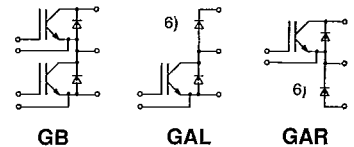
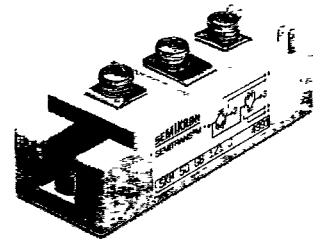


Absolute Maximum Ratings		Values		Units	
Symbol	Conditions <sup>1)</sup>	... 101 D	... 121 D		
V <sub>CES</sub>		1000	1200	V	
V <sub>CGR</sub>	R <sub>GE</sub> = 20 kΩ	1000	1200	V	
I <sub>C</sub>	T <sub>case</sub> = 25/80 °C		50/34	A	
I <sub>CM</sub>	T <sub>case</sub> = 25/80 °C		100/68	A	
V <sub>GES</sub>			± 20	V	
P <sub>tot</sub>	per IGBT, T <sub>case</sub> = 25 °C		400	W	
T <sub>J</sub> , T <sub>stg</sub>		- 55 ... +150		°C	
V <sub>isol</sub>	AC, 1 min		2 500	V	
humidity	DIN 40 040		Class F		
climate	DIN IEC 68 T.1		55/150/56		
Inverse Diode					
I <sub>F</sub> = - I <sub>C</sub>			50	A	
I <sub>FM</sub> = - I <sub>CM</sub>			100	A	
Characteristics					
Symbol	Conditions <sup>1)</sup>	min.	typ.	max.	Units
V <sub>(BR)CES</sub>	V <sub>GE</sub> = 0, I <sub>C</sub> = 1 mA	≥ V <sub>CES</sub>	-	-	V
V <sub>GE(th)</sub>	V <sub>GE</sub> = V <sub>CE</sub> , I <sub>C</sub> = 4 mA	4,5	5,5	6,5	V
I <sub>CES</sub>	V <sub>GE</sub> = 0 } T <sub>J</sub> = 25 °C	-	0,01	1	mA
		V <sub>CE</sub> = V <sub>CES</sub> } T <sub>J</sub> = 125 °C	-	-	4
I <sub>GES</sub>	V <sub>GE</sub> = 20 V, V <sub>CE</sub> = 0	-	-	100	nA
V <sub>CEsat</sub>	V <sub>GE</sub> = 15 V } T <sub>J</sub> = 25 °C	-	3	3,5	V
		I <sub>C</sub> = 50 A } T <sub>J</sub> = 150 °C	-	4	4,5
g <sub>fs</sub>	V <sub>CE</sub> = 20 V, I <sub>C</sub> = 50 A	17	24	-	S
C <sub>CHC</sub>	per IGBT	-	-	100	pF
C <sub>ies</sub>	V <sub>GE</sub> = 0	-	6	-	nF
		V <sub>CE</sub> = 25 V	-	480	-
C <sub>oes</sub>	f = 1 MHz	-	200	-	pF
C <sub>res</sub>		-	-	20	nH
L <sub>CCE</sub>		-	-	20	nH
t <sub>d(on)</sub>	V <sub>CC</sub> = 600 V V <sub>GE</sub> = 15 V I <sub>C</sub> = 50 A R <sub>Gon</sub> = R <sub>Goff</sub> = 3,3 Ω T <sub>J</sub> = 125 °C	-	80 <sup>3)</sup>	-	ns
t <sub>r</sub>		-	150 <sup>3)</sup>	-	ns
t <sub>d(off)</sub>		-	250 <sup>3)/250</sup> <sup>4)</sup>	-	ns
t <sub>f</sub>		-	400 <sup>3)/100</sup> <sup>4)</sup>	-	ns
W <sub>off12</sub> <sup>5)</sup>		-	3 <sup>4)</sup>	-	mWs
W <sub>off23</sub> <sup>5)</sup>		-	1,5 <sup>4)</sup>	-	mWs
Inverse Diode ... 101 D					
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 50 A, V <sub>GE</sub> = 0; (T <sub>J</sub> = 125 °C)	-	1,8 (1,6)	2,4	V
t <sub>rr</sub>	T <sub>J</sub> = 25 °C <sup>2)</sup>	-	-	-	ns
	T <sub>J</sub> = 125 °C <sup>2)</sup>	-	200	-	ns
Q <sub>rr</sub>	T <sub>J</sub> = 25/125 °C <sup>2)</sup>	-	2/9	-	μC
f <sub>s</sub>	f <sub>s</sub> = t <sub>f</sub> / (t <sub>rr</sub> - t <sub>f</sub> )	-	1 <sup>2)</sup>	-	
Inverse Diode ... 121 D					
V <sub>F</sub> = V <sub>EC</sub>	I <sub>F</sub> = 50 A, V <sub>GE</sub> = 0; (T <sub>J</sub> = 125 °C)	-	2,4 (1,9)	2,9	V
t <sub>rr</sub>	T <sub>J</sub> = 25 °C <sup>2)</sup>	-	-	-	ns
	T <sub>J</sub> = 125 °C <sup>2)</sup>	-	250	-	ns
Q <sub>rr</sub>	T <sub>J</sub> = 25/125 °C <sup>2)</sup>	-	2,5/10	-	μC
f <sub>s</sub>	f <sub>s</sub> = t <sub>f</sub> / (t <sub>rr</sub> - t <sub>f</sub> )	-	1 <sup>2)</sup>	-	
Thermal Characteristics					
R <sub>thjc</sub>	per IGBT	-	-	0,31	°C/W
R <sub>thjc</sub>	per diode	-	-	0,9	°C/W
R <sub>thch</sub>	per module	-	-	0,05	°C/W

