

## Features

1. High frequency operation
2. Low losses and soft switching
3. Isolated baseplate for easy heat sinking
4. Discrete super-fast recovery free-wheel diode
5. Small temperature dependence of the turn-off switching loss

## Typical Applications

- AC Motor Control
- DC Motor Control
- UPS
- Welding Power Supplies
- Inverter
- Electronic welders at  $f_{SW}$  up to 20kHz

Ordering code

|             |            |           |           |          |
|-------------|------------|-----------|-----------|----------|
| <b>NSGM</b> | <b>300</b> | <b>GB</b> | <b>xx</b> | <b>B</b> |
| (1)         | (2)        | (3)       | (4)       | (5)      |

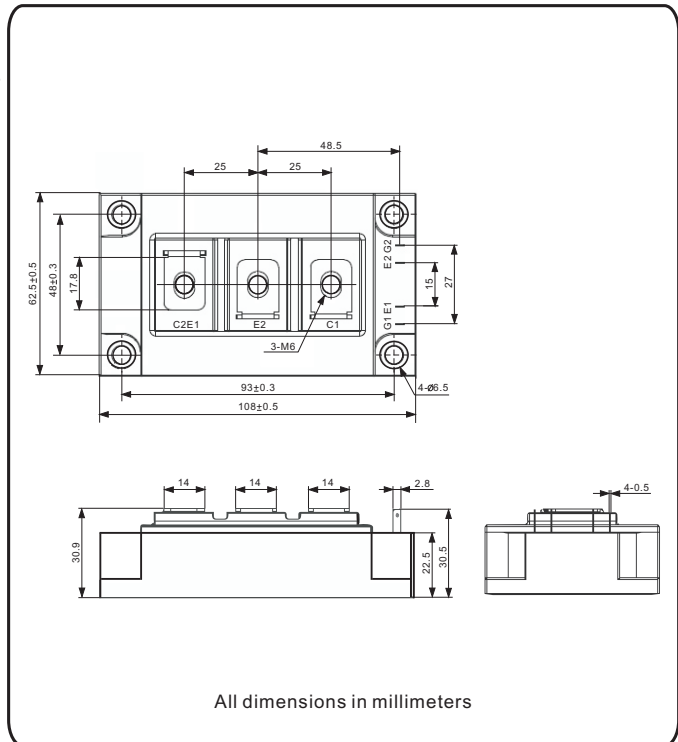
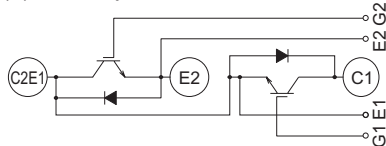
(1) For IGBT module

(2) Maximum average forward current, A

(3) 2 in one-package

(4) Voltage code, V (code x 10 =  $V_{RRM}$ )

(5) Case style



## Electrical Characteristics

Absolute maximum ratings,  $T_j=25^\circ\text{C}$  unless otherwise specified

| Symbol    | Parameter                         | Condition                                             | Max. Value | Unit             |
|-----------|-----------------------------------|-------------------------------------------------------|------------|------------------|
| $I_C$     | Collector current                 | $T_C=80^\circ\text{C}$                                | 300        | A                |
| $I_{CM}$  | Peak collector current            | $T_C=25^\circ\text{C}$                                | 600        | A                |
| $P_C$     | Maximum collector dissipation     | $T_C=25^\circ\text{C}$ , $T_j \leq 150^\circ\text{C}$ | 2100       | W                |
| $V_{CES}$ | Collector-emitter voltage         | G-E Short                                             | 1200       | V                |
| $V_{GES}$ | Gate-emitter voltage              | C-E Short                                             | $\pm 20$   | V                |
| $V_{iso}$ | Isolation voltage                 | Main terminal to baseplate, AC 1 min                  | 3000       | V                |
| $T_j$     | Junction temperature              |                                                       | -40 to 150 | $^\circ\text{C}$ |
| $T_{stg}$ | Storage temperature               |                                                       | -40 to 125 | $^\circ\text{C}$ |
| T         | Mounting torque, M6 main terminal |                                                       | 3 to 5     | N.m              |
|           | Mounting torque, M6 mounting      |                                                       | 3 to 5     |                  |
| $W_t$     | Approximate weight                |                                                       | 370        | g                |

