Vincotech

用于1500 V太阳能应用的升级产品

新型VINcoNPC X12设计
用于推动光伏集中式逆变器的更高效率

EMPOWERING **YOUR IDEAS**

用于1500 V 太阳能应用的升级产品

1MW 1500 V 直流光伏集中式逆变器的三电平模块

由于成本压力的推动，太阳能系统正向着1000V以上直流电压的应用方向发展。多组串逆变器快速适应着新要求，减小了与集中式逆变器的差价，从而加剧了电力设施的竞争。两电平解决方案对于集中式逆变器不再具有竞争力，而简单地将两电平封装调整为三电平拓扑并不能解决问题。这种做法不仅限制了最大频率，而且降低了三电平配置的优势。

Vincotech利用对三电平模块深入的了解及经验，提出了大功率解决方案。

低电感的VINco X封装，其设计正是为了处理更高的开关频率，同时可有效降低无源组件的成本并实现更高效率。

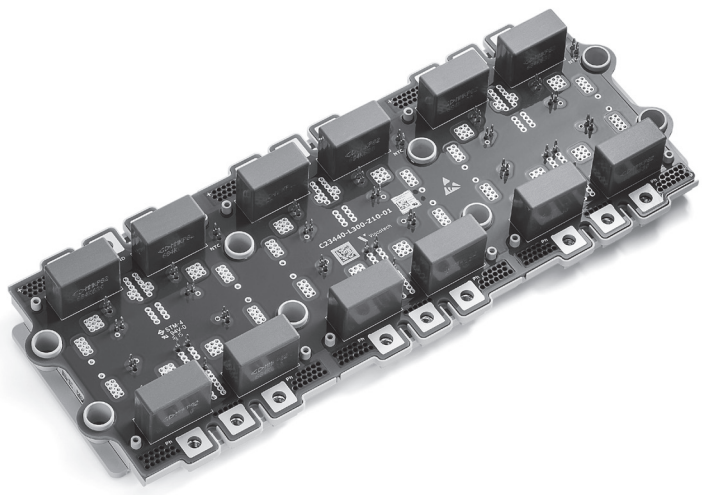


图1： VINcoNPC X12

VINco X

VINcoNPC X12系列产品在保持组串型逆变器的速度和灵活性的同时全面满足了集中式逆变器的各类要求。

终端连接能够将DC与AC级相分离，从而大大简化母排设计。

布局经过精心设计，可确保电流分配均匀，防止各组件过载。

特点

- 针对三电平拓扑结构进行了优化连接
- 内部电感较低（低感应换向回路5 nH；高感应回路9 nH），可实现更高的频率
- 完全对称的布局以实现更好的均流
- 模块化结构以获得更好的散热性能

