

EiceDRIVER™

6ED300E17-S

**SixPack Evaluation Board
for IGBT driver 2ED300C17-S**

Technical Documentation



prepared by : M.Hornkamp	date of publication: 01.05.2003
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Correspondence of the contents of this document with the described hardware has been checked. Discrepancies may exist nevertheless; no guaranty is assumed for total congruence. The information contained in this document is subject to regular revision. Any alterations required will be incorporated in the next issue. Suggestions for improvement are welcome.

Changes of the document may occur without prior notice.

Safety notice!

It must be prevented that children and the general public have access to the installed driver or can get into proximity!

The driver/adapter board may only be used for the purposes prescribed by the manufacturer. Inadmissible alterations and use of spare parts and accessories not recommend by the manufacturer of the driver can cause fire, electric shock and injuries.

This document has to be at the disposal of all users, developers and qualified personnel who are to work with the driver.

If measurements and tests on the live device have to be carried out, then the regulations of the Safety Code VBG 4.0 are to be observed, in particular § 8 "Admissible deviations during work on live parts". Suitable electronic devices are to be used.

Prior to installation and commissioning please read this document thoroughly.

- Commissioning is prohibited if there is visible damage by inappropriate handling or transport.
- Contact while uninstalled is permitted only with ESD protection.
- Install only without supply voltage.
- Always keep sufficient safety distance during commissioning without closed protective housing.
- Contact under live condition is strictly prohibited.
- Work after turn-off is not admissible until the absence of supply voltage has been verified.
- During work after turn-off it has to be observed that components heat up during operation. Contact with these can cause burning.
- The drivers are mounted electrically and mechanically into the 6ED300E17-S mother board by soldering. The mechanical strength has to be verified by the user and, if necessary, assured with appropriate tests.
- The evaluation board with the 2ED300C17-S are designed for use with eupec IGBT modules type IHM, EconoPACK+, 62mm. In case of ulterior use, safe operation cannot be guaranteed.

*EiceDRIVER*TM 6ED300E17-S

General information for the evaluation board 6ED300E17-S:

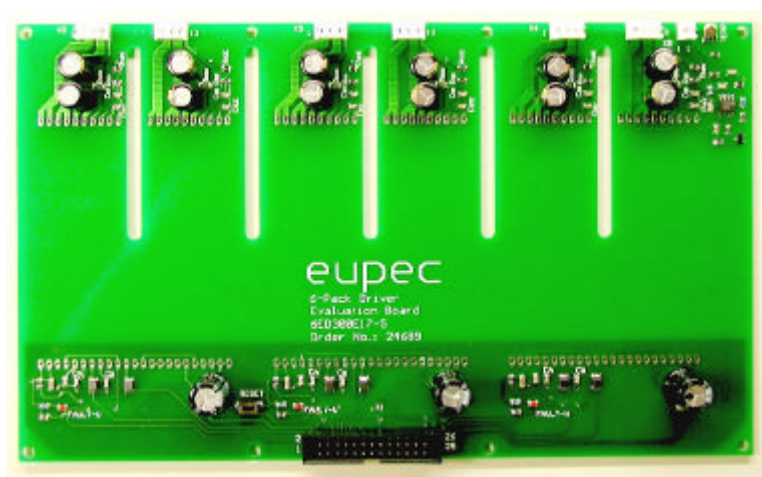
The evaluation board 6ED300E17-S is an application add-on for the Dual IGBT driver 2ED300C17-S. In this function the evaluation board supports the application of the 2ED300C17-S. Documented is the minimum required circuitry of the 2ED300C17-S. Special circuits such as "Active Clamping", separate R_{gon}/ R_{goff} or use of the EDFA (see datasheet of the 2ED300C17-S chapter 3.9) are not described in this document, are, however, possible with the 2ED300E17-S.

This technical document is to be used only in conjunction with the datasheet of the 2ED300C17-S.

Commissioning of the evaluation board 6ED300E17-S:

Basis of this datasheet is the datasheet of the 2ED300C17-S. Before commissioning the evaluation boards the datasheet of the 2ED300C17-S has to be read.

