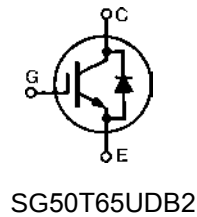
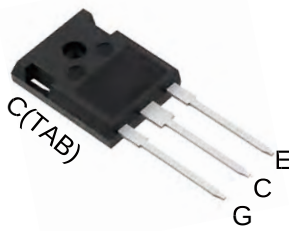


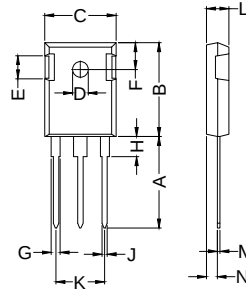
# SG50T65UDB2

## Discrete IGBTs



SG50T65UDB2

Dimensions TO-247AD



| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 19.81      | 20.32 | 0.780  | 0.800 |
| B    | 20.80      | 21.46 | 0.819  | 0.845 |
| C    | 15.75      | 16.26 | 0.620  | 0.640 |
| ØD   | 3.15       | 3.65  | 0.124  | 0.144 |
| E    | 4.32       | 5.49  | 0.170  | 0.216 |
| F    | 5.40       | 6.30  | 0.213  | 0.248 |
| G    | 1.65       | 2.18  | 0.065  | 0.086 |
| H    | 3.80       | 4.50  | 0.150  | 0.177 |
| J    | 1.00       | 1.40  | 0.039  | 0.055 |
| K    | 10.80      | 11.10 | 0.425  | 0.437 |
| L    | 4.70       | 5.30  | 0.185  | 0.209 |
| M    | 0.40       | 0.80  | 0.016  | 0.031 |
| N    | 1.50       | 2.49  | 0.059  | 0.098 |

G=Gate, C=Collector,  
E=Emitter, TAB=Collector



### MAXIMUM RATING (Ta=25°C)

| SYMBOL            | CHARACTERISTIC                           |                        | RATING      | UNIT |
|-------------------|------------------------------------------|------------------------|-------------|------|
| V <sub>CES</sub>  | Collector-Emitter Voltage                |                        | 650         | V    |
| V <sub>GES</sub>  | Gate-Emitter Voltage                     |                        | ±20         | V    |
| I <sub>C</sub>    | Collector Current                        | @T <sub>c</sub> =25°C  | 100         | A    |
|                   |                                          | @T <sub>c</sub> =100°C | 50          | A    |
| I <sub>CM</sub> * | Pulsed Collector Current                 |                        | 150         | A    |
| I <sub>F</sub>    | Diode Continuous Forward                 | @T <sub>c</sub> =100°C | 50          | A    |
| I <sub>FM</sub>   | Current Diode Maximum                    |                        | 100         | A    |
| P <sub>D</sub>    | Forward Current Ma:<br>Power Dissipation | @T <sub>c</sub> =25°C  | 277         | W    |
|                   |                                          | @T <sub>c</sub> =100°C | 111         | W    |
| T <sub>j</sub>    | Maximum Junction Temperature             |                        | 150         | °C   |
| T <sub>stg</sub>  | Storage Temperature Range                |                        | -55 to +150 | °C   |

\*Repetitive rating : Pulse width limited by max. junction temperature

### THERMAL CHARACTERISTIC

| SYMBOL            | CHARACTERISTIC                                  | MAX. | UNIT |
|-------------------|-------------------------------------------------|------|------|
| R <sub>thJC</sub> | Thermal Resistance, Junction to Case            | 0.45 | °C/W |
| R <sub>thJC</sub> | (IGBT) Thermal Resistance, Junction to Case     | 1.0  | °C/W |
| R <sub>thJA</sub> | (DIODE) Thermal Resistance, Junction to Ambient | 40   | °C/W |

### General Description

SIRECTIFIER Trench Field Stop IGBTs offer low switching losses, high energy efficiency and short circuit ruggedness. It is designed For applications such as motor control, uninterrupted power Supplies(UPS), general inverters.

