950W AC/DC Switching Power Supply
Model: TG14-0950-0X



TG14-0950-02
Airflow Out

TG14-0950-03
Airflow In

FEATURES

- Universal 90 - 264VAC input voltage.
- Built-in active PFC function.
- 950W with forced air cooling.
- Dual output, High efficiency up to 90%.
- High power density, compact size: 9.06"x3.07"x1.59".
- Operating ambient temperature range: 0°C to +50°C.
- Output short circuit, over-current, over-voltage protection, Over-temperature protection.
- N+1 redundancy design with active current sharing.
- Supports Digital Power Management via PMBus.
- Operating altitude up to 5000m.
- Safety according to IEC62368-1.

Models & Ratings

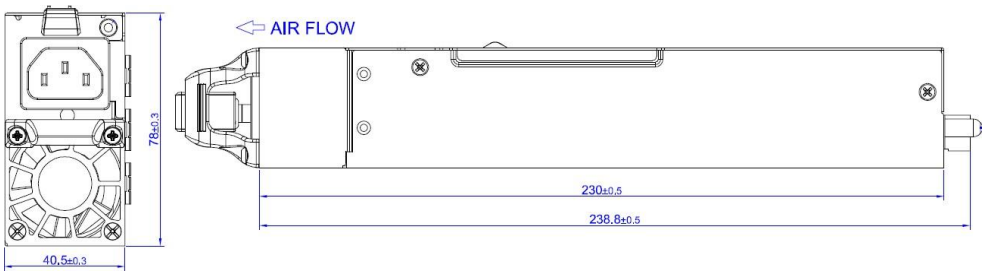
Model No. (1)	Output Power	Output 1 Voltage/ Current		Output 2 Voltage/ Current		Efficiency Typ. (2)
TG14-950-0X	950W	56V	13.4A	12V	16.7A	90%

Notes:

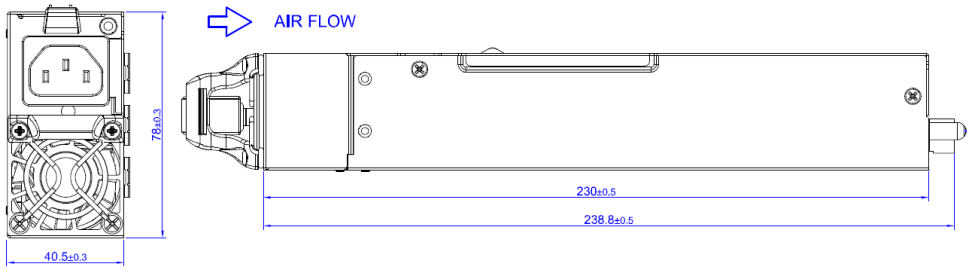
1. Model Name Description.

TG 14 - 0950 - 0X
①

① 0X : Series Model
02 : AFO (Airflow Out)
03 : AFI (Airflow In).



Note : The handle with Red color.(TG14-0950-02)



Note : The handle with blue color. (TG14-0950-03)

2. Typical values are measured at 50% of maximum load and 230Vac/50Hz input voltage at 25°C.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range	Input voltage (Refer to power derating curve)		90	100-127	140	VAC
	Input voltage		180	200-240	264	
Input Frequency	-		47	50/60	63	Hz
Input Current	115VAC & 80% of maximum load		-	-	8.7	Arms
	230VAC & maximum load		-	-	5.2	
Inrush Current	115VAC	At 25°C, Cold start	-	-	30	A peak
	230VAC		-	-	60	
Power Factor	115VAC & 80% of maximum load		0.98	-	-	-
	230VAC & maximum load		0.95	-	-	-
Earth Leakage Current	264VAC/63Hz		-	-	3.5	mA

