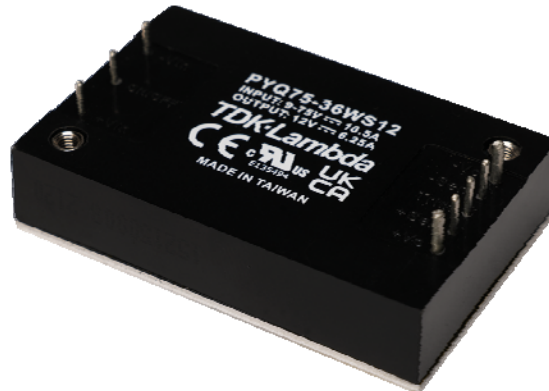


PYQ75 Series Instruction and Application Manual



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All parameters are typical values specified at nominal input voltage, nominal output load, 25°C ambient and after a 5 minutes run-in time unless otherwise noted. The information presented in this document is believed to be accurate and reliable and may change without notice.

For additional information, please visit <https://product.tdk.com/en/power/py>.

1. PRODUCT DESCRIPTION

The PYQ75 series are board mount 75W DC-DC converters in a quarter-brick housing and provide a regulated and galvanically isolated output voltage.

The most outstanding features of this series are the exceptionally wide input voltage range from 9V to 75V (8:1) and the high input/output isolation strength of 3000Vac.

The wide allowed case temperature range from -40°C to +105°C, the low heat generation, due to the high efficiencies up to 90% and the high shock and vibration resistance thanks to the potted design make this device suitable for nearly every situation.

Another unique feature is the compliance with the standard EN 50155, which is an international standard covering electronic equipment used on rolling stock for railway applications. In combination with the wide input voltage range, there are many application opportunities in this segment. Further applications for this DC-DC converter can be found in Distributed Power Architecture (DPA), telecommunications, battery-powered devices, measurement and laboratory equipment, devices in industrial environments, and many other areas.

2. PRODUCT FEATURES

- Quarter-brick (2.28x1.45") Industry Standard Footprint
- 3000Vac Input to Output Isolation
- 9-75V (8:1) Wide-range Input
- EN 50155 Railway Compliant
- IEC 62368-1 (ICT) Approved
- High Shock and Vibration Resistance due to Potted Design
- Efficiency up to 90% and Low No-load Power Consumption
- -40 to +105°C Operating Case Temperature Range
- Remote ON/OFF Input
- Output Voltage Sense Lines

3. INTENDED USE

This device is designed and manufactured as a component part to be mounted on a pc-board and to be installed in electronic devices.

This device is intended for commercial use, such as in industrial control, process control, monitoring and measurement equipment or the like.

Additionally, this device is also designed for equipment that is intended for use in railway rolling stock applications according to EN 50155.

Do not use this device in equipment, where malfunctioning may cause severe personal injury or threaten human life without additional appropriate safety devices, that are suited for the end-application.

If this device is used in a manner outside of its specification, the protection provided by the device may be impaired.

4. INSTALLATION INSTRUCTIONS

Before operating this device, please read this manual thoroughly and retain for future reference! This device may only be installed and put into operation by qualified personnel. If damage or malfunction should occur during operation, immediately turn power off and send device to the factory for inspection. The device does not contain serviceable parts.

⚠ WARNING Risk of electrical shock, fire, personal injury or death.

Turn power off before working on the device. Protect against inadvertent re-powering.

Do not modify or repair the unit.

Do not open the unit as high voltages are present inside.

Use caution to prevent any foreign objects from entering the housing.

Do not use in locations where flammable gas or ignitable substances are present.

Do not use in wet locations or in areas where moisture or condensation can be expected.

Do not use in environment with strong electromagnetic field, corrosive gas or conductive substances or direct sunlight.

Do not touch during power-on, and immediately after power-off. Hot surfaces may cause burns.

Obey the following installation instructions:

This device may only be installed and put into operation by qualified personnel.

This device does not contain serviceable parts. Replace fuses only when explicitly permitted. If damage or malfunction should occur during installation or operation, immediately turn power off and send unit to the factory for inspection.

Install the device in an enclosure providing protection against electrical, mechanical and fire hazards.

The device is designed for pollution degree 2 areas in controlled environments. No condensation or frost is allowed.

The input can be powered from batteries or similar DC sources.

Check for correct input polarity. The device will get damaged when the voltage is reversed.

Ensure sufficient cooling to avoid overloading the device.

The device is designed for altitudes up to 5000m (16400ft).

This device is not internally fused. An external input fuse must always be used. Use a 12A slow-blow fuse.

The maximum operational case temperature is +105°C (+221°F). The case temperature is defined in the middle of the top side of the cover.

The device is designed to operate in areas with a maximum relative humidity of 95%.

Do not apply return voltages from the load to the output terminals.

Do not connect the outputs of multiple devices in parallel for higher output currents.

Do not connect batteries for charging purposes without additional charging circuit to the output of the device.

5. FUNCTIONAL DESCRIPTION

The output is electronically protected against no-load, overload and short circuit. In case of an overload or short circuit, the device will operate intermittently (hiccup mode).

The device can supply resistive and inductive loads.

Avoid loads with large input capacitances. If the capacitive load is higher than the values specified, the device operates in an intermittent mode (hiccup mode).

PYQ75-36WS12: max. 14000µF

PYQ75-36WS15: max. 10000µF

PYQ75-36WS24: max. 3900µF

PYQ75-36WS28: max. 3200µF

PYQ75-36WS48: max. 1100µF

The output voltage can be adjusted with an external resistor connected between the TRIM-pin and the output voltage.

The device is equipped with sense lines for the output voltage. This feature moves the output voltage regulation point from the output of the device to the point of connection of the remote sense pins.

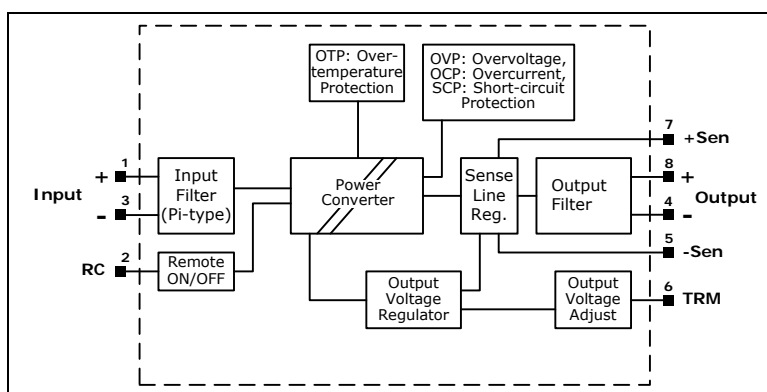
The device is equipped with an over-temperature protection. In case of a high temperature, the output shuts down and starts automatically after cooling off.

