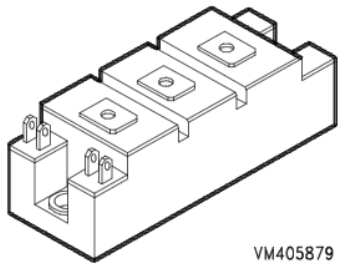
IGBT Power Module

- Half-bridge
- Including fast free-wheeling diodes
- Package with insulated metal base plate



Type	V_{CE}	I_C	Package	Ordering Code
BSM 50 GB 120 DN2	1200V	78A	HALF-BRIDGE 1	C67076-A2105-A70

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1200	V
Collector-gate voltage R_{GE} = 20 kΩ	V_{CGR}	1200	
Gate-emitter voltage	V_{GE}	± 20	
DC collector current T_C = 25 °C T_C = 80 °C	I_C	78 50	A
Pulsed collector current, t_p = 1 ms T_C = 25 °C T_C = 80 °C	I_{Cpuls}	156 100	
Power dissipation per IGBT T_C = 25 °C	P_{tot}	400	W
Chip temperature	T_j	+ 150	°C
Storage temperature	T_{stg}	-40 ... + 125	
Thermal resistance, chip case	R_{thJC}	≤ 0.3	K/W
Diode thermal resistance, chip case	R_{thJCD}	≤ 0.6	
Insulation test voltage, t = 1min.	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 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Gate threshold voltage	$V_{GE(th)}$				V
$V_{GE} = V_{CE}$, I_C = 2 mA		4.5	5.5	6.5	
Collector-emitter saturation voltage	$V_{CE(sat)}$				
V_{GE} = 15 V, I_C = 50 A, T_j = 25 °C		-	2.5	3	
V_{GE} = 15 V, I_C = 50 A, T_j = 125 °C		-	3.1	3.7	
Zero gate voltage collector current	I_{CES}				mA
V_{CE} = 1200 V, V_{GE} = 0 V, T_j = 25 °C		-	0.8	1	
V_{CE} = 1200 V, V_{GE} = 0 V, T_j = 125 °C		-	3.5	-	
Gate-emitter leakage current	I_{GES}				nA
V_{GE} = 20 V, V_{CE} = 0 V		-	-	200	
AC Characteristics					
Transconductance	g_{fs}				S
V_{CE} = 20 V, I_C = 50 A		23	-	-	
Input capacitance	C_{iss}				nF
V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		-	3.3	-	
Output capacitance	C_{oss}				
V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		-	0.5	-	
Reverse transfer capacitance	C_{rss}				
V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		-	0.25	-	

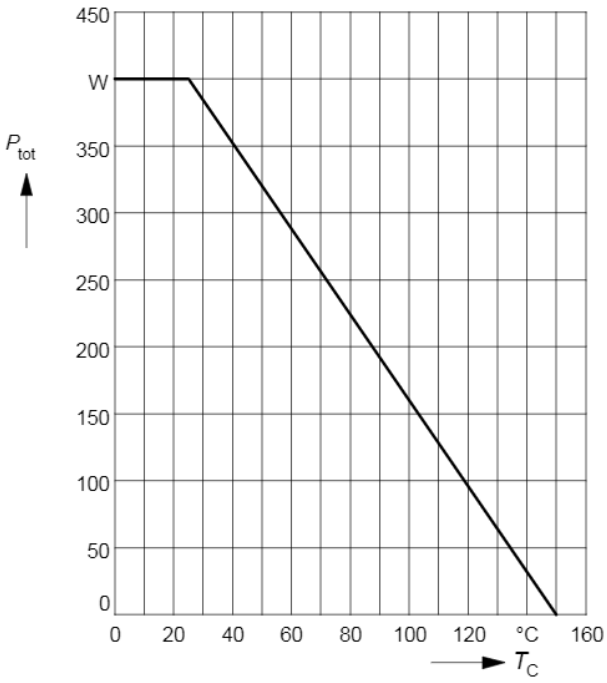
Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Switching Characteristics, Inductive Load at T_j = 125 °C					
Turn-on delay time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A R_{Gon} = 22 Ω	$t_{d(on)}$	-	44	100	ns
Rise time V_{CC} = 600 V, V_{GE} = 15 V, I_C = 50 A R_{Gon} = 22 Ω	t_r	-	56	100	
Turn-off delay time V_{CC} = 600 V, V_{GE} = -15 V, I_C = 50 A R_{Goff} = 22 Ω	$t_{d(off)}$	-	380	500	
Fall time V_{CC} = 600 V, V_{GE} = -15 V, I_C = 50 A R_{Goff} = 22 Ω	t_f	-	70	100	
Free-Wheel Diode					
Diode forward voltage I_F = 50 A, V_{GE} = 0 V, T_j = 25 °C I_F = 50 A, V_{GE} = 0 V, T_j = 125 °C	V_F	- -	2.3 1.8	2.8 -	V
Reverse recovery time I_F = 50 A, V_R = -600 V, V_{GE} = 0 V di_F/dt = -800 A/µs, T_j = 125 °C	t_{rr}	-	0.2	-	µs
Reverse recovery charge I_F = 50 A, V_{GE} = 0 V V_R = -600 V, di_F/dt = -800 A/µs, T_j = 25 °C V_R - 600 V, di_F/dt - 800 A/µs, T_j = 125 °C	Q_{rr}	- -	2.8 8	- -	µC

