

Quarter-Brick DC-Dc converter up to 132 Watts

3
YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Railway



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



3000
VAC
Reinforced
Insulation

2250
VDC
Basic
Insulation

4 : 1
Wide
Input
Range

NO
Min. Load
Required

LOW
Standby
Power

REMOTE
ON
OFF

OCP

OTP

OVP

SCP

UVP

PART NUMBER STRUCT URE

VPE150
Series Name

- 48
Input
Voltage
(VDC)

S
Output
Quantity

05
Output
Voltage
(VDC)

W
Input
Range

- P
Ctrl and
Pin Options

HS
Assembly Option

24: 8.5~36
48: 16.5~75
110: 40~160

S: Single

3P3: 3.3
05: 5
12: 12
15: 15
24: 24
30: 30
48: 48

4:1

□: Negative logic
P: Positive logic

□: None
HS: 7G-0029B-F; H=0.24"
HS1: 7G-0030B-F; H=0.5"
HS2: 7G-0031B-F; H=0.24"
HS3: 7G-0032B-F; H=0.5"
TH: Through hole (No thread)
* The module can't equip Heat-sink with TH option.

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 |
| VPE150-24S3P3W | 8.5 ~ 36 | 3.3 | 30 | 25 | 88 | 91000 |
| VPE150-24S05W | 8.5 ~ 36 | 5 | 24 | 25 | 89 | 48000 |
| VPE150-24S12W | 8.5 ~ 36 | 12 | 10 | 25 | 88 | 8300 |
| VPE150-24S15W | 8.5 ~ 36 | 15 | 8 | 25 | 89 | 5300 |
| VPE150-24S24W | 8.5 ~ 36 | 24 | 5 | 25 | 88 | 2100 |
| VPE150-24S30W | 8.5 ~ 36 | 30 | 4 | 25 | 89 | 1300 |
| VPE150-24S48W | 8.5 ~ 36 | 48 | 2.5 | 25 | 88 | 520 |
| VPE150-48S3P3W | 16.5 ~ 75 | 3.3 | 30 | 15 | 88 | 91000 |
| VPE150-48S05W | 16.5 ~ 75 | 5 | 24 | 15 | 89 | 48000 |
| VPE150-48S12W | 16.5 ~ 75 | 12 | 10 | 15 | 89 | 8300 |
| VPE150-48S15W | 16.5 ~ 75 | 15 | 8 | 15 | 90 | 5300 |
| VPE150-48S24W | 16.5 ~ 75 | 24 | 5 | 15 | 90 | 2100 |
| VPE150-48S30W | 16.5 ~ 75 | 30 | 4 | 15 | 90 | 1300 |
| VPE150-48S48W | 16.5 ~ 75 | 48 | 2.5 | 15 | 90 | 520 |
| VPE150-110S3P3W | 40 ~ 160 | 3.3 | 30 | 8 | 88 | 91000 |
| VPE150-110S05W | 40 ~ 160 | 5 | 24 | 8 | 89 | 48000 |
| VPE150-110S12W | 40 ~ 160 | 12 | 11 | 8 | 88 | 9170 |
| VPE150-110S15W | 40 ~ 160 | 15 | 8.6 | 8 | 89 | 5730 |
| VPE150-110S24W | 40 ~ 160 | 24 | 5.5 | 8 | 89 | 2290 |
| VPE150-110S30W | 40 ~ 160 | 30 | 4.4 | 8 | 89 | 1470 |
| VPE150-110S48W | 40 ~ 160 | 48 | 2.7 | 8 | 89 | 560 |