The device is equipped with under-voltage protection on the input side. If the input voltage is too low, the device does not start or switches off.

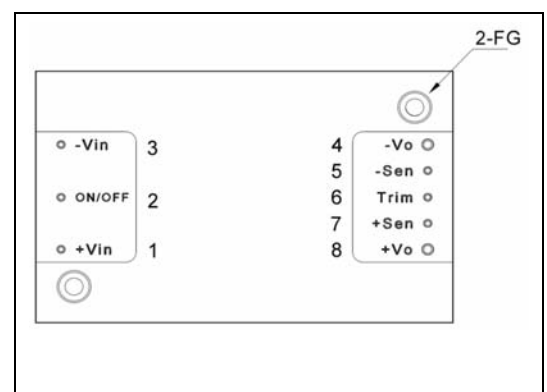
In case of an internal defect, a redundant circuit prevents the output voltage from becoming excessive or dangerous (zener diode type protection).

The device is equipped with a remote ON/OFF function.

6. FUNCTIONAL DIAGRAM



Functional diagram



Pin assignment

RC: Remote ON/OFF control pin

TRM: Trim pin for output voltage adjustment

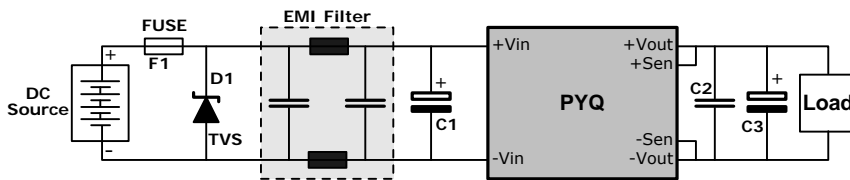
-Sen, +Sen: Sense lines for output voltage

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For additional information, please visit <https://product.tdk.com/en/power/py>.

DC-DC Converter Isolated, 75W, ¼ Brick, PCB Mount

7. RECOMMENDED WIRING SCHEME



Fuse F1: The DC-DC converter is not internally fused. An external input fuse must always be used. Use a 12A slow-blow fuse.

Diode D1: Transient voltage suppressor diode (TVS) SMCJ78A.

Capacitor C1: 220uF aluminum capacitor

Capacitor C2: 1uF multi layer ceramic capacitor

Capacitor C3: 22µF aluminum or tantalum capacitor.

EMI Filter: This filter reduces the conducted emission to the input. A circuit example can be found in the chapter "EMC Considerations".

8. PRODUCT NOMENCLATURE AND LIST OF MODELS

Product Nomenclature:

PY	a	bb	-	ccc	d	ee	-	z
Family Name PY	Size Q = Quarter Brick	Output Power 75 = 75W		Input Voltage 36W = 9-75V	Output Type S = Single Output	Output Voltage 12 = 12V 15 = 15V 24 = 24V 28 = 28V 48 = 48V		Options <u>Remote ON/OFF & Mounting:</u> Blank = Positive Logic and M3 Thread N = Negative Logic and M3 Thread PD = Positive Logic and 3.2mm Hole ND = Negative Logic and 3.2mm Hole

Model list:

PYQ75-36WS12	DC-DC converter isolated, 75W, Input: 9-75V, Output: 12V 6.25A, quarter-brick, pcb-mount
PYQ75-36WS15	DC-DC converter isolated, 75W, Input: 9-75V, Output: 15V 5A, quarter-brick, pcb-mount
PYQ75-36WS24	DC-DC converter isolated, 75W, Input: 9-75V, Output: 24V 3.12A, quarter-brick, pcb-mount
PYQ75-36WS28	DC-DC converter isolated, 75W, Input: 9-75V, Output: 28V 2.67A, quarter-brick, pcb-mount
PYQ75-36WS48	DC-DC converter isolated, 75W, Input: 9-75V, Output: 48V 1.56A, quarter-brick, pcb-mount

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9. SHORT-FORM DATA

Input voltage range	Min. 9Vdc Nom. 36Vdc Max. 75Vdc	
Input current at no load	Typ. 8mA 10mA	For 12v and 14V models For 24V, 28V and 48V models
Input current at remote OFF	Typ. 5mA Max. 10mA	For all models
Output power	Max. 75W	For all models
Output current	Nom. 6.25A ¹⁾ Nom. 5.0A ¹⁾ Nom. 3.12A ¹⁾ Nom. 2.67A ¹⁾ Nom. 1.56A ¹⁾	For 12V model For 15V model For 24V model For 28V model For 48V model
Output voltage adjustment range	Max. -20%/+15%	For all models
Output voltage remote sense range	Max. +15%	For all models
Output voltage accuracy range	±1%	Factory setting
Line regulation	Max. ±0.2%	Between 9 and 75Vdc
Load regulation	Max. ±0.2%	For a 0% to 100% to 0% load step
Transient response recovery time	250µs	For a 75% to 100% load step
Temperature coefficient	Max. ±0.02%/°C	For all models
Start-up time	Typ. 30ms	For resistive load, after applying an input voltage or remote ON signal and reaching 95% of output voltage
Ripple and noise voltage	Max. 150mVp-p ²⁾ Max. 150mVp-p ²⁾ Max. 240mVp-p ²⁾ Max. 240mVp-p ²⁾ Max. 480mVp-p ²⁾ Max. 80mV rms ²⁾ Max. 80mV rms ²⁾ Max. 120mV rms ²⁾ Max. 120mV rms ²⁾ Max. 220mV rms ²⁾	For 12V model For 15V model For 24V model For 28V model For 48V model For 12V model For 15V model For 24V model For 28V model For 48V model
Efficiency	Typ. 90% / 90% Typ. 90% / 90% Typ. 90% / 90% Typ. 90% / 90% Typ. 90% / 90%	For 5V model, full load, 36/48Vdc input For 12V model, full load, 36/48Vdc input For 24V model, full load, 36/48Vdc input For 28V model, full load, 36/48Vdc input For 48V model, full load, 36/48Vdc input
Operational temperature range	-40°C to +105°C	See chapter "Thermal Considerations" for derating requirements
Case temperature	Max. +105°C	
Storage temperature rang	-55°C to +125°C	
Relative humidity	Max. 95% RH	No condensation allowed
Altitude	Max. 5000m / 16 400ft	
Atmospheric pressure	110-54kPa	
Vibration	20Hz-1kHz:0.04g ² /Hz 1-2kHz: -6dB/octave 60 minutes per axis	According to MIL-STD-810F, random vibration, units are operational
Shock	50 g, 11 ms 18 shocks (3 shocks for each ±axis)	According to MIL-STD-810F, units are operational

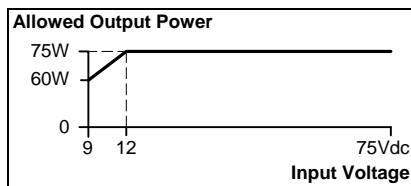
All parameters are typical values specified at nominal input voltage, nominal output load, 25°C ambient and after a 5 minutes run-in time unless otherwise noted. The information presented in this document is believed to be accurate and reliable and may change without notice.