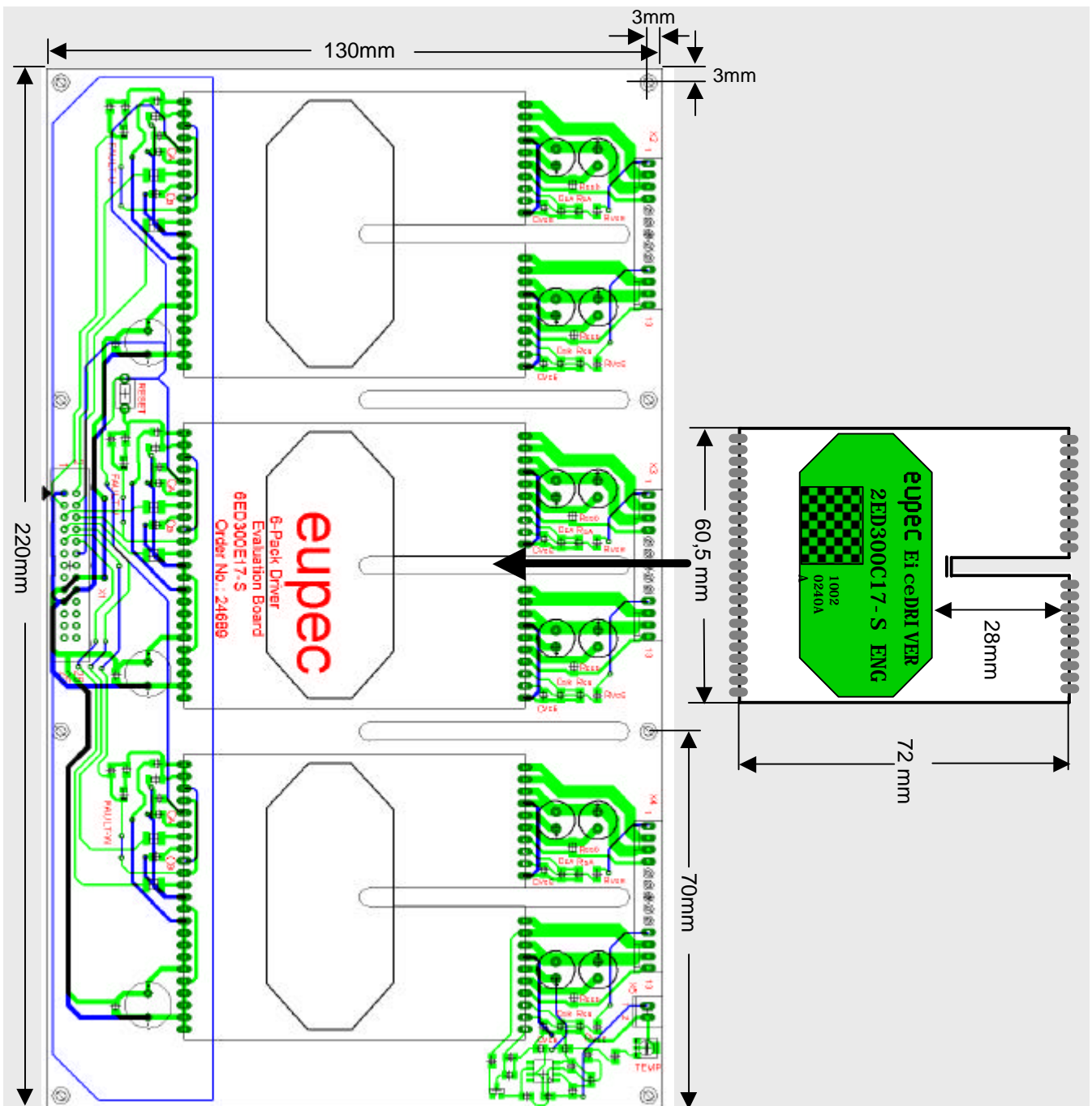
- 1) Insert three IGBT drivers 2ED300C17-S into the evaluation board 6ED300E17-S and solder. **Page 4.**
- 2) Choose half-bridge or direct mode. **Page 7.**
- 3) For half-bridge mode set interlock delay times. **Page 7.**
- 4) Connect eupec IGBT module(s) with the evaluation board. **Page 8.**
- 5) Apply PWM Signals. **Page 6**
- 6) Apply supply voltage +15V. **Page 6**
- 7) Adapt the 6ED300C17-S to the IGBT module and its application. **Page 7 and 9**



