

BLOCK DIAGRAM

To drive IGBT modules for a general industrial use apparatus.

**APPLICATIONS**

- TTL compatible input.
- Electrical isolation voltage between input and output is 400Vrms (for 1minute)
- Variable fall time on activity of short circuit protection
- Built-in short circuit protection (With fault output)
- SIP outline allows more space on mounting area
- Built-in the isolated type DC-DC converter for gate drive

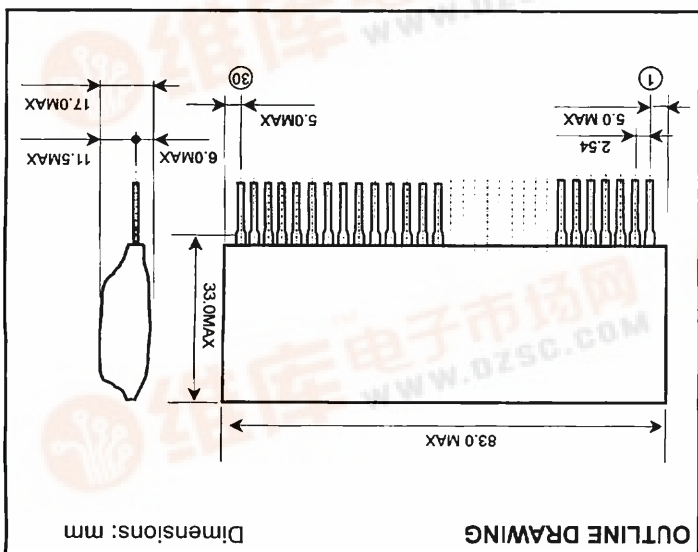
**FEATURES**

- V<sub>CE</sub> = 600V series up to 600A class
- V<sub>CE</sub> = 1200V series up to 1400A class
- V<sub>CE</sub> = 1700V series up to 1000A class
- Recommended IGBT modules:

time after the detection of short circuit.  
to time by function to maintain reverse bias for a predetermined  
The system of built-in short circuit protection provide a margin  
supply is not required.  
converter for a Gate drive. Therefore design of the gate power  
(for 1minute). This device include the isolated type DC-DC  
Electrical isolation voltage between input and output is 400Vrms  
n-channel IGBT modules in any gate-amplifier application.

**DESCRIPTION**

VLA500K is a hybrid integrated circuit designed for driving



OUTLINE DRAWING

Dimensions: mm



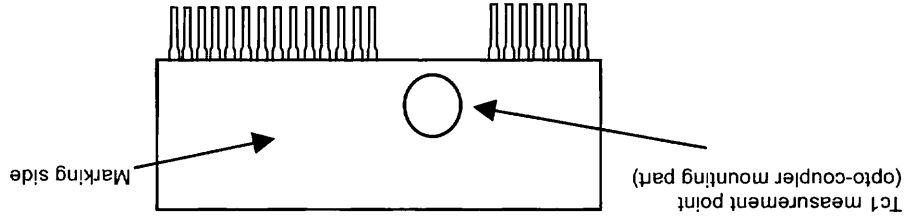
**MAXIMUM RATINGS** (Unless otherwise noted, Ta=25°C)

Symbol	Parameter	Conditions	Unit
VD	Supply voltage	DC	V
VI	Input signal voltage	Applied between pin 6 - 7 50% duty cycle, pulse width 1ms	V
VO	Output voltage	When the output voltage is "H"	V
IOHP	Output current	Pulse width 2µs	A
IOLP	Output current		A
VISO	Isolation voltage	Sine wave voltage 60Hz, for 1min., R.H.<60%	Vrms
TC1	Case temperature1	Surface temperature(opto-coupler mounting part) (*3)	°C
TC2	Case temperature2	Surface temperature(excepting opto-coupler mounting part)	°C
TOPR	Operating temperature	No condensation allowable	°C
TSIG	Storage temperature	No condensation allowable	°C
IC0	Fault output current	Applied pin 28	mA
VR30	Input voltage to pin 30	Applied pin 30	V
IGDVE	Gate drive current	Gate average current	mA

(\*1) Differs from H/C condition

(\*2) Refer to Idrive-Ta CHARACTERISTICS (Now preliminary)

(\*3) Refer to the below figure.



