ATQ150 SERIES
9-75VDC INPUT / 150W OUTPUT
8:1 ISOLATED DC-DC CONVERTER

Advanced Technology Applications Qualified

"**A**chieve **T**otal **A**ssurance and **Q**uality in Power."

EFFICIENT - INNOVATIVE - VERSATILE

The ATQ150 Series provides a high-performance solution for demanding power conversion applications. With its 150-Watt output power, 9 - 75VDC input voltage and 8:1 input voltage range, this isolated DC-DC converter ensures reliable operation and high efficiency. It is engineered for robustness supports a wide operating temperature range and complies with industrial standards.

I. *Compliant with MIL-STD-1275(*) with external components*
II. *Compliant with MIL-STD-704(*) with external components*

NOTE:
* Suitable for COTS use. If the product is intended to be used with a military system, it must be tested in the internal structure of a system subject to military tests. ATAQ does not guarantee the use of this product in military and medical products.

FEATURES TABLE

Feature	Specification	Details
Ultra-Wide Input Voltage:	9 – 75 VDC	- Over-Temperature, Over-Current, Short-Circuit, Over-Voltage, Under-Voltage Lockout protection.
Efficiency:	Up to 90%	- Turned off by the ON/OFF input.
Switching Frequency:	Fixed, 200kHz	- Output voltage trim range of ±10%.
Output Regulation:	Regulated Outputs	- Remote sense for the output voltage.
Remote On/Off:	Yes	- 2.40" L x 2.28" W x 0.50" H (61.0mm L x 57.9mm W x 12.7mm H)
Protection:	Fully (OTP/OCP/OVP/UVLO)	- Complies with safety standards for reliable operation.
Isolation Voltage:	1500Vdc I/O Isolation	
Operating Case Temperature:	-40°C to +100°C	
Package Size:	Half Brick Size	
Safety Approval:	UL60950-1 2nd Edition	

MODEL NUMBER	INPUT VOLTAGE	OUTPUT VOLTAGE	OUTPUT CURRENT		INPUT CURRENT		% EFF.	CAPACITOR LOAD MAX.
			MIN.	MAX.	NO LOAD	FULL LOAD	Nominal Input Voltage 36VDC	
ATQ150-WH36S24	9-75 VDC	24 VDC	0 mA	6.25 A	60 mA	4.66 A	89.1 (1)	2000µF (2)

NOTE:

1. The output terminal of 24Vout models required a minimum capacitor 100uF to maintain specified regulation
2. The input external capacitor recommends to parallel with 330uF ESR<0.5Ω to reduce the input ripple voltage

PART NUMBER

Series	Input Voltage Range	Dimension	Nominal Input Voltage	Number of Outputs		Nominal Output Voltage	Remote On/Off Logic	
	X	X	XX	X		XX	X	
ATQ150-	**W** **W**ide Input Voltage Range (9-75 VDC)	**H** (**H**alf Brick)	**36** (**36** VDC)	**S**ingle **D**ouble	**S** **D**	**24** (**24** VDC)	High **L**ow	- **L**

TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, full load at 25°C unless otherwise noted.)

ABSOLUTE MAXIMUM RATINGS:

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage	Continuous	24Vo	-0.3		75	Vdc
Input Surge Voltage	100ms max.	24Vo			100	Vdc
Input Surge Voltage	100ms max.	24Vo			80	Vdc
Operating Case Temperature	At the Center Part of Base Plate	24Vo	-40		100	°C
Storage Temperature		24Vo	-55		105	°C

INPUT CHARACTERISTICS:

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Input Voltage		24Vo	9	36	75	Vdc
Input Under Voltage Lockout						
Turn-On Voltage Threshold		24Vo	8.5	9.0	9.5	Vdc
Turn-Off Voltage Threshold		24Vo	7.5	8.0	8.5	Vdc
ON/OFF control, positive remote ON/OFF logic	Logic low (Module OFF) Logic high (Module ON)	24Vo	0 3.5V or open circuit		1.2 75	Vdc
Lockout Hysteresis Voltage		24Vo	1			Vdc
Maximum Input Current	V_{in}=9V, Full Load.	24Vo	20			A
No-Load Input Current	V_{in}=36V, Io=0A		20			mA
Input Filter	LC filter	24Vo				
Recommended Input Fuse	Fast acting type	24Vo	30			A
Input Capacitance (External)	< 0.5Ω ESR	24Vo	330			uF
Switching frequency		24Vo	200			kHz

OUTPUT CHARACTERISTICS:

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Voltage Set Point Accuracy	V_{in}=36V, Full Load, Tc=25°C	24Vo	-1.0		+1.0	%
Output Voltage Regulation						
Load Regulation	Full Load to No Load	24Vo			±0.2	%
Line Regulation	V_{in}=High Line to Low Line, Full Load	24Vo			±0.2	%
Output Voltage Ripple and Noise (5Hz to 20MHz bandwidth)						
Peak-to-Peak	Full load, 10uF tantalum and 1.0uF ceramic capacitors	24Vo			280	mV
RMS		24Vo			100	mV
Output Current Range	V_{in}= 9 to 75V	0 – 6.25				A
Over Current Protection	<90% Vo	24Vo	105	160	200	%
Short Circuit Protection	Hiccup Mode / Auto Recovery	24Vo	Continuous, Auto Recovery			
External Load Capacitance	Full load (Constant resistive load)	2000				uF
Output Voltage Trim Range	Po≦max rated power, Io ≦ Io_max	24Vo	-10		+10	%
Start-up time		24Vo	110			ms

EFFICIENCY:

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
100% Load	Vin=24V	up to 90%				%

GENERAL SPECIFICATIONS:

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	I_O=100% of Io_max; MIL-HDBK-217F_Notice 1, GB, 25°C	24Vo		800		K hours
Weight		24Vo		109		Grams
Isolation resistance	10^7 ohms, min.					
Isolation capacitance (Typical)	Input to Output	2300				pF
	Input to Case (Base Plate)	1000				
	Output to Case (Base Plate)	1000				
Isolation voltage	Input / Output : 1500VDC min. (1 minute) Input / Case : 1500VDC min. Output / Case : 1500VDC min.					
Case Material	Plastic, DAP, UL 94V-0					
Dimensions	57.9 x 61.0 x 12.7 mm					
Base plate Material	Aluminum					
Potting Material	UL 94V-0					
Pin Material	Base: Copper Plating: Nickel with Matte Tin					
Shock/Vibration	MIL-STD-810F Compliant					
Humidity	95% RH max. non-condensing					
Altitude	2000m Operating Altitude, 12000m Transport Altitude					
Thermal Shock	MIL-STD-810F					
EMI	Meets EN55032 (with external filter)					Class A

ELECTRICAL BLOCK DIAGRAM:

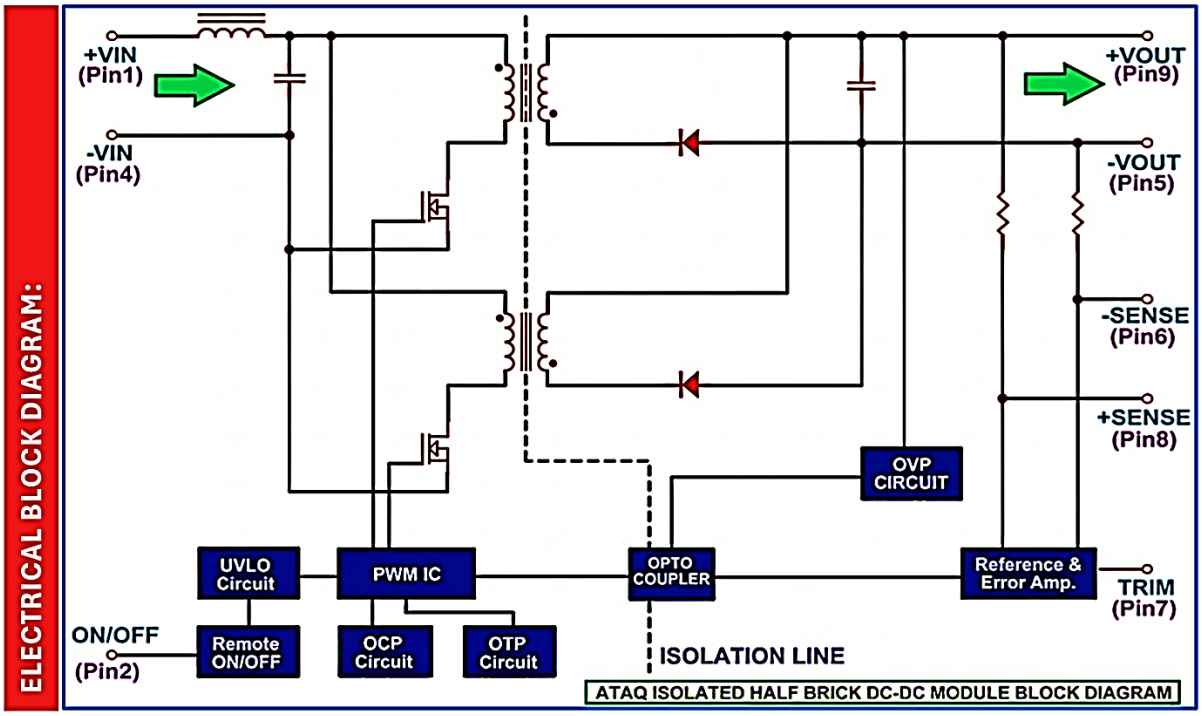

Figure-1

STANDARDS COMPLIANCE						
MIL-STD-1275D						
No	**Parameters**	**Min**	**Typ**	**Max**	**Unit**	**Status**
1	5.1.3.1 Steady-State Voltage	25	-	30	VDC	Passed
2	5.1.3.2 Ripple	-	-	2	VDC	Passed
3	5.1.3.3 Surges	28	-	40	VDC	Passed
4	5.1.4.1 Steady-State Voltage	23	-	33	VDC	Passed
5	5.1.4.2 Ripple	-	-	7	VDC	Passed
MIL-HDBK-704-8						
No	**Parameters**	**Min**	**Typ**	**Max**	**Unit**	**Status**
1	LDC101	-	-	-	-	Passed
2	LDC102	16	28	40	VDC	Passed
3	LDC105	28	-	100	VDC	Passed
4	LDC201	-	-	-	-	Passed
5	LDC301-704E	20	-	31,5	VDC	Passed
6	LDC302-704E	22	-	50	VDC	Passed
7	LDC401-704E	18	-	29	VDC	Passed
8	LDC501	12	-	29	VDC	Passed
9	LDC601	0	-	28	VDC	Passed

Table-1: *MIL-STD-1275 and MIL-STD-704 baseline test results applied with external components (TVS+EMC filters).*

CHARACTERISTIC CURVE & GRAPHS

POWER DERATING CURVE:

Note: Figure 1 shows the results of thermal tests for different heatsinks.
Heatsink – 1 / VHS-95 (517-95AB) /, **Heatsink – 2** / VHS-45 (528-45AB), **Heatsink – 3** / M-C308

