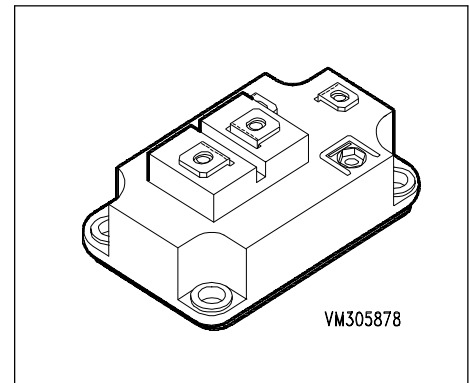


## IGBT Power Module

- Single switch
- Including fast free-wheeling diodes
- Package with insulated metal base plate



Type	$V_{CE}$	$I_C$	Package	Ordering Code
BSM 400 GA 120 DN2	1200V	550A	SINGLE SWITCH	C67070-A2302-A70
BSM 400 GA 120 DN2 S	1200V	550A	SSW SENSE 1	C67070-A2308-A70

## Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	$V_{CE}$	1200	V
Collector-gate voltage $R_{GE} = 20 \text{ k}\Omega$	$V_{CGR}$	1200	
Gate-emitter voltage	$V_{GE}$	$\pm 20$	
DC collector current $T_C = 25 \text{ }^\circ\text{C}$ $T_C = 80 \text{ }^\circ\text{C}$	$I_C$	550 400	A
Pulsed collector current, $t_p = 1 \text{ ms}$ $T_C = 25 \text{ }^\circ\text{C}$ $T_C = 125 \text{ }^\circ\text{C}$	$I_{Cpuls}$	1100 800	
Power dissipation per IGBT $T_C = 25 \text{ }^\circ\text{C}$	$P_{tot}$	2700	W
Chip temperature	$T_j$	+ 150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-40 ... + 125	
Thermal resistance, chip case	$R_{thJC}$	$\leq 0.045$	K/W
Diode thermal resistance, chip case	$R_{thJCD}$	$\leq 0.09$	
Insulation test voltage, $t = 1 \text{ min.}$	$V_{is}$	2500	Vac
Creepage distance	-	20	mm
Clearance	-	11	
DIN humidity category, DIN 40 040	-	F	sec
IEC climatic category, DIN IEC 68-1	-	40 / 125 / 56	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**Static Characteristics**

Gate threshold voltage $V_{GE} = V_{CE}, I_C = 16\text{ mA}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter saturation voltage $V_{GE} = 15\text{ V}, I_C = 400\text{ A}, T_j = 25\text{ °C}$ $V_{GE} = 15\text{ V}, I_C = 400\text{ A}, T_j = 125\text{ °C}$	$V_{CE(sat)}$	- -	2.5 3.1	3 3.7	
Zero gate voltage collector current $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ °C}$ $V_{CE} = 1200\text{ V}, V_{GE} = 0\text{ V}, T_j = 125\text{ °C}$	$I_{CES}$	- -	6 24	8 -	mA
Gate-emitter leakage current $V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	$I_{GES}$	-	-	400	

**AC Characteristics**

Transconductance $V_{CE} = 20\text{ V}, I_C = 400\text{ A}$	$g_{fs}$	216	-	-	S
Input capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{iss}$	-	26	-	
Output capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{oss}$	-	4	-	nF
Reverse transfer capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	$C_{rss}$	-	2	-	

**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 $V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 400\text{ A}$ $R_{Gon} = 2.7\ \Omega$	$t_{d(on)}$	-	100	200	ns
Rise time $V_{CC} = 600\text{ V}$ , $V_{GE} = 15\text{ V}$ , $I_C = 400\text{ A}$ $R_{Gon} = 2.7\ \Omega$	$t_r$	-	110	220	
Turn-off delay time $V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 400\text{ A}$ $R_{Goff} = 2.7\ \Omega$	$t_{d(off)}$	-	550	800	
Fall time $V_{CC} = 600\text{ V}$ , $V_{GE} = -15\text{ V}$ , $I_C = 400\text{ A}$ $R_{Goff} = 2.7\ \Omega$	$t_f$	-	80	120	

