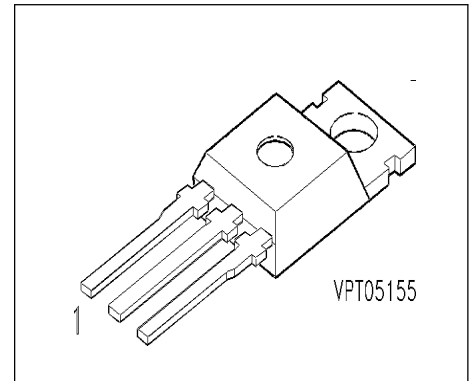


### IGBT

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 410	600V	13A	TO-220 AB	C67040-A4424-A2

### Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	$V_{CE}$	600	V
Collector-gate voltage $R_{GE} = 20 \text{ k}\Omega$	$V_{CGR}$	600	
Gate-emitter voltage	$V_{GE}$	$\pm 20$	
DC collector current $T_C = 25 \text{ }^\circ\text{C}$ $T_C = 90 \text{ }^\circ\text{C}$	$I_C$	13 8	A
Pulsed collector current, $t_p = 1 \text{ ms}$ $T_C = 25 \text{ }^\circ\text{C}$ $T_C = 90 \text{ }^\circ\text{C}$	$I_{Cpuls}$	26 16	
Avalanche energy, single pulse $I_C = 6 \text{ A}$ , $V_{CC} = 50 \text{ V}$ , $R_{GE} = 25 \text{ }\Omega$ $L = 500 \text{ }\mu\text{H}$ , $T_j = 25 \text{ }^\circ\text{C}$	$E_{AS}$	9	mJ
Power dissipation $T_C = 25 \text{ }^\circ\text{C}$	$P_{tot}$	50	W
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	$R_{thJC}$	$\leq 2.5$	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 $V_{GE} = V_{CE}, I_C = 0.2\text{ mA}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter saturation voltage $V_{GE} = 15\text{ V}, I_C = 6\text{ A}, T_j = 25\text{ }^\circ\text{C}$ $V_{GE} = 15\text{ V}, I_C = 6\text{ A}, T_j = 125\text{ }^\circ\text{C}$ $V_{GE} = 15\text{ V}, I_C = 12\text{ A}, T_j = 25\text{ }^\circ\text{C}$ $V_{GE} = 15\text{ V}, I_C = 12\text{ A}, T_j = 125\text{ }^\circ\text{C}$	$V_{CE(sat)}$	-	2.1 2.2 3 3.3	2.8 2.9 -	
Zero gate voltage collector current $V_{CE} = 600\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ }^\circ\text{C}$	$I_{CES}$	-	-	20	$\mu\text{A}$
Gate-emitter leakage current $V_{GE} = 25\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	100	nA

### AC Characteristics

Transconductance $V_{CE} = 20\text{ V}, I_C = 6\text{ A}$	$g_{fs}$	2	-	-	S
Input capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{iss}$	-	320	430	pF
Output capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{oss}$	-	40	60	
Reverse transfer capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{rss}$	-	25	40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

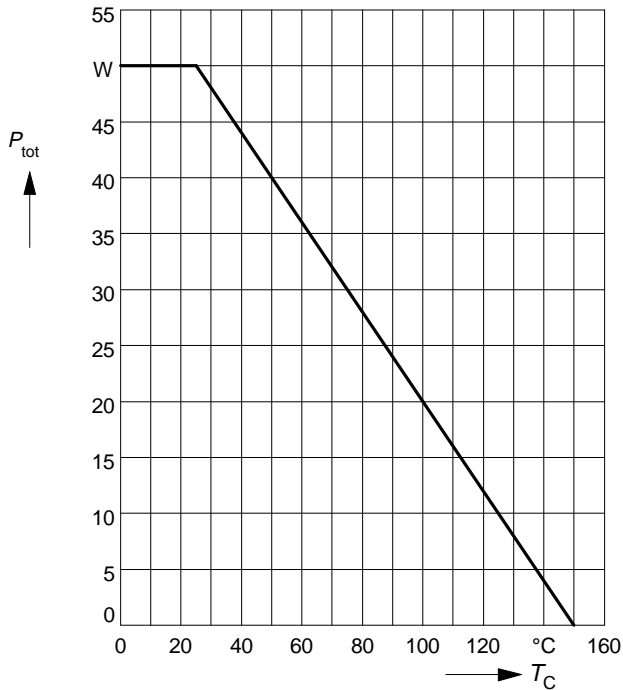
**Switching Characteristics, Inductive Load at  $T_j = 125\text{ }^\circ\text{C}$**

