DRIVER IGBT 3066

DESCRIPTION

Driver for high range double IGBTs, working between 1200-1700V. This driver by itself can control a branch (TOP and BOTTOM).

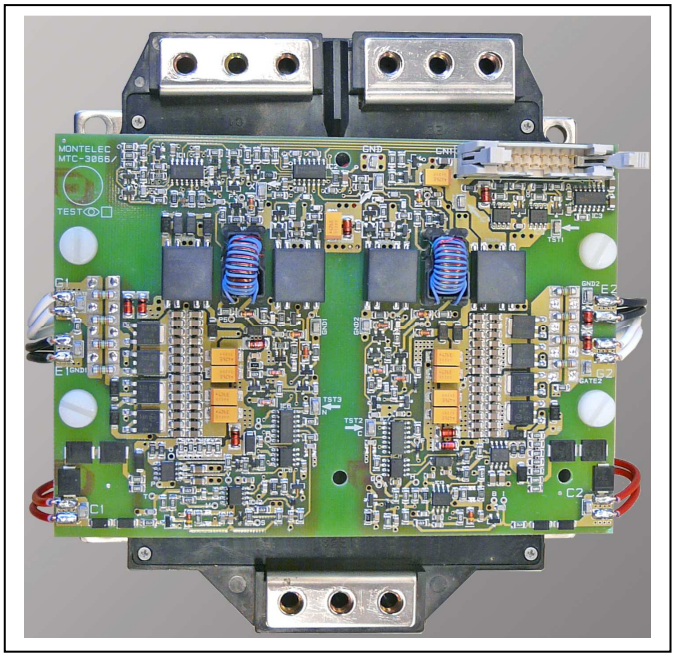
This card, unlike another type of Driver is personalized from factory. Does not need additional elements such as printed circuits, resistors, capacitors, neither calculations, nor adjustments, just input control signals.

Each Driver is adjusted to be able to operate only with one or two IGBT modules. With this personalization a better performance is obtained and there is a better adaptation to electric and physical characteristic of each IGBT.

Easy connections from the board to the IGBT through a female HOUSING type connector.

Connections with interface through 16_{PIN} flat cable.

Card fixed to the IGBT through M6 Nylon screws, both separated by plastic elevators.