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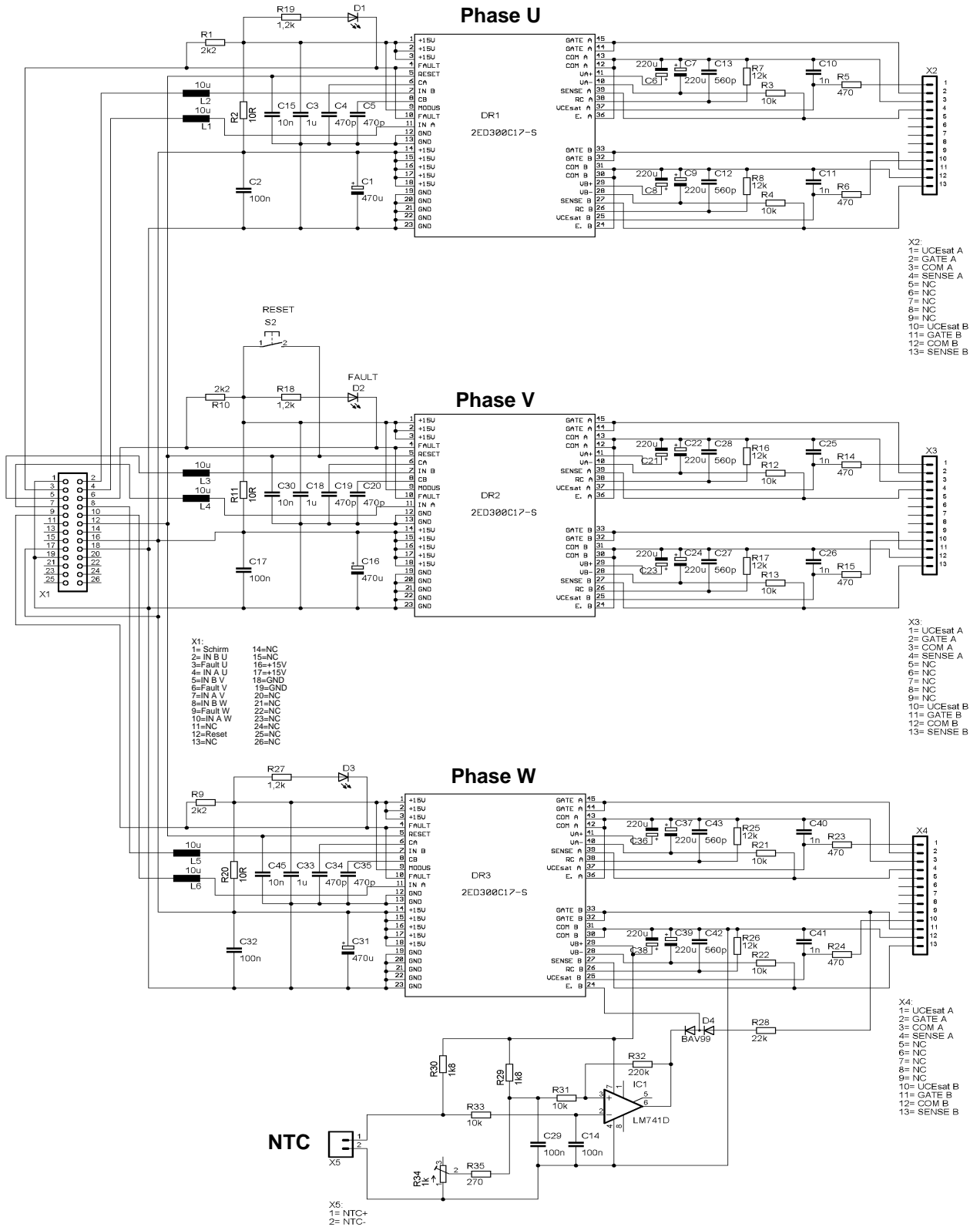
Mounting and dimensions:

The half-bridge drivers 2ED300C17-S are inserted onto the component side of the 6ED300E17-S and soldered cleanly from the back. Make sure not to cause shorts between the pins of the 2ED300C17-S drivers. It is important that the drivers are inserted as far as possible into the evaluation board. When mounting the adapter board, make sure that appropriate safety distances are kept between the back of the board and other potentials, as DC-bus voltage is present on the back of the adapter PCB.



