SEMIKRON

T-33-15

Absolute Maximum Ratings			
Symbol	Conditions [1]	Values	Units
V_{CES}		1000	V
V_{CGR}	R_{GE} = 20 kΩ	1000	V
I_C	T_{case} = 70 °C	50	A
I_{CM}	T_{case} = 70 °C	100	A
V_{GES}		± 20	V
P_{tot}	per IGBT, T_{case} = 25 °C	400	W
T_j, T_{stg}		−55 ... +150	°C
V_{isol}	AC, 1 min, 200 µA	2500	V
humidity	DIN 40 040	Class F	
climate	DIN IEC 68 T.1	55/150/56	
Inverse Diode, Free-Wheeling Diode			
I_F = −I_C	T_{case} = 70 °C	50	A
I_{FM} = −I_{CM}	T_{case} = 70 °C	100	A

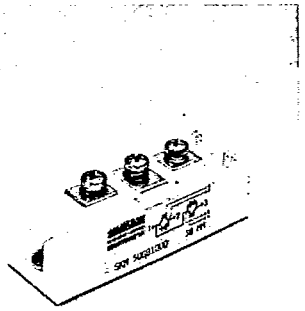
Characteristics					
Symbol	Conditions [1]	min.	typ.	max.	Units
$V_{(BR)CES}$	V_{GE} = 0, I_C = 1 mA	1000	–	–	V
$V_{GE(th)}$	V_{GE} = V_{CE}, I_C = 4 mA	4,5	5,5	7	V
I_{CES}	V_{GE} = 0, T_j = 25 °C	–	0,01	1	mA
	V_{CE} = 1000 V, T_j = 125 °C	–	–	4	mA
I_{GES}	V_{GE} = 20 V, V_{CE} = 0	–	–	100	nA
V_{CEsat}	V_{GE} = 15 V, I_C = 50 A	–	3,5	5	V
g_{fs}	V_{CE} = 20 V, I_C = 50 A	22	28	–	S
C_{CHC}	per IGBT	–	–	100	pF
C_{ies}	V_{GE} = 0; V_{CE} = 25 V	–	16	–	nF
C_{oes}	f = 1 MHz	–	640	–	pF
C_{res}		–	200	–	pF
L_{CE}		–	–	20	nH
$t_{d(on)}$	V_{CC} = 600 V	–	100 [3]	–	ns
t_r	I_C = 50 A	–	300 [3]	–	ns
$t_{d(off)}$	V_{GE} = 15 V	–	400 [3] / 400 [4]	–	ns
t_f	R_{Gon} = R_{Goff} = 3,3 Ω	–	500 [3] / 250 [4]	–	ns
$W_{off\,12}$	T_j = 125 °C	–	0,9 [4]	–	mWs
$W_{off\,23}$	see fig. 21	–	1,3 [4]	–	mWs
Inverse Diode, Free-Wheeling Diode					
V_{EC}	I_F = 50 A, V_{GE} = 0; (T_j = 125 °C)	–	1,8 (1,6)	–	V
t_{rr}	T_j = 25 °C [2]	–	–	–	ns
	T_j = 125 °C [2]	–	200	–	ns
Q_{rr}	T_j = 25/125 °C [2]	–	2/9	–	µC
I_{RRM}	T_j = 25/125 °C [2]	–	–	–	A
Thermal Characteristics					
R_{thjc}	per IGBT	–	–	0,31	°C/W
R_{thjc}	per diode	–	–	1,0	°C/W
R_{thch}	per module	–	–	0,05	°C/W

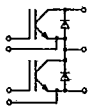
Mechanical Data						
M_1	to heatsink, SI Units		4	–	6	Nm
	to heatsink, US Units		35	–	53	lb.in.
M_2	for terminals, SI Units		2,5	–	3,5	Nm
	for terminals, US Units		22	–	24	lb.in.
a			–	–	5x9,81	m/s^2
w			–	–	250	g
Case	→ page B 6 – 103	GAL		D 33		
		GB		D 27		

