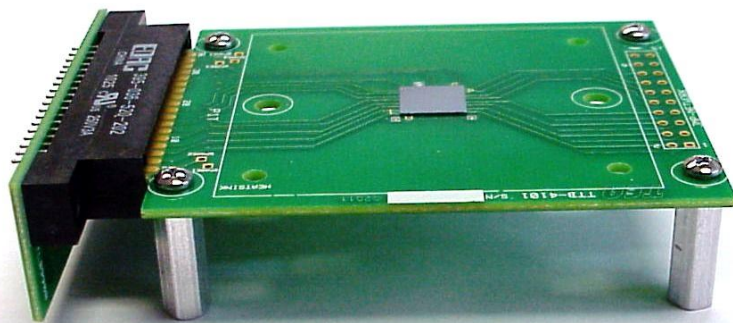
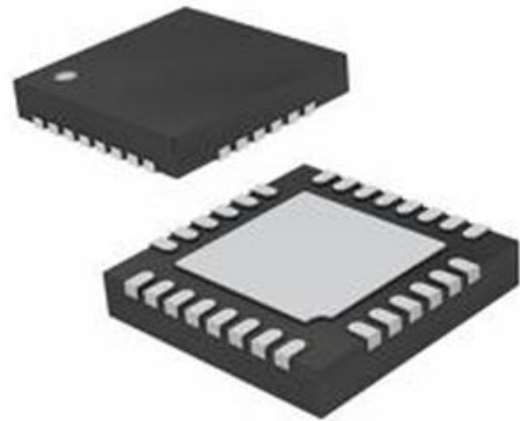
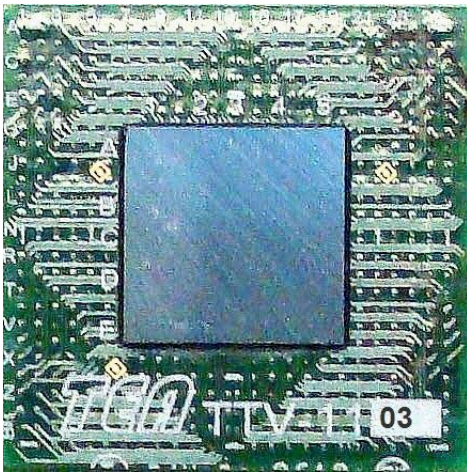


Thermal Test Vehicle

Product Family



Thermal Engineering Associates, Inc.

3287 Kifer Road, Santa Clara, CA 95051 USA

Tel: 650-961-5900 Email: info@thermengr.com

CHIP PACKAGING

Standard Packages

The Thermal Test Chips are also available in packaged form. TEA currently offers standard products in BGA and QFN versions. Other package types are currently being developed; please contact TEA for the latest packaged TTC product offerings.

BGA Packages

Package Size (mm)	Chip Type	Package Contacts	# Con-tacts	Chip Array	Chip Size (mm)	Electrical Configuration	Part Number
40X40				10x10			
27X27	FC	1mm pitch 0.6mm Ø	480 peripheral array	1X1	2.5X2.5	Fully Program- able (FP)	TTV-1101
				2X2	5.08X5.08		TTV-1201
				3X3	7.65X7.65		TTV-1102
				4X4	10.23X10.23		TTV-1202
				5X5	12.8X12.8		TTV-1103
18X18	FC	0.5mm pitch 0.30mm Ø	1225	5X5	12.8X12.8	Special	TTV-2103
12.7X12.7	WB	0.8mm pitch 0.5mm Ø	201*	2X2	5.08X5.08	Series	TTV-1501
12.7X12.7	FC			2X2	5.08X5.08		TTV-1502

* Includes 25 thermal balls in center

Examples of the 27X27mm packages are shown in figure at right.

