

Standard Package



Size: 1.45in x 2.28in x 0.50in (36.8mm x 57.9mm x 12.7mm)

Heatsink Package ("HSx" Suffix)



Size: 1.45in x 2.28in x 0.75~1.51in (36.8mm x 57.9mm x 19.1~38.3mm)

OPTIONS

- Remote Control Logic
- Heatsink
- Through Hole (No Thread)
- Bus & UVP

APPLICATIONS

- Railway
- Automation
- Datacom
- IPC
- Industrial
- Measurement
- Telecom

FEATURES

- Ultra-Wide 12:1 Input Voltage Range
- 2250VDC Basic Insulation
- 3000VAC Reinforced Insulation
- No Minimum Load Requirement
- Low Standby Power
- Remote On/Off
- High Efficiency
- Optional Heatsink
- Over Voltage, Over Load, Over Temperature, and Short Circuit Protection
- IEC/UL/EN62368-1 Safety Approvals
- EN50155 & EN45545-2 Railway Approvals

DESCRIPTION

The DCQUW40 series of quarter-brick DC/DC converters offers up to 40 watts of output power in a compact 1.45" x 2.28" x 0.50" package with optional heatsink. This series consists of single output models with an ultra-wide 12:1 input voltage range. Each model in this series features low standby power, no minimum load requirement, remote on/off, and 2250VDC basic insulation. This series also has over voltage, over load, over temperature, and short circuit protection as well IEC/UL/EN62368-1 safety approvals and EN50155 and EN45545-2 railway approvals. Please contact factory for ordering information.

MODEL SELECTION TABLE

Model Number ⁽¹⁾	Input Voltage Range	Output Voltage	Full Load Output Current	Ripple & Noise	Efficiency	Maximum Capacitive Load	No Load Input Current	Output Power
DCQUW40-36S05	36VDC (9~75VDC)	5VDC	8A	75mVp-p	89%	16000µF	20mA	Up to 40 Watts
DCQUW40-36S12		12VDC	3.33A	100mVp-p	91%	2800µF	30mA	
DCQUW40-36S15		15VDC	2.67A	100mVp-p	91%	1800µF	30mA	
DCQUW40-36S24		24VDC	1.67A	200mVp-p	90%	720µF	20mA	
DCQUW40-36S28		28VDC	1.43A	200mVp-p	91%	520µF	20mA	
DCQUW40-36S48		48VDC	0.83A	300mVp-p	91%	180µF	20mA	
DCQUW40-36S53		53VDC	0.75A	300mVp-p	91%	150µF	20mA	
DCQUW40-72S05	72VDC (14~160VDC)	5VDC	8A	75mVp-p	89%	16000µF	15mA	Up to 40 Watts
DCQUW40-72S12		12VDC	3.33A	100mVp-p	91%	2800µF	20mA	
DCQUW40-72S15		15VDC	2.67A	100mVp-p	91%	1800µF	20mA	
DCQUW40-72S24		24VDC	1.67A	200mVp-p	90%	720µF	15mA	
DCQUW40-72S28		28VDC	1.43A	200mVp-p	91%	520µF	15mA	
DCQUW40-72S48		48VDC	0.83A	300mVp-p	90%	180µF	15mA	
DCQUW40-72S53		53VDC	0.75A	300mVp-p	91%	150µF	15mA	

