

# GP100 Rectifier For Edge Power Architecture

Advanced Technology to Simplify Your Network



## Description

The ABB GP100 rectifier for Edge Power Architecture is a true three-phase rectifier. The rectifier efficiently transforms energy from any standard three-phase source into the 48-volt DC power needed for modern data center architectures. The rectifier operates using any three-phase input voltage from 320 V<sub>AC</sub> to 530 V<sub>AC</sub> without need for a neutral conductor. This means that one single rectifier can be used globally to meet all your at scale 48-volt powering needs.

The GP100 efficiency is market leading for diode protected, true hot pluggable, three-phase 48-volt rectifiers.

The GP100 rectifier for Edge offers a powerful combination of efficiency, data center architecture simplicity and reliability

## True System Solution

- GP100 rectifiers are part of the proven Global Platform Line of rectifier products designed to meet the demanding needs of data center and wireless and telecommunications customers.
- Monitoring/Control – the built in microprocessor controls and monitors all critical rectifier functions and communicates with the system controller using the built in Galaxy Protocol serial interface.
- Designed and tested with in rack battery modules to support a safe, reliable and low cost way to provide five nines data center reliability.

## Features & Advantages

- Compact – 1RU form factor provides high power density 27 Watts/cubic inch.
- Efficient – Flat efficiency curve maintains 96% efficiency over a wide range of loads.
- Flexible Output – Provides up to 125 Amps of 48-volt power for fast charging of discharged batteries.
- Programmable – Output is programable between 42 and 58 V<sub>DC</sub> to support traditional lead-acid and advanced battery chemistries.
- Wide Range Input – Operates at any three-phase AC voltage from 320 to 530 V<sub>AC</sub>.
- Temperature Hardened – Operates -40°C to 70°C
- Fail-Safe Performance – hot insertion capabilities allow for rectifier replacement without system shutdown; soft start and inrush current protection prevent nuisance tripping of upstream breakers.
- Extended Service Life – parallel operation with automatic load sharing ensures that load is distributed across all units.
- Plug and Play – installation of the rectifier in a shelf connected to a system controller initializes all set up parameters, automatically.
- Compliant to RoHS Directive 2011/65/EU and amended Directive (EU) 2015/863
- Compliant to REACH Directive (EC) No 1907/2006

# Technical Specifications

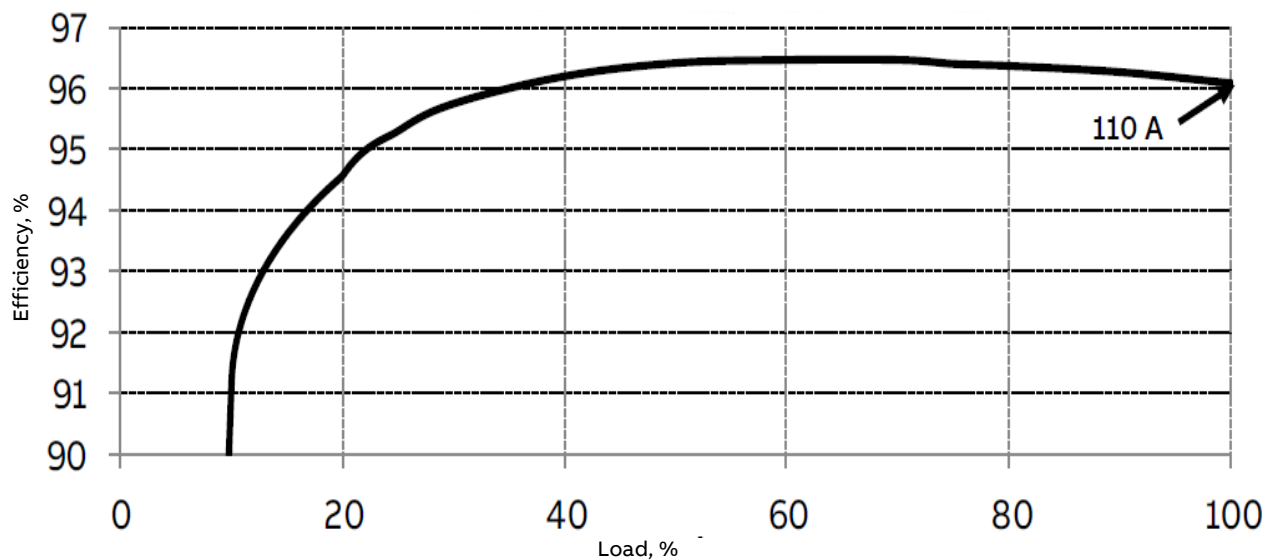
## Electrical Specifications for System Design

