

# 2MBI300VX-120-50

IGBT Modules

**Power Module (V series)**  
1200V / 300A / 2-in-1 package

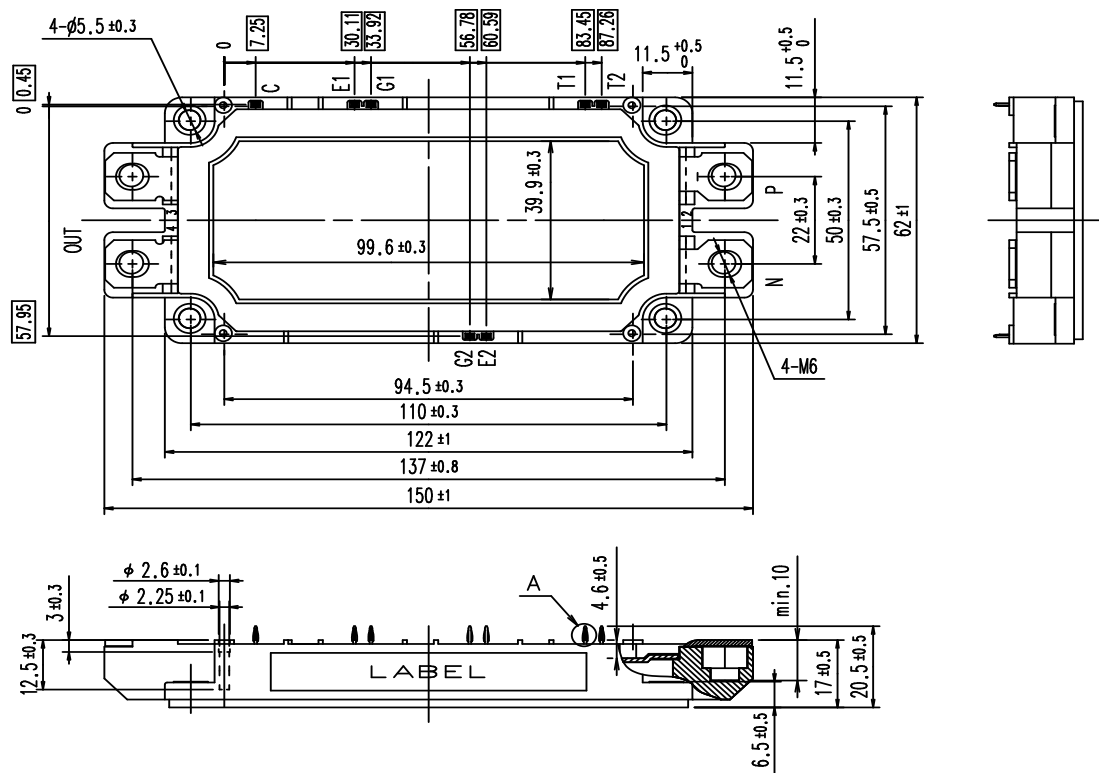
## ■ Features

- LOW  $V_{CE(sat)}$
- Low Inductance Module structure
- Solderless press-fit terminals

## ■ Applications

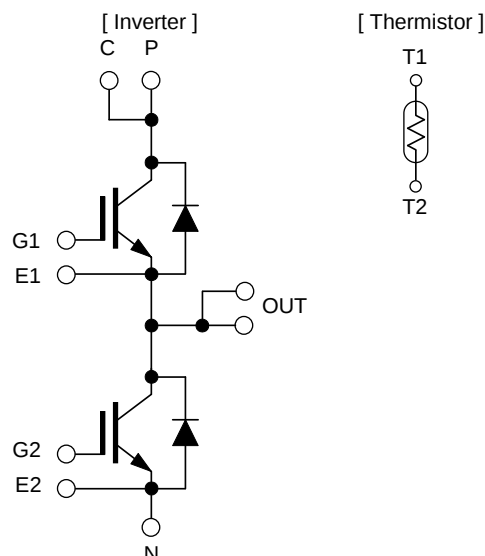
- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems, Wind Turbines, PV Power Conditioning Systems

## ■ Outline drawing ( Unit : mm )



Weight: 350g (typ.)