优势

- 更简易的母排设计
- 所需的无源器件更小
- 内部器件不会过载
- 热分布更均匀
- 为集中式逆变器提供更具成本优势的解决方案

新型 VINco X12
功率更高

新型M7 IGBT和二极管与VINcoNPC X12系列完美匹配。M7芯片具有较高的功率密度，可以将标称电流从1200 A增加到1800 A。

此外，导通损耗降低了20%，并且开关特性提供了优异的EMI性能。

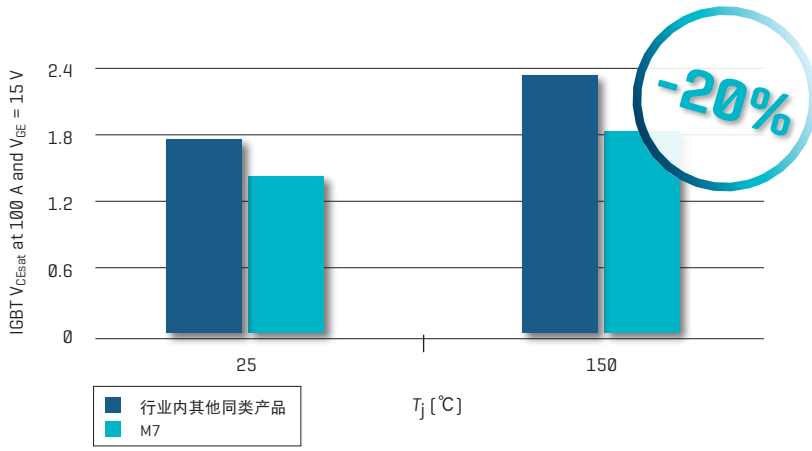


图3： IGBT V_{CEsat} at 100 A and V_{GE} = 15 V

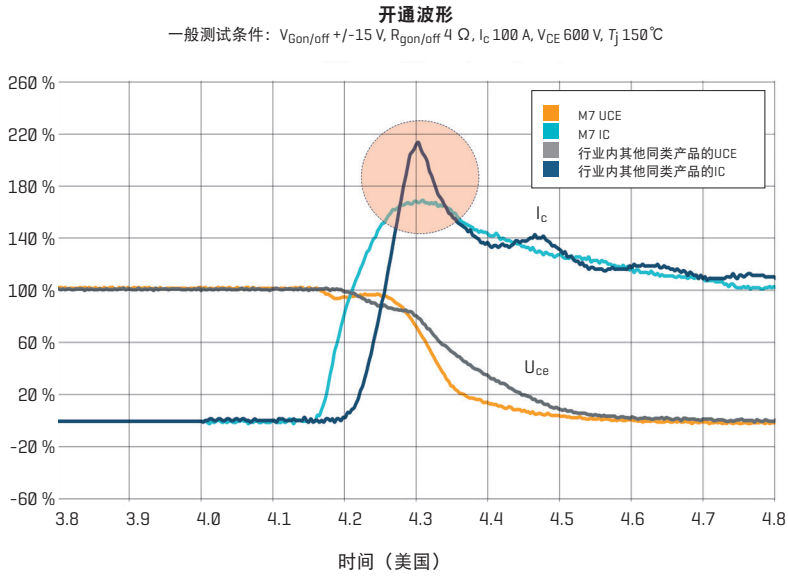
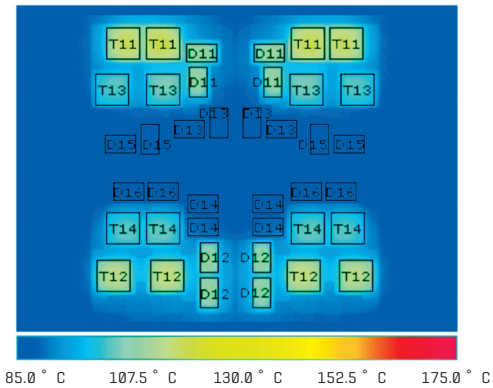


图4： 开通波形
测试条件： $VG_{on/off}$ +/-15 V, $R_{gon/off}$ 4 Ω, I_C 100 A, V_{CE} 600 V, T_j 150 ℃

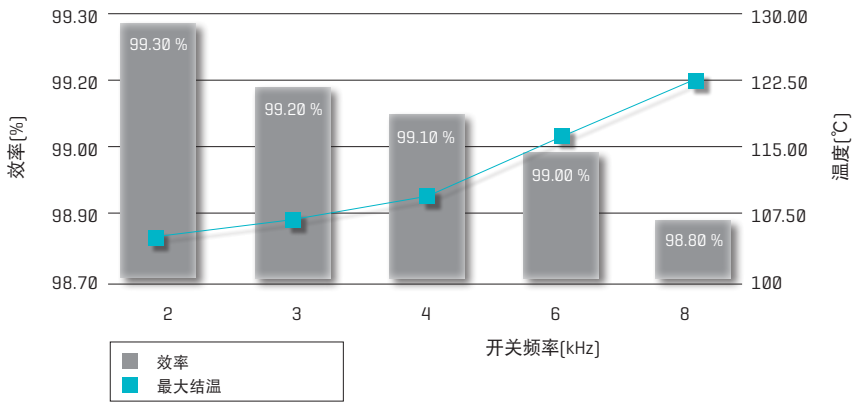
无需并联模块即可达到1MW，也不必使用两电平高感量设计来实现三电平配置。

通过每相使用一个模块来达到1MW，在6kHz下可以实现99%的高效率，在较低的开关频率下甚至实现更高的效率。在这些条件下，所有器件的最大结温保持在120℃以下，保证了过载条件下具有良好的安全余量。



