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

Applications:
- Railway Systems
- Automation
- Telecom/Datacom
- Industry Control Systems
- IPC
- Measurement

FEATURES

- Soft Start
- Single Outputs
- Input Under Voltage Protection
- High Efficiency up to 90%
- Remote ON/OFF Control
- 4:1 Ultra Wide Input Voltage Ranges
- No Minimum Load Required
- Low Stand-by Power Consumption
- Industry Standard Quarter-brick Package
- Up to 132 Watts Maximum Output Power
- 2250VDC I/O Basic Insulation
- Short Circuit, Over Voltage, Over Load, & Over Temp. Protection
- UL60950-1, EN60950-1, IEC60950-1, EN45545-2 & EN50155 Safety Approvals
- CE Marked
- Compliant to RoHS II & REACH
- Optional Heatsinks Available
- Threaded (Standard) or Thru-Hole (Optional) Inserts Available
- Railway Applications

DESCRIPTION

The DCQAW150 series of DC/DC power converters provides up to 132 Watts of output power in a 2.28” x 1.45” x 0.5” industry standard quarter-brick package. This series has single output models with 4:1 wide input voltage ranges of 8.5-36VDC, 16.5-75VDC, and 40-160VDC. Some features include high efficiency up to 90%, 2250VDC I/O basic insulation, and remote ON/OFF control. These converters are also protected against input under voltage, short circuit, over voltage, over load, and over temperature conditions. All models are RoHS compliant and have UL60950-1, EN60950-1, IEC60950-1, EN45545-2 and EN50155 safety approvals. Several different options are available for this series including negative logic remote ON/OFF, heatsinks, and thru-hole inserts.

MODEL SELECTION TABLE

Model Number	Input Voltage	Output Voltage	Output Current		Output Ripple & Noise	No Load Input Current	Output Power	Efficiency	Maximum Capacitive Load
			Min Load	Max Load					
DCQAW150-24S33	24 VDC (8.5 - 36 VDC)	3.3 VDC	0mA	30A	75mVp-p	25mA	99W	88%	91,000µF
DCQAW150-24S05		5 VDC	0mA	24A	75mVp-p	25mA	120W	89%	48,000µF
DCQAW150-24S12		12 VDC	0mA	10A	100mVp-p	25mA	120W	88%	8300µF
DCQAW150-24S15		15 VDC	0mA	8A	100mVp-p	25mA	120W	89%	5300µF
DCQAW150-24S24		24 VDC	0mA	5A	200mVp-p	25mA	120W	88%	2100µF
DCQAW150-24S30		30 VDC	0mA	4A	200mVp-p	25mA	120W	89%	1300µF
DCQAW150-24S48		48 VDC	0mA	2.5A	300mVp-p	25mA	120W	88%	520µF
DCQAW150-48S33	48 VDC (16.5 - 75 VDC)	3.3 VDC	0mA	30A	75mVp-p	15mA	99W	88%	91,000µF
DCQAW150-48S05		5 VDC	0mA	24A	75mVp-p	15mA	120W	89%	48,000µF
DCQAW150-48S12		12 VDC	0mA	10A	100mVp-p	15mA	120W	89%	8300µF
DCQAW150-48S15		15 VDC	0mA	8A	100mVp-p	15mA	120W	90%	5300µF
DCQAW150-48S24		24 VDC	0mA	5A	200mVp-p	15mA	120W	90%	2100µF
DCQAW150-48S30		30 VDC	0mA	4A	200mVp-p	15mA	120W	90%	1300µF
DCQAW150-48S48		48 VDC	0mA	2.5A	300mVp-p	15mA	120W	90%	520µF
DCQAW150-110S33	110 VDC (40 - 160 VDC)	3.3 VDC	0mA	30A	75mVp-p	8mA	99W	88%	91,000µF
DCQAW150-110S05		5 VDC	0mA	24A	75mVp-p	8mA	120W	89%	48,000µF
DCQAW150-110S12		12 VDC	0mA	11A	100mVp-p	8mA	132W	88%	9170µF
DCQAW150-110S15		15 VDC	0mA	8.6A	100mVp-p	8mA	129W	89%	5730µF
DCQAW150-110S24		24 VDC	0mA	5.5A	200mVp-p	8mA	132W	89%	2290µF
DCQAW150-110S30		30 VDC	0mA	4.4A	200mVp-p	8mA	132W	89%	1470µF
DCQAW150-110S48		48 VDC	0mA	2.7A	300mVp-p	8mA	129.6W	89%	560µF