## ■ Equivalent Circuit



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## ■ Absolute Maximum Ratings (at $T_C = 25^\circ\text{C}$ unless otherwise specified)

| Items                                                       |                                       | Symbols      | Conditions | Maximum Ratings                                       | Units      |
|-------------------------------------------------------------|---------------------------------------|--------------|------------|-------------------------------------------------------|------------|
| Collector-Emitter voltage                                   |                                       | $V_{CES}$    |            | 1200                                                  | V          |
| Gate-Emitter voltage                                        |                                       | $V_{GES}$    |            | $\pm 20$                                              | V          |
| Collector current                                           |                                       | $I_C$        | Continuous | $T_C = 25^\circ\text{C}$<br>$T_C = 100^\circ\text{C}$ | 450<br>300 |
|                                                             |                                       | $I_C$ pulse  | 1ms        |                                                       | 600        |
|                                                             |                                       | $-I_C$       |            |                                                       | 300        |
|                                                             |                                       | $-I_C$ pulse | 1ms        |                                                       | 600        |
| Collector power dissipation                                 |                                       | $P_C$        | 1 device   |                                                       | 1595       |
| Junction temperature                                        |                                       | $T_J$        |            |                                                       | 175        |
| Operating junction temperature (under switching conditions) |                                       | $T_{Jop}$    |            |                                                       | 150        |
| Case temperature                                            |                                       | $T_C$        |            |                                                       | 125        |
| Storage temperature                                         |                                       | $T_{stg}$    |            |                                                       | -40 ~ 125  |
| Isolation voltage                                           | between terminal and copper base (*1) | $V_{iso}$    | AC: 1min.  | 2500                                                  | VAC        |
|                                                             | between thermistor and others (*2)    |              |            |                                                       |            |
| Screw Torque                                                | Mounting (*3)                         | -            |            | 3.5                                                   | N m        |
|                                                             | Terminals (*4)                        | -            |            | 4.5                                                   |            |

(\*1) All terminals should be connected together during the test.

(\*2) Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

(\*3) Recommendable Value : 2.5-3.5 Nm (M5)

(\*4) Recommendable Value : 3.5-4.5 Nm (M6)

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## ■ Electrical characteristics (at $T_j = 25^\circ\text{C}$ unless otherwise specified)

| Items                                | Symbols                            | Conditions                                                                                                                       |                       | Characteristics |      |      | Units |
|--------------------------------------|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------|------|------|-------|
|                                      |                                    |                                                                                                                                  |                       | min.            | typ. | max. |       |
| Zero gate voltage Collector current  | I <sub>CES</sub>                   | V <sub>GE</sub> =0V, V <sub>CE</sub> =1200V                                                                                      |                       | -               | -    | 3.0  | mA    |
| Gate-Emitter leakage current         | I <sub>GES</sub>                   | V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V                                                                                       |                       | -               | -    | 600  | nA    |
| Gate-Emitter threshold voltage       | V <sub>GE(th)</sub>                | V <sub>CE</sub> =20V, I <sub>C</sub> =300mA                                                                                      |                       | 6.0             | 6.5  | 7.0  | V     |
| Collector-Emitter saturation voltage | V <sub>CE(sat)</sub><br>(terminal) | V <sub>GE</sub> = 15V<br>I <sub>C</sub> = 300A                                                                                   | T <sub>J</sub> =25°C  | -               | 2.20 | 2.65 | V     |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =125°C | -               | 2.50 | -    |       |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =150°C | -               | 2.55 | -    |       |
|                                      | V <sub>CE(sat)</sub><br>(chip)     |                                                                                                                                  | T <sub>J</sub> =25°C  | -               | 1.75 | 2.20 |       |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =125°C | -               | 2.05 | -    |       |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =150°C | -               | 2.10 | -    |       |
| Internal gate resistance             | R <sub>G(int)</sub>                | -                                                                                                                                | -                     | 2.5             | -    | Ω    |       |
| Input capacitance                    | C <sub>ies</sub>                   | V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=1MHz                                                                                |                       | -               | 27   | -    | nF    |
| Turn-on time                         | t <sub>on</sub>                    | V <sub>CC</sub> = 600V      I <sub>C</sub> = 300A<br>V <sub>GE</sub> = ±15V      R <sub>G</sub> = 0.93Ω<br>L <sub>S</sub> = 80nH |                       | -               | 550  | -    | nsec  |
|                                      | t <sub>r</sub>                     |                                                                                                                                  |                       | -               | 180  | -    |       |
|                                      | t <sub>r(l)</sub>                  |                                                                                                                                  |                       | -               | 120  | -    |       |
| Turn-off time                        | t <sub>off</sub>                   |                                                                                                                                  |                       | -               | 1050 | -    |       |
|                                      | t <sub>f</sub>                     |                                                                                                                                  |                       | -               | 110  | -    |       |
| Forward on voltage                   | V <sub>F</sub><br>(terminal)       | V <sub>GE</sub> = 0V<br>I <sub>F</sub> = 300A                                                                                    | T <sub>J</sub> =25°C  | -               | 2.15 | 2.60 | V     |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =125°C | -               | 2.30 | -    |       |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =150°C | -               | 2.25 | -    |       |
|                                      | V <sub>F</sub><br>(chip)           |                                                                                                                                  | T <sub>J</sub> =25°C  | -               | 1.70 | 2.15 |       |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =125°C | -               | 1.85 | -    |       |
|                                      |                                    |                                                                                                                                  | T <sub>J</sub> =150°C | -               | 1.80 | -    |       |
| Reverse recovery time                | t <sub>rr</sub>                    | I <sub>F</sub> = 300A                                                                                                            |                       | -               | 200  | -    | nsec  |
| Thermistor Resistance                | R                                  | T=25°C                                                                                                                           |                       | -               | 5000 | -    | Ω     |
|                                      |                                    | T=100°C                                                                                                                          |                       | 465             | 495  | 520  |       |
| Thermistor B value                   | B                                  | T=25/50°C                                                                                                                        |                       | 3305            | 3375 | 3450 | K     |

