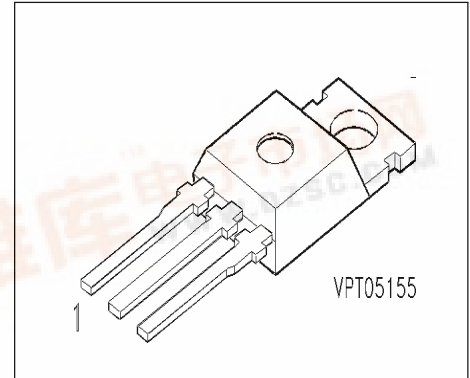


### IGBT

#### 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 202	1000V	12A	TO-220 AB	Q67078-A4401-A2

#### Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	$V_{CE}$	1000	V
Collector-gate voltage	$V_{CGR}$	1200	V
$R_{GE} = 20 \text{ k}\Omega$			
Gate-emitter voltage	$V_{GE}$	$\pm 20$	A
DC collector current	$I_C$	12	
$T_C = 25 \text{ }^\circ\text{C}$ $T_C = 90 \text{ }^\circ\text{C}$		8	
Pulsed collector current, $t_p = 1 \text{ ms}$	$I_{Cpuls}$	24	A
$T_C = 25 \text{ }^\circ\text{C}$ $T_C = 90 \text{ }^\circ\text{C}$		16	
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	$P_{tot}$	100	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

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

### AC Characteristics

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

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

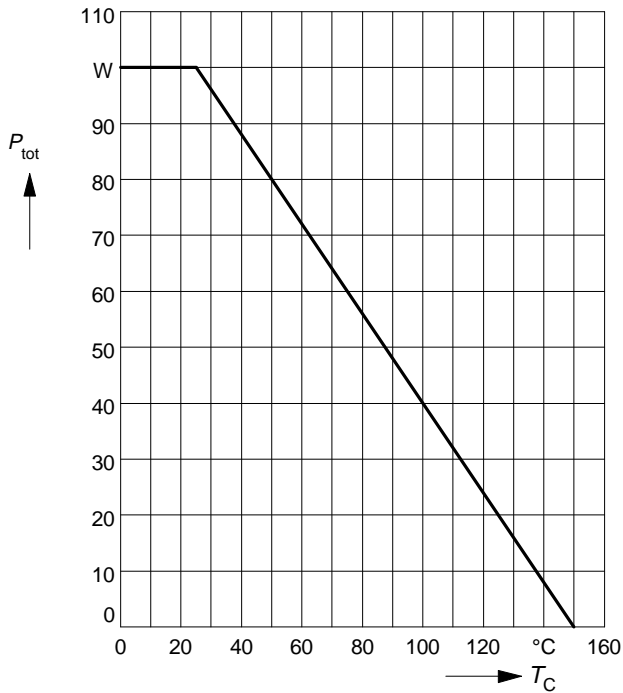
**Switching Characteristics, Inductive Load at  $T_j = 125\text{ °C}$**

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

### Power dissipation

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

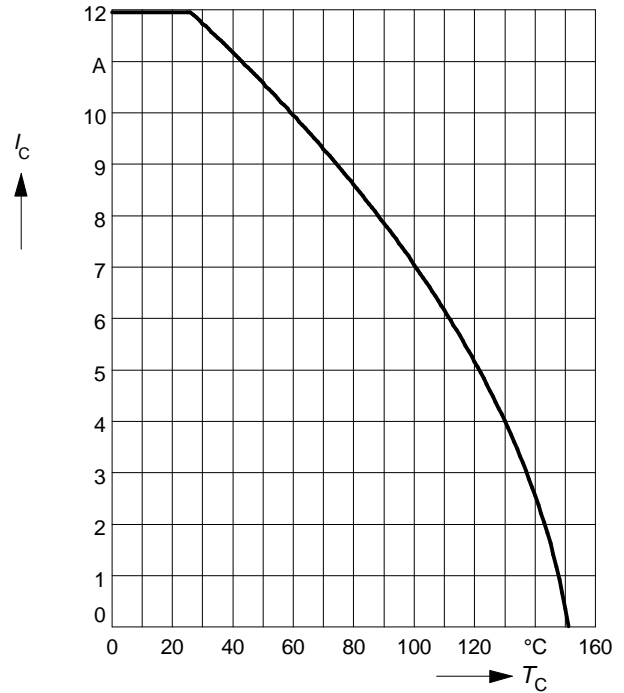
parameter:  $T_j \leq 150\text{ }^\circ\text{C}$