NOTES
1. Input Source Impedance: The power modules will operate to specifications without external components, assuming that the source voltage has very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage sources have finite impedance, performance is improved by adding an external filter capacitor.
   - For 24VDC & 48VDC input models we recommend using Nippon Chemi-con KY series, 100µF/100V.
   - For 110VDC input models we recommend using Ruby-con BXF series, 39µF/200V.
2. If remote sense is not being used, sense pins should connect to the output pins with same polarity.
3. The DCQAW150 series can only meet EMI Class A or Class B with external components added. Please contact factory for more information.
4. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
   - For 24VDC & 48VDC input models we recommend with 2pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220µF/100V)
   - For 110VDC input models we recommend with 3pcs of aluminum electrolytic capacitor (Ruby-con BXF series, 100µF/250V).
5. Both positive logic and negative logic remote ON/OFF control is available. Positive logic remote ON/OFF comes standard; for negative logic remote ON/OFF add the suffix “R” to the model number (Ex: DCQAW150-48S24R).
6. Optional heatsinks available. See page 5 for ordering details.
7. M3 x 0.5 threaded-thru inserts come standard. For Ø.126 thru-hole inserts add the suffix “TH” to the model number (Ex: DCQAW150-48S24TH). Models with thru-hole inserts cannot be equipped with a heatsink.
8. BASE-PLATE GROUNDING: EMI can be reduced when you connect two screw bolts to shield plane.

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

SPECIFICATIONS: DCQAW150 SERIES

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

SPECIFICATION	TEST CONDITIONS		Min	Typ	Max	Unit
INPUT SPECIFICATIONS						
Input Voltage Range	24VDC nominal input models		8.5	24	36	VDC
	48VDC nominal input models		16.5	48	75	
	110VDC nominal input models		40	110	160	
Start-Up Voltage	24VDC nominal input models				9	VDC
	48VDC nominal input models				18	
	110VDC nominal input models				43	
Shutdown Voltage	24VDC nominal input models		7.3	7.7	8.1	VDC
	48VDC nominal input models		15.5	15.9	16.3	
	110VDC nominal input models		33.0	34.5	36.0	
Input Surge Voltage (1sec, max.)	24VDC nominal input models				50	VDC
	48VDC nominal input models				100	
	110VDC nominal input models				185	
Input Current	No Load		See Table			
Input Filter (See Note 1)			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	3.3V & 5V Output Models	-0.2		+0.2	%
		Others	-0.1		+0.1	
Voltage Adjustability	Maximum output deviation is inclusive of remote sense		-20		+10	%
Remote Sense (See Note 2)	% of Vo (nom)				10	%
Output Power			See Table			
Output Current			See Table			
Minimum Load			0			%
Maximum Capacitive Load	Minimum input and constant resistive load		See Table			
Ripple & Noise (20MHz BW)	Measured with a 22µF/25V X7R MLCC	3.3V & 5V Output Models		75		mVp-p
	Measured with a 22µF/25V X7R MLCC	12V & 15V Output Models		100		
	Measured with a 4.7µF/50V X7R MLCC	24V & 30V Output Models		200		
	Measured with a 2.2µF/100V X7R MLCC	48V Output Models		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
PROTECTION						
Short Circuit Protection			Continuous, automatic recovery			
Over Load Protection	% of rated Iout; hiccup mode		110		140	%
Over Voltage Protection	% of Vo (nom); hiccup mode		115		130	%
Over Temperature Protection				+110		°C
GENERAL SPECIFICATIONS						
Efficiency	Nominal input voltage and full load		See Table			
Switching Frequency			270	300	330	kHz
Isolation Voltage	1 minute (reinforced insulation)	Input to Output	3000			VAC
		Input/Output to Base-plate	1500			
	1 minute (basic insulation)	Input to Output	2250			VDC
		Input/Output to Base-plate	2250			
Isolation Resistance	500VDC		1			GΩ
Isolation Capacitance					1500	pF
REMOTE ON/OFF (See Note 5)						
Positive Logic (standard)	Referenced to –Input pin	DC/DC ON	Open or 3~12 VDC			
		DC/DC OFF	Short or 0~1.2VDC			
Negative Logic (optional)	Referenced to –Input pin	DC/DC ON	Short or 0~1.2 VDC			
		DC/DC OFF	Open or 3~12VDC			
Input Current of Remote Control Pin	Nominal Vin		-0.5		1	mA
Remote OFF State Input Current	Nominal Vin			3		mA

