



P-DUKE POWER

MPP10 · MPP10W Series

DC-DC Converter
Up to 10.05 Watts

5
YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Medical



PV



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Railway

UL US

CB

CE UK
CA

FC

2
x
MOPP

5000
VAC
Reinforced
Insulation

4 : 1
Wide
Input
Range

2 : 1
Input
Range

Internal
EN55032
Class
A
Filter

LOW
Leakage
Current

LOW
Standby
Power

NO
Min. Load
Required

Operating
Altitude
5000
meter

OCP

OVP

SCP

UVP

PART NUMBER STRUCTURE

| Series Name | Input Voltage (VDC) | Output Quantity | Output Voltage (VDC) | Input Range | Pin Connection Options | Remote On/Off Options | Trim Options |
|--|---|-----------------|--|-------------|----------------------------------|--|--|
| MPP10 - 48 S 05 W A - P T | 05:4.5~9 12:9~18 24:18~36 48:36~75 | S:Single | 3P3:3.3 05:5 12:12 15:15 24:24 | □: 2:1 | A: A type(Standard) B: B type | □:No pin P:Remote On/Off (Only for B type Pin connection) | □:No Trim T:Trim (Only for B type Pin connection) |
| | | D: Dual | 05:±5 12:±12 15:±15 | | | | |
| MPP10 - 48 S 05 W A - P T | 24:9~36 48:18~75 | S:Single | 3P3:3.3 05:5 12:12 15:15 24:24 | W: 4:1 | A: A type(Standard) B: B type | □:No pin P:Remote On/Off (Only for B type Pin connection) | □:No Trim T:Trim (Only for B type Pin connection) |
| | | D: Dual | 05:±5 12:±12 15:±15 | | | | |