54V Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage	-	-	56	-	VDC
Initial Set Accuracy	At output 1A	55.3	-	55.5	VDC
Output Accuracy	-	-	±5	-	%
Output Load	-	0	-	13.4	A
Line Regulation	90 - 264VAC, constant load	-	±1	-	%
Load Regulation	Output from 0 - 100% load	-	±2	-	%
Ripple & Noise	Oscilloscope Bandwidth : 20MHz	-	-	1	%
Transient Response	1.34A-6.7A and 6.7A-13.4A load step, 1A/μs slew rate, at 470μF capacitive load.	-	±5	-	%
Turn on Delay Time	115VAC 80% of maximum load from input AC turn on	-	-	2	S
Rise Time	10% to 90% of output voltage	0.1	-	100	mS
Hold-up Time	At 25°C, 115VAC & 80% of maximum load , the output below 50.4V	12	-	-	mS
Over Voltage Protection	Output shut down and latch off, manual reset (Re-power on)	-	-	65	V
Over Current Protection	Output shut down and auto recovery	14.0	-	18.1	A
Short Circuit Protection	Output shut down and auto recovery	-	-	-	-
Over Temperature Protection	Output shut down and latch off, manual reset (Re-power on)	-	-	-	-

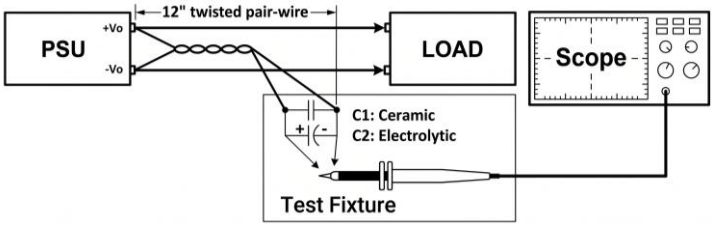
12V Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage	-	-	12	-	VDC
Initial Set Accuracy	At output 3.34A	11.95	-	12.05	VDC
Output Accuracy	-	-	±5	-	%
Minimum Load	-	0	-	-	A
Line Regulation	90 - 264VAC, constant load	-	±1	-	%
Load Regulation	Output from 0 - 100% load	-	±2	-	%
Ripple & Noise	Oscilloscope Bandwidth : 20MHz	-	-	1	%
Transient Response	1.67A-8.35A and 8.35A-16.7A load step, 1A/μs slew rate, at 1,000μF capacitive load.	-	±5	-	%
Turn on Delay Time	115VAC 80% of maximum load from input AC turn on	-	-	2	S
Rise Time	10% to 90% of output voltage	0.1	-	100	mS
Hold-up Time	At 25°C, 115VAC & 80% of Maximum load , the	12	-	-	mS

	output below 10.8V				
Over-voltage Protection	Output shut down and latch off, manual reset (Re-power on)	13.2	-	16	V
Over-current Protection	Output shut down and auto recovery	17.5	-	22.5	A
Short Circuit Protection	Output shut down and auto recovery	-	-	-	-
Over-temperature Protection	Output shut down and latch off, manual reset (Re-power on)	-	-	-	-

Ripple & Noise

The +12V output is decoupled with 10μF low ESR aluminum electrolytic (C2) and 0.1μF ceramic capacitor (C1). The +54V output is decoupled with 470μF low ESR aluminum electrolytic (C2) and 0.1μF ceramic capacitor (C1). Measurement is made with a high impedance probe connected across the decoupling capacitance. Measurements shall be made with an oscilloscope with 20 MHz bandwidth.



Over Temperature Protection

Over temperature shut down function is provided.

When ambient or internal temperature rises abnormally, over temperature protection function operates and output will be shut down. After shut down, please wait for the temperature to return to normal and automatically resume operation or remove the input and cool it down to reset over temperature protection, and then re-input.

Over temperature protection function operates at out of the specification area.

