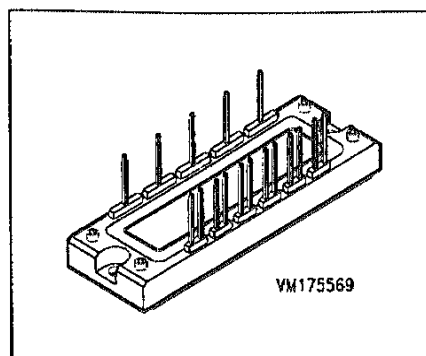


IGBT Power Module

- Power module
- 3-phase full-bridge
- Including fast free-wheel diodes
- Package with insulated metal base plate
- E3226: long terminals, limited current per terminal



Type	V _{CE}	I _C	Package	Ordering Code
BSM 50 GD120DN2E3226	1200V	50A	ECONOPACK 2	C67070-A2514-A67

Maximum Ratings

Parameter	Symbol	Values	Unit
Collector-emitter voltage	V _{CE}	1200	V
Collector-gate voltage	V _{CGR}	1200	
<i>R</i> _{GE} = 20 kΩ		± 20	
Gate-emitter voltage	V _{GE}	± 20	
DC collector current	I _C	50	A
<i>T</i> _C = 25 °C		45	
<i>T</i> _C = 80 °C			
Pulsed collector current, <i>t</i> _p = 1 ms	I _{Cpuls}	100	
<i>T</i> _C = 25 °C		90	
<i>T</i> _C = 80 °C			
Power dissipation per IGBT	P _{tot}	350	W
<i>T</i> _C = 25 °C			
Chip temperature	<i>T</i> _j	+ 150	°C
Storage temperature	<i>T</i> _{stg}	-40...+125	
Thermal resistance, chip case	<i>R</i> _{thJC}	≤ 0.35	K/W
Diode thermal resistance, chip case	<i>R</i> _{thJCD}	≤ 0.7	
Insulation test voltage, <i>t</i> = 1 min.	V _{is}	2500	Vac
Creepage distance	-	16	mm
Clearance	-	11	
DIN humidity category, DIN 40 040	-	F	-
IEC climatic category, DIN IEC 68-1	-	55 / 150 / 56	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

Static Characteristics

Gate threshold voltage $V_{GE} = V_{CE}, I_C = 2\text{ mA}$	$V_{GE(th)}$	4.5	5.5	6.5	V
Collector-emitter saturation voltage $V_{GE} = 15\text{ V}, I_C = 50\text{ A}, T_j = 25\text{ °C}$ $V_{GE} = 15\text{ V}, I_C = 50\text{ A}, T_j = 125\text{ °C}$	$V_{CE(sat)}$	-	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}	-	0.8 4	1 -	mA
Gate-emitter leakage current $V_{GE} = 20\text{ V}, V_{CE} = 0\text{ V}$	I_{GES}	-	-	200	

AC Characteristics

Transconductance $V_{CE} = 20\text{ V}, I_C = 50\text{ A}$	g_{fs}	23	-	-	S
Input capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	C_{iss}	-	3300	-	
Output capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	C_{oss}	-	500	-	pF
Reverse transfer capacitance $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$	C_{rss}	-	220	-	

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 $V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 50\text{ A}$ $R_{Gon} = 22\ \Omega$	$t_{d(on)}$	-	44	100	ns
Rise time $V_{CC} = 600\text{ V}$, $V_{GE} = 15\text{ V}$, $I_C = 50\text{ A}$ $R_{Gon} = 22\ \Omega$	t_r	-	56	100	
Turn-off delay time $V_{CC} = 600\text{ V}$, $V_{GE} = -15\text{ V}$, $I_C = 50\text{ A}$ $R_{Goff} = 22\ \Omega$	$t_{d(off)}$	-	380	500	
Fall time $V_{CC} = 600\text{ V}$, $V_{GE} = -15\text{ V}$, $I_C = 50\text{ A}$ $R_{Goff} = 22\ \Omega$	t_f	-	70	100	

