Features & Benefits

- True 3-Phase Power Factor Correction
- Operation Without "Neutral Wire"
- Wide Input Voltage Range: 360–528 V_{LL_RMS}
- Input Frequency Range: 57-63 Hz
- Internal Input Emi Filter*
- Up To 3420 W Output Power
- Virtually No Inrush Current
- Less Than 5% THD of AC Input Current
- Power Factor of 0.99 at Full Load
- 95% Efficiency at Full Load
- RS-485 Communication
- Input Under/Over Protection
- Over Temperature Protection
- Input Over Current Protection
- Output Over Voltage Protection
- Baseplate Cooled
- Compatible With KOLT DC-DC Converters

Compliance

Module is designed to meet:

- MIL-STD-1399B
- MIL-STD-461G*
- MIL-STD-810G

*MIL-STD-461G testing requires additional input EMI filtering

Typical Applications

- Military/Defense Power Supplies
- Marine Platforms
- Armored Vehicles
- Land Platforms
- Communications and Radar Systems

Product Ratings	
V_{IN}	360–528 V_{LL_RMS} (Three-Phase)
V_{IN_NOM}	440 V_{LL_RMS}
V_{OUT}	380 V_{DC}
I_{OUT}	9 A
P_{OUT}	3420 W

Product Description

True 3-Phase Power Factor Correction is a low profile and compact single output non-isolated PFC Module with 3-phase 3-wire, 57-63 Hz, delta input. Module can operate over a wide input voltage range (360–528 V_{LL_RMS}) and generates constant 380 V_{DC} output. Module draws a nearly sinusoidal current with less than 5% THD and close to unity power factor. It has superior protection features backed by analog comparators that guarantee hassle free operation.

Since the module is cooled via baseplate, it can be used with different cooling applications, including liquid baseplate cooling. Natural cooling and forced air cooling can also be used via mounting on a heatsink.

The innovative baseplate cooling technology engineered by KOLT allows adaptation of different cooling strategies including liquid baseplate cooling. The natural and forced air cooling strategies can also be implemented via mounting on an external heatsink with peace of mind.

Size: 220 × 130 × 35.8 mm

Electrical Characteristics

Input Characteristics					
Parameters	**Comments**	**Min**	**Typ**	**Max**	**Unit**
Input Voltage	Continuous	207	254	305	V_{RMS}
Input No Load Current	@Nominal input voltage	-	205	-	mA

Output Characteristics					
Parameters	**Comments**	**Min**	**Typ**	**Max**	**Unit**
Output Voltage	User settable	-	380	-	V_{DC}
Output Current Limit	User settable	0	9	10	A_{DC}
Output Power		-	-	3420	W
Output Ripple and Noise	@20 MHz Bandwidth	-	-	±2.5	V_{pk-pk}
Line Regulation	Over the full range of line input voltage	Insignificantly small			-
Load Regulation	From 10% load to full load, nominal input voltage	-	100	-	mV
External Load Capacitance		-	-	?	µF

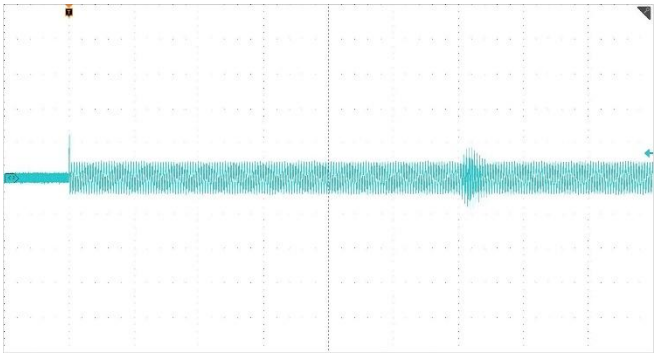
General Characteristics					
Parameters	**Comments**	**Min**	**Typ**	**Max**	**Unit**
Efficiency	@Rated output power	97%	-	-	-
Turn-on Delay	Factory settable, health check	-	-	2000	ms
Soft-Start Time	Factory settable	-	-	1000	ms
Power Density	@Rated output power	-	3554	4265	W/dm^3
Weight		-	1.2	-	kg
Length	Connector's lengths are not included	-	166	-	mm
Depth		-	130	-	mm
Height		-	36.5	-	mm
Cooling	Baseplate Cooling				
Built-in Test Feature	DC OK, Remote Error Sensing				