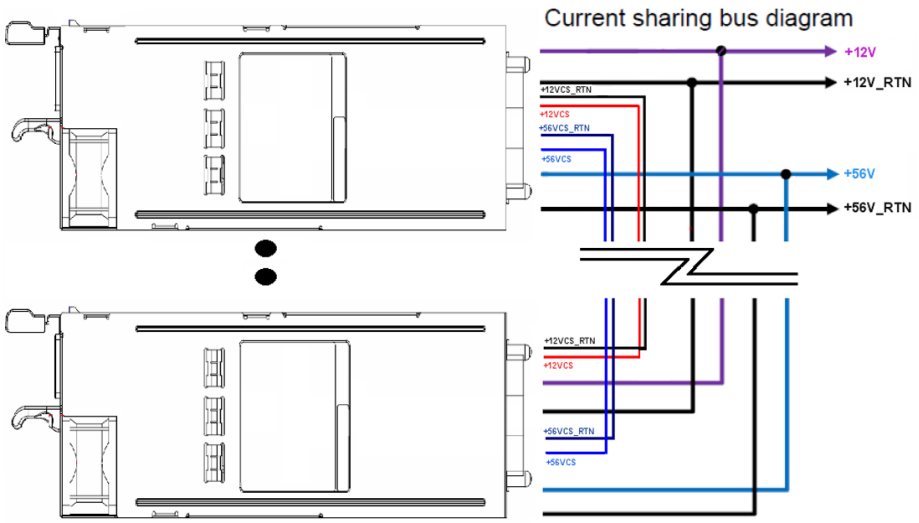
This function may not activate or cannot avoid power supply damage depending on the situation.

Output Fault Protection Isolation

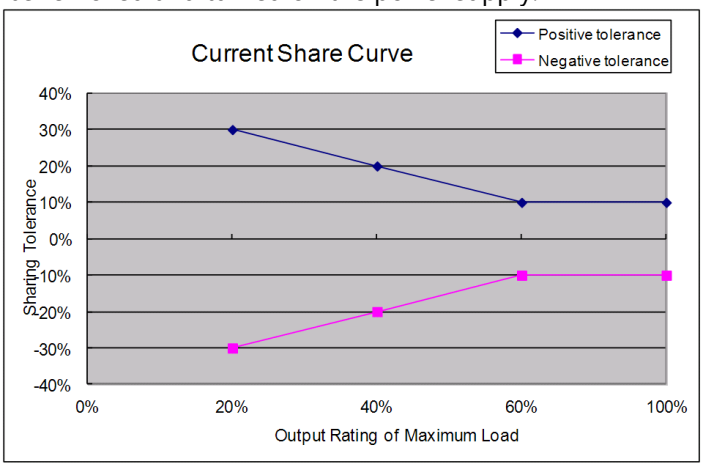
The power supply shall have an output isolation circuit (also known as ORing or paralleling circuit) in series with the positive output terminals for +56V, and the +12V bias (keep alive circuit).

Current Share (Optional)

Current share is achieved by means of active current sharing for max. 4 units of same type redundant application. Provision is made for a current share line for +12V or +54 V named +12VCS or +54VCS. +12VCS and +54VCS bus is independent. The current share line is referenced to the negative sense lead (+12CS_RTN and +54VCS_RTN).



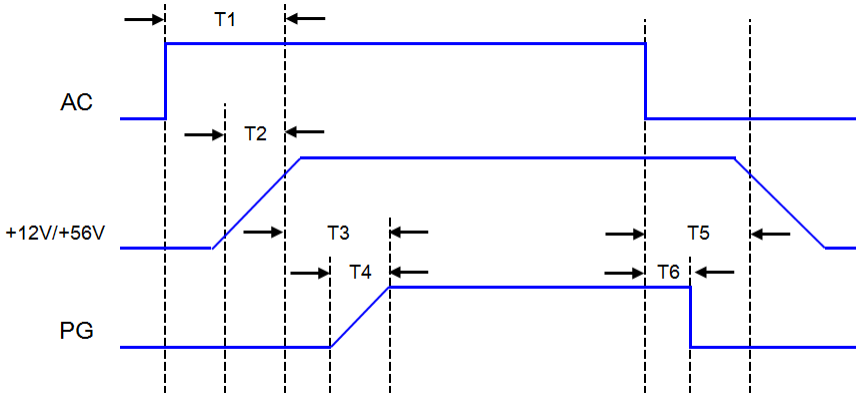
Current sharing tolerance is defined since every output load more than 20% of the max. load. If there was one piece of power supply shut down at the condition of 1+1 current sharing, the max. load of system must be reduced to 2 x 90% x max. load (Amp.) until the fault was removed and turned on the power supply.



