BMR320

8:1 fixed ratio digital IBC (400 W)

BMR320 is based on an unregulated and non-isolated topology, and is intended for applications needing a lower voltage intermediate bus for improved system efficiencies such as AI and Cloud Computing.

BMR320 delivers an efficiency of 97.6% at half load, and offers a PMBus compatible digital interface, and is supported by our Flex Power Designer tool.

Up to 3 units can be used in parallel to supply an overall output power of up to 1080 W.

Key features

- 8:1 fixed ratio IBC
- Small form factor
- Parallelable - up to 3 units
- Unregulated
- Non-isolated
- Digital interface with PMBus
- Excellent price/performance ratio

Target key electrical information

Parameter	Values
Input range	40 - 60 V
Output voltage	5 - 7.5 V
Output current continuous	60 A at 54 in
Output power continuous	400 W
Output peak power	740 W

Mechanical

27.0 x 18.0 x 6.4 mm / 1.06 x 0.71 x 0.25 in

Soldering methods

- Pb Free SMD reflow

Application areas

- Designed for Artificial Intelligence (AI) applications

Product options

The table below describes the different product options.

Example:	BMR320	1	0	01	/002	C	Definitions
Product family	BMR320						
Pin length options		1					0 = Pin length TBD 1 = SMD
Baseplate / HS option			0				0 = No baseplate
Other hardware options				01			00 = Standard variant 01 = variant of P_{peak} 740 W @ 40-60 V_{in}
Configuration code					/002		/001 = standard config. for 40-60 Vin /002 = P_{peak} 740 W for 40-60 Vin
Packaging options						C	C = Tape on Reel H = hard tray, dry pack

For more information, please refer to Part 3 Mechanical information.

Part 1: Electrical specifications

Absolute maximum ratings

Stress in excess of our defined *absolute maximum ratings* may cause permanent damage to the converter. Absolute maximum ratings, also referred to as *non-destructive limits,* are normally tested with one parameter at a time exceeding the limits in the electrical specification.

Characteristics	min	typ	max	Unit
Operating temperature (T_{P1})	-40		125	°C
Storage temperature	-55		125	°C
Input voltage (V_{in})	-0.3		60	V
Isolation voltage (input to output)	0		0	V
5V V_{CC}	-0.3		5.5	V
Enable control pin voltage	-0.3		V_{CC}+0.3	V
PMBus pins	-0.3		V_{CC}+0.3	V

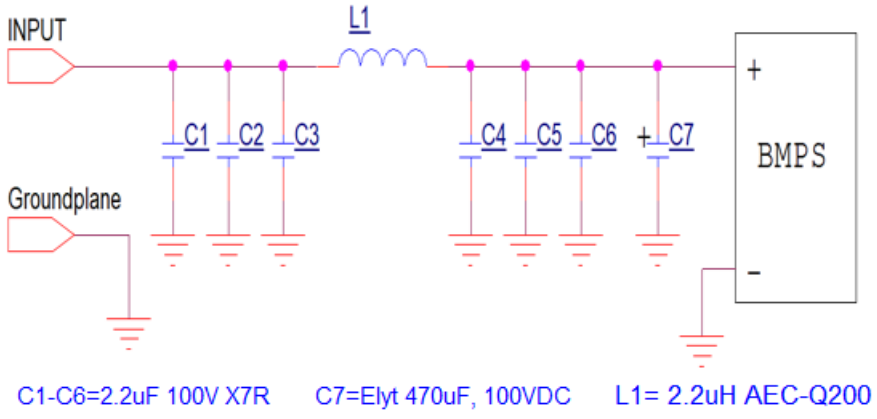
Reliability

Failure rate (λ) and mean time between failures (MTBF= 1/ λ) are calculated based on *Telcordia SR-332 Issue 4: Method 1, Case 3, (80% of I_{out_TDP}, T_{P1} = 40°C, Airflow = 200 LFM).*

	Mean	90% confidence level	Unit
Steady-state failure rate (λ)	108	142	nfailures/h
Standard deviation (σ)	26.3		nfailures/h
MTBF	9.24	7.04	MHr

Typical application diagram

Capacitor values are defined in the Electrical Specification tables. The EMI filter is defined in the EMC Part 2.