| INPUT SPECIFICATIONS | | | | | | |
|-------------------------------|-------------------------|------------------------------------|-----------|---------------------|------|------|
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
| Operating input voltage range | 24Vin(nom) | | 8.5 | 24 | 36 | VDC |
| | 48Vin(nom) | | 16.5 | 48 | 75 | |
| | 110Vin(nom) | | 40 | 110 | 160 | |
| Start up voltage | 24Vin(nom) | | | | 9 | VDC |
| | 48Vin(nom) | | | | 18 | |
| | 110Vin(nom) | | | | 43 | |
| Shutdown voltage | 24Vin(nom) | | 7.3 | 7.7 | 8.1 | VDC |
| | 48Vin(nom) | | 15.5 | 15.9 | 16.3 | |
| | 110Vin(nom) | | 33.0 | 34.5 | 36.0 | |
| Start up time | Constant resistive load | Power up | | 75 | 100 | ms |
| | | Remote ON/OFF | | 75 | 100 | |
| Input surge voltage | 1 second, max. | 24Vin(nom) | | | 50 | VDC |
| | | 48Vin(nom) | | | 100 | |
| | | 110Vin(nom) | | | 185 | |
| Input filter ⁽¹⁾ | | | Pi type | | | |
| Remote ON/OFF | Referred to -Vin pin | Negative logic DC-DC ON (Standard) | DC-DC OFF | Short or 0 ~ 1.2VDC | | |
| | | Positive logic DC-DC ON (Option) | DC-DC OFF | Open or 3 ~ 12 VDC | | |
| | | Input current of Ctrl pin | | -0.5 | 1 | mA |
| | | Remote off input current | | | 3 | 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 | | -0.1 | | +0.1 | % |
| Load regulation | No Load to Full Load | 3.3 & 5Vout | -0.2 | | +0.2 | % |
| | | Others | -0.1 | | +0.1 | |
| Voltage adjustability | Maximum output deviation is inclusive of remote sense | | -20 | | +10 | % |
| Remote sense | % of Vout(nom) If remote sense is not being used, sense pins should connect to the output pins with the same polarity. | | | | 10 | % |
| Ripple and noise | Measured by 20MHz bandwidth | | | 75 | | mVp-p |
| | With a 22µF/25V X7R MLCC | 3.3Vout, 5Vout | | 100 | | |
| | With a 22µF/25V X7R MLCC | 12Vout, 15Vout | | 200 | | |
| | With a 4.7µF/50V X7R MLCC | 24Vout, 30Vout | | 300 | | |
| | With a 2.2µF/100V X7R MLCC | 48Vout | | | | |
| Temperature coefficient | | | -0.02 | | +0.02 | %/°C |
| Transient response recovery time | 25% load step change | | | 250 | | µs |
| Over voltage protection | % of Vout(nom); Hiccup mode | | 115 | | 130 | % |
| Over load protection | % of Iout rated; Hiccup mode | | 110 | | 140 | % |
| Short circuit protection | | | Continuous, automatic recovery | | | |

| GENERAL SPECIFICATIONS | | | | | | |
|------------------------|--------------------------|-------------------------------------------------|---------------------------------------|------|------|----------------------------|
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
| Isolation voltage | 1 minute | 110Vin(nom) | 3000 | | | VAC |
| | (Reinforced insulation) | Input to Output Input (Output) to Base-Plate | 1500 | | | |
| | 1 minute | Others | 2250 | | | VDC |
| | (Basic insulation) | Input to Output Input (Output) to Base-Plate | 2250 | | | |
| Isolation resistance | 500VDC | | 1 | | | GΩ |
| Isolation capacitance | | | | | 1500 | pF |
| Switching frequency | | | 270 | 300 | 330 | kHz |
| Safety approvals | IEC/ EN/ UL 62368-1 | | | | | UL:E193009 CB:UL(Demko) |
| Standard approvals | EN50155 EN45545-2 | | | | | |
| Case material | | | Aluminum base-plate with plastic case | | | |
| Potting material | | | Silicone (UL94 V-0) | | | |
| Weight | | | 64g (2.26oz) | | | |
| MTBF | MIL-HDBK-217F, Full load | | 3.684 x 10 ⁵ hrs | | | |

| ENVIRONMENTAL SPECIFICATIONS | | | | | | |
|----------------------------------|-----------------------------|--|-----------------------|------|------|------|
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
| Operating base-plate temperature | | | -40 | | +105 | °C |
| Maximum case temperature | | | | | 105 | °C |
| Over temperature protection | | | | 110 | | °C |
| Storage temperature range | | | -55 | | +125 | °C |
| Thermal impedance | Without Heat-sink | | | 9 | | °C/W |
| | Mount on 2U iron base-plate | | | 2.8 | | |
| | With 0.24" Height Heat-sink | | | 7.1 | | |
| | With 0.5" Height Heat-sink | | | 5.5 | | |
| Thermal shock | | | MIL-STD-810F | | | |
| Shock | | | EN61373, MIL-STD-810F | | | |
| Vibration | | | EN61373, MIL-STD-810F | | | |
| Relative humidity | | | 5% to 95% RH | | | |