### Environmental, Compliance & Physical

Operating Ambient Temperature Range	-40°C to +70°C (Output de-rates at 2%/°C beginning at 55°C)
Cooling Method	Front to back airflow with onboard temperature controlled fans
Operating Relative Humidity	0 - 95% (non-condensing) for use in a controlled environment
Electromagnetic Compatibility	FCC Part 15, EN 55032 (CISPR32), EN 55035 (CISPR 35), Level A, GR-1089
Lightning Surge	EN/IEC 61000-4-5 Level 4 (Error free), ANSI C62.41 Category B 100 kHzring and 1.2/50μs combination waves (6kV damage free)
Agency Certifications	UL/CSA/EN62368-1, NEBS GR-1089, GR-63-CORE
Heat Release	217 Watts, or 740 BTU/hr at full load of 6000 Watts
Mean Time Between Failure (MTBF); Life	300k Hours @ 25°C per Telcordia SR-332, Method 1, Case 3; 10 Years
Height x Width x Depth, Weight, Packaged weight	1.6x8x17.9in (41x236x455mm), 8.95 lbs (4.1 kg), 9.85 lbs (4.5 kg)

## Input Voltage and Power

Response to AC input voltage	Provides full power between 320 V <sub>ac</sub> and 530 V <sub>ac</sub> three-phase.
Ac input current	10A max @380 V <sub>ac</sub> three-phase; 8A @480 V <sub>ac</sub> three-phase
Power Factor	0.96-0.995@loads over 50%
THD	< 6% @loads over 70% Typical
Holdover	12 milliseconds, with V <sub>out</sub> final >40 V
Frequency	47 to 66Hz



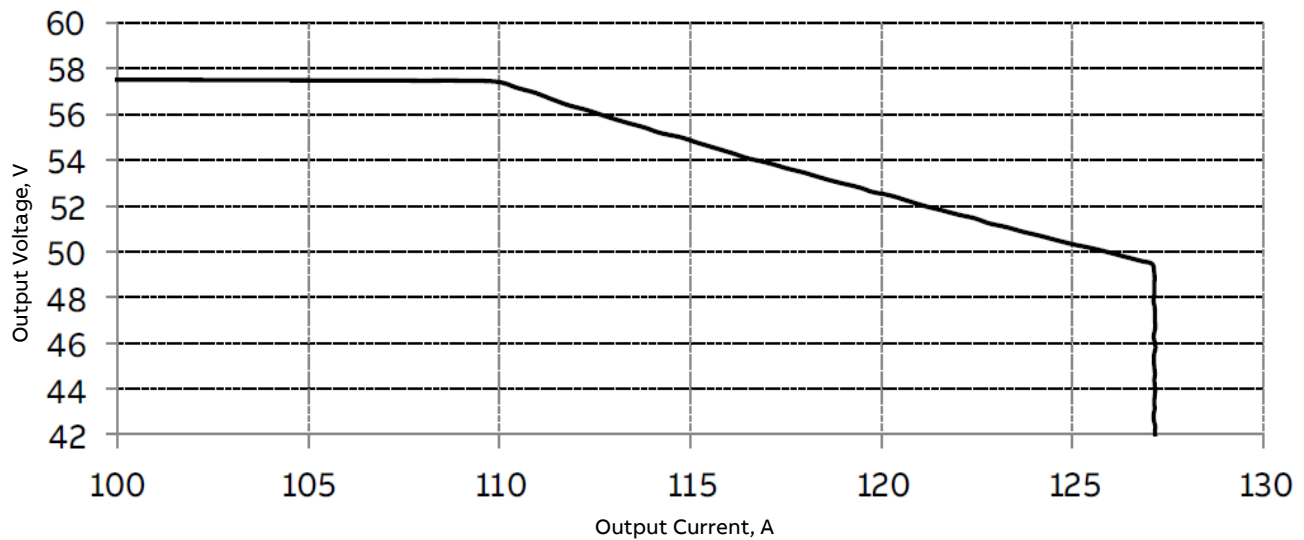
Efficiency vs. Load 25°C, V<sub>in</sub>480V<sub>ac</sub>, V<sub>out</sub> 54V<sub>dc</sub>

