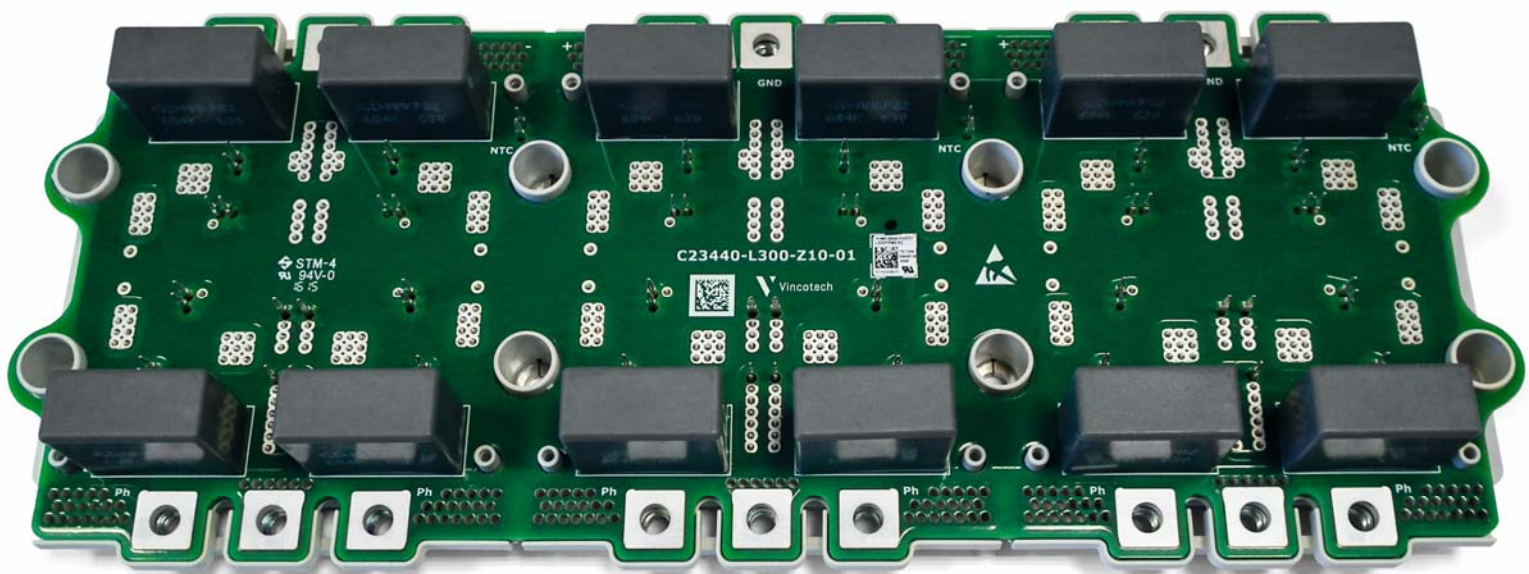




Vincotech

## AN for VINcoMNPC X12 (L30X)

How to drive this module using the GD-M20X Vincotech gate driver





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## Revision History

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## 1 Abstract

This application note describes the 70-W612M3A1K8SC02-L300FP70 Vincotech module. This AN will give a short description of the module and a description of the suitable Vincotech gate driver for this 1200 V/1800 A power module.

## 2 Introduction

The 70-W612M3A1K8SC02-L300FP70 is a new member of the Vincotech increased power range power modules family VINcoMNPC X12. It's a new member in VINco X12 housing and a new member in MNPC topology. With its power range 1200 V/1800 A targets the solar inverter, UPS and high speed motor drive market as well. To learn more about Vincotech modules, please visit: [www.vincotech.com](http://www.vincotech.com)

## 3 The power module.

70-W612M3A1K8SC02-L300FP70 is the latest high efficient mixed voltage NPC topology in VINco X12 housing with on board DC snubber capacitors for a low stray inductance MNPC topology with IGBT4 in half bridge IGBT position and IGBT3 in neutral path positions.

