ERICSSON

Technical Specification

BMR 911 483 Power Module, Input 48 V, Output 355 W	EN/LZT 108 9752 R1C January 2009

Key Features

- - 48 V DC input; 355 W output power
- Full-size (6HP) Single-width form-factor
- 16 channels of payload and management power outputs
- Designed to comply PICMG® specification MTCA.0 R1.0
- Full support for redundancy functions
- USB interface for system debugging and future firmware updates

General Characteristics

- Very high efficiency, 95 % at half load
- Superior accuracy, 12V +/-3%
- Output over voltage protection
- Input under voltage shutdown
- Over temperature protection
- Output short-circuit protection
- Highly automated manufacturing ensures quality
- ISO 9001/14001 certified supplier

Safety Approvals

Design for Environment

RoHS compatible

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General Information

Ordering Information

The product ordering number is **BMR 911 483/1**.

Reliability

The Mean Time Between Failure (MTBF) is calculated at full output power and an operating ambient temperature (T_A) of +40°C, which is a typical condition in Information and Communication Technology (ICT) equipment. Different methods could be used to calculate the predicted MTBF and failure rate which may give different results. Ericsson Power Modules currently uses Telcordia SR332.

Predicted MTBF for the series is:
- 0.26 million hours according to Telcordia SR332, issue 1, Black box technique.

Telcordia SR332 is a commonly used standard method intended for reliability calculations in ICT equipment. The parts count procedure used in this method was originally modelled on the methods from MIL-HDBK-217F, Reliability Predictions of Electronic Equipment. It assumes that no reliability data is available on the actual units and devices for which the predictions are to be made, i.e. all predictions are based on generic reliability parameters.

Compatibility with RoHS requirements

The products are compatible with the relevant clauses and requirements of the RoHS directive 2002/95/EC and have a maximum concentration value of 0.1% by weight in homogeneous materials for lead, mercury, hexavalent chromium, PBB and PBDE and of 0.01% by weight in homogeneous materials for cadmium. The product does not contain Deca BDE.

Exemptions in the RoHS directive utilized in Ericsson Power Modules products include:
- Lead in high melting temperature type solder (used to solder the die in semiconductor packages)
- Lead in glass of electronics components and in electronic ceramic parts (e.g. fill material in chip resistors)
- Lead as an alloying element in copper alloy containing up to 4% lead by weight (used in connection pins made of Brass)

Quality Statement

The products are designed and manufactured in an industrial environment where quality systems and methods like ISO 9000, 6σ (sigma), and SPC are intensively in use to boost the continuous improvements strategy. Infant mortality or early failures in the products are screened out and they are subjected to an ATE-based final test. Conservative design rules, design reviews and product qualifications, plus the high competence of an engaged work force, contribute to the high quality of our products.

Warranty

Warranty period and conditions are defined in Ericsson Power Modules General Terms and Conditions of Sale.

Limitation of Liability

Ericsson Power Modules does not make any other warranties, expressed or implied including any warranty of merchantability or fitness for a particular purpose (including, but not limited to, use in life support applications, where malfunctions of product can cause injury to a person's health or life).

Safety Specification

General information

Ericsson Power Modules board mounted and embedded power supplies are designed in accordance with safety standards IEC/EN/UL60950, *Safety of Information Technology Equipment*.

IEC/EN/UL60950 contains requirements to prevent injury or damage due to the following hazards:

- Electrical shock
- Energy hazards
- Fire
- Mechanical and heat hazards
- Radiation hazards
- Chemical hazards

Board mounted and embedded power supplies are defined as component power supplies. As components they cannot fully comply with the provisions of any Safety requirements without "Conditions of Acceptability". Clearance between conductors and between conductive parts of the component power supply and conductors in the final product must meet the applicable Safety requirements. Certain conditions of acceptability apply for component power supplies with limited stand-off (see Mechanical Information for further information). It is the responsibility of the installer to ensure that the final product housing these components complies with the requirements of all applicable Safety standards and Directives for the final product.

Component power supplies for general use should comply with the requirements in IEC60950, EN60950 and UL60950 *"Safety of information technology equipment".* There are other more product related standards, e.g. IEEE802.3af "Ethernet LAN/MAN Data terminal equipment power", and ETS300132-2 "Power supply interface at the input to telecommunications equipment; part 2: DC", but all of these standards are based on IEC/EN/UL60950 with regards to safety.