Protections					
Parameters	**Comments**	**Min**	**Typ**	**Max**	**Unit**
Input Under Voltage Protection	When the voltage returns within the normal limits, unit resumes operation automatically	205	207	210	V_{AC}
Input Over Voltage Protection		300	305	310	V_{AC}
Output Over Current Protection	Fully electronic against over-load	-	-	130%	I_{OUT_TYP}
Output Over Voltage Protection		-	-	115%	V_{OUT_TYP}
Output Short Circuit Protection	Fully electronic against over-load and continuous short-circuit conditions				
Over Temperature Protection	Automatically resumes operation when the heat sink temperature decreases below 70°C	-	80	-	°C
Battery	Prevention of battery discharge when charger is off				
	Reverse polarity				

Isolation Characteristics					
Parameters	**Comments**	**Min**	**Typ.**	**Max**	**Unit**
Insulation Resistance	Input to Case	-	>100	-	MΩ
Isolation Voltage	Input to Case	-	-	500	V_{DC}
Isolation Voltage	Output to Case	-	-	500	V_{DC}

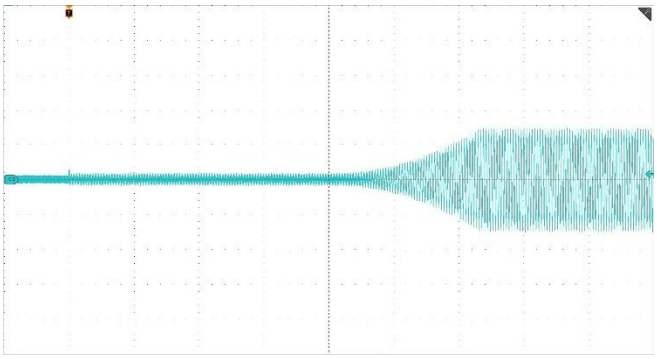
Environmental Characteristics					
Parameters	**Standard / Method**	**Min**	**Typ**	**Max**	**Unit**
Operational Temperature	MIL-STD-810G Method 501.5/502.5 Procedure II	-32	-	+50	°C
Storage / Transport Temperature	MIL-STD-810G Method 501.5/502.5 Procedure I	-40	-	+63	°C
Operational Low Pressure	MIL-STD-810G Method 500.5 Procedure II	-	-	10000	ft
Storage / Transport Low Pressure	MIL-STD-810G Method 500.5 Procedure I	-	-	15000	ft
Parameters	**Standard / Method**	**Waveform**	**Peak Value**	**Pulse Duration**	**Axis**
Shock	MIL-STD-810G Method 516.6 Procedure I	Sawtooth	20g	11 ms	±X, ±Y, ±Z
		Half-Sine	10g	11 ms	±X, ±Y, ±Z
Parameters	**Standard / Method**	**Category**		**Platform**	**Vehicle**
Vibration	MIL-STD-810G Method 514.6 Procedure I	Category 4		Secured Cargo	Truck Transportation and Composite Wheeled Vehicles
		Category 8		Aircraft	Propeller
		Category 10		Watercraft	Marine Vehicles
		Category 11		Railroad	Train
		Category 20		Ground Vehicles	Wheeled and Tracked Vehicles
		Category 21		Watercraft	Marine Vehicles
Parameters	**Standard / Method**	**Condition**			
Fungus	MIL-STD-810G Method 508.6	Analysis of the degree of inertness to fungus growth of the components.			
Solar Radiation	MIL-STD-810G Method 505.5 Procedure I	A2			
Humidity	MIL-STD-810G Method 507.5 Procedure II	≥ %95 Relative @30°C			
Parameters	**Standard / Method**	**Test**			
EMI/EMC*	MIL-STD-461E [b] MIL-STD-461G [a]	CE102 [a, b] CS101 [a, b] CS114 [a, b] CS115 [a] CS116 [a, b] CS118 [a] RE101 [b] RE102 [a, b] RS101 [b] RS103 [a, b]			

* Tested at the system level with an EMI filter installed at the input.
[a] Ground Army
[b] Surface Ships