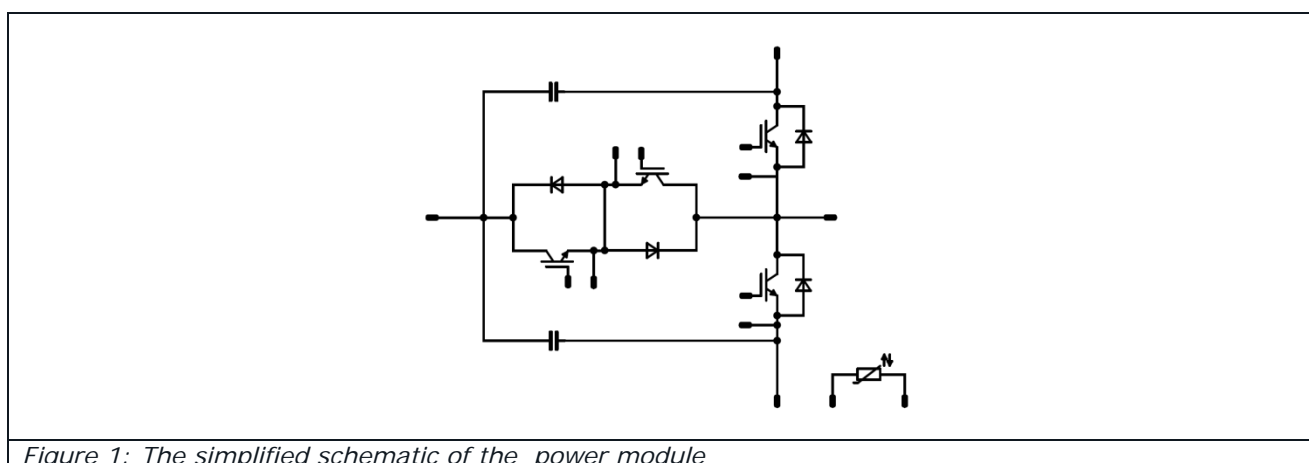


Figure 1: The simplified schematic of the power module

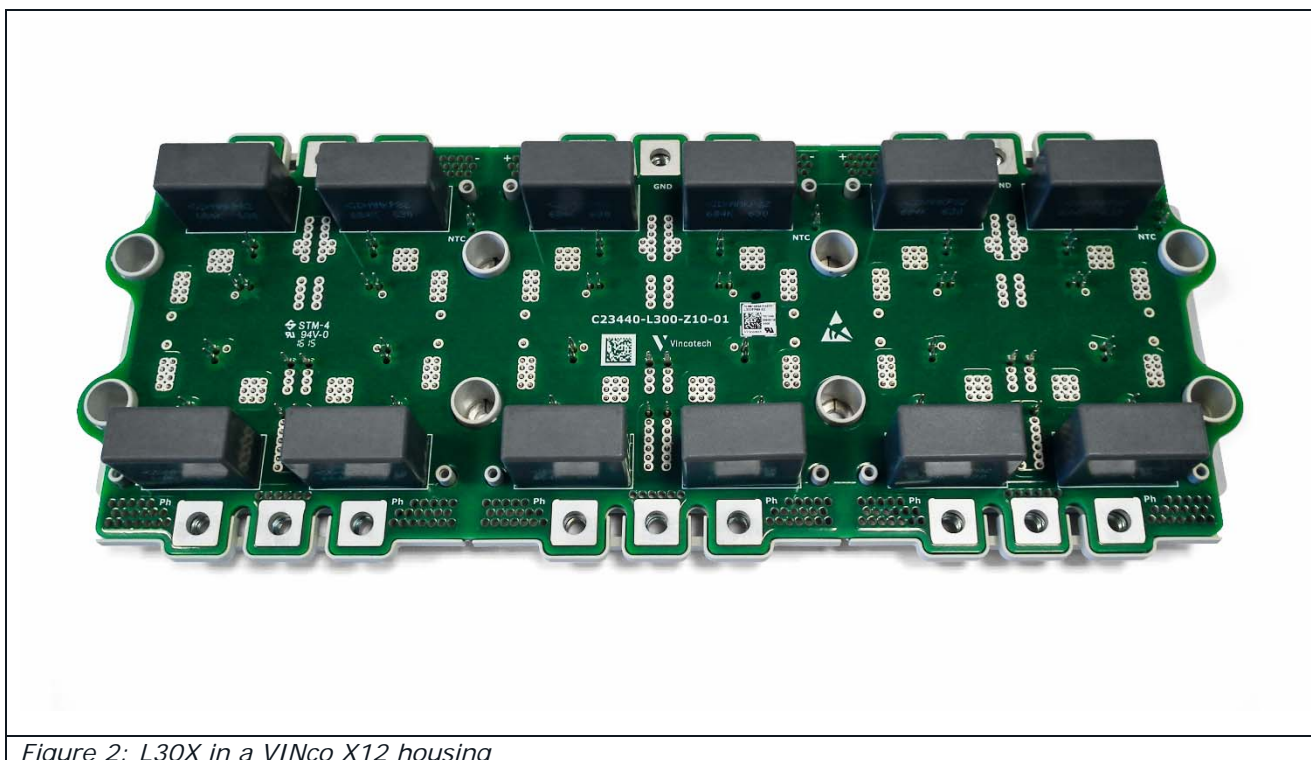


Figure 2: L30X in a VINco X12 housing

### 3.1 Mechanical dimensions, housing

The L300, packaged in the VINco X12 housing, can be seen in **figure 3** with its main dimensions. This new housing is from the “power” point of view a triplication of VINco X4 and joined together with its common PCB. The input screw connections: **DC+**, **GND**, **DC-**, and the output screw connections: **Ph** are joined together through the top PCB. Nevertheless, these input junctions still have to be connected together externally, while paying a special attention to a symmetrical connection to achieve a balanced current sharing.