Static electrical characteristics,  $T_j=25^\circ\text{C}$  unless otherwise specified

| Symbol        | Parameter                            | Condition                                                | Min. | Typ. | Max. | Unit          |
|---------------|--------------------------------------|----------------------------------------------------------|------|------|------|---------------|
| $I_{CES}$     | Collector-cutoff current             | $V_{CE}=V_{CES}$ , $V_{GE}=0V$                           |      |      | 1.0  | mA            |
| $I_{GES}$     | Gate leakage current                 | $V_{GE}=\pm 20V$ , $V_{CE}=0V$ , $T_j=125^\circ\text{C}$ |      |      | 200  | $\mu\text{A}$ |
| $V_{GE(th)}$  | Gate-emitter threshold voltage       | $I_C=6mA$ , $V_{CE}=V_{GE}$ , $T_j=25^\circ\text{C}$     | 5    | 6.2  | 7    | V             |
| $V_{CE(sat)}$ | Collector-emitter saturation voltage | $I_C=300A$ , $V_{GE}=15V$ , $T_j=25^\circ\text{C}$       |      | 2    |      | V             |
|               |                                      | $I_C=300A$ , $V_{GE}=15V$ , $T_j=125^\circ\text{C}$      |      | 2.3  |      |               |
| $Q_G$         | Total gate charge                    |                                                          |      | 3060 |      | nC            |
| $V_{EC}$      | Emitter-collector voltage            | $I_C=-190A$ , $V_{GE}=0V$                                |      |      | 2.2  | V             |

Dynamic electrical characteristics ,  $T_j=25^\circ\text{C}$  unless otherwise specified

| Symbol       | Parameter                       | Condition                                                         | Min. | Typ. | Max. | Unit    |
|--------------|---------------------------------|-------------------------------------------------------------------|------|------|------|---------|
| $C_{ies}$    | Input capacitance               | $V_{GE}=0V, V_{CE}=25V$<br>$f=1\text{MHz}$                        |      | 30   |      | nF      |
| $C_{oes}$    | Output capacitance              |                                                                   |      | 2    |      |         |
| $C_{res}$    | Reverse transfer capacitance    |                                                                   |      | 1.6  |      |         |
| $t_{d(on)}$  | Turn-on delay time , Resistive  | $V_{CC}=600V, I_C=300A$<br>$V_{GE1}=V_{GE2}=\pm 15V, R_G=5\Omega$ |      | 220  |      | ns      |
| $t_r$        | Rise time , Load                |                                                                   |      | 60   |      |         |
| $t_{d(off)}$ | Turn-off delay time , Switching |                                                                   |      | 530  |      |         |
| $t_f$        | Fall time , Times               |                                                                   |      | 350  |      |         |
| $t_{rr}$     | Diode reverse recovery time     | $I_C=-190A, d_i/dt=-150A/\mu s$                                   |      |      | 250  | ns      |
| $Q_{rr}$     | Diode reverse recovery charge   | $I_C=-190A, d_i/dt=-150A/\mu s$                                   |      | 12   |      | $\mu C$ |

Thermal and mechanical characterisitics ,  $T_j=25^\circ\text{C}$  unless otherwise specified

| Symbol        | Parameter                             | Condition                           | Min. | Typ. | Max. | Unit               |
|---------------|---------------------------------------|-------------------------------------|------|------|------|--------------------|
| $R_{th(j-c)}$ | Thermal resistance , junction to case | Per IGBT                            |      |      | 0.09 | $^\circ\text{C/W}$ |
|               |                                       | Per FWDi                            |      |      | 0.24 |                    |
| $R_{th(c-f)}$ | Contact thermal resistance            | Per module , thermal grease applied |      |      | 0.05 | $^\circ\text{C/W}$ |

