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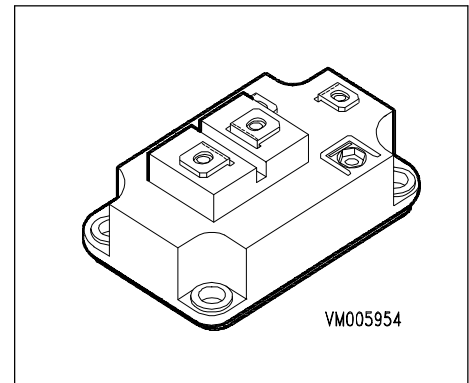
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IGBT Power Module

- Single switch
- Including fast free-wheeling diodes
- Package with insulated metal base plate
- $R_{G\ on, min} = 5.6\ \Omega$



Type	V_{CE}	I_C	Package	Ordering Code
BSM 300 GA 170 DN2	1700V	440A	SINGLE SWITCH 1	C67070-A2706-A67
BSM 300 GA 170 DN2 S	1700V	440A	SSW SENSE 1	C67070-A2708-A67

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V_{CE}	1700	V
Collector-gate voltage $R_{GE} = 20\ k\Omega$	V_{CGR}	1700	
Gate-emitter voltage	V_{GE}	± 20	
DC collector current $T_C = 25\ ^\circ C$ $T_C = 80\ ^\circ C$	I_C	440 300	A
Pulsed collector current, $t_p = 1\ ms$ $T_C = 25\ ^\circ C$ $T_C = 80\ ^\circ C$	I_{Cpuls}	880 600	
Power dissipation per IGBT $T_C = 25\ ^\circ C$	P_{tot}	2500	W
Chip temperature	T_j	+ 150	$^\circ C$
Storage temperature	T_{stg}	-40 ... + 125	
Thermal resistance, chip case	R_{thJC}	≤ 0.05	K/W
Diode thermal resistance, chip case	R_{thJCD}	≤ 0.17	
Insulation test voltage, $t = 1\ min.$	V_{is}	4000	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 $V_{GE} = V_{CE}, I_C = 20\text{ mA}$	$V_{GE(th)}$	4.8	5.5	6.2	V
Collector-emitter saturation voltage $V_{GE} = 15\text{ V}, I_C = 300\text{ A}, T_j = 25\text{ °C}$ $V_{GE} = 15\text{ V}, I_C = 300\text{ A}, T_j = 125\text{ °C}$	$V_{CE(sat)}$	- -	3.4 4.6	3.9 5.3	
Zero gate voltage collector current $V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_j = 25\text{ °C}$ $V_{CE} = 1700\text{ V}, V_{GE} = 0\text{ V}, T_j = 125\text{ °C}$	I_{CES}	- -	2 8	3 -	mA
Gate-emitter leakage current $V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	I_{GES}	-	-	400	nA

AC Characteristics

Transconductance $V_{CE} = 20\text{ V}, I_C = 300\text{ A}$	g_{fs}	108	-	-	S
Input capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	C_{iss}	-	44	-	nF
Output capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	C_{oss}	-	3.5	-	
Reverse transfer capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	C_{rss}	-	1	-	

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 $V_{CC} = 1200\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 300\text{ A}$ $R_{Gon} = 5.6\ \Omega$	$t_{d(on)}$	-	600	1200	ns
Rise time $V_{CC} = 1200\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 300\text{ A}$ $R_{Gon} = 5.6\ \Omega$	t_r	-	200	400	
Turn-off delay time $V_{CC} = 1200\text{ V}$, $V_{GE} = -15\text{ V}$, $I_C = 300\text{ A}$ $R_{Goff} = 5.6\ \Omega$	$t_{d(off)}$	-	1280	1900	
Fall time $V_{CC} = 1200\text{ V}$, $V_{GE} = -15\text{ V}$, $I_C = 300\text{ A}$ $R_{Goff} = 5.6\ \Omega$	t_f	-	110	160	

