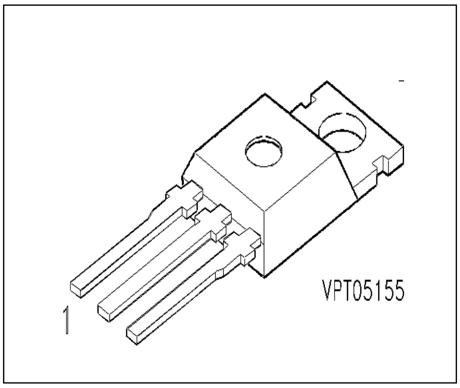


IGBT

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}		
R_{GE} = 20 kΩ		600	
Gate-emitter voltage	V_{GE}	± 20	
DC collector current, (limited by bond wire)	I_C		A
T_C = 60 °C		42	
T_C = 90 °C		32	
Pulsed collector current, t_p = 1 ms	I_{Cpuls}		
T_C = 25 °C		104	
T_C = 90 °C		64	
Avalanche energy, single pulse	E_{AS}		mJ
I_C = 25 A, V_{CC} = 50 V, R_{GE} = 25 Ω			
L = 200 µH, T_j = 25 °C		65	
Power dissipation	P_{tot}		W
T_C = 25 °C		200	
Chip or operating temperature	T_j	- 55 ... + 150	°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}	≤ 0.63	K/W

Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Gate threshold voltage $V_{GE} = V_{CE}$, I_C = 0.7 mA	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter saturation voltage	$V_{CE(sat)}$				
V_{GE} = 15 V, I_C = 30 A, T_j = 25 °C		-	2.1	2.7	
V_{GE} = 15 V, I_C = 30 A, T_j = 125 °C		-	2.2	2.8	
V_{GE} = 15 V, I_C = 60 A, T_j = 25 °C		-	3	-	
V_{GE} = 15 V, I_C = 60 A, T_j = 125 °C		-	3.3	-	
Zero gate voltage collector current V_{CE} = 600 V, V_{GE} = 0 V, T_j = 25 °C	I_{CES}	-	-	150	µA
Gate-emitter leakage current V_{GE} = 25 V, V_{CE} = 0 V	I_{GES}	-	-	100	nA
AC Characteristics					
Transconductance V_{CE} = 20 V, I_C = 30 A	g_{fs}	6	-	-	S
Input capacitance V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz	C_{iss}	-	1600	2150	pF
Output capacitance V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz	C_{oss}	-	170	260	
Reverse transfer capacitance V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz	C_{rss}	-	100	150	

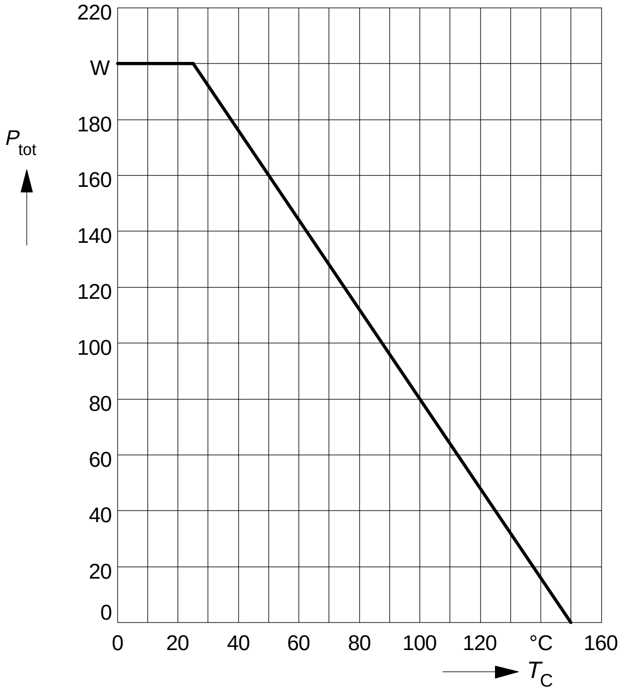
Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	**Symbol**	**Values**			**Unit**
		min.	**typ.**	**max.**	
Switching Characteristics, Inductive Load at T_j = 125 °C					
Turn-on delay time V_{CC} = 300 V, V_{GE} = 15 V, I_C = 30 A R_{Gon} = 33 Ω	$t_{d(on)}$	-	50	75	ns
Rise time V_{CC} = 300 V, V_{GE} = 15 V, I_C = 30 A R_{Gon} = 33 Ω	t_r	-	80	120	
Turn-off delay time V_{CC} = 300 V, V_{GE} = -15 V, I_C = 30 A R_{Goff} = 33 Ω	$t_{d(off)}$	-	250	340	
Fall time V_{CC} = 300 V, V_{GE} = -15 V, I_C = 30 A R_{Goff} = 33 Ω	t_f	-	500	700	

