



P-DUKE POWER

MAH450 Series

3 X 5 Inch AC-DC POWER SUPPLIES
Up to 450 Watts

5
YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT

+85°C
-40°C
AMBIENT TEMP.



Medical



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



PV



Railway

UL US CB CE FCC



2
X
MOPP

4000
VAC
Reinforced
Insulation

ADJ.
Output
Voltage

Internal
EN55032
Class
Filter **B**

LOW
Leakage
Current

LOW
Standby
Power

Operating
Altitude
5000
meter

**POWER
GOOD**

Protection
Class **I**

REMOTE
**ON
OFF**

OCP

OTP

OVP

SCP

PART NUMBER STRUCTURE

M	A	H	450	U	S	12		-	F2
Application	Package Code	Dimension Code	Output Power (W)	Input Voltage (VAC)	Output Quantity	Output Voltage (VDC)	Protection Type		Option
Medical Application	A: Open type E: Enclosed type			U: Universal 85 ~ 264VAC	S: Single	12: 12V 15: 15V 24: 24V 28: 28V 36: 36V 48: 48V 53: 53V	Blank: CLASS I		Blank: Fan connector with fixed fan speed control. Y: Fan connector with variable fan speed control. For MEH450 only: Fixed fan speed F1: Fan 1, fan on the top F2: Fan 2, fan on the side Variable fan speed Y1: Fan 1, fan on the top Y2: Fan 2, fan on the side

TECHNICAL SPECIFICATION All specifications are typical at 230VAC input, full load and 25°C unless otherwise noted

Model Number	Input Range	Output Voltage	Output Current @ 230VAC				Input Power @ No Load	Efficiency
			Natural convection	Conduction cooling	Forced air cooling			
					21 CFM External Fan	Internal Fan		
	VAC	VDC	A	A	A	A	W	%
MAH450US12(-Y)	85 ~ 264	12	20.8	23.3	37.5	---	0.3	91
MEH450US12(-Y)	85 ~ 264	12	20.8	23.3	37.5	---	0.3	91
MEH450US12-F1(Y1)	85 ~ 264	12	---	---	---	37.5	0.4	91
MEH450US12-F2(Y2)	85 ~ 264	12	---	---	---	37.5	0.4	91
MAH450US15(-Y)	85 ~ 264	15	16.6	18.6	30.0	---	0.5	92
MEH450US15(-Y)	85 ~ 264	15	16.6	18.6	30.0	---	0.5	92
MEH450US15-F1(Y1)	85 ~ 264	15	---	---	---	30.0	0.8	92
MEH450US15-F2(Y2)	85 ~ 264	15	---	---	---	30.0	0.8	92
MAH450US24(-Y)	85 ~ 264	24	13.3	14.55	18.75	---	0.5	93
MEH450US24(-Y)	85 ~ 264	24	13.3	14.55	18.75	---	0.5	93
MEH450US24-F1(Y1)	85 ~ 264	24	---	---	---	18.75	0.8	93
MEH450US24-F2(Y2)	85 ~ 264	24	---	---	---	18.75	0.8	93
MAH450US28(-Y)	85 ~ 264	28	11.4	12.5	16.1	---	0.5	93
MEH450US28(-Y)	85 ~ 264	28	11.4	12.5	16.1	---	0.5	93
MEH450US28-F1(Y1)	85 ~ 264	28	---	---	---	16.1	0.8	93
MEH450US28-F2(Y2)	85 ~ 264	28	---	---	---	16.1	0.8	93
MAH450US36(-Y)	85 ~ 264	36	8.9	9.72	12.5	---	0.5	93
MEH450US36(-Y)	85 ~ 264	36	8.9	9.72	12.5	---	0.5	93
MEH450US36-F1(Y1)	85 ~ 264	36	---	---	---	12.5	0.8	93
MEH450US36-F2(Y2)	85 ~ 264	36	---	---	---	12.5	0.8	93
MAH450US48(-Y)	85 ~ 264	48	6.65	7.3	9.4	---	0.5	94
MEH450US48(-Y)	85 ~ 264	48	6.65	7.3	9.4	---	0.5	94
MEH450US48-F1(Y1)	85 ~ 264	48	---	---	---	9.4	0.8	94
MEH450US48-F2(Y2)	85 ~ 264	48	---	---	---	9.4	0.8	94
MAH450US53(-Y)	85 ~ 264	53	6.05	6.6	8.55	---	0.5	94
MEH450US53(-Y)	85 ~ 264	53	6.05	6.6	8.55	---	0.5	94
MEH450US53-F1(Y1)	85 ~ 264	53	---	---	---	8.55	0.8	94
MEH450US53-F2(Y2)	85 ~ 264	53	---	---	---	8.55	0.8	94