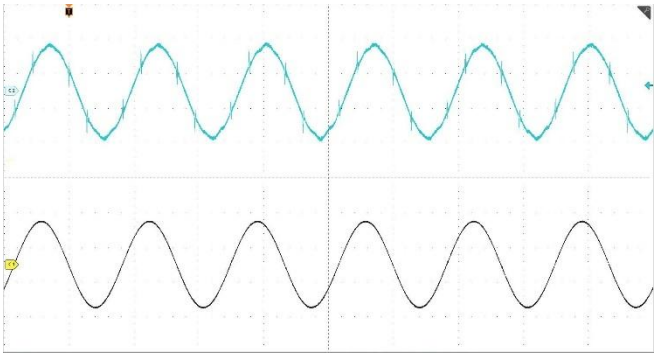
Input current (navy blue) (1 A/div) Time base : 400 ms/div

Figure 1. Inrush current at nominal input voltage



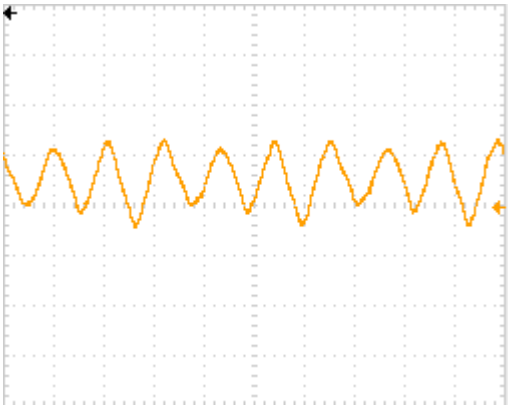
Input current (navy blue) (5 A/div) Time base : 1 s/div

Figure 2. Input current for inrush and start-up stages at nominal input voltage



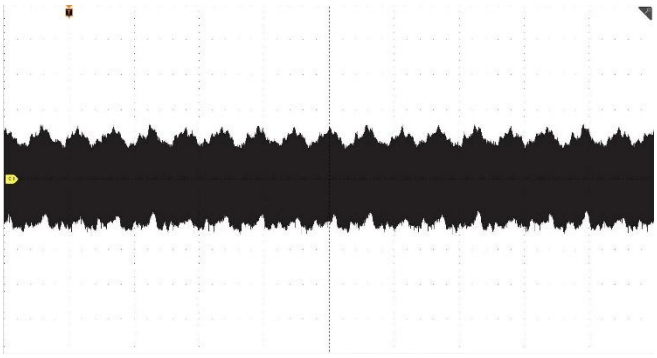
Input voltage (navy blue) (500 V/div) Time base : 10 ms/div
Input current (black) (5 A/div)

Figure 3. Typical input voltage and current waveforms at rated load current



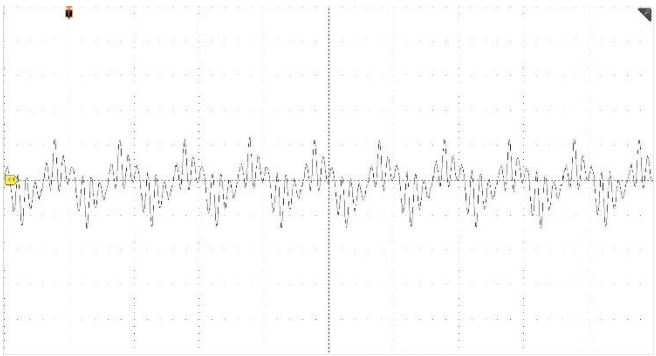
Leakage current (orange) (400 uA/div) Time base : 5 ms/div

Figure 4. Leakage current to ground at nominal input voltage and 10% load current



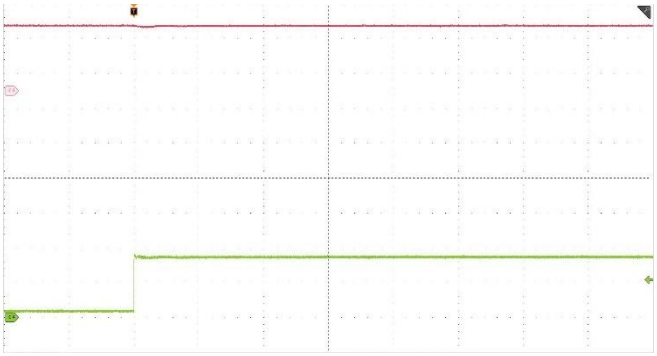
Output voltage (black) (2 V/div) Time base : 10 ms/div