Power dissipation

$P_{tot} = f(T_C)$

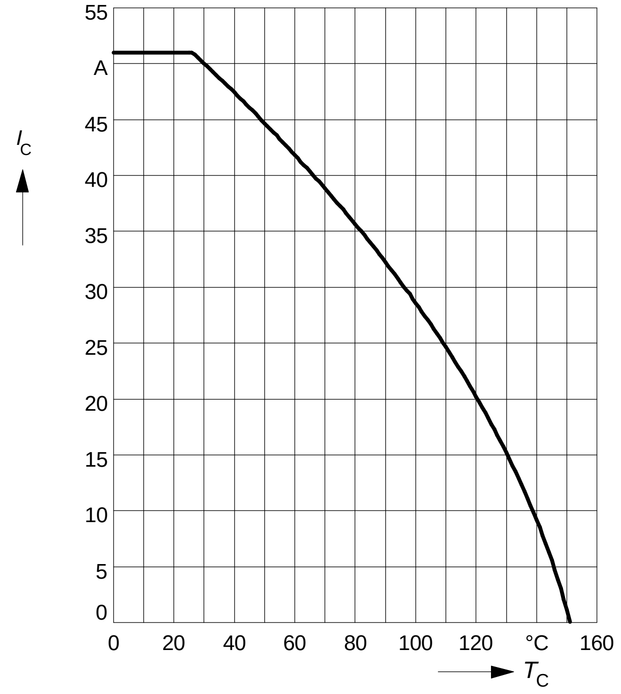
parameter: $T_j \leq 150$ °C



Collector current

$I_C = f(T_C)$

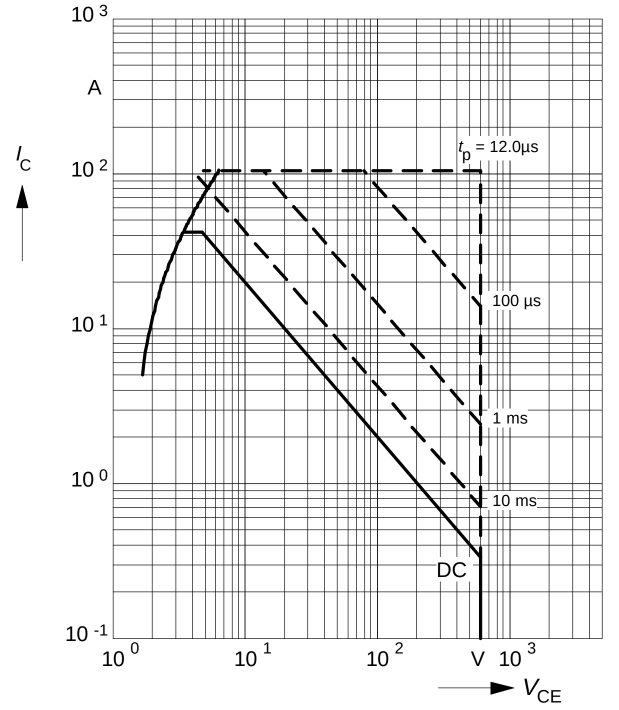
parameter: $V_{GE} \geq 15$ V , $T_j \leq 150$ °C