For additional information, please visit <https://product.tdk.com/en/power/py>.

DC-DC Converter Isolated, 75W, ¼ Brick, PCB Mount

Size	57.9x 36.8x 12.7mm 2.28 x 1.45 x 0.5"	Length x Width x Height
Weight	66g / 0.15lb	
MTBF	663 000h 759 000h 750 000h 740 000h 780 000h	For 12V model For 15V model For 24V model For 28V model For 48V model Acc. to MIL HDBK 217F at full load, GB25°C

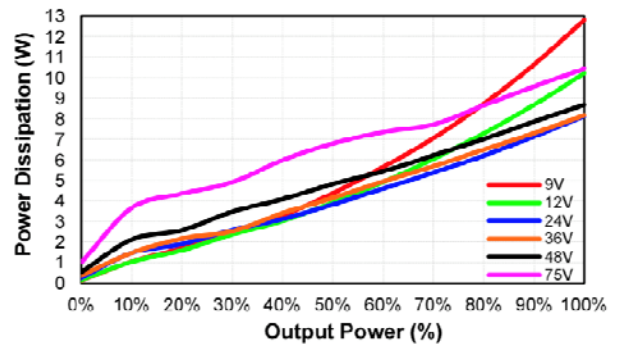
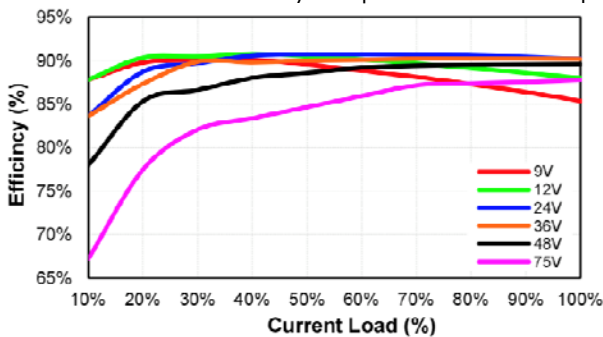
- 1) This is the nominal current which must not be exceeded even at lower tuned output voltages. At higher output voltages, the current is reduced according to the nominal power. Below 16.5Vdc the continuous output power is reduced according to the following curve:



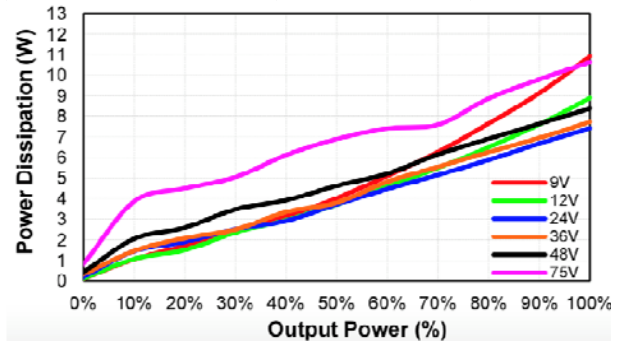
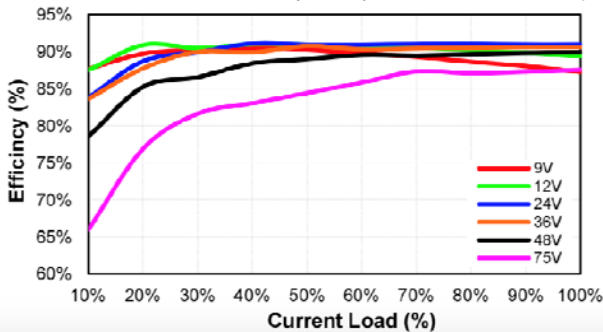
- 2) With 22µF Electrolytic/tantalum capacitor and 1µF multi layer ceramic capacitor parallel in measurement path.

10. EFFICIENCY AND POWER DISSIPATION CURVES

PYQ75-36WS12: Efficiency and power losses vs. output load



PYQ75-36WS15: Efficiency and power losses vs. output load

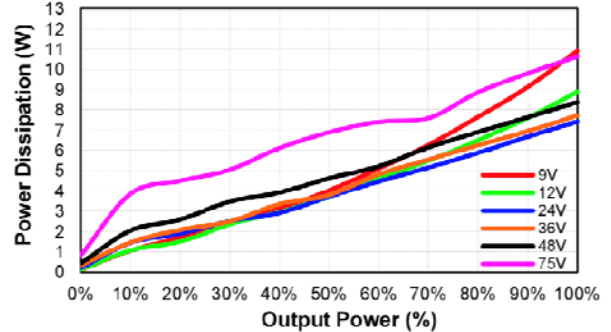
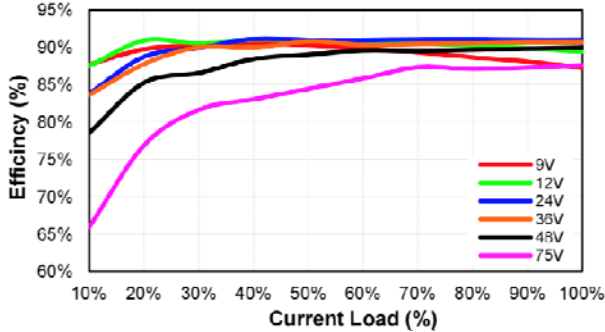


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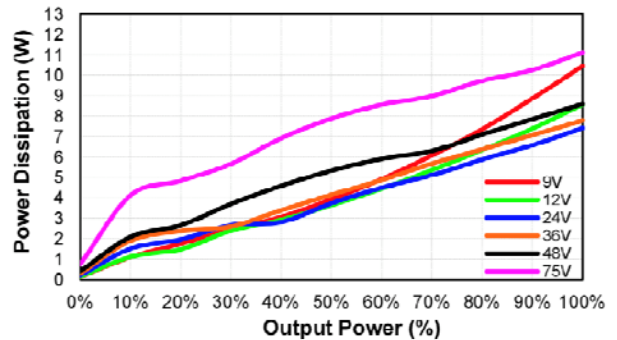
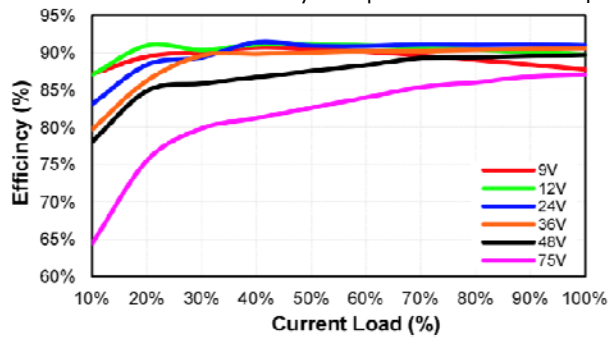
For additional information, please visit <https://product.tdk.com/en/power/py>.