# Technical Specifications (continued)

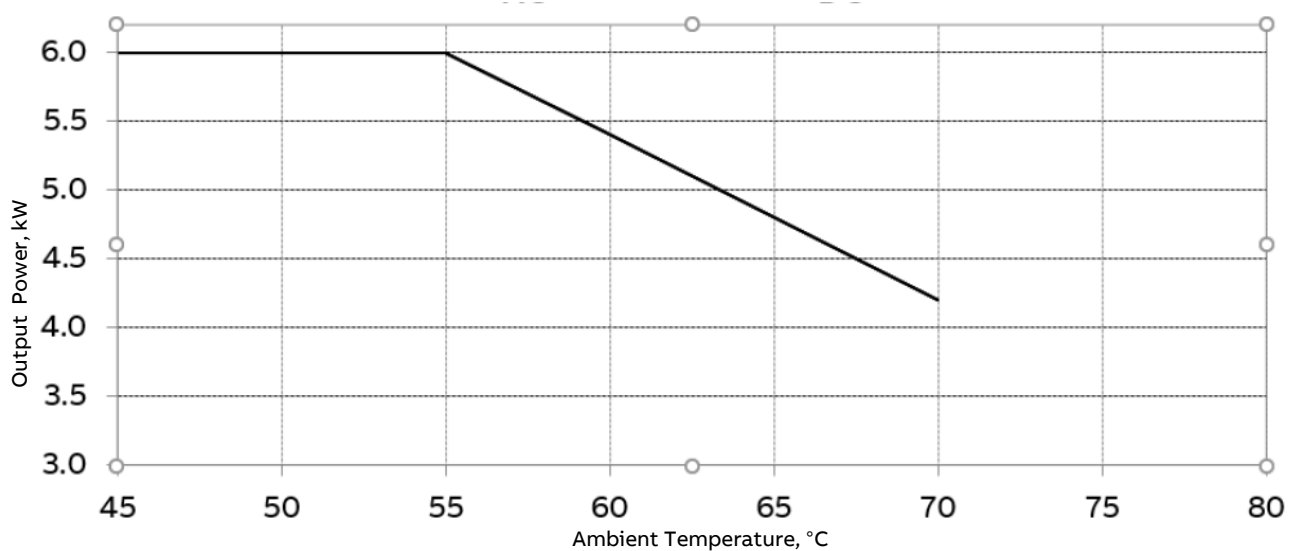
## Electrical Specifications for System Design (continued)

### Output

$V_{out}$	42–58 V <sub>DC</sub> range. Default = 52 V <sub>DC</sub>
$I_{out}$	110A @ 54.5 V <sub>DC</sub> output 125A @ 48 V <sub>DC</sub> output
Regulation	± 1% w/controller
Ripple	100 mV <sub>rms</sub> , 250 mV <sub>p-p</sub>
Efficiency	96.5% Peak
Soft Start	Starts up into fully discharged batteries.