Power dissipation

$P_{tot} = f(T_C)$

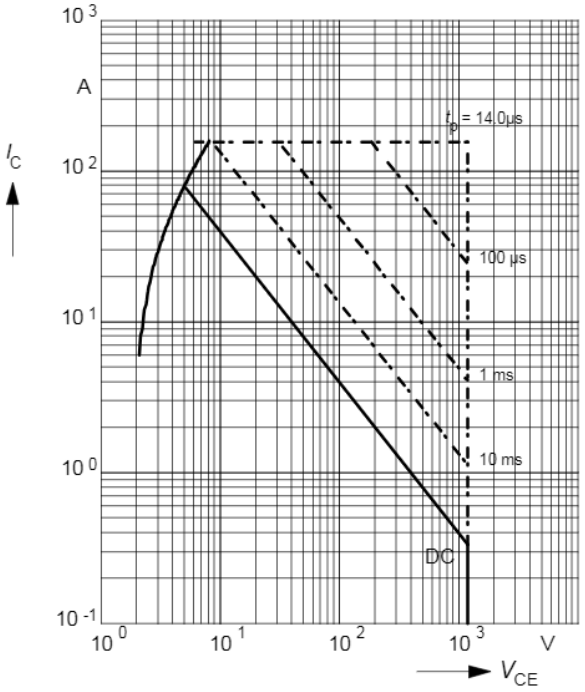
parameter: $T_j \leq 150$ °C



Safe operating area

$I_C = f(V_{CE})$

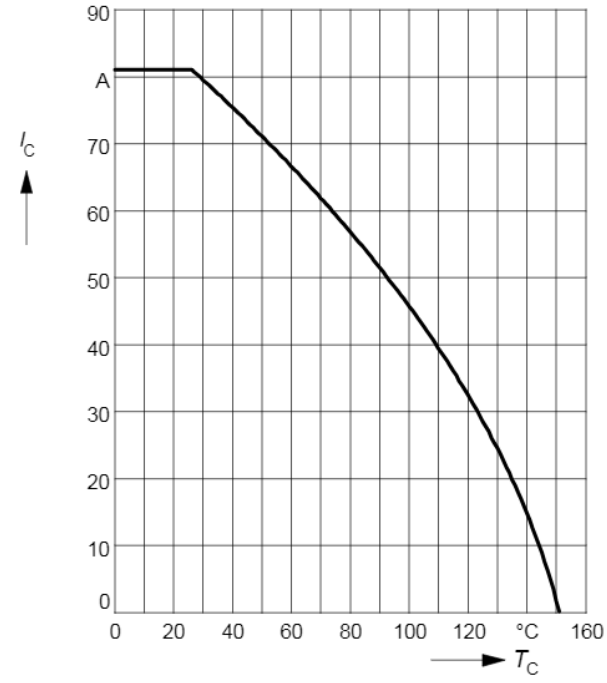
parameter: $D = 0$, $T_C = 25$°C , $T_j \leq 150$ °C