Figure 5. Output voltage ripple at nominal input voltage and rated load current (AC Coupled), Bandwidth: 20 MHz



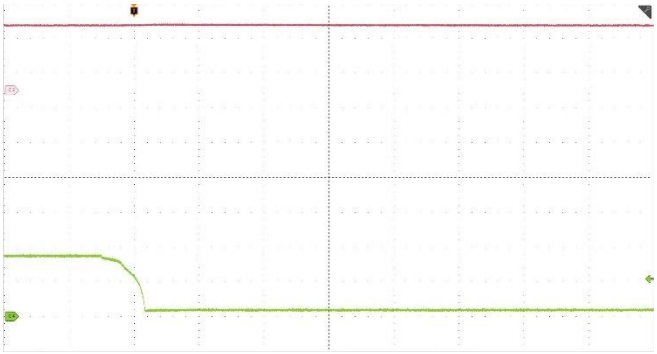
Output voltage (black) (2 V/div) Time base : 10 µs/div

Figure 6. Output voltage ripple at nominal input voltage and rated load current (AC Coupled), Bandwidth: 20 MHz



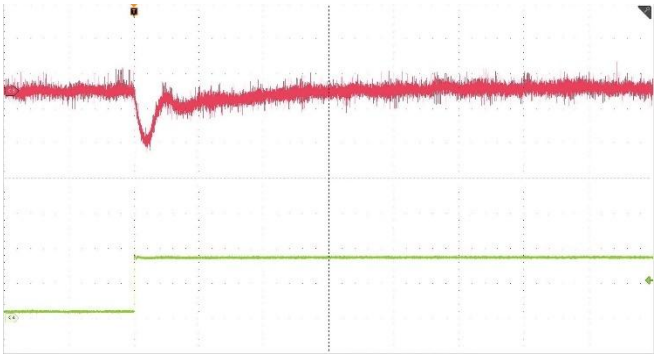
Output voltage (red) (200 V/div) Time base : 4 ms/div
Output current (green) (5 A/div)

Figure 7. Load transient response: from 10% to 100% nominal output voltage (DC Coupled)



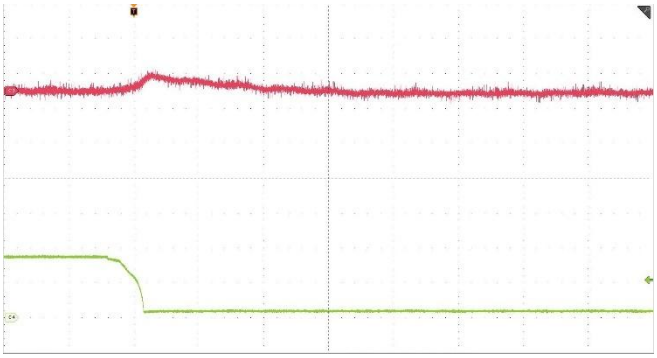
Output voltage (red) (200 V/div) Time base : 4 ms/div
Output current (green) (5 A/div)

Figure 8. Load transient response: from 100% to 10% nominal output voltage (DC Coupled)



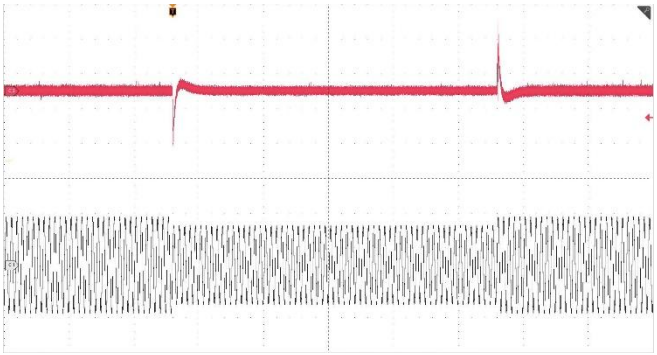
Output voltage (red) (10 V/div) Time base : 4 ms/div
Output current (green) (5 A/div)

Figure 9. Load transient response from 10% to 100% nominal output voltage (AC Coupled)



