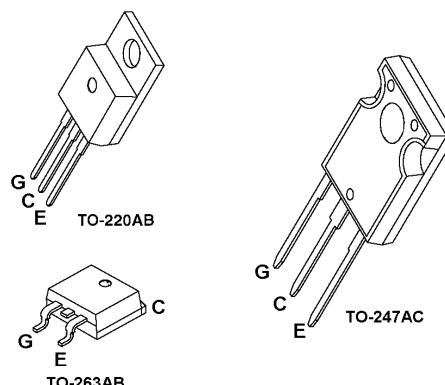


### Fast S-IGBT in NPT-Technology

- 75 % lower  $E_{\text{off}}$  compared to previous generation combined with low conduction losses
- Short circuit withstand time 10  $\mu\text{s}$
- Designed for moderate and high frequency applications:
  - SMPS and PFC up to 150 kHz
  - Inverter, Motor controls
- NPT-Technology for 600V applications offers:
  - tighter parameter distribution
  - higher ruggedness, temperature stable behaviour
  - parallel switching capability



Type	$V_{\text{CE}}$	$I_{\text{C}}$	$V_{\text{CE(sat)}}$	$T_{\text{j}}$	Package	Ordering Code
SGP30N60	600 V	30 A	2.5 V	150 °C	TO-220AB	Q67041-A4713-A2
SGB30N60					TO-263AB	Q67041-A4713-A3
SGW30N60					TO-247AC	Q67040-S4237

### Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{\text{CE}}$	600	V
DC collector current	$I_{\text{C}}$		A
$T_{\text{C}} = 25\text{ °C}$		41	
$T_{\text{C}} = 100\text{ °C}$		30	
Pulsed collector current, $t_{\text{p}}$ limited by $T_{\text{jmax}}$	$I_{\text{Cpuls}}$	112	
Gate-emitter voltage	$V_{\text{GE}}$	$\pm 20$	V
Avalanche energy, single pulse $I_{\text{C}} = 30\text{ A}$ , $V_{\text{CC}} = 50\text{ V}$ , $R_{\text{GE}} = 25\ \Omega$ , start at $T_{\text{j}} = 25\text{ °C}$	$E_{\text{AS}}$	165	mJ
Short circuit withstand time <sup>1)</sup> $V_{\text{GE}} = 15\text{ V}$ , $V_{\text{CC}} = 600\text{ V}$ , $T_{\text{j}} \leq 150\text{ °C}$	$t_{\text{sc}}$	10	$\mu\text{s}$
Power dissipation $T_{\text{C}} = 25\text{ °C}$	$P_{\text{tot}}$	250	W
Operating junction and storage temperature	$T_{\text{j}}$ , $T_{\text{stg}}$	-55...+150	°C
Soldering temperature, 1.6mm from case for 10s	-	260	

<sup>1)</sup> allowed number of short circuits: <1000; time between short circuits: >1s

**SIEMENS****SGP30N60, SGB30N60, SGW30N60**

Thermal Resistance					
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Thermal resistance, junction - case	$R_{thJC}$	-	-	0.5	K/W
Thermal resistance, junction - ambient	$R_{thJA}$				
TO-220AB		-	-	62	
TO-247AC		-	-	40	
SMD version, device on PCB: <sup>1)</sup>	$R_{thJA}$	-	-	40	
TO-263AB					

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Static Characteristics</b>					
Collector-emitter breakdown voltage $V_{GE} = 0\text{ V}$ , $I_C = 500\text{ }\mu\text{A}$	$V_{(BR)CES}$	600	-	-	V
Collector-emitter saturation voltage $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $T_j = 25\text{ °C}$ $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $T_j = 150\text{ °C}$	$V_{CE(sat)}$	1.6 -	2.1 2.5	2.5 3	
Gate-emitter threshold voltage $I_C = 300\text{ }\mu\text{A}$ , $V_{CE} = V_{GE}$	$V_{GE(th)}$	3	4	5	
Zero gate voltage collector current $V_{CE} = 600\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_j = 25\text{ °C}$ $V_{CE} = 600\text{ V}$ , $V_{GE} = 0\text{ V}$ , $T_j = 150\text{ °C}$	$I_{CES}$	-	-	40 3000	$\mu\text{A}$
Gate-emitter leakage current $V_{GE} = 25\text{ V}$ , $V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	100	

<sup>1)</sup> Device on 50mm\*50mm\*1.5mm epoxy PCB FR4 with 6cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for collector connection. PCB is vertical without blown air.

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Transconductance $V_{CE} = 20\text{ V}, I_C = 30\text{ A}$	$g_{fs}$	-	20	-	S
Input capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{iss}$	-	1600	1920	pF
Output capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{oss}$	-	150	180	
Reverse transfer capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{rss}$	-	92	110	

### Characteristics

Gate charge $V_{CC} = 480\text{ V}, V_{GE} = 15\text{ V}, I_C = 30\text{ A}$	$Q_{Gate}$	-	140	182	nC
Internal emitter inductance measured 5mm from case	$L_E$	-	7	-	nH

### Safe Operating Area Characteristics

Short circuit collector current 1) $V_{CE} \leq 600\text{ V}, V_{GE} = 15\text{ V}, t_{sc} \leq 10\text{ }\mu\text{s},$ $T_j \leq 150\text{ °C}$	-	-	-	300	A
Turn off safe operating area $V_{CE} \leq 600\text{ V}, T_j \leq 150\text{ °C}$	-	-	-	112	

1) allowed number of short circuits: <1000; time between short circuits: >1s

**SIEMENS****SGP30N60, SGB30N60, SGW30N60****Switching Characteristics, Inductive Load (Diode: BUP603D), at  $T_j = 25\text{ °C}$** 