DC-DC Converter Isolated, 75W, 1/4 Brick, PCB Mount

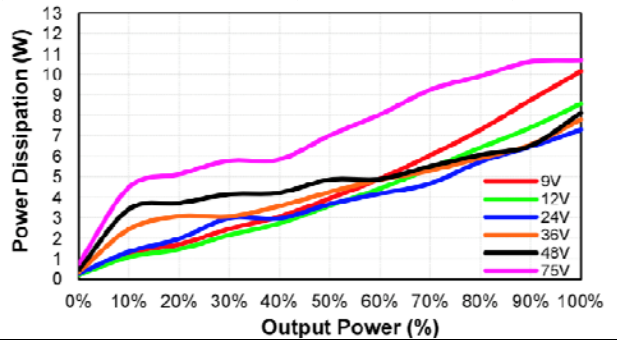
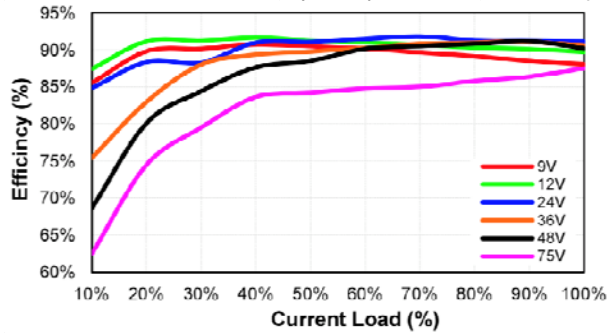
PYQ75-36WS24: Efficiency and power losses vs. output load



PYQ75-36WS48: Efficiency and power losses vs. output load



PYQ75-36WS48: Efficiency and power losses vs. output load

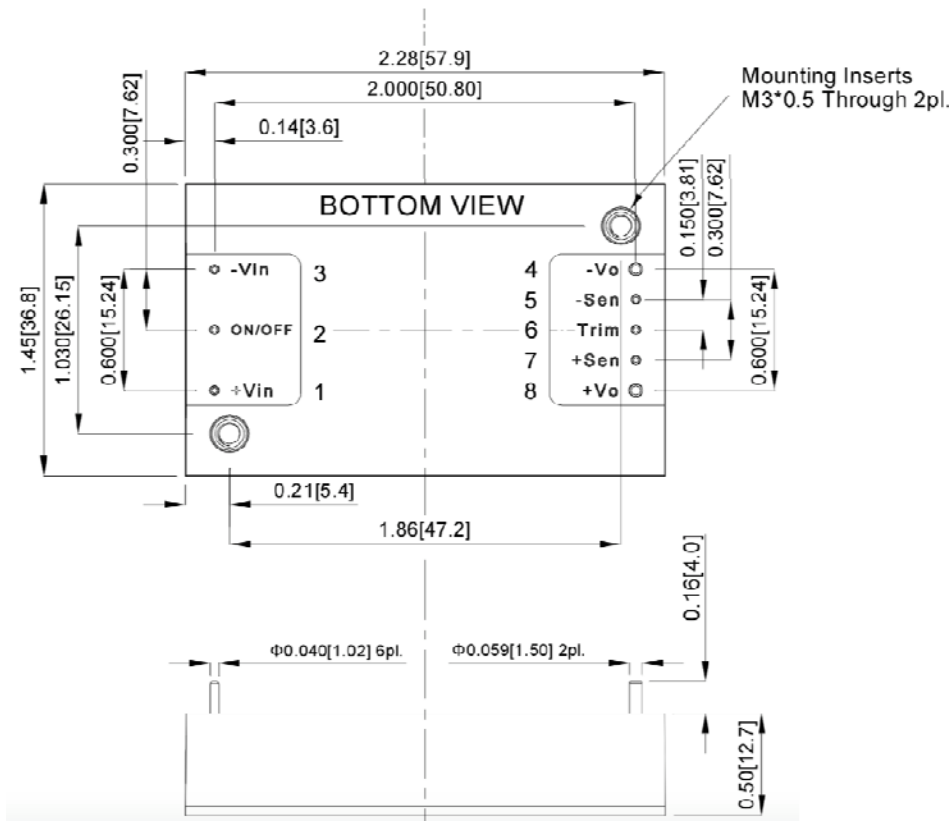


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11. PHYSICAL DIMENSIONS AND PIN LAYOUT:

Format	Quarter-Brick
Length	57.9mm, 2.28"
Width	36.8mm, 1.45"
Height	12.7mm, 0.5"
Weight	66g / 0.15lb
Case material	Plastic
Base plate	Aluminium
Potting Material	Silicone
Pin material	Base: copper Plating: nickel with matte tin



Pin assignment

Pin	Function
1	+V Input
2	R/C
3	-V Input
4	-V Output
5	- Sense
6	Trim
7	+ Sense
8	+V Output

Inch tolerances:

x.xx±0.02, x.xxx±0.01

Millimeter tolerances:

x.x±0.5, x.xx±0.25

Recommendations for pad design:

Pin 4, 8:

1.8mm plated, through hole
3.3mm pad size

Pin 1, 2, 3, 5, 6, 7:

1.3mm plated, through hole
2.5mm pad size

Converter screws:

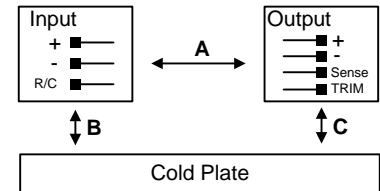
3.5mm through hole

All dimensions in inch [mm]

12. ISOLATION AND DIELECTRIC STRENGTH

The output voltage is floating and has no ohmic connection to the input or the case.

Hi-pot tests may be repeated by the customer using appropriate test equipment, which applies the voltage with a slow ramp (2s up and 2s down). Connect all input-terminals together as well as all output poles before conducting the test.