## 5. Thermal resistance characteristics

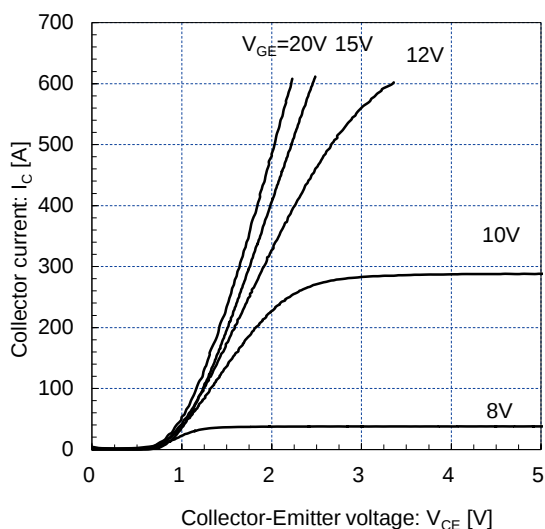
| Items                                     | Symbols       | Conditions            | Characteristics |        |       | Units              |
|-------------------------------------------|---------------|-----------------------|-----------------|--------|-------|--------------------|
|                                           |               |                       | min.            | typ.   | max.  |                    |
| Thermal resistance (1device)              | $R_{th(j-c)}$ | IGBT                  | -               | -      | 0.094 | $^\circ\text{C/W}$ |
|                                           |               | FWD                   | -               | -      | 0.15  |                    |
| Contact thermal resistance (1device) (*1) | $R_{th(c-f)}$ | with thermal compound | -               | 0.0167 | -     |                    |

(\*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

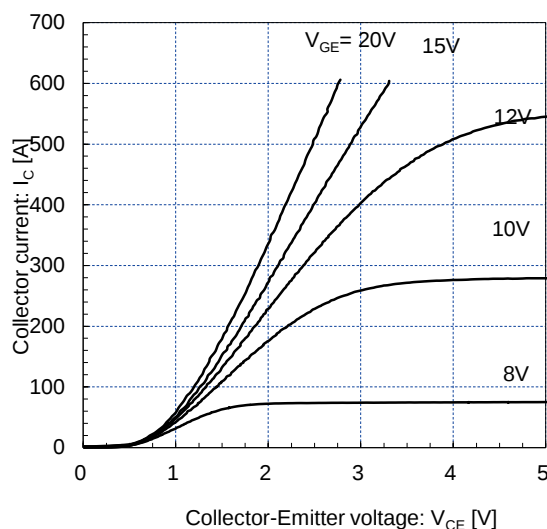
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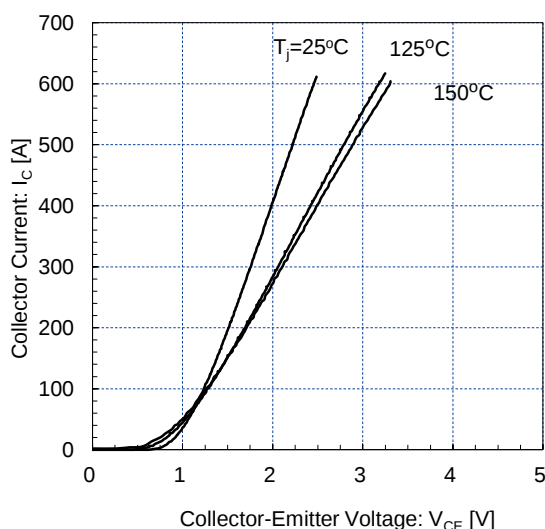
Collector current vs. Collector-Emitter voltage  
 $T_j = 25^\circ\text{C}$  / chip