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	AC input	85		264	VAC
	DC input	120		370	VDC
Input frequency	AC input	47		63	Hz
Input current	100VAC and Full Load			5.8	A
	240VAC and Full Load			2.4	
No load input power	230VAC MAH(-Y), MEH(-Y)		0.3		Watts
			0.5		
	MEH -F□(Y□)		0.4		
			0.8		
Leakage current	264VAC			100	μA
Power Factor		0.95			
Start up time				2000	ms
Rise time			30		ms
Hold up time	115VAC and Full Load		14		ms
Input inrush current	230VAC			100	A
Input protection	Internal fuse in line and neutral			T6.3A/250VAC	

OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output power	Forced air cooling Conduction cooling @ 230VAC Natural convection @ 230VAC * Please refer to the derating curve for detailed rating.	All 12Vout, 15Vout others 12Vout, 15Vout others		450 280 350 250 320	Watts
Initial set voltage accuracy	230VAC and Full Load	-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load	-0.2		+0.2	%
Load regulation	No Load to Full Load 10% Load to 90% Load	-0.5 -0.4		+0.5 +0.4	%
Voltage adjustability		-8		+8	%
Minimum load			0		%
Ripple and noise	Measured by 20MHz bandwidth With a 1 μ F/25V 1206 X7R MLCC With a 1 μ F/50V 1206 X7R MLCC With a 0.1 μ F/100V 1206 X7R MLCC		250 300 240 280 480 530		mVp-p
Temperature coefficient		-0.02		+0.02	%/°C
Transient response	Load step from 50 ~ 75% change at 2.5A/ μ s		3 600		% Vout μ s
Over voltage protection	% of Vout(nom); Latch mode	110		135	%
Over load protection	% of Iout rated; Hiccup mode	115		155	%
Short circuit protection	Protection level 1 (nominal) Protection level 2 (instantaneous high current)				Continuous, automatic recovery Latch
Standby power supply				5V at 2000mA	
Fan power supply				12V at 500mA	

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute (2MOPP insulation)	4000 2500			VAC
Isolation resistance	500VDC	0.1			G Ω
Switching frequency	230VAC, Full load		75 65		kHz
Safety approvals	IEC/ EN/ ANSI/AAMI ES 60601-1 IEC/ EN/ UL 60950-1, 62368-1				UL:E360199 UL:E193009 CB:UL(Demko)
Weight					MAH(-Y) MEH(-Y) MEH -F1(Y1) MEH -F2(Y2) 462g(16.29oz) 504g(17.77oz) 524g(18.48oz) 552g(19.47oz)
MTBF	MIL-HDBK-217F Ta=25°C, Full load				4.093 x 10 ⁵ hrs

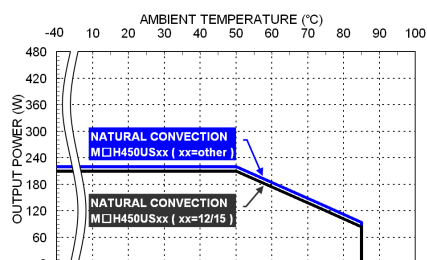
ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating	MAH(-Y), MEH(-Y) MEH -F□(Y□)	-40 -40	+85 +80	°C
Storage temperature range		MAH, MEH MEH -F□(Y□)	-40 -40	+85 +75	°C
Operating altitude				5000	m
Thermal shock					MIL-STD-810F
Shock					IEC60068-2-27
Vibration					IEC60068-2-6
Relative humidity	Non-condensing				5% to 95% RH