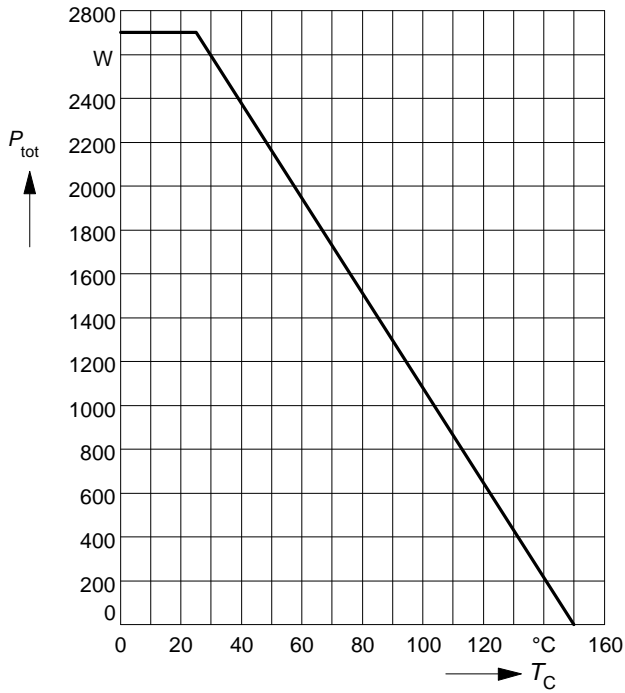
**Free-Wheel Diode**

Diode forward voltage $I_F = 400\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 25\text{ °C}$ $I_F = 400\text{ A}$ , $V_{GE} = 0\text{ V}$ , $T_j = 125\text{ °C}$	$V_F$	-	2.3	2.8	V
		-	1.8	-	
Reverse recovery time $I_F = 400\text{ A}$ , $V_R = -600\text{ V}$ , $V_{GE} = 0\text{ V}$ $di_F/dt = -3000\text{ A}/\mu\text{s}$ , $T_j = 125\text{ °C}$	$t_{rr}$	-	0.6	-	$\mu\text{s}$
Reverse recovery charge $I_F = 400\text{ A}$ , $V_R = -600\text{ V}$ , $V_{GE} = 0\text{ V}$ $di_F/dt = -3000\text{ A}/\mu\text{s}$ $T_j = 25\text{ °C}$ $T_j = 125\text{ °C}$	$Q_{rr}$	-	16	-	$\mu\text{C}$
		-	45	-	

**Power dissipation**

$P_{tot} = f(T_C)$

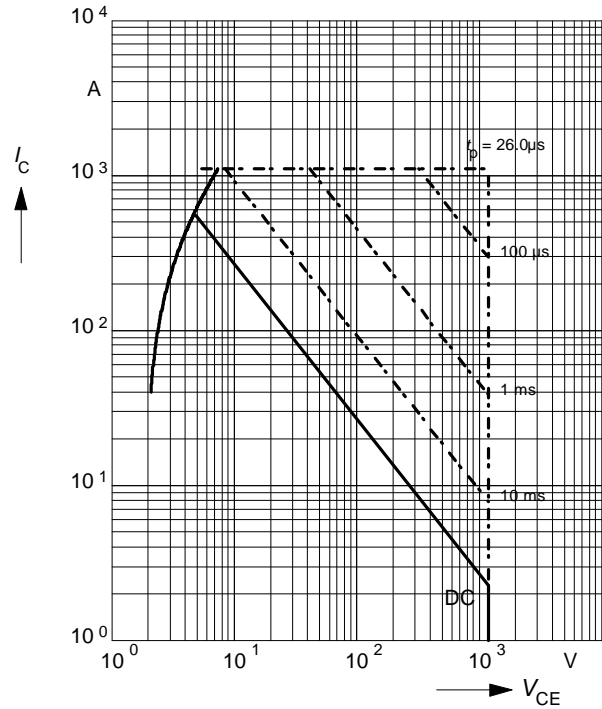
parameter:  $T_j \leq 150\text{ }^\circ\text{C}$



**Safe operating area**

$I_C = f(V_{CE})$

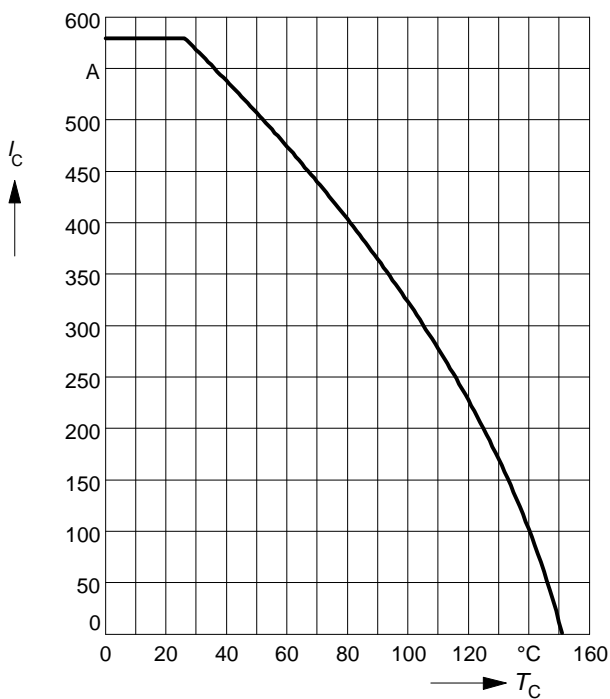
parameter:  $D = 0, T_C = 25\text{ }^\circ\text{C}, T_j \leq 150\text{ }^\circ\text{C}$