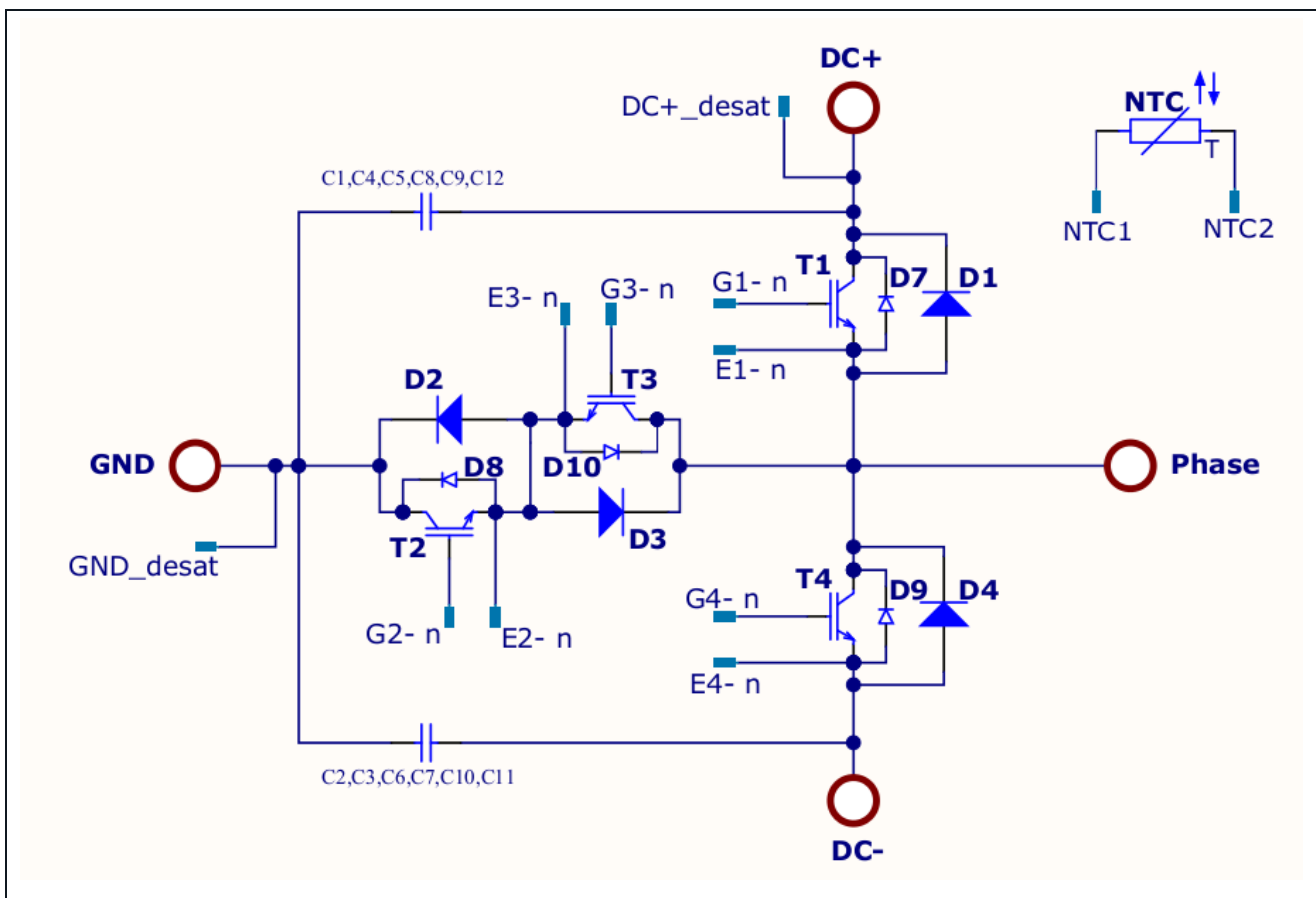


Figure 4: Schematic of the topology

ID	Component	Voltage	Current	Function
T1, T4	IGBT	1200 V	1800A	Half Bridge switch
D2, D3	FWD	650 V	1800A	Neutral path diode
T2, T3	IGBT	650 V	1800A	Neutral path switch
D1, D4	FWD	1200 V	1800A	Half Bridge diode
C	CAPACITOR	630 V		DC-Snubber Capacitor
Rt1,Rt2,Rt3	NTC			Thermistor