条件：
V_{IN} = 1300 V_{DC}; V_{OUT}= 400 V_{AC}; I_{OUT} = 833 A/phase; f_{SW} = 6kHz; f_{SW} = 50 Hz; $R_{g\_ON/OFF}$ = 0,5 Ω; T_{SINK} = 85℃

图5：输入功率为1 MW时，70-W624NIA1K8M701-LD00FP70一个单元的热分配情况



条件： V_{IN} = 1300 V_{DC}; V_{OUT}= 400 V_{AC}; I_{OUT} = 833 A/phase; f_{SW} = 50 Hz; $R_{g\_ON/OFF}$ = 0,5 Ω; T_{SINK} = 85℃

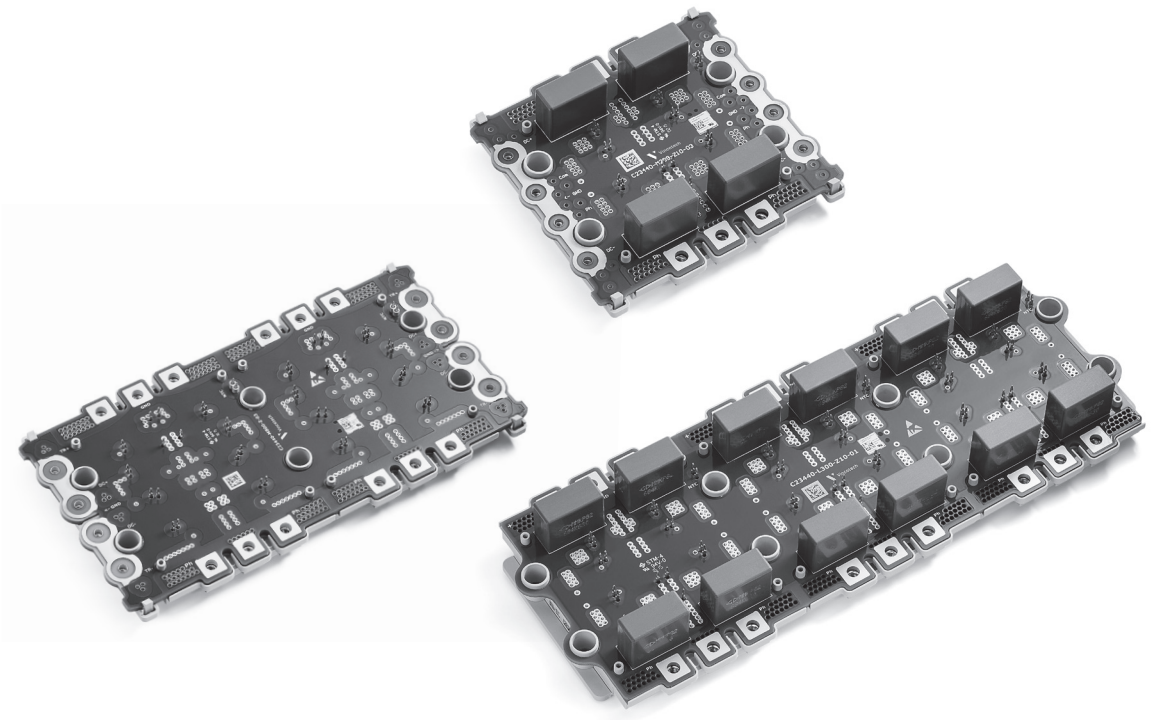
图6：LD00FP70的效率和最大结温与1 MW开关频率对比

VINco X
产品系列

VINco X4封装　　VINco X8封装　　VINco X12封装

产品号	拓扑	芯片技术	电压	电流	封装
70-W224NIA400SH-M400P	NPC	IGBT 4	2400 V	400 A	VINco X4
70-W424NIA800SH-M800F	NPC	IGBT 4	2400 V	800 A	VINco X8
70-W624N3A1K2SC-L400FP	NPC	IGBT 4 HS	2400 V	1200 A	VINco X12
70-W624N3A1K2SC01-L400FP10	NPC	IGBT 4	2400 V	1200 A	VINco X12
70-W624NIA1K2M702-L400FP70*	NPC	IGBT M7	2400 V	1200 A	VINco X12
70-W624NIA1K8M701-LD00FP70*	NPC	IGBT M7	2400 V	1800 A	VINco X12

* 正在开发中



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Vincotech

A STEP UP FOR **1500 V SOLAR**

The new VINcoNPC X12 engineered to power update efficiency of PV Central Inverters

EMPOWERING **YOUR IDEAS**

A STEP UP FOR 1500 V SOLAR

Three-level Modules for 1+ MW 1500 VDC Solar PV Central Inverters

Cost pressure is driving the development of solar energy systems that can handle more than 1000 VDC. Multi-string inverters are adapting fast to the new requirements reducing the price gap with central inverters thus heating up the competition for utilityscale installations.