### FEATURES

- High speed switching
- High ruggedness, temperature
- stable behavior
- Short Circuit Withstand Times > 10us
- Extremely enhanced avalanche capability

# SG50T65UDB2

## Discrete IGBTs

### ELECTRICAL CHARACTERISTICS (Ta=25°C)

| SYMBOL               | CHARACTERISTIC                       | TEST CONDITION                                                                                                                                 | MIN.                                                                                                                                            | TYP. | MAX. | UNIT |    |
|----------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|----|
| Static               |                                      |                                                                                                                                                |                                                                                                                                                 |      |      |      |    |
| BV <sub>CES</sub>    | Collector-Emitter Breakdown Voltage  | V <sub>GE</sub> =0V , I <sub>C</sub> =250μA                                                                                                    | 650                                                                                                                                             | -    | -    | V    |    |
| I <sub>CES</sub>     | Collector Cut-off Current            | V <sub>GE</sub> =0V, V <sub>CE</sub> =650V                                                                                                     | -                                                                                                                                               | -    | 250  | μA   |    |
| I <sub>GES</sub>     | Gate Leakage Current                 | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V                                                                                                     | -                                                                                                                                               | -    | ±100 | nA   |    |
| V <sub>GE(th)</sub>  | Gate Threshold Voltage               | V <sub>GE</sub> =V <sub>CE</sub> , I <sub>C</sub> =5mA                                                                                         | 4.5                                                                                                                                             | 5.5  | 7.0  | V    |    |
| V <sub>CE(sat)</sub> | Collector-Emitter Saturation Voltage | V <sub>GE</sub> =15V, I <sub>C</sub> =50A                                                                                                      | -                                                                                                                                               | 1.65 | 2.10 | V    |    |
|                      |                                      | V <sub>GE</sub> =15V, I <sub>C</sub> =100A                                                                                                     | -                                                                                                                                               | 2.25 | -    | V    |    |
|                      |                                      | V <sub>GE</sub> =15V, I <sub>C</sub> =50A, T <sub>C</sub> = 125°C                                                                              | -                                                                                                                                               | 1.90 | -    | V    |    |
| Dynamic              |                                      |                                                                                                                                                |                                                                                                                                                 |      |      |      |    |
| Q <sub>g</sub>       | Total Gate Charge                    | V <sub>CC</sub> =300V, V <sub>GE</sub> =15V, I <sub>C</sub> = 50A                                                                              | -                                                                                                                                               | 200  | -    | nC   |    |
| Q <sub>ge</sub>      | ChargeGate-Emitter Charge            |                                                                                                                                                | -                                                                                                                                               | 30   | -    | nC   |    |
| Q <sub>gc</sub>      | Gate-Collector Charge                |                                                                                                                                                | -                                                                                                                                               | 100  | -    | nC   |    |
| t <sub>d(on)</sub>   | Turn-On Delay Time                   | V <sub>CC</sub> =300V, I <sub>C</sub> =50A, V <sub>GE</sub> =15V,<br>R <sub>G</sub> =10Ω Inductive Load, T <sub>C</sub> = 25°C<br><br>(Note 1) | -                                                                                                                                               | 60   | -    | ns   |    |
| t <sub>r</sub>       | Rise Time                            |                                                                                                                                                | -                                                                                                                                               | 45   | -    | ns   |    |
| t <sub>d(off)</sub>  | Turn-Off Delay Time                  |                                                                                                                                                | -                                                                                                                                               | 250  | -    | ns   |    |
| t <sub>f</sub>       | Fall Time                            |                                                                                                                                                | -                                                                                                                                               | 40   | -    | ns   |    |
| E <sub>on</sub>      | Turn-On Switching Loss               |                                                                                                                                                | -                                                                                                                                               | 1.25 | 1.65 | mJ   |    |
| E <sub>off</sub>     | Turn-Off Switching Loss              |                                                                                                                                                | -                                                                                                                                               | 0.95 | 1.25 | mJ   |    |
| E <sub>ts</sub>      | Total Switching Loss                 |                                                                                                                                                | -                                                                                                                                               | 2.2  | 2.9  | mJ   |    |
| t <sub>d(on)</sub>   | Turn-On Delay Time                   |                                                                                                                                                | V <sub>CC</sub> =300V, I <sub>C</sub> =50A, V <sub>GE</sub> =15V,<br>R <sub>G</sub> =10Ω Inductive Load, T <sub>C</sub> = 125°C<br><br>(Note 1) | -    | 60   | -    | ns |
| t <sub>r</sub>       | Rise Time                            |                                                                                                                                                |                                                                                                                                                 | -    | 50   | -    | ns |
| t <sub>d(off)</sub>  | Turn-Off Delay Time                  | -                                                                                                                                              |                                                                                                                                                 | 260  | -    | ns   |    |
| t <sub>f</sub>       | Fall Time                            | -                                                                                                                                              |                                                                                                                                                 | 50   | -    | ns   |    |
| E <sub>on</sub>      | Turn-On Switching Loss               | -                                                                                                                                              |                                                                                                                                                 | 1.25 | -    | mJ   |    |
| E <sub>off</sub>     | Turn-Off Switching Loss              | -                                                                                                                                              |                                                                                                                                                 | 1.15 | -    | mJ   |    |
| E <sub>ts</sub>      | Total Switching Loss                 | -                                                                                                                                              |                                                                                                                                                 | 2.4  | -    | mJ   |    |
| C <sub>ies</sub>     | Input Capacitance                    | V <sub>CE</sub> =30V, V <sub>GE</sub> =0V, f=1MHz                                                                                              | -                                                                                                                                               | 4000 | 5200 | pF   |    |
| C <sub>oes</sub>     | CapacitanceOuput Capacitance         |                                                                                                                                                | -                                                                                                                                               | 250  | -    | pF   |    |
| C <sub>res</sub>     | Reverse Transfer Capacitance         |                                                                                                                                                | -                                                                                                                                               | 150  | -    | pF   |    |
| t <sub>sc</sub>      | Short Circuit Withstand Time         | V <sub>CC</sub> =300V, V <sub>GE</sub> =15V, T <sub>C</sub> =100°C                                                                             | 10                                                                                                                                              | -    | -    | μs   |    |