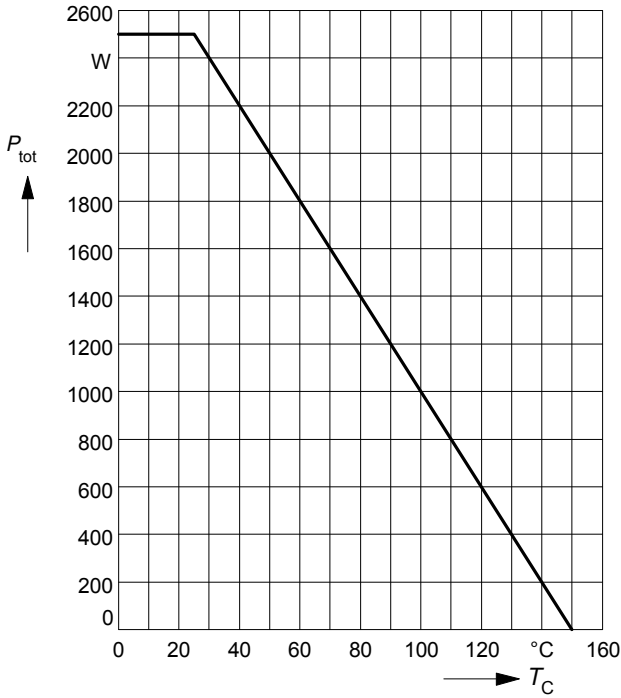
Free-Wheel Diode

Diode forward voltage $I_F = 300\text{ A}$, $V_{GE} = 0\text{ V}$, $T_j = 25\text{ °C}$ $I_F = 300\text{ A}$, $V_{GE} = 0\text{ V}$, $T_j = 125\text{ °C}$	V_F	-	2.3 2.1	2.8 -	V
Reverse recovery time $I_F = 300\text{ A}$, $V_R = -1200\text{ V}$, $V_{GE} = 0\text{ V}$ $di_F/dt = -1500\text{ A}/\mu\text{s}$, $T_j = 125\text{ °C}$	t_{rr}	-	1	-	
Reverse recovery charge $I_F = 300\text{ A}$, $V_R = -1200\text{ V}$, $V_{GE} = 0\text{ V}$ $di_F/dt = -1500\text{ A}/\mu\text{s}$ $T_j = 25\text{ °C}$ $T_j = 125\text{ °C}$	Q_{rr}	-	22 70	- -	μC

Power dissipation

$P_{tot} = f(T_C)$

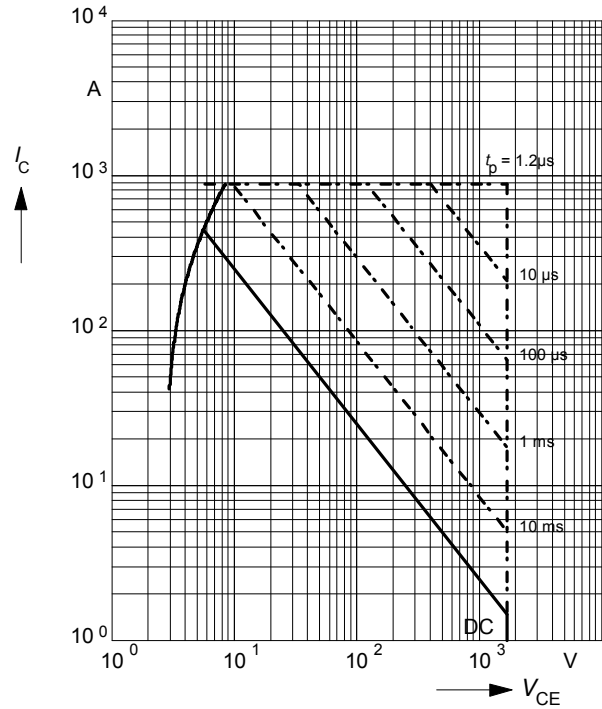
parameter: $T_j \leq 150\text{ }^\circ\text{C}$