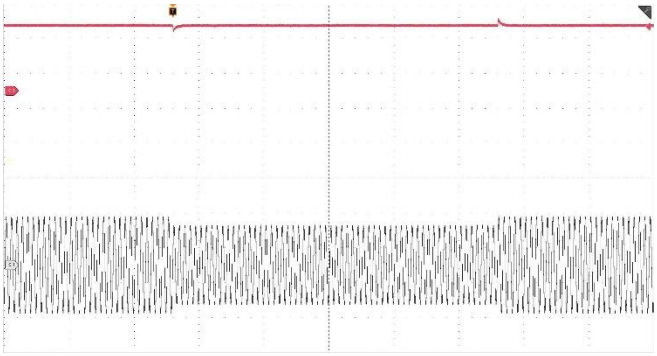
Output voltage (red) (10 V/div) Time base : 100 ms/div
Output current (green) (5 A/div)

Figure 10. Load transient response: from 100% to 10% nominal output voltage (DC Coupled)



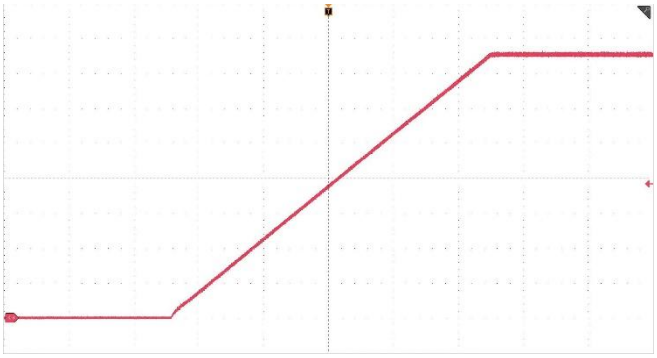
Output voltage (red) (20 V/div) Time base : 1 s/div
Input voltage (black) (500 V/div)

Figure 11. Line transient response: from 280 V_{RMS} to 228 V_{RMS} and from 228 V_{RMS} to 280 V_{RMS} at nominal output voltage (DC Coupled)



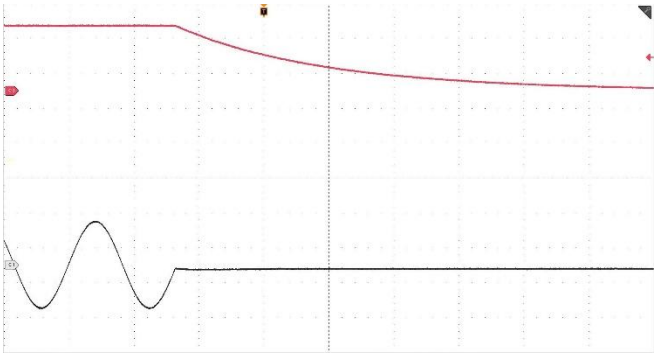
Output voltage (red) (200 V/div) Time base : 1 s/div
Input voltage (black) (500 V/div)

Figure 12. Line transient response: from 265 V_{RMS} to 175 V_{RMS} and from 175 V_{RMS} to 265 V_{RMS} at nominal output voltage (AC Coupled)



Output voltage (black) (50 V/div) Time base : 1 s/div

Figure 13. Start-up waveform at rated load current and nominal output voltage



Output voltage (red) (200 V/div) Time base : 10 ms/div
Input voltage (black) (500 V/div)