### Collector current

$$I_C = f(T_C)$$

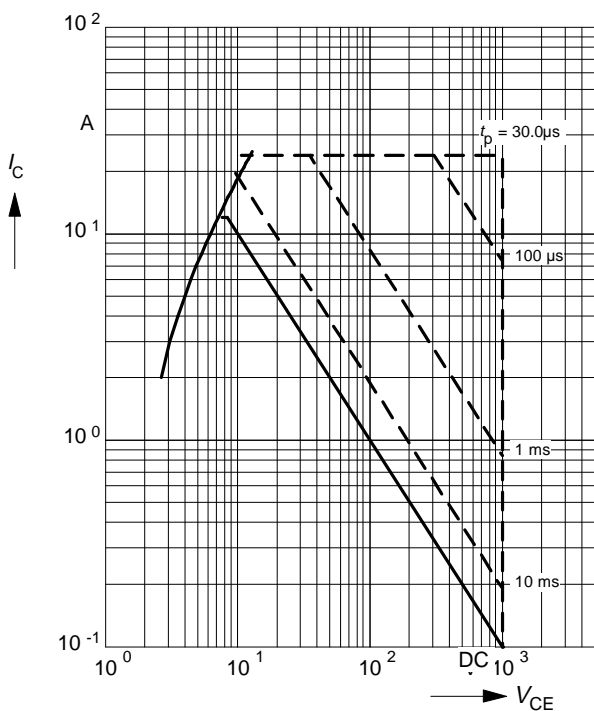
parameter:  $V_{\text{GE}} \geq 15\text{ V}$ ,  $T_j \leq 150\text{ }^\circ\text{C}$



### Safe operating area

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

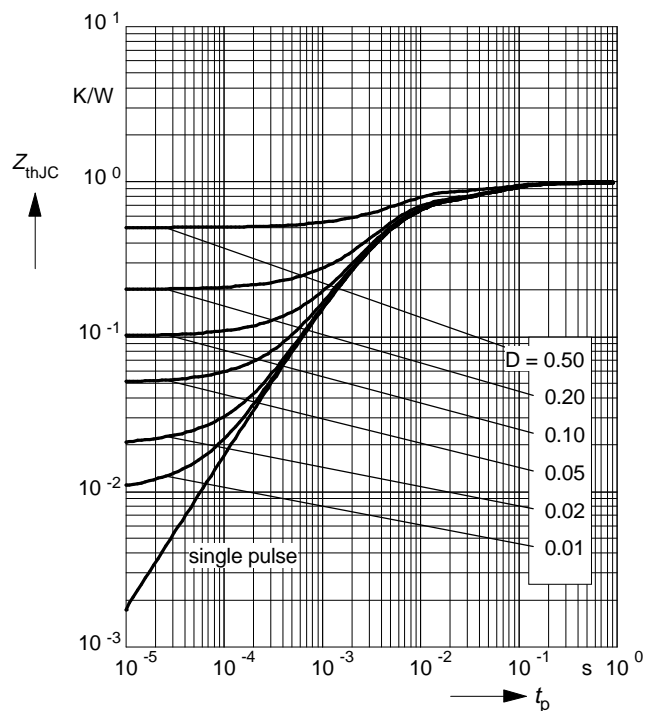
parameter:  $D = 0$ ,  $T_C = 25\text{ }^\circ\text{C}$ ,  $T_j \leq 150\text{ }^\circ\text{C}$