Turn-on delay time $V_{CC} = 300\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 6\text{ A}$ $R_{Gon} = 100\ \Omega$	$t_{d(on)}$	-	20	35	ns
Rise time $V_{CC} = 300\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 6\text{ A}$ $R_{Gon} = 100\ \Omega$	$t_r$	-	45	70	
Turn-off delay time $V_{CC} = 300\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 6\text{ A}$ $R_{Goff} = 100\ \Omega$	$t_{d(off)}$	-	175	240	
Fall time $V_{CC} = 300\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 6\text{ A}$ $R_{Goff} = 100\ \Omega$	$t_f$	-	160	220	

### Power dissipation

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

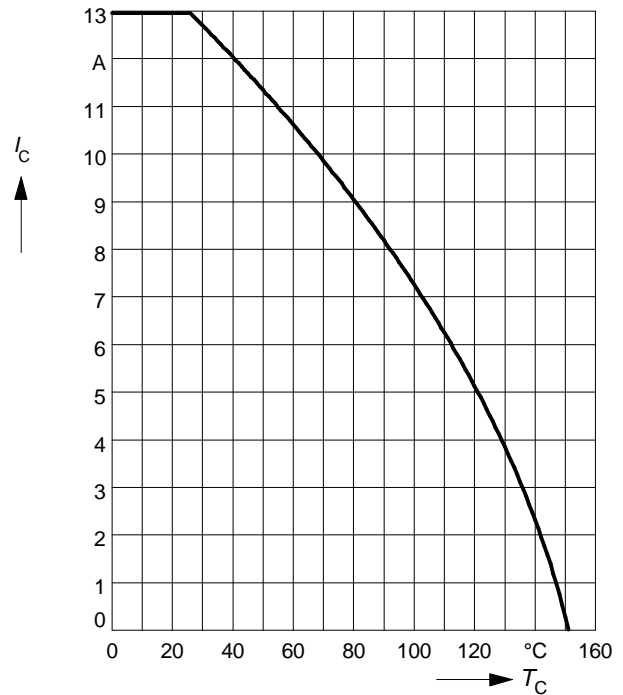
parameter:  $T_j \leq 150\text{ }^\circ\text{C}$



### Collector current

$$I_C = f(T_C)$$

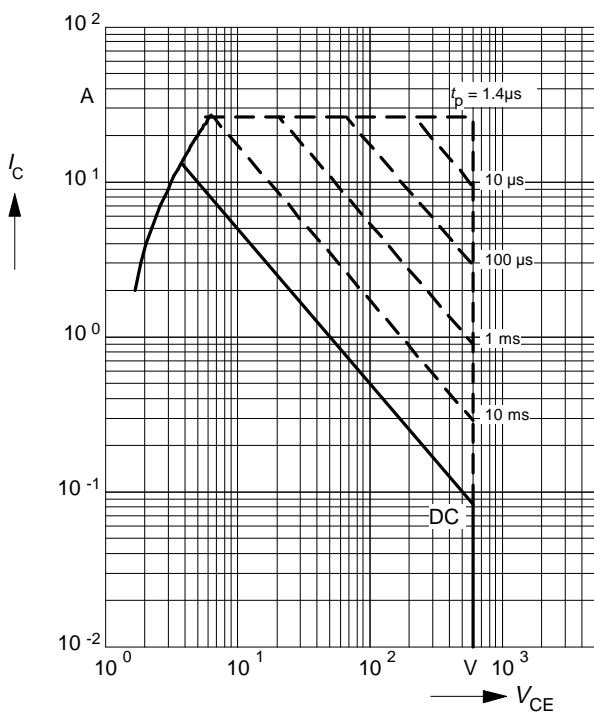
parameter:  $V_{\text{GE}} \geq 15\text{ V}$ ,  $T_j \leq 150\text{ }^\circ\text{C}$