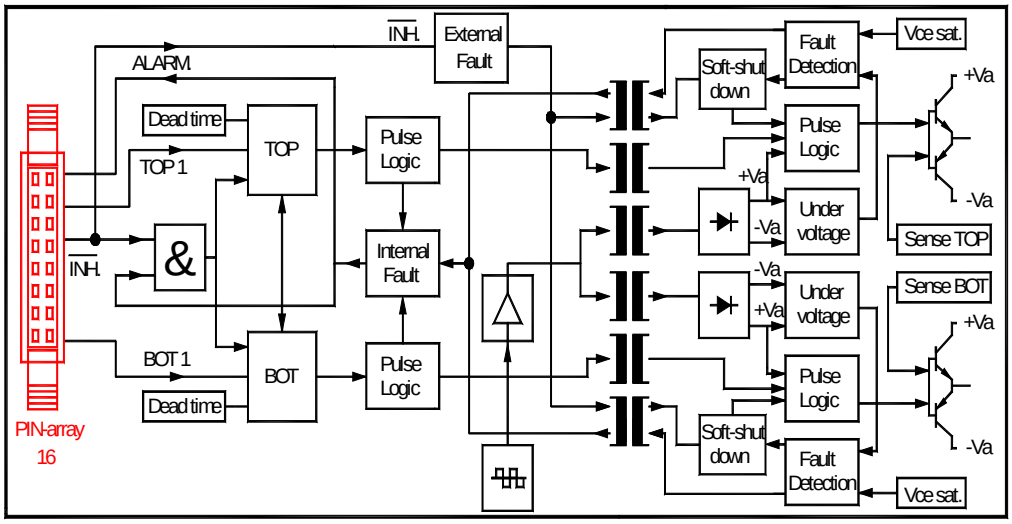


TECHNICAL SPECIFICATIONS

- ✓ 4500V (Up.eff.) electric insulation between primary and secondary.
- ✓ 4500V (Up.eff.) electric insulation between secondaries.
- ✓ Inputs TOP, BOTTOM and INH (inputs CMOS 20V max., 3K3 impedance).
- ✓ Inputs signals filtration. Signals with less time than 1µs are rejected.
- ✓ Trigger inputs protected against electrostatic discharges.
- ✓ Min. dead time generation, can not be accumulated to the one applied by software.
- ✓ Working cycle from 0 to 100%.
- ✓ Recommended tension for boards supply 16 V_{DC}.
- ✓ Protection against supply drop in voltage in both secondaries +13V/-13V.
- ✓ Protections against over-currents by comparison of the $V_{ce.sat.}$ with prefixed standard.
- ✓ **Soft shut down** of the IGBT with alarm**.** (This procedure avoids V_{ce} over-tension in the most unfavourable moment).
- ✓ **Soft shut down** with primary signal (INH) or from the secondary protection circuit.
- ✓ Over-current active protection on the switching off of the IGBT **"DVRC" (Dynamic Voltage Rise Control).** This protections acts from 900V on. Configurated according to model.
- ✓ Open-Collector output alarm. Alarm prolonged during 30ms.
- ✓ Signals and supply connexion through 16_{PIN} flat cable.
- ✓ Working temperature from –40ºC to 85ºC
- ✓ Commutation frequency 20 KHz
- ✓ Measurements 150x105mm.
- ✓ Trigger with +15V/-15V in both IGBTs
- ✓ Easy adaptation with interface MTC-3074.

DRIVER IGBT 3066

GENERAL DIAGRAM IN BLOCKS



Explanatory notes:

- All inputs are protected against tension peaks.
- The INH input is an additional input for the input pulses authorization. At the same time this input sends a signal of extern alarm to the secondary, this input also allows a soft shut down on the secondaries, as it is explained in the paragraph 2.1. When it is not used must remain as +Vcc.
- The connexions are duplicated, alternated with a GND signal to increase the immunity to the electromagnetic noise.

PROTECTIONS

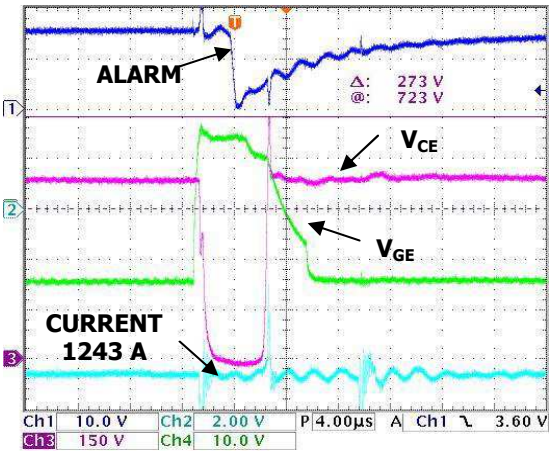
Soft shut down

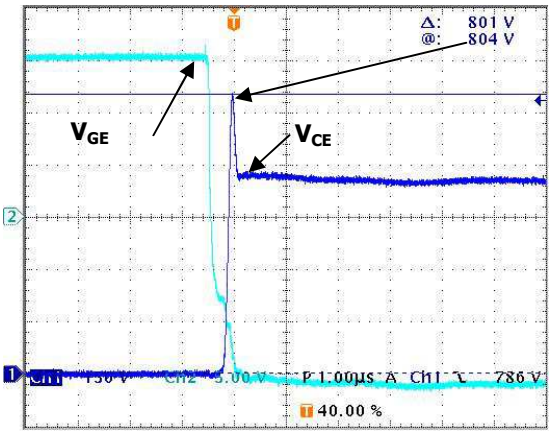
It is used to disconnect the IGBT in a soft way when the an alarm it is produced. This occurs to avoid the IGBT destruction due to an excessive tension during the shutting down process T_{off-}. In the left hand side graph we can appreciate a soft shut down, this shut down generates an over-tension of 723V with 1243A. In the right hand side graph a normal shut down T_{off} at 710ª of peak, generates a blockade peak of 840V.

The descendent slope of this soft shut down is customized with a resistor value determined to the IGBT model, **$R._{SSD}$.**

In a normal working operation the IGBT is triggered quickly to minimize the commutation looses.

CM900DY-24NF





DRIVER IGBT 3066

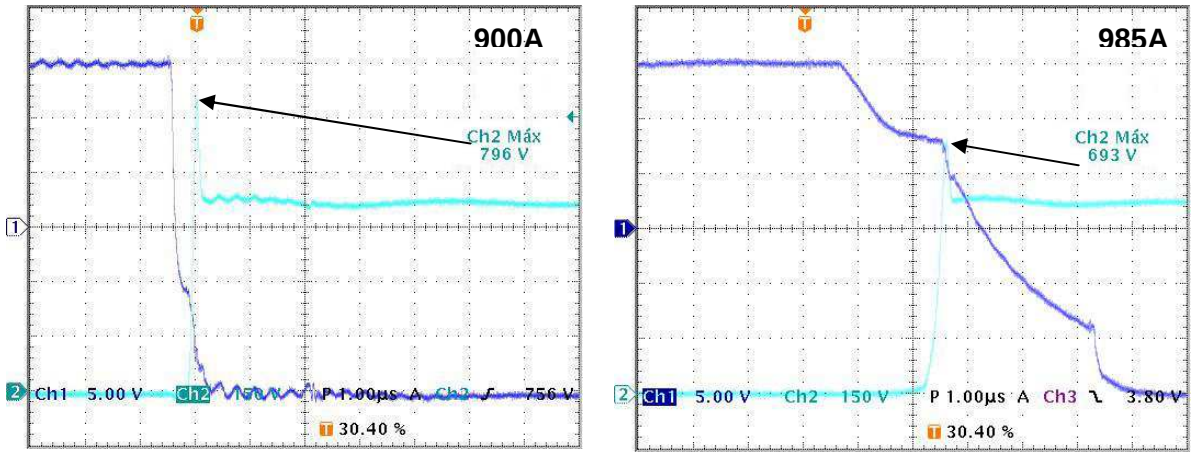
The protection circuit is based on comparing constantly the $V_{ce.sat}$ with a prearranged standard, if for any reason, the $V_{ce.sat}$ exceeds the standard, a soft shut down takes places. Each IGBT module has its own driver code and the standard is adjusted according to the table attached at the end of this document.