Safe operating area

$I_C = f(V_{CE})$

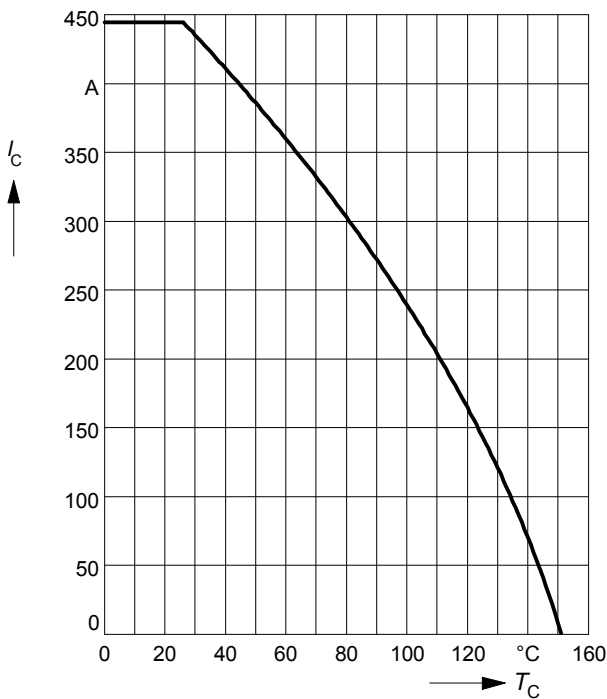
parameter: $D = 0, T_C = 25\text{ }^\circ\text{C}, T_j \leq 150\text{ }^\circ\text{C}$



Collector current

$I_C = f(T_C)$

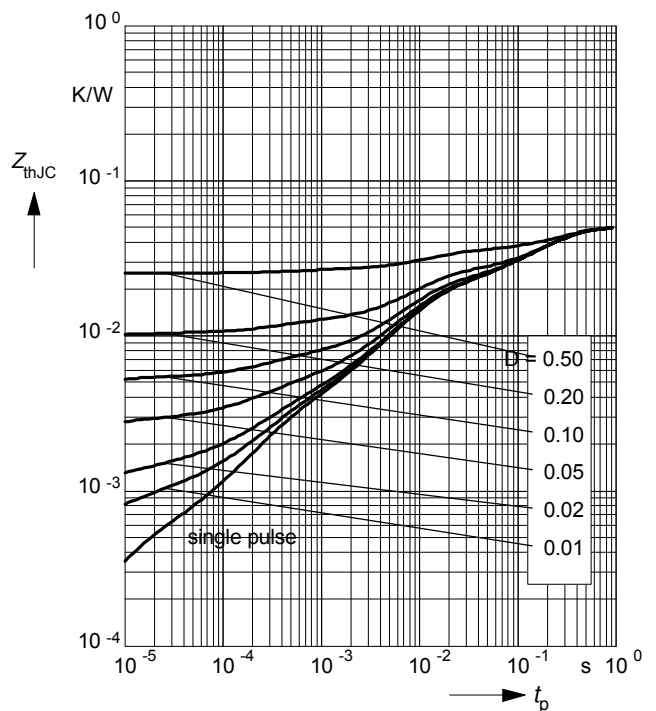
parameter: $V_{GE} \geq 15\text{ V}, T_j \leq 150\text{ }^\circ\text{C}$