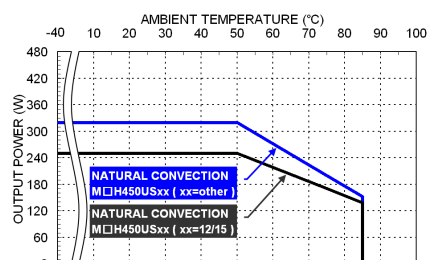
EMC SPECIFICATIONS

Parameter	Conditions	Level
EMI	EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15 For optimum EMI performance, the power supply should be mounted to a metal plate grounded to all 4 mounting holes of the power supply. To comply with safety standards, this plate must be properly grounded to protective earth.	Conducted Class B Radiated Class A
Harmonic currents	EN61000-3-2 Full Load	Class A and D
Voltage flicker	EN61000-3-3	
EMS	EN55024 and EN60601-1-2	
ESD	EN61000-4-2 Air $\pm 15\text{kV}$ and Contact $\pm 8\text{kV}$	Perf. Criteria A
Radiated immunity	EN61000-4-3 3 V/m	Perf. Criteria A
Fast transient	EN61000-4-4 $\pm 2\text{kV}$	Perf. Criteria A
Surge	EN61000-4-5 DM $\pm 1\text{kV}$ and CM $\pm 2\text{kV}$	Perf. Criteria A
Conducted immunity	EN61000-4-6 20 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8 30 A/m	Perf. Criteria A
Dip and interruptions	EN61000-4-11	

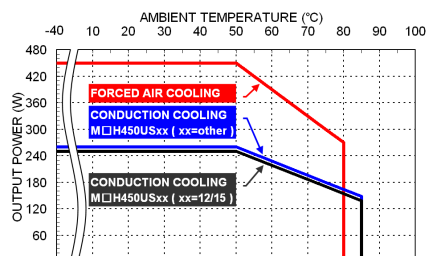
CHARACTERISTIC CURVE



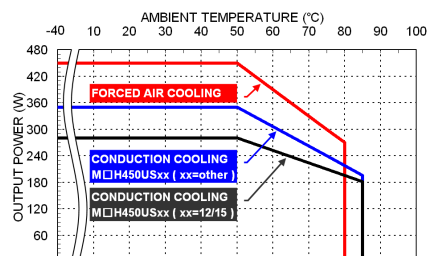
Derating Curve vs. Ambient Temperature
Vin=115VAC and Natural convection



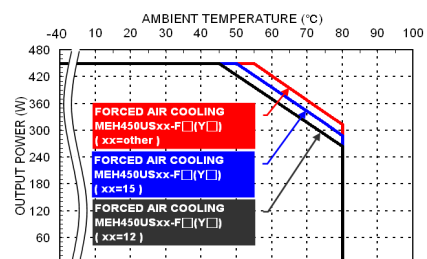
Derating Curve vs. Ambient Temperature
Vin=230VAC and Natural convection



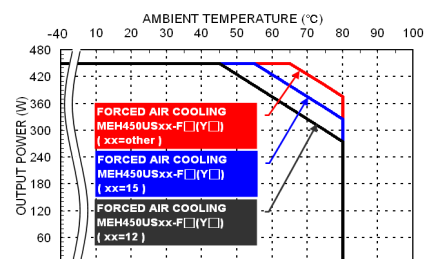
Derating Curve vs. Ambient Temperature
Vin=115VAC and Conduction cooling
Forced air cooling with 21CFM (External Fan)



Derating Curve vs. Ambient Temperature
Vin=230VAC and Conduction cooling
Forced air cooling with 21CFM (External Fan)

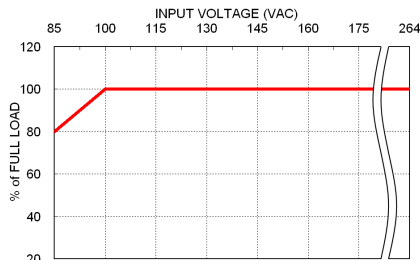


Derating Curve vs. Ambient Temperature
Vin=115VAC and Forced air cooling (Internal Fan)