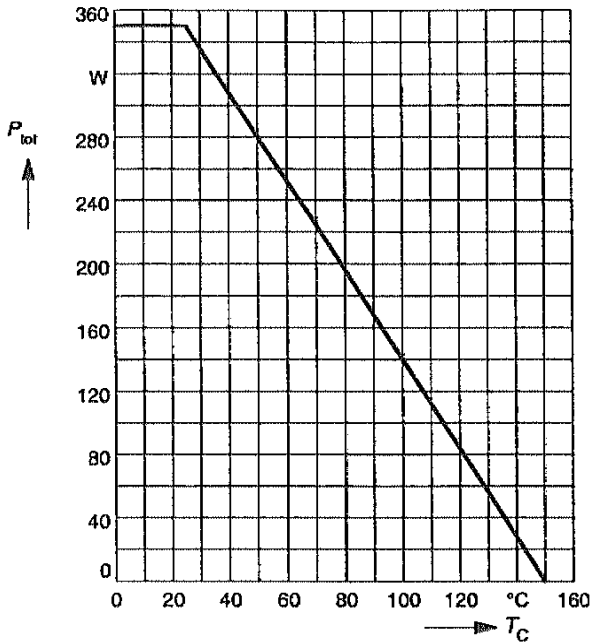
Free-Wheel Diode

Diode forward voltage $I_F = 50\text{ A}$, $V_{GE} = 0\text{ V}$, $T_j = 25\text{ °C}$ $I_F = 50\text{ A}$, $V_{GE} = 0\text{ V}$, $T_j = 125\text{ °C}$	V_F	-	2.3 1.8	2.8 -	V
Reverse recovery time $I_F = 50\text{ A}$, $V_R = -600\text{ V}$, $V_{GE} = 0\text{ V}$ $di_F/dt = -800\text{ A}/\mu\text{s}$, $T_j = 125\text{ °C}$	t_{rr}	-	0.2	-	
Reverse recovery charge $I_F = 50\text{ A}$, $V_R = -600\text{ V}$, $V_{GE} = 0\text{ V}$ $di_F/dt = -800\text{ A}/\mu\text{s}$ $T_j = 25\text{ °C}$ $T_j = 125\text{ °C}$	Q_{rr}	-	2.8 8	- -	μC

Power dissipation

$P_{tot} = f(T_C)$

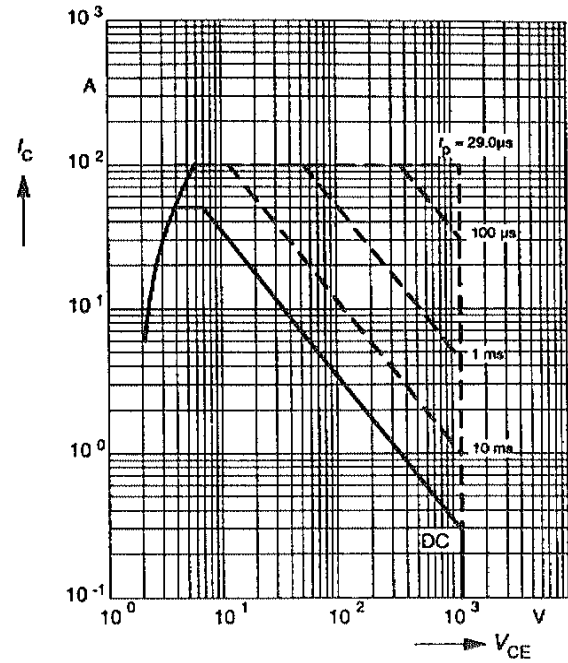
parameter: $T_j \leq 150\text{ }^\circ\text{C}$



Safe operating area

$I_C = f(V_{CE})$

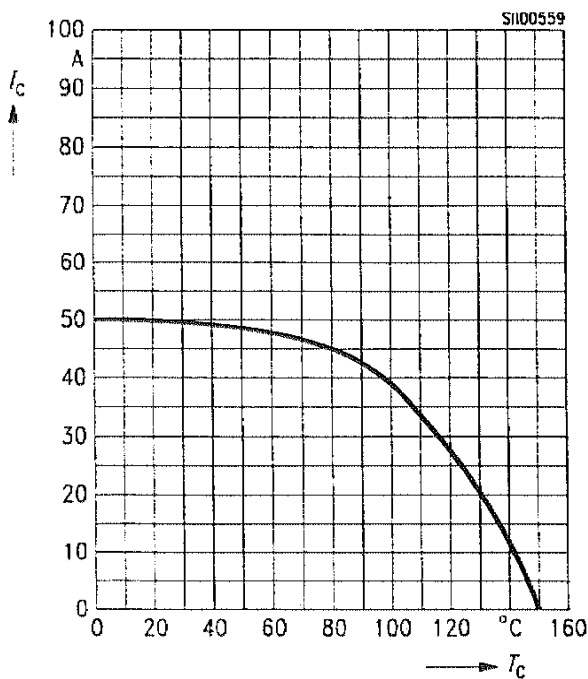
parameter: $D = 0, T_C = 25^\circ\text{C}, T_j \leq 150\text{ }^\circ\text{C}$