Hot Swap Description

A power supply may be inserted or removed from a system chassis which is already powered and live with other power supplies running or inactive with no power supplies running. During such actions (PSU insertion and removal), all the output (bus) voltages in the system back plane shall remain within their regulation limits when the system is active and shall not cause any damage to any power supplies in the system chassis. To facilitate Hot-swap action, the output connector shall have a shorter for pin PSON.

Sequencing



AC input 115Vac/60Hz

T1: +12V / +56V power on delay time ≦ 2s.

T2: The output voltages rise time from 10% to 90% (Loads are CR mode) ,0.1ms to 100ms.

T3: PG signal turn on delay time, 100~500ms.

T4: PG signal rise time , ＜ 1mS.

T5: AC loss to +12V / +56V output hold up time, ≧ 8ms.

T6: AC loss to PG signal hold up time, ≧ 1ms

Power Good Signal

PG is a “power good” signal. It should be asserted high by the power supply to indicate that the +12V and +56V output is above the 90%, and PG should be de-asserted to a low state when +12V and +56V output voltage falls below its under-voltage threshold, or when mains power has been removed for a time sufficiently long such that power supply operation cannot be guaranteed beyond the power-down warning time. The electrical and timing characteristics of the PG signal are given in below.

Signal type	+3.3V TTL compatible
Logic level low	≦ 0.8V while sinking 3 mA
Logic level high	Between 2V and 3.6V output while sourcing 400 μA
High state output impedance	1KΩ from output to RTN
PG delay time	100mS ≦ T3 ≦ 500mS
AC loss to PG hold up time	T6 ≧ 1mS

LED Indicator
When PG signal is high level, light emitting diode (LED) shall glow green color.
When PG signal is low level or PSU during protection mode, the LED shall be off.

PS Present
This signal connects to +12V_return inside the power supply via 1KΩ(1/8w) resistor.

PSON Signal
PSON is active low input signal to the power supply. When this signal is low that turns on the power supply. When this signal is not pulled low by the system, or left open, the outputs turn OFF. The power supply must have internal pull-ups to 5V on these signals.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Electrical Strength Test (3)	Input - Output	Electrical strength test for 1 minute, leakage current is less than 10mA.	3,000	-	-	VAC
	Input - FG		1,800	-	-	
	54V Output - FG		2,250	-	-	VDC
	12V Output - FG		500			
Insulation Resistance	Input - Output	25±5°C, 70% RH, non-condensing testing voltage 500VDC.	100	-	-	MΩ
	Input - FG		100	-	-	
	54V Output - FG		100	-	-	
	12V Output - FG		100	-	-	
Mean Time Between Failure	At 230VAC/60Hz maximum load 25°C, Telcordia SR332, issue4.		300,000	-	-	hrs.

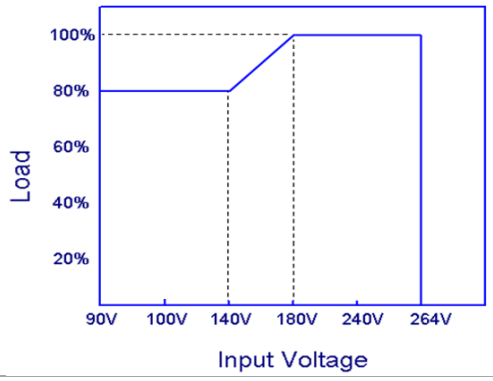
Notes:
3. The electric strength test of LY production line was conducted for 3 seconds, and the leakage current was less than 10mA.

Environmental Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Operating Temperature	Refer to power de-rating curve		0	-	+50	°C
Storage Temperature	Non-operation		-40	-	+80	
Operating Humidity	Non-condensing		20	-	80	%
Storage Humidity	Non-operation		5	-	95	
Power De-rating	Input voltage	90VAC - 140VAC	-	-	760	W
	Input voltage	180VAC - 264VAC	-	-	950	
Altitude	Operating altitude		-	-	5,000	meter
Vibration	Operating：0.5G, 5 - 500Hz, 10 min/cycle, 30 min each axis (X, Y, Z)					
Shock	Non-operating (package)：20G, 11 ms, 1 shock per direction per axis (X, Y, Z)					

Power De-rating

Input voltage derating curve: Please refer to the derating specifications and curves below.