Transient thermal impedance IGBT

$Z_{thJC} = f(t_p)$

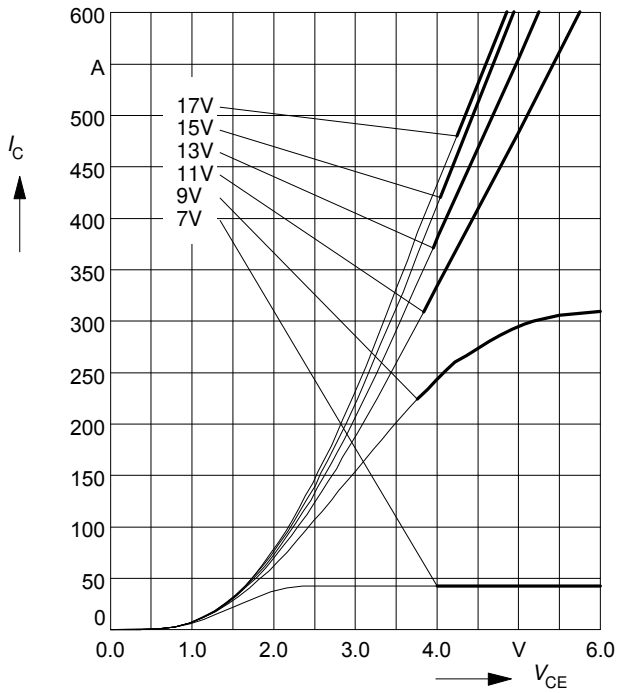
parameter: $D = t_p / T$



Typ. output characteristics

$I_C = f(V_{CE})$

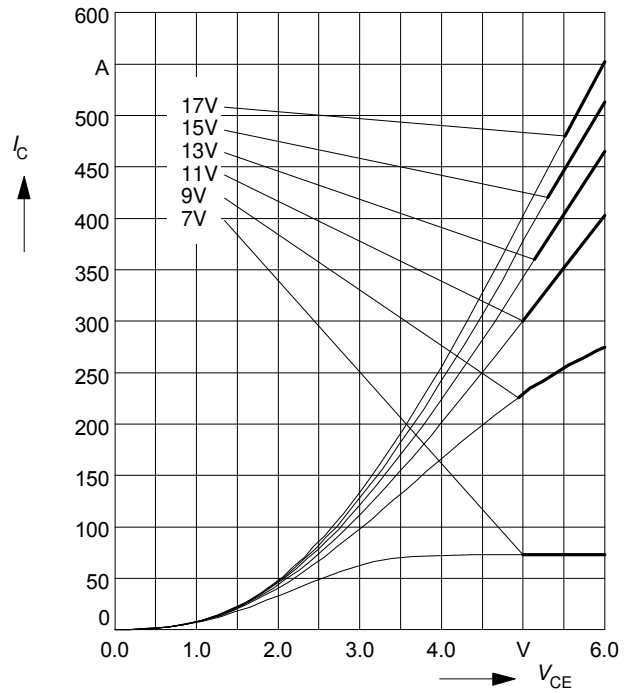
parameter: $t_p = 80 \mu s, T_j = 25 \text{ }^\circ C$



Typ. output characteristics

$I_C = f(V_{CE})$

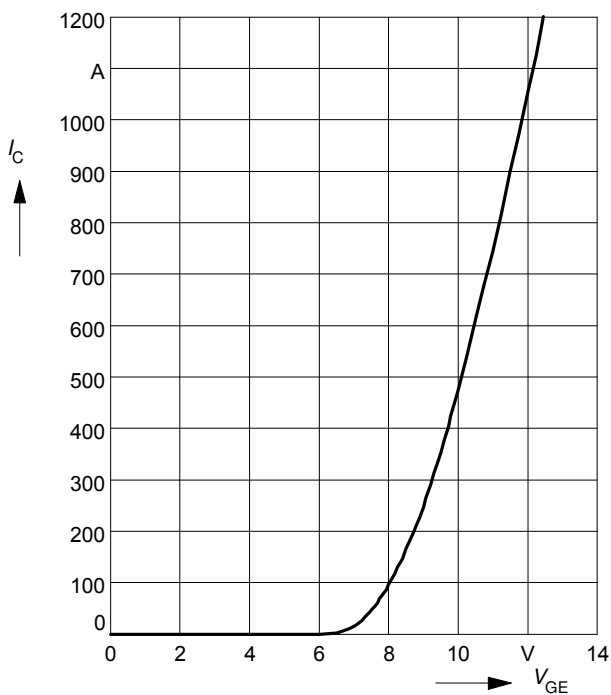
parameter: $t_p = 80 \mu s, T_j = 125 \text{ }^\circ C$