Fig.1 Typ. output characteristic ,  $t_p=80\mu s$ ;  $125^\circ\text{C}$

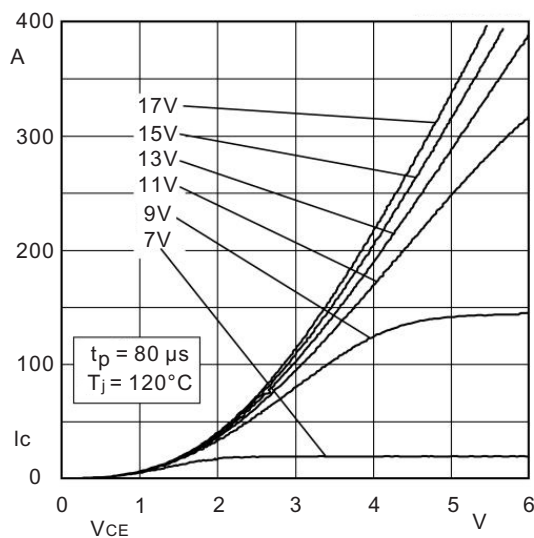


Fig.2 Rated current vs. temperature  $I_c = f(T_c)$

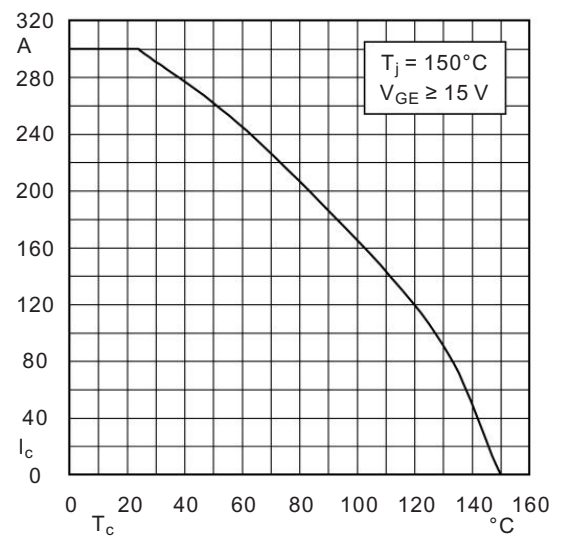


Fig.3 Typ. turn-on/off energy = f ( $I_c$ )

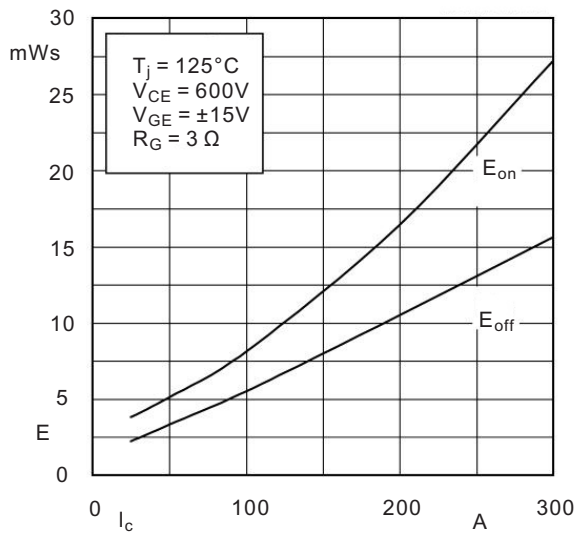


Fig. 4 Typ. turn-on/off energy = f ( $F_G$ )