SEMITRANS® M
IGBT Modules

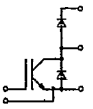
SKM 50 GB 100 D
SKM 50 GAL 100 D

Preliminary Data





GB



GAL

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
- Electronic welders
- General power switching applications
- Pulse frequencies above 15 kHz

IGBT – Insulated Gate Bipolar Transistor

1) T_{case} = 25 °C, unless otherwise specified
2) I_F = −I_C, V_R = 600 V, −di_F/dt = 800 A/µs, V_{GE} = 0
3) resistive load
4) inductive load

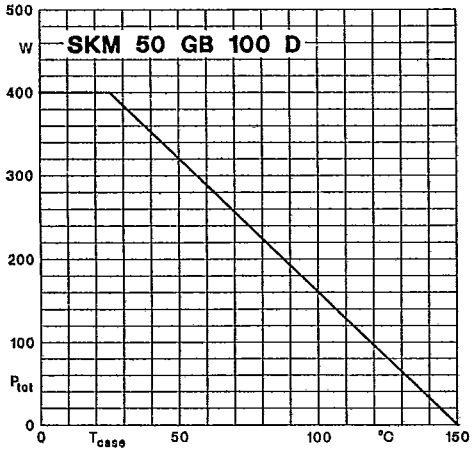


Fig. 1 Rated power dissipation vs. temperature