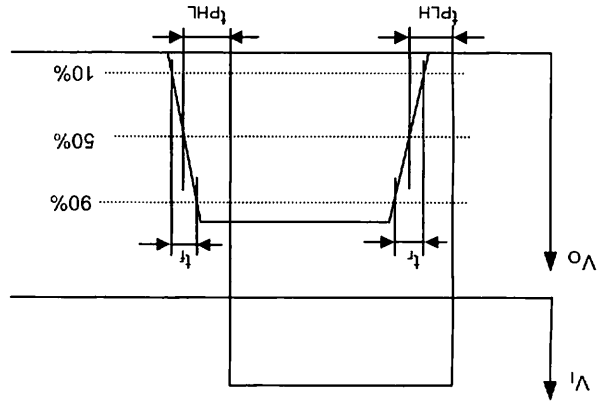
**ELECTRICAL CHARACTERISTICS** (Unless otherwise noted, Ta=25°C, VD=15V, RG=2.2 ohm)

Symbol	Parameter	Conditions	Limits		
			Min	Typ	Max
VD	Supply voltage	Recommended range	14.2	15	15.8
VIN	Pull-up voltage on input side	Recommended range	4.75	5	5.25
IIN	"H" input current	Recommended range	15.2	16	19
f	Switching frequency	Recommended range	-	-	20
RG	Gate resistance	Recommended range	1	-	-
IIN	"H" input current	VIIN = 5V	-	16	-
VCC	Gate positive supply voltage	-	15.2	-	17.5
VEE	Gate negative supply voltage	-	-6	-	-11.5
ETA	Gate supply efficiency	Load current = 210mA Eta = (VCC+VVEE) / (15 x ID) x 100	60	75	-
VOH	"H" output voltage	10k ohm connected between pin 23-20	14	15.3	16.5
VOL	"L" output voltage	10k ohm connected between pin 23-20	-5.5	-	-11
tPLH	"L-H" propagation time	IIN = 16mA	0.3	0.6	1
tF	"L-H" rise time	IIN = 16mA	-	0.3	1
tPHL	"H-L" propagation time	IIN = 16mA	0.6	1.0	1.3
tF	"H-L" fall time	IIN = 16mA	-	0.3	1
tTimer	Timer	Between start and cancel (under input sign "L")	1	-	2
IC0	Fault output current	Applied pin 28, R = 4.7k ohm	-	5	-
tHP1	Controlled time detect short circuit 1	Pin 30 : 15V and more, pin 29 : open	-	2.8	-
tHP2	Controlled time detect short circuit 2	Pin 30 : 15V and more, pin 29-21,22 : 10pF (connective capacitance)	-	3.2	-
VSC	SC detect voltage	Collector voltage of module	15	-	-

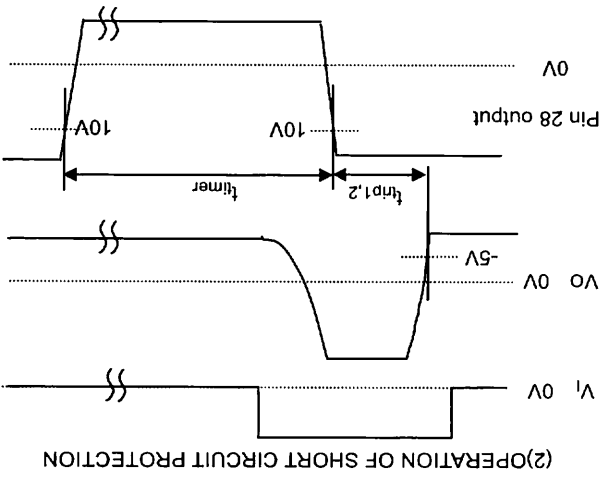
(\*4) Length of wiring of condenser controlled time detect short-circuit is within 5cm from pin 21,22 and 29 coming and going.