Safety Approvals

Certification	Standard	Notes & conditions
UL	UL/cUL UL62368-1, 3rd Edition	-
TUV	TUV EN62368-1, 3rd Edition	-
CB report	CB IEC62368-1, 3rd Edition	-
Safety Class	Class I	-

Electromagnetic Compatibility (EMC)

EMC Emissions (4)	Standard	Test level
Conducted	EN55032(CISPR32), FCC part 15 Class A	Class A
Radiated	EN55032(CISPR32), FCC part 15 Class A	Class A
Harmonic Current	EN61000-3-2	Class A
Voltage Flicker	EN61000-3-3	-

EMC Immunity	Standard	Test level	Criteria
ESD	EN61000-4-2	level 4, Contact +/- 8KV; Air discharge +/-15KV	Criteria A
RS	EN61000-4-3	level 3, 10V/m	Criteria A
EFT	EN61000-4-4	level 3, +/- 2KV	Criteria A
Surge	EN61000-4-5	level 3, Line to Line +/-1KV; Line to Earth +/-2KV	Criteria A
		level 4, Line to Line +/-2KV; Line to Earth +/-4KV	Criteria B
CS	EN61000-4-6	level 2	Criteria A
PFMF	EN61000-4-8	level 1	Criteria A
DIP	EN61000-4-11		Criteria B

Note:

4. The power supply should be considered a part of the system component. All EMC tests conducted with the unit installed in a metal enclosure dummy system. The power supply needs to be confirmed for electromagnetic compatibility in conjunction with the terminal equipment.

PMBus Interface

Addressing

The PMbus device address locations are shown below. For redundant systems there are up to 2 signals to set the address location of the power supply once it is install in the system: A1, A0.

System addressing (A1/A0)	0/0	0/1	1/0	1/1
Power supply PMBus device address	78h	7Ah	7Ch	7Eh

Hardware

The PMBus device in the power supply shall be compatible with both SMBus specification 2.0 for I^2C V_{dd} based power and drive. This bus shall operate at 3.3V level.
Only system needs to have 4.7KΩ internal pull up to 3.3V on the SDA or SCL lines and operate with 3.3V nominal voltage level.

Data Speed

The PMBus device in the power supply shall operate at the 100Kbps SMBus speed.

PMBus Command Summary

PMBus commands are one byte command codes. As below listing is power supply can support of PMBus commands.

Code	Command	Data Format	Typical
00h	PAGE	Byte	00h or 01h
06h	PAGE_PLUS_READ	Block	Variable
03h	Clear_Faults	N/A	N/A
19h	Capability	Byte	80h
1Ah	Query	Byte	by command status
78h	Status_Byte	Byte	00h
7Ah	Status_Vout	Byte	00h
7Bh	Status_Iout	Byte	00h
7Dh	Status_Temperature	Byte	00h
7Eh	Status_CML	Byte	00h
8Bh	Read_Vout	Linear	Variable
8Ch	Read_Iout	Linear	Variable
8Dh	Read_Temperature	Linear	Variable
90h	Read_Fan speed	Linear	Variable
96h	Read_Pout	Linear	Variable
99h	MFR_ID	String	“LEAD YEAR”
9Ah	MFR_MODEL	String	“TG14-0950-0X”
9Dh	MFR_DATE	String	N/A
9Eh	MFR_SERIAL	String	N/A

Page 0 - +12V output information, Page 1 - +56V output information.

PAGE

This command is provides the ability to configure, control and monitor through only one physical address. Address 00h define of +12V and 01h define +56V.

PAGE_PLUS_READ

This command is used to set the page within a device, send a command, and read the data returned by the command in one packet

Read Command

The READ commands allow the host to read temperature, current, voltage, power and energy parameters of the power supply.