Electrical specifications for BMR3201001/002

6.7 V, 60 A (110 A peak) / 400 W (740 W peak)

Min and Max values are valid for: T_{P1} = -40 to + 85°C, V_{in} = 40 to 60 V, unless otherwise specified under conditions. Typical values given at: T_{P1} = +25°C, V_{in} = 54 V, max P_{out_TDP}, unless otherwise specified under conditions, see Note 1.
Additional external C_{in} = 220 µF, C_{out} = 1 mF

Characteristic	conditions	minimum	typical	maximum	unit
Key features					
	50% of P_{out_TDP}		97.6		%
	100% of P_{out_TDP}		96.5		%
	50% of P_{out_TDP} V_{in} = 40V		96.9		%
Efficiency (η)	100% of P_{out_TDP} V_{in} = 40V		95.7		%
P_{out_TDP} thermal design power (TDP)	See Note 1			400	W
P_{out_MAX} peak power (t ≤ 2.5 ms)	See Note 1			740	W
Recommend capacitive load		110		5000	µF
	50% of P_{out_TDP}		5.5		W
	100% of P_{out_TDP}		14		W
	50% of P_{out_TDP} V_{in} = 40V		6.1		W
Power Loss	100% of P_{out_TDP} V_{in} = 40V		22		W
Input characteristics					
Input voltage range (V_{in})		40	54	60	V
Input OVP		63	64	65	V
Recommended external input capacitance		47		470	µF
Output characteristics					
Output voltage initial setting and accuracy	P_{out} = 0 W	5	6.7	7.5	V
Output current (I_{out})	V_{in} = 40 - 60 V	0	60	80	A
Max start-up load	Max load			5	A
Load transient voltage deviation	See Note 2		±200		mV
Load transient recovery time	See Note 2		5		ms
Output ripple & noise	max P_{out_TDP}			50	mV_{p-p}

Note 1: Peak output current is rated at 110 A at 54V_{in}. Peak power is ≤ 740 W and continuous power (thermal design power (TDP) is ≤ 400 W depending on thermal conditions.
Note 2: Load step 25-75-25% of max P_{out_TDP} di/dt = 1 A/µs.

Electrical specifications for BMR3201001/002

6.7 V, 60 A (110 A peak) / 400 W (740 W peak)

Characteristic	conditions	minimum	typical	maximum	unit
On/off control					
Turn-off input voltage	Decreasing input voltage		35.5		V
Turn-on input voltage	Increasing input voltage		37		V
Minimum enable activate time from 5V VCC applied		50			ms
Ramp-up time (from 10−90% of V_{out})			8		ms
Enable start-up time				20	ms
Logic high: trigger level	Voltage Rising			0.7	V
Logic low: trigger level	Voltage Falling	0.6			V
Logic high: response time			0.5		ms
Sink current			0.35		mA
Protection features					
Compare OCP threshold			240		A
Compare OCP response time	Note 4, 5			1	µs
Average OCP threshold			130		A
Average OCP response time	Note 3, 4, 5	0.75		1	ms
Timed OCP threshold			110		A
Timed OCP response time			3.5		ms
Fault response			Latch		
Output overvoltage protection (OVP)			7.9		V
Output overvoltage protection (OVP) response and type	Latching			100	us
Over temperature protection (OTP)			125		°C
Over temperature protection (OTP) response and type				100	us
5.0 V Vcc Auxiliary power					
Voltage		4.5	5.0	5.5	V
Current	Note 1			200	mA

Electrical specifications for BMR3201001/002

6.7 V, 60 A (110 A peak) / 400 W (740 W peak)

In the table below all PMBus are written in capital letters.