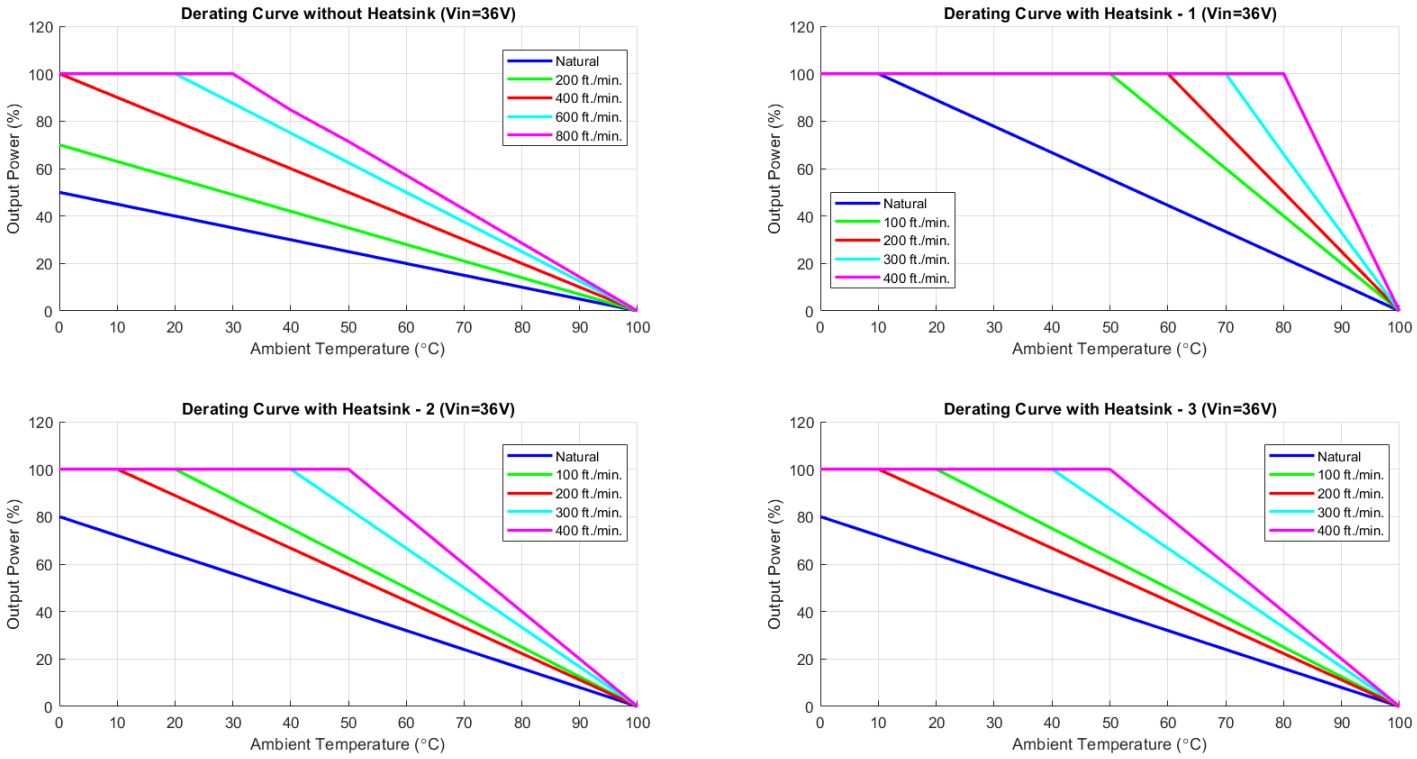

Figure-2

PERFORMANS INFO & DATA

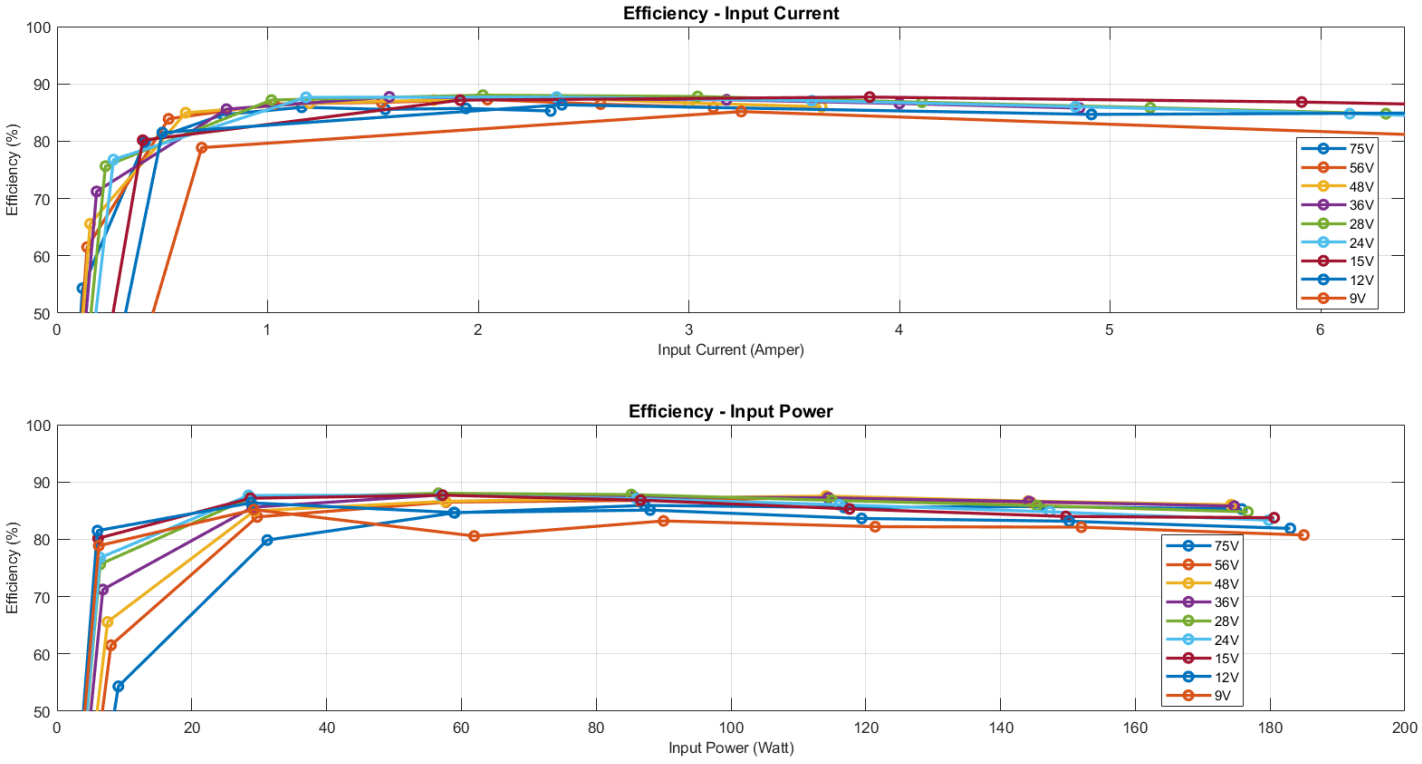

Figure-3

Note: The Efficiency-Output Power graph provides a clearer view of the relationship between output power and efficiency for each load value. (Figure-3 / Efficiency – Output Power Graph)