Dielectric strength	Min.	3000Vac or	Input to output (A) for 1 minute
	Min.	4200Vdc	
	Min.	2100Vac or	Input to base plate (B) for 1 minute
Min.	3000Vdc		
	Min.	1500Vac or	Output to base plate (C) for 1 minute
	Min.	2100Vdc	
Isolation resistance	Min.	100 MΩ	Input to output (A), measured at 500Vdc
Isolation capacitance	Typ.	1nF	Input to output (A)
	Typ.	1nF	Output to base plate (C)

13. PROTECTION FEATURES

Under voltage protection (UVP)	Min.	8.4Vdc	For all models
Turn-On voltage	Typ.	8.8Vdc	
	Max.	9.0Vdc	
Under voltage protection (UVP)	Min.	7.6Vdc	0.8V lock-out hysteresis voltage
Shut-down voltage	Typ.	8.0Vdc	
	Max.	8.2Vdc	
Input surge voltage	Max.	100Vdc	For maximal 100ms
Output over voltage protection (OVP)	Min.	117%	
	Typ.	125%	
	Max.	140%	
Output over-current protection (OCP)	Min.	110%	Of nominal output current, intermittent operation (hiccup mode)
	Typ.	150%	
	Max.	210%	
Output short-circuit protection (SCP)		Included	Continuous, automatic recovery
Over temperature protection (OTP)	Typ.	110°C	Temperature at the centre part of base plate, non-latching, automatic recovery when temperature falls below 100°C
Reverse input polarity protection		Not included	Use external protection diode if required
Degree of pollution		2	According to IEC 60664-1, not conductive

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For additional information, please visit <https://product.tdk.com/en/power/py>.

14. APPROVALS AND REGULATORY COMPLIANCES

CE	EU Declaration of Conformity includes Low-Voltage and RoHS Directive
UKCA	UK Declaration of Conformity includes Electrical Safety and RoHS Directive
EN 62368-1	Safety requirements for audio/video, information and communication technology equipment
UL 62368-1	Recognized component for audio/video, information and communication technology equipment, E-File E133400, Categories QQJQ2 and QQJQ8

15. RAIL APPLICATIONS

The DC-DC converter with additional circuits is tested according to the following standards and is suitable for railroad applications.

EN 50155	Railway applications - Rolling stock - Electronic equipment
EN 45545-2	Fire protection on railway vehicles - Part 2: Requirements for fire behaviour of materials and components
EN 61373	Railway applications - Rolling stock equipment - Shock and vibration tests
EN 50121-3-2	Railway applications - Electromagnetic compatibility - Part 3-2: Rolling stock - Apparatus

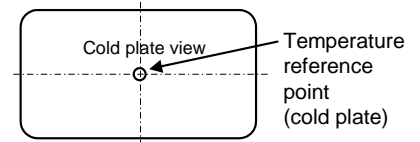
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16. THERMAL CONSIDERATION AND DERATING

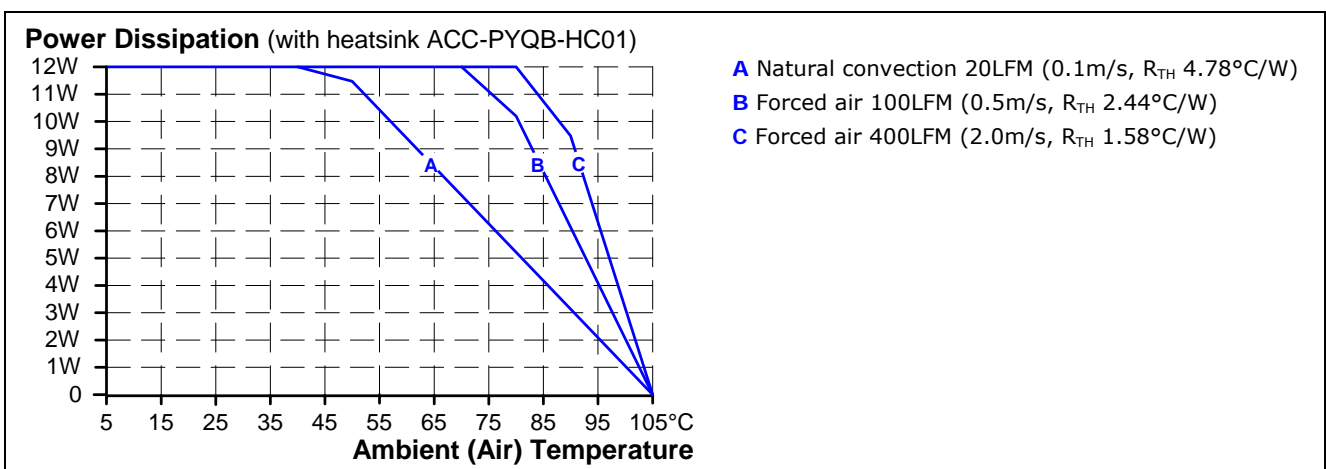
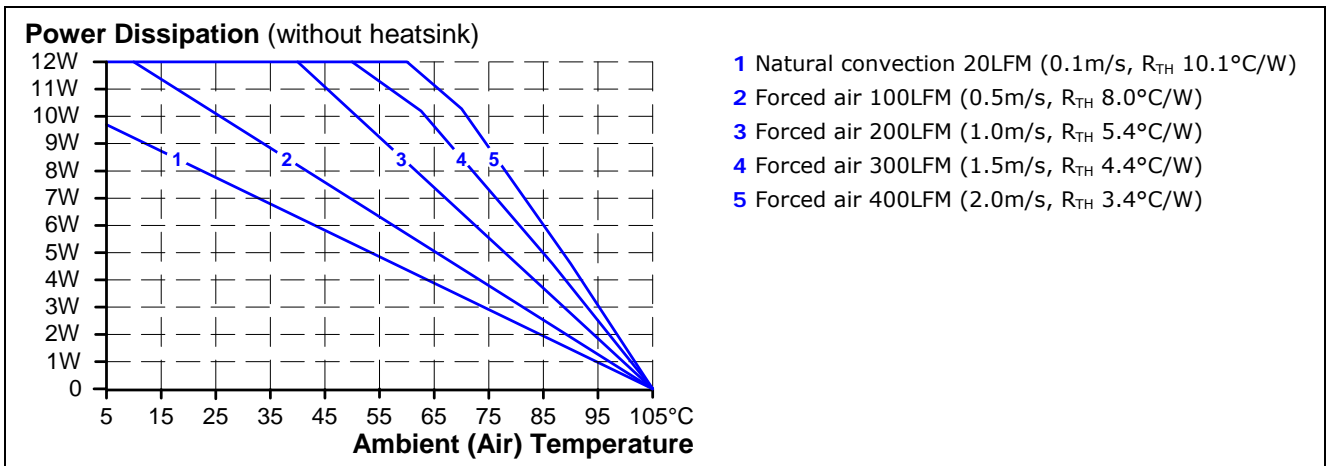
The DC-DC converters operate over a wide temperature range. Even if the heat generated by the DC-DC converters are very low, it must be removed. This can be done either by convection cooling, forced air cooling, radiation or the use of an additional heatsink.