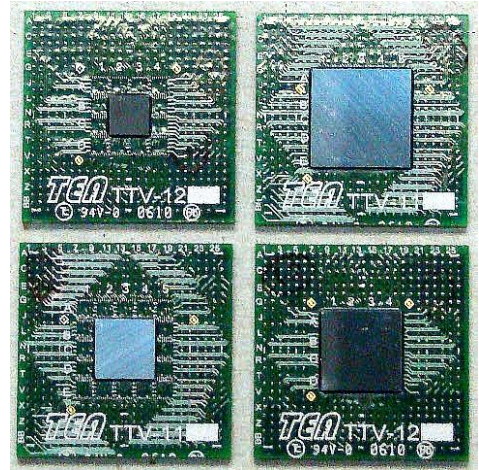


Figure 8-1 TTV-110X & TTV-120X

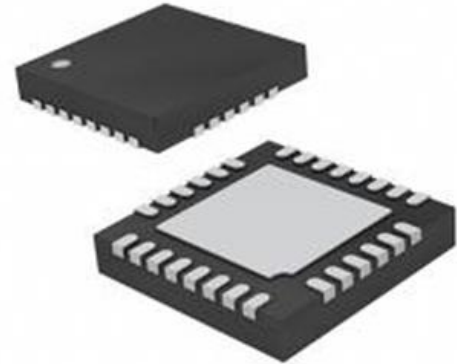
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QFN Packages

Package Size (mm)	Chip Type	Package Contacts	# Con-tacts	Chip Array	Chip Size (mm)	Electrical Configuration	Part Number
6X6	WB	0.5mm pitch	32	1X1	2.5X2.5	Series	TTV-3006
8X8			56	2X2	5.08X5.08		TTV-3008
10X10			72	3X3	7.65X7.65		TTV-3010
12X12			80				TTV-3012

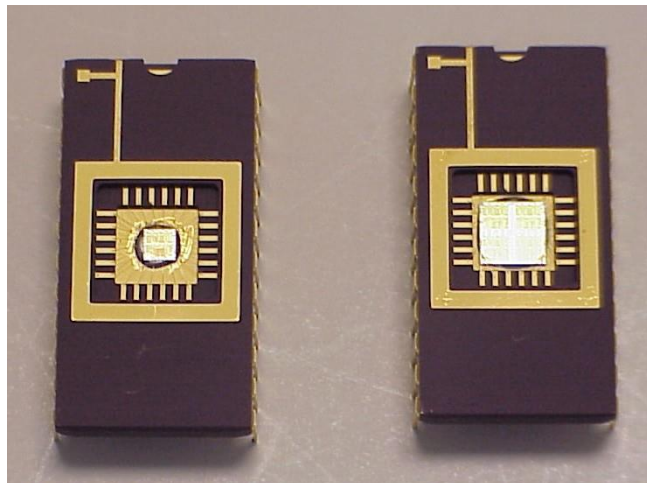
These packages are open-cavity type and have exposed Direct Attach Pad (DAP) on bottom side.



DIP Packages

Package Size	Chip Type	Package Contacts	# Con-tacts	Chip Array	Chip Size (mm)	Electrical Configuration	Part Number
0.60" W (15.24mm)	WB	0.10" (2.54mm) pitch	24	1X1	2.5X2.5	Series	TTV-3101
1.24" L (31.5mm)			24	2X2	5.08X5.08		TTV-3102

These ceramic side brazed packages have silicon lid tapped onto packed for chip protection.



Please contact TEA for package details and optional versions of these packages.

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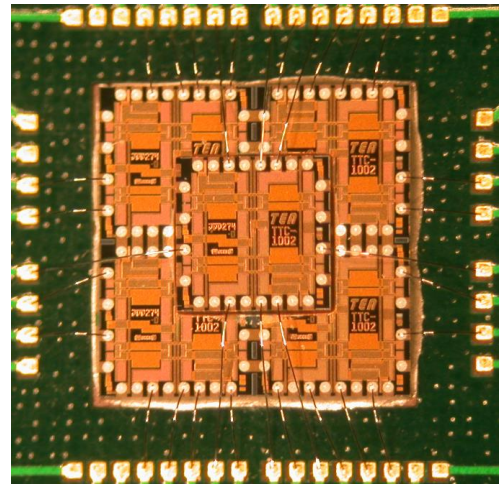
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Custom Packages

TEA offers package and test board development services for those requirements that can not be addressed by the standard packages and boards described above.

