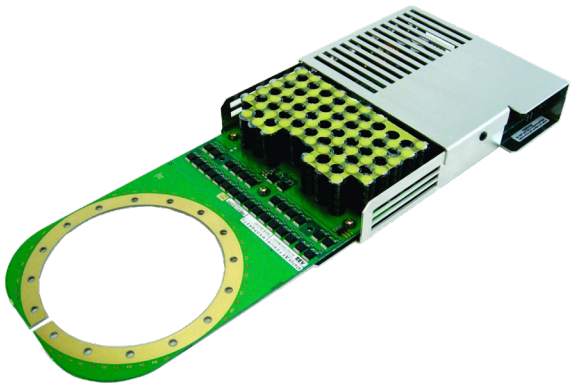
HITACHI
Inspire the Next

Application note 5SYA 2031-06

Applying IGCT gate units

Nowadays semiconductor manufactures are increasingly taking technical and commercial responsibility for both the power semiconductor and its gate unit. Control parameters such as turn-on and off pulse amplitudes, pulse width and rate of rise, gate circuit inductance, back-porch current and others are standardised by the manufacturer, making the IGCT suitable for converter topologies such as Voltage and Current Source Inverters, Resonance Converters and Static Breakers.



1. Introduction

The control interface discussion between converter design engineers and the power semiconductor manufacturer can be reduced to the specification of power supply, control signal transfer and mechanical assembly leading to a reduction of development costs and time. As a result the power semiconductor technologies made available to a broader group of users. Basic design rules and handling / application recommendations for IGCT gate units regarding power supply, insulation and optical control interface, control-, diagnostics- and protection parameters as well as environmental aspects are described in this application note.

2. Gate unit generations

This application note covers the gate units of several IGCT types. The gate units can be grouped into two generations. Within a generation, the gate units are very similar in circuitry and functionality. They only differ in mechanical size and the dimensioning of the gate drive circuit. The application note is valid for IGCTs with both generation B and generation C gate units unless otherwise noted. Series and parallel connection with different generations is not recommended.

Hitachi Energy

Table of contents

Table 1 shows the IGCT with its respective gate unit.

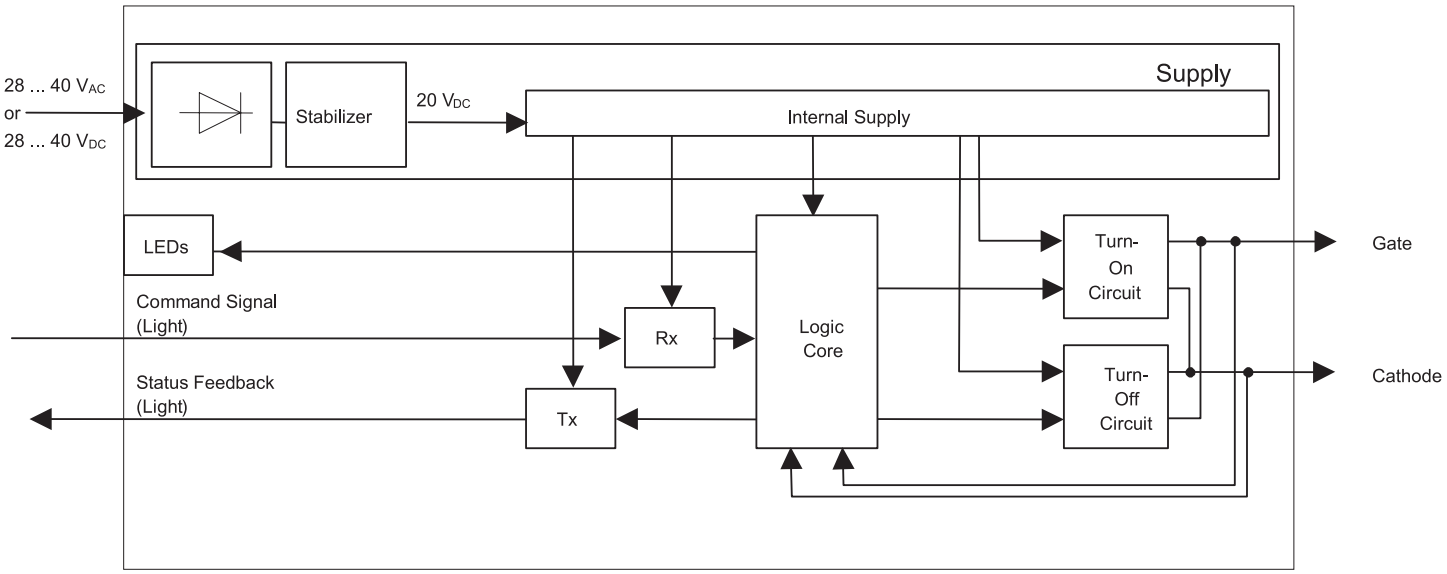
Picture	IGCT types	Gate unit generation
	5SHY 35L4520	B, C
	5SHY 35L4522	
	5SHY 45L4520	
	5SHY 55L4500	
	5SHY 65L4521	
	5SHY 65L4522	
	5SHY 50L5500	
	5SHY 42L6500	
	5SHX 26L4520	
	5SHX 19L6020	
	5SHX 36L4520	
	5SHX 36L4521	

3. Users guide

In this users guide the most important aspects of the gate unit power supply, the insulation interface, the optical interface, control and the diagnostic functionality during normal operation and during fault occurrences are explained. Also environmental issues such as electromagnetic immunity, vibration compliance and thermal management are briefly covered. As an appetizer an example of a functional block diagram of an IGCT gate unit is given in figure 1.

3.1. Power supply interface insulation

The insulation requirement in the IGCT environment is a function of the maximum applied nominal voltage of the converter application itself. This voltage varies from a few thousand volts to several tens of thousands of volts over the IGCT application range. Hence, the requirements on insulation strength and distances can be very different. Furthermore, the power which needs to be transferred through the insulation interface is also strongly application dependent, and users are likely to require quite different insulation interfaces in terms of both power handling capability and insulation strength. As this also applies to the costs of the interface, standardisation of the insulation interface is difficult. This is why the IGCT gate unit does not provide an on-board potential separation. The gate unit power supply output as well as the supply cable must withstand the high voltage potential of the power semiconductor switch against all other relevant potentials in the converter.



01 Block diagram of an IGCT gate unit

Hitachi Energy Switzerland Ltd.
Semiconductors
Fabrikstrasse 3
5600 Lenzburg, Switzerland
Tel: +41 58 586 10 00
salesdesksem@hitachienergy.com