Current Limit Profile, Typical 480 V<sub>AC</sub> Input, 60 Hz @ 25°C



Output Power vs. Temperature 480 V<sub>AC</sub> Input, 54V<sub>DC</sub> Output

## Technical Specifications (continued)

### Detailed Specifications

#### Absolute Maximum Rating

Parameter	Symbol	Min	Max	Unit
Input Voltage: Continuous	$V_{IN}$	0	600	$V_{AC}$
Operating Ambient Temperature	$T_A$	-40	70	°C
Storage Temperature	$T_{stg}$	-40	85	°C
I/O Isolation voltage to Frame (100% factory Hi-Pot tested)			2121	$V_{AC}$

#### Input

Parameter	Symbol	Min	Typical	Max	Unit
Operating Voltage Range (three-phase delta with safety frame ground)	$V_{IN}$	320	380/480	530	
Low voltage	Turn-OFF			320	
	Turn-ON			330	
	Hysteresis	5			
High voltage	Turn-OFF	530			$V_{AC}$
	Turn-ON	520			
	Hysteresis	5			
Input Voltage Phase Inbalance	$V_{IN}$	-15	1	+10	%
Frequency	$F_{IN}$	47		63	Hz
Operating Current (three-phase - all phases operational)	$I_{IN}$			15	$A_{AC}$
Input Current Phase Inbalance [load > 50% of FL]				1.5	%
Inrush Transient (per $\phi$ at 480V <sub>RMS</sub> , 25°C, excluding X-Capacitor charging)	$I_{IN}$			30	$A_{PK}$
Source Impedance (NEC allows 2.5% of source voltage drop inside a building)		0.20	0.25	0.30	$\Omega$
Idle Power (at 480V <sub>AC</sub> , 25°C)	Main output OFF			25	W
	Main output ON @ $I_o=0$			45	
Leakage Current (per $\phi$ , 480V <sub>AC</sub> , 60Hz)	$I_{IN}$			5	%
Power Factor (50 – 100% load)	PF	0.96	0.995		
Efficiency (380/480V <sub>AC</sub> @ 25°C)	30-80% load		93/95		%
	50% load		94.5/96.5		
Holdup Time (with no batteries present) ( $V_{in} = 320V_{RMS}$ , $V_{out} \geq 42V_{DC}$ , constant power load)	T	10	12		ms
Ride Through (at 480V <sub>AC</sub> , 25°C, constant power load)	T	1/2	1		cycle
Isolation (per EN62368)	Input – Output		3000		$V_{AC}$
	Input-Chassis/Signals		2087		$V_{AC}$

