



# P-DUKE POWER

## FED30W Series

DC-DC Converter  
Up to 30 Watts

**3**  
YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway

UL US CB CE UK CA

**1600**  
VDC  
Isolation  
Voltage

**4 : 1**  
Wide  
Input  
Range

**6**  
sided  
Shielding

**NO**  
Min. Load  
Required

**REMOTE**  
**ON**  
**OFF**

**OCP**

**OTP**

**OVP**

**SCP**

**UVP**

### PART NUMBER STRUCTURE

| FED30       | - | 48                  | S                       | 05  | W           | - | N   | HC  |
|-------------|---|---------------------|-------------------------|---|-------------|---|---|---|
| Series Name |   | Input Voltage (VDC) | Output Quantity         | Output Voltage (VDC)  | Input Range |   | Remote Control Options  | Assembly Options  |
|             |   | 24:9~36<br>48:18~75 | S:Single<br><br>D: Dual | 1P5: 1.5<br>2P5: 2.5<br>3P3: 3.3<br>05: 5<br>5P1: 5.1<br>12: 12<br>15: 15<br><br>05: ±5<br>12: ±12<br>15: ±15 | 4:1         |   | <input type="checkbox"/> : Positive logic<br><input checked="" type="checkbox"/> : Negative logic | <input type="checkbox"/> : None<br><input checked="" type="checkbox"/> : Heat-sink with Clamp |

**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            | A                         | mA                      | %          | μF                     |
| FED30-24S1P5W | 9 ~ 36      | 1.5            | 8.5                       | 70                      | 80         | 20000                  |
| FED30-24S2P5W | 9 ~ 36      | 2.5            | 8                         | 70                      | 83         | 20000                  |
| FED30-24S3P3W | 9 ~ 36      | 3.3            | 7.5                       | 85                      | 86         | 20000                  |
| FED30-24S05W  | 9 ~ 36      | 5              | 6                         | 115                     | 88         | 14400                  |
| FED30-24S5P1W | 9 ~ 36      | 5.1            | 6                         | 115                     | 88         | 14400                  |
| FED30-24S12W  | 9 ~ 36      | 12             | 2.5                       | 20                      | 89         | 3000                   |
| FED30-24S15W  | 9 ~ 36      | 15             | 2                         | 30                      | 89         | 2000                   |
| FED30-24D05W  | 9 ~ 36      | ±5             | ±3                        | 90                      | 88         | ±3000                  |
| FED30-24D12W  | 9 ~ 36      | ±12            | ±1.25                     | 25                      | 87         | ±2000                  |
| FED30-24D15W  | 9 ~ 36      | ±15            | ±1                        | 25                      | 87         | ±1300                  |
| FED30-48S1P5W | 18 ~ 75     | 1.5            | 8.5                       | 30                      | 80         | 20000                  |
| FED30-48S2P5W | 18 ~ 75     | 2.5            | 8                         | 45                      | 84         | 20000                  |
| FED30-48S3P3W | 18 ~ 75     | 3.3            | 7.5                       | 45                      | 86         | 20000                  |
| FED30-48S05W  | 18 ~ 75     | 5              | 6                         | 65                      | 88         | 14400                  |
| FED30-48S5P1W | 18 ~ 75     | 5.1            | 6                         | 65                      | 88         | 14400                  |
| FED30-48S12W  | 18 ~ 75     | 12             | 2.5                       | 65                      | 90         | 3000                   |
| FED30-48S15W  | 18 ~ 75     | 15             | 2                         | 50                      | 91         | 2000                   |
| FED30-48D05W  | 18 ~ 75     | ±5             | ±3                        | 50                      | 88         | ±3000                  |
| FED30-48D12W  | 18 ~ 75     | ±12            | ±1.25                     | 15                      | 88         | ±2000                  |
| FED30-48D15W  | 18 ~ 75     | ±15            | ±1                        | 15                      | 88         | ±1300                  |