Collector current

$I_C = f(T_C)$

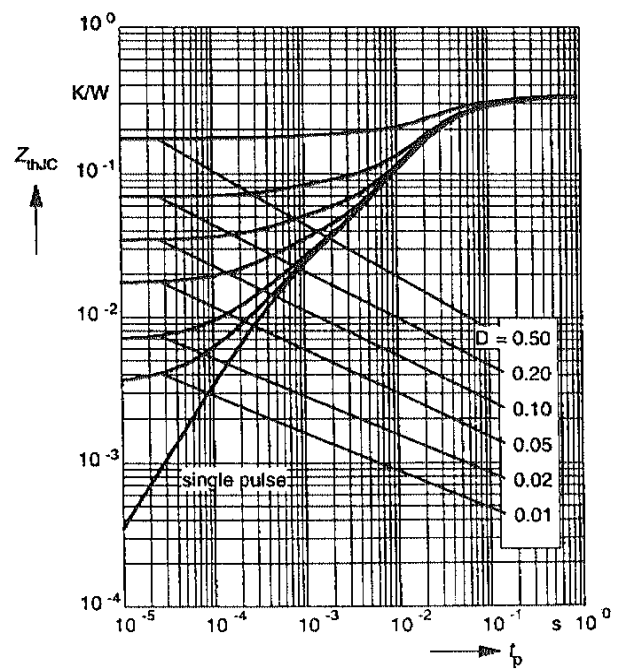
parameter: $V_{GE} \geq 15\text{ V}, T_j \leq 150\text{ }^\circ\text{C}$



Transient thermal impedance IGBT

$Z_{thJC} = f(t_p)$

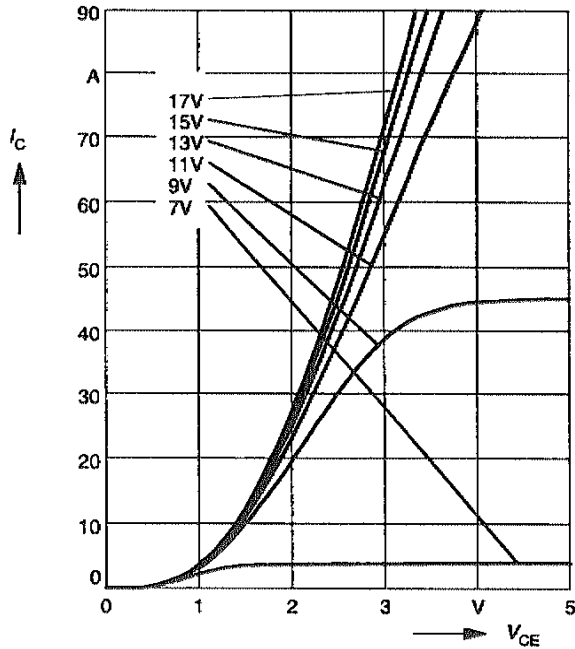
parameter: $D = t_p / T$



Typ. output characteristics

$I_C = f(V_{CE})$

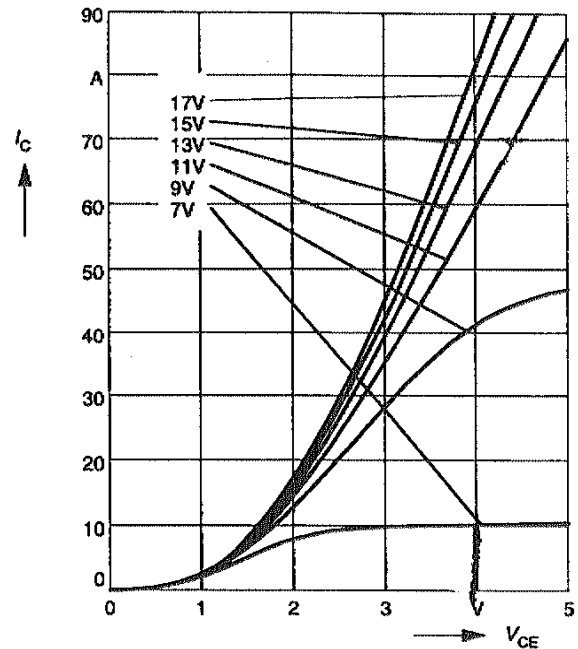
parameter: $t_p = 80 \mu s, T_j = 25 \text{ }^\circ\text{C}$



