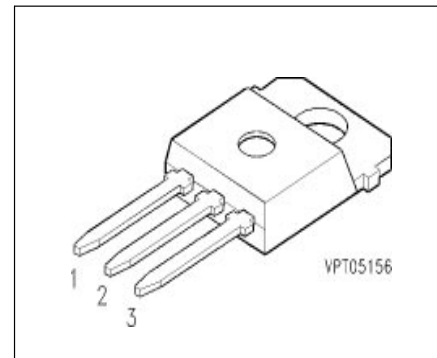


### IGBT

Preliminary data

- Low forward voltage drop
- High switching speed
- Low tail current
- Latch-up free
- Avalanche rated



| Pin 1 | Pin 2 | Pin 3 |
|-------|-------|-------|
| G     | C     | E     |

| Type    | $V_{CE}$ | $I_C$ | Package   | Ordering Code   |
|---------|----------|-------|-----------|-----------------|
| BUP 302 | 1000V    | 12A   | TO-218 AB | Q67078-A4205-A2 |

### Maximum Ratings

| Parameter  | Symbol      | Values        | Unit             |
|--|-------------|---------------|------------------|
| Collector-emitter voltage  | $V_{CE}$    | 1000          | V                |
| Collector-gate voltage   | $V_{CGR}$   | 1000          |                  |
| $R_{GE} = 20 \text{ k}\Omega$  |             |               |                  |
| Gate-emitter voltage   | $V_{GE}$    | $\pm 20$      |                  |
| DC collector current   | $I_C$       | 12            | A                |
| $T_C = 25 \text{ }^\circ\text{C}$  |             | 8             |                  |
| $T_C = 90 \text{ }^\circ\text{C}$  |             |               |                  |
| Pulsed collector current, $t_p = 1 \text{ ms}$                               | $I_{Cpuls}$ | 24            |                  |
| $T_C = 25 \text{ }^\circ\text{C}$  |             | 16            |                  |
| $T_C = 90 \text{ }^\circ\text{C}$  |             |               |                  |
| Avalanche energy, single pulse   | $E_{AS}$    | 10            | mJ               |
| $I_C = 5 \text{ A}$ , $V_{CC} = 24 \text{ V}$ , $R_{GE} = 25 \text{ }\Omega$ |             |               |                  |
| $L = 3.3 \text{ mH}$ , $T_j = 25 \text{ }^\circ\text{C}$                     |             |               |                  |
| Power dissipation  | $P_{tot}$   | 125           | W                |
| $T_C = 25 \text{ }^\circ\text{C}$  |             |               |                  |
| Chip or operating temperature  | $T_j$       | -55 ... + 150 | $^\circ\text{C}$ |
| Storage temperature  | $T_{stg}$   | -55 ... + 150 |                  |

### Maximum Ratings

| Parameter                           | Symbol | Values        | Unit |
|-------------------------------------|--------|---------------|------|
| DIN humidity category, DIN 40 040   | -      | E             | -    |
| IEC climatic category, DIN IEC 68-1 | -      | 55 / 150 / 56 |      |

### Thermal Resistance

|                               |            |          |     |
|-------------------------------|------------|----------|-----|
| Thermal resistance, chip case | $R_{thJC}$ | $\leq 1$ | K/W |
|-------------------------------|------------|----------|-----|