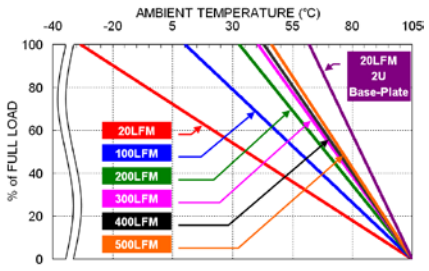
SPECIFICATIONS: DCQAW150 SERIES

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

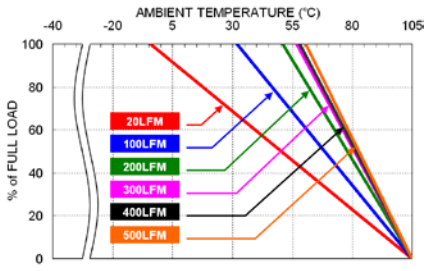
SPECIFICATION	TEST CONDITIONS		Min	Typ	Max	Unit
ENVIRONMENTAL SPECIFICATIONS						
Operating Base-Plate Temperature			-40		+105	°C
Storage Temperature Range			-55		+125	°C
Thermal Impedance (See Note 6)	Vertical direction by natural convection (20LFM)	Without Heatsink		9		°C/W
		With 0.24" Height Heatsink		7.1		
		With 0.5" Height Heatsink		5.5		
		Mounted on 2U iron base-plate		2.8		
Relative Humidity			5		95	% RH
Thermal Shock				MIL-STD-810F		
Shock				EN61373, MIL-STD-810F		
Vibration				EN61373, MIL-STD-810F		
MTBF	MIL-HDBK-217F, full load			368,400 hours		
PHYSICAL SPECIFICATIONS						
Weight				2.26oz (64g)		
Dimensions (L x W x H)				2.28x1.45x0.50 inch (57.9x36.8x12.7 mm)		
Case Material				Aluminum base-plate with plastic case		
Potting Material				Silicon (UL94-V0)		
SAFETY & EMC CHARACTERISTICS						
Safety Approvals				IEC60950-1, UL60950-1, EN60950-1, EN45545-2, EN50155		
EMI (See Note 3)	EN55011, EN55032			Class A, Class B		
ESD	EN61000-4-2	Air ±8kV Contact ±6kV		Perf. Criteria A		
Radiated Immunity	EN61000-4-3	20 V/m		Perf. Criteria A		
Fast Transient (See Note 4)	EN61000-4-4	±2kV		Perf. Criteria A		
Surge (See Note 4)	EN61000-4-5	EN55024: ±2kV EN50155: ±2kV		Perf. Criteria A		
Conducted Immunity	EN61000-4-6	10 Vrms		Perf. Criteria A		
Power Frequency Magnetic Field	EN614000-4-8	100A/m continuous; 1000A/m 1 sec		Perf. Criteria A		

CHARACTERISTIC CURVES

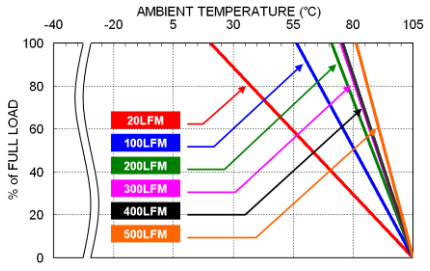
DCQAW150-24S05 Derating Curve



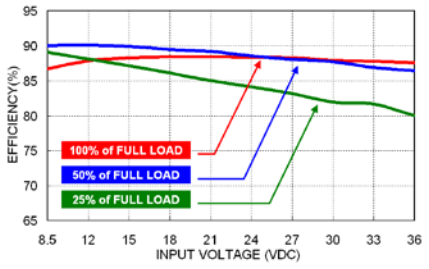
DCQAW150-24S05 Derating Curve w/ 0.24" Heatsink