Typ. output characteristics

$I_C = f(V_{CE})$

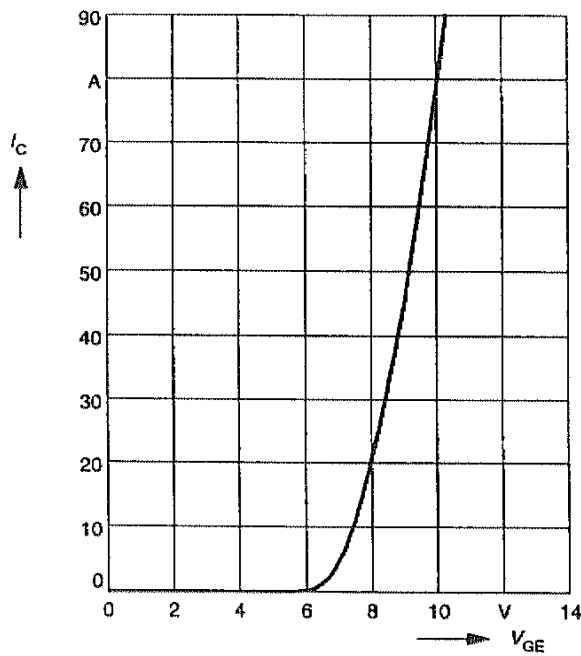
parameter: $t_p = 80 \mu s, T_j = 125 \text{ }^\circ\text{C}$



Typ. transfer characteristics

$I_C = f(V_{GE})$

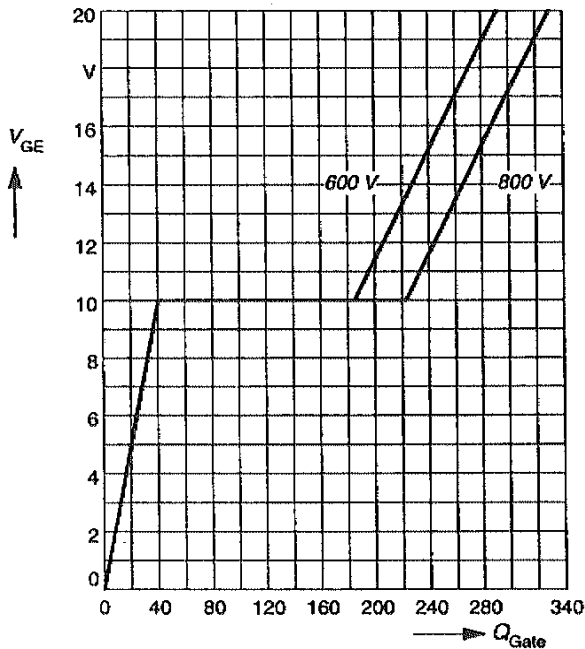
parameter: $t_p = 80 \mu s, V_{CE} = 20 \text{ V}$