**Collector current**

$I_C = f(T_C)$

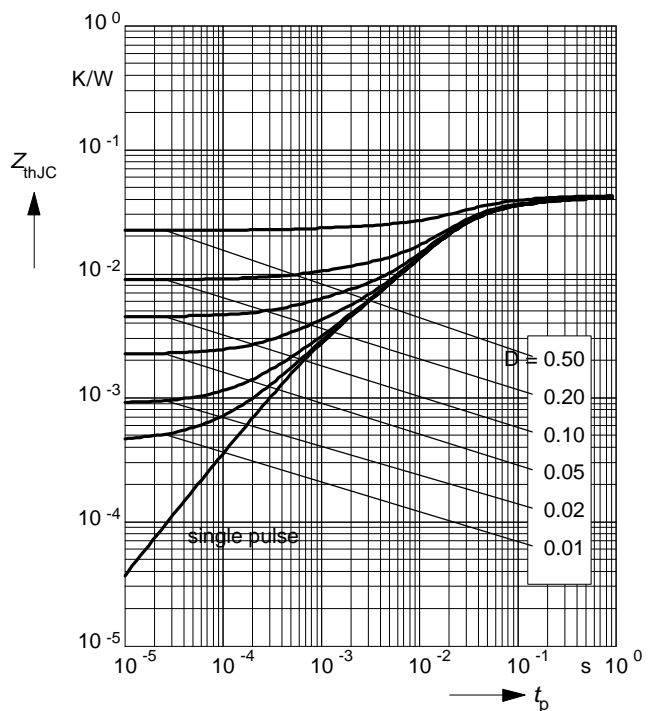
parameter:  $V_{GE} \geq 15\text{ V}, T_j \leq 150\text{ }^\circ\text{C}$



**Transient thermal impedance IGBT**

$Z_{thJC} = f(t_p)$

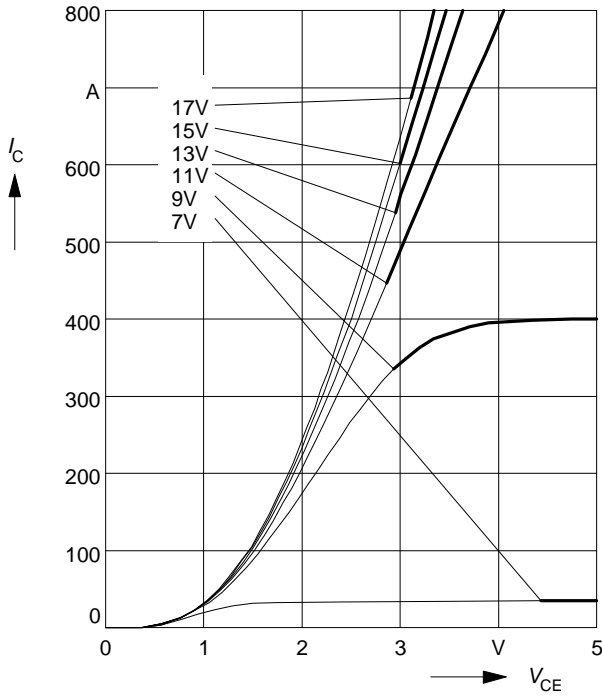
parameter:  $D = t_p / T$



**Typ. output characteristics**

$I_C = f(V_{CE})$

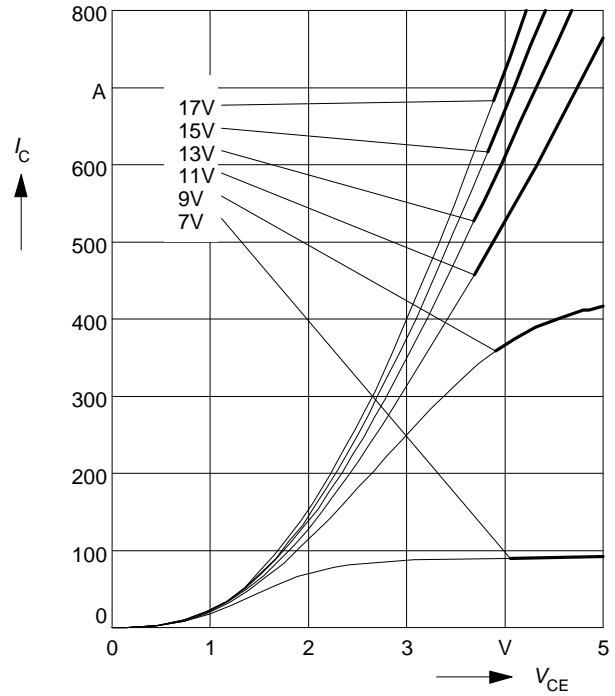
parameter:  $t_p = 80 \mu s, T_j = 25 \text{ }^\circ\text{C}$