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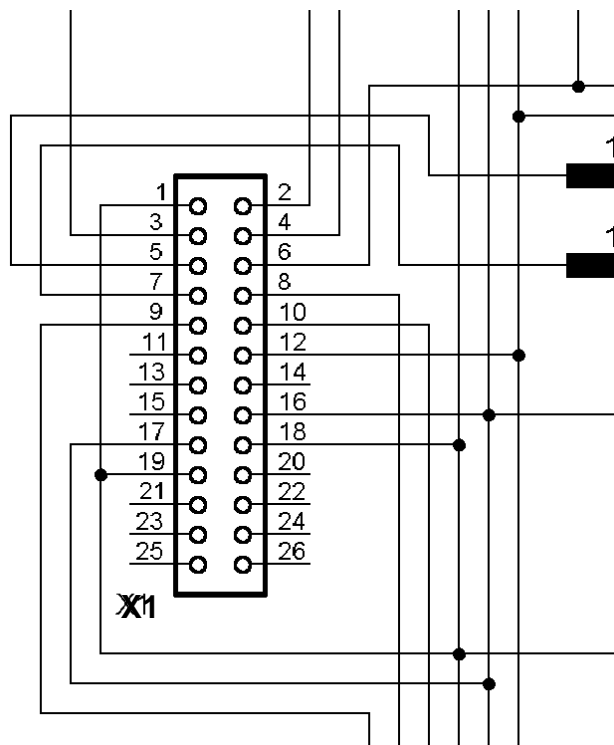
Circuit diagram of the evaluation board 6ED300E17-S:



EiceDRIVER™ 6ED300E17-S

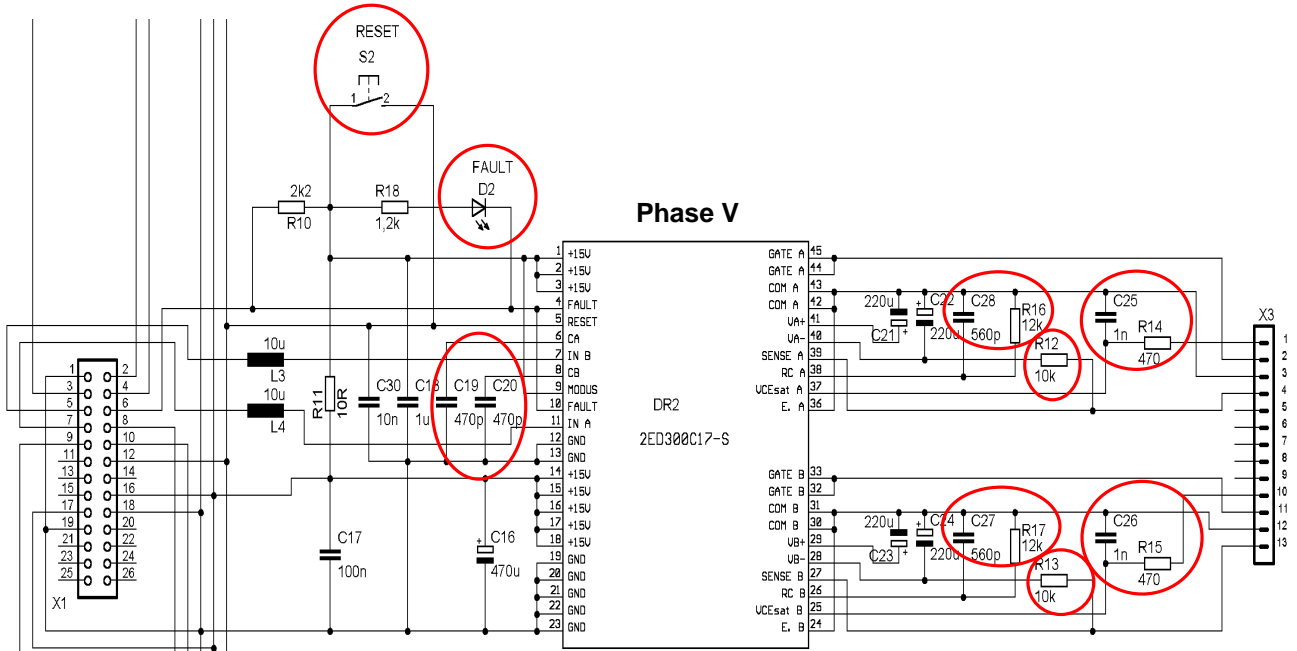
Inputs and Outputs of the 6ED300E17-S

X5		
PIN1	NTC+	
PIN2	NTC-	
X1		
Pin1	Shield	
Pin2	IN B U	PWM signal inputs for channel B U
Pin3	Fault U	The fault output indicates a fault for phase U
Pin4	IN A U	PWM signal inputs for channel A U
Pin5	IN B V	PWM signal inputs for channel B V
Pin6	Fault V	The fault output indicates a fault for phase V
Pin7	IN A V	PWM signal inputs for channel A V
Pin8	IN B W	PWM signal inputs for channel B W
Pin9	Fault W	The fault output indicates a fault for phase W
Pin10	IN A W	PWM signal inputs for channel A W
Pin11	NC	
Pin12	Reset	Reset input for all channels
Pin13	n.c.	
Pin14	n.c.	
Pin15		
Pin16	+15V±5%	V_{DC} and V_{DD} supply
Pin17	+15V±5%	V_{DC} and V_{DD} supply
Pin18	GND	GND for +15V supply
Pin19	GND	GND for +15V supply
Pin20		
Pin21		
Pin22		
Pin23		
Pin24		
Pin25		
Pin26		



X2/ X3/ X4		
Pin1	$V_{CE\ sat\ A;}$	Input saturation voltage monitoring
Pin2	Gate A	Driver output to the gate of the IGBT module via an external gate resistor
Pin3	COM A	Auxiliary emitter
Pin4	Sense A	Control input "soft shut down or for "Active Clamping"
Pin5	n.c.	
Pin6	n.c.	
Pin7	n.c.	
Pin8	n.c.	
Pin9	n.c.	
Pin10	$V_{CE\ sat\ B}$	Input saturation voltage monitoring
Pin11	Gate B	Driver output to the gate of the IGBT module via an external gate resistor
Pin12	COM B	Auxiliary emitter
Pin13	Sense B	Control input "soft shut down or for "Active Clamping"

Using and adapting the 6ED300E17-S:



Reset: Switch S2 and X1/Pin12

By the use of a Reset switch S2 or with a positive edge greater than 10V on X1/12 the driver is reset in case of a fault.

Fault output: LED D1, D2, D3 and X1/Pin3, Pin6, Pin9

In case of a fault the red LED is turned on and the the output and corresponding output X1 goes to Low (negative logic)

Mode:

Two modes may be chosen: the half-bridge mode and the direct mode.

With the 6ED300E17 the **half-bridge mode** is **fixed and activated** as the mode selection is connected to +15V.

See also the datasheet of the 2ED300C17-S chapter 3.2

Interlock times: CA and CB

Interlock delay times in the half-bridge mode are set with capacitors C4, C5 ; C19, C20; C34, C35. Preset is approx. 4.5µs. See also the datasheet of the 2ED300C17-S chapter 3.3

Phase V

Soft Shut Down: R_{SSD}

The R_{SSD} R4/R3, R12/R13, R21/R22 is preset to 10kOhm. The performance of the SSD depends on the R_{SSD} and has to be adapted. See also the datasheet of the 2ED300C17-S chapter 3.8.

$V_{CE\ sat}$ Reference curve: C_{SX} and R_{SX}

The $V_{CE\ sat}$ reference curve for phase U can be set with the components C12, C13 and R7, R8. Equally phase V is set with components C27/C28 and R16/R17 and phase W with C42/C43 and R25/R26. See also the datasheet of the 2ED300C17-S chapter 3.7