Safe operating area

$I_C = f(V_{CE})$

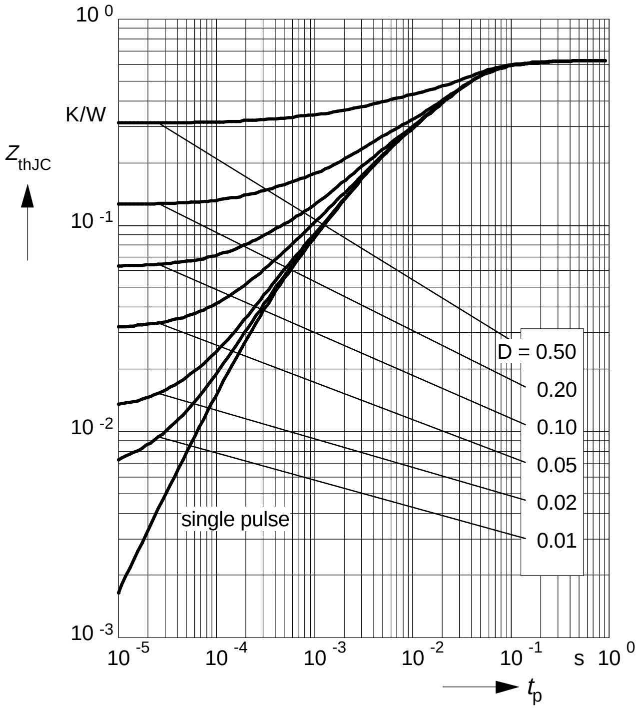
parameter: $D = 0$, $T_C = 25$°C , $T_j \leq 150$ °C