Typ. transfer characteristics

$I_C = f(V_{GE})$

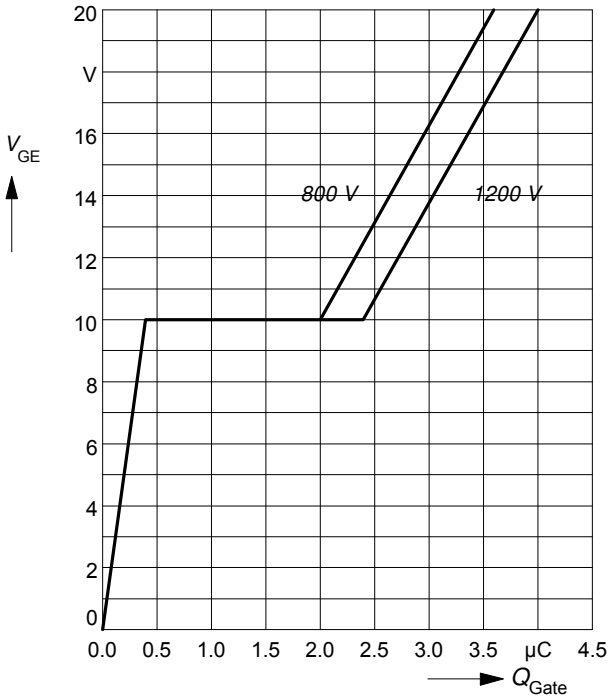
parameter: $t_p = 80 \mu s, V_{CE} = 20 \text{ V}$