**Typ. output characteristics**

$I_C = f(V_{CE})$

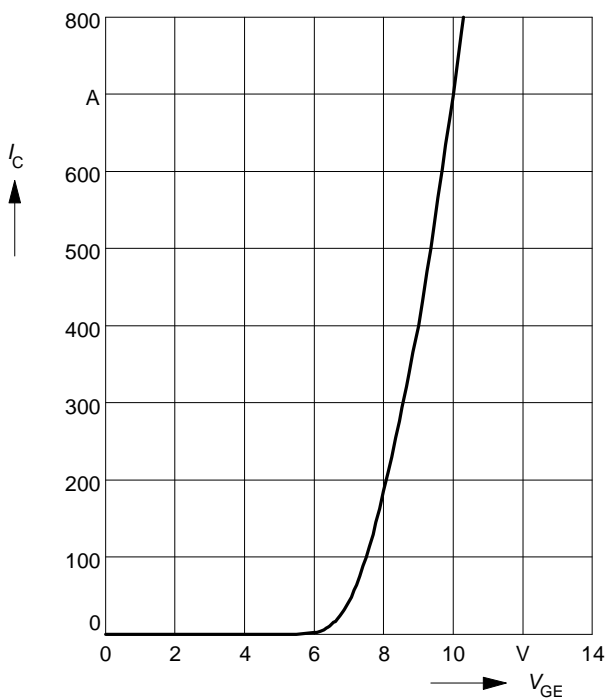
parameter:  $t_p = 80 \mu s, T_j = 125 \text{ }^\circ\text{C}$



**Typ. transfer characteristics**

$I_C = f(V_{GE})$

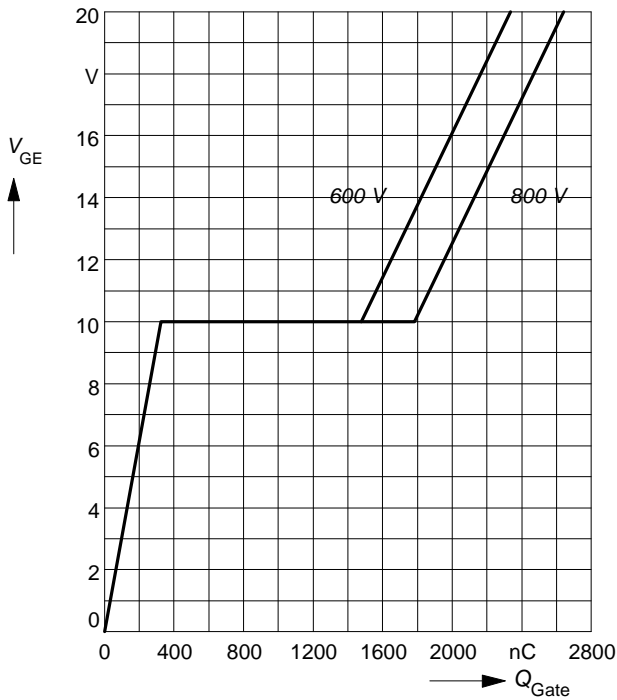
parameter:  $t_p = 80 \mu s, V_{CE} = 20 \text{ V}$