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25°C unless otherwise noted

| Model Number | Input Range | Output Voltage | Output Current @ Full Load | Input Current @ No Load | Efficiency | Maximum Capacitor Load |
|------------------|-------------|----------------|----------------------------|-------------------------|------------|------------------------|
| | VDC | VDC | mA | mA | % | µF |
| MPP10-05S3P3A/B | 4.5 ~9 | 3.3 | 2500 | 10 | 80 | 3000 |
| MPP10-05S05A/B | 4.5 ~9 | 5 | 2000 | 10 | 84 | 2500 |
| MPP10-05S12A/B | 4.5 ~9 | 12 | 830 | 20 | 86.5 | 430 |
| MPP10-05S15A/B | 4.5 ~9 | 15 | 670 | 20 | 87 | 350 |
| MPP10-05S24A/B | 4.5 ~9 | 24 | 416 | 20 | 85.5 | 125 |
| MPP10-05D05A/B | 4.5 ~9 | ±5 | ±1000 | 25 | 83 | ± 1440 |
| MPP10-05D12A/B | 4.5 ~9 | ±12 | ±416 | 25 | 85.5 | ± 250 |
| MPP10-05D15A/B | 4.5 ~9 | ±15 | ±333 | 25 | 86.5 | ± 180 |
| MPP10-12S3P3A/B | 9 ~ 18 | 3.3 | 2500 | 10 | 83 | 3000 |
| MPP10-12S05A/B | 9 ~ 18 | 5 | 2000 | 10 | 85.5 | 2500 |
| MPP10-12S12A/B | 9 ~ 18 | 12 | 830 | 10 | 88 | 430 |
| MPP10-12S15A/B | 9 ~ 18 | 15 | 670 | 10 | 89 | 350 |
| MPP10-12S24A/B | 9 ~ 18 | 24 | 416 | 10 | 89 | 125 |
| MPP10-12D05A/B | 9 ~ 18 | ±5 | ±1000 | 10 | 84 | ± 1440 |
| MPP10-12D12A/B | 9 ~ 18 | ±12 | ±416 | 10 | 89 | ± 250 |
| MPP10-12D15A/B | 9 ~ 18 | ±15 | ±333 | 10 | 88 | ± 180 |
| MPP10-24S3P3A/B | 18 ~ 36 | 3.3 | 2500 | 6 | 83 | 3000 |
| MPP10-24S05A/B | 18 ~ 36 | 5 | 2000 | 6 | 86.5 | 2500 |
| MPP10-24S12A/B | 18 ~ 36 | 12 | 830 | 6 | 89 | 430 |
| MPP10-24S15A/B | 18 ~ 36 | 15 | 670 | 6 | 89 | 350 |
| MPP10-24S24A/B | 18 ~ 36 | 24 | 416 | 6 | 89 | 125 |
| MPP10-24D05A/B | 18 ~ 36 | ±5 | ±1000 | 6 | 85 | ± 1440 |
| MPP10-24D12A/B | 18 ~ 36 | ±12 | ±416 | 6 | 89 | ± 250 |
| MPP10-24D15A/B | 18 ~ 36 | ±15 | ±333 | 6 | 88 | ± 180 |
| MPP10-48S3P3A/B | 36 ~ 75 | 3.3 | 2500 | 4 | 82.5 | 3000 |
| MPP10-48S05A/B | 36 ~ 75 | 5 | 2000 | 4 | 86.5 | 2500 |
| MPP10-48S12A/B | 36 ~ 75 | 12 | 830 | 4 | 89 | 430 |
| MPP10-48S15A/B | 36 ~ 75 | 15 | 670 | 4 | 89 | 350 |
| MPP10-48S24A/B | 36 ~ 75 | 24 | 416 | 4 | 88.5 | 125 |
| MPP10-48D05A/B | 36 ~ 75 | ±5 | ±1000 | 4 | 85 | ± 1440 |
| MPP10-48D12A/B | 36 ~ 75 | ±12 | ±416 | 4 | 88 | ± 250 |
| MPP10-48D15A/B | 36 ~ 75 | ±15 | ±333 | 4 | 88 | ± 180 |
| MPP10-24S3P3WA/B | 9 ~ 36 | 3.3 | 2500 | 6 | 83 | 3000 |
| MPP10-24S05WA/B | 9 ~ 36 | 5 | 2000 | 6 | 86.5 | 2500 |
| MPP10-24S12WA/B | 9 ~ 36 | 12 | 830 | 6 | 89 | 430 |
| MPP10-24S15WA/B | 9 ~ 36 | 15 | 670 | 6 | 89 | 350 |
| MPP10-24S24WA/B | 9 ~ 36 | 24 | 416 | 6 | 89 | 125 |
| MPP10-24D05WA/B | 9 ~ 36 | ±5 | ±1000 | 6 | 85 | ± 1440 |
| MPP10-24D12WA/B | 9 ~ 36 | ±12 | ±416 | 6 | 89 | ± 250 |
| MPP10-24D15WA/B | 9 ~ 36 | ±15 | ±333 | 6 | 88 | ± 180 |
| MPP10-48S3P3WA/B | 18 ~ 75 | 3.3 | 2500 | 4 | 82.5 | 3000 |
| MPP10-48S05WA/B | 18 ~ 75 | 5 | 2000 | 4 | 86.5 | 2500 |
| MPP10-48S12WA/B | 18 ~ 75 | 12 | 830 | 4 | 89 | 430 |
| MPP10-48S15WA/B | 18 ~ 75 | 15 | 670 | 4 | 89 | 350 |
| MPP10-48S24WA/B | 18 ~ 75 | 24 | 416 | 4 | 88.5 | 125 |
| MPP10-48D05WA/B | 18 ~ 75 | ±5 | ±1000 | 4 | 85 | ± 1440 |
| MPP10-48D12WA/B | 18 ~ 75 | ±12 | ±416 | 4 | 88 | ± 250 |
| MPP10-48D15WA/B | 18 ~ 75 | ±15 | ±333 | 4 | 88 | ± 180 |