### Transient thermal impedance IGBT

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

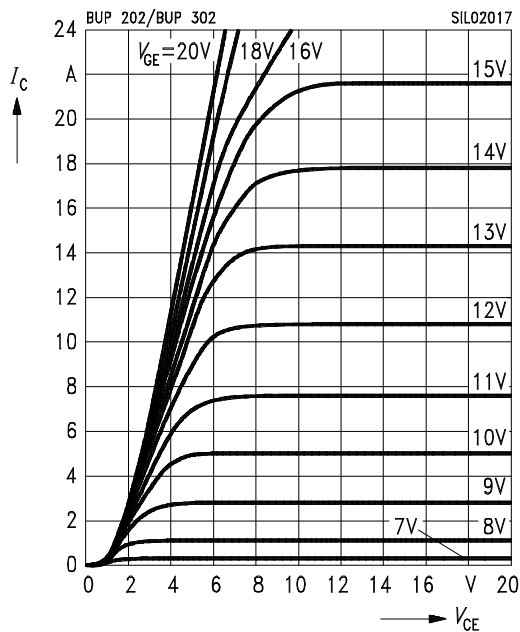
parameter:  $D = t_p / T$



### Typ. output characteristics

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

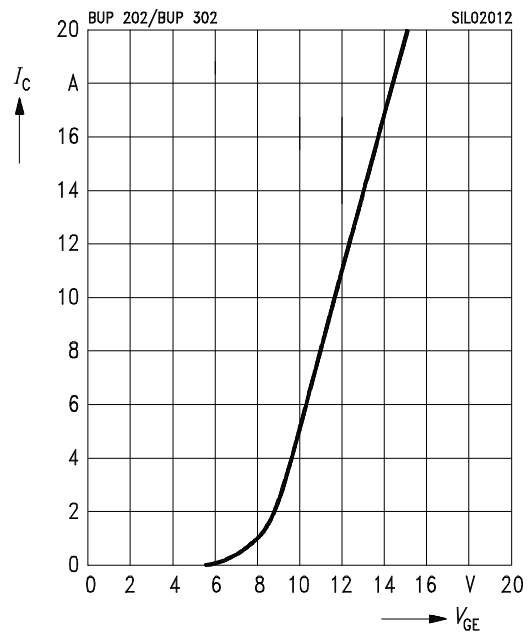
parameter:  $t_p = 80 \mu s$ ,  $T_j = 125 \text{ }^\circ\text{C}$



### Typ. transfer characteristics

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

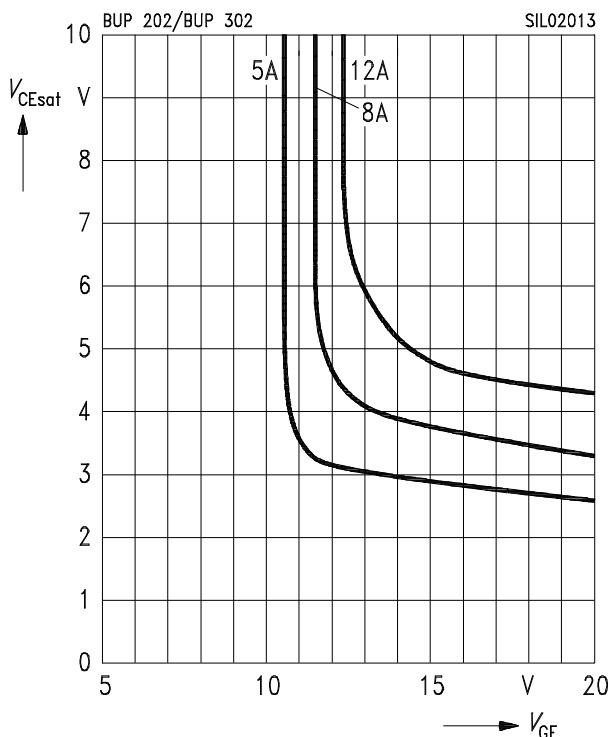
parameter:  $t_p = 80 \mu s$ ,  $V_{CE} = 20 \text{ V}$ ,  $T_j = 25 \text{ }^\circ\text{C}$