In addition to single chip packages, TEA can also develop and supply the TTC in custom stacked chip packages (see image at right for example), multi-chip (horizontal layout) packages, and Package-on-Package components.

Please contact TEA for discussions about specific custom package requirements.



Wire Bond 1X1 chip mounted on Wire Bond 2X2 chip

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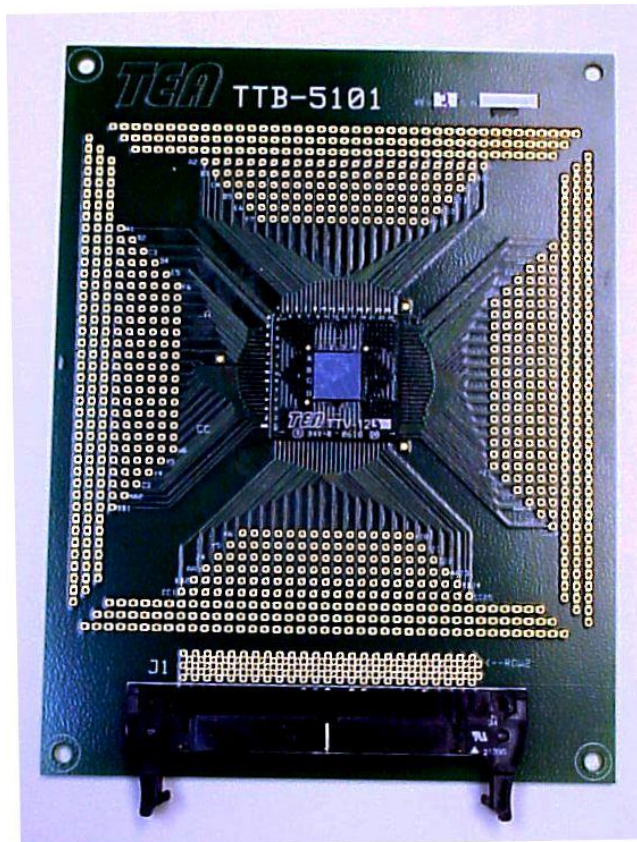
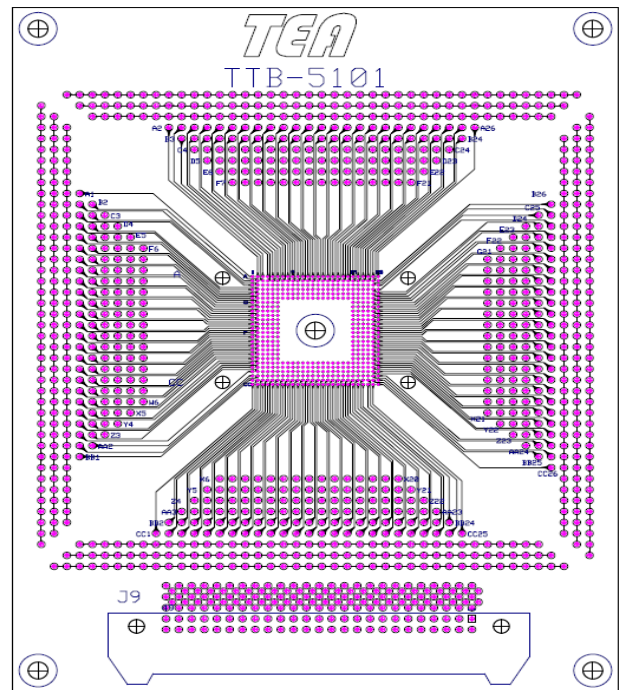
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THERMAL TEST BOARDS