T_{P1} = -40 to +125 °C, V_{in} = 40 to 60 V, unless otherwise specified under conditions.
Typical values given at: T_{P1} = +25 °C, V_{in} = 54 V, max P_{out_TDP}, unless otherwise specified under conditions

Command	Conditions	minimum	typical	maximum	Unit
Monitoring accuracy					
Input voltage READ_VIN			±0.3	±2	V
Output voltage READ_VOUT			±80	±250	mV
Output current READ_IOUT			±1.5	±5	A
Temperature READ_TEMPERATURE_1	See Note 1 See Note 2		±1	±5	°C

Note 1: Depends on cooling type and thermal resistance.
Note 2: Below 0° C the temperature telemetry readings deviation is higher and not possible to read temperature lower then –22°C
Note 3: The threshold is compared against a moving average value of four samples with 0.25 ms sampling interval. In addition, up to 0.3 ms may pass after a fault is trigged before switching stops.

Note 4: Response time = the required duration time being above the threshold in order to trig a fault.

Note 5: In practice, the effective response time may be longer due to that temperature is changing during the transient.

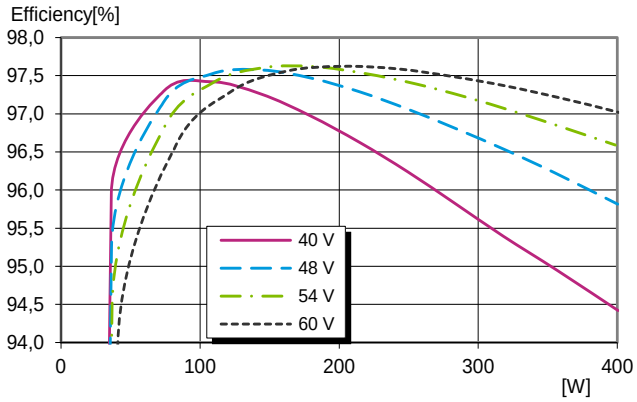
For more detailed information please refer to Technical Reference Document: PMBus commands.

This product is supported by the Flex Power Designer tool.

