

RADIAN TPCMQ24 SERIES

24VDC Input 1RU Rack-Mount DC-DC Front-Ends
 48DC @ 1000W and 1200W | 54.4VDC @ 1000W

INDUSTRIES & APPLICATIONS



Telecom



Cable



Utilities



Government



Industrial

FEATURES

- Isolated 5V, ¼ A Standby Output
- Hot-Swap Operation
- 48 or 54.4V DC Output
- Up to 3600 Watts System Output
- Remote Output Adjustment
- Wide Range 20 to 30VDC Input
- Integral LED Status Indicators
- -20°C to +70°C Operating
- I²C Serial Data Bus Option
- Up to 15 Watts/Cubic Inch Power Density
- Low Profile: 1.6 Inches High
- Single Hot-Swappable Connector
- Reverse Air Flow Option
- Staged Pin Engagement
- ORing Diode on Output
- 1U, 19" Rack/Shelf Holds 3 Units
- 19- or 23-Inch Rack Mounting
- Active Current Sharing
- Optimized Thermal Management
- No Minimum Load
- Control & Monitoring Features



TPCMQ24 Series Module

1U High
 1.6" x 5" x 10"
 (41 x 127 x 254 mm)



Three-Unit Rack/Shelf
 TPCMQR1U3-24



U8V10 07
 61384 011



LVD2006/95/EC
 ROHS2011/65/EU



THREE-YEAR WARRANTY
 Patent Protected

STANDARD MODELS

OUTPUT POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	MODULE NUMBER	RACK/SHELF NUMBER
1200W	48VDC	25.0A	TPCPQ24-48/25	TPCMQR1U3-24
1000W	48VDC 54.4VDC	20.8A 18.4A	TPCMQ24-48/20 TPCMQ24-54/18	TPCMQR1U3-24

NOTES:

1. System rack and hot-swap modules must be ordered separately.
2. Racks mount in 19" and 23" frames.
3. The table does not show the independent 5V, ¼A standby output which is standard on all models.

OPTIONS

CODE	DESCRIPTION
Z	I ² C Serial Data Bus

NOTE: Add Option Code as suffix to model no. on both module and rack/shelf.

SAFETY CERTIFICATIONS

UL60950-1
 CSA22.2, No. 60950-1
 EN60950-1

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SPECIFICATIONS

Typical at Nominal 45VDC Input, Full Load and 25°C Unless Otherwise Noted.

OUTPUT SPECIFICATIONS

Total Output Power, Continuous, Max.....	see table page 1
Voltage Adjustment Range, Min.....	-25% to +10%
Total Regulation ¹	2.0%
Total Regulation, Standby Supply	5.0%
Ripple & Noise, Pk-Pk ²	200mV
Voice Band Noise ³	<32dBnC
Dynamic Response.....	300μS
Temperature Coefficient.....	±0.02%/°C
Minimum Load	0A
Current Limit	105% Rated Current
Overload Protection	Auto Recovery
Overvoltage Protection	Latched Shutdown
Remote Sense.....	Up to 0.25V Per Wire
Current Share.....	±10% Full Load Rating
Standby Output	+5V, 250mA
Output Power Good Signal.....	Logic Low
Input Power Fail Signal.....	Logic High
Inhibit	Logic Low
Enable	Logic Low
Thermal Warning.....	Logic High

INPUT SPECIFICATIONS

Input Voltage Range	20-30VDC
Inrush Current Limiting	100A Peak
Input EMI Filter	Standard
Analog Voltage Adjust.....	0 to +5V
Input Immunity, Conducted	
Fast Transients, Line-Line.....	±500V (EN61000-4-4)
Surges, Line-Line.....	±500V (EN61000-4-5)
Surges, Input Ground	±500V (EN61000-4-5)
Input Protection.....	Internal Fuse, 100A

GENERAL SPECIFICATIONS

Efficiency	89% at Full Load
Switching Frequency.....	210kHz Nominal
Isolation, Class I, min. ⁴	
Input-Output	2121VDC
Input-Ground	1000VDC
Output-Ground	100VDC
MTBF (Bellcore)	200,000 Hours
Safety Standards.....	EN60950-1, UL60950-1, CSA22.2 No.60950-1