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Turn-on delay time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Gon} = 11\text{ }\Omega$	$t_{d(on)}$	-	31	37	ns
Rise time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Gon} = 11\text{ }\Omega$	$t_r$	-	48	58	
Turn-off delay time $V_{CC} = 400\text{ V}$ , $V_{GE} = 0\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Goff} = 11\text{ }\Omega$	$t_{d(off)}$	-	291	350	
Fall time $V_{CC} = 400\text{ V}$ , $V_{GE} = 0\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Goff} = 11\text{ }\Omega$	$t_f$	-	58	70	
Turn-on energy <sup>1)</sup> $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Gon} = 11\text{ }\Omega$	$E_{on}$	-	1.34	1.54	mJ
Turn-off energy $V_{CC} = 400\text{ V}$ , $V_{GE} = 0\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Goff} = 11\text{ }\Omega$	$E_{off}$	-	0.65	0.85	
Total switching energy <sup>1)</sup> $V_{CC} = 400\text{ V}$ , $V_{GE} = 0/+15\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 11\text{ }\Omega$	$E_{ts}$	-	1.99	2.39	

1)  $E_{on}$  and  $E_{ts}$  include BUP603D diode commutation losses.

**SIEMENS****SGP30N60, SGB30N60, SGW30N60****Switching Characteristics, Inductive Load (Diode: BUP603D), at  $T_j = 150\text{ °C}$** 

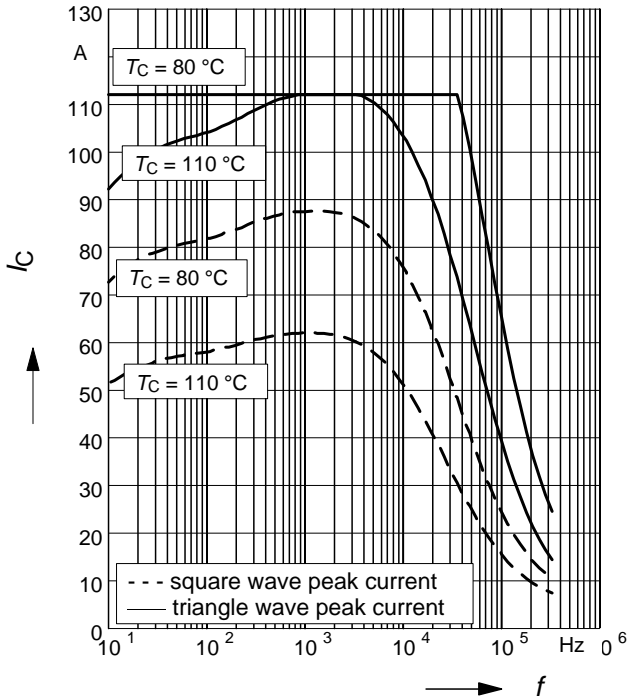
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>Characteristics</b>					
Turn-on delay time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Gon} = 11\ \Omega$	$t_{d(on)}$	-	30	36	ns
Rise time $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Gon} = 11\ \Omega$	$t_r$	-	46	55	
Turn-off delay time $V_{CC} = 400\text{ V}$ , $V_{GE} = 0\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Goff} = 11\ \Omega$	$t_{d(off)}$	-	324	389	
Fall time $V_{CC} = 400\text{ V}$ , $V_{GE} = 0\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Goff} = 11\ \Omega$	$t_f$	-	67	80	
Turn-on energy <sup>1)</sup> $V_{CC} = 400\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Gon} = 11\ \Omega$	$E_{on}$	-	1.81	2.08	mJ
Turn-off energy $V_{CC} = 400\text{ V}$ , $V_{GE} = 0\text{ V}$ , $I_C = 30\text{ A}$ , $R_{Goff} = 11\ \Omega$	$E_{off}$	-	0.92	1.2	
Total switching energy <sup>1)</sup> $V_{CC} = 400\text{ V}$ , $V_{GE} = 0/+15\text{ V}$ , $I_C = 30\text{ A}$ , $R_G = 11\ \Omega$	$E_{ts}$	-	2.73	3.28	

1)  $E_{on}$  and  $E_{ts}$  include BUP603D diode commutation losses.

### Typ. collector current

$$I_C = f(f)$$

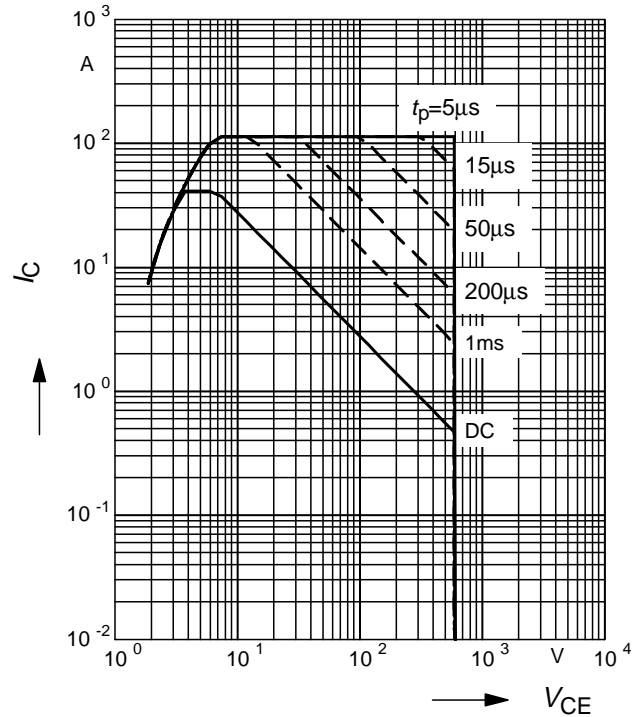
parameter:  $D = 0.5, T_j \leq 150\text{ }^\circ\text{C}$