EMC SPECIFICATIONS

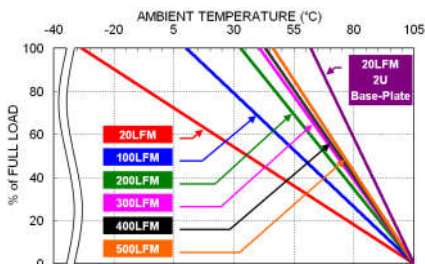
| Parameter | Conditions | Level |
|--------------------------------|----------------------------------------------------------------------------------------------------------|------------------|
| EMI | EN55011, EN55032 With external components | Class A, Class B |
| EMS | EN55024 | |
| ESD | EN61000-4-2 Air ± 8kV and Contact ± 6kV | Perf. Criteria A |
| Radiated immunity | EN61000-4-3 20 V/m | Perf. Criteria A |
| Fast transient | EN61000-4-4 ± 2kV VPE150-24S □□W VPE150-48S □□W VPE150-110S □□W | Perf. Criteria A |
| Surge | EN61000-4-5 EN55024:±2kV and EN50155:±2kV VPE150-24S □□W VPE150-48S □□W VPE150-110S □□W | Perf. Criteria A |
| 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 |

Note:

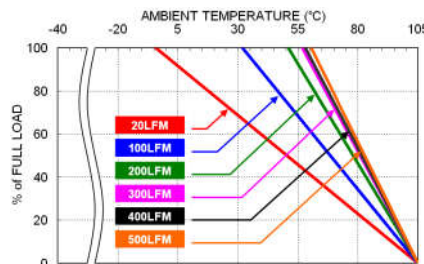
- Input source impedanc e: The power module will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. The VPE150-24S □□W and VPE150-48S □□W recommended Nippon Chemi-con KY series, 100µF/100V. The VPE150-110S □□W recommended Ruby-con BXF series, 39µF/200V.
- BASE-PLATE GROUNDING: When connect two screw bolts to shield plane, the EMI could be reduced.

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

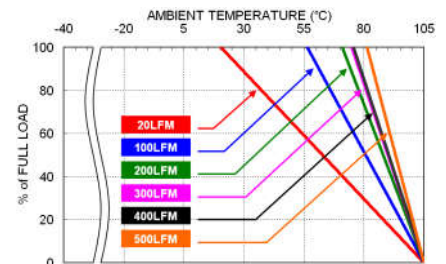
CHARACTERISTIC CURVE



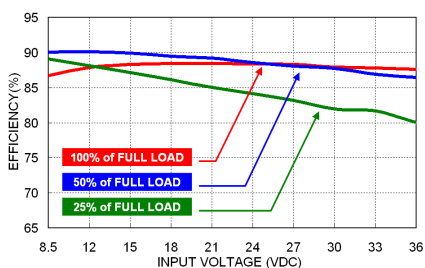
VPE150-24S05W Derating Curve



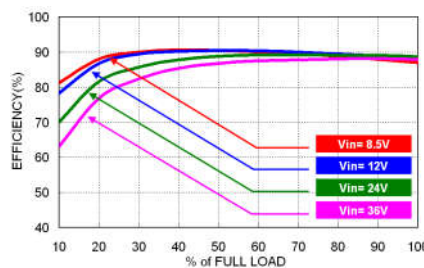
VPE150-24S05W Derating Curve With 0.24" Height Heat-sink