Typ. gate charge

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

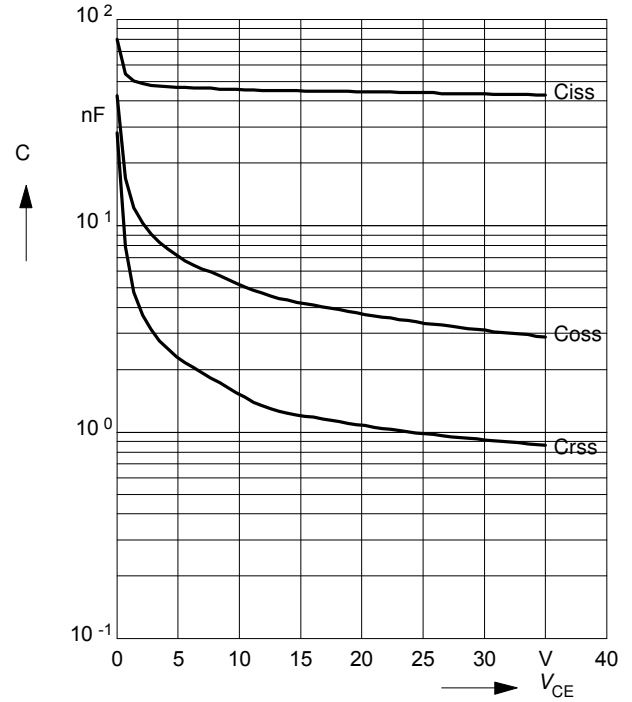
parameter: $I_{C puls} = 300 A$



Typ. capacitances

$C = f(V_{CE})$

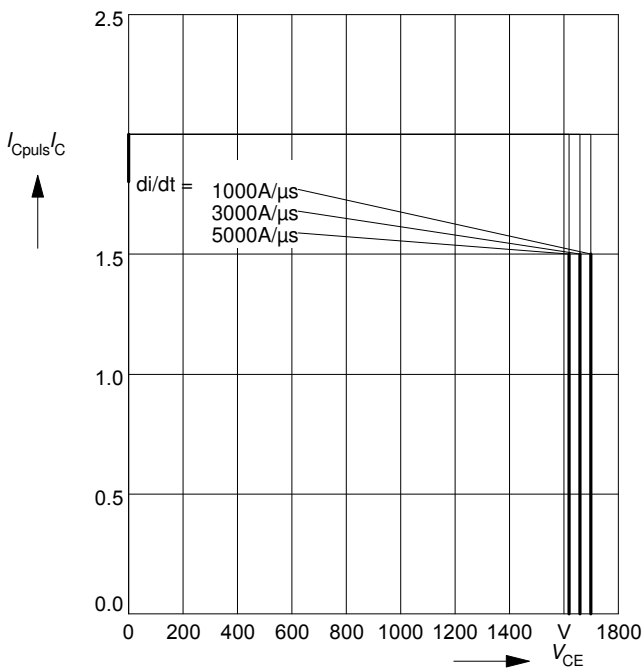
parameter: $V_{GE} = 0, f = 1 MHz$



Reverse biased safe operating area

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

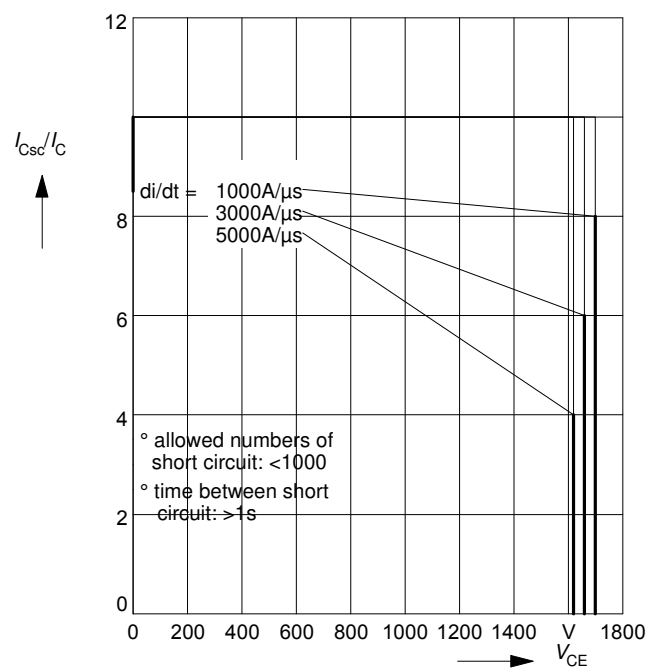
parameter: $V_{GE} = \pm 15 V, t_p \le 1 ms, L < 20 nH$



Short circuit safe operating area

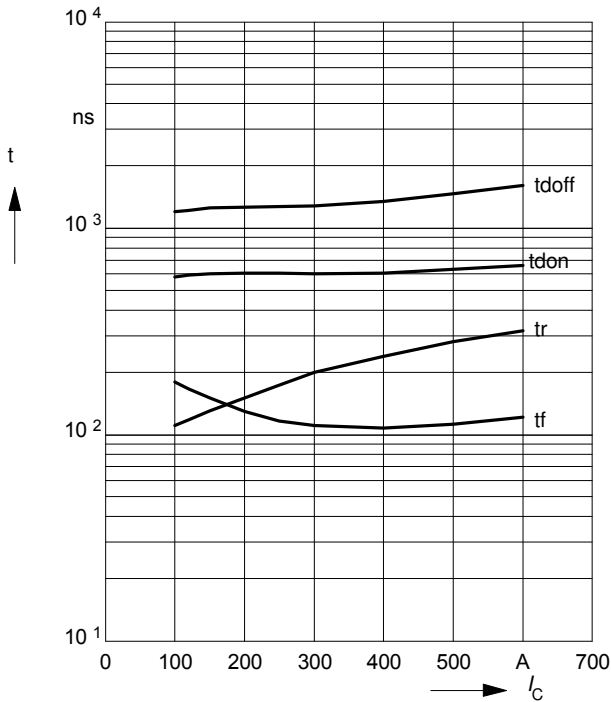
$I_{C sc} = f(V_{CE}), T_j = 150^\circ C$