Two-level solutions are no longer competitive for central inverters and simply adapting two-level housings to three-level topologies is not the answer.

This limits the maximum frequency and negates some of the advantages of three-level configurations. Vincotech has tapped its deep well of experience with three-level modules to come up with high-power solutions.

The low inductive VINco X housings are built to handle higher switching frequencies, enabling you to reduce your overhead in passive components and achieve outstanding efficiencies.

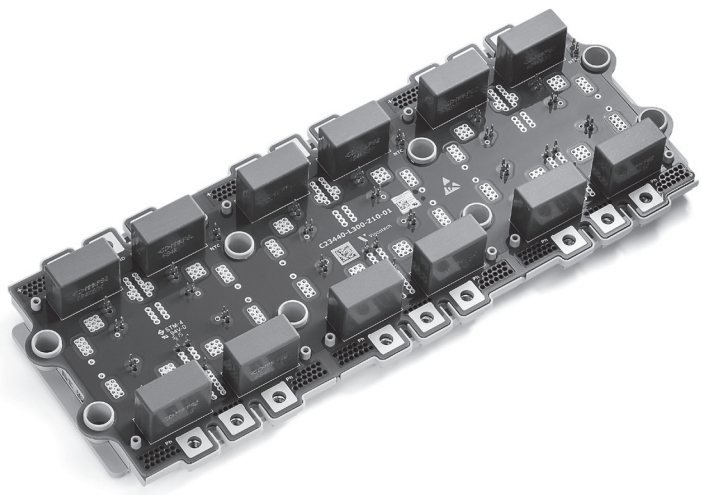


Figure 1: VINcoNPC X12 outline

VINco X

VINcoNPC X12 family meets the demanding requirements for central inverters, while retaining the string inverter ‘s speed and flexibility.

The terminal connection allows DC and AC stages to be split, which makes busbar design that much easier.

The layouts are meticulously designed to guarantee even current distribution and prevent individual components from overloading.

Features

- Optimized connections for three-level topologies
- Low internal inductance (5 nH for low inductive commutation loop; 9 nH for the high inductive loop) enables higher frequencies
- Fully symmetrical layouts for uniform current sharing
- Modular constructions for better thermal performance

Benefits

- Easier busbar design
- Smaller passive components needed
- Individual dies are not overloaded
- Proper thermal performance
- Cost competitive solution for central inverters

New VINco X12 with extended Power

The new M7 IGBTs and Diodes are a perfect match for the VINcoNPC X12 family. The high power density of the M7 dies gives the possibility to increment the nominal current from 1200 A to 1800 A.

Besides, the conduction losses are up to 20 % lower and the switching characteristics offer a superior EMI behavior.

