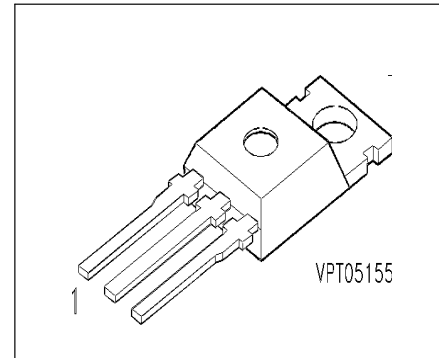


### IGBT

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 403 | 600V     | 42A   | TO-220 AB | C67078-A4406-A2 |

### Maximum Ratings

| Parameter   | Symbol      | Values         | Unit             |
|---|-------------|----------------|------------------|
| Collector-emitter voltage   | $V_{CE}$    | 600            | V                |
| Collector-gate voltage  | $V_{CGR}$   | 600            |                  |
| $R_{GE} = 20 \text{ k}\Omega$   |             |                |                  |
| Gate-emitter voltage  | $V_{GE}$    | $\pm 20$       |                  |
| DC collector current, (limited by bond wire)                                  | $I_C$       |                | A                |
| $T_C = 60 \text{ }^\circ\text{C}$   |             | 42             |                  |
| $T_C = 90 \text{ }^\circ\text{C}$   |             | 32             |                  |
| Pulsed collector current, $t_p = 1 \text{ ms}$                                | $I_{Cpuls}$ |                |                  |
| $T_C = 25 \text{ }^\circ\text{C}$   |             | 104            |                  |
| $T_C = 90 \text{ }^\circ\text{C}$   |             | 64             |                  |
| Avalanche energy, single pulse  | $E_{AS}$    |                | mJ               |
| $I_C = 25 \text{ A}$ , $V_{CC} = 50 \text{ V}$ , $R_{GE} = 25 \text{ }\Omega$ |             |                |                  |
| $L = 200 \text{ }\mu\text{H}$ , $T_j = 25 \text{ }^\circ\text{C}$             |             | 65             |                  |
| Power dissipation   | $P_{tot}$   |                | W                |
| $T_C = 25 \text{ }^\circ\text{C}$   |             | 200            |                  |
| 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 | $R_{thJC}$ | $\leq 0.63$ | 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>$V_{GE} = V_{CE}, I_C = 0.7\text{ mA}$  | $V_{GE(th)}$  | 4.5 | 5.5 | 6.5 | V             |
| Collector-emitter saturation voltage<br>$V_{GE} = 15\text{ V}, I_C = 30\text{ A}, T_j = 25\text{ }^\circ\text{C}$   | $V_{CE(sat)}$ | -   | 2.1 | 2.7 |               |
| $V_{GE} = 15\text{ V}, I_C = 30\text{ A}, T_j = 125\text{ }^\circ\text{C}$  |               | -   | 2.2 | 2.8 |               |
| $V_{GE} = 15\text{ V}, I_C = 60\text{ A}, T_j = 25\text{ }^\circ\text{C}$   |               | -   | 3   | -   |               |
| $V_{GE} = 15\text{ V}, I_C = 60\text{ A}, T_j = 125\text{ }^\circ\text{C}$  |               | -   | 3.3 | -   |               |
| Zero gate voltage collector current<br>$V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ }^\circ\text{C}$ | $I_{CES}$     | -   | -   | 150 | $\mu\text{A}$ |
| Gate-emitter leakage current<br>$V_{GE} = 25\text{ V}, V_{CE} = 0\text{ V}$   | $I_{GES}$     | -   | -   | 100 | nA            |

**AC Characteristics**

|   |           |   |      |      |    |
|---|-----------|---|------|------|----|
| Transconductance<br>$V_{CE} = 20\text{ V}, I_C = 30\text{ A}$                                 | $g_{fs}$  | 6 | -    | -    | S  |
| Input capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$            | $C_{iss}$ | - | 1600 | 2150 | pF |
| Output capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$           | $C_{oss}$ | - | 170  | 260  |    |
| Reverse transfer capacitance<br>$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$ | $C_{rss}$ | - | 100  | 150  |    |