Note 1 : Energy loss include tail current and diode reverse recovery.

# SG50T65UDB2

## Discrete IGBTs

### ELECTRICAL CHARACTERISTIC OF DIODE

| SYMBOL          | CHARACTERISTIC                      | TEST CONDITION                                                |                       | MIN. | TYP. | MAX. | UNIT |
|-----------------|-------------------------------------|---------------------------------------------------------------|-----------------------|------|------|------|------|
| V <sub>F</sub>  | Diode Forward Voltage               | I <sub>F</sub> = 50A                                          | T <sub>C</sub> =25°C  | -    | 1.8  | 2.5  | V    |
|                 |                                     |                                                               | T <sub>C</sub> =125°C | -    | 1.9  | -    |      |
| t <sub>rr</sub> | Diode Reverse Recovery Time         | V <sub>CC</sub> =300V, I <sub>F</sub> =50A<br>di/dt = 600A/μs | T <sub>C</sub> =25°C  | -    | 100  | -    | ns   |
|                 |                                     |                                                               | T <sub>C</sub> =125°C | -    | 175  | -    |      |
| I <sub>rr</sub> | Diode Peak Reverse Recovery Current |                                                               | T <sub>C</sub> =25°C  | -    | 19   | -    | A    |
|                 |                                     |                                                               | T <sub>C</sub> =125°C | -    | 22   | -    |      |
| Q <sub>rr</sub> | Diode Reverse Recovery Charge       |                                                               | T <sub>C</sub> =25°C  | -    | 1.1  | -    | μC   |
|                 |                                     |                                                               | T <sub>C</sub> =125°C | -    | 2.3  | -    |      |