### Electrical Characteristics, at $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

### Static Characteristics

|  |               |     |                 |                   |               |
|--|---------------|-----|-----------------|-------------------|---------------|
| Gate threshold voltage<br>$V_{GE} = V_{CE}, I_C = 0.3\text{ mA}$   | $V_{GE(th)}$  | 4.5 | 5.5             | 6.5               | V             |
| Collector-emitter saturation voltage<br>$V_{GE} = 15\text{ V}, I_C = 5\text{ A}, T_j = 25\text{ }^\circ\text{C}$<br>$V_{GE} = 15\text{ V}, I_C = 5\text{ A}, T_j = 125\text{ }^\circ\text{C}$<br>$V_{GE} = 15\text{ V}, I_C = 5\text{ A}, T_j = 150\text{ }^\circ\text{C}$ | $V_{CE(sat)}$ | -   | 2.8<br>3.8<br>4 | 3.3<br>4.3<br>4.5 |               |
| Zero gate voltage collector current<br>$V_{CE} = 1000\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ }^\circ\text{C}$<br>$V_{CE} = 1000\text{ V}, V_{GE} = 0\text{ V}, T_j = 125\text{ }^\circ\text{C}$   | $I_{CES}$     | -   | 1<br>-          | 100<br>300        | $\mu\text{A}$ |
| Gate-emitter leakage current<br>$V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$  | $I_{GES}$     | -   | 0.1             | 100               | nA            |

### AC Characteristics

|   |           |     |     |     |             |
|---|-----------|-----|-----|-----|-------------|
| Transconductance<br>$V_{CE} = 20\text{ V}, I_C = 1.5\text{ A}$                                | $g_{fs}$  | 1.7 | 2.5 | -   | S           |
| Input capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$            | $C_{iss}$ | -   | 650 | 870 | $\text{pF}$ |
| Output capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$           | $C_{oss}$ | -   | 50  | 80  |             |
| Reverse transfer capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$ | $C_{rss}$ | -   | 20  | 30  |             |

**Electrical Characteristics**, at  $T_j = 25\text{ °C}$ , unless otherwise specified

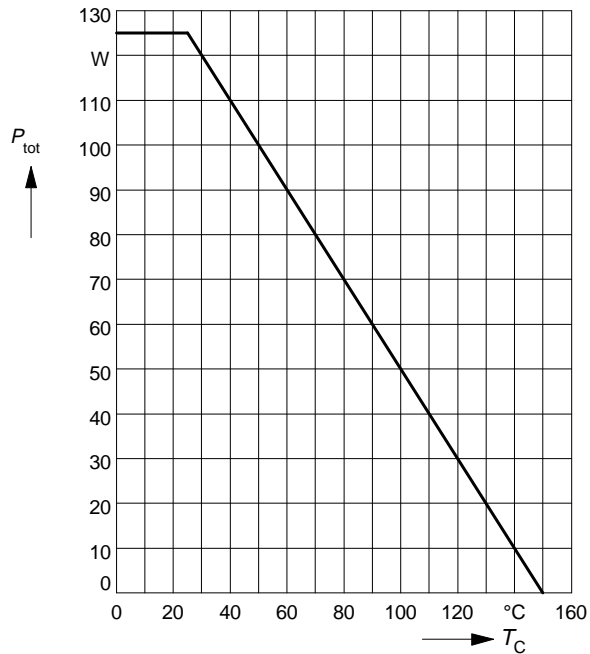
| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

**Switching Characteristics, Inductive Load at  $T_j = 125\text{ °C}$**

|   |              |   |     |     |     |
|---|--------------|---|-----|-----|-----|
| Turn-on delay time<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 5\text{ A}$<br>$R_{Gon} = 68\ \Omega$           | $t_{d(on)}$  | - | 30  | 50  | ns  |
| Rise time<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 5\text{ A}$<br>$R_{Gon} = 68\ \Omega$                    | $t_r$        | - | 20  | 30  |     |
| Turn-off delay time<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 5\text{ A}$<br>$R_{Goff} = 68\ \Omega$        | $t_{d(off)}$ | - | 180 | 270 |     |
| Fall time<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 5\text{ A}$<br>$R_{Goff} = 68\ \Omega$                  | $t_f$        | - | 15  | 25  |     |
| Total turn-off loss energy<br>$V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 5\text{ A}$<br>$R_{Goff} = 68\ \Omega$ | $E_{off}$    | - | 0.7 | -   | mWs |