**SEMITRANS® M**  
**IGBT Modules**

- SKM 50 GB 101 D
- SKM 50 GAL 101 D <sup>6)</sup>
- SKM 50 GB 121 D
- SKM 50 GAL 121 D <sup>6)</sup>
- SKM 50 GAR 121 D <sup>6)</sup>

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**Features**

- MOS input (voltage controlled)
- N channel
- Low saturation voltage
- Very low tail current
- Low temperature sensitivity
- Breakdown proof
- High short circuit capability
- No latch-up
- Fast inverse diodes
- Isolated copper baseplate
- Large clearances and creepage distances
- UL recognized, file no. E 63 532

**Typical Applications**

- Switched mode power supplies
- DC servo and robot drives
- Self-commutated inverters
- DC choppers
- AC motor speed control
- Inductive heating
- Uninterruptible power supplies
- General power switching applications
- Electronic welders
- Pulse frequencies above 15 kHz

Cases and mechanical data see page B 6 - 102

<sup>1)</sup> T<sub>case</sub> = 25 °C, unless otherwise specified

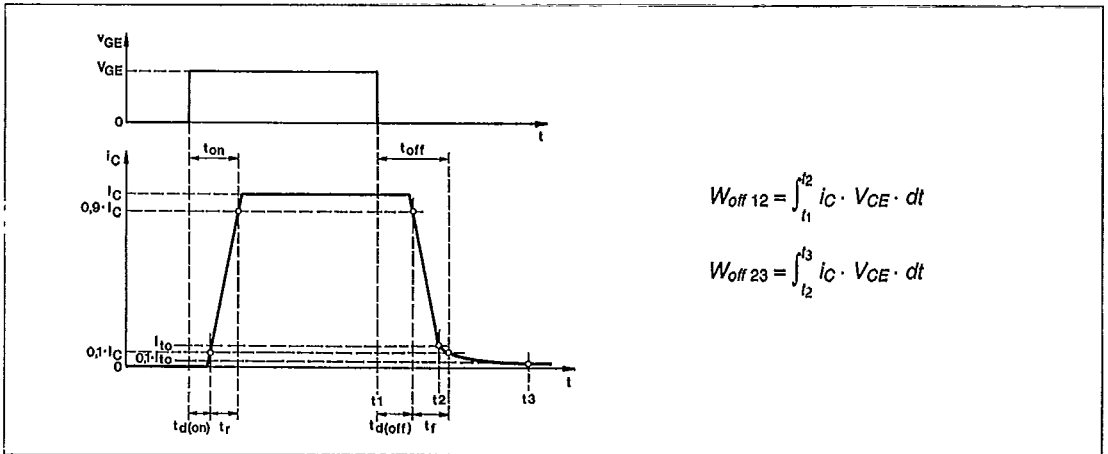
<sup>3)</sup> resistive load

<sup>4)</sup> inductive load

<sup>2)</sup> I<sub>F</sub> = - I<sub>C</sub>, V<sub>R</sub> = 600 V, - di<sub>F</sub>/dt = 800 A/μs, V<sub>GE</sub> = 0