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

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

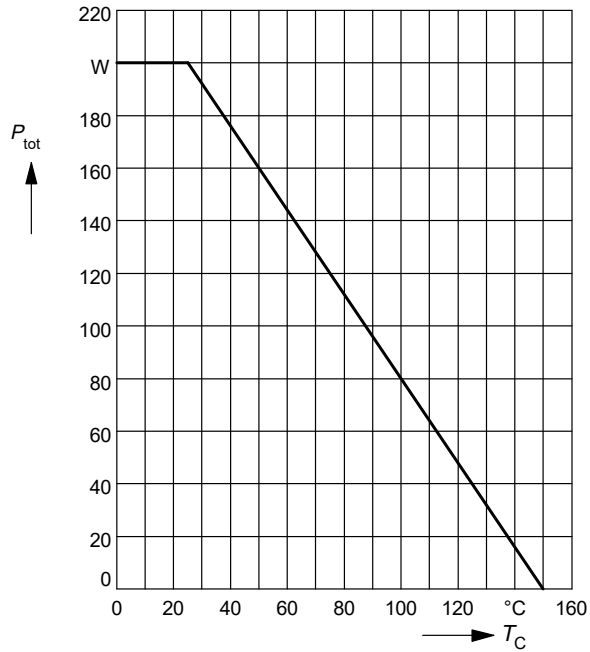
**Switching Characteristics, Inductive Load at  $T_j = 125\text{ °C}$**

|   |              |   |     |     |    |
|---|--------------|---|-----|-----|----|
| Turn-on delay time<br>$V_{CC} = 300\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$<br>$R_{Gon} = 33\ \Omega$    | $t_{d(on)}$  | - | 50  | 75  | ns |
| Rise time<br>$V_{CC} = 300\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$<br>$R_{Gon} = 33\ \Omega$             | $t_r$        | - | 80  | 120 |    |
| Turn-off delay time<br>$V_{CC} = 300\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 30\text{ A}$<br>$R_{Goff} = 33\ \Omega$ | $t_{d(off)}$ | - | 250 | 340 |    |
| Fall time<br>$V_{CC} = 300\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 30\text{ A}$<br>$R_{Goff} = 33\ \Omega$           | $t_f$        | - | 500 | 700 |    |

### Power dissipation

$$P_{\text{tot}} = f(T_C)$$

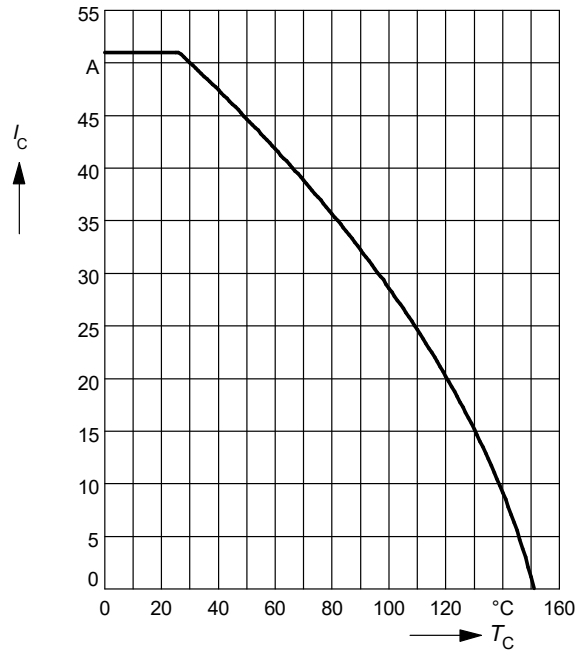
parameter:  $T_j \leq 150^\circ\text{C}$