The fact of working with high currents generates an increment of the *di/dt*, this generates an over-tension in the internal parasite inductances *"V_B=Lb*di/dt"* that increases the $V_{ce.}$ of the IGBT. If this over-tension overcomes the maximum allowed by the IGBT, this can be damaged.

To avoid the damage of the IGBT in this situation, the driver has a circuit installed that allows making a **soft shut down**, from the signal coming from the primary (INH) or from the signal of the secondary.

In the following example we can see two different shut downs, a normal one and a soft one, at similar currents, 900A and 985A. We can observe that the peak generated is significantly lower when a soft shut down takes place.

CM900DY-24NF



The driver is fixed so it can operate with just one or two IGBT modules. Each driver is customized to each IGBT's electrical characteristics, this way better performances are obtained and they are better adapted to physic and electrical characteristic of each IGBT.

Power supply secondary alarm

If the secondary supply falls because a short-circuit or an excessive consumption, a trigger in bad conditions or insufficient can be originated, being able to destroy the IGBT. To prevent this situation there is a comparator in each of the secondaries that cuts the triggers when the power supply falls below **+13/-13V.**

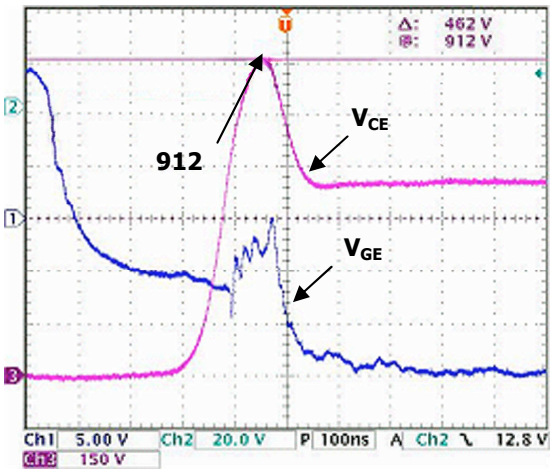
This alarm also generates a **"Soft Shut Down".**

Active alarm "DVRC" (Dynamic Voltage Rise Control)

In the normal working cycle of the IGBT exists the possibility that the short-circuit takes place exactly during the normal shut down T_{off} (rapid shut down) of the IGBT, this is a very strange case, but it can happen. In this case the system will not realize a soft shut down, being able to destroy the IGBT. For these cases, the **"DVRC"** active alarm is implanted. This additional circuit controls the derivative *di/dt* in all the IGBT shutting down operation, therefore prevents an inadmissible V_{ce} voltage.

In the graph below we can see how the protection has entered from 900V of V_{ce}.

CM900DY-24NF



DEAD TIME

Dead time guarantees us the minimum commutation time between triggers in a branch, before one starts driving the other must be shut down. This dead time is assured by hardware.

This time can not be accumulated to the one that could be added by software. If the control generates a time lower than the one stipulated to the equipment, the circuit adds this minimum dead time.

In this driver the guaranteed time is **5.6µs**.

INPUTS SIGNALS FILTER TOP/BOTTOM

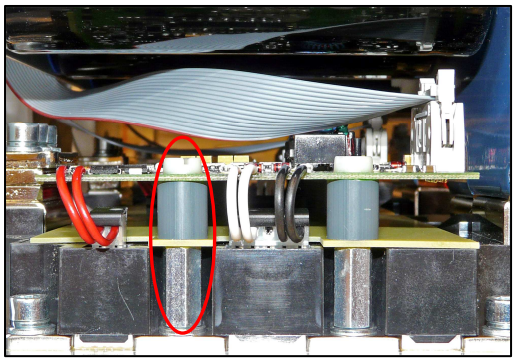
Each of the channels *(top and bottom)* has a filter on the input that filters all signals lower than **1µs**. This passive filter that we have connected to the input guarantees the elimination of any not wanted electric noise.