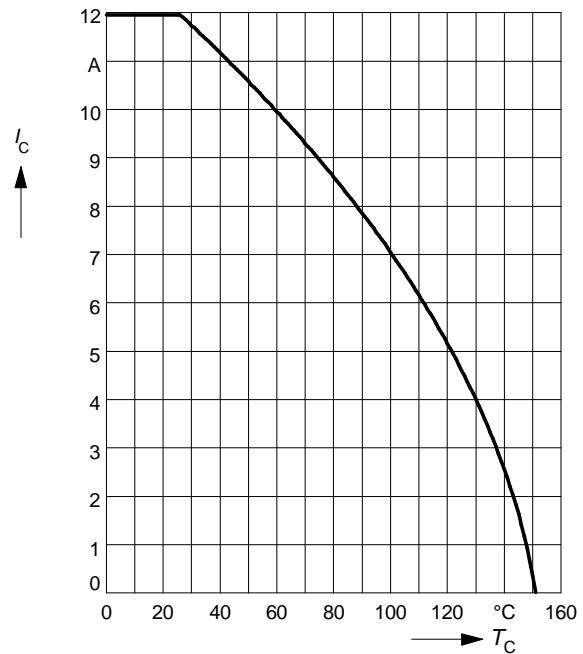
### Power dissipation

$P_{tot} = f(T_C)$   
parameter:  $T_j \leq 150\text{ }^\circ\text{C}$



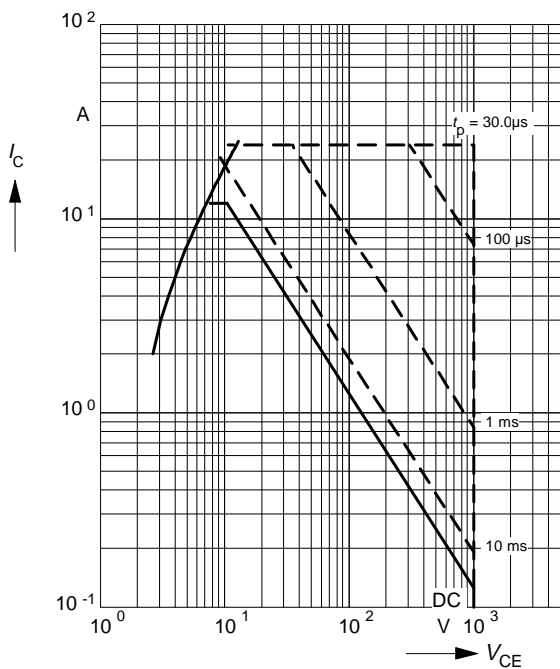
### Collector current

$I_C = f(T_C)$   
parameter:  $V_{GE} \geq 15\text{ V}$ ,  $T_j \leq 150\text{ }^\circ\text{C}$



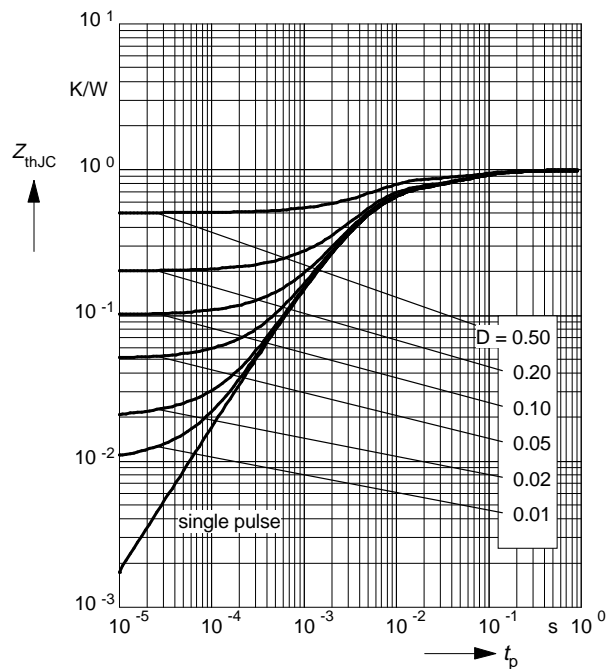
### Safe operating area

$I_C = f(V_{CE})$   
parameter:  $D = 0$ ,  $T_C = 25\text{ }^\circ\text{C}$ ,  $T_j \leq 150\text{ }^\circ\text{C}$