<sup>5)</sup> see fig. 21; R<sub>Goff</sub> = 6,3 Ω

<sup>6)</sup> The free-wheeling diodes of the GAL and GAR types have the data of the inverse diodes of SKM 75 ...



$$W_{off 12} = \int_{t_1}^{t_2} i_C \cdot V_{CE} \cdot dt$$

$$W_{off 23} = \int_{t_2}^{t_3} i_C \cdot V_{CE} \cdot dt$$

Fig. 21 Switching times and turn-off energies

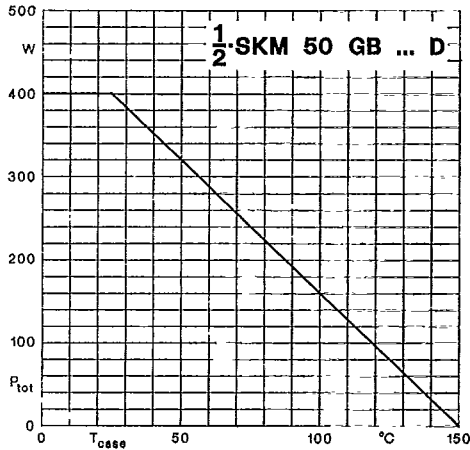


Fig. 22 Rated power dissipation vs. temperature

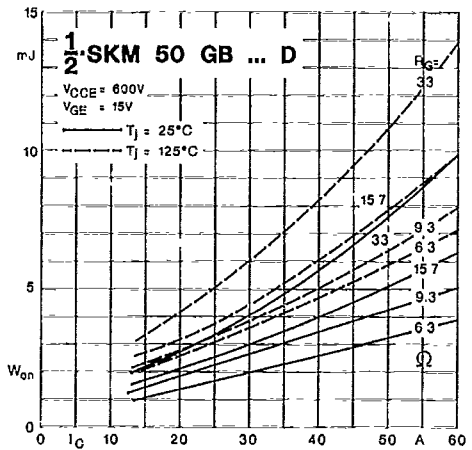


Fig. 23 Turn-on energy dissipation per pulse