**DEFINITION OF CHARACTERISTICS**

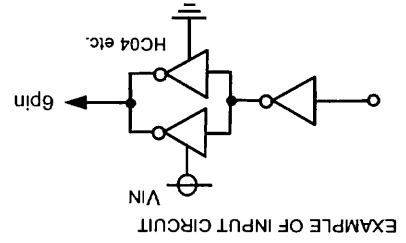
(1) SWITCHING OPERATION



**APPLICATION EXAMPLE**

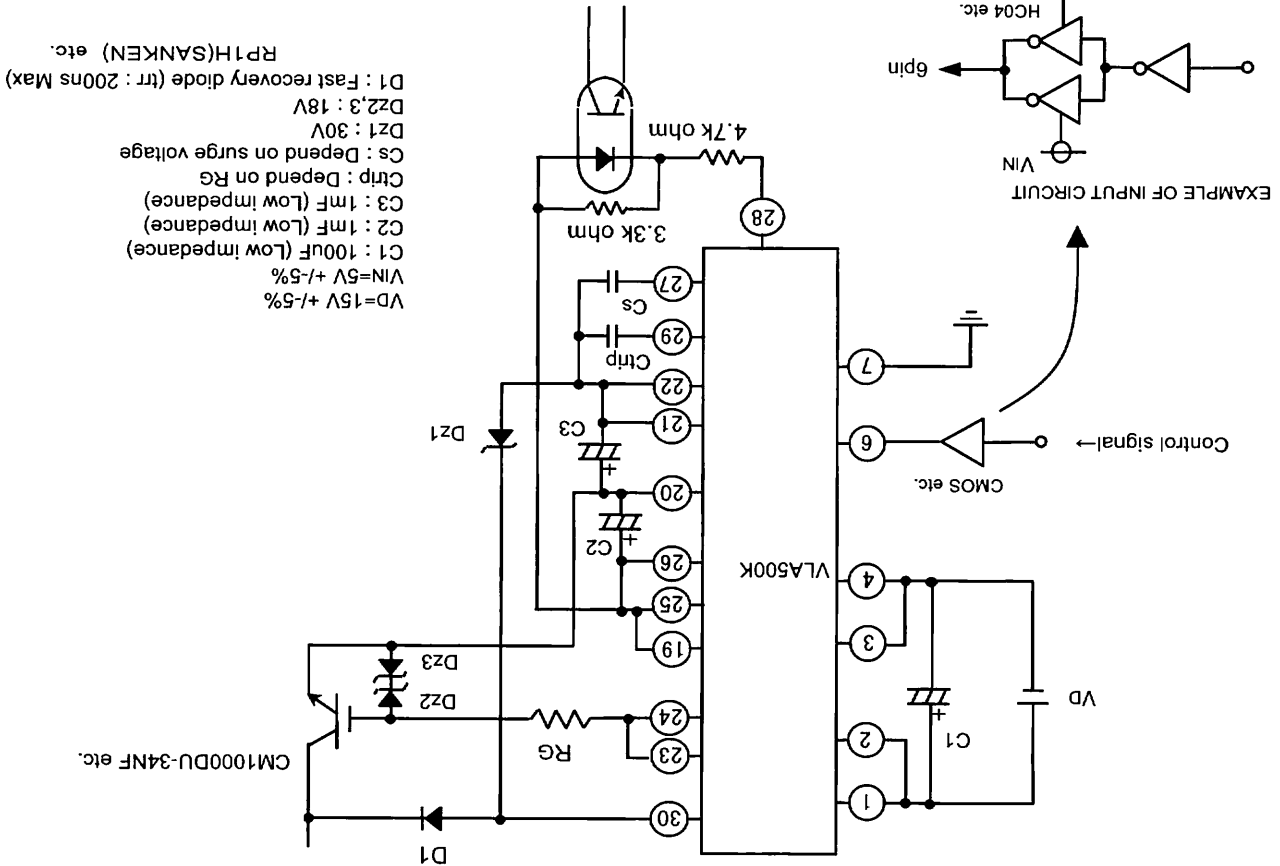


(2) OPERATION OF SHORT CIRCUIT PROTECTION



**PRECAUTION**

- (1) Voltage compensate capacitors are expected to be located as close as possible to the Hybrid IC.
- (2) Minimize the area of closed circuit of gate circuit so as not to be affected by induction noise.
- (3) D1 requires approximately the same voltage of power modules.
- (4) When recovery current flow in D1, pin 30 is applied high voltage.
- In that case, counterpin for protection which insert a zener diode between pin21,22 and 30 are necessary like above diagram.