### Transient thermal impedance IGBT

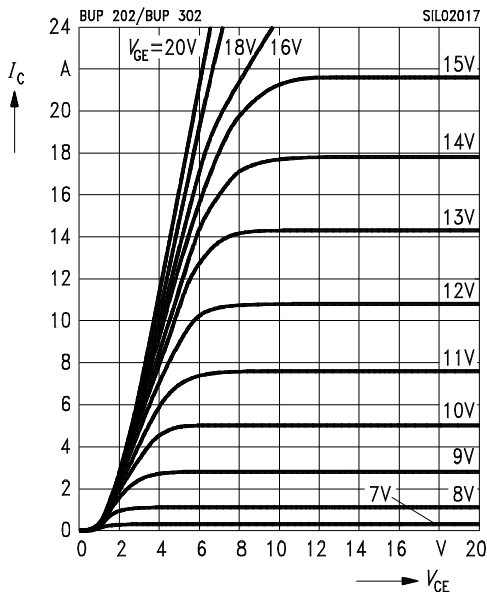
$Z_{thJC} = f(t_p)$   
parameter:  $D = t_p / T$



**Typ. output characteristics**

$$I_C = f(V_{CE})$$

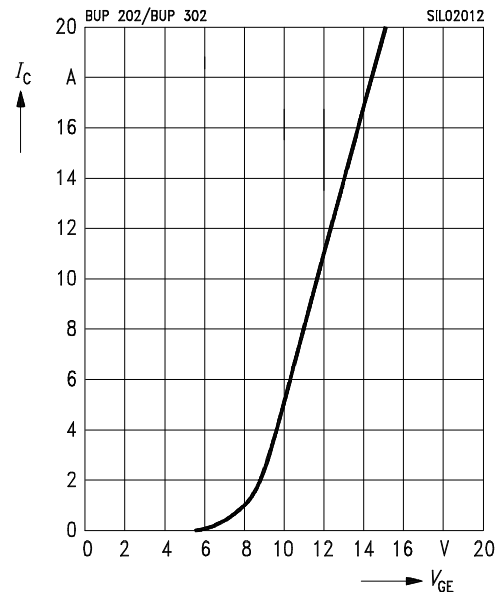
parameter:  $t_p = 80 \mu s$ ,  $T_j = 125 \text{ }^\circ C$



**Typ. transfer characteristics**

$$I_C = f(V_{GE})$$

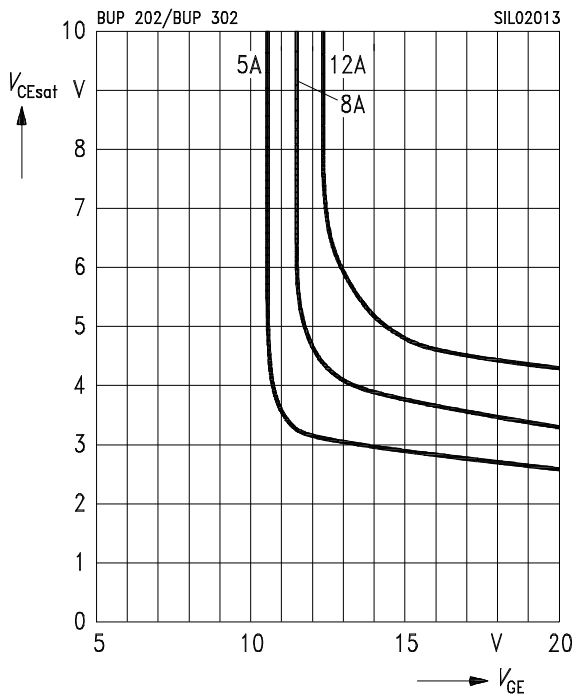
parameter:  $t_p = 80 \mu s$ ,  $V_{CE} = 20 \text{ V}$ ,  $T_j = 25 \text{ }^\circ C$