$V_{CE\ sat}$ Trigger suppression: C_{VCE} and R_{VCE}

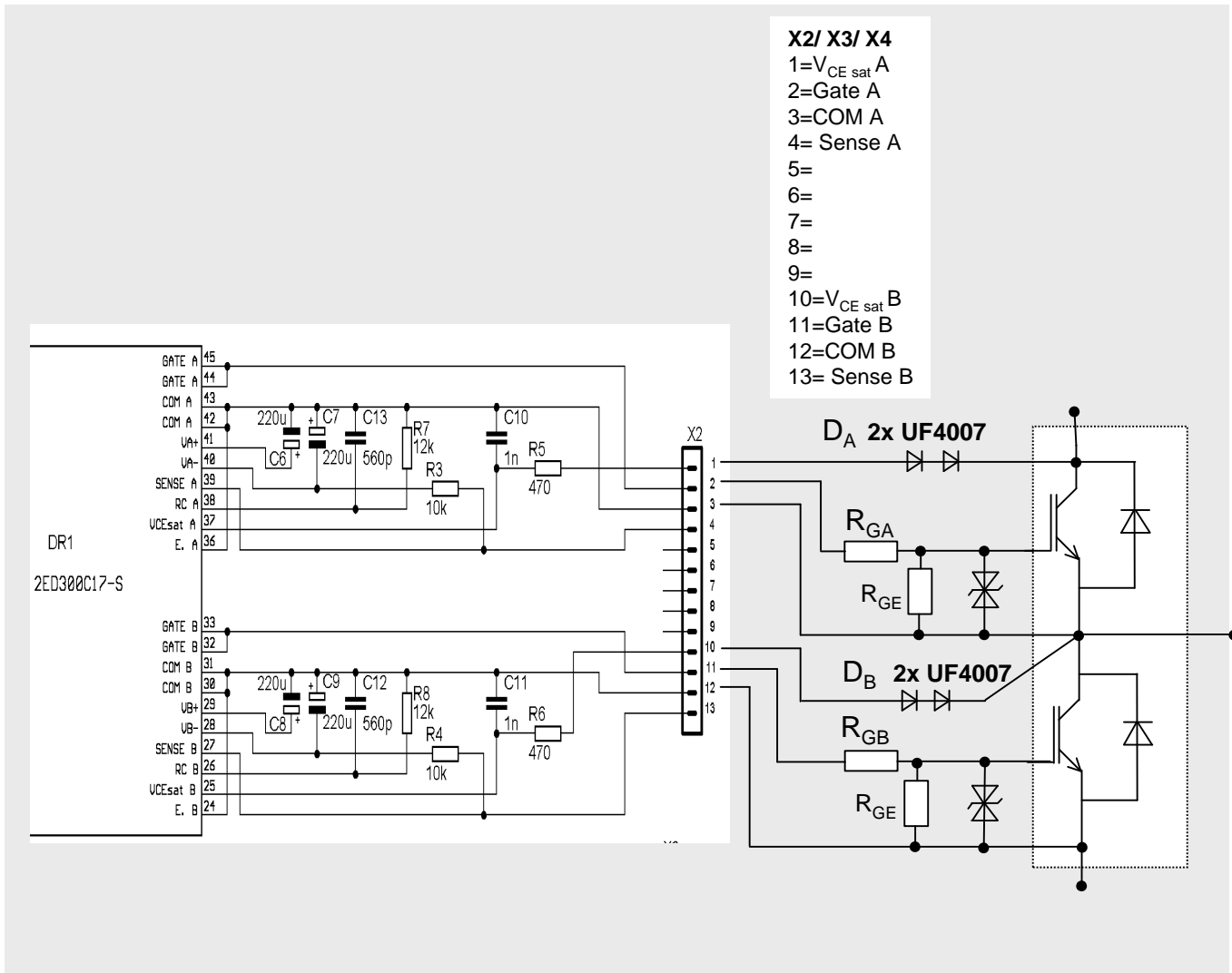
By changing the values of C10, C11 and R5, R6 the trigger level of the $V_{CE\ sat}$ monitoring can be set for phase U. C25/C26 and R14/R15 for phase V. C40/C41 and R23/R24 for phase W.

See also the datasheet of the 2ED300C17-S chapter 3.7.

NOTE ! The PWM inputs have a trigger level of +10V.