### Safe operating area

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

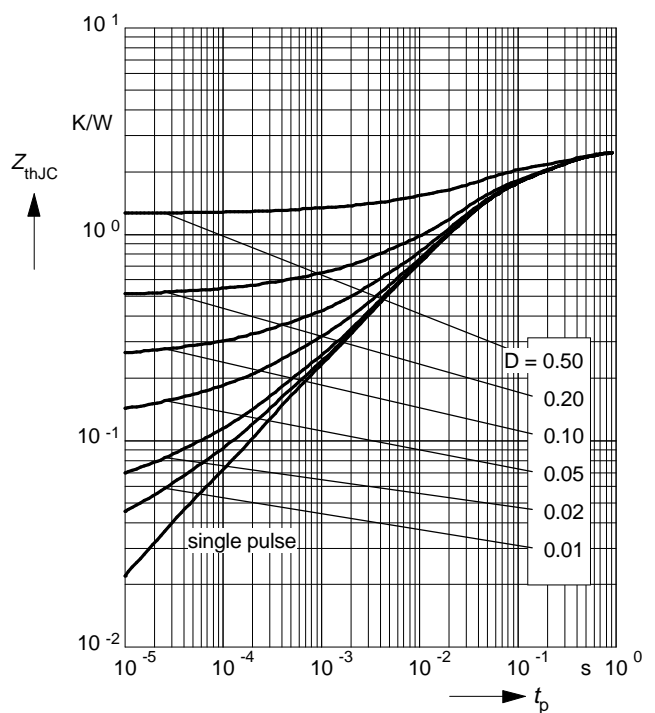
parameter:  $D = 0$ ,  $T_C = 25\text{ }^\circ\text{C}$ ,  $T_j \leq 150\text{ }^\circ\text{C}$