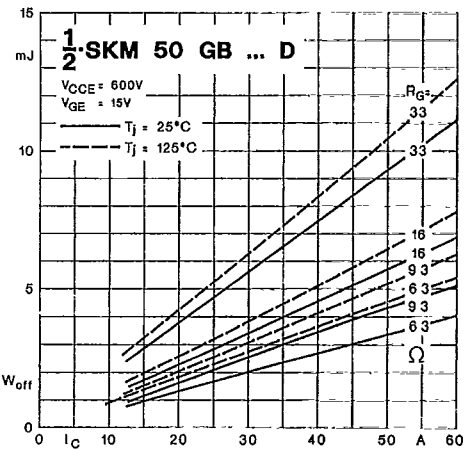


Fig. 24 Turn-off energy dissipation per pulse

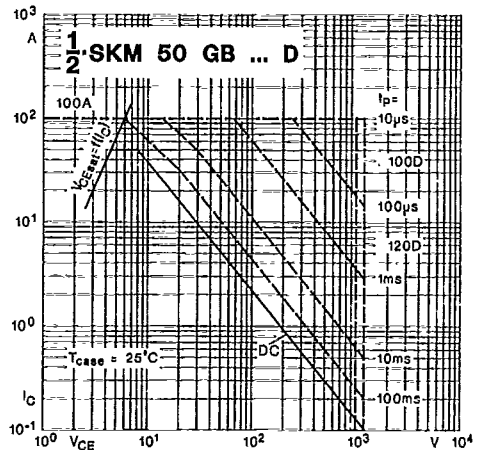


Fig. 25 Maximum safe operating area

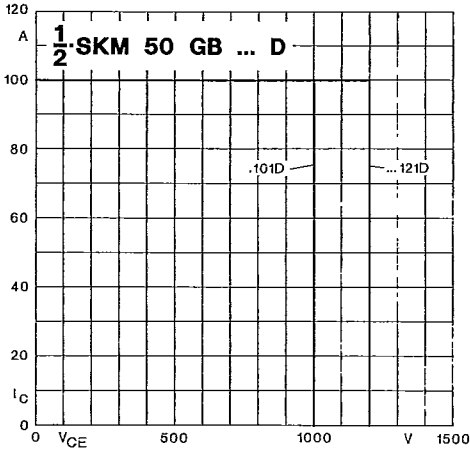


Fig. 26 Turn-off safe operating area

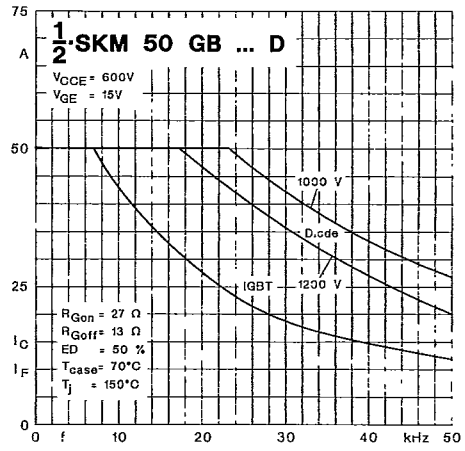


Fig. 27 Rated current vs. pulse frequency

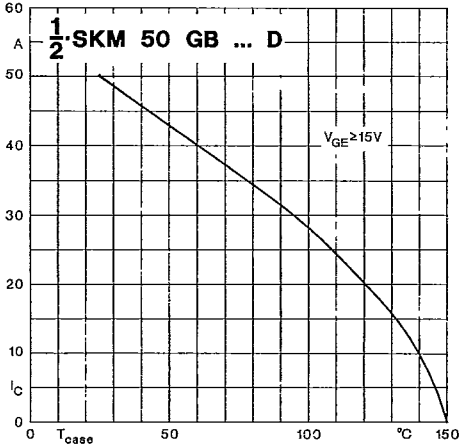


Fig. 28 Rated current vs. temperature

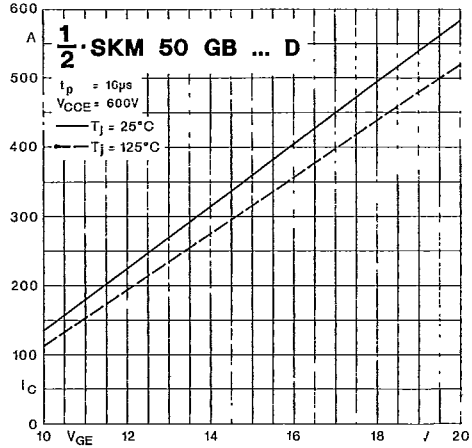


Fig. 29 Short-circuit current vs. turn-on gate voltage

