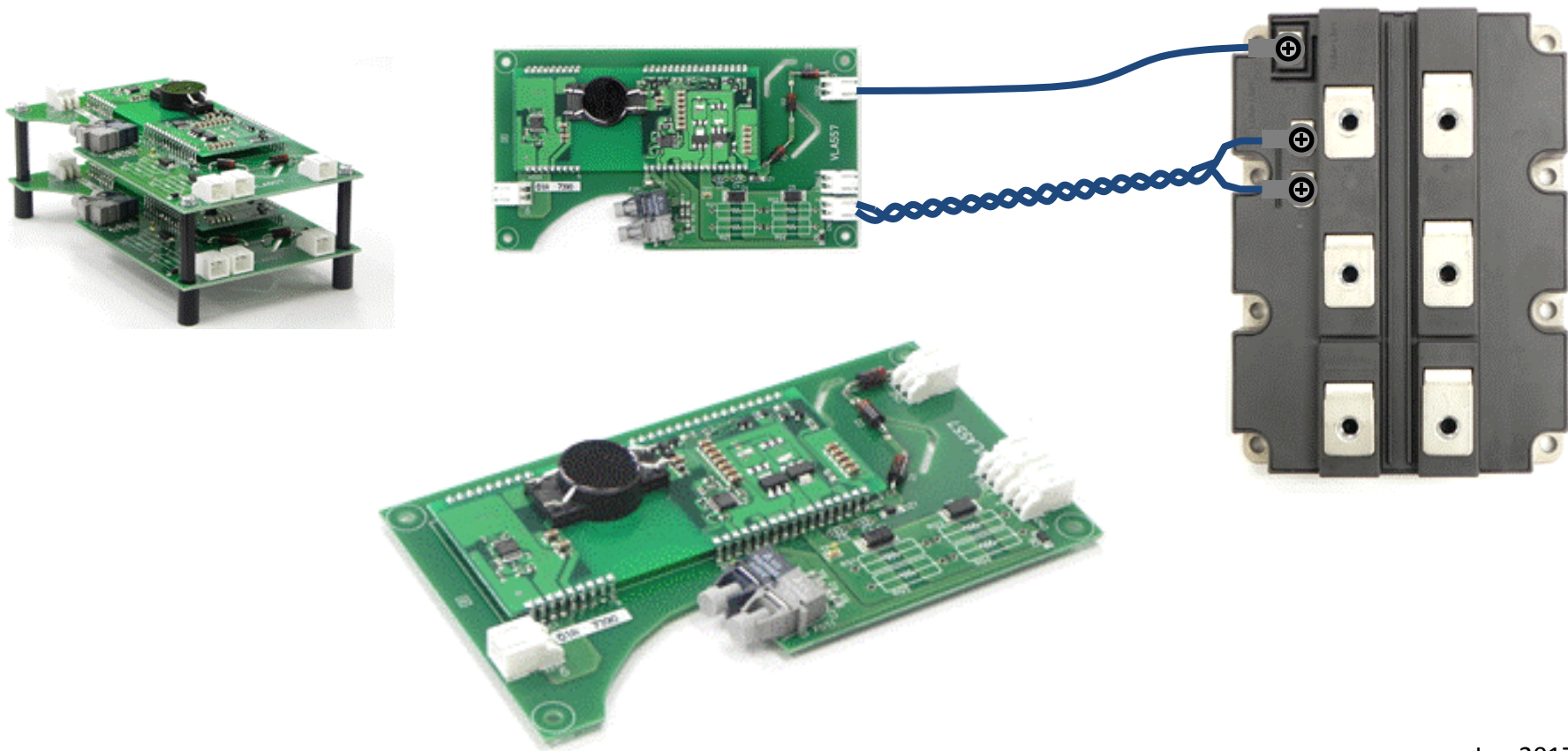


Gate Drive Unit VLA557-01R for 3.3kV class HVIGBT

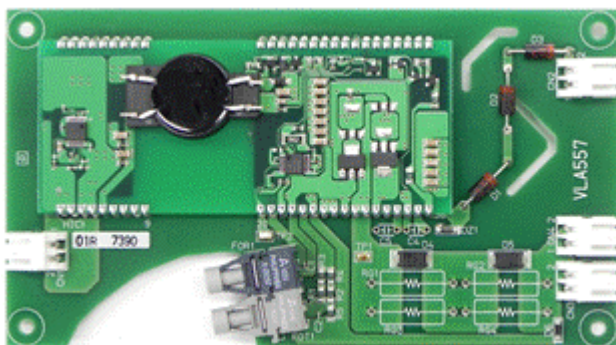


Jun.2017

HVIGBT Gate Drive Unit VLA557-01R

Preliminary

Outline (Image photo)