Table 1: Components , function , voltage /current rating

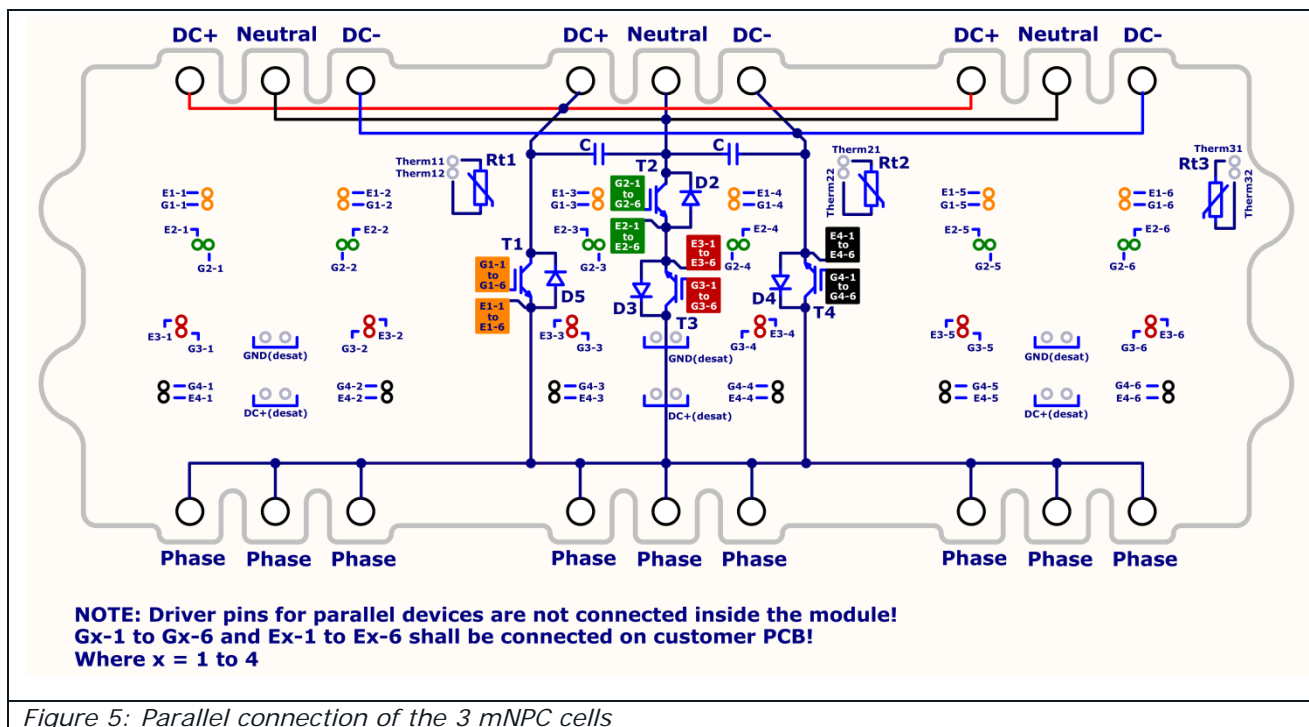


Figure 5: Parallel connection of the 3 mNPC cells



## 4 The gate driver of VINcoMNPC X12 (L30X)

Once the VINcoMNPC X12 is a successor of VINcoMNPC X4 it is obvious to use for L30X the same gate driver with certain modifications. Vincotech developed for the M20X module family its own gate driver **GD-M200-Master** and **GD-M200-Slave**. These gate drivers can operate in stand-alone or master-slave mode. So for L30X we can use the GD-M200 gate drivers in a SLAVE–MASTER-SLAVE configuration as will be shown in the next chapters.

For more details about the VINcoMNPC X4 gate driver please visit the Vincotech web site. Direct link to the AN:

[https://www.vincotech.com/Evaluation\\_board\\_for\\_M20x\\_VINcoMNPC\\_X4\\_modules](https://www.vincotech.com/Evaluation_board_for_M20x_VINcoMNPC_X4_modules)

### 4.1 Signal distribution at S-M-S gate drivers

In order to drive an L30X power module we will use a SLAVE-MASTER-SLAVE gate driver configuration. The input PWM signals are received by the CTR cards of the MASTER gate driver. INPUT PWM signals can be transmitted to the CTR card via fiber optics or optocoupler, the FAULT signals transmitted by the CTR cards in opposite direction it's made in this alternative mode as well. **Figure 6** shows the block diagram of electrical interconnection of the SLAVE-MASTER-SLAVE gate drivers. The current booster PCB has two current boost stages that are connected in parallel to provide a high gate current when necessary. The module has two gate pins, each for half of the nominal module current. A common gate resistor and separated gate resistors are used for the gates as well, and common emitter resistor. In this way the synchronous switching of the stages can be assured.