### Safe operating area

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

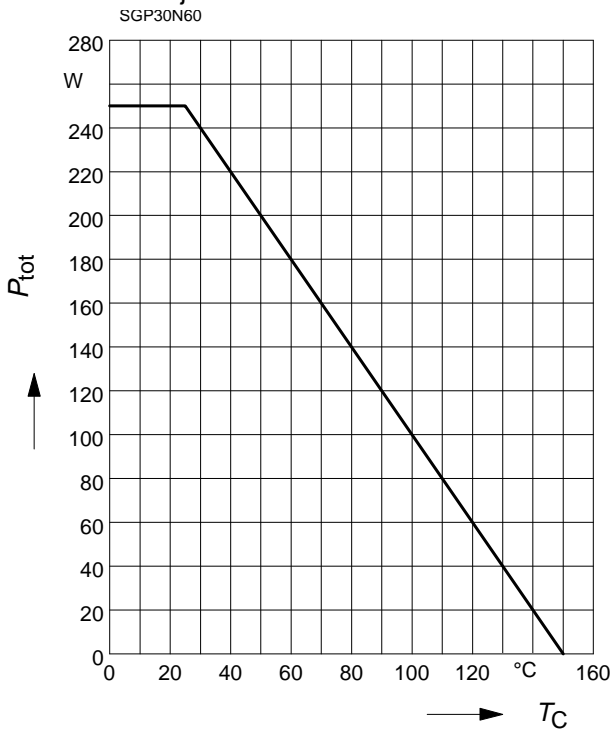
parameter:  $D = 0, T_C = 25\text{ }^\circ\text{C}, T_j \leq 150\text{ }^\circ\text{C}$



### Power dissipation

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

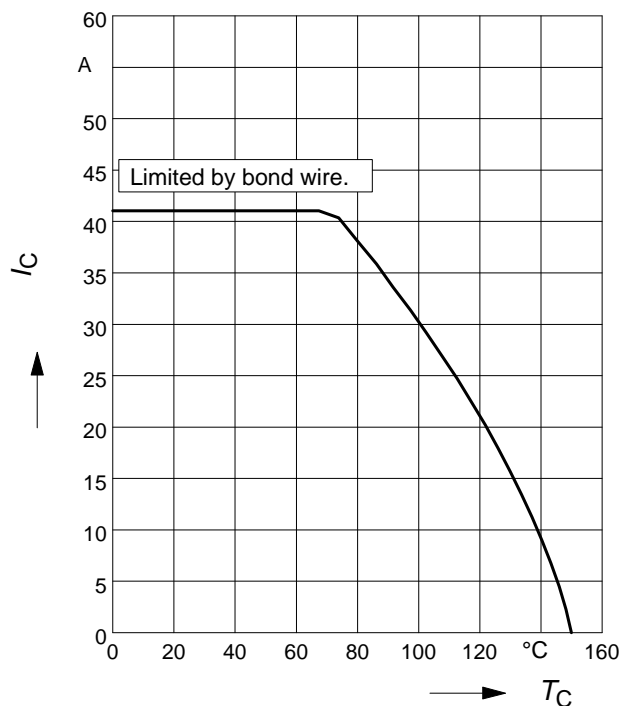
parameter:  $T_j \leq 150\text{ }^\circ\text{C}$



### Collector current

$$I_C = f(T_C)$$

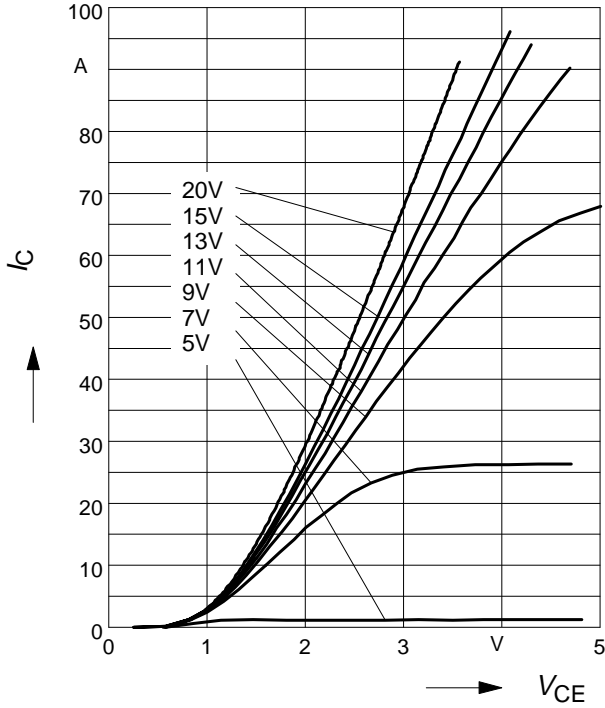
parameter:  $V_{GE} \geq 15\text{ V}, T_j \leq 150\text{ }^\circ\text{C}$