Transient thermal impedance IGBT

$Z_{th\,JC} = f(t_p)$

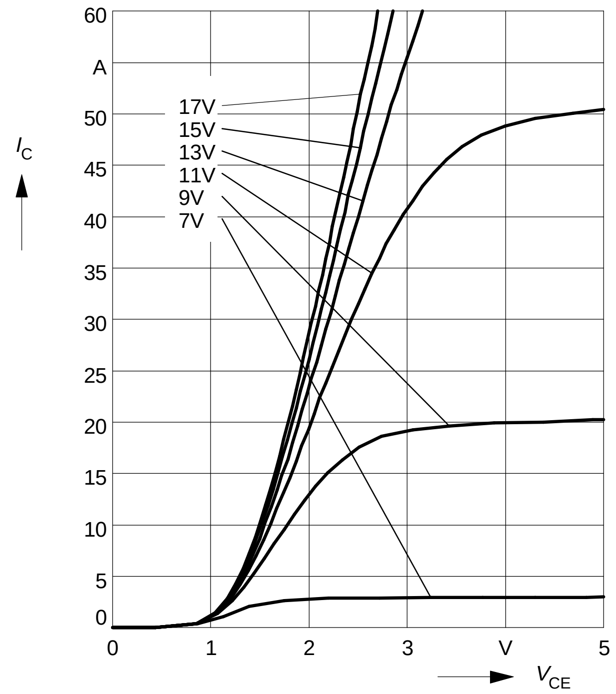
parameter: $D = t_p / T$



Typ. output characteristics

$I_C = f(V_{CE})$

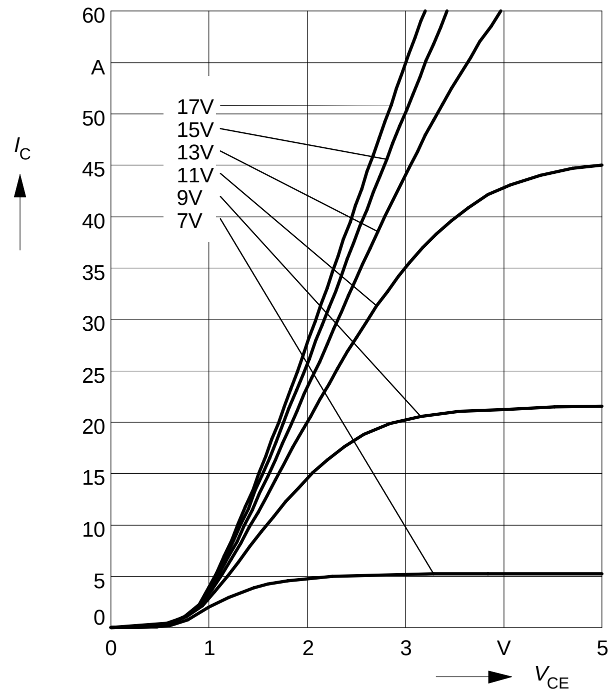
parameter: t_p = 80 µs, T_j = 25 °C



Typ. output characteristics

$I_C = f(V_{CE})$

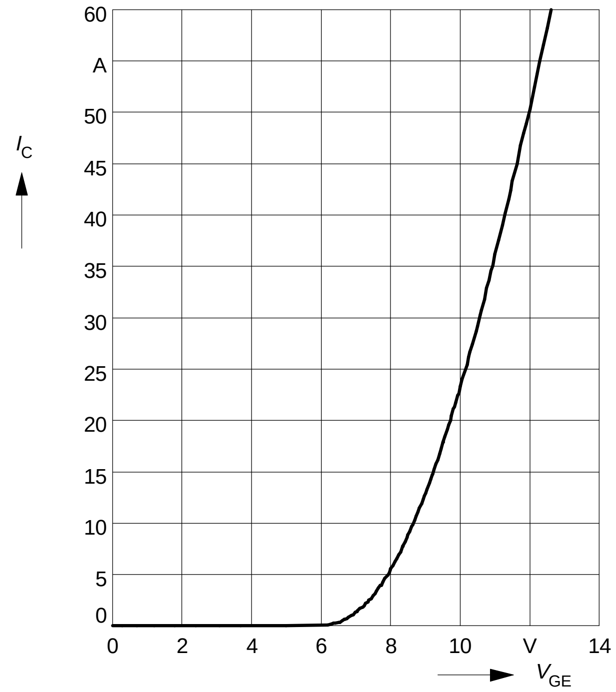
parameter: t_p = 80 µs, T_j = 125 °C



Typ. transfer characteristics

$I_C = f(V_{GE})$

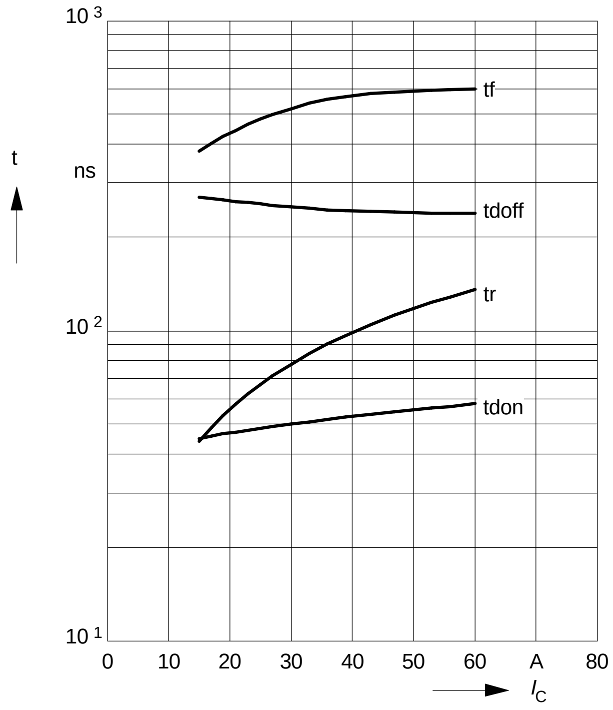
parameter: t_p = 80 µs, V_{CE} = 20 V