### Collector current

$$I_C = f(T_C)$$

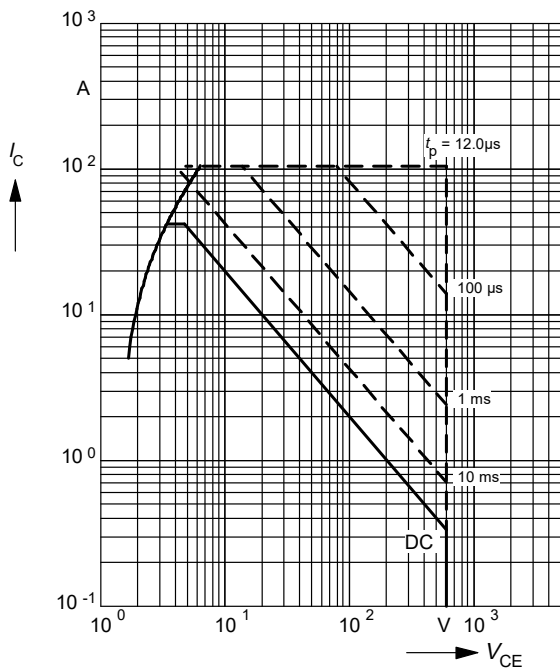
parameter:  $V_{\text{GE}} \geq 15\text{ V}$ ,  $T_j \leq 150^\circ\text{C}$



### Safe operating area

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

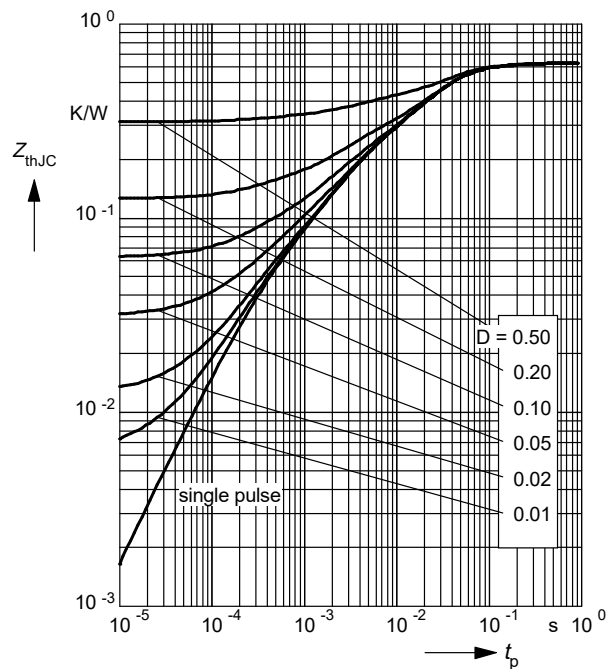
parameter:  $D = 0$ ,  $T_C = 25^\circ\text{C}$ ,  $T_j \leq 150^\circ\text{C}$