**Typ. saturation characteristics**

$$V_{CE(sat)} = f(V_{GE})$$

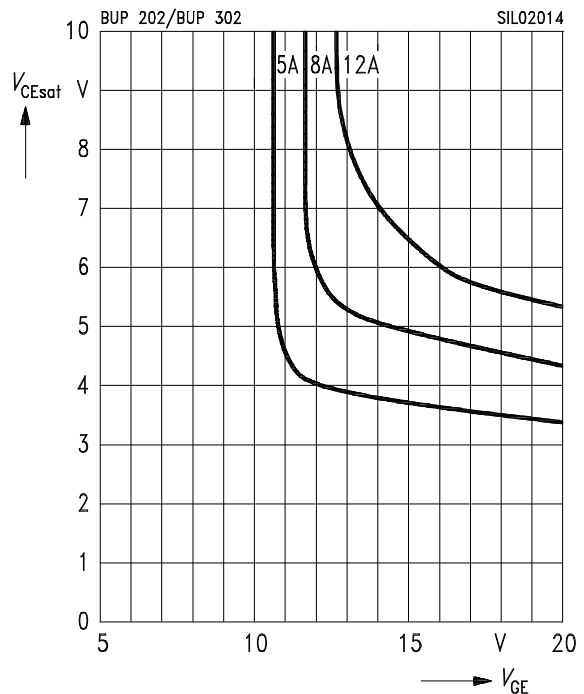
parameter:  $T_j = 25 \text{ }^\circ C$



**Typ. saturation characteristics**

$$V_{CE(sat)} = f(V_{GE})$$

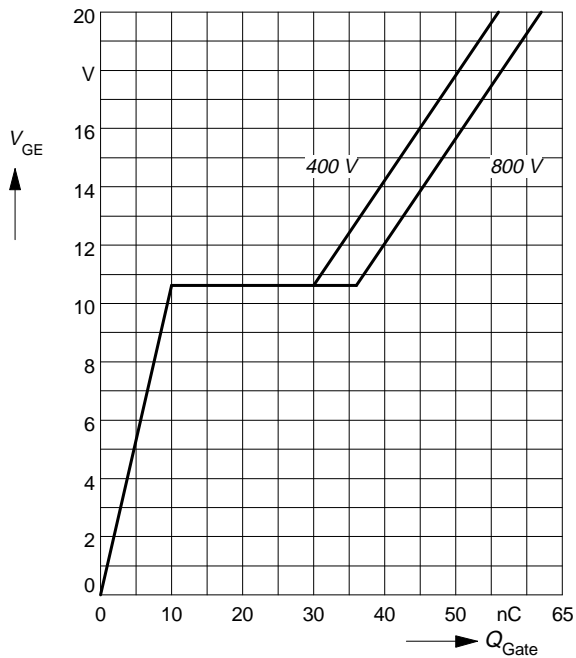
parameter:  $T_j = 125 \text{ }^\circ C$