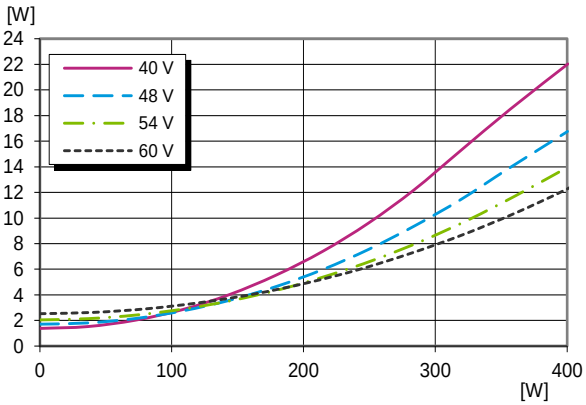
Electrical graphs for BMR3201001/002

6.7 V, 60 A (110 A peak) / 400 W (740 W peak)

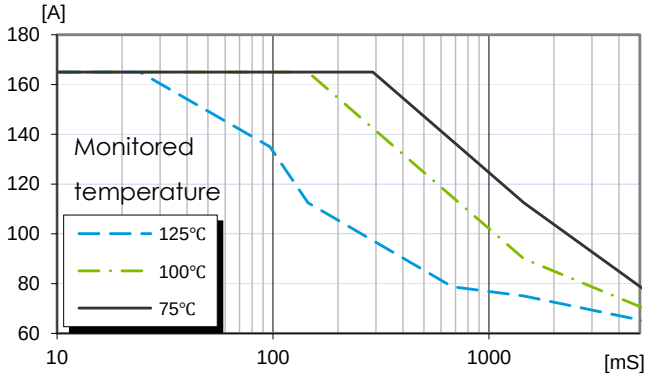
Efficiency



Power dissipation



Peak Current Capability

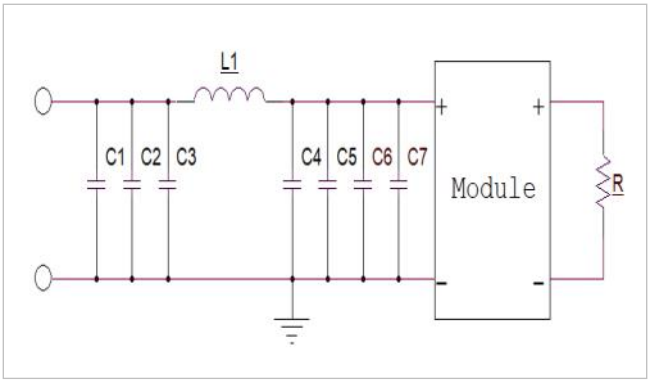


Max peak output current vs pulse duration and monitored temperature when pulse starts. Limit given by max internal junction temperature of hotspot component.

Part 2: EMC

Optional external filter for Class B

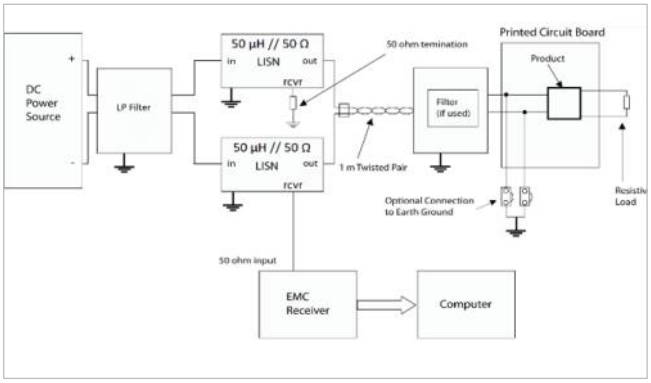
Suggested external input filter in order to meet Class B in EN 55022 / EN 55032, CISPR 22 / CISPR 32 and FCC part 15J.



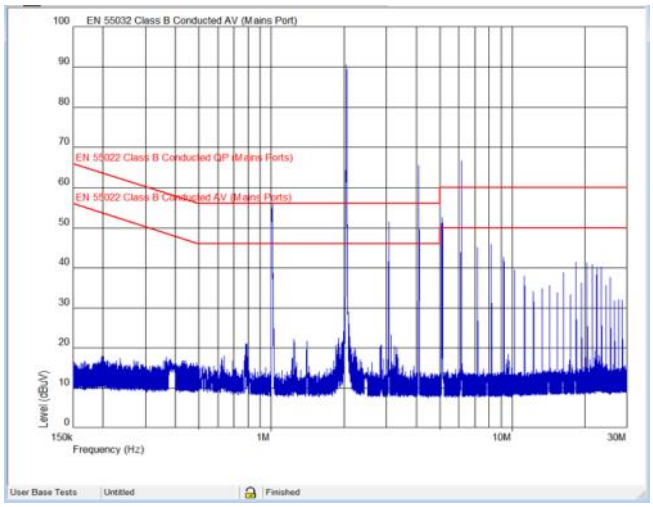
Filter components:
C1-C6 2.2uF 10% 1210 100V X7R, capacitor