**Typ. gate charge**

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

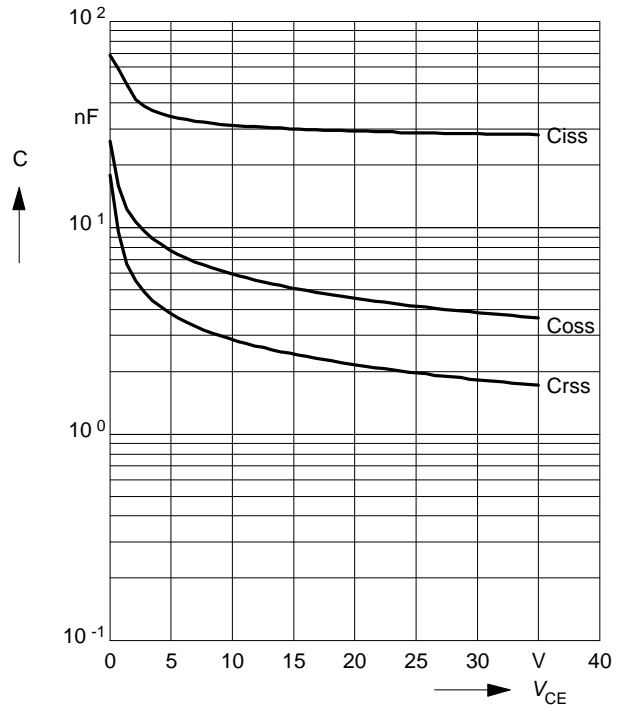
parameter:  $I_{C\ puls} = 400\ A$



**Typ. capacitances**

$C = f(V_{CE})$

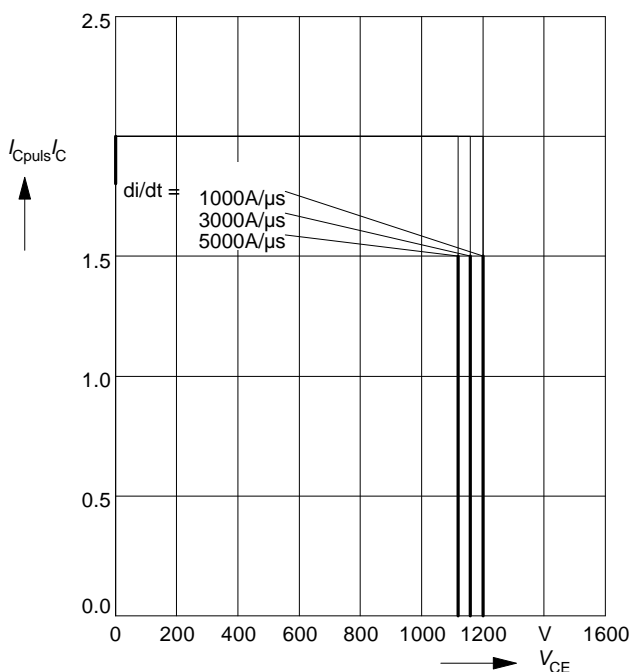
parameter:  $V_{GE} = 0\ V, f = 1\ MHz$



**Reverse biased safe operating area**

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

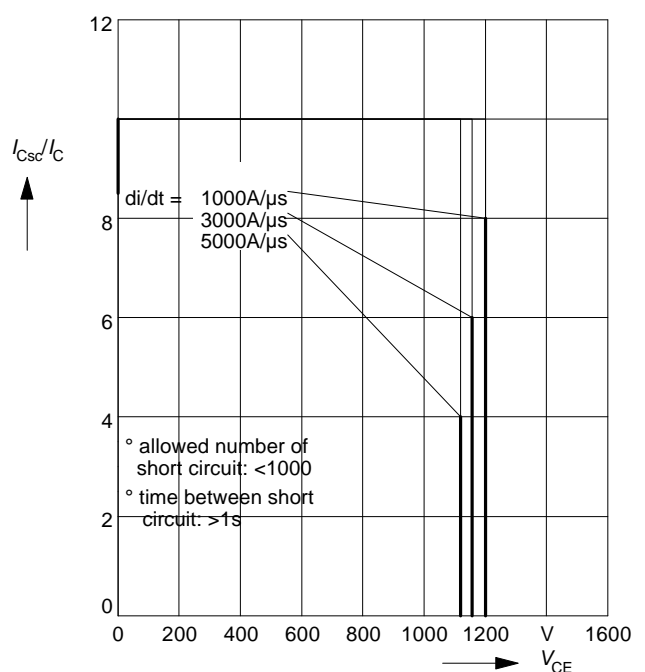
parameter:  $V_{GE} = \pm 15\ V, t_p \le 1\ ms, L < 20\ nH$



**Short circuit safe operating area**

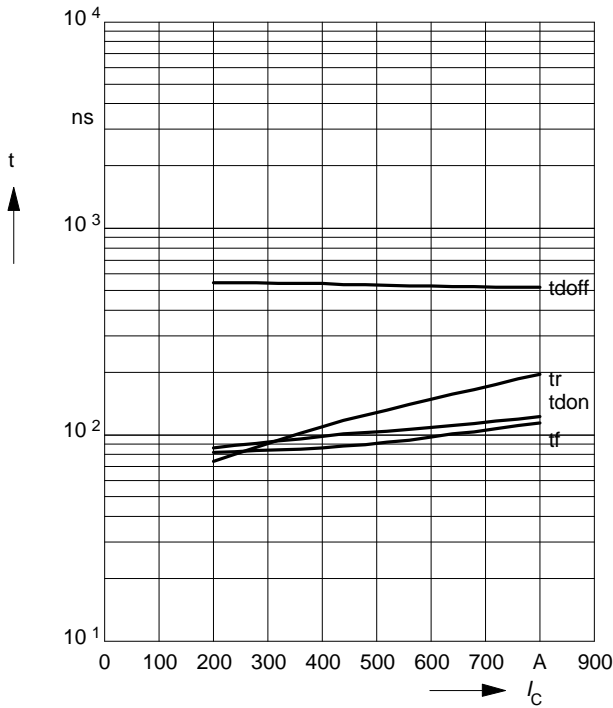
$I_{C\ sc} = f(V_{CE}), T_j = 150^\circ C$