### Typ. output characteristics

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

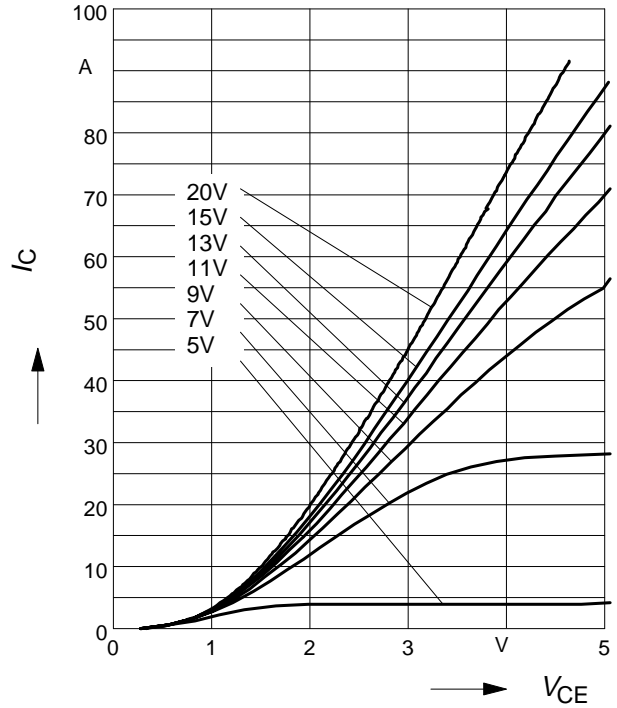
parameter:  $t_p = 80 \mu s$ ,  $T_j = 25 \text{ }^\circ\text{C}$



### Typ. output characteristics

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

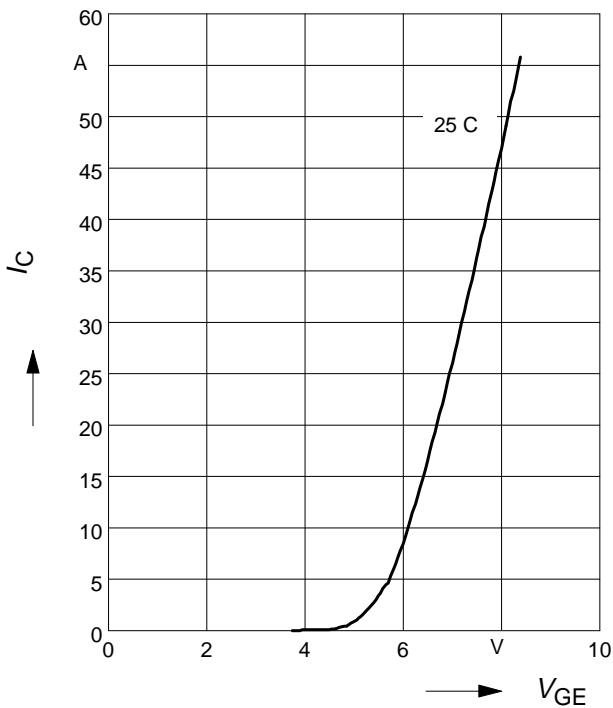
parameter:  $t_p = 80 \mu s$ ,  $T_j = 150 \text{ }^\circ\text{C}$



### Typ. transfer characteristics

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

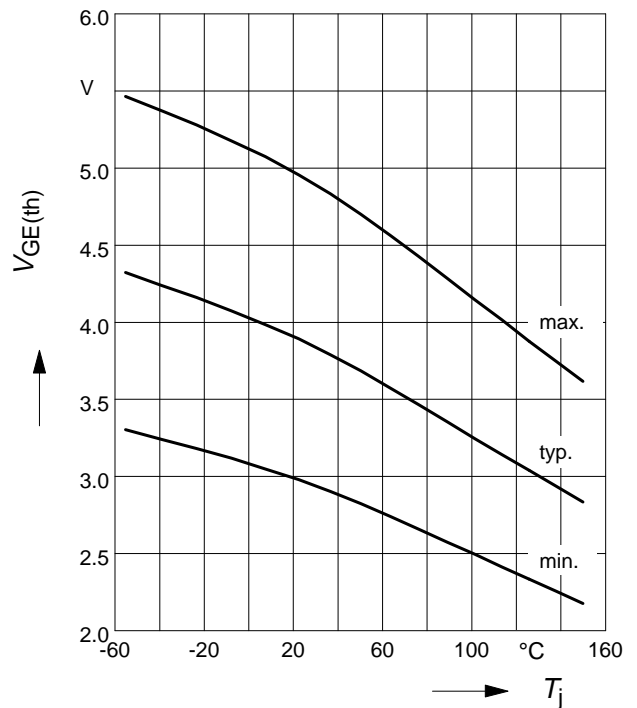
parameter:  $t_p = 80 \mu s$ ,  $V_{CE} = 10 \text{ V}$