Ericsson Power Modules board mounted and embedded power supplies are UL60950 recognized and certified in accordance with EN60950.

The flammability rating for all construction parts of the products meets requirements for V-0 class material according to IEC 60695-11-10.

The products should be installed in the end-use equipment, in accordance with the requirements of the ultimate application. Normally the output is considered as SELV (Safety Extra Low Voltage) and the input source must be isolated by minimum Double or Reinforced Insulation from the primary circuit (AC mains) in accordance with IEC/EN/UL60950.

Isolated Power Supplies

It is recommended that a slow blow fuse with a rating twice the maximum input current per selected product be used at the input of each product. If an input filter is used in the circuit the fuse should be placed in front of the input filter. In the rare event of a component problem in the input filter or in the product that imposes a short circuit on the input source, this fuse will provide the following functions:

- Isolate the faulty product from the input power source so as not to affect the operation of other parts of the system.
- Protect the distribution wiring from excessive current and power loss thus preventing hazardous overheating.

The galvanic isolation is verified in an electric strength test. The test voltage (V_{iso}) between input and output is 1500 Vdc for 60 seconds (refer to product specification). Leakage current is less than 1 µA at nominal input voltage.

48 and 60 V DC systems

If the input voltage to the product is 75 Vdc or less, then the output remains SELV (Safety Extra Low Voltage) under normal and abnormal operating conditions.

Single fault testing in the input power supply circuit should be performed with the product connected to demonstrate that the input voltage does not exceed 75 Vdc.

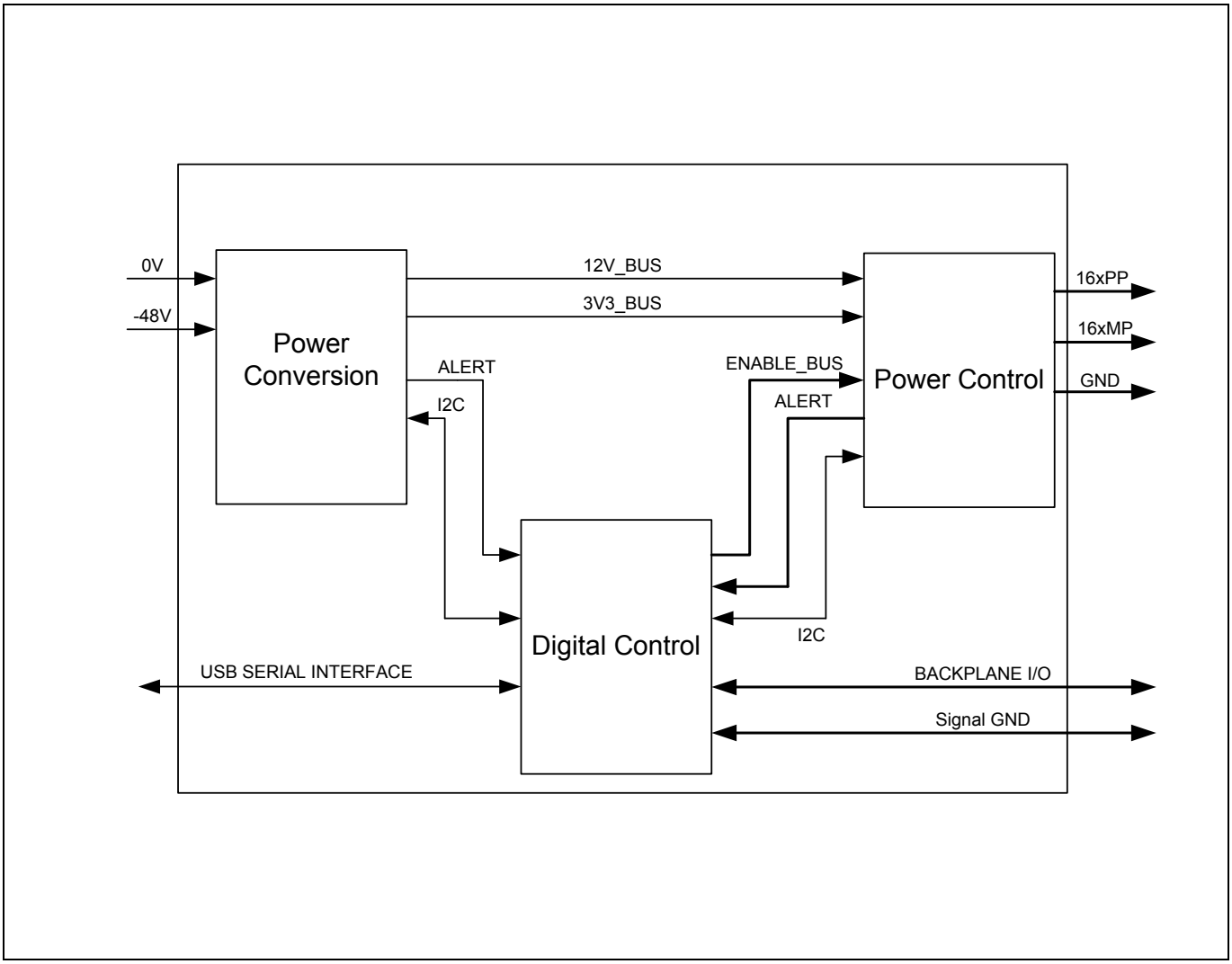
If the input power source circuit is a DC power system, the source may be treated as a TNV2 circuit and testing has demonstrated compliance with SELV limits and isolation requirements equivalent to Basic Insulation in accordance with IEC/EN/UL60950.