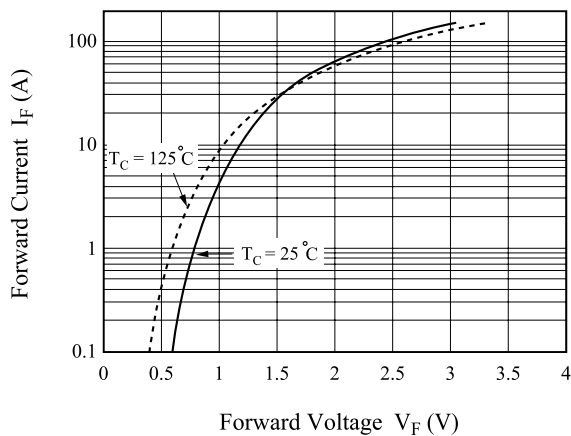


Fig.1 Forward Characteristics

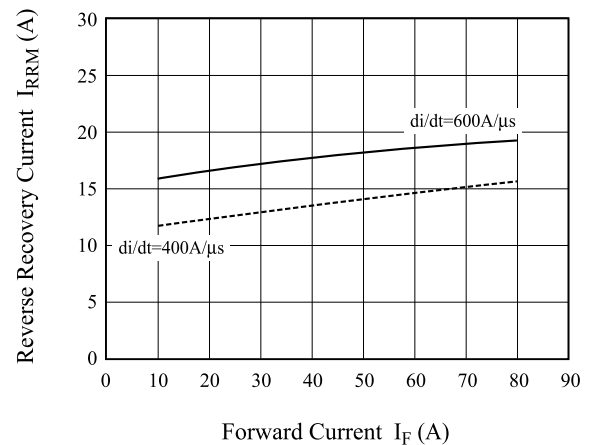


Fig.2 Reverse Recovery Current

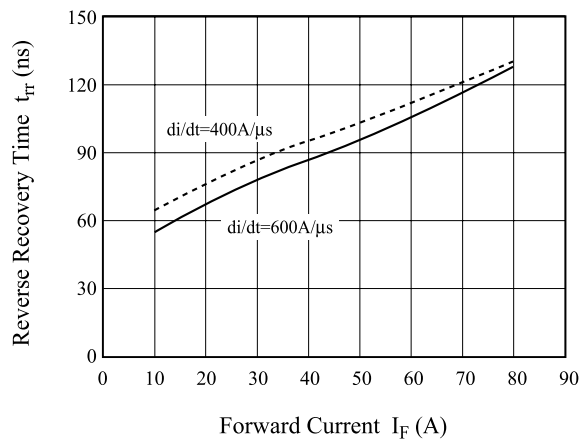
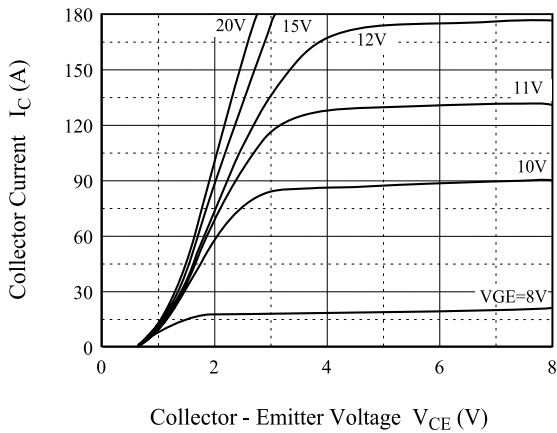


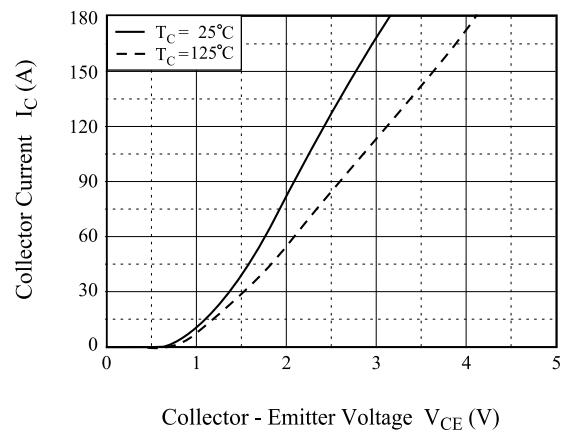
Fig.3 Reverse Recovery Time

# SG50T65UDB2

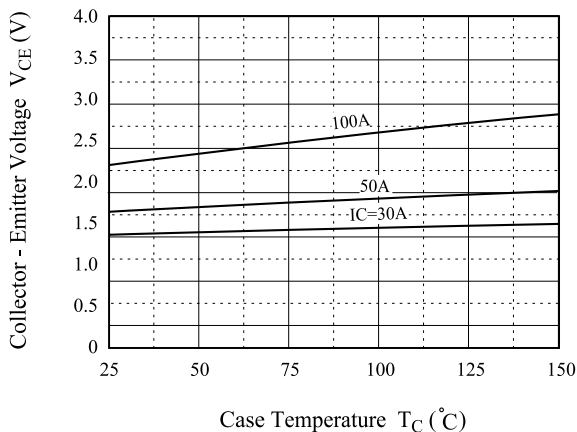
## Discrete IGBTs



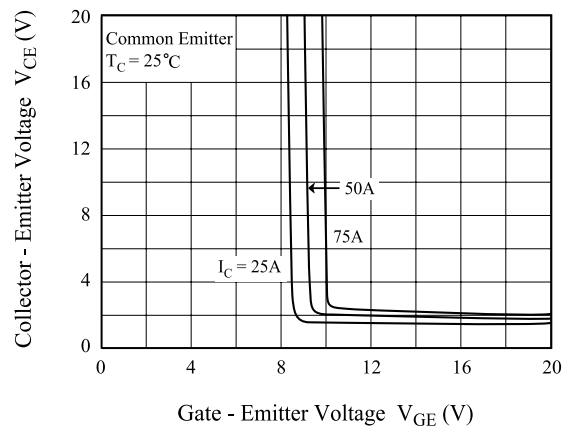
**Fig.4** Saturation Voltage Characteristics