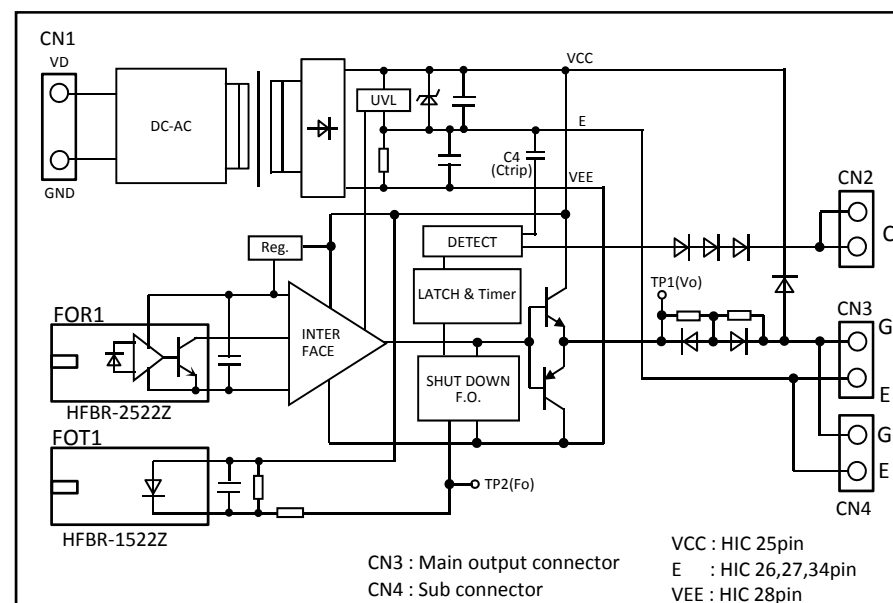


Size : 83 x 150 mm

Feature

- >Single channel simple and easy gate drive system
- >Wire connection to IGBT
- >Built in the isolated DC-DC converter for gate drive
- >Output peak current is +/-24A(max)
- >Built in short circuit protection with soft shut down
- >Electrical isolation voltage is 6000Vrms (for 1 minute)
- >Fiber optic interface

Block Diagram



Targeted IGBT Modules

VCES : 3300V,450A ~ 1500A class IGBT module

Applications

HVDC infrastructure
Medium voltage inverter
Wind turbine inverter etc..

Maximum ratings

(unless otherwise noted, Ta=25 degC)

Preliminary

Symbol	Parameter	Conditions	Ratings	Unit
VD	Supply voltage	Between VD and GND	16.5	V
IOHP	Output peak current	Pulse width 3us	-27	A
IOLP			27	A
Viso	Isolation voltage between primary and secondary	Sine wave voltage 60Hz, for 1min	6000	Vrms
Tc	Case temperature	Surface temperature of power transistor	100	deg C
Topr	Operating temperature	No condensation allowable	TBD	deg C
Tstg	Storage temperature	No condensation allowable	-40 ~ 85	deg C
Idrive	Gate drive current	Gate average current	200	mA
VC	Collector voltage	Terminal voltage of CN2	3300	V

Electrical characteristics

(unless otherwise noted, Ta=25 degC, VD=15V, RG_on=RG_off=1.5Ω, f=3kHz)