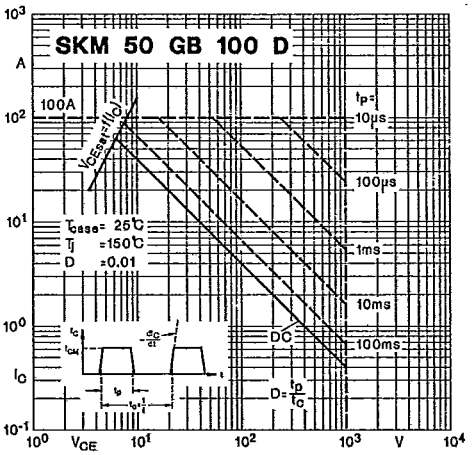


Fig. 2 Maximum safe operating area

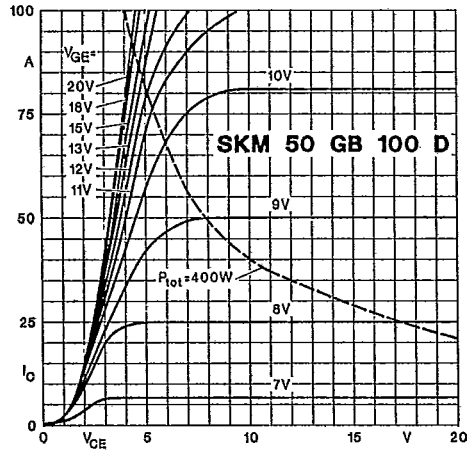


Fig. 15 Output characteristic

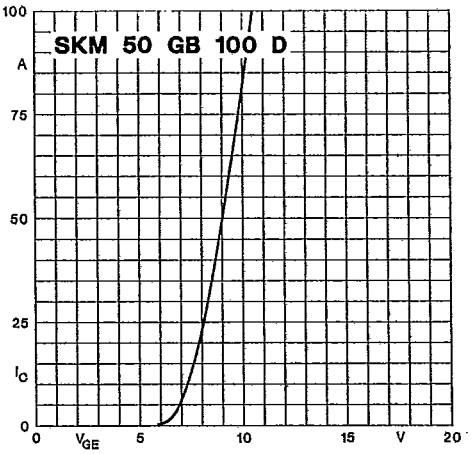


Fig. 16 Transfer characteristic

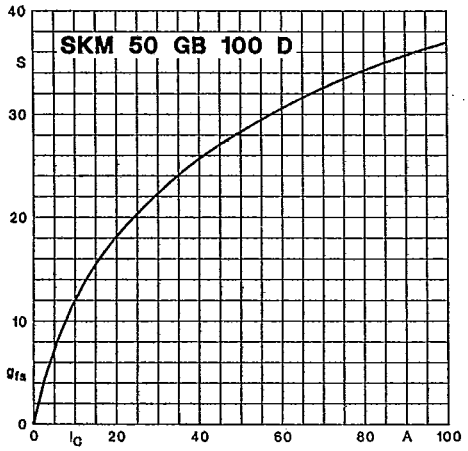


Fig. 17 Forward transconductance

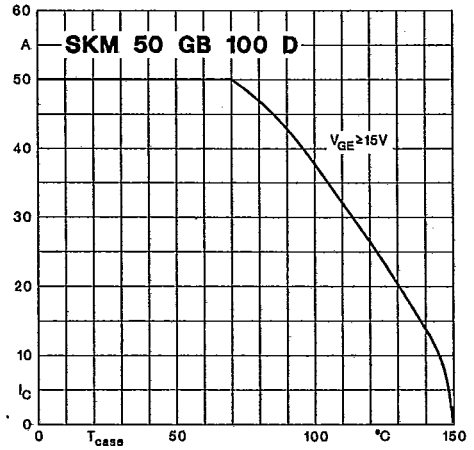


Fig. 18 Rated current vs. temperature

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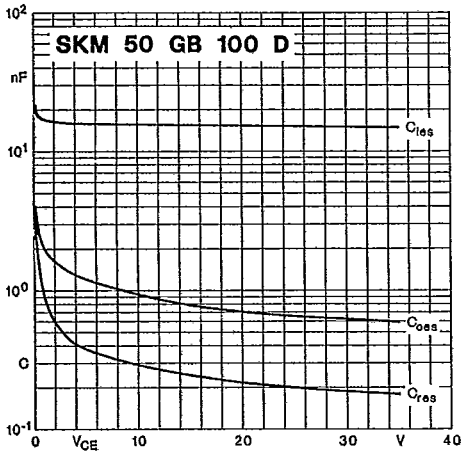
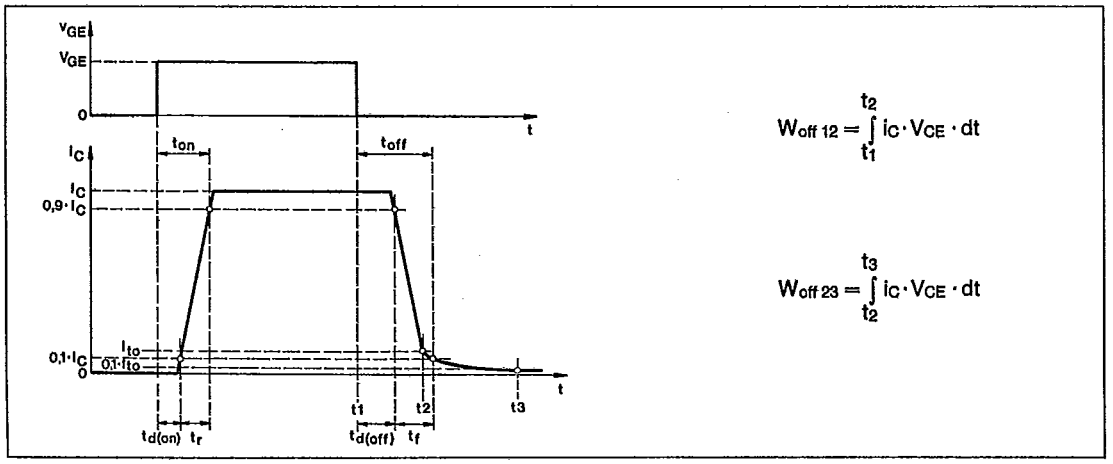