- (5) When you make late speed of reverse bias at the time of short circuit protection operation, please adjust and connect a capacitor between the 21,22 and 27.



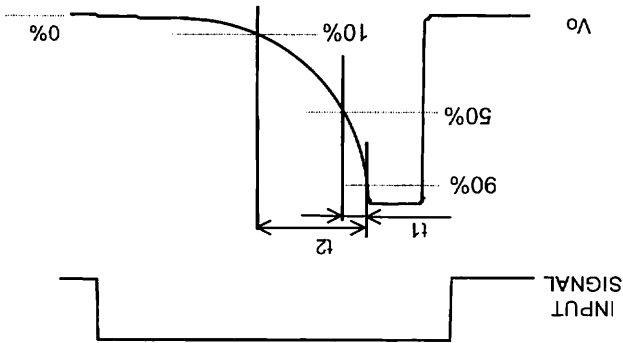
- VD=15V +/-5%
- VIN=5V +/-5%
- C1 : 100uF (Low impedance)
- C2 : 1mF (Low impedance)
- C3 : 1mF (Low impedance)
- C4 : 1mF (Low impedance)
- C5 : Depend on surge voltage
- Ctrp : Depend on RG
- DZ1 : 30V
- DZ2,3 : 18V
- D1 : Fast recovery diode (trr : 200ns Max)
- RP1H(SANKEN) etc.

**ADJUSTMENT OF OUTPUT FALL TIME**

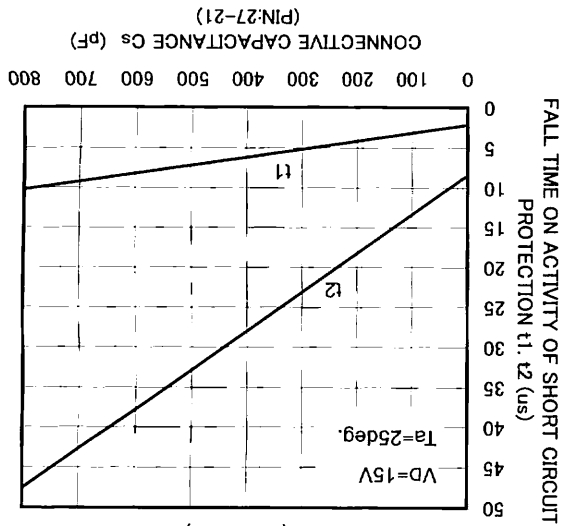
(When the protection circuit is operating)

In case you want to decrease the speed of reverse bias when the protection circuit is operating, you can adjust that speed by connecting the capacitor (Cs) between pin 21, 22 and 27.

(Please refer to under figures.)