### Transient thermal impedance IGBT

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

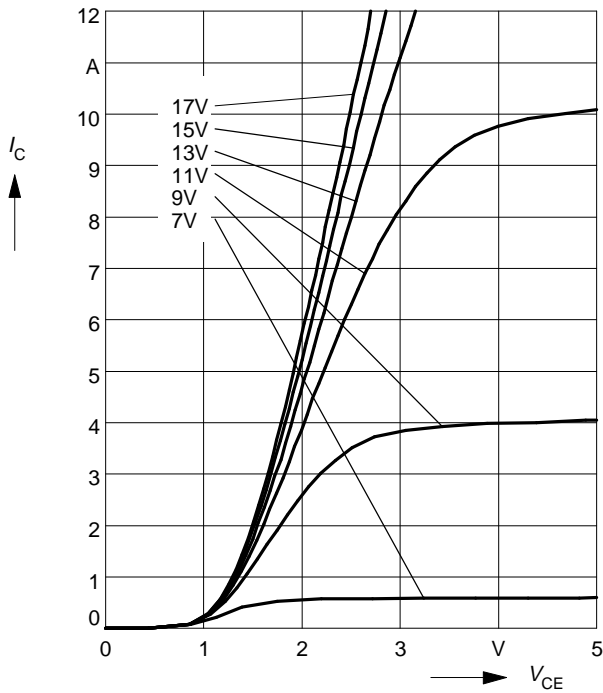
parameter:  $D = t_p / T$



### Typ. output characteristics

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

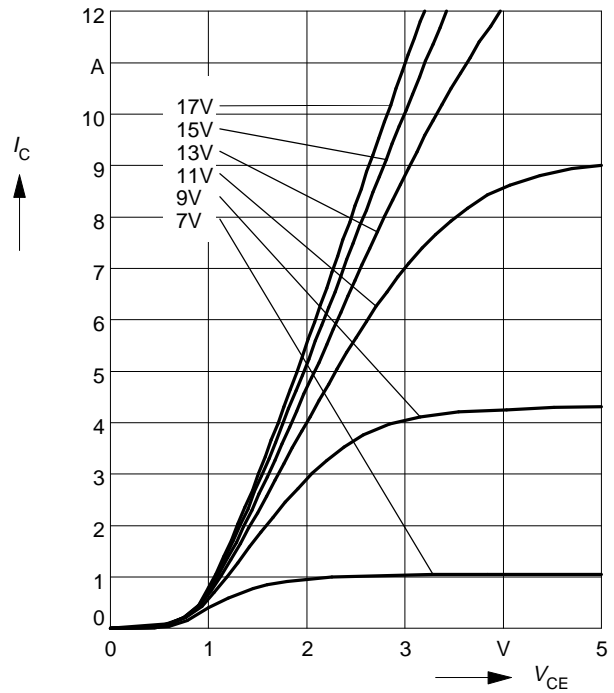
parameter:  $t_p = 80 \mu s, T_j = 25^\circ C$



### Typ. output characteristics

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

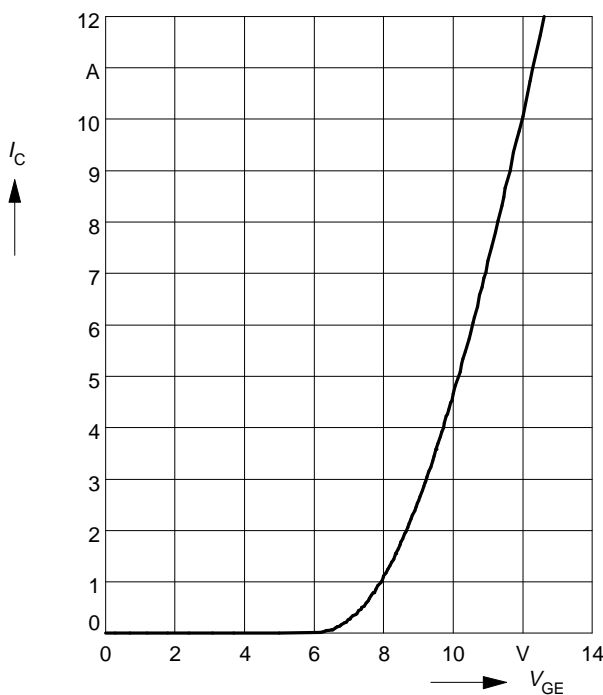
parameter:  $t_p = 80 \mu s, T_j = 125^\circ C$