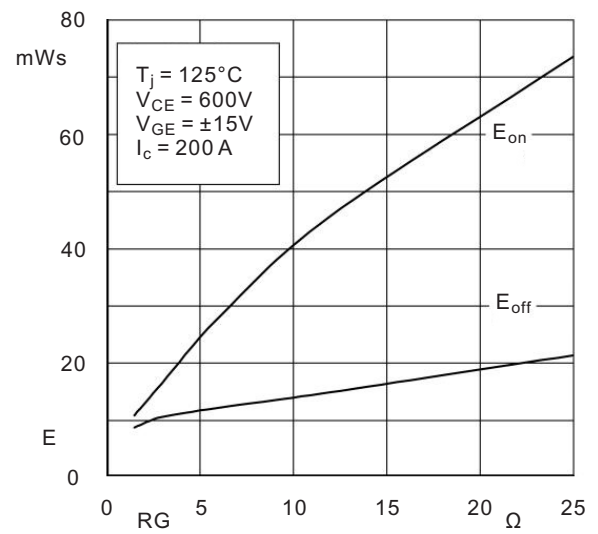


Fig. 5 Typ. transfer characteristic,  
 $t_p = 80\mu\text{s}$ ;  $V_{CE} = 20\text{V}$

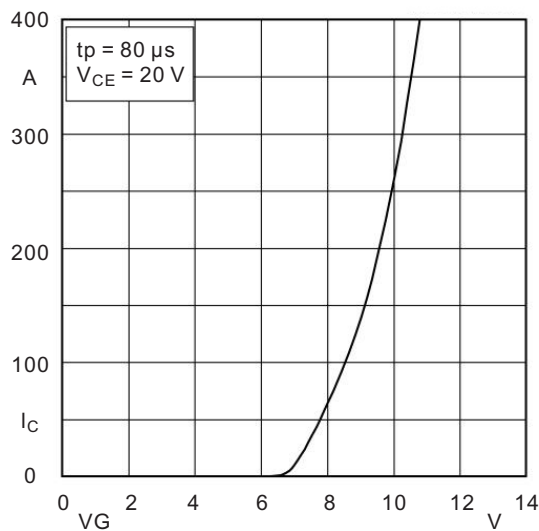


Fig. 6 Typ. gate charge characteristic

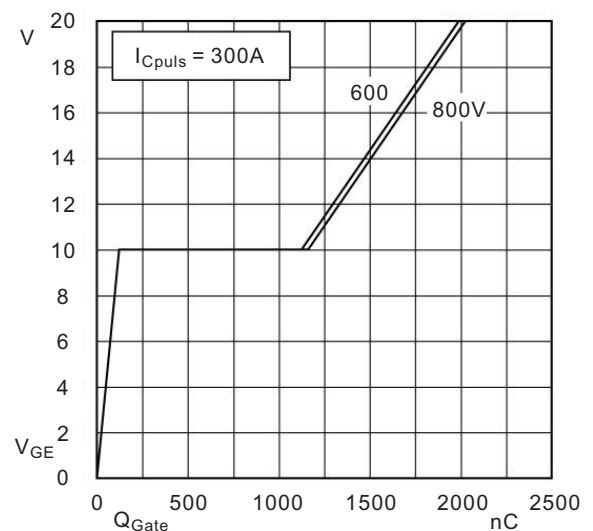


Fig. 7 Typ. switching times vs.  $I_c$

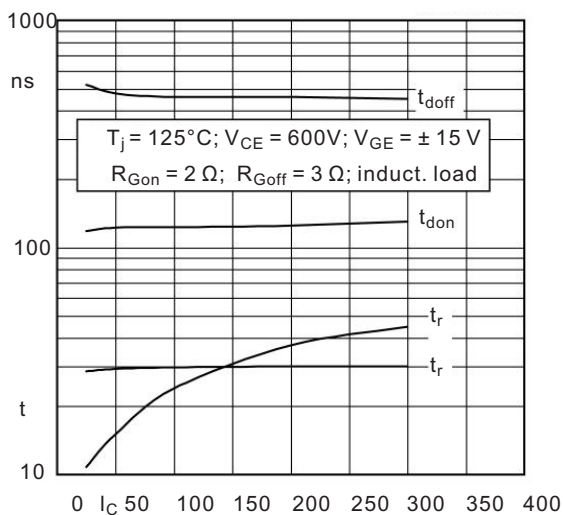


Fig.8 Typ. switching times vs. gate resistor  $R_G$

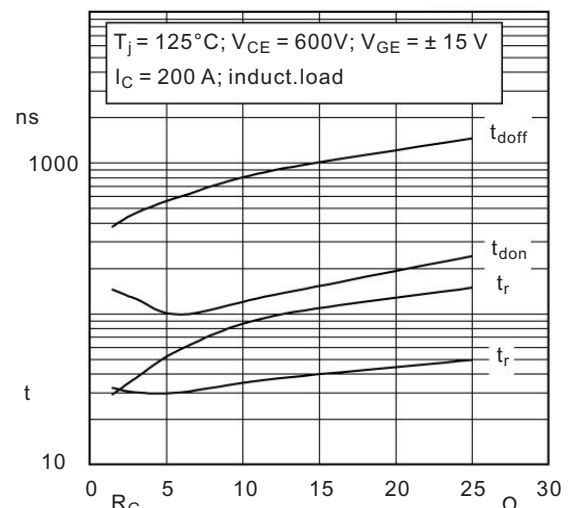