SPECIFICATIONS

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS		Min	Typ	Max	Unit
INPUT SPECIFICATIONS						
Operating Input Voltage Range	36Vin Nominal Input		9	36	75	VDC
	72Vin Nominal Input		14	72	160	
Start-Up Voltage	36Vin Nominal Input				9	VDC
	72Vin Nominal Input				14	
Shutdown Voltage	36Vin Nominal Input		7.3	7.7	8.1	VDC
	72Vin Nominal Input		10	11	12	
Input Transient Voltage	100mS max.	36Vin Nominal Input	8.1			VDC
		72Vin Nominal Input	12			
Input Surge Voltage	1 Second, max.	36Vin Nominal Input			100	VDC
		72Vin Nominal Input			185	
Input Filter ⁽²⁾			Pi Type			
OUTPUT SPECIFICATIONS						
Output Voltage			See Table			
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		-0.1		+0.1	%
Voltage Adjustability	Maximum output deviation is inclusive of remote sense		-20		+10	%
Remote Sense ⁽³⁾	% of Vout(nom)				10	%
Output Power			See Table			
Output Current			See Table			
Maximum Capacitive Load			See Table			
Ripple & Noise (20MHz bandwidth)	With a 1µF/25V X7R MLCC & 22µF/25V POS-CAP	5Vout		75		mVp-p
	With a 22µF/25V X7R MLCC	12Vout, 15Vout		100		
	With a 4.7µF/50V X7R MLCC	24Vout, 28Vout		200		
	With a 2.2µF/100V X7R MLCC	48Vout, 53Vout		300		
Transient Response Recovery Time	25% Load step change			250		µs
Start-Up Time	Constant resistive load	Power Up		75	100	ms
		Remote On/Off		75	100	
Temperature Coefficient			-0.02		+0.02	%/°C
REMOTE ON/OFF CONTROL ⁽⁴⁾						
Positive Logic	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		1	mA
Remote OFF Input Current				3		mA
PROTECTION						
Short Circuit Protection			Continuous, Automatic Recovery			
Over Load Protection	% of Iout rated; Hiccup Mode		120		140	%
Over Voltage Protection	% of Vout(nom); Hiccup Mode		120		135	%
Over Temperature Protection				+110		°C
ENVIRONMENTAL SPECIFICATIONS						
Operating Base-Plate Temperature	With Derating		-40		+105	°C
Storage Temperature			-55		+125	°C
Maximum Case Temperature					+105	°C
Relative Humidity			5		95	%RH
Thermal Impedance	DC/DC Module without Assembly Option			8.3		°C/W
	Only Mount on the Iron Base-Plate			2.5		
	Heat-Sink Type with 0.24" Height			7.4		
	Heat-Sink Type with 0.5" Height			6.2		
	Heat-Sink Type with 0.65" Height			5.1		
	Heat-Sink Type with 1" Height			4.1		
Thermal Shock			MIL-STD-810F			
Shock			EN61373, MIL-STD-810F			
Vibration			EN61373, MIL-STD-810F			
MTBF	MIL-HDBK-217F, Full Load			829,700		Hours

SPECIFICATIONS

All specifications are based on 25°C, Nominal Input Voltage, and Maximum Output Current unless otherwise noted.
We reserve the right to change specifications based on technological advances.

SPECIFICATION	TEST CONDITIONS			Min	Typ	Max	Unit
GENERAL SPECIFICATIONS							
Efficiency				See Table			
Switching Frequency				160	180	200	kHz
Isolation Voltage	36V _{in}	1 Minute	Input to Output	2250			VDC
	Nominal Input	(Basic Insulation)	Input (Output) to Base-Plate	1600			
	72V _{in}	1 Minute	Input to Output	3000			VAC
	Nominal Input	(Reinforced Insulation)	Input (Output) to Base-Plate	1500			
Isolation Resistance	500VDC			1			GΩ
Isolation Capacitance						1000	pF
PHYSICAL SPECIFICATIONS							
Weight				2.26oz (64g)			
Dimensions (L x W x H)	Standard Package			1.45in x 2.28in x 0.50in (36.8mm x 57.9mm x 12.7mm)			
	Heatsink Option 1 ("HS" Suffix) & Option 3 ("HS2" Suffix)			1.45in x 2.28in x 0.78in (36.8mm x 57.9mm x 19.8mm)			
	Heatsink Option 2 ("HS1" Suffix) & Option 4 ("HS3" Suffix)			1.45in x 2.28in x 1.04in (36.8mm x 57.9mm x 26.4mm)			
	Heatsink Option 5 ("HS4" Suffix)			1.45in x 2.28in x 1.19in (36.8mm x 57.9mm x 30.2mm)			
	Heatsink Option 6 ("HS5" Suffix)			1.45in x 2.28in x 1.54in (36.8mm x 57.9mm x 39.1mm)			
Case Material				Aluminum Base-Plate with Plastic Case			
Potting Material				Silicone (UL94 V-0)			
SAFETY CHARACTERISTICS							
Safety Approvals ⁽⁵⁾				IEC/EN/UL62368-1		CB: UL (Demko)	
Standard Approvals				Railway		EN50155 EN45545-2	
EMI	EN50121-3-2, EN55032 with External Components			Class A, Class B			
EMS	EN55035, EN50121-3-2						
ESD	EN61000-4-2	Air ±8kV and Contact ±6kV		Perf. Criteria A			
Radiated Immunity	EN61000-4-3	20V/m		Perf. Criteria A			
Fast Transient ⁽⁷⁾	EN61000-4-4	±2kV		Perf. Criteria A			
Surge ⁽⁷⁾	EN61000-4-5	EN55035: ±1kV EN50121-3-2: ±2kV		Perf. Criteria A			
Conducted Immunity	EN61000-4-6	10Vr.m.s		Perf. Criteria A			
Power Frequency Magnetic Field	EN61000-4-8	100A/m continuous; 1000A/m 1 second		Perf. Criteria A			