INPUT SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|--|-------------------------|---------------|---------------------------|------|--------------------|------|
| Operating input voltage range | 2:1 | 5Vin(nom) | 4.5 | 5 | 9 | VDC |
| | | 12Vin(nom) | 9 | 12 | 18 | |
| | (W) 4:1 | 24Vin(nom) | 18 | 24 | 36 | VDC |
| | | 48Vin(nom) | 36 | 48 | 75 | |
| Start up voltage | 2:1 | 5Vin(nom) | | | 4.5 | VDC |
| | | 12Vin(nom) | | | 9 | |
| | (W) 4:1 | 24Vin(nom) | | | 18 | VDC |
| | | 48Vin(nom) | | | 36 | |
| Shutdown voltage | 2:1 | 5Vin(nom) | 3 | 4 | 4.4 | VDC |
| | | 12Vin(nom) | 7 | 8 | 8.8 | |
| | (W) 4:1 | 24Vin(nom) | 15 | 16 | 17.5 | VDC |
| | | 48Vin(nom) | 31.5 | 33 | 34.5 | |
| Start up time | Constant resistive load | Power up | | 30 | | ms |
| | | Remote ON/OFF | | 30 | | |
| Input surge voltage | 3 second, max. | 2:1 | 5Vin(nom) | | 16 | VDC |
| | | | 12Vin(nom) | | 25 | |
| | 3 second, max. | (W) 4:1 | 24Vin(nom) | | 50 | VDC |
| | | | 48Vin(nom) | | 100 | |
| Input filter | | | | | Pi type | |
| Remote ON/OFF (Only for B-type Pin connection option) | Referred to -Vin pin | DC-DC ON | | | OPEN or 0 ~ 1.2VDC | |
| | | DC-DC OFF | | | 2.2 ~ 12VDC | |
| | | | Input current of Ctrl pin | -0.5 | 1 | mA |
| | | | Remote off input current | 2.5 | | mA |

OUTPUT SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|--|---|--------------------------|-------|------|-------|--------------------------------|
| Voltage accuracy | | | -1.0 | | +1.0 | % |
| Line regulation | Low Line to High Line at Full Load | Single | -0.2 | | +0.2 | % |
| | | Dual | -0.5 | | +0.5 | |
| Load regulation | No Load to Full Load | Single | -0.2 | | +0.2 | % |
| | | Dual | -1.0 | | +1.0 | |
| Cross regulation | Asymmetrical load 25%/100% FL | Dual | -5.0 | | +5.0 | % |
| Voltage adjustability (Only for B-type Pin connection option) | Single output | 3.3Vout, 5Vout, 12Vout | -10 | | +10 | % |
| | | 15Vout, 24Vout | -10 | | +20 | |
| | Dual output | ±5Vout, ±12Vout, ±15Vout | -10 | | +10 | |
| Ripple and noise | Measured by 20MHz bandwidth With a 10µF/25V X7R MLCC | 3.3Vout, 5Vout | | 30 | | mVp-p |
| | | 12Vout, 15Vout | | 40 | | |
| | | 24Vout | | 50 | | |
| Temperature coefficient | | | -0.02 | | +0.02 | %/°C |
| Transient response recovery time | 25% load step change | | | 250 | | µs |
| Over voltage protection | Single | 3.3Vout | 3.7 | | 5 | VDC |
| | | 5Vout | 5.6 | | 7.0 | |
| | | 12Vout | 13.5 | | 16 | |
| | Dual | 15Vout | 18.3 | | 22.0 | VDC |
| | | 24Vout | 29.1 | | 34.5 | |
| | | 5Vout | 5.6 | | 7.0 | |
| | | 12Vout | 13.5 | | 18.2 | VDC |
| | | 15Vout | 17.0 | | 22.0 | VDC |
| Over load protection | % of Iout rated; Hiccup mode | | | 150 | | % |
| Short circuit protection | | | | | | Continuous, automatic recovery |

GENERAL SPECIFICATIONS

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--|------|------|------|---|
| Isolation voltage | 1 minute Input to Output Reinforced insulation for 250VAC working voltage | 5000 | | | VAC |
| Isolation resistance | 500VDC | 10 | | | GΩ |
| Isolation capacitance | | | 12 | 17 | pF |
| Leakage current | 240VAC,60Hz | | | 2 | μA |
| Switching frequency | | 270 | 300 | 330 | kHz |
| Clearance/Creepage | | 8 | | | mm |
| Safety approvals | IEC/ EN/ ANSI/ AAMI ES 60601-1 IEC/ EN/ UL 62368-1 | | | | UL:E360199 UL:E193009 CB: UL(Demko) |
| Case material | | | | | Non-conductive black plastic |
| Base material | | | | | Non-conductive black plastic |
| Potting material | | | | | Silicone (UL94 V-0) |
| Weight | | | | | 14g (0.48oz) |
| MTBF | MIL-HDBK-217F, Full load | | | | 3.849 x 10 ⁶ hrs |