TTB-5101 Direct Attach Thermal Test Board

Features:

- **Direct-attach test board for use with TTV-11XX and TTV-12XX Thermal Test Vehicles.**
- **Every ball contact is available for all possible configurations of TTV applications.**
- **50-pin boxed header with connector latches mounted provides electrical connection access to the board.**
- **Wire jumpers configure the board for specific applications.**
- **Board is 120.7mm X 158.8mm.**
- **Socketed version (TTB-6101) also available.**



TTB-5101 shown with TTV-1202 mounted.

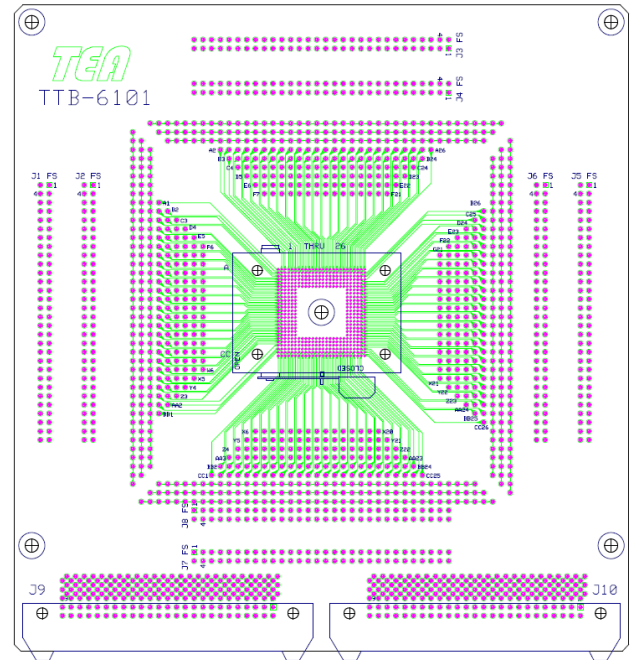
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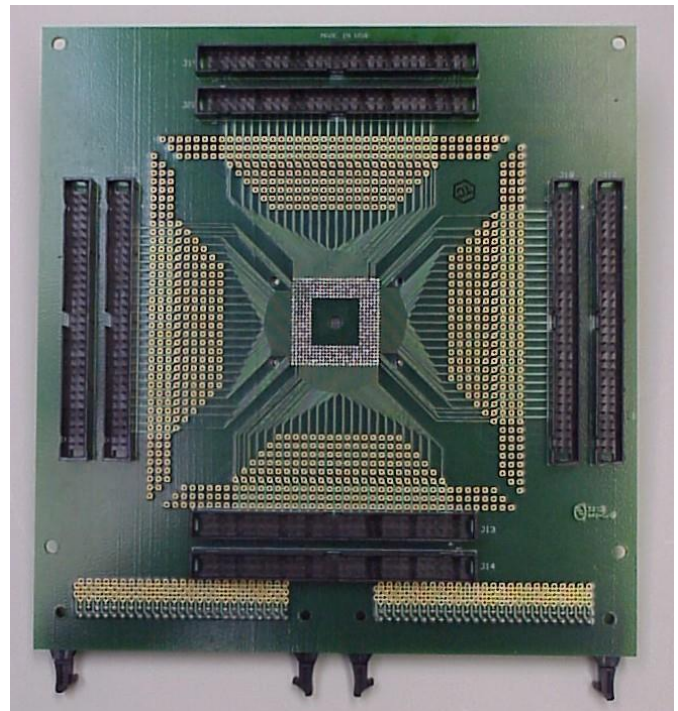
TTB-6101 Socketed Thermal Test Board

Features:

- Socketed test board for use with TTV-11XX and TTV-12XX Thermal Test Vehicles.
- Every ball contact is available for all possible configurations of TTV applications.
- J1 ⇒ J8 provide direct connection to all 480 balls – 60-pin boxed headers mounted on bottom side.
- J9 & J10 are available for custom connection configuration to select TTV contacts by jumper wiring – two 50-pin boxed header with connector latches.
- Board is 178mm X 187mm.
- Direct Attach version (TTB-5101) also available.