ENVIRONMENTAL SPECIFICATIONS

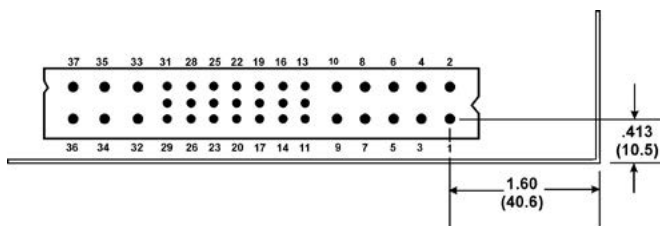
Operating Temperature.....	-20°C to 70°C Ambient
Derating.....	2.5%/°C, 50°C to 70°C
Storage Temperature.....	-40°C to +85°C
Cooling.....	Integral Ball Bearing Fans

PHYSICAL SPECIFICATIONS

Case Material, Module & Rack/Shelf	Aluminum
Dimensions, Inches(mm)	
Module	1.6 H x 5.0 W x 10.0 D (40.6 x 127 x 254)
Rack/Shelf	1.72H x 19.00 W x 11.56 D (44 x 483 x 294)
Weight	
Module	3.15lbs (1.43kg)
Rack/Shelf	4.15lbs (1.88kg)

- NOTES:
1. No load to full load, including line regulation and load regulation.
 2. Whichever is greater. 20MHz bandwidth. Measure with 0.1μF ceramic and 10μF tantalum capacitors in parallel across the output.
 3. <4% deviation recovering to within 1% for 25% load change.
 4. Input-output isolation figure is for isolation components only. 100% production Hipot tested input to ground.

PIN CONNECTIONS



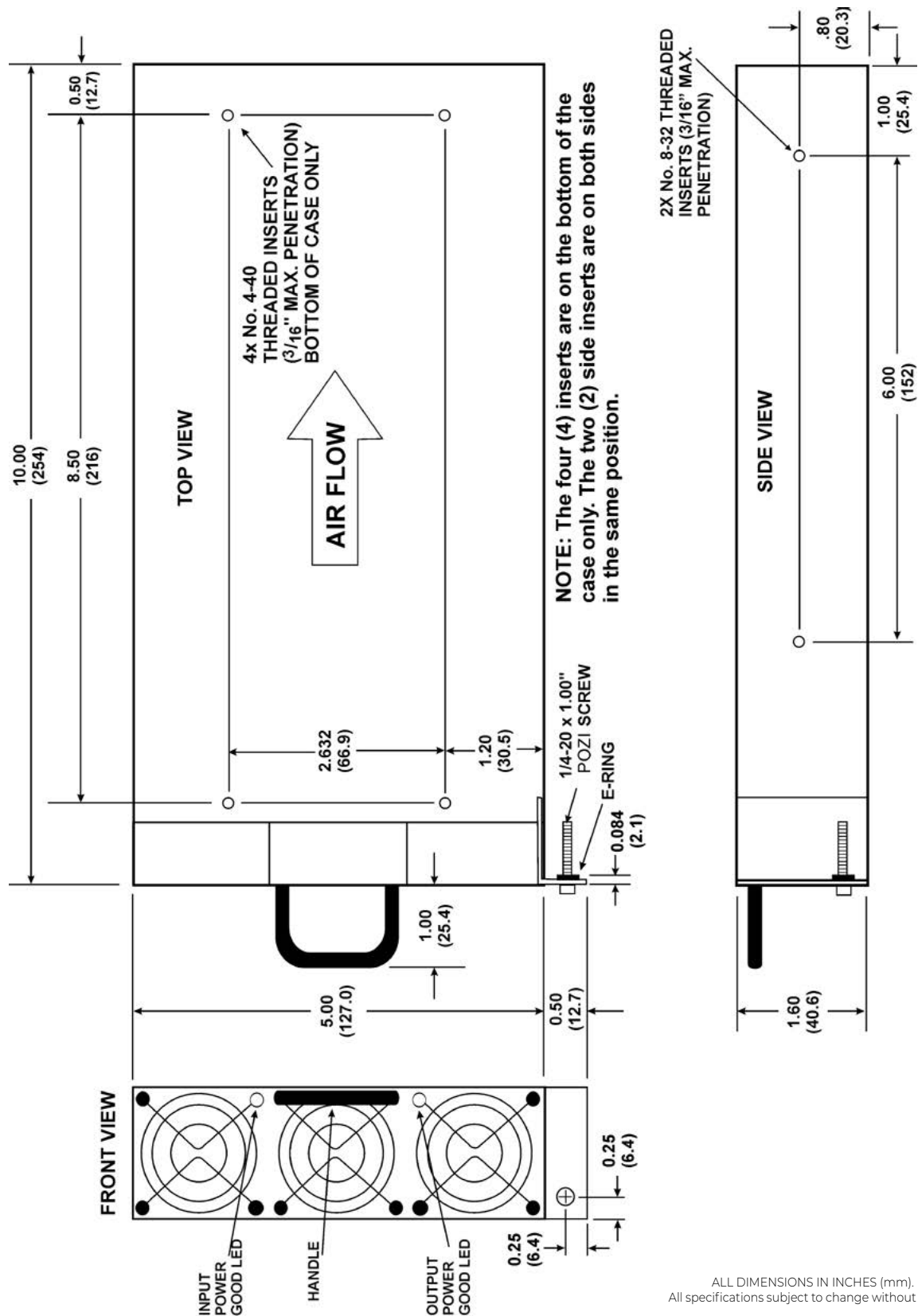
MODULE CONNECTOR: POSITRONICS PCIM37W16RM400A1
MATING CONNECTOR: POSITRONICS PCIM37W16RF400A1