Collector current

$I_C = f(T_C)$

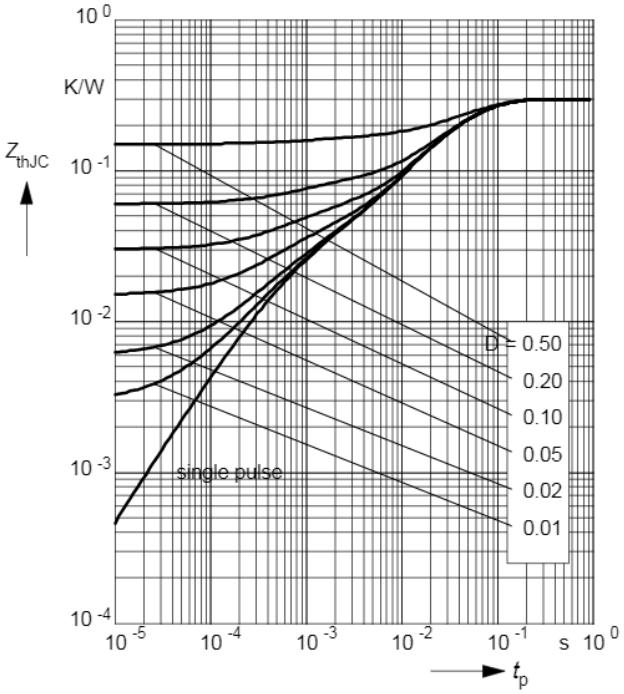
parameter: $V_{GE} \geq 15$ V , $T_j \leq 150$ °C



