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 1.01in (36.8mm x 57.9mm x 25.7mm)

OPTIONS

- Ctrl & Pin
- Heatsink
- Through Hole (No Thread)

FEATURES

- Ultra-Wide 8:1 & 10:1 Input Voltage Range
- 2250VDC Basic Insulation
- 3000VAC Reinforced Insulation
- No Minimum Load Requirement
- Low Standby Power
- Remote On/Off
- Optional Heatsink
- Over Voltage, Over Load, Over Temperature, and Short Circuit Protection
- IEC/UL/EN60950-1 and IEC/UL/EN62368-1 Safety Approvals (Pending)
- EN50155 & EN45545-2 Railway Approvals (Pending)

APPLICATIONS

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

DESCRIPTION

The DCQUW60 series of quarter-brick DC/DC converters offers up to 60 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 8:1 and 10:1 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/EN60950-1 and IEC/UL/EN62368-1, pending safety approvals and EN50155 and EN45545-2 pending 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
DCQUW60-36S05	36VDC (9~75VDC)	5VDC	12A	75mVp-p	90%	24000µF	20mA	Up to 60 Watts
DCQUW60-36S12		12VDC	5A	100mVp-p	89%	4200µF		
DCQUW60-36S15		15VDC	4A	100mVp-p	89%	2700µF		
DCQUW60-36S24		24VDC	2.5A	200mVp-p	90%	1100µF		
DCQUW60-36S28		28VDC	2.15A	200mVp-p	90%	780µF		
DCQUW60-36S48		48VDC	1.25A	300mVp-p	92%	260µF		
DCQUW60-36S53		53VDC	1.14A	300mVp-p	90%	220µF		
DCQUW60-72S05	72VDC (16~160VDC)	5VDC	12A	75mVp-p	89%	24000µF	10mA	Up to 60 Watts
DCQUW60-72S12		12VDC	5A	100mVp-p	89%	4200µF		
DCQUW60-72S15		15VDC	4A	100mVp-p	89%	2700µF		
DCQUW60-72S24		24VDC	2.5A	200mVp-p	90%	1100µF		
DCQUW60-72S28		28VDC	2.15A	200mVp-p	90%	780µF		
DCQUW60-72S48		48VDC	1.25A	300mVp-p	90%	260µF		
DCQUW60-72S53		53VDC	1.14A	300mVp-p	90%	220µF		

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			16	72	160	
Start-Up Voltage	36Vin Nominal Input					9	VDC
	72Vin Nominal Input					16	
Shutdown Voltage	36Vin Nominal Input			7.3		8.1	VDC
	72Vin Nominal Input			10		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	%/ºC
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)				Short or 0~1.2VDC			
				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		ºC
ENVIRONMENTAL SPECIFICATIONS							
Operating Base-Plate Temperature	With Derating			-40		+105	ºC
Storage Temperature				-55		+125	ºC
Maximum Case Temperature						+105	ºC
Relative Humidity				5		95	%RH
Thermal Impedance	DC/DC Module				8.27		ºC/W
	Only Mount on the Iron Base-Plate				2.43		
	Heat-Sink Type with 0.24” Height				7.40		
	Heat-Sink Type, with 0.5” Height				6.16		
Thermal Shock				EN61373, MIL-STD-810F			
Vibration				EN61373, MIL-STD-810F			
MTBF	MIL-HDBK-217F, Full Load				738,100		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					180		kHz
Isolation Voltage	36Vin Nominal Input	1 Minute (Basic Insulation)	Input to Output	2250			VDC
			Input (Output) to Base-Plate	1600			
	72Vin Nominal Input	1 Minute (Reinforced Insulation)	Input to Output	3000			VAC
			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 0.75in (36.8mm x 57.9mm x 19.1mm)		
	Heatsink Option 2 (“HS1” Suffix) & Option 4 (“HS3” Suffix)				1.45in x 2.28in x 1.01in (36.8mm x 57.9mm x 25.7mm)		
Case Material					Aluminum Base-Plate with Plastic Case		
Potting Material					Silicone (UL94 V-0)		
SAFETY CHARACTERISTICS							
Safety Approvals (Pending)							IEC/UL/EN60950-1 IEC/UL/EN62368-1
	Railway						EN50155 EN45545-2
EMI[5]	EN55011, EN55032 with External Components						Class A, Class B
ESD	EN61000-4-2	Air ±8kV and Contact ±6kV					Perf. Criteria A
Radiated Immunity	EN61000-4-3	20V/m					Perf. Criteria A
Fast Transient[6]	EN61000-4-4	±2kV					Perf. Criteria A
Surge[6]	EN61000-4-5	EN55024: ±1kV EN50155: ±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