**INPUT SPECIFICATIONS**

| Parameter                     | Conditions              | Min.                      | Typ.      | Max.                | Unit |
|-------------------------------|-------------------------|---------------------------|-----------|---------------------|------|
| Operating input voltage range | 24Vin(nom)              | 9                         | 24        | 36                  | VDC  |
|                               | 48Vin(nom)              | 18                        | 48        | 75                  |      |
| Start up voltage              | 24Vin(nom)              |                           |           | 9                   | VDC  |
|                               | 48Vin(nom)              |                           |           | 18                  |      |
| Shutdown voltage              | 24Vin(nom)              | 7                         | 8         | 8.8                 | VDC  |
|                               | 48Vin(nom)              | 15                        | 16        | 17.5                |      |
| Start up time                 | Constant resistive load | Power up                  | 30        |                     | ms   |
|                               |                         | Remote ON/OFF             | 30        |                     |      |
| Input surge voltage           | 100 ms, max.            |                           |           | 50<br>100           | VDC  |
| Input filter                  |                         |                           |           | Pi type             |      |
| Remote ON/OFF                 | Referred to -Vin pin    | Positive logic (Standard) | DC-DC ON  | Open or 3 ~ 12VDC   |      |
|                               |                         |                           | DC-DC OFF | Short or 0 ~ 1.2VDC |      |
|                               |                         | Negative logic (Option)   | DC-DC ON  | Short or 0 ~ 1.2VDC |      |
|                               |                         |                           | DC-DC OFF | Open or 3 ~ 12VDC   |      |
|                               |                         | Input current of Ctrl pin | -0.5      | +0.5                | mA   |
|                               |                         | Remote off input current  |           | 3.0                 | 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           | Others         | -0.2                           |      | +0.2  | %       |
|                                  |  | Dual 5Vout     | -0.25                          |      | +0.25 | %       |
| Load regulation                  | No Load to Full Load                         | Single         | -0.5                           |      | +0.5  | %       |
|                                  |  | Dual           | -1.0                           |      | +1.0  | %       |
| Cross regulation                 | Asymmetrical load 25%/100% FL                | Dual           | -5.0                           |      | +5.0  | %       |
| Voltage adjustability            | Single output                                |                | -10                            |      | +10   | %       |
| Ripple and noise                 | 20MHz bandwidth<br>With a 1 $\mu$ F/50V MLCC | Others         |                                | 100  |       | mVp-p   |
|                                  |  | 12Vout, 15Vout |                                | 150  |       |         |
| Temperature coefficient          |  |                | -0.02                          |      | +0.02 | %/°C    |
| Transient response recovery time | 25% load step change                         |                |                                | 250  |       | $\mu$ s |
| Over voltage protection          | Zener diode clamp                            | 1.5Vout        |                                | 2.0  |       | VDC     |
|                                  |  | 2.5Vout        |                                | 3.3  |       |         |
|                                  |  | 3.3Vout        |                                | 3.9  |       |         |
|                                  |  | 5Vout, 5.1Vout |                                | 6.2  |       |         |
|                                  |  | 12Vout         |                                | 15   |       |         |
|                                  |  | 15Vout         |                                | 18   |       |         |
| Over load protection             | % of Iout rated                              |                |                                | 150  |       | %       |
| Short circuit protection         |  |                | Continuous, automatic recovery |      |       |         |

| GENERAL SPECIFICATIONS |                          |   |   |      |      |            |
|------------------------|--------------------------|---|---|------|------|------------|
| Parameter              | Conditions               |   | Min.  | Typ. | Max. | Unit       |
| Isolation voltage      | 1 minute                 | Input to Output<br>Input (Output) to Case | 1600<br>1600                                  |      |      | VDC        |
| Case grounding         |                          |   | Connect case to -Vin<br>with decoupling Y Cap |      |      |            |
| Isolation resistance   | 500VDC                   |   | 1   |      |      | G $\Omega$ |
| Isolation capacitance  |                          |   |   |      | 1500 | pF         |
| Switching frequency    |                          |   | 387   | 430  | 473  | kHz        |
| Safety approvals       | IEC/ EN/ UL62368-1       |   | UL:E193009<br>CB:UL(Demko)                    |      |      |            |
| Case material          |                          |   | Nickel-coated copper                          |      |      |            |
| Base material          |                          |   | FR4 PCB                                       |      |      |            |
| Potting material       |                          |   | Epoxy (UL94 V-0)                              |      |      |            |
| Weight                 |                          |   | 30.5g (1.07oz)                                |      |      |            |
| MTBF                   | MIL-HDBK-217F, Full load |   | 1.288 x 10 <sup>6</sup> hrs                   |      |      |            |