parameter:  $V_{GE} = \pm 15\ V, t_{sc} \le 10\ \mu s, L < 20\ nH$



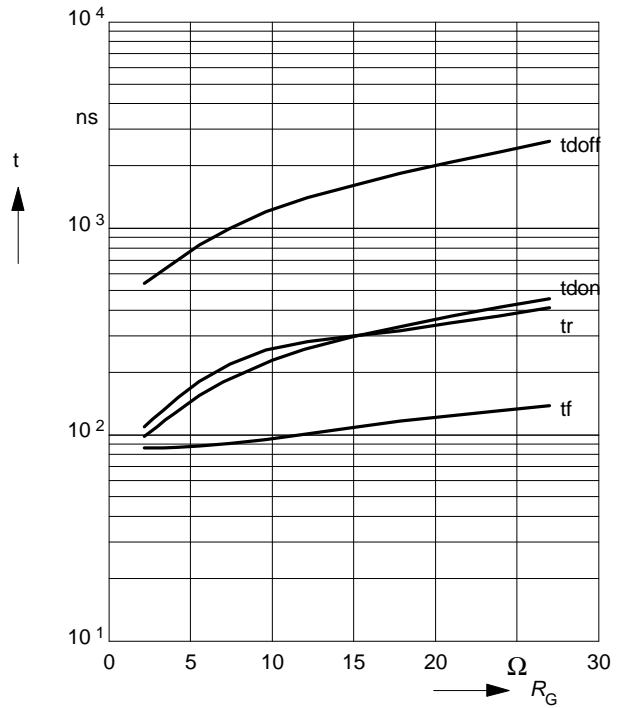
**Typ. switching time**

$t = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 2.7\ \Omega$



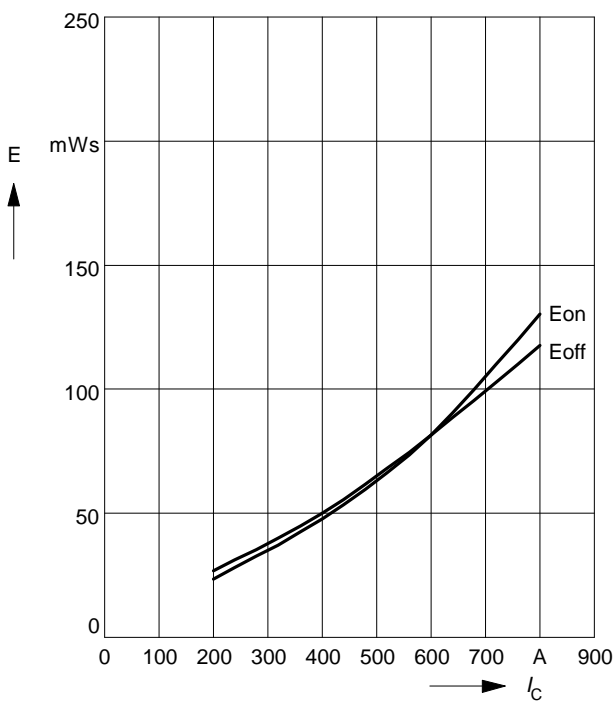
**Typ. switching time**

$t = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 400\text{ A}$



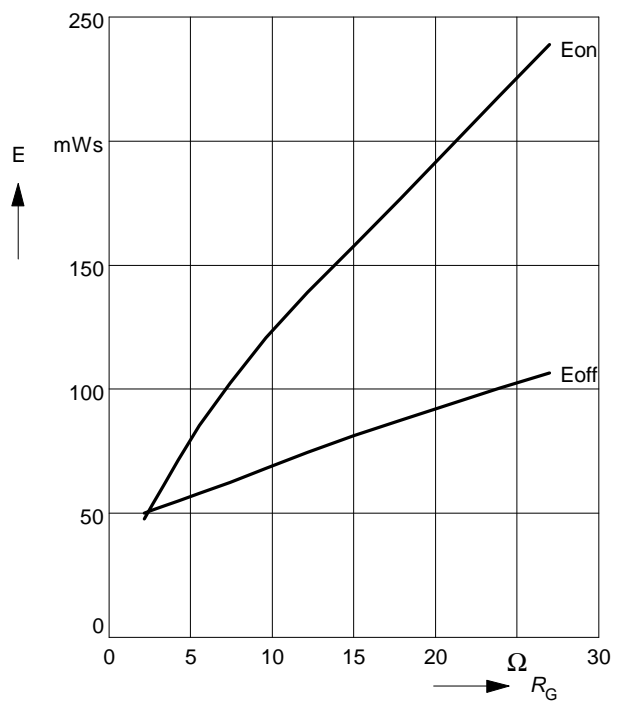
**Typ. switching losses**

$E = f(I_C)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $R_G = 2.7\ \Omega$