### Typ. gate charge

$$V_{GE} = f(Q_{Gate})$$

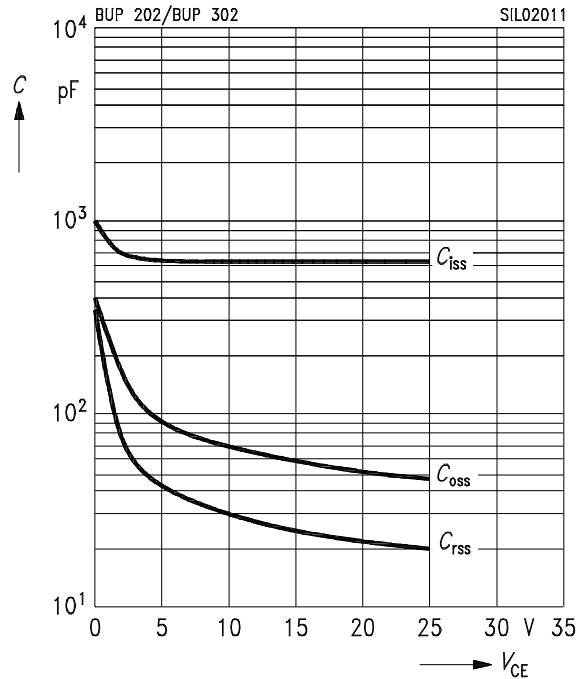
parameter:  $I_{C\ puls} = 6\ A$



### Typ. capacitances

$$C = f(V_{CE})$$

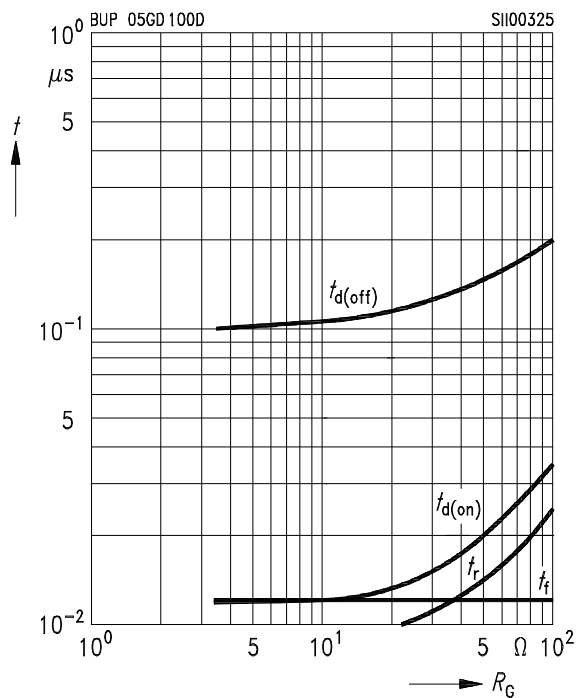
parameter:  $V_{GE} = 0\ V, f = 1\ MHz$



### Typ. switching time

$t = f(R_G)$ , inductive load,  $T_j = 125\ ^\circ C$

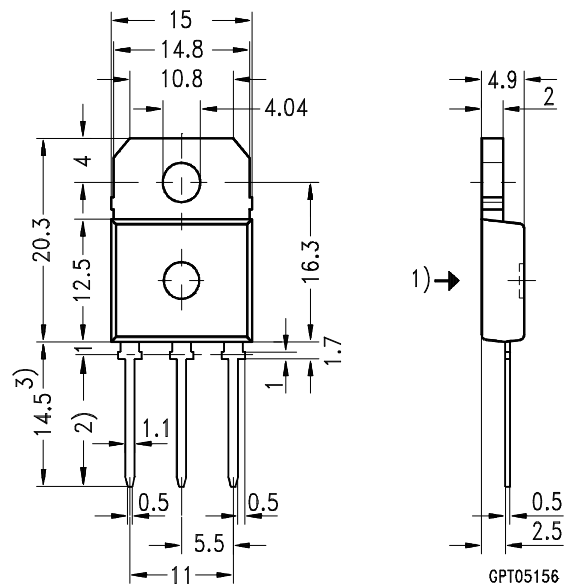
parameter:  $V_{CE} = 600\ V, V_{GE} = \pm 15\ V, I_C = 5\ A$



## Package Outlines

Dimensions in mm

Weight: 8 g



- 1) punch direction, burr max. 0.04
- 2) dip finning
- 3) max. 15.5 by dip finning press burr max. 0.05