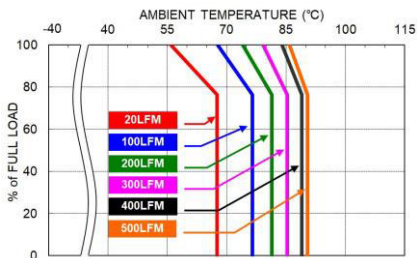
| ENVIRONMENTAL SPECIFICATIONS  |                                     |  |              |          |            |      |
|-------------------------------|-------------------------------------|--|--------------|----------|------------|------|
| Parameter                     | Conditions                          |  | Min.         | Typ.     | Max.       | Unit |
| Operating ambient temperature | Without derating<br>With derating   |  | -40<br>+50   |          | +50<br>+85 | °C   |
| Maximum case temperature      |                                     |  |              |          | 105        | °C   |
| Over temperature protection   |                                     |  |              | 115      |            | °C   |
| Storage temperature range     |                                     |  | -55          |          | +125       | °C   |
| Thermal impedance             | Without heat-sink<br>With heat-sink |  |              | 12<br>10 |            | °C/W |
| Thermal shock                 |                                     |  | MIL-STD-810F |          |            |      |
| Vibration                     |                                     |  | MIL-STD-810F |          |            |      |
| Relative humidity             |                                     |  | 5% to 95% RH |          |            |      |

## EMC SPECIFICATIONS

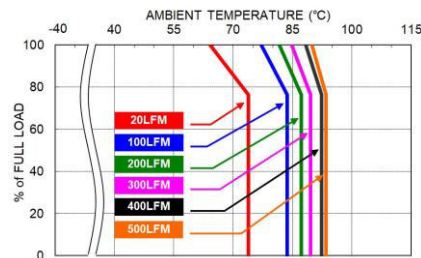
| Parameter                      | Conditions   | Level            |
|--------------------------------|--|------------------|
| EMI                            | EN55032<br>With external components  | Class A          |
| EMS                            | EN55035  |                  |
| ESD                            | EN61000-4-2<br>Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$   | Perf. Criteria A |
| Radiated immunity              | EN61000-4-3<br>10 V/m  | Perf. Criteria A |
| Fast transient                 | EN61000-4-4<br>$\pm 2\text{kV}$  | Perf. Criteria A |
| Surge                          | 24VDC input<br>With an external input filter capacitor<br>(Nippon chemi-con KY series, 330 $\mu\text{F}/50\text{V}$ )  | Perf. Criteria A |
|                                | 48VDC input<br>With an external input filter capacitor<br>(Nippon chemi-con KY series, 220 $\mu\text{F}/100\text{V}$ ) |                  |
| Surge                          | EN61000-4-5<br>$\pm 1\text{kV}$  | Perf. Criteria A |
| Surge                          | 24VDC input<br>With an external input filter capacitor<br>(Nippon chemi-con KY series, 330 $\mu\text{F}/50\text{V}$ )  | Perf. Criteria A |
|                                | 48VDC input<br>With an external input filter capacitor<br>(Nippon chemi-con KY series, 220 $\mu\text{F}/100\text{V}$ ) |                  |
| Conducted immunity             | EN61000-4-6<br>10 Vr.m.s   | Perf. Criteria A |
| Power frequency magnetic field | EN61000-4-8<br>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.

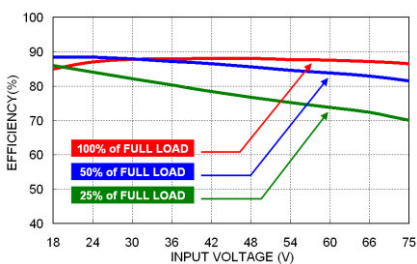
## CHARACTERISTIC CURVE



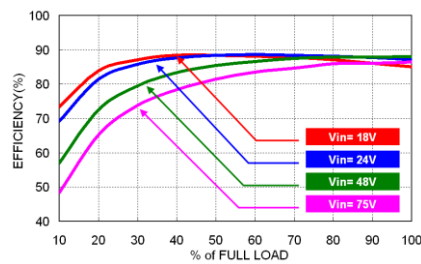
FED30-48S05W Derating Curve



FED30-48S05W Derating Curve With Heat-sink



FED30-48S05W Efficiency vs. Input Voltage



FED30-48S05W 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.