NOTES

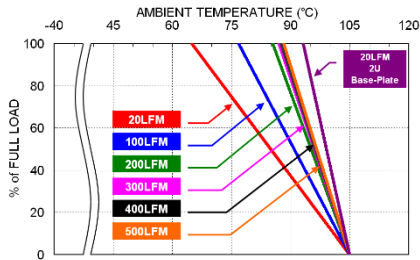
- Several options available for this series that change product model number. See Model Number Setup for more information.
- Input source impedance: The power module will operate as specified without external components, assuming that the source voltage has a very low impedance and reasonable input voltage 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 an external filter capacitor.
-Recommended filter for 36V_{in} Nominal Input Models: Nippon Chemi-con KY series, 220μF/100V.
-Recommended filter for 72V_{in} Nominal Input Models: Nippon Chemi-con KXJ series, 150μF/200V.
- If remote sense is not being used, SENSE pins should be connected to corresponding polarity OUTPUT pins.
- Referred to -V_{in} pin
- This product is Listed to applicable standards and requirements by UL.
- BASE-PLATE GROUNDING: when two screw bolts are connected to shield plane, EMI could be reduced
- With 2pcs of aluminum electrolytic capacitor:
-Recommended for 36V_{in} Nominal Input Models: Nippon Chemi-con KY series, 220μF/100V
-Recommended for 72V_{in} Nominal Input Models: Nippon Chemi-con KXJ series, 150μF/200V

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

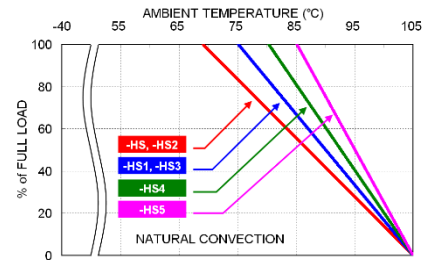
**Due to advances in technology, specifications subject to change without notice.*

DERATING CURVES

DCQUW40-72S05 Derating Curve
(See Thermal Considerations)

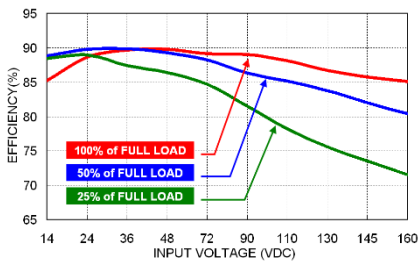


DCQUW40-72S05 Heatsink Derating Curve
(See Thermal Considerations)