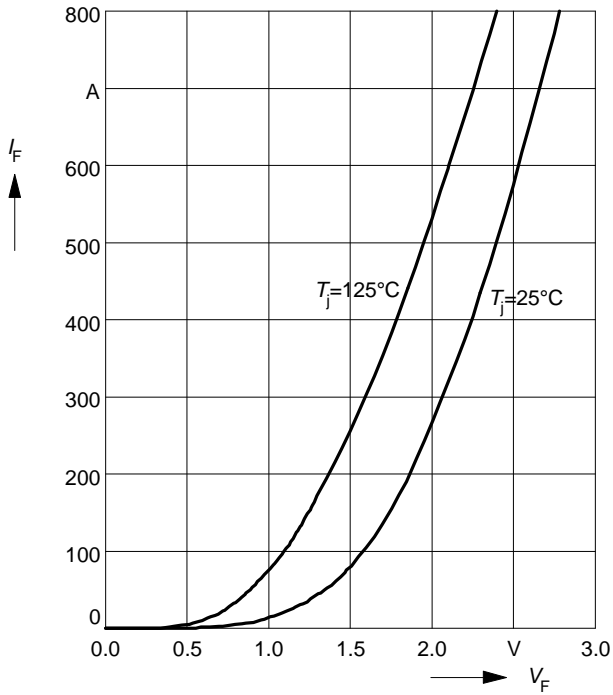
**Typ. switching losses**

$E = f(R_G)$ , inductive load,  $T_j = 125^\circ\text{C}$   
 par.:  $V_{CE} = 600\text{ V}$ ,  $V_{GE} = \pm 15\text{ V}$ ,  $I_C = 400\text{ A}$



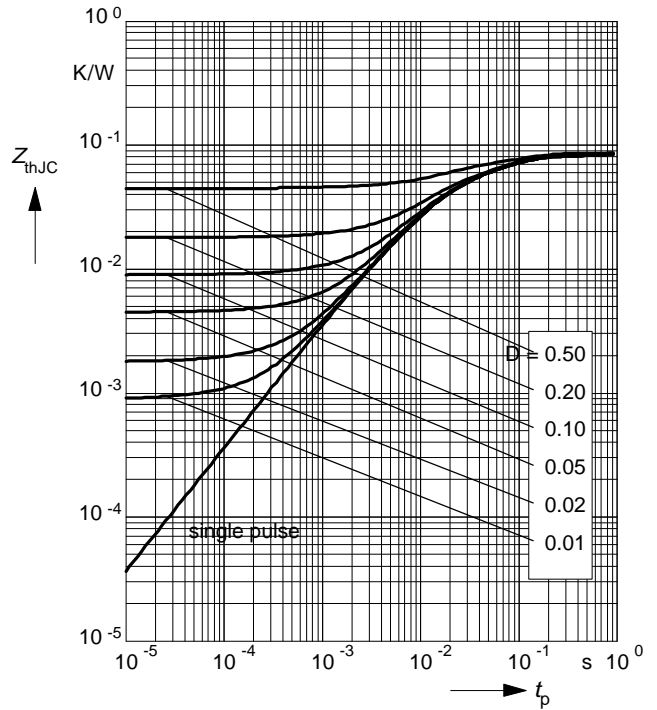
**Forward characteristics of fast recovery reverse diode**  $I_F = f(V_F)$