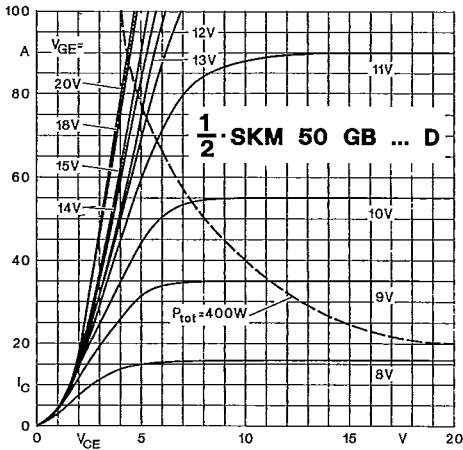


Fig. 30 Output characteristic

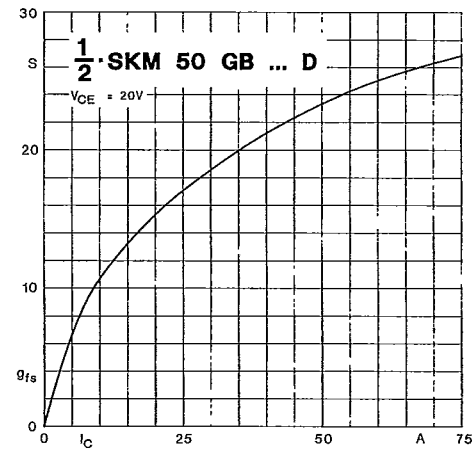


Fig. 31 Forward transconductance

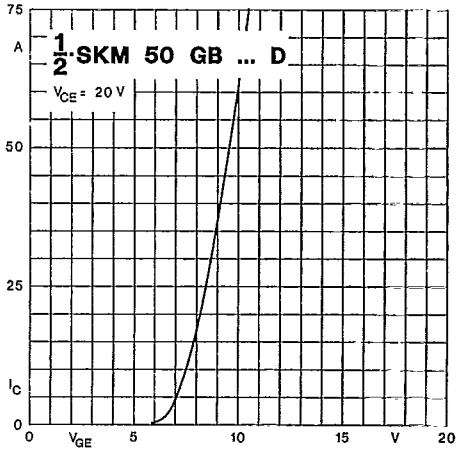


Fig. 32 Transfer characteristic

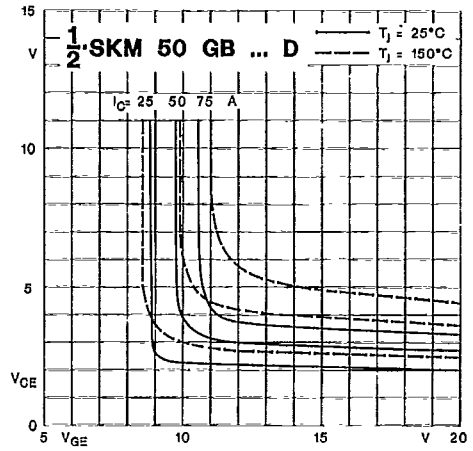


Fig. 33 Saturation characteristics

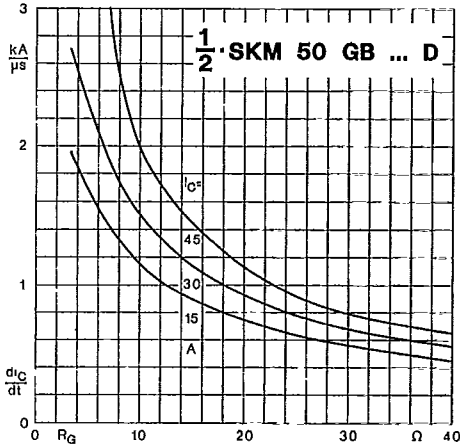


Fig. 34 Rate of rise of collector current

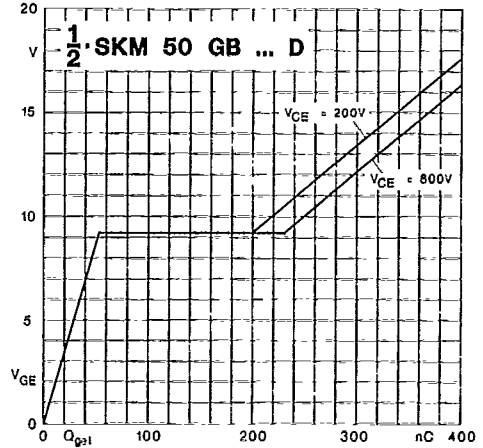


Fig. 35 Gate charge characteristic

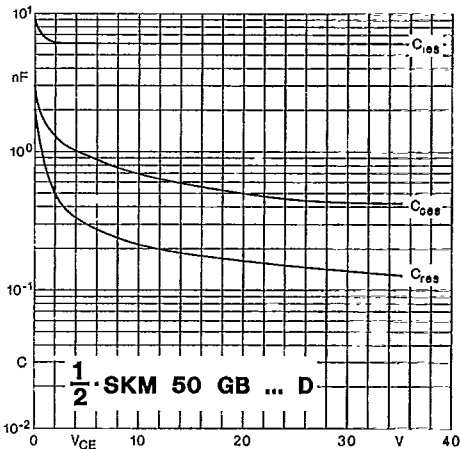


Fig. 36 Capacitances vs. collector-emitter voltage