C7 470uF 100VDC 20%, Electrolite capacitor

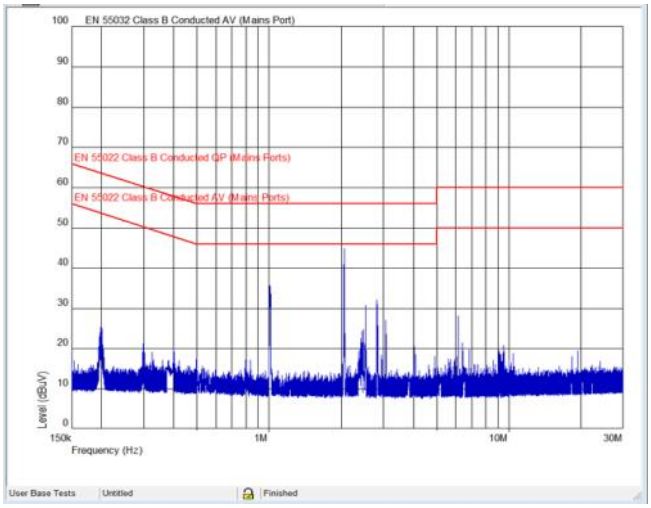
L1 2.2uH 20% 12A DC, Inductor



Test set-up



Without EMC filter, V_{in}= 54 V, max P_{out_TDP}

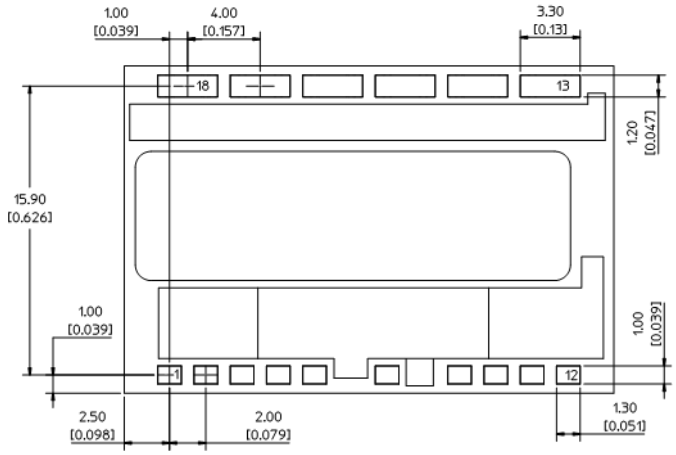


With EMC filter, V_{in}= 54 V, max P_{out_TDP}

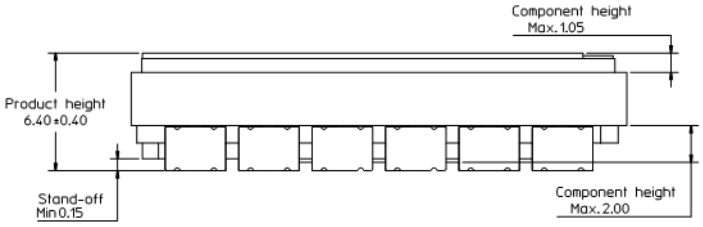
Part 3: Mechanical information

BMR320xxxx/xxx: surface mounted

Bottom view



Side view



Pins

Material: Copper alloy

Plating: Min 0,1 µm Au over 2 µm Ni

Module weight: typical 9.3 g

All dimensions in mm [inches]

Tolerances unless specified:

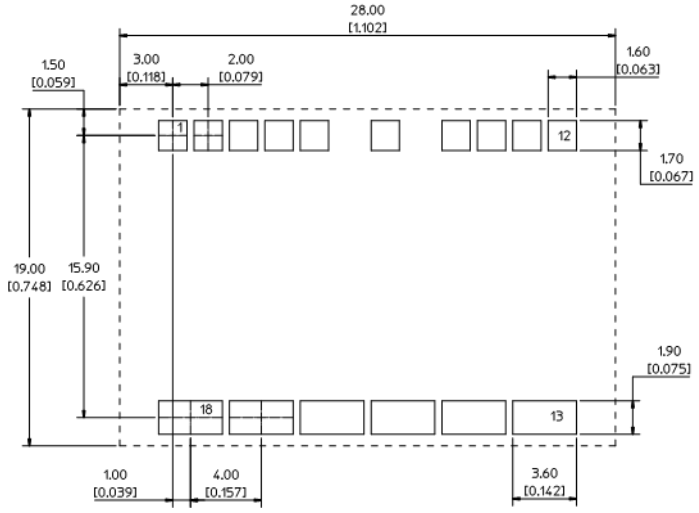
x.x ±0.5 mm [0.02 inch]