parameter:  $T_j$



**Transient thermal impedance Diode**  $Z_{thJC} = f(t_p)$

parameter:  $D = t_p / T$





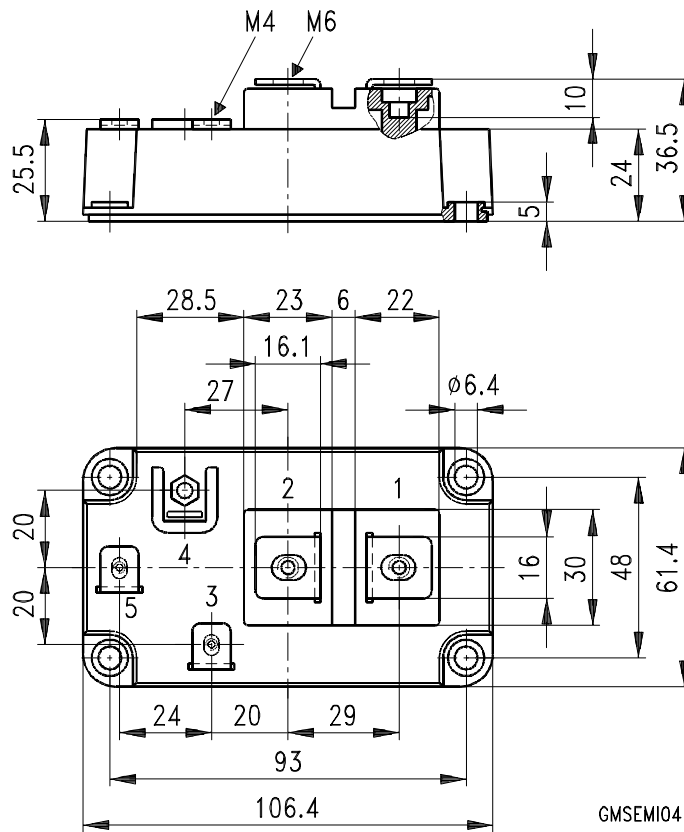
**Circuit Diagram**



**Package Outlines**

Dimensions in mm

Weight: 420 g





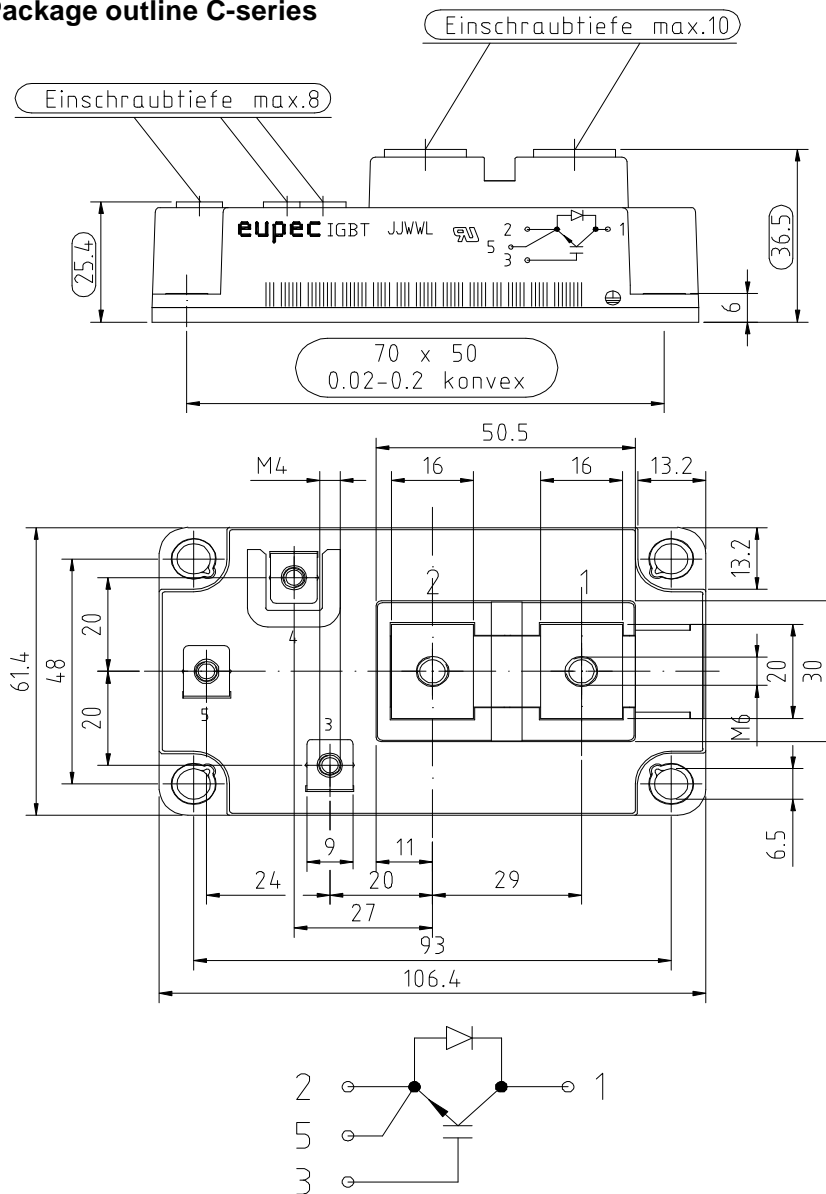
**Anhang C-Serie**  
**Appendix C-series**

**Gehäuse spezifische Werte**  
**Housing specific values**

**typ.**

Modulinduktivität stray inductance module		$L_{sCE}$	20	nH
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**Gehäusemaße C-Serie**  
**Package outline C-series**



## **Terms & Conditions of Usage**

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