### Gate-emitter threshold voltage

$$V_{GE(th)} = f(T_j)$$

parameter:  $I_C = 0.3 \text{ mA}$



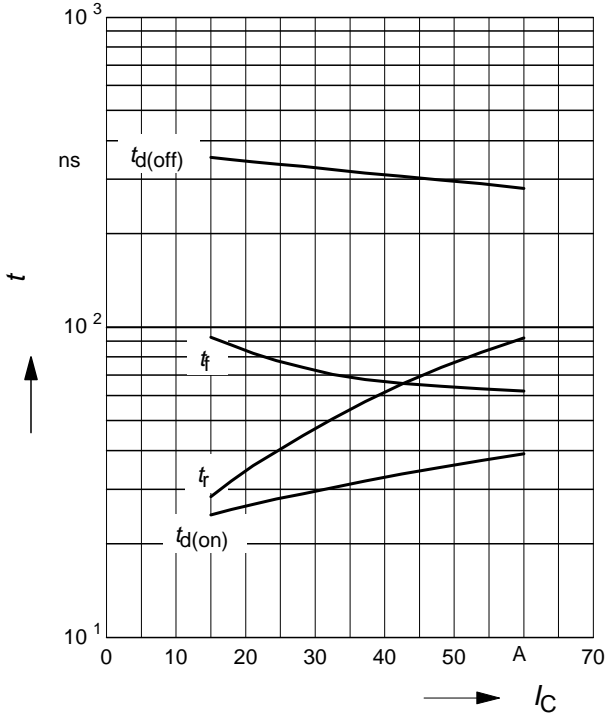
# SIEMENS

## SGP30N60, SGB30N60, SGW30N60

### Typ. switching time

$t = f(I_C)$ , inductive load,  $T_j = 150^\circ\text{C}$

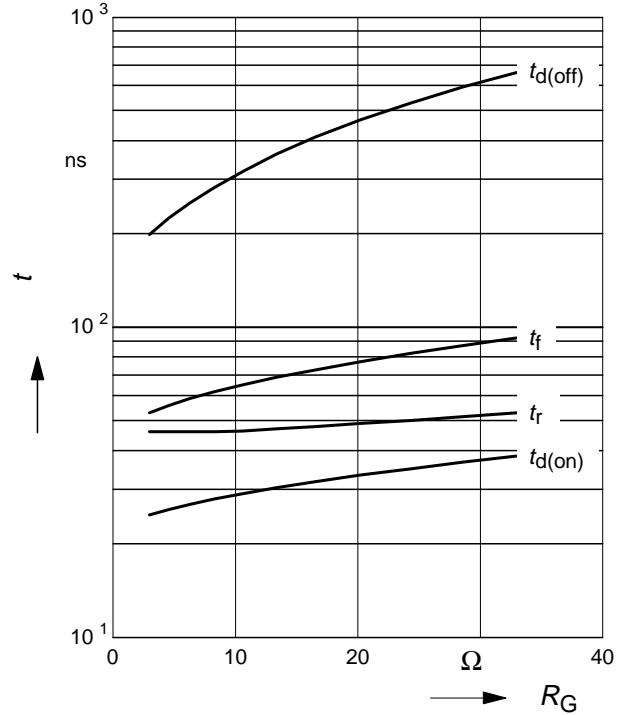
par.:  $V_{CE} = 400\text{ V}$ ,  $V_{GE} = 0/+15\text{ V}$ ,  $R_G = 11\ \Omega$



### Typ. switching time

$t = f(R_G)$ , inductive load,  $T_j = 150^\circ\text{C}$

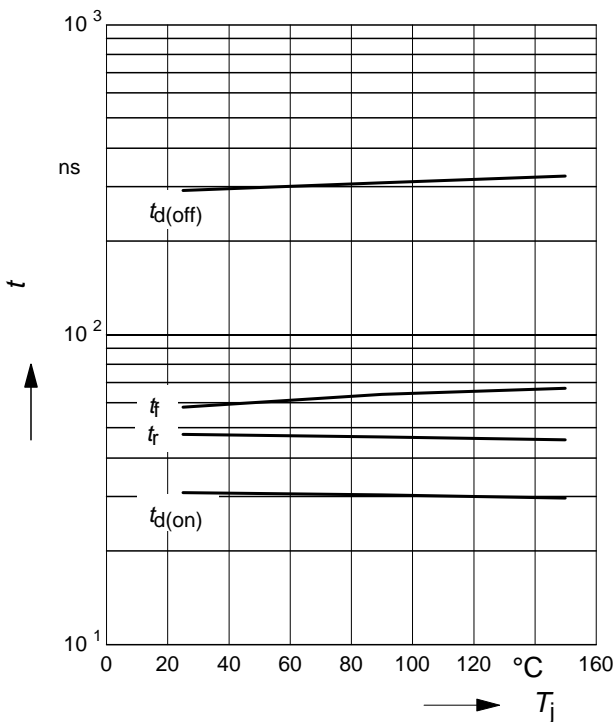
par.:  $V_{CE} = 400\text{ V}$ ,  $V_{GE} = 0/+15\text{ V}$ ,  $I_C = 30\text{ A}$



### Typ. switching time

$t = f(T_j)$ , inductive load,  $V_{CE} = 400\text{ V}$

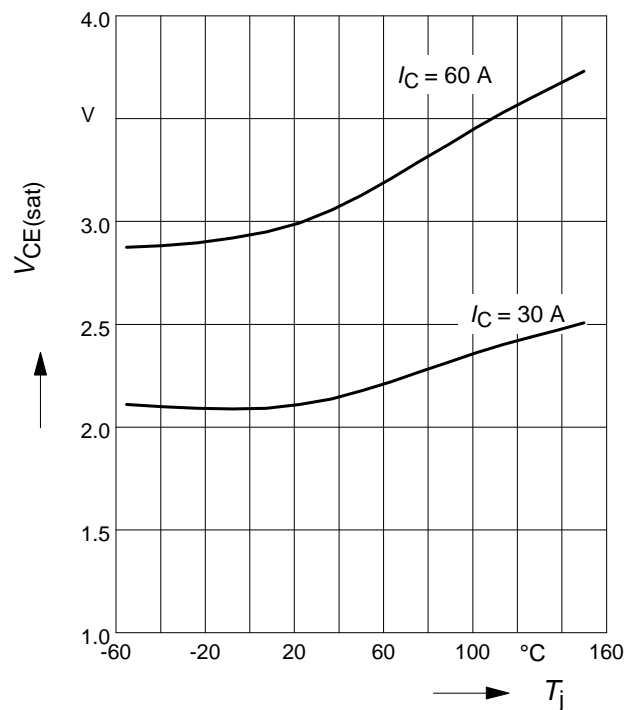
$V_{GE} = 0/+15\text{ V}$ ,  $I_C = 30\text{ A}$ ,  $R_G = 11\ \Omega$