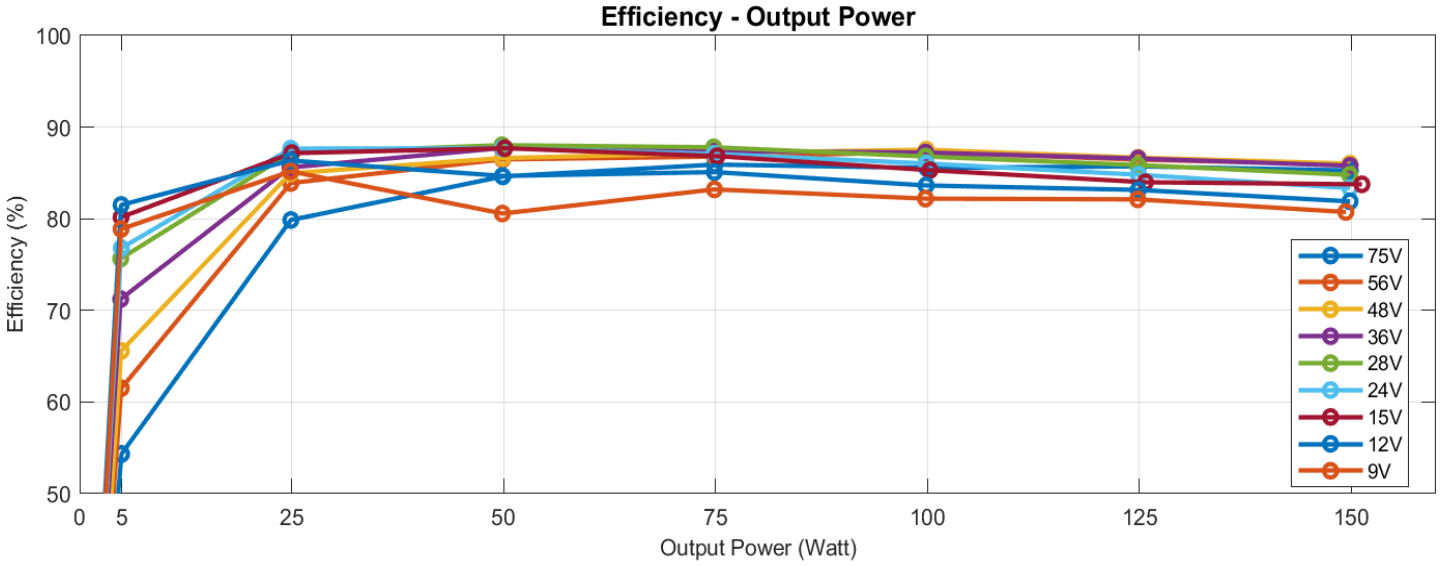

Figure-4

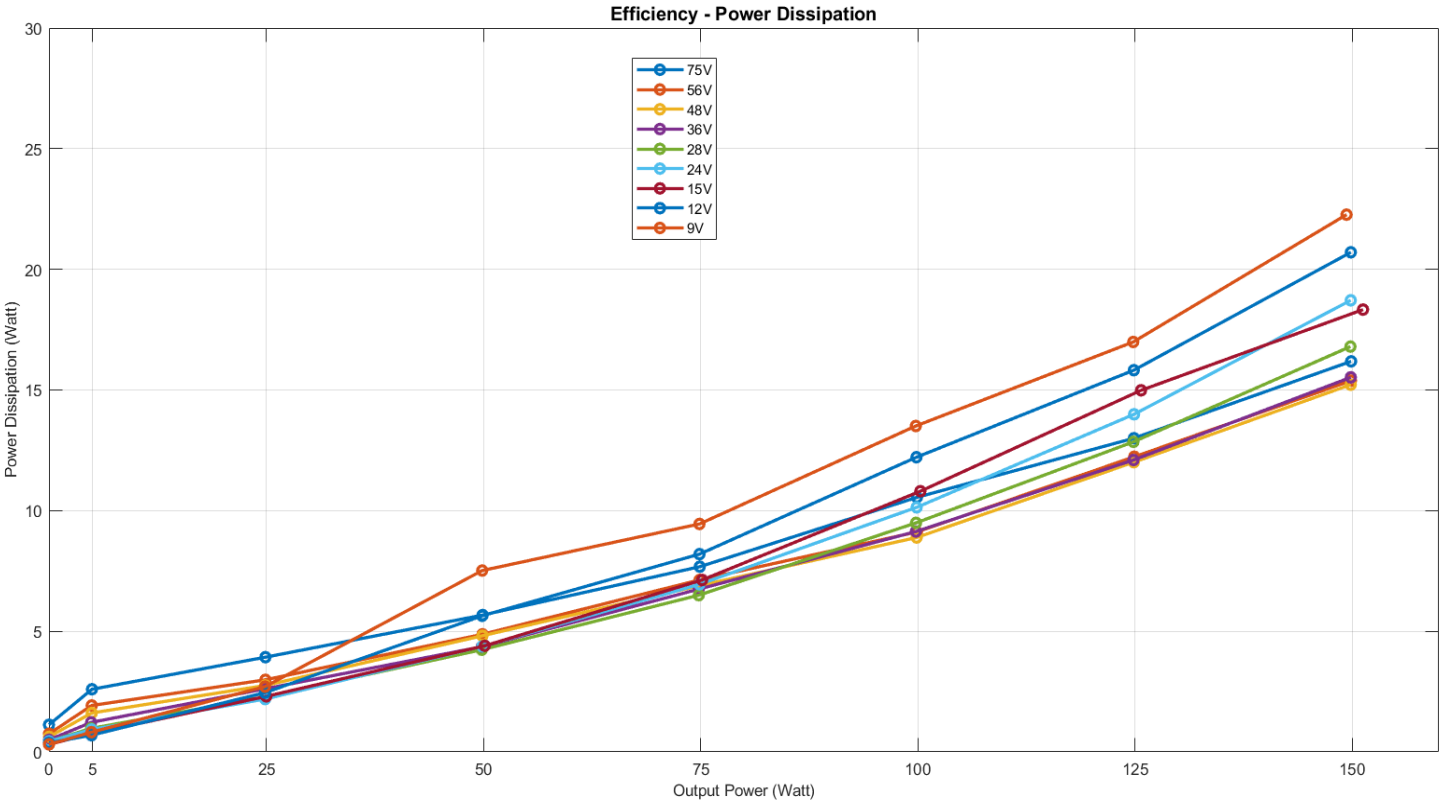

Figure-5

OUTPUT VOLTAGE ADJUSTMENT:

The Trim input permits the user to adjust the output voltage up or down 10%. This is accomplished by connecting an external resistor between the Trim pin and either the Vo (+) pin or the Vo(-) pin (TRIM pin). Please see Figure.

Only one of the trim-up or trim-down resistors should be used to increase or decrease the output voltage.