Top view showing BGA socket & ribbon cable connectors



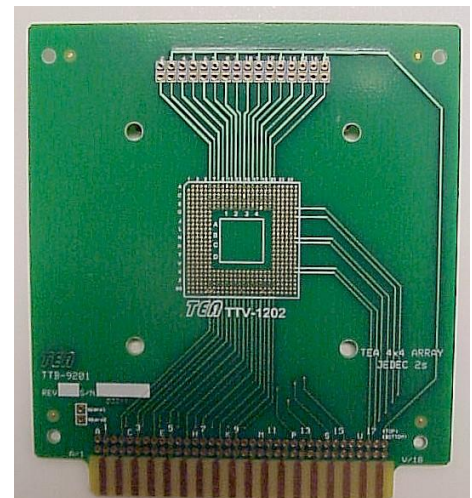
Bottom view showing boxed header connectors

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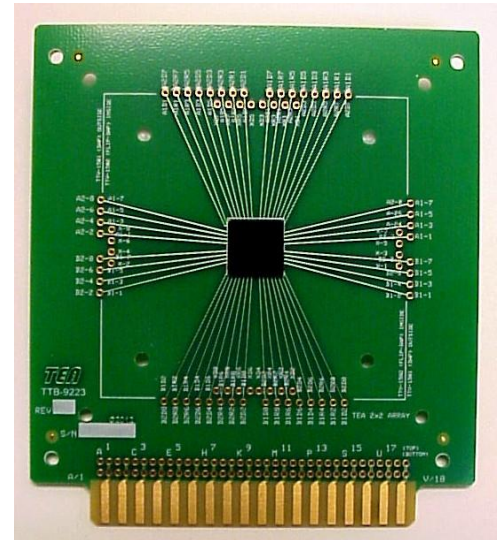
TTB-9201 Thermal Test Board

- Direct attach test board for use with TTV-1202 Thermal Test Vehicle.
- Eight series strings of heating resistors that can be wired in parallel for uniform heating or powered individually for non-uniform heating applications.
- Ten temperature sensing diodes across the array are available through the connector contacts.
- Thirty-six edge finger dual row contacts have 0.156" pitch and mate with EDAC 357-036-520-202 solder tail connector.
- Board is 4" (101.6mm) X 4.5" (114.3mm).



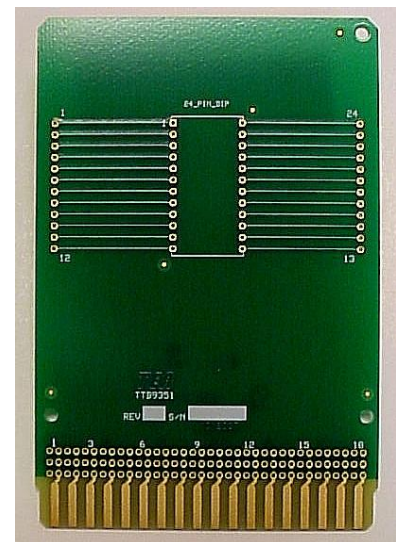
TTB-9223 Thermal Test Board

- Direct attach test board for use with TTV-1501 and TTV-1502 Thermal Test Vehicles.
- Four series strings of heating resistors that can be wired in parallel for uniform heating or powered individually for non-uniform heating applications.
- Four temperature sensing diodes across the array are available through the connector contacts.
- Thirty-six edge finger dual row contacts have 0.156" pitch and mate with EDAC 357-036-520-202 solder tail connector.
- Board is 4" (101.6mm) X 4.5" (114.3mm).