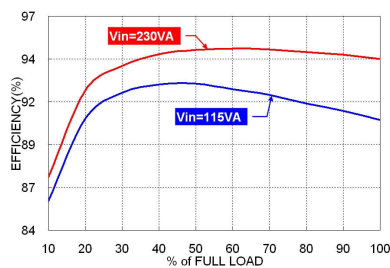


Derating Curve vs. Ambient Temperature
Vin=230VAC and Forced air cooling (Internal Fan)

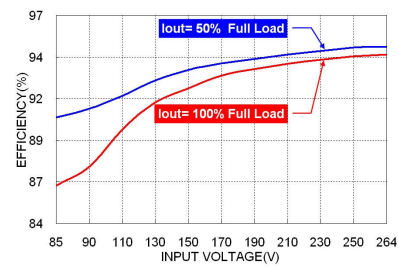
CHARACTERISTIC CURVE (CONTINUED)



Derating Curve vs. Input Voltage
MAH450



Efficiency vs. Output Load
MAH450US24 with Forced air cooling



Efficiency vs. Input Voltage
MAH450US24 with Forced air cooling

OUTPUT SENSING

Output sensing function can be applied via connecting wires on CON3. Initially, Pin 7 and Pin 8 are shorted by a jumper set as default, shown as Fig. 1.

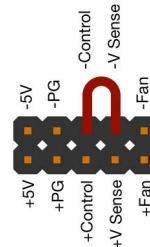
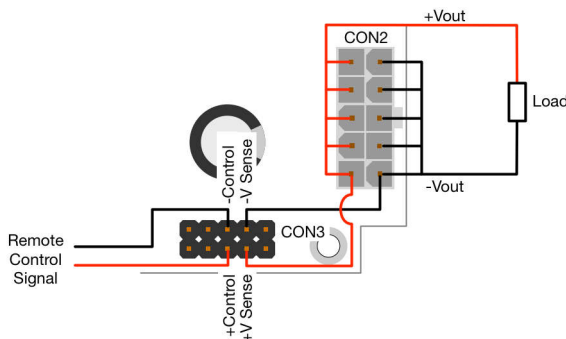
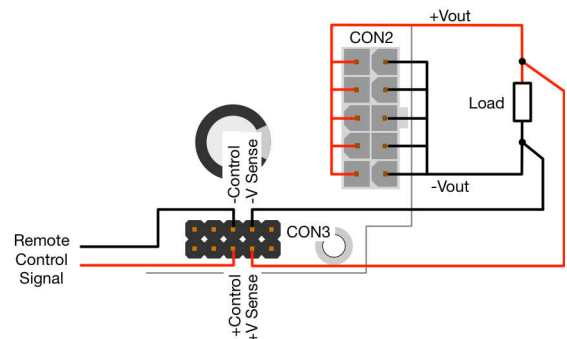


Fig. 1 Default connection

But if remote control function is to be used, the jumper on Pin 7 and Pin 8 should be removed. Since sense pins could not be left open for module stability, please follow the connections as below (Fig. 2).



(a) Sense pins connect to corresponding polarity of Vout pin

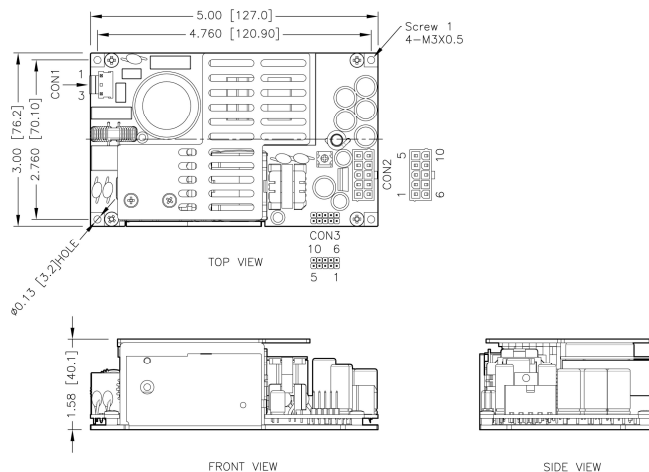


(b) Sense pins connect to corresponding polarity terminal of load.