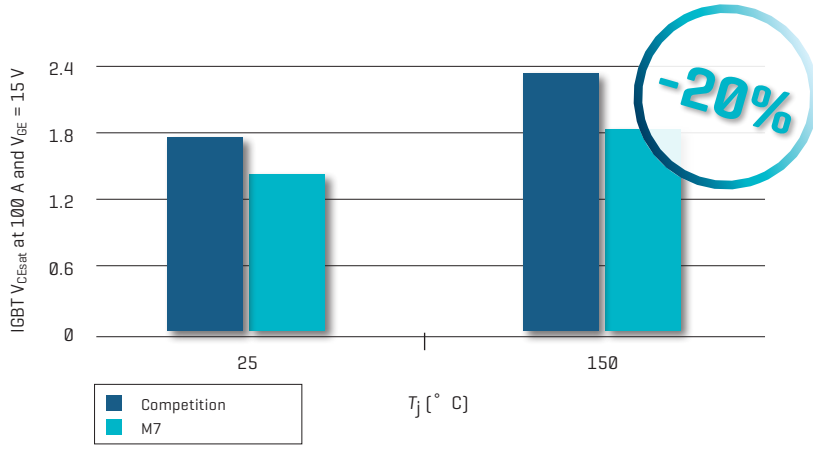


Figure 3: IGBT V_{CEsat} at 100 A and V_{GE} = 15 V

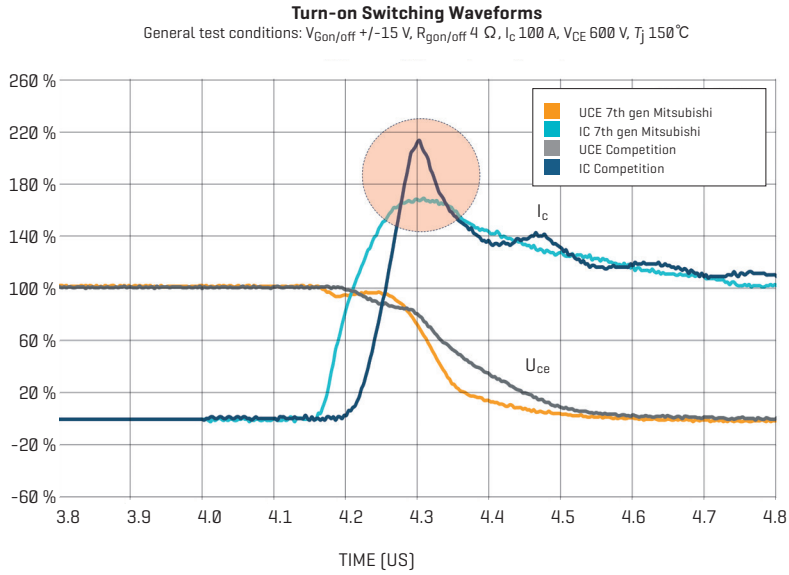
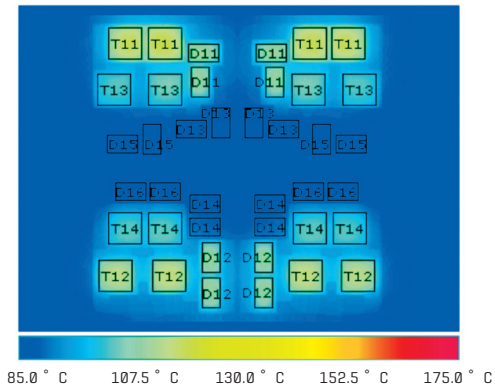


Figure 4: Turn-on Switching Waveforms
Test conditions: $VG_{on/off}$ +/-15 V, $R_{gon/off}$ 4 Ω, I_C 100 A, V_{CE} 600 V, T_j 150°C

1 MW can be reached without paralleling modules or having to use two-level modules in a high inductive design to achieve the three-level configuration.

By using one module per phase to reach 1 MW, an outstanding efficiency of 99 % can be achieved at 6 kHz, being even higher at lower switching frequencies. Under these conditions the maximum junction temperature of all components remains below 120° C, keeping a good safety margin for overload conditions.



Conditions:
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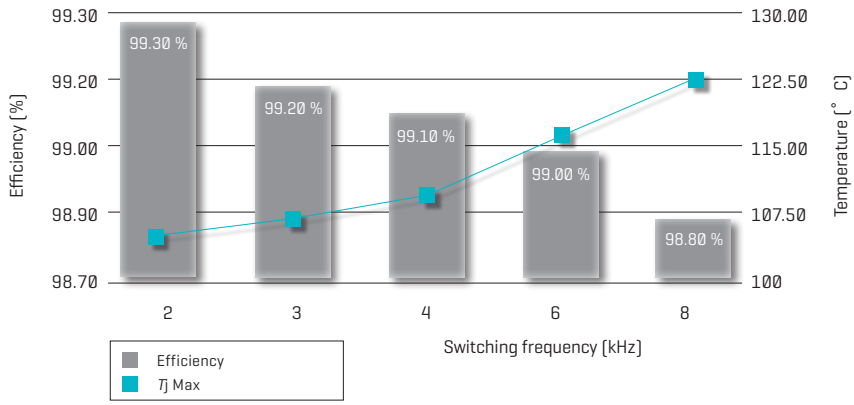
Figure 5: Thermal distribution of one unit of the 70-W624NIA1K8M701-LD00FP70 for 1 MW output power