Absolute Maximum Ratings

Characteristics		min	typ	Max	Unit
T_{P1}	Operating Temperature (see Thermal Consideration section)	-5		+55	°C
T_S	Storage temperature	-40		+85	°C
V_I	Input voltage			60	V
V_{iso}	Isolation voltage	1500			Vdc

Stress in excess of Absolute Maximum Ratings may cause permanent damage. Absolute Maximum Ratings, sometimes referred to as no destruction limits, are normally tested with one parameter at a time exceeding the limits of Output data or Electrical Characteristics. If exposed to stress above these limits, function and performance may degrade in an unspecified manner.

Fundamental Circuit Diagram



Input Electrical Specification — BMR 911 483

T_{P1} = -5 to +55ºC, V_I = 40.5 to 57 V
Typical values given at: T_{P1} = +25°C, V_I= 54 V_I max I_O, unless otherwise specified under Conditions.

Characteristics		Conditions	min	typ	Max	Unit
P_{in_max}	Max input Power	355W output power and Nominal input voltage			385	W
V_{in_nom}	Nominal voltage			54		V
V_I	Normal voltage (full performance)		40.5		57	V
	Abnormal voltage (non destruction)		0		60	V
V_{Ion}	turn on input voltage			35		V
V_{Ioff}	turn off input voltage			33		V
η	Efficiency	50 % of max I_O		94.6		%
		max I_O		93.2		
P_d	Power Dissipation	max I_O		27		W
P_{li}	Input idling power	I_O = 0 A, V_I = 54 V		4.2		W
	Hold-up	Vin 50V, 80% of max load		10		ms
	Burst	According to IEC 61000-4-4	4			kV
I_{PK}	Inrush Current	t = 0.1ms to 0.9ms			40	A
		t = 0.9ms to 3ms			7	A

12V Payload Power Electrical Specification BMR 911 483

There are 16 Payload Power channels:
two (2) for MCH supply, PP_M1, PP_M2, two (2) for fan supply, PP_CU1, PP_CU2 and 12 channels for AMC board supply, PP_1 to PP_12.

T_{P1} = -5 to +55ºC, V_I = 40.5 to 57 V,
Typical values given at: T_{P1} = +25°C, V_I= 54 V_I max I_O, unless otherwise specified under Conditions.

Characteristics		Conditions	min	typ	max	Unit
V_{OP}	+12V Payload Power	Primary Power Module Over all normal operating conditions, including line/load regulation and temperature.	12.25		12.95	V
V_{OR}	+12V Payload Power	Redundant Power Module Over all normal operating conditions, including line/load regulation and temperature.	11.6		12.0	V
V_O	Line regulation	max I_O		160		mV
	Load regulation	V_I = 54 V, 0-100 % of max I_O		100		mV
V_{tr}	Load transient voltage deviation	V_I = 54 V, Load step 80W, di/dt = 1 A/µs		±200		mV
t_{tr}	Load transient recovery time			1		ms
t_r	Ramp-up time (from 10–90 % of V_{Oi})	80W resistive load + 1600uF capacitive load			12	ms
I_O	Output current per PP channel		0		7.6	A
I_{lim}	Current limit threshold per PP channel		7.6	8.7	9.7	A
I_{sc}	Short circuit current per PP channel			13		A
C_{out}	Start-up against Capacitive Load		0		1600	µF
V_{Oac}	Output ripple & noise	See ripple & noise graphs, max I_O, V_{Oi}			100	mVp-p

+3.3V Management Power Electrical Specification BMR 911 483

There are 16 Management Power channels:
two (2) for MCH supply, MP_M1, MP_M2, two (2) for fan supply, MP_CU1, MP_CU2 and 12 channels for AMC board supply, MP_1 to MP_12.