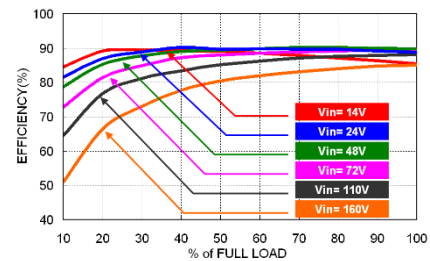


EFFICIENCY GRAPHS

DCQUW40-72S05 Efficiency vs. Input Voltage

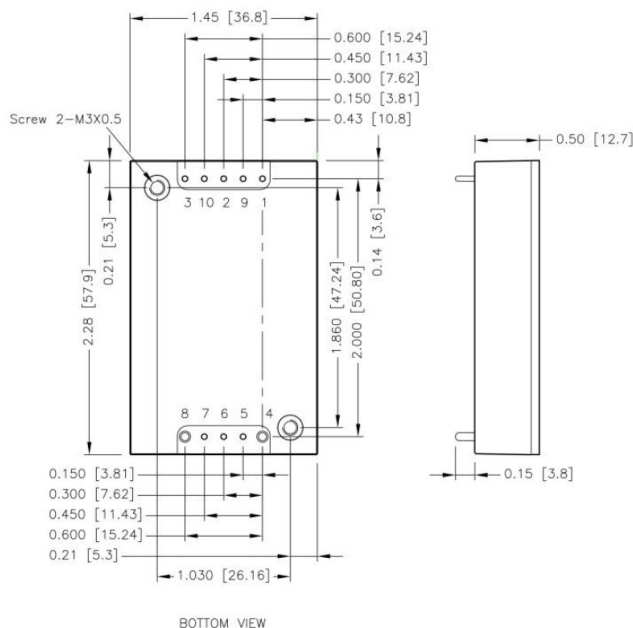


DCQUW40-72S05 Efficiency vs. Output Load



MECHANICAL DRAWINGS

Standard Package



PIN Connection

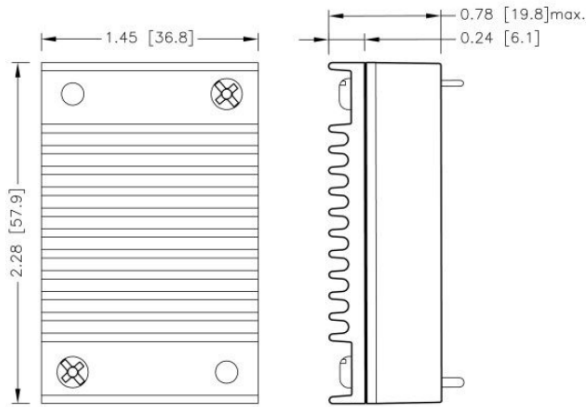
PIN	DEFINE	DIAMETER
1	-Vin	0.04 Inch
2	Ctrl	0.04 Inch
3	+Vin	0.04 Inch
4	-Vout	0.06 Inch
5	-Sense	0.04 Inch
6	Trim	0.04 Inch
7	+Sense	0.04 Inch
8	+Vout	0.06 Inch
9	Bus	0.04 Inch
10	UVLO	0.04 Inch

Notes:

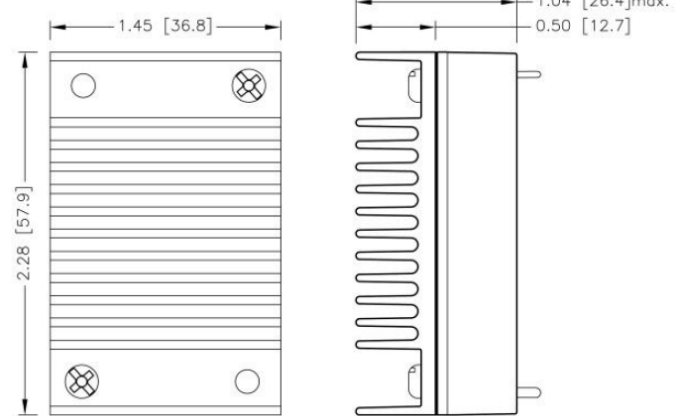
1. All dimensions in inch [mm]
2. Tolerances: $x.xx \pm 0.02$ [$x.xx \pm 0.5$]
 $x.xxx \pm 0.01$ [$x.xx \pm 0.25$]
3. Pin dimension tolerance ± 0.004 [0.10]
4. The screw locked torque: MAX 3.5kgf-cm [0.34N-m]

Heatsink Options

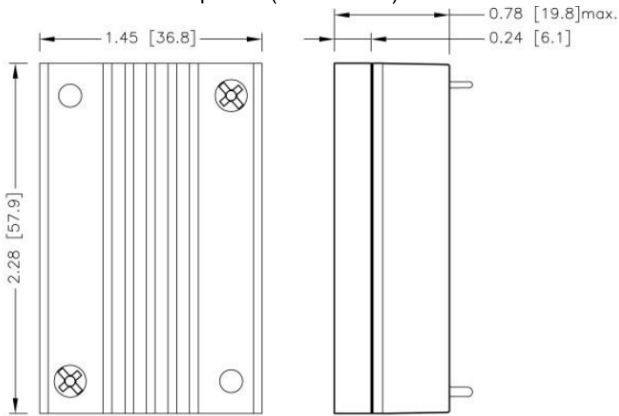
Heatsink Option 1 ("HS" Suffix) 7G-0029B-F