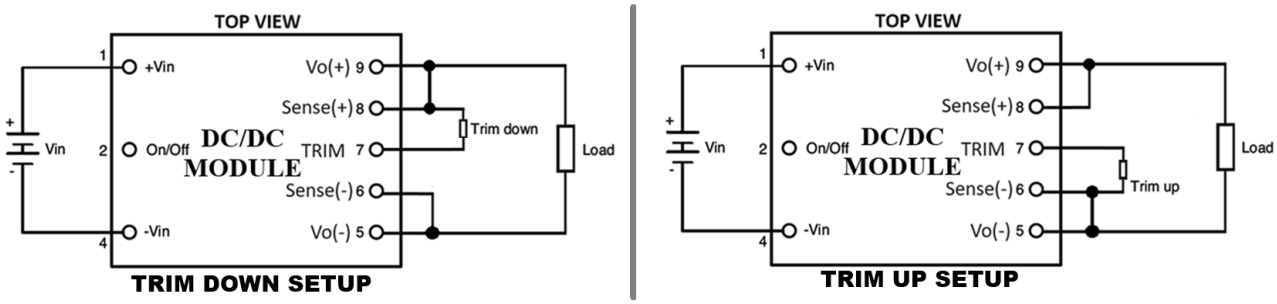

Figure-6

The Trim pin should be left open if trimming is not being used. Connecting an external resistor (Rtrim-down) between the Trim pin and the Vout(+) (or Sense(+)) pin decreases the output voltage.

The following equation determines the required external resistor value to obtain a down percentage output voltage change of Δ%.