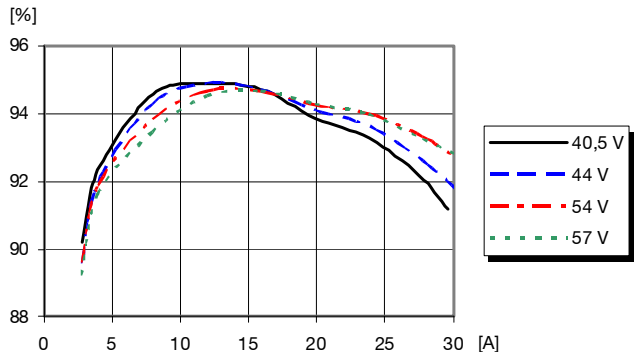
T_{P1} = -5 to +55ºC, V_I = 44 to 57 V,
Typical values given at: T_{P1} = +25°C, V_I= 54 V_I max I_O, unless otherwise specified under Conditions.

Characteristics		Conditions	min	typ	max	Unit
V_O	+3.3V Management Power	Over all normal operating conditions, including line/load regulation and temperature.	3.13		3.63	V
V_O	Load regulation	V_I = 54 V, 0-100 % of max I_O			50	mV
V_{tr}	Load transient voltage deviation	V_I = 54 V, Load step 150mA, di/dt = 1 A/µs		-200		mV
t_{tr}	Load transient recovery time			0		ms
t_r	Ramp-up time (from 10–90 % of V_{Oi})	150mA resistive load + 150uF capacitive load			12	ms
I_O	Output current per MP channel		0		150	mA
I_{lim}	Current limit threshold per MP channel	T_{P1} < max T_{P1}	150	195	225	mA
I_{sc}	Short circuit current per MP channel	T_{P1} = 25ºC		195		A
C_{out}	Recommended against Capacitive Load	T_{P1} = 25ºC	0		150	µF
V_{Oac}	Output ripple & noise	See ripple & noise graphs, max I_O, V_{Oi}			30	mVp-p

Payload Power Typical Characteristics

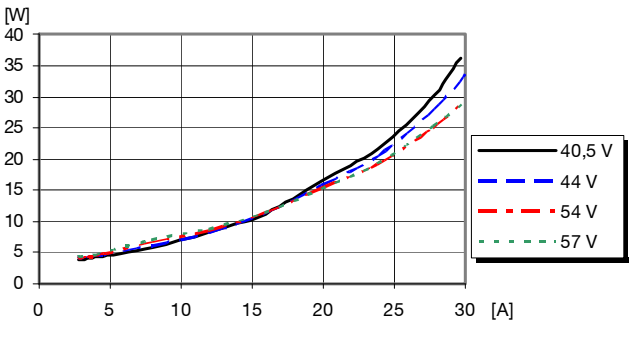
BMR 911 483

Efficiency



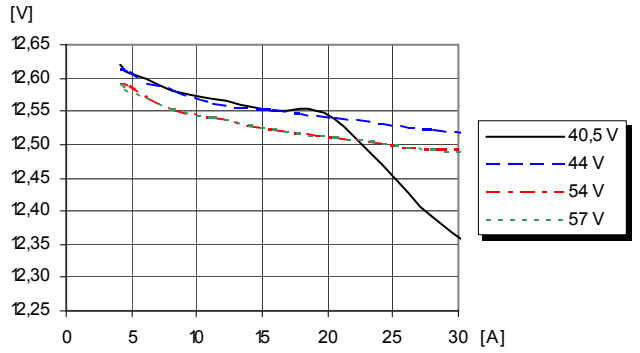
Efficiency vs. load current and input voltage at T_{P1} = +25°C