Figure 14. Hold-up waveform at rated load current and nominal output voltage

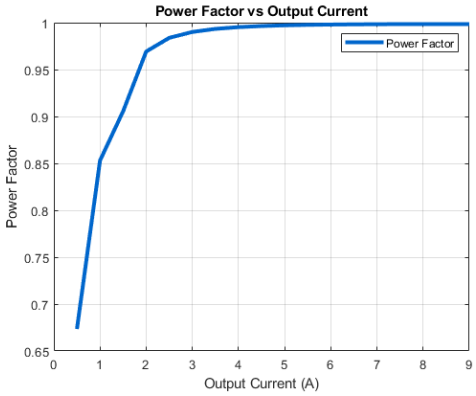


Figure 15. Power factor versus output current at nominal input voltage

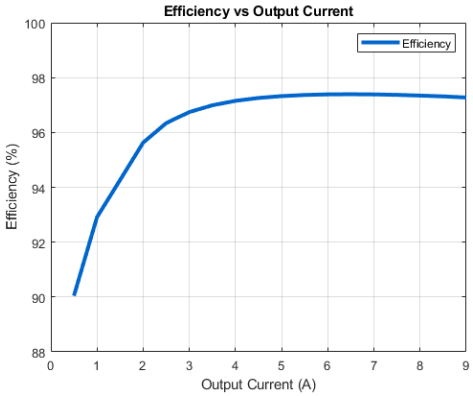


Figure 16. Efficiency versus output current at nominal input voltage

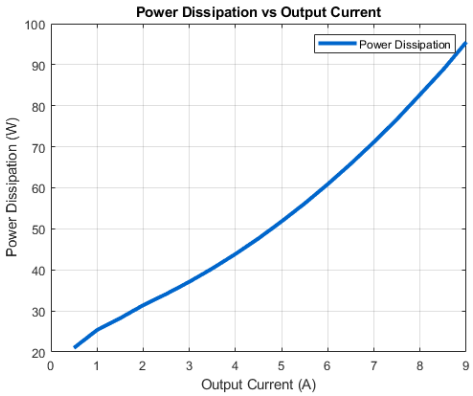


Figure 17. Power dissipation versus output current at nominal input voltage

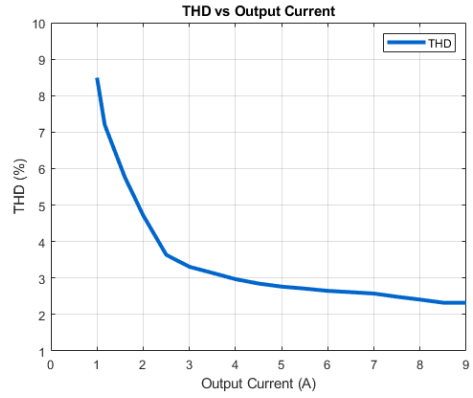
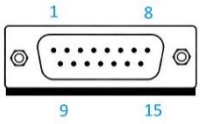


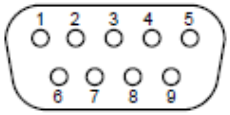
Figure 18. Total harmonic distortion (THD) versus output current at nominal input voltage

Connector Configuration

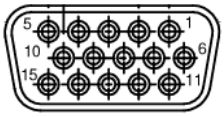
Input Connector DAMN-15P-N-K87	
Pin	**Signal**
1	V_L1
2	NC
3	V_L2
4	NC
5	V_L3
6	NC
7	CHASSIS
8	NC
9	V_L1
10	NC
11	V_L2
12	NC
13	V_L3
14	NC
15	CHASSIS
MTG1	CHASSIS
MTG2	CHASSIS



Output Connector DEMM9SL	
Pin	**Signal**
1	DC_OUT
2	DC_OUT
3	NC
4	DC_OUT RTN
5	DC_OUT RTN
6	DC_OUT
7	NC
8	NC
9	OUT RTN
MTG1	CHASSIS
MTG2	CHASSIS



Output Signal Connector ICD15S13E4GV00LF	
Pin	**Signal**
1	AC_LED_RED
2	AC_LED_GREEN
3	PGND
4	POWER_OUT_GOOD
5	PGND
6	CAN_IN_P
7	CAN_IN_N
8	RS_D+_PRLL
9	RS_D-_PRLL
10	ISO_12V_AUX
11	NC
12	NC
13	RS422_D-_INT
14	RS422_D+_INT
15	NC
MTG1	CHASSIS
MTG2	CHASSIS