### Typ. transfer characteristics

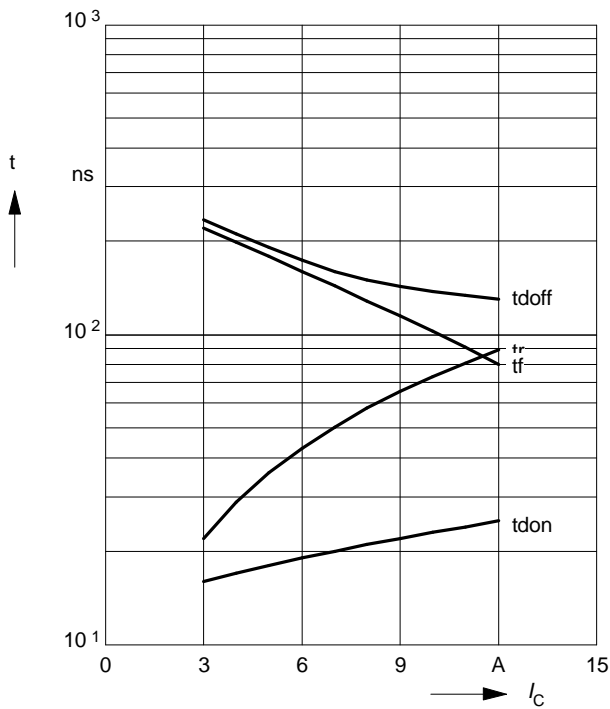
$$I_C = f(V_{GE})$$

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



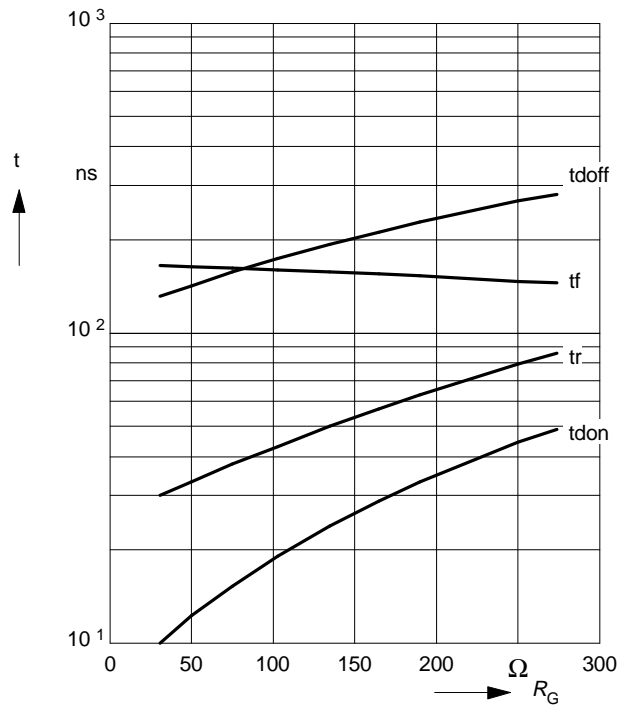
### Typ. switching time

$t = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 100\ \Omega$



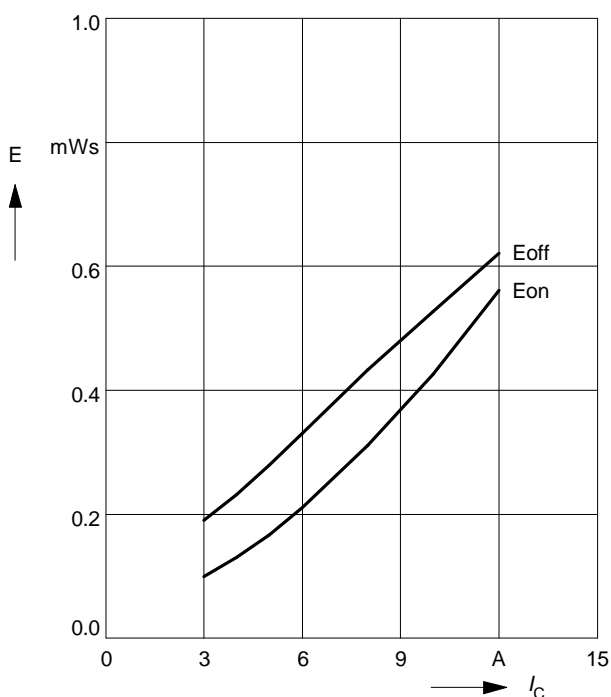
### Typ. switching time

$t = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 6\text{ A}$