### Typ. saturation characteristics

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

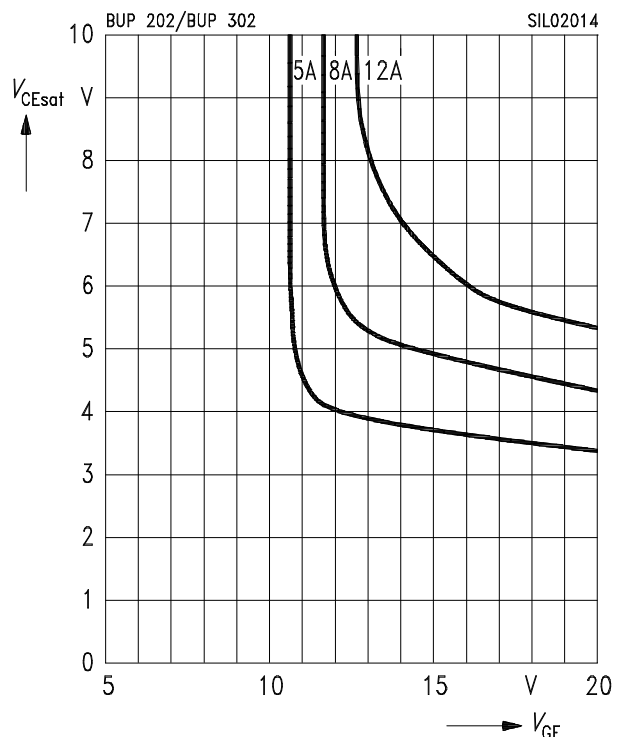
parameter:  $T_j = 25 \text{ }^\circ\text{C}$