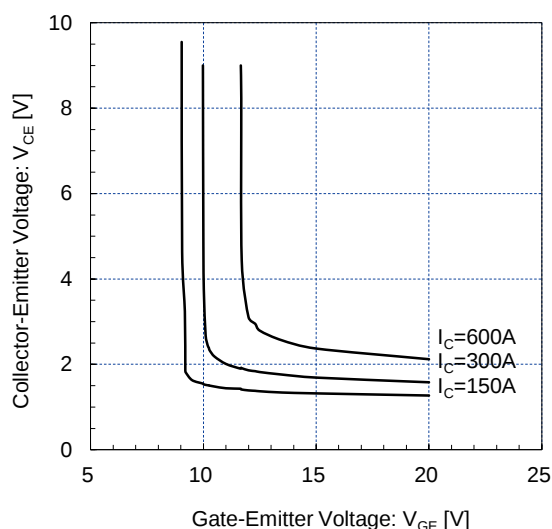
Collector current vs. Collector-Emitter voltage (typ.)  
 $T_j = 150^\circ\text{C}$  / chip



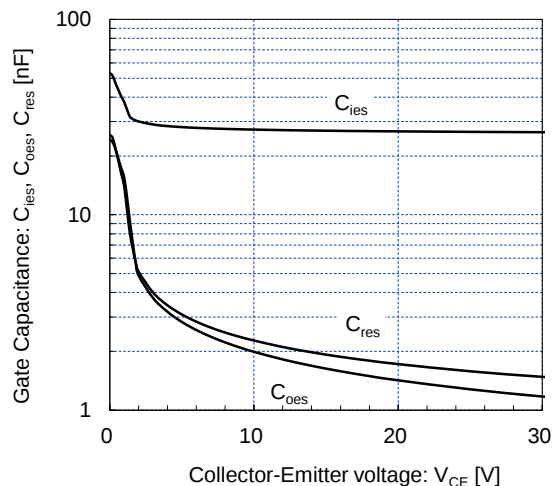
Collector current vs. Collector-Emitter voltage  
 $V_{GE} = 15\text{V}$  / chip



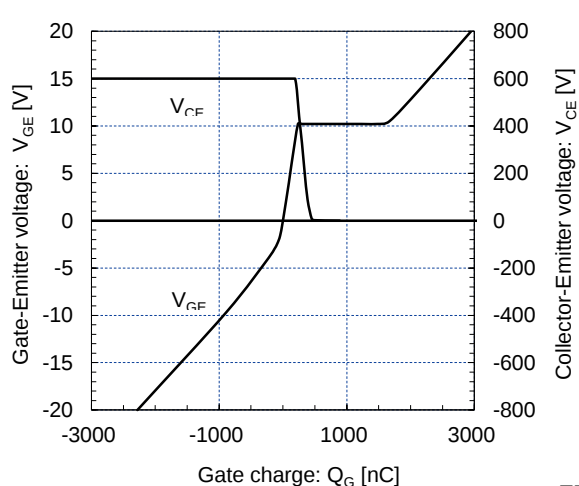
Collector-Emitter voltage vs. Gate-Emitter voltage  
 $T_j = 25^\circ\text{C}$  / chip



Capacitance vs. Collector-Emitter Voltage  
 $V_{GE} = 0\text{V}$ ,  $f = 1\text{MHz}$ ,  $T_j = 25^\circ\text{C}$