Fig. 2 Recommended output sensing connections

MECHANICAL DRAWING

MAH450USXX (-Y)



*Either one of four screw holes can be considered as PE connection for CLASS I application.

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. Screw 1 locked torque : MAX 5.2Kgf-cm/0.51N.m

CONNECTORS CONNECTIONS

CON1 – Input Connector

Pin 1	Line
Pin 3	Neutral

Mates with
 Molex housing : **09-50-8031**
 Molex crimp terminals : **2478,6838,45570**

CON2 – Output Connector

Pin 1,2,3,4,5	+Vout
Pin 6,7,8,9,10	-Vout

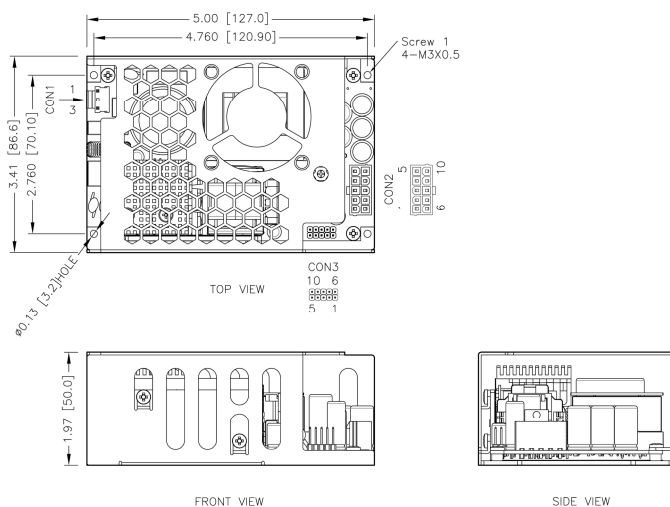
Mates with
 Molex housing : **39-01-2105**
 Molex crimp terminals : **5556,45750**

CON3 – Aux Connector

Pin 1	+Fan	Pin 6	-Fan
Pin 2	+V Sense	Pin 7	-V Sense
Pin 3	+Control	Pin 8	-Control
Pin 4	+PG	Pin 9	-PG
Pin 5	+5V	Pin10	-5V

Mates with
 Molex housing : **90143-0008**
 Molex crimp terminals : **90119**

MEH450USXX (-Y)



*Either one of four screw holes can be considered as PE connection for CLASS I application.

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. Screw 1 locked torque : MAX 5.2Kgf-cm/0.51N.m

CONNECTORS CONNECTIONS

CON1 – Input Connector

Pin 1	Line
Pin 3	Neutral

Mates with
 Molex housing : **09-50-8031**
 Molex crimp terminals : **2478,6838,45570**

CON2 – Output Connector

Pin 1,2,3,4,5	+Vout
Pin 6,7,8,9,10	-Vout

Mates with
 Molex housing : **39-01-2105**
 Molex crimp terminals : **5556,45750**

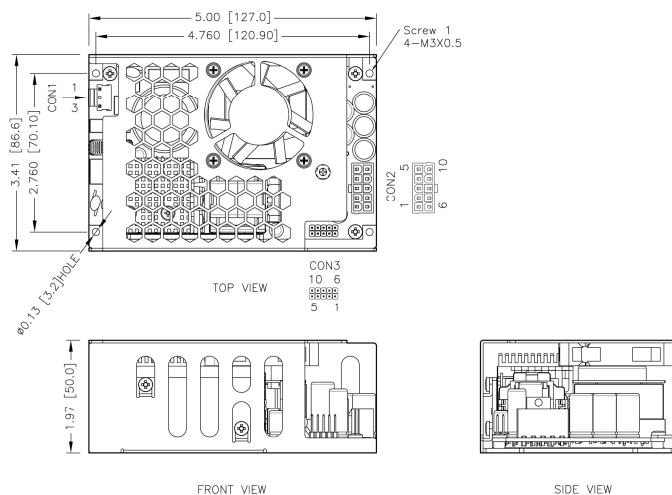
CON3 – Aux Connector

Pin 1	+Fan	Pin 6	-Fan
Pin 2	+V Sense	Pin 7	-V Sense
Pin 3	+Control	Pin 8	-Control
Pin 4	+PG	Pin 9	-PG
Pin 5	+5V	Pin10	-5V

Mates with
 Molex housing : **90143-0008**
 Molex crimp terminals : **90119**

MECHANICAL DRAWING (CONTINUED)

MEH450USXX-F1 (Y1) FAN dimension: 50x50x10mm Air flow: 11.4 CFM
The fan's life is shorter than power supply and has only 2 years warranty.