PMBus command	Description	Data format

Read_Vout	Returns the output voltage in voltage.	Linear
Read_Iout	Returns the output current in amperes.	Linear
Read_Temperature_1	Returns the temperature in ℃ of the airflow inside temperature.	Linear

Accuracy

	Accuracy	Remark
Read_Vout	±5%	
Read_Iout	±0.5A	Iout tolerance is defined since every output load more than 20% of the max. load.
Read_Pout	±10%	Pout tolerance is defined since both output load more than 20% of the max. load.
Read_Temperature_1	±8℃	Ambient temperature, only page 00h
Read_Fan speed	18,000±1,800 rpm	Duty cycle at 100%

Capability (19h)

This command provides a way for a host system to determine some key capabilities of a PMBus device. There is one data byte formatted as shown below.

Bits	Description	Value	Meaning
7	Packet Error Checking	0	Packet Error Checking not supported
		1	Packet Error Checking is supported
6:5	Maximum Bus Speed	00	Maximum supported bus speed is 100 kHz
4	SMBALERT#	0	The device does not have a SMBALERT# pin and does not support the SMBus Alert Response protocol
3:0	Reserved	xxxx	Reserved

Query (1Ah)

This command is used to ask a PMBus device if it supports a given command. There is one data byte formatted as shown below.

Bits	Value	Meaning
7	1	Command is supported
	0	Command is not supported
6	1	Command is supported for write
	0	Command is not supported for write
5	1	Command is supported for read
	0	Command is not supported for read
4:2	000	Linear Data Format used
	001	16 bit signed number
	010	Reserved
	011	Direct Mode Format used
	100	8 bit unsigned number
	101	VID Mode Format used
	110	Manufacturer specific format used
	111	Command does not return numeric data. This is also used for commands that return blocks of data.
1:0	xx	Reserved for future use

Status_Commands

Status information is binary. A value of 1 indicates a fault or warning event has occurred and a value of 0 indicates that a fault or warning event has not occurred.

The Status_Byte message content is described as shown below.

Bits	Status Bit Name	Meaning
7	Busy	Not support, set to 0
6	Off	Not support, set to 0
5	Vout_OV_Fault	Output over voltage fault has occurred
4	Iout_OC_Fault	Output over current fault has occurred
3	Vin_UV_Fault	Not support, set to 0
2	Temperature	Temperature fault or warning has occurred
1	CML	A communications, memory or logic fault has occurred
0	None of the above	Not support, set to 0

The Status_Vout command returns one data byte with contents as below:

Bits	Meaning
7	Output over voltage fault has occurred
6	Output over voltage warning has occurred
5	Output under voltage warning has occurred
4	Not support, set to 0
3	Not support, set to 0
2	Not support, set to 0
1	Not support, set to 0
0	Not support, set to 0

The Status_Iout command returns one data byte with contents as below:

Bits	Meaning
7	Output over current fault has occurred
6	Output over current fault and low voltage fault has occurred
5	Output over current warning has occurred
4	Not support, set to 0
3	Not support, set to 0
2	Not support, set to 0
1	Output over power fault has occurred
0	Output over power warning has occurred

Status_Temperature command returns one data byte with contents as below:

Bits	Meaning
7	Over temperature fault
6	Over temperature warning
5	Under temperature warning
4	Under temperature fault
3	Reserved
2	Reserved
1	Reserved
0	Reserved

Status_CML command returns one data byte with contents as below:

Bits	Meaning
7	Invalid or unsupported command received
6	Invalid or unsupported data received
5	Packet error check failed
4	Memory fault detected
3	Processor fault detected

2	Reserved
1	Other communication fault has occurred
0	Undetermined fault has occurred

PMBus Linear Data Format

The linear data format is typically used for commanding and reporting the parameters such as (but not only) the following:

- Input power and output power,
- Operating temperatures,
- Input current and output current,
- Input voltage,
- Fan speed RPM

The linear data format is a two bytes value with:

- An 11 bit, two's complement mantissa and
- A 5 bit, two's complement exponent (scaling factor).