NOTES:

1. For unit to operate, pin 17 must be at logic LO or shorted to pin 30.
2. For proper operation the following pins must be connected together: all +V Out pins (35-37); all -V Out pins (32-34).
3. Pins 24-28 carry I²C functions when the I²C option is fitted.

PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
1	-DC Input	20	Module Present
2	-DC Input	21	N.C.
3	-DC Input	22	Input Power Fail
4	-DC Input	23	N.C.
5	+DC Input	24	GA2
6	+DC Input	25	GA1
7	+DC Input	26	SCL
8	+DC Input	27	SDA
9	Chassis Ground	28	GAO
10	Chassis Ground	29	Remote Adjust
11	N.C.	30	-Sense
12	Standby Return	31	+Sense
13	+5V Standby	32	-V Out
14	Output Power Good	33	-V Out
15	Overtemp. Warning	34	-V Out
16	Inhibit	35	+V Out
17	Enable	36	+V Out
18	Current Share	37	+V Out
19	Current Monitor		

CASE OUTLINE



I²C SERIAL BUS SPECIFICATIONS

Three forms of data are available via the I²C serial bus, allowing the user to monitor the actual status of an individual unit, manage system loading through measurement of the actual load on the output and also control inventory through an inbuilt EEPROM containing specific data about each individual unit. The implementation of I²C that has been utilized in TPCMQ24 is a subset of more complete implementations such as IPMI. The following information provides the information required by the system designer to make decisions on how to utilize the available information within his overall system philosophy.

I²C DEVICES EMPLOYED

PCF8574 - An 8-bit digital register manufactured by Philips.

24C02 - A 256 byte EEPROM manufactured by ST.

PCF8591 - A Quad A/D converter manufactured by Philips.

MAX6633 - A 12-bit temperature measurement device manufactured by Maxim.

For detailed information about the operation of these devices please consult the original manufacturers' datasheets.

ELECTRICAL INTERFACE

Addressing (GA0, GA1 and GA2)

Three external address lines are employed allowing up to eight TPCMQ24 modules to be addressed on a single I²C bus. Module addressing is achieved through hard-wiring the address lines to -Sense or the +5V auxiliary supply via a 100-ohm resistor on the system back-plane. In this way it is the location or position of the module rather than any particular module that is identified by an individual address.

Serial Clock (SCLK)

This line is clocked by the processor which controls the I²C serial bus. It should

be tied to +5V via a pull-up resistor in the range 3k to 10k.

Serial Data (SDA)

This line is a bidirectional data line. It should be tied to +5V via a pull-up resistor in the range 3k to 10k.

BUS speed

The I²C interface as used in TPCMQ24 is designed to run with a serial clock speed 100kHz.

OPERATION AND FUNCTION

Digital Functions

Digital status functions are provided by a PCF8574 8-bit I/O port device. When this device is read by the serial bus controller a single 8-bit word provides the following information:

BIT	FUNCTION	GOOD STATE	MEANING
0	Input Power Fail	0	A "1" provides warning of input supply failure.
1	Output Power Good	0	Vout is within specified limits.
2	Temperature Warning	1	Temperature exceeds normal operating limit.
3	Fan #1 Good	1	Fan running at >80% nominal speed.
4	Fan #2 Good	1	Fan running at >80% nominal speed.
5	-	1	Not used
6	-	1	Not used
7	Temperature Alarm	1	Ambient temperature exceeds 70°C, unit switched off. Also indicates OVP and Inhibit activated.