TTB-9351 Thermal Test Board

- Direct attach or socketed (socket is optional) test board for use with TTV-3101 and TTV-3102 Thermal Test Vehicles.
- With mounting of TTV-3101, there are two series strings of heating resistors that can be wired in parallel for uniform heating or powered individually for non-uniform heating applications.
- With mounting of TTV-3102, there are four series strings of heating resistors that can be wired in parallel for uniform heating or powered individually for non-uniform heating applications.
- Four temperature sensing diodes in the mounted array is available through the connector contacts.
- Thirty-six edge finger dual row contacts have 0.156" pitch and mate with EDAC 357-036-520-202 solder tail connector.
- Board is 3" (76.2mm) X 4.5" (114.3mm).



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Chip-on-Board Products

(Pictures shown below are of the TTV-4101 but are generally applicable to other versions.)

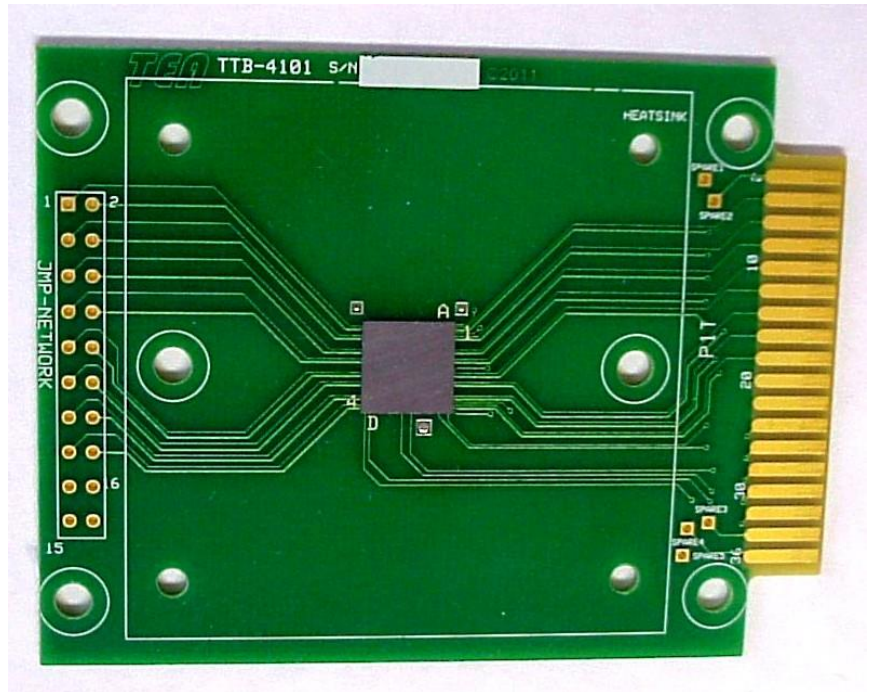
TTV-410X Board

TTV-4101-0-000

(4X4 Array, 10.23X10.23mm)

TTV-4102-0-000

(5X5 Array, 12.8X12.8mm)



TTV-410X Board with Mating Connector and Breakout Board

TTV-4101-?-000

(4X4 Array, 10.23X10.23mm)