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
VD	Supply voltage	Recommended range	14.5	15	15.5	V
f	Switching frequency	Recommended range It is limited by gate average current (max:200mA)	-	-	10	kHz
RG	Gate resistance	Recommended range	0.5	-	-	Ω
VOH	Plus bias output voltage	Idrive = 0 ~ 200mA	13.5	15.3	16.5	V
VOL	Minus bias output voltage	Idrive = 0 ~ 200mA	-16.5	-13	-11	V
tPLH	"L-H" propagation time	IF=30mA, Fiber length=50cm, C_load:0.57uF	0.1	0.4	0.8	us
tPHL	"H-L" propagation time	IF=30mA, Fiber length=50cm, C_load:0.57uF	0.03	0.15	0.5	us
ttimer	Timer	Between start and cancel of protection (Under input signal is off state)	1	-	2	ms
ttrip	Masked time detect short circuit	Detect terminal (CN2) : over than 50V or open	-	TBD	-	us
VSC	SC detect voltage	Collector voltage of IGBT	50	-	-	V
UVLO+_VCC	Under voltage lock out (Operation start)	VCC voltage	-	12.6	-	V
UVLO-_VCC	Under voltage lock out (Operation stop)	VCC voltage	-	11.7	-	V

Calculation for gate drive current (gate average current)

This product has isolated DCDC converter built in for gate drive.

The maximum output average current is 200mA.

This current means maximum gate average current.

When you decide the switching frequency,
please check the gate average current by next formula.

$$I_{drive} = (Q1 + |Q2|) \times f \quad \leftarrow \text{It must be less than 200mA}$$

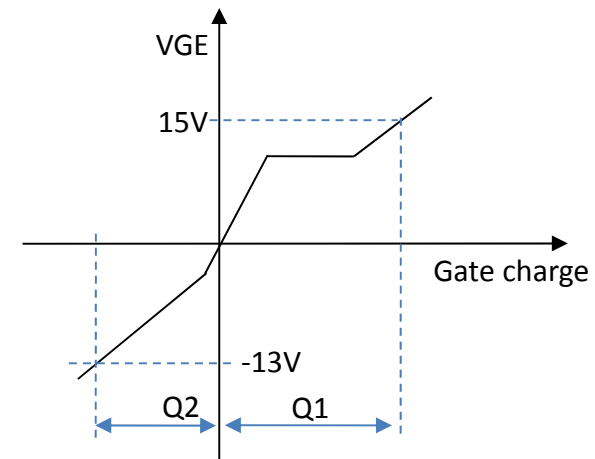
I_{drive} : Gate average current

$Q1$: Gate charge at +15V (Read from data sheet of IGBT)

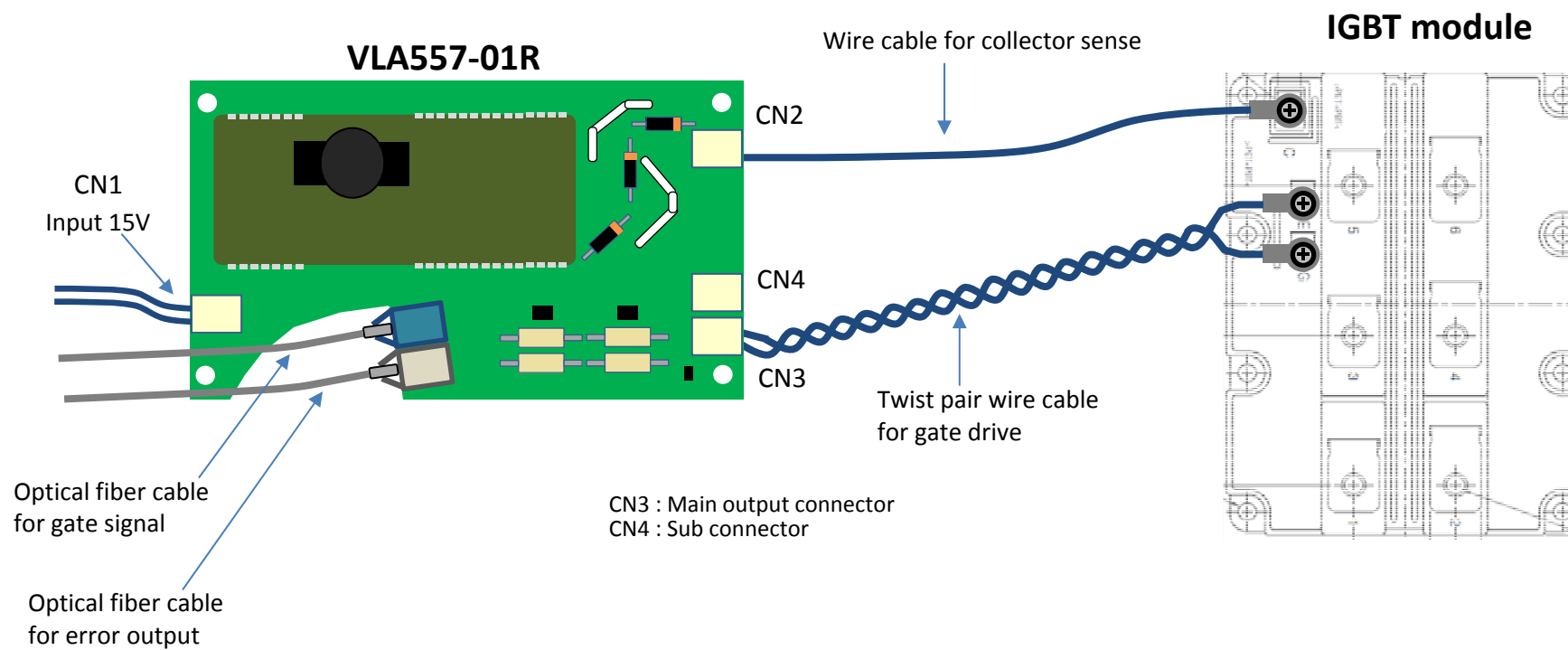
$Q2$: Gate charge at -13V (Read from data sheet of IGBT)