### Transient thermal impedance IGBT

$$Z_{\text{thJC}} = f(t_p)$$

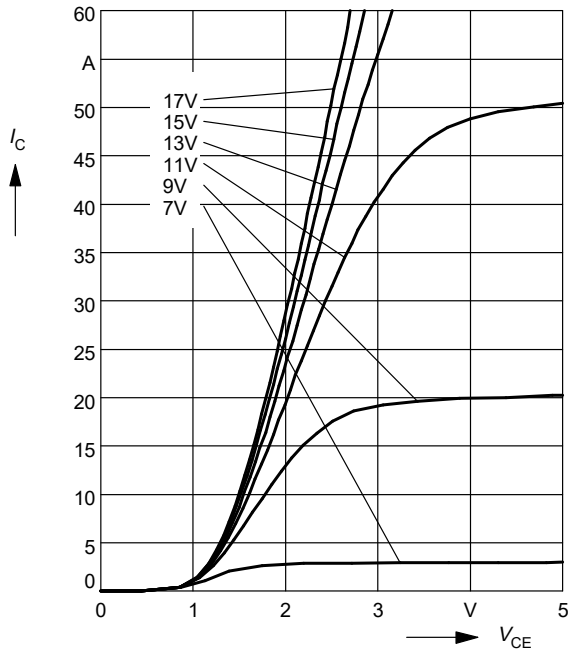
parameter:  $D = t_p / T$



### Typ. output characteristics

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

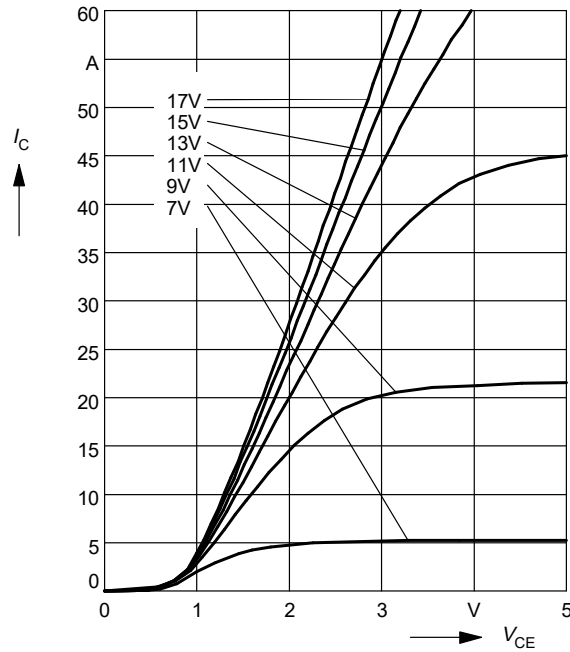
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25^\circ C$



### Typ. output characteristics

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

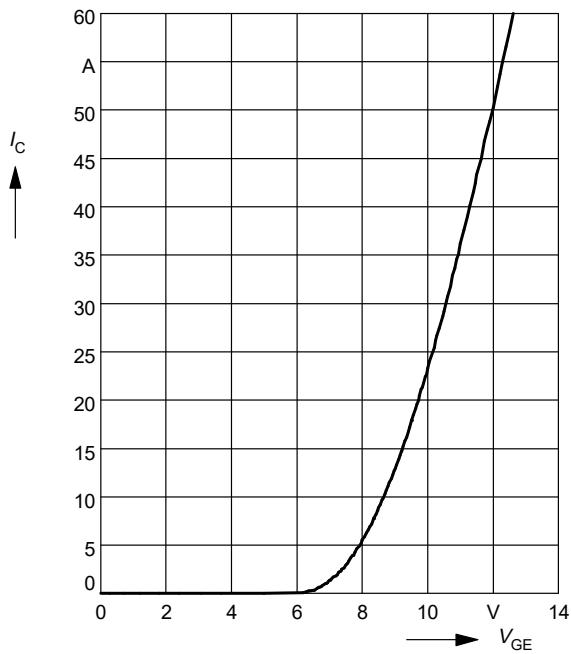
parameter:  $t_p = 80 \mu s$ ,  $T_j = 125^\circ C$