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



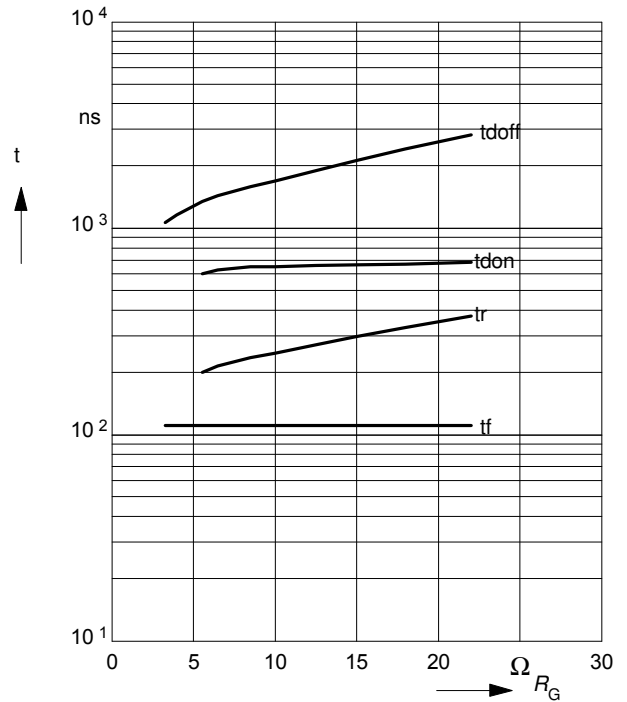
Typ. switching time

$t = f(I_C)$, inductive load, $T_j = 125^\circ\text{C}$
 par.: $V_{CE} = 1200\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_G = 5.6\ \Omega$



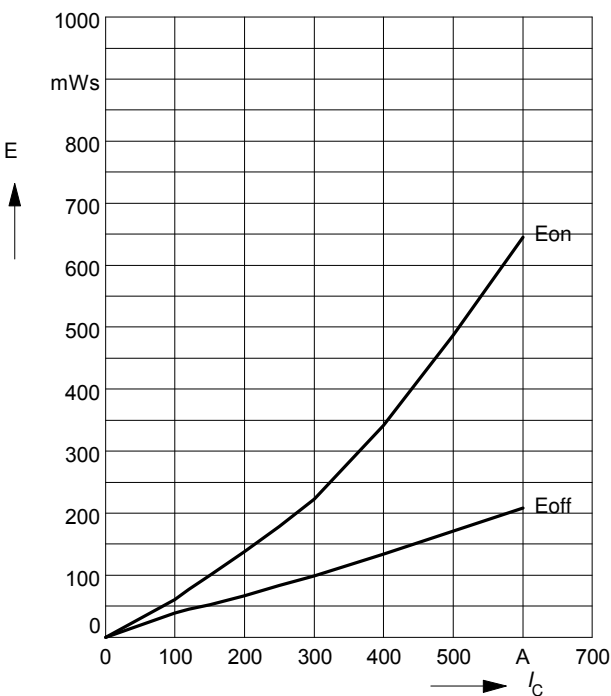
Typ. switching time

$t = f(R_G)$, inductive load, $T_j = 125^\circ\text{C}$
 par.: $V_{CE} = 1200\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $I_C = 300\text{ A}$