### Typ. collector-emitter saturation voltage

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

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

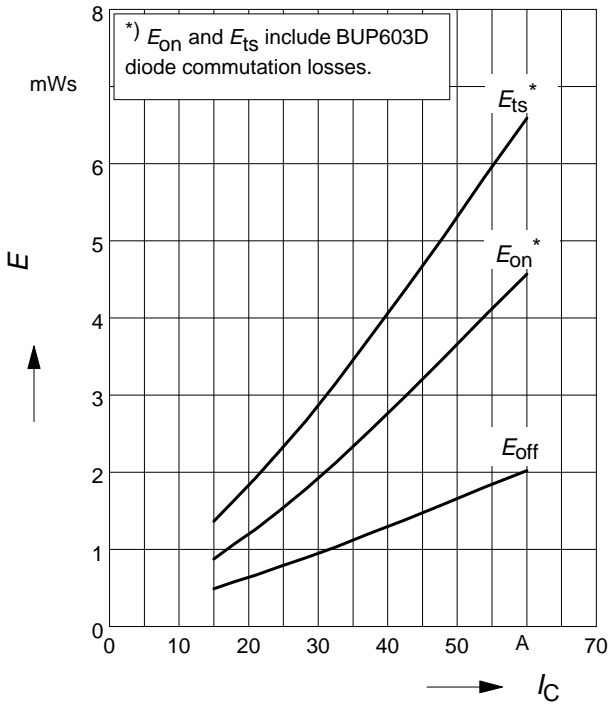




### Typ. switching losses

$E = f(I_C)$ , inductive load,  $T_j = 150^\circ\text{C}$

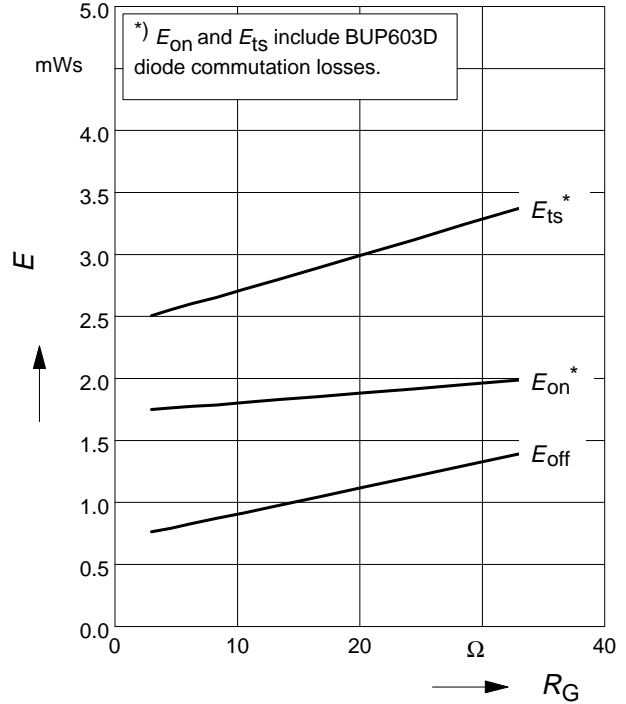
par.:  $V_{CE} = 400\text{ V}$ ,  $V_{GE} = 0/+15\text{ V}$ ,  $R_G = 11\ \Omega$



### Typ. switching losses

$E = f(R_G)$ , inductive load,  $T_j = 150^\circ\text{C}$

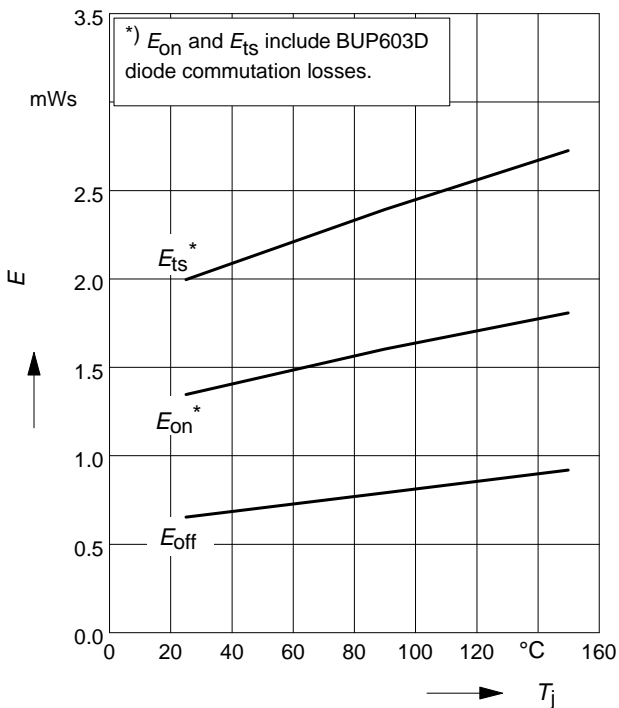
par.:  $V_{CE} = 400\text{ V}$ ,  $V_{GE} = 0/+15\text{ V}$ ,  $I_C = 30\text{ A}$