Fig. 9 Transient thermal impedance of IGBT

$$Z_{thp(j-c)} = f(t_p); D = t_p/t_c = t_p * f$$

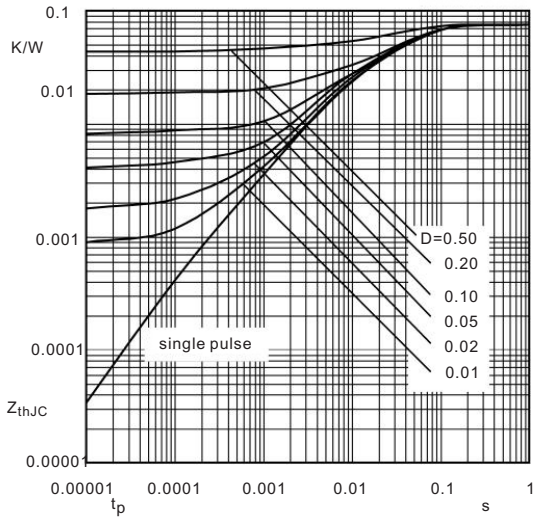


Fig. 10 Transient thermal impedance of FWD

$$Z_{thp(j-c)} = f(t_p); D = t_p/t_c = t_p * f$$

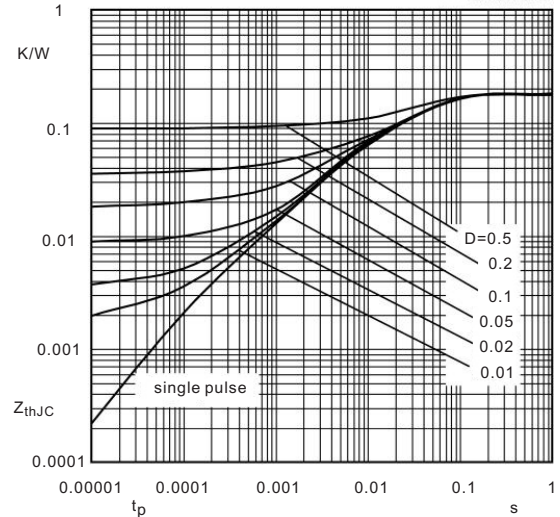


Fig.11 CAL diode forward characteristic

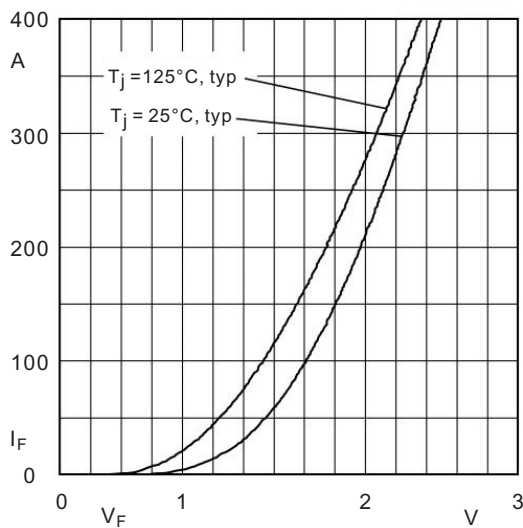


Fig. 12 Typ. CAL diode peak reverse recovery current