## Technical Specifications (continued)

### Detailed Specifications (continued)

#### Output 48V<sub>DC</sub>

Parameter	Symbol	Min	Typical	Max	Unit	
Output Power ( 380-480V <sub>AC</sub> – three-phase, T <sub>AMB</sub> = -5 – 55°C )	W	6050			W <sub>DC</sub>	
Factory Default Set Point V <sub>IN</sub> = 480V, I = 10% FL, 25°C			52		V <sub>DC</sub>	
Overall Regulation (load, temperature, aging) LOAD>2.5A @25°C T <sub>AMB</sub> > 45°C	V <sub>OUT</sub>	-0.5		+0.5	%	
		-2		+2	%	
Output Voltage Set Range (Target Resolution +/- 0.012 V <sub>DC</sub> )		42		58	V <sub>DC</sub>	
Output Current Range (54 V <sub>DC</sub> /, T <sub>AMB</sub> < 45°C ) V <sub>OUT</sub> = 54V <sub>DC</sub> V <sub>OUT</sub> = 52V <sub>DC</sub>	I <sub>OUT</sub>	1		111	A <sub>DC</sub>	
		1		115		
		1		125		
Current Share ( > 50% FL)				2	%FL	
Max Units Parallelable Using Physical Address/ Virtual Address		-2		20/100	units	
Proportional Current Share Between Different Power Supplies			<7		%FL	
Output Ripple ( 20MHz bandwidth, load > 10%FL)	V <sub>OUT</sub>	RMS (5Hz to 20MHz)		100	mV <sub>rms</sub>	
		Peak-to-Peak (5Hz to 20MHz)		250	mV <sub>p-p</sub>	
Load < 10%FL				400	mV <sub>p-p</sub>	
Voice Band Output Noise	V <sub>OUT</sub>	With 880Ahr Battery inSystem		45	dBrnC	
		Without Battery		55		
		Psophometric Noise		2		mV <sub>rms</sub>
External Bulk Load Capacitance	C <sub>OUT</sub>	0		0.17	F	
Turn-On Monotonic Range, Above -5°C		30		100	% V <sub>nom</sub>	
Delay	@480V <sub>in</sub>		5		s	
Rise Time – Fast Mode			100		ms	
Rise Time – Walk-in Mode (default)	T	55A (50% load )	2.5		s	
		83A (75% load)	5			
		100A (90% load)	8			
Output Overshoot	V <sub>OUT</sub>			2	%	
Load Step Response, ΔV, [load step 20% <->80% Load, @ 1A/μs ]	V <sub>OUT</sub>			5	%	
	T	-5		2	ms	
Overload - Power Limit When V <sub>OUT</sub> ≥ 48V <sub>DC</sub>	P <sub>OUT</sub>	6050			W <sub>DC</sub>	
Recoverable Current Limit When 40V <sub>DC</sub> < V <sub>OUT</sub> < 48V <sub>DC</sub>	I <sub>OUT</sub>	110		120	%FL	
Output Shutdown (one retry after a 2 – 10 second delay)	V <sub>OUT</sub>			36	V <sub>DC</sub>	
Overload Shutdown Delay at Turn On for Other Module Insertion			20		s	
Short Circuit Protection			No damage			
Overvoltage Protection	V <sub>OUT</sub>	200ms Delayed (Default) Immediate Shutdown	59		V <sub>DC</sub>	
			> 65	59.5		60
		Programmable Range	44			59.5
Latched Shutdown		If one restart fails inside 30s window unit latches			OFF	
Restart Delay		3.5	4	5	sec	
Over-Temperature Shutdown Margin (below max device rating )	T		20		°C	
Restart Attempt Hysteresis (below shutdown level)			10			
Restart/Reset Conditions		Loss of input > 100ms or Output OFF then ON command				
Isolation Output-Chassis	V	500			V <sub>DC</sub>	

# Technical Specifications (continued)

## Detailed Specifications (continued)

### Digital Information Specifications

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Measurement System Characteristics						
Standard Measurement Parameters	Update frequency				1	Hz
	Report delay after 25% step				2	Sec
	Report delay to accuracy				10	sec
I <sub>OUT</sub> Measurement Range	Linear	I <sub>MR</sub>	0		130	A <sub>DC</sub>
V <sub>OUT</sub> Measurement Range	Linear	V <sub>OUT(rMR)</sub>	0		70	V <sub>DC</sub>
P <sub>OUT</sub> Measurement Range	Linear	P <sub>OUT(rMR)</sub>	0		6100	W <sub>DC</sub>
Temp Measurement Range	Linear	Temp <sub>(rMG)</sub>	0		150	°C
V <sub>IN</sub> Measurement Range, Each Phase	Linear	V <sub>IN(rMG)</sub>	0		600	V <sub>AC</sub>
I <sub>IN</sub> Measurement Range, Each Phase	Linear	I <sub>IN(MR)</sub>	0		20	A <sub>DC</sub>
P <sub>IN</sub> Measurement Range, Computed three-phase result	Linear	P <sub>in(rng)</sub>	0		6750	W <sub>IN</sub>
P <sub>IN</sub> Measurement Accuracy	10-100% Load	P <sub>in(ACC)</sub>	-150		150	W
Fan Speed Measurement Accuracy			-10		10	%
Fan Speed Control – Duty Cycle	Direct		0		100	%