f : Switching frequency of IGBT

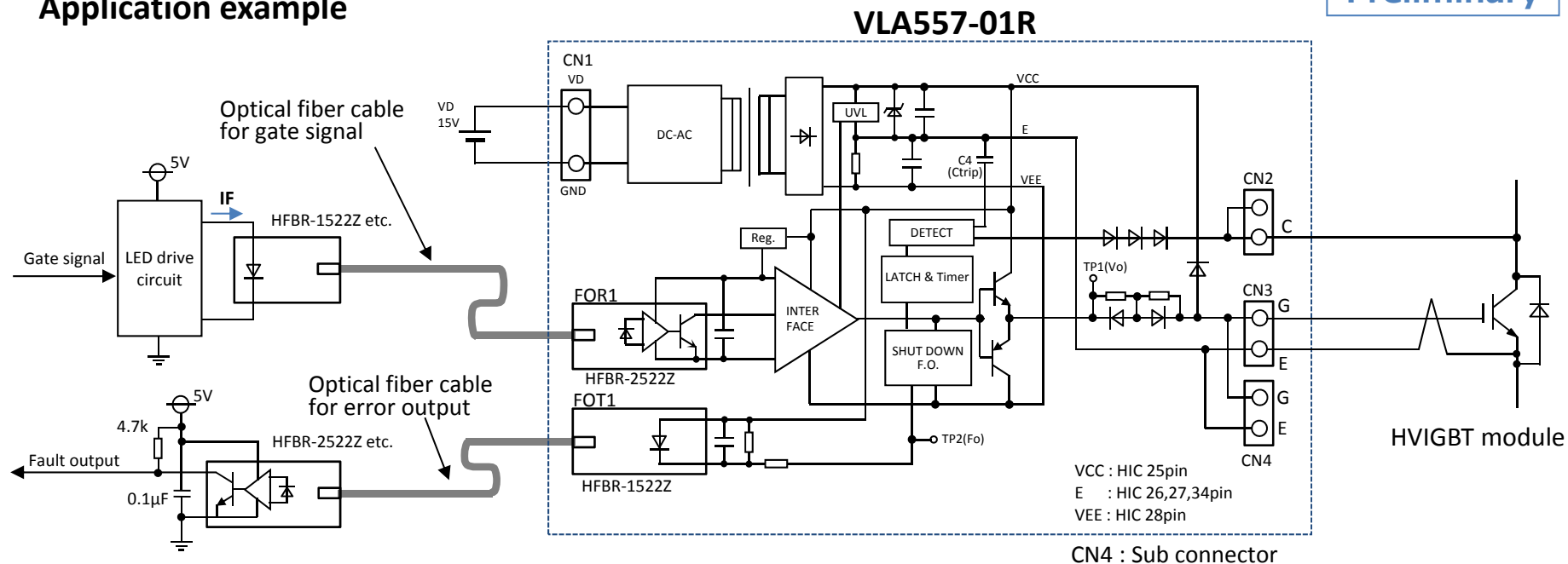
Gate charge characteristic of IGBT



Connection example

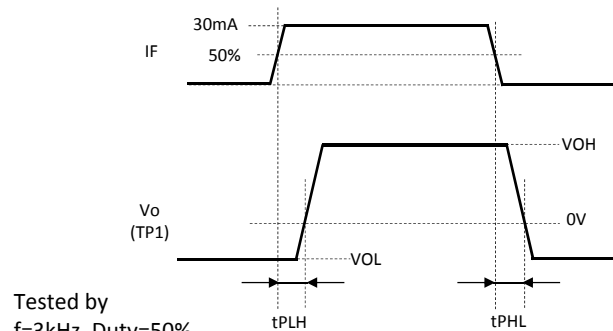


Application example

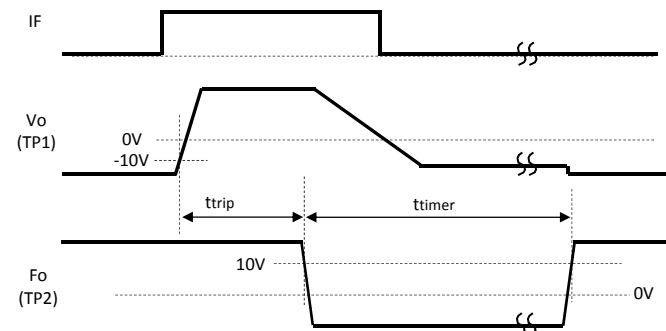


Definition of characteristics

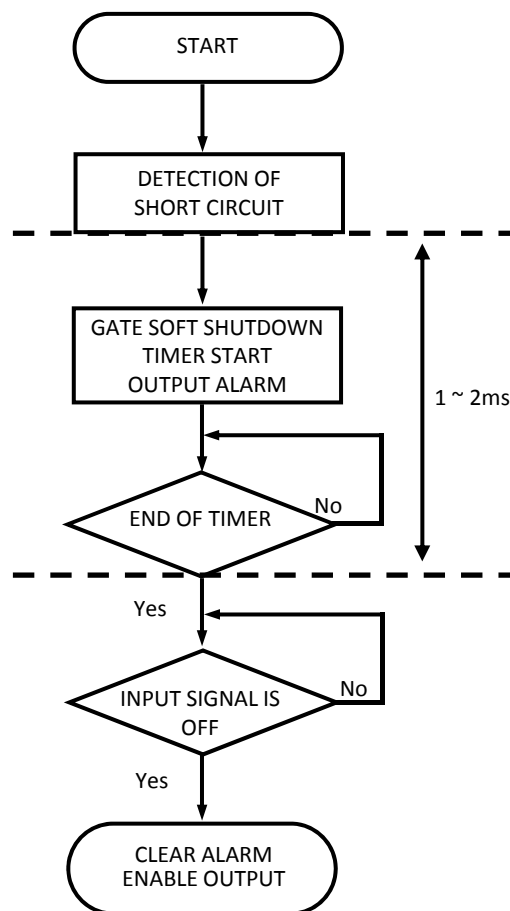
Switching operation



Operation of short circuit protection



Operation flow on detecting short circuit



Operation of protection circuit

- (1) In case the gate voltage is "H" and the collector voltage is high, this drive unit will recognize the circuit as short circuit and reduce the gate voltage (soft shut down). Besides, put out error signal ("L") which inform that protection circuit is operating at the same time from Fo terminal (TP2).
- (2) The protection circuit reset and resort to ordinary condition if input signal is "OFF" when the premised 1~2msec passed. ("OFF" period needs 10us or more)
- (3) When the output rises, the masked time detect short circuit (ttrip) is set up so that on-time of IGBT can be secured properly.
It is possible to adjust that time by connecting the capacitor (Ctrip) at the point of C4.

Latch & Timer reset system in short-circuit protection circuit

Once the short-circuit protection circuit starts, it shuts down the gate output and keeps alarm output, causing the latch status. This status is canceled if the input signal is OFF when specific time elapses after the activation of the short-circuit protection circuit. Then, gate output depending on input signals becomes possible. If the input signal is ON when specific time elapses, the latch status is not canceled: it is canceled when the signal becomes OFF.