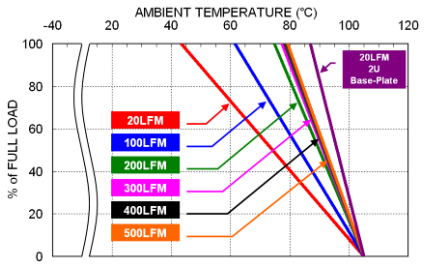
NOTES

1. Several options available for this series that change product model number. See Model Number Setup for more information.
2. 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 36Vin Nominal Input Models: Nippon Chemi-con KY series, 220µF/100V.
   -Recommended filter for 72Vin Nominal Input Models: Nippon Chemi-con KXJ series, 150µF/200V.
3. If remote sense is not being used, SENSE pins should be connected to corresponding polarity OUTPUT pins.
4. Referred to –Vin pin
5. BASE-PLATE GROUNDING: when two screw bolts are connected to shield plane, EMI could be reduced
6. With 2pcs of aluminum electrolytic capacitor:
   -Recommended for 36Vin Nominal Input Models: Nippon Chemi-con KY series, 220µF/100V
   -Recommended for 72Vin Nominal Input Models: Nippon Chemi-con KXJ series, 150µF/200V

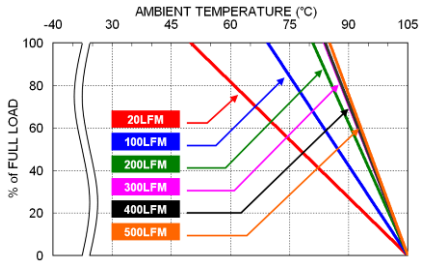
CAUTION: This power module is not internally fused. An input line fuse must always be used.
**Due to advances in technology, specifications subject to change without notice.*

DERATING CURVES

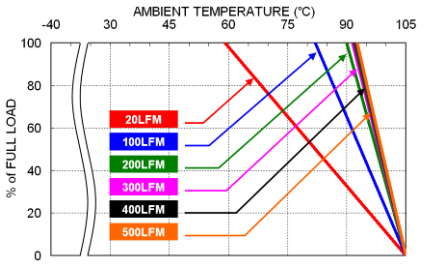
DCQUW60-72S05 Derating Curve
(See Thermal Considerations)



DCQUW60-72S05 with 0.24" Height Heatsink Derating Curve
(See Thermal Considerations)

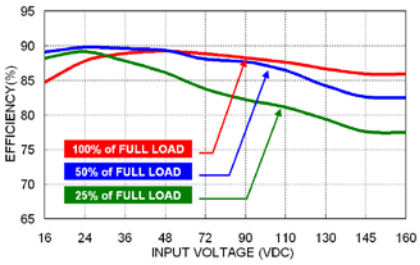


DCQUW60-72S05 with 0.5" Height Heatsink Derating Curve
(See Thermal Considerations)