Typ. gate charge

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

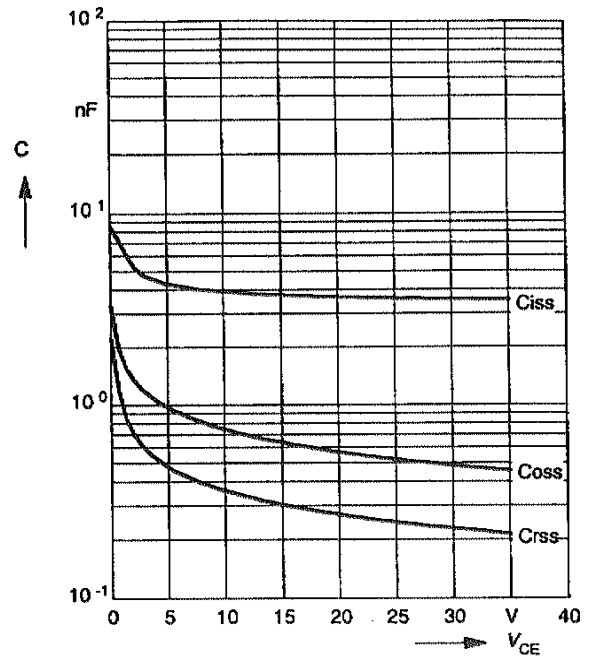
parameter: $I_{C\ puls} = 50\ A$



Typ. capacitances

$C = f(V_{CE})$

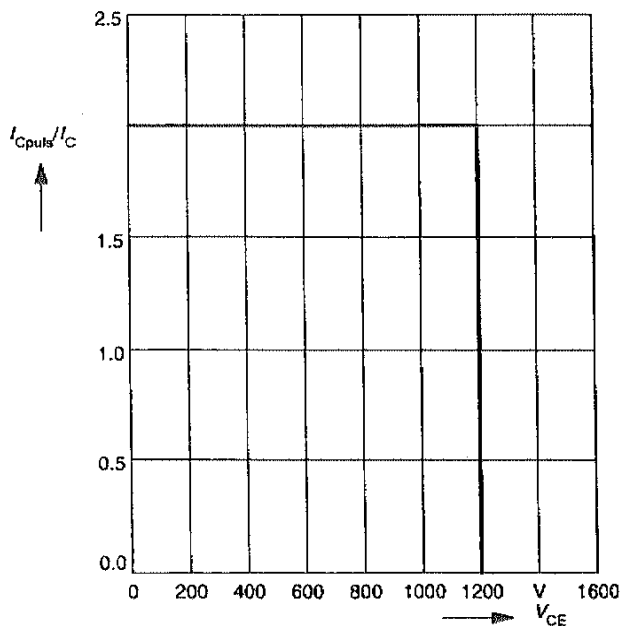
parameter: $V_{GE} = 0\ V, f = 1\ MHz$



Reverse biased safe operating area

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

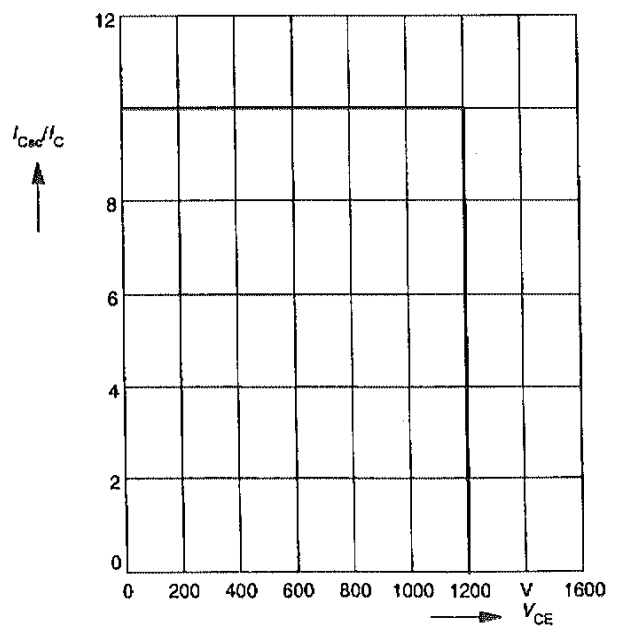
parameter: $V_{GE} = 15\ V$



Short circuit safe operating area

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

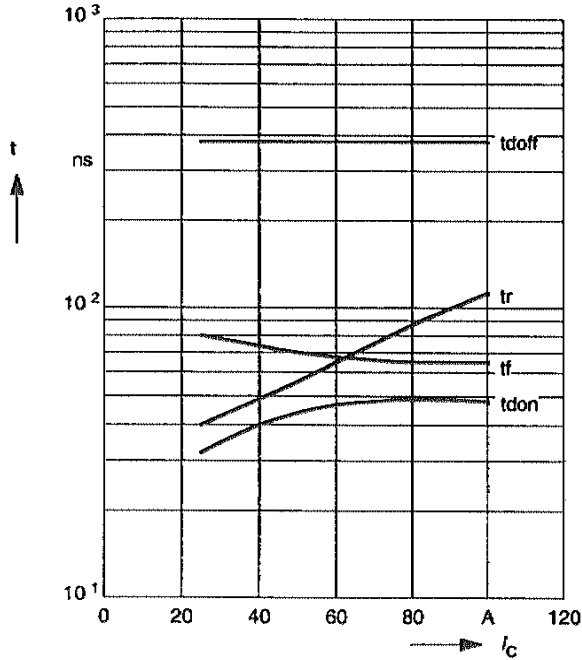
parameter: $V_{GE} = \pm 15\ V, t_{SC} \le 10\ \mu s, L < 50\ nH$