The format of the two data bytes is illustrated in Figure 4.

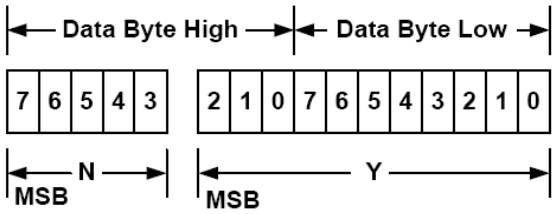


Figure 4. Linear Data Format Data Bytes

The relation between *Y*, *N* and the "real world" value is:

$X = Y \cdot 2^N$

Where, as described above:

X is the "real world" value; *Y* is an 11 bit, two's complement integer; and *N* is a 5 bit, two's complement integer.

Devices that use the linear format must accept and be able to process any value of *N*.

MFR_ID

This command is used to read the manufacturer's name is "LEAD YEAR".

MFR_MODEL

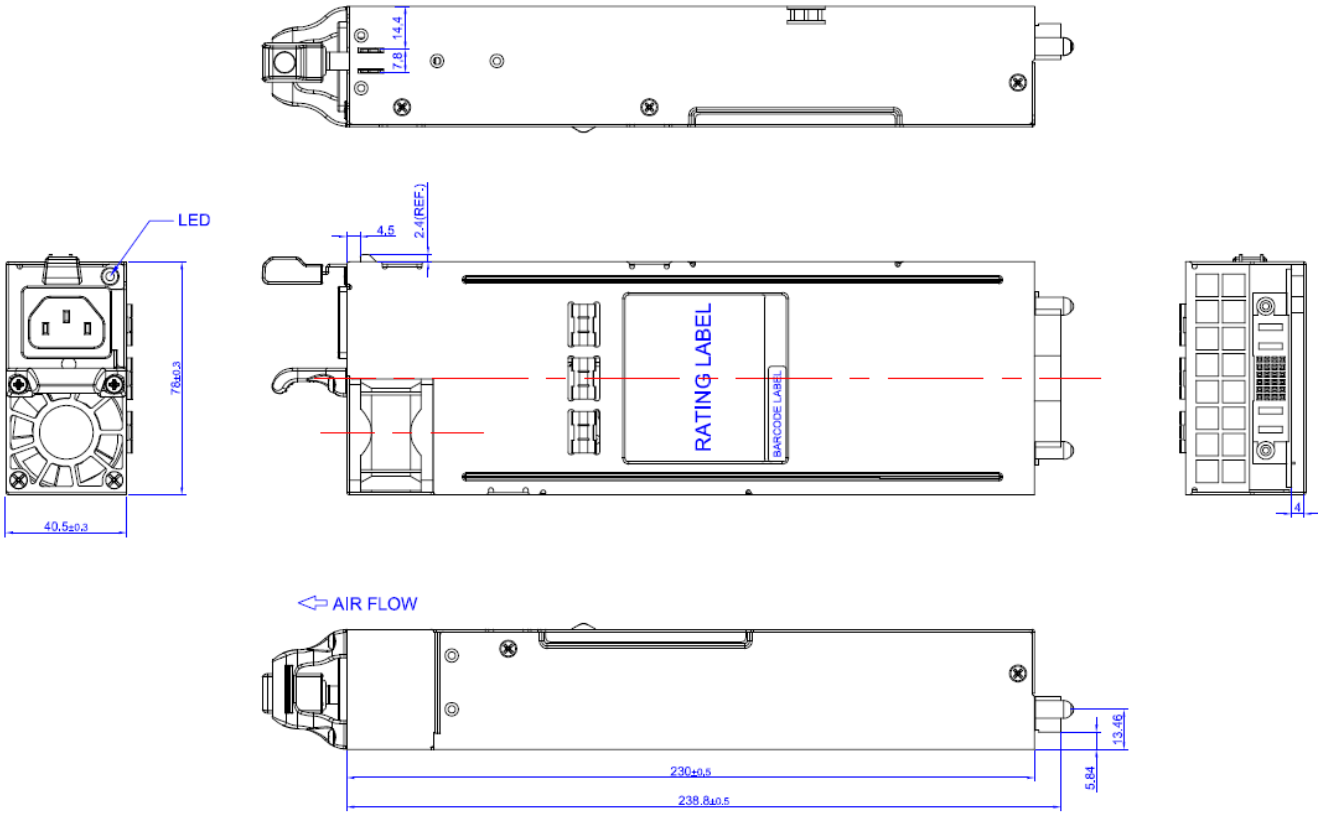
This command is used to read the model number is "TG14-0950-0X".