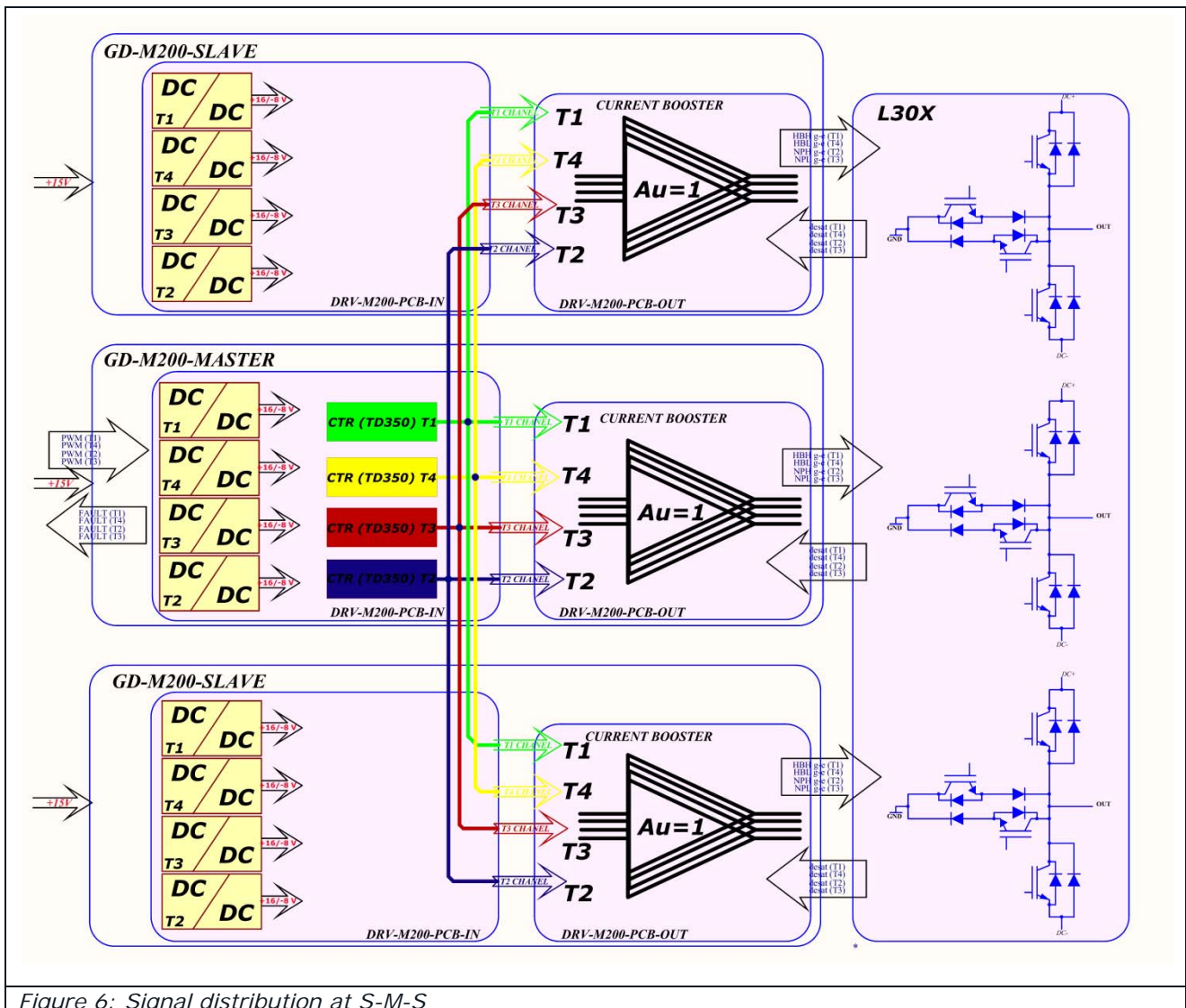
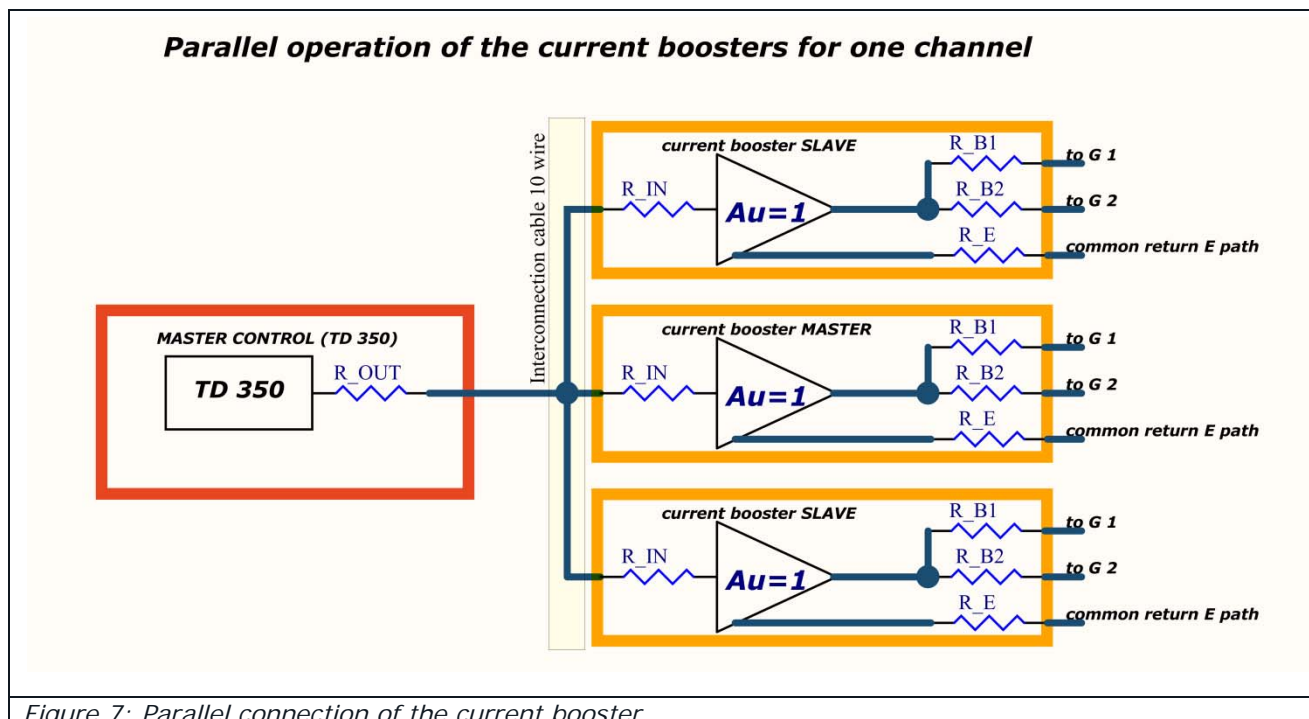


Figure 6: Signal distribution at S-M-S

At **figure 7** the parallel connection of the current boosters for one channel is illustrated.



## 4.2 Mechanical assembly of the gate drivers

L30X power module is pin compatible with M20X. Gate signals desaturation sensing points and NTC outputs are located at same x-y coordinates. **Figure 8** shows the L30X module with its S-M-S gate drivers