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IGBT connection:

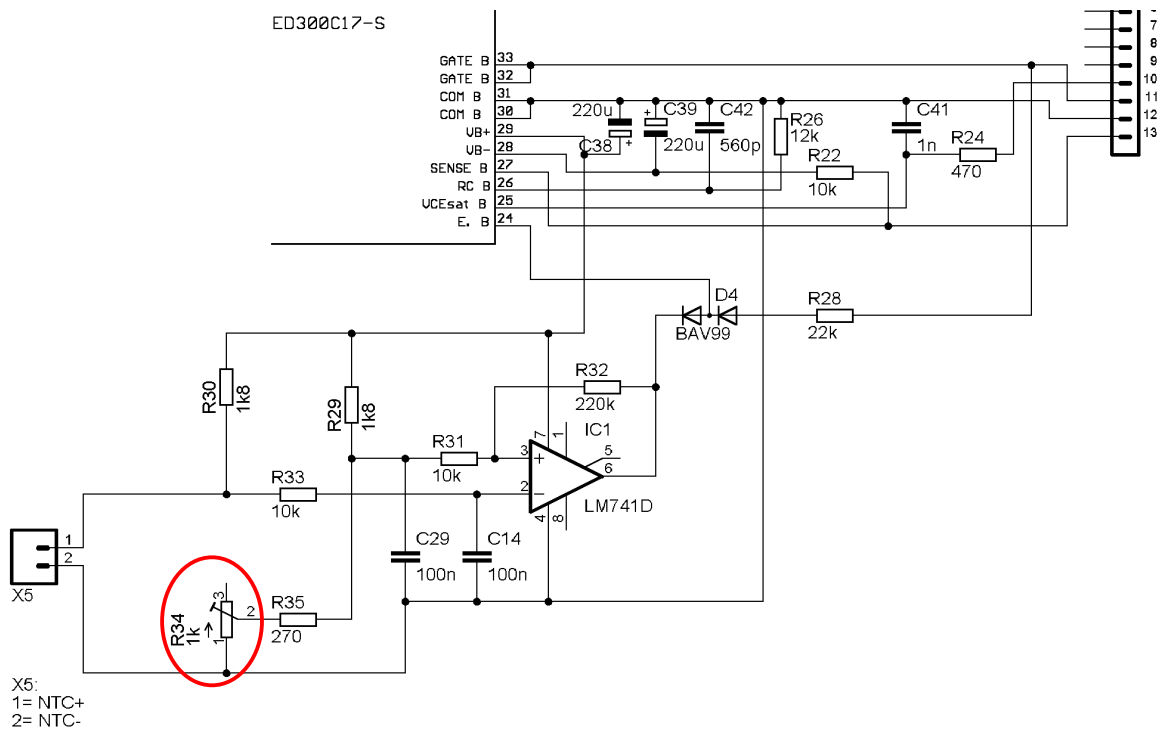


Gate resistors as well as gate-emitter clamping should be placed in closest vicinity to the IGBT module.

It is equally important to place the collector diodes appropriately. Make sure to be aware of the possible high voltages.

Should an "Active Clamping" as in the datasheet of the 2ED300C17-S chapter 3.10 be used, the sense input is to be utilised.

The plug used for X2/ X3/ X4 is a "Molex"- type

Temperature measurement with the 6ED300E17-S:

Terminal **X5** is provided for the connection of a NTC resistor. The associated circuit is adapted to the NTCs inside eupec IGBT modules. This NTC resistor is for example contained in the EconoPACK+ IGBT module. Sensing is done digitally. With an adjustable switching level via potentiometer R34 the comparator IC1 switches input E.B. pin 24 on the 2ED300E17-S.

The switching signal can only usefully be utilised as an overtemperature signal when the IGBT is turned on, i.e. when the gate is at +15V. Hence the conjunction with the gate signal.

An overtemperature signal is only processed when the output of the driver stage is at “HIGH”!

The hysteresis is preset and depends on the position of the potentiometer R34. If the switching level is set to 125°C NTC temperature the hysteresis is approx. 10K.