Dimensions and Recommended Layout

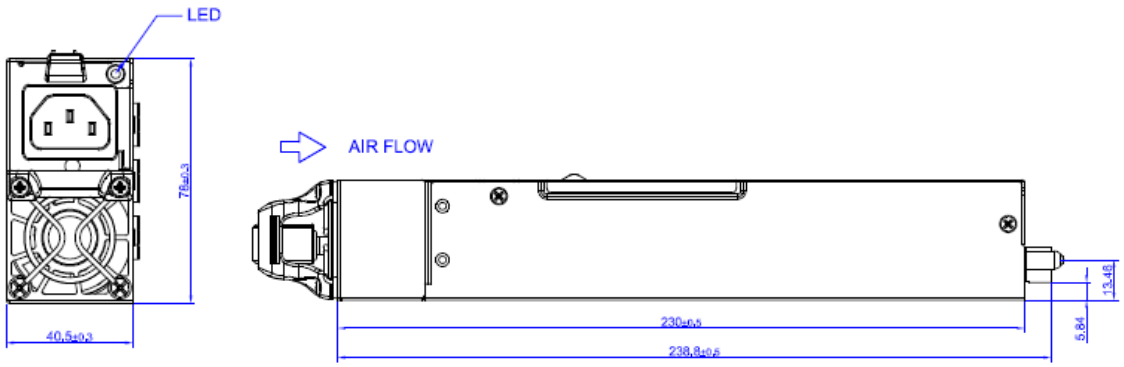
Item	Models	Value	Unit
Weight (Typ.)	-	1,030 (Ref.)	g
Size (L x W x H)	-	230 x 78 x 40.5 (Refer to outline drawing)	mm

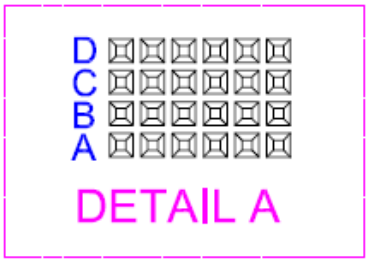
Outline Drawing：(Unit: mm, Tolerance: ±0.5 mm)

TG14-0950-02

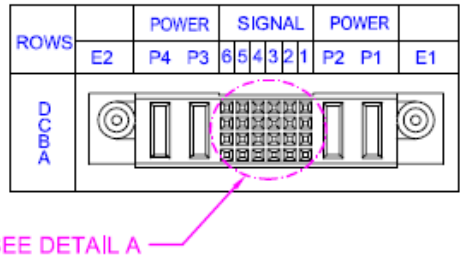


TG14-0950-03





DC OUTPUT
ALLTOP C18091-128H3-Y
Amphenol FCI 51760-10202402ABLF
PIN DEFINITION



Pin	Designation
P1	+12V
P2	+12V_RTN
1A	N/C
1B	PS Present
1C	N/C
1D	N/C
2A	+12VCS
2B	PG
2C	A0
2D	A1
3A	+12V_RTN
3B	SDA
3C	SCL
3D	+12VCS_RTN
4A	N/C
4B	N/C
4C	N/C
4D	N/C
5A	N/C
5B	N/C
5C	N/C
5D	+56VCS
6A	N/C
6B	+56VCS_RTN
6C	PSON
6D	N/C
P3	+56V_RTN
P4	+56V

Note:
Signal location 6C must use shorter pin connector in the customer side connector.
Customer side connector reference: TE Internal #: 2-6450130-9