Power Dissipation



Power dissipation vs. load current and input voltage at T_{P1} = +25°C

Output Characteristics

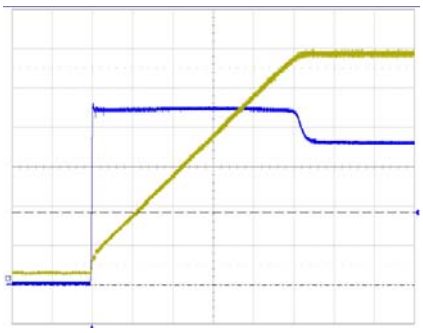


Output voltage vs. load current at T_{P1} = +25°C

Payload Power Typical Characteristics

BMR 911 483

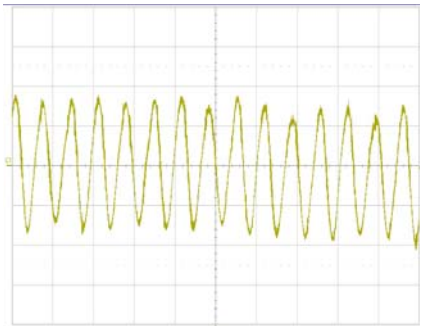
Start-up



Start-up enabled by connecting V_I at:
T_{P1} = +25°C, V_I = 54 V,
I_O = 7 A resistive load + 1680uF cap. load.

Top trace: output voltage (2 V/div.).
Bottom trace: output voltage (2 A/div.).
Time scale: (2 ms/div.).

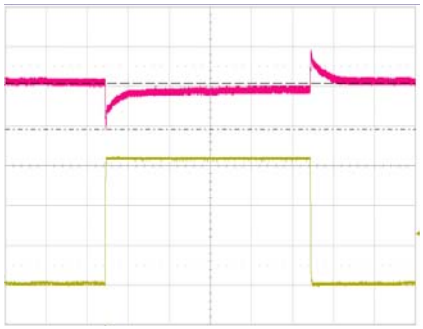
Output Ripple & Noise



Output voltage ripple at:
T_{P1} = +25°C, V_I = 54 V,
I_O = 7 A resistive load.

Trace: output voltage (20 mV/div.).
Time scale: (5 µs/div.).

Output Characteristics



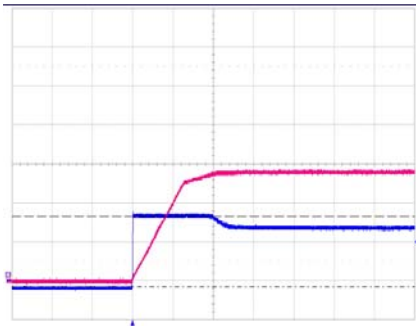
Output voltage response to load current step-change (0W-80W-0W) at:
T_{P1} =+25°C, V_I =54 V.

Top trace: output voltage ({200 mV/div.).
Bottom trace: load current (2 A/div.).
Time scale: (2 ms/div.).

Management Power, Typical Characteristics

BMR 911 483

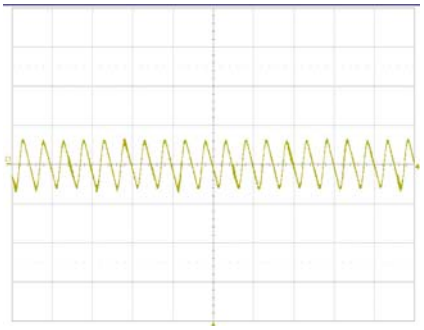
Start-up



Start-up enabled by connecting V_I at:
T_{P1} = +25°C, V_I = 54 V,
I_O1 = 150 mA resistive load + 150uF capacitive load.

Top trace: output voltage 1 (1 V/div.).
Bottom trace: input voltage (100 mA/div.).
Time scale: (1 ms/div.).

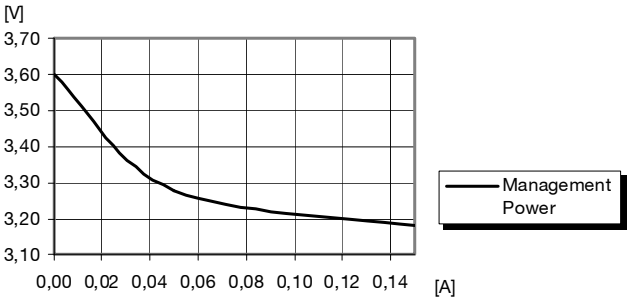
Output Ripple & Noise



Output voltage ripple at:
T_{P1} = +25°C, V_I = 54 V,
I_O1 = 150 mA

Top trace: output voltage 1 (20 mV/div.).
Time scale: (500 µs/div.).