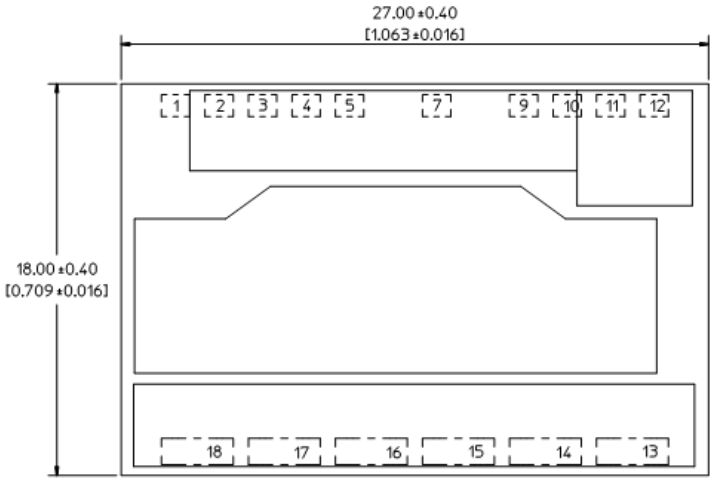
x.xx ±0.25 mm [0.01 inch]

(not applied on footprint or typical values)

Note: Max pull force 6N, this applies for an orthogonal force widespread over the whole ferrite surface

Top View - Recommended footprint all variants showing pin positions





Pin	Designation
1	Not connected
2	SCL
3	SDA
4	GND
5	ADDR
6	Not mounted
7	VIN
8	Not mounted
9	5V Vcc

Pin	Designation
10	Not connected
11	ON/OFF
12	PGOOD
13	Vout+
14	GND
15	Vout+
16	GND
17	Vout+
18	GND

Part 4: Thermal considerations

The products are designed to operate using a heatsink mounted on top of the device.

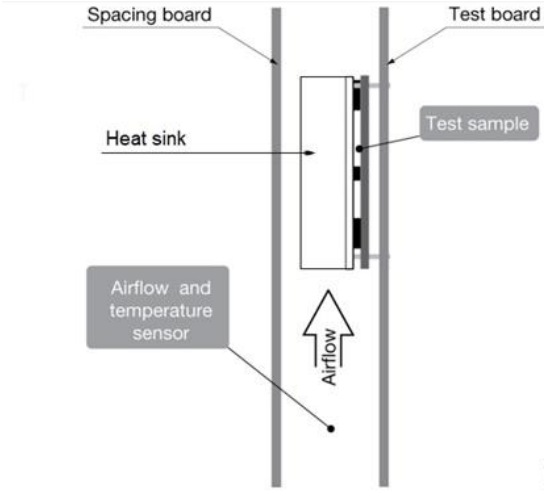
General

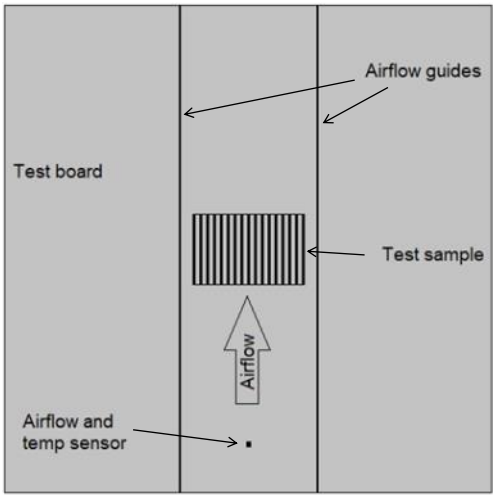
For products mounted on a PWB with a heatsink attached, cooling is achieved both by conduction, from the pins to the host board, and through the heatsink mounted on top of the device. The wind speed and temperature are measured in a point upstream the device. The output current derating graphs found later in this section provide the available output current vs. ambient air temperature and air velocity at V_{in} = 54 V.

For products using any form of heatsink structure a top spacing board and side airflow guides are used to ensure airflow hitting the module and not diverted away.

Distance between the tested device and the top space board and the side airflow guides are 6.35 mm ± 1 mm.