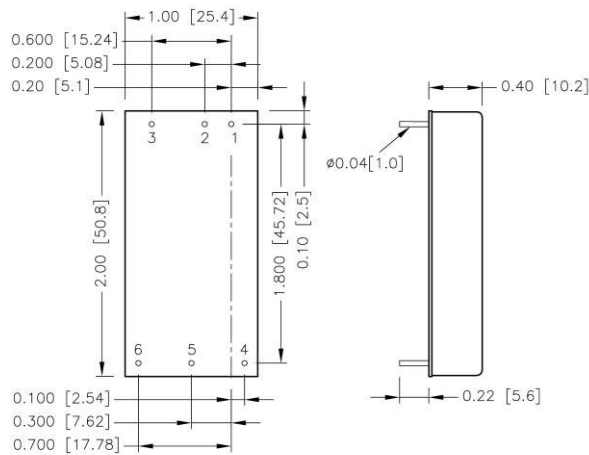
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

| Model                       | Fuse Rating (A) | Fuse Type |
|-----------------------------|-----------------|-----------|
| FED30-24S□□W · FED30-24D□□W | 6.3             | Slow-Blow |
| FED30-48S□□W · FED30-48D□□W | 3.15            | 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



BOTTOM VIEW

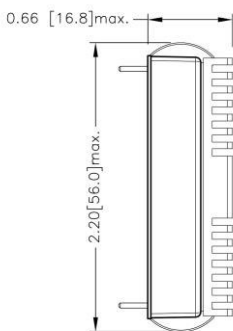
## PIN CONNECTION

| PIN | SINGLE | DUAL   |
|-----|--------|--------|
| 1   | +Vin   | +Vin   |
| 2   | -Vin   | -Vin   |
| 3   | Ctrl   | Ctrl   |
| 4   | +Vout  | +Vout  |
| 5   | -Vout  | Common |
| 6   | Trim   | -Vout  |

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

## HEAT-SINK OPTIONS

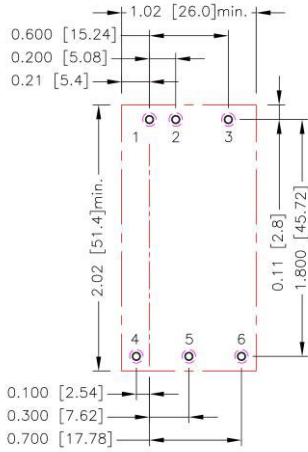
-HC (Heat-sink with clamps)



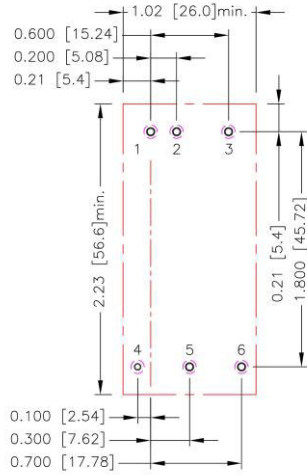
\* All dimensions in inch [mm]

**RECOMMENDED PAD LAYOUT**

**Standard**



**-HC**

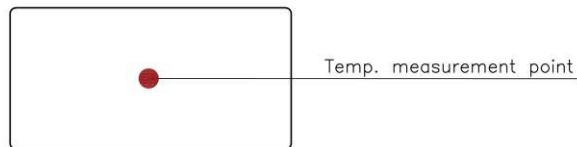


All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.4.5.6:  $\Phi 0.051$ [1.30]  
 Top view pad 1.2.3.4.5.6:  $\Phi 0.064$ [1.63]  
 Bottom view pad 1.2.3.4.5.6:  $\Phi 0.102$ [2.60]

**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

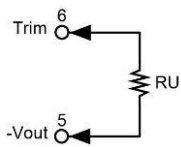
**OUTPUT VOLTAGE ADJUSTMENT**

Output voltage set point adjustment allows the user to increase or decrease the output voltage set point 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 -Vout, the output voltage set point increases. With an external resistor between the Trim and +Vout, the output voltage set point decreases. The external Trim resistor needs to be at least 1/16W of rated power.