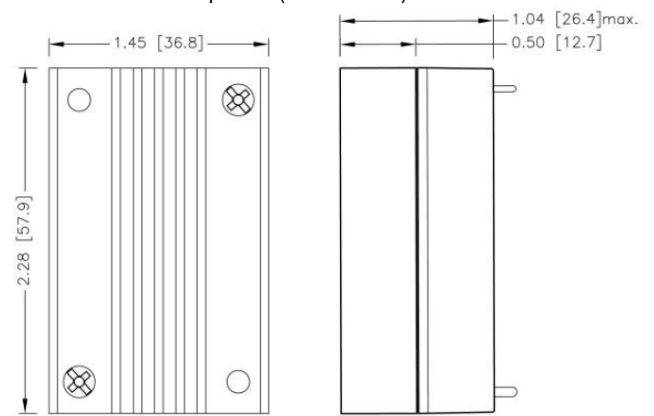
Heatsink Option 2 ("HS1" Suffix) 7G-0030B-F



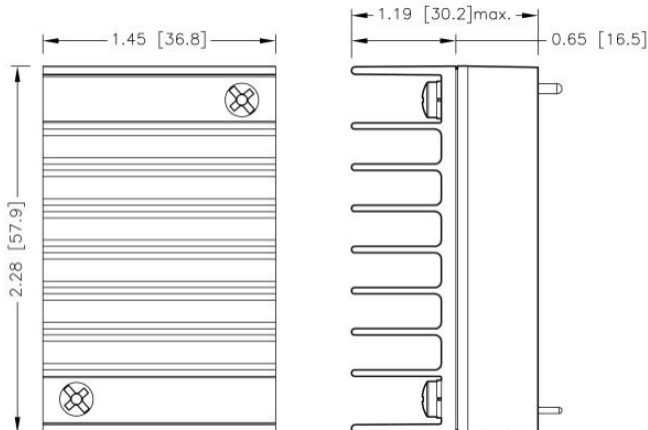
Heatsink Option 3 ("HS2" Suffix) 7G-0031B-F



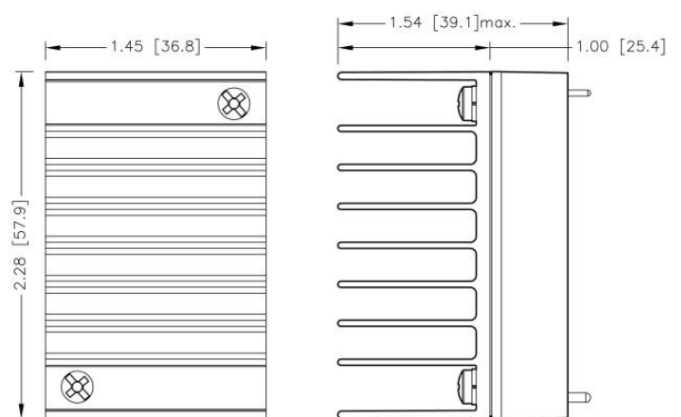
Heatsink Option 4 ("HS3" Suffix) 7G-0032B-F



Heatsink Option 5 ("HS4" Suffix) 7GA0124P01-F

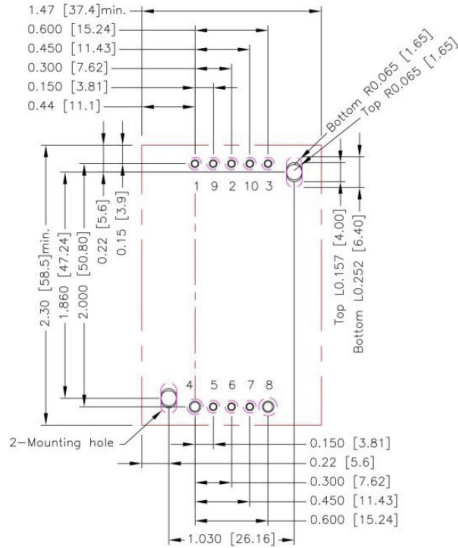


Heatsink Option 6 ("HS5" Suffix) 7GA0125P01-F



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

RECOMMENDED PAD LAYOUT



Notes:

All dimensions in inch [mm]
Pad size (lead free recommended)
Through Hole 1.2.3.5.6.7.9.10: Ø0.051 [1.30]
Through Hole 4.8: Ø0.075 [1.90]
Through Hole of Mounting: Ø0.126 [3.20]
Top View Pad 1.2.3.5.6.7.9.10: Ø0.064 [1.63]
Top View Pad 4.8: Ø0.094 [2.38]
Top View Pad of Mounting: Groove R0.065 [1.65] L0.157 [4.00]
Bottom View Pad 1.2.3.5.6.7.9.10: Ø0.102 [2.60]
Bottom View Pad 8: Ø0.150 [3.80]
Bottom View Pad 4: Ø0.130 [3.30]
Bottom View Pad of Mounting: Groove R0.065 [1.65] L0.252 [6.40]

FUSE CONSIDERATIONS

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

Suggested input line below:

Model	Fuse Rating (A)	Fuse Type
DCQUW40-36Sxx	8A	Fast-Acting
DCQUW40-72Sxx	5A	Slow-Blow

Table based on information provided in data sheet on inrush energy and maximum DC input current at low Vin.

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.

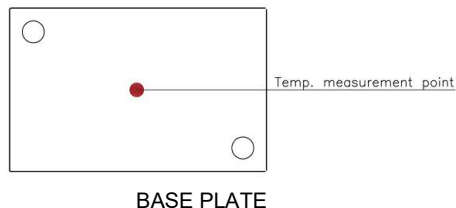
Proper cooling can be verified by measuring the point in the figure below.

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, 7GA0124P01-F, 7GA0125P01-F



BASE PLATE

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

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

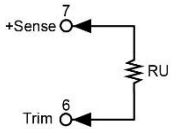
Trim Down Equation

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

External Output Trimming

Output can be externally trimmed using the method shown below

Trim-Up



5VDC Output Models

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

12VDC Output Models

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

15VDC Output Models

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

24VDC Output Models

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

28VDC Output Models

ΔV	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	28.28	28.56	28.84	29.12	29.40	29.68	29.96	30.24	30.52	30.80
RU	(k Ω)	11275.58	5691.08	3829.58	2898.83	2340.38	1968.08	1702.151	1502.705	1347.58	1223.48

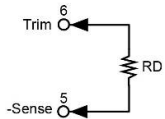
48VDC Output Models

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

53VDC Output Models

ΔV	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	53.53	54.06	54.59	55.12	55.65	56.18	56.71	57.24	57.77	58.30
RU	(k Ω)	21808.437	11009.651	7410.056	5610.259	4530.38	3810.461	3296.233	2910.562	2610.596	2370.623

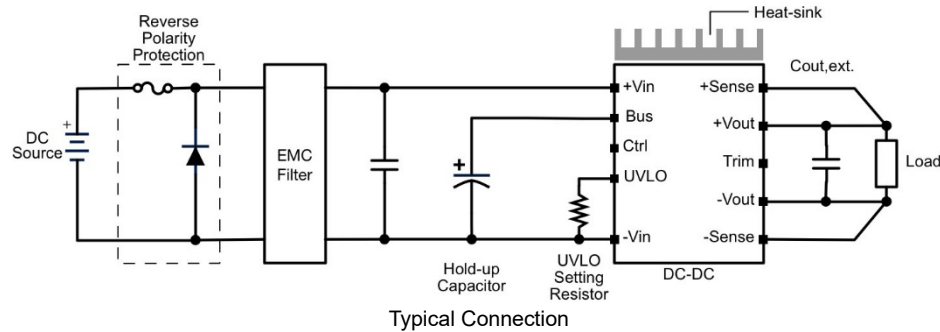
Trim Down



All Models

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

TYPICAL APPLICATION



• UVLO

This series has ultra wide input range. It could cover many kinds of nominal input voltage in one module. In order to preventing incorrect operating under different input system, it offers UVLO adjustment by connecting a resistor to set UVLO threshold.