Vout=24V:

$$Rtrim\_down = 20 * \frac{(Vo,set - \Delta\% * Vo,set - 2.5)}{\Delta\% * Vo,set} - 100K\Omega$$

Where

For example, to trim-down the output voltage of 24V module (ATQ150-WH36S24) by 5% to 22.8V, Rtrim-down is calculated as follow:

Δ %=5%

$$Rtrim\_down = 20 * \frac{(24 - 5\% * 24 - 2.50)}{5\% * 24} - 100K\Omega$$

Rtrim_down = 238.33KΩ

Connecting an external resistor (Rtrim-up) between the Trim pin and the Vout (-) (or Sense (-)) pin increases the output voltage. The following equations determine the required external resistor value to obtain an up percentage output voltage change of Δ%.

Vout=24V:

$$Rtrim\_up = 20 * \frac{(2.5 - \frac{0.46 * 100}{100 + 5.6})}{\Delta\% * Vo,set} - \frac{5.6 * 100}{100 + 5.6} K\Omega$$

Where

$$V_{out} = V_{o,set}, \Delta\% = \left(\frac{V_{desired} - V_{o,set}}{V_{o,set}} \right) \times 100$$

For example, to trim-up the output voltage of 24V module (ATQ150-WH36S24) by 5% to 25.2V, Rtrim-up is calculated as follow:

$\Delta\%=5\%$

$$Rtrim\_up = 20 * \frac{(2.5 - \frac{0.46*100}{100+4.3})}{5\%*24} - \frac{5.6*100}{100+5.6} K\Omega$$

Rtrim_up = 29.013KΩ

Note:
Although the output voltage can be increased by both the remote sense and by the trim, the maximum increase for the output voltage is not the sum of both.

The maximum increase is the larger of either the remote sense or the trim. The amount of power delivered by the module is defined as the voltage at the output terminals multiplied by the output current. When using remote sense and trim, the output voltage of the module can be increased and consequently increase the power output of the module if output current remains unchanged.

Care should be taken to ensure that the maximum output power of the module remains at or below the maximum rated power (Maximum rated power = Vo,set x Io,max)

The output voltage on 24V models is adjustable within the range of +10% to –10%.

MECHANICAL SPECIFICATION:

Pin Connections	
Pin	Single
1	+Vin
2	Remote On/Off
3	Case
4	-Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

NOTES:
- All dimensions are in mm
- Weight: 110 g approx.
- Tolerance: x.xx = ±0.50
  x.xxx= ±0.25

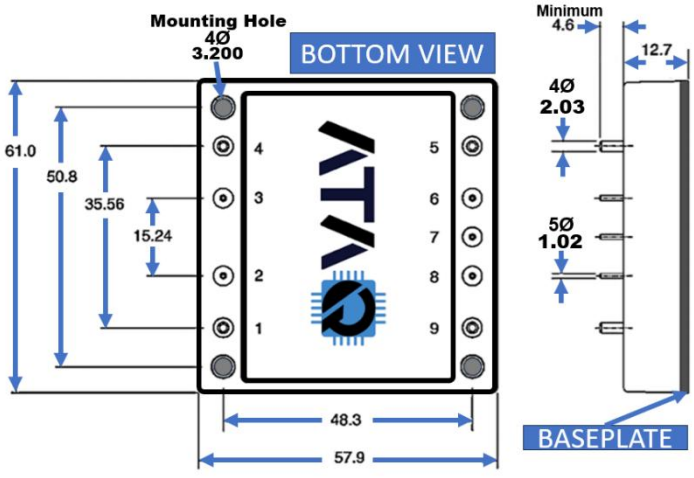

Figure-7

Figure-8

PACKAGING:

Due to ATAQ' s value-added services, the packaging type may change when purchasing quantities below the standard package.

Figure-9

For all other features and applications, please refer to the ATQ150-WH series application notes document.

Contact ATAQ for further information and to order.