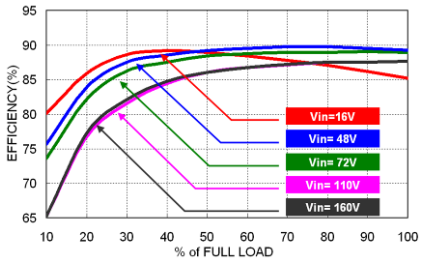


EFFICIENCY GRAPHS

DCQUW60-72S05 Efficiency vs. Input Voltage

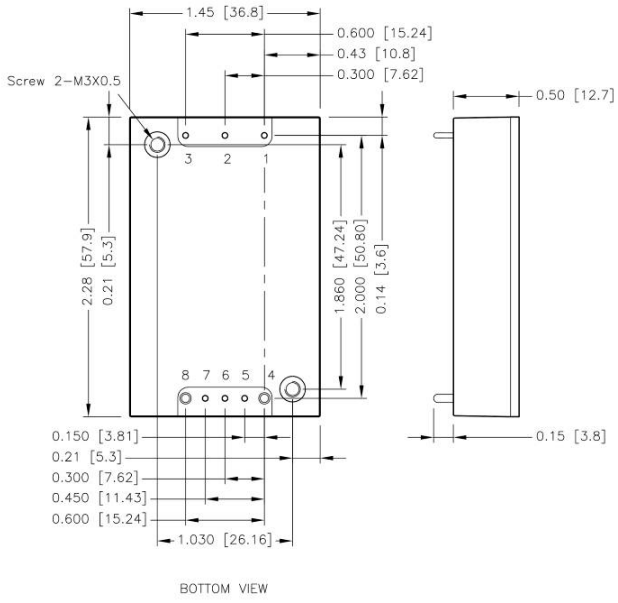


DCQUW60-72S05 Efficiency vs. Output Load



MECHANICAL DRAWINGS

Standard Package



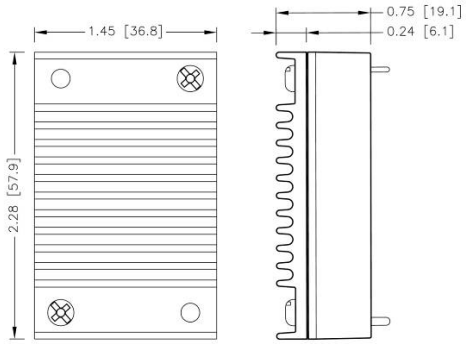
PIN Connection

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

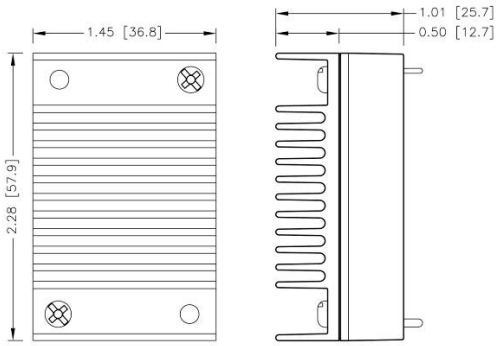
Notes:
1. All dimensions in inch [mm]
2. Tolerances: x.xx±0.02 [x.x±0.5]
   x.xxx±0.01 [x.xx±0.25]
3. Pin pitch tolerance ±0.01 [0.25]
4. Pin dimension tolerance ±0.004 [0.10]
5. The screw locked torque: MAX 3.5kgf-cm [0.34N-m]

Heatsink Options

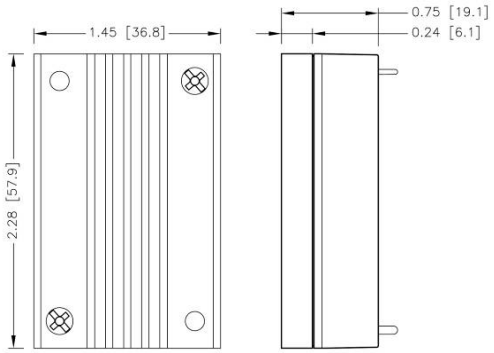
Heatsink Option 1 (“HS” Suffix) 7G-0029B-F