Transient thermal impedance IGBT

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

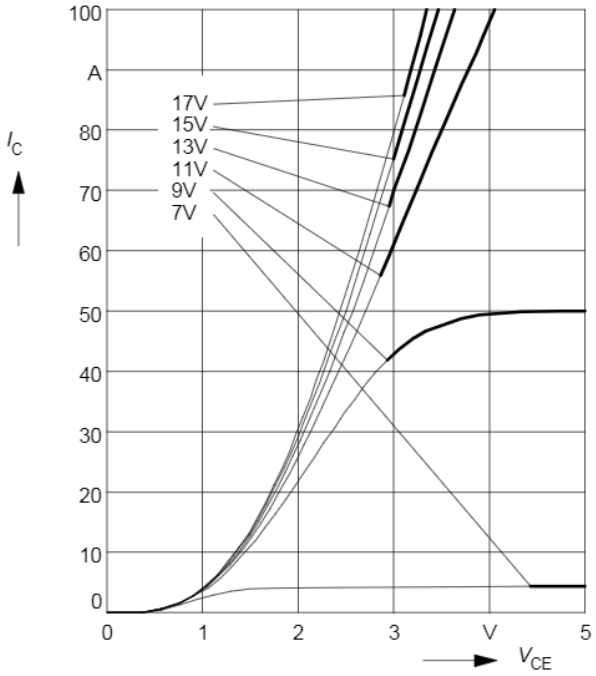
parameter: $D = t_p / T$



Typ. output characteristics

$I_C = f(V_{CE})$

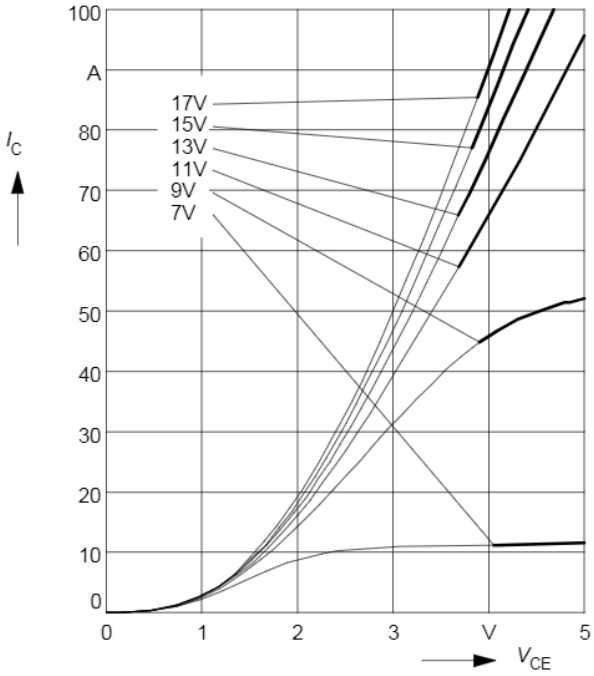
parameter: t_p = 80 µs, T_j = 25 °C



Typ. output characteristics

$I_C = f(V_{CE})$

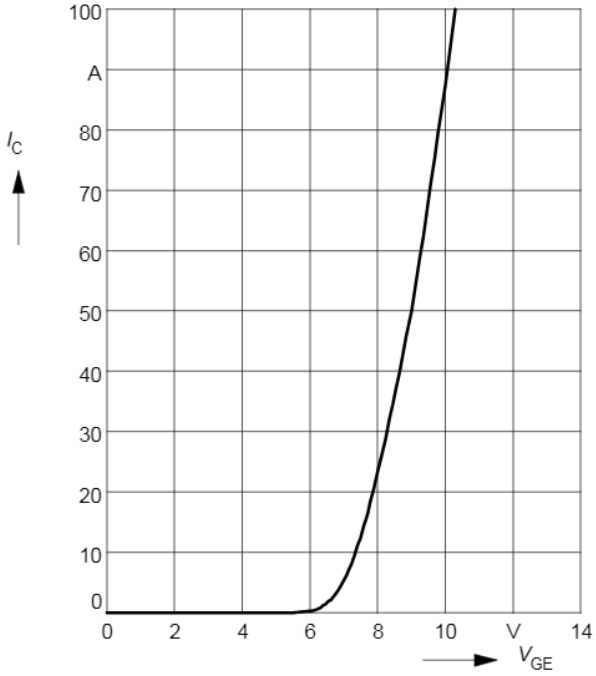
parameter: t_p = 80 µs, T_j = 125 °C