VPE150-24S05W Derating Curve With 0.5" Height Heat-sink



VPE150-24S05W Efficiency vs. Input Voltage



VPE150-24S05W Efficiency vs. Output Load

FUSE CONSIDERATION

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

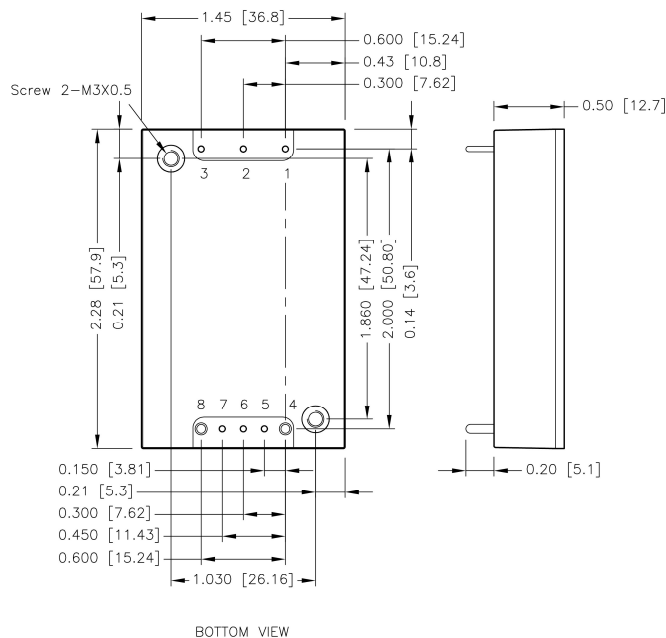
This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

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 |
|---------------|-----------------|-------------|
| VPE150-24S W | 25 | Fast-Acting |
| VPE150-48S W | 12 | Fast-Acting |
| VPE150-110S W | 6.3 | 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

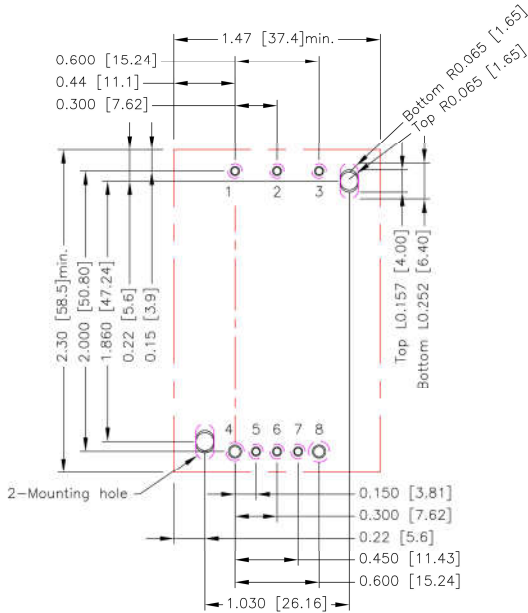


PIN CONNECTION

| PIN | DEFINE | DIAMETER |
|-----|---------|-----------|
| 1 | - Vin | 0.04 Inch |
| 2 | Ctrl | 0.04 Inch |
| 3 | + Vin | 0.04 Inch |
| 4 | - Vout | 0.06 Inch |
| 5 | - Sense | 0.04 Inch |
| 6 | Trim | 0.04 Inch |
| 7 | + Sense | 0.04 Inch |
| 8 | + Vout | 0.06 Inch |

1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.010 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]
4. The screw locked torque:MAX 3.5kgf-cm [0.34N-m]

RECOMMENDED PAD LAYOUT

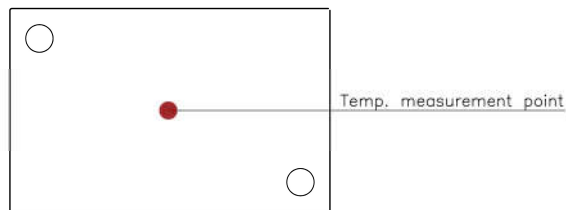


All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 1.2.3.5.6.7: $\varnothing 0.051[1.30]$
 Through hole 4.8: $\varnothing 0.075[1.90]$
 Through hole of mounting: $\varnothing 0.126[3.20]$
 Top view pad 1.2.3.5.6.7: $\varnothing 0.064[1.63]$
 Top view pad 4.8: $\varnothing 0.094[2.38]$
 Top view pad of mounting: Groove R0.065[1.65]L0.157[4.00]
 Bottom view pad 1.2.3.5.6.7: $\varnothing 0.102[2.60]$
 Bottom view pad 8: $\varnothing 0.150[3.80]$
 Bottom view pad 4: $\varnothing 0.130[3.30]$
 Bottom view pad of mounting: Groove R0.065[1.65]L0.252[6.40]

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.