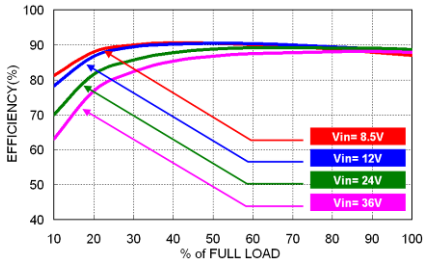
DCQAW150-24S05 Derating Curve w/ 0.5" Heatsink



DCQAW150-24S05 Efficiency vs Input Voltage



DCQAW150-24S05 Efficiency vs Output Load



OUTPUT VOLTAGE ADJUSTMENT

Output 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 decreases.
With an external between the TRIM and +SENSE pin, the output voltage set point increases.
Maximum output deviation is +10% inclusive of remote sense. The value of the external resistor can be obtained by the equations below.

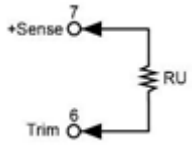
Trim Up Equation

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

Trim Down Equation

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

TRIM UP



3.3V Output Models

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 (kΩ)	869.117	436.331	292.07	219.939	176.66	147.808	127.198	111.742	99.72	90.103

5V 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 (kΩ)	1585.35	797.994	535.542	404.316	325.58	273.09	235.596	207.476	185.605	168.109

12V 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 (kΩ)	4534.55	2287.19	1538.08	1163.52	938.78	788.956	681.939	601.676	539.25	489.309

15V 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 (kΩ)	5798.49	2925.42	1967.73	1488.89	1201.58	1010.04	873.229	770.619	690.812	626.966

24V 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 (kΩ)	9590.32	4840.11	3256.7	2465	1989.98	1673.3	1447.1	1277.45	1145.5	1039.94

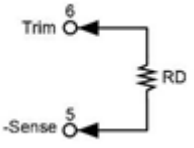
30V Output Models

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 (kΩ)	12118.2	6116.57	4116.02	3115.74	2515.58	2115.47	1829.68	1615.33	1448.62	1315.25

48V 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 (kΩ)	19701.9	9945.94	6693.96	5067.97	4092.38	3441.99	2977.42	2628.99	2357.99	2141.19

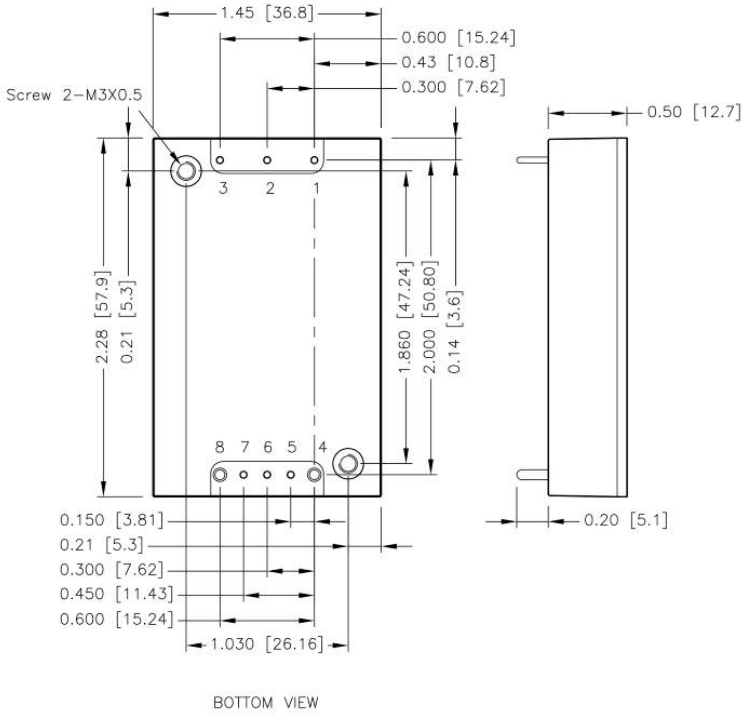
TRIM DOWN



All Models

ΔV (%)	1	2	3	4	5	6	7	8	9	10
RD (kΩ)	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 (kΩ)	36.235	32.363	29.088	26.28	23.847	21.718	19.839	18.169	16.675	15.33