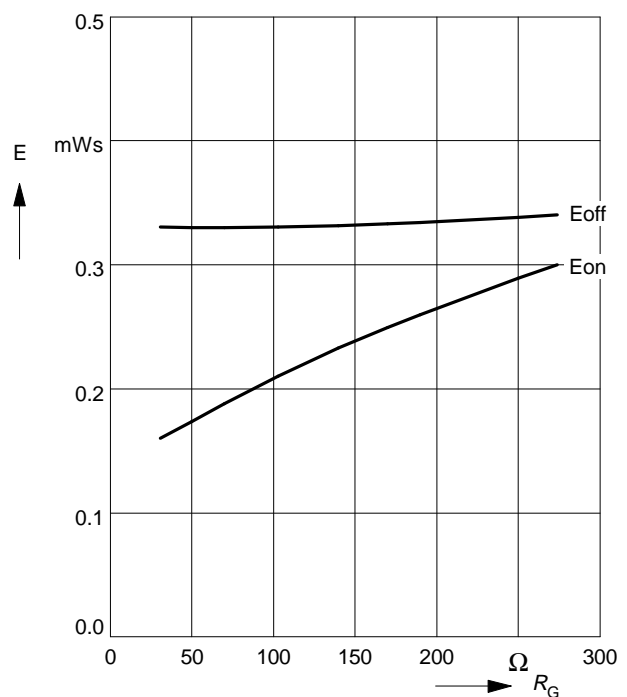
### Typ. switching losses

$E = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 100\ \Omega$



### Typ. switching losses

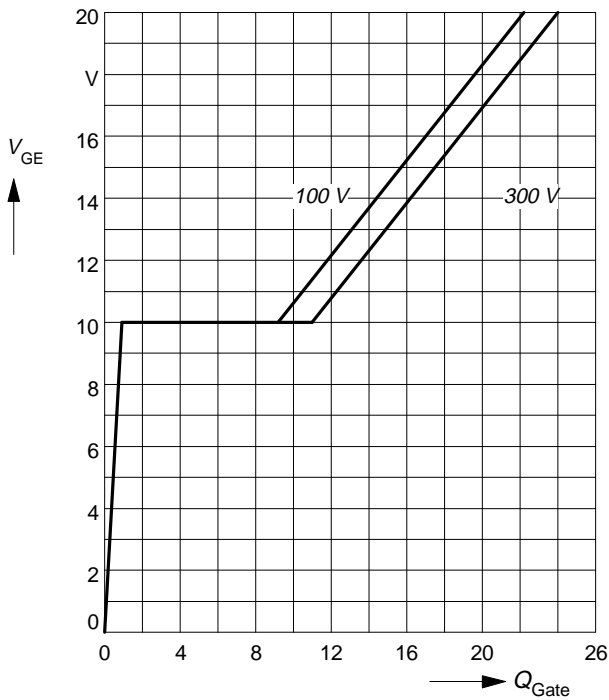
$E = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 300\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 6\text{ A}$