ENVIRONMENTAL SPECIFICATIONS

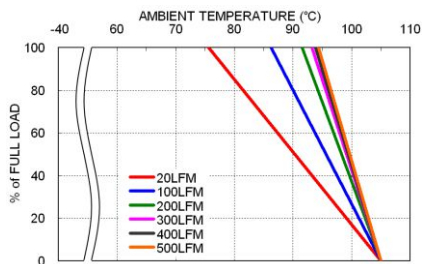
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------|------------------|------|------|------|--------------|
| Operating ambient temperature | Without derating | -40 | | +77 | °C |
| | With derating | +77 | | +105 | |
| Maximum case temperature | | | | 105 | °C |
| Storage temperature range | | -55 | | +125 | °C |
| Thermal impedance | | | 18 | | °C/W |
| Operating altitude | | | | 5000 | m |
| Thermal shock | | | | | MIL-STD-810F |
| Vibration | | | | | MIL-STD-810F |
| Relative humidity | | | | | 5% to 95% RH |

EMC SPECIFICATIONS

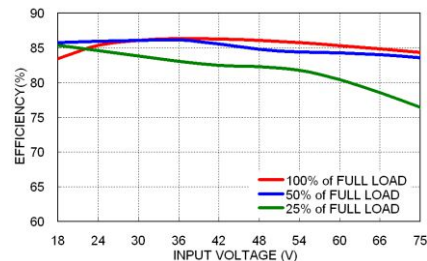
| Parameter | Conditions | Level |
|--------------------------------|--|------------------|
| EMI | EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15 Without external filter | Class A |
| | With external filter | Class B |
| EMS | EN55035 and EN60601-1-2 | |
| ESD | EN61000-4-2 Air $\pm 15\text{kV}$ and Contact $\pm 8\text{kV}$ | Perf. Criteria A |
| Radiated immunity | EN61000-4-3 10 V/m | Perf. Criteria A |
| Fast transient | EN61000-4-4 $\pm 2\text{kV}$ | Perf. Criteria A |
| | MPP10-05□□□□□□ With an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 1000 $\mu\text{F}/25\text{V}$) and a reverse diode (Vishay V10P45) in parallel. | |
| | MPP10-12□□□□□□ MPP10-24□□□□□□ With an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 470 $\mu\text{F}/50\text{V}$). | |
| | MPP10-48□□□□□□ With an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 330 $\mu\text{F}/100\text{V}$). | |
| Surge | EN61000-4-5 $\pm 2\text{kV}$ | Perf. Criteria A |
| | MPP10-05□□□□□□ With an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 1000 $\mu\text{F}/25\text{V}$) and a reverse diode (Vishay V10P45) in parallel. | |
| | MPP10-12□□□□□□ MPP10-24□□□□□□ With an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 470 $\mu\text{F}/50\text{V}$). | |
| | MPP10-48□□□□□□ With an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 330 $\mu\text{F}/100\text{V}$). | |
| Conducted immunity | EN61000-4-6 10 Vr.m.s | Perf. Criteria A |
| Power frequency magnetic field | EN61000-4-8 100A/m continuous; 1000A/m 1 second | Perf. Criteria A |

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

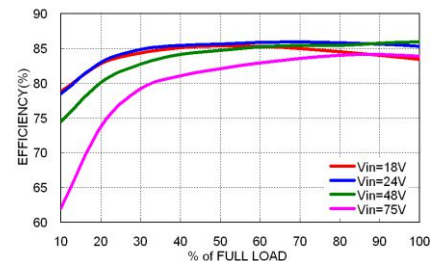
CHARACTERISTIC CURVE



MPP10-48S05WA Derating Curve



MPP10-48S05WA Efficiency vs. Input Voltage



MPP10-48S05WA Efficiency vs. Output Load

FUSE CONSIDERATION

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

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.