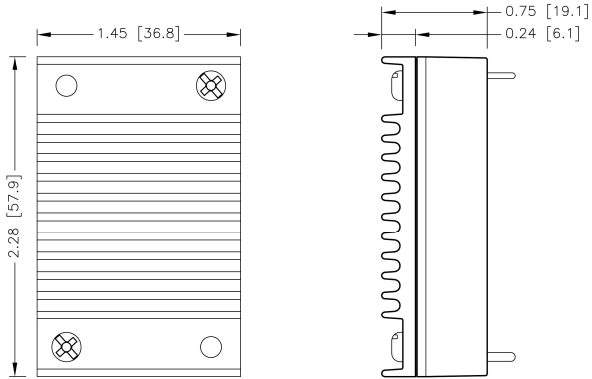
- Thermal test condition with vertical direction by natural convection (20LFM).
- The iron base-plate dimension is 19" X 3.5" X 0.063" (The height is EIA standard 2U).
- The heat-sink is optional and P/N: 7G-0029B-F , 7G-0030B-F , 7G-0031B-F , 7G-0032B-F



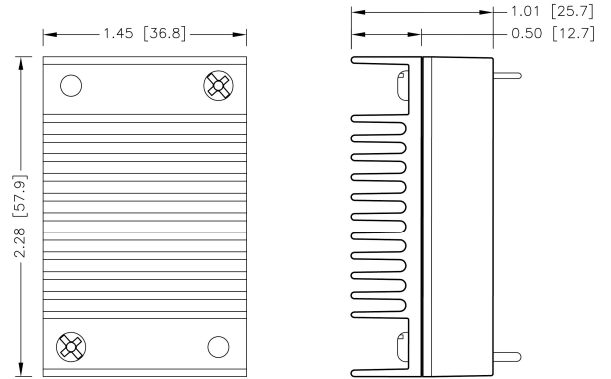
BASE PLATE

HEAT-SINK TYPE OPTIONS

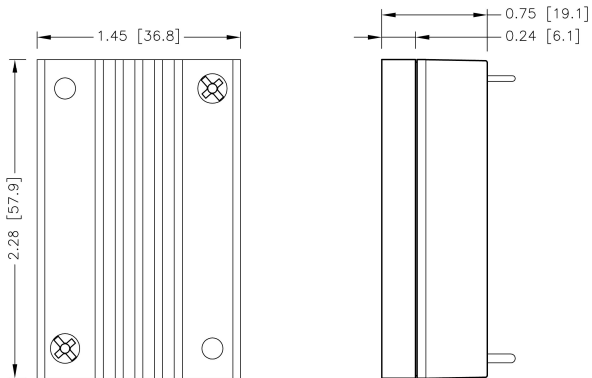
VPE150-□□S□□W - HS
7G-0029B-F



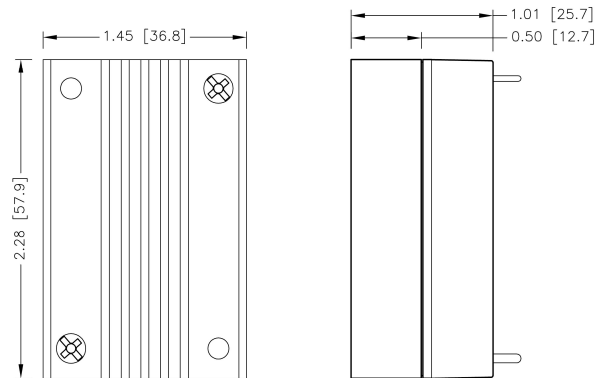
VPE150-□□S□□W - HS1
7G-0030B-F



VPE150-□□S□□W - HS2
7G-0031B-F



VPE150-□□S□□W - HS3
7G-0032B-F



1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]

OUTPUT VOLTAGE ADJUSTMENT

Output voltage is adjustable for 10% trim up or -20% trim down of nominal output voltage by connecting an external resistor between the Trim pin and either the +Sense or -Sense pins.

With an external resistor between the Trim and -Sense pin, the output voltage set point decreases.