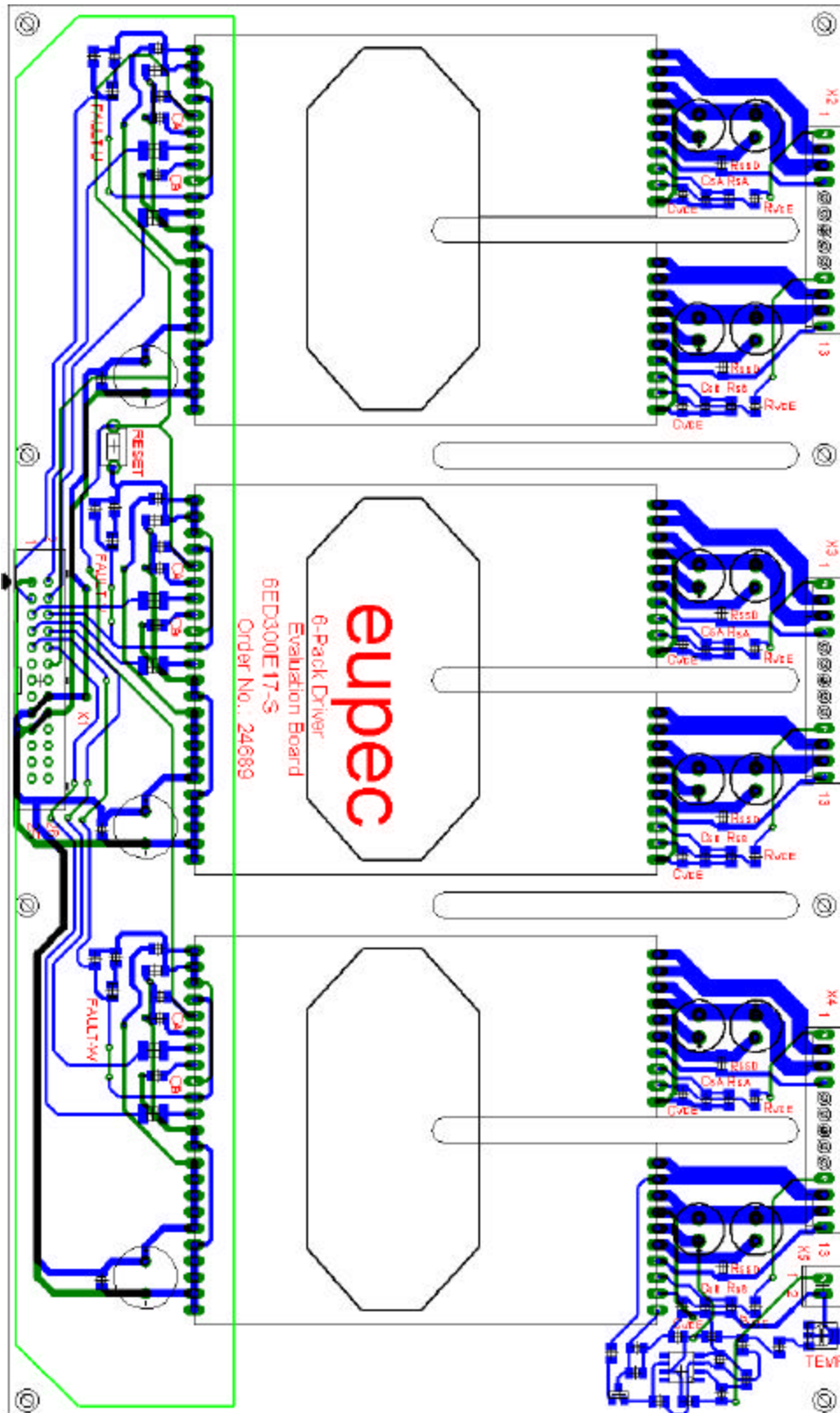
Take note of the fact that the entire circuit may float at high potential. The NTC and its connection leads therefore have to satisfy the requirements of the insulation stipulated by EN50178.

The NTC internal of the eupec IGBT modules EconoPACK+ and EconoPACK is base insulated to its surround and is insulation tested.

Make sure that the NTC and its leads have to be isolated from its surrounding environment, as high potential may be present !

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Layout and component print:



On the component side of the 6ED300E17-S PCB is a print layout showing all relevant components. The corresponding explanations are to be found on page 7 and in the datasheet of the ZED300C17-S

*EiceDRIVER*TM 6ED300E17-S

Type designation :

*EiceDRIVER*TM eupec IGBT controlled efficiency DRIVER

For example: **2ED300C17-ST**

Insulation class:

F = Base insulated
S = Safe separation
ST = Safe separation / traction

Voltage class:

06 = 600V
12 = 1200V
17 = 1700V and 1200V
33 = 3300V
65 = 6500V

Driver type:

C = Driver core with DC/DC
E = Evaluation board
I = Driver IC (Coreless transformer)
L = Driver IC (Level shifter)

Maximum output current :

e.g.:
004 = 0.4 A
020 = 2.0 A
300 = 30.0 A

eupec IGBT driver

Driver channels

1 = single driver
2 = half-bridge driver
6 = SixPACK driver