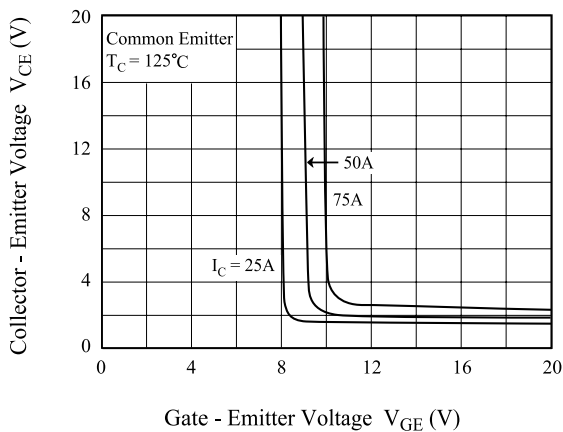
**Fig.5** Saturation Voltage Characteristics



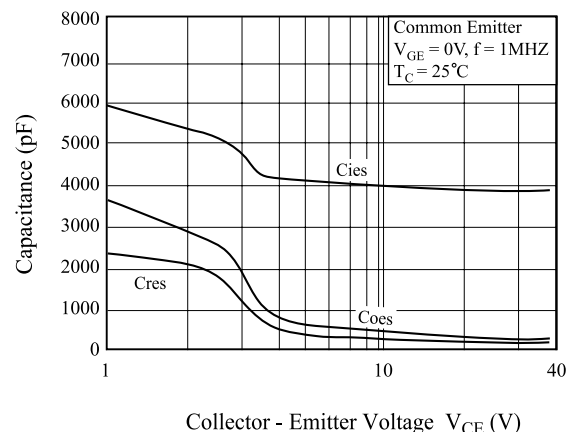
**Fig.6** Saturation Voltage vs. Case Temperature