As mentioned above, on the latch & timer reset system, the latch status is resulted after activation of the protection circuit and shutdown of the gate output. Therefore, during this period, gate output is not made no matter how much input signals are received. For this reason, it is possible to safely stop the entire equipment by sending error signals to the microcomputer during this period to stop all gate signals.

About mounting gate resistor

Preliminary

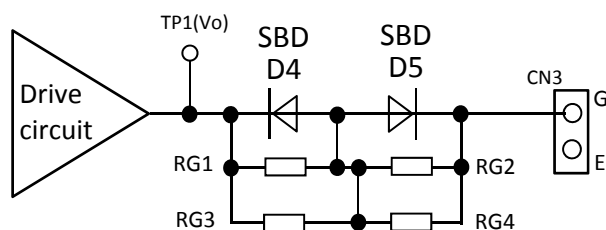
There is not Gate Resistors at the initial state.

It is possible to install up to 4 resistors in mount area of gate resistor.

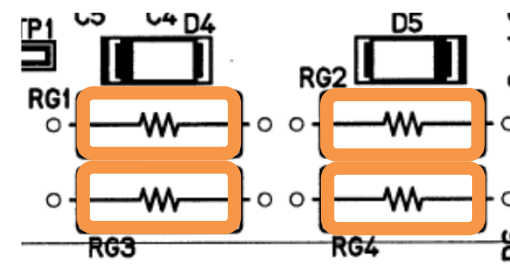
And there are some variations by combining resistor.

There are some examples in the following chart, please refer to it and set the gate resistor.

And please solder the chosen resistor.

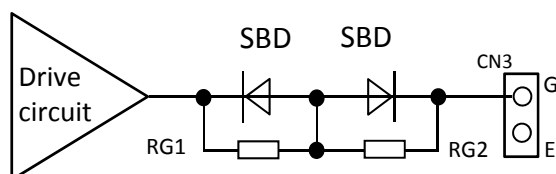


Layout pattern connection on substrate



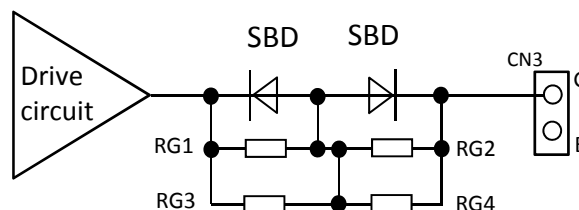
 : Gate resistor mount part (Initial is open)

Example 1



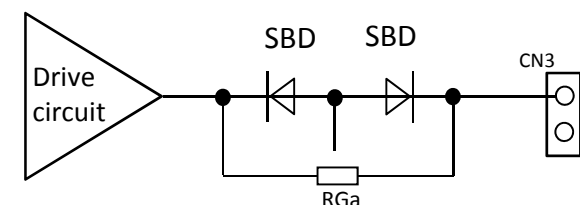
RG_on → RG1
RG_off → RG2

Example 2



RG_on → RG1//RG3
RG_off → RG2//RG4

Example 3



RG_on → R_{Ga}
RG_off → R_{Ga}

Details of connector

CN1 : 53259-0229 (Molex)	
Pin N.o.	Signal
1	VD
2	GND

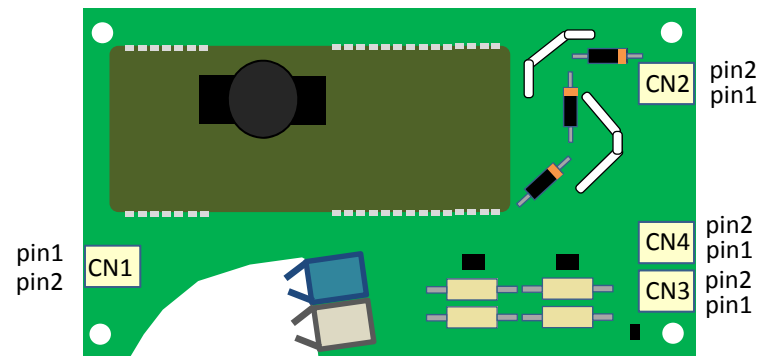
CN2: 53259-0229 (Molex)	
Pin N.o.	Signal
1	Collector
2	Collector