Output Characteristics



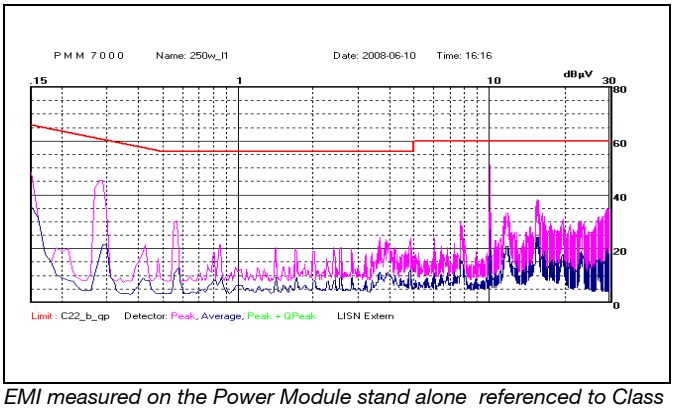
Output voltage response to load current step-change, output 1 (0A-150mA-0A) at:
T_{P1} =+25°C, V_I = 54 V

Top trace: output voltage 1 (200 mV/div.).
Bottom trace: load current (150 mA/div.).
Time scale: (2 ms/div.).

EMC Specification

Conducted EMI measured according to EN55022 and CISPR 22.

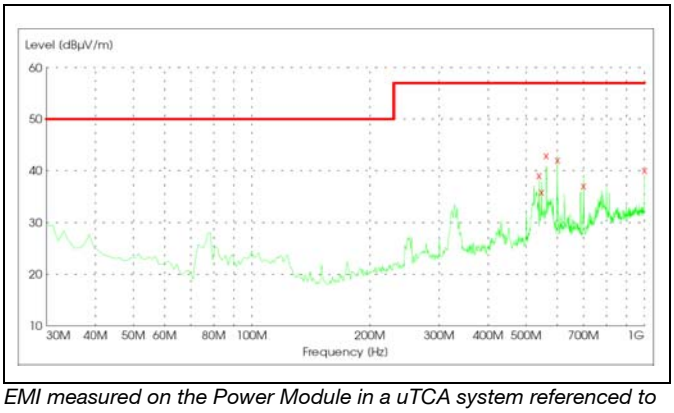
Conducted EMI Input terminal value (typ)



EMI measured on the Power Module stand alone referenced to Class B limit.

Test setup
Test setup according to EN55022, CISPR 22

Radiated EMI



EMI measured on the Power Module in a uTCA system referenced to Class B limit.

Test setup
Test setup according to EN55022, CISPR 22

ESD Specification

Module has been tested and meets requirements according to GR-78 R9-2.

Operating information

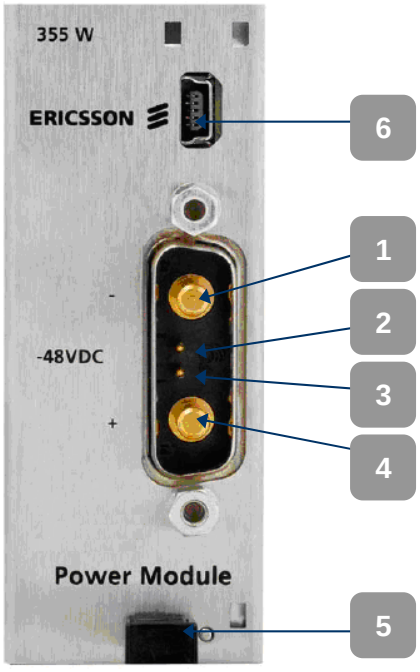
External Fuse

The product is not internally fused. It is recommended that a slow blow fuse with a rating twice the maximum input current per selected product be used at the input of each product. If an input filter is used in the circuit the fuse should be placed in front of the input filter. In the rare event of a component problem in the input filter or in the product that imposes a short circuit on the input source, this fuse will provide the following functions:

- Isolate the faulty product from the input power source so as not to affect the operation of other parts of the system.
- Protect the distribution wiring from excessive current and power loss thus preventing hazardous overheating.