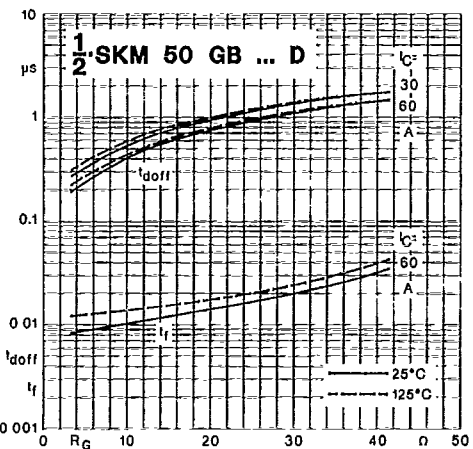


Fig. 37 Switching times vs. gate resistor

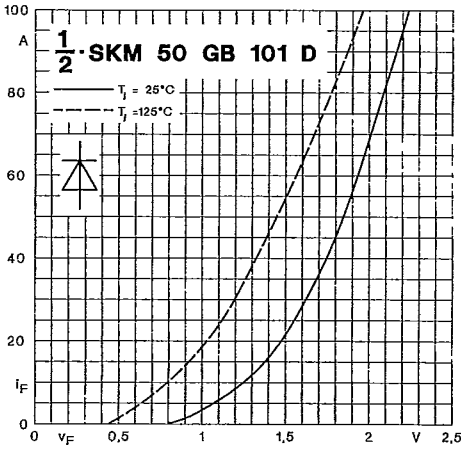


Fig. 38 a Diode forward characteristic

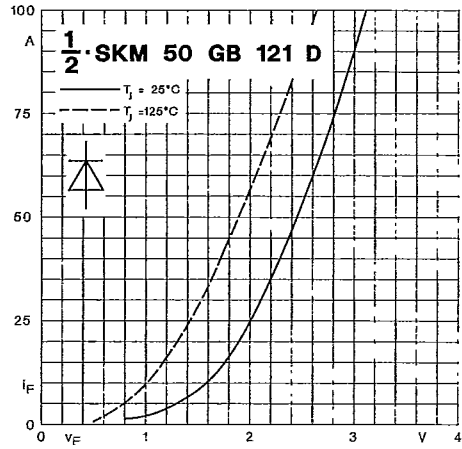


Fig. 38 b Diode forward characteristic

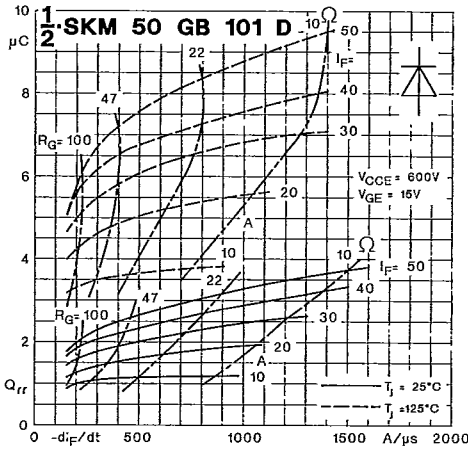


Fig. 39 a Diode recovered charge

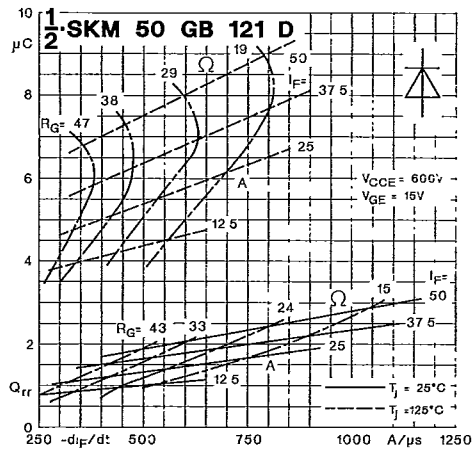


Fig. 39 b Diode recovered charge

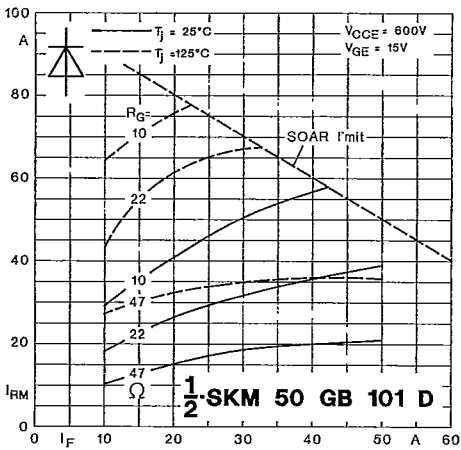


Fig. 40 a Diode peak reverse recovery current ( $I_{RM}$ )