Fig. 19 Capacitances vs. collector-emitter voltage

Fig. 20 Gate charge characteristic

Fig. 11 Diode forward characteristic

Fig. 12 Diode recovered charge



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

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

Fig. 21 Switching times and turn-off energies

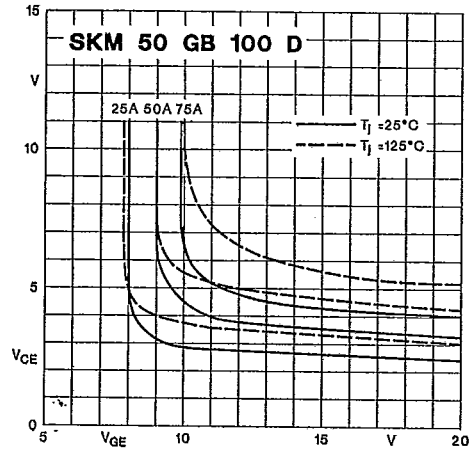


Fig. 22 Saturation characteristics

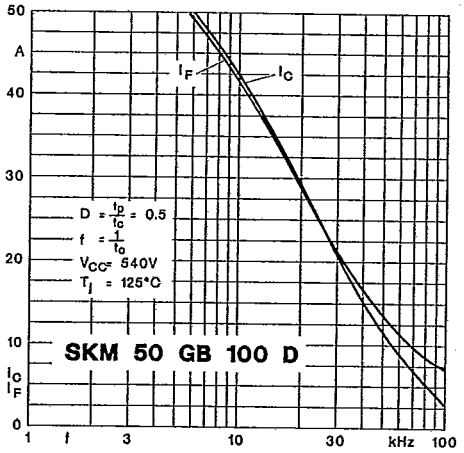


Fig. 23 Current ratings vs. pulse frequency

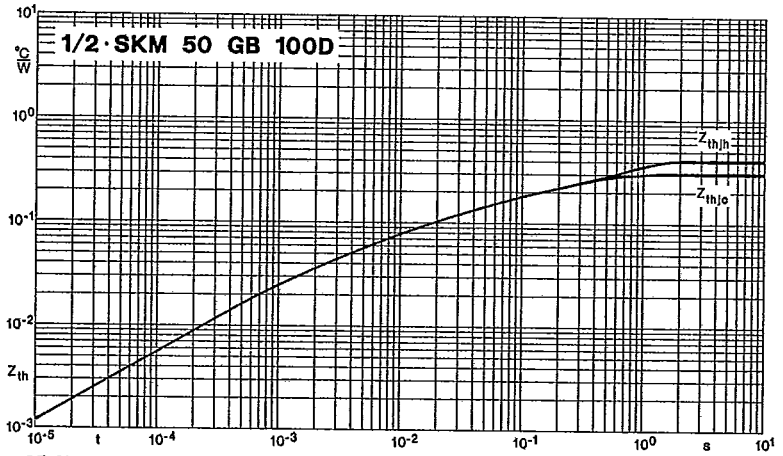


Fig. 25 Transient thermal impedance

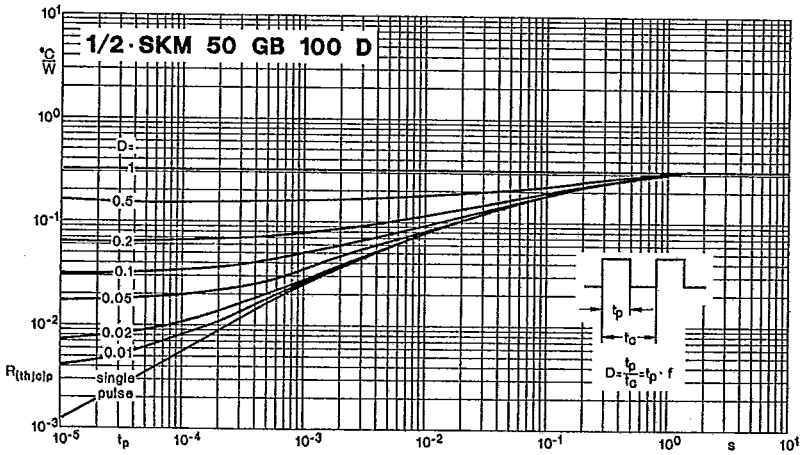


Fig. 26 Thermal impedance under pulse conditions