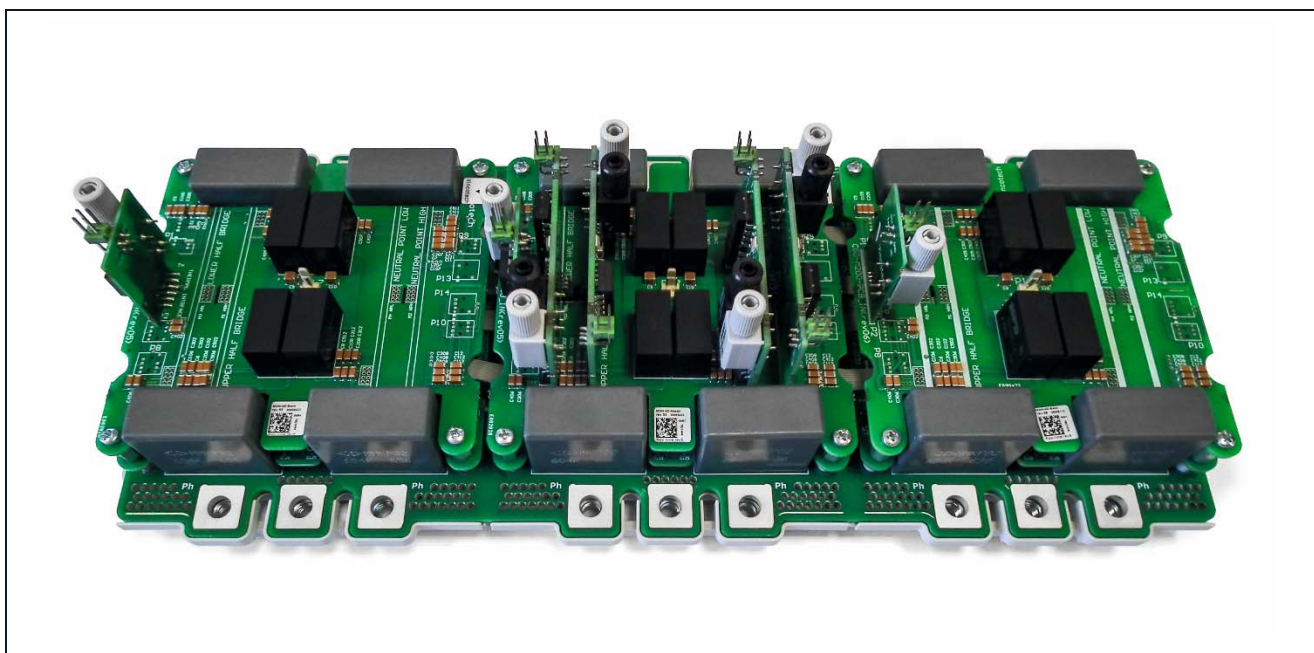


Figure 8: L30X with S-M-S gate driver

Interconnection of the gate drivers from bottom view:

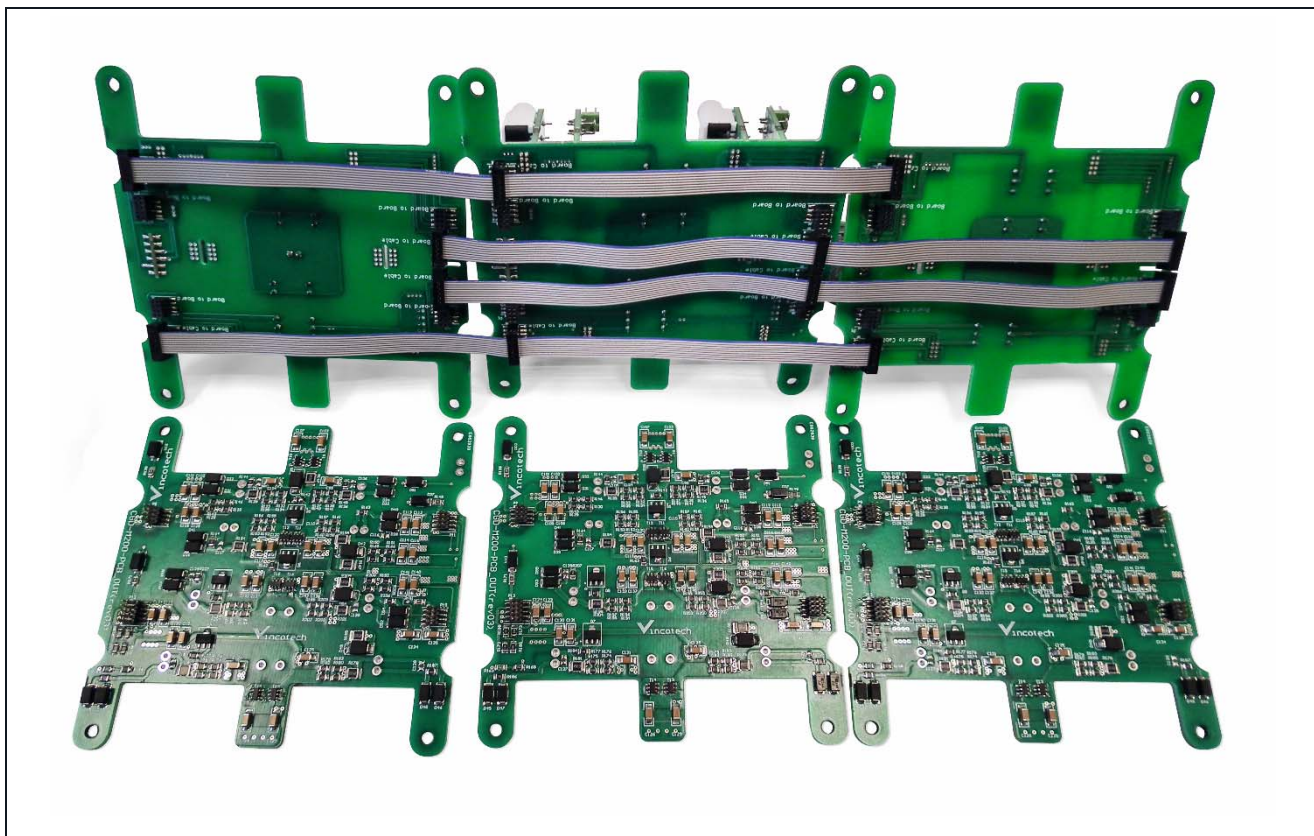


Figure 9: S-M-S interconnection at IN PCB level



### 4.3 Interconnection cable for S-M-S operation

ID	Functional block	PIN nr. on INRECONN cable	Signals at MASTER/SLAVE	Signals description
T1	HBH	1	desat hb H	Desaturation protection
		2	+16V hb 1-2	Positive supply
		3	out H hb H	Signal for turn-on
		4	out L hb H	Signal for turn-off
		5	-8V hb 1-2	Negative supply
		6	clamp hb H	Miller clamping
		7	hbGND 1-2	Ground
		8	NC	not connected
		9	NC	not connected
		10	NC	not connected
T4	HBL	1	desat hb L	Desaturation protection
		2	+16V hb 3-4	Positive supply
		3	out H hb L	Signal for turn-on
		4	out L hb L	Signal for turn-off
		5	-8 V hb 3-4	Negative supply
		6	clamp hb L	Miller clamping
		7	hbGND 3-4	Ground
		8	NC	not connected
		9	NC	not connected
		10	+5V hb 3-4	+5V
T2	NPH	1	desat np H	Desaturation protection
		2	+16V np 1-2	Positive supply
		3	out H np H	Signal for turn-on
		4	out L np H	Signal for turn-off
		5	-8 V np 1-2	Negative supply
		6	clamp np H	Miller clamping
		7	npGND 1-2	Ground
		8	NC	not connected
		9	NC	not connected
		10	NC	not connected
T3	NPL	1	desat hb H	Desaturation protection
		2	+16V hb 1-2	Positive supply
		3	out H hb H	Signal for turn-on
		4	out L hb H	Signal for turn-off
		5	-8 V hb 1-2	Negative supply
		6	clamp hb H	Miller clamping
		7	hbGND 1-2	Ground
		8	NC	not connected
		9	NC	not connected
		10	NC	not connected

Table 2: Signals on Interconnection cables



Signal distribution between the MASTER and SLAVE-s is assured by 4 interconnection cables, 10 wires each. The supply voltages are paralleled (16 V, GND, -8 V), this means if one DC/DC converter is supplied not only the supplied gate driver is functional, the others are also powered up. Nevertheless, it is very important that all the gate drivers externally supplied by +15 V at P17 as well, to avoid the overload of the DC/DC converters of the IN PCB card.

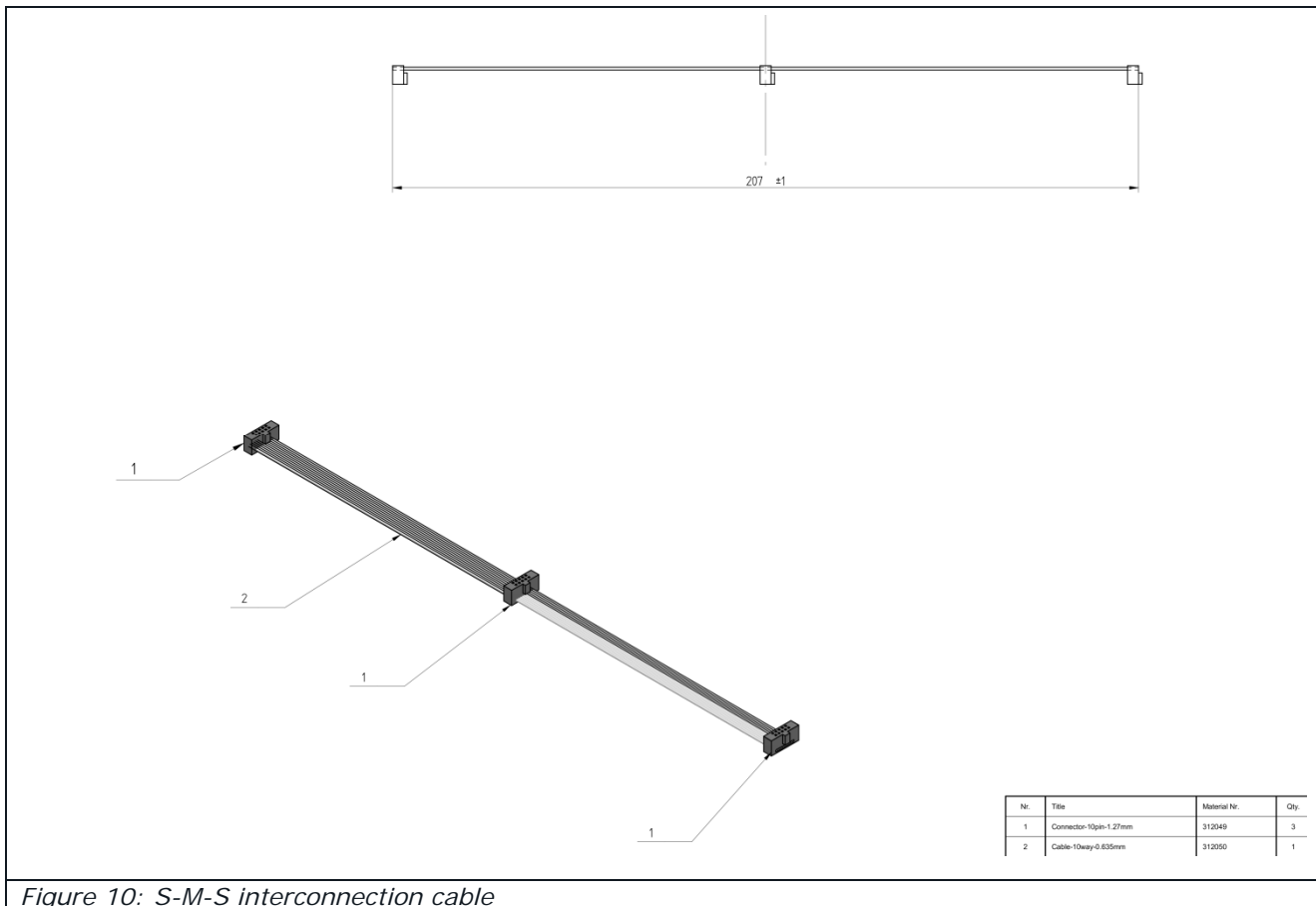


Figure 10: S-M-S interconnection cable

**Figure 10** shows the 10 wired interconnection cable. The total length of the cable is 207+/-1 mm, with a symmetrical assembling of the connectors.