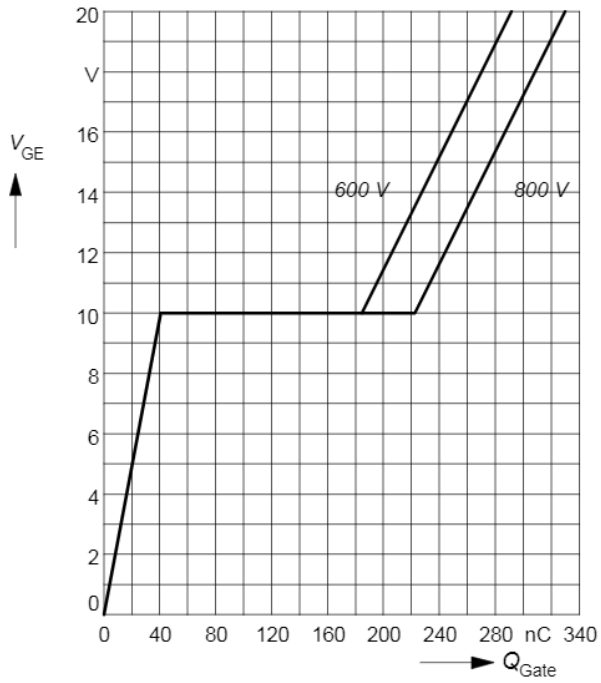
Typ. transfer characteristics

$I_C = f(V_{GE})$

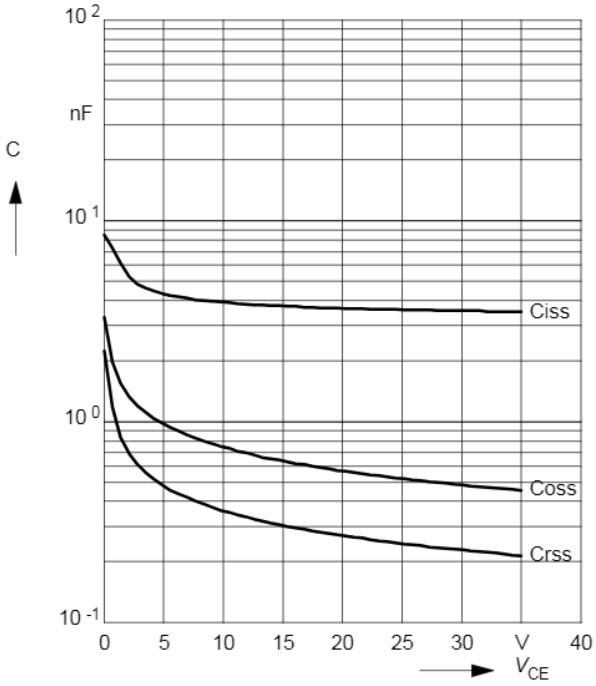
parameter: t_p = 80 µs, V_{CE} = 20 V



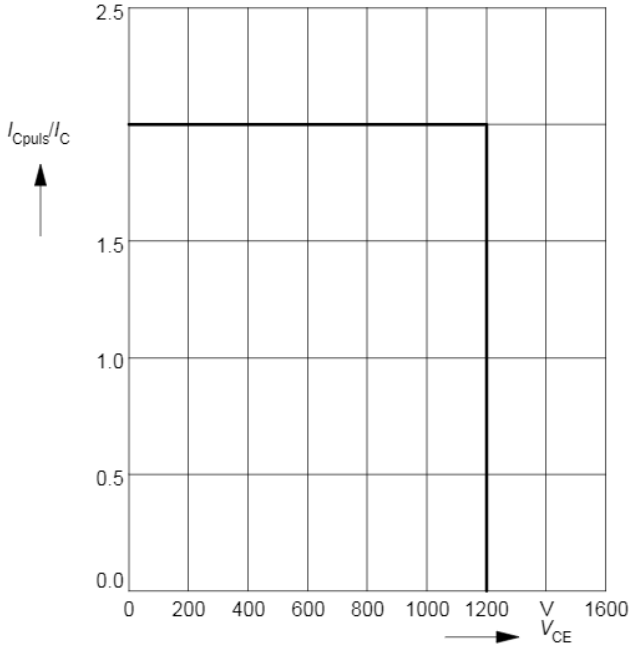
Typ. gate charge
$V_{GE} = f(Q_{Gate})$
parameter: $I_{C\ puls}$ = 50 A



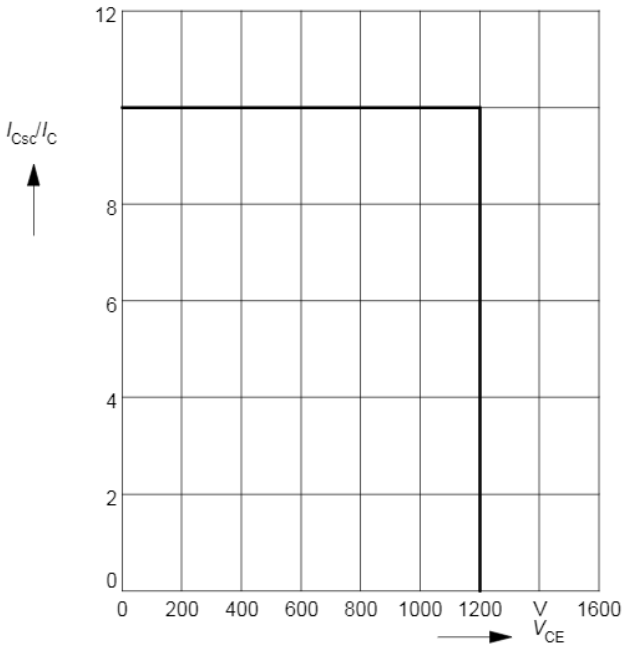
Typ. capacitances
$C = f(V_{CE})$
parameter: V_{GE} = 0, f = 1 MHz