### Typ. gate charge

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

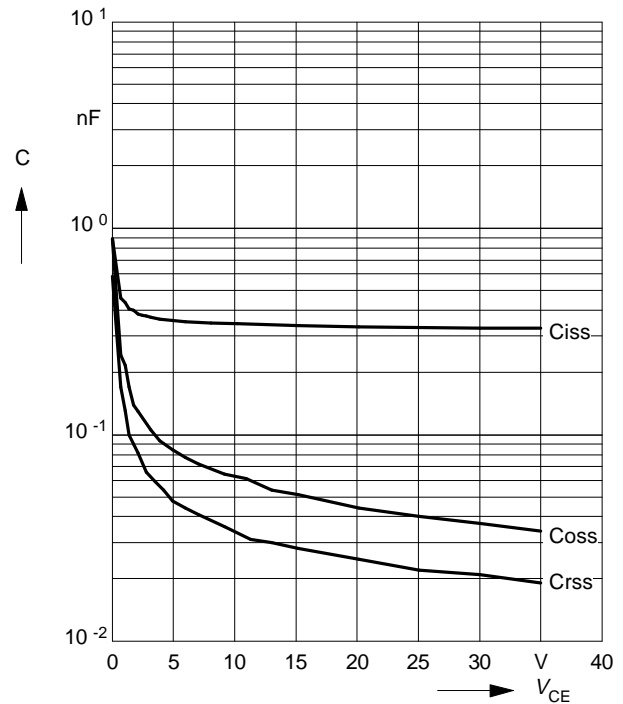
parameter:  $I_{C\ puls} = 6\ A$



### Typ. capacitances

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

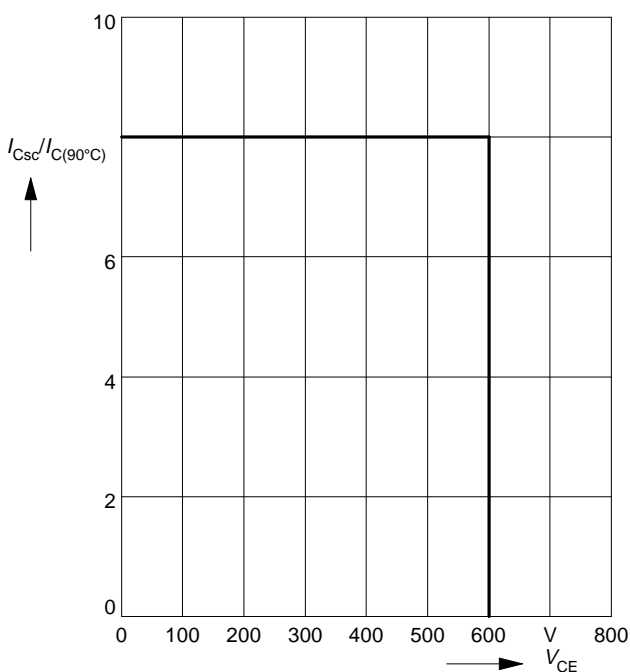
parameter:  $V_{GE} = 0\ V, f = 1\ MHz$



### Short circuit safe operating area

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

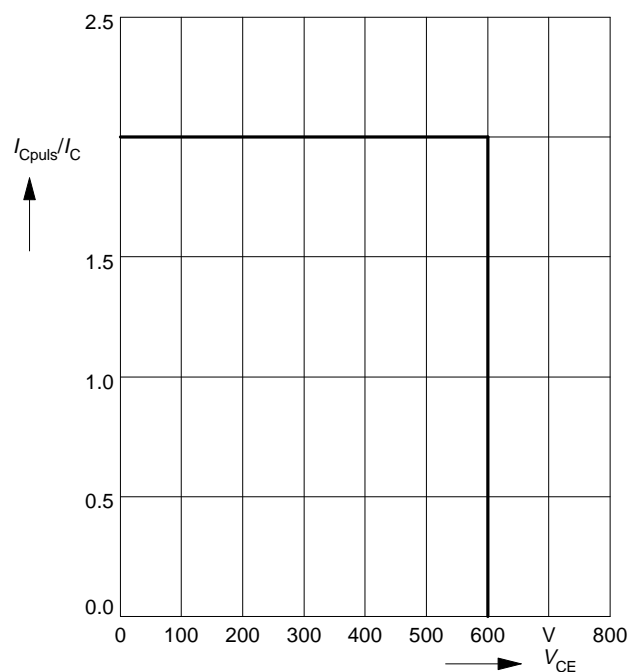
parameter:  $V_{GE} = \pm 15\ V, t_{sc} \leq 10\ \mu s, L < 50\ nH$



### Reverse biased safe operating area

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

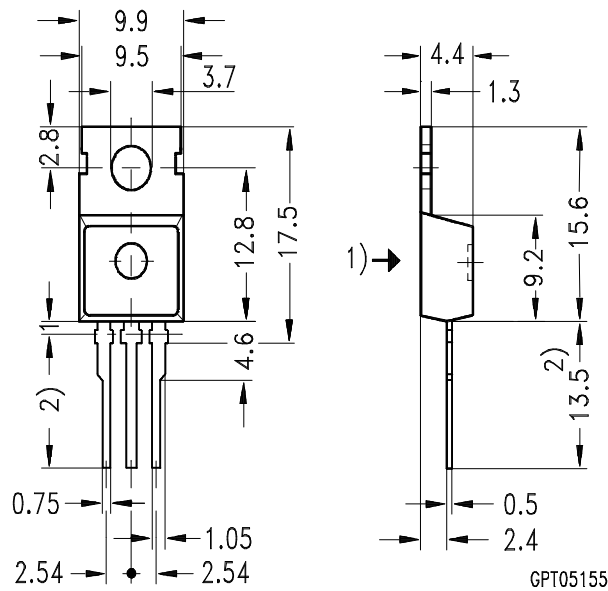
parameter:  $V_{GE} = 15\ V$



### 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



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

[LittleDiode.com](http://LittleDiode.com)

Looking forward to providing you with the best possible service.