**Fig.7** Saturation Voltage vs.  $V_{GE}$



**Fig.8** Saturation Voltage vs.  $V_{GE}$



**Fig.9** Capacitance Characteristics

# SG50T65UDB2

## Discrete IGBTs

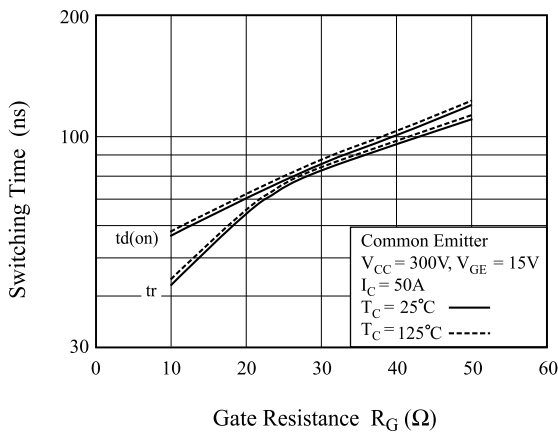


Fig.10 Turn-On Characteristics vs. Gate Resistance

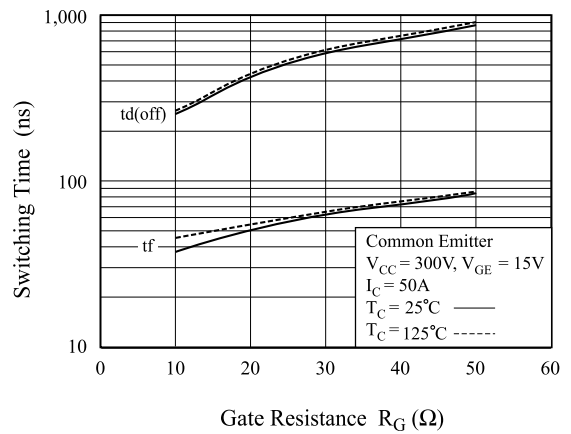


Fig.11 Turn-Off Characteristics vs. Gate Resistance

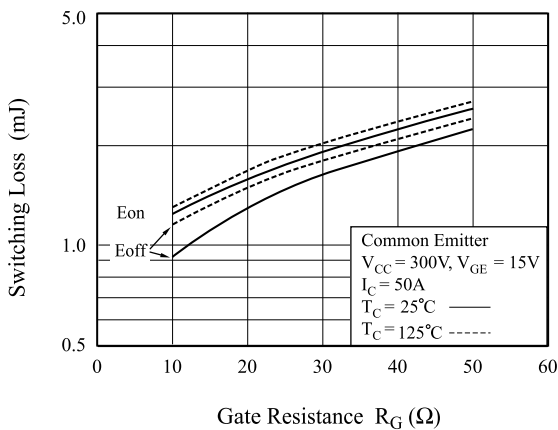


Fig.12 Switching Loss vs. Gate Resistance

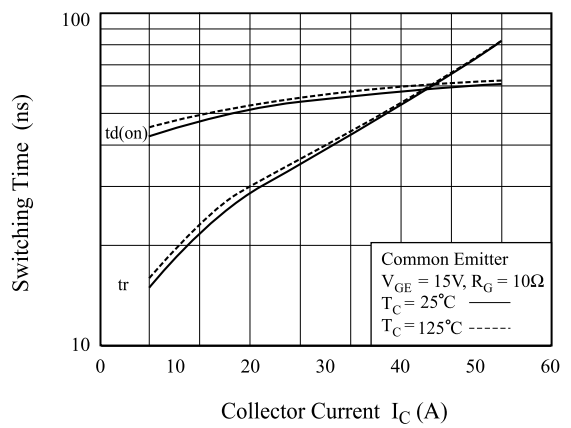


Fig.13 Turn-On Characteristics vs. Collector Current