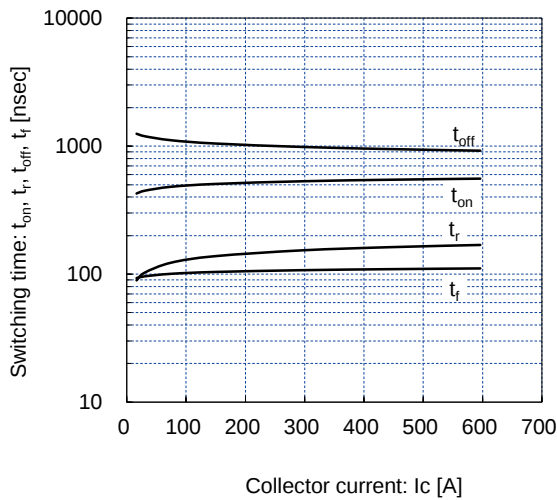
Dynamic Gate Charge (typ.)  
 $V_{CC} = 600\text{V}$ ,  $I_C = 300\text{A}$ ,  $T_j = 25^\circ\text{C}$



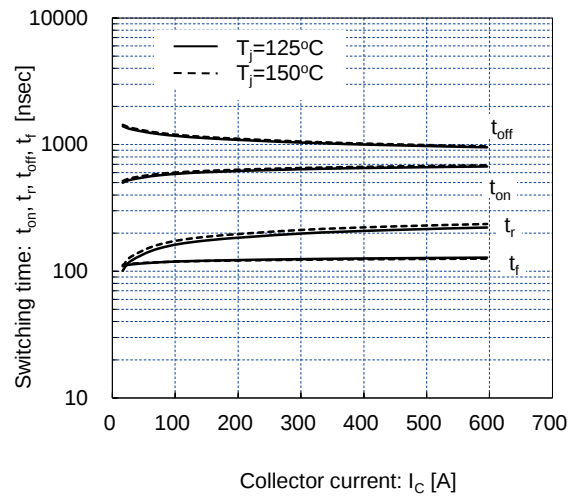
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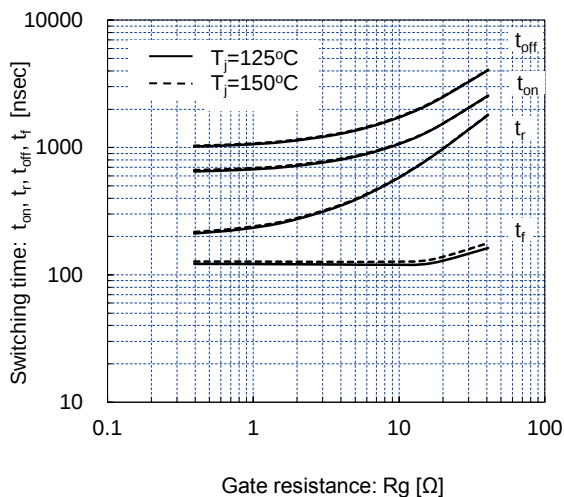
Switching time vs. Collector current (typ.)  
V<sub>cc</sub>=600V, V<sub>GE</sub>=±15V, R<sub>g</sub>=0.93Ω, T<sub>j</sub>=25°C



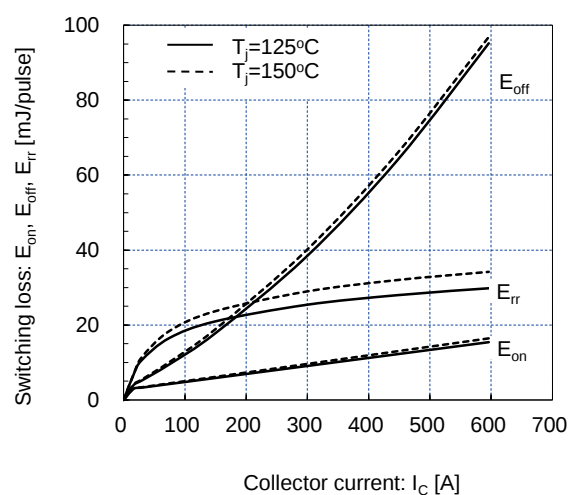
Switching time vs. Collector current (typ.)  
V<sub>cc</sub>=600V, V<sub>GE</sub>=±15V, R<sub>g</sub>=0.93Ω, T<sub>j</sub>=125°C, 150°C