Conditions: V_{IN} = 1300 V_{DC}; V_{OUT}= 400 V_{AC}; I_{OUT} = 833 A/phase; f_{SW} = 50 Hz; $R_{g\_ON/OFF}$ = 0,5 Ω; T_{SINK} = 85° C

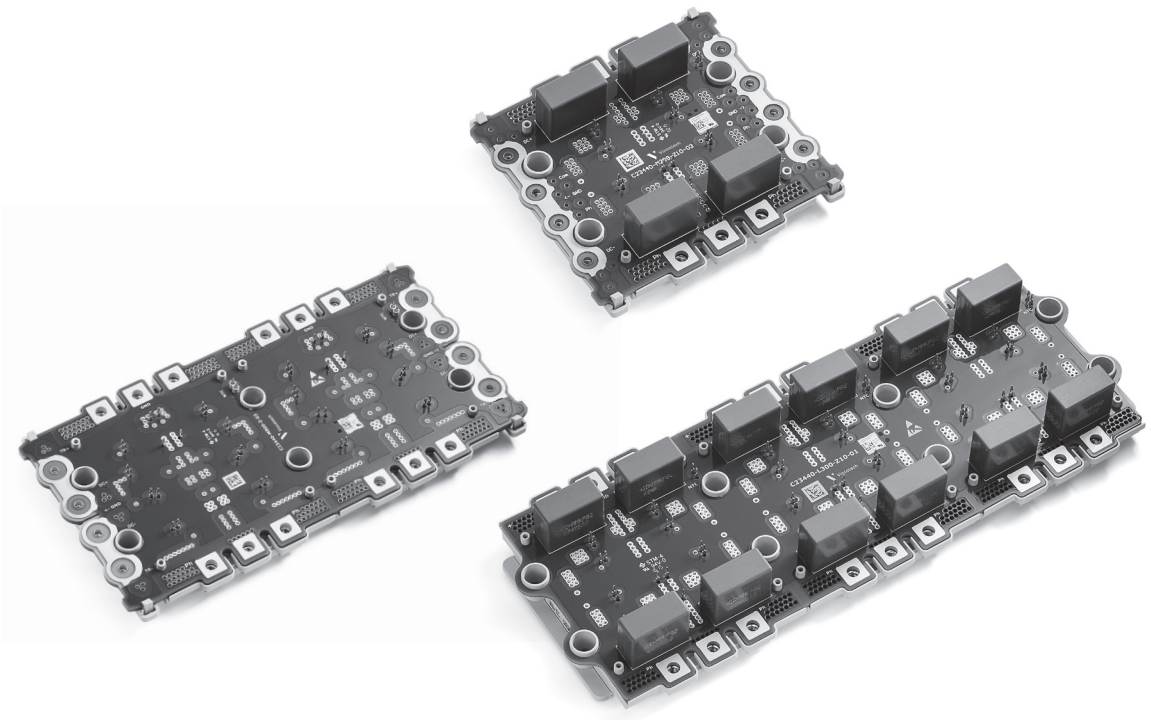
Figure 6: LD00FP70 efficiency and maximum junction temperature vs. switching frequency for 1 MW

VINco X
Product portfolio

VINco X4 Housing | VINco X8 Housing | VINco X12 Housing

Part Number	Topology	Chip technology	Voltage	Current	Housing
70-W224NIA400SH-M400P	NPC	IGBT 4	2400 V	400 A	VINco X4
70-W424NIA800SH-M800F	NPC	IGBT 4	2400 V	800 A	VINco X8
70-W624N3A1K2SC-L400FP	NPC	IGBT 4 HS	2400 V	1200 A	VINco X12
70-W624N3A1K2SC01-L400FP10	NPC	IGBT 4	2400 V	1200 A	VINco X12
70-W624NIA1K2M702-L400FP70*	NPC	IGBT M7	2400 V	1200 A	VINco X12
70-W624NIA1K8M701-LD00FP70*	NPC	IGBT M7	2400 V	1800 A	VINco X12

* Under development



VINco X

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