With an external resistor between the Trim and +Sense pin, the output voltage set point increases.

Maximum output deviation is +10% inclusive of remote sense.

The external Trim resistor needs to be at least 1/8W of rated power.

Trim Up Equation

$$R_U = \left(\frac{5.11V_{OUT}(100 + \Delta\%)}{1.225\Delta\%} - \frac{511 + 10.22\Delta\%}{\Delta\%} \right) k\Omega$$

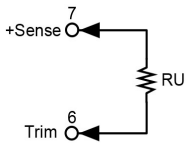
Trim Down Equation

$$R_D = \left(\frac{511}{\Delta\%} - 10.22 \right) k\Omega$$

EXTERNAL OUTPUT TRIMMING

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

Trim-up



□□S3P3W

| 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) | 869.117 | 436.331 | 292.07 | 219.939 | 176.66 | 147.808 | 127.198 | 111.742 | 99.72 | 90.103 |

□□S05W

| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|---------|---------|---------|---------|--------|--------|---------|---------|---------|---------|
| Vout (V) | 5.05 | 5.10 | 5.15 | 5.20 | 5.25 | 5.30 | 5.35 | 5.40 | 5.45 | 5.50 |
| RU (k Ω) | 1585.35 | 797.994 | 535.542 | 404.316 | 325.58 | 273.09 | 235.596 | 207.476 | 185.605 | 168.109 |

□□S12W

| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|---------|---------|---------|---------|--------|---------|---------|---------|--------|---------|
| Vout (V) | 12.12 | 12.24 | 12.36 | 12.48 | 12.60 | 12.72 | 12.84 | 12.96 | 13.08 | 13.20 |
| RU (k Ω) | 4534.55 | 2287.19 | 1538.08 | 1163.52 | 938.78 | 788.956 | 681.939 | 601.676 | 539.25 | 489.309 |

□□S15W

| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Vout (V) | 15.15 | 15.30 | 15.45 | 15.60 | 15.75 | 15.90 | 16.05 | 16.20 | 16.35 | 16.50 |
| RU (k Ω) | 5798.49 | 2925.42 | 1967.73 | 1488.89 | 1201.58 | 1010.04 | 873.229 | 770.619 | 690.812 | 626.966 |

□□S24W

| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|---------|---------|--------|-------|---------|--------|--------|---------|--------|---------|
| Vout (V) | 24.24 | 24.48 | 24.72 | 24.96 | 25.20 | 25.44 | 25.68 | 25.92 | 26.16 | 26.40 |
| RU (k Ω) | 9590.32 | 4840.11 | 3256.7 | 2465 | 1989.98 | 1673.3 | 1447.1 | 1277.45 | 1145.5 | 1039.94 |

□□S30W

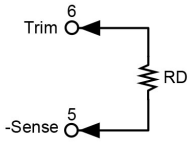
| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Vout (V) | 30.3 | 30.6 | 30.9 | 31.2 | 31.5 | 31.8 | 32.1 | 32.4 | 32.7 | 33 |
| RU (k Ω) | 12118.2 | 6116.57 | 4116.02 | 3115.74 | 2515.58 | 2115.47 | 1829.68 | 1615.33 | 1448.62 | 1315.25 |

□□S48W

| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Vout (V) | 48.48 | 48.96 | 49.44 | 49.92 | 50.40 | 50.88 | 51.36 | 51.84 | 52.32 | 52.80 |
| RU (k Ω) | 19701.9 | 9945.94 | 6693.96 | 5067.97 | 4092.38 | 3441.99 | 2977.42 | 2628.99 | 2357.99 | 2141.19 |

OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

Trim-down



□□S□□W

| | | | | | | | | | | |
|------------------|--------|--------|---------|--------|--------|--------|--------|--------|--------|-------|
| ΔV (%) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| RD (k Ω) | 500.78 | 245.28 | 160.113 | 117.53 | 91.98 | 74.947 | 62.78 | 53.655 | 46.558 | 40.88 |
| ΔV (%) | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| RD (k Ω) | 36.235 | 32.363 | 29.088 | 26.28 | 23.847 | 21.718 | 19.839 | 18.169 | 16.675 | 15.33 |