MECHANICAL DRAWING

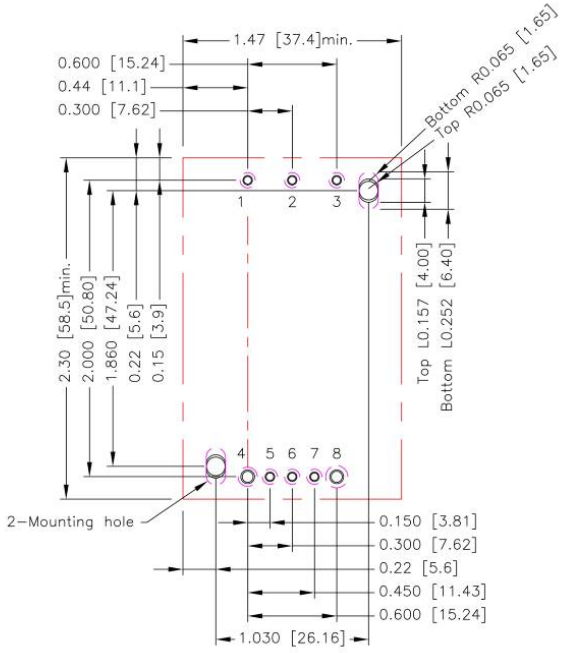


PIN CONNECTION

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

Notes:
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 pitch tolerance: ±0.01 [0.25]
4. Pin dimension tolerance ±0.004 [0.10]
5. The screw locked torque: MAX 3.5kgf-cm [0.34N-m]

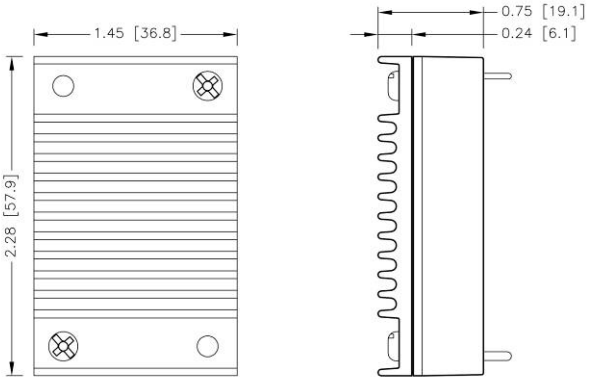
RECOMMENDED PAD LAYOUT



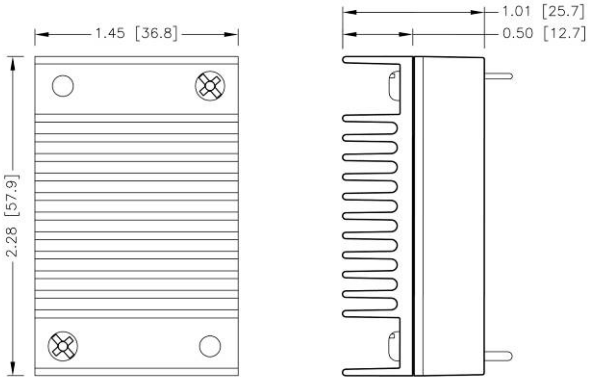
Notes:
All dimensions in inch [mm]
Pad size (lead free recommended)
Through Hole 1.2.3.5.6.7: Ø0.051 [1.30]
Through Hole 4.8: Ø0.075[1.90]
Through Hole of Mounting: Ø0.126[3.20]
Top view pad 1.2.3.5.6.7: Ø0.064 [1.63]
Top view pad 4.8: Ø0.094[2.38]
Top view pad of mounting: Groove R0.065[1.65]L0.157[4.00]
Bottom view pad 1.2.3.5.6.7: 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]