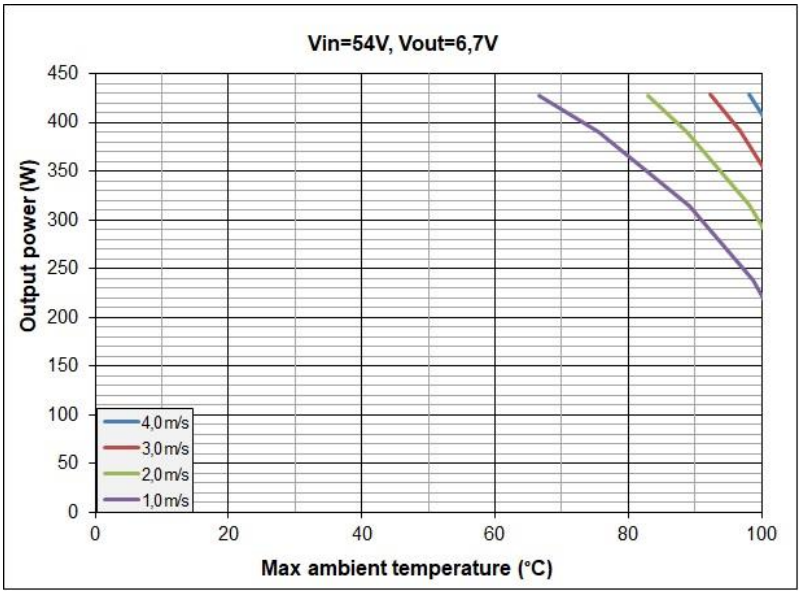
The product is tested on a 200 x 200 mm, 105 µm (3 oz), 6-layer test board mounted vertically in a wind tunnel.





Thermal graphs

Output power derating



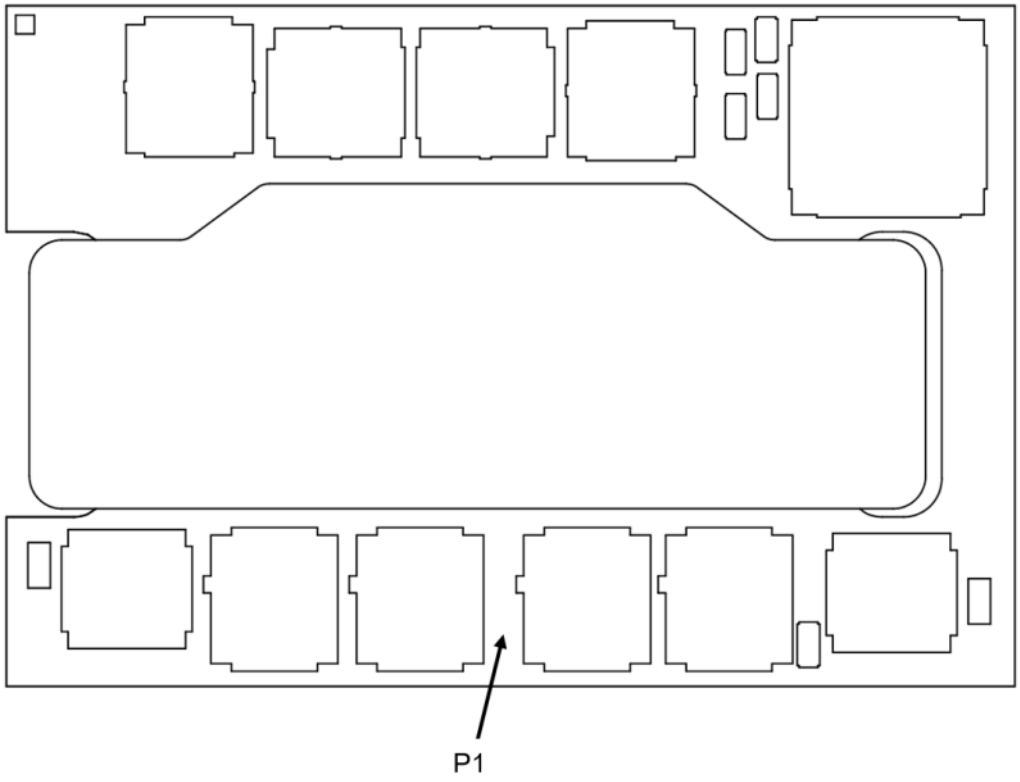
Device with 4.7 K/W thermal resistance heat sink.