## 4.4 Ordering numbers

Vincotech offers the L30X gate driver solution as a ready to use kit, including the input DC connector (+15V) screws and standoffs for assembling. Table 3 shows the ordering numbers for a S-M-S gate driver suitable for L30X.

Ordering number	BOM	Quantity	Obs.
GD-L30X-KIT	GD-M200-Master	1	including input connector, screws and standoffs
	GD-M200-Slave	2	including input connector, screws and standoffs
	GD-L300-SMS-CONN	4	

*Table 3: Ordering numbers for an L30X gate driver*

## 5 Conclusion

With a proper parallel connection of the current boosters the current capability of the gate driver can be increased in order to serve the higher current rated Vincotech power modules. Meanwhile the equal current sharing between the paralleled power modules is still kept. To maintain this balanced current the customer has to pay a special attention to a symmetrical connection of the input-output wiring.

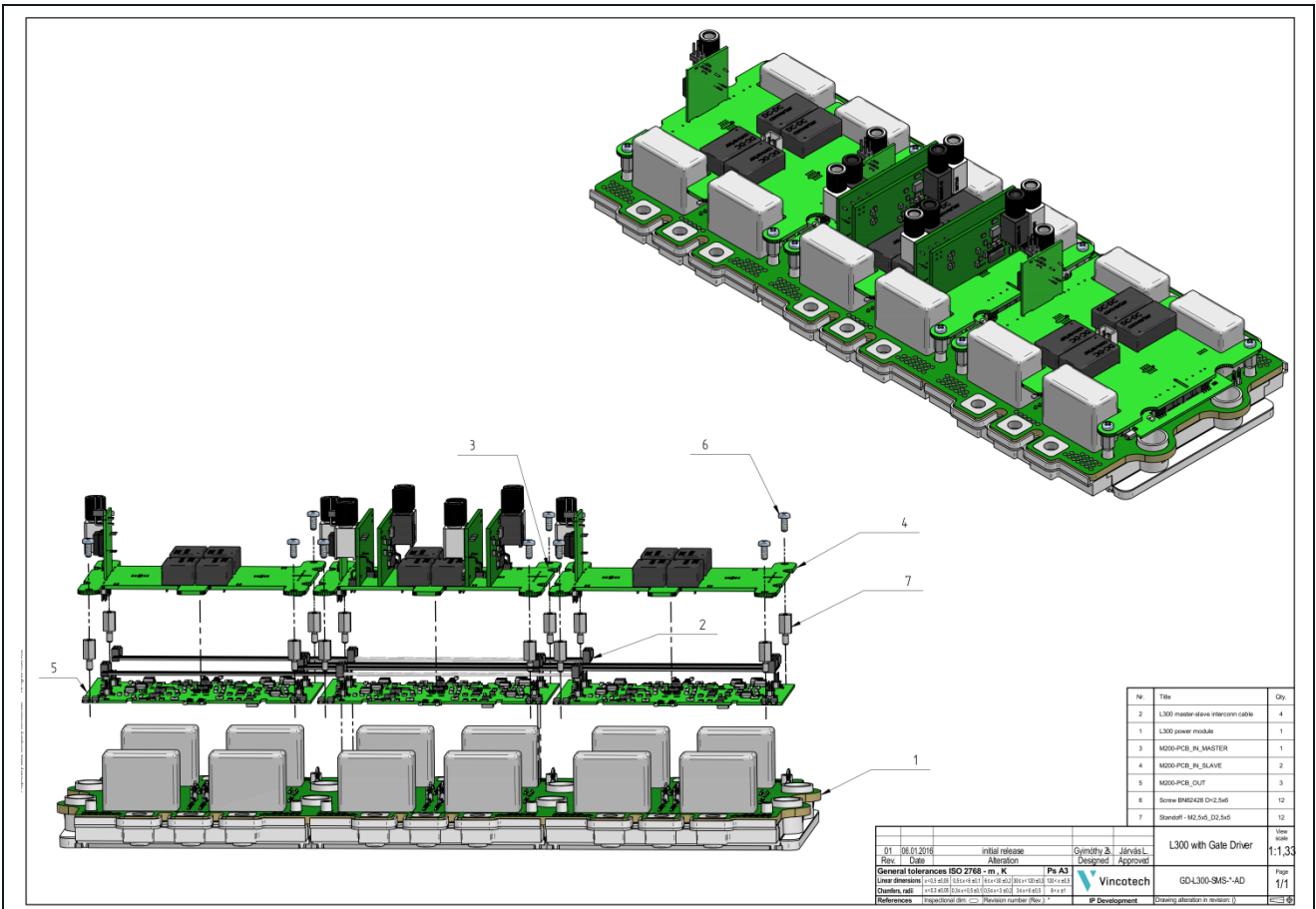


Figure 11: Mechanical assembly of the S-M-S gate driver system