### Typ. transfer characteristics

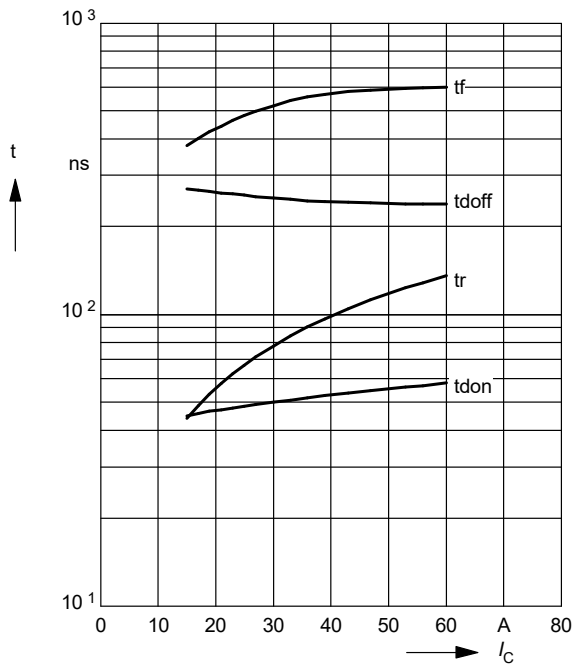
$$I_C = f(V_{GE})$$

parameter:  $t_p = 80 \mu s$ ,  $V_{CE} = 20 V$



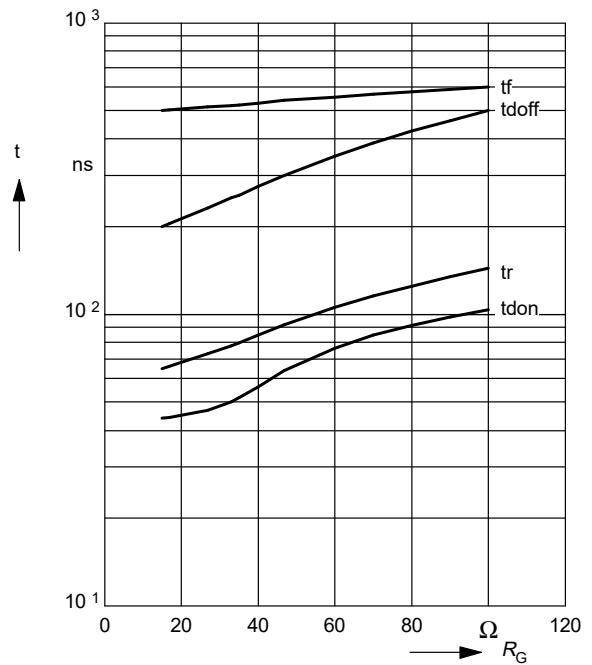
### Typ. switching time

$t = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 33\ \Omega$



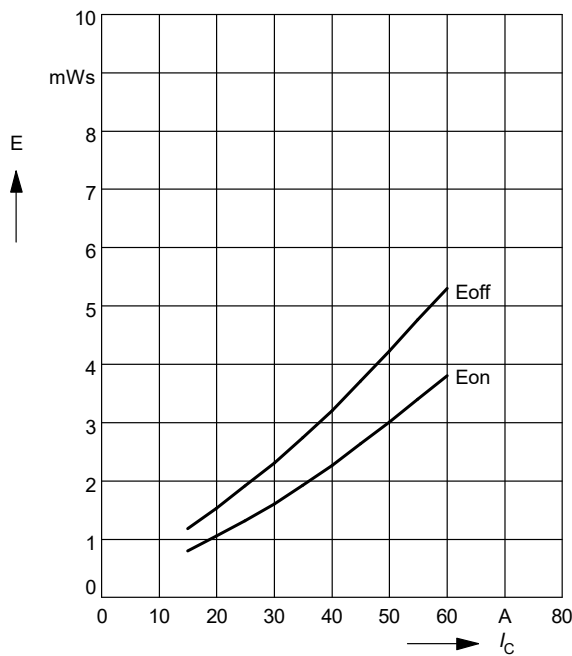