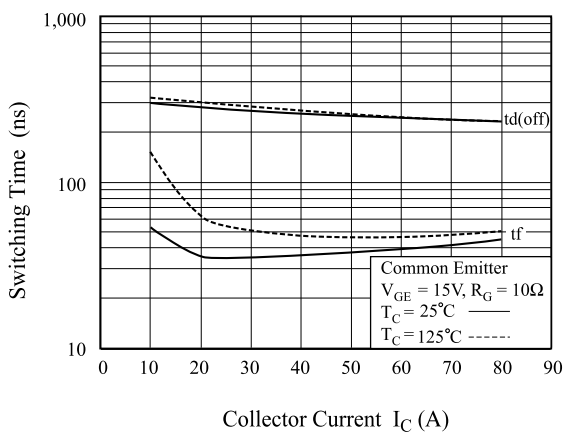


Fig.14 Turn-Off Characteristics vs. Collector Current

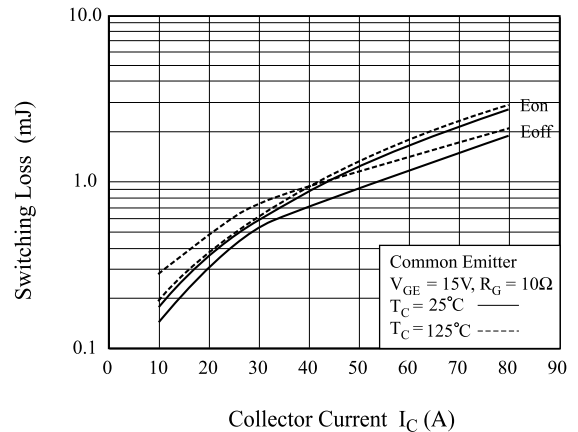


Fig.15 Switching Loss vs. Collector Current

# SG50T65UDB2

## Discrete IGBTs

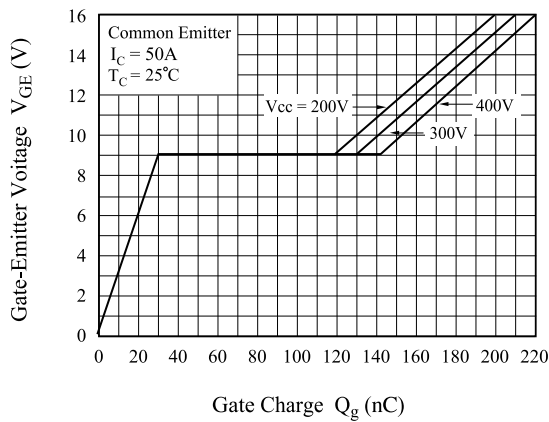


Fig.16 Gate Charge Characteristics

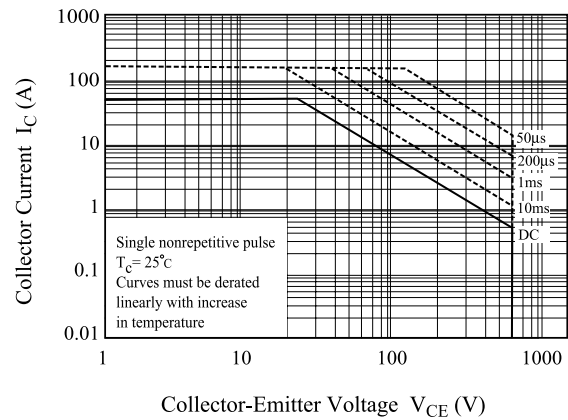


Fig.17 SOA Characteristics

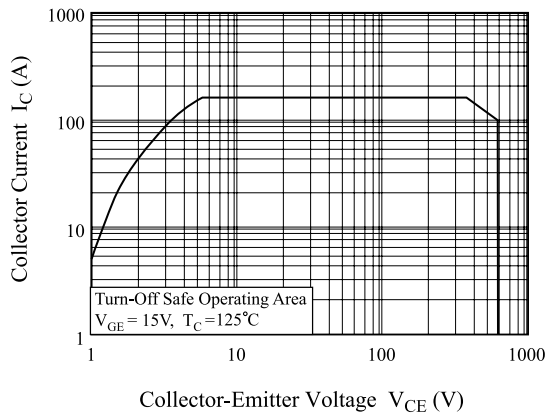


Fig.18 Turn-Off SOA

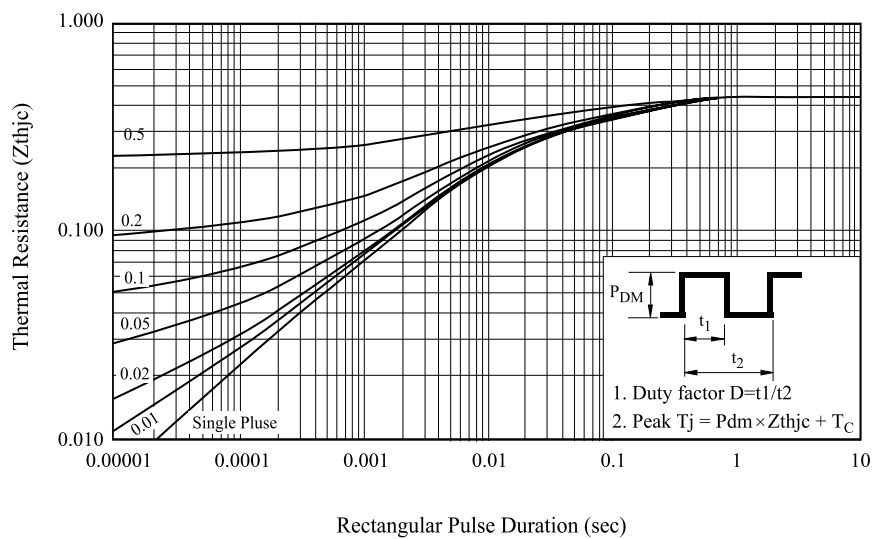


Fig.19 Transient Thermal Impedance of IGBT

# SG50T65UDB2

## Discrete IGBTs

Fig.20 Switching Test Circuit