Connections

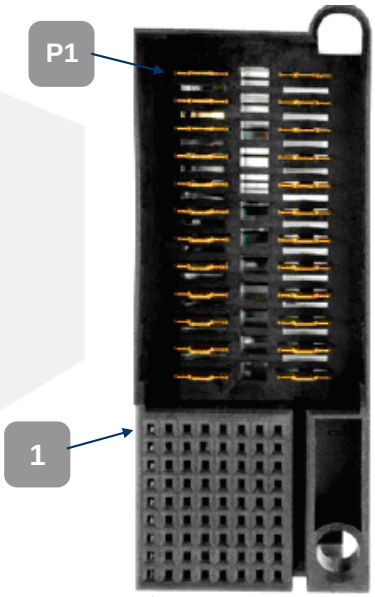
Input



Number	Pin Number	Function
1	P2	-48V
2	2	Control Return (connected to GND)
3	1	Control
4	P1	-48V Return
5		Latch/Handle
6		USB Connector (type A-mini B)

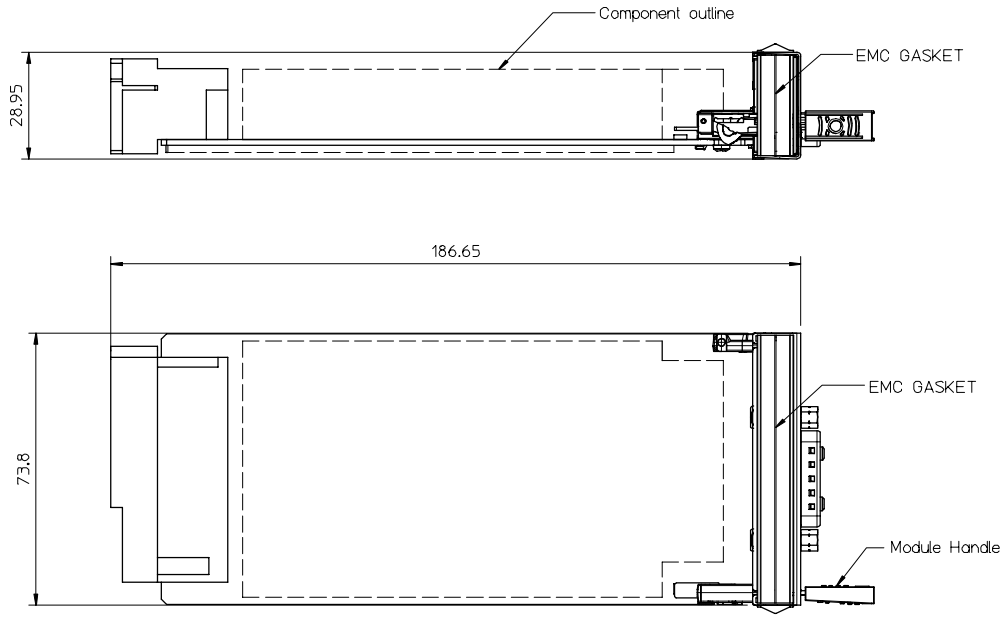
Output

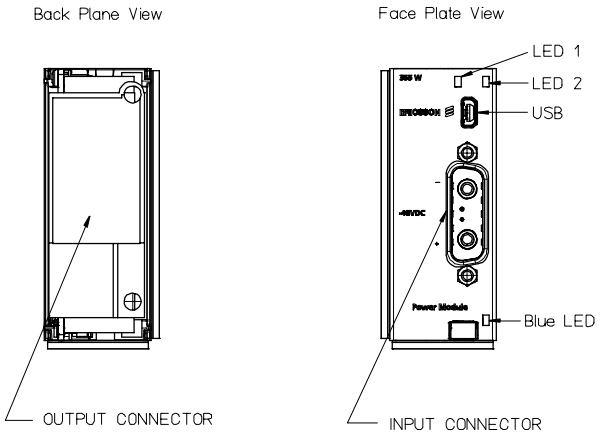
P1	PP_M1	PP_1	P13
P2	PP_CU1	PP_2	P14
P3	PP_CU2	PP_3	P15
P4	GND	PP_4	P16
P5	GND	PP_5	P17
P6	GND	PP_6	P18
P7	GND	PP_7	P19
P8	GND	PP_8	P20
P9	GND	PP_9	P21
P10	GND	PP_10	P22
P11	GND	PP_11	P23
P12	PP_M2	PP_12	P24