CN3: 53259-0229 (Molex)	
Pin N.o.	Signal
1	Emitter
2	Gate

CN4: 53259-0229 (Molex)	
Pin N.o.	Signal
1	Emitter
2	Gate

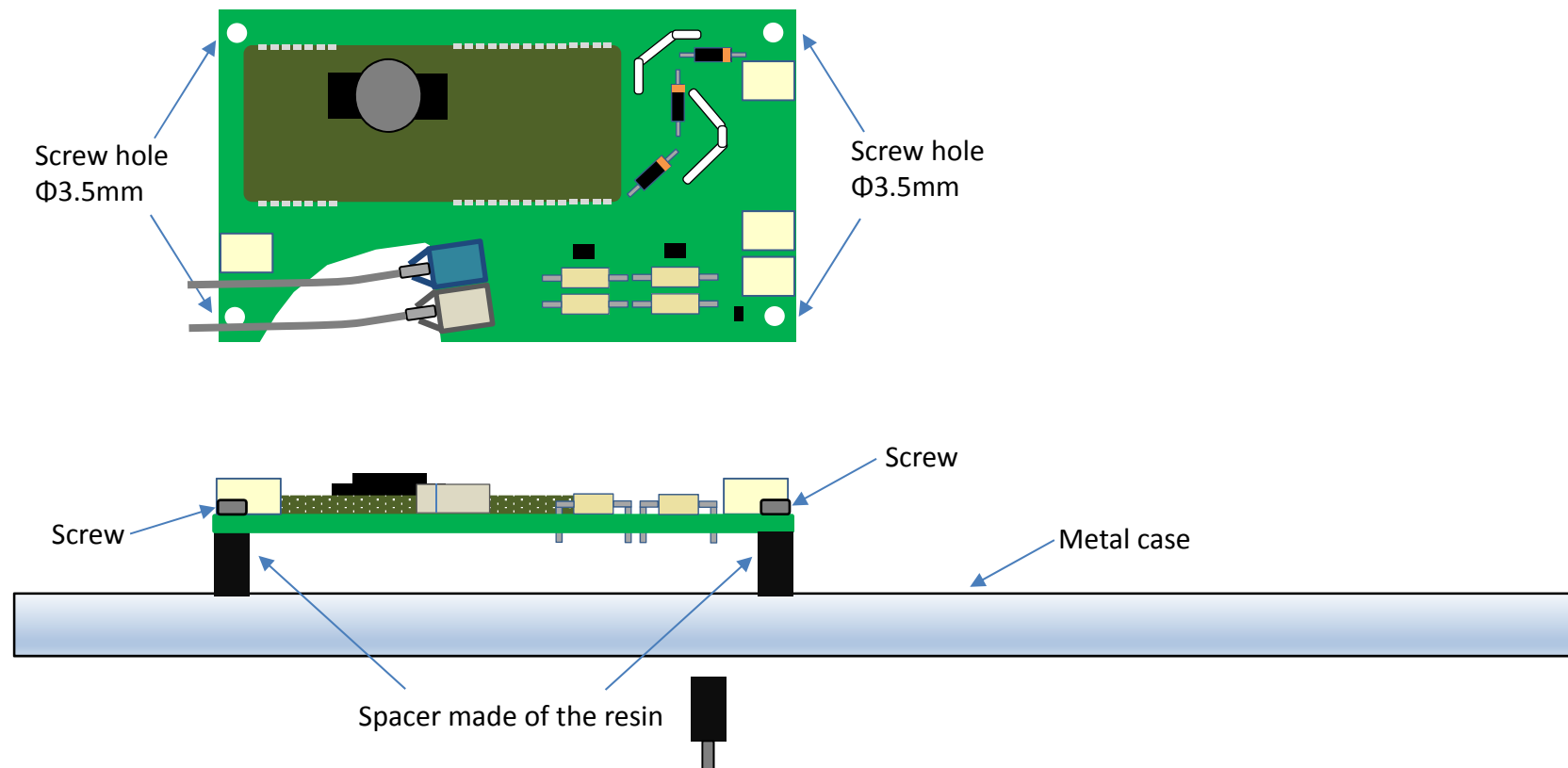
We recommend following parts or equivalent product for wire cable

HOUSING	TERMINAL	Maker
51067-0200	50217-8100	Molex



The installation of the drive unit on metallic case

When fixing this drive unit on a metallic case, please use the spacer made of the resin.