HEATSINK OPTIONS

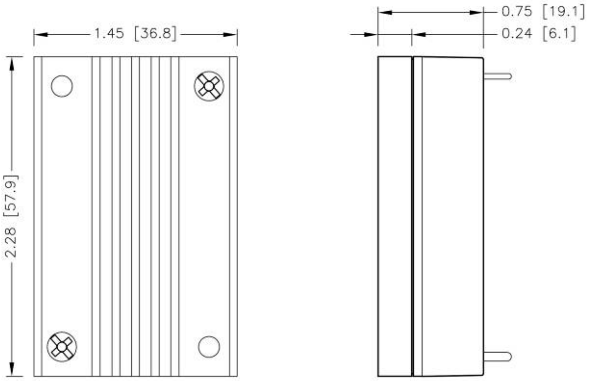
Horizontal Fin Orientation (Suffix Options: H) 7G-0029B-F



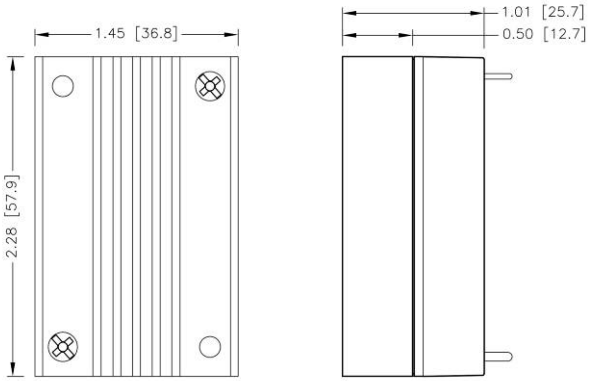
Horizontal Fin Orientation (Suffix Options: H, H1) 7G-0030B-F



Vertical Fin Orientation (Suffix Options: H2) 7G-0031B-F



Vertical Fin Orientation (Suffix Options: H3) 7G-0032B-F

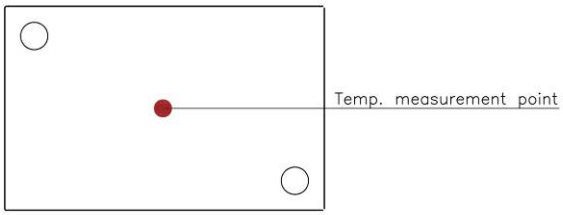


Note: Models with thru-hole inserts cannot be equipped with a heatsink
All dimensions in inch [mm]
Tolerance: x.xx±0.02 [x.x±0.5]

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 condition, 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 105ºC.
When operating, adequate cooling must be provided to maintain the test point temperature at or below 105ºC
Although maximum point temperature of the power modules is 105ºC, 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 option and P/N: 7G-0029B-F, 7G-0030B-F, 7G-0031B-F, 7G-0032B-F



BASE PLATE

THERMAL CONSIDERATIONS

The 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 suggested input line fuse is below.

Model	Fuse Rating	Fuse Type
24VDC nominal input models	25A	Fast-Acting
48VDC nominal input models	12A	Fast-Acting
110VDC nominal input models	6.3A	Slow-Blow

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

MODEL NUMBER SETUP

DCQAW	150	-	48	S	05	R	H (1)
Series Name	Output Power		Input Voltage	Output Quantity	Output Voltage	Remote ON/OFF	Hole Thread & Heatsink Options
	150: 150 Watts		**24:** 8.5~36 VDC **48:** 16.5~75 VDC **110:** 40~160 VDC	**S:** Single Output	**33:** 3.3 VDC **05:** 5 VDC **12:** 12 VDC **15:** 15 VDC **24:** 24 VDC **30:** 30 VDC **48:** 48 VDC	**None:** Positive Logic **R:** Negative Logic	**None:** M3x0.5 Threaded-thru Inserts **TH:** Ø.126 Thru-hole Inserts (1) **H:** 0.24” Horizontal Heatsink **H1:** 0.5” Horizontal Heatsink **H2:** 0.24” Vertical Heatsink **H3:** 0.5” Vertical Heatsink

(1) Models with thru-hole inserts 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 ISO9001-2008 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:

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