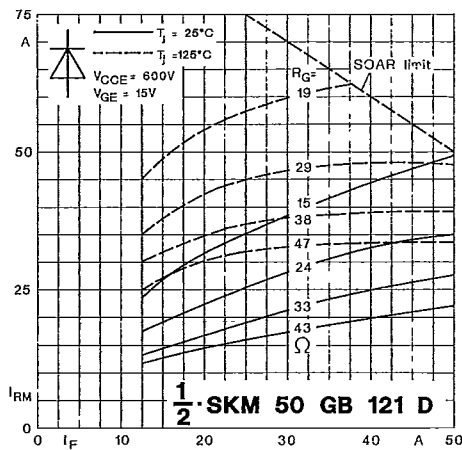


Fig. 40 b Diode peak reverse recovery current ( $I_{RM}$ )

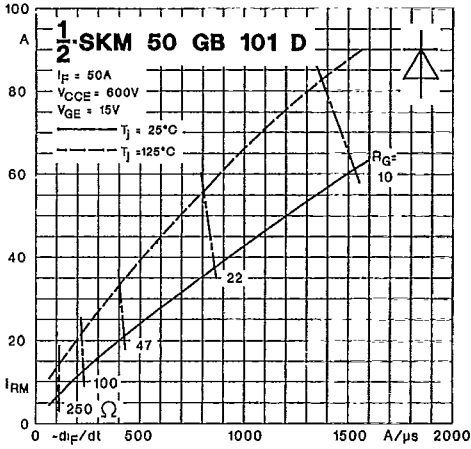


Fig. 41 a Diode peak reverse recovery current (-diF/dt)

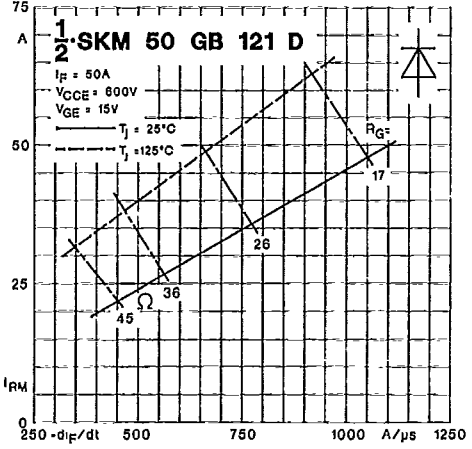


Fig. 41 b Diode peak reverse recovery current (-diF/dt)

