926	1.944	1.962	1.98
RU (k Ω)	11.639	5.205	3.06	1.988	1.344	0.915	0.609	0.379	0.2	0.057

□□S2.5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	2.525	2.55	2.575	2.6	2.625	2.65	2.675	2.7	2.725	2.75
RU (k Ω)	37.076	16.675	9.874	6.474	4.434	3.074	2.102	1.374	0.807	0.354

□□S33

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.630
RU (k Ω)	57.930	26.165	15.577	10.283	7.106	4.988	3.476	2.341	1.459	0.753

□□S5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	5.050	5.100	5.150	5.200	5.250	5.300	5.350	5.400	5.450	5.500
RU (k Ω)	36.570	16.580	9.917	6.585	4.586	3.253	2.302	1.588	1.032	0.588

□□S12

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	12.120	12.240	12.360	12.480	12.600	12.720	12.840	12.960	13.080	13.200
RU (k Ω)	367.910	165.950	98.636	64.977	44.782	31.318	21.701	14.488	8.879	4.391

□□S15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	15.150	15.300	15.450	15.600	15.750	15.900	16.050	16.200	16.350	16.500
RU (k Ω)	404.180	180.590	106.060	68.796	46.437	31.531	20.883	12.898	6.687	1.718

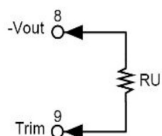
□□-12

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	± 12.12	± 12.24	± 12.36	± 12.48	± 12.6	± 12.72	± 12.84	± 12.96	± 13.08	± 13.2
RU (k Ω)	218.21	98.105	58.07	38.052	26.042	18.035	12.316	8.026	4.69	2.021

□□-15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	± 15.15	± 15.3	± 15.45	± 15.6	± 15.75	± 15.9	± 16.05	± 16.2	± 16.35	± 16.5
RU (k Ω)	268.29	120.64	71.429	46.822	32.058	22.215	15.184	9.911	5.81	2.529

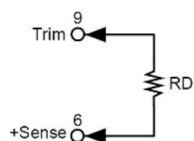
Dual Output



MWA40/B2A SERIES

Output Voltage Adjustment Trim Down

Single Output



□□S1.5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.485	1.47	1.455	1.44	1.425	1.41	1.395	1.38	1.365	1.35
RD (k Ω)	5.704	2.571	1.527	1.005	0.692	0.483	0.334	0.222	0.135	0.065

□□S1.8

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	1.782	1.764	1.746	1.728	1.71	1.692	1.674	1.656	1.638	1.62
RD (k Ω)	14.66	6.57	3.874	2.525	1.716	1.177	0.792	0.503	0.278	0.098

□□S2.5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	2.475	2.45	2.425	2.4	2.375	2.35	2.325	2.3	2.275	2.25
RD (k Ω)	49.641	22.481	13.428	8.902	6.186	4.375	3.082	2.112	1.358	0.754

□□S33

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.970
RD (k Ω)	69.470	31.235	18.490	12.117	8.294	5.745	3.924	2.559	1.497	0.647

□□S5

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	4.950	4.900	4.850	4.800	4.750	4.700	4.650	4.600	4.550	4.500
RD (k Ω)	45.533	20.612	12.306	8.152	5.660	3.999	2.812	1.922	1.230	0.676

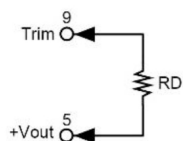
□□S12

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	11.880	11.760	11.640	11.520	11.400	11.280	11.160	11.040	10.920	10.800
RD (k Ω)	460.990	207.950	123.600	81.423	56.118	39.249	27.199	18.162	11.132	5.509

□□S15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	14.850	14.700	14.550	14.400	14.250	14.100	13.950	13.800	13.650	13.500
RD (k Ω)	499.820	223.410	131.270	85.204	57.563	39.136	25.974	16.102	8.424	2.282

Dual Output



□□-12

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	± 11.88	± 11.76	± 11.64	± 11.52	± 11.4	± 11.28	± 11.16	± 11.04	± 10.92	± 10.8
RD (k Ω)	273.44	123.02	72.874	47.803	32.76	22.732	15.568	10.196	6.017	2.675

□□-15

ΔV (%)	1	2	3	4	5	6	7	8	9	10
Vout (V)	± 14.85	± 14.7	± 14.55	± 14.4	± 14.25	± 14.1	± 13.95	± 13.8	± 13.65	± 13.5
RD (k Ω)	337.71	152.02	90.126	59.178	40.609	28.23	19.387	12.756	7.598	3.471