### Typ. switching losses

$E = f(T_j)$ , inductive load,  $V_{CE} = 400\text{ V}$ ,

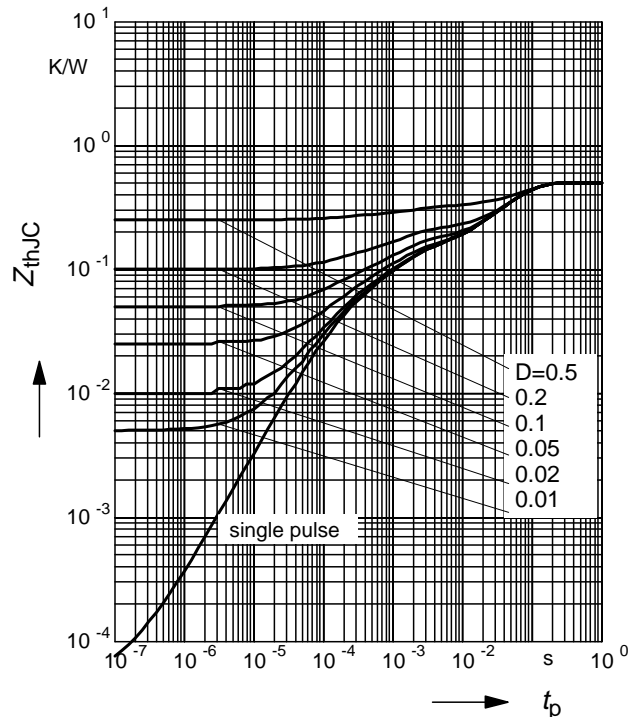
$V_{GE} = 0/+15\text{ V}$ ,  $I_C = 30\text{ A}$ ,  $R_G = 11\ \Omega$



### Transient thermal impedance

$Z_{thJC} = f(t_p)$

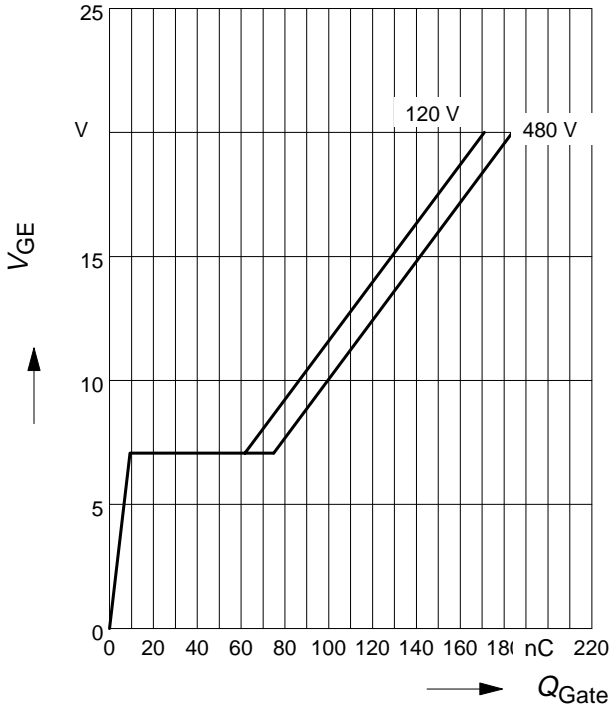
parameter:  $D = t_p / T$



### Typ. gate charge

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

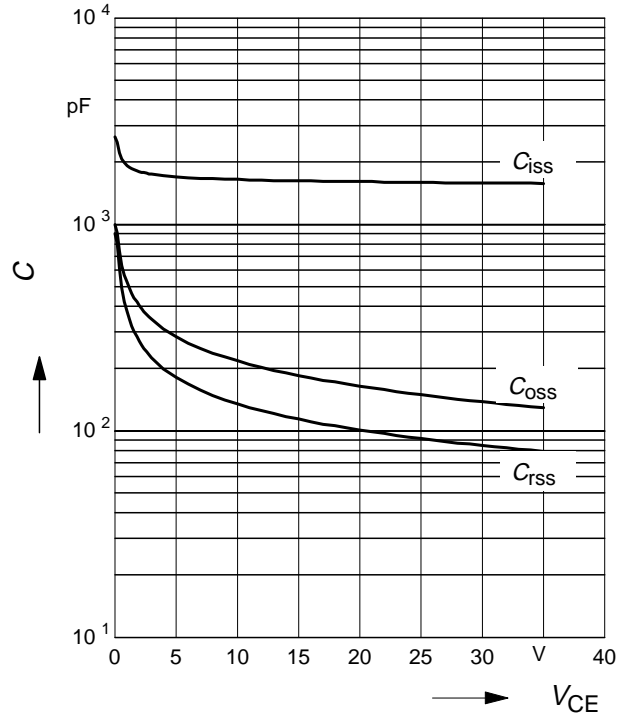
parameter:  $I_C = 30\text{ A}$



### Typ. capacitances

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

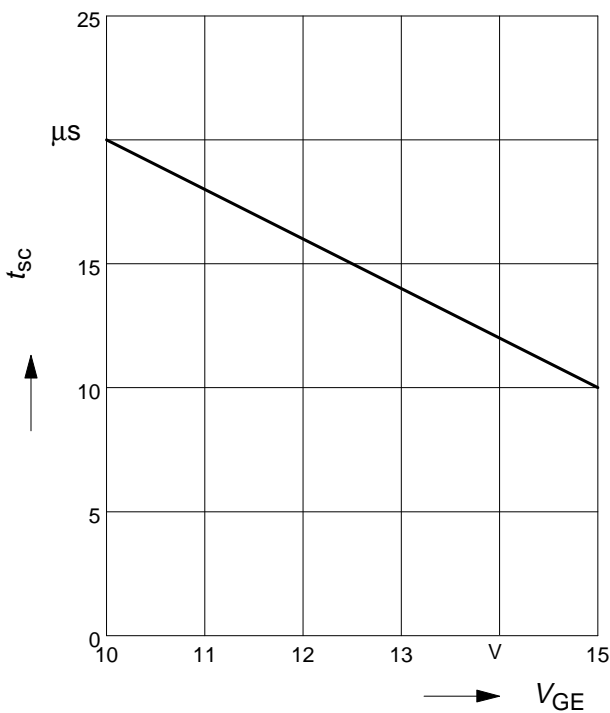
parameter:  $V_{GE} = 0\text{ V}$ ,  $f = 1\text{ MHz}$