Typ. switching time

$t = f(I_C)$, inductive load, $T_j = 125^\circ\text{C}$

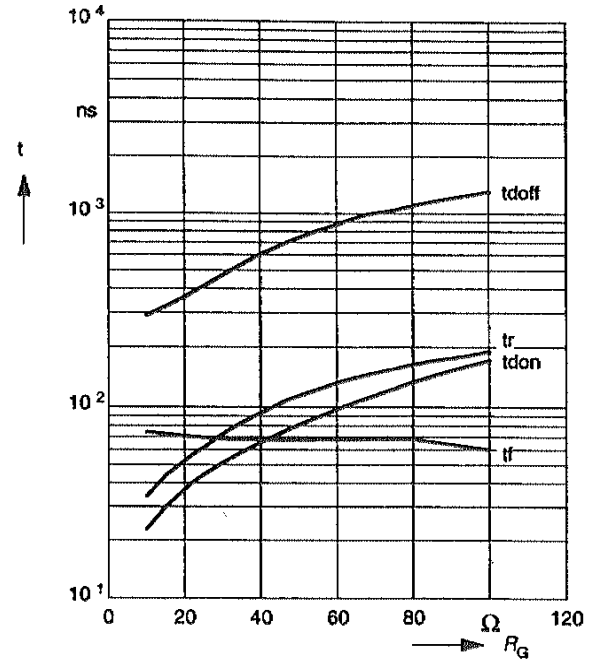
par.: $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_G = 22\ \Omega$



Typ. switching time

$t = f(R_G)$, inductive load, $T_j = 125^\circ\text{C}$

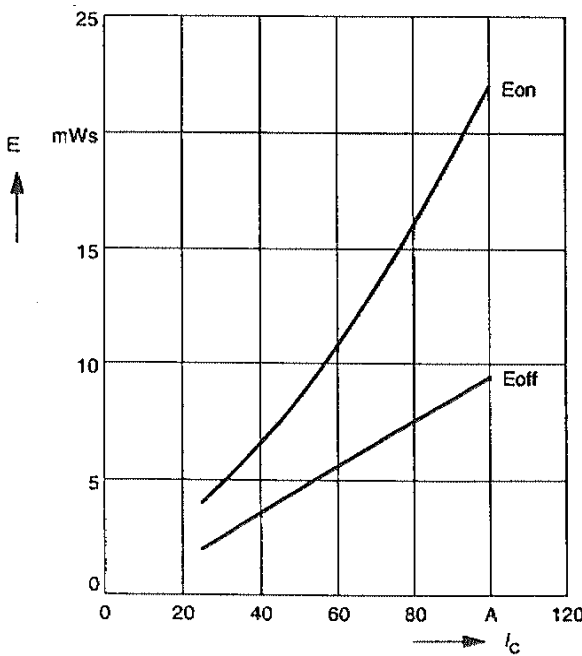
par.: $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$



Typ. switching losses

$E = f(I_C)$, inductive load, $T_j = 125^\circ\text{C}$

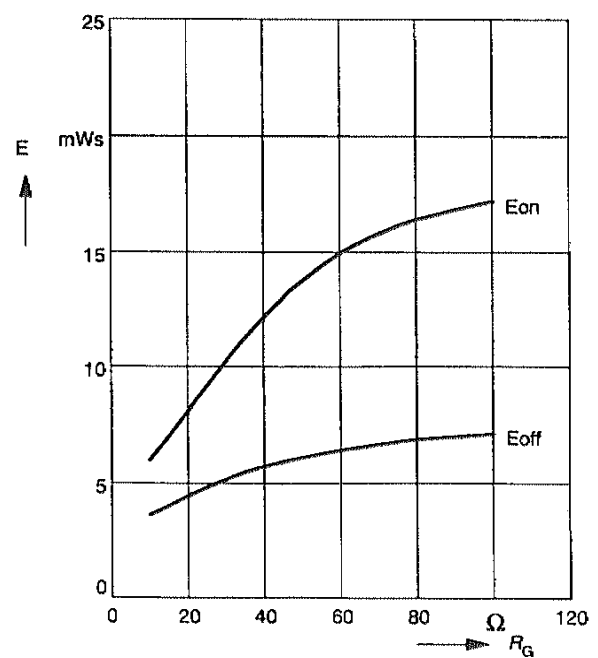
par.: $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $R_G = 22\ \Omega$