GATE RESISTOR R_{gate}

The driver MTC-3066 has different gate resistors **R_{gate}** personalized to each IGBT according to *"Characteristics table"* attached at the end of the document.

The **R_{gate}** resistor is adapted searching the ideal working point of the IGBT, trying to obtain a better performance of the equipment, as well as a better protection.

CONNECTION WITH IGBT



IMPORTANT:
The fixing of the driver to the IGBT must be done with nylon stacking spacers and screws of the same material to respect the isolations between the primary and the secondaries.

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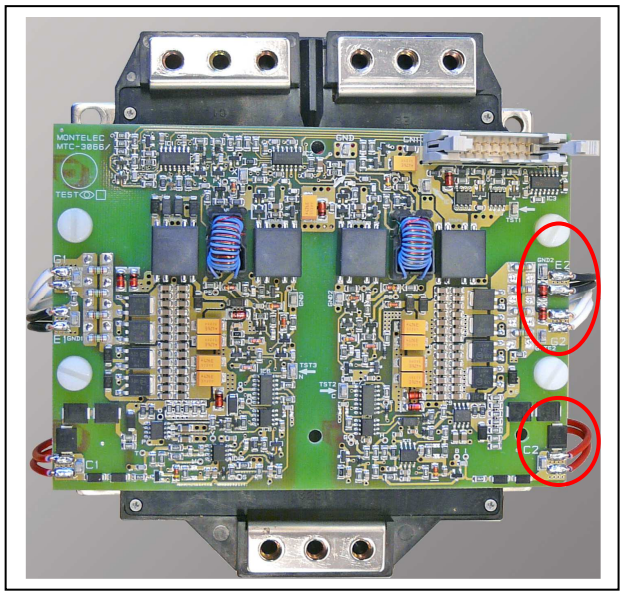
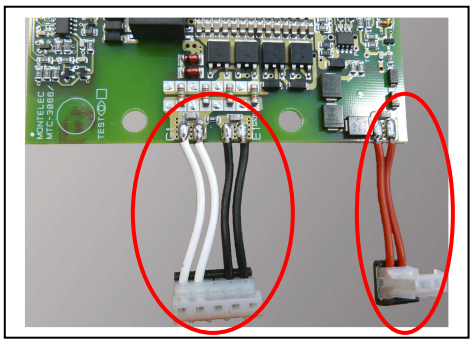


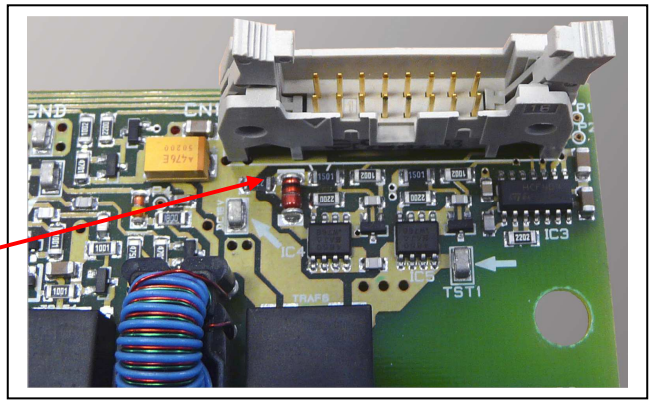
Connection to IGBT through female HOUSING type connector.



DRIVER CONNECTION

Pin	Signal	Remark
1	+VDD	15-16V
2	+VDD	
3	GND	Ground 0V
4	TOP	PWM Input TOP
5	TOP	
6	GND	Ground 0V
7	BOT	PWM Input BOT
8	BOT	
9	GND	Ground 0V
10	INH	Input INH. 0 = Stop
11	INH	
12	GND	Ground 0V
13	reserved.	
14	reserved.	
15	ALARM.	Fault Output
16	ALARM.	

Supply connection and signals to exterior through 16 pin flat cable.



The connections are duplicated, alternated with a GND signal to increase immunity to electromagnetic noise.

TECHNICAL SPECIFICATIONS

	CARD MODEL	CODE	Lecture delay Vce.	Ton tail value IGBT	Vce. Sat.	R. SSD. Value	DVRC. V.	Rg. DRIVE (Ω)	Rg. mod. IGBT (Ω)	Qg IGBT (nC).	NF LINE	SERIE A
	MTC-3066-	902	800ns	220pf	2.35	1k6	900	0.55	1	4800	CM900DU-24NF	
	MTC-3066-	142	1100ns	220pf	2.35	1k6	900	0.55	0.67	7200	CM1400DU-24NF	
*	MTC-3066	107	750ns	220pF	2.65	1K6	1200	0,47	0.67	6000	CM1000DU-34NF	
	* *Preliminaries*											