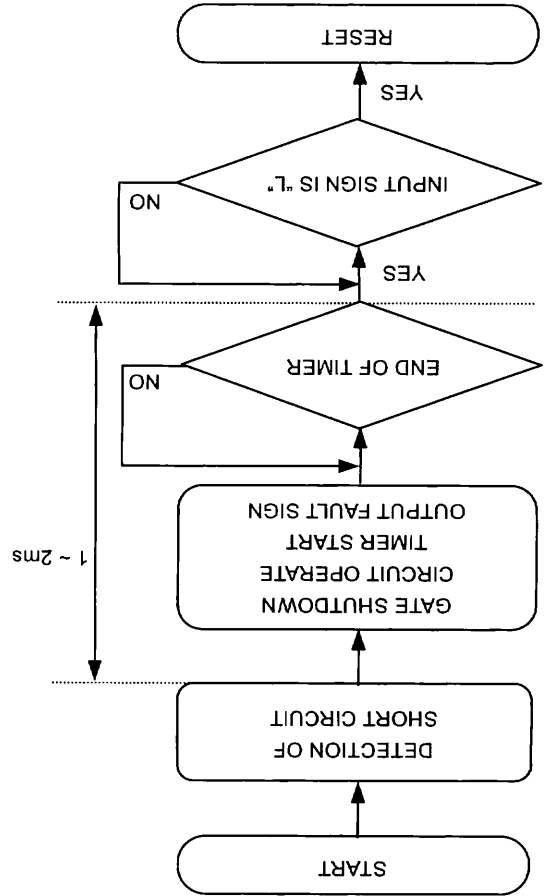
t1, t2 VS. Cs CHARACTERISTICS (TYPICAL)



**OPERATION OF PROTECTION CIRCUIT**

- (1) In case the gate voltage is "H" and the collector voltage is high, this Hybrid IC will recognize the circuit as short circuit and immediately reduce the gate voltage. Besides, put out a fault sign ("L") which inform that protection circuit is operating at the same time from pin 28.
  - (2) The protection circuit reset and resorted to ordinary condition if input sign is "L" when the predetermined time (1 ~ 2ms) passed.
  - (3) When the output rises, the controlled time detect short circuit ("L" period needs 15us or more)
- It is possible to adjust that time by connecting the capacitor (Ctrip) between pin 21, 22 and 29.

**OPERATION FLOW ON DETECTING SHORT CIRCUIT**



Note : "L" output voltage with protection circuit operating is about VEE + 2V.

Great detail and careful attention are given to the production activity of Hics, such as the development, the quality of production, and in its reliability. However the reliability of Hics depends not only on their own factors but also in their condition of usage. When handling Hics, please note the following cautions.

FOR SAFETY USING

DRIIVER FOR IGBT MODULES

**VLA500K-01R**

CAUTIONS	
<p>The materials used in packing Hics can only withstand normal external conditions. When exposed to outside shocks, rain and certain environmental contaminants, the packing materials will deteriorates. Please take care in handling.</p> <p>1) Don't stack boxes too high. Avoid placing heavy materials on boxes.</p> <p>2) Boxes must be positioned correctly during transportation to avoid breakage.</p> <p>3) Don't throw or drop boxes.</p> <p>4) Keep boxes dry. Avoid rain or snow.</p> <p>5) Minimal vibration and shock during transportation is desirable.</p>	<p>Packing</p>
<p>When storing Hics, please observe the following notices or possible deterioration of their electrical characteristics, risk of solder ability, and external damage may occur.</p> <p>1) Devices must be stored where fluctuation of temperature and humidity is minimal, and must not be exposed to direct sunlight. Store at the normal temperature of 5 to 30 degrees Celsius with humidity at 40 to 60%.</p> <p>2) Avoid locations where corrosive gasses are generated or where much dust accumulates.</p> <p>3) Storage cases must be static proof.</p> <p>4) Avoid putting weight on boxes.</p>	<p>Storage</p>
<p>When extended storage is necessary, Hics must be kept non-processed. When using Hics which have been stored for more than one year or under severe conditions, be sure to check that the exterior is free from flaw and other damages.</p> <p>To prevent any electrical damages, use Hics within the maximum ratings. The temperature, current, voltage, etc. must not exceed these conditions.</p>	<p>Extended storage</p>
<p>To protect Hics from destruction and deterioration due to wrong insertion, make sure of polarity in inserting leads into the board holes, conforming to the external view for the terminal arrangement.</p>	<p>Maximum ratings</p>
<p>To protect Hics from destruction and deterioration due to wrong insertion, make sure of polarity in inserting leads into the board holes, conforming to the external view for the terminal arrangement.</p>	<p>Polarity</p>

**Keep safety first in your circuit designs!**  
- ISAHAYA Electronics Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (1) placement of substitutive, auxiliary circuits, (2) use of non-flammable material or (3) prevention against any malfunction or mishap.

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