PCF8527 slave address

BIT	7	6	5	4	3	2	1	0
VALUE	0	1	0	0	A2	A1	A0	R/W

Note: If a zero is written to bit 7 in a data byte, the unit will be inhibited.
The default state is enabled.

EEPROM Functions

The EEPROM is a 2048 bit (256 byte) device which is preprogrammed at the factory with the following data:

ADDRESS RANGE	DATA
0-15	Model Number
16-31	Manufacturing Part Number
32-47	Serial Number
48-63	Modification Level
64-79	Manufacturer
80-95	Country of Manufacture
96-255	Not Used

Notes:
Data is organized such that each field of data can be accessed by a page read (16 bytes).

Customers may specify other data to special order.

EEPROM slave address

BIT	7	6	5	4	3	2	1	0
VALUE	1	0	1	0	A2	A1	A0	R/W

Analogue Functions

Analogue status functions are provided by two PCF8591 4-channel 8-bit A/D converter devices. When these devices are read by the serial bus controller a single 8-bit word provides the following information:

Device: U1			
A/D	FUNCTION	A/D	FUNCTION
1	Vout voltage	3	not used
2	Vout current	4	not used

PCF8591 slave address

BIT	7	6	5	4	3	2	1	0	Device
VALUE	1	0	0	1	A2	A1	A0	R/W	U1

The PCF8591 devices initially require a control byte (04 Hex) to be written to the configuration register. This control byte sets the device so that on each successive read the data from the next A/D is read. Note that on each read a conversion is started for a particular channel and the result will be read from the previous channel, thus the first result from a sequence of reads should always be discarded.

A/D Converter Scaling

To obtain a correct voltage or current measurement it is necessary to employ a scaling factor in the controlling software. Note that all voltage measurements are made inside the PSU module, before the 'ORing' diodes, and are typically 0.5V higher than the actual module output voltage. The following calculation should be employed:

Value = (byte read x scaling factor)

Output Voltage	Scaling	Tolerance	
48V	0.24	±2%	V Measure (U1 A/D Chan. 1)
48V	0.125	±10% *	I Measure (U1 A/D Chan. 2)

* percentage of full scale

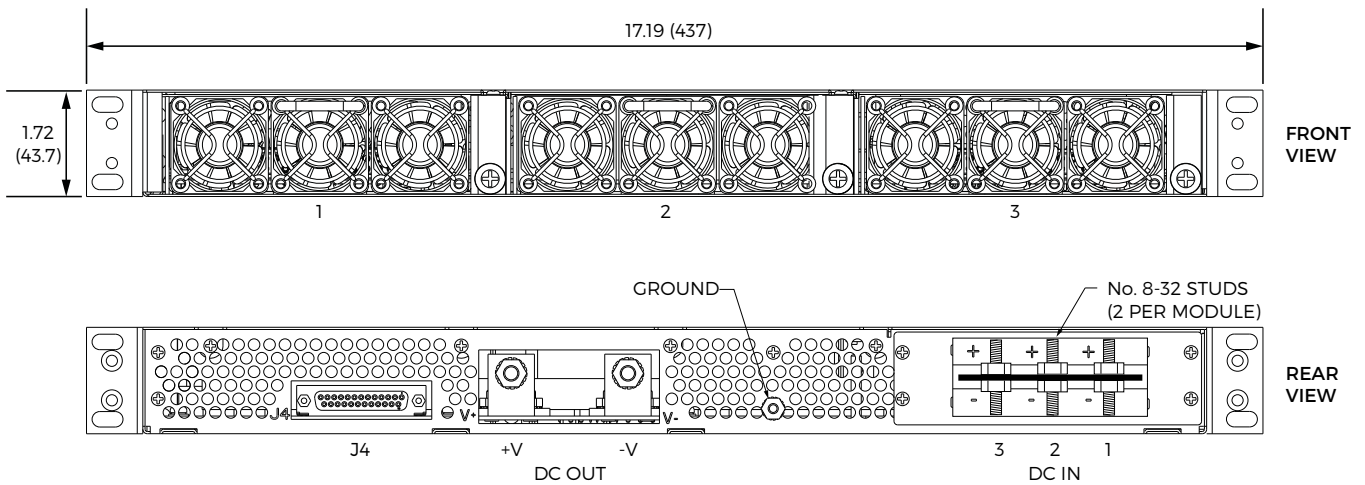
Temperature Measurement Functions

The internal temperature of the unit is measured using a MAX6633. This device provides a 12-bit measurement at a resolution of 0.0625°C.