Reverse biased safe operating area
$I_{Cpuls} = f(V_{CE})$, T_j = 150°C
parameter: V_{GE} = 15 V



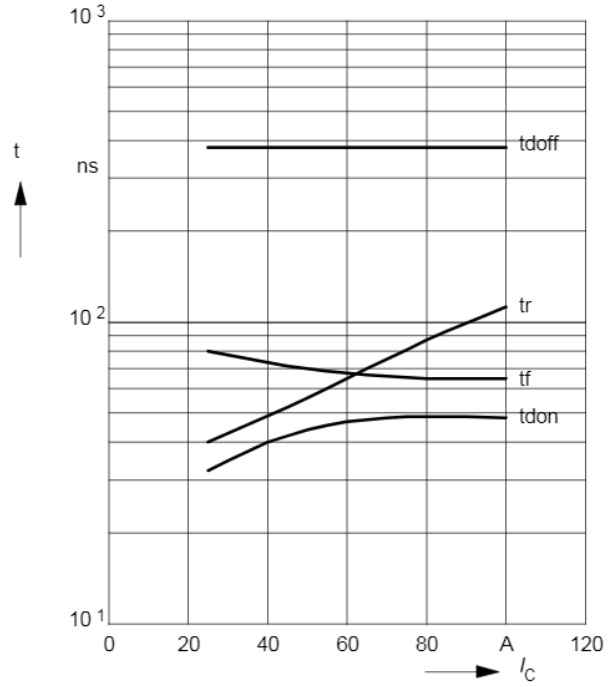
Short circuit safe operating area
$I_{Csc} = f(V_{CE})$, T_j = 150°C
parameter: V_{GE} = ± 15 V, $t_{SC} \leq$ 10 µs, L < 50 nH



Typ. switching time

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

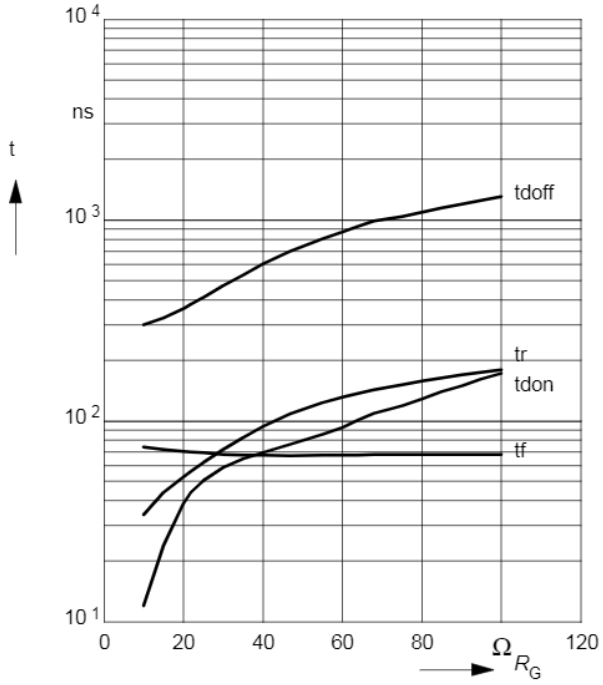
par.: V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