*Either one of four screw holes can be considered as PE connection for CLASS I application.

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. Screw 1 locked torque : MAX 5.2Kgf-cm/0.51N.m

CONNECTORS CONNECTIONS

CON1 – Input Connector

Pin 1	Line
Pin 3	Neutral

Mates with

Molex housing : **09-50-8031**

Molex crimp terminals : **2478,6838,45570**

CON2 – Output Connector

Pin 1,2,3,4,5	+Vout
Pin 6,7,8,9,10	-Vout

Mates with

Molex housing : **39-01-2105**

Molex crimp terminals : **5556,45750**

CON3 – Aux Connector

Pin 1	+Fan	Pin 6	-Fan
Pin 2	+V Sense	Pin 7	-V Sense
Pin 3	+Control	Pin 8	-Control
Pin 4	+PG	Pin 9	-PG
Pin 5	+5V	Pin10	-5V

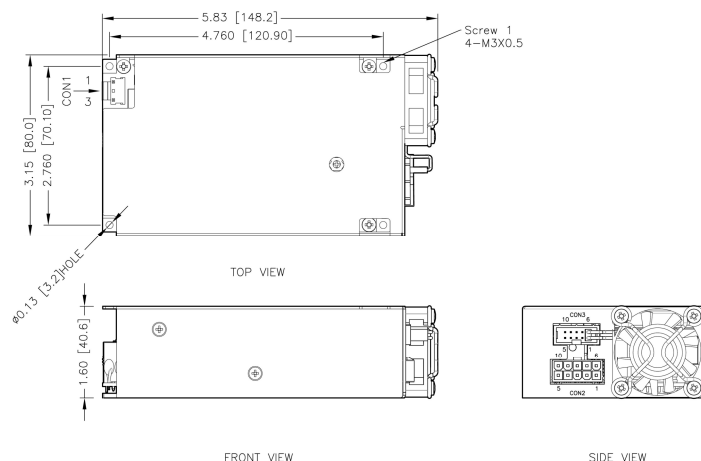
Mates with

Molex housing : **90143-0008**

Molex crimp terminals : **90119**

MECHANICAL DRAWING (CONTINUED)

MEH450USXX-F2 (Y2) FAN dimension: 40x40x10mm Air flow: 9.5 CFM
The fan's life is shorter than power supply and has only 2 years warranty.



*Either one of four screw holes can be considered as PE connection for CLASS I application.

1. All dimensions in inch [mm]
2. Tolerance : $x.xx \pm 0.02$ [$x.x \pm 0.5$]
 $x.xxx \pm 0.01$ [$x.xx \pm 0.25$]
3. Screw 1 locked torque : MAX 5.2Kgf-cm/0.51N.m

CONNECTORS CONNECTIONS

CON1 – Input Connector

Pin 1	Line
Pin 3	Neutral

Mates with
Molex housing : **09-50-8031**
Molex crimp terminals : **2478,6838,45570**

CON2 – Output Connector

Pin 1,2,3,4,5	-Vout
Pin 6,7,8,9,10	+Vout

Mates with
Molex housing : **39-01-2105**
Molex crimp terminals : **5556,45750**

CON3 – Aux Connector

Pin 1	+Fan	Pin 6	-Fan
Pin 2	+V Sense	Pin 7	-V Sense
Pin 3	+Control	Pin 8	-Control
Pin 4	+PG	Pin 9	-PG
Pin 5	+5V	Pin10	-5V

Mates with
Molex housing : **90143-0008**
Molex crimp terminals : **90119**