	A	B	C	D	E	F	G	H
1	PS_PM#	PM_OK#	PS1_M1#	PS1_CU1#	EN_M1#	EN_CU1#	MP_M1	MP_CU1
2	TCK	PMP_A#	PS1_2#	PS1_1#	EN_2#	EN_1#	MP_2	MP_1
3	TMS	PMP_B#	PS1_4#	PS1_3#	EN_4#	EN_3#	MP_4	MP_3
4	TRST#	PMP_C#	PS1_6#	PS1_5#	EN_6#	EN_5#	MP_6	MP_5
5	TDO	RST_PM_IN#	PS1_8#	PS1_7#	EN_8#	EN_7#	MP_8	MP_7
6	TDI	RST_PM_A#	PS1_10#	PS1_9#	EN_10#	EN_9#	MP_10	MP_9
7	GA0	RST_PM_B#	PS1_12#	PS1_11#	EN_12#	EN_11#	MP_12	MP_11
8	GA1	RST_PM_C#	PS1_M2#	PS1_CU2#	EN_M2#	EN_CU2#	MP_M2	MP_CU2
9	GA2	SMP	SCL_B	SDA_B	SCL_A	SDA_A	PWR_ON_M2	PWR_ON_M1

Mechanical Information





Notes:
1. Power Module specific Mechanical Dimensions are shown in PICMG Specification MTCA.0 R1.0
2. Power Module Handle/Latch Mechanism are shown in PICMG Specification MTCA.0 R1.0

Weight: typical 280 g
All dimensions in mm
Tolerances unless specified
Refer to PICMG Specification MTCA.0 R1.0

Mounting Information

For MicroTCA power module mounting information please read PICMG ® Specification MTCA.0 R1.0.

Input Connector:

FCI P/N 10070158
or equivalent

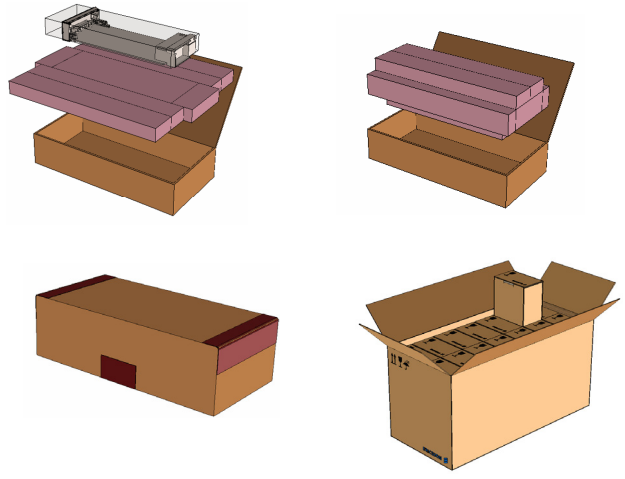
Output Connector:

Tyco P/N 1469922-1
Or equivalent

Delivery Package Information

The products are delivered in antistatic foam.

Package Specifications	
Inner fitment Material	PE Foam
Inner fitment Surface resistance	10^5 < Ohm/square < 10^{12}
Inner Box Dim. (L x W x H) mm	261 x 123 x 77
Outer Box Dim. (L x W x H) mm	551 x 258 x 284
Inner Box capacity	1 pcs/box
Outer Box capacity	14 pcs/box
Weight	Typical 1,427 kg (complete with 14pcs of single pack)



Product Qualification Specification

Characteristics			
External visual inspection	IPC-A-610		
Change of temperature (Temperature cycling)	IEC 60068-2-14 Nb	Temperature range Number of cycles Dwell/transfer time	-5 to 55°C Half cycle 3h
Cold (in operation)	IEC 60068-2-1 Ad	Temperature T_A Duration	-5°C 16 h
Damp heat	IEC 60068-2-78 Cab	Temperature Humidity Duration	+30°C 85 % Rh 96 hours
Dry heat	IEC 60068-2-2 Bd	Temperature Duration	55°C 96 h
Mechanical shock	IEC 60068-2-27 Ea	Peak acceleration duration Duration	30 m/s^2, direction of bumps 6 11 ms, 3 in each direction
Sinusoidal vibration Random vibration Bump Free fall	IEC 60068-2-6 IEC 60068-2-18 IEC 60068-2-29 IEC 60068-2-32	Frequency, Acceleration Frequency, ASD Acceleration, Duration	5 to 200 Hz, 2 m^2/s^2 5 to 200 Hz, 1 m^2/s^2 180 m^2/s^2, 6 ms