Typ. switching time

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

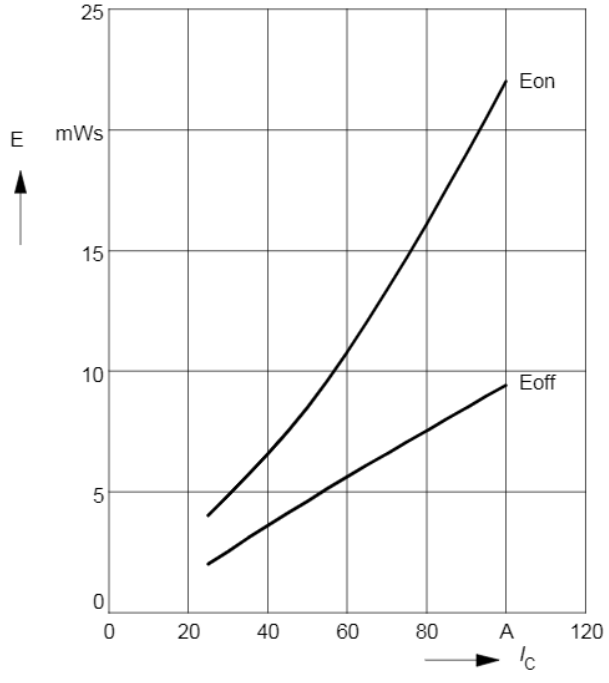
par.: V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 50 A



Typ. switching losses

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

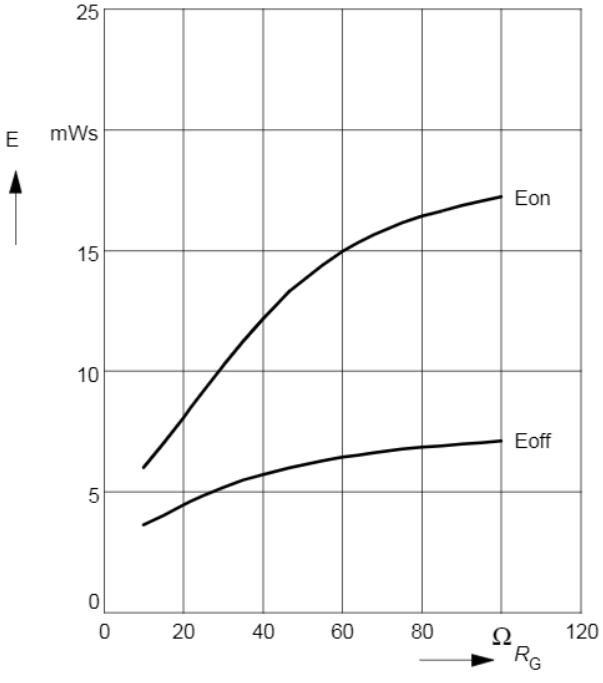
par.: V_{CE} = 600 V, V_{GE} = ± 15 V, R_G = 22 Ω