To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

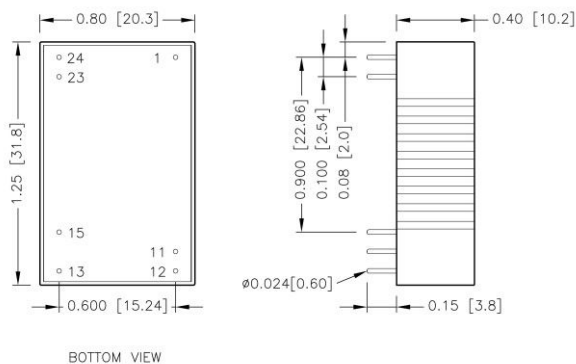
| Model | Fuse Rating (A) | Fuse Type |
|-------------------------|-----------------|-----------|
| MPP10-05S□□、MPP10-05D□□ | 5 | Slow-Blow |
| MPP10-12S□□、MPP10-12D□□ | 2 | Slow-Blow |
| MPP10-24S□□、MPP10-24D□□ | 1 | Slow-Blow |
| MPP10-48S□□、MPP10-48D□□ | 0.5 | Slow-Blow |

| Model | Fuse Rating (A) | Fuse Type |
|---------------------------|-----------------|-----------|
| MPP10-24S□□W、MPP10-24D□□W | 2 | Slow-Blow |
| MPP10-48S□□W、MPP10-48D□□W | 1 | Slow-Blow |

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

MECHANICAL DRAWING

A TYPE



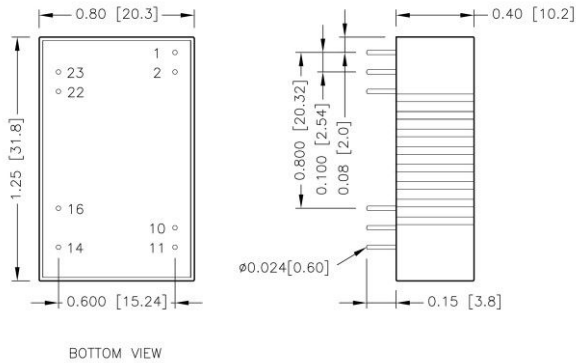
PIN CONNECTION

| PIN | SINGLE | DUAL |
|-----|--------|--------|
| 1 | + Vin | + Vin |
| 11 | No pin | Common |
| 12 | -Vout | No pin |
| 13 | +Vout | -Vout |
| 15 | No pin | +Vout |
| 23 | - Vin | - Vin |
| 24 | - Vin | - Vin |

- All dimensions in inch [mm]
- Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
- Pin dimension tolerance ±0.004[0.10]

MECHANICAL DRAWING(CONTINUED)

B TYPE



PIN CONNECTION

| PIN | SINGLE | DUAL |
|-----|-------------------------|-------------------------|
| 1 | Ctrl (Option) / No pin* | Ctrl (Option) / No pin* |
| 2 | - Vin | - Vin |
| 10 | Trim (Option) / No pin* | Trim (Option) / No pin* |
| 11 | No pin / NC ** | -Vout |
| 14 | +Vout | +Vout |
| 16 | -Vout | Common |
| 22 | +Vin | +Vin |
| 23 | +Vin | +Vin |

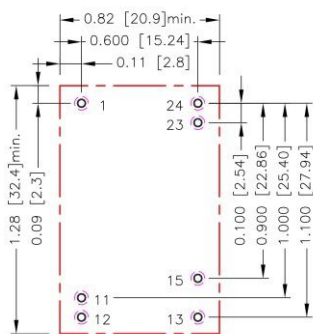
* If don't choose Ctrl or Trim option, there is no pin on the corresponding pin number.