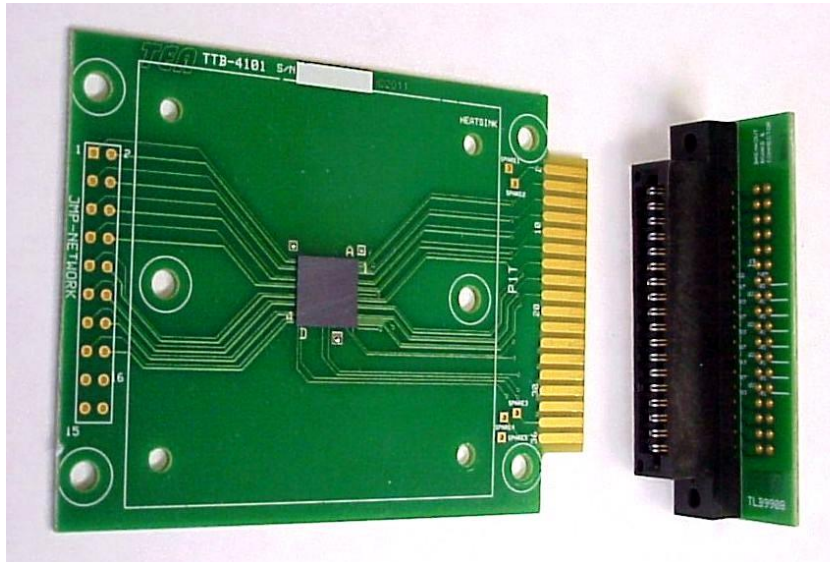
TTV-4102-?-000

(5X5 Array, 12.8X12.8mm)

? = 1 for 105°C connector
? = 2 for 150°C connector

Notes:

- 1) The Jumper Network solder eyelets shown on the left in the pictures above can be used to electrically reconfigure the heating resistors – see schematics for the board electrical connections.
- 2) The Breakout Board/Connector combination can be used with either the board up or down position relative to the edge finger connectors.
- 3) Refer to the TTC-1002 Applications Manual for further information on the chips. Manual is available upon request from TEA.



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TTV-4103

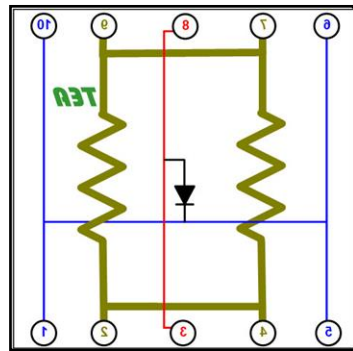
Refer to the TTV-4103 Applications Manual for further information (available upon request).



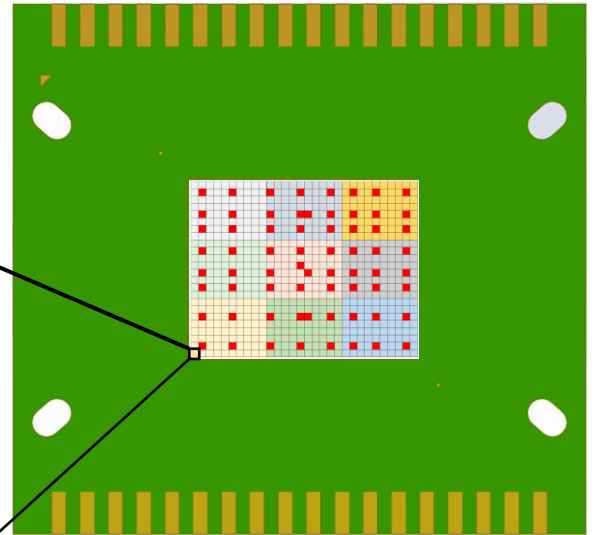
Max power

3.6kW @60V

2.5kW @50V



9 heating zones



67 temperature sensor locations (possible)
(matrix design, accessible through 18 connections)

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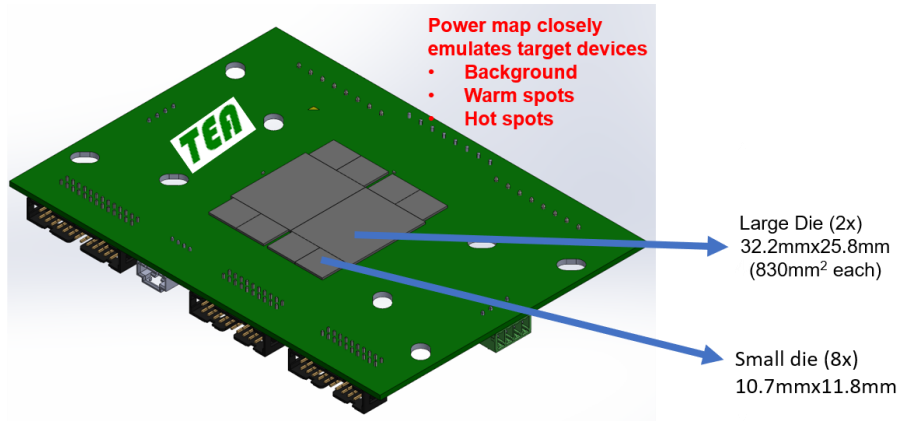
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TTV-4104