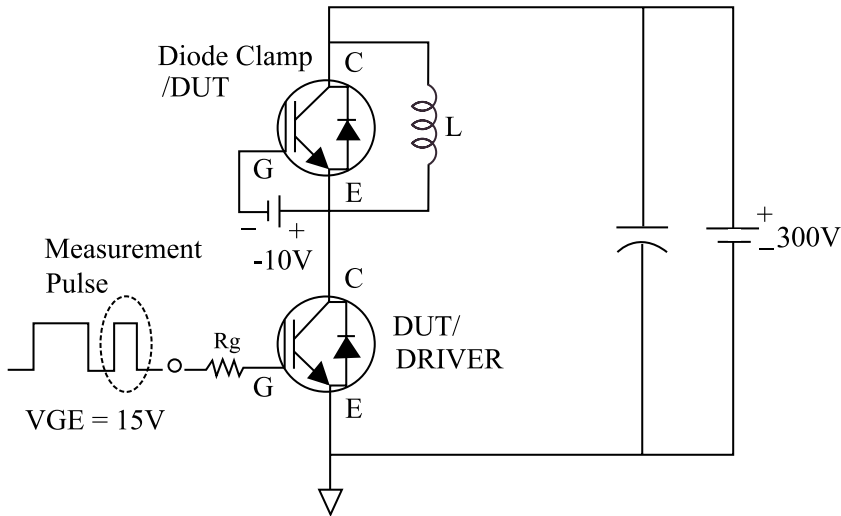


Fig.21 Definition Switching Time & Loss

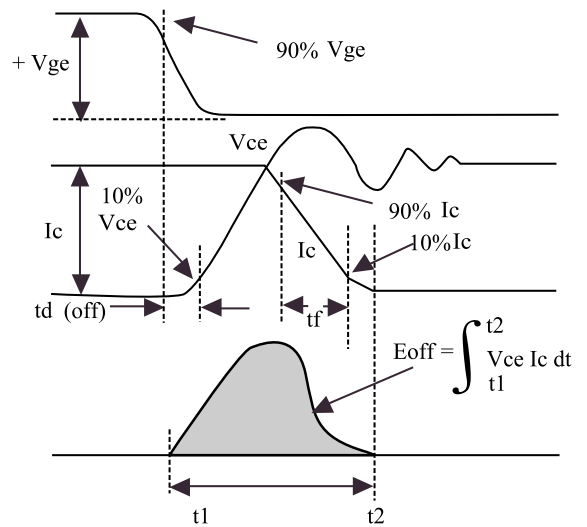
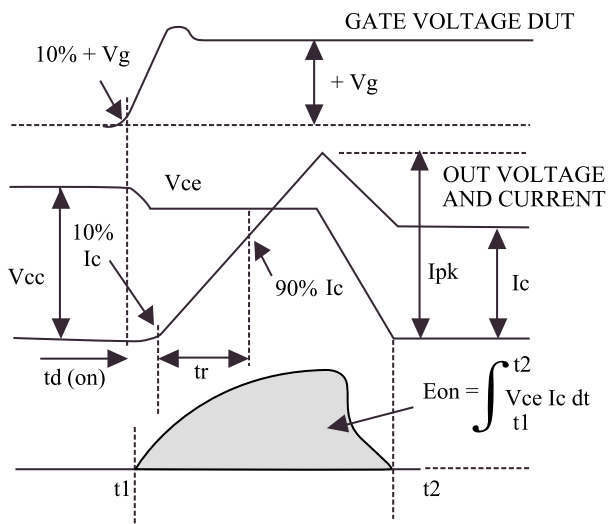
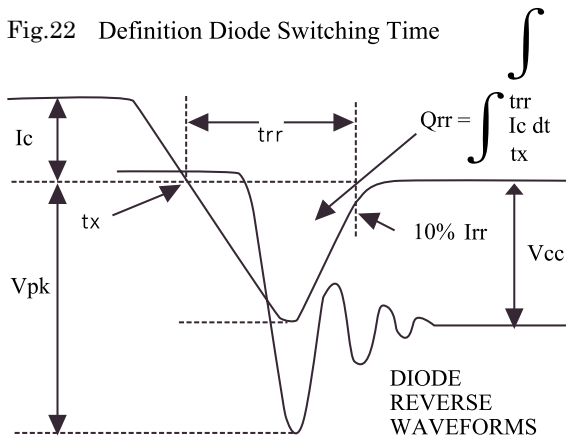


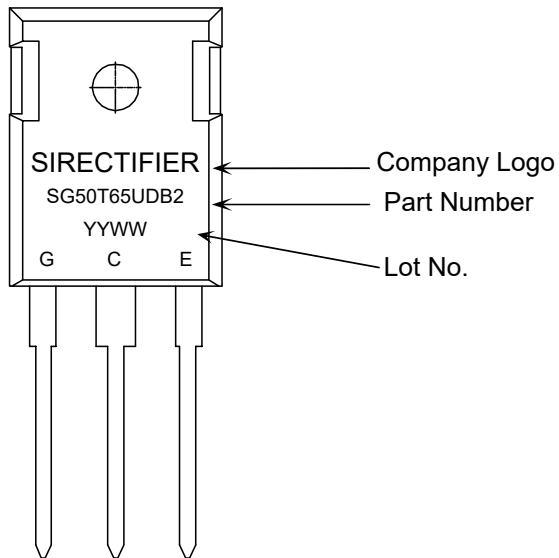
Fig.22 Definition Diode Switching Time



# SG50T65UDB2

## Discrete IGBTs

### MARKING



### ORDERING INFORMATION

| Part Number | Package  | Shipping     | Marking Code |
|-------------|----------|--------------|--------------|
| SG50T65UDB2 | TO-247AD | 30pcs / Tube | SG50T65UDB2  |