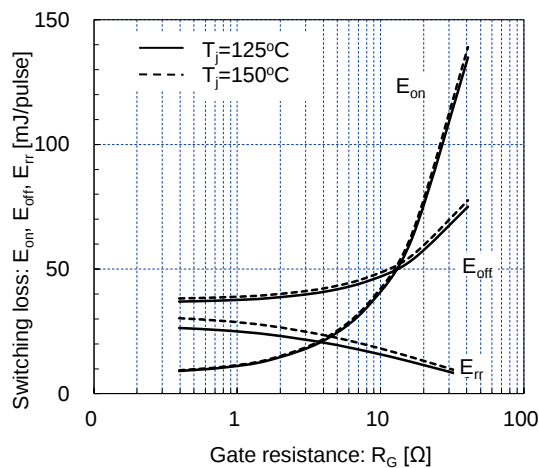
Switching time vs. Gate resistance (typ.)  
V<sub>cc</sub>=600V, I<sub>C</sub>=300A, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C, 150°C



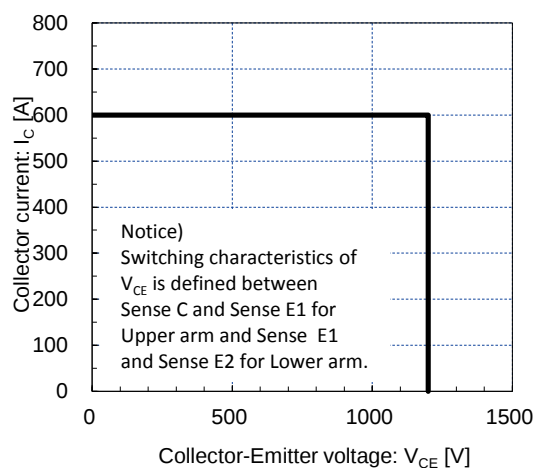
Switching loss vs. Collector current (typ.)  
V<sub>cc</sub>=600V, V<sub>GE</sub>=±15V, R<sub>g</sub>=0.93Ω, T<sub>j</sub>=125°C, 150°C



Switching loss vs. Gate resistance (typ.)  
V<sub>cc</sub>=600V, I<sub>C</sub>=300A, V<sub>GE</sub>=±15V, T<sub>j</sub>=125°C, 150°C



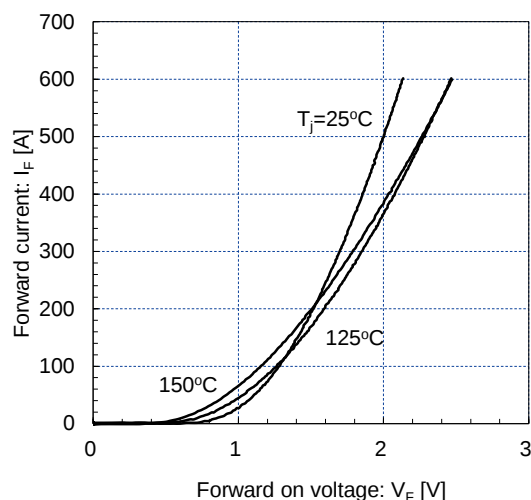
Reverse bias safe operating area (max.)  
+V<sub>GE</sub>=15V, -V<sub>GE</sub>=15V, R<sub>g</sub>=0.93Ω, T<sub>j</sub>=150°C



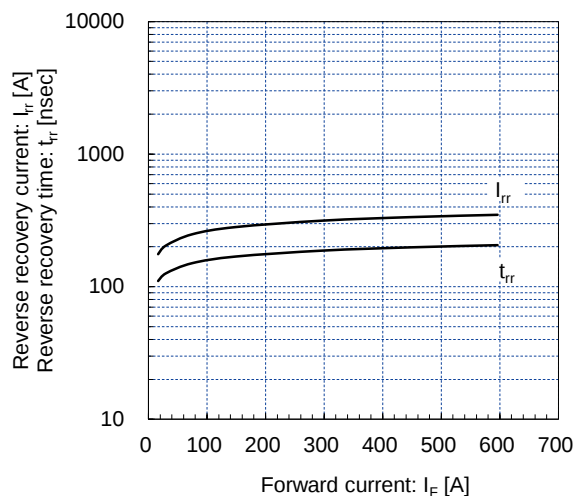
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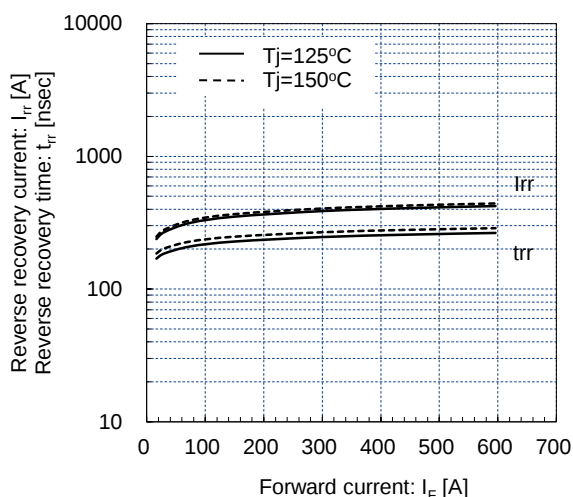
Forward current vs. Forward vltage (typ.)  
chip