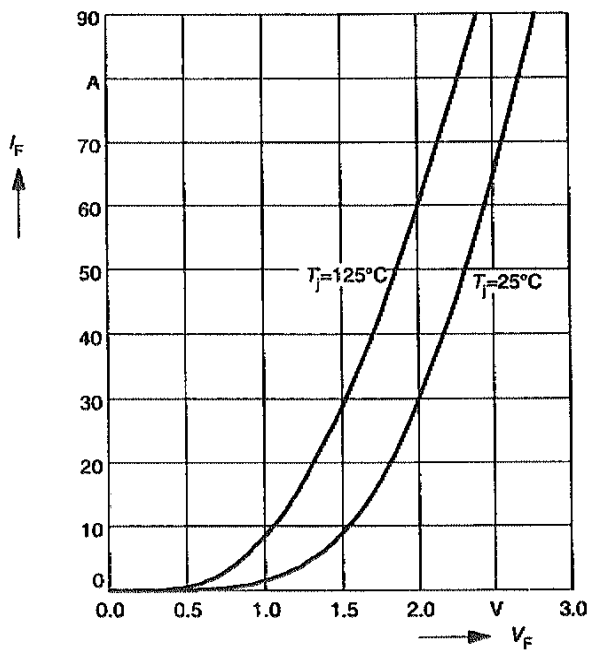
Typ. switching losses

$E = f(R_G)$, inductive load, $T_j = 125^\circ\text{C}$

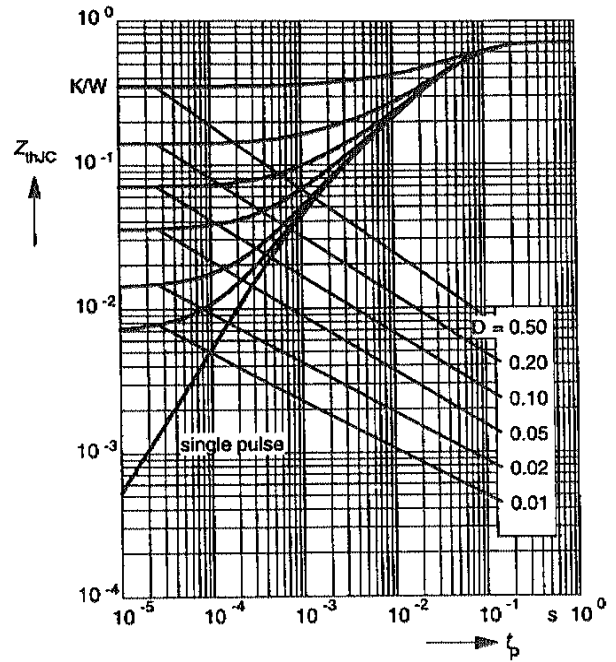
par.: $V_{CE} = 600\text{ V}$, $V_{GE} = \pm 15\text{ V}$, $I_C = 50\text{ A}$



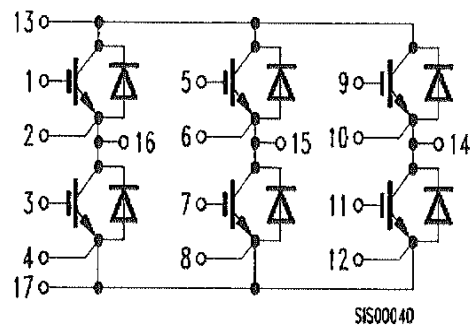
Forward characteristics of fast recovery reverse diode $I_F = f(V_F)$
 parameter: T_j



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



Circuit Diagram



Package Outlines

Dimensions in mm

Weight: 180 g