Typ. switching time

$I = f(I_C)$, inductive load , $T_j = 125°C$

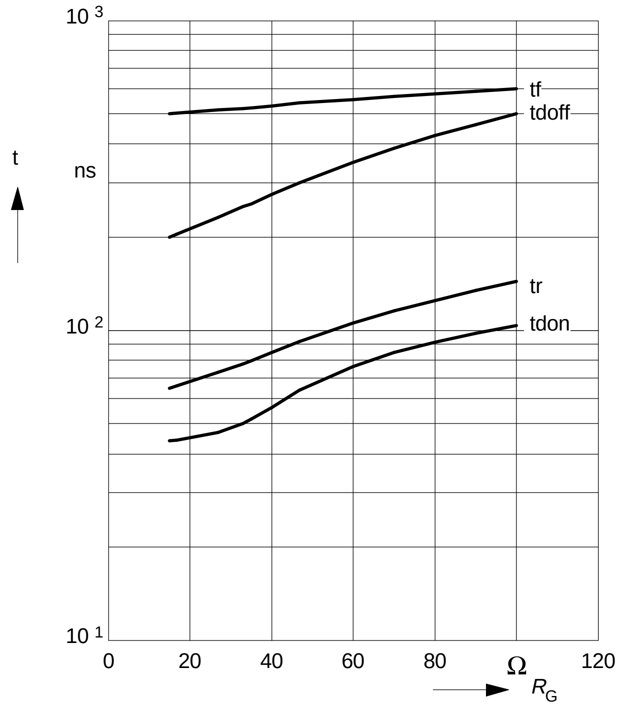
par.: $V_{CE} = 300$ V, $V_{GE} = \pm 15$ V, $R_G = 33\ \Omega$



Typ. switching time

$t = f(R_G)$, inductive load , $T_j = 125°C$

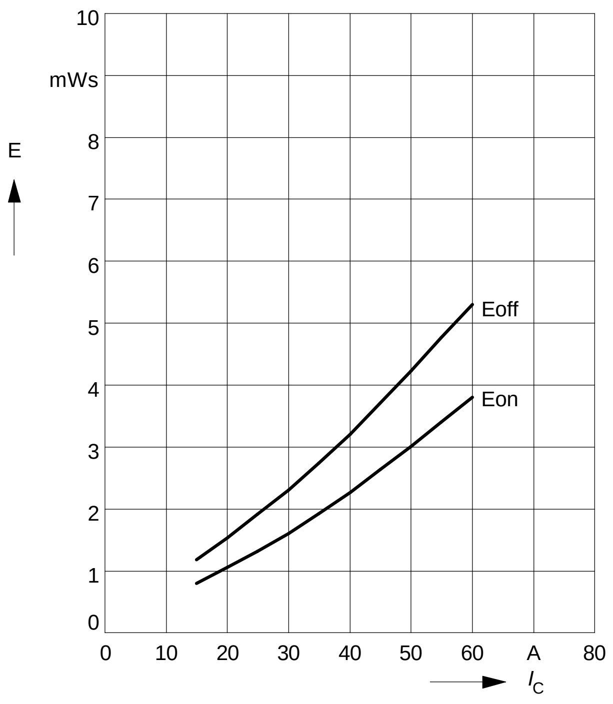
par.: $V_{CE} = 300$ V, $V_{GE} = \pm 15$ V, $I_C = 30$ A



Typ. switching losses

$E = f(I_C)$, inductive load , $T_j = 125°C$

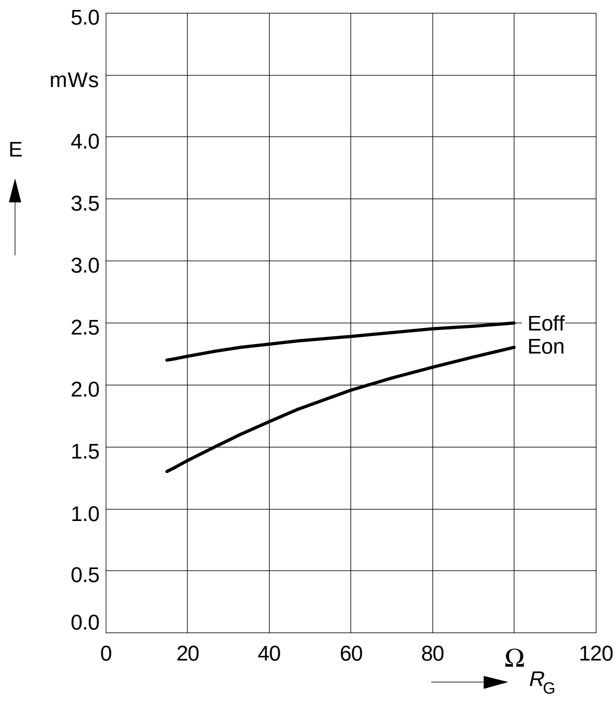
par.: $V_{CE} = 300$ V, $V_{GE} = \pm 15$ V, $R_G = 33\ \Omega$