### Typ. saturation characteristics

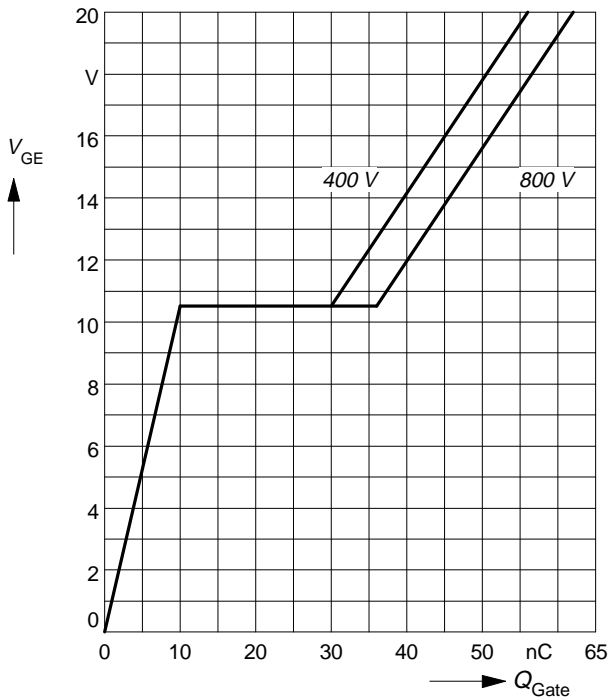
$$V_{CE(sat)} = f(V_{GE})$$

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



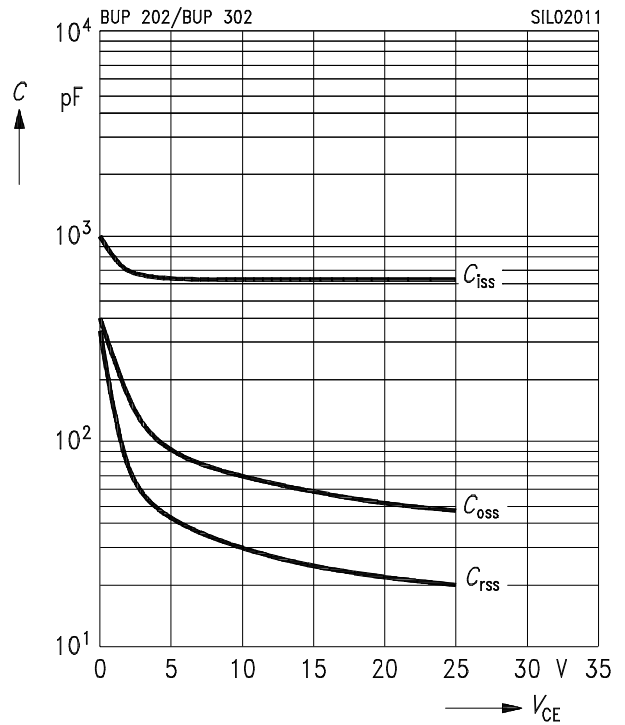
### Typ. gate charge

$V_{GE} = f(Q_{Gate})$   
 parameter:  $I_{C\ puls} = 6\text{ A}$



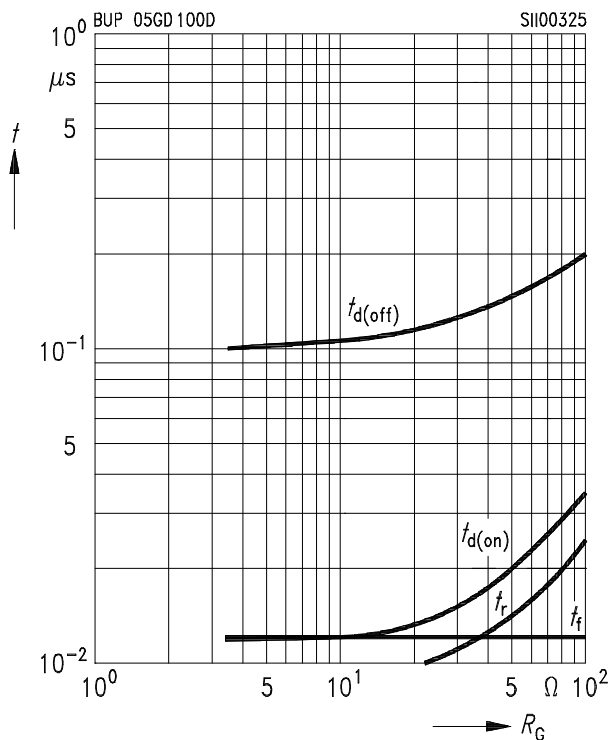
### Typ. capacitances

$C = f(V_{CE})$   
 parameter:  $V_{GE} = 0\text{ V}, f = 1\text{ MHz}$



### Typ. switching time

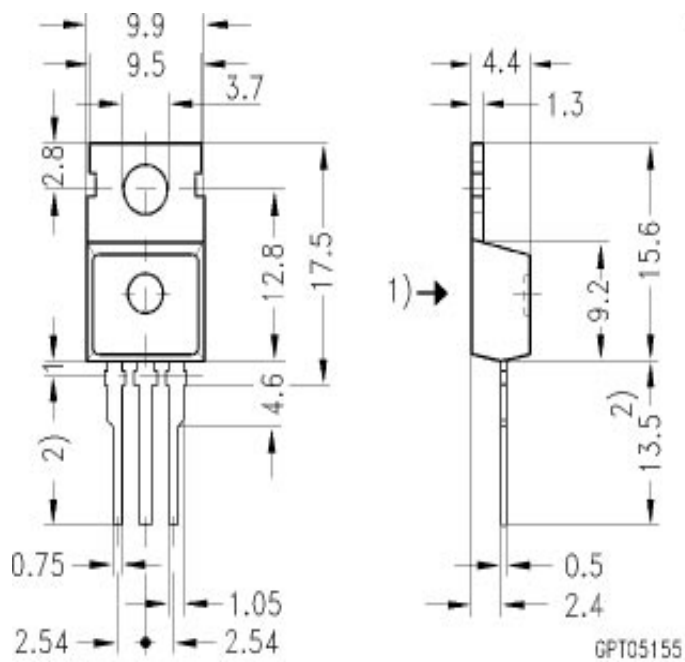
$t = f(R_G)$ , inductive load,  $T_j = 125\text{ °C}$   
 parameter:  $V_{CE} = 600\text{ V}, V_{GE} = \pm 15\text{ V}, I_C = 5\text{ A}$



### Package Outlines

Dimensions in mm

Weight: 8 g



1) punch direction, burr max. 0.04

2) dip finning

3) max. 14.5 by dip finning press burr max. 0.05