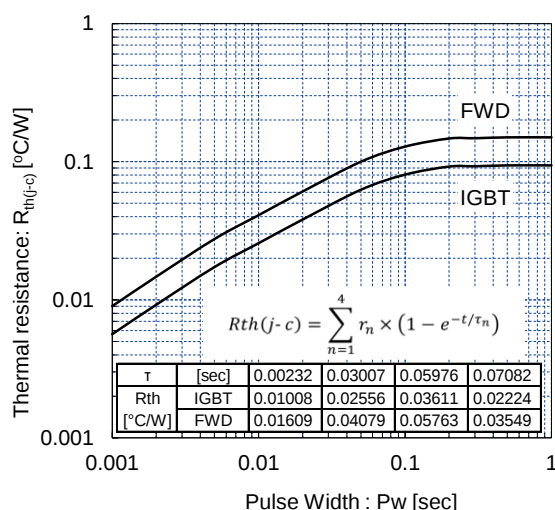
Reverse recovery characteristics (typ.)  
V<sub>CC</sub>=600V, V<sub>GE</sub>=±15V, R<sub>g</sub>=0.93Ω, T<sub>J</sub>=25°C



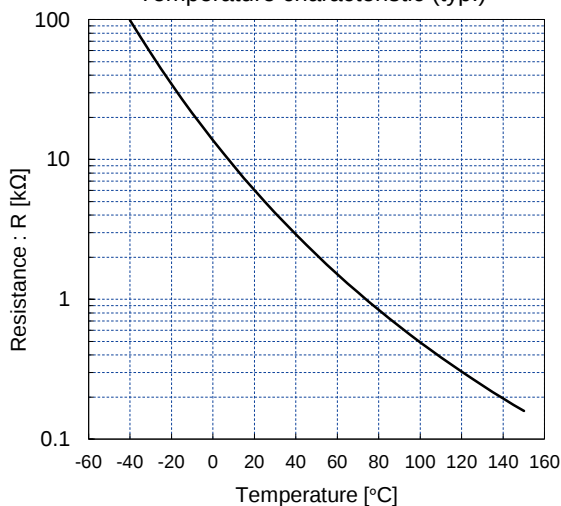
Reverse Recovery Characteristics (typ.)  
T<sub>J</sub>=125°C, 150°C



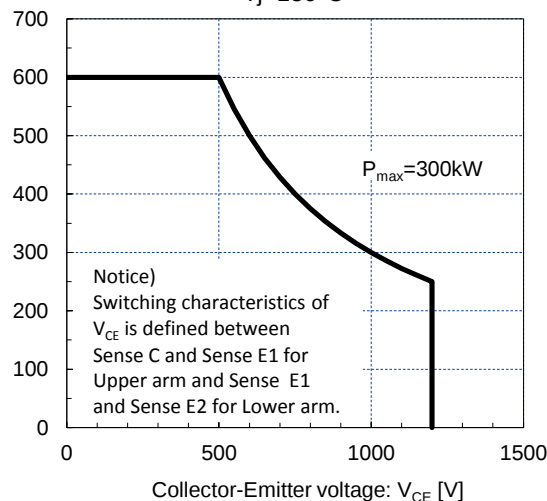
Transient Thermal Resistance (max.)



[THERMISTOR]  
Temperature characteristic (typ.)



FWD safe operating area (max.)  
T<sub>J</sub>=150°C



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