Typ. switching losses

$E = f(R_G)$, inductive load , $T_j = 125°C$

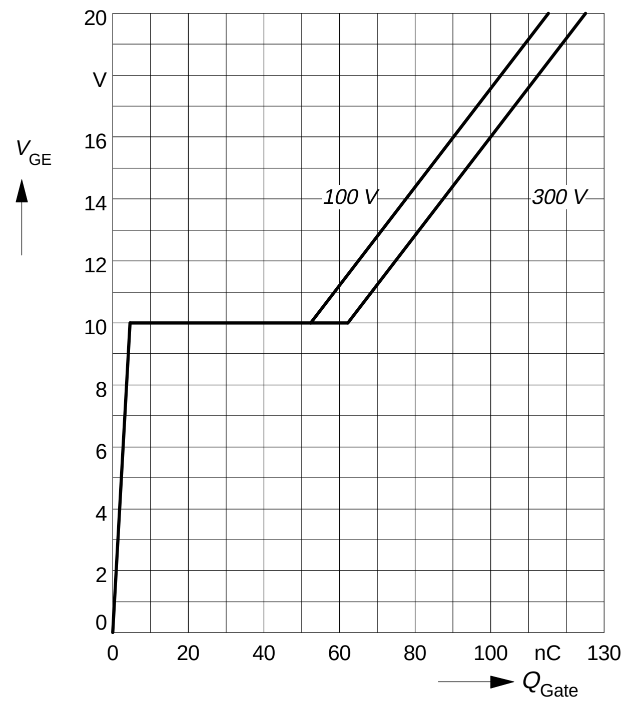
par.: $V_{CE} = 300$V, $V_{GE} = \pm 15$ V, $I_C = 30$ A