It is important that the enclosure temperature at the indicated temperature reference point does not exceed the maximum enclosure temperature, which is 105°C.



To predict the approximate cooling needed for the DC-DC converter, refer to the following power dissipation curves. These curves are approximations of the ambient temperatures and airflows required to keep the DC-DC converter temperature below its 105°C. After installation in the actual application, the temperature of the module should be re-measured to ensure that the temperatures are not exceeded.

The following curves show the possible power dissipation that the PYQ75 series can thermally dissipate without an additional heatsink and with a typical heatsink. The curves apply in vertical mounting position with natural convection cooling or forced air cooling.



The power dissipation depends on the operating conditions of the DC-DC converter and can be taken from the curves in chapter "Efficiency and power dissipation curves".

Example:

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For additional information, please visit <https://product.tdk.com/en/power/py>.

DC-DC Converter Isolated, 75W, ¼ Brick, PCB Mount

A PYQ75-36WS12 operates at 48Vdc input voltage and is loaded with 80% of the nominal output current results in a power dissipation of 7W. With these 7W you go into the above curves and determine the required airflow or the heat sink requirement. If the ambient temperature is expected to be below 50°C, the following two options could be considered:

- Option 1 without a heatsink: Curve 2 shows that 7W can be dissipated with forced airflow of 100LFM.
- Option 2 with heatsink: Curve A shows that 7W can be dissipated up to 70°C without forced airflow.

The derating is never hardware controlled. The user has to take this into consideration to stay below the de-rated current limits in order not to overload the unit.

17. EMC CONSIDERATIONS

In terms of EMC, this DC-DC converter module is considered a component for installation in an end device by a device manufacturer. In order to meet all the requirements of the end device, additional components may have to be deployed and final EMC measurements must be carried out in the end application.

The following tests and measurements were performed according to EN 55032 and EN 50121-3-2 (emission) and EN 55024 and EN 50121-3-2 (immunity).

All tests and measurements were carried out with standardized test set-ups.

EMC Immunity

Electrostatic discharge	EN 61000-4-2	Air discharge	±8kV	Criterion A
		Contact discharge	±6kV	Criterion A
Electromagnetic RF field	EN 61000-4-3	80MHz-1GHz	20V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4	Input, with additional components see note 1)	±2kV	Criterion A
Surge voltage	EN 61000-4-5	Input, with additional components see note 1)	±2kV	Criterion A
Conducted disturbance	EN 61000-4-6	0.15-80MHz	10V	Criterion A

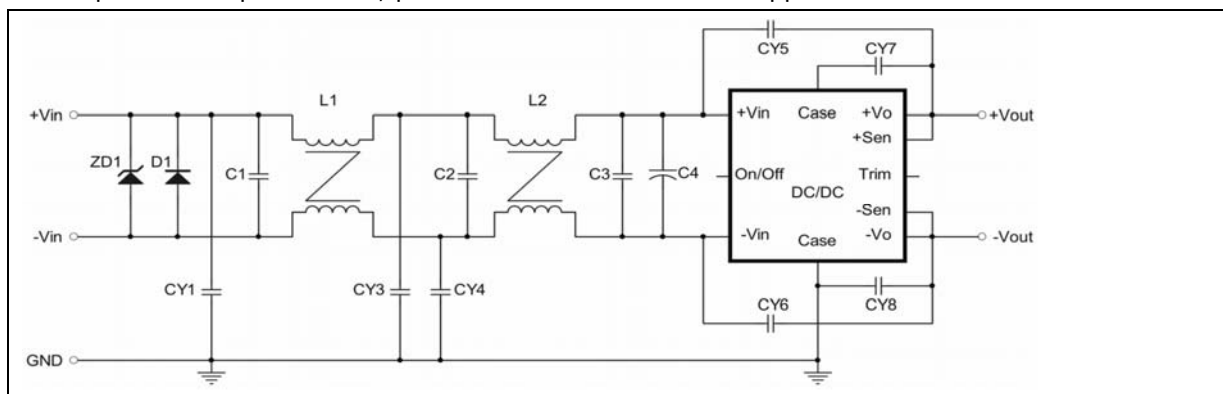
Performance criterion A: The device shows normal operation behavior within the defined limits.

Note 1) Burst and surge tests were performed with an additional 220µF capacitor and 78V suppressor diode SMDJ78A.

EMC Emission

Recommended external EMI filter for EN 55011, EN 55032 Class A and EN 50121-3-2

The placement of components and the routing of traces on the pc-board must be carried out according to EMC aspects. If help is needed, please contact our technical support team.



BOM | For all models

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DC-DC Converter Isolated, 75W, ¼ Brick, PCB Mount

C1, C2, C3	4.7uF/100V, 1812 MLCC, X7R ceramic
C4	220uF/100V, Aluminum Capacitor Nippon Chemi-Con KY series
CY1	2200pF/Y1, TDK Y1 capacitors or equivalent
CY3, CY4, CY5, CY6	4700pF/Y1, TDK Y1 capacitors or equivalent
CY7, CY8	10nF/Y1, MURATA Y2 capacitors or equivalent
ZD1	SMDJ78A, Littelfuse
D1	FSV20150V, ON Semiconductor
L1, L2	1.5mH(100kHz), DM 1.0mm/14T, Core: FCNO179C

Switching Frequency

Main converter	Min.	180kHz	Fixed frequency
	Typ.	200kHz	
	Max.	220kHz	

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18. REMOTE ON/OFF FUNCTION

The device is equipped with a remote ON/OFF function to turn the output ON or OFF.

Two logics are possible. With the positive logic (standard version), the output switches OFF as soon as pin 2 (R/C) and pin 3 (-Vin) are linked or the voltage is less than 1V.

The optionally available negative logic (option -N) is exactly the vice versa. Here the output switches ON as soon as pin 2 (R/C) and pin 3 (-Vin) are linked or the voltage is less than 1V.

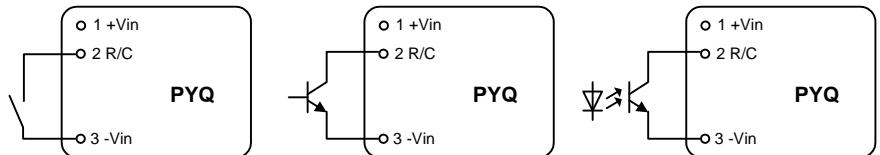
The RC-input is a sink input, which requires a maximal current of 1mA (typically 0.3mA) to be activated. The maximal allowed voltage (open circuit voltage) for this pin is 75Vdc.