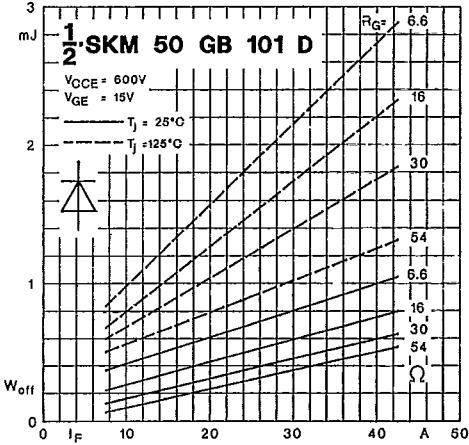


Fig. 42 a Diode turn-off energy dissipation per pulse

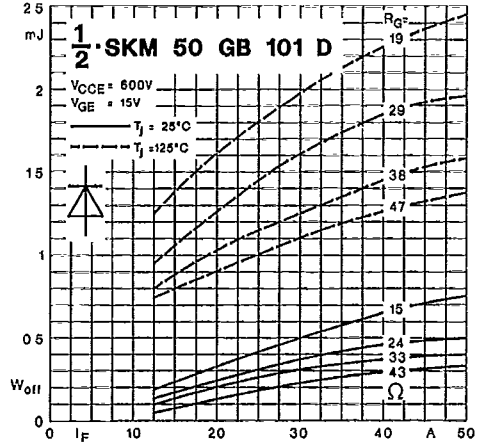


Fig. 42 b Diode turn-off energy dissipation per pulse

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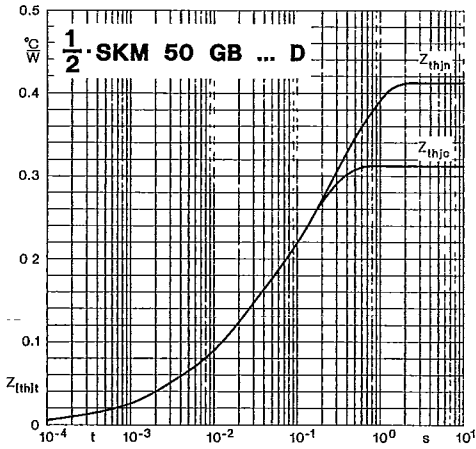


Fig. 51 Transient thermal impedance

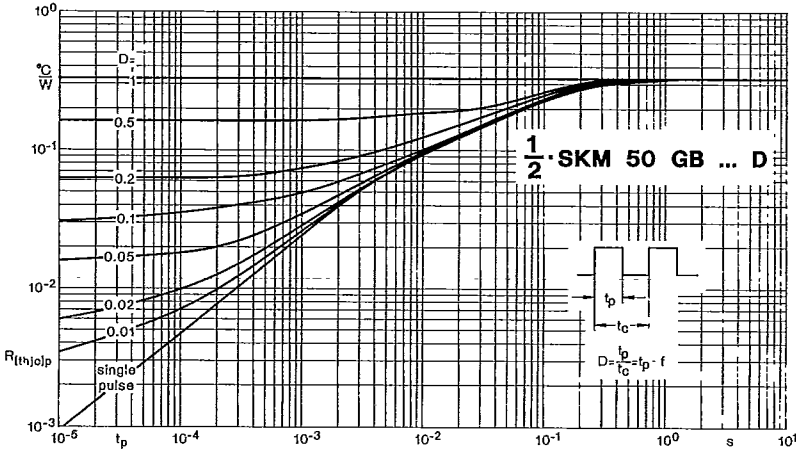


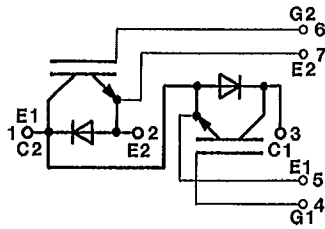
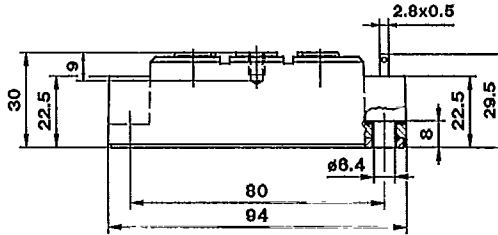
Fig. 52 Thermal impedance under pulse conditions

SKM 50 GB 101 D

SKM 50 GB 121 D

Case D 27

UL recognized, file no. E 63 532

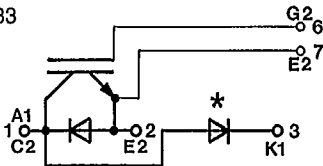


Dimensions in mm

SKM 50 GAL 101 D

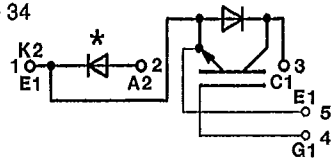
SKM 50 GAL 121 D

Case D 33



SKM 50 GAR 121 D

Case D 34



Mechanical Data		Values			Units
Symbol	Conditions	min.	typ.	max.	
M <sub>1</sub>	to heatsink, SI Units	3	—	6	Nm
	to heatsink, US Units	27	—	53	lb.in.
M <sub>2</sub>	for terminals, SI Units	2,5	—	5	Nm
	for terminals US Units	22	—	44	lb.in.
a		—	—	5x9,81	m/s <sup>2</sup>
w		—	—	250	g

This is an electrostatic discharge sensitive device (ESDS). Please observe the international standard IEC 747-1, Chapter IX.

\*The free-wheeling diode has the data of the inverse diode of SKM 75 ...