### Detailed Environmental Specifications

Parameter	Min	Typ	Max	Unit	Notes	
Ambient Temperature	-40		70	°C	Air inlet from sea level to 5,000 feet. Designed to start and work at an ambient as low as -40°C, but may not meet operational limits until above -5°C	
Storage Temperature	-40		85	°C		
Operating Altitude			3048/10000	m / ft		
Non-operating Altitude			8200/30k	m / ft		
Power Derating with Temperature			2.0	%/°C	55°C to 70°C	
Power Derating with Altitude				°C/305		
			2.0	m	Above 1524/5000 m/ft; 3962/13000 m/ft max	
				°C/1000 ft		
Humidity	Operating Storage	5	95	%	Relative humidity, non-condensing	
		5	95	%		
	Operational	Meets IPC 9592 Class II, Section 5 and GR-63_CORE requirements				
Shock and Vibration	Packaged	0.02	0.01	0.02	Modified IASTM-D-4728-91 8 hour duration on each axis	
						g <sup>2</sup> /Hz
Acoustic Noise		55	58	dBA	Confirmation Pending	
Earthquake Rating		4		Zone	Meet GR-63_CORE requirements	
Airborne Contamination Protection		PCBs conformally coated with UL 94V-0, UL Recognized component (QMJU2) material				

# Technical Specifications (continued)

## Detailed Specifications (continued)

### Electromagnetic Compliance

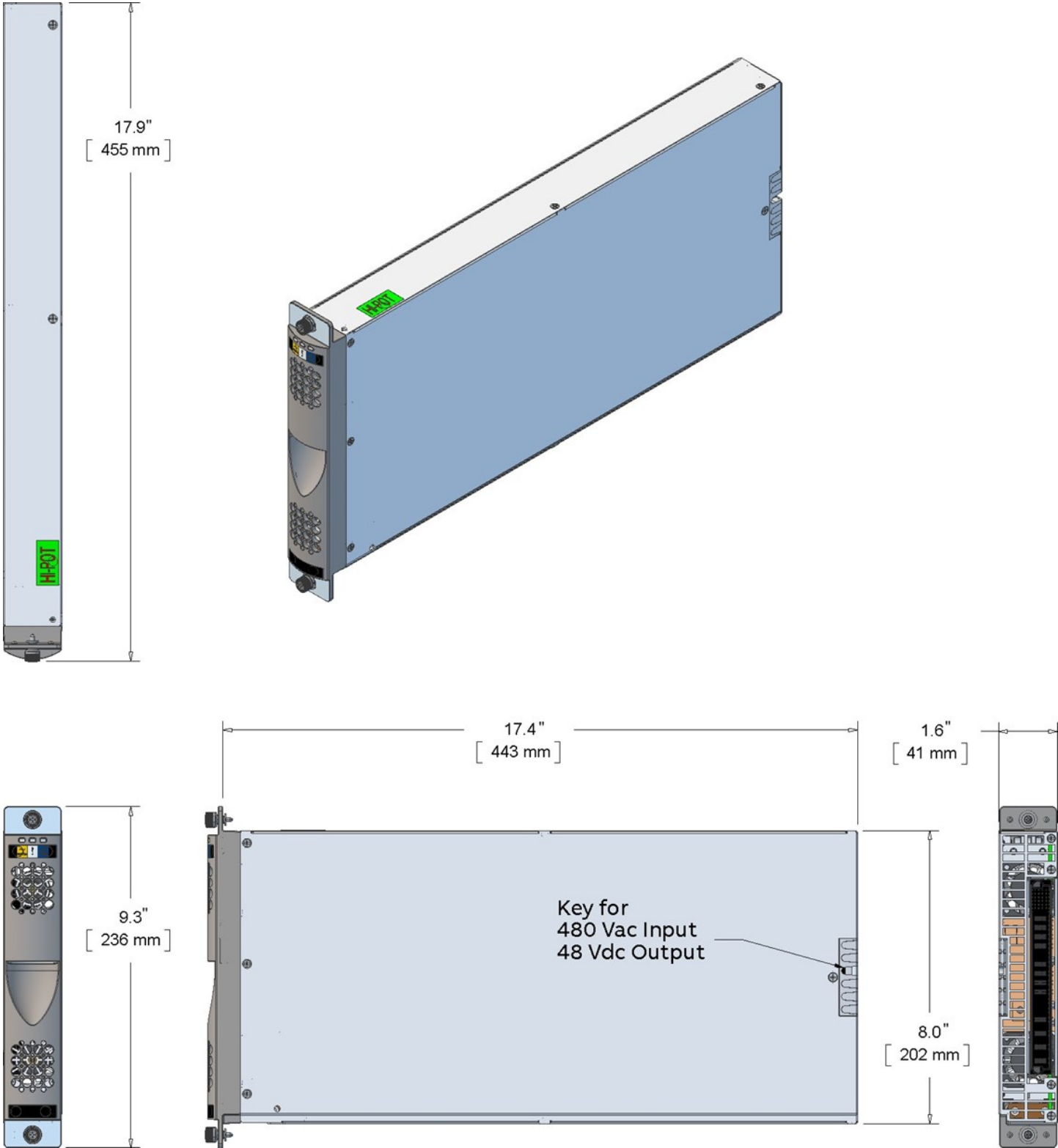
Parameter	Function	Standard	Level	Criteria	Test	
AC input	Conducted Emissions	EN55032, FCC part 15	A – 6dB		0.15 – 30MHz	
		EN61000-3-2, Telcordia GR1089-CORE	margin		0 – 2 KHz	
	Radiated Emissions	EN55032	A – 6dB margin		30 – 10000MHz	
	Line surge		$3 \times V_{NOM}$ 480V	B	1 F only or all 3F	
				A	-30%, 10ms	
		EN61000-4-11			B	-60%, 100ms
		Output will stay above 40V <sub>DC</sub> @ full load			B	-100%, 5sec
		Sag must be higher than 80Vrms.			A	25% sag for 2 sec
	Line Sags and Interruptions			A	1 cycle interruption	
AC Input Immunity		SEMI-F47 Compliant at derated power. Output will Stay at derating Power	50% Sag	Any Phase	10 cycles @ 50Hz 12 cycles @ 60Hz	
			70% Sag		25 cycles @ 50Hz 30 cycles @ 60Hz	
			80% Sag		50 cycles @ 50Hz 60 cycles @ 60Hz	
Lightning Surge		EN61000-4-5, Level 4, 1.2/50µs – error free		A	4kV, comm	
				A	2kV, diff	
			ANSI C62.41-2002	3, Category B 3, Category B	B, Table2 B, Table3 B, Table7	6kV/0.5kA 6kV, 3kA 2kV, severity II
			100kHz ringwave 1.2/50µs-8/20µs 550ns EFT burst			
Fast transients	EN61000-4-4		3	A	5/50ns, 2kV (common mode)	
Conducted RF fields	EN61000-4-6		3	A	130dBµV, 0.15 - 80MHz, 80% AM	
Enclosure Immunity	Radiated RF Fields	EN61000-4-3	3	A	10V/m, 80 - 1000MHz, 80% AM	
		ENV 50140		A		
ESD		EN61000-4-2	4	A	8kV contact, 15kV air	