### Typ. switching time

$t = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 30\text{ A}$



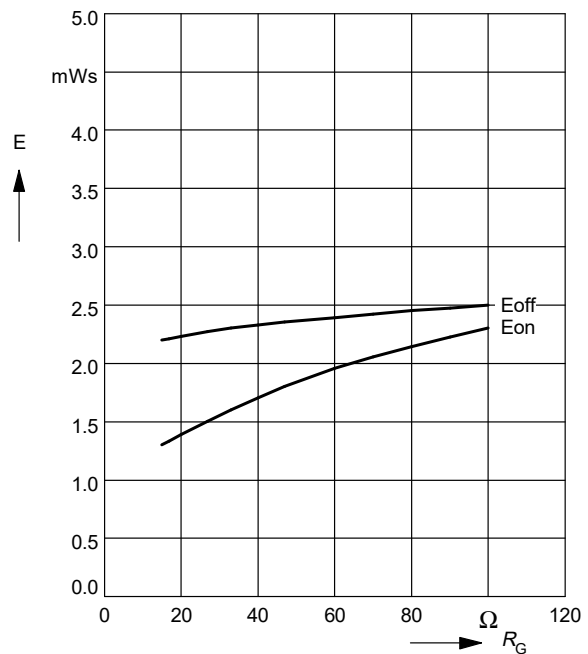
### Typ. switching losses

$E = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 33\ \Omega$



### Typ. switching losses

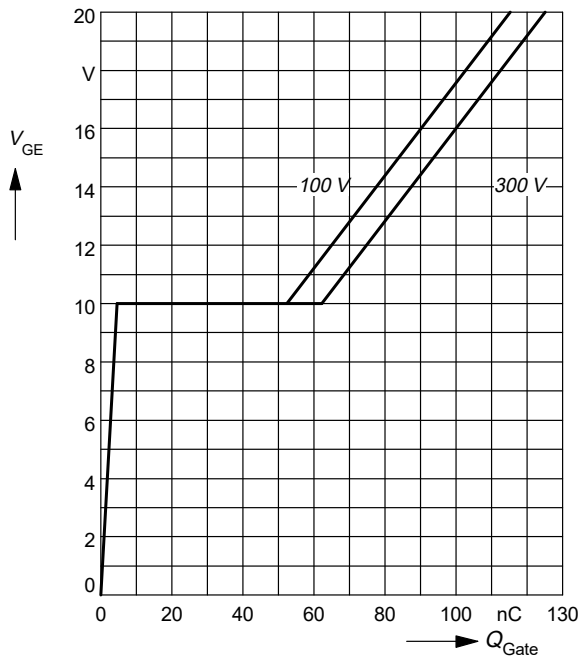
$E = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 30\text{ A}$