** Pin 11 is "No pin" for
MPP10-□□S□□□**B-T**
MPP10-□□S□□□**B-PT**
Pin 11 is "NC" for
MPP10-□□S□□□**B**
MPP10-□□S□□□**B-P**

- All dimensions in inch [mm]
- Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
- Pin dimension tolerance ±0.004[0.10]

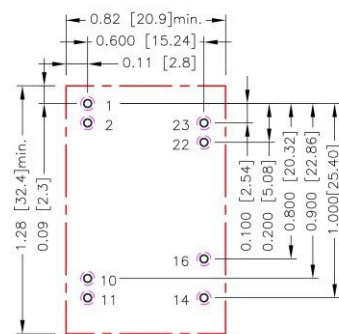
RECOMMENDED PAD LAYOUT

A TYPE



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.11.12.13.15.23.24: $\Phi 0.035$ [0.90]
Top view pad 1.11.12.13.15.23.24: $\Phi 0.044$ [1.13]
Bottom view pad 1.11.12.13.15.23.24: $\Phi 0.071$ [1.80]

B TYPE



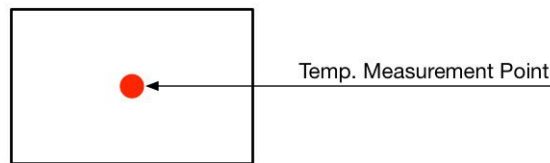
All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.10.11.14.16.22.23: $\Phi 0.035$ [0.90]
Top view pad 1.2.10.11.14.16.22.23: $\Phi 0.044$ [1.13]
Bottom view pad 1.2.10.11.14.16.22.23: $\Phi 0.071$ [1.80]

- * There should be at least 8mm distance between primary and secondary circuit.
** For further information, please contact P-DUKE.

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. Proper cooling can be verified by measuring the point as the figure below. The temperature at this location should not exceed "Maximum case temperature". When operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature". You can limit this temperature to a lower value for extremely high reliability.

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



TOP VIEW

OUTPUT VOLTAGE ADJUSTMENT

It allows the user to increase or decrease the output voltage of the module. This is accomplished by connecting an external resistor between the Trim pin and either the +Vout or -Vout pins. With an external resistor between the Trim and -Output pin, the output voltage increases. With an external resistor between the Trim and +Output pin, the output voltage decreases. The external Trim resistor needs to be at least 1/16W of rated power.

Trim Up Equation

$$R_U = \left[\frac{G \times L}{(V_{o,up} - L - K)} - H \right] \Omega$$

Trim Down Equation

$$R_D = \left[\frac{(V_{o,down} - L) \times G}{(V_o - V_{o,down})} - H \right] \Omega$$

Trim constants

| Module | G | H | K | L |
|------------------------|-------|-------|------|-----|
| □□S3P3B-□T、□□S3P3WB-□T | 5110 | 2050 | 0.8 | 2.5 |
| □□S05B-□T、□□S05WB-□T | 5110 | 2050 | 2.5 | 2.5 |
| □□S12B-□T、□□S12WB-□T | 10000 | 5110 | 9.5 | 2.5 |
| □□S15B-□T、□□S15WB-□T | 10000 | 5110 | 12.5 | 2.5 |
| □□S24B-□T、□□S24WB-□T | 56000 | 13000 | 21.5 | 2.5 |

| Module | G | H | K | L |
|----------------------|-------|-------|------|-----|
| □□D05B-□T、□□D05WB-□T | 3000 | 3000 | 7.5 | 2.5 |
| □□D12B-□T、□□D12WB-□T | 56000 | 13000 | 21.5 | 2.5 |
| □□D15B-□T、□□D15WB-□T | 30000 | 13000 | 27.5 | 2.5 |

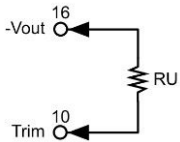
OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

EXTERNAL OUTPUT TRIMMING

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

Trim-up

Single Output



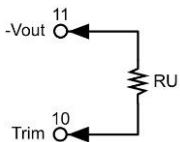
□□S3P3B-□T、□□S3P3WB-□T

| 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) | 385.071 | 191.511 | 126.990 | 94.730 | 75.374 | 62.470 | 53.253 | 46.340 | 40.963 | 36.662 |

□□S05B-□T、□□S05WB-□T

| 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) | 253.450 | 125.700 | 83.117 | 61.825 | 49.050 | 40.533 | 34.450 | 29.888 | 26.339 | 23.500 |

Dual Output



□□S12B-□T、□□S12WB-□T

| 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) | 203.223 | 99.057 | 64.334 | 46.973 | 36.557 | 29.612 | 24.652 | 20.932 | 18.038 | 15.723 |