Typ. gate charge

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

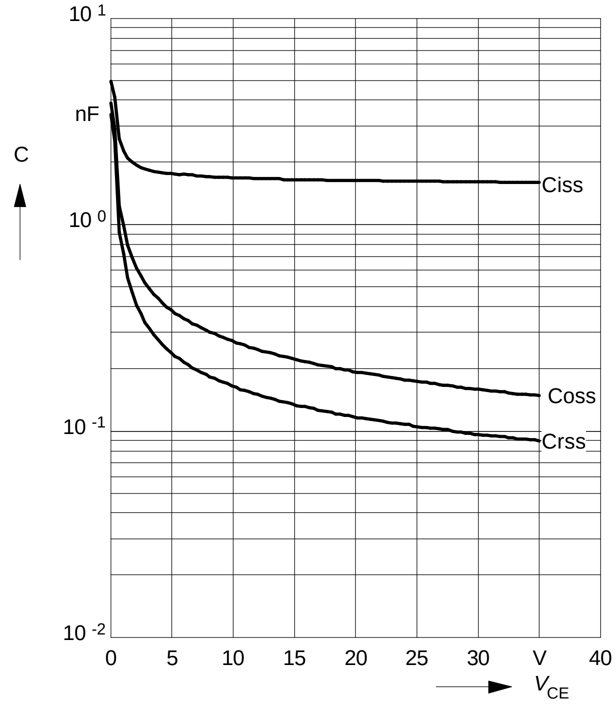
parameter: $I_{C\ puls}$ = 30 A



Typ. capacitances

$C = f(V_{CE})$

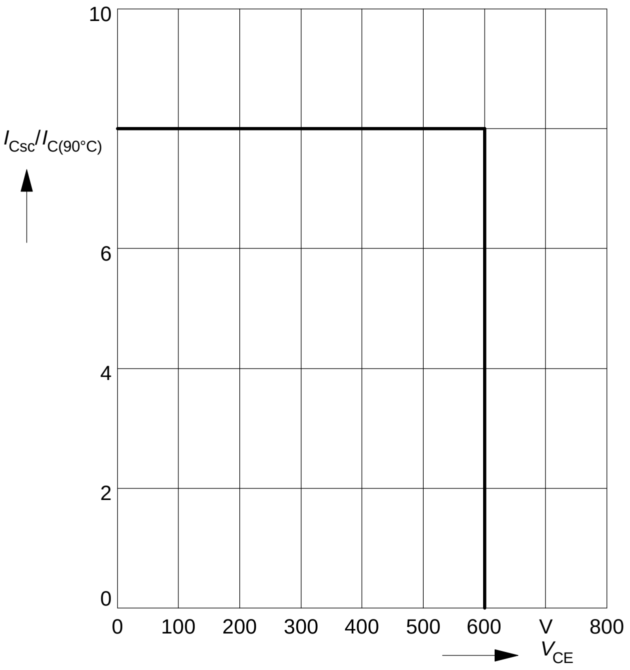
parameter: V_{GE} = 0 V, f = 1 MHz



Short circuit safe operating area

$I_{Csc} = f(V_{CE})$, T_j = 150°C

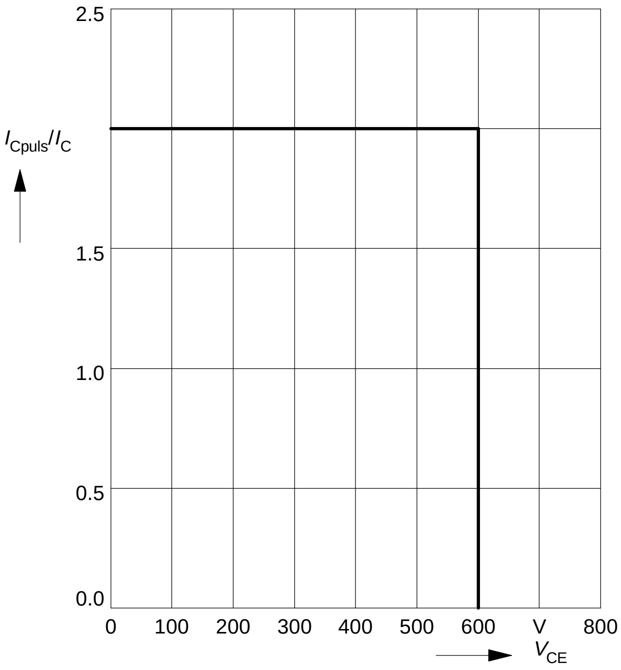
parameter: V_{GE} = ± 15 V, $t_{sc} \leq$ 10 µs, L < 50 nH



Reverse biased safe operating area

$I_{Cpuls} = f(V_{CE})$, T_j = 150°C

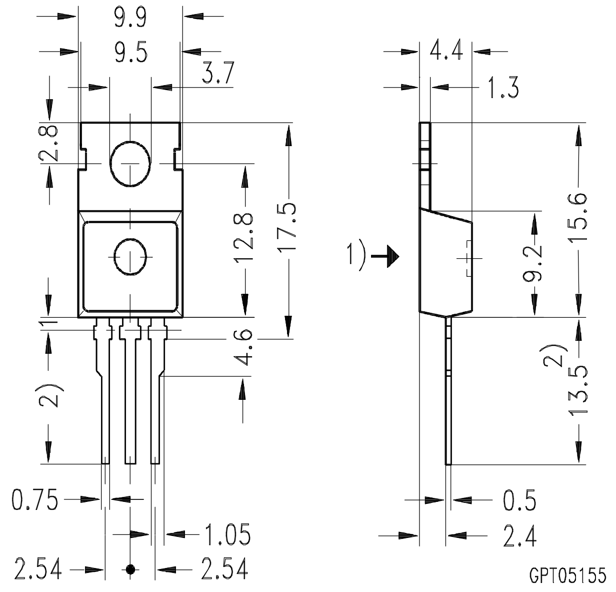
parameter: V_{GE} = 15 V



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