### Short circuit withstand time

$$t_{sc} = f(V_{GE})$$

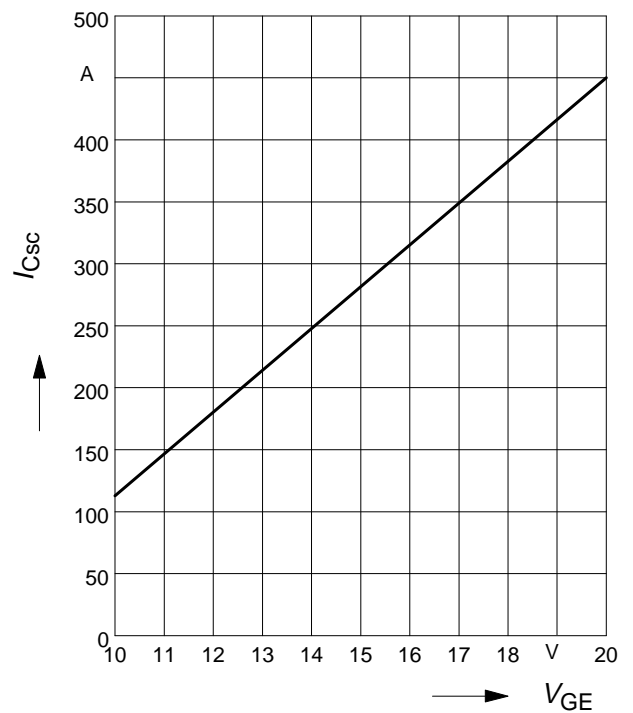
par.:  $V_{CE} = 600\text{ V}$ , start at  $T_j = 25\text{ °C}$



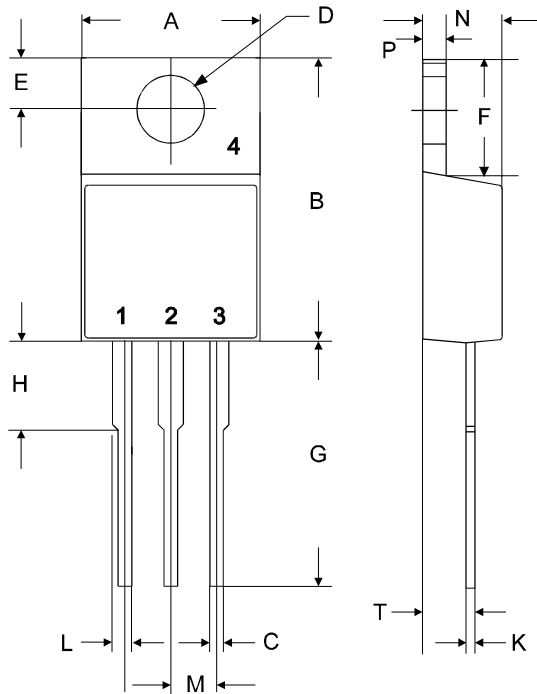
### Typ. short circuit current

$$I_{Csc} = f(V_{GE})$$

par.:  $V_{CE} \leq 600\text{ V}$ ,  $T_C = 25\text{ °C}$ ,  $T_j \leq 150\text{ °C}$

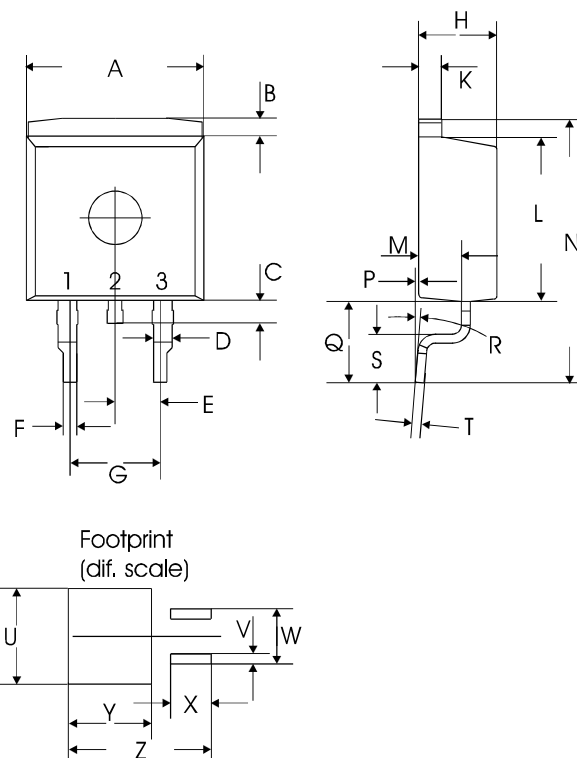


TO-220AB



symbol	dimensions [mm]	
	min	max
A	9.70	10.30
B	14.88	15.95
C	0.65	0.86
D	3.55	3.89
E	2.60	3.00
F	6.00	6.80
G	13.00	14.00
H	4.35	4.75
K	0.38	0.65
L	0.95	1.32
M	2.54 typ.	
N	4.30	4.50
P	1.17	1.40
T	2.30	2.72

TO-263AB



symbol	dimensions [mm]	
	min	max
A	9.80	10.20
B	0.70	1.30
C	1.00	1.60
D	1.03	1.07
E	2.54 typ.	
F	0.65	0.85
G	5.08 typ.	
H	4.30	4.50
K	1.17	1.37
L	9.05	9.45
M	2.30	2.50
N	15 typ.	
P	0.00	0.20
Q	4.20	5.20
R	8° max	
S	2.40	3.00
T	0.40	0.60
U	10.80	
V	1.15	
W	6.23	
X	4.60	
Y	9.40	
Z	16.15	

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