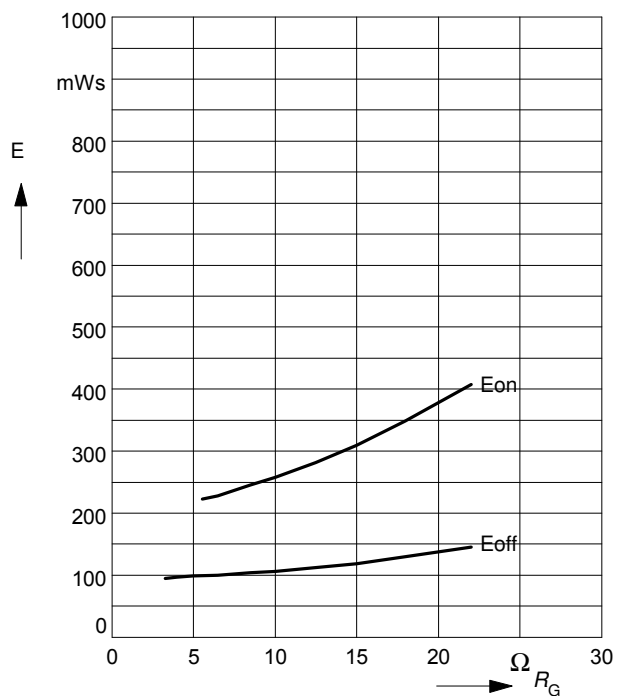
Typ. switching losses

$E = f(I_C)$, inductive load, $T_j = 125^\circ\text{C}$
 par.: $V_{CE} = 1200\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_G = 5.6\ \Omega$



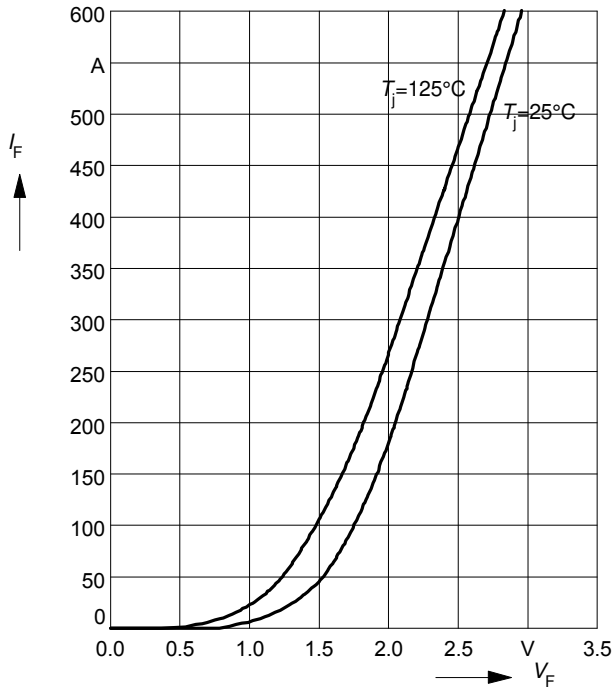
Typ. switching losses

$E = f(R_G)$, inductive load, $T_j = 125^\circ\text{C}$
 par.: $V_{CE} = 1200\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $I_C = 300\text{ A}$



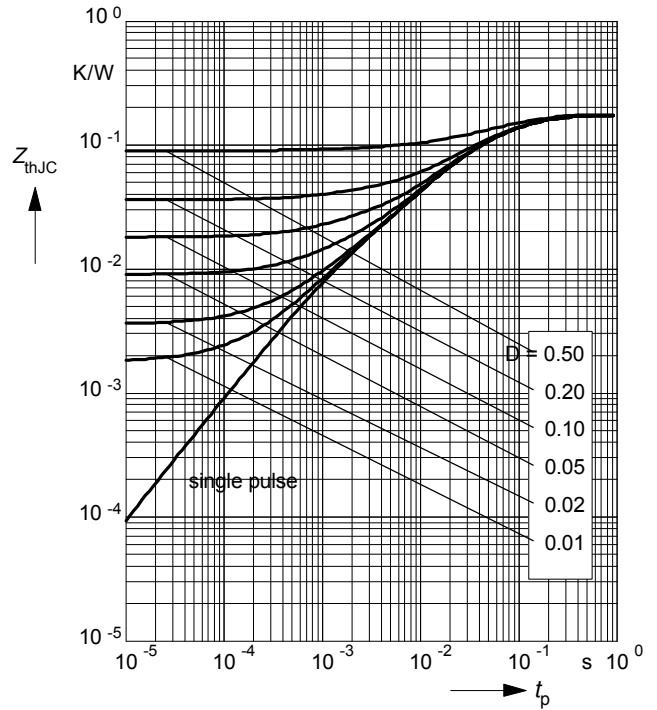
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$

parameter: T_j



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

parameter: $D = t_p / T$



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