□□S15B-□T、□□S15WB-□T

| 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) | 161.557 | 78.223 | 50.446 | 36.557 | 28.223 | 22.668 | 18.700 | 15.723 | 13.409 | 11.557 |

| ΔV (%) | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Vout (V) | 16.650 | 16.800 | 16.950 | 17.100 | 17.250 | 17.400 | 17.550 | 17.700 | 17.850 | 18.000 |
| RU (k Ω) | 10.042 | 8.779 | 7.711 | 6.795 | 6.001 | 5.307 | 4.694 | 4.149 | 3.662 | 3.223 |

□□S24B-□T、□□S24WB-□T

| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|---------|---------|---------|---------|---------|--------|--------|--------|--------|--------|
| Vout (V) | 24.240 | 24.480 | 24.720 | 24.960 | 25.200 | 25.440 | 25.680 | 25.920 | 26.160 | 26.400 |
| RU (k Ω) | 570.333 | 278.667 | 181.444 | 132.833 | 103.667 | 84.222 | 70.333 | 59.917 | 51.815 | 45.333 |

| ΔV (%) | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Vout (V) | 26.640 | 26.880 | 27.120 | 27.360 | 27.600 | 27.840 | 28.080 | 28.320 | 28.560 | 28.800 |
| RU (k Ω) | 40.030 | 35.611 | 31.872 | 28.667 | 25.889 | 23.458 | 21.314 | 19.407 | 17.702 | 16.167 |

□□D05B-□T、□□D05WB-□T

| 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) | 72.000 | 34.500 | 22.000 | 15.750 | 12.000 | 9.500 | 7.714 | 6.375 | 5.333 | 4.500 |

□□D12B-□T、□□D12WB-□T

| 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) | 570.333 | 278.667 | 181.444 | 132.833 | 103.667 | 84.222 | 70.333 | 59.917 | 51.815 | 45.333 |

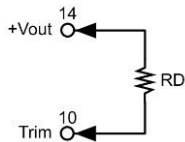
□□D15B-□T、□□D15WB-□T

| 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) | 237.000 | 112.000 | 70.333 | 49.500 | 37.000 | 28.667 | 22.714 | 18.250 | 14.778 | 12.000 |

OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

Trim-down

Single & Dual Output



□□S3P3B-□T、□□S3P3WB-□T

| 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) | 116.719 | 54.779 | 34.133 | 23.810 | 17.616 | 13.486 | 10.537 | 8.325 | 6.604 | 5.228 |

□□S05B-□T、□□S05WB-□T

| 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) | 248.340 | 120.590 | 78.007 | 56.715 | 43.940 | 35.423 | 29.340 | 24.778 | 21.229 | 18.390 |

□□S12B-□T、□□S12WB-□T

| 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) | 776.557 | 380.723 | 248.779 | 182.807 | 143.223 | 116.834 | 97.985 | 83.848 | 72.853 | 64.057 |

□□S15B-□T、□□S15WB-□T

| 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) | 818.223 | 401.557 | 262.668 | 193.223 | 151.557 | 123.779 | 103.938 | 89.057 | 77.483 | 68.223 |

□□S24B-□T、□□S24WB-□T

| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|----------|----------|----------|----------|---------|---------|---------|---------|---------|---------|
| Vout (V) | 23.760 | 23.520 | 23.280 | 23.040 | 22.800 | 22.560 | 22.320 | 22.080 | 21.840 | 21.600 |
| RD (k Ω) | 4947.667 | 2439.333 | 1603.222 | 1185.167 | 934.333 | 767.111 | 647.667 | 558.083 | 488.407 | 432.667 |

□□D05B-□T、□□D05WB-□T

| 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) | 219.000 | 106.500 | 69.000 | 50.250 | 39.000 | 31.500 | 26.143 | 22.125 | 19.000 | 16.500 |

□□D12B-□T、□□D12WB-□T

| 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) | 4947.667 | 2439.333 | 1603.222 | 1185.167 | 934.333 | 767.111 | 647.667 | 558.083 | 488.407 | 432.667 |

□□D15B-□T、□□D15WB-□T

| 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) | 2707.000 | 1332.000 | 873.667 | 644.500 | 507.000 | 415.333 | 349.857 | 300.750 | 262.556 | 232.000 |