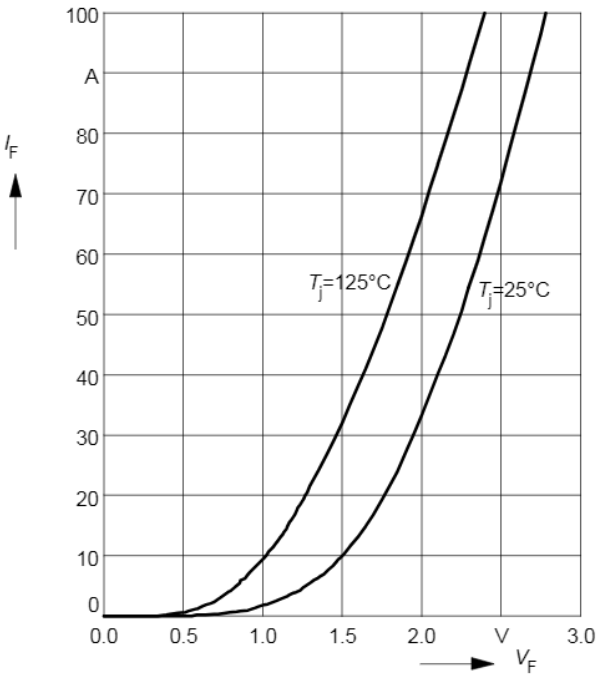
Typ. switching losses

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

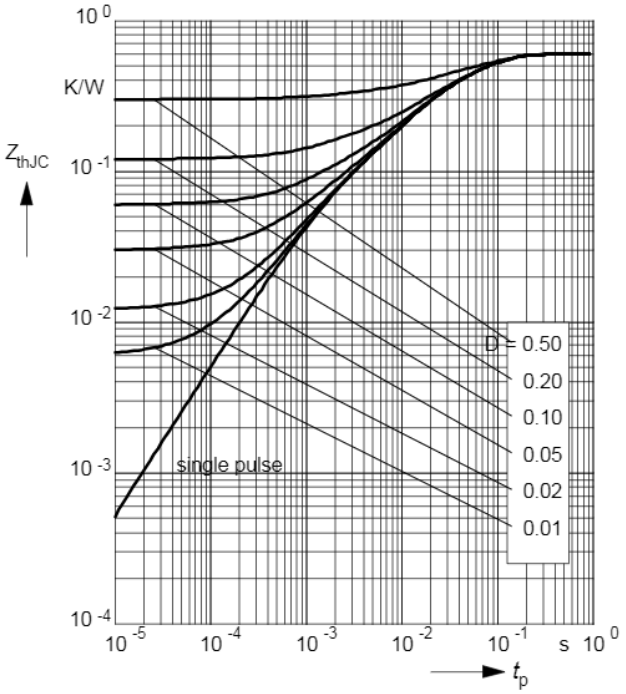
par.: V_{CE} = 600 V, V_{GE} = ± 15 V, I_C = 50 A



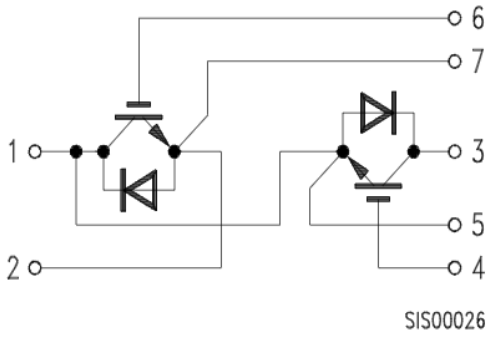
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
parameter: T_j



Transient thermal impedance Diode
$Z_{th\,JC} = f(t_p)$
parameter: $D = t_p / T$



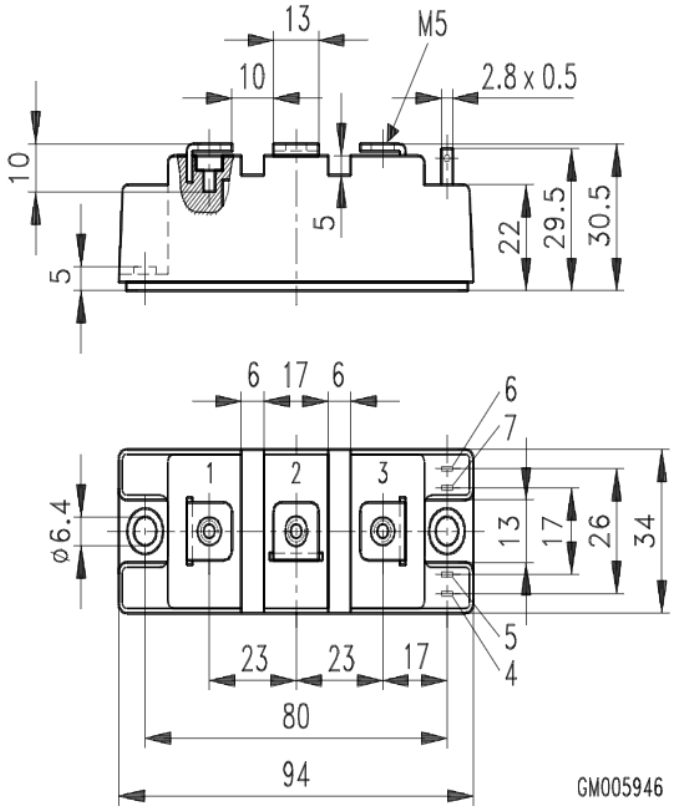
Circuit Diagram



Package Outlines

Dimensions in mm

Weight: 250 g



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