Note: Surges and sags applied one phase at a time and all three phases simultaneously; phase angles 0, 90, 270°

# Technical Specifications (continued)

## Physical Specifications (continued)

### Overall Dimensions



GP100 for Edge Power Architecture [1600092584A]



## Technical Specifications (continued)

### LED Reporting Table



Rectifier Condition	LED State		
	AC OK Green	Fault Red	DC OK Green
1 OK	1	0	1
2 Thermal Alarm (5C before shutdown)	1	Blinks	1
3 Thermal Shutdown	1	1	0
4 Defective Fan	1	1	0
5 Blown AC Fuse in Unit	1	1	0
6 AC Present but not within limits	Blinks	0	0
7 AC not present	0	0	0
8 Boost Stage Failure	1	1	0
9 Over Voltage Latched Shutdown	1	1	0
10 Over Current	1	0	Blinks
11 Non-catastrophic Internal Failure	1	1	1
12 Standby (remote)	1	0	0

Item	Description	Ordering code
GP100 for Edge	True three-phase 380-480 V <sub>AC</sub> to 48 V <sub>DC</sub> , 6kW rectifier for data centers	1600092584A

## Contact Us

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## Change History (excludes grammar & clarifications)

Version	Date	Description of the change
4.4	12/28/2021	Updated as per template Upgraded RoHS standard



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