**EXTERNAL OUTPUT TRIMMING**

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

Trim-up


 **S1P5W**

| $\Delta V$ (%)   | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Vout (V)         | 1.515 | 1.530 | 1.545 | 1.560 | 1.575 | 1.590 | 1.605 | 1.620 | 1.635 | 1.650 |
| RU (k $\Omega$ ) | 4.578 | 2.065 | 1.227 | 0.808 | 0.557 | 0.389 | 0.270 | 0.180 | 0.110 | 0.054 |

 **S2P5W**

| $\Delta V$ (%)   | 1      | 2      | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------------------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| Vout (V)         | 2.525  | 2.550  | 2.575 | 2.600 | 2.625 | 2.650 | 2.675 | 2.700 | 2.725 | 2.750 |
| RU (k $\Omega$ ) | 37.076 | 16.675 | 9.874 | 6.474 | 4.434 | 3.074 | 2.102 | 1.374 | 0.807 | 0.354 |

 **S3P3W**

| $\Delta V$ (%)   | 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 $\Omega$ ) | 57.930 | 26.165 | 15.577 | 10.283 | 7.106 | 4.988 | 3.476 | 2.341 | 1.459 | 0.753 |

 **S05W**

| $\Delta V$ (%)   | 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 $\Omega$ ) | 36.570 | 16.580 | 9.917 | 6.585 | 4.586 | 3.253 | 2.302 | 1.588 | 1.032 | 0.588 |

 **S5P1W**

| $\Delta V$ (%)   | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| Vout (V)         | 5.151  | 5.202  | 5.253  | 5.304 | 5.355 | 5.406 | 5.457 | 5.508 | 5.559 | 5.610 |
| RU (k $\Omega$ ) | 38.135 | 17.368 | 10.446 | 6.985 | 4.908 | 3.524 | 2.535 | 1.793 | 1.217 | 0.755 |

 **S12W**

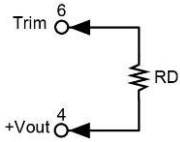
| $\Delta V$ (%)   | 1       | 2       | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |
|------------------|---------|---------|--------|--------|--------|--------|--------|--------|--------|--------|
| Vout (V)         | 12.120  | 12.240  | 12.360 | 12.480 | 12.600 | 12.720 | 12.840 | 12.960 | 13.080 | 13.200 |
| RU (k $\Omega$ ) | 367.908 | 165.954 | 98.636 | 64.977 | 44.782 | 31.318 | 21.701 | 14.488 | 8.879  | 4.391  |

 **S15W**

| $\Delta V$ (%)   | 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 $\Omega$ ) | 404.184 | 180.592 | 106.061 | 68.796 | 46.437 | 31.531 | 20.883 | 12.898 | 6.687  | 1.718  |

**OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)**

Trim-down


  S1P5W

| $\Delta V$ (%)   | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Vout (V)         | 1.485 | 1.470 | 1.455 | 1.440 | 1.425 | 1.410 | 1.395 | 1.380 | 1.365 | 1.350 |
| RD (k $\Omega$ ) | 5.704 | 2.571 | 1.527 | 1.005 | 0.692 | 0.483 | 0.334 | 0.222 | 0.135 | 0.065 |

  S2P5W

| $\Delta V$ (%)   | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| Vout (V)         | 2.475  | 2.450  | 2.425  | 2.400 | 2.375 | 2.350 | 2.325 | 2.300 | 2.275 | 2.250 |
| RD (k $\Omega$ ) | 49.641 | 22.481 | 13.428 | 8.902 | 6.186 | 4.375 | 3.082 | 2.112 | 1.358 | 0.754 |

  S3P3W

| $\Delta V$ (%)   | 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 $\Omega$ ) | 69.470 | 31.235 | 18.490 | 12.117 | 8.294 | 5.745 | 3.924 | 2.559 | 1.497 | 0.647 |

  S05W

| $\Delta V$ (%)   | 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 $\Omega$ ) | 45.533 | 20.612 | 12.306 | 8.152 | 5.660 | 3.999 | 2.812 | 1.922 | 1.230 | 0.676 |

  S5P1W

| $\Delta V$ (%)   | 1      | 2      | 3      | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| Vout (V)         | 5.049  | 4.998  | 4.947  | 4.896 | 4.845 | 4.794 | 4.743 | 4.692 | 4.641 | 4.590 |
| RD (k $\Omega$ ) | 47.191 | 21.431 | 12.844 | 8.551 | 5.975 | 4.258 | 3.031 | 2.111 | 1.396 | 0.823 |

  S12W

| $\Delta V$ (%)   | 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 $\Omega$ ) | 460.992 | 207.946 | 123.597 | 81.423 | 56.118 | 39.249 | 27.199 | 18.162 | 11.132 | 5.509  |

  S15W

| $\Delta V$ (%)   | 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 $\Omega$ ) | 499.816 | 223.408 | 131.272 | 85.204 | 57.563 | 39.136 | 25.974 | 16.102 | 8.424  | 2.282  |