Outline & Size

Note

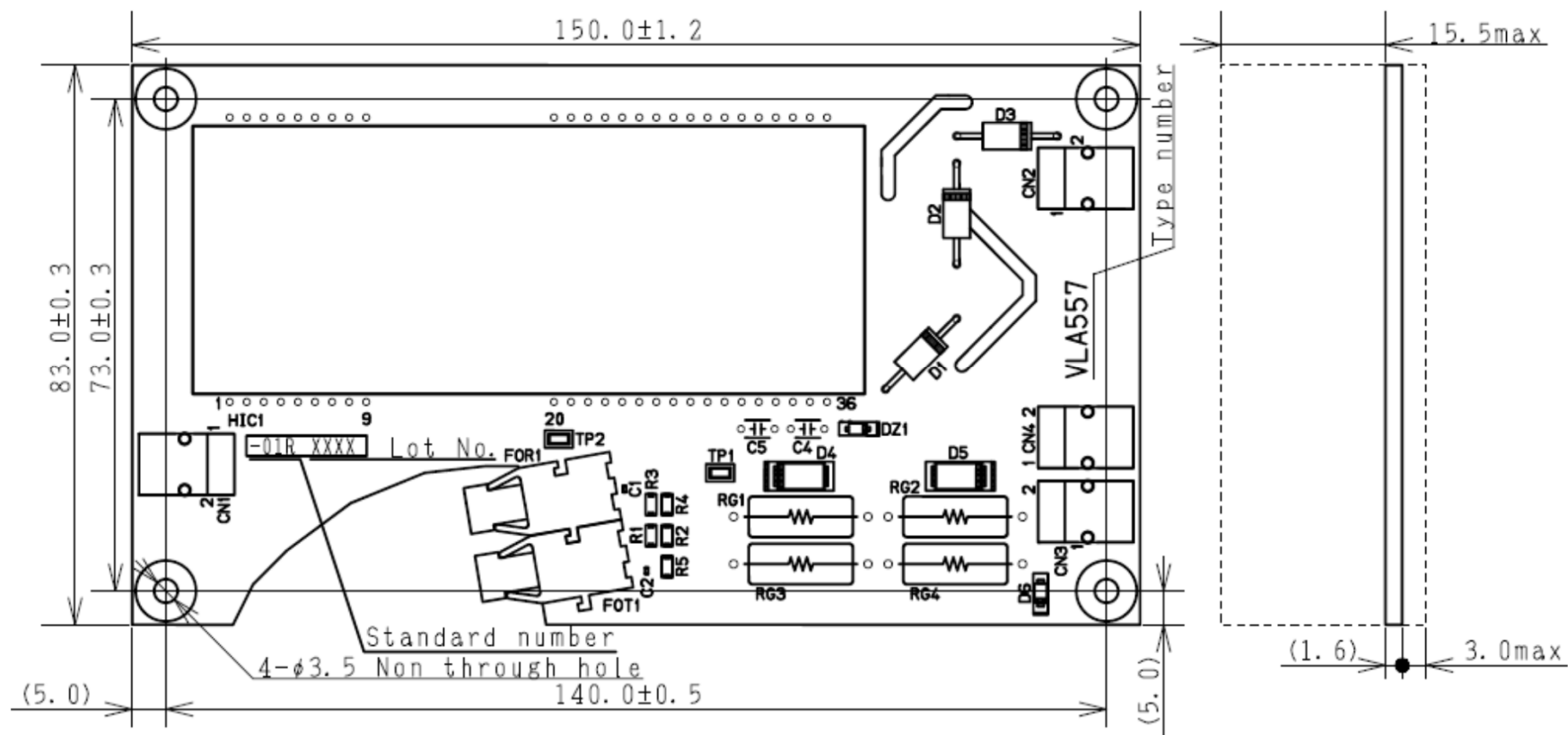
- 1) There is not Gate Resistors at the initial state.
So please solder the chosen resistor.

Clearance & Creepage

Input side - Output side → Clearance
22.5mm

Preliminary

Creepage
22.5mm



Keep safety first in your circuit designs!

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