Mechanical Drawings

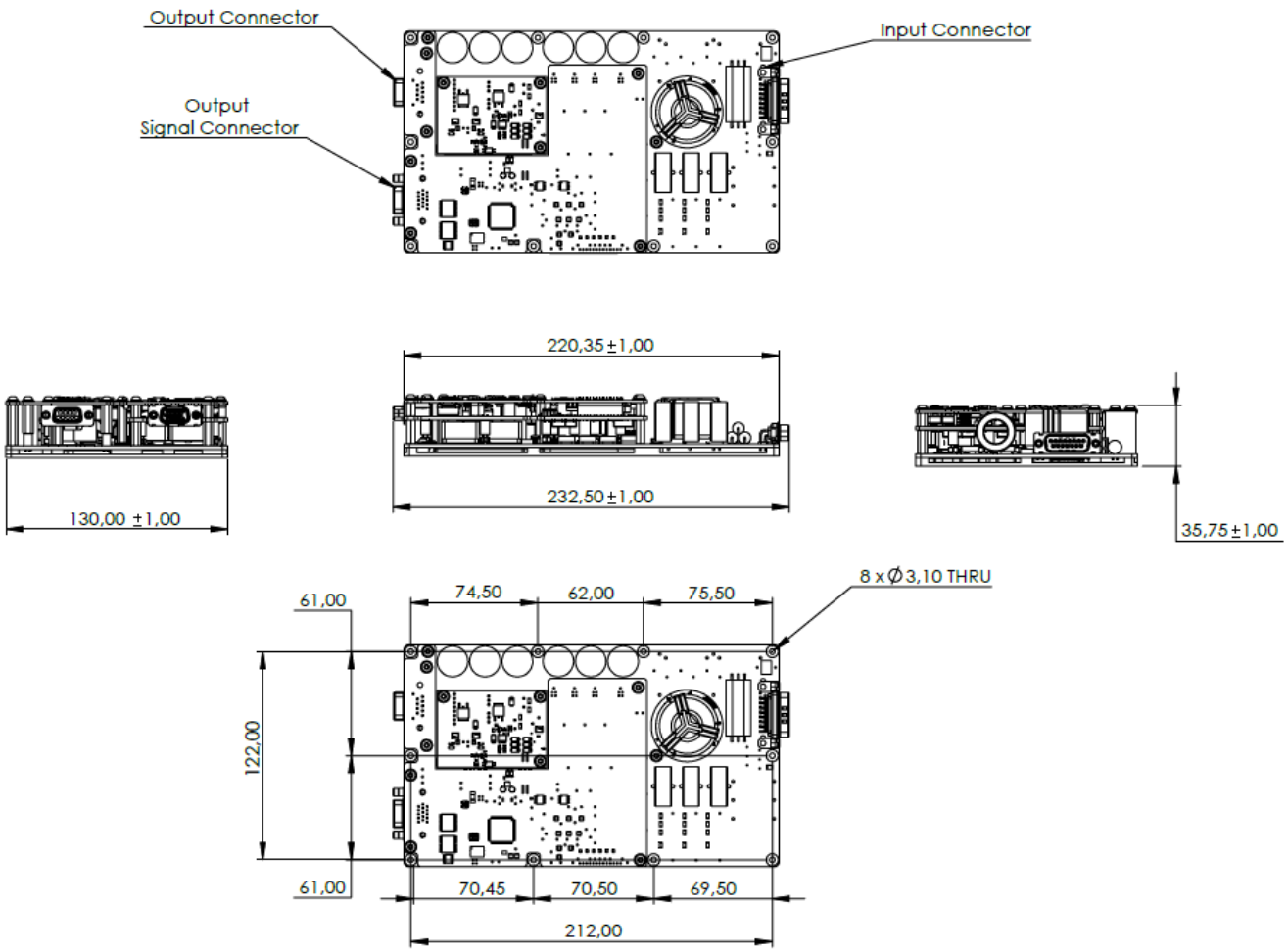


Figure 19. Mechanical Dimensions

Part Ordering Information

Family	Product Variant	Option Variant	Compliance
KEU-PF593	**-001**	-XXX	**R:** RoHS & REACH

Ordering Number	Conformal Coating	RoHS (Note*)
KEU- PF593-001-001	Yes	RoHS compliant with exemptions
KEU- PF593-001-002	No	RoHS compliant with exemptions
KEU- PF593-001-001R	Yes	RoHS-3 & REACH compliant
KEU- PF593-001-002R	No	RoHS-3 & REACH compliant

RoHS & REACH Compliance*

All KOLT products ship by default with SnPb solder under EU RoHS Directive 2011/65/EU, utilizing lead Exemption 7(a).

To obtain a lead-free build that meets **RoHS-3** requirements and REACH compliancy, add the "-R" suffix to the part number. These units are CE marked.

Revision History

Document Number	Revision	Date	Description	Page Number(s)
107902	01	23.10.2024	Initial Release	-
107902	02	23.03.2025	Second Release • Compliances updated • EMI filter information added • Revision History and Contact information added	1, 2
107902	03	5.08.2025	Part Number Updated	-

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