• UVLO Constants

Model	A	B	C
DCQUW40-36Sxx	48000	8273	0.96
DCQUW40-72Sxx	120000	12500	2.4

• UVLO Equation

Start-up Voltage

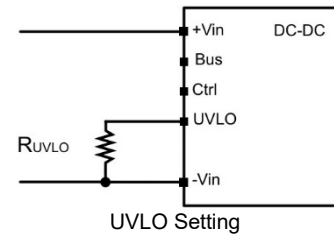
$$V_{\text{start-up}} = 1.25 \times \left[\frac{A \times (R_{\text{UVLO}} + B)}{R_{\text{UVLO}} \times B} + 1 \right]$$

Shutdown Voltage

$$V_{\text{shutdown}} = V_{\text{start-up}} - C$$

• UVLO values for various nominal input voltage and R_{UVLO} table

Nominal Vin	12V	24V	36V	48V
Start-up voltage	8.46 V	13.36 V	20.56 V	27.76 V
Shutdown voltage	7.5 V	12.4 V	19.6 V	26.8 V
UVLO Setting resistor	Open	12.35 KΩ	4.98 KΩ	3.12 KΩ



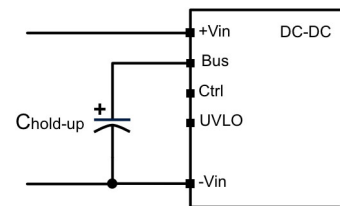
DCQUW40-72Sxx

Nominal Vin	24 V	36 V	48 V	72 V	96 V	110 V
Start-up voltage	14.8 V	22 V	29.2 V	43.6 V	58 V	66.4 V
Shutdown voltage	12.4 V	19.6 V	26.8 V	41.2 V	55.6 V	64 V
UVLO Setting resistor	96.77 KΩ	17.14 KΩ	9.40 KΩ	4.94 KΩ	3.35 KΩ	2.82 KΩ

• Hold Up Time

Generally, connecting a large number of hold up capacitors on input are necessary to get a long duration of hold up time for S2, C2 described in EN50155. The Bus pin features excellent function can simply connect capacitors to Bus pin with less quantity of capacitors. It helps reduce layout area and smooth the inrush current.

For further information, please contact factory.



MODEL NUMBER SETUP

DCQUW	40	-	72	S	05	K	P	HS
Series Name	Output Power		Input Voltage	Output Quantity	Output Voltage	Bus & UVP adj. Options	Remote Control Options	Assembly Options
			36: 9~75VDC 72: 14~160VDC	S: Single	05: 5VDC 12: 12VDC 15: 15VDC 24: 24VDC 28: 28VDC 48: 48VDC 53: 53VDC	Blank: None K: With Bus & UVP adj. V: With UVP adj.	Blank: Positive Logic N: Negative Logic	Blank: 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" HS4: 7GA0124P01-F, H=0.65" HS5: 7GA0125P01-F, H=1" TH: Through Hole (No Thread)

NOTES

- Models with TH option cannot be equipped with a heatsink.

COMPANY INFORMATION

Wall Industries, Inc. has created custom and modified units for over 50 years. Our in-house research and development engineers will provide a solution that exceeds your performance requirements on-time and on budget. Our ISO9001: 2015 certification is just one example of our commitment to producing a high quality, well-documented product for our customers.

Our past projects demonstrate our commitment to you, our customer. Wall Industries, Inc. has a reputation for working closely with its customers to ensure each solution meets or exceeds form, fit and function requirements. We will continue to provide ongoing support for your project above and beyond the design and production phases. Give us a call today to discuss your future projects.

Contact **Wall Industries** for further information:

Phone: ☎(603)778-2300
Toll Free: ☎(888)597-9255
Fax: ☎(603)778-9797
E-mail: sales@wallindustries.com
Web: www.wallindustries.com
Address: 37 Industrial Drive
Exeter, NH 03833

©2023 Wall Industries, Inc. Specifications subject to change without notice. Wall Industries is not responsible for typographical errors. The information contained herein is for informational purposes only. This information is provided by Wall Industries and we make no representations or warranties of any kind, express or implied, about the completeness, accuracy, reliability, suitability or availability with respect to the information contained in this document for any purpose. All product and manufacturer names are trademarks or registered trademarks of their respective companies.