Definition of product operating temperature

Proper thermal conditions can be verified by measuring the temperature at position P1 as shown below. The temperature at this position (T_{P1}) should not exceed the maximum temperatures in the table below. The number of measurement points may vary with different thermal design and topology. Temperatures above maximum T_{P1}, measured at the reference point P1 are not allowed and may cause permanent damage.

Position	Description	Max. Temp.
P1	PWB TOP side	T_{P1}= 125 °C

TOP view

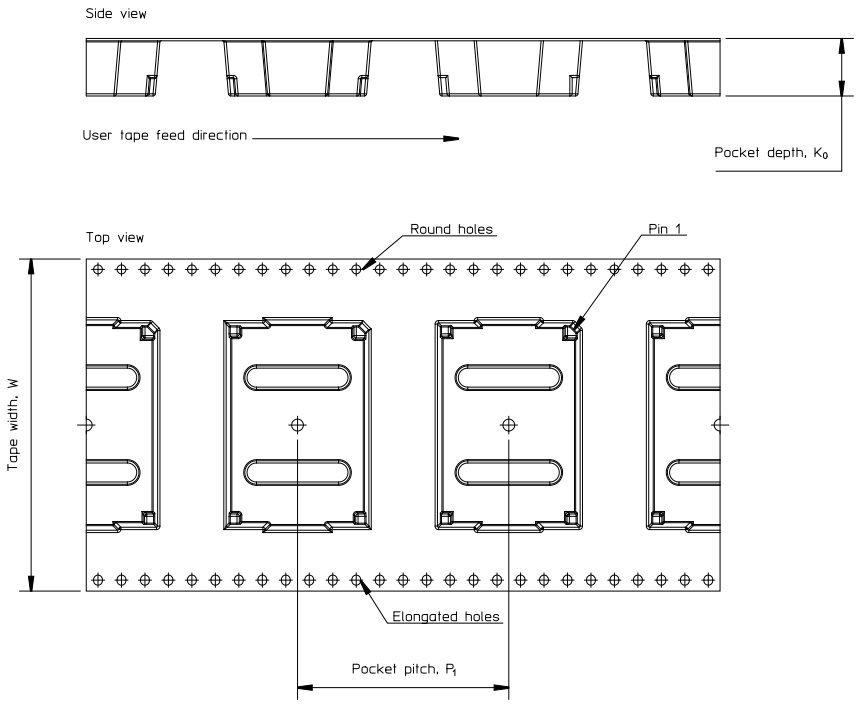


Part 5: Packaging

Packaging information

The surface mount products are delivered in an antistatic carrier tape (Jedec design EIA 481 standard).

Carrier Tape Specification	
Material	Antistatic PS
Surface resistance	10^7 < ohm/square
Bakabilty	Tape cannot be baked
Tape width, W	56 mm [2.2 inch]
Pocket pitch, P_1	28 mm [1.1 inch]
Pocket depth, K_0	7.75 mm [0.287 inch]
Reel diameter	380 mm [15 inch]
Reel capacity	200 products /reel
Reel weight	2.3 kg/full reel



Part 6: Revision history

Revision table

Revision number	revision change	date	revisor
Rev. A	New document	2024-08-06	jidgezou
Rev. B	Updated the file header	2024-08-07	jidgezou

Flex Power Modules, a buiness line of Flex, is a leading manufacturer and solution provider of scalable DC/DC converter primarily serving the data processing, communications, industrial and transportation markets. Offering a wide range of both isolated and non-isolated solutions, its digitally-enabled DC/DC converters include PMBus compatibility supported by the powerful Flex Power Designer.