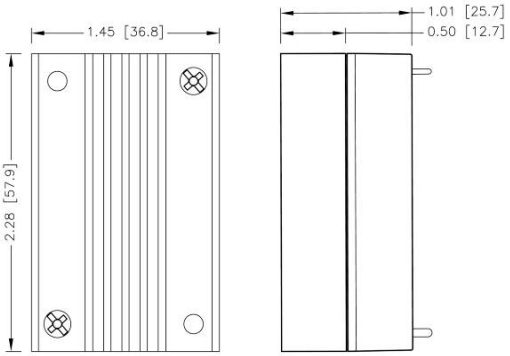
Heatsink Option 2 (“HS1” Suffix) 7G-0030B-F



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

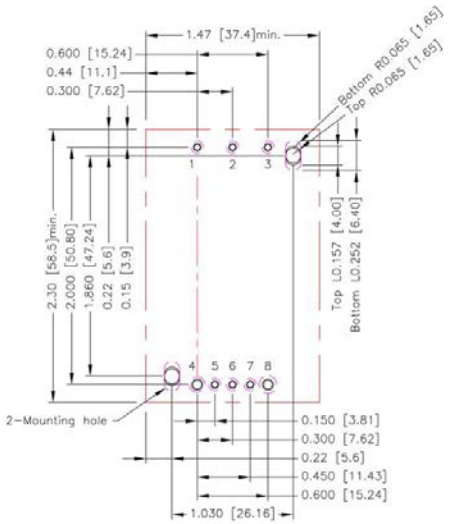


Heatsink Option 4 (“HS3” Suffix) 7G-0032B-F



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: 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]

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-along 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.
Suggested input line below:

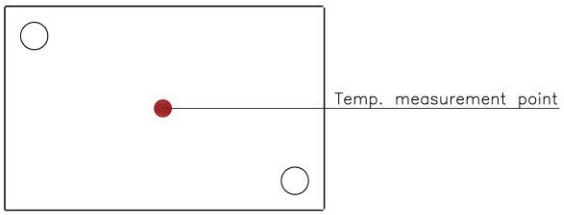
Model	Fuse Rating (A)	Fuse Type
DCQUW60-36Sxx	12A	Fast-Acting
DCQUW60-72Sxx	8A	Fast-Acting

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



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

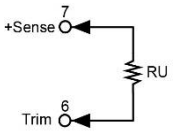
$$R_U = \left(\frac{5.11 V_{OUT} (100 + \Delta\%)}{1.225 \Delta\%} - \frac{511 + 10.22 \Delta\%}{\Delta\%} \right) k\Omega$$

Trim Down Equation

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

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	(kΩ)	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	(kΩ)	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	(kΩ)	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	(kΩ)	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	(kΩ)	11275.58	5691.08	3829.58	2898.83	2340.38	1968.08	1702.151	1502.705	1347.58	1223.48

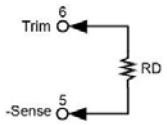
48VDC Output Models

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	(kΩ)	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	(kΩ)	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	(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

MODEL NUMBER SETUP

DCQUW	60	-	72	S	05	P	HS
Series Name	Output Power		Input Voltage	Output Quantity	Ouptut Voltage	Ctrl and Pin Options	Assembly Options
			36: 9~75VDC **72:** 16~160VDC	**S:** Single	**05:** 5VDC **12:** 12VDC **15:** 15VDC **24:** 24VDC **28:** 28VDC **48:** 48VDC **53:** 53VDC	**Blank:** Positive Logic, 0.150" pin length **S:** Positive Logic, 0.200" pin length **N:** Negative Logic, 0.150" pin length **L:** Negative Logic, 0.200" pin length	**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" **TH:** Through Hole (No Thread)

NOTES
1. 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 ISO9001-2008 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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