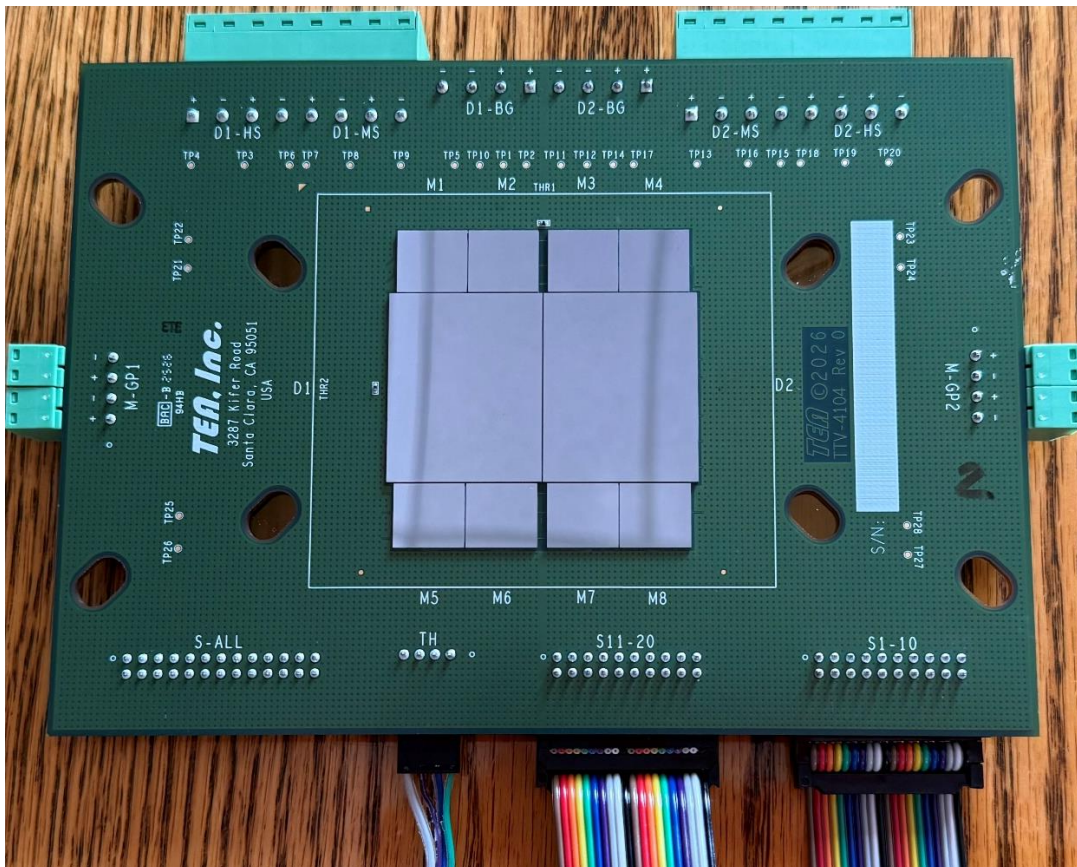
Refer to the TTV-4104 Applications Manual for further information (available upon request).



Total Si area: 2,672 mm²
Total power achievable: >6,500W
Total *in situ* temperature sensors: >100

Diode temperature sensor configuration

- 42 sensors in each large die
- 5 sensors in each small die
- 124 sensors total



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