MAX6633 slave address

BIT	7	6	5	4	3	2	1	0
VALUE	1	0	0	0	A2	A1	A0	0

SPECIFICATIONS, TPCMRIU3-24 RACKS/SHELF

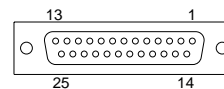


J4 PIN CONNECTIONS			
PIN	FUNCTION	PIN	FUNCTION
1	Inhibit	14	Input Power Fail - 1
2	Overtemp. Warning - 1	15	Output Power Good - 1
3	Current Monitor - 1	16	Input Power Fail - 2
4	Overtemp. Warning - 2	17	Output Power Good - 2
5	Current Monitor - 2	18	Input Power Fail - 3
6	Overtemp. Warning - 3	19	Output Power Good - 3
7	Current Monitor - 3	20	Module Present - 1
8	+5V Standby	21	Module Present - 2
9	SDA	22	Module Present - 3
10	Current Share	23	- Sense
11	+Sense	24	Remote Adjust - 1
12	Remote Adjust - 2	25	Remote Adjust - 3
13	SCL		

NOTES: 1. Standby return is connected to -Sense lead. Current rating of +5Vstandby is 250mA.
2. All signals are referenced to -Sense lead. Pins 9 and 13 are I²C outputs when that option is present.

MAXIMUM RATED OUTPUT - 3 MODULES		
MODULES	NON-REDUNDANT	2+1 REDUNDANT
TPCMQ24-48/20	48VDC @ 62.4A	48VDC @ 41.6A
TPCPQ24-48/25	48VDC @ 75.0A	48VDC @ 50.0A
TPCMQ24-54/18	54.4VDC @ 55.2A	54.4VDC @ 36.8A

J4 SIGNAL CONNECTOR









Standard 25-Pin
Subminiature D Connector









NOTES:

- All connections are made to the rear of the rack/shelf. The modules are 1, 2, 3, from left to right as seen from the front of the rack/shelf.
- All module outputs are connected in parallel in the rack/shelf with active current sharing between them.
- There is a separate DC input for each module, but the inputs may be paralleled by means of an adaptor kit. See accessories list opposite.
- The Module Present outputs (J4 pins 20, 21 & 22) are grounded (to -Sense) when the module is plugged in and open when the module is out.
- For details on the I²C function (option Z), contact the factory.

ALARM & COMMUNICATIONS ADAPTORS

RELAY ALARM ADAPTOR		Part No.: 009-1005-0000	Datasheet WEB Link	Notes
	Plugs directly into the 25 way D-Type signal connector J1 (J2) and converts DC good signal for each module to a Form-C volts-free relay contact output. The module allows daisy chaining of parallel connected shelves for share bus and remote sense.			
SNMP ALARM TRAP ADAPTOR		Part No.: 009-1006-0000	Datasheet WEB Link	Notes
	Plugs directly into the 25 way D-Type signal connector J1 (J2). Monitors DC Good signal of each power module. Plugs directly into the 25 way DType signal connector J1 (J2). Monitors DC Good signal of each power module. When an alarm occurs or clears a built-in processor sends an SNMP alarm trap to the monitoring host and can send an email message. Allows daisy chaining of parallel connected shelves for share bus and remote sense connections.			MIB files (.exe)  Setup guide 

DC CABLES

DC CABLE KIT - 1 to 1 LUG 30"	Part No.: 775-1497-1130	Start Lug	End Lug
Pair of Black / Red #4AWG copper cable (600V 125A) 30" (76cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55".			
DC CABLE KIT - 1 to 2 LUG 30"	Part No.: 775-1497-1230	Start Lug	End Lug
Pair of Black / Red #4AWG copper cable (600V 125A) 30" (76cm) with lug terminations and heat shrink. Hole size 0.25", tongue w = 0.55", spacing 0.63"			
DC CABLE KIT - 2 to 2 LUG 30"	Part No.: 775-1497-2230	Start Lug	End Lug
One pair Black / Red #4AWG copper cable (600V 125A) 30" (76cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55", spacing 0.63"			
DC CABLE KIT - 1 to 1 LUG 84"	Part No.: 775-1497-1184	Start Lug	End Lug
One pair Black / Red #4AWG copper cable (600V 125A) 84" (213cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55"			
DC CABLE KIT - 1 to 2 LUG 84"	Part No.: 775-1497-1284	Start Lug	End Lug
One pair Black / Red #4AWG copper cable (600V 125A) 84" (213cm) with lug terminations and heat shrink. Hole size 0.25", tongue width 0.55", spacing 0.63"		