Positive logic (standard)

Converter ON: open or 4-75V
 Converter FF: closed or 0-1V

Negative logic (option -N)

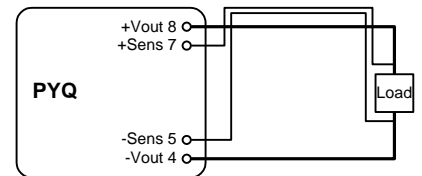
Converter ON: closed or 0-1V
 Converter FF: open or 4-75V



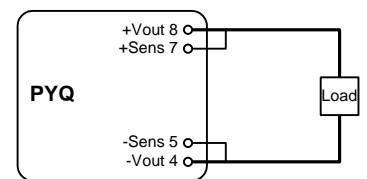
19. OUTPUT REMOTE SENSING

The PYQ75 series has the feature to remotely sense both lines of its output. This feature moves the output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the PYQ75 series in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load.

When remote sense is in use, the sense should be connected by twisted-pair wire or shield wire. Output voltage might become unstable because of impedance of wiring and load condition when length of wire is exceeding 400mm.



If the remote sense feature is not to be used, the sense pins should be connected locally. The +Sense pin should be connected to the +Vout pin at the module and the -Sense pin should be connected to the -Vout pin at the module. Wire between +Sense and +Vout and between -Sense and -Vout as short as possible. Loop wiring should be avoided. The converter might become unstable by noise coming from poor wiring.



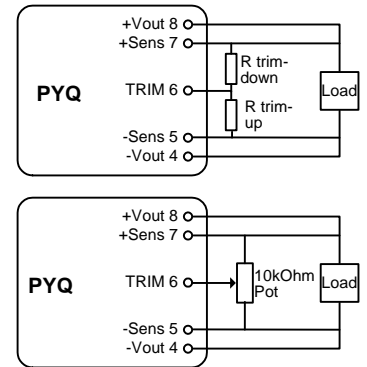
Please note: Although the output voltage can be varied (increased or decreased) by both remote sense and TRIM, the maximum variation for the output voltage is the larger of the two values not the sum of the values. The output power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. Using remote sense and TRIM can cause the output voltage to increase and consequently increase the power output of the module if output current remains unchanged. Always ensure that the output power of the module remains at or below the maximum rated power.

20. OUTPUT VOLTAGE ADJUSTMENT

The output voltage can be adjusted in the range of -20%/+15%.

To increase the output voltage, connect an external resistor between the TRIM-Pin and the negative output voltage (-Vout) and to decrease the voltage, connect the resistor between the TRIM-Pin and the positive output voltage (+Vout).

Alternatively a 10kΩ potentiometer can be used to adjust the output voltage continuously within its limits.



Resistor values for adjusting the 12V output model

Output (V)	9.6	10.08	10.56	11.04	11.52	12V	12.36	12.72	13.08	13.44	13.8
	-20%	-16%	-12%	-8%	-4%		+3%	+6%	+9%	+12%	+15%
R-up (Ω)	-	-	-	-	-	-	74640	35370	22280	15730	11810
R-down (Ω)	17080	24380	36540	60860	133820	-	-	-	-	-	-

Resistor values for adjusting the 15V output model

Output (V)	12.0	12.6	13.2	13.8	14.4	15V	15.45	15.9	16.35	16.8	17.25
	-20%	-16%	-12%	-8%	-4%		+3%	+6%	+9%	+12%	+15%
R-up (Ω)	-	-	-	-	-	-	83570	40290	25860	18640	14310
R-down (Ω)	28010	38520	56020	91030	196070	-	-	-	-	-	-

Resistor values for adjusting the 24V output model

Output (V)	19.2	20.16	21.12	22.08	23.04	24V	24.72	25.44	26.16	26.88	27.6
	-20%	-16%	-12%	-8%	-4%		+3%	+6%	+9%	+12%	+15%
R-up (Ω)	-	-	-	-	-	-	86570	41340	26260	18720	14190
R-down (Ω)	58900	79370	113500	181750	386490	-	-	-	-	-	-

Resistor values for adjusting the 28V output model

Output (V)	22.40	23.52	24.64	25.76	26.88	28V	28.84	29.68	30.52	31.36	32.20
	-20%	-16%	-12%	-8%	-4%		+3%	+6%	+9%	+12%	+15%
R-up (Ω)	-	-	-	-	-	-	93800	44950	28670	20530	15640
R-down (Ω)	71780	96350	137310	219210	464920	-	-	-	-	-	-

Resistor values for adjusting the 48V output model

Output (V)	38.4	40.32	42.24	44.16	46.08	48V	49.44	50.88	52.32	53.76	55.2
	-20%	-16%	-12%	-8%	-4%		+3%	+6%	+9%	+12%	+15%
R-up (Ω)	-	-	-	-	-	-	79710	37900	23970	17000	12820
R-down (Ω)	126350	167840	236980	375270	790150	-	-	-	-	-	-

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21. HOLD-UP TIME CIRCUITRY

The hold time is defined as the time period during which the DC-DC converter output remains active after a loss of input power. The DC-DC converter itself is not capable of providing a hold time. For this, an external circuit with a large hold-up (storage capacitor) is required. The lower the operating voltage of the system, the larger this hold-up capacitor must be.

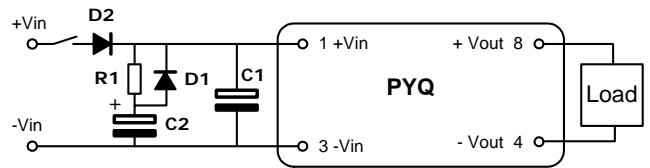
D1, D2: 100V/10A

D2: To prevent the stored energy from flowing in the wrong direction and not being available for the DC-DC converter. Use only if needed.