### Typ. gate charge

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

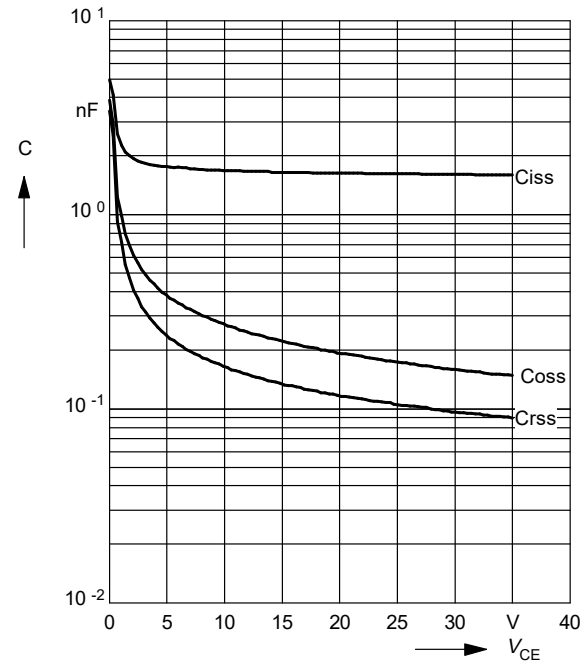
parameter:  $I_{C\ puls} = 30\ A$



### Typ. capacitances

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

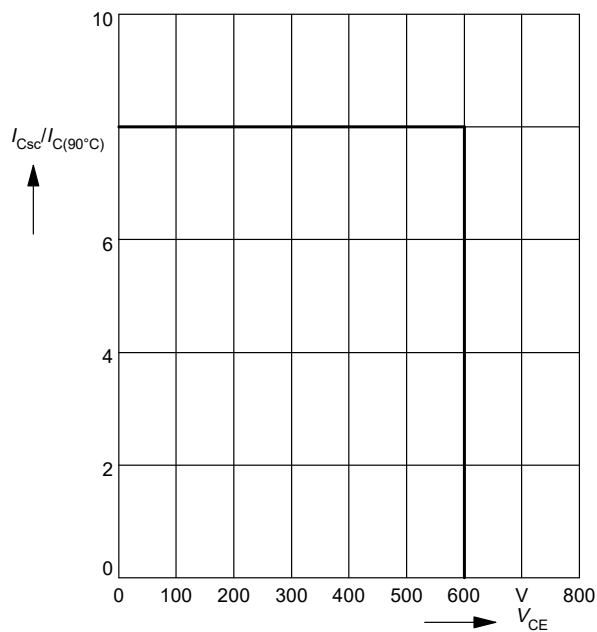
parameter:  $V_{GE} = 0\ V, f = 1\ MHz$



### Short circuit safe operating area

$$I_{Csc} = f(V_{CE}), T_j = 150^\circ C$$

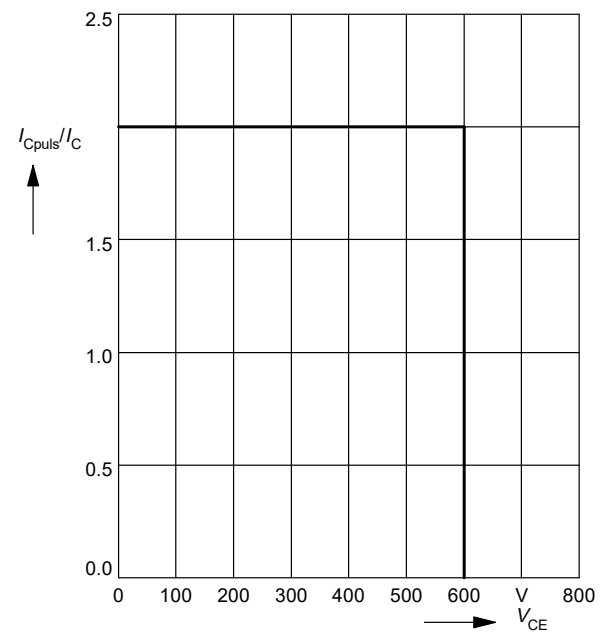
parameter:  $V_{GE} = \pm 15\ V, t_{sc} \leq 10\ \mu s, L < 50\ nH$



### Reverse biased safe operating area

$$I_{Cpuls} = f(V_{CE}), T_j = 150^\circ C$$

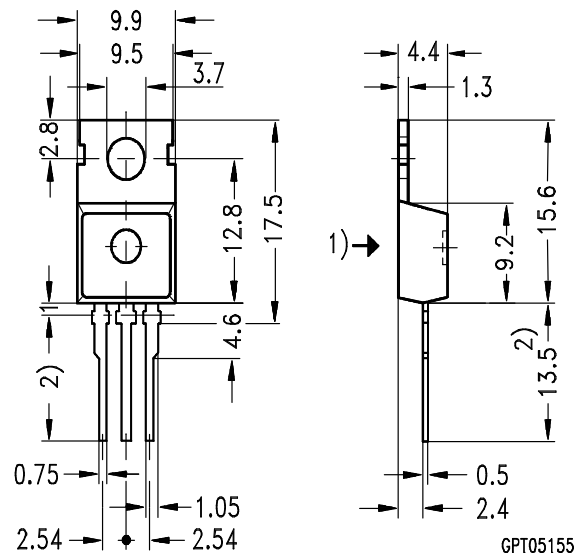
parameter:  $V_{GE} = 15\ V$



## Package Outlines

Dimensions in mm

Weight:



- 1) punch direction, burr max. 0.04
- 2) dip tinning
- 3) max. 14.5 by dip tinning press burr max. 0.05