R1: 100Ω, 10W

C1: 220uF/100V ESR<0.047Ω

C2: see table below, voltage must be larger than the supply voltage



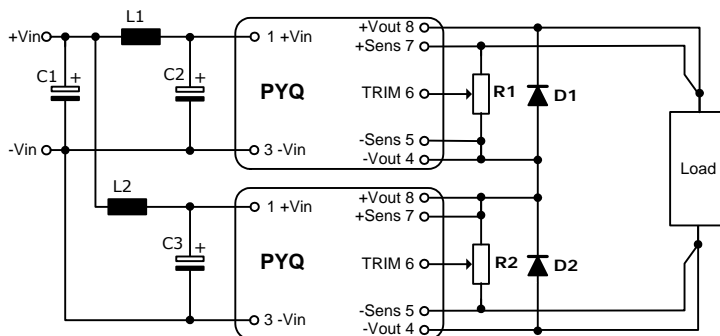
Sizing the hold-up capacitor

Input Voltage	24Vdc	36Vdc	48Vdc
Hold-up capacitor (C2) for 10ms	4000μF	1500μF	750μF
Hold-up capacitor (C2) for 30ms	12200μF	4900μF	2600μF

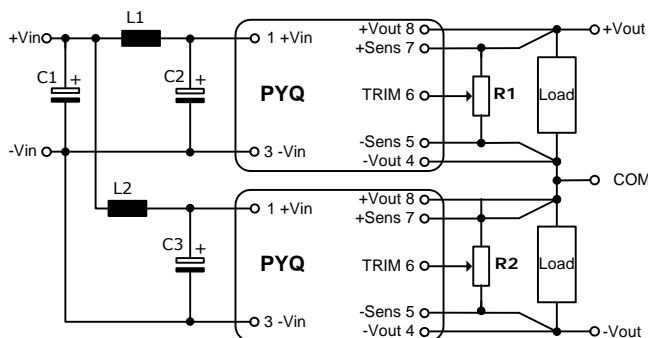
22. SERIES OPERATION OF OUTPUTS

Series operation is possible by connecting the outputs of two or more identical devices. The connection is shown in the following drawing.

Series operation for higher output voltages:



Series operation for +/- output voltages:



- L1, L2: 1.0uH
- C1, C2, C3: 220uF (ESR<0.047Ω)
- R1, R2: 10kΩ potentiometer
- D1, D2: 10A

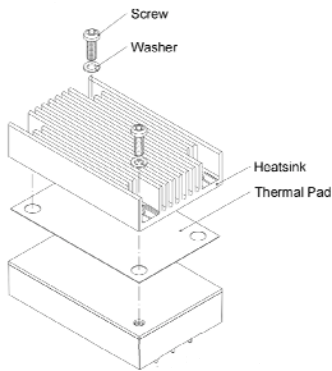
Notes:

- Use larger C1, C2, C3 or capacitors in parallel if the impedance of input line is high or unknown.
- Use larger C1, C2, C3 or capacitors in parallel when ambient temperature becomes lower than -20 °C.
- Use a Schottky diode (D1, D2) across the output of each device, so that if one converter shuts-down for any reason, the output converter does not get damaged.

23. PARALLEL OPERATION OF OUTPUTS

Parallel operation of outputs for higher output currents is not possible.

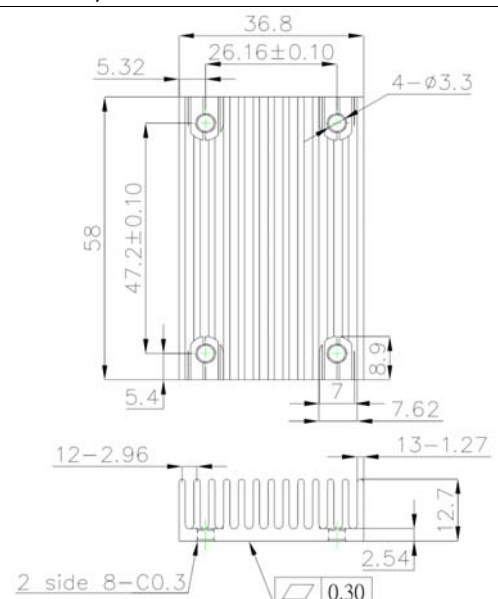
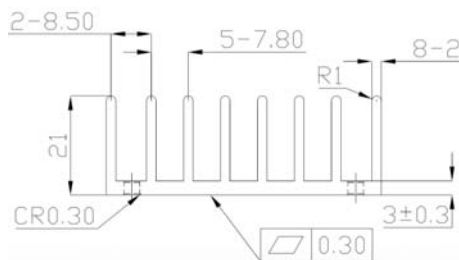
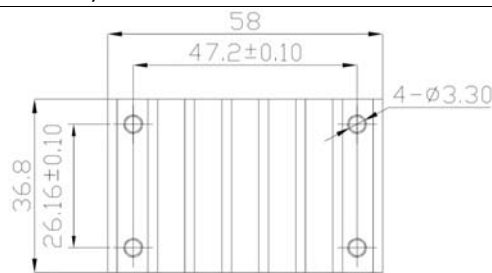
24. ACCESSORY – HEATSINK KITS



Heatsink kits can be ordered separately and mounted on the converter by means of two screws, two washers and a thermal pad.

The heatsink kit includes one heatsink, one thermal pad, screws and washers.

Order number	ACC-PYQB-HC01	ACC-PYQB-HC05
Fin Style	Transverse	Longitudinal
Size (L x W x H)	58 x 36.8 x 21mm	36.8 x 58 x 12.7mm
Material	Aluminium	Aluminium
Weight	T.B.D.	T.B.D.
Recommended Tightening Torque	3Kgf-cm	3Kgf-cm
Screw	M3 x 8mm (4x)	M3 x 8mm (4x)
Washer	3.2mm (4x)	3.2mm (4x)
Thermal Pad	35.8 x 56.9 x 0.25mm	35.8 x 56.9 x 0.25mm
Thermal impedance	4.78°C/W nat. convection 2.44°C/W with 100LFM 2.06°C/W with 200LFM 1.76°C/W with 300LFM 1.58°C/W with 400LFM	5.61°C/W nat. convection 4.01°C/W with 100LFM 3.39°C/W with 200LFM 2.86°C/W with 300LFM 2.49°C/W with 400LFM



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25. CLEANING PROCESS AND SOLDERING PROFILE

Cleaning process

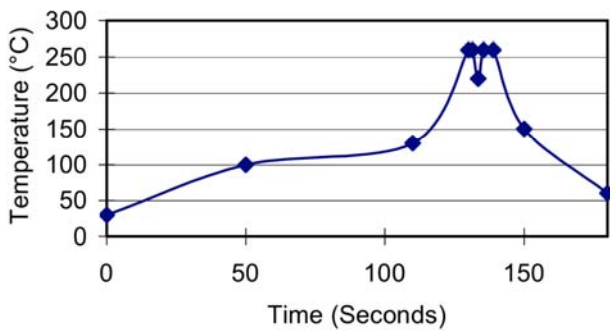
Clean the soldered side of the module with a brush, prevent liquid from getting into the module. Do not clean by soaking the module into liquid. Do not allow solvent to come in contact with product labels or resin case as this may change the color of the resin case or cause deletion of the letters printed on the product label. After cleaning, dry the modules well.

Hand soldering

The suggested soldering iron is $420 \pm 10^\circ\text{C}$ for up to 4~15seconds